Integration of PLC with EPICS IOC for SuperKEKB Control System

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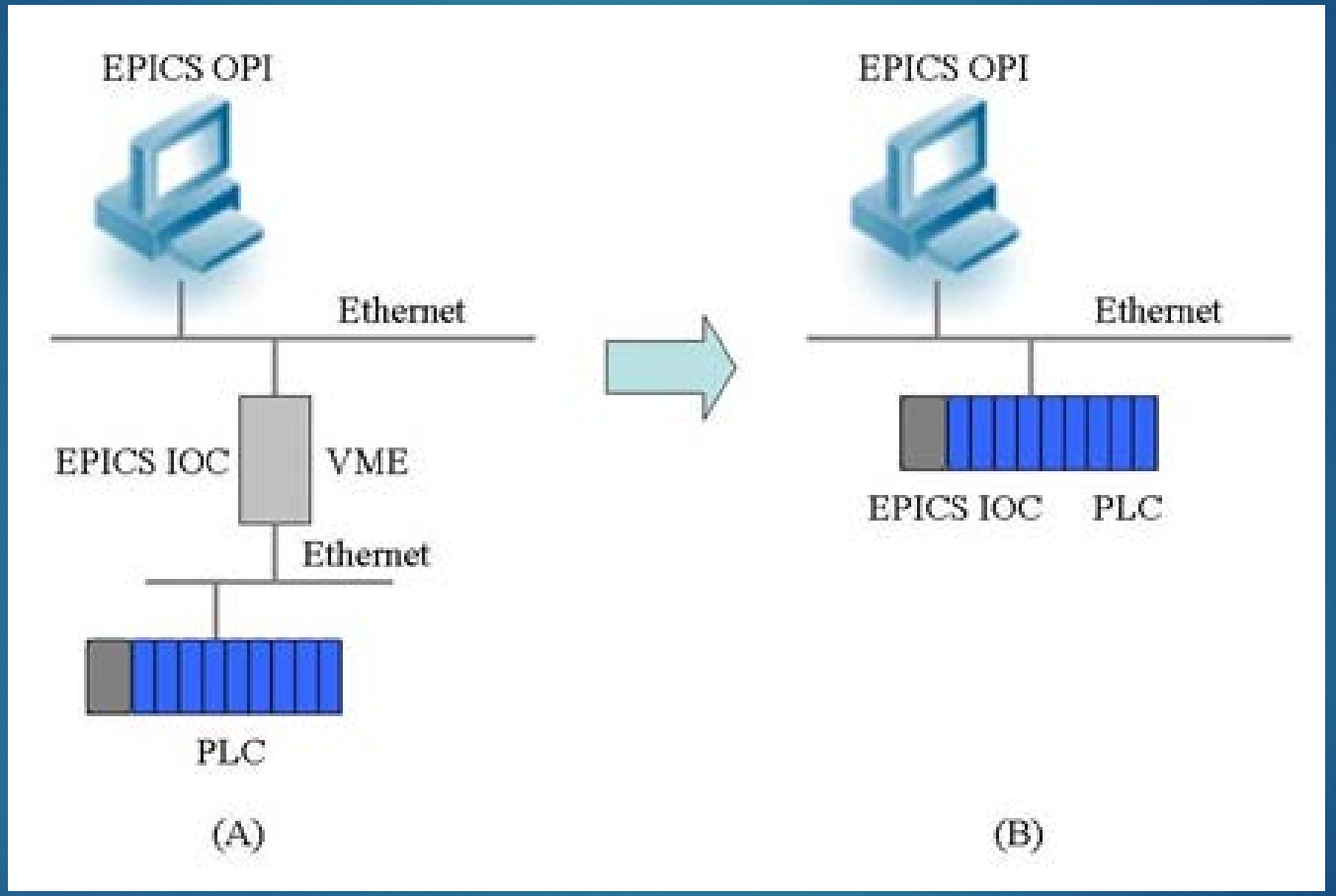
What is PLC-based IOC?

