L3 DAQ

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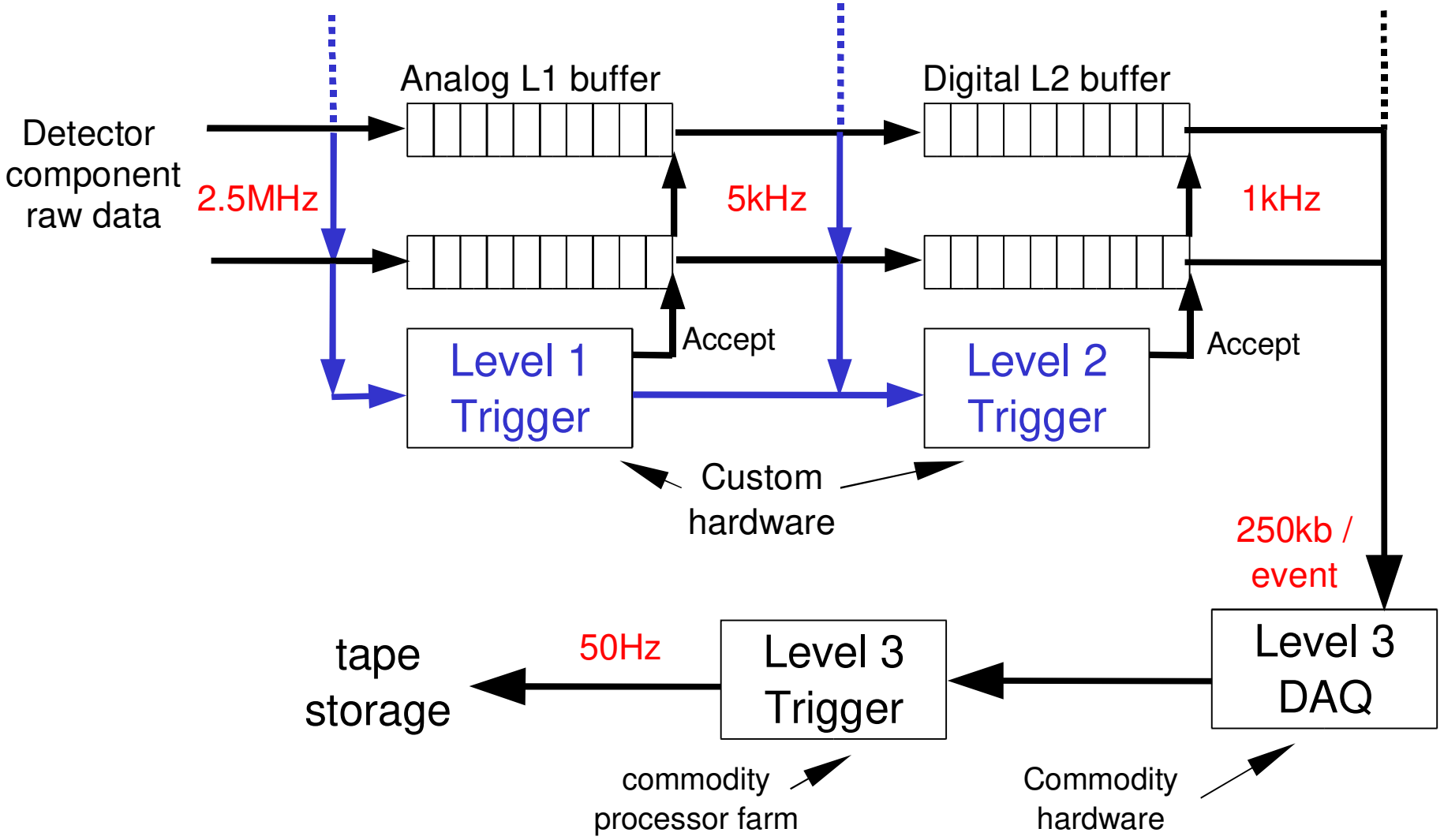
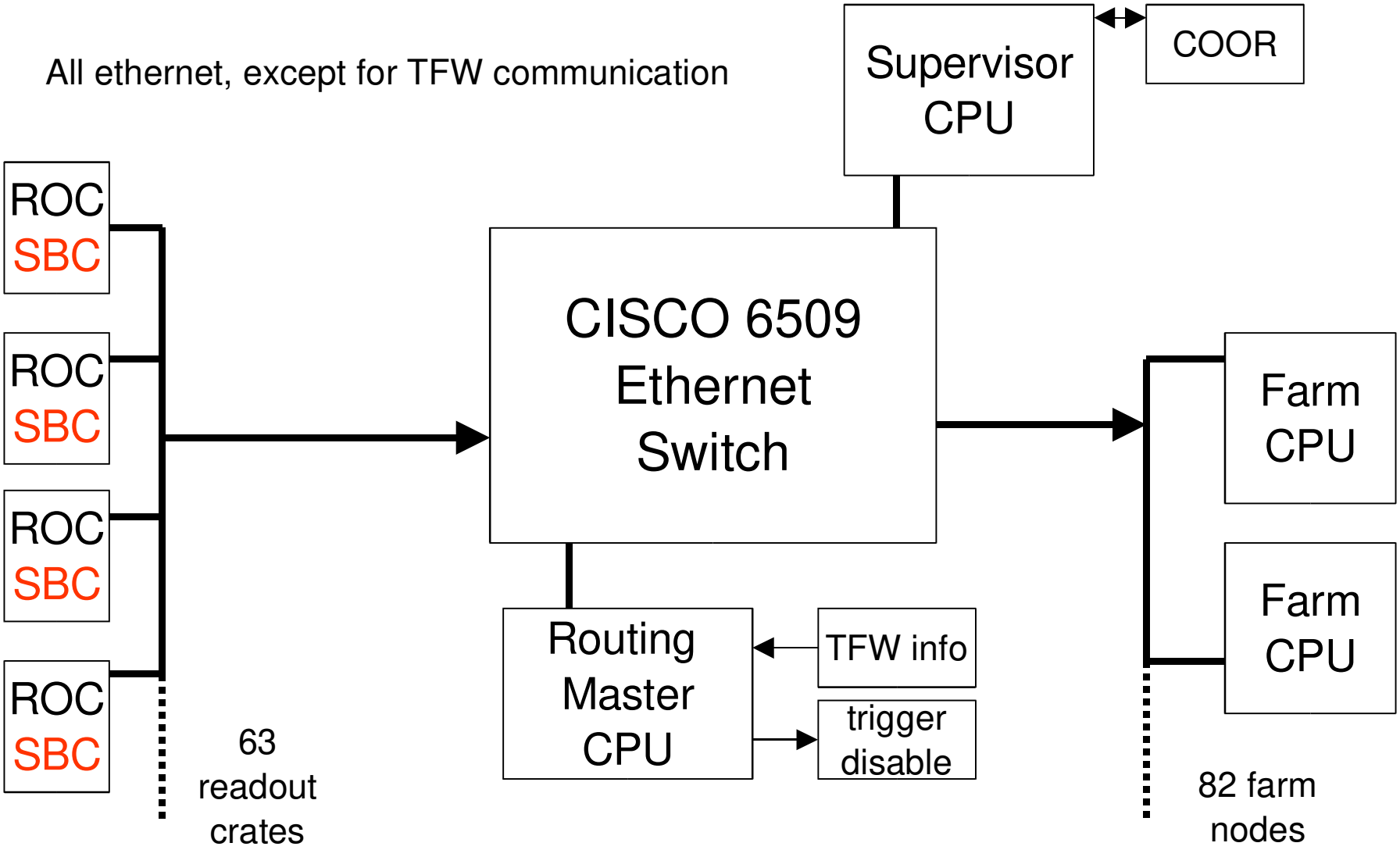
for the L3DAQ group

