Digital Preservation Metadata and Improvements to PREMIS in Version 3.0

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University of Portsmouth

Agenda

- Digital preservation metadata
  - Why is it needed and what does it look like?
- PREMIS
  - What is it?
  - Data model
  - How to use it
- From V2 to V3

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What is digital preservation metadata?

- Digital preservation metadata =

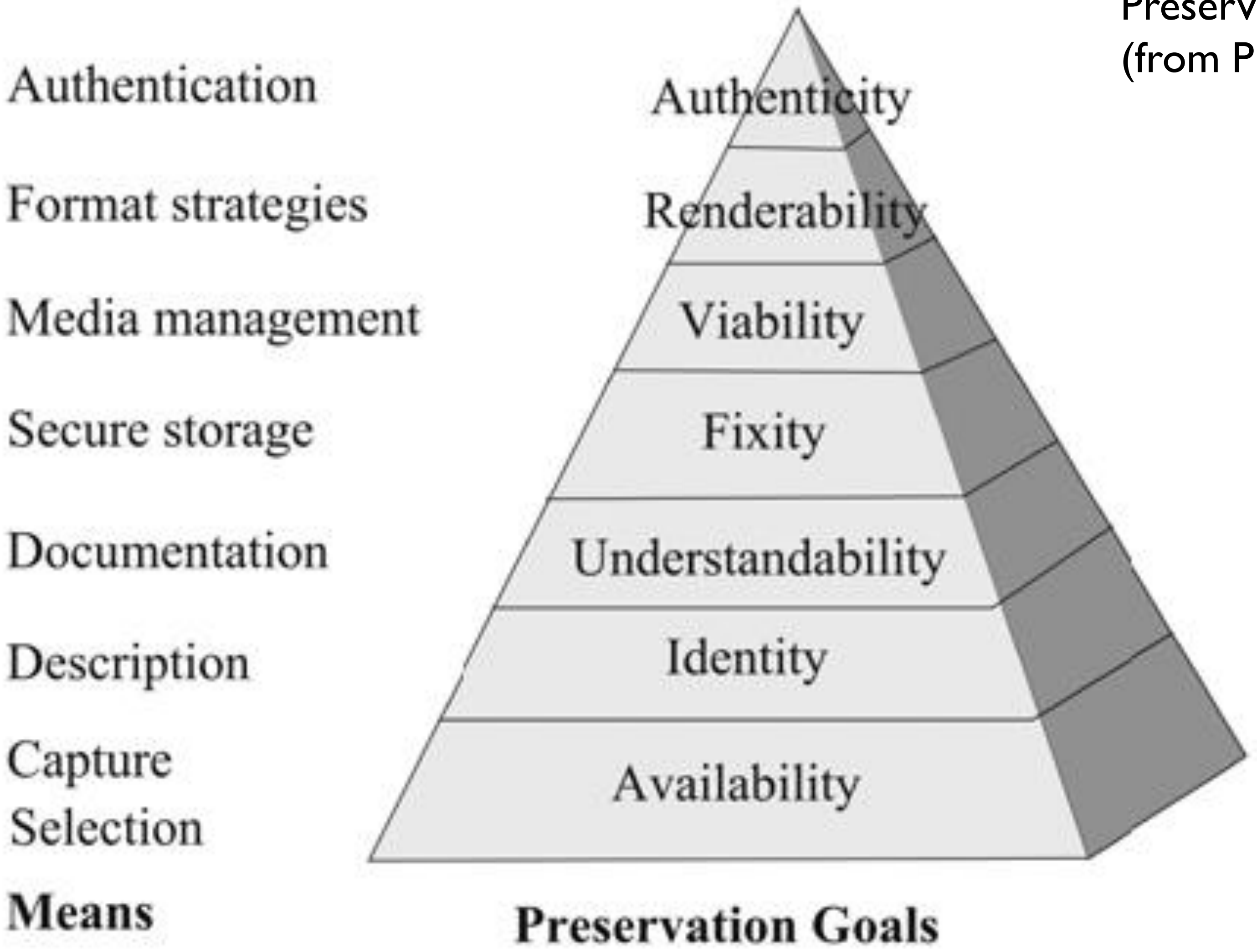
  Metadata to ensure long-term accessibility
  of digital resources

- Digital objects must be self-descriptive

- Must be able to describe, manage and discover independently from the systems that were used to create them

  XML (machine and human readable)

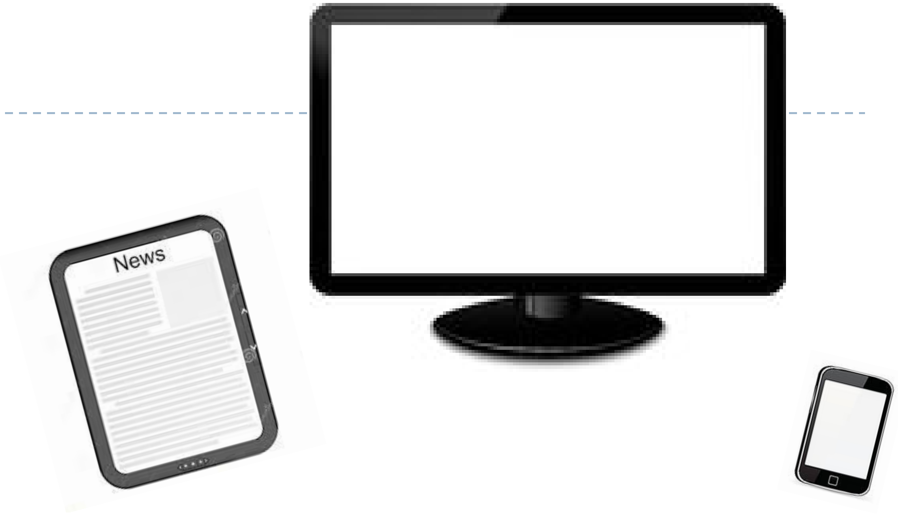
DP metadata supports preservation goals



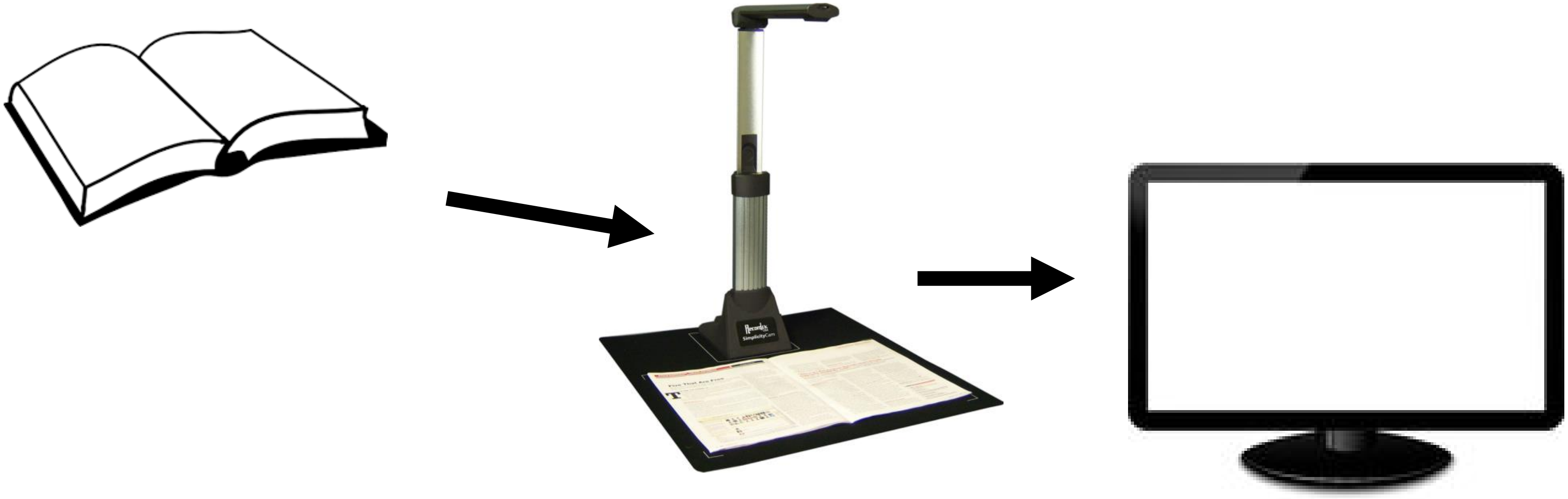
Preservation Pyramid
(from Priscilla Caplan)

