DATABASE SCHEME FOR UNIFIED OPERATION OF SACLA/SPRING-8

K.Okada, M.Ishii, N.Hosoda, T.Sugimoto, M.Yamaga, T.Fukui, T.Maruyama, T.Fujiwara, K.Watanabe, H.Sumitomo

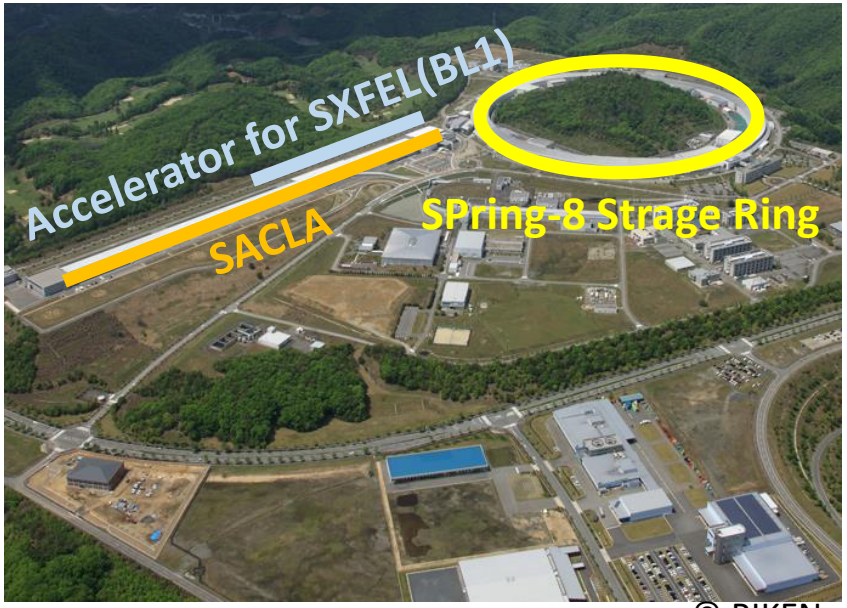
10/10/2017

ICALPCS 2017

Outline

- Background
- A new database scheme
- Transition plan and status
- Summary

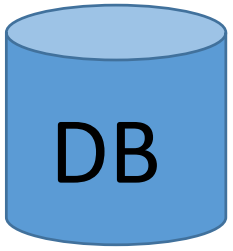
Background



- SPring-8, SACLA, A4SXFEL
- 20 years of operation
- An upgrade project
  (SPring-8-II, early 2020s)
  Use SACLA as an injector to the new SP8 SR.

- We, the control group, decided to overhaul the system.

This talk is about DB.

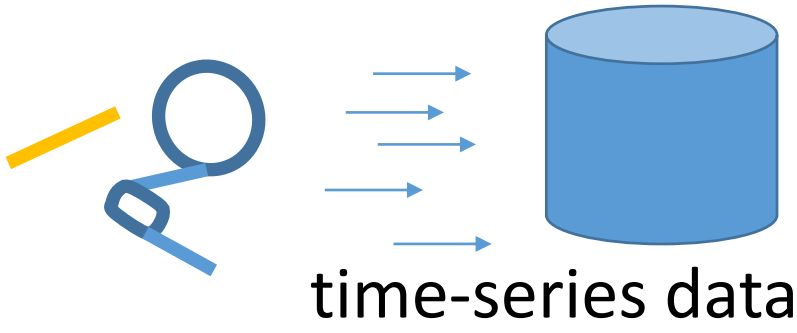


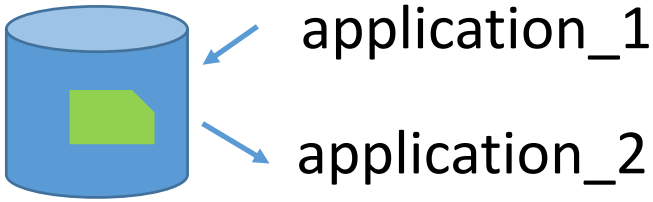
3 roles of database at SPring-8

- Log data
  - time series data

    env, mon, status, etc.
- Parameter set
  - communication between applications
    - operation points, etc.
- ◇ Management

