Software Process in ATLAS DAQ Prototype -1

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Note: This presentation refers essentially to the back-end sub-system of the DAQ project.

ATLAS DAQ Prototype "-1"

- goal

  to produce a prototype system representing a "full slice" of a DAQ suitable for evaluating candidate technologies and architectures for the final ATLAS DAQ system

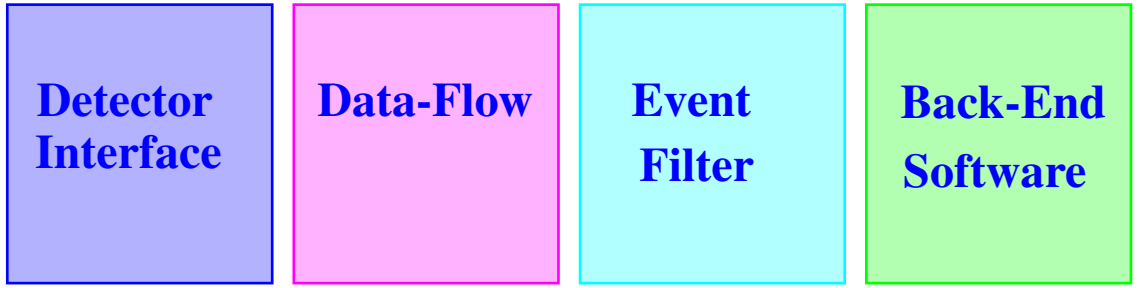
- timescales

  the prototype should be running by mid 1998

- working groups

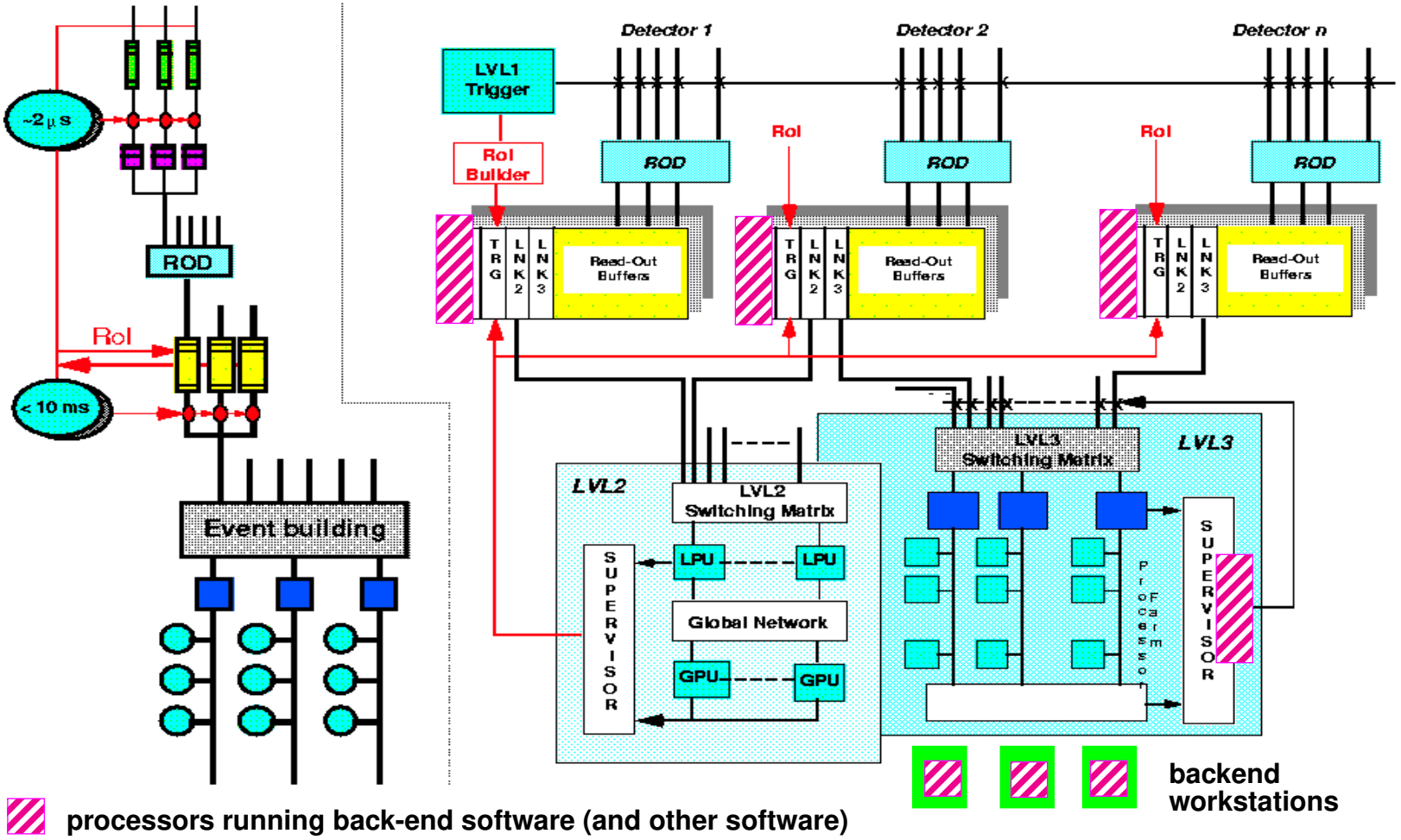
  working groups have been defined to address each part of the DAQ

