L3 DAQ

Doug Chapin
for the L3DAQ group

• Overview of L3 DAQ
• uMon
• l3xqt
• l3xmon

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The L3DAQ System

All ethernet, except for TFW communication

- ROC SBC
- ROC SBC
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- ROC SBC

CISCO 6509 Ethernet Switch

- Supervisor CPU
- COOR

- Farm CPU
- Farm CPU

Routing Master CPU

- TFW info
- trigger disable

63 readout crates

48 farm nodes
Communication Flow

Run information:
crate and node list
by trigger bit

Routing info:
destination
farmnode
by event

Bits fired
by event

Crate list
by event

“node ready”

SCL: accept

Supervisor

COOR

ScriptRunner
trigger
programming

EVB
Filter-shell

Farm node

Routing Master

TFW
trigger
disable
ReadOutCrate Example

- Data Card
- Data Card
- VME block transfer(s)
- SBC initiated
- SBC
- Ethernet
- ctrl req programming
- CPU Card
- Controller Card
- J3
- Slave Ready
- Done
SBCs

- Intel ~1GHz, 128MB RAM, dual 100Mb ethernet, 128MB flash, VME Universe2
- VME slave interface
  - VBD control register emulation
  - Data buffer access
    - Component front-end debugging
- J3 Control (SlaveReady,Done)
  - DIO PMC add-on card
    - Also drives status LEDs
- Software connections
  - Actively connect to RM
  - Receive up to 2 connections from each farmnode
SBC Operation

- Match head event tag to head fragment via event number
- Fragments have one sec timeout
  - If no tags, throw away head event after 1s
- Route queue circular, non-blocking
  - Tags can be overwritten if no fragments are available
- Event number mismatch
  - If frag ev# > tag ev#, throw away tag
  - If frag ev# < tag ev#, drop fragment
Supervisor Process

- **Connections to**
  
  - **RM**
    - Receives crate and node list per bit
    - RM complains if needed nodes/sbcs not connected
  
  - **Scriptrunner processes**
    - Receive complete trigger programming
      - Passed on from COOR
      - When trigger downloaded
    - Node processes may get stuck
    - Big trigger lists take several minutes to download
  
  - **NO** connection to SBC or EVB processes
Farm Nodes

- Dual 1GHz Intel, 1GB RAM
  - 48 nodes so far
- Runs Event Builder (EVB) and Filtershell processes
- Filtershell Processes (usually 2)
  - This is ScriptRunner (L3 filters)
  - Receives trigger programming info from supervisor
  - Receives full event from EVB process
- EVB Process Operation
  - Connects to all SBCs (incl RM), all the time
  - Receive crate list by event# from RM
  - Sends no. of free buffers to RM (“node ready”)
  - Builds event from received fragments
    - 1 - 5 second timeout
Routing Master (RM)

- Receives "run" information from supervisor
  - Farm node list and crate list per bit
- Gets bits fired per event# from TFW
- Receives no. of free buffers from each farm node
- Decides which nodes receive which events
- Sends routing info by event# to SBCs
- Sends crate list by event# to farm nodes
- Disables triggers when necessary
RM Operation

- Process generates event tags and crate list
  - based on bits fired and run info
- One sender thread and event tag queue per SBC
  - Wait for 10 tags or 250ms, then send
    - Minimize ethernet overhead
- Crate list sent to target node on every event
L3 Disable

- RM process running on TFW crate's SBC (d0sbc001b)
- Spy on the TFW data block
  - Extract L1 fired bits and L3 transfer number
- When L3-disable is needed
  - Update RM monitoring information
  - RM tells SBC to stop reading out the TFW crate
    - TFW crate goes 100% front-end-busy and stops triggers
    - Acts as global disable
- Cons
  - Actual L3 Disable line is not used
    - Cannot easily separate out l3daq backup (accounting issue)
  - Shifter must check L3DAQ monitoring every time TFW crate is 100% front-end-busy
Monitoring

- All processes (SBC, RM, super, EVB) produce monitoring info
- Monitor clients
  - l3xmon
    - ScriptRunner status (processing, flattening, sending, ...)
  - üMon is your friend
    - SBC, RM, and some Supervisor info
    - EVB info (missing crates, input rate)
    - Send comments to sean@fnal.gov
  - l3xqt
    - Mostly expert info
    - Daqmon info (L1/L2 busy fractions) useful to shifters
Scripts

- **Online scripts**
  - `l3xreset`
    - can restart farmnode processes\n      - EVB and ScriptRunner simultaneously
    - can restart Supervisor process (node d0lxmlast)
  - `l3xdaq_reset`
    - Restarts sbc processes (incl RM)

- **SBC scripts**
  - `is_crate_requesting_readout.sh` (SlaveReady asserted?)
  - `getInfo.sh` (sbc driver stats and status)
  - `reset_all.sh` (restarts processes)
L3DAQ Shifter Webpage

- [http://www-d0o1/www/groups/l3daq/shifter](http://www-d0o1/www/groups/l3daq/shifter)
- “What To Do When”
  - Extremely useful
  - Frequently updated???
- On-call schedule
- uMon documentation!!!
- Logfile access
Typical Problems

• Prescales set for < 10Hz
  - Unpredictable results (all crates missing)
• Not enough nodes in run
  - L3 disables (TFW 100% FEB)
  - SMT/CFT/CAL in full-readout mode?
• Farmnode loses connection to SBC
  - Crate is missing (reset farmnode to fix)
• Crate 100% missing
  - Almost always a component problem
  - Check Route and Event queue state in uMon
Improvements to Come…

• Phase out l3xmon
  - Currently uses a separate monitor server
  - Move features into uMon

• Trigger Crate
  - Set L3 disables correctly