Integration of PLC with EPICS IOC for SuperKEKB Control System

J. Odagiri on behalf of:
Many Contributors

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- What is PLC-based IOC?
- Application to LLRF Control System
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What is PLC-based IOC?
CPU of FA-M3 PLC
- EXECUTES LINUX AS IT'S OS
- CAN HAVE ACCESS TO ALMOST ALL OF I/O MODULES
- CAN WORK WITH ORDINARY SEQUENCE CPU IF NECESSARY
Making PLC itself IOC

Presented by S. Motohashi (KIS)
PLC (FA-M3)-based IOC

Presented by M. Komiyama (RIKEN)
## Performance Measurement

<table>
<thead>
<tr>
<th>I/O Module type</th>
<th>Record Type</th>
<th>Record Processing</th>
<th>System Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3AD08-1R</td>
<td>ai</td>
<td>26.5</td>
<td>15.7</td>
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<td>F3DA08-1X</td>
<td>ao</td>
<td>24.3</td>
<td>12.3</td>
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<td>F3XD32-3F</td>
<td>bi</td>
<td>23.2</td>
<td>13.0</td>
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Application to
WRF Control System
Appearance of LLRF System
State Diagram of Start-up Sequence
Application to Vacuum Control System
## Number of I/O Channels

<table>
<thead>
<tr>
<th>Component</th>
<th>Analogue Input</th>
<th>Analogue Output</th>
<th>Digital Input</th>
<th>Digital Output</th>
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<tbody>
<tr>
<td>Temperature</td>
<td>4000 ch</td>
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<td></td>
<td></td>
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<tr>
<td>Ion Pump</td>
<td>600 ch</td>
<td>600 ch</td>
<td>600 ch</td>
<td>600 ch</td>
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<tr>
<td>Vacuum Gauge</td>
<td>600 ch</td>
<td>600 ch</td>
<td>600 ch</td>
<td>600 ch</td>
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<tr>
<td>Gate Valve</td>
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<td>80 ch</td>
<td>80 ch</td>
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<tr>
<td>Rough Pump</td>
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<td>20 ch</td>
<td>20 ch</td>
<td></td>
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<tr>
<td>NEG Heater</td>
<td>550 ch</td>
<td>50 ch</td>
<td>50 ch</td>
<td>50 ch</td>
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<tr>
<td>Flow Meter</td>
<td>1400 ch</td>
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<td>500 ch</td>
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</table>
PLC-based IOC

F3RP61 (IOC)

Ordinary CPU
Application to Monitoring Personnel Protection System
**Requirements and Solution**

- IOC must be able to read any relay of interest
- IOC must NOT be able to write any relays
Display of Personnel Protection System
The consolidation of IOC and PLC made the frontend control layer flatter and simpler to result in easier development and maintenance of control software.
Back-up Slides
Be fore and After

Before:
- OPI
- IOC (VME)
- PLC
- CAMAC
- DA100
- GPIB
  - Temperature

Channel Access:
- DO
- DI
- AI

After:
- OPI
- cRIO
- PLC
- CA-Serer
- DA100
- GPIB
  - Temperature

Channel Access:
- DO
- DI
- AI
- DI
- AI