Frontier system deployment and monitoring
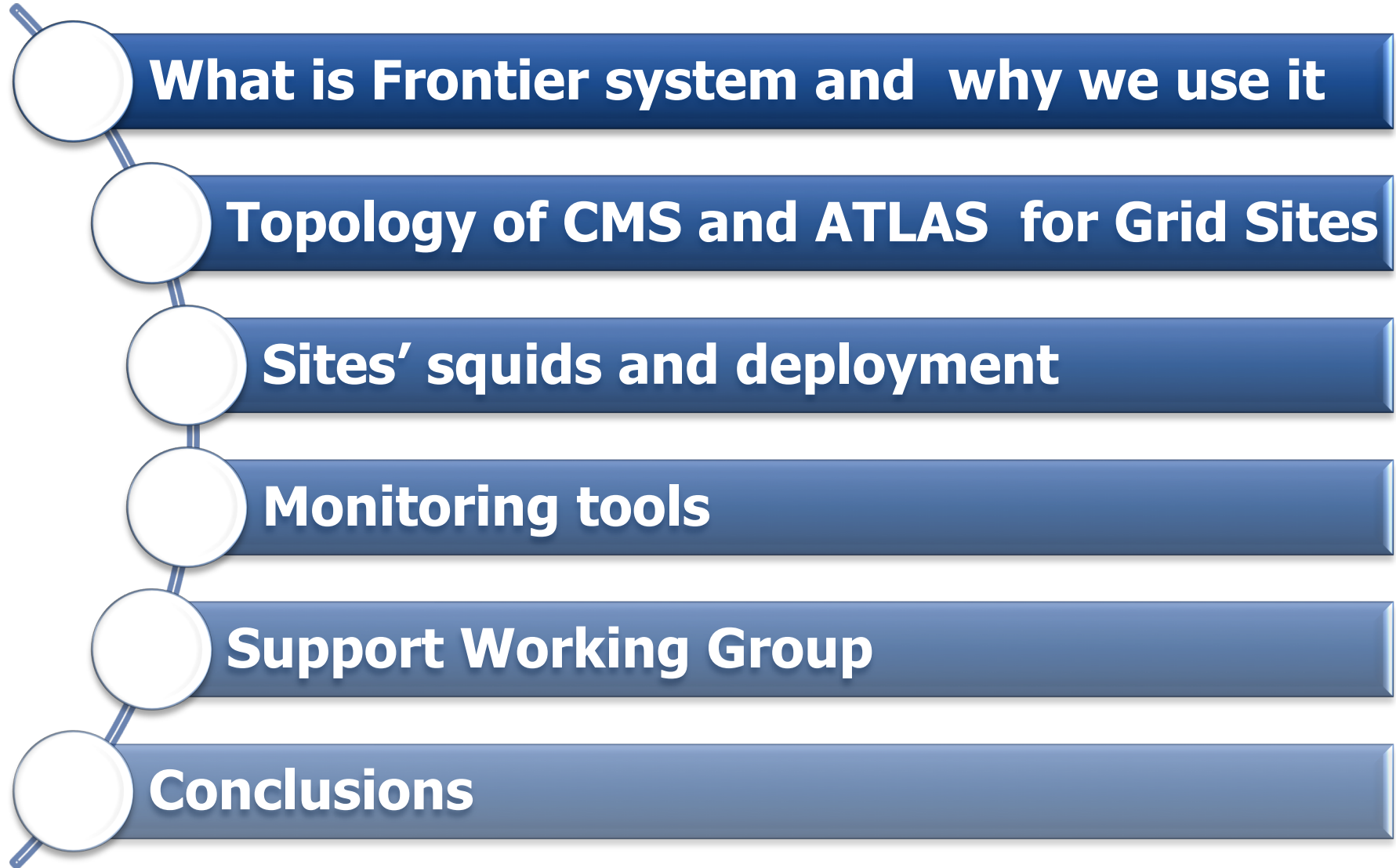
Vamvakopoulos Emmanouil

**J*ournées LCG-France*, 19-23 June 2018, CC-IN2P3 du CNRS**

Frontier System

- The Frontier system distributes data from data sources to many clients around the world.

- Based on http protocol and RESTful architecture

- Excellent scaling

- The Frontier system uses the caching tool squid to cache the http objects close at every site.

- It is ideal for applications where there are large numbers of widely distributed clients that read basically the same data at close to the same time

- The Frontier system was developed for the CDF (Collider Detector at Fermilab)

- For LHC projects, the database is located at the CERN/Tier 0, and the Frontier system distributes data to to all the Tier 1, Tier 2, and Tier 3 sites around the world