  groups will be reviewed on completion of requirements definition phase

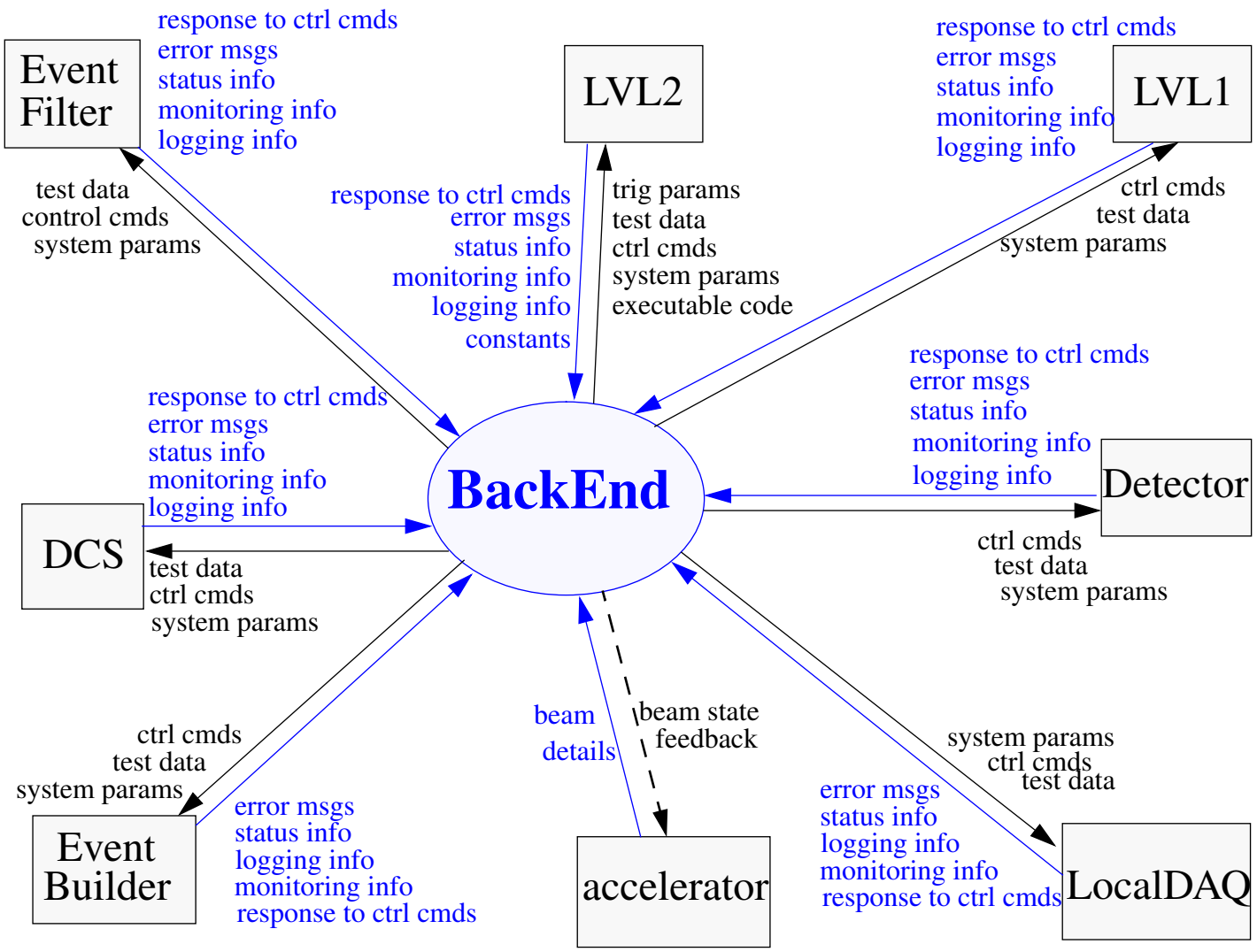


ATLAS Back-End DAQ

software for configuring, controlling and monitoring the DAQ
excludes management/processing/transportation of physics data



BackEnd integration in ATLAS online



Backend: general approach

- project phases
  - collect requirements (ESA-PSS05 style URD produced)
  - identify common issues (e.g. data storage, graphics, communication etc.)
  - perform pre-design investigations into candidate technologies/techniques
  - develop high-level design
  - detailed-design, implementation and unit testing
  - integration
- principles
  - rapidly evolving software market (e.g. Java, UML, UNIX/WNT)
  - adhere to relevant standards (e.g. OMG, ODMG)
  - use commercial software wherever possible
  - rely on other projects for specific areas (e.g. RD45 persistence)
  - concentrate development effort on ATLAS-DAQ specific items
  - use common solutions across all components of the backend
  - requirements, analysis & design most important aspects to get to 2005

BackEnd components

Run control	controls DAQ configuration and data taking operations
Configuration databases	define all aspects of the DAQ configuration
Message reporting system	report/capture of information messages
Information service	general purpose information exchange
Process manager	basic job control of programs
Status display	shows current status of data taking to the shift operator
Partition/resource manager	allows concurrent data taking activity
Test manager	bank of functionality tests for DAQ components
Diagnostics package	uses tests held in the test manager to diagnose problems
Run bookkeeper	electronic tape log book
Monitoring & event display[a]	access to sampled data for analysis and quality checking
Data and event viewing[a]	facility for viewing event data and sets of histograms

a. online aspects only (in conjunction with data-flow group)

core

data-flow

detector

BackEnd DAQ status: September'97

component	*require-ments*	*design*	*imple-ment.*	*integra-tion*	*institutes*
Run control					CERN, IN2P3-Marseille, Sheffield
Configuration databases					CERN, PNPI
Message reporting system					CERN, IAP-Bucharest, PNPI
Information service					CERN, IAP-Bucharest, PNPI
Process manager					IN2P3-Marseille
Status display					IAP-Bucharest, IN2P3-Marseille
Partition/resource manager					JINR-Dubna
Test manager					NIKHEF
Diagnostics package					
Run bookkeeper					LIP
Monitoring & event display[a]					
Data and event viewing[a]					

a. online aspects only (in conjunction with data-flow group)

