
LARP Software

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LARP/LHC Software: Goals

- List, define and explain S/W projects
 - Define "endpoints"
 - *Especially: Inception and completion*
 - Find common issues
 - Help with common solutions
- Identify people who will do the work
- Ensure that all effort benefits LHC
 - Especially initial commissioning!

For each piece of S/W ...

- Is it a realistic project that can be completed/made useful
 - In 6 months?
 - In one year?
- If so ...
 - Who is going to do it?
 - How long will it take
 - *In calendar days and in FTE effort*
 - How will it be used at LHC?
 - What, specifically, will it do?
 - Test during SPS re-commissioning in Summer 06?



Possible LARP Software Projects

- SDA
 - T. Bolshakov, E. McCrory & J. Slaughter
- CHEF for linear and nonlinear analysis & diagnosis
 - L. Michelotti & J-F Ostiguy
- Passive tune control from Schottky data
 - R. Moore
- Orbit control feedback
 - V. Ranjbar
- Control of tune and chromaticity drift at injection and ramp
 - M. Martens
- Schottky monitor software
 - A. Jansson, et al.
- PLL and tune feedback
 - C-Y Tan

Other LHC Software at FNAL

- Not part of LARP mission:
 - LHC@FNAL
 - *Remote operations center, to be located, we think, in WH1*
 - *E. Gottschalk, et al.*
 - Helping with the writing of LHC applications
 - *S. Gysin starting to investigate this*
- LARP web pages
 - larp.fnal.gov
 - *My feeble attempt to make a LARP web page*
 - dms.uslarp.org
 - *A Plone-based DMS in TD*
 - *J. Konc*

Summary of LARP S/W Issues

- Devise an algorithm for LHC
 - How does LHC differ from our experience?
 - *Hardware, lattices, studies, etc.*
- Implement the algorithm at CERN
 - How does one write an application for LHC?
 - *How do you write, compile, test, store, release an application?*
 - *How do you get data?*
 - *Long-term support?*
 - *Intro: Jim Patrick's talk, last time*
 - We need an LHC "Hello World!" application

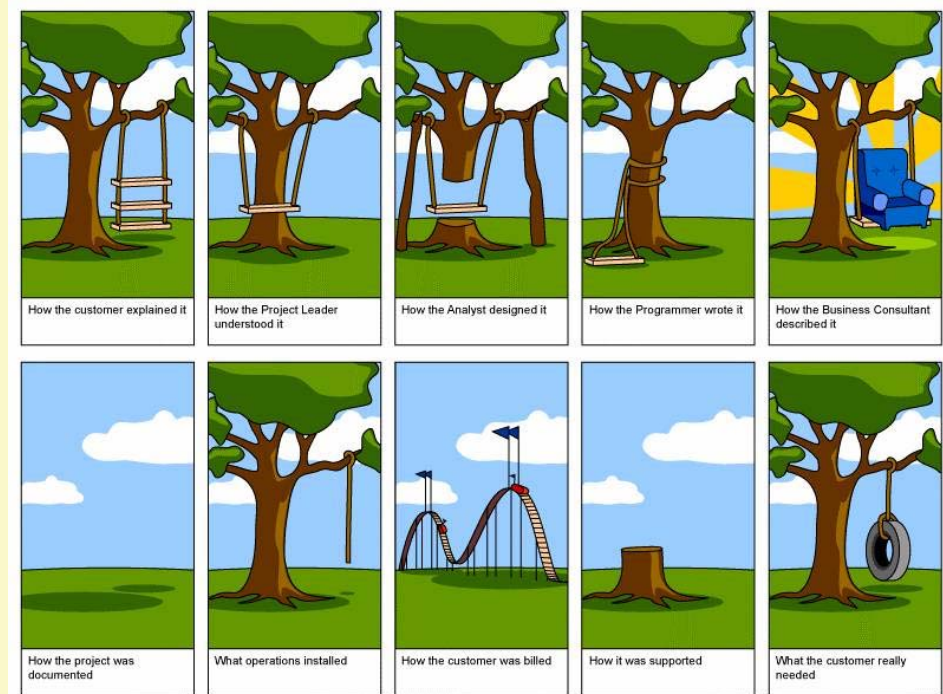


LARP/Lab support: Logistics

- LARP and the lab need to decide:
 - Will we really be able to spend significant time on LARP?
 - Will we really be able to move to CERN for a year?
 - *Abandon local responsibilities?*
 - *Homes here/lodging there, taxes, schools, spouses, etc.*
- Most respondents echoed these concerns

