Moab HPC Suite

Installation and Configuration Guide 9.0.3 for SUSE 11-Based Systems

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Welcome

Welcome to the Moab HPC Suite 9.0.3 Installation and Configuration Guide for SUSE 11-Based Systems.

This guide includes detailed instructions for installing each component of the suite so that you can quickly get up and running.

This guide is intended for system administrators who are responsible for installing the Moab HPC Suite components.

> 🛈 Depending on your system configuration and license, not all of the HPC Suite components may be available.

The Moab HPC Suite 9.0.3 contains the following components for SUSE 11-based systems:

- Torque Resource Manager 6.0.3
- Moab Workload Manager 9.0.3
- Moab Accounting Manager 9.0.3
- Nitro 2.0.1; Nitro Web Services is not available for a SUSE 11-based system.
- Reprise License Manager 12.1.2

Before commencing the installation or upgrade, please see Chapter 1 Planning your Installation on page 2 to verify your system conforms to minimum prerequisites.

Chapter 1 Planning your Installation

> ⚠️ It is highly recommended that you *first* perform installations and upgrades in a *test environment*. Standard installation and upgrade procedures and use cases are tested prior to release. However, due to the wide range of possible configurations and customizations, it is important to exercise caution when deploying new versions of software into your production environments. This is especially true when the workload has vital bearing on your organization's day-to-day operations. We recommend that you test in an environment that mirrors your production environment's configuration, workflow and load as closely as possible. Please contact your Adaptive Computing account manager for suggestions and options for installing/upgrading to newer versions.

There are many different ways to install and configure the Moab HPC Suite. Each environment has its own set of requirements and preferences. This chapter is intended to help an administrator understand how each of the Moab HPC Suite components interact, basic requirements and configuration information to prepare for the installation.

> ℹ️ Code samples have been provided for convenience. Some code samples provide sample passwords (i.e. "changeme!"). We strongly recommend that you do not use these passwords during installation, as using the documented passwords could introduce unnecessary security vulnerabilities into your system.

In this chapter:

Installation Terminology

To aid in documentation clarity, Adaptive Computing uses the following terms in this Installation and Configuration Guide:

- Components – The different "products" included in the Moab HPC Suite. For example, Moab Workload Manager, Moab Web Services.

- Servers – Also known as components, but specifically relating to the actual services. For example, the Moab Workload Manager component is referred to as the Moab Server for non-client services.
- Host – The actual box where an Moab HPC Suite component (server or client) is installed.

> ⓘ Previous documentation typically used Head Node to designate a host or a Server.

Where to Start

You will need to plan your environment and determine how many hosts you will need and for which you components you will install using the Manual Installation or the RPM Installation method. The following are suggested steps to help you in your planning and installing process.

1. Determine whether you have a small, medium, High-Throughput or large environment; including an example, and required and recommended hardware requirements. See .

2. Decide whether you will perform a Manual Installation or an RPM Installation for the various components. See .

> ⓘ The Manual Installation and the RPM Installation chapters each have an "Additional Configuration" section that provides additional information and instructions for optional, but recommended configurations.

3. Review the software requirements for your components and set up your hosts accordingly. See .

4. Install the individual components on their respective host(s). See or as applicable.

5. Refer to for assistance in addressing common problems during installation and configuration.

Server Hardware Requirements

The Moab HPC Suite is installed and configured differently for small, medium or large environment types. This topic provides a general topology of the Moab HPC Suite and the server hardware requirements depending on your environment size.

In this topic:

Topology

The following diagram provides a general topology of the Moab HPC Suite for a medium (with high throughput) or a large environment.
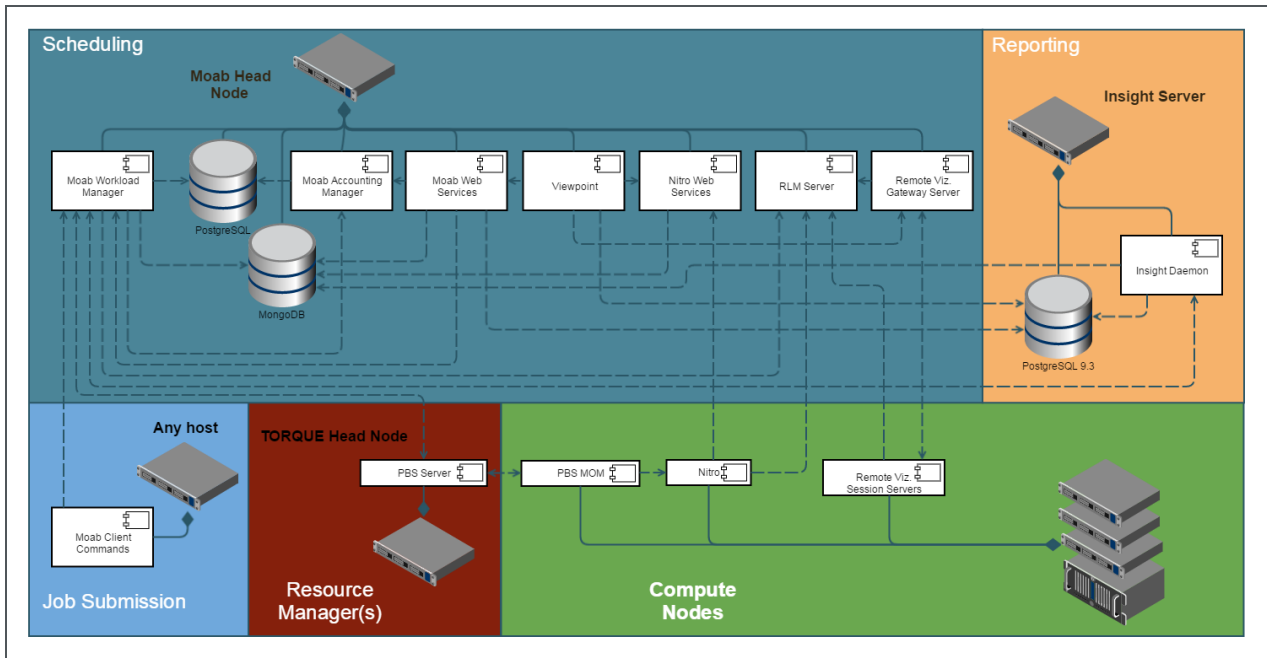
Please note the following:

- Smaller environments may elect to consolidate the Torque Server with the Moab Server on the same host, including PBS Server in the list of components installed on the same host.

- Although Moab Workload Manager and Moab Accounting Manager may share the same database instance, it is not a requirement. Two database instances may be used, one for each component.

- Larger systems will require more dedicated resources for each component, in which case it may be necessary to move individual components from the Moab Server Host (i.e. databases, Moab Accounting Manager, and/or Viewpoint) to their own respective servers.

Hardware Requirements

The following table identifies the minimum and recommended hardware requirements for the different environment types. Use this table as a guide when planing out your suite topology.

> ⓘ Software requirements are listed per-component rather than suite-wide as the suite components reside on different hosts. See Component Requirements on page 8

Environment Type	# of Compute Nodes	Jobs/ Week	Minimum Requirements (per Host Distribution)	Recommended Requirements (targeting minimum number of hosts)
Proof of Concept / Small Demo	50	<1k	**Moab Server+Torque Server Host** • 4 Intel/AMD x86-64 cores • At least 8 GB RAM • At least 100 GB dedicated disk space **Insight Server Host** • 4 Intel/AMD x86-64 cores • At least 8 GB RAM • At least 256 GB dedicated disk space	Same as minimum

Environment Type	# of Compute Nodes	Jobs/ Week	Minimum Requirements (per Host Distribution)	Recommended Requirements (targeting minimum number of hosts)
Medium	500	<100k	**Moab Server+Torque Server Host** • 8 Intel/AMD x86-64 cores • At least 16 GB RAM • At least 512 GB dedicated disk space **Insight Server Host** • 8 Intel/AMD x86-64 cores • At least 8 GB of RAM; a dedicated 1 Gbit channel between Insight and Moab • 128 GB local SSD for swap • At least 512 GB disk	**Moab Server+Torque Server Host** • 16 Intel/AMD x86-64 cores • At least 32 GB RAM • At least 1 TB dedicated disk space **Insight Server Host** • 8 Intel/AMD x86-64 cores • At least 8 GB of RAMA dedicated 1 Gbit channel between Insight and Moab • 128 GB local SSD for swap • At least 512 GB disk

Environment Type	# of Compute Nodes	Jobs/ Week	Minimum Requirements (per Host Distribution)	Recommended Requirements (targeting minimum number of hosts)
Medium with High Throughput or Larger	>500	>100k	**Moab Server Host** • 8 Intel/AMD x86-64 cores • At least 16 GB RAM • At least 512 GB dedicated disk space **Torque Server Host** • 8 Intel/AMD x86-64 cores • At least 16 GB RAM • At least 512 GB dedicated disk space **Insight Server Host** • 8 Intel/AMD x86-64 cores • At least 16 GB of RAM; a dedicated 1 Gbit channel between Insight and Moab • 128 GB local SSD for swap • At least 512 GB disk	The Moab Server should *not* reside on the same host as the Torque Server. MWS Server *must* reside on the same host as the Moab Server (Moab Server Host). The MAM Server may reside on its own host, on the Moab Host (preferred), or another server's host (except for the Insight Host). The Viewpoint Server may reside on its own host, on the Moab Server Host (preferred), or another server's host (except for the Insight Server Host). Databases may also reside on the same or a different host from its server component.

Please note the following:

- All requirements above (minimum and recommended) target a minimum number of management servers. Administrators are encouraged to separate the Torque Server and the Moab Server onto different hosts where possible for better results; especially when High Throughput is enabled.

- Although many factors may have an impact on performance (network bandwidth, intended use and configuration, etc.), we consider High

Throughput as something that makes a significant enough difference between minimum and recommended hardware requirements to merit mention in the table above.

- Moab and Torque are both multi-threaded and perform better with more processors.

- Due to the large amount of data Moab must send to Insight, Moab performs better without Insight enabled (for environments that do not require Viewpoint, or use Crystal Reporting).

- Regarding disk space, consideration should be given to requirements related to log files, log depth, number of jobs/nodes/reservations (more objects impact database journal size), average number of events generated (more events take more space), etc.

Component Requirements

This topic provides the various software requirements and dependencies for the suite components (servers) for SUSE 11-based systems.

In this topic:

Torque

⚠ If you intend to use Torque 6.0 with Moab Workload Manager, you must run Moab version 9.0 or 8.0 or later. Torque 6.0 will not work with versions earlier than Moab 8.0.

In this section:

Supported Operating Systems

- CentOS 6.x, 7.x
- RHEL 6.x, 7.x

- Scientific Linux 6.x, 7.x
- SUSE Linux Enterprise Server 11, 12

Software Requirements

- libxml2-devel package (package name may vary)
- openssl-devel package (package name may vary)
- Tcl/Tk version 8 or later if you plan to build the GUI portion of Torque or use a Tcl-based scheduler
- cpusets and cgroups
  - NUMA-awareness uses cgroups, which include cpusets. Red Hat systems must use libcgroup version 0.40.rc1-16.el6 or later; SUSE systems need to use a comparative libcgroup version.
  - cpusets: libhwloc 1.9.1 is the minimum supported, however NVIDIA K80 requires libhwloc 1.11.0. If you need to install libhwloc and the corresponding hwloc-devel package, see Linux Cpuset Support in the *Torque Resource Manager Administrator Guide*.

> ⚠️ Using "zypper install hwloc" may install an older, non-supported version.

> ℹ️ `--enable-geometry-requests` is *not* compatible with `--enable-cgroups`. In addition, if `--enable-cgroups` is specified, `--enable-cpuset` is ignored.

> ℹ️ If you are building with cgroups enabled, you must have boost version 1.41 or later.

- if you build Torque from source (i.e. clone from github), the following additional software is required:
  - gcc
  - gcc-c++
  - posix-compatible version of make
  - libtool 1.5.22 or later

○ boost-devel 1.36.0 or later

> ⓘ Red Hat 6-based systems come packaged with 1.41.0 and Red Hat 7-based systems come packaged with 1.53.0. If needed, use the --with-boost-path=DIR option to change the packaged boost version. See Customizing the Install in the *Torque Resource Manager Administrator Guide*.

Moab Workload Manager

In this section:

Supported Operating Systems

- CentOS 6.x, 7.x
- RHEL 6.x, 7.x
- Scientific Linux 6.x, 7.x
- SUSE Linux Enterprise Server 11, 12

> ⚠ A SUSE 11-based OS is *only* supported for Moab Server if your configuration does *not* include MWS.

