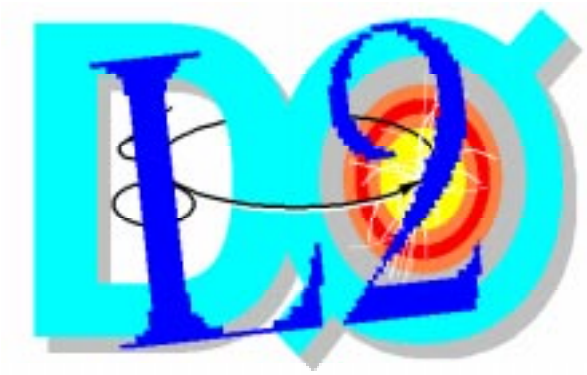


Reinhard Schwienhorst

for the DØ L2 group

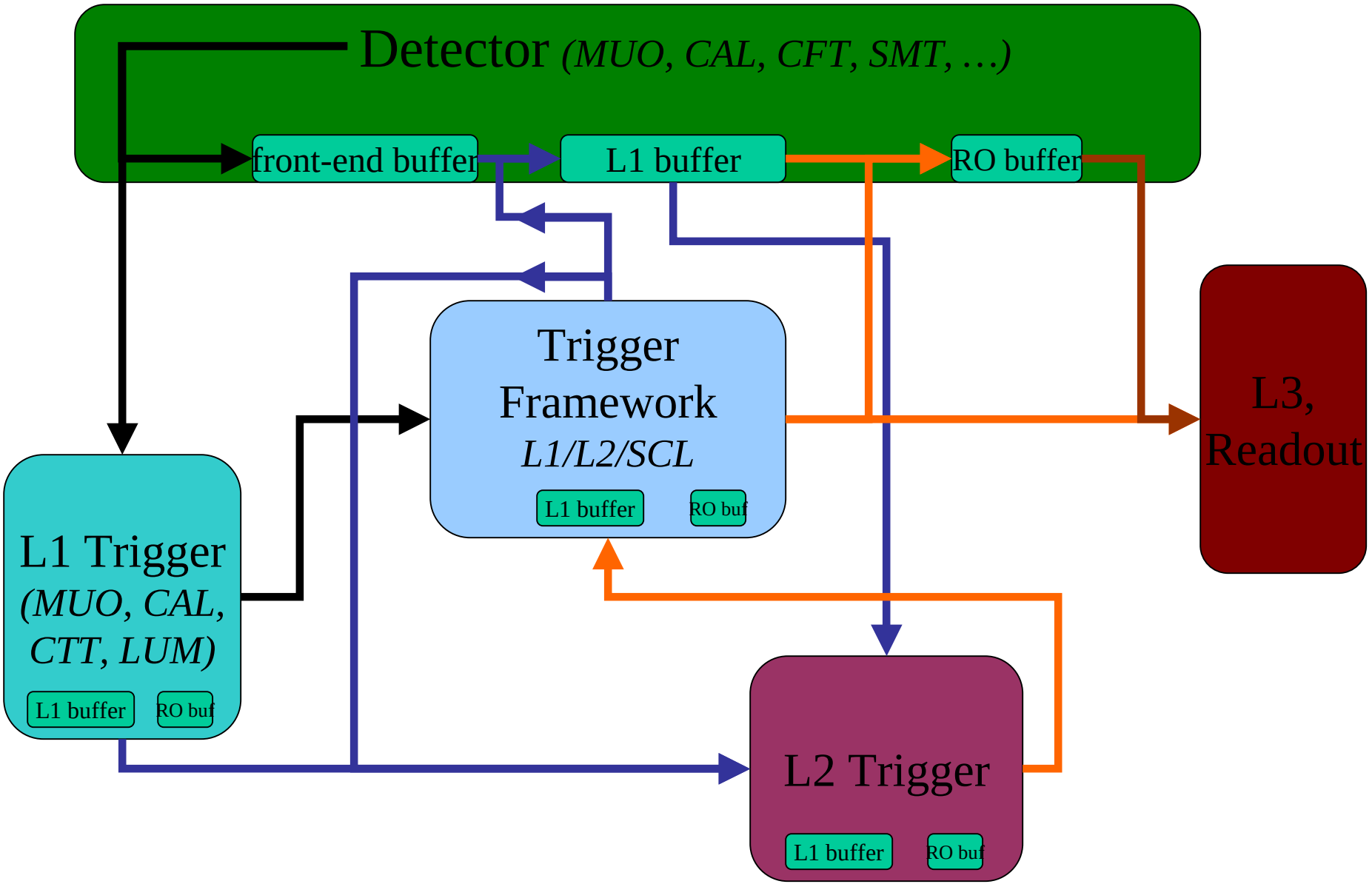
Shifter Tutorial 08/04/03

Outline

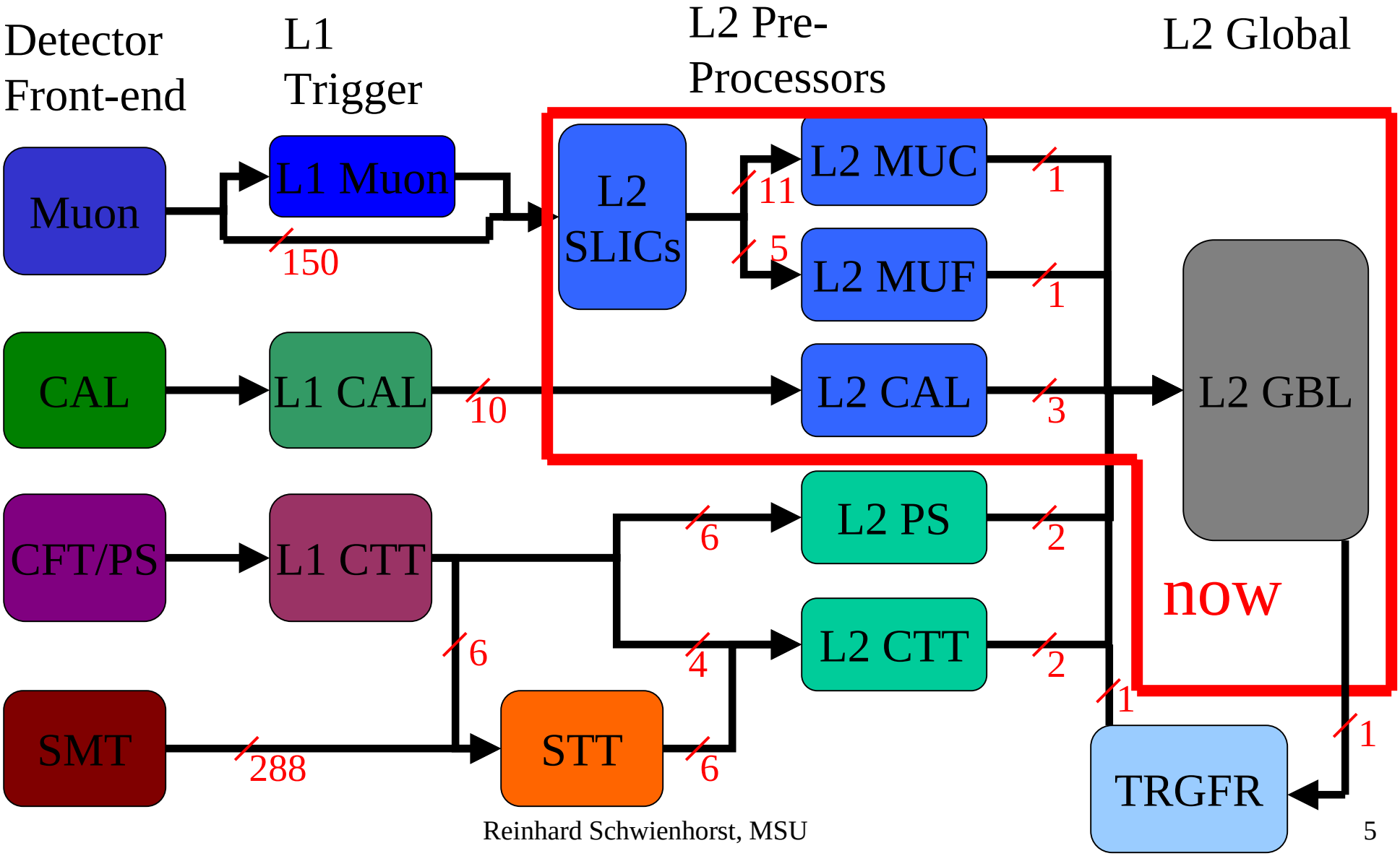
1. Information flow
2. Controls (L2 TCC)
3. Monitoring
   - L2 Dataflow gui
4. Operation
   - L2 - DAQ shifter interaction
   - Common problems
5. Resources

