LHCb ECS
Error Reporting
Guidelines

LHCB Technical Note

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Abstract

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This document is intended to guide sub-detector control system designers and developers with the generation and handling of Alarm messages in view of the integration of their systems into the final LHCb Control System.

Document Status Sheet

Table 1 Document Status Sheet

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Introduction

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1. Introduction

LHCb's Experiment Control System is in charge of the configuration, control and monitoring of all the components of the online system. This includes all devices in the areas of: data acquisition, detector control, trigger, timing and the interaction with the outside world.

All problems, in any of these areas, should be reported to the operator using one single tool: The Standard PVSS/FW Alarm Screen.

The Alarm Screen can be configured in different ways and in particular can be used centrally to report all messages from all sub-systems, or locally by each sub-detector to view only their messages.

Special care has to be taken by all developers when producing error messages, to make sure that they are meaningful and that they do not overload the Alarm Screen.

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2. General Rules

Alarms can have three severities: WARNING, ERROR and FATAL

All messages reported in the Alarm Screen imply that an action should be taken by the operator (most of the time by contacting the expert). The meaning of the different severities is as follows:

- FATAL – Action should be taken immediately otherwise there could be damage to the detector (HV, Gas, Cooling problems for example)

- ERROR – Action should be taken, but there is no immediate danger

- WARNING – Action may need to be taken, the problem needs to be followed up
  (A temperature or Humidity level is starting to raise, for example)

While these rules are quite obvious for power supplies, cooling systems, temperature monitoring, etc. they are less obvious for errors happening in the DAQ area. There the following definition would apply:

- ERROR :

  o A component failed to configure, the message should indicate the cause.

  o During a RUN a problem is detected that either prevents from running or affects permanently the quality of the data

  o Should also trigger the FSM to go to ERROR state
    (and probably STOP the RUN)

- WARNING:

  o Problems that don't prevent from running and don't affect permanently the quality of the data but should be followed up.

  o Should not trigger the FSM to go to ERROR

  o Here care should be taken to prevent repetitive messages.
    Some of these types of problems (if irrelevant for the operator) could instead just be reported using the new PVSS Central Log Viewer in preparation (see chapter 5).

In general the idea is that whenever the FSM goes into ERROR state, the operator should find in the Alarm Screen an explanation message from the source of the problem.

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Alarm Generation Mechanisms

3. Alarm Generation Mechanisms

In order to appear in the Alarm Screen, alarm messages have to be generated by PVSS.

The standard PVSS alarm generation mechanism: when a value arrives it is compared with alarm limits and may trigger an alarm, is appropriate for most data coming from the DCS area.
But again, in the DAQ area, the decision to raise an alarm may be more complicated, and may depend on several values or functions.
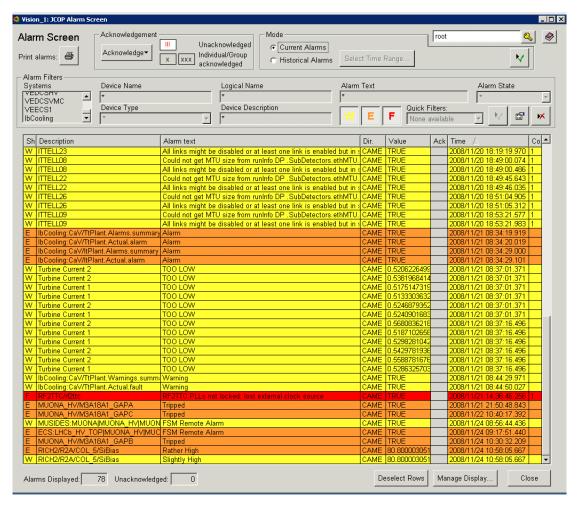
So, there are two mechanisms to generate alarms:

- The standard PVSS mechanism
  The developer adds an "alarm config" to a PVSS datapoint, defining the severity, the alarm limits, etc. **Only the following alarm classes should be used:**

    - **_fwFatalNack, _fwErrorNack, _fwWarningNack
      meaning No Acknowledgeable alarms!**

- A library of functions that can be called from a PVSS script, in particular it should be called inside the Device Unit scripts to report errors before changing the FSM state (in the DAQ area).
  Documentation available here:
  http://lhcb-online.web.cern.ch/lhcb-online/ecs/fwExternalAlertHandler/default.html

When using the standard PVSS mechanism the alarm disappears from the Alarm Screen automatically as soon as the value goes below the alarm limits. But when using the library, it is up to the user to remove the alarm when the problem disappears. The library contains functions to clear the alarms.
In general the alarms should be cleared at Initialize and then at "START", "RESET", "CONFIGURE", etc.

4. The Alarm Screen

The FW Alarm Screen is configurable. But for LHCb we would like to configure it as above, i.e.:

- Only one "source" column: "Description"
  This means that this column will show:

  - The datapoint description if there is one

  - Otherwise the datapoint alias (logical name) if there is one

  - Otherwise the datapoint name

  - **So the DP description, if there is one, should describe the source of the message and not as above "Turbine Current 2" for example. Users should remove or correct all datapoint descriptions that don't identify uniquely the device.**

- The Alarm Text should be short but meaningful, messages like above saying "Alarm" or "Warning" are clearly not meaningful.

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In order to start the alarm screen, shortcuts have been created for all sub-detectors and for the central one. They are available in the usual place:

- G:\online\ecs\NewShortcuts\<sub-detector>

And are called:

- <top-level-project>_UI_fwAlarmHandlingScreen

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5. Other Reporting Tools

In order to make it easier to debug and understand problems other reporting tools exist or are being prepared. These tools are meant to report messages that are best reported as log messages (i.e. they are reported with a time stamp and a severity but they just scroll back in the screen instead of disappearing).

These are:

- The ErrorLogger (part of Bologna's Farm Monitoring Tools) used to report messages from the farm processes (HLT, Storage, Monitoring, etc.):

    o   /group/online/dataflow/scripts/errorLog <partition-name>
        (Linux only for the moment)

- A central PVSS Log Viewer is in preparation, it will allow to browse remotely through the PVSS log messages of all PVSS systems.
  There will be a function similar to PVSS's "DebugN" to report messages to be seen in this LogViewer (DebugN messages will not be shown).
  More info on this will follow.