Run Control Shifter Training

April 2015

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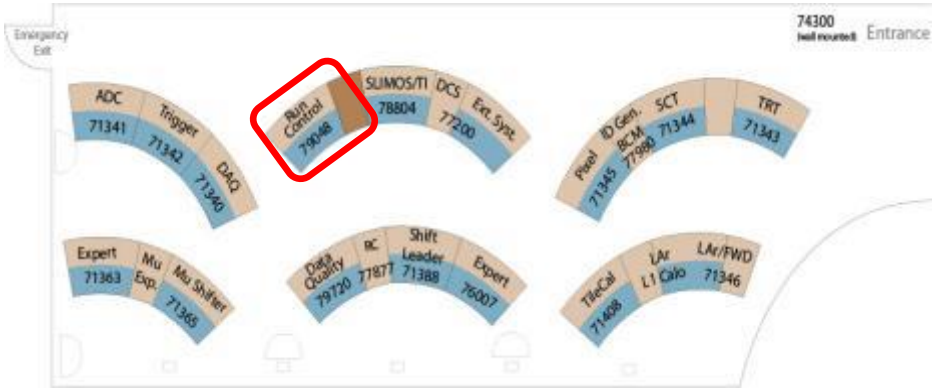


Speaker: Alina Corso-Radu

Material by A.Corso-Radu on behalf of the DAQ Training Team

Run Control Shifter Training

DAY 2 Session Outline

- Run Control Shifter duties
- Prepare the working environment
- Operational Procedures - Control
  - Start a run
  - Stop a run
  - Change configuration
  - Shutdown a partition
- Operational Procedures - Monitor
  - Shifter Assistant
  - IGUI ERS Message Window, Log Manager
  - Busy Presenter
  - DFSummary
  - Monitor OLC and L1CT infrastructure
- Troubleshooting
- Conclusions

Duties of Run Control shifter

- Following Shift Leader decisions you will:
- Prepare for a run
  - Change configuration – enable/disable segments
  - Change trigger keys
  - Reload configuration
- Start a run, follow the FSM, reach RUNNING state
- During a run: monitor the data flow, messages, BUSY state, L1, HLT and recording rates
- Monitor stop-less removal and recovery actions; check with Detector shifters correct configuration
- Monitor the OLC infrastructure, L1CT
- Keep run ongoing; react on error messages and try to minimize the dead time
- Record your actions into the logbook during the shift: insert a Shift Summary at the end and insert an entry each time you have a problem for faster feedback.

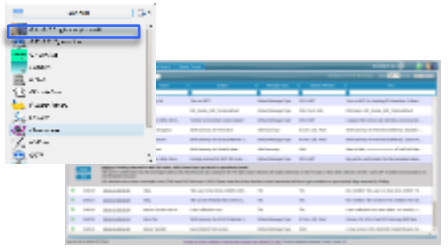
REMINDER:

- **You are not the Shift Leader; inform him/her before any important action!**

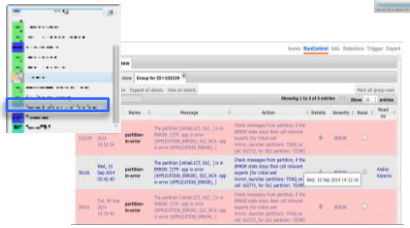
Prepare your working environment

- Start and configure *DAQPanel* from CRD TDAQ menu (see DAY 1 general tutorial)

- Start and authenticate to *ELisA logbook* from CRD General menu (see DAY 1 general tutorial)



- Start and authenticate to *ShifterAssistant* from CRD TDAQ menu (see DAQ training DAY1)



Reminder:

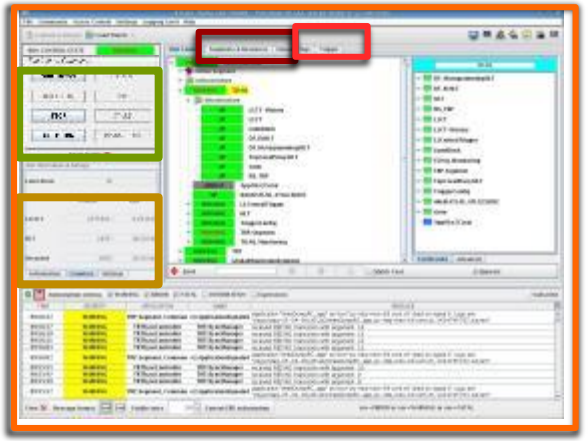
- Logout and authenticate yourself to different tools at the beginning of your shift.
- Check the Whiteboard for up-to-date information about the run, etc,
- Submit a Shift Summary entry to the logbook at the end of your shift
- Wait for the next shifter…

Operational procedures: **Control**

A. Start a run
B. Stop a run
C. Changing configuration
D. Shutdown a partition

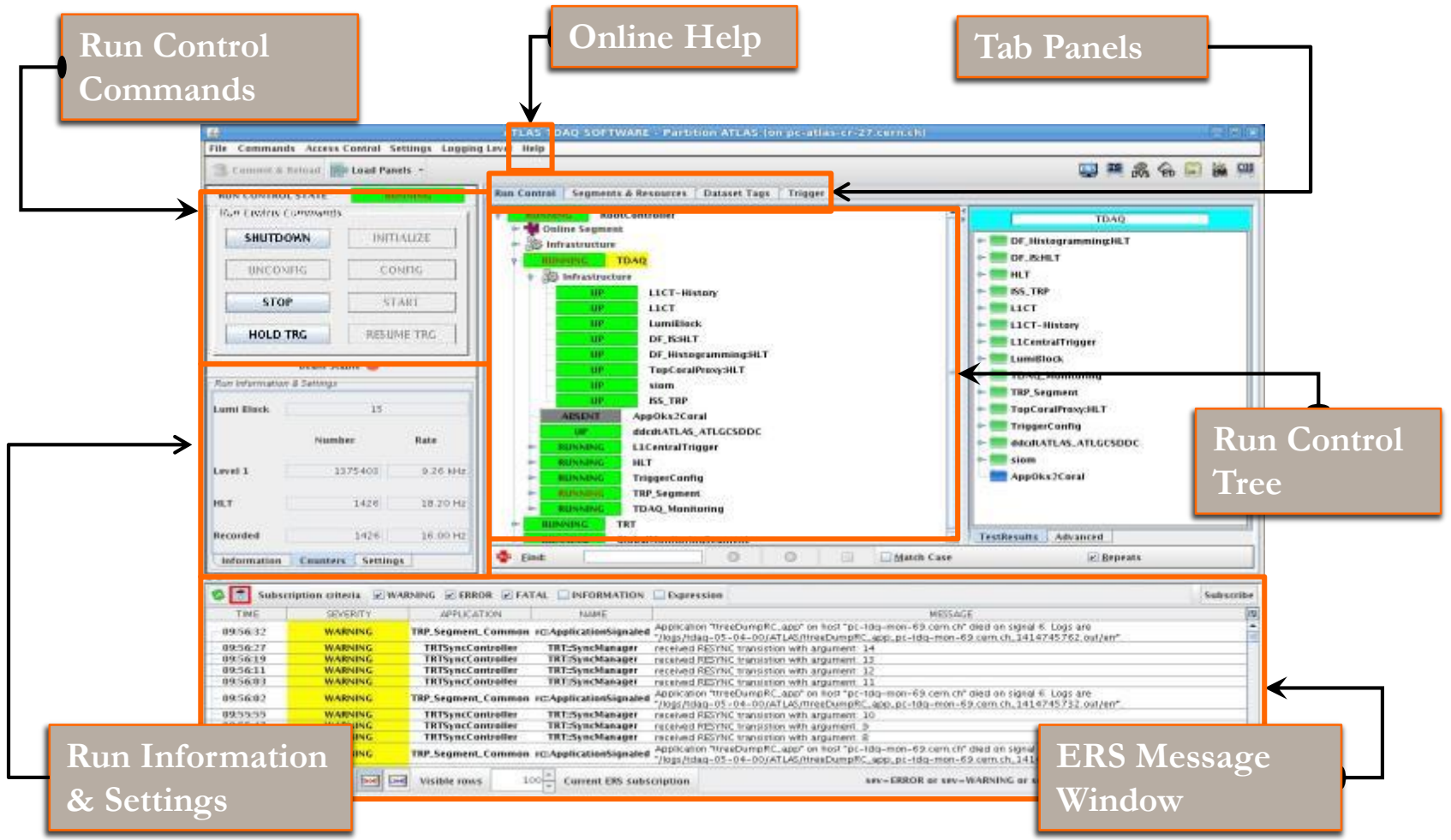
A. Start a run

1. Check if IGUI is already running. If yes, to go step 3.
2. Press *Start Partition* button in DAQPanel
   - ✓ IGUI will be started, RootController in NONE state
3. IGUI Segments and Resources Panel
   - ✓ Give a look at this panel to check that the configuration is the one you are expecting for the next run



4. IGUI Trigger Panel
   - ✓ Check with the Trigger shifter what trigger keys to use
5. IGUI Run Settings Panel
   - ✓ Check run parameters before starting the run
6. IGUI RunControl Tree
   - ✓ Go through the FSM: INITIALIZE, CONFIG, START, and bring the DAQ to RUNNING state
   - ✓ When the e-log window appears (at start/stop of run) do not simply close it, but fill it with useful information!

