



Long-term CAD Data Archiving Project

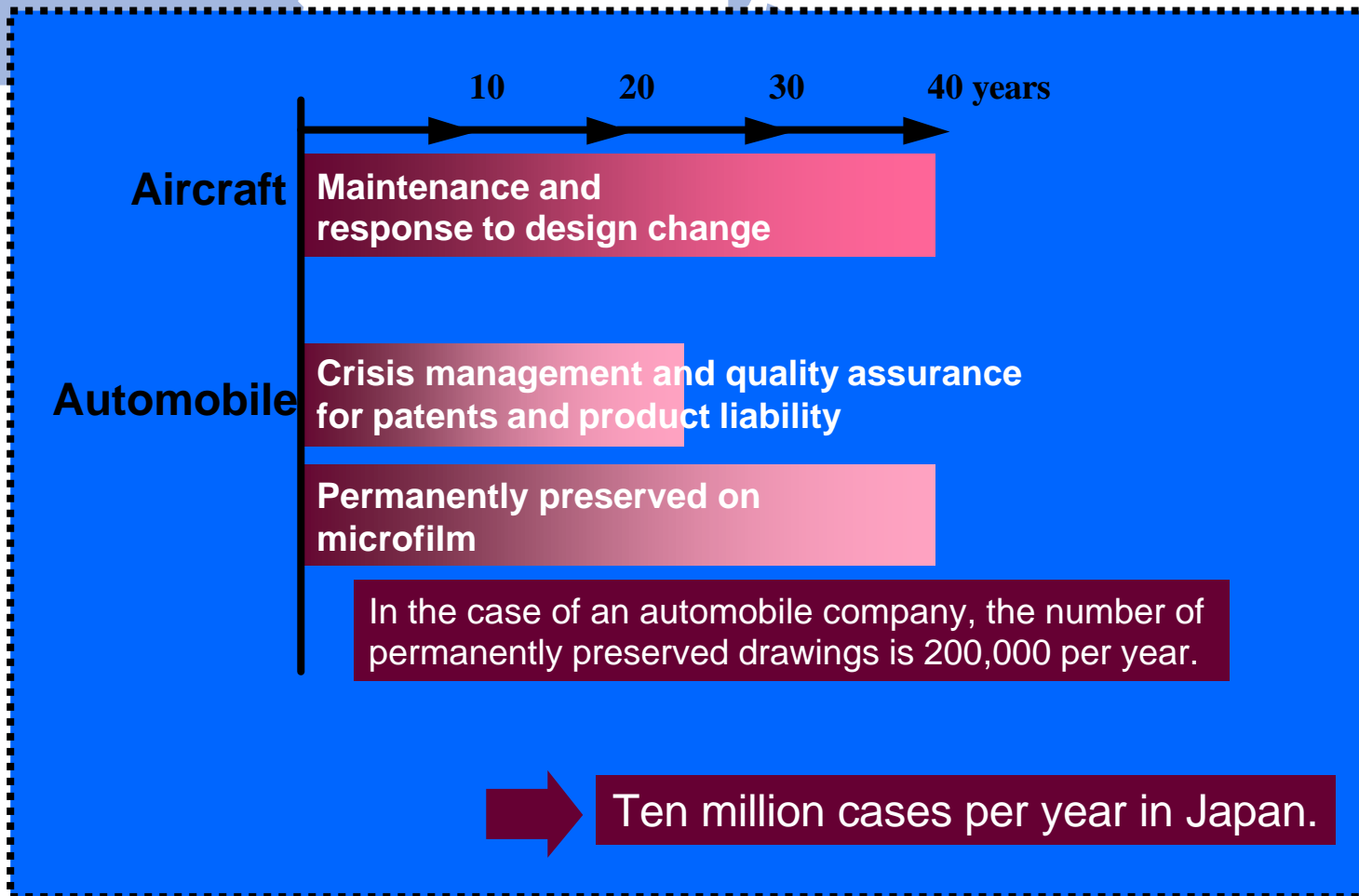
Toru KATO (TOYOTA Motor Corporation)
Hiroyuki HIRAOKA (Chuo University)

Maturity of standard for long-term CAD data archiving
MOSLA
<http://www.mosla.org/>

Background of needs



We need long-term archiving of CAD data.

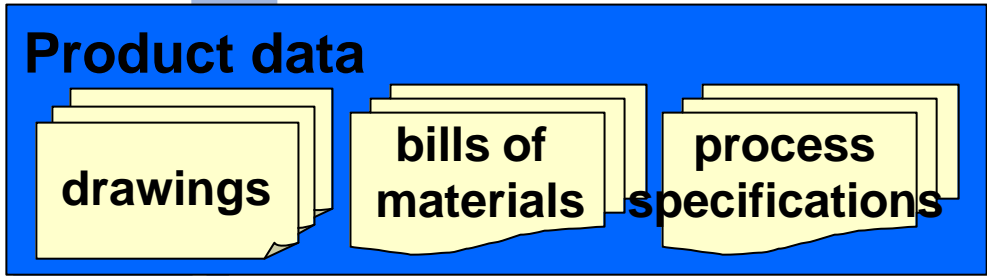


Background of needs (cont.)

