

SOLARIS PROJECT STATUS AND CHALLENGES*

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Abstract

The Polish synchrotron radiation facility, Solaris, is being built in Krakow. The project is strongly linked to the MAX-IV project and the 1.5 GeV storage ring. An overview will be given of activities and of the control system and will outline the similarities and differences between the two machines.

INTRODUCTION

The first synchrotron light source in Poland will be built in Krakow. It will be located at the III Campus of the Jagiellonian University. The project is hosted by the Jagiellonian University and funded with EU regional development funds of 143 MPLN. The contract for the establishment of the National Synchrotron Radiation Centre Solaris was signed between the Jagiellonian University and the Polish State on March 9th, 2010.

MAX IV Collaboration

The agreement between the Jagiellonian University and Lund University in Sweden is crucial for the success of the Solaris project. It was signed in November, 2010 following earlier Memorandum of Understanding. According to the agreement between these institutions, the Solaris facility will be built based on the MAX IV design. The project is based on a close cooperation with the MAX IV project. MAX IV provides not only design but also expertise, support and training for the Solaris team.

Machine Description

Machine will consist of a 1.5 GeV ring and a 550 MeV linac injector (see Fig. 1). The ring will be an exact copy of the smaller ring of the MAX IV project but with differences in beamlines, insertion devices and general infra-structure.

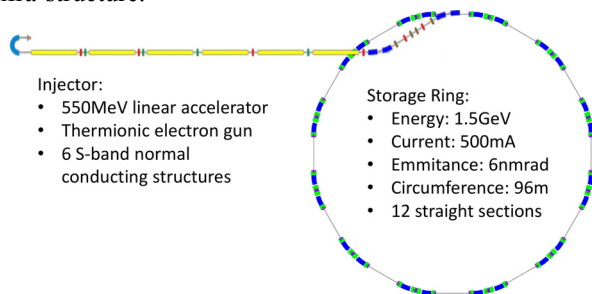


Figure 1: Layout of the machine.

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A thermionic electron gun will be used as the source of electrons. The beam will then be accelerated by an S-band normal conducting linac. The linac injector will be built with the same components of MAX IV incorporating similar design concepts. Since at the first stage of solaris the linac will not provide full energy injection, a ramping procedure will be implemented. Infra-structure and the design of the accelerators will permit a future implementation of top-up [2].

CURRENT STATUS AND ACTIVITIES

The status of Solaris has been reported in [1]. In this paper the control system status and IT related issues will be emphasized.

Since the machine will be a replica of the MAX IV 1.5 GeV ring it is reasonable to have the same control system solutions. Therefore most of the control system concepts for Solaris follow relevant ones for MAX IV.

The TANGO [4] control system and its dedicated tools have been chosen for the integration layer. TANGO has been implemented at several laboratories in Europe and found to be both reliable and mature. Close collaboration between laboratories involved in TANGO projects provides plenty of software tools, components and support.

From the tools the TANGO community provides several have been chosen. As an example Sardana developed at ALBA will be used for sequencing purposes. Graphic user interfaces will be built with different tools like Taurus, Jddd, JDraw and the ATK library. Among them Taurus and Python scripting language is preferred.

Development

Subversion and the Redmine server for a source code sharing and projects' tracking have been adopted.

There are several on-going software developments at MAX-lab. Some of them are directly connected to the new facility. Others are for maintaining the current laboratory in operation. All new development at MAX-lab, however, is using the TANGO control system and may be regarded as preparation and proof of the system.

Developments related to future control system include: the pre-injector test stand control system, the Virtual Accelerator and the Allan Bradley PLC device server.

MAX IV is cooperating with Soleil to adopt their motion control standard and evaluate a new standard in the future.

Evaluation

Many of activities are on going to find and evaluate solutions to be implemented for both MAX IV and Solaris. The MAX III ring has been integrated into TANGO using channel access device servers. TANGO historical and temporary archiving is in operation at MAX-lab for more than one year and several beamlines are using TANGO at the facility.

