Database preservation toolkit:

a flexible tool to normalize and give access to databases

DLM Forum: “Making the Information Governance Landscape in Europe”

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KEEP SOLUTIONS // University of Minho

Nov. 12-14, 2014, Lisbon, Portugal

KEEP SOLUTIONS: Projects

- DigitArq, CRAV (2003..[2008-2012])
- RODA (2006..[2008-…[)
- RCAAP (2008-…)
- PPA (2009)
- Open source: RODA, KOHA, DSpace, Moodle, etc.
- Scientific research (european projects)
  - **SCAPE**: Large scale preservation
  - **4C**: the cost for curation
  - **e-arK**: presented by Kuldar

http://www.keep.pt

This work was partially supported by the SCAPE Project.
The SCAPE project is co-funded by the European Union under FP7 ICT-2009.4.1 (Grant Agreement number 270137).

Database Preservation Toolkit

Developed within RODA project

Now stand-alone open-source project

http://keeps.github.io/db-preservation-toolkit/

Imports and exports between DBMS and DB formats

Supports preservation formats: DBML, SIARD

The Past: 2006 - 2009

RODA:
Repositório de Objectos Digitais Autênticos

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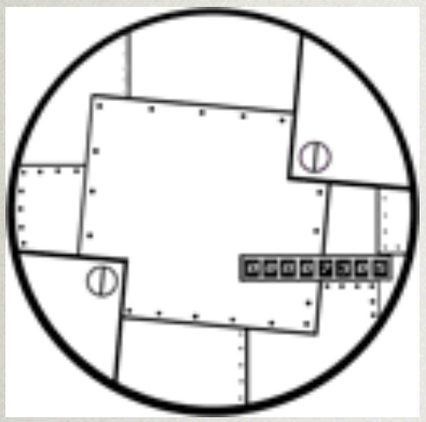
What is RODA?

A digital repository created for archives, with the following features:

- Long term preservation and Autenticity
- Standards based (OAIS, EAD, PREMIS, METS, etc.)
- Following TRAC demands (Trustworthy Repositories Audit & Certification)
- Security policies
- Service Oriented Architecture (SOA)
- Nice and simple design
- Open source
- DGArq and University of Minho

Context



RODA (2006-2009)

- Metadata management (EAD)
- Digital Object management (...)
- Digital Preservation Policies and protocols
- National Project (Archives National Board)

CRiB
Conversion and Recommendation of Digital Object Formats

CRiB: Preservation Services Digital Repositories (2005-2008)

- Distributed Migration Service
- Migration Service supported by knowledge base
- phd Thesis / U. Minho (Miguel Ferreira)

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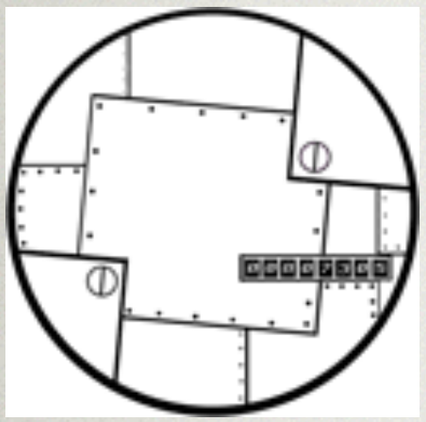

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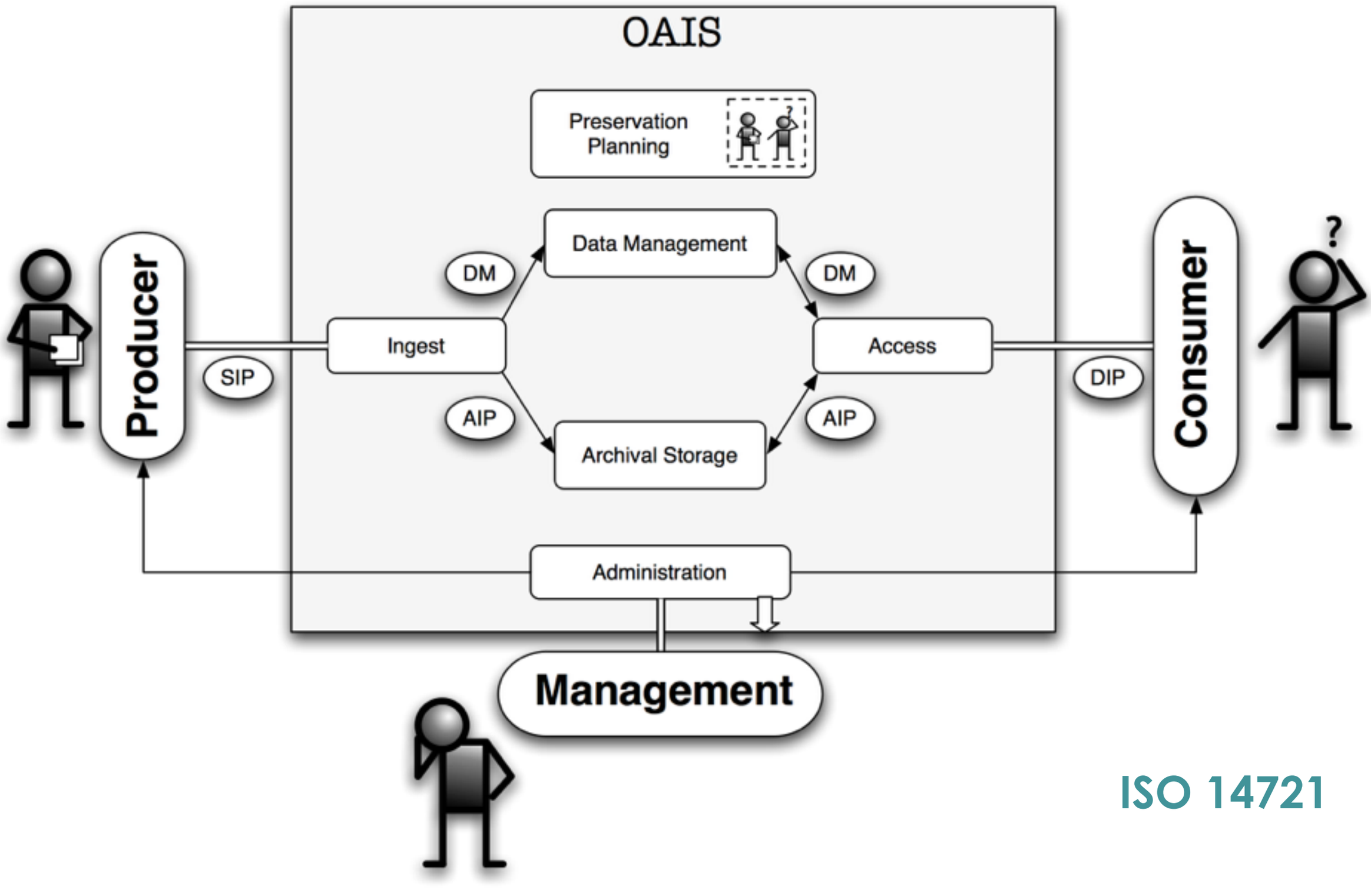
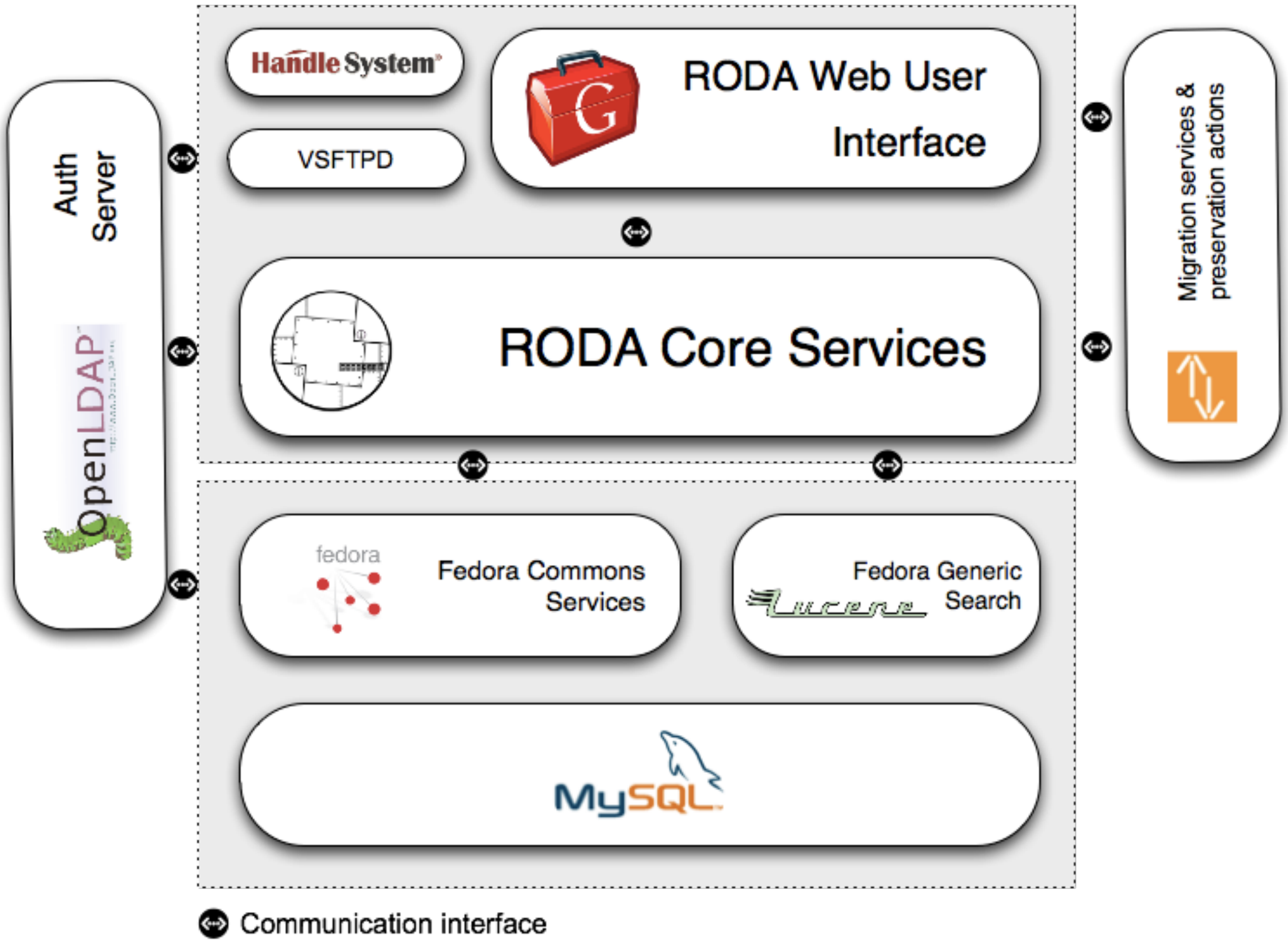
OAIS



ISO 14721

Architecture



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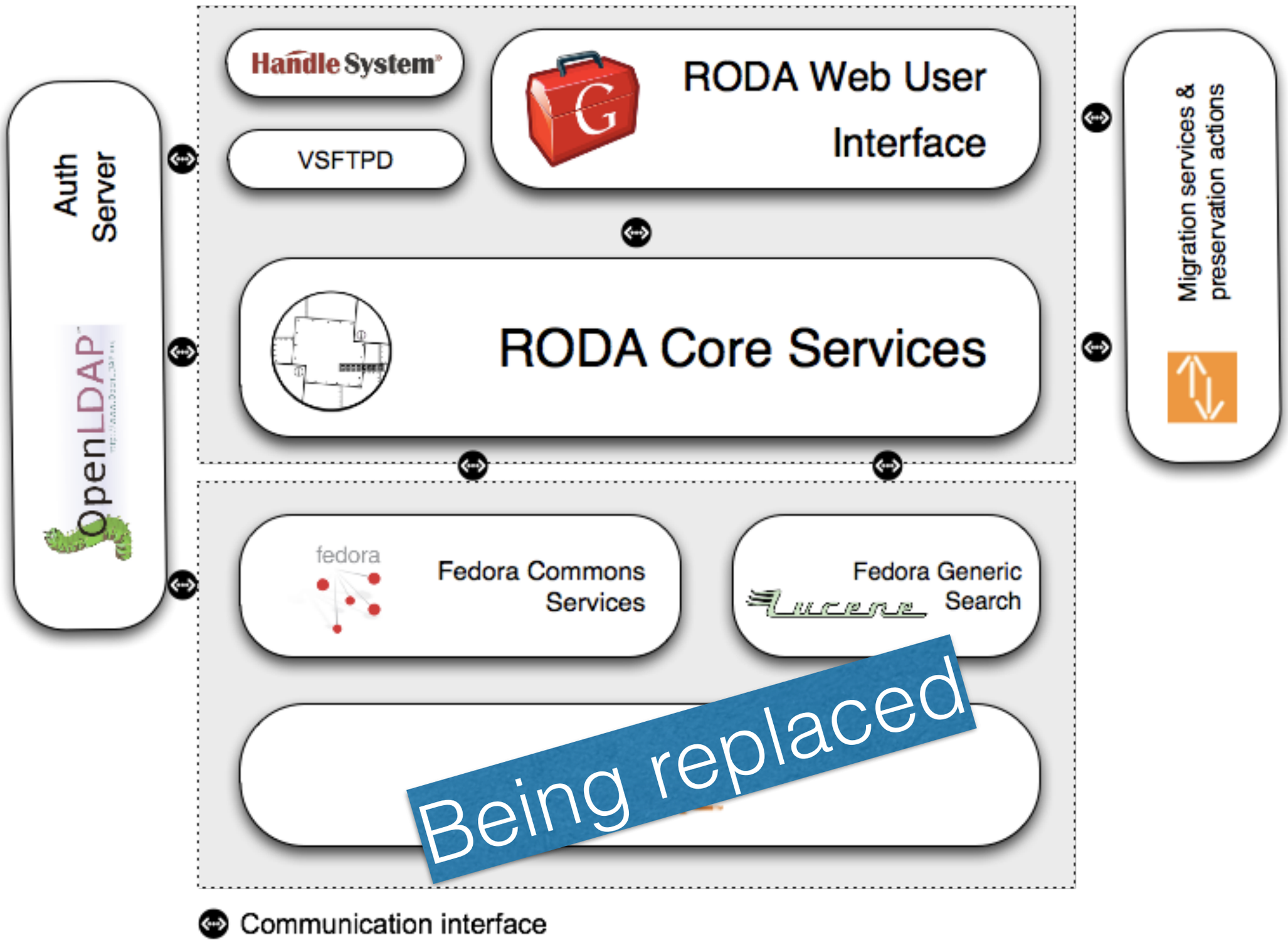
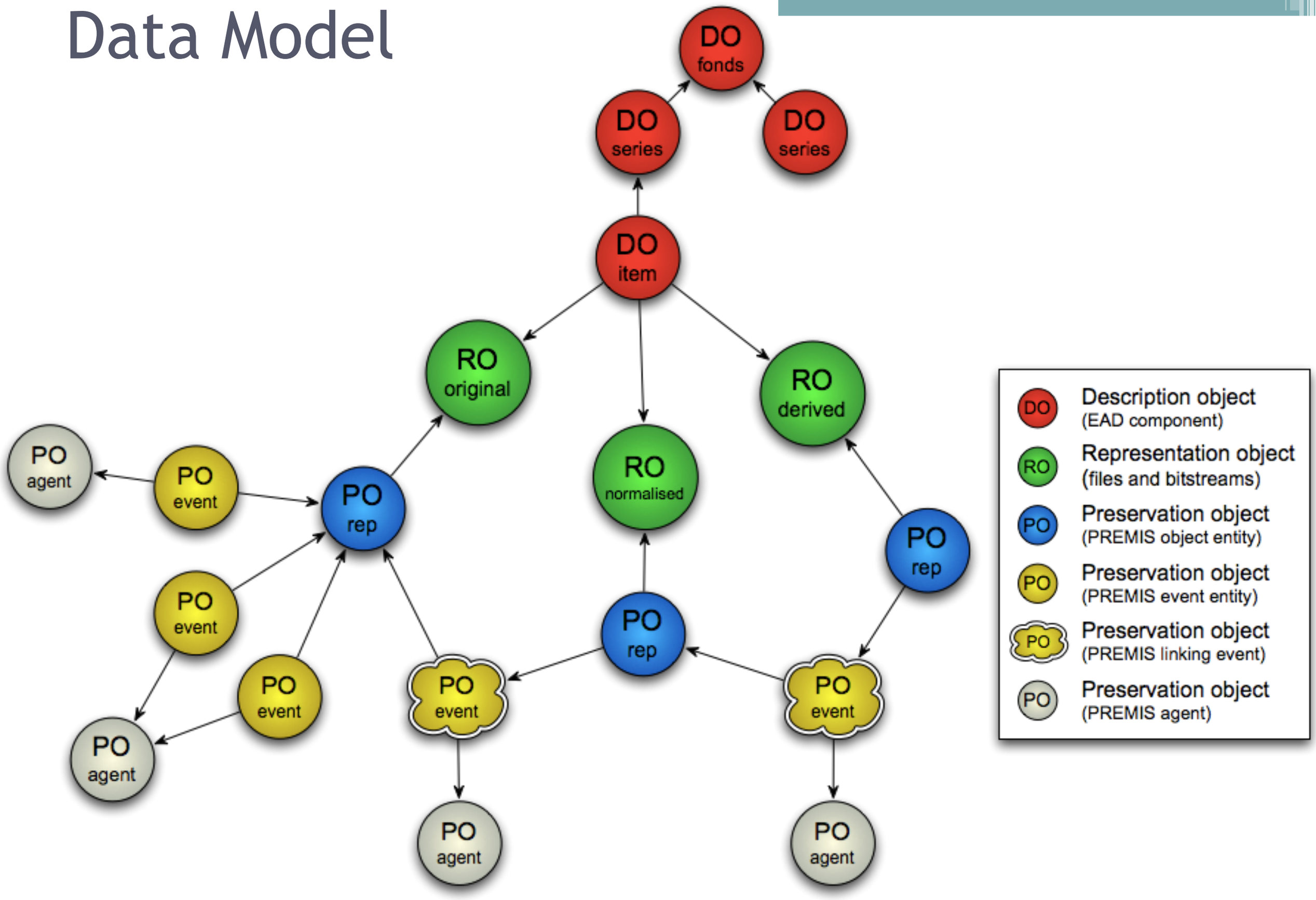


Data Model


DO fonds
DO series
DO series
DO item
RO original
RO derived
RO normalised
PO agent
PO event
PO rep
PO event
PO event
PO rep
PO rep
PO event
PO event
PO agent
PO agent
PO agent
Description object (EAD component)
Representation object (files and bitstreams)
Preservation object (PREMIS object entity)
Preservation object (PREMIS event entity)
Preservation object (PREMIS linking event)
Preservation object (PREMIS agent)

