INFORMATION SYSTEMS FOR PHYSICS EXPERIMENTS (Part 1)

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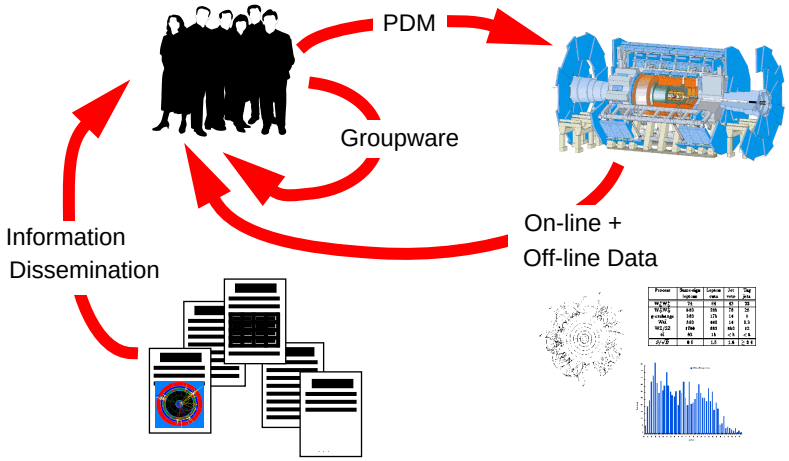
Information Systems are software applications that allow their users to obtain information, and to publish information for other users. For a physics experiment the word “information” covers a large variety of data and documents, ranging from physics events to technical reports, mechanical drawings and electronics drawings, simulation results, source code, minutes of meetings, articles, pictures, etc. Information Systems are important for physics experiments, because they can strengthen the cohesion of a geographically sparse collaboration, they allow physicists to participate more actively and they improve efficiency of work. As shown in the figure below, information systems for physics experiments may be classified in 4 main categories (not necessarily exclusive).



Groupware gathers software applications such as video-conferencing, whiteboards, email, but also discussion lists and workflow. *Product Data Management (PDM) Systems* are used to manage the data required in the design, construction and maintenance of complex products such as detectors (see the CEDAR project below). Detectors generate on-line and off-line data that need to be made available. Finally, physics collaboration rely upon dissemination of data and documents such as internal reports, papers, user manuals, address books, general services and even source code (see the LIGHT project below).

1 THE STRUCTURE OF INFORMATION SYSTEMS

Information systems have 3 main components, respectively for the *production*, *storage* and *delivery* of information. Because it is multiplatform, accessible world-wide and provides a uniform and natural interface, the WWW appears an excellent way of delivering information. Recent technological breakthrough (JavaScript, DOM, Cascading Style Sheets, Dynamic HTML) have even reinforced the usefulness of the Web. Nevertheless, the WWW is not sufficient by itself because, in High Energy Physics, most information is neither produced nor maintained in HTML form. Numerous examples can be mentioned: detectors’ real time data, word processors files, information stored in Database Management Systems, data encoded in proprietary formats of various software applications, etc. In order to make all this information available on the WWW, two solutions exist:

– convert native information to HTML and/or to a WWW browsable format. This solution applies to slow changing, poorly structured information. Examples of systems using this strategy are HTML converters for word processors such as LaTeX, MS Word or FrameMaker [1].

– store information in the most appropriate form, and convert it to WWW form “on the fly”, upon request. This solution is more appropriate for fast changing, structured information. The technology involved covers Common Gateway Interfaces, Database interfaces, scripting languages such as JavaScript, Java, WebObjects, etc.

2 THE LIGHT PROJECT - LIFE CYCLE GLOBAL HYPERTEXT

The LIGHT System, developed in the IPT Group at CERN, uses a combination of both solutions. The goal of LIGHT is to improve software understanding and maintenance by making available on the WWW all documents produced during the software development life-cycle: requirements, analysis and design diagrams, source code, user documentation, etc. To do so, all documents are converted to HTML in such a way that hypertext links are automatically generated between the documents. For instance, a function call may be linked to the reference manual that documents it, a class box in an OMT diagram is linked to the corresponding class definition in the C++ code, etc. This system is now in production in ALEPH off-line [2], and is currently applied to other experiments such as DELPHI and ATLAS [3].

3 PRODUCT DATA MANAGEMENT SYSTEMS - THE CEDAR PROJECT

Other examples of information Systems are Product Data Management (PDM) systems. The goal of the CEDAR project is to implement a PDM system at CERN, for the LHC accelerator and experiments [4]. A PDM system is built around of an electronic data vault. The basic idea is that data files produced by users with various applications (e.g. Euclid, FrameMaker, MS Project) are made known and referenced by the PDM system, to become “Managed Files”. Once known by the PDM system, a file can only be requested or updated through the EDMS. The PDM system may be accessed by users providing and/or consulting files. Users may be located at CERN, in external institutes or in companies. Users can browse and request the data vault with the native PDM system user interface, or through a WWW interface that guaranties world-wide access. Access is controlled by a system of privileges specified by the PDM system administrators.

The meta-data superimposes structure and semantics to the set of controlled files. To do so, it records the location, nature, status, authors, versions ... of each file, but also the relationships and dependencies between data (e.g. product structure, documentation, ...). Users are notified of new releases and changes in the data vault that may affect their work. At the occasion of releases, Managers and Coordinators are requested by the PDM system to approve, reject or comment the changes.

You can find more complete information, as well as the slides of the lectures, articles and related WWW pointers at the following URL:

`http://www.cern.ch/IPT/CSC/1997/`

REFERENCES

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