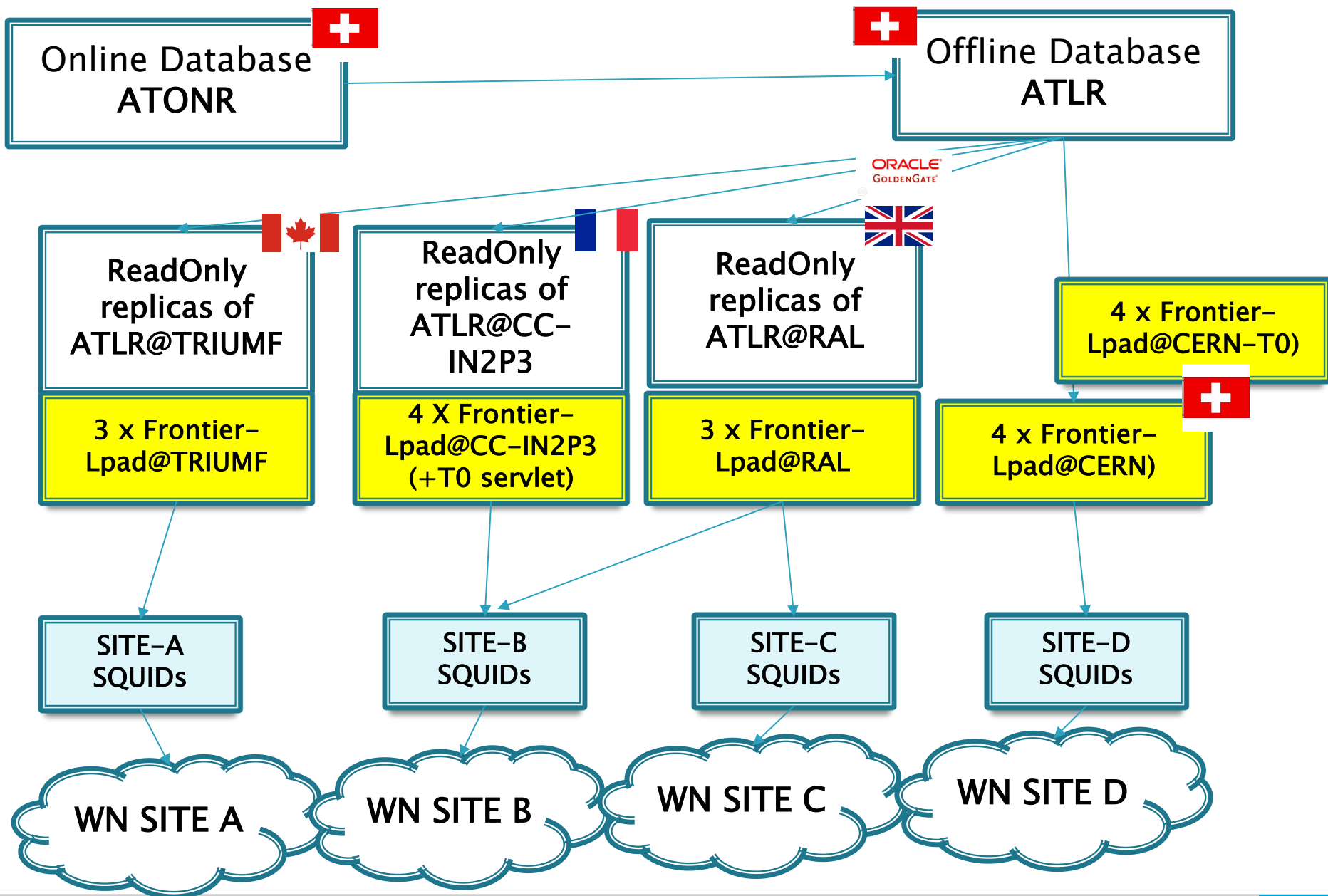# CMS and Atlas Conditions data

Online Database ATONR

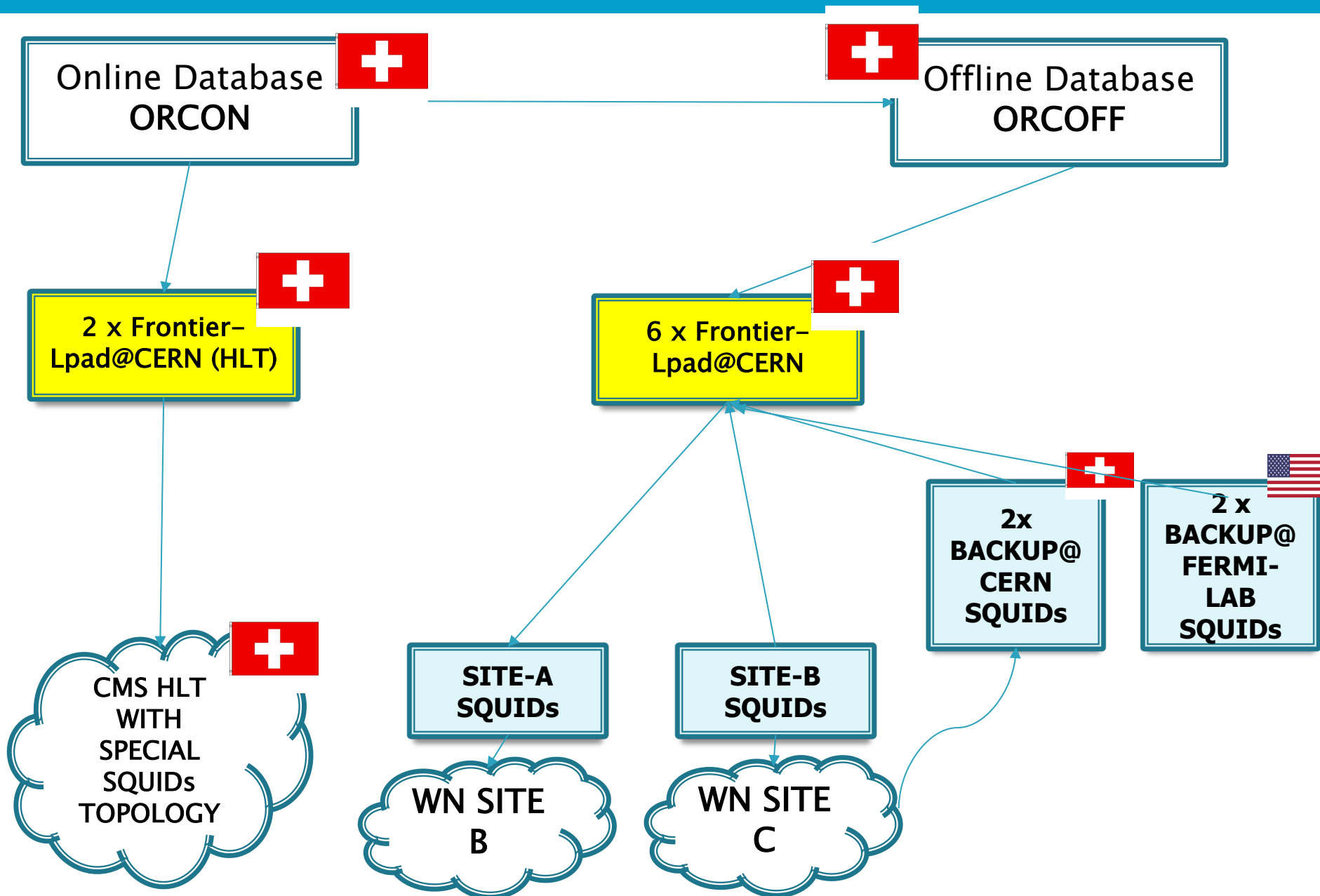(e.g. Detector Status, Data taking Conditions, Calibrations, Alignment, Geometry)
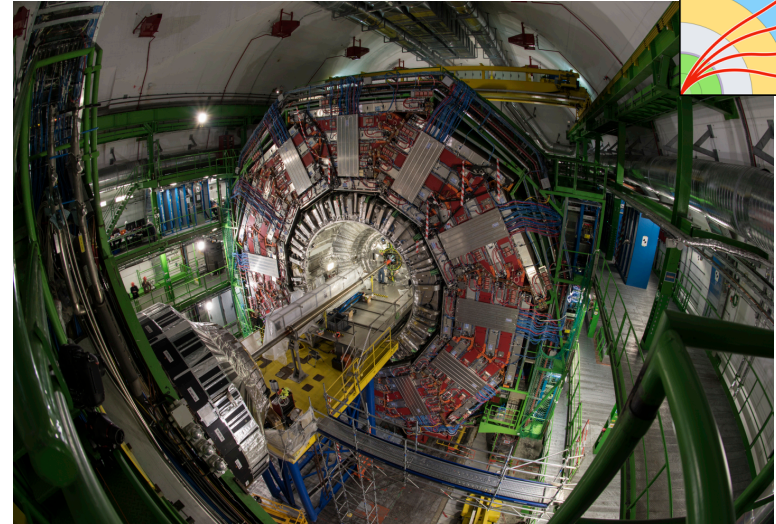
Online Database ORCON

