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Subject: R&D prototypes that could be developed to gain field experience at an operating facility

Posted by [carwardine](#) on Thu, 31 May 2007 08:40:15 GMT

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Please add to this list of candidate prototypes as you see fit...

1. Vertical slice HA Control System using ATCA front-end instrumentation electronics (FLASH, NML,...)
2. Long-haul and short-haul precision RF phase & timing distribution (FLASH, NML,...)
3. HA EPICS PV gateway on ATCA (APS)
4. Vertical demonstration of integrated distributed FPGA code management for online front-end systems (FLASH,...)
5. Vertical demonstration of orbit feedback system with transparent recovery from bpm failures

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Subject: Issues and unknowns that need to be resolved before completing the EDR

Posted by [carwardine](#) on Thu, 31 May 2007 08:43:32 GMT

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Please add to this list as you see fit...

1. Control system scalability
  2. How to make cost-conscious decisions on the control system design
  3. How do we manage a global controls project? Controls, interfaces with technical systems, standardization,&#8230;
  4. How do we make it possible for [algorithms, hardware, software components etc] to be tested & integrated at different facilities? Issues are: interfaces, portability, interoperability, standards,&#8230;
- 
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Subject: Proposed new work packages, work packages that that need to be done  
Posted by [carwardine](#) on Thu, 31 May 2007 08:45:47 GMT  
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Please add to this you see fit...

1. Write test criteria for... LLRF system, Controls front-end, Controls Middleware, etc
2. Write use cases for... LLRF software, Controls applications, Remote access, etc
3. Develop algorithms/methods for bpm introspection
4. Create online list of work being done now &#8211; by topic, keyword, etc
5. Create an online knowledge base of existing (ATCA) solutions to applications (hardware, software, tools, etc)
6. Develop LLRF algorithm inter-operability standard to be able to exchange algorithms and test at different facilities eg Adaptive feed-forward algorithm&#8230;

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Subject: Re: R&D prototypes that could be developed to gain field experience at an operating facility  
Posted by [rehlich](#) on Thu, 31 May 2007 08:46:08 GMT  
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Control system failover implementation for subsystems e.g. the two laser systems at FLASH

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Subject: Exchanging LLRF algorithms  
Posted by [carwardine](#) on Thu, 31 May 2007 08:47:42 GMT  
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Means to exchange algorithms should have following features...

1. Should be independent of&#8230;
  - o Sample rate
  - o Hardware implementation (fpga, dsp, micro, analog)

o Software/code platform

2. Should define

o Available signals for input

o Required signals for output

o Required signals for debugging

o A common way to describe the algorithm; eg flow chart, difference equation, transfer function, Matlab/Simulink blocks, etc

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Subject: Summary descriptions of ongoing work, lists of work packages

Posted by [carwardine](#) on Thu, 31 May 2007 10:07:15 GMT

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This thread is intended as a place to gather summary descriptions about Controls and LLRF related work activities in the three regions at Labs, Universities, etc

Please do not use this topic to post progress reports.

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Subject: Re: R&D prototypes that could be developed to gain field experience at an operating facility

Posted by [rehlich](#) on Thu, 31 May 2007 10:19:23 GMT

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O HA (High Availability) LLRF Implementation in ATCA

- Architecture (incl. standardization), ATCA and uTCA, T.Jezynski
- Development of ATCA carrier boards with FPGA,DSP ,IPNO
- Fast analog IO and digital IO (100 MHz, 14-bit) ,ISE
- Ultra fast analog IO (2 Gs, 10 bit),INFNP
- Neutron detector board with customized ASIC ,DMCS
- Gamma detector board ,DMCS
- Integration of downconverters and upconverters ,DESY,Mathias Hoffman
- Digital signal processing ,DCMS
- Communication ,IPNO
- Redundancy and self diagnostic ,DMCS
- HA Design (HW, SW), QA and QC ,DESY, T.Jezynski
-

- o High precision Timing and Synchronisation for LLRF
  - Integration MLO, MO, Timing ,ISE
  - Integration pulsed optical with RF ,DESY,H.Weddig
  - Cal. Reference and LO to downconverters ,DESY,F.Ludwig
  - Clock synthesizer for LLRF ADCs ,ISE
  - Int. with ultrast. timing and clock, event, (data ?),ISE
  
- o Software Architecture and Implementation Strategies,
  - Software architecture ,DESY,Markus Hoffman
  - Software development tools ,DMCS
  - Software documentation tools ,DMCS
  - Distribution of Algorithms (FPGA, DSP, CPU) ,ISE
  - Software/hardware co-design ,DMCS
  - Communication protocols ,ISE
  - Algorithm development ,DESY ,W.Koprek
  - Diagnostics (HW & SW) ,DESY,T.Jezynski
  