1. Information Flow

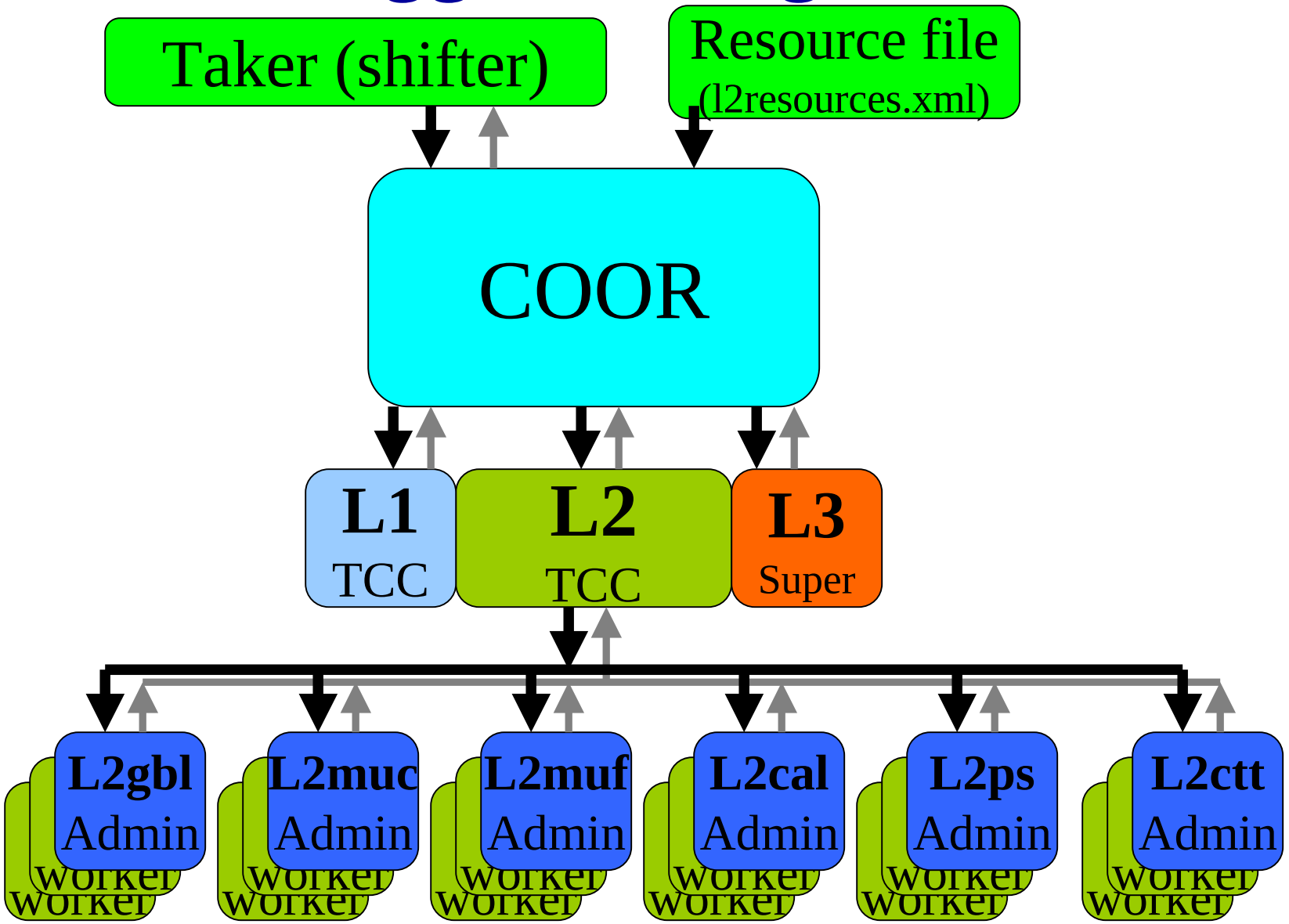
Trigger System Data Flow



L2 Trigger Data Flow

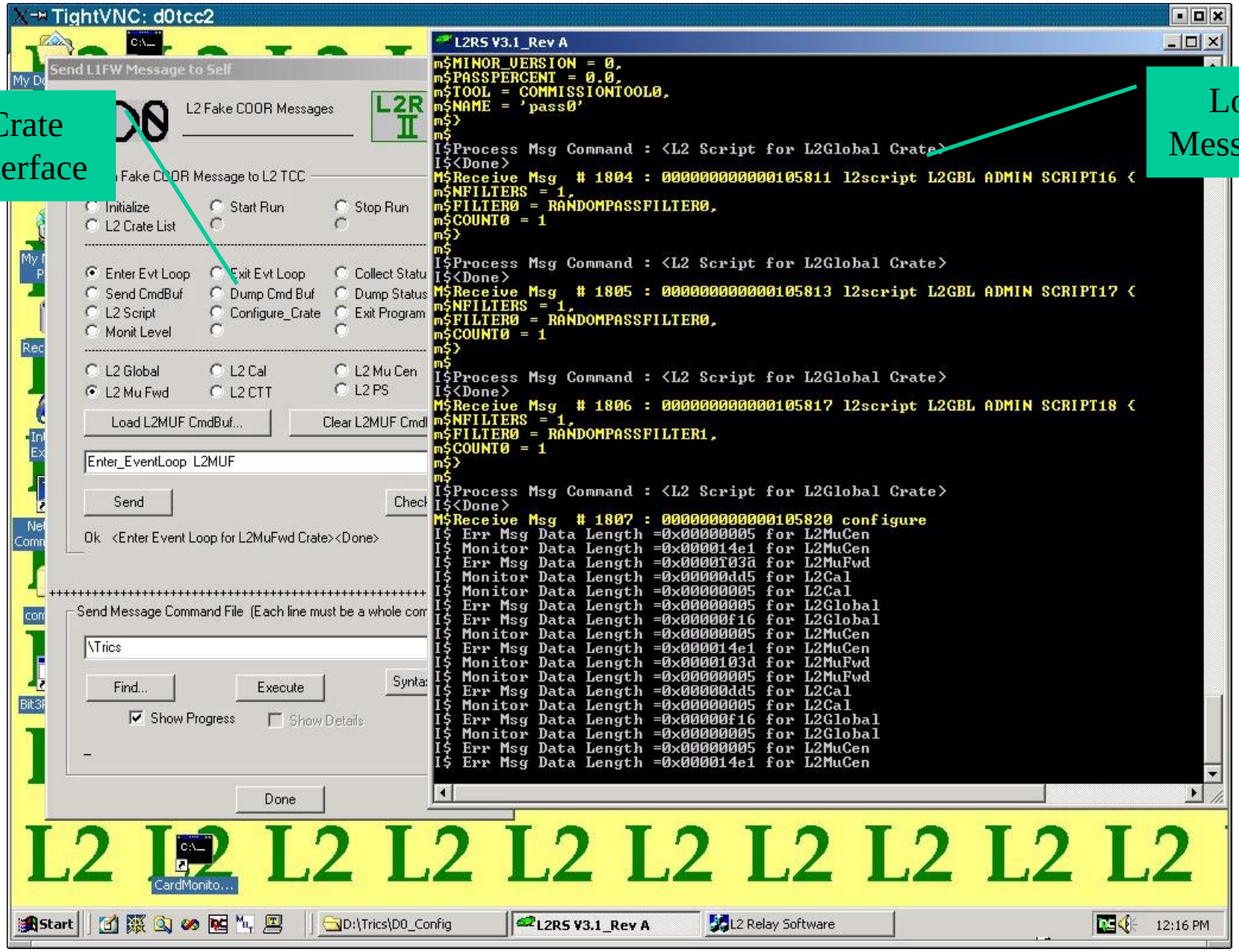


L2 Trigger Configuration Flow



2. Controls

L2 TCC



Crate Interface

Log Messages

L2 TCC - general

- L2 Trigger Control Computer
- Runs L2RS (L2 Relay Software)
- Interface to COOR, Monitor Servers
- Configures/Controls all L2 crates
  - Static configuration files loaded on COOR initialize
  - Forwards and coordinates COOR messages to L2 crates when starting/stopping runs

L2 TCC - L2RS

- Equivalent to Trics in L1 TCC
- Allows Expert access to all L2 crates
  - Send messages to Admin (Configure, StartRun, …)
- Log window with recent activity
  - I$ means info (monitoring, “<Done>”)
  - M$ means message (from COOR)
  - E$ means error (“failure communicating with Admin”)
  - Useful when debugging L2 related problems

You can look at it, but you can’t touch it!