Outline

- Go over some of the details of each identified S/W project
 - SDA
 - CHEF
 - Orbit Control
 - Chromaticity drift
 - Schottky
 - PLL/Bar-B-Q
 - Other concerns
 - *Web pages*
 - *LHC@FNAL*



SDA at LHC

- LHC does not have this concept
 - Post Mortem for failures
 - Timber data logger
 - *Would be a crucial part of SDA*
 - *But does not have*
 - *Time abstraction*
 - *Recalculations*
- Take our software to run it at LHC?
 - T. Bolshakov and I are interested/enthusiastic
 - M. Lamont has tentatively identified worker(s?) to think about this idea.



What is SDA?



- **Sequenced Data Acquisition**
 - Storing any data into a relational DB
 - Indexed by the "shot number"
 - *"Time" is translated to human-understandable form*
 - *Case, Set*
 - Applicable to any "big event"
- **Shot Data Analysis**
 - The Supertable
 - High-level summaries of Sequenced DA "shots"
 - Includes calculations that are not done in front ends
 - *E.g., transmission efficiencies*
- **Recalculations (in Shot Data Analysis)**
 - *E.g., emittances*

SDA At LHC: Bolshakov

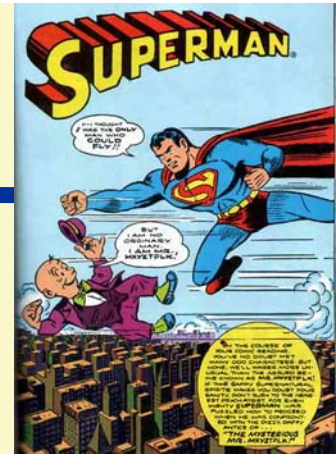
- Our experience with both SDA's can create a simpler, better system
 - Do not repeat mistakes!
- TB will think about prototype SDA's
 - Need SDA Editor and Viewer
 - Process to run on SDA sequencer
 - *Need to understand the event and device models at LHC*
- Can begin as a system that only runs from data logger
 - But this is not what we want, ultimately.
 - *Recalculations: a crucial part of Shot Data Analysis*
 - SDA DB provides redundancy to data logger DB
 - *And vice versa.*

CHEF

- Francois Ostiguy and Leo Michelotti
 - LM has transferred to CD
- MXYZPTLK, Beamline, etc.
 - Well established differential algebra tracking software
 - *Arbitrary order*
 - Extensive libraries
 - *Operator overloading is fundamental*
 - C++
 - *Completely rewritten in the last 3 months*
 - *E.g., "smart pointers"*
 - *60 times faster than previous version*
 - Python (PyCHEF)

CHEF: Mxyzptlk

Mister Mxyzptlk (pronounced ZYE-tul) is the name used on Earth (his true name is untranslatable) by a devilish being from another plane of reality, completely different from our own, which he calls the "Fifth Dimension." **A trickster whose deviousness knows no bounds or limits**, he is only able to travel to our dimension once every ninety days. Once here, his only goal is to cause as much trouble as he can. His past "pranks" have included forcing Superman and the Flash to compete against each other in an around-the-world foot race, and the creation of Red Kryptonite, a variant version of the more deadly green Kryptonite which temporarily robbed Superman of his powers. **Ever unpredictable, Mxyzptlk continues to plot and scheme, waiting for his next opportunity to cause mayhem and mischief.**

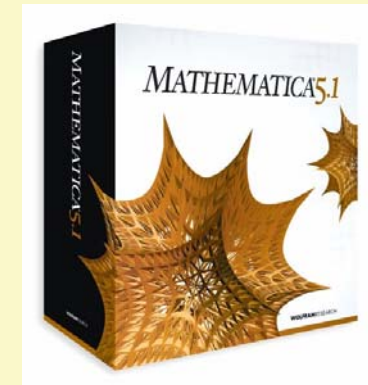




CHEF and Python



- All Mxyzptlk classes are cast to be used in Python - PyCHEF.
 - Magic of C++ templates!
- All Python data analysis classes avail
 - FFT, signal processing, etc...
 - Same libraries used by Mathematica
- Simple examples for powerful operations
 - See J-F. Ostiguy for demonstration.