F3RP61

- 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)

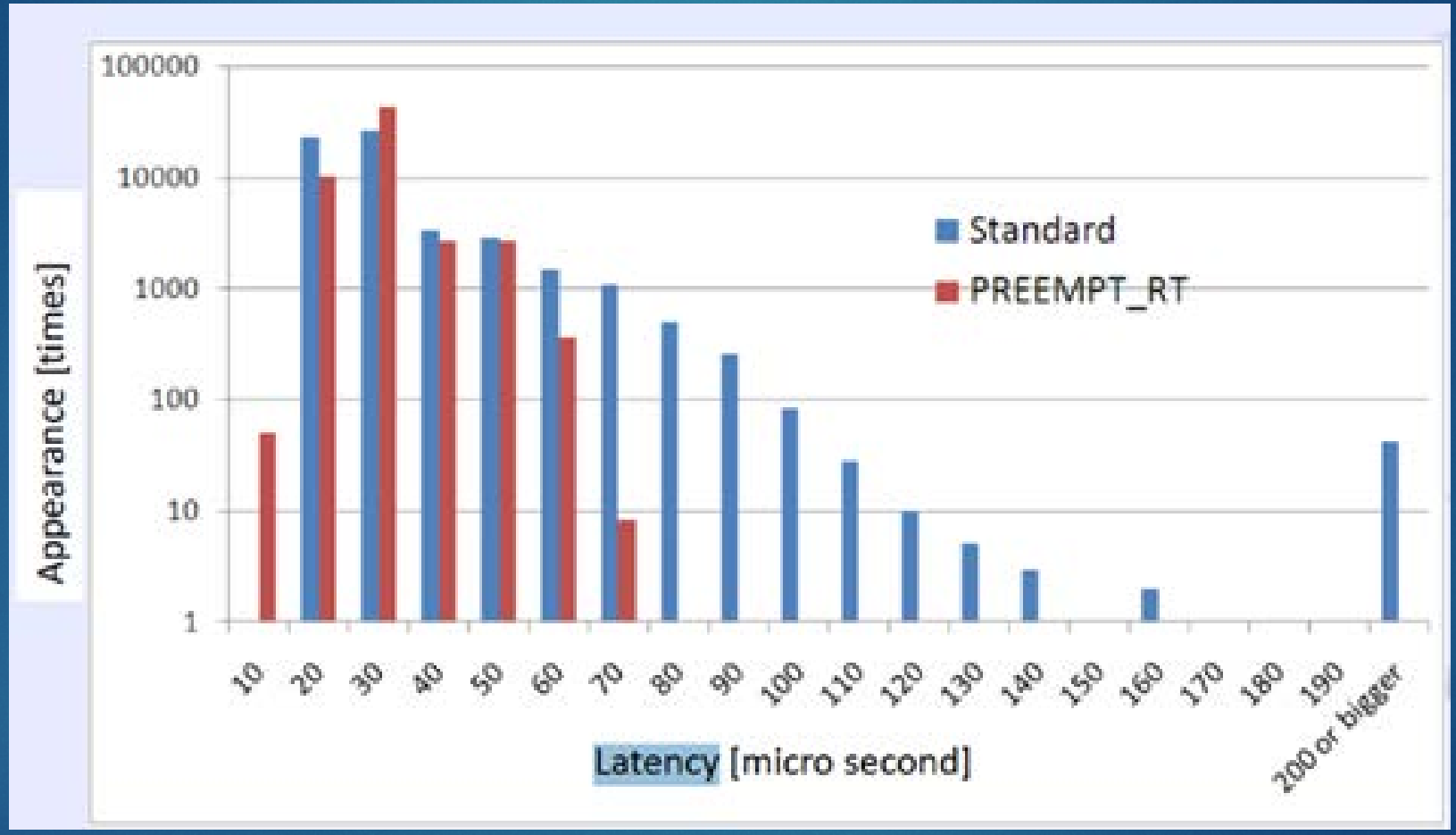
PLC(FA-M3)-based IOC

Presented by M. Komiyama (RIKEN)

