

# Moab Accounting Manager

## Administrator Guide 10.0.0

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## Chapter 1: Overview

### Welcome to *Moab Accounting Manager 10.0.0 Administrator Guide*

This guide is intended as a reference for system administrators.

Moab Accounting Manager is an accounting management system that allows for usage tracking, charge accounting, and allocation enforcements for resource usage in technical computing environments. It acts somewhat like a bank where credits are deposited into funds with constraints designating which entities can access the funds. As resources or services are utilized, funds are charged and usage recorded. It supports familiar operations such as deposits, withdrawals, transfers, and refunds. It provides balance and usage feedback to users, managers, and system administrators.

Since the accounting and billing models vary widely from organization to organization, Moab Accounting Manager has been designed to be extremely flexible, featuring customizable usage and fund configurations, and supporting a variety of tracking, charging and allocation models. Attention has been given to scalability, security, and fault tolerance.

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## 1.1 Background

Moab Accounting Manager was originally developed as open source software called the Gold Allocation Manager at Pacific Northwest National Laboratory (PNNL) under the Department of Energy (DOE) Scalable Systems Software (SSS) SciDAC project. It has been extended and enhanced by Adaptive Computing Enterprises, Inc. (formerly Cluster Resources, Inc.) and is in production use at many commercial, government and educational sites.

## 1.2 Conceptual Overview

Moab Accounting Manager was designed to be used in technical computing environments for usage tracking, charge accounting and allocation enforcement. Usage tracking involves [resource usage in customizable usage records](#). Charge accounting involves calculating and recording charges for usage for invoicing or cost tracking. Allocation enforcement involves establishing limits on the use of system resources by defining separate funds having limited debit or credit balances.

In this overview, we will assume that you want to track or charge for workload resource usage. The use of resources by a job or reservation may result in a usage record. The usage record tracks the resources that were used, whom they were used by, and (optionally) how much the usage cost.

With Moab Accounting Manager, it is possible to allocate resource credits to various parties. This is done by associating a cost for the usage by deciding on a currency unit (generically referred to as credits), whether based on a real currency such as dollars, or a reference currency such as billing units or processor seconds. Next you will define charge rates in this currency for the components of your usage (consumable resource costs, multipliers, fees, etc.). You can create pools of funds called allocations via deposits that can be debit- or credit-based, finite or infinite, and limited to a time frame when they can be used. These allocations are deposited into logical containers called funds, which have constraints that distinguish the conditions under which the funds can be used.

Moab Workload Manager interacts with Moab Accounting Manager to ensure sufficient funds and to track and charge for usage. A typical usage pattern might be as follows. When a job is submitted, a quote is obtained to see how much it will cost and to verify that you have sufficient funds. When it is time for the job to start, a lien (or hold) is placed against your funds for the amount of the requested resources. When the job ends, the appropriate fund is debited and the lien is removed. A usage record is updated with the charge amount and job usage details. The actual composition of the interactions is very flexible and will be defined by the accounting mode and interaction methods.

## 1.3 Features

Feature	Description
<b>Dynamic Charging</b>	Rather than post-processing resource usage records on a periodic basis to rectify fund balances, charging can occur incrementally throughout usage or at usage completion.
<b>Liens</b>	A hold (called a lien) is placed against the funds for the estimated amount of credits before the usage begins, followed by appropriate charges during and/or at the end of the usage, thereby preventing accounts from using more resources or services than were allocated to them.
<b>Customizable Usage Records</b>	Usage record fields can be configured by the site to track custom usage properties.
<b>Flexible Fund Allocation</b>	A uniquely flexible design allows resource or service credits to be allocated to arbitrary entities and purposes.
<b>Expiring Allocations</b>	Credits can be restricted for use within a designated time period allowing sites to implement a use-it-or-lose-it policy to prevent year-end resource exhaustion and establishing an allocation cycle.
<b>Flexible Charging</b>	The billing system can track and charge for composite time-based or non-time-based resource or service usage, and apply flexible charge multipliers and fees.
<b>Guaranteed Quotes</b>	Users and resource brokers can determine ahead of time the cost of using resources or services.
<b>Credit and Debit Allocations</b>	Allocations feature an optional credit limit allowing support for both debit and credit models. This feature can also be used to enable overdraft protection for specific funds.
<b>Infinite Allocations</b>	Deposits can be made with infinite amounts or infinite credit limits when used with a supporting database.
<b>Powerful Querying</b>	A powerful querying and update mechanism (based on SQL queries) that facilitates flexible reporting and streamlines administrative tasks.
<b>Nonintrusiveness</b>	Object-level, attribute-level and correlated defaults can be established for arbitrary objects such as users, accounts and organizations. Additionally, these objects can be configured to be automatically created

Feature	Description
	the first time they are seen by the resource management system. These features allow the accounting system to be used with less impact and involvement from users and administrators.
<b>Consistency</b>	Moab Accounting Manager has been engineered for robustness, consistency and resiliency. Complex operations are atomic and are automatically rolled back on failure.
<b>Security</b>	Multiple security mechanisms for strong authentication and encryption.
<b>Role-Based Authorization</b>	Fine-grained (instance-level) Role Based Access Controls are provided for all operations, which allows users to view and manipulate only those objects permitted to them.
<b>Dynamic Customization</b>	Sites can create or modify record types on the fly enabling them to meet their custom accounting needs. Dynamic object creation allows sites to customize the types of accounting data they collect without modifying the code. This capability turns this system into a generalized information service. This capability is extremely powerful and can be used to manage all varieties of custom configuration data, or to function as a persistence interface for other components.
<b>Web Interface</b>	A powerful dynamic web-based GUI is provided for easy remote access for users, managers and administrators, which displays only the actions allowed by their role.
<b>Journaling</b>	A journaling mechanism preserves the indefinite historical state of all objects and records. This powerful mechanism allows historical bank statements to be generated, provides an undo/redo capability and allows commands to be run as if it were any arbitrary time in the past.
<b>Event Scheduler</b>	An event engine can be used to schedule arbitrary Moab Accounting Manager commands to run periodically or at a designated time in the future.

## 1.4 Interfaces

Moab Accounting Manager provides a variety of means of interaction, including command-line interfaces, graphical user interfaces, application programming interfaces, and communication protocols.

### In this topic:

- [1.4.1 Command-Line Clients - page 21](#)
- [1.4.2 Interactive Control Program - page 21](#)
- [1.4.3 Web-Based Graphical User Interface - page 22](#)
- [1.4.4 Perl API - page 22](#)
- [1.4.5 Java API \(no longer supported\) - page 22](#)
- [1.4.6 SSSRMAP Wire Protocol - page 22](#)

### 1.4.1 Command-Line Clients

The command-line clients provided feature rich argument sets and built-in documentation. These commands allow scripting and are the preferred way to interact with Moab Accounting Manager for basic usage and administration. Use the `--help` option for usage information or the `--man` option for a manual page on any command.

*Example 1-1: Listing Users Using a Command-Line Client*

```
mam-list-users
```

### 1.4.2 Interactive Control Program

The `mam-shell` command uses a control language to issue object-oriented requests to the server and display the results. The commands can be included directly as command-line arguments or read from stdin. Use the `ShowUsage:=True` option after a valid Object Action combination for usage information on the command.

*Example 1-2: Listing Users Using the mam-shell Control Program*

```
mam-shell User Query
```



The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. Do not use this command unless you understand the syntax and the potential for unintended results.

### 1.4.3 Web-Based Graphical User Interface

A powerful and easy-to-use web-based GUI permits browser access by users, managers and administrators according to their role definitions.

*Example 1-3: Listing Users via the Web GUI*

Click on Manage Users -> List Users

### 1.4.4 Perl API

You can access the full functionality via the Perl API. Use perldoc to obtain usage information for the Moab Accounting Manager Perl MAM modules.

*Example 1-4: Listing Users Using the Perl API*

```
use MAM;
my $request = new MAM::Request(object => "User", action => "Query");
my $response = $request->getResponse();
foreach my $datum ($response->getData())
{
    print $datum->toString(), "\n";
}
```

### 1.4.5 Java API (no longer supported)

**i** Beginning with Moab Accounting Manager 9.0, Java API is no longer supported, use Perl API instead.

### 1.4.6 SSSRMAP Wire Protocol

It is also possible to interact with Moab Accounting Manager by directly using the SSSRMAP Wire Protocol and Message Format over the network.

*Example 1-5: Listing Users via the SSSRMAP Wire Protocol*

```
POST /SSSRMAP HTTP/1.1
Content-Type: text/xml; charset="utf-8"
Transfer-Encoding: chunked
190
<?xml version="1.0" encoding="UTF-8"?>
<Envelope>
  <Body actor="scottmo" chunking="True">
    <Request action="Query" object="User"></Request>
  </Body>
  <Signature>
    <DigestValue>azu4obZswzBt89OgATukBeLyt6Y=</DigestValue>
```

```
<SignatureValue>YXE/C08XX3RX4PMU1bWju+5/E5M=</SignatureValue>  
<SecurityToken type="Symmetric" name="scottmo"></SecurityToken>  
</Signature>  
</Envelope>  
0
```

## 1.5 License

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In this topic:

[1.5.1 Moab Accounting Manager License - page 23](#)

[1.5.2 BSD License - page 23](#)

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## Chapter 2: Initial Setup

After installation, you will need to perform certain steps to prepare Moab Accounting Manager to fulfill its desired role in your environment.

Moab Accounting Manager can be configured for a myriad of use cases. It can be used in different accounting modes such as for usage tracking, notional charging, or allocation enforcement. This chapter will walk you through the steps you need to take to integrate and initialize the accounting manager.

In this chapter:

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2.2 Integrate Moab Accounting Manager With Your Resource Manager .....	26
2.3 Follow the Setup Guide for Your Selected Accounting Mode .....	26

### 2.1 Select an Appropriate Accounting Mode

Moab Accounting Manager can be configured to be used in a variety of different accounting modes. Some sites might want to create and enforce resource usage limits through allocations. Others might want to impute a charge amount to their workload, but never deny workload based on availability of funds. Still others might not want to calculate a charge at all, but simply record the usage details of the workload. Select the accounting mode from the following options that best matches your requirements:

- **strict-allocation** - Use this mode if you want to strictly enforce allocation limits. Under this mode, you can prevent workload from running if the end-users do not have sufficient funds. Funds, allocations, quotes, liens, charge rates, and usage records support this mode. Before a job runs, MAM places a lien (or hold) against the user's funds to prevent overcommitment of their allocation. When a job completes, MAM removes the lien, debits the user's allocation, and records the workload usage details and charge in a usage record. This is the normal default.
- **fast-allocation** - Use this mode if you want to debit allocations but need higher throughput by eliminating the lien and quote of strict-allocation mode. If you implement it properly through scripts, you can replace the lien and quote of strict-allocation mode with an asynchronous balance check, causing MAM to disable the accounts from further use after the first job that causes the fund to become negative. Funds, allocations, balance checks, charge rates and usage records support this mode.

- **notional-charging** - Use this mode if you want to calculate and record charges for workload usage but not keep track of fund balances or allocation limits. Charge rates and usage records support this mode. The workload usage details and charge are recorded in a usage record.
- **usage-tracking** - Use this mode if you want to simply record workload usage details but not to calculate a charge or keep track of fund balances or allocation limits. Usage records support this mode.

Refer to the corresponding setup guide to prepare Moab Accounting Manager and Moab Workload Manager for your selected accounting mode. See [Follow the Setup Guide for Your Selected Accounting Mode](#).

## 2.2 Integrate Moab Accounting Manager With Your Resource Manager

If you have not already done so, you will need to integrate with your resource management system. See [Integration](#).

## 2.3 Follow the Setup Guide for Your Selected Accounting Mode

Refer to the appropriate setup guide to prepare Moab Accounting Manager and your resource manager for your selected accounting mode:

- strict-allocation - See [Strict Allocation Setup Guide](#)
- fast-allocation - See [Fast Allocation Setup Guide](#)
- notional-charging - See [Notional Charging Setup Guide](#)
- usage-tracking - See [Usage Tracking Setup Guide](#)

## Chapter 3: Strict Allocation Setup Guide

This chapter will walk you through the typical steps needed to set up Moab Workload Manager and Moab Accounting Manager to use the strict allocation accounting mode.

With the strict allocation accounting mode, you can establish rigorous limits on the use of compute resources by your various parties. This is done by associating a cost for the usage by deciding on a currency unit, generically referred to as credits, whether based on a real currency such as dollars, or a reference currency such as billing units or processor-seconds, and then creating charge rates based on this currency. Funds are established to contain credit allocations attributed to specific accounts. Users are designated as members of the accounts. Deposits are made into funds associated with the accounts creating allocations. An allocation cycle can be established whereby allocations are considered for renewal on a regular periodic basis (such as yearly, quarterly or monthly).

Before a job is started, Moab Workload Manager will verify that the user has sufficient credits to run the job by attempting to place a hold against their funds (referred to as a lien). When a job completes, the user's funds will be debited via a charge, usage information will be recorded for the job and the lien will be removed. Users or managers can query the status of their allocations or details of their job charges and resource utilization.



You will need to be a Moab Accounting Manager System Administrator to perform many of the tasks in this chapter. It is assumed that you have already installed Moab Workload Manager and installed, bootstrapped, and started Moab Accounting Manager before performing the steps discussed in this chapter.



For testing or demo purposes, an initialization script is available that provides a similar affect to running the example commands in this chapter to minimally set up MAM for the strict-allocation accounting mode with a small amount of dummy sample data. It will not perform the Moab configuration steps described in this chapter. It can be cleaned up by running the `hpc-cleanup.sh` script.

```
$ ./hpc-strict-allocation.sh
```

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## 3.1 Set the Strict Allocation Accounting Mode

Set the `AMCFG[mam] MODE` parameter to `strict-allocation` in `moab.cfg` and set the `accounting.mode` parameter to `strict-allocation` in both the `mam-server.conf` and `mam-client.conf` files. Since strict allocation is the default accounting mode in both Moab Workload Manager and Moab Accounting Manager, it may not be necessary to do anything here unless you were previously using a different accounting mode.

*Example 3-1: Setting the Accounting Mode to strict-allocation*

`AMCFG[] MODE` parameter must be set in the Moab server configuration file (`moab.cfg`). After editing the `moab.cfg` file, you will need to restart `moab`.

```
# vi /opt/moab/etc/moab.cfg
AMCFG[mam] MODE=strict-allocation

# systemctl restart moab.service
```

The `accounting.mode` parameter must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). After editing the `mam-server.conf` file, you will need to restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
accounting.mode = strict-allocation

$ vi /opt/mam/etc/mam-client.conf
accounting.mode = strict-allocation
```

```
# systemctl restart mam.service
```

## 3.2 Decide on a Currency and Set the Currency Precision

Since we will be calculating charges, we will need to decide which currency unit a MAM credit represents and set the currency precision accordingly. For this example we will define a currency where one credit represents the value of using one processor core for one hour. We will assume for simplicity that a processor-hour on one machine will have the same value as a processor-hour on another machine. Charge rates will be specified relative to this currency unit. Monetary transactions such as deposits and charges will be specified in terms of this currency. Since we want to be able to track and account for short jobs, we will specify a currency precision of two so that our currency credits will be represented as a floating point number with two decimal places. If instead we used processor-seconds as the currency base, we would want to set the `currency.precision` value to zero since processor seconds can easily be represented as an integer with no decimal places. If we used dollars as the currency base, we would have set the `currency.precision` value to two.

*Example 3-2: Setting the Currency Precision to Two*

The currency precision value must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). It must also be set in the GUI configuration file (`mam-gui.conf`) if you will be using the web GUI. If you make changes in `mam-server.conf`, you must restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
currency.precision = 2
$ vi /opt/mam/etc/mam-client.conf
currency.precision = 2
# systemctl restart mam.service
```

## 3.3 Customize the Usage Record

The usage properties that you can track are limited by the properties sent by your resource manager to MAM. You can customize the usage record by adding additional properties for which you would like to track.

See [14.9 Customizing the Usage Record Object - page 114](#) for information on customizing the properties tracked in the usage record. If you are using Moab Workload Manager, see

'Accounting Properties Reported to Moab Accounting Manager' in the *Moab Workload Manager Administrator Guide* for the list of usage record properties included with the accounting calls to MAM.

## 3.4 Define Charge Rates

Since we are charging, we must establish the charge rates for the usage. In our example, we will define a charge rate that charges 1 credit for each processor-hour utilized by the job. See [Managing Charge Rates](#) for more detailed information on setting up charge rates.

*Example 3-3: Define a Charge Rate for Processors*

```
$ mam-create-chargerate -n Processors -z 1/h -d "1 credit per processor-hour"
Successfully created 1 charge rate

$ mam-list-chargerates
```

Name	Value	Amount	Description
Processors	1/h	1	credit per processor-hour

## 3.5 Define Accounts

Next we will define some accounts and assign users to the accounts. We will also associate each account with an organization so that usage reports can be generated for the organization level, as well as the account and user level. We will create accounts for biology, chemistry, and film and assign them some users. The biology and chemistry account will be associated with the sciences organization, while the film account will be associated with the arts organization. See [Managing Accounts](#) for more information on setting up accounts.

*Example 3-4: Define the Biology, Chemistry, and Film Accounts*

```
$ mam-create-account -a biology -o sciences -u amy,bob -d "Biology Department"
Successfully created 1 account

$ mam-create-account -a chemistry -o sciences -u amy,dave -d "Chemistry Department"
Successfully created 1 account

$ mam-create-account -a film -o arts -u bob,dave -d "Film Department"
Successfully created 1 account

$ mam-list-accounts
```

Name	Active	Users	Organization	Description
biology	True	amy, bob	sciences	Biology Department

```
chemistry True amy, dave sciences Chemistry Department
film True bob, dave arts Film Department
```

## 3.6 Create Funds

The next task will be to create the funds that will hold the allocated credits. A fund is much like a numbered bank account, where credits can be deposited and are defined by constraints that distinguish who or what can use the contained credits and for what purposes. In this example, we will create a fund for each of the three accounts. The reason that funds are defined separately from accounts is that it is possible to create multiple funds for the same account. For example, you might have a fund that can be used for the chemistry account only when running the red cluster, and another fund that is used for the chemistry account when using a certain quality of service. See [Chapter 10: Managing Funds - page 73](#) for more detailed information on setting up funds.

In this example, we will assume that we want to establish a periodic allocation cycle with predesignated allocation amounts being deposited on a quarterly schedule. In order to facilitate this, we will associate a default deposit amount with the science funds. For the biology fund, we will configure it to make a resetting deposit for 5000 credits for each period. The chemistry fund is going to be disabled at the end of the allocation period. The film account will remain unaffected by allocation renewals. See [Chapter 11: Managing Allocations - page 88](#) for more information on periodic allocations.

### Example 3-5: Create a Fund for Each of the Three Accounts

```
$ mam-create-fund -a biology -n "biology" --default-deposit 5000
Successfully created 1 fund with id 1 and 1 constraint

$ mam-create-fund -a chemistry -n "chemistry" --default-deposit -1
Successfully created 1 fund with id 2 and 1 constraint

$ mam-create-fund -a film -n "film"
Successfully created 1 fund with id 3 and 1 constraint

$ mam-list-funds
```

ID	Name	Constraints	Allocated	Balance	DefaultDeposit	Description
1	biology	Account=biology	0.00	0.00	5000.00	
2	chemistry	Account=chemistry	0.00	0.00	-1.00	
3	film	Account=film	0.00	0.00		

## 3.7 Make Deposits

Now we need to allocate credits to these funds by making deposits to them. An allocation has a start and end time associated with it declaring the time frame when it can be used

(defaulting to a start time of the present and an end time of infinity). It can also have a credit limit that defines the extent to which the allocation is allowed to go negative. Allocations can be reset on a periodic basis or future allocations with different time frames can be pre-created within a fund to establish an allocation cycle and set expectations for credit expenditure. See [Managing Allocations](#) and [Making Deposits](#) for additional information.

In this example, we will allocate 5000 and 3000 credits to the biology and chemistry accounts respectively. The film account will be given a credit limit of 2000 credits, which allows them to charge up to 2000 credits before rectifying their fund. When making a deposit we must specify the fund we are depositing into unless the fund can be unambiguously determined by its constraint references (i.e., there is only a single fund associated with the account biology). In the next example, we will utilize the fund's deposit amount in the first deposit, specify the amount explicitly in the second deposit, and establish a credit allocation in the third deposit.

#### Example 3-6: Making Deposits

```
$ mam-deposit -a biology
Successfully deposited 5000.00 credits into fund 1
Successfully created 1 allocation

$ mam-deposit -z 3000 -a chemistry
Successfully deposited 3000.00 credits into fund 2
Successfully created 1 allocation

$ mam-deposit -L 2000 -a film
No credits were deposited into fund 3
Successfully created 1 allocation
```

Let's examine the allocations we just created and its effect on the funds:

```
$ mam-list-allocations
```

Id	Fund	StartTime	EndTime	InitialDeposit	Allocated	CreditLimit	Remaining
		PercentUsed					
1	1	2023-08-09 18:18:56	Infinity	5000.00	5000.00	0.00	5000.00
		0.00					
2	2	2023-08-09 18:18:56	Infinity	3000.00	3000.00	0.00	3000.00
		0.00					
3	3	2023-08-09 18:18:57	Infinity	0.00	0.00	2000.00	0.00
		0.00					

```
$ mam-list-funds
```

Id	Name	Constraints	Allocated	Balance	DefaultDeposit	Description
1	biology	Account=biology	5000.00	5000.00	5000.00	
2	chemistry	Account=chemistry	3000.00	3000.00	0.00	
3	film	Account=film	0.00	0.00		



## 3.8 Check the Balance

We can verify the resulting balance (see [Querying the Balance](#)).

*Example 3-7: Let's Look at Amy's Balance*

```
$ mam-balance -u amy
```

Id	Name	Balance	CreditLimit	Available
1	biology	5000.00	0.00	5000.00
1	chemistry	3000.00	0.00	3000.00

## 3.9 Automate Allocation Renewal

To facilitate the automatic renewal of our allocations, we will create a repeating event that resets all funds (see [Creating Events](#)) at the beginning of each new quarter.

*Example 3-8: Create an Automatic Allocation Renewal Event*

```
# vi /opt/mam/etc/mam-server.conf
event.scheduler = true

$ mam-server -r

$ mam-create-event --fire-command "Fund Reset" -s "2024-01-01" --rearm-period "3
months^"
Successfully created 1 event

$ mam-list-events
```

Id	FireCommand	FireTime	ArmTime	RearmPeriod	EndTime	Notify
			CatchUp	CreationTime	Description	
1	Fund Reset	2024-01-01	2023-08-09 18:21:28	3 months^		False
		True	2023-08-09 18:21:28			

## 3.10 Run a Job

Let's submit a job and examine the effects on the accounting system.

*Example 3-9: Submit a Job*

```
$ echo sleep 300 | msub -A chemistry -l procs=12,walltime=600
```

## 3.11 The Usage Lien

When a job starts, Moab Workload Manager typically creates a lien (or hold) against the appropriate allocations based on the estimated duration of the job. We will examine the effect of a running job on the accounting system (see [Managing Liens](#)).

*Example 3-10: Examine the Effect of a Running Job on the Accounting System*

```
$ mam-list-liens

Id Instance Amount StartTime           EndTime           Duration UsageRecord Funds
Description
-----
1 74          2.00 2023-08-09 18:22:42 2023-08-09 18:22:42 600      1          2
```

This lien will decrease our available balance by the amount reserved:

```
$ mam-balance -u amy -a chemistry

Id Name      Balance Reserved Effective CreditLimit Available
-----
2  chemistry 3000.00     2.00  2998.00     0.00  2998.00
```

The actual allocation has not changed:

```
$ mam-list-allocations -a chemistry

Id Fund      Active StartTime           EndTime Amount CreditLimit Deposited
Description
-----
2  2          True  2023-08-09 18:18:56 Infinity 3000.00 0.00 3000.00
```

Note that the lien resulted in the initial creation of a usage record for the job with Stage Start:

```
$ mam-list-usagerecords

Id Type Instance Charge Stage User Group Account Organization Class
QualityOfService Machine Nodes Processors CPUTime Memory Duration StartTime EndTime
Description
-----
1 Job 74          0.00 Start amy faculty chemistry sciences batch normal
colony 1 12          0
```

## 3.12 The Usage Charge

After a job completes, any associated liens are removed and a charge is issued against the appropriate allocations based on the resources and actual wallclock time used by the job. An allocation is debited and the usage record is modified with the charge and usage information.

*Example 3-11: Examine the Effect of a Completed Job on the Accounting System*

Your allocation will now have gone down by the amount of the charge:

```
$ mam-list-allocations -u amy -a chemistry
```

Id	Fund	StartTime	EndTime	InitialDeposit	Allocated	CreditLimit	Remaining
2	2	2023-08-09 18:18:56	Infinity	3000.00	3000.00	0.00	2999.00
		0.03					

However, your balance actually goes up (because the lien that was removed was larger than the actual charge):

```
$ mam-balance -u amy -a chemistry
```

Id	Name	Balance	Reserved	Effective	CreditLimit	Available
2	chemistry	2999.00	0.00	2999.00	0.00	2999.00

A usage record for the job was updated as a side-effect of the charge. See [14.2 Querying Usage Records - page 107](#).

```
$ mam-list-usagerecords
```

Id	Type	Instance	Charge	Stage	User	Group	Account	Organization	Class
QualityOfService	Machine	Nodes	Processors	CPUTime	Memory	Duration	StartTime	EndTime	Description
1	Job	74	1.00	End	amy	faculty	chemistry	sciences	batch normal
	colony	1	12				300	2023-08-09 18:22:42	2023-08-09 18:27:42

## 3.13 Usage Refund

Now, we will illustrate the effect of issuing a refund for the user's job. For more information, see [Issuing Usage Refunds](#).

**Example 3-12: Refund the Job**

```
$ mam-refund -J 74
Successfully refunded 1.00 credits to usage record 1 for instance 74
```

Our balance is back as it was before the job ran:

```
$ mam-balance -u amy -a chemistry

Id Name      Balance Reserved Effective CreditLimit Available
-----
2  chemistry 3000.00      0.00   3000.00      0.00   3000.00
```

The allocation, of course, is likewise restored:

```
$ mam-list-allocations -u amy -a chemistry

Id Fund StartTime      EndTime  InitialDeposit Allocated CreditLimit Remaining
PercentUsed
-----
2  2    2023-08-09 18:18:56 Infinity      3000.00  3000.00      0.00  3000.00
0.00
```

Notice that the usage charge is now zero because the job has been fully refunded:

```
$ mam-list-usagerecords

Id Type Instance Charge Stage User
Group Account Organization Class QualityOfService Machine Nodes Processors CPUTime
e Memory Duration StartTime      EndTime      Description
-----
1  Job  74      0.00 End   amy   faculty chemistry sciences   batch   normal
   colony 1      12      300   2023-08-09 18:22:42 2023-08-09
18:27:42
```

## 3.14 List Transactions

Let's list the transactions relating to this job (see [Querying Transactions](#)).

**Example 3-13: Listing Transaction Details for This Job**

```
$ mam-list-transactions -J 74 --full

Id  Object      Action Actor Key Child Instance Count Amount Delta Balance Remaining
User Account  Machine Fund Allocation UsageRecord Duration Description Details
-----
ModificationTime Deleted RequestId TransactionId CreationTime
```

```

-----
-----
-----
6481 UsageRecord Create root 1 74 1
1 0
Charge=0,Deleted=False,Stage=Start,Type=Job
2023-08-
09 18:22:42 2023-08-09 18:22:42 False 8615 6481
6484 UsageRecord Reserve root 1 74 1 2.00
amy chemistry colony 1 600
Class=batch,Group=research,ItemizedCharges:=12 [Processors] * 0.000277777777777778
[ChargeRate{Processors}] * 600 [Duration] =
2,Nodes=1,Organization=sciences,Processors=12,QualityOfService=normal
2023-08-09 18:22:42 2023-08-09 18:22:42 False
8615 6484
6489 UsageRecord Charge root 1 74 74 1 1.00 -1.00 2999.00 2999.00
amy chemistry colony 2 2 1 300
CPUTime=1800,Class=batch,EndTime:=1413997758,Group=research,ItemizedCharges:=12
[Processors] * 0.000277777777777778 [ChargeRate{Processors}] * 300 [Duration] =
1,Nodes=1,Organization=sciences,Processors=12,QualityOfService=normal,StartTime:=14139
97458 2023-08-09 18:27:42 2023-08-09 18:27:42 False 8627 6489
6495 UsageRecord Refund root 1 74 1 1.00 1.00 3000.00 3000.00
2 2 1
2023-08-09 18:28:58 False 8636 6495
2023-08-09 18:28:58

```

## 3.15 Examine Fund Statement

Finally, you can examine the fund statement for the activities (see [Obtaining a Fund Statement](#)).

*Example 3-14: You Can Request an Itemized Fund Statement Over All Time for Use amy and the chemistry Account (fund 2)*

```

$ mam-statement -u amy -a chemistry

#####
#
# Includes fund 2 (chemistry)
# Generated on Tue Aug 9 18:29:53 2023.
#
# Reporting fund activity from -infinity to now.
#
#####
Beginning Balance:                0.00
-----
Total Credits:                    3001.00
Total Debits:                     -1.00
-----
Ending Balance:                   3000.00

##### Credit Detail #####

```

Chapter 3: Strict Allocation Setup Guide


Object	Action	Instance	Amount	Balance	Time			
Fund	Deposit		3000.00	3000.00	2023-08-09 18:18:56			
UsageRecord	Refund	74	1.00	3000.00	2023-08-09 18:28:58			
##### Debit Detail #####								
Object	Action	Instance	Account	User	Machine	Amount	Balance	Time
UsageRecord	Charge	74	chemistry	amy	colony	-1.00	2999.00	2023-08-09 18:27:42
##### End of Report #####								


## Chapter 4: Fast Allocation Setup Guide

This chapter will walk you through the typical steps needed to set up Moab Workload Manager and Moab Accounting Manager to use the fast allocation accounting mode.

If you want to enforce allocations by debiting funds in Moab Accounting Manager, but need higher throughput by eliminating the lien and quote operations of the strict allocation accounting mode, you can use the fast allocation accounting mode. With the fast allocation accounting mode, Moab Workload Manager checks a cached account balance, and jobs or reservations may be prevented from starting or continuing after the balance has become zero or negative. As with the strict allocation accounting mode, you establish limits on the use of compute resources by your various parties. This is done by associating a cost for the usage by deciding on a currency unit, generically referred to as credits, whether based on a real currency such as dollars, or a reference currency such as billing units or processor-seconds, and then creating charge rates based on this currency. Funds are established to contain credit allocations attributed to specific accounts. Users are designated as members of the accounts. Deposits are made into funds associated with the accounts creating allocations. An allocation cycle can be established whereby allocations are considered for renewal on a regular periodic basis (such as yearly, quarterly or monthly).

Before a job is started, Moab Workload Manager will check its internal cache to verify that the user has a positive account balance. When a job completes, the user's funds will be debited via a charge, usage information will be recorded for the job and Moab's account balance cache is updated. Since Moab Accounting Manager is not contacted at job submission or start time in order to verify account membership, additional configuration is needed in Moab to synchronize account information with Moab Accounting Manager. Additionally, since the cache in Moab Workload Manager supports only account based funds, when using the fast allocation accounting mode, funds having no constraints or having non-account constraints should not be used.

 You will need to be a Moab Accounting Manager System Administrator to perform many of the tasks in this chapter. It is assumed that you have already installed Moab Workload Manager and installed, bootstrapped, and started Moab Accounting Manager before performing the steps discussed in this chapter.

 For testing or demo purposes, an initialization script is available that provides a similar affect to running the example commands in this chapter to minimally set up MAM for the fast-allocation accounting mode with a small amount of dummy sample data. It will not perform the Moab configuration steps described in this chapter. It can be cleaned up by running the `hpc-cleanup.sh` script.

```
$ ./hpc-fast-allocation.sh
```

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## 4.1 Set the Fast Allocation Accounting Mode

Set the `AMCFG[mam] MODE` parameter to `fast-allocation` in `moab.cfg` and set the `accounting.mode` parameter to `fast-allocation` in both the `mam-server.conf` and `mam-client.conf` files.

*Example 4-1: Setting the Accounting Mode to fast-allocation*

`AMCFG[] MODE` parameter must be set in the Moab server configuration file (`moab.cfg`). After editing the `moab.cfg` file, you will need to restart `moab`.

```
# vi /opt/moab/etc/moab.cfg
AMCFG[mam] MODE=fast-allocation

# systemctl restart moab.service
```

The `accounting.mode` parameter must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). After editing the `mam-server.conf` file, you will need to restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
accounting.mode = fast-allocation
```



```
$ vi /opt/mam/etc/mam-client.conf
accounting.mode = fast-allocation

# systemctl restart mam.service
```

## 4.2 Additional Moab Configuration

Since Moab will be checking an internal account balance cache when starting jobs and reservations instead of contacting Moab Accounting Manager, we need to periodically update Moab Workload Manager with account information from Moab Accounting Manager so that Moab can correctly apply default accounts and enforce account memberships. Additionally, it is beneficial to poll the account balances periodically so that external actions such as new deposits, transfers, etc., will be reflected properly in Moab's account balance cache.

*Example 4-2: Configuring Moab to Synchronize Account Information*

We will set `AMCFG[] CREATECRED=TRUE` in order to enable Moab to query accounts, users, user membership in accounts, and users' default accounts from Moab Accounting Manager and define them in Moab. We will set the `AMCFG[] REFRESHPERIOD` parameter to the interval that we want Moab to update these credential updates, as well as its account balance cache. We will also set the `ENFORCEACCOUNTACCESS` parameter to `TRUE` in order to tell Moab to restrict users to use only accounts to which they belong.

```
# vi /opt/moab/etc/moab.cfg

AMCFG[mam] CREATECRED=TRUE
AMCFG[mam] REFRESHPERIOD=2:00:00
ENFORCEACCOUNTACCESS TRUE

# systemctl restart moab.service
```

## 4.3 Decide on a Currency and Set the Currency Precision

Since we will be calculating charges, we will need to decide what currency unit a MAM credit represents and set the currency precision accordingly. For this example we will define a currency where one credit represents the value of using one processor core for one hour. We will assume for simplicity that a processor-hour on one machine will have the same value as a processor-hour on another machine. Charge rates will be specified relative to this currency unit. Monetary transactions such as deposits and charges will be specified in terms of this currency. Since we want to be able to track and account for short jobs, we

will specify a currency precision of two so that our currency credits will be represented as a floating point number with two decimal places. If instead we used processor-seconds as the currency base, we would want to set the `currency.precision` value to zero since processor seconds can easily be represented as an integer with no decimal places. If we used dollars as the currency base, we would have set the `currency.precision` value to two.

*Example 4-3: Setting the Currency Precision to Two*

The currency precision value must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). It must also be set in the GUI configuration file (`mam-gui.conf`) if you will be using the web GUI. If you make changes in `mam-server.conf`, you must restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
currency.precision = 2
$ vi /opt/mam/etc/mam-client.conf
currency.precision = 2
# systemctl restart mam.service
```

## 4.4 Customize the Usage Record

The usage properties that you can track are limited by the properties sent by your resource manager to MAM. You can customize the usage record by adding additional properties for which you would like to track.

See [14.9 Customizing the Usage Record Object - page 114](#) for information on customizing the properties tracked in the usage record. If you are using Moab Workload Manager, see 'Accounting Properties Reported to Moab Accounting Manager' in the *Moab Workload Manager Administrator Guide* for the list of usage record properties included with the accounting calls to MAM.

## 4.5 Define Charge Rates

Since we are charging, we must establish the charge rates for the usage. In our example, we will define a charge rate that charges 1 credit for each processor-hour utilized by the job. See [Managing Charge Rates](#) for more detailed information on setting up charge rates.

*Example 4-4: Define a Charge Rate for Processors*

```
$ mam-create-chargerate -n Processors -z 1/h -d "1 credit per processor-hour"
```

```
Successfully created 1 charge rate

$ mam-list-chargerates

Name          Value Amount Description
-----
Processors    1/h      1 credit per processor-hour
```

## 4.6 Define Accounts

Next we will define some accounts and assign users to the accounts. We will also associate each account with an organization so that usage reports can be generated for the organization level, as well as the account and user level. We will create accounts for biology, chemistry and film and assign them some users. The biology and chemistry account will be associated with the sciences organization, while the film account will be associated with the arts organization. See [Managing Accounts](#) for more information on setting up accounts.

*Example 4-5: Define the Biology, Chemistry, and Film Accounts*

```
$ mam-create-account -a biology -o sciences -u amy,bob -d "Biology Department"
Successfully created 1 account

$ mam-create-account -a chemistry -o sciences -u amy,dave -d "Chemistry Department"
Successfully created 1 account

$ mam-create-account -a film -o arts -u bob,dave -d "Film Department"
Successfully created 1 account

$ mam-list-accounts

Name          Active Users      Organization Description
-----
biology       True    amy,bob    sciences    Biology Department
chemistry     True    amy,dave   sciences    Chemistry Department
film          True    bob,dave   arts        Film Department
```

## 4.7 Create Funds

The next task will be to create the funds that will hold the allocated credits. A fund is much like a numbered bank account, where credits can be deposited and are defined by constraints that distinguish who or what can use the contained credits and for what purposes. In this example, we will create a fund for each of the three accounts. The reason that funds are defined separately from accounts is that it is possible to create multiple funds for the same account. For example, you might have a fund that can be used for the chemistry account only when running the red cluster, and another fund that is used for the

chemistry account when using a certain quality of service. See [Managing Funds](#) for more detailed information on setting up funds.

In this example, we will assume that we want to establish a periodic allocation cycle with predesignated allocation amounts being deposited on a quarterly schedule. In order to facilitate this, we will associate a default deposit amount with the science funds. For the biology fund, we will configure it to make a resetting deposit of 5000 credits for each period. The chemistry fund is going to be disabled at the end of the allocation period. The film account will remain unaffected by allocation renewals. See [Managing Allocations](#) for more information on periodic allocations.

*Example 4-6: Create a Fund for Each of the Three Accounts*

```
$ mam-create-fund -a biology -n "biology" --default-deposit 5000
Successfully created 1 fund with id 1 and 1 constraint

$ mam-create-fund -a chemistry -n "chemistry" --default-deposit -1
Successfully created 1 fund with id 2 and 1 constraint

$ mam-create-fund -a film -n "film"
Successfully created 1 fund with id 3 and 1 constraint

$ mam-list-funds
```

Id	Name	Constraints	Allocated	Balance	DefaultDeposit	Description
1	biology	Account=biology	0.00	0.00	5000.00	
2	chemistry	Account=chemistry	0.00	0.00	-1.00	
3	film	Account=film	0.00	0.00		

## 4.8 Make Deposits

Now we need to allocate credits to these funds by making deposits to them. An allocation has a start and end time associated with it declaring the time frame when it can be used (defaulting to a start time of the present and an end time of infinity). It can also have a credit limit that defines the extent to which the allocation is allowed to go negative. Allocations can be reset on a periodic basis or future allocations with different time frames can be precreated within a fund to establish an allocation cycle and set expectations for credit expenditure. See [Managing Allocations](#) and [Making Deposits](#) for additional information.

In this example, we will allocate 5000 and 3000 credits to the biology and chemistry accounts respectively. The film account will be given a credit limit of 2000 credits, which allows them to charge up to 2000 credits before settling their fund. When making a deposit we must specify the fund we are depositing into unless the fund can be unambiguously determined by its constraint references (i.e., there is only a single fund associated with the account biology). In the next example, we will utilize the fund's default deposit amount in

the first deposit, specify the amount explicitly in the second deposit and establish a credit allocation in the third deposit.

#### Example 4-7: Making Deposits

```
$ mam-deposit -a biology
Successfully deposited 5000.00 credits into fund 1
Successfully created 1 allocation

$ mam-deposit -z 3000 -a chemistry
Successfully deposited 3000.00 credits into fund 2
Successfully created 1 allocation

$ mam-deposit -L 2000 -a film
No credits were deposited into fund 3
Successfully created 1 allocation
```

Let's examine the allocations we just created and its effect on the funds:

```
$ mam-list-allocations
```

Id	Fund	StartTime	EndTime	InitialDeposit	Allocated	CreditLimit	Remaining
1	1	2023-08-09 18:18:56	Infinity	5000.00	5000.00	0.00	5000.00
2	2	2023-08-09 18:18:56	Infinity	3000.00	3000.00	0.00	3000.00
3	3	2023-08-09 18:18:57	Infinity	0.00	0.00	2000.00	0.00

```
PercentUsed
```

```
$ mam-list-funds
```

Id	Name	Constraints	Allocated	Balance	DefaultDeposit	Description
1	biology	Account=biology	5000.00	5000.00	5000.00	
2	chemistry	Account=chemistry	3000.00	3000.00	0.00	
3	film	Account=film	0.00	0.00		

## 4.9 Check the Balance

We can verify the resulting balance (see [Querying the Balance](#)).

#### Example 4-8: Let's Look at Amy's Balance

```
$ mam-balance -u amy
```

Id	Name	Balance	CreditLimit	Available
1	biology	5000.00	0.00	5000.00
1	chemistry	3000.00	0.00	3000.00

## 4.10 Automate Allocation Renewal

To facilitate the automatic renewal of our allocations, we will create a repeating event that resets all funds (see [Creating Events](#)) at the beginning of each new quarter.

*Example 4-9: Create an Automatic Allocation Renewal Event*

```
# vi /opt/mam/etc/mam-server.conf
event.scheduler = true

$ mam-server -r

$ mam-create-event --fire-command "Fund Reset" -s "2024-01-01" --rearm-period "3
months^"
Successfully created 1 event

$ mam-list-events
```

Id	FireCommand	FireTime	ArmTime	RearmPeriod	EndTime	Notify
	RearmOnFailure	FailureCommand	CatchUp	CreationTime	Description	
1	Fund Reset	2024-01-01	2023-08-09 18:21:28	3 months^		False

## 4.11 Run a Job

Now, let's submit a job and examine the effects on the accounting system.

*Example 4-10: Submit a Job*

```
$ echo sleep 300 | msub -A chemistry -l procs=12,walltime=600
```

## 4.12 The Usage Charge

After a job completes, a charge is issued against the appropriate allocations based on the resources and actual wallclock time used by the job. An allocation is debited and the usage record is modified with the charge and usage information.

*Example 4-11: Examine the Effect of a Completed Job on the Accounting System*

Your allocation and balance will have gone down by the amount of the charge:

```
$ mam-list-allocations -u amy -a chemistry
```

```

Id Fund StartTime           EndTime  InitialDeposit Allocated CreditLimit Remaining
PercentUsed
-----
2  2    2023-08-09 18:18:56 Infinity      3000.00  3000.00      0.00  2999.00
0.03

$ mam-balance -u amy -a chemistry

Id Name      Balance CreditLimit Available
-----
2  chemistry 2999.00      0.00  2999.00

```

The usage record for the job was updated as a side-effect of the charge (see [Querying Usage Records](#)):

```

$ mam-list-usagerecords

Id Type Instance Charge Stage User Group  Account  Organization Class
QualityOfService Machine Nodes Processors CPUTime Memory Duration StartTime
EndTime           Description
-----
1  Job   74           1.00 End   amy  faculty chemistry sciences  batch normal
colony 1      12           300    2023-08-09 18:22:42 2023-08-09
18:27:42

```

## 4.13 Usage Refund

Now, we will illustrate the effect of issuing a refund for the user's job (see [Issuing Usage Refunds](#)).

*Example 4-12: Refund the Job*

```

$ mam-refund -J 74

Successfully refunded 1.00 credits to usage record 1 for instance 74

```

Our balance is back as it was before the job ran:

```

$ mam-balance -u amy -a chemistry

Id Name      Balance CreditLimit Available
-----
2  chemistry 3000.00      0.00  3000.00

```

The allocation, of course, is likewise restored:

```

$ mam-list-allocations -u amy -a chemistry

Id Fund StartTime           EndTime  InitialDeposit Allocated CreditLimit Remaining
PercentUsed
-----

```

```
-----
2 2 2023-08-09 18:18:56 Infinity 3000.00 3000.00 0.00 3000.00
0.00
```

Notice that the usage charge is now zero because the job has been fully refunded:

```
$ mam-list-usagerecords

Id Type Instance Charge Stage User Group Account Organization Class
QualityOfService Machine Nodes Processors CPUTime Memory Duration StartTime
EndTime Description
-----
1 Job 74 0.00 End amy faculty chemistry sciences batch normal
colony 1 12 300 2023-08-09 18:22:42 2023-08-09
18:27:42
```

## 4.14 List Transactions

Let's list the transactions relating to this job (see [Querying Transactions](#)).

*Example 4-13: Listing Transaction Details for This Job*

```
$ mam-list-transactions -J 74 --full

Id Object Action Actor Key Child Instance Count Amount Delta Balance
Remaining User Account Machine Fund Allocation UsageRecord Duration Description
Details

CreationTime ModificationTime Deleted RequestId TransactionId
-----
6489 UsageRecord Charge root 1 74 74 1 1.00 -1.00 2999.00
2999.00 amy chemistry colony 2 2 1 300
CPUTime=1800,Class=batch,EndTime:=1413997758,Group=research,ItemizedCharges:=12
[Processors] * 0.000277777777777778 [ChargeRate{Processors}] * 300 [Duration] =
1,Nodes=1,Organization=sciences,Processors=12,QualityOfService=normal,StartTime:=14139
97458 2023-08-09 18:27:42 2023-08-09 18:27:42 False 8627 6489
6495 UsageRecord Refund root 1 74 1 1.00 1.00 3000.00
3000.00 2 2 1

18:28:58 2023-08-09 18:28:58 False 8636 6495 2023-08-09
```



## 4.15 Examine Fund Statement

Finally, you can examine the fund statement for our activities (see [Obtaining a Fund Statement](#)).

*Example 4-14: We Can Request an Itemized Fund Statement Over All Time for Use amy and the chemistry Account (fund 2)*

```
$ mam-statement -u amy -a chemistry

#####
#
# Includes fund 2 (chemistry)
# Generated on Tue Aug 9 18:29:53 2023.
# Reporting fund activity from -Infinity to Now.
#
#####

Beginning Balance:                0.00
-----
Total Credits:                    3001.00
Total Debits:                     -1.00
-----
Ending Balance:                   3000.00

##### Credit Detail #####

Object      Action  Instance Amount  Balance Time
-----
Fund        Deposit      3000.00 3000.00 2023-08-09 18:18:56
UsageRecord Refund   74         1.00 3000.00 2023-08-09 18:28:58

##### Debit Detail #####

Object      Action  Instance Account  User Machine Amount Balance Time
-----
UsageRecord Charge 74      chemistry amy   colony   -1.00 2999.00 2023-08-09 18:27:42

##### End of Report #####
```

## Chapter 5: Notional Charging Setup Guide

This chapter will walk you through the typical steps needed to set up Moab Workload Manager and Moab Accounting Manager to use the notional charging accounting mode.

Some sites may want to use Moab Accounting Manager to calculate and record charges, but not to impose allocation limits or prevent any workload from running. With notional charging, charge rates will be used to calculate a cost for using resources, but there is no need to make deposits, debit funds or keep track of allocation limits. Although it would be possible to set up accounts and assign users to specific accounts, this chapter will assume that account membership is not going to be enforced. If you would prefer to enforce account membership, you can continue to use the notional charging accounting setup as described in this chapter, but you will need to additionally define accounts and account memberships, as well as configure Moab to synchronize account information from Moab Accounting Manager as described in [Chapter 4: Fast Allocation Setup Guide - page 39](#). Liens, balance queries and quotes are not needed. Our main task is to define charge rates.

At the end of a job, Moab Workload Manager will send usage information to the accounting manager. Moab Accounting Manager will calculate a charge and store this with the job usage record.



You will need to be a Moab Accounting Manager System Administrator to perform many of the tasks in this chapter. It is assumed that you have already installed Moab Workload Manager and installed, bootstrapped, and started Moab Accounting Manager before performing the steps discussed in this chapter.



For testing or demo purposes, an initialization script is available that provides a similar affect to running the example commands in this chapter to minimally set up MAM for the notional-charging accounting mode with a small amount of dummy sample data. It will not perform the Moab configuration steps described in this chapter. It can be cleaned up by running the `hpc-cleanup.sh` script.

```
$ ./hpc-notional-charging.sh
```

In this chapter:

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## 5.1 Set the Notional Charging Accounting Mode

Set the `AMCFG[mam] MODE` parameter to `notional-charging` in `moab.cfg` and set the `accounting.mode` parameter to `notional-charging` in both the `mam-server.conf` and `mam-client.conf` files.

### Setting the Accounting Mode to notional-charging

`AMCFG[] MODE` parameter must be set in the Moab server configuration file (`moab.cfg`). After editing the `moab.cfg` file, you will need to restart `moab`.

```
# vi /opt/moab/etc/moab.cfg
AMCFG[mam] MODE=notional-charging

# systemctl restart moab.service
```

The `accounting.mode` parameter must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). After editing the `mam-server.conf` file, you will need to restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
accounting.mode = notional-charging

$ vi /opt/mam/etc/mam-client.conf
accounting.mode = notional-charging

# systemctl restart mam.service
```

## 5.2 Decide on a Currency and Set the Currency Precision

Since we will be calculating charges, we will need to decide what currency unit a MAM credit represents and set the currency precision accordingly. For this example we will define a currency where one credit represents the value of using one processor core for one hour. We will assume for simplicity that a processor-hour on one machine will have the same value as a processor-hour on another machine. Charge rates will be specified relative

to this currency unit. Monetary transactions such as deposits and charges will be specified in terms of this currency. Since we want to be able to track and account for short jobs, we will specify a currency precision of two so that our currency credits will be represented as a floating point number with two decimal places. If instead we used processor-seconds as the currency base, we would want to set the `currency.precision` value to zero since processor seconds can easily be represented as an integer with no decimal places. If we used dollars as the currency base, we would have set the `currency.precision` value to two.

## Setting the Currency Precision to Two

The currency precision value must be set in the server and client configuration files (`mam-server.conf` and `mam-client.conf`). It must also be set in the GUI configuration file (`mam-gui.conf`) if you will be using the web GUI. If you make changes in `mam-server.conf`, you must restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
currency.precision = 2
$ vi /opt/mam/etc/mam-client.conf
currency.precision = 2
# systemctl restart mam.service
```

## 5.3 Customize the Usage Record

The usage properties that you can track are limited by the properties sent by your resource manager to MAM. You can customize the usage record by adding additional properties for which you would like to track.

See [14.9 Customizing the Usage Record Object - page 114](#) for information on customizing the properties tracked in the usage record. If you are using Moab Workload Manager, see 'Accounting Properties Reported to Moab Accounting Manager' in the *Moab Workload Manager Administrator Guide* for the list of usage record properties included with the accounting calls to MAM.

## 5.4 Define Charge Rates

Since we are charging, we must establish the charge rates for the usage. In our example, we will define a charge rate that charges 1 credit for each processor-hour utilized by the job. See [Managing Charge Rates](#) for more detailed information on setting up charge rates.

## Define a Charge Rate for Processors

```
$ mam-create-chargerate -n Processors -z 1/h -d "1 credit per processor-hour"
Successfully created 1 charge rate
```

```
$ mam-list-chargerates
```

Name	Value	Amount	Description
Processors	1/h	1	credit per processor-hour

## 5.5 Run a Job

Now, let's submit a job and examine the effects on the accounting system.

### Submit a Job

```
$ echo sleep 300 | msub -A chemistry -l procs=12,walltime=600
```

## 5.6 The Usage Charge

After a job completes, a usage record is generated with the charge and resource usage information.

*Example 5-1: List the Usage and Charge for Our Job*

```
$ mam-list-usagerecord
```

Id	Type	Instance	Charge	Stage	User	Group	Account	Organization	Class
QualityOfService	Machine	Nodes	Processors	CPUTime	Memory	Duration	StartTime	EndTime	Description
1	Job	74	1.00	End	amy	faculty	chemistry	sciences	batch normal
	colony	1	12				300	2023-08-09 18:22:42	2023-08-09 18:27:42

## 5.7 Usage Refund

Now, we will illustrate the effect of issuing a refund for the user's job (see [Issuing Usage Refunds](#)).

## Refund the Job

```
$ mam-refund -J 74
```

```
Successfully refunded 1.00 credits to usage record 1 for instance 74
```

Notice that the usage charge is now zero because the job has been fully refunded:

```
$ mam-list-usagerecords
```

```
Id Type Instance Charge Stage User Group Account Organization Class
QualityOfService Machine Nodes Processors CPUTime Memory Duration StartTime
EndTime Description
-----
-----
1 Job 74 0.00 End amy faculty chemistry sciences batch normal
colony 1 12 300 2023-08-09 18:22:42 2023-08-09
18:27:42
```

## 5.8 List Transactions

Let's list the transactions relating to this job. See [17.1 Querying Transactions - page 135](#).

### Listing Transaction Details for This Job

```
$ mam-list-transactions -J 74 --full
```


```
Id Object Action Actor Key Child Instance Count Amount User Account
Machine Fund Allocation UsageRecord Duration Description Details
-----
-----
Deleted RequestId TransactionId CreationTime ModificationTime
-----
-----
6489 UsageRecord Charge root 1 74 74 1 1.00 amy chemistry colony
1 300
CPUTime=1800,Class=batch,EndTime:=1413997758,Group=research,ItemizedCharges:=12
[Processors] * 0.000277777777777778 [ChargeRate{Processors}] * 300 [Duration] =
1,Nodes=1,Organization=sciences,Processors=12,QualityOfService=normal,StartTime:=14139
97458 2023-08-09 18:27:42 2023-08-09 18:27:42 False 8627 6489
6495 UsageRecord Refund root 1 74 1 1.00
1
-----
2023-08-09 18:28:58 2023-08-09 18:28:58 False
8636 6495
```


## Chapter 6: Usage Tracking Setup Guide

This chapter will walk you through the typical steps needed to set up Moab Workload Manager and Moab Accounting Manager to use the usage tracking accounting mode.

When used solely for usage tracking, Moab Accounting Manager logs resource usage in usage records. This usage can be queried to report what resources were used when and by whom. In this case, there is no need for charge rates, funds, allocations, liens or quotes. There is no need to define account membership.

At the end of a job, Moab Workload Manager will send usage information to the accounting manager. Moab Accounting Manager will store this information in a job usage record.

 You will need to be a Moab Accounting Manager System Administrator to perform many of the tasks in this chapter. It is assumed that you have already installed Moab Workload Manager and installed, bootstrapped, and started Moab Accounting Manager before performing the steps discussed in this chapter.

 For testing or demo purposes, an initialization script is available that provides a similar affect to running the example commands in this chapter to minimally set up MAM for the usage-tracking accounting mode with a small amount of dummy sample data. It will not perform the Moab configuration steps described in this chapter. It can be cleaned up by running the `hpc-cleanup.sh` script.

```
$ ./hpc-usage-tracking.sh
```

In this chapter:

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6.2 Customize the Usage Record .....	56
6.3 Run a Job .....	56
6.4 Query Job Usage Information .....	57

### 6.1 Set the Usage Tracking Accounting Mode

Set the `AMCFG[mam] MODE` parameter to `usage-tracking` in `moab.cfg` and set the `accounting.mode` parameter to `usage-tracking` in both the `mam-server.conf` and `mam-client.conf` files.

*Example 6-1: Setting the Accounting Mode to usage-tracking.*

AMCFG[] MODE parameter must be set in the Moab server configuration file (`moab.cfg`). After editing the `moab.cfg` file, you will need to restart Moab.

```
# vi /opt/moab/etc/moab.cfg
AMCFG[mam] MODE=usage-tracking

# systemctl restart moab.service
```

The `accounting.mode` parameter must be set in the server configuration file (`mam-server.conf`). After editing the `mam-server.conf` file, you will need to restart `mam-server`.

```
$ vi /opt/mam/etc/mam-server.conf
accounting.mode = usage-tracking

# systemctl restart mam.service
```

The `accounting.mode` parameter should also be set in the client configuration file (`mam-client.conf`):

```
$ vi /opt/mam/etc/mam-client.conf
accounting.mode = usage-tracking
```

## 6.2 Customize the Usage Record

The usage properties that you can track are limited by the properties sent by your resource manager to MAM. You can customize the usage record by adding additional properties for which you would like to track.

See [14.9 Customizing the Usage Record Object - page 114](#) for information on customizing the properties tracked in the usage record. If you are using Moab Workload Manager, see 'Accounting Properties Reported to Moab Accounting Manager' in the *Moab Workload Manager Administrator Guide* for the list of usage record properties included with the accounting calls to MAM.

## 6.3 Run a Job

Now, let's submit a job and examine the effects on the accounting system.

### Submit a Job

```
$ echo sleep 300 | msub -A chemistry -l procs=12,walltime=600
```



## 6.4 Query Job Usage Information

After a job completes, usage information is recorded. Let's examine the usage record that was created (see [Querying Usage Records](#)).

### Example 6-2: List Usage Records

```
$ mam-list-usagerecords

Id Type Instance Stage User Group Account Organization Class QualityOfService
Machine Nodes Processors CPUtime Memory Duration StartTime EndTime
Description
-----
-----
1 Job 74 End amy faculty chemistry sciences batch normal
colony 1 12 300 2023-09-17 15:42:43 2023-09-17
15:47:22
```

## Chapter 7: Managing Users

A user is a person authorized to use a resource or service. Default user properties include the common name, phone number, email address, default account, and description for that person. A user can be created, queried, modified, and deleted. By default, a standard user can only query his or her own user record.

User queries allow the specification of filter options that narrow down the users that will be returned to those belonging to the specified account.

In this chapter:

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7.2 Querying Users .....	59
7.3 Modifying Users .....	60
7.4 Deleting Users .....	60
7.5 User Auto-Generation .....	61
7.6 Default User .....	62

### 7.1 Creating Users

To create a new user, use the command `mam-create-user`.

```
mam-create-user {[-u] <user_name>} [-A | -I] [-n <common_  
name>] [--phone <phone_number>] [--email <email_address>] [-  
a <default_account>] [-d <description>] [-X, --extension  
<property>=<value>]...  [--debug]  [--site <site_name>]  [--help]  
 [--man]  [--quiet]  [--verbose]  [--version]  [--about]
```

*Example 7-1: Creating a user*

```
$ mam-create-user -n "Smith, Robert F." --email "bob@bank.com" --phone "(509) 555-  
1234" bob  
  
Successfully created 1 user
```

#### Related Topics

- [mam-create-user](#)

## 7.2 Querying Users

To display user information, use the command `mam-list-users`.

```
mam-list-users [[-u] <user_pattern>] [-A | -I] [-X, --
extension <property>=<value>]... [-a <account_name>] [--full]
[-show <attribute_name>,...] [--long] [--wide] [--format
csv|raw|standard] [--debug] [--site <site_name>] [--help] [--
man] [--quiet] [--version] [--about]
```

### Listing standard info about active users

```
$ mam-list-users -A
```

Name	Active	CommonName	PhoneNumber	EmailAddress
	DefaultAccount	Description		
amy	True	Wilkes, Amy	(509) 555-8765	amy@bank.com
bob	True	Smith, Robert F.	(509) 555-1234	bob@bank.com

### Displaying bob's phone number

```
$ mam-list-users --show PhoneNumber bob --quiet
```

```
(509) 555-1234
```

### Listing amy's accounts

```
$ mam-list-users --show Accounts amy -l -q
```

```
-----
chemistry
biology
```

### Listing all users belonging to the chemistry account

```
$ mam-list-users --show Name -a chemistry -q
```

```
-----
amy
dave
```

---

### Related Topics

- [mam-list-users](#)

## 7.3 Modifying Users

To modify a user, use the command *mam-modify-user*.

```
mam-modify-user {[-u] <user_name>} [-A | -I] [-n <common_
name>] [--phone <phone_number>] [--email <email_address>] [-
a <default_account>] [-d <description>] [-X, --extension
<property>=<value>]... [--debug] [--site <site_name>] [--help]
[--man] [--quiet] [--verbose] [--version] [--about]
```

### Deactivating a user

```
$ mam-modify-user -I bob
Successfully modified 1 user
```

**i** In order for user validity enforcement to occur, the Values property for the UsageRecord User attribute must be set to '@User'.

```
$ mam-shell Attribute Modify Object==UsageRecord Name==User Values=@User
```

### Setting a user's default account

```
$ mam-modify-user -a chemistry amy
Successfully modified 1 user
```

### Changing a user's email address

```
$ mam-modify-user --email "rsmith@cs.univ.edu" bob
Successfully modified 1 user
```

#### Related Topics

[mam-modify-user](#)

## 7.4 Deleting Users

To delete a user, use the command *mam-delete-user*.

```
mam-delete-user {[-u] <user_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## Deleting a user

```
$ mam-delete-user bob
Successfully deleted 1 user
```

### Related Topics

- [mam-delete-user](#)

## 7.5 User Auto-Generation

If user auto-generation is enabled (this is the default), users are automatically created when first added as a member to an account or role. It is also possible to automatically create users when first encountered in a usage function (charge, reserve or quote). In order for user auto-generation to occur, the `AutoGen` property for the `User` object must be set to `True` (this is the default). Additionally, for user auto-generation to occur when a user is added as a member of another object (such as `Account`) via an association table (e.g., `AccountUser`), the `Values` property for the user attribute of the Association (e.g., `Name`) must be set to `@User`, indicating that that value should be constrained to be a valid instance of the `User` object. For user auto-generation to occur when initially encountered in a usage function, the `Values` property of the user attribute of the `UsageRecord` object must be similarly set to `@User`. The auto-creation of users can be completely disabled by setting the `AutoGen` property for the `User` object to `False`.

### Enable auto-generation of users when initially seen in a charge

```
$ mam-shell Attribute Modify Object==UsageRecord Name==User Values=@User
Successfully modified 1 attribute
```

### Disable all auto-generation of users

```
$ mam-shell Object Modify Name==User AutoGen=False
Successfully modified 1 object
```

See [Object Auto-Generation](#) for more information about the auto-generation of objects.

---

**Related Topics**

- [23.6 Object Auto-Generation - page 168](#)

## 7.6 Default User

It is possible to set a global default user to which usage would be ascribed in quotes, liens, or charges where no user is specified. This can be accomplished by setting the `DefaultValue` property for the `User` object to the desired user.

It is also possible to set a custom user default for a specific object, which will result in usage being ascribed to the specified user when the object is attributed to the usage. This is done by creating a default usage override modifier. For example, to specify that `acmeuser` be the default user for usage associated with the `acme` organization, you might first create an attribute called `DefaultUser` for the `Organization` Object with the `Values` property of `@?=User`. Then you would populate the new `DefaultUser` property for the `acme` organization with the value of `acmeuser`. See [Customizing Objects](#) for more information on default and other usage override modifiers.

### Assign a global default user

```
$ mam-shell Object Modify Name==User DefaultValue=anonymous
Successfully modified 1 object
```

## Chapter 8: Managing Accounts

An account represents a work entity requiring the use of resources or services for a common purpose. Users can be designated as members of an account and can be allowed to share its allocations. If the special 'ANY' user is added to an account, then any user can use funds allocated to the account. The user members can be designated as active or inactive, and as an administrator for the account. Default account properties include the description, the organization it is part of, and whether or not it is active. An account can be created, queried, modified and deleted. An account's user membership can also be adjusted. By default, a standard user can only query accounts they belong to.

Account queries allow the specification of filter options that narrow down the accounts that will be returned to those having the specified users in them.

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8.4	Deleting Accounts .....	66
8.5	Account Auto-Generation .....	67
8.6	Default Account .....	68

### 8.1 Creating Accounts

To create a new account, use the command `mam-create-account`.

```
mam-create-account {[-a] <account_name>} [-A | -I] [-o <organization_name>] [-d <description>] [-X, --extension <property>=<value>]... [-u [^|!][+|-]<user_name>,...]... [--create-fund True|False] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

When defining users, the optional caret or exclamation symbol indicates whether the user should be created as an admin (^) or not (!) for the account. The optional plus or minus sign can precede each member to indicate whether the member should be created in the active (+) or inactive (-) state. By default, a user will be created in the active state but not an admin. Multiple users can be passed to the `-u` option in a comma-delimited list. Alternatively, multiple `-u` options can be specified.

**i** If the Fund object's AutoGen property is set to true (see [Fund Auto-Generation](#)), a fund will be automatically created for the account (unless overridden with the `--createFund` option). The auto-generated fund will be associated with the new account.

