ATLAS TDAQ Architecture Working Group

Working Group Definition

Authors : B. Di Girolamo, B. Dobinson, S. Gonzalez, B. Gorini, R. Hauser, S. Kolos, G.Mornacchi

Version : 1.0. 3 October 02

Preface

Readership and Objectives of this document

Readership

This document is intended for the ATLAS TDAQ Management Team, the ATLAS TDAQ steering group and anybody, in ATLAS, interested in the future activities of the architecture working group.

Objectives of this document

This document is the base on which to start the ATLAS TDAQ architecture working group. Its objectives are:

- To define the purpose, scope and objectives of the working group as derived by the initial working group team from the project mandate.

- To explain the organisation of the working group, in terms of activities, milestones and deliverables.

- To define a plan of activities

Related documents

- L. Mapelli. Presentation to the ATLAS TDAQ and DAQ steering groups July 2002.

- TDAQ review July 2002

Background

Management Summary and Context

Management Summary

The ATLAS TDAQ project has completed a two-year phase of intensive design and development: designs and prototype implementation of sub-systems, performance studies of components, integrated prototypes have been produced. This phase has been extensively reviewed in July 2002. The next major milestone of the ATLAS TDAQ project is now the production of the Technical Design Report (TDR). In particular the TDR will propose an architecture for the ATLAS TDAQ system and it will address system wide problems such as those related to operations and reliability.

To this end, the creation of an architecture working group has been proposed to coordinate the definition of an overall ATLAS TDAQ architecture.

The ATLAS TDAQ steering group has issued an initial mandate for the working group.

Context

The ATLAS TDAQ project is responsible for the design and implementation of the Trigger and Data Acquisition System for the ATLAS experiment. In particular the next project milestone is the presentation of a TDR, by June 2003, for the High Level Triggers and the Data Acquisition System. The TDR will propose an architecture, and suggest an implementation:

- Which is valid with respect to the expected performance requirements (and their evolution with respect to the evolution of the detector and machine performance);

- Which can be implemented, possibly in stages, within the budget constraints.

- Which satisfies the functional and operational requirements, as defined by the ATLAS experiment.

The ATLAS TDAQ project is organised in systems (Level-1 trigger, high level triggers and data acquisition), which in turn are organised in terms of sub-systems (for example the DAQ project includes the online software, dataflow and part of the detector control system). The responsibility for the design and the development of the various TDAQ parts lies with the systems and sub-systems.

The architecture working group is an activity spanning TDAQ systems and sub-systems; it is an integral part of the ATLAS TDAQ project structure.

Working Group Definition

Purpose, Scope and Objectives

Purpose and Benefits

Purpose

The purpose of the "Architecture Working Group" is to coordinate, within the organisation of the ATLAS TDAQ project:

1) The definition of an overall architecture for the ATLAS TDAQ system, compatible with the performance, budget, scalability and deferral scenarios requirements as well as the TDR time scale of June 2003.

2) The identification, prioritisation and, where necessary with respect to the TDR, solution of TDAQ system wide issues which fall outside the competence of individual sub-systems.

The main expected benefit from the creation of the working group is: the creation of a body, which did not exist before, where the TDAQ community will develop an overall system architecture and will address in depth system wide problems. An additional potential benefit is: to provide a forum were cross-system problems and non-addressed issues can be detected and tackled.

Project Scope and Constraints

Scope

The following activities fall under the mandate:

- The coordination of the definition of the TDAQ architecture:

1) Identify the major TDAQ system components, that is to say those components that are visible at the architectural level. For instance, in the presently developed TDAQ, the ROS and the level-2 supervisor are examples of major components.

2) Specify the requirements for the major components: in terms of functionality, performance, reliability, operability, etc.

3) The definition of the relationships, boundaries and interfaces, between major components.

Taking into account the cost/performance optimisation required by the budgetary constraints, the physics requirement and the LHC machine performance.

