CAD services for mechanical integration of large experiments

Introduction to a discussion
aiming to collect
comments and requirements
from 4 LHC experiments

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Catia & SmarTeam

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.

CATIA @ CERN

CATIA is the official 3D mechanical CAD system at CERN.

Main rules concerning use of CATIA at CERN:

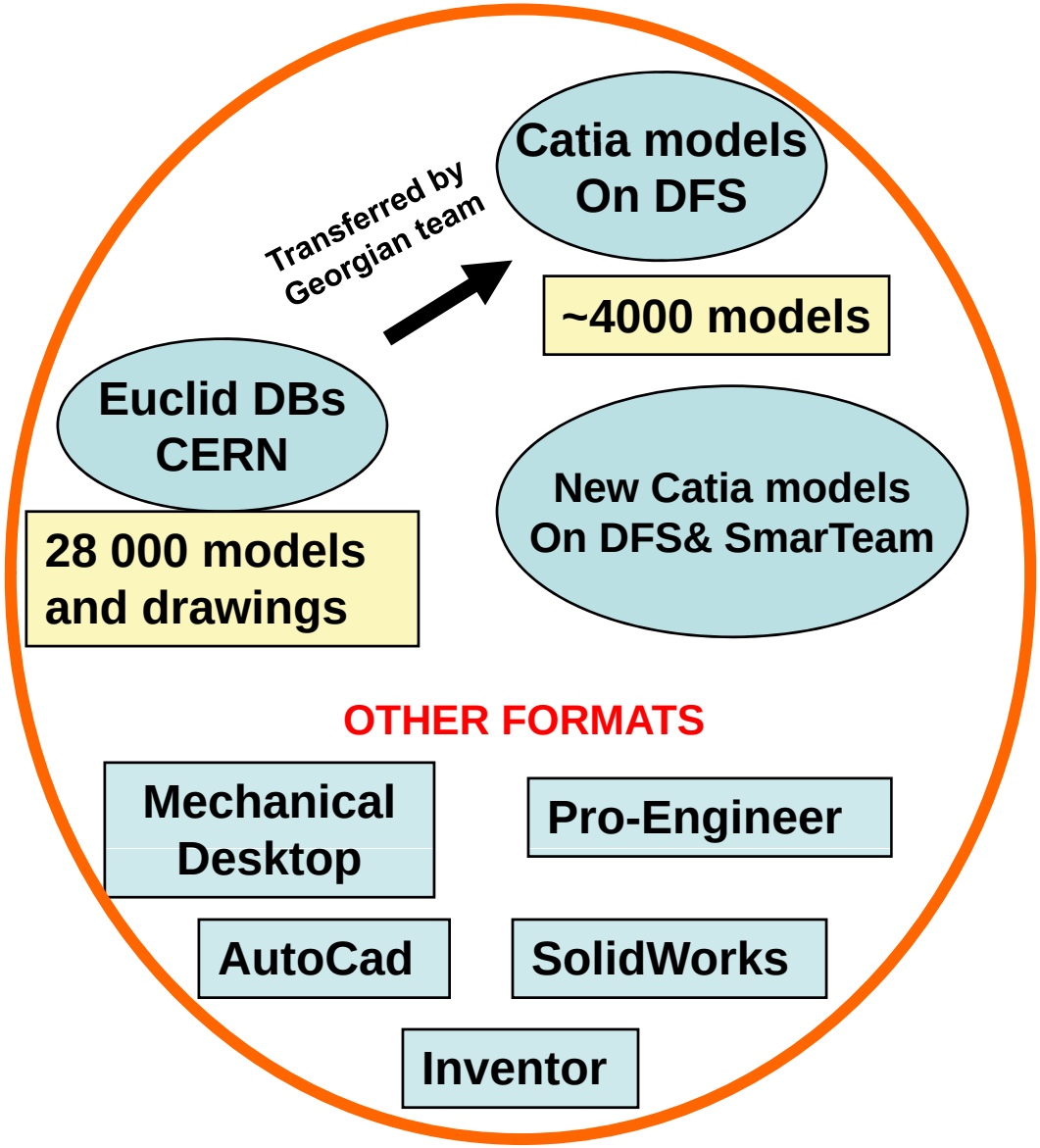
- CATIA support is given to trained users on supported computer configurations. The CATIA training is organized via the CERN Technical Training (https://hr-training.web.cern.ch/hr-training/).
- CATIA for mechanical design is in production. CATIA with full data management tools will be in production in mid-2008.
- CATIA is to be used in new CERN non-LHC projects requiring 3D CAD.
- The CERN Euclid production service will be stopped by the end of 2008. Euclid data owners are strongly encouraged to migrate the critical data to CATIA as soon as possible, preferably by mid-2008. For migration methods and tools see documentation in https://edms.cern.ch/document/841521/1. For more information contact CAD support.

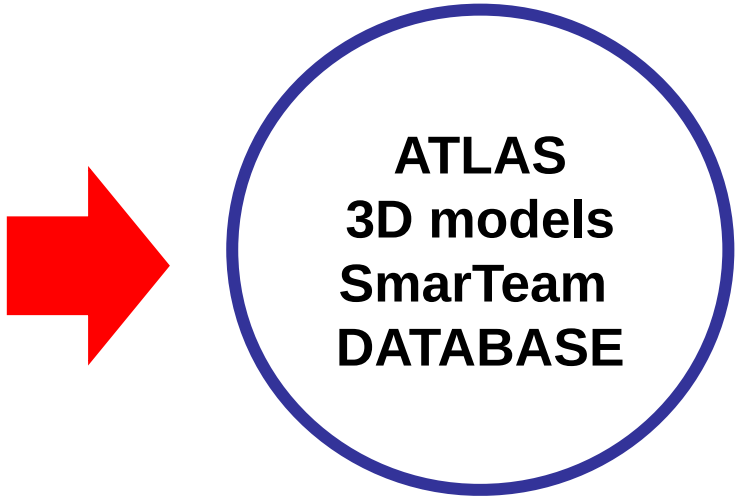
Rules for storing of CATIA data:

- New projects shall use the CATIA data base (SmarTeam) for data storage and management.
- Data stored in file systems shall be migrated to the CATIA data base, as soon as possible, preferably by mid-2008. For more information contact CAD support.