(e.g. Detector Status, Data taking Conditions CMS ECAL Laser Monitoring System)

ATLAS Conditions DB and FRONTIER SYSTEM TOPOLOGY

Online Database
ATONR

Offline Database
ATLR

ORACLE
GOLDENGATE

ReadOnly
replicas of
ATLR@TRIUMF

ReadOnly
replicas of
ATLR@CC–
IN2P3

ReadOnly
replicas of
ATLR@RAL

4 x Frontier–
Lpad@CERN–T0)

3 x Frontier–
Lpad@TRIUMF

4 X Frontier–
Lpad@CC–IN2P3
(+T0 servlet)

3 x Frontier–
Lpad@RAL

4 x Frontier–
Lpad@CERN)

SITE–A
SQUIDs

SITE–B
SQUIDs

SITE–C
SQUIDs

SITE–D
SQUIDs

WN SITE A

WN SITE B

WN SITE C

WN SITE D

CMS Conditions DB and FRONTIER SYSTEM TOPOLOGY

Online Database ORCON

Offline Database ORCOFF

2 x Frontier–Lpad@CERN (HLT)

6 x Frontier–Lpad@CERN

2x BACKUP@ CERN SQUIDs

2 x BACKUP@ FERMI-LAB SQUIDs

CMS HLT WITH SPECIAL SQUIDs TOPOLOGY

SITE-A SQUIDs

SITE-B SQUIDs

WN SITE B

WN SITE C

Frontier-system : service components
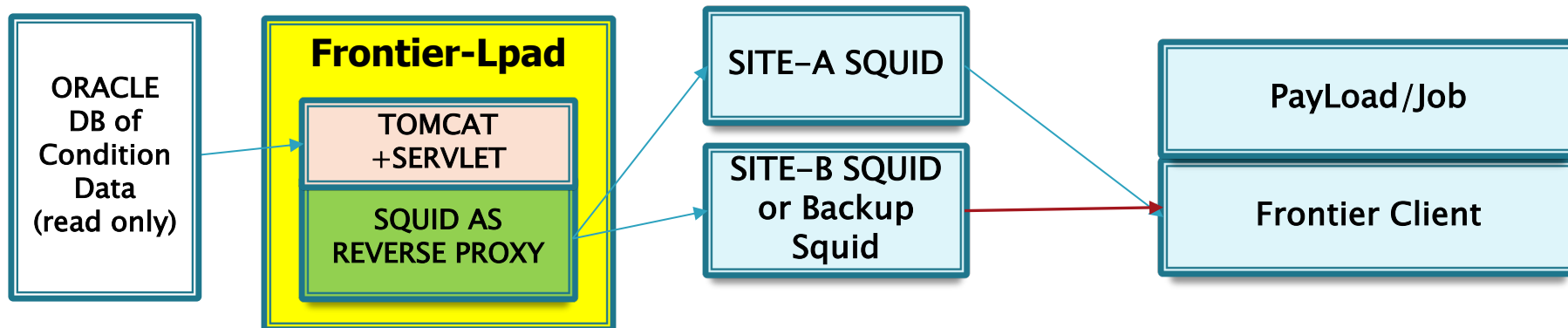
▸ **Frontier Client is shipped with the experiment's software**
- ◦ Central Configuration of Clients (Agis from ATLAS & site's config for CMS) for each WLcG or OSG sites
- ◦ Local site configuration overrides could be applied for Cloud and HPC resources
- ◦ Failover support in the level of the Frontier Client
  - · for Frontier-Lpads ordering (primary and secondary)
  - · for site's squids
  - · and for backup squids

▸ **Sites' Squids**
- ◦ Local site cache squid is supported by Frontier-squid rpms

▸ **Backup Squids**
- ◦ Locate at CERN and Fermilab for CMS
- ◦ Service component is adopted by ATLAS recently
- ◦ Cache squid is supported by Frontier-squid rpms

▸ **Frontier-Lpads close to Oracle - Golden Gate (RO) replicas**
- ◦ CERN T0 for CMS
- ◦ CERN, IN2P3-CC, RAL AND TRIUMF
- ◦ Frontier-Lpads cache squid is supported by Frontier-squid rpms (reverse proxy configuration)

