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for the CEDAR collaboration

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Fermilab, 2005-10-20

Combined e-Science Data Analysis Resource for high-energy physics

Tuning of Monte Carlo and other calculation programs:

building on



JetWeb.

Archive of published data from particle scattering experiments:

building on



HepData.

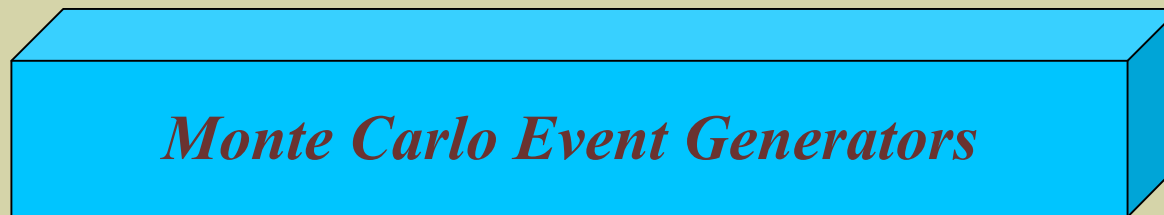
A software environment providing an open development
system for any HEP software:



HepForge.

A standardised set of data formats: **HepML.**

Why? (physics goals)



Provide background estimates
to searches for new physics

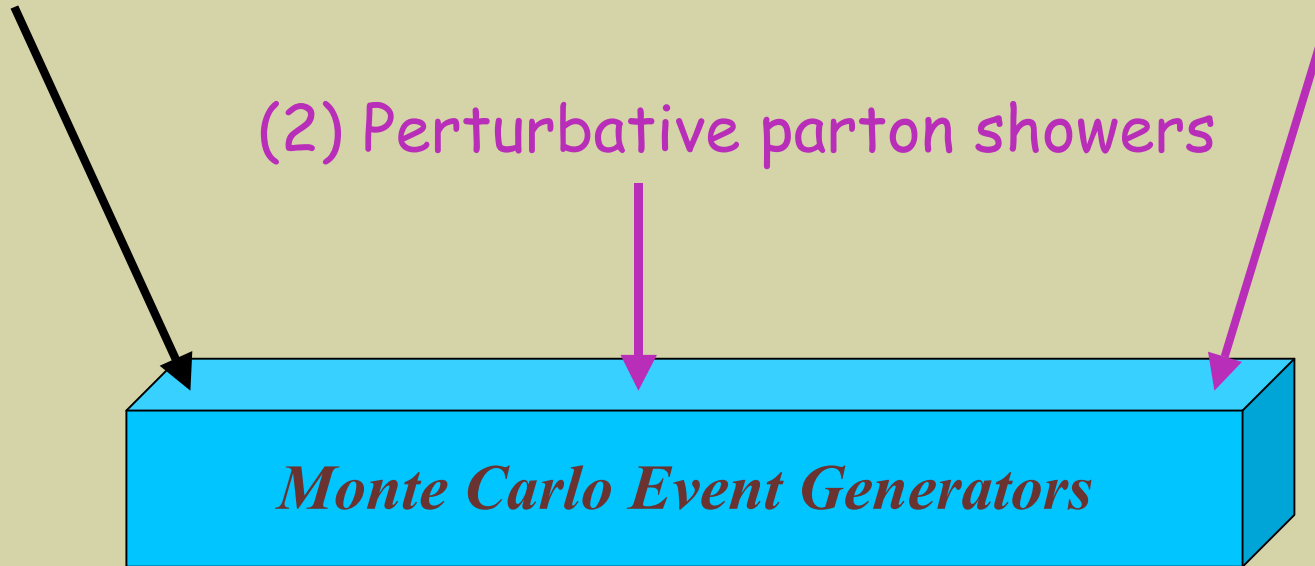
Used to extract true physics
signal from events observed by
experiments

Used to optimise the design of future facilities

(1) exact matrix elements
for fundamental process

(3) Phenomenological models
for non-perturbative physics

(2) Perturbative parton showers



(2) & (3) contain parameters that must be tuned to
experimental data.