## Creating an account

```
$ mam-create-account -d "Chemistry Department" chemistry
Successfully created 1 account
```

## Creating an account that can be used by any user

```
$ mam-create-account -d "Common Account" -u ANY common
Successfully created 1 account.
```

## Creating an account and specifying user members at the same time

In this example, we make amy the account admin and associate the account with the sciences organization:

```
$ mam-create-account -d "Chemistry Department" -u ^amy,bob,dave chemistry -o sciences
Successfully created 1 account
```

### Related Topics

- [mam-create-account](#)

## 8.2 Querying Accounts

To display account information, use the command `mam-list-accounts`.

```
mam-list-accounts [-a] <account_pattern> [-A | -I] [-o] <organization_name> [-X, --extension <property>=<value>]...
[-u <user_name>] [--full] [--show <attribute_name>,... [--long] [--wide] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing all info about all accounts

```
$ mam-list-accounts
```



Name	Active	Users	Organization	Description
biology	True	amy, ^bob	sciences	Biology Department
chemistry	True	^amy, ^dave	sciences	Chemistry Department
film	True	amy, ^dave	arts	Film Department

## Displaying the name and user members of an account in long format

```
$ mam-list-accounts --show Name,Users -long chemistry
```

Name	Users
chemistry	^amy
dave	

## Listing all account names

```
$ mam-list-accounts --show Name --quiet
```

```
biology
chemistry
film
```

## Listing all accounts that have dave as a member

```
$ mam-list-accounts --show Name -u dave --quiet
```

```
chemistry
film
```

## Related Topics

- [mam-list-accounts](#)

## 8.3 Modifying Accounts

To modify an account, use the command *mam-modify-account*.

```
mam-modify-account {[-a] <account_name>} [-A | -I] [-o <organization_name>] [-d <description>] [-X, --extension <property>=<value>]... [--add-user(s) [^|!][+|-]<user_name>, ...]... [--del-user(s) <user_name>, ...] [--mod-user(s) [^|!][+|-]<user_name>, ...]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

User members can be added, removed or modified in an account. When adding user members to an account, the optional caret or exclamation symbol indicates whether the user should be created as an admin (^) or not (!) for the account. The optional plus or

minus signs can precede each member to indicate whether the member should be created in the active (+) or inactive (-) state. When modifying user members of an account, the caret symbol or exclamation symbol indicates the user should be changed to become an admin (^) or not (!) for the account. The plus or minus signs indicate whether the user should be changed to become active (+) or inactive (-). If an active or admin modifier is not specified, that aspect of the user member will remain unchanged. If the `user.firstaccountdefault` server parameter is set to true, the first account that a user is added to will additionally become the default account for that user.

## Deactivating an account

```
$ mam-modify-account -I chemistry
Successfully modified 1 account
```

**i** In order for account validity enforcement to occur, the Values property for the UsageRecord Account attribute must be set to '@Account'.

```
$ mam-shell Attribute Modify Object==UsageRecord Name==Account Values=@Account
```

## Adding users as members of an account

```
$ mam-modify-account --add-users jsmith,barney chemistry
Successfully added 2 users
```

## Deactivating a user in an account

```
$ mam-modify-account --mod-user -dave chemistry
Successfully modified 1 user
```

# 8.4 Deleting Accounts

To delete an account, use the command `mam-delete-account`.

```
mam-delete-account {[-a] <account_name>}  [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## Deleting an account

```
$ mam-delete-account chemistry
Successfully deleted 1 account
```

---

**Related Topics**

- [mam-delete-account](#)

## 8.5 Account Auto-Generation

It is possible to have accounts be created automatically when first encountered in a usage function (charge, reserve or quote). It is also possible for accounts to be automatically created when initially added as a member of another object. In order for account auto-generation to occur, the `AutoGen` property for the `Account` object must be set to `True`. This is the default. For account auto-generation to occur when initially encountered in a usage function, the `Values` property of the account attribute of the `UsageRecord` object must be set to `@Account`. Additionally, for account auto-generation to occur when an account is added as a member of another object (such as the `Organization` object) via an association table (e.g., `OrganizationAccount`), the `Values` property for the account attribute of the Association (e.g., `Name`) must be set to `@Account`, indicating that that value should be constrained to be a valid instance of the `Account` object. The auto-creation of accounts can be completely disabled by setting the `AutoGen` property for the `Account` object to `False`.

### Enable auto-generation of accounts when initially seen in a charge

```
$ mam-shell Attribute Modify Object==UsageRecord Name==Account Values=@Account
Successfully modified 1 attribute
```

### Disable all auto-generation of accounts

```
$ mam-shell Object Modify Name==Account AutoGen=False
Successfully modified 1 object
```

See [Object Auto-Generation](#) for more information about the auto-generation of objects.

---

**Related Topics**

- [23.6 Object Auto-Generation - page 168](#)

## 8.6 Default Account

It is possible to set a global default account to which usage would be ascribed in quotes, liens, or charges where no account is specified. This can be accomplished by setting the `DefaultValue` property for the `Account` object to the desired account name.

A per-user default account can be established by setting the `DefaultAccount` property for the user. If the `user.firstaccountdefault` server parameter is set to true (the default), the first account that a user is added to will automatically become the default account for that user. Otherwise, you can use the `mam-modify-user` command along with the `-a` option to set or change the default account for the user.

It is also possible to set a custom account default for a specific object, which will result in usage being ascribed to the specified account when the object is attributed to the usage. This is done by creating a default usage override modifier. For example, to specify a default account of testing for the beta organization, you might first create an attribute called `DefaultAccount` for the `Organization` Object with the `Values` property of `@?=Account`. Then you would populate the new `DefaultAccount` property for the beta organization with the value of testing. See [Customizing Objects](#) for more information on default and other usage override modifiers.

### Assign a global default account

```
$ mam-shell Object Modify Name==Account DefaultValue=common
Successfully modified 1 object
```

---

#### Related Topics

- [Chapter 23: Customizing Objects - page 165](#)

## Chapter 9: Managing Organization

An organization is a virtual organization in which accounts are grouped. An account can only belong to a single organization, while an organization can have multiple accounts. For example, an account may represent a project or cost-center while an organization may represent an institutional department or business division. The purpose of defining organizations is to support the ability to produce reporting for higher-order organizational entities beyond the individual account. Default organization properties include a name and a description. An organization can be created, queried, modified, and deleted.

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### 9.1 Creating Organizations

To create a new organization, use the command `mam-create-organization`.

```
mam-create-organization {[-o] <organization_name>} [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_man>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

#### Creating an organization

```
$ mam-create-organization -d "Sciences Department" sciences
Successfully created 1 organization
```

#### Related Topics

- [mam-create-organization](#)

## 9.2 Querying Organizations

To display organization information, use the command *mam-list-organizations*.

```
mam-list-organizations [[-o] <organization_pattern>] [-X, --extension <property>=<value>]... [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--debug] [--site <site_man>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing all organization names

```
$ mam-list-organizations --show Name -q
+ arts
+ sciences
```

#### Related Topics

- [mam-list-organizations](#)

## 9.3 Modifying Organizations

To modify an organization, use the command *mam-modify-organization*.

```
mam-modify-organization {[-o] <organization_name>} [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Changing an organization's description

```
$ mam-modify-organization -d "Art College" art
Successfully modified 1 organization
```

#### Related Topics

- [mam-modify-organization](#)

## 9.4 Deleting Organizations

To delete an organization, use the command `mam-delete-organization`.

```
mam-delete-organization {[-o] <organization_name>} [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [-
-version] [--about]
```

### Deleting an organization

```
$ mam-delete-organization arts
Successfully deleted 1 organization
```

#### Related Topics

- [mam-delete-organization](#)

## 9.5 Organization Auto-Generation

It is possible to have organizations be created automatically when initially added as a member of another object. In order for organization auto-generation to occur, the `AutoGen` property for the `Organization` object must be set to `True`. This is the default. For organization auto-generation to occur when initially encountered in a usage function, the `Values` property of the organization attribute of the `UsageRecord` object must be set to `@Organization`. Additionally, for organization auto-generation to occur when an organization is added as a member of another object (such as a hypothetical `Site` object) via an association table (e.g., `SiteOrganization`), the `Values` property for the organization attribute of the Association (e.g., `Name`) must be set to `@Organization`, indicating that that value should be constrained to be a valid instance of the `Organization` object. The auto-creation of organizations can be completely disabled by setting the `AutoGen` property for the `Organization` object to `False`.

### Enable auto-generation of organizations when initially seen in a charge

```
$ mam-shell Attribute Modify Object==UsageRecord Name==Organization
Values=@Organization
Successfully modified 1 attribute
```

## Disable all auto-generation of organizations

```
$ mam-shell Object Modify Name==Organization AutoGen=False
Successfully modified 1 object
```

See [Object Auto-Generation](#) for more information about the auto-generation of objects.

---

### Related Topics

- [23.6 Object Auto-Generation - page 168](#)

## 9.6 Default Organization

It is possible to set a global default organization to which usage would be ascribed in quotes, liens, or charges where no organization is specified. This can be accomplished by setting the `DefaultValue` property for the `Organization` object to the desired organization name.

It is also possible to set an organization default for a specific object, which will result in usage being ascribed to the specified organization when the object is attributed to the usage. This is done by creating a default usage override modifier. For example, to specify that retail be the default organization for usage associated with the user amy, you might first create an attribute called `DefaultOrganization` for the `User` object with the `Values` property of `@?=Organization`. Then you would populate the new `DefaultOrganization` property for the amy user with the value of retail. See the chapter on [Customizing Objects](#) for more information on default and other usage override modifiers.

### Assign a global default organization

```
$ mam-shell Object Modify Name==Organization DefaultValue=sciences
Successfully modified 1 object
```



## Chapter 10: Managing Funds

A fund is a container for a time-bounded reference currency called credits for which the usage is restricted by constraints that define how the credits must be used. Much like with a bank, a fund is a repository for these resource or service credits that are added through deposits and debited through withdrawals and charges. Each fund has a set of constraints designating which entities (such as Users, Accounts, Machines, Classes, Organizations, etc.) can access the encapsulated credits or for which aspects of usage the funds are intended (QualityOfService, GeographicalArea, etc.). Fund constraints can also be negated with an exclamation point leading the constraint value.

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### 10.1 About Funds

Funds can have a name that is not necessarily unique for the fund. Funds can also have a priority that will influence the order of fund selection when charging. A default deposit amount can be set for a fund, which is used when the amount is not specified for a deposit. Derived properties such as Allocated, Balance, Effective, Available, Capacity, PercentRemaining, PercentUsed and Used can be displayed via the `mam-list-funds` or `mam-balance` commands (see the commands reference for [mam-list-funds](#) or [mam-balance](#) for more details). Operations include creating, querying, modifying, deleting and

resetting funds, as well as making deposits, withdrawals, transfers and balance queries. By default, a standard user can only query and view the balance for funds that pertain to them.

Credits are added to a fund via a deposit. If no amount is specified for the deposit, the fund's default deposit value is used for the deposit amount. When credits are deposited into a fund, they are associated with a time period within which they are valid. These time-bounded pools of credits are known as allocations. The initial deposit into a fund will create a new allocation having the specified or default time boundaries.

A fund can be reset, causing the currently active allocation to end and creating a new allocation. When a fund is reset, the default deposit amount will be used to determine the amount of the new allocation. A zero default deposit amount will result in the creation of an allocation with a zero balance. A negative default deposit amount can be used to stipulate that the allocations in the fund should be ended if the fund is reset. An empty default deposit amount stipulates that no change will be made to the allocations if the fund is reset. As an alternative to resetting funds, allocations with predesignated start and end times can be created ahead of time. By using one of these methods to implement periodic allocations, it is possible to establish an allocation cycle. See [Chapter 11: Managing Allocations - page 88](#) for more information on periodic allocations, as well as credit limits and infinite allocations.

Funds can be nested. Hierarchically nested funds may be useful for the delegation of management roles and responsibilities. Deposit shares can be established that assist to automate a trickle-down effect for credits deposited at higher level funds. Additionally, an optional overflow feature allows charges against lower level funds to trickle up the hierarchy.

Some fund operations (Query, Deposit, Withdraw, and Refund) allow the specification of filter options that narrow down the funds that will be acted on for that operation. There are three fund filter types that can be employed: ExactMatch, Exclusive, and NonExclusive. The NonExclusive filter type will be used by default if no filter type is specified.

- If an exact-match filter type is used, the query will return only the funds for which the specified filters exactly match the fund constraints. For example, `Fund Query FilterType:=ExactMatch Filter:=User=amy` would only return a fund with the sole constraint `User=amy`.
- If an exclusive filter type is used, the query will return only the funds for which the specified filters meet all constraints for usage. Another way to think of an exclusive filter is to ask: "If usage were to be posted given only the specified filter options as ACLs, which funds would be eligible for charging?" For example, `Fund Query FilterType:=Exclusive Filter:=User=amy` would not return a fund with the sole constraint `Machine=blue` because `Machine=blue` was not included in the filters. Not only must the filters be a non-conflicting superset of the fund

constraints, but all constraint dependencies must also be satisfied (for example, an appropriate user may need to be specified with the account).

- If a non-exclusive filter type is used, the query will return all funds for which the filters do not specifically exclude the constraints. The query assumes that if constraints are not specified within the filters, they can be assumed as a wildcard and will return all funds that are not specifically excluded by the filter. For example, `Fund Query FilterType:=NonExclusive Filter:=User=amy` would return a fund whose only constraint was `Machine=blue` (because it does not conflict) but would not return a fund with the constraint `User=bob` (because it does conflict).

## 10.2 Creating Funds

`mam-create-fund` is used to create a new fund. You can specify a fund name, a description, and any number of fund constraints. If a name is not specified and constraints are specified, a name will be automatically generated based on the constraints. A new unique ID is automatically generated for the fund.

```
mam-create-fund [-n <fund_name>] [--priority <fund_priority>]
[--default-deposit <deposit_amount>] [-d <description>] [-X, -
-extension <property>=<value>]... [-u <user_name>,...].... [-
g <group_name>,...].... [-a <account_name>,...].... [-
o <organization_name>,...].... [-c <class_name>,...].... [-
m <machine_name>,...].... [--constraint <constraint_name>=
[!]<constraint_value>,...].... [--parent <parent_fund_id>] [--
debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

**i** It is possible to have funds be created automatically when accounts are created by setting the Fund object's `AutoGen` property to `true` (see [Fund Auto-Generation](#)). The auto-generated fund will be associated with the new account.

### Creating a fund valid for the chemistry account

```
$ mam-create-fund -a chemistry -n "Chemistry"
Successfully created 1 fund with id 7 and 1 constraint
```

### Creating a wide-open fund that can be used by anyone for anything

```
$ mam-create-fund -n "Windfall"
```

```
Successfully created 1 fund with id 8
```

## Creating a fund valid toward all biology account members except for dave and just the machine colony

```
$ mam-create-fund --constraint Account=biology,User=!dave,Machine=colony -n "Biology on Colony not for Dave"
```

```
Successfully created 1 fund with id 9 and 3 constraints
```

### Related Topics

- [mam-create-fund](#)

## 10.3 Querying Funds

To display fund information, use the command `mam-list-funds`.

```
mam-list-funds [-f] <fund_id> [-A | -I] [-n <fund_name>] [-X, --extension <property>=<value>]... [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--filter-type ExactMatch|Exclusive|NonExclusive] [--full] [--show <attribute_name>,...] [--long] [--wide] [--format csv|raw|standard] [--hours] [--debug] [--site <site_man>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing all info about all funds with multi-valued fields displayed in a multi-line format

```
$ mam-list-funds --long
```

Id	Name	Constraints	Allocated	Balance	DefaultDeposit	Description
1	biology	Account=biology	25000000	25000000	25000000	
2	chemistry for amy	User=amy	35000000	34802392	35000000	
3	chemistry not amy	Account=chemistry User=!amy	50000000	50000000	50000000	
4	film on colony	Account=film Machine=colony		0	0	

### Wide listing all info about all funds useable by amy

```
$ mam-list-funds -u amy
```

Id	Name Description	Constraints	Allocated	Balance	DefaultDeposit
1	biology	Account=biology	25000000	25000000	25000000
2	chemistry for amy	Account=chemistry,User=amy	35000000	34802392	35000000
4	film on colony	Machine=colony,Account=film	0	0	

## Related Topics

- [mam-list-funds](#)

## 10.4 Modifying Funds

To modify a fund, use the command `mam-modify-fund`.

```
mam-modify-fund [[-f] <fund_id>] [-u <user_name>] [-g <group_
name>] [-a <account_name>] [-o <organization_name>] [-
c <class_name>] [-m <machine_name>] [--filter <filter_
name>=<filter_value>]... [--filter-type
ExactMatch|Exclusive|NonExclusive] {[[-n <fund_name>] [--
priority <fund_priority>] [--default-deposit <deposit_amount>]
[-d <description>] [-X, --extension <property>=<value>]... [-
add-constraint <constraint_name>=[!]<constraint_value>,...] [-
del-constraint(s) <constraint_name>[=<constraint_
value>],...]... [--parent <parent_fund_id>]} | {--reset [--
all]}] [--debug] [--site <site_name>] [--help] [--man] [--
quiet] [--verbose] [--version] [--about]
```

### Adding a constraint to a fund so that it can only be used by the acme organization

```
$ mam-modify-fund --add-constraint Organization=acme 7
Successfully created 1 constraint
```

### Setting the default deposit amount for a fund

```
$ mam-modify-fund --default-deposit 5000000 -f 1
Successfully modified 1 fund
```

### Resetting a fund

```
$ mam-modify-fund --reset 1
```

```
Successfully deposited 5000000 credits into fund 1
Successfully stopped 1 allocation
Successfully created 1 allocation
```

## Related Topics

- [mam-modify-fund](#)

## 10.5 Making Deposits

*mam-deposit* is used to deposit time-bounded resource credits into a fund resulting in the creation or increase of an allocation (see [Chapter 11: Managing Allocations - page 88](#) for information about managing allocations). The start time will default to `-infinity` and the end time will default to `infinity` if not specified. Filter options can be specified to help select a unique fund for the deposit. If multiple funds are matched by the filters, the matching funds will be listed and you will be prompted to respecify the deposit with one of the fund IDs. If an allocation for the deposit fund is found having the start and end times for the deposit, the amount of the allocation will be increased by the deposit amount. Otherwise, a new allocation will be created for the fund with the amount of the deposit. If no funds match your criteria, if fund auto-generation is enabled, a fund will be created and the deposit made into it. Otherwise, the deposit will fail (the fund will need to be first created using *mam-create-fund*).

Deposits can be used to extend the debit ceiling by specifying an amount for the deposit (with the `-z` option) or extend the credit floor by specifying a credit limit for the deposit (with the `-L` option) or a combination of both options can be used. Additionally, `Infinity` can be used for either of these option values when Moab Accounting Manager is coupled with a database that supports IEEE Standard 754 for Floating-Point Arithmetic (e.g., PostgreSQL).

To make a deposit, use the command *mam-deposit*.

```
mam-deposit [-f <fund_id>] [-i <allocation_id>] [-u <user_
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filterType
ExactMatch|Exclusive|NonExclusive] [[-z] <deposit_amount>] [-
L <credit_limit>] [-s <start_time>] [-e <end_time>] [--reset]
[-d <description>] [--create-fund True|False] [--hours] [--
debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

## Making a Deposit into fund 1

```
$ mam-deposit -z 360000000 -f 1
Successfully created 1 allocation
```

## Making a Deposit "into" an Account

If an account has a single fund then a deposit can be made against the account:

```
$ mam-deposit -z 360000000 -a chemistry
Successfully deposited 360000000 credits into fund 2
```

## Creating a Credit Allocation

```
$ mam-deposit -L 10000000000 -f 3
Successfully created 1 allocation
```

## Making a Reset Deposit

Stop the active allocation within a fund and create a new allocation:

```
$ mam-deposit -f 4 -z 36000000 --reset
Successfully deposited 36000000 credits into fund 4
Successfully stopped 1 allocation
Successfully created 1 allocation
```

## Creating an Infinite Allocation

```
$ mam-deposit -z Infinity -f 5
Successfully deposited inf credits into fund 5
Successfully created 1 allocation
```

**i** The use of infinite allocations requires the use of a database that supports the IEEE Standard 754 for Floating-Point Arithmetic (e.g., PostgreSQL).

## Creating a Future Quarterly Allocation

```
$ mam-deposit -s 2023-10-01 -e 2024-01-01 -z 25000000 -a biology
Successfully created 1 allocation
```

---

### Related Topics

- [mam-deposit](#)

## 10.6 Querying the Balance

To display balance information, use the command `mam-balance`.

```
mam-balance [-u <user_name>] [-g <group_name>] [-a <account_
name>] [-o <organization_name>] [-c <class_name>] [-m
<machine_name>] [--filter <filter_name>=<filter_value>]... [--
filterType ExactMatch|Exclusive|NonExclusive] [--ignore-
ancestors] [--full] [--show <attribute_name>,...] [--long] [--
wide] [--format csv|raw|standard] [--hours] [--debug] [--
site <site_name>] [--help] [--man] [--quiet] [--version] [--
about]
```

### Querying amy's balance

```
$ mam-balance -u amy
```

ID	Name	Balance	Reserved	Effective	CreditLimit	Available
1	biology	2785.87	103.22	2682.65	0.00	2682.65
2	chemistry	1785.87	0.00	1785.87	0.00	1785.87

### List the available balances that amy can charge against along with the constraints on those balances

```
$ mam-balance -u amy --show Available,Constraints
```

Available	Constraints
25000000	Account=biology
34802392	Account=chemistry,User=amy
0	Machine=colony,Account=film

### Related Topics

- [mam-balance](#)

## 10.7 Personal Balance

The `mybalance` has been provided as a wrapper script to show users their personal balance. It provides a list of balances for the funds that they can charge to.

```
mybalance [--hours] [--help] [--man]
```



## List my fund balances

```
$ mybalance
Name                Available
-----
biology             25000000
chemistry for amy  34802392
```

## List my balance in (Processor) hours

```
$ mybalance --hours
Name                Available
-----
biology             6944.44
chemistry for amy  9667.33
```

### Related Topics

- [mybalance](#)

## 10.8 Making Withdrawals

A withdrawal can be used to debit a fund without being associated with the usage charge from some item. To issue a withdrawal, use the command *mam-withdraw*.

```
mam-withdraw [-f <fund_id>] [-i <allocation_id>] [-u <user-
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filter-type
ExactMatch|Exclusive|NonExclusive] {[-z] <withdrawal_amount>}
[-d <description>] [--hours] [--debug] [--site <site_name>] [-
-help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Making a Withdrawal

```
$ mam-withdraw -z 12800 -f 1 -d "Grid Tax"
Successfully withdrew 12800 credits from fund 1
```

### Making a Withdrawal "from" an Account

If an account has a single fund, then a withdrawal can be made against the account:

```
$ mam-withdraw -z 12800 -a biology
```

```
Successfully withdrew 12800 credits from fund 1
```

If more than one fund exists for the account or filter, you will be asked to be more specific:

```
$ mam-withdraw -z 12800 -a chemistry

Multiple funds were matched for the withdrawal.
Please respecify using one of the following fund ids:
2  [chemistry for amy]
3  [chemistry not amy]
```

## Related Topics

- [mam-withdraw](#)

## 10.9 Making Transfers

To issue a transfer between funds, use the command *mam-transfer*. If the allocation ID is specified, then only credits associated with the specified allocation will be transferred; otherwise, only active credits will be transferred. Fund transfers preserve the allocation time periods associated with the resource or service credits from the source to the destination funds. Source and destination filters can be used if they result in a single source fund and single destination fund.

```
mam-transfer {--from-fund <source_fund_id> &| --from-
allocation <source_allocation_id> &| --from-filter <filter_
name>=<filter_value>...} {--to-fund <destination_fund> &| --
to-allocation <destination_allocation_id> &| --to-
filter <filter_name>=<filter_value>...} [--filter-type
ExactMatch|Exclusive|NonExclusive] {[-z] <transfer_amount>} [-
d <description>] [--hours] [--debug] [--site <site_name>] [--
help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Transferring credits between two funds

```
$ mam-transfer --from-fund 1 --to-fund 2 10000

Successfully transferred 10000 credits from fund 1 to fund 2
```

### Transferring credits between two single-fund accounts

```
$ mam-transfer --from-filter Account=biology --to-filter Account=chemistry 10000

Successfully transferred 10000 credits from fund 1 to fund 2
```

**Related Topics**

- [mam-transfer](#)

## 10.10 Obtaining a Fund Statement

To generate a fund statement, use the command `mam-statement`. For a specified time frame it displays the beginning and ending balances, as well as the total credits and debits to the fund over that period. This is followed by an itemized report of the debits and credits. Summaries of the debits and credits will be displayed instead of the itemized report if the `--summarize` option is specified. If filter options are specified instead of a fund, then the statement will consist of information merged from all funds valid toward the specified entities.

```
mam-statement [[-f] <fund_id>] [-n <fund_name>] [-u <user_
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filter-type
ExactMatch|Exclusive|NonExclusive] [-s <start_time>] [-e <end_
time>] [--summarize] [--hours] [--debug] [--site <site_man>]
[--help] [--man] [--version] [--about]
```

### Generating a fund statement for all chemistry funds for the fourth quarter of 2022

```
$ mam-statement -a chemistry -s 2022-10-01 -e 2023-01-01 --summarize

#####
#
# Includes fund 3 (chemistry not amy)
# Includes fund 2 (chemistry for amy)
# Generated on Mon Feb 7 18:44:23 2023.
# Reporting fund activity from 2022-10-01 to 2023-01-01.
#
#####
Beginning Balance:          0
-----
Total Credits:              90122212
Total Debits:               -5308668
-----
Ending Balance:            84813544
##### Credit Summary #####
Object      Action      Amount
-----
Fund        Deposit    90100000
UsageRecord Refund      22212
##### Debit Summary #####
Object      Action      Account  User      Machine  Amount  Count
-----
```

```
UsageRecord  Charge  chemistry amy  colony  -19744  239
##### End of Report #####
```

**i** The fields that are used as default discriminators in the detail section of the `mam-statement` command (which are by default Account, User, and Machine) can be customized by setting the `statement.show` configuration parameter in `mam-client.conf`.

---

### Related Topics

- [mam-statement](#)

## 10.11 Deleting Funds

To delete a fund, use the command `mam-delete-fund`.

```
mam-delete-fund {[-f] <fund_id>}  [--debug] [--site <site_name>]  [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Deleting a fund

```
$ mam-delete-fund 2
Successfully deleted 1 fund
```

---

### Related Topics

- [mam-delete-fund](#)

## 10.12 Fund Auto-Generation

It is possible to enable the auto-generation of funds by setting the `AutoGen` property of the `Fund` object to `True`. When creating a new account, if fund auto-generation is enabled, a fund will automatically be created for the account (unless overridden with the `--create-fund` option). The fund will be usable only by usage attributed to the new account. Additionally, if fund auto-generation is set, a deposit that does not match an existing fund will automatically generate a fund using the filters as constraint options.

Objects associated with the constraint that have `AutoGen` set to `True` will be auto-generated as well (unless overridden with the `--create-fund` option).

*Example 10-1: Enable auto-generation of funds*

```
$ mam-shell Object Modify Name==Fund AutoGen=True
Successfully modified 1 object
```

## 10.13 Hierarchical Funds

A hierarchy can be established between funds. When creating a fund or by modifying it later, one can specify a parent fund ID via the `--parent` option to establish the object fund as a child of the specified parent fund. A fund can have multiple children funds but only a single parent fund.

*Example 10-2: Establishing a child relationship with another fund*

```
$ mam-modify-fund --parent 3 -f 6
Successfully added 1 parent
```

Deposit shares can be established between the parent fund and its children that assist to automate a trickle-down effect for funds deposited at higher level funds (`DepositShare` is an attribute of the `FundFund` association object). Deposit shares are integers and are treated as a percentage of each deposit and the sum of the deposit shares for a fund's children cannot exceed 100. If the deposit shares for the children of a fund totals less than 100, the difference is taken to be the share of the deposit that will be allocated to the parent. When a deposit is made into a parent fund, for each child fund that has a non-zero deposit share a recursive deposit amounting to the designated percentage of the parent deposit is issued to that child. After the share amounts have been deposited to each of the child funds, the remaining percentage of the deposit is allocated to the parent fund. This effect is recursive with each child. If a start time and/or end time are specified in the original deposit, these time frames will be recursively applied to all descendant deposits. You have to use the `mam-shell` interactive control program to manage deposit shares. For the `FundFund` association object, the `Fund` is the parent and the `Id` is the child.

*Example 10-3: Establishing a 10% deposit share between a parent and a child fund*

```
$ mam-shell FundFund Modify Fund==3 Id==6 DepositShare=10
Fund      Id      DepositShare  Overflow
-----
3          6      10             False
Successfully modified 1 fundFund
```

An overflow policy can be established between the parent fund and its children to enable a trickle-up effect for charges, liens, and quotes from the lower level funds (Overflow is an attribute of the FundFund association object). The Overflow attribute is a boolean value (True or False). If the overflow value between a child and its parent is set to True, any charges, liens, or quotes issued against the child fund that cannot be satisfied by the balance in the child fund, will recursively issue the unsatisfied portion of the charge, lien, or quote against the parent fund. If the charge, lien, or quote cannot be satisfied by the ancestors, no charges, liens, or quotes will result against any of funds. The balance in the descendant funds will be depleted before ancestor funds. This effect is recursive with each parent. If a parent fund is linked with overflow to a child fund and a charge, lien, or quote overflows to the parent fund, the constraints of the parent fund will not be checked against the properties of the item. One must use the mam-shell control program to manage the overflow policy. For the FundFund association object, the Fund is the parent and the Id is the child.

*Example 10-4: Enabling overflow between a parent and a child fund*

```
$ mam-shell FundFund Modify Fund==3 Id==6 Overflow=True
```

Fund	Id	DepositShare	Overflow
3	6	10	True

```
Successfully modified 1 fundFund
```

## 10.14 Fund Priority

By default, when an item can charge to multiple funds, funds with more constraints are chosen over funds with fewer constraints. For example, if the user amy is charging against the chemistry account for usage of an item and there are two viable funds, one with a single constraint (e.g., Account=chemistry) and another with two constraints (e.g., Account=chemistry and User=amy), credits will be taken from the more specific fund (with 2 constraints) before they are taken from the more general fund (with 1 constraint). To override this behavior, it is possible to give a priority to a fund. The priority factor of a fund has higher precedence than the specificity (constraint count) of the fund. Therefore, all else being equal, if a fund with a lower number of constraints is given a higher priority than a fund with a higher number of constraints, the higher priority fund will be depleted first. Other factors, such as the end time of the allocation or whether there is an existing lien for the item against a fund, have a higher precedence than the specificity of the fund. If you want the allocations in a particular fund to be chosen before allocations that expire sooner or that have a lien, you may need to specify fund priorities that are in the millions (see [Allocation Precedence](#) for a discussion of the manner of sorting allocations for charging).

*Example 10-5: Setting a fund priority*

```
$ mam-modify-fund -f 3 --priority 1
```

```
Successfully modified 1 fund
```

## Chapter 11: Managing Allocations

An allocation is a time-bound pool of credits associated with a fund. A fund can have multiple allocations, each for use during a different time period. Normally, only a single allocation will be active within a fund at any given time.

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### 11.1 About Allocations

Allocations are normally created via a fund deposit. An allocation has an amount, an initial deposit, and an allocated value. The `Amount` attribute tracks the current amount of credits in the allocation. The `InitialDeposit` attribute stores the amount originally deposited into an allocation when it is initially created. The `Allocated` attribute stores the current adjusted allocated amount. It begins set to the initial deposit amount and is incremented with each crediting deposit or incoming transfer and decremented with each withdrawal or outgoing transfer. When a deposit is made to a fund, if a matching allocation already exists with the appropriate time period, the existing allocation is modified. Otherwise, a new allocation is created. A resetting deposit will end the currently active allocation and create a new allocation.

An allocation has a start time and an end time that defines the time period during which the allocation can be used. If a start time or end time is specified when making a deposit, an existing allocation having the specified boundary times will be credited. If no start time or end time is specified, the active allocation will be credited. If no matching or active allocations can be found, a new allocation will be created with the specified or default start and end time (the start time defaults to the present and the end time defaults to infinity). An active flag is automatically updated to `True` if the allocation is within its valid time frame or `False` if it is not. An allocation that becomes active because the current time is greater than its start time undergoes an activation that normally registers as a credit to the



fund. An allocation that becomes inactive because the current time is greater than its end time undergoes a deactivation that normally registers as a debit to the fund.

By using multiple allocations that expire in regular intervals it is possible to implement a use-it-or-lose-it policy and establish an allocation cycle. There are two primary methods to implement periodic allocations. In the first method, called Resetting Allocations, funds are reset (ending the current allocation and creating a new one) at the beginning of each allocation period. By setting and maintaining an appropriate default deposit amount for each fund, the process of resetting funds can be simplified. The periodic reset can be performed either by making a resetting deposit for each fund (e.g., `mam-deposit -f 1 --reset`), which allows you to override default deposit amounts, by calling the reset action for each fund (e.g., `mam-modify-fund -f 1 --reset`), which allows you to select which funds to reset, or by invoking a reset across all funds (e.g., `mam-modify-fund --reset --all`). The effect of any of these commands is to end the currently active allocation in the fund and then make a fresh deposit. The fund's default deposit amount is used any time the amount is not specified in a deposit (as in the case of a fund reset command). If the default deposit amount is positive, the currently active allocation is ended and a new allocation is created with the default amount. If the default deposit amount is set to a value of zero, the active allocation is ended and no new allocation is created. If the default deposit amount is not set, the fund's allocations are not affected. The reset can be performed via a scheduled event or via a cron script. If default deposit amounts are kept up-to-date (including being zeroed out for funds that are slated to end and being unset for funds that you do not want affected by the reset), automation of this method can be as simple as creating a single periodic event with a FireCommand of 'Fund Reset' (see [Creating Events](#)). In the second method, called Expiring Allocations, funds with predesignated start and end times are created head of time. When the beginning of an allocation period is reached, the currently active allocation automatically expires and the next one automatically becomes active. A future allocation is created by making a deposit while specifying a start time and an end time in the future (e.g., `mam-deposit -f 1 -s 2023-10-01 -e 2024-01-01`). This method can also take advantage of default deposit amounts. The overall effect of either of these methods is very similar.

By default, Moab Accounting Manager attempts to enforce Discrete allocations, or ensure that allocations within a fund are non-overlapping (in time) and non-reusable (each allocation period should use a distinct allocation). This behavior is designated by the `allocation.enforcediscrete` server configuration parameter. If set to `true`, this policy prevents new allocations within a fund from overlapping existing ones. Enabling this policy helps to improve clarity when reporting on allocation usage during a particular period. If set to `false`, overlapping allocations within a fund can be created. This might be useful if you want to allow the remaining balance from a prior allocation period to carry over into the new allocation period. With overlapping allocations, it is harder to describe what percentage of a group's allocation has been used. This policy is applied when making deposits that create new allocations, when making transfers that create new allocations, or when modifying the start and end times of an existing allocation. It is possible to override

the configured policy for an individual command by specifying the `EnforceDiscrete` option (e.g., `mam-deposit --option name=EnforceDiscrete value=False`).

An allocation can have a credit limit representing the amount by which it can go negative. Therefore, by having a positive balance in the `Amount` field, the fund is like a debit account, implementing a pay-first use-later model. By establishing a credit limit instead of depositing an initial balance, the fund will be like a credit account, implementing a use-first pay-later model. These strategies can be combined by depositing some amount of funds coupled with a credit limit, implementing a form of overdraft protection where the funds will be used down to the negative of the credit limit.

It is possible for the allocation `Amount` or `CredLimit` to be set to `Infinity` (via a deposit). If the amount is infinite, debits will not decrease the balance. An infinite deposit will result in an infinite `Allocated` amount. If the credit limit is infinite, there will be no negative limit for debits. It is not possible to have infinite charges, liens, quotes, withdrawals, refunds, or transfers. However, it is possible to have infinite allocation activations, deactivations, and deletions. This capability is only available when using a database that supports IEEE Standard 754 for Floating-Point Arithmetic (e.g., PostgreSQL).

Operations include querying, modifying, and deleting allocations. Allocations can be created by a fund deposit, creating a fund with allocation auto-generation enabled, refunding a usage record, or a transfer between funds. Allocations can also be indirectly modified via charges, withdrawals, transfers, or refunds. By default, a standard user can only query allocations that pertain to them.

Allocation queries allow the specification of filter options that filter the allocations to those with funds meeting the specified fund constraints. There are three allocation filter types that can be employed: `ExactMatch`, `Exclusive`, and `NonExclusive`. The `NonExclusive` filter type will be used by default if no filter type is specified.

- If an exact-match filter type is used, the query will return only the allocations relating to the funds for which the specified filters exactly match the constraints. For example, `Allocation Query FilterType:=ExactMatch Filter:=User=bob` would only return a fund with the sole constraint `User=bob`.
- If an exclusive filter type is used, the query will return only allocations relating to funds for which the specified filters meet all constraints. For example, `Allocation Query FilterType:=Exclusive Filter:=User=amy` would not return an allocation for a fund with the sole constraint `Machine=blue`.
- If a non-exclusive filter type is used, the query will return all allocations relating to funds for which the filters do not specifically exclude the constraints. The query assumes that if constraints are not specified within the filters, they can be assumed as a wildcard and will return all allocations involving funds that are not specifically excluded by the filter. For example, `Allocation Query FilterType:=NonExclusive Filter:=User=amy` would return an

allocation with a fund whose only constraint was `Machine=blue` but would not return an allocation with a fund with the constraint `User=bob`.

## 11.2 Creating Allocations

Allocations are normally created by making fund deposits via the `mam-deposit` command (see [Making Deposits](#)).

## 11.3 Querying Allocations

To display allocation information, use the command `mam-list-allocations`.

```
mam-list-allocations [-i <allocation_id>] [-f <fund_id>] [-A  
| -I | {[ -s <start_time>] [-e <end_time>]}] [-X, --extension  
<property>=<value>]... [-u <user_name>] [-g <group_name>] [-a  
<account_name>] [-o <organization_name>] [-c <class_name>]  
[-m <machine_name>] [--filter <filter_name>=<filter_value>]...  
[--filter-type ExactMatch|Exclusive|NonExclusive] [--include-  
ancestors] [--full] [--show <attribute_name>, ...] [--format  
csv|raw|standard] [--hours] [--debug] [--site <site_name>] [-  
help]  [--man]  [--quiet]  [--version]  [--about]
```

### Listing allocations for fund 1

```
$ mam-list-allocations -f 1
```

Id	Fund	Active	StartTime	EndTime	InitialDeposit	Allocated	CreditLimit	Remaining
1	1	True	2023-01-01	2023-04-01	25000000	25000000	0	24974400
								0.10
2	1	False	2023-04-01	2023-07-01	25000000	25000000	0	25000000
								0.00
3	1	False	2023-07-01	2023-10-01	25000000	25000000	0	25000000
								0.00
4	1	False	2023-10-01	2024-01-01	25000000	25000000	0	25000000
								0.00

### Related Topics

- [mam-list-allocations](#)

## 11.4 Modifying Allocations

To modify an allocation, use the command *mam-modify-allocation*.

```
mam-modify-allocation {[-i] <allocation_id>} [-s <start_time>]
[-e <end_time>] [-L <credit_limit>] [-d <description>] [-X, --
extension <property>=<value>]... [--hours] [--debug] [--
site <site_name>] [--help] [--man] [--quiet] [--verbose] [--
version] [--about]
```

### Changing the end time for an allocation

```
$ mam-modify-allocation -e "2024-01-01" 4
Successfully modified 1 allocation
```

### Changing the credit limit for an allocation

```
$ mam-modify-allocation -L 500000000000 -i 2
Successfully modified 1 allocation
```

---

#### Related Topics

- [mam-modify-allocation](#)

## 11.5 Deleting Allocations

To delete an allocation, use the command *mam-delete-allocation*.

```
mam-delete-allocation {-I | {[-i] <allocation_id>}} [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--
version] [--about]
```

### Deleting an allocation

```
$ mam-delete-allocation 4
Successfully deleted 1 allocation
```

### Purging inactive allocations

```
$ mam-delete-allocation -I
```

```
Successfully deleted 2 allocations
```

## Related Topics

- [mam-delete-allocation](#)

## 11.6 Allocation Auto-Generation

It is possible to enable the auto-generation of allocations by setting the `AutoGen` property of the `Allocation` object to `True`. When creating a new fund, if allocation auto-generation is enabled, an allocation will automatically be created for the fund via a deposit. The deposit will use the default amount and default credit limit (defined in the `DefaultValue` property of the `Allocation Amount` and `Allocation CreditLimit` attributes). The default action for allocation auto-generation is to create an allocation with an infinite credit limit.

### Enable auto-generation of allocations

```
$ mam-shell Object Modify Name==Allocation AutoGen=True
Successfully modify 1 object
```

## 11.7 Allocation Precedence

When issuing a charge (or lien or quote) for the usage of a resource or service, the feasible allocations are sorted according to a weight given to them for that transaction. The weight for each allocation is calculated as follows:

- Independent of precedence, if the instance has current liens against one or more allocations, the reserved allocations will be debited first in order to avoid double booking.
- For the remaining non-nested funds, allocations will be given a value of  $100 + \text{int}((2147483647 - \langle \text{end\_epoch\_time} \rangle) / 86400) + 10 * \langle \text{fund\_priority} \rangle + \langle \text{constraint\_count} \rangle$ . Therefore, sooner expiring allocations will be used before later expiring allocations.
- Fund priority will be the next highest factor (assuming small priority values of 1-10), followed by the number of constraints on the fund (more specific funds will be used before more general funds). Of course, since priority is configurable, a sufficiently large priority (in the millions) can be used to override the precedence of earlier expiring allocations.

- Lastly, nested funds that become feasible because of overflow to ancestor funds have a negative weighting and are used last, with the earliest expiring allocations being used before later expiring allocations and closer level ancestors being depleted before ancestor funds that are at more distant levels. These allocations are given a weight of  $\langle \text{distance} * 100000 \rangle - \langle \text{end\_epoch\_time} \rangle$ .

After all feasible allocations are sorted according to the above rules, the charge (or lien or quote) will be applied against the allocations one by one in sorted order (highest value first) until the request is fulfilled, or until it fails due to insufficient funds.

If a transaction is not able to be satisfied in whole, then:

- for a *charge*, partial debits will be applied and the entire transaction will succeed regardless of the amount successfully debited.
- for a *quote* or a *lien*, the entire transaction will fail and no partial debits will be applied.

## Chapter 12: Managing Liens

A lien is a hold placed against an allocation. Before usage of a resource or service begins, a lien is made against one or more allocations within the requesting user's applicable fund (s). Subsequent usage requests will also post liens while the available balance (active allocations minus liens) allows. When the usage ends, the lien is removed and the actual charge is made to the allocation(s). This procedure ensures that usage will only be permitted so long as the requestors have sufficient funds.

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### 12.1 About Liens

Associated with a lien is the instance name (name of the item being used such as the job ID), the usage record (which contains the item details), a start time and end time for the lien and a description. The lien will automatically expire and no longer count against the user's balance after the end time passes. Each lien will be associated with held amounts from one or more allocations. Operations include creating, querying, modifying, and deleting liens. By default, a standard user can only query liens attributed to them.

Lien queries allow the specification of filter options that narrow down the liens that will be returned. There are two lien filter types that can be employed: `AttributedTo` and `ImpingesUpon`. If `ImpingesUpon` is used, the query will return all liens associated with funds satisfying the filters. For example, `Lien Query FilterType:=ImpingesUpon Filter:=User=scottmo` will return all liens impinging on Funds usable by `scottmo`. If `AttributedTo` is used, the query will return all liens associated with usage records satisfying the filters. For example, `Lien Query FilterType:=AttributedTo Filter:=User=scottmo` will return all liens for resources or services allocated to `scottmo`.

When a lien is created via the `UsageRecord Reserve` action (such as via `mam-reserve`), if another lien exists with the same instance name, the default behavior is to leave the old lien in place (and create the new one alongside it). This behavior assumes that the other

lien is probably a separate lien created by a resource or service manager that reuses instance IDs. However, alternate behaviors can be specified via the mutually exclusive `Modify` or `Replace` options. If the `Replace` option is specified, any pre-existing liens with matching instance names will first be deleted, thereby ensuring only one lien per instance name at a time. If the `Modify` option is specified, a pre-existing lien with matching instance name will be modified to have the new properties (but keeping the same lien ID), and can be used to extend a lien. This might be used with incremental charging to dynamically stretch liens along a little at a time as needed (see [Making a Usage Lien](#) for a description of the action using these options).

Liens can be granted a grace period (in seconds), which is defined as the difference between the validity period of the lien (end time minus start time) and the expected duration of the usage. The purpose of a grace period is to account for the fact that we might not know precisely when the usage will begin and the lien needs to remain in force during the lifetime of the usage. One can apply a desired grace period for a lien by setting the end time longer than the specified duration. Alternatively, a grace duration option can be specified with the duration when creating a lien via `mam-reserve` as a helper to computing a relatively adjusted end time.

## 12.2 Creating Liens

Liens are normally created with the `mam-reserve` command (see [Making a Usage Lien](#)).

However, it is also possible to create a manual lien against specified allocations using the `mam-create-lien` command. A lien object and its allocation associations will be created. Unlike `mam-reserve`, no calculated lien amount will be returned or a usage record be created or updated with the lien. Furthermore, `mam-create-lien` will not perform any checking to ensure that the specified allocations have a sufficient active balance to support the lien.

```
mam-create-lien [-J <instance_name>] [-s <start_time>] {-
e <end_time> | -t <lien_duration>} [-d <description>] [-X, --
extension <property>=<value>]... {-A <allocation_id><-<fund_
id>=<sublien_amount>,...}... [--debug] [--site <site_name>] [-
-help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Creating a manual lien

```
$ mam-create-lien -J weekend_run -t 84600 -A "5<-2=3600"
Successfully created 1 lien
```





Use of the `mam-create-lien` command bypasses the normal mechanisms that prevent more liens from being placed against an allocation than it can support. Use `mam-reserve` instead if you want to avoid the possibility of oversubscribing the allocations.

## Related Topics

- [mam-create-lien](#)

## 12.3 Querying Liens

To display lien information, use the command `mam-list-liens`.

```
mam-list-liens [[-l] <lien_id>] [-A | -I] [-J <instance_
pattern>] [-X, --extension <property>=<value>]... [-u <user_
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filter-
type AttributedTo|ImpingesUpon] [--full] [--show <attribute_
name>,...] [--long] [--wide] [--format csv|raw|standard] [--
hours] [--debug] [--site <site_name>] [--help] [--man] [--
quiet] [--version] [--about]
```

### Listing All Info About All Liens for Amy

```
$ mam-list-liens -u amy
```

Id	Instance Description	Amount	StartTime	EndTime	UsageRecord	Funds
3	PBS.1234.4	57600	2023-04-06 21:21:48	2023-04-06 22:31:48	7	2

### Listing All Info About All Liens that Impinge Against Dave's Balance

```
$ mam-list-liens -u dave --filter-type ImpingesUpon
```

Id	Instance Description	Amount	StartTime	EndTime	UsageRecord	Funds
4	batch.12	7600	2023-04-06 15:30:34	2023-04-06 15:41:50	244	3

## Listing Total of Lien Amounts Broken Down by Attributed Account

```
$ mam-list-liens --show "GroupBy(Account),Sum(Amount)=Reserved"
```

Account	Reserved
biology	1.00
chemistry	4.00

### Related Topics

- [mam-list-liens](#)

## 12.4 Modifying Liens

To modify a lien, use the command *mam-modify-lien*.

```
mam-modify-lien {[-l] <lien_id>} [-s <start_time>] [-e <end_time>] [-t <lien_duration>] [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Changing the Expiration Time of a Lien

```
$ mam-modify-lien -e "2023-06-06 14:43:02" 1
```

```
Successfully modified 1 lien
```

### Related Topics

- [mam-modify-lien](#)

## 12.5 Deleting Liens

To delete a lien, use the command *mam-delete-lien*.

```
mam-delete-lien {-I | {-J <instance_name>} | {[-l] <lien_id>}} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## Deleting a lien by instance (or job ID)

```
$ mam-delete-lien -J PBS.1234.0  
Successfully deleted 1 lien
```

## Deleting a lien by Lien ID

```
$ mam-delete-lien 1  
Successfully deleted 1 lien
```

## Purging stale liens

```
$ mam-delete-lien -I  
Successfully deleted 2 liens
```

---

### Related Topics

- [mam-delete-lien](#)

## Chapter 13: Managing Quotes

A quotation provides a way to determine beforehand how much would be charged for a job. When a guaranteed quote is requested, the charge rates applicable to the usage request are saved and a quote ID is returned. Charge rates can be specified with the quote or the standard rates can be used in the quote calculation. When the lien and the final charge are issued, the quote ID can be referenced to ensure that the saved quote charge rates are used instead of current standard values. A quotation has an expiration time after which it cannot be used. A quotation can also be used to verify that the given job has sufficient funds and meets the policies necessary for the charge to succeed.

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### 13.1 About Quotes

Associated with a quote is the ID, the instance name (name of the item being used such as the job ID), the amount quoted (assuming full use of the quoted resources or services), the usage record (which contains the usage details), a start and end time for the quote, a duration (how long the item is expected to be used), a boolean indicating whether the quote is pinned or unpinned, and a description. Each guaranteed quote will be associated with one or more saved charge rates. Operations include creating, querying, modifying and deleting quotes. By default, a standard user can only query quotes attributed to them.

Quote queries allow the specification of filter options that narrow down the quotes that will be returned. The query will return all quotes associated with usage records satisfying the filters. For example, `Quote Query Filter:=User=scottmo` will return all quotes for resources or services allocated to `scottmo`.

A quote can be pinned (restricted to a particular instance) or unpinned (allowed to be used by any number of different instances). If a quote is pinned and has not been tied to a particular instance when initially created, it will be tied to the first instance that claims it. Once pinned to an instance, it can then be used repeatedly by that same instance until the

quote expires, but not by any other instance. If a quote is not pinned, any instances can use the quoted rates while the quote is active.

A quote can be granted a grace period, which is defined as the difference between the validity period of the quote (end time minus start time) and the expected duration of the usage in seconds. The purpose of a grace period is to account for the fact that we might not know precisely when the usage will begin and the quote needs to be valid during the time of completion of the usage in order for the guaranteed charge rates to be applied. One can apply a desired grace period for a quote by setting the end time longer than the specified duration. Alternatively, a grace duration option can be specified with the duration when creating a quote via *mam-quote* as a helper to computing a relatively adjusted end time.

A distinction can be made between quotes and quote templates, both of which use the Quote object. A quote will always return a cost estimate and will be associated with a specific usage record. A quote template provides a way to bundle together a package of special charge rates that can be applied to quotes, liens, and charges. Quote templates use the same Quote object as regular quotes but they are not associated with a usage record and do not generate a quote amount.

In calculating a price, a quote will use (in order of lower to higher precedence) the standard charge rates, the charge rates from a specified quote template, the specified override charge rates, or an externally specified charge amount. In saving guaranteed charge rates, the standard charge rates pertaining to the specified usage record properties will be used unless overridden by a specified quote template or specified charge rates.

There are several key purposes for using quotes and quote templates. First, a quote can be requested to discover the cost of using a resource or service. If this is your sole purpose, then you may want to use the *mam-quote* command with the `--costOnly` option. Second, a quote can be used to check whether the requestor has sufficient access and funds to use the requested resource. This can be accomplished by invoking the *mam-quote* command without the `--costOnly` option. Third, a quote or a quote template can be used to lock-in current or specified charge rates for use in future liens and charges. If the details of the usage are known and you would like to get a quote amount with a quote ID that can be referenced to guarantee the quoted charge rates, you can use the *mam-quote* command with the `--guarantee` option. Override charge rates can be factored in to the cost estimate of the quote by using the *mam-quote* command with the `--rate` option. If specific override charge rates need to be saved or guaranteed for future use within a quote, lien, or charge without generating a cost estimate, create a pinned quote template by using the *mam-create-quote* command with the `--pin` and `--rate` options. If it is necessary to create a quote template that can be used to override the standard charge rates for multiple instances, use the *mam-create-quote* command with the `--nopin` and `-rate` options.

## 13.2 Creating Quotes

Quotes are normally generated by the resource management system with the *mam-quote* command before an instance uses requested resources or services (see [Obtaining Usage Quotes](#)).

## 13.3 Creating Quote Templates

Quote templates can be created by using the *mam-create-quote* command. Quote templates provide a way to bundle together a package of special charge rates that can be applied to quotes, liens, and charges.

```
mam-create-quote [--pin] [-J <instance_name>] | --nopin] [-s <start_time>] {-e <end_time> | -t <quote_duration>} [-d <description>] [-X, --extension <property>=<value>]... {--rate <charge_rate_name>[<charge_rate_value>]=<charge_rate_amount>,...}... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Creating a pinned quote template

```
$ mam-create-quote --pin -J vpc.1 -t 86400 --rate  
Processors=1.5/s,QualityOfService{Premium}=*1.7  
Successfully created 1 quote template with id 17
```

### Creating an unpinned quote template

```
$ mam-create-quote --nopin -t 86400 --rate Disk=2.5/s,License{Matlab}=4/s  
Successfully created 1 quote template with id 18
```

**i** Use of the *mam-create-quote* command will not result in a cost estimate or the creation of a usage record. Use *mam-quote* instead if you want to obtain a quote for usage.

### Related Topics

- [mam-create-quote](#)

## 13.4 Querying Quotes

To display quote information, use the command `mam-list-quotes`.

```
mam-list-quotes [[ -q <quote_id>] [-J <instance_name>] [-A | -I] [-X, --extension <property>=<value>]... [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--full] [--show <attribute_name>, ...] [--long] [--wide] [--format csv|raw|standard] [--hours] ] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing all quotes for user amy on machine colony

```
$ mam-list-quotes -u amy -m colony
```

Id	Amount	Pinned	Instance	UsageRecord	StartTime	EndTime	D
uration	ChargeRates		Description				
1	57600	True	242		2023-04-06 12:49:53	2023-04-	
13	13:09:58	3600	Processors:1/s				

### Related Topics

- [mam-list-quotes](#)

## 13.5 Modifying Quotes

To modify a quote, use the command `mam-modify-quote`.

```
mam-modify-quote {[-q <quote_id>] [-s <start_time>] [-e <end_time>] [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]}
```

### Changing the Expiration Time of a Quote

```
$ mam-modify-quote -e "2023-05-01" 1
```

```
Successfully modified 1 quote
```

## Related Topics

- [mam-modify-quote](#)

## 13.6 Deleting Quotes

To delete a quote, use the command *mam-delete-organization*.

```
mam-delete-quote {-I | {[-q] <quote_id>}} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Deleting a quote

```
$ mam-delete-organization 1  
Successfully deleted 1 quote
```

### Purging stale quotes

```
$ mam-delete-organization -I  
Successfully deleted 2 quotes
```

---

## Related Topics

- [mam-delete-quote](#)



## Chapter 14: Managing Usage Records

Moab Accounting Manager can track the usage of resources and services on your system, recording the charge and the details of the usage in a usage record. A usage record is created when a resource or service manager requests a guaranteed quote for usage, places a lien for usage, or charges for the usage of an item. Usage records can also be created directly via UsageRecord Create (*mam-create-usagerecord*). A refund can be invoked to credit a charge amount back to the originating fund. Usage records can also be queried, modified, or deleted. By default, a standard user can only query usage records attributed to them.

In a typical use case, a quote might be used to discover how much it would cost to use an item (resource or service) and to verify the user had sufficient access to the item and funds to cover the requested usage. Just before the item is about to be used, a lien (or hold) might be placed against the user's allocated credits for the requested usage. After the usage is complete, a charge for the actual usage can be debited from their fund and the lien removed.

As is the case for other Moab Accounting Manager objects, usage records are highly customizable. One can remove most usage record properties and add new usage record properties. Refer to the section [Customizing the Usage Record Object](#) for examples of customizing usage records.

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## 14.1 Creating a Usage Record

In most cases, usage records will be created by the resource management system via the API or with the *mam-quote*, the *mam-reserve* or the *mam-charge* command.

However, it is also possible to create usage records directly using the *mam-create-usagerecord* command.

```
mam-create-usagerecord {-J <instance_name>} [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{ \"<feature_name>\":<feature_count>,...}"] [-R "{ \"<resource_name>\":<resource_count>,...}"] [-L "{ \"<license_name>\":<license_count>,...}"] [-Z "{ \"<metric_name>\":<metric_amount>,...}"] [-V "{ \"<variable_name>\": \"<variable_value>\",...}"] [-W <requested_duration>] [-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-x <exit_code>] [--stage <lifecycle_stage>] [-d <description>] [-X --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Creating a Usage Record

```
$ mam-create-usagerecord -u jsmith -a chem -m cluster -X Charge=2468 -P 2 -t 1234 -J PBS.1234.0
```

```
Successfully created 1 usage record with id 246
```

**i** The fields that are displayed by default by this command can be customized by setting the `usagerecord.show` configuration parameter in `mam-client.conf`.

**i** Use of the `mam-create-usagerecord` command to record usage will not result in the debiting of a user's allocation. Use `mam-charge` instead if you want to charge for the usage.

### Related Topics

- [mam-create-usagerecord](#)

## 14.2 Querying Usage Records

To display usage record information, use the command `mam-list-usagerecords`.

```
mam-list-usagerecords [[-j] <usage_record_id>] [-J <instance_
name_pattern>] [-T <usage_record_type>] [-u <user_name>] [-
g <group_name>] [-a <account_name>] [-o <organization_name>]
[-c <class_name>] [-Q <quality_of_service>] [-m <machine_
name>] [--stage <lifecycle_stage>] [-X, --extension
<property>=<value>]... [-s <start_time>] [-e <end_time>] [--
full] [--show <attribute_name>,...] [--format
csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--
help] [--man] [--quiet] [--version] [--about]
```

### Show Specific Info about Usage Tallied by Amy

```
$ mam-list-usagerecords --show=Type,Instance,Account,Machine,Charge -u amy
```

Type	Instance	Account	Machine	Charge
Job	PBS.1234.0	chemistry	colony	22212

### Show Breakdown of Charges by Account and User

```
$ mam-list-usagerecords --show "GroupBy(Account),GroupBy(User),Sum(Charge)"
```

Account	User	Charge
biology	bob	5.00
chemistry	amy	5.00
chemistry	bob	1.00

### Show Number of Jobs per Quality of Service

```
$ mam-list-usagerecords --show "Count(Instance)=Jobs,GroupBy(QualityOfService)"
```

Jobs	QualityOfService
40	
1	premium
9	windfall

### Show Number of Jobs Using the Bigmem Node Feature

```
$ mam-list-usagerecords --show "Count(Features{bigmem})"
```

bigmem
147

## Show Number of Matlab Licenses Used by the Chemistry Account

```
$ mam-list-usagerecords -a chemistry --show "Sum(Licenses{matlab})"
matlab
-----
407
```

### Related Topics

- [mam-list-usagerecords](#)

## 14.3 Modifying a Usage Record

It is possible to modify a usage record by using the command *mam-modify-usagerecord*.

```
mam-modify-usagerecord {[-j] <usage_record_id> | -J <instance_
name>} [-n <designated_name>] [-T <usage_record_type>] [-
u <user_name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-Q <quality_of_
service>] [-m <machine_name>] [-N <nodes>] [-P <processors>]
[-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "
{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_
name>\":<resource_count>,...}" ] [-L "{\<license_
name>\":<license_count>,...}" ] [-Z "{\<metric_
name>\":<metric_amount>,...}" ] [-V "{\<variable_
name>\":\<variable_value>\",...}" ] [-W <requested_duration>]
[-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-
x <exit_code>] [--stage <lifecycle_stage>] [-d <description>]
[-X, --extension <property_name>=<value>]... [--debug] [--
site <site_name>] [--help] [--man] [--quiet] [--verbose] [--
version] [--about]
```

### Changing a Usage Record

```
$ mam-modify-usagerecord -Q HalfPrice -X Charge=1234 -d "Benchmark" -J PBS.1234.0
Successfully modified 1 usage record
```

**i** Changing a recorded charge in this manner will not change the allocated balance (see [Issuing Usage Refunds](#) to refund a charge).

---

**Related Topics**

- [mam-modify-usagerecord](#)

## 14.4 Deleting a Usage Record

To delete a usage record, use the command `mam-delete-usagerecord`.

```
mam-delete-usagerecord {[-j] <usage_record_id> | -J <instance_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Deleting a usage record

```
$ mam-delete-usagerecord -J PBS.1234.0
Successfully deleted 1 usage record
```

---

**Related Topics**

- [mam-create-usagerecord](#)

## 14.5 Obtaining Usage Quotes

Usage quotes can be used to determine how much it will cost to use a resource. Provided the cost-only option is not specified, this step will additionally verify that the submitter has sufficient funds and meets all the allocation policy requirements for the usage, and can be used at the submission of the usage request as an early filter to prevent the usage from getting blocked when it tries to obtain a lien to start later. If a guaranteed quote is requested, a quote ID is returned and can be used in the subsequent charge to guarantee the rates that were used to form the original quote. A guaranteed quote has the side effect of creating a quote record and a permanent usage record. A quote ID will be returned that can be used with the lien and charge to claim the quoted charge rates. A cost-only quote can be used to determine how much would be charged for usage without verifying sufficient funds or checking to see if the charge could succeed. A breakdown of the charges in the quote can be returned by specifying the `--itemize` option with the `--verbose` option.

To request a usage quote, use the command `mam-quote`.

```

mam-quote [-J <instance_name>] [[-j] <usage_record_id>] [-q <quote_template_id>] [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property>=<value>]... [-zt <quote_duration> [-G <grace_duration>]] [-zs <quote_start_time>] [-z <quote_amount>] [--cost-only | --guarantee] [---rate <charge_rate_name>[{\<charge_rate_value>}]=<charge_rate_amount>,...]... [--hours] [--itemize] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]

```

## Requesting a Quote

```

$ mam-quote -a chemistry -u amy -m colony -P 2 -W 3600
Successfully quoted 7200 credits

```

## Requesting a Guaranteed Quote

```

$ mam-quote -a chemistry -u amy -m colony -P 16 -W 3600 --guarantee
Successfully quoted 57600 credits with quote id 1 and usage record id 86

$ mam-list-quotes


```

Id	Amount	UsageRecord	StartTime	EndTime	Duration	Used	ChargeRates	Description
1	57600	86	2023-04-06 10:09:58	2023-04-06 11:09:58	3600	0	Processors:1/s	

**i** It is possible to establish a system default machine, project or user to be used in job functions (charge, reserve or quote) when left unspecified. See [25.2 Server Configuration - page 195](#) for more information.

## Related Topics

- [mam-quote](#)

## 14.6 Making a Usage Lien

A usage lien can be used to place a hold on the user's fund before usage starts to ensure that the credits will be there when it completes. The replace option can be specified if you want the new lien to replace existing liens of the same instance name (associated with the same usage record). The modify option can be specified to dynamically extend any existing lien with the same instance name with the specified characteristics instead of creating a new one. See [Managing Liens](#) for more information about these options.

To create a usage lien use the command `mam-reserve`.

```
mam-reserve {-J <instance_name>} [[-j] <usage_record_id>] [-q <quote_id>] [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [-s <start_time>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property=value>]... [-zt <lien_duration> [-zs <lien_start_time> [-G <grace_duration>]] [-z <lien_amount>] [--modify | --replace] [--rate <charge_rate_name>[{\<charge_rate_value>}]=<charge_rate_amount>,...]]... [--hours] [--itemize] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Creating a Lien

```
$ mam-reserve -J PBS.1234.0 -a chemistry -u amy -m colony -P 2 -W 3600
```

```
Successfully reserved 7200 credits with lien id 37 for instance PBS.1234.0 and created usage record id 87
```

## Related Topics

- [mam-reserve](#)

## 14.7 Charging for Usage

A usage charge debits the appropriate allocations based on the attributes of the usage. The charge is calculated based on factors including the resources used, the usage time, and other quality-based factors (see [Managing Charge Rates](#)). By default, any liens associated with the charge will be removed. The incremental option can be specified if you want associated liens to be reduced instead of removed. If a usage record already exists for the instance being charged it will be updated with the data properties passed in with the charge request; otherwise, a new usage record will be created.

A quote ID can be specified to use a previously quoted set of charge rates. This will also ensure the charge will update the usage record instantiated with the quote. A lien ID can be specified to help match up a charge with its lien (this may assist in deleting the correct lien if instance IDs are not unique). This will also ensure the charge will update the usage record that may have been instantiated by the lien.

Although, by default, Moab Accounting Manager will calculate the charge for the usage using its default charge rates or using the charge rates saved by a referenced quote or quote template, it is possible to specify override charge rates via the rate option. Alternatively, it is possible to designate an externally calculated charge by specifying the charge amount with the Charge option (-z option to *mam-charge*).

To charge for a usage use the command *mam-charge*.