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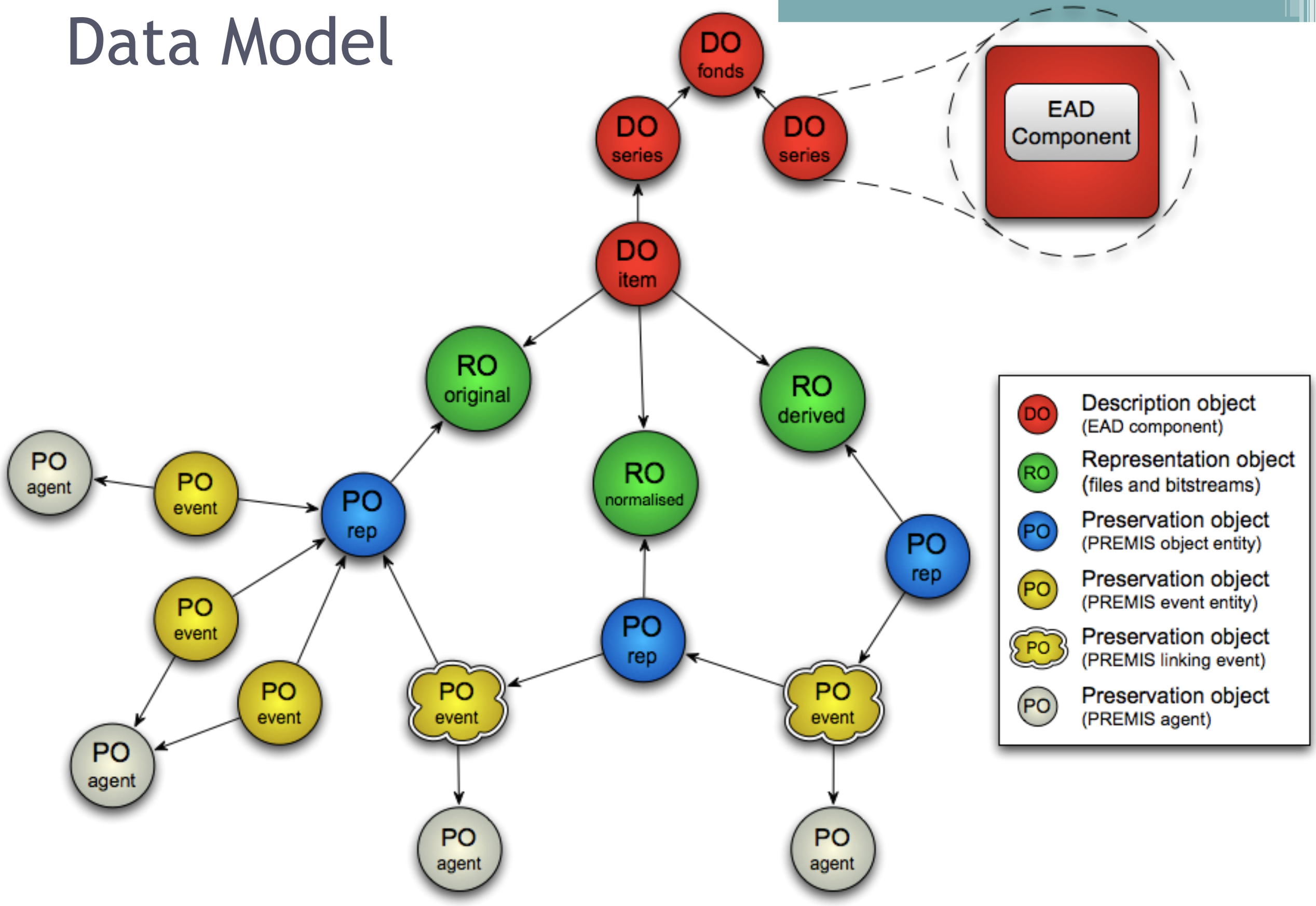
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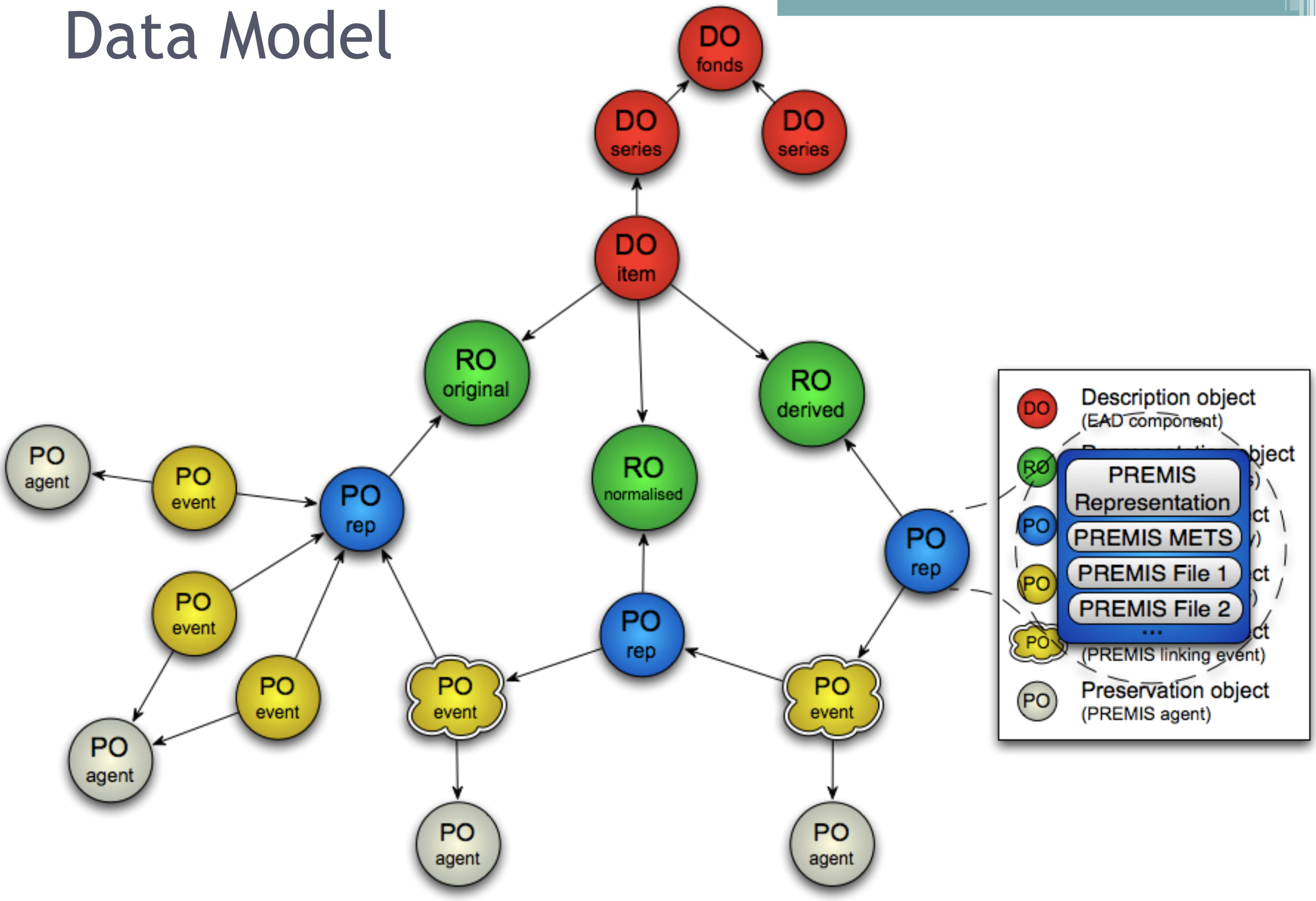
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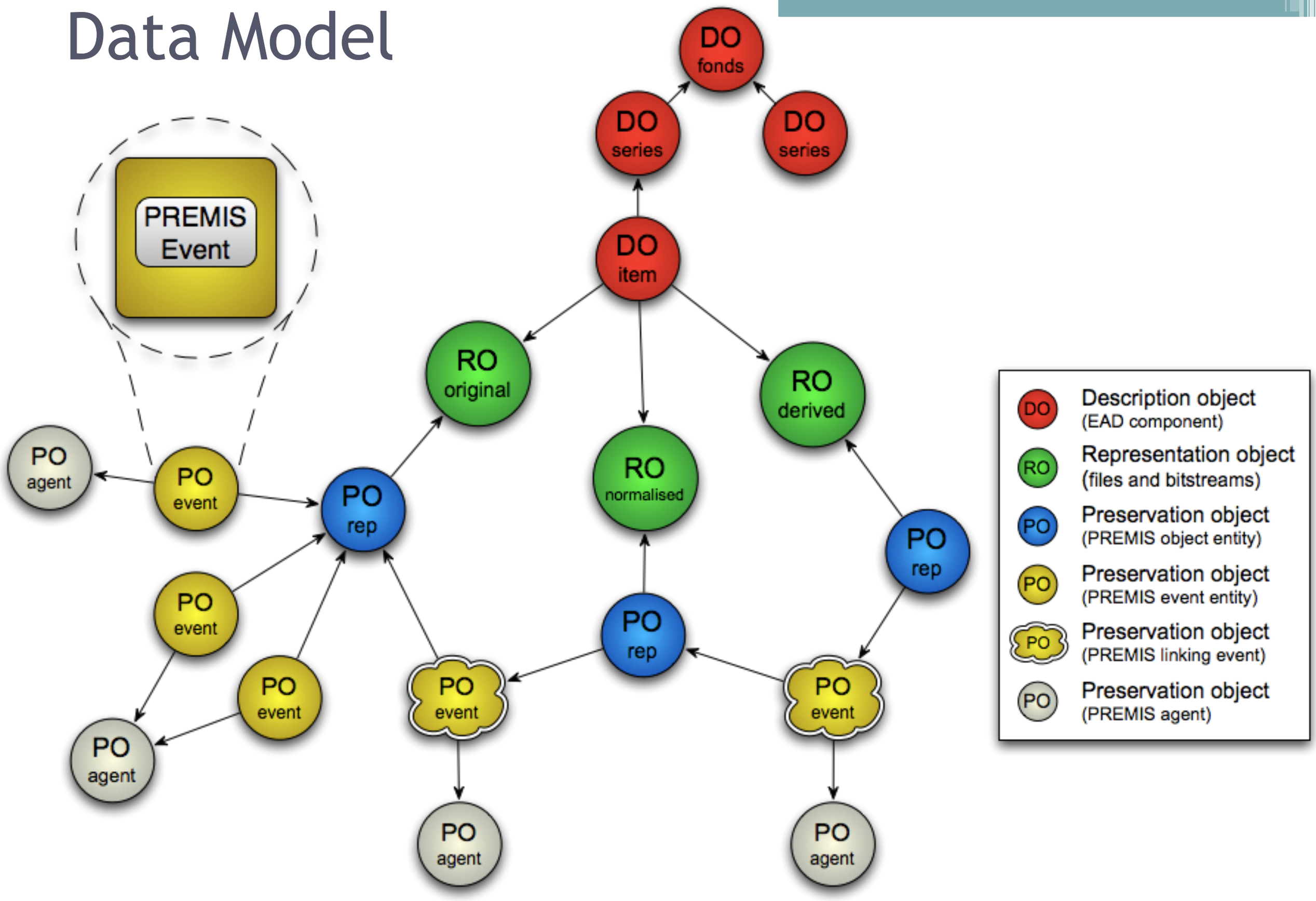
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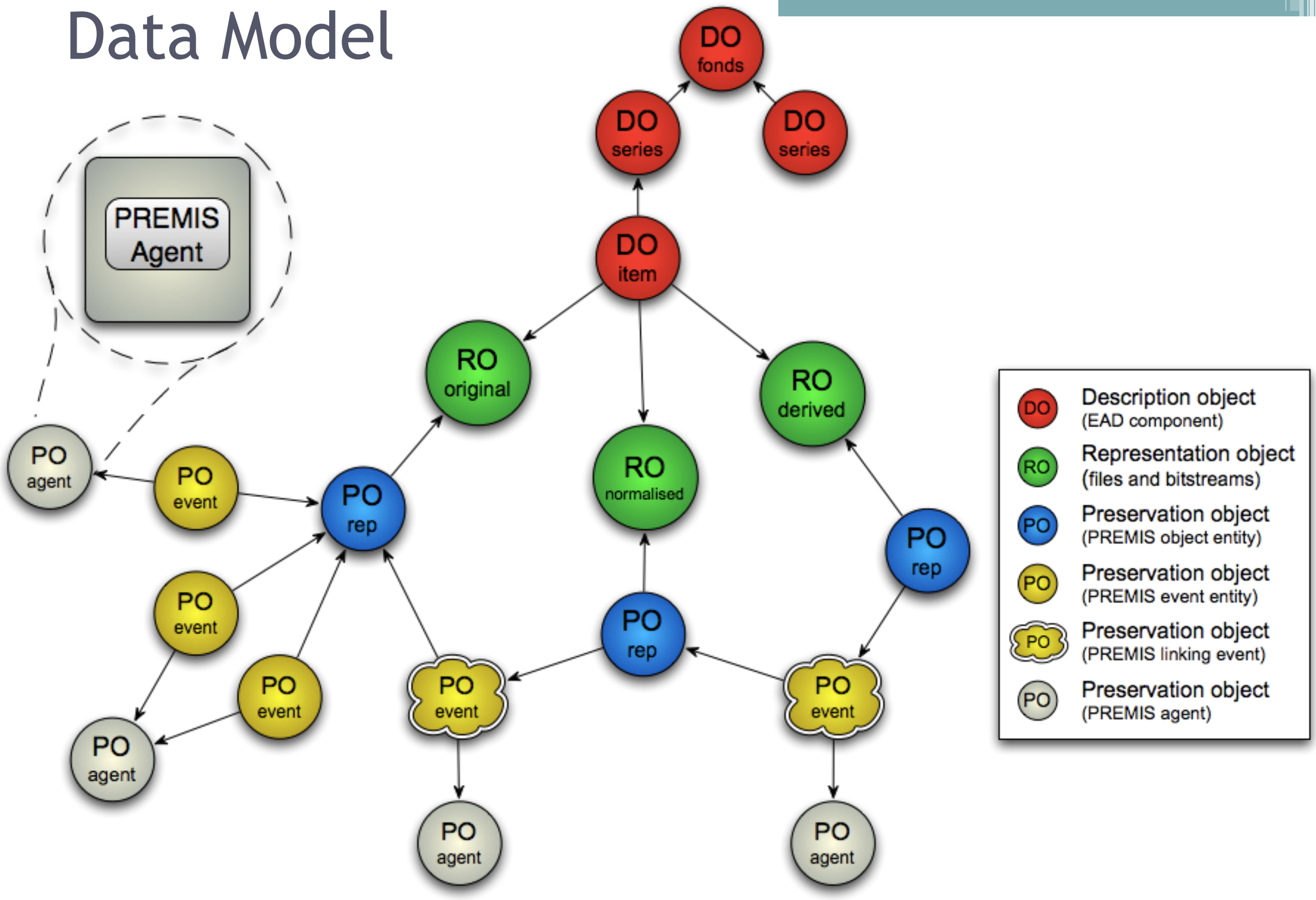
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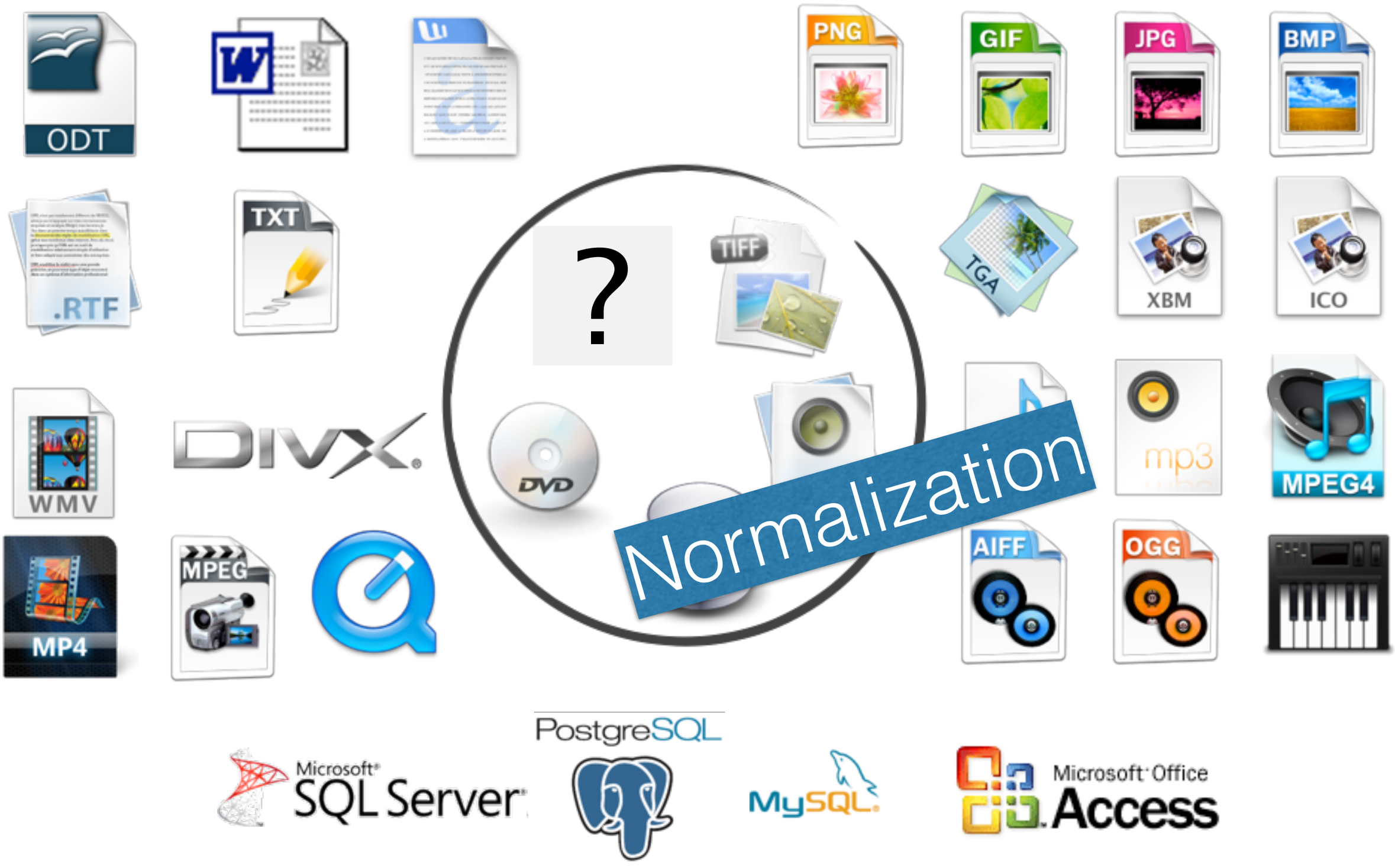
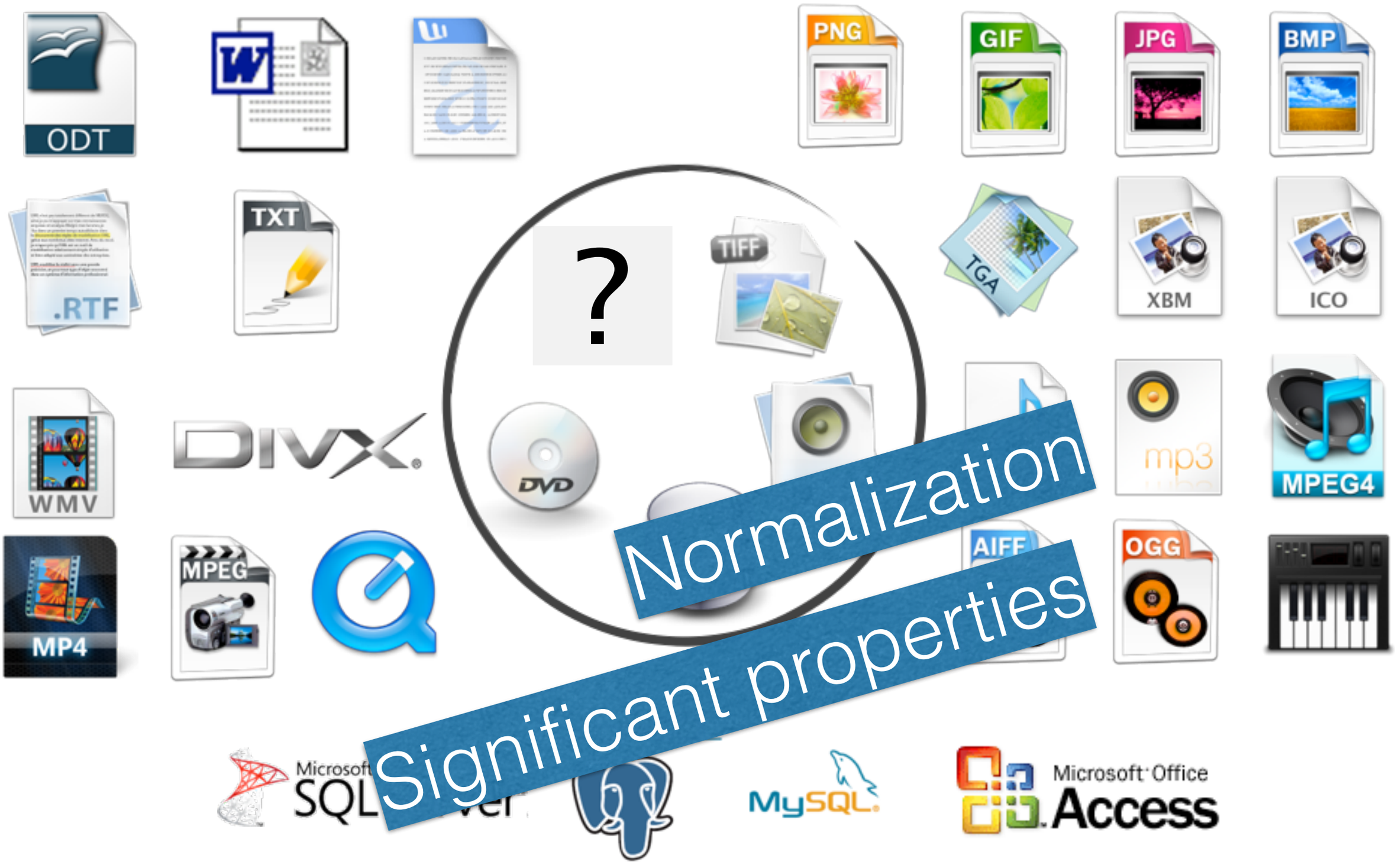
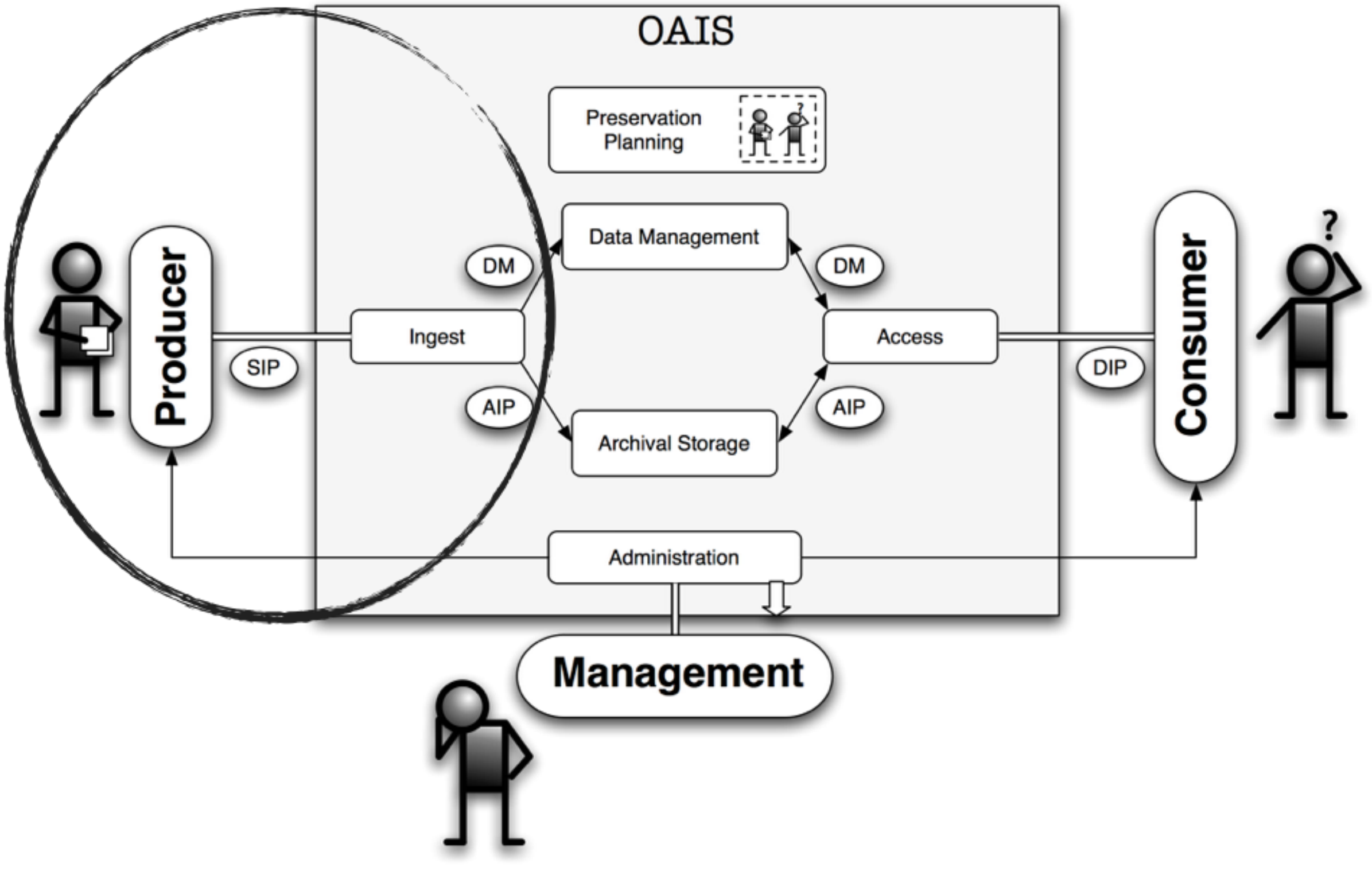


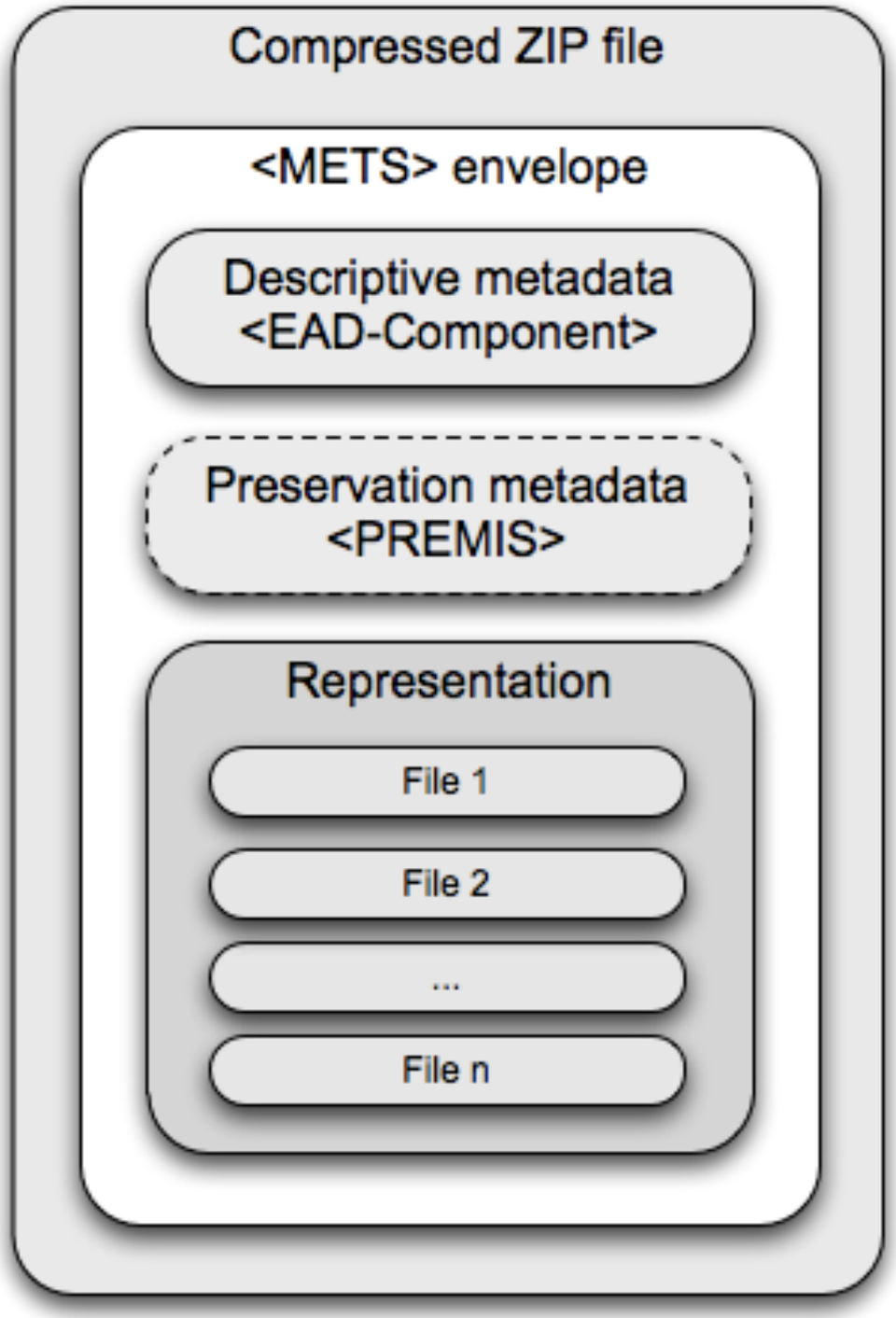
Digital Object Classes



Ingest

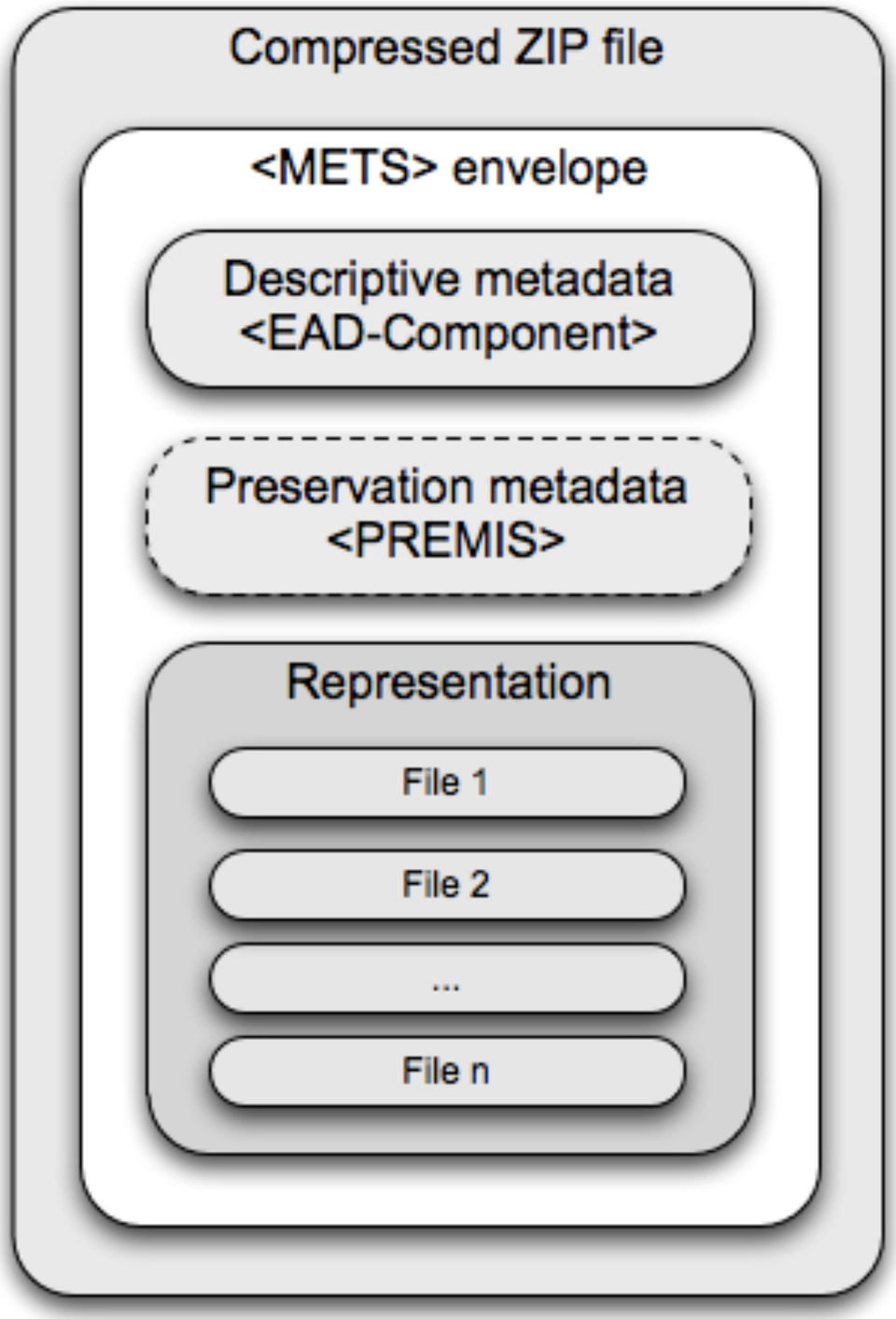

OAIS
Preservation Planning
Data Management
DM
DM
Ingest
Access
SIP
DIP
AIP
AIP
Archival Storage
Administration
Producer
Consumer
Management