Frontier-squid rpms

▸ **Frontier-squid rpm is enhanced version of squid**

Correctly supports the HTTP standard headers Last-Modified and If-Modified-Since

- Correctly supports collapsed forwarding with If-Modified-Since headers
- Works well with applications that do not require If-Modified-Since headers including CVMFS
- Supports IPv6 (only for Frontier-Squid-3.5.x series, current version Frontier-Squid-3.5.27-4.2)
- Supports configuration file generator with valid tuned parameters
- Efficient Log rotation
- The frontier-squid log format is more human readable and includes contents of client-identifying headers
- Multiple independent squid 'services' using the same configuration can be easily started on the same machine
- Supports add-on 'frontier-awstats' package for central services

▸ **Frontier-squid rpm is supported by FermiLab :**

- **From OSG repositories**
  - *http://opensciencegrid.org/docs/data/frontier-squid/*
- **From EMI repositories**
  - *https://wiki.egi.eu/wiki/URT:UMD_products_ID_cards#Frontier-Squid*
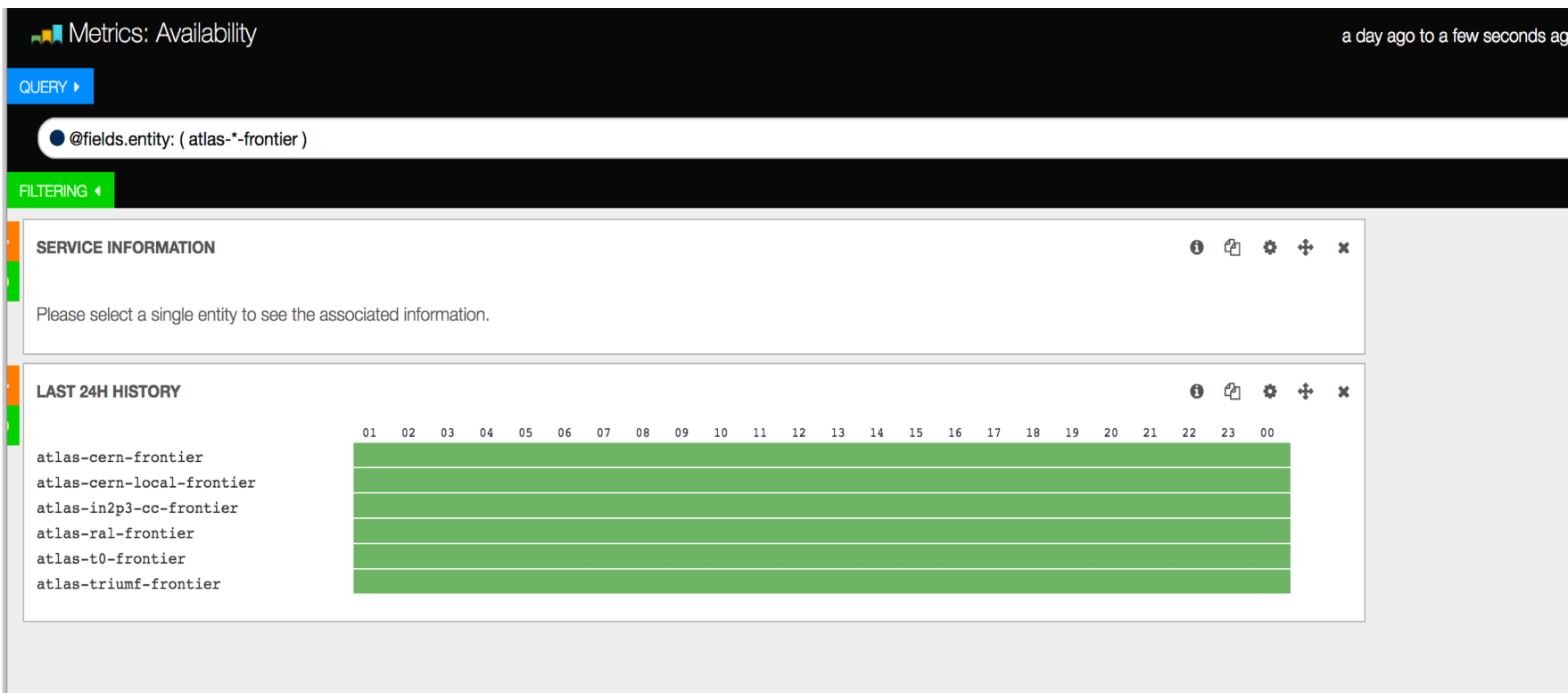- **And CERN-Frontier's repositories**
  - *http://frontier.cern.ch/dist/rpms/*

▸ **Detailed Installation Guide and Recommendations**
- *https://twiki.cern.ch/twiki/bin/view/Frontier/InstallSquid*

FRONTIER MONITORING

SLS/KIBANA Availability metrics and Alerts
For Central Services (e.g. ATLAS Frontier-lpads)

Squid services will be registered in GOCDB & OIM, as publicly available round-robin DNS aliases if there is more than one squid implementing the same service

WLCG Squid Monitoring

This is the homepage for monitoring of WLCG Squids, which currently covers the following projects:

- ATLAS
- CMS
- CVMFS

Please find below the relevant destinations you want to go:

Project	Page
WLCG	All Squids registered in GOCDB / OIM (MRTG)
ATLAS	Global clouds status (MRTG)
	Individual site status (MRTG)
	Detailed statistics for central servers (awstats)
	Site status of all worldwide squids (SSB)
CMS	Global regional status (MRTG)
	Individual site status (MRTG)
	Failover activity history
	Detailed statistics for central servers (awstats)
CVMFS	Individual site status (MRTG)
	Detailed statistics for central servers (awstats)

For the current monitoring status per squid, per site, click here.