```
mam-charge {-J <instance_name>} [[-j] <usage_record_id>] [-n <designated_name>] [-q <quote_id>] [-l <lien_id>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-x <exit_code>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property>=<value>]... [-zt <charge_duration>] [-zs <charge_start_time>] [-z <charge_amount>] [-f <fund_id>]
```



```
[--incremental] [--rate <charge_rate_name>[{{<charge_rate_
value>}}=<charge_rate_amount>,...]]... [--hours] [--itemize] [-
-debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

## Issuing a Usage Charge

```
$ mam-charge -J PBS.1234.0 -a chemistry -u amy -m colony -P 2 -t 1234

Successfully charged 2468 credits for instance PBS.1234.0
1 lien was removed
```

### Related Topics

- [mam-charge](#)

## 14.8 Issuing Usage Refunds

A charged amount can be credited back in part or in whole by issuing a usage refund. This action attempts to lookup the referenced usage record to ensure that the refund does not exceed the original charge and so that the charge entry can be updated. If multiple matches are found (such as the case when instance names, such as job IDs, are non-unique), this command will return the list of matched usage records with unique IDs so that the correct usage record can be specified for the refund.

To issue a refund for a usage charge, use the command *mam-refund*.

```
mam-refund {-J <instance_name> | [-j] <usage_record_id>} [-
z <refund_amount>] [-i <allocation_id>] [-d <description>] [--
hours] [--debug] [--site <site_name>] [--help] [--man] [--
quiet] [--verbose] [--version] [--about]
```

### Issuing a Usage Refund

```
$ mam-refund -J PBS.1234.0

Successfully refunded 19744 credits for instance PBS.1234.0
```

### Related Topics

- [mam-refund](#)

## 14.9 Customizing the Usage Record Object

The usage record object as natively defined can be customized with the attributes you want to track in your use cases. The chapter on [Customizing Objects](#) goes into some detail on the customization syntax. However, since this may be a common requirement, this section will provide a few examples on modifying, adding and deleting usage record attributes and getting them to be tracked and show up in queries.

Usage record discriminators are those properties that are considered primary differentiators between usage, lien, and quote records. Usage record discriminators are used in the dynamic web portal as filters for the listing, modification, and deletion of usage records, liens, and quotes. The default usage record discriminators are Type, User, Group, Account, Organization, Class, QualityOfService, and Machine. Any new attributes added to the usage record object will become usage record discriminators. Removing a discriminator attribute from the usage record object will necessarily remove it as a usage record discriminator as well. It will be necessary to log out and back in after adding or removing a discriminator in order for it to be reflected in the web GUI.

### Adding an Application Field (and Discriminator)

Let's say you would like to track the application run by the jobs. First, you would add `Application` as an Attribute of the `UsageRecord` Object.

```
$ mam-shell Attribute Create Object=UsageRecord Name=Application DataType=String
Successfully created 1 attribute
```

If you want the new attribute to show up in `mam-list-usagerecords`, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Application,Charge,Stage,User,Group,Account,Organization,Class,Qualit
yOfService,Machine,Nodes,Processors,Memory,Duration,SubmitTime,StartTime,EndTime,Descr
iption
```

If you want to filter the usage records by `Application`, (such as listing all usage records associated with the specified application), use the `-X` (or `--extension`) option in `mam-list-usagerecords`:

```
$ mam-list-usagerecords -X Application=foo --
show=Type,Instance,Charge,User,Application

Type Instance   Charge User Application
-----
Job   PBS.1234.0 19744 amy   foo
```

You could also use `Application` as the basis of a `ChargeRate`. See [Chapter 16: Managing Charge Rates - page 126](#) for how to do this.

Although the initial step above allows the application value to be tracked in the usage record, it is also possible to add it as an attribute of the Transaction table so that it will be automatically populated from actions having assignments, conditions, options and data values referring to the Application:

```
$ mam-shell Attribute Create Object=Transaction Name=Application DataType=String
Successfully created 1 attribute
```

Additionally, the *mam-statement* client command can show Application as one of its discriminators (which are Account, User, and Machine by default) in its debit detail. These statement discriminators are specified by the `--show` argument to *mam-statement* and can be configured with the `statement.show` configuration parameter in `mam-client.conf`.

## Tracking the User-Specified Job Name

The following example demonstrates how to add a Name attribute to the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=Name DataType=String
Description="\User-Specified Name\"
Successfully created 1 attribute
```

If you want the new attribute to show up in *mam-list-usagerecords*, you must add it to the `usagerecord.show string` in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,Memory,Duration,SubmitTime,StartTime,EndTime,Description
```

## Tracking Accelerator Usage

The following examples demonstrate how to track hardware accelerator usage (e.g., GPUs and/or MICs) within the usage record:

- To track GPUs:

```
$ mam-shell Attribute Create Object=UsageRecord Name=GPUs DataType=Integer
Description="\Number of GPUs Allocated\"
Successfully created 1 attribute
```

- To track MICs:

```
$ mam-shell Attribute Create Object=UsageRecord Name=MICs DataType=Integer
Description="\Number of MICs Allocated\"
Successfully created 1 attribute
```

If you want the new attributes to show up in `mam-list-usagerecords`, you must add them to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,GPU, MICs,Memory,Duration,SubmitTime,StartTime,EndTime,Description
```

Once you have added them to the usage record, you can charge for them by adding an affiliated charge rate. See [Charging for GPUs \(and/or MICs\) - page 129](#) for how to do this.

## Tracking Energy Used

The following example demonstrates how to add an Energy attribute to the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=Energy DataType=Float
Description="\Energy Used\"

Successfully created 1 attribute
```

If you want the new attribute to show up in `mam-list-usagerecords`, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,Memory,Energy,Duration,SubmitTime,StartTime,EndTime,Description
```

## Tracking Node Features

The following example demonstrates how to add a Features attribute to the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=Features DataType=JSON
Description="\Node Features Allocated\"

Successfully created 1 attribute
```

If you want the new attribute to show up in `mam-list-usagerecords`, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,Memory,Duration,Features,SubmitTime,StartTime,EndTime,Description
```

## Tracking NUMA Properties

The following examples demonstrate how to track NUMA properties (e.g., Sockets, NumaNodes, Cores, Threads) with the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=Sockets DataType=Integer
Description="\Number of NUMA Sockets Allocated\""
```

```
Successfully created 1 attribute
```

```
$ mam-shell Attribute Create Object=UsageRecord Name=NumaNodes DataType=Integer
Description="\Number of NUMA Nodes Allocated\""
```

```
Successfully created 1 attribute
```

```
$ mam-shell Attribute Create Object=UsageRecord Name=Cores DataType=Integer
Description="\Number of NUMA Cores Allocated\""
```

```
Successfully created 1 attribute
```

```
$ mam-shell Attribute Create Object=UsageRecord Name=Threads DataType=Integer
Description="\Number of NUMA Threads Allocated\""
```

```
Successfully created 1 attribute
```

If you want the new attributes to show up in `mam-list-usagerecords`, you must add them to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf
```

```
usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,M
achine,Nodes,Processors,Sockets,NumaNodes,Cores,Threads,Memory,Duration,SubmitTime,Sta
rtTime,EndTime,Description
```

## Adding a ProcessorEquivalents Field

The following example demonstrates how to track processor equivalents (PE) with the usage record. See the information on PE in 'Scheduling Environment' in the *Moab Workload Manager Administrator Guide* for a description of what processor equivalent means.

```
$ mam-shell Attribute Create Object=UsageRecord Name=ProcessorEquivalents
DataType=Float Description="\Processor Equivalents\""
```

```
Successfully created 1 attribute
```

If you want the new attribute to show up in `mam-list-usagerecords`, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf
```

```
usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,M
achine,Nodes,Processors,ProcessorEquivalents,Memory,Duration,SubmitTime,StartTime,EndT
ime,Description
```

You could also use `ProcessorEquivalents` as the basis of a `ChargeRate`. See [Chapter 16: Managing Charge Rates - page 126](#) for how to do this.

## Adding a BlockedProcessors Field

The following example demonstrates how to track blocked processors with the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=BlockedProcessors
DataType=Integer Description="\Number of Processors Blocked by the Job\"
Successfully created 1 attribute
```

If you want the new attribute to show up in *mam-list-usagerecords*, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,BlockedProcessors,Memory,Duration,SubmitTime,StartTime,EndTime,Description
```

You could also use `BlockedProcessors` as the basis of a `ChargeRate`. See [Chapter 16: Managing Charge Rates - page 126](#) for how to do this.

## Tracking Queued Duration

The following example demonstrates how to track the effective duration that a job was in the idle state by adding a `QueueDuration` attribute to the usage record:

```
$ mam-shell Attribute Create Object=UsageRecord Name=QueueDuration DataType=Integer
Description="\Queue Duration\"
Successfully created 1 attribute
```

If you want the new attribute to show up in *mam-list-usagerecords*, you must add it to the `usagerecord.show` string in `mam-client.conf`:

```
$ vi /opt/mam/etc/mam-client.conf

usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,Memory,Duration,QueueDuration,SubmitTime,StartTime,EndTime,Description
```

## Enabling Reservation Statistics

The following example demonstrates how to track reservation statistics with the usage record. In this example, we will show how to track reserved processor seconds and idle processor seconds within a reservation.

```
$ mam-shell Attribute Create Object=UsageRecord Name=ReservedProcessorSeconds
DataType=Integer Description="\Reserved Processor Seconds\"
Successfully deleted 1 attribute
```

```
$ mam-shell Attribute Create Object=UsageRecord Name=IdleProcessorSeconds
DataType=Integer Description="\Unused Processor Seconds\"
Successfully deleted 1 attribute
```

Once you are able to track idle processor seconds, you can use the `IdleProcessorSeconds` property to charge for the unused cycles in a reservation. See [Charging for the Unused Cycles in Reservations - page 130](#) for how to do this.

## Removing the UsageRecord Class Field

Let's say you were not interested in tracking the class. First, you would delete `Class` as an Attribute of the `UsageRecord` Object:

```
$ mam-shell Attribute Delete Object==UsageRecord Name==Class
Successfully deleted 1 attribute
```

Next, we need to make sure `mam-list-usagerecords` doesn't try to list the class:

```
$ vi /opt/mam/etc/mam-client.conf
usagerecord.show =
Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,QualityOfService,Machine
,Nodes,Processors,Memory,Duration,SubmitTime,StartTime,EndTime,Description
```

If the attribute you want to delete is also an attribute in the `Transaction` table, you could delete it from there as well.

## Setting VM as the Default Usage Record Type

As installed, the usage record type defaults to `Job`. The default value can be set to `NULL` if there should be no default value, or to any other default value. This example will demonstrate how to set the default usage record type to `VM`.

```
$ mam-shell Attribute Modify Object=UsageRecord Name=Type DefaultValue=VM
Successfully modified 1 attribute
```

## 14.10 Usage Record Property Verification

If a usage record property has an object associated with it, you may want to verify that when that usage record property is specified in a scheduling action (`Charge`, `Reserve`, `Quote`), it verifies that that property is a valid instance of its object type. You can apply a simple verification to a usage record property by setting the property's `Values` attribute to an `@` sign followed by the name of the object.

## Ensure that an Organization Specified in a Charge Actually Exists

```
$ mam-shell Attribute Modify Object==UsageRecord Name==Organization
Values=@Organization
Successfully modified 1 attribute
```

See [Managing Attributes](#) for more information about setting the `Values` attribute.

## 14.11 Usage Record Property Defaults

It is possible to set defaults for usage record properties when they are not specified in the usage data for a charge, lien, or quote. There are two cases that must be considered — when the property has an object associated with it and when the property does not.

If a property does not have an object associated with it, simply set the `DefaultValue` attribute for the property's `UsageRecord Attribute` object to the desired value.

### Setting a System-Wide Simple Default Class of Batch for Usage Functions

```
$ mam-shell Attribute Modify Object==UsageRecord Name==Class DefaultValue=batch
Successfully modified 1 attribute
```

If a property does have an object associated with it, you will need to both set the `DefaultValue` attribute for the property's `UsageRecord Attribute` object to the desired value AND set the `DefaultValue` attribute for the corresponding object to the desired value.

### Setting a System-Wide Simple Default User of Anonymous for Usage Functions

```
$ mam-shell Attribute Modify Object==UsageRecord Name==User DefaultValue=anonymous
Successfully modified 1 attribute
```

See [Global Object-Based Defaults](#) for more information about setting default values for objects. See [Local Attribute-Based Defaults](#) for more information about setting default values for attributes.

---

#### Related Topics

- [23.7 Global Object-Based Defaults - page 169](#)



## 14.12 Usage Record Property Auto-Generation

It is possible for usage record properties that have object definitions to automatically create the referenced objects the first time they are encountered in a usage function (charge, reserve or quote). To do this, the referenced object must be set to `AutoGen=True` and the `Values` attribute for the `UsageRecord` attribute corresponding to the object must be set to a string consisting of the `@` sign followed by the object name.

### Setting the Usage Record Type to Auto-Generate Items for Usage Functions

For example, let's assume there were many usage record types that could be charged for (Food, Book, Haircut) and that you had already created an `Item` object. It would be possible to automatically generate a new `Item` instance each time a new usage record type was referenced in a charge operation.

```
$ mam-shell Object Modify Name==Item AutoGen=True
Successfully modified 1 object

$ mam-shell Attribute Modify Object==UsageRecord Name==Type Values=@Item
Successfully modified 1 attribute
```

See [Object Auto-Generation](#) for more information about the auto-generation of objects.

---

#### Related Topics

- [23.6 Object Auto-Generation - page 168](#)

## 14.13 Usage Record Property Instantiators

It is possible to establish a dynamic correlation between usage record properties where one usage record property can instantiate another. For example, if a user is specified in a charge but no account is specified then the user's default account should be applied to the fund constraints and logged; or if an account is specified in a charge but not its organization then the organization corresponding to that account should be looked up and applied to the fund constraints and logged. Three usage record property instantiator types are currently supported and are configured by prefixing the property instance's `Values` foreign object reference with the appropriate characters: Assign if not defined (`@?=`), Assign if not different (`@!=`), Assign always (`@:=`). We shall look at each of these individually and in different terms.

*Applying a correlated default (@?=)* — If property X is specified with the value x in the usage record and property Y is not specified in the usage record and if the object instance referred to by x has a correlated default value of y' for property Y', then y' will be applied as the default value for property Y in the usage record. For example, we could establish the notion of a default account for a user.

## Establishing a Default Account for a User

First we add a `DefaultAccount` attribute (the name is arbitrary) to the `User` object and give it a `Values` property of `@?=Account`:

```
$ mam-shell Attribute Create Object=User Name=DefaultAccount DataType=String
Values="\@?=Account\" Description="\Default Account\"
Successfully created 1 attribute
```

Then we can establish the default account for user `scottmo` to be `chemistry`:

```
User Modify Name==scottmo DefaultAccount=chemistry
Successfully modified 1 user
```

Subsequently, when a `Charge`, `Lien`, or `Quote` is issued that specifies the User `scottmo` but does not specify the `Account`, the `chemistry` `Account` will be applied to the charge as if originally specified in the usage record charge data.

*Applying a correlated verification (@!=)* — If property X is specified with the value x in the usage record and property Y is specified with the value y in the usage record and if the object instance referred to by x has a correlated verification value of y' for the property Y' and if y' does not equal y, then fail with an error message. Additionally, if property X is specified with the value x in the usage record and property Y is not specified in the usage record and if the object instance referred to by x has a correlated verification value of y' for property Y', then y' will be applied as the default value for property Y in the usage record. For example, we could establish a parent-child relationship between organizations and accounts where explicitly specified incongruities result in a failure.

## Establishing an Override Hierarchy with Accounts and Organizations

First we add a `VerifyOrganization` attribute (the name is arbitrary) to the `Account` object and give it a `Values` property of `@!=Organization`:

```
$ mam-shell Attribute Create Object=Account Name=VerifyOrganization DataType=String
Values="\@!=Organization\" Description="\Verify Organization\"
Successfully created 1 attribute
```

Then we can establish the verify organization for account `chemistry` to be `sciences`:

```
$ mam-shell Account Modify Name==chemistry VerifyOrganization=sciences
```

```
Successfully modified 1 account
```

Subsequently, when a Charge, Lien, or Quote is issued that specifies the Account `chemistry` and specifies the wrong Organization (e.g., `arts`), the transaction will fail with an error message. Additionally, when a Charge, Lien, or Quote is issued that specifies the Account `chemistry` but does not specify the Organization, the Organization `sciences` will be applied to the charge as if originally specified in the usage record charge data.

*Applying a correlated override (@ :=)* — If property X is specified with the value `x` in the usage record and if the object instance referred to by `x` has a correlated override value of `y'` for property Y', then `y'` will be applied as the override value for property Y in the usage record. For example, we could establish a parent-child relationship between organizations and accounts where explicitly specified incongruities are silently overridden with the value from the child.

## Establishing an Override Hierarchy with Accounts and Organizations

First we add an `OverrideOrganization` attribute (the name is arbitrary) to the Account object and give it a `Values` property of `@ :=Organization`:

```
$ mam-shell Attribute Create Object=Account Name=OverrideOrganization DataType=String
Values="\">@:=Organization\" Description="\Override Organization\""
```

```
Successfully created 1 attribute
```

Then we can establish the override organization for account `chemistry` to be `sciences`:

```
$ mam-shell Account Modify Name==chemistry OverrideOrganization=sciences
```

```
Successfully modified 1 account
```

Subsequently, when a Charge, Reserve or Quote is issued that specifies the Account `chemistry` and specifies either the wrong Organization (e.g., `arts`) or no Organization, the Organization `sciences` will be silently applied to the charge as if originally specified in the usage record charge data.

## Chapter 15: Managing Itemized Charges

The itemized charge table provides an ability to display the components of a composite charge in a line item format. Each charge transaction will write the components of its charge into the charge record so that you can get a line-item breakdown of each charge for usage including the names, values, rates, scaling factors, charge amounts and details listed for each component of the charge. This capability is enabled by setting `charge.itemization = true` in the `mam-server.conf` (it is `false` by default).

Itemized charges can only be queried. They are created automatically in charge transactions and there are no command line clients to change or remove them.

Additionally, an `itemize` option can be specified for quotes, liens, and charges to include an itemized charge breakdown in the response data instead of a single line with the amount.

In this chapter:

<a href="#">15.1 Querying Itemized Charges</a>	124
<a href="#">15.2 Displaying Itemized Charges for a Transaction</a>	125

### 15.1 Querying Itemized Charges

To display itemized charge information, use the command `mam-list-itemizedcharges`.

```
mam-list-itemizedcharges [-j <usage_record_id>] [-J <instance_name>] [-n <usage_property_name>] [-s <start_time>] [-e <end_time>] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

#### Listing all Itemized Charge Information

```
$ mam-list-itemizedcharges
```

UsageRecord nTime	Instance Name Description	Value	Duration	Rate	ScalingFactor	Amount	Creatio
24 04-05 17:49:41	job.1 Storage	100	86400	1.157e-07	1	1	2023-
25	job.2 Processors	4	86400	5.787e-07	1	20	2023-

```

04-05 17:49:42
25      job.2      Memory      4096  86400    1.13e-08  1          4 2023-
04-05 17:49:42
26      job.3      Processors  1      86400    5.787e-05 1          5 2023-
04-05 17:49:43
26      job.3      Memory      1004  86400    1.13e-08  1          1 2023-
04-05 17:49:43

```

## Related Topics

- [mam-list-itemizedcharges](#)

## 15.2 Displaying Itemized Charges for a Transaction

In addition to the itemized charge table, Moab Accounting Manager captures the itemized charges for usage record charges, liens, and guaranteed quotes in the details of the transaction. The itemized charges show the details for the formula used to calculate the charge for the transaction. To display the itemized charges for a scheduling transaction, parse the details from the command `mam-list-transactions --full -A Charge|Reserve|Quote:`

### Extract the Itemized Charges for a Job Charge

```

$ mam-list-transactions -A Charge -J PBS.1234.1 -q --show Details | perl -pe 's/.*
(ItemizedCharges[^\,]*)\.*/\1/'
ItemizedCharges:=4 [Processors] * 5.787e-05 [ChargeRate{Processors}] * 86400
[Duration] + 4096 [Memory] * 1.13e-08
[ChargeRate{Memory}] * 86400 [Duration] = 24

```

## Chapter 16: Managing Charge Rates

Charge rates establish how much to charge for usage. A charge rate consists of its name, an optional value, and the amount. Charge rates are applied when usage properties matching the charge rate names are found in the usage data. In order for a charge rate of a given name to be applied, a usage record attribute of the same name must exist. For example, a charge rate having the name Processors will be applied if Processors is defined as a Usage Record attribute and the incoming usage data for the charge request contains a property called Processors that matches the value specified in the charge rate.

In this chapter:

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16.2 Creating Charge Rates .....	128
16.3 Querying Charge Rates .....	132
16.4 Modifying Charge Rates .....	133
16.5 Deleting Charge Rates .....	133

### 16.1 About Charge Rates

There are two basic types of charge rates - Name-valued charge rates and Numeric-valued charge rates:

- Name-valued charge rates charge rates are used for usage properties that take strings for values (e.g., `QualityOfService=premium` or `Account=chemistry`). The charge rate that is applied will be determined by a lookup of the usage property value to see if there is a matching charge rate value. A default rate can be specified by creating a name-valued charge rate with an empty charge rate value. Multiple values can be assigned to the same rate via separate charge rate definitions or by combining the values in a single charge rate value separated by commas.
- Numeric-valued charge rates are used for usage properties that take numbers for values (e.g., `Processors=2` or `CPUtime=12.67`). The charge rate amount that is applied will be multiplied by the usage property value. The charge rate value is commonly left blank to be taken as the default rate for the full range of usage property values. A particular value can also be specified as the charge rate value, which means that that rate will only be used if the usage property value exactly matches the charge rate value. A half-bounded expression can be used by specifying

a less than or greater than sign with an optional equal sign, followed by the number. For example, the charge rate value `<=4` would match a usage property value of `x` if `x <= 4`. A charge rate value can also be specified as a range (of the form `<number>[-<number>]`). For example, the range `1-4` would be match a usage property value of `x` if `1 <= x <= 4`. If you need to be more specific about the boundedness of the ranges, you can replace the dash with a less than sign with an optional equal sign on either side of it to indicate whether the endpoints are included. For example, the range `1<4` would match if `1 < x < 4`, `1=<4` would match if `1 <= x < 4`, `1<=4` would match if `1 < x <=4` and `1=<=4` would match if `1 <= x <= 4`. So you might use ranges like `1=<2`, `2=<4`, `4=<8`, and `>=8`. Multiple values or value ranges having the same charge rate can be specified in a single expression separated by commas.

A charge rate amount can have an operation modifier that dictates the way the rate is factored into the charge calculation. For example, consumption-based charge rates or usage fees will often be additive in nature while quality-based charge rates may be multiplicative. The additive charge rates can be further distinguished by whether they should be added before or after the multiplicative charge rates are applied. The charge formula can be represented in the following form:  $(\Sigma(\text{Pre-Additive Rates}) * \Pi(\text{Multiplicative Rates})) + \Sigma(\text{Post-Additive Rates})$ . Therefore, there are three operation modifiers: Pre-Additive, Multiplicative and Post-Additive.

Composite Type	Description
<b>Pre-Additive</b>	Pre-additive modifiers are applied to charge rates that should be added together before any charge multipliers are applied. A pre-additive modifier is specified by prepending a plus sign '+' to the charge rate amount. Since pre-additive is the most commonly specified operation modifier, a charge rate amount without an operation modifier will be assumed to be pre-additive by default.
<b>Multiplicative</b>	Multiplicative modifiers are applied to charge rates that should be multiplied together with other multiplicative charge rates and with the sum of the pre-additive charge rates. A multiplicative modifier is specified by prepending an asterisk '*' to the charge rate amount.
<b>Post-Additive</b>	Post-additive modifiers are applied to charge rates that should be added together after any charge multipliers are applied. A post-additive modifier is specified by appending a plus sign '+' to the charge rate amount.

A pre-additive charge rate can have a time-based modifier that dictates that charge should be multiplied by amount of time the feature was used. For example, it is common for the processor charge to be multiplied by the amount of time the processors were used. A time-based modifier is specified by appending a forward slash '/' to the charge rate amount,

followed by one of the following time designators: s (per-second), m (per-minute), h (per-hour), d (per-day), W (per-week), M (per-month), Y (per-year). As an example, a per-hour time-based modifier is specified by appending '/h' to the charge rate amount and will cause a charge to be multiplied by the number of hours the feature was used. Technically, a rate with a time-based modifier will be multiplied by the number of seconds the feature was used, then divided by the number of seconds corresponding to the time designator (e.g., 3600), and will ultimately be rounded to the number of decimal places in the currency precision.

A pre-additive charge rate can have a divisor modifier that dictates that the charge should be divided by the specified integer. A divisor modifier is specified by appending a forward slash '/' to the charge rate amount, followed by an integer number. A divisor modifier can be used in lieu of expressing a small decimal fraction charge rate such as when converting a value from Megabytes to Gigabytes. If a divisor modifier is used in conjunction with a time-based modifier, the divisor modifier must precede the time-based modifier.

A charge rate can have one or more conditions that dictates additional qualifications that must be met in order for the charge rate to be applied. A condition is specified by prepending `<propertyName>=<propertyValue>` followed by a question mark '?' to the value field of the charge rate. If you want Processors to apply a special charge rate (e.g., .5/s) for user amy, the charge rate value should consist of the string "User=amy?". Additionally, you can combine charge rate conditions with either a pipe symbol '|' for or, or an ampersand symbol '&' for and. For example, `User=amy|User=dave?` or `User=amy&Project=chemistry?`. You cannot combine ands and ors in the same charge rate value.

## 16.2 Creating Charge Rates

To create a new charge rate, use the command `mam-create-chargerate`.

```
mam-create-chargerate {[-n] <charge_rate_name>} [-x <charge_rate_value>] [-z <charge_rate_amount>} [-d <description>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```



You must first create the usage record property before you can charge by it. See [Customizing the Usage Record Object](#) for instructions on how to create a usage record property.

### Charging for Requested Memory

For consumable resources, we use a time-based modifier (e.g., '/s') to multiply the memory by the duration the resource was used (in this case, seconds). We also divide the result by



1024 since Moab reports memory in Megabytes but we want to charge for Gigabytes.

```
$ mam-create-chargerate -n Memory -z 1/1024/s -d "1 credit per requested Gigabyte of
memory per second.
Successfully created 1 charge rate
```

## Charging for GPUs (and/or MICs)

If you intend to have the accelerator charge multiplied by the amount of time that was used, use the appropriate time modifier. Use the name GPUs if charging for GPUs or use the name MICs if charging by MICs. Alternatively, you can create separate charge rates for each if both are present in your system.

```
$ mam-create-chargerate -n GPUs -z 1/s -d "1 credit per GPU-second"
Successfully created 1 charge rate
```

## Charging for CPU Time

Since CPU time already incorporates the element of time in its value, we do not need to include a time-based modifier in the charge rate:

```
$ mam-create-chargerate -n CPUTime -z 1 -d "1 credit per utilized cpu-second"
Successfully created 1 charge rate
```

## Charging for Blocked Processors (Jobs Only)

It is possible to charge for blocked processors rather than allocated processors. For example, all of the processors in an entire node may be blocked by a job using a node-exclusivity policy (e.g., a node access policy of 'single-job') even though a lesser number of processors were actually requested and allocated to the job.

```
$ mam-create-chargerate -n BlockedProcessors -x Type=Job? -z 1/s -d "1 credit per
blocked processor second"
Successfully created 1 charge rate
```

## Charging for Processor Equivalents

Some sites may want to charge for processor equivalents rather than allocated processors. Processor equivalents scale the allocated processors by the most constrained consumable resource (e.g., memory or CPU).

```
$ mam-create-chargerate -n ProcessorEquivalents -z 1/s -d "1 credit per processor
equivalent per second"
Successfully created 1 charge rate
```

## Charging for the Unused Cycles in Reservations

If your resource manager supports it, and if configured to do so, you can charge for the unused cycles in administrative or standing reservations. If using Moab Workload Manager, you must first enable reservation charging. See in the *Moab Workload Manager Administrator Guide* for how to do this.

It will also be necessary to add the required reservation statistics to the usage record object (e.g., IdleProcessorSeconds and ReservedProcessorSeconds). See [Enabling Reservation Statistics - page 118e](#) for how to do this.

After adding the necessary usage record attributes, you must create a charge rate that charges for the unused cycles in the reservation. The following charge rate will charge for processor seconds that were not blocked by jobs running within the reservation:

```
$ mam-create-chargerate -n IdleProcessorSeconds -x 'Type=Reservation?' -z 1 -d "1
credit per unused processor second in reservations"
```

```
Successfully created 1 charge rate
```

If also charging for jobs, it is recommended that you charge jobs for the blocked processors with a condition of 'Type=Job?' since this is the best counterpart to the IdleProcessorSeconds metric, which charges for unblocked processors. See [Charging for Blocked Processors \(Jobs Only\) - page 129](#) for how to do this.

## Creating a Name-Valued Pre-Additive Charge Rate

```
$ mam-create-chargerate -n License -x matlab -z 5
```

```
Successfully created 1 charge rate
```

## Creating a Numeric-Valued Multiplicative Charge Rate

```
$ mam-create-chargerate -n Discount -z *1
```

```
Successfully created 1 charge rate
```

## Charging for Quality of Service

We want to multiply the resource charge by a value that depends on the quality of service applied to the job. Therefore we must create a set of name-valued multiplicative charge rates with a default value:

```
$ mam-create-chargerate -n QualityOfService -x Premium -z *2
```

```
Successfully created 1 charge rate
```

```
$ mam-create-chargerate -n QualityOfService -J BottomFeeder -z *0.5
```

```
Successfully created 1 charge rate
```

```
$ mam-create-chargerate -n QualityOfService -z *1  
Successfully created 1 charge rate
```

## Charging for Licenses

```
$ mam-create-chargerate -n Licenses -x Matlab -z +20  
Successfully created 1 charge rate
```

## Charging for Generic Resources

```
$ mam-create-chargerate -n Resources -x graphics -z 5  
Successfully created 1 charge rate
```

## Charging for Job Variables

```
$ mam-create-chargerate -n Variables -x foo:bar -z 10  
Successfully created 1 charge rate
```

## Creating a Numeric-Valued Post-Additive Charge Rate

```
$ mam-create-chargerate -n Shipping -z 25+  
Successfully created 1 charge rate
```

## Creating a Name-Valued Post-Additive Charge Rate

```
$ mam-create-chargerate -n Zone -x Asia -z 200+  
Successfully created 1 charge rate
```

## Creating a Couple of Conditional Numeric-Valued Pre-Additive Charge Rates

```
$ mam-create-chargerate -n Disk -x User=dave? -z 0.2/s  
Successfully created 1 charge rate
```

```
$ mam-create-chargerate -n Disk -x User=mike? -z 0.5/s  
Successfully created 1 charge rate
```

## Creating Some Numeric-Valued Pre-Additive Charge Rate Ranges and a Default

```
$ $ mam-create-chargerate -n Processors -x 1-4 -z 2/s  
Successfully created 1 charge rate
```

```
$ mam-create-chargerate -n Processors -x 5-8 -z 1.5/s
Successfully created 1 charge rate
```

```
$ mam-create-chargerate -n Processors -z 1/s
Successfully created 1 charge rate
```

## Creating Some Numeric-Valued Pre-Additive Rate Ranges for Floating Point Values (without Time-Based Modifiers)

```
$ $ mam-create-chargerate -n Power -x '<2' -z 0.005
Successfully created 1 charge rate
```

```
$ $ mam-create-chargerate -n Power -x '2=<4' -z 0.004
Successfully created 1 charge rate
```

```
$ $ mam-create-chargerate -n Power -x '>=4' -z 0.003
Successfully created 1 charge rate
```

## Assigning Multiple Classes to Run for Free

```
$ $ mam-create-chargerate -n Class -x dev,test -z *0
Successfully created 1 charge rate
```

### Related Topics

- [mam-create-chargerate](#)

## 16.3 Querying Charge Rates

To display charge rate information, use the command `mam-list-chargerates`.

```
mam-list-chargerates [[-n] <charge_rate_name>] [-x <charge_rate_value>] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing All Charge Rates

```
$ mam-list-chargerates
```

Name	Value	Amount	Description
------	-------	--------	-------------

```

Class          dev,test      *0
CPUTime        1
Discount       *1
Disk           User=dave?    0.2/s
Disk           User=mike?    0.5/s
License        Matlab       5/s
Memory         1/1024/s
Power          <2          0.005
Power          2=<4        0.004
Power          >=4        0.003
Processors     1/s
Processors     1-4          2/s
Processors     5-8          1.5/s
QualityOfService *1
QualityOfService BottomFeeder *0.5
QualityOfService Premium    *2
Shipping       25+
Zone          Asia       200+

```

---

### Related Topics

- [mam-list-chargerates](#)

## 16.4 Modifying Charge Rates

To modify a charge rate, use the command *mam-modify-chargerate*.

```

mam-modify-chargerate {[-n] <charge_rate_name>} [-x <charge_
rate_value>] [-z <charge_rate_amount>] [-d <description>] [--
debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]

```

### Changing a Charge Rate

```

$ mam-modify-chargerate -n License -x Matlab -z 4/s

Successfully modified 1 charge rate

```

---

### Related Topics

- [mam-modify-chargerate](#)

## 16.5 Deleting Charge Rates

To delete a charge rate, use the command *mam-delete-chargerate*.

```
mam-delete-chargerate {[-n] <charge_rate_name>} [-x <charge_rate_value>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## Deleting a Charge Rate

```
$ mam-delete-chargerate -n Memory  
Successfully deleted 1 charge rate
```

---

### Related Topics

- [mam-delete-chargerate](#)

## Chapter 17: Managing Transactions

Moab Accounting Manager logs all modifying transactions in a detailed transaction journal (queries are not recorded). Previous transactions can be queried but not modified or deleted. By default, a standard user can only query transactions performed by them.

In this chapter:

17.1 Querying Transactions .....	135
17.2 Customizing the Transaction Object .....	136

### 17.1 Querying Transactions

To display transaction information, use the command `mam-list-transactions`.

```
mam-list-transactions [[-T <transaction_id>] [-R <request_id>] [-O <object>] [-A <action>] [-k <primary_key_value>] [-U <actor>] [-f <fund_id>] [-i <allocation_id>] [-u <user_name>] [-a <account_name>] [-m <machine_name>] [-j <usage_record_id>] [-J <instance_name>] [-s <start_time>] [-e <end_time>] [-X, --extension <property>=<value>]... [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

#### List All Deposits Made in 2023

```
$ mam-list-transactions -A Deposit -s 2023-01-01 -e 2024-01-01
```

#### List Refund Totals Broken Down by Fund

```
$ mam-list-transactions -A Refund --show "Sum(Amount),GroupBy(Fund)"
```

#### List Usage and Charge Totals Broken Down by Account and User

```
$ mam-list-transactions -A Charge --show "GroupBy(Account),GroupBy(User),Sum(ProcHours),Sum(Amount)=Charged"
```

## List Every Transaction Performed by Amy Since the Beginning of 2023

```
$ mam-list-transactions -U amy -s 2023-01-01
```

## List All Transactions Related to Job moab.1

```
$ mam-list-transactions -J moab.1
```

## List All Transactions Affecting Charge Rates

```
$ mam-list-transactions -O ChargeRate
```

---

### Related Topics

- [mam-list-transactions](#)

## 17.2 Customizing the Transaction Object

The transaction record as natively defined can be customized with the attributes you want to track in your use cases. It is possible to add additional attributes to the Transaction table so that it will be automatically populated from actions having assignments, conditions, options and data values referring to the attribute.

Transaction discriminators are those properties that are considered primary differentiators between transaction records (besides the metadata differentiators of object, action, and instance). Transaction discriminators are used in the dynamic web portal as filters for the listing of transaction records. Any new attributes added to the Transaction object will become transaction discriminators. Removing a discriminator attribute from the transaction object will necessarily remove it as a transaction discriminator as well. It will be necessary to log out and back in after adding or removing a discriminator in order for it to be reflected in the web GUI.

*Example 17-1: Adding an Organization field to the Transaction record (which also makes it a discriminator)*

```
$ mam-shell Attribute Create Object=Transaction Name=Organization DataType=String
Successfully created 1 attribute
```



## Chapter 18: Managing Events

Moab Accounting Manager has an internal event scheduler that can be configured to execute Moab Accounting Manager actions at a designated time in the future or on a periodic basis. Valid actions on an event include Create, Query, Fire, Modify, Refresh and Delete. Event attributes include Id, FireCommand, ArmTime, FireTime, RearmPeriod, EndTime, Notify, RearmOnFailure, FailureCommand, CatchUp and Description.

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### 18.1 About Events

There are two server configuration parameters that affect event scheduling: `event.scheduler`, which specifies whether the event scheduler is enabled or not (it is disabled by default) and `event.pollinterval`, which is the period in minutes that the event scheduler uses to fire events. The poll interval must divide evenly into the number of minutes in a day (1440).

**i** In order for events to fire, you must set `event.scheduler = true` in `mam-server.conf` and restart the MAM Server.

The command(s) to be fired by an event are expressed in a serialized form of the request identical to the syntax used in the interactive control program (`mam-shell`). There are two commands that can be configured in an event: the `FireCommand`, which is the command to be executed when the event is fired, and the `FailureCommand`, which is the command to be executed if the fired command results in an unsuccessful response status. The `FireTime` is the target time for the event to be triggered by the event scheduler. The actual fire time may be dependent on the state of the server and will be recorded in the `CreationTime` property of the corresponding 'Event Fire' Transaction. An event can also be fired manually with the Event Fire action.

The `RearmPeriod` is a time period expression specifying when the event will be rearmed. This period expression is of the form: `<period>[[@<instant>][~|^]!]`. The time period is expressed as an integer number followed by a designator of minute(s), hour(s), day(s), week(s), month(s), or years(s). For example, the period might be 1 day, 2 hours, or 5 minutes. The optional Instant locks the period to a specific instant within the time period such as 1 day @ hour 12 or 1 month @ day 3.

The modifiers indicate whether the time period should be relative to now (!), or relative to the start of this (~) designator (month or minute, etc.), or relative to the start of the first (^) designator (month or minute, etc.). For example, assuming the `FireTime` was 7:15, if you specified `4 hours !` as the rearm period it would be rearmed at 11:15, if you specified `4 hours ~` as the rearm period it would be rearmed at 11:00, and if you specified `4 hours ^` as the rearm period it would be rearmed at 8:00.

The `ArmTime` is the time the event was last armed or fired. This field is used as a reference time to be able to derive how long the event has been waiting to happen. This field will be initially set to mark the moment the first `FireTime` is set and updated thereafter to indicate the last time the event was fired. In the case where an event does not have a `FireTime` set, this field can be set manually and used in a similar manner.

If we consider the time between event firings as 'laps', this could be thought of as the Lap Start Time. If the `RearmOnFailure` boolean is set to `False`, the event will not be rearmed if the command was unsuccessful. If set to `True`, the event will be evaluated for rearming even if the command response has a status of `Failure`. The standard default is `False`. If the `CatchUp` boolean is set to `True` and the server was down during the time this event should have fired, the event scheduler will attempt to make up for the past due events by progressively firing them (rearming based on previous arm time) until catching up to the present. The actions will still show as having occurred in the present rather than in the past. If set to `False`, and the server is brought back up after an outage, the event scheduler will still fire immediately for a past due event, but it will only fire once and then rearm relative to the current time.

A Notification method can be specified via the `Notify` parameter and is of the form: `[+|=][<delivery_method>:] [<recipient>][, [+|=][<delivery_method>:] [<recipient>]]*`. If the term is a -, the notification is sent only on failure. If the term is a +, the notification is sent only on success. Otherwise the notification is always sent. There can be multiple notify expressions separated by a comma. All applicable notifications will be sent. See the chapter on [Managing Notifications](#) for more information about delivery method and recipient.

## 18.2 Creating Events

To create a new event, use the command `mam-create-event`.

```
mam-create-event [--fire-command <fire_command>] [-s <fire_time>] [-e <end_time>] [--rearm-period <rearm_period>] [--rearm-on-failure <boolean>] [--failure-command <failure_command>] [--notify <notification_url>] [--catch-up <boolean>] [-d <description>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## Creating an Automatic Allocation Renewal Event

```
$ mam-create-event --fire-command "Fund Reset" -s "2024-01-01" --rearm-period "3 months^"
```

```
Successfully created 1 event
```

**i** In order for events to fire, you must set `event.scheduler = true` in `mam-server.conf` and restart the MAM Server.

### Related Topics

- [mam-create-event](#)

## 18.3 Querying Events

To display event information, use the command `mam-list-events`.

```
mam-list-events [[-E] <event_id>] [-s <start_time>] [-e <end_time>] [--full] [--show <attribute_name>,...] [--format <csv|raw|standard>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### Listing All Events

```
$ mam-list-events
```

Id	FireCommand	FireTime	ArmTime	RearmPeriod	EndTime	Notify
	RearmOnFailure	FailureCommand	CatchUp	CreationTime	Description	
1	Fund Reset	2024-01-01	2023-11-09 10:31:28	3 months^		False
	True		2023-11-09 10:31:28			

### Related Topics

- [mam-list-events](#)

## 18.4 Modifying Events

To modify an event, use the command *mam-modify-event*.

```
mam-modify-event {[-E] <event_id>} [--fire-command <fire_
command>] [-s <fire_time>] [-e <end_time>] [--rearm-
period <rearm_period>] [--rearm-on-failure True|(False)] [--
failure-command <failure_command>] [--notify <notification_
url>] [--catch-up (True)|False] [-d <description>] [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [-
version] [--about]
```

### Changing an Event's Rearm Period to be Monthly

```
$ mam-modify-event --rearm-period "1 month" 1
Successfully modified 1 event
```

#### Related Topics

- [mam-modify-event](#)

## 18.5 Deleting Events

To delete an event, use the command *mam-delete-event*.

```
mam-delete-event {[-E] <event_id>} [--debug] [--site <site_
name>] [--help] [--man] [--quiet] [--verbose] [--version] [--
about]
```

### Deleting an Event

```
$ mam-delete-event 1
Successfully deleted 1 event
```

#### Related Topics

- [mam-delete-event](#)

## Chapter 19: Managing Notifications

When event commands are executed (asynchronously), the success or failure of the operation is communicated back to the initiator via a notification. When an event is created, you can specify the `Notify` option, which will associate a notification method with the event. Currently, there is only one `DeliveryMethod` implemented, which is `Store`. With the `Store` delivery method, command response information is stored as instances of the `Notification` object. These messages can later be retrieved by the initiator via a `Notification Query`. Payments can also route a notification method down to their associated events via a `Notify` option.

The notification attributes include `Id` (auto-generated), `Type`, `Event`, `Status`, `Code`, `Message`, `Key`, `Recipient`, `EndTime` and `CreationTime`. Stored notifications can be queried on any of these conditions. The notification type distinguishes what type of command resulted in the notification (`Fire` or `Failure`). The notification key is the value of the primary key of the object instance that the command acted on (e.g., the `Payment Id`). The recipient could be a user name or any tag that identifies the intended reader for the notification. The `Notification Query` supports a `Delete` option, which if set to `True`, will delete the notifications after they have been queried. Additionally, stored notifications have an `EndTime` after which they are automatically deleted by MAM. The `Notification` actions include `Send`, `Refresh`, `Create`, `Query`, `Delete` and `Modify`.

There are two server configuration parameters that affect notifications: `notification.deliverymethod`, which dictates which delivery method is used by default if unspecified and `notification.duration`, which defines how long notifications stick around if the `Store` delivery method is used.

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## 19.1 Querying Notifications

To display notification information, use the command `mam-list-notifications`.

```
mam-list-notifications [[-N] <notification_id>] [-E <event_id>] [-T <notification_type>] [-k <primary_key_value>] [-u <recipient>] [-x <status>] [-s <start_time>] [-e <end_time>] [--delete] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

**Example 19-1: Listing all failure notifications**

```
$ mam-list-notifications -x Failure

Id Event Type Status Code Message
                                     Key Recipient EndTime
e
-----
4 20 Fire Failure 782 Payment Begin failed starting payment: Failed creating payment starting lien: Insufficient balance to reserve usage
(Instance Moab.1)\nClearing the event fire time.\nThe controlling event has been deleted.
          9 amy          2023-04-23 13:35:01 2023-04-09 13:35:01
```

### Related Topics

- [mam-list-notifications](#)

## 19.2 Deleting Notifications

To delete a notification, use the command `mam-delete-notification`.

```
mam-delete-notification {[-N] notification_id} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### Example 19-2: Deleting a notification

```
$ mam-delete-notification 4
Successfully deleted 1 notification
```

### Example 19-3: Deleting all successful notifications

To delete many notifications, query them with the `--delete` option:

```
$ mam-list-notifications -x Success --delete

Id Event Type Status Code Message
-----
cipient EndTime CreationTime Key Re
-----
-----
-----

4 20 Fire Failure 782 Payment Begin failed starting payment: Failed creating paym
ent starting lien: Insufficient balance to reserve usage
(Instance Moab.1)\ nClearing the event fire time.\ nThe controlling event has been del
eted.
    9 amy 2023-04-23 13:35:01 2023-04-09 13:35:01

1 11 Fire Success 000 Payment Begin: Successfully charged 10 credits for instance
Moab.1\ nSuccessfully charged 20 credits for instance Moab.2\ nSuccessfully charged 2
0 credits for instance Moab.3\ nSuccessfully started payment
(6) and created 3 liens\ nClearing the event fire time.\ nThe controlling event has be
en deleted.
    6 scottmo 2023-04-23 13:28:02 2023-04-09 13:28:02

2 14 Fire Success 000 Payment Begin: Successfully charged 10 credits for instance
Moab.1\ nSuccessfully charged 20 credits for instance Moab.2\ nSuccessfully charged 2
0 credits for instance Moab.3\ nSuccessfully started payment
(7) and created 3 liens\ nClearing the event fire time.\ nThe controlling event has be
en deleted.
    7 amy 2023-04-23 13:31:02 2023-04-09 13:31:02

3 17 Fire Success 000 Payment Begin: Successfully charged 10 credits for instance
Moab.1\ nSuccessfully charged 20 credits for instance Moab.2\ nSuccessfully charged 2
0 credits for instance Moab.3\ nSuccessfully started payment
(8) and created 3 liens\ nClearing the event fire time.\ nThe controlling event has be
en deleted.
    8 amy 2023-04-23 13:32:02 2023-04-09 13:32:02
Successfully deleted 3 notifications
```

**Related Topics**

- [mam-delete-notification](#)



## Chapter 20: Managing Roles

Moab Accounting Manager uses instance-level role-based access controls to determine what users can perform what functions. Named roles are created, actions are associated with the roles, and users are assigned to these roles.

The actions for a role consist of a set of tuples of object, action and instance permitted by the role. In other words, each role action defines an object (whether specific or `ANY`), the action that can be taken on that object (whether specific or `ANY`) and the instance of the object that action can be taken on (whether specific or `ANY`).

In the base configuration, there are three default roles: `SystemAdmin`, `Anonymous` and `OVERRIDE`. Other configurations, such as the bank configuration, add additional roles. Roles can be added as desired. The three base roles are required for proper function of Moab Accounting Manager and should not be deleted. By default, the `SystemAdmin` role can perform any action on any object. This role is usually assigned to the super user. The `Anonymous` role is intended to define the actions available to your standard unprivileged user. This may include the ability to set your password, query certain public objects and modify objects that belong to you (implemented via the `OVERRIDE` role). The `OVERRIDE` role is a special role type that defines those actions that should use special business logic intrinsic to the routine that handles that object and action. For example, in the bank configuration, the `OVERRIDE` logic for the Account Query routine will only allow the standard user to see information about accounts for which that user is a member. A given user's privileges will be the superset of the actions of all roles that apply to that user.

The instance indicates which specific instances of the object the action can be performed on. There are several special instance types that can be used in certain situations. The `ANY` instance is supported by all objects and permits the specified action on all instances of the specified object. The `SELF` instance applies to the user's own instance if the object is `User`, or to objects that have a `User` attribute associated with the user. The `MEMBERS` instance applies to objects for which the user is a direct member. The `ADMIN` instance applies to objects for which the user is designated as an administrator. Unless otherwise specified, the instance will default to a value of `ANY`.

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## 20.1 Creating Roles

To create a new role, use the command `mam-create-role`. Users and actions can be associated with the role at creation time. When assigning actions to a role, the object, action and instance must be specified in the form shown. Multiple actions or users can be specified for the role.

```
mam-create-role {[-r] <role_name>} [-d <description>] [-u <user_name>,...] ... [-A "<object_name>-><action_name>[<instance_name>]"] ... [--debug]  [--site <site_name>] [-help]  [--man]  [--quiet]  [--verbose]  [--version]  [--about]
```

### Creating a Manager Role

```
$ mam-create-role -r Manager -d "Manages Roles and Responsibilities"  
Successfully created 1 role
```

#### Related Topics

- [mam-create-role](#)

## 20.2 Querying Roles

To display the role information, use the command `mam-list-roles`.

```
mam-list-roles [[[-r] <role_name>]  [--full]  [--show <attribute_name>,...]  [--long]  [--wide]  [--format csv|raw|standard]  [--debug]  [--site <site_name>]  [--help]  [--man]  [--quiet]  [--version]  [--about]
```

### Listing All Roles Along with Users and Descriptions

```
$ mam-list-roles --show=Name,Users,Description
```

Name	Users	Description
AccountAdmin		Can update or view an account they are admin for
Anonymous	ANY	Things that can be done by anybody
OVERRIDE	ANY	A custom authorization method will be invoked
Schedule	root	Scheduler relevant Transactions
SystemAdmin	scottmo	Can update or view any object
UserServices		User Services

## Listing Information About the Scheduler Role

```
$ mam-list-roles --long Scheduler
```

Name	Users	Actions	Description
Scheduler	root	UsageRecord->Create (ANY) UsageRecord->Quote (ANY) UsageRecord->Reserve (ANY) UsageRecord->Charge (ANY) Lien->Delete (ANY)	Scheduler relevant Transactions

### Related Topics

- [mam-list-roles](#)

## 20.3 Modifying Roles

To modify a role, use the command `mam-modify-role`.

```
mam-modify-role {[-r] <role_name>} [-d <description>] [--add-user(s) <user_name>,...] ... [---add-action(s) "<object_name>-><action_name>[<instance_name>]"],... ... [---del-user(s) <user_name>,...] ... [---del-action(s) "<object_name>-><action_name>[<instance_name>]"],... ... [---debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

Users can be added to a role or removed from a role. Actions also can be added to a role or removed from a role. When specifying actions, the instance will default to a value of ANY.

### Adding a User to a Role

Let's add dave to our new Manager role:

```
$ mam-modify-role --add-user dave -r Manager
Successfully added 1 user
```

### Associating an Action with a Role

Allow the Manager to change role responsibilities:

```
$ mam-modify-role --add-action "RoleAction->ANY" Manager -v
Successfully added 1 action
```

---

**Related Topics**

- [mam-modify-role](#)

## 20.4 Deleting Roles

To delete a role, use the command `mam-delete-role`.

```
mam-delete-role {[-r] <role_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

Users can be added to a role or removed from a role. Actions also can be added to a role or removed from a role. When specifying actions, the instance will default to a value of `ANY`.

### Deleting the Manager Role

Let's add dave to our new Manager role:

```
$ mam-delete-role Manager
Successfully deleted 1 role and 2 associations
```

---

**Related Topics**

- [mam-delete-role](#)

## Chapter 21: Managing Passwords

Passwords must be established for each user who wants to use the web-based GUI. Passwords must be at least eight characters and are stored in encrypted form. A *mam-set-password* command line client exists to aid a user or administrator in setting or changing a password. Other operations (deleting or listing password entries) must be performed using the interactive control program (*mam-shell*). By default, a standard user can only set or change his or her own password. A system administrator can set or change any user's password.



Because Moab Accounting Manager caches password information for faster responsiveness, it will be necessary to restart the server after running *mam-set-password* for the GUI to accept that password change.

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### 21.1 Setting Passwords

To set a new password, use the command *mam-set-password*. If the user name is not specified via an option or as the unique argument, then the invoking user will be taken as the user whose password will be set. The invoker will be prompted for the new password.

```
mam-set-password [[-u] <user_name>] [--debug] [--site <site_name>]
[--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

#### Setting a Password

```
$ mam-set-password amy
Enter your new password:
Successfully created 1 password
```

**Related Topics**

- [mam-set-password](#)

## 21.2 Querying Passwords

To display password information, use the command `mam-shell Password Query`:

```
mam-shell Password Query [Show:=<"Field1,Field2,...">]
[User==<User Name>] [ShowUsage:=True]
```

### List the Users Who Have Set Passwords

```
$ mam-shell Password Query Show:=User
User
-----
amy
mam
```

## 21.3 Deleting Passwords

To delete a password, use the command `mam-shell Password Delete`:

```
mam-shell Password Delete User==<User Name>]
```



The `mam-shell` control program allows you to make powerful and sweeping modifications to Moab Accounting Manager objects. Misuse of this command could result in the inadvertent deletion of all passwords.

### Deleting a Password

```
$ mam-shell Password Delete User==amy
User Password
-----
amy HZYzwD20o1XIE/gxRYyFKP2sumkCluHm
Successfully deleted 1 password
```

## Chapter 22: Using the MAM Shell (mam-shell)

`mam-shell` is an interactive control program that can access all of the advanced functionality in Moab Accounting Manager.



The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. Inadvertent mistakes could result in modifications that are very difficult to reverse.

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### 22.1 Usage

`mam-shell` commands can be invoked directly from the command line as arguments, or read from stdin (interactively or redirected from a file).

```
mam-shell [--format csv|raw|standard] [--debug] [--site <site_
name>] [--help] [--man] [--quiet] [--verbose] [--version] [--
about] [<command>]
```

#### Specifying the Command as Direct Arguments

```
$ mam-shell System Query
```

Name	Version	Description
Moab Accounting Manager	10.0.0.0	Commercial Release

## Using the Interactive Prompt

```
$ mam-shell
mam> System Query
Name                Version Description
-----
Moab Accounting Manager 10.0.0.0 Commercial Release
mam> quit
```

## Reading Commands from a File

```
$ cat >commands.mam <<EOF
System Query
quit
EOF
$ mam-shell <commands.mam
Name                Version Description
-----
Moab Accounting Manager 10.0.0.0 Commercial Release
```

### Related Topics

- [mam-shell](#)

## 22.2 Command Syntax

*mam-shell* commands are of the form:

```
<Object> [=<Alias>] [,<Object> [=<Alias>]...] <Action> [
[<Conjunction>] [<Open_Parenthesis>...] [<Object>.] <Name> <Operator>
[<Subject>.] <Value> [<Close_Parenthesis>...] ...]
```

The basic form of a command is `<Object> <Action>`

`[<Name><Operator><Value>]*`. When an action is performed on more than one object, such as in a multi-object query, the objects are specified in a comma-separated list. Commands can accept zero or more predicates, which may function as fields to return, conditions, update values, processing options, etc. Predicates, in their simplest form, are expressed as Name, Operator, Value tuples. Predicates can be combined via conjunctions with grouping specified with parentheses. When performing multi-object queries, names and values may need to be associated with their respective objects.



Valid conjunctions include:

Conjunction	Meaning
<b>&amp;&amp;</b>	and
<b>  </b>	or
<b>&amp;!</b>	and not
<b> !</b>	or not

Open parentheses can be any number of literal open parentheses '('.

Name is the name of the condition, assignment, or option. When performing a multi-object query, an attribute name may need to be prepended by its associated object separated by a period (<object>.<attribute>). When specifying a partial condition, the name will consist of the attribute followed by the part enclosed in curly braces (<attribute> {<part>}).

Valid operators include:

Operator	Meaning
<b>==</b>	equals
<b>&lt;</b>	less than
<b>&gt;</b>	greater than
<b>&lt;=</b>	less than or equal to
<b>&gt;=</b>	greater than or equal to
<b>!=</b>	not equal to
<b>~</b>	matches
<b>=</b>	is assigned
<b>+=</b>	is incremented by

Operator	Meaning
<code>-=</code>	is decremented by
<code>:=</code>	option
<code>!:</code>	not option

Value is the value of the selection list, condition, assignment, or option. When performing a multi-object query, a value may need to be prepended by its associated object (called the subject) separated by a period.

Close parentheses can be any number of literal closing parentheses ')'

## 22.3 Valid Objects

To list the objects available for use with commands in *mam-shell* commands, use the mam-shell command: *Object Query*

### Listing All Objects

```

mam> Object Query Show:="Sort (Name) "
Name
-----
Account
AccountUser
Action
Allocation
Attribute
ChargeRate
Constraint
Fund
FundFund
Lien
LienAllocation
Object
Organization
Password
Quote
QuoteChargeRate
Role
RoleAction
RoleUser
System
Transaction
UsageRecord
User

```

## 22.4 Valid Actions for an Object

To list the actions that can be performed on an object, use the *mam-shell* command:  
*Action Query*

### Listing All Actions Associated with the Fund Object

```
mam> Action Query Object==Fund Show:="Sort (Name) "  
  
Name  
-----  
Create  
Delete  
Deposit  
Modify  
Query  
Transfer  
Undelete  
Withdraw
```

## 22.5 Valid Predicates for an Object and Action

By appending the option *ShowUsage:=True* to a command, the syntax of the command is returned, expressed in SSSRMAP XML Message Format.

### Show the Usage for Allocation Query

```
mam> Allocation Query ShowUsage:=True
```

```

<Request action="Query">
  <Object>Allocation<Object>
    [<Get name="Id" [op="Sort|Tros|Count|GroupBy|Max|Min"]></Get>]
    [<Get name="Fund" [op="Sort|Tros|Count|GroupBy|Max|Min"]></Get>]
    [<Get name="StartTime" [op="Sort|Tros|Count|GroupBy|Max|Min"]></Get>]
    [<Get name="EndTime" [op="Sort|Tros|Count|GroupBy|Max|Min"]></Get>]
    [<Get name="Amount" [op="Sort|Tros|Count|GroupBy|Max|Min|Sum|Average"]></Get>]
    [<Get name="CreditLimit"
    [op="Sort|Tros|Count|GroupBy|Max|Min|Sum|Average"]></Get>]
    [<Get name="InitialDeposit"
    [op="Sort|Tros|Count|GroupBy|Max|Min|Sum|Average"]></Get>]
    [<Get name="Allocated" [op="Sort|Tros|Count|GroupBy|Max|Min|Sum|Average"]></Get>]
    [<Get name="Active" [op="Sort|Tros|Count|GroupBy"]></Get>]
    [<Get name="Description" [op="Sort|Tros|Count|GroupBy|Max|Min"]></Get>]
    [<Where name="Id" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>Integer Number}</Where>]
    [<Where name="Fund" [op="EQ|NE|GT|GE|LT|LE|Match|NotMatch (EQ)"] [conj="And|Or
    (And)"] [group="<Integer Number>Fund Name}</Where>]
    [<Where name="StartTime" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>YYYY-MM-DD[hh:mm:ss]|-infinity|infinity|now</Where>]
    [<Where name="EndTime" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>YYYY-MM-DD[hh:mm:ss]|-infinity|infinity|now</Where>]
    [<Where name="Amount" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>Decimal Number}</Where>]
    [<Where name="CreditLimit" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>Decimal Number}</Where>]
    [<Where name="InitialDeposit" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>Decimal Number}</Where>]
    [<Where name="Allocated" [op="EQ|NE|GT|GE|LT|LE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>Decimal Number}</Where>]
    [<Where name="Active" [op="EQ|NE (EQ)"] [conj="And|Or (And)"]
    [group="<Integer Number>True|False</Where>]
    [<Where name="Description" [op="EQ|NE|GT|GE|LT|LE|Match|NotMatch (EQ)"]
    [conj="And|Or (And)"] [group="<Integer Number>Description}</Where>]
    [<Option name="Filter">True|False (False)</Option>]
    [<Option name="FilterType">Exclusive|NonExclusive (NonExclusive)</Option>]
    [<Option name="IncludeAncestors">True|False (False)</Option>]
    [<Option name="Time">YYYY-MM-DD[hh:mm:ss]</Option>]
    [<Option name="Unique">True|False (False)</Option>]
    [<Option name="ChunkSize">{Integer Number}</Option>]
    [<Option name="Limit">{Integer Number}</Option>]
    [<Option name="Offset">Integer Number}</Option>]
    [<Option name="ShowHidden">True|False (False)</Option>]
    [<Option name="ShowUsage">True|False (False)</Option>]
  </Request>

```

## 22.6 Common Options

There are a number of options that can be specified for all commands. These options include: ShowUsage

*ShowUsage* — This option can be included with any command to cause the command to return a usage message in SSSRMAP XML Message Format.

## 22.7 Common Actions Available for Most Objects

There are a number of actions that are available for most objects. These actions include Query, Create, Modify, Delete, and Undelete. Commands involving these actions inherit some common structure unique to the action type.

In this topic:

- [22.7.1 Query Action - page 157](#)
- [22.7.2 Create Action - page 160](#)
- [22.7.3 Modify Action - page 160](#)
- [22.7.4 Delete Action - page 161](#)
- [22.7.5 Undelete Action - page 162](#)

### 22.7.1 Query Action

The Query action is used to query objects. It accepts selections that describe the attributes (fields) to return (including aggregation operations on those attributes), conditions that select which objects to return the attributes for, and other options unique to queries.

#### Selections

Selections use the `Show` option to specify a list of the attributes to return for the selected object. If selections are not specified, a default set of attributes (defaulting to those not marked as hidden) will be returned.

Name = `Show`

Op = `:=`

Value = `"selection1,selection2,selection3,..."`

Aggregation operators can be applied to attributes by enclosing the target attribute in parenthesis and prepending the name of the desired operator. The aggregation operators that can be applied depend on the datatype of the attribute.

Valid selection operators include:

Sort — Ascending sort

Tros — Descending sort

Count — Count

Max — Maximum value

Min — Minimum value

Average — Average value

	<p><b>Sum</b> — Sum</p> <p><b>GroupBy</b> — Group other aggregations by this attribute</p> <p>Partial values can be requested for complex (multi-valued) attributes. Partial values are specified in the form: <code>&lt;attribute&gt;{&lt;part&gt;}</code>.</p> <p>Additionally, aliases can be applied to selections so that columns can be renamed as desired. Aliases are expressed by adding "<code>=&lt;Alias&gt;</code>" to the target attribute name (and after the trailing parenthesis of the aggregation if specified).</p> <p><b>Examples:</b></p> <pre>Allocation Query Show:="GroupBy(Fund),Sum (Amount)=Total" UsageRecord Query Show:="GroupBy(Account),Sum(Licenses {matlab})=Matlab_Licenses_Used"</pre>
<b>Conditions</b>	<p>Conditions are used to select which objects the action is to be performed on.</p> <p><b>Name</b> = Name of the attribute to be tested</p> <p><b>Op</b> = conditional operator</p> <p><b>Value</b> = The object or value against which the attribute is tested</p> <p>When expressing a condition that is part of a multi-object join, the name may consist of the attribute prepended with the object and a period (<code>&lt;object&gt;.&lt;attribute&gt;</code>).</p> <p>When expressing a condition for a part of a complex (multi-valued) attribute, the name will consist of the attribute followed by the part in curly braces (<code>&lt;attribute&gt;{&lt;part&gt;}</code>).</p> <p>Valid condition operators include:</p> <ul style="list-style-type: none"> <li><code>==</code> Equal to</li> <li><code>!=</code> Not equal to</li> <li><code>&lt;</code> Less than</li> <li><code>&gt;</code> Greater than</li> <li><code>&lt;=</code> Less than or equal to</li> <li><code>&gt;=</code> Greater than or equal to</li> <li><code>~</code> Matches</li> <li><code>!~</code> Does not match</li> </ul> <p>Matching uses the wildcards <code>*</code> and <code>?</code> (equivalent to SQL <code>%</code> and <code>_</code> respectively) in</p>

a manner similar to file globbing. \* matches zero or more unspecified characters and ? matches exactly one unspecified character. For example, `m$cf*` matches objects having the specified attributes whose values start with the letters `m$cf`, while `m$cf?` matches objects having the specified attributes whose values start with `m$cf` and have a total of exactly five characters.

**Examples:**

