

TDAQ Operations

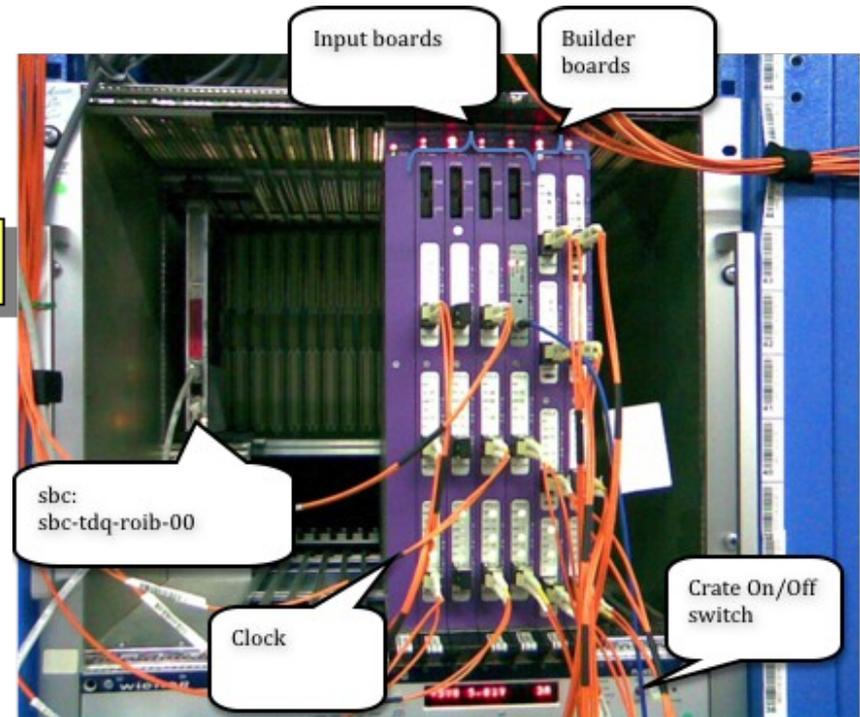
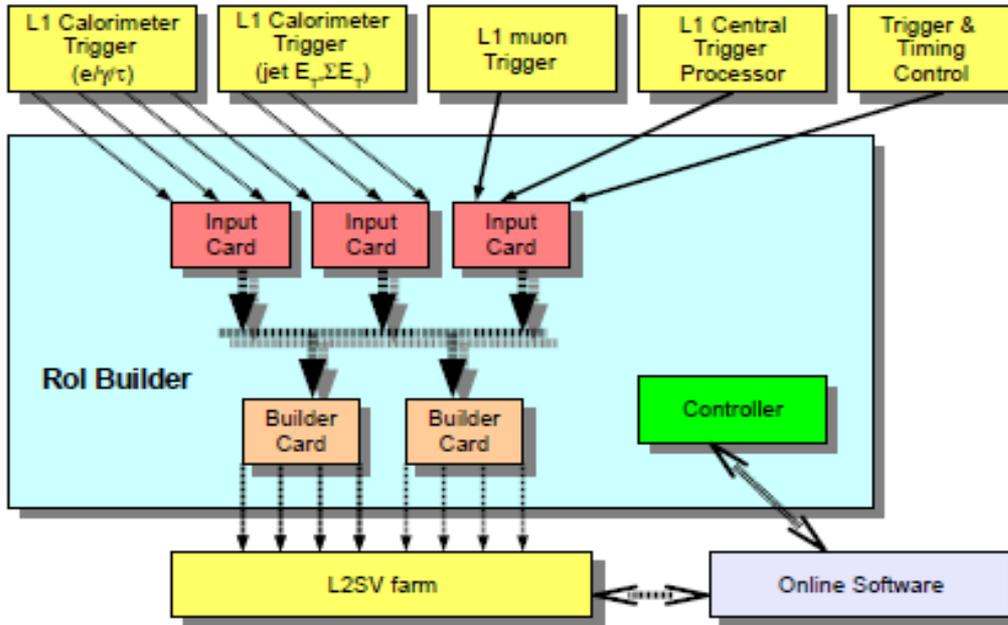
- Current & Future
 - People and tasks
 - potential issues
 - known issues

Scope of responsibilities

- Region of Interest Builder (RoIB) was unique in the US TDAQ deliverables as having a long term support component
 - if it doesn't work we don't take triggers
 - ANL, MSU built and support this
 - Until recently most of the support was provided by ANL staff at CERN
 - Moving from a phase of deployment, debugging ... to long term support mode
- Beyond this the US has responsibilities in supporting the TDAQ/HLT software
 - hardware wise there is very little in the DAQ/HLT area that doesn't have vast amounts of redundancy (i.e. failure simply degrades the rate capability)
 - ANL,WU,MSU,UCI...