SIP structure



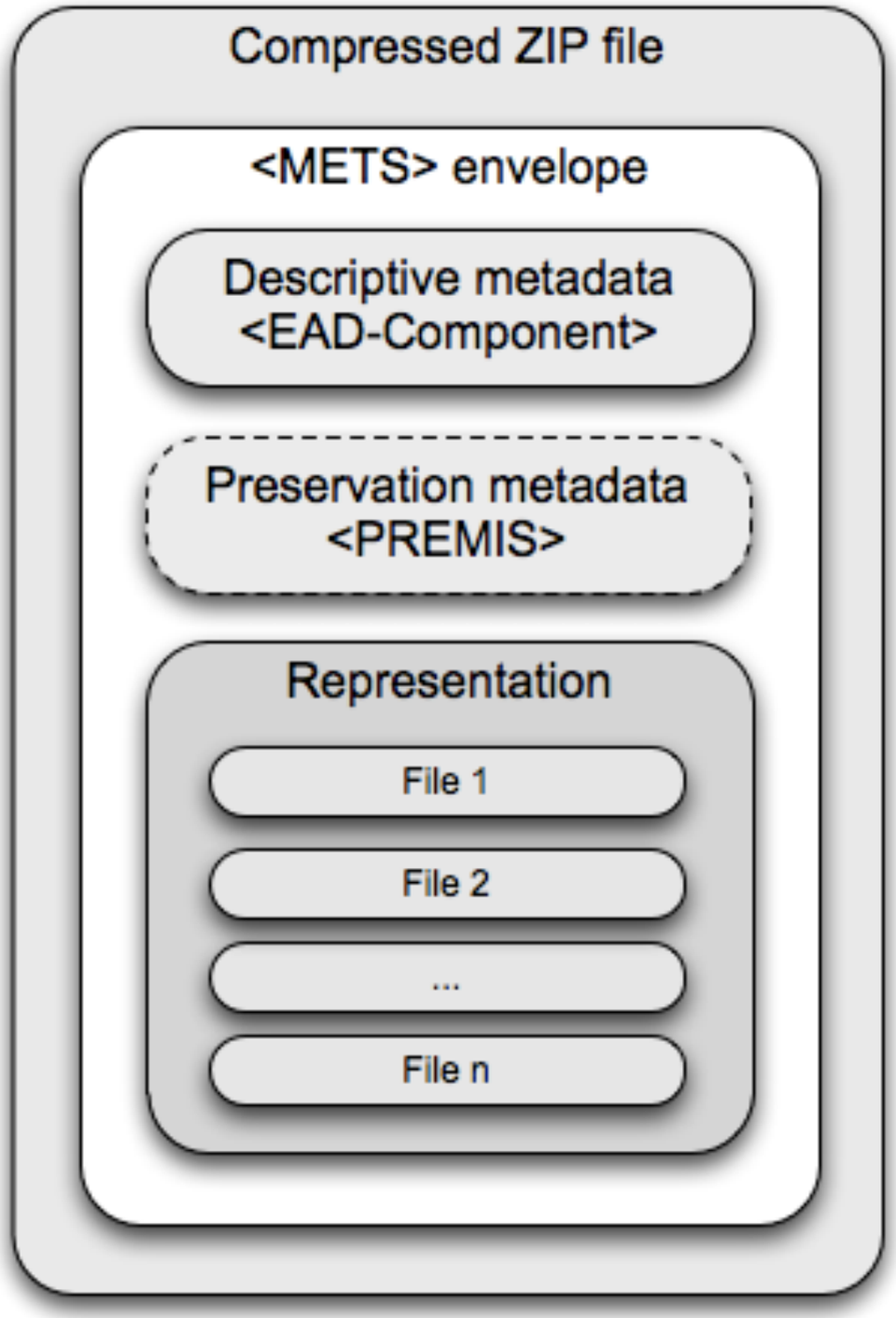
SIP structure

- Object class and format



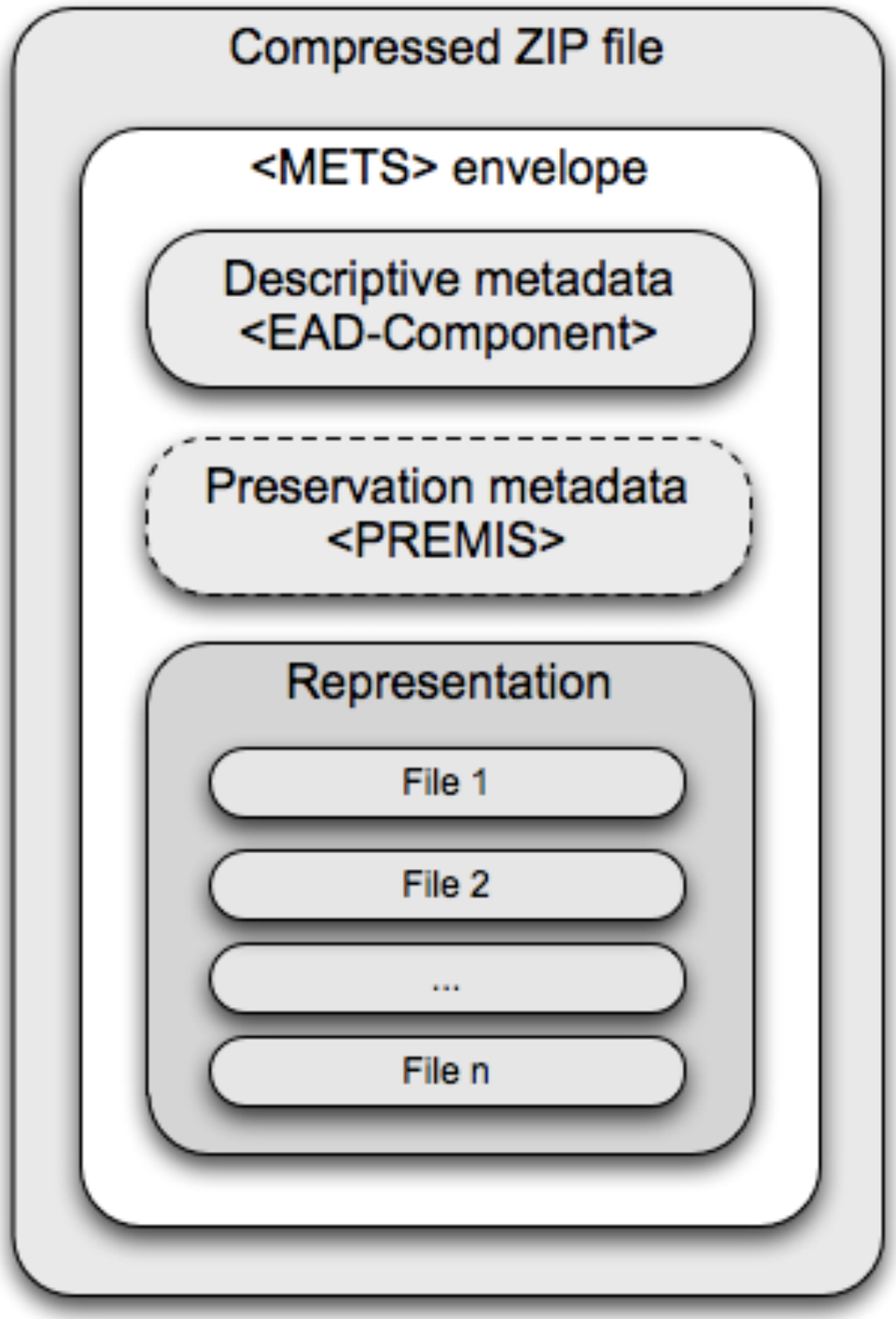
SIP structure

- Object class and format
- Place in classification plan



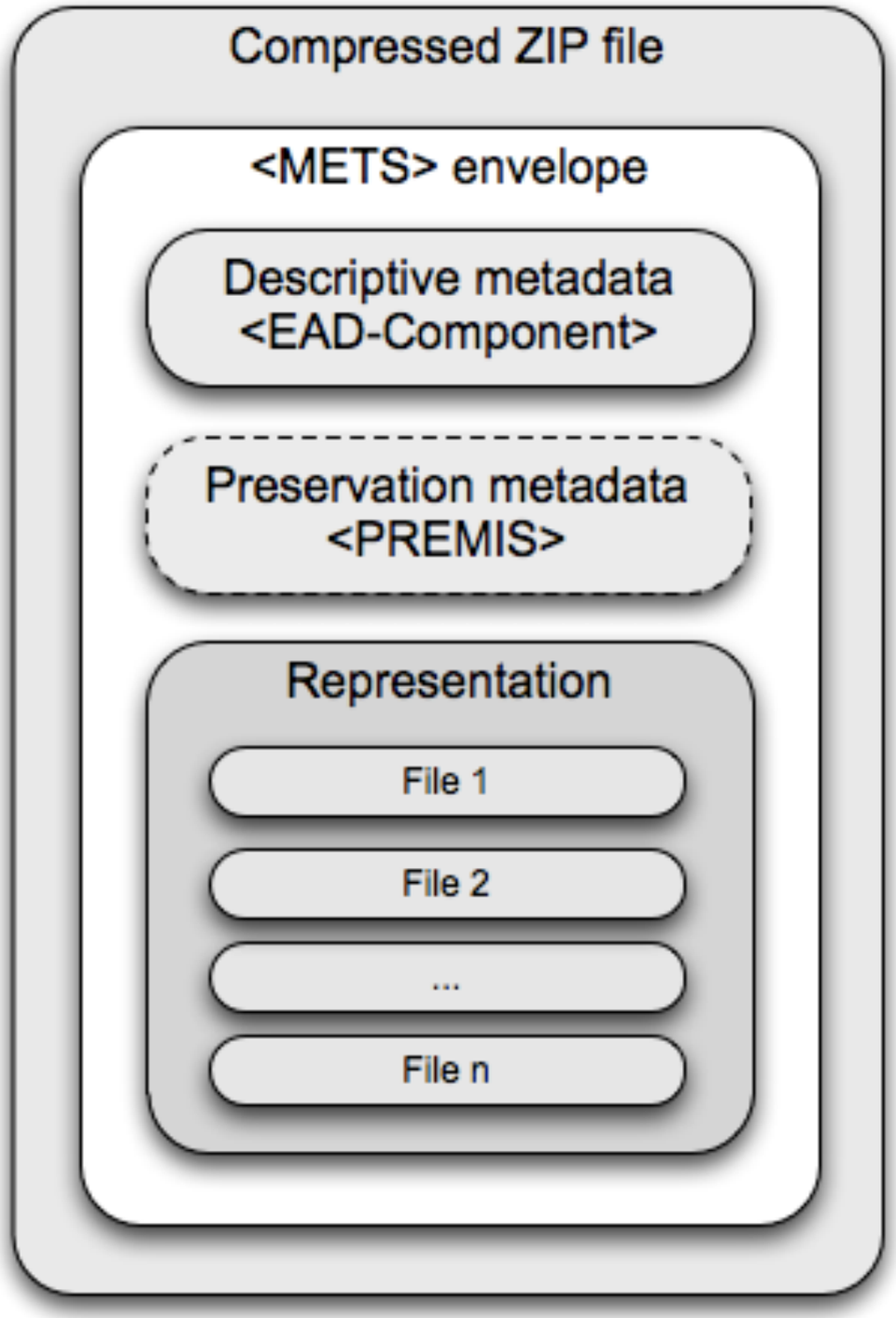
SIP structure

- Object class and format
- Place in classification plan
- Descriptive metadata



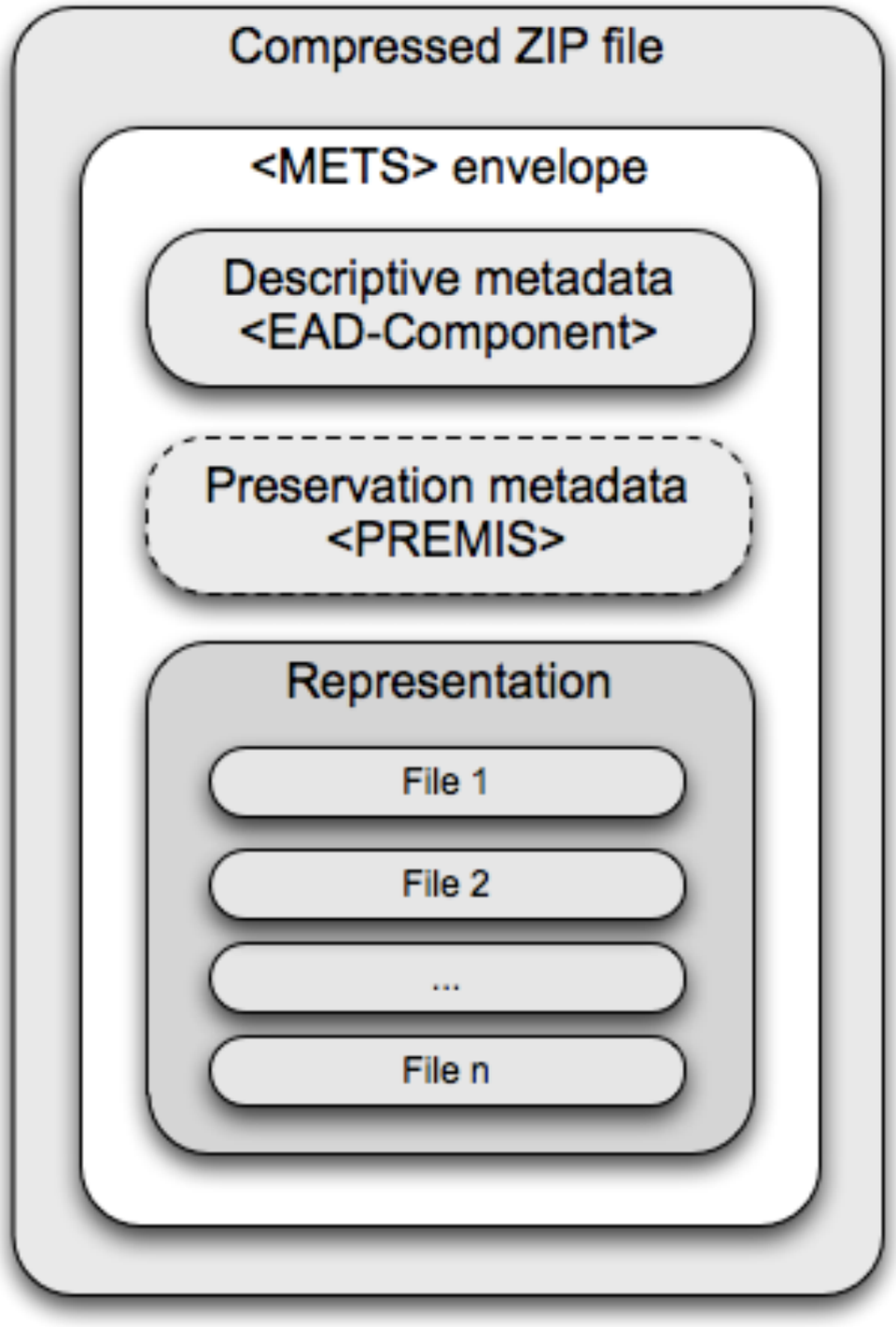
SIP structure

- Object class and format
- Place in classification plan
- Descriptive metadata
- Preservation metadata



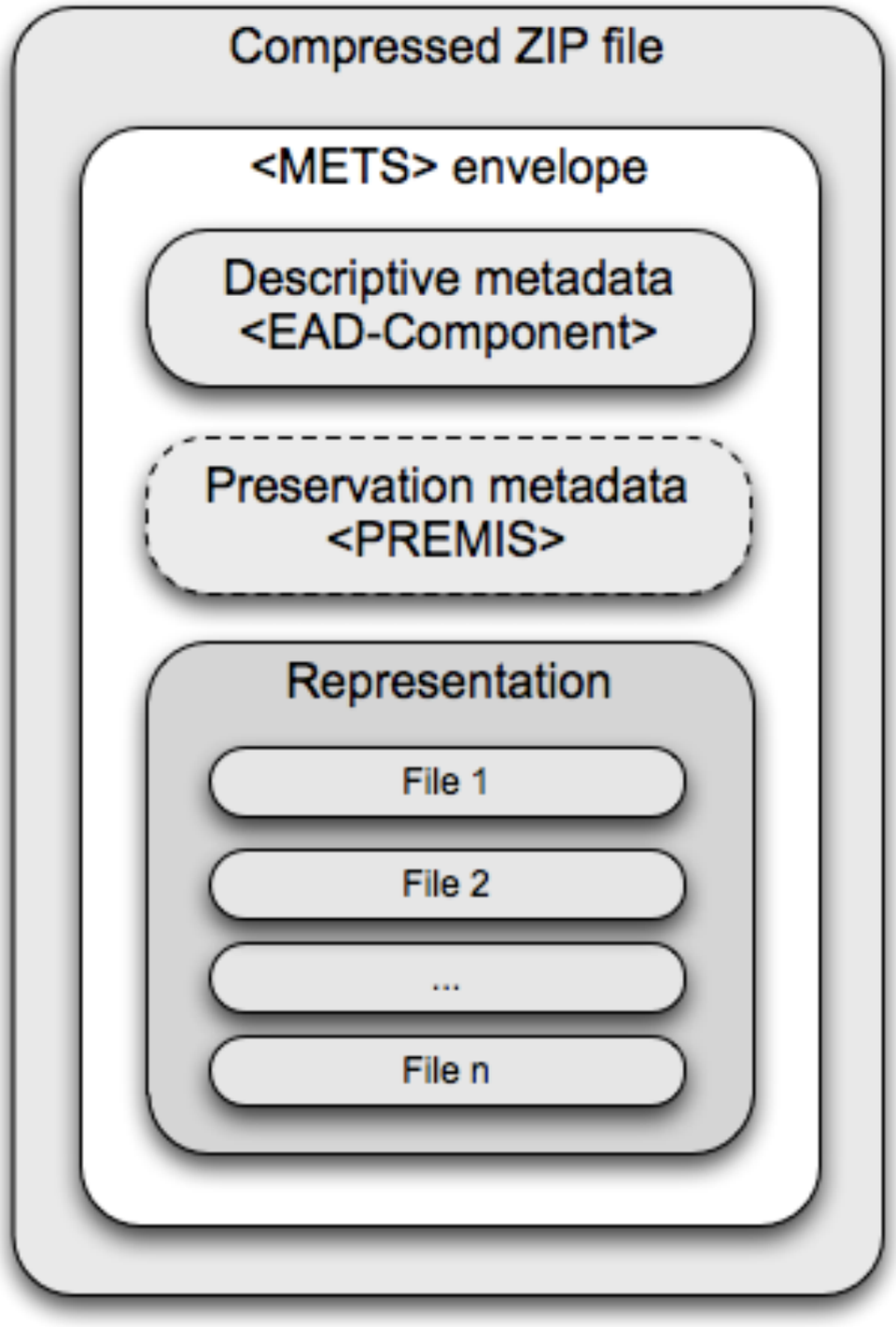
SIP structure

- Object class and format
- Place in classification plan
- Descriptive metadata
- Preservation metadata
- Technical metadata



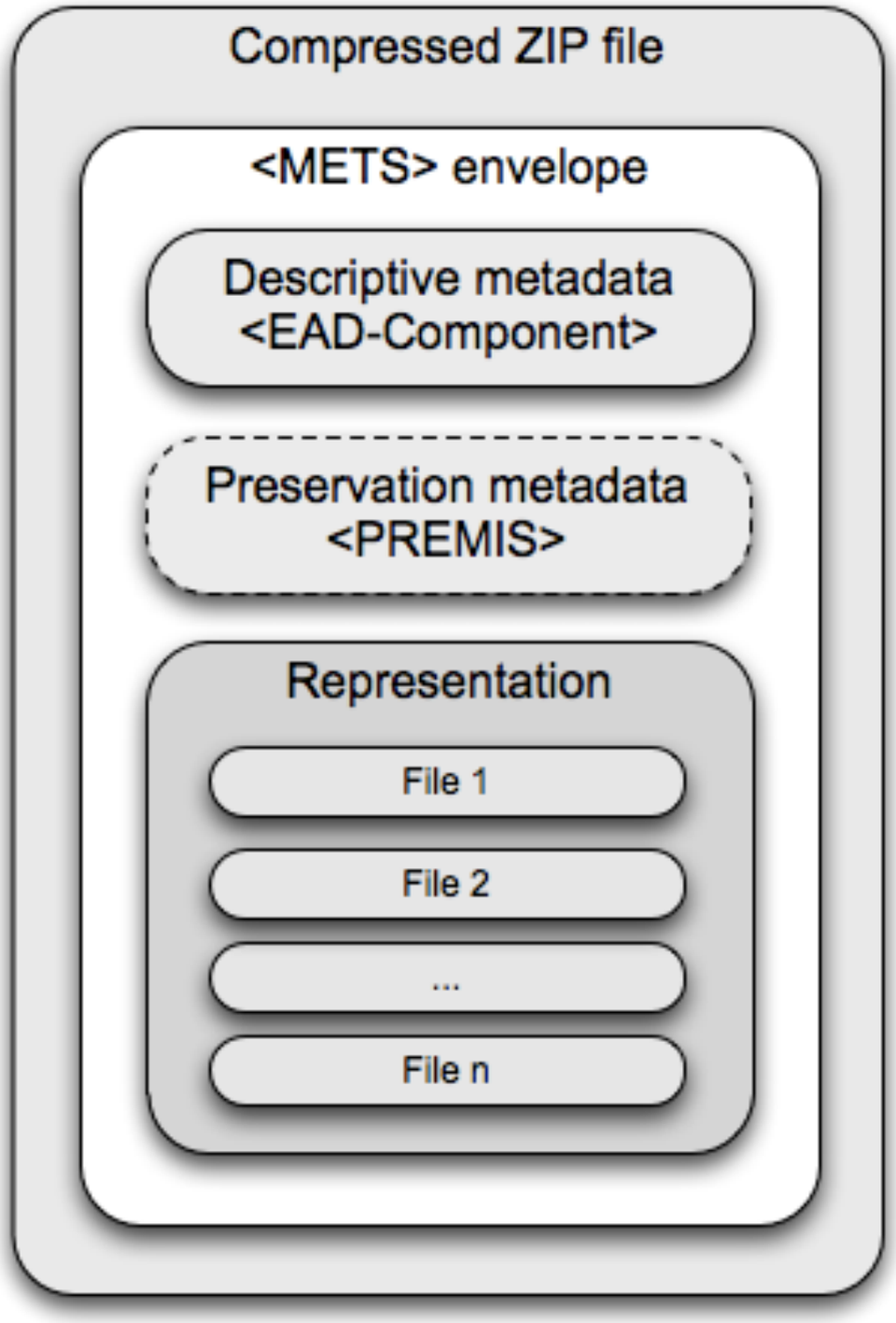
SIP structure

- Object class and format
- Place in classification plan
- Descriptive metadata
- Preservation metadata
- Technical metadata
- Representation files



SIP structure

- Object class and format
- Place in classification plan
- Descriptive metadata
- Preservation metadata
- Technical metadata
- Representation files
- Identification of root file



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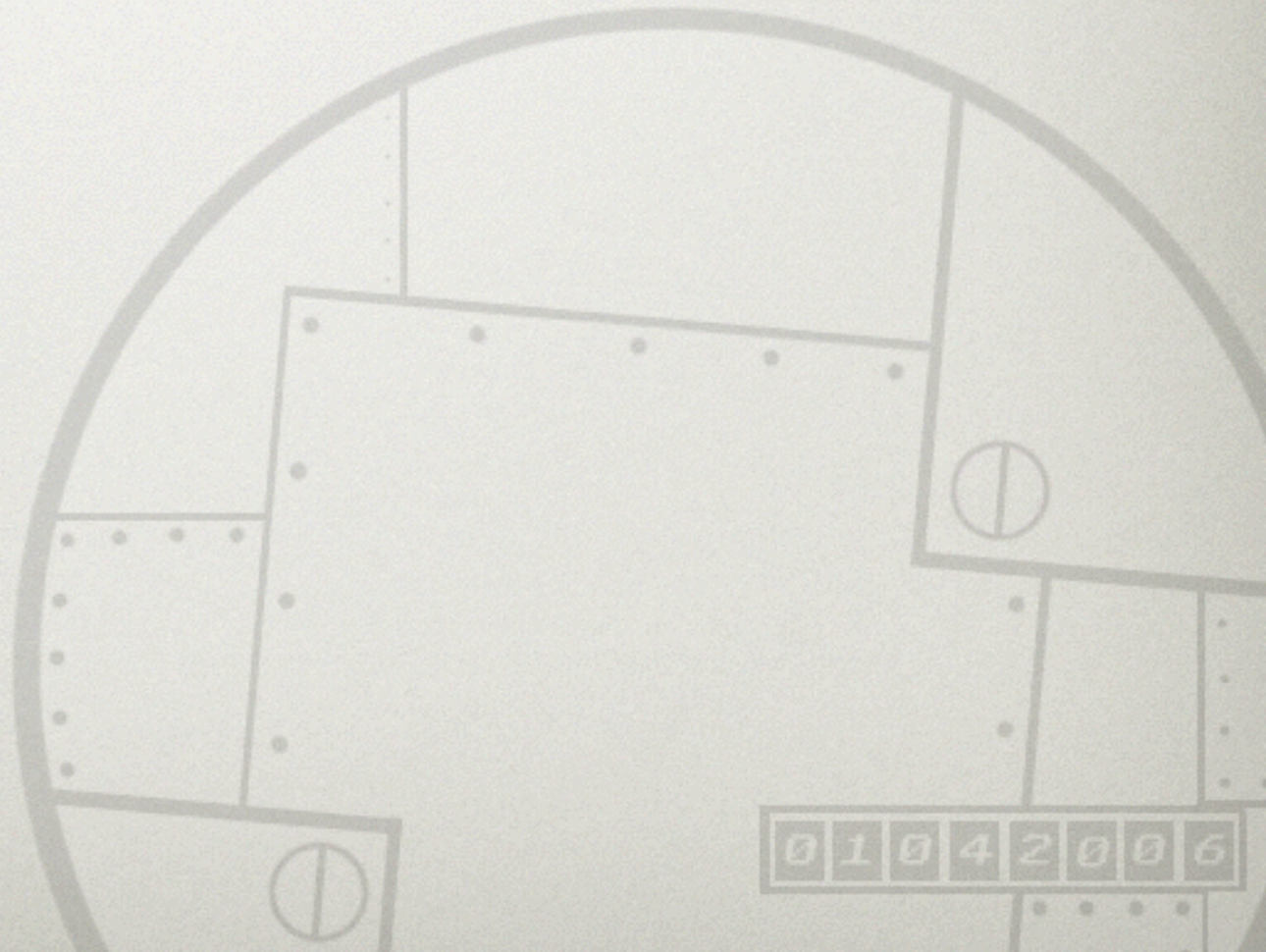

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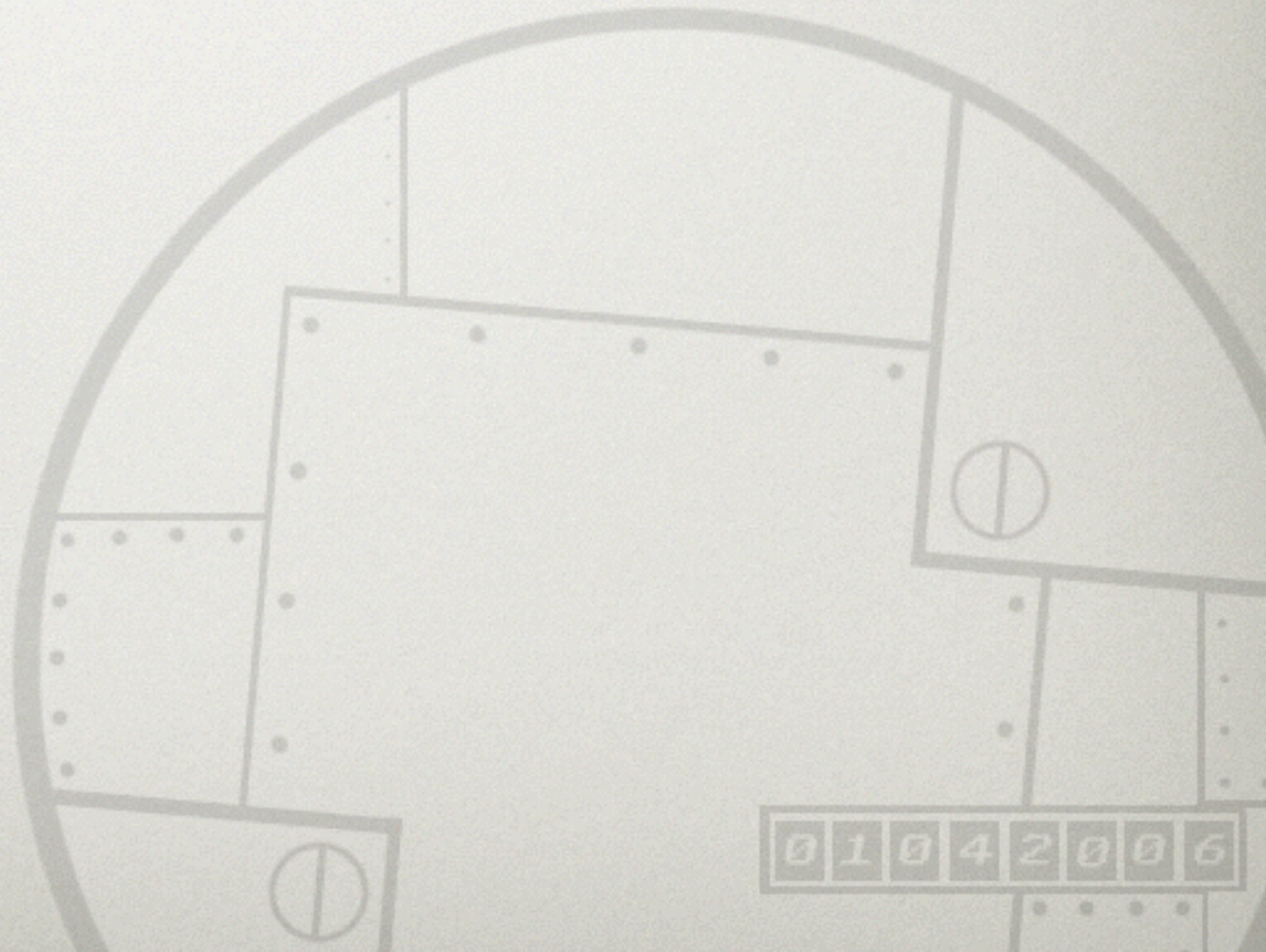