Network Reflective Memory based on the FERMI@Elettra solution is being evaluated and adjusted in cooperation with Fermi [3]. It is likely that MAX IV will use the image acquisition and processing system developed at Fermi too.

Procurements

There are several procurements at MAX IV related to the control system. Recently, two framework agreements have been awarded:

- For control system services and support
- For PLC's hardware and support

All of them include the option for Solaris. According to the agreement between the Jagiellonian and Lund Universities, Solaris may purchase specific hardware or services using a single source procurement procedure to ensure compatibility amongst the two machines.

In parallel to the above activities, the construction of the building infra-structure is on-going in Krakow. It includes power, water and heating, air conditioning, the security system and computer network.

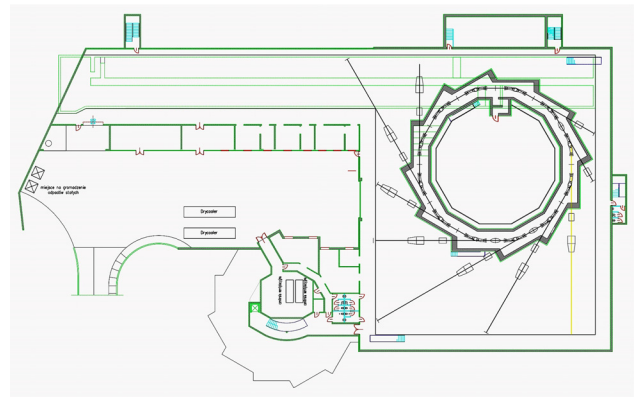


Figure 2: Concept layout of the facility.

Network

The computer network will be connected to the Jagiellonian University campus network. However, it will be operated independently from the rest of University network at least for the accelerator control systems. The general layout has already been designed along with some technological solutions to be used. Separation between the control network, the office network and the campus network will be implemented with VLANs and an on-site firewall. Additionally it is planned to use stackable switches in a main distribution point with the office network and control system network connected to separate similar units (see Fig. 3).

