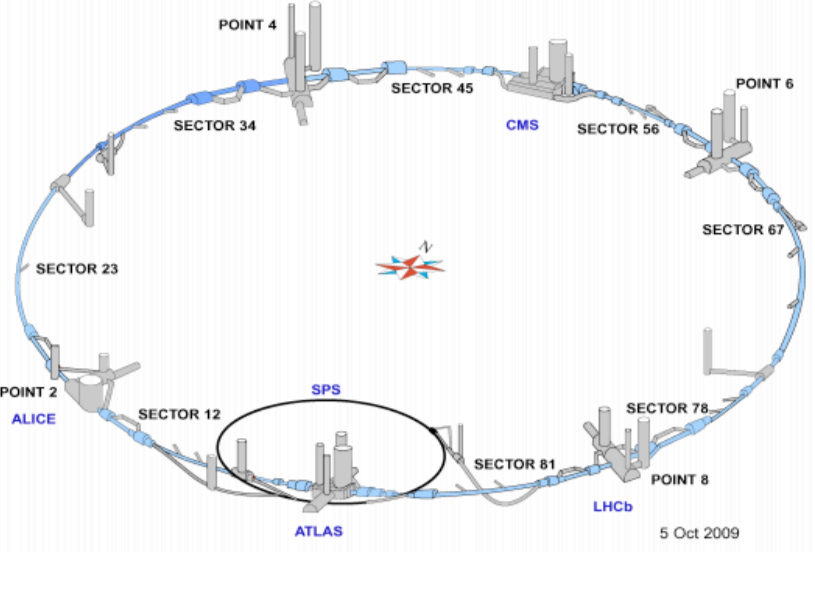


A Rapid Application Development Framework used for LHC Hardware Commissioning tools and other accelerator related applications