- Overview of L3 DAQ
- Monitor Clients
- Common issues

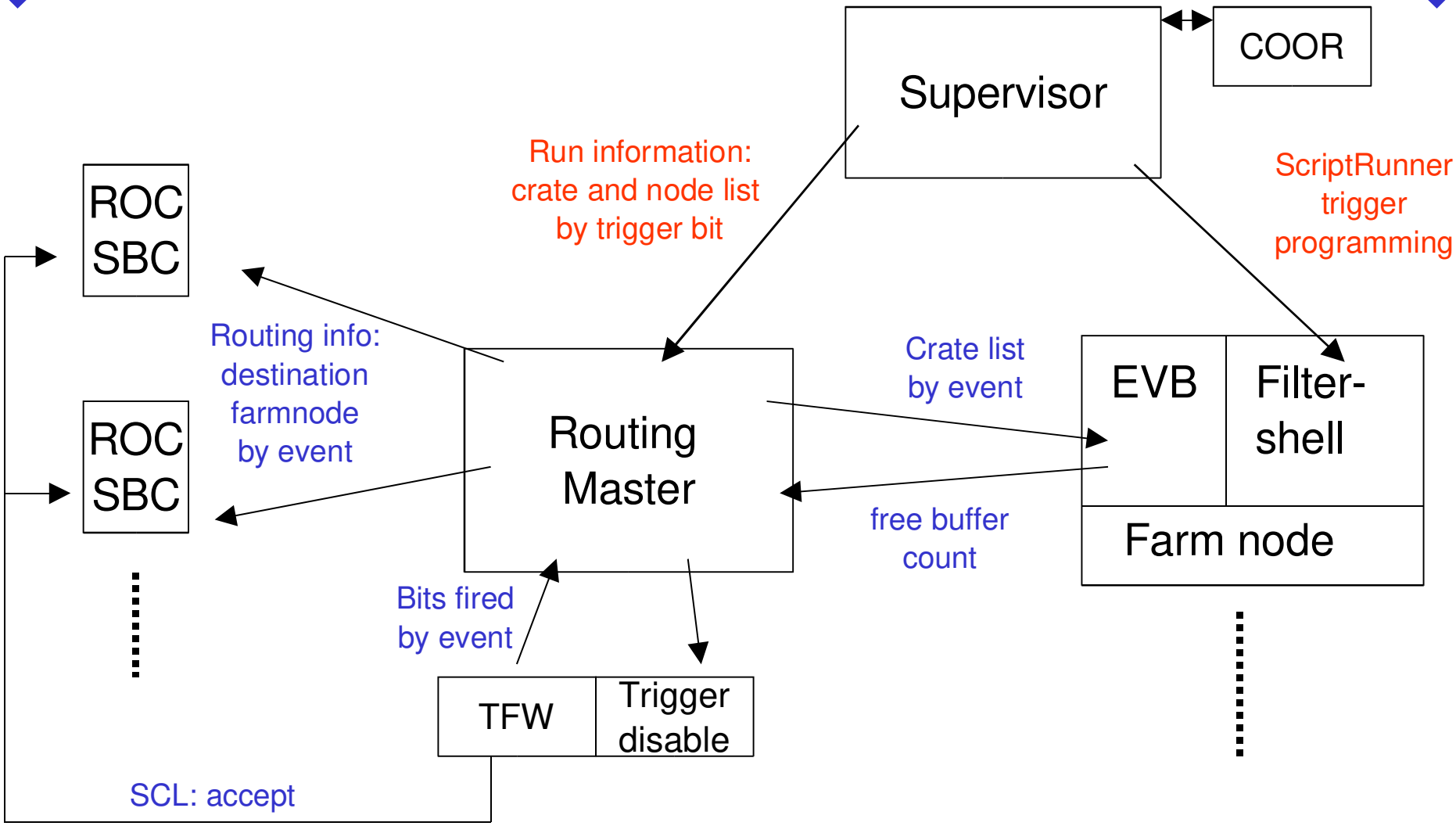
D0 DAQ


Detector component raw data
2.5MHz
Analog L1 buffer
5kHz
Digital L2 buffer
1kHz
Accept
Accept
Level 1 Trigger
Level 2 Trigger
Custom hardware
250kb / event
Level 3 DAQ
Level 3 Trigger
50Hz
tape storage
commodity processor farm
Commodity hardware

