

Developing adequate CAD services for the mechanical integration of modern detectors like Atlas, CMS
(Proposal for R&D in Mechanical Engineering within the PH Department)

T. Klioutchnikova, ATLAS Integration Team

CERN has chosen the CAD product "CATIA" for in-house design. Being reinforced by the data management system "SmarTeam" it creates a solid platform to support today's needs. However, lack of the "business-critical" functionality and technologies already limits the existing system usage and makes it very difficult to use (virtually useless) in next stages of design and update processes.

CERN carries on responsibility to maintain in centralized way the database of all detector drawings and layouts, including ad-hoc changes and deviations from original designs. Also it worse of mentioning here CERN's "own components", like detector's services, integration and maintenance structures to complete the picture of a complex heterogeneous set of 3D models, drawings and other mechanical design artifacts which evolves over time (quite rapidly in some periods) and is accessed by tens of designer groups concurrently. Navigation links to and from other (non-drawing) information items are required for efficient usage of these sets.

The existing system does not provide adequate functionality and should be extended in several directions. In few areas the requirements (navigation, search) might be very CERN-specific and some prototype efforts could be anticipated.

1. Design artefact import technology.

Modern collaborations (ATLAS, CMS) consist of several dozens of research centers where people contribute to the experiment's design databases. It would be unrealistic to think that everybody will use the same version of one CAD product to create, maintain and update detector models and drawings. Hence technology (-ies) to import from (occasionally to export to) "non-CERN" CAD systems is required for current and further stages of the experiment lifecycle. That includes capabilities to import numerous "old formats", which a considerable fraction of designs was done and does exist so far.

Import technology should support artefact's cross-references, versioning and tagging, flexible yet powerful set of access rights, as well as it should automate the whole process to the maximum possible extend.

2. Dynamic custom attributes, navigation and classification schemas

Existing CAD systems do not provide support for custom attributes designers need to assign to models and drawings. In a day-today design and maintenance process it is almost impossible to limit designers by a pre-defined static set of attributes they may use to annotate models and drawing they are working on. The system must allow users to create and modify attributes of several types dynamically and to use newly created as well as "old" attributes in search criteria.

The major usage of such functionality will be in creation of multiple navigation and classification schemas. Today the ATLAS model database contains tens of thousands of 3D models and is used by hundreds of designers world-wide. One single navigation/classification schema (and even few of them) can not suit real needs and slows down design processes. Real problems require multiple ("sharable" and "private") schemas to exist concurrently and ability to create and modify them.

3. Search technologies

Experience with ATLAS integration processes leads to specific requirements in the 3D models and drawings search functionality. In addition to ability to run efficiently “traditional” attribute-based search (including custom attributes) designers need a “geographic” search, where a query language supports object coordinate expressions and detector’s regions. Some similarities may be found in the famous “Google Earth” product. An ergonomic graphic user interface would facilitate and increase efficiency of the search process. Additional requirements include search for inter-detector dependencies (sharable services, support structures).