Development Status of the TPS Control System

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Abstract

The EPICS was chosen as control system framework for the new project of 3 GeV synchrotron light source (Taiwan Photon Source, TPS). The standard hardware and software components had been defined, and the various IOCs (Input Output Controller) are gradually implemented as various subsystems control platforms. The subsystems control interfaces include event based timing system, Ethernet based power supply control, corrector power supply control, PLC based pulse magnet power supply control and machine protection system, insertion devices motion control system, various diagnostics, and etc. Development of the infrastructure of high level and low level software are on-going. Installation and integration test are in proceeding. Progress will be summarized in the paper.

TPS Project

Control System Framework

Equipment Interface Layer

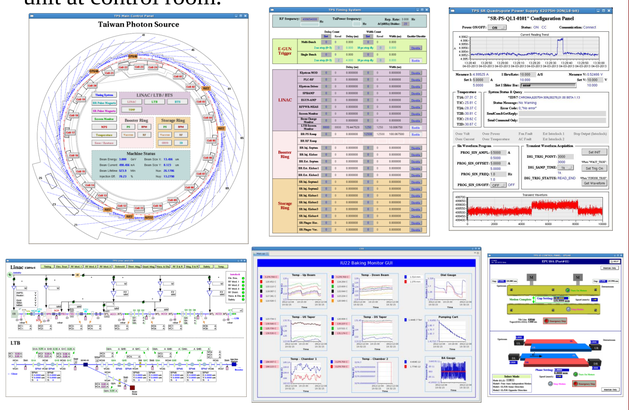
- Most of the devices and equipments will connect to cPCI IOCs crates running EPICS directly.
- The cPCI EPICS IOC could be equipped
  - ADLINK cPCI-6510 CPU module.
  - The 128 bits DI/DO module will be used for BI, BO solution.
  - ADC module embedded EPICS IOC will provide slow data acquisition and waveform data.
  - High precision DAC module (equipped with 20 or 18 bits DAC) will be dedicated for power supply control.
  - Industry pack (IP) carrier board in 6U cPCI form factor can equip up to 4 IP modules. Various IP modules are adopted for necessary applications.
  - Event system modules are in 6U cPCI form factor
- Ethernet interface devices communicate to the EPICS IOC.
  - Power supplies of all magnets except for corrector
  - Multi-axis motion controller
  - Temperature monitor
  - Oscilloscopes with Ethernet interface
  - Gigabit Vision cameras

Operator Interface

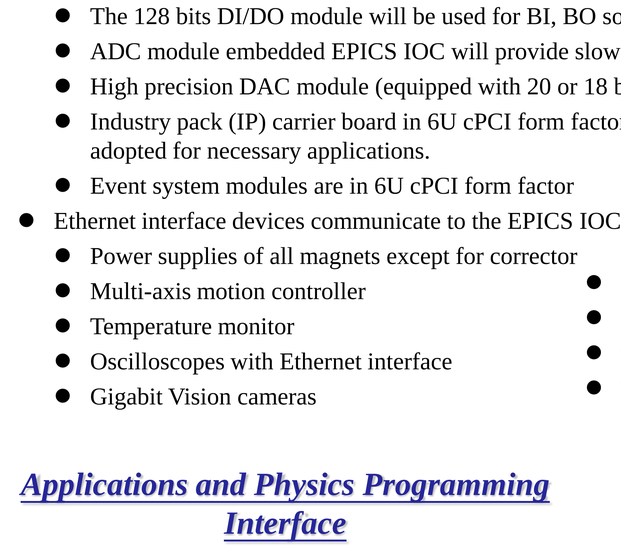
- Various EPICS OPI tools and Matlab will be adopted.
- Most of the GUIs will be implemented by EDM and Matlab.
- Consoles in the control room have multiple LCD screens.
- The OPI computer will be installed at the equipment area of control room with optical PCIe extension to remote display unit at control room.

Applications and Physics Programming Interface

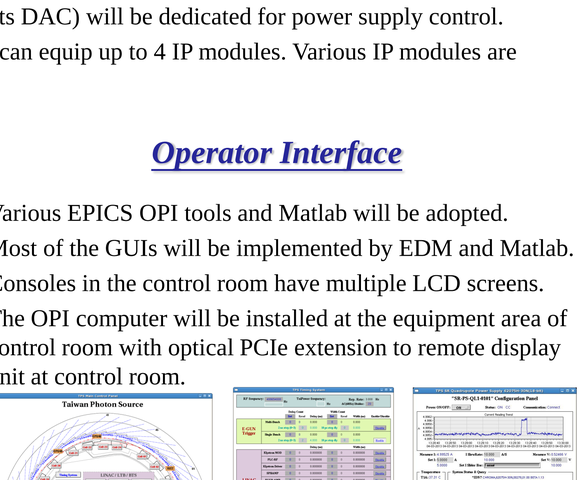
- The accelerator physics tools for TPS include Matlab Middle Layer (MML) and Accelerator Toolbox (AT) software packages.
- The Middle Layer communicates with the machine from within MATLAB using LabCA.
- The virtual accelerator has been implemented to give simulation of the accelerators through the EPICS PV interface.