Lots of available data from many experiments that
should be used simultaneously. Data from present/past
colliders (HERA, Tevatron, LEP, SPS) can be used to
tune/validate for future colliders (LHC, LC).



specifies a generator, version and parameters

Database of expt. data and MC plots from **HzTool routines**.

reproduce expt. distributions and comparable MC plots

Performs fits between **MC models** and selected ppbar, ep, ee data.



Web interface - find results of fits for given MC model and sets of data. If MC model not in database, submit request.

HzTool

Library of Fortran routines that reproduce published experimental distributions and comparable plots from MC events (can be used independently from **JetWeb**).

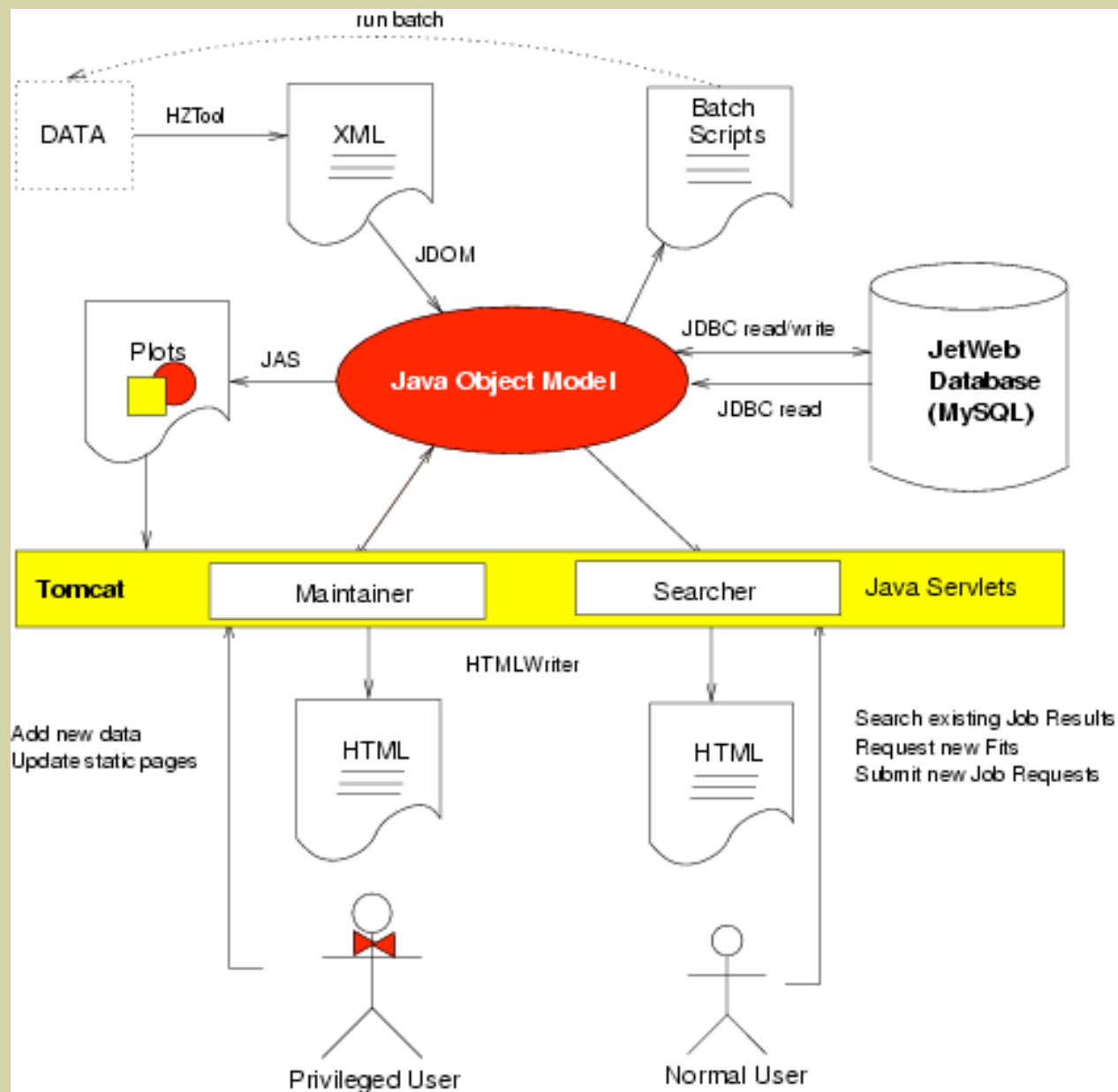
- typically one per paper
- generally written by paper authors
- should be independent of generator used

HzSteer

Collection of main programs submitted by **JetWeb** to generate MC events with parameters read from steering cards, including which **HzTool** routines to call.



