Level 2 Trigger Overview
(for DAQ shifters ...)

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L2 Trigger Group

DØ Operation meeting - May 18, 2004
Outline

• L2 Trigger Data Flow

• L2 Controls
  • L2 Trigger Control Computer

• L2 Monitoring
  • L2 Data Flow GUI

• L2 Operations
  • Common Problems and Solutions
  • DAQ shifter vs. L2 expert
  • Resources (where to find info about L2)
L2 Trigger Data Flow - trigger framework

Detector Front-end

Muon

CAL

CFT/PS

SMT

L1 Trigger

L1 Muon

L1 CAL

L1 CTT

L1 Trigger

STT

L2 Pre-Processors

L2 SLICs

L2 MUC

L2 MUF

L2 CAL

L2 PS

L2 CTT

L2 Global

L2 GBL

NOW

TRGFR

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L2 Trigger Data Flow - Single L2 Crate

- Front End Muon Crates
- L1 Crates
- Trigger Framework

10kHz

- Second Level Input Computer (SLIC)
- Magic Bus Transceiver (MBT)
- Fiber Input Converter (FIC)

10kHz

- Administrator Alpha/Beta
- Bit3 Card

Worker Beta
1kHz

SBC
1kHz

L3 Trigger
1kHz

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L2 Trigger Data Flow - configuration

- Taker (shifter)
- Resource file
  (L2resources.xml)

COOR

L1 TCC

L2 TCC

L3 Super

L2gb1 Admin
L2muc Admin
L2mut Admin
L2cal Admin
L2ps Admin
L2ctt Admin

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L2 Controls - L2TCC

- L2 Trigger Control Computer (or L2TCC)
  - runs L2 Relay Software (or L2RS)
- interface to COOR and monitor servers
- configures and controls all L2 crates
  - static configuration files are loaded when COOR is initialized
  - forwards and coordinates COOR messages to all L2 crates when run is being started or stopped

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L2 Controls - L2RS

- Equivalent to Trics in L1TCC
- allows access for L2 experts to all L2 crates
  - send messages to L2 administrator (configure, exit/enter event loop, etc. ...)
- provides a log window with recent activity
  - monitoring information: I$ ("<done>")
  - messages from COOR: M$
  - error messages: E$ (e.g. “failure communication with admin”)

Useful when debugging L2 problems!

You CAN look at it, but you CANNOT touch it!
L2 Controls - L2RS

Crate Interface

Log Messages

L2 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2
L2 Controls - L2RS

Error: Beta is not responding to L2TCC
L2 Monitoring - L2 data flow GUI

SLIC input buffer

Admin timing state

Crate input buffer (MBT)

Error light

L1/L2 accept rates

L1/L2 busy for L2 preprocessor

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L2 Monitoring - L2 data flow GUI

- **information flow**: from **left** to **right**
  - SLIC outputs = input for L2 muon crates
  - L2 crates outputs = input for L2 global crate

- **small triangles** = SLICs (one per SLIC)

- **big triangles** = L2 pre-processors (crate's Administrator)

- **pie charts** = timing information
  - await an event, processing, L2 answer, L3 readout, collect status, worker replay, interrupt

- **update** - every 5 sec - L3 monitor server from the DAQMON scraper (l3ms_util_clients)
L2 Monitoring - L2 data flow GUI

**GREEN** color = idle/empty
- empty input buffer
- SLIC/Beta in idle state
- TFW is not waiting for L2 global

**RED** color = error
- administrator errors (red box)
- input error

**ORANGE/YELLOW** color = working
- processing event (orange)
- input buffers filled (yellow)

**GRAY** color = inputs are disabled (for crates/SLICs)
**L2 Monitoring** - L2 data flow GUI

- **Stripmon** - up to 70 min of L1, L2, L3 and busy rates
- Also available as stand alone plot (but usually part of l2df)
  - global L1, L2 and L3 rates
  - specific triggers rates/buses
  - Geometric-sector rates and buses

**L2 message box**
- information about missing inputs
- time to the last missing input

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L2 Operations

• When DAQ shifter downloads a trigger, COOR:
  ➢ configures L1 framework
  ➢ sends L2 configuration to L2TCC
  ➢ configures L3 supervisor

• When DAQ shifter starts run, COOR
  ➢ sends start run to L1, L2 and L3
  ➢ L2TCC sends configuration to L2 administrator
    and administrator configures pre-processor
    (enables MBT channels) = workers

• TWF issues SCL-init
L2 Operations - problems and solutions

- When/How DAQ shifter can see an L2 problem?
  - by looking at l2df GUI
    - red box, pie chart is mostly orange (blue)
    - L2 crate is missing from events or is L1/L2 100% FEB
    - L2TCC (L2RS) contains red messages about L2 crate/crates

- When it is likely NOT an L2 problem?
  - no red box but framework shows “14/16” and we have no rates or pie chart is brown
  - no red L2 crate in daq_dialog/uMon
  - some other crate is red in daq_dialog/uMon

- Check daq_dialog/uMon, l2df GUI, check taker's messages and L2TCC (L2RS) messages
L2 Operations - problems and solutions