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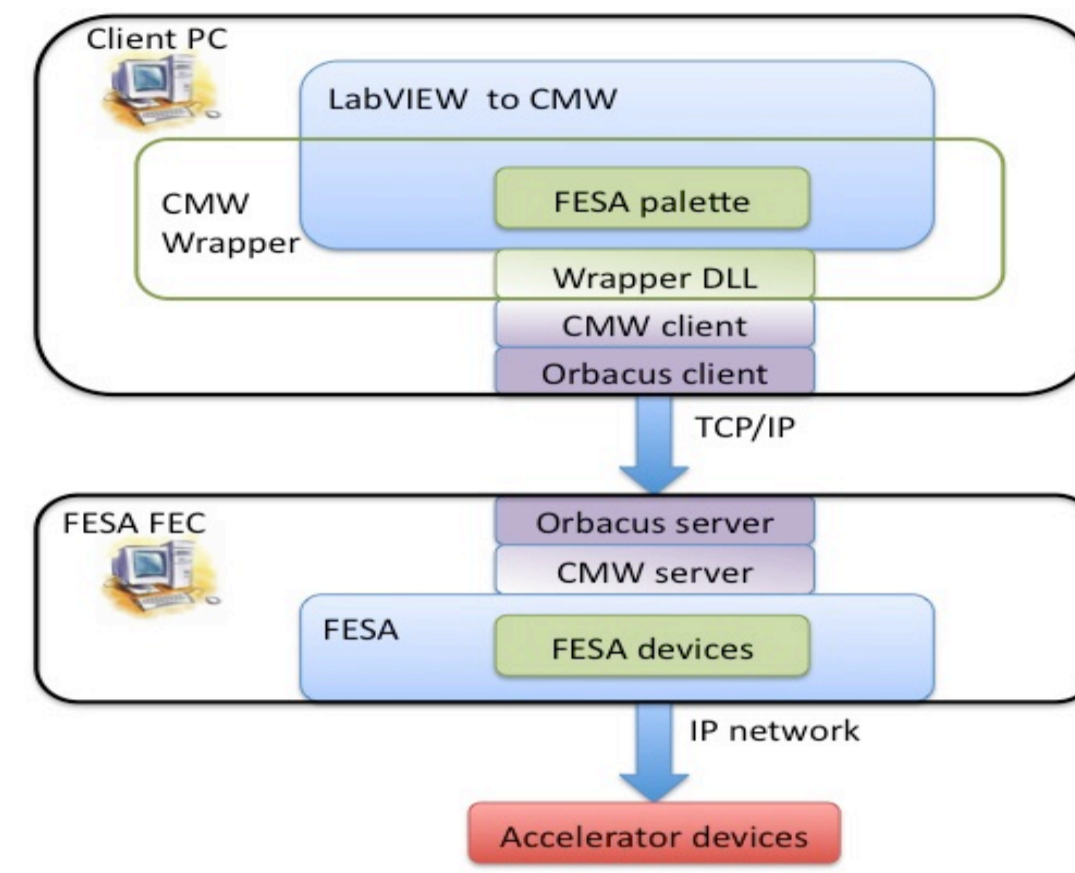
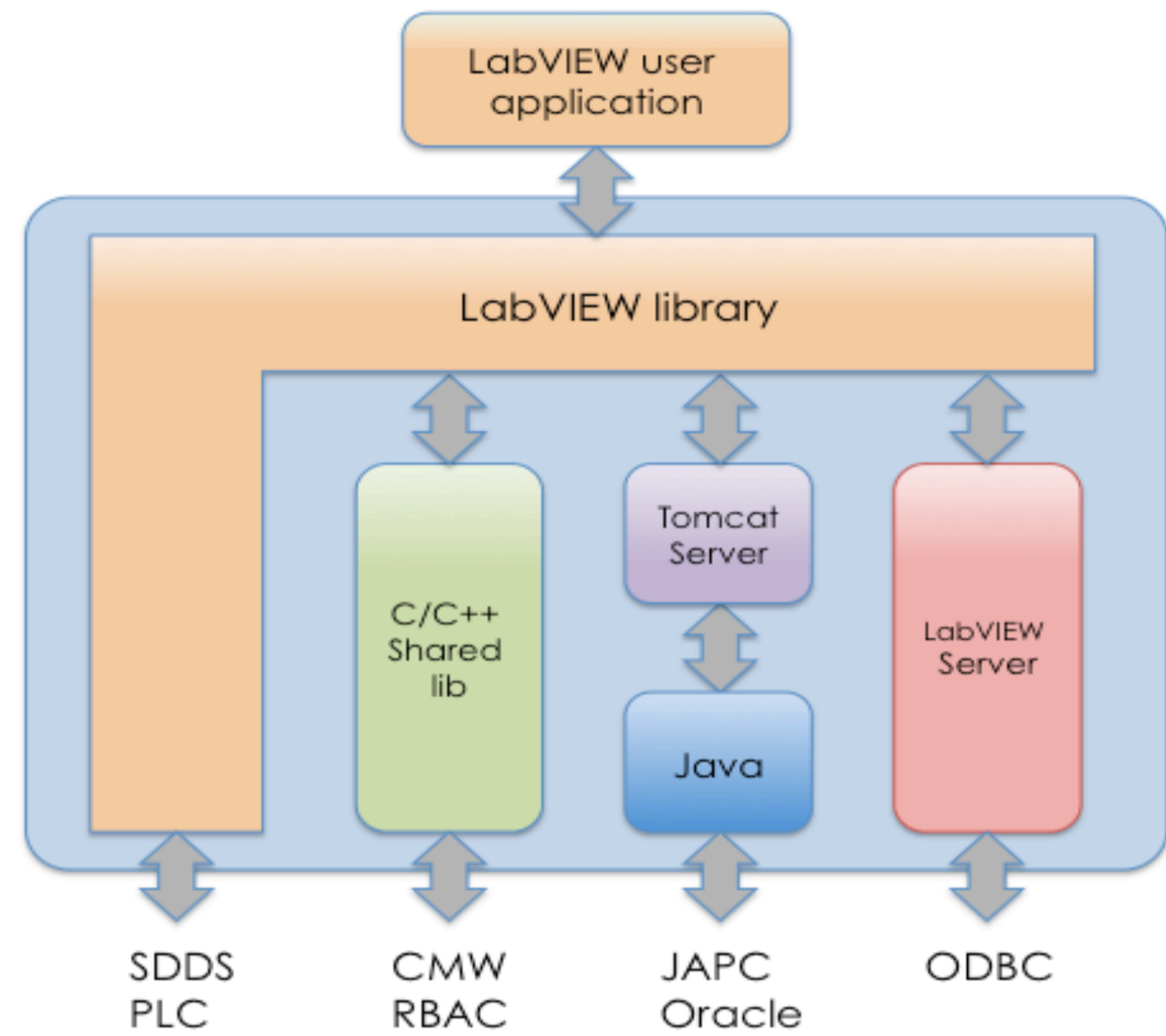
LHC HARDWARE COMMISSIONING FEATURES

- ❖ 1232 superconducting dipole magnets operating at 1.9K and more than 8000 other superconducting magnets
- ❖ More than 1600 circuits needs to be validated and more than 10 tests per circuit
- ❖ A current of 11850A flows in the dipoles, to create the 8.33T magnetic field required to bend the 7TeV beam around the 27km ring of the LHC
- ❖ Operating the machine requires powerful diagnostics to trace back the origin of power and beam related problems
- ❖ These tools was developed using a Rapid Application Development Framework based on LabVIEW™, because it was the most suited to fulfil the requirements of flexibility, adaptability, quality, integration into the LHC accelerator control software and light maintenance



RADE

The Rapid Application Development Environment is based on LabVIEW™ and is targeting test and development applications. RADE makes use of several communication layers, to adapt and interface to the systems and the protocols used in the CERN accelerator control environment.

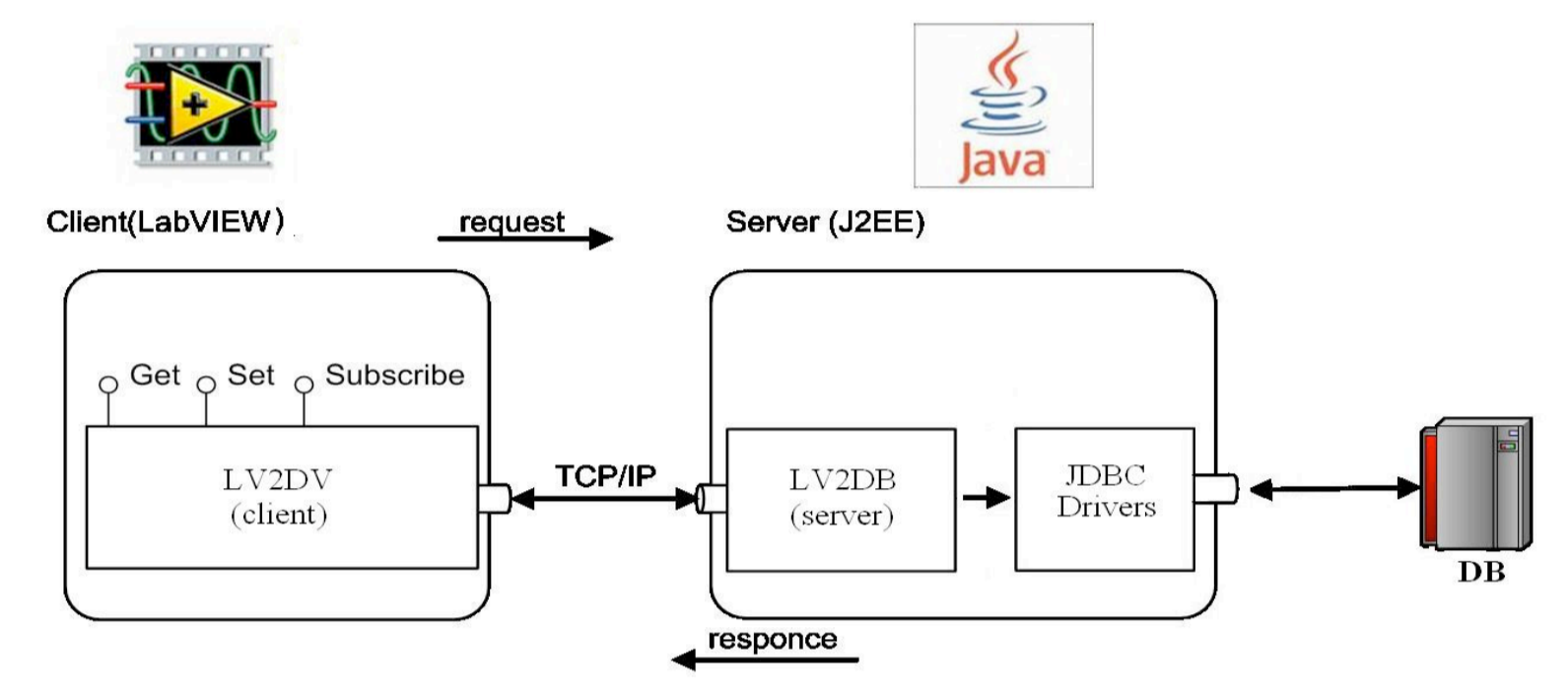


CMW wrapper
The Common MiddleWare is based on the Remote Device Access (RDA) client package to access accelerator Front End Computers (FESA FEC). We implemented the LabVIEW™ to CMW interface in the form of a wrapper to the library.

