Reducing Faulty Jobs by Job Submission Verifier in Grid Engine

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Abstract

Grid Engine is a Distributed Resource Manager (DRM), that manages the resources of distributed systems (such as Grid, HPC, or Cloud systems).

Grid Engine applies scheduling policies to allocate resources for jobs while maintaining optimal utilization of all resources.

The complexity of Grid Engine’s job submission commands and complicated resource management policies increases the number of faulty job submissions in data centers.

We designed and implemented a Job Submission Verifier (JSV) to communicate with Univa Grid Engine (UGE).

JSV verifies whether a submitted job should be accepted as is, or modified then accepted, or rejected due to improper requests for resources.

Our evaluation shows a substantial positive impact on reducing the number of faulty jobs submitted to UGE on HPC clusters of Texas Tech University.

JSV Design for Quanah Cluster:

- Resources and Policies on QUANAH Cluster:
  - 467 nodes, 16,612 cores (36 core per node)
  - 87.56 TB total RAM (192 GB per node)
  - Intel OmniPath internal network (100 Gbps)

- JSV Design and Reference Implementation:
  - Verifies if the requested number of cores is divisible by 20 cores.
  - Sets the total requested cores as a multiple of 20 cores.

- JSV Design and Reference Implementation:
  - Validates the requested number of cores matches the total requested cores.
  - Ensures the requested memory size is divisible by 2048 MB.

JSV Design for Hrothgar Cluster:

- Resources and Policies on HROTHGAR Cluster:
  - Hrothgar (West): 563 nodes, 6,756 cores (12 cores/node), 13.19 TB total RAM (24 GB/node), and DDR Infiniband.
  - Hrothgar (Ivy): 96 nodes, 1,920 cores (20 cores/node), 6.14 TB Total RAM (64 GB/node), and QDR Infiniband.

- JSV Design and Reference Implementation:
  - Identical hardware as Hrothgar West. No change in policies and request script.
  - Must request for a multiple of 12 cores.

Evaluation

99.5% ACCEPTED
8.5% CORRECTED
0.5% REJECTED

References:


