Monitoring And Accounting For Cloud Resources

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Job Monitoring and Accounting





Dynafed Monitoring





	Top Sources of Failed Request		Offline Endpoints
	ource v	Failures	
b	plus020.cern.ch	1	
ft	s441.cern.ch	1	
ft	s440.cern.ch	2	1
ft	s439.cern.ch	3	
ft	s438.cern.ch	1	



Top 20 Sources				Top 20 Destinations			
Host	City	Country	Requests +	Host	City	Country	Requests -
206-167-181-50.cloud.computecanada.ca	Sherbrooke	Canada	3.1 к	206-12-96-97.cloud.computecanada.ca	Victoria	Canada	6.4 К
elephant14.heprc.uvic.ca	Victoria	Canada	1.6 K	206-167-181-49.cloud.computecanada.ca	Sherbrooke	Canada	3.1 K
elephant13.heprc.uvic.ca	Victoria	Canada	1.6 K				
206-12-96-86.cloud.computecanada.ca	Victoria	Canada	1.6 K	lcg-lrz-http.grid.lrz.de	Garching bei Munchen	Germany	2.0 K
				052 54 70 12 240 45	Deardman	United States	



	Evenend	Jource	Descritation	Thename @ site	Thename @1	parype	Success/Failure	
2018-03-05 16:50:23	3149022299	206-167-181-50.cloud.computecanada.ca	206-167-181-49.cloud.computecanada.ca	BHWide.tgz	N/A	Read	Success	
2018-03-05 16:50:15	424971493	elephant13.heprc.uvic.ca	206-12-96-97.cloud.computecanada.ca	RBB.tgz	N/A	Read	Success	
2018-03-05 16:49:59	1485479871	206-167-181-50.cloud.computecanada.ca	206-167-181-49.cloud.computecanada.ca	Coulomb.tgz	N/A	Read	Success	
2018-03-05 16:49:58	2809387180	206-12-96-86.cloud.computecanada.ca	206-12-96-97.cloud.computecanada.ca	RBB.tgz	N/A	Read	Success	
2018-03-05 16:49:47	394822849	elephant12.heprc.uvic.ca	206-12-96-97.cloud.computecanada.ca	BHWide.tgz	N/A	Read	Success	
2019 02 05	102612421	206 167 181 50 cloud computeranada ca	206 167 181 40 cloud computecanada ca	PH/Mido taz		Boad		
	1 2 3 4 5 6 7 8 9							

Job Staging (with Dynafed)



YH CERN-EXTENSION_CERN StagingInTime Hist

52

2

200

150 Count

100



- Staging times and data rates
- Jobs run on cloud resource
- Data Access:
 - Local grid SE 0
 - Local grid SE via Dynafed Ο
 - Object Store via Dynafed 0

Summary

- 1. Cloud Monitoring and accounting:
 - a. At CERN: <u>https://es-cloudmon.cern.ch</u>
 - b. At UVic: https://elk.heprc.uvic.ca:15601
 - c. Scripts: <u>https://gitlab.cern.ch/seuster/ES-cloud-jobmonitoring</u>
- 2. Dynafed Monitoring:
 - a. At TRIUMF: <u>https://atlas-fed-metrics.triumf.ca</u>
- 3. Qualification Tasks Starting:
 - a. Benjamin Rottler (Freiburg, PhD) HTTP/Dynafed Benchmarking
 - b. Benoit Roland (Freiburg, PostDoc) Cloud Monitoring & Accounting (w. ROCED)

Backup & Details

Job Accounting

Running many clouds for other groups

 Split up resources by: new queue or accounting on our side

Cross check commercial providers

Compare clouds and focus on most performant ones
Benchmark:

- fastBmk (HEPiX benchmarking working group) python scripts from cvmfs
- Run at boot of every VM, gives us rough estimate of HepSPEC06

Accounting Overview (2018 so far)

basic Cloudinformation: current and in 3 different time windows



400.000.000 Provided CPU second.. 300,000,000 200,000,000 100,000,000 cloud: Descending

Accounting: provided CPU seconds on all cores this month per cloud



Accounting Table CPU Hours (HS06) monthly

cloud: Descending 🗢	Jan ≑	Feb 👚	Mar 🗘	Apr 🗘	May 🗘	Jun ‡	Jul ‡	Aug 🗘	Sep ≑	Oct 🗘	Nov 🗘	Dec ≑
amazon-east	25.059	206.092	65.438	0	0	0	0	0	0	0	0	0
dair-ab	103.08	267.932	56.984	0	0	0	0	0	0	0	0	0
dair-qc	163.496	396.813	83.127	0	0	0	0	0	0	0	0	0
Irz	78.12	741.539	137.244	0	0	0	0	0	0	0	0	0
cc-east-a	645.404	845.596	14.625	0	0	0	0	0	0	0	0	0
amazon-west	346 629	1 497 433	218 788	٥	n	n	٥	n	٥	n	n	n