```
UsageRecord Query Application~"NWChem*"
UsageRecord Query Metrics{temperature}>100.0
```

**Options**

Options indicate processing options that affect the result.

Name = Name of the option

Op = :=

Value = Value of the option

Valid options for query actions include:

ShowHidden:=True|False (False) Includes hidden attributes in the result

Time:=YYYY-MM-DD [hh:mm:ss] Run the command as if it were the specified time

Unique:=True|False (False) Display only unique results (like DISTINCT in SQL)

ChunkSize:={Integer Number} Number of records to return per page

Limit:={Integer Number} Limit the results to the number of objects specified

Offset:={Integer Number} Number or records to skip before starting to return data

**i** It is important to specify the sort order (using the Sort operator) when using the ChunkSize, Limit, or Offset options; otherwise, the query may return records in a nondeterministic order (different order in different requests). It is especially important to specify the sort order when using the ChunkSize option; otherwise, the same records might be returned in different chunks, while other records might not be returned at all. This is not a bug; it is a consequence of the behavior of the underlying database, which does not promise to deliver the results of a query in any particular order unless ORDER BY is used to constrain the order.

## Return the Number of Inactive Liens

```
mam> Lien Query EndTime<now Show:="Count(Id)"
```

```
Id
```

```
----
```

```
8
```

## 22.7.2 Create Action

The Create action is used to create a new object. It accepts assignments that describe the values of the attributes to be set.

Assignments	<p>Assignments specify values to be assigned to attributes in the new object.</p> <p>Name = Name of the attribute being assigned a value</p> <p>Op = = (is assigned)</p> <p>Value = The new value being assigned to the attribute</p>
-------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Add a New Account Member

```
mam> AccountUser Create Account=chemistry Name=scottmo
Account      Name      Active   Admin
-----
chemistry    scottmo   True     False
Successfully created 1 accountUser
```

## 22.7.3 Modify Action

The Modify action is used to modify existing objects. It accepts conditions that select which objects will be modified and predicates that describe the values of the attributes to be set.

Assignments	<p>Assignments specify values to be assigned to attributes in the selected objects.</p> <p>Name = Name of the attribute being assigned a value</p> <p>Op = assignment operators {=, +=, -=}</p> <p>Value = The value being assigned to the attribute</p> <p>Valid assignment operators include:</p> <ul style="list-style-type: none"> <li>= is assigned</li> <li>+= is incremented by</li> <li>-= is decremented by</li> </ul>
Conditions	<p>Conditions are used to select which objects the action is to be performed on.</p> <p>Name = Name of the attribute to be tested</p> <p>Op = conditional operator</p> <p>Value = The object or value against which the attribute is tested</p> <p>Valid condition operators include:</p> <ul style="list-style-type: none"> <li>== Equal to</li> </ul>



!= Not equal to  
 < Less than  
 > Greater than  
 <= Less than or equal to  
 >= Greater than or equal to  
 ~ Matches  
 !~ Does not match

Matching uses the wildcards \* and ? (equivalent to SQL % and \_ respectively) in a manner similar to file globbing. \* matches zero or more unspecified characters and ? matches exactly one unspecified character. For example, mscf\* matches objects having the specified attributes whose values start with the letters mscf, while mscf? matches objects having the specified attributes whose values start with mscf and have a total of exactly five characters.

## Change/Set Scottmo's Phone Number and Email Address

```
mam> User Modify Name==scottmo PhoneNumber="(801) 717-3700"
EmailAddress="scottmo@adaptivecomputing.com"
```

Name	Active	CommonName	PhoneNumber	EmailAddress
		DefaultAccount	Description	
scottmo	True	Jackson, Scott M.	(801) 717-3700	scottmo@adaptivecomputing.com

Successfully modified 1 user

## Extend All Liens Against Account Chemistry by 10 Days

```
mam> Lien Modify EndTime+=864000 Instance=="job.1"
```

Id	Fund	Amount	Instance	UsageRecord	User	Project	Machine	EndTime
			Description					
1	2	57600	PBS.1234.0	1	amy	chemistry	colony	2023-04-16 10:47:30

Successfully modified 1 lien

### 22.7.4 Delete Action

The Delete action is used to delete objects. It accepts conditions that select which objects are to be deleted.

**Conditions** Conditions are used to select which objects the action is to be performed on.

Name = Name of the attribute to be tested  
 Op = conditional operator  
 Value = The object or value against which the attribute is tested

Valid condition operators include:

== Equal to  
 != Not equal to  
 < Less than  
 > Greater than  
 <= Less than or equal to  
 >= Greater than or equal to  
 ~ Matches  
 !~ Does not match

Matching uses the wildcards \* and ? (equivalent to SQL % and \_ respectively) in a manner similar to file globbing. \* matches zero or more unspecified characters and ? matches exactly one unspecified character. For example, mscf\* matches objects having the specified attributes whose values start with the letters mscf, while mscf? matches objects having the specified attributes whose values start with mscf and have a total of exactly five characters.

## Get Rid of the Pesky Jacksons

```
mam> User Delete CommonName~"Jackson*"

Name          Active   CommonName          PhoneNumber          EmailAddress
-----
DefaultAccount Description
-----
scottmo      True    Jackson, Scott M.   (801) 717-
3700        scottmo@adaptivecomputing.gov
Successfully deleted 1 user and 1 association
```

### 22.7.5 Undelete Action

The Undelete action is used to restore deleted objects. It accepts conditions that select which objects are to be undeleted.

Conditions	<p>Conditions are used to select which objects the action is to be performed on.</p> <p>Name = Name of the attribute to be tested</p> <p>Op = conditional operator</p> <p>Value = The object or value against which the attribute is tested</p>
------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Valid condition operators include:

== Equal to

!= Not equal to

< Less than

> Greater than

<= Less than or equal to

>= Greater than or equal to

~ Matches

!~ Does not match

Matching uses the wildcards \* and ? (equivalent to SQL % and \_ respectively) in a manner similar to file globbing. \* matches zero or more unspecified characters and ? matches exactly one unspecified character. For example, `m_scf*` matches objects having the specified attributes whose values start with the letters `m_scf`, while `m_scf?` matches objects having the specified attributes whose values start with `m_scf` and have a total of exactly five characters.

## Resurrect the Deleted Users That Were Active

```
mam> User Undelete Active==True
```

Name	Active	CommonName	PhoneNumber	EmailAddress
		DefaultAccount	Description	
scottmo	True	Jackson, Scott M.	(801) 717-3700	scottmo@adaptivecomputing.com

Successfully undeleted 1 user and 1 association

## 22.8 Multi-Object Queries

mam-shell supports multi-object queries (table joins). Multiple objects are specified via a comma-separated list and attributes need to be prefixed by the associated object.

### Print the Sums for Active Balance and Allocated Amounts Grouped by Account

```
mam> Allocation,Constraint Query
Show:="GroupBy(Constraint.Value)=Account,Sum(Allocation.Amount)=Balance,Sum
(Allocation.Deposited)=Allocation"
Constraint.Fund==Allocation.Fund Constraint.Name==Account
Allocation.Active==True
```

Account	Balance	Allocation
biology	193651124	360000000

```
chemistry      296167659      360000000
```

## Show All Active Accounts for Amy's Privileges


```
mam> RoleUser,RoleAction Query
Show:="RoleAction.Object,RoleAction.Name=Action"
RoleUser.Role==RoleAction.Role && ( RoleUser.Name==amy ||
RoleUser.Name==ANY ) Unique:=True
```


Object	Action
Account	Query
AccountUser	Query
Action	Query
Allocation	Query
Attribute	Query
ChargeRate	Query
Constraint	Query
Fund	Query
FundFund	Query
Lien	Query
LienAllocation	Query
Object	Query
Organization	Query
Password	ANY
Quote	Query
QuoteChargeRate	Query
Role	Query
RoleAction	Query
RoleUser	Query
System	Query
Transaction	Query
UsageRecord	Query
User	Query

**i** Although the forgoing was a good example of a join request, it should be understood that it is not a straightforward way to determine the full extent of a user's privileges. Some of the actions might be tied to specific object instances and many of them are associated with an override method, which might not actually permit the user access to any instances of the object. Using `Show:="RoleUser.Role,RoleUser.Name=User,RoleAction.Object,RoleAction.Name=Action,RoleAction.Instance"` may be revealing in this regard. See the chapter on [Managing Roles](#) for more information about managing roles.

## Chapter 23: Customizing Objects

Moab Accounting Manager provides the ability to dynamically create new objects, or customize or delete existing objects through the interactive control program (mam-shell).

 The object customizations described in this chapter will be noticeable in subsequent mam-shell queries (and in the web GUI after a fresh login). Client commands may need to be modified to properly interact with changed objects or attributes.

 The mam-shell control program allows you to make powerful and sweeping modifications to many objects with a single command. Inadvertent mistakes could result in modifications that are very difficult to reverse.

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## 23.1 Managing Objects

In Moab Accounting Manager, Objects correspond to tables in the repository that have Attributes (such as Name and Color) and Actions (such as Query and Modify). A specific instance of an object is described as an Instance and has Properties (the specific values of the attributes for that object). The instance is uniquely referred to via its primary key(s) (such as its Name or Id).

An object must have a name and may have a description. An object can be set to auto-generate its instances when first seen (see [Object Auto-Generation](#)) and/or a default value can be designated for the object (see [Global Object-Based Defaults](#)).

Objects can reference other objects. If a single instance of an object references only a single instance of another object (for example, a usage record may only have one user), then it is sufficient for the first object to have an attribute field for the second object (the UsageRecord object has an attribute called User). However, if there is a many-to-many relationship between objects (for example, an account may have multiple users and a user may belong to multiple accounts), then it is necessary to maintain a separate object as an association table (e.g., AccountUser). When creating an association object, the object should be given an appropriate name (e.g., AccountUser), it should be marked as an association (`Association=True`), and an object needs to be designated for the parent (e.g., Account) and the child (e.g., User). The association object itself may have additional attributes that provide qualitative information about the association (e.g., a particular AccountUser association may be active or be an administrator).

## 23.2 Creating a Custom Object

To create a new object, use the command `mam-shell Object Create`. When an object is created, the 5 default actions are automatically created for the object: Create, Delete, Modify, Query and Undelete. A number of default metadata attributes are created as well: CreationTime, ModificationTime, Deleted, RequestId and TransactionId. These attributes are normally hidden in regular queries.

```
mam-shell Object Create Name=<Object Name> [AutoGen=True|
(False)] [DefaultValue=<Default Value>]
[Description=<Description>] [Association=True|False]]
[Child=<Child Object>] [Parent=<Parent Object>]
[ShowUsage:=True]
```

### Creating a Node Object

```
$ mam-shell Object Create Name=Node Description=\"Node Information\"
```

```
Successfully created 1 object and 5 actions
```

## Add a Node Name Attribute

```
$ mam-shell Attribute Create Object=Node Name=Name DataType=String PrimaryKey=True
Successfully created 1 attribute
```

## Add a Processor Count Attribute

```
$ mam-shell Attribute Create Object=Node Name=Processors DataType=Integer
Successfully created 1 attribute
```

## 23.3 Querying Objects

To display object information, use the command `mam-shell Object Query`:

```
mam-shell Object Query [Name=<Object Name>]
[Show:=Name,AutoGen,DefaultValue,Description,Association,Parent,Child]
[ShowUsage:=True]
```

### List Information for the Node Object

```
$ mam-shell Object Query Name==Node
```

Name	Association	Parent	Child	DefaultValue	AutoGen	Description
Node	False				False	Node Information

## 23.4 Modifying an Object

It is possible to modify an object by using the command `mam-shell Object Modify`:

```
mam-shell Object Query [Name=<Object Name>]
[AutoGen=True|False] [DefaultValue=Default Value>]
[Description=Description>] [Association=True|(False)]
[Child=Child Object>] [Parent=Parent Object>]
[ShowUsage:=True]
```

### Changing the Node Object's Description

```
$ mam-shell Object Modify Name==Node Description="\Host Information\"
```

```
Successfully modified 1 object
```

## 23.5 Deleting an Object

To delete an object, use the command `mam-shell Object Delete`. When an object is deleted, all associated attributes, actions and other associations are automatically deleted as well.

```
mam-shell Object Delete [Name=<Object Name>] [ShowUsage:=True]
```

### Deleting the Node Object

```
$ mam-shell Object Delete Name==Node
```

```
Successfully deleted 1 object
```



This is a very dangerous operation and could result in the deletion of all object definitions requiring database repair. The mam-shell control program allows you to make powerful and sweeping modifications to many objects with a single command. Be sure to specify conditions for the object you want to delete.

## 23.6 Object Auto-Generation

It is possible to have object instances be automatically generated the first time they are referenced in designated contexts. For example, you might want a user to be auto-generated when newly added to an account. You could have an organization auto-generated when specified as the default for a user. You could have a cost-center be auto-generated when referenced in a usage record. To do this, the referenced object must be set to `AutoGen=True` and the `Values` property for the attribute that you want to trigger the auto-generation must be set to a string consisting of the @ sign followed by the object name.

### Auto-Generate an Account's Organization

For example, let's assume that your accounts belong to specific organizations that you may want to run a report against but you don't want to define all of the organizations up front. It would be possible to automatically generate a new organization instance each time an undefined organization is specified for an account.

```
$ mam-shell Object Modify Name==Organization AutoGen=True
```



```
Successfully modified 1 object
```

```
$ mam-shell Attribute Modify Object==Account Name==Organization Values=@Organization
```

```
Successfully modified 1 attribute
```

See [Usage Record Property Auto-Generation](#) for a discussion of auto-generating objects referenced in usage records.

---

### Related Topics

- [14.12 Usage Record Property Auto-Generation - page 121](#)

## 23.7 Global Object-Based Defaults

It is possible to set a global default for an object that will be applied to all attributes referencing this object. When a new instance of an object is being created that has an attribute referring to another object via its `Values` property, if that attribute has not been specified and you want it to default to the global default, you will need to set the `DefaultValue` attribute for the referenced object to the desired value.

### Setting a System-Wide Simple Default Organization Called General

```
$ mam-shell Object Modify Name==Organization DefaultValue=general
```

```
Successfully modified 1 object
```

Thereafter each (non-association) object that has an attribute with a `Values` property set to `@Organization` will default to `general` if that attribute is not specified. Perhaps we would want the default value to be taken for the organization when a new account is created.

```
$ mam-shell Attribute Modify Object==Account Name==Organization Values=@Organization
```

```
Successfully modified 1 attribute
```

See [Local Attribute-Based Defaults](#) for more information about setting default values for attributes. See [Usage Record Property Defaults](#) for more information about setting default values for usage record properties.

---

### Related Topics

- [23.13 Local Attribute-Based Defaults - page 174](#)
- [14.11 Usage Record Property Defaults - page 120](#)

## 23.8 Managing Attributes

Objects can have any number of fields called Attributes. When an object is first created, a number of attributes are created for the object by default. These are: `CreationTime` (time the object was first created), `ModificationTime` (time the object was last updated), `Deleted` (whether the object is deleted or not), `RequestId` (request ID that resulted in the last modification of the object), `TransactionId` (transaction ID that resulted in the last modification of the object).

An attribute must have a name and be associated with an object.

An attribute will have a data type that can be one of (`AutoGen`, `Boolean`, `Currency`, `Float`, `Integer`, `JSON`, `String`, `TimeStamp`) and defaults to `String`. A data type of `AutoGen` means the field will be a primary key of type integer, which will assume the next auto-incremented value from the `g_key_generator` table. `TimeStamps` are epoch times stored in integer format. `Booleans` are strings constrained to the values of `True` or `False` (or unset). `Float` is used to store decimal or floating point values. `Currency` is like `Float` but may have special business logic for handling currency values. The `JSON` data type provides support for complex properties and must store a valid JSON value. The current implementation only provides support for simple JSON objects of the form `{key:value, ...}` where `key` is a double-quoted string and `value` can be a number or a double-quoted string. One can also use the more nuanced forms (`JSON:Integer`, `JSON:Float`, or `JSON:String`, etc.) to indicate the expectation that the values of the JSON object will be of the designated variety. Using these forms may be useful for clients and web services to render partial queries in the anticipated data type.

An object can have zero or more attributes, which are primary keys (`PrimaryKey==True`), the combination of which are used to uniquely identify an object instance. Moab Accounting Manager will try to ensure that there can only be one object instance with the exact same set of values of its primary keys.

A required attribute (`Required==True`), must be either specified or be derived via a default value or other dynamic mechanism when the object is created. It can also not be unset.

A fixed attribute (`Fixed==True`), cannot be changed from its initial value.

An attribute can be constrained to certain values via the `Values` attribute. The values can be constrained to members of a list expressed as a parenthesized comma-delimited list of strings (i.e., `Values="(Brazil,China,France,Russia,USA)"`). Alternatively, the values can be constrained to be an instance of a particular object type (like a foreign key constraint) by assigning to the `Values` attribute the name of an object prefixed by the `@` sign (e.g., `Values="@Account"`), which would constrain the value of this attribute to be a valid account name. Stronger versions of the `@`-prefixed object-constrained values can be

used in Quote, Reserve and Charge actions to enforce dynamic interactions between usage record properties such as to assign default values if not defined (e.g., `Values="@?=Account"`), verification values that evoke an error if they differ (e.g., `Values="@!=Account"`), or designated values that always overwrite the value (e.g., `Values="@:=Account"`). See [Usage Record Property Instantiators](#) for more information.

A default value can be assigned to an attribute via the `DefaultValue` attribute. When a new instance of an object is created, if a property is not specified for the attribute, the default value will be used.

The `Sequence` attribute determines which order an object's attributes will be listed in for queries if no selection list is specified in the query. Attributes with smaller sequence numbers will appear before attributes with larger sequence numbers. The `Sequence` attribute is also used to enforce a proper attribute display ordering in the web GUI.

The `Hidden` attribute specifies whether an attribute should be shown in a query by default or not. Hidden attributes can be seen in queries by specifying the `ShowHidden` option with a value of `True`.

The `Description` field is a location to describe the meaning of the attribute and is used in the GUI for field descriptions.

## 23.9 Adding an Attribute to an Object

To create a new attribute for an object, use the command `mam-shell Attribute Create`:

```
mam-shell Attribute Create Object=<Object Name>
Name=<Attribute Name>
[DataType=AutoGen|TimeStamp|Boolean|Float|Integer|Currency|
(String)] [PrimaryKey=True|(False)] [Required=True|(False)]
[Fixed=True|(False)] [Values=<Foreign Key or List of Values>]
[DefaultValue=<Default Value>] [Sequence=<Integer Number>]
[Hidden=<True|(False)>] [Description=<Description>]
[ShowUsage:=True]
```

### Adding a Country Attribute to User

```
$ mam-shell Attribute Create Object=User Name=Country Values="\
(Brazil,China,France,Russia,USA)\\"" DefaultValue=USA
Successfully created 1 attribute
```

## Tracking Submission Time in Usage records

```
$ mam-shell Attribute Create Object=UsageRecord Name=SubmissionTime DataType=TimeStamp
Successfully created 1 attribute
```

## 23.10 Querying Attributes

To display attribute information, use the command *mam-shell Attribute Query*:

```
mam-shell Attribute Query Object=<Object Name> Name=<Attribute Name>
```

```
[Show:=Object,Name,DataType,PrimaryKey,Required,Fixed,Values,DefaultValue,Sequence,Hidden,Description] [ShowHidden:=True]
```

```
[ShowUsage:=True]
```

### List the Attributes of the Node Object


```
$ mam-shell Attribute Query Object==Node
```

Object Name	DataType	PrimaryKey	Required	Fixed	Values	DefaultValue	Sequence
Hidden	Description						
Node False	Processors	Integer	False	False	False		20
Node False	Name	String	True	True	True		10
Node True	TransactionId Last Modifying Transaction Id	Integer	False	False	True		990
Node True	RequestId Last Modifying Request Id	Integer	False	False	True		980
Node True	Deleted Is this object deleted?	Boolean	False	False	True		970
Node True	ModificationTime Last Updated	TimeStamp	False	False	True		960
Node True	CreationTime First Created	TimeStamp	False	False	True		950

## 23.11 Modifying an Attribute

To modify an attribute, use the command *mam-shell Attribute Modify*:

```
mam-shell Attribute Modify Object==<Object Name>
Name==<Attribute Name> [Required=True|(False)] [Fixed=True|
(False)] [Values=<Foreign Key or List of Values>]
[DefaultValue=<Default Value>] [Sequence=<Integer Number>]
[Hidden=<True|(False)>] [Description=<Description>]
[ShowUsage:=True]
```

 The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. A mistake made using this command could result in the inadvertent modification of all attributes.


## Change Account Organization Values to Not Be Restricted to the Set of Organization Instances


```
$ mam-shell Attribute Modify Object==Account Name==Organization Values=NULL
Successfully modified 1 attribute
```

## 23.12 Removing an Attribute From an Object

To delete an attribute, use the command `mam-shell Attribute Delete`:

```
mam-shell Attribute Delete Object==<Object Name>
Name==<Attribute Name> [ShowUsage:=True]
```

 The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. A mistake made using this command could result in the inadvertent modification of all attributes.

 When using Moab Accounting Manager as an accounting manager, certain objects and attributes are assumed to exist. For example, a call to `UsageRecord Charge` would fail if you had deleted the `Allocation Amount` attribute. The `Attribute Undelete` command might come in useful in such a case.

## Removing the Organization Attribute from Account

```
$ mam-shell Attribute Delete Object==Account Name==Organization
Successfully deleted 1 attribute
```

## Perhaps We Don't Care to Track the QualityOfService Attribute in a Usage Record

```
$ mam-shell Attribute Delete Object==UsageRecord Name==QualityOfService
Successfully deleted 1 attribute
```

### 23.13 Local Attribute-Based Defaults

It is possible to set a specific default for an object attribute that will be applied when an instance of that object is created but the attribute is not specified. This type of default is intended for attributes that do not refer to another object or which should vary from the object global default. This default value is assigned to an attribute via the `DefaultValue` attribute. When a new instance of the associated object is created, if a property is not specified for the attribute, the specified default value will be used. A local attribute default will have precedence over a global object default.

```
mam-shell Attribute Delete Object==<Object Name>
Name==<Attribute Name> [ShowUsage:=True]
```

#### Setting a Default Organization Just for the Account Object

```
$ mam-shell Attribute Modify Object==Account Name==Organization
DefaultValue=university
Successfully modified 1 attribute
```

#### Setting a Default Phone for the User Object

```
$ mam-shell Attribute Modify Object==User Name==PhoneNumber DefaultValue="\NoPhone\"
Successfully modified 1 attribute
```

See [Global Object-Based Defaults](#) for more information about setting default values for objects.

See [Usage Record Property Defaults](#) for more information about setting default values for usage record properties.

---

#### Related Topics

- [23.7 Global Object-Based Defaults - page 169](#)
- [14.11 Usage Record Property Defaults - page 120](#)

## 23.14 Managing Actions

Moab Accounting Manager defines which actions can be performed by which objects. When an object is first created, five basic actions are created for the object by default. These are: Create, Modify, Query, Delete and Undelete. Specific code must exist in Moab Accounting Manager modules in order for objects to support additional actions.

An action is uniquely specified by its name and the object with which it is associated. An action also has a description and a boolean display attribute that governs whether this action should be displayed in the web GUI or not.

## 23.15 Adding an Action to an Object

To specify that an action is allowed for an object, use the command `mam-shell Action Create`:

```
mam-shell Action Create Object=<Object Name> Name=<Action
Name> [Display=True|(False)] [Description=<Description>]
[ShowUsage:=True]
```

### Adding a Modify Action to Transaction

```
$ mam-shell Action Create Object=Transaction Name=Modify Description=Modify
Successfully created 1 action
```

## 23.16 Querying Actions

To display action information, use the command `mam-shell Action Query`:

```
mam-shell Action Query [Object==<Object Name>]
[Name==<Attribute Name>]
[Show:=Object,Name,Display,Description] [ShowUsage:=True]
```

### List the Actions of the Node Object

```
$ mam-shell Action Query Object==Node
```


Object	Name	Display	Description
Node	Create	False	Create
Node	Delete	False	Delete
Node	Modify	False	Modify

```
Node   Query   False   Query
Node   Undelete False   Undelete
```

## 23.17 Modifying an Action

To modify an action, use the command `mam-shell Action Modify`:

```
mam-shell Action Modify [Object==<Object Name>]
[Name==<Attribute Name>] [Display=True|(False)]
[Description=<Description>] [ShowUsage:=True]
```

 The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. A mistake made using this command could result in the inadvertent modification of all actions.


### Display All Node Actions but Undelete in the Web GUI


```
$ mam-shell Action Modify Object==Node Name!=Undelete Display=True
Successfully modified 4 actions
```

## 23.18 Removing an Action From an Object

To delete an action from an object, use the command `mam-shell Action Delete`:

```
mam-shell Action Delete [Object==<Object Name>]
[Name==<Attribute Name>] [ShowUsage:=True]
```

 The `mam-shell` control program allows you to make powerful and sweeping modifications to many objects with a single command. A mistake made using this command could result in the inadvertent modification of all actions.

 When using Moab Accounting Manager as an accounting manager, certain actions are assumed to exist. Be careful what you delete!

### Do Not Allow Accounts to be Deleted

```
$ mam-shell Action Delete Object==Account Name==Delete
Successfully deleted 1 action
```



## 23.19 Examples Creating Custom Objects

Creating a custom object normally involves defining a new object and adding attributes to the object.

*Example 23-1: Creating a License object to track license usage and charges.*

Invoke the Moab Accounting Manager control program in interactive mode:

```
$ mam-shell
```

Create the License Object:

```
mam> Object Create Name=License Description=License
Successfully created 1 object and 5 actions
```

Next, define its attributes. Give each record a unique ID (so the record can be more easily modified), a license type that can be one of (Matlab,Mathematica,Compiler,AutoCAD,Oracle), the user who is using it, the start and end time, how many instances of the license were used, and how much was charged.

```
mam> Attribute Create Object=License Name=Id DataType=AutoGen PrimaryKey=True
Description="Record Id"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=Type DataType=String Required=True Values="
(Matlab,Mathematica,Compiler,AutoCAD,Oracle)" Fixed=True Description="License Type"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=User Required=True Values="@User"
Description="User Name"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=StartTime DataType=TimeStamp
Description="Start Time"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=EndTime DataType=TimeStamp Description="End
Time"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=Count DataType=Integer Description="Number
of Licenses Used"
Successfully created 1 attribute
mam> Attribute Create Object=License Name=Charge DataType=Currency Description="Amount
Charged"
Successfully created 1 attribute
```

Finally, since we would like to manage licenses from the web GUI, set `Display=True`:

```
mam> Action Modify Object==License Name!=Undelete Display=True
Successfully modified 4 actions
```

When done, exit the mam-shell prompt:

```
mam> quit
```

Licenses should now be able to be managed via the GUI and mam-shell. The data source will need to use one of the methods of interacting with Moab Accounting Manager (see [Methods of Interacting with Moab Accounting Manager](#)) in order to push license record usage info to Moab Accounting Manager.

Apart from being used as an accounting manager, Moab Accounting Manager can be used as a generalized information service. It can be used to manage just about any object-oriented information over the web. For example, Moab Accounting Manager could be used to provide meta-schedulers with machine/user mappings, or node/resource information.

*Example 23-2: Using Moab Accounting Manager as a Grid Map File.*

Invoke the mam-shell control program in interactive mode:

```
$ mam-shell
```

Create the GridMap Object:

```
mam> Object Create Name=GridMap Description="Online Grid Map File"
Successfully created 1 object and 5 actions
```

Next, define its attributes. Each entry will consist of a userid (which will serve as the primary key) and a required public X.509 certificate.

```
mam> Attribute Create Object=GridMap Name=User PrimaryKey=True Values=@User
Description="User Name"
Successfully created 1 attribute

mam> Attribute Create Object=GridMap Name=Certificate DataType=String Required=True
Description="X.509 Public Key"
Successfully created 1 attribute
```

Exit the mam-shell prompt:

```
mam> quit
```

From this point, a peer service will need to use one of the methods of interacting with Moab Accounting Manager (see Interaction Methods) in order to query the GridMap information.

## Chapter 24: Integration

Moab Accounting Manager (MAM) works in conjunction with a resource management system, such as Moab Workload Manager. Moab Workload Manager incorporates direct support for MAM and offers a full-featured integration. MAM can generally be made to work with other resource management systems, so long as they provide support for prolog and epilog scripts.

In addition to integrating with resource managers, Moab Accounting Manager can be integrated with supported third-party services including PAM (Pluggable Authentication Module) and MWS (Moab Web Services).

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## 24.1 Integrating with Moab Workload Manager

Moab Workload Manager can be configured to interact with Moab Accounting Manager to track and charge for resources utilized by jobs and reservations. You will need to have the Accounting Manager Licensing feature in Moab in order to have support for Moab Accounting Manager.

In this topic:

- 24.1.1 Select an Appropriate Accounting Management Interface Type - page 180
- 24.1.2 Run `Configure --with-am` - page 181
- 24.1.3 Edit the Moab Server Configuration File - page 181
- 24.1.4 Edit the Moab Private Configuration File - page 182
- 24.1.5 Restart Moab Workload Manager - page 182

### 24.1.1 Select an Appropriate Accounting Management Interface Type

There are two accounting manager interface types that Moab can use to interact with Moab Accounting Manager: MAM, which makes direct calls to MAM over the SSS wire protocol, and Native, where customizable scripts are invoked to communicate with Moab Accounting Manager. The MAM accounting manager interface is the default as it is usually faster. The Native accounting manager interface can be used if higher customizability is needed, or if you need to interface with a third party accounting or allocation system. See the *Moab Workload Manager Administrator Guide* for more information. Choose the accounting manager interface type that is right for your needs and remember it. This information will be used in a later step.

## 24.1.2 Run Configure --with-am

It may be necessary or advantageous when installing Moab Workload Manager to run `configure` with certain accounting related options.

Configure Moab to use the Moab Accounting Manager by running `./configure` with the applicable options when installing Moab:

- `--with-am[=TYPE]` - Enable accounting management with the specified accounting manager interface type (mam or native) [mam].
- `--with-am-dir=DIR` - Uses the specified prefix directory for the accounting manager if installed in a non-default location.

The `--with-am` option specifies the accounting manager interface type that you want to use as either mam, which is the default, or native. Specifying this option will add essential entries into Moab configuration files. Although these entries can be added manually later, this step facilitates configuration by adding parameters appropriate for your selected accounting manager interface type.

Use `--with-am-dir` to specify the prefix directory for Moab Accounting Manager if it has been installed in a non-default location. This value is used to help the native accounting manager scripts find the Moab Accounting Manager libraries and server connection information.

### Configuring Moab to Use the Direct Accounting Manager Interface

```
$ ./configure --with-am
```

## 24.1.3 Edit the Moab Server Configuration File

Add or uncomment the essential AMCFG lines in the `moab.cfg` file.

### Configuring Moab to Use the MAM Accounting Manager Interface

If you are using the direct (MAM) accounting manager interface, at a minimum, you must tell Moab to use `AMCFG [ ] TYPE=MAM`. Additionally, if your Moab Accounting Manager server is running on a different host than the Moab Workload Manager server, you must specify the hostname via the `AMCFG[] HOST` parameter.

```
$ vi /opt/moab/etc/moab.cfg
AMCFG[mam] TYPE=MAM HOST=localhost
```

### Configuring Moab to Use the Native Accounting Manager Interface

If you are using the script (Native) accounting manager interface, at a minimum, you must tell Moab to use `AMCFG [ ] TYPE=NATIVE`. Moab Workload Manager will default to using

a set of stock scripts to interact with Moab Accounting Manager.

```
$ vi /opt/moab/etc/moab.cfg
AMCFG[mam] TYPE=NATIVE
```

### 24.1.4 Edit the Moab Private Configuration File

If you have chosen to use the direct MAM accounting manager interface type, you will need to configure Moab to have Moab Accounting Manager's symmetric key for secure authentication. This step is not necessary when using the Native accounting manager interface type since the secret key can be securely derived from Moab Accounting Manager and used via the connection libraries.

#### Configuring Moab to Communicate Securely with Moab Accounting Manager

Add or uncomment a `CLIENTCFG[AM:mam] KEY` parameter line in `moab-private.cfg`. Copy the `token.value` parameter in `/opt/mam/etc/mam-site.conf` into the `KEY` value in `/opt/moab/etc/moab-private.cfg`.

```
# vi /opt/moab/etc/moab-private.cfg
CLIENTCFG[AM:mam] KEY=UiW7EihzKyUyVQg6dKirDhV3
```

### 24.1.5 Restart Moab Workload Manager

In order for the configuration changes to take effect, restart Moab:

```
# systemctl restart moab.service
```

## 24.2 Integrating With Slurm

Moab Accounting Manager can be configured to interact with Slurm to track and charge for resources utilized by jobs. The integration involves the use of an epilog script as well as a patch and the use of a prolog script if enforcing allocations.

In this topic:

[24.2.1 Copy MAM's Slurm Contrib Scripts - page 183](#)

[24.2.2 Set Database Max Connections Appropriately - page 183](#)

[24.2.3 Configure the Controller Epilog to Call the MAM Charge Script - page 184](#)

[24.2.4 Patch Slurm - page 184](#)

[24.2.5 Configure the Controller Prolog to Call the MAM Reserve Script - page 185](#)

[24.2.6 Customize the Reserve Script - page 186](#)

[24.2.7 Limitations with MAM when using Slurm - page 187](#)

## 24.2.1 Copy MAM's Slurm Contrib Scripts

If you installed MAM from tarball, the Slurm integration scripts can be found in the directory where you unpacked the tarball. If you installed from RPM, the Slurm integration scripts can be found in `/usr/share/maab-accounting-manager/contrib`. Copy MAM's Slurm contrib scripts to `/opt/slurm/etc` and ensure that they are owned and executable by the Slurm user.

### Copying the Slurm Contrib Scripts

```
[root]# cp /software/mam-<version>/contrib/slurm/mam-*.slurm.pl /opt/slurm/etc
[root]# chown slurm:slurm /opt/slurm/etc/mam-*.slurm.pl
[root]# chmod +x /opt/slurm/etc/mam-*.slurm.pl
```

## 24.2.2 Set Database Max Connections Appropriately

Each Slurm job will require a database connection when creating liens for jobs, and another when charging for the job completion. For array jobs, or a large batch of simultaneous submissions, this can result in a large number of simultaneous connections. If the database does not have enough connections configured, this will result in array job failures.

Be sure to increase your database connections enough to handle your expected workload. A good rule of thumb would be to set it to at least half the expected number of jobs that might be submitted within a short time. Also, be sure to monitor Slurm's logs for database connection failures from `scontrol`.

For PostgreSQL, as an example, the database connections are specified in `postgresql.conf` (usually found in the directory `/var/lib/pgsql/data/`). The number of connections is specified by the `max.connections` value. When increasing the connection count, it's a good idea to also increase the size of the pool for shared buffers (using the `shared_buffers` setting). Your needs may vary, but a good starting point is 32 MB of shared buffer space for every 100 connections.

Also, when making these adjustments you may also need to increase the kernel's `shmmax` setting. It is recommended that a qualified DBA review the database configuration.

## 24.2.3 Configure the Controller Epilog to Call the MAM Charge Script

If you do not intend to use the `slurmctld` epilog for any purpose other than for integration with MAM, you can configure Slurm to call the script directly by editing the Slurm configuration file, setting the `EpilogSlurmctld` to point to the `mam-charge.slurm.pl` file, and reconfiguring `slurmctld`.

### Setting the Controller Epilog to Call the Charge Script Directly

```
[root]# vi /opt/slurm/etc/slurm.conf
EpilogSlurmctld=/opt/slurm/etc/mam.charge.slurm.pl
[root]# scontrol reconfigure
```

If you already have a `slurmctld` epilog configured, the charge script can be called within your existing epilog script. Edit your `slurmctld` epilog script and add a section at the end of the epilog that calls the charge script and exits with the status returned by the charge script. The exit in this case is optional and can be excluded if desired, as its only use is for logging purposes.

### Editing the Existing Epilog Script to Call the Charge Script

```
[root]# vi <slurmctld_epilog_script>
```

If you are using a bash script for your `slurmctld` epilog, include an excerpt similar to the following:

```
/opt/slurm/etc/mam.charge.slurm.pl
exit $?
```

If you are using a Perl script, include an excerpt similar to the following:

```
my $cmd = "/opt/slurm/etc/mam.charge.slurm.pl";
my $output = `$cmd 2>&1` || `sh -c "$cmd 2>&1"`;
exit $? >> 8;
```

If you are using a Python script, include an excerpt similar to the following:

```
import subprocess
cmd = '/opt/slurm/etc/mam.charge.slurm.pl'
rc = subprocess.Popen(cmd).wait()
exit(rc)
```

## 24.2.4 Patch Slurm

If you intend to use the strict allocation accounting mode in MAM, you will need to patch Slurm in order for Slurm to enforce your configured failure action when unable to obtain a



lien with MAM. This patch will need to be reapplied each time Slurm is upgraded.

## Patching Slurm

```
[root]# scontrol shutdown slurmctld
[root]# cd /software/slurm-<version>
[root]# patch -p 0 < /software/mam-<version>/contrib/slurm/slurm-<major_release>.patch
[root]# make
[root]# make install
[root]# su - slurm -c "slurmctld"
```

### 24.2.5 Configure the Controller Prolog to Call the MAM Reserve Script

If you intend to use the strict allocation accounting mode in MAM, you will need to configure SLURM to call the reserve script from the `slurmctld` prolog.

If you do not intend to use the `slurmctld` prolog for any purpose other than for integration with MAM, you can configure Slurm to call the script directly by editing the Slurm configuration file, setting the `PrologSlurmctld` to point to the `mam-reserve.slurm.pl` file, and reconfiguring `slurmctld`.

#### Setting the Controller Prolog to Call the Reserve Script Directly

```
[root]# vi /opt/slurm/etc/slurm.conf

PrologSlurmctld=/opt/slurm/etc/mam.reserve.slurm.pl

[root]# scontrol reconfigure
```

If you already have a `slurmctld` prolog configured, the reserve script may be called within your existing prolog script. Edit your `slurmctld` prolog script and add a section in the prolog that calls the reserve script and exits with an appropriate exit code.

#### Editing the Existing Prolog Script to Call the Reserve Script

```
[root]# vi <slurmctld_prolog_script>
```

If you are using a bash script for your `slurmctld` prolog, include an excerpt similar to the following:

```
/opt/slurm/etc/mam.reserve.slurm.pl
rc=$?
if (( $rc >= 78 && $rc <= 103 )); then
    exit $?
fi
```

If you are using a Perl script, include an excerpt similar to the following:

```
my $cmd = "/opt/slurm/etc/mam.reserve.slurm.pl";
```

```
my $output = `$cmd 2>&1` || `sh -c "$cmd 2>&1"`;
my $rc = $? >> 8;
exit $rc if ($rc >= 78 && $rc <= 103);
```

If you are using a Python script, include an excerpt similar to the following:

```
import subprocess
cmd = '/opt/slurm/etc/mam.reserve.slurm.pl'
rc = subprocess.Popen(cmd).wait()
if rc >= 78 and rc <= 103:
    exit(rc)
```

## 24.2.6 Customize the Reserve Script

If you intend to use the strict allocation accounting mode in MAM, edit the `mam.reserve.slurm.pl` script and set the connection failure action, funds failure action, and general failure action values according to your desired policy.

Before starting a job, the prolog will call MAM to create a lien in order to verify and protect the funds required for the job run. If the lien fails, one of four failure actions can be applied:

- IGNORE – allows the job to start
- DEFER – delays the start of the job for 5 minutes
- HOLD – puts an administrative hold on the job
- CANCEL – cancels the job

A separate failure action can be configured for each of three different situations:

- The connection failure action is applied if there is a communication problem with the accounting manager.
- The funds failure action is applied if the lien request is rejected due to insufficient funds.
- The general failure action is applied if the accounting manager rejects the lien request for any other reason.

### Configuring the Failure Action Policies in the Reserve Script

```
[root]# vi /opt/slurm/etc/mam.reserve.slurm.pl

my $connectionFailureAction = 'DEFER';
my $fundsFailureAction = 'HOLD';
my $generalFailureAction = 'CANCEL';
```

When an accounting failure occurs in the prolog, the MAM response message and the resulting failure action is recorded in the job's comment field.

## 24.2.7 Limitations with MAM when using Slurm

Due to the lack of true integrated support in Slurm for MAM, some features of MAM are not available in the current Slurm-MAM integration solution:

- The fast-allocation accounting mode is not supported with Slurm.
- Since the prolog and epilog scripts are not throttled or handled via a thread pool in Slurm, resource-related issues can occur in high job throughput situations. Some attempt has been made to remedy this in the contributed prolog and epilog scripts by protecting the critical section with semaphores, however, this solution is not guaranteed and may have limits in its effectiveness.
- Slurm job arrays have not been tested.
- Other features unique to Slurm may not be supported within the MAM-Slurm integration.

## 24.3 Integrating with PAM

Moab Accounting Manager can be configured to have the MAM GUI and/or MAM Web Services authenticate against PAM (Pluggable Authentication Module). Using PAM allows these services to authenticate using the local Unix password or LDAP password rather than the password stored in the MAM database Password table. Configuring MAM to use PAM authentication involves setting the `authentication.method` parameter to a value of `pam` and configuring the PAM configuration file. Additionally, when the PAM configuration file is set to use Unix password authentication, MAM will need to be run as root in order to have sufficient privileges to perform authentication for the users.

In this topic:

- [24.3.1 Set the `authentication.method` Parameter to `pam` - page 187](#)
- [24.3.2 Edit the PAM Configuration for MAM - page 188](#)
- [24.3.3 Configure MAM to Run as Root if using Unix Password Authentication - page 188](#)
- [24.3.4 Restart Httpd If Using MAM Web Services - page 189](#)

### 24.3.1 Set the `authentication.method` Parameter to `pam`

Either or both of the GUI and web services configuration files may be configured to use PAM for authentication. Edit the appropriate configuration file (`mam-gui.conf` and/or `mam-ws.conf`) and set the value of the `authentication.method` parameter to `pam`.

*Example 24-1: Configuring MAM GUI to authenticate using PAM*

```
$ vi /opt/mam/etc/mam-gui.conf
authentication.method = pam
```

*Example 24-2: Configuring MAM Web Services to authenticate using PAM*

```
$ vi /opt/mam/etc/mam-ws.conf
authentication.method = pam
```

## 24.3.2 Edit the PAM Configuration for MAM

The stock PAM configuration file for MAM (`/etc/pam.d/mam`) will cause MAM to use the system-default authentication mechanism and should be sufficient for most cases. PAM is very flexible and can be configured as desired. This section will highlight a few alternate configuration options.

*Example 24-3: Using Unix password authentication*

```
# vi /etc/pam.d/mam

#%PAM-1.0
auth      required      pam_unix.so
account   required      pam_permit.so
```

*Example 24-4: Using LDAP password authentication*

```
# vi /etc/pam.d/mam

#%PAM-1.0
auth      sufficient    pam_unix.so
auth      sufficient    pam_ldap.so use_first_pass
auth      required      pam_deny.so
account   required      pam_permit.so
```

**i** If MAM has been configured with the `--without-pam` option, you will need to either manually create the PAM config file, or rerun `configure`, `make` and `make install` without this option to install the stock PAM config file.

## 24.3.3 Configure MAM to Run as Root if using Unix Password Authentication

If PAM is configured to use Unix password authentication, MAM will need to be running as root in order to perform authentication for other users. To configure MAM to run as root, you will need to add the root user to the SystemAdmin role and reconfigure MAM to use root as the accounting admin user.

*Example 24-5: Adding the root user to the SystemAdmin role*

```
$ mam-modify-role --add-user root -r SystemAdmin
```

*Example 24-6: Reconfiguring MAM to use root as the accounting admin user*

Run `configure` with either the `--with-pam` or `--with-user=root` option, including the same options that were used in the previous installation. Using the `--with-pam` configuration option has the side effect of configuring MAM to use `root` for the accounting admin user. This results in a similar outcome to using the `--with-user=root` option, but has the additional effect of setting the default authentication method to `pam` for the GUI and web services. The `make install` command must be run as the root user and the MAM service must be restarted (so that it will be running as root).

```
$ ./configure --with-pam ...
$ make
# make install
# systemctl daemon-reload
# systemctl restart mam.service
```

**i** If you have SELinux enabled, you may need to rerun the `chcon` command on `/opt/mam/log` to reimpose the selinux context after having its owner changed to `root` (e.g. `chcon -v -t httpd_sys_rw_content_t /opt/mam/log`).

### 24.3.4 Restart Httpd If Using MAM Web Services

If you are using MAM Web Services, the HTTPD server daemon must be restarted to force `mod_perl` to reload the new authentication settings.

*Example 24-7: Restarting the Httpd Service*

```
# systemctl restart httpd.service
```

## 24.4 Integrating with Moab Web Services

Moab Web Services can be configured to interact with Moab Accounting Manager order to be able to perform RESTful web service queries against accounting objects in Moab Accounting Manager.

**i** Integration with Moab Web Services is deprecated in favor of using MAM Web Services and may be removed in a later release.

In this topic:

[24.4.1 Edit the MWS HPC Configuration File - page 190](#)

[24.4.2 Restart Moab Web Services - page 190](#)

## 24.4.1 Edit the MWS HPC Configuration File

Uncomment and set the following parameters in `/opt/mws/etc/mws.d/mws-config-hpc.groovy`:

- **mam.secretKey** - Set to the value of the `token.value` parameter in `/opt/mam/etc/mam-site.conf`
- **mam.server** - Set to the hostname of the MAM server
- **mam.port** - Set to the port of the MAM server (defaults to 7112)

### Configuring Moab Web Services to Communicate with MAM Accounting Manager

```
$ vi /opt/mws/etc/mws.d/mws-config-hpc.groovy
mam.secretKey = "UiW7EihzKyUyVQg6dKirDhV3"
mam.server = "localhost"
mam.port = 7112
```

## 24.4.2 Restart Moab Web Services

In order for the MWS configuration changes to take effect, restart Tomcat:

```
# systemctl restart tomcat.service
```

## 24.5 Methods of Interacting with Moab Accounting Manager

There are several ways of interacting with Moab Accounting Manager. Let's consider a simple usage charge in each of the different ways.

In this topic:

- [24.5.1 Using the Appropriate Command-Line Client - page 191](#)
- [24.5.2 Using the Interactive Control Program - page 191](#)
- [24.5.3 Using Web Services - page 191](#)
- [24.5.4 Use the Perl API - page 192](#)
- [24.5.5 Communicating Over the Wire via the SSSRMAP Protocol - page 192](#)

## 24.5.1 Using the Appropriate Command-Line Client

From inside a script, or by invoking a system command, you can use a command-line client (one of the "g" commands in the bin directory).

*Example 24-8: To issue a charge at the completion of job usage, you could use mam-charge:*

```
mam-charge -J Moab.1234 -a chemistry -u amy -m colony -P 2 -t 3600
```

## 24.5.2 Using the Interactive Control Program

The interactive control program, mam-shell, will issue a charge for a job expressed in xml.

*Example 24-9: To issue a charge you must invoke the Charge action on the Job object:*

```
mam-shell UsageRecord Charge
Data:="<<UsageRecord><Instance>Moab.1234</Instance><Account>chemistry</Account><User>amy</User><Machine>colony</Machine><Processors>2</Processors><Duration>3600</Duration></UsageRecord>" Duration:=3600
```

## 24.5.3 Using Web Services

The charge can be issued as a POST to the MAM Web Services URL with a JSON usage record payload.

*Example 24-10: The POST might look something like:*

```
POST https://localhost/mamws/usage-records?action=charge
{
  "account" : "chemistry",
  "duration" : 300,
  "instance" : "Moab.1234",
  "machine" : "colony",
  "processors" : 2,
  "user" : "amy"
}
```

## 24.5.4 Use the Perl API

The Perl API exposes the full functionality of Moab Accounting Manager. The client commands can be examined as sample code. Use `perldoc` on the modules in `lib/mam` for function documentation.

*Example 24-11: To make a charge via this interface you might do something like:*

```
use MAM;

my $request = new MAM::Request(object => "UsageRecord", action => "Charge");
my $usageRecord = new MAM::Datum("UsageRecord");
$usageRecord->setProperty("Instance", "Moab.1234");
$usageRecord->setProperty("Account", "chemistry");
$usageRecord->setProperty("User", "amy");
$usageRecord->setProperty("Machine", "colony");
$usageRecord->setProperty("Processors", "2");
$usageRecord->setProperty("Duration", "3600");
$request->addDatum($usageRecord);
$request->setOption("Duration", "3600");
my $response = $request->getResponse();
print $response->getStatus(), ": ", $response->getMessage(), "\n";
```

## 24.5.5 Communicating Over the Wire via the SSSRMAP Protocol

Finally, it is possible to interact with Moab Accounting Manager by directly using the SSSRMAP Wire Protocol and Message Format over the network. This will entail building the request body in XML, appending an XML digital signature, combining these in an XML envelope framed in an HTTP POST, sending it to the server, and parsing the similarly formed response. The Moab Workload Manager communicates with Moab Accounting Manager via this method.

*Example 24-12: The message might look something like:*

```
POST /SSSRMAP HTTP/1.1
Content-Type: text/xml; charset="utf-8"
Transfer-Encoding: chunked

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<?xml version="1.0" encoding="UTF-8"?>
<Envelope>
  <Body>
    <Request action="Charge" actor="scottmo">
      <Object>UsageRecord</Object>
      <Data>
        <UsageRecord>
          <Instance>Moab.1234</Instance>
          <Account>chemistry</Account>
          <User>amy</User>
          <Machine>colony</Machine>
          <Processors>2</Processors>
          <Duration>3600</Duration>
        </UsageRecord>
      </Data>
```



```
    <Option name="Duration">3600</Option>
  </Request>
</Body>
<Signature>
  <DigestValue>azu4obZswzBt890gATukBeLyt6Y=</DigestValue>
  <SignatureValue>YXE/C08XX3RX4PMU1bWju+5/E5M=</SignatureValue>
  <SecurityToken type="Symmetric"></SecurityToken>
</Signature>
</Envelope>
0
```

## Chapter 25: Configuration Files

Moab Accounting Manager uses four configuration files: one for the connection information (`mam-site.conf`), one for the server (`mam-server.conf`), one for the clients (`mam-client.conf`) and one for the graphical user interface (`mam-gui.conf`). For configuration parameters that have hard-coded defaults, the default value is specified within brackets.

After modifying configuration parameters used by the server (such as those in the site configuration or server configuration files), you must restart the `mam-server` for the new settings to take effect. Alternatively, for most parameters, you can force the server to reread its configuration by running ``mam-server --reconfig`` or by sending the HUP signal to the main server process.

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### 25.1 Site Configuration

The site configuration file specifies the connection information for the current site such as the server host name, port, backup server, default security method and the symmetric key. Optionally, it can also have blocks that specify connection information for other sites. This file should be readable only by the accounting admin user.

*Example 25-1: The following is an example `mam-site.conf` file:*

```
server.host = red-head1
backup.host = red-head2
server.port = 7071
token.type = Symmetric
token.value = pBaIapJqbfLd8NiyzTJefFXW

[white]
server.host = white-head1
server.port = 7071
token.value = Fl7wOkioUpyjdqJ8ckvWK_ta

[blue]
```

```
server.host = blue-head1
server.port = 7071
token.value = gVSeQ8Diz5O3pzj01y4inGWq
```

The following configuration parameters can be set in the site configuration file (`mam-site.conf`):

`backup.host` — The hostname of the backup server. Each site can have both a primary server and a hot-standby backup server. They should either point to the same database or separate instances of a replicated database. If `backup.host` is specified, clients will try communicating with the primary server first, and if the connection fails, they will try communicating with the backup server. Since both the primary and backup servers can run simultaneously, events are disabled for the backup server so they do not conflict with events triggered by the primary server.

`server.host` — The hostname of the primary server

`server.port` [7112] — The port that the server listens on

`token-type` [Symmetric] — Indicates the default security token type to be used in both authentication and encryption. Valid token types include `Password` and `Symmetric`. The default is `Symmetric`.


`token.value` — When using the `Symmetric` token type, `token.value` is the secret key. It is a base64-encoded symmetric key used between clients and the server for authentication and encryption.

## 25.2 Server Configuration

The following configuration parameters can be set in the server configuration file (`mam-server.conf`):

Parameter	Description
<b>accounting.mode</b> [strict-allocation]	The accounting mode can be one of <code>usage-tracking</code> , <code>notional-charging</code> , <code>fast-allocation</code> , or <code>strict-allocation</code> . If <code>usage-tracking</code> is specified, charges will simply result in the creation of usage records with no charge value. No charge will be calculated and allocations will not be debited. If <code>notional-charging</code> is specified, a charge will be calculated and recorded with the usage record, but allocations are not debited. If <code>fast-allocation</code> is specified, usage records will be updated with charge amounts and allocations will

Parameter	Description
	be debited, but liens will not be used to protect the allocation from simultaneous use. If <code>strict-allocation</code> is specified, usage records will be updated with charge amounts and allocations will be debited, and liens will be used to protect the allocation from simultaneous use.
<b>allocation.enforcediscrete [true]</b>	If enabled (the default), new allocations will be prevented from overlapping existing ones. This policy helps to improve clarity when reporting on allocation usage during a particular period.
<b>authentication.enabled [true]</b>	Indicates whether incoming message authentication is required.
<b>currency.itemization [false]</b>	Enables ( <code>true</code> ) or disables ( <code>false</code> ) the storing of itemized charges to the Charge table for charge transactions.
<b>currency.precision [0]</b>	Indicates the number of decimal places in the resource credit currency. For example, if you will be dealing with an integer billable unit like processor-seconds, use 0 (which is the default). If you will be charging dollars and cents, then use 2. This parameter should be the same in the <code>mam-server.conf</code> and <code>mam-client.conf</code> files.
<b>database.datasource [DBI:Pg:dbname=mam;host=localhost]</b>	The Perl DBI data source name for the database you want to connect to.
<b>database.password</b>	The password to be used for the database connection (if any).
<b>database.user</b>	The username to be used for the database connection (if any).
<b>encryption.enabled [false]</b>	Indicates whether incoming message encryption is required.
<b>event.scheduler [true]</b>	Specifies whether the event scheduler is enabled ( <code>true</code> ) or not ( <code>false</code> ).

Parameter	Description
	<div style="border: 1px solid red; padding: 5px; background-color: #ffe6e6;">  MAM relies on pre-configured events for refreshing stale allocations and notifications; disabling the event scheduler will prevent these updates from occurring. </div>
<b>event.pollinterval [5]</b>	The period in minutes that the event scheduler uses to check and fire events. The poll interval must divide evenly into the number of minutes in a day (1440).
<b>log4perl.appender.Log.filename</b>	Used by <code>log4perl</code> to set the base name of the log file.
<b>log4perl.appender.Log.max</b>	Used by <code>log4perl</code> to set the number of rolling backup logs.
<b>log4perl.appender.Log.size</b>	Used by <code>log4perl</code> to set the size the log will grow to before it is rotated.
<b>log4perl.appender.Log.Threshold</b>	Used by <code>log4perl</code> to set the debug level written to the log. The logging threshold can be one of TRACE, DEBUG, INFO, WARN, ERROR, and FATAL.
<b>log4perl.appender.Screen.Threshold</b>	Used by <code>log4perl</code> to set the debug level written to the screen. The logging threshold can be one of TRACE, DEBUG, INFO, WARN, ERROR, and FATAL.
<b>notification.deliverymethod [store]</b>	Specifies which delivery method is used by default if unspecified.
<b>notification.duration [1209600]</b>	Defines how long in seconds that stored notifications persist before being automatically deleted. The default is two weeks.
<b>response.chunksize [0]</b>	Indicates the line length in the data response that will trigger message segmentation (or truncation). A value of 0 (zero) means unlimited (i.e., that the server will not truncate or segment large responses unless overridden by a chunksize

Parameter	Description
	specification in a client request). The response chunksize will be taken to be the smaller of the client and server chunksize settings.
<b>super.user [root]</b>	Removed beginning with the 9.1.0 release.
<b>user.firstaccountdefault [true]</b>	If set to true, the first account that a user is added to will become the default account for that user. This default value is true.

## 25.3 Client Configuration

The following configuration parameters can be set in the client configuration file (`mam-client.conf`):

Parameter	Description
<b>account.show [Name,Active,Users,Organization,Description]</b>	The default fields shown by <code>mam-list-accounts</code> .
<b>accounting.mode [strict-allocation]</b>	The accounting mode can be one of <code>usage-tracking</code> , <code>notional-charging</code> , <code>fast-allocation</code> , or <code>strict-allocation</code> . The value of this parameter can modify the default fields displayed by certain commands such as <code>mam-list-usagerecords</code> .
<b>allocation.show [Id,Fund,StartTime,EndTime,InitialDeposit,Allocated,CreditLimit,Remaining,PercentUsed]</b>	The default fields shown by <code>mam-list-allocations</code> .
<b>authentication.enabled [true]</b>	Indicates whether outgoing message are signed.
<b>balance.show [Id,Name,Balance,Reserved,Effective,CreditLimit,Available]</b>	The default fields shown by <code>mam-balance</code> .

Parameter	Description
<b>currency.precision [0]</b>	Indicates the number of decimal places in the credit currency. For example, if you will be dealing with integer billable units like processor-seconds, use 0 (which is the default). If you will be charging dollars and cents, then use 2. This parameter should be the same in the <code>mam-server.conf</code> and <code>mam-client.conf</code> files.
<b>encryption.enabled [false]</b>	Indicates whether outgoing messages are encrypted.
<b>event.show</b>	[Id,FireCommand,FireTime,ArmTime,RearmPeriod,EndTime,Notify,RearmOnFailure,FailureCommand,CatchUp,CreationTime,Description] -- The default fields shown by <code>mam-list-events</code> .
<b>fund.show [Id,Name,Constraints,Allocated,Balance,DefaultDeposit,Description]</b>	The default fields shown by <code>mam-list-funds</code> .
<b>lien.show [Id,Instance,Amount,StartTime,EndTime,UsageRecord,Funds,Description]</b>	The default fields shown by <code>mam-list-liens</code> .
<b>log4perl.appender.Log.filename</b>	Used by log4perl to set the base name of the log file.
<b>log4perl.appender.Log.max</b>	Used by log4perl to set the number of rolling backup logs.
<b>log4perl.appender.Log.size</b>	Used by log4perl to set the size the log will grow to before it is rotated.
<b>log4perl.appender.Log.Threshold</b>	Used by log4perl to set the debug level written to the log. The logging threshold can be one of TRACE, DEBUG, INFO, WARN, ERROR, and FATAL.

Parameter	Description
<b>log4perl.appender.Screen.Threshold</b>	Used by log4perl to set the debug level written to the screen. The logging threshold can be one of TRACE, DEBUG, INFO, WARN, ERROR, and FATAL.
<b>notification.show</b>	[Id,Event,Type,Status,Code,Message,Key,Recipient,EndTime,CreationTime] --The default fields shown by <i>mam-list-notifications</i> .
<b>organization.show [Name,Description]</b>	The default fields shown by <i>mam-list-organizations</i> .
<b>promotion.method</b>	When using the symmetric key for security authentication or encryption, since the site configuration file is readable only by the accounting admin user, a method must be employed to temporarily elevate privileges in order to encrypt the communication with the symmetric key. One of two privilege promotion methods may be selected: <code>suidperl</code> or <code>mamauth</code> . <code>Suidperl</code> allows a Perl script to temporarily elevate privileges to the owner of the script if the <code>setuid</code> bit is set on the file. This method is recommended when <code>suidperl</code> can be installed on the system. If you prefer not to use <code>suidperl</code> or if it is not available for your system (such as with Perl 5.12 and higher), you will need to use the <code>mamauth</code> promotion method. <code>Mamauth</code> uses a <code>setuid</code> binary executable that allows the request body to be passed in as standard input and returns the authenticated digest and signature. Currently, only <code>suidperl</code> can be used for encryption of client communication. The privilege promotion method should be configured at install time by specifying the <code>--with-promotion</code>



Parameter	Description
	configuration parameter and defaults to <code>suidperl</code> when it is available.
<b>quote.show</b> [Id,Amount,Pinned,Instance,UsageRecord,StartTime,EndTime,Duration,ChargeRates,Description]	The default fields shown by <code>mam-list-quotes</code> .
<b>response.chunking</b> [false]	Indicates whether large responses should be chunked (segmented). If set to false, large responses will be truncated.
<b>response.chunksize</b> [1000]	Indicates the line length in the data response that will trigger message segmentation (or truncation). A value of 0 (zero) means unlimited, (i.e., that the client will accept the chunksize set by the server). The response chunksize will be taken to be the smaller of the client and server chunksize settings.
<b>statement.show</b> [Account,User,Machine]	The default discriminator fields in <code>mam-statement</code> .
<b>transaction.show</b> [Id,Object,Action,Actor,Name,Child,Instance,Count,Amount,Delta,Balance,User,Account,Machine,Fund,Allocation,UsageRecord,Duration,Description]	The default fields shown by <code>mam-list-transactions</code> .
<b>usagerecord.show</b> [Id,Type,Instance,Charge,Stage,User,Group,Account,Organization,Class,QualityOfService,Machine,Nodes,Processors,Memory,Duration,SubmitTime,StartTime,EndTime,Description]	The default fields shown by <code>mam-list-usagerecords</code> .
<b>user.show</b> [Name,Active,CommonName,PhoneNumber,EmailAddress,DefaultAccount,Description]	The default fields shown by <code>mam-list-users</code> .

## 25.4 GUI Configuration

The following configuration parameters can be set in the GUI configuration file (`mam-gui.conf`).

Parameter	Description
<b>authentication.enabled [true]</b>	Indicates whether outgoing message are signed.
<b>authentication.method [mam-password]</b>	Specifies which server-side authentication mechanism to use. It can assume a value of <code>mam-password</code> , which compare a hashed value of the password with the value in the MAM database Password table, or a value of <code>pam</code> , which uses PAM (Pluggable Authentication Module) for authentication. The default value depends on the <code>--with-pam</code> configure option.
<b>currency.enablehours [false]</b>	If set to true, the graphical user interface will include a ShowHours radio button (defaulting to <code>True</code> ) for certain panels (e.g., Fund Deposit, Query, Statement, Transfer, Withdraw) that will allow the currency inputs or outputs to be divided by 3600.
<b>currency.precision [0]</b>	Indicates the number of decimal places in the credit currency. For example, if you will be dealing with integer billable units like processor-seconds, use 0 (which is the default). If you will be charging dollars and cents, then use 2. This parameter should be the same in the <code>mam-server.conf</code> and <code>mam-client.conf</code> files.
<b>encryption.enabled [false]</b>	Indicates whether outgoing messages are encrypted.
<b>log4perl.appender.Log.filename</b>	Used by log4perl to set the base name of the log file.
<b>log4perl.appender.Log.max</b>	Used by log4perl to set the number of rolling backup logs.
<b>log4perl.appender.Log.size</b>	Used by log4perl to set the size the log will grow to before it is rotated.
<b>log4perl.appender.Log.Threshold</b>	Used by log4perl to set the debug level written to the log. The logging threshold can be one of TRACE, DEBUG, INFO, WARN, ERROR, and FATAL.

Parameter	Description
<b>promotion.method</b>	When using the symmetric key for security authentication or encryption, since the site configuration file is readable only by the accounting admin user, a method must be employed to temporarily elevate privileges in order to encrypt the communication with the symmetric key. One of two privilege promotion methods may be selected: <code>suidperl</code> or <code>mamauth</code> . <code>Suidperl</code> allows a Perl script to temporarily elevate privileges to the owner of the script if the <code>setuid</code> bit is set on the file. This method is recommended when <code>suidperl</code> can be installed on the system. If you prefer not to use <code>suidperl</code> or if it is not available for your system (such as with Perl 5.12 and higher), you will need to use the <code>mamauth</code> promotion method. <code>Mamauth</code> uses a <code>setuid</code> binary executable that allows the request body to be passed in as standard input and returns the authenticated digest and signature. Currently, only <code>suidperl</code> can be used for encryption of client communication. The privilege promotion method should be configured at install time by specifying the <code>--with-promotion</code> configuration parameter and defaults to <code>suidperl</code> when it is available.
<b>response.chunking [false]</b>	Indicates whether large responses should be chunked (segmented). If set to false, large responses will be truncated.
<b>response.chunksize [1000]</b>	Indicates the line length in the data response that will trigger message segmentation (or truncation). A value of 0 (zero) means unlimited (i.e., that the client will accept the chunksize set by the server). The response chunksize will be taken to be the smaller of the client and server chunksize settings.
<b>statement.discriminators</b>	The Fund Statement page will group summary entries in the debit detail by these transaction properties.

## 25.5 Web Services Configuration

The following configuration parameters can be set in the web services configuration file (`mam-ws.conf`).

Parameter	Description
<b>authentication.enabled [true]</b>	Indicates whether outgoing messages are signed.
<b>authentication.method [mam-password]</b>	Specifies which server-side authentication mechanism to use. It can assume a value of <code>mam-password</code> , which compares a hashed value of the password with the value in the MAM database Password table, or a value of <code>pam</code> , which uses PAM (Pluggable Authentication Module) for authentication. The default value depends on the <code>--with-pam</code> configure option.
<b>encryption.enabled [false]</b>	Indicates whether outgoing messages are encrypted.
<b>log4perl.appender.Log.filename</b>	Used by <code>log4perl</code> to set the base name of the log file.
<b>log4perl.appender.Log.max</b>	Used by <code>log4perl</code> to set the number of rolling backup logs.
<b>log4perl.appender.Log.size</b>	Used by <code>log4perl</code> to set the size the log will grow to before it is rotated.
<b>log4perl.appender.Log.Threshold</b>	Used by <code>log4perl</code> to set the debug level written to the log. The logging threshold can be one of <code>TRACE</code> , <code>DEBUG</code> , <code>INFO</code> , <code>WARN</code> , <code>ERROR</code> , and <code>FATAL</code> .
<b>response.chunking [false]</b>	Indicates whether large responses should be chunked (segmented). If set to false, large responses will be truncated.
<b>response.chunksize [link]</b>	Indicates the line length in the data response that will trigger message segmentation (or truncation). A value of 0 (zero) means unlimited, i.e. that the client will accept the chunksize set by the server. The response chunksize will be taken to be the smaller of the client and server chunksize settings.

## Chapter 26: Web Services

Moab Accounting Manager Web Services (MAMWS) provides a REST-like interface permitting access to the full Moab Accounting Manager API. MAMWS communicates with Moab Accounting Manager using the same wire protocol, message format, and Perl API as the MAM command-line clients and GUI interfaces. MAMWS runs under `mod_perl` from an Apache `httpd` server.

**i** Refer to the *Moab HPC Suite Installation and Configuration Guide* for instructions on installing and configuring MAM Web Services.

This chapter provides information about the Web Services API and contains specific examples of the accounting and the framework resources using that API.

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## 26.1 Web Services API

MAMWS provides a web interface using REST (Representational State Transfer) concepts to create, query, modify, and delete objects in Moab Accounting Manager. MAMWS also supports additional actions and alternative syntax options for interacting with the web service.

This topic provides information on the Web Services API, including the format of the request and response syntax and authentication and error code details.

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## 26.1.1 URL Format

- A MAMWS URL is composed of a resource URI and optional query string.
- The resource URI is composed of the prefix and a resource.
- The prefix is composed of the protocol (normally https), the MAM Web Services httpd server hostname or IP address, the location (/mamws), and an optional API version.
- The resource corresponds with MAM objects and instances of those objects. Therefore, a MAMWS resource is composed of a MAM object optionally followed by one or more primary keys.
- The resource's object is specified in kebab-case and is normally pluralized. For example, /usage-records represents the UsageRecord object in MAM, while /usage-records/1 represents the instance of the UsageRecord object having the value 1 as the primary key. HTTP parameters and data are used as syntactical parameters and options for the API queries.

For example:

```
<mamws_url> ::= <mamws_uri>[<query_string>]
<mamws_uri> ::= <mamws_prefix><mamws_resource>
<mamws_prefix> ::= <protocol>://<mamws_server>/mamws[/<version>]
<mamws_resource> ::= <mam_object>[/<primary_key>...]
<query_string> := ?<parameter>[&<parameter>...]
```

An expanded URL is of the form:

```
<protocol>://<mamws_server>/mamws[/<version>]/<object>[/<primary_key>...] [ ?<parameter>
[&<parameter>...]]
```

## 26.1.2 HTTP Methods

MAMWS supports the use of REST concepts utilizing HTTP (Hypertext Transfer Protocol) methods operating on endpoint URLs that describe resources.

The following table describes the HTTP methods used in MAMWS.

Method	Path Info	Description
GET	/<object>	Query for a list of resources.
GET	/<object>/<primary_key>...	Query a single resource.
POST	/<object>	Create a resource (primary key(s) not included in path).

Method	Path Info	Description
PUT	/<object>/<primary_key>...	Create a resource (primary key(s) included in path).
PATCH	/<object>/<primary_key>...	Modify a resource.
DELETE	/<object>/<primary_key>...	Delete a resource.
POST	/<object>?action=<action>	Other actions.

### 26.1.3 JSON Data Format

When HTTP data is included in the HTTP request or response, it is encoded in JSON object format:

- Input data for a POST or PATCH must be in JSON format with the top-level data type being a JSON object. The Content-Type header should be set to 'application/json'.
- Output data is always in JSON format and always consists of a JSON object with two or more key/value pairs. The output is "pretty-printed" by default.

#### Sample Request Data

```
POST /users
{
  "active" : true,
  "common-name" : "Amy Miller",
  "default-account" : "chemistry",
  "email-address" : "amy@hpc.com",
  "name" : "amy",
  "phone-number" : "(801) 717-3700"
}
```

#### Sample Response Data

```
GET /users/amy
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "common-name" : "Amy Miller",
      "default-account" : "chemistry",
      "description" : null,
      "email-address" : "amy@hpc.com",
```



```

    "name" : "amy:",
    "phone-number" : "(801) 717-3700"
  },
  "status" : "Success"
}

```

## 26.1.4 API Version

The Web Services API supports versioning.

The version is optional and, when used, is appended to the prefix (effectively prepended to the resource) in the URL (i.e., `https://<mamws_server>/mamws[/<version>]/<object>[/<primary_key>...][?<parameter>[&<parameter>...]]`). For example:

```
GET https://localhost/mamws/v1/users
```

If you omit the version in the URL, the web services client will use the *current* version. If an invalid version is specified, the request will fail.

**i** With the MAM 9.1.0 release, the Web Services API is version 1 (v1) and comes with versioning support for future enhancements and possible compatibly-breaking changes.

## 26.1.5 Request Format

A MAMWS Request includes the object (or instance, which consists of the object and primary keys) and the action (whether explicit or implied), and can provisionally include selections, assignments, conditions, options, data, and meta-options.

In this section:

- [26.1.5.A Object - page 210](#)
- [26.1.5.B Action - page 210](#)
- [26.1.5.C Other Request Components - page 211](#)
- [26.1.5.D Selections - page 212](#)
- [26.1.5.E Assignments - page 213](#)
- [26.1.5.F Conditions - page 215](#)
- [26.1.5.G Options - page 219](#)
- [26.1.5.H Data - page 220](#)
- [26.1.5.I Meta-Options - page 221](#)

### 26.1.5.A Object

The request object is specified in the URL path info. Some actions or methods additionally require or allow primary keys to be specified as additional path elements in the URL to specify the object instance.

**i** The values of the filters (object and primary-key) must be specified in UpperCamel case; the web service interface does *not* translate the case for values.

#### Examples

Specify the User object in a query (query all users):

```
GET /users
```

Specify the instance of the User object having the primary key 'amy' (query just the user amy):

```
GET /users/amy
```

List valid objects:

```
GET /objects?fields=name
```

List primary keys for the usage record object in sequential order:

```
GET /attributes?filter=object=UsageRecord,primary-key=True&fields=name&sort-by-sequence
```

List all attributes for the usage record object:

```
GET /attributes?filter=object=UsageRecord&fields=sort(name)
```

### 26.1.5.B Action

The request action can be specified via the action parameter. When not specified via the parameter, the action will be implied from the HTTP method as follows:

- The GET method implies the Query action.
- The PUT and POST methods imply the Create action.
- The PATCH method implies the Modify action.
- And the DELETE method implies the Delete action.

**i** The POST method will permit any supported action to be explicitly specified via the action parameter; all other methods are restricted to their default action.

## Examples

Delete action implied by the DELETE method:

```
DELETE /users/amy
```

Refund action explicitly specified via the action parameter:

```
POST /usage-records/1?action=refund&id=1
```

List all actions available to the usage record object:

```
GET /actions?filter=object=UsageRecord&fields=sort(name)
```

### 26.1.5.C Other Request Components

Other request components can be specified via parameters in the query string or via JSON data.

The following table describes the parameter information for the other components:

Parameter Type	Description	Examples
Selections	Designate which properties of an object are returned in a query.	<code>fields=name,active</code>
Assignments	Specify new field values when creating and modifying objects.	<code>update=active=true active@=true {   "active" : true }</code>
Conditions	Specify which objects to query, update or delete.	<code>fields=active=true active==true</code>
Options	Specify additional business-logic parameters.	<code>options=show- hidden=true show-hidden:=true show-hidden=true</code>
Data	Although not a parameter type, JSON data can be used with some actions as assignment properties or as input data.	<code>{   "processors" : 2,   "account" :   "chemistry" }</code>
Meta-Options	Options used to by the web services client and not forwarded in the MAM request.	<code>pretty=false !pretty</code>

The following table describes the actions and the supported parameter type for the other components.

**i** The use of square brackets means this parameter type is optional.

Actions	Supported Parameter Type
Query	[Selections], [Conditions], [Options], [Meta-Options]
Create	Assignments*, [Options], [Meta-Options]
Modify	Assignments*, [Conditions], [Options], [Meta-Options]
Delete, Undelete	[Conditions], [Options], [Meta-Options]
Other actions	[Options], [Data], [Meta-Options]

\* For these actions, Assignments can alternatively be specified in the JSON data.

### 26.1.5.D Selections

Selections designate the fields that are to be returned in a query. Besides simple field selection, selection criteria can also include sorting, extraction of partial values from complex data types, aliases, and aggregation (sum, average, min, max, etc.).

Selections are expressed as a comma-separated list of desired object properties as the value of the fields parameter in the following form:

```
fields=[<aggregation_function>(<name>[<part>])][=<alias>],...
```

The following table describes the selection parameter components:

Selection Parameter Component	Description	Examples
aggregation_function	Designates sorting or an aggregation function to apply to the field. Valid values: <ul style="list-style-type: none"> <li>sum (sum of values)</li> <li>average (average of values)</li> <li>min (minimum value)</li> </ul>	<pre>fields=sum(amount),group-by (account) fields=sort(name)</pre>

Selection Parameter Component	Description	Examples
	<ul style="list-style-type: none"> <li>max (maximum value)</li> <li>count (count of values)</li> <li>group-by (group-by field)</li> <li>sort (descending sort)</li> <li>tos (increasing sort)</li> </ul>	
name	Name of the field or object property to display or use in an aggregation.	<code>fields=name,email-address</code>
part	Name of the part to extract from the complex object property.	<code>fields=resources{telescope}</code>
alias	Designates what to call the returned property or aggregation value.	<code>fields=name=user</code> <code>fields=sum(amount)=total</code>

**i** Aliases for the fields parameter include select, show, and get.

### 26.1.5.E Assignments

Assignments designate the new values in the creation *or* modification of objects. Besides simple assignment, assignments can alternatively increment or decrement the value.

Assignments can be expressed in one of three different ways:

- using the update parameter
- directly with the property name as the parameter name with an assignment operator
- as a JSON object in the request data

#### Expressed Using the Update Parameter

When using the update parameter, assignments are expressed as a comma-separated list of update expressions in the following form:

```
update=<name><op><value>,...
```

The following table describes the assignment parameter components when expressed using the update parameter:

Assignment Parameter Component	Description	Examples
name	Name of the object property to set or update.	<code>update=name=amy,active=true</code>
op	Designates whether the specified value should be assigned to the property, or used to increment or decrement it: <ul style="list-style-type: none"> <li>• = (assignment)</li> <li>• += (increment)</li> <li>• -= (decrement)</li> </ul>	<code>update=duration+=3600</code>
value	Designates the value to assign as the new value of the property or the amount to increment or decrement it. Use null to unset the object property.	<code>update=email-address=null</code>

**i** Aliases for the update parameter include assign and set.

## Expressed Directly

Assignments can be expressed directly with the property name as the parameter name with an assignment operator in the form:

```
<name><op><value>
```

The following table describes the assignment operator components when expressed directly:

Assignment Operator Component	Description	Examples
name	Name of the object property to set or update.	<code>active@=true</code>
op	Designates whether the specified value should be assigned to the property, or used to increment or decrement it: <ul style="list-style-type: none"> <li>• @= (assignment)</li> <li>• += (increment)</li> </ul>	<code>duration+=3600</code>

Assignment Operator Component	Description	Examples
	<ul style="list-style-type: none"> <li>-= (decrement)</li> </ul>	
value	Designates the value to assign as the new value of the property or the amount to increment or decrement it. Use null to unset the object property.	<pre>email-address@=null</pre>

## Expressed as a JSON Object in the Request Data

The properties to be assigned can be expressed as a JSON object in the HTTP request data in the form:

```
{
  <name> : <value>, ...
}
```

**i** This form *cannot* be used to increment or decrement the object property.

The following table describes the assignment data components when expressed as a JSON object:

Assignment Data Component	Description	Examples
name	Name of the object property to set or update.	<pre>{   "name" : "amy"   "active" : true }</pre>
value	Designates the value to assign as the new value of the property or the amount to increment or decrement it. Use null to unset the object property.	<pre>{   "email-address" :   null }</pre>

### 26.1.5.F Conditions

Conditions allow filtering of the objects to be queried, updated, or acted upon. Besides simple equality conditions, condition criteria can include filtering on part names of a complex value, comparisons (greater-than, not equal, etc.), pattern matching, conjunctions (and, or), and grouping.

Conditions can be expressed in one of two different ways:

- using the filter parameter
- directly with the property name as the parameter name with a condition operator

## Expressed Using the Filter Parameter

When using the filter parameter, conditions are expressed as a list of filter expressions (delimited with the respective conjunction symbol) in the following form:

```
filter=[<pre-group>]<name>[{{<part>}}]<op><value>[<post-group>]<conjunction>...
```

The following table describes the condition parameter components when expressed using the filter parameter:

Condition Parameter Component	Description	Examples
pre-group	Zero or more open parentheses used for grouping of ANDed and ORed conditions.	<code>filter=(instance~j1 charge&gt;10),id&lt;5&amp;fields=id</code>
name	Name of the object property used in determining which objects to include in the query or update.	<code>filter=active=true</code>
part	Designates to only include objects having an individual named part with the specified value.	<code>filter=resources{telescope}==2</code>
op	Comparison or matching operator employed to determine whether objects having the specified name are included in the operation: <ul style="list-style-type: none"> <li>• == or = (equality)</li> <li>• &gt; (greater than)*</li> <li>• &gt;= (greater than or equal to)*</li> <li>• &lt; (less than)*</li> <li>• &lt;= (less than or equal to)*</li> <li>• != (not equal to)</li> <li>• ~ (matches)**</li> <li>• !~ (does not match)**</li> </ul>	<code>filter=processors&gt;=4</code> <code>filter=account~chem*</code>



Condition Parameter Component	Description	Examples
	<p>* These operators are <i>only</i> valid with attributes having numeric data types (e.g., AutoGen, Currency, Float, Integer, TimeStamp).</p> <p>** These operators are <i>only</i> valid with attributes having string data types (e.g., String).</p> <p>The following wildcards are supported with matching operators:</p> <ul style="list-style-type: none"> <li>• ? (matches any one character)</li> <li>• * (matches zero or more of any characters)</li> </ul>	
value	Value of the specified object property. Use null to include objects whose specified property is unset.	<pre>filter=email-address==null</pre>
post-group	Zero or more open parentheses used for grouping ANDed and ORed conditions.	<pre>filter=instance~j1 (charge&gt;10,id&lt;5)&amp;fields=id</pre>
conjunction	<p>Symbol used to connect condition groups indicating whether the current and preceding condition group should be ANDed or ORed:</p> <ul style="list-style-type: none"> <li>• , (and)</li> <li>•   (or)</li> </ul>	<pre>filter=user==amy,account==chemistry filter=account==chemistry account==biology</pre>

**i** Aliases for the filter parameter include query and where.

## Expressed Directly

Conditions can be expressed directly with the property name as the parameter name with a condition operator in the form:

```
<name><op><value>
```

**i** This form *cannot* be used to specify parts, conjunctions, or grouping.

The following table describes the condition operator components when expressed directly:

Condition Operator Component	Description	Examples
name	Name of the object property used to filter objects included in the operation.	<code>active==true</code>
op	<p>Comparison or matching operator employed to determine whether objects having the specified name are included in the operation:</p> <ul style="list-style-type: none"> <li>• == (equality)</li> <li>• &gt; (greater than)*</li> <li>• &gt;= (greater than or equal to)*</li> <li>• &lt; (less than)*</li> <li>• &lt;= (less than or equal to)*</li> <li>• != (not equal to)</li> <li>• ~ (matches)**</li> <li>• !~ (does not match)**</li> </ul> <p>* These operators are <i>only</i> valid with attributes having numeric data types (e.g., AutoGen, Currency, Float, Integer, TimeStamp).</p> <p>** These operators are <i>only</i> valid with attributes having string data types (e.g., String).</p> <p>The following wildcards are supported with matching operators:</p> <ul style="list-style-type: none"> <li>• ? (matches any one character)</li> <li>• * (matches zero or more of any characters)</li> </ul>	<pre>processors&gt;=4 account~chem*</pre>
value	Value of the specified object property. Use null to include objects whose specified property is unset.	<code>email-address==null</code>

### 26.1.5.G Options

Options specify additional business-logic options that may affect the behavior of the request or resulting response.

Options can be expressed in one of three different ways:

- using the options parameter
- directly with the option name as the parameter name with an option operator
- using the meta-option operator (=) where there is no similarly-named meta-option

#### Expressed using the Options Parameter

When using the options parameter, options are expressed as a list of comma-delimited option expressions in the following form:

```
options=<name>=<value>,...
```

The following table describes the option parameter components when expressed using the options parameter:

Option Parameter Component	Description	Examples
name	Name of the option.	<code>options=job-id=2,amount=1.5</code>
value	Value of the option.	<code>options=show-hidden=true</code>

#### Expressed Directly

Options can be expressed directly with the option name as the parameter name with an option operator in the form:

```
<name><op><value>
```

The following table describes the option operator components when expressed directly:

Option Operator Component	Description	Examples
name	Name of the option.	<code>active:=true</code>

Option Operator Component	Description	Examples
op	Option operator: <ul style="list-style-type: none"> <li>• := (assertion)</li> </ul>	filter-type:=NonExclusive
value	Value of the option. As a shorthand notation for a boolean value of true, the operator and the value can be omitted. As a shorthand notation for a boolean value of false, the name can be preceded by an exclamation point (!) and the operator and value omitted.	active !active

## Expressed Using the Meta-Option Operator

Parameters of the form <name>=<value> that are *not* interpreted as meta-options will be taken as request options. However, when using this form, care must be taken to avoid conflict with the meta-options.

For example, filter=User=amy should not be used to express the Filter request option with the value User=amy, since this expression would be interpreted as specifying the filter meta-option for the User condition with value amy. In this case, you would need to either use the constraint-filter meta-option (constraint-filter=User=amy), the options meta-option (options=filter=User=amy) or the option operator (filter:=User=amy).

### 26.1.5.H Data

Some actions require input data with the request (e.g., Charge, Reserve and Quote require a usage record as input data). Other actions, such as Create and Modify, allow the newly created or updated fields to be passed in via the data as an alternate form of expressing the assignment fields.

In all cases, data is expressed as a JSON object in the following form:

```
{
  <name> : <value>, ...
}
```

The following table describes the request data components:

Request Data Component	Description	Examples
name	Name of the object property.	<pre>{   "name" : "amy",   "active" : true }</pre>
value	Value of the object property. In some cases, the value itself can be a simple JSON object (e.g., complex usage record fields).	<pre>{   "class" : null,   "amount" : 12.5,   "resources" : {     "telescope" : 2   } }</pre>

### 26.1.5.I Meta-Options

Meta-options are HTTP parameters used by the web services client and not forwarded in the request to Moab Accounting Manager. Meta-options include fields, update, filter, options. It also includes their respective aliases as described in previous sections of this topic.

The following table describes the supplemental meta-options:

Meta-Option Name	Function	Examples
force	In some situations, asserting the force parameter may allow an action to do something potentially dangerous or bend RESTful rules, such as allowing the PATCH or DELETE methods to operate on multiple instances.	<pre>force=true force</pre>
pretty	Pretty-printing is enabled by default. To disable it, deassert the pretty parameter.	<pre>pretty=false !pretty</pre>
suppress-nulls	When rendering the response data in JSON, null-valued fields are explicitly shown as having the null value by default. Asserting the suppress-nulls parameter will avoid printing fields having a null value.	<pre>suppress- nulls=true suppress-nulls</pre>

## 26.1.6 Response Format

A MAMWS Response has an HTTP status code and HTTP data. The HTTP data is in the form of a JSON object with key value pairs that includes a MAM status and code (different from the HTTP status code), and can optionally include a message, a count, and JSON data. The MAM response is expressed in the HTTP response data as a JSON object of the following form:

```
{
  "code" : <code>,
  ["count" : <count>],
  ["data" : <data>],
  ["message" : <message>],
  "status" : <status>
}
```

The following table describes the response data components:

Response Data Component	Description	Examples
code	MAM SSSRMAP* Status Code.	<code>"code" : "740"</code>
count	Usually the number of objects returned or affected; but sometimes is used to return other key values such as amount charged.	<code>"count" : 24</code>
data	Response data as a JSON object.	<code>"data" : [   {     "name" : "amy",     "active" : true   },   {     "name" : "bob",     "active" : false   } ]</code>
message	Response message.	<code>"message" : "Successfully modified 2 users"</code>
status	Status: <ul style="list-style-type: none"> <li>• Success</li> <li>• Warning</li> <li>• Failure</li> </ul>	<code>"status" : "Failure"</code>

\* SSSRMAP stands for Scalable Systems Software Resource Manager and Accounting Protocol

### 26.1.6.A HTTP Codes

The following table describes the HTTP codes that may be returned with the HTTP response:

HTTP Status Code	Description	When Used
200	OK	Successful response received from MAM server.
400	Bad Request	Invalid request on the client side or any business-logic or miscellaneous problem that the server could not successfully fulfill.
401	Unauthorized	User did not successfully authenticate.
403	Forbidden	User is not authorized to perform the request.
404	Not Found	The specified resource does not exist.
405	Method Not Allowed	The HTTP method is not used in the API.

### 26.1.6.B Status Codes

MAMWS uses 3 digit SSSRMAP status codes in the JSON response object.

## 26.1.7 Authentication

MAMWS uses HTTP Basic Authentication for all REST API requests. The required username and password is forwarded to the MAM server for authentication and authorization. Therefore, each user that wants to be able to use MAM Web Services must first set a password in MAM (e.g., with the `mam-set-password` client command).

The username and password in the Basic Authentication header are encoded but *not* encrypted. It is *strongly* recommended that MAMWS be run under an `httpd` server with SSL enabled.

**Related Topics**

- [26.2 MAM Actions Mapping - page 224](#)
- [26.3 Accounting Resources - page 226](#)
- [26.4 Framework Resources - page 294](#)
- [Chapter 26: Web Services - page 205](#)

## 26.2 MAM Actions Mapping

This topic provides an aid in mapping MAM actions to HTTP methods and resources in MAM Web Services.

In this topic:

- [26.2.1 Query Action - page 224](#)
- [26.2.2 Create Action - page 225](#)
- [26.2.3 Modify Action - page 225](#)
- [26.2.4 Delete Action - page 226](#)
- [26.2.5 Other Actions - page 226](#)

### 26.2.1 Query Action

Use the GET method to query an object. In MAM, there is no fundamental difference between querying a single instance of an object *or* multiple instances of the object. Querying a single object simply includes a query filter using the object's primary keys. With REST, these are differentiated by the presence of additional path info nodes in the request URL.

The following table describes the methods and resources used for the Query action:

HTTP Method	MAMWS Resource	Description	Example
GET	/<object>	Query multiple objects.	GET /users
GET	/<object>{/<primary_key>...}	Query a single object.	GET /users/amy



In a MAMWS query response, the selected object properties are returned in the JSON data field as an array of objects. This is true both when querying in the single object form or in the multiple object form, and is done this way so that a client can use the same parsing routine for both cases.

## 26.2.2 Create Action

Use the POST method or the PUT method to create resources (objects) in MAMWS:

- When using POST, the resource URI should *not* include the primary keys with the object in the path info.
- When using PUT, the resource URI must include the primary keys with the object in the path info. Therefore, PUT can only be used when you know the primary keys that will uniquely define the object instance being created.

The POST method is considered the primary method since it is considered more straightforward to put all of the new object properties in a single location (the request data).

The following table describes the methods and resources used for the Create action:

HTTP Method	MAMWS Resource	Description	Example
POST	/<object>	Create an object (primary key(s) not included in path).	<pre>POST /users {   "name" :   "amy"   "active" :   true }</pre>
PUT	/<object> {/<primary_key>...}	Create an object (primary key(s) included in path).	<pre>PUT /users/amy {   "active" :   true }</pre>

## 26.2.3 Modify Action

Use the PATCH method to modify an object.

The following table describes the methods and resources used for the Modify action:

HTTP Method	MAMWS Resource	Description	Example
PATCH	/<object>{/<primary_key>...}	Modify an object.	<pre>PATCH /users/amy {   "active" :   false }</pre>

## 26.2.4 Delete Action

Use the DELETE method to delete an object.

The following table describes the methods and resources used for the Delete action:

HTTP Method	MAMWS Resource	Description	Example
DELETE	/<object>{/<primary_key>...}	Delete an object.	<pre>DELETE /users/amy</pre>

## 26.2.5 Other Actions

All other actions are implemented using the POST method and using the action parameter.

The following table describes the methods and resources used for all other actions:

HTTP Method	MAMWS Resource	Description	Example
POST	/<object>	Perform an action against an object.	<pre>POST /users?action=undelete&amp;filter=name=amy</pre>

### Related Topics

- [26.1 Web Services API - page 206](#)
- [Chapter 26: Web Services - page 205](#)

## 26.3 Accounting Resources

This section provides information on available MAMWS accounting resources.

## In this chapter:

26.3.1 Accounts Resource .....	227
26.3.2 Allocations Resource .....	235
26.3.3 Charges Resource .....	240
26.3.4 Charge Rates Resource .....	241
26.3.5 Funds Resource .....	246
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26.3.10 Usage Records Resource .....	275
26.3.11 Users Resource .....	289

## 26.3.1 Accounts Resource

This section provides information on the supported actions for the Accounts accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query accounts	GET	/accounts[/<name>]
Create an account	POST	/accounts
Modify an account	PATCH	/accounts/<name>
Delete an account	DELETE	/accounts/<name>
Query account users	GET	/account-users[/<account>[/<user>]]
Add a user to an account	POST	/account-users
Modify an account user	PATCH	/account-users/<account>/<user>

Action	HTTP Method	Resource
Remove a user from an account	DELETE	/account-users/<account>/<user>

## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.1.A Query Accounts

## Synopsis

```
GET /accounts[/<name>][?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>constraint-filter</b>	Applies meta-filters to the query (user: include only accounts having the specified user)	GET /accounts?constraint-filter=user=amy
<b>fields</b>	Designates the properties to be returned in the query	GET /accounts?fields=name
<b>filter</b>	Filters the objects to be returned in the query	GET /accounts?filter=organization=sciences
<b>limit</b>	Limits the results to the number of objects specified	GET /accounts?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /accounts?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /accounts?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /accounts?fields=organization&unique=true

## Sample Request

```
GET /accounts/amy
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "description" : "Chemistry Department",
      "name" : "chemistry",
      "organization" : "sciences"
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.1.B Create an Account

### Synopsis

```
POST /accounts[?<parameter>]
{
  <name> : <value>, ...
}
```

### Parameters

Parameter	Description	Example
<b>create-fund</b>	Overrides the fund auto-generation setting	<pre>POST /accounts?create-fund=true {   "name" : "chemistry" }</pre>

## Sample Request

```
POST /accounts
{
  "description" : "Chemistry Department",
  "name" : "chemistry",
  "organization" : "sciences"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "description" : "Chemistry Department",
      "name" : "chemistry",
      "organization" : "sciences"
    }
  ],
  "message" : "Successfully created 1 account",
  "status" : "Success"
}
```

---

### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.1.C Modify an Account

#### Synopsis

```
PATCH /accounts/<name>
{
  <name> : <value>, ...
}
```

#### Sample Request

```
PATCH /accounts/chemistry
{
  "active" : false
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : false,
      "description" : "Chemistry Department",
      "name" : "chemistry",
      "organization" : "sciences"
    }
  ],
  "message" : "Successfully modified 1 account",
  "status" : "Success"
}
```

### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.1.D Delete an Account

#### Synopsis

```
DELETE /accounts/<name>
```

#### Sample Request

```
DELETE /accounts/chemistry
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "description" : "Chemistry Department",
      "name" : "chemistry",
      "organization" : "sciences"
    }
  ],
  "message" : "Successfully deleted 1 account",
  "status" : "Success"
}
```

**Related Topics**

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

**26.3.1.E Query Account Users****Synopsis**

```
GET /account-users[/<account>[/<user>]] [?<parameter>[&<parameter>...]]
```

**Parameters**

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /account-users/chemistry?fields=name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /account-users?filter=name=amy</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /account-users?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /account-users?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /account-users?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /account-users?fields=name&amp;unique=true</code>

**Sample Request**

```
GET /account-users/chemistry?fields=name
```

**Sample Response**

```
{
  "code" : "000",
```



```

"count" : 2,
"data" : [
  {
    "name" : "amy"
  },
  {
    "name" : "dave"
  }
],
"status" : "Success"
}

```

---

## Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.1.F Add a User to an Account

## Synopsis

```

POST /account-users
{
  <name> : <value>, ...
}

```

## Sample Request

```

POST /account-users
{
  "account" : "chemistry",
  "active" : true,
  "admin" : true,
  "name" : "amy"
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "active" : true,
      "admin" : true,
      "name" : "amy"
    }
  ],
  "message" : "Successfully created 1 account user",
}

```

```

    "status" : "Success"
  }

```

---

### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.1.G Modify an Account User

### Synopsis

```

PATCH /account-users/<account>/<user>
{
  <name> : <value>, ...
}

```

### Sample Request

```

PATCH /account-users/chemistry/amy
{
  "active" : false
}

```

### Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "active" : false,
      "admin" : true,
      "name" : "amy"
    }
  ],
  "message" : "Successfully modified 1 account user",
  "status" : "Success"
}

```

---

### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.1.H Remove a User from an Account

#### Synopsis

```
DELETE /account-users/<account>/<user>
```

#### Sample Request

```
DELETE /accounts-users/chemistry/amy
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "active" : false,
      "admin" : true,
      "name" : "amy"
    }
  ],
  "message" : "Successfully deleted 1 account user",
  "status" : "Success"
}
```

#### Related Topics

- [26.3.1 Accounts Resource - page 227](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.2 Allocations Resource

This section provides information on the supported actions for the Allocations accounting resource.

#### Supported Actions

Action	HTTP Method	Resource
Query allocations	GET	/allocations[/<id>]
Modify an allocation	PATCH	/allocations/<id>

Action	HTTP Method	Resource
Delete an allocation	DELETE	/allocations/<id>

## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.2.A Query Allocations

## Synopsis

```
GET /allocations[/<id>] [?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>constraint-filter</b>	Displays allocations whose fund constraints comply with the specified filters	<code>GET /allocations?constraint-filter=user=amy</code>
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /allocations?fields=id,amount</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /allocations?filter=active=true</code>
<b>filter-type</b>	Designates the constraint	<code>GET /allocations?constraint-filter=user=amy&amp;filter-type=ExactMatch</code>

Parameter	Description	Example
	filter type	
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /allocations?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /allocations?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /allocations?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /allocations?fields=fund&amp;unique=true</code>

## Sample Request

```
GET /allocations/2
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "allocated" : 3000,
      "amount" : 3000,
      "credit-limit" : 0,
      "description" : null,
      "end-time" : "Infinity",
      "fund" : 2,
      "id" : 2,
      "initial-deposit" : 3000,
      "start-time" : "2023-06-15 18:29:44"
    }
  ],
}
```

```

    "status" : "Success"
  }

```

## Related Topics

- [26.3.2 Allocations Resource - page 235](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.2.B Modify an Allocation

## Synopsis

```

PATCH /allocations/<id>
{
  <name> : <value>,...
}

```

## Sample Request

```

PATCH /allocations/2
{
  "credit-limit" : 1000
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "allocated" : 3000,
      "amount" : 3000,
      "credit-limit" : 1000,
      "description" : null,
      "end-time" : "Infinity",
      "fund" : 2,
      "id" : 2,
      "initial-deposit" : 3000,
      "start-time" : "2023-06-15 18:29:44"
    }
  ],
  "message" : "Successfully modified 1 allocation",
  "status" : "Success"
}

```

---

## Related Topics

- [26.3.2 Allocations Resource - page 235](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.2.C Delete an Allocation

## Synopsis

```
DELETE /allocations/<id>
```

## Sample Request

```
DELETE /allocations/2
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "allocated" : 3000,
      "amount" : 3000,
      "credit-limit" : 0,
      "description" : null,
      "end-time" : "Infinity",
      "fund" : 2,
      "id" : 2,
      "initial-deposit" : 3000,
      "start-time" : "2023-06-15 18:29:44"
    }
  ],
  "message" : "Successfully deleted 1 allocation",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.2 Allocations Resource - page 235](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.3 Charges Resource

This section provides information on the supported actions for the Charges accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query itemized charges	GET	/charges

### Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.3.A Query Itemized Charges

#### Synopsis

```
GET /charges [ ?<parameter> [&<parameter>... ] ]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /charges?fields=sum(amount)
<b>filter</b>	Filters the objects to be returned in the query	GET /charges?filter=usage-record=1
<b>limit</b>	Limits the results to the number of objects specified	GET /charges?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /charges?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /charges?show-hidden=true



Parameter	Description	Example
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /charges?fields=name&unique=true

## Sample Request

```
GET /charges?filter=usage-record=1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : 1,
      "description" : null,
      "details" : "12 [Processors] * 0.000277777777777778 [ChargeRate{Processors}]
* 300 [Duration]",
      "duration" : 300,
      "instance" : "24809",
      "name" : "Processors",
      "rate" : "1/h",
      "scaling-factor" : 1,
      "usage-record" : 1,
      "value" : "12"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.3 Charges Resource - page 240](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.4 Charge Rates Resource

This section provides information on the supported actions for the Charge Rates accounting resource.

## Supported Actions

Action	HTTP Method	Resource
Query charge rates	GET	/charge-rates[/<name>[/<value>]]
Create a charge rate	POST	/charge-rates
Modify a charge rate	PATCH	/charge-rates/<name>/<value>
Delete a charge rate	DELETE	/charge-rates/<name>/<value>

### Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.4.A Query Charge Rates

#### Synopsis

```
GET /charge-rates[/<name>[/<value>]] [??<parameter> [&<parameter>...]]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /charge-rates?fields=name
<b>filter</b>	Filters the objects to be returned in the query	GET /charge-rates?filter=name=Processors
<b>limit</b>	Limits the results to the number of objects specified	GET /charge-rates?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /charge-rates?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /charge-rates?show-hidden=true

Parameter	Description	Example
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /charge-rates?fields=name&amp;unique=true</code>

## Sample Request

```
GET /charge-rates
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : "1/h",
      "description" : "1 credit per processor-hour",
      "name" : "Processors",
      "value" : null
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.4 Charge Rates Resource - page 241](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.4.B Create a Charge Rate

## Synopsis

```
POST /charge-rates
{
  <name> : <value>, ...
}
```

## Sample Request

```
POST /charge-rates
{
  "amount" : "1/h",
  "description" : "1 credit per processor-hour",
```

```

    "name" : "Processors"
  }

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : "1/h",
      "description" : "1 credit per processor-hour",
      "name" : "Processors",
      "value" : null
    }
  ],
  "message" : "Successfully created 1 charge rate",
  "status" : "Success"
}

```

---

## Related Topics

- [26.3.4 Charge Rates Resource - page 241](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.4.C Modify a Charge Rate

## Synopsis

```

PATCH /charge-rates/<name>/<value>
{
  <name> : <value>, ...
}

```

## Sample Request

```

PATCH /charge-rates/Processors/null
{
  "amount" : "2/h"
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {

```

```

    "amount" : "2/h",
    "description" : "1 credit per processor-hour",
    "name" : "Processors",
    "value" : null
  }
],
"message" : "Successfully modified 1 charge rate",
"status" : "Success"
}

```

---

## Related Topics

- [26.3.4 Charge Rates Resource - page 241](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.4.D Delete a Charge Rate

## Synopsis

```
DELETE /charge-rates/<name>/<value>
```

## Sample Request

```
DELETE /charge-rates/Processors/null
```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : "1/h",
      "description" : "1 credit per processor-hour",
      "name" : "Processors",
      "value" : null
    }
  ],
  "message" : "Successfully deleted 1 charge rate",
  "status" : "Success"
}

```

---

## Related Topics

- [26.3.4 Charge Rates Resource - page 241](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5 Funds Resource

This section provides information on the supported actions for the Funds accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query funds	GET	/funds[/<id>]
Create a fund	POST	/funds
Modify a fund	PATCH	/funds/<id>
Delete a fund	DELETE	/funds/<id>
Query fund constraints	GET	/constraints[/<id>]
Add a fund constraint	POST	/constraints
Remove a fund constraint	DELETE	/constraints/<id>
Deposit into a fund	POST	/funds?action=deposit
Withdraw from a fund	POST	/funds?action=withdraw
Transfer between funds	POST	/funds?action=transfer
Reset a fund	POST	/funds?action=reset

---

### Related Topics

- [26.3 Accounting Resources - page 226](#)

## 26.3.5.A Query Funds

### Synopsis

```
GET /funds[/<id>][?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>constraint-filter</b>	Displays funds whose constraints do not conflict with the specified filters	<code>GET /funds?constraint-filter=user=amy</code>
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /funds?fields=id,name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /funds?filter=priority&gt;0</code>
<b>filter-type</b>	Designates the constraint filter type	<code>GET /funds?constraint-filter=user=amy&amp;filter-type=ExactMatch</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /funds?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /funds?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /funds?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /funds?fields=priority&amp;unique=true</code>

## Sample Request

```
GET /funds/2
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "default-deposit" : -1,
      "description" : null,
      "id" : 2,
      "name" : "chemistry",
      "priority" : 0
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.B Create a Fund

### Synopsis

```
POST /funds[?<parameter>]
{
  <name> : <value>, ...
}
```

### Parameters

Parameter	Description	Example
<b>constraint</b>	Specifies a constraint for the fund	<pre>POST /funds?constraint=account=chemistry</pre>

### Sample Request

```
POST /funds?constraint=account=chemistry
```



```
{
  "default-deposit" : 5000
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "default-deposit" : 5000,
      "description" : null,
      "id" : 2,
      "name" : "chemistry",
      "priority" : 0
    }
  ],
  "message" : "Successfully created 1 fund with id 2 and 1 constraint",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.5.C Modify a Fund

## Synopsis

```
PATCH /funds/<id>
{
  <name> : <value>, ...
}
```

## Sample Request

```
PATCH /funds/2
{
  "default-deposit" : -1
}
```

## Sample Response

```
{
  "code" : "000",
```

```

"count" : 1,
"data" : [
  {
    "default-deposit" : -1,
    "description" : null,
    "id" : 2,
    "name" : "chemistry",
    "priority" : 0
  }
],
"message" : "Successfully modified 1 fund",
"status" : "Success"
}

```

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.D Delete a Fund

### Synopsis

```
DELETE /funds/<id>
```

### Sample Request

```
DELETE /funds/2
```

### Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "default-deposit" : -1,
      "description" : null,
      "id" : 2,
      "name" : "chemistry",
      "priority" : 0
    }
  ],
  "message" : "Successfully deleted 1 fund",
  "status" : "Success"
}

```

## Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.E Query Fund Constraints

### Synopsis

```
GET /constraints[/<id>][?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /constraints?fields=fund,name,value</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /constraints?filter=name=Account,value=chemistry</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /constraints?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /constraints?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /constraints?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /constraints?fields=name&amp;unique=true</code>

### Sample Request

```
GET /constraints?filter=fund=2
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "fund" : 2,
      "id" : 2,
      "name" : "Account",
      "value" : "chemistry"
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.F Add a Fund Constraint

### Synopsis

```
POST /constraints
{
  <name> : <value>, ...
}
```

### Sample Request

```
POST /constraints
{
  "fund" : 2,
  "name" : "Account",
  "value" : "chemistry"
}
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "fund" : 2,
      "id" : 2,
      "name" : "Account",
      "value" : "chemistry"
    }
  ]
}
```

```

    },
    ],
    "message" : "Successfully created 1 constraint",
    "status" : "Success"
  }
}

```

---

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.G Remove a Fund Constraint

### Synopsis

```
DELETE /constraints/<id>
```

### Sample Request

```
DELETE /constraints/2
```

### Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "fund" : 2,
      "id" : 2,
      "name" : "Account",
      "value" : "chemistry"
    }
  ],
  "message" : "Successfully deleted 1 constraint",
  "status" : "Success"
}

```

---

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.H Deposit into a Fund

### Synopsis

```
POST /funds?action=deposit [<parameter>...]
```

### Parameters

Parameter	Description	Example
<b>allocation</b>	Specifies that the deposit should go into the specified allocation	<code>POST /funds?action=deposit&amp;allocation=2&amp;amount=1000</code>
<b>amount</b>	Amount to deposit	<code>POST /funds?action=deposit&amp;id=2&amp;amount=1000</code>
<b>constraint-filter</b>	Restricts the fund to one whose constraints do not conflict with the specified filters	<code>POST /funds?action=deposit&amp;constraint-filter=account=chemistry&amp;amount=1000</code>
<b>credit-limit</b>	Credit limit for the new allocation	<code>POST /funds?action=deposit&amp;id=2&amp;credit-limit=1000</code>
<b>filter-type</b>	Designates the constraint filter type	<code>POST /funds?action=deposit&amp;constraint-filter=account=chemistry&amp;filter-type=ExactMatch&amp;amount=1000</code>
<b>id</b>	ID of the fund into which the deposit will be made	<code>POST /funds?action=deposit&amp;id=2&amp;amount=1000</code>
<b>reset</b>	Ends the current allocation and creates a new allocation with the deposit	<code>POST /funds?action=deposit&amp;id=2&amp;amount=1000&amp;reset=true</code>

### Sample Request

```
POST /funds?action=deposit&id=2&amount=1000
```

### Sample Response

```
{
  "code" : "000",
```

```

"count" : 1000,
"message" : "Successfully deposited 1000.00 credits into fund 2",
"status" : "Success"
}

```

## Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.5.I Withdraw from a Fund

## Synopsis

```
POST /funds?action=withdraw[&<parameter>...]
```

## Parameters

Parameter	Description	Example
<b>allocation</b>	The credits will be withdrawn from the specified allocation only	POST /funds?action=withdraw&allocation=2&amount=1000
<b>amount</b>	Amount to withdraw	POST /funds?action=withdraw&id=2&amount=1000
<b>constraint-filter</b>	Restricts the fund to one whose constraints do not conflict with the specified filters	POST /funds?action=withdraw&constraint-filter=account=chemistry&amount=1000
<b>filter-type</b>	Designates the constraint filter type	POST /funds?action=withdraw&constraint-filter=account=chemistry&filter-type=ExactMatch&amount=1000
<b>id</b>	ID of the fund from which the withdrawal will be made	POST /funds?action=withdraw&id=2&amount=1000

## Sample Request

```
POST /funds?action=withdraw&id=2&amount=1000
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1000,
  "message" : "Successfully withdrew 1000.00 credits from fund 2",
  "status" : "Success"
}
```

## Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.J Transfer Between Funds

### Synopsis

```
POST /funds?action=transfer [&<parameter>...]
```

### Parameters

Parameter	Description	Example
<b>amount</b>	Amount to transfer	<pre>POST /funds?action=transfer&amp;from-id=2&amp;to-id=3&amp;amount=1000</pre>
<b>from-allocation</b>	The credits will be transferred from the specified allocation only	<pre>POST /funds?action=transfer&amp;from-allocation=2&amp;to-id=3&amp;amount=1000</pre>
<b>from-id</b>	Fund to be debited	<pre>POST /funds?action=transfer&amp;from-id=2&amp;to-id=3&amp;amount=1000</pre>



Parameter	Description	Example
<b>to-allocation</b>	The credits will be transferred to the specified allocation only	<code>POST /funds?action=transfer&amp;from-id=2&amp;to-allocation=3&amp;amount=1000</code>
<b>to-id</b>	Fund to be credited	<code>POST /funds?action=transfer&amp;from-id=2&amp;to-id=3&amp;amount=1000</code>

### Sample Request

```
POST /funds?action=transfer&from-id=2&to-id=1&amount=1000
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1000,
  "message" : "Successfully transferred 1000.00 credits from fund 2 to fund 1",
  "status" : "Success"
}
```

### Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.5.K Reset a Fund

### Synopsis

```
POST /funds?action=reset [&<parameter>...]
```

## Parameters

Parameter	Description	Example
<b>constraint-filter</b>	Restricts the fund to one whose constraints do not conflict with the specified filters	<pre>POST /funds?action=reset&amp;constraint-filter=account=chemistry</pre>
<b>filter-type</b>	Designates the constraint filter type	<pre>POST /funds?action=reset&amp;constraint-filter=account=chemistry&amp;filter-type=ExactMatch</pre>
<b>id</b>	ID of the fund to reset	<pre>POST /funds?action=reset&amp;id=2</pre>

## Sample Request

```
POST /funds?action=reset&id=1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 5000,
  "message" : "Successfully deposited 5000.00 credits into fund 1\nSuccessfully stopped 1 allocation\nSuccessfully created 1 allocation",
  "status" : "Success"
}
```

## Related Topics

- [26.3.5 Funds Resource - page 246](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.6 Liens Resource

This section provides information on the supported actions for the Liens accounting resource.

## Supported Actions

Action	HTTP Method	Resource
Query liens	GET	/liens[/<id>]
Modify a lien	PATCH	/liens/<id>
Delete a lien	DELETE	/liens/<id>
Query lien allocations	GET	/lien-allocations[/<lien>[/<allocation>]]

### Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.6.A Query Liens

#### Synopsis

```
GET /liens[/<id>][?<parameter>[&<parameter>...]]
```

#### Parameters

Parameter	Description	Example
<b>active</b>	Displays only unexpired liens	<pre>GET /liens?active=true</pre>
<b>constraint-filter</b>	Displays liens whose constraints comply with the specified filters	<pre>GET /liens?constraint-filter=user=amy</pre>
<b>fields</b>	Designates the properties to be returned in the query	<pre>GET /liens?fields=id,amount</pre>

Parameter	Description	Example
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /liens?filter=usage-record=1</code>
<b>filter-type</b>	Designates the constraint filter type	<code>GET /liens?constraint-filter=user=amy&amp;filter-type=ImpingesUpon</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /liens?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /liens?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /liens?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /liens?fields=usage-record&amp;unique=true</code>

## Sample Request

```
GET /liens?active=true
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : null,
      "duration" : 600,
      "end-time" : "2023-06-15 18:39:47",
      "id" : 1,
      "instance" : "24809",
      "start-time" : "2023-06-15 18:29:47",
      "usage-record" : 1
    }
  ]
}
```

```

    ],
    "status" : "Success"
  }

```

## Related Topics

- [26.3.6 Liens Resource - page 258](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.6.B Modify a Lien

## Synopsis

```

PATCH /liens/<id>
{
  <name> : <value>,...
}

```

## Sample Request

```

PATCH /liens/1
{
  "end-time" : "2023-06-16"
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : null,
      "duration" : 600,
      "end-time" : "2023-06-16",
      "id" : 1,
      "instance" : "24809",
      "start-time" : "2023-06-15 18:29:47",
      "usage-record" : 1
    }
  ],
  "message" : "Successfully modified 1 lien",
  "status" : "Success"
}

```

---

## Related Topics

- [26.3.6 Liens Resource - page 258](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.6.C Delete a Lien

## Synopsis

```
DELETE /liens/<id>
```

## Sample Request

```
DELETE liens/2
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : null,
      "duration" : 600,
      "end-time" : "2023-06-15 18:39:47",
      "id" : 1,
      "instance" : "24809",
      "start-time" : "2023-06-15 18:29:47",
      "usage-record" : 1
    }
  ],
  "message" : "Successfully deleted 1 lien",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.6 Liens Resource - page 258](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.6.D Query Lien Allocations

### Synopsis

```
GET /lien-allocations[/<lien>/<allocation>][?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /lien-allocations/chemistry?fields=sum(amount),group-by(fund)</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /lien-allocations?filter=fund=4</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /lien-allocations?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /lien-allocations?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /lien-allocations?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /lien-allocations?fields=fund&amp;unique=true</code>

## Sample Request

```
GET /lien-allocations?fields=sum(amount),group-by(fund)
```

## Sample Response

```
{
  "code" : "000",
  "count" : 2,
  "data" : [
    {
      "amount" : 2,
      "fund" : 2
    },
    {
      "amount" : 10.56,
      "fund" : 4
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.3.6 Liens Resource - page 258](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.7 Organizations Resource

This section provides information on the supported actions for the Organizations accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query organizations	GET	/organizations[/<name>]
Create an organization	POST	/organizations
Modify an organization	PATCH	/organizations/<name>
Delete an organization	DELETE	/organizations/<name>



## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.7.A Query Organizations

## Synopsis

```
GET /organizations[/<name>] [?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /organizations?fields=name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /organizations?filter=name~sci*</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /organizations?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /organizations?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /organizations?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /organizations?fields=name&amp;unique=true</code>

## Sample Request

```
GET /organizations/sciences
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
```

```

    {
      "description" : "Sciences College",
      "name" : "sciences"
    }
  ],
  "status" : "Success"
}

```

---

### Related Topics

- [26.3.7 Organizations Resource - page 264](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.7.B Create an Organization

### Synopsis

```

POST /organizations
{
  <name> : <value>,...
}

```

### Sample Request

```

POST /organizations
{
  "description" : "Sciences College",
  "name" : "sciences"
}

```

### Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Sciences College",
      "name" : "sciences"
    }
  ],
  "message" : "Successfully created 1 organization",
  "status" : "Success"
}

```

## Related Topics

- [26.3.7 Organizations Resource - page 264](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.7.C Modify an Organization

## Synopsis

```
PATCH /organizations/<name>
{
  <name> : <value>, ...
}
```

## Sample Request

```
PATCH /organizations/sciences
{
  "description" : "Sciences Department"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Sciences Department",
      "name" : "sciences"
    }
  ],
  "message" : "Successfully modified 1 organization",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.7 Organizations Resource - page 264](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.7.D Delete an Organization

#### Synopsis

```
DELETE /organizations/<name>
```

#### Sample Request

```
DELETE /organizations/sciences
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Sciences College",
      "name" : "sciences"
    }
  ],
  "message" : "Successfully deleted 1 organization",
  "status" : "Success"
}
```

#### Related Topics

- [26.3.7 Organizations Resource - page 264](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.8 Quotes Resource

This section provides information on the supported actions for the Quotes accounting resource.

#### Supported Actions

Action	HTTP Method	Resource
Query quotes	GET	/quotes[/<id>]
Modify a quote	PATCH	/quotes/<id>

Action	HTTP Method	Resource
Delete a quote	DELETE	/quotes/<id>
Query quote charge rates	GET	/quote-charge-rates[/<quote>[/<name>[/<value>]]]

## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.8.A Query Quotes

## Synopsis

```
GET /quotes[/<id>][?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>active</b>	Displays only unexpired quotes	GET /quotes?active=true
<b>constraint-filter</b>	Displays quotes whose constraints comply with the specified filters	GET /quotes?constraint-filter=user=amy
<b>fields</b>	Designates the properties to be returned in the query	GET /quotes?fields=id,amount
<b>filter</b>	Filters the objects to be returned in the query	GET /quotes?filter=usage-record=1
<b>limit</b>	Limits the results to the number of objects specified	GET /quotes?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /quotes?offset=100

Parameter	Description	Example
<b>show-hidden</b>	Includes hidden attributes in the result	GET /quote?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /quotes?fields=usage-record&unique=true

## Sample Request

```
GET /quotes?active=true
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : 0.56,
      "description" : null,
      "duration" : 1000,
      "end-time" : "2023-08-23 18:16:18",
      "id" : 1,
      "instance" : "j1",
      "pinned" : true,
      "start-time" : "2023-08-23 17:59:38",
      "usage-record" : 12
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.8 Quotes Resource - page 268](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.8.B Modify a Quote

## Synopsis

```
PATCH /quotes/<id>
{
  <name> : <value>, ...
}
```

## Sample Request

```
PATCH /quotes/1
{
  "end-time" : "2023-08-24"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : 0.56,
      "description" : null,
      "duration" : 1000,
      "end-time" : "2023-08-24",
      "id" : 1,
      "instance" : "j1",
      "pinned" : true,
      "start-time" : "2023-08-23 17:59:38",
      "usage-record" : 12
    }
  ],
  "message" : "Successfully modified 1 quote",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.8 Quotes Resource - page 268](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.8.C Delete a Quote

## Synopsis

```
DELETE /quotes/<id>
```

## Sample Request

```
DELETE /quotes/1
```

## Sample Response

```
{
  "code" : "000",
```

```

"count" : 1,
"data" : [
  {
    "amount" : 0.56,
    "description" : null,
    "duration" : 1000,
    "end-time" : "2023-08-23 18:16:18",
    "id" : 1,
    "instance" : "j1",
    "pinned" : true,
    "start-time" : "2023-08-23 17:59:38",
    "usage-record" : 12
  }
],
"message" : "Successfully deleted 1 quote",
"status" : "Success"
}

```

## Related Topics

- [26.3.8 Quotes Resource - page 268](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.8.D Query Quote Charge Rates

## Synopsis

```
GET /quote-charge-rates[/<quote>/</name>/</value>]] [??<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /quote-charge-rates?fields=name
<b>filter</b>	Filters the objects to be returned in the query	GET /quote-charge-rates?filter=name=Processors
<b>limit</b>	Limits the results to the number of objects specified	GET /quote-charge-rates?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /quote-charge-rates?offset=100



Parameter	Description	Example
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /quote-charge-rates?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /quote-charge-rates?fields=name&amp;unique=true</code>

## Sample Request

```
GET /quote-charge-rates/1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : "1/h",
      "name" : "Processors",
      "quote" : 1,
      "value" : null
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.8 Quotes Resource - page 268](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.9 Transactions Resource

This section provides information on the supported actions for the Transactions accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query transactions	GET	/transactions[<id>]

## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.9.A Query Transactions

## Synopsis

```
GET /transactions[/<id>][?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /transactions?filter=action=Charge&amp;fields=sum(amount)</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /transactions?filter=action=Charge</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /transactions?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /transactions?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /transactions?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /transactions?fields=account&amp;unique=true</code>

## Sample Request

```
GET /transactions?filter=usage-record=1,action=Charge
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "action" : "Charge",
      "actor" : "scottmo",
      "allocation" : 2,
      "amount" : 1,
      "balance" : 2999,
      "child" : "24809",
      "count" : 1,
      "delta" : -1,
      "description" : null,
      "duration" : 300,
      "fund" : 2,
      "id" : 334,
      "instance" : "24809",
      "key" : "1",
      "machine" : "colony",
      "object" : "UsageRecord",
      "remaining" : 2999,
      "usage-record" : 1,
      "user" : "amy"
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.3.9 Transactions Resource - page 273](#)
- [26.3 Accounting Resources - page 226](#)

## 26.3.10 Usage Records Resource

This section provides information on the supported actions for the Usage Records accounting resource.

### Supported Actions

Action	HTTP Method	Resource
Query usage records	GET	/usage-records[<id>]

Action	HTTP Method	Resource
Create a usage record	POST	/usage-records
Modify a usage record	PATCH	/usage-records/<id>
Delete a usage record	DELETE	/usage-records/<id>
Quote for usage	POST	/usage-records?action=quote
Reserve for usage	POST	/usage-records?action=reserve
Charge for usage	POST	/usage-records?action=charge
Refund usage	POST	/usage-records?action=refund

---

## Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.10.A Query Usage Records

#### Synopsis

```
GET /usage-records[/<id>][?<parameter>[&<parameter>...]]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /usage-records?fields=account,charge
<b>filter</b>	Filters the objects to be returned in the query	GET /usage-records?filter=instance=24809
<b>limit</b>	Limits the results to the number of objects specified	GET /usage-records?limit=100

Parameter	Description	Example
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /usage-records?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /usage-records?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /usage-records?fields=account&amp;unique=true</code>

## Sample Request

```
GET /usage-records?filter=instance=24809
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "c-p-u-time" : 1800,
      "charge" : 0,
      "class" : "batch",
      "description" : null,
      "duration" : 300,
      "end-time" : "2023-06-15 18:34:47",
      "exit-code" : null,
      "group" : "research",
      "id" : 1,
      "instance" : "24809",
      "licenses" : null,
      "machine" : "colony",
      "memory" : null,
      "metrics" : null,
      "nodes" : 1,
      "organization" : "sciences",
      "processors" : 12,
      "quality-of-service" : "normal",
      "requested-duration" : 600,
      "resources" : "{\"gres\":1,\"color\":2}",
      "stage" : null,
      "start-time" : "2023-06-15 18:29:47",
      "submit-time" : null,
      "type" : "Job",
      "user" : "amy",
      "variables" : null
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.B Create a Usage Record

## Synopsis

```
POST /usage-records
{
  <name> : <value>, ...
}
```

## Sample Request

```
POST /usage-records
{
  "account" : "chemistry",
  "c-p-u-time" : 1800,
  "class" : "batch",
  "duration" : 300,
  "end-time" : "2023-06-15 18:34:47",
  "group" : "research",
  "instance" : "24809",
  "machine" : "colony",
  "nodes" : 1,
  "organization" : "sciences",
  "processors" : 12,
  "quality-of-service" : "normal",
  "requested-duration" : 600,
  "resources" : "{\\"gres\\":1,\\"color\\":2}",
  "start-time" : "2023-06-15 18:29:47",
  "type" : "Job",
  "user" : "amy",
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "c-p-u-time" : 1800,
      "charge" : 0,
      "class" : "batch",
      "description" : null,
      "duration" : 300,
      "end-time" : "2023-06-15 18:34:47",
      "exit-code" : null,
```

```

    "group" : "research",
    "id" : 1,
    "instance" : "24809",
    "licenses" : null,
    "machine" : "colony",
    "memory" : null,
    "metrics" : null,
    "nodes" : 1,
    "organization" : "sciences",
    "processors" : 12,
    "quality-of-service" : "normal",
    "requested-duration" : 600,
    "resources" : "{\\"gres\\":1,\\"color\\":2}",
    "stage" : null,
    "start-time" : "2023-06-15 18:29:47",
    "submit-time" : null,
    "type" : "Job",
    "user" : "amy",
    "variables" : null
  }
],
"message" : "Successfully created 1 usage-record",
"status" : "Success"
}

```

---

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.C Modify a Usage Record

#### Synopsis

```

PATCH /usage-records/<id>
{
  <name> : <value>,...
}

```

#### Sample Request

```

PATCH /usage-records/1
{
  "group" : "staff"
}

```

#### Sample Response

```

{
  "code" : "000",
}

```

```

"count" : 1,
"data" : [
  {
    "account" : "chemistry",
    "c-p-u-time" : 1800,
    "charge" : 0,
    "class" : "batch",
    "description" : null,
    "duration" : 300,
    "end-time" : "2023-06-15 18:34:47",
    "exit-code" : null,
    "group" : "staff",
    "id" : 1,
    "instance" : "24809",
    "licenses" : null,
    "machine" : "colony",
    "memory" : null,
    "metrics" : null,
    "nodes" : 1,
    "organization" : "sciences",
    "processors" : 12,
    "quality-of-service" : "normal",
    "requested-duration" : 600,
    "resources" : "{\"gres\":1,\"color\":2}",
    "stage" : null,
    "start-time" : "2023-06-15 18:29:47",
    "submit-time" : null,
    "type" : "Job",
    "user" : "amy",
    "variables" : null
  }
],
"message" : "Successfully modified 1 usage record",
"status" : "Success"
}

```

---

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.D Delete a Usage Record

#### Synopsis

```
DELETE /usage-records/<id>
```

#### Sample Request

```
DELETE /usage-records/1
```



## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "account" : "chemistry",
      "c-p-u-time" : 1800,
      "charge" : 0,
      "class" : "batch",
      "description" : null,
      "duration" : 300,
      "end-time" : "2023-06-15 18:34:47",
      "exit-code" : null,
      "group" : "research",
      "id" : 1,
      "instance" : "24809",
      "licenses" : null,
      "machine" : "colony",
      "memory" : null,
      "metrics" : null,
      "nodes" : 1,
      "organization" : "sciences",
      "processors" : 12,
      "quality-of-service" : "normal",
      "requested-duration" : 600,
      "resources" : "{\"gres\":1,\"color\":2}",
      "stage" : null,
      "start-time" : "2023-06-15 18:29:47",
      "submit-time" : null,
      "type" : "Job",
      "user" : "amy",
      "variables" : null
    }
  ],
  "message" : "Successfully deleted 1 usage record",
  "status" : "Success"
}
```

---

### Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.E Quote for Usage

#### Synopsis

```
POST /usage-records?action=quote [&<parameter>...]
{
  <name> : <value>, ...
}
```

}

## Parameters

Parameter	Description	Example
<b>charge</b>	Specifies the quote amount if calculated externally	<pre>POST /usage-records?action=quote&amp;charge=1 {   "instance" : "j1" }</pre>
<b>cost-only</b>	Returns the cost, ignoring all balance and validity checks	<pre>POST /usage-records?action=quote&amp;cost-only=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>duration</b>	Incremental duration for the quote in seconds	<pre>POST /usage-records?action=quote&amp;duration=3600 {   "processors" : 1 }</pre>
<b>end-time</b>	End time for the quote	<pre>POST /usage-records?action=quote&amp;start-time=2023-08-23&amp;end-time=2023-08-24 {   "processors" : 1 }</pre>
<b>grace-duration</b>	Grace period in seconds	<pre>POST /usage-records?action=quote&amp;id=1&amp;duration=3600&amp;grace-duration=3600 {   "processors" : 1 }</pre>
<b>id</b>	Usage record for the quote (if usage record already created)	<pre>POST /usage-records?action=quote&amp;id=1 {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>itemize</b>	Returns the composite charge information in the response data	<pre>POST /usage-records?action=quote&amp;itemize=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>

Parameter	Description	Example
<b>quote</b>	Quote template used to override standard charge rates	<pre>POST /usage-records?action=quote&amp;quote=1 {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>rate</b>	Uses the specified charge rate in the quote	<pre>POST /usage-records?action=quote&amp;rate=Processors=2/h {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>start-time</b>	Start time for the quote	<pre>POST /usage-records?action=quote&amp;start-time=2023-08-23&amp;duration=3600 {   "processors" : 1 }</pre>

## Sample Request

```
POST /usage-records?action=quote
{
  "account" : "chemistry",
  "class" : "batch",
  "group" : "research",
  "machine" : "colony",
  "nodes" : 1,
  "processors" : 12,
  "quality-of-service" : "normal",
  "requested-duration" : 600,
  "user" : "amy"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 2,
  "data" : [
    {
      "amount" : 2
    }
  ],
  "message" : "Successfully quoted 2.00 credits",
  "status" : "Success"
}
```

**Related Topics**

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

**26.3.10.F Reserve for Usage****Synopsis**

```
POST /usage-records?action=reserve[&<parameter>...]
{
  <name> : <value>, ...
}
```

**Parameters**

Parameter	Description	Example
<b>charge</b>	Specifies the lien amount if calculated externally	<pre>POST /usage-records?action=reserve&amp;charge=1 {   "instance" : "j1" }</pre>
<b>duration</b>	Incremental duration for the lien in seconds	<pre>POST /usage-records?action=reserve&amp;duration=3600 {   "processors" : 1 }</pre>
<b>end-time</b>	End time for the lien	<pre>POST /usage-records?action=reserve&amp;start-time=2023-08-23&amp;end-time=2023-08-24 {   "processors" : 1 }</pre>
<b>grace-duration</b>	Grace period in seconds	<pre>POST /usage-records?action=reserve&amp;id=1&amp;duration=3600&amp;grace-duration=3600 {   "processors" : 1 }</pre>
<b>id</b>	Usage record for the lien (if usage record already created)	<pre>POST /usage-records?action=quote&amp;id=1 {   "processors" : 1,   "requested-duration" : 3600 }</pre>

Parameter	Description	Example
<b>itemize</b>	Returns the composite charge information in the response data	<pre>POST /usage-records?action=reserve&amp;itemize=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>modify</b>	Augments existing liens instead of creating new ones	<pre>POST /usage-records?action=reserve&amp;modify=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>rate</b>	Uses the specified charge rate in the lien	<pre>POST /usage-records?action=reserve&amp;rate=Processors=2/h {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>replace</b>	Similarly named liens will be deleted before this lien is created	<pre>POST /usage-records?action=reserve&amp;replace=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>start-time</b>	Start time for the lien	<pre>POST /usage-records?action=reserve&amp;start-time=2023-08-23&amp;duration=3600 {   "processors" : 1 }</pre>

## Sample Request

```
POST /usage-records?action=reserve
{
  "account" : "chemistry",
  "class" : "batch",
  "group" : "research",
  "instance" : "j1",
  "machine" : "colony",
  "nodes" : 1,
  "processors" : 12,
  "quality-of-service" : "normal",
  "requested-duration" : 600,
  "user" : "amy"
}
```

## Sample Response

```
{
```

```

"code" : "000",
"count" : 2,
"data" : [
  {
    "amount" : 2,
    "instance" : "j1",
    "lien" : 17,
    "usage-record" : 14
  }
],
"message" : "Successfully reserved 2.00 credits with lien id 17 for instance j1 and
created usage record 14",
"status" : "Success"
}

```

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.G Charge for Usage

## Synopsis

```

POST /usage-records?action=charge [&<parameter>...]
{
  <name> : <value>, ...
}

```

## Parameters

Parameter	Description	Example
<b>charge</b>	Specifies the charge amount if calculated externally	<pre> POST /usage-records?action=charge&amp;charge=1 {   "instance" : "j1" } </pre>
<b>duration</b>	Incremental duration for the charge in seconds	<pre> POST /usage-records?action=charge&amp;duration=3600 {   "processors" : 1 } </pre>

Parameter	Description	Example
<b>end-time</b>	End time for the charge	<pre>POST /usage-records?action=charge&amp;start-time= 2023-08-23&amp;end-time=2023-08-24 {   "processors" : 1 }</pre>
<b>fund</b>	Fund to charge	<pre>POST /usage-records?action=charge&amp;fund=2 {   "processors" : 1,   "duration" : 3600 }</pre>
<b>id</b>	Usage record for the charge (if usage record already created)	<pre>POST /usage-records?action=charge&amp;id=1 {   "processors" : 1,   "duration" : 3600 }</pre>
<b>incremental</b>	Any associated liens will be debited instead of removed	<pre>POST /usage-records?action=charge&amp;incremental=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>itemize</b>	Returns the composite charge information in the response data	<pre>POST /usage-records?action=charge&amp;itemize=true {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>rate</b>	Uses the specified charge rate in the charge	<pre>POST /usage-records?action=charge&amp;rate=Processors=2/h {   "processors" : 1,   "requested-duration" : 3600 }</pre>
<b>start-time</b>	Start time for the charge	<pre>POST /usage-records?action=charge&amp;start-time= 2023-08-23&amp;duration=3600 {   "processors" : 1 }</pre>

## Sample Request

```
POST /usage-records?action=charge
{
  "account" : "chemistry",
```

```

"class" : "batch",
"c-p-u-time" : 1800,
"duration" : 300,
"end-time" : "2023-06-15 18:34:47",
"group" : "research",
"instance" : "j1",
"machine" : "colony",
"nodes" : 1,
"processors" : 12,
"quality-of-service" : "normal",
"start-time" : "2023-06-15 18:29:47",
"user" : "amy"
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : 1,
      "instance" : "j1",
      "usage-record" : 15
    }
  ],
  "message" : "Successfully charged 1.00 credits for instance j1 and created usage record 15",
  "status" : "Success"
}

```

---

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.10.H Refund Usage

## Synopsis

```
POST /usage-records?action=refund[&<parameter>...]
```



## Parameters

Parameter	Description	Example
<b>allocation</b>	Allocation to be credited	<code>POST /usage-records?action=refund&amp;id=1&amp;allocation=2</code>
<b>amount</b>	Amount to refund	<code>POST /usage-records?action=refund&amp;id=1&amp;amount=0.5</code>
<b>id</b>	Usage record to be refunded	<code>POST /usage-records?action=refund&amp;id=1</code>
<b>instance</b>	Instance to be refunded	<code>POST /usage-records?action=refund&amp;instance=j1</code>

## Sample Request

```
POST /usage-records?action=refund&instance=j1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "amount" : 1,
      "id" : "1",
      "instance" : "j1"
    }
  ],
  "message" : "Successfully refunded 1.00 credits to usage record 1 for instance j1",
  "status" : "Success"
}
```

## Related Topics

- [26.3.10 Usage Records Resource - page 275](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.11 Users Resource

This section provides information on the supported actions for the Users accounting resource.