ATLAS Back-end DAQ

adopted technologies

• StP/OMT & Booch	OO method and CASE tool
• FrameMaker/WebMaker	documentation system
• Objectivity ODBMS	ODBMS for long-term storage
• Tools.h++	general C++ utilities and simple persistence
• Corba/ILU	inter-process communication
• ACE	portable C++ interface to operating system
• Java/Motif	graphics for status display and editors
• X-Designer	cross-platform GUI development and testing
• CHSM	finite state machines in C++
• SRT	configuration management

Back-end DAQ: Definition of requirements

- Deliverables
  - To produce a user requirements document
  - Define a work-plan for the next phase
- Organisation
  - Organised as a working group (19: DAQ + detector reps.)
  - Used ESA-PSS05 Framemaker template from ECP/IPT group
- Duration
  - 4 months (Jan-Apr'96)
- Review
  - URD announced at Trigger/DAQ meeting of March 1996 ATLAS week
  - Comments (very few) received and incorporated in the URD
  - We also produced a summary document: no specific requirements but shorter and easier to read
  - Visited LEP experiment sites to discuss back-end issues and compare the requirements specified in the URD against working systems.
  - URD divided software into components. Workplan ordered components according to priority.

Back-end DAQ: Pre-design investigations

- Deliverables
  - Evaluation note of technologies thought to be capable of satisfying the URD
- Organisation
  - Details of each evaluation defined in work-plan
  - Organised as small working groups (max. 4 people) - one for each technology
  - Used custom-made Framemaker technical note template
- Duration
  - 5 months (Jun-Oct'96)
- Review
  - Every evaluation technical note was reviewed in the back-end DAQ meetings
  - Based on the results a single technology was selected for each area (except GUIs: Motif & Java)

Back-end DAQ: High-level design

- Deliverables
  - high-level design for the component with a document containing:
    - a short textual overview of the design
    - descriptions of the interfaces to other components, sub-systems and users
    - diagrams taken from the OMT/Booch methods, produced with StP, describing the various aspects of the design
- Organisation
  - Initially 5 small groups (one per “core” component)
  - Groups concentrated by institute (to avoid excessive travel)
  - OMT/StP training organised on CERN site
  - StP repository set-up (at CERN)
- Duration
  - 5 months (Oct’96-Apr’97)
- Review
  - Every high-level design document was reviewed in back-end DAQ meetings
  - Several revisions of the documents were made as the designs evolved
  - Dropped Partition Manager component (not enough information)
  - Discovered Information Service (general on-line information exchange)