  signal attributes,
  DAQ settings





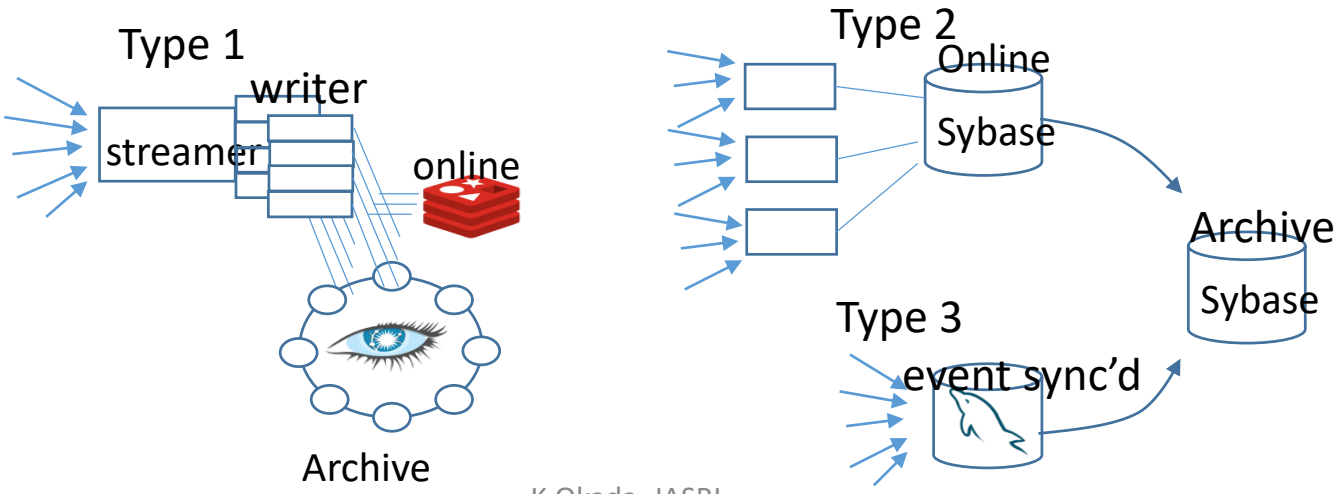
Log database

Current situation: local evolutions

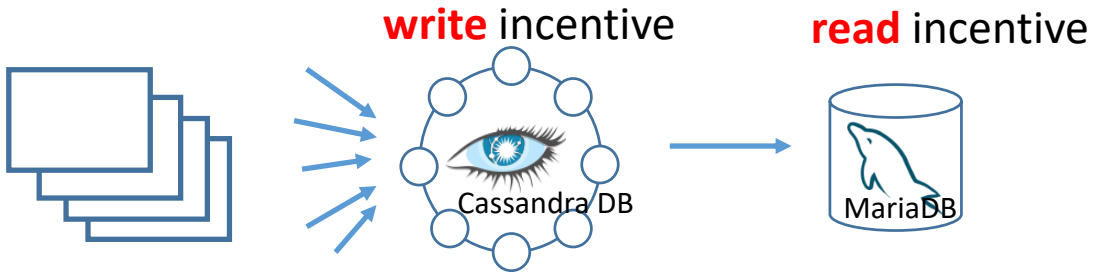
- SPring-8, SACLA, A4SXFEL
  - Type 1,2,3 are in operation.
- Requirements
  - Logging SACLA's 60Hz shot by shot synchronized data
  - Unified system

    for the control from SACLA through the new SR

    for the maintenance cost



New logging scheme

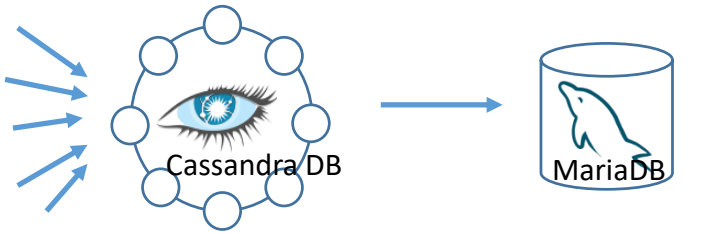


Simple (no intermediate stage)
Treats all kind of data
→ Easy to add data points

A relatively tight connection between frontends and DB

We adopt a policy to limit types of frontend platforms

New logging scheme



Online
First stage

Archive

Cassandra (NoSQL)

First stage storage

key (date+signal_id) & value@time1
key (date+signal_id) & value@time2
key (date+signal_id) & value@time3
…….. ……..