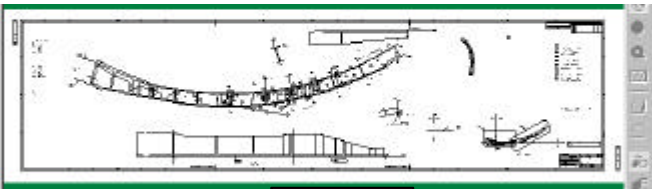


We need long-term archiving of CAD data.

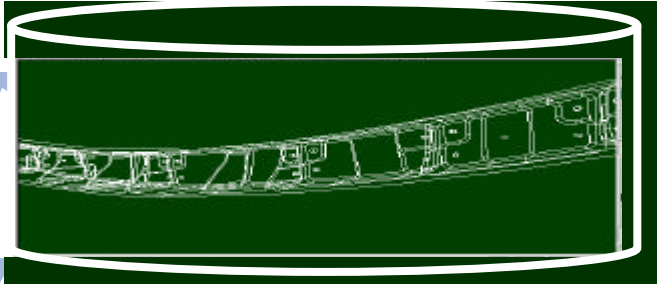
Rapid increase of 3-D CAD



Drawing sheet



CAD data



CAD data are the property of the enterprise to be maintained

Fig. 1

Background of needs (cont.)

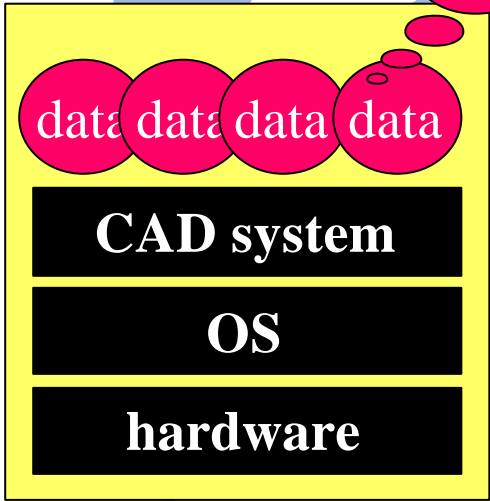


Currently, we preserve CAD data ..

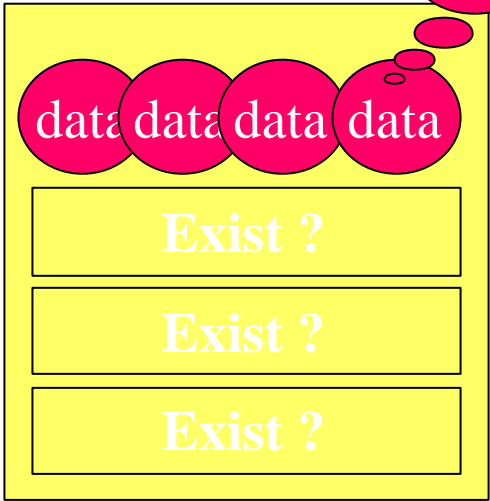
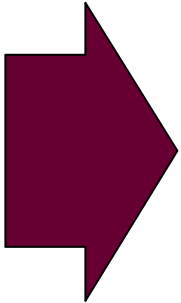
Hardware + OS + CAD system + CAD data must be preserved collectively.

Important !

High-risk !