For questions, contact wlcg-squidmon-support at cern.ch

GOCDB 5.7.2

Browse
- My Resources
- Projects
- NGIs
- Sites
- Service Groups
- Services
- Scopes
- Role Action Map

Add
- Add Site
- Add Service Group
- Add Service
- Add Downtime

Downtimes
- Active & Imminent
- Downtime Calendar

About GOCDB5
- Doc, Help & Support

Search
[Submit]

User Status
Unregistered user
Register
Retrieve Old Account

Service: atlas-squid.gridpp.rl.ac.uk - org.squid-cache.Squid

ATLAS Frontier squids

System	
Host name	PROTECTED - Auth required
IP Address	PROTECED - Auth required
IP v6 Address	PROTECTED - Auth required
Operating System	PROTECTED - Auth required
Architecture	PROTECTED - Auth required
Contact E-Mail	PROTECTED - Auth required
Notifications	✖

Grid Information	
Host DN	PROTECTED - Auth required
URL	http://atlas-squid.gridpp.rl.ac.uk:3128
Parent Site	RAL-LCG2
Scope Tags	atlas, EGI, tier1, wlcg

Project Data	
Production Level	✔
Beta	✖
Monitored	✔

Service Groups this Service Belongs To

Service Endpoints (endpoints?)

Name	URL	Interface Name

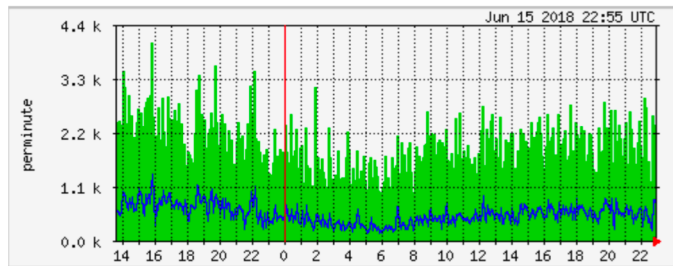**http://wlcg-squid-monitor.cern.ch**

System: Lpad-IN2P3-CC_3
Maintainer: atlas-frontier-support@cern.ch
Description: Frontier Server: Squid, ccfrontier05.in2p3.fr
The statistics were last updated **Friday, 15 June 2018 at 22:55 UTC**,
at which time **'squid frontier-squid-3.5.27-3.1'** had been up for **115 days, 12:20:10**
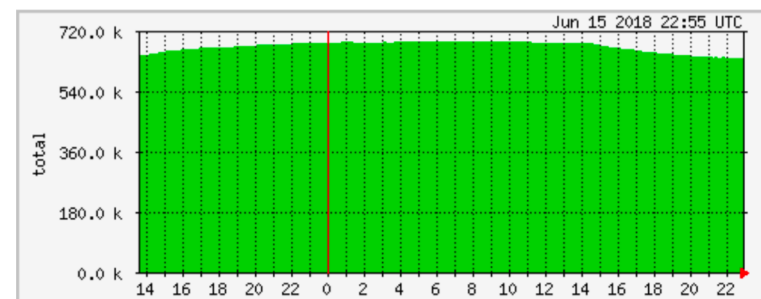
`Daily' Graph (5 Minute Average)

	Max	**Average**	**Current**
HTTP reqs	4040.0 req/min	1847.0 req/min	1798.0 req/min
HTTP fetches	1337.0 req/min	525.0 req/min	705.0 req/min

`Daily' Graph (5 Minute Average)
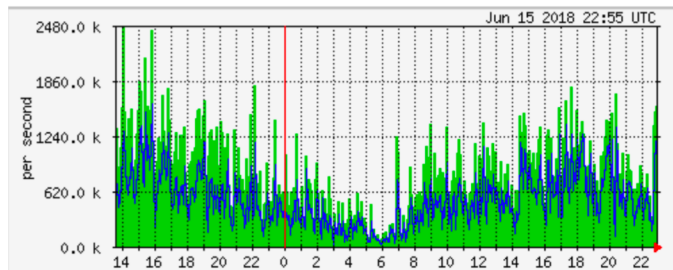
	Max	**Average**	**Current**
Total	2454.0 kB/s	778.0 kB/s	1574.0 kB/s
Fetches	1589.0 kB/s	521.0 kB/s	1058.0 kB/s

`Daily' Graph (5 Minute Average)

	Max	**Average**	**Current**
Obj num	688.2 kobj	671.7 kobj	636.2 kobj

ATLAS awstats links
Times are the local time of each server

- **atlasbpfrontier.cern.ch** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasbpfrontier1.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasbpfrontier2.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **atlasbpfrontier.fnal.gov** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasbpfrontier1.fnal.gov** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasbpfrontier2.fnal.gov** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **atlasfrontier.cern.ch** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier1-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier2-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier3-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier4-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **atlast0frontier.cern.ch** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlast0frontier1-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlast0frontier2-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlast0frontier3-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlast0frontier4-ai.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **atlasfrontier-local.cern.ch** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier1-local.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **atlasfrontier2-local.cern.ch** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **ccfrontier.in2p3.fr** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **ccfrontier01.in2p3.fr** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **ccfrontier02.in2p3.fr** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **ccfrontier03.in2p3.fr** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **ccfrontier04.in2p3.fr** testing today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **ccfrontier05.in2p3.fr** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **lcgft-atlas.gridpp.rl.ac.uk** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **lcgvo-frontier01.gridpp.rl.ac.uk** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **lcgvo-frontier02.gridpp.rl.ac.uk** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **lcgvo-frontier03.gridpp.rl.ac.uk** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- **t1-frontier.triumf.ca** combined today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **frontier-atlas1.lcg.triumf.ca** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **frontier-atlas2.lcg.triumf.ca** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
- **frontier-atlas3.lcg.triumf.ca** production today this month 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Last Update: 15 Jun 2018 - 22:43

