Software Components, Tools and Databases

- 36(+1-1) talks + 72 posters
  - Databases, Data, Metadata
  - Python
  - Multicore, Parallelization
  - Frameworks
  - Monitoring
  - Development Environment
  - Virtualization
  - Performance
  - Simulation

Julius Hrivnac, Atlas@LAL/CNRS
for CHEP'09 in Prague

LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

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Software Components, Tools and Databases

- Heterogeneity
- Overlaps with other tracks
- Subparallel sessions on Thursday

Julius Hrivnac, Atlas@LAL/CNRS
for CHEP'09 in Prague

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Databases

- Web Service
  - Standard tools or home-grown
  - API and Web pages
- Distribution, Oracle Streams
- Proxies and caches, Frontier
- Client-Server
- Oracle "by design", SQLite
- Conditions databases

Conditions Databases

CMS offline conditions database software

Z. Xie (Princeton University)
G. Govi(Northeastern University)
V. Innocente(CERN PH-SFT)

For the CMS collaboration

21-27 March 2009 CHEP'09 Prague, Czech Republic

CHEP'09 - 23 March 2009
Computing in High Energy and Nuclear Physics

Advanced Technologies for Scalable ATLAS Conditions Database Access on the Grid

A. Vaniachine (Argonne)
P. Nevski (Brookhaven)
anali, M. Girone, R. Hawkings, A. Valassi, F. Viegas (CERN)
G. Dimitrov (DESY)
R. Walker (LMU Munich)
A. Wong (TRIUMF)

Pilot query, Frontier

The TileCal Web Systems for Data Quality Analyses

Authors: **Fernando Ferreira**
Carmen Maidantchik
Andressa Sivolella
Felipe Grael
Kaio Karam

for ATLAS Tile Calorimeter Community

Federal University of Rio de Janeiro - UFRJ

CHEP 09

The JANA Calibrations and Conditions Database API

March 23, 2009

David Lawrence JLab

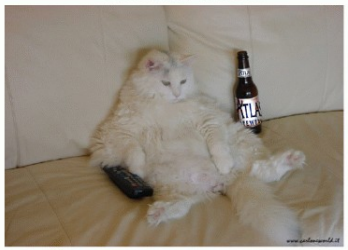
Ajax, XSLT and SVG

Displaying ATLAS conditions data with new web technologies

Shaun Roe

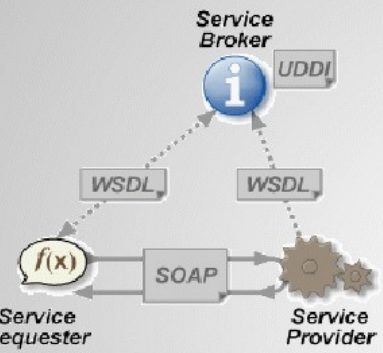
A RESTful Web Service Interface to the ATLAS COOL Database

Shaun Roe



Web Service (1)

Calibration Web Service

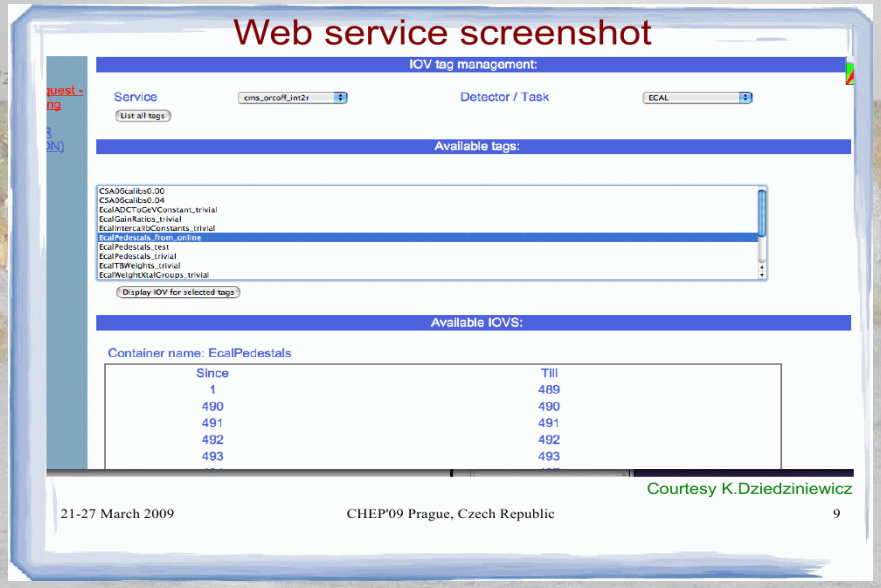


- Calibration constants will need to be accessible from remote computers via the internet
- Direct access to a database is problematic due to cybersecurity concerns
- Web services work over HTTP and so are the appropriate mechanism for remote access

- The *JCalibrationWS* class provides calibration constants through a web service
  - Implemented as a plugin so remote access can be added to an existing execut
  - Allows read-only access to calibration constants from anywhere in the world c (http://www.jlab.org/Hall-D/cgi-bin/calib)
  - Uses gSOAP, a C++ SOAP implementation
  - Currently works like a proxy for *JCalibrationFile* on server side, but could trivia made to use another type of backend

