Future Trends in the CAD The Death of the File

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Message

For engineering,

the file will be replaced by the database

therefore

data sustainment must change

Contents

- The File will go the same way as the Scroll
- Trend 1: Model-based systems
  - File no longer unit of record
- Trend 2: Increasing scope of models
  - Model no long a single unit of record
- Trend 3: Integrated systems of model
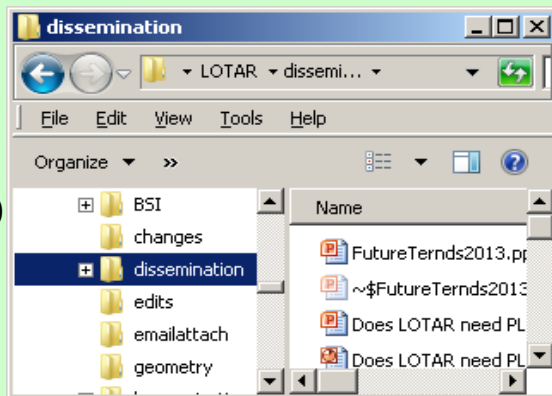 - Boundaries between models will be blurred

Scroll v the codex
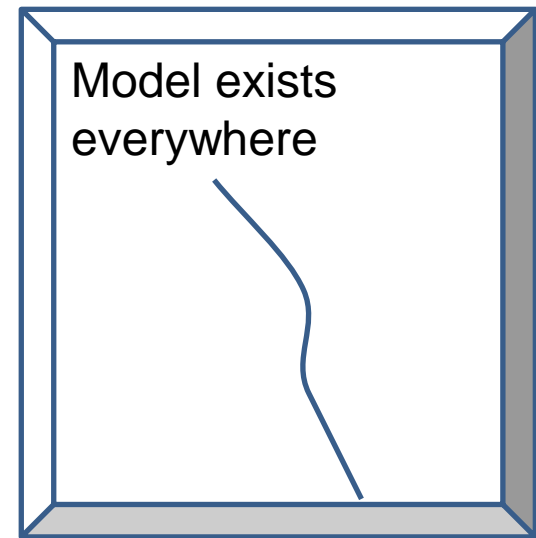

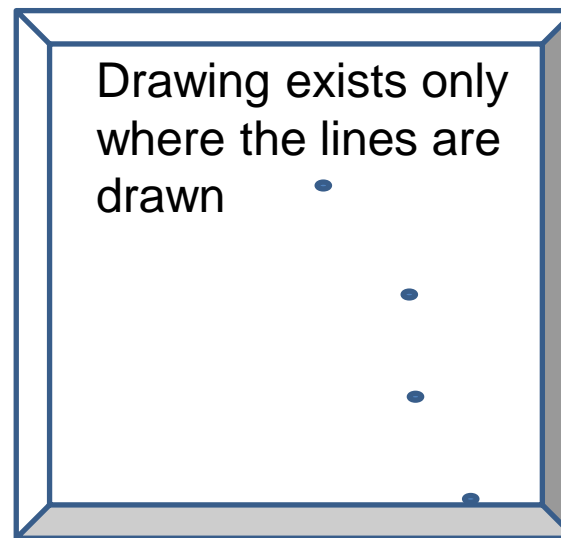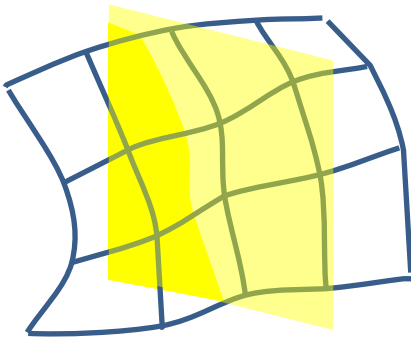Scroll

Serial Access

CAD
File

Codex

Random Access

Database

Trend 1: What is Model Based Engineering?