Reported period: Jun 2018 OK

Back to main page

Visitors domains/countries

Domains/Countries		Pages	Hits	Bandwidth
France	fr	33732797	33732797	489.89 GB
Russian Federation	ru	16044842	16044842	81.31 GB
Switzerland	ch	14193663	14193663	101.66 GB
Germany	de	10584599	10584599	141.62 GB
Spain	es	7218672	7218672	28.28 GB
Netherlands	nl	6385582	6385582	88.06 GB
Romania	ro	4991658	4991658	23.18 GB
Non-Profit Organizations	org	4390314	4390314	64.80 GB
Israel	il	3986560	3986560	8.92 GB
Japan	jp	3800481	3800481	71.34 GB
Azerbaidjan	az	3394119	3394119	15.07 GB
Taiwan	tw	2926118	2926118	37.43 GB
China	cn	1607236	1607236	9.24 GB
Slovak Republic	sk	1553834	1553834	609.84 MB
USA Educational	edu	1471937	1471937	281.64 MB
Hong Kong	hk	1465058	1465058	70.62 MB
Portugal	pt	1414955	1414955	2.84 GB
Former USSR	su	1329082	1329082	8.89 GB
Unknown	ip	1081058	1081058	2.26 GB
Commercial	com	850821	850821	1.42 GB
South Africa	za	629935	629935	32.34 MB
Turkey	tr	327410	327410	670.77 MB
Slovenia	si	53770	53770	502.58 MB
Norway	no	42152	42152	278.62 MB
Network	net	30773	30773	139.69 MB
Argentina	ar	27475	27475	124.07 MB
United Kingdom	uk	19696	19696	115.86 MB

Frontier–Lpads

ccfrontier.in2p3.fr

FR, DE, NL, RU, ES

~62 sites

UK, CERN–PROD, CERN–T0 ..etc

~53 sites

Statistics for: ccfrontier.in2p3.fr

Reported period Month Jun 2018
First visit 01 Jun 2018 - 00:00
Last visit 15 Jun 2018 - 22:38

Summary

	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Viewed traffic *	889	12894 (14.5 visits/visitor)	123567102 (9583.3 Pages/Visit)	123567102 (9583.3 Hits/Visit)	1179.05 GB (95883.32 KB/Visit)
Not viewed traffic *			5	5	1.08 KB

* Not viewed traffic includes traffic generated by robots, worms, or replies with special HTTP status codes.

Monthly history

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2018	2517	137373	317575178	317575178	2775.65 GB
Feb 2018	2412	19192	344495398	344495398	3022.82 GB
Mar 2018	1300	24630	267353840	267353840	3590.84 GB
Apr 2018	1689	28481	185873900	185873900	1151.15 GB
May 2018	1179	27048	215681103	215681103	734.22 GB
Jun 2018	889	12894	123567102	123567102	1179.05 GB
Jul 2018	0	0	0	0	0
Aug 2018	0	0	0	0	0
Sep 2018	0	0	0	0	0
Oct 2018	0	0	0	0	0
Nov 2018	0	0	0	0	0
Dec 2018	0	0	0	0	0
Total	9986	249618	1454546521	1454546521	12453.72 GB

Monitoring the total traffic
And the activity on Frontier–lpads and backup proxies

Frontier Failover history

This is a visual representation of direct connections from non-squid machines to central groups of servers. The charts are both **viewers** and **controllers**: they allow for interactive exploration of the failover activity on display. The current filtering selections are noted at each chart's header.
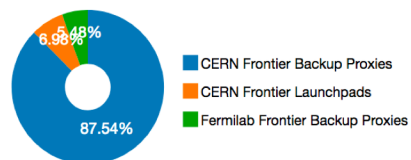
[Update]

Time:
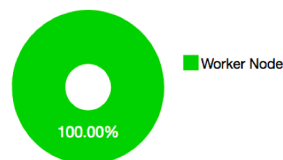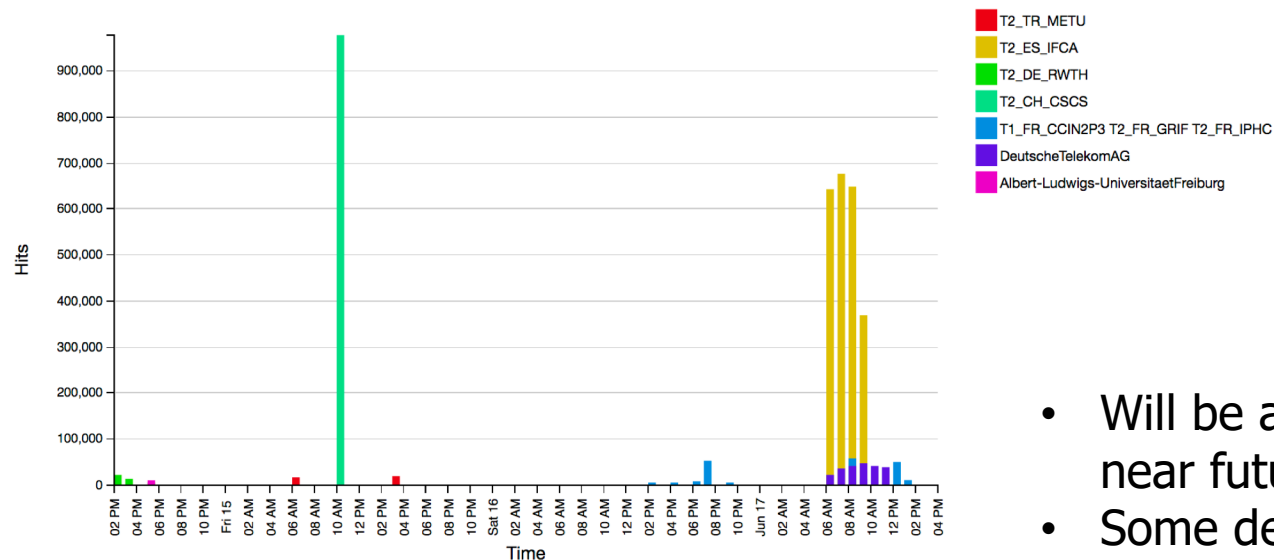Jun 14, 2018 03:00 PM – Jun 17, 2018 03:00 PM

