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Requirements, Specification, and Interfaces for the RAON Control System

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Abstract

This document is the Rare Isotope Science Project at Institute for Basics Science Requirements, Specification, and Interfaces for the RAON Accelerator Control System. It shows all general requirements and specifications for the RAON contron system.

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1 Overview

The Control team has selected the Experimental Physics and Industrial Control System (EPICS) [1] as a main framework of the control system, because it is reliable, scalable, maintainable, low-cost system, and standard. The EPICS is an open-source, i.e. the source code is accessible, software that has various tools, libraries, and predefined applications developed by a world-wide user community and is used in large and small experimental physics projects such as particles accelerators, telescopes, and light sources since 1994. In addition, EPICS supports several hundred different modules with almost all bus types that produced by more than hundred manufacturers. One can find further information at http:///www.aps.anl.gov/epics/.

- The EPICS clients shall be Debian Linux Stable PCs. The current version is Debian 7 Wheezy [2].
- EPICS servers on PC hardware shall run Debian Linux Stable (or other version as approved by RAON Accelerator Control Team (RACT))
- EPICS servers on Versa Module Europa bus (VMEbus) hardware shall run VxWorks version 6.9 (or other version as approved by RACT)

2 EPICS Versions

- All EPICS software submitted by the Contractors, Collaborators, or any other third party shall be based on EPICS base version 3.14.12 (or later version as specified by RACT.
- Where additional EPICS modules are used, the versions shall be according to Table 1. Later versions may be specified by RACT.
- If a module is not explicitly specified in Table 1, the default version of this module used shall be the version provided in the synApps packages version 5.7. One can see the further information at http://www.aps.anl.gov/bcda/synApps/.

Table 1 EPICS Module Versions

Name	Version	comments
asyn	R4-24	http://www.aps.anl.gov/epics/modules/soft/asyn/
stream	2-6	http://epics.web.psi.ch/software/streamdevice/
ether_ip	2-26	http://sourceforge.net/projects/epics/files/ether_ip/

Table 1 – *Continued on next page*

Name	Version	comments
seq	2.1.7	http://www-csr.bessy.de/control/SoftDist/sequencer
areaDetector	R2-1	http://cars9.uchicago.edu/software/epics/areaDetector.html
motor	R6-8	http://www.aps.anl.gov/bcda/synApps/motor/

3 EPICS Support

Where the contract involves the development of an EPICS interface to the equipment and any devices, the following itemized list shall apply.

3.1 Input Output Controller (IOC) platform

- The standard IOC hardware platform is an 1U rack mountable server.
- All IOC hardware shall be installed into the standard 19-in. rack by the Contractor.
- The IOC shall be included in the system performance tests at the Supplier's factory.

3.2 Database development

- The Contractor shall provide EPICS databases with layout information compatible with the Visual Database Configuration Tool (VisualDCT) EPICS database development tool [3].

3.3 Device support

- The Contractor shall supply EPICS device drivers and device support for any hardware delivered as part of this contract.
- Where the Contractor provides a motion controller, the EPICS interface shall be the standard Moder record, or a set of records that provides equivalent functionality.

3.4 RACT Supplied Items

- Debian Linux Stable, upon request.
- Control System Studio, upon request.

- A naming convention document for the control system.
- A specification for the file structure to be used for software development. **Need to be a section in this document**

3.5 Operator Interface (OPI)

Where the contract involves the development of an EPICS interface to the components, the following shall apply.

- The Contractor shall supply a GUI to perform the following functions:
  - Equipment control panel(s) showing the state of all signals associated with the equipment. These should enable users to monitor and control the equipment for routine operation. It shall be possible to call up the engineering control panels from the Equipment control panel.
  - The enginnering control panels should enable engineers to monitor and control all the available parameters of the equipment for commissioning and for troubleshooting.
- The OPI shall be implemented in CSS/BOY.
- The version of CSS used shall be the stable release, currently 3.3.11, or later version as approved by RACT.
- The version of BOY used shall be the stable release, currently 3.3.0, or later version as approved by RACT.
- The OPI shall be implemented on a Linux PC. The version of Linux, defined in Chapter 1, shall be used.
- The OPI for all optical elements shall include information about the direction and sign of the coordinate system used, including linar and rotations axes.

3.6 Software Development

- The Contractor shall provide current versions of all source code developed by the Contractor when the relevant Equipment is delivered to the Purchaser.
- The Contractor shall provide final versions of all source code developed by the Contrator at the completion of equipment commissioning.
- The Contractor shall provide software design documentation including functional specifications, sequence diagrams, class diagrams, and so on for the software developed to meet this contract.

- A suitable level of commenting shall be adopted for all developed software. As an indication, comments should be provided, on average, for every subroutine and any complex code segment.
- All software comments shall be in English or Korean. In case of Korean, UFT-8 encoding shall be used.
- The Contractor shall allow the source code developed to meet this contract to be open source, consistent with the EPICS Open license.

3.7 Other Software

- The Contractor shall provide EPICS device support source code for all devices supplied as part of this contract.

4 Acknowledgment

The document is re-compiled by the author based on the original NSLS-II XFD RSI for the Controls and DAQ Systems [4] in order to use it for the RAON accelerator control system. I owe much to Bob Dalesio and Wayne Lewis for fruitful discussions about the requirements, specifications, and interface for controls systems.

Bibliography

[1] A Johnson et al. Experimental Physics and Industrial Control System - EPICS, 2010. URL http://www.aps.anl.gov/epics/.

[2] Debian Linux Stable Distribution, 2013. URL http://www.debian.org/.

[3] Visual Database Development Tool. URL https://wiki-ext.aps.anl.gov/epics/index.php/VDCT_S

[4] Experimental Facilities Requirements, Specifications and Interface for the Controls and Data Acquisition System, Version 3, 2013.