L2 TCC - log window

```
m$  INPUT_DIR10 = 4, # ID 0x16?
I$Process Msg Command : <L2 Script for L2MuFwd Crate>
I$<Done>
M$Receive Msg  # 2002 : 000000000000107673 l2script L2CAL ADMIN IPMANAGER {
m$  ALPHACH0 =  1,
m$  ALPHACH1 = 0,          # none
m$  ALPHACH2 = 1,          # L1CAL 1
m$  ALPHACH3 = 1,          # L1CAL 2
m$  ALPHACH4 = 1,          # L1CAL 3
m$  ALPHACH5 = 1,          # L1CAL 4
m$  ALPHACH6 = 1,          # L1CAL 5
m$  ALPHACH7 = 1,          # L1CAL 6
m$  ALPHACH8 = 0,          # L1CAL 7
m$  ALPHACH9 = 0,          # L1CAL 8
m$  ALPHACH10 = 0,          # L1CAL 9
m$  ALPHACH11 = 0,          # none
m$  ALPHACH12 = 0,         # none
m$, ALPHACH13 = 0
m$L2CAL ADMIN PILOTMBT {
m$  VMESLOT = 20,     # VME slot number of the card
m$  CHAN0 = -1,          # none
m$  CHAN1 = 2,          # L1CAL 1
m$  CHAN2 = 3,          # L1CAL 2
m$  CHAN3 = 4,          # L1CAL 3
m$  CHAN4 = 5,          # L1CAL 4
m$  CHAN5 = 6,          # L1CAL 5
m$  CHAN6 = 7,          # L1CAL 6
m$  CHAN7 = 0,          # SCL
m$  DISP_CHAN = 7,    # Channel to display on the MBT front panel
m$  TEST_SCL = 0,     # Disable testing mode
m$  CYCLE_BUFFERS = 1,# cycle the b?
I$Process Msg Command : <L2 Script for L2Cal Crate>
I$<Done>
M$Receive Msg  # 2003 : 000000000000107675 start_run 173228 4
I$Process Msg Command : <Start Run #173228 for Spec Trig(s) #  4>
```

```
I$ Admin has noticed the new commands for L2MuFwd Crate: TCC Waiting
I$ Admin Replied Ok for L2MuFwd Crate
I$<Done>
I$Process Msg Command : <Start Run for L2Cal Crate>
I$ Err Msg Data Length =0x0000016d for L2MuFwd
I$ Monitor Data Length =0x0000103d for L2MuFwd
I$ Sending TCC->L2Cal Admin Command <EXIT_EVENTLOOP>
I$ Waking Up L2Cal Admin
I$ Waiting for L2Cal Admin Reply
I$ Admin Replied Ok for L2Cal Crate
I$ Relaying COOR Commands to L2Cal Buffer = 1 Commands, 1781 Bytes
I$ Waking Up L2Cal Admin
I$ Waiting for L2Cal Admin Reply
I$ Admin has noticed the new commands for L2Cal Crate: TCC Waiting
I$ Admin Replied Ok for L2Cal Crate
I$ Clearing L2Cal Crate Command Buffer
I$ Sending TCC->L2Cal Admin Command <ENTER_EVENTLOOP>
I$ Waking Up L2Cal Admin
I$ Waiting for L2Cal Admin Reply
I$ Err Msg Data Length =0x00000005 for L2Cal
I$ Monitor Data Length =0x00000dd5 for L2Cal
I$ Admin has noticed the new commands for L2Cal Crate: TCC Waiting
I$ Admin Replied Ok for L2Cal Crate
I$<Done>
I$<Done>
I$ Err Msg Data Length =0x00000005 for L2Global
I$ Err Msg Data Length =0x00000221 for L2MuCen
```

COOR Download

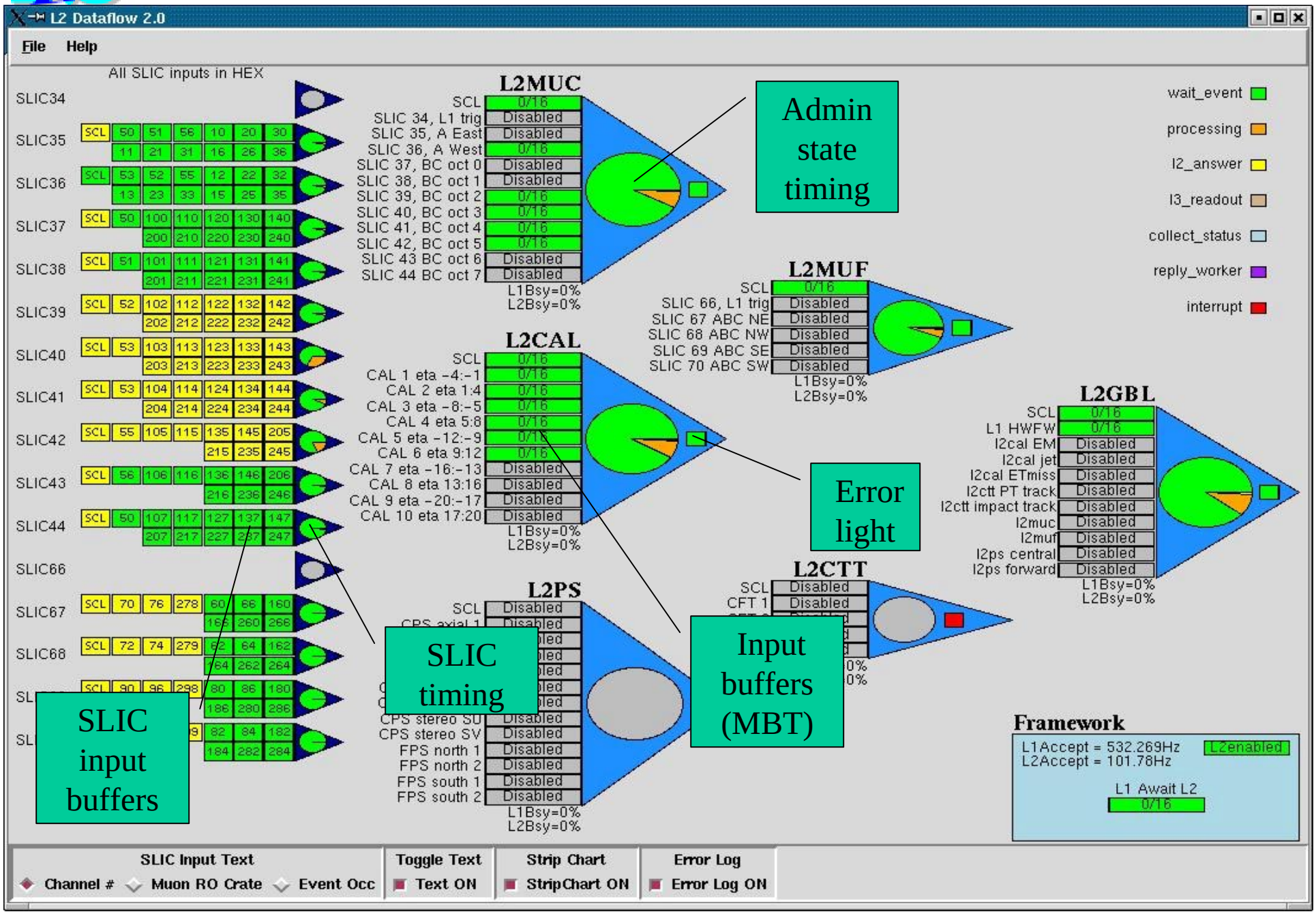
Good Start Run

```
I$ Sending TCC->L2MuCen Admin Command <COLLECT_STATUS>
I$ Waking Up L2MuCen Admin
I$ Waiting for L2MuCen Admin Reply
E$ Timeout waiting for Admin to Wake Up for L2MuCen Crate: TCC Give Up
I$ Sending TCC->L2Cal Admin Command <COLLECT_STATUS>
I$ Waking Up L2Cal Admin
I$ Waiting for L2Cal Admin Reply
E$ Timeout waiting for Admin to Wake Up for L2Cal Crate: TCC Give Up
I$ Sending TCC->L2MuFwd Admin Command <COLLECT_STATUS>
I$ Waking Up L2MuFwd Admin
I$ Waiting for L2MuFwd Admin Reply
E$ Timeout waiting for Admin to Wake Up for L2MuFwd Crate: TCC Give Up
I$ Sending TCC->L2Global Admin Command <COLLECT_STATUS>
I$ Waking Up L2Global Admin
I$ Waiting for L2Global Admin Reply
E$ Timeout waiting for Admin to Wake Up for L2Global Crate: TCC Give Up
I$ Sending TCC->L2MuCen Admin Command <COLLECT_STATUS>
I$ Waking Up L2MuCen Admin
```