XML
XSLT
SQL
SVG
XML-RPC
SOAP
JSP
CherryPy
PHP

Web service screenshot

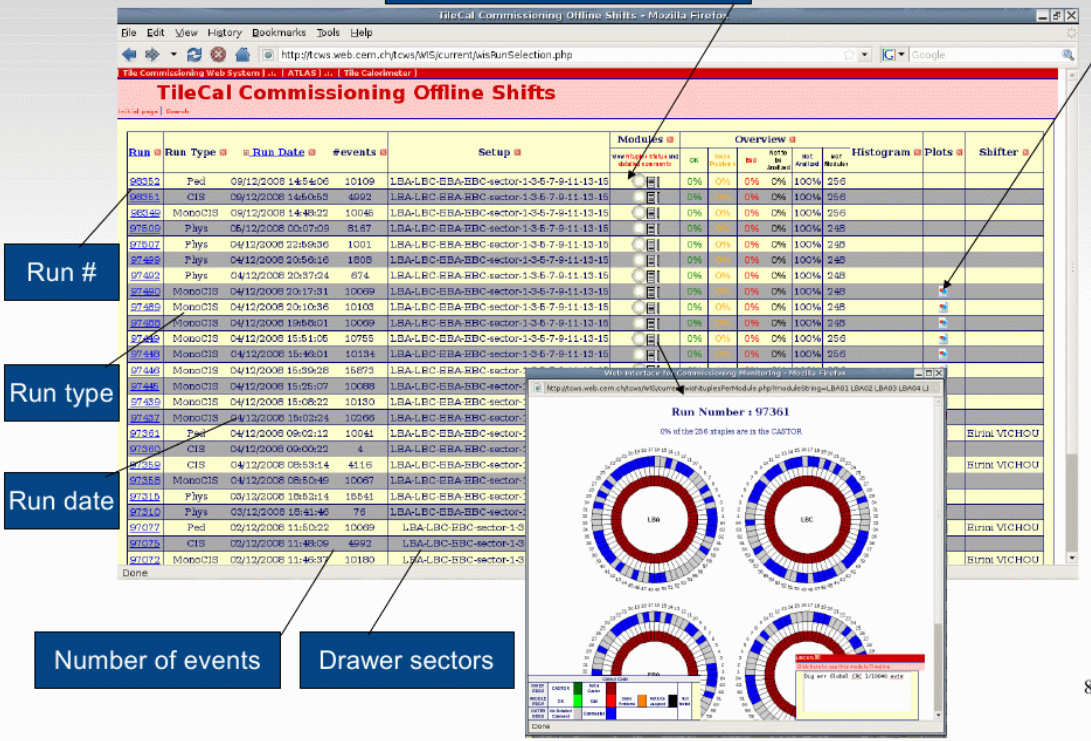


Courtesy K.Dziedziniewicz

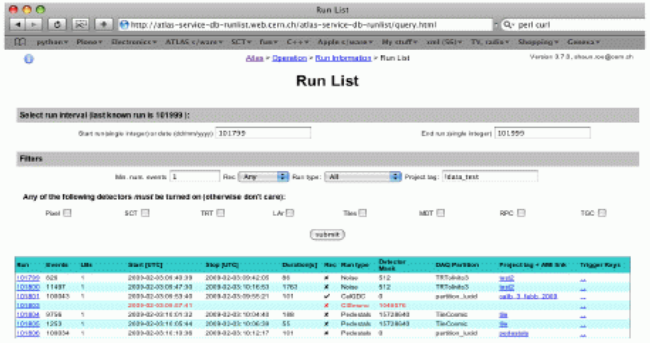
WIS – Monitor by run

On click, system shows the ntuples statuses and detailed module comments

Run performance overview



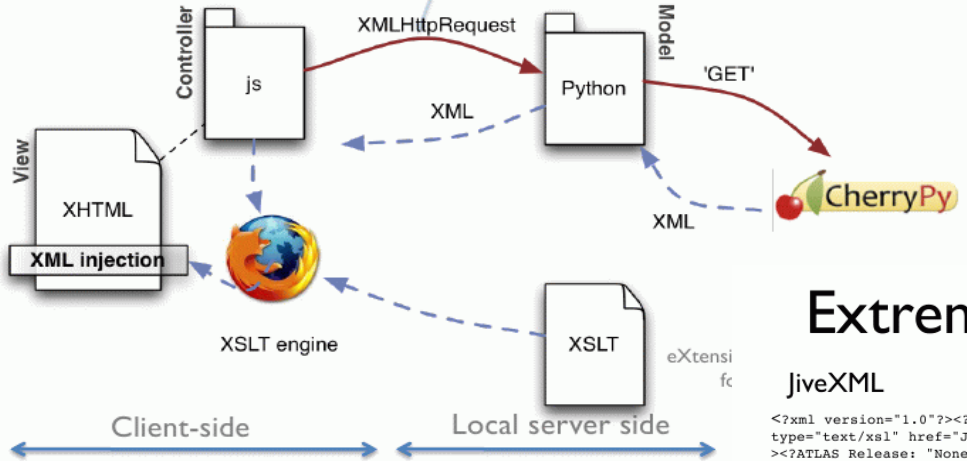
Web Service (2)



Example: Run List

Search for runs matching criteria, display results;
Uses an 'Ajax' request to get the CherryPy XML.

XML is inserted directly in the XHTML page, and associated with an XSLT stylesheet to format it as a table

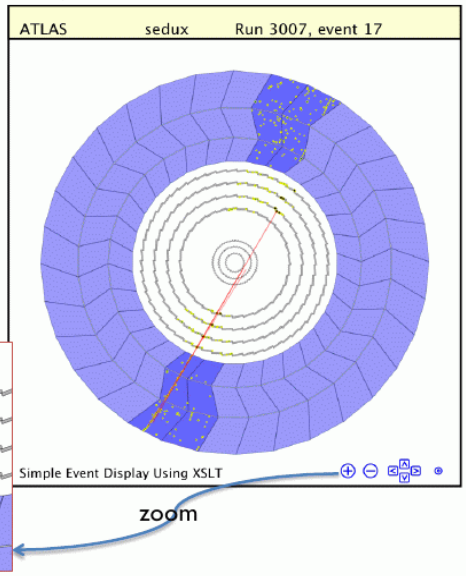


Extreme SVG

JiveXML

```
<?xml version="1.0"?><?xml-stylesheet
type="text/xsl" href="JiveXML_event.xsl"?
><?ATLAS Release: "None"?><!DOCTYPE Event
SYSTEM "event.dtd"><Event version="None"
runNumber="3007" eventNumber="17"
dateTime="2006-06-20 11:01:54 CEST"><STC
count="138" storeGateKey=""><barcode>0 0 0
0 0 0 0 0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0
0 0 0 0 0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0
0 0 0 0 0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0
0 0 0 0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0 0
0 0 0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0 0 0
0 0 00 0 0 0 0 0 0 0 0 0 00 0 0 0 0 0 </
barcode><etaModule>-5 5 -5 -4 -3 1 3 3 3 -2
-1-1 3 3 3 3 -3 4 -3 -1 -1 1…
```

http://cern.ch/sroe/display/example.xml



LCG Database Products

DM Data Management Group — CERN IT Department

POOL/CORAL/COOL over Root/Oracle/SQLite

LCG Persistency Framework

CORAL, POOL, COOL – Status and Outlook

A. Valassi, R. Basset, R. Chytracek, D. Duellmann, A. Kalkhof,
I. Papadopoulos, W. Pokorski, Z. Molnar *(CERN IT-DM)*

M. Nowak *(BNL / Atlas)*
S. A. Schmidt, M. Wache *(University of Mainz / Atlas)*

D. Dykstra *(FNAL / CMS)*
G. Govi *(Northeastern University / CMS)*
Z. Xie *(Princeton University / CMS)*

M. Clemencic, M. Frank *(CERN PH / LHCb)*

DM Data Management — CERN IT Department

Distributed Database Services

A Fundamental Component of WLCG Service

Experience and Outlook

CHEP 2009, 23 March 2009

Maria Girone, CERN - IT, Data Management Group

DM Data Management Group — CERN IT Department

CORAL Server

A middle tier for accessing relational database servers from CORAL applications

A. Valassi, A. Kalkhof, D. Duellmann, Z. Molnar (CERN IT-DM)
M. Wache (University of Mainz / Atlas)
A. Salnikov, R. Bartoldus (SLAC / Atlas)

CHEP2009 (Prague), 23rd March 2009

Custom protocol - RPC over Python/C++

Oracle Streams, Frontier/Squid/RAC
Only 3.5 hours service unavailability in 2008

Metadata

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

An Integrated Overview of Metadata in ATLAS

Elizabeth Gallas,
Solveig Albrand, Richard Hawkings, David Malon, Eric Torrence
on behalf of the ATLAS Collaboration
at the
CHEP 2009 Conference
Prague, Czech Republic
March 23, 2009

UNIVERSITY OF OXFORD

CHEP09 - March 23 2009

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

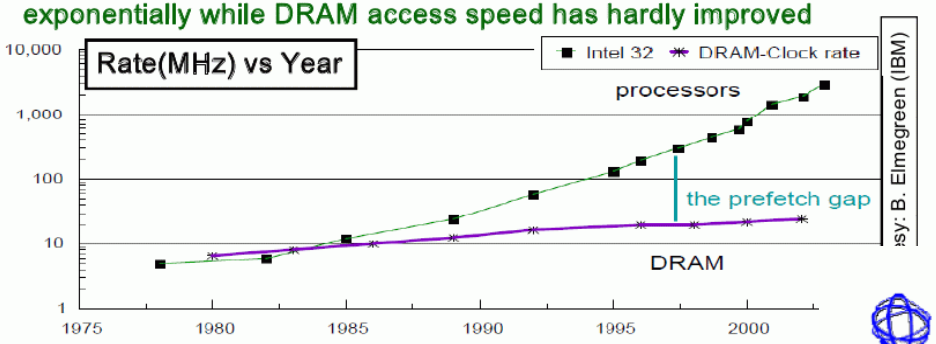
Event Selection Services in ATLAS

Jack Cranshaw
Argonne National Laboratory
for the ATLAS TAG Development Team

Metadata

Getting Conditions data to CPU intensive tasks

- Storage capacity and processing speed per unit cost have increased exponentially while DRAM access speed has hardly improved



