

CHEP'06 / Mumbai

➤ Interesting

- New Visualisation Techniques
- Cmt Eclipse Plugin
- Gene Programming
- AJAX

➤ Brave New TWorld

➤ My Contributions

- Athenaeum
- GraXML/AGDD
- SQL/JDBC
- Metadata





Application of data visualisation techniques in particle physics

Steve Watts
Particle Physics Group and BITlab
School of Engineering and Design
Brunel University, West London, UK

There is more to data visualisation than histograms, scatterplots and x/y plots.

Talk at - Computing in High Energy and Nuclear Physics, 13-17 February 2006, Mumbai, India



Conclusion

These are powerful techniques and we should implement them in our data analysis toolkit.

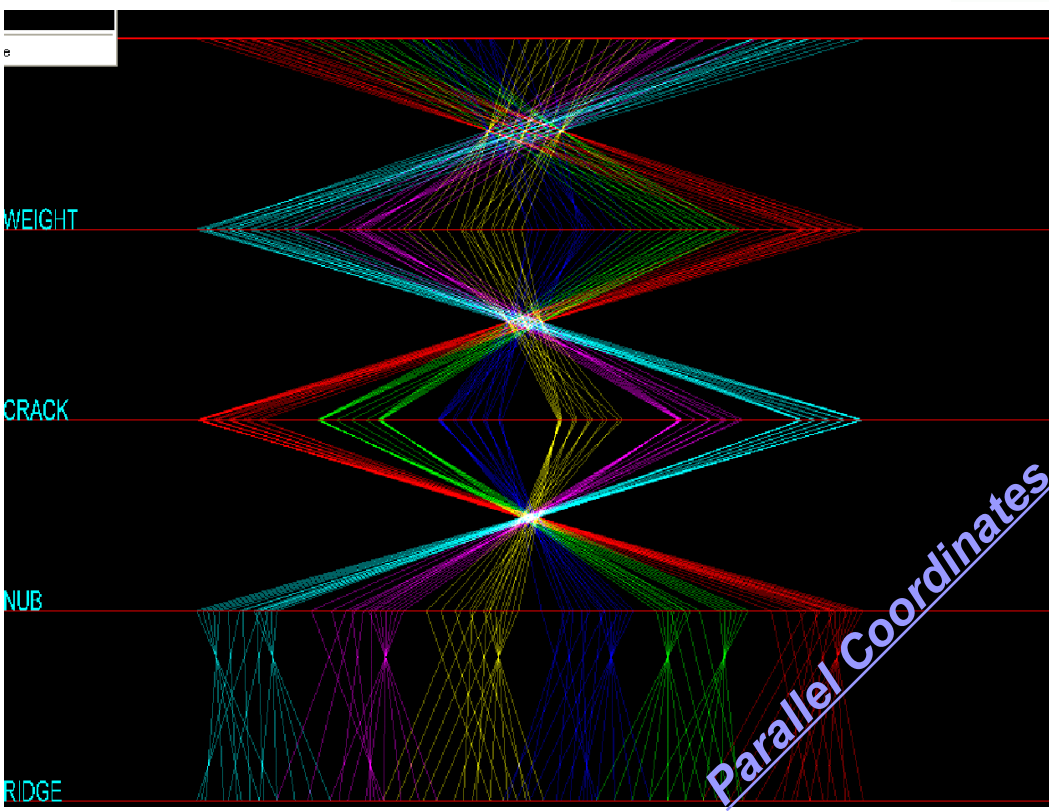
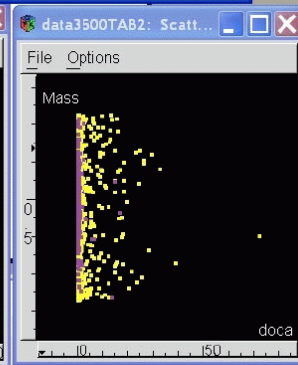
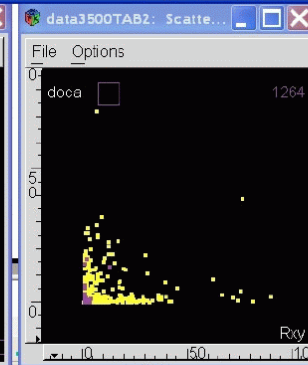
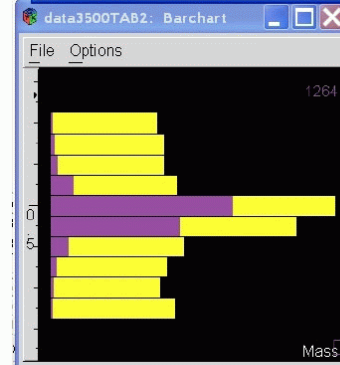
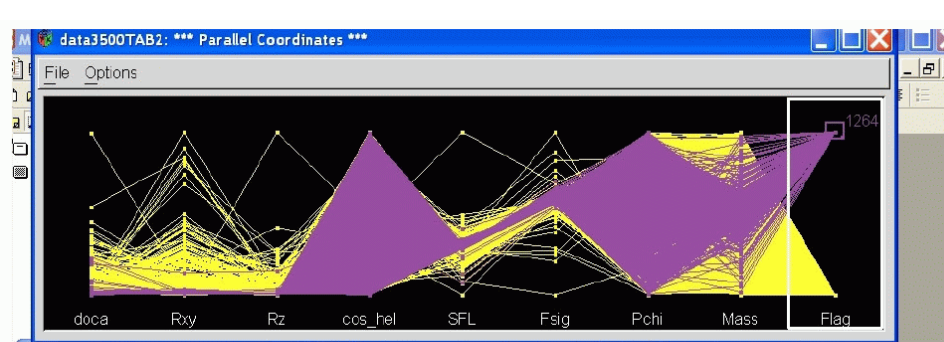
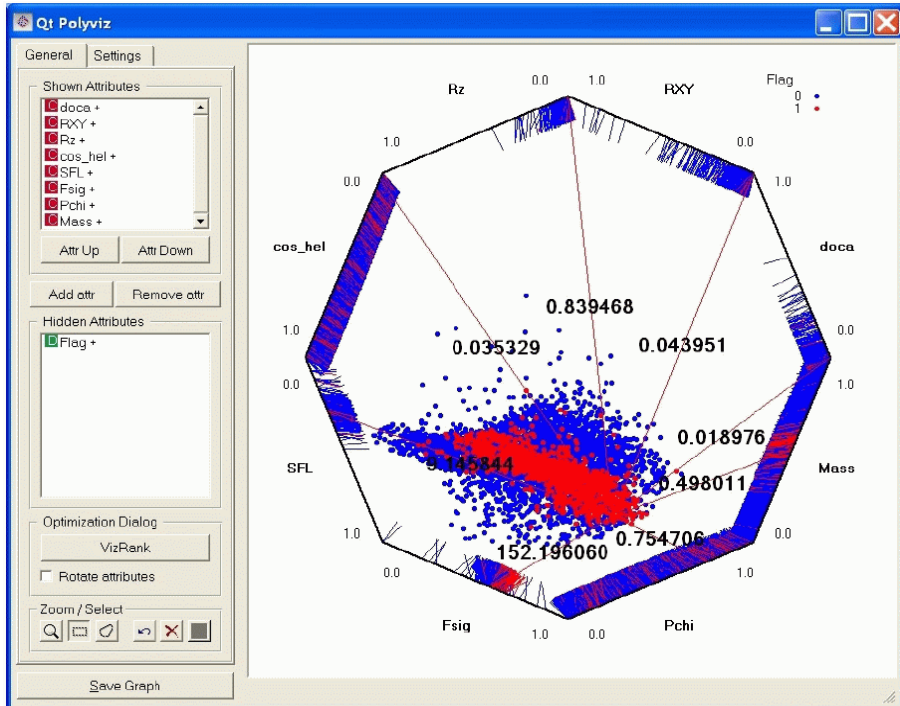
Many other ideas that I have not discussed. It is also easier to understand dynamically – just ask and I will show you.

