DSH.LMC Alarms Handling

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Outline

DSH.LMC Alarms

- DSH.LMC Alarms specs
- LMC Alarms specs
- ANSI/ISA–18.2–2009 Management of Alarm Systems for the Process Industries
- TANGO Alarm System

DSH.LMC Alarms specs

DSH.LMC Alarms

SKA-TEL-SKO-0000150, “SKA1-MID Interface Control Document TM To Dish” , Rev 02

Alarm information: The DSH shall send to the TM the following information for each alarm:

a) Time of detection of the condition

b) Description of the condition, (e.g. “over-temperature”)

c) The conditional data measured (e.g. 65degC) as justification for raising the alarm.

Alarm and event filtering : The DSH shall filter alarms, events and logs to prevent the reporting of alarms for items that are not fitted or that are under maintenance

DSH.LMC Alarms specs

DSH.LMC Alarms

SKA-TEL-DSH-0000016, “DISH LOCAL MONITORING & CONTROL REQUIREMENTS SPECIFICATION” , Rev 03

Alarm information: The DSH shall send to the TM the following information for each alarm:

a) Time of detection of the condition

b) Description of the condition, (e.g. “over-temperature”)

c) The conditional data measured (e.g. 65degC) as justification for raising the alarm.

LMC Alarm Latency: The latency from an internal LMC alarm event to reporting the alarm to TM shall be no more than 5 seconds

LMC Alarm transfer latency: The latency from LMC receiveing an alarm from othersub-elements, to reporting the alarm to TM shall be no more than 2 seconds.

DSH.LMC Alarms specs

DSH.LMC Alarms

- **SKA-TEL-TM-0000030,** "SKA1 LMC Scope and Responsibilities", Rev 01
- **SKA-TEL-TM-0000031,** "SKA1 LMC Interface Guideline", Rev 01
- **SKA-TEL-TM-00000161**, "Tango Interface Guidelines", Rev C

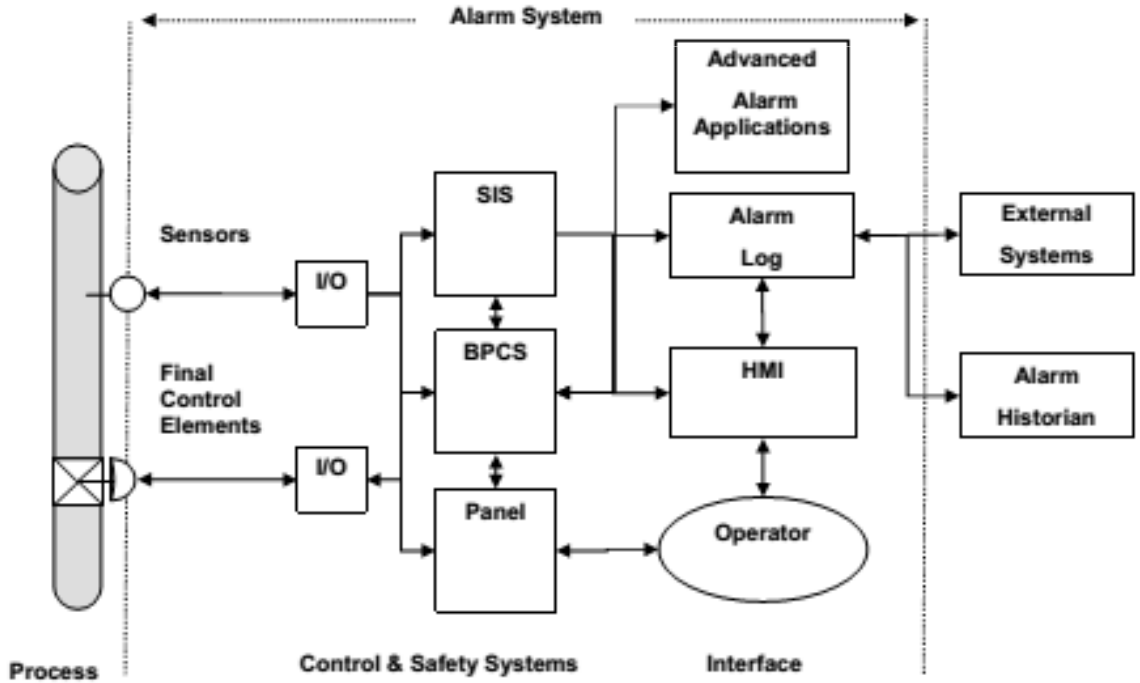
Event/alarm definitions and general requirements about detection, logging, reporting, filtering, severity levels, configuration and handling, TM and LMC responsibilities, TANGO alarm configuration

Alarm Systems

ANSI/ISA–18.2–2009 Management of Alarm Systems for the Process Industries

1.2 The Alarm System

The alarm system serves to notify operators of abnormal process conditions or equipment malfunctions. It may include both the basic process control system (BPCS) and the safety instrumented system (SIS), each of which uses measurements of process conditions and logic to generate alarms (see Figure 1). The alarm system also includes an alarm log and a mechanism for communicating the alarm information to the operator via a HMI, usually a computer screen or an annunciator panel. There are other functions outside the alarm system that are important to the effectiveness of the alarm system, which many include an alarm historian.