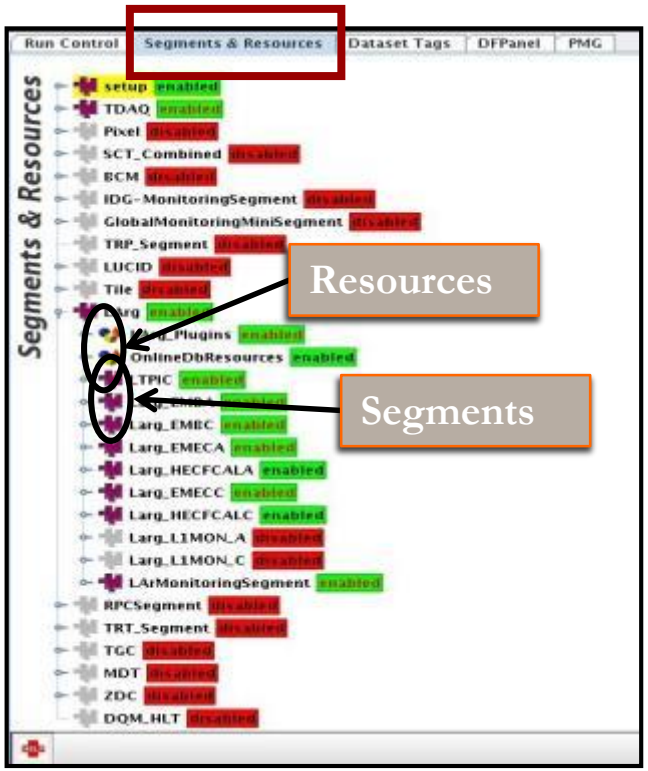
IGUI tool description



IGUI Tool

- IGUI can work in two modes: Control and Status Display (can switch between them from top menu bar "*Access Control*")
  - At RunControl desk you should always have the IGUI in control mode (all buttons are enabled)
  - In case of errors when asking back the control for IGUI, you will get information on the user holding the expert token (look for that user or call the DAQ on-call)
- IGUI will enable only those actions (buttons) that are allowed for a given system state (don't need to know details about the FSM). Only "*Shutdown*" button is enabled at every moment. Do not abuse using it!
- Buttons in *Run Control commands* area will send commands to the top node RootController and the commands will be distributed to its children until all tree components will reach the same state. In case of errors no other state transition is possible, until the error is fixed and the RunControl Tree is no more in error state (is green)
- Not all the IGUI panels are loaded by default. Use "*Load Panels*" top menu item to load/unload the panel needed.

IGUI Segments and Resources panel

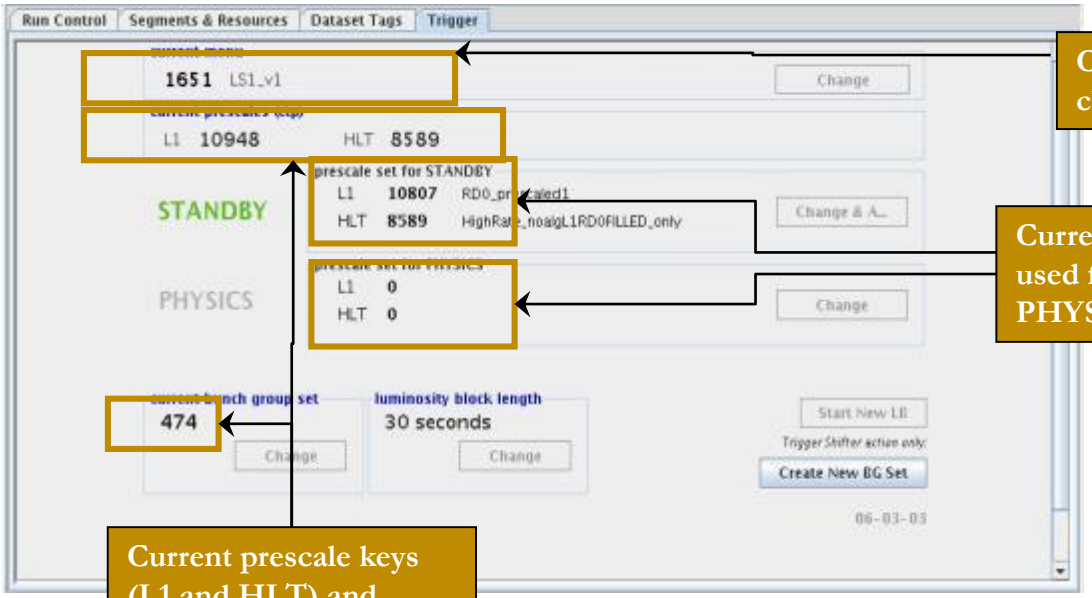


- It shows segments and resources in the partition in a tree hierarchy
- Panel used to put a (sub)detector in or out the data taking operation
- During a combined run, verify with the Shift Leader which sub-systems are included in the run and if they are ready to start
- Right click on tree items to enable/disable them
  - Controllers will accept reloading the database if they are in **None** state
  - Disabled items will not appear in the run control tree
- Press the middle mouse button to know the reason why a segment or a resource is disabled

enabled	Component enabled
disabled	Component directly disabled
disabled	Component indirectly disabled
enabled	Component enabled but with disabled children

Remember to commit changes to the database using the *Commit & Reload* button in the IGUI toolbar!

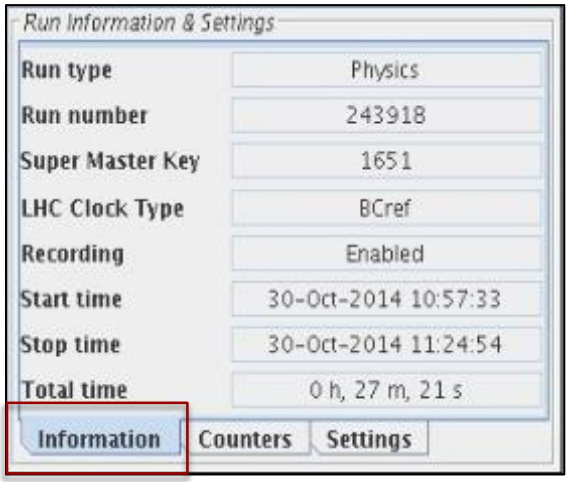
IGUI Trigger panel

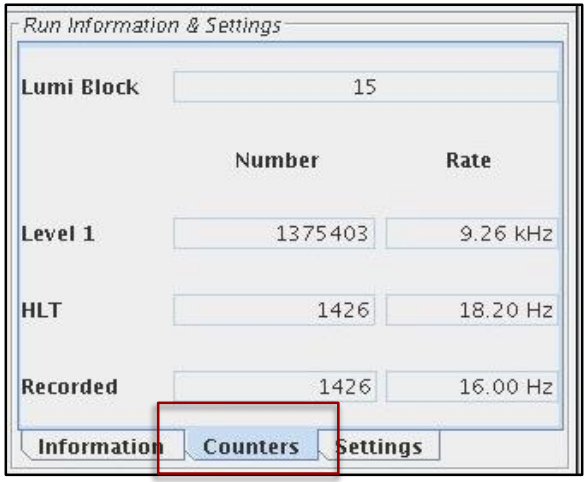


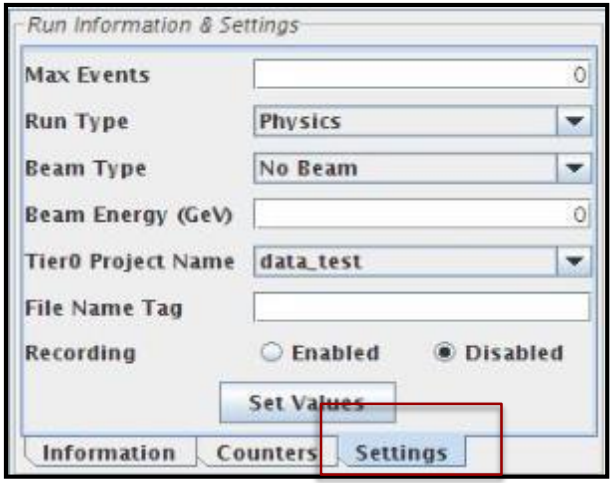
The switch between Standby/Physics is done automatically during Warm start/stop.

- Standby
  - No beam or no stable beams (before warm start)
  - Detectors in SAFE mode, high voltage OFF (low) for ID and Muon systems
- Physics (ATLAS ready)
  - Stable beams, all detectors in physics mode
  - Data for physics analysis, all triggers in, HLT rejection
  - Prescale sets prepared for different luminosities, changed automatically during the run; confirmation is needed from the shifter. Always ask the trigger shifter!