Error: Alpha not responding to TCC

3. Monitoring

L2 Dataflow Gui



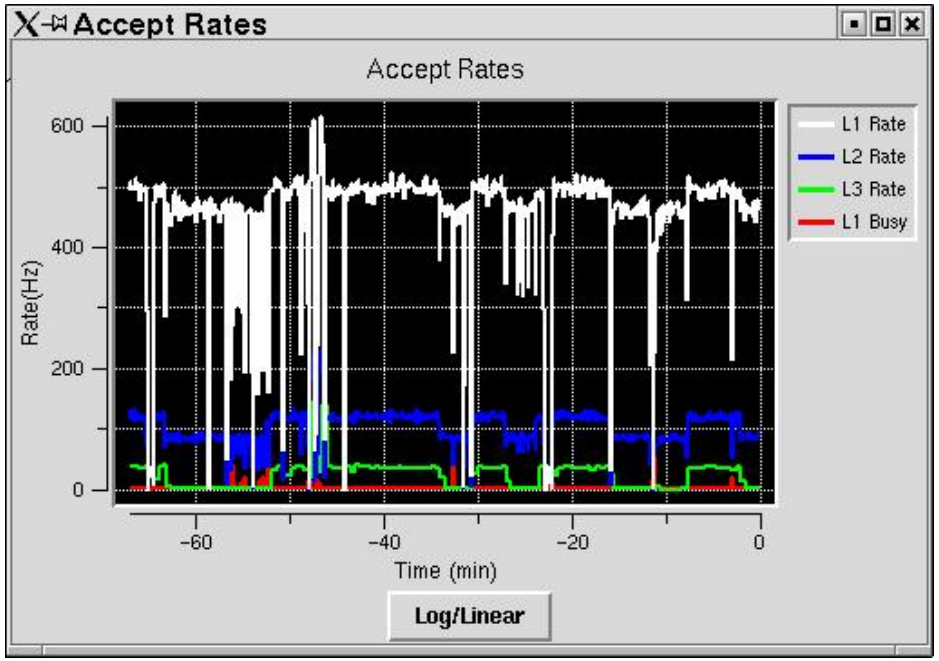
L2 Dataflow Gui - general

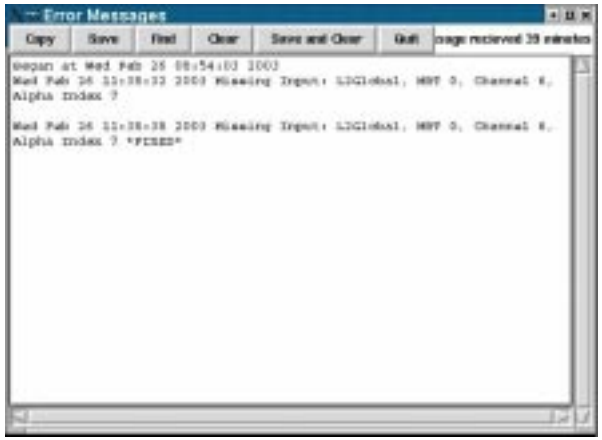
- Information flow left → right
  - SLIC outputs are L2 muon crate inputs
  - L2 pre-processor outputs are L2 global inputs
- Triangles for a processor
  - One triangle per SLIC,
  - One triangle per Admin Alpha/Beta
- Pie Charts for timing information, states
- Update every 5 seconds
  - Source: L3 monitor server, from DAQMON scraper
- Stripchart window for global rate history

L2 Dataflow Gui - colors

- Green means idle/empty
  - Empty input buffers
  - Alpha/Beta/SLIC in idle state
  - TFW not waiting for L2 global
- Red means error
  - Admin error (red box)
  - Input error
- Yellow/orange means working
  - Processing events
  - Input buffers filled
- Grey means disabled
  - Inputs or Crates