CrystalVision is the best software for parallel coords. but it does not export results of the analysis. Has blending and alpha channel. Can also use **stereo** with CrystalVision.

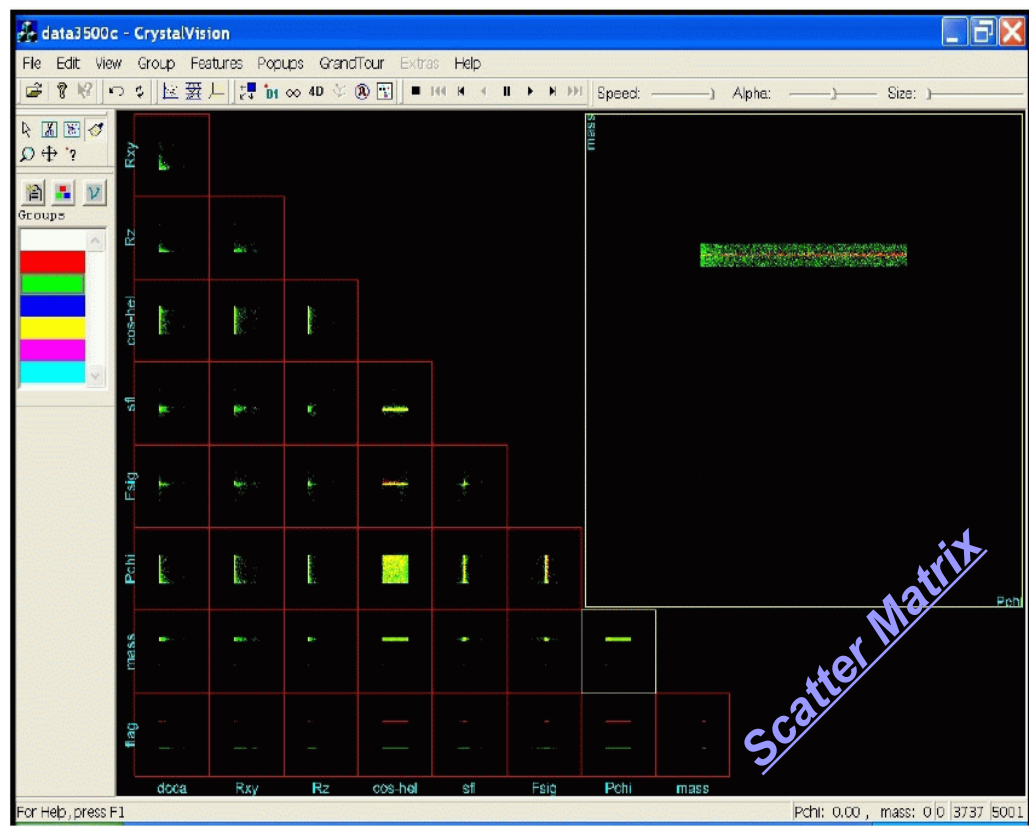
GGobi is good – new version to be released soon.

Data Analysis – **Exploratory Visual Data Analysis** followed by **machine learning/GEP techniques**
(Liliana Teodorescu) to select/cut data in a human independent way.

Can we find signals using data mining without a prior knowledge of what we think is there ?



Parallel Coordinates



Scatter Matrix



Software	Site	Comment
CrystalVision	ftp://www.galaxy.gmu.edu/pub/	Windows. ExplorN Unix α -channel. GT, PC Needs development.
GGobi	www.ggobi.org	No α -channel. GT, PC All Platforms. Access to R.
Mondrian	http://stats.math.uni-augsburg.de/Mondrian/	Java. α -channel.
Visulab	http://www.inf.ethz.ch/personal/hinterbe/Visulab/	Excel plugin. PC only
Orange	http://www.ailab.si/orange	Component based data mining. C++ and python scripting. PC.
Datadesk	http://www.datadesk.com/	Commercial. Linked plots. Stats.
Statistica	http://www.statsoft.com/	Commercial. Very powerful. Not evaluated yet. Graphics + Stats.
VisualExplorer	www.curvaceous.com	Commercial. PC for process control Excel PlugIn.



National Energy Research Scientific Computing Center (NERSC)

Eclipse as Physicist Work Environment

Wim T.L.P. Lavrijsen, Sebastien Binet
NERSC HENPC, LBNL
CHEP – Mumbai, February 2006



Build with external tool



File Edit Refactor Navigate Search Project Run Window Help

C/C++ Projects

MyAlg.h MyAlg.cxx

```

StatusCode MyAlg::initialize() {
  MsgStream log( msgSvc(). name() );

  log << MSG::INFO << "initialize() ... "
    << "my message: " << m_message << " (" << m_value << ")"

  return StatusCode::SUCCESS;
}

```

Building Workspace

Building all...

Invoking Command: cmt bro make clean all

Run in Background Cancel Details >>

Problems Console Properties

C-Build [Example]