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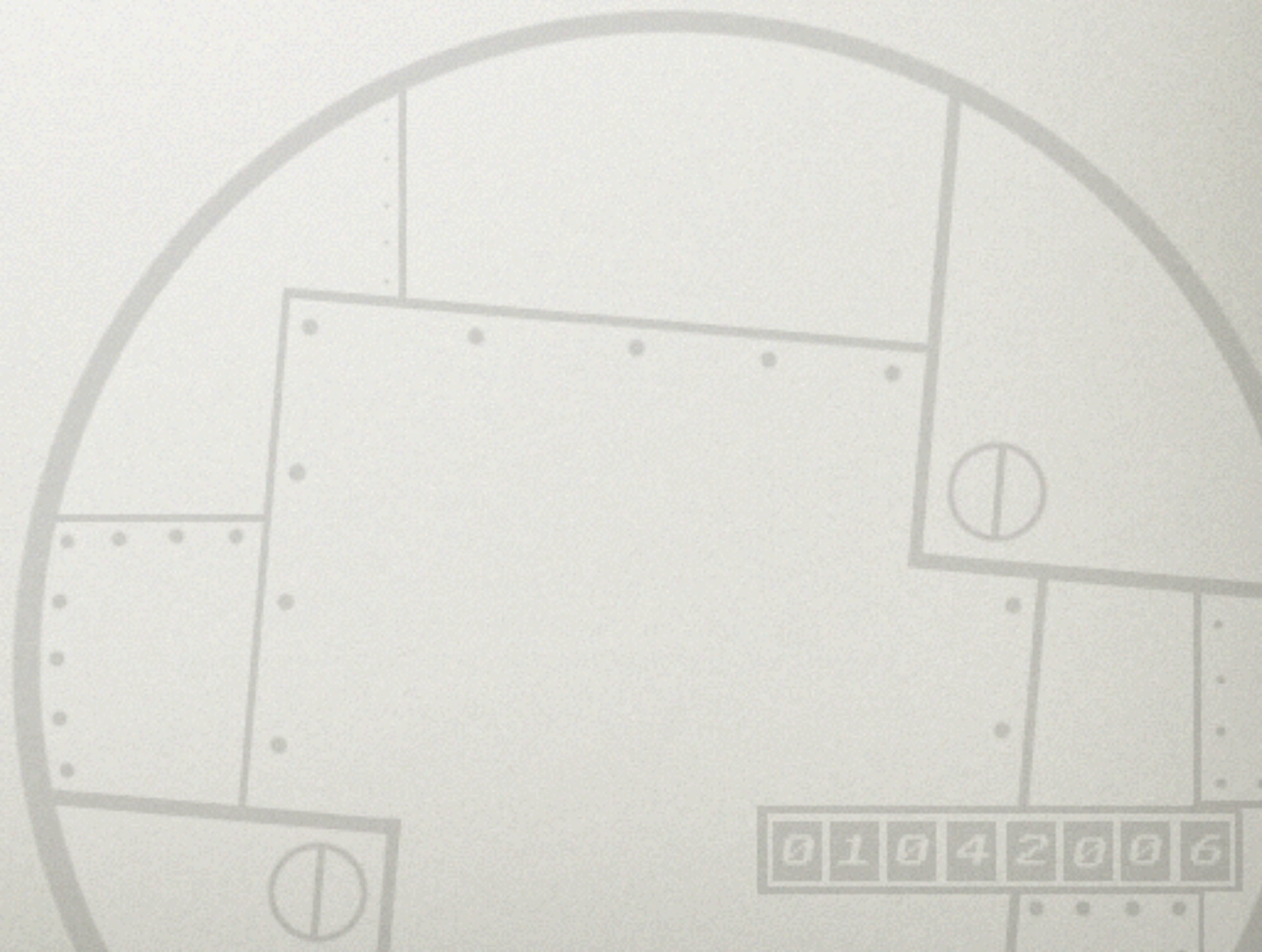

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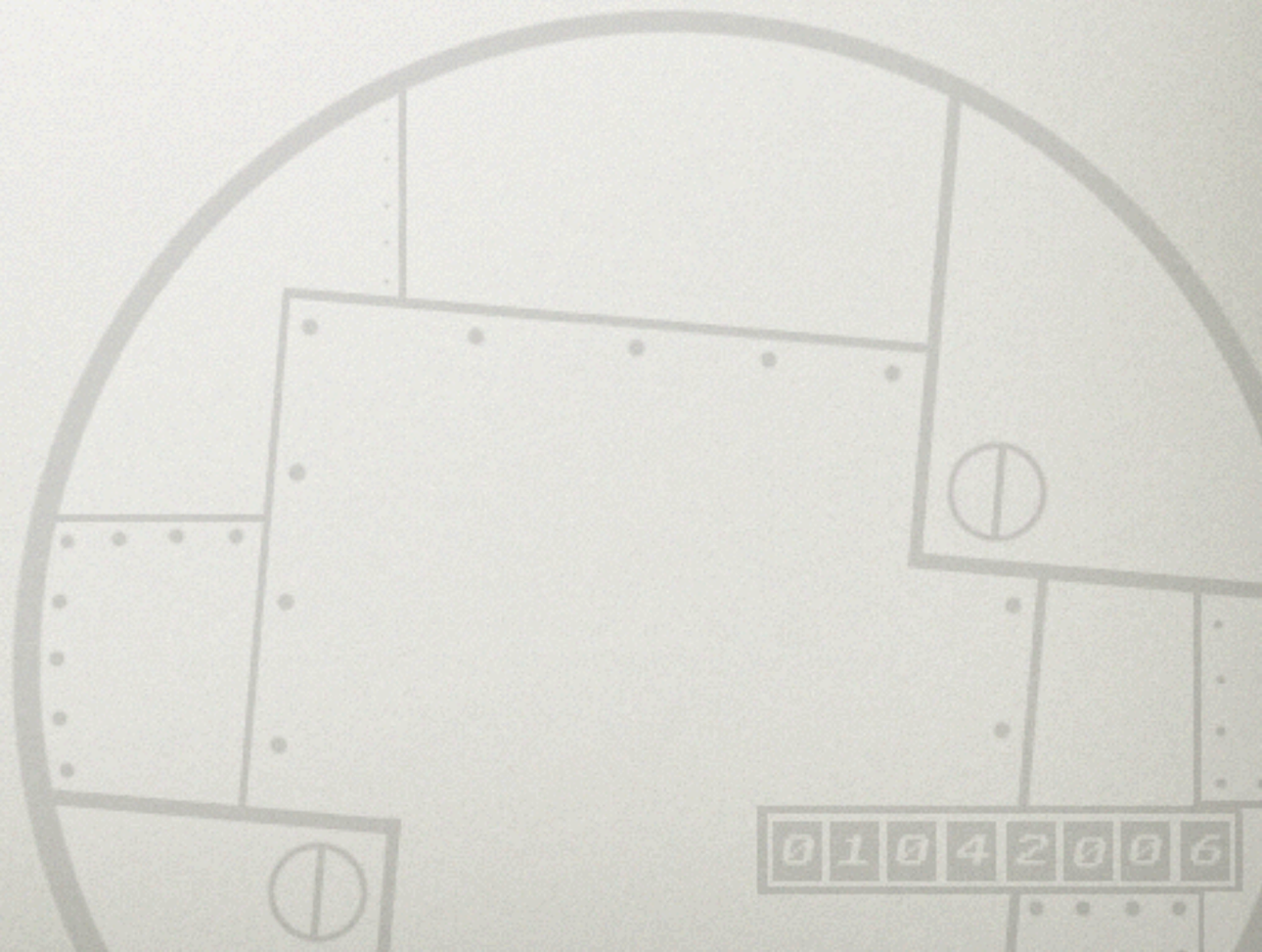

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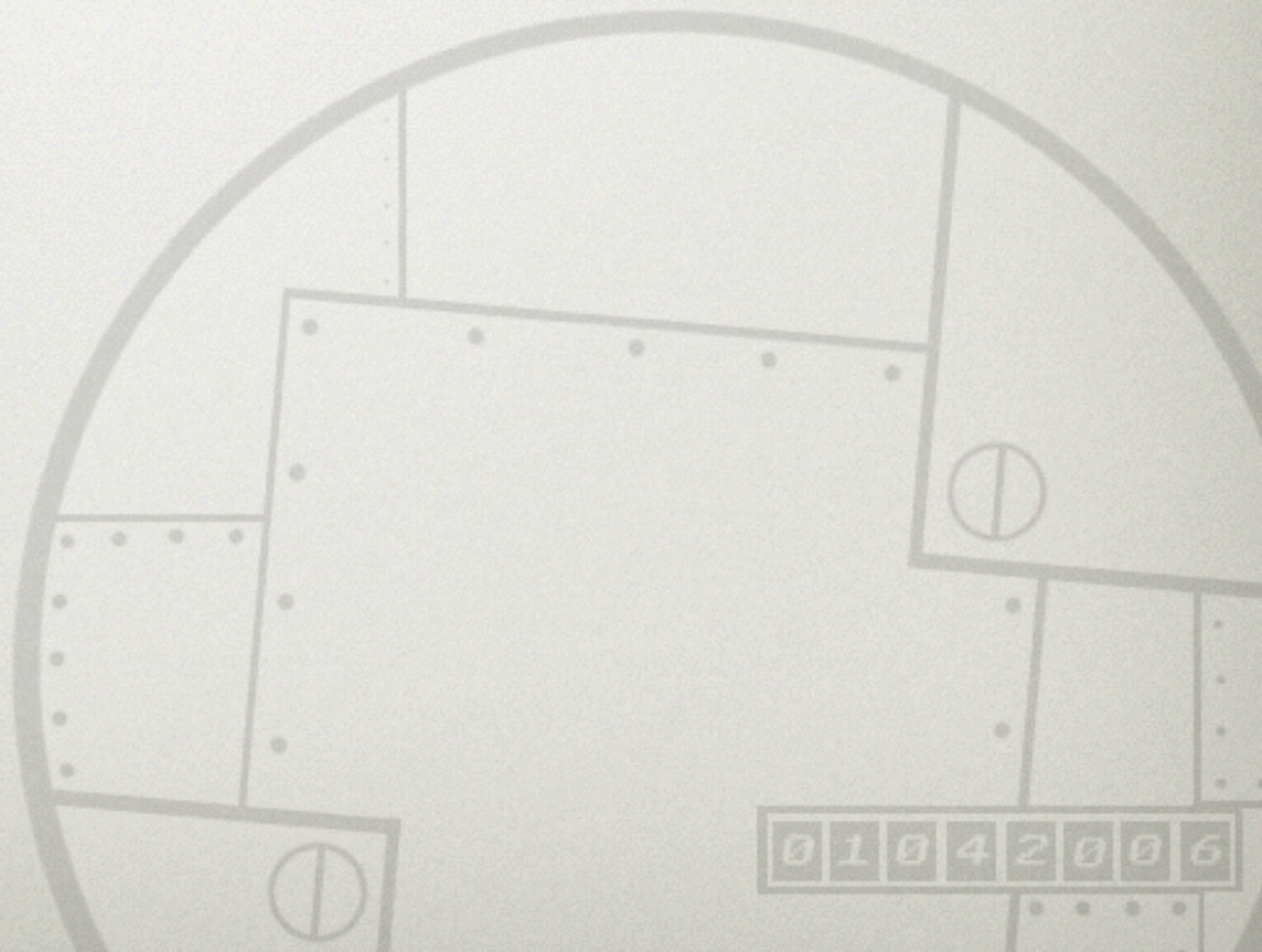

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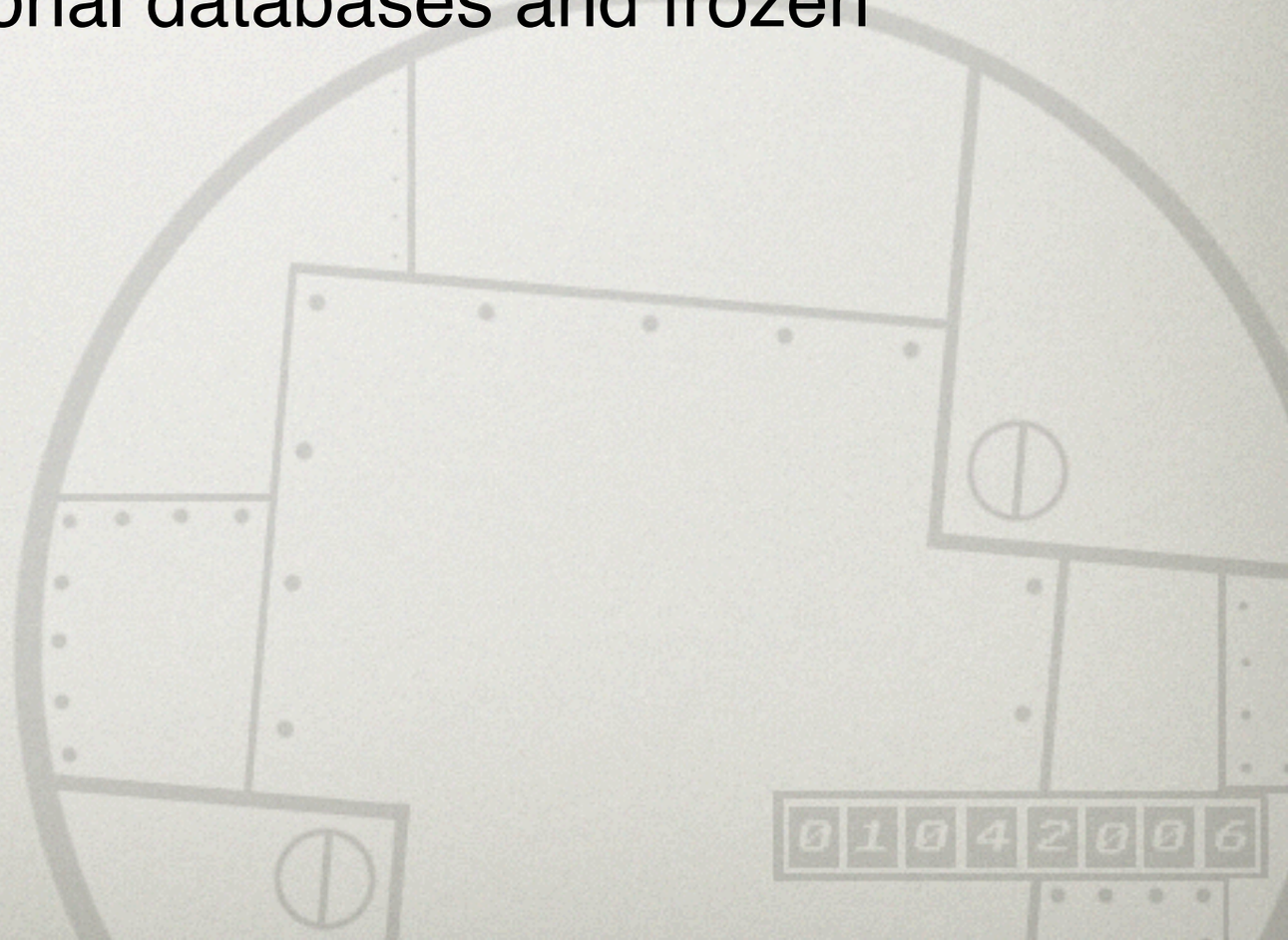

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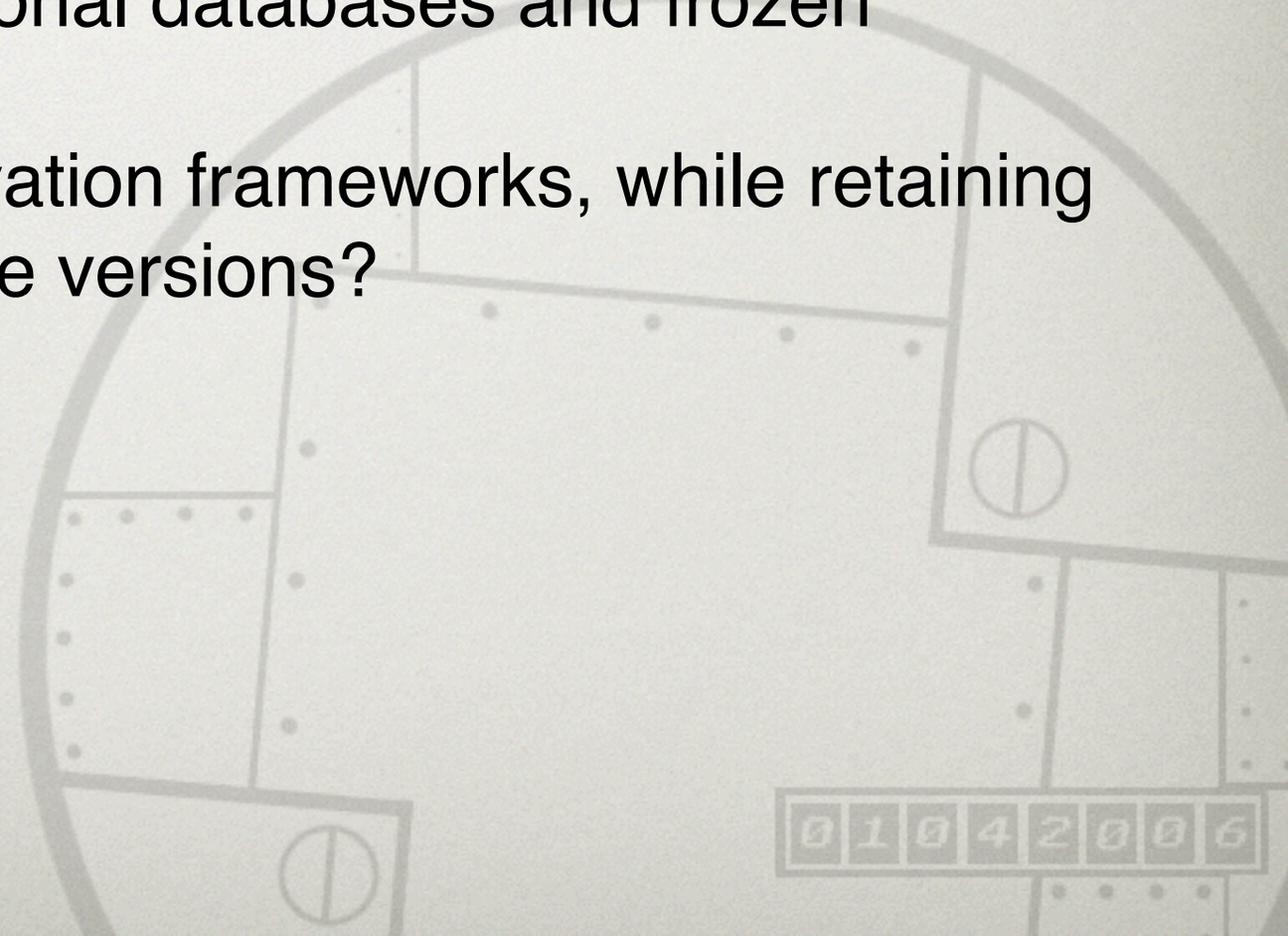

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General big questions...

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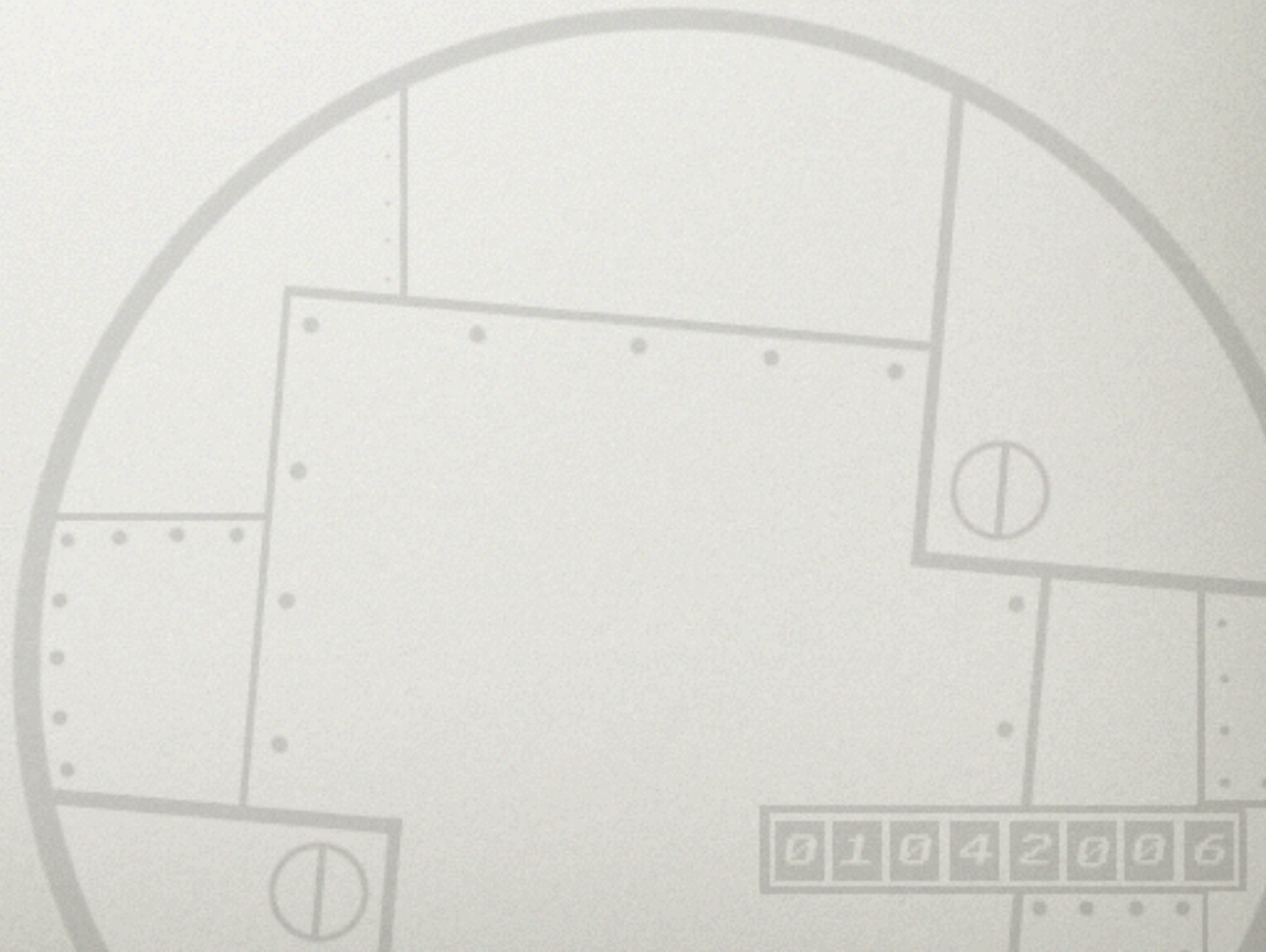

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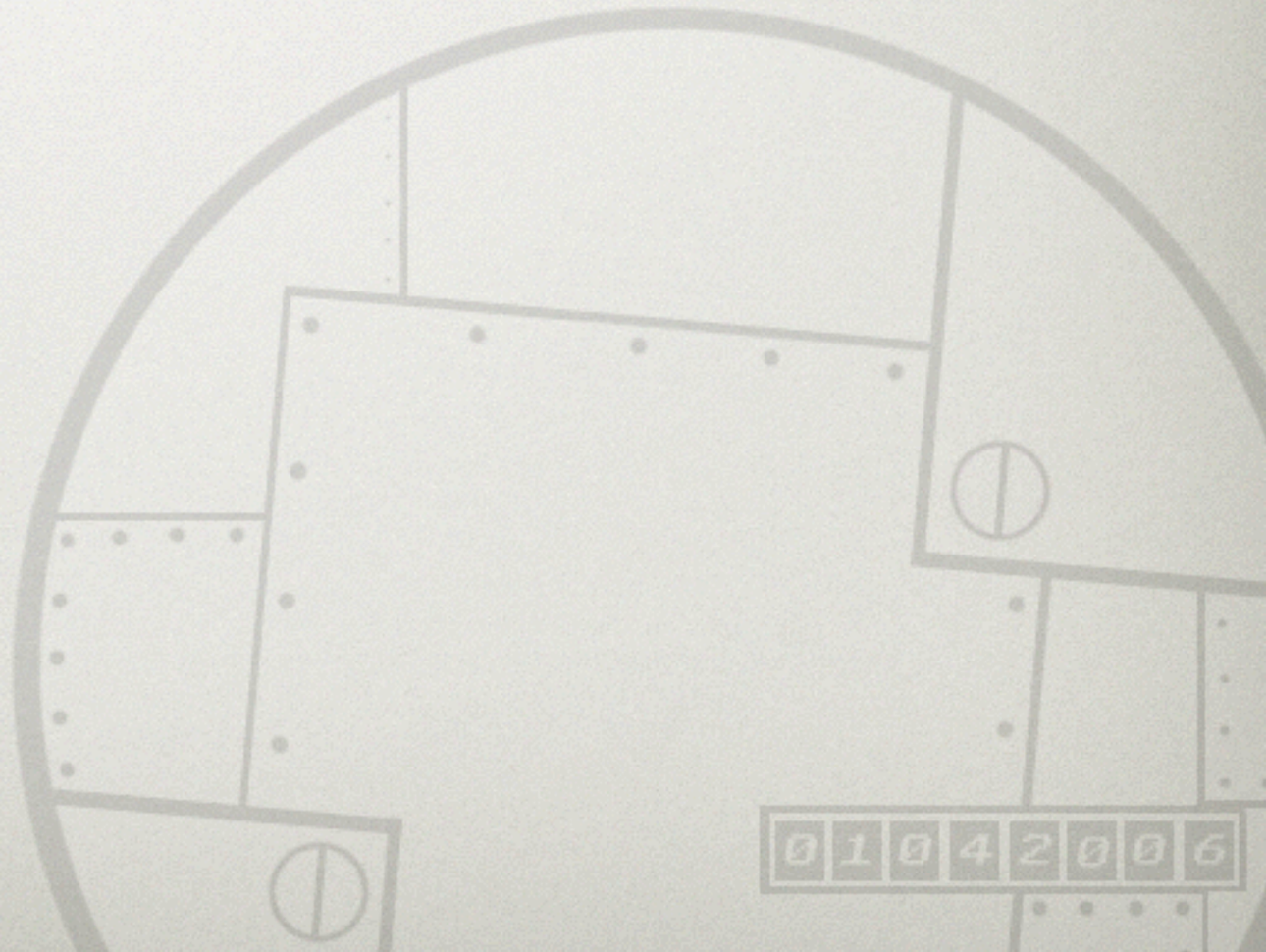

