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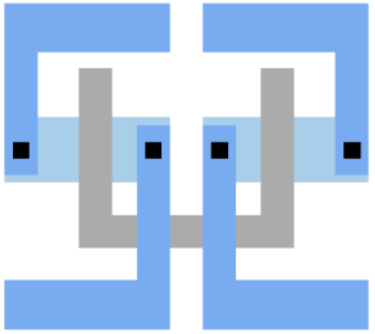
PXD Slow Control
Phase 2 / Phase 3 / PXD 2020



Michael Ritzert

michael.ritzert@ziti.uni-heidelberg.de

Belle II PXD Workshop

DESY

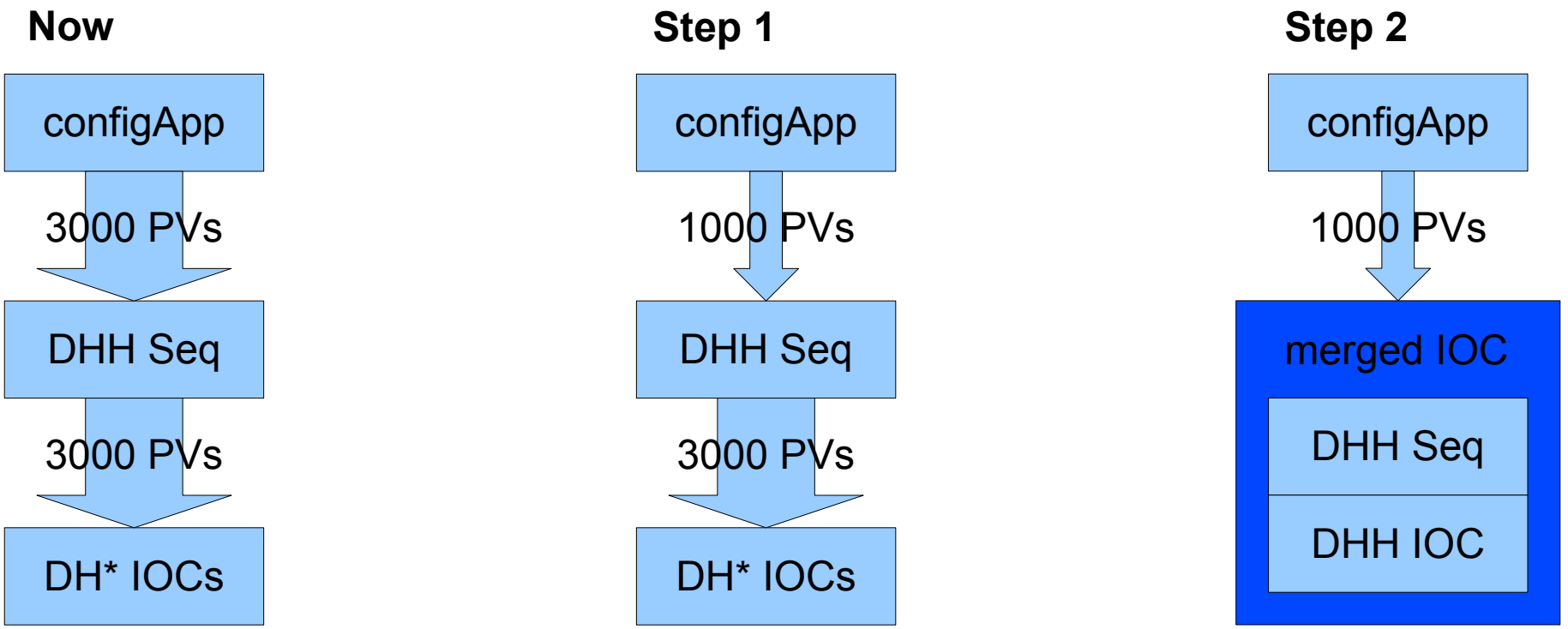
08.10.2018

Phase 3

configApp Overload

- Recent observation: With 20 modules, the DHH Sequence overloads the system, especially the configApp.
- I haven't had the possibility to debug in detail, but the evidence I've seen so far:
  - It happens during the operation of the DHH sequence.
  - A long time to establish PV connections is part of the problem.
  - The commit is huge (68k PVs), partly due to inefficient storage of booleans (dcdmask, pixel).
- Possible „fast“ changes in this area.
  - Reduce the number of PVs by ~60% overall:
    256 values in one blob (CDATA), instead of 256 individual PVs.
    (Provide tools to update commits, prepare and edit new commits.)
  - Move the PV connection out of the critical path.
- Improvements in other areas, as the problem is analyzed further.
  - The configApp doesn't have much room for improvements:
    All actual application logic is provided by EPICS.