Domain

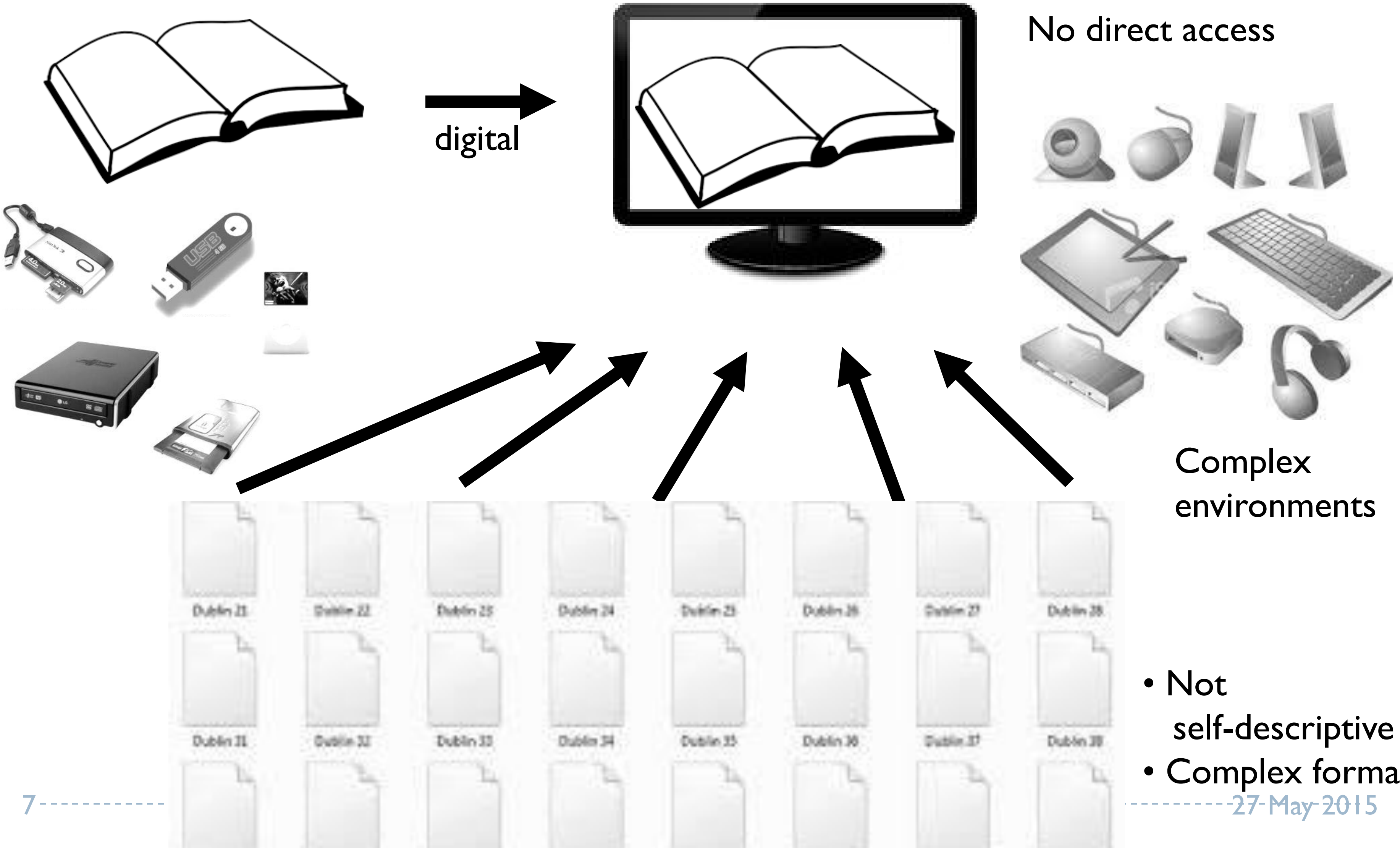
Born digital



Digitized



Technology dependence



digital

No direct access

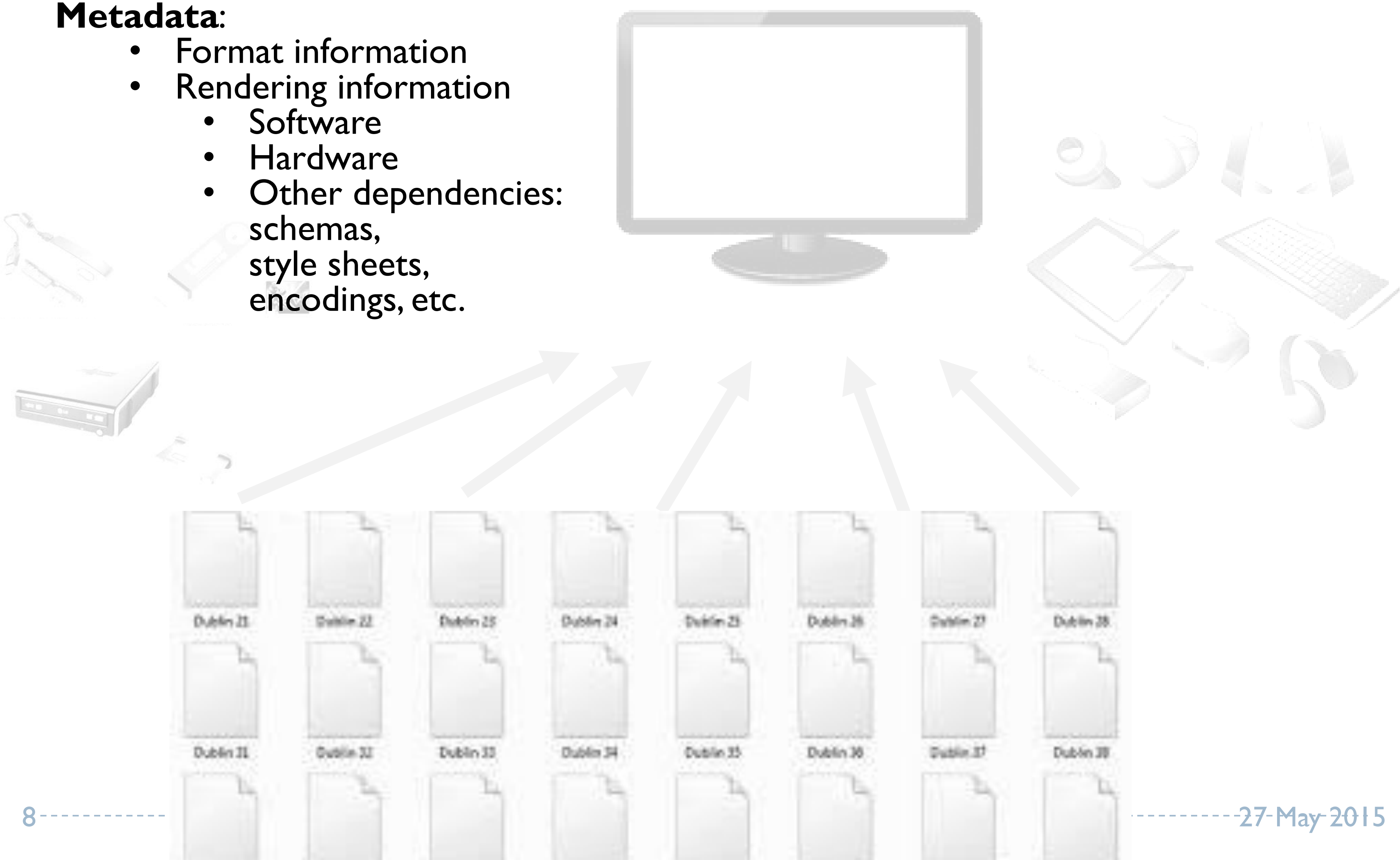
Complex environments

- Not self-descriptive
- Complex formats

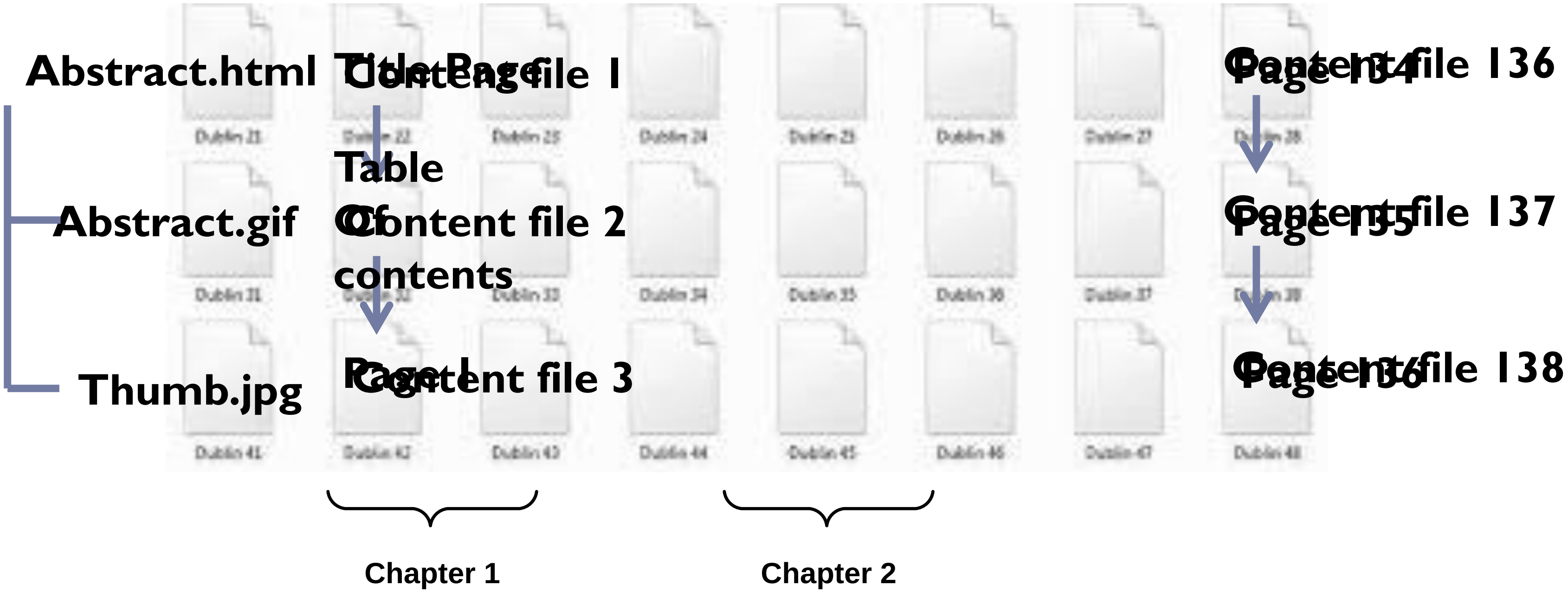
Technology dependence

Metadata:

- Format information
- Rendering information
  - Software
  - Hardware
  - Other dependencies: schemas, style sheets, encodings, etc.



Complex structures


Abstract.html

Abstract.gif

Thumb.jpg

Title Page

Table Of contents

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Content file 2

Content file 3

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Page 135

Page 136

Content file 136

Content file 137

Content file 138

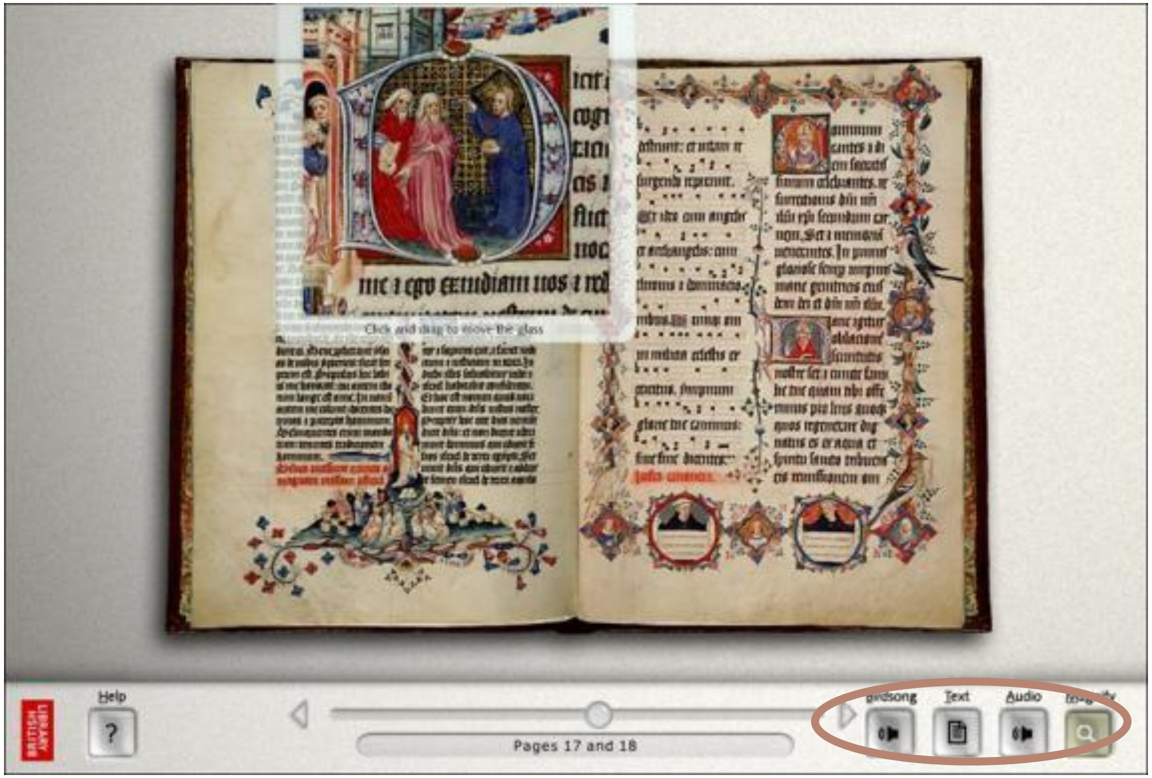
Chapter 1

Chapter 2

Metadata

- Physical structural relationships
  - Embedded files
  - File sequence
- Logical structural relationships

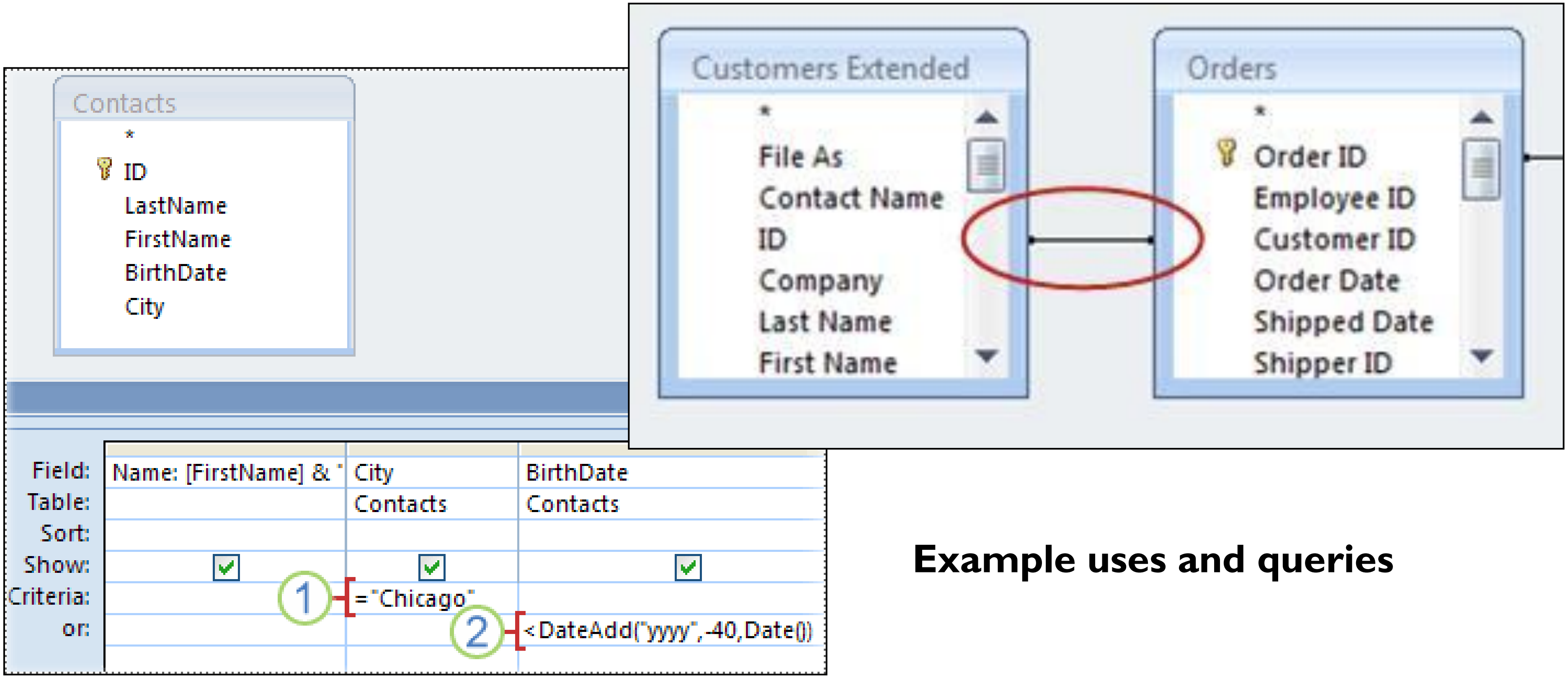
Supporting features



Metadata:

Semantic information for the designated community

Supporting features



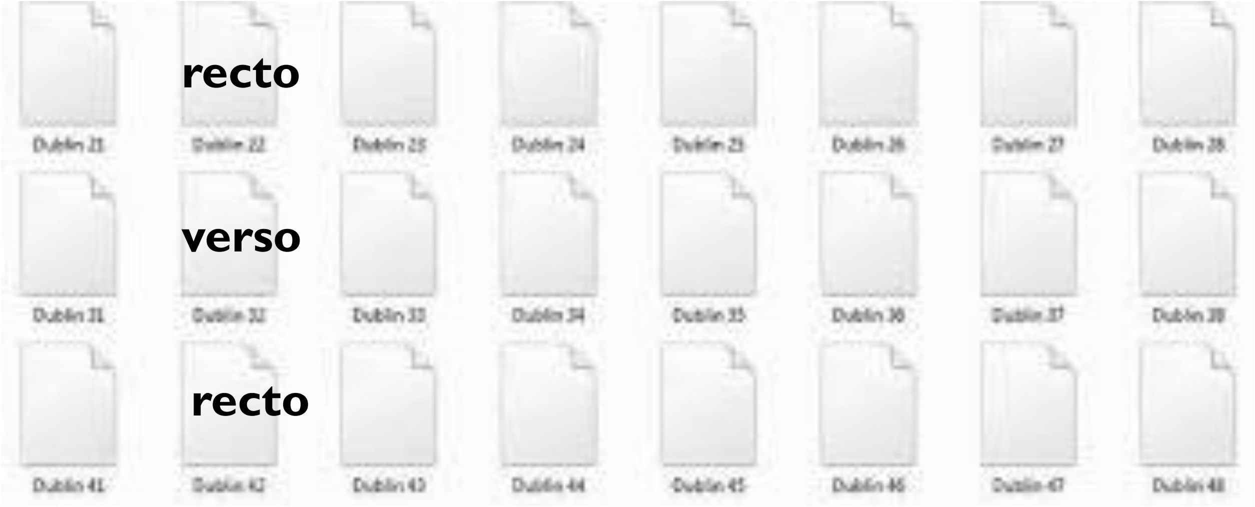
Field:	Name: [FirstName] & "	City	BirthDate
Table:		Contacts	Contacts
Sort:			
Show:	☑	☑	☑
Criteria:		="Chicago"	
or:			<DateAdd("yyyy",-40,Date())

Example uses and queries

Metadata:

Semantic information for the designated community

Context descriptions



Metadata:

Context descriptions

- Original source
- Related items (e.g. migration source)

Obsolescence

-> object transformations

- Pre-emptive preservation actions
  - Bit migration
  - Content migration
  - Replacing part of the rendering stack
- Forensic transformation actions

Obsolescence / object transformations

Goals

- Avoid rights violations

- Prove authenticity

  - ❑Events
  - ❑Dates
  - ❑Changes and decisions
  - ❑Agents (decision maker + tools used)

Metadata

- Rights information for preservation actions during copyright / license period

- Provenance metadata:
  - History of all actions performed on the resource
  - History of custodianship

Obsolescence / object transformations

Goals

- Manage potential loss of object characteristics
- Demonstrate degree of authenticity
- Explain decisions

❑ Documentation

Metadata

- Significant characteristics
- Lost characteristics
- Business rules (policy, strategy) guiding preservation actions

Mutability

- Intentional or accidental change
- Decay: rapid and potentially complete

Goals

- Viability: the object is readable
- Fixity: the object is unchanged

Metadata

- Data carrier metadata
  - Type of medium
  - Its preservation characteristics
  - Age of medium
  - Date of recording
  - Usage patterns
- Checksums, message digests, hash function
- Event creating them
  - Algorithms creating them
  - Date/time
  - Originator

Mutability

- Intentional or accidental change
- Decay: rapid and potentially complete

Goals

- Integrity: the object is whole and unimpaired
- Authenticity: the object is what it purports to be

Metadata

- Event information for format identification and validation events (= provenance)
- Structural metadata
- Digital signatures
- Access rights

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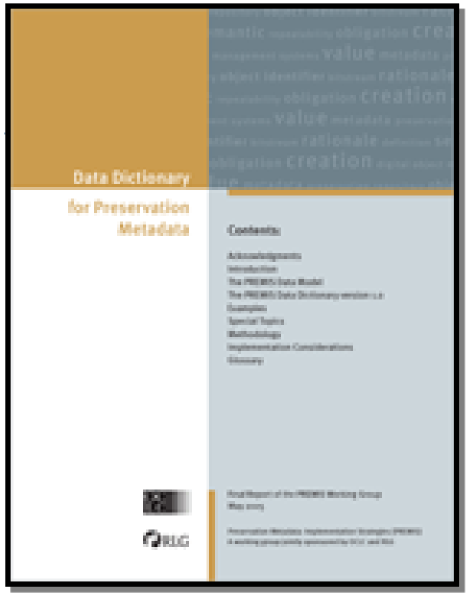
The PREMIS standard

- International *de-facto* standard for metadata to support the preservation of digital objects and ensure their long-term usability.
  - Information you need to know for preserving digital objects

    Preservation Metadata: Implementation Strategies
- Developed by an international team of experts.
- Implemented in digital preservation projects around the world.
- Incorporated into commercial and open-source digital preservation tools and systems.

The PREMIS standard


Data Dictionary
for Preservation
Metadata

Contents:

Acknowledgments
Introduction
The PREMIS Data Model
The PREMIS Data Dictionary version 1.0
Examples
Special Topics
Methodology
Implementation Considerations
Glossary

Final Report of the PREMIS Working Group
May 2005

Preservation Metadata: Implementation Strategies (PREMIS)
A working group jointly sponsored by OCLC and RLG

- Data Dictionary (PREMIS 2.2)
  - http://www.loc.gov/standards/premis/v2/premis-2-2.pdf
  - Version 3 will be released this summer – major release
- XML schema v2.3
- OWL ontology
- Supporting documentation

Activities

- The PREMIS Editorial Committee
  - Coordinates revisions and implementation of the standard
- PREMIS Implementors' Group forum (pig@loc.gov)
  - Email message to listserv@loc.gov:
    Text: subscribe pig <your name>
- PREMIS Implementation Fair (PIF)
  - User group meetings (@iPres)

Scope

- What PREMIS DD is:
  - Common data model for organizing/thinking about preservation metadata
  - Standard for exchanging information packages between repositories
  - Implementable
  - Technically neutral
  - Core metadata

Scope

- What PREMIS DD is not:
  - Out-of-the-box solution
  - All needed metadata
  - Lifecycle management of objects outside repository
    - increasing support for integration with outside
  - Rights management standard
    - strong support for rights statements

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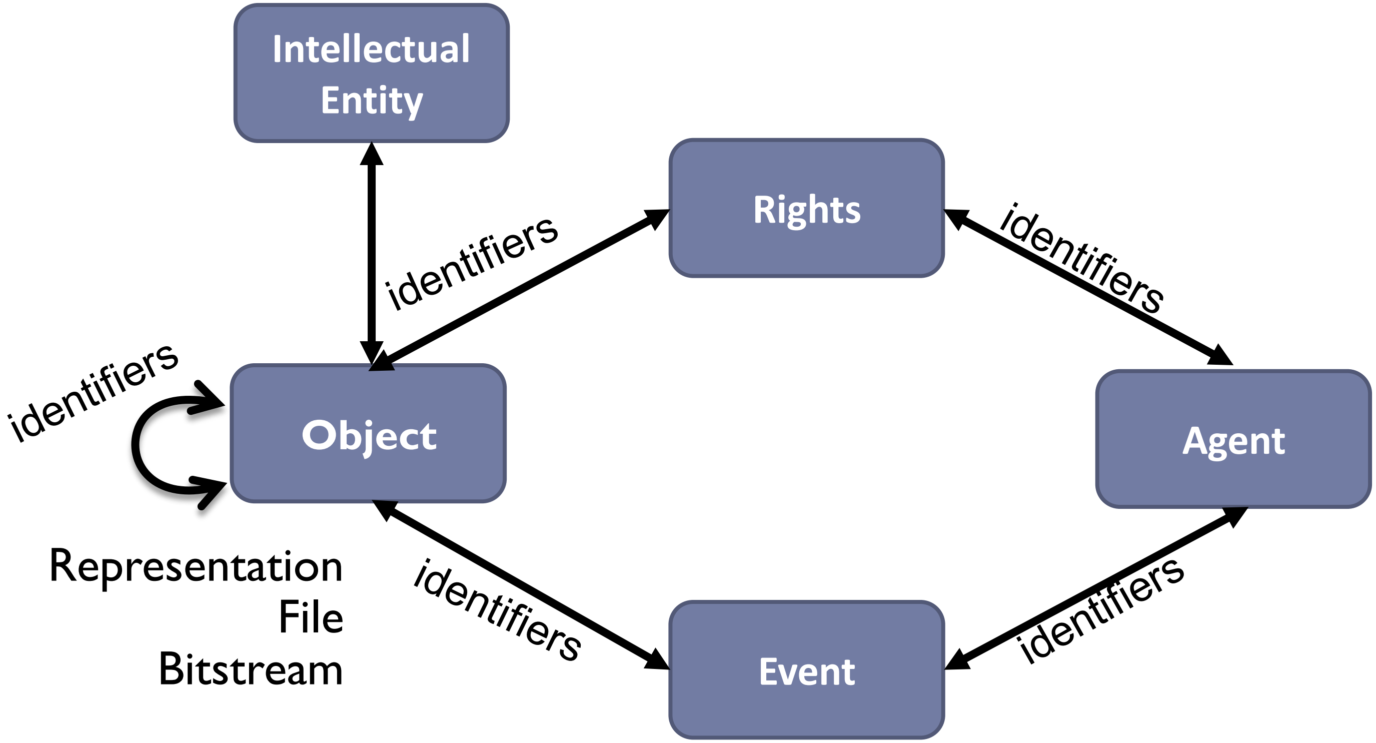
Data Model in PREMIS Version 2

- Entities: "things" relevant to digital preservation that are described by preservation metadata

Entity

- Relationships between Entities ↔
- Properties of Entities (semantic units)



Intellectual Entity

Rights

Object

Agent

Event

identifiers

identifiers

identifiers

identifiers

identifiers

identifiers

Representation
File
Bitstream

Example: Object Entity semantic units

- 1.1 object Identifier
- 1.2 object Category
- 1.3 preservation Level
- 1.4 significant Properties
- 1.5 o

- 1.6 original Name
- 1.7 storage
- 1.8 environment
- 1.9 signature Information

Object

1.5 objectCharacteristics

1.5.1 compositionLevel

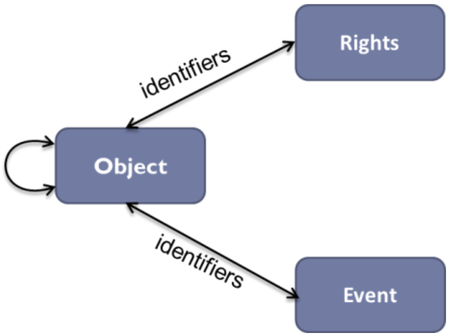
1.5.2 fixity

1.5.3 size

1.5.4 format

1.5.5 creatingApplication

1.5.6 inhibitors



1.10 relationship

1.11 linkingEventIdentifier

1.13 linkingRightsStatementIdentifier

Sample Data Dictionary Entry

- 1.5 objectCharacte
- 1.5.1 compositionL
- 1.5.2 fixity
- 1.5.3 size
- 1.5.4 format
- 1.5.5 creatingAppli
- 1.5.6 inhibitors

Semantic unit	size		
Semantic components	None		
Definition	The size in bytes of the file or bitstream stored in the repository.		
Rationale	Size is useful for ensuring the correct number of bytes from storage have been retrieved and that an application has enough room to move or process files. It might also be used when billing for storage.		
Data constraint	Integer		
Object category	**Representation**	**File**	**Bitstream**
Applicability	Not applicable	Applicable	Applicable
Examples		2038927	
Repeatability		Not repeatable	Not repeatable
Obligation		Optional	Optional
Creation/ Maintenance notes	Automatically obtained by the repository.		
Usage notes	Defining this semantic unit as size in bytes makes it unnecessary to record a unit of measurement. However, for the purpose of data exchange the unit of measurement should be stated or understood by both partners.		