## Supported Actions

Action	HTTP Method	Resource
Query users	GET	/users[/<name>]
Create a user	POST	/users
Modify a user	PATCH	/users/<name>
Delete a user	DELETE	/users/<name>

### Related Topics

- [26.3 Accounting Resources - page 226](#)

### 26.3.11.A Query Users

#### Synopsis

```
GET /users[/<name>] [ ?<parameter> [&<parameter>... ] ]
```

#### Parameters

Parameter	Description	Example
<b>constraint-filter</b>	Applies meta-filters to the query (account: include only users associated with the specified account)	<code>GET /users?constraint-filter=account=chemistry</code>
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /users?fields=name,email-address</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /users?filter=active=true</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /users?limit=100</code>

Parameter	Description	Example
<b>offset</b>	Number of objects to skip before starting to return data	GET /users?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /users?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /users?fields=default-account&unique=true

## Sample Request

```
GET /users/amy
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "common-name" : "Amy Miller",
      "default-account" : "chemistry",
      "description" : null,
      "email-address" : "amy@hpc.com",
      "name" : "amy",
      "phone-number" : "(801) 717-3700"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.3.11 Users Resource - page 289](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.11.B Create a User

## Synopsis

```
POST /users
```

```
{
  <name> : <value>, ...
}
```

## Sample Request

```
POST /users
{
  "common-name" : "Amy Miller",
  "default-account" : "chemistry",
  "email-address" : "amy@hpc.com",
  "name" : "amy",
  "phone-number" : "(801) 717-3700"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "common-name" : "Amy Miller",
      "default-account" : "chemistry",
      "description" : null,
      "email-address" : "amy@hpc.com",
      "name" : "amy",
      "phone-number" : "(801) 717-3700"
    }
  ],
  "message" : "Successfully created 1 user",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.11 Users Resource - page 289](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.11.C Modify a User

## Synopsis

```
POST /users/<name>
{
  <name> : <value>, ...
}
```

## Sample Request

```
PATCH /users/amy
{
  "email-address" : "amy@htc.org"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "active" : true,
      "common-name" : "Amy Miller",
      "default-account" : "chemistry",
      "description" : null,
      "email-address" : "amy@htc.org",
      "name" : "amy",
      "phone-number" : "(801) 717-3700"
    }
  ],
  "message" : "Successfully modified 1 user",
  "status" : "Success"
}
```

---

## Related Topics

- [26.3.11 Users Resource - page 289](#)
- [26.3 Accounting Resources - page 226](#)

### 26.3.11.D Delete a User

## Synopsis

```
DELETE /users/<name>
```

## Sample Request

```
DELETE /users/amy
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
```

```
{
  "active" : true,
  "common-name" : "Amy Miller",
  "default-account" : "chemistry",
  "description" : null,
  "email-address" : "amy@hpc.com",
  "name" : "amy",
  "phone-number" : "(801) 717-3700"
},
"message" : "Successfully deleted 1 user",
"status" : "Success"
}
```

**Related Topics**

- [26.3.11 Users Resource - page 289](#)
- [26.3 Accounting Resources - page 226](#)

## 26.4 Framework Resources

This section provides information on available MAMWS framework resources.

In this chapter:

<a href="#">26.4.1 Actions Resource</a>	<a href="#">295</a>
<a href="#">26.4.2 Attributes Resource</a>	<a href="#">299</a>
<a href="#">26.4.3 Events Resource</a>	<a href="#">304</a>
<a href="#">26.4.4 Notifications Resource</a>	<a href="#">308</a>
<a href="#">26.4.5 Objects Resource</a>	<a href="#">311</a>
<a href="#">26.4.6 Passwords Resource</a>	<a href="#">315</a>
<a href="#">26.4.7 Roles Resource</a>	<a href="#">319</a>
<a href="#">26.4.8 System Resource</a>	<a href="#">329</a>

## 26.4.1 Actions Resource

This section provides information on the supported actions for the Actions framework resource.

### Supported Actions

Action	HTTP Method	Resource
Query actions	GET	/actions[/<object>[/<name>]]
Create an action	POST	/actions
Modify an action	PATCH	/actions/<object>/<name>
Delete an action	DELETE	/actions/<object>/<name>

### Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.1.A Query Actions

#### Synopsis

```
GET /actions[/<object>[/<name>]] [ ?<parameter> [&<parameter>... ] ]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /actions/UsageRecord?fields=name
<b>filter</b>	Filters the objects to be returned in the query	GET /actions?filter=name=Refund
<b>limit</b>	Limits the results to the number of	GET /actions?limit=100

Parameter	Description	Example
	objects specified	
<b>offset</b>	Number of objects to skip before starting to return data	GET /actions?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /actions?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /actions?fields=object&unique=true

## Sample Request

```
GET /actions/UsageRecord/Charge
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Charge for Usage",
      "display" : false,
      "name" : "Charge",
      "object" : "UsageRecord"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.4.1 Actions Resource - page 295](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.1.B Create an Action

## Synopsis

```
POST /actions
```



```
{
  <name> : <value>,...
}
```

## Sample Request

```
POST /actions
{
  "description" : "Modify",
  "name" : "Modify",
  "object" : "Transaction"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Modify",
      "display" : false,
      "name" : "Modify",
      "object" : "Transaction"
    }
  ],
  "message" : "Successfully created 1 action",
  "status" : "Success"
}
```

---

### Related Topics

- [26.4.1 Actions Resource - page 295](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.1.C Modify an Action

#### Synopsis

```
PATCH /actions/<object>/<name>
{
  <name> : <value>,...
}
```

#### Sample Request

```
PATCH /actions/Transaction/Modify
{
```

```

    "display" : true
  }

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Modify",
      "display" : true,
      "name" : "Modify",
      "object" : "Transaction"
    }
  ],
  "message" : "Successfully modified 1 action",
  "status" : "Success"
}

```

---

## Related Topics

- [26.4.1 Actions Resource - page 295](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.1.D Delete an Action

## Synopsis

```
DELETE /actions/<object>/<name>
```

## Sample Request

```
DELETE /actions/Transaction/Modify
```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Modify",
      "display" : false,
      "name" : "Modify",
      "object" : "Transaction"
    }
  ],

```

```

"message" : "Successfully deleted 1 action",
"status" : "Success"
}

```

---

### Related Topics

- [26.4.1 Actions Resource - page 295](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.2 Attributes Resource

This section provides information on the supported actions for the Attributes framework resource.

### Supported Actions

Action	HTTP Method	Resource
Query attributes	GET	/attributes[/<object>[/<name>]]
Create an attribute	POST	/attributes
Modify an attribute	PATCH	/attributes/<object>/<name>
Delete an attribute	DELETE	/attributes/<object>/<name>

---

### Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.2.A Query Attributes

#### Synopsis

```
GET /attributes[/<object>[/<name>]] [??<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /attributes/UsageRecord?fields=name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /attributes/ChargeRate?filter=primary-key=True</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /attributes?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /attributes?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /attributes?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /attributes?fields=name&amp;unique=true</code>

## Sample Request

```
GET /attributes/Account/Organization
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "data-type" : "String",
      "default-value" : null,
      "description" : "Organization",
      "fixed" : false,
      "hidden" : false,
      "name" : "Organization",
      "object" : "Account",
      "primary-key" : false,
      "required" : false,
      "sequence" : 30,
      "values" : "@!=Organization"
    }
  ],
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.2 Attributes Resource - page 299](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.2.B Create an Attribute

### Synopsis

```
POST /attributes
{
  <name> : <value>, ...
}
```

### Sample Request

```
POST /attributes
{
  "data-type" : "String",
  "description" : "Organization",
  "name" : "Organization",
  "object" : "Account",
  "values" : "@!=Organization"
}
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "data-type" : "String",
      "default-value" : null,
      "description" : "Organization",
      "fixed" : false,
      "hidden" : false,
      "name" : "Organization",
      "object" : "Account",
      "primary-key" : false,
      "required" : false,
      "sequence" : 30,
      "values" : "@!=Organization"
    }
  ],
  "message" : "Successfully created 1 attribute",
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.2 Attributes Resource - page 299](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.2.C Modify an Attribute

## Synopsis

```
PATCH /attributes/<object>/<name>
{
  <name> : <value>, ...
}
```

## Sample Request

```
PATCH /attributes/Account/Organization
{
  "default-value" : "university"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "data-type" : "String",
      "default-value" : "university",
      "description" : "Organization",
      "fixed" : false,
      "hidden" : false,
      "name" : "Organization",
      "object" : "Account",
      "primary-key" : false,
      "required" : false,
      "sequence" : 30,
      "values" : "@!=Organization"
    }
  ],
  "message" : "Successfully modified 1 attribute",
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.2 Attributes Resource - page 299](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.2.D Delete an Attribute

## Synopsis

```
DELETE /attributes/<object>/<name>
```

## Sample Request

```
DELETE /attributes/Account/Organization
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "data-type" : "String",
      "default-value" : null,
      "description" : "Organization",
      "fixed" : false,
      "hidden" : false,
      "name" : "Organization",
      "object" : "Account",
      "primary-key" : false,
      "required" : false,
      "sequence" : 30,
      "values" : "@!=Organization"
    }
  ],
  "message" : "Successfully deleted 1 attribute",
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.2 Attributes Resource - page 299](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.3 Events Resource

This section provides information on the supported actions for the Events framework resource.

### Supported Actions

Action	HTTP Method	Resource
Query events	GET	/events[/<id>]
Create an event	POST	/events
Modify an event	PATCH	/events/<id>
Delete an event	DELETE	/events/<id>

### Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.3.A Query Events

#### Synopsis

```
GET /events[/<id>] [/?<parameter>[&<parameter>...]]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /events?fields=id,description
<b>filter</b>	Filters the objects to be returned in the query	GET /events?filter=fire-time>now
<b>limit</b>	Limits the results to the number of objects specified	GET /events?limit=100



Parameter	Description	Example
<b>offset</b>	Number of objects to skip before starting to return data	GET /events?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /events?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /events?fields=rearm-period&unique=true

## Sample Request

```
GET /events/1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "arm-time" : "2023-05-31 16:29:05",
      "catch-up" : false,
      "description" : "Delete Stale Notifications",
      "end-time" : null,
      "failure-command" : null,
      "fire-command" : "Notification Refresh",
      "fire-time" : "2023-05-31 16:29:05",
      "id" : 1,
      "notify" : "Store:",
      "rearm-on-failure" : true,
      "rearm-period" : "1 day @ hour 2"
    }
  ],
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.3 Events Resource - page 304](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.3.B Create an Event

#### Synopsis

```
POST /events
{
  <name> : <value>,...
```

#### Sample Request

```
POST /events
{
  "catch-up" : false,
  "description" : "Delete Stale Notifications",
  "fire-command" : "Notification Refresh",
  "fire-time" : "Now",
  "rearm-on-failure" : true,
  "rearm-period" : "1 day @ hour 2"
}
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "arm-time" : "2023-05-31 16:29:05",
      "catch-up" : false,
      "description" : "Delete Stale Notifications",
      "end-time" : null,
      "failure-command" : null,
      "fire-command" : "Notification Refresh",
      "fire-time" : "2023-05-31 16:29:05",
      "id" : 1,
      "notify" : "Store:",
      "rearm-on-failure" : true,
      "rearm-period" : "1 day @ hour 2"
    }
  ],
  "message" : "Successfully created 1 event",
  "status" : "Success"
}
```

---

#### Related Topics

- [26.4.3 Events Resource - page 304](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.3.C Modify an Event

#### Synopsis

```
PATCH /events/<id>
{
  <name> : <value>,...
}
```

#### Sample Request

```
PATCH /events/1
{
  "rearm-period" : "12 hours^"
}
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "arm-time" : "2023-05-31 16:29:05",
      "catch-up" : false,
      "description" : "Delete Stale Notifications",
      "end-time" : null,
      "failure-command" : null,
      "fire-command" : "Notification Refresh",
      "fire-time" : "2023-05-31 16:29:05",
      "id" : 1,
      "notify" : "Store:",
      "rearm-on-failure" : true,
      "rearm-period" : "12 hours^"
    }
  ],
  "message" : "Successfully modified 1event",
  "status" : "Success"
}
```

#### Related Topics

- [26.4.3 Events Resource - page 304](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.3.D Delete an Event

#### Synopsis

```
DELETE /events/<id>
```

#### Sample Request

```
DELETE /events/1
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "arm-time" : "2023-05-31 16:29:05",
      "catch-up" : false,
      "description" : "Delete Stale Notifications",
      "end-time" : null,
      "failure-command" : null,
      "fire-command" : "Notification Refresh",
      "fire-time" : "2023-05-31 16:29:05",
      "id" : 1,
      "notify" : "Store:",
      "rearm-on-failure" : true,
      "rearm-period" : "1 day @ hour 2"
    }
  ],
  "message" : "Successfully deleted 1 event",
  "status" : "Success"
}
```

#### Related Topics

- [26.4.3 Events Resource - page 304](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.4 Notifications Resource

This section provides information on the supported actions for the Notifications framework resource.

## Supported Actions

Action	HTTP Method	Resource
Query notifications	GET	/notifications[/<id>]
Delete a notification	DELETE	/notifications/<id>

### Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.4.A Query Notifications

#### Synopsis

```
GET /notifications[/<id>] [?<parameter>[&<parameter>...]]
```

#### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /notifications?fields=message
<b>filter</b>	Filters the objects to be returned in the query	GET /notifications?filter=status=Failure
<b>limit</b>	Limits the results to the number of objects specified	GET /notifications?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /notifications?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /notifications?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET notifications?fields=type&unique=true

## Sample Request

```
GET /notifications/1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "code" : "000",
      "end-time" : "2023-09-23 13:55:00",
      "event" : 1,
      "id" : 1,
      "key" : null,
      "message" : "No stale events were located for deletion",
      "recipient" : null,
      "status" : "Success",
      "type" : "Fire"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.4.4 Notifications Resource - page 308](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.4.B Delete a Notification

## Synopsis

```
DELETE /notifications/<id>
```

## Sample Request

```
DELETE /notifications/1
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "code" : "000",
```

```

    "end-time" : "2023-09-23 13:55:00",
    "event" : 1,
    "id" : 1,
    "key" : null,
    "message" : "No stale events were located for deletion",
    "recipient" : null,
    "status" : "Success",
    "type" : "Fire"
  }
],
"message" : "Successfully deleted 1 notification",
"status" : "Success"
}

```

---

### Related Topics

- [26.4.4 Notifications Resource - page 308](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.5 Objects Resource

This section provides information on the supported actions for the Objects framework resource.

### Supported Actions

Action	HTTP Method	Resource
Query objects	GET	/objects[/<name>]
Create an object	POST	/objects
Modify an object	PATCH	/objects/<name>
Delete an object	DELETE	/objects/<name>

---

### Related Topics

- [26.4 Framework Resources - page 294](#)

## 26.4.5.A Query Objects

### Synopsis

```
GET /objects[/<name>][?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /objects?fields=name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /objects?filter=association=True</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /objects?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /objects?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /objects?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /objects?fields=child&amp;unique=true</code>

### Sample Request

```
GET /objects/Organization
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "association" : false,
      "auto-gen" : true,
      "child" : null,
      "default-value" : null,
      "description" : "Virtual Organization",
      "name" : "Organization",
      "parent" : null
    }
  ]
}
```



```

    ],
    "status" : "Success"
  }

```

## Related Topics

- [26.4.5 Objects Resource - page 311](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.5.B Create an Object

### Synopsis

```

POST /objects
{
  <name> : <value>, ...
}

```

### Sample Request

```

POST /objects
{
  "auto-gen" : true,
  "description" : "Virtual Organization",
  "name" : "Organization",
}

```

### Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "association" : false,
      "auto-gen" : true,
      "child" : null,
      "default-value" : null,
      "description" : "Virtual Organization",
      "name" : "Organization",
      "parent" : null
    }
  ],
  "message" : "Successfully created 1 object",
  "status" : "Success"
}

```

---

**Related Topics**

- [26.4.5 Objects Resource - page 311](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.5.C Modify an Object

**Synopsis**

```
PATCH /objects/<name>
{
  <name> : <value>,...
}
```

**Sample Request**

```
PATCH /objects/Organization
{
  "auto-gen" : false
}
```

**Sample Response**

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "association" : false,
      "auto-gen" : false,
      "child" : null,
      "default-value" : null,
      "description" : "Virtual Organization",
      "name" : "Organization",
      "parent" : null
    }
  ],
  "message" : "Successfully modified 1 object",
  "status" : "Success"
}
```

---

**Related Topics**

- [26.4.5 Objects Resource - page 311](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.5.D Delete an Object

#### Synopsis

```
DELETE /objects/<name>
```

#### Sample Request

```
DELETE /objects/Organization
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "association" : false,
      "auto-gen" : true,
      "child" : null,
      "default-value" : null,
      "description" : "Virtual Organization",
      "name" : "Organization",
      "parent" : null
    }
  ],
  "message" : "Successfully deleted 1 object",
  "status" : "Success"
}
```

#### Related Topics

- [26.4.5 Objects Resource - page 311](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.6 Passwords Resource

This section provides information on the supported actions for the Passwords framework resource.

#### Supported Actions

Action	HTTP Method	Resource
Query password	GET	/passwords[/<user>]

Action	HTTP Method	Resource
Create a password	POST	/passwords
Modify a password	PATCH	/passwords/<user>
Delete a password	DELETE	/passwords/<user>

## Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.6.A Query Passwords

## Synopsis

```
GET /passwords[/<user>] [?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /passwords?fields=user
<b>filter</b>	Filters the objects to be returned in the query	GET /passwords?filter=user~a*
<b>limit</b>	Limits the results to the number of objects specified	GET /passwords?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /passwords?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /passwords?show-hidden=true
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	GET /passwords?fields=user&unique=true

## Sample Request

```
GET /passwords/amy
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "password" : "LWL9zk00yv1ekGCRfFuuMeOHp4EtRdjX",
      "user" : "amy"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.4.6 Passwords Resource - page 315](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.6.B Create a Password

## Synopsis

```
POST /passwords
{
  <name> : <value>, ...
}
```

## Sample Request

```
POST /passwords
{
  "password" : "changeme!",
  "user" : "amy"
}
```

## Sample Response

```
{
  "code" : "080",
  "count" : 1,
  "data" : [
    {
      "password" : "LWL9zk00yv1ekGCRfFuuMeOHp4EtRdjX",

```

```

    "user" : "amy"
  }
],
"message" : "Successfully created 1 password",
"status" : "Success"
}

```

---

## Related Topics

- [26.4.6 Passwords Resource - page 315](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.6.C Modify a Password

## Synopsis

```

PATCH /passwords/<name>
{
  <name> : <value>, ...
}

```

## Sample Request

```

PATCH /passwords/amy
{
  "password" : "changeme2"
}

```

## Sample Response

```

{
  "code" : "080",
  "count" : 1,
  "data" : [
    {
      "password" : "TDB5dM5sKdpti8N730cMWxoJx6XUksq1",
      "user" : "amy"
    }
  ],
  "message" : "Successfully modified 1 password",
  "status" : "Success"
}

```

---

## Related Topics

- [26.4.6 Passwords Resource - page 315](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.6.D Delete a Password

#### Synopsis

```
DELETE /passwords/<name>
```

#### Sample Request

```
DELETE /passwords/amy
```

#### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "password" : "LWL9zk00yv1ekGCRfFuuMeOHp4EtRdjX",
      "user" : "amy"
    }
  ],
  "message" : "Successfully deleted 1 password",
  "status" : "Success"
}
```

#### Related Topics

- [26.4.6 Passwords Resource - page 315](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.7 Roles Resource

This section provides information on the supported actions for the Roles framework resource.

#### Supported Actions

Action	HTTP Method	Resource
Query roles	GET	/roles[/<name>]

Action	HTTP Method	Resource
Create a role	POST	/roles
Modify a role	PATCH	/roles/<name>
Delete a role	DELETE	/roles/<name>
Query role actions	GET	/role-actions[/<role>[/<object>[/<name>]]]
Add an action to a role	POST	/role-actions
Remove an action from a role	DELETE	/role-actions/<role>/<object>/<name>
Query role users	GET	/role-users[/<role>[/<user>]]
Add a user to a role	POST	/role-users
Remove a user from a role	DELETE	/role-users/<role>/<user>

## Related Topics

- [26.4 Framework Resources - page 294](#)

### 26.4.7.A Query Roles

## Synopsis

```
GET /roles[/<name>] [?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /roles?fields=name</code>



Parameter	Description	Example
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /roles?filter=name~Account*</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /roles?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /roles?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /roles?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /roles?fields=name&amp;unique=true</code>

## Sample Request

```
GET /roles/UserServices
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "User Services",
      "name" : "UserServices"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.7.B Create a Role

### Synopsis

```
POST /roles
{
  <name> : <value>,...
```

### Sample Request

```
POST /roles
{
  "description" : "User Services",
  "name" : "UserServices"
}
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "User Services",
      "name" : "UserServices"
    }
  ],
  "message" : "Successfully created 1 role",
  "status" : "Success"
}
```

---

### Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.7.C Modify a Role

### Synopsis

```
PATCH /roles/<name>
{
  <name> : <value>,...
```

## Sample Request

```
PATCH /roles/UserServices
{
  "description" : "Help Desk"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Help Desk",
      "name" : "UserServices"
    }
  ],
  "message" : "Successfully modified 1 role",
  "status" : "Success"
}
```

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.7.D Delete a Role

## Synopsis

```
DELETE /roles/<name>
```

## Sample Request

```
DELETE /roles/UserServices
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "User Services",
      "name" : "UserServices"
    }
  ],
}
```

```

"message" : "Successfully deleted 1 role",
"status"  : "Success"
}

```

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.7.E Query Role Actions

### Synopsis

```
GET /role-actions[/<role>[/<object>[/<name>]]] [ ?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	GET /role-actions/UserServices?fields=object,name,instance
<b>filter</b>	Filters the objects to be returned in the query	GET /role-actions?filter=object=UsageRecord
<b>limit</b>	Limits the results to the number of objects specified	GET /role-actions?limit=100
<b>offset</b>	Number of objects to skip before starting to return data	GET /role-actions?offset=100
<b>show-hidden</b>	Includes hidden attributes in the result	GET /role-actions?show-hidden=true
<b>unique</b>	Displays only unique results (like	GET /role-actions?fields=object&unique=true

Parameter	Description	Example
	DISTINCT in SQL)	

## Sample Request

```
GET /role-actions/UserServices/UsageRecord
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "instance" : "ANY",
      "name" : "Refund",
      "object" : "UsageRecord",
      "role" : "UserServices"
    }
  ],
  "status" : "Success"
}
```

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.7.F Add an Action to a Role

## Synopsis

```
POST /role-actions
{
  <name> : <value>, ...
}
```

## Sample Request

```
POST /role-actions
{
  "name" : "Refund",
  "object" : "UsageRecord",
  "role" : "UserServices"
}
```

## Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "instance" : "ANY",
      "name" : "Refund",
      "object" : "UsageRecord",
      "role" : "UserServices"
    }
  ],
  "message" : "Successfully created 1 role action",
  "status" : "Success"
}
```

### Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.7.G Remove an Action from a Role

### Synopsis

```
DELETE /role-actions/<role>/<object>/<name>
```

### Sample Request

```
DELETE /role-actions/UserServices/UsageRecord/Refund
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "instance" : "ANY",
      "name" : "Refund",
      "object" : "UsageRecord",
      "role" : "UserServices"
    }
  ],
  "message" : "Successfully deleted 1 role action",
  "status" : "Success"
}
```

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.7.H Query Role Users

## Synopsis

```
GET /role-users[/<role>[/<user>]][?<parameter>[&<parameter>...]]
```

## Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /role-users/UserServices?fields=name</code>
<b>filter</b>	Filters the objects to be returned in the query	<code>GET /role-users?filter=name=amy</code>
<b>limit</b>	Limits the results to the number of objects specified	<code>GET /role-users?limit=100</code>
<b>offset</b>	Number of objects to skip before starting to return data	<code>GET /role-users?offset=100</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /role-users?show-hidden=true</code>
<b>unique</b>	Displays only unique results (like DISTINCT in SQL)	<code>GET /role-users?fields=name&amp;unique=true</code>

## Sample Request

```
GET /role-users/UserServices/amy
```

## Sample Response

```
{
  "code" : "000",
```

```

    "count" : 1,
    "data" : [
      {
        "name" : "amy",
        "role" : "UserServices"
      }
    ],
    "status" : "Success"
  }

```

---

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

### 26.4.7.I Add a User to a Role

## Synopsis

```

POST /role-users
{
  <name> : <value>, ...
}

```

## Sample Request

```

POST /role-users
{
  "name" : "amy",
  "role" : "UserServices"
}

```

## Sample Response

```

{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "name" : "amy",
      "role" : "UserServices"
    }
  ],
  "message" : "Successfully created 1 role user",
  "status" : "Success"
}

```



---

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.7.J Remove a User from a Role

### Synopsis

```
DELETE /role-users/<role>/<user>
```

### Sample Request

```
DELETE /role-users/UserServices/amy
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "name" : "amy",
      "role" : "UserServices"
    }
  ],
  "message" : "Successfully deleted 1 role user",
  "status" : "Success"
}
```

---

## Related Topics

- [26.4.7 Roles Resource - page 319](#)
- [26.4 Framework Resources - page 294](#)

## 26.4.8 System Resource

This section provides information on the supported actions for the System framework resource.

## Supported Actions

Action	HTTP Method	Resource
Query system properties	GET	/system

---

### Related Topics

- [26.4 Framework Resources - page 294](#)

## 26.4.8.A Query the System

### Synopsis

```
GET /system[?<parameter>[&<parameter>...]]
```

### Parameters

Parameter	Description	Example
<b>fields</b>	Designates the properties to be returned in the query	<code>GET /system?fields=version</code>
<b>show-hidden</b>	Includes hidden attributes in the result	<code>GET /system?show-hidden=true</code>

### Sample Request

```
GET /system
```

### Sample Response

```
{
  "code" : "000",
  "count" : 1,
  "data" : [
    {
      "description" : "Commercial Release",
      "name" : "Moab Accounting Manager",
      "version" : "10.0.0"
    }
  ],
  "status" : "Success"
}
```

### Related Topics

- [26.4.8 System Resource - page 329](#)
- [26.4 Framework Resources - page 294](#)

## Appendix A: Commands Reference

Moab Accounting Manager provides a server daemon and client commands for use by administrators and end users.

### Common Command Options

Most Moab Accounting Manager commands support the following common options.

Option	Description
<b>--help</b>	Brief command option summary.
<b>--format</b> <b>&lt;output-format&gt;</b>	Data output format. Valid values include standard, raw and csv. <ul style="list-style-type: none"> <li>• csv – Fields are delimited by commas (CSV = comma-separated values). Fields containing commas are double-quoted.</li> <li>• raw – Fields are delimited by the pipe character (' ') .</li> <li>• standard (default) – Fields are aligned to fixed-width columns; widths are dynamically calculated based on the widest value in a column (including the header).</li> </ul>
<b>--man</b>	Full command documentation.
<b>--site</b>	Obtain response from specified site.
<b>--version</b>	Display product version.

### List of Commands

Click a command to see detailed information about the command.

Command	Description
<a href="#">mam-balance</a>	Display balance information
<a href="#">mam-charge</a>	Create a usage charge
<a href="#">mam-create-account</a>	Create a new account

Command	Description
<b>mam-create-chargerate</b>	Create a new charge rate
<b>mam-create-event</b>	Create a new event
<b>mam-create-fund</b>	Create a new fund
<b>mam-create-lien</b>	Create a lien
<b>mam-create-organization</b>	Create a new organization
<b>mam-create-quote</b>	Create a quote template
<b>mam-create-role</b>	Create a new role
<b>mam-create-usagerecord</b>	Create a new usage record
<b>mam-create-user</b>	Create a new user
<b>mam-delete-account</b>	Delete an account
<b>mam-delete-allocation</b>	Delete an allocation or purge stale allocations
<b>mam-delete-chargerate</b>	Delete a charge rate
<b>mam-delete-event</b>	Delete an event
<b>mam-delete-fund</b>	Delete a fund
<b>mam-delete-lien</b>	Delete a lien
<b>mam-delete-notification</b>	Delete a stored notification
<b>mam-delete-organization</b>	Delete an organization
<b>mam-delete-quote</b>	Delete a quote
<b>mam-delete-role</b>	Delete a role

Command	Description
<b>mam-delete-usagerecord</b>	Delete a usage record
<b>mam-delete-user</b>	Delete a user
<b>mam-deposit</b>	Issue a deposit
<b>mam-list-accounts</b>	Query accounts
<b>mam-list-allocations</b>	Query allocations
<b>mam-list-chargerates</b>	Query charge rates
<b>mam-list-events</b>	Query events
<b>mam-list-itemizedcharges</b>	Query charges
<b>mam-list-funds</b>	Query funds
<b>mam-list-liens</b>	Query liens
<b>mam-list-notifications</b>	Query stored notifications
<b>mam-list-organizations</b>	Query organizations
<b>mam-list-quotes</b>	Query quotes
<b>mam-list-roles</b>	Query roles
<b>mam-list-transactions</b>	Query transactions
<b>mam-list-usagerecords</b>	Query usage records
<b>mam-list-users</b>	Query users
<b>mam-modify-account</b>	Modify an account
<b>mam-modify-allocation</b>	Modify an allocation

Command	Description
<b>mam-modify-chargerate</b>	Modify a charge rate
<b>mam-modify-event</b>	Modify an event
<b>mam-modify-fund</b>	Modify a fund
<b>mam-modify-lien</b>	Modify a lien
<b>mam-modify-organization</b>	Modify an organization
<b>mam-modify-quote</b>	Modify a quote
<b>mam-modify-role</b>	Modify a role
<b>mam-modify-usagerecord</b>	Modify a usage record
<b>mam-modify-user</b>	Modify a user
<b>mam-quote</b>	Quote for usage
<b>mam-read-configuration</b>	Query configuration
<b>mam-refund</b>	Issue a usage refund
<b>mam-reserve</b>	Reserve for usage
<b>mam-server</b>	Moab Accounting Manager server
<b>mam-set-password</b>	Set a user password
<b>mam-shell</b>	Interactive shell for MAM
<b>mam-statement</b>	Display fund statement
<b>mam-transfer</b>	Issue a transfer
<b>mam-withdraw</b>	Issue a withdrawal
<b>mybalance</b>	Display personal balance information

## A.1 mam-balance

### A.1.1 Synopsis

```
mam-balance [-u <user_name>] [-g <group_name>] [-a <account_
name>] [-o <organization_name>] [-c <class_name>] [-m
<machine_name>] [--filter <filter_name>=<filter_value>]... [--
filterType ExactMatch|Exclusive|NonExclusive] [--ignore-
ancestors] [--full] [--show <attribute_name>,...] [--long] [--
wide] [--format csv|raw|standard] [--hours] [--debug] [--
site <site_name>] [--help] [--man] [--quiet] [--version] [--
about]
```

### A.1.2 Overview

*mam-balance* displays balance information for funds having active allocations.

### A.1.3 Options

**-a**

<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified account.

**-c**

<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified class.



<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified group.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified machine.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified organization.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the balance available to the specified user.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debugging information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the balance for funds where constraints do not conflict with the specified filters. You can use multiple filter options by logically ANDing them together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	NonExclusive
<b>Description</b>	<p>Selects the filtering type:</p> <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--format</b>	
<b>Format</b>	<code>--format &lt;output_type&gt;</code>
<b>Default</b>	standard
<b>Description</b>	Data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--ignore-ancestors</b>	
<b>Format</b>	<code>--ignore-ancestors</code>
<b>Default</b>	---
<b>Description</b>	Does not include hierarchical ancestor funds in the result.

<b>--long</b>	
<b>Format</b>	<code>--long</code>
<b>Default</b>	---
<b>Description</b>	Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays the full documentation.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---

**--hours**

<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.
--------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--quiet**

<b>Format</b>	--quiet
---------------	---------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Suppresses headers and success messages.
--------------------	------------------------------------------

**--show**

<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
---------------	-----------------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	<p>Displays only the specified attributes in the order you specified. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <b>Allocated</b> - Adjusted allocation. This value stores the effective allocated amount based on the initial deposit and subsequent allocation adjustments via deposits, withdrawals or transfers.</li> <li>• <b>Available</b> - Total amount currently available for charging (Balance - Reserved + CreditLimit).</li> <li>• <b>Balance</b> - Sum of active allocation amounts remaining within this fund. It does not take into account current liens.</li> <li>• <b>Capacity</b> - Total expendable amount (Allocated + CreditLimit).</li> <li>• <b>Constraints</b> - Constraints on fund usage.</li> <li>• <b>CreationTime</b> - Time this fund was created.</li> <li>• <b>CreditLimit</b> - Sum of active credit limits within this fund.</li> <li>• <b>Deleted</b> - Boolean indicating whether this fund is deleted.</li> <li>• <b>Description</b> - Fund description.</li> <li>• <b>Effective</b> - Effective allocation total not blocked by liens (Balance - Reserved).</li> <li>• <b>Id</b> - Fund ID.</li> <li>• <b>ModificationTime</b> - Time this fund was last modified.</li> <li>• <b>Name</b> - Fund name.</li> </ul>
--------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

<b>--show</b>	
	<ul style="list-style-type: none"> <li>• <code>PercentRemaining</code> - Percentage of allocation remaining (<math>\text{Balance} * 100 / \text{Capacity}</math>).</li> <li>• <code>PercentUsed</code> - Percentage of allocation used (<math>\text{Used} * 100 / \text{Capacity}</math>).</li> <li>• <code>RequestId</code> - Id of the last modifying request.</li> <li>• <code>Reserved</code> - Sum of active lien amounts against this fund.</li> <li>• <code>TransactionId</code> - Id of the last modifying transaction.</li> <li>• <code>Used</code> - Total amount used from this allocation (<math>\text{Allocated} - \text{Balance}</math>).</li> </ul> <p>Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form of <code>operator(attribute_name) [=alias]</code>. Valid operators include <code>Sum</code>, <code>Average</code>, <code>Count</code>, <code>Min</code>, <code>Max</code> and <code>GroupBy</code>. When an operator is specified, fields without an explicit operator are assumed to have the <code>GroupBy</code> operator.</p>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--wide</b>	
<b>Format</b>	<code>--wide</code>
<b>Default</b>	---
<b>Description</b>	Displays multi-valued fields in a single-line, comma-separated format.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

[10.6 Querying the Balance - page 80](#)

[Appendix A: Commands Reference - page 332](#)

## A.2 mam-charge

### A.2.1 Synopsis

```
mam-charge {-J <instance_name>} [[-j] <usage_record_id>] [-n <designated_name>] [-q <quote_id>] [-l <lien_id>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-x <exit_code>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property>=<value>]... [-zt <charge_duration>] [-zs <charge_start_time>] [-z <charge_amount>] [-f <fund_id>] [--incremental] [--rate <charge_rate_name>[{\<charge_rate_value>}]=<charge_rate_amount>,...]... [--hours] [--itemize] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.2.2 Overview

`mam-charge` charges for resource usage.

## A.2.3 Options

**-a**

<b>Format</b>	<code>-a &lt;account_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Account to charge.

**-c**

<b>Format</b>	<code>-c &lt;class_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Class of queue used.

**-C**

<b>Format</b>	<code>-C &lt;cpu_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	<p>CPU time used. <code>cpu_time</code> can be an expression of the form of <code>[cumulative_cpu_time][(incremental_cpu_time)]</code>:</p> <ul style="list-style-type: none"> <li>• If both <code>incremental_cpu_time</code> and <code>cumulative_cpu_time</code> are specified, then <code>incremental_cpu_time</code> will be used for the charge and <code>cumulative_cpu_time</code> will be recorded as the cumulative value used in the usage record.</li> <li>• If only <code>incremental_cpu_time</code> is specified, this value will be used for the charge <i>only</i> and no <code>cpu_time</code> value will be recorded in the usage record.</li> <li>• If only <code>cumulative_cpu_time</code> is specified, this value will be used both in the charge <i>and</i> recorded in the usage record.</li> </ul>

<b>-d</b>	
<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Description of the usage.

<b>-D</b>	
<b>Format</b>	<code>-D &lt;disk&gt;</code>
<b>Default</b>	---
<b>Description</b>	Amount of disk space used.

<b>-e</b>	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	Now
<b>Description</b>	End time for the usage in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>-E</b>	
<b>Format</b>	<code>-E &lt;energy&gt;</code>
<b>Default</b>	---
<b>Description</b>	Amount of energy used.

<b>-f</b>	
<b>Format</b>	<code>-f &lt;fund_id&gt;</code>
<b>Default</b>	---



<b>-f</b>	
<b>Description</b>	Fund ID to charge.

<b>-F</b>	
<b>Format</b>	<code>-F "{\ "&lt;feature_name&gt;\":&lt;feature_count&gt;,...}"</code>
<b>Default</b>	---
<b>Description</b>	Allocated node features. Features represent counts of the node features allocated to the job.

<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Name of the group to charge.

<b>-j</b>	
<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record ID for the charge (if already created with <i>mam-create-usagerecord</i> , <i>mam-quote</i> , <i>mam-reserve</i> or a previous <i>mam-charge</i> ). Use <code>-j</code> to charge an existing usage record if the instance name (such as a job ID) is ambiguous, or if a usage has already been debited and you want to charge an additional amount to the same usage record.

<b>-J</b>	
<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---

<b>-J</b>	
<b>Description</b>	Instance name (or job ID) for the charge, if known. This can sometimes be non-unique (such as when a resource manager recycles job IDs) and does not always unambiguously identify a usage record to charge. In such cases, look up and specify the usage record ID for the charge.

<b>-I</b>	
<b>Format</b>	<code>-I &lt;lien_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Lien ID, which MAM will use to match up the right usage record ID and remove the correct lien, if ambiguous.

<b>-L</b>	
<b>Format</b>	<code>-L "{ \"&lt;license_name&gt;\":&lt;license_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	Licenses used. Licenses represent software licenses that are used (in integer units).

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Name of the cluster.

<b>-M</b>	
<b>Format</b>	<code>-M &lt;memory&gt;</code>
<b>Default</b>	---
<b>Description</b>	Amount of memory used.

<b>-n</b>	
<b>Format</b>	-n <designated_name>
<b>Default</b>	---
<b>Description</b>	User-specified job name.

<b>-N</b>	
<b>Format</b>	-N <nodes>
<b>Default</b>	---
<b>Description</b>	Number of nodes used.

<b>-o</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Organization name.

<b>-P</b>	
<b>Format</b>	-P <processors>
<b>Default</b>	---
<b>Description</b>	Number of processors used.

<b>-q</b>	
<b>Format</b>	-q <quote_id>
<b>Default</b>	---
<b>Description</b>	Quote MAM should use to determine charge rates.

<b>-Q</b>	
<b>Format</b>	<code>-Q &lt;quality_of_service_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Quality of service used.

<b>-R</b>	
<b>Format</b>	<code>-R "{ \"&lt;resource_name&gt;\":&lt;resource_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	Consumable resources allocated. Resources represent consumable resources that can be allocated (in integer units).

<b>--rate</b>	
<b>Format</b>	<code>--rate &lt;charge_rate_name&gt;[ {&lt;charge_rate_value&gt;} ]=&lt;charge_rate_amount&gt;, ...</code>
<b>Default</b>	---
<b>Description</b>	Charge rate expressions. Multiple charge rate expressions can be passed to the <code>--rate</code> option in a comma-delimited list. Alternatively, multiple <code>--rate</code> options can be specified.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Start time for the usage in the format <code>YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now</code>

<b>--stage</b>	
<b>Format</b>	<code>--stage &lt;lifecycle_stage&gt;</code>
<b>Default</b>	---
<b>Description</b>	Latest stage in the object's accounting lifecycle (Create, Start, Continue, End).

<b>-t</b>	
<b>Format</b>	<code>-t &lt;actual_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Total actual duration (in seconds).

<b>-T</b>	
<b>Format</b>	<code>-T &lt;usage_record_type&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record type (Job, Reservation, etc.).

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	User name.

<b>-V</b>	
<b>Format</b>	<code>-V "{\&lt;variable_name&gt;\":\&lt;variable_value&gt;\",...}"</code>
<b>Default</b>	---
<b>Description</b>	Job variables. Variables represent arbitrary variables passed into the job.

<b>-W</b>	
<b>Format</b>	<code>-W &lt;requested_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Total estimated wallclock duration (in seconds).

<b>-x</b>	
<b>Format</b>	<code>-x exit_code</code>
<b>Default</b>	---
<b>Description</b>	Exit code.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	<p>Extension property. You can specify any number of extra usage properties with the charge.</p> <p>When expressing accumulating properties, value can be an expression in the form of <code>[cumulative_value] [(incremental_value)]</code>:</p> <ul style="list-style-type: none"> <li>• If both <code>incremental_value</code> and <code>cumulative_value</code> are specified, then <code>incremental_value</code> will be used for the charge and <code>cumulative_value</code> will be recorded as the cumulative value used in the usage record.</li> <li>• If only <code>incremental_value</code> is specified, this value will be used for the charge <i>only</i> and no cumulative value will be recorded in the usage record.</li> <li>• If only <code>cumulative_value</code> is specified, this value will be used both in the charge <i>and</i> recorded in the usage record.</li> </ul>

<b>-z</b>	
<b>Format</b>	<code>-z &lt;charge_amount&gt;</code>
<b>Default</b>	---

-z	
<b>Description</b>	Charge amount if calculated externally.

-zs	
<b>Format</b>	-zs <charge_start_time>
<b>Default</b>	Now - <charge_duration> (if unable to derive by other means)
<b>Description</b>	Start time for the charge in the format YYYY-MM-DD[hh:mm:ss]   -Infinity Infinity Now This is <i>only</i> needed for incremental charges when the start of the charge interval differs from the original start time <i>and</i> is used to determine the appropriate allocation to the charge.

-zt	
<b>Format</b>	-zt <charge_duration>
<b>Default</b>	---
<b>Description</b>	Incremental duration of the charge (in seconds). This is <i>only</i> needed for incremental charges when the incremental duration differs from the total actual duration and is used to compute the incremental charge amount.

-Z	
<b>Format</b>	-Z "{\"<metric_name>\":<metric_amount>, ...}"
<b>Default</b>	---
<b>Description</b>	Generic metrics. Metrics represent floating point metrics of the job <i>or</i> average metrics values across the nodes in the job.

--hours	
<b>Format</b>	--hours

<b>--hours</b>	
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--itemize</b>	
<b>Format</b>	--itemize
<b>Default</b>	---
<b>Description</b>	Returns the composite charge information in the response data. This must be used in conjunction with the <a href="#">--verbose</a> flag to display the data.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debugging information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--incremental</b>	
<b>Format</b>	--incremental
<b>Default</b>	---



<b>--incremental</b>	
<b>Description</b>	Debits any associated liens instead of removing them.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays the full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [14.7 Charging for Usage - page 112](#)
- [Appendix A: Commands Reference - page 332](#)

## A.3 mam-create-account

### A.3.1 Synopsis

```
mam-create-account {[-a] <account_name>} [-A | -I] [-o <organization_name>] [-d <description>] [-X, --extension <property>=<value>]... [-u [^|!][+|-]<user_name>,...]... [--create-fund True|False] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.3.2 Overview

*mam-create-account* creates a new account. Users can be associated with the account. If you turn on auto-generation for the Fund object or assert the `--create-fund` flag, a fund will automatically be created for the account.

## A.3.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the new account.

-A	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Activates the account.

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies an account description.

-I	
<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Deactivates the account.

-o	
<b>Format</b>	-o <organization_name>

<b>-o</b>	
<b>Default</b>	---
<b>Description</b>	Specifies the name of the organization to which the account belongs.

<b>-u</b>	
<b>Format</b>	<code>-u [^ !][+ -]&lt;user_name&gt;[, [^ !][+ -]&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Defines user members of the account. The optional caret or exclamation symbol indicates whether the user should be created as an admin (^) or not (!) for the account. The optional plus or minus sign can precede each member to indicate whether the member should be created in the active (+) or inactive (-) state. By default, a user will be created in the active state but not an admin. Multiple users can be passed to the <code>-u</code> option in a comma-delimited list or by specifying multiple <code>-u</code> options.

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--create-fund</b>	
<b>Format</b>	<code>--create-fund True False</code>
<b>Default</b>	---
<b>Description</b>	Overrides the fund auto-generation setting. Setting this option to <code>True</code> creates a default fund for this account. Setting this option to <code>False</code> inhibits the creation of a default fund for this account.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [8.1 Creating Accounts - page 63](#)
- [Appendix A: Commands Reference - page 332](#)

## A.4 mam-create-chargerate

### A.4.1 Synopsis

```
mam-create-chargerate {[-n] <charge_rate_name>} [-x <charge_rate_value>} [-z <charge_rate_amount>} [-d <description>} [--
```

```
debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

## A.4.2 Overview

*mam-create-chargerate* creates a new charge rate.

## A.4.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a charge rate description.

-n	
<b>Format</b>	[-n] <charge_rate_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the usage record property for which the rate is charging, such as Processors or QualityOfService.

-x	
<b>Format</b>	-x <charge_rate_value>
<b>Default</b>	---
<b>Description</b>	Specifies charge rate value. For name-valued charge rates, this is the usage property value corresponding to the rate. For numeric-valued charge rates, this is the range of values corresponding to the rate. A blank value will function as a default charge rate. See <a href="#">Chapter 16: Managing Charge Rates - page 126</a> for more information.

<b>-z</b>	
<b>Format</b>	<code>-z &lt;charge_rate_amount&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the rate for the charge. This is an integer or decimal number and can include operators that indicate how the charge is applied, as well as divisors and time-based units. See <a href="#">Chapter 16: Managing Charge Rates - page 126</a> for more information.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>



<b>--quiet</b>	
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

**Related Topics**

- [16.2 Creating Charge Rates - page 128](#)
- [Appendix A: Commands Reference - page 332](#)

## A.5 mam-create-event

### A.5.1 Synopsis

```
mam-create-event [--fire-command <fire_command>] [-s <fire_time>] [-e <end_time>] [--rearm-period <rearm_period>] [--rearm-on-failure <boolean>] [--failure-command <failure_command>] [--notify <notification_url>] [--catch-up <boolean>] [-d <description>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.5.2 Overview

*mam-create-event* creates a new event.

### A.5.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies an event description.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	---

<b>-e</b>	
<b>Description</b>	Specifies the time that this event becomes inactive in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>-s</b>	
<b>Format</b>	-s <fire_time>
<b>Default</b>	---
<b>Description</b>	Specifies the target time for the event scheduler to trigger the event. The actual fire time may be dependent on the state of the server and will be recorded in the CreationTime property of the corresponding 'Event Fire' Transaction. An event can also be fired manually with the mam-shell Event Fire action.

<b>--catch-up</b>	
<b>Format</b>	--catch-up <boolean>
<b>Default</b>	True
<b>Description</b>	If you set --catch-up to True and the server was down during the time this event should have fired, the event scheduler will attempt to make up for the past-due events by progressively firing them (rearming based on previous arm time) until it catches up to the present. The actions will still appear to have occurred in the present rather than in the past. If you set it to False and the server is brought back up after an outage, the event scheduler will still fire immediately for a past due event, but it will only fire once and then rearm relative to the current time.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--failure-command</b>	
<b>Format</b>	<code>--failure-command &lt;failure_command&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the command MAM should execute if the fired command results in an unsuccessful response status. This command is expressed in a serialized form of the request identical to the syntax used in the interactive control program (mam-shell). You must appropriately quote and/or escape the option argument to avoid misinterpretation or alteration by the shell.

<b>--fire-command</b>	
<b>Format</b>	<code>--fire-command &lt;fire_command&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the command MAM should execute.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--notify</b>	
<b>Format</b>	<code>--notify [+==] [&lt;delivery_method&gt;:] [&lt;recipient&gt;]</code>
<b>Default</b>	Log all event statuses to the Notification table.
<b>Description</b>	Causes MAM to log the result of the fired command. If the term is a -, the notification is sent only on failure. If the term is a +, the notification is sent only on success. Otherwise the notification is always sent. See <a href="#">Chapter 19: Managing Notifications - page 141</a> for more information about delivery method and recipient.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--rearm-on-failure</b>	
<b>Format</b>	<code>--rearm-on-failure &lt;Boolean&gt;</code>
<b>Default</b>	False
<b>Description</b>	If you set <code>--rearm-on-failure</code> to <code>False</code> , MAM will not rearm the event if the command was unsuccessful. If you set it to <code>True</code> , the event will be evaluated for rearming even if the command response has a status of <code>Failure</code> .

<b>--rearm-period</b>	
<b>Format</b>	<code>--rearm-period &lt;period&gt;[[@instant][~ ^]!]</code>
<b>Default</b>	---
<b>Description</b>	Specifies when the event will be rearmed. This period expression is in the form of <code>&lt;period&gt;[[@instant][~ ^]!]</code> . The <code>&lt;period&gt;</code> is expressed as an integer number followed by a designator of minute(s), hour(s), day(s), week(s), month(s), or year(s). For example, the period might be 1 day, 2 hours, or 5

**--rearm-period**

minutes. The optional `instant` locks the period to a specific instant within the time period such as `1 day @ hour 12` or `1 month @ day 3`. The modifiers indicate whether the time period should be relative to now (!), relative to the start of this (~) designator (month, minute, or other unit), or relative to the start of the first (^) designator (month, minute, or other unit). For example, assuming the `FireTime` was 7:15, if you specified `4 hours !` as the rearm period it would be rearmed at 11:15; if you specified `4 hours ~` as the rearm period, it would be rearmed at 11:00; and if you specified `4 hours ^` as the rearm period it would be rearmed at 8:00.

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

**--verbose**

<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

**--about**

<b>Format</b>	<code>--about</code>
---------------	----------------------

--about	
Default	---
Description	Displays product information.

---

## Related Topics

- [18.2 Creating Events - page 138](#)
- [Appendix A: Commands Reference - page 332](#)

## A.6 mam-create-fund

### A.6.1 Synopsis

```
mam-create-fund [-n <fund_name>] [--priority <fund_priority>]
[--default-deposit <deposit_amount>] [-d <description>] [-X, -
-extension <property>=<value>]... [-u <user_name>,...]... [-
g <group_name>,...]... [-a <account_name>,...]... [-
o <organization_name>,...]... [-c <class_name>,...]... [-
m <machine_name>,...]... [--constraint <constraint_name>=
[!]<constraint_value>,...]... [--parent <parent_fund_id>] [--
debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

### A.6.2 Overview

*mam-create-fund* creates new funds. MAM automatically generates a new ID for the fund. It essentially creates a new container into which time-bounded credits valid toward a specific set of constraints can be later credited and debited.

## A.6.3 Options

**-a**

<b>Format</b>	<code>-a &lt;account_name&gt;[,&lt;account_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies the account required by the fund. You can pass multiple accounts to the <code>-a</code> option in a comma-delimited list or by specifying multiple <code>-a</code> options .

**-c**

<b>Format</b>	<code>-c &lt;class_name&gt;[,&lt;class_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies the class or queue required by the fund. You can pass multiple classes to the <code>-c</code> option in a comma-delimited list or by specifying multiple <code>-c</code> options.

**--constraint**

<b>Format</b>	<code>--constraint &lt;constraint_name&gt;=&lt;constraint_value&gt;[,&lt;constraint_name&gt;=&lt;constraint_value&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies a constraint for the fund. The constraint value may be a perl5 regular expression. You can prepend an exclamation point to the constraint value to express a negation of the constraint. You can specify multiple constraint options. For example, <code>--constraint User=amy --constraint Machine=colony</code> will make the credits in this fund valid only for the user amy on the machine colony. You can pass multiple constraints to the <code>--constraint</code> option in a comma-delimited list or by specifying multiple <code>--constraint</code> options.

**-d**

<b>Format</b>	<code>-d &lt;description&gt;</code>
---------------	-------------------------------------



<b>-d</b>	
<b>Default</b>	---
<b>Description</b>	Specifies a fund description.

<b>--default-deposit</b>	
<b>Format</b>	<code>--default-deposit &lt;default_amount&gt;</code>
<b>Default</b>	---
<b>Description</b>	<p>Sets the default amount for any deposit that is made to this fund that does not specify a deposit amount:</p> <ul style="list-style-type: none"> <li>• A zero value will result in the creation of an allocation with a zero balance (or add nothing if an allocation already exists and a reset is not being requested).</li> <li>• A negative value can be used to stipulate that the allocations in the fund should be ended if the fund is reset.</li> <li>• An empty value (") or NULL can be used to stipulate that no change will be made to the allocations if the fund is reset.</li> </ul>

<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;[,&lt;group_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies the group required by the fund. You can pass multiple groups to the <code>-g</code> option in a comma-delimited list or by specifying multiple <code>-g</code> options.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;[,&lt;machine_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies the machine (cluster) the fund requires. You can pass multiple machines to the <code>-m</code> option in a comma-delimited list or by specifying multiple <code>-m</code> options.

<b>-n</b>	
<b>Format</b>	<code>-n &lt;fund_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the fund name.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;[,&lt;organization_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Specifies the organization the fund requires. You can pass multiple organizations to the <code>-o</code> option in a comma-delimited list or by specifying multiple <code>-o</code> options.

<b>--parent</b>	
<b>Format</b>	<code>--parent &lt;parent_fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Associates the newly created fund as a child of the specified parent fund.

<b>--priority</b>	
<b>Format</b>	<code>--priority &lt;fund_priority&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the fund priority.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;[,&lt;user_name&gt;...]</code>
<b>Default</b>	---

<b>-u</b>	
<b>Description</b>	Specifies the user required by the fund. You can pass multiple users to the <code>-u</code> option in a comma-delimited list or by specifying multiple <code>-u</code> options.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

## Related Topics

- [10.2 Creating Funds - page 75](#)
- [Appendix A: Commands Reference - page 332](#)

# A.7 mam-create-lien

## A.7.1 Synopsis

```
mam-create-lien [-J <instance_name>] [-s <start_time>] {-e <end_time> | -t <lien_duration>} [-d <description>] [-X, --extension <property>=<value>]... {-A <allocation_id><-<fund_id>=<sublien_amount>,...}... [--debug] [--site <site_name>] [-help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.7.2 Overview

*mam-create-lien* creates a lien against specified allocations. MAM will create a lien object and its allocation associations. Unlike *mam-reserve*, MAM will not return a calculated lien amount or create a usage record with the lien.

**i** This command bypasses the normal mechanisms that prevent more liens from being placed against an allocation than it can support.

## A.7.3 Options

-A	
<b>Format</b>	<code>-A &lt;allocation_id&gt;&lt;-&lt;fund_id&gt;=&lt;sublien_amount&gt; [,&lt;allocation_id&gt;&lt;-&lt;fund_id&gt;=&lt;sublien_amount&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Creates subliens against the specified allocations. You must specify at least one allocation expression with the lien. You can pass multiple allocation expressions to the <code>-A</code> option in a comma-delimited list or by specifying multiple <code>-A</code> options.

<b>-d</b>	
<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a description for the lien.

<b>-e</b>	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	Now
<b>Description</b>	Specifies the expiration time for the lien in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>-J</b>	
<b>Format</b>	<code>[-J] &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the instance name (e.g., job ID) for the lien.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	Now
<b>Description</b>	Specifies a new start time for the lien in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>-t</b>	
<b>Format</b>	<code>-t &lt;lien_duration&gt;</code>

<b>-t</b>	
<b>Default</b>	Lien end time minus start time
<b>Description</b>	Specifies the duration of the lien in seconds.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.



## Related Topics

- [12.2 Creating Liens - page 96](#)
- [Appendix A: Commands Reference - page 332](#)

# A.8 mam-create-organization

## A.8.1 Synopsis

```
mam-create-organization {[-o] <organization_name>} [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_man>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.8.2 Overview

*mam-create-organization* creates a new organization.

## A.8.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a description for the organization.

-o	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the organization.

**-X, --extension <property>**

<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

**--man**

<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

**--quiet**

<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---

<b>--quiet</b>	
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

## Related Topics

- [9.1 Creating Organizations - page 69](#)
- [Appendix A: Commands Reference - page 332](#)

# A.9 mam-create-quote

## A.9.1 Synopsis

```
mam-create-quote [--pin] [-J <instance_name>] | --nopin] [-s <start_time>] {-e <end_time> | -t <quote_duration>} [-d <description>] [-X, --extension <property>=<value>]... {--rate <charge_rate_name>[<charge_rate_value>]=<charge_rate_amount>,...}... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.9.2 Overview

*mam-create-quote* creates a new chargeable quote template. MAM will create a quote object and its associated charge rates. Instances referencing the quote will use the override charge rates specified in the command. Unlike *mam-quote*, *mam-create-quote* will not return a calculated quote amount or create a usage record with the quote.

## A.9.3 Options

**-d**

<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a description of the quote.

**-e**

<b>Format</b>	-e <end_time>
---------------	---------------

<b>-e</b>	
<b>Default</b>	---
<b>Description</b>	Specifies the expiration time for the quote template in the format YYYY-MM-DD[hh:mm:ss] -Infinity Infinity Now. The rates associated with this quote cannot be claimed after this time. If you do not specify an end time but did specify a duration, MAM will calculate the end time as start time + duration. If you specify both end time and duration but they are inconsistent, MAM will ignore the duration specification.

<b>-J</b>	
<b>Format</b>	-J <instance_name>
<b>Default</b>	---
<b>Description</b>	Specifies the instance name (e.g., job ID) for the quote. You cannot specify an instance name if the quote is unpinned.

<b>--rate</b>	
<b>Format</b>	--rate <charge_rate_name>[{{<charge_rate_value>}}=<charge_rate_amount>[,<charge_rate_name>[{{<charge_rate_value>}}]=<charge_rate_amount>...]
<b>Default</b>	---
<b>Description</b>	Charge rate expressions. Multiple charge rate expressions can be passed to the --rate option in a comma-delimited list. Alternatively, multiple --rate options can be specified.

<b>-S</b>	
<b>Format</b>	-s <start_time>
<b>Default</b>	Now
<b>Description</b>	Specifies a beginning time for the quote template in the format YYYY-MM-DD[hh:mm:ss] -Infinity Infinity Now. The rates associated with this quote cannot be claimed before this time.

<b>-t</b>	
<b>Format</b>	<code>-t &lt;quote_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the amount of time in seconds the rates in the quote template can be used. MAM uses the duration to calculate an end time (start time + duration) as an alternative to specifying the end time.

<b>-X, --extension &lt;property&gt;</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>

<b>--man</b>	
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--nopin</b>	
<b>Format</b>	<code>--nopin</code>
<b>Default</b>	Not set
<b>Description</b>	Indicates that the quote is not to be pinned to a specific instance. An instance can use an unpinned quote while the quote is active.

<b>--pin</b>	
<b>Format</b>	<code>--pin</code>
<b>Default</b>	Set
<b>Description</b>	Indicates that the quote will be pinned to a specific instance. If you do not specify the instance when you create the quote, the first instance to claim it will become the pinned instance. Once a quote is pinned to a particular instance, no other instances can use the quote.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>

<b>--site</b>	
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [13.3 Creating Quote Templates - page 102](#)
- [Appendix A: Commands Reference - page 332](#)



## A.10 mam-create-role

### A.10.1 Synopsis

```
mam-create-role {[-r] <role_name>} [-d <description>] [-u <user_name>, ...]... [-A "<object_name>-><action_name>[<instance_name>] [,<object_name>-><action_name>[<instance_name>]...]" ...]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.10.2 Overview

*mam-create-role* creates a new role. You can associate users and actions with the role at creation time.

### A.10.3 Options

-A	
<b>Format</b>	-A "<object_name>-><action_name>[<instance_name>] [,<object_name>-><action_name>[<instance_name>]...]"
<b>Default</b>	ANY
<b>Description</b>	Adds actions to the role. You must specify the object, action and instance in the form shown. You can pass multiple actions to the -A option in a comma-delimited list or specify multiple -A options.

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a role description.