Control System Infrastructure



TPS Standard EPICS IOC Hardware Building Block

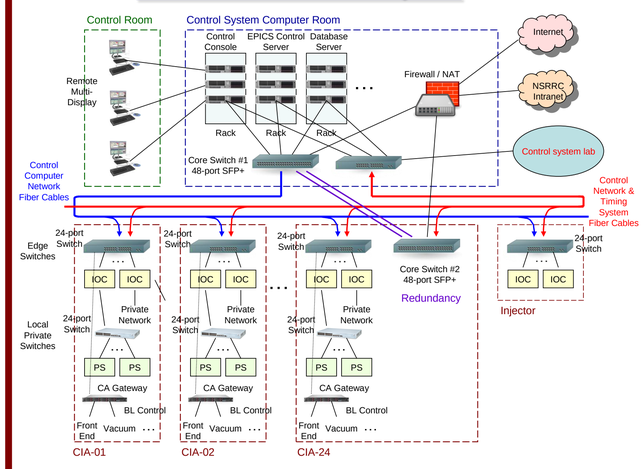


Turnkey System Interface

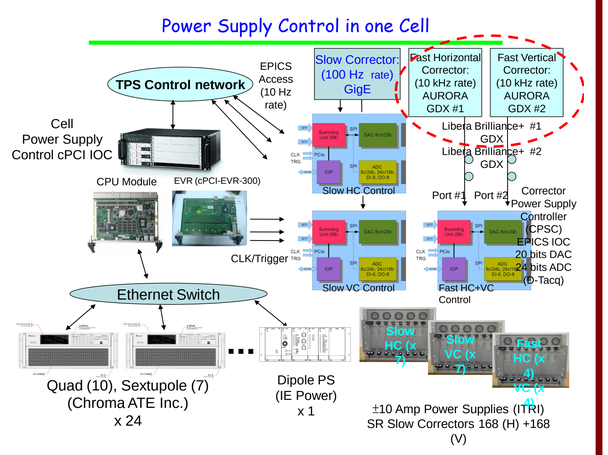
- Control system is EPICS based control system.
- The IOC purpose to CompactPCI based Linux IOC (hard-IOC and soft-IOC will support).
- Standard components should be chosen to get consistency of hardware
- EPICS development environment and document on the TPS
- The PV name of EPICE control system will be complied with TPS name convention.

Configuration of Some Selected Subsystem

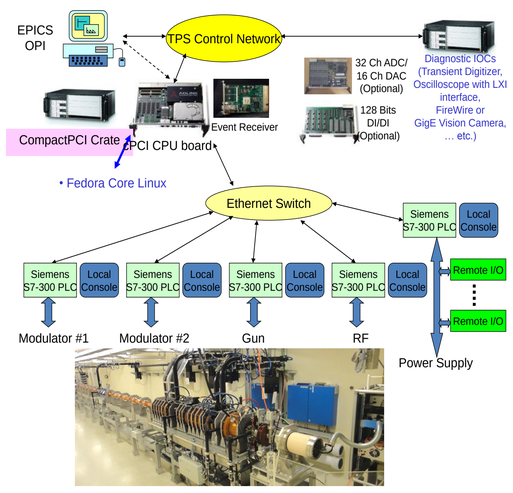
Control Network Layout



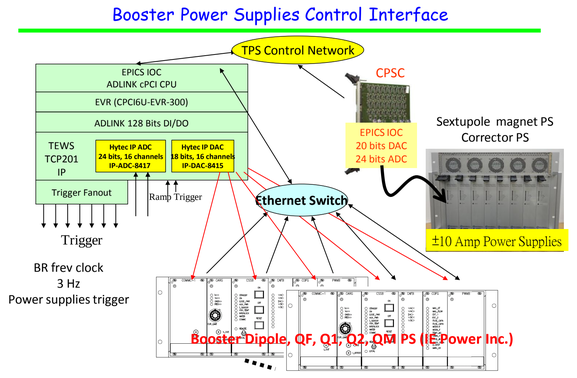
Storage Ring Power Supply Control Architecture



Linac Control Environment (Turnkey System)