Online/index

key (date+signal_id) & latest value

MariaDB (RDB)

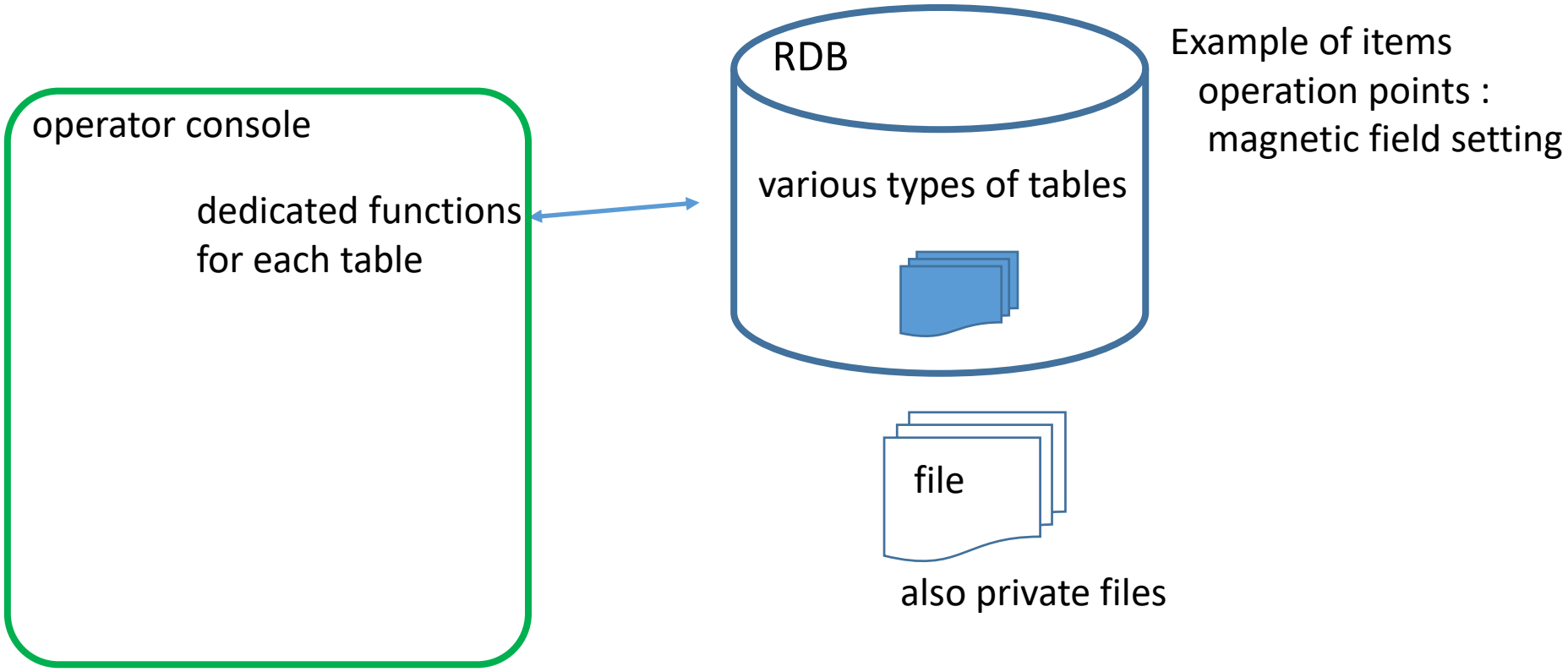
1table/signal

up to 60 data points packed
for data volume and access speed.

t0_1, [[Δt,v], [Δt',v'], [Δt",v"],...]
t0_2, [[Δt,v], [Δt',v'], [Δt",v"],...]
t0_3, [[Δt,v], [Δt',v'], [Δt",v"],...]
....

Parameter set

Current situation (What is wrong)



There had been no effort to formalize the usage.