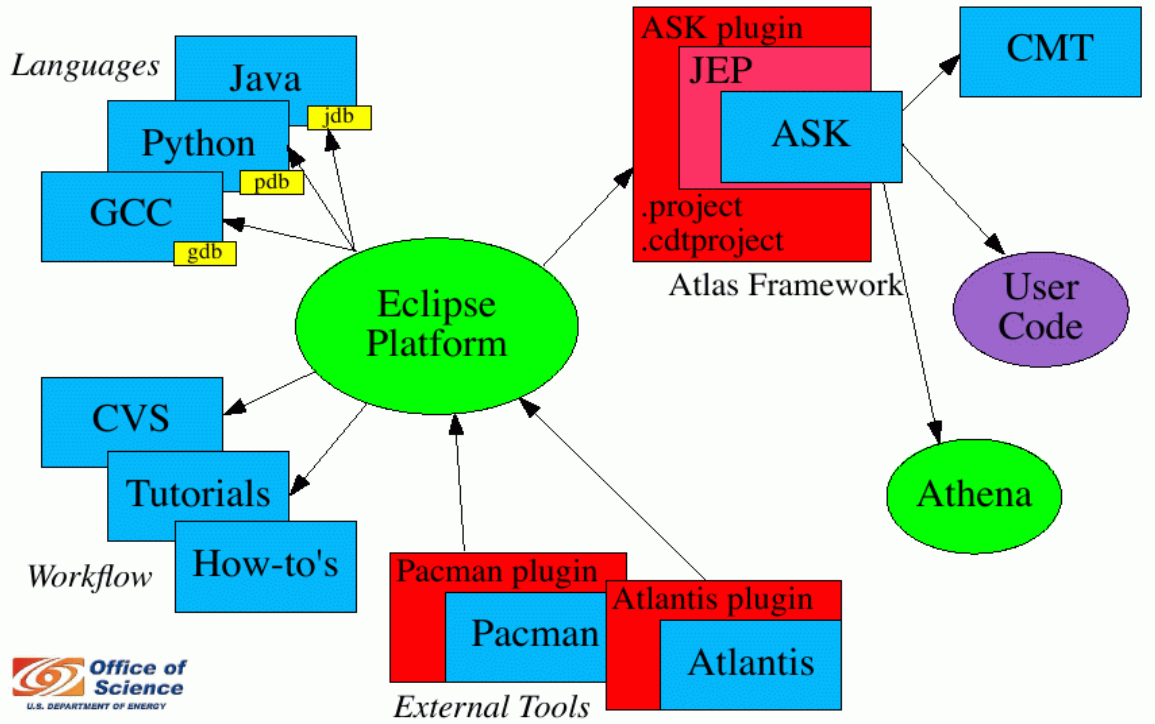
```

----- (components:make) starting configclean
make[3]: Nothing to be done for 'configclean'.
install_includesclean configclean
allclean ok.

```



Tools integration





chep06

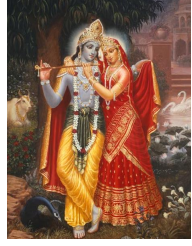
Computing in High Energy and Nuclear Physics, 13-17 February 2006, Mumbai, India

1

High Energy Physics Event Selection with Gene Expression Programming

Liliana Teodorescu

Brunel
UNIVERSITY
WEST LONDON



GEP allows

- fast identification of powerful cuts
- signal/background separation of 92-95% accuracy for samples with S/N = 0.25, 1, 5
- potential of discovering new correlations between variables
- large number of selection functions does not improve the classification accuracy

GEP

is still in the R&D phase
needs software development -> underway

chep06 **Gene Expression Programming**

Reproduction

Liliana Te

Genetic operators applied on chromosomes not on ET => always produce syntactically correct structures!

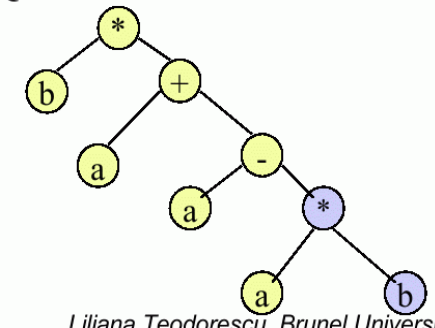
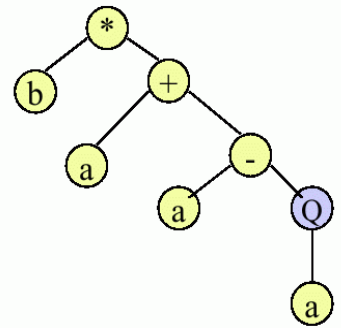
Recombination – exchanges parts of two chromosomes

