Logging data in relation with Post-Mortem and archiving

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AB-CO

Topics

- Purpose of the LHC Logging Service
- Architecture overview
- Interaction with the Post-Mortem system
  - Combining and correlation of slow logging data and external transient data
  - Naming conventions and enforcement
  - Data lifetime policy
- Ideas and possibilities
  - Better use of the Naming database
  - Storing of PM summary information
- *No* conclusion

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Logging Service - Purpose

- Need to know what's going on in and around the LHC by *logging* heterogeneous time series data, in order to
  - manage information required to improve the performance of the machine and individual systems;
  - meet specific INB requirements to record beam history;
  - make available long term operational statistics for management;
  - avoid duplicate logging developments.

- Logging Project started in 2001
- First operational implementation used in autumn 2003

- Any client can use the service, including the injectors and the experiments
- Exponential increase in data volumes
- Expected to stabilize after 1st year of LHC operation ~5TB per year

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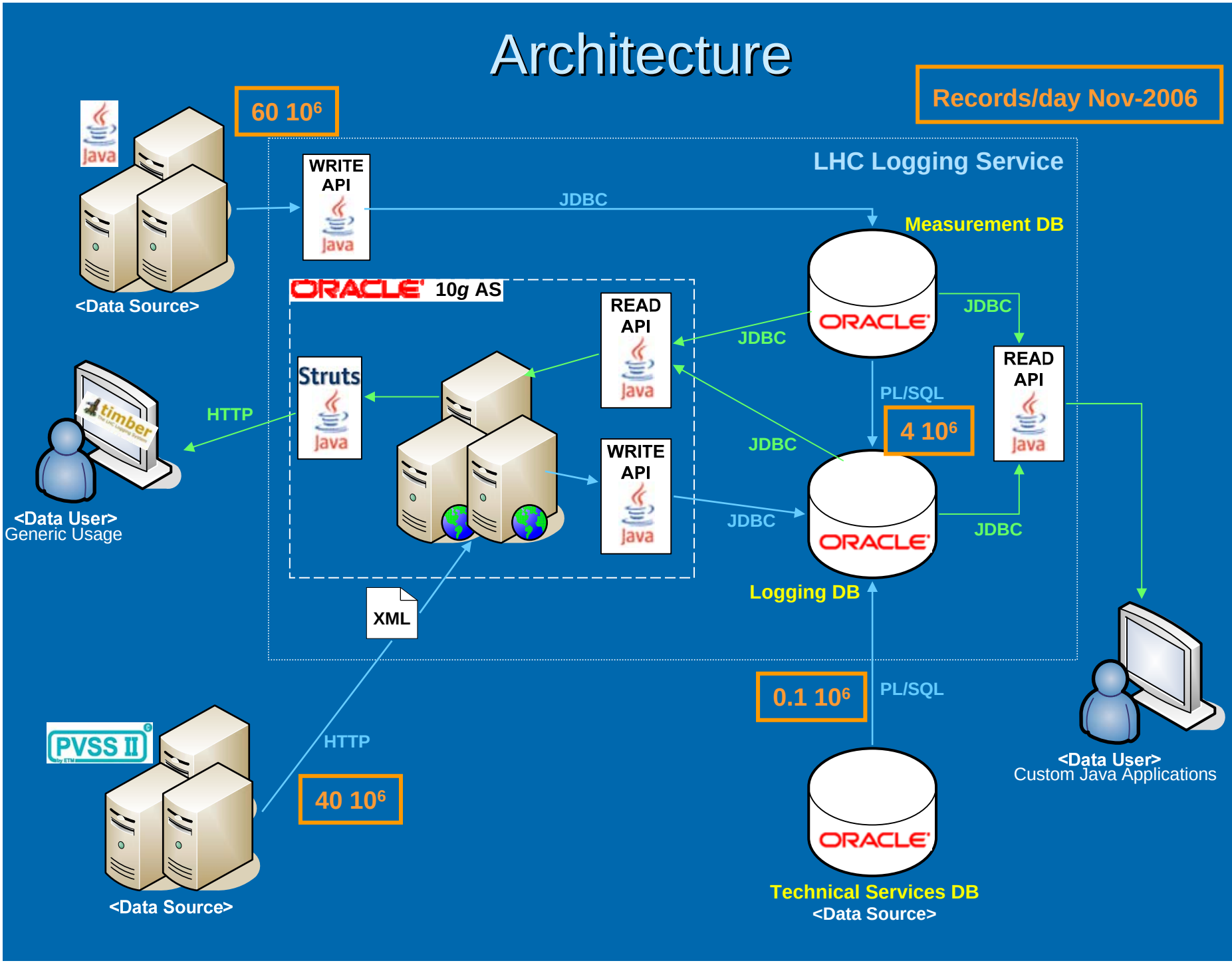
Architecture