Performance Measurement

I/O Module type	Rcord Type	Record Processing	System Call
F3AD08-1R	ai	26.5	15.7
F3DA08-1X	ao	24.3	12.3
F3XD32-3F	bi	23.2	13.0

Real-time Performance



Application to LLRF Control System

Appearance of LLRF System

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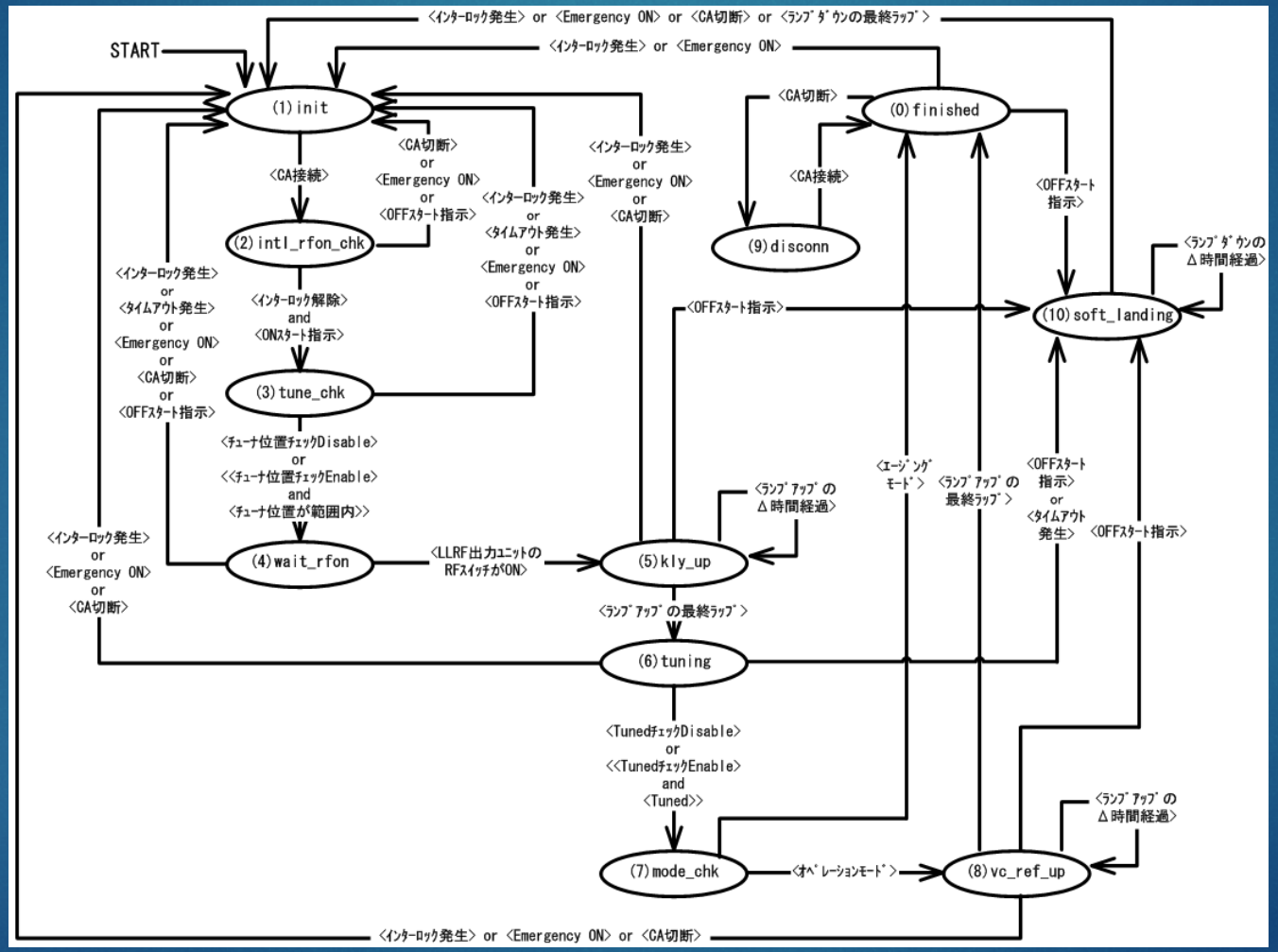
State Diagram of Start-up Sequence