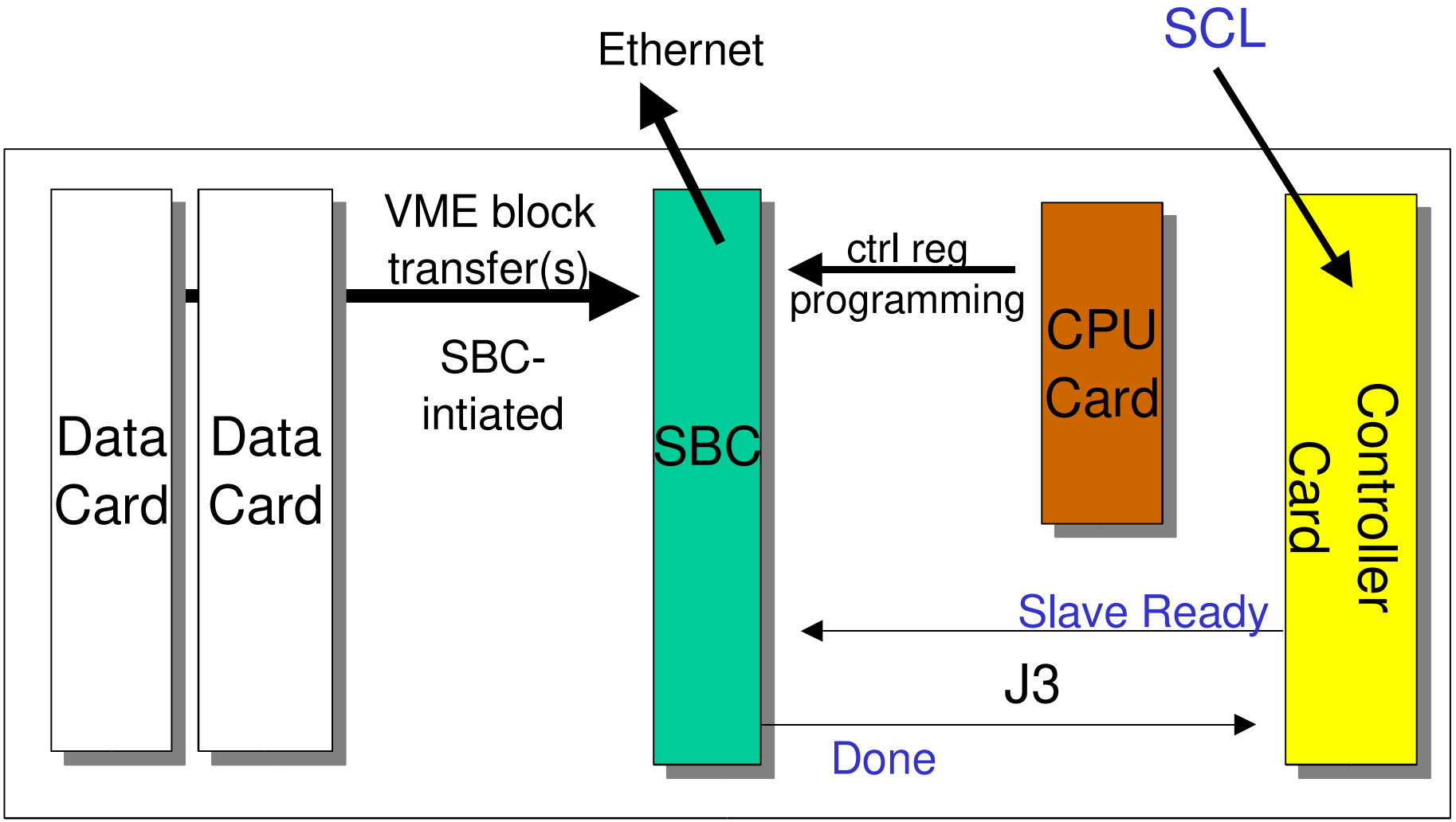
The L3DAQ System



Communication Flow



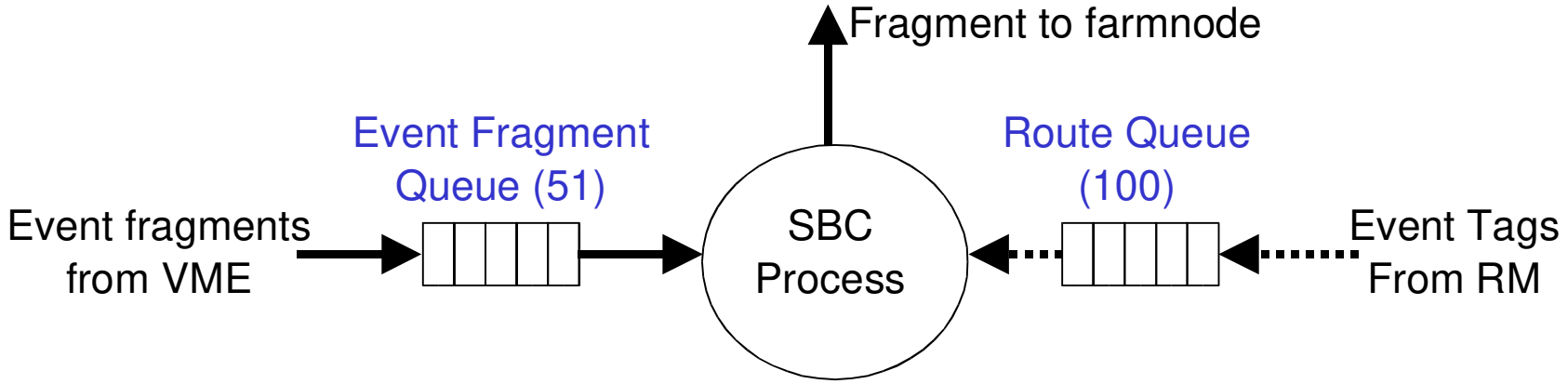
ReadOutCrate Example



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
  - Recieve 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
- Stale tags also thrown away after a few seconds
- Route queue non-blocking
  - Flushed when full
- Event number mismatch
  - If frag ev# > tag ev#, throw away tag ("vme event ahead of rte event")
  - If frag ev# < tag ev#, drop fragment ("vme event behind rte event")