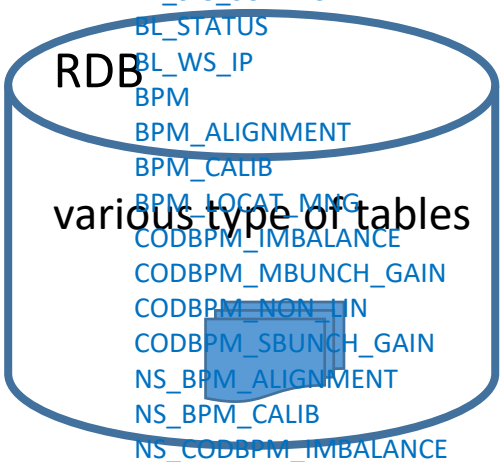
Current situation

db_update_run_curr_ns_fill.c
db_update_run_curr_ns_lnbt.c
db_update_run_curr_ns_lnbt_energy.c
db_update_run_curr_ns_qmag.c
db_update_run_curr_ns_rf.c
db_update_run_curr_ns_rf_eqip.c
db_update_run_curr_ns_sept.c
db_update_run_curr_ns_seq.c
db_update_run_curr_ns_seq_all.c
db_update_run_curr_ns_skew.c
db_update_run_curr_ns_st.c
db_update_run_curr_ns_sx.c
db_update_run_curr_qmag.c
db_update_run_curr_quad.c
db_update_run_curr_rf.c
db_update_run_curr_rf_eqip.c
db_update_run_curr_sept.c
db_update_run_curr_set_hs.c
db_update_run_curr_set_li.c
db_update_run_curr_skew.c
db_update_run_curr_skew_oct.c
db_update_run_curr_skew_sx.c
db_update_run_curr_sp8.c
db_update_run_curr_sr.c
db_update_run_curr_ssbt_q.c
db_update_run_curr_ssbt_st.c
db_update_run_curr_st.c
db_update_run_curr_sx.c
db_update_run_curr_sy.c
db_update_run_curr_sy_mag.c
db_update_run_curr_sy_mon.c
db_update_run_curr_sy_rf.c
db_update_run_curr_sy_tmg.c
db_update_run_mode_run_time.c
db_update_run_proc_mng.c
db_update_run_proc_mng_now.c
db_update_run_proc_mng_ut.c
db_update_spa_run_curr_set.c
db_update_spbpm_imbalance.c
db_update_sr_injection_time.c

db_get_run_mode_maxid.c
db_get_run_mode_name.c
db_get_run_proc_host.c
db_get_run_proc_mng.c
db_get_run_set_bmag.c
db_get_run_set_bump.c
db_get_run_set_bump_tilt.c
db_get_run_set_by_id.c
db_get_run_set_fill.c
db_get_run_set_li.c
db_get_run_set_ns.c
db_get_run_set_ns_fill.c
db_get_run_set_ns_seq.c
db_get_run_set_qmag.c
db_get_run_set_quad.c
db_get_run_set_rf.c
db_get_run_set_rf_eqip.c
db_get_run_set_sept.c
db_get_run_set_skew.c
db_get_run_set_skew_oct.c
db_get_run_set_skew_sx.c
db_get_run_set_sp8.c
db_get_run_set_sr.c
db_get_run_set_ssbt_q.c
db_get_run_set_ssbt_st.c
db_get_run_set_st.c
db_get_run_set_sx.c
db_get_run_set_sy.c
db_get_run_set_table_type.c
db_get_spa_run_curr_set.c
db_get_spa_run_set.c
db_get_spbpm_delay_comm.c
db_get_spbpm_delay_machine.c
db_get_spbpm_gain.c
db_get_spbpm_imbalance.c
db_get_spbpm_non_lin.c
db_get_sr_injection_time.c
db_get_station.c
db_get_sub_grp_id_by_name.c
db_get_sub_grp_inf.c

operator console

dedicated functions for each table



BL_MNG
BL_SIG_HISTORY
BL_SIG_SCHEDULE
BL_STATUS
BL_WS_IP
BPM
BPM_ALIGNMENT
BPM_CALIB
BPM_LOCAT_MNG
CODBPM_IMBALANCE
CODBPM_MBUNCH_GAIN
CODBPM_NON_LIN
CODBPM_SBUNCH_GAIN
NS_BPM_ALIGNMENT
NS_BPM_CALIB
NS_CODBPM_IMBALANCE
NS_CODBPM_MBUNCH_GAIN
NS_CODBPM_NON_LIN
NS_CODBPM_SBUNCH_GAIN
FILLING_PATTERN
INTLK_BIT_INF
INTLK_CODE
KLY
LI_BPM_EQIP
LI_BPM_INF
LI_MOD_FIRST_INTLK
LI_MOD_H0H1_FIRST_INTLK
LI_MOD_M18_FIRST_INTLK
LIL3_PM_EQIP
LNBT_ENERGY
MAG_COEFF
MAG_LOCAT_MNG
MAG_PS_MNG
MAG_ID_ATTR
NS_INJECTION_TIME
NS_MAG_LOCAT_MNG