IGUI Run Settings panel







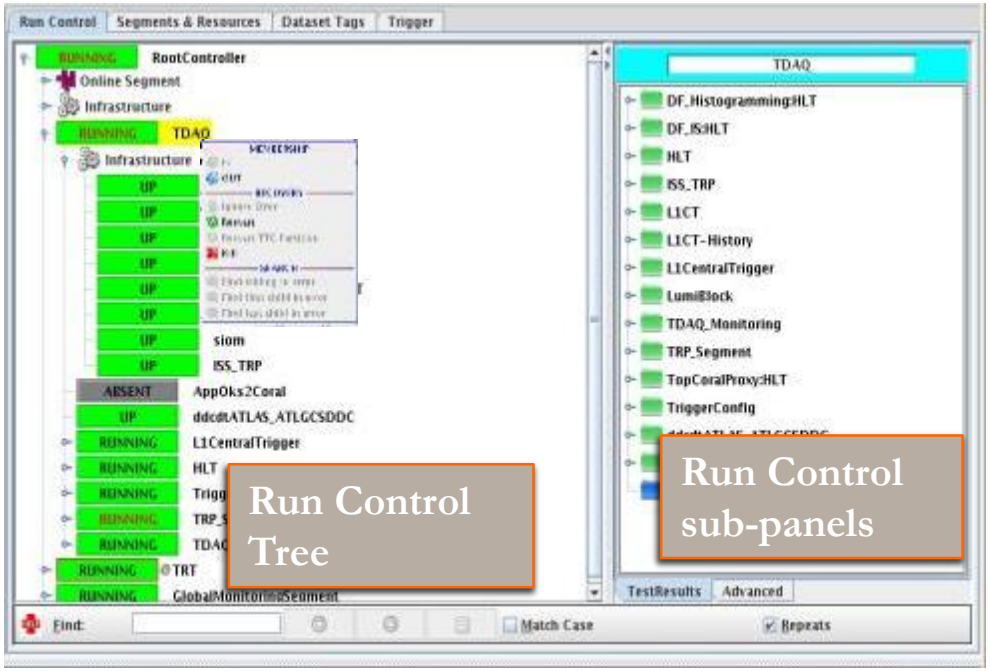
- It allows to see and set the run parameters
- Mandatory checks before starting
  - Run Type – usually Physics
  - Beam Type – protons, ions
  - Recording – if set to **Disabled** no data will be recorded
  - Tier0 Project Name –crucial for data reconstruction at T0
    - http://atlasop.cern.ch/twiki/bin/view/Main/RCWhiteBoard
- Max Events='x' means the run will be stopped automatically after x events. If =0 the run is not stopped automatically.
- Remember to apply changes using the **Set Values** button before running - IGUI will remind you!

IGUI Run Control Commands

Button	Action	Initial State	Final State
INITIALIZE	Initialize the DAQ system	NONE	INITIAL
CONFIG	Configure the DAQ system	INITIAL	CONNECTED
START	Start the data taking	CONNECTED	RUNNING
STOP	Stop the data taking	RUNNING	CONNECTED
UNCONFIG	Unconfigure the DAQ system	CONNECTED	INITIAL
SHUTDOWN	Shutdown the DAQ System	INITIAL	NONE
HOLD TRG	Inhibit triggers	RUNNING	RUNNING
RESUME TRG	Re-activate triggers	RUNNING	RUNNING

- *HOLD TRG* and *RESUME TRG* do not cause any state transition and are enabled only in RUNNING state.
- Intermediate states during some transitions:
  - At CONFIG: INITIAL->Configured->CONNECTED
  - At STOP: RUNNING->Roibstopped, Dcstopped, Hltstopped, Sfostepped, Gthstopped->CONNECTED

IGUI Run Control panel



- Node state changing during the Run Control transitions
- Applications can be:
  - State-aware - follow the FSM with state as: None, Initial, Connected, Running
  - Stateless: status Up or Absent (an application can be Absent in Running state; as long as the controller tree is not in error, this can be valid situation)

- Select a node in the tree; right-mouse menu items are enabled/disabled taking into account the controller state
  - The menu will not be shown if the IGUI is in status display
- See Troubleshooting section for the recovery commands.

Operational procedures: **Control**

A. Start a run

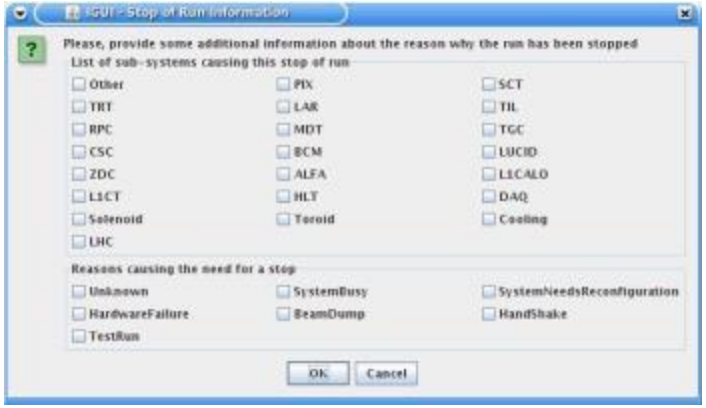
B. Stop a run

C. Changing configuration

D. Shutdown a partition

B. Stop a run

- Always follow the Shift Leader decision
- Start sending transition commands to the Run Control: STOP->UNCONFIG->SHUTDOWN
- At STOP there are two different popup windows; do not simply close them
  - Stop-Of-Run logbook entry
  - Stop-Of-Run information - appears when the beam mode is one of the following: FLAT TOP, SQUEEZE, ADJUST, STABLE → Give details about the reasons of the stop.



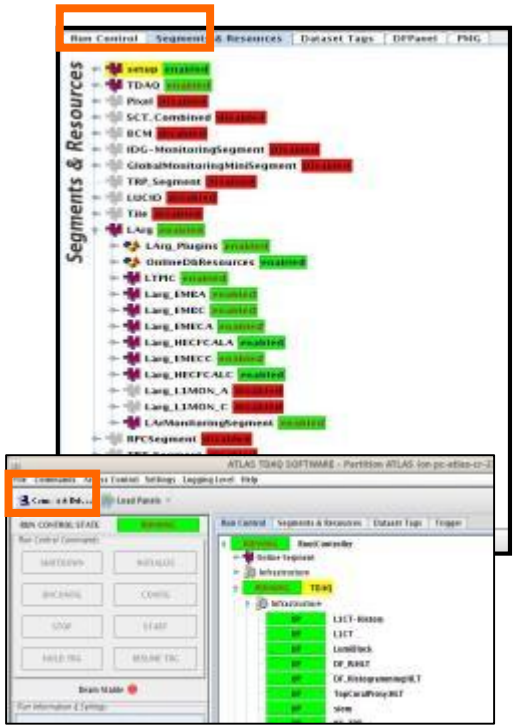
Warning: If the STOP button is NOT available (and you have to stop the run), it means that something is in error! Expand the Run Control tree, find the offending application. Ignoring or putting it out of the tree, the STOP button will appear again!

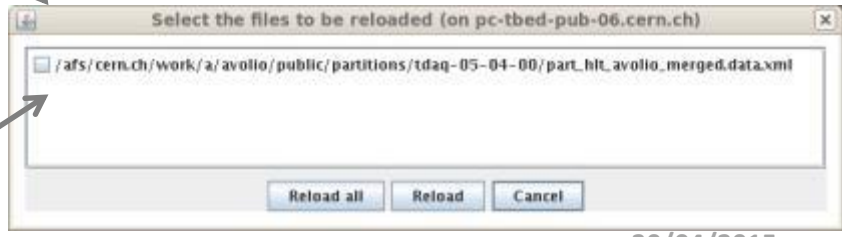
Operational procedures: **Control**

A. Start a run
B. Stop a run
C. Changing configuration
D. Shutdown a partition

C. Changing configuration

- Always follow the Shift Leader decision!
- Use IGUI Segments and Resources panel. Changes are allowed only in the FSM's **NONE** state.
- If you have to disable some segments (e.g. during a calibration period just a sub-detector runs within ATLAS) you have to press "***Commit&Reload***"button in IGUI in order to apply the changes to the database.
  - First will appear a pop-up window for the commit action: put a comment.
  - Then will appear a second pop-up window with the list of modified files -> Choose only the modifications you are aware of!! Ask relevant shifters.





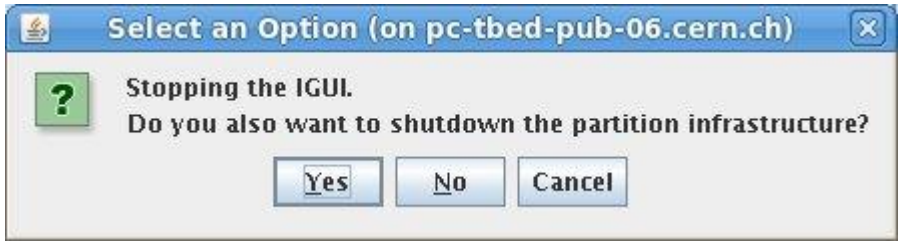
If you disable a segment, always reload "combined/partitions/ATLAS.xml"

Operational procedures: **Control**

A. Start a run
B. Stop a run
C. Changing configuration
D. Shutdown a partition

D. Shutdown a partition

- Always follow the Shift Leader decision!
- Exit IGUI
  - You will be asked if you want to shutdown the partition infrastructure. Press YES.