- The coordination of the identification and solution of those system wide aspects which are relevant for the architecture or are relevant to more than one system or sub-system

Other issues which fall under the mandate of the working group, and for which the working group will provide coordination are:

- External dependencies: identify and properly address those cases where there is a dependency on development outside TDAQ (for example offline).

- Identification of missing documentation.

- General TDAQ operational aspects.

Suggestion of measurements to be performed on test beds or prototype TDAQ vertical slices, for the purpose of validating the architecture.

The following issues are not in the scope of the working group:

- Implementation in general. For example the topology and organisation of the networks are in the scope of the architecture, which specific protocols are used is instead out of the scope. The separation between architecture and network technology is, however, not a sharp one: architecture and choice of network technology may influence each other. For this reason we do not exclude the network technology from the scope of the working group.

- The internal design of the major components. For example how a ROS is organised is not in the scope of the working group; however the existence of the ROS components belongs to the scope of the working group.

The definition and organisation of test beds and prototype TDAQ vertical slices.

Constraints

The following issues guide and constrain the project.

- The architecture will evolve from the current TDAQ developments. In particular the documentation collected for the July TDAQ review and the review results are the starting point for the work of the working group.

- The working group will follow up the findings of the "Global Issues Working Group".

- The design of the Level-1 system, as documented in the Level-1 Trigger TDR.

- Budget, staging and deferral requirements.

- Scalability requirements with respect to the evolution of the LHC machine and ATLAS detector performance.

- TDAQ organisation and structure.

- The TDR milestone (June 2003).

Objectives

The main objective for the working group is: to coordinate the definition of the TDAQ architecture on the time scale of the TDR (June 2003).

A second objective is: to identify, document and prioritise system wide issues and to coordinate the activity necessary to address those issues that ought to be tackled before the TDR.

Mode of operation and Milestone Plan

Mode of operation

For convenience the activities are grouped in two main steps: one for the definition of the work to be done and for the gathering of information, the second, based on the information gathered in the first phase, for the definition of the architecture, identification of global issues and tackling these latter. Depending on how the production of the TDR is organised, a third phase might be envisaged for writing those parts of the TDR relevant to the architecture.

First Phase - Work definition and information gathering

Input is provided by the mandate prepared by the TDAQ steering group and by the documents provided for and the results of the TDAQ July 2002 review week.

The objectives are to: 1) define the mode of operation of the working group and its organisation 2) gather the necessary information to describe the current (as of July 2002) TDAQ architecture and 3) document the current architecture.

The following documents (internal and external) will be produced:

- A definition document for the working group (this document)

- An initial description of the current TDAQ architecture. The format of the document is yet to be decided. However the document should identify the major components, document the current view of their requirements, identify and describe the boundaries and interfaces between the components.

- A definition, derived from the information that is currently available, of the parameters and their standard values of global interest to TDAQ (examples are ROD's per detector, fragment sizes, rates, etc.)

To achieve the objectives above:

- Collect background material: working group members suggest, for the subsystem they represent, a number of "interesting" documents (out of the wealth of documentation available for the various sub-systems). These, with the presentations and results of the TDAQ review, represent the background material for understanding the current architecture.

- Starting from the ROD, follow the flow of data and control (and may be other information) down in the system according to the current designs. In order to do this efficiently, it is proposed to have a series of informal discussions with relevant people from the different sub-systems.

Review

The working group will give a status report during the ATLAS week in October 2002. A more complete review of the working group activities, in particular as regards the outcome of the first phase, will be done during the TDAQ week, end 2002.

Second Phase

This phase is based on the architecture extracted from the current designs during the first phase. The role of the working group is that of coordinating the evolution of the current architecture into one that is valid for the TDR:

- Identification of design weaknesses, necessary modifications and non-addressed issues. For example identify a weakness in the interface or boundaries between two components.

- Suggest an action to be undertaken, this could typically be the suggestion that one or more sub-systems collaborate together to find a solution to the problem identified. The member, or members, of the working group that represent the sub-system(s) will participate to the common effort to study the solution.