PLC library
The communication to the PLC is written in standard LabVIEW™ using the "Fetch-Write" protocol from Siemens™.

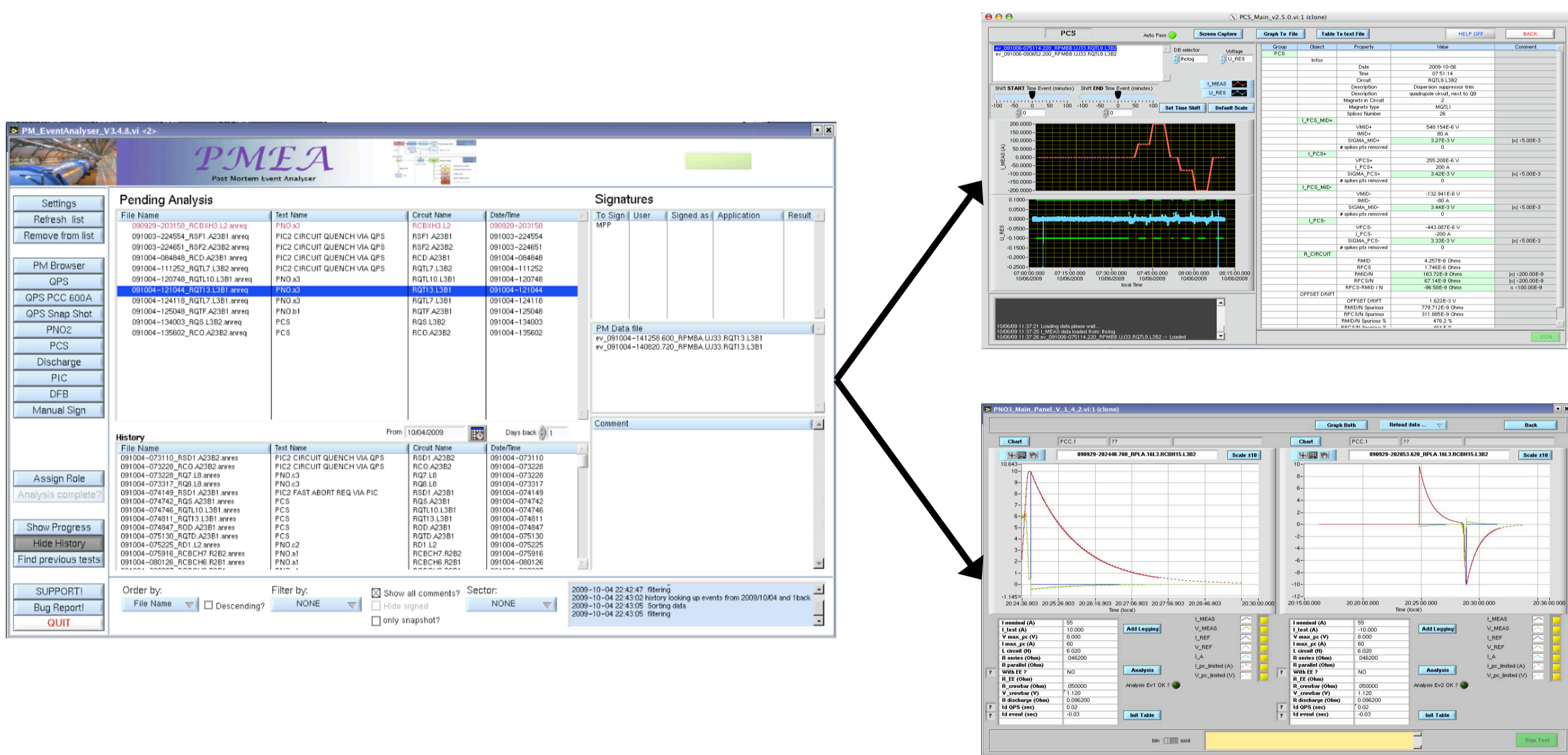
SDDS library
Self Described Data Set file format is commonly used at CERN. The SDDS library in RADE was implemented in pure LabVIEW™.