Region of Interest Builder (RoIB)



VME based RoIB Builder

- 8 Dell 1950 supervisors (rack mounted Intel computers with custom input cards) which distribute the Level 1 data to Level 2 (L2SV farm)
- ~23kHz each (L2SV is the limiting factor not the VME based hardware)
- Typically a subset of the Level 2 farm is served by one L2SV
- custom input card (FILAR) is PCIX and current generation of PCs don't have a PCIX bus (only PCIe)

Current TDAQ Operations

- Lead responsibility for RoIB hardware and software that touches it
 - control software for the RoIB
 - L2SV software
 - Pre-series and DAQ
- What's actually involved?
 - Staffing on call point of contact for smooth operation of detector during data taking
 - this has been a very low level of activity but requires presence at CERN
 - Denis, Jinlong, Sasha Paramonov and I have until recently covered this
 - Yuri Ermoline, Barbara Alvarez Gonzalez, Huaxiao Zhang (MSU) recently added and are working on increasing the pool of available people for this
 - generally try to take advantage of people resident for extended periods at CERN
 - Software maintenance (i.e. as problems surface, releases and APIs change)
 - Denis has been primarily on this with a little help (Jinlong, Per Werner and myself)
 - implementation and testing of the new Tdaq-03-00-01 RunController, MessagePassing and MasterTrigger interfaces in L2SV, RoIB and RoIB Feeder.
 - RoIB programs for board testing were revamped and resurrected.



A few examples of operations issues during the last year

- Data from previous run trapped in RoIB buffer injected into next run
- Update to interfaces and state machine (new TDAQ release) which impacted test systems and the L2SV software
- Improvements in error handling allowing an L2SV to fail without forcing an end to the run and reconfiguration
- Input interface failure
- Software changes to prevent database access by L2SVs during run (look up of L2 processor configuration was moved to run start – this fixed a performance issue)
- Setting up remote reset of the SBC via the Detector Control System
- Interface reset problems on the FILAR

None of these resulted in significant down time or lost data

Current Operations++

- Improve documentation
 - Partly just good practice
 - Partly in support of expanding the personnel available for operations support and long term sustainability
- Develop training program
 - Expand people for on call support (Barbara and Huaxio were first trainees)
 - require runcontrol training plus some specialized additional training
- Support a test setup here for board repair
 - Current system has suffered from not being kept up to date with evolving TDAQ software
 - partly no real need since we have yet to have board failures that need fixing
 - we do, however, have repaired boards from production failures which increase the pool of spares
 - can serve as a software test and development system (harder than it should be since release testing is almost exclusively being done at CERN)
 - Test routines used for initial production testing are available
 - These routines have been dressed up (GUI added) to make them more usable by non-expert or experts that haven't used them for a while



The screenshot shows a software window titled 'Roll I/O' with tabs for 'Config', 'Actions', and 'Debug'. The main area is divided into three sections: 'quest cards', 'input boards', and 'output boards'. Each section contains a grid of checkboxes representing individual slots. In the 'quest cards' section, slots 1 and 2 are checked. In the 'input boards' section, slots 3, 7, 11, 12, 13, 14, and 15 are checked. In the 'output boards' section, slots 0, 4, 8, and 12 are checked. Below the grids, there are input fields for 'active input bitmask' (0x110), 'active output bitmask' (0x1), 'quest bitmask' (0x6), and 'slots#' (15 and 16). A 'Clear Result' button is located to the right. At the bottom, a log window displays test results for three hosts: usth0, usth0, and usth7. The log entries show the setup of various software releases and the execution of test routines, with the second usth0 entry providing specific performance metrics.