- "The prefetch gap" == performance gap between CPU speed a access latency: continues to widen

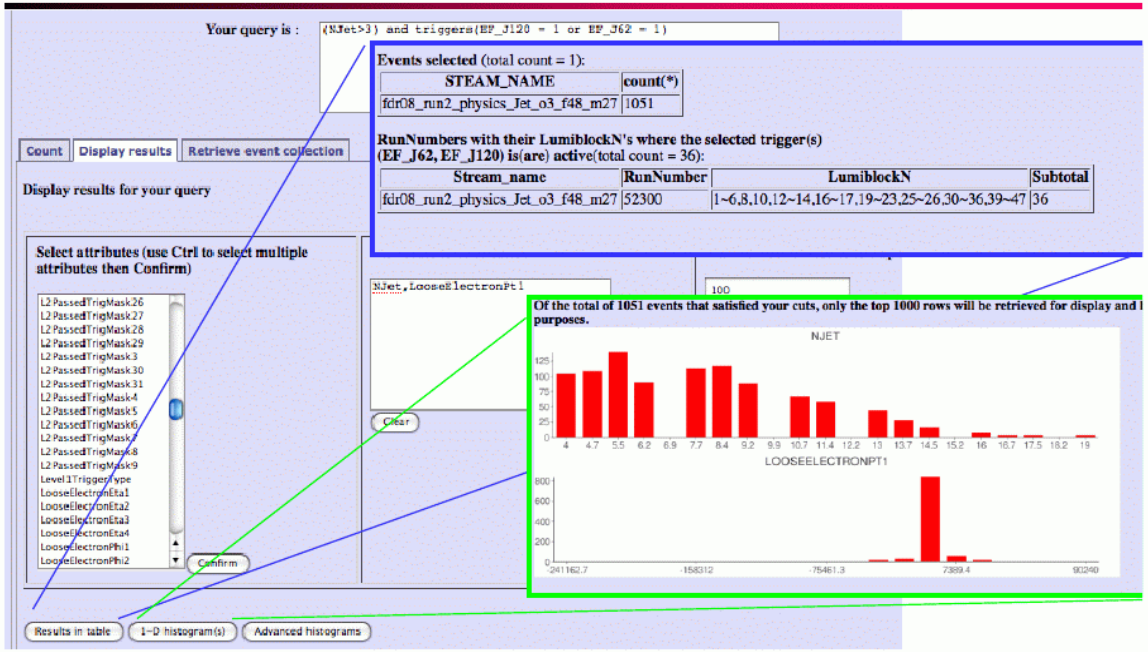
ATLAS uses Metadata to find the data needed by a to help bridge the gap to facilitate computing intensive (calibration, alignment, processing, reprocessing, ana

23-Mar-2009 Elizabeth Gallas -Oxford ATLAS @ LHC

CHEP09 - March 23 2009

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

ELSSI Tour: Perform Query



Jack Cranshaw: ATLAS Computing

Web Service

Other Databases

The HADES Oracle database

and its interfaces for experimentalists

Ilse Koenig, GSI Darmstadt
for the HADES collaboration

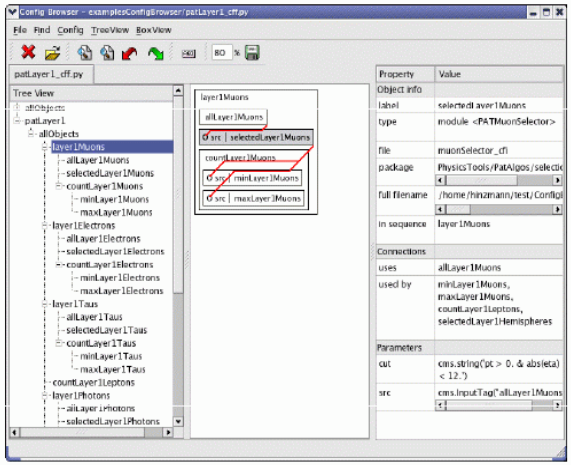
High availability
Oracle DataGuards

A lightweight high availability strategy for Atlas LCG File Catalogs

Daniela Anzellotti
Alessandro De Salvo
Barbara Martelli
Lorenzo Rinaldi

Python

Visualization of the CMS Python Configuration System



Andreas Hinzmann, O. Actis, M. Erdmann, R. Fischer, T. Klimkovich, G. Müller, J. Steggemann (RWTH Aachen University), B. Hegner (CERN)

Usage of the Python Programming Language in the CMS Experiment

Rick Wilkinson (Caltech), Benedikt Hegner (CERN)
On behalf of CMS Offline & Computing

User-friendly Parallelization of GAUDI Applications with Python

CHEP 09, 22-27 March 2009, Prague
Pere Mato (CERN), Eoin Smith (CERN)

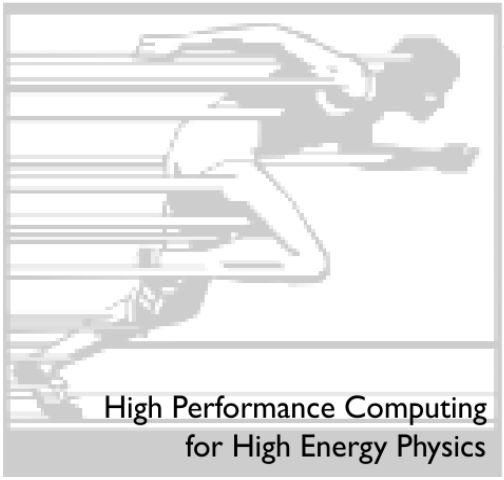
About Using Python

- No top-down decision to use it
  - Groups decided to use it on their own
  - Probably influenced by what others are doing
- Why people say they use Python
  - Easy to learn
  - Easy to understand syntax
  - Good for rapid prototyping
  - Lots of standard tools
  - Lots of useful external tools
    - cherrypy, PyRoot, PyQt
  - Can do their scripting and their programming in one step

Multicore, Parallelization

Plenary

The challenge of adapting HEP physics software applications to run on many-core cpus



CHEP, March '09

Vincenzo Innocente
CERN

Harnessing multicores: strategies and implementations in ATLAS

Sébastien Binet,
Paolo Calafiura, Scott Snyder,
Werner Wiedenmann, Frank Winklmeier

24-03-2009 CHEP09

User-friendly Parallelization of GAUDI Applications with Python

CHEP 09, 22-27 March 2009, Prague

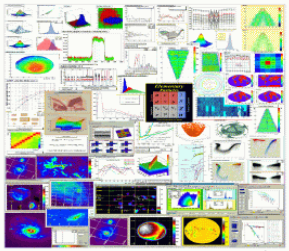
Pere Mato (CERN), Eoin Smith (CERN)

Frameworks (1)