Tango Alarms

Alarm: asynchronous notification that some event happened or that a given state has been reached

Alarm system: a complex that allows for creating, configuring and managing alarms

The **Alarm Collector** : an alarm system developed for the Tango Control System framework

(from Lorenzo Pivetta, Graziano Scalamera :Tango Alarms presentation at Tango Meeting - 17-18.04.2008.)

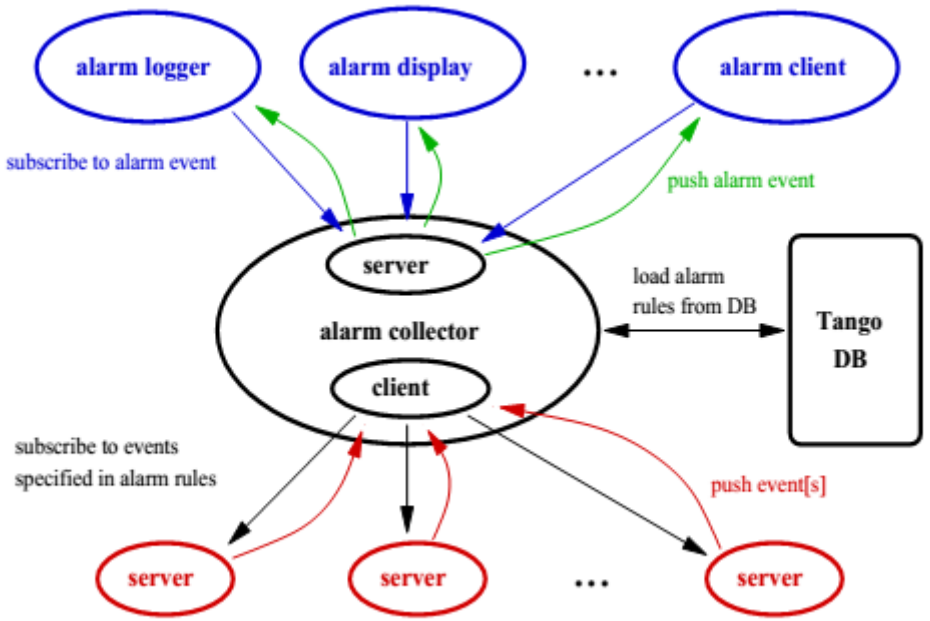
Tango Alarms

The Alarm Collector

The alarm system has been developed as a special TANGO device server, named the AlarmCollector.

The core of the alarm system is a special TANGO device server based on a double client/server architecture: as a client gathers input values from TANGO devices and as a server provides alarm notifications

Relies on the TANGO event system to collect input values as well as to provide alarm notifications



Tango Alarms

Tango Alarm System (from *L. Pivetta: DEVELOPMENT OF THE TANGO ALARM SYSTEM. 10th ICALEPCS Int. Conf. on Accelerator & Large Expt. Physics Control Systems. Geneva, 10 - 14 Oct 2005*)

The event system is the TANGO implementation of the “event-driven” communication paradigm.In this paradigm, instead of polling the server for updating a value, the client registers its interest in the value just once and the server provides the current value by sending an “event” when a given condition is met. Although the “*change*” event is the most suitable for alarm purposes, other types of events are implemented in TANGO: change, quality, periodic, archive and user event.

The “*change*”event is generated when the attribute changes significantly. Absolute and relative “delta” thresholds can be specified for analog attributes. In addition to writing the *alarm rules*, setting up the alarm system clearly involves choosing the proper attribute *event thresholds*, having in mind the peculiarity of the real device and its physical variables.

During normal operation the Alarm Collector will be idle, waiting for events. As soon as en event is received, the server evaluates the alarm formulas containing the attribute corresponding to the received event and updates the alarm value. In case the alarm status changes an event notification is eventually sent to every interested client.

Tango Alarms

ALARM RULES

Properties **min_alarm** and **max_alarm** are used to define the range outside which the attribute is considered in Tango alarm.

