EUROPEAN SPALLATION SOURCE

Document Type	Project Report
Document Number	ESS-0150753
Date	Aug 23, 2017
Revision	1 (1)
State	Preliminary
Confidentiality Level	Internal
Page	1 (4)

Target and Dump Proton Beam Imaging Systems CDR
Status of Imaging System EPICS and FPGA development

	Name	Role/Title
Owner	Hinko Kocevar and Grey Christoforo	Researchers
Reviewer	Erik Adli	Oslo in-kind manager
Approver		

1. SCOPE

This document documents the current state of the ESS ICS support for the Imaging Systems, both EPICS support for imaging system cameras, spectrometers etc. and definition and delivery of FPGA platform.

2. INTRODUCTION

The following has been agreed by the Oslo-ESS in-kind contract technical annex [ESS-0044049] :

"ESS will provide EPICS support, code review services and standard FPGA and software frame-works. In particular, ESS will provide all layers of device drivers and control system software for cameras, up to the point of delivering a demo software which acquires images. Also for the FPGA design, ESS will provide the standard FPGA framework up to the point of delivering a demo framework where the image information is available. "

In order for Oslo to deliver the final imaging systems, it is necessary that a reasonably stable version of EPICS, including the control system software, is made available well in advance of the system commissioning, in order to do the necessary. "Well in advance" means at least a year, but preferably more.

Similarly, it is necessary that the final FPGA platform is available well in advance of the system commissioning, in order to do the necessary development.

Furthermore, ESS and the Oslo group is already performing test beam work for coating development. For this work it is a clear desire to operate cameras, spectrometers similar or the same as the final hardware, and with EPICS, in order to gain sufficient experience for the implementation for the final hardware. If EPICS is not available, a parallel, temporary control framework would have to be implemented instead, something which would be suboptimal use of resources.

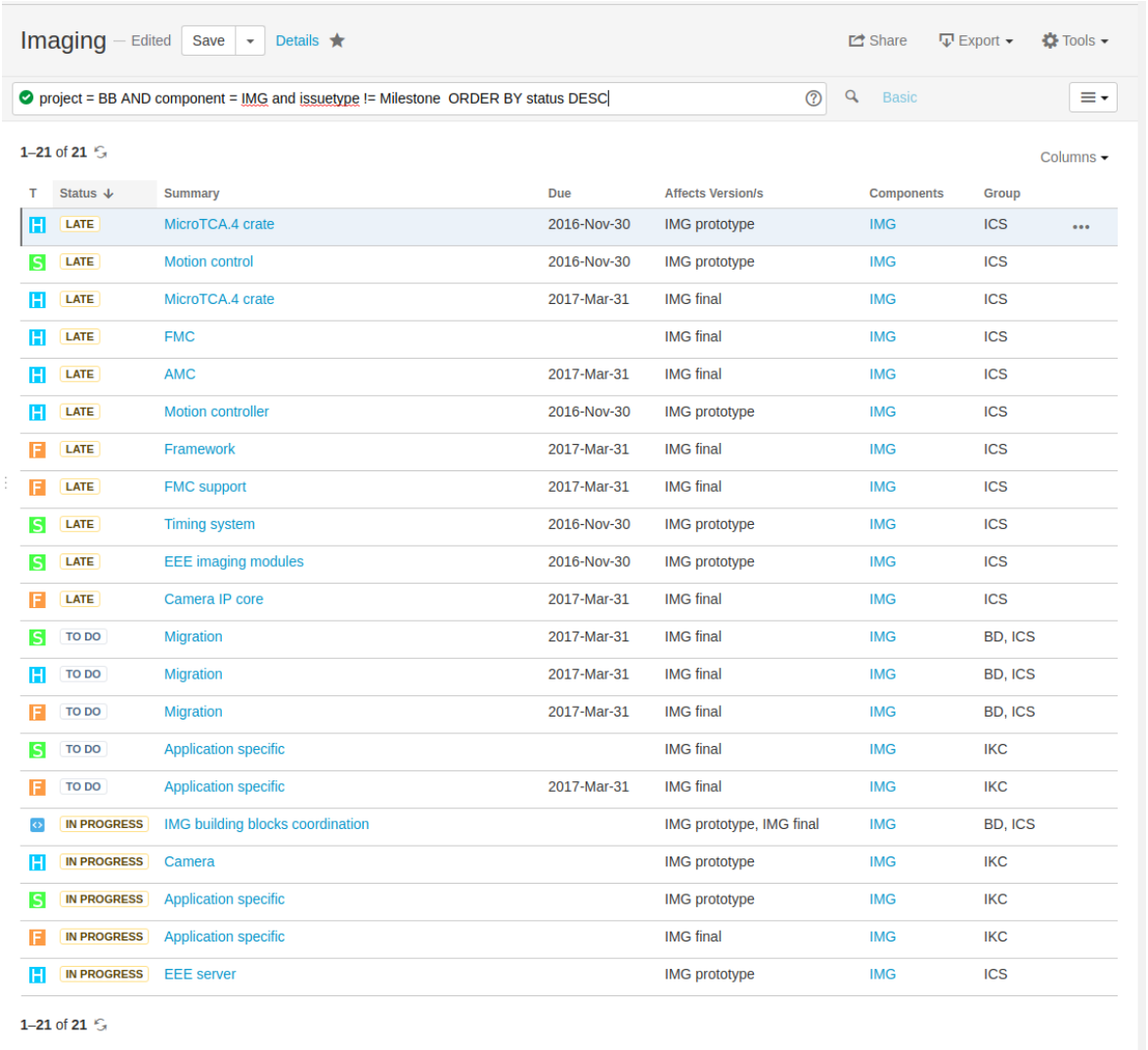
The Oslo group has not the resources available to develop EPICS device drivers and control system layers themselves, so it is necessary for the progress of the project that the support from ESS become available.