Global Overview of the Current ROOT System

CHEP09 : Prague, 24 March 2009

René Brun/ CERN
for the ROOT team



CHEP2009 - Prague, March 24, 2009

Recent Developments in the Gaudi Software Framework

Marco Clemencic
marco.clemencic@cern.ch

Fit Panel

Root

David Gonzalez Maline
Lorenzo Moneta
Ilka Antcheva
CERN, PH SFT Group

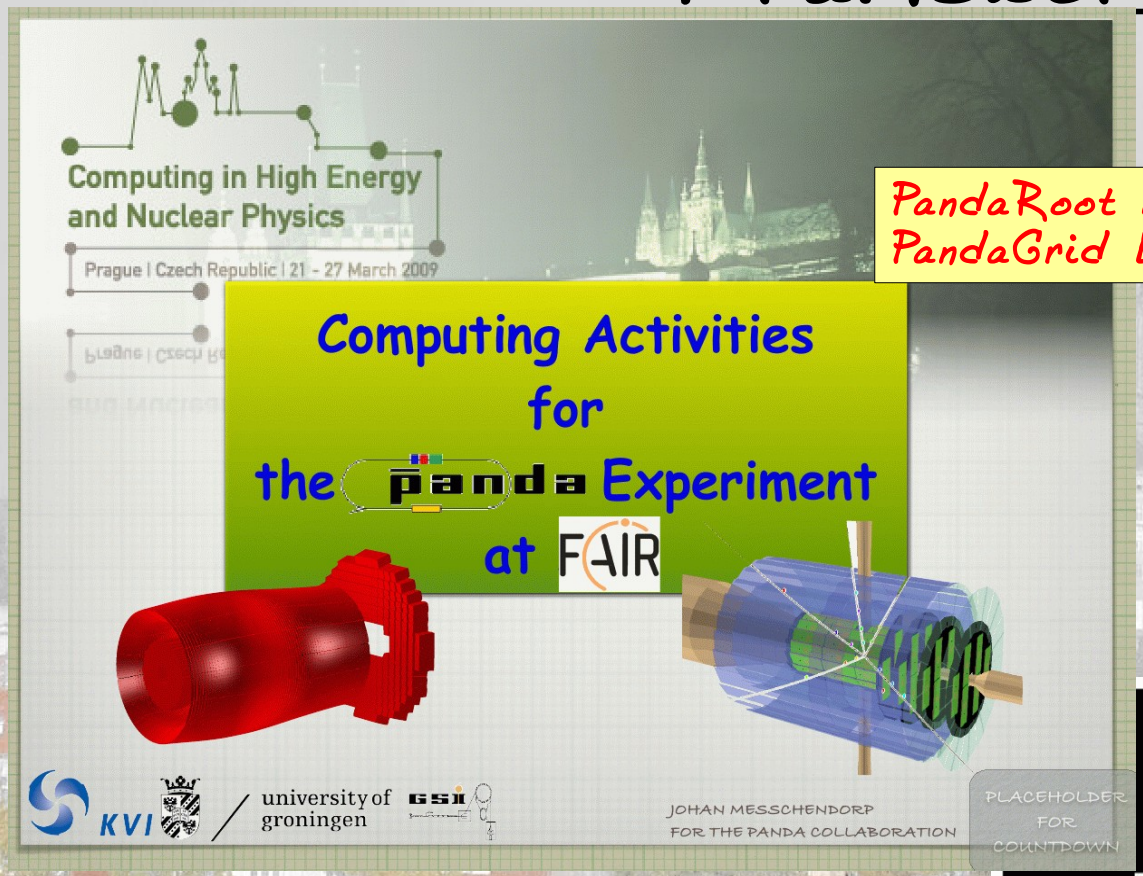
XML configuration
CLI and API

Hierarchy Software Development Framework (h-dp-fwk) Project

Alexander Zaytsev // Alexander.S.Zaytsev@gmail.com
Budker Institute of Nuclear Physics (BINP)
Novosibirsk, Russia

CHEP2009 (Prague)

Frameworks (2)



PandaRoot based on FairRoot
PandaGrid based on AliEn

The ALICE Offline Environment - Status and Perspectives

Federico Carminati

on behalf of the ALICE Core Offline Team

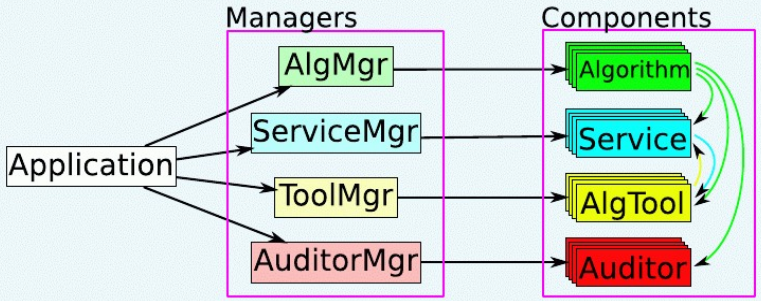
26/03/2009

AliRoot, Proof, AliEVE

Gaudi

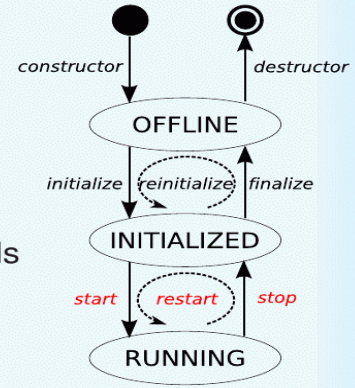
Finalization order of services cont.

- Adding the concept of *managers*



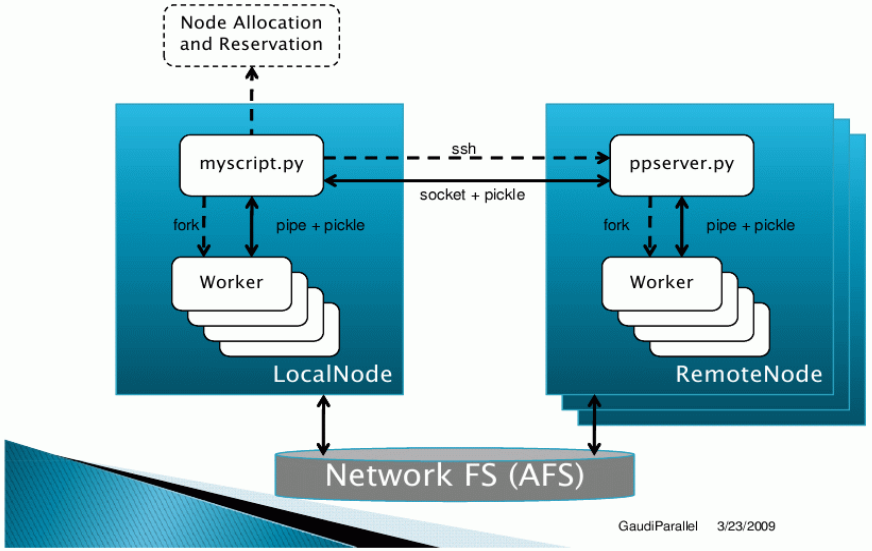
New state machine implementation cont.

