

The OAIS Reference Model: current implementations

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Presentation outline

- The OAIS Reference Model (brief)
 - Background
 - Definitions
 - Functional Model
 - Information Model
- Implementing the model:
 - Preservation metadata
 - System design
 - Conformance and certification



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The OAIS reference model (1)

- Background:
 - *Reference Model for an Open Archival Information System (OAIS)*
 - Development led by the Consultative Committee for Space Data Systems (CCSDS)
 - Adopted as ISO 14721:2003
 - Establishes a common framework of terms and concepts
 - Identifies the basic functions of an OAIS
 - Defines an information model
 - www.ccsds.org/documents/650x0b1.pdf



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The OAIS reference model (2)

- Provides definitions of terms that need to have well-defined meanings, e.g.:
 - Archival Storage, Content Data Object, Designated Community (key term), Ingest, Metadata, Representation Information, etc.
 - OAIS = "An archive, consisting of an organization of people and systems, that has accepted the responsibility to preserve information and make it available for a Designated Community" (OAIS 1.7.2)



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The OAIS reference model (3)

- High level concepts, e.g.:
 - The *environment* of an OAIS (Producers, Consumers, Management)
 - Definitions of *information*, Information Objects and their relationship with Data Objects
 - Definitions of *Information Packages*, conceptual containers of Content Information and Preservation Description Information
- OAIS Responsibilities



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The OAIS reference model (4)

- Functional Model:
 - Six entities
 - Ingest
 - Archival Storage
 - Data Management
 - Administration
 - Preservation Planning
 - Access
 - Described using UML diagrams

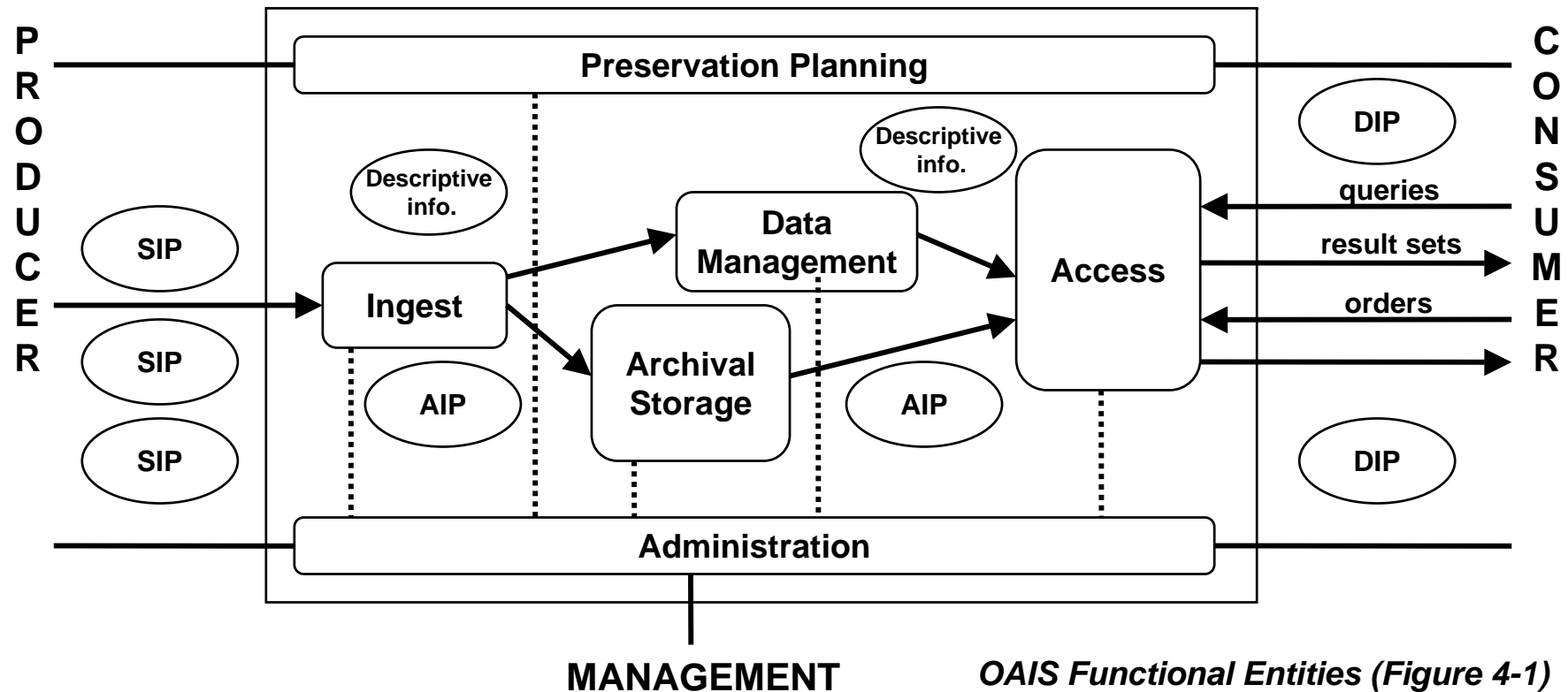


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The OAIS reference model (5)



