

OPC-UA based DCS



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- OLE: Object Linking and Embedding
- OPC: OLE Process Control (since 1996)
- OPC-UA: OPC unified architecture (since 2008)

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KEK

OPC-UA Overview

Industrial standard

- [IEC 62541](#)
- [OPCFoundation](#)

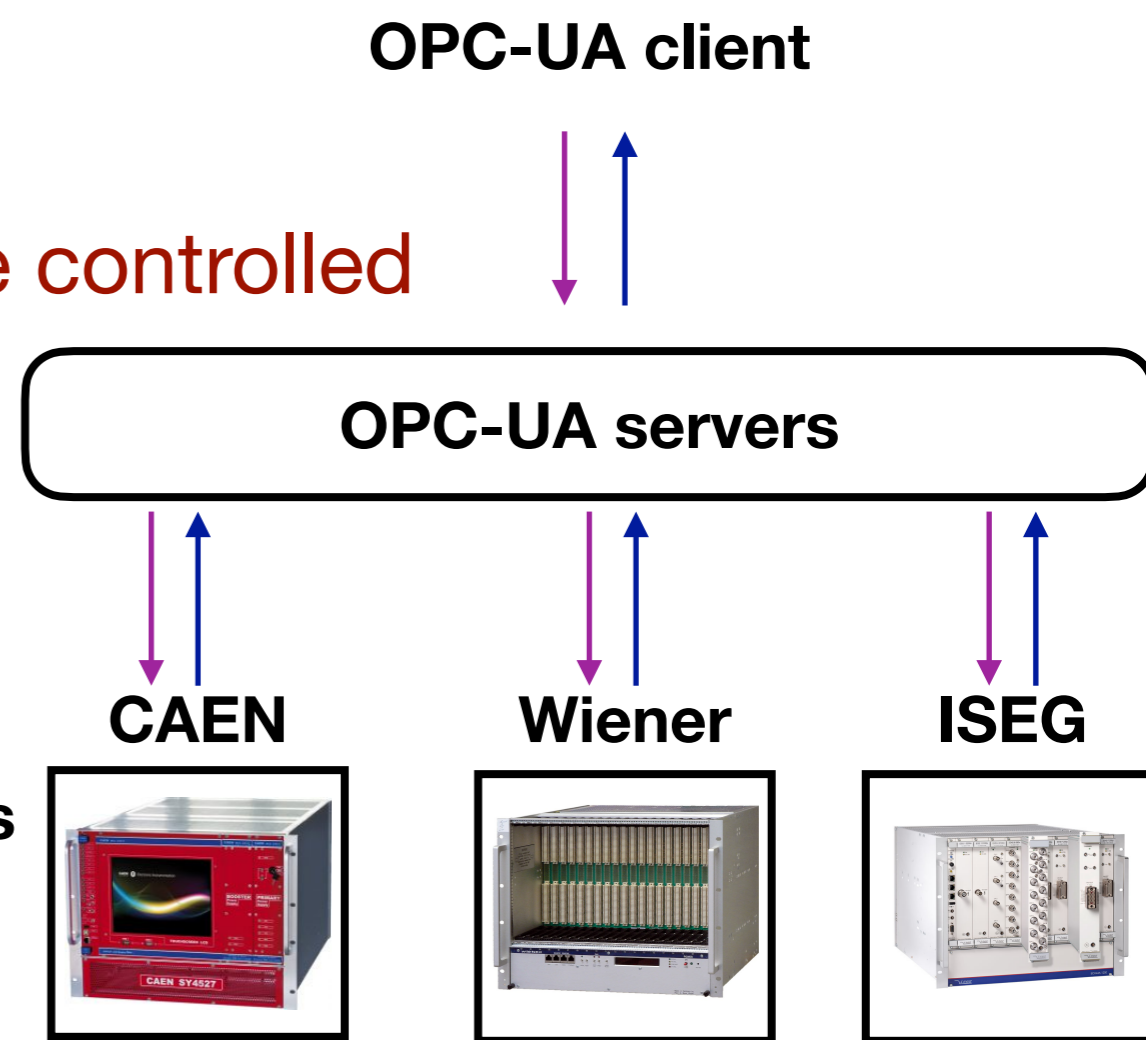
Main points

- Cross platform (e.g. [CAEN](#), [Wiener](#), [ISEG](#))
- Firewall friendly
- Efficient protocol
- Free & open-source implementations
- PLC, PDU (and other systems) can be controlled

Features SYx527

- Modular design makes upgrade and maintenance simple and straightforward
- The modular CPU is available in three versions (BASIC, ADVANCED, FULL), allowing the user to customize the interface to experimental specifications
- Control options include REMOTE (Gigabit Ethernet or optional Wi-Fi) and LOCAL (optional LCD Color Touchscreen)
- Connectivity via Gigabit Ethernet or Wi-Fi
- Integrated EPICS IOC
- OPC Server for simple integration into Detector Control System (DCS)
- Java-based Web-browser control option for uncomplicated connectivity and control