(From CAD support web page)

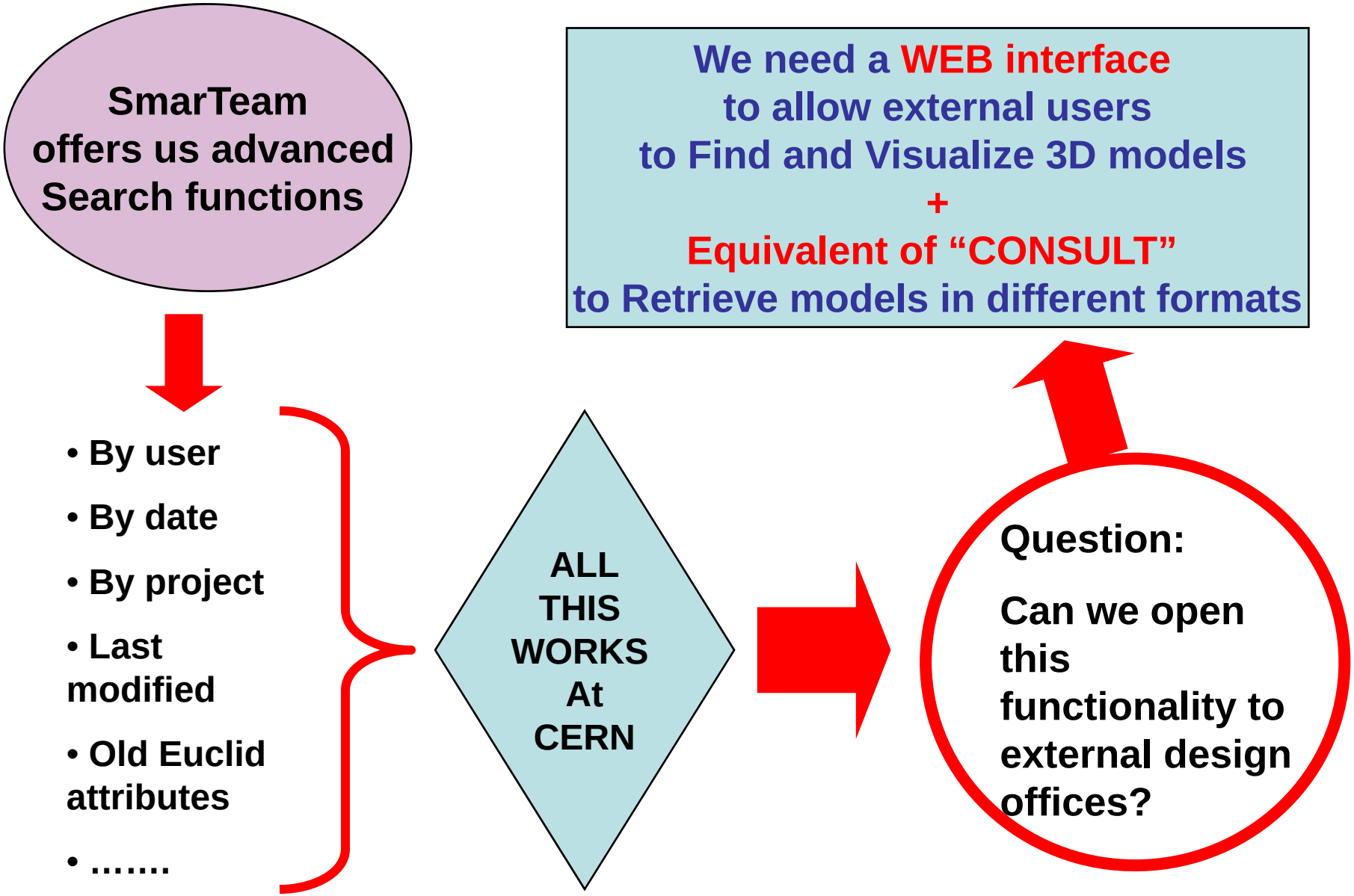
ATLAS strategy for organization of 3D models database





To run a successful integration process we want to have homogeneous information centralised in a single database.

MODELS SEARCH

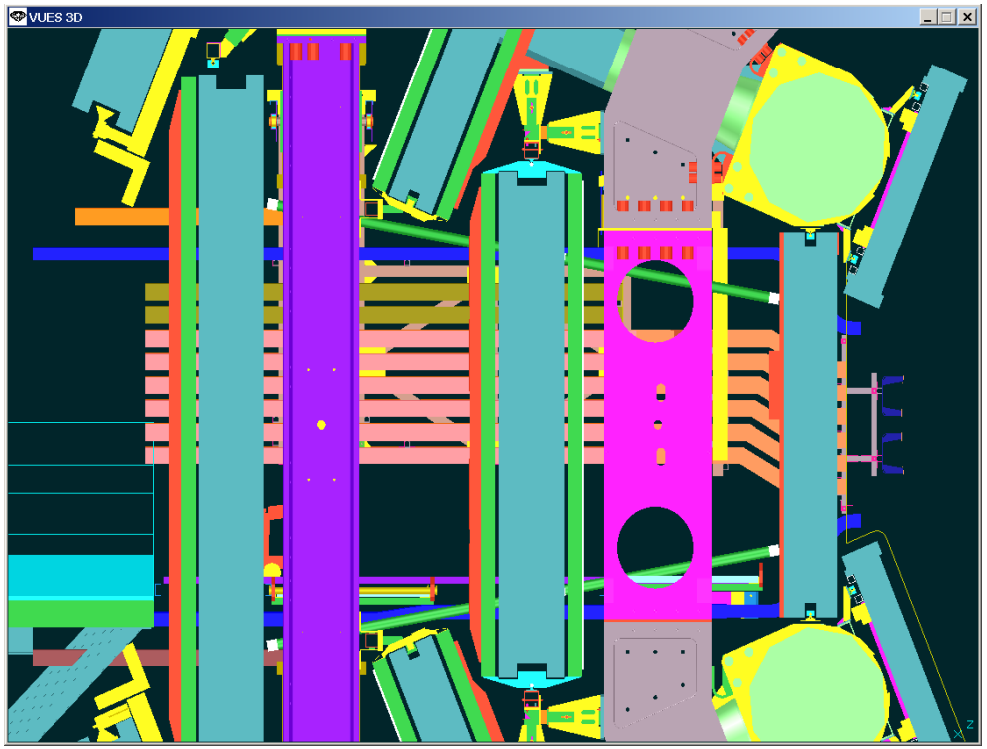


MODELS SEARCH

How we managed Global integration In Euclid?