Mutation – changes the value of a node

Transposition – moves a part of the chromosome to another location in the same chromosome

e.g. Mutation: Q replaced with *

*b+a-aQab+//+b+babbabbbababbaaa *b+a-aQab+//+b+babbabbbababbaaa





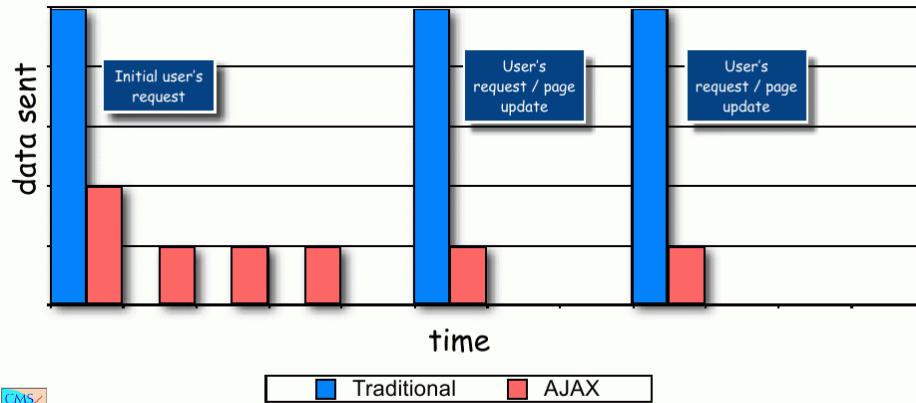
Interactive Web-based Analysis Clients using AJAX: examples for CMS, ROOT and GEANT4



Giulio Eulisse
George Alverson
Shahzad Muzaffar
Ianna Osborne
Lucas Taylor
Lassi Tuura

The AJAX advantage

On update only deltas are sent



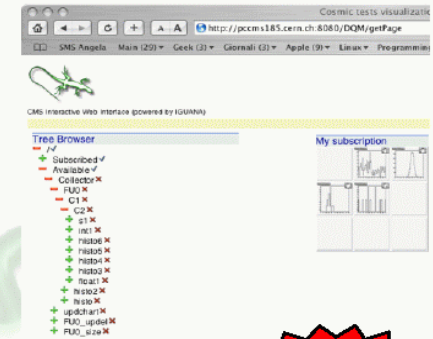
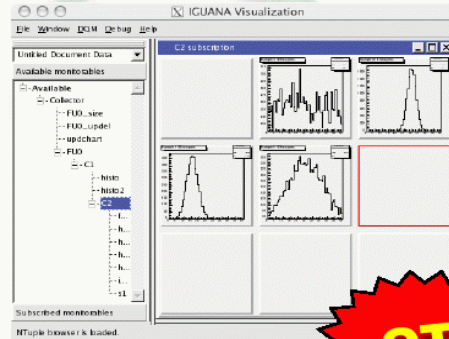
Legend: ■ Traditional ■ AJAX



Asynchronous Javascript And XML

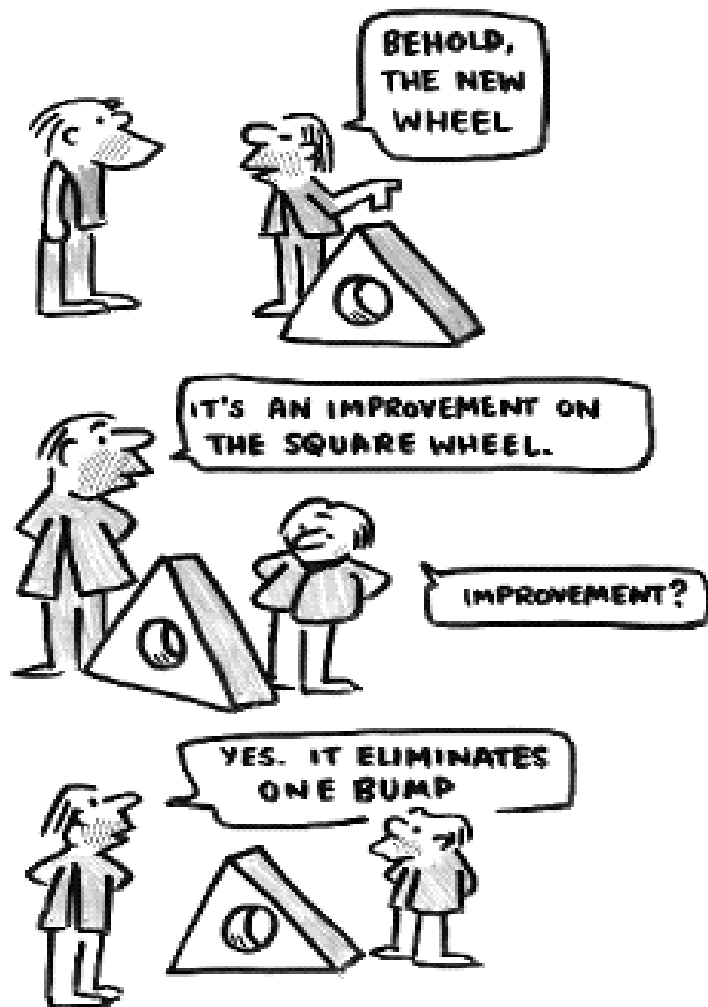
Generic DQM GUI

The two implementations share most of the code!!!