Current

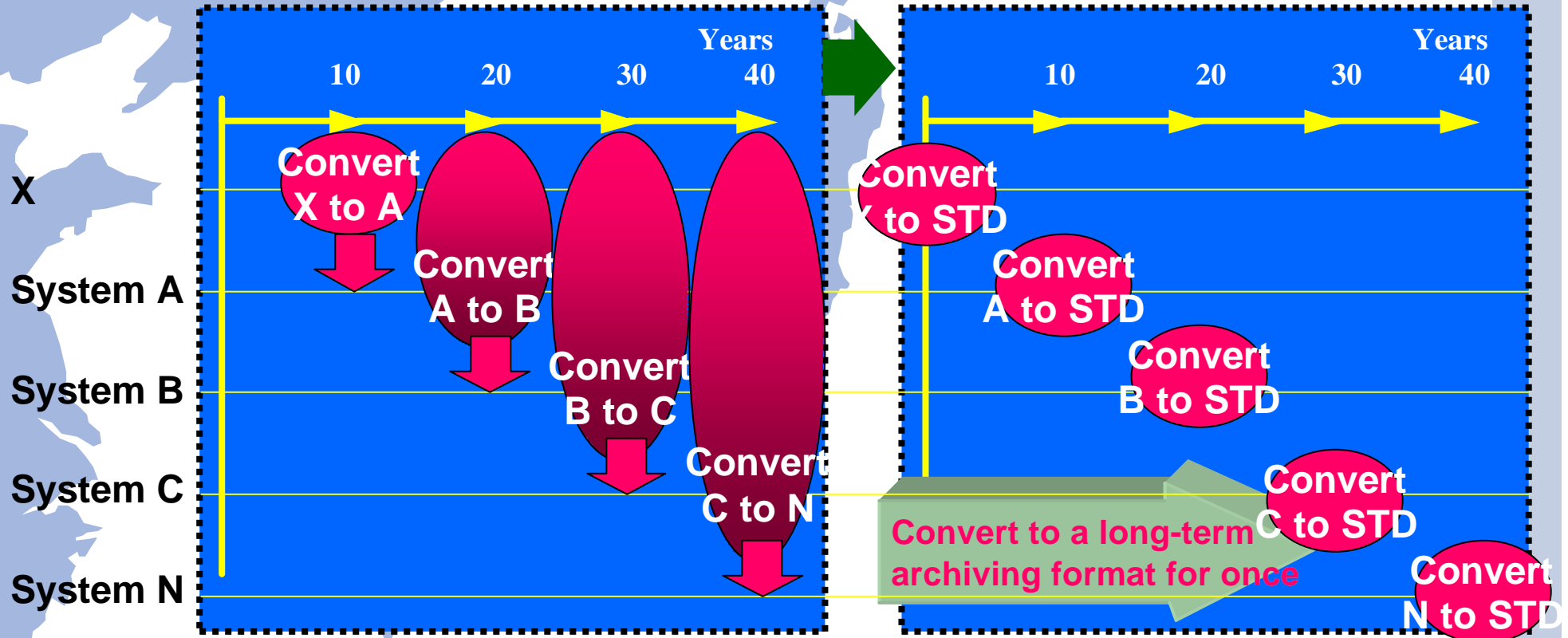


Next decade

Background of needs (cont.)



We need a standard ..



**ISO/STEP is the best choice for this platform
(Stability, practicality, international nature, necessity)**

Progress and Organization



Past activity : Activity of JSTEP

- ❑ **WG Chairman: T. KATO from Toyota in 1996 - 1997**
 - the brainchild of this project.
 - ❑ **Investigation on STEP/AP203 and AP202**
 - Deep understanding of AP202 through WG discussions
 - Graphical representations of AP202/AIM instances are generated
 - SEDS issues concerning AP202 and ATS302 are submitted in October 1997
 - ❑ **Evaluation of STEP**
 - Relationship between STEP standards and design & manufacturing
 - Applicability of STEP standards on our business
 - limitation of STEP standards
- ❖ **As a result, we judged AP202 "able to use in the industry".**
- Refer to JSTEP report in March 1998, etc.

➔ **Long-term CAD data archiving project**

Progress and Organization (cont.)



Long-term CAD data archiving project

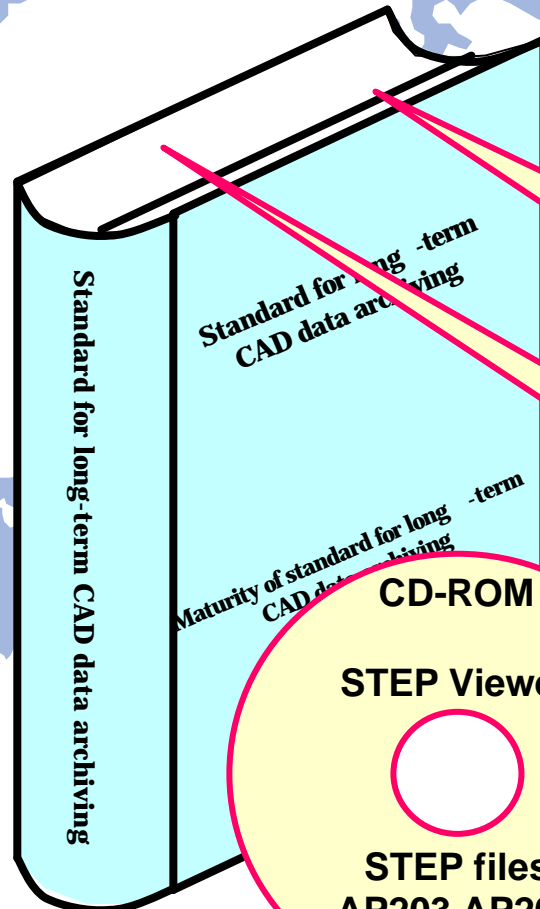
- ❑ This project obtained funds from Japanese government in autumn 1998.
The prime contractor is MicroCAD.
- ❑ Formal meeting of all members Chairman: T. KATO from Toyota
Automobile (Toyota, Mitsubishi), Aircraft (KHI, IHI),
IBM Japan, Unisys Japan, iSiD, TSE, JIM, MicroCAD
- ❑ Maturity of standard for long-term CAD data archiving
Chairman F. KIMURA (The University of Tokyo) ,
Manager T. KATO (Toyota), Secretariat H. NAKATSUKA (MicroCAD)
Academia: F. KIMURA, H. HIRAOKA, N. SUGIMURA, H. SUZUKI,
K.G. KOBAYASHI, Y. KIKUCHI
Industry: Toyota (M. TSUZAKA, K. TANAKA, M. YOSHIDA, KHI I. TAKIMOTO,
IHI (K. HORIE, Mitsubishi H. INAGAKI, MicroCAD T. SEGAMI, etc.
- ❑ Development of software : STEP Viewer, AP202 file creation program,
Usage program of drawing and product
- ❑ Experiment : Trial and creation of data that can be exhibited
- ❑ **Continual off-site meetings covering multiple industry domains**

