European Organisation for Nuclear Research (Conseil Européen pour la Recherche Nucléaire)

- Founded in 1954, 22 member states today
- World’s largest particle physics laboratory
- Located at Franco-Swiss border near Geneva
- ≈ 2300 staff members, > 12000 users
IT Department at CERN

Enabling the laboratory to fulfil its mission

- Main data centre in Meyrin site
- Wigner data centre in Budapest, 23 ms away
- Connected via 2 dedicated 100 Gb/s links
- Service resources in both sites where possible (+ disaster recovery)
Storage (I)

AFS Phaseout:

- Long-term viability of OpenAFS?
- No hard deadline, final clean-up during LS2
- Usage review ongoing with user communities
- Alternatives: CVMFS, CASTOR, EOS, Ceph, CERNBox
Storage (II)

CERNBox:

- For all CERN users, 1 TB each
- Update: bug fixes, future desktop clients, notebook viewers, Service for Web-based Analysis (SWAN) pilot
- Growing fast, 5000 users

See Jan’s talk
Operating Systems

- Windows:
  - Win 10 pilot > 300 PCs, on new ones by July 2017
  - Win 7 support planned to end before 2020
- macOS 10.11, 10.12 supported, 10.12 encouraged (security)
- Linux:
  - Production: SLC 6.8, CC 7.2
  - Docker Registry pilot → GitLab Registry
- Software:
  - Office 365 ProPlus, Windows and Mac
  - Visual Studio Community 2015, Windows
Databases (I)

DB on Demand (DBoD)

- Almost full DBA privileges
- MySQL, PostgreSQL, InfluxDB
- Clusters, backups to EOS, replication

Database on Demand instances
Evolution of the amount of MySQL, Oracle, and PostgreSQL instances in the DBoD service
Databases (II)

Hadoop:

- Service: infrastructure, consultancy, community
- Impala, Spark, Sqoop, Pig, Hive, . . .
- Experiments, general purpose, SQL: > 6 PB

See Kate’s talk
Version Control Services

GitLab:
- SVN until end of LS2, Gitolite now read-only
- GitLab: 5k users, 70k clone-pull/d, 4k push/d
- Now scaling up and replicating to Wigner

Other features:
- GitLab-CI, > 300 projects running builds
- GitLab Pages, generate static web sites
- GitLab Registry
Batch Services

- 82k slots in LSF, 26k in Condor
- Mostly Grid work in Condor, opening now for local users
  - Kerberos token renewal implemented – thanks UW!
  - Migration of all work to Condor starting now
- External batch running all 4 LHC experiments seamlessly through the main Condor instance
- Monitoring of Condor moved to Fifemon from FNAL (Graphite/Grafana + Condor probes)
Batch Services

Cluster Batch Jobs -

**Current Job Status**
- Total: 19069
- Running: 17367
- Idle: 1702
- Held: 4

**Recent Jobs Started**

**Recent Jobs Submitted**

**CPU Utilization**

**Memory Utilization**

**Disk Utilization**

**Current CPU Efficiency**: 78%

**Current Memory Efficiency**: 47.37%

**Current Disk Efficiency**: 92.7%

**Running Jobs by User**

**Running Jobs by Runtime**
Cloud Services (I)

- OpenStack, partly Liberty/Mitaka
- 7k KVM, 200 Hyper-V, mostly for Batch
- 45 cells, 5 availability zones, 2 data centres
- 3k images, 3k volumes
- 3k users, 3k projects
Cloud Services (II)

- H/W retirement, live/cold migration of 5k VMs
- Neutron in production – how to move VMs?
- Migrating Windows VMs from Hyper-V to KVM
- Container orchestration for Swarm, Kubernetes, Mesos in production
- Looking at Ironic (Bare Metal as a Service)
Interactive Services – LXPLUS

- 80 VMs, 2k users/day
- 25 users/VM, 60 sessions/VM
- Cgroups: CPU and I/O fairshare, memory limits
- User accounting
Configuration Management

Numbers:

- 80 quadcore Puppet masters
- 312 modules (CERN and upstream)
- Resources in commercial clouds

Recent activities:

- Foreman 1.6.1→1.11.2, Ruby 1.9→2.2, SLC6→CC7
- Root passwords management with Puppet
- BagPlus Puppet module, install lxplus-like nodes
- MCollective broker migration
Networking

IPv6 and saving IPv4 addresses:
- More dynamic addressing
- Merge fixed and dynamic GPN services
- Fixed addresses only for services

Wi-Fi:
- More and more mobile devices used
- Moving between buildings
- 1 access point/3 offices

See Vincent’s talk
Collaboration

Mattermost:

- Common place where everyone can be reached
- Alternative to Slack
- Hooks: RSS feeds, Indico, restaurant menu
- Fast evolution, we can contribute
- Service in the making
Unified Monitoring

Data Sources
- Metrics Manager
- Lemon Agent
- XSLT
- Service Logs
- ATLAS Rucio
- FTS Servers
- DPM Servers
- XROOTD Servers
- CRAB2
- CRAB3
- WM Agent
- Farmout
- Grid Control
- CMS Connect
- PANDA WMS
- ProdSys
- Nagios
- V0Feed
- OIM
- GOCDB
- REBUS

Transport
- Flume
- AMQ
- Kafka
- Flume
- AMQ
- GLED
- HTTP Collector
- SQL Collector
- MonaLisa Collector
- AMQ
- HTTP GET
- HTTP PUT

Storage & Search
- HDFS
- ElasticSearch
- Oracle
- ElasticSearch
- HDFS
- ElasticSearch
- Oracle
- ElasticSearch

Display Access
- Kibana
- Jupyter
- Zeppelin
- Dashboards (ED)
- Kibana
- Zeppelin
- Real Time (ED)
- Accounting (ED)
- API (ED)
- SSB (ED)
- SAM3 (ED)
- API (ED)

http://monit.cern.ch
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Transport
- Flume
- AMQ
- Kafka

Storage & Search
- Hadoop HDFS
- ElasticSearch
- InfluxDB
- Other

Processing & Aggregation
- Spark
- Hadoop Jobs
- GNI
- Other

Data Access
- Kibana
- Grafana
- Jupyter
- Zeppelin
- Other

http://monit.cern.ch
**Elasticsearch**

Need for a central service:
- Survey: > 20 independent ES instances
- Consolidation: central service
- Production foreseen Q1 2017

Current status:
- Test instances for 20 different use cases
- Most prerequisites for production in place
- Clusters ranging from a few GB to 250 TB
- Kibana 4.x, Elasticsearch 2.x
- Now: finalising use cases, improving workflows
More Talks from CERN This Week (I)

- CERN Computing Facilities Evolution, Wayne Salter
- Pre-Studies for Wi-Fi Service Enhancement at CERN, Adam Sosnowski
- Wi-Fi Service Enhancement at CERN, Vincent Ducret
- Deploying Open Compute Hardware at CERN, Marco Guerri
- A Race for the Data Center: POWER8 and AArch64, Marco Guerri
- Security Update, Hannah Short
- Can We Trust eduGAIN?, Hannah Short
More Talks from CERN This Week (II)

- EOS, DPM and FTS Developments and Plans, Andrea Manzi
- Update on HNSciCloud Project, Helge Meinhard
- Update from Database Services, Kate Dziedziniewicz-Wojcik
- AFS Phaseout at CERN, Jan Iven
- Cloud Services – Network Realities, Tony Cass
- SDN-enabled Intrusion Detection System, Adam Krajewski