OSG Area Coordinators

Network Monitoring Update: **November 2 2016**

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Review Networking Goals Year 5

1. **Maintain / update the OSG networking services / documentation.**
2. **Reach out to non-WLCG OSG sites; Integrate those interested:**
   - Advertise that OSG is ready to help sites with networking issues via:
     - OSG web pages
     - Targeted email (Cyberinfrastructure list, perfSONAR user list, etc)
     - Via interactions with sites at conferences and meetings.
   - Encourage as many NSF CC*xxx sites as possible to integrate their perfSONAR instances into OSG networking; OSG will provide them a mesh-configuration and gather their data.
   - Provide Soichi's standalone mesh-configuration tool for use by campuses and VOs.
3. **OSG will create a network alerting service to find "obvious" network problems**
   - This will involve the creation of a suitable analysis pipeline such that perfSONAR data can be analyzed on a timescale of every 1-2 hours.
   - Obvious problems include significant decrease in bandwidth between a source and destination or continuing significant packet loss along a path or correlated with a specific site.
   - Actual alerts will be issued by GOC staff based upon alarms they receive.
4. **Enable automated alerting (email, SMS) on well identified alarms.**
   - This is a "reach" goal for the year but I think it should be feasible
   - Requires accurate, synchronized mapping of sites to contacts
   - Tunable pattern of alerts (e.g., 1 alert, wait 1 day and alert if problem continues, then every 3 days until fixed)

Near-term Milestones

- Creation of initial OSG web pages informing sites of OSG services in networking --- **July 30, 2016 (ready)**
- Recruiting of 5 new sites for OSG networking -- **August 31, 2016 (slipped)**
- Need technical design of suitable analysis system based upon existing time-series technologies and proposed data and analysis workflows --- **September 31, 2016 (ready)**
- Definition of support process for integrating new sites and triaging tickets in OSG production --- **September 15, 2016 (done)**
- Initial implementation of analysis running on OSG network data --- **September 30, 2016 (running)**
- Initial release of Soichi's standalone mesh-configuration utility packaged and available --- **September 30, 2016 (Moved)**

OSG Networking Web Pages

- New front page deployed by Kyle: https://www.opensciencegrid.org/
  - Includes OSG Network paragraph
- New web pages about OSG networking added
  - https://www.opensciencegrid.org/open-science-grid-networking/
- Goal is to solicit sites to join into OSG networking
  - Has pointers to user-support for sites with questions about networking
  - Useful to help recruit new, non-WLCG sites
  - Comments or suggestions very welcome.

Recruiting non-WLCG Sites

- One passed milestone was to recruit 5 (or more) non-WLCG sites who have perfSONAR instances to "join" OSG
  - This means they use the OSG mesh-configuration to define tests
  - OSG will gather metrics from their instances
  - Our dashboard and check_mk will display their metrics and monitor their perfSONAR services
- It is time to follow up with a target email campaign soon.
  - CHEP, HEPiX and SC16 are interfering but need to push ahead
  - We now have documentation and procedures in place
  - Still missing stand-alone mesh-config (see later slide)
  - Operations + User Support help?
  - Suggestions needed and welcome.

Enabling Alarming

- We have a longer term goal of alerting and alarming on network issues.
- Milestone completed: technical design of a suitable analysis system based upon existing time-series technologies
  - **Worked with Ilija Vukotic to enable ActiveMQ to ElasticSearch at UC: ELK stack + Jupyter seems to be suitable**
  - Very effective so far using attached Jupyter instance (Python workbook) to do analytics and graphs
  - Anyone can subscribe to simple alert-emails.
    - Currently can alert when >50% of paths to/from a site show >2% packet-loss for 3 hrs OR when any one path has packet loss >50% for 3 hrs
  - OSG could benefit from such an analytics system...other use-cases? Could this become an OSG instance?
- Marian Babik and I are looking into check_mk rule-based notifications as a future means of implementing the alerting component. Not yet enabled but Marian is working on ETF implementation (beta in ~ 2-3 weeks)

Recent Achievements

- Significant "outreach". Networking talks involving OSG activities at CHEP, including plenary, HEPiX and at WLCG throughput meetings
- Web pages and documentation in place
- Making progress on getting the new OSG stand-alone mesh configuration available
  - Document describing mesh-config goals and process written https://docs.google.com/document/d/1WW0WtkngrtTekcNRM6jt53rxhgiXEMxLR-IJvmaMzwQ/edit
  - We will need Soichi to get v1.0 complete and packaged
  - Have identified options to fund 20%@4 months+10%@2 months
- Prototype of packet-loss analysis system using Jupyter and OSG network data sent to ElasticSearch operating
- Identification of "challenges" in operating the OSG network services
  - Currently having issues with MaDDash in production and prototyping

Concerns

- Operation of services
  - OSG production network service still seeing some issues
  - Monitoring being tweaked to be less noisy
  - **MaDDash in production has been orange for a few days and fixes have not been effective.**
  - Challenging to identify root cause/fixes with indirect access
  - Significant set of updates coming in 30-45 days…need to prep
- Identifying suitable non-WLCG sites to benefit from OSG networking services (need ~5 sites identified to recruit)
- Long-term data lifecycle management (see next slide)
  - Still nothing from ESnet in this area; need something in ~6 mths
  - perfSONAR developer's management alerted
- Convergence on "alarming" system.
  - Needed components are in place and being played with
  - Need to build the user-facing interface and enable continuous operation