- New transition added to accommodate the separation between server and client start up
- To be reviewed
  - another transition
  - redefine the re* methods



Stability x Evolution

Parallelization on a Cluster

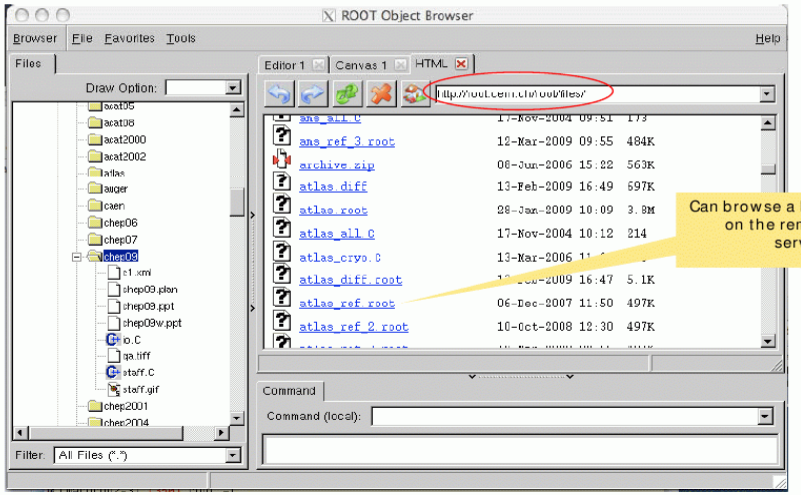


Root

- Consolidation, stable manpower
- New Web pages and documentation
- Surprising messages about technologies used elsewhere:
  - "XML files are basically useless"
  - "QT interfaces: a big pain"
- BOOT seems to be dead

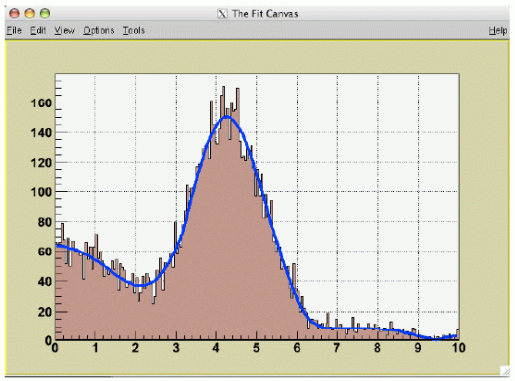
More Root talks in other tracks

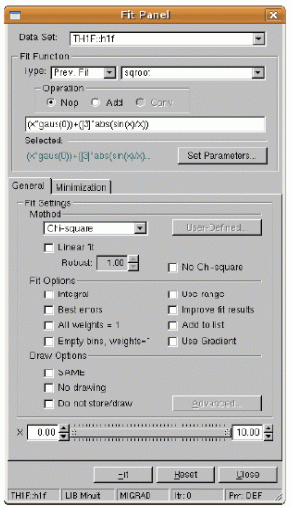
GUI Examples II



Tuning Parameters

Immediate preview of the changed function





Interactive fitting

Root

LLVM-based C++ Interpreter For ROOT

Axel Naumann, CERN
Lukasz Janyst, CERN
Philippe Canal, Fermilab

LLVM - competition for GCC, written in C++
JustInTime compiler for C++ (+...)
for C++: production quality expected in 2011
for Root dialect of C++: many additional challenges

The Challenges

As compiler, LLVM expects all code to be available.

cling on the other hand:

1. must allow iterative loading
2. must keep stack
3. must support unloading

```
cling[0] .L func0.C
cling[1] func0();
cling[2] .U func0.C
cling[3] int func0 = 0;
```

Unthinkable for compilers.

Solution: need to modify AST, re-link, track dependencies,…

Monitoring

Monitoring the CDF analysis farm (CAF)

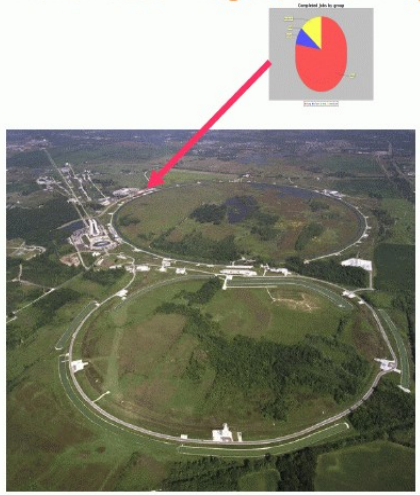
CHEP 2009 21 - 27 March 2009 Prague, Czech Republic