L2 Dataflow Gui - other windows

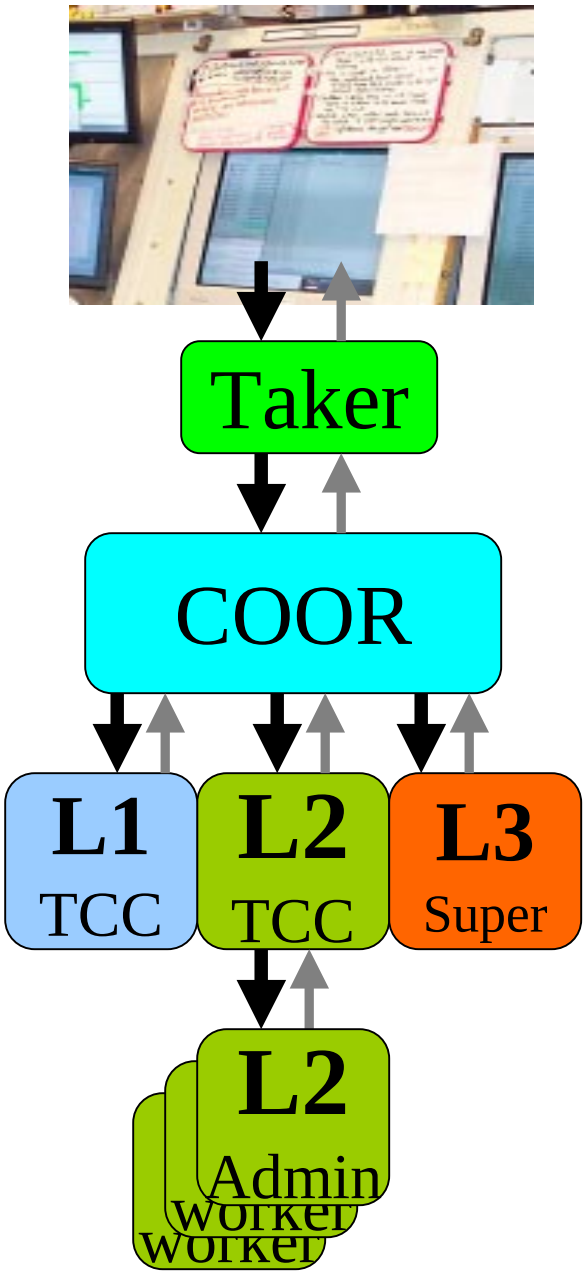




- Stripmon
  - L1/L2/L3 rates and L1 busy
  - Also available as a standalone display
    - Global L1/L2/L3 rate
    - Spec trig rates/busies
    - Geo sect rates/busies
- L2 Message box
  - Missing Input info

