ICALEPCS 2023, Cape Town South Africa 9-13 September 2023

Equipment life-cycle management at EuXFEL

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Abstract / Introduction

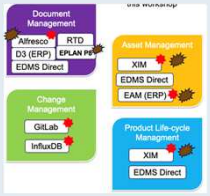
Scientific instruments at the European X-Ray Free Electron Laser Facility (EuXFEL) comprises of a large variety of equipment, ranging from controllers, motors and encoders to valves. It is a false assumption that once a specific equipment had been procured and integrated, that no further attention is required. Reality is much more complex and incorporates various stages across the entire equipment life-cycle. This starts from the initial selection, standardization of the equipment, procurement, integration, tracking, spare part management, maintenance, documentation of interventions and repair, replacement and lastly, decommissioning. All aspects of such a life-cycle management are crucial in order to ensure safe and reliable operation across the life time of the equipment, whether it be five years, twenty years, or longer.
At EuXFEL, many aspects of the described life-cycle management are already carried out with dedicated tools. However some aspects rely on manual work, which requires significant effort and discipline.
This contribution aims to provide an overview of the requirements, and the ongoing efforts to develop and establish a complete life-cycle management at the EuXFEL.

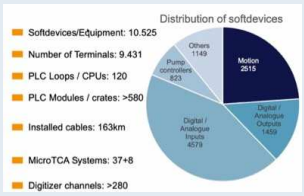
Motivation

- Many equipment, controller and controlled entities alike, are chosen and purchased, in scientific facilities without previous life-cycle assessments.
- The reality at many facilities shows that even temporary installations are used for 10 to 30 years or even longer.
- Typical scientific and industrial instrumentation are complex and contain many sub-elements. These may be operated efficiently if all sub-components work properly and minimal efforts are needed for maintenance, safety, security and, when parts need to be exchanged or replaced, compatibility exists among hardware models and different versions.
- We have installed scientific and industrial equipment along 6 km of tunnels and in 7 experiment locations (starting around the year 2012)

The EuXFEL accelerator and laboratory

- Some of the equipment has been running ever since, with basically 100% duty cycle
- We aim to:
  - improve, develop, locate, track and maintain the devices keeping the down time to a minimum and keep historical knowledge
  - develop intervention strategies (possibly w/o interference) to exchange devices near end of life-time
  - keep track of integrated duty-time of devices and interventions (whether to repair or modify)
  - understand which equipment has become or is going to become obsolete (and prepare for possible replacement with equivalent device(s))

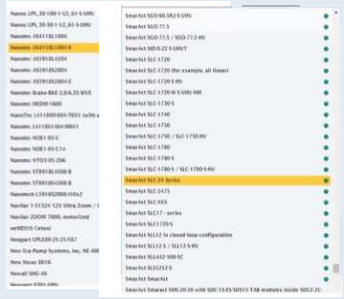




Software products used to manage assets and document equipment (left), summary of installed hardware (some device types might not be listed: eg GigE camera,…)

Methods

- **Contacts** to other facilities in the world, and within groups in our facility, have been started to assess how these have addressed such issues, what tools are used or what aspects need be taken care of.
- **Discussions** with vendors in order to evaluate and improve our situation, removing single vendor dependence and possibly to influence them into providing new, interchangeable and innovative solutions.
- The European XFEL GmbH facility, in order to strengthen the efficiency of the **centralized technical vetting** which is already in place, is planning to introduce equipment life-cycle management to assess and where possible minimize risks related to the way electric and electronic equipment is procured and at the same time to efficiently maintain what has been already installed.



Preliminary Results

- First steps have been taken to **catalogue all equipment installed** across the facility, including evaluation of singular setups and singleton equipment in use, with the aim of defining policies which will significantly reduce these cases in production environments. Redundancy of equipment, by extensive analysis of equivalent functions perform by different hardware in the facility, is also planned to take place.
  - Extracting Equipment lists from documents used to deploy control system (CRD)
  - Catalogue Equipment and remove Typos

Summary / Outlook

- First steps taken to assess the problem
- We aim to:
  - improve, develop, locate, track and maintain the devices keeping the down time to a minimum and keep historical knowledge
  - develop intervention strategies (possibly w/o interference) to exchange devices near end of life-time

References

private communication with CERN, ESO, ESS ESRF and Max-IV employees.

Acknowledgements

The author would like to thank all involved collaborators and member of EuXFEL as well as other experts of other facilities, which have been contacted, they have been always willing to offer their opinions, suggestions, feedback and expertise without their most valuable input this effort would seem to be unsurmountable.

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