Deliverables in February 2000 - Publication with CD-ROM



**Maturity of standard
for long-term
CAD data archiving
MOSLA**

Identification of user needs



Agreement section

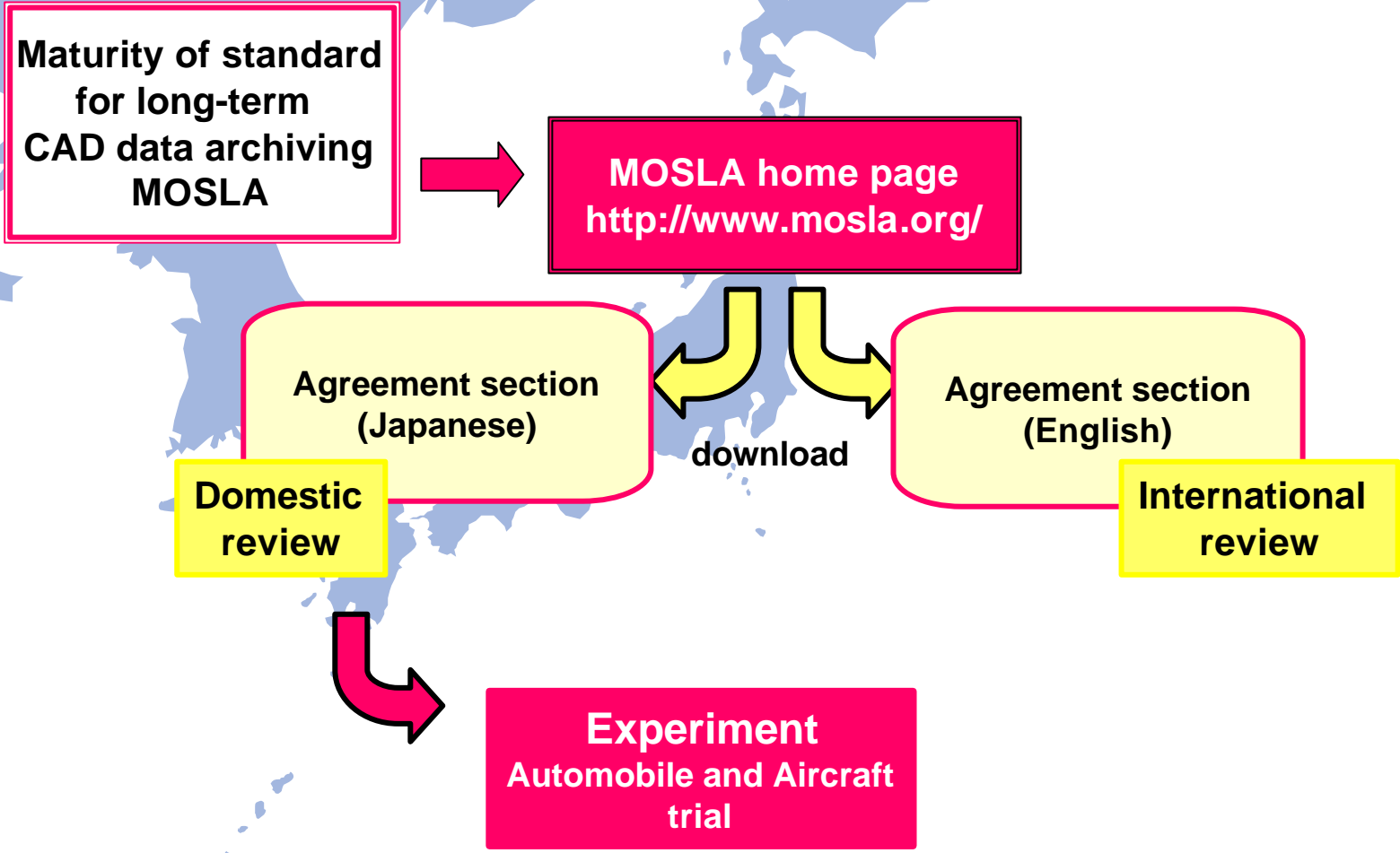
describes provisions specified for AP203 and AP202 by MOSLA.

Description section

explains the standard for CAD users and CAD benders.

Written in Japanese

Deliverables in February 2000 (cont.)



Standard for long-term CAD Data Archiving

- Basic points



**Purpose : not CAD data exchange but long-term CAD data archiving;
CAD data exchange is out of scope**

Long-term CAD data archiving is an indispensable subject, and has the necessity of using STEP standards. The requirements for long-term CAD data archiving are different from those of CAD data exchange. In CAD data exchange, STEP is one method of choices.

Subset of AP203 and AP202 is the best practice for long-term CAD data archiving

“Standard for CAD data long-term archiving” is constructed based on STEP standards, after we have grasped their details.

- The purpose is long-term archiving. That is why ISO standards, which are a stable resource, are observed strictly and without change.
- The information that should be held by BOM system is out of scope.
- The requirements from users, for example, not drawing control but drawing sheet control, are incorporated as constraints.
- MOSLA gives constraints to the items that we consider ambiguous or inconsistent.

Standard for long-term CAD Data Archiving

- Basic points (cont.)



Pre-study on accommodating change in CAD in the future

Pre-study on accommodating change to drawing- less, changes in CAD usage, and the evolutionary changes in CAD in the future.

- Draughting model of AP202 is used to give the design directions by the color of surfaces, notes, dimension, and tolerance, on a solid model or surface model.

We aim to make it de facto standard

Agreement section presented in August 1999

"Agreement section" describes provisions specified by "Standard for long-term CAD data archiving" for STEP/AP203, AP202, and Part 21.

➔ The scope of AP203 and AP202 which MOSLA supports is explicitly described.