Software Requirements

- libcurl (http://curl.haxx.se/libcurl/)
- Perl 5.8.8 or later
- perl-CPAN (package name may vary)
- libxml2-devel (package name may vary)
- *(Optional)* Moab Accounting Manager 9.0
- *(Optional)* MongoDB 2.4.x; required for MWS or Insight
- *(Optional)* MySQL, PostgreSQL, or Oracle with ODBC driver (see Database Configuration in the *Moab Workload Manager Administrator Guide* for details)

Supported Resource Managers

- Torque 5.0 or later
- SLURM

Moab Accounting Manager

> ⓘ MAM is commonly installed on the same host as Moab Workload Manager; however, in some cases you might obtain better performance by installing them on different hosts.

In this topic:

Supported Operating Systems

- CentOS 6.x, 7.x
- RHEL 6.x, 7.x
- Scientific Linux 6.x, 7.x
- SUSE Linux Enterprise Server 11, 12

Software Requirements

- gcc
- httpd
- mod_ssl
- rrdtool
- Moab Workload Manager 9.0.3
- Perl modules; see Installing Moab Accounting Manager on page 28 (Manual Installation) 1.1 Installing Moab Accounting Manager (RPM Installation) for more details

Depends On (not necessarily on the same host)

MAM uses an RDBMS as a back end.

- PostgreSQL 7.2 or later

RLM Server

Remote Visualization and Nitro require access to a centralized Reprise License Manager (RLM) server.

Adaptive Computing *strongly* recommends that your RLM Server is version 12.1.2. RLM Server version 12.1.2 is packaged with Moab HPC Suite 9.0.2 or later.

This server is not load-extensive so it may be installed on any host within your Moab HPC Suite environment. It may also be installed on its own host.

> **ⓘ** If your company already utilizes an RLM Server, you do not have to install another as long as the Moab HPC Suite components can access it.

> **⚠** The host on which you install RLM Server must always be on and should have High Availability (uptime).

Nitro

> **ⓘ** When integrated with the Moab HPC Suite, Nitro resides on the Torque compute nodes.

In this section:

Hardware Requirements

- Nitro requires one or more multi-core processors per host. Generally the more processors (sockets) and/or OS cores a host has, the more tasks Nitro can execute simultaneously on each host; although this will be application-dependent.

- It is recommended that hosts should have sufficient memory to execute as many applications as possible so that Nitro can run them at a rate of one application instance per OS core (especially if they are not multi-threaded). This eliminates the need for users to have to request memory in their Nitro task definitions.

> **ⓘ** See the *Nitro Administrator Guide* for information on specifying memory requirements.

Supported Operating Systems

- CentOS 6.x, 7.x
- Red Hat 6.x, 7.x
- Scientific Linux 6.x, 7.x
- SUSE Linux Enterprise Server 11, 12

License Requirements

Nitro requires access to a centralized Reprise License Manager (RLM) server. See RLM Server on page 12 for more information.

Software Requirements

Nitro is built with all needed libraries statically linked. This provides for a quick and simple installation and helps avoid troublesome library mismatches. No additional packages need to be installed on the compute nodes.

However, users running the nitrostat utility require Python 2.6.6 or later on the system from which they are running it.

Identify the Manual or RPM Installation Methods

Adaptive Computing provides two methods for installing the Moab HPC Suite components, Manual Installation and RPM Installation.

Depending on your environment and which components you are installing (and on which host), you may need to use a combination of Manual Installation and RPM Installation.

> ⓘ Most components can be installed using either method. Please choose one method for each component.

Manual Installation

This method provides advantages for administrators who want non-standard configure options.

- This method has more supported operating systems than the RPM Installation method.
- Some components can not be installed using the Manual Installation method.

RPM Installation

This method provides advantages for administrators who want a standard installation, with little customization.

- This method is *not* applicable for SUSE 11-based systems.

Chapter 2 Manual Installation

This chapter provides installation, configuration, and upgrading information using the Manual Installation method.

Be aware of the following:

- Manual Installation is not available for Insight, Viewpoint, or Remote Visualization.

- Because many system-level files and directories are accessed during the installation, the instructions in this guide should be executed with root privileges. You will see that the instructions execute commands as the root user. Also be aware that the same commands will work for a non-root user with the `sudo` command.

Related Topics

Manual Installation

This section provides instructions and other information for installing your Moab HPC Suite components for SUSE 11-based systems using the Manual installation method.

In this section:

Preparing for Manual Installation

The manual installation process of the Moab HPC Suite includes installing the different components in the suite. This guide contains detailed instructions for installing each component.

> ℹ Many individual components have dependencies on other components (see Chapter 1 Planning your Installation on page 2). However, if you do not require a certain component, you do not have to install it.

The install instructions for each component include information about system requirements and dependencies. Some include prerequisite instructions that you will need to complete before you begin the install. Please read this information carefully, and make sure you have installed all the dependencies and packages that are necessary in order to avoid errors during the Moab HPC Suite install process.

> ℹ Because many system-level files and directories are accessed during the installation, the instructions in this guide should be executed with root privileges.
>
> You will see that the instructions execute commands as the root user. Please note that the same commands will work for a non-root user with the `sudo` command.

Set Up Proxies

If your site uses a proxy to connect to the internet, configure yum to use a proxy by editing the `/etc/yum.conf` file as follows:

```
proxy=http://<proxy_server_id>:<port>
```

If your site uses an external repository to install python dependencies (for example, the host where you install Viewpoint might need to download extra packages), you will need to set up pip to use a proxy. Do the following:

```
export http_proxy=http://<proxy_server_id>:<port>
export https_proxy=http://<proxy_server_id>:<port>
```

Enable Extra Packages for the Repository

Many individual components have dependencies that are found in the optional add-on repositories for the distribution. You must enable the respective repository for your distribution on all hosts upon which you install Adaptive Computing software components.

Do the following:

1. Verify that you have a licensed installation of SLES 11 and that you are registered for a SUSE Linux Enterprise subscription.

2. Download the SUSE Linux Enterprise 11 Software Development Kit e-Media Kit and add the ISO to the repository.

3. Add the `devel:languages:perl` and the `devel:languages:python` repos for your SLES version to the your software repositories.

Install the Moab HPC Suite Software Components for SUSE 11-Based Systems

To install the Moab HPC Suite, install the packages in the following order:

1. Torque. See .

2. Moab Workload Manager. See .

3. Moab Accounting Manager. See .

4. RLM Server. See .

5. Integrate Nitro with your Moab HPC Suite. See .

Installing Torque Resource Manager

> ⚠️ If you intend to use Torque Resource Manager 6.0.3 with Moab Workload Manager, you must run Moab version 8.0 or later. However, some Torque 6.0 functionality requires Moab 9.0 or later.

This topic contains instructions on how to install and start Torque Resource Manager (Torque).

> ℹ️ For Cray systems, Adaptive Computing recommends that you install Moab and Torque Servers (head nodes) on commodity hardware (*not* on Cray compute/service/login nodes).
>
> *However*, you *must* install the Torque pbs_mom daemon and Torque client commands on Cray login and "mom" service nodes since the pbs_mom *must* run on a Cray service node within the Cray system so it has access to the Cray ALPS subsystem.
>
> See Installation Notes for Moab and Torque for Cray in the *Moab Workload Manager Administrator Guide* for instructions on installing Moab and Torque on a non-Cray server.

In this topic:

Prerequisites

In this section:

Open Necessary Ports

Torque requires certain ports to be open for essential communication.

- For client and pbs_mom communication to pbs_server, the default port is 15001.

- For pbs_server communication to pbs_mom, the default port is 15002.
- For pbs_mom communication to pbs_mom, the default port is 15003.

For more information on how to configure the ports that Torque uses for communication, see Configuring Ports in the *Torque Resource Manager Administrator Guide* for more information.

If you have a firewall enabled, do the following:

1. On the Torque Server Host:

```
[root]# vi /etc/sysconfig/SuSEfirewall2

# Add the following port to the FW_SERVICES_EXT_TCP parameter
FW_SERVICES_EXT_TCP="15001"

[root]# service SuSEfirewall2_setup restart
```

2. On the Torque MOM Hosts (compute nodes):

```
[root]# vi /etc/sysconfig/SuSEfirewall2

# Add the following ports to the FW_SERVICES_EXT_TCP parameter
FW_SERVICES_EXT_TCP="15002 15003"

[root]# service SuSEfirewall2_setup restart
```

Verify the hostname

On the Torque Server Host, confirm your host (with the correct IP address) is in your `/etc/hosts` file. To verify that the hostname resolves correctly, make sure that hostname and hostname -f report the correct name for the host.

Install Dependencies, Packages, or Clients

Install Packages

On the Torque Server Host, use the following commands to install the `libxml2-devel`, `openssl-devel`, and `boost-devel` packages.

```
[root]# zypper install libopenssl-devel libtool libxml2-devel boost-devel gcc gcc-c++
make gmake automake
```

Install Torque Server

> ⓘ You *must* complete the prerequisite tasks and the tasks to install the dependencies, packages, or clients before installing Torque Server. See Prerequisites on page 18 and Install Dependencies, Packages, or Clients on page 19.

On the Torque Server Host, do the following:

1. Download the latest 6.0.3 build from the Adaptive Computing website. It can also be downloaded via command line for the tarball distribution (recommended) or the github method. .

   - Get the tarball source distribution.

   ```
   [root]# zypper install wget
   [root]# wget http://www.adaptivecomputing.com/download/torque/torque-6.0.3-
   <filename>.tar.gz -O torque-6.0.3.tar.gz
   [root]# tar -xzvf torque-6.0.3.tar.gz
   [root]# cd torque-6.0.3/
   ```

   - Clone the source from github.

   > ℹ️ If git is not installed:
   >
   > ```
   > [root]# zypper install git
   > ```

   ```
   [root]# git clone https://github.com/adaptivecomputing/torque.git -b 6.0.3 6.0.3
   [root]# cd 6.0.3
   [root]# ./autogen.sh
   ```

2. Run each of the following commands in order.

   ```
   [root]# ./configure
   [root]# make
   [root]# make install
   ```

   See Customizing the Install in the *Torque Resource Manager Administrator Guide* for information on which options are available to customize the ./configure command.

3. Verify that the `/var/spool/torque/server_name` file exists and contains the correct name of the server.

   ```
   [root]# echo <torque_server_hostname> > /var/spool/torque/server_name
   ```

4. Configure the `trqauthd` daemon to start automatically at system boot.

   ```
   [root]# cp contrib/init.d/suse.trqauthd /etc/init.d/trqauthd
   [root]# chkconfig --add trqauthd
   [root]# echo /usr/local/lib > /etc/ld.so.conf.d/torque.conf
   [root]# ldconfig
   [root]# service trqauthd start
   ```

5. By default, Torque installs all binary files to `/usr/local/bin` and `/usr/local/sbin`. Make sure the path environment variable includes these directories for both the installation user and the root user.

   ```
   [root]# export PATH=/usr/local/bin/:/usr/local/sbin/:$PATH
   ```

6. Initialize `serverdb` by executing the `torque.setup` script.

```
[root]# ./torque.setup root
```

7. Add nodes to the `/var/spool/torque/server_priv/nodes` file. See
    Specifying Compute Nodes in the *Torque Resource Manager Administrator
    Guide* for information on syntax and options for specifying compute nodes.

8. Configure pbs_server to start automatically at system boot, and then start
    the daemon.

```
[root]# cp contrib/init.d/suse.pbs_server /etc/init.d/pbs_server
[root]# chkconfig --add pbs_server
[root]# service pbs_server restart
```

Install Torque MOMs

In most installations, you will install a Torque MOM on each of your compute
nodes.

> 🛈 See Specifying Compute Nodes or Configuring on Compute Nodes in the
> Torque Resource Manager Administrator Guide for more information.

Do the following:

1. On the Torque Server Host, do the following:

    a. Create the self-extracting packages that are copied and executed on your
        nodes.

```
[root]# make packages
Building ./torque-package-clients-linux-x86_64.sh ...
Building ./torque-package-mom-linux-x86_64.sh ...
Building ./torque-package-server-linux-x86_64.sh ...
Building ./torque-package-gui-linux-x86_64.sh ...
Building ./torque-package-devel-linux-x86_64.sh ...
Done.

The package files are self-extracting packages that can be copied and executed
on your production machines.  Use --help for options.
```

    b. Copy the self-extracting packages to each Torque MOM Host.

        Adaptive Computing recommends that you use a remote shell, such as
        SSH, to install packages on remote systems. Set up shared SSH keys if
        you do not want to supply a password for each Torque MOM Host.