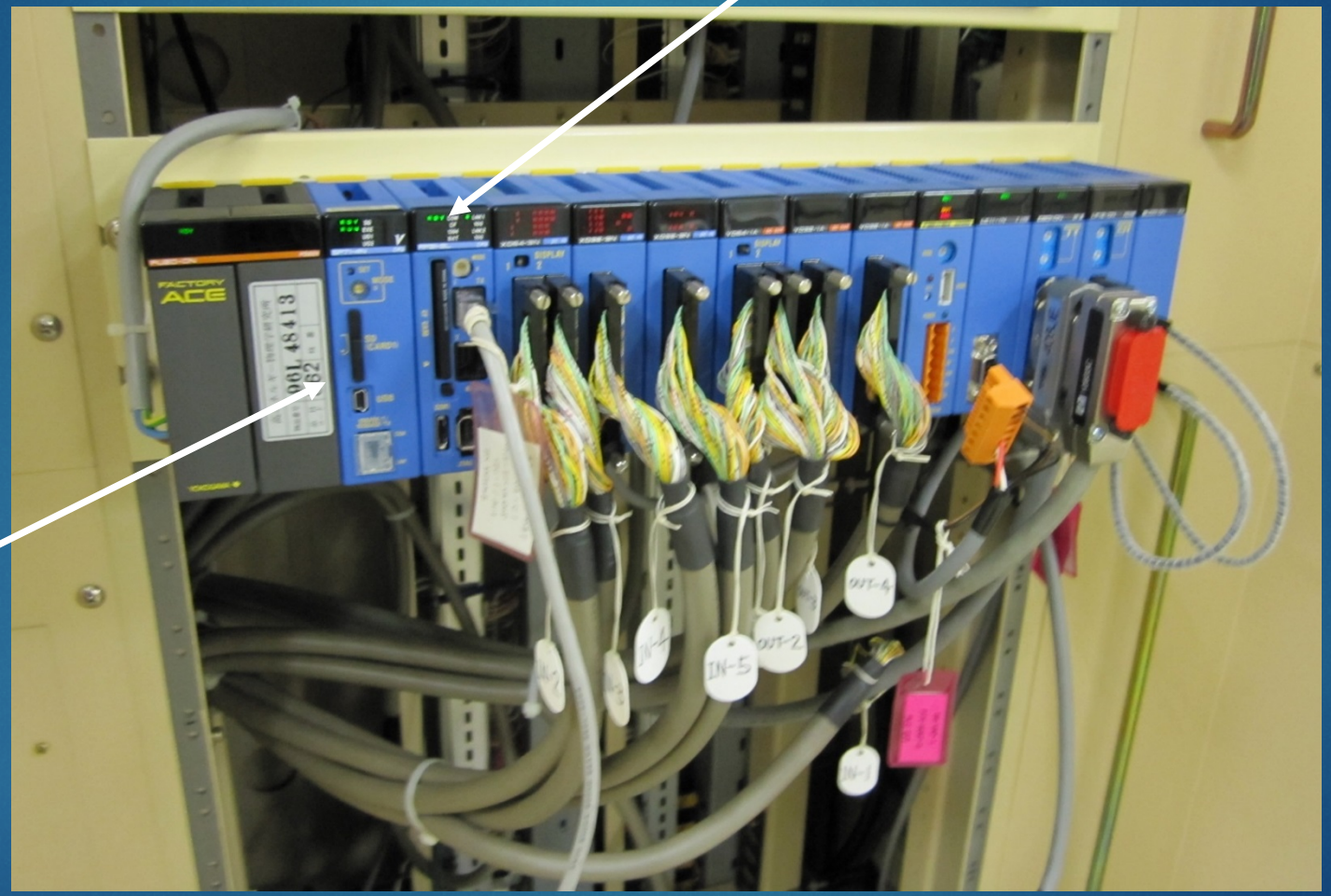


Application to Vacuum Control System

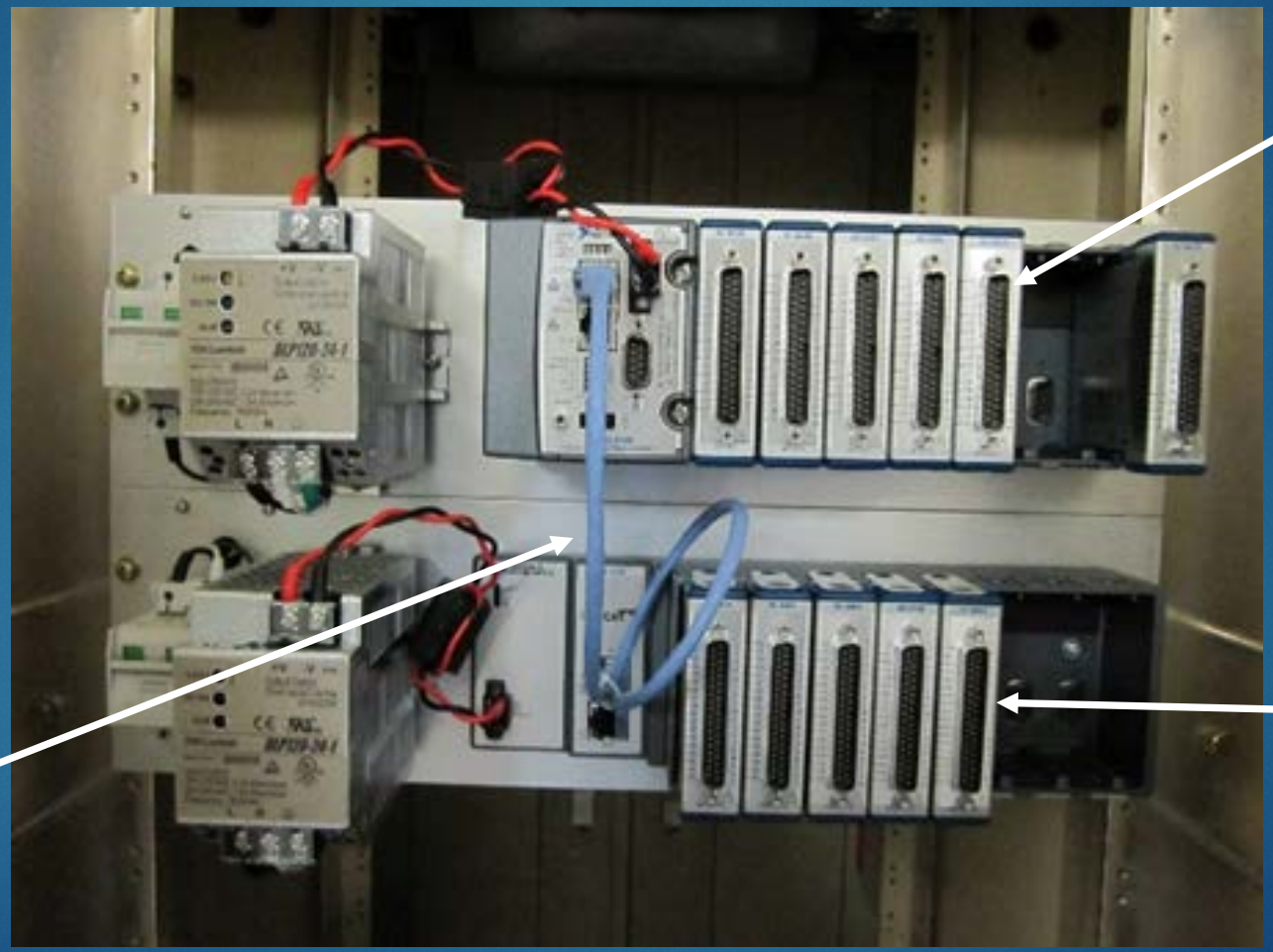
Number of I/O Channels

