



Introduction to Oracle Grid Engine

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Introduction

- **Oracle Grid Engine**, previously known as *Sun Grid Engine* is:
 - A grid computing computer cluster software system
 - **CODINE** (Computing in Distributed Networked Environments) or **GRD** (Global Resource Director).
- Typically used on:
 - A computer farm or high-performance computing (HPC) cluster.

Introduction

- Responsible for:
 - accepting, scheduling, dispatching, and managing the remote and distributed execution of large numbers of standalone, parallel or interactive user jobs.
 - manages and schedules the allocation of distributed resources such as processors, memory, disk space, etc.

Features

- Advance reservation
- Array job interdependencies
- Rule-based Resource Quota control
- Enhanced remote execution
- Multi-clustering
- Daemons managed by the Service Management Facility on Solaris
- Job Submission Verifier (client-side and server-side job verification)
- GUI Installer and SGE Inspect

Features

Cluster Queue Status 0%

	Type	Slot Usage	Load Avg.	Load Ratio	System Type	State
alarm.q@test.gridengine.info	BIP	0%	0.11000	1.1000%	lx24-amd64	a
all.q@test.gridengine.info	BIP	0%	0.11000	6.3%	lx24-amd64	e
disabled.q@test.gridengine.info	BIP	0%	0.11000	6.3%	lx24-amd64	d

• There are no active jobs

Pending Jobs: 2

Priority	Job ID	Job Owner	Job Name	Slots Requested	Array Tasks	Submission Time	State
0.56000	<u>1</u>	<u>dag</u>	impossibleJob.sh	1		05:20:45 PM, May 04	qw
<i>Job 1 Hard Request: arch=solaris64</i>							
0.55500	<u>2</u>	<u>dag</u>	hostname	1		08:15:15 PM, Jun 29	Eqw

Rendered: Thu, 27 Dec 2007 01:31:59

XHTML Sony PSP RSS Available XML VALIDATE

A screenshot of the xml-qstat web interface

Done

History

- In 2000, Sun acquired Gridware, Inc. a privately owned commercial vendor of advanced computing resource management software.
- Later that year, Sun offered a free version of Gridware for Solaris and Linux, and renamed the product **Sun Grid Engine**.
- In 2001, Sun made the source code available.
- In 2010, after the purchase of Sun by **Oracle**.