- The working group takes up the solution and includes it in the TDAQ architecture definition.

The working group acts as a catalyst, individuating "problems" and suggesting actions. It is not the role of the working group, as a whole, to supply solutions; this role belongs to the sub-systems. Nevertheless individual working groups members do participate to the elaboration of the solutions.

Open meetings will be used 1) to present and discuss the issues and formulate the statement of the problem, recommendations and actions and 2) to openly discuss the solutions proposed by the sub-systems. The frequency of these meetings will be every 2 to 4 weeks, or more frequently according to needs.

The open meetings will be prepared by regular discussions within the working group, where input from the sub-systems is expected through their representatives in the working group.

The implementation of the actions recommended by the working group is a step in the decision process which involves the TDAQ management team and, when necessary, the TDAQ steering group. The management team is informed of the issues requiring action and on the action being recommended by the working group, ahead of the open meeting where these latter will be discussed. After the open meeting the management team will take the managerial steps to implement the recommendation (who is involved, how and on what time scale). When necessary, i.e. in the case of decisions with a strong implication on the system, in tight connection with the TDAQ steering group.

An open mailing list and a web site, where documents and notes from meetings and discussions will be kept, will be made available.

It is proposed to organise a TDAQ architecture workshop, in a form yet to be defined, before the TDAQ review for the TDR (i.e. early spring 2003).

The work plan individuates 4 major tasks:

- Working group Organisation: this task includes 1) the definition of the working group mandate, objectives, mode of operation, composition 2) the set-up of the working group and 3) the preparation of a work plan. This task will be terminated end of September 2002 with the following deliverables:

  1) The working group definition document (this document).

  2) A work plan (included in the above document).

  3) A list of TDAQ system components relevant for the TDAQ architecture.

- Parameters and Cost Model: this task will 1) define the parameters of interest to the TDAQ architecture 2) collect their standard values 3) organise them in a suitable database and 4) define a costing model for the TDAQ system. This task will be terminated by end February 2003 with an intermediate milestone end October 2003:

  End October 2003: a first version of the database (including the values of the parameters) and the cost model.

  End February 2003: complete database (with existing values) and cost model.

- TDAQ Architecture: provide the architectural definition of the ATLAS TDAQ system for the TDAQ TDR. This task will deliver a reference document describing the ATLAS TDAQ architecture. The task will be terminated by end February 2003 with intermediate milestones in October and January:

  End October 2002:

  1) Architecture document for the existing TDAQ architecture

  2) List of issues and problems individuated with recommendations to address them

  3) Implementation of the recommendations (e.g. form task forces addressing the issues).

  End January 2003

  1) Completion of work on issues

  2) Architecture Workshop

  End February 2003

  Architecture document

- Use cases: identify and address TDAQ-wide use cases related to global and operational issues. This task will deliver 1) a list of use cases (prioritised with respect to the milestone of the TDR) and 2) documents describing those use cases, which ought to be addressed ahead of the TDR. The task will be completed by end March 2003. Milestones:

  End November 2002: list of use cases (with priorities)

  January 2003: addressing the use cases (e.g. by ad hoc groups).

  End March 2003: Use case documents.

TASK		DATE	MILESTONE	DETAILS
Organisation				
		09/2002	Working Group definition document	A document defining the mandate, objectives, scope, mode of operation and the main work plan.
		09/2002	List of TDAQ architecture components	The list of TDAQ components (hardware and/or software) which are relevant to the architecture (i.e. visible at the architectural level)
Parameters and Cost Model				
		10/2002	First version of parameters data base	
		10/2002	First version of cost model	
Architecture				
		10/2002	Architecture Document	Document the current ATLAS TDAQ Architecture
		10/2002	List of issues and reccomendations	Agreed list of issues
		01/2003	Issues addressed	
		01/2003	Architecture Workshop	
		02/2003	Architecture document	

TASK	DATE	MILESTONE	DETAILS
Use Cases			
	11/2002	List of use cases	
	01/2003	Implement study groups	
	03/2003	Use case documents	