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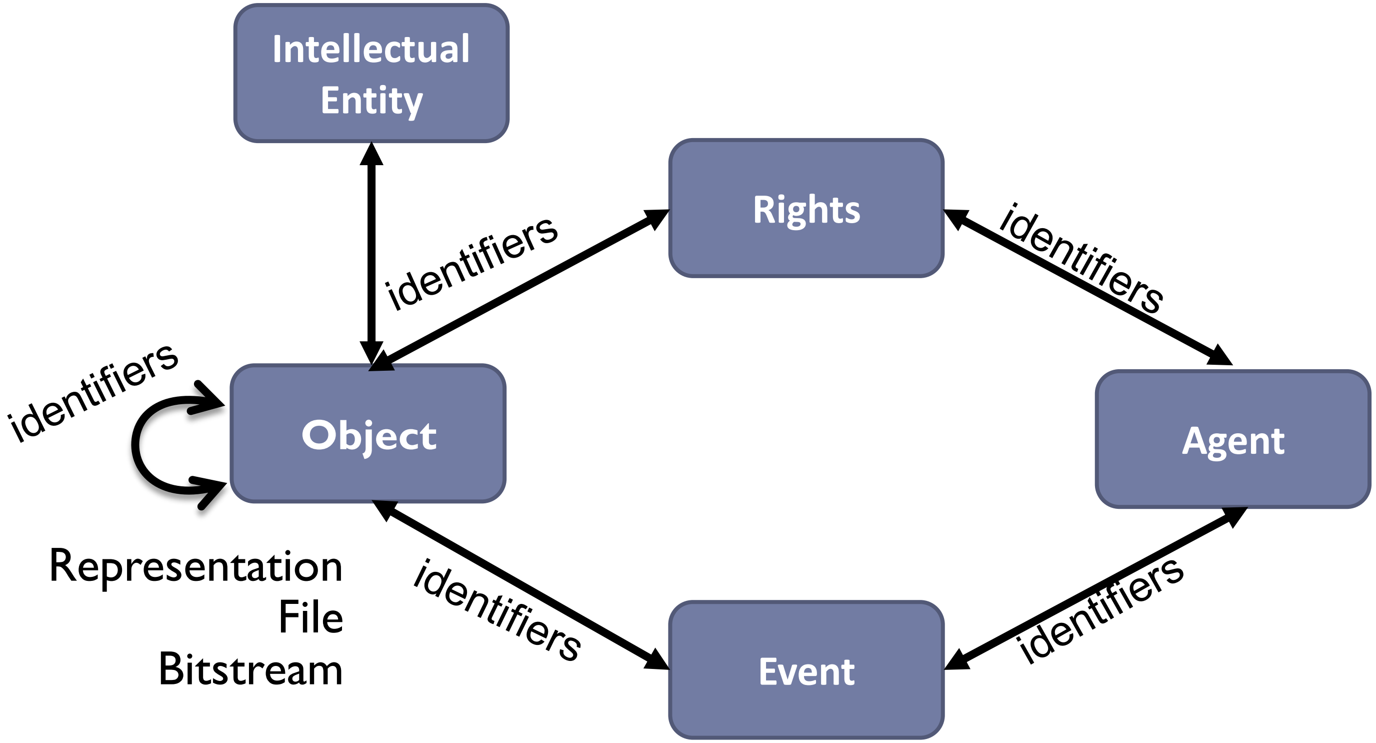
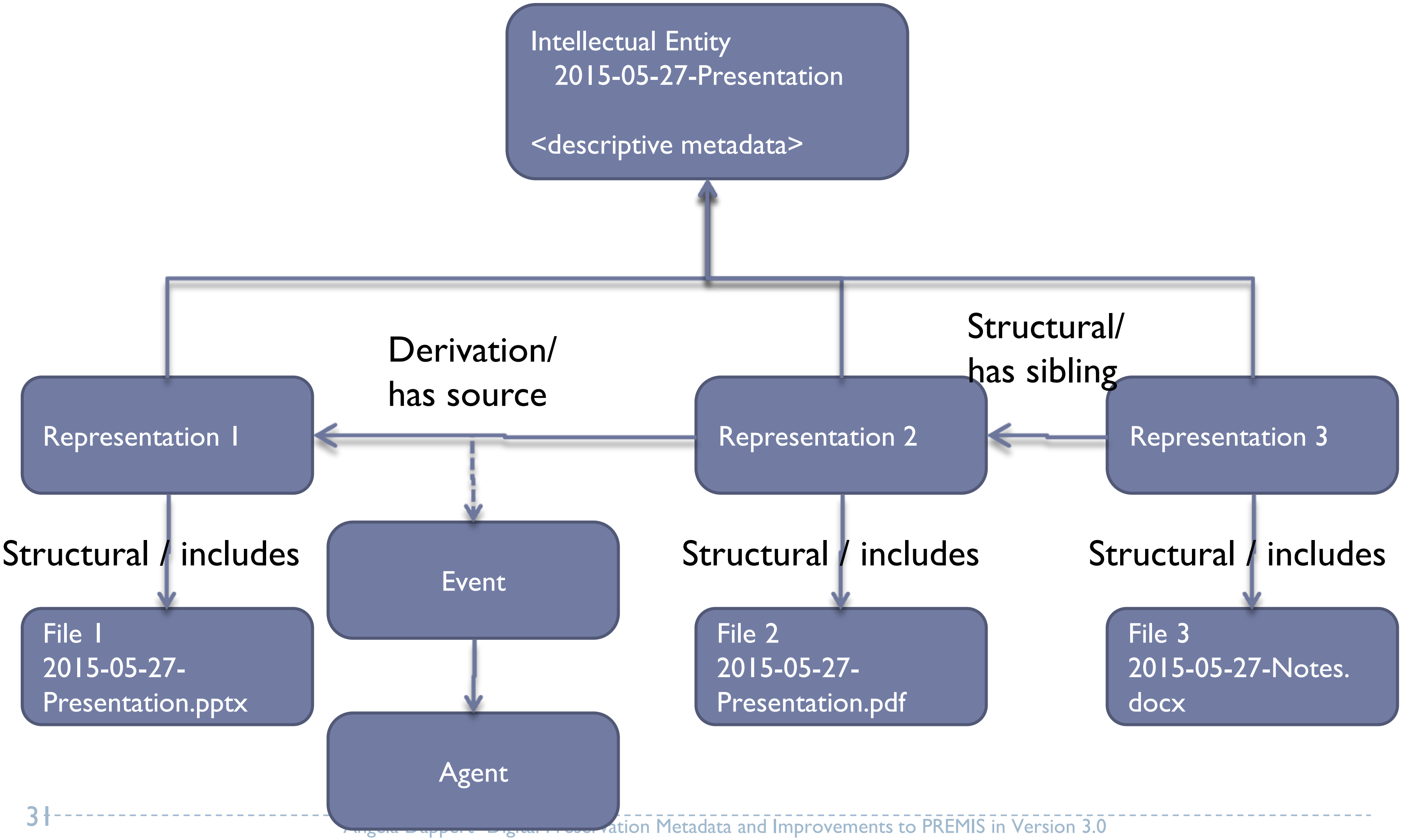
Tayloring PREMIS to needs

- Evolving metadata
  - Increasing experience ensuring the longevity of digital objects
  - Changing future technical possibilities
  - Changing future legal framework
- Tayloring solutions
  - Varying needs
    - □ Content-types
    - □ Institutional policies
    - □ Intended use

From here to an implementation …



Example: Document in 3 representations



Intellectual Entity
2015-05-27-Presentation

<descriptive metadata>

Representation 1

Derivation/
has source

Representation 2

Structural/
has sibling

Representation 3

Structural / includes

Event

Structural / includes

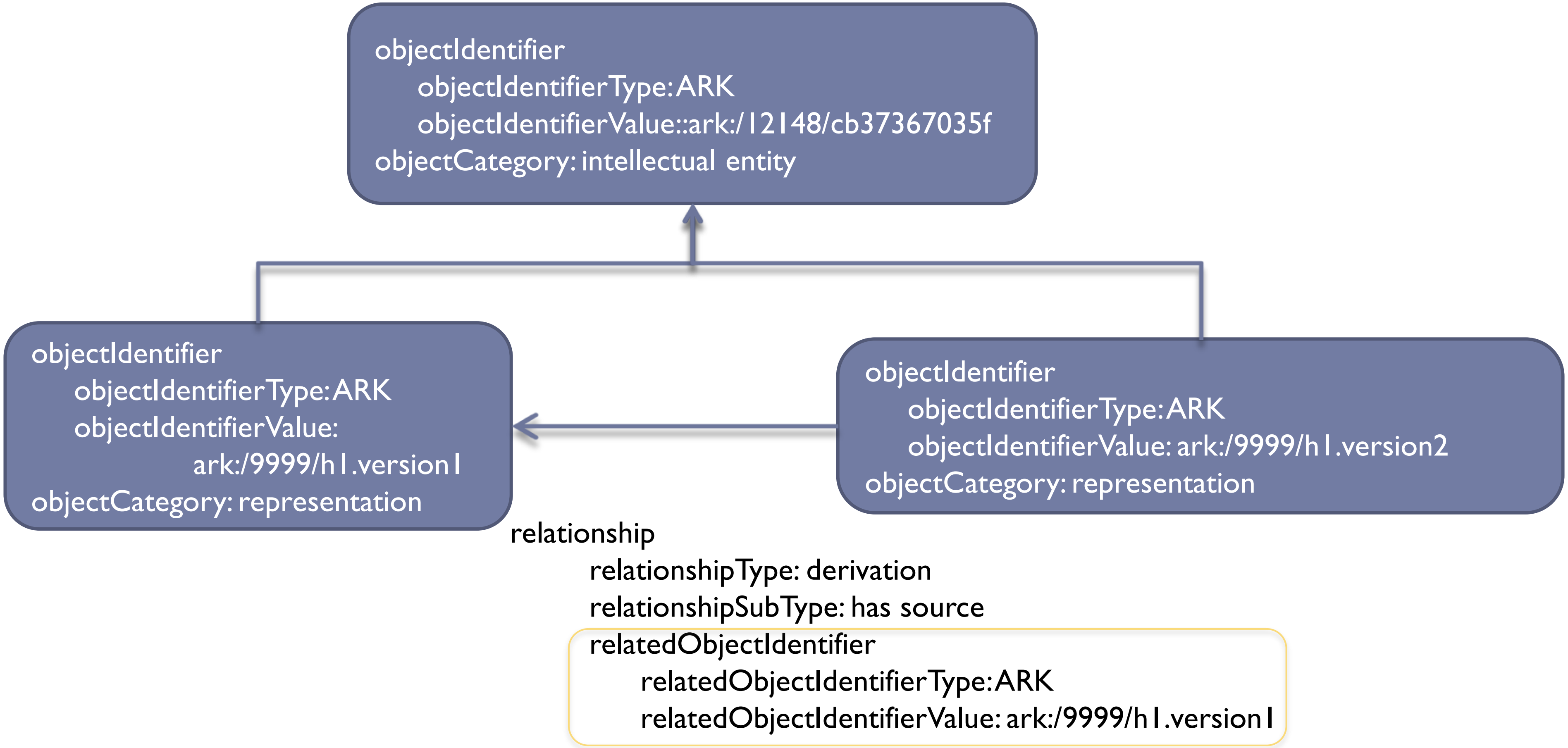
Structural / includes

File 1
2015-05-27-Presentation.pptx

Agent

File 2
2015-05-27-Presentation.pdf

File 3
2015-05-27-Notes.docx

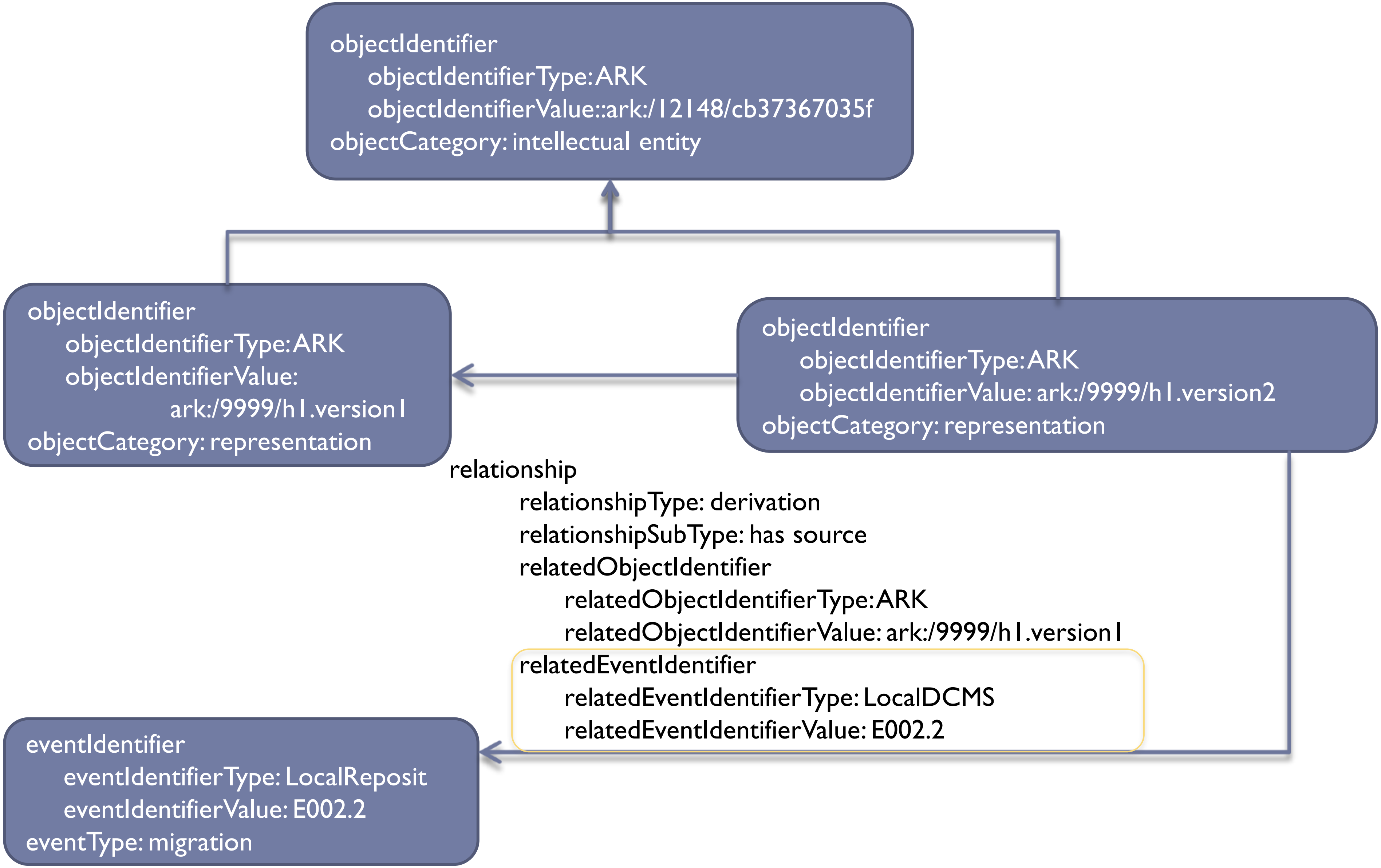


objectIdentifier
    objectIdentifierType: ARK
    objectIdentifierValue::ark:/12148/cb37367035f
objectCategory: intellectual entity