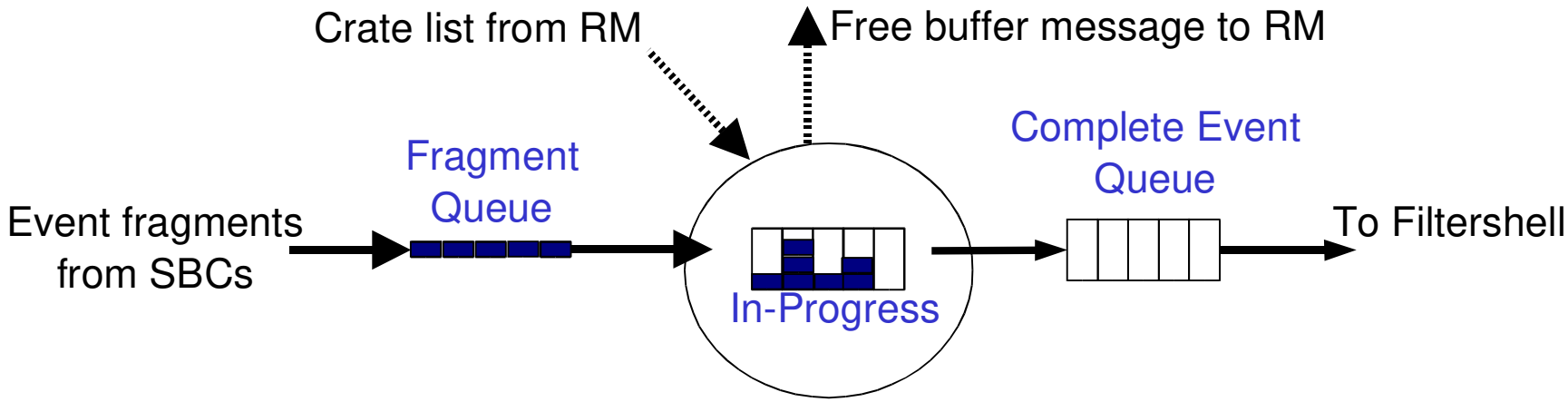
Supervisor Process

- Connections to:
  - COOR (of course)
  - RM
    - Receives crate and node list per bit
    - RM complains if needed nodes/SBCs not connected
  - Scriptrunner processes (via EVB/ioprocess)
    - Receive complete trigger programming
      - Passed on from COOR
      - Only when trigger downloaded
    - Farmnode processes wont respond when SENDING
    - Big trigger lists take several minutes to download
  - *N0* connection to SBC or EVB processes

Farm Nodes

- Two species
  - 48 Dual Intel PIII 1GHz, 1GB RAM
  - 34 Dual AMD Athlon 2GHz, 1GB RAM
  - Dual ethernet: online and L3DAQ switches
- Run Event Builder (EVB) and Filtershell processes
- Filtershell Processes (usually 2)
  - This is ScriptRunner (L3 filters)
  - Recieves trigger programming info from Supervisor
  - Recieves full event from EVB process
- EVB Process
  - Connects to all SBCs (incl RM), all the time
  - Receive crate list by event# from RM
  - Sends no. of free buffers to RM
  - Builds event from received fragments

EVB Operation

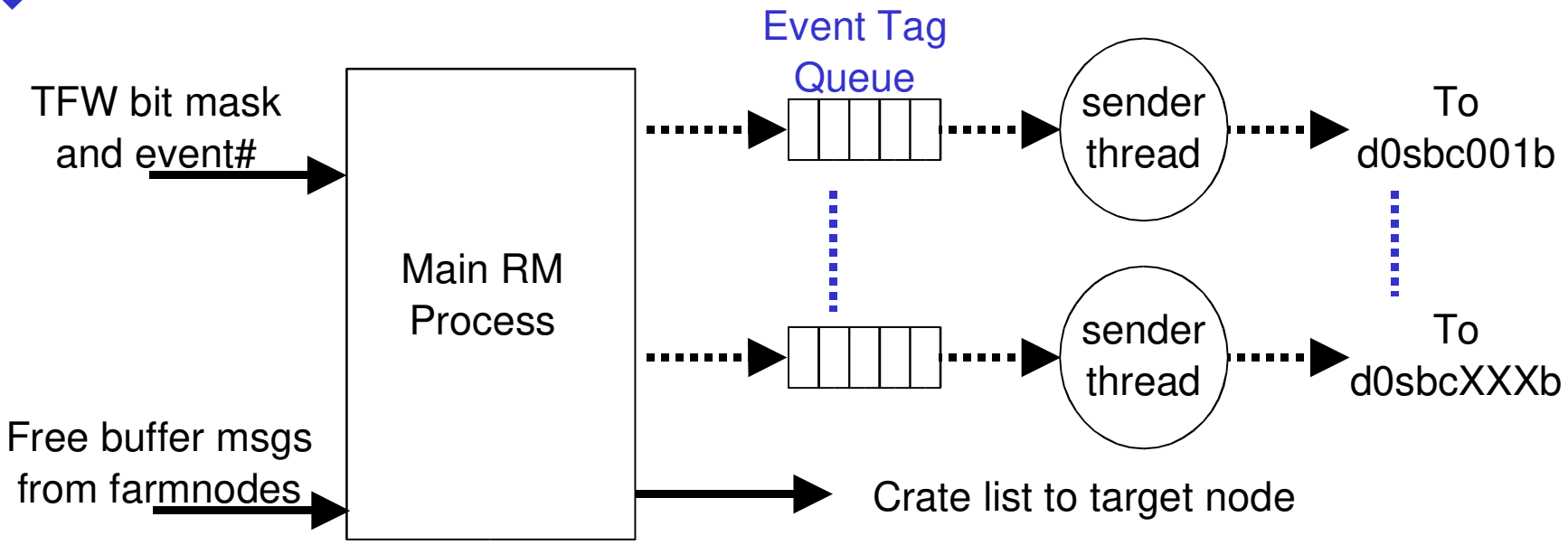


- 80 total buffers (complete + in-progress + free)
- Of the free buffers, max of 3 advertised to RM
  - Limits instantaneous amount of data in 6509 switch
    - 82 nodes * 3 buffers * 250k/event -> ~60MB
    - 6509 has 112MB capacity
- In-Progress events have 1s timeout
  - Incomplete event

