On the Improvement of the Network QoS in a Grid Environment

Melbourne, November 2006

Agustín Caminero Herráez, Carmen Carrión Espinosa and Blanca Caminero Herráez
☛ agustin@dsi.uclm.es

ABSTRACT

Grid systems are highly variable environments, made of a series of independent organizations that share their resources, creating what is known as *virtual organization, VO*. This variability makes quality of service (*QoS*) highly desirable, though it is very complex to achieve due to the large scale of interconnected networks. Entities entrusted with the care of the users' interests in a Grid, are known as *meta-schedulers* or *Grid Schedulers*. These entities usually take into account the power of computing resources in order to decide which resource will run an user's job, but do not pay attention to the interconnecting network. The provision of network QoS in a Grid environment is the topic of interest of this work, and what we want to do is to develop a meta-scheduler that pays attention to the network when making decisions. This new entity, known as ***grid network broker, GNB***, will be developed at first using a simulation tool. The simulation tool that we have chosen is GridSim, because it provides us with a good infrastructure, including an implementation of Differentiated Services. The implementation of differentiated services in GridSim is the *Self Clocked Fair Queueing (SCFQ)*. A SCFQ scheduler can provide differentiated service to traffic by changing the weights associated with a certain class of traffic. The higher the weight of a class of traffic is, the better treatment it receives.

Our aim is firstly develop our GNB on a simulator and, when our model is tested, we will proceed with its implementation on a real grid environment.

ARCHITECTURE OF THE GNB

GNB performs ***resource allocation*** and ***admission control***, and it will have a global knowledge of the topology of the VO.

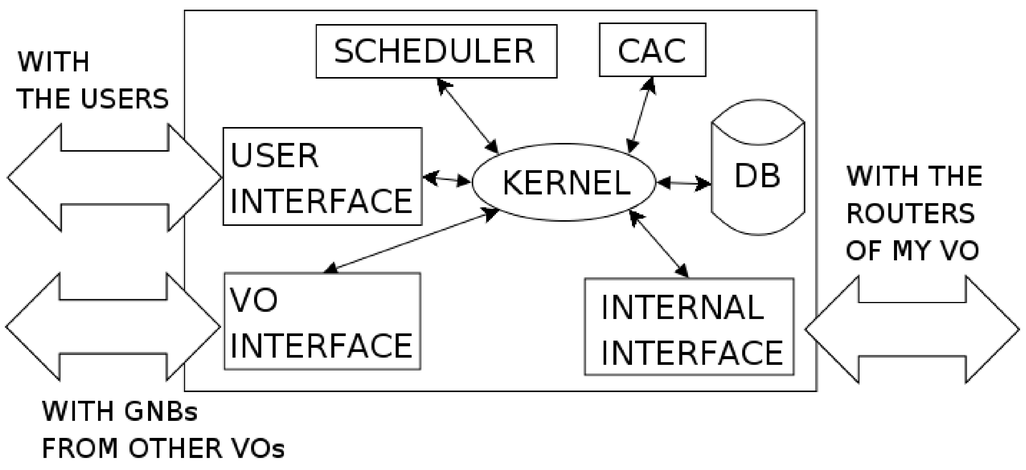

Figure 1: Architecture of the GNB

- ***Data base:*** Keeps some useful information like the routing tables of every router of the VO.

- ***Connection admission control (CAC):*** Checks whether a new connection can go through every link of the network path between the user and a computing resource.

- ***Scheduler:*** Decides which computing resource will be the ***best*** one to run each of the users' jobs.