objectIdentifier
    objectIdentifierType: ARK
    objectIdentifierValue:
        ark:/9999/h1.version1
objectCategory: representation

objectIdentifier
    objectIdentifierType: ARK
    objectIdentifierValue: ark:/9999/h1.version2
objectCategory: representation

relationship
    relationshipType: derivation
    relationshipSubType: has source
    relatedObjectIdentifier
        relatedObjectIdentifierType: ARK
        relatedObjectIdentifierValue: ark:/9999/h1.version1



objectIdentifier
    objectIdentifierType: ARK
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objectCategory: intellectual entity

objectIdentifier
    objectIdentifierType: ARK
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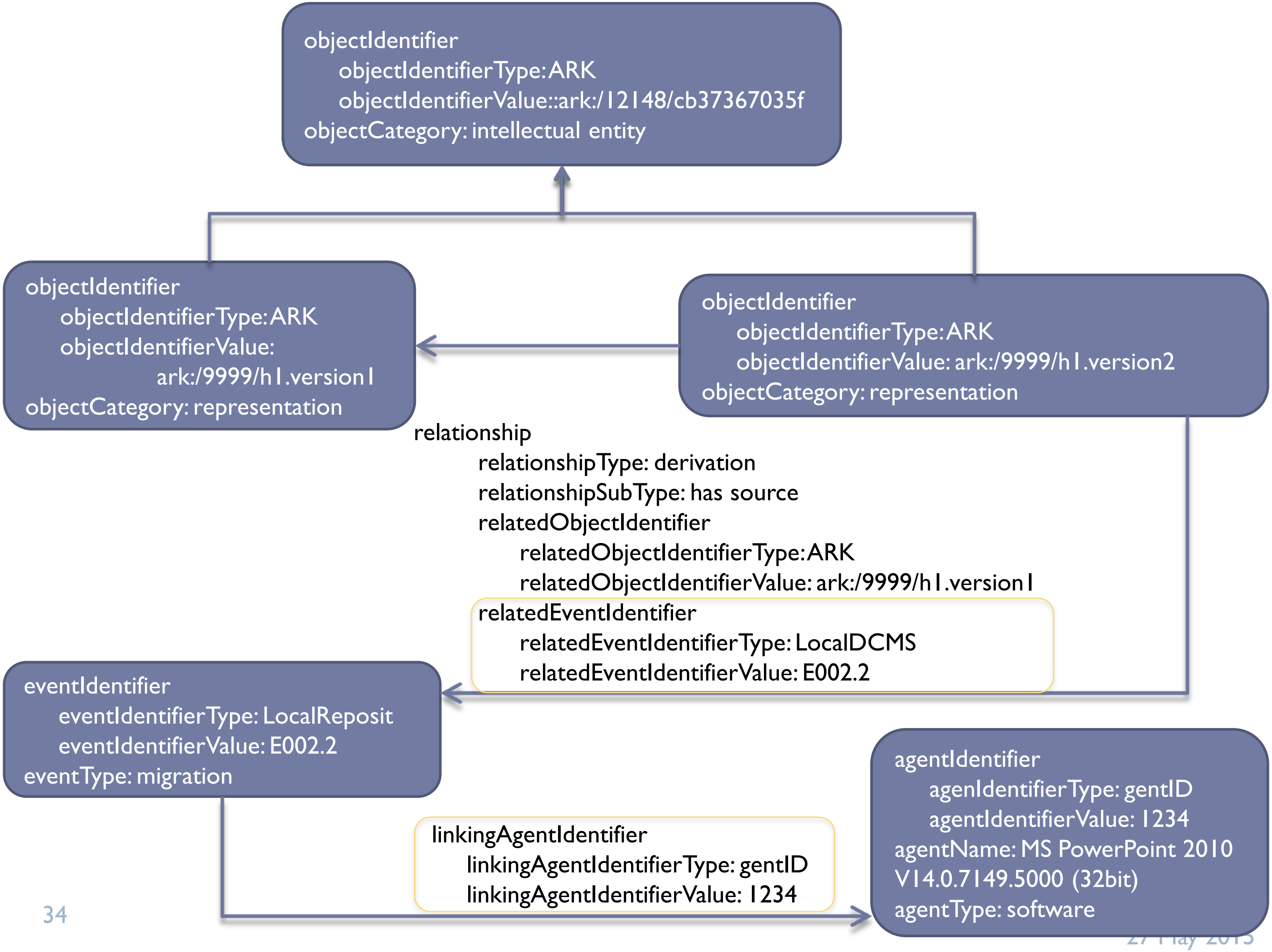
        ark:/9999/h1.version1
objectCategory: representation

objectIdentifier
    objectIdentifierType: ARK
    objectIdentifierValue: ark:/9999/h1.version2
objectCategory: representation

relationship
    relationshipType: derivation
    relationshipSubType: has source
    relatedObjectIdentifier
        relatedObjectIdentifierType: ARK
        relatedObjectIdentifierValue: ark:/9999/h1.version1
    relatedEventIdentifier
        relatedEventIdentifierType: LocalDCMS
        relatedEventIdentifierValue: E002.2

eventIdentifier
    eventIdentifierType: LocalReposit
    eventIdentifierValue: E002.2
eventType: migration



objectIdentifier
objectIdentifierType: ARK
objectIdentifierValue::ark:/12148/cb37367035f
objectCategory: intellectual entity

objectIdentifier
objectIdentifierType: ARK
objectIdentifierValue:
ark:/9999/h1.version1
objectCategory: representation

objectIdentifier
objectIdentifierType: ARK
objectIdentifierValue: ark:/9999/h1.version2
objectCategory: representation

relationship
relationshipType: derivation
relationshipSubType: has source
relatedObjectIdentifier
relatedObjectIdentifierType: ARK
relatedObjectIdentifierValue: ark:/9999/h1.version1
relatedEventIdentifier
relatedEventIdentifierType: LocalDCMS
relatedEventIdentifierValue: E002.2

eventIdentifier
eventIdentifierType: LocalReposit
eventIdentifierValue: E002.2
eventType: migration

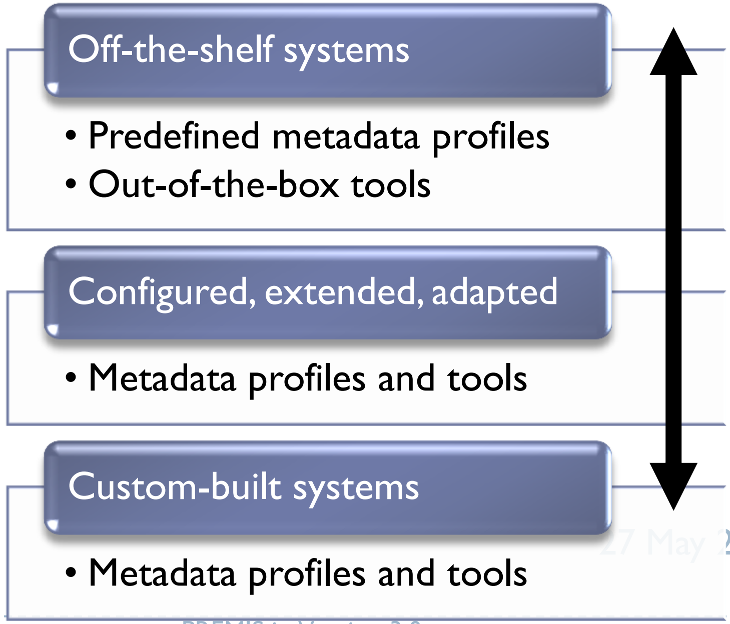
linkingAgentIdentifier
linkingAgentIdentifierType: gentID
linkingAgentIdentifierValue: 1234

agentIdentifier
agenIdentifierType: gentID
agentIdentifierValue: 1234
agentName: MS PowerPoint 2010
V14.0.7149.5000 (32bit)
agentType: software

Tayloring PREMIS to needs

- Evolving metadata
  - Increasing experience ensuring the longevity of digital objects
  - Changing future technical possibilities
  - Changing future legal framework

- Tayloring solutions
  - Varying needs
    - □ Content-types
    - □ Institutional policies
    - □ Intended use
  - Off-the-shelf (OS / commercial) or custom-built



Off-the-shelf systems

- Predefined metadata profiles
- Out-of-the-box tools

Configured, extended, adapted

- Metadata profiles and tools

Custom-built systems

- Metadata profiles and tools

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PREMIS: From V2 to V3

- Next major version of the PREMIS Data Dictionary
- Released by July 2014 (hopefully ☺)
- Proof-reading phase

PREMIS: From V2 to V3

- Improving PREMIS based on user needs

- Add preservationLevelType semantic unit
- Add agentVersion semantic unit
- Add "unknown" values
- Add eventDetailInformation semantic unit

minor

- Add authority for controlled vocabulary
- Make Intellectual Entity an Object category
- Make Environments independent Objects
- Add physical Objects
- Update conformance statement

Approved Changes:
Add eventDetailInformation semantic unit .

- 2.1 eventIdentifier
- 2.2 eventType
- 2.3 eventDateTime
- 2.4 eventDetail
- 2.5 eventOutcomeInformation
- 2.6 linkingAgentIdentifier
- 2.7 linkingObjectIdentifier

Approved Changes:
Add eventDetailInformation semantic unit .

- 2.1 eventIdentifier
- 2.2 eventType
- 2.3 eventDateTime
- 2.4 eventDetailInformation
- 2.4.1 eventDetail
- 2.4.2 eventDetailExtension
- 2.5 eventOutcomeInformation
- 2.6 linkingAgentIdentifier
- 2.7 linkingObjectIdentifier

PREMIS: From V2 to V3

- Improving PREMIS based on user needs

- Add preservationLevelType semantic unit
- Add agentVersion semantic unit
- Add "unknown" values
- Add eventDetailInformation semantic unit

minor

- Add authority for controlled vocabulary

bonus

- Make Intellectual Entity an Object category
- Make Environments independent Objects
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- Update conformance statement

Implementation specific change:
Add authority for controlled vocabulary

eventIdentifier:
    eventIdentifierType: UUID
    eventIdentifierValue: 908985d3-9600-4da4-a7e7-
eventType: validation

authority="premisEventType"
authorityURI= "http://id.loc.gov/vocabulary/preservation/eventType.html"
valueURI= "http://id.loc.gov/vocabulary/preservation/eventType/val.html

eventDateTime: 2014-07-03T23:18:19
eventDetailInformation:
    eventDetail: program="Jhove"; version="1.5"
eventOutcomeInformation:
    eventOutcome: fail
    eventOutcomeDetail:
        eventOutcomeDetailNote:
            format="JPEG"; version="1.02"; result="Not well-formed“

capture
compression
creation
digital signature validation
fixity check
ingestion
message digest calculation
migration
normalization
replication
validation
virus check

PREMIS: From V2 to V3

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- Add preservationLevelType semantic unit
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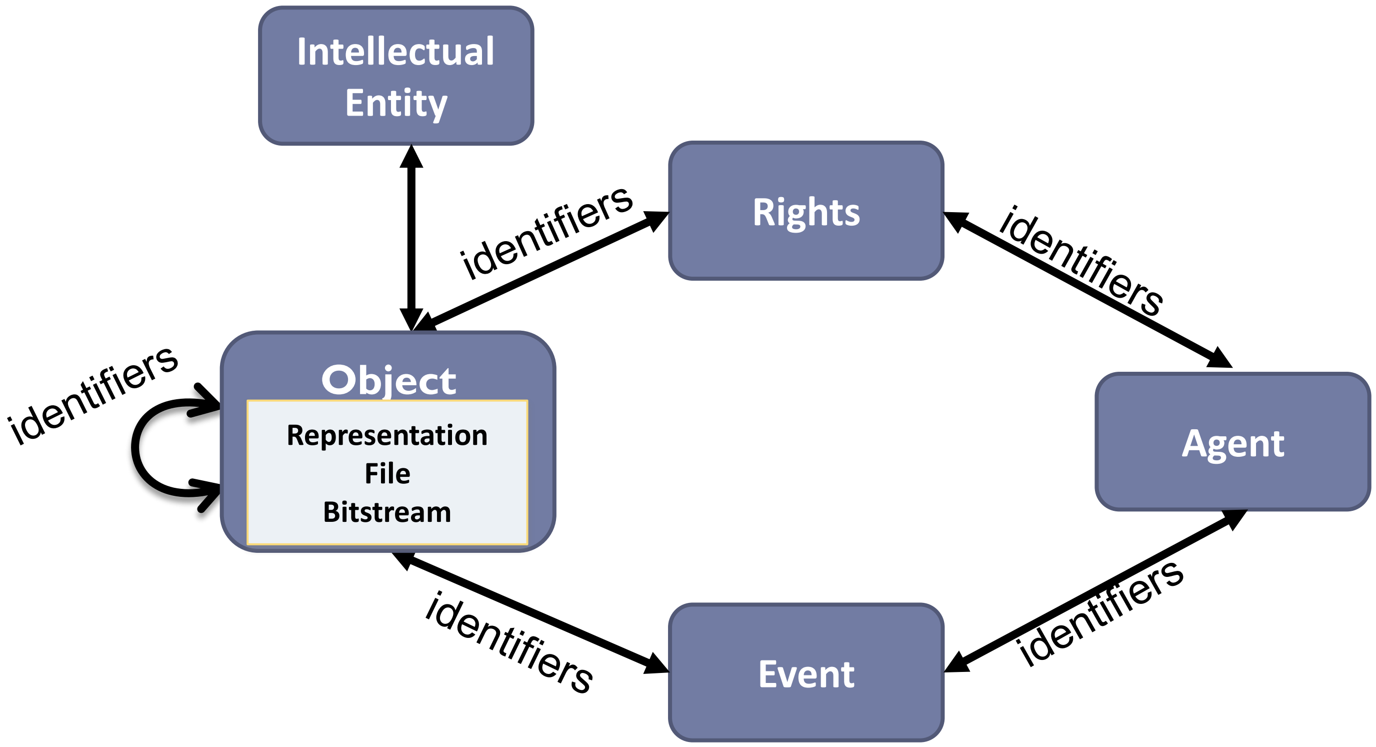
- Update conformance statement