AJAX allows to have the same behaviour of desktop and web applications.





Proposal for a new scenario



Introducing

BOOT

A Software **Boot**strap system

René Brun, CERN

ROOT in the multi-core cpu era

*Incompatible Clone
TJAS, TEclipse*

The ROOT Project in the multi-core CPU era



CHEPo6, Mumbai

15 February 2006

René Brun
CERN





ROOT I/O for SQL databases

Sergey Linev, GSI, Germany

Incompatible Clone
~~TJDBC, THibernate~~

SQL support in ROOT

Abstract interface via three classes:

- TSQLServer – query execution
- TSQLResult – result of single SELECT query
- TSQLRow – content of single row

Implemented for MySQL, Oracle, PostgreSQL

TTreeSQL class provides TTree interface to database tables. Allow tree drawing and table modifications

ROOT
An Object-oriented Data Analysis Framework



Incompatible Clone
~~TOpenInventor, TJava3D~~

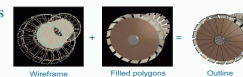
ROOT 3D Graphics

René Brun, Olivier Couet, Richard Maunder, Timur Pocheptsov *

CERN, Geneva, Switzerland
*JINR, Dubna, Russia

GL Features : Rendering

- 3 draw styles



- High quality (vector) pdf and eps
- Support composite (CSG) shapes

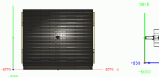


GL Features : Cameras

- 3 Perspective Cameras: Keep 'floor' (plane of two global axes e.g. X/Y) level.



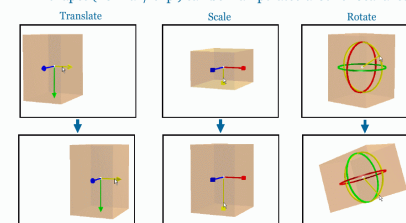
- 3 Orthographic Cameras: Project



- More in future – non-linear fishes

GL Features : Manipulators

- All shapes (normal / clip) can be manipulated around local axes.