> 🛈 The only required package for the compute node is mom-linux.
> Additional packages are recommended so you can use client
> commands and submit jobs from compute nodes.

```
[root]# scp torque-package-mom-linux-x86_64.sh <mom-node>:
[root]# scp torque-package-clients-linux-x86_64.sh <mom-node>:
```

   c. Copy the pbs_mom startup script to each Torque MOM Host.

```
[root]# scp contrib/init.d/suse.pbs_mom <mom-node>:/etc/init.d/pbs_mom
```

> ℹ Not all sites see an inherited ulimit but those that do can change the ulimit in the pbs_mom init script. The pbs_mom init script is responsible for starting and stopping the pbs_mom process.

2. On each Torque MOM Host, do the following:

   a. Install the self-extracting packages and run ldconfig.

```
[root]# ssh root@<mom-node>
[root]# ./torque-package-mom-linux-x86_64.sh --install
[root]# ./torque-package-clients-linux-x86_64.sh --install
[root]# echo /usr/local/lib > /etc/ld.so.conf.d/torque.conf
[root]# ldconfig
```

   b. Configure pbs_mom to start at system boot, and then start the daemon.

```
[root]# chkconfig --add pbs_mom
[root]# service pbs_mom start
```

Install Torque Clients

If you want to have the Torque client commands installed on hosts other than the Torque Server Host (such as the compute nodes or separate login nodes), do the following:

1. On the Torque Server Host, do the following:

   a. Copy the self-extracting client package to each Torque Client Host.

> ℹ Adaptive Computing recommends that you use a remote shell, such as SSH, to install packages on remote systems. Set up shared SSH keys if you do not want to supply a password for each Torque MOM Host.

```
[root]# scp torque-package-clients-linux-x86_64.sh <torque-client-host>:
```

   b. Copy the trqauthd startup script to each Torque Client Host.

```
[root]# scp contrib/init.d/suse.trqauthd <torque-client-
host>:/etc/init.d/trqauthd
```

2. On each Torque Client Host, do the following:

> ℹ Many of these steps can be done from the Torque server from a remote shell, such as SSH. Set up shared SSH keys if you do not want to supply a password for each Torque Client Host.

a. Install the self-extracting client package.

```
[root]# ./torque-package-clients-linux-x86_64.sh --install
[root]# echo /usr/local/lib > /etc/ld.so.conf.d/torque.conf
[root]# ldconfig
```

b. Enable and start the trqauthd service.

```
[root]# chkconfig --add trqauthd
[root]# service trqauthd start
```

Configure Data Management

When a batch job completes, stdout and stderr files are generated and placed in the spool directory on the master Torque MOM Host for the job instead of the submit host. You can configure the Torque batch environment to copy the stdout and stderr files back to the submit host. See Configuring Data Management in the *Torque Resource Manager Administrator Guide* for more information.

Related Topics

Installing Moab Workload Manager

This topic contains instructions on how to install and start Moab Workload Manager (Moab).

> ℹ️ For Cray systems, Adaptive Computing recommends that you install Moab and Torque Servers (head nodes) on commodity hardware (*not* on Cray compute/service/login nodes).
>
> *However*, you *must* install the Torque pbs_mom daemon and Torque client commands on Cray login and "mom" service nodes since the pbs_ mom *must* run on a Cray service node within the Cray system so it has access to the Cray ALPS subsystem.
>
> See Installation Notes for Moab and Torque for Cray in the *Moab Workload Manager Administrator Guide* for instructions on installing Moab and Torque on a non-Cray server.

In this topic:

- [Verify the Installation on page 27](#)
- [(Optional) Install Moab Client on page 27](#)

Open Necessary Ports

Moab uses a configurable server port (default 42559) for client-server communication. If you intend to run client commands on a different host from the Moab Server Host, or if you will be using Moab in a grid, and if you have a firewall enabled, you will need to configure the firewall to allow the server port.

On the Moab Server Host, do the following:

```
[root]# vi /etc/sysconfig/SuSEfirewall2

# Add the following ports to the FW_SERVICES_EXT_TCP parameter as required

# Needed on the Moab server for off-host client communication
FW_SERVICES_EXT_TCP="42559"

[root]# service SuSEfirewall2_setup restart
```

Install Dependencies, Packages, or Clients

In this section:

- [Dependencies and Packages on page 24](#)
- [Torque Client on page 24](#)

Dependencies and Packages

On the Moab Server Host, use the following commands to install the required Moab dependencies and packages.

```
[root]# zypper update
[root]# zypper install make curl libxml2-devel gcc
```

Torque Client

If you are using Torque and are installing the Torque Server on a different host (Torque Server Host) from the Moab Server (Moab Server Host), you will need to install the Torque client on the Moab Server Host in order for Moab to interact with Torque.

Follow the instructions in [Install Torque Clients on page 22](#) using the Moab Server Host as the Torque Client Host; with the exception that you must copy and install the torque-package-devel-linux-*<arch>*.sh self-extracting package in addition to the torque-package-client-linux-*<arch>*.sh package.

Install Moab Server

> **ⓘ** You *must* complete the tasks to install the dependencies, packages, or clients before installing Moab Server. See Install Dependencies, Packages, or Clients on page 24.
>
> If your configuration uses firewalls, you *must also* open the necessary ports before installing the Moab Server. See Open Necessary Ports on page 24.

On the Moab Server Host, do the following:

1. Download the latest Moab build (`moab-<version>-<OS>.tar.gz`) from the Adaptive Computing Moab HPC Suite Download Center (https://www.adaptivecomputing.com/support/download-center/moab-hpc-suite-download/).

   > **ⓘ** The variable marked *<version>* indicates the build's version, revision, and changeset information. The variable marked *<OS>* indicates the OS for which the build was designed.

2. As the root user, run each of the following commands in order.

   ```
   [root]# tar xzvf moab-<version>-<OS>.tar.gz
   [root]# cd moab-<version>-<OS>
   ```

   If Elastic Computing is part of your Moab Workload Manager configuration, install `deps/acpython-base*`.

   ```
   [root]# zypper install deps/acpython-base*
   ```

3. Configure Moab. If you are installing Moab Accounting Manager, configure Moab with the `--with-am` option.

   ```
   [root]# ./configure <options>
   ```

   > **ⓘ** See Moab Workload Manager Configuration Options on page 45 for a list of commonly used options or use `./configure --help` for a complete list of available options.

4. *ONLY* if you are using green computing, *or* if you are using a resource manager other than Torque.

   Run the make perldeps command to install the necessary perl modules using CPAN. When first running CPAN, you will be asked for configuration information. It is recommended that you choose an automatic configuration. You will be prompted to provide input during module installation; running the make perldeps command with a script is not recommended.

```
[root]# make perldeps
```

5. Install Moab.

```
[root]# make install
```

6. Modify the Moab configuration file.

```
[root]# vi /opt/moab/etc/moab.cfg
```

Do the following:

a. Verify that **SUBMITCMD** is set up for your Torque resource manager and that it points to a valid `qsub` executable. For example:

```
RMCFG[torque] SUBMITCMD=/usr/local/bin/qsub
```

If you use a SLURM resource manager, see Moab-SLURM Integration Guide in the *Moab Workload Manager Administrator Guide* for configuration information. If you use a NATIVE resource manager, see Managing Resources Directly with the Native Interface in the *Moab Workload Manager Administrator Guide* for configuration information.

b. If you are using Torque as a resource manager and you installed the Torque Server on a different host (Torque Server Host), configure the RMCFG HOST parameter to tell Moab the host on which Torque Server is running.

```
RMCFG[torque] HOST=<torque_server_hostname>
```

7. Source the appropriate profile script to add the Moab executable directories to your current shell *$PATH* environment.

```
[root]# . /etc/profile.d/moab.sh
```

8. Copy your license file into the same directory as `moab.cfg` (`/opt/moab/etc/` by default).

```
[root]# cp moab.lic $MOABHOMEDIR/etc/moab.lic
```

To verify the current status of your license, run the following command:

```
[root] # moab --about 2>&1 | grep License
```

You should get something similar to the following in the response:

```
Moab Workload Manager Version '9.0.2' License Information:
 Current License:  Max Procs   = 10000
 Current License:  Valid Until - Thu Jul 13 19:42:10 2017
```

> ⓘ A license is required for Moab. A trial license may be included in your Moab installation enabling you to run Moab for a limited time and with limited features. Email licenses@adaptivecomputing.com for information on obtaining licenses.

9. Start Moab.

```
[root]# chkconfig moab on
[root]# service moab start
```

Configure Torque to Trust Moab

If you are using Torque as a resource manager and you installed the Torque Server on a different host (Torque Server Host); recommended, do the following:

- On the Torque Server Host, add the name of the Moab Server Host (where Moab Server is installed) as a manager and as a submit host.

```
[root]# qmgr
Qmgr: set server managers += root@<moab_server_hostname>
Qmgr: set server submit_hosts += <moab_server_hostname>
Qmgr: exit
```

Verify the Installation

If you have a resource manager configured, verify that the scheduler is able to schedule a job. Do the following:

- Submit a sleep job as a non-root user (adaptive is used in this example) and verify the job is running.

```
[root]# su - adaptive
[adaptive]$ echo sleep 150 | msub
[adaptive]$ showq
[adaptive]$ exit
```

(Optional) Install Moab Client

After you have installed Moab Server, you can create a client tarball to install just the Moab client commands on a login/client host. This tarball uses a single `tar` command to install the binary Moab client command files and their man pages. The tarball also contains a `moab.cfg` file configured with the Moab Server host name and port number so you do not have to manually configure this information on the login/client node.

> ⓘ If your site needs secure communication and authentication between Moab Client Host and the Moab Server Host, create a site-specific key and place it in the same directory as your `moab.cfg` file. By default, this would be `$MOABHOMEDIR/etc/.moab.key`. When the Moab server and client commands detect the presence of those two files they will use the key in those files to authenticate and communicate, instead of the default key. See _Mauth Authentication_ in the _Moab Workload Manager Administrator Guide_ for more information.

Do the following:

1. On the Moab Server Host, create the client tarball.

```
[root]# make client-pkg
```

2. Copy the tarball to the root directory of the Moab Client Host.

3. On the Moab Client Host, run the tarball to install the Moab client commands.

```
[root]# tar xvf client.tgz
```

Related Topics

Preparing for Manual Installation on page 16

Installing Moab Accounting Manager

This topic contains instructions on how to install and start Moab Accounting Manager (MAM).

Perform the following in order:

- Plan Your Installation
- Open Necessary Ports
- Install and Initialize the PostgreSQL Server
- Install Dependencies, Packages, or Clients
- Install MAM Server
- Configure the MAM GUI
- Access the MAM GUI
- Configure Moab Workload Manager to Use Moab Accounting Manager
- Initialize Moab Accounting Manager

Plan Your Installation

The first step is determining the number of different hosts (physical machines) required for your MAM installation.

Your MAM installation includes:

- MAM Server
- MAM Database
- MAM GUI (optional)
- MAM Clients (possibly several hosts)

Each of these components can be installed on their own hosts (meaning the actual physical machine) or can be combined on same hosts. For example, the MAM Database can be installed on the same *host* as the MAM Server. Or the MAM Server may be installed on the same host you installed the Moab Server.

Once you have determined which components are installed on which hosts, complete the rest of the instructions for the MAM installation.

> ⓘ The instructions that follow in this topic will use the term Host after each component to reflect installing on a host (again, meaning the physical machine). For example, MAM Server Host and MAM Database Host. Depending on your configuration, Host may refer to as installed on its own machine or installed on the same machine as another component.

Open Necessary Ports

If your site is running firewall software on its hosts, you will need to configure the firewall to allow connections to the necessary ports.

Do the following as needed:

1. If you will be installing the MAM Server on a different host from where you installed the Moab Server *or* you will be installing the MAM Clients on other hosts, then on the MAM Server Host, open the MAM Server port (7112) in the firewall.

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="7112"

[root]# service SuSEfirewall2_setup restart
```

2. If using the MAM GUI, then on the MAM GUI Host, open the https port (443) in the firewall for secure browser communication.

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="443"

[root]# service SuSEfirewall2_setup restart
```

3. If you will be installing the MAM PostgreSQL Database on a different host from the MAM Server, then on the host where the MAM PostgreSQL Database Host will reside, open the postgres port (5432) in the firewall.

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="5432"

[root]# service SuSEfirewall2_setup restart
```

Install and Initialize the PostgreSQL Server

Moab Accounting Manager uses a database for transactions and data persistence.

The MAM PostgreSQL database may be installed on:

- the same host as the MAM Server.
- a separate PostgreSQL database host.
- a separate *shared* PostgreSQL database host.

On the host where the MAM PostgreSQL database will reside, do the following:

1. Install and initialize the PostgreSQL Server.