BAE SYSTEMS

A model *REPRESENTS* the data
A drawing only *PRESENTS* the data

Cut a surface with a plane

Drawing exists only where the lines are drawn

Model exists everywhere
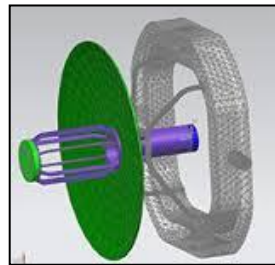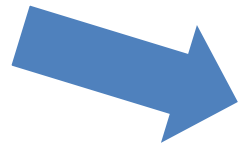
Consequently: MANAGE the MODEL not the drawing

Trend 1: Model Based Engineering

The Model is used directly downstream
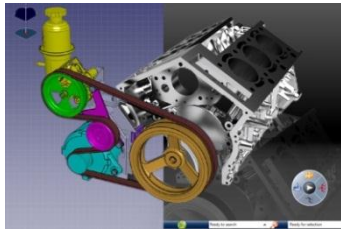
Future CAD:
    integrated
    feature level
data management

Finite element meshes generated directly from CAD model
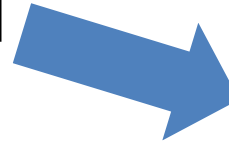
FE used for Lightning Strike Analysis - preserve for certification

Images various sources

Trend 1: Model Based Engineering

Even "documents" can be model-based

ISO 10303
one "view" of PLCS

Model

Produces

Presentation

PLCS
50,000 components with a
processor to render Presentation

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Trend 2: Greater Data Content - PMI

Existing LOTAR Parts for Mechanical CAD - STEP AP 203 &AP 214

- 100 Basics
- 110 CAD Shape   ← *Basic content for CAD*
- 115 CAD Assemblies
- **120 CAD with Product Manufacturing Information (PMI)** *as displayed*
- **120 V2 CAD with PMI** *as model*
- **125 CAD Assemblies with PMI**

1.2		1.2
Theoretically exact dimension	*ISO* *PMI Standards* *ASME*	**Basic dimension**
1.2		(1.2)
Auxiliary dimension		**Reference dimension**

Diagram ©LOTAR

Trend 2: Greater Content: AP242 v 1
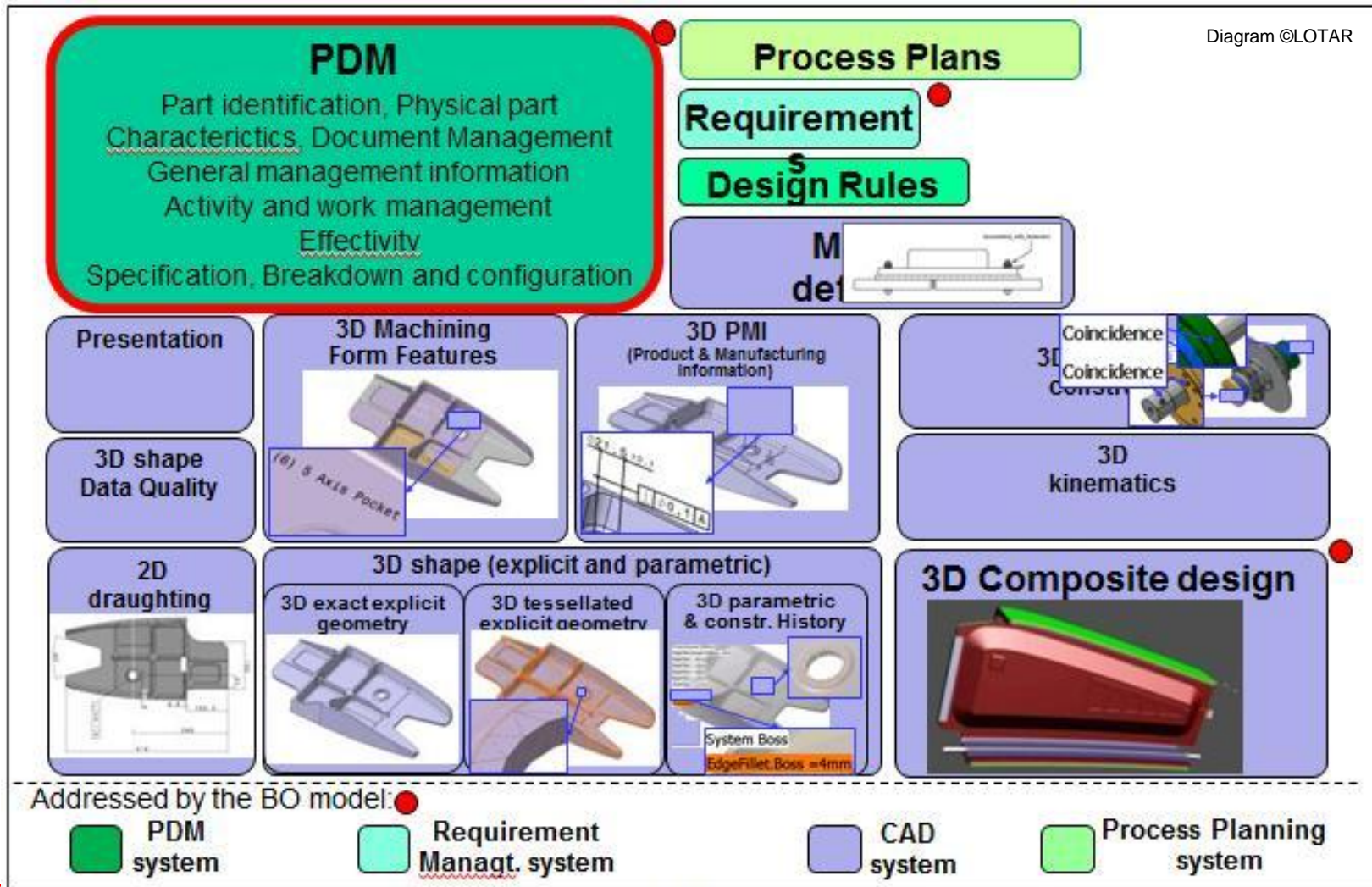
Diagram ©LOTAR

