In principle, event processing is a solved or even a trivial problem. Given an implementor, EVPRO could provide the trivial solution in practice.

---

## Virtual Prototyping at CERN

S. GENNARO (CERN)

The VENUS (Virtual Environment Navigation in the Underground Sites) project is probably the largest Virtual Reality application to Engineering design in the world. VENUS is just over one year old and offers a fully immersive and stereoscopic "flythru" of the LHC pits for the proposed experiments, including the experimental area equipment and the surface models that are being prepared for a territorial Impact Study. VENUS' Virtual Prototypes are an ideal replacement for the wooden models traditionally build for the past CERN machines, as they are generated directly from the EUCLID CAD files, therefore they are totally reliable, they can be updated in a matter of minutes, and they allow designers to explore them from inside, in a one-to-one scale. Navigation can be performed on the computer screen, on a stereoscopic large projection screen, or in immersive conditions, with an helmet and 3D mouse. By using specialised collision detection software, the computer can find optimal paths to lower each detector part into the pits and position it to destination, letting us visualize the whole assembly probess. During construction, these paths can be fed to a robot controller, which can operate the bridge cranes and build LHC almost without human intervention. VENUS is currently developing a multiplatform VR browser that will let the whole HEP community access LHC's Virtual Protoypes over the web.

---

## Standard Formatted Data Units

F. LOPINTO (COMPUTER SCIENCES CO.)

D. Sawyer (Goddard, NASA)

Metadata is information about data. Data without metadata is generally useless. An image of the Earth from space or a bubble chamber photograph may be beautiful but without metadata (e.g., where was the spacecraft, what was in bubble chamber) the data will yield few insights. What we need is a way to link data and its associated metadata such that researchers around the world, now and in the future, can access and understand the information generated by our scientific instruments.

The Consultative Committee on Space Data Systems (CCSDS) is an organization whose members are the space agencies from around the world. CCSDS conducts its work through three technical panels. Panel 1 deals with Telemetry, Tracking, and Command. Panel 2 deals with Standard Data Interchange Structures. Panel 3 deals with Cross Support Operations. The focus of this paper is to describe the work of Panel 2 and specifically the Standard Formatted Data Unit (SFDU) Structures and Construction Rules. Though SFDU "officially" stands for Standard Formatted Data Unit, we sometimes referred to it as the "Standard For Data Understanding."

The SFDU Recommendation is a packaging standard. It describes a method of encapsulating data within Label Value Objects (LVOs) and then relating LVOs to each other. There are no restrictions whatsoever on the format of the encapsulated data. The header part of the LVO provides information that can be used to find a description of the encapsulated data. One can think of an SFDU as a well organized, machine readable UNIX tar file (though the standard is independent of UNIX or any other operating system). The SFDU is a root directory. It contains files (simple LVOs) and subdirectories (compound LVOs). Instead of "readme" files containing some (possibly) useful descriptions, the SFDU either contains or points to machine readable Data Description Units (DDUs). DDUs describe the syntax of the data (i.e., how to read it), the semantics of the data (i.e., what physical quantities were measured), and supplementary data (e.g., a photograph of the apparatus, data analysis software, technical papers). Naturally, there are no restrictions whatsoever on the format of these descriptions.

NASA has developed the SFDU Science Data User's Workbench to make it easy for people to create SFDUs and to decode and examine them. The Workbench is an object oriented, distributed application that runs on UNIX workstations networked with TCP/IP. It provides a graphical, drag-and-drop user interface and has been demonstrated to members of the space science community in the United States and in Japan and Europe. It has also led to new software engineering insights as we use SFDUs to encode messages between objects, to organize and launch distributed applications, and to

classify and retrieve software components in reuse libraries.

## SESSION SUMMARIZERS

**Analysis** - TBA

**Data Access and Storage** - MICHAEL ERNST (DESY)

**DAQ and Triggering** - TBA

**Worldwide Collaboration** - RICHARD MOUNT (Caltech)

**Tools and S/W development** - RUTH PORDES (Fermilab)

**Systems and Facilities** - TBA

**Conference Summary** - JOEL BUTLER (Fermilab)

# A ANALYSIS

## A.1 ANALYSIS AND SIMULATION PACKAGE AND TOOLS

ABS_151 .

### Image Reconstruction of X-ray Astrophysics Observation by Direct Demodulation Method

FANGJUN LU (BEIJING)
Tipei Li, Xuejun Sun and Mei Wu (Beijing)

The direct demodulation method is a newly developed technique to solve the image reconstruction problem in high energy astrophysics with a high sensitivity and spatial resolution. Applying this method in ME/EXOSAT galactic plane observation data analyses, we have gotten several new images of the galactic plane X-ray emission,and these images show a number of point sources which were unresolved in the previous analysis. HEAO1-A4 all sky survey is the only one in high energy X-ray band(13-180kev) until now, but the previous analysis on these data is a model-dependent fitting procedure by using the positions of known sources in other energy band. Direct demodulation image reconstruction analysis also gives very good results from the survey data only.



ABS_149

### MCFast: A fast simulation program for HEP detector studies

A. BOEHNLEIN (FERMILAB)

The Simulation Group at Fermilab has developed a new fast Monte Carlo package MCfast for detector design studies. The goal of MCfast is to provide a general framework for the comparison of differing detector geometries and to simulate the production and decay of $b$ hadrons in a collider environment. MCfast, however, is flexible enough that it can be used as a framework to simulate other physics processes at colliders or fixed target experiments.

The code is written primarily in Fortran and is interfaced to standard HEP event generators Pythia, Herwig and Isajet through the STDHEP interface. The