<b>-r</b>	
<b>Format</b>	<code>[-r] &lt;role_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the new role.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;[,&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Adds users to the role. You can pass multiple users to the <code>-u</code> option in a comma-delimited list or specify multiple <code>-u</code> options.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---

<b>--man</b>	
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [20.1 Creating Roles - page 146](#)
- [Appendix A: Commands Reference - page 332](#)

# A.11 mam-create-usagerecord

## A.11.1 Synopsis

```
mam-create-usagerecord {-J <instance_name>} [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":<variable_value>\",...}" ] [-W <requested_duration>] [-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-x <exit_code>] [--stage <lifecycle_stage>] [-d <description>] [-X --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.11.2 Overview

*mam-create-usagerecord* creates a new usage record.

## A.11.3 Options

<b>-a</b>	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Account name.

<b>-c</b>	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Class or queue.

<b>-C</b>	
<b>Format</b>	-C <cpu_time>
<b>Default</b>	---
<b>Description</b>	CPU time used.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Description of the usage.

<b>-D</b>	
<b>Format</b>	-D <disk>

<b>-D</b>	
<b>Default</b>	---
<b>Description</b>	Amount of disk used.

<b>-e</b>	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	Date and time the usage ended in the format YYYY-MM-DD[hh:mm:ss]   -Infinity Infinity Now

<b>-E</b>	
<b>Format</b>	-E <energy>
<b>Default</b>	---
<b>Description</b>	Amount of energy used.

<b>-F</b>	
<b>Format</b>	-F "{ \"<feature_name>\":<feature_count>, ... }"
<b>Default</b>	---
<b>Description</b>	Allocated node features. Features represent counts of the node features allocated to the job.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Group name.

-L	
<b>Format</b>	-L "{ \"<license_name>\":<license_count>, ... }"
<b>Default</b>	---
<b>Description</b>	Licenses used. Licenses represent software licenses that are used (in integer units).

-J	
<b>Format</b>	-J <instance_name>
<b>Default</b>	---
<b>Description</b>	Instance name or job ID of the new usage record.

-m	
<b>Format</b>	-m <machine_name>
<b>Default</b>	---
<b>Description</b>	Name of the cluster.

-M	
<b>Format</b>	-M <memory>
<b>Default</b>	---
<b>Description</b>	Amount of memory used.

-n	
<b>Format</b>	-n <designated_name>
<b>Default</b>	---

<b>-n</b>	
<b>Description</b>	User-specified job name.

<b>-N</b>	
<b>Format</b>	-N <nodes>
<b>Default</b>	---
<b>Description</b>	Number of nodes used.

<b>-o</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Organization name.

<b>-P</b>	
<b>Format</b>	-P <processors>
<b>Default</b>	---
<b>Description</b>	Number of processors used.

<b>-Q</b>	
<b>Format</b>	-Q <quality_of_service>
<b>Default</b>	---
<b>Description</b>	Quality of service used.



<b>-R</b>	
<b>Format</b>	-R "{ \"<resource_name>\":<resource_count>, ... }"
<b>Default</b>	---
<b>Description</b>	Consumable resources allocated. Resources represent consumable resources that can be allocated (in integer units).

<b>-s</b>	
<b>Format</b>	-s <start_time>
<b>Default</b>	---
<b>Description</b>	Date and time the usage started in the format YYYY-MM-DD [hh:mm:ss]   -Infinity Infinity Now

<b>--stage</b>	
<b>Format</b>	--stage <lifecycle_stage>
<b>Default</b>	---
<b>Description</b>	Latest stage in the object's accounting lifecycle (Create, Start, Continue, End).

<b>-t</b>	
<b>Format</b>	-t <actual_duration>
<b>Default</b>	---
<b>Description</b>	Total actual duration (in seconds).

<b>-T</b>	
<b>Format</b>	-T <usage_record_type>

<b>-T</b>	
<b>Default</b>	---
<b>Description</b>	Usage record type (Job or reservation, for example).

<b>-u</b>	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	User name.

<b>-V</b>	
<b>Format</b>	-V "{ \"<variable_name>\": \"<variable_value>\", ... }"
<b>Default</b>	---
<b>Description</b>	Job variables. Variables represent arbitrary variables passed into the job.

<b>-W</b>	
<b>Format</b>	-W <requested_duration>
<b>Default</b>	---
<b>Description</b>	Total estimated wallclock duration (in seconds).

<b>-x</b>	
<b>Format</b>	-x <exit_code>
<b>Default</b>	---
<b>Description</b>	Exit code.

**-X, --extension**

<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Extension property. You can specify any number of extra field assignments.

**-Z**

<b>Format</b>	<code>-Z "{\"&lt;metric_name&gt;\":&lt;metric_amount&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	Generic metrics. Metrics represent floating point metrics of the job <i>or</i> average metrics values across the nodes in the job.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

**--man**

<b>Format</b>	<code>--man</code>
<b>Default</b>	---

**--man**

<b>Description</b>	Displays full documentation.
--------------------	------------------------------

**--quiet**

<b>Format</b>	<code>--quiet</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Suppresses headers and success messages.
--------------------	------------------------------------------

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Obtains a response from specified site.
--------------------	-----------------------------------------

**--verbose**

<b>Format</b>	<code>--verbose</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays modified object details.
--------------------	-----------------------------------

**--version**

<b>Format</b>	<code>--version</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays the product version.
--------------------	-------------------------------

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [14.1 Creating a Usage Record - page 106](#)
- [Appendix A: Commands Reference - page 332](#)

## A.12 mam-create-user

### A.12.1 Synopsis

```
mam-create-user {[-u] <user_name>} [-A | -I] [-n <common_name>] [--phone <phone_number>] [--email <email_address>] [-a <default_account>] [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.12.2 Overview

*mam-create-user* creates a new user.

### A.12.3 Options

-a	
<b>Format</b>	-a <default_account>
<b>Default</b>	---
<b>Description</b>	Account MAM will charge when no account is specified.

<b>-A</b>	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Activates the user.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	User description.

<b>--email</b>	
<b>Format</b>	--email <email_address>
<b>Default</b>	---
<b>Description</b>	Email address.

<b>-I</b>	
<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Deactivates the user.

<b>n</b>	
<b>Format</b>	-n <common_name>
<b>Default</b>	---
<b>Description</b>	Common name for the user.

<b>--phone</b>	
<b>Format</b>	<code>--phone &lt;phone_number&gt;</code>
<b>Default</b>	---
<b>Description</b>	Phone number.

<b>-u</b>	
<b>Format</b>	<code>[-u] &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	User's ID or name.

<b>-X, --extension &lt;property&gt;</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.



--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [7.1 Creating Users - page 58](#)
- [Appendix A: Commands Reference - page 332](#)

## A.13 mam-delete-account

### A.13.1 Synopsis

```
mam-delete-account {[-a] <account_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.13.2 Overview

*mam-delete-account* deletes an account.

### A.13.3 Options

-a	
<b>Format</b>	[-a] <account_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the account to be deleted.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [8.4 Deleting Accounts - page 66](#)
- [Appendix A: Commands Reference - page 332](#)

## A.14 mam-delete-allocation

### A.14.1 Synopsis

```
mam-delete-allocation {-I | {[-i] <allocation_id>}} [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [-
-version] [--about]
```

## A.14.2 Overview

*mam-delete-allocation* deletes an allocation or purges stale allocations.

## A.14.3 Options

**-i**

<b>Format</b>	<code>[-i] &lt;allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the allocation to be deleted.

**-I**

<b>Format</b>	<code>-I</code>
<b>Default</b>	---
<b>Description</b>	Deletes inactive allocations.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [11.5 Deleting Allocations - page 92](#)
- [Appendix A: Commands Reference - page 332](#)

## A.15 mam-delete-chargerate

### A.15.1 Synopsis

```
mam-delete-chargerate {[-n] <charge_rate_name>} [-x <charge_rate_value>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.15.2 Overview

*mam-delete-chargerate* deletes a charge rate.

### A.15.3 Options

-n	
<b>Format</b>	[-n] <charge_rate_name>
<b>Default</b>	---
<b>Description</b>	Specifies the charge rate to delete.

<b>-x</b>	
<b>Format</b>	<code>-x &lt;charge_rate_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the charge rate value to delete. If you do not specify a value, MAM will only delete a charge rate with an empty value.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---

**--quiet**

<b>Description</b>	Suppresses headers and success messages.
--------------------	------------------------------------------

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Obtains a response from specified site.
--------------------	-----------------------------------------

**--verbose**

<b>Format</b>	<code>--verbose</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays modified object details.
--------------------	-----------------------------------

**--version**

<b>Format</b>	<code>--version</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays the product version.
--------------------	-------------------------------

**--about**

<b>Format</b>	<code>--about</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays product information.
--------------------	-------------------------------



---

## Related Topics

- [16.5 Deleting Charge Rates - page 133](#)
- [Appendix A: Commands Reference - page 332](#)

# A.16 mam-delete-event

## A.16.1 Synopsis

```
mam-delete-event {[-E] <event_id>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.16.2 Overview

*mam-delete-event* deletes an event.

## A.16.3 Options

-E	
<b>Format</b>	[-E] <event_id>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the event to be deleted.

--debug	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [18.5 Deleting Events - page 140](#)
- [Appendix A: Commands Reference - page 332](#)

## A.17 mam-delete-fund

### A.17.1 Synopsis

```
mam-delete-fund {[-f] <fund_id>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.17.2 Overview

*mam-delete-fund* deletes a fund.

## A.17.3 Options

<b>-f</b>	
<b>Format</b>	<code>[-f] &lt;fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the fund to be deleted.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>

<b>--quiet</b>	
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

## Related Topics

- [10.11 Deleting Funds - page 84](#)
- [Appendix A: Commands Reference - page 332](#)

# A.18 mam-delete-lien

## A.18.1 Synopsis

```
mam-delete-lien {-I | {-J <instance_name>} | {[ -l ] <lien_id>}}
[--debug] [--site <site_name>] [--help] [--man] [--quiet] [--
verbose] [--version] [--about]
```

## A.18.2 Overview

*mam-delete-lien* deletes a lien or purges stale liens.

## A.18.3 Options

**-I**

<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Deletes expired liens.

**-J**

<b>Format</b>	-J <instance_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the liens with the specified instance name, or job ID, will be deleted.

<b>-l</b>	
<b>Format</b>	<code>[-l] &lt;lien_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the lien to be deleted.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [12.5 Deleting Liens - page 98](#)
- [Appendix A: Commands Reference - page 332](#)



## A.19 mam-delete-notification

### A.19.1 Synopsis

```
mam-delete-notification {[-N] notification_id} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.19.2 Overview

*mam-delete-notification* deletes a stored notification.

### A.19.3 Options

-N	
<b>Format</b>	-N <notification_id>
<b>Default</b>	---
<b>Description</b>	Deletes expired liens.

--debug	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

--help	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [19.2 Deleting Notifications - page 143](#)
- [Appendix A: Commands Reference - page 332](#)

## A.20 mam-delete-organization

### A.20.1 Synopsis

```
mam-delete-organization {[-o] <organization_name>} [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [-
-version] [--about]
```

### A.20.2 Overview

*mam-delete-organization* deletes an organization.

### A.20.3 Options

-o	
<b>Format</b>	[-o] <organization_name>
<b>Default</b>	---
<b>Description</b>	Specifies the organization to delete.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [9.4 Deleting Organizations - page 71](#)
- [Appendix A: Commands Reference - page 332](#)

## A.21 mam-delete-quote

### A.21.1 Synopsis

```
mam-delete-quote {-I | {[-q] <quote_id>}} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.21.2 Overview

`mam-delete-quote` deletes a quote or purges expired quotes.

## A.21.3 Options

**-I**

<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Deletes expired quotes.

**-q**

<b>Format</b>	[-q] <quote_id>
<b>Default</b>	---
<b>Description</b>	Specifies the quote to be deleted.

**--debug**

<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [13.6 Deleting Quotes - page 104](#)
- [Appendix A: Commands Reference - page 332](#)

## A.22 mam-delete-role

### A.22.1 Synopsis

```
mam-delete-role {[-r] <role_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.22.2 Overview

*mam-delete-role* deletes a role.

### A.22.3 Options

-r	
<b>Format</b>	[-r] <role_name>
<b>Default</b>	---
<b>Description</b>	Specifies the role to delete.



<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [20.4 Deleting Roles - page 148](#)
- [Appendix A: Commands Reference - page 332](#)

## A.23 mam-delete-usagerecord

### A.23.1 Synopsis

```
mam-delete-usagerecord {[-j] <usage_record_id> | -J <instance_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.23.2 Overview

`mam-delete-usagerecord` deletes a usage record.

## A.23.3 Options

**-j**

<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the usage record to delete. Instance names can be non-unique, because resource managers often recycle job IDs. This option enables specifying a unique usage record using the unique identifier.

**-J**

<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the instance name (e.g., job ID) to delete. Since instance names are assigned externally and can be non-unique (such as job IDs assigned by a resource manager), all usage records with the specified instance name will be deleted.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
---------------	---------------------

<b>--help</b>	
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [14.4 Deleting a Usage Record - page 109](#)
- [Appendix A: Commands Reference - page 332](#)

## A.24 mam-delete-user

### A.24.1 Synopsis

```
mam-delete-user {[-u] <user_name>} [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.24.2 Overview

*mam-delete-user* deletes a user.

## A.24.3 Options

**-u**

<b>Format</b>	<code>[-u] &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the user to delete.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

**--man**

<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

**--quiet**

<b>Format</b>	<code>--quiet</code>
---------------	----------------------

<b>--quiet</b>	
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [7.4 Deleting Users - page 60](#)
- [Appendix A: Commands Reference - page 332](#)

# A.25 mam-deposit

## A.25.1 Synopsis

```
mam-deposit [-f <fund_id>] [-i <allocation_id>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--filterType ExactMatch|Exclusive|NonExclusive] [[-z] <deposit_amount>] [-L <credit_limit>] [-s <start_time>] [-e <end_time>] [--reset] [-d <description>] [--create-fund True|False] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.25.2 Overview

*mam-deposit* makes time-bound deposits into funds. After applying all filter options, if there is exactly one debitible fund for the specified criteria, a deposit will be made into that fund. If multiple funds match the specified criteria, a list of matching funds will be displayed, and you will be prompted to respecify the deposit against one of the enumerated funds. If no funds match your criteria, if auto-generation is turned on for the fund object, or the `--create-fund` flag is asserted, a fund will be created and a deposit made into it; otherwise, the deposit will fail (the fund will need to be created with `mam-create-fund`).

The `--reset` option can be used to end the current allocation and create a new allocation with the deposit:

- If an amount is not specified for the deposit, the fund's default deposit amount will be used.
- A zero amount or a default deposit amount will result in the creation of an allocation with a zero balance (or add nothing if an allocation already exists and a reset is not being requested).



- A negative default deposit amount can be used to stipulate that the allocations in the fund should be ended if the fund is reset.
- An empty default deposit amount stipulates that no change will be made to the allocations if the fund is reset.

### A.25.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Restricts the fund for the deposit to one usable by the specified account.

-c	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Restricts the fund for the deposit to one usable by the specified class.

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies the reason for the deposit. The annotation applies to the transaction description (seen via <a href="#">mam-list-transactions</a> ), not the allocation description.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	Infinity

<b>-e</b>	
<b>Description</b>	Specifies the end time for the allocation to be credited in the format YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now

<b>-f</b>	
<b>Format</b>	-f <fund_id>
<b>Default</b>	Infinity
<b>Description</b>	Specifies the ID of the fund into which the deposit will be made.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the deposit should be restricted to one usable by the specified group.

<b>-i</b>	
<b>Format</b>	-i <allocation_id>
<b>Default</b>	---
<b>Description</b>	Specifies the allocation in which to make the deposit. This option is incompatible with the <a href="#">-L</a> option.

<b>-L</b>	
<b>Format</b>	-L <credit_limit>
<b>Default</b>	---
<b>Description</b>	Creates a new allocation with the specified credit limit. This option is incompatible with the <a href="#">-i</a> option.

-m	
<b>Format</b>	-m <machine_name>
<b>Default</b>	---
<b>Description</b>	Restricts the fund for the deposit to one usable by the specified machine.

-o	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Restricts the fund for the deposit to one usable by the specified organization.

-s	
<b>Format</b>	-s <start_time>
<b>Default</b>	Infinity
<b>Description</b>	Specifies the start time for the allocation to be credited in the format YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now

-u	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	Restricts the fund for the deposit to one usable by the specified user.

-z	
<b>Format</b>	[-z] <deposit_amount>
<b>Default</b>	---

**-z**

<b>Description</b>	Specifies the amount to deposit.
--------------------	----------------------------------

**--create-fund**

<b>Format</b>	<code>--create-fund True False</code>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Overrides the fund auto-generation setting. Setting this option to <code>True</code> creates a default fund for this deposit. Setting this option to <code>False</code> inhibits the creation of a default fund for this deposit.
--------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--hours**

<b>Format</b>	<code>--hours</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Treats currency as specified in hours. In systems where the currency is measured in resource-seconds (like processor-seconds), this option allows you to specify the amount and credit limit in resource-hours.
--------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--debug**

<b>Format</b>	<code>--debug</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Logs debug information to the screen.
--------------------	---------------------------------------

**--filter**

<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
---------------	----------------------------------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Restricts the fund to one where constraints do not conflict with the specified
--------------------	--------------------------------------------------------------------------------

**--filter**

filters. For example, `mam-modify-fund --filter User=amy` restricts the fund to one usable by the user `amy`. You can specify multiple filter options by logically ANDing them together.

**--filter-type****Format**

`--filter-type ExactMatch|Exclusive|NonExclusive`

**Default**

`NonExclusive`

**Description**

Specifies the filtering type:

- If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.
- If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).
- If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.

**--help****Format**

`--help`

**Default**

---

**Description**

Displays a brief help message.

**--man****Format**

`--man`

**Default**

---

**Description**

Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--reset</b>	
<b>Format</b>	<code>--reset</code>
<b>Default</b>	---
<b>Description</b>	Ends the current allocation and creates a new allocation with the deposit.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [10.5 Making Deposits - page 78](#)
- [Appendix A: Commands Reference - page 332](#)

## A.26 mam-list-accounts

### A.26.1 Synopsis

```
mam-list-accounts [[-a] <account_pattern>] [-A | -I] [-o <organization_name>] [-X, --extension <property>=<value>]... [-u <user_name>] [--full] [--show <attribute_name>,...] [--long] [--wide] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.26.2 Overview

*mam-list-accounts* displays account information.

You can customize the fields this command displays by default by setting the `account.show` configuration parameter in `mam-client.conf`.

### A.26.3 Options

-a	
<b>Format</b>	[-a] <account_pattern>

<b>-a</b>	
<b>Default</b>	---
<b>Description</b>	Displays only accounts matching the pattern. Supported wildcards: * Matches any number of characters. ? Matches a single character. If no pattern is specified then all accounts are displayed.

<b>-A</b>	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Displays only active accounts.

<b>-I</b>	
<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Displays only inactive accounts.

<b>-o</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Displays only accounts belonging to the specified organization.

<b>-u</b>	
<b>Format</b>	-u <user_name>
<b>Default</b>	---



<b>-u</b>	
<b>Description</b>	Displays only accounts that have the specified user as a member.

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	<code>--format csv raw standard</code>
<b>Default</b>	standard
<b>Description</b>	Specifies the data output format.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--long</b>	
<b>Format</b>	<code>--long</code>
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---

<b>--show</b>	
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Active</code> - Boolean indicating whether this account is active or not.</li> <li>• <code>CreationTime</code> - Time this account was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this account is deleted or not.</li> <li>• <code>Description</code> - Account description.</li> <li>• <code>ModificationTime</code> - Time this account was last modified.</li> <li>• <code>Name</code> - Account name.</li> <li>• <code>Organization</code> - Organization to which the account belongs.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> <li>• <code>TransactionId</code> - ID of the last modifying transaction.</li> <li>• <code>Users</code> - List of users belonging to the account. A caret prefixing a user name indicates that the user is an account admin. A minus sign prefixing a user name indicates that the user is an inactive member of the account.</li> </ul>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--wide</b>	
<b>Format</b>	<code>--wide</code>
<b>Default</b>	---

**--wide**

<b>Description</b>	Wide format. Displays multi-valued fields in a single-line, comma-separated format.
--------------------	-------------------------------------------------------------------------------------

**--about**

<b>Format</b>	--about
---------------	---------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays product information.
--------------------	-------------------------------

**Related Topics**

- [8.2 Querying Accounts - page 64](#)
- [Appendix A: Commands Reference - page 332](#)

## A.27 mam-list-allocations

### A.27.1 Synopsis

```
mam-list-allocations [[-i] <allocation_id>] [-f <fund_id>] [-A
| -I | {[ -s <start_time>] [-e <end_time>]}] [-X, --extension
<property>=<value>]... [-u <user_name>] [-g <group_name>] [-
a <account_name>] [-o <organization_name>] [-c <class_name>]
[-m <machine_name>] [--filter <filter_name>=<filter_value>]...
[--filter-type ExactMatch|Exclusive|NonExclusive] [--include-
ancestors] [--full] [--show <attribute_name>,...] [--format
csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--
help] [--man] [--quiet] [--version] [--about]
```

### A.27.2 Overview

*mam-list-allocations* displays allocation information.

You can customize the fields this command displays by default by setting the `allocation.show` configuration parameter in `mam-client.conf`.

### A.27.3 Options

-a	
<b>Format</b>	<code>-a &lt;account_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations usable by the specified account.

-A	
<b>Format</b>	<code>-A</code>
<b>Default</b>	---
<b>Description</b>	Displays only active allocations.

-c	
<b>Format</b>	<code>-c &lt;class_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations usable by the specified class.

-e	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations that start before the specified end time in the format <code>YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now</code>

**-f**

<b>Format</b>	<code>-f &lt;fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the allocations associated with the specified fund.

**-g**

<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations usable by the specified group.

**-i**

<b>Format</b>	<code>[-i] &lt;allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the allocation with the specified ID.

**-I**

<b>Format</b>	<code>-I</code>
<b>Default</b>	---
<b>Description</b>	Displays only inactive allocations.

**-m**

<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations usable by the specified machine.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only accounts usable to the specified organization.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations that end after the specified start time in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only allocations usable by the specified user.

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>

<b>--debug</b>	
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays allocations where fund constraints comply with the specified filters. For example, <code>mam-list-funds --filter User=amy</code> displays funds usable by the user <code>amy</code> . You can specify multiple filter options by logically ANDing them together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	<code>NonExclusive</code>
<b>Description</b>	Specifies the filtering type: <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--format</b>	
<b>Format</b>	<code>--format csv raw standard</code>
<b>Default</b>	<code>standard</code>
<b>Description</b>	Specifies a data output format.



<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--include-ancestors</b>	
<b>Format</b>	<code>--include-ancestors</code>
<b>Default</b>	---
<b>Description</b>	Includes ancestors of the selected allocations.

<b>--man</b>	
<b>Format</b>	<code>--man</code>

<b>--man</b>	
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the order you specify. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Active</code> - Boolean indicating whether this allocation is active or not.</li> <li>• <code>Adjustments</code> - Total of subsequent adjustments to the initial deposit via deposits, withdrawals or transfers (<code>Allocated</code> - <code>InitialDeposit</code>).</li> <li>• <code>Allocated</code> - Adjusted allocation. This value stores the effective allocated amount based on the initial deposit and subsequent allocation adjustments via deposits, withdrawals or transfers.</li> <li>• <code>Available</code> - Amount currently available for charging. If the allocation is active, this is <code>Remaining</code> - <code>Reserved</code> + <code>CreditLimit</code>. If the allocation is inactive, this is zero.</li> <li>• <code>Balance</code> - Active allocation balance. If the allocation is active, this is the remaining allocation amount (<code>Remaining</code>). If the allocation is inactive, this is zero.</li> <li>• <code>Capacity</code> - Total expendable amount (<code>Allocated</code> + <code>CreditLimit</code>).</li> <li>• <code>CreationTime</code> - Time this allocation was created.</li> <li>• <code>CreditLimit</code> - Determines how far in the negative this allocation is permitted to be used (enforced in quotes and liens).</li> <li>• <code>Deleted</code> - Boolean indicating whether this allocation is deleted or not.</li> <li>• <code>Description</code> - Allocation description.</li> <li>• <code>Effective</code> - Effective balance not blocked by liens. If the allocation is</li> </ul>

**--show**

active, this is Remaining - Reserved. If the allocation is inactive, this is zero.

- EndTime - Time this allocation becomes inactive.
- Fund - Fund ID.
- FundName - Fund name.
- Id - Allocation ID.
- InitialDeposit - Amount of the first deposit into this allocation.
- ModificationTime - Time this allocation was last modified.
- PercentRemaining - Percentage of allocation remaining (remaining \* 100 / Capacity).
- PercentUsed - Percentage of allocation used (Used \* 100 / Capacity).
- Remaining - Remaining allocation amount.
- RequestId - ID of the last modifying request.
- Reserved - Sum of active lien amounts against this allocation.
- StartTime - Time this allocation becomes active.
- TransactionId - ID of the last modifying transaction.
- Used - Amount used from this allocation (Allocated - Remaining).

Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form of `operator(attribute_name) [=alias]`. Valid operators include Sum, Average, Count, Min, Max and GroupBy. When an operator is specified, fields without an explicit operator are assumed to have the GroupBy operator.

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---

--version	
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [11.3 Querying Allocations - page 91](#)
- [Appendix A: Commands Reference - page 332](#)

## A.28 mam-list-chargerates

### A.28.1 Synopsis

```
mam-list-chargerates [[-n] <charge_rate_name>] [-x <charge_rate_value>] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.28.2 Overview

*mam-list-chargerates* displays charge rate information.

## A.28.3 Options

**-n**

<b>Format</b>	<code>[-n] &lt;charge_rate_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only charge rates of the specified name.

**-x**

<b>Format</b>	<code>-x &lt;charge_rate_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only charge rates having the specified value.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--format**

<b>Format</b>	<code>--format &lt;output_format&gt;</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

**--full**

<b>Format</b>	<code>--full</code>
---------------	---------------------

<b>--full</b>	
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	Displays only the specified attributes in the order specified. Valid attributes: <ul style="list-style-type: none"> <li>Amount – Charge rate amount. The amount is an integer or decimal</li> </ul>

**--show**

number and can include operators indicating how to apply the charge rate, as well as divisors and time-based units. See [Managing Charge Rates](#) for more information.

- `CreationTime` - Time this charge rate was created.
- `Deleted` - Boolean indicating whether this charge rate is deleted or not.
- `Description` - Charge rate description.
- `ModificationTime` - Time this charge rate was last modified.
- `Name` - Charge rate name (such as Processors or License).
- `RequestId` - ID of the last modifying request.
- `TransactionId` - ID of the last modifying transaction.
- `Value` - Charge rate value. For name-valued charge rates this is the usage property value corresponding to the rate. For numeric-valued charge rates this is the range of values corresponding to the rate. A blank value will function as a default charge rate. See [Managing Charge Rates](#) for more information.

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

**--about**

<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

**Related Topics**

- [16.3 Querying Charge Rates - page 132](#)
- [Appendix A: Commands Reference - page 332](#)

## A.29 mam-list-events

### A.29.1 Synopsis

```
mam-list-events [[-E] <event_id>] [-s <start_time>] [-e <end_time>] [--full] [--show <attribute_name>,...] [--format <csv|raw|standard>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.29.2 Overview

*mam-list-events* displays event information.

You can customize the fields this command displays by default by setting the `event.show` configuration parameter in `mam-client.conf`.

### A.29.3 Options

<b>-e</b>	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays events with a prospective fire time occurring before the specified time in the format <code>YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now</code>

<b>-E</b>	
<b>Format</b>	<code>[-E] &lt;event_id&gt;</code>
<b>Default</b>	---



<b>-E</b>	
<b>Description</b>	Displays only the event with the specified ID.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays events with a prospective fire time occurring after the specified time in the format <code>YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now</code>

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	<code>--format csv raw standard</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>ArmTime</code> - Time the event was last armed or fired. This field is used as a reference time to be able to derive how long the event has been waiting to happen. This field will be initially set to mark the moment the first <code>FireTime</code> is set and updated thereafter to indicate the last time the event was fired. In the case where an event does not have a <code>FireTime</code> set, this field can be set manually and used in a similar manner. If we consider the time between event firings as "laps," this could be thought of as the Lap Start Time.</li> </ul>

**--show**

- `CatchUp` - If set to `True` and MAM was down during the time this event should have fired, MAM will attempt to make up for the past due events by progressively firing them (rearming based on previous arm time) until catching up to the present. The actions will still show as having occurred in the present rather than in the past. If set to `False`, and MAM is brought back up after an outage, MAM will still fire immediately for a past due event, but it will only fire once and then rearm relative to the current time.
- `CreationTime` - Time this event was created.
- `Deleted` - Boolean indicating whether this event is deleted or not.
- `Description` - Event description.
- `EndTime` - Time after which an event having a rearm period will be deleted.
- `FailureCommand` - Serialized MAM request string to be executed if the fired command results in an unsuccessful response status. They syntax is the same as used to invoke commands within the mam-shell prompt.
- `FireCommand` - Serialized MAM request string to be executed when the event is fired. They syntax is the same as used to invoke commands within the mam-shell prompt.
- `FireTime` - Target time for the event to be triggered. The actual fire time may be dependent on the state of the server and will be recorded in the `CreationTime` property of the corresponding 'Event Fire' Transaction.
- `Id` - Event ID.
- `ModificationTime` - Time this event was last modified.
- `Notify` - Expression specifying where to send a notification of the response for the fire command and the failure command. The notification expression is of the form: `[+|=] [delivery_method:] [recipient] [, [+|=] [delivery_method:] [recipient]]*` (For example, `-store:amy`). If the term is a `-`, the notification is sent only on failure. If the term is a `+`, the notification is sent only on success. Otherwise the notification is always sent. There can be multiple notify expressions separated by a comma.
- `RearmPeriod` - Time period expression specifying when the event will be rearmed. This period expression is of the form: `period [[@instant] [~|^] | !]` where period can be something like 1 day, 2 hours, or 5 minutes. Instant locks the period to a specific instant within the time period such as 1 day @ hour 12 or 1 month @ day 3. The modifiers indicate whether the time period should be relative to now (!), or relative to the start of this (~) designator (month or minute, etc.), or relative to the start of the first (^) designator (month or minute, etc.).
- `RearmOnFailure` - If set to `False`, the event will not be rearmed if the command was unsuccessful. If set to `True`, the event will be evaluated for rearming even if the command response has a status of Failure. The standard default value for this boolean is `False`.

**--show**

- RequestId - ID of the last modifying request.
- TransactionId - ID of the last modifying transaction.

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

**--about**

<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [18.3 Querying Events - page 139](#)
- [Appendix A: Commands Reference - page 332](#)

## A.30 mam-list-funds

### A.30.1 Synopsis

```
mam-list-funds [[-f] <fund_id>] [-A | -I] [-n <fund_name>] [-X, --extension <property>=<value>]... [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--filter-type ExactMatch|Exclusive|NonExclusive] [--full] [--show <attribute_name>,...] [--long] [--wide] [--format csv|raw|standard] [--hours] [--debug] [--site <site_man>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.30.2 Overview

`mam-list-funds` displays fund information.

You can customize the fields this command displays by default by setting the `fund.show` configuration parameter in `mam-client.conf`.

### A.30.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Displays only funds valid toward the specified account.

-A	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Displays funds with active allocations.

<b>-c</b>	
<b>Format</b>	<code>-c &lt;class_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only funds usable by the specified class.

<b>-f</b>	
<b>Format</b>	<code>[-f] &lt;fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the funds with the specified ID.

<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only funds usable by the specified group.

<b>-I</b>	
<b>Format</b>	<code>-I</code>
<b>Default</b>	---
<b>Description</b>	Displays only funds with inactive allocations.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only funds valid toward the specified machine.

<b>-n</b>	
<b>Format</b>	-n <fund_name>
<b>Default</b>	---
<b>Description</b>	Displays only funds with the specified name.

<b>-o</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Displays only funds valid toward the specified organization.

<b>-u</b>	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	Displays only funds valid toward the specified user.

<b>-X</b>	
<b>Format</b>	-X or --extension <property>=<value>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---

<b>--debug</b>	
<b>Description</b>	Logs debug information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays funds where constraints do not conflict with the specified filters. For example, <code>mam-list-funds -f User=amy</code> displays funds usable by the user amy. You can specify multiple filter options by logically ANDing them together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	NonExclusive
<b>Description</b>	Specifies the filtering type: <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--format</b>	
<b>Format</b>	<code>--format csv raw standard &lt;output_format&gt;</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.



<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--long</b>	
<b>Format</b>	<code>--long</code>
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---

<b>--hours</b>	
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <b>Allocated</b> - Adjusted allocation. This value stores the effective allocated amount based on the initial deposit and subsequent allocation adjustments via deposits, withdrawals or transfers.</li> <li>• <b>Allocations</b> - Lists the active allocations in this fund in the format <code>id:amount:start_time:end_time</code>.</li> <li>• <b>Balance</b> - Sum of active allocation amounts within this fund.</li> <li>• <b>Children</b> - Lists the children funds in the format <code>id[(deposit_share)][^]</code> where the carat symbol (^) is displayed if <code>Overflow</code> is <code>True</code>.</li> <li>• <b>Constraints</b> - Constraints on fund usage.</li> <li>• <b>CreationTime</b> - Time this fund was created.</li> <li>• <b>CreditLimit</b> - Sum of active credit limits within this fund.</li> <li>• <b>DefaultDeposit</b> - Used as the default amount for any deposit that is made to this fund that does not specify a deposit amount. A zero value will result in the creation of an allocation with a zero balance (or add nothing if an allocation already exists and a reset is not being requested). A negative value can be used to stipulate that the allocations in the fund should be ended if the fund is reset. An empty value is used to stipulate that no change will be made to the allocations if the fund is reset.</li> <li>• <b>Deleted</b> - Boolean indicating whether this fund is deleted or not.</li> </ul>

**--show**

- Description - Fund description.
- Id - Fund ID.
- InitialDeposit - Initial deposit for current allocation.
- ModificationTime - Time this fund was last modified.
- Name - Fund name.
- Parent - Displays the parent fund in the format `id[(deposit_share)][^]` where the carat symbol (^) is displayed if Overflow is True.
- Priority - Fund priority.
- RequestId - ID of the last modifying request.
- TransactionId - ID of the last modifying transaction.

Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form: `operator(attribute_name)[=alias]`. Valid operators include Sum, Average, Count, Min, Max and GroupBy. When an operator is specified, fields without an explicit operator are assumed to have the GroupBy operator.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>

--about	
<b>Default</b>	---
<b>Description</b>	Displays product information.

--wide	
<b>Format</b>	--wide
<b>Default</b>	---
<b>Description</b>	Wide format. Displays multi-valued fields in a single-line comma-separated format.

---

### Related Topics

- [10.3 Querying Funds - page 76](#)
- [Appendix A: Commands Reference - page 332](#)

## A.31 mam-list-itemizedcharges

### A.31.1 Synopsis

```
mam-list-itemizedcharges [-j <usage_record_id>] [-J <instance_name>] [-n <usage_property_name>] [-s <start_time>] [-e <end_time>] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.31.2 Overview

*mam-list-itemizedcharges* displays allocation information.

### A.31.3 Options

**-e**

**Format** -e <end\_time>

**Default** ---

**Description** Displays charges occurring before the specified time in the format YYYY-MM-DD[hh:mm:ss]|-Infinity|Infinity|Now

**-j**

**Format** -j <usage\_record\_id>

**Default** ---

**Description** Displays only charges associated with the specified usage record.

**-J**

**Format** -J <instance\_name>

**Default** ---

**Description** Displays only charges against the specified instance (such as a job ID).

**-n**

**Format** -n <usage\_record\_property\_name>

**Default** ---

**Description** Displays only charges against the specified usage property.

**-s**

**Format** -s <start\_time>

<b>-s</b>	
<b>Default</b>	---
<b>Description</b>	Displays charges occurring after the specified time in the format YYYY-MM-DD [hh:mm:ss]   -Infinity Infinity Now

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	--format csv raw standard
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format.

<b>--hours</b>	
<b>Format</b>	--hours
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--full</b>	
<b>Format</b>	--full
<b>Default</b>	---

--full	
<b>Description</b>	Displays all attributes.

--help	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

--man	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

--quiet	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

--show	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• Amount - Amount charged.</li> <li>• CreationTime - Time this charge was created.</li> <li>• Deleted - Boolean indicating whether this allocation is deleted or not.</li> </ul>

**--show**

- `Description` - Charge description.
- `Details` - Details of the formula used in calculating the charge.
- `Duration` - Amount of time the item was used in seconds.
- `Instance` - Instance name (such as job ID) for the charge.
- `ModificationTime` - Time this charge was last modified.
- `Name` - Usage record property name (also charge rate name).
- `Rate` - Base charge rate.
- `RequestId` - ID of the last modifying request.
- `ScalingFactor` - Product of all applicable multipliers (discounts and premiums) applied to the base rate.
- `TransactionId` - ID of the last modifying transaction.
- `UsageRecord` - Usage record ID.
- `Value` - Usage record property value.

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

**--about**

<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.



## Related Topics

- [15.1 Querying Itemized Charges - page 124](#)
- [Appendix A: Commands Reference - page 332](#)

## A.32 mam-list-liens

### A.32.1 Synopsis

```
mam-list-liens [[-l] <lien_id>] [-A | -I] [-J <instance_
pattern>] [-X, --extension <property>=<value>]... [-u <user_
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filter-
type AttributedTo|ImpingesUpon] [--full] [--show <attribute_
name>,...] [--long] [--wide] [--format csv|raw|standard] [--
hours] [--debug] [--site <site_name>] [--help] [--man] [--
quiet] [--version] [--about]
```

### A.32.2 Overview

*mam-list-liens* displays lien information.

You can customize the fields this command displays by default by setting the `lien.show` configuration parameter in `mam-client.conf`.

### A.32.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified account.

<b>-A</b>	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Displays only unexpired liens.

<b>-c</b>	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified class.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified group.

<b>-I</b>	
<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Displays only expired liens.

<b>-J</b>	
<b>Format</b>	-J <instance_pattern>
<b>Default</b>	---
<b>Description</b>	Displays only liens with the instance names (or job IDs) matching the pattern.

l	
<b>Format</b>	<code>[-l] &lt;lien_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the specified lien.

-m	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified machine.

-o	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified organization.

-u	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only liens against the specified user.

-X	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---

**-X**

<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.
--------------------	-----------------------------------------------------------------------------------------

**--debug**

<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--filter**

<b>Format</b>	--filter <filter_name>=<filter_value>
<b>Default</b>	---
<b>Description</b>	Displays liens where constraints do not conflict with the specified filters. For example, <code>mam-list-liens -f User=amy</code> will display liens usable by the user amy. You can specify multiple filter options by logically ANDing them together.

**--filter-type**

<b>Format</b>	--filter-type <filter_type>
<b>Default</b>	AttributedTo
<b>Description</b>	Selects the filtering type. If you use the <code>AttributedTo</code> filter type, the query returns all liens associated with usage records satisfying the filters. If you use the <code>ImpingesUpon</code> filter type, the query returns all liens affecting the balances of funds satisfying the filters.

**--format**

<b>Format</b>	--format <output_format>
<b>Default</b>	standard

<b>--format</b>	
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	--full
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--long</b>	
<b>Format</b>	--long
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--hours</b>	
<b>Format</b>	--hours
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the order specified. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Allocations</code> - List of allocations that the lien has holds against in the format <code>&lt;allocation_id&gt;&lt;-&lt;fund_id&gt;=&lt;reserved_amount&gt;</code>.</li> <li>• <code>Amount</code> - Reserved amount.</li> <li>• <code>CreationTime</code> - Time this lien was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this lien is deleted or not.</li> <li>• <code>Description</code> - Lien description.</li> <li>• <code>Duration</code> - Expected duration of the reserved usage in seconds.</li> <li>• <code>EndTime</code> - Time the lien becomes inactive.</li> <li>• <code>Funds</code> - List of funds that the lien has holds against.</li> <li>• <code>Id</code> - Lien ID.</li> <li>• <code>Instance</code> - The lien is against the specified instance (for instance, job ID).</li> <li>• <code>ModificationTime</code> - Time this lien was last modified.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> </ul>

**--show**

- StartTime - Time the lien becomes active.
- TransactionId - ID of the last modifying transaction.
- UsageRecord - ID of the usage record associated with the lien and containing the usage properties.

Additionally, unambiguous usage record properties can also be specified for display (User, Group, Account, Organization, Class, QualityOfService, Machine, Nodes, Processors, Memory, etc.).

Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form of `operator(attribute_name) [=alias]`. Valid operators include Sum, Average, Count, Min, Max and GroupBy. When an operator is specified, fields without an explicit operator are assumed to have the GroupBy operator.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

--wide	
<b>Format</b>	--wide
<b>Default</b>	---
<b>Description</b>	Wide format. Displays multi-valued fields in a single-line comma-separated format.

---

### Related Topics

- [12.3 Querying Liens - page 97](#)
- [Appendix A: Commands Reference - page 332](#)

## A.33 mam-list-notifications

### A.33.1 Synopsis

```
mam-list-notifications [[-N] <notification_id>] [-E <event_id>] [-T <notification_type>] [-k <primary_key_value>] [-u <recipient>] [-x <status>] [-s <start_time>] [-e <end_time>] [--delete] [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.33.2 Overview

*mam-list-notifications* displays stored notification information.

You can customize the fields this command displays by default by setting the `notification.show` configuration parameter in `mam-client.conf`.



### A.33.3 Options

<b>-e</b>	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the notifications sent before the specified time in the format YYYY-MM-DD[hh:mm:ss]   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>-E</b>	
<b>Format</b>	<code>-E &lt;event_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the notifications associated with the specified event ID.

<b>-k</b>	
<b>Format</b>	<code>-k &lt;primary_key_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the notifications associated with the specified primary key value. This value of the primary key of the object instance that the command acted on.

<b>-N</b>	
<b>Format</b>	<code>[-N] &lt;notification_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only the notifications with the specified ID.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays notifications sent after the specified time in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>-x</b>	
<b>Format</b>	<code>-x &lt;status&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays notifications having the specified status (such as Success or Failure).

<b>-T</b>	
<b>Format</b>	<code>-T &lt;notification_type&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays notifications of the specified type (such as Fire or Failure).

<b>-u</b>	
<b>Format</b>	<code>-u &lt;recipient&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays notifications having the specified recipient. This could be a user name or any tag that identifies the intended reader of this notification.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---

<b>--debug</b>	
<b>Description</b>	Logs debug information to the screen.

<b>--delete</b>	
<b>Format</b>	--delete
<b>Default</b>	---
<b>Description</b>	Deletes a notification after it has been queried.

<b>--format</b>	
<b>Format</b>	--format <output_format>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	--full
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Code</code> - Event command exit code.</li> <li>• <code>CreationTime</code> - Time this notification was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this notification is deleted or not.</li> <li>• <code>EndTime</code> - Time after which a notification will be detected.</li> <li>• <code>Event</code> - Event ID.</li> <li>• <code>Key</code> - Object primary key value.</li> <li>• <code>Id</code> - Notification ID.</li> <li>• <code>Message</code> - Event command message.</li> <li>• <code>ModificationTime</code> - Time this notification was last modified.</li> <li>• <code>Recipient</code> - Recipient to notify.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> <li>• <code>Status</code> - Event command status.</li> <li>• <code>TransactionId</code> - ID of the last modifying transaction.</li> <li>• <code>Type</code> - Displays the type of notification. Notifications can be created by event 'Fire' commands or by event 'Failure' commands.</li> </ul>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [19.1 Querying Notifications - page 142](#)
- [Appendix A: Commands Reference - page 332](#)

## A.34 mam-list-organizations

### A.34.1 Synopsis

```
mam-list-organizations [[-o] <organization_pattern>] [-X, --extension <property>=<value>]... [--full] [--show <attribute_name>, ...] [--format csv|raw|standard] [--debug] [--
```

```
site <site_man>] [--help] [--man] [--quiet] [--version] [--about]
```

## A.34.2 Overview

`mam-list-organizations` displays organization information.

You can customize the fields this command displays by default by setting the `organization.show` configuration parameter in `mam-client.conf`.

## A.34.3 Options

**-o**

<b>Format</b>	<code>-o &lt;organization_pattern&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only organizations matching the pattern. If no pattern is specified then all organizations are displayed. The following wildcards are supported: * - matches any number of characters ? - matches a single character

**-X**

<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Extension property. You can specify any number of extra custom conditions .

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	<code>--format &lt;output_format&gt;</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the order you specify. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>CreationTime</code> - Time this organization was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this organization is deleted or not.</li> <li>• <code>Description</code> - Organization description.</li> <li>• <code>ModificationTime</code> - Time this organization was last modified.</li> <li>• <code>Name</code> - Organization name.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> <li>• <code>TransactionId</code> - ID of the last modifying transaction.</li> </ul>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.



## Related Topics

- [9.2 Querying Organizations - page 70](#)
- [Appendix A: Commands Reference - page 332](#)

# A.35 mam-list-quotes

## A.35.1 Synopsis

```
mam-list-quotes [[-q] <quote_id>] [-J <instance_name>] [-A | -I] [-X, --extension <property>=<value>]... [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--full] [--show <attribute_name>,...] [--long] [--wide] [--format csv|raw|standard] [--hours] ] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

## A.35.2 Overview

*mam-list-quotes* displays quote information.

You can customize the fields this command displays by default by setting the `quote.show` configuration parameter in `mam-client.conf`.

## A.35.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified account.

<b>-A</b>	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Displays only unexpired quotes.

<b>-c</b>	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified class.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified group.

<b>-I</b>	
<b>Format</b>	-I
<b>Default</b>	---
<b>Description</b>	Displays only expired quotes.

<b>-J</b>	
<b>Format</b>	-J <instance_name>
<b>Default</b>	---
<b>Description</b>	Displays only quotes with the specified instance name or job ID.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified machine.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified organization.

<b>-q</b>	
<b>Format</b>	<code>[-q] &lt;quote_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only information for the specified quote.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only quotes for the specified user.

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---

**-X**

<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.
--------------------	-----------------------------------------------------------------------------------------

**--debug**

<b>Format</b>	--debug
---------------	---------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Logs debug information to the screen.
--------------------	---------------------------------------

**--filter**

<b>Format</b>	--filter <filter_name>=<filter_value>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays quotes where constraints do not conflict with the specified filters. For example, <code>mam-list-quotes --filter User=amy</code> will display funds usable by the user amy. You can specify multiple filter options by logically ANDing them together.
--------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--format**

<b>Format</b>	--format <output_format>
---------------	--------------------------

<b>Default</b>	standard
----------------	----------

<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.
--------------------	--------------------------------------------------------------------------

**--full**

<b>Format</b>	--full
---------------	--------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays all attributes.
--------------------	--------------------------

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--long</b>	
<b>Format</b>	<code>--long</code>
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---

<b>--quiet</b>	
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Amount</code> - Quoted amount.</li> <li>• <code>ChargeRate</code> - Saved charge rates to be used when the quote is referenced. These are displayed in the format <code>&lt;charge_rate_name&gt; [{&lt;charge_rate_value&gt;}]=&lt;charge_rate_amount&gt;</code></li> <li>• <code>CreationTime</code> - Time this quote was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this quote is deleted or not.</li> <li>• <code>Description</code> - Quote description.</li> <li>• <code>Duration</code> - Expected duration of the quoted usage in seconds.</li> <li>• <code>EndTime</code> - Time the quote becomes inactive.</li> <li>• <code>Id</code> - Quote ID.</li> <li>• <code>Instance</code> - The quote can only be used by the specified instance.</li> <li>• <code>ModificationTime</code> - Time this quote was last modified.</li> <li>• <code>Pinned</code> - Boolean indicating whether the quote is pinned or not.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> <li>• <code>StartTime</code> - Time the quote becomes active.</li> <li>• <code>TransactionId</code> - ID of the last modifying transaction.</li> <li>• <code>UsageRecord</code> - ID of the usage record associated with the quote and containing the usage properties.</li> </ul> <p>Additionally, unambiguous usage record properties can also be specified for display (User, Group, Account, Organization, Class, QualityOfService, Machine, Nodes, Processors, Memory, etc.).</p> <p>Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form of <code>operator(attribute_name) [=alias]</code>. Valid operators include Sum, Average, Count, Min, Max and GroupBy. When an operator is specified, fields without an explicit operator are assumed to have the GroupBy operator.</p>

--site	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

--wide	
<b>Format</b>	--wide
<b>Default</b>	---
<b>Description</b>	Wide format. Displays multi-valued fields in a single-line comma-separated format.

---

**Related Topics**

- [13.4 Querying Quotes - page 103](#)
- [Appendix A: Commands Reference - page 332](#)

## A.36 mam-list-roles

### A.36.1 Synopsis

```
mam-list-roles [[-r] <role_name>] [--full] [--show <attribute_name>, ...] [--long] [--wide] [--format csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.36.2 Overview

*mam-list-roles* displays role information.

### A.36.3 Options

**-r**

<b>Format</b>	[-r] <role_name>
<b>Default</b>	---
<b>Description</b>	Displays information for only the specified role.

**--debug**

<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--format**

<b>Format</b>	--format <output_format>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.



--full	
<b>Format</b>	--full
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

--help	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

--long	
<b>Format</b>	--long
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

--man	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

--quiet	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <b>Actions</b> - List of actions permitted by the role. Actions are displayed in the format <code>object-&gt;action{instance}</code></li> <li>• <b>CreationTime</b> - Time this role was created.</li> <li>• <b>Deleted</b> - Boolean indicating whether this role is deleted or not.</li> <li>• <b>Description</b> - Role description.</li> <li>• <b>ModificationTime</b> - Time this role was last modified.</li> <li>• <b>Name</b> - Role name.</li> <li>• <b>RequestId</b> - ID of the last modifying request.</li> <li>• <b>TransactionId</b> - ID of the last modifying transaction.</li> <li>• <b>Users</b> - List of users granted access to the role.</li> </ul>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>

--about	
<b>Default</b>	---
<b>Description</b>	Displays product information.

--wide	
<b>Format</b>	--wide
<b>Default</b>	---
<b>Description</b>	Wide format. Displays multi-valued fields in a single-line comma-separated format.

---

### Related Topics

- [20.2 Querying Roles - page 146](#)
- [Appendix A: Commands Reference - page 332](#)

## A.37 mam-list-transactions

### A.37.1 Synopsis

```
mam-list-transactions [[-T <transaction_id>] [-R <request_id>] [-O <object>] [-A <action>] [-k <primary_key_value>] [-U <actor>] [-f <fund_id>] [-i <allocation_id>] [-u <user_name>] [-a <account_name>] [-m <machine_name>] [-j <usage_record_id>] [-J <instance_name>] [-s <start_time>] [-e <end_time>] [-X, --extension <property>=<value>]... [--full] [--show <attribute_name>,...] [--format csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

### A.37.2 Overview

*mam-list-transactions* displays transaction information.

You can customize the fields this command displays by default by setting the `transaction.show` configuration parameter in `mam-client.conf`.

### A.37.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Displays only transactions involving the specified account.

-A	
<b>Format</b>	-A <action>
<b>Default</b>	---
<b>Description</b>	Displays only transactions invoking the specified action.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	Displays transactions occurring before the specified time in the format YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now

-f	
<b>Format</b>	-f <fund_id>
<b>Default</b>	---
<b>Description</b>	Displays only transactions involving the specified fund.

<b>-i</b>	
<b>Format</b>	<code>-i &lt;allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only transactions logged against the specific allocation.

<b>-j</b>	
<b>Format</b>	<code>-j &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only transactions affecting the given usage record.

<b>-J</b>	
<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only transactions affiliated with the given instance name (e.g., job ID).

<b>-k</b>	
<b>Format</b>	<code>-k &lt;primary_key_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only transactions involving the objects having the specified primary key value (i.e., having the specified Id or Name) or associations with the given parent name.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---

**-m**

<b>Description</b>	Displays only transactions involving the specified machine.
--------------------	-------------------------------------------------------------

**-O**

<b>Format</b>	-O <object>
---------------	-------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays only transactions performing actions on the given object type.
--------------------	-------------------------------------------------------------------------

**-R**

<b>Format</b>	-R <request_id>
---------------	-----------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays only transactions with the specified request ID. A unique request ID is associated with each request, while each request can be associated with more than one transaction.
--------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**-s**

<b>Format</b>	-s <start_time>
---------------	-----------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays transactions occurring on or after the specified time in the format YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now
--------------------	--------------------------------------------------------------------------------------------------------------------------------

**-T**

<b>Format</b>	[-T] <transaction_id>
---------------	-----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays only transactions with the specified transaction ID. A transaction occurs when an action is invoked on an object. A complex request can involve
--------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------

-T	
	multiple transactions.

-u	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	Displays only transaction involving the specified user.

-U	
<b>Format</b>	-U <actor>
<b>Default</b>	---
<b>Description</b>	Displays only transactions invoked by the specified user.

-X	
<b>Format</b>	-X or --extension <property>=<value>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

--debug	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	<code>--format csv raw_standard</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>



<b>--man</b>	
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	--show <attribute_name>[,<attribute_name>...]
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the specified order. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Account</code> - Account name associated with the transaction.</li> <li>• <code>Action</code> - Action name.</li> <li>• <code>Actor</code> - User that performed the action.</li> <li>• <code>Allocation</code> - Allocation ID associated with the transaction.</li> <li>• <code>Amount</code> - Amount.</li> <li>• <code>Balance</code> - Effective active balance. If the allocation is active, this is the same as the remaining allocation amount (<code>Remaining</code>). If the allocation is inactive, this is zero.</li> <li>• <code>Child</code> - If the transaction object is an association, this is the value of the child.</li> <li>• <code>Count</code> - Number of objects affected by the transaction.</li> <li>• <code>CreationTime</code> - Time this transaction was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this transaction is deleted or not.</li> <li>• <code>Delta</code> - Change (positive or negative) to the effective active balance of an allocation (<code>Balance</code>). This may differ in some cases from the change in the actual allocation amount (<code>Remaining</code>). For example, if an allocation expires, a negative <code>Delta</code> will be recorded for the event, while the remaining allocation amount has not changed. On the other hand, a modification of the amount in an expired allocation will be recorded as a</li> </ul>

**--show****Delta of zero.**

- `Description` - Transaction description.
- `Details` - Additional assignments, conditions, options, and other details of the transaction are recorded here when there is no applicable transaction property to store them in.
- `Duration` - Expected duration of the transaction in seconds.
- `Fund` - Fund ID associated with the transaction.
- `Id` - Transaction ID.
- `Instance` - Instance name.
- `Key` - If the transaction object is an association, this is the value of the parent; otherwise, this is the value of the primary key (ID or name) of the object.
- `Machine` - Machine name associated with the transaction.
- `ModificationTime` - Time this transaction was last modified.
- `Object` - Object name.
- `Remaining` - Remaining allocation amount. If an allocation amount has the potential for being affected by this transaction, this field stores the remaining allocation amount after the transaction completed. Note that for expired allocations, this will still record the allocation's actual remaining amount, even though the allocation's effective active balance (`Balance`) may be zero. Therefore it is possible for the `Remaining` amount to change even though the `Delta` is zero or the `Remaining` amount to remain unchanged even though the `Delta` is non-zero.
- `RequestId` - ID of the last modifying request.
- `TransactionId` - ID of the last modifying transaction.
- `UsageRecord` - ID of the usage record associated with the transaction.
- `User` - User name associated with the transaction.

Additionally, when the transaction refers to a Usage record, unambiguous usage record properties can also be specified for display (`Group`, `Organization`, `Class`, `QualityOfService`, `Nodes`, `Processors`, `Memory`), as well the derived fields (`NodeHours`, `NodeSeconds`, `ProcHours`, and `ProcSeconds`).

Aggregate values can be requested for specified attributes by using operators. Aliases can be used to specify the column name for the aggregated field. Aggregated fields are specified in the form of `operator(attribute_name) [=alias]`. Valid operators include `Sum`, `Average`, `Count`, `Min`, `Max` and `GroupBy`. When an operator is specified, fields without an explicit operator are assumed to have the `GroupBy` operator.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [17.1 Querying Transactions - page 135](#)
- [Appendix A: Commands Reference - page 332](#)

## A.38 mam-list-usagerecords

### A.38.1 Synopsis

```
mam-list-usagerecords [[-j] <usage_record_id>] [-J <instance_
name_pattern>] [-T <usage_record_type>] [-u <user_name>] [-
g <group_name>] [-a <account_name>] [-o <organization_name>]
```

```
[-c <class_name>] [-Q <quality_of_service>] [-m <machine_
name>] [--stage <lifecycle_stage>] [-X, --extension
<property>=<value>]... [-s <start_time>] [-e <end_time>] [--
full] [--show <attribute_name>,...] [--format
csv|raw|standard] [--hours] [--debug] [--site <site_name>] [--
help] [--man] [--quiet] [--version] [--about]
```

## A.38.2 Overview

`mam-list-usagerecords` displays usage record information.

You can customize the fields this command displays by default by setting the `usagerecord.show` configuration parameter in `mam-client.conf`.

## A.38.3 Options

**-a**

<b>Format</b>	<code>-a &lt;account_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the specified account.

**-c**

<b>Format</b>	<code>-c &lt;class_name&gt;</code>
<b>Default</b>	---
<b>C</b>	Specifies the class or queue name.

**-e**

<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Ended before the specified time in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

**-g**

<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the specified group.

**-j**

<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays the usage record with the specified ID.

**-J**

<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only usage records matching the specified instance name (e.g., job ID) pattern. The following wildcards are supported: * - matches any number of characters ? - matches a single character

**-m**

<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the specified machine.

**-o**

<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
---------------	-------------------------------------------

<b>-O</b>	
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the specified organization.

<b>-Q</b>	
<b>Format</b>	<code>-Q &lt;quality_of_service&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the given quality of service .

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Ended on or after the specified time in the format YYYY-MM-DD [hh:mm:ss]   -Infinity Infinity Now

<b>--stage</b>	
<b>Format</b>	<code>--stage &lt;lifecycle_stage&gt;</code>
<b>Default</b>	---
<b>Description</b>	Latest stage in the object's accounting lifecycle (e.g., Create, Start, Continue, End).

<b>-T</b>	
<b>Format</b>	<code>-T &lt;usage_record_type&gt;</code>
<b>Default</b>	---

<b>-T</b>	
<b>Description</b>	Displays only usage records associated with the specified type (such as Job or Reservation).

<b>-u</b>	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	Displays only usage records affiliated with the given user.

<b>-X</b>	
<b>Format</b>	-X or --extension <property>=<value>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	--format <output_format>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	<code>--full</code>
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>



<b>--quiet</b>	
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the order specified. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Account</code> - Account name associated with the usage.</li> <li>• <code>BlockedProcessors</code> - Number of processors blocked by the job.</li> <li>• <code>Charge</code> - Cumulative amount charged.</li> <li>• <code>Class</code> - Class or queue name associated with the usage.</li> <li>• <code>CPUTime</code> - CPU time used.</li> <li>• <code>CreationTime</code> - Time this usage record was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this usage record is deleted or not.</li> <li>• <code>Description</code> - Usage description.</li> <li>• <code>Duration</code> - Expected duration of the usage.</li> <li>• <code>EndTime</code> - Overall end time of the usage.</li> <li>• <code>Features</code> - Allocated node features. Individual feature counts can be displayed using the partial value syntax <code>Features{&lt;feature_part_name&gt;}</code>.</li> <li>• <code>Group</code> - Group name associated with the usage.</li> <li>• <code>Id</code> - Usage record ID.</li> <li>• <code>Instance</code> - Instance name (job ID).</li> <li>• <code>Licenses</code> - Licenses used. Individual license counts can be displayed using the partial value syntax <code>Licenses{&lt;license_part_name&gt;}</code>.</li> <li>• <code>Machine</code> - Cluster name.</li> <li>• <code>Metrics</code> - Generic metrics. Individual metric values can be displayed using the partial value syntax <code>Metrics{&lt;metric_part_name&gt;}</code>.</li> <li>• <code>Memory</code> - Amount of memory used.</li> <li>• <code>ModificationTime</code> - Time this usage record was last modified.</li> <li>• <code>Nodes</code> - Number of nodes used.</li> <li>• <code>NodeHours</code> - <code>Nodes * Duration / 3600</code>.</li> </ul>

**--show**

- `NodeSeconds` – `Nodes * Duration`.
- `Organization` – Organization name associated with the usage.
- `Processors` – Number of cores or processors allocated.
- `ProcessorEquivalents` – Number of processor equivalents allocated by the job.
- `ProcHours` – `Processors * Duration / 3600`.
- `ProcSeconds` – `Processors * Duration`.
- `QualityOfService` – Quality of service associated with the usage.
- `QueueDuration` – Duration the job was in the idle state.
- `Quote` – Associated quote ID.
- `RequestedDuration` – Requested wallclock limit.
- `RequestId` – ID of the last modifying request.
- `Resources` – Generic resources. Individual resource amounts can be displayed using the partial value syntax `Resources{<resource_part_name>}`.
- `Stage` – Latest stage in the object's accounting lifecycle (Create, Start, Continue, End).
- `StartTime` – Latest start time of the usage.
- `SubmitTime` – Creation or submit time of the item.
- `TransactionId` – ID of the last modifying transaction.
- `Type` – Usage record type.
- `User` – User name associated with the usage.
- `Variables` – Job variables. Individual variable values can be displayed using the partial value syntax `Variables{<variable_part_name>}`.

Aggregate values can be requested for specified attributes by using operators. Aggregated fields are specified in the form of `operator(attribute_name)`. Valid operators include Sum, Average, Count, Min, Max and GroupBy. When an operator is specified, fields without an explicit operator are assumed to have the GroupBy operator.

Partial values can be requested for complex (multi-valued) attributes. Partial values are specified in the form of `attribute_name{part_name}`.

Aliases can be used to specify the resultant column name. Aliases are specified in the form of `attribute_name=alias`.

Aggregate values, partial values and aliases can be combined (e.g., `operator(attribute_name{part_name})=alias`).

--site	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [14.2 Querying Usage Records - page 107](#)
- [Appendix A: Commands Reference - page 332](#)

## A.39 mam-list-users

### A.39.1 Synopsis

```
mam-list-users [[-u] <user_pattern>] [-A | -I] [-X, --extension <property>=<value>]... [-a <account_name>] [--full] [-show <attribute_name>,...] [--long] [--wide] [--format
```

```
csv|raw|standard] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--version] [--about]
```

## A.39.2 Overview

`mam-list-users` displays user information.

You can customize the fields this command displays by default by setting the `user.show` configuration parameter in `mam-client.conf`.

## A.39.3 Options

**-a**

<b>Format</b>	<code>-a &lt;account_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only users affiliated with the specified account.

**-A**

<b>Format</b>	<code>-A</code>
<b>Default</b>	---
<b>Description</b>	Displays only active users.

**-I**

<b>Format</b>	<code>-I</code>
<b>Default</b>	---
<b>Description</b>	Displays only inactive users.

<b>-u</b>	
<b>Format</b>	<code>[-u] &lt;user_pattern&gt;</code>
<b>Default</b>	---
<b>Description</b>	Displays only users matching the pattern. If you do not specify a pattern then all users are displayed. The following wildcards are supported: * - matches any number of characters ? - matches a single character

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an extension property. You can specify any number of extra custom conditions.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--format</b>	
<b>Format</b>	<code>--format &lt;output_format&gt;</code>
<b>Default</b>	standard
<b>Description</b>	Specifies a data output format. Valid values are standard, raw, and csv.

<b>--full</b>	
<b>Format</b>	<code>--full</code>

<b>--full</b>	
<b>Default</b>	---
<b>Description</b>	Displays all attributes.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--long</b>	
<b>Format</b>	--long
<b>Default</b>	---
<b>Description</b>	Long format. Displays multi-valued fields in a multi-line format.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--show</b>	
<b>Format</b>	<code>--show &lt;attribute_name&gt;[,&lt;attribute_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	<p>Displays only the specified attributes in the order specified. Valid attributes:</p> <ul style="list-style-type: none"> <li>• <code>Accounts</code> - List of accounts to which the user belongs.</li> <li>• <code>Active</code> - Boolean indicating whether this user is active or not.</li> <li>• <code>CommonName</code> - Common name for the user.</li> <li>• <code>CreationTime</code> - Time this user was created.</li> <li>• <code>Deleted</code> - Boolean indicating whether this user is deleted or not.</li> <li>• <code>DefaultAccount</code> - Default account.</li> <li>• <code>Description</code> - User description.</li> <li>• <code>EmailAddress</code> Email address.</li> <li>• <code>ModificationTime</code> - Time this user was last modified.</li> <li>• <code>Name</code> - User name.</li> <li>• <code>PhoneNumber</code> - Phone number.</li> <li>• <code>RequestId</code> - ID of the last modifying request.</li> <li>• <code>TransactionId</code> - ID of the last modifying transaction.</li> </ul>

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

--wide	
<b>Format</b>	--wide
<b>Default</b>	---
<b>Description</b>	Wide format. Displays multi-valued fields in a single-line comma-separated format.

---

## Related Topics

- [7.2 Querying Users - page 59](#)
- [Appendix A: Commands Reference - page 332](#)

## A.40 mam-modify-account

### A.40.1 Synopsis

```
mam-modify-account {[-a] <account_name>} [-A | -I] [-o <organization_name>] [-d <description>] [-X, --extension <property>=<value>]... [--add-user(s) [^|!][+|-]<user_name>,...]... [--del-user(s) <user_name>,...] [--mod-user(s) [^|!][+|-]<user_name>,...]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.40.2 Overview

*mam-modify-account* modifies an account.



