Level 2 Trigger Overview

L2 tutorial for DAQ shifters ...

Miroslav Kopál
University of Oklahoma
Outline

- L2 Trigger Data Flow
- L2 Controls
  - L2 Trigger Control Computer
- L2 Monitoring
  - L2 Data Flow GUI
- L2 Operations
  - what you must know about L2
  - common problems and solutions
  - contacts and resources
    - where to find information about L2
L2 Trigger Data Flow - trigger framework
L2 Trigger Data Flow - configuration

Taker (shifter) -> Resource file (l2resources.xml) -> COOR

L1 TCC -> L2 TCC -> L3 Super

L2gbl Admin, L2muc Admin, L2mut Admin, L2cal Admin, L2ps Admin, L2ctt Admin

M. Kopál - April 12, 2005
L2 Controls - TCC2

- **Level 2 Trigger Control Computer** (L2TCC or TCC2)
  - runs **L2 Relay Software** (or L2RS) ... next page
- interface to COOR and monitoring
- configures and controls all L2 crates
  - contains static configuration files for all L2 crates downloaded when COOR is initialized
  - forwards COOR messages to all L2 crates when run is being started or stopped
L2 Controls - L2RS

- L2RS is equivalent to Trics in L1TCC
- provides an access to all L2 crates (only for L2 experts!)
  - send messages to L2 administrator, eg. Configure, exit/enter event loop, status report, etc. ...
- provides a log window with recent activity
  - monitoring information: I$
  - messages information from COOR (run start/stop): M$
  - error messages: E$, eg. ”failure communication with admin” when there is a problem with L2 crate

Useful, when debugging L2 problems. Look at it, but DO NOT touch it!
L2 Controls - L2RS

log messages (look here!)

crate interface (do not touch!)
L2 Controls - L2RS

Messages: problem with L2 crates: L2MUF, ...
L2 Monitoring

- SLIC inputs (muon channels)
- error/status light
- processing time
- crate inputs (MBT channels)
- unused or disabled inputs
- switch between channel/crate and occupancy
- L1/L2 rates
- L1/L2 FEB
L2 Monitoring

- **Level 2 data flow GUI (l2df)**
  - Information flow ⇒ read it as it flows from left to right

- **MDT/PDT/scintillator channels = SLICs' inputs**
  - Muon crates (x30-3b) → L2 SLICs → L2MUC (x21) or/and L2MUF (x22)
  - L1CAL (x10) → L2CAL (x23)
  - ... no inputs from CAL crates (x40-4c)
  - L1CTT (---) → L2PS (x24)
  - ... no inputs for FPS
  - L1CTT (---) → L2CTT (x25)
  - ... crate x13 is only L1CTT readout crate - does not send any data to L2
  - L1TFW+L2 → L2GBL (x20)
L2 Monitoring

- big triangles
  - L2 preprocessors - crates' administrator

- pie charts
  - timing information: await/idle an event, processing, L2 answer, L3 readout, collect status, worker replay, interrupt

- framework information
  - L1 and L2 rates, L1 await L2

- l2df GUI
  - every 5 seconds - monitoring information comes from the L3 monitor server's DAQMON scraper (l3ms_util_clients server)
L2 Monitoring

**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** or **YELLOW** = working

- processing event (orange)
- input buffers filled (yellow)

**GRAY** color = disable
L2 Monitoring

- **stripmon** - up to 70 min of L1, L2, L3 and FEB rates history
- available as stand alone plot (but usually, it is part of l2df)
  - global L1, L2 and L3 rates
  - specific triggers rates/FEB
  - geometric-sector rates and busies

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

- DAQ shifter wants to start downloading global physics trigger list
  - check that all L2 crates are included in the run
- trigger list is being downloaded ...
  - L1 framework is configured, COOR sends new configuration to TCC2 and L3 supervisor is configured
- run is started ...
  - TCC2 sends to configuration to all L2 crates (only now L2 crates know which inputs are enabled/disabled)
L2 Operations

• When can you exclude a level 2 crate?

  1. CFT calibration
     ➢ exclude $x_{25}$ before the calibration
     ➢ include $x_{25}$ back in the readout when the calibration is finished
  2. when L2 expert asks you kindly (repair/test)

• How can DAQ shifter monitor L2?

  1. listen to daqAI, check üMon and daqdialog
     → DAQ monitoring tools
  2. check for presence of major L2 alarms
     → alarm display
  3. check l2df and messages in TCC2
     → L2 monitoring tools
L2 Operations

- What is actually an L2 problem?
  - What is a problem with L2 but does not look like?
  - What isn't a problem with L2 but looks like it is?