Back-end DAQ: Detailed design and implementation

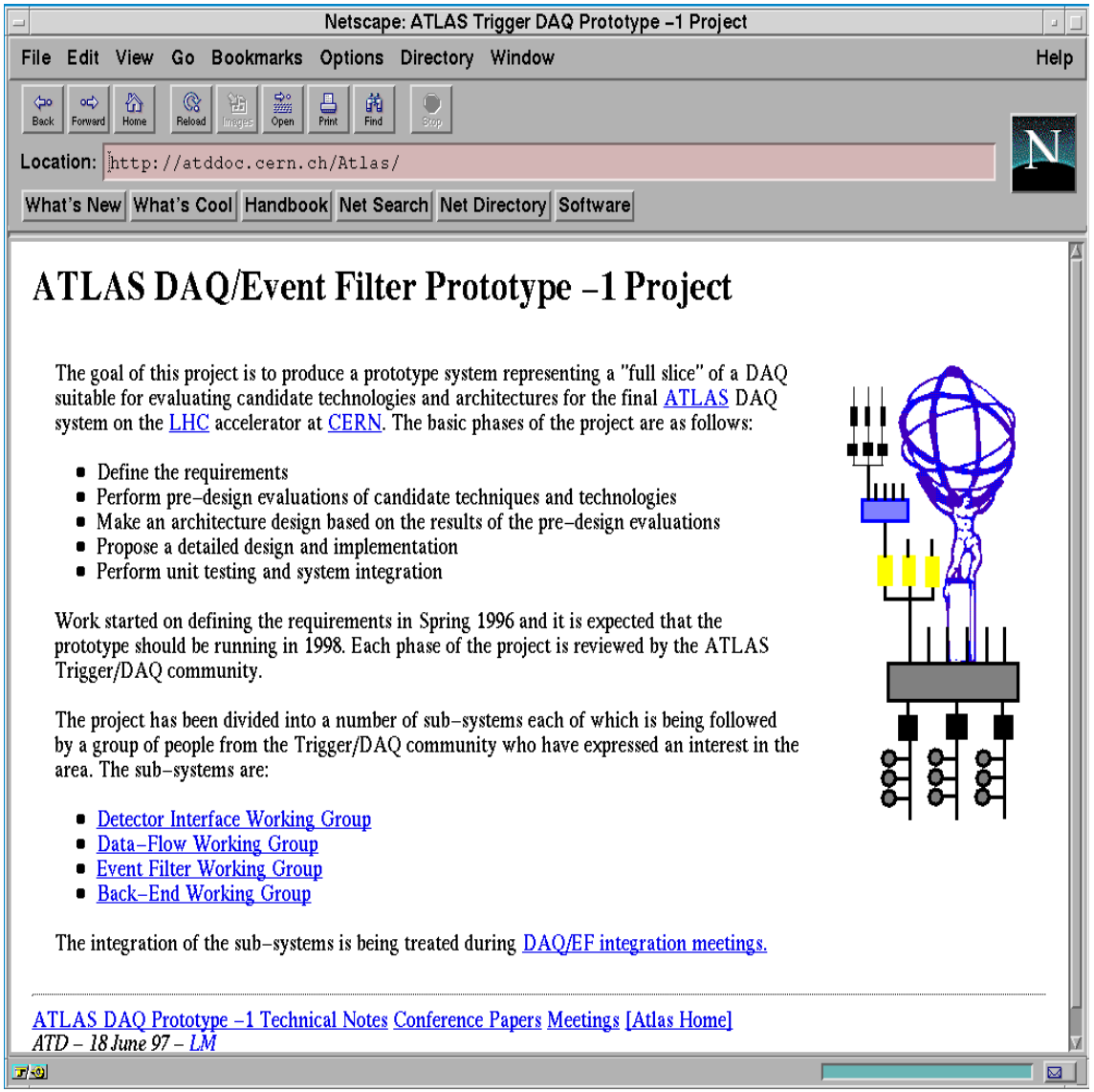
- Deliverables
  - Unit-tested implementations of the "core" components according to the high-level design
  - User & Programmer documentation
- Organisation
  - Organised as small working groups (max. 4 people) - one for each component
  - Generally the same individuals have followed a component through design and implementation
  - Used custom-made Framemaker technical note template
  - Use StP code generation where possible (e.g. CHSM, OKS, Objectivity)
- Duration
  - on going (started Apr'97). Expect to be ready for integration with data-flow at Xmas'97.
- Review
  - Code reviews will be made (partially done for MRS, IS and run-control)

Back-end DAQ: testing

- Organisation
  - Unit-tests based on use-cases identified in the high-level design documents
  - Attempts to produce test-plans at the high-level design phase met with limited success
  - Kept with the implementation in the SRT repository (/tests sub-directory)
- Tools
  - Purify for memory leaks (Insure++ as well but less liked)
  - StateMate (for run-control component finite state machine simulation)
  - CHSM debug tools (for finite state machines)
  - Logiscope (code coverage & metrics)
- Future
  - StP/T - test-case generator tool for APIs
  - Coding rule checker (off-line experience)

ATLAS DAQ Prototype -1 web

http://atddoc.cern.ch/Atlas/



slides

minutes

technical notes

conf. papers

overview