Creating “Help Assemblies”

Creating lists of models (by designers, by functions…)



	Name of model	Euclid number (assembly)	A3	A2	A1	Z0 region	C1	C2	C3	Coordinate System
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44										
45										
46	BOS platforms sec 8	Catia help assembly	G:\Services\Mechanical\CAD\Catia\CEPN\ATLAS\ATLHXT__\Divers\BOS_access_S2&3\Sect8_access.CatProduct							1102
47										
48										
49	Strut platforms sec 9	AT392492MQ	AT392303MQ (Mir.Sym. 20Y)	AT392306MQ (Mir.Sym. 20Y)	AT392264MQ (Mir.Sym. 20Y)	AT392459MQ AT392447MQ AT392527MQ	AT392264MQ (M.S.20Y,20X)	AT392306MQ (M.S.20Y,20X)	AT392303MQ (M.S.20Y,20X)	1101
50			AT392511MQ (Mir.Sym. 20Y)							
51										
52	Voussoir platforms sec 9	AT392493MQ	AT392559MQ	AT392338MQ (Mir.Sym. 20Y)	AT392144MQ (Mir.Sym. 20Y)	see plaff strut sec9	AT392144MQ (M.S.20Y,20X)	AT392338MQ (M.S.20Y,20X)	AT392559MQ (Mir.Sym.20X)	1101
53										
54										
55	Voussoir platforms sec 10	AT392494MQ	AT392232MQ (Mir.Sym. 20Y)	AT392569MQ	AT392329MQ (Mir.Sym. 20Y)		AT392329MQ (M.S.20Y,20X)	AT392330MQ (M.S.20Y,20X)	AT392332MQ (M.S.20Y,20X)	1101
56										
57										
58	Strut platforms sec 11	AT392495MQ	AT392311MQ (Mir.Sym.20Y)	AT392309MQ (Mir.Sym.20Y)	AT392268MQ (Mir.Sym.20Y)	AT392567MQ (Mir.Sym.20Y)	AT392268MQ (M.S.20Y,20X)	AT392309MQ (M.S.20Y,20X)	AT392311MQ (M.S.20Y,20X)	1101
59			AT392559MQ (Mir.Sym.20Y)				AT392559MQ (Mir.Sym.20Y,20X)			
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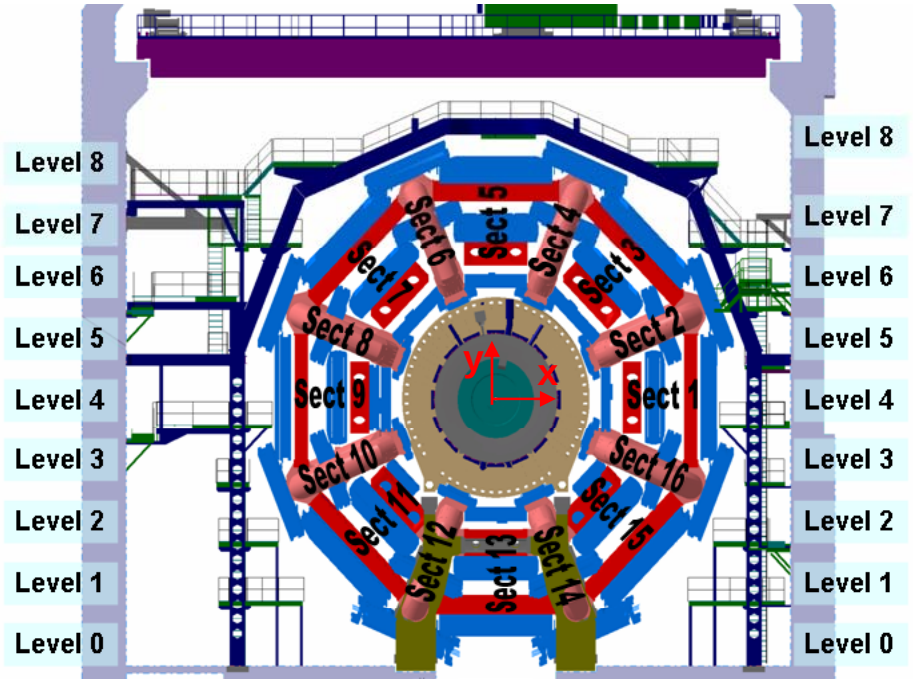
62										
63	Strut platforms sec 13	AT392123MQ								1101
64	Voussoir platforms sec 13	AT392122MQ								1101
65										
66	Strut platforms sec 15	AT392424MQ	AT392311MQ	AT392309MQ	AT392268MQ	AT392567MQ	AT392268MQ (Mir.Sym. 20X)	AT392309MQ (Mir.Sym. 20X)	AT392311MQ (Mir.Sym. 20X)	1101
67			AT392559MQ				AT392559MQ (Mir.Sym.20X)			
68										
69	Voussoir platforms sec 15	AT392429MQ	AT392574MQ	AT392557MQ	AT392540MQ	AT392558MQ	AT392540MQ (Mir.Sym. 20X)	AT392557MQ (Mir.Sym. 20X)	AT392574MQ (Mir.Sym. 20X)	1101
70										
71	Voussoir platforms sec 16	AT392497MQ	AT392332MQ	AT392330MQ	AT392329MQ		AT392329MQ (Mir.Sym. 20X)	AT392569MQ (M.S.20Y,20X)	AT392332MQ (Mir.Sym. 20X)	1101

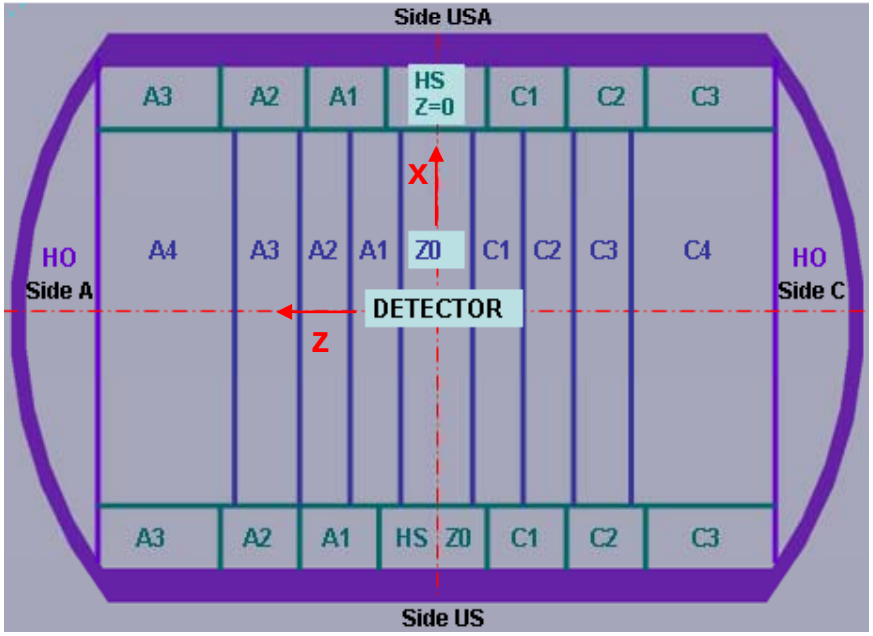
We need “geographic” search:

- By regions inside the experiment
- By coordinates
- models close to a given object
- …

