Minutes of the ITS DCS workshop – CERN, 19/20 March 2019 – P. Martinengo

Version 1: w.r.t. v0 added Ivan's comment

The present layout foresees 8 FLP (today, March 28, I learnt from F. Costa that the option to have 12 is still on the table, pending final qualification of the FLP); "natural" allocation seems to be 2 FLP for the IB, 2.25 for ML, 3.75 OB. From a DCS point of view, different mappings would also be fine and changing at a later stage would not have major impact on the system nor require huge work.
Also mixing IB/ML/OB in the same FLP or CRU is fine.
Remark: the IB FLP would deal with 216 chips, the OB one with 4704, i.e. the number of values to be monitored will be highly unbalanced.

Present baseline architecture has 1 ALF/FLP, 1 FRED connected to 8 ALF, 1 WinCC server.
Different configuration, for instance 3 ALF/FLP, i.e. 1 ALF/CRU is also possible, not clear the impact on performance and whether needed. Multiple instances of FRED, for instance 1 FRED/ALF, can run concurrently on the same server. More interesting is probably the possibility to have more than 1 server running FRED to provide extra computing power if required.
One ALF can also connect to more than one FRED.
Changes in the configuration are almost transparent, i.e. we do not have to decide now.
Servers will be provided by central DCS, i.e. ITS does not have to pay for them.

ALPIDE has 21 quantities which can be monitored via built-in ADC plus several registers/counters (60 ?) which potentially could be monitored. Monitoring all of them at the same time would lead to 24000 chips x 80 parameters = ~ 2M parameters to be acquired/monitored. Extra parameters are T, V, I from the RU and PB, pt100 from the staves but they are of the order of thousand.
For comparison, the whole ALICE in RUN2 had 1 M. Archiving/retrieving would also be nearly impossible.
However not all quantities need monitoring at the same rate and at the same time, if we assume 5/chip we have 24000 x 5 = 120K parameters to monitor at a frequency of ~ Hz, with the "5" changing over time. The IB ALF would read 216 x 5 = 1080/sec values, the OB one 4704 x 5 = 23520/sec. This makes more complex the monitoring task implemented in the RU FW but in term of performance of ALF looks like still fine. Pull mechanism for the transfer of the data from the RU to ALF was adopted as baseline. Push is not excluded but put on hold.

We had separate discussion on the registers to be monitored from the RU itself: the full set would be ~ 100/RU but only a handful will be required during data taking, still the possibility to read all of them for debugging purposes has to be provided. The use of this information was discussed; QC seems the natural place where to monitor. Attaching those registers to the payload event-by-event could have a large impact on the data size, especially in pp when events will be mostly empty. An option would be to attach at the payload at fixed rate, for instance every 10^5 events. However it would require major modification of the firmware. It was agreed that event-by-event is not required.
We agreed on reading the registers via DCS as the other monitored parameters, i.e. by pulling. Not yet clear where, by whom and how this information will be used: the registers/counters will provide information about the status of the read-out, natural place seems to be QC (old DQM) but then we need to find a mechanism to ship data to QC. After the workshop I checked with Vasco, a communication channel between DCS and QC is not foreseen at present but can be considered.
Second option would be to use the DCS FLP (DCS will have its own FLP, not clear to me the use) but it looks like a rather twisted idea: we would read the parameters via the detector ITS, strip them, inject them in the DCS FLP such that they can reach QC. Archiving may also be a problem as potentially the number of parameters to be archived by the ITS alone after LS2 can exceed the total numbers for

ALICE in RUN2 (see Peter presentation). While smoothing, i.e. averaging, can help with analog quantities it would not with counters. Most likely FRED/QC will have to decide whether it is worth to store the information or not and possibly compress it. Increase in the stored number of parameters will also slow down retrieving them from DB.
How to exploit the information is also unclear: offline, i.e. warning detector expert or real time, i.e. requesting DCS and/or DAQ to take action ?
We agreed that further discussion with O2 is needed as well as clarification in the project.

If correlation among RU and/or with data is needed then latching of the registers in mirror registers is needed. (I can't remember whether this is already available in the present fw or it can/will be implemented).

The simulation of the sequencer to run monitoring tasks in the RU is well advanced, test will start soon. Both HW and SW is already available in Bergen but support will be needed for ALF FRED.
It is also needed to provide a test bench in Kosice, ARIA board available, missing RU, PB and stave.

Programming of PA3 needs some optimization as at present requires ~ 20 min.
Expert interface seems to be needed in the SCADA as access to the FLP will be restricted (forbidden ?) during data taking. Similar issue with RU; DCS has to provide also debugging capabilities concurrently with data taking (w/o interfering with it, of course)?

FW to control CANbus available, requires test with multiple RU + long cable.

The status and functionality of the present implementation of ALF FRED was presented.
W.r.t. previous version MAPI was added; performance agreement was found between measurements, both in Bergen and CERN, and Matteo's theoretical prediction.
Extra features, like recursion, were proposed and will be included in the next release.

Preparation for the commissioning of a large number of RU (O(10)) in 167 was discussed: a crate, with cooling lines, is already available. Power cables have to be finalized in the next couple of weeks. The RUs will be connected to a CRU in the FLP which is not used at present and controlled via FRED and/or WinCC.
Moving the CRU to the second FLP available in 167 (which is not used at present) does not seem to help and indeed would introduce some extra overhead. The second FLP will be equipped with the next batch of CRUs.

<u>Meeting on 22/03/2019 in Paolo's office: Jo, Ivan, Matteo, Paolo</u>
Python cannot be abandoned on the short term because the test bench for validation of the fw (including simulation) is based on it. Porting to C++ is foreseen but it is a project on its own and manpower has not yet been allocated to it. Jo needs functionality that a compiled language cannot provide, at least not in a natural way as a scripted one.
In the coming months Python and C++ has to coexist.
Present DAQ test functionality is being ported to FRED and its suitability as development/debugging framework will be assessed as soon as available.