- If IGUI reports errors during the shutdown process.
  - Start PMG Control Panel from the DAQPanel to check for leftover processes.
  - List processes and clean them.
  - See Troubleshooting section.

Operational procedures: **Monitor**

I. Watch the Shifter Assistant (SA)
   - ✓ Read and acknowledge the alerts.

II. Follow the messages in the IGUI ERS Message Window
   - ✓ Log Manager can be useful as well

III. Use Busy Presenter to monitor the dead-time
   - ✓ If the busy is not coming for a sub-detector, use DFSummary to understand the source of the problem.

IV. Use DFSummary to monitor the DAQ
   - ✓ monitor the flow of data from ROS to Tier0

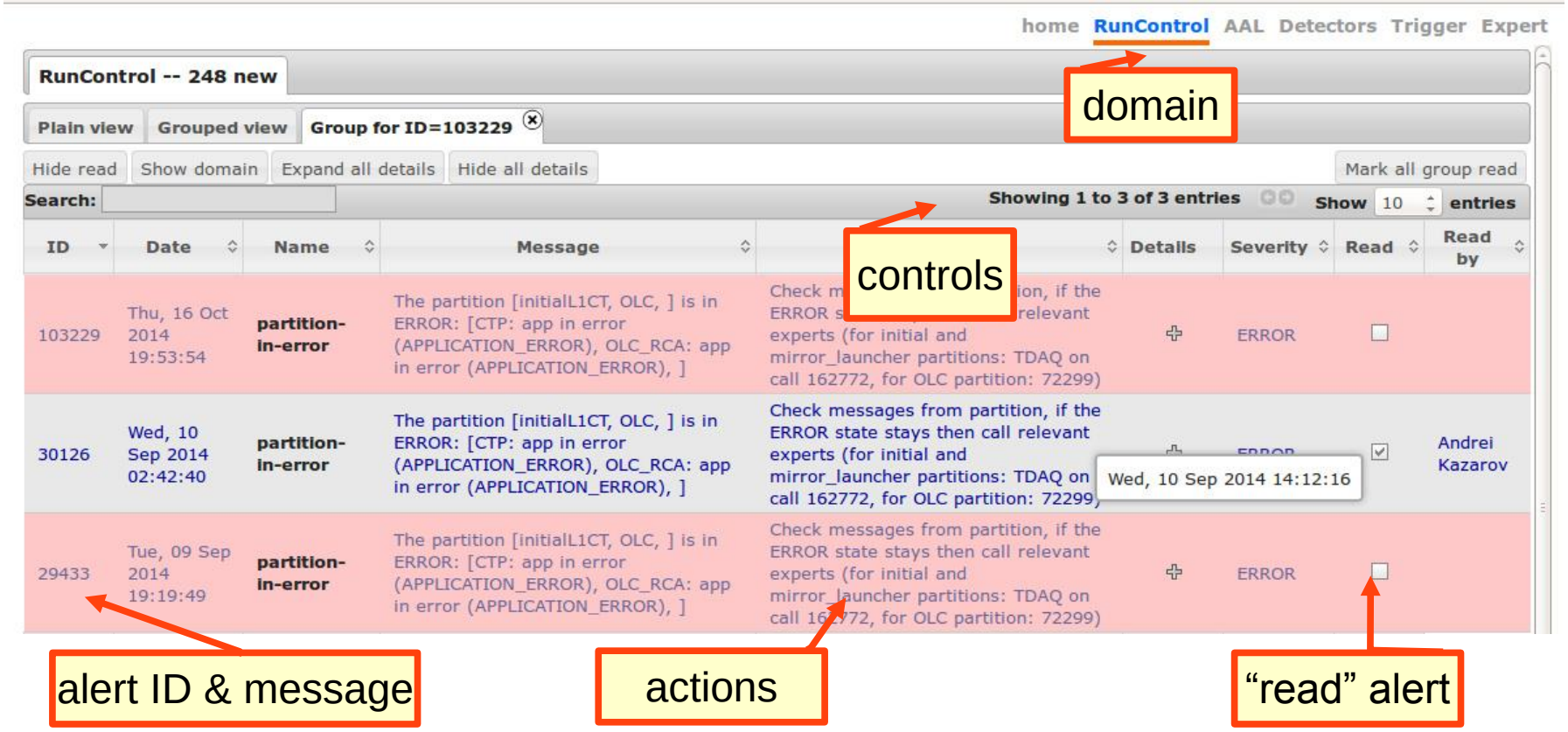
V. Monitor OLC infrastructure

VI. Monitor L1CT infrastructure

I. Shifter Assistant

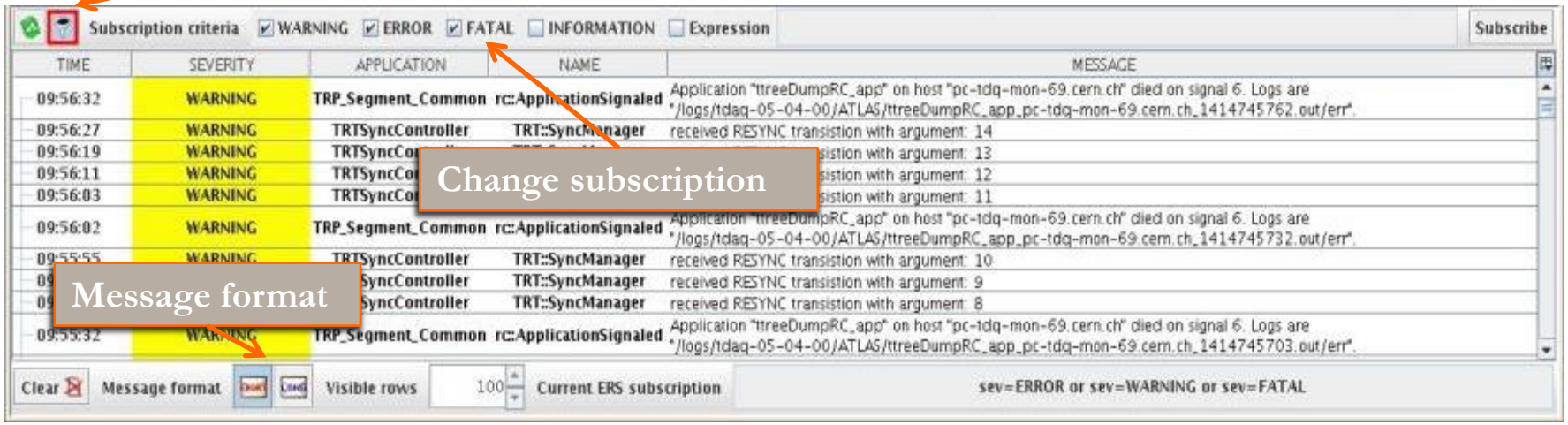
- A service to **reduce and simplify** shifters tasks
  - Provide automated monitoring procedures
  - Collects and analyzes data from all TDAQ/DCS/Sysadmins sources: mainly via IS, ERS, databases
  - Contains a set of “directives”, developed by experts from relevant domains, performing real-time queries on the flow of operational monitoring data
  - Automatically recognize unexpected behavior of the system
  - Suggest actions to take (even if it is just “call the on-call expert”)
- **Alerts** are generated when defined conditions are met
  - Application status outside parameters
  - Start of Run check errors, End of Run, etc.
- Alerts are available in a Web application (next slide) via a browser and requiring CERN SSO log-in (and log-out at the end of the shift).
- Once alert is read (i.e. “acknowledged”) by the shifter, it is marked as “read” in the SA web page (and database), having timestamp and user ID recorded – making it traceable by the experts.