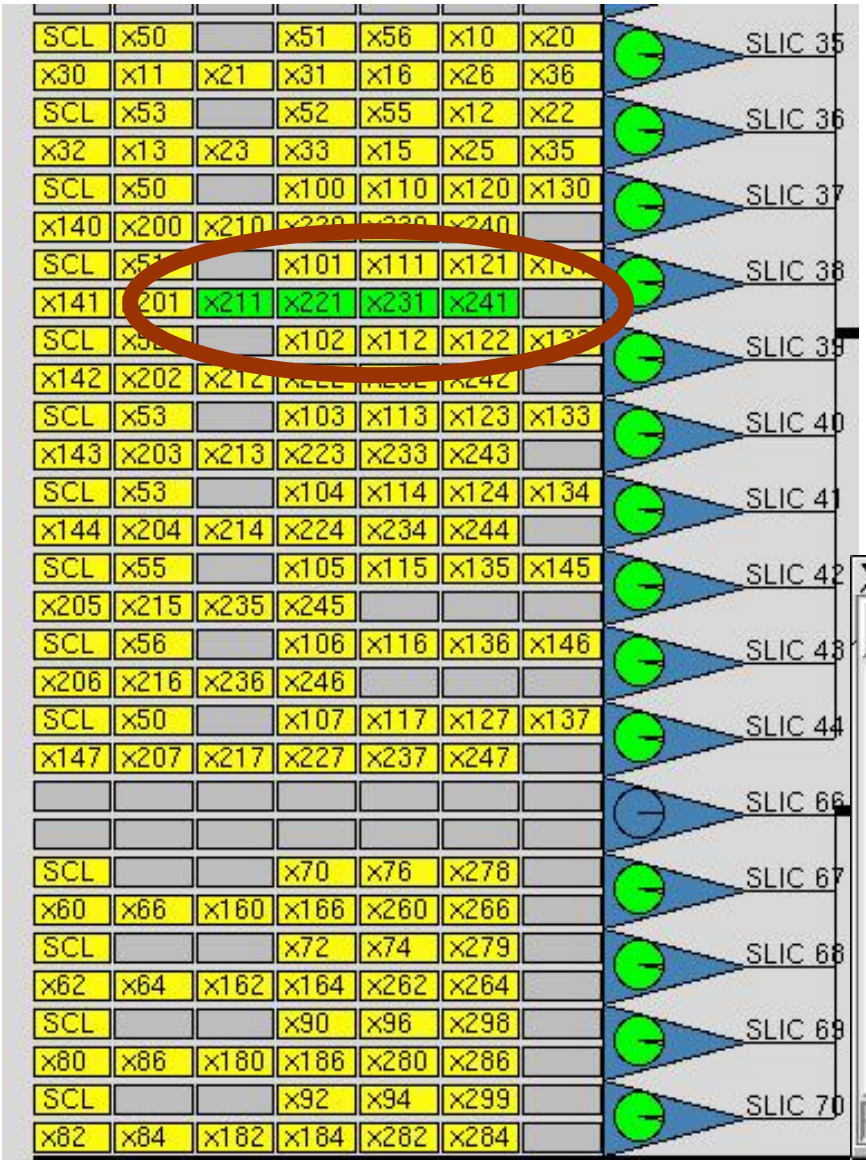
4. Operation

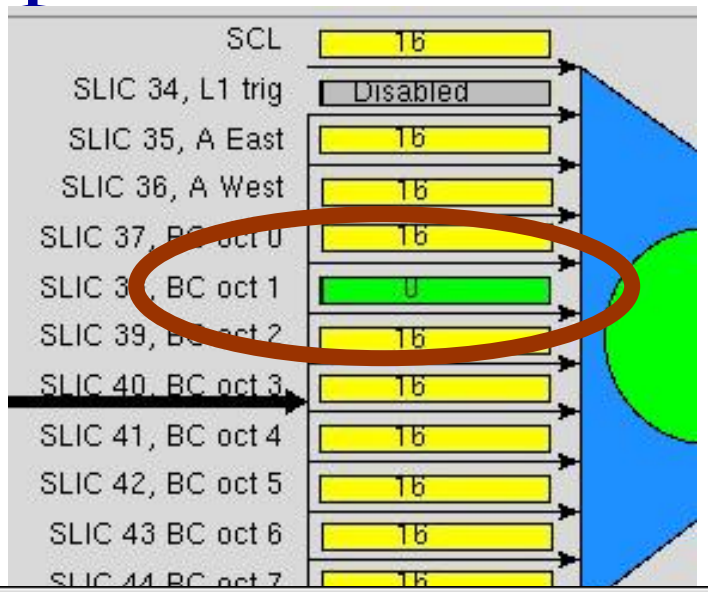
Shifter-L2 Connection

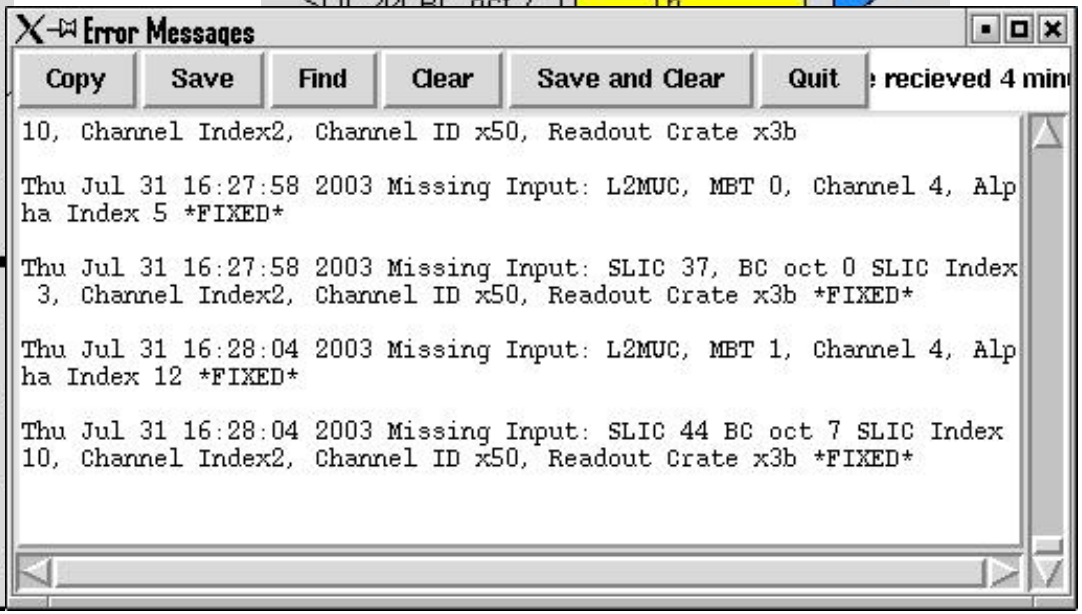


- DAQ shifter downloads trigger, COOR:
  - Configures L1, framework
  - Configures L3 (supervisor)
  - Sends L2 configuration to L2 TCC
    - Not to Admin
- DAQ shifter starts run, COOR:
  - Sends “Start Run” to L1/L2/L3
  - L2 TCC sends configuration to L2 Admin
    - Admin configures hardware, workers
  - TFW issues SCL init

L2 Dataflow Diagnostics - Missing Inputs



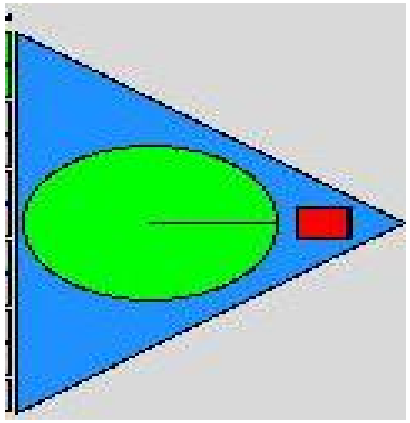




L2 Dataflow Diagnostics - Missing Inputs

- Detected by DaqAI
- Only a problem in L2 Muon Crates
- Diagnosis:
  - All input buffers are yellow (at least 1 event)
  - except for one which is green (no events)
    - This is the missing input
    - Follow it back to the corresponding SLIC
  - L2 message box also tells you which input and which front-end this corresponds to
- Disabling L2 inputs is done automatically when muon front-end is disabled (need to reinit COOR)

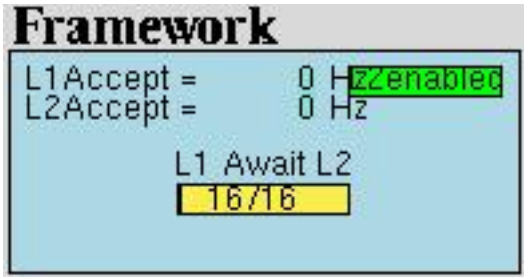
L2 Dataflow Diagnostics - Errors



- Red Error Box is on
- Requires SCL init
- Cannot start/stop runs while box is red
- Typical problems:
  - Input sync errors in L2 muon
    - Recognized by daqAI, SCL-init
  - Configuration problems in L2 Global
    - Need to stop all runs, SLC-init, re-download all triggers