```
[root]# zypper install postgresql-server
[root]# service postgresql start
```

2. Configure trusted connections.

    Edit or add a "host" line in the pg_hba.conf file for the interface from which the MAM Server will be connecting to the database and ensure that it specifies a secure password-based authentication method (for example, md5).

```
[root]# vi /var/lib/pgsql/data/pg_hba.conf

# Replace 127.0.0.1 with the IP address of the MAM Server Host if the
# MAM PostgreSQL server is on a separate host from the MAM server.
host    all            all             127.0.0.1/32          md5
host    all            all             ::1/128               md5

---
```

3. If the MAM Database Host is installed on a *different* host from where you will install the MAM Server, configure PostgreSQL to accept connections from the MAM Server Host.

```
[root]# vi /var/lib/pgsql/data/postgresql.conf

# Replace <mam-server-host> with the interface name from which the MAM server
# will be connecting to the database.
listen_addresses = '<mam-server-host>'

---
```

4. Start or restart the database.

```
[root]# chkconfig postgresql on
[root]# service postgresql restart
```

Install Dependencies, Packages, or Clients

Use the following instructions to install the required Moab Accounting Manager dependencies, packages, or clients.

> ℹ Depending on your configuration, the MAM Server Host and the MAM GUI Host may be installed on the same host. The MAM Client Host is automatically installed on the same host as the MAM Server Host; however, you can also install the MAM Client Host on any other hosts on which you want to have the MAM client commands available to users or administrators.

1. On the MAM Server Host, the MAM GUI Host, and the MAM Client Hosts, do the following:

```
[root]# zypper install gcc lsb-release perl-Config-Tiny perl-Crypt-CBC perl-Crypt-
DES perl-Crypt-DES_EDE3 perl-Digest-HMAC perl-Error perl-Log-Log4perl perl-XML-
LibXML perl-Params-Validate perl-YAML perl-Log-Dispatch perl-Log-Dispatch-
FileRotate
```

2. On the MAM Server Host, do the following:

```
[root]# zypper install postgresql postgresql-libs perl-DBD-Pg perl-Date-Manip perl-
DBI
```

3. On the MAM GUI Host, do the following:

```
[root]# zypper install apache2 perl-CGI perl-CGI-Session
```

4. On each of the MAM Client Hosts (including the MAM Server Host), do the following:

```
[root]# zypper install libopenssl-devel perl-TermReadLine-Gnu perl-TermReadKey
[root]# chmod 4755 /usr/bin/sperl*
```

> ℹ If any of the Perl module packages fail to install or are unavailable for your system, you can install it from CPAN by running `cpan MODULENAME` where *MODULENAME* is the respective perl module name.

Install MAM Server

On the MAM Server Host, do the following:

1. Create a user called `mam` and switch to that user.

```
[root]# useradd -m mam
[root]# su - mam
[mam]$ mkdir src
[mam]$ cd src
```

2. Download the latest MAM build (`mam-<version>.tar.gz`) from the Adaptive Computing Moab HPC Suite Download Center (https://www.adaptivecomputing.com/support/download-center/moab-hpc-suite-download/).

> ℹ The variable marked *<version>* indicates the build's version.

3. Untar the MAM tarball.

```
[mam]$ tar -zxvf mam-9.0.3.tar.gz
```

4. Navigate to `mam-9.0.3`.

```
[mam]$ cd mam-9.0.3
```

5. Configure the software. For a list of all the configuration options, see Moab Accounting Manager Configuration Options on page 46.

```
[mam]$ ./configure
```

6. Compile the software.

```
[mam]$ make
```

> ℹ If you only need to install the clients on a particular system, replace make with make clients-only. If you only need to install the web GUI on a particular system, replace make with make gui-only.

7. Install the software.

```
[mam]$ exit
[root]# cd ~mam/src/mam-9.0.3
[root]# make install
```

> ℹ If you only need to install the clients on a particular system, replace make install with make install-clients-only. If you only need to install the web GUI on a particular system, replace make install with make install-gui-only.

8. As the database user, create a database called `mam` and grant database privileges to the `mam` user.

> ℹ PostgreSQL should have previously been installed using the instructions in Preparing for Manual Installation on page 16.

```
[root]# su - postgres
[postgres]$ psql

create database mam;
create user mam with password 'changeme!';
\q

[postgres]$ exit
```

The password you define must be synchronized with the `database.password` value in `/opt/mam/etc/mam-server.conf`

```
[root]# vi /opt/mam/etc/mam-server.conf

database.password = changeme!
```

9. Run the `hpc.sql` script to populate the Moab Accounting Manager database with objects, actions, and attributes necessary to function as an Accounting Manager.

```
[root]# su - mam
[mam]$ cd src/mam-9.0.3
[mam]$ psql mam < hpc.sql
[mam]$ exit
```

10. Configure MAM to automatically start up at system boot; start the `mam` service.

```
[root]# chkconfig --add mam
[root]# service mam start
```

Configure the MAM GUI

If you plan to use the web GUI, then on the MAM GUI Host, do the following:

1. As `root`, add or edit the SSL virtual host definition as appropriate for your environment. To do so, configure the `cgi-bin` directory in `ssl.conf`. Below the `cgi-bin` directory element, create an alias for `/cgi-bin` pointing to your `cgi-bin` directory. If you chose to install to a cgi-bin sub-directory, you might want to create an alias for that as well. Also, add `index.cgi` to the `DirectoryIndex` so you can use the shorter sub-directory name.

```
[root]# a2enflag SSL
[root]# cp /etc/apache2/vhosts.d/vhost-ssl.template /etc/apache2/vhosts.d/mam-
ssl.conf
[root]# vi /etc/apache2/vhosts.d/mam-ssl.conf

<Directory "/srv/www/cgi-bin">
## Add these lines
  Options ExecCGI
  AddHandler cgi-script .cgi
  AllowOverride All
  Order allow,deny
  Allow from all
</Directory>

# Aliases for /cgi-bin
Alias /cgi-bin/ /srv/www/cgi-bin/
Alias /mam /srv/www/cgi-bin/mam/

# Make shorter sub-dir name available
DirectoryIndex index.cgi
```

2. For the highest security, it is recommended that you install a public key certificate that has been signed by a certificate authority. The exact steps to do this are specific to your distribution and the chosen certificate authority. An overview of this process for CentOS 7 is documented at https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_ Linux/7/html/System_Administrators_Guide/ch-Web_Servers.html#s2- apache-mod_ssl.

   Alternatively, if your network domain can be secured from man-in-the-middle attacks, you could use a self-signed certificate. Often this does not require any additional steps since in many distributions, such as Red Hat, the Apache SSL configuration provides self-signed certificates by default.

   If your configuration uses self-signed certificates, do the following:

```
[root]# cd /etc/apache2
[root]# openssl genrsa -out ssl.key/server.key 1024
[root]# openssl req -new -key ssl.key/server.key -x509 -out ssl.crt/server.crt
```

3. Start or restart the HTTP server daemon.

```
[root]# chkconfig apache2 on
[root]# service apache2 restart
```

Access the MAM GUI

If you plan to use the web GUI, then on the MAM Server Host, do the following:

1. Create a password for the `mam` user to be used with the MAM Web GUI.

```
[root]# su - mam
[mam]$ mam-set-password
[mam]$ exit
```

2. Verify the connection.

    a. Open a web browser and navigate to `https://<mam-server-host>/cgi-bin/mam`.

    b. Log in as the `mam` user with the password you set in step 1.

Configure Moab Workload Manager to Use Moab Accounting Manager

Do the following:

1. Configure Moab to talk to MAM

    Do *one* of the following:

    - **MAM Option.** If you are will be using the MAM (direct network) accounting manager interface with Moab Workload Manager (this is the default), do the following:

        a. On the Moab Server Host, edit the Moab configuration file, uncomment the AMCFG lines and set the TYPE to MAM and set the HOST. If the Moab Server and the MAM Server are on the same host, set HOST to 'localhost'; otherwise, set HOST to the host name for the MAM Server (MAM Server Host).

        ```
        [root]# vi /opt/moab/etc/moab.cfg
        AMCFG[mam]  TYPE=MAM HOST=<mam_server_host>
        ```

        Customize additionally as needed. See Accounting, Charging, and Allocation Management in the *Moab Workload Manager Administrator Guide*

        b. Configure Moab to authenticate with MAM using the MAM secret key.

            i. On the MAM Server Host, copy the auto-generated secret key from the token.value value in the `/opt/mam/etc/mam-site.conf` file.

            ii. On the Moab Server Host, add the secret key to the moab-private.cfg file as the value of the CLIENTCFG KEY attribute.

            ```
            [root]# vi /opt/moab/etc/moab-private.cfg
            CLIENTCFG[AM:mam]  KEY=<MAMSecretKey>
            ```

    - **Native Option.** If you are will be using the Native (custom script) accounting manager interface with Moab Workload Manager, do the following:

        a. On the Moab Server Host, edit the Moab configuration file, uncomment the AMCFG lines and set the TYPE to NATIVE.

```
[root]# vi /opt/moab/etc/moab.cfg
AMCFG[mam] TYPE=NATIVE
```

b. If you are installing Moab Accounting Manager on a different host (MAM Server Host) from the Moab Server (Moab Server Host), you will need to install the Moab Accounting Manager client on the Moab Server Host in order for the custom scripts to use the MAM API.

On the *Moab* Server Host, follow the instructions in Install Dependencies, Packages, or Clients on page 31 and Install MAM Server on page 32; with the following exceptions:

- Install only the dependent packages applicable to MAM Client Hosts
- Use the configure option --without-init
- Instead of running make, use make clients-only
- Instead of running make install, use make install-clients-only
- Omit the step to create the database and all of the steps thereafter

2. On the Moab Server Host, restart Moab.

```
service moab restart
```

Initialize Moab Accounting Manager

You will need to initialize Moab Accounting Manager to function in the way that is most applicable to the needs of your site. See Initial Setup in the *Moab Accounting Manager Administrator Guide* to set up Moab Accounting Manager for your desired accounting mode.

Related Topics

Preparing for Manual Installation on page 16

Installing RLM Server

Access to a Reprise License Manager (RLM) server is required when using Nitro.

As the RLM Server can run multiple licenses, it is recommended that you install *one* RLM Server for your configuration. If your company already uses an RLM Server, you do not need to install a new one for Adaptive Computing products. However, Adaptive Computing *strongly* recommends that your RLM Server is version 12.1.2 and the Adaptive Computing products may use a different port than the default RLM Server port (5053).

> ⚠️ If your system configuration requires more than one RLM Server, additional configuration may be needed. See Using Multiple RLM Servers on page 48 for more information.

This topic contains instructions on how to install an RLM Server.

In this topic:

- Open Necessary Ports on page 37
- Install the RLM Server on page 38
- Change the Default Passwords on page 39

Open Necessary Ports

If your site is running firewall software on its hosts, you will need to configure the firewall to allow connections to the necessary ports.

> ℹ️ These instructions assume you are using the default ports. If your configuration will use other ports, then substitute your port numbers when opening the ports.

On the RLM Server do the following:

1. Open the RLM Server port (5053) and the RLM Web Interface port (5054).

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="5053 5054"

[root]# service SuSEfirewall2_setup restart
```

2. If Remote Visualization is part of your configuration, open the Remote Visualization port (57889).

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="57889"

[root]# service SuSEfirewall2_setup restart
```

3. If Nitro is part of your configuration, open the ISV adapativeco port for the Adaptive license-enabled products (for example: 5135).

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="5135"

[root]# service SuSEfirewall2_setup restart
```

Install the RLM Server

On the host where the RLM Server will reside, do the following:

1. Download the latest RLM build from the Adaptive Computing Moab HPC Suite Download Center (https://www.adaptivecomputing.com/support/download-center/moab-hpc-suite-download/).

2. Create a non-root user and group (rlm is used in the example).

```
[root]# groupadd -r rlm
[root]# useradd -r -g rlm -d /opt/rlm -c "A non-root user under which to run
Reprise License Manager" rlm
```

3. Create a directory and install the tarball files in that location (we are using /opt/rlm as the install location in the example).

```
[root]# mkdir -p -m 0744 /opt/rlm
[root]# cd /opt/rlm
[root]# tar -xzvf /tmp/ac-rlm-12.1.tar.gz --strip-components=1
[root]# chown -R rlm:rlm /opt/rlm
```

> ℹ The `--strip-components=1` removes the "ac-rlm-12.1/" from the relative path so that they are extracted into the current directory.

