Univa Corporation

Grid Engine Documentation

Univa Grid Engine HP Insight CMU Connector

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Contents

1 Introduction

The Univa Grid Engine Connector for HP Insight CMU provides an interface between HP's Cluster Management Utility and Univa Grid Engine which is simple to install, configure and use. Cluster administrators can manage, control, and monitor their cluster environment from the HP Insight CMU GUI and command line interface.

2 Installation of Univa Grid Engine Connector on HP Insight CMU

The following section describes the installation and use of the Univa Grid Engine HP Insight CMU Connector.

2.1 Prerequisites

The installation requires the following components installed in the cluster:

- HP Insight CMU Version 7.2 or higher
- Univa Grid Engine 8.1 or higher

Further the following prerequisites must be fulfilled:

- The HP Insight CMU server host must be an admin host in the Univa Grid Engine cluster.
- The *root* user on CMU server host should be able to change files in Univa Grid Engine. If this is not allowed, the CMU directory in the $SGE_ROOT subdirectory /util/resources needs to be copied in a local directory on the CMU server host. Then the installation needs to be executed within this directory. Finally this CMU directory needs to be copied back to the original location. This is usually performed on the NFS server.

Note that the HP Insight CMU server can also run on the qmaster host. When doing so please take into consideration that the host need to offer enough memory and processing capabilities in order supply both services.

2.2 Installation Steps

In order to install the HP Insight CMU Univa Grid Engine Connector the following steps need to be performed:

- Login as *root* on CMU master host
- Source $SGE_ROOT/default/common/settings.sh - so that UGE commands (like qconf) can be executed.
- cd $SGE_ROOT/util/resources/CMU
- Call installation script: ./install_cmu_uge_extensions.sh

- Follow instructions (confirm path to CMU / confirm if HTML documentation is available).
- Restart CMU service: /etc/init.d/cmu restart
- Start CMU GUI

2.3 Validating Install

After successful installation and restart of the CMU service the installation needs to be verified. This can be done by logging into the CMU GUI and checking the availability of UGE metrics. At least two user groups need to exist in CMU when Univa Grid Engine was previously installed:

- UGE_execution_hosts
- UGE_master_host

Clicking on a host in the *UGE_execution_hosts* group should display Univa Grid Engine related metrics. Examples are *UGE_execd_uptime*, *UGE_execd_state*, and *UGE_topology_inuse*. When no metrics are reported (value is "No reference value" or "NA") then verify that the Univa Grid Engine execution daemon is running. You can check this with a ssh login to that host from the CMU GUI. On the host please check for the process named sge_execd (ps -ef | grep sge). If this is an valid execution host you can startup the execution daemon from the context menu (*Startup Execution Daemon*).

In order to use the top and context menu entries for Univa Grid Engine you need to be logged in the CMU admin mode. Go to the *Options* top menu and login by selecting *Enter admin mode*.

3 Usage of Univa Grid Engine Connector on HP Insight CMU

The following sections describes how the Univa Grid Engine connector can be used with the HP Insight CMU GUI. Different integration points for Univa Grid Engine are installed in the GUI. The top menu contains under the **Tools** menu item a new group of entries in the Univa Grid Engine folder. Those controls work independent from the selected hosts (host groups) in the HP Insight CMU resource view. Further when selecting a host or a host group and pressing the right mouse button a Univa Grid Engine folder is available in the context menu. Within this menu you can perform host and host group related actions. Additionally the HP Insight CMU monitoring interface contains Univa Grid Engine related load metrics, which can be used in the **Instant View**, **Table View**, or **Time View**. Finally, the Univa Grid Engine connector automatically creates Univa Grid Engine host groups, which can be seen in the **User Groups** resource. They are going to be used for identifying the general structure of the Univa Grid Engine cluster (compute nodes, master node, failover nodes).

3.1 Functionality Overview

Following list provides an overview about the available functionality provided by the Univa Grid Engine CMU connector.