Routing Master (RM)

- Recieves "run" information from Supervisor
  - Farm node list and crate list per bit
- Gets bits fired per event# from TFW
- Recieves 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 specific 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

L3DAQ Trigger Crate

- RM process running on SBC (d0sbc001b)
- VME boards interface with TFW
- Receives from TFW (via ECL lines)
  - 128 bit L2 fired mask and 16 bit L3 transfer #
  - Buffered in hardware FIFO
- Sends to TFW (via ECL lines)
  - 128 bit L3 disable mask
  - actually disables L1 accepts
    - May get 16 more L2 accepts after disable!

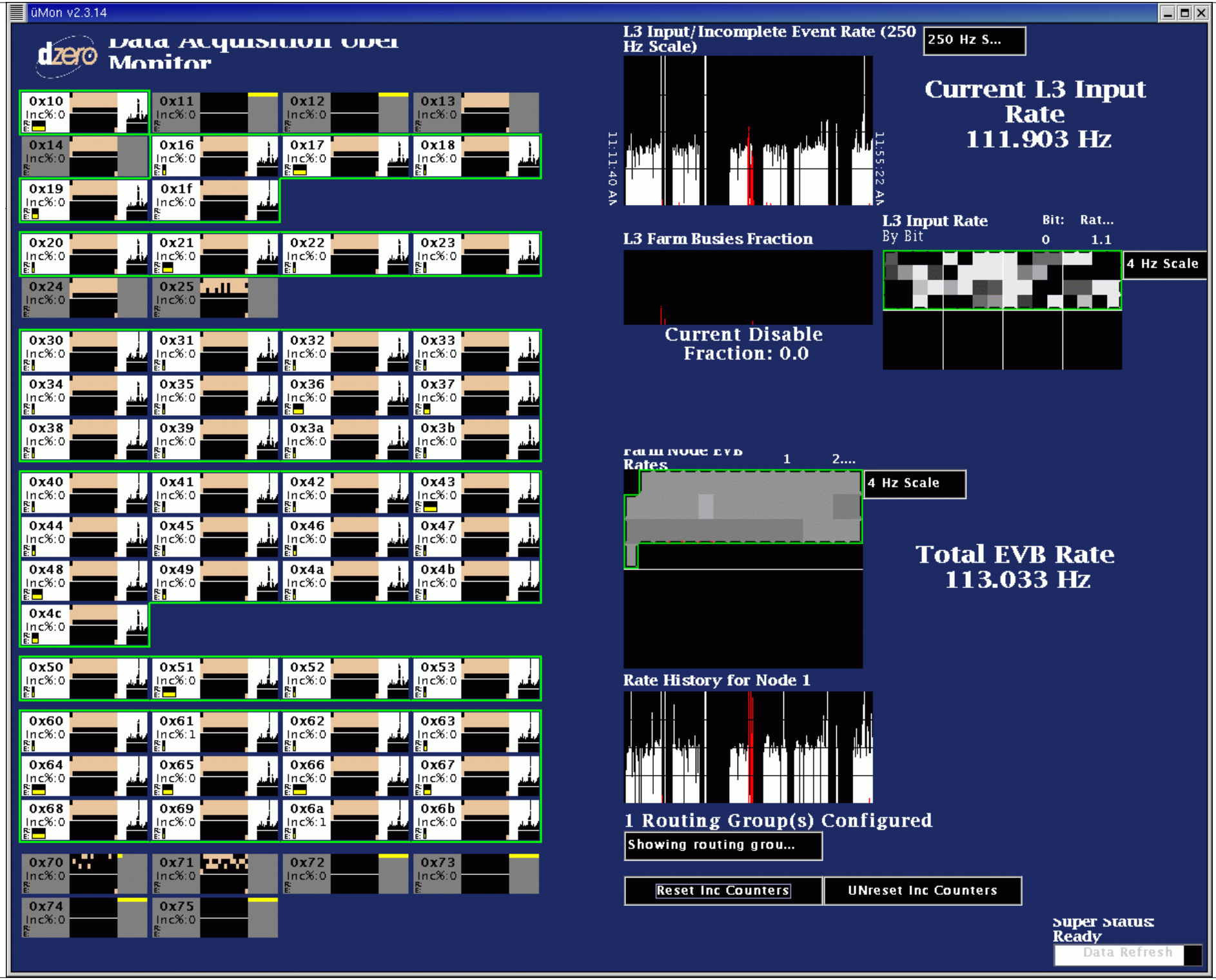
L3 Disables

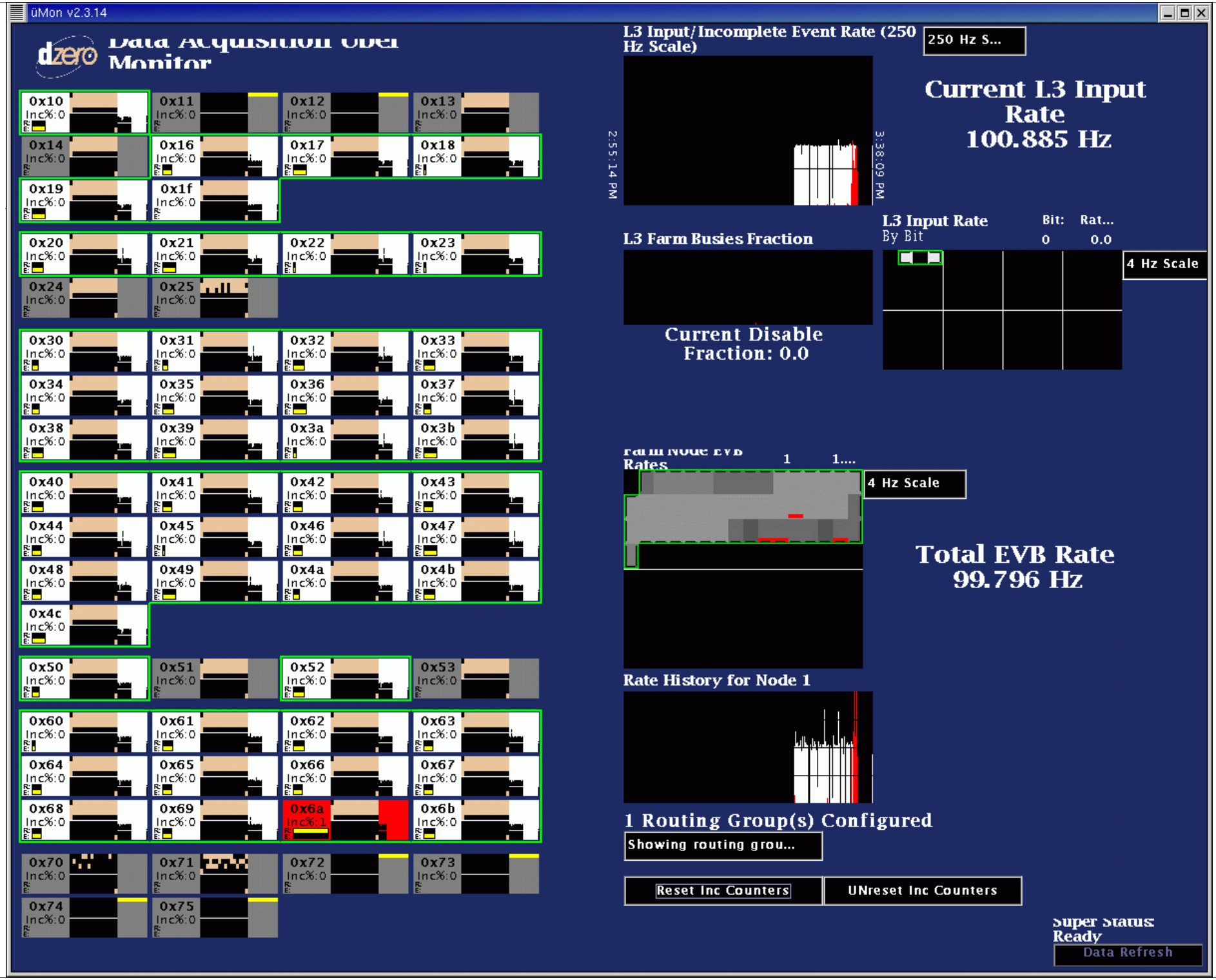
- RM disables all bits in a run when:
  - Less than 16 free node buffers available
- RM enables all bits in a run when:
  - Greater than 24 free node buffers available
- Note: a farmnode advertises max of 3 buffers
- Consequences of less than 9 nodes in a run
  - RM ignores above logic
  - Disables in that run will also disable other runs!
  - Potential unknown chaos
- Ask for at least 10 nodes in your run