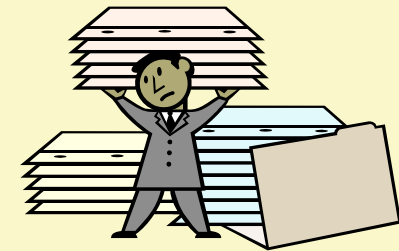


CHEF: LHC Plan

- Get Lattice Files
 - Dynamically
 - ...
- Determine relevance to commissioning
 - Algorithms specified so far are simple to implement

CHEF: LHC Lattice Files

- Specified in "sequence files"
 - MAD X input scheme
 - *Drifts are implied, not specified directly*
 - Completely flat lattice description
 - *Yuck!*
 - Gigantic files!
 - *Used in the control system*
- J-F. O. will write parser for this
 - About 1 month of work
 - Can reuse a lot of existing code
 - *E.g., expressions*



CHEF: Possible Calculations

- Suggestions from T. Sen
- Linear analysis
- Nonlinear analysis



CHEF: Linear Analysis

- Using difference orbits data
 - Beta beating, dispersion beating etc
 - Find sources of error
 - *Mis-powered or misaligned quads etc*
 - *Valishev has an algorithm that uses the orbit response matrix*
- Using turn by turn orbit data, extract with high precision:
 - Beta and dispersion functions, phase advances between BPMs, coupling angles, ...

CHEF: Nonlinear Analysis

- With turn by turn orbit data
 - Detuning with amplitude,
 - Resonance driving terms
 - *Frank Schmidt has algorithm*
- Linear & 2nd order chromaticity of an insertion
 - With thick quads
 - Chromatic dependence of the usual Twiss functions.
- Calculate measures of nonlinearity of a map
 - L2 measure of a map at specified amplitudes,
 - Nonlinear resonance driving terms,
 - Resonance widths,
 - Detuning with amplitude
- Algorithms for nonlinear correction of the IR
 - E.g. the one implemented in the baseline LHC optics
- Frequency map analysis and chaotic boundary with short term tracking

CHEF: Short-term plan

- Next 3 months
 - Generate sample of what CHEF can do
 - Get another person to help
- Generate an algorithm that is relevant to LHC commissioning
 - E.g., F. Schmidt's algorithm from 10-Nov-05 seminar
- Make this easy to use
- Demonstrate it far and wide



Schottky Monitor Software

- Collaborators

- FNAL

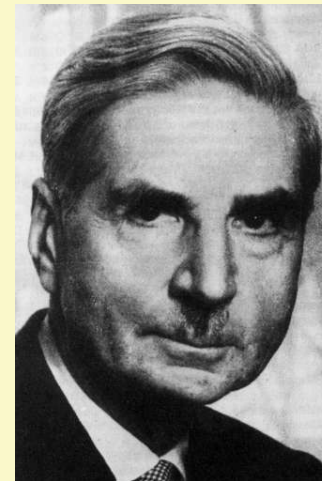
- *R. Pasquinelli, P. Lebrun, D. Sun, D. Tinsley, A. Jansson*

- BNL

- *P. Cameron, P. Oddo*

- CERN

- *F. Caspers, R. Jones*



- Porting the Fermilab Schottky analysis software to the CERN control system framework.

- CERN provides the generic controls communications software and the platform for running the code.

- (FNAL, FY'06-07)

- How to run it?

- In a "black box" (like our OAC)?

- In a dedicated, stand-alone PC? (AJ's preference)



PLL and Tune Feedback

- C-Y. Tan
- "Bar B Q"
- Will follow the same path as Schottky
 - Use vector signal analyzer?
 - *Probably just a port of existing Tevatron software*
 - Use VSA, DAQ board, etc.?
 - *Much bigger software effort*
 - *Again, rely on Schottky solution*



Passive Control from Schottky Data

- Ron Moore

- Experienced Java programmer
- Wants to help!
 - *User interfaces?*
 - *Bunch by bunch display*
 - *This may be our "Hello World!" example*



- Our experience

- The pbar tunes must be adjusted throughout the store due to beam-beam tune shift
- Have implemented an alarm to advise when to change tunes

- Will LHC be willing to run PLL/BBQ during stores?