## A.40.3 Options

-a	
<b>Format</b>	<code>[-a] &lt;account_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the account to modify.

-A	
<b>Format</b>	<code>-A</code>
<b>Default</b>	---
<b>Description</b>	Activates the account.

-d	
<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies the account description.

-I	
<b>Format</b>	<code>-I</code>
<b>Default</b>	---
<b>Description</b>	Deactivates the account.

-o	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>

<b>-o</b>	
<b>Default</b>	---
<b>Description</b>	Modifies the name of the organization to which the account belongs.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--add-user</b>	
<b>Format</b>	<code>--add-user [^ !][+ -]&lt;user_name&gt;[, [^ !][+ -]&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Adds user members of the account. The optional caret or exclamation symbol indicates whether the user should be created as an administrator (^) or not (!) for the account. The optional plus or minus signs can precede each member to indicate whether the member should be created in the active (+) or inactive (-) state. By default, a user will be created in the active state but not an administrator. You can pass multiple users to the <code>--add-user</code> option in a comma-delimited list or you can specify multiple <code>--add-user</code> options.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--del-user</b>	
<b>Format</b>	<code>--del-user &lt;user_name&gt;[,&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Removes user members from the account. You can pass multiple users to the <code>--del-user</code> option in a comma-delimited list or specify multiple <code>--del-user</code> options.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--mod-user</b>	
<b>Format</b>	<code>--mod-user [^ !][+ -]&lt;user_name&gt;[, [^ !][+ -]&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Modifies user members of the account. The caret symbol or exclamation symbol indicates the user should be changed to become an administrator (^) or not (!) for the account. The plus or minus signs indicate whether the user should be changed to become active (+) or inactive (-). If you do not specify an active or admin modifier, that aspect of the user member will remain unchanged. You can pass multiple users to the <code>--mod-user</code> option in a comma-delimited list or you can specify multiple <code>--mod-user</code> options.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

**Related Topics**

- [8.3 Modifying Accounts - page 65](#)
- [Appendix A: Commands Reference - page 332](#)

## A.41 mam-modify-allocation

### A.41.1 Synopsis

```
mam-modify-allocation {[-i] <allocation_id>} [-s <start_time>]
[-e <end_time>] [-L <credit_limit>] [-d <description>] [-X, --
extension <property>=<value>]... [--hours] [--debug] [--
site <site_name>] [--help] [--man] [--quiet] [--verbose] [--
version] [--about]
```

### A.41.2 Overview

*mam-modify-allocation* modifies an allocation. This includes changing the credit limit or description or adjusting the start time or end time.

### A.41.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Modifies the allocation description.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	Specifies a new end time in the format YYYY-MM-DD [hh:mm:ss]   -

**-e**

Infinity|Infinity|Now

**-i**

<b>Format</b>	<code>[-i ]&lt;allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	The ID of the allocation to modify.

**-L**

<b>Format</b>	<code>-L &lt;credit_limit&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new credit limit.

**-s**

<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new start time in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity Infinity Now</code>

**-X, --extension <property>**

<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--hours</b>	
<b>Format</b>	--hours
<b>Default</b>	---
<b>Description</b>	Treats currency as specified in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), this option allows the credit limit to be specified in resource hours.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---

**--quiet**

<b>Description</b>	Suppresses headers and success messages.
--------------------	------------------------------------------

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Obtains a response from specified site.
--------------------	-----------------------------------------

**--verbose**

<b>Format</b>	<code>--verbose</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays modified object details.
--------------------	-----------------------------------

**--version**

<b>Format</b>	<code>--version</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays the product version.
--------------------	-------------------------------

**--about**

<b>Format</b>	<code>--about</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays product information.
--------------------	-------------------------------



## Related Topics

- [11.4 Modifying Allocations - page 92](#)
- [Appendix A: Commands Reference - page 332](#)

# A.42 mam-modify-chargerate

## A.42.1 Synopsis

```
mam-modify-chargerate {[-n] <charge_rate_name>} [-x <charge_rate_value>] [-z <charge_rate_amount>] [-d <description>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.42.2 Overview

*mam-modify-chargerate* modifies a charge rate. Only the amount or the description of a charge rate can be modified.

## A.42.3 Options

**-d**

<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

**-n**

<b>Format</b>	[-n] <charge_rate_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the charge rate to change.

<b>-x</b>	
<b>Format</b>	<code>-x &lt;charge_rate_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the charge rate value expression to change. If you do not specify a value, an empty value is assumed.

<b>-z</b>	
<b>Format</b>	<code>-z &lt;charge_rate_amount&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new amount for the charge rate. The amount is an integer or decimal and can include operators indicating how to apply the charge rate, as well as divisors and time-based units. See <a href="#">Chapter 16: Managing Charge Rates - page 126</a> for more information.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [16.4 Modifying Charge Rates - page 133](#)
- [Appendix A: Commands Reference - page 332](#)

## A.43 mam-modify-event

### A.43.1 Synopsis

```
mam-modify-event {[-E] <event_id>} [--fire-command <fire_
command>] [-s <fire_time>] [-e <end_time>] [--rearm-
period <rearm_period>] [--rearm-on-failure True|(False)] [--
failure-command <failure_command>] [--notify <notification_
url>] [--catch-up (True)|False] [-d <description>] [--debug]
[--site <site_name>] [--help] [--man] [--quiet] [--verbose] [-
version] [--about]
```

### A.43.2 Overview

*mam-modify-event* modifies an event.

### A.43.3 Options

-d	
<b>Format</b>	-d <description>

<b>-d</b>	
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

<b>-e</b>	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	Specifies the time this event becomes inactive in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>-E</b>	
<b>Format</b>	-E <event_id>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the event to modify.

<b>-s</b>	
<b>Format</b>	-s <fire_time>
<b>Default</b>	---
<b>Description</b>	Specifies a new target time for the event to be triggered by the event scheduler. The actual fire time may be dependent on the state of the server and will be recorded in the CreationTime property of the corresponding 'Event Fire' Transaction. An event can also be fired manually with the mam-shell Event Fire action.

<b>--catch-up</b>	
<b>Format</b>	--catch-up <boolean>

<b>--catch-up</b>	
<b>Default</b>	True
<b>Description</b>	If you set the <code>--catch-up</code> boolean to <code>True</code> and the server was down during the time this event should have fired, the event scheduler will attempt to make up for the past due events by progressively firing them (rearming based on previous arm time) until it catches up to the present. The actions will still show as having occurred in the present rather than in the past. If set to <code>False</code> and the server is brought back up after an outage, the event scheduler will still fire immediately for a past due event, but it will only fire once and then rearm relative to the current time.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debugging information to the screen.

<b>--failure-command</b>	
<b>Format</b>	<code>--failure-command &lt;failure_command&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new command MAM should execute if the fired command results in an unsuccessful response status. This command is expressed in a serialized form of the request identical to the syntax used in the interactive control program ( <code>mam-shell</code> ). The option argument will need to be appropriately quoted and/or escaped in order to avoid misinterpretation or alteration by the shell.

<b>--fire-command</b>	
<b>Format</b>	<code>--fire-command &lt;fire_command&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the command MAM should execute.

--help	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

--man	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays the full documentation.

--notify	
<b>Format</b>	--notify [+==] [<delivery_method>:] [recipient]
<b>Default</b>	Logs all event statuses to the Notification table.
<b>Description</b>	A Notification method logs the result of the fired command. If the term is a -, the notification is sent only on failure. If the term is a +, the notification is sent only on success. Otherwise the notification is always sent. See <a href="#">Chapter 19: Managing Notifications - page 141</a> for more information about delivery method and recipient.

--quiet	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--rearm-on-failure</b>	
<b>Format</b>	<code>--rearm-on-failure &lt;boolean&gt;</code>
<b>Default</b>	False
<b>Description</b>	If you set the <code>--rearm-on-failure</code> boolean to <code>False</code> , MAM will not rearm the event if the command was unsuccessful. If you set it to <code>True</code> , MAM will evaluate the event for rearming even if the command response has a status of <code>Failure</code> .

<b>--rearm-period</b>	
<b>Format</b>	<code>--rearm-period &lt;period&gt;[[@instant][~ ^]!]</code>
<b>Default</b>	---
<b>Description</b>	The <code>--rearm-period</code> is a time period expression specifying when MAM will rearm the event. This period expression is in the form of <code>&lt;period&gt; [[@instant][~ ^]!]</code> . The <code>&lt;period&gt;</code> is expressed as an integer number followed by a designator of minute(s), hour(s), day(s), month(s), or year(s). For example, the period might be 1 day, 2 hours, or 5 minutes. The optional <code>instant</code> locks the period to a specific instant within the time period such as 1 day @ hour 12 or 1 month @ day 3. The modifiers indicate whether the time period should be relative to now (!), relative to the start of this (~) designator (month, minute, or other unit), or relative to the start of the first (^) designator (month, minute, or other unit). For example, assuming the <code>FireTime</code> was 7:15, if you specified <code>4 hours !</code> as the rearm period it would be rearmed at 11:15; if you specified <code>4 hours ~</code> as the rearm period, it would be rearmed at 11:00; and if you specified <code>4 hours ^</code> as the rearm period it would be rearmed at 8:00.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.



<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [18.4 Modifying Events - page 140](#)
- [Appendix A: Commands Reference - page 332](#)

## A.44 mam-modify-fund

### A.44.1 Synopsis

```
mam-modify-fund [[-f] <fund_id>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_
```

```

name>=<filter_value>]... [--filter-type
ExactMatch|Exclusive|NonExclusive] {[[-n <fund_name>] [--
priority <fund_priority>] [--default-deposit <deposit_amount>]
[-d <description>] [-X, --extension <property>=<value>]... [-
add-constraint <constraint_name>=[!]<constraint_value>,...] [-
del-constraint(s) <constraint_name>[=<constraint_
value>],...]... [--parent <parent_fund_id>]} | {--reset [--
all]}} [--debug] [--site <site_name>] [--help] [--man] [--
quiet] [--verbose] [--version] [--about]

```

## A.44.2 Overview

*mam-modify-fund* modifies a fund. This includes adding to or deleting from constraints for the account. After applying all filter options, if there is exactly one applicable fund, that fund will be modified. Otherwise, a list of funds will be displayed for the specified filters and you will be prompted to rerun *mam-modify-fund* against one of the enumerated funds.

## A.44.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given account.

-c	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given class.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

<b>-f</b>	
<b>Format</b>	[-f] <fund_id>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the fund to modify.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given group.

<b>-m</b>	
<b>Format</b>	-m <machine_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given machine.

<b>-n</b>	
<b>Format</b>	-n <fund_name>

<b>-n</b>	
<b>Default</b>	---
<b>Description</b>	Specifies a new fund name.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given organization.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund to modify should be restricted to one usable by the given user.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--add-constraint</b>	
<b>Format</b>	<code>--add-constraint &lt;constraint_name&gt;=[!]&lt;constraint_value&gt;[,&lt;constraint_name&gt;=[!]&lt;constraint_value&gt;...]</code>
<b>Default</b>	---

**--add-constraint**

<b>Description</b>	Adds a constraint to the fund. The constraint value can be a perl5 regular expression. You can prepend an exclamation point to the constraint value to express a negation of the constraint. You can pass multiple constraints to the <code>--add-constraint</code> option in a comma-delimited list or specify multiple <code>--add-constraint</code> options.
--------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--all**

<b>Format</b>	<code>--all</code>
---------------	--------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Specifies that you want to reset all active allocations for all funds when you use it with the <code>--reset</code> option.
--------------------	-----------------------------------------------------------------------------------------------------------------------------

**--debug**

<b>Format</b>	<code>--debug</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Logs debug information to the screen.
--------------------	---------------------------------------

**--default-deposit**

<b>Format</b>	<code>--default-deposit &lt;deposit_amount&gt;</code>
---------------	-------------------------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	<p>Specifies the default amount for any deposit that is made to this fund that does not already specify a deposit amount:</p> <ul style="list-style-type: none"> <li>• A zero value will result in the creation of an allocation with a zero balance (or add nothing if an allocation already exists and a reset is not being requested).</li> <li>• A negative value can be used to stipulate that the allocations in the fund should be ended if the fund is reset.</li> <li>• An empty value ( " ) or NULL can be used to stipulate that no change will be made to the allocations if the fund is reset.</li> </ul>
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<b>--del-constraint</b>	
<b>Format</b>	<code>--del-constraint &lt;constraint_name&gt;=&lt;constraint_value&gt; [,&lt;constraint_name&gt;[=&lt;constraint_value&gt;]...]</code>
<b>Default</b>	---
<b>Description</b>	Removes a constraint from the fund. You can pass multiple constraints to the <code>--del-constraint</code> option in a comma-delimited list or by specifying multiple <code>--del-constraint</code> options.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Restricts the fund to one without constraints that conflict with the specified filters. For example, <code>mam-modify-fund --filter User=amy</code> will restrict the fund to one usable by the user <code>amy</code> . You can specify multiple filter options by logically ANDing them together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	<code>NonExclusive</code>
<b>Description</b>	<p>Specifies the filtering type:</p> <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--parent</b>	
<b>Format</b>	<code>--parent &lt;parent_fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Sets a new parent fund, replacing the current parent fund if one exists.

<b>--priority</b>	
<b>Format</b>	<code>--priority &lt;fund_priority&gt;</code>
<b>Default</b>	---
<b>Description</b>	Sets a new fund priority.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--reset</b>	
<b>Format</b>	<code>--reset</code>
<b>Default</b>	---
<b>Description</b>	Ends all active allocations and initiates a new default deposit. If the default deposit amount is positive, MAM creates a new allocation with this amount; otherwise, no deposit is made and the fund becomes inactive. You can reset the allocations for a specified fund using the <code>-f</code> option, all funds using the <code>--all</code> option, or use filtering options to filter the funds to be reset. Do not use this option with any other modifying option.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.



--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [10.4 Modifying Funds - page 77](#)
- [Appendix A: Commands Reference - page 332](#)

## A.45 mam-modify-lien

### A.45.1 Synopsis

```
mam-modify-lien {[-l] <lien_id>} [-s <start_time>] [-e <end_time>] [-t <lien_duration>] [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.45.2 Overview

*mam-modify-lien* modifies a lien.

### A.45.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

<b>-e</b>	
<b>Format</b>	<code>-e &lt;end_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new expiration time in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>-l</b>	
<b>Format</b>	<code>[-l] &lt;lien_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the lien to modify.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new start time in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>-t</b>	
<b>Format</b>	<code>-t &lt;lien_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the duration of the lien in seconds. Although the lien start time and end time are enforced, the duration is not authoritative. If the time frame between the end time and the start time is greater than the duration, the difference is the allotted grace period (which defaults to 10 minutes).

<b>-X, --extension &lt;property&gt;</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---

**--quiet**

<b>Description</b>	Suppresses headers and success messages.
--------------------	------------------------------------------

**--site**

<b>Format</b>	<code>--site &lt;site_name&gt;</code>
---------------	---------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Obtains a response from specified site.
--------------------	-----------------------------------------

**--verbose**

<b>Format</b>	<code>--verbose</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays modified object details.
--------------------	-----------------------------------

**--version**

<b>Format</b>	<code>--version</code>
---------------	------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays the product version.
--------------------	-------------------------------

**--about**

<b>Format</b>	<code>--about</code>
---------------	----------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays product information.
--------------------	-------------------------------

## Related Topics

- [12.4 Modifying Liens - page 98](#)
- [Appendix A: Commands Reference - page 332](#)

# A.46 mam-modify-organization

## A.46.1 Synopsis

```
mam-modify-organization {[-o] <organization_name>} [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.46.2 Overview

*mam-modify-organization* modifies an organization.

## A.46.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

-o	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the organization to modify.

**-X, --extension <property>**

<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

**--debug**

<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

**--help**

<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

**--man**

<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

**--quiet**

<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---

<b>--quiet</b>	
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

## Related Topics

- [9.3 Modifying Organizations - page 70](#)
- [Appendix A: Commands Reference - page 332](#)

## A.47 mam-modify-quote

### A.47.1 Synopsis

```
mam-modify-quote {[-q] <quote_id>} [-s <start_time>] [-e <end_time>] [-d <description>] [-X, --extension <property>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.47.2 Overview

*mam-modify-quote* modifies a quote.

### A.47.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	Specifies a new expiration time in the format YYYY-MM-DD[hh:mm:ss]   -Infinity Infinity Now



<b>-q</b>	
<b>Format</b>	<code>[-q] &lt;quote_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the quote to modify.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new start time in the format <code>YYYY-MM-DD[hh:mm:ss]   -Infinity   Infinity   Now</code>

<b>-X, --extension &lt;property&gt;</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Modifies an extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>

<b>--help</b>	
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [13.5 Modifying Quotes - page 103](#)
- [Appendix A: Commands Reference - page 332](#)

## A.48 mam-modify-role

### A.48.1 Synopsis

```
mam-modify-role {[-r] <role_name>} [-d <description>] [--add-user(s) <user_name>,...]... [--add-action(s) "<object_name>-><action_name>[<instance_name>]",...]... [--del-user(s) <user_name>,...]... [--del-action(s) "<object_name>-><action_name>[<instance_name>]",...]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.48.2 Overview

*mam-modify-role* modifies a role. This can include adding or removing users from a role and adding removing actions from a role.

## A.48.3 Options

<b>-d</b>	
<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new description.

<b>-r</b>	
<b>Format</b>	<code>[-r] &lt;role_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the role to modify.

<b>--add-action</b>	
<b>Format</b>	<code>--add-action "&lt;object_name&gt;-&gt;&lt;action_name&gt;[&lt;instance_name&gt;]] [,&lt;object_name&gt;-&gt;&lt;action_name&gt;[&lt;instance_name&gt;]]..."</code>
<b>Default</b>	---
<b>Description</b>	Adds actions to the role. You must specify the object, action and instance in the form shown. Unless specified, the instance will default to a value of ANY. You can pass multiple actions to the <code>--add-action</code> option in a comma-delimited list or by specifying multiple <code>--add-action</code> options.

<b>--add-user</b>	
<b>Format</b>	<code>--add-user &lt;user_name&gt;[,&lt;user_name&gt;...]</code>
<b>Default</b>	---
<b>Description</b>	Adds users to the role. You can pass multiple users to the <code>--add-user</code> option in a comma-delimited list or by specifying multiple <code>--add-user</code> options.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--del-action</b>	
<b>Format</b>	--del-action "<object_name>-><action_name>[{{<instance_name>}}] [,<object_name>-><action_name>[{{<instance_name>}}]...]"
<b>Default</b>	---
<b>Description</b>	Removes actions from a role. You must specify the object and action; however, the instance is optional. You can pass multiple actions to the --del-action option in a comma-delimited list or by specifying multiple --del-action options.

<b>--del-user</b>	
<b>Format</b>	--del-user <user_name>[,<user_name>...]
<b>Default</b>	---
<b>Description</b>	Removes users from the role. You can pass multiple users to the --del-user option in a comma-delimited list or by specifying multiple --del-user options.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [20.3 Modifying Roles - page 147](#)
- [Appendix A: Commands Reference - page 332](#)

## A.49 mam-modify-usagerecord

### A.49.1 Synopsis

```
mam-modify-usagerecord {[-j] <usage_record_id> | -J <instance_name>} [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [-t <actual_duration>] [-s <start_time>] [-e <end_time>] [-x <exit_code>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property_name>=<value>]... [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.49.2 Overview

*mam-modify-usagerecord* modifies a usage record.

## A.49.3 Options

**-a**

**Format**      -a <account\_name>

**Default**      ---

**Description**    New account name.

**-c**

**Format**      -c <class\_name>

**Default**      ---

**Description**    New class or queue.

**-C**

**Format**      -C <cpu\_time>

**Default**      ---

**Description**    New CPU time used.

**-d**

**Format**      -d <description>

**Default**      ---

**Description**    New description.

**-D**

**Format**      -D <disk>



<b>-D</b>	
<b>Default</b>	---
<b>Description</b>	New amount of disk used.

<b>-e</b>	
<b>Format</b>	-e <end_time>
<b>Default</b>	---
<b>Description</b>	New date and time the usage ended in the format YYYY-MM-DD [hh:mm:ss]  -Infinity Infinity Now

<b>-E</b>	
<b>Format</b>	-E <energy>
<b>Default</b>	---
<b>Description</b>	New energy used.

<b>-F</b>	
<b>Format</b>	-F "{ \"<feature_name>\":<feature_count>, ... }"
<b>Default</b>	---
<b>Description</b>	New allocated node features. Features represent counts of the node features allocated to the job.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	New group name.

-j	
<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	ID of the usage record to modify. Instance names can be non-unique (resource managers often recycle job IDs). This option allows you to specify a usage record using the unique identifier.

-J	
<b>Format</b>	<code>[-J] &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Instance name (e.g., job ID) of the usage record(s) to modify. If there is exactly one matching usage record, that usage record will be modified. Otherwise, a list of usage records will be displayed for the specified instance, and you will be prompted to rerun <i>mam-modify-usagerecord</i> against one of the enumerated usage records.

-L	
<b>Format</b>	<code>-L "{\ "&lt;license_name&gt;\":&lt;license_count&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	New licenses used. Licenses represent software licenses that are used (in integer units).

-m	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	New name of the cluster.

<b>-M</b>	
<b>Format</b>	-M <memory>
<b>Default</b>	---
<b>Description</b>	New amount of memory used.

<b>-n</b>	
<b>Format</b>	-n <designated_name>
<b>Default</b>	---
<b>Description</b>	New user-specified job name.

<b>-N</b>	
<b>Format</b>	-N <nodes>
<b>Default</b>	---
<b>Description</b>	New number of nodes used.

<b>-O</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	New organization name.

<b>-P</b>	
<b>Format</b>	-P <processors>
<b>Default</b>	---
<b>Description</b>	New number of processors used.

<b>-Q</b>	
<b>Format</b>	<code>-Q &lt;quality_of_service&gt;</code>
<b>Default</b>	---
<b>Description</b>	New quality of service used.

<b>-R</b>	
<b>Format</b>	<code>-R "{ \"&lt;resource_name&gt;\":&lt;resource_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	New consumable resources allocated. Resources represent consumable resources that can be allocated (in integer units).

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies a new date and time the usage started in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

<b>--stage</b>	
<b>Format</b>	<code>--stage &lt;lifecycle_stage&gt;</code>
<b>Default</b>	---
<b>Description</b>	New latest stage in the object's accounting lifecycle (Create, Start, Continue, End).

<b>-t</b>	
<b>Format</b>	<code>-t &lt;actual_duration&gt;</code>

<b>-t</b>	
<b>Default</b>	---
<b>Description</b>	New total actual duration (in seconds).

<b>-T</b>	
<b>Format</b>	-T <usage_record_type>
<b>Default</b>	---
<b>Description</b>	New usage record type (Job or Reservation, for example).

<b>-u</b>	
<b>Format</b>	-u <user_name>
<b>Default</b>	---
<b>Description</b>	New user name.

<b>-V</b>	
<b>Format</b>	-V "{ \"<variable_name>\": \"<variable_value>\", ... }"
<b>Default</b>	---
<b>Description</b>	New job variables. Variables represent arbitrary variables passed into the job.

<b>-W</b>	
<b>Format</b>	-W <requested_duration>
<b>Default</b>	---
<b>Description</b>	New total estimated wallclock duration (in seconds).

<b>-x</b>	
<b>Format</b>	<code>-x &lt;exit_code&gt;</code>
<b>Default</b>	---
<b>Description</b>	New exit code.

<b>-X, --extension</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---
<b>Description</b>	New extension property. You can specify any number of extra field assignments.

<b>-Z</b>	
<b>Format</b>	<code>-Z "{\"&lt;metric_name&gt;\":&lt;metric_amount&gt;,...}"</code>
<b>Default</b>	---
<b>Description</b>	New generic metrics. Metrics represent floating point metrics of the job <i>or</i> average metrics values across the nodes in the job.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>

<b>--help</b>	
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [14.3 Modifying a Usage Record - page 108](#)
- [Appendix A: Commands Reference - page 332](#)

## A.50 mam-modify-user

### A.50.1 Synopsis

```
mam-modify-user {[-u] <user_name>} [-A | -I] [-n <common_
name>] [--phone <phone_number>] [--email <email_address>] [-
a <default_account>] [-d <description>] [-X, --extension
<property>=<value>]... [--debug] [--site <site_name>] [--help]
[--man] [--quiet] [--verbose] [--version] [--about]
```

### A.50.2 Overview

*mam-modify-user* modifies a user.



## A.50.3 Options

<b>-a</b>	
<b>Format</b>	-a <default_account>
<b>Default</b>	---
<b>Description</b>	Account MAM will charge when no account is specified.

<b>-A</b>	
<b>Format</b>	-A
<b>Default</b>	---
<b>Description</b>	Activates the user.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	New description.

<b>--email</b>	
<b>Format</b>	--email <email_address>
<b>Default</b>	---
<b>Description</b>	New email address.

<b>-I</b>	
<b>Format</b>	-I

<b>-l</b>	
<b>Default</b>	---
<b>Description</b>	Deactivates the user.

<b>n</b>	
<b>Format</b>	-n <common_name>
<b>Default</b>	---
<b>Description</b>	Common name for the user.

<b>--phone</b>	
<b>Format</b>	--phone <phone_number>
<b>Default</b>	---
<b>Description</b>	New phone number.

<b>-u</b>	
<b>Format</b>	[-u] <user_name>
<b>Default</b>	---
<b>Description</b>	Name of the user to modify.

<b>-X, --extension &lt;property&gt;</b>	
<b>Format</b>	-X or --extension <property>=<value>
<b>Default</b>	---
<b>Description</b>	New extension property. You can specify any number of extra field assignments.

<b>--debug</b>	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [7.3 Modifying Users - page 60](#)
- [Appendix A: Commands Reference - page 332](#)

## A.51 mam-quote

### A.51.1 Synopsis

```
mam-quote [-J <instance_name>] [[-j] <usage_record_id>] [-q <quote_template_id>] [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_
```

```

name>] [-o <organization>] [-c <class_name>] [-Q <quality_of_
service>] [-m <machine_name>] [-N <nodes>] [-P <processors>]
[-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "
{"<feature_name>":<feature_count>,...}" ] [-R "{"<resource_
name>":<resource_count>,...}" ] [-L "{"<license_
name>":<license_count>,...}" ] [-Z "{"<metric_
name>":<metric_amount>,...}" ] [-V "{"<variable_
name>":<variable_value>","...}" ] [-W <requested_duration>]
[--stage <lifecycle_stage>] [-d <description>] [-X, --
extension <property>=<value>]... [-zt <quote_duration> [-
G <grace_duration>]] [-zs <quote_start_time>] [-z <quote_
amount>] [--cost-only | --guarantee] [---rate <charge_rate_
name>[<charge_rate_value>]=<charge_rate_amount>,...]. . . [--
hours] [--itemize] [--debug] [--site <site_name>] [--help] [--
man] [--quiet] [--verbose] [--version] [--about]

```

## A.51.2 Overview

*mam-quote* obtains a quote for usage. This command and its options can estimate the cost of using resources, validate that a requester has sufficient access and funds to use the requested resources, and guarantee that the charge rates used to generate the quote do not change when applying subsequent liens and charges.

## A.51.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Account name.

-c	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Class or queue used.

<b>-C</b>	
<b>Format</b>	<code>-C &lt;cpu_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Estimated CPU time used.

<b>--cost-only</b>	
<b>Format</b>	<code>--cost-only</code>
<b>Default</b>	---
<b>Description</b>	Returns the cost, ignoring all balance and validity checks. This option is mutually exclusive with <code>--guarantee</code> .

<b>-d</b>	
<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Description of the usage.

<b>-D</b>	
<b>Format</b>	<code>-D &lt;disk&gt;</code>
<b>Default</b>	---
<b>Description</b>	Amount of disk used.

<b>-E</b>	
<b>Format</b>	<code>-E &lt;energy&gt;</code>
<b>Default</b>	---

<b>-E</b>	
<b>Description</b>	Amount of energy used.

<b>-F</b>	
<b>Format</b>	<code>-F "{ \"&lt;feature_name&gt;\":&lt;feature_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	Allocated node features. Features represent counts of the node features allocated to the job.

<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Group name.

<b>-G</b>	
<b>Format</b>	<code>-G &lt;grace_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Grace period (in seconds). If you specify the quote duration but not the quote end time, MAM will calculate the quote end time as the quote start time plus the quote duration plus the grace duration.

<b>--guarantee</b>	
<b>Format</b>	<code>--guarantee</code>
<b>Default</b>	---
<b>Description</b>	Guarantees the quote and returns a quote ID to secure the current charge rates. This results in the creation of a quote record and a permanent usage record. This option is mutually exclusive with <code>--cost-only</code> .

-j	
<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record ID for the quote if already created with <i>mam-create-usagerecord</i> or a previous <i>mam-quote</i> .

-J	
<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Instance name (e.g., job ID) of the quote, if known.

-L	
<b>Format</b>	<code>-L "{ \"&lt;license_name&gt;\":&lt;license_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	Licenses used. Licenses represent software licenses that are used (in integer units).

-m	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Name of the cluster.

-M	
<b>Format</b>	<code>-M &lt;memory&gt;</code>



<b>-M</b>	
<b>Default</b>	---
<b>Description</b>	Amount of memory used.

<b>-n</b>	
<b>Format</b>	-n <designated_name>
<b>Default</b>	---
<b>Description</b>	User-specified job name.

<b>-N</b>	
<b>Format</b>	-N <nodes>
<b>Default</b>	---
<b>Description</b>	Number of nodes used.

<b>-o</b>	
<b>Format</b>	-o <organization_name>
<b>Default</b>	---
<b>Description</b>	Organization name.

<b>-P</b>	
<b>Format</b>	-P <processors>
<b>Default</b>	---
<b>Description</b>	Number of processors used.

<b>-q</b>	
<b>Format</b>	<code>-q &lt;quote_template_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Quote template used to override standard charge rates.

<b>-Q</b>	
<b>Format</b>	<code>-Q &lt;quality_of_service&gt;</code>
<b>Default</b>	---
<b>Description</b>	Quality of service used.

<b>-R</b>	
<b>Format</b>	<code>-R "{ \"&lt;resource_name&gt;\":&lt;resource_count&gt;, ... }"</code>
<b>Default</b>	---
<b>Description</b>	Consumable resources allocated. Resources represent consumable resources that can be allocated (in integer units).

<b>--rate</b>	
<b>Format</b>	<code>--rate &lt;charge_rate_name&gt;[{{&lt;charge_rate_value&gt;}}=&lt;charge_rate_amount&gt;, ...]</code>
<b>Default</b>	---
<b>Description</b>	Charge rate expressions. Multiple charge rate expressions can be passed to the <code>--rate</code> option in a comma-delimited list. Alternatively, multiple <code>--rate</code> options can be specified.

<b>--stage</b>	
<b>Format</b>	<code>--stage &lt;lifecycle_stage&gt;</code>
<b>Default</b>	---
<b>Description</b>	Latest stage in the object's accounting lifecycle (Create, Start, Continue, End).

<b>-T</b>	
<b>Format</b>	<code>-T &lt;usage_record_type&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record type, such as job or reservation.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	User name.

<b>-V</b>	
<b>Format</b>	<code>-V "{\&lt;variable_name&gt;\":\&lt;variable_value&gt;\",...}"</code>
<b>Default</b>	---
<b>Description</b>	Job variables. Variables represent arbitrary variables passed into the job.

<b>-W</b>	
<b>Format</b>	<code>-W &lt;requested_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Total estimated wallclock duration (in seconds).

-X	
<b>Format</b>	-X or --extension <property>=<value>
<b>Default</b>	---
<b>Description</b>	<p>Extension property. You can specify any number of extra usage properties with the quote.</p> <p>When expressing accumulating properties, value can be an expression in the form of [cumulative_value][(incremental_value)]:</p> <ul style="list-style-type: none"> <li>• If both incremental_value and cumulative_value are specified, then incremental_value will be used for the quote and cumulative_value will be recorded as the cumulative value used in the usage record.</li> <li>• If only incremental_value is specified, this value will be used for the quote <i>only</i> and no cumulative value will be recorded in the usage record.</li> <li>• If only cumulative_value is specified, this value will be used both in the quote <i>and</i> recorded in the usage record.</li> </ul>

-z	
<b>Format</b>	-z <quote_amount>
<b>Default</b>	---
<b>Description</b>	Quote amount if calculated externally.

-zs	
<b>Format</b>	-zs <quote_start_time>
<b>Default</b>	---
<b>Description</b>	<p>Start time for the quote in the format YYYY-MM-DD [hh:mm:ss]   -Infinity Infinity Now</p> <p>This is <i>only</i> needed for non-cost-only quotes <i>and</i> is used to determine the appropriate allocation to apply to quote to.</p>

<b>-zt</b>	
<b>Format</b>	<code>-zt &lt;quote_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Incremental duration for the quote (in seconds). This is <i>only</i> needed for incremental quotes when the incremental duration differs from the wallclock duration <i>and</i> is used to compute the incremental quote amount.

<b>-Z</b>	
<b>Format</b>	<code>-Z "{\"&lt;metric_name&gt;\":&lt;metric_amount&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	Generic metrics. Metrics represent floating point metrics of the job <i>or</i> average metrics values across the nodes in the job.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--itemize</b>	
<b>Format</b>	<code>--itemize</code>
<b>Default</b>	---
<b>Description</b>	Returns the composite charge information in the response data. You must use this in conjunction with the <code>--verbose</code> flag to display the data.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

--verbose	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [14.5 Obtaining Usage Quotes - page 109](#)
- [Appendix A: Commands Reference - page 332](#)

## A.52 mam-read-configuration

### A.52.1 Synopsis

```
mam-read-configuration [-c|-s|-g|-w] [-p parameter_pattern] [--help] [--man] [--quiet] [--version]
```

## A.52.2 Overview

*mam-read-configuration* is used to display configuration information. It simply parses the configuration files and will only display enabled (uncommented) parameter values. If none of `-c`, `-s`, `-g`, or `-w` are specified, configuration parameters from all configuration files will be displayed.

## A.52.3 Options

<code>-c</code>	
<b>Format</b>	<code>-c</code>
<b>Default</b>	---
<b>Description</b>	Display only client configuration parameters.

<code>-g</code>	
<b>Format</b>	<code>-g</code>
<b>Default</b>	---
<b>Description</b>	Display only GUI configuration parameters.

<code>-p</code>	
<b>Format</b>	<code>-p &lt;parameter_pattern&gt;</code>
<b>Default</b>	---
<b>Description</b>	Display only configuration parameters matching the specified pattern. The following wildcards are supported: <ul style="list-style-type: none"> <li>* – Matches any number of characters</li> <li>? – Matches a single character</li> </ul>



<b>-s</b>	
<b>Format</b>	-s
<b>Default</b>	---
<b>Description</b>	Display only server configuration parameters.

<b>-w</b>	
<b>Format</b>	-w
<b>Default</b>	---
<b>Description</b>	Display only web services configuration parameters.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---

**--quiet**

<b>Description</b>	Suppress headers and parameter names.
--------------------	---------------------------------------

**--version**

<b>Format</b>	--version
---------------	-----------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Display product version.
--------------------	--------------------------

**Related Topics**

- [Appendix A: Commands Reference - page 332](#)

## A.53 mam-refund

### A.53.1 Synopsis

```
mam-refund {-J <instance_name> | [-j] <usage_record_id>} [-z <refund_amount>] [-i <allocation_id>] [-d <description>] [--hours] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.53.2 Overview

*mam-refund* issues a refund for the specified usage. The command will return a list of usage records if the usage search does not yield a unique match. If an amount is not specified, the appropriate allocations will be credited for the full amount the overall usage was charged. A lesser amount can be specified for a partial refund. The refund will go to the allocations that were charged unless an allocation is specified, in which case the specified allocation will be credited.

### A.53.3 Options

**-d**

<b>Format</b>	<code>-d &lt;description&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies an explanatory message for the refund.

**-i**

<b>Format</b>	<code>-i &lt;allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the allocation to be credited. If this is omitted, the allocations that were debited in the original charges will be credited.

**-j**

<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the unique usage record identifier the accounting manager assigns to distinguish between usage with non-unique instance names.

**-J**

<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the name of the instance (e.g., job ID). This ID might not be unique among the historical list of usage records the accounting manager manages.

<b>-z</b>	
<b>Format</b>	<code>-z &lt;refund_amount&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the amount to refund. This amount must be non-negative and less than or equal to the amount charged for the overall usage.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Treats currency as specified in hours. In systems where the currency is measured in resource-seconds (like processor-seconds), this option allows the amount to be specified in resource-hours.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	By default, MAM refunds amounts to the same fund from which it took them. If you want to override this, by specifying filters you can restrict the fund to be refunded to one whose constraints are consistent with the specified filters. For example, <code>mam-refund --filter User=amy</code> will refund the amount to the fund usable by the user <code>amy</code> . You can specify multiple filter options by logically ANDing them together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type &lt;filter_type&gt;</code>
<b>Default</b>	<code>NonExclusive</code>
<b>Description</b>	Selects the filtering type. If you use the <code>Exclusive</code> filter type, a fund will only be matched if the specified filters meet all constraints. If you use the <code>NonExclusive</code> filter type, a fund will be matched as long as the specified filters do not conflict with the constraints.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>

<b>--site</b>	
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	--verbose
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [14.8 Issuing Usage Refunds - page 113](#)
- [Appendix A: Commands Reference - page 332](#)

## A.54 mam-reserve

### A.54.1 Synopsis

```
mam-reserve {-J <instance_name>} [[-j] <usage_record_id>] [-q <quote_id>] [-n <designated_name>] [-T <usage_record_type>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization>] [-c <class_name>] [-Q <quality_of_service>] [-m <machine_name>] [-N <nodes>] [-P <processors>] [-C <cpu_time>] [-M <memory>] [-D <disk>] [-E <energy>] [-F "{\<feature_name>\":<feature_count>,...}" ] [-R "{\<resource_name>\":<resource_count>,...}" ] [-L "{\<license_name>\":<license_count>,...}" ] [-Z "{\<metric_name>\":<metric_amount>,...}" ] [-V "{\<variable_name>\":\<variable_value>\",...}" ] [-W <requested_duration>] [-s <start_time>] [--stage <lifecycle_stage>] [-d <description>] [-X, --extension <property=value>]... [-zt <lien_duration> [-zs <lien_start_time> [-G <grace_duration>]] [-z <lien_amount>] [--modify | --replace] [--rate <charge_rate_name>[{\<charge_rate_value>}]=<charge_rate_amount>,...]... [--hours] [--itemize] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.54.2 Overview

*mam-reserve* obtains a lien for usage.

### A.54.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Account name.

<b>-c</b>	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Class or queue used.

<b>-C</b>	
<b>Format</b>	-C <cpu_time>
<b>Default</b>	---
<b>Description</b>	Estimated CPU time used.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Description of the usage.

<b>-D</b>	
<b>Format</b>	-D <disk>
<b>Default</b>	---
<b>Description</b>	Amount of disk used.

<b>-E</b>	
<b>Format</b>	-E <energy>
<b>Default</b>	
<b>Description</b>	Amount of energy used.



<b>-F</b>	
<b>Format</b>	<code>-F "{\"&lt;feature_name&gt;\":&lt;feature_count&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	Allocated node features. Features represent counts of the node features allocated to the job.

<b>-g</b>	
<b>Format</b>	<code>-g &lt;group_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Group name.

<b>-G</b>	
<b>Format</b>	<code>-G &lt;grace_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Grace period in seconds. If you specify the lien duration but not the lien end time, MAM will calculate the lien end time as the lien start time plus the lien duration plus the grace duration.

<b>-j</b>	
<b>Format</b>	<code>[-j] &lt;usage_record_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record ID for the lien (if already created with <code>mam-create-usagerecord</code> , <code>mam-quote</code> , or a previous <code>mam-reserve</code> ). This is used to place a hold against an existing usage record if the instance name (e.g., job ID) is ambiguous or if usage has already been debited and you want to reserve an additional amount associated with the same usage record.

<b>-J</b>	
<b>Format</b>	<code>-J &lt;instance_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Instance name (e.g., job ID) of the lien, if known. This can sometimes be non-unique, such as when a resource manager recycles job IDs, and does not always unambiguously identify a usage record to reserve. In such cases, look up and specify the usage record ID for the lien.

<b>-L</b>	
<b>Format</b>	<code>-L "{\"&lt;license_name&gt;\":&lt;license_count&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	Licenses used. Licenses represent software licenses that are used (in integer units).

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Name of the cluster.

<b>-M</b>	
<b>Format</b>	<code>-M &lt;memory&gt;</code>
<b>Default</b>	---
<b>Description</b>	Amount of memory used.

<b>--modify</b>	
<b>Format</b>	<code>--modify</code>

<b>--modify</b>	
<b>Default</b>	---
<b>Description</b>	Causes the reserve operation to augment existing liens instead of creating new ones. This new option is mutually exclusive with the <code>--replace</code> option, which deletes existing matching liens and recreates a new one. The default action is to create a new lien even if a lien for an instance of the same name exists. The modify behavior supports extending liens out dynamically and is often used with incremental charging.

<b>-n</b>	
<b>Format</b>	<code>-n &lt;designated_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	User-specified job name.

<b>-N</b>	
<b>Format</b>	<code>-N &lt;nodes&gt;</code>
<b>Default</b>	---
<b>Description</b>	Number of nodes used.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Organization name.

<b>-P</b>	
<b>Format</b>	<code>-P &lt;processors&gt;</code>

<b>-P</b>	
<b>Default</b>	---
<b>Description</b>	Number of processors used.

<b>-q</b>	
<b>Format</b>	<code>[-q] &lt;quote_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Quote used to determine charge rates.

<b>-Q</b>	
<b>Format</b>	<code>-Q &lt;quality_of_service&gt;</code>
<b>Default</b>	---
<b>Description</b>	Quality of service used.

<b>-R</b>	
<b>Format</b>	<code>-R "{\ "&lt;resource_name&gt;\":&lt;resource_count&gt;,...}"</code>
<b>Default</b>	---
<b>Description</b>	Consumable resources allocated. Resources represent consumable resources that can be allocated (in integer units).

<b>--rate</b>	
<b>Format</b>	<code>--rate &lt;charge_rate_name&gt;[{\&lt;charge_rate_value&gt;}]=&lt;charge_rate_amount&gt;,...</code>
<b>Default</b>	---

<b>--rate</b>	
<b>Description</b>	Charge rate expressions. Multiple charge rate expressions can be passed to the <code>--rate</code> option in a comma-delimited list. Alternatively, multiple <code>--rate</code> options can be specified.

<b>--replace</b>	
<b>Format</b>	<code>--replace</code>
<b>Default</b>	---
<b>Description</b>	If you specify this option, MAM will delete similarly named liens before creating this lien. The default action is to create a new lien while leaving any existing liens for instances of the same name. The replace option should be specified if you want this lien to replace existing liens for instances of the same name such as when a system reuses instance names. This new option is mutually exclusive with the <code>--modify</code> option, which modifies any existing matching lien instead of creating a new one.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	---
<b>Description</b>	Start time for the usage in the format <code>YYYY-MM-DD[hh:mm:ss]</code>   <code>-Infinity</code>   <code>Infinity</code>   <code>Now</code>

<b>--stage</b>	
<b>Format</b>	<code>--stage &lt;lifecycle_stage&gt;</code>
<b>Default</b>	---
<b>Description</b>	Latest stage in the object's accounting lifecycle (Create, Start, Continue, End).

<b>-T</b>	
<b>Format</b>	<code>-T &lt;usage_record_type&gt;</code>
<b>Default</b>	---
<b>Description</b>	Usage record type, such as job or reservation.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	User name.

<b>-V</b>	
<b>Format</b>	<code>-V "{ \"&lt;variable_name&gt;\": \"&lt;variable_value&gt;\", ... }"</code>
<b>Default</b>	---
<b>Description</b>	Job variables. Variables represent arbitrary variables passed into the job.

<b>-W</b>	
<b>Format</b>	<code>-W &lt;requested_duration&gt;</code>
<b>Default</b>	---
<b>Description</b>	Total estimated wallclock duration (in seconds).

<b>-X</b>	
<b>Format</b>	<code>-X or --extension &lt;property&gt;=&lt;value&gt;</code>
<b>Default</b>	---

**-X****Description**

Specifies an extension property. You can specify any number of extra usage properties with the lien.

When expressing accumulating properties, value can be an expression in the form of `[cumulative_value] [(incremental_value)]`:

- If both `incremental_value` and `cumulative_value` are specified, then `incremental_value` will be used for the lien and `cumulative_value` will be recorded as the cumulative value used in the usage record.
- If only `incremental_value` is specified, this value will be used for the lien *only* and no cumulative value will be recorded in the usage record.
- If only `cumulative_value` is specified, this value will be used both in the lien *and* recorded in the usage record.

**-z****Format**

`-z <lien_amount>`

**Default**

---

**Description**

Lien amount if calculated externally.

**-zs****Format**

`-zs <lien_start_time>`

**Default**

Now (if unable to derive by other means)

**Description**

Start time for the lien in the format `YYYY-MM-DD[hh:mm:ss] | -Infinity | Infinity | Now`

This is *only* needed for incremental liens when the start of the lien interval differs from the original start time *and* is used to determine the appropriate allocation to reserve.

**-zt****Format**

`-zt <lien_duration>`

**Default**

---

<b>-zt</b>	
<b>Description</b>	Incremental duration for the lien (in seconds). This is <i>only</i> needed for incremental liens when the incremental duration differs estimated wallclock duration <i>and</i> is used to compute the incremental lien amount.

<b>-Z</b>	
<b>Format</b>	<code>-Z "{\"&lt;metric_name&gt;\":&lt;metric_amount&gt;, ...}"</code>
<b>Default</b>	---
<b>Description</b>	Generic metrics. Metrics represent floating point metrics of the job <i>or</i> average metrics values across the nodes in the job.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Displays time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--itemize</b>	
<b>Format</b>	<code>--itemize</code>
<b>Default</b>	---
<b>Description</b>	Returns the composite charge information in the response data. You must use this in conjunction with the <code>--verbose</code> flag to display the data.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---



<b>--debug</b>	
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	--quiet
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	--site <site_name>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [14.6 Making a Usage Lien - page 111](#)
- [Appendix A: Commands Reference - page 332](#)

## A.55 mam-server

### A.55.1 Synopsis

```
mam-server [-s, --start] [-k, --stop] [-r, --restart] [-c, --reconfig] [-l, --status] [--primary] [--backup] [-d, --debug [<debug_level>]] [--help] [--man] [--version] [--about]
```

## A.55.2 Overview

*mam-server* is a forking server that listens for and services Moab Accounting Manager client requests. It handles the startup and daemonization, shutdown and restart of the application.

## A.55.3 Options

### --backup

<b>Format</b>	--backup
<b>Default</b>	---
<b>Description</b>	Causes the server to start up in the backup server role. When running under the backup server role, events are disabled.

### -c, --reconfig

<b>Format</b>	-c or --reconfig
<b>Default</b>	---
<b>Description</b>	Causes the server to reread the configuration files. This can also be accomplished by sending the HUP signal to the main server process.

### -k, --stop


<b>Format</b>	-k or --stop
<b>Default</b>	---
<b>Description</b>	Shuts down (kill) the server. This can also be accomplished by sending the TERM signal to the main server process.

### -l, --status

<b>Format</b>	-l or --status
---------------	----------------

<b>-l, --status</b>	
<b>Default</b>	---
<b>Description</b>	Displays the status of the server, indicating whether it is running or has stopped.

<b>--primary</b>	
<b>Format</b>	--primary
<b>Default</b>	---
<b>Description</b>	Causes the server to start up in the primary server role. When running under the primary server role, events are enabled.

<b>-r, --restart</b>	
<b>Format</b>	-r or --restart
<b>Default</b>	---
<b>Description</b>	<p>Restarts the server.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p> If MAM has been started under systemd, use <code>systemctl restart mam.service</code> instead of using this option.</p> </div>

<b>-s, --start</b>	
<b>Format</b>	-s or --start
<b>Default</b>	---
<b>Description</b>	Starts the server. This option is assumed in the absence of a stop or restart flag and can be omitted in a start request.

<b>-d, --debug</b>	
<b>Format</b>	-d or --debug [<debug_level>]

<b>-d, --debug</b>	
<b>Default</b>	DEBUG
<b>Description</b>	Logs debug information to the screen. You can supply an optional debug level parameter to indicate the logging threshold. It can be one of TRACE, DEBUG, INFO, WARN, ERROR and FATAL.

<b>--help</b>	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--version</b>	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [Appendix A: Commands Reference - page 332](#)

# A.56 mam-set-password

## A.56.1 Synopsis

```
mam-set-password [[-u] <user_name>] [--debug] [--site <site_name>] [--help] [--man] [--quiet] [--verbose] [--version] [--about]
```

## A.56.2 Overview

*mam-set-password* sets a user password. If the user name is not specified via an option or as the unique argument, then the invoking user will be taken as the user whose password will be set. The invoker will be prompted for the new password.

## A.56.3 Options

-u	
<b>Format</b>	[-u] <user_name>
<b>Default</b>	---
<b>Description</b>	Specifies the name of user whose password is to be set. If no user is specified, the invoking user will be taken as the user whose password will be set.

--debug	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

--version	
<b>Format</b>	--version
<b>Default</b>	---
<b>Description</b>	Displays the product version.

--about	
<b>Format</b>	--about
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

### Related Topics

- [21.1 Setting Passwords - page 149](#)
- [Appendix A: Commands Reference - page 332](#)

## A.57 mam-shell

### A.57.1 Synopsis

```
mam-shell [--format csv|raw|standard] [--debug] [--site <site_
name>] [--help] [--man] [--quiet] [--verbose] [--version] [--
about] [<command>]
```

### A.57.2 Overview

*mam-shell* is an interactive control program that can access all functionality available in MAM. You can invoke commands directly from the command line, or an interpreter can parse commands from stdin.

Commands follow the form:

```
<Object>[,<Object>...] <Action> [<Predicate>]...
```



<Predicate> follows the form:

```
[<Conjunction>] [<OpenParentheses>] [<Object>.]<Name Operator>
[<Subject>.]<Value> [<CloseParentheses>]
```

Where:

- <Conjunction> defaults to "And" and includes:
  - && - and
  - || - or
  - &! - and not
  - |! - or not
- <OpenParentheses> can be any number of literal open parentheses '('.
- <Name> is the name of the condition, assignment or option.
- <Operator> is one of:
  - == - equals
  - < - less than
  - > - greater than
  - <= - less than or equal to
  - >= - greater than or equal to
  - != - not equal to
  - ~ - matches
  - !~ - does not match
  - = - assignment
  - += - increment
  - -= - decrement
  - := - option
  - :! - negated option
- <Value> is the value of the condition, assignment, or option and can be enclosed in double quotes to enclose spaces or special characters.
- <CloseParentheses> can be any number of literal close parentheses ')'

You can specify the desired selections (columns to be displayed) in a query via a pseudo Show option with a value of comma-separated attribute names. It can optionally include an object, operator and alias. It will follow the form:

Show:="[operator()][object.]name[=alias][)][,[operator()][object.]name[=alias][)]...".

See [Chapter 22: Using the MAM Shell \(mam-shell\) - page 151](#) for more information on constructing requests.

### A.57.3 Options

--debug	
<b>Format</b>	--debug
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

--format	
<b>Format</b>	--format <standard csv>
<b>Default</b>	standard
<b>Description</b>	Specifies the data output format. Valid values are standard, raw, and csv.

--help	
<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

--man	
<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

## Related Topics

- [Chapter 22: Using the MAM Shell \(mam-shell\) - page 151](#)
- [Appendix A: Commands Reference - page 332](#)

# A.58 mam-statement

## A.58.1 Synopsis

```
mam-statement [[-f] <fund_id>] [-n <fund_name>] [-u <user_name>] [-g <group_name>] [-a <account_name>] [-o <organization_name>] [-c <class_name>] [-m <machine_name>] [--filter <filter_name>=<filter_value>]... [--filter-type ExactMatch|Exclusive|NonExclusive] [-s <start_time>] [-e <end_time>] [--summarize] [--hours] [--debug] [--site <site_man>] [--help] [--man] [--version] [--about]
```

## A.58.2 Overview

*mam-statement* displays a fund statement. For a specified time frame it displays the beginning and ending balances, as well as the total credits and debits to the fund over that period. This is followed by an itemized report of the debits and credits. You can use filters to select the funds you would like to review.

## A.58.3 Options

-a	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this account. Note that the statement may include information from other accounts if multiple accounts share the included funds.

-c	
<b>Format</b>	-c <class_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this class. Note that the statement may include information from other classes if multiple classes share the included funds.

-e	
<b>Format</b>	-e <end_time>
<b>Default</b>	Now
<b>Description</b>	Specifies the end of the reporting period in the format YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now

-f	
<b>Format</b>	[-f] <fund_id>
<b>Default</b>	Infinity
<b>Description</b>	Specifies that MAM should make the fund statement for the specified fund.

-g	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this group. Note that the statement may include information from other groups if multiple groups share the included funds.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this machine. Note that the statement may include information from other machines if multiple machines share the included funds.

<b>-n</b>	
<b>Format</b>	<code>[-n] &lt;fund_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that MAM will display the fund statement for funds with the given name.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this organization. Note that the statement may include information from other organizations if multiple organizations share the included funds.

<b>-s</b>	
<b>Format</b>	<code>-s &lt;start_time&gt;</code>
<b>Default</b>	<code>-Infinity</code>
<b>Description</b>	Specifies the beginning of the reporting period in the format <code>YYYY-MM-DD [hh:mm:ss]   -Infinity   Infinity   Now</code>

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the statement will represent a combination of information for all the funds available for this user. Note that the statement may include information from other users if multiple machines share the included users.

<b>---hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Specifies that MAM should display time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), the currency is divided by 3600 to display resource-hours.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Restricts the fund to one where constraints do not conflict with the specified filters. For example, <code>mam-statement --filter User=amy</code> will restrict the fund to one usable by the user <code>amy</code> . You can specify multiple filter options that are logically ANDed together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	<code>NonExclusive</code>
<b>Description</b>	<p>Specifies the filtering type:</p> <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	<code>---</code>
<b>Description</b>	Suppresses headers and success messages.



<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--summarize</b>	
<b>Format</b>	<code>--summarize</code>
<b>Default</b>	---
<b>Description</b>	Displays transaction summaries only. Deposits, Refunds, Charges, and other properties will be shown as total as opposed to being itemized.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

**Related Topics**

- [10.10 Obtaining a Fund Statement - page 83](#)
- [Appendix A: Commands Reference - page 332](#)

## A.59 mam-transfer

### A.59.1 Synopsis

```
mam-transfer {--from-fund <source_fund_id> &| --from-
allocation <source_allocation_id> &| --from-filter <filter_
name>=<filter_value>...} {--to-fund <destination_fund> &| --
to-allocation <destination_allocation_id> &| --to-
filter <filter_name>=<filter_value>...} [--filter-type
ExactMatch|Exclusive|NonExclusive] {[-z] <transfer_amount>} [-
d <description>] [--hours] [--debug] [--site <site_name>] [--
help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.59.2 Overview

*mam-transfer* issues a transfer between funds.

### A.59.3 Options

-d	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies the reason for the transfer. The annotation applies to the transaction description (seen via <a href="#">mam-list-transactions</a> ), not the allocation description.

-z	
<b>Format</b>	[-z] <transfer_amount>
<b>Default</b>	---
<b>Description</b>	Specifies the amount to transfer.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Treats currency as specified in hours. In systems where the currency is measured in resource-seconds (like processor-seconds), this option allows the amount to be specified in resource-hours.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	<code>NonExclusive</code>
<b>Description</b>	<p>Specifies the filtering type:</p> <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--from-allocation</b>	
<b>Format</b>	<code>--from-allocation &lt;source_allocation_id&gt;</code>
<b>Default</b>	---

**--from-allocation**

<b>Description</b>	Transfers credits from the specified allocation ID only. If you omit the allocation, only credits from active allocations will transfer in the order of earliest expiring first.
--------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--from-filter**

<b>Format</b>	<code>--from-fund &lt;filter_name=&lt;filter_value&gt;</code>
---------------	---------------------------------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	If you specify one or more source filters and there is exactly one matching fund, MAM makes the transfer from that fund. Otherwise, it displays a list of funds for the specified filters and you will be prompted to respecify the transfer against one of the enumerated funds. You can specify multiple <code>--from-filter</code> options by logically ANDing them together.
--------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**--from-fund**

<b>Format</b>	<code>--from-fund &lt;source_fund_id&gt;</code>
---------------	-------------------------------------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Specifies the fund to be debited.
--------------------	-----------------------------------

**--help**

<b>Format</b>	<code>--help</code>
---------------	---------------------

<b>Default</b>	---
----------------	-----

<b>Description</b>	Displays a brief help message.
--------------------	--------------------------------

**--man**

<b>Format</b>	<code>--man</code>
---------------	--------------------

<b>Default</b>	---
----------------	-----

<b>--man</b>	
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--to-allocation</b>	
<b>Format</b>	<code>--to-allocation &lt;destination_allocation_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Transfers credits to the specified allocation ID only. If you omit the allocation, MAM transfers the credits to the allocation having the same start and end time as the source allocation the funds are taken from, or, if such an allocation is non-existent, MAM will create a new allocation in the target fund having the same start and end time.

<b>--to-filter</b>	
<b>Format</b>	<code>--to-filter &lt;filter_name&gt;--&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	If you specify one or more destination filters and there is exactly one matching

**--to-filter**

fund, a transfer will be made to that fund. Otherwise, MAM displays a list of funds for the specified filters and you will be prompted to respecify the transfer against one of the enumerated funds. You can specify multiple `--to-filter` options by logically ANDing them together.

**--to-fund**

<b>Format</b>	<code>--to-fund &lt;destination_fund_id&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies the fund to be credited.

**--verbose**

<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

**--version**

<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

**--about**

<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

**Related Topics**

- [10.9 Making Transfers - page 82](#)
- [Appendix A: Commands Reference - page 332](#)

## A.60 mam-withdraw

### A.60.1 Synopsis

```
mam-withdraw [-f <fund_id>] [-i <allocation_id>] [-u <user-
name>] [-g <group_name>] [-a <account_name>] [-
o <organization_name>] [-c <class_name>] [-m <machine_name>]
[--filter <filter_name>=<filter_value>]... [--filter-type
ExactMatch|Exclusive|NonExclusive] {[-z] <withdrawal_amount>}
[-d <description>] [--hours] [--debug] [--site <site_name>] [-
-help] [--man] [--quiet] [--verbose] [--version] [--about]
```

### A.60.2 Overview

*mam-withdraw* makes a withdrawal from the specified fund.

### A.60.3 Options

<b>-a</b>	
<b>Format</b>	-a <account_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified account.
<b>-c</b>	
<b>Format</b>	-c <class_name>

<b>-c</b>	
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified class.

<b>-d</b>	
<b>Format</b>	-d <description>
<b>Default</b>	---
<b>Description</b>	Specifies the reason for the withdrawal. The annotation applies to the transaction description (seen via <code>mam-list-transactions</code> ), not the allocation description.

<b>-f</b>	
<b>Format</b>	-f <fund_id>
<b>Default</b>	---
<b>Description</b>	Specifies the ID of the fund from which MAM will make the withdrawal.

<b>-g</b>	
<b>Format</b>	-g <group_name>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified group.

<b>-i</b>	
<b>Format</b>	-i <allocation_id>
<b>Default</b>	---



<b>-i</b>	
<b>Description</b>	Withdraws credits from the specified allocation ID only. If you omit the allocation, MAM only withdraws credits from active allocations in the order of earliest expiring first.

<b>-m</b>	
<b>Format</b>	<code>-m &lt;machine_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified machine.

<b>-o</b>	
<b>Format</b>	<code>-o &lt;organization_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified organization.

<b>-u</b>	
<b>Format</b>	<code>-u &lt;user_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Specifies that the fund for the withdrawal should be usable by the specified user.

<b>-z</b>	
<b>Format</b>	<code>[-z] &lt;withdrawal_amount&gt;</code>
<b>Default</b>	---

<b>-z</b>	
<b>Description</b>	Specifies the amount to withdraw. You can also specify the amount as the sole argument.

<b>--hours</b>	
<b>Format</b>	<code>--hours</code>
<b>Default</b>	---
<b>Description</b>	Specifies that MAM should display time-based credits in hours. In cases where the currency is measured in resource-seconds (like processor-seconds), this option allows the amount to be specified in resource-hours.

<b>--debug</b>	
<b>Format</b>	<code>--debug</code>
<b>Default</b>	---
<b>Description</b>	Logs debug information to the screen.

<b>--filter</b>	
<b>Format</b>	<code>--filter &lt;filter_name&gt;=&lt;filter_value&gt;</code>
<b>Default</b>	---
<b>Description</b>	Restricts the fund to one where constraints do not conflict with the specified filters. For example, <code>mam-withdraw --filter User=amy</code> will restrict the fund to one usable by the user <code>amy</code> . You can specify multiple filter options that are logically ANDed together.

<b>--filter-type</b>	
<b>Format</b>	<code>--filter-type ExactMatch Exclusive NonExclusive</code>
<b>Default</b>	<code>NonExclusive</code>

<b>--filter-type</b>	
<b>Description</b>	<p>Specifies the filtering type:</p> <ul style="list-style-type: none"> <li>• If the exact-match filter type is used, a fund will only be matched if the specified filters exactly match the fund constraints.</li> <li>• If the exclusive filter type is used, a fund will only be matched if the specified filters meet all constraints (not only must the filters be a non-conflicting superset of the fund constraints, but all constraint association dependencies must also be satisfied).</li> <li>• If the non-exclusive filter type is used, a fund will be matched as long as the specified filters do not conflict with the constraints.</li> </ul>

<b>--help</b>	
<b>Format</b>	<code>--help</code>
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

<b>--man</b>	
<b>Format</b>	<code>--man</code>
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

<b>--quiet</b>	
<b>Format</b>	<code>--quiet</code>
<b>Default</b>	---
<b>Description</b>	Suppresses headers and success messages.

<b>--site</b>	
<b>Format</b>	<code>--site &lt;site_name&gt;</code>
<b>Default</b>	---
<b>Description</b>	Obtains a response from specified site.

<b>--verbose</b>	
<b>Format</b>	<code>--verbose</code>
<b>Default</b>	---
<b>Description</b>	Displays modified object details.

<b>--version</b>	
<b>Format</b>	<code>--version</code>
<b>Default</b>	---
<b>Description</b>	Displays the product version.

<b>--about</b>	
<b>Format</b>	<code>--about</code>
<b>Default</b>	---
<b>Description</b>	Displays product information.

---

## Related Topics

- [10.8 Making Withdrawals - page 81](#)
- [Appendix A: Commands Reference - page 332](#)

## A.61 mybalance

### A.61.1 Synopsis

```
mybalance [--hours] [--help] [--man]
```

### A.61.2 Overview

*mybalance* displays balance information for the invoking user.

### A.61.3 Options

#### --hours

<b>Format</b>	--hours
<b>Default</b>	---
<b>Description</b>	Displays balance in processor-hours (instead of processor-seconds).

#### --help

<b>Format</b>	--help
<b>Default</b>	---
<b>Description</b>	Displays a brief help message.

#### --man

<b>Format</b>	--man
<b>Default</b>	---
<b>Description</b>	Displays full documentation.

### **Related Topics**

- [10.7 Personal Balance - page 80](#)
- [Appendix A: Commands Reference - page 332](#)