First Change: Reduce the Number of PV Connections



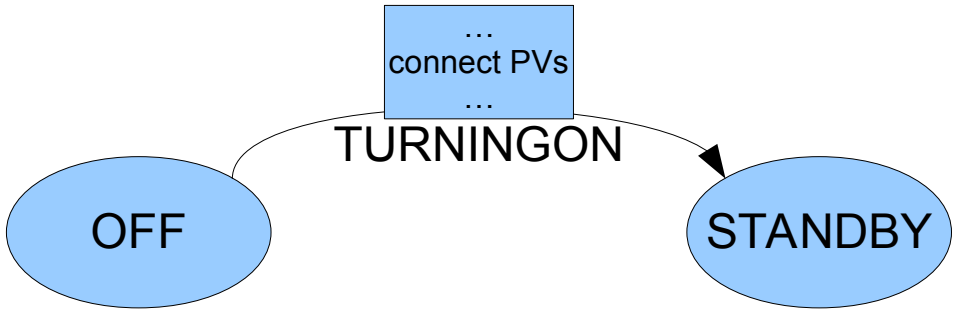
If PV connections towards the DHH IOC are also a problem, the sequence for one DHH can be merged with the corresponding IOC.

- Just build the sequence as a library instead of an executable.
- Assumes that we can run several DH* IOCs as one.

⇒ These PV connections are now no longer established over the IP network.

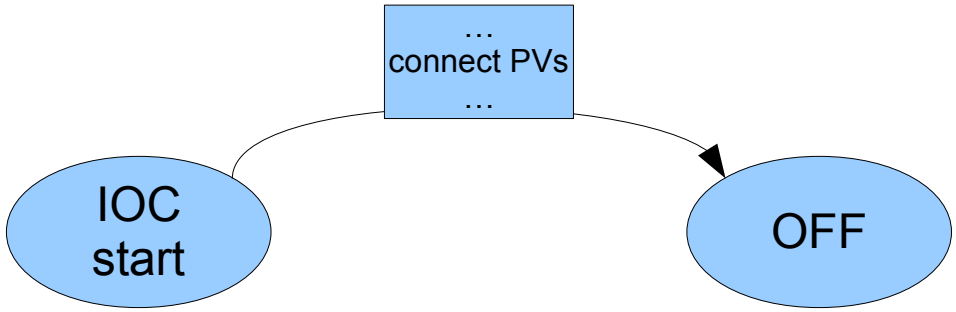
Second, Orthogonal Direction of Improvements: Timing of PV connections

Now



PVs are only connected during TURNINGON state.
⇒ All sequences connect at the same time.
⇒ PV connection happens on the critical path.

Early Connect



Connect all PVs as soon as the IOC starts.
⇒ Take the required configuration (ASIC types, …) from st.cmd.
⇒ We can spread out the load by starting the IOCs one by one, if required.

Who, When, Where

- **Who**: Harrison and me.
- **When:** ASAP
- **Where:** Requires a test setup with full DHH + module.
  - With the test setup at Göttingen? 1 module + DHE.
  - With the DAQ test setup at KEK?
    ⇒ Needs another new network to be able to reconnect the commissioning system to the b2epics network.
  - With the new setup here at DESY?
- **Next:** Evaluate with the full system at KEK.
  The ideal result would be:
  - Moving the PV connections earlier already solves the problem.
  - Reducing the PV count by 60% gives us the factor of two we will go up again when going to 40 modules.

RC / PSC Improvements

- Support recovering from OFF via global PS control.
  - Last missing piece towards full shifter-less operation.
  - What's missing?
  - (Note: This transition should happen very infrequently.)

- Proposal: Go to TRIP if a single module fails.
  - Currently: ERROR ⇒ full abort.
  - TRIP should allow the run to continue and recovery of the failed module.
  - Related: Do we need to mark the HV status in the data?

(Still) GUI

- Progress on the GUI side, but mostly orthogonal to the direction of a shifter-friendly GUI:
  - Still all expert-level OPIs.
  - No integration between subsystems.

- We need a working group for GUI development.
  - Not too many members:
    - 1 or 2 module experts,
    - 1 or 2 DAQ experts,
    - 1 or 2 CSS experts.
  - Goal: Increase the abstraction layer of the OPIs.

Archiver

- 20 modules are a nice intermediate step.
  - Estimating the load for 40 modules from the load for 20 modules gives a lot smaller error than from 4 modules as before.
    ⇒ We can plan with less security margin.

- Trying to find the right size of the server to buy.
  ⇒ Running with 20 modules on the „small“ IOC server (pxdgw2) to study where the bottlenecks are (CPU? RAM? HD?). So far it looks good.

- Procurement of a suitably sized server planned in time for phase 3 start.

Immediate Next Steps

- Deactivate the DAQ test setup after use.
  - Revert the network configuration to the standard one (i.e. PXD SC over b2epics).
  - Deactivate pxdtest11 as an IOC server.
  - Or will the setup continue to be in use? How?

- Install new PS firmware for more precise bulk current measurement?