also private files

Example of items
magnet field setting
conversion factor
alignment

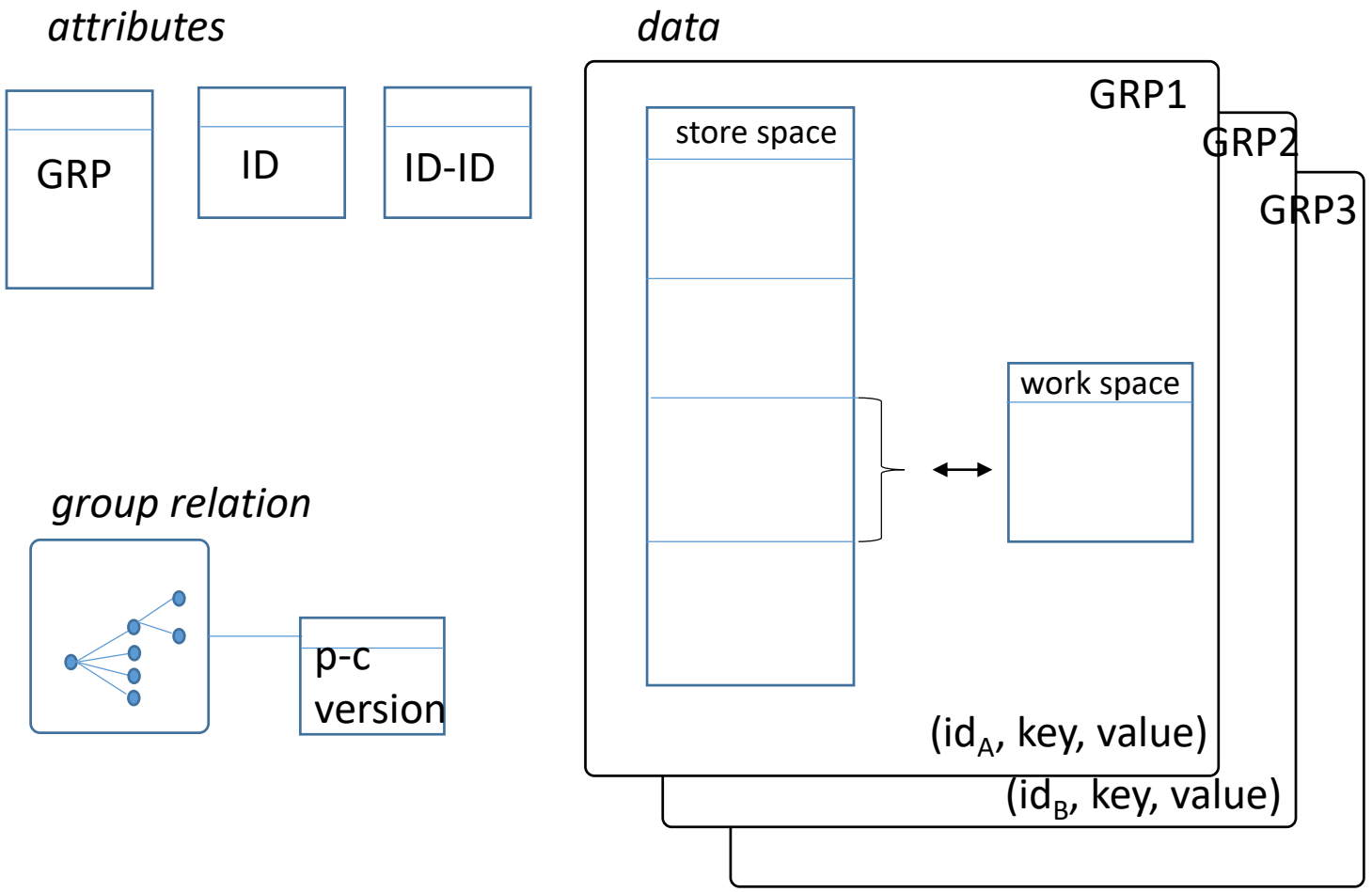
BMAG_RUN_SET
QMAG_RUN_SET
SKEW_OCT_RUN_SET
SKEW_RUN_SET
SKEW_SX_RUN_SET
ST_RUN_SET
SX_RUN_SET
NS_BMAG_RUN_SET
NS_LNBT_RUN_SET
NS_SEPT_RUN_SET
LI_BS_RUN_SET
LI_MAG_RUN_SET
LI_RF_RUN_SET
LI_RUN_SET
NS_RUN_SET
SP8_RUN_SET
SPA_RUN_SET
SR_RUN_SET
SY_MAG_RUN_SET
SY_MON_RUN_SET
SY_RF_RUN_SET
SY_RUN_SET
SY_TMG_RUN_SET
LI_BS_SHUTTER_RUN_SET
LI_DELAY_RUN_SET
LI_TMG_RUN_SET
FILL_RUN_SET
NS_FILL_RUN_SET
LI_BM_H1_RUN_SET
LI_BM_L1BT_RUN_SET
LI_BM_L3BT_RUN_SET
LI_BM_LSBT_RUN_SET
LI_BM_M20_RUN_SET
LI_BS_IRIS_RUN_SET
LI_BS_SLIT_RUN_SET
LI_GUN_RUN_SET