Host	Result
usth0	Setting up TDAQ Common SW release 'tdaq-common-01-14-00' Setting up DQM Common SW release 'dqm-common-00-10-00' Setting up DAQ SW release 'tdaq-02-00-03' ic85-slc5-gcc43-opt
usth0	Setting up TDAQ Common SW release 'tdaq-common-01-14-00' Setting up DQM Common SW release 'dqm-common-00-10-00' Setting up DAQ SW release 'tdaq-02-00-03' ic85-slc5-gcc43-opt Active Input Channels: 4, 8, Active Output Channels: 0, Tested Output Ports: 0, Filler channels: 0, 1000 passes will be made using data files from /home/fellmann/data/ 9.329 usec/event, 60 words/event, 0 errors
usth7	Setting up TDAQ Common SW release 'tdaq-common-01-14-00' Setting up DQM Common SW release 'dqm-common-00-10-00' Setting up DAQ SW release 'tdaq-02-00-03' ic85-slc5-gcc43-opt

Test routines were used intensively during production by small group of experts – upgrading the user friendliness so *intensive* use is not a requirement for *successful* use.

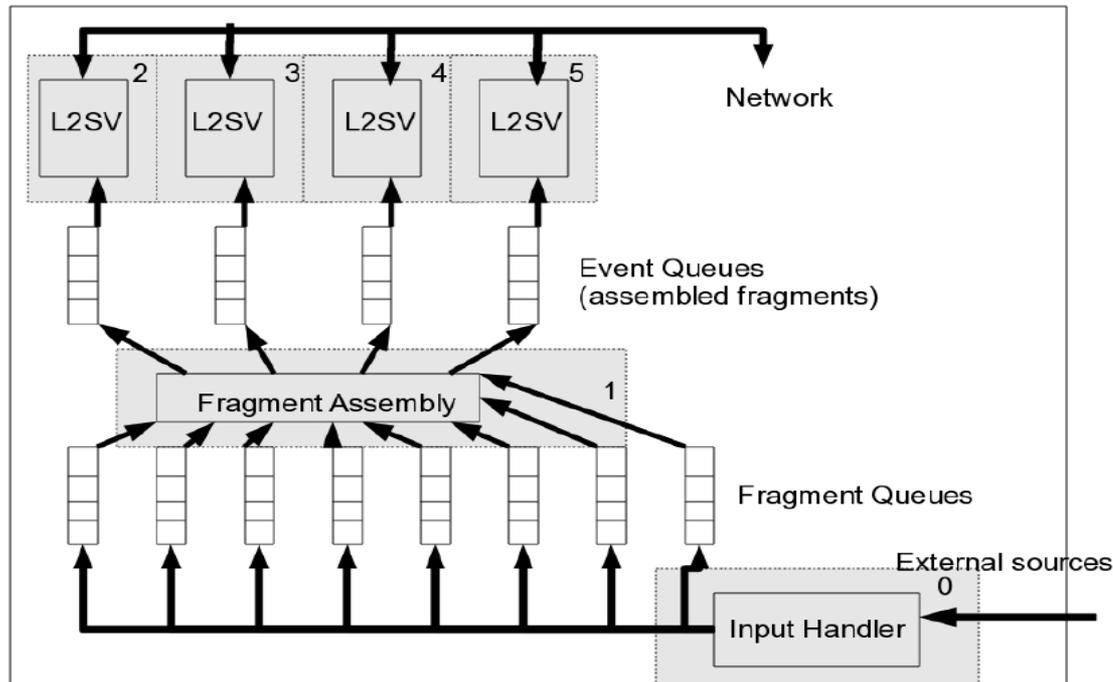
Future operations related activity

- RoIB itself is VME based
 - Single Board Computer (SBC) in the VME crate is an aging Pentium
 - Typical of many front end detector systems
 - As years go by the support level for these 32 bit systems is questionable
 - How long will RHEL work
 - How long will the hardware work (we don't usually keep computing systems around for more than 3 to 5 years and these are ~7 years old)
 - Currently no firm plan for upgrading these systems but likely this will be necessary
- Hardware that services the RoIB
 - FILAR cards that receive the RoIB data are PCIx cards
 - The last motherboards that have PCIx slots are soon to disappear from the market (just bought 2 Dell R5400 systems for the test setup here 1 PCIx slot)
 - CERN has produced a PCIe version of the FILAR which is driver compatible
 - Need to test this in TDAQ context and make sure there are no surprises
 - If this goes well then we are okay as far as the Level 2 supervisors being upgradeable



Dealing with this

- Have upgrades for the test setup which will do PCIe and PCIx
- Need to test and validate the new FILARs
- Potential alternative (exploiting modern multi-core systems):



Alternative Futures (upgrade or M&O?)

