

# Joint nanoHUB Open Science Grid TaskForce Face-to-Face Meeting

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Fermilab

## Summary Report

Present: Ruth Pordes, Steven Clark, Jaime Frey, Mats Rynge, Burt Holzman,  
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In absentia: Gerhard Klimeck, Miron Livny

### Mission

NanoHUB on OSG - Higher efficiency, Higher volume, More science.

### Plan

[https://twiki.grid.iu.edu/twiki/pub/VirtualOrganizations/JointTaskForces/nanoHUB-OSGwide\\_JointTaskforce\\_Plan.xls](https://twiki.grid.iu.edu/twiki/pub/VirtualOrganizations/JointTaskForces/nanoHUB-OSGwide_JointTaskforce_Plan.xls)

### Proposed nanoHUB-OSG Operational Logic

1. Dispatch nanoHUB GridProbes OSG Facility-wide.
2. Record results.
3. Process results through a ranking function.
4. Generate ranking of the sites.
5. Dynamic selection of the top subset of sites.
6. Target this top-ranked subset of sites to maximize effectiveness of opportunistic usage.
7. Dispatch nanoHUB GridApps OSG subset-wide.
8. Resubmit in a chain, to a series of sites, if one site poses availability failure or a link failure. But, lower the site rank for future.
9. [Case-A] Job completion is chain success.
10. [Case-B] Job failure is chain failure.
11. Failure's cause can be actual resource failure, in the final link, or failure to get any resources at all.
12. Record the link failures distinctly from chain failures.
13. Link failures can trigger reasons for investigation of a site status, but are not the failure of the OSG infrastructure.
14. The chain failures are OSG infrastructure failures.

## Site Stability

High stability of a subset of OSG sites, part of TaskForce, is now well-affirmed. This is for both classes of nanoHUB jobs, GridProbe and GridAppTest. Site success rate is more than 98%.

## Site Validation System

nanoHUB's TaskForce site validation system has been extended to display all OSG sites, facility wide. It gives a clear indication of routine causes, why a fraction of sites fail in support for nanoHUB. We will continue to pursue this in parallel, using plain GOC tickets. This fraction is almost a quarter to a third. In reality, a fraction of the facility can always lack functional support for a given VO. In such case, however, the sites should advertise this duly.

This is an area in need of discussion with OSG Sites and GOC.

## Distributed Grid: Failure Naming Conventions, Chained Submissions

Distributed systems are inherently unreliable, *in parts*, and inherently beneficial, *as a whole*. Hence, usage attempts should work around the unreliability and target only the reliable fraction. Interim failure events, if judged, should be judged from all views. E.g., at least 3 views here. From OSG facility provider view, and from nanoHUB science portal provider view, resource availability *failure or non-success* is important to record when a given site abandons the job due to lack of resources during a given time window. It is an *availability failure*, not *resource failure per se*.

Chained submissions, with resubmission attempts in succession are an excellent strategy used by nanoHUB on OSG.

Using chained submissions, if a subsequent resubmission leads to job completion at another site, in the same chain, then the *full chain* itself ought to be considered a *success*, from nanoHUB portal end-user view; and considered *part success part a cause to investigate* from the other 2 views.

However, if job completion itself fails, either due to the final resource's failure, or otherwise, due to failure to get any resources at all, all views can agree that, indeed, the *full chain failed*.

## **Blueprint level topic: Heuristics of Failures**

In chained submissions, taking into account the *number of link failures* prior to the final successful link, can be beneficial for all views of all parties. E.g., this can be used to understand *heuristics of failures*, possibly, if it is useful.

Due to the nature of the topic, slated for a future OSG Blueprint discussion.

## **Managing ‘Availability Failures’**

Management of resource selection is important, and of naturally resulting *availability failures* which are characteristic of opportunistic usage.

At least 3 levels of improvements possible between nanoHUB and OSG:

- (i) Feeding back results from probes into the decision making process, prior to submitting actual applications.
- (ii) Making a judicious selection of sites based on a ranking or bias or history, to maximize *derived value* from the distributed OSG infrastructure.
- (iii) Marking and categorizing resource *availability failures*, as such, different from actual *resource failures*.