4. Install the startup scripts.

> ℹ If you are using a user:group other than rlm:rlm or a location other than /opt/rlm, then edit the following files to reflect those changes after copying them.

```
[root]# cp init.d/rlm /etc/init.d
```

5. Start the services and configure the RLM Server to start automatically at system reboot.

```
[root]# chkconfig --add rlm
[root]# chkconfig rlm on
[root]# service rlm start
```

Change the Default Passwords

The RLM Web interface includes two usernames (admin and user) by default. These usernames have the default password "changeme!".

> ⚠️ If you do not change this password, RLM, and Remote Visualization, will not be secure. For tips on choosing a good password, see https://www.us-cert.gov/ncas/tips/ST04-002.

Do the following for both the user and the admin usernames:

1. Using a web browser, navigate to your RLM instance. (http://*<RLM_host>*:5054; where *<RLM_host>* is the IP address or name of the RLM Server Host).

   > ℹ️ If you have problems connecting using the web browser, on the RLM server check /opt/rlm/rlm.dll for error information.

2. Log in.
3. Select **Change Password** and change the password according to your password security process.

> ℹ️ The password for "user" will be needed as part of the Remote Visualization installation.

Nitro Integration

This section provides instructions on integrating Nitro as part of your Moab HPC Suite configuration.

- Preparing for Nitro Manual Installation or Upgrade on page 63
- Installing Nitro on page 40; Nitro Web Services is not available for a SUSE 11-based system.

Preparing for Nitro Manual Installation or Upgrade

This topic contains instructions on how to download and unpack the Nitro Tarball Bundle for all the hosts in your configuration.

> ℹ Whether you are installing tarballs on one host or on several hosts, each host (physical machine) on which a server is installed (Nitro, Nitro Web Servcies) *must* have the Nitro Tarball Bundle.

> ⚠ Nitro Web Services is currently not available for SUSE 11-based systems; it is not in the Nitro Tarball Bundle for that OS.

Set Up Proxies

If your site uses a proxy to connect to the Internet, do the following:

```
export http_proxy=http://<proxy_server_id>:<port>
export https_proxy=http://<proxy_server_id>:<port>
```

Download and Unpack the Nitro Tarball Bundle

The Nitro Tarball Bundle contains all the tarballs available for Nitro. However, not every tarball may be installed on the same host.

On each host (physical machine), do the following:

1. Using a web browser, navigate to the Adaptive Computing Nitro Download Center https://www.adaptivecomputing.com/support/download-center/nitro/.

2. Download the Nitro Tarball Bundle `nitro-tarball-bundle-<version>-<OS>.tar.gz`.

   > ℹ The variable marked <version> indicates the build's version, revision, and changeset information. The variable marked <OS> indicates the OS for which the build was designed.

3. Unpack the Nitro Tarball Bundle.

   ```
   [root]# tar xzvf nitro-tarball-bundle-<version>-<OS>.tar.gz
   ```

Related Topics

- Nitro Integration on page 39
- Upgrading Your Nitro Integration on page 62

Installing Nitro

This topic contains instructions on how to install Nitro.

Nitro

- needs to be available to all of the nodes that will be used as part of the Nitro job.
- can be installed either to each node individually *or* to a shared file system that each node can access.
- can be installed to integrate with a scheduler, such as Moab, or without (Nitro standalone). The instructions are the same.

In this topic:

Obtain a Nitro License

The Nitro license file is installed on an RLM Server.

> ⚠️ These instructions assume you already have access to an RLM Server. See Installing RLM Server on page 37 for instructions on how to set up a new RLM Server.

Do the following:

1. On the RLM server, obtain the hostid and hostname.
   - hostid

     ```
     [root]# /opt/rlm/rlmhostid
     ```

     You should see output similar to the following.

     ```
     rlmhostid v12.1
     Copyright (C) 2006-2016, Reprise Software, Inc. All rights reserved.

     Hostid of this machine: 00259096f004
     ```

   - hostname

     ```
     [root]# /opt/rlm/rlmhostid host
     ```

     You should see output similar to the following.

     ```
     rlmhostid v12.1
     Copyright (C) 2006-2016, Reprise Software, Inc. All rights reserved.

     Hostid of this machine: host=<your-host-name>
     ```

2. Email licenses@adaptivecomputing.com for a license and include the hostid and hostname you just obtained.

3. Adaptive Computing will generate the license and send you the Nitro license file (.lic) file in a return email.

4. On the RLM server, do the following:

   a. Download and install the license file.

   ```
   [root]# cd /opt/rlm
   [root]# chown rlm:rlm <licenseFileName>.lic
   ```

   b. If the RLM Server in your configuration uses a firewall, edit the license file to reference the ISV adaptiveco port for the Adaptive license-enabled products. This is the same port number you opened during the RLM Server installation. See the instructions to open necessary ports in the Installing RLM Server on page 37 (manual installation method) or 1.1 Installing RLM Server (RPM installation method) for more information.

   ```
   [root]# vi /opt/rlm/nitro.lic


   ISV adaptiveco port=5135
   ```

   The license file already references the RLM Server port (5053 by default).

   > ℹ If the RLM Server in your configuration uses different ports, you will need to modify the license file to reflect the actual ports. See the instructions to open necessary ports in the Installing RLM Server on page 37 (manual installation method) or 1.1 Installing RLM Server (RPM installation method) for more information.

   c. If you did *not* install an RLM Server using the file available from Adaptive Computing (for example, because your system configuration already uses one), do the following:

      i. Download the 'adaptiveco.set' file from the Adaptive Computing Nitro Download Center (https://www.adaptivecomputing.com/support/download-center/nitro/).

      ii. Copy the 'adaptiveco.set' file into the same directory where the Nitro license resides (/opt/rlm).

   d. Perform a reread to update the RLM Server with your license.

   ```
   [root]# /opt/rlm/rlmreread
   ```

Open Necessary Ports

Nitro uses several ports for communication between the workers and the coordinator.

The default port is 47000, and up to four ports are used in running Nitro (ports 47000-47003).

On each compute node (coordinator), open the necessary ports.

```
[root]# vi /etc/sysconfig/SuSEfirewall2

FW_SERVICES_EXT_TCP="47000 47001 47002 47003"

[root]# service SuSEfirewall2_setup restart
```

Install Nitro

> ⓘ You *must* complete the tasks to obtain a Nitro license before installing Nitro. See Obtain a Nitro License on page 41.
>
> If your configuration uses firewalls, you *must also* open the necessary ports before installing Nitro. See Open Necessary Ports on page 42.

On the host where Nitro will reside, do the following:

1. If you have not already done so, complete the steps to prepare the host. See Preparing for Nitro Manual Installation or Upgrade on page 63.

2. Change the directory to the root of the unpacked Nitro tarball bundle.

```
[root]# cd nitro-tarball-bundle-<version>-<OS>
```

3. Identify the Nitro product tarball (nitro-<*version*>-<*OS*>.tar.gz).

4. As the root user, run each of the following commands in order.

```
[root]# mkdir /opt/nitro
[root]# tar xzvpf nitro-<version>-<OS>.tar.gz -C /opt/nitro --strip-components=1
```

5. Copy the license file you generated earlier in this topic to each compute node (coordinator). On each compute node, *or* on the shared file system, do the following:

```
[root]# cp <licenseFileName>.lic /opt/nitro/bin/
```

6. Identify the launch_nitro.sh script version for your resource manager. This script will be copied to the bin directory from where user job scripts will execute Nitro. See the *Nitro Administrator Guide* for more information.

   Reference scripts are provided in `/opt/nitro/scripts`.

```
[root]# find /opt/nitro -name launch_nitro.sh

./scripts/lsf/launch_nitro.sh
./scripts/torque/launch_nitro.sh
./scripts/slurm/launch_nitro.sh
./scripts/alps/torque/launch_nitro.sh
./scripts/alps/slurm/launch_nitro.sh
```

7. Copy the launch script to the bin directory. (This example uses the Torque-based launch script.)

```
[root]# cp /opt/nitro/scripts/torque/launch_nitro.sh /opt/nitro/bin/
```

> ℹ This is a "copy" file operation and not a "move" operation. This allows you to customize your version of the script and always have the factory version available for consultation and/or comparison.

8. Customize the bin/launch_nitro.sh script as needed for your site's administrative policies. For example, to enable the Nitro coordinator's host to always execute a local Nitro worker, modify the bin/launch_nitro.sh script version to always pass the --run-local-worker command line option to the coordinator. See the *Nitro Administrator Guide* for more information on editing the launch script.

9. If you are *not* using a shared file system, copy the Nitro installation directory to *all* hosts.

```
[root]# scp -r /opt/nitro root@host002:/opt
```

Verify Network Communication

Verify that the nodes that will be running Nitro are able to communicate with the Nitro ports *and* that the nodes are able to communicate with one another.

Related Topics

-

Additional Configuration

In this section:

Moab Workload Manager Configuration Options

The following is a list of commonly used configure options. For a complete list, use ./configure --help when configuring Moab.

Option	Description	Example
--prefix	Specifies the location of the binaries and libraries of the Moab install. The default location is /opt/moab.	```[root]# ./configure --prefix=/usr/local```
--with-am	Specifies that you want to configure Moab with Moab Accounting Manager.	```[root]# ./configure --with-am```
--with-am-dir	Uses the specified prefix directory for the accounting manager if installed in a non-default location.	```[root]# ./configure --with-am-dir=/opt/mam-9.0.3```
--with-flexlm	Causes Moab to install the license.-mon.flexLM.pl script in the /opt/moab/tools directory. For more information about this script, see the Interfacing to FLEXlm section in the Moab Administrator Guide.	```[root]# ./configure --with-flexlm```
--with-homedir	Specifies the location of the Moab configuration directory and the MOABHOMEDIR environment variable. The default location is /opt/moab. ⓘ MOABHOMEDIR is automatically set on some distributions during installation, when the --with-profile option is enabled.	```[root]# ./configure --with-homedir=/var/moab``` *The Moab HPC Suite home directory will be /var/moab instead of the default /opt/moab.*

Option	Description	Example
--without-init	Disables the installation of a distribution-specific, Moab service startup file. By default, make install will install an init.d or systemd service startup file as appropriate for your distribution. The installed file (`/etc/init.d/moab` or `/usr/lib/systemd/system/moab.service`) may be customized to your needs. If you do not want this file to be installed, use this option to exclude it.	`[root]# ./configure --without-init`
--without-profile	Disables the installation of a distribution-specific shell profile for bash and C shell. By default, make install will install the Moab shell initialization scripts as appropriate for your operating system. These scripts help to establish the MOABHOMEDIR, PERL5LIB, PATH and MANPATH environment variables to specify where the new moab configuration, scripts, binaries and man pages reside. The installed scripts (`/etc/profile.d/moab.{csh,sh}`) may be customized to your needs. If you do not want these scripts to be installed, use this option to exclude them.	`[root]# ./configure --without-profile`

Moab Accounting Manager Configuration Options

The following table comprises commonly-used configure options.

Option	Description
-h,--help	Run `./configure --help` to see the list of configure options.
--localstatedir=DIR	Home directory where per-configuration subdirectories (such as `etc`, `log`, `data`) will be installed (defaults to `PREFIX`).
--prefix=PREFIX	Base installation directory where all subdirectories will be installed unless otherwise designated (defaults to `/opt/mam`).
--with-cgi-bin=DIR	If you intend to use the web GUI, use `--with-cgi-bin` to specify the directory where you want the Moab Accounting Manager CGI files to reside (defaults to `/var/www/cgi-bin/mam`).

Option	Description
--with-db-name=NAME	Name of the SQL database that the server will sync with (defaults to `mam`).
--with-legacy-links	Creates symbolic links allowing the use of the old client and server command names (for example, mam-list-users would be created as symbolic link to mam-list-users). When running a command under its old name, the command will issue a deprecation warning. This warning can be disabled by setting `client.deprecationwarning = false` in the `mam-client.conf` file. The default is not to install the legacy links.
--with-mam-libs=local|site	Use `--with-mam-libs` to indicate whether you want to install the Perl MAM modules in a local directory (`${exec_prefix}/lib`) or in the default system site-perl directory (defaults to `local`).
--with-pro-motion=mamauth|suidperl	Command-line clients and scripts using the API need to use a security promotion method to authenticate and encrypt the communication using the symmetric key. The default is `suidperl` if it is installed on the system, otherwise the default is `mamauth`. See the description for the **security.promotion** configuration parameter in the Client Configuration section for more information about the two security promotion methods.
--with-sha=SHA|SHA1	Allows you to override the auto-detected SHA Digest Perl (whether Digest::SHA1 or Digest::SHA) that should be used for your system.
--with-user=USER	Use `--with-user` to specify the accounting admin userid that the server will run under and who will have full administrative privileges (defaults to the user running the configure command). It is recommended that this be a non-privileged user for the highest security.
--without-gui	Specifies whether to install the CGI web GUI. If you do not intend to use the CGI web GUI, you can specify `--without-gui` to not install the CGI scripts. Otherwise, the default is to install the GUI CGI scripts.
--without-init	If you do not intend to use the mam `init.d` service, you can use `--without-init` to specify that Moab HPC Suite should not install the mam `init.d` script. Otherwise, the script is installed by default.
--without-profile	If you do not intend to use the mam `profile.d` environment scripts, you can use `--without-profile` to specify that Moab HPC Suite should not install the mam `profile.d` scripts. Otherwise, the scripts are installed by default.