JAPC interface
JAPC is a communication layer to control accelerator devices using JAVA. We have implemented a LabVIEW™ to JAPC interface via a Tomcat server.



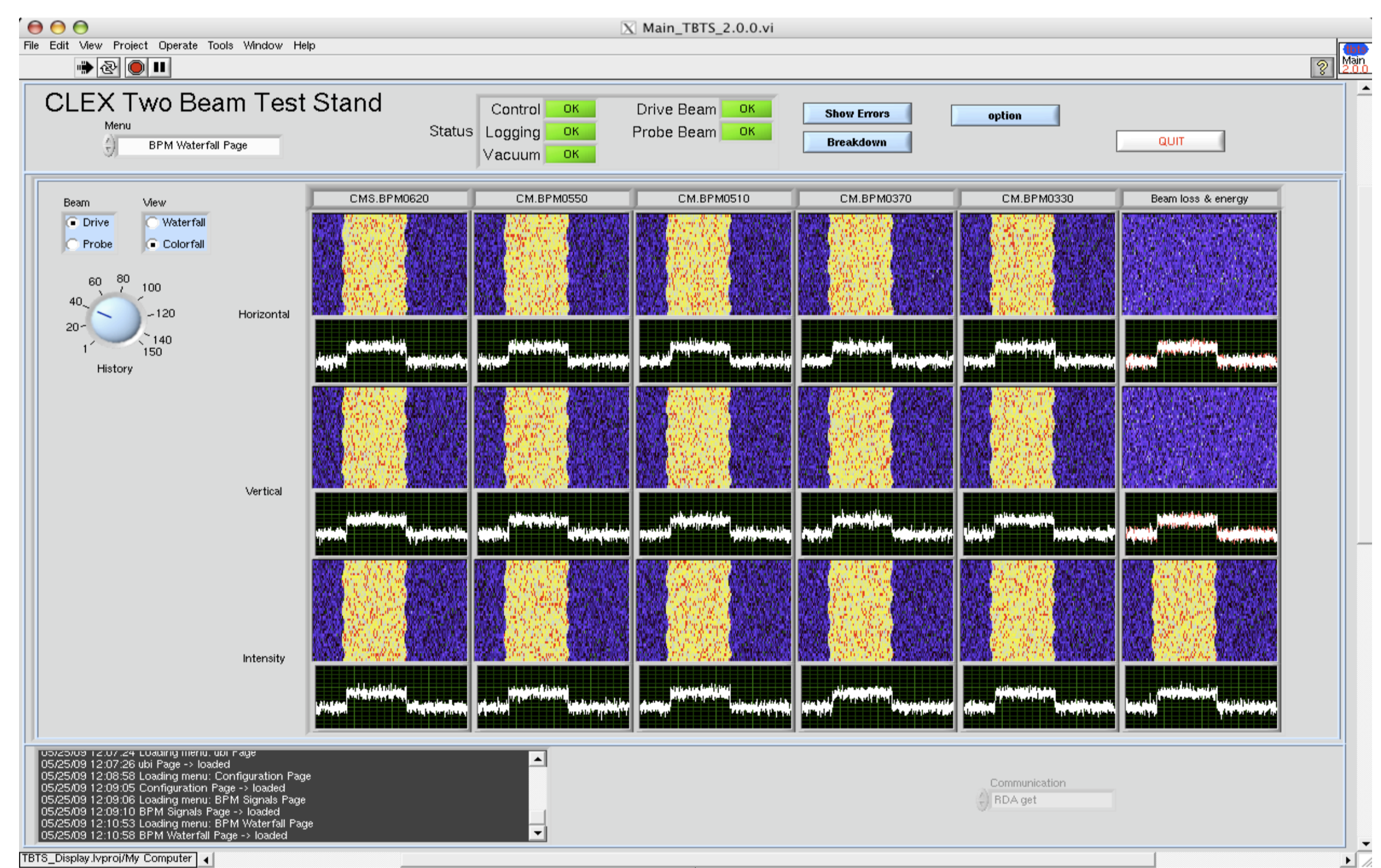
RADE FOR THE LHC HARDWARE COMMISSIONING

The Post-Mortem Analysis tool, developed on RADE, performs the data analysis during the Hardware Commissioning. The collected data is presented in the Event Analyser; it carries-out the analysis particular to each circuit type, by presenting the data extracted from the SDDS files and from the ORACLE™ database to the operator.