MODELS SEARCH

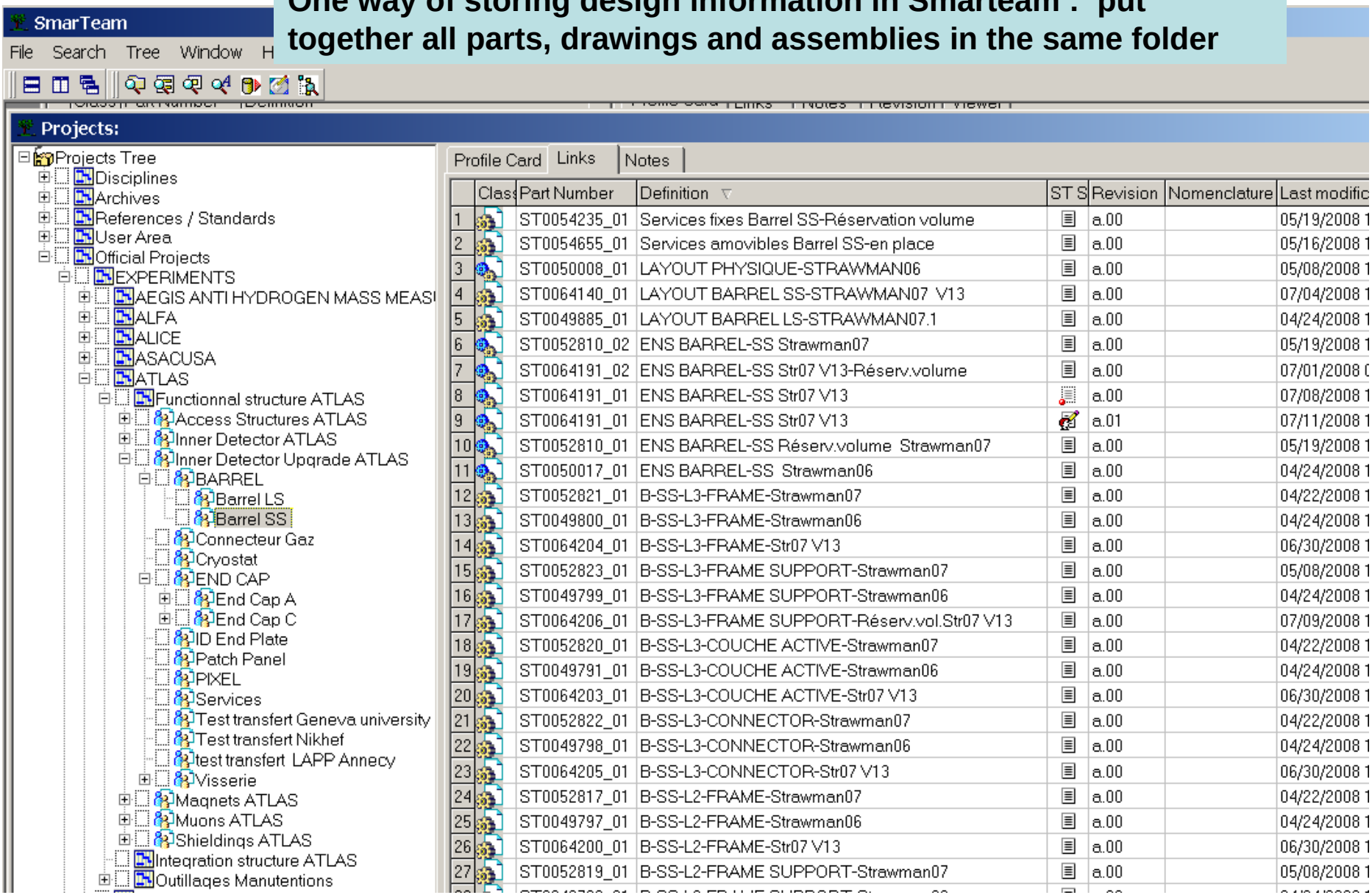
Experience with ATLAS integration processes leads to specific requirements in the 3D models and drawings search functionality. In addition to ability to run efficiently "traditional" attribute-based search (including custom attributes) designers need a "geographic" search, where a query language supports 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).





Work Methodology for big assemblies-1

One way of storing design information in Smarteam : put together all parts, drawings and assemblies in the same folder