Integration with other services

- For a complete PM analysis, slow logging data will need to be combined with transient data captured by the PM server
- Many data sources are the same for PM and Logging
  - Interlocks: PIC, WIC, BIC
  - Beam instrumentation: BCT, BL, BPM
  - Equipment: Power Converters, Collimators, RF, Beam Dump
  - Quench Protection System
  - Technical infrastructure: CV, electricity
  - Cryogenics: production, instrumentation
  - Vacuum: pressures
- Two prerequisites are to be fulfilled
  - Consistent identification of the data ⇦ Name of Parameter or Entity
  - Coherent time-stamping of the data ⇦ UTC at the data source
- The same logic holds for Alarms, Setting, Trims,...

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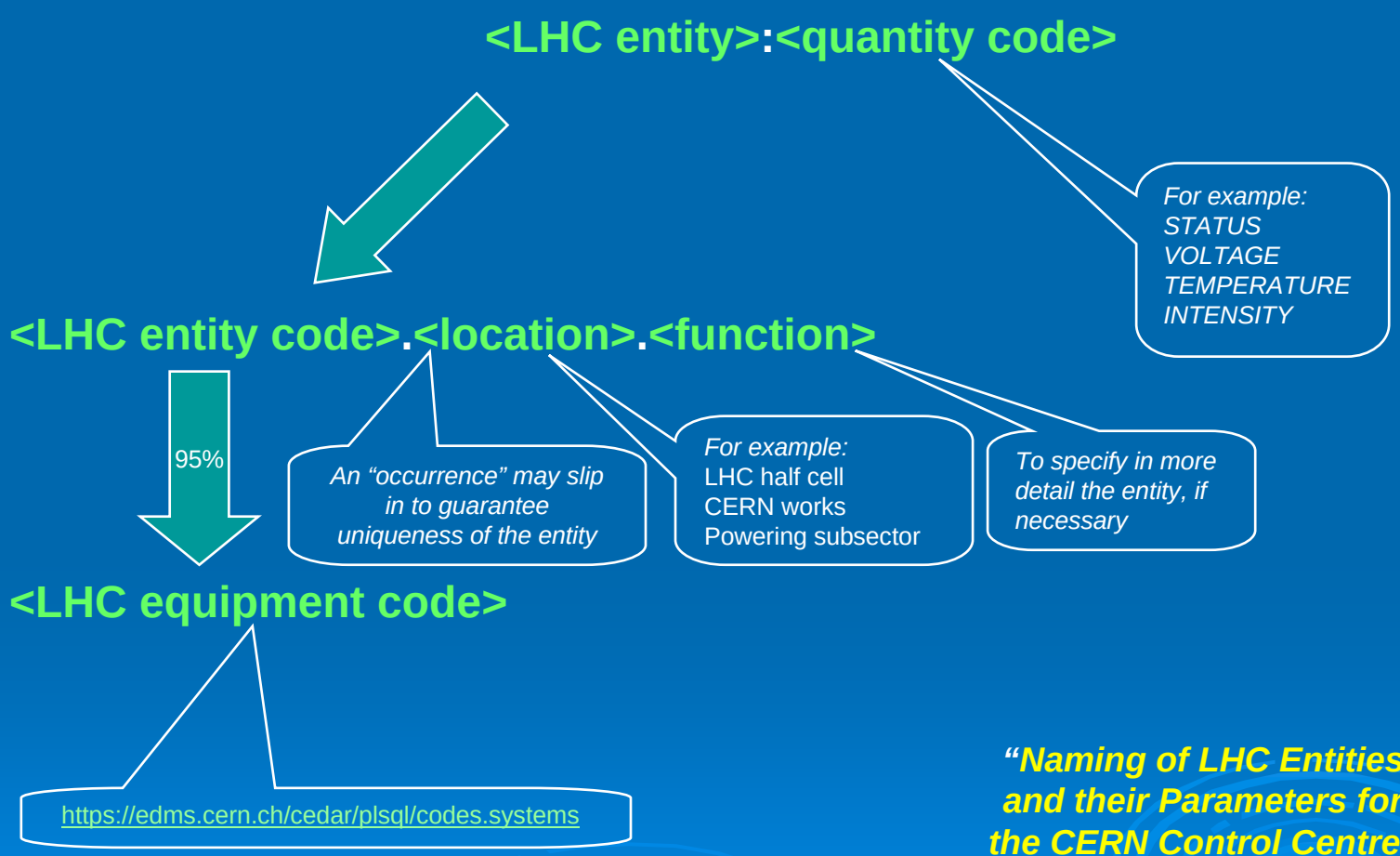
General naming scheme