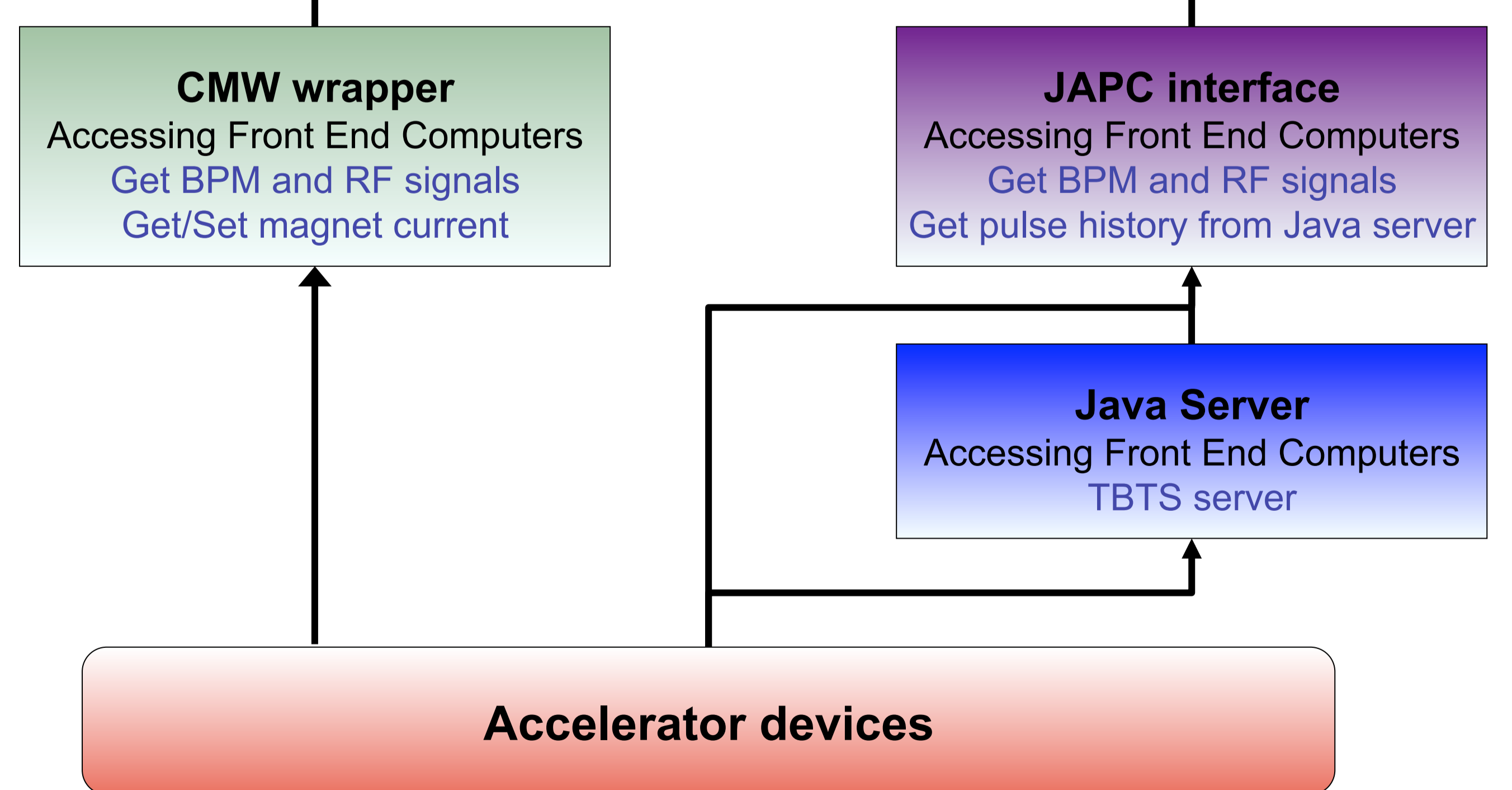
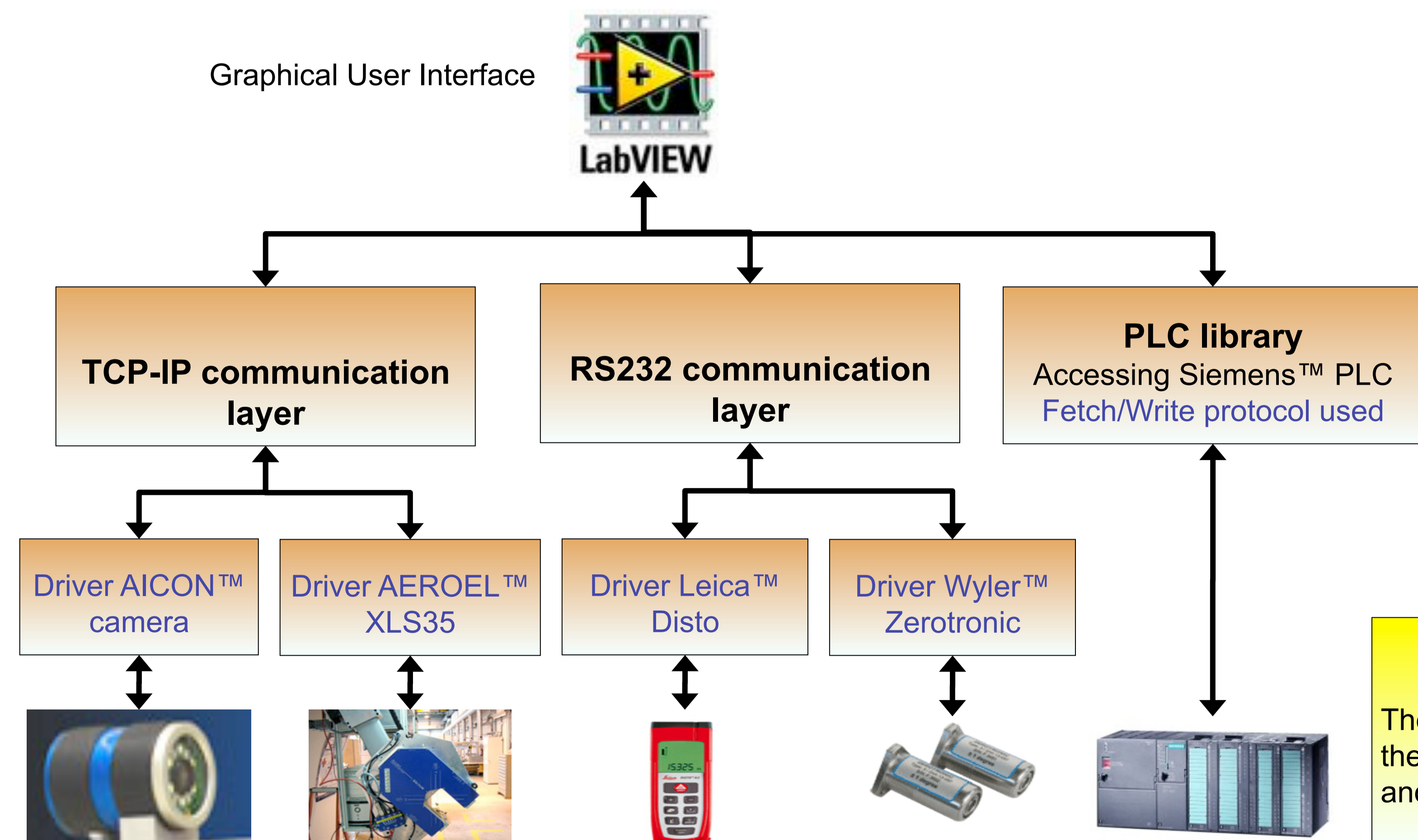
RADE FOR TWO-BEAM TEST STAND

The Two-Beam Test Stand (TBTS) in the CLIC experimental hall (CLEX) aims at testing the two-beam acceleration scheme for CLIC, the CERN Linear Collider. Below is one of the available views where BPMs intensity history have been plotted in time, choosing the color to emphasis the contrast.



RADE FOR MULTI-ALIGNMENT CONTROL SYSTEM

MACS is a remotely controlled survey system to verify the alignment of the LHC collimators. The whole system has been installed on a train, controlled by a Siemens™ PLC, attached to a monorail and can be remote controlled by operators outside the LHC tunnel.



CONCLUSIONS

The described applications show that RADE is efficient and flexible with a good integration into the CERN accelerator control infrastructure. RADE is a basis to be extended to other interfaces and protocols, like DIP (Data Interchange Protocol), accelerator timing and alarms.