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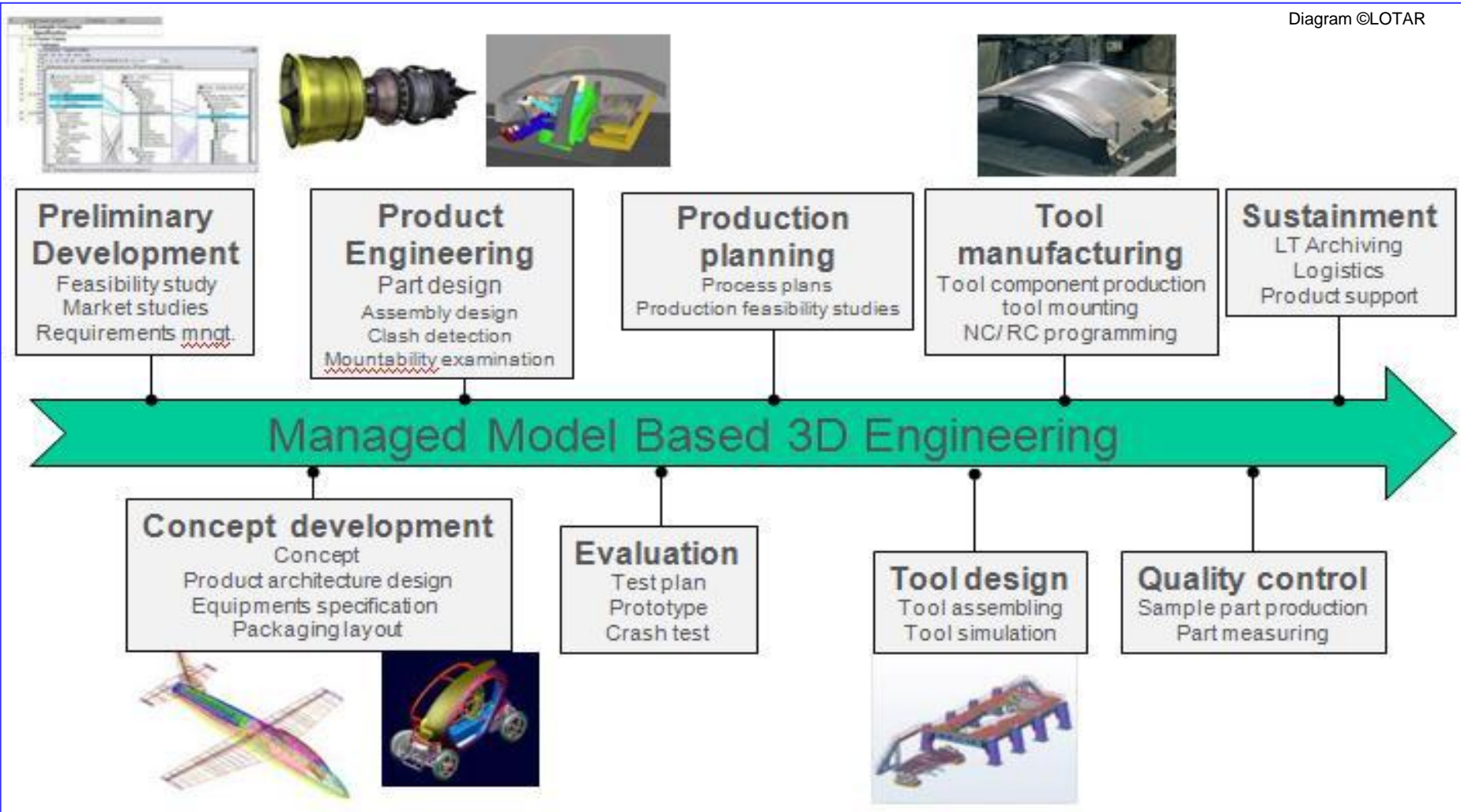# Trend 3: Integrated Data Model