There had been no effort to formalize the usage

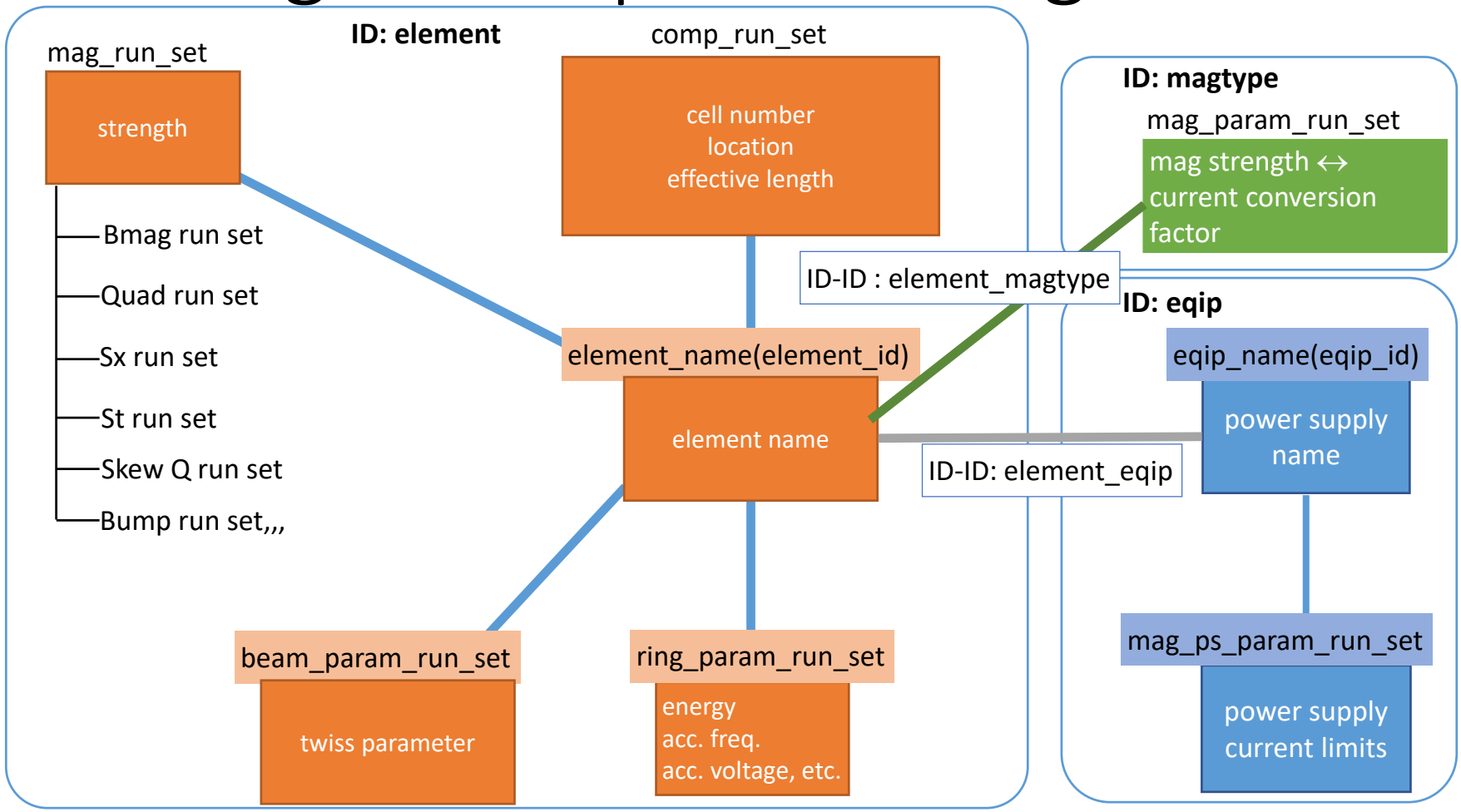
Requirements are simple

- group (= a set of values in a same category)
- store a set of values with the version#
- parent and child groups (e.g. magnet, vacuum)
- access to ID# and relation between ID's