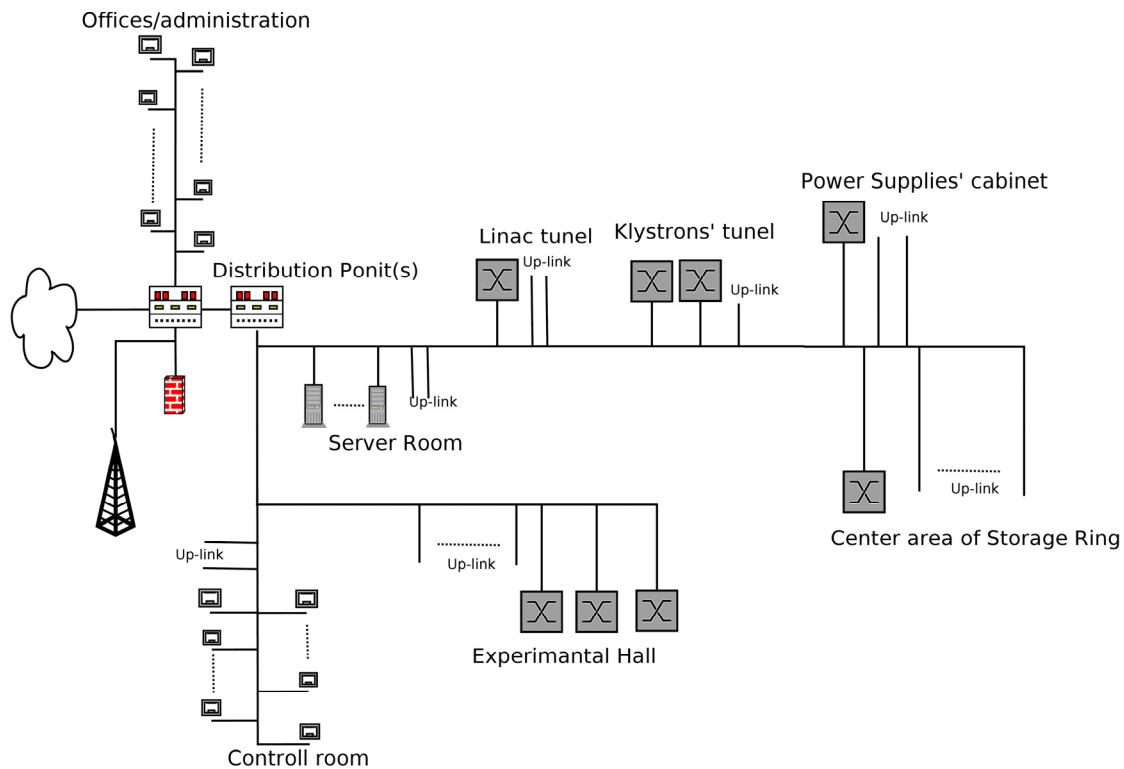


Figure 3: Concept network diagram.

Offices will be equipped with a 1GbE network whereas the accelerator control system will be provided with 10GbE fibre access points in specified locations. At these locations switches will be installed according to needs. Redundancy will be implemented through the provision of backup uplink connections between neighbouring switches, assuming a spanning tree protocol will be used.

This has been found to be a cost effective solution and flexible enough for future upgrades. Compatibility with Network Reflective Memory should be achieved, too.

DIFFERENCES TO MAX IV

In general, the Solaris control system will be identical to MAX IV. The main goal is to have both systems as similar as possible. If there is any dissimilarity at least the same tools (software, protocols etc.) should be used.

Differences between Solaris and MAX IV come mainly from project physical and logical dimensions (scale) and location. The scale of the Solaris project means there is no need to implement all the features of the MAX IV control system. The Solaris team will handle location and environmental differences.

Most of the work resulting from these differences may be related to configuration but it depends on a design of affected element. Configuration may be regarded as a part of installation and not as additional work. However, it may require pre steps like re-designing.

Differences Between Solaris and MAX IV

Listed below are the identified differences grouped by source and in brackets the consequent work.

Location:

- Network (design, configuration)
- Server and equipment location (installation)
- Cable trays (installation)
- Racks (installation)
- Geographical GUIs (design and development)

Equipment differences:

- Beamline (design, development, configuration, installation)
- EPS (configuration, re-development)
- Standard servers and workstation hardware (no impact)

Project scale:

- One mode linac operation
 - Triggering system (configuration)
 - GUIs (simplification, configuration, development)
- No need for Network Reflective Memory or equivalent
- Shorter linac, no bunch compressor
 - GUIs (simplification, configuration, development)
- Ramping (development, configuration)
 - GUIs (configuration, design, development)
 - Operation logic (development, configuration)

- Number of signals
 - Less archiving space
 - Less network load

Environment:

- Staff size (management)
- Office infrastructure and services
- PSS (development, purchase)
- Schedule (management)

Schedule Impacts

MAX IV and Solaris schedules are compatible in terms of purchasing and installation. Commissioning of the Solaris ring will, however, occur before that of the MAX IV rings. This means that Solaris should actively participate and follow work in Lund in preparation of a rapid systems start-up. In the area of the control system this is especially important in regard to eventual debugging of the system during the commissioning phase.

Collaboration

Collaborations with other institutes will be established to cope with differences and to handle additional work. In this respect Memorandums of Understanding with Elettra and ALBA have already been signed. This will provide additional expertise and support too.

CONCLUSION

As outlined in the paper, the Solaris project is progressing. Due to the linking to the MAX IV project the most demanding part of activities is in management. Almost all design and development is being done in Lund by MAX IV team with support being provided by the Solaris group. Work is being undertaken to design, develop and put into operation the Solaris facility and its control system. Solaris will rely on tight cooperation between the Jagiellonian and Lund Universities and on collaboration within the TANGO community. The facility will be built on limited resources and within a short time schedule through shared knowledge, shared expertise, shared workload and rapid training .

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