- If not, then this sort of passive tune data may be necessary to do a feedback.

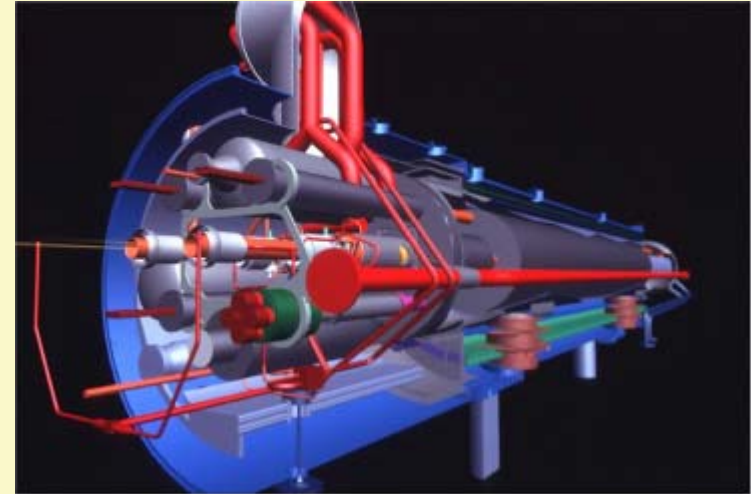
Orbit Control Feedback

- Vahid Ranjibar
 - CERN folks: Jorg Wenninger & grad student
 - *Also working on collimation*
- Our experience
 - Tevatron orbit control works now
 - Simple algorithms to enable global orbit control
 - But has been a major effort
 - *Highly iterative*