Integrated Models

- Historically: to each process a model
  - E.g. STEP for mechanical, electrical, finite element, manufacturing
- New: Whole business domain joining multiple data
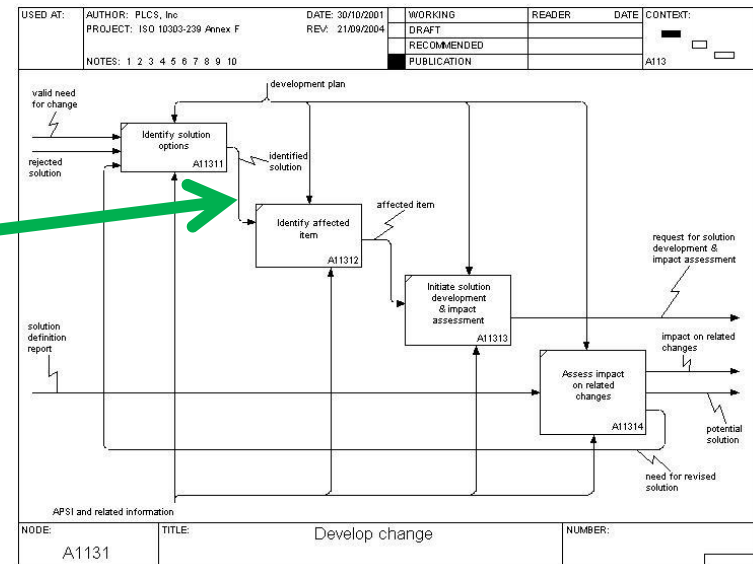- Overlay domain with transactions subsets