Using Multiple RLM Servers

As the RLM Server can run multiple licenses, it is recommended that you install *one* RLM Server for your configuration.

However, if your configuration requires more than one RLM Server, you will *need* to configure the Adaptive Computing products to connect to a specific RLM Server. If not configured to connect to a specific RLM Server, the Adaptive Computing product will scan the network and connect to the first RLM Server it finds listening to request the license. If the first RLM Server does *not* have the product's license, the RLM connection will fail.

If you are using multiple RLM Servers and you want to configure the Adaptive Computing products to connect to a specific RLM Server, do the following:

1. Modify the RLM Server to not accept the network search connections.

    - Edit the init script in `/opt/rlm/` to add -noudp.

      ```
      start() {
      su -l $rlmuser -s /bin/bash -c "$rlmdir/rlm -l -dlog $debuglog -noudp &"
      }
      ```

2. Enable the Adaptive Computing product to connect to the specific RLM.

    On the host where the Adapative Computing product resides, do the following:

    a. Create a new text file and name it with the .lic extension (typically, remote.lic) and save it in the same location as the other Adaptive Computing licenses. Be careful not to override an existing license.

    b. Edit the new remote.lic file to point to the specific RLM Server (hostname) and accept the RLM Server port. Port 5053 is the default. If you use a different port number for the RLM Server, specify that port number in the remote.lic file.

      ```
      HOST $<hostname> ANY 5053
      ```

Repeat as needed for each Adaptive Computing product that you want to connect to a specific RLM Server.

Manual Upgrade

This section provides instructions and other information when upgrading your Moab HPC Suite components for SUSE 11-based systems using the Manual upgrade method.

In this section:

Preparing for Upgrade

The upgrade process of the Moab HPC Suite includes upgrading the database and different components in the suite. This guide contains detailed instructions for upgrading each component for SUSE 11-based systems.

> ⚠️ It is highly recommended that you *first* perform upgrades in a *test environment*. Installation and upgrade procedures are tested prior to release; however, due to customizable variations that may be utilized by your configuration, it is not recommended to drop new versions of software directly into production environments. This is especially true when the workload has vital bearing. Contact Adaptive Computing Professional Services for more information.

> ℹ️ Because many system-level files and directories are accessed during the upgrade, the upgrade instructions in this guide should be executed with root privileges.
>
> You will see that the instructions execute commands as the root user. Please note that the same commands will work for a non-root user with the `sudo` command.

Upgrade the Moab HPC Suite in the following order:

1. Torque. See Upgrading Torque Resource Manager.

2. Moab Workload Manager. See Upgrading Moab Workload Manager.

3. Moab Accounting Manager. See Upgrading Moab Accounting Manager.

4. RLM Server. See Upgrading RLM Server on page 61.

5. Upgrade Nitro with your Moab HPC Suite. See Upgrading Your Nitro Integration on page 62.

Upgrading Torque Resource Manager

Torque 6.0 binaries are backward compatible with Torque 5.0 or later. However they are not backward compatible with Torque versions prior to 5.0. When you upgrade to Torque 6.0.3 from versions prior to 5.0, all MOM and server daemons must be upgraded at the same time.

The job format is compatible between 6.0 and previous versions of Torque and any queued jobs will upgrade to the new version. It is not recommended to upgrade Torque while jobs are in a running state.

This topic contains instructions on how to upgrade and start Torque Resource Manager (Torque).

> ℹ️ If you need to upgrade a Torque version prior to 4.0, contact Adaptive Computing.

> ℹ️ See Considerations Before Upgrading in the *Torque Resource Manager Administrator Guide* for additional important information including about how to handle running jobs during an upgrade, mixed server/MOM versions, and the possibility of upgrading the MOMs without having to take compute nodes offline.

In this topic:

- Before You Upgrade on page 51
- Stop Torque Services on page 51
- Upgrade the Torque Server on page 52
- Update the Torque MOMs on page 53
- Update the Torque Clients on page 53
- Start Torque Services on page 54
- Perform Status and Error Checks on page 54

Before You Upgrade

This section contains information of which you should be aware before upgrading.

In this section:

serverdb

The `pbs_server` configuration is saved in the file `TORQUE_HOME`/server priv/serverdb. When running Torque 4.1 or later for the first time, this file converts from a binary file to an XML-like format.

> ⓘ Recommended: before shutting down pbs_server to upgrade it, make a backup of the settings in serverdb by running the following command:
>
> ```
> qmgr -c "print server" > qmgr.backup
> ```
>
> In the event of a loss of settings, this can by restored by running the following command:
>
> ```
> qmgr < qmgr.backup
> ```

Running Jobs

Before upgrading the system, all running jobs must complete. To prevent queued jobs from starting, nodes can be set to offline or all queues can be disabled (using the "started" queue attribute). See pbsnodes or Queue Attributes in the *Torque Resource Manager Administrator Guide* for more information.

Cray Systems

For upgrading Torque to 6.0.3 on a Cray system, refer to the Installation Notes for Moab and Torque for Cray in Appendix G of the *Moab Workload Manager Administrator Guide*.

Stop Torque Services

Do the following:

1. On the Torque Server Host, shut down the Torque server.

   ```
   [root]# service pbs_server stop
   ```

2. On each Torque MOM Host, shut down the Torque MOM service.

> ⚠️ Confirm all jobs have completed before stopping pbs_mom. You can do this by typing "momctl -d3". If there are no jobs running, you will see the message "NOTE: no local jobs detected" towards the bottom of the output. If jobs are still running and the MOM is shutdown, you will only be able to track when the job completes and you will not be able to get completion codes or statistics.

```
[root]# service pbs_mom stop
```

3. On each Torque Client Host (including the Moab Server Host, the Torque Server Host, and the Torque MOM Hosts, if applicable), shut down the trqauthd service.

```
[root]# service trqauthd stop
```

Upgrade the Torque Server

> ℹ️ You *must* complete all the previous upgrade steps in this topic before upgrading Torque server. See the list of steps at the beginning of this topic.

On the Torque Server Host, do the following:

1. Back up your `server_priv` directory.

```
[root]# tar -cvf backup.tar.gz TORQUE_HOME/server_priv
```

2. If not already installed, install the Boost C++ headers.

```
[root]# zypper install boost-devel
```

3. Download the latest 6.0.3 build from the Adaptive Computing website.

4. Install the latest Torque tarball.

```
[root]# cd /tmp
[root]# tar xzvf torque-<version>-<build number>.tar.gz
[root]# cd torque-<version>-<build number>
[root]# ./configure
[root]# make
[root]# make install
```

5. Update the pbs_server service startup script.

   a. Make a backup of your current service startup script.

```
[root]# cp /etc/init.d/pbs_server pbs_server.bak
```

b. Copy in the new stock service startup script.

```
[root]# cp contrib/init.d/suse.pbs_server /etc/init.d/pbs_server
```

c. Merge in any customizations.

```
[root]# vi /etc/init.d/pbs_server
```

Update the Torque MOMs

Do the following:

1. On the Torque Server Host, do the following:

   a. Create the self-extracting packages that are copied and executed on your nodes.

   ```
   [root]# make packages
   Building ./torque-package-clients-linux-x86_64.sh ...
   Building ./torque-package-mom-linux-x86_64.sh ...
   Building ./torque-package-server-linux-x86_64.sh ...
   Building ./torque-package-gui-linux-x86_64.sh ...
   Building ./torque-package-devel-linux-x86_64.sh ...
   Done.

   The package files are self-extracting packages that can be copied and executed
   on your production machines.  Use --help for options.
   ```

   b. Copy the self-extracting packages to each Torque MOM Host.

   Adaptive Computing recommends that you use a remote shell, such as SSH, to install packages on remote systems. Set up shared SSH keys if you do not want to supply a password for each Torque MOM Host.

   ```
   [root]# scp torque-package-mom-linux-x86_64.sh <torque-mom-host>:
   ```

   c. Copy the pbs_mom startup script to each Torque MOM Host.

   ```
   [root]# scp contrib/init.d/suse.pbs_mom <torque-mom-host>:/etc/init.d/pbs_mom
   ```

2. On each Torque MOM Host, do the following:

   > 🛈 This step can be done from the Torque server from a remote shell, such as SSH. Set up shared SSH keys if you do not want to supply a password for each Torque MOM Host.

   ```
   [root]# ./torque-package-mom-linux-x86_64.sh --install
   ```

Update the Torque Clients

This section contains instructions on updating the Torque clients on the Torque Client Hosts (including the Moab Server Host and Torque MOM Hosts, if applicable).

1. On the Torque Server Host, do the following:

   a. Copy the self-extracting packages to each Torque Client Host.

      Adaptive Computing recommends that you use a remote shell, such as SSH, to install packages on remote systems. Set up shared SSH keys if you do not want to supply a password for each Torque MOM Host.

      ```
      [root]# scp torque-package-clients-linux-x86_64.sh <torque-client-host>:
      ```

   b. Copy the trqauthd startup script to each Torque Client Host.

      ```
      [root]# scp contrib/init.d/suse.trqauthd <torque-client-
      host>:/etc/init.d/trqauthd
      ```

2. On each Torque Client Host, do the following:

   > ℹ This step can be done from the Torque server from a remote shell, such as SSH. Set up shared SSH keys if you do not want to supply a password for each Torque Client Host.

   ```
   [root]# ./torque-package-clients-linux-x86_64.sh --install
   ```

Start Torque Services

Do the following:

1. On each Torque Client Host (including the Moab Server Host, Torque Server Host and Torque MOM Hosts, if applicable), start up the trqauthd service.

   ```
   [root]# service trqauthd start
   ```

2. On each Torque MOM Host, start up the Torque MOM service.

   ```
   [root]# service pbs_mom start
   ```

3. On the Torque Server Host, start up the Torque server.

   ```
   [root]# service pbs_server start
   ```

Perform Status and Error Checks

On the Torque Server Host, do the following:

1. Check the status of the jobs in the queue.

   ```
   [root]# qstat
   ```

2. Check for errors.

   ```
   [root]# grep -i error /var/spool/torque/server_logs/*
   [root]# grep -i error /var/spool/torque/mom_logs/*
   ```

Upgrading Moab Workload Manager

This topic provides instructions to upgrade Moab Workload Manager to the latest release version. Depending on which version of Moab you are presently running, upgrade instructions may vary.

Moab Workload Manager uses the standard configure, make, and make install steps for upgrades. This topic provides a number of sample steps referenced to a particular installation on a Linux platform using the bash shell. These steps indicate the user ID in brackets performing the step. The exact commands to be performed and the user that issues them will vary based on the platform, shell, installation preferences, and other factors.

It is highly recommended that you *first* perform upgrades in a *test environment*. See the warning in Preparing for Upgrade on page 49. It is also recommend that you verify the policies, scripts, and queues work the way you want them to in this test environment. See Testing New Releases and Policies in the *Moab Workload Manager Administrator Guide* for more information.

If you are also upgrading Torque from an older version (pre-4.0), contact Adaptive Computing.

> 🛈 Because many system-level files and directories are accessed during the installation, the instructions in this guide should be executed with root privileges.
>
> You will see that the instructions execute commands as the root user. Please note that the same commands will work for a non-root user with the `sudo` command.

Upgrade Moab Workload Manager

On the Moab Server Host, do the following:

1. If you have not already done so, install extra packages from the add-on repositories. See Enable Extra Packages for the Repository on page 17

2. Download the latest Moab build (`moab-<version>-<OS>.tar.gz`) from the Adaptive Computing website.

   > 🛈 The variable marked *<version>* indicates the build's version, revision, and changeset information. The variable marked *<OS>* indicates the OS for which the build was designed.