- Monitoring of all Grid Engine hosts
- Runtime metrics for running and finished jobs (long running, host exclusive jobs).
- Host metrics
  - Univa Grid Engine daemon CPU load
  - Univa Grid Engine daemon uptime
  - Number of running jobs
  - Number of consumed slots
  - Number of free slots
  - Cores in use when using core binding / cpuset feature
- Host state
  - Execution daemon state (running / not running)
- Host roles
  - Execution daemon host roles (submit host / admin host)
- Grid Engine master migration
- Grid Engine cluster administration
  - Job control
  - Queue control
  - Startup/Shutdown services
  - Scheduler configuration
  - Global and host configuration
  - Resource configuration (complex configuration)

3.2 Top Menu Controls

The Univa Grid Engine top menu contains global functions which are not specific to certain hosts or functions which can only be executed on a specific host (like the master host). The Univa Grid Engine menu is installed as a submenu in the **Tools** top menu. Please note that in order to use the menu you need to be logged in as CMU admin user (see Validating Install).

The following table shows the available top menu entries:

Univa Grid Engine Top Menu	**Semantic**
Start qmaster	Starts the qmaster daemon on the qmaster host.
Stop qmaster	Shuts down the qmaster daemon (jobs stay running).
Modify Global Configuration	Opens an editor where the global configuration can be changed.
Show Global Configuration	Shows the global configuration in a terminal.
Modify Scheduler Configuration	Opens an editor where the scheduler configuration can be changed.
Show Scheduler Configuration	Shows the scheduler configuration in a terminal.

Univa Grid Engine Top Menu	Semantic
Show Queue Instances	Shows queue instance list in a terminal.
Modify Resource Configuration	Opens the complex configuration in an editor.
Create Grid Engine Backup	Opens the Grid Engine backup creation dialog in a terminal.
Restore Grid Engine Backup	Opens the Grid Engine restore dialog in a terminal.
Univa Information	Opens Univa website in a web browser.
Univa Support	Opens Univa support site in a web browser.

3.3 Context Menu Controls

The context menu entries appears when selecting a host group, one, or more hosts and then pressing the right mouse button. As a result the Univa Grid Engine sub-menu is visible. Two types of entries can be distinguished:

- Entries which are only valid for one host.
- Entries which triggers actions which can be applied on multiple hosts in parallel.

If more than one entry was selected entries which can only applied to one host are grayed out. Those are typically configuration actions which opens an editor in a terminal in order to be handled interactively.

The next table lists all available context menu entries.

Context Menu Entry	Multiple Hosts	Semantic
Kill Jobs	Yes	Sends a forced kill (qdel -f) to all queue instances on the selected hosts.
Reschedule Jobs	Yes	Reschedules all jobs (forced) on all queue instances on the selected hosts.
Disable Queue Instances	Yes	Disables all queue instances on the selected hosts, so that no new job is scheduled to those hosts anymore. Useful before rescheduling jobs and shutting down the execution daemon finally.
Enable Queue Instances	Yes	Enables all queue instances on the selected hosts.
Shutdown Execution Daemon	Yes	Shuts the selected execution daemon down. This does not affect running jobs.
Startup Execution Daemon	Yes	Starts the selected execution daemons up. Running jobs are reconnected automatically.

Context Menu Entry	Multiple Hosts	Semantic
Show Jobs on Host	No	Opens a terminal and prints out a list of jobs running on that host.
Modify Host Configuration	No	Opens a terminal with an editor which allows to change the host configuration.
Modify Execution Configuration	No	Opens a terminal with an editor which allows to change the execution host configuration. Here for example new host resources can be initialized on the complex_values field.
Add as Submit Host	Yes	Adds the selected hosts in the submit host list, so that it is allowed to submit jobs from those hosts in the Grid Engine cluster.
Delete as Submit Host	Yes	Removes the selected hosts from the submit host list.
Add as Admin Host	Yes	Adds the selected hosts in the admin host list, so that it is allowed for admin users to change the Grid Engine configuration from these hosts.
Delete as Admin Host	Yes	Removes the selected hosts from the admin host list.
Migrate Grid Engine Master	No	Triggers a qmaster migration to the selected host. The selected host must be configured as a shadowd host in order to avoid migration to hosts which does not fulfill required properties.