Marian Zvada

Hans Wenzel,
Federica Moscato

Fermilab

March 26th, 2009



Web Service

ATLAS Data Quality Offline Monitoring

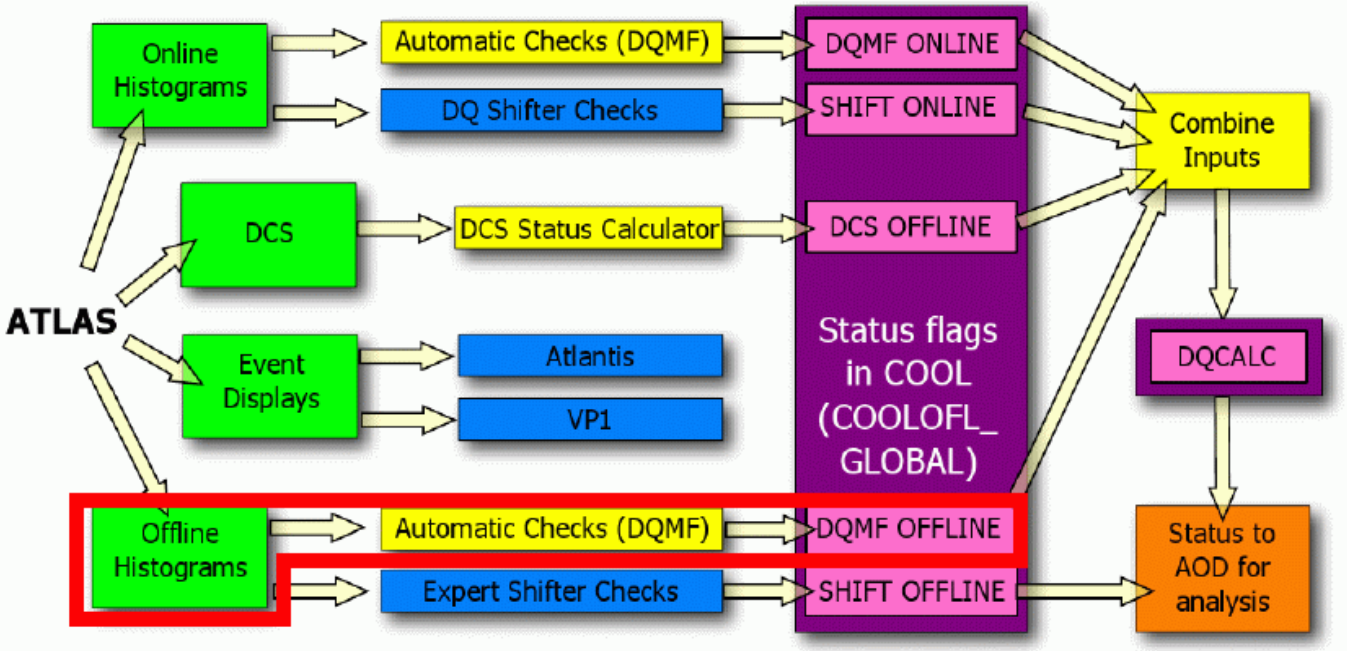
Peter Onyisi

THE UNIVERSITY OF CHICAGO

CHEP 2009, Prague
24 March 2009

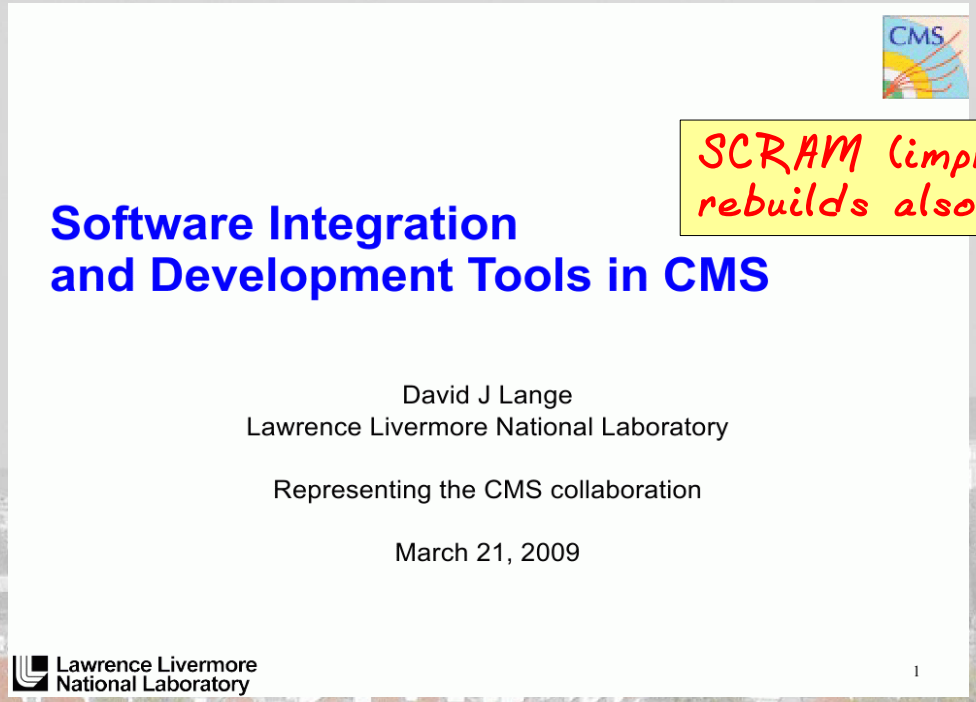
Monitoring

Data Quality Monitoring Tools

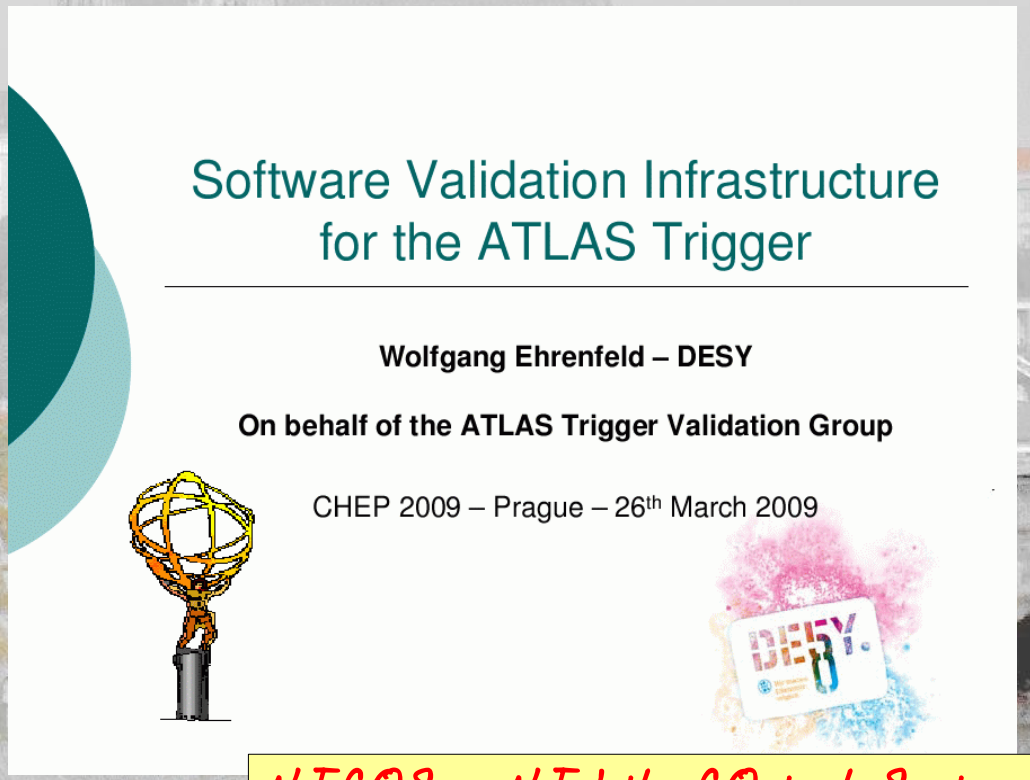


Covering one component of the full architecture here...

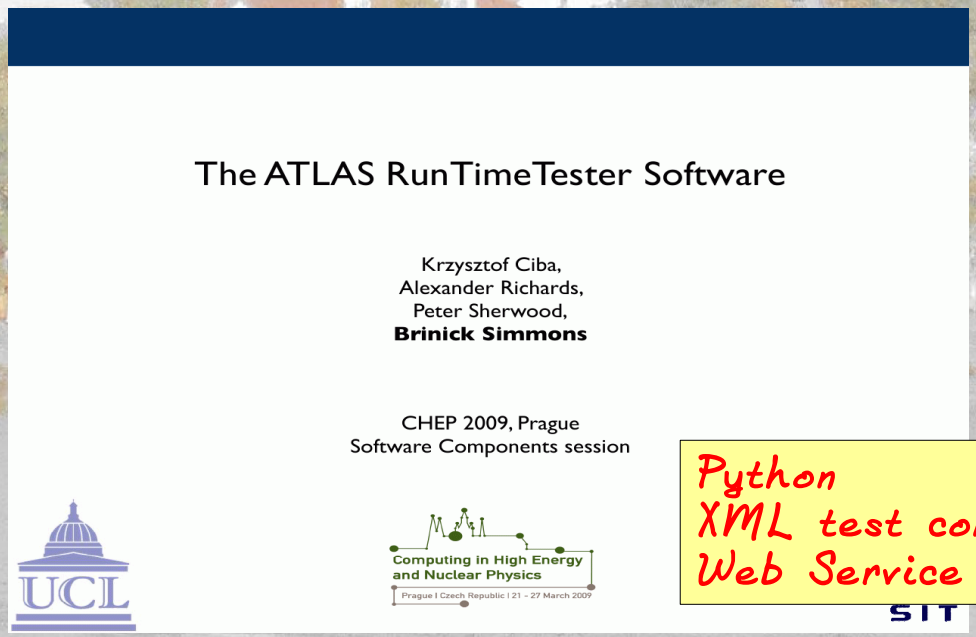
Development Environment (1)



SCRAM (improved), RPM, apt-get, PKGTOOLS, CMSDIST
rebuilds also external packages



NICOS - NIghtly COntrol System
ATN - AT Night Testing
RTT - Run Time Tester



Python
XML test configuration
Web Service

Development Environment (2)

Servicing HEP experiments with a complete set of ready integrated and configured common software components

Stefan Roiser [1], Ana Gaspar [1], Yves Perrin [1], Karol Kruzelzki [2]
CERN PH/SFT[1] & CERN PH/LBC[2]

Organization, Management, and Documentation of ATLAS Offline Software Releases

Presented by Frederick Luehring
Indiana University
On Behalf of the ATLAS Software Infrastructure Team (SIT)

Development Environment

7 million lines of code: C++/Python/Perl/Java/Fortran/SQL
220 cores for everyu nightly