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2		ST0054655_01	Services amovibles Barrel SS-en place		a.00		05/16/2008 1
3		ST0050008_01	LAYOUT PHYSIQUE-STRAWMAN06		a.00		05/08/2008 1
4		ST0064140_01	LAYOUT BARREL SS-STRAWMAN07 V13		a.00		07/04/2008 1
5		ST0049885_01	LAYOUT BARREL LS-STRAWMAN07.1		a.00		04/24/2008 1
6		ST0052810_02	ENS BARREL-SS Strawman07		a.00		05/19/2008 1
7		ST0064191_02	ENS BARREL-SS Str07 V13-Réserv.volume		a.00		07/01/2008 0
8		ST0064191_01	ENS BARREL-SS Str07 V13		a.00		07/08/2008 1
9		ST0064191_01	ENS BARREL-SS Str07 V13		a.01		07/11/2008 1
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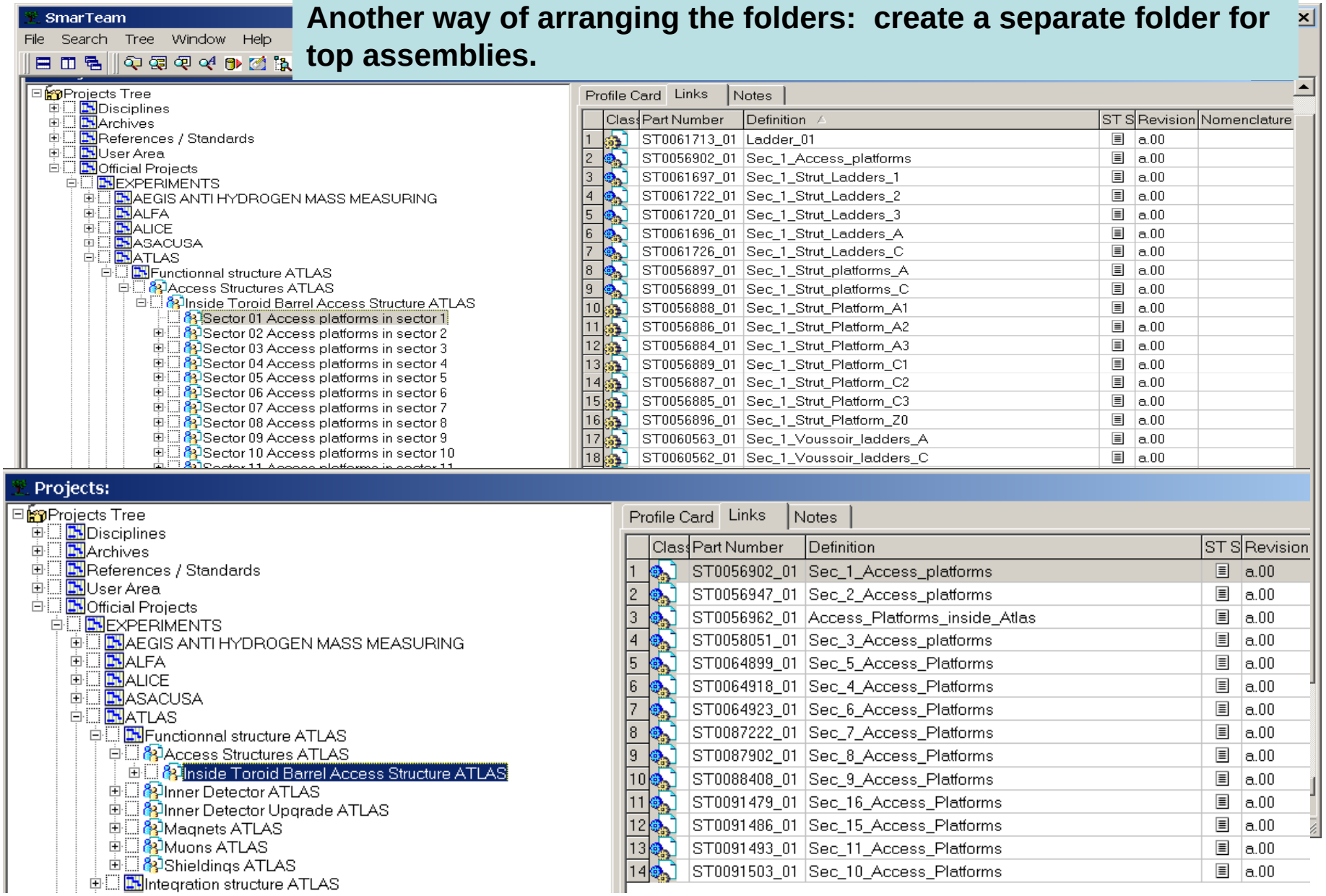
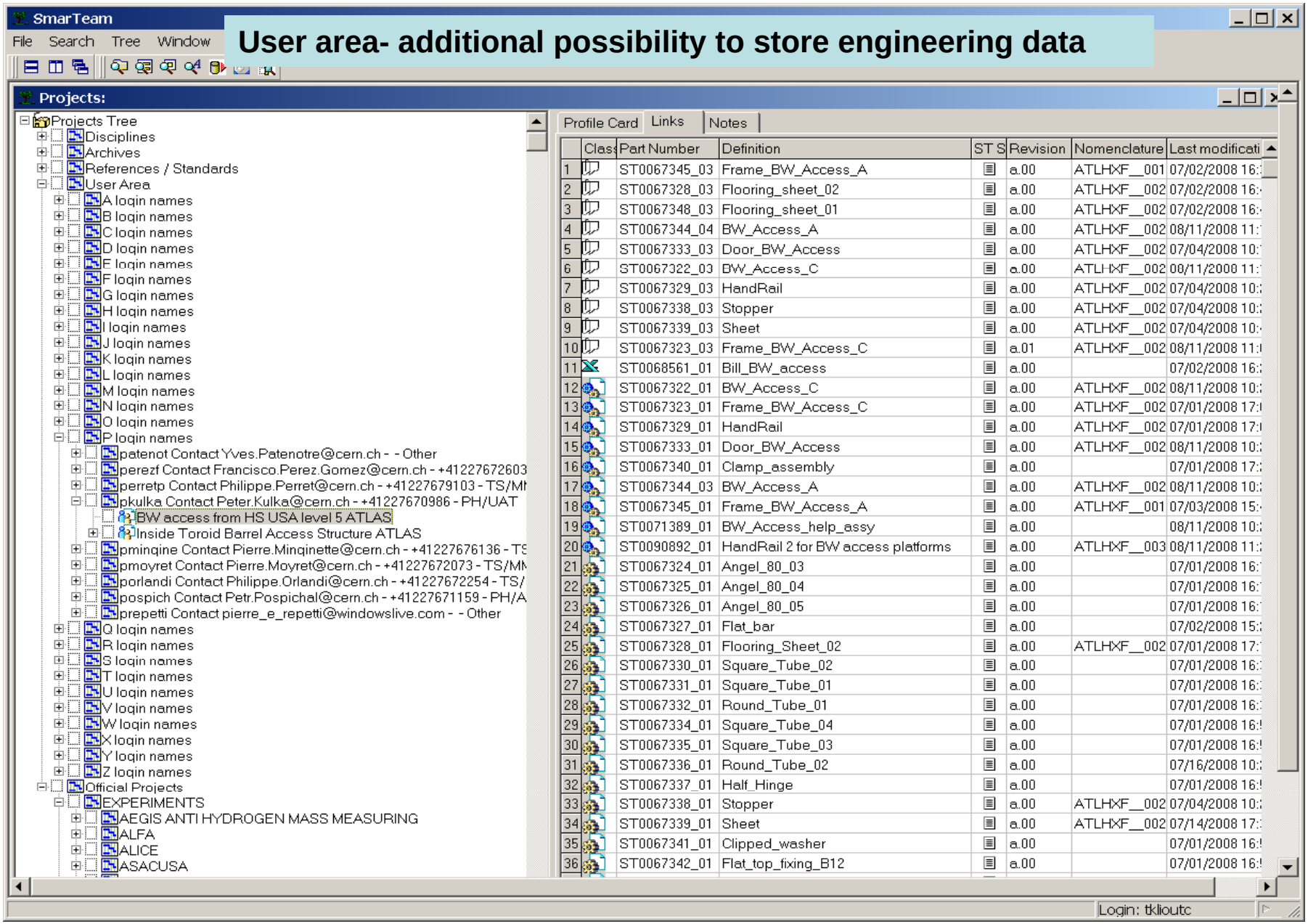
27		ST0052819_01	B-SS-L2-FRAME SUPPORT-Strawman07		a.00		05/08/2008 1

Work Methodology for big assemblies-2

Another way of arranging the folders: create a separate folder for top assemblies.