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The OAIS reference model (6)

- Information model:
 - Information Object (basic concept):
 - Data Object (bit-stream)
 - Representation Information (permits “the full interpretation of Data Object into meaningful information”)
 - Information Object Classes:
 - Content Information
 - Preservation Description Information (PDI)
 - Packaging Information
 - Descriptive Information



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The OAIS reference model (7)

- Information model (continued):
 - Information package:
 - Container that encapsulates Content Information and PDI
 - Packages for submission (SIP), archival storage (AIP) and dissemination (DIP)
 - AIP = “... a concise way of referring to a set of information that has, in principle, all of the qualities needed for permanent, or indefinite, Long Term Preservation of a designated Information Object”



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The OAIS reference model (8)

- Archival Information Package (AIP):
 - Content Information
 - Original target of preservation
 - Information Object (Data Object & Representation Information)
 - Preservation Description Information (PDI)
 - other information (metadata) “which will allow the understanding of the Content Information over an indefinite period of time”
 - A set of Information Objects
 - Based on categories discussed in CPA/RLG report: *Preserving Digital Information* (1996)

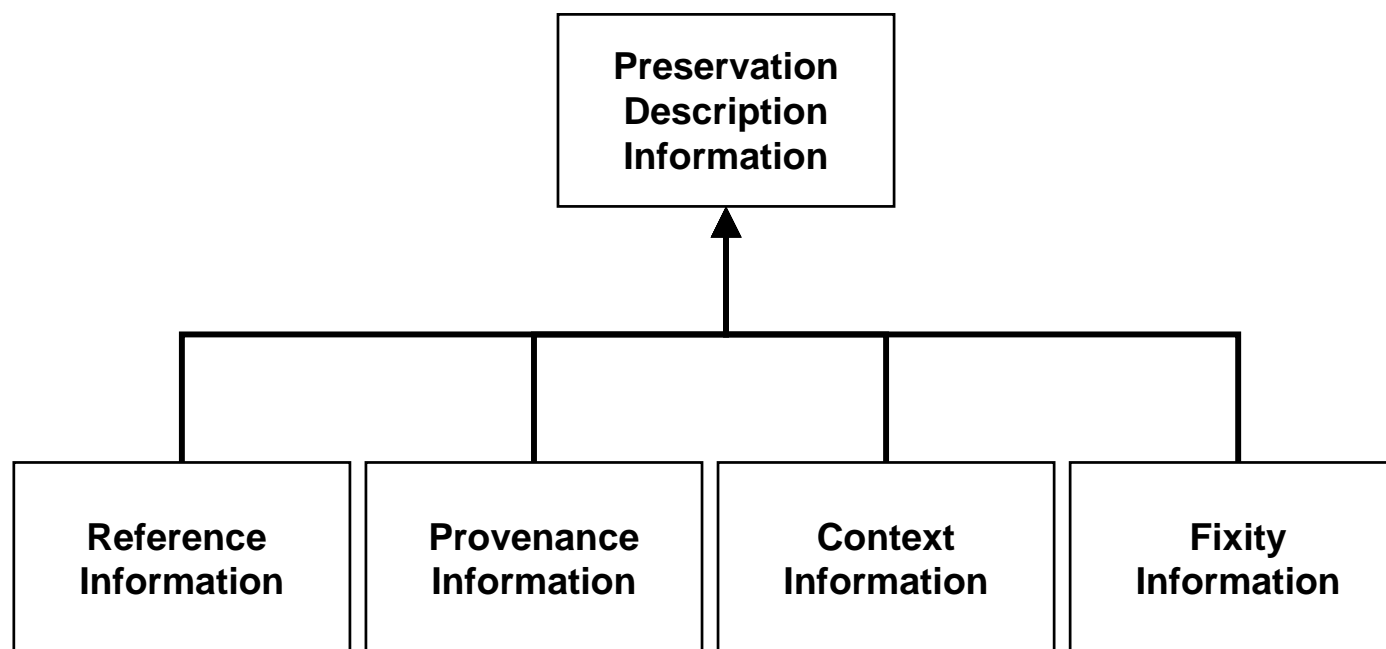


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The OAIS reference model (9)



PDI Preservation Description Information (Figure 4-16)



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The OAIS reference model (10)

- There is much, much more ...
 - The Archival Information Unit and Archival Information Collections
 - Data transformations
 - Digital Migration
 - Preservation of look and feel (e.g., emulation, virtual machines)
 - Interoperability



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Implementing OAIS (1)

- Fundamentals:
 - OAIS is a reference model (conceptual framework), NOT a blueprint for system design
 - It informs the design of system architectures, the development of systems and components
 - It provides common definitions of terms ... a common language, means of making comparison
 - But it does NOT ensure consistency or interoperability between implementations