Description section will be presented in February 2000

- **Introduction** Including overview of STEP standards
- **STEP file** token, structures of STEP file, Japanese Kanji
- **Shape model** solid, manifold surface, surface, 2-D/3-D wireframe, unit, placement of shape
- **Product model** Product version and assembly, Design management items including approval and creation date
- **Draughting model** product and drawing, projection, presentation of geometric elements, annotation elements, draughting callout, association, style, grouping
- **Graphical representation examples**
The sample figure shows how to connect between draughting model instances.
- **Instance forms** instance form on STEP file

Standard for long-term CAD Data Archiving

- Outline of the supported range



Unsupported items

❑ Ignored:

Configuration design, effectivity, action, alternate part, supplied part, certification, contract, product category, security classification, and assembly (except for fundamental ones) do not have any meaning.

❑ Conformance Classes of AP203

In AP203, CC2, 4 and 6 are supported. i.e., solid model, surface model with topology, surface model, or 3-D wireframe model.

In AP203, CC1, 3 and 5 are not available. i.e., no shape, wireframe model with topology, or faceted model.

❑ Conformance Classes of AP202

In AP202, CC1, 3, 5, 9, and 10 are supported. i.e., solid model, surface model with topology, surface model, and 2-D/3-D wireframe model.

Elementary XXX models, wireframe model with topology, and faceted model are not available.

❑ Not available:

Specific types of point, curve, and surface, such as offset, are not available. SCOPE structure and short name of entity are not available

Standard for long-term CAD Data Archiving

- Outline of the supported range (cont.)



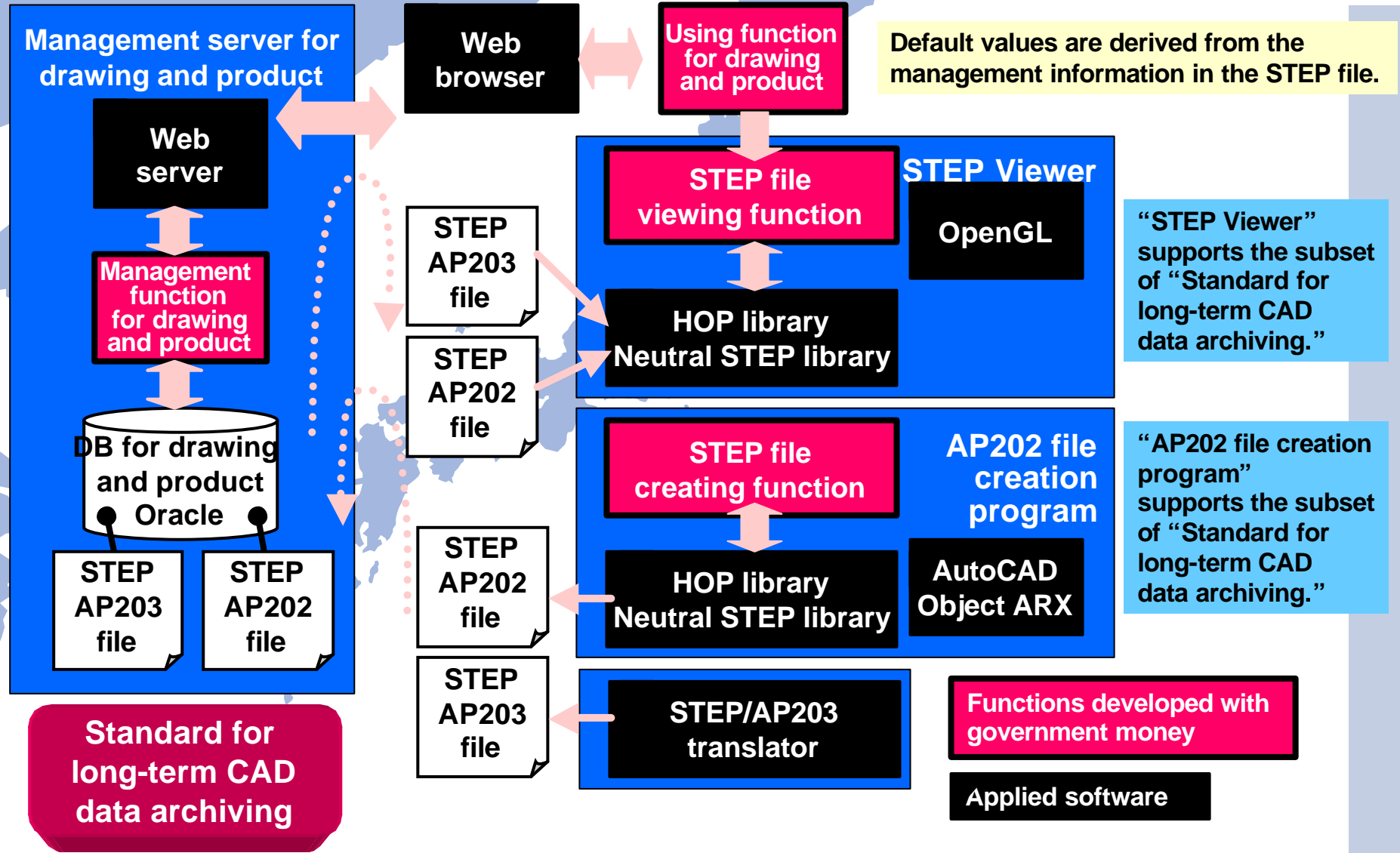
Specified items

- Indispensable design management items of product and drawing are explicitly described or specified as requisites.
- The welding symbols are specified.
- The paths that represent product, assembly, or relation, are explicitly described or specified.

