

# Overview of US Work on Simulation and Reconstruction

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August 28, 2003

US ATLAS Computing Meeting at BNL

# Introduction

- This talk is a catalog of US ATLAS work on reconstruction and simulation (officially “Application Software”) where I am the level 3 manager.
- The information contained in the talk was obtained by two surveys of the groups working in this area:
  - In June, I contacted groups asking who was working in this area in order to help Srimi fill out a revised WBS of US effort on ATLAS software.
  - In July, I again contacted the groups asking for help in filling out the quarterly report of US group activities.
- I greatly thank everyone for your cooperation with my requests for information.
  - I do realize that you are all very busy.
- Please correct an mistakes or oversights.

# WBS Areas

- Simulation and reconstruction fall into the third level WBS item 2.2.4 which is designated “Application Software”. This category is divided into the following fourth level topics:
  - 2.2.4.1 Simulation
  - 2.2.4.2 Subsystem Reconstruction
  - 2.2.4.3 Combined Reconstruction
  - 2.2.4.4 Analysis (currently inactive?)
  - 2.2.4.5 Trigger
  - 2.2.4.6. Combined Testbeam Software
- So this category actually encompasses more than simulation and reconstruction.

# Groups

- I asked the following groups for information:
  - ANL
  - Arizona
  - Boston
  - BNL
  - Chicago
  - Harvard
  - Indiana
  - LBL
  - Michigan
  - MSU
  - Nevis
  - Pittsburgh
  - SMU
  - Wisconsin

# ANL

- Personnel: LeCompte
- Major work area is:
  - A database that provide calibrations and a cabling map to simulate the tile calorimeter.
- Previous work area was:
  - Extensive work on the detector description of the tile calorimeter.

# Arizona

- Personnel: Loch, Rutherford, Savine, Shupe
  - Peter Loch is the coordinator of the LAr reconstruction software.
  - Mike Shupe was the major responsible for the code used by the Radiation Task Force.
- Major work areas are:
  - Simulation of radiation levels in the ATLAS experimental cavern.
    - Many shielding designs were studied and a report is being written.
  - Development of an object navigation system for LAr reconstruction.
  - Simulation of the FCAL in GEANT4 using Athena.
  - Writing software for jet reconstruction and calibration of hadronic energy deposition in the calorimeters.
  - Monitoring and reconstruction sw for the FCAL testbeam.

# Boston

- Personnel: Shank.
  - Jim will give a talk on Muon reconstruction in this session.
- Major work area is:
  - Development of an object oriented muon reconstruction package called Moore.
  - .

# BNL

- Personnel: Assamagan, Fisyak, Ma, Nevski, Paige, Rajagopalan
  - Pavel Nevski is the ATLAS GEANT3 simulation coordinator
- Major work areas are:
  - Generation of GEANT3 (Zebra) datasets for data challenges.
  - Overall coordination of LAr software and database.
  - LAr calorimeter reconstruction and calibration algorithms.
  - Development of e/gamma reconstruction algorithms.
  - Development of jet calibration and reconstruction software.
  - Standalone muon reconstruction and combined (with the Inner Tracker) muon reconstruction.

# Chicago

- Personnel: Gupta, Merritt, Oreglia, Teuscher
  - Ambreesh Gupta is the package coordinator for JetRec.
    - Ambreesh will present a talk on jet reconstruction in this session.
- Major work areas are:
  - Extensive work on jet reconstruction.
    - Development of Missing Et algorithm.
    - Development of a calibration algorithm for hadronic energy.
  - Development of the tile calorimeter Event Data Model (EDM) used to digitize the tile calorimeter simulated hits.
  - Production of SUSY DC1 data.

# Harvard

- Personnel: Huth, Karhif
- Major work areas are:
  - Using Moore to understand reconstruction issues when running in a distributed environment.

