C2MON
A modern open-source platform for data acquisition, monitoring and control

Justin Lewis Salmon, CERN
justin.lewis.salmon@cern.ch

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Technical Infrastructure: A lot of systems to control

- Controls
- Computers
- Electricity
- Cryogenics
- Magnets
- Safety
- Cooling
- Ventilation
- Vacuum

85’000 Devices
> 2 Million I/O Endpoints

Much more when including subsystems!
Main systems controlled from one central point:
The CERN Control Centre
A complex controls infrastructure...

- Each **dot** is a process
- Each **line** is a network connection
The configuration hell

- Many different types of data sources and protocols
- Complex data structure
- Different data rates

How to subscribe to my data?
What if…

… there is a platform that:

- handles low level data subscriptions
- monitors the different data sources
- reconfigures acquisition processes at runtime
- standardises messages and data storage
- reduces data streams to relevant information
- always keeps the latest values available
- provides custom data streams
- provides access to history

… and is modular and open source?
C2MON – A platform for many use cases

Use C2MON…

- as backbone for your SCADA system
- to feed your analytics framework
- to persist your data in ES for offline analytics
- as configurable data proxy
- as data homogenizer
- …
C2MON - CERN Control and Monitoring Platform

- Modular and **scalable at all layers**
- Optimized for **high availability & throughput**
- Powerful rule evaluation engine
- Server based on in-memory cache

Two big monitoring services (TIM & DIAMON) **running in production with C2MON at CERN**

Central LHC alarm system (LASER) in migration phase
Technical Infrastructure Monitoring (TIM)

- Operational **24/7** since 2005
- Since Jan. 2012 based on new server architecture with C2MON
- ~100 different main users at CERN
- Simple synoptic dashboarding and trend analysis
- 91k data sensors, 41k alarms
- ~400 million raw values per day
- ~2 million after filtering
Roadmap

- New rule evaluation engine for real-time streaming analytics
- Zero-configuration acquisition
- WebSockets on the client layer
- ...

https://cern.ch/c2mon
https://github.com/c2mon
Summary

- C2MON is now open source since Sept 2016
- Stable, mature, full-featured, acquisition and control framework
- Actively seeking new collaborations

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Additional Material
What is C2MON?

C2MON - CERN Control and Monitoring Platform

A modular Java framework developed by CERN for building highly available, large industrial monitoring and control solutions.

- heterogeneous data acquisition framework
- supports subscription to live data streams
- live configuration
- value persistence & historical browsing
- built-in control and alarm functionalities
- sophisticated raw data filtering
Technologies used for C2MON

C2MON server: No J2EE server and only open source!
- Java 7, Spring 4.2
- persistence framework: MyBATIS (server), Hibernate (client)

Dependency management through Maven

Supported Databases: Oracle, HSQL, MySQL, Elasticsearch

Middleware: JMS ActiveMQ
- no direct communication between message publisher and consumer
- secured broker access
- broker clustering
- persistent queues
- topics for broadcast/reply messages

Message transport format: XML and JSON

Remote caching solution for C2MON server cluster: Terracotta/Ehcache,
- horizontally scalable
- proven technology
- open source
- support contract possible