Economic Model and the problem of Allocating Opportunistic Resources

OSG Staff Retreat

Frank Würthwein (UCSD)

Credits

- Most if not all the information in here is based on the Economic Model Document by Jim Weichel et al.
- The technical parts of the talk are courtesy Igor Sfiligoi.
- All credit is deserved by them.
- All complaints are deserved by fkw.

Purpose of these Slides

- Frame a discussion
  - Why should OSG care about opportunistic resources consumed via OSG?
  - What drives Resource Providers towards opening up their resources for opportunistic use?
    - How can we increase their incentives?
  - Why should OSG care about implementing a policy that allows control over who gets the opportunistic resources that are available?

Some Preliminaries

- OSG as well as the vast majority of its stakeholders are funded by “federal agencies”.
  - It is in our interest to support the mission of the agencies, and this includes serving a broad set of communities across many scientific disciplines.
- OSG has a vision for the national cyberinfrastructure that informs our desire to support as broad a set of scientific communities as possible.
- OSG is ambitious. We want to grow the resources we can provide because that allows us to serve a broader set of scientific communities to do more and better science in less time.

The Nature of Resource Providers

- We acknowledge the existence of two types:
  - Those funded to primarily serve a specific community. E.g. ATLAS, CMS, …
  - Those funded to serve broadly the entire science portfolio of the agencies. E.g. the traditional supercomputer centers.
    - Who gets how much resources is decided via peer review, or some other process.
  - Let's focus on what incentives the first type has to provide opportunistic access to its resources.

Incentives for Community based Providers

- Altruism: “Doing what is right”
- Pleasing the Agencies: “Preserving my future budgets”
- Buying an insurance policy for “bad times” to come.

- The first two are probably self-explanatory, so let’s focus on the third.

Insurance Policy

- OSG does track who provides opportunistic resources.
- If OSG was able to provide “preferred access” to opportunistic resources then this capability might motivate provider communities to make their resources accessible to others with the understanding that they benefit from it in times of crisis.
  - This is above and beyond unregulated opportunistic access.
  - It is NOT a quid-pro-quo. I.e. a provider should not expect to “break even”, but rather to have “piece of mind” that OSG can be relied upon during a crisis.

Aside

- In addition, OSG provides a community of providers and science users.
- It thus may stimulate collaborative efforts between providers and science communities, in effect “brokering” partnerships.
  - Imagine a small VO finding a large OSG site to host hardware for them.
- This comes for free with the ecosystem we have built. (No new software effort required to make this happen)

Discussion of Insurance Model

- In the next few slides, we discuss some generic features, as well as a concrete implementation that would allow OSG to implement policies, and take (some) control over the opportunistic resources.
- This is followed with some more adventurous thinking of options for growing the available opportunistic resources.

Goal

- Implement the means to specify a policy on how the opportunistic resources are used.
  - What set of DNs receive what max quota, and what relative priority for walltime access.
- Resource Owners continue to be in full control over policies at their sites.
  - We thus introduce only an additional entity: "OSG" that the owner may or may not allow, and may or may not give priority over others when it comes to opportunistic use of resources.

Straw Proposal Implementation

- OSG operates the “OSG CE”
- This CE is logically equivalent to any other site.
- The resources behind this CE are accumulated via glideins from all sites that support the OSG VO.
- OSG-ET controls policy at the OSG site.

Types of Policies

- Let us distinguish two things here:
  - Grouping users together
  - Applying some preference for resource access onto one group over another group
- In the following, we briefly discuss each of these one at a time.

Grouping Users

- No grouping
  - Each DN fends for itself.
  - We probably will have the group of all DNs that don't fall into any other explicitly defined group.
- Group by VO
  - Requires user to actually use VO attribute
- Group based on VO + Role combination
  - Requires user to actually use VO + Role attribute

Implementing preferences

- Group X shall get 2x total wall time than each of the other groups on average.
  - This is the standard priority setting policy that is customary in batch systems.
- Group X shall get preferred access to 1000 slots simultaneously, but beyond that compete evenly with every other group.
  - This is the standard group quota setting policy in Condor. Other batch systems tend to implement “hard” rather than this kind of “soft” quota.

Future Vision (I)

- Imagine, OSG strikes a deal with XD allocation committee that gives OSG an allocation on XD that is X% of the cycles provided to XD allocations via opportunistic use on OSG.
- This allocation then can be used to fund the insurance policy for OSG providers.

Future Vision (II)

- OSG approaches commercial Cloud Computing providers for cycle donations.
  - It's pure philanthropy on the side of the provider
- This can be either in form of peak access to provide extra reliability of the insurance idea, or steady state addition of the opportunistic pool.
- Again, the cpus just get added to the OSG CE via glidein.