## **Learning from OSG MatchMaker logic: Proposal for 3 improvements in nanoHUB-OSG framework**

Workflow-level matchmaking, i.e., VO-specific selection of remote resources, is key. OSG MatchMaker logic, based on ReSS, Resource Selection Service, is one effective solution.

At the same time, nanoHUB GridProbe site validation combined with Web display system is becoming highly mature. The latter can become self sufficient if 3 items can be added:

- (i) Probe-to-App site status feedback loop.
- (ii) Dynamic site ranking and selection.
- (iii) Dynamic site information pulled from the newly released OSG OIM, in lieu of VORS.

We decided that OSG MatchMaker integration is not immediately necessary.

## **Generic Information Provider: CE Est. Response Time, WN Memory**

GIP is not used currently by nanoHUB. Two attributes, advertised by most OSG sites to GIP, which can be beneficial for nanoHUB are Estimated Response Time of CE and Memory at WNs.

Memory aspect of a site is important for nanoHUB. But, advertisement of memory at WNs can be non-trivial using GLUE schema, if a site has heterogeneous mix of hardware. 32 bit versus 64 bit, and uneven memory configuration, if not advertised properly can lead to erroneous decisions in site selection. Informal conventions may already be in place in OSG, e.g., to always advertise upper bound or lower bound.

This is an area in need of discussion with GIP and Sites. We decided that if there is a future need, nanoHUB can convey official requirements for GIP.

## **Norms of OSG Sites on Suspension, Preemption, Eviction**

Context here is suspension, preemption, eviction of jobs by a site, owned by a larger more active VO, being used opportunistically by nanoHUB. We agreed that these site policies and actions are naturally expected, and additional measures that we have agreed to add in nanoHUB-OSG framework should be sufficient.

Informal conventions may already exist in OSG, e.g., sites should run a job for a specified time before interrupting it, or should not start a job at all, if resource unavailability is deterministically known. Additional measures to publish/discover such site policies, if possible, can be beneficial.

This is an area in need of discussion with Sites and Production.

## **Gratia Accounting: Application-level Exit-codes**

During the TaskForce, nanoHUB has systematically added a variety of exit codes. Short term, this helps in diagnosis. Long term, in proper archival of operational status. If Gratia Accounting system can capture application level exit codes, it will be beneficial.

This is an area in need of discussion with Gratia.

## **Gratia Accounting: Different Categories of Jobs or Applications**

If Gratia Accounting system can capture different job *streams* or categories, it will be beneficial.

During the TaskForce, we have separated job submissions into multiple *streams*. E.g., GridProbe to TaskForce-wide sites, GridProbe to Facility-wide sites, GridAppTest to TaskForce-wide sites, GridAppTest to subset of Facility-wide sites. In addition, GridAppTest has 6 streams (3 simulator codes): Cntfet/Coaxial, Cntfet/Default, Nanofet/Default, Nanofet/Idvd, Nanowire/Default, Nanowire/Uncoupled\_Scattering.

This is an area in need of discussion with Gratia.

## **OSG Metrics: Different Plot-views on Exit codes and on Categories**

If OSG Metrics system, as an extension to the Gratia feature requests, can generate different graphical views of different exit codes, and for different applications, it will be beneficial.

This is an area in need of discussion with Metrics.

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## Proposed nanoHUB-OSG Operational Enhancements

- (i) A volume influx increase in grid applications, to nearly 1000 wall hours per day, sustained.
- (ii) A different annotation/color to distinguish - *link failures* and *availability failures* versus *chain failures* and *resource failures*.

## Pending out-of-taskforce-scope OSG Enhancements

- (i) Multi-gatekeeper handling: Difficulty to evaluate status of a site with multiple gatekeepers on the same cluster. There is a need to advertise *gk1 OR gk1* model so that a VO does not erroneously evaluate such a site using *gk1 AND gk2* as the usual logic.
- (ii) Interruption in service and impact of change in CA certificate distribution mechanism: CAs in use by nanoHUB are not regular DOECA, thus nanoHUB was affected by the procedural change. A fraction of OSG sites seem not to have implemented the transition.