OSG Datastore Challenge

- OSG has said it will collect OSG/WLCG perfSONAR network metrics and make them available "indefinitely"
  - We have **approximately 6 months** before our OSG network datastore hardware runs out of storage space
- Originally we intended to rely upon the perfSONAR developers (and ESnet in particular) to provide suitable tools to manage data migration from ESmond to new storage locations, e.g., run a script moving all data older than 1-year to a new storage location each month and maintain access to that data at potentially lower levels of performance.
  - Sometime in the last year that milestone disappeared from the list of work for perfSONAR/ESnet.
- OSG Executive Team wants a plan in place to address this looming problem…

OSG Network Datastore Lifecycle Goals

- We need to determine how to continue to provide the OSG Network Datastore services (gathering and making accessible the data) given that our storage space will be exhausted in 6 months
  1. We need to identify secondary storage to migrate older data to
  2. We need a tool that is capable of non-disruptively migrating "older" data from ESmond to the secondary storage in a way that allows us to continue to provide access to that data

The Plan: A Discussion

- The perfSONAR developer leads acknowledge the problem and are willing to work with us.
  - We are the first "client" to hit this kind of problem…but likely not the last one
  - Not sure of anticipated effort levels or timeline
- **Suggestion**: We send our problem and goals to the perfSONAR developers **requesting the creation of a tool which can handle moving data from one ESmond instance to another one running on different storage via the network.**
  - Must be able to run while Datastore is in use
  - Should clean up when data is successfully migrated (freeing space on the original storage)
- **Challenges assuming we have such a tool:**
  - How to handle access to the migrated data from the user perspective?
  - Still need to identify where the secondary storage lives…FNAL cloud? Slower, cheap, new OSG storage?
- **Other ideas, comments or suggestions?**

Questions or Comments?

Thanks!

URLs of Relevance

- OSG Network Datastore Documents
  - Operations https://docs.google.com/document/d/11144BSo-88M0cLMMjKcKMIE-Q5s21X-w3lYl-0Pn_08/edit#
  - SLA https://twiki.grid.iu.edu/bin/view/Operations/PSServiceLevelAgreement
- Current OSG network documentation https://www.opensciencegrid.org/bin/view/Documentation/NetworkingInOSG
- Draft OSG web page document https://drive.google.com/drive/u/0/folders/0B63jqzjmiVgcOG5aMmg1cFo2SDA
- OSG networking year-5 goals and milestones: https://docs.google.com/document/d/1FzmXZinO4Pb8NAfd5SWUzaAFYOL23dt66hQsDmaP-WI/edit
- perfSONAR adoption tracking: http://grid-monitoring.cern.ch/perfsonar_coverage.txt
- Deployment documentation for both OSG and WLCG hosted in OSG (migrated from CERN) https://twiki.opensciencegrid.org/bin/view/Documentation/DeployperfSONAR
- ATLAS Analytics: http://cl-analytics.mwt2.org:5601/
- Mesh-config in OSG https://oim.grid.iu.edu/oim/meshconfig
- Beta Mesh-config: https://ps-test.sca.iu.edu/meshconfig/
- MadAlert: http://madalert.aglt2.org/madalert/diff.html
- perfSONAR homepage: http://www.perfsonar.net/

Details on Ilija's / Xinran's Work

Concerning our own activities, we have been discussing with Shawn the possibility to start running notifications/alarms on some of the measurements, I guess two most obvious cases would be to detect sudden loss of throughput on a link (breaking a trend for N days moving average or similar) as well as detecting consistent packet loss and any changes in packet reordering and jitter (I guess last two are not currently imported in ES). Can the ES service help us compute some of this, so we could just query it and issue an alarm (we can start off with simple avg over all links for a site, but eventually we will probably want to look at each individual link) ?

I have a summer student Xinran Wang that I have tasked to understand the measurements we are collecting and creating an alerting service and you can see his task list here:

https://docs.google.com/document/d/1YPSjPzLn9uw11rl_6_pZmekJ-GK8yLV0tXx-AhTe6QQ/edit?usp=sharing

The other thing we have been discussing was to generate a network map of WLCG and use it to detect when routing changes occur and maybe correlate this with some other measurements - here I'm not sure how ES could help, I have done some prototyping with Neo4J and heard that ES plans to have support for graphs, but not sure about the details. An alternative might be to implement some of this in SPARK graphX, which is what I mentioned at the throughput call some time ago, do you plan to support some streaming analytics platform in the future ?

I was also thinking about adding path data to the ES… I though that it would be the best to:

a) calculate hashes for paths

b) once a day report paths and hashes and the rest of the time only hashes.

c) store paths in a new index, store hashes together with the data on OWD, pocket loss, throughput.

d) for investigative plotting we could use Jupyter

e) for some fancy page one could use whatever jqeury + whatever plotting library + ES as a backend.

We will have streaming analytics later but nothing right now.

Details on Jerrod's Work

- The perfSONAR data gathered on the ATLAS-kibana server is currently assisting a project investigating the affects of the grid network on the performance of jobs based on geographic location and the transference of the dataset between storage location and computing location.
- Jerrod is using the Jupyter portal at http://uct2-lx2.mwt2.org:9999/ to do this investigation