Summary of first LHCb Software Week
Feb 8-12, 1999

John Harvey
CERN/ EP-ALC

Software week Agenda

Day	Topic	Attendance Total/CERN based
Monday p.m.	Tools	25 / 20
Tuesday a.m.	GAUDI	27 / 22
Wednesday a.m.	Data Analysis Tools	22 / 16
Thursday a.m.	Algorithms	21 / 18
Friday a.m.	SICB	27 / 12
Friday p.m.	Projects	

Plus informal discussions on use of GAUDI and on the future work programme

GAUDI Framework Status

- Version 1.0 has been released.
- Functionality:
  - Read existing SICB events within a C++ framework and an O-O LHCb event model.
  - Implementation of basic services (Job Options, Message,…)
- Composed of:
  - Libraries (WNT 4.0, IBM AIX 4.1.5 & 4.3, HP-UX 10.20, Linux RedHat 5.1)
  - Example code
  - Documentation: User Guide, Reference Manual
- URL: http://lhcb.cern.ch/computing/Components/html/GaudiMain.html

Feedback from Software week

- Suggestions given during presentations for improvements.
  - (Algorithm interface, Histogram interface, output level handling)
- Need study impact of design decisions on performance e.g. the separation between transient and persistent data.
  - This separation allows us to develop code independently of the storage technology by adding some overhead.

Next steps

- Detector description and geometry
  - A generic model of the geometry will be developed by the Gaudi team.
  - Specifics for each subdetector will need to be added.
- Writable storage to be able to store results.
  - The candidate solutions are: ROOT I/O, Objectivity.
  - We will first try with ROOT I/O.
- Visualization and interactivity
  - The candidate solutions are: ROOT, WIRED/JAS (Java), Open Scientist (OpenGL, OpenInventor,…)
  - We will try the integration of these 3 solutions with the Gaudi Framework
- Libraries
  - study what exists (NAGC, clhep, STL,…)
  - make recommendations and guidelines

Algorithms

- RICH (D. Liko, N. Neufeld)
  - Goal - re-implement the existing pattern recognition algorithms in OO
  - Complex problem - good test
  - Model radiators, mirrors, detectors + tracks, pixels, photons
  - OO design made, implementation to be completed soon
  - Compare with FORTRAN algorithm : understandability, cpu usage….
  - Next steps…integrate with GAUDI
- Tracking (G. Gracia)
  - first ideas presented
  - pattern recognition software directly (only) in C++
  - develop in new GAUDI framework
  - stressed need for detector geometry, field map and event display