Component	Analogue Input	Analogue Output	Digital Input	Digital output
Temperature	4000 ch			
Ion Pump	600 ch		600 ch	600 ch
Vacuum Gauge	600 ch		600 ch	600 ch
Gate Valve			80 ch	80 ch
Rough Pump			20 ch	20 ch
NEG Heater	550 ch	50 ch	50 ch	50ch
Flow Meter	1400 ch			500 ch

PLC-based IOC



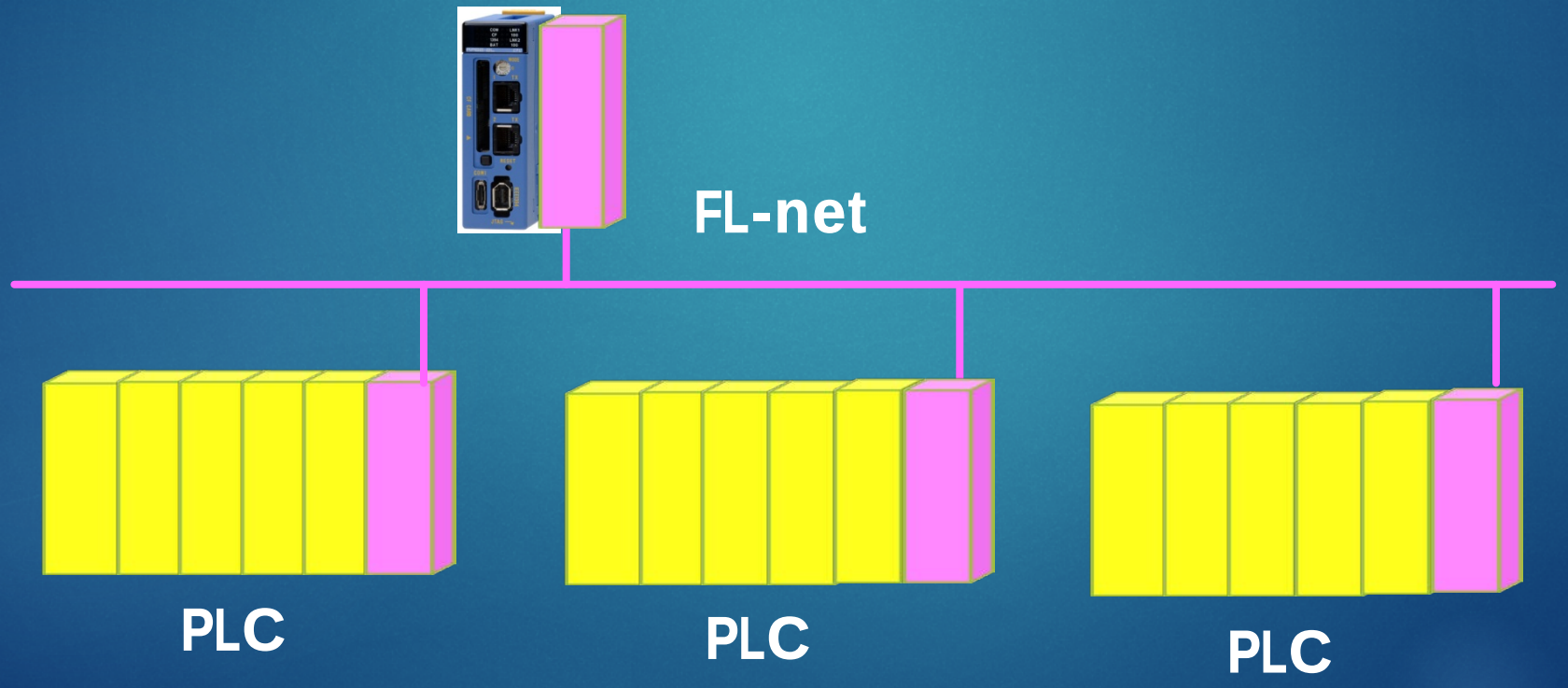
CompactRIO (cRIO)



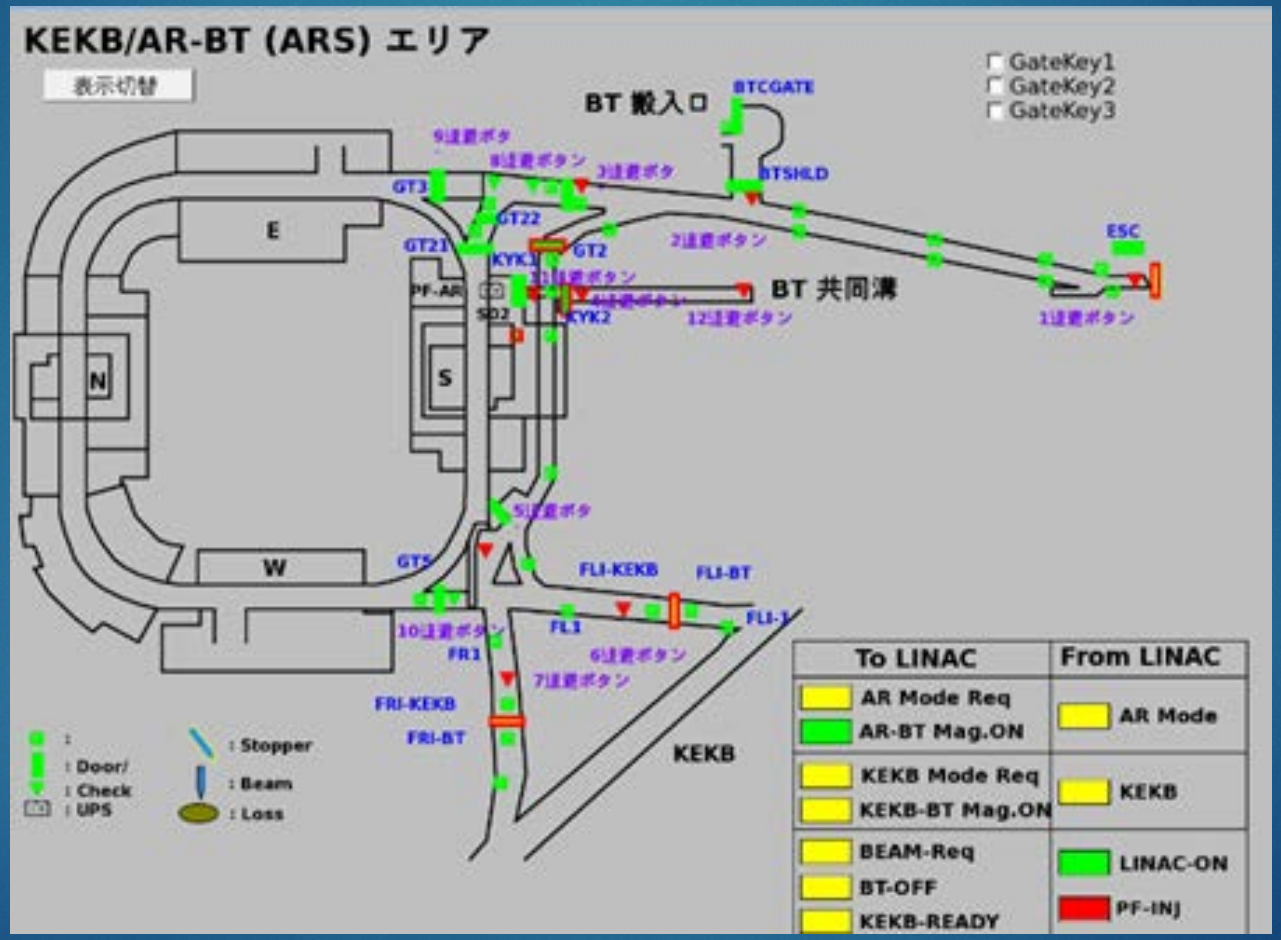
Application to Monitoring Personnel Protection System