PLCS DEX linking process-to-process

Diagram ©ISO

Trend 3: Integrated Data Model

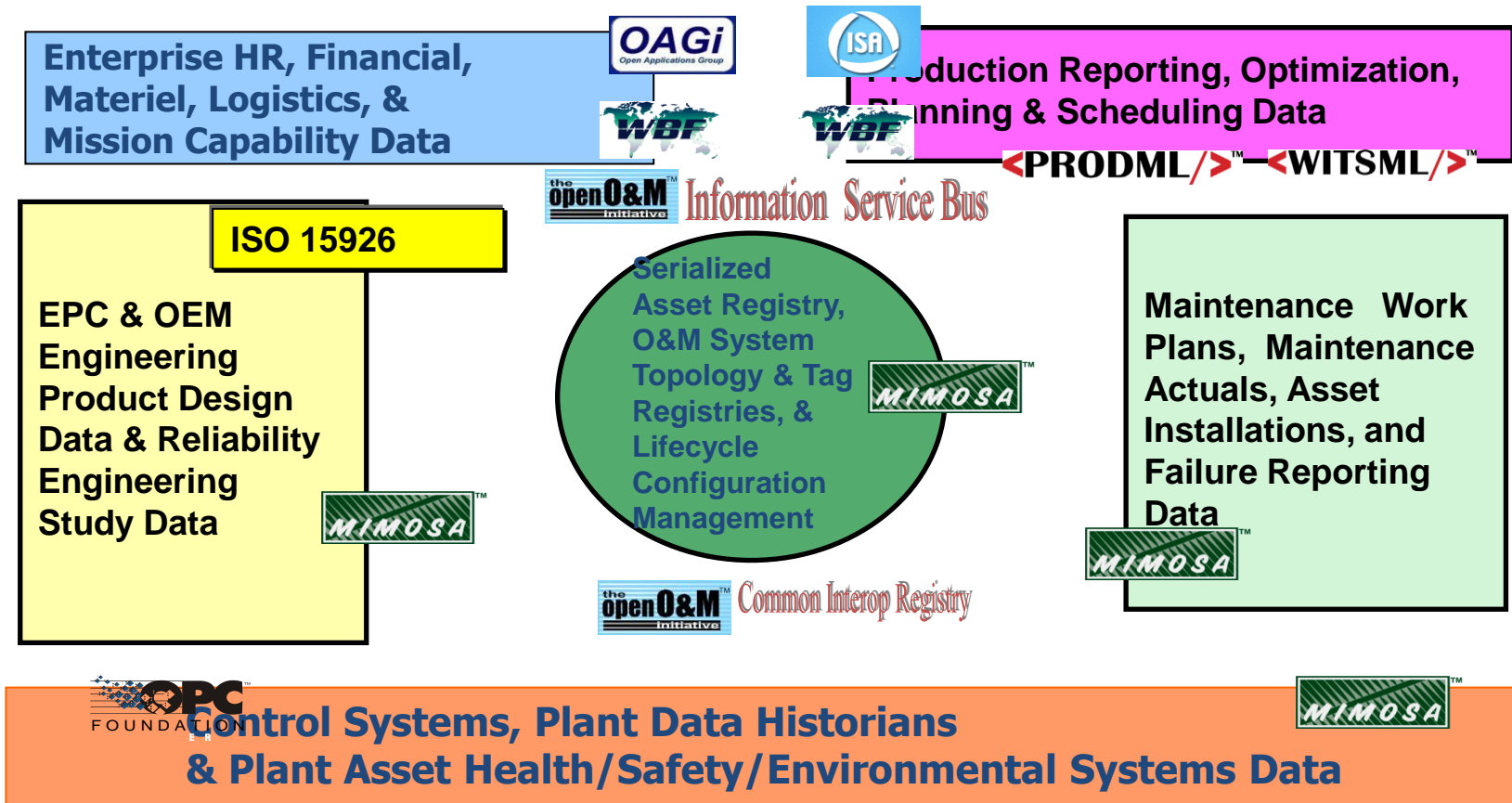OpenO&M Approach –Each System Engineered to Speak a Common O&M Language over a Common Information Bus

OAGi Open Applications Group

ISA

Enterprise HR, Financial, Materiel, Logistics, & Mission Capability Data

Production Reporting, Optimization, Planning & Scheduling Data

WBF

WBF

<PRODML/> <WITSML/>

openO&M Initiative **Information Service Bus**

ISO 15926

EPC & OEM Engineering Product Design Data & Reliability Engineering Study Data

MIMOSA

Serialized Asset Registry, O&M System Topology & Tag Registries, & Lifecycle Configuration Management

MIMOSA

Maintenance Work Plans, Maintenance Actuals, Asset Installations, and Failure Reporting Data

MIMOSA

openO&M Initiative **Common Interop Registry**

OPC FOUNDATION

Control Systems, Plant Data Historians & Plant Asset Health/Safety/Environmental Systems Data