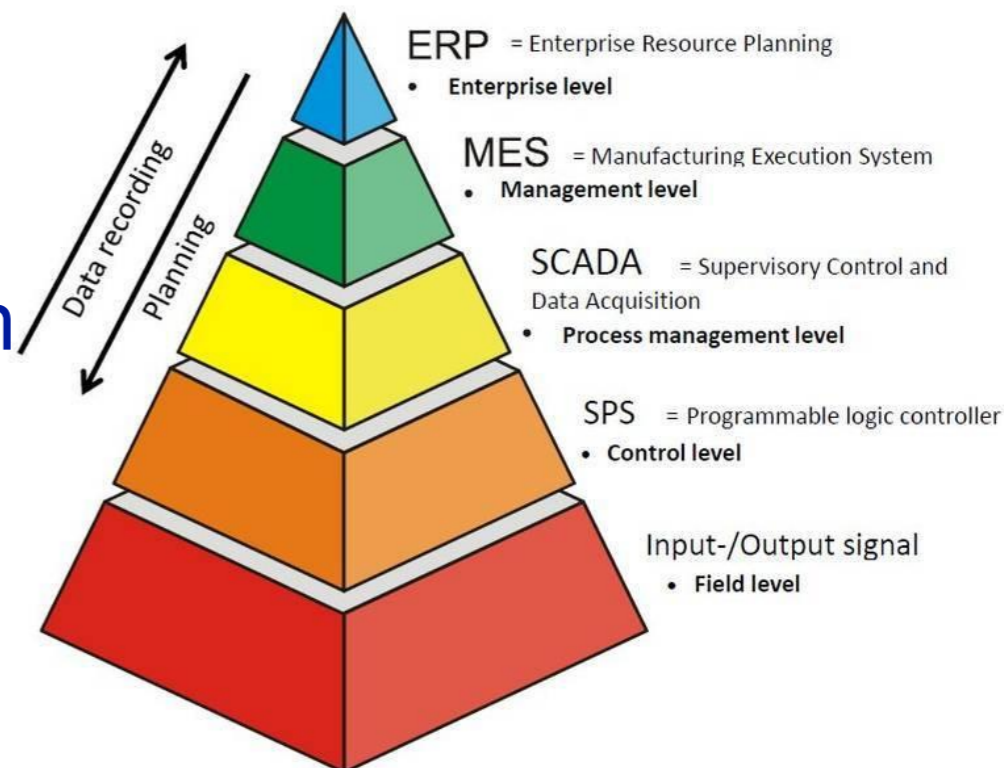
Devices



Design engineering

Five layers

- ERP and MES are too much for Belle II
- Supervision layer
 - SCADA may be needed for better automation
 - but simple logging and operation, we can use Elasticsearch (via Machinebeat, [link](#)) + Elastalert and EPICS (opcua module, [link](#))
- Control layer
 - Process management (middleware)
 - OPC-UA server handles data readout, commands
 - No need to develop the server, but we can concentrate on configuration
- Field layer
 - Current field devices can be kept (TBC)



What will be changed?

Current

- No security
 - While protected by the bdaq network against non Belle II users
 - Any users can damage our detectors unintentionally
- Controller processes need to be developed
- Many hard-coded configuration

OPC-UA based

- Security will be introduced
 - LDAP authentication
 - Role-assignment to each user/group
- OPC-UA servers ready
- Configuration can be summarised into a file (e.g. XML format)

What kind of tests needed?

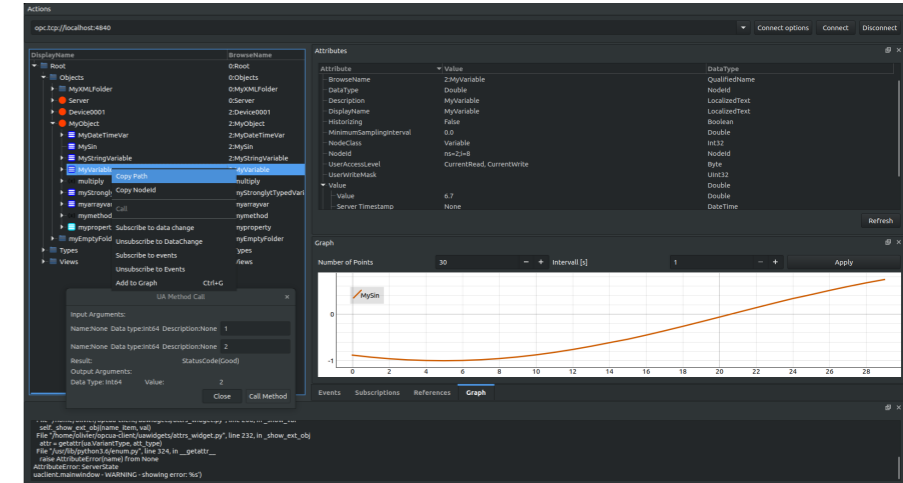
- Survey if all our devices are OPC(-UA) ready
- Demonstrate a simple test



Test module



OPC-UA server



OPC-UA client

I have gained a (very simple) experience controlling a PLC by free opc-ua server/client on a Raspberry Pi (as my hobby not as business/HEP experiment)

- Summarise our configuration into XML
- Integrate our state transitions (and related commands) into an OPC-UA client GUI
 - We can keep our current state mechanism but need to implement it to an OPC-UA client