- Currently have an ATCA crate with two dual Nehalem (i7) blades
 - Shelf has ethernet fabric and switch
 - May be a reasonable alternative to upgrading the VME hardware
 - Needs to be demonstrated and reviewed by the collaboration
- With the addition of hardware to input S-link (replace FILARs with a Rear Transition Module, RTM, a single card to feed the input to a modern multi-core processor)
 - Could upgrade both the S-link input and the VME crate to modern standards
 - Would require opportunity (time to install and test)
 - Given that RoIB+L2SVs are needed through 2017 this would be sensible for the 2013 shutdown
 - Would require a working prototype, in the next year.
- After 2013 shutdown we will have additional hardware support obligations related to the FTK readout



Backup Slides



Single Points of Failure (HW)

- Run Continues, some data is lost
 - ROS failures/ ROBIN failures
- Run needs to be started (after some sw changes)
 - DFM failure
 - ROIB failure
 - LFS serving anything other than XPU's
 - Most ONL & some Mon machines (SW: RDB, IS, gIPC server, coral server)
- Run needs to be started (after some hw changes)
 - L2SVs die
 - Rack containing, L2SV + DFM (maybe split the resources into 2 racks)
 - DNS/Time servers, (on the same rack).
 - SFO file server
 - EF switch or blades (stefan)
- Redundant enough, no problems expected
 - CFS - not used
 - NetApp (dual redundant)
 - ROS NW switches (dual DC1&DC2)
 - ES on 21st XPU dies

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risk assessment (thx to F.Wickens)

Probability

no	impossible	1
	almost impossible	2
	very unlikely	3
maybe	unlikely	4
	little plausible	5
	plausible	6
	likely	7
yes	very likely	8
	almost certain	9
	certain	10

Detectability

yes	immediately	1
	easily	2
	quite easily	3
maybe	probably	4
	likely	5
	possibly	6
	with difficulty	7
	unlikely	8
no	improbably	9
	impossibly	10

Gravity

minor	nil	1
	hardly visible	2
	very limited	3
average	limited	4
	visible	5
	significant	6
	very significant	7
	important	8
major	disastrous	9
	catastrophic	10

- Severity= Probability x Detectability x Gravity

➔ Focus on high severity

- Budget allowance

➔ Δ : Cost to rectify the effects of the risk

▸ e.g. to reduce severity below 100

➔ Total reserve required= $\sum \Delta \times \text{Probability}$

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<i>Risk</i>	<i>P</i>	<i>D</i>	<i>G</i>	<i>S</i>	$\Delta_{(FTE)}$	Σ
Ros/Robin	3.5	4	6	84	6	21
DFM	6	1	7	42	2	12
ROIB	4	3	8	96	3	12
non-XPU LFS (e.g. SFO)	3	2	6	36		0
ONL/MON central services	4	1	8	32		0
L2SV	5	1	7	35		0
L2SV/DFM rack	4	1	8	32		0
DNS/TS rack	4	1	8	32		0
EF switch	3	1	8	24		0

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A rather subjective view...

Outlook

- ROS/Robin - 5 FTEs

- replacement of ROS & checking of ROBINS
 - happening nowish

- DFM - 2 FTE

- Replacement of existing PCs, according to the plan
- investigation of the possibility of running 2 DFM in parallel

- ROIB - 3 FTEs

- 0.5 FTE : to improve detectability
- 1.5 FTE : to improve reliability of the device, update FW
- 1 FTE: future directions, ROIB on PC?

- Additionally

- NW switches and cables including, the cost
 - Brief chat with SS reveals the redundant EF(BE) switch is available for
- ROIB input/output card failure? ==> Alternatives to be
- Survey of the SW related risks to be done

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