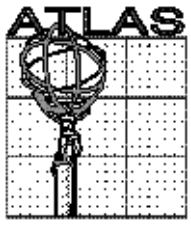


# ATLAS
# High-Level Triggers, DAQ and DCS

# Technical Design Report

| | |
|---|---|
| Issue: | Annotated Outline |
| Revision: | 0 |
| Reference: | ATLAS TDR-xx |
| Created: | 12 November 2003 |
| Last modified: | 26November 2003 |
| **Prepared By:** | ATLAS HLT/DAQ/DCS Group |

# ATLAS Collaboration

**CERN**
European Laboratory for Particle Physics (CERN), Geneva

# Acknowledgements

The authors would like to thank Mario Ruggier for preparing the template upon which this document is based and the DocSys group for their help in using it.

# Table Of Contents

# Part 1

## Global View

# 1 Overview

## 1.1 Main system requirements

### 1.1.1 From physics

text

### 1.1.2 From performance (Read-out, selection)

### 1.1.3 Functional and operational

## 1.2 System functions

### 1.2.1 Detector R/O

### 1.2.2 Event selection/rate reduction

### 1.2.3 Movement of data

### 1.2.4 Storage of data (events, conditions, etc.)

### 1.2.5 Experiment Operation

### 1.2.6 Detector controls

## 1.3 Definitions useful for the rest of the TDR

### 1.3.1 Glossary

### 1.3.2 Types of data TDAQ deals with

#### 1.3.2.1 Detector control values

#### 1.3.2.2 Event data

#### 1.3.2.3 Configuration data

#### 1.3.2.4 Conditions data

#### 1.3.2.5 Statistics and monitoring data

## 1.4 References

1-1

1-2

# 2 Parameters

## 2.1 Detector R/O parameters

### 2.1.1 RODs per detector per partition

text

### 2.1.2 Fragment sizes per detector

*Includes physics and calibration data.*

*Should have average values, spread and uncertainties; should be shown against luminosity; and against data compression schemes.*

## 2.2 Trigger parameters

### 2.2.1 LVL1 rates

## 2.3 DCS parameters

## 2.4 Data volume summaries

## 2.5 Monitoring requirements

## 2.6 References

2-1

2-2

# 3 System Operations

## 3.1 Event identification

## 3.2 TDAQ states

## 3.3 The run

### 3.3.1 Generic definition

### 3.3.2 Physics and calibration runs

### 3.3.3 Transition between runs

### 3.3.4 Operations outside a run

*Should include operations before and after a run and when machine is "off".*

## 3.4 Partitions and related operations

*Should include when and how partitions are split/joined*

*Issues such as TTC and use of VLANS to support partitioning should either be addressed here or in the component chapters.*

## 3.5 Error/Fault reporting/handling strategy

*Brief description of the global strategy here as the details are in Chapter 6.*

## 3.6 Configuration DB

*Should contain definition, purpose and scope.*

## 3.7 Conditions DB

*Should contain definition, purpose and scope.*

## 3.8 References

3-1

3-2

# 4 Event selection strategy

## 4.1 The approach

*Should include LVL2 (i.e. RoI) and EF.*

## 4.2 Trigger menu

## 4.3 References

4-1

4-2

# 5 Architecture

*Note that this is not a hardware and implementation description.*

## 5.1 TDAQ context

### 5.1.1 TDAQ interfaces to ATLAS

*Should include what parts of ATLAS TDAQ interfaces to.*

### 5.1.2 Types of data to and from TDAQ

*ie between TDAQ and other parts of ATLAS*

### 5.1.3 External interfaces

*Should at least include a list of interfaces with responsibilities.*

## 5.2 TDAQ decomposition

### 5.2.1 Functional view

*Should include detector R/O, etc. as given in Section 1.2.*

### 5.2.2 Sub-system view

*Main “blob” view, ie R/O system, LVL2, EB, EF, online software services.*

### 5.2.3 Component view

*Elementary abstract component view: intelligent buffers, processors, networks.*

## 5.3 TDAQ generic architecture

### 5.3.1 Architectural components

*Should include the following components: ROD, RRC, ..., RoIB, L2SV, online software major components such as control, DB, ... For each component the following information should be provided: a definition or purpose, and required performance.*

### 5.3.2 Generic diagram

## 5.4 TDAQ data flow architectural view

*Specialised generic architecture for the purpose of Data flow.*

*Shall contain: functional decomposition into DF packages and sub-packages; interfaces and boundaries between DF packages and sub-packages; main use-cases realisation; "Event control and event flow" view which will include the rates and data volumes between DF packages and sub-packages (including type of communication).*

## 5.5 TDAQ "online" view

*Specialised generic architecture for the purpose of control (eg show local controllers). It may also contain the online software architecture here.*

## 5.6 TDAQ data base view

*Data base architecture: including where access to (in and out of) databases is done.*

## 5.7 HLT view

## 5.8 How partitioning is realised on the architecture

## 5.9 Scalability of the system

## 5.10 Baseline architecture implementation

*Specifying abstract components, eg. ROD to ROB etc.*

## 5.11 References

5-1 Document from Architecture working group on global architecture.

5-2 DataFlow Architecture document.

5-3 ROS Architecture document.

5-4 Data Collection Architecture document.