3. Untar the distribution file. For example:

   ```
   [root]# tar -xzvf moab-<version>-<OS>.tar.gz
   ```

4. Change directory into the extracted directory.

5. Configure the installation package.

   Use the same configure options as when Moab was installed previously. If you cannot remember which options were used previously, check the `config.log` file in the directory where the previous version of Moab was installed from.

   For a complete list of configure options, use `./configure --help`.

6. Stop Moab.

   ```
   [root]# mschedctl -k
   moab will be shutdown immediately
   ```

   > ⓘ While Moab is down, all currently running jobs continue to run on the nodes, the job queue remains intact, and new jobs cannot be submitted to Moab.

7. Back up your Moab Workload Manager home directory (`/opt/moab/` by default) before continuing.

8. If you are using green computing, or if you are using a resource manager other than Torque, run the `make perldeps` command to install the necessary perl modules using CPAN.

   > ⓘ CPAN is installed on SUSE-based systems by default.

   ```
   [root]# make perldeps
   ```

9. Install Moab.

   ```
   [root]# make install
   ```

   > ⓘ Default configuration files are installed during `make install`. Existing configuration files are not overwritten and the new files are given a `.dist` extension.

10. If you use ODBC, you must confirm the database schema compatibility. For example, if you are upgrading Moab 8.1 to 9.0 no schema changes were made; however if you upgrade from Moab 8.0 and prior, you will need to upgrade your database. See Migrating Your Database to Newer Versions of Moab in the *Moab Workload Manager Administrator Guide* for more information.

11. Verify the version number is correct before starting the new server version.

```
[root]# moab --about

Defaults:    server=:42559  cfgdir=/opt/moab (env)  vardir=/opt/moab
Build dir:   /tmp/jenkins/workspace/MWM-9.0.0/label/build-<OS>
Build host: us-devops-build10
Build date: Fri Oct 09 13:00:00 MST 2015
Build args: NA
Compiler Flags:  -D__M64 -D_BUILDDATETIME="2015100913" -DMUSEZEROMQ -
DMUSEWEBSERVICES -DMUSEMONGODB -DMMAX_GRES=512 -DMMAX_RANGE=2048 -DMMAX_TASK=32768
-fPIC -gdwarf-3 -Wall -Wextra -DVALGRIND -Og -x c++ -std=c++11 -DDMAX_PJOB=512 -D_
GNU_SOURCE
Compiled as little endian.
Version: moab server 9.0.0 (revision 2015100913, changeset
14dee972ebcee919207e48054e9f285db9f6a555)
```

12. If you are using Moab Accounting Manager with the native interface
    (**TYPE**=*native*), remove all entries in `moab.cfg` with the form (AMCFG[*]
    URL=exec://), except for those that you have customized. See AMCFG
    Parameters and Flags in the *Moab Workload Manager Administrator Guide*
    for more information.

    > ℹ In Moab Workload Manager 8.1 and after, Moab defaults to using a set
    > of stock scripts that no longer need to be explicitly configured in the
    > server configuration file.

13. Start Moab.

```
[root]# service moab start
```

Upgrading Moab Accounting Manager

This topic provides instructions to upgrade MAM to the latest release version. It
includes instructions for migrating your database schema to a new version if
necessary.

Moab Accounting Manager uses the standard `configure`, `make`, and `make
install` steps for upgrades. This document provides a number of sample
steps referenced to a particular installation on a Linux platform using the bash
shell. These steps indicate the user ID in brackets performing the step. The
exact commands to be performed and the user that issues them will vary based
on the platform, shell, installation preferences, and other factors.

Upgrade Moab Accounting Manager

On the MAM Server Host, do the following:

1. Determine the MAM Accounting admin user and change to that user.

   - If you are upgrading MAM from a version *prior* to 9.0, use glsuser.

   ```
   [root]# glsuser | grep 'Accounting Admin'
   mam        True
   Accounting Admin
   [root]# su - mam
   ```

   - If you are upgrading MAM at or after 9.0, use mam-list-users.

   ```
   [root]# mam-list-users | grep 'Accounting Admin'
   mam        True
   Accounting Admin
   [root]# su - mam
   ```

2. Determine whether you need to migrate your database.

   a. Determine your database version.

      - If you are upgrading MAM from a version *prior* to 9.0, run `goldsh System Query`.

      ```
      [mam]$ goldsh System Query
      ```

      - If you are upgrading MAM at or after 9.0, run `mam-shell System Query`.

      ```
      [mam]$ mam-shell System Query
      ```

   b. If the current version is lower than 9.0, you must migrate your database. The steps required to do so are incorporated in the remaining steps for this topic.

3. Stop the server daemon.

   - If you are upgrading MAM from a version *prior* to 9.0, run goldd -k.

   ```
   [mam]$ goldd -k
   ```

   - If you are upgrading MAM at or after 9.0, run mam-server -k.

   ```
   [mam]$ mam-server -k
   ```

4. If you determined that you must migrate your database, create a database backup.

   - PostgreSQL database.

   ```
   [mam]$ pg_dump -U <mam_database_user> -W <old_database_name> > /tmp/<old_
   database_name>.sql
   ```

- MySQL database.

```
[mam]$ mysqldump -u <mam_database_user> -p <old_database_name> > /tmp/<old_
database_name>.sql
```

5. Verify that each of the prerequisites listed in Installing Moab Accounting Manager on page 28 have been satisfied.

6. Download the latest MAM build (`mam-<version>.tar.gz`) from the Adaptive Computing website.

> ℹ️ The variable marked *<version>* indicates the build's version, revision, and changeset information.

7. Unpack the tar archive and change directory into the top directory of the distribution.

```
[mam]$ tar -zxvf mam-<version>.tar.gz
[mam]$ cd mam-<version>
```

8. Configure Moab Accounting Manager by running the `configure` script with the desired options.

   It is recommended that you use the same configure options that were used in the previous installation. You can examine the config.log file where you unpacked your previous distribution to help determine the configuration options that were used to install the prior version of MAM.

> ⚠️ Client and server command names changed beginning with 9.0. If you want to create symbolic links to enable you to continue to use the old client and server command names, use the --with-legacy-links option with configure. When running a command under its old name, the command will issue a deprecation warning. This warning can be disabled by setting client.deprecationwarning = false in the mam-client.conf file.

```
[mam]$ ./configure
```

9. To compile the program, type `make`.

```
[mam]$ make
```

> ℹ️ If you only need to install the clients on a particular system, replace make with make clients-only. If you only need to install the web GUI on a particular system, replace make with make gui-only.

10. Run `make install` as root to install Moab Accounting Manager.

```
[mam]$ su -c "make install"
```

> ℹ If you only need to install the clients on a particular system, replace "make install" with "make install-clients-only". If you only need to install the web GUI on a particular system, replace "make install" with "make install-gui-only".

11. Edit the configuration files as necessary. You may want to compare your existing configuration files with those distributed with the new release to determine if you want to merge and change any of the new options within your configuration files.

    - If you are upgrading MAM from a version *prior* to 9.0, the install process will have saved your prior configuration files to {goldd,gold,goldg}.conf.pre-9.0 and written new default server configuration file as mam-{server,client,gui}.conf. You will need to merge any non-default parameters from your prior config files to the new default config files.

    ```
    [mam]$ diff /opt/mam/etc/goldd.conf.pre-9.0 /opt/mam/etc/mam-server.conf
    [mam]$ vi /opt/mam/etc/mam-server.conf
    [mam]$ diff /opt/mam/etc/gold.conf.pre-9.0 /opt/mam/etc/mam-client.conf
    [mam]$ vi /opt/mam/etc/mam-client.conf
    [mam]$ diff /opt/mam/etc/goldg.conf.pre-9.0 /opt/mam/etc/mam-gui.conf
    [mam]$ vi /opt/mam/etc/mam-gui.conf
    ```

    - If you are upgrading MAM at or after 9.0, merge and change any of the new options supplied in the new default configuration files (saved in mam-{server,client,gui}.conf.dist) into your existing configuration files (mam-{server,client,gui}.conf).

    ```
    [mam]$ diff /opt/mam/etc/mam-server.conf /opt/mam/etc/mam-server.conf.dist
    [mam]$ vi /opt/mam/etc/mam-server.conf
    [mam]$ diff /opt/mam/etc/mam-client.conf /opt/mam/etc/mam-client.conf.dist
    [mam]$ vi /opt/mam/etc/mam-client.conf
    [mam]$ diff /opt/mam/etc/mam-gui.conf /opt/mam/etc/mam-gui.conf.dist
    [mam]$ vi /opt/mam/etc/mam-gui.conf
    ```

    Verify that your current path points to your newly installed clients and server.

    ```
    [mam]$ which mam-server
    /opt/mam/sbin/mam-server
    ```

12. Start the server daemon back up.

    ```
    [mam]$ mam-server
    ```

13. If you are migrating your database to 9.0, you will do so by running one or more migration scripts. You must run every incremental migration script

between the version you are currently using and the new version (9.0). These scripts are designed to be rerunnable, so if you encounter a failure, resolve the failure and rerun the migration script. If you are unable to resolve the failure and complete the migration, contact Support.

For example, if you are migrating from Moab Accounting Manager version 7.2, you must run five migration scripts: the first to migrate the database schema from 7.2 to 7.3, the second to migrate from 7.3 to 7.5, the third to migrate the database schema from 7.5 to 8.0, the fourth to migrate the database schema from 8.0 to 8.1, and the fifth to migrate the database schema from 8.1 to 9.0.

```
[mam]$ sbin/migrate_7.2-7.3.pl
[mam]$ sbin/migrate_7.3-7.5.pl
[mam]$ sbin/migrate_7.5-8.0.pl
[mam]$ sbin/migrate_8.0-8.1.pl
[mam]$ sbin/migrate_8.1-9.0.pl
```

14. Verify that the resulting database schema version is 9.0.

```
[mam]$ mam-shell System Query

Name                   Version Description
---------------------- ------- -----------------
Moab Accounting Manager 9.0    Commercial Release
```

15. Verify that the executables have been upgraded to 9.0.3.

```
[mam]$ mam-server -v

Moab Accounting Manager version 9.0.3
```

Upgrading RLM Server

Adaptive Computing *strongly* recommends that your RLM Server is version 12.1.2.

In this topic:

Confirm if an Upgrade is Needed

Run the following command to determine your current version of RLM Server.

```
[root]# /opt/rlm/rlm -v
```

If the version reported is less than 12.1.2, continue with the section to Upgrade the RLM Server later in this topic.

Upgrade the RLM Server

> ℹ These instructions assume you used /opt/rlm as the install location.

On the RLM Server Host, do the following:

1. Download the latest RLM build (`ac-rlm-<version>.tar.gz`) from the [Adaptive Computing Moab HPC Suite Download Center](https://www.adaptivecomputing.com/support/download-center/moab-hpc-suite-download/) (https://www.adaptivecomputing.com/support/download-center/moab-hpc-suite-download/).

2. Stop the RLM service.

   ```
   [root]# service rlm stop
   ```

3. Archive the existing RLM installation, including the license file(s).

   ```
   [root]# mv /opt/rlm/ /opt/rlm-<archive_version>/
   ```

4. Install the new tarball files.

   ```
   [root]# mkdir -p -m 0744 /opt/rlm
   [root]# cd /opt/rlm
   [root]# tar -xzvf /<unpack-directory>/ac-rlm-12.1.tar.gz --strip-components=1
   [root]# chown -R rlm:rlm /opt/rlm
   ```

   > ℹ The `--strip-components=1` removes the "ac-rlm-12.1/" from the relative path so that they are extracted into the current directory.

5. Install the startup scripts.

   > ℹ If you are using a user:group other than rlm:rlm or a location other than /opt/rlm, then edit the following files to reflect those changes after copying them.

   ```
   [root]# cp init.d/rlm /etc/init.d
   ```

6. Restore the license file(s).

   ```
   [root]# cp /opt/rlm-<archive_version>/*.lic /opt/rlm/
   ```

7. Restart the RLM service.

   ```
   [root]# service rlm restart
   ```

Upgrading Your Nitro Integration

This section provides instructions on upgrading your Nitro Integration as part of your Moab HPC Suite configuration.

In this section:

Preparing for Nitro Manual Installation or Upgrade

This topic contains instructions on how to download and unpack the Nitro Tarball Bundle for all the hosts in your configuration.

> 🛈 Whether you are installing tarballs on one host or on several hosts, each host (physical machine) on which a server is installed (Nitro, Nitro Web Servcies) *must* have the Nitro Tarball Bundle.

> ⚠️ Nitro Web Services is currently not available for SUSE 11-based systems; it is not in the Nitro Tarball Bundle for that OS.

