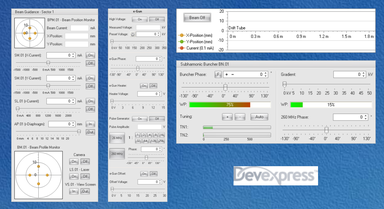


The custom written HMI software makes use of Devexpress UI components to provide a crystal clear use interface.

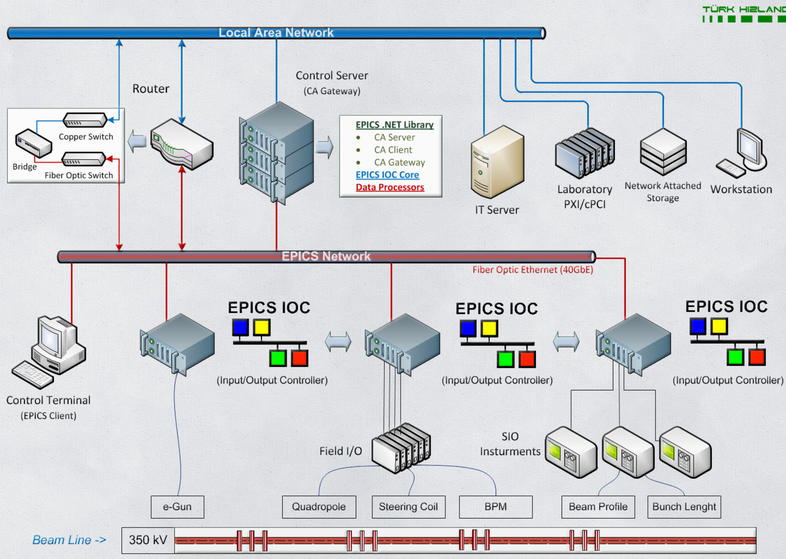
At T.A.C. facility almost all of the human-machine interactions occur at software level thus providing the users with a solid interface is essential. The main goal of this user interface is to provide the means for effective operation and control of the machines and gather the feedback signals on a single screen, which aids the operator in making operational decisions.

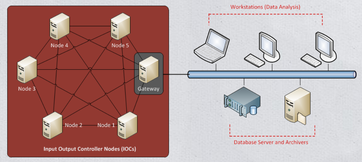
Interface consistency is up to par with the rest of the system so users will readily be familiar with this software. Again, this HMI software makes extensive use of our EPICS .NET Library & Microsoft .NET Framework in order to provide unrivaled functionality.

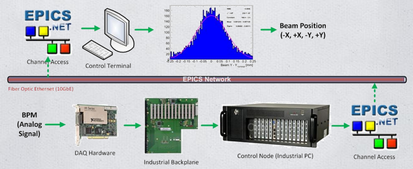
Software Systems

In accordance with the technical requirements, network security and performance along with reliability is taken to be the priorities of the design. Counting for the performance requirements, backbone of the control network is planned to be a fiber optic 10 Gigabit Ethernet while the LAN workgroups are to communicate on standard Gigabit copper Ethernet over Cat-6E cables.

In a typical configuration, control nodes like industrial PCs or PLCs have data acquisition hardware that collects analog or digital signals from the machines. This DAQ hardware then converts these signals into digital data, which is processed by the control node's processor and then published on the EPICS network using the control library. Any other computer requiring to access this data will simply subscribe to it again using the control library.

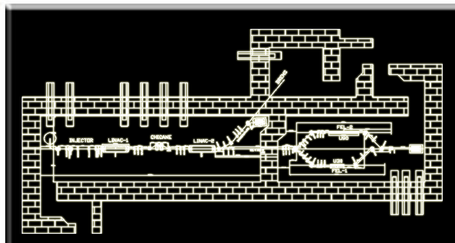






Clearly shown on the left, two-tier approach provides the ultimate security and isolation between distinct control networks and workgroups.

Network Infrastructure



Current facility project aims to produce FEL (free electron laser) between 2-250 μm, 2.5 cm and 9 cm period length with resonators using 15-40 MeV electron beam (10 MeV electrons for Bremsstrahlung). In order to have wide research area we plan to use Superconducting accelerators with IOT power sources. Planned research areas are:

- Biomedical Science
- Semiconductors
- Non-linear Optics
- Nanotechnology
- Material Science
- Photo-Chemistry

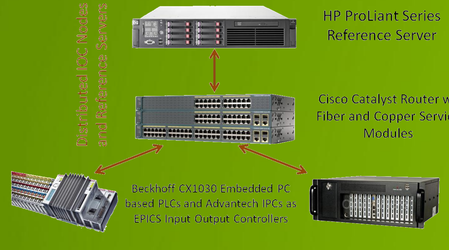
TURKISH ACCELERATOR CENTER

Control Network Infrastructure

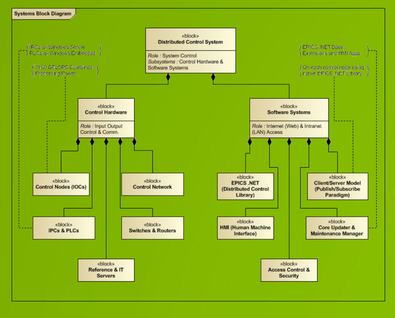
The control systems of Turkish Accelerator Center are designed to deliver exceptional performance, scalability, and reliability with least possible maintenance. The complete architecture is implemented as a soft real-time distributed control system based on EPICS (Experimental Physics and Industrial Control System) software. With a distinguished two-tier approach, the backbone of the control network infrastructure is fiber optic 10 Gigabit Ethernet while gateways provide data access for LAN workgroups and web clients. This two-tier approach completely isolates the stable control network from the other workgroup networks where possible software glitches, viruses, and other problems may clog the data links. As a backup to fiber optic 10GbE, a separate copper Ethernet is deployed with redundant switches for all the distributed control nodes (like IPCs, PACs, and PLCs). When completed, this project will mark a milestone for future nuclear research laboratories in terms of the industrial grade reliability and IT level of technology of its control network infrastructure..

Prepared by Teoman Soygul
UPHUK4 (P17), TR-Bodrum 8/31/2010

The distributed control architecture chosen for the facility is made up of control nodes which are autonomous computing entities that are "self conscious".



System Architecture



Distributed control and computing system is made up of components given on the left. Science all the control nodes depend on simple server/client model with publish/subscribe paradigm, it was possible to keep the design in its simplest form. On the figure to the right, it is easy to note that due to the chosen architecture there is not central point of control, rather all the control nodes are distributed. The existence of reference server is only for providing the nodes with software updates and static reference data.

"In this distributed architecture, input output controllers (IOCs) are the computing units with attached data acquisition modules (DAQ). These computing units may be full-blown computers or PLCs with general-purpose processors. These are self-conscious decision nodes with their own control logic built-in."

Layout of the control system