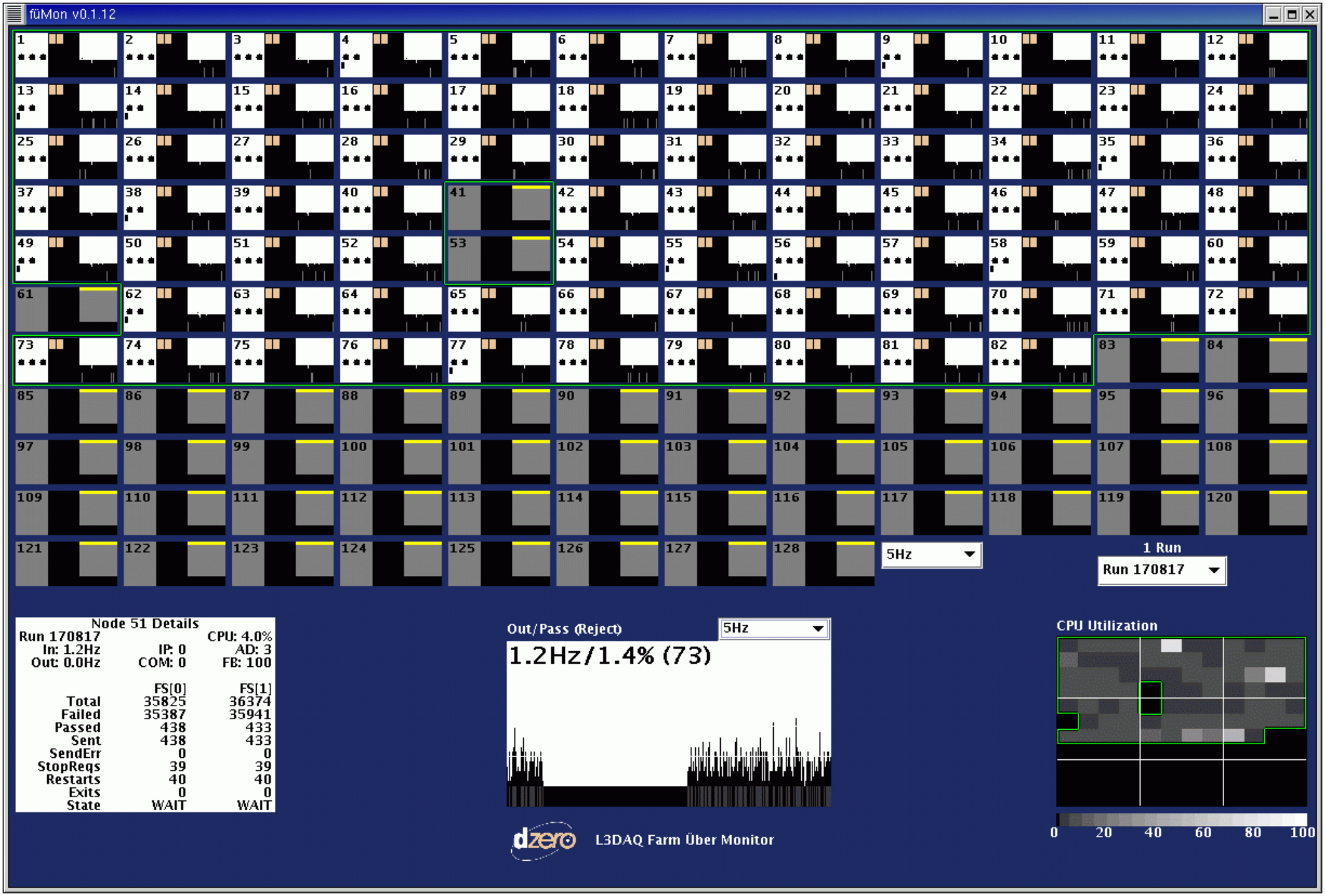
Monitoring

- All processes (SBC, RM, Super, EVB) produce monitoring info
- Monitor clients
  - füMon (L3DAQ Farm Über Monitor)
    - EVB buffer info
    - FS states, in/out rate, pass fraction
    - Comments to dpchapin@fnal.gov
  - üMon (L3DAQ Über Monitor)
    - 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