The items of STEP standards that we consider ambiguous or inconsistent

- Geometric element of AP202/ARM and its corresponding mapping table. Especially in the case of shape model with topology, we add interpretations on the method of assigning styles or associations, which has a broad influence.
- Interpretation is provided for two or more kinds of associations specified by AP202 to make them in the same manner.

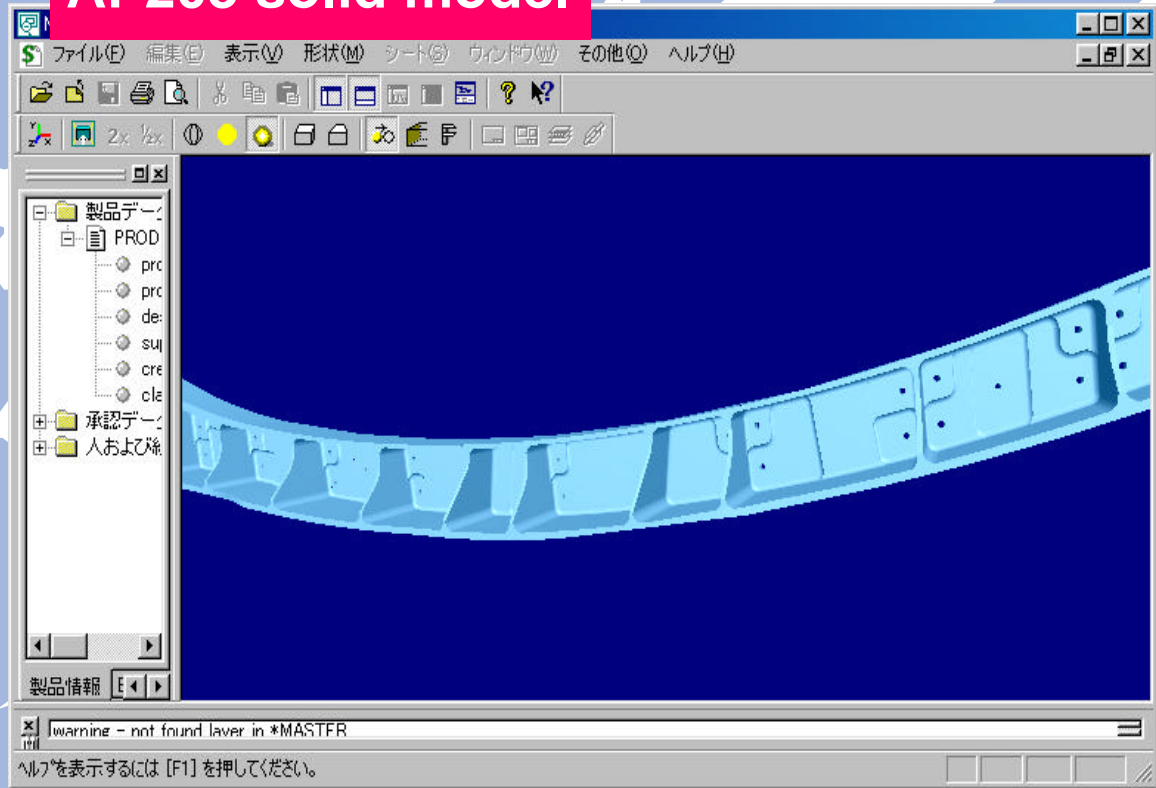
Development of Software Prototype of experiment



