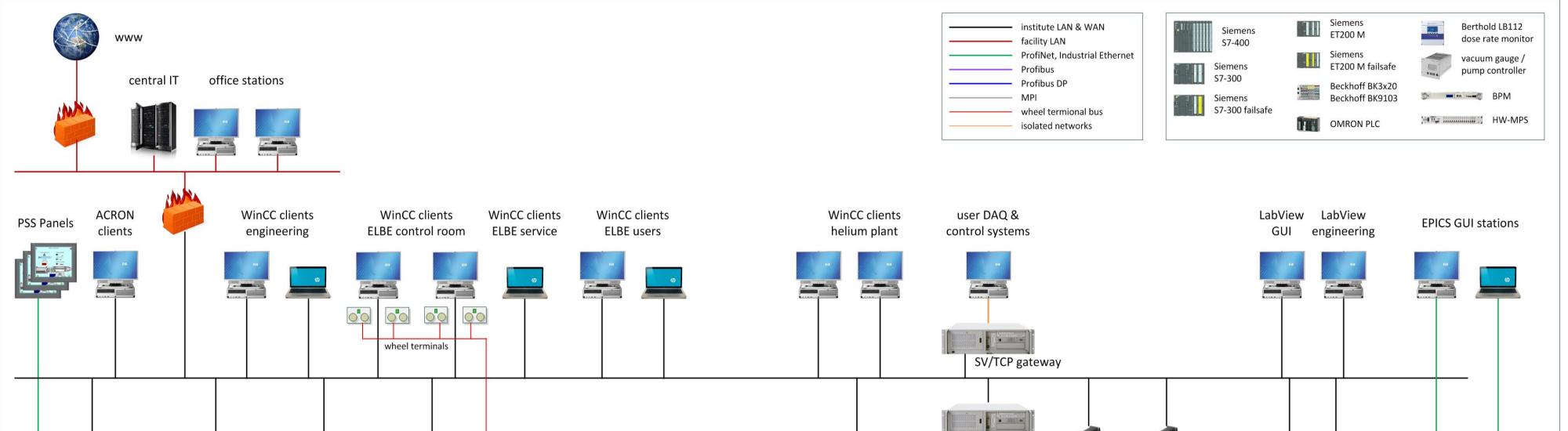
# Improvements of the ELBE Control System Infrastructure and SCADA Environment

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**ELBE CS Overview** 

ELBE is a 35 MeV C.W. electron LINAC user facility with diverse secondary radiation sources [1]

- Interconnected Siemens PLCs with WinCC SCADA System [2] for equipment control and MPS
- Fast & triggered DAQ mainly using





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- NI hardware & software [3]
- Distributed I/O using Profibus / Profinet fieldbus technology
- OPC DA and OPC UA or TPC/IP Send/Recieve for connectivity
- Configurable hardware based systems for fast MPS
- Separated LAN for institute, facility and control system

ACRON server (historian) engineering server #1 server #2	WinCC server #3 OPC DA server OPC UA DPC DA server Link #1 Link #2
	LabWindows /CVI PC IOC PXI systems
personal safety system &       MPS       IR beam lines       vacuum       cryo       beam dump cooling         dose rate monitoring       electron beam generation & beam control       media       cooling         cooling	cryogenics       beam diagnostics       THz beam lines         helium plant       DAQ & control       THz beam lines         connectivity       data acquisition and other systems

#### Fieldbus Improvements

- Replacement of Profibus by Profinet, esp. WinCC connection
- Improvement of Profibus systems (baud rates, optical Profibus components, electrical segmentation & termination)
- commercial Profibus monitoring

### **OPC UA evaluation**

- test of IBH OPC UA gateway [6] and Siemens CP443-1 UA as successor of OPC DA
- use of native and third party [7]
   OPC UA client channel for WinCC
- Trilateral project with DESY and TU Dresden [8[ for OPC UA stack

#### OOP for PLCs & WinCC

- structured data types in PLC code and WinCC improved reuse of software and well defined data access
- templates and tag prefixes for WinCC for efficient engineering

definition	tag definition	runtime application code	application co
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system (TH Scope [4])

 SINEMA server for Profinet monitoring [2]

#### WinCC Upgrade

Upgrade to V7.0  $\rightarrow$  V7.3 incl.