# Indiana

- Personnel: Luehring
  - FL in the TRT Software Coordinator.
  - FL is the Inner Detector Simulation Coordinator
- Major work areas are:
  - Simulation of the TRT using GEANT3. IU has the full responsibility for maintaining the TRT GEANT3 simulation.
  - Providing assistance to the groups, doing the GEANT4 simulation of the TRT, the simulation of transition radiation (TR), and the C++ digitization.
  - Reconstruction studies of the ATLAS Inner Tracker using xKalman.

# LBL

- Personnel: Costanzo, Dobbs, Hinchliffe
  - Davide Costanzo is the Inner Detector responsible for the GEANT4 simulation
  - Davide Costanzo is ATLAS-wide responsible for digitization.
- Major work areas are:
  - Full responsibility for the GEANT4 pixel simulation.
  - Development the C++ digitization for the pixels and made it compatible with the Athena framework. This digitization is also used by the SCT.
- Previous work area were:
  - Development of the Pixel testbeam simulation.
  - Development of the Moore.

# MSU

- Personnel: Abolins, Brock, Ermoline, Hauser
  - Reiner Hauser will speak in this session on the HLT TDR.
- Major work areas are:
  - Work on the Level 2 trigger supervisor software.
    - The software issues instructions to the Level 2 processors based on inputs from the region of interest builders.
  - DAQ Software for the data flow from Readout System (ROS) to Level 2 and the event filter.
  - DAQ & Trigger software for the testbeam.
  - Studies of trigger performance for the HLT TDR.
  - “Paper Model” of the trigger and data acquisition systems.
  - Monte Carlo studies of “Single Top” events.
  - Monte Carlo studies of production and reconstruction of tau events.

# Michigan

- Personnel: Diehl, Goldfarb, Levin, McKee, Neal, Thun, Zhengguo, Zhou
  - Steve Goldfarb is the Muon Software Coordinator.
  - Steve Goldfarb is the Atlas Muon Database Task Leader.
- Major work areas are:
  - Coordination of the core software of the Muon Spectrometer database.
  - Detector Description of the muon spectrometer.
  - Development of Moore.
  - Michigan has also worked on simulations of staging the muon chambers and Higgs searches.
  - Work on reconstruction of testbeam data.

# Nevis

- Personnel: Dodd, Leltchouk, Negroni, Parsons, Seligman
  - Bill Seligman will speak in this session on GEANT4 simulation of the LAr calorimeter.
- Major work areas:
  - Development of the GEANT4 LAr code both on the geometry and the use of parametric models for shower generation.
  - Worked on using GeoModel with LAr simulation.
  - Testing various releases of the LAr GEANT4 simulation and on material identifiers for the LAr simulation.
  - Reconstruction of top-quark events.

# Pittsburgh

- Personnel: Boudreau, new hire
  - Joe Boudreau is ATLAS detector description coordinator.
- Major work areas are:
  - Full responsibility for the GeoModel package used to provide a geometrical description of the ATLAS detector (detector description). While not strictly in the WBS work area of this talk GeoModel will be used to supply the geometrical description of the entire ATLAS detector for both the simulation and reconstruction.
  - Specific work on using the very complex muon spectrometer geometry to test GeoModel.
  - Assist all of the ATLAS subdetector systems with getting their geometries described in GeoModel.

# SMU

- Personnel: Barberio, Gao, Lu, Stroynowski
- Major work areas are:
  - Development of a fast simulation model that for the electromagnetic showers in the LAr calorimeter for use with the ATLAS GEANT4 simulation
    - Time per event is reduced from hours to minutes.
  - Work on e-pi separation in LAr testbeam data.

# Wisconsin

- Personnel: Gonzalez, Mellado, Wiedenmann, Wu, Zobernig
- Major work area are:
  - PESA steering software.
  - HLT control software.

# Conclusions

- If your name is not on the list, please let me know.
  - Possible additional institutes working in this area are:  
Hampton, New Mexico, Oklahoma, UTA.
- There are a lot of areas of work.
- There is a lot of work to do.