INTEGRATING OPC UA DEVICES IN EPICS

ICALEPCS 2021

R. Lange, ITER Organization, France

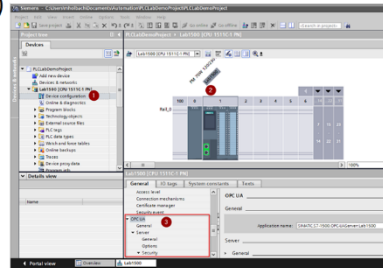R. A. Elliot, K. Vestin, European Spallation Source, Sweden

D. Zimoch, Paul-Scherrer-Institut, Switzerland

B. Kuner, C. Winkler, Helmholtz-Zentrum Berlin, Germany

What is OPC UA?

- Industrial standard (2006) to interface SCADA to PLCs
  - Covers data, alarms, events, historical data, remote methods
- Based on OPC Classic (Microsoft; 1996), plus
  - Portability → UA does *not* require DCOM/Windows like Classic
  - Safety/security (authentication, encryption)
  - Information modeling (user defined structures)
  - Remote method execution
- Gaining momentum in industrial context as universal integration standard
- Siemens S7-1500 series PLCs include an embedded OPC UA server

Why OPC UA?

- Symbolic addressing
  names, not numbers
- No PLC programming
  keep PLC development separate
- Industrial standard
  one to connect them all
- Portability
  at least Linux, Windows
- User-defined structures
  for reusable PLC objects

- Subscription mechanism
  update on change
- Server-side queues
  handle bursts well
- Browsing support
  find variables easily
- Security (TLS, X.509)
  encrypt, sign, authenticate
- Remote procedure calls
  with parameters and results

EPICS Device Support

- Designed to support different low level clients
  - First option based on commercial C++ Client SDK by Unified Automation
    4k€ for full source code and 1 year support (extend support: 20% per year)
    Binaries can be deployed/distributed royalty-free
    Platforms: Windows and Linux
  - Second option based on free open-source project open62541
    Pull request under review, to be merged soon
- Increasing test coverage (unit and end-to-end tests)
- Collaborative development
  - B. Kuner (HZB/BESSY): evaluation of low-level clients and prototype
  - R. Lange (ITER): full implementation
  - R. A. Elliot, K. Vestin (ESS): end-to-end test suite
  - D. Zimoch (PSI), C. Winkler (HZB/BESSY): open62541 client integration
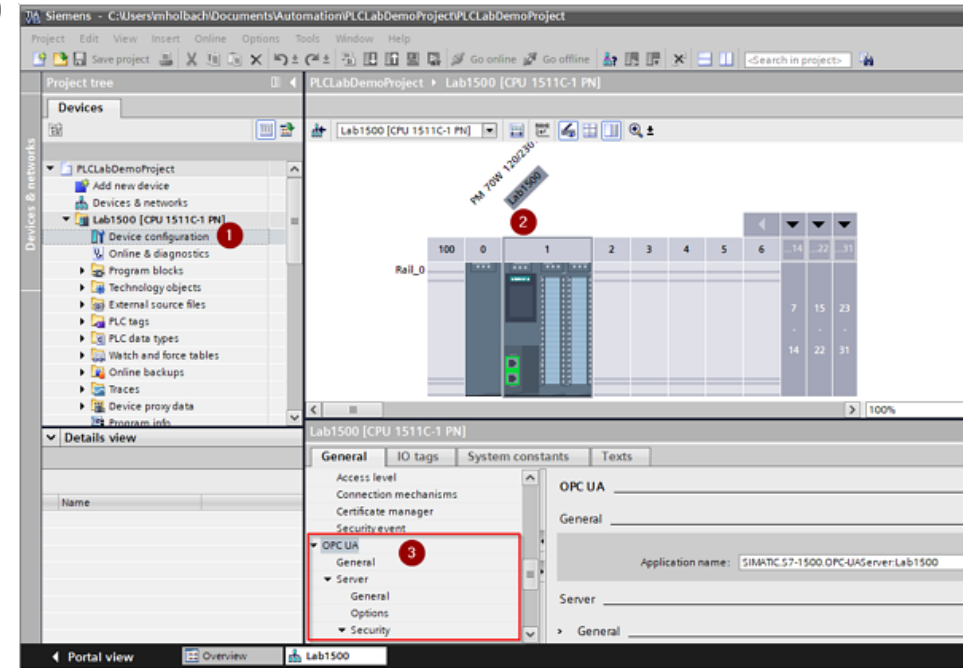
Current Status

- Stable, mature and robust
  - Several applications in production environment
- Next steps
  - Support OPC UA methods
  - Complete user manual
  - Add more tests

github.com/epics-modules/opcua

Facility	OPC UA Server	Status
ASIPP	LabVIEW	production
	PLC Siemens S7-1500	production
Australian Synchrotron	PLC Siemens S7-1500F	near production
BESSY II @HZB	PLC Siemens S7-1500	production
	Phoenix Contact	production
	Softing uaGate	production
CHIMERA @CCFE	PLC Siemens S7-1500	development
	LabVIEW	development
ESS	PLC Siemens S7-1500F	production
	ABB Power SCADA	near production
	Siemens DESIGO	development
Fermilab	Kepware KEPServerEX	testing
	PLC Siemens S7-400	development
IPR	PLC Siemens S7-1500	testing
ITER	PLC Siemens S7-1500	production
	Siemens WinCC OA	production
	PCVue	production
KATRIN @KIT	LabVIEW	prototyping
PSI	PLC Siemens S7-1500	development
Varian ProBeam	PLC Siemens S7	production
	PLC Beckhoff	production

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Table: Current (Oct 2021) Users