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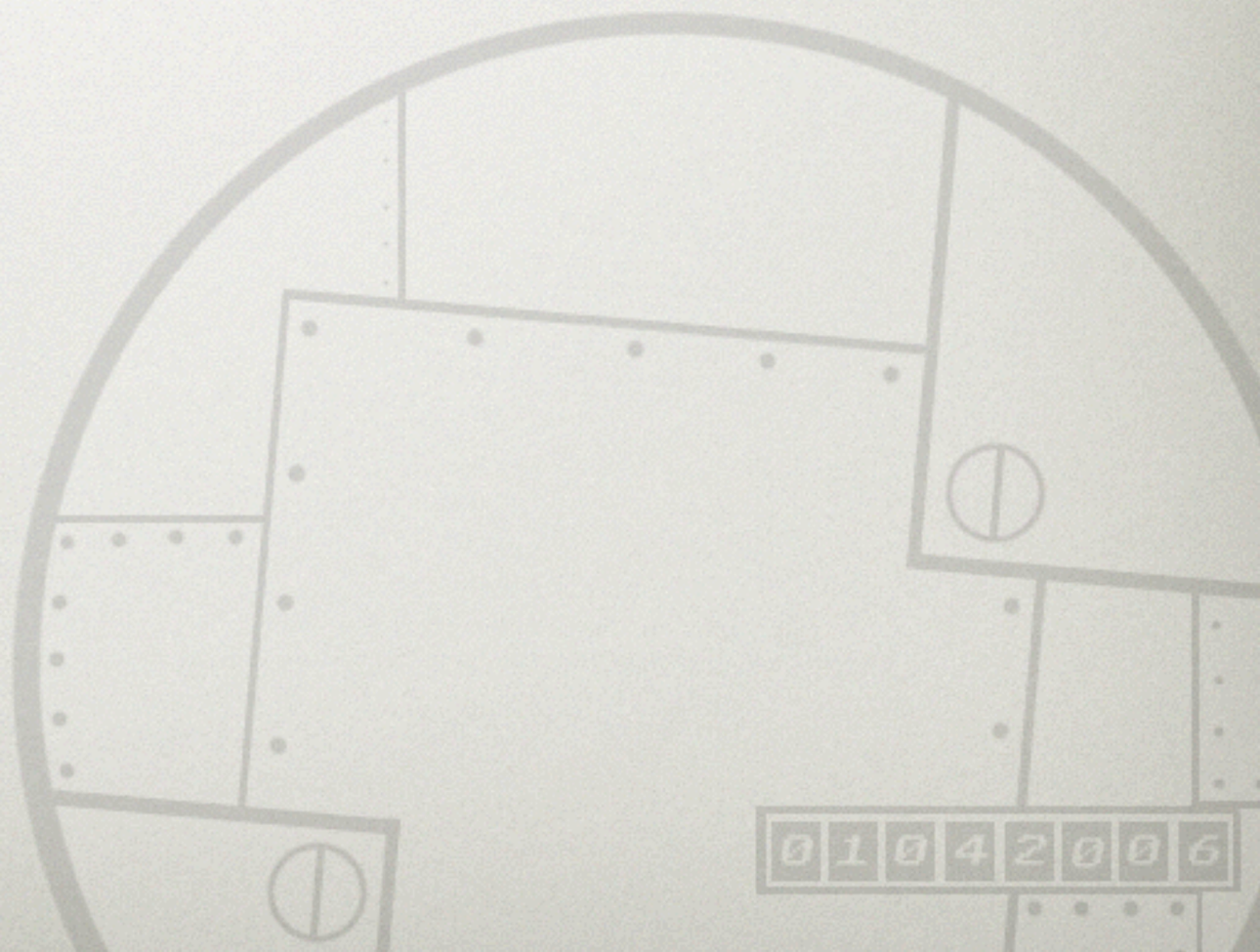

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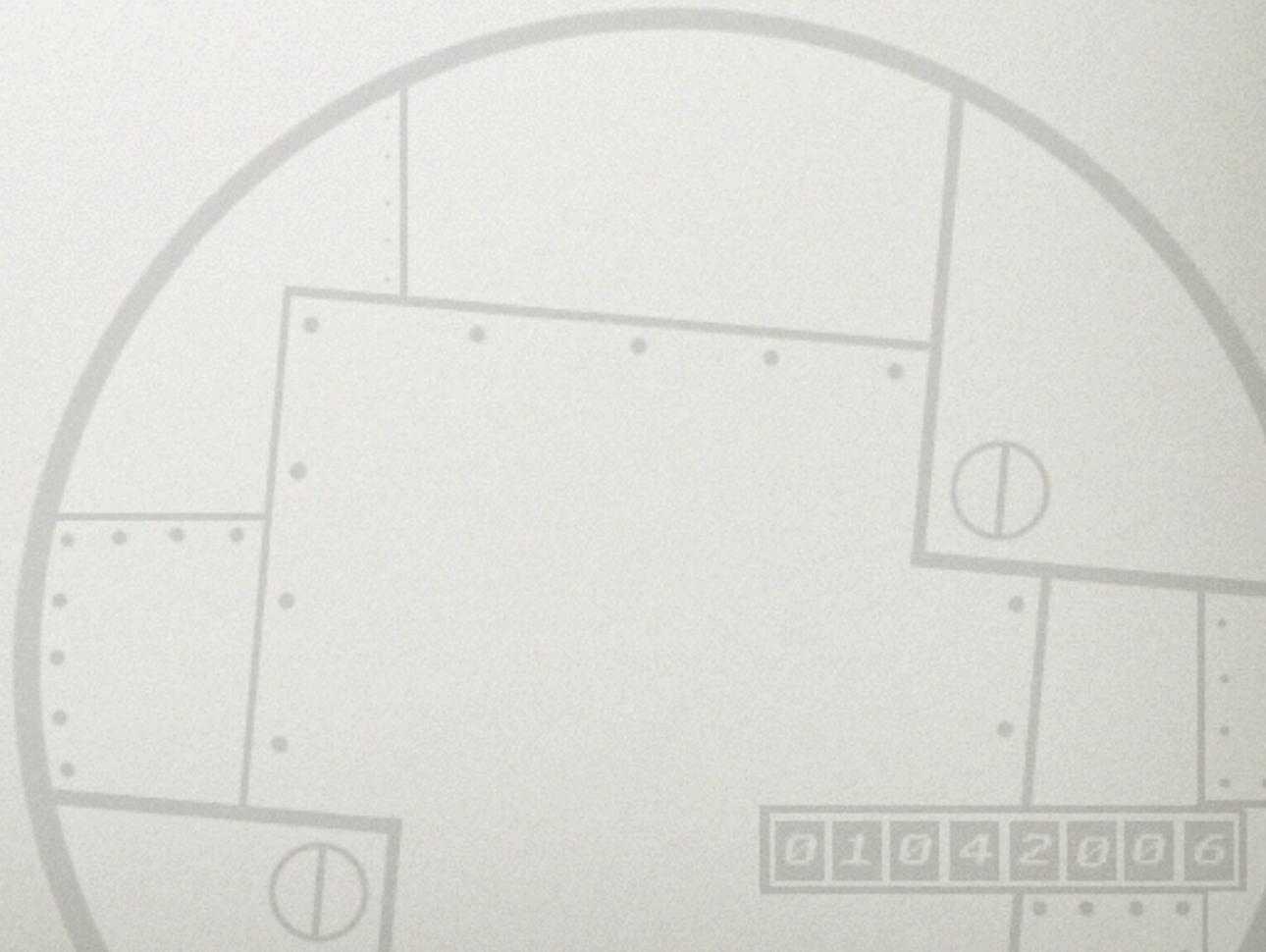

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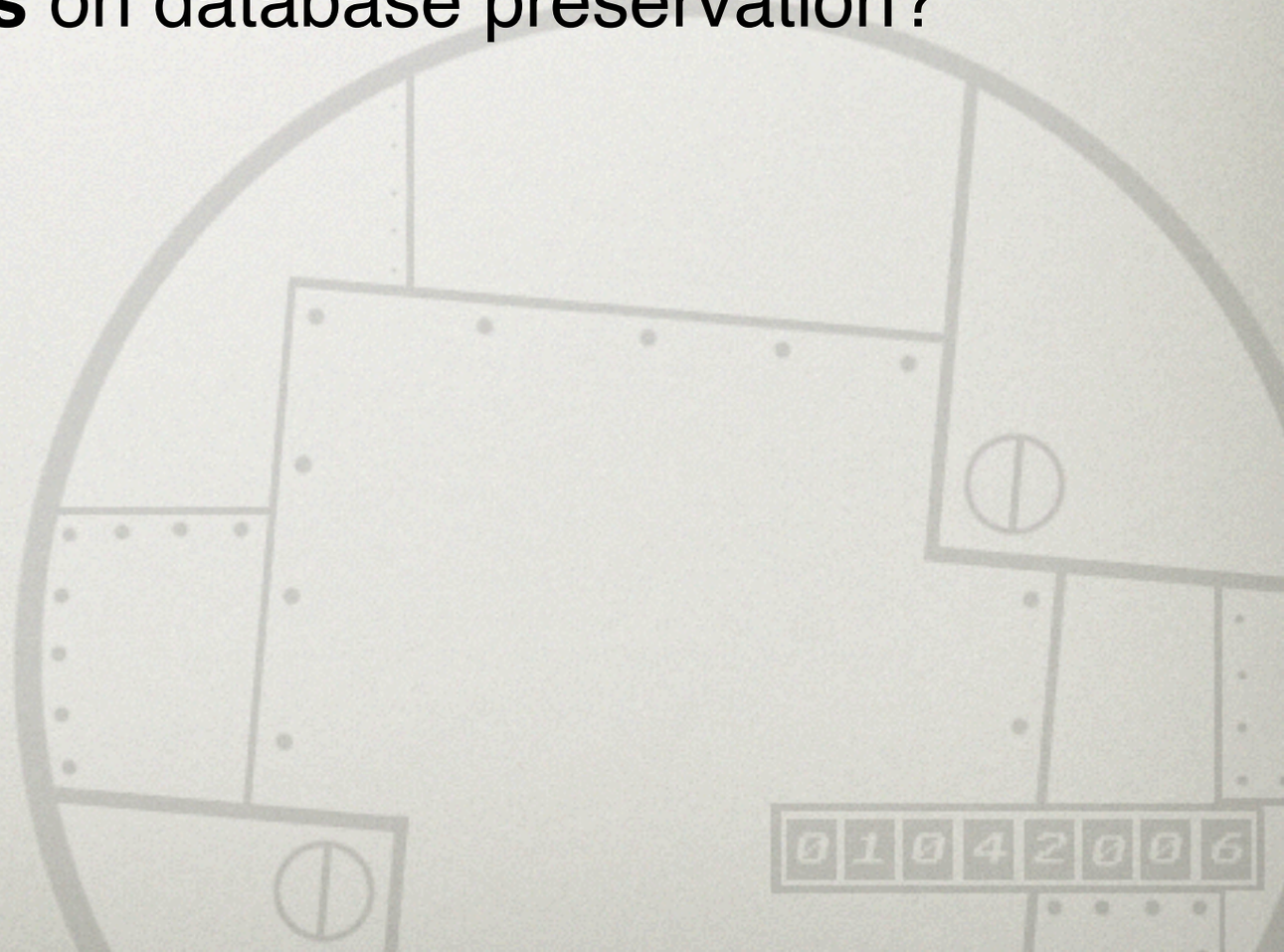

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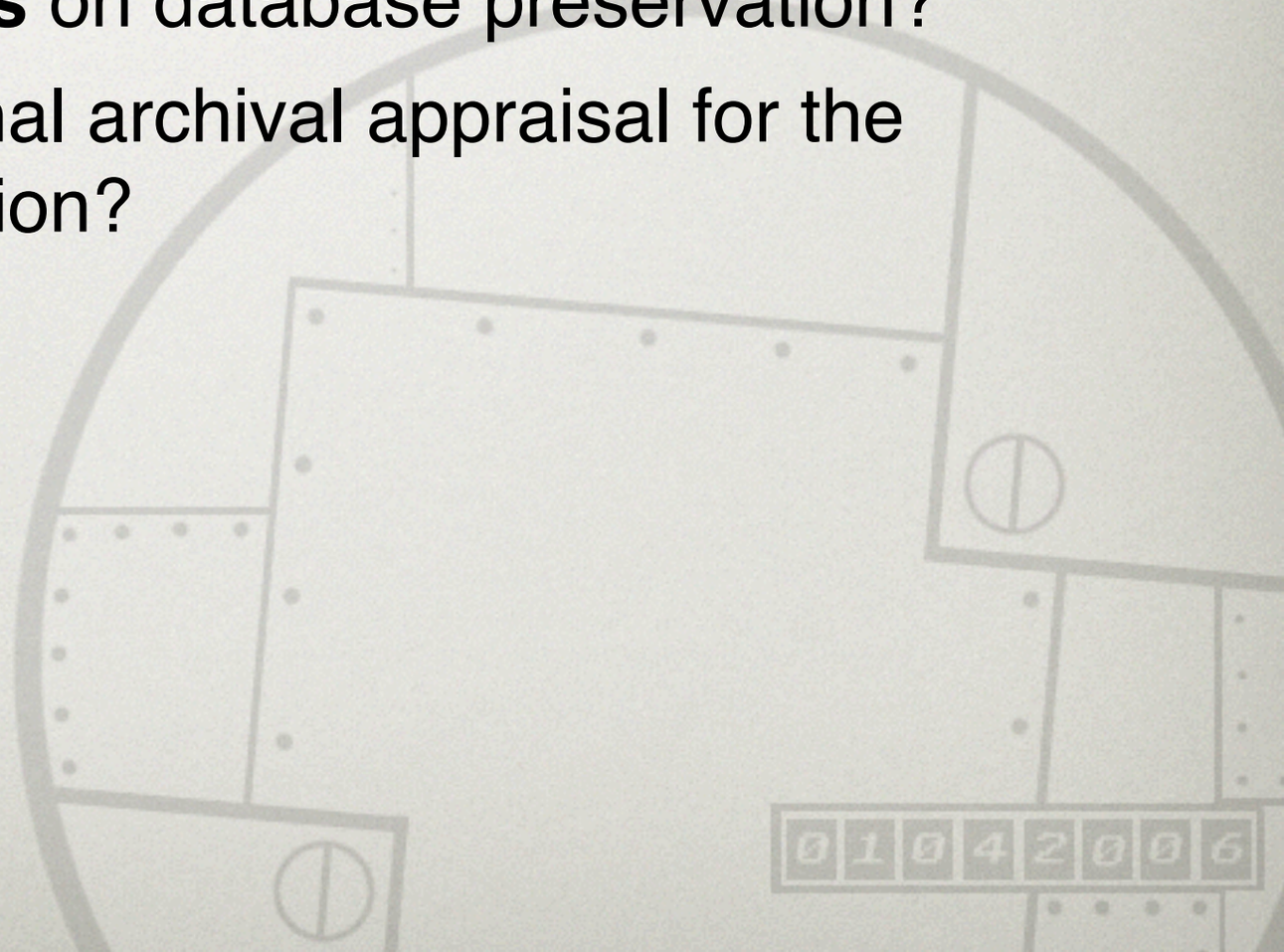

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- To what extent can the preservation strategies, and procedural policies developed by archivists be adapted for databases?
- How can we mesure the quality of preservation strategies when they are applied to data- bases? What are **DB significant properties**? *(quality assurance...)*

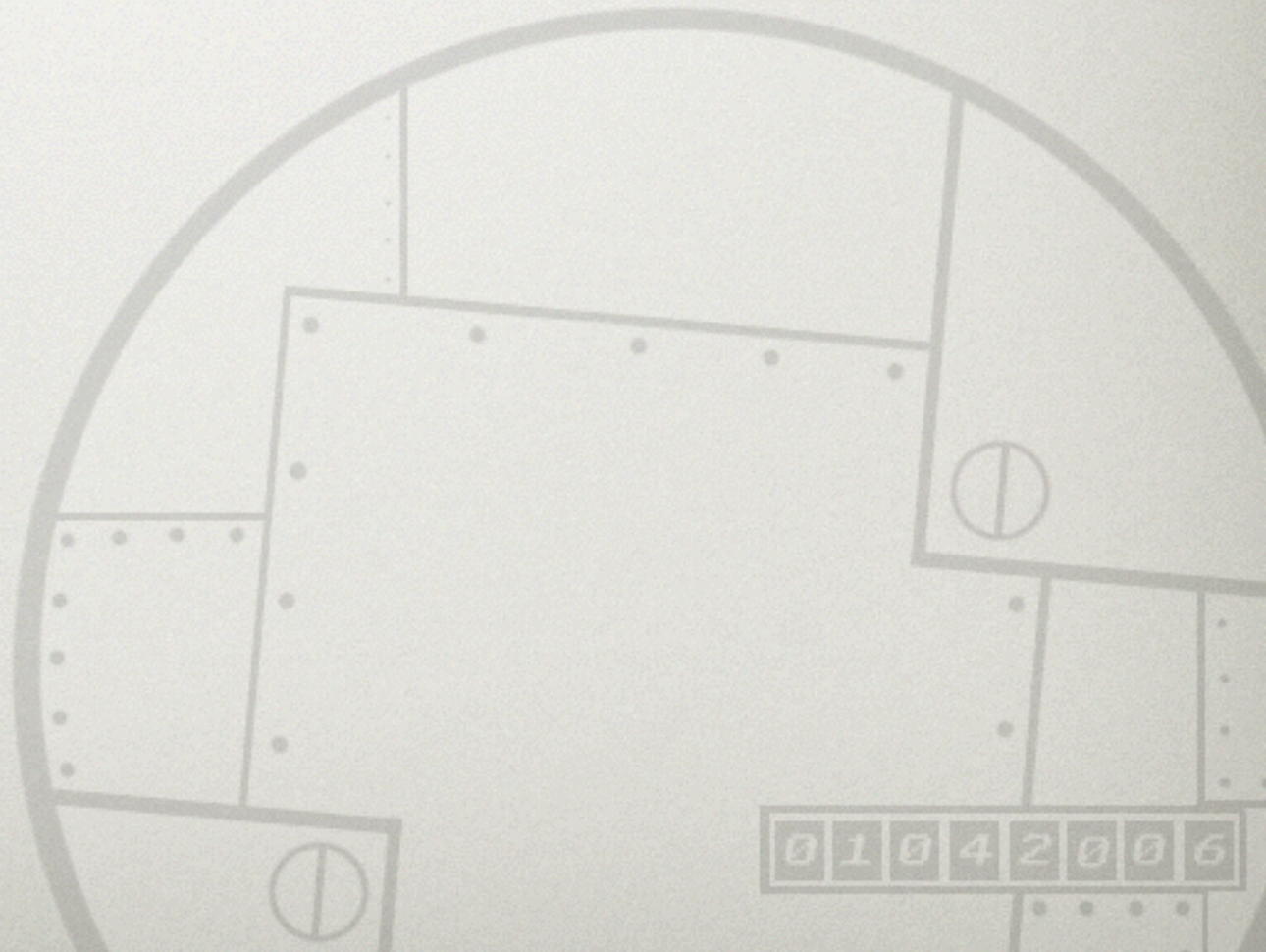
Databases

- **What are the salient features of a database that should be preserved?** ***(significant properties...)***
- What are the different **stages** in the database preservation's life cycle?
- What **documentation** is preserved together with a database, and in what **format**?
- What are the **legal encumbrances** on database preservation?
- What can be learned from traditional archival appraisal for the selection of databases for preservation?
- To what extent can the preservation strategies, and procedural policies developed by archivists be adapted for databases?
- How can we mesure the quality of preservation strategies when they are applied to data- bases? What are **DB significant properties**? *(quality assurance...)*

Technical questions...

Databases: goals

- How do we store them?
- How do we access them?



Databases: goals

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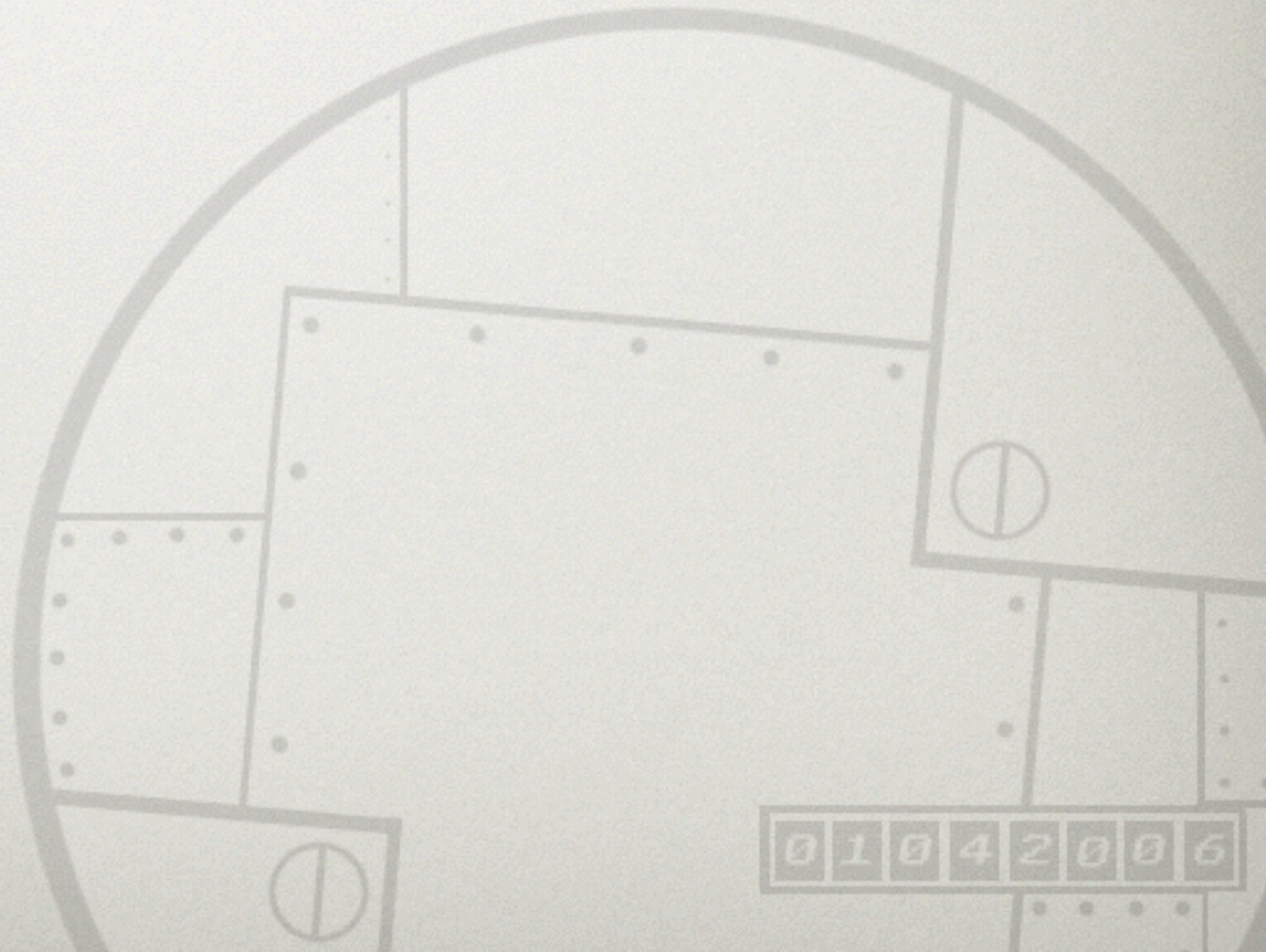
- How do we access them?

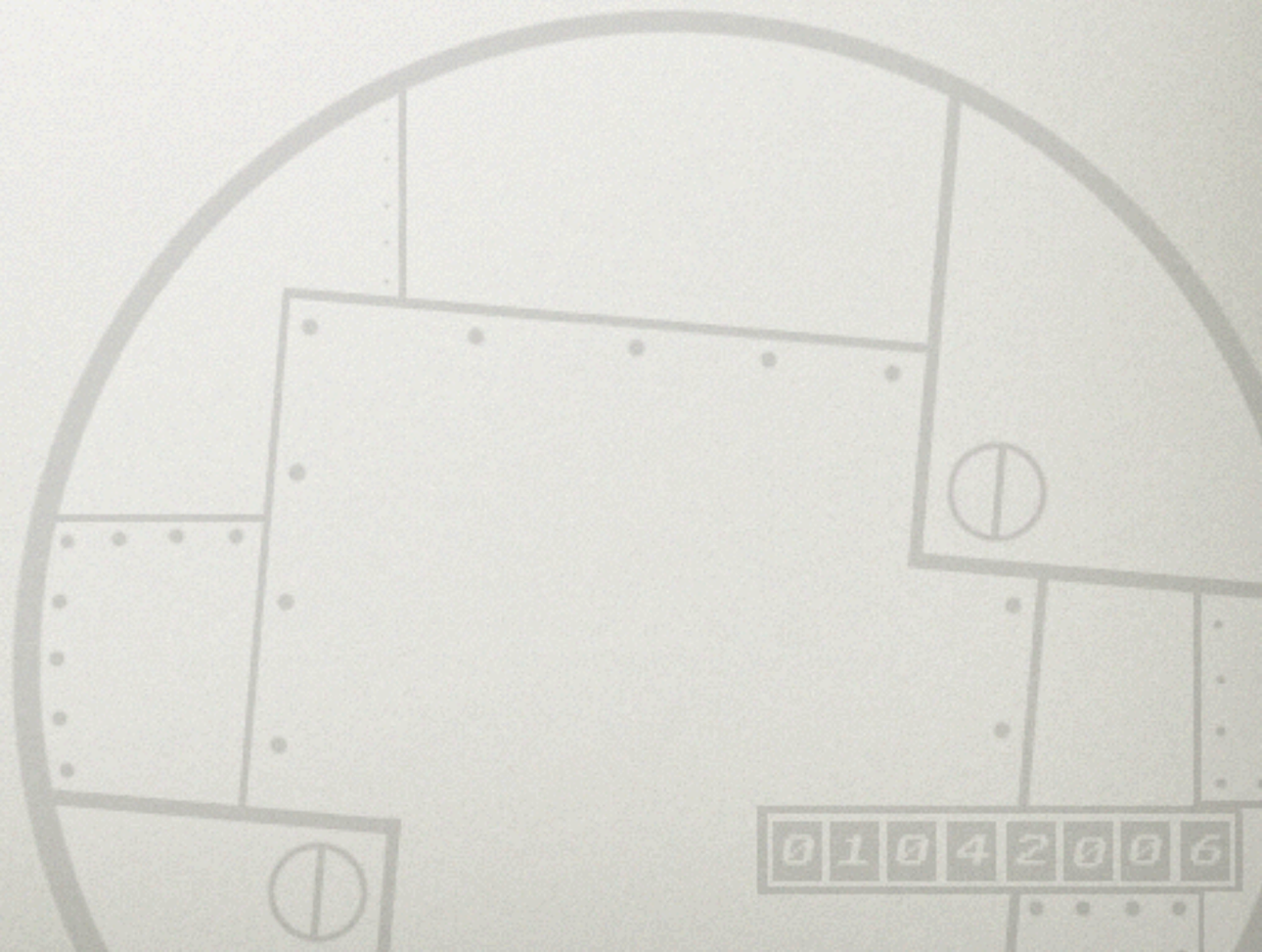
RODA questions...

Databases



Databases

Normal evolution path:
Data => Structure => Semantics



Databases

Normal evolution path:
Data => Structure => Semantics

First prototype:

- Data
- Structure
- Only “frozen” DBs

Databases

- Data?

Normal evolution path:
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Normal evolution path:
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Databases

- Data?
- Structure?
- Views?

Normal evolution path:
Data => Structure => Semantics

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Databases

- Data?
- Structure?
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- Reports?

Normal evolution path:
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Databases

- Data?
- Structure?
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- Reports?
- Stored Procedure

Normal evolution path:
Data => Structure => Semantics

First prototype:

- Data
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Databases

- Data?
- Structure?
- Views?
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- ...