Tools and Databases - 26 March 2009

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

Software Release Tools

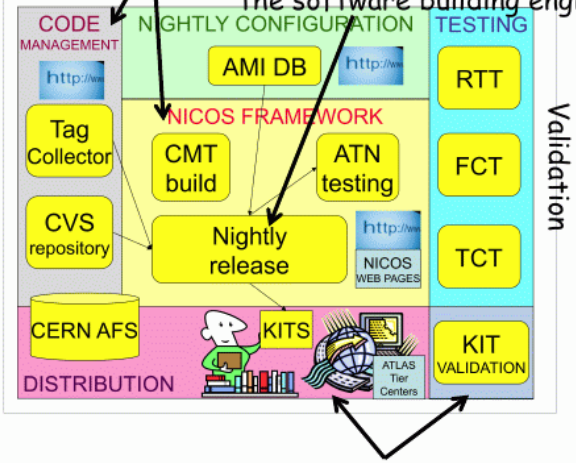
- The SIT uses a number of tools to build, test, and distribute the SW:
  1. CVS - the code repository that holds the code submitted by the developers
  2. Tag Collector (TC) - manages which software versions are used in the release
  3. CMT - manages software configuration, build, and use
  4. NICOS - drives nightly builds of the ATLAS

riety of tools
fficial releases
date the

tools, Pacman -
e distribution kit.
ools, we also
our code
ooks to
ow to use the

"Bedrock" base allowing the management of many developers and releases

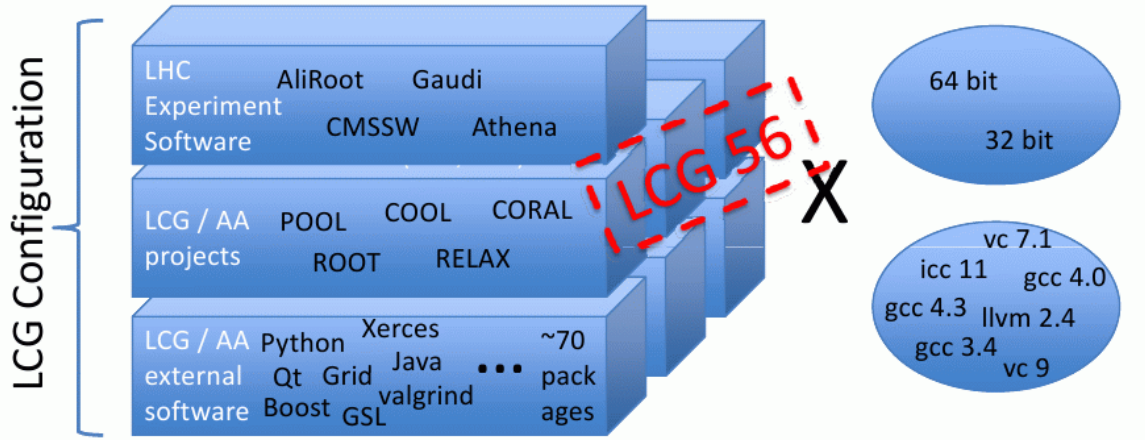
The control framework of the software building engine



Easy to use distribution tools

F. Luehring: ATLAS Computing 9

LHC Software



= ~ 20 different platforms

Building, testing, deployment

Virtualization

CernVM
SoFTware Appliance

CernVM - a virtual software appliance for LHC applications

C. Aguado-Sanchez [1], P. Buncic [1], L. Franco [1], A. Harutyunyan[2], P. Mato [1], Y. Yao [3]

1) CERN, Geneva,
2) Yerevan Physics Institute, Yerevan,
3) LBNL, Berkeley

Predrag Buncic (CERN/PH-SFT)

Linux standard

A comparison between xen and kvm

Andrea Chierici
Riccardo Veraldi
INFN-CNAF

CHEP 2009

Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

VML and CernVM Virtualization for ATLAS

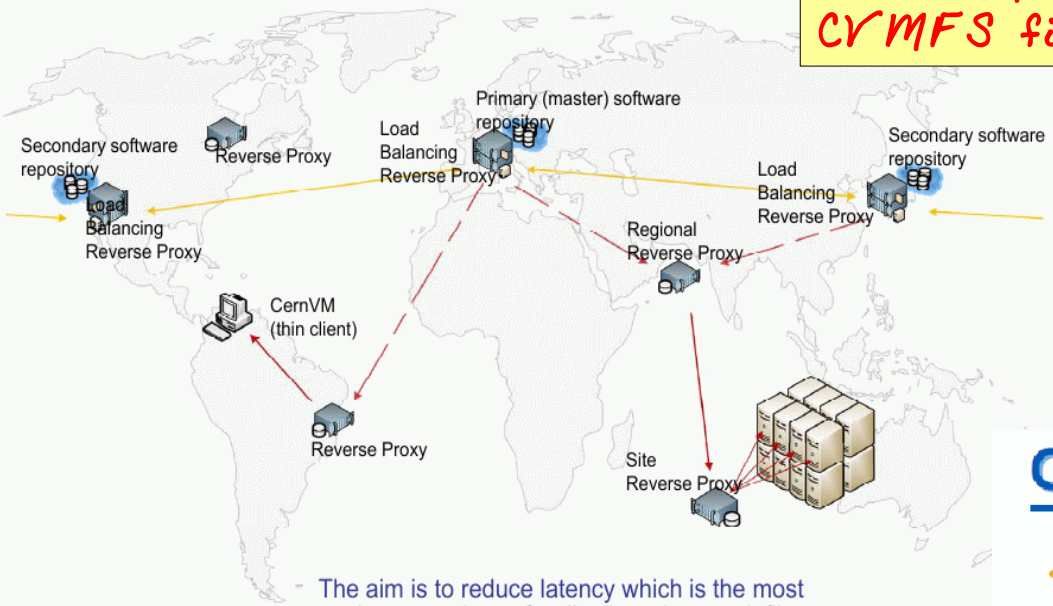
Yushu Yao, Paolo Calafiura, Charles Leggett (LBNL)
Andrea Cavalli, Julien Poffet, Frederic Bapst (EIA, Fribourg)

In collaboration with the CernVM Team

Virtualization (1)

CernVM
SoFTware Appliance

Current deployment model



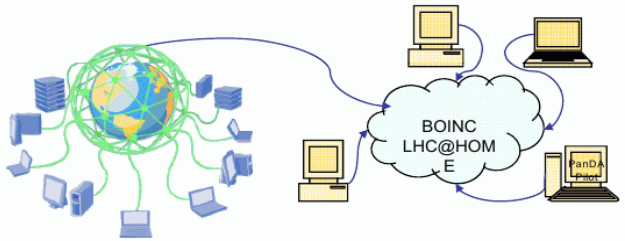
The aim is to reduce latency which is the most important issue for distributed network file systems

Virtual Machine + deployment and update infrastructure
CVMFS filesystem

CernVM
SoFTware Appliance

Bridging Grids & Clouds

- BOINC
  - Open-source software for volunteer computing and grid computing
  - http://boinc.berkeley.edu/
- CernVM CoPilot development
  - Based on BOINC, LHC@HOME experience and CernVM image
  - Image size is of outmost importance to motivate volonteers
  - Can be easily adapted to Pilot Job frameworks (AliEn,Dirac, Panda)
    - … or Condor Worker, or proofd..
  - Aims to demonstrate running of ATLAS simulation using BOINC infrastructure and PanDa



Virtualization (2)