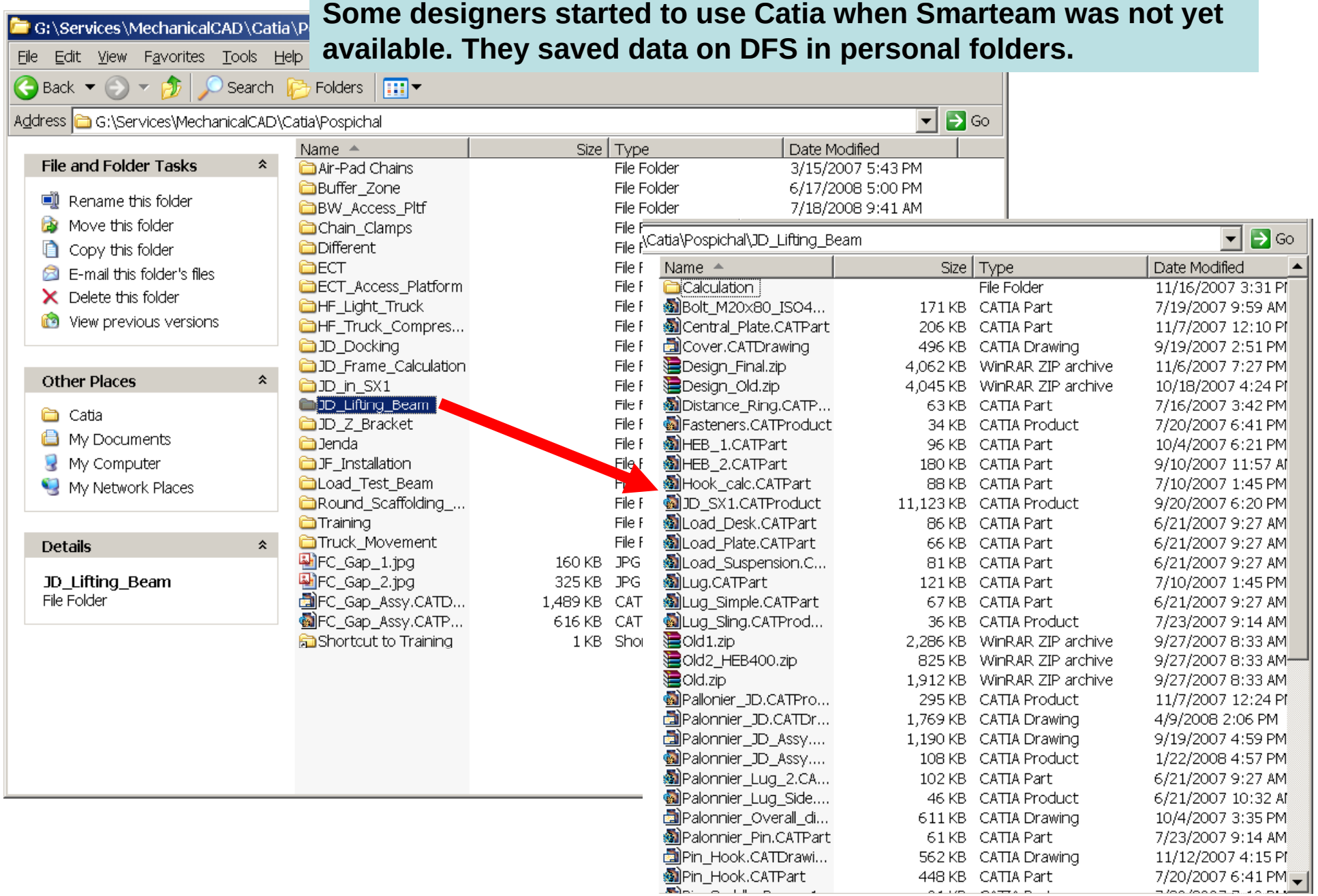


Work Methodology for big assemblies-3

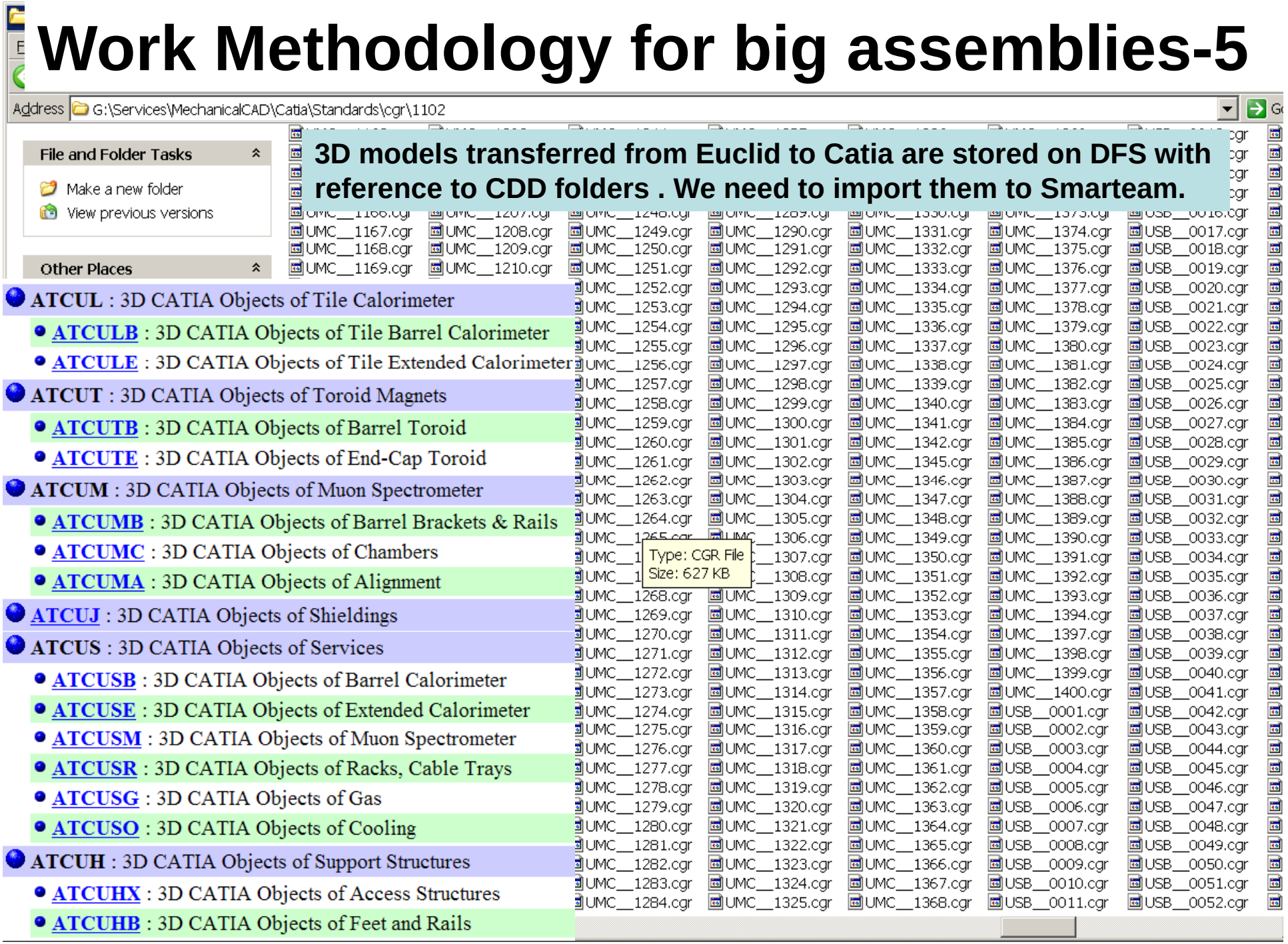


Work Methodology for big assemblies-4

Some designers started to use Catia when Smarteam was not yet available. They saved data on DFS in personal folders.