Normal evolution path:
Data => Structure => Semantics

First prototype:

- Data
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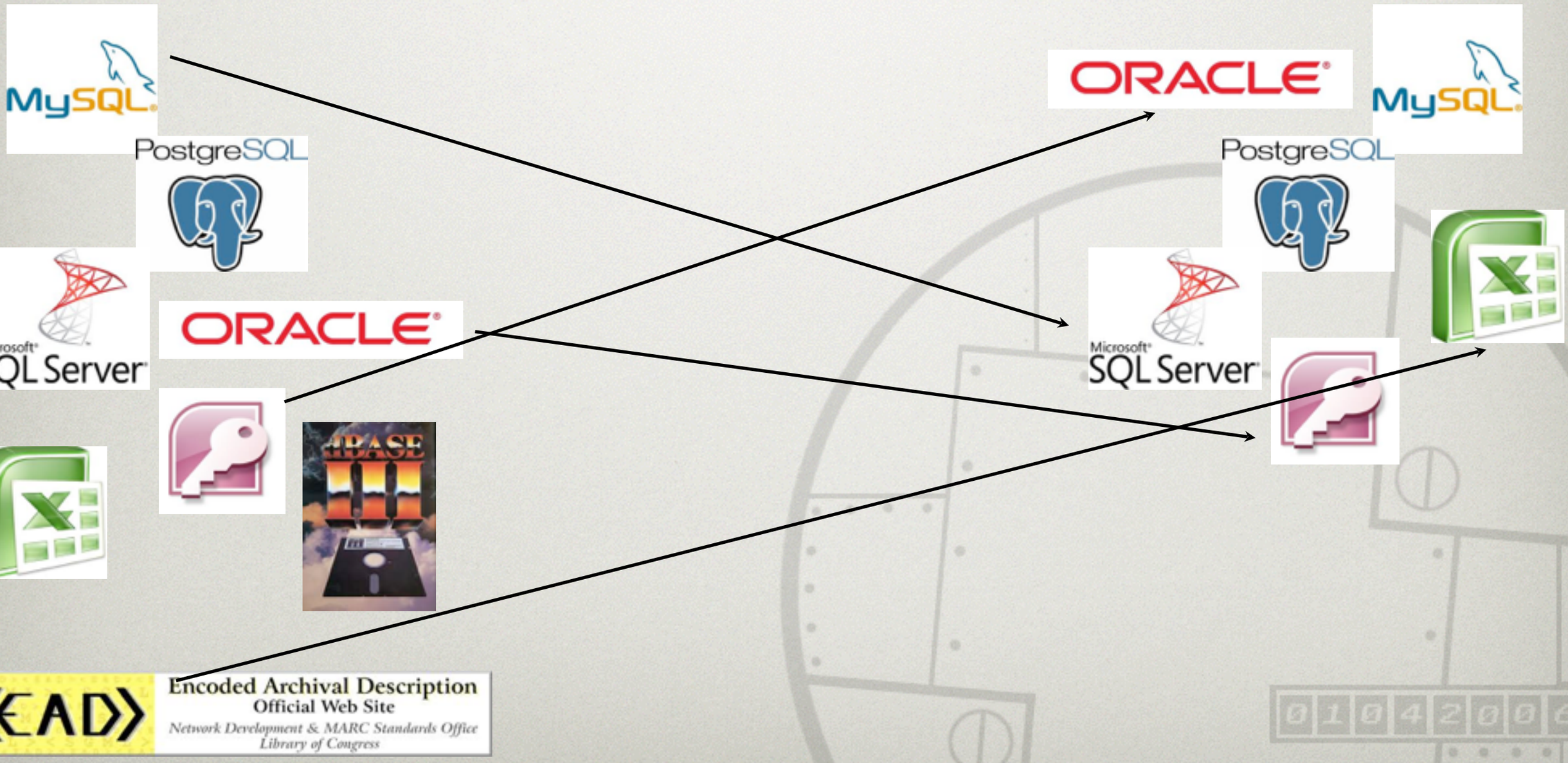
HOW?

The need for an intermediate representation

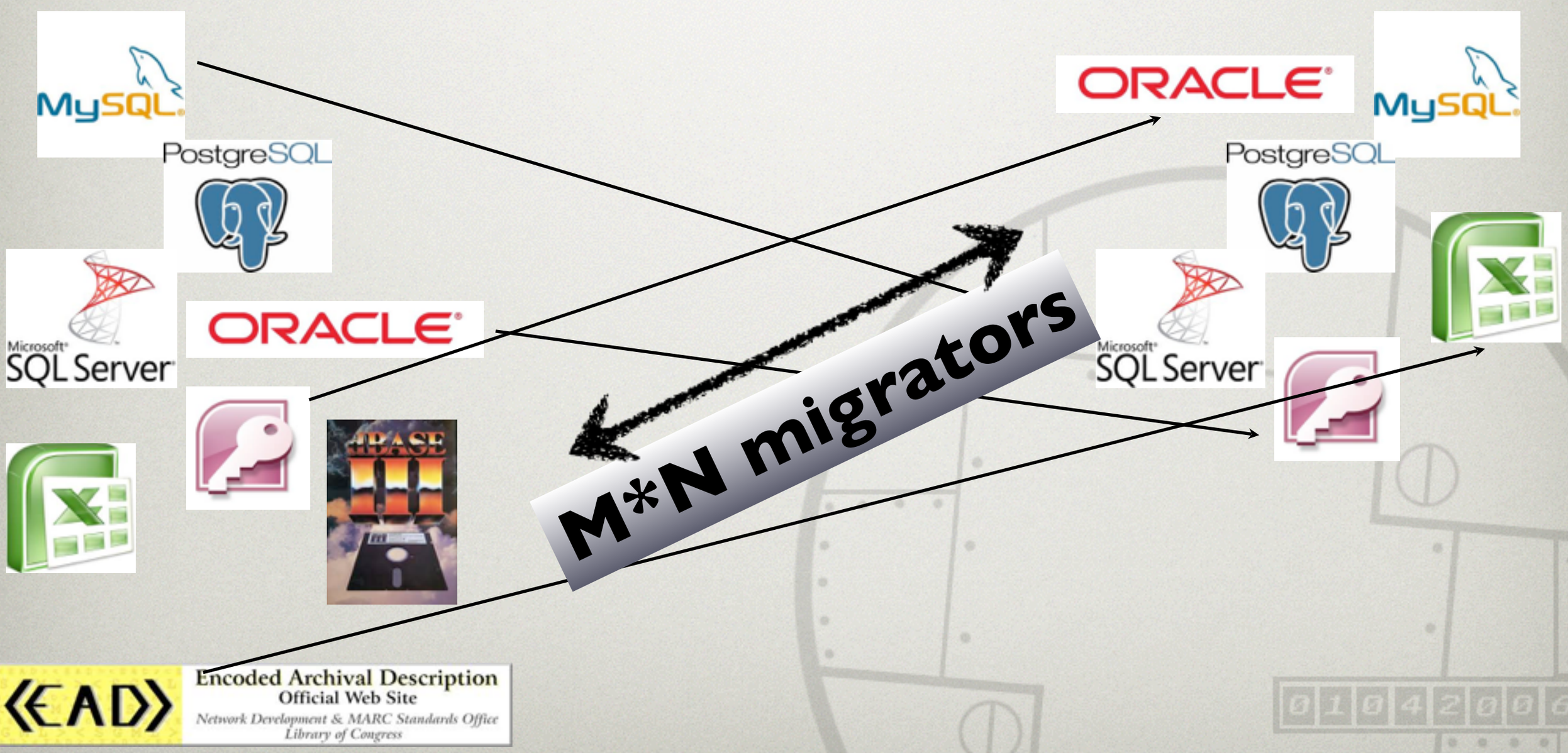
Input Formats (M) **Output Formats (N)**



HOW?

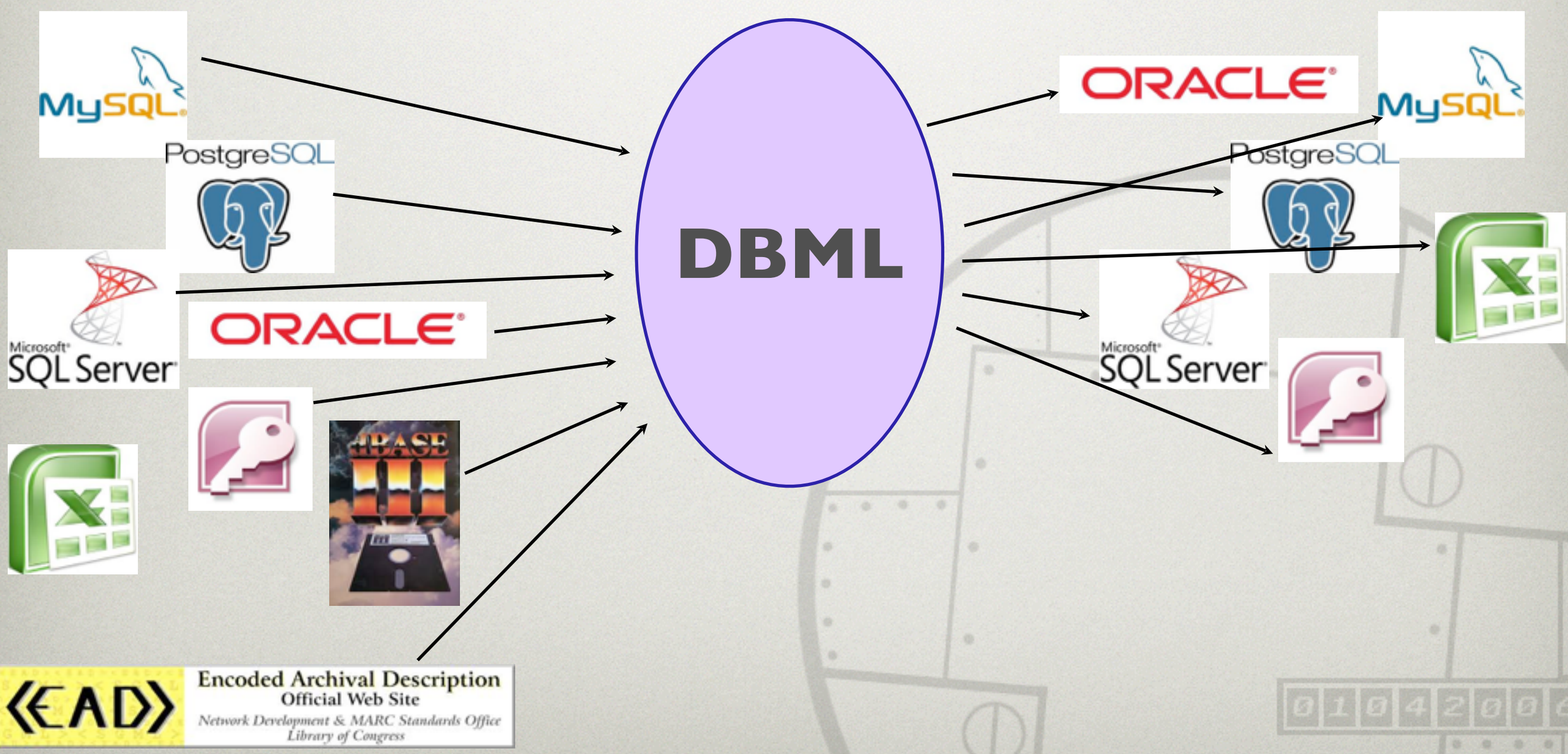
The need for an intermediate representation

Input Formats (M) **Output Formats (N)**



IR: DBML

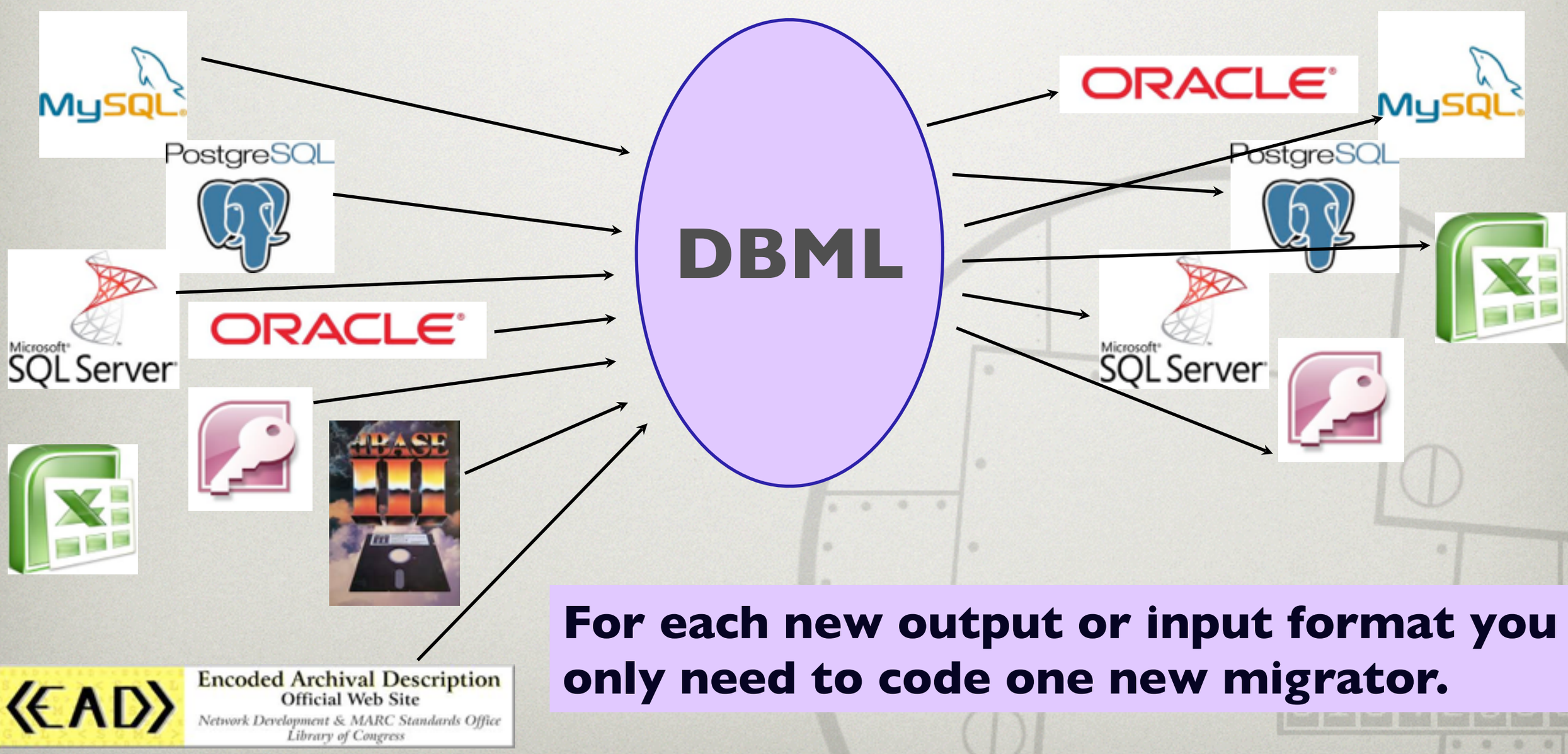
Input Formats (M) Output Formats (N)



«EAD» Encoded Archival Description
Official Web Site
Network Development & MARC Standards Office
Library of Congress

IR: DBML

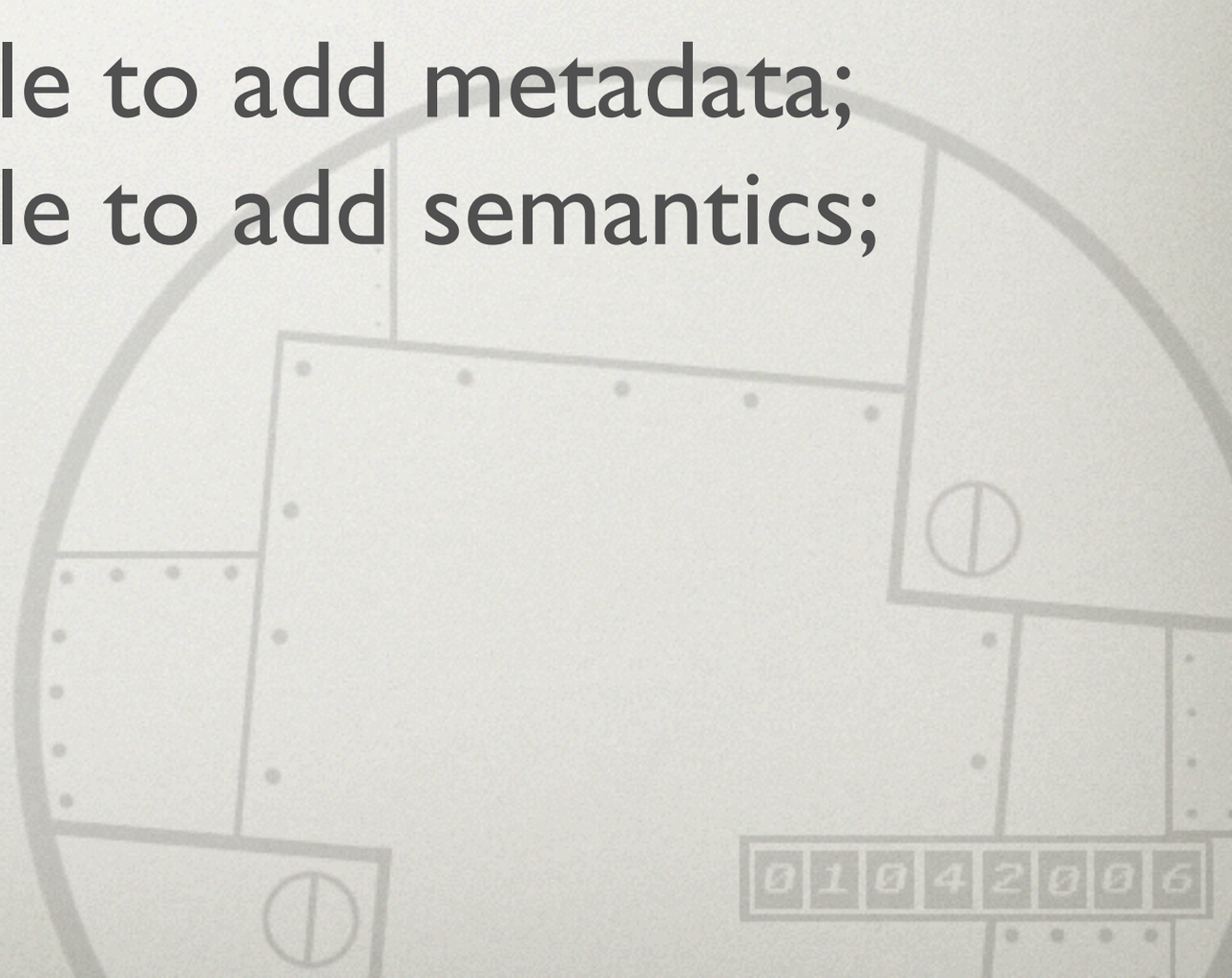
Input Formats (M) Output Formats (N)



For each new output or input format you only need to code one new migrator.

DBML design Principles

- Hardware independent;
- Software independent;
- Easy to process;
- Descriptive;
- It should be possible to add metadata;
- It should be possible to add semantics;



DBML design Principles

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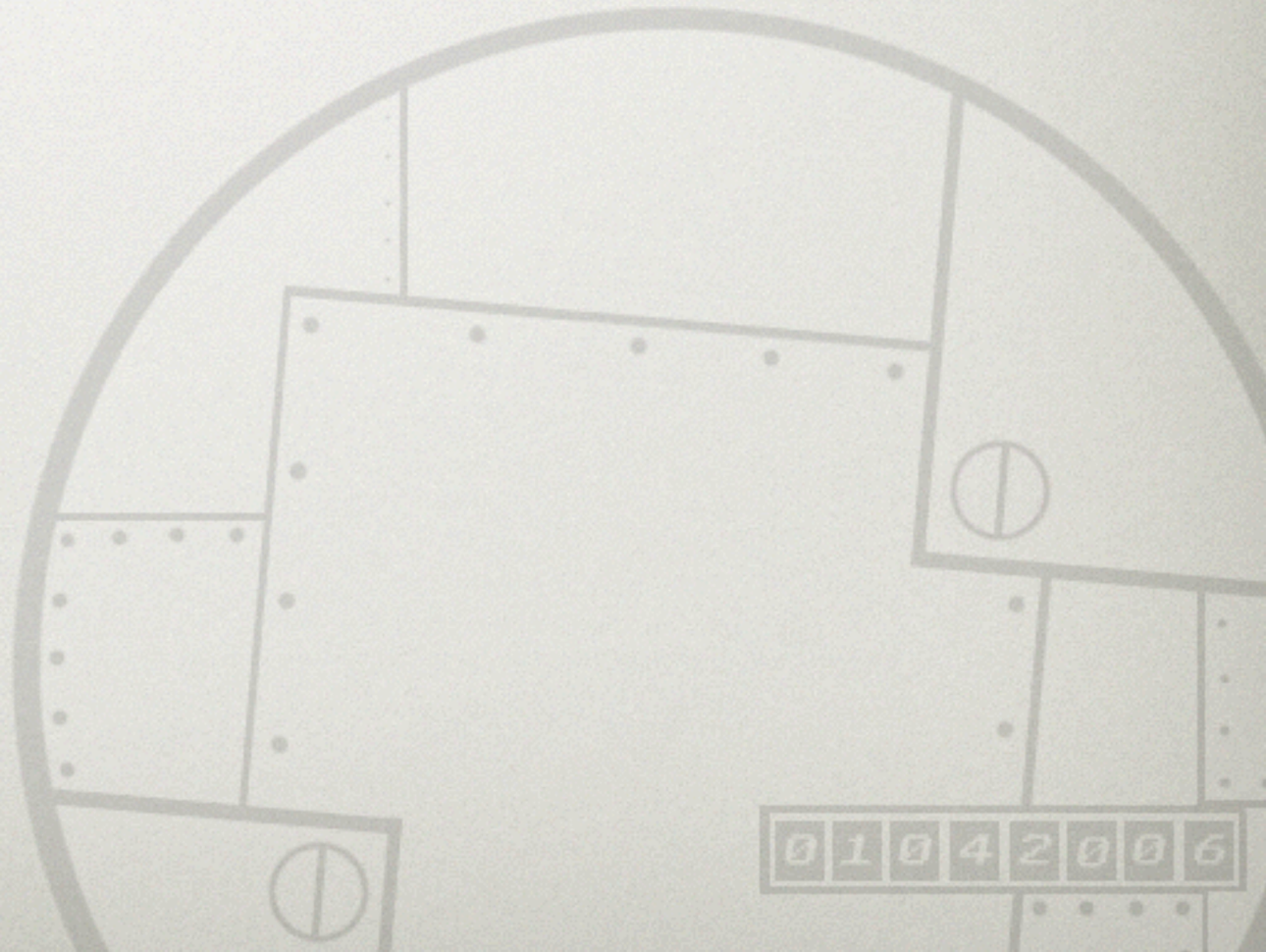
XML was the obvious choice

SIP Structure (DB example)



KEEPS Employees

SIP Structure (DB example)

Manifest

KEEPS Employees

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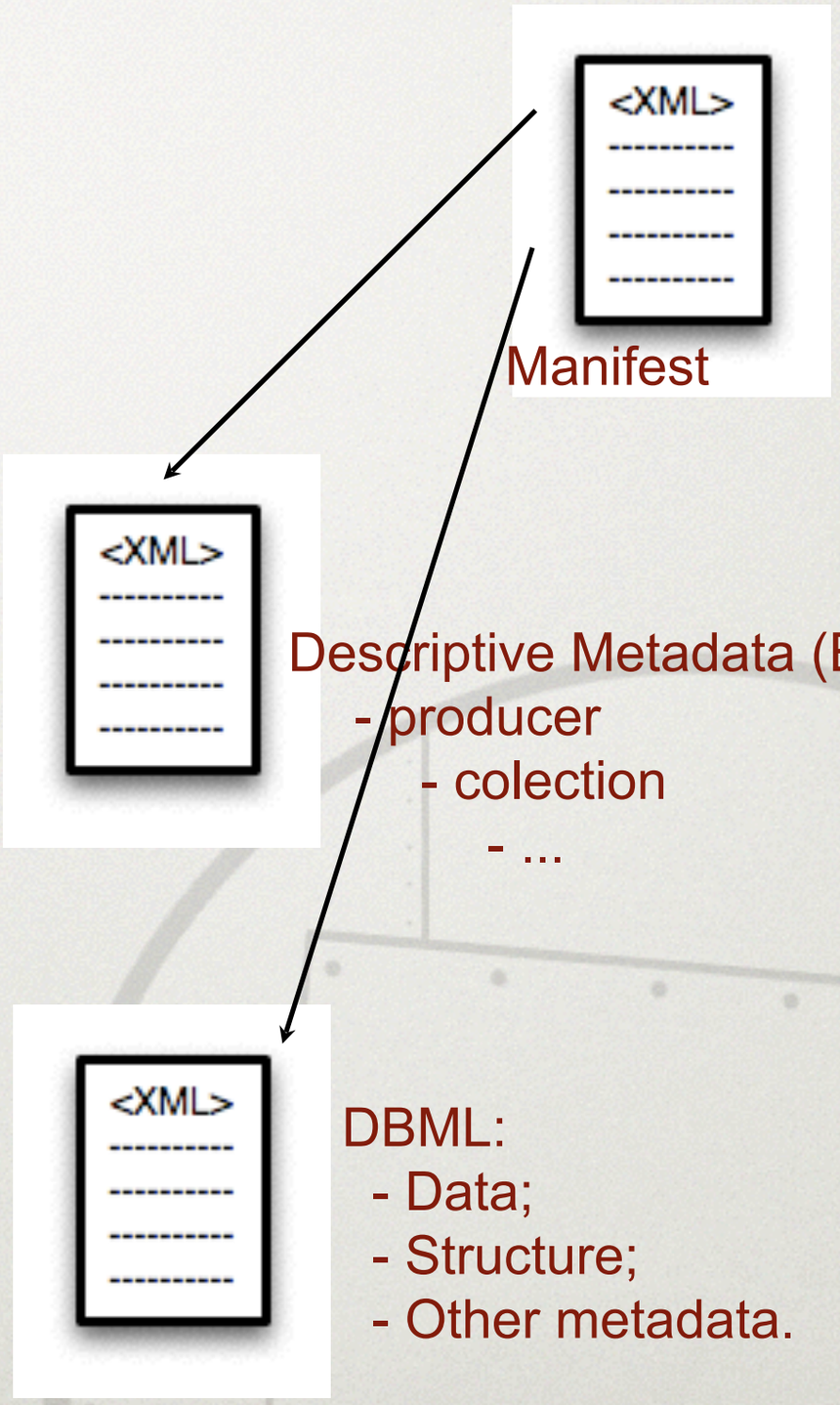


SIP Structure (DB example)

Binaries

Descriptive Metadata (EAD):
- producer
  - colection
    - ...

DBML:
- Data;
- Structure;
- Other metadata.

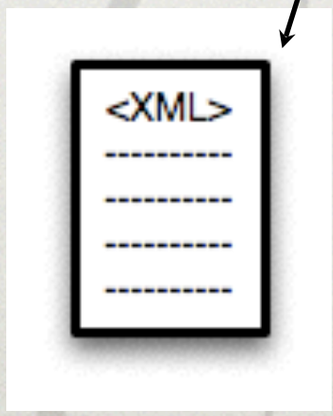
SIP Structure (DB example)

Binaries

Technical Metadata:
- color
- dimensions
- ...

Manifest

Descriptive Metadata (EAD):
- producer
  - colection
    - ...