Accounting: provided CPU seconds on all cores this week per cloud



Accounting: Efficiencies last time periods per cloud

0.6

0.4

Job Accounting - Details

•Kibana: great interactive plots awful for processing

- Process most numbers already on VMs and report only few stats
- Store various numbers in pickle files on VM
 - to calculate CPU time provided this month, this week, this day
 - e.g. to get weekly numbers subtract numbers on Sunday at midnight from 'now'

Report system and user times → efficiencies
 Report monthly numbers in kibana table

Ongoing: validate statistics in elasticsearch vs our old accounting system - does ATLAS publish own numbers ?

Job Monitoring



 To aid debugging, get application status of workload from bigpanda •Combine several sources of information to make useful for us: -CloudScheduler + HTCondor write to ascii file -python + bigpanda CloudScheduler: talk via REST + json HTCondor: -name of VM -name of VM -ES python bindings -cloud -GlobalJobId to upload to ES -'VMType' -Kibana to visualize



Cloud Job Monitoring (2018 so far)



Links

•ES at CERN (behind SSO):

https://es-cloudmon.cern.ch

•ES at UVic (mirror, testing and newer items): https://elk.heprc.uvic.ca:15601

CERN gitlab for monitoring code:

https://gitlab.cern.ch/seuster/ES-cloud-jobmonitoring

•Brief description of what's been done in more details (in progress): https://wiki.heprc.uvic.ca/twiki/bin/view/HEPrc/AtlasJobMonitoring

Dynafed

Log Processing and Accounting

ELK – Stack Process - Apache

- Clients send GET, PUT or DELETE requests.
- Dynafed selects a storage endpoint and provides a 302 "redirect" link.
- Dynafed in sot aware of the transfer itself.
- This information is logged into two different files: access_log and error_log.
- The default format does not give enough information therefore we use custom formats and log files.

Apache	• Dynafed • Produces logs
Filebeat	 Monitors log files Exports events as JSON Outputs to Logstash
Logstash	 Aggregates events Parses and enriches Outputs JSON docs
Elasticsear	StoresIndexesReplicates
Grafana	• Visualizes

ELK – Stack Process - Filebeat

- Monitors Apache's log files.
- Queues new log lines.
- Embeds each line into a single JSON object field called "message".
- Sends objects to a Logstash for further processing.

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ELK – Stack Process - Logstash

- Parses each "message" and extracts all the data into key -> value JSON fields.
- Aggregates corresponding access and error log lines of each unique request.
- Extracts and sets the earliest timestamp.
- Determines type of request: read (GET), write (PUT), delete (DELETE) event.
- Determines success/failure on obtaining a redirect link.
- Extracts the client, requested file and source and destination storage endpoints.
- Resolves DNS and obtains GeoIP info.
- Creates two JSON Objects sent to Elasticsearch databse.

Apache	 Dynafed Produces logs
	• Monitors log files
	• Exports events as ISON
Filebeat	Outputs to Logstash
	• Aggregates events
~	• Parses and enriches
	a a ses and enhenes
Logstash	• Outputs JSON docs
Logstash	• Outputs JSON docs • Stores • Indexes
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ELK – Stack Process - Elasticsearch

- Events ars stored under two main indices:
 - logstash-dynafed-httpd-acct-*
 - logstash-dynafed-httpd-ops-*
- Replicates events within nodes in the Elasticsearch cluster for redundancy and parallel querying.
- Indices are rotated daily or every 1G events while maintaining the ability to analyze all events by utilizing index aliases.

	• Dynafed
Apache	Produces logs
	- Manitana lag filos
	Monitors log lifes Exports events as ISON
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	• Stores
Elasticsearc	• Indexes
h	• Replicates
	• Visualizes
Grafana	VISAULECS

ELK – Stack Process - Grafana

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https://atlas-fed-metrics.triumf.ca/ Flexibility to create dashboards by Dvnafed Produces logs querying the Elasticsearch database as Apache well as other sources (like Prometheus). Monitors log files Currently provides information per • Exports events as JSON • Outputs to Logstash Dynafed host on: Filebeat • Count of success/failure of requests. Aggregates events Count of type of request. • Parses and enriches Outputs JSON docs Logstash • Top clients with failed requests. Top 20 sources and destinations SF's. • Stores Indexes Elasticsear • Replicates ch Extending the idea with Metricbeats and Execbeats it can also provide: Latency and connection errors to Visualizes SF's. Grafana Apache metrics.

ELK – Grafana – Main Dashboard



ELK – Grafana – Detailed View of Requests