JetWeb: behind the scenes





JetWeb search form

Search the JetWeb database

Specify any HERWIG parameters to be changed.

Get results Clear all parameters Default parameters Get by Fit ID: Sort results by: Fit (All data) Select plots to be included

Common parameters

Generator

Herwig v6.400 ☒ Minimum transverse momentum of hard scatters (GeV) Underlying event model(Integer 0-5) [More info](#)

Herwig v6.100 ☐ Photon PDF GRVLO ☐ Proton PDF GRVLO ☐ Intrinsic transverse momentum in photon (PYTHIA) (GeV) Intrinsic transverse momentum in proton (HERWIG photon also) (GeV)

Pythia v6.206 ☐ SaS1D ☐ CTEQ5L ☐ SaS2D ☐ CTEQ4L ☐ WHIT2 ☐

Herwig Parameters

PHAD PHRAD PRRAD QSPAC PRSOF IOPREM

BTCLM QCCLAM VQCUT CLMAX PSPLT1 PSPLT2

JetWeb: J. M. Butterworth, S. Butterworth, B. M. Waugh, University College London



JetWeb search results

Results sorted by Fit (All data)

http://jetweb.hep.ucl.ac.uk/JetWeb/JWSearch

Apple (163) eBay Amazon Yahoo! News (1134)

Results sorted by Fit (All data)

Last updated 19-Oct-2005 at 21:03:51

HERWIG v6.400 run 07/11/2003 PDFs: Photon **GRVLO** Proton **CTEQ4L** PTMIN **3.0GeV** UE **JIMMY+SUE** Photon kt:0.0 Proton kt:0.0 Scale **1.55**: Fit ID **624**: [Plots etc](#)

Combined: Chi2/Dof: All: **3.33** High ET: **2.91** Low ET: **2.45** Jet Shape: **4.72** Charm: **8.71**

EP Lumi 69.210182 pb⁻¹ Chi2/Dof: All: 3.35 High ET: 2.91 Low ET: 2.43 Jet Shape: 5.16 Charm: 8.71

EE Lumi 2800.0 pb⁻¹ Chi2/Dof: All: 6.69 High ET: ? Low ET: 4.05 Jet Shape: 21.22 Charm: ?

PP Lumi 0.00013 pb⁻¹ Chi2/Dof: All: 1.02 High ET: ? Low ET: 0.06 Jet Shape: 1.56 Charm: ?

HERWIG v6.400 run 13/12/2003 PDFs: Photon **SaS1D** Proton **CTEQ5L** PTMIN **3.0GeV** UE **JIMMY+SUE** Photon kt:0.0 Proton kt:0.0 Scale **1.7**: Fit ID **843**: [Plots etc](#)

Combined: Chi2/Dof: All: **3.53** High ET: **1.88** Low ET: **2.87** Jet Shape: **6.51** Charm: **4.27**

EP Lumi 15.458857 pb⁻¹ Chi2/Dof: All: 2.9 High ET: 1.88 Low ET: 2.51 Jet Shape: 5.83 Charm: 4.27

EE Lumi 500.0 pb⁻¹ Chi2/Dof: All: 8.41 High ET: ? Low ET: 4.22 Jet Shape: 31.5 Charm: ?

PP Lumi 0.00014 pb⁻¹ Chi2/Dof: All: 2.91 High ET: ? Low ET: ? Jet Shape: 2.91 Charm: ?

HERWIG v6.400 run 04/08/2003 PDFs: Photon **GRVLO** Proton **CTEQ5L** PTMIN **3.0GeV** UE **JIMMY+SUE** Photon kt:0.0 Proton kt:0.0 Scale **1.6**: Fit ID **627**: [Plots etc](#)

Combined: Chi2/Dof: All: **3.55** High ET: **2.67** Low ET: **3.02** Jet Shape: **5.39** Charm: **5.38**

EP Lumi 74.878387 pb⁻¹ Chi2/Dof: All: 3.38 High ET: 2.67 Low ET: 3.08 Jet Shape: 5.11 Charm: 5.38

EE Lumi 2800.0 pb⁻¹ Chi2/Dof: All: 7.23 High ET: ? Low ET: 4.68 Jet Shape: 21.22 Charm: ?