Grid Engine Component Architecture

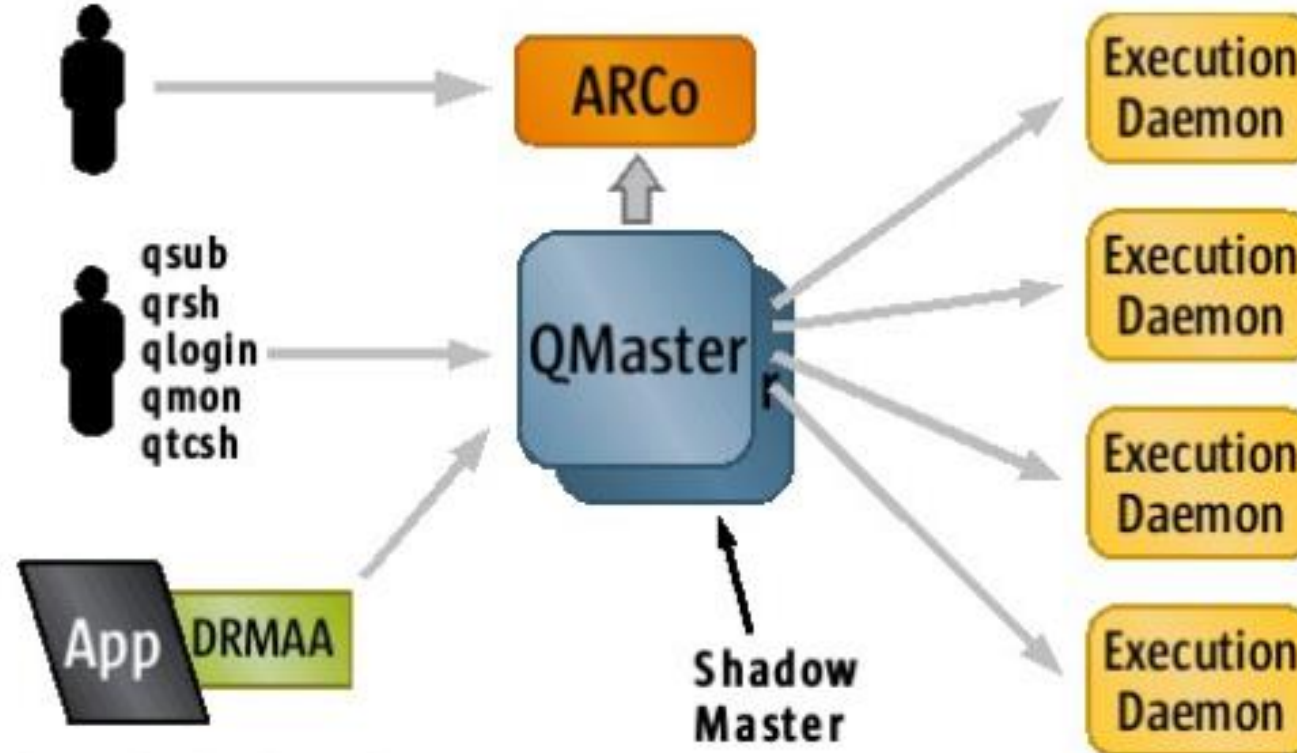


Figure 1: Sun Grid Engine Component Architecture

Grid Engine Basics and Concepts

- **Jobs**
 - Batch job
 - Parametric job
 - Parallel job
 - Interactive job
- **Queues**
- **Host Groups**
- **Resources**