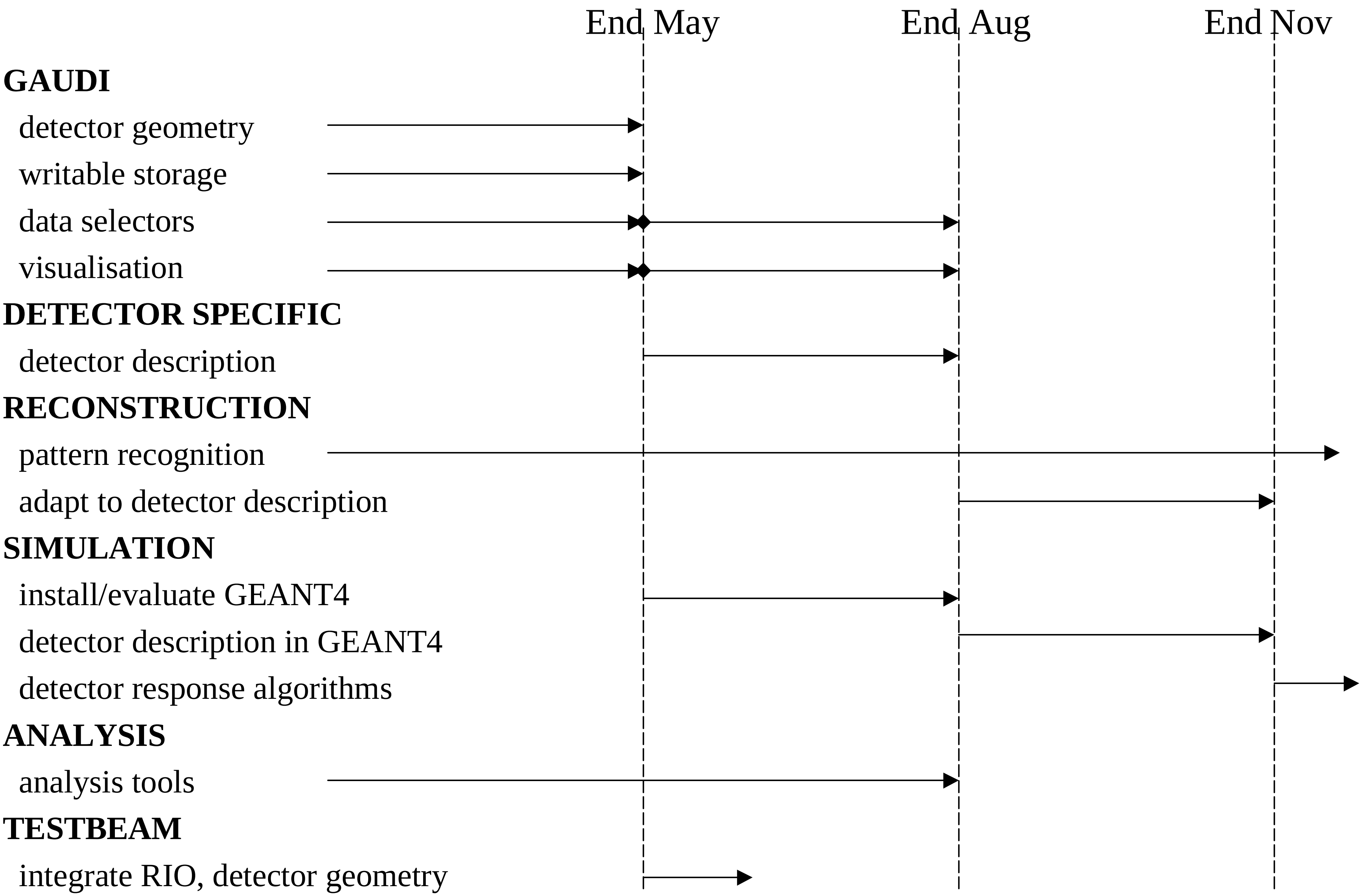
Algorithms

- ❑ Muon (P. Colrain)
  - ➢ take relatively simple piece, digitisation
  - ➢ make complete analysis, design and code
  - ➢ design made, implement and test soon
  - ➢ repeat procedure for reconstruction and trigger
- ❑ ECAL (V. Breton)
  - ➢ first look at requirements on simulation, monitoring, calibration, reconstruction
- ❑ Analysis (G. Corti)
  - ➢ first ideas on tools for physics analysis
  - ➢ walkthrough examples, find common requirements
  - ➢ tag events in data store
  - ➢ develop event selector, use for physics analysis

Practical Experience (Niko Neufeld)

- Importance of books, training, trial and error
- Tools - powerful but complex (Rose)
- Libraries - NAGC, clhep, STL
- Steep learning curve - spend lot of time in analysis & design
- Reuse existing solutions…design patterns

Software Work Programme in 1999



Software Planning

- Meet with subdetector convenors and subdetector software contact people to discuss programme of work in 1999
- Establish the goals (producing real data processing applications for reconstruction, simulation and analysis) and timescales for producing them
- Explain what features will be supported by the framework and by when
- To understand plans of the subdetector groups and the resources
- To see what additional help can be provided in terms of training, support etc.

Status of SICB

- Latest Version - 116 (A.Tsaregorodtsev)
  - Infrastructure to plug in any event generator (HEPEVT)
  - LHC proton beams : angles and smearing (trigger studies)
  - Luminosity handling (multiple interactions per beam crossing)
  - Updated Muon Detector Geometry
- Generators
  - Current version Pythia 5.7 and Jetset 7.4
  - New b-decay generator (QQ package - CLEO) will be integrated into SICB scheme (P.Koppenburg)

SICB New Developments - Detectors

- Vertex Detector (D.Steele)
  - new vertex detector layout (27 stations, 4 ϕ sectors) - for future release
- RICHes (G.Wilkinson)
  - Improve fast parameterization (no background, no pattern recognition)
  - Full digitization and Pattern Recognition - study extended tracking and CPU needs
- Calorimeters (I. Korolko)
  - Projective geometry for Preshower, ECAL and HCAL
  - More accurate GEANT Simulation
    - Lower thresholds for HCAL (**from 500 MeV to 10 MeV**)
    - Full sampling in HCAL
  - New trigger code : 2x2 algorithm and 3x3 algorithm in the 4/12 scheme

SICB New Developments

- Muon Trigger (R. Le Gac)
  - New chamber geometry and surrounding material
  - Physics background (showering in muon shielding and neutron capture).
- Beam Pipe (G von Holtey)
  - New design with new interconnections (flanges or welds)
  - Still under study
- Magnetic Field Map (A.Jacholkowska)
  - New conical magnet design (CERN)

URGENT

  - field less uniform, higher Bx (study impact on μ trigger and tracking)
  - conical grid projected to vertex, waiting for regular Cartesian grid

Production Plans

- v116 + old field map (10kevts/channel) end March
- v116 + new field map (10kevts/channel) end March
- v117 (calorimeters, RICH, beampipe) after March

Platforms

- v116 ported to WindowsNT (Eric van Herwijnen)
- Production on PCSF (NT farm)….and on RSPLUS
- ported to Linux
- Liverpool Linux farm under development

SICB Responsibilities

SICB Library	A. Tsaregorodtsev
Vertex Detector	D. Steele
Tracker	M. Merk
RICHes	G. Wilkinson
CALOs	I. Korolko
Muon	P. Colrain
Trigger (μ)	A. Tsaregodotsev
(e)	I. Korolko
(h)	O. Yushchenko
(pileup)	N. Zaitsev
Beam Pipe	???
Magnet	A. Jacholkowska
Physics	A. Jacholkowska
b decays	P. Koppenburg

Summary

- First version of new framework available - allows development of pattern recognition algorithms
- New components being added which will allow it to be used as a real reconstruction and analysis tool
- Need feedback, new ideas welcome, adapt as required
- Software developers from all subdetectors are strongly encouraged to start using the new software and to produce fully functional data processing applications.
- Remember there is a learning curve before becoming effective
- Start projects for each application program
  - starting with reconstruction
  - project leader to organise regular working sessions as required