Time Zone:
CERN ▼

Machine Groups

6.98% | 5.48%
87.54%

- CERN Frontier Backup Proxies
- CERN Frontier Launchpads
- Fermilab Frontier Backup Proxies

Host Type

100.00%

- Worker Node

Hits by site per hour

- T2_TR_METU
- T2_ES_IFCA
- T2_DE_RWTH
- T2_CH_CSCS
- T1_FR_CCIN2P3 T2_FR_GRIF T2_FR_IPHC
- DeutscheTelekomAG
- Albert-Ludwigs-UniversitaetFreiburg
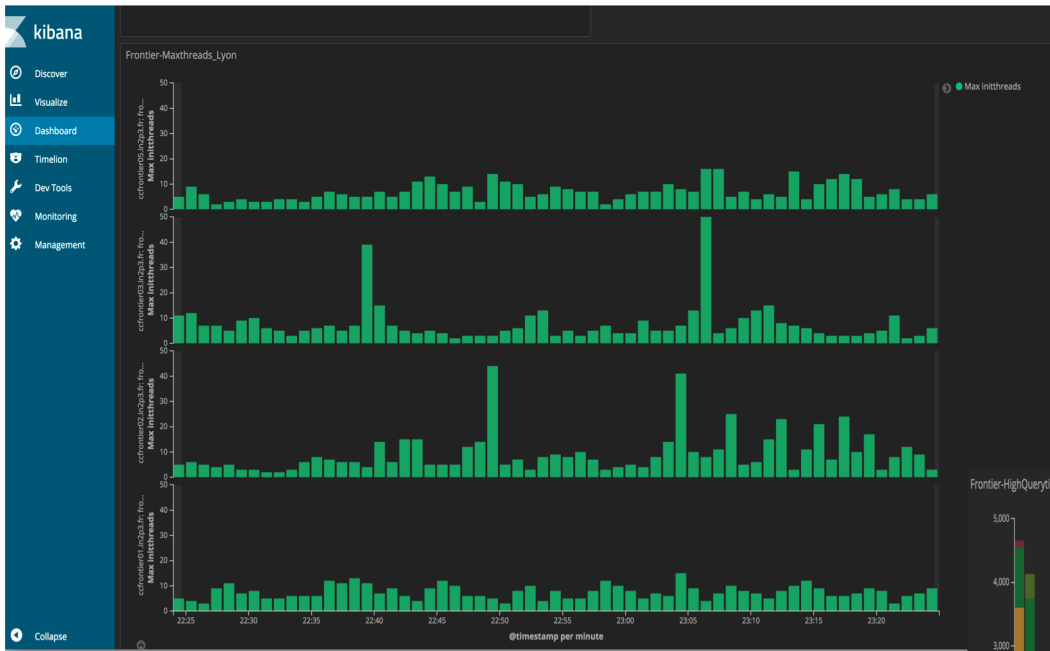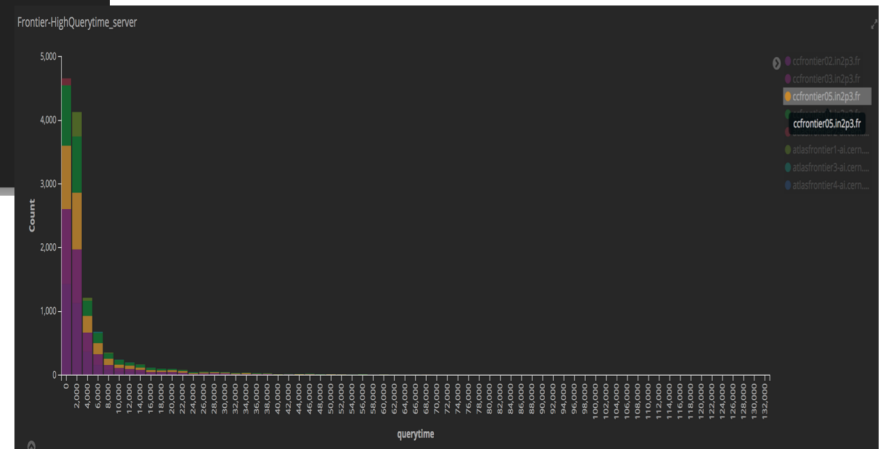
- Will be adapted from ATLAS near future
- Some development need to be done

Chicago Elasticsearch DB + Kibana infrastructure
Aggregate information for all Frontier-lpads nodes
- Metrics for the Nodes
- Metrics for the Tasks

https://twiki.cern.ch/twiki/bin/viewauth/AtlasComputing/FroNTier#Frontier_Kibana_Monitoring_Analy

Frontier Monitoring, Alessandro De Salvo INFN, Julio Lozano Bahilo (Univ. of Valencia and CSIC (ES)) , Conditions DB during S&C Week, 6 Mar 2018, CERN

FRONTIER WORKING GROUP

- **Bi-Weekly regular meetings**
- **Participants**
  - ATLAS, CMS/CERN
  - RAL, IN2P3-CC, TRIUMF
  - and CMS/FERMILAB
- **Agenda**
  - News and updates from CERN
  - Site issues and incident
  - Recent developments in the System and in the Monitoring tools
  - Development Road Map of the system
- **Mail list** (e-groups)
  - frontier-talk@cern.ch
  - ATLAS-adc-frontier@cern.ch
  - cms-frontier-support@cern.ch
  - wlcg-squidmon-support@cern.ch

Comments and Conclusions

▸ Frontier-squid rpms are used on different service component of the Frontier system
  ◦ Frontier-lpads
  ◦ Sites' squids
  ◦ and central backup squids

▸ Frontier-squids rpms are the recommended version for site squids in order to support correct the Frontier System and include valid tuned parameters (current version Frontier-Squid-3.5.27-4.2)