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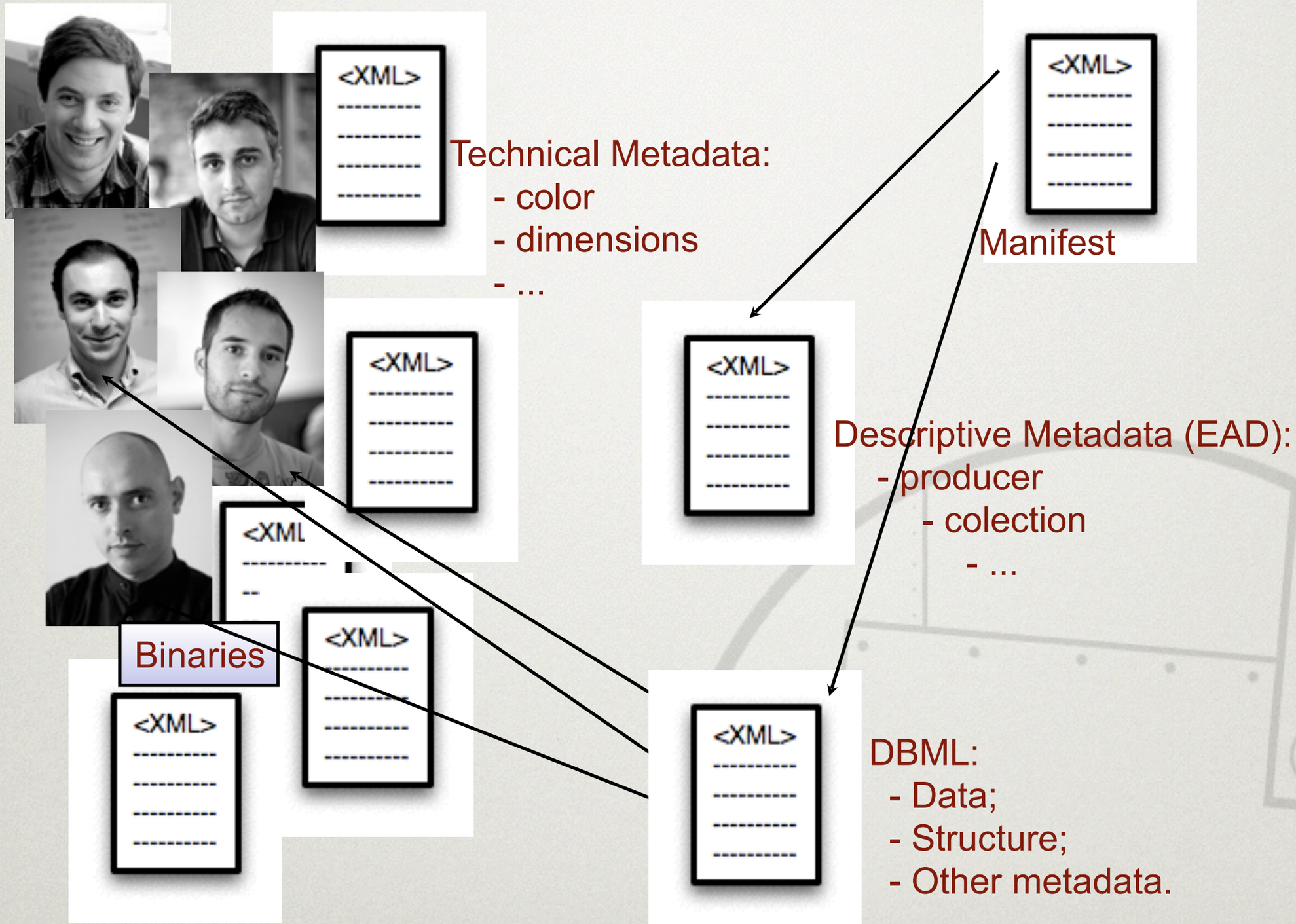

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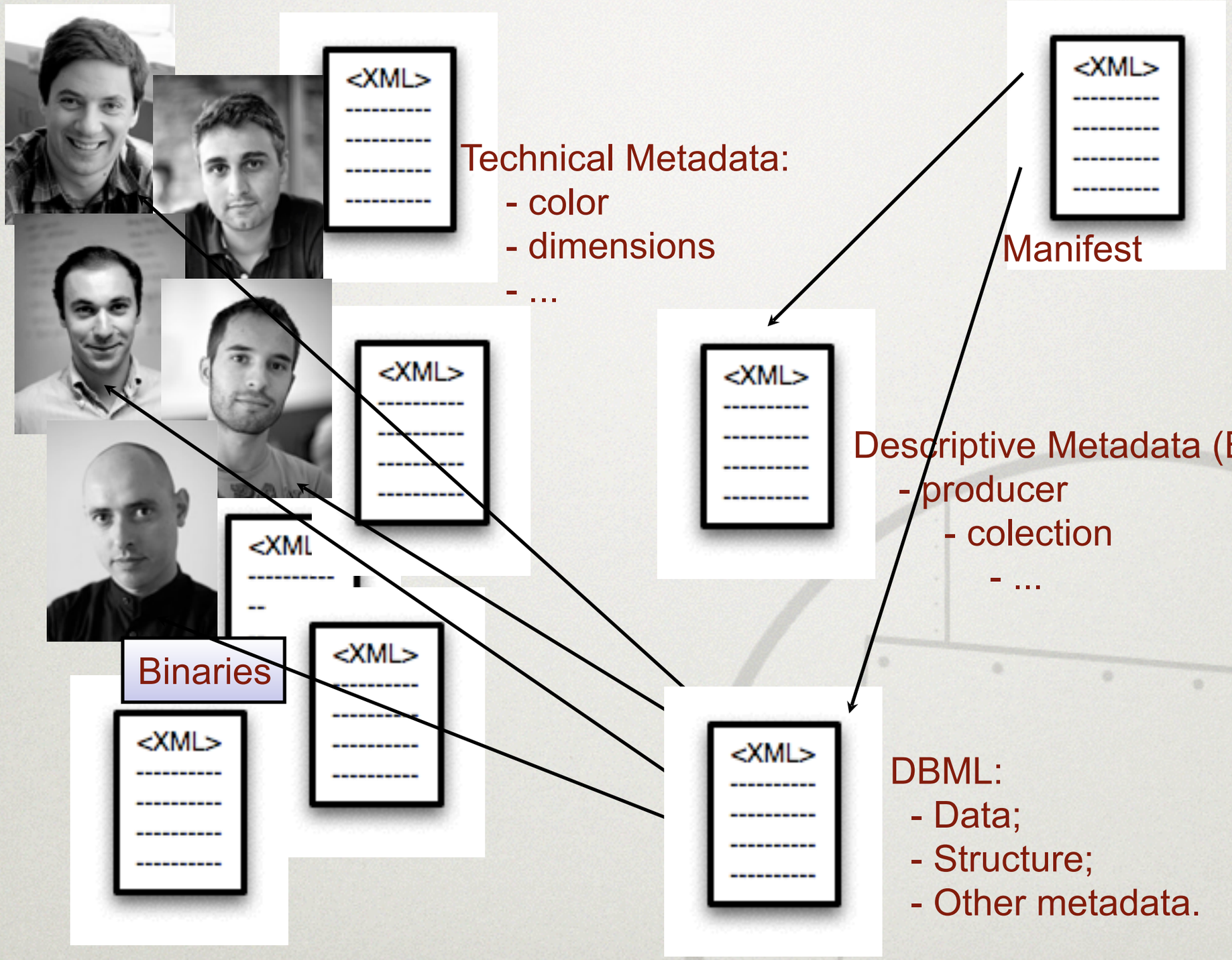

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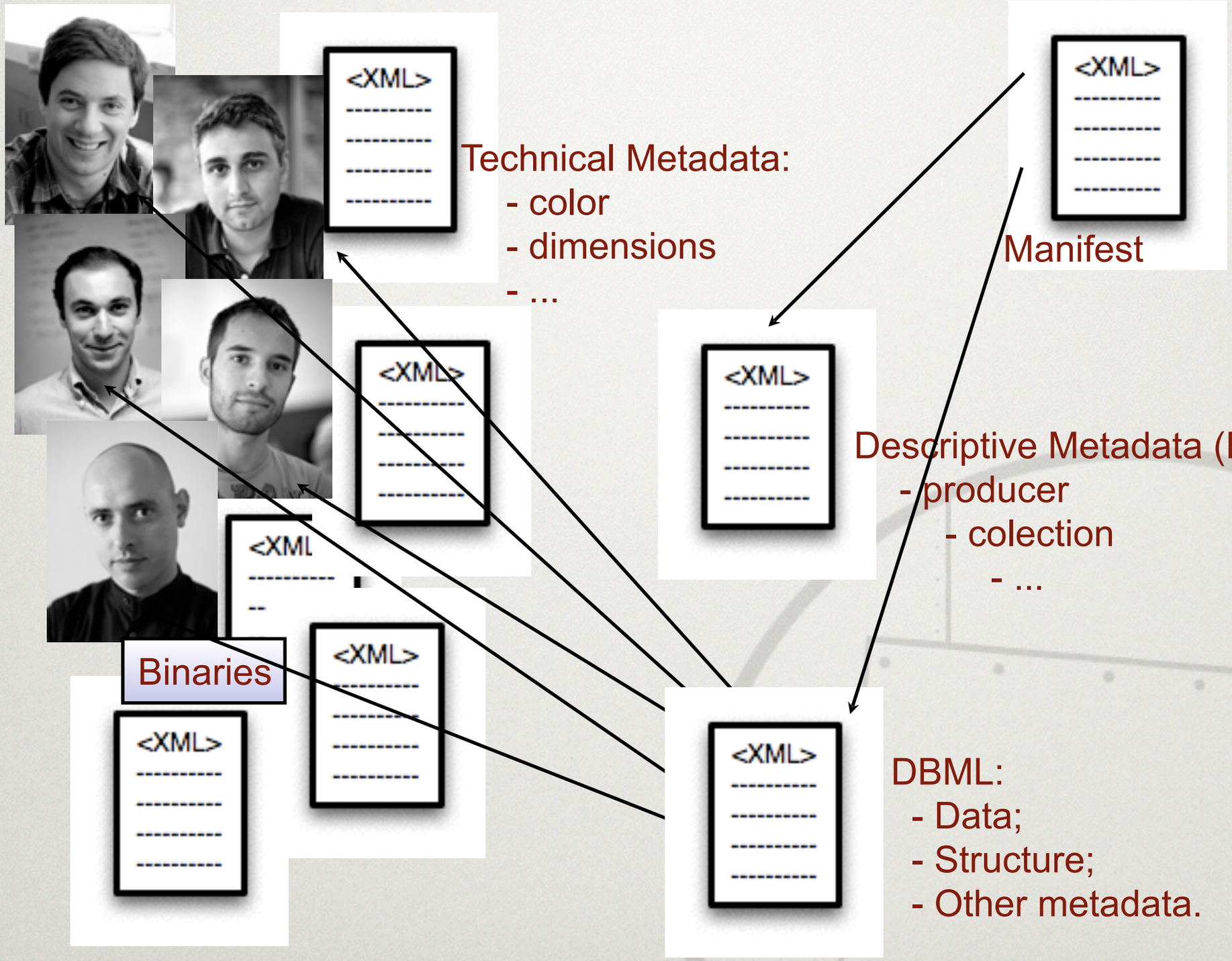

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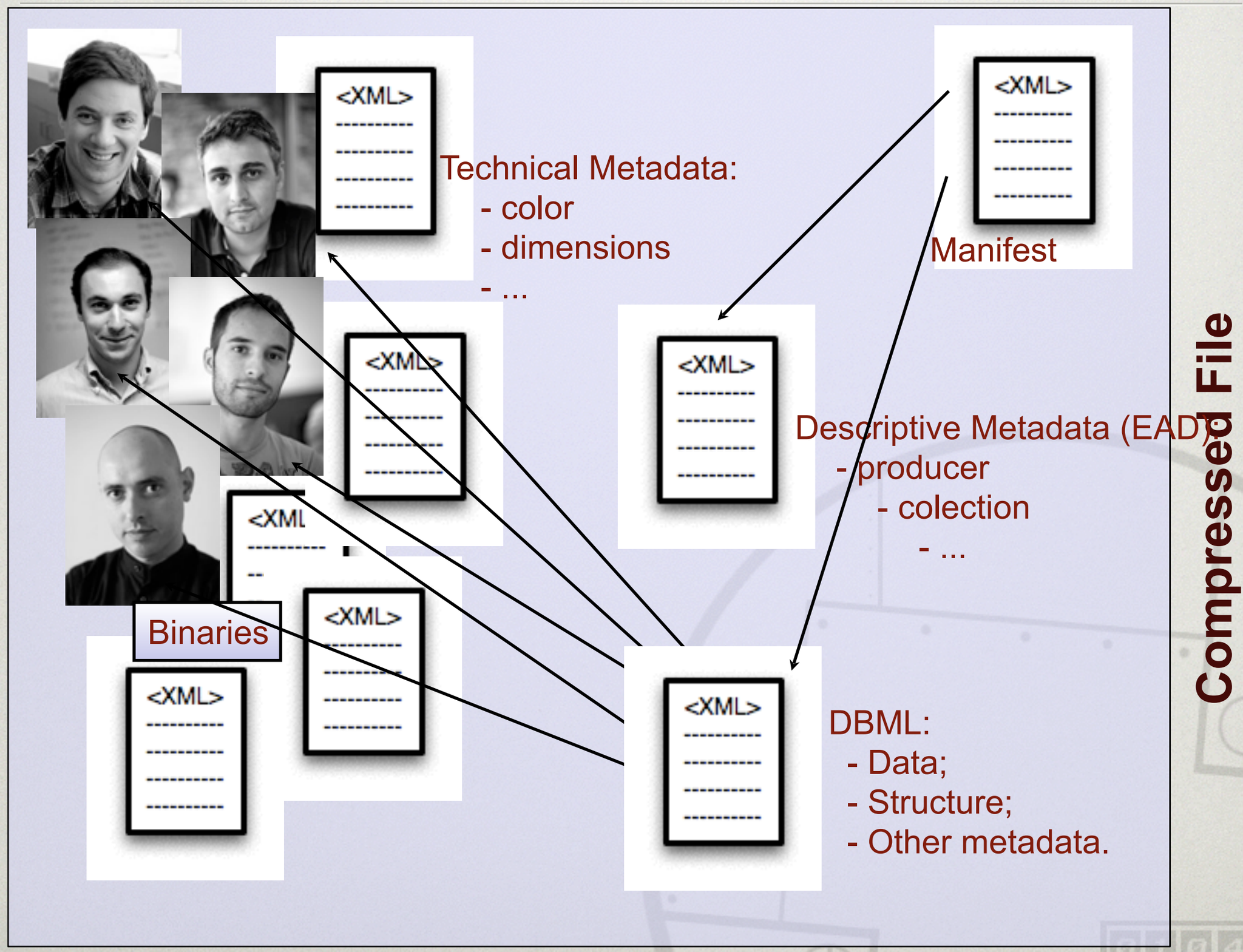
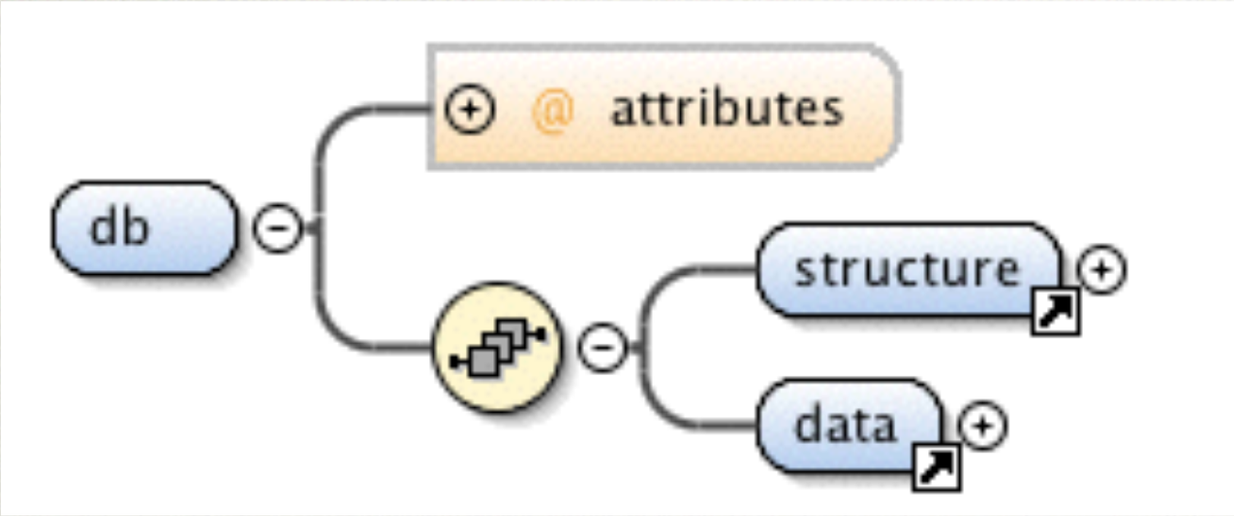
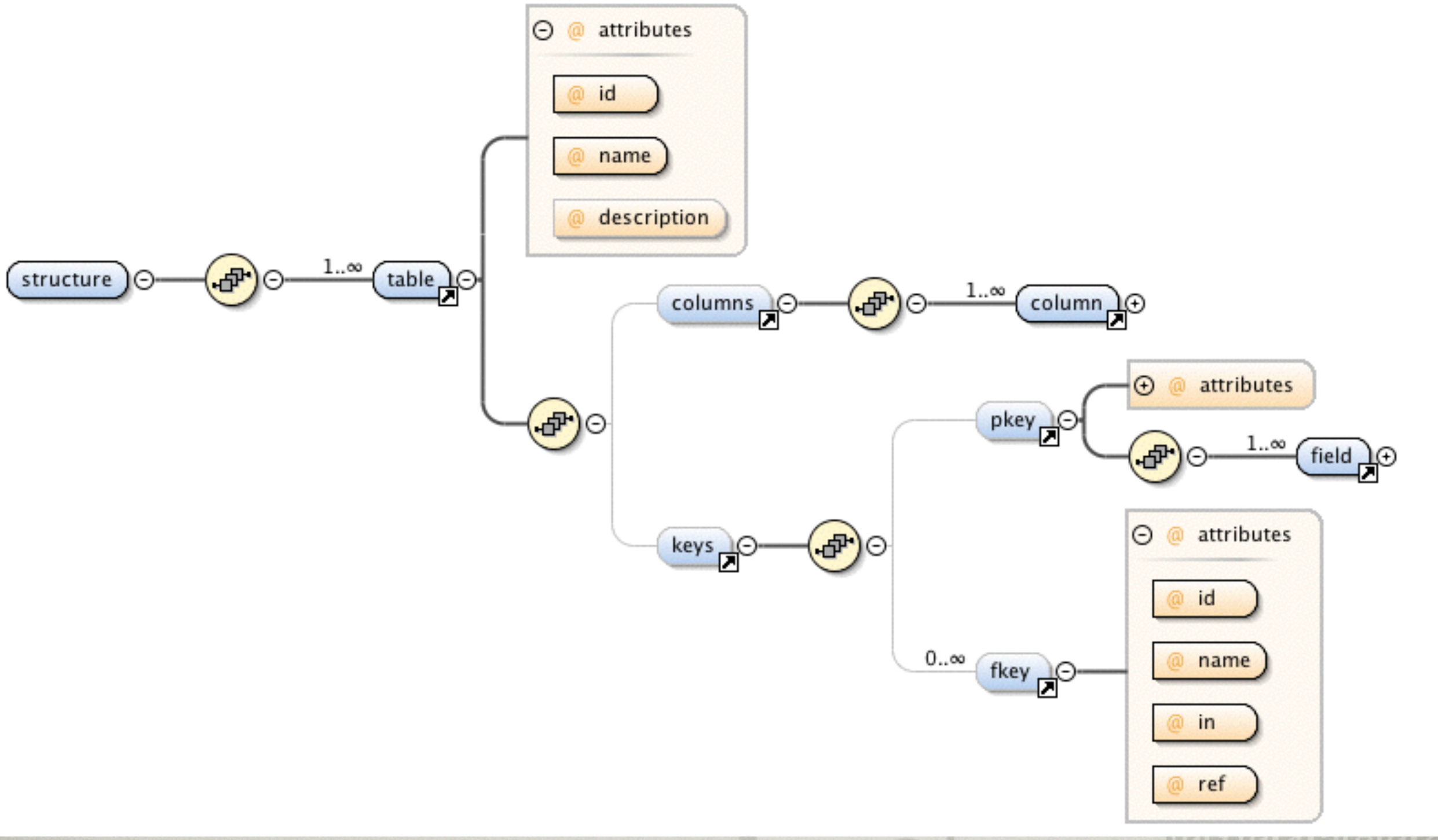


KEEPS Employees

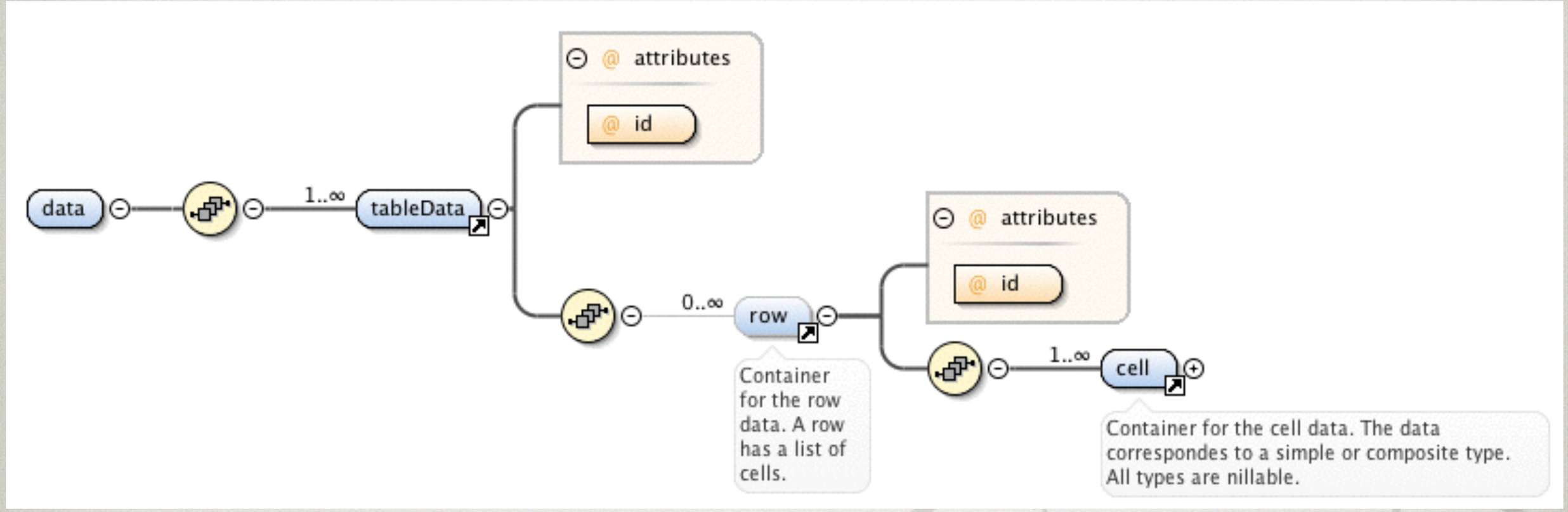
DBML



DBML: Structure



DBML: Data


@ attributes
@ id
data
1..∞
tableData
@ attributes
@ id
0..∞
row
1..∞
cell
Container for the row data. A row has a list of cells.
Container for the cell data. The data correspondes to a simple or composite type. All types are nillable.

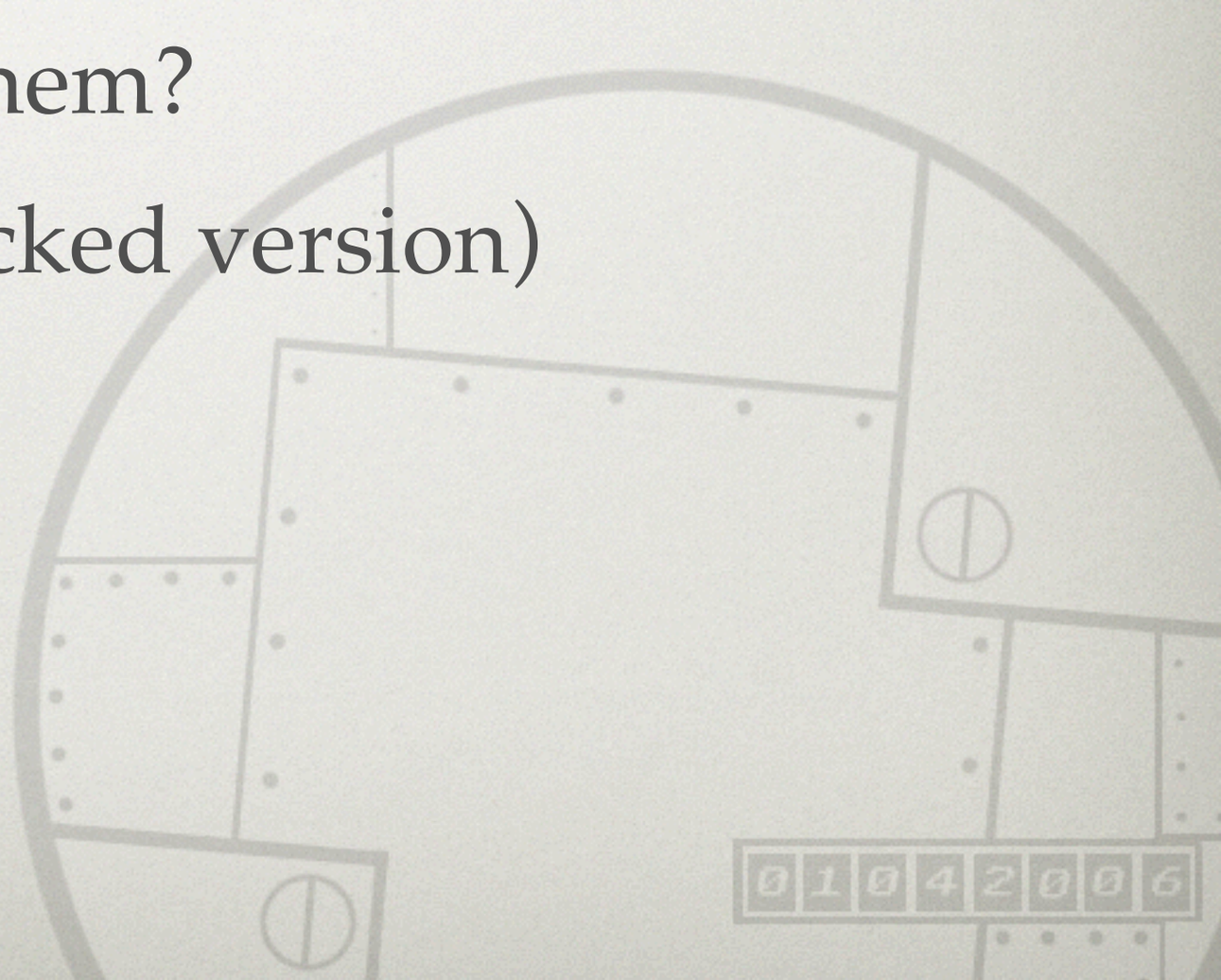
Databases: RODA answers

- How do we store them?

  ★ DBML + binaries + technical metadata

- How do we access them?

  ★ PhpMyAdmin (hacked version)



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RODA answers...