MIMOSA

Image from MIMOSA

Trend 3: Integrated Data Models

Example: Integrated Vehicle Health Monitoring

- **MIMOSA-CBM covering Real Time Health Monitoring**
- **MIMOSA-EAI for Data Warehouse based analysis**
- **S1000D for maintenance manuals**
- **PLCS integrating maintenance, product configuration, change and fleet management**
- **STEP for design management**
- **OAGIS for supply chain management**
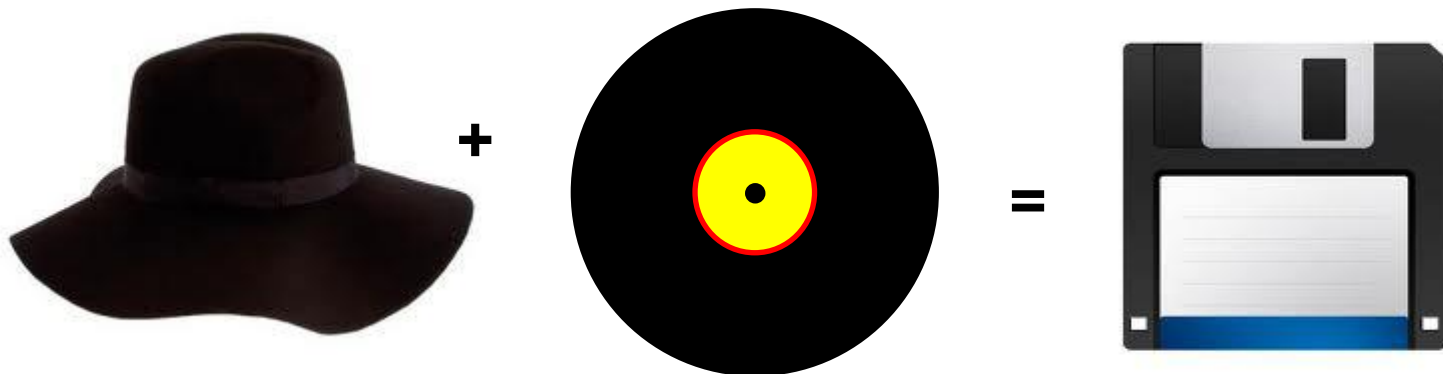

Asset to Part Mapping
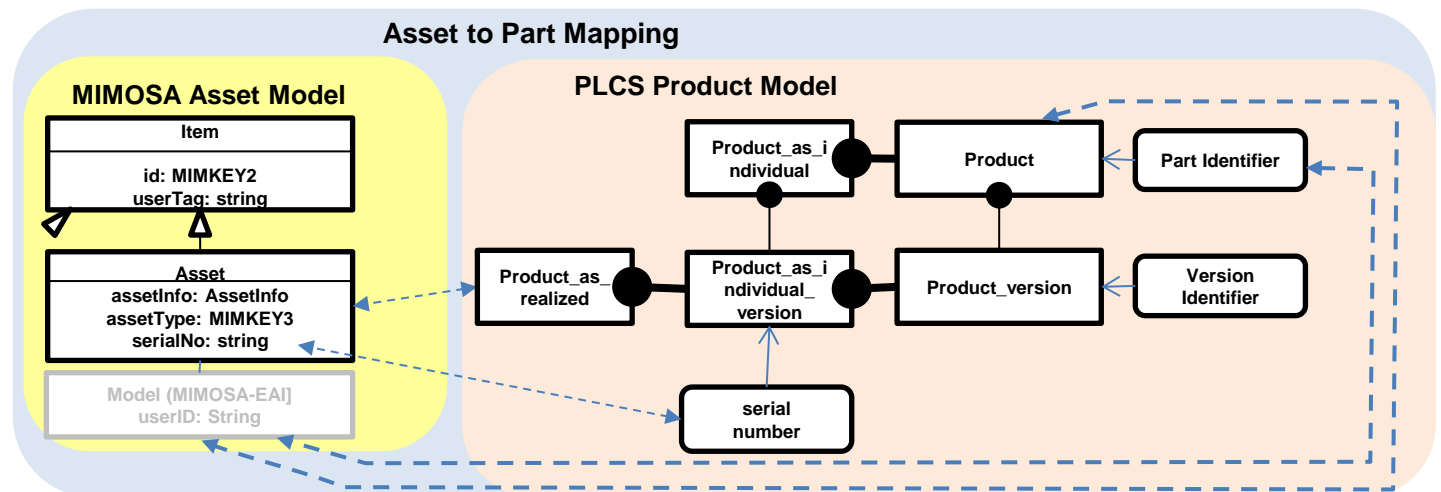
Implications

Now

- Investigate preservation planning for database based systems
- Importance of validation properties

In thirty years

- File based methodologies will become niche
- Methodologies to migrate files to databases will be common place
- Need a teaching programme to explain how things used to be done

In 2000   "Floppy"   **+**   "Disc"   **=**   Rigid Square

Summary

4 Stages of computerisation:

- Stage1 - reproduce documents
- Stage 2 - replace documents with models
- Stage 3 - add more functions
- Stage 4 - join everything together

BUT

Long term sustainment mostly at stages 1 & 2

We need a Science Museum not the British Library