Set Up Proxies

If your site uses a proxy to connect to the Internet, do the following:

```
export http_proxy=http://<proxy_server_id>:<port>
export https_proxy=http://<proxy_server_id>:<port>
```

Download and Unpack the Nitro Tarball Bundle

The Nitro Tarball Bundle contains all the tarballs available for Nitro. However, not every tarball may be installed on the same host.

On each host (physical machine), do the following:

1. Using a web browser, navigate to the Adaptive Computing Nitro Download Center https://www.adaptivecomputing.com/support/download-center/nitro/.

2. Download the Nitro Tarball Bundle `nitro-tarball-bundle-<version>-<OS>.tar.gz`.

   > 🛈 The variable marked <version> indicates the build's version, revision, and changeset information. The variable marked <OS> indicates the OS for which the build was designed.

3. Unpack the Nitro Tarball Bundle.

```
[root]# tar xzvf nitro-tarball-bundle-<version>-<OS>.tar.gz
```

Related Topics

Upgrading Nitro

This topic contains instructions on how to upgrade Nitro.

In this topic:

Upgrade Nitro

On the host where Nitro resides, do the following:

1. If you have not already done so, complete the steps to prepare the host. See Preparing for Nitro Manual Installation or Upgrade on page 63.

2. Back up your existing launch script in `/opt/nitro/bin/`.

3. Change the directory to the root of the unpacked Nitro tarball bundle.

```
[root]# cd nitro-tarball-bundle-<version>-<OS>
```

4. Identify the Nitro product tarball (nitro-*<version>*-*<OS>*.tar.gz) and unpack the tarball into the same directory you created when you first installed Nitro (for example, `/opt/nitro`).

```
[root]# tar xzvpf nitro-<version>-<OS>.tar.gz -C /opt/nitro --strip-components=1
```

5. Identify the `launch_nitro.sh` script version for your resource manager.

   Reference scripts are provided in `/opt/nitro/scripts`.

```
[root]# find . -name launch_nitro.sh
./scripts/lsf/launch_nitro.sh
./scripts/torque/launch_nitro.sh
./scripts/slurm/launch_nitro.sh
./scripts/alps/torque/launch_nitro.sh
./scripts/alps/slurm/launch_nitro.sh
```

6. Copy the latest launch script to the bin directory. (This example uses the Torque-based launch script.)

```
[root]# cp /opt/nitro/scripts/torque/launch_nitro.sh /opt/nitro/bin/launch_nitro.sh
```

> ⓘ This is a "copy" file operation and not a "move" operation. This allows you to customize your version of the script and always have the factory version available for consultation and/or comparison.

7. Merge any customizations from your existing `launch_nitro.sh` script into the script you just copied to the bin directory.

8. If you are not using a shared file system, copy the updated Nitro installation directory to all hosts.

   Only the Nitro bin directory with its proper path is required to run Nitro jobs. This means that you only need to copy the Nitro bin directory to the other hosts.

   ```
   [root]# scp -r /opt/nitro/bin root@host002:/opt/nitro
   nitrostat                                    100%   12KB  12.0KB/s   00:00
   launch_nitro.sh                              100% 6890     6.7KB/s   00:00
   nitro                                        100%   15MB  14.9MB/s   00:00
   ```

Verify Network Communication

Verify that the nodes that will be running Nitro are able to communicate with the Nitro ports *and* that the nodes are able to communicate with one another.

Related Topics

- Upgrading Your Nitro Integration on page 62

Migrating the MAM Database from MySQL to PostgreSQL

PostgreSQL is the preferred DBMS for MAM. Customers who have already installed MySQL as the DBMS for MAM are not required to migrate their database to use PostgreSQL at this time. However, MySQL is considered deprecated and new installations will only use PostgreSQL.

> 🛈 PostgreSQL does not provide a standard procedure for migrating an existing database from MySQL to PostgreSQL. Adaptive Computing has had success using the py-mysql2pgsql tools for migrating/converting/exporting data from MySQL to PostgreSQL. See https://github.com/philipsoutham/py-mysql2pgsq for additional details.

To Migrate the MAM Database

This procedure was successfully tested on an actual customer MySQL database with millions of transactions on CentOS 6.4. It completed in less than an hour.

1. Make a backup copy of your MySQL mam database.

   ```
   [root]# mysqldump mam > /archive/mam.mysql
   ```

2. Follow the instructions to Install PostgreSQL.

- **Manual Install** - [Install and Initialize the PostgreSQL Server on page 30](#)
- **RPM Install** - [1.1.4.A Install and Initialize PostgreSQL Server](#)

3. Install the prerequisite packages.

4. Install pg-mysql2pgsql (from source).

```
[root]# cd /software
[root]# git clone git://github.com/philipsoutham/py-mysql2pgsql.git
[root]# cd py-mysql2pgsql
[root]# python setup.py install
```

5. Run pg-mysql2pgsql once to create a template yaml config file.

```
[root]# py-mysql2pgsql -v
```

6. Edit the config file to specify the MySQL database connection information and a file to output the result.

```
[root]# vi mysql2pgsql.yml
```

```
mysql:
hostname: localhost
port: 3306
socket:
username: mam
password: changeme
database: mam
compress: false
destination:
# if file is given, output goes to file, else postgres
file: /archive/mam.pgsql
postgres:
hostname: localhost
port: 5432
username:
password:
database:
```

7. Run the pg-mysql2pgsql program again to convert the database.

```
[root]# py-mysql2pgsql -v
```

8. Create the mam database in PostgreSQL.

```
[root]# su - postgres
[postgres]$ psql
postgres=# create database "mam";
postgres=# create user mam with password 'changeme!';
postgres=# \q
[postgres]$ exit
```

9. Import the converted data into the PostgreSQL database.

```
[root]# su - mam
[mam]$ psql mam < /archive/mam.pgsql
```

10. Point MAM to use the new postgresql database.

```
[mam]$ cd /software/mam-latest
[mam]$ ./configure                  # This will generate an etc/mam-
server.conf.dist file
[mam]$ vi /opt/mam/etc/mam-server.conf   # Merge in the database.datasource from
etc/mam-server.conf.dist
```

11. Restart Moab Accounting Manager.

```
[mam]$ mam-server -r
```

Chapter 3 Troubleshooting

This chapter details some common problems and general solutions. Additional troubleshooting may be found in the individual Moab HPC Suite component documentation.

In this chapter:

General Issues

This topic details some common problems and general solutions.

In this topic:

Moab error: "cannot determine local hostname"

```
# service moab start
Starting moab: ERROR:    cannot determine local hostname - node is misconfigured
                              [FAILED]
```

```
...
SCHEDCFG[Moab]                        SERVER=<moab-hostname>:42559
...
```

Also check `/etc/hosts` to be sure the host name resolves, at least with localhost:

```
...
127.0.0.1    <moab-hostname> localhost localhost.localdomain localhost4
localhost4.localdomain4
...
```

Moab error: "Moab will now exit due to license file not found"

```
# service moab start
Starting moab: Moab will now exit due to license file not found
Please contact Adaptive Computing (sales@adaptivecomputing.com) to get a license for
your system
                              [FAILED]
```

If you encounter this error when starting Moab, make sure your Moab license file is named **moab.lic** and is located in the `/opt/moab/etc/` directory.

Also make sure the license is not expired. The expiration date is listed in the license file. For example:

```
# cat /opt/moab/etc/moab.lic
...
# Expires after Tue Dec 31 10:43:46 2013
...
```

Other Moab issues

See Troubleshooting and System Maintenance in the *Moab Workload Manager Administrator Guide*.

Where do I need to set credentials and what are the default values?

Communication and cooperation between various components of the Moab HPC Suite requires credentials to be properly configured. For ease of use, the credential information, including where credentials are set, default values, and where they are used are grouped by database and product.

In this section:

Database Credentials

MongoDB

Data-base	User	Default Pass-word	Used By	Parameters
admin	admi-n_user	secret1	system admins	NA

Data-base	User	Default Pass-word	Used By	Parameters
moab	moab_user	secret2	/opt/moab/etc/moab-private.cfg	MONGOUSER, MONGOPASSWORD
moab	mws_user	secret3	/opt/mws/etc/mws-config.groovy	grails.-mongo.username, grails.-mongo.password
moab	insigh-t_user	secret4	/opt/insight/etc/config.groovy	moab.-mongo.username, moab.-mongo.password
mws	mws_user	secret3	/opt/mws/etc/mws-config.groovy	grails.-mongo.username, grails.-mongo.password
insight	insigh-t_user	secret4	/opt/insight/etc/config.groovy	mongo.username, mongo.password
insight	mws_user	secret3	http://<mws_server->:8080/mws/admin/plugins/edit/viewpoint-query-helper	user, password
nitro-db	nitro_user	secret5	/opt/nitro-web-services/etc/nitro.cfg	db_username, db_password

PostgreSQL

Database	User	Default Password	Used By	Parameters
moab_view-point	moab_viewpoint	changeme!	/opt/viewpoint/etc/viewpoint.cfg	VIEWPOINT_DATABASE_USER, VIEWPOINT_DATABASE_PASSWORD
mam	mam	changeme!	/opt/mam/etc/mam-server.cfg	database.user, database.password

Database	User	Default Password	Used By	Parameters
moab_insight	moab_insight	changeme!	/opt/insight/etc/config.groovy	jdbc.username, jdbc.password
moab_insight_reference	moab_insight	changeme!	/opt/insight/etc/config.groovy	jdbc.username, jdbc.password

Product Credentials

Moab Workload Manager

Declared Parameter		Used By		Default Value
File	Parameter Name	File	Parameter Name	
/opt/moab/etc/moab-private.cfg	MESSAGEQUEUESECRETKEY	/opt/mws/etc/mws-config.groovy	moab.messageQueue.secretKey	NA
		/opt/insight/etc/config.groovy	messageQueue.secretKey	
/opt/moab/etc/.moab.key	NA	/opt/mws/etc/mws-config.groovy	moab.secretKey	NA

Moab Accounting Manager

Declared Parameter		Used By		Default Value
File	Parameter Name	File	Parameter Name	
/opt/mam/etc/mam-site.conf	token.value	/opt/moab/etc/moab-private.cfg	CLIENTCFG [AM:mam] KEY	NA
		/opt/mws/etc/mws.d/mws-config-hpc.groovy	mam.secretKey	

Moab Web Services

Declared Parameter		Used By		Defaul-t Value
File	Parameter Name	File	Para-meter Name	
/op-t/m-ws/etc/mws-config.groovy	auth.defaultUser.username	http://<viewpoint_ server->:8081/configuration/	User-name	moab-admin
		/opt/moab/etc/moab-private.cfg	CLIENTC-FG [RM:mw-s] USERNA-ME	
/op-t/m-ws/etc/mws-config.groovy	auth.defaultUser.password	http://<viewpoint_ server->:8081/configuration/	Password	change-me!
		/opt/moab/etc/moab-private.cfg	CLIENTC-FG [RM:mw-s] PASSWO-RD	
/op-t/m-ws/etc/mws-config.groovy	grails.plu-gin.springsecurity.oauthProvider.clients [0].clientSecret	http://<viewpoint_ server->:8081/configuration/	Client Secret	NA

Nitro Web Services

Declared Parameter		Used By	Default Value
File	Parameter Name		
/opt/nitro-web-ser-vices/etc/nitro.cfg	ws_admin_ password	Installation - default NWS API user creation	ChangeMe2!

Declared Parameter		Used By	Default Value
File	Parameter Name		
/opt/nitro-web-ser-vices/etc/nitro.cfg	ws_readonly_ username	Installation - default NWS API user creation http://<viewpoint_server>:8081/configuration/ -> Nitro Services -> Username	nitro-readonly-user
/opt/nitro-web-ser-vices/etc/nitro.cfg	ws_readonly_ password	Installation - default NWS API user creation http://<viewpoint_server>:8081/configuration/ -> Nitro Services -> Password	ChangeMe3!
/opt/nitro-web-ser-vices/etc/nitro.cfg	ws_writeonly_ username	Installation - default NWS API user creation /opt/nitro-web-services/etc/zmq_job_status_ adapter.cfg -> username	nitro-writeonly-user
/opt/nitro-web-ser-vices/etc/nitro.cfg	ws_writeonly_ password	Installation - default NWS API user creation /opt/nitro-web-services/etc/zmq_job_status_ adapter.cfg -> password	ChangeMe4!

Viewpoint

Declared Parameter		Used By	Default Value
File	Parameter Name		
/opt/viewpoint/etc/viewpoint.cfg	username	http://<viewpoint_server->:8081/login/	viewpoint-admin
/opt/viewpoint/etc/viewpoint.cfg	password	http://<viewpoint_server->:8081/login/	changeme!