Some problems

- Extracting data is easy:
  - ✦ SELECT * FROM ...
- Extracting the structure is not:
  - ✦ DBMS protect this information;
  - ✦ Each DBMS stores it differently;
  - ✦ Different versions of the same DBMS can also act differently;
  - ✦ We have to “prepare/hack” the DBMS.

Open Planets: “Database Archiving” (Copenhagen 2012)

Two approaches emerged:

- **Preserve the database and the environment allowing authentic access to the information and any accompanying applications**

- **Extract / migrate the raw data and table structure from the original database**

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Relies on emulation strategy

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RODA+DBML

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RODA+DBML

SIARD

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RODA+DBML

SIARD

SIARD-DK

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RODA+DBML

SIARD

SIARD-DK

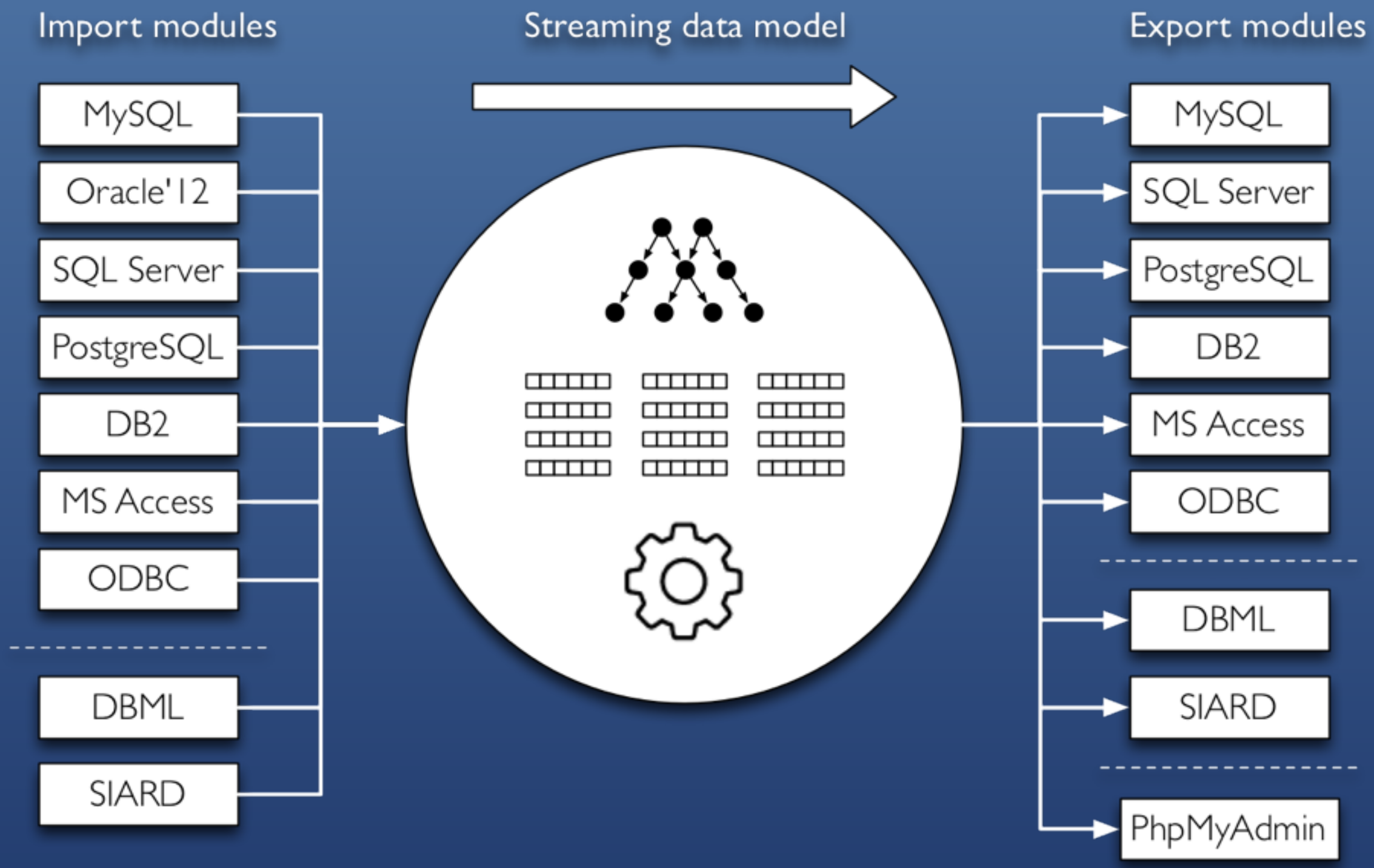
ADDML

Relies on migration strategy

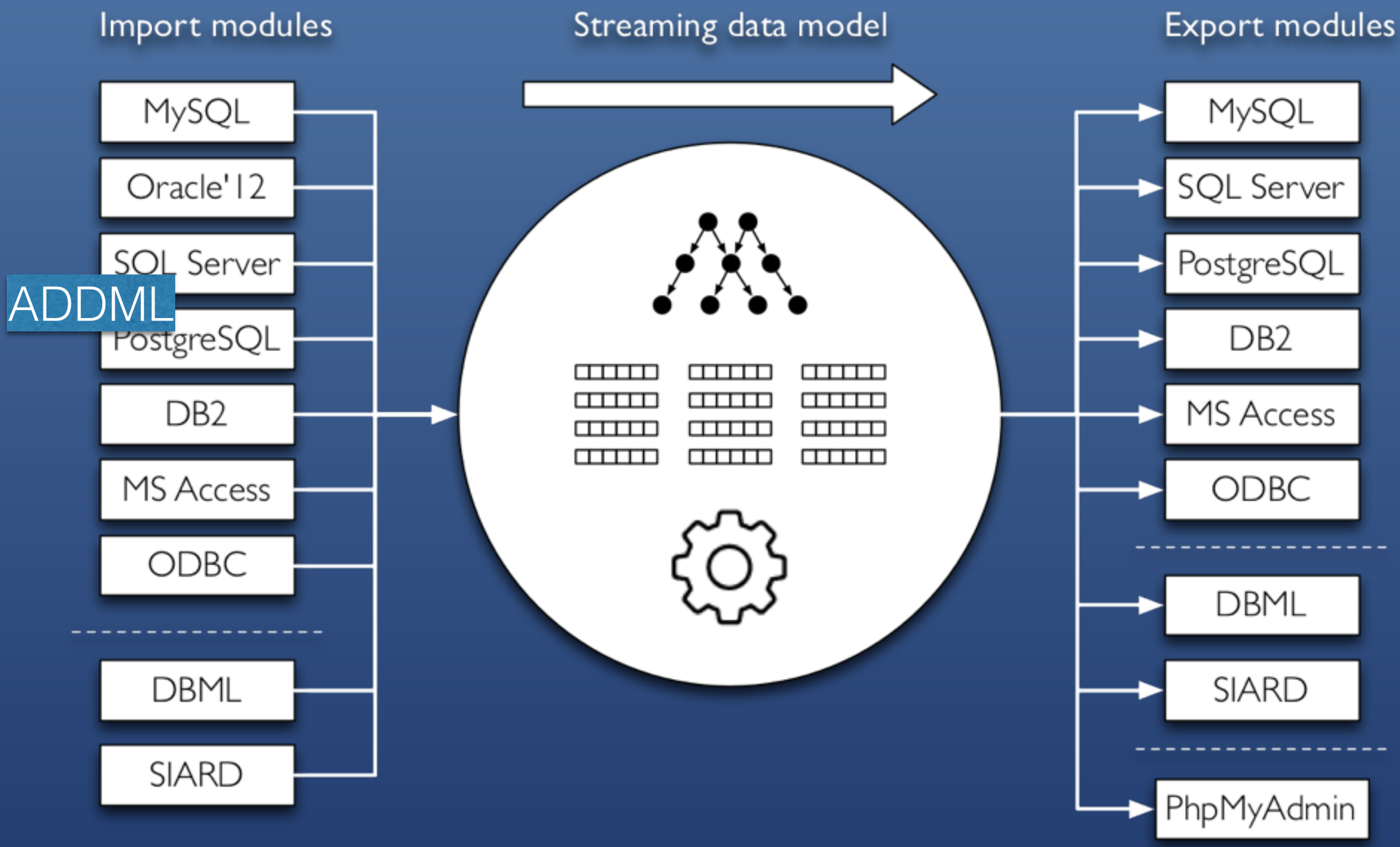
DBML vs SIARD

	DBML	*SIARD*
Data	*Yes (no segmentation)*	*Yes (with segmentation)*
Structure	*Yes (XML)*	*Yes (XSD)*
Stored Procedures	*No*	*Yes (XML)*
Triggers	*No*	*Yes (XML)*
Views	*No*	*Yes (XML)*

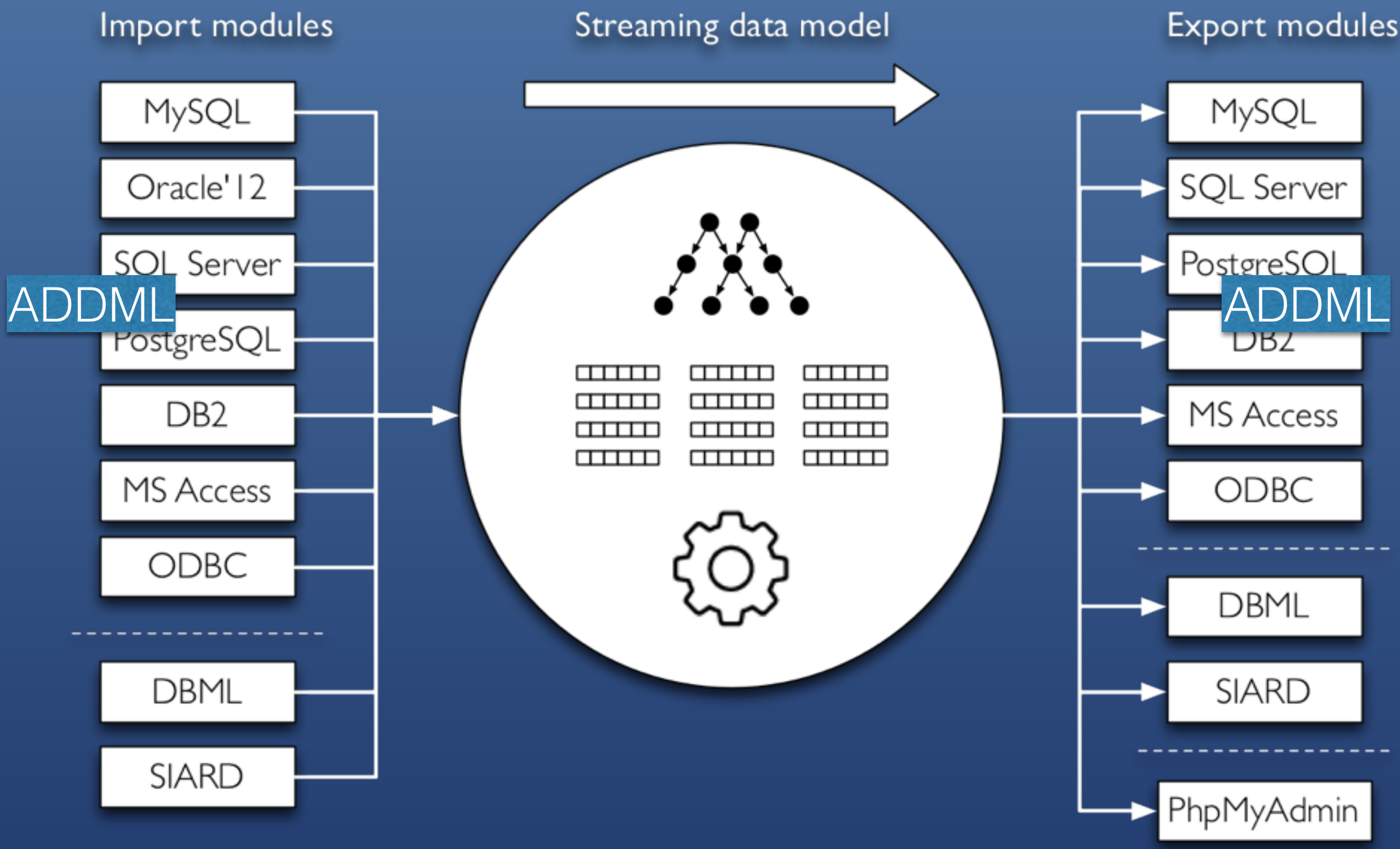
db-preservation-toolkit architecture



db-preservation-toolkit architecture



db-preservation-toolkit architecture

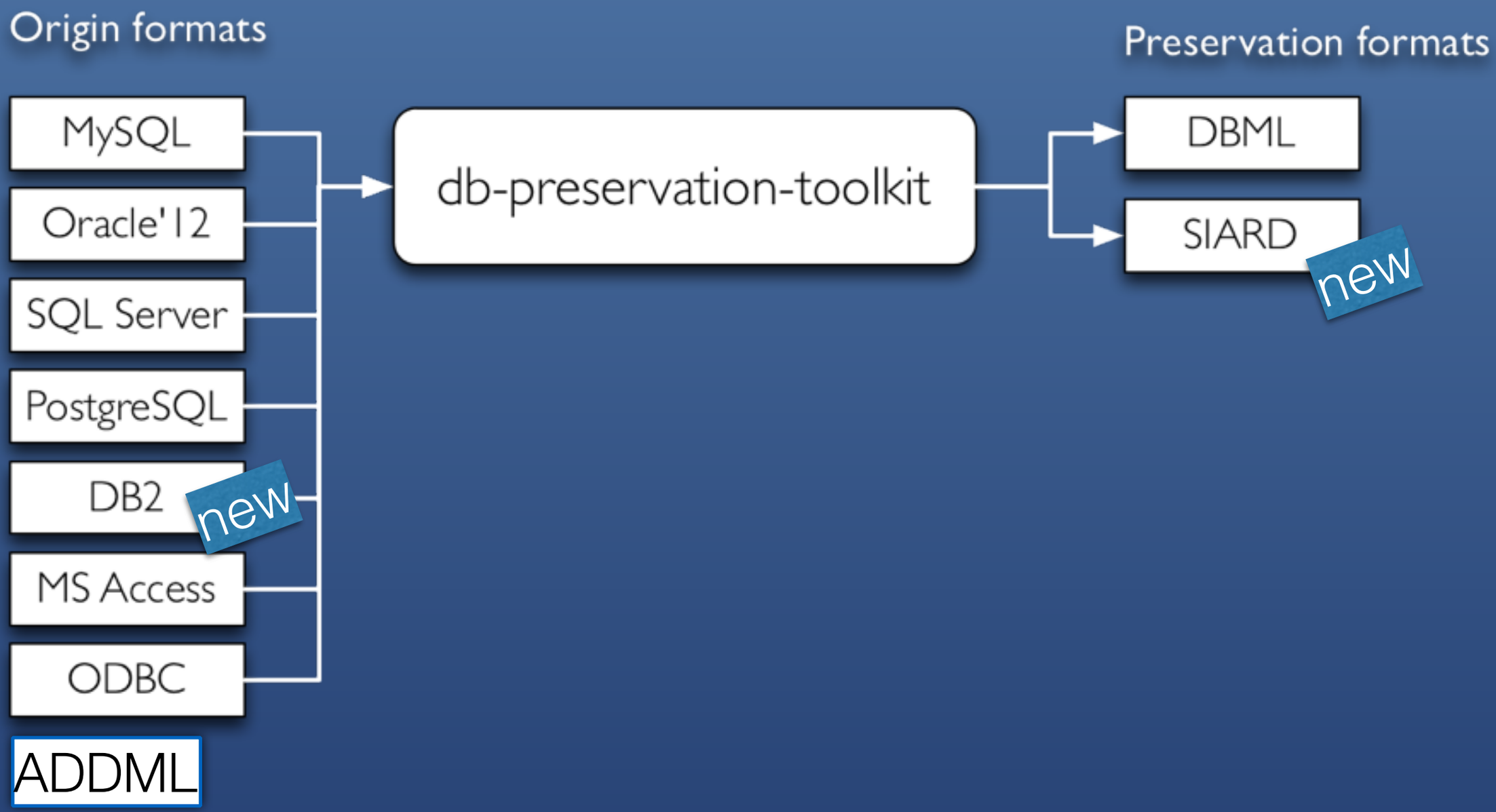


Pre-ingest / Production / SIP creation

Pre-ingest / Production / SIP creation

Pre-ingest / Production / SIP creation

Pre-ingest / Production / SIP creation



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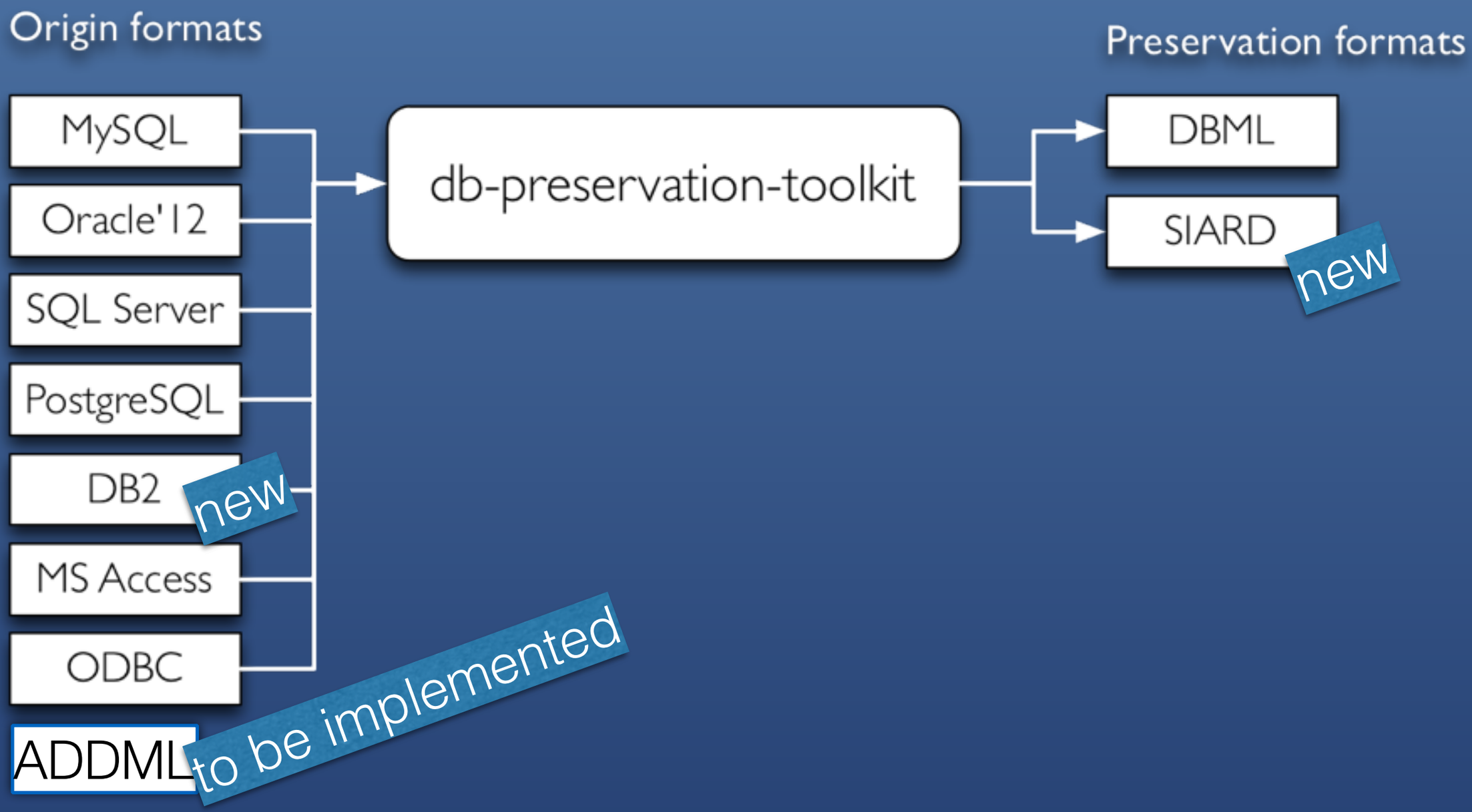
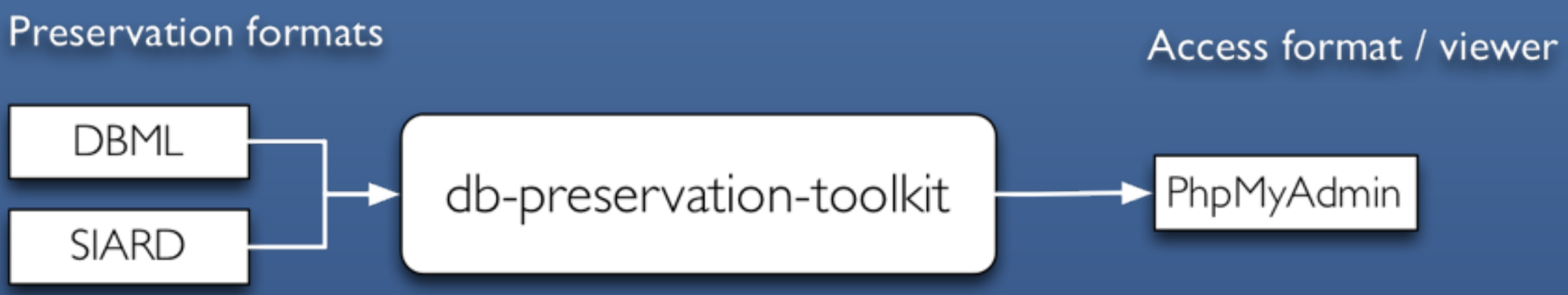
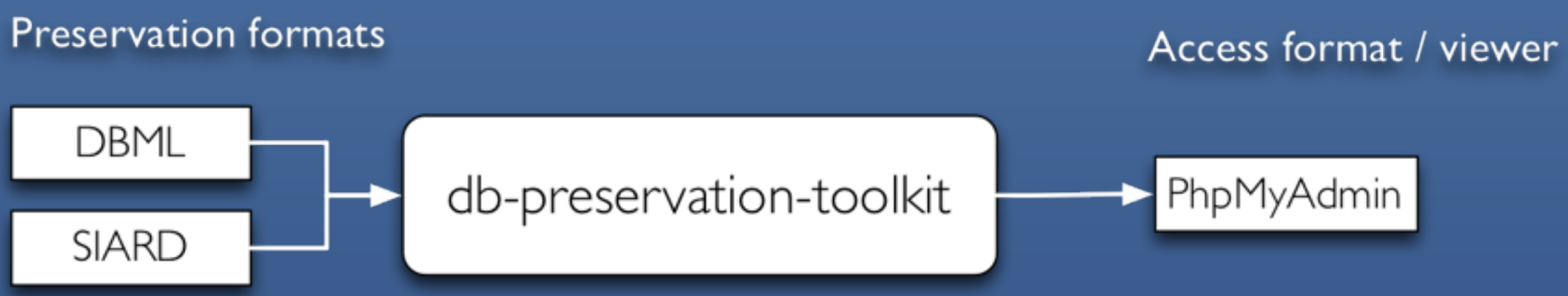


Access


Preservation formats
Access format / viewer
DBML
SIARD
db-preservation-toolkit
PhpMyAdmin

Access



Working on RDF viewer, we don’t need to stay stuck in the relational model

New prototype

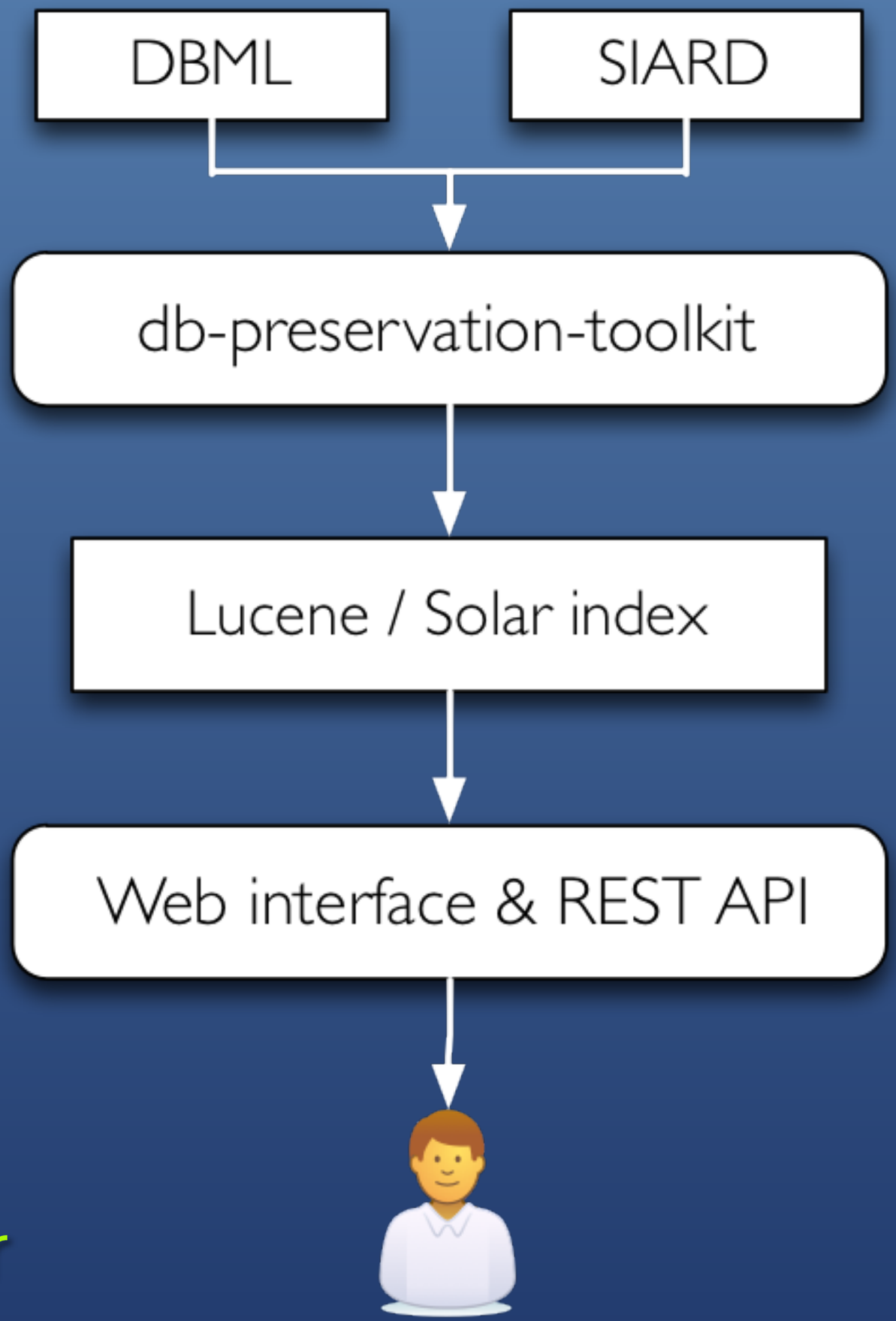
Msc thesis: *"Database Convert Tool: exploring SIARD"*

- *OWL model development*
- *Triple Store Implementation*
- *RDF endpoint implementation*
- *SPARQL based access*

Preservation formats

Fast viewer resources

Fast viewer application



Future plan:
Fast database viewer

Recent work

Phd thesis: Graph view dissemination, relational model reverse engineering, algorithm development (from relational to graph model) [http://repositorium.sdum.uminho.pt/handle/1822/25655]

Msc thesis: SIARD support (DBML replacement)

Msc thesis: RDF representation for databases

Questions?

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University of Minho SPIN-OFF

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