- How to diagnose DAQ/L2 problems?

- How to solve DAQ/L2 problems?
  (... I'm talking about some DAQ problems, only those L2-like, not all of them!)
Missing input

➢ Diagnostics:

➢ often announced by *daqAI* and observed in *üMon* and *l2df* GUIs

➢ *l2muc*, *l2muf*, *l2ctt* and *l2ps* often, but *l2cal* rarely

➢ *l2df* shows inputs *yellow* (16/16), except one being *green* (0/16) and message box states which channel and crate is involved, this crate and input crates could be *red* in *üMon*

➢ using *l2df* and *üMon* you must be able to diagnose the crate/channel which is not sending any data

➢ Action:

➢ ask *CALMUO* (*l2muc/l2muf/l2cal*), *CFT* (*l2ps/l2ctt*) or *SMT* (*l2ctt*) shifter(s) to fix the inputs to L2 crate(s)

Fix the inputs to L2 first!
L2 - what-to-do-if ...
**L2 - what-to-do-if ...**

**Corrupted input or crate/input is out-of-sync**

➢ **Diagnostics:**

➢ rates are at zero and l2df shows an L2 crate red (interrupt)

➢ L2RS on d0tcc2 might contain red error messages and crate is 100% FEB in daqdialog

➢ **Action:**

➢ difficult to find out which inputs are out-of-sync. L2 expert needs to look into the log L2 files and at l2mon. Meanwhile, you try:

→ sclinit
→ l2reset <L2_crate_name>

➢ if it did not help, page the L2 expert

When doing l2reset, make sure that all runs are stopped!
L2 - what-to-do-if ... 

L2 crate is 100% FEB

➢ Diagnostic:

➢ L2 crate is red in daqdialog and/or in üMon. L2 crate is always 100% FEB when one of its inputs is missing or is corrupted/out-of-sync. This “problem” is somehow similar to the previous cases.

➢ check l2df and L2RS on d0tcc2 for any additional information

➢ Action:

➢ first, try:
  → sclinit
  → l2reset <L2_crate_name>

➢ if it did not help, page the L2 expert
COOR ↔ L2 problems

➢ Diagnostic:
  ➢ L2 crate is not configured properly - this will be immediately noticed by the DAQ shifter because of red messages in taker. Red error messages will also appear in L2RS on d0tcc2.
  ➢ if you see red l2dnl in coormon, your last coor_reinit or l2reset failed

➢ Action:
  ➢ red messages in taker - failed to start a run: if you just applied l2reset to l2muc/l2muf, wait ~30 sec and try again. SLICs need some time to boot up.
  ➢ in other cases, try:
    → l2reset <L2_crate_name>
  ➢ if this did not help, you need expert's assistance - page the L2 expert
L2 rack tripped

➢ Diagnostic:
  ➢ you should see L2 major alarms in the alarm display
  ➢ d0tcc2 is frozen, because it cannot talk/connect to L2 crates in the tripped rack

➢ Action:
  ➢ page the OP shifter, and page the L2 expert - he could ask you to try to turn-on the rack. If you are not able to do so, you must page one of Fermilab’s electrical personnel (eg. John Anderson).
  ➢ ... this is bad ...
Other problems

➢ SBC problem
  ➢ non-standard problem with L3 SBC in an L2 crate would exhibit itself in l2df as brown pie chart instead of orange
  ➢ try “l2reset <L2_crate_name>”, then page the L3 and L2 experts

➢ L2GBL problem
  ➢ you do not see any L2 crate with red square in l2df, or missing inputs to L2, nor any crates being red in üMon, but you might see “x1f” 100% FEB (plus other, slower, crates). The only other unusual thing is in l2df:
  ➢ try “l2reset <L2_crate_name>” on L2GBL, then page the L2 expert
L2df - downloaded zero_bias trigger list
L2df - loading a trigger
L2df - global physics run (almost perfect)

missing l2muc+l2muf
L2df - l2gbl is crashed ...

(still) missing l2muc+l2muf
What are the duties of L2 experts?

➢ diagnose and fix L2 problems
➢ apply L2 hammers - medium and large
➢ we often help to diagnose DAQ problems and determine whether it is a problem with L2, or not. Certainly, we will (should) try to help.

How to contact L2 experts?

➢ DØ building pager: x4674
➢ primary pager: (630) 266-0744
➢ or (the last resort) secondary pager: (630) 266-0750
Where to find L2 documentation?

It is available from L2 web pages:

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