Level 2 Trigger Overview
(for DAQ ...)

Miroslav Kopal
L2 trigger group
(based on Reinhard’s presentation from August 4)
University of Oklahoma

DZero operations - December 1, 2003
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 → L1 Muon (150)

CAL → L1 CAL (10)

CFT/PS → L1 CTT

SMT → STT (288)

L1 Trigger

L2 Pre-Processors

L2 SLICs (1)
L2 MUC (11)
L2 MUF (5)
L2 CAL (1)
L2 PS (2)
L2 CTT (3)

L2 Global

L2 GBL

NOW

TRGFR

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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, L2muf Admin, L2calc 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 loaded when COOR is initialized
  - Forwards and coordinates COOR messages to all L2 crates when run being started or stopped
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>”)
  - message from COOR: M$
  - error message: E$ (e.g. “failure communication with admin”)

Useful when debugging L2 problems!

You CAN look at it but you CANNOT touch it!

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L2 Controls - L2RS

Crate Interface

Log Messages

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**L2 Controls - L2RS**

Error: Beta is not responding to L2TCC

COOR Download

Good Start Run

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L2 Monitoring - L2 data flow GUI

- SLIC input buffer
- Admin timing state
- Error light
- Crate input buffer (MBT)
- 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 Admin)
- pie charts = timing information
  - await event, processing, L2 answer, L3 readout, collect status, worker replay, interrupt

- update - every 5 sec - L3 monitor server from DAQMON scraper

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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
- Admin error (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 (usually part of l2df)
  - global L1/L2/L3 rates
  - specific triggers rates/buses
  - geo sector rates/buses

L2 message box
- info about missing inputs
- time to last missing input

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L2 Operations

- When DAQ shifter downloads trigger, COOR
  - configures L1 framework
  - sends L2 configuration to L2 TCC
  - configures L3 supervisor
- When DAQ shifter starts run, COOR
  - sends start run to L1/L2/L3
  - L2 TCC sends configuration to L2 admin and admin configures hardware (enables MBT channels) and workers
- TWF issues SCL-init
L2 Operations - problems and solutions

- **When/How DAQ shifter can see an L2 problem?**
  - by looking at I2df GUI
    - red box, pie chart is 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 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 daqdialog/uMon
  - Some other crate is red in daqdialog/uMon

- **Check daqdialog/uMon, I2df GUI, check taker 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 L2 problems, such as:

I. **missing inputs to an L2 crate**
   - detected by daqAI, but it happens to l2muc/l2muf only
   - **Diagnosis:**
     - all inputs buffers are **yellow** (at least 1 event) except one which is **green** (no events)
     - check the L2 message box, which tells you which input channel and which front-end crate it is
   - **Action:** notify MUON/CAL shifter
   - disabling of 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 inputer
  - select input MBT, select channel, save changed configuration
  - reinitialize COOR, download the trigger, start run
  - entire process takes at least 2 min!
  - l2inputer re-writes l2resources.xml configuration file
- to save time, by disabling MUON channels also L2 input channels are disabled
- other crates (l2ps and l2ctt) - by disabling an L1 readout crate in taker also L2 input channels are disabled = faster (should be done by COOR)
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
- **Diagnosis:**
  - daqdialog/uMon shows that crate
- **Action:**
  - issue an SCL-init (once or twice)
  - it may not help, better to contact the L2 expert and follow his instruction. The fix may require “medium hammer” or even “large hammer”. It is always the L2 expert's duty to do it.
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 daqdialog for busy crate/crates
# 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 vs. November (pre- vs. post-shutdown)
  - L2 has **two new preprocessors**
    - l2ps - preshower preprocessor
    - l2ctt/stt - tracking preprocessor
  - **do not require** a special treatment BUT no triggers have been formed yet ...

- **DAQ shifter watches daqdialog, uMon and fuMon**
  - confront daqdialog and uMon information with l2df GUI
  - try **SCL-init** first
  - 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 crates
  - diagnose the L2 system
- help to diagnose whether it's the L2 problem or others (it's not a Level 2 issue but we 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/d0/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/online/daq_shifter/index.html

  L2 expert web page:
  www-d0online.fnal.gov/www/groups/trigger/l2/online/expert/index.html

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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 crate/crates in error state:
- Red error messages in taker - L2TCC times out and fails to respond to COOR
- Red error messages in L2RS - Admin does not replay to L2TCC

- 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