EXPERIMENTS AND RESULTS

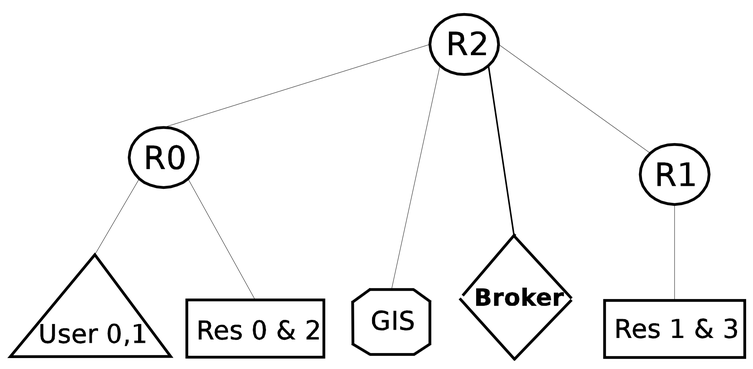

Figure 2: Topology of the VO

- User 0 has more priority than User 1 for the network transmissions.

- Resources 1 and 2 are more powerful than 0 and 3 :
  - Resources 0 and 3: 1 machine made of 4 CPUs with a rating of 750 MIPS.
  - Resources 1 and 2: 1 machine made of 4 CPUs with a rating of 1500 MIPS.

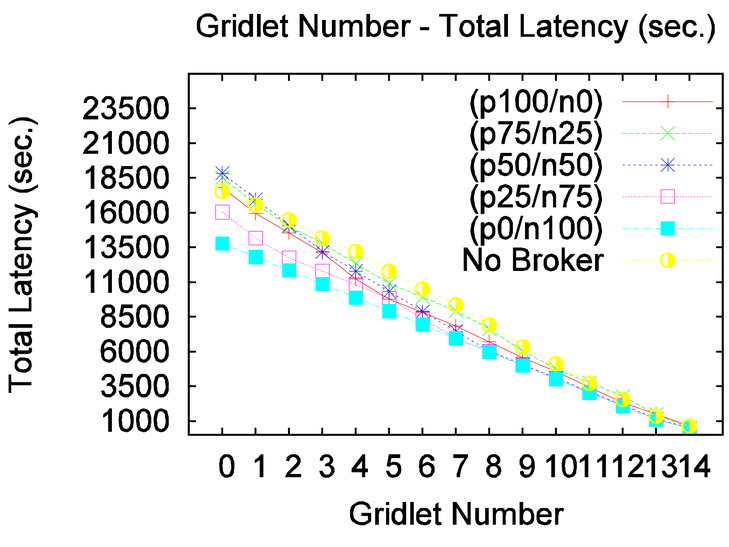

Figure 3: Total latencies without CAC.

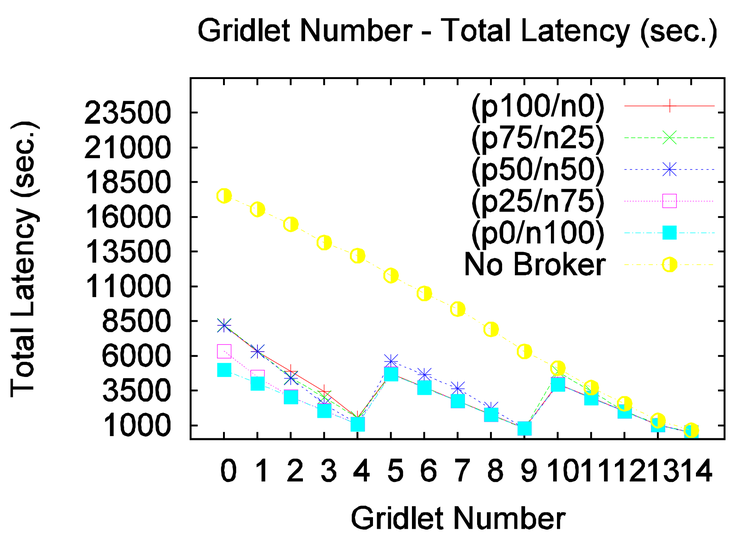

Figure 4: Total latencies with CAC.

When the CAC module is enabled, network load is well-balanced over time, which means that the time users have to wait for a gridlet after it has been submitted to a resource is very much lower when the CAC module is enabled.