Requirements and Solution

- IOC must be able to read any relay of interest
- IOC must NOT be able to write any relays

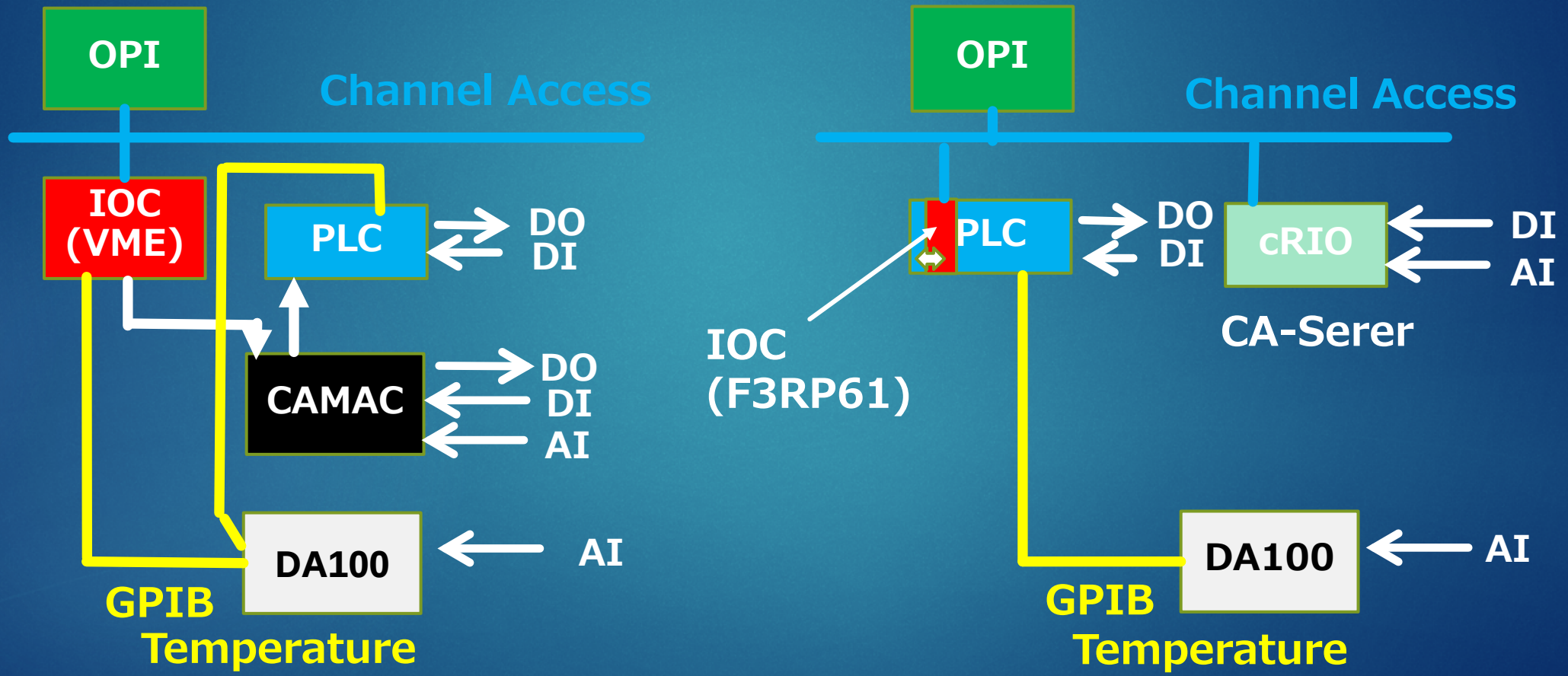


Display of Personnel Protection System



Conclusion

- 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