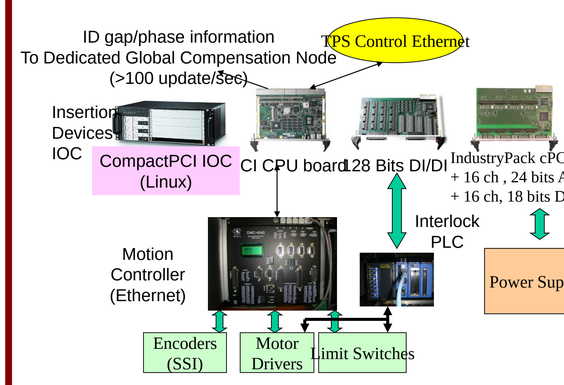


Booster Power Supply Control Interface

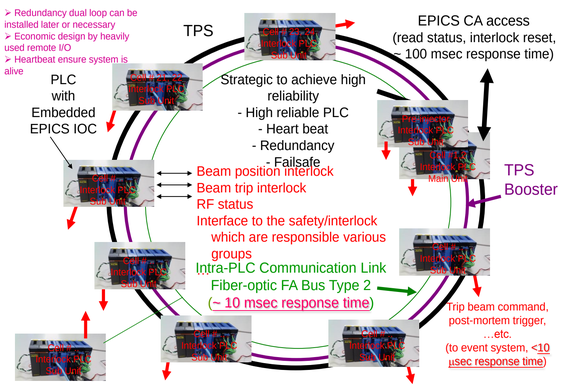


Two Options: Analogue Reference Input (Waveform) or Embedded Waveform Generator

Insertion Devices Interface

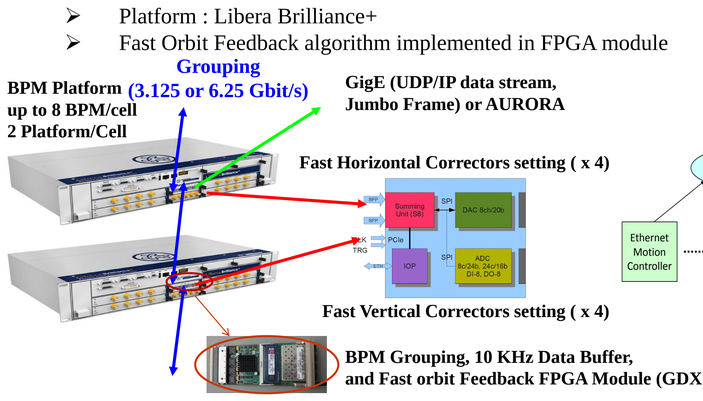


Global Interlock System

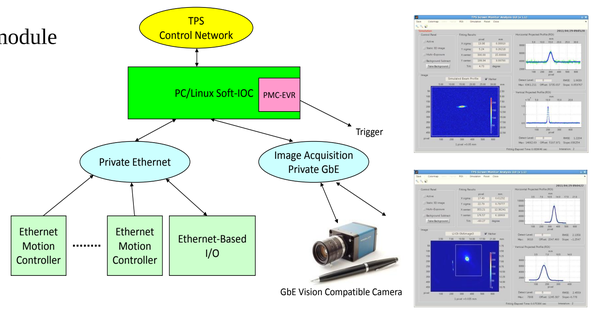


BPM and Integrated Orbit Feedback System

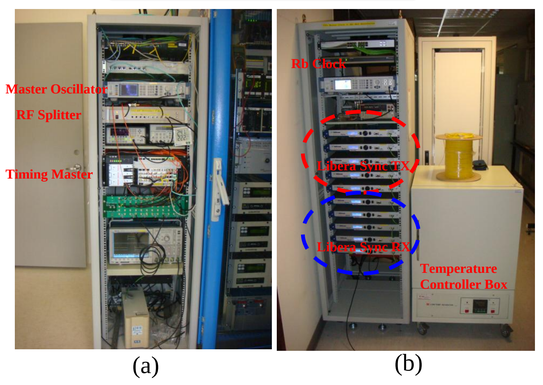
- Platform : Libera Brilliance+
- Fast Orbit Feedback algorithm implemented in FPGA module



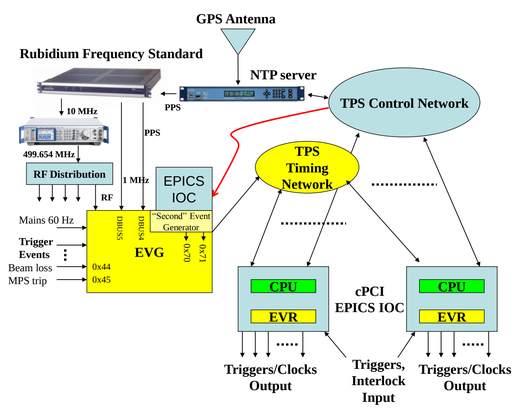
Profile Monitor Interface (OTR, Ce:YAG Fluorescence Screen, ..etc.)



Timing Master and Fiber Based RF Reference Distribution



Timing System



Summary

- Installation of the TPS control system is started from now.
- Fiber network for network, BPM grouping, timing are in proceed!
- All major components of control system are ready for installation.
- Installation complete is expected in the 1st quarter of 2014.
- System integration is expected during 2nd~3rd quarter of 2014.
- Beam commissioning are scheduled in later 2014.

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