SA: read and acknowledge alerts



II. IGUI ERS Message window

Default Message Filter is enabled



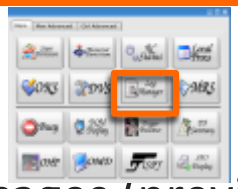
Change subscription

Message format

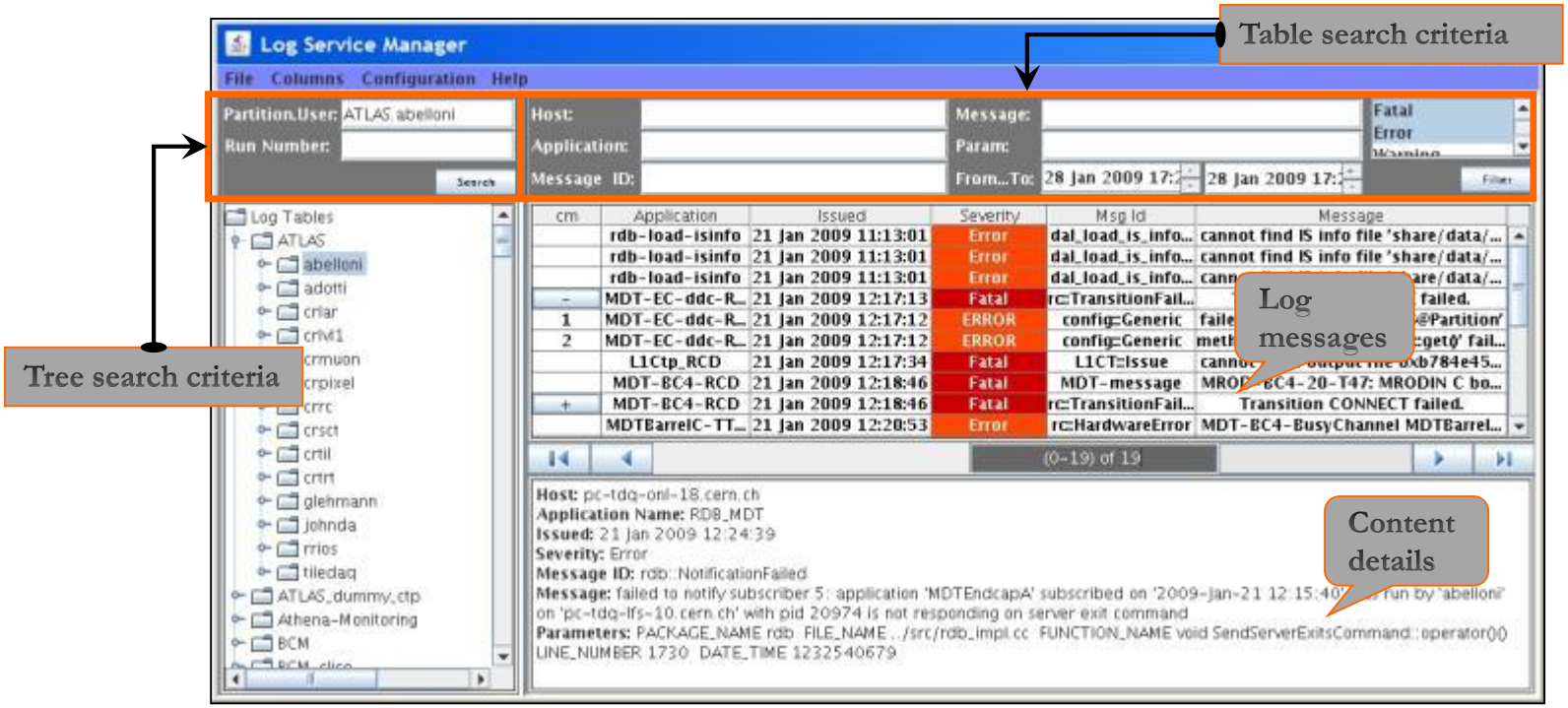
- Show all ERS messages flowing through the system that the IGUI tool is subscribed for.
- Changing subscription criteria to display less messages does not mean that the messages are not produced anymore.
- Messages can be masked out using expressions.
  - For example one can filter out messages from application name matching HLTMPPU-1:* and with message text matching a certain expression: (app != HLTMPPU-1:*) and (msg!= monsvc::*) and (msg!=dcm::Hltpu*)
- A default message filter may be defined via the configuration database.

Log Manager

- Start from DAQPanel

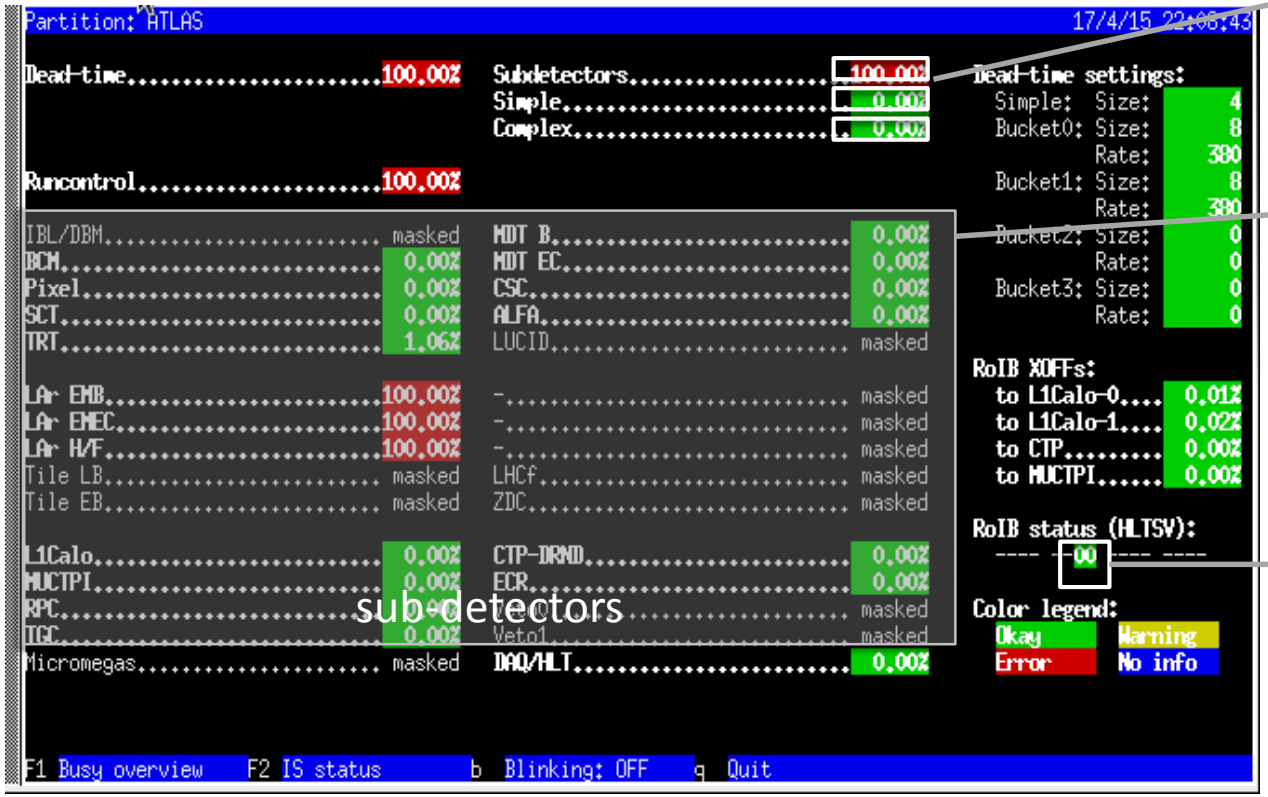


- Use it to browse log messages (previous runs, too many messages in ERS window)



III. Busy Presenter

- No data flowing through the system? It may be in BUSY state.
- Once the busy source is found, alert the subsystem desk!



There are several contributions to the dead-time: simple, complex and sub-detector.

If sub-detector is busy (RED LABEL), then it can be the RODs of the sub-detectors, and it is important to figure out which sub-detector it is.

Important to understand that DAQ/HLT propagates its busy through the trigger detectors (CTP, MUCTPI, L1Calo), so if any of those is busy, it is either due to this sub-detector OR the DAQ/HLT.

Tool under development, keep yourself up to date!

IV. DF Summary

Tool under development, keep yourself up to date!

Run: global run information and status (monitor LB, run number, duration of the run, state of the RootController)

Busy: monitor the global busy and the busy fraction excluding preventive deadtime

Trigger Keys: actual SMK, bunch group, L1 and HLT prescale (physics and standby) keys as described in the database