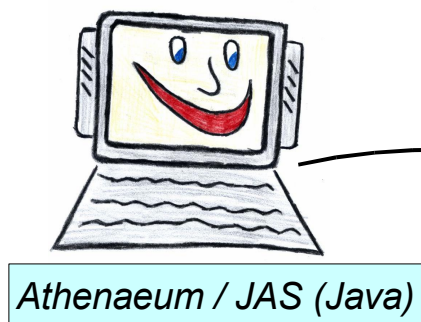




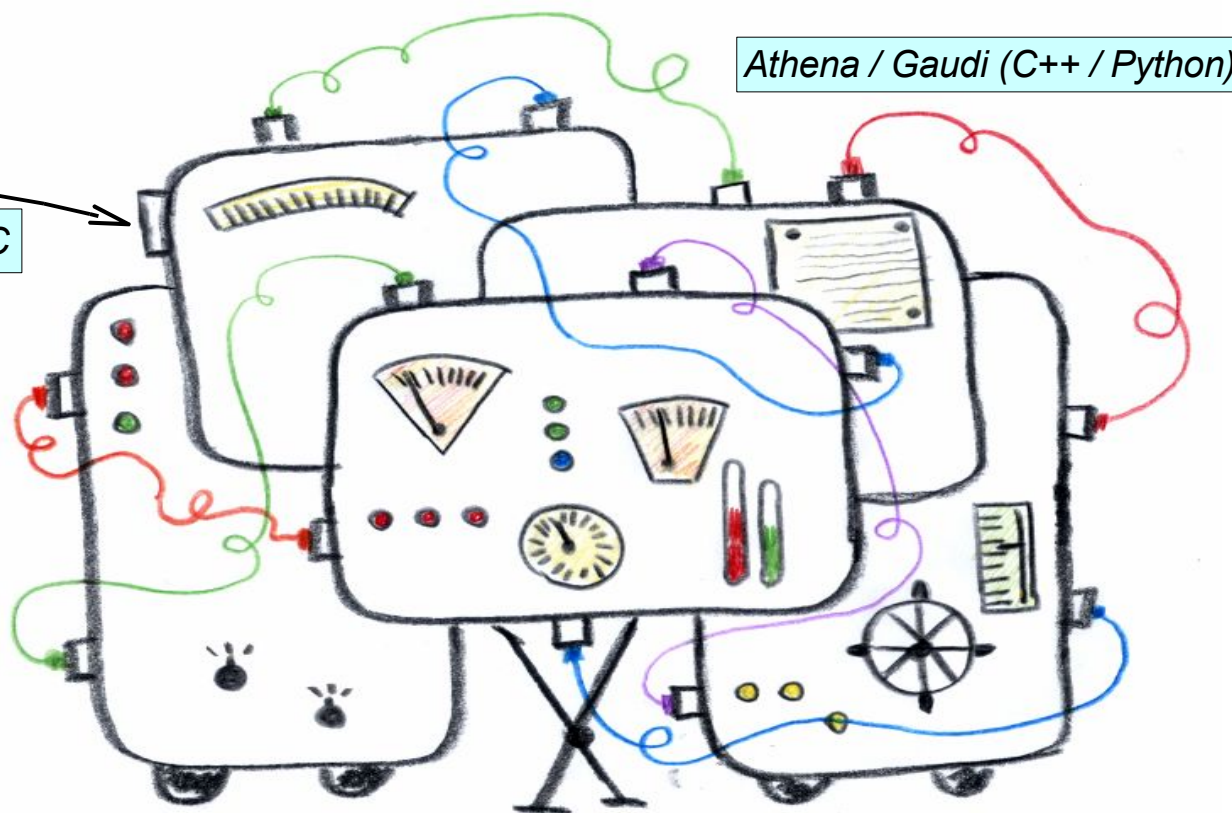
Athenaeum

Using **J**ava **A**nalysis **S**tudio
as an interface to the
Atlas Offline Framework

FREE **HEP**



XML-RPC



- **Athenaeum** allows to access (remote) Athena from (local) JAS.
- Any Python script can be send directly from JAS to Athena.
- Results (usually in XML) are send back and can be processed within JAS.
- Special Python scripts are provided to automatically present standard Athena data within JAS.

J.Hrivnac, LAL/Orsay
CHEP'06/Mumbai, Feb'06

Optimized Access to Distributed Relational Database System

J.Hrivnac, LAL/Orsay (using widely available JDBC components)
 CHEP'06/Mumbai, Feb'06



Web Service

- ColMan Event Selector is available via XML-RPC service. The service is generally deployed as /ColMan/EventSelector Web Service application and can be accessed via ColMan Web Service Client.
- JSP (Java Server Pages) GUI for ColMan tools has been deployed as /ColMan-GUI Web Service application and can be accessed directly from the standard Web Browsers.

SQL Tuple / ColMan

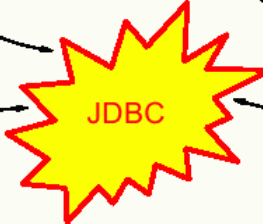
- SQL Tuple extends FreeHEP implementation of ITuple AIDA interface so that Tuples can be stored in an SQL database.
- It supports any relational DB backend via JDBC standard interface.
- All AIDA operations (projections, filters, evaluators,...) are supported in a standard way.
- Some new functions have been included on top of standard AIDA interface.
- SQL Tuple can be used in any AIDA-compliant tool.
- SQL Tuple understands LCG Pool AttributeList data.
- ColMan provides higher level utilities for managing (Event) Collections.

JAS Plugins

- Both SQL Tuple and ColMan are available as JAS plugins.
- All functionality is available via standard JAS GUI.
- Specific functionality (like SQL queries) is added to the JAS GUI.
- Interoperability with other JAS plugins is assured.

MultiLanguage interfaces

- Selected SQL Tuple/ColMan functionality is available to legacy C++ applications via proxies created by JACE.
- All SQL Tuple/ColMan functionality is available to Python applications using Jython or Jpype (when access to C++ is needed too).
- Access from other languages (Ruby, Groovy,...) is directly possible.



continuent

Sequoia

- SQL tables can be spread over several database Servers, some tables may be replicated. User wants a single front-end.
- Sequoia acts as a (Proxy) Virtual SQL Server forwarding all requests to appropriate databases (real or another virtual). Replicated and/or complementary tables are supported (even on heterogeneous Servers), similar to RAID disks.
- Sequoia is used via its JDBC driver, so any application using JDBC API can directly use Sequoia. No application modification is required to use Sequoia.
- Sequoia directly handles any SQL query. No pre-knowledge is needed. No specialized interface is required.
- Sequoia handles both query (read access) and update (write access).
- JDBC interface can be transparently accessed from other languages (Python, Ruby, Groovy, C++,...).