Properties **min_warning** and **max_warning** are used to define lower and upper bounds for WARNING.

At the basis of the whole alarm system are the rules that specify each alarm condition. Each **rule** is made of three distinct fields: the **alarm name**, the **alarm formula** and an **optional message**. The alarm name is a self-explaining unique label for each configured alarm. The second field is used to store the alarm formula in the form of a string made of identifiers, numbers, binary and logical operators, as well as simple mathematical functions. Each alarm rule also allows for storing an optional text field, containing the alarm explanation or a specific message for the machine operator. As an example, the following alarm rule will generate an alarm when the power supply of an insertion device correction coil is turned off:

sr/pscid/s1.1/off ({sr/pscid/s1.1/stat} & 0x40) "Correction coil power supply OFF“

sr/pscid/s1.1/off is the alarm name and {sr/pscid/s1.1/stat} is the reading of the power supply status; the braces contain the values to be acquired from the plant, i.e. the attributes read from the TANGO device servers.

ALARM MESSAGES

As a result of the formula evaluation the alarm status could assume two values, ALARM or NORMAL, stating whether the alarm is active or not. When an alarm is active the Alarm Collector composes a formatted text string, the alarm message, to be sent to the client.

The alarm message contains the **time stamp**, the **alarm identifier** (or alarm name), the **alarm status**, the **acknowledge flag** and the **optional text** message. The acknowledge flag shows whether an alarm has been received by at least one visualization client and acknowledgedby the machine operator, who should realize the meaning of the alarm and take the necessary actions.

Per-alarm alarm severity level: **LOG, WARNING, FAULT**

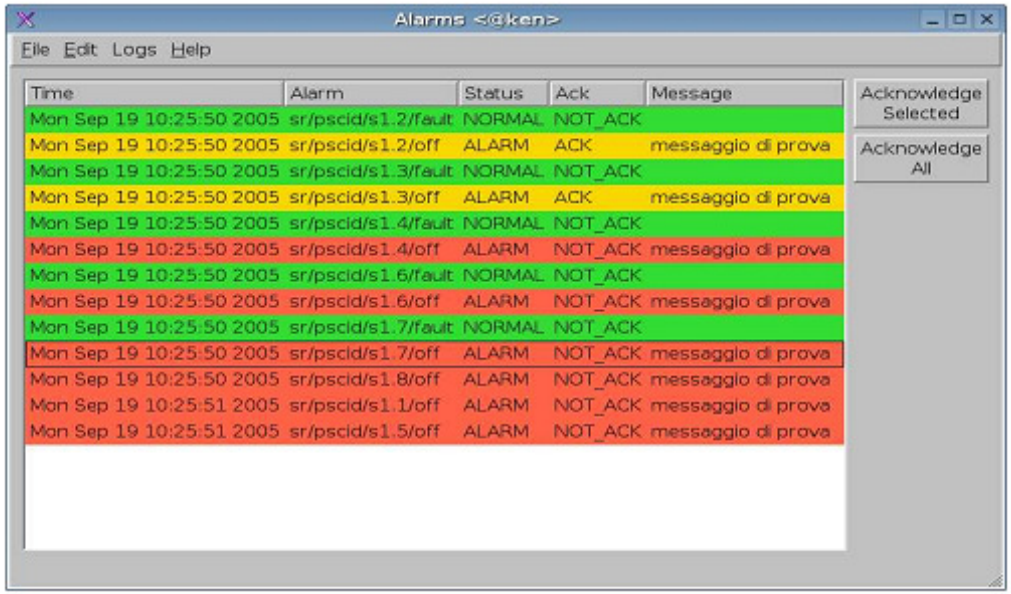
The acknowledge flag could have the values **ACK** or **NOT_ACK**, with obvious meaning. Acknowledging an alarm in NORMAL status will remove it from the active alarms table. In the same manner, an alarm that has already been acknowledged will disappear from the list when switching to NORMAL.

Tango Alarms

Alarm presentation panel

A simple client application has been developed for testing theAlarm Collector device server. The visualization client, written in Python using the Qt libraries[6], subscribes to the “alarm” event. The alarm server will send an updated list of alarms each time the status of at least one of them changes.

The visualization client uses colours to show alarm messages according to their status: red for ALARM/NOT_ACK status, yellow for ALARM/ACK status and green for NORMAL/NOT_ACK status. The panel also provides two push buttons to acknowledge either the selected alarms or the whole alarm list.



DSH.LMC Tango Alarms

Prototype Proposal:

Use of a hierarchical structure with DSH.LMC Alarm Handler based upon Tango Alarm System as central supervisor