PP Lumi 0.00014 pb⁻¹ Chi2/Dof: All: 1.81 High ET: ? Low ET: 0.03 Jet Shape: 2.91 Charm: ?

HERWIG v6.400 run 04/08/2003 PDFs: Photon **SaS2D** Proton **CTEQ5L** PTMIN **3.0GeV** UE **JIMMY+SUE** Photon kt:0.0 Proton kt:0.0 Scale **1.65**: Fit ID **703**: [Plots etc](#)

Combined: Chi2/Dof: All: **3.62** High ET: **2.43** Low ET: **2.56** Jet Shape: **6.49** Charm: **7.2**

EP Lumi 67.512817 pb⁻¹ Chi2/Dof: All: 3.43 High ET: 2.43 Low ET: 2.54 Jet Shape: 6.96 Charm: 7.2

EE Lumi 1700.0 pb⁻¹ Chi2/Dof: All: 8.36 High ET: ? Low ET: 4.22 Jet Shape: 31.13 Charm: ?

PP Lumi 0.00036 pb⁻¹ Chi2/Dof: All: 1.34 High ET: ? Low ET: 0.13 Jet Shape: 2.02 Charm: ?

HERWIG v6.400 run 01/08/2003 PDFs: Photon **WHIT2** Proton **CTEQ5L** PTMIN **3.0GeV** UE **JIMMY+SUE** Photon kt:0.0 Proton kt:0.0 Scale **1.8**: Fit ID **695**: [Plots etc](#)

Combined: Chi2/Dof: All: **3.72** High ET: **2.01** Low ET: **3.01** Jet Shape: **7.21** Charm: **2.43**

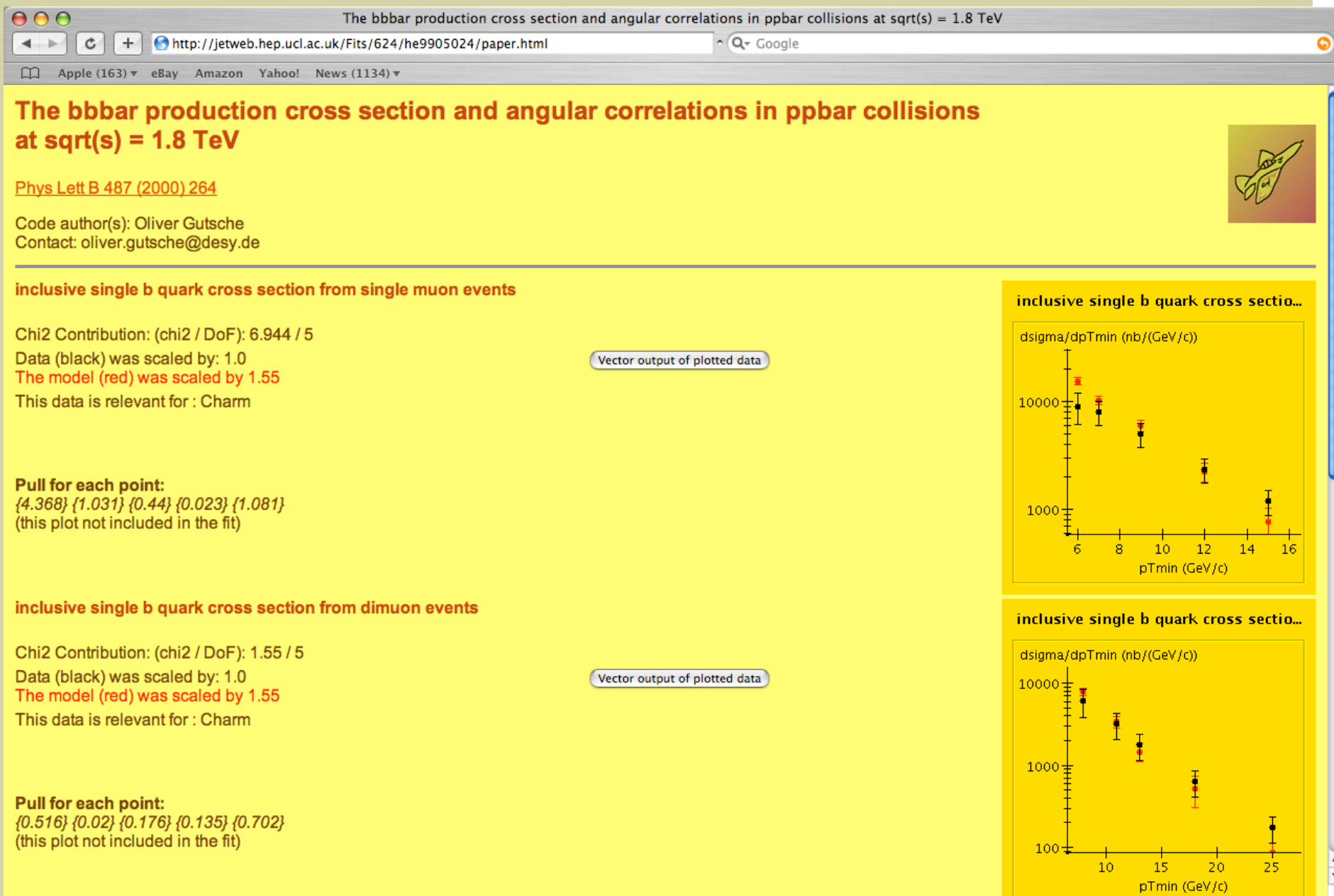
EP Lumi 46.0 pb⁻¹ Chi2/Dof: All: 3.48 High ET: 2.01 Low ET: 2.74 Jet Shape: 9.17 Charm: 2.43