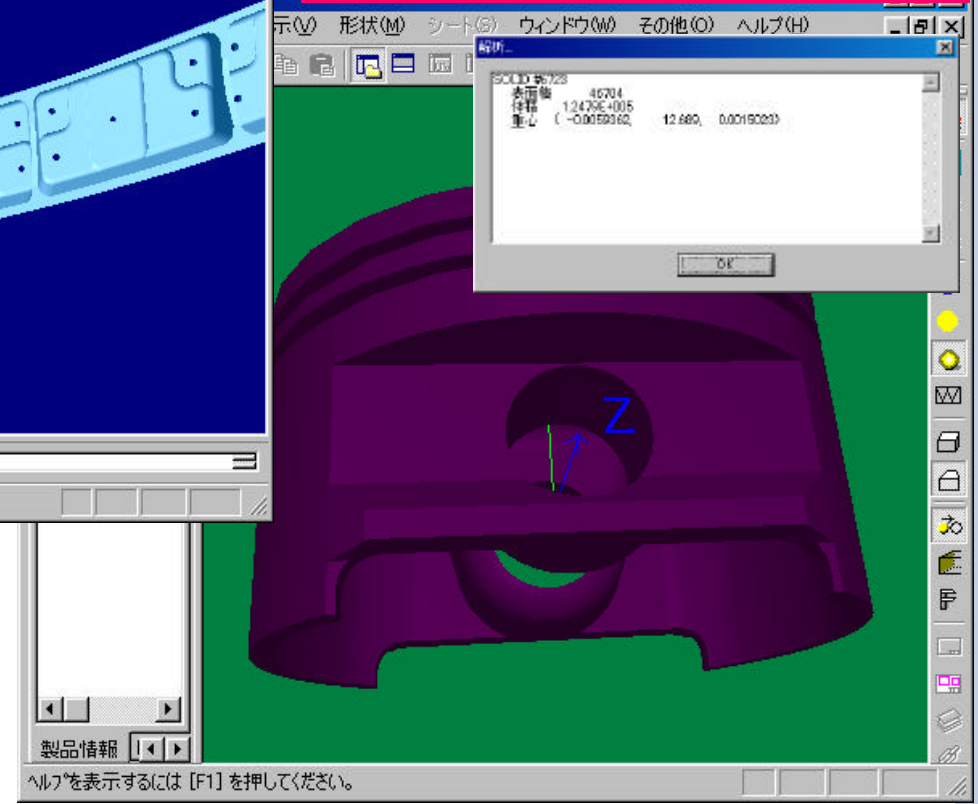
Sample Presentations on STEP Viewer

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AP203 solid model



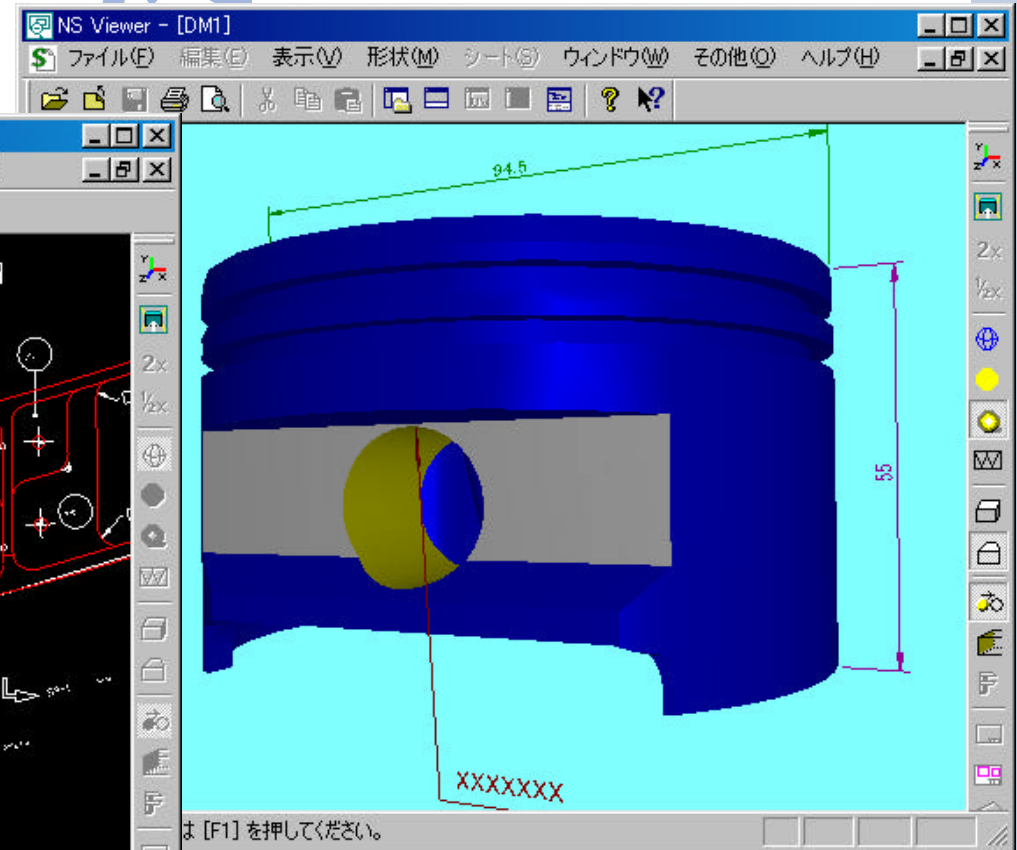
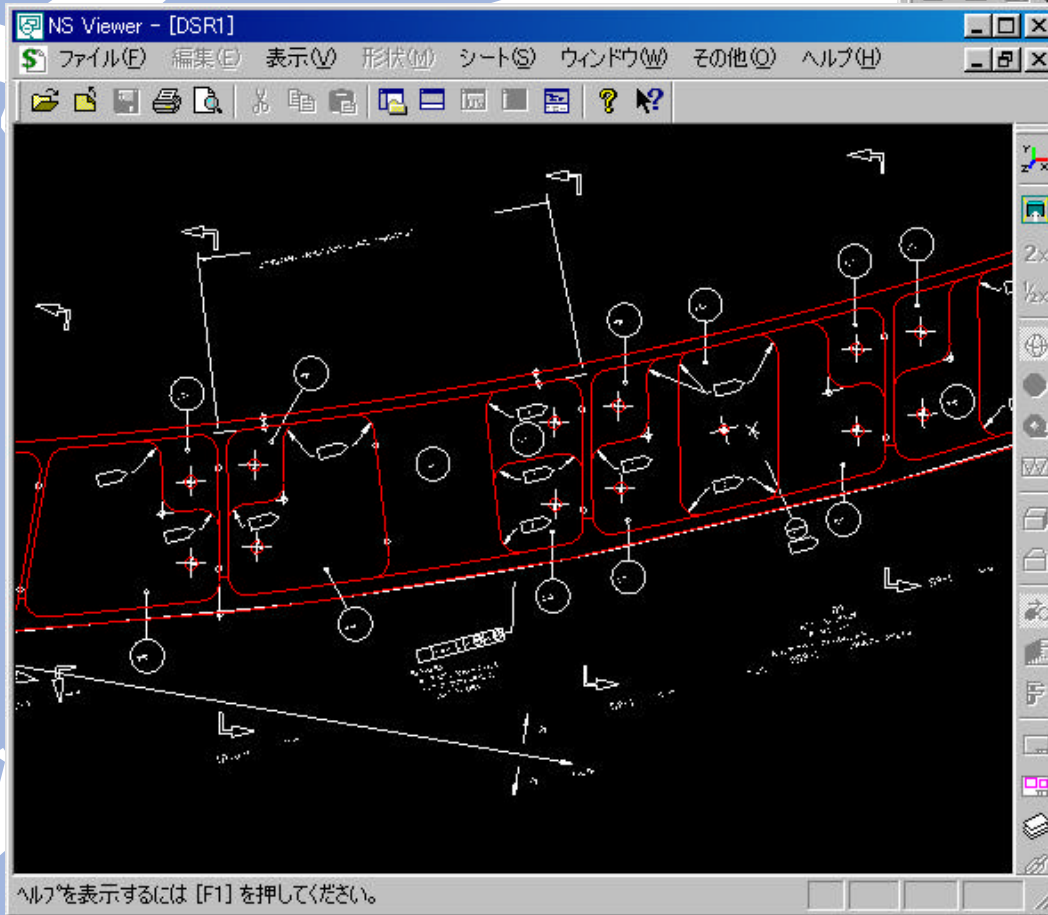
Values of area, volume, and center of gravity