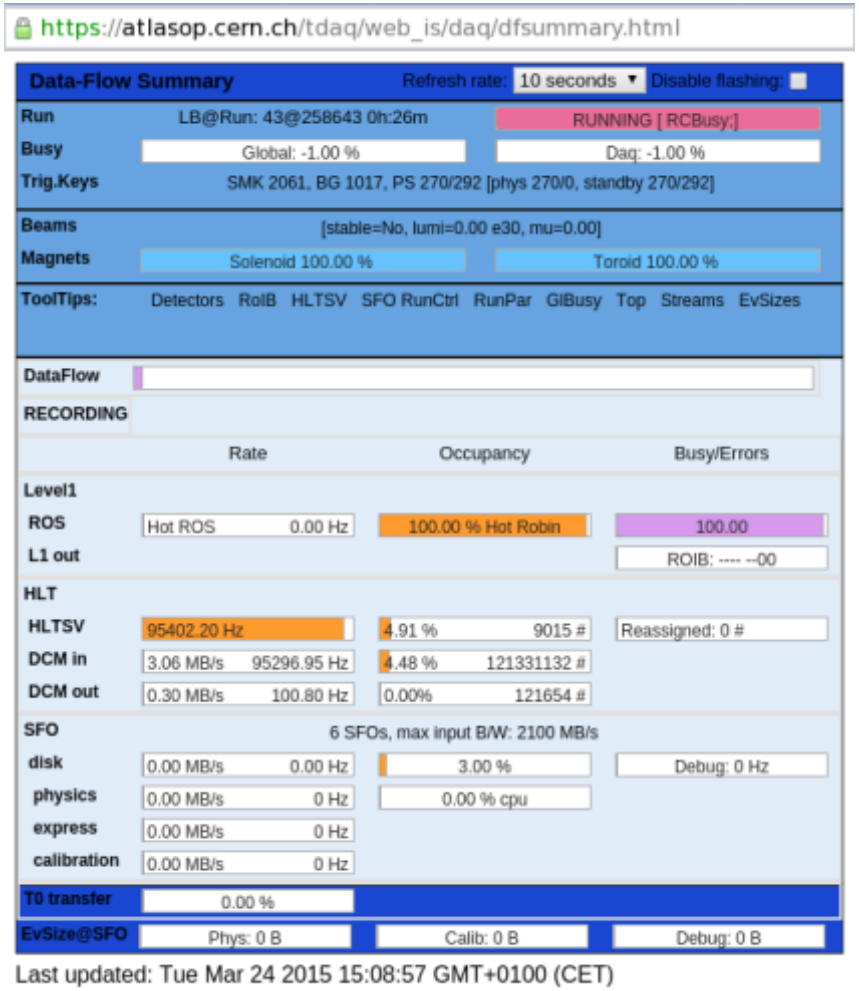
Beams: the status of the beams

Magnets: solenoid and toroid current (in percentage wrt nominal values)

DataFlow: get an overall idea about the status of the TDAQ system. In case of dead-time or errors, you can analyze the individual farms.

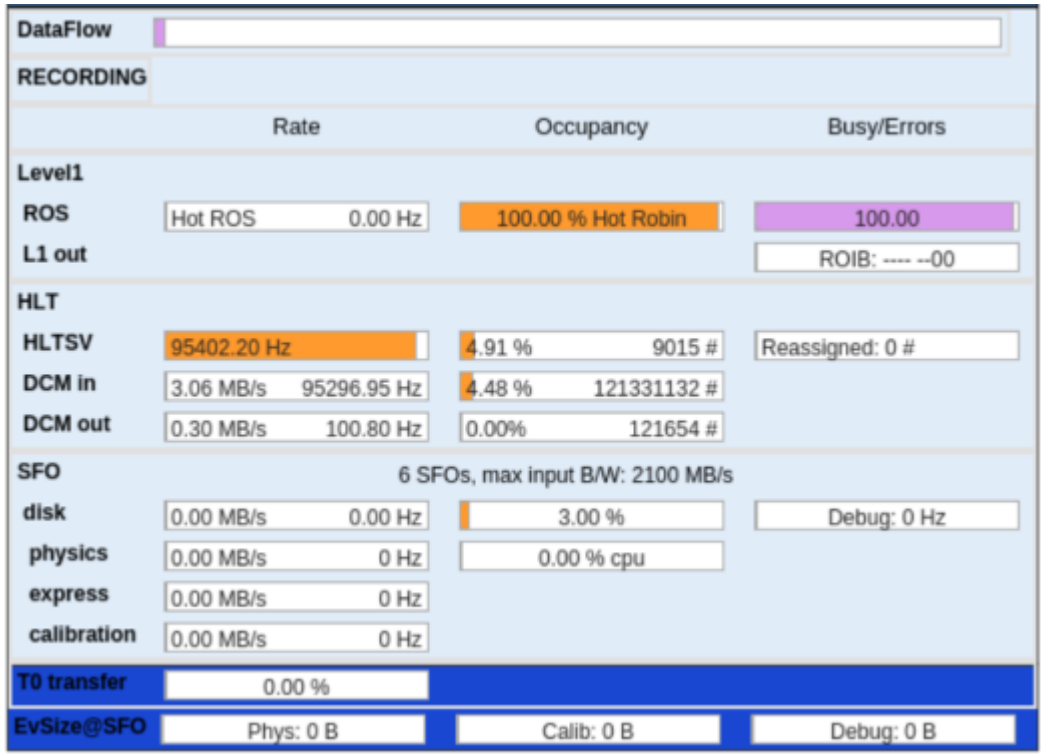
ToolTips: mouse move on each entry you get the overview of the variables and their actual values monitored

Open from CRD –TDAQ menu



IV. DF Summary – L1, HLT, SFO

- **ROS:** we monitor the ROS, the ROBIN (the buffer) and the ROS load. In case of busy, you can see from which component the busy is coming from.
  - **Hot ROS/ROBIN** shows the level of occupancy of the most requested ROS/most occupied ROBIN.
- **HLT**
  - We monitor the rate of data input & output
  - The occupancy of the input & output queues, the cpu usage
- **SFO**: the data storage
  - Data writing speed (total & per stream). Note: it can be greater than the input since data can be duplicated in different streams.
  - Top used disk
  - How many data end in the debug stream (should be very small)
- **T0 transfer**: the data are transferred to T0 and deleted from the local mass storage. **This operation can start up one hour later than the start of run**.



V. OLC Infrastructure (1)

H. Keoshkerian, N. Garelli

- The instantaneous and integrated ATLAS luminosity data are computed online by applications which live in a **dedicated partition, called OLC**

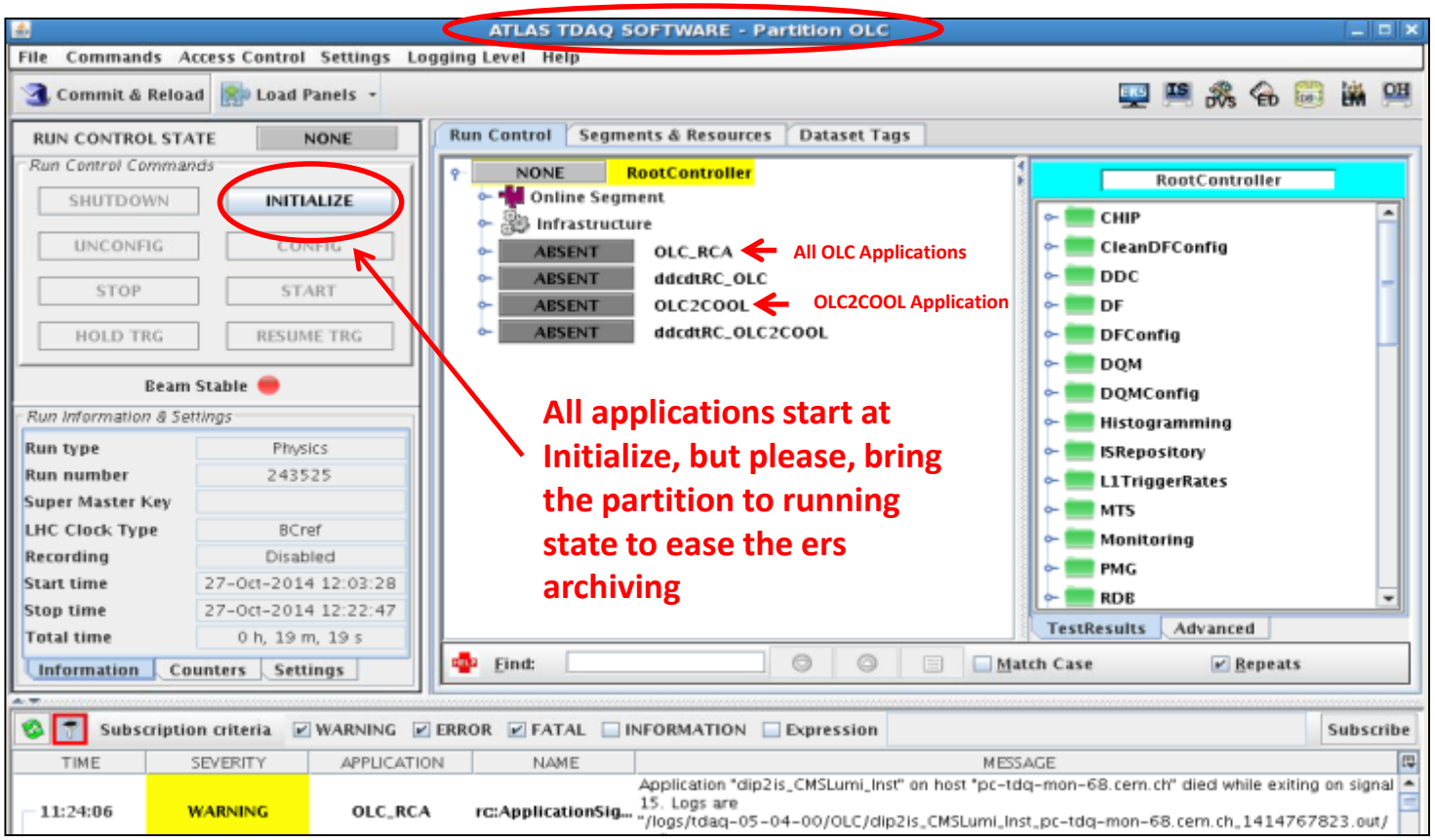
- Those applications are grouped in 4 segments
  1. OLC_RCA
     - Several applications which read and publish from/to **IS and DIP** (Data Interchange Protocol) relevant information from the ATLAS partition (where the luminosity detectors run) and LHC
     - Two main applications (OLCApp and OBCApp) to compute the luminosity & other accelerator parameters (beam & bunch currents, beam positions & sizes, etc.)
  2. ddcdtRC_OLC
     - Mechanism to ship data to DCS → plots looked by DQ shifter
  3. OLC2COOL
     - One application which reads the luminosity information and write them to **COOL**. By design, it is 2 LB behind wrt the ATLAS current one.
  4. Ddcdt_OLC2COOL
     - Mechanism to ship data to DCS → plots looked by DQ shifter

