Planning of Interventions With the Atlas Expert System

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Introduction

- ATLAS is a general-purpose particle physics experiment at the LHC
- Its major components are
  - Magnet, Muon, Inner detector, Calorimeters
  - Many others like computing, Control and Safety systems
- Confident knowledge on many systems of the detector is critical for maintenance, upgrade operations control and monitoring
What is ATLAS?

A physicist thinks this is ATLAS

A engineer thinks this is ATLAS

A Safety person thinks this is ATLAS

General public
What is ATLAS for us?

ATLAS is...

- Database
- User Interface
- Questions
- Answers
- Decisions

Tasks!

https://its.cern.ch/jira/projects/ATLASTCES/issues

What happens if EXD1 trips??
What happens if the TRT cooling loop 3 stops?
What happens if fire detection system loses power?
What happens if....

Questions

Number of issues done and pending vs time
Simulating ATLAS behavior

Using graphical interface

- Individual systems can be found by locations, types or groups
- Systems can be switch off and alarms be triggered
- Systems are represented as boxes with up to 3 icons (switch, state, info)
- When there is an interaction, the inference engine determines the consequences and displays the new scenario
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**Cooling**

- Cooling US15
- Cooling TRT
- Muon Cooling Loops
- DSS Alarms
- Cryogenics Racks USA15
- Detector Cooling
- Inhibit Request
- LAR Heater Racks
- Evaporative Cooling
- Minimax
- Thermosyphon
- IBL Cooling
Sub detector descriptions - CSC

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Inhibit Request
Simulation of power cut

- Quickly understanding of events
- Consequences of a power cut in a main line
- Minimize impact in subsystems
Impact on IBL
Impact on ATLAS
Expert System portability

- **Database**
  - Objects
  - Relationships

- **Server**
  - Logic
  - Database class helpers

- **Web application**
  - Communication with server
  - Diagrams

### Model
- Maintenance of simulation state
- Store and retrieve data

### Controller
- Respond to user input
- Interpret user request with data from model

### View
- User interaction
- Scenario rendering

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General
ATLAS specific
The ATLAS Expert System by ATLAS Technical coordination is a diagnostic tool for the maintenance of the experiment.

Description of critical systems like electricity, gas, detectors and others is reaching the desired granularity.

The Expert System has been proven useful evaluating the impact of interventions.

Simulations have been compared with actual intervention outcomes during LS2.

The portability to other detectors is possible.

Future plans include the ability to search the causes of current state in the simulations.
Thank you for your attention