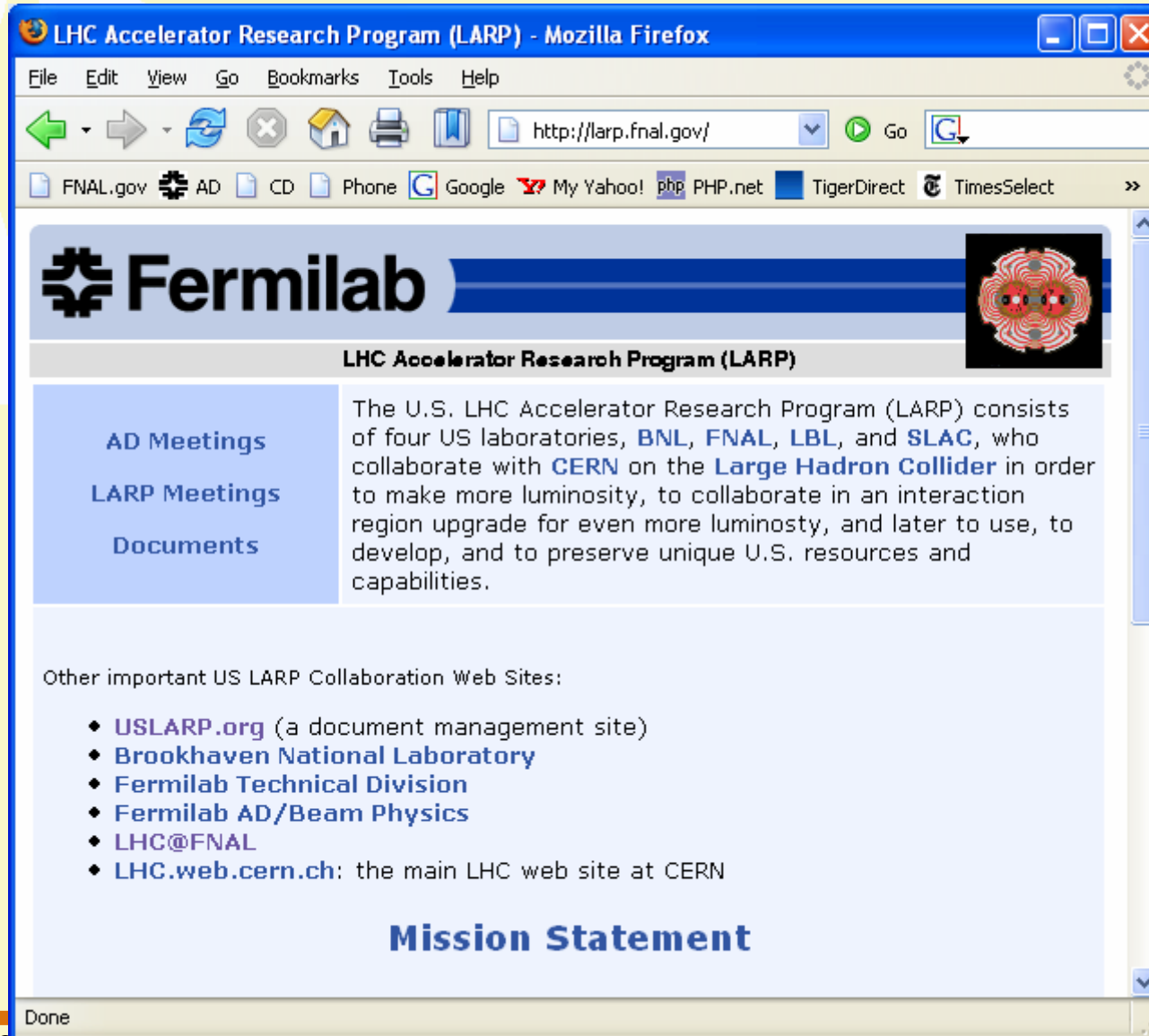


Tune/Chromaticity Drift Control

- Mike Martens
- Ordered to-do list
 - Understand the magnets
 - *Chromaticity circuits*
 - *How do they ramp?*
 - Get beam-based studies to determine
 - *Details of magnet fields*
 - *Magnet measurements are incomplete, by design*
 - *Specifics of the algorithms necessary*
 - Implement the algorithm
 - *Actually, a small amount of work, once the previous steps are completed.*



LARP Web Pages: larp.fnal.gov



The screenshot shows a Mozilla Firefox browser window titled "LHC Accelerator Research Program (LARP) - Mozilla Firefox". The address bar displays "http://larp.fnal.gov/". The browser's menu bar includes File, Edit, View, Go, Bookmarks, Tools, and Help. The toolbar contains navigation icons (back, forward, home, stop, refresh) and a search engine icon. The browser's bookmark bar shows links for FNAL.gov, AD, CD, Phone, Google, My Yahoo!, PHP.net, TigerDirect, and TimesSelect.

The website content features the Fermilab logo and the title "LHC Accelerator Research Program (LARP)". A sidebar on the left contains links for "AD Meetings", "LARP Meetings", and "Documents". The main content area contains the following text:

The U.S. LHC Accelerator Research Program (LARP) consists of four US laboratories, [BNL](#), [FNAL](#), [LBL](#), and [SLAC](#), who collaborate with [CERN](#) on the [Large Hadron Collider](#) in order to make more luminosity, to collaborate in an interaction region upgrade for even more luminosity, and later to use, to develop, and to preserve unique U.S. resources and capabilities.

Other important US LARP Collaboration Web Sites:

- ◆ [USLARP.org](#) (a document management site)
- ◆ [Brookhaven National Laboratory](#)
- ◆ [Fermilab Technical Division](#)
- ◆ [Fermilab AD/Beam Physics](#)
- ◆ LHC@FNAL
- ◆ LHC.web.cern.ch: the main LHC web site at CERN

Mission Statement

Done

USLARP.org Plone Site

The screenshot shows a Mozilla Firefox browser window displaying the USLARP Document Management System. The browser title is "Welcome to the USLARP Document Management System — USLARP - Mozilla Firefox". The address bar shows "https://dms.uslarp.org/". The browser's menu bar includes File, Edit, View, Go, Bookmarks, Tools, and Help. The browser's toolbar contains various icons for navigation and actions. The browser's status bar at the bottom shows "Done" and "dms.uslarp.org".