Work Methodology for big assemblies-5



Work Methodology for big assemblies

We start working using new complex system. Every designer starts inventing his own methods of work. We need answers to all kind of questions, like:

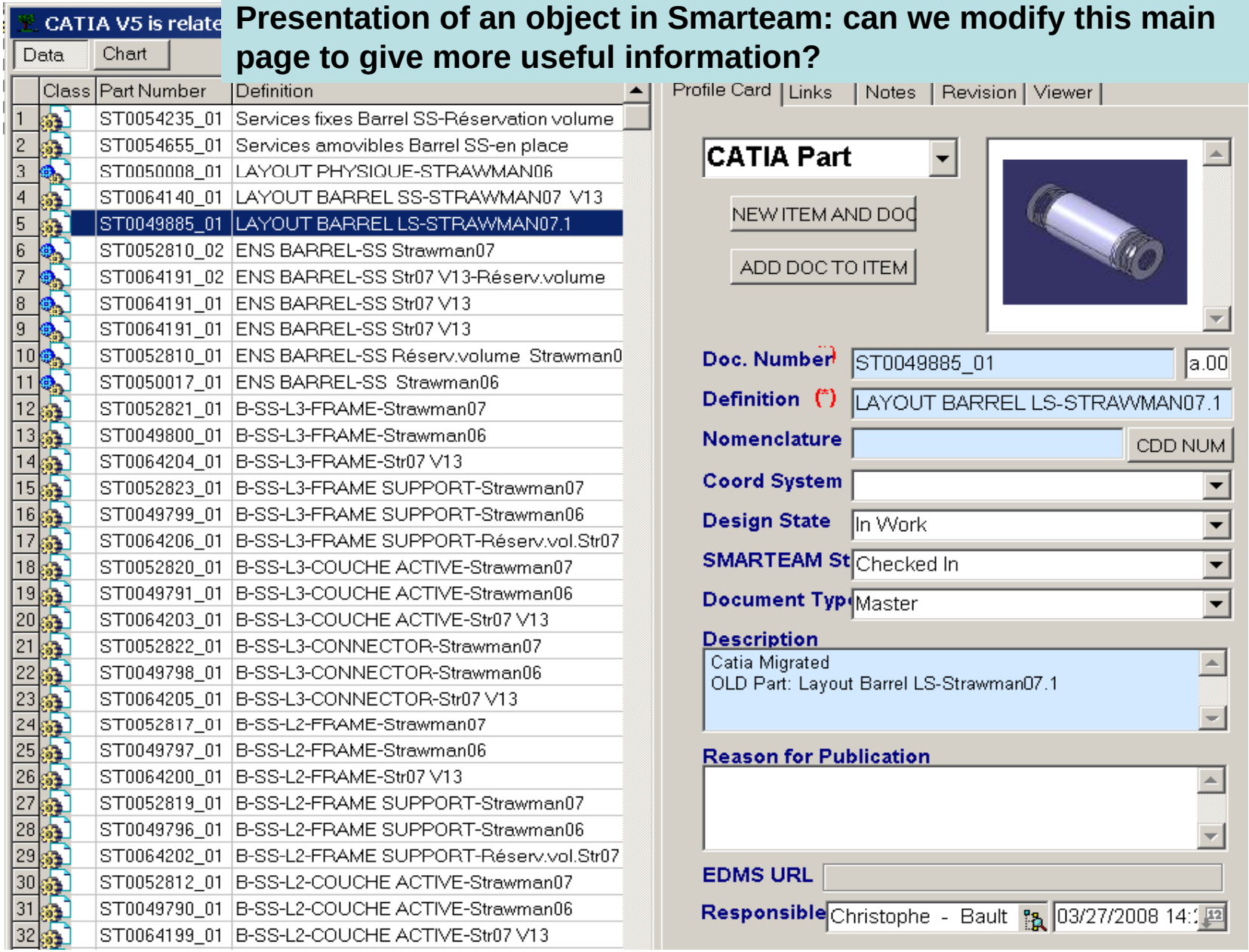
Do we put together all parts, documents and assemblies in the same folder or create a separate folder for top assemblies?

Attempt to re-create sub-assemblies in SmarTeam – is it a good way of search problem solving?

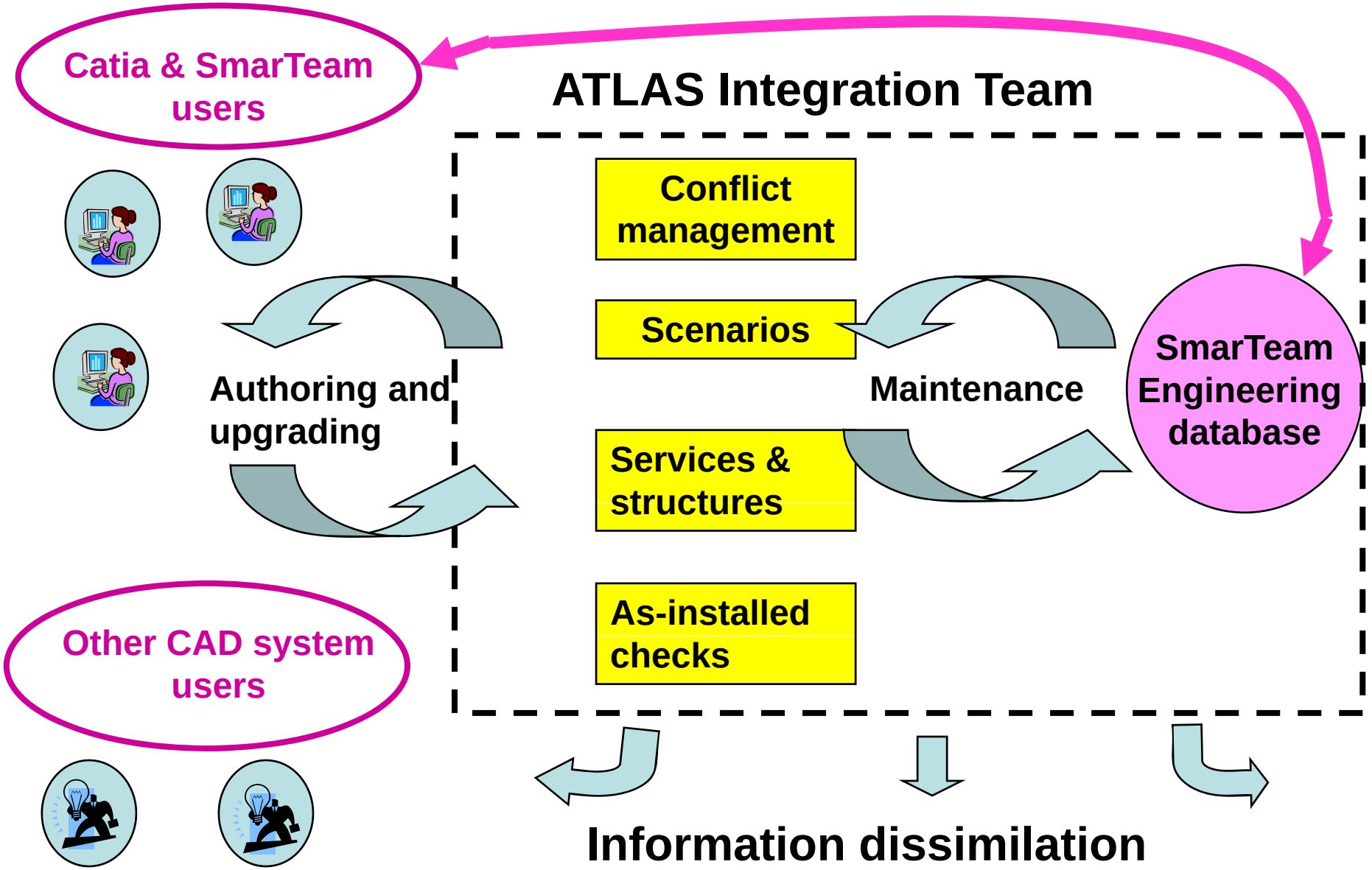
We need a well defined work methodology similar for all designers