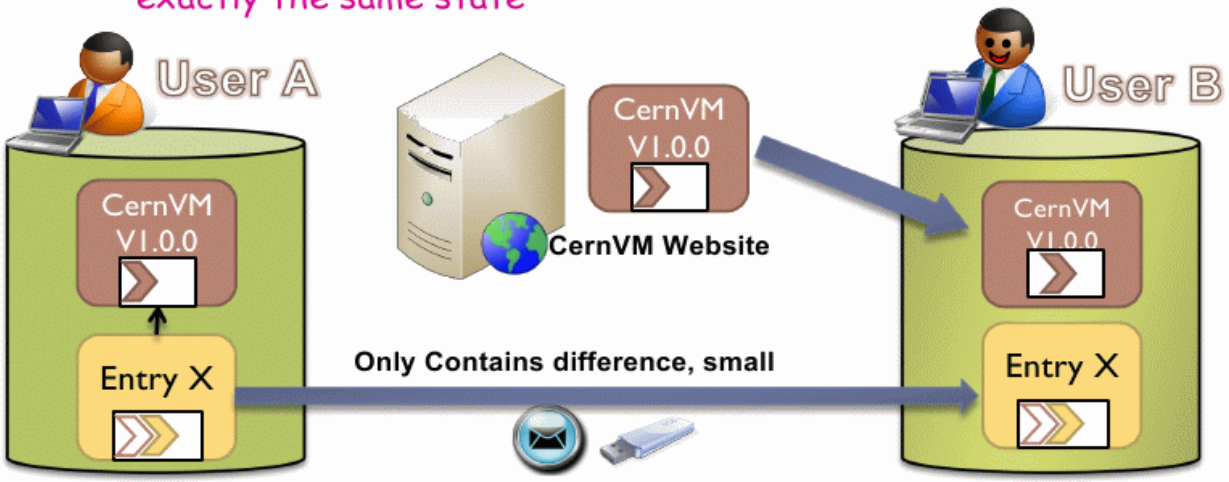
VML = Virtual Machine Logbook

CHEP 2009

Sharing Work with VML

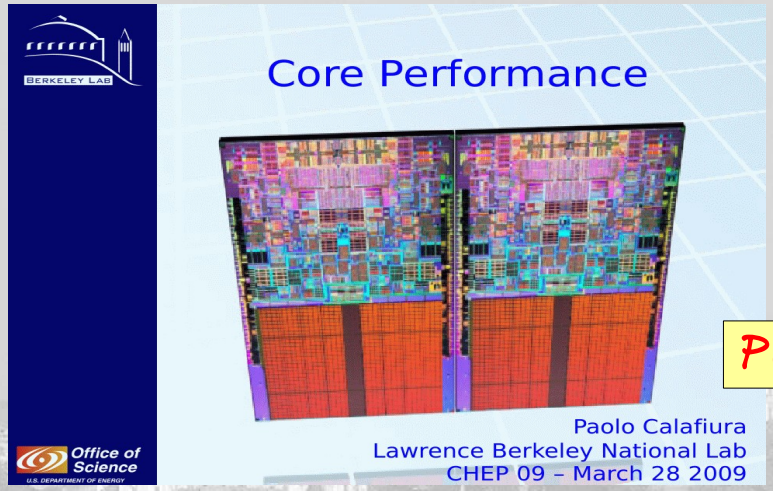
Computing in High Energy and Nuclear Physics
Prague | Czech Republic | 21 - 27 March 2009

- All your CernVM projects are based on certain version of CernVM (e.g. 1.01)
- VML can save a state of your work
  - the saved state contains only the difference from its base
  - The difference can be very small, that you can send it over email.
- To share your work, just send the difference to another user
  - VML will obtain the base CernVM automatically and reconstruct exactly the same state



Performance

Openlab
to be included in RHEL, it should be in the kernel



Plenary

An update on perfmon and the struggle to get into the Linux kernel

Andrzej Nowak
March 26th 2009

CERN openlab

CERN

CHEP 2009

GPU's for event reconstruction in FairRoot Framework

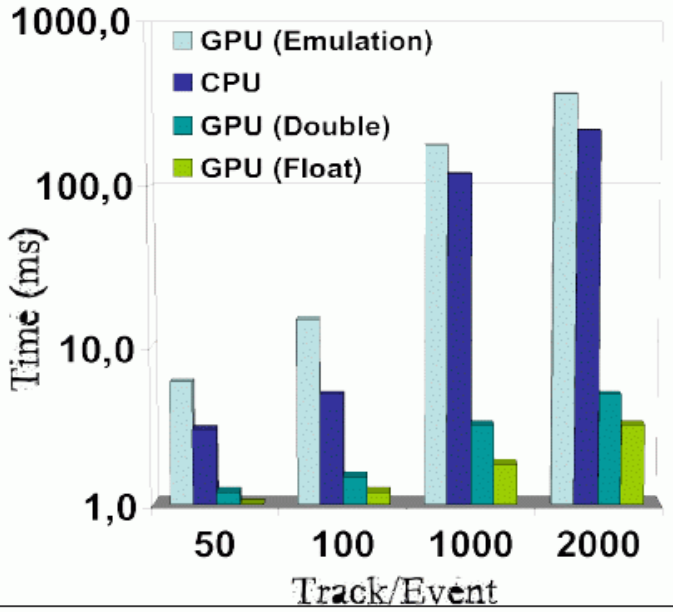
Mohammad Al-Turany (GSI-IT)
Florian Uhlig (GSI-IT)
Radoslaw Karabowicz (GSI-IT)

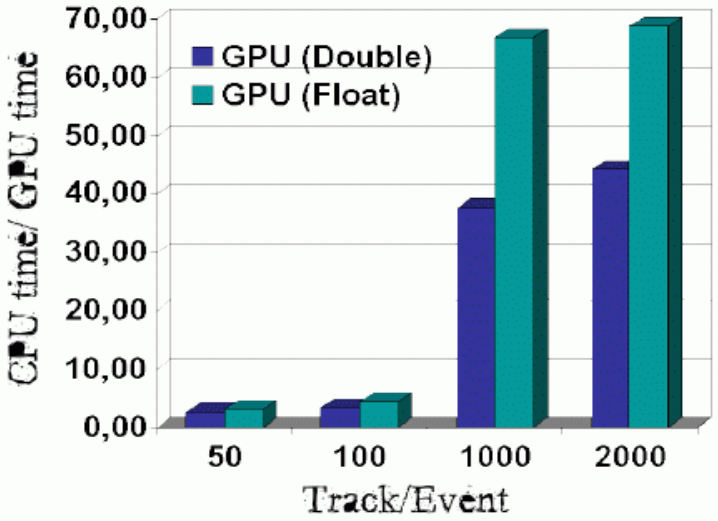
CUDA - Nvidia's Compute Unified Device Architecture, works with C
light threads (thousands threads)
vector and parallel processing
could gain order-of-magnitude in speed x expensive

Performance

What we gain?

Track/Event	50	100	1000	2000
GPU (Double)	2.5	3.3	37.5	44.0
GPU (Float)	3.0	4.2	66.7	68.8





Simulation

CHEP 2009
Prague, 21-27 March 2009

Design and performance evaluation of generic programming techniques in a R&D prototype of Geant4 physics

Maria Grazia Pia (INFN Genova)

M. Augelli, M. Begalli, E. Gargioni, B. Gros
P. de Queiroz Filho, L. Quintieri, P. Saracco, R.
M. Sudhakar, G. Weidenspointner, A.

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Loma Linda University Medical
Max-Planck-Institut für extraterrestrische Physik a
Physikalisch-Technische Bundesanstalt (PTB),
State University of Rio de Janeiro (

Maria Grazia Pia, *INFN Genova*

"design, design, design"

Development, validation and maintenance of Monte Carlo event generators & generator services in the LHC era

Dmitri Konstantinov

1

GENSER = LCG Generator Library
HEPMC = the MC Truth Interface
HEPML = metadata (XML)
RIVET = Robuste Independent Validation of Experiment and Theory

Misc

Job Life Cycle Management Libraries for CMS Workflow Management Projects

Stuart Wakefield on behalf of CMS DMWM group

Thanks to Frank van Lingen for the sli

CEDAR = Condor Communication layer
Security, authentication

Flexible Session Management in a Distributed System

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Condor

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Thanks