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Implementing OAIS (2)

- ISO 14721:2003 published in early 2003
- However, earlier versions of the model made available by the CCSDS informed implementations long before then
- Three broad areas of influence:
 - Preservation metadata schemas
 - Architecture and system design
 - Conformance criteria



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Implementing OAIS - metadata (1)

- The OAIS Information Model has been used to inform the development of preservation metadata schemas, e.g.:
 - Draft schemas developed by the National Library of Australia, Cedars project, NEDLIB project, etc.
 - Information Model used for the conceptual structure of the OCLC/RLG Metadata Framework (2002)
 - PREMIS working group



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Implementing OAIS - metadata (2)

- The Metadata Encoding and Transmission Standard (METS)
 - An XML-based metadata framework for the association of digital object content with metadata
 - An XML 'wrapper' combining 'buckets' of descriptive, administrative and structural metadata
 - For object transfer or presentation
 - METS objects can be seen as an implementation of OAIS Information Packages (SIP, AIP, and DIP)



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Implementing OAIS - systems (1)

- Two main uses (to date):
 1. To analyse existing preservation management practices
 - Helps with the comparison of repositories and the identification of important gaps
 2. "It is assumed that implementers will use this reference model as a guide while developing a specific implementation to provide identified services and content" (OAIS 1.4)
 - Some examples ...



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Implementing OAIS - systems (2)

- Ensuring Access to Mathematics Over Time
 - Cornell University Library and SUB Göttingen
 - Stated aim to "develop and implement a system that adheres to the principles put forth in the Open Archival Information System (OAIS) Reference Model."
 - Maintains directory of OAIS functions
 - www.library.cornell.edu/dlit/EATMOT/



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Implementing OAIS - systems (3)

- Stanford Digital Repository
 - Stanford University Libraries & Academic Information Resources
 - Designing "OAIS-compliant" system for managing digitised objects, publications (e.g. from HighWire Press), electronic records, software, etc.
 - "... a means to gather and protect every facet of the University's organizational memory and intellectual capital."
 - Needs to scale to petabytes
 - www.diglib.org/pubs/news04_01/stanford.htm



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Implementing OAIS - systems (4)

- OCLC Digital Archive Service
 - Subscription service provided by OCLC Online Computer Library Center, Inc.
 - Objects harvested from Web or can be submitted in batch (ingest)
 - Integrated with cataloguing workflows
 - OCLC preservation metadata specification
 - "Based on OAIS"
 - www.oclc.org/digitalarchive/



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Implementing OAIS - systems (5)

- Many other examples:
 - Cedars project distributed archive prototype
 - Representation nets
 - Harvard University Library
 - XML-based Submission Information Package for e-journals
 - DSpace
 - KB e-Depot



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Implementing OAIS - conformance (1)

- Many repositories claim OAIS compliance:
 - e.g., DSpace, OCLC Digital Archive, METS, etc.
 - Also, the LOCKSS System has produced a "formal statement of conformance to ISO 14721:2003" (lockss.stanford.edu/)
- The OAIS model claims to be a basis for conformance (OAIS 1.4), e.g.:
 - Supporting the information model (OAIS 2.2),
 - Fulfilling mandatory responsibilities (OAIS 3.1)



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Implementing OAIS - conformance (2)

- OAIS Mandatory Responsibilities:
 - Negotiating and accepting information
 - Obtaining sufficient control of the information to ensure long-term preservation
 - Determining the "designated community"
 - Ensuring that information is "independently understandable"
 - Following documented policies and procedures
 - Making the preserved information available



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Implementing OAIS - conformance (3)

- OCLC/RLG Digital Archive Attributes Working Group
 - Trusted Digital Repositories report (2002)
 - Recommended the development of a process for the certification of digital repositories
 - Audit model
 - Standards model
 - Goes well beyond OAIS mandatory responsibilities
 - e.g., administrative responsibility, organisational viability, financial sustainability, system security, etc.



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Implementing OAIS - conformance (4)

- RLG/NARA Task Force on Digital Repository Certification
 - Research Libraries Group (RLG) and the US National Archives and Records Administration (NARA).
 - To define certification model and process
 - Identify those things that need to be certified (attributes, processes, functions, etc.)
 - Develop a certification process (organisational implications)
 - Draft proposal to be issued later in 2004



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Summing up

- The OAIS model is a foundation stone for current and future digital preservation efforts
- It is already widely used to inform the development of preservation tools and repositories
- It could be used in the future as a basis for conformance, but its mandatory responsibilities do not identify all relevant criteria
- There may be a need for periodic revision, some clarification of definitions, possibly some comment from the archives world



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Key links:

- OAIS Reference Model:
<http://www.ccsds.org/documents/650x0b1.pdf>
- DPC Technology Watch Report on OAIS model by Brian Lavoie