Design of RDB tables and access functions



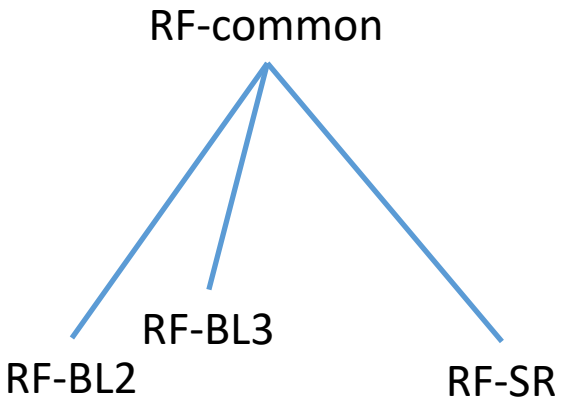
Redesign example : SR magnet

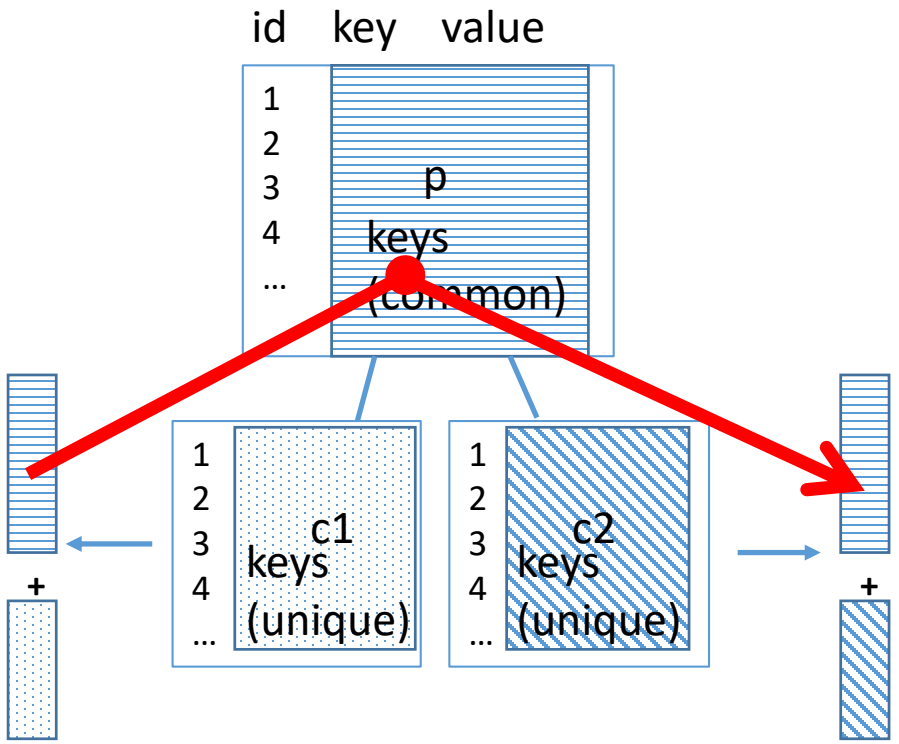


A new feature : inheritance

SACLA delivers electrons to XFEL-BLs and SR.
Shot by shot switching operation

RF operation parameters



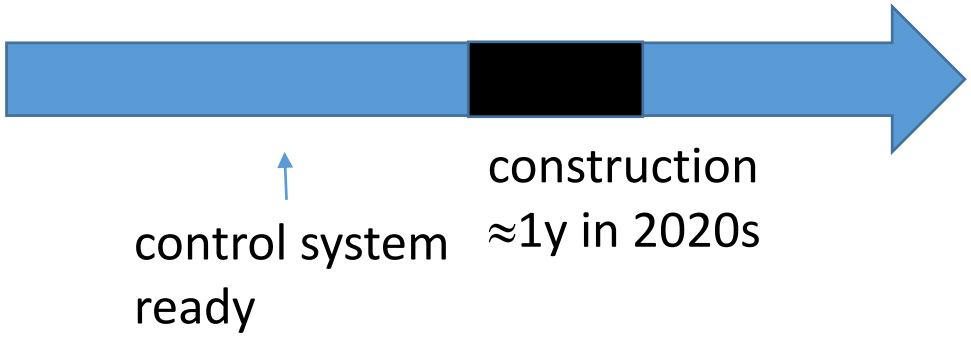


Changes applied to “c1” are properly inherited to “c2”.

Transition plan

Transition plan

- Since it is a running facility, the blackout period should be minimized.

