Monitoring

Data Centre Monitoring
• Monitoring of DC at CERN and Wigner
• Hardware, operating system, and services
• Data Centres equipment (PDUs, temperature sensors, etc.)
• Used by service providers in IT, experiments

Experiment Dashboards
• Sites availability, data transfers, job information, reports
• Used by WLCG, experiments, sites and users

Both hosted by CERN IT, in different teams

Mandate for 2016
• Regroup monitoring projects
Data Centres Monitoring
Experiment Dashboards

- Job monitoring, sites availability, data management and transfers
- Used by experiments operation teams, sites, users, WLCG
Current Monitoring
Unified Monitoring

**Unified Monitoring Architecture for IT and Grid Services** – CHEP 2016

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

### 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
Unified Monitoring Architecture

- **Data Sources**: Data Centres, WLCG
- **Transport**: ActiveMQ, Flume, kafka
- **Storage/Search**: Hadoop, Elasticsearch
- **Processing**: Spark
- **Data Access**: Kibana, jupyter, Apache Zeppelin, Grafana
Unified Data Sources

- Data is channeled via Flume, validated and modified if necessary.
- Adding new Data Sources is documented and fairly simple.
Unified Processing

Transport

Kafka cluster (buffering)*

Processing

On the fly
Data enrichment
Data aggregation
Data correlation

Batch
Reprocessing, reports, ..

* Current retention period 12 h, at scale 24 h
Unified Access

- Multiple data access methods (dashboards, notebooks, CLI)
- Mainstream and evolving technologies
Status since January

- Data size ~200 GB/day (~500 GB/day at full scale)
- ~200M documents/day with spikes at 10KHz
- Relying on VMs complaint to the CERN IT AI standards (Openstack/Puppet)
- 20 nodes Kafka cluster
- 23 nodes Flume input and output gateways
- 9 nodes Mesos/Spark cluster
- Scaled down version for QA environment
- Centrally provided by IT
  - Dedicated Elasticsearch cluster: ~30 nodes
  - Shared Hadoop/HDFS cluster: ~40 nodes
Interactive Visualisations

MONIT FTS Overview

Home - Overview - Transfer Plots - Matrix View - Failures - Custom Views

MONIT FTS Volume Transferred (per VO)

MONIT FTS Transfer Efficiency (per VO)

Data Transferred: 308.9TB
Transfer Efficiency: 0.948

MONIT FTS Top 10 Source Sites

MONIT FTS Top 10 Destination Sites
Interactive Visualisations

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Conclusions

Merged Monitoring projects
- Same team, technologies, practices and infrastructure

Unified monitoring infrastructure for CERN Data Centres and WLCG
- Moving all data via new transport (Flume, AMQ, Kafka)
- Data in ES and Hadoop (and soon in InfluxDB)
- Aggregation and processing via Spark
- Visualization with Kibana, Grafana, Zeppelin

Service Proposed
- Collect, process, aggregate, visualise and raise alarms
- Cover metrics and logs
- Operate and scale the infrastructure
- Support interfacing new data sources, custom processing, building dashboards and reports
Reference and Contact

Dashboard Prototypes
monit.cern.ch

Feedback/Requests (SNOW)
cern.ch/monit-support

Early-Stage Documentation
cern.ch/monitdocs
Backup slides
Monitoring Processing Platform

- Reliable and scalable job execution (Spark)
- Job orchestration (Marathon / Chronos)
- Lightweight deployment (Docker)