3. IMAGING SYSTEM BUILDING BLOCKS

The "building blocks" are intended as an interfaces with ESS Controls Group on required hardware to be supported. See :

https://confluence.esss.lu.se/display/BB/IMG+-+building+blocks

For reference, a snapshot of the building blocks on 12 October 2017, is seen below.



Imaging — Edited | Save | Details | Share | Export | Tools

project = BB AND component = IMG and issuetype != Milestone ORDER BY status DESC | Basic

1–21 of 21 | Columns

T	Status	Summary	Due	Affects Version/s	Components	Group
H	LATE	MicroTCA.4 crate	2016-Nov-30	IMG prototype	IMG	ICS
S	LATE	Motion control	2016-Nov-30	IMG prototype	IMG	ICS
H	LATE	MicroTCA.4 crate	2017-Mar-31	IMG final	IMG	ICS
H	LATE	FMC		IMG final	IMG	ICS
H	LATE	AMC	2017-Mar-31	IMG final	IMG	ICS
H	LATE	Motion controller	2016-Nov-30	IMG prototype	IMG	ICS
F	LATE	Framework	2017-Mar-31	IMG final	IMG	ICS
F	LATE	FMC support	2017-Mar-31	IMG final	IMG	ICS
S	LATE	Timing system	2016-Nov-30	IMG prototype	IMG	ICS
S	LATE	EEE imaging modules	2016-Nov-30	IMG prototype	IMG	ICS
F	LATE	Camera IP core	2017-Mar-31	IMG final	IMG	ICS
S	TO DO	Migration	2017-Mar-31	IMG final	IMG	BD, ICS
H	TO DO	Migration	2017-Mar-31	IMG final	IMG	BD, ICS
F	TO DO	Migration	2017-Mar-31	IMG final	IMG	BD, ICS
S	TO DO	Application specific		IMG final	IMG	IKC
F	TO DO	Application specific	2017-Mar-31	IMG final	IMG	IKC
	IN PROGRESS	IMG building blocks coordination		IMG prototype, IMG final	IMG	BD, ICS
H	IN PROGRESS	Camera		IMG prototype	IMG	IKC
S	IN PROGRESS	Application specific		IMG prototype	IMG	IKC
F	IN PROGRESS	Application specific		IMG final	IMG	IKC
H	IN PROGRESS	EEE server		IMG prototype	IMG	ICS

1–21 of 21

4. STATUS OF ESS HARDWARE SUPPORT

As seen in the list of building blocks in chapter 3 none of the listed hardware components were delivered by ICS. IKC has not been given ESS supported hardware platform with accompanying AMC board(s), timing system and motion controller.

Question about the preferred camera hardware interface, that ICS would support, was asked by IKC but never an answered by ICS (https://jira.esss.lu.se/browse/BB-123).

5. STATUS OF ESS EPICS SUPPORT

As seen in the list of building blocks in chapter 3 the none of the listed software EPICS components were delivered by the ICS. EEE server was setup by IKC with ICS providing instructions over e-mail/WIKI.

EEE itself is currently unable to support IKC selected camera and spectrometer due to EEE dependency issues. This was reported to ICS but no action was taken to resolve the problem (https://jira.esss.lu.se/browse/EPICSENV-76). Others (IKC and BD) have reported similar problems, too, with no resolve.

This situation is impacting the progress of software development IKC is responsible for.

Temporary solution, which was avoided as long as it could be, is that IKC does not use EEE. Selected camera and spectrometer work without any problems under community supported EPICS. This way IKC can proceed with software development.

Doing that shall result in BD providing the resources and support for IKC where ICS is not delivering.

6. STATUS OF ESS FPGA SUPPORT

FPGA algorithm development is proceeding despite the fact that the FPGA development team at Oslo has not received the final FPGA platform hardware from ICS (or even concrete specifications for what this hardware will be). The team has various relevant image transformation and processing algorithms running in real time on an arbitrary development platform board available at the time of development. The team hopes that it will be straightforward to translate these algorithms to the final hardware. The Oslo development team has made guesses at what the final FPGA hardware platform will be like and has used these guesses to run simulations and extract estimates as to weather the image processing algorithms under development will meet the final system timing requirements. These simulations and estimates suggest that the final system timing requirements will be met.

7. GLOSSARY

See https://confluence.esss.lu.se/display/BIG/Abbreviations.

DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
1	CDR	NN	2017-10-01
2	Update hardware, software and firmware chapters	Hinko Kocevar and Grey Christoforo	2017-10-12