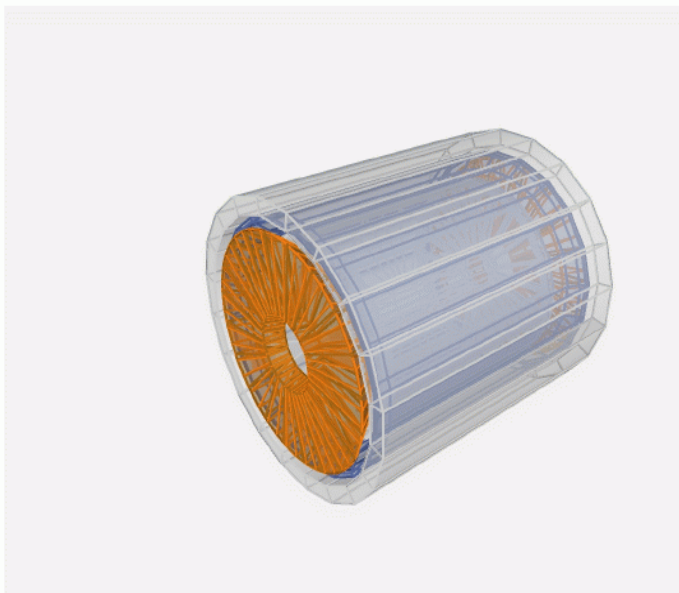
Octopus

Enhydra

- Octopus is a Java-based Extraction, Transformation, and Loading tool. It may connect to any JDBC data sources and perform transformations defined in an XML file.
- Octopus has been customised to support non-standard SQL features used in LCG and to overcome LCG-specific bugs.
- Octopus is routinely used to replicate Atlas Detector Description database. It has been successfully tested with other Atlas databases.



Using XML for Detector Geometry Description in the Virtual Monte Carlo Framework



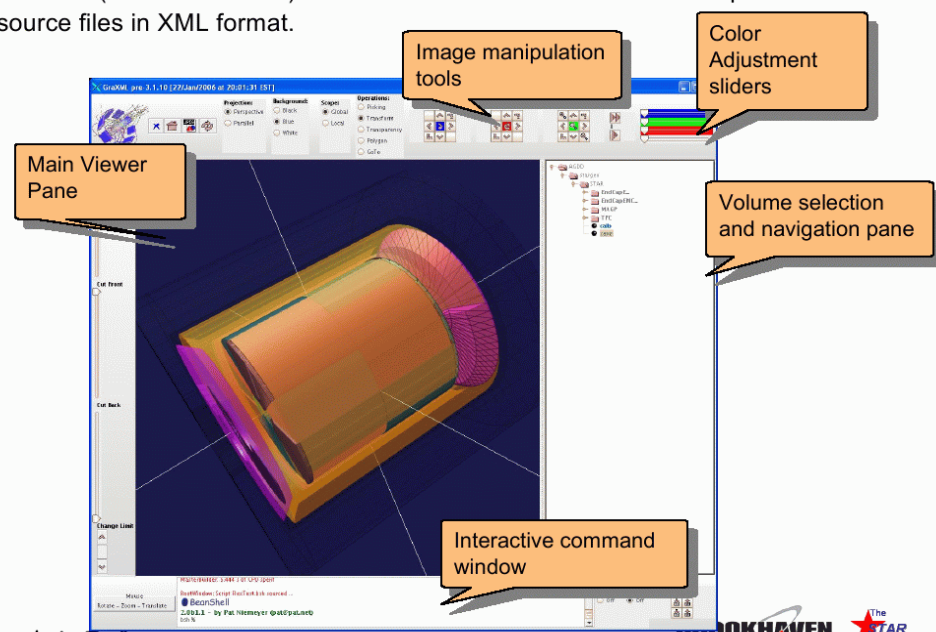
V.Fine, J.Lauret, M.Potek
STAR Collaboration, Brookhaven National I

J.Hrivnac

Laboratoire de l'Accélérateur Linéaire, Orsay

Geometry Modeling and Description

Accompanying product for the AGDD schema: an advanced graphics viewer known as GraXML (credit: J.Hrivnac). Allows full visualization of AGDD-compliant geometry source files in XML format.





A Flexible Distributed Event-level Metadata System for ATLAS

David Malon*, Jack Cranshaw, Kristo Karr (Argonne),
Julius Hrivnac, Arthur Schaffer (LAL Orsay)

CHEP' 06, Mumbai
13-17 February 2005