# 6 Fault tolerance and error handling

*General strategy is described in Chapter 3.*

## 6.1 Categories of faults and errors

*Should include which ones are handled locally or globally.*

## 6.2 Error reporting mechanisms

## 6.3 Error recovery mechanisms

## 6.4 Fault tolerance

*Should include: ROL (flow control, missing ROD fragments, failure); DF applications (failure of one or more); control and/or event data messages (packet loss, flow control, QOS (peer to peer or switches). Results from modelling may be used to justify.*

### 6.4.1 Non critical items

*Should include how we deal with a dead ROB.*

### 6.4.2 Critical Items

*Should identify which ones are single points of failure, what fault tolerance to build in and how to implement fault tolerance.*

## 6.5 Requirements on components

*Summary of Section 6.4.*

## 6.6 References

6-1

6-2

# 7 Monitoring

## 7.1 References

7-1

7-2

# Part 2

## System Components

# 8 Data-flow components

*Chapter 8, Chapter 9,Chapter 10 and Chapter 11 should contain the major components as identified by the architecture.*

*Details should be provided on design, implementation and supporting measurements. For each component describe: the purpose/function/scope of the component, the performance requirements of the component, the architecture of the component, a proposed implementation, and performance and validation measurements.*

*Shall include: definition of physical nodes and the connections between them; justification for the types of these; interoperability issues; diagrams of relationships between architecture and physical items; expects parameters for these physical items.*

*Should the geographical, racks, power supplies, and cooling issues be addresses in this chapter (also HLT and online ones) or in Chapter 16, "Organization and resources"?*

## 8.1 ROD crate DAQ ?

## 8.2 Read-out system

## 8.3 Data collection software framework

## 8.4 Event Builder (SFI and DFM)

*Should include DFM.*

## 8.5 MSS ?

## 8.6 RoI Builder, LVL2 supervisor and pROS

*Should it go here or in Chapter 9, "High-level trigger components".*

## 8.7 Network

## 8.8 References

8-1 ROS URD

8-2 Data Collection URD

8-3 RoI Builder URD

8-4 Documents supporting technology choices.

# 9 High-level trigger components

*Chapter 8, Chapter 9, Chapter 10 and Chapter 11 should contain the major components as identified by the architecture.*

*Details should be provided on design, implementation and supporting measurements. For each component describe: the purpose/function/scope of the component, the performance requirements of the component, the architecture of the component, a proposed implementation, and performance and validation measurements.*

*The commonalities and differences between LVL2 and EF should clearly be shown.*

## 9.1 Level 2

### 9.1.1 RoI mechanism

*ie selective Read-out.*

### 9.1.2 RoI Builder, LVL2 supervisor and pROS

*Should it go here or in Chapter 8, "Data-flow components".*

## 9.2 Event filter

## 9.3 Event selection software

## 9.4 References

9-1

9-2

# 10 Online software components

*Chapter 8, Chapter 9, Chapter 10 and Chapter 11 should contain the major components as identified by the architecture.*

*Details should be provided on design, implementation and supporting measurements. For each component describe: the purpose/function/scope of the component, the performance requirements of the component, the architecture of the component, a proposed implementation, and performance and validation measurements.*

*Other questions have arisen as to the section headings that were proposed by the management.*

## 10.1 Detector control (DCS + online)

## 10.2 TDAQ control and supervision

## 10.3 Databases

## 10.4 Information sharing

## 10.5 References

10-1

10-2

# 11 DCS components

*Chapter 8, Chapter 9, Chapter 10 and Chapter 11 should contain the major components as identified by the architecture.*

*Details should be provided on design, implementation and supporting measurements. For each component describe: the purpose/function/scope of the component, the performance requirements of the component, the architecture of the component, a proposed implementation, and performance and validation measurements.*

## 11.1 ...

## 11.2 References

11-1

11-2

11-3

# 12 Interfaces

## 12.1 External to TDAQ

### 12.1.1 LHC machine

### 12.1.2 Detectors

### 12.1.3 Off-line

## 12.2 Internal to TDAQ

### 12.2.1 LVL1

### 12.2.2 ...

## 12.3 References

12-1

12-2

# Part 3

# System Performance

# 13 Physics selection and HLT performance

## 13.1 Signatures

### 13.1.1 Rates & efficiencies

### 13.1.2 Event rates and size to off-line

## 13.2 ...

## 13.3 References

13-1

13-2

# 14 Overall system performance and validation

## 14.1 Prototypes and their use

## 14.2 Test sites and test beam

## 14.3 Test and diagnostics facilities

## 14.4 Modelling

## 14.5 Development process

## 14.6 Quality assurance

## 14.7 References

14-1

14-2

# Part 4

# Organisation and Plan

# 15 Costing

## 15.1 Initial system

## 15.2 Final system

## 15.3 Deferral plan

## 15.4 References

15-1

15-2

# 16 Organization and resources

*Should the geographical, racks, power supplies, and cooling issues be addresses in this chapter or in the system component ones?*

## 16.1 ...

## 16.2 References

16-1

16-2

# 17 Work-plan

*Post TDR.*

## 17.1 Schedule

## 17.2 Commissioning

### 17.2.1 TDAQ

### 17.2.2 Tools for detectors

## 17.3 References

17-1

17-2

This document has been prepared with Release 5.5 of the Adobe FrameMaker® Technical Publishing System using the Technical Design Report template prepared by Mario Ruggier of the Information and Programming Techniques Group, ECP Division, CERN, according to requirements from the ATLAS collaboration.

To facilitate multiple author editing and electronic distribution of documents, only widely available fonts have been used. The principal ones are:

| | |
|---|---|
| Running text: | Palatino 10.5 point on 13 point line spacing |
| Chapter headings: | Helvetica Bold 18 point |
| 2nd, 3rd and 4th level headings: | Helvetica Bold 14, 12 and 10 point respectively |
| Figure and table captions: | Helvetica 9 point |