The website header features the USLARP logo, which is a stylized red and white circular design resembling a particle detector. To the right of the logo, the text reads "U.S. LARP Large Hadron Collider Accelerator Research Project". Below the logo and text, there are navigation tabs for "home", "news", and "members". A search box is located to the right of the navigation tabs, with a "search" button. The browser's status bar shows "you are here: home".

The main content area is titled "Welcome to the USLARP Document Management System" and includes a sub-header "This repository can be used to store, organize and exchange documents relating to LARP." Below this, there is a section titled "LARP Mission Statement (see [this BNL site](#)):" followed by a paragraph of text. The text describes the US LHC Accelerator Research Program and its goals. Below the mission statement, there are two sections: "Other LARP resources on the web..." and "Some important Tips for users of this site".

The left sidebar contains a "navigation" menu with links to Home, Members, Groups, Accelerator Systems, Magnet R&D, Program Management, Presentations, Help & How-Tos, LARP DMS Log, Protected Folders, and LARP Schedule. Below the navigation menu is a "recent items" section, which currently shows "No items published or changed since your last log-in." and a "More..." link.

The right sidebar contains a "news" section with a link to "New Tips and Help for Users" dated "2005-10-29" and a "More..." link. Below the news section is a calendar for "November 2005". The calendar shows the days of the week (Su, Mo, Tu, We, Th, Fr, Sa) and the dates (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30). The date "11" is highlighted in orange.

LARP = Live Action Role Playing

NewOrder 2005, vom 18.-21.08.2005: NewOrder 2005, vom 18.-21.08.2005 auf dem Zeltgelände Burg Waldeck - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.larp.net/

FNAL.gov AD CD Phone Google My Yahoo! PHP.net TigerDirect TimesSelect Latest Headlines

DIE LARP - ZUSAMMENKUNFT SEIT 2002



home spielkonzept anmeldungen community info & faq kontakt

>> NewOrder 2005, vom 18.-21.08.2005 auf dem Zeltgelände Burg Waldeck

NEWS



++Bilder des NewOrder 2005



Unten findet Ihr die ersten Bilder des diesjährigen NewOrder. Wir haben sie in drei Gallerien unterteilt, um das Ganze übersichtlicher zu gestalten. Viel Spaß beim Stöbern wünscht Euch Euer NewOrder-Team!

[NewOrder Galerie 1](#)

[NewOrder Galerie 2](#)

[NewOrder Galerie 3](#)

Ihr habt selbst Bilder des NewOrder? Stellt sie der Allgemeinheit zur

2005

VERKLEIDEST DU DICH NOCH ODER LARPST DU SCHON?

Aber was ist Larp? Wann ist man „nur“ verkleidet und wer bestimmt dann, was überhaupt Larp ist?