"Naming of LHC Entities and their Parameters for the CERN Control Centre"
LHC-C-QA-0002
EDMS 473091

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Signal names in practice

Signal	Description	System
MQ.12L3:U_1_EXT	Voltage across first half of MQ.12L3 external aperture	QPS
MB.A8R7:ST_MAGNET_OK	Magnet status (SC or quenched) MB.A8R7	QPS
RCD.A56B2:I_DIDT	Current slope in corrector circuit RCD.A56B2	QPS
DQAMG.UA63.RQ4.L6:ST_FIP	WorldFIP status from controller on circuit RQ4.L6	QPS
DQQDL.A8R7:ST_PWR_PERM	Power permit from quench loop controller DQQDL.A8R7	QPS
RCD.A56B2:ST_ABORT_PIC	Quench status signal received by PIC for circuit RCD.A56B2	PIC
RB.A12.ODD:CMD_ABORT_PIC	Fast abort request issued by PIC for odd side on circuit RB.A12	PIC
CIP.UA63.ML6:ST_SUPPLY_24V_1	Status of the first 24V power supply in CIP.UA63.ML6	PIC
RPTE.UA87.RB.A81:I_REF	Current reference of 13kA power converter on MB circuit	PC
RPTE.UA87.RB.A81:STATE_PLL	Phase-locked loop state of 13 kA power converter on MB circuit	PC
RPLB.UA83.RCOSX3.L8:I_MEAS ⓘ	Measured current of 120A power converter for inner triplet skew octupole corrector circuit	PC
RPMBB.UA83.RQSX3.L8:STATE ⓘ	State of 600A power converter for inner triplet skew quadrupole corrector circuit	PC

ⓘ *Have been logged during hardware commissioning heat runs 2005-2006*

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A different key per data store

PM Server — file system
folder ../RPLB.UA83.COSX3.L8/2006_01...
file pmdata-100Hz.sdds

Logging database — table records
var-name RPLB.UA83.COSX3.L8:I_MEAS
var-id 139162

LASER alarms database — table records
FF FFC_50
FM RPLB.UA83.COSX3.L8
FC 23 (voltage source fault)

Measurement database — table records
var-name RPLB.UA83.COSX3.L8:I_MEAS
var-id 2877

Layout database — table records
slot RPLB.UA83.COSX3.L8
slot-id 322206

MTF — EDMS doc file
slot RPLB.UA83.COSX3.L8
file 24HrsHeatRun_lasse_RPLB.UA83.COSX3.L8@SUB_51@I_MEAS@14_26_00_000@0.sdds

Naming database — *for all accelerators*

Entity codes / Equipment codes
RPLB

→ **Entities**
entity code RPLB
location UA83
function COSX3.L8

→ ***Parameters***
entity RPLB.UA83.COSX3.L8
quantity code I_MEAS
unit ampere
data type numeric

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Naming database

- The naming database has implemented the quality assurance definition rules
- Public portal : http://cern.ch/service-acc-naming
- The naming database can be used as:
  - Centrally maintained equipment code catalogue
  - Dictionary for entity parameters (signals)
  - Preparation of foreseen entities and their parameters
  - Propagation of definitions to other data stores
  - Generation of supervision systems configuration
- Usable for all accelerators
- Currently 150,000+ signals defined

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Data lifetime

- Data stored in the logging database will be kept for the lifetime of LHC
- Policy for keeping PM events (after analysis) has to be defined as well
- The more data there is, the more difficult it will be to analyze
  - 10^7 records/ hour from QPS sector (i.e. a lot of noise)
- Logging database could hold summary information per PM event
- Data definitions may vary over time
  - ☠ Renaming (for whatever reason)
  - ☠ Correcting historical errors (e.g. inversion of power converter cabling
  - ☑ End-user must be confident when retrieving data for analysis
- ⇩ ...Data Management of PM related data risks to get tricky over time

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