3.4 Univa Grid Engine Host Metrics

The connector also provides a facility to report Univa Grid Engine related host metrics. The availability of those host metrics depends if and which Univa Grid Engine daemons are running there. The following table shows the list of available metrics:

Metric Name	Available on	Semantic
UGE_cpu_load	execd / qmaster	Displays how much CPU load (in %) all execd and qmaster processes on the host are consuming.
UGE_mem_load	execd / qmaster	Displays how much memory load (in %) all execd and qmaster processes on the host are consuming.
UGE_execd_uptime	execd	Displays when the execution daemon was started.
UGE_qmaster_uptime	execd	Displays when the qmaster daemon was started.
UGE_running_jobs	execd	Displays the number of jobs running on this host.

Metric Name	Available on	Semantic
UGE_consumed_slots	execd	Displays the number of slots consumed on this host. The amount of slots is the sum of all consumed slots on all queue instances on the host.
UGE_free_slots	execd	Displays the number of free slos on this host. The amount of slots is the sum of all free slots on all queue instances on the host.
UGE_execd_state	execd	Shows whether an execd is running (online) or not (offline).
UGE_host_roles	execd	Shows if the host is configured in Grid Engine as admin host (adminhost) and / or submit host (submithost).
UGE_topology_inuse	execd	When core binding is used it shows the cores which are used by running jobs in the topology string format (S denotes a socket, C a free core, and c a core which is used by a job).

3.5 Univa Grid Engine Host Groups

The Univa Grid Engine connector automatically installs detected host groups. Host groups are created for executions hosts (UGE_execution_hosts), failover hosts which have a shadow daemon running (UGE_shadow_hosts), and for the master host (UGE_master_host).

Host groups are also created for long running jobs. The name of the host group contains the job id. When the job is an array job task, the array job task id is also part of the host group. Those host groups contain all hosts on which a particular job is running. HP Insight CMU automatically archives the host groups as well as the collected host data when a job finished. The job related host group is then moved and available in the Archived User Groups. From there finished jobs can be analyzed for how they used host resources (like network access / cpu / memory etc.).

3.6 HP Insight CMU Command Line Examples

Additionally to the GUI, the Univa Grid Engine enhancements are also available on the HP Insight CMU command line interface. The following examples demonstrate some of these enhanced capabilities.

Show all execution hosts:

```
/opt/cmu/bin/cmu_show_user_groups UGE_execution_hosts
```

Show the amount of running jobs on the execution hosts:

```
/opt/cmu/bin/cmu_monstat --sensors=UGE_running_jobs --ug=UGE_execution_hosts
```

Show the CPU load of all execution daemons:

```
/opt/cmu/bin/cmu_monstat --sensors=UGE_cpu_load --ug=UGE_execution_hosts
```

Show all user groups (including dynamic user groups for jobs):

```
/opt/cmu/bin/cmu_show_user_groups
```

Show all hosts where a particular job is running, by selecting its dynamic user group:

```
/opt/cmu/bin/cmu_show_user_groups job_4
```

List available menu items from custom menu:

```
/opt/cmu/bin/cmu_custom_run -l
```

Shutdown all execution daemons on hosts listed in /tmp/nodes file:

```
/opt/cmu/bin/cmu_custom_run -t "Univa Grid Engine|Shutdown Execution Daemon" -f /tmp/nodes
```

Shutting down qmaster:

```
/opt/cmu/bin/cmu_custom_run -t "Univa Grid Engine|Stop qmaster"
```

4 Known issues and limitations

The HP Insight CMU Univa Grid Engine connector only supports management of one Univa Grid Engine cluster.