Usage of attributes and creation of dynamic custom attributes

Presentation of an object in Smarteam: can we modify this main page to give more useful information?



Exchange with external designers

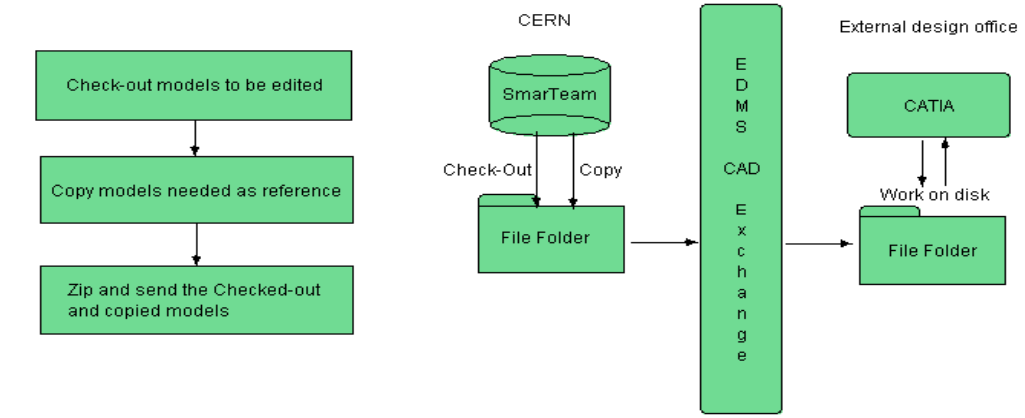


Exchange with external designers

How to send and receive models stored in Smarteam with external design office?

Selecting and Sending the documents

Overview of Procedure:

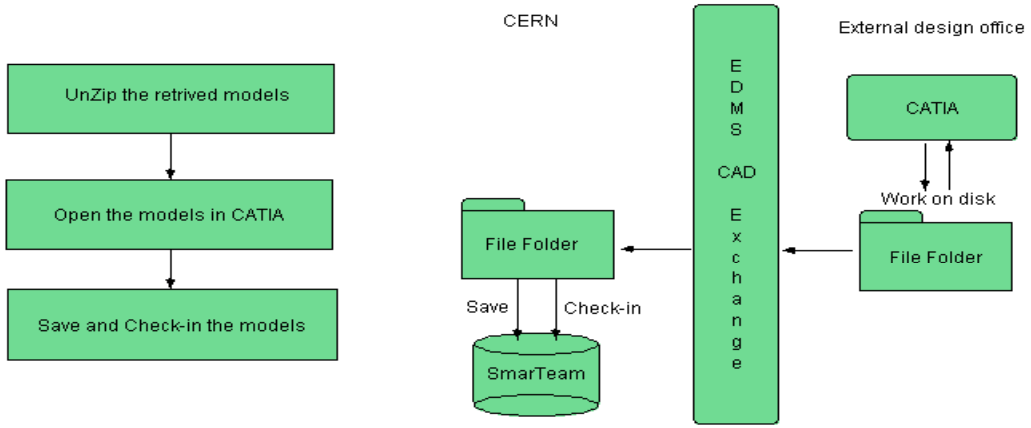


1. **Create a new document in EDMS CAD exchange for the exchange, note the EDMS document number. EDMS CAD exchange: http://edms.cern.ch/nav/CERN-0000006727**
2. **Create a file folder for the exchange with the EDMS document number in it.**
3. **Login to Smarteam as owner of the documents and transfer the responsibility to the external design office for the models they will edit.**
4. **Login to SmarTeam as the external design office.**
5. **Create a user project for the exchange with the name on the EDMS document number.**
6. **Create a *compressed (zipped) folder* of the folder for the exchange.**
7. **Make a list of objects with the corresponding filename.**
8. **Upload the *compressed (zipped) folder* to the EDMS document of the exchange.**
9. **Perform an 'Engineering-Check' on the document when all desired files are uploaded.**

Exchange with external designers

Re-integrating the documents in SmarTeam

Overview of Procedure:



1. Retrive the models from the external design office via an EDMS document in EDMS CAD exchange.
2. Place the new and updated files in the folder used for the exchange.
3. Make sure that the *SMARTEAM-FileCatalog* folder is intact, or restore it from the EDMS document used to send the documents. * This is a system folder only needed for the re-integration of the files to SmarTeam.
4. Login to SmarTeam as the external design office.
5. Open the New and modified documents in CATIA.
   - If there are modified files that are Read-only, check the modifications and resolve the problem is needed.
6. Save and Check-In the models.

This procedure described on CAD support web page includes 15 manual operations and works only when external design office use the same version of Catia & Smarteam (2 out of 3 groups participating in Atlas upgrade using Catia have different versions, 17 and 18)

CONCLUSIONS : first proposals for possible improvements

1. **Additional possibilities of SEARCH functionality: “geographic” search with graphic interface**
2. **Methodology of work common for all designers**
3. **Possibility of custom attribute creation**
4. **Additional possibilities for external design offices to find, visualize and retrieve 3D models in different formats: Web interface .**