▸ Extensive monitoring is in place which covers all service components

▸ Monitoring tools is under further development and improvements

Thanks very much for your Attention

BACKUP SLIDES

IN2P3-CC FRONTIER@LPADS news and updates

- **New ceph volume service in production (Tier mode sdd + sata**
- **disk)**
- **New DNS load balancer supporting dns round robin and IPv6**
- **Recent on Production new set of VMs for frontier nodes**
- with IPV6
  - Three (3) VMS: 4VCPU, 8GB ram, 40GB local disk on top of GPFS for OS, 220GB on CEPH for data
  - One (1) physical machine dell R(Intel(R) Xeon(R) CPU E52623 v3 @ 3.00GHz) 16 cores, 32GB 2x 1TBytes sas disk on raid 1, R410, MegaRAID SAS-3 3108
- **No major recent issue, except some I/O on log rotation due to failover from other sites (e.g. CERN)**

Figure 3. Another example client request after data item expires
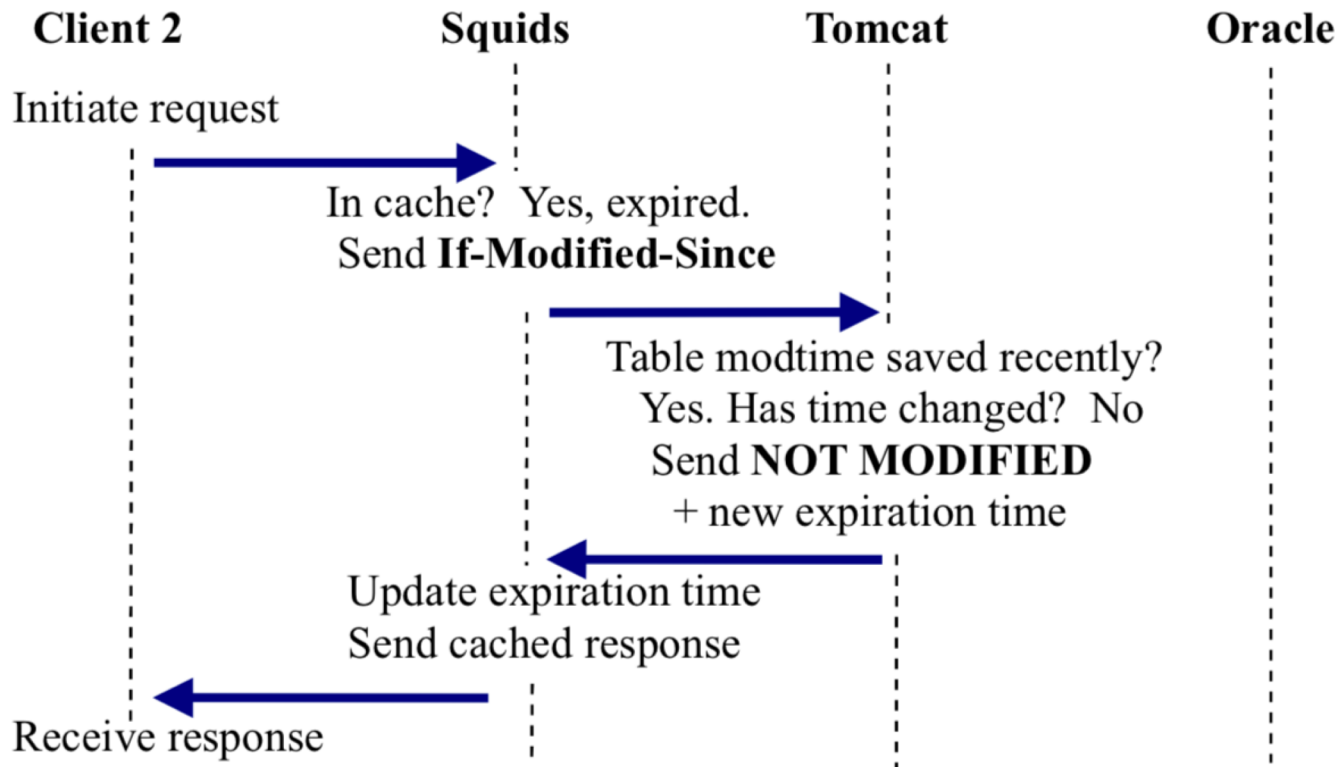
Greatly improved cache update times for conditions data with Frontier/Squid
Dave Dykstra and Lee Lueking , Computing Division, Fermilab, Batavia, IL, USA
 http://frontier.cern.ch/dist/Paper_CHEP09_Frontier-newcaching.pdf

Figure 2: An example of filling data into the cache

ccin2p3-ccfrontier01	ccin2p3-AtlasFrontier t0atlr
ccin2p3-ccfrontier02	ccin2p3-AtlasFrontier t0atlr
ccin2p3-ccfrontier03	ccin2p3-AtlasFrontier t0atlr
ccin2p3-ccfrontier04	
ccin2p3-ccfrontier05	ccin2p3-AtlasFrontier t0atlr
ccin2p3.Summary	ccin2p3-AtlasFrontier t0atlr
atlasfrontier-ai-1	atlr
atlasfrontier-ai-2	atlr
atlasfrontier-ai-3	atlr
atlasfrontier-ai-4	atlr
cern.Summary	atlr
atlasfrontier-local-1	atlr
atlasfrontier-local-2	atlr
cernlocal.Summary	atlr
atlast0frontier-ai-1	t0atlr
atlast0frontier-ai-2	t0atlr
atlast0frontier-ai-3	t0atlr
atlast0frontier-ai-4	t0atlr
cernt0.Summary	t0atlr

ccin2p3.Summary ccin2p3-AtlasFrontier

Latest value (in last 5 minutes):

update time: Sun Jun 17 15:15:00 2018 (local time of the site)

Maximum threads: 25;

Average client response time: 137.780 msec; Average DB query time: 231.427 msec

---

Last 48 hours

Maximum threads: 100;

Average client response time: 110.532 msec; Average DB query time: 176.088 msec