Present and Future Usage of the OSG

Brian Bockelman
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The Open Science Grid

• The OSG provides organization and infrastructure for a cohesive national grid in the United States.

• The OSG focuses on scalability, distributed infrastructure, and

• Enabling the computational programs of its core users - USLHC, LIGO, FNAL Run II, and others.
The OSG

• One of the strengths of the OSG is its focus on decentralized software - it’s possible to use the same software at a smaller scale to deploy a campus or regional grid.

• But this decentralized nature makes it difficult to collect information about sites!
OSG Growth

• What questions can we ask about the grid?
  • How is it used?
  • How “big” is the OSG?
  • How will it grow in the future?
OSG Usage

- The usage is the easiest question to answer.
- The next few slides show the OSG’s growth over the last 12 months.
VO-centric View

Monthly Wall Hours per VO

52 Weeks from Week 13 of 2008 to Week 13 of 2009

1,000,000 hrs = 114 years

Note the top 4: USLHC and FNAL Run II.
VO-centric (Job Count)

Notice ATLAS prefers a large # of short jobs - OSG infrastructure is able to handle this
The “Other” category is the aggregate of all sites too small to list individually: the OSG has a “long tail.”
Who are the users of Resources?

- Sum of non-HEP usage is about 1/3 of the size of USATLAS.
- OSG is actively trying to engage new communities, but recognize the stakeholders are the priority.
Who are the providers of Resources?

- Compare this to the previous slide.

- Primary beneficiaries of opportunistic resources are FNAL Run II and non-HEP users.
Lots of these organizations don’t have steady production like the HEP VOs -- usage is seasonal according to research activities
How big is the OSG?

• This is a favorite question - how big/powerful is the OSG - but fairly tricky to answer.

• Let’s catalogue the ways we’ve failed to do this.
Failing to measure the OSG

- Survey sites: We don’t “own” the sites, so there was low participation; sites misunderstood the questions (i.e., # of cores vs # of CPUs) and filled in the wrong value.

- Query the batch systems: It’s impossible/difficult to understand all the possible batch system configurations and know what cores are grid-accessible.

- Have site admins fill in information during configure time: Sometimes site admins are lazy and just put in fake numbers. When resources are added, they don’t always update the configuration.
Stories of Failure

• Nebraska under-reported their cores in the site survey by 50% due to confusion in the survey questions.

• SLAC is a huge, huge computation farm (~9k cores) that only allows about 300 grid jobs to run at a time.

• UFlorida accidentally wrote a few too many zeros in their configuration and advertised 320,000 cores (whoops!).
New Approach

• “Proven Capacity”: We only want to count a size as having a certain size if we can use that many cores.

• Site size is equal to the maximum observed utilization in Gratia accounting.

• Probably a lower bound - we implicitly assume that the site has been fully utilized at some point (but if we can’t fully use it, we probably shouldn’t include those cores in the OSG anyway!!).
Proven Capacity

- So, if a site reports 168k wall hours in a week, then the proven capacity will be at least $\frac{168k}{7 \text{ days} \times 24 \text{ hrs}} = 1,000 \text{ cores}$.

- Pros:
  - No human input = no human error.
  - All sites report accounting numbers - very reliable.
  - Accounting numbers are examined daily for errors.
Normalization

- We still do collect information about the CPU models at each site - not to determine size, but to guess average KSI2K score per CPU.

- Currently, average normalization constant is 2.3 KSI2K

- Remaining graphs don’t show cores, but KSI2K-cores.
Top number is all cores in all clusters - regardless if we’ve ever accessed them (or even could!)
How will the OSG Grow?

Simple linear fit to data.
Growth

• The proven capacity grows by about 207 KSI2K-cores / day; usage grows by 135 KSI2K-cores.

• At this rate, we’ll have accomplished over 655 million KSI2K-hours during Year 3.

• This is assuming the current trend continues -- beware of predicting the future!
Predicting Usage

• We know there’s one major event - *LHC turn-on* - that will probably disrupt our usage patterns.

• In terms of growth, will this help or hinder? We don’t know.

• Certainly, if the USLHC VOs utilize their owned resource, they will want to start using opportunistic resources too!

• Increased competition? Will this push out other VOs? These questions are unanswered.
Conclusions

• OSG continues to grow as a grid!
  • Main drivers are HEP, non-HEP usage is presently small but expected to grow.

• Measuring the size of a grid is non-trivial.
  • Our favorite metrics are ones that avoid human input/error.

• If trends continue, OSG will accumulate around 1 billion KSI2K-hours by around October 2009.
  • But we know our primary growth drivers (HEP community) are having a huge event in October 2009, so our crystal ball is a bit murky.