OSG GRid ACCounting system
:: GRACC

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GRACC - Mapping Jobs to ES

- Each job is mapped to a document in ES with ~60 attributes each
- GRACC receives 1.2M records a day
- Commodity hardware (and no SSDs)! - ES proved too slow to visualize using raw records over 30+ days.
- Summarized by bucket’ing jobs into 1 day periods on specific unique attributes. Summing the usage.
- Enrich the summarized records with outside resource information
GRACC Big Picture

- **Gratia probe**: A piece of software that collects accounting data from the computer on which it's running, and transmits it to a Gratia server.
- **GRACC server**: A server that collects Gratia accounting data from one or more sites and can share it with users via a web page. The GRACC server is hosted by the OSG.
- **Reporter**: A web service running on the GRACC server. Users can connect to the reporter via a web browser to explore the Gratia data.
- **Collector**: A web service running on the GRACC server that collects data from one or more Gratia probes. Users do not directly interact with the collector.
Gratia probes run on CE’s and submit hosts

Each of these boxes are multiple actual processes
GRACC Collector

- Program that listens for HTTP POSTs from gratia probes.
- Parses a semi-XML format from the POST into JSON
- Places the records onto the message bus for ingestion into ES
Message Bus

Message bus is utilized by GRACC, Network Monitoring, StashCache federation accounting

- Hosted on commercial provider: CloudAMQP
- Monitored through Grafana alerts, and CloudAMQP alerts
ES Ingestion

- We use Logstash receive from the message bus and insert into ES
- Network ingestion uses custom ingester, and constantly a source of trouble
  - Very difficult to write a correct message bus to ES ingester
  - Many error conditions
  - Correctly confirming to message bus when ingested
Elastic

- Elasticsearch 5.6.5 (really old)
- Read-only ES interface with 2 layers of security
  - NGINX proxy that only allows GET requests, no POST or PUTS...
  - Read Only Rest instance
- Backups
  - HDFS daily snapshots
- Grafana (4.6.3)
- Kibana (5.6.5)
Interfaces

- **Grafana (prod)**
  - Dashboards made for/by stakeholders
- **Kibana - Debug**
  - Used primarily for debug and early prototyping
- **Email Reports**
  - Periodic status updates
  - Queries the Read Only interface with custom query
GRACC technical specs

Hardware hosted on OpenStack platform

- ElasticSearch cluster (ELK), CEPH storage
- 1 VM Front-End (64GB RAM, 2TB data volume)
- 5 VMs data nodes (32GB RAM, 5TB data volume)
- With this allocated volume size we're good for another ~3 years

End of Jan 2019: 10.69 TB
End of July 2019: 12.80 TB
End of Sep 2019: 13.51 TB
GRACC

Monitoring
- check_mk with automated notifications

Deployment
- fully puppetized
- docker containers (not for everything)
GRACC
Monitoring dashboards

- status of ES health
- status of nodes
## Transfer and Cache Accounting

In addition to jobs, we use GRACC for transfer and cache accounting.

### StashCache Working Set Size by Host and Directory

<table>
<thead>
<tr>
<th>Cache Hostname</th>
<th>logical_dirname.keyword: Descending</th>
<th>Working Set</th>
<th>Total Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>red-gridftp1.unl.edu</td>
<td>/user/ligo</td>
<td>2.581TB</td>
<td>552.518GB</td>
</tr>
<tr>
<td>red-gridftp4.unl.edu</td>
<td>/user/ligo</td>
<td>2.484TB</td>
<td>531.206GB</td>
</tr>
<tr>
<td>red-gridftp5.unl.edu</td>
<td>/user/ligo</td>
<td>2.444TB</td>
<td>502.28GB</td>
</tr>
<tr>
<td>198.17.101.66</td>
<td>/user/ligo</td>
<td>2.069TB</td>
<td>4.784TB</td>
</tr>
<tr>
<td>osg-gftp.pace.gatech.edu</td>
<td>/user/ligo</td>
<td>662.879GB</td>
<td>3.234TB</td>
</tr>
<tr>
<td>osg.chic.nrp.internet2.edu</td>
<td>/pnfs/fnal.gov/usr/minerva</td>
<td>346.096GB</td>
<td>6.644TB</td>
</tr>
<tr>
<td>osg.kans.nrp.internet2.edu</td>
<td>/pnfs/fnal.gov/usr/minerva</td>
<td>331.676GB</td>
<td>1.839TB</td>
</tr>
<tr>
<td>red-gridftp7.unl.edu</td>
<td>/user/ligo</td>
<td>166.961GB</td>
<td>231.755GB</td>
</tr>
<tr>
<td>145.146.100.30</td>
<td>/user/ligo</td>
<td>164.316GB</td>
<td>266.428GB</td>
</tr>
<tr>
<td>osg.newy32aoa.nrp.internet2.edu</td>
<td>/user/ligo</td>
<td>146.106GB</td>
<td>173.994GB</td>
</tr>
</tbody>
</table>
TCP Transfer Statistics

- Finding network issues between submit hosts and worker nodes
- Using Filebeats for uploading XferLogs from HTCondor

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Unique IPs</th>
<th>Average Retransmissions</th>
<th>Average Rordering</th>
<th>Sum of bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>login.duke.ci-connect.net</td>
<td>cinvestav.mx</td>
<td>1</td>
<td>11698</td>
<td>3</td>
<td>1.818GB</td>
</tr>
<tr>
<td>login.duke.ci-connect.net</td>
<td>syr.edu</td>
<td>3</td>
<td>1992</td>
<td>66</td>
<td>5.627GB</td>
</tr>
<tr>
<td>login.uscms.org</td>
<td>ac.uk</td>
<td>3</td>
<td>1446.333</td>
<td>220</td>
<td>108.992MB</td>
</tr>
<tr>
<td>login.uscms.org</td>
<td>gridka.de</td>
<td>1</td>
<td>515.5</td>
<td>151.5</td>
<td>450.093MB</td>
</tr>
<tr>
<td>login02.osgconnect.net</td>
<td>syr.edu</td>
<td>3</td>
<td>317</td>
<td>26.5</td>
<td>1.343GB</td>
</tr>
<tr>
<td>login.duke.ci-connect.net</td>
<td>unl.edu</td>
<td>1</td>
<td>234</td>
<td>127</td>
<td>5.066GB</td>
</tr>
<tr>
<td>login.uscms.org</td>
<td>org.br</td>
<td>1</td>
<td>138.167</td>
<td>225.917</td>
<td>495.509MB</td>
</tr>
<tr>
<td>login.uscms.org</td>
<td>infn.it</td>
<td>1</td>
<td>89.8</td>
<td>218.8</td>
<td>172.332MB</td>
</tr>
<tr>
<td>login.uscms.org</td>
<td>jinr-t1.ru</td>
<td>2</td>
<td>87</td>
<td>31</td>
<td>141.175MB</td>
</tr>
<tr>
<td>login.duke.ci-connect.net</td>
<td>iu.edu</td>
<td>1</td>
<td>85</td>
<td>3</td>
<td>239.492MB</td>
</tr>
</tbody>
</table>
Wishlist

- Interested in roll-ups for summarization. Not sure about enriching the records
- Some life-cycle management with Curator, could be expanded
Concerns

- ES can be slow, but it’s probably our hosting platform
- We are scared of drive-by attacks
- We have done disaster recovery exercises, takes >48 hours to restore the platform and data from snapshots.
  - Likely days from tape...
- We inherit projects from others, and we are scared of ingesters
  - Writing a good ingester from message bus to ES is hard, so many error conditions