Approved Changes:
Make Intellectual Entity an Object category

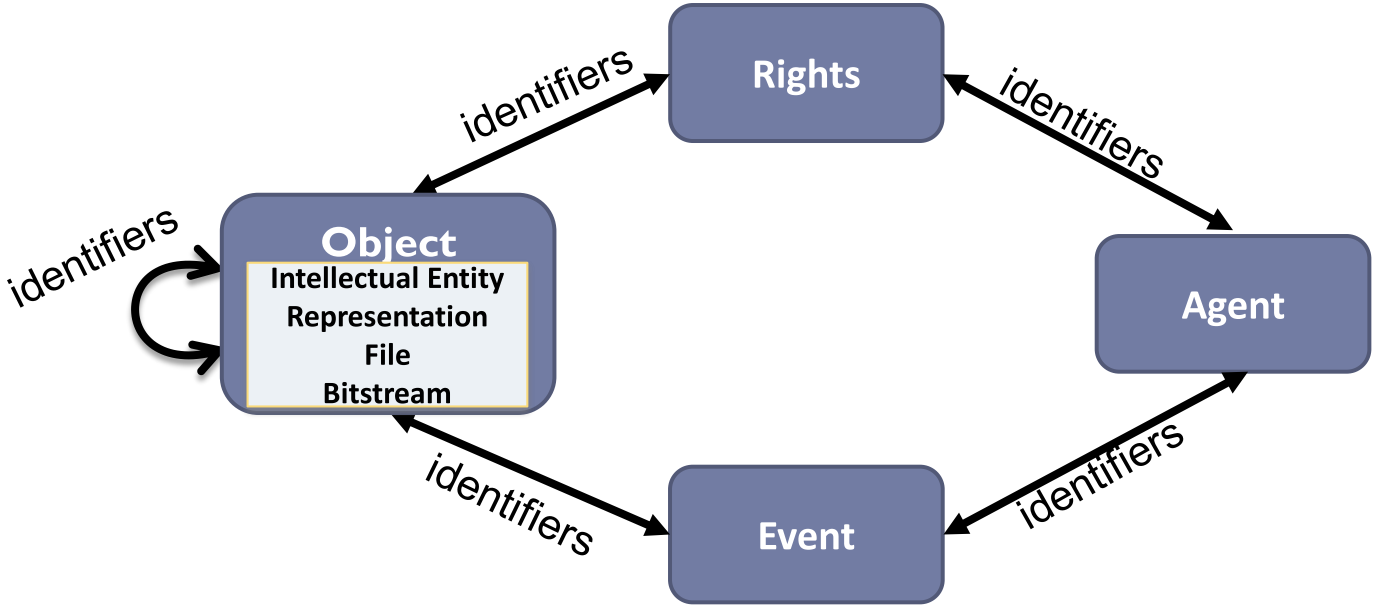


V2:

- Assumed to be held in a container metadata schema
- No Intellectual Entity semantic units
- Exception: identifier to enable linking to a description
- PREMIS Objects link to it.

- A set of content that is considered a single intellectual unit for purposes of management and description
- For example, a particular book, map, photograph, or database.

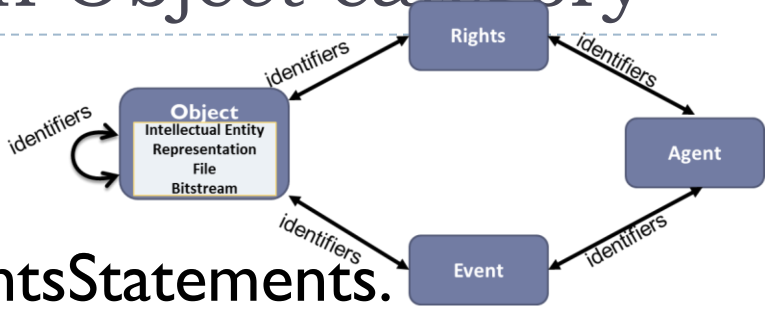
Approved Changes: Make Intellectual Entity an Object category



V3:

- Possibility to describe preservation aspects of intellectual entities
- Same semantic units as Representations

Approved Changes: Make Intellectual Entity an Object category



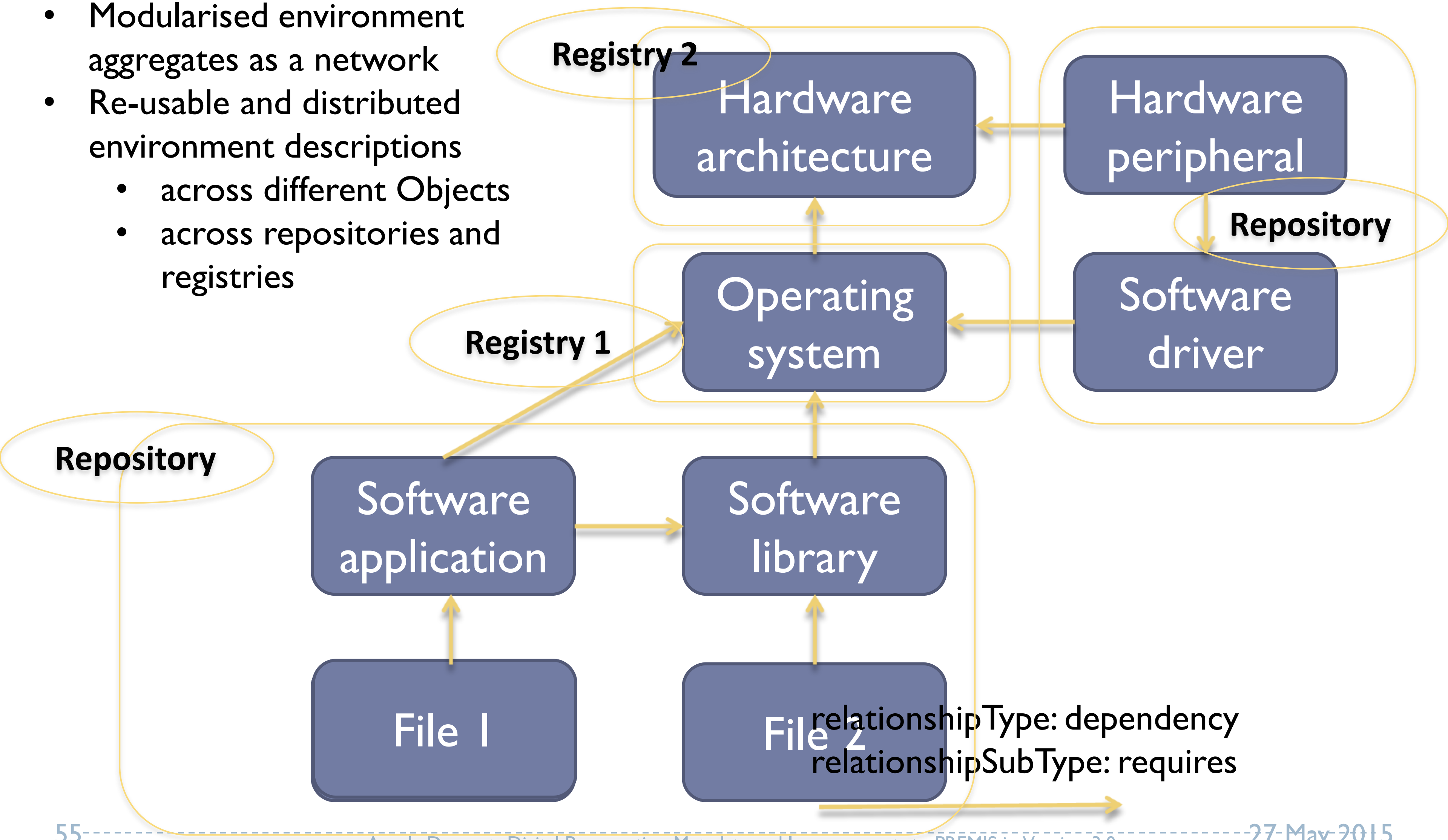
- Relate to PREMIS Events and RightsStatements.
- Support structural and derivative relationships with Objects.
- Represent an aggregate, such as a collection, FRBR work, FRBR expression, fonds or series.
- Capture versioning information and metadata update events at the Intellectual Entity level
- Associate business requirements with them.
  - Significant characteristics, risk definitions, guidelines for preservation actions, etc..

Approved Changes: Make Environments independent Objects

- What is needed to render or use an object
    - Operating system
    - Application software
    - Hardware
    - Computing resources
- A high-level data model
- **No** detailed characteristics specific to an environment type

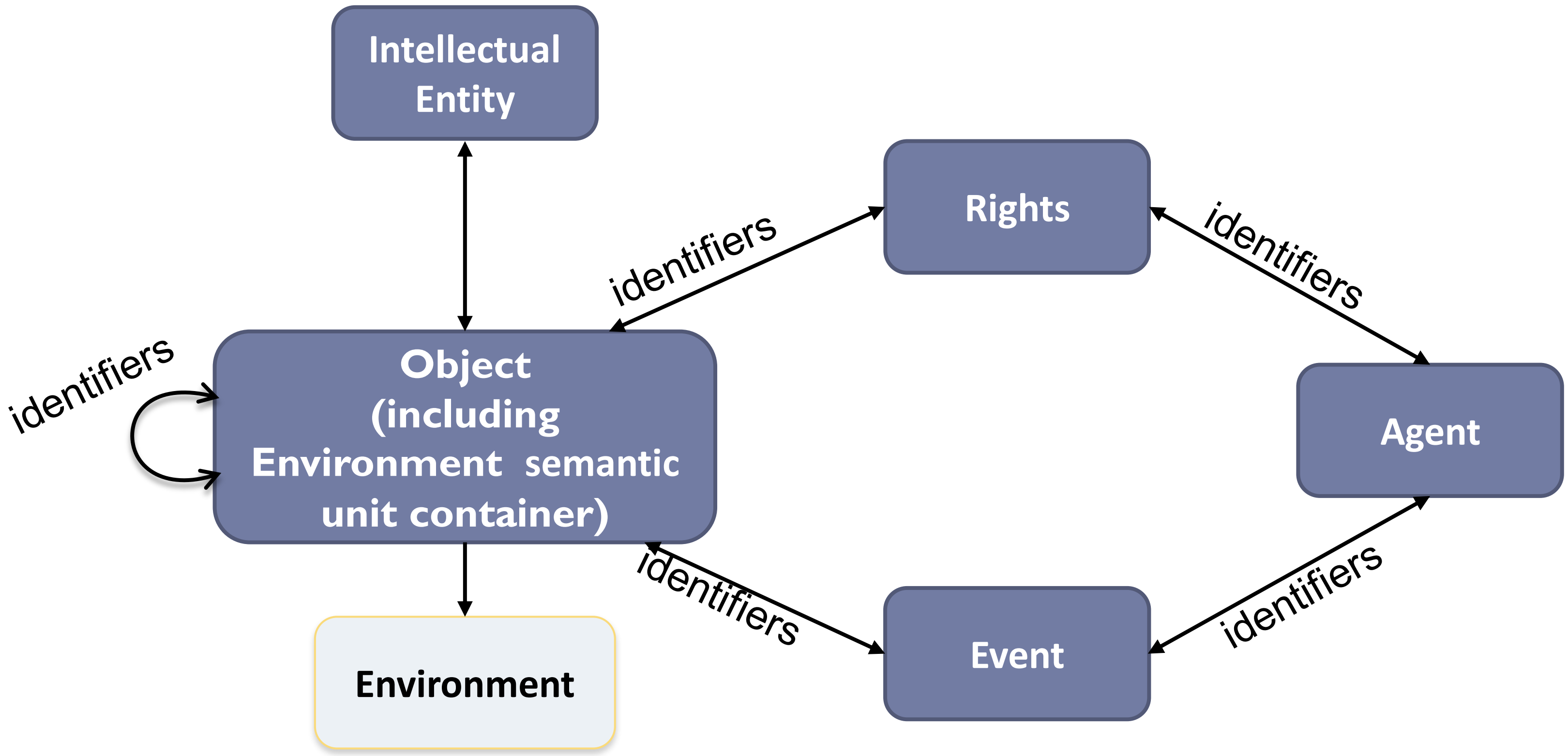
Example: Environment stack and dependency relationships

