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An aerial photograph of the ISIS Neutron and Muon Source facility. The image shows several large, modern industrial buildings with flat roofs, some featuring blue accents. A prominent building has a large blue roof section. The facility is surrounded by open fields and a road. The word 'Welcome' is overlaid in large white text at the bottom.

# Welcome

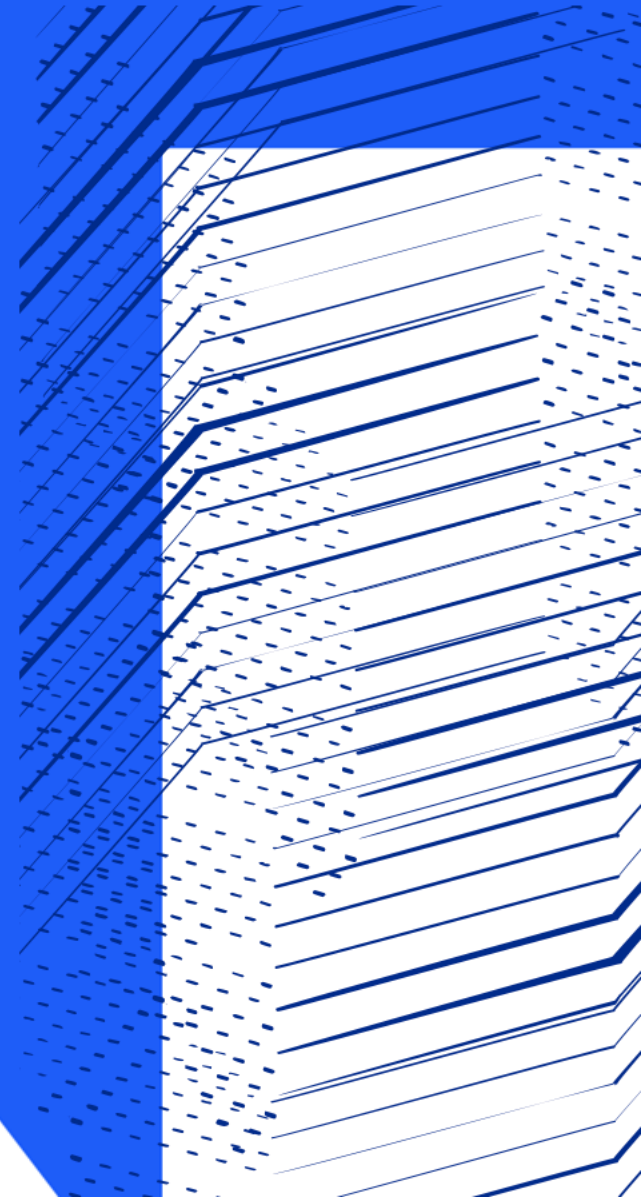


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# Python based EPICS interface with CIP enabled devices

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*Basil Aljamal*



# ISIS control system modernization

- Intel Itanium → Intel Xeon
- OpenVMS → Linux
- Bare metal + Xen VMs → Docker containers
- Vsystem → EPICS
- ABB, Schneider, Omron CX/CJ → Omron NX/NJ
- FINS → CIP

# CIP vs FINS

<b>CIP (Common Industrial Protocol)</b>	<b>FINS (Factory Interface Network Service)</b>
access memory via tags	access memory via physical memory addresses
complex data structures support	Basic data types
Hard to implement	easy to implement

# PLC side implementation

- Array of structures
- Each structure holds all information related to certain process variables including pvname
- PLC is the source of truth

▼ PVDData	STRUCT	NJ
PVName	STRING[60]	
PVDesc	STRING[40]	
PVValue	REAL	
PVHigh	REAL	
PVHiHi	REAL	
PVLow	REAL	
PVLoLo	REAL	
PVAlarmState	UINT	
Hyst	BOOL	
PVAlarmDesc	STRING[40]	
PVEGU	STRING[10]	

# EPICS side implementation

- Python based PVAserver (using PvaPy library) and cpppo library for CIP communication
- Read full array of structures at startup
- Read just the value and alarm state every second
- Reread full structure every 30 seconds

# Lessons learned

- CIP has a maximum packet length of 500 bytes for forward open connection and 2000 bytes for large forward open connection
- CIP protocol has a feature called “read tag fragmented service” but is not supported by all PLC vendors
- Increasing the communication percentage of the PLC processing cycle won't help
- Having a structure of arrays is better than an array of structures



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# Thank you

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