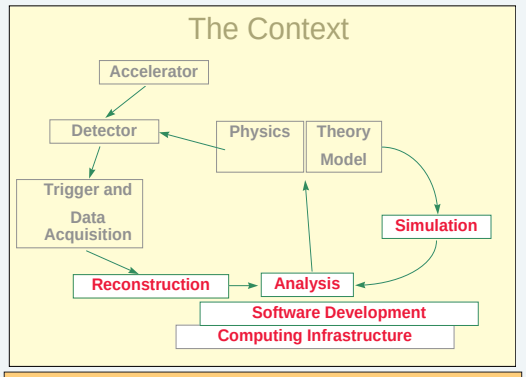
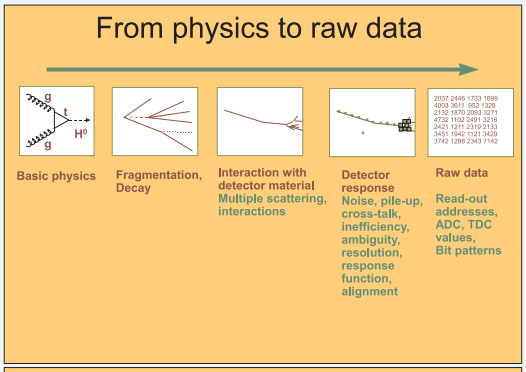
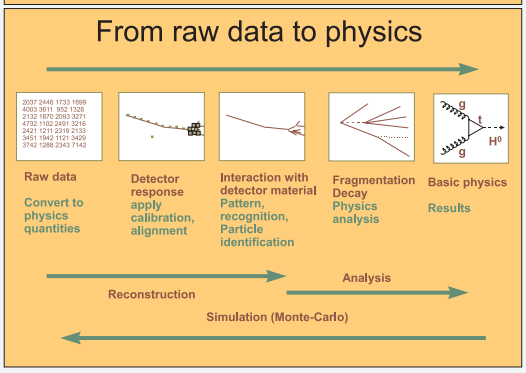
Offline Computing

All ATLAS institutes participate in Offline Computing

Overview







Hardware

Requirements

The ATLAS **data** will be delivered at a rate of 100 events per second to the offline system. Each event will consist of about 1 Mbyte of raw data. The data produced in one second correspond to the information content of the phone-books of Switzerland.

The amount of data produced per year will amount to 1 Peta-Byte (10^{15} Bytes) - filling 2 Million of today's CD-ROMs.

In order to extract the physics out of these data, an enormous **computing power** of 250,000 SPECint95 will be needed. Today, this would require 50,000 of the most powerful PCs.

A large number of the 1600 physicists in ATLAS will participate in the physics analysis. As they all need to access the data, performing **networks** are essential elements in the ATLAS computing model.

Monte-Carlo production sites

Currently, simulated ATLAS events for detector optimisation and reconstruction studies are produced in many institutes of the collaboration, in particular: LBL Berkeley (USA), RAL Chilton (UK), Milano (Italy), Pavia (Italy), Lyon (France), Innsbruck (Austria) and CERN.

Software

AGE - ATLAS detector description

The ATLAS detectors are described in a meta-language, AGE, which can be transformed into FORTRAN code for the current simulation and reconstruction programs as well as into C++ for new developments in object-oriented programming. The ATLAS detectors are described in great detail allowing a realistic understanding of their behaviour. The detector description results in 11 million GEANT volumes.

DICE - ATLAS simulation program

DICE is the ATLAS simulation program based on Geant 3.21 and the detector description in AGE. It is used for

- detector optimisation
- physics performance studies
- development of reconstruction and analysis algorithms
- development of trigger algorithms.

ATRECON - ATLAS reconstruction program

The ATLAS reconstruction program combines several algorithms:

XKalman - Track finding and fitting starting from the TRT detector, extending into the precision layers of the pixel and SCT detectors using the Kalman filter mechanism.

IPatRec - Track finding in seed regions defined by calorimeter clusters or muon tracks starting in the silicon detectors adding TRT hits for best resolution.

PixlRec - track finding optimised to work in regions where the track density is high inside jets starting from the silicon pixel detector.

LPatRec - object-oriented pattern recognition and track fitting combining several of the previous algorithms.

Calorec - Electromagnetic Calorimeter Reconstruction providing cluster finding and particle identification.

Hadronic Jet Reconstruction finding clusters in the hadronic calorimeters and reconstructing jets in the combined calorimeters.

MuonBox - Pattern recognition in the ATLAS muon system and muon track fitting.

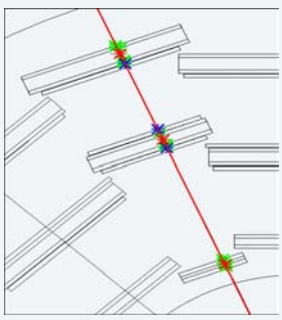
ATRIG - Trigger simulation program

Detailed simulation of LVL1 and LVL2 trigger algorithms demonstrating the feasibility of the concepts.

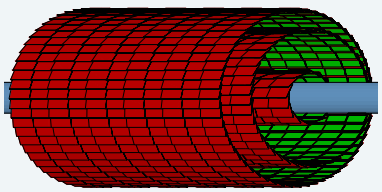
Object-oriented software

ATLAS very actively pursues research and development of object-oriented software. In particular:

- participation in the RD44 (GEANT4) object-oriented simulation tool kit
- in the framework of the research and development project RD41 (MOOSE) development of a software process aimed at a distributed software development of a large project with long lifetime and
- study of object-oriented software implementation for the ATLAS detectors (tracking, calorimetry, muon)
- study of data organisation and data storage and access in collaboration with RD45.



Event display of an object-oriented program performing pattern recognition and track reconstruction in the muon system.



Pixel detector with GEANT 4