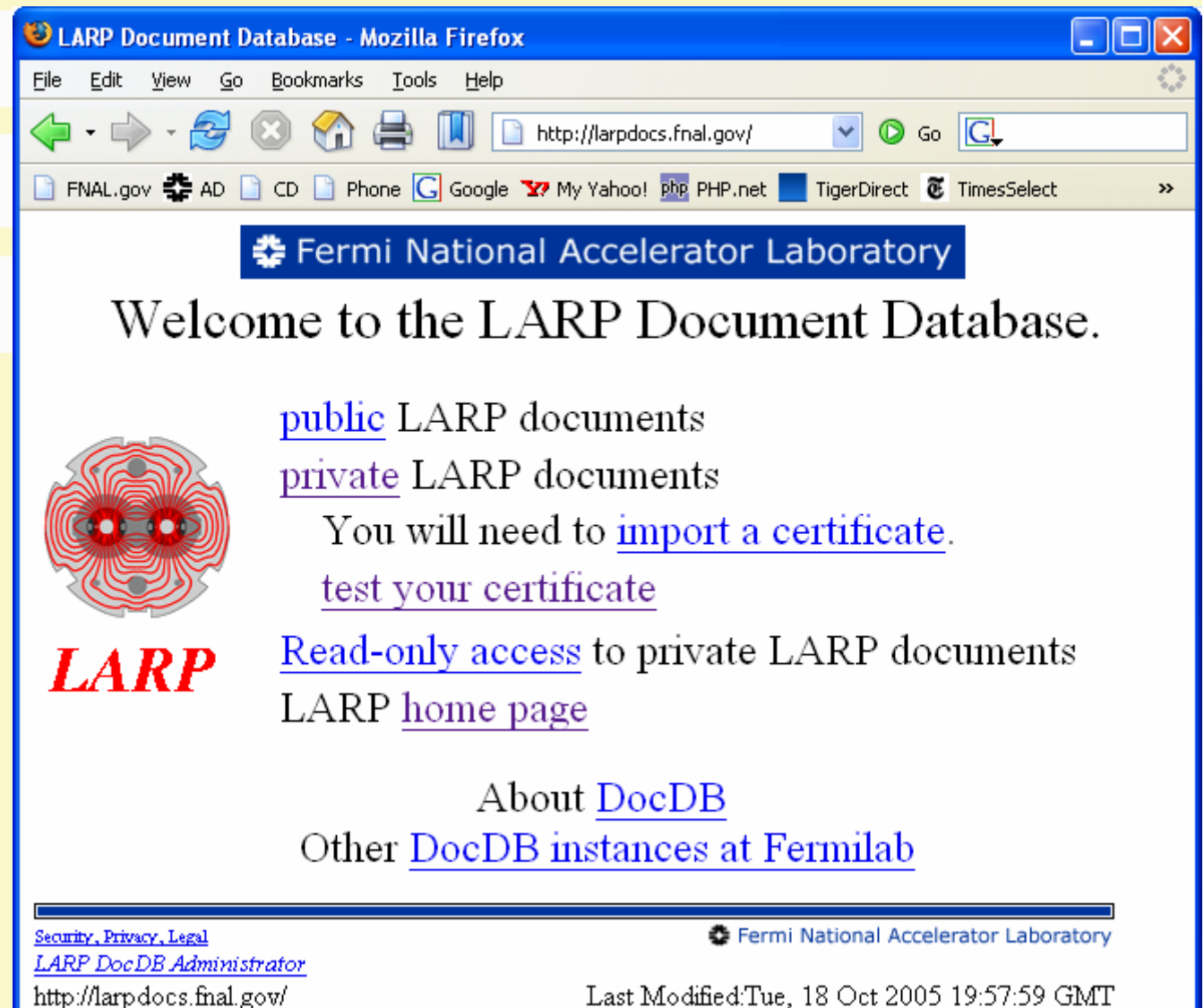
Wir konnten auch keine allgemeingültigen Antworten auf diese Fragen finden, haben lange mit anderen Spielern geredet, Foren durchstöbert, Cons besucht, Kritik ernst genommen und Ideen gesammelt – aber wir haben keine vollends befriedigende Antwort gefunden, keine Patentlösung für das „ideale Con“, kein Dogma für die richtige Spielweise...



zur Weltkennseite

Larpdocs.fnal.gov

- No longer needs certificate
➤ Hurray!!



The screenshot shows a Mozilla Firefox browser window titled "LARP Document Database - Mozilla Firefox". The address bar contains "http://larpdocs.fnal.gov/". The page content includes the Fermi National Accelerator Laboratory logo, a welcome message, and several links: "public LARP documents", "private LARP documents", "You will need to import a certificate.", "test your certificate", "Read-only access to private LARP documents", "LARP home page", "About DocDB", and "Other DocDB instances at Fermilab". The footer contains "Security, Privacy, Legal", "LARP DocDB Administrator", "http://larpdocs.fnal.gov/", "Fermi National Accelerator Laboratory", and "Last Modified: Tue, 18 Oct 2005 19:57:59 GMT".

LARP Document Database - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://larpdocs.fnal.gov/

FNAL.gov AD CD Phone Google My Yahoo! PHP.net TigerDirect TimesSelect

Fermi National Accelerator Laboratory

Welcome to the LARP Document Database.

[public](#) LARP documents

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[LARP DocDB Administrator](#)

http://larpdocs.fnal.gov/

Fermi National Accelerator Laboratory

Last Modified: Tue, 18 Oct 2005 19:57:59 GMT

LHC@FNAL To Exist in WH1



- Or maybe on the West Side...

Summary

- Everyone in the same boat for writing software for LHC
- Need a practical understanding of how to do this
 - S. Gysin (CD) & I are planning trip to CERN in January to begin to address this need.
 - "Hello, World!" controls application