EE Lumi 1300.0 pb⁻¹ Chi2/Dof: All: 8.92 High ET: ? Low ET: 5.83 Jet Shape: 25.89 Charm: ?

PP Lumi 0.00036 pb⁻¹ Chi2/Dof: All: 1.35 High ET: ? Low ET: 0.15 Jet Shape: 2.02 Charm: ?



JetWeb fit and plots





JetWeb: status and ongoing work

- Database frozen: can search but not submit jobs.
- Framework being adapted to make the addition of new physics models (generators, NLO programs) easier.
- Experimental data to be accessed from HepData, rather than duplication in a separate database.

HzTool: status and ongoing work

- Now hosted by CEDAR as a HepForge project.
- Interfaces to ARIADNE, CASCADE, HERWIG (inc. JIMMY), LEPTO, PYTHIA, PHOJET, QCDINS, RAPGAP, RIDI and DJANGO.
- Development of a C++ replacement of HzTool (Rivet) has begun.
- Many new analysis routines since first release (HERA, Tevatron, LEP, SPS). Many new analysis routines needed, including many from Tevatron Run I and Run II.

note: Authors of relevant analyses please write an HzTool routine. See <http://hepforge.cedar.ac.uk/hztool/tutorial> for a tutorial on writing and testing your own routine and send it to hztool@cedar.ac.uk



HepData: Durham HEP Database

published data distributions available as text files

parton distribution functions

UK mirror to:

SPIRES

PDG

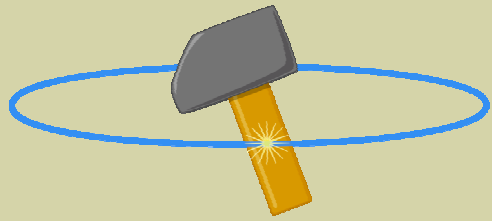
<http://durpdg.dur.ac.uk/hepdata>



HepData: status and ongoing work

- Database currently uses a hierarchical management system. A relational database using MySQL is being developed.
- Data currently available as “flat” text files, good for humans, but not for automated tools. Front ends to be provided which will present the data in a choice of formats (via HepML), allowing access by JetWeb (and other users).
- Similarly, data currently input as text files. A standardised HepML format being devised.

(note: for now please submit a text file containing the results of any published data to M.R.Whalley@durham.ac.uk to ensure your results are available to others!)