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L2 Operations – problems and solutions

- DAQ shifters are able to deal with some L2 problems, for instance

I. missing inputs to an L2 crate

- detected by daqAI, often it happens to l2muc (x21) or l2muf (x22)
- **Diagnostic:**
  - input buffers are **yellow** (at least 1 event) except one, which is **green** (no events = missing events in this one!)
  - check the L2 message box, which tells you which input channel and which front-end crate is involved
- **Action:** notify MUON/CAL shifter
- disabling of the L2 input channel is done automatically, when muon front-end channel is disabled (by MUON/CAL shifter)
L2 Operations - problems and solutions

Ib. disabling input (MBT) channels to L2 crates

- should be done only by the L2 expert (or following his instructions)
- using l2inputer program:
  - stop run, start the L2 inputer
  - select input MBT, select channel, save changed configuration
  - re-initialize COOR, and download the trigger, start run
  - entire process takes at least 2 min!
- l2inputer re-writes l2resources.xml configuration file
- other crates (l2ps or l2ctt) - by disabling an L1 readout crate in taker, also L2 input channels are disabled = faster (done by COOR)
L2 Operations - problems and solutions

II. L2 crate is 100% FEB/missing from events

- also detected by daqAI
- it may/may not be something which requires L2 expert's attention
- Diagnostic:
  - daqdialog/uMon shows which crate is involved
- Action:
  - issue an SCL-init (once, twice, ...) = small hammer
  - If it does not help, proceed to medium hammer - do not try it more than twice it's better to contact the L2 expert
  - medium hammer = l2reset <L2 crate name>

ALL RUNS MUST BE STOPPED!

<L2 crate name> = l2gbl (x20), l2muc (x21), l2muf (x22), l2cal (x23), l2ps (x24) or l2ctt (x25)

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III. Diagnostics of L2 errors

- **red box** in l2df

  - Requires an SCL-init
  - Typical problems may be:
    - **input sync errors** - recognized by daqAI
    - **configuration problem** - in L2 global. In this case run should be stopped, SCL-init should be issued and triggers re-downloaded
L2 Operations - problems and solutions

- **L2 busy**
  - l2df shows "L1 await L2: 14/16"
  - but no missing inputs

- check daq_dialog for busy crate/crates

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## L2 Operations - problems and solutions

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L2 Operations – problems and solutions

- **SBC/L3 problem**
  - l2df shows large "L3 readout" fraction in the pie chart
  - Typically it's an L3 problem:
    - reset the SBC
    - reset Routing Master
    - last resort = page the L3 expert
L2 Operations - DAQ vs. L2 expert

August '03 vs. November '03 vs. May '04

- L2 has 6 preprocessors, the most recent ones are:
  - L2ps (x24) - pre-shower preprocessor
  - l2ctt/stt (x25) - tracking preprocessor
- do not require a special treatment BUT no triggers have been formed in v12 BUT v13 will use l2ctt/stt

DAQ shifter watches daq_dialog, uMon and fuMon

- confront daq_dialog and uMon information with l2df GUI
- try SCL-init first, then try medium hammer
- page the L2 expert (follow his instructions)
L2 Operations - DAQ vs. L2 expert

- **L2 expert duties:**
  - apply L2 hammers = *small, medium, large*
    - small hammer = SCL-init
    - medium hammer = restart L2 executable (l2reset <crate_name>)
    - large hammer = power cycle L2 crate
    - diagnose the L2 system
  - help to diagnose whether it's an L2 problem or not (it's not a Level 2 issue but we'll try to help ...)

- **L2 experts pagers:**
  - primary pager: **630-266-0744**
  - secondary pager: **630-266-0750**
L2 Operations - resources

- Documentation sits on the web!
  - General L2 web page: www.pa.msu.edu/hep/daq/l2
  - L2 online web page: www-d0online.fnal.gov/www/groups/trigger/l2/online
  - L2 DAQ web page: www-d0online.fnal.gov/www/groups/trigger/l2/daq/daq_shifter/index.html
  - L2 expert web page: www-d0online.fnal.gov/www/groups/trigger/l2/online/expert/index.html
L2

- Only L2 muon preprocessors have SLIC inputs

- L2df GUI
  - switches on the bottom:
    - MUON channel
    - MUON readout crate
    - event occupancy (number of events)
  - L2 enabled/disabled

- DAQ taker - L2 global is always IN!

- Run with all L2 crates - even with l2ps and l2ctt - all the time!
L2

**COOR - L2 connection problems**

- L2 crate/crates in error state:
  - red box in l2df
  - red error messages in taker - L2 TCC times out and fails to respond to COOR
  - red error messages in L2RS - administrator does not replay to L2 TCC

✓ stop run, SCL-init, re-download, start run

- time out when starting run:
  - SLIC configuration has changed (some MUON input channels were enabled/disabled)

✓ wait ~ 30 sec and start run again
L2 - first β
L2df - downloaded zero_bias
L2df - loading a trigger

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L2df - global physics run with v13 trigger list
L2df - l2gbl is crashed ...

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