Sample Presentations on STEP Viewer

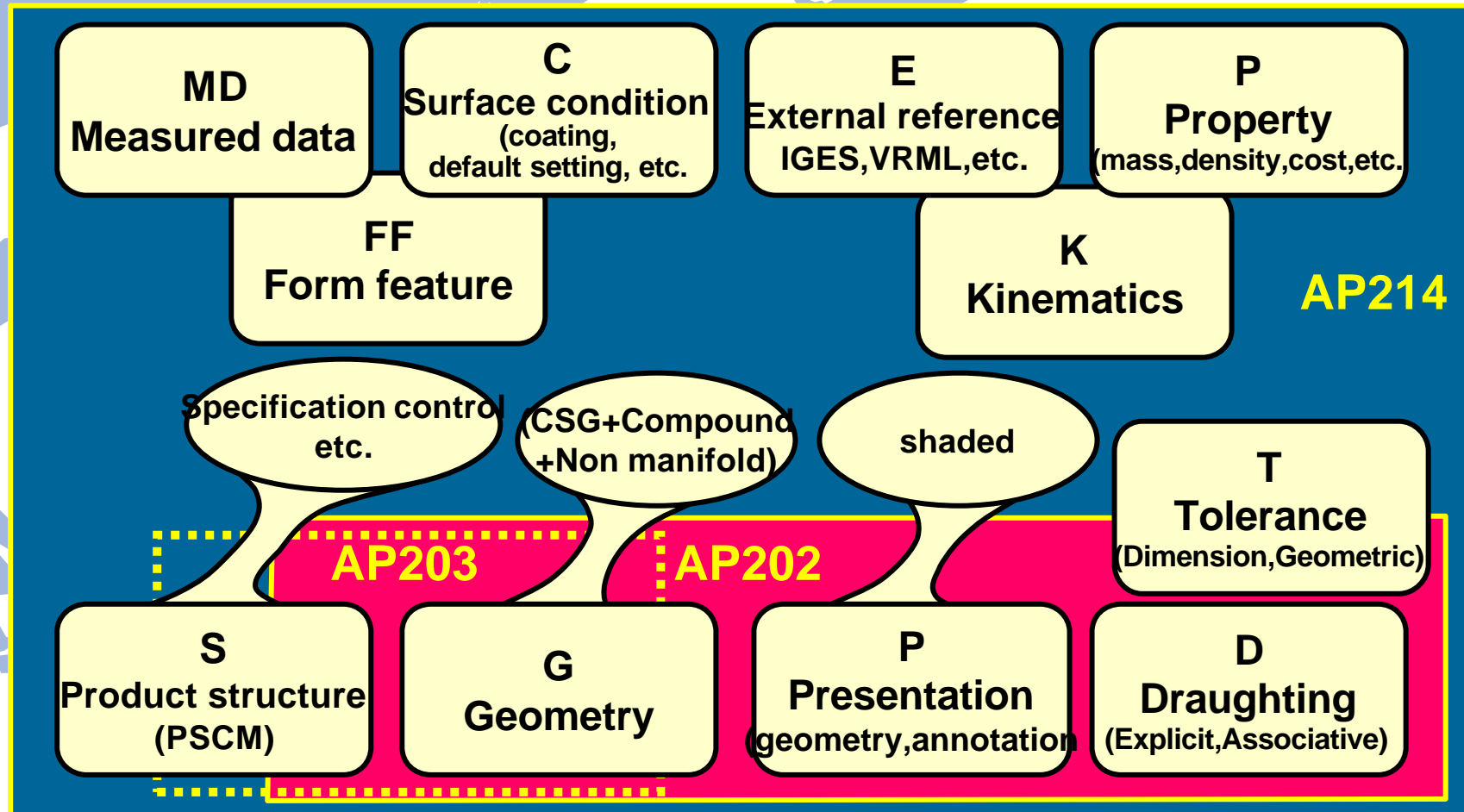
Maturity
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AP202 drawing
using 2-D/3-D wireframe model



AP202 drawing model
with solid, dimensions, and notes

Relation between AP214, AP203, and AP202



S: product management data, element structure, item definition structure, effectivity, work management, classification, specification control, process plan

G: The shape representations used in CC2, CC4, CC8, and a part of CC6 of AP202, are not available in AP214.