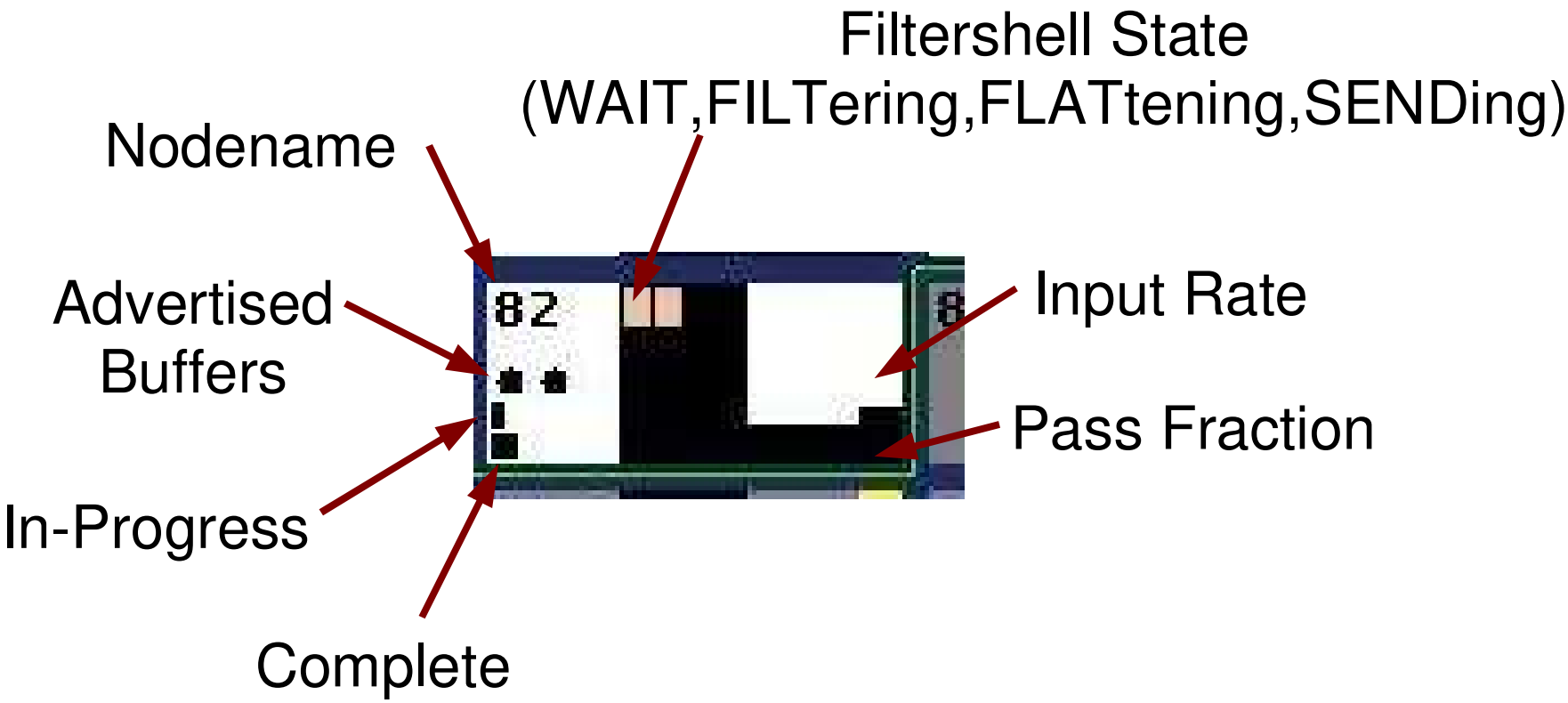
DAQ_Dialog
9
99.9466
50
85.8286
OK


üMon v2.3.14
Data Acquisition Oberl Monitor
0x10 Inc%:0
0x11 Inc%:0
0x12 Inc%:0
0x13 Inc%:0
0x14 Inc%:0
0x16 Inc%:0
0x17 Inc%:0
0x18 Inc%:0
0x19 Inc%:0
0x1f Inc%:0
0x20 Inc%:0
0x21 Inc%:0
0x22 Inc%:0
0x23 Inc%:0
0x24 Inc%:0
0x25 Inc%:0
0x30 Inc%:0
0x31 Inc%:0
0x32 Inc%:0
0x33 Inc%:0
0x34 Inc%:0
0x35 Inc%:0
0x36 Inc%:0
0x37 Inc%:0
0x38 Inc%:0
0x39 Inc%:0
0x3a Inc%:0
0x3b Inc%:0
0x40 Inc%:0
0x41 Inc%:0
0x42 Inc%:0
0x43 Inc%:0
0x44 Inc%:0
0x45 Inc%:0
0x46 Inc%:0
0x47 Inc%:0
0x48 Inc%:0
0x49 Inc%:0
0x4a Inc%:0
0x4b Inc%:0
0x4c Inc%:0
0x50 Inc%:0
0x51 Inc%:0
0x52 Inc%:0
0x53 Inc%:0
0x60 Inc%:0
0x61 Inc%:1
0x62 Inc%:0
0x63 Inc%:0
0x64 Inc%:0
0x65 Inc%:0
0x66 Inc%:0
0x67 Inc%:0
0x68 Inc%:0
0x69 Inc%:0
0x6a Inc%:1
0x6b Inc%:0
0x70 Inc%:0
0x71 Inc%:0
0x72 Inc%:0
0x73 Inc%:0
0x74 Inc%:0
0x75 Inc%:0
L3 Input/Incomplete Event Rate (250 Hz Scale)
250 Hz S...
11:11:40 AM
11:55:22 AM
Current L3 Input Rate 111.903 Hz
L3 Farm Busies Fraction
Current Disable Fraction: 0.0
L3 Input Rate By Bit
Bit: 0
Rat... 1.1
4 Hz Scale
Farm Node EVB Rates
1
2....
4 Hz Scale
Total EVB Rate 113.033 Hz
Rate History for Node 1
1 Routing Group(s) Configured
Showing routing grou...
Reset Inc Counters
UNreset Inc Counters
Super Status: Ready
Data Refresh


üMon v2.3.14
dzero
Data Acquisition Obel Monitor
0x10 Inc%:0
0x11 Inc%:0
0x12 Inc%:0
0x13 Inc%:0
0x14 Inc%:0
0x16 Inc%:0
0x17 Inc%:0
0x18 Inc%:0
0x19 Inc%:0
0x1f Inc%:0
0x20 Inc%:0
0x21 Inc%:0
0x22 Inc%:0
0x23 Inc%:0
0x24 Inc%:0
0x25 Inc%:0
0x30 Inc%:0
0x31 Inc%:0
0x32 Inc%:0
0x33 Inc%:0
0x34 Inc%:0
0x35 Inc%:0
0x36 Inc%:0
0x37 Inc%:0
0x38 Inc%:0
0x39 Inc%:0
0x3a Inc%:0
0x3b Inc%:0
0x40 Inc%:0
0x41 Inc%:0
0x42 Inc%:0
0x43 Inc%:0
0x44 Inc%:0
0x45 Inc%:0
0x46 Inc%:0
0x47 Inc%:0
0x48 Inc%:0
0x49 Inc%:0
0x4a Inc%:0
0x4b Inc%:0
0x4c Inc%:0
0x50 Inc%:0
0x51 Inc%:0
0x52 Inc%:0
0x53 Inc%:0
0x60 Inc%:0
0x61 Inc%:0