HepForge

A development environment for hep software projects which provides developers with:

- Shell account with up to date tools (compilers, autotools)
- Web page hosting
- CVS or Subversion code repository
- Mailing lists
- Bug tracker and wiki

Current projects using **HepForge**:

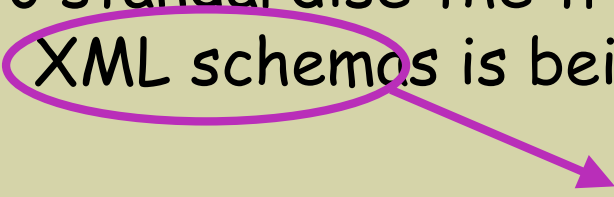
fastNLO, HepML, Herwig, Herwig++, HZSteer, HZTool, JetWeb, Jimmy, KtJet, LHAPDF, RunMC, ThePEG

Eventually **HepForge** will also host **HepCode**: a project to provide access to well-defined versions of MC generators, pdfs and other hep calculation codes.

If you are interested in registering a project send a mail to: hepforge@cedar.ac.uk

HepML

To standardise the transfer of data between projects a set of XML schemas is being defined: HepML.

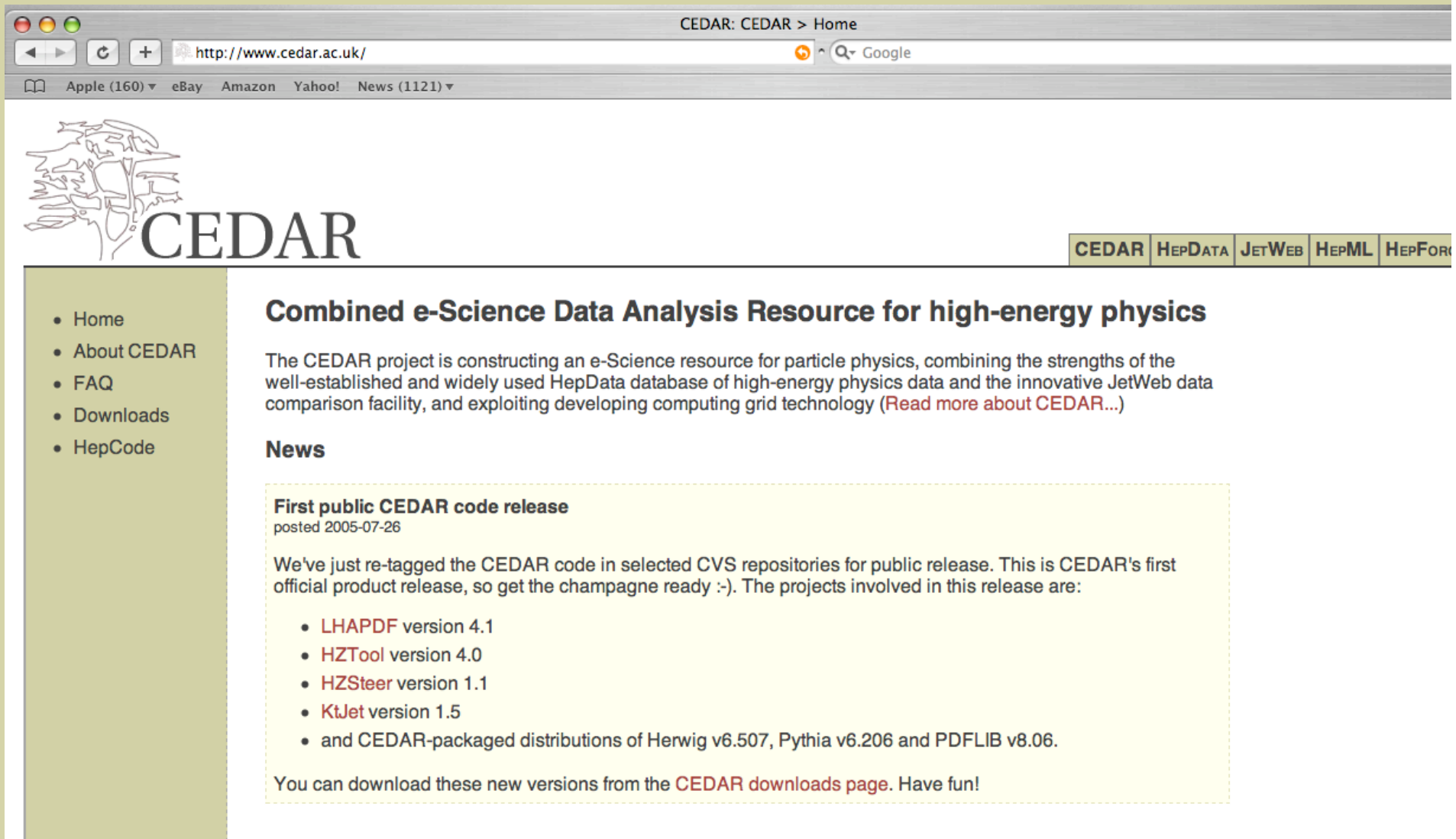


description of what comprises a valid XML document for our purposes

HepML will be used to describe:

- HepData records (expt. results).
- Monte Carlo generator logfile outputs (to be used by JetWeb to access parameters).

Bringing it all together:



The screenshot shows a web browser window with the address bar displaying <http://www.cedar.ac.uk/>. The browser's title bar reads "CEDAR: CEDAR > Home". Below the address bar, there are search and navigation buttons, and a list of links: Apple (160), eBay, Amazon, Yahoo!, and News (1121). The main content area features the CEDAR logo on the left, which includes a stylized tree icon and the word "CEDAR". To the right of the logo is a navigation bar with links: CEDAR, HEPDATA, JETWEB, HEPML, and HEPFOR. The main heading is "Combined e-Science Data Analysis Resource for high-energy physics". Below this, a paragraph describes the project: "The CEDAR project is constructing an e-Science resource for particle physics, combining the strengths of the well-established and widely used HepData database of high-energy physics data and the innovative JetWeb data comparison facility, and exploiting developing computing grid technology ([Read more about CEDAR...](#))". A "News" section follows, with a sub-heading "First public CEDAR code release" and a date "posted 2005-07-26". The news text states: "We've just re-tagged the CEDAR code in selected CVS repositories for public release. This is CEDAR's first official product release, so get the champagne ready :-). The projects involved in this release are:". A bulleted list follows:


- [LHAPDF](#) version 4.1
- [HZTool](#) version 4.0
- [HZSteer](#) version 1.1
- [KtJet](#) version 1.5
- and CEDAR-packaged distributions of Herwig v6.507, Pythia v6.206 and PDFLIB v8.06.

The news section concludes with: "You can download these new versions from the [CEDAR downloads page](#). Have fun!".

CEDAR: CEDAR > Home

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Combined e-Science Data Analysis Resource for high-energy physics

The CEDAR project is constructing an e-Science resource for particle physics, combining the strengths of the well-established and widely used HepData database of high-energy physics data and the innovative JetWeb data comparison facility, and exploiting developing computing grid technology ([Read more about CEDAR...](#))

News

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posted 2005-07-26

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- First official public release was in July!
- Web page is up and functional.
- Status of individual projects:
 - **JetWeb** is frozen whilst developments are made
 - **HepData** is running as before whilst developments are made
 - **HepForge** is active and hosting several projects
 - **HepML** is being developed

What CEDAR needs from the hep community

(make sure the best possible use is made of your result!!)

- HzTool routines for all analyses that can be used to tune/validate Monte Carlo generators. See <http://hepforge.cedar.ac.uk/hztool/tutorial> for a tutorial on writing and testing your own routine and e-mail it to hztool@cedar.ac.uk
- HepData record of any published results (for now a text file). E-mail it to M.R.Whalley@durham.ac.uk
- Data should be corrected for any detector effects to make them useful to the outside world!

Summary

- **CEDAR** is a combination of the already established **JetWeb** and **HepData** projects and more (**HepForge**, **HepML**, **HepCode**).
- The project is well underway with the first public release out in July 2005.
- **CEDAR** should prove to be pivotal in the validation and tuning of MC generators required for present and future colliders.
- The Tevatron is an ideal place to make the measurements required to validate/tune for the upcoming start of the LHC! Make sure your results are included!