- BCM sends luminosity information **even if ATLAS is not running → OLC partition runs also when ATLAS is not running**

V. OLC Infrastructure (2)

- You need to **react on the Shifter Assistant messages**
- If the DQ shifter and the Shift Leader do not see luminosity information, they will call the luminosity on-call (**72299**) and you will be potentially asked to
  - Restart an application
  - Read the ERS messages
- The OLC partition is typically running, but you might be asked by the expert on-call or the ATLAS run coordinator to **restart it**
  - Shutdown the whole partition (also the infrastructure)
  - Start it again from the DAQ panel using:
    - Script: /det/tdaq/scripts/setup_TDAQ_tdaq-05-05-00.sh
    - DB file: /atlas/oks/tdaq-05-05-00/lumi/partitions/OLC.data.xml
    - Partition name: OLC
  - Make an elog entry under “Beam Conditions” + “DAQ”
- **Make an e-log entry under “Beam Conditions” + “DAQ” whenever you had to do something related to the OLC partition.**

V. OLC Infrastructure (3)



<u>For the moment:</u> The Run Control Shifter should NOT do anything related to the OLC → the OLC expert (H. Keoshkerian) will take care of it

Troubleshooting

- Start a partition from scratch (no infrastructure)
- PMG Control Panel
- Infrastructure Panel
- IGUI Run Control Panels: Tests Results and Advanced
- IGUI Run Control recovery commands
- Run time recoveries

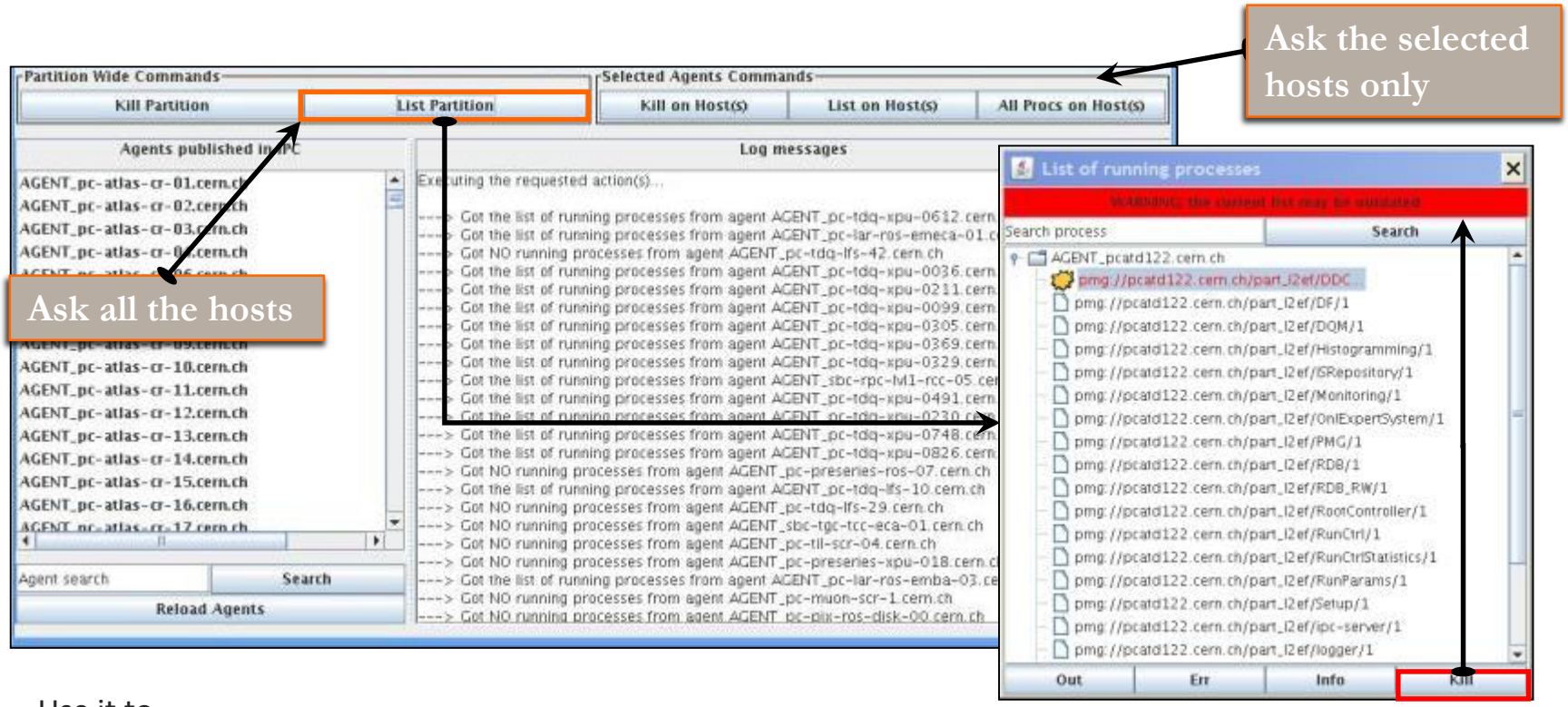
Start a run with no partition infrastructure

- Occasionally you will be asked to start a partition from scratch i.e. when NO partition infrastructure is ready

1. Start PMG Control Panel from DAQPanel Advanced tab
   - ✓ Check leftover processes and clean them.
2. Press Start Partition button in DAQPanel
   - ✓ Infrastructure Panel

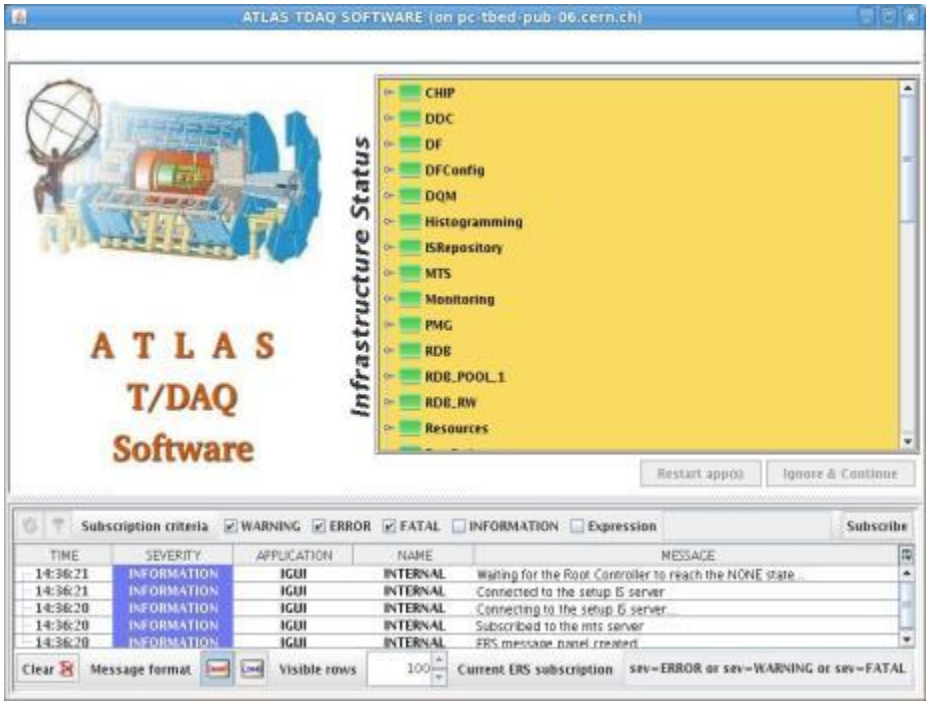
3. Continue with steps 3-4-5-6 from Control Procedure A.

ProcessManager Control Panel



- Use it to…
  - make sure all the process in the partition were correctly terminated at exit
  - list and kill **partition** processes
    - On all the hosts or only on the selected ones
- Operations are usually fast (less than 30 seconds)

Infrastructure Panel



Buttons enabled if the tests fail:

- Ignore&Continue: failed tests will be ignored
- Restart apps: restart failing applications.

