

LHC-CP
Workshop

The LHC Alarm Service

LASER (Lhc Alarm SERvice) Project Report
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Presentation outline

- Overview
- Current status
- Objectives for 2001
- Conclusions

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Overview

- Project mandate:
 - "Provide a solution for naming, receiving, processing, transmitting and displaying all alarm conditions inherent to the operation of the future LHC machine"
- What does that mean ?

Overview

- The Alarm Service: what, where, why, who.
 - What?
 - Deals with ‘problems’
 - Where?
 - “Accepts from anywhere, distributes everywhere”
 - Why?
 - Offers standardisation and standard facilities (services)
 - Who?
 - Makes the results available for:
 - ‘dedicated displays’
 - any ‘external software’

Overview

- What

- An *alarm/warning* is something wrong, abnormal, a problem with the *process*
- The *process* is anything which could affect the well being of the LHC complex be it either : hardware, software or environment
- Since we consider problems both at the alarm level and at the warning level, we refer to them as *Fault States* (FS)

Overview

- Where

- LHC Control Centre(s) and specialists will require FS information from any part of the CERN site:

- Radio Frequency, Power Converters, Magnets
- Beam monitoring
- Beam transfer
- Vacuum
- Cryogenic
- Cooling & Ventilation
- Electricity
- Safety System
- Experiments
- Control SW
- Environment

Overview

- Why

- Services:

- FS definition
 - Gathering
 - Analysis
 - Distribution
 - Archive management

Overview

- Why

- Services:

- FS definition
- Gathering
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- Distribution
- Archive management

- ⇒ Standard way to define a FS
- ⇒ Dedicated FS definition management consoles

Overview

- Why

- Services:

- FS definition
- **Gathering**
- Analysis
- Distribution
- Archive management

- ⇒ FS are collected from all the different sources
- ⇒ *A Single Point of Access* is offered for all the alarm information

Overview

- Why

- Services:

- FS definition
- Gathering
- **Analysis**
- Distribution
- Archive management

- ⇒ Reduction
 - node
 - multiplicity
 - oscillation
- ⇒ Conditioning
 - mode
 - maintenance

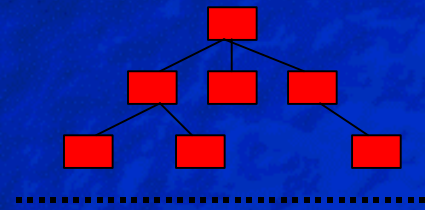
Overview

- Why

- Services:

- FS definition
- Gathering
- Analysis
- **Distribution**
- Archive management

⇒ Treated FS are distributed accordingly to a well known alarm category group hierarchy



⇒ Interested clients subscribe to the content hierarchy

Overview

- Why

- Services:

- FS definition
- Gathering
- Analysis
- Distribution
- Archive management

- ⇒ Storage
- ⇒ Retrieval
- ⇒ Statistics

Overview

- Who
 - External Software
 - Diagnostic tools
 - Control System components
 - User specific applications

Overview

- The Alarm Service does not:
 - Survey the equipment
 - responsibility of
 - » Equipment groups
 - » Control SW writers
 - Decide what is a FS
 - we define :
 - » how to describe a FS
 - we accept :
 - » FS descriptions
 - » FS messages

Overview

- Related projects:
 - Controls Middleware (PS/SL)
 - JCOP (IT)
 - SPS2001 (SL)
 - CESAR (SL)
 - CSAM (ST)
 - HELIX (SL)
 - UNICOS (LHC)
 - ...

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Current Status

- Have an operational system that must be maintained for:
 - SPS
 - technical services
 - safety
- Collaboration with the PS/SL CMW project
 - MOM technologies investigation
 - Publish/Subscribe paradigm
- Collaboration with ST
 - Prototype of an alarm facility using PVSS presented at ST Chamonix

Current Status

- Collaboration with STRING II
 - Extracting alarm information from PCView through CMW OPC gateway
- Anyone requiring alarm facilities NOW can be 'easily' connected to the present alarm system
 - display + treatment facilities
 - access to all technical and safety information
- All new FS will be attached to the current system until it is switched off

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Objectives for 2001

- User requirements
 - ‘Alarm Service Survey’ in preparation
 - UR gathering and analysis by Q2 2001
 - UR document by Q3 2001
- Technology investigation
 - Two possible solutions:
 - Use an industrial system
 - Use open technologies
 - Decision by Q4 2001
- Functional and architectural specification
 - Depending on the adopted solution
 - Carried on in parallel with technology investigation
 - Preliminary functional and architectural spec by Q4 2001/Q1 2002

Objectives for 2001

- Alarm Service Survey
 - Addressed to anybody concerned
 - Operators of various Control Rooms
 - Equipment and SW specialists
 - Related projects
 - ...
 - Consists of:
 - Definitions of basic terms
 - Alarm Service overview
 - User Requirements capture at different levels:
 - Information provider (interfaces)
 - End-User (GUI & services)

Objectives for 2001

- Alarm Service sensitive issues:
 - Scalability
 - Openness
 - Reliability
 - Integration
 - Alarm analysis
 - Alarm archive management
 - Graphical alarm display

