

Plan for Network Based EPICS Drivers of PLC's and Measurement Stations

Kazuro Furukawa, KEK
<furukawa@kek.jp>

JHF Linac Control Group

Plan of Control System for JHF Linac

- ◆ Studied Control Systems at KEK
and Chose EPICS
- ◆ During Study, Many Field Networks Found in KEK
Homemade, Proprietary, etc.
- ◆ However at KEK e^- Linac,
Many TCP/IP Connected Controllers (>150)
No new Field Networks Recently

Network Connected Controllers

- ◆ **Simplified Software, Management, Troubleshooting**
Efficient in Speed, Cost, Manageability
Do not Consume Human Resource much
- ◆ **Selection of Standard Network Device Technology**
Standard Software
Flexible in Designing the Network
Easily Understood (the Same Technology at Offices)
- ◆ **Normally UDP/IP for Simplicity and Error Handling**
TCP/IP as well (cf. out-of-band TCP packets)

Programmable Logic Controller; PLC

- ◆ Modern PLC's are Powerful and Flexible
 - Good Candidate for Remote I/O Controllers
- ◆ Not too Fast on the Network (5 to 30 millisecond Response)
 - but Fast Enough for General Purposes
- ◆ Pre-processing of Control Variables
 - Scientific Functions, Floating Point Calculations
- ◆ Chose Yokogawa's FA-M3 (Factory ACE)
 - Maintenance Capability over Ethernet/TCPIP
 - Not from other Venders in Japan
- ◆ At JHF,
 - Vacuum, Magnet, Ion Source
 - and Microwave Equipment

Measurement Station

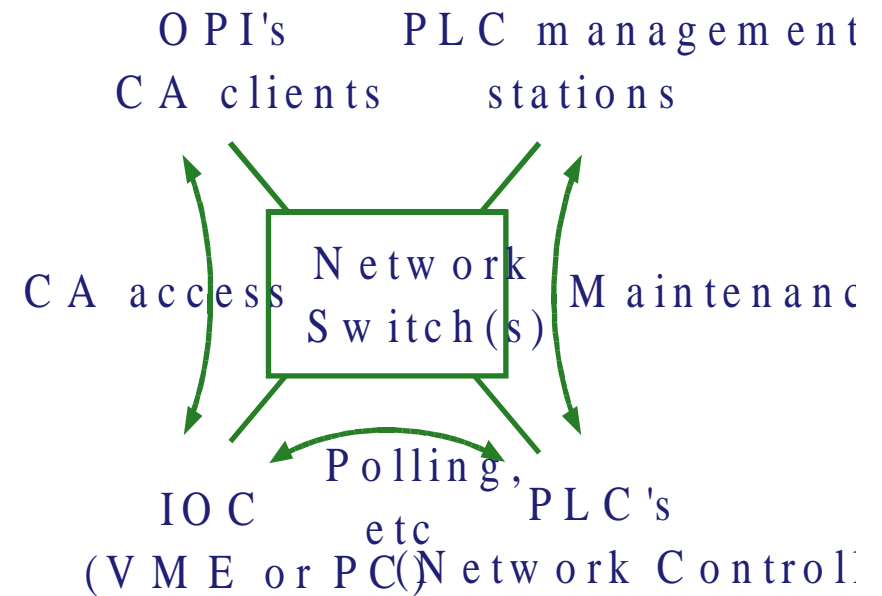
- ◆ **Waveform Observation**
 - GPIB connected Oscilloscopes or VXI**
- ◆ **At JHF,**
 - Beam Pulse of Several Hundred Nanosecond**
 - Cost Performance**
 - Noises from Modulators**
- ◆ **Chose Yokogawa's WE7000 (as well as VXI)**
- ◆ **Network Specification was Disclosed**
 - Evaluating IP Communication Software on Unix**
(Originally Developed for Windows Environment)

GPIB, Serial and Others

- ◆ Major measurement Instrument
 - Still GPIB or Serial (RS232C)
 - Cannot Escape from them
- ◆ Gateway Boxes
 - Employed also in EPICS Community
 - Can Accomodate Distant Location
 - Isolate Hardware Trouble Easily
- ◆ Many Venders Began to sell
 - Network connected devices
 - Oscilloscopes, Video Frame Grabbers, etc

Configuration under EPICS

- ◆ Investigate a Proper Network Structure for EPICS and Network based Controllers
- ◆ Communication between
IOC's and OPI's
through CA
IOC's and Network Controllers
for Polling
Management Station
and Network Controllers



EPICS Software

- ◆ IP Software is Available Standard on VxWorks
- ◆ Synchronous Access is Straightforward
- ◆ But Response Time of 5 - 30 Milliseconds

EPICS do not Allow This

- ◆ Asynchronous Version should be Developed
- ◆ First, Test Implementation on Unix
Then, to VxWorks

Software for PLC

- ◆ PLC Access Routine at e⁻ Linac was Generalized
Tested on Unix
- ◆ Synchronous Version of EPICS Device Support
Help Understanding this Architecture
- ◆ Testing Several Access Method
- ◆ On-demand (Interrupt) Protocol
Host IP Address Have to be Hard-coded
- ◆ Block of PLC Memory as Shared Memory
Between IOC and PLC
- ◆ Naming Scheme for OUT/INP

Software for WE7000

- ◆ Software is Evaluated and Investigated on Unix
- ◆ Status of a Station Have to be Managed on Host
Implemented with Threads
- ◆ Port Software on to VxWork IOC
Replacing POSIX Thread with VxWorks Tasks
- ◆ Waveform Record will be Implemented First

Conclusion

- ◆ **IP Network Based Controllers**
Such as PLC or WE7000
Simplify Designing Control System
(While Keep Studying Other Field Networks)
- ◆ **Software is under Implementation**
Straightforward and Will be Realized soon
- ◆ **More Investigation on Naming Scheme**
Specification of Variables
- ◆ **Hardware/Software will be Installed**
From the Beginning of the Next Year