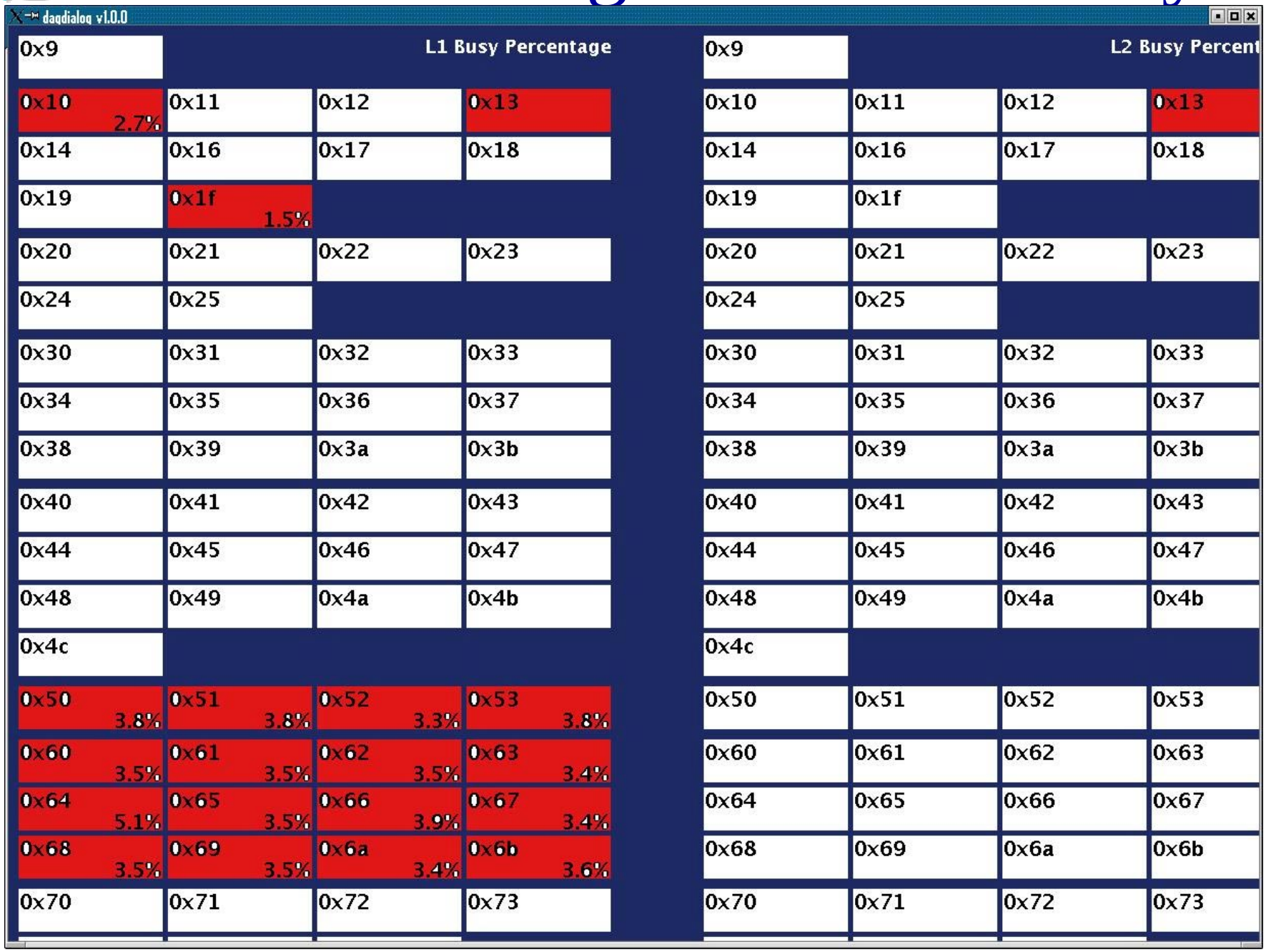
Dataflow Diagnostics - L2 busy

- L2 Dataflow gui shows
  - L1 await L2: 14/16
  - But no missing inputs



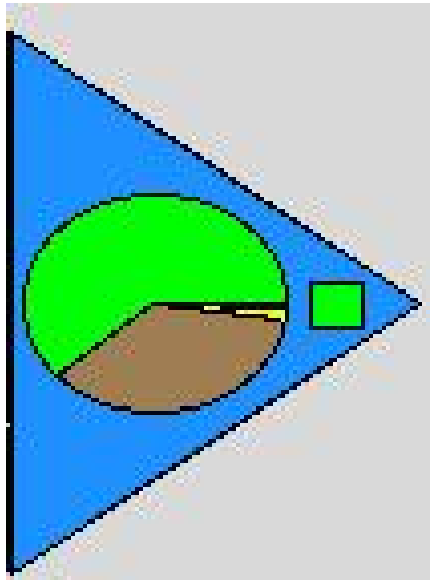
- Check for L2 busy in some readout crate
  - daqdialog

Dataflow Diagnostics - L2 busy



L2 Dataflow Diagnostics - L3 or SBC problems

- Large “L3 Readout” fraction in pie chart
  - Typically N/5
    - SBC timeout: 1 second
    - Monitoring Update: 5 seconds
  - L3 problem:
    - Reset SBC
    - Reset Routing Master
    - Page L3 expert



L2 Expert Duties

- Apply L2 hammers
  - Restart l2 executable when stuck, after crash
    - Soon to be DAQ shifter task (> l2reset l2muc)
  - Power-cycle L2 crate in case of serious problems
- Help diagnose other dataflow issues
  - "It's not a Level 2 problem, but we'll help anyway"
- Soon: L2 Data Quality Monitoring
  - Mostly done by GM shifters

L2 Resources

- L2 Homepage:

  http://www.pa.msu.edu/hep/d0/l2/

- L2 Online web page:
  http://www-clued0.fnal.gov/L2/online/

- L2 Experts
  http://www-clued0.fnal.gov/L2/online/contact.html
  - Primary expert pager : (630) 266-0744
  - Secondary expert pager: (630) 266-0750

5. Supporting Slides

L2 dataflow Gui - L2 Crates

- One triangle per crate
  - Name above the triangle
  - Pie chart for Admin timing in the center
    - Shows fraction of time spent processing,
    - Indicates problem if the entire pie is non-green
  - Pie charts for Worker timing…
    - …once we have multiple Betas per crate
  - Error light in the tip
    - Red means Alpha/Beta is in Error State
  - Input buffer occupancy on the left
    - Also shows status (enabled/disabled) of inputs
  - L1 busy/L2 busy fraction underneath

L2 dataflow Gui - SLICs

- Only in L2 Muon crates
  - 11 SLICs in l2muc, 5 SLICs in l2muf
- One triangle per SLIC
  - Timing pie chart in the center
  - Input buffer occupancy on the left
    - Also shows status (enabled/disabled) of inputs
    - Also shows channel # or corresponding muon readout crate # or event occupancy
      - Helps in debugging missing L2 muon inputs

L2 dataflow Gui - Framework

- Is L2 enabled?
  - Or does the trigger framework make its own L2 decision
- Overall L1/L2 accept rate
- L1 await L2:
  - Number of L1 accepts TFW has issued that it are awaiting a decision from L2 global

COOR-L2 connection problems

- L2 crate is stuck in an error state
  - Red error light in l2df
  - Admin will not respond to L2 TCC
  - L2 TCC times out, responds fail to COOR
    - When starting or stopping runs
  - SCL inits will get L2 out of the error state
    - StartRun includes SCL init
    - Problem solved!
    - Only if L2 Alpha/Beta is not frozen
    - The problem might come right back with the next L1 accept

  ✓ Stop run, SCL init, re-download, start run
- Time-out when starting a run
  - SLIC configuration change (disabled L2 muon input)

  ✓ Wait 30 seconds, start again

L2 Examine

- Part of the Global Monitor Trigger Examine
  - Compare to reference plots
- Display
  - Pre-processor output
    - Local electrons, jets, muons
  - Global objects
    - Electrons, jets, muons
  - Trigger bits
    - L2 rejection for each trigger bit compared to nominal rejection
- Correctly shows problems
  - but not every discrepancy is a problem