- o Precision RF Field Measurement
  - Low noise, low drift downconverter (field detector),INFNP
  - Low cost, low real estate, multi-channel downc. (ASIC) ,DMCS,ISE
  - Transient detection (low cost multichannel) ,DMCS,DESY,P.Morozov, M.Grecki
  
- O Procedures for Commissioning and Operation
  - Commissioning and Operation Procedures,DESY, V.Ayvazyan
  - Automation of Operation ,DMCS
  - Cavity simulator including rf front end ,ISE
  - Interfacing to other accelerator subsystems ,DESY ,P.Pucyk
  - Interlocks ,ISE
  - Monitors,ISE
  
- O Fast Frequency tuner
  - Piezo driver ,DMCS
  - Increased stroke of PZT
  - Segmented fusing of piezostacks, DMCS
  - Microphonics control ,DMCS
  
- O Beam feedbacks for LLRF

- Beam feedback Concepts ,PSI
- Beam diagnostics and monitors (Int. with LLRF) ,PSI
- Beam feedback prototype impl. At FLASH ,PSI

other collaboration partners:

IPNO Orsay, INFN Padova, PSI, other IN2P3

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Subject: Work package descriptions for Americas Region in FY 2008-09  
Posted by [carwardine](#) on Thu, 31 May 2007 10:25:12 GMT  
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The attached file summaries proposed work packages for Fiscal Years 2008-09 for the Americas Region

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#### File Attachments

1) [ART\\_WBS\\_List\\_FY08\\_09.doc](#), downloaded 1070 times

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Subject: Re: R&D prototypes that could be developed to gain field experience at an operating facility  
Posted by [michizon](#) on Thu, 31 May 2007 10:38:17 GMT  
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- LLRF system for STF modulator #1
- LLRF system for STF modulator #2
- STF LLRF-network server and EPICS installation
- Development of FPGA interlock system
- Development of high-sensitivity arc detector
- Development of intermediate frequency (IF) mixture method
  - for the reduction of the number of ADCs half or 1/3

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Subject: ATCA for physics applications  
Posted by [carwardine](#) on Thu, 31 May 2007 10:43:58 GMT

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This topic is intended for discussions relating to using ATCA in physics applications.

Sub-topics might include:

ATCA profiling ("preferred implementations")  
ATCA for instrumentation  
ATCA/Control system integration

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Subject: Questions relating to Controls & LLRF and the ILC EDR  
Posted by [carwardine](#) on Thu, 31 May 2007 10:46:05 GMT  
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A place to post questions specific to the ILC Engineering Design (EDR) phase...

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Subject: General  
Posted by [carwardine](#) on Thu, 31 May 2007 11:02:53 GMT  
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A place for posting discussion or questions not covered in other threads...

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Subject: template for new work packages  
Posted by [g-gollin](#) on Thu, 31 May 2007 11:05:43 GMT  
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Here is a proposed template file for new work package documents.  
Comments/corrections/suggestions to [g-gollin@uiuc.edu](mailto:g-gollin@uiuc.edu) please. I will update the file and post a revised version.

#### File Attachments

1) [WP\\_template\\_CNTR.doc](#), downloaded 917 times

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Hi,

Here are the details from our (ART) workpackages. Clearly the deployment at NML could really be a deployment at a test area in any of the three regions.

#### 1) Control System High Availability

##### Description:

High availability is achieved through the application of a variety of well-known techniques. Within this work package we research the application of these techniques in the context of accelerator control systems. We examine those techniques where the application to controls is not well understood. Among the techniques to apply are conflict avoidance, controller redundancy and failover, model-based resource monitoring, model-based configuration management, automated diagnosis, and adaptive control. The goal is to create an operational example of selected techniques applicable to the ILCTA.

##### Deliverables:

1. Prototype of conflict avoidance mechanism(s) suitable for deployment at ILCTA.
2. Prototype of hardware/software resource monitoring suitable for deployment at ILCTA.
3. Prototype of configuration management example suitable for deployment at ILCTA.
4. Prototype of automated diagnosis application suitable for deployment at ILCTA.
5. Prototype of resource redundancy/failover for candidate resources (ex. CPUs, switches) suitable for deployment at ILCTA.
6. Plan for fault injection to test effectiveness of techniques."
7. Prototype of adaptive control (ex. Adjust feedback alg. due to loss of sensor/actuator) suitable for deployment at ILCTA.
8. Deployment and test of prototypes at ILCTA per test plan.
9. Documented recommendations for integration with EDR."