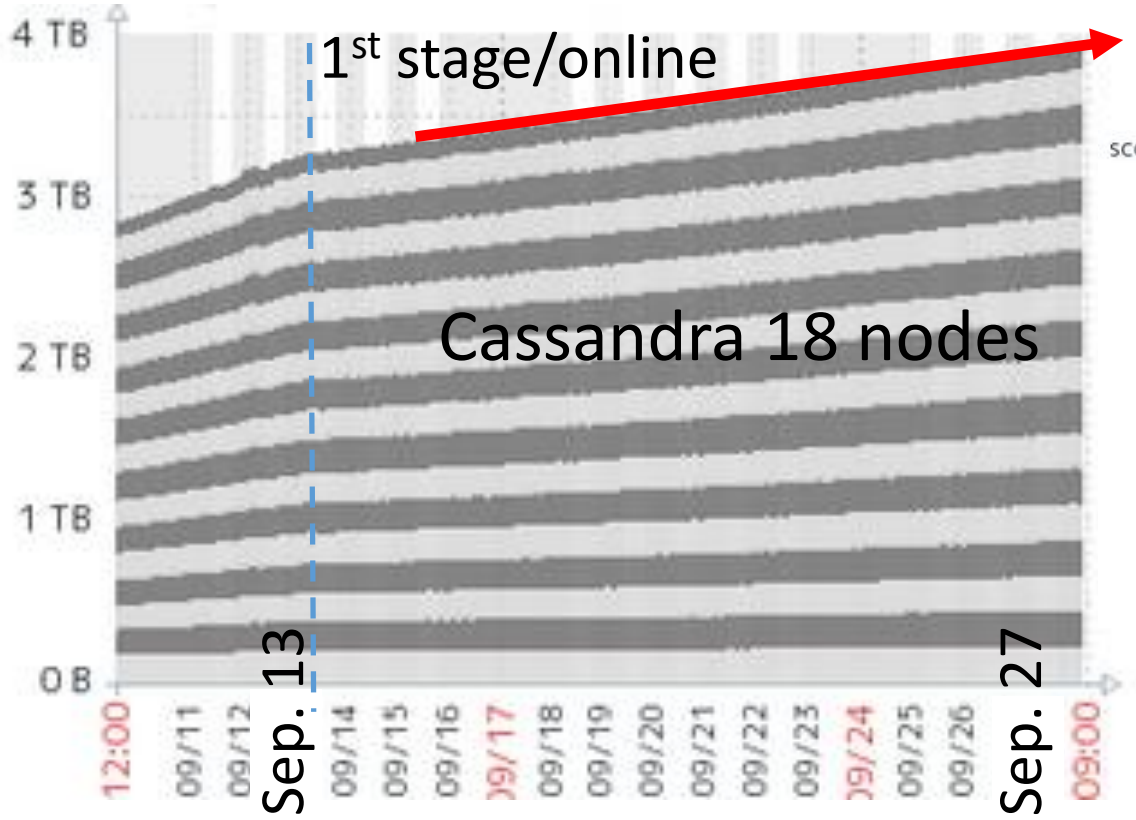


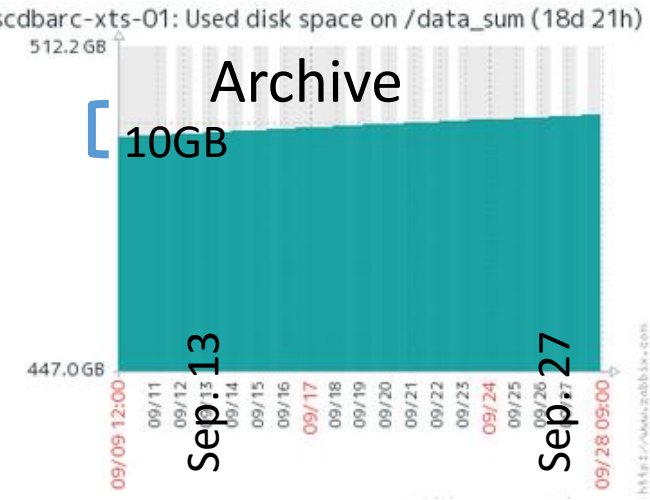
- We started the transition this summer with A4SXFEL. It is independent and a relatively small system.

Status of A4SXFEL system

It operates well under the new data logging scheme and applications.

log data accumulation monitor





Summary

- SPring-8-II upgrade in the early 2020s.
  Planning SACLA/SPring-8 unified operation.
- overhaul the control system
- new database scheme is shown
  - ➢ log database
  - ➢ parameter set
  - management
- 2017 summer, transition of A4SXFEL went smoothly
- working for SPring-8 SR, SACLA

- See also Dr. Fukui's presentation on Friday (FRAPL03) for the overview of the new control system.