0x62 Inc%:0
0x63 Inc%:0
0x64 Inc%:0
0x65 Inc%:0
0x66 Inc%:0
0x67 Inc%:0
0x68 Inc%:0
0x69 Inc%:0
0x6a Inc%:1
0x6b Inc%:0
0x70 Inc%:0
0x71 Inc%:0
0x72 Inc%:0
0x73 Inc%:0
0x74 Inc%:0
0x75 Inc%:0
L3 Input/Incomplete Event Rate (250 Hz Scale)
250 Hz S...
2:55:14 PM
3:38:09 PM
Current L3 Input Rate
100.885 Hz
L3 Farm Busies Fraction
Current Disable Fraction: 0.0
L3 Input Rate By Bit
Bit: Rat...
0 0.0
4 Hz Scale
Farm Node EVB Rates
1 1....
4 Hz Scale
Total EVB Rate
99.796 Hz
Rate History for Node 1
1 Routing Group(s) Configured
Showing routing grou...
Reset Inc Counters
UNreset Inc Counters
Super Status:
Ready
Data Refresh


füMon v0.1.12
5Hz
1 Run
Run 170817
Node 51 Details
Run 170817
In: 1.2Hz
Out: 0.0Hz
IP: 0
COM: 0
CPU: 4.0%
AD: 3
FB: 100
FS[0] FS[1]
Total 35825 36374
Failed 35387 35941
Passed 438 433
Sent 438 433
SendErr 0 0
StopReqs 39 39
Restarts 40 40
Exits 0 0
State WAIT WAIT
Out/Pass (Reject)
5Hz
1.2Hz/1.4% (73)
CPU Utilization
0 20 40 60 80 100
L3DAQ Farm Über Monitor

FuMon Farmnode



Typical Problems

- Not enough nodes in run
  - Symptom: L3 disables, nodes in FILTERING
  - SMT/CFT/CAL in full-readout mode?
- Collector Router backed up
  - Farmnodes orange (SENDING) in fuMon
  - L3 output rate too high or event size too large
  - Farmnodes wont respond to Super when SENDING
    - Supervisor appears hung
    - Must PAUSE and wait OR restart farmnodes and Super
- Crate 100% missing
  - Almost always a component problem
  - Check Route and Event queue state in uMon

L3DAQ Shifter Webpage

- http://www-d0online/www/groups/l3daq/shifter
- What-To-Do-When
  - Extremely useful
  - Frequently updated
- On-call schedule and phone numbers
- uMon/fuMon documentation
- Logfile access

SBC Scripts

- SBC scripts
  - is_crate_requesting_readout.sh (SlaveReady asserted?)
  - getInfo.sh (sbc driver stats and status)
  - sbc_config_rdwr (VME targets and modes)
  - reset_all.sh (restarts processes)