Grid Engine Basics and Concepts

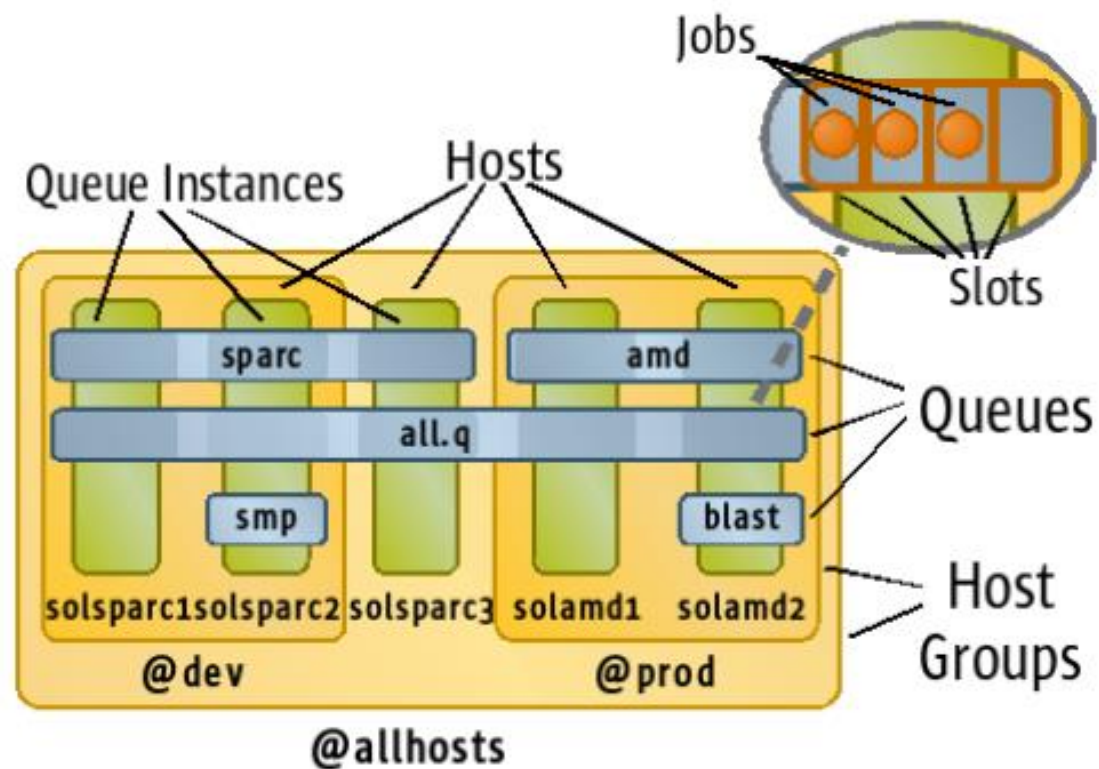


Figure 2: Example Host Group and Queue Configuration

Grid Engine Scheduler

- At the heart of a Sun Grid Engine cluster is the **scheduler**.
- It is responsible for prioritizing pending jobs and deciding which jobs to schedule to which resources.
- **Job Selection**
 - The first stage of the scheduling process, in which every job in the pending job list is assigned a priority, and the entire list is sorted according to priority order.
- **Job Scheduling**
 - The second step of the scheduling process is the actual job scheduling, or assignment of a job to a set of free resources.

Grid Engine Scheduler: Job Selection

1. Ticket Policies

- I. Share Tree Policy
- II. Functional Ticket Policy
- III. Override Ticket Policy

