



ATLAS

High-Level Triggers,

DAQ

and DCS

Technical Design Report

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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