- The partition infrastructure is tested. If all tests passed, main IGUI will be displayed.
- It may take few minutes for the IGUI tool to appear when running ATLAS partition.
- In case of errors with the partition infrastructure, call the DAQ on-call

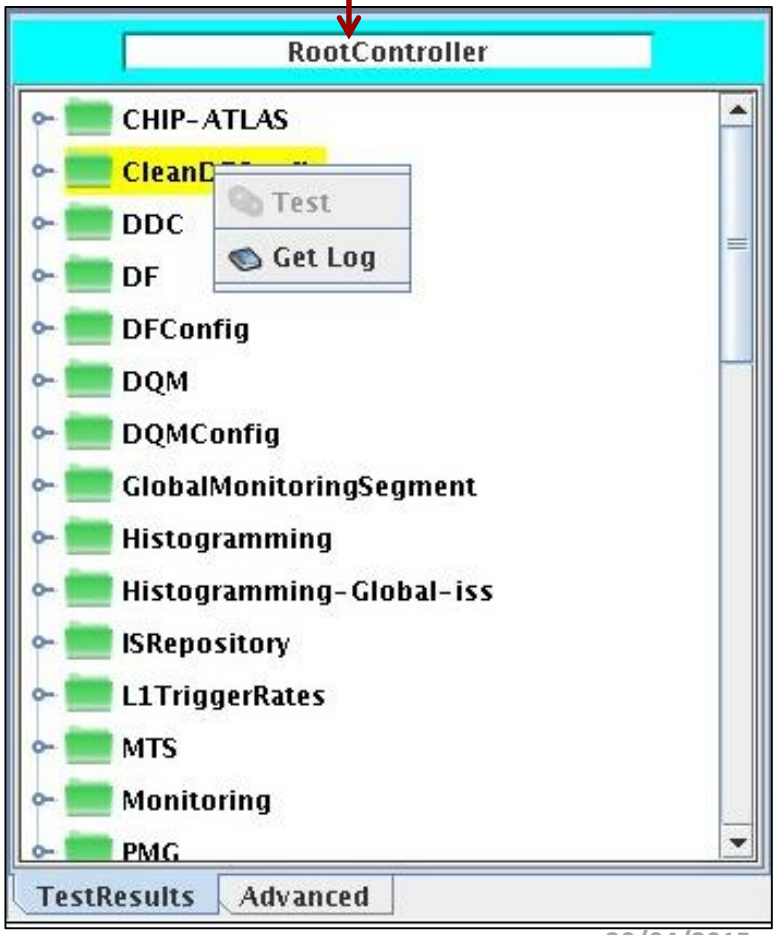
Troubleshooting

- Start a partition from scratch (no infrastructure)
- PMG Control Panel
- Infrastructure Panel
- IGUI Run Control Panels: Tests Results and Advanced
- IGUI Run Control recovery commands
- Run time recoveries

IGUI Run Control TestResults Panel

- Show the status of the tests performed by the RunControl on applications (just indicative for the moment)
  - Blue folder – not tested yet or does not have tests associated
  - Green folder – tests passed
  - Red folder – at least one test failed
  - Yellow folder – problems with the tests execution
- Right mouse button click on component:
  - *Test*: test the selected component
  - *Get Log*: display the test log of the selected component

Panel always refers to the item currently selected in the Run Control Tree



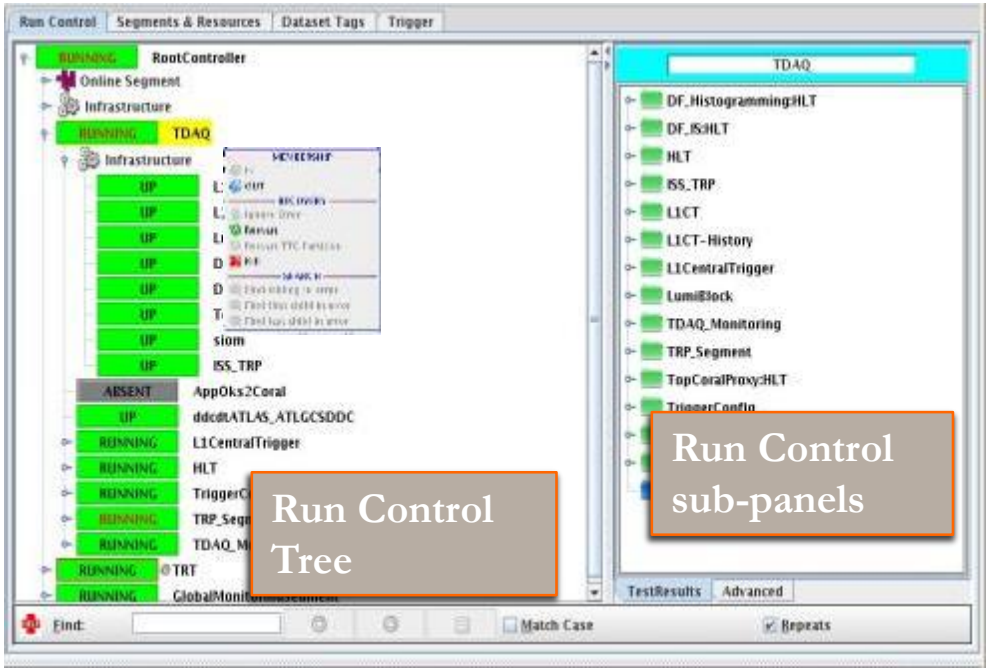
IGUI Run Control Advanced Panel

Panel always refers to the item currently selected in the Run Control Tree

- Used to send transitions commands to the selected controller.
- Central column shows the current state
- Left and right columns show buttons to move through FSM.
- Commands disabled if IGUI is in Display mode.

Application information

IGUI Run Control recovery commands



- Membership IN/OUT **is not** the way to enable/disable parts of the system. Use IGUI Segments&Resources panel.

- Select a node in the tree; on right-mouse the menu items are enabled/disabled taking into account the controller state.
  - The menu will not be shown if IGUI is in status display mode.
- Membership commands:
  - If **OUT** the controller/application will be out of the Run Control Tree (i.e. errors will be ignored, commands will not be sent, but the application will NOT be killed)
- Recovery commands to controllers & applications
  - **Ignore error**: ignore the children error
  - **Restart**: restart the controller or application
  - **Restart TTC Partition**: dynamically restart a whole region of a detector. Shift Leader decision!
  - **Kill**: kill the controller or application
- Search commands to help finding the element in error.

Troubleshooting

- Start a partition from scratch (no infrastructure)
- PMG Control Panel
- Infrastructure Panel
- IGUI Run Control Panels: Tests Results and Advanced
- IGUI Run Control Recovery Commands
- Run time Recoveries

1. Stop-less Removal/Recovery

- Sometimes a part of the readout gets stuck and blocks the central trigger of ATLAS (100% BUSY)
  - The system is capable of automatically detecting this situation and handling it by excluding the faulty part from the data taking
  - As Run Control shifter you will be sometimes asked to acknowledge the stop-less removal procedure
    - Read the message carefully and ASK the Shift Leader to decide what action to take in collaboration with the relevant detector shifter!
- Some detectors have implemented a recovery for the components that have been excluded from data taking
  - This procedure is completely automated and there is nothing that you should do
- When preparing the shift summary list all the occurrences of the messages
  - **rc::HardwareError, rc::ReadyForHardwareRecovery, rc::HardwareRecovered**

2. TTC Restart

- Sometimes one sub-detector's readout goes into such a bad state that it needs to be completely reconfigured
  - The request for making a TTC restart may come from a detector shifter or expert
  - **The decision to make a TTC restart belongs to the shift leader!**
- If the shift leader instructs you to perform a TTC restart on a sub-system
  - Select the controller of the system in the IGUI
  - With a right-mouse-click get a menu of commands that can be sent to that controller
  - Send the TTC restart command

- The trigger will be automatically put on hold for the whole duration of the recovery procedure
  - It will be resumed if the procedure succeeds or upon a timeout
  - Do not resume the trigger on your own initiative!

3. Holding the Trigger during Stable Beams

- In some rare occasions you will be asked by a detector shifter (or expert) to put the trigger on hold during a RUN
  - If there are STABLE BEAMS this operation can only be done upon agreement of the shift leader
- If you put the trigger on hold it is YOUR responsibility to resume it as soon as possible.

Conclusions

- You are not the Shift Leader; inform him/her before any important action!
- Keep run ongoing; react on error messages and try to minimize the dead time
- Record your actions into the logbook during the shift: insert a Shift Summary log entry at the end of your shift and insert a log entry each time you have a problem for faster feedback from experts.
- Do not hesitate to call the DAQ on-call in case of problems.
- Keep yourself up-to-date with the training material.
- Ask Andrei.Kazarov@cern.ch to be added to the RunControl shifters list
- Do couple of shadow shifts before the first real shift.

Good luck!

Documentation

- DAQ/HLT Whiteboard

https://atlasop.cern.ch/twiki/bin/view/Main/DAQWhiteBoard

- Plan of the day

https://atlasop.cern.ch/twiki/bin/view/Main/PlanOfTheDay

- Exercise IGUI
  https://twiki.cern.ch/twiki/bin/view/Atlas/DaqHltDevTraining