Adaptive COMPUTING

Intelligent HPC Workload Management

Using Moab® Cloud for the HPC Suite with Grid Environments
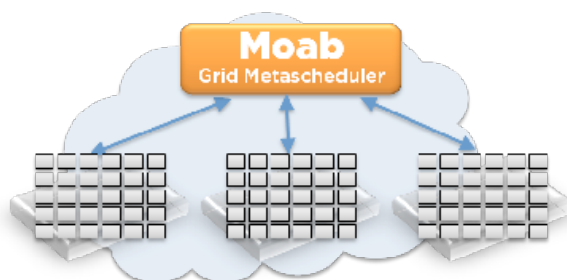
Consolidation and Grid

Many sites have multiple clusters as a result of having multiple independent groups or locations, each with demands for HPC, and frequent additions of newer machines. Each new cluster increases the overall administrative burden and overhead. Additionally, many of these systems can sit idle while others are overloaded. Because of this systems-management challenge, sites turn to grids to maximize the efficiency of their clusters. Grids can be enabled either independently or in conjunction with one another in three areas:

• **Reporting Grids** Managers want to have global reporting across all HPC resources so they can see how users and projects are really utilizing hardware and so they can effectively plan capacity. Unfortunately, manually consolidating all of this information in an intelligible manner for more than just a couple clusters is a management nightmare. To solve that problem, sites will create a reporting grid, or share information across their clusters for reporting and capacity-planning purposes.

• **Management Grids** Managing multiple clusters independently can be especially difficult when processes change, because policies must be manually reconfigured across all clusters. To ease that difficulty, sites often set up management grids that impose a synchronized management layer across all clusters while still allowing each cluster some level of autonomy.

• **Workload-Sharing Grids** Sites with multiple clusters often have the problem of some clusters sitting idle while other clusters have large backlogs. Such inequality in cluster utilization wastes expensive resources, and training users to perform different workload-submission routines across various clusters can be difficult and expensive as well. To avoid these problems, sites often set up workload-sharing grids. These grids can be as simple as centralizing user submission or as complex as having each cluster maintain its own user submission routine with an underlying grid-management tool that migrates jobs between clusters.

Inhibitors to Grid Environments

Three common inhibitors keep sites from enabling grid environments:

• **Politics** Because grids combine resources across users, groups, and projects that were previously independent, grid implementation can be a political nightmare. To create a grid in the real world, sites need a tool that allows clusters to retain some level of sovereignty while participating in the larger grid.

• **Multiple Resource Managers** Most sites have a variety of resource managers used by various groups within the organization, and each group typically has a large investment in scripts that are specific to one resource manager and that cannot be changed. To implement grid computing effectively, sites need a robust tool that has flexibility in integrating with multiple resource managers.

• **Credentials** Many sites have different log-in credentials for each cluster, and those credentials are generally independent of one another. For example, one user might be Joe.P on one cluster and J_Peterson on another. To enable grid environments, sites must create a combined user space that can recognize and combine these different credentials.

Using Moab Cloud for the HPC Suite in a Grid

Sites can use Moab Cloud for the HPC Suite to set up any combination of reporting, management, and workload-sharing grids. Moab Cloud is a grid metascheduler that allows sites to set up grids that work effectively in the real world. It's feature-rich functionality overcomes the inhibitors of politics, multiple resource managers, and varying credentials by providing:

- **Grid Sovereignty** Moab Cloud has multiple features that break down political barriers by letting sites choose how each cluster shares in the grid. Sites can control what information is shared between clusters and can specify which workload is passed between clusters. In fact, sites can even choose to let each cluster be completely sovereign in making decisions about grid participation for itself.

- **Support for Multiple Resource Managers** Moab Cloud meta-schedules across all common resource managers. It fully integrates with TORQUE and SLURM, the two most-common open-source resource managers, and also has limited integration with commercial tools such as PBS Pro and SGE. Moab Cloud's integration includes the ability to recognize when a user has a script that requires one of these tools, and it can intelligently ensure that the script is sent to the correct machine. Moab Cloud even has the ability to translate common scripts across multiple resource managers.

- **Credential Mapping** Moab Cloud can map credentials across clusters to ensure that users and projects are tracked appropriately and to provide consolidated reporting.

Benefits of Using Moab Cloud for the HPC Suite

Setting up a grid with Moab Cloud provides key business benefits:

- Increase cluster utilization by sharing workload among systems to maximize the ROI from hardware investments
- Consolidate and standardize job submission across the entire organization to increase user efficiency and decrease administrative burden
- Create reports that account for all resources collectively, and conduct holistic capacity planning
- Increase collaboration among users and projects

To learn more about Moab Cloud for the HPC Suite - Grid Option, visit www.AdaptiveComputing.com.
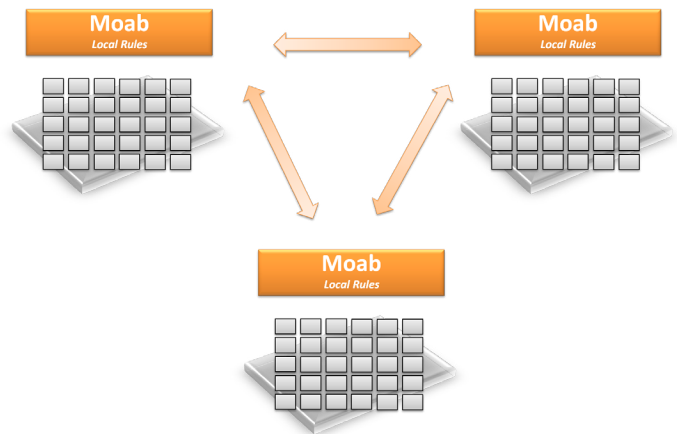
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