Objectives for 2001

- SCADA based solution
 - ETM PVSS
 - Pros
 - Industrial system (supported, maintained, built-in functionality, ...)
 - Adopted CERN wide :
 - » Experiments Slow Control System (JCOP)
 - » CERN Safety Alarm Monitoring (ST)
 - » Cryogenics (?)
 - » Vacuum (?)
 - » ...
 - Cons
 - Industrial system (vendor dependent, technology dependent, ...)
 - Need for customisation

Objectives for 2001

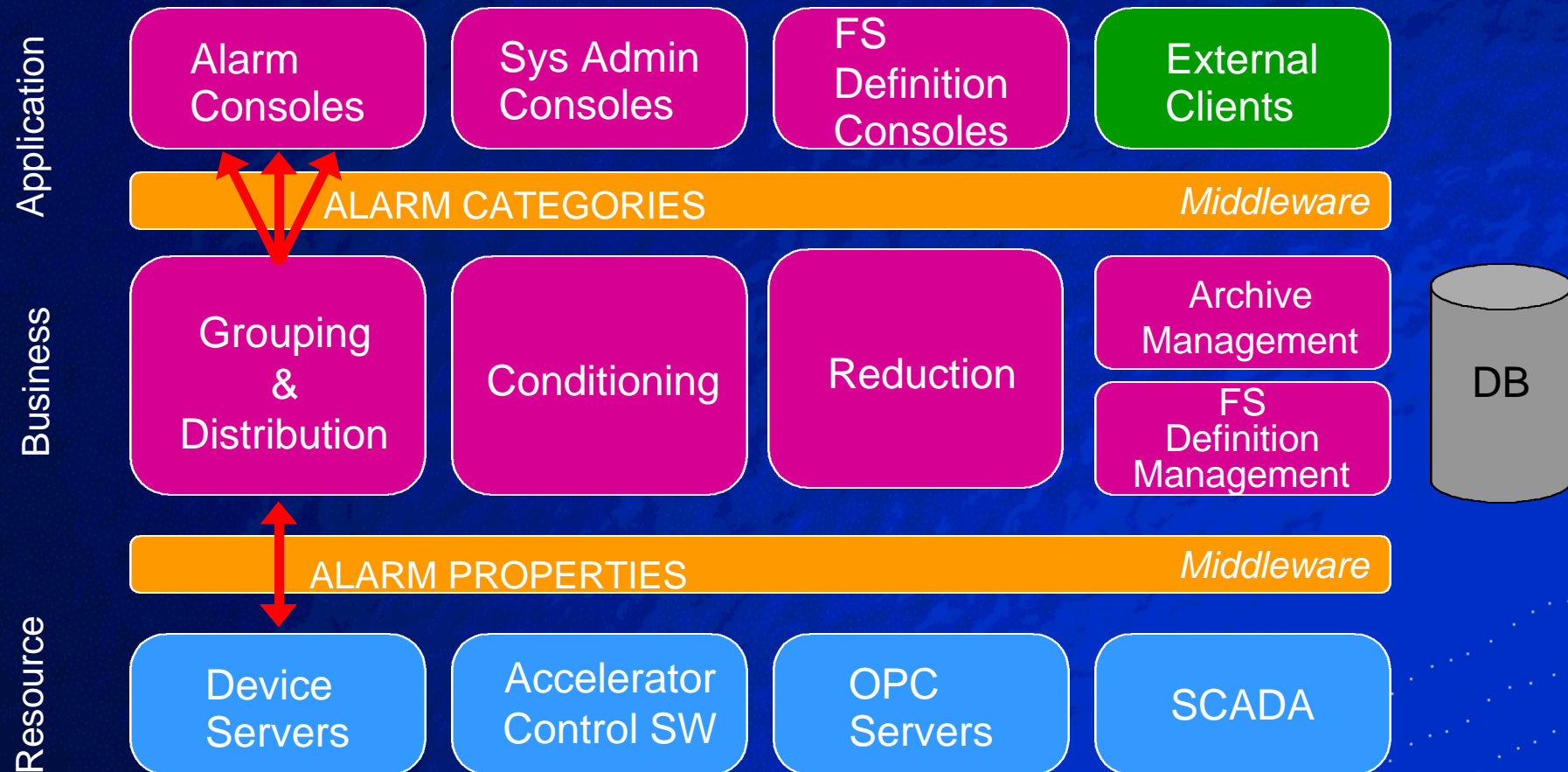
- 'In-house' solution
 - Three-tier architecture
 - We are investigating :
 - PS/SL Middleware for communication
 - Device/Property model (Device Alarm properties)
 - Publish & Subscribe on subjects (Alarm Category group hierarchy)
 - EJB for the business tier
 - Java/WEB based solutions for display
 - We are prototyping :
 - Alarm transmission chain :
 - » Device Server/SCADA -> business-tier -> Alarm Console

Objectives for 2001

- 'In-house' solution
 - Pros
 - Provides optimised solutions
 - Flexibility
 - Choice
 - Cons
 - Maintenance

Objectives for 2001

Three-tier architecture proposal



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Conclusions

- 2001 : a year of study, analysis and investigation
 - Requirements specification and analysis
 - Technical study and prototyping:
 - SCADA
 - Opened technologies
 - Progress on Functional and Architectural specifications
 - Operational system to maintain
- What next ?
 - 2002
 - Operational prototype
 - 2003
 - Prototype testing and validation using QRL
 - Switch off old system
 - 2004
 - System in operation for LHC Sector Tests

Thanks for your attention!

<http://cern.ch/proj-laser>

Any question ?