- Modularised environment aggregates as a network
- Re-usable and distributed environment descriptions
  - across different Objects
  - across repositories and registries

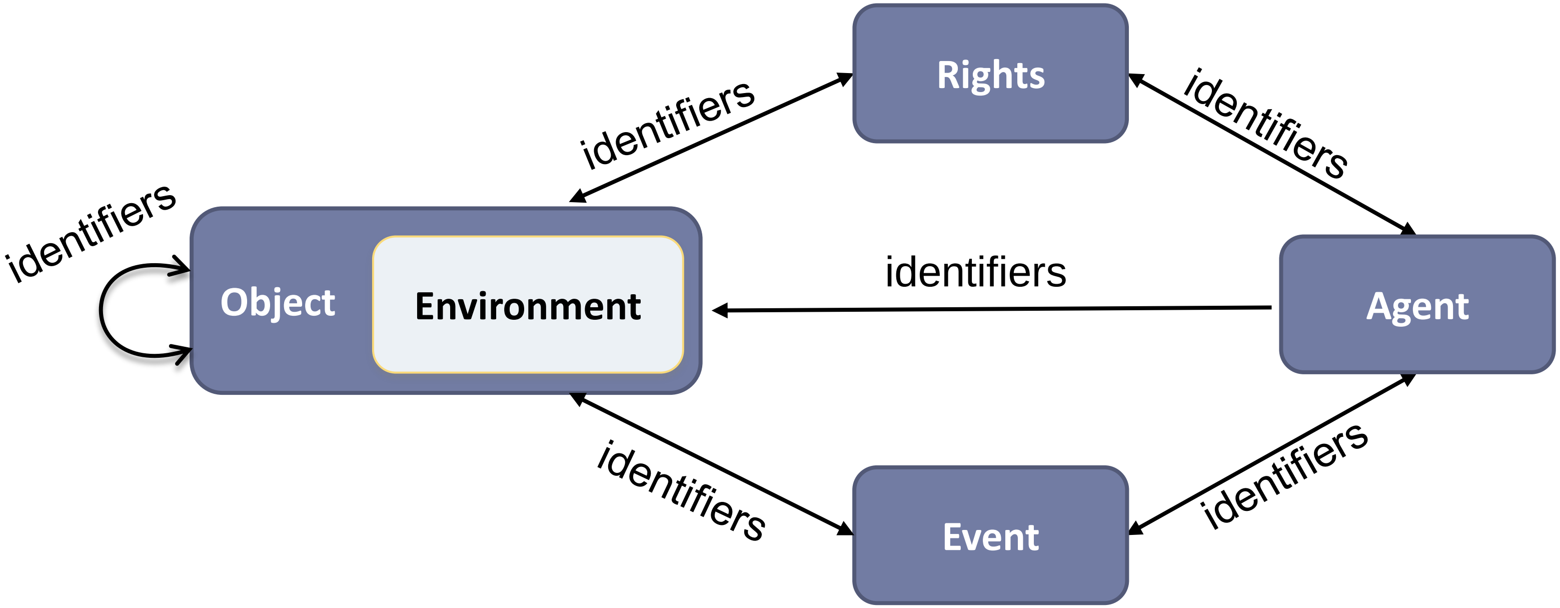


relationshipType: dependency
relationshipSubType: requires

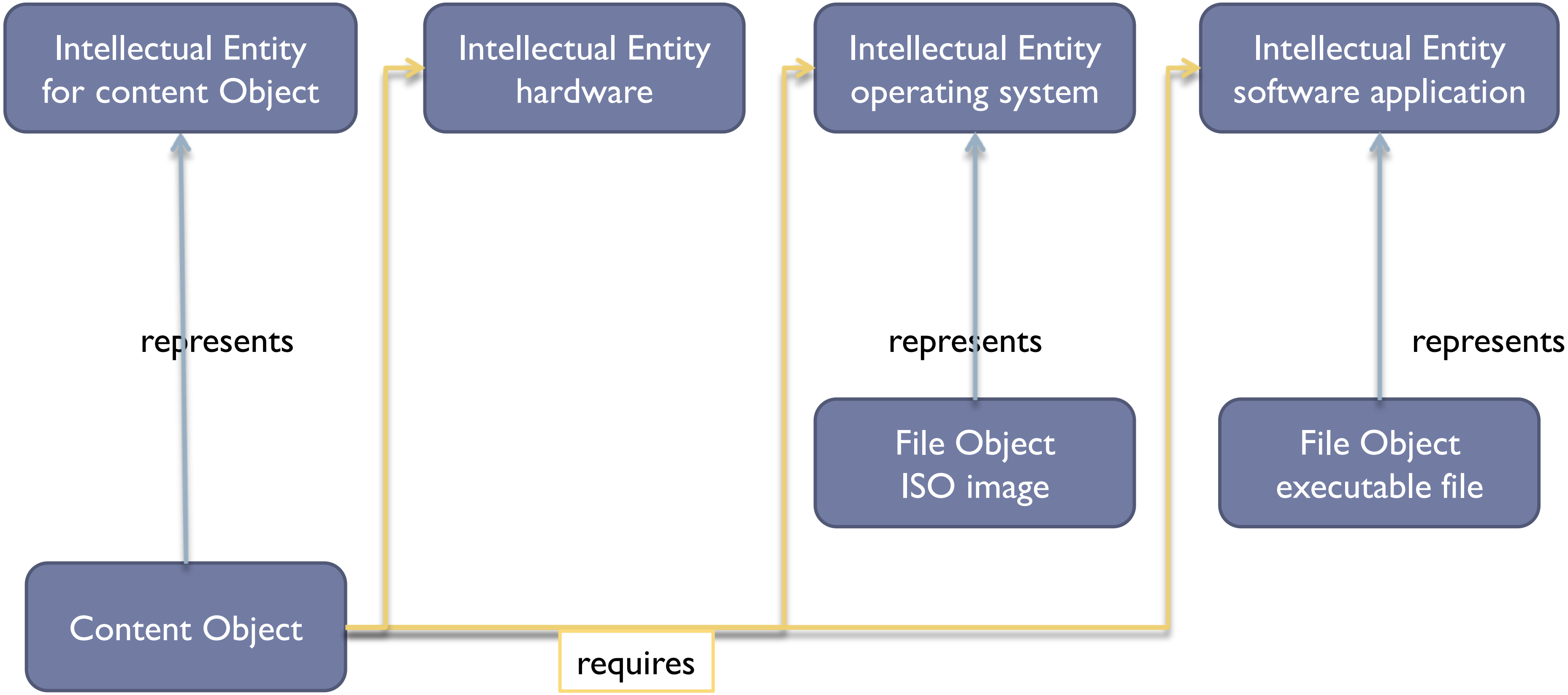
Data Model in PREMIS V2



Data Model in PREMIS V3

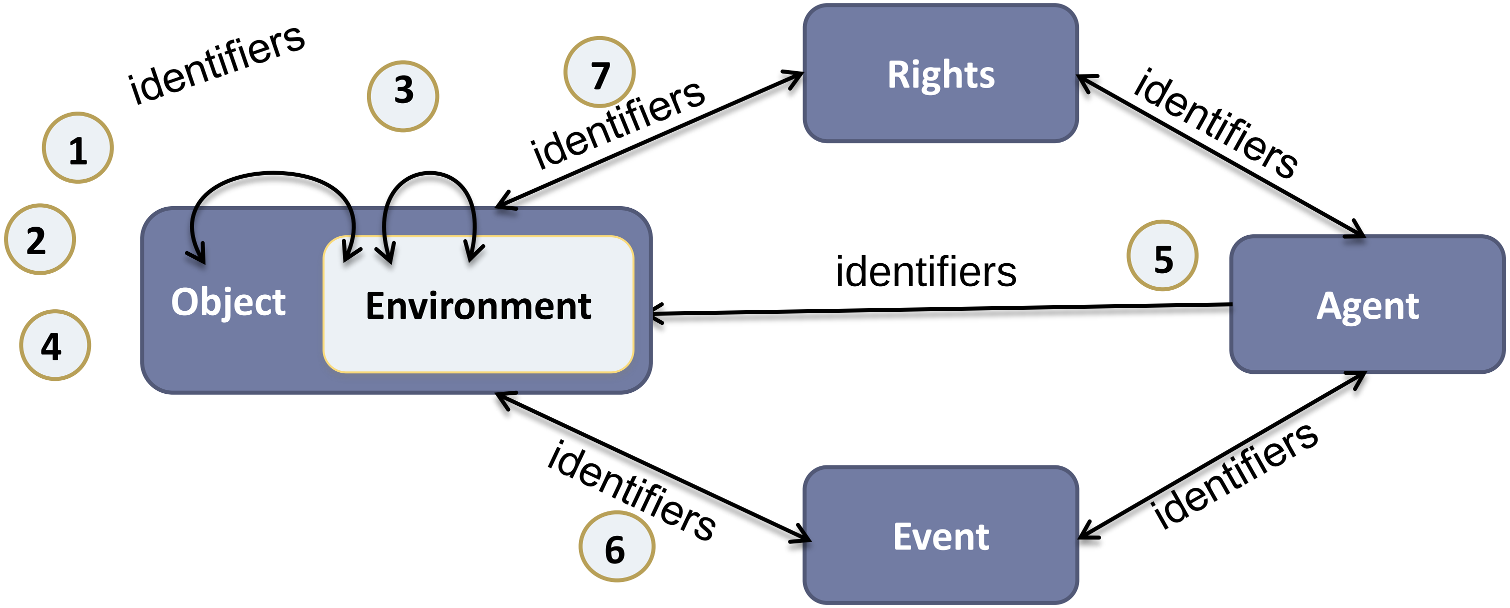


Example:
An object and its rendering environment


Intellectual Entity for content Object
Intellectual Entity hardware
Intellectual Entity operating system
Intellectual Entity software application
represents
represents
represents
File Object ISO image
File Object executable file
Content Object
requires

represents =
relationshipType: structural
relationshipSubType: represents

requires =
relationshipType: dependency
relationshipSubType: requires



1. Object to environment - specify computational context
2. environment to Object - documentation, specifications, surrogates
3. environment to environment - inclusion, dependency, derivation,other
4. environment is an Object – preserved software source code
5. Agent to Environment - role of an Agent
6. environment to Event - environment specific Events (provenance)
7. environment to RightsStatement - software license, policy

“Object”: here a traditional content Object

Expanded relationship types for environment Objects

- Dependency
  - Requires, is required by
  - Is deployed on
- Derivation
  - Is source of, has source
- Logical
  - generalises,
    is generalised by
- Reference
  - Documents,
    is documented in
- Replacements
  - Supercedes,
    is superceded by
- Structural
  - Includes, is included in
  - Represents,
    is represented as

Semantic units only applicable to environment Intellectual Entities

- 1.9 environmentFunction
  - environmentFunctionType
  - environmentFunctionLevel

objectIdentifier
- objectIdentifierType: ARK
- objectIdentifierValue: ark:/9999/b1

objectCategory: intellectual entity

environmentFunction
- environmentFunctionType: software
- environmentFunctionLevel: 1

environmentFunction
- environmentFunctionType: operating system
- environmentFunctionLevel: 2

XP Professional, Service Pack 3

Semantic units only applicable to environment Intellectual Entities

- 1.9 environmentFunction
  - environmentFunctionType
  - environmentFunctionLevel
- 1.10 environmentDesignation
  - environmentName
  - environmentVersion
  - environmentOrigin
  - environmentDesignationNote
  - environmentDesignationExtension

objectCategory: intellectual entity

environmentFunction
- environmentFunctionType: software
- environmentFunctionLevel: 1

environmentFunction
- environmentFunctionType: operating system
- environmentFunctionLevel: 2

environmentDesignation
- environmentName: Windows XP Professional
- environmentVersion: Service Pack 3
- environmentDesignationNote: maintenance deadline: 2014-04