2. Urgency Policies

- I. Wait Time Policy
- II. Deadline Policy
- III. Resource Urgency Policy

3. Custom Policy

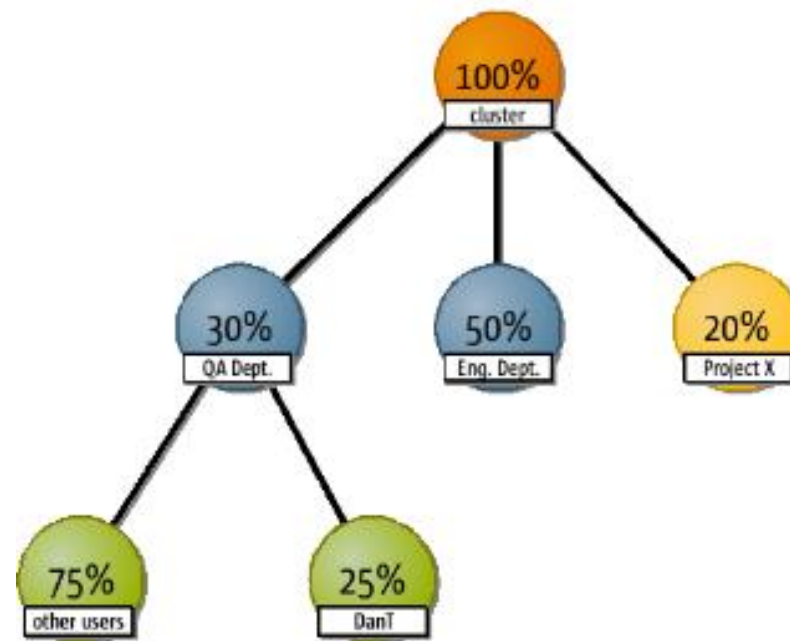


Figure 3: Example Share Tree

Grid Engine Scheduler: Job Selection

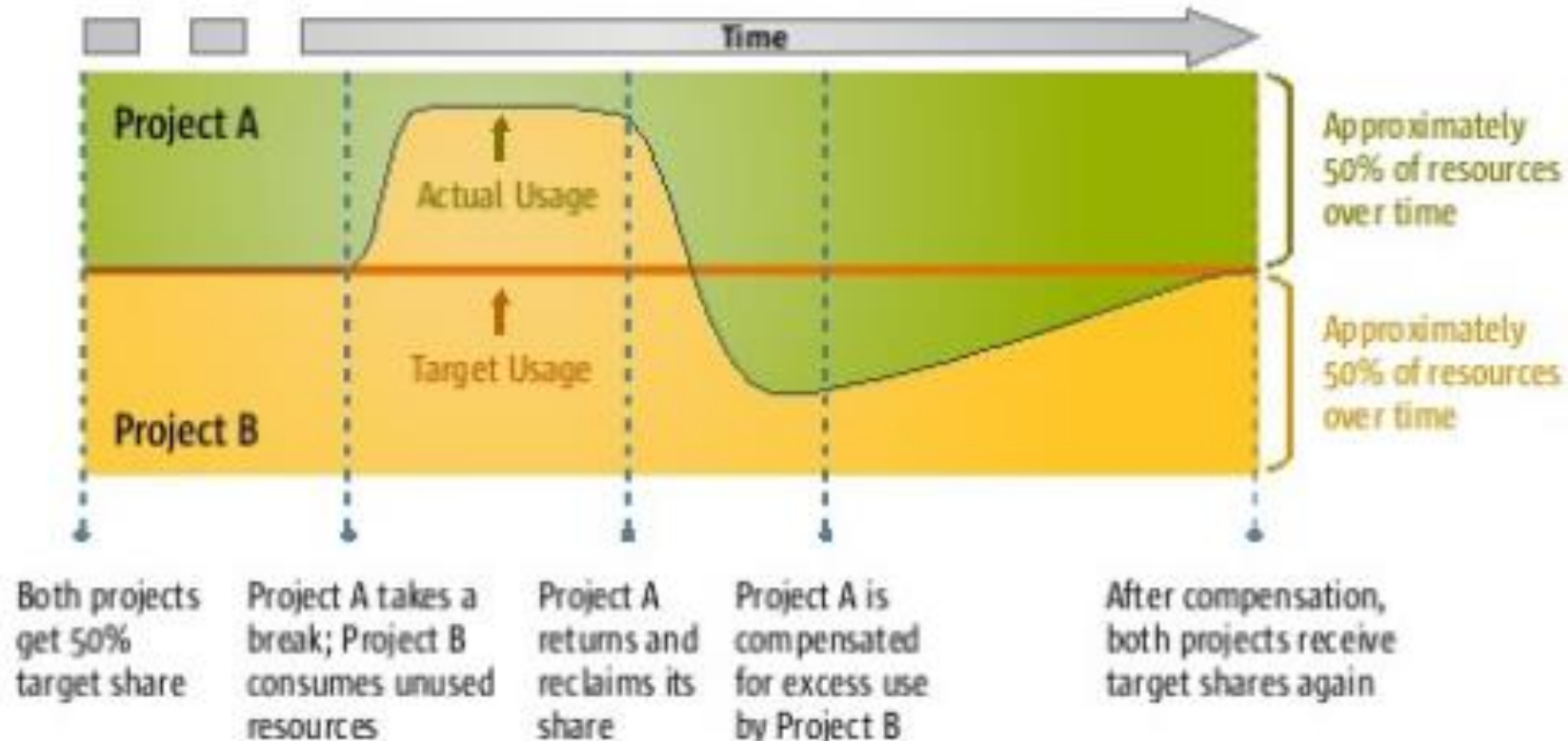


Figure 4: Example of Share Tree Policy Target Resource Share Management

Grid Engine Scheduler: Job Selection

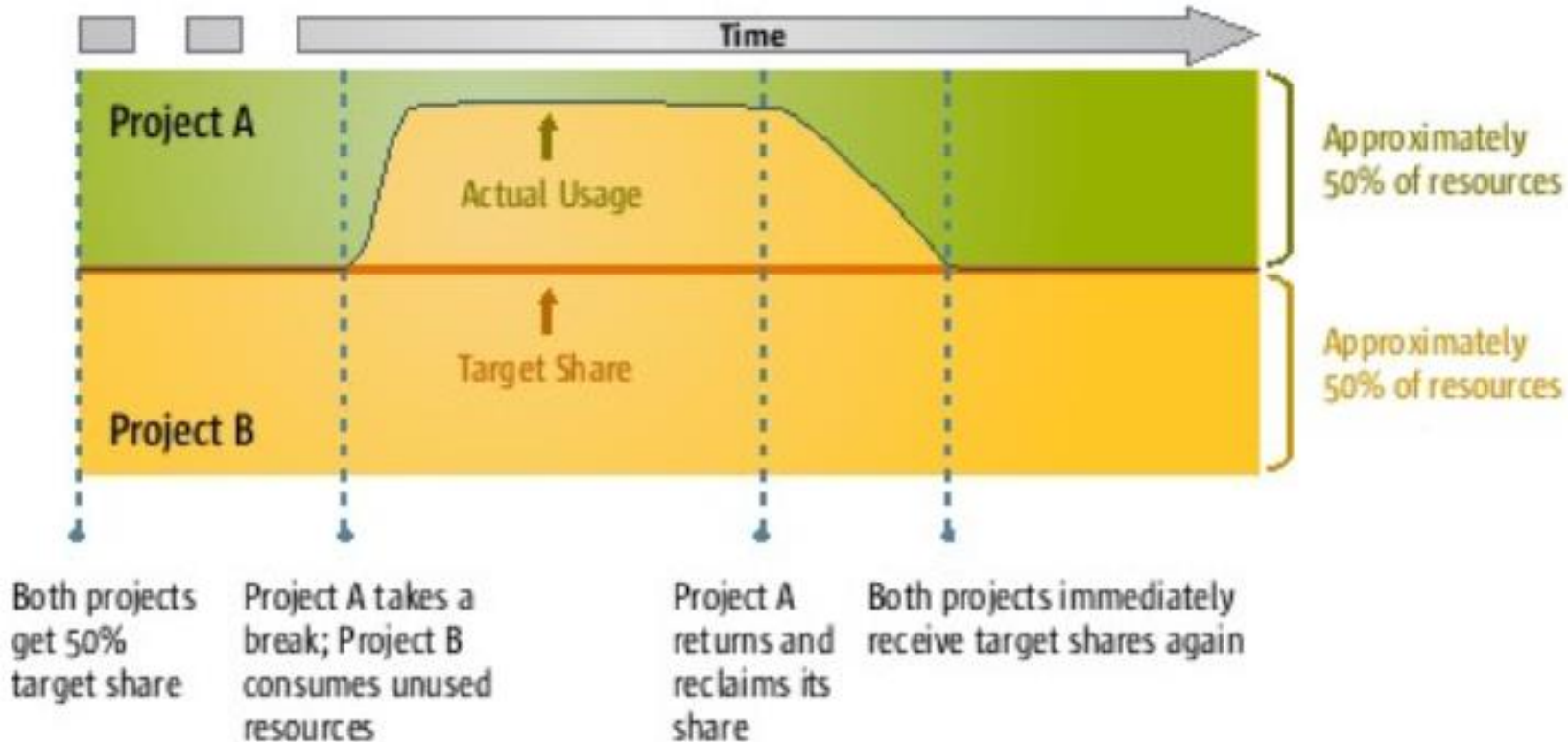


Figure 5: Example of Functional Ticket Policy Target Resource Share Management

Grid Engine Scheduler: Job Scheduling

1. The list of queue instances is filtered according to hard resource requests.
2. The remaining list of queue instances is sorted according to soft resource requests.
3. The top tier of the sorted list of queue instances from the previous step is further sorted according to queue sequence number.
4. The top tier of the sorted list of queue instances from the previous step is further sorted according to the host load.

Grid Engine Scheduler: Scheduling Features

- Resource Quota Sets
- Resource Reservation
- Advance Reservation

Consultation

- Job scheduling with the Sun Grid Engine software is a very large topic.
- The Sun Grid Engine software provides a wide variety of scheduling policies with a great degree of flexibility.
- What is presented above only scratches the surface of what can be done with the Sun Grid Engine 6.2 software.

References

- **BEGINNER'S GUIDE TO SUN™ GRID ENGINE 6.2**, *Installation and Configuration, White Paper September 2008.*
- **Oracle Grid Engine page on Wikipedia**, the free encyclopedia, available at https://en.wikipedia.org/wiki/Oracle_Grid_Engine

Thank you for your attention.