- Compatibility revision for OS, hardware and software environment
- WinCC project integration into Step7 project environment to enable engineering station workflow [5]
- Change from cold to hot server redundancy
- Improved backup strategy
- redundant process historian foreseen
- no more SCADA system failures

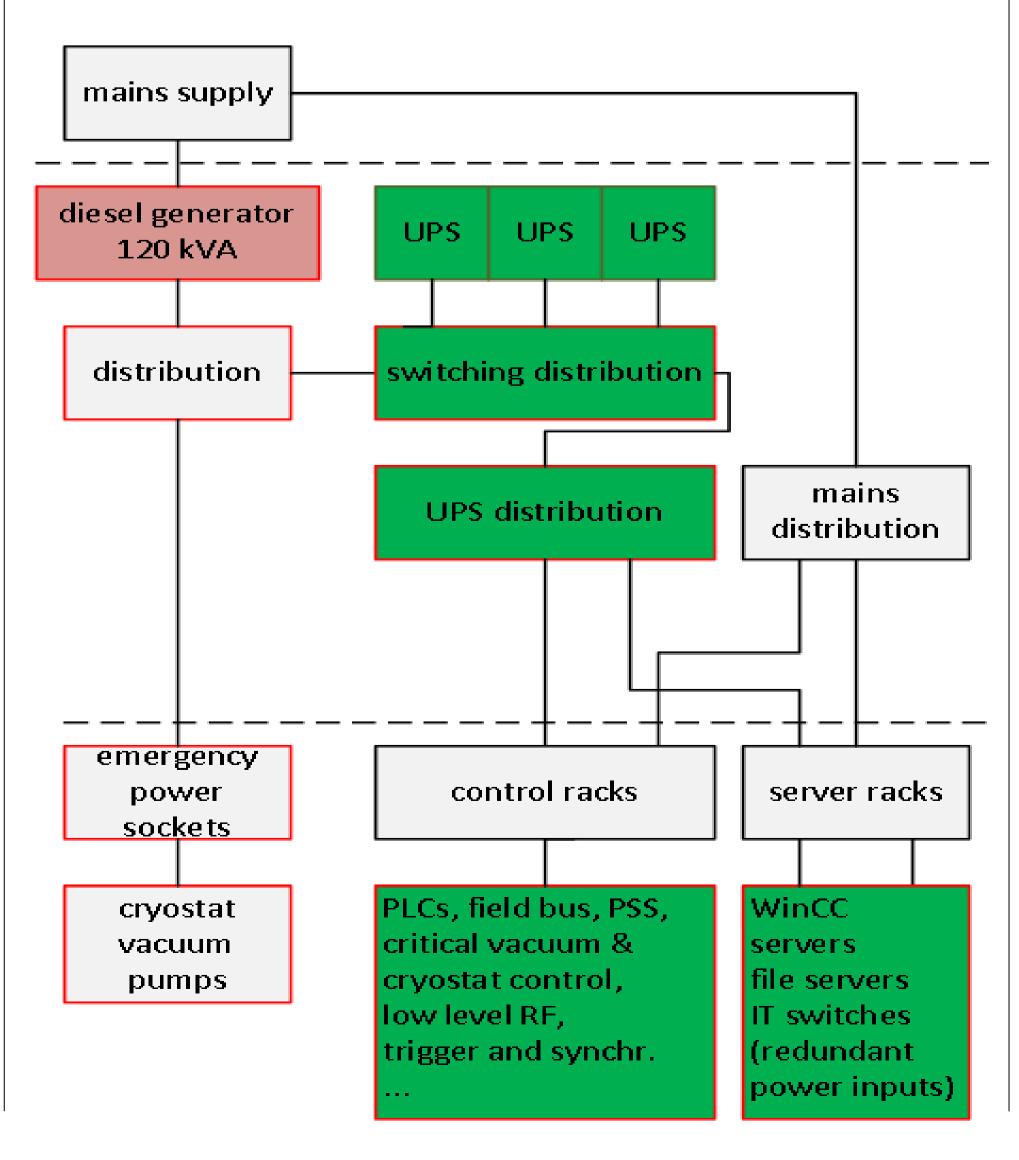
Step 7 server project project

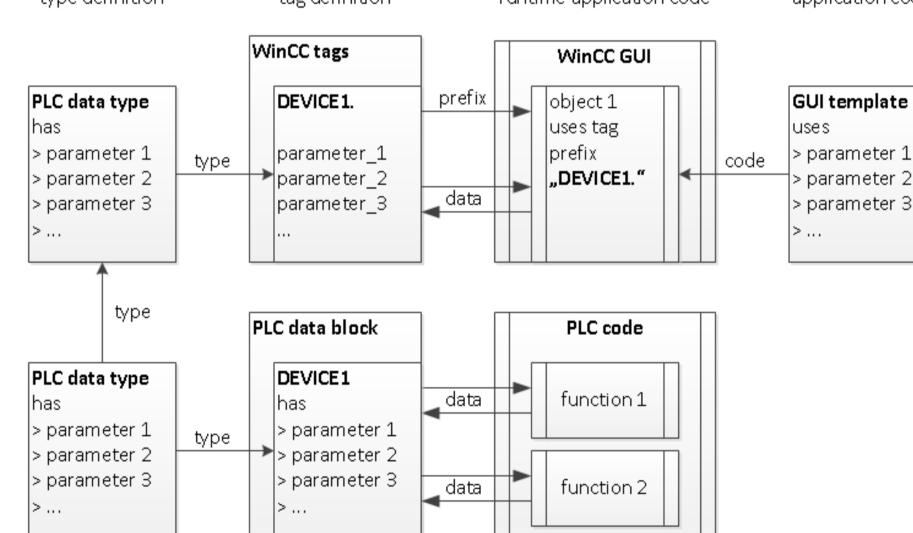
## implementation to MTCA4 hardware → THPHA166 ←

#### **Electrical Infrastructure**

New 2+1 UPS cluster with diesel generator backup for

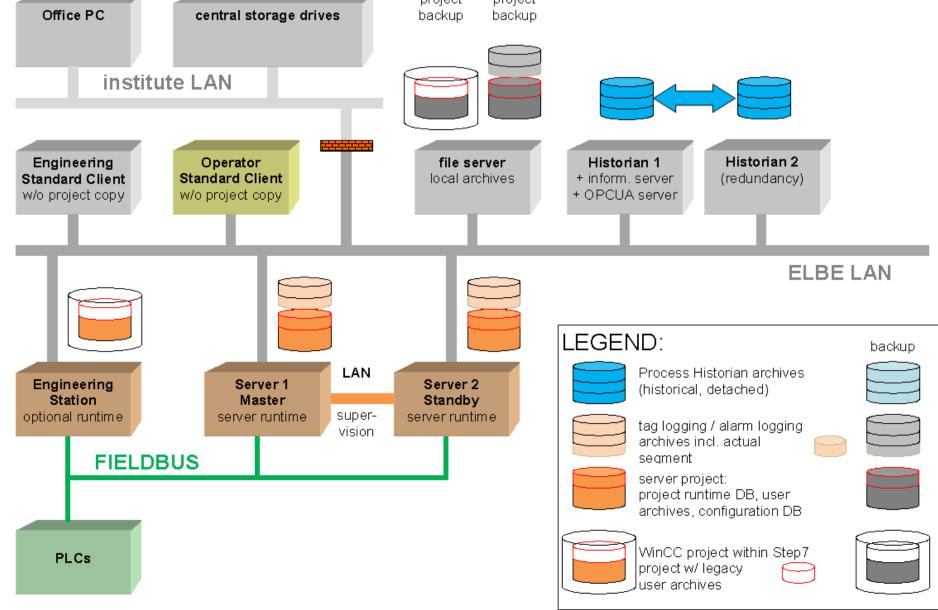
- CS and fieldbus components
- critical systems (i.e. injector & accelerator vacuum, cryo system)
- PSS, MPS and safety-related facility infrastructure





#### References

- Helm, M., Michel, P., Gensch, M., Wagner, A, "Alles im Fluss", in *Physik Journal 15(2016)1*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany, 2016, pp. 29-34.
- [2] https://www.siemens.com/global/en/ho me/products/automation.html
- [3] http://www.ni.com
- [4] https://industrial.softing.com/en/product s/network-diagnostics/monitoring.html
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System Manual 5E34376116-AA 06/2014, Siemens AG, Nürnberg, Germany, 2014 [6] https://www.ibhsoftec.com/IBH-Link-UA-Eng [7] https://www.allmendinger.de/Produkte/ WinCCKommunikation/OPCUAClientfor WinCCEN/tabid/1679/language/de-DE/Default.aspx

[8] R. Steinbrück et al., "Control System Integration of a μTCA.4 Based Digital LLRF Using the ChimeraTK OPC UA Adapter", presented at *ICALEPCS'17*, Barcelona, Spain, Oct. 2017, poster THPHA166, this conference

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