Semantic units only applicable to environment Intellectual Entities

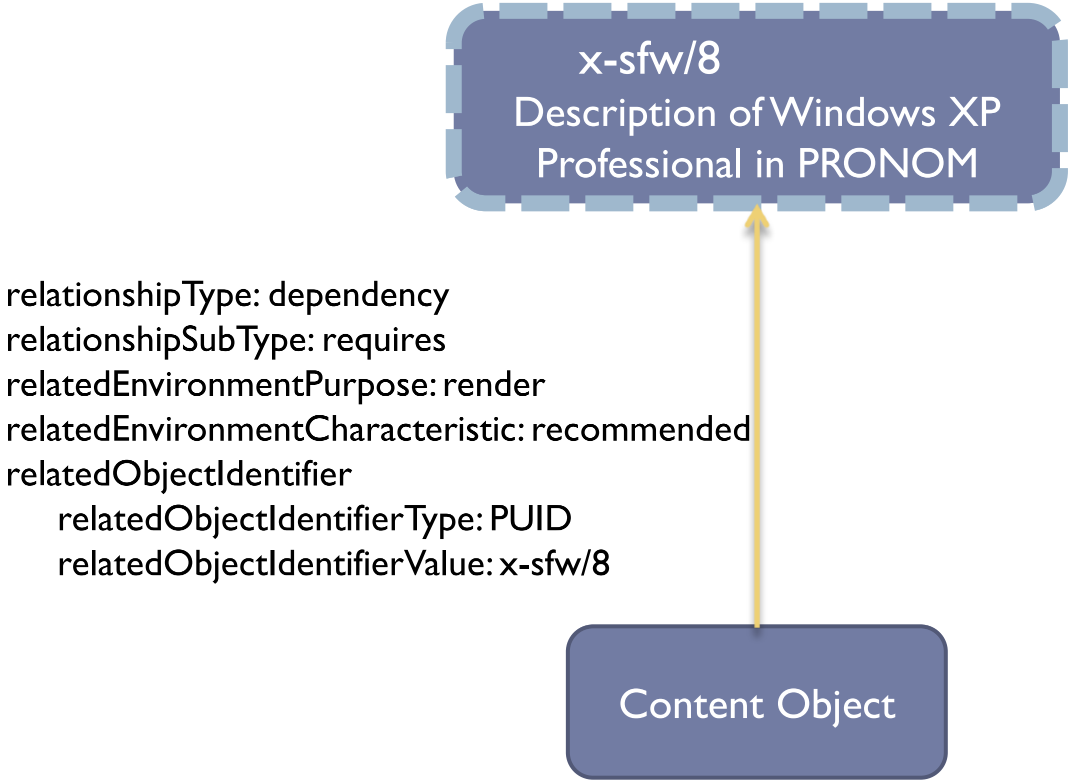
- 1.9 environmentFunction
  - environmentFunctionType
  - environmentFunctionLevel
- 1.10 environmentDesignation
  - environmentName
  - environmentVersion
  - environmentOrigin
  - environmentDesignationNote
  - environmentDesignationExtensio
- 1.11 environmentRegistry
  - environmentRegistryName
  - environmentRegistryKey
  - environmentRegistryRole

objectCategory: intellectual entity
environmentFunction
    environmentFunctionType: software
 environmentFunctionLevel: 1
environmentFunction
    environmentFunctionType: operating system
 environmentFunctionLevel: 2
environmentDesignation
    environmentName: Windows XP Professional
    environmentVersion: Service Pack 3
environmentRegistry
    environmentRegistryName: PRONOM
    environmentRegistryKey: x-sfw/8
    environmenttRegistryRole: identity

Semantic units only applicable to environment Intellectual Entities

- 1.9 environmentFunction
  - environmentFunctionType
  - environmentFunctionLevel
- 1.10 environmentDesignation
  - environmentName
  - environmentVersion
  - environmentOrigin
  - environmentDesignationNote
  - environmentDesignationExtension
- 1.11 environmentRegistry
  - environmentRegistryName
  - environmentRegistryKey
  - environmentRegistryRole

Alternative:
Link to an external registry



relationshipType: dependency
relationshipSubType: requires
relatedEnvironmentPurpose: render
relatedEnvironmentCharacteristic: recommended
relatedObjectIdentifier
    relatedObjectIdentifierType: PUID
    relatedObjectIdentifierValue: x-sfw/8

Semantic units only applicable to environment Intellectual Entities

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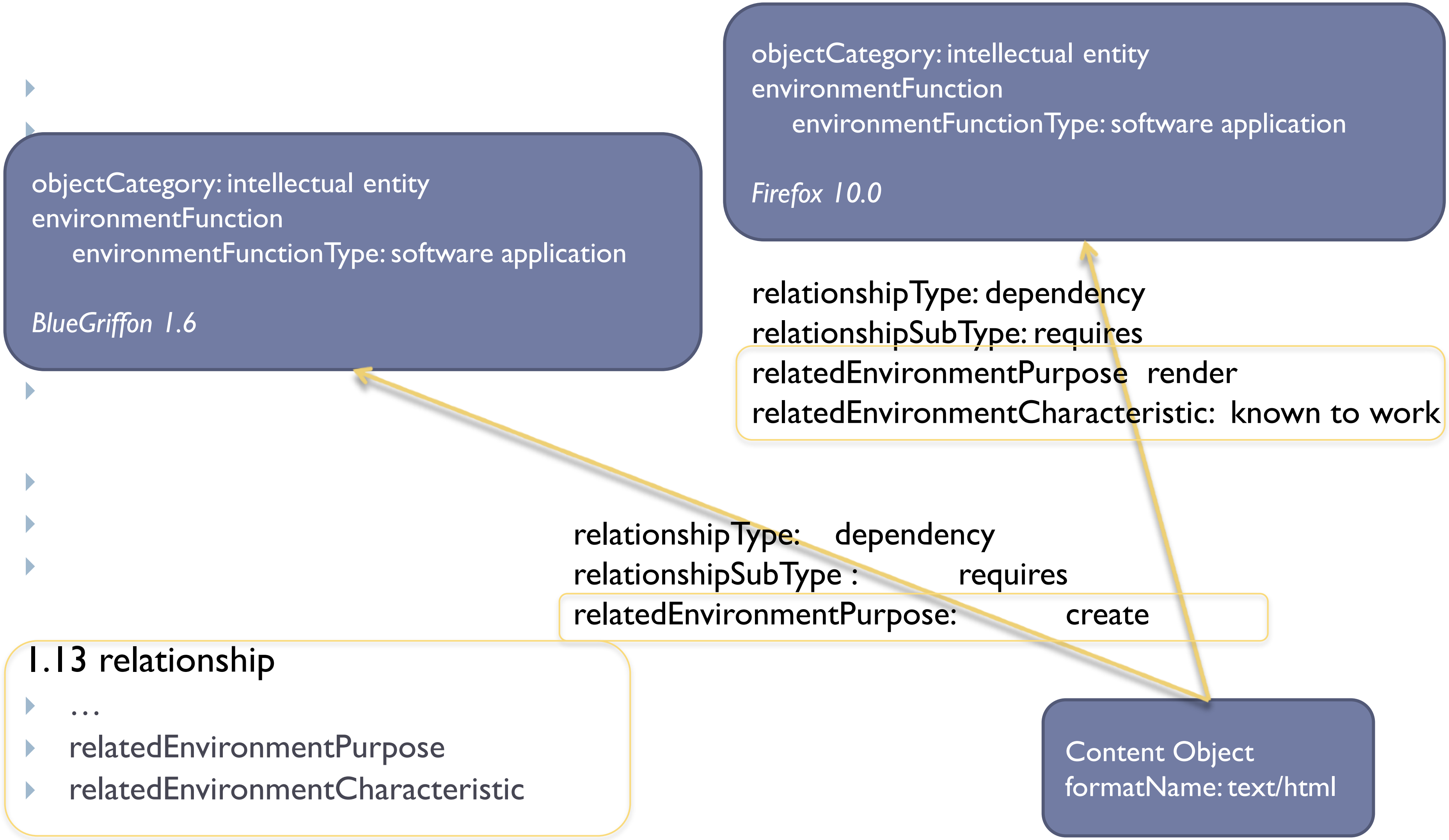
  - environmentVersion
  - environmentOrigin
  - environmentDesignationNote
  - environmentDesignationExtension
- 1.11 environmentRegistry
  - environmentRegistryName
  - environmentRegistryKey
  - environmentRegistryRole
- 1.12 environmentExtension
- 1.13 relationship

  …
  - relatedEnvironmentPurpose
  - relatedEnvironmentCharacteristic



objectCategory: intellectual entity
environmentFunction
environmentFunctionType: software application

BlueGriffon 1.6

objectCategory: intellectual entity
environmentFunction
environmentFunctionType: software application

Firefox 10.0

relationshipType: dependency
relationshipSubType: requires
relatedEnvironmentPurpose render
relatedEnvironmentCharacteristic: known to work

relationshipType: dependency
relationshipSubType : requires
relatedEnvironmentPurpose: create

Content Object
formatName: text/html

1.13 relationship

- …
- relatedEnvironmentPurpose
- relatedEnvironmentCharacteristic

Approved Changes: Add physical Objects

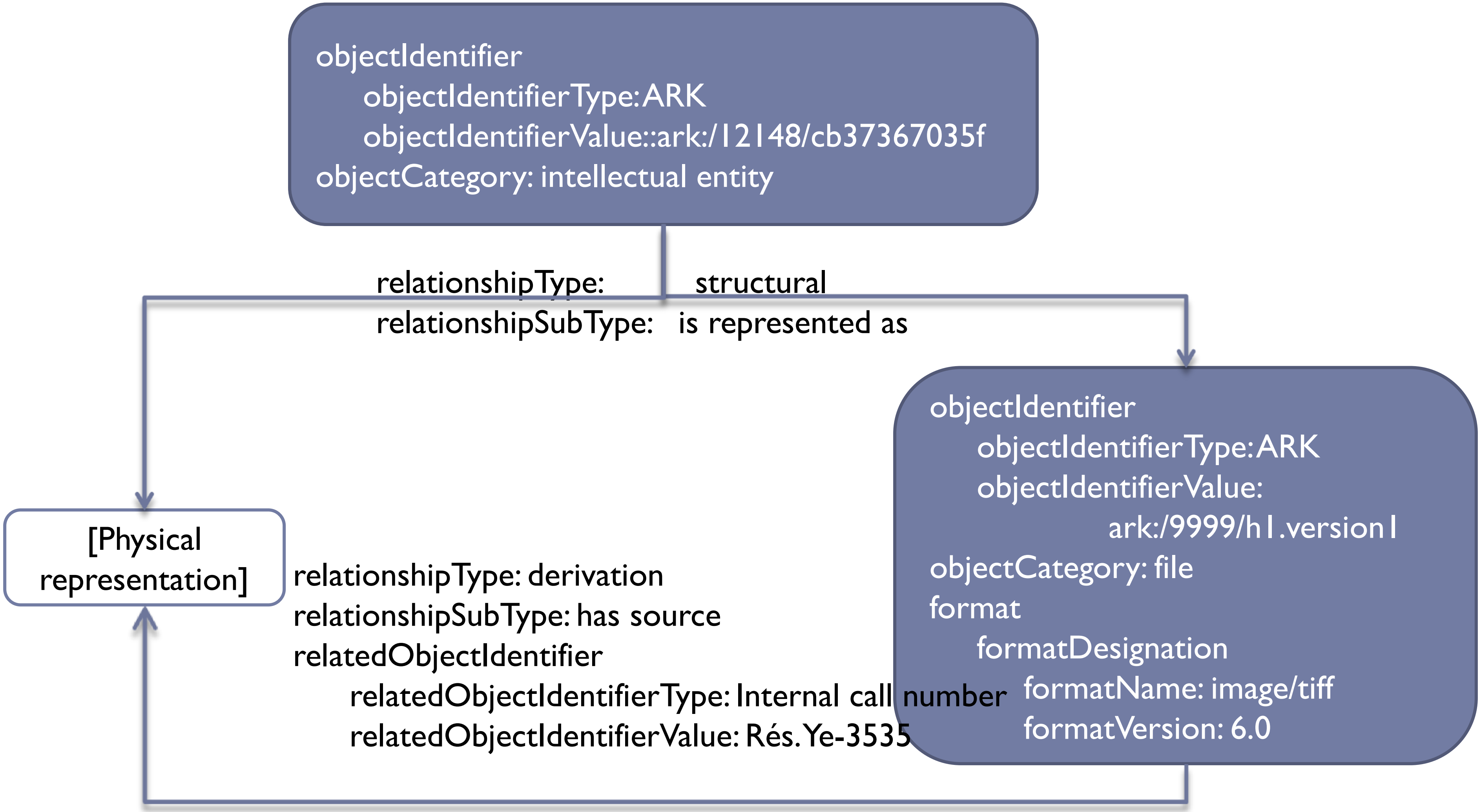
- A physical Object is
  - A content Object, such as a manuscript, or printed document
  - An environment Object, such as a physical hardware device.

- Representation: A digital or physical Object
- Either one instantiates or embodies an Intellectual Entity

- Digital and non-digital Objects can be captured uniformly.
- Physical Objects can relate to digital Objects and other physical Objects.

- In V3 *storage* is applicable to Representations.
  For physical Representations: the physical location, e.g. a shelf location.

Approved Changes: Add physical Objects



objectIdentifier
objectIdentifierType: ARK
objectIdentifierValue::ark:/12148/cb37367035f
objectCategory: intellectual entity

relationshipType: structural
relationshipSubType: is represented as

[Physical representation]

objectIdentifier
objectIdentifierType: ARK
objectIdentifierValue: ark:/9999/h1.version1
objectCategory: file
format
formatDesignation
formatName: image/tiff
formatVersion: 6.0

relationshipType: derivation
relationshipSubType: has source
relatedObjectIdentifier
relatedObjectIdentifierType: Internal call number
relatedObjectIdentifierValue: Rés. Ye-3535

PREMIS: From V2 to V3

- Improving PREMIS based on user needs

- Add preservationLevelType semantic unit
- Add agentVersion semantic unit
- Add "unknown" values
- Add eventDetailInformation semantic unit

minor

- Add authority for controlled vocabulary

bonus

- Make Intellectual Entity an Object category
- Make Environments independent Objects
- Add physical Objects

major

- Update conformance statement

clarification

http://www.loc.gov/standards/premis/premis-conformance-20150429.pdf

Thank you!

- Resources: http://www.loc.gov/standards/premis/
- PREMIS Implementors Group Forum: PIG@listserv.loc.gov