#### 2. Control System Architecture

##### Description:

This track involves researching and documenting the overall control system architecture. Included here are the site-wide network infrastructure, client applications tier, services tier, technical equipment tier, and protocols. In addition, the set of standards, interfaces, and methodology are to be documented. Unique research is required to assure that the requirements for high availability, scalability, automation, feedback, synchronous operation, and remote operation are met with an optimized design.

##### Deliverables:

"1. Common tool(s) selected for documenting architecture (ex. UML) with central document repository.

2. Documented reference network architecture.
  3. Documented reference software architecture.
  4. Prototype remote operations technology (ex. Role-Based Access) suitable for deployment at ILCTA."
  5. Suite of documented standards and interfaces for distribution to other technical groups.
  6. Simulation of network data flow and documented conclusions in relation to network architecture.
  7. Deploy prototype of remote operations technology to ILCTA."
3. Controls system requirements document.

In addition, we would like to see (some of which could be deliverables in the workpackages above):

4. Defining interface between technical systems and controls with regard to the high availability boundary. How much do the tech systems need to do on their own vs reporting to controls? What kind of information needs to be reported to controls system for diagnostic information?

5. A more detailed review/update of the controls system information in Tom Himel's availability simulation.

For ATCA

1. Evaluate ATCA Basic Components Evaluate Chassis options, power systems, shelf manager operation, basic redundancy and hot-swap features using commercially available components. Develop reports & share results with collaboration.
2. Prototype HA Controls Core Test  
Build up controls node test system consisting of single ATCA shelf, redundant processors, switch modules and power supplies; plus two  $\mu$ TCA crates each with processor, power supply, binary and analog I/O; and an external PC server. Demonstrate high level, middleware, real time OS for operation of above. Demonstrate failover & hot-swap.
3. Demonstrate AMC Cards for ATCA and  $\mu$ TCA  
Develop Mezzanine cards for one or more key applications. Demonstrate operation with ATCA and  $\mu$ TCA.
4. Tools for Module Development  
Specify tools for module development and testing in ILC environment. Procure and test commercial tools including ATCA and  $\mu$ TCA starter kits, available software, reference card test platform, shelf management components. Evaluate, recommend analog, RF and digital IO connectors for Rear Transition Module area for hot-swap implementation. Develop or recommend adapters to other standards such as VME to increase options for test instrumentation.
5. Evaluate  $\mu$ TCA Basic Components



Evaluate Chassis options, power systems, shelf manager operation, basic redundancy and hot-swap features using commercially available components. Evaluate wiring options such as half backplane on double wide chassis. Develop reports & share results with collaboration.

#### 6. Diagnostic Processor Modules

Develop Diagnostic Processor Modules for various subsystems to collect operational data from within systems such as power modulators, redundant power supplies, RF systems. Internal dynamic data such as power waveform sampling of special interest. Develop low and high level software to manage DP data. Demonstrate simple example of intervention for machine protection, fault avoidance.

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Subject: Re: Proposed new work packages, work packages that that need to be done

Posted by [michizon](#) on Thu, 31 May 2007 15:14:47 GMT

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- Evaluation of rf power overhead

- FB performance under the given overhead in RDR.

- how can we improve the performance by klystron linearization, adaptive FF algorithm and so on.

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Subject: "List of Lists" from Controls working session on 30 May 07

Posted by [carwardine](#) on Thu, 31 May 2007 19:24:16 GMT

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The attached file is a snapshot of the List of Lists shown at the Controls working session today. Discussions and updates will be directed to topic threads set up for specific lists.

#### File Attachments

1) [ListofLists\\_31May07.rtf](#), downloaded 987 times

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Subject: Link to Marc Ross's EDR presentation at LCWS  
Posted by [carwardine](#) on Thu, 31 May 2007 19:35:37 GMT  
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Marc Ross's presentation give at the opening plenary session of LCWS can be found at the following link on the ilcagenda server...

[http://ilcagenda.linearcollider.org/getFile.py/access?contri  
bld=5&sessionId=0&resId=0&materialId=slides& confId=1296](http://ilcagenda.linearcollider.org/getFile.py/access?contri<br/>bld=5&sessionId=0&resId=0&materialId=slides& confId=1296)

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Subject: FNAL's additional R&D plan  
Posted by [michizon](#) on Fri, 01 Jun 2007 11:42:40 GMT  
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#### File Attachments

1) [WBS ideas.doc](#), downloaded 789 times

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Subject: ATCA evaluation for Detector DAQ needs  
Posted by [carwardine](#) on Wed, 13 Jun 2007 10:59:25 GMT  
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The detector DAQ group is interested in ATCA largely because of the potential for implementing high channel density. What does the work package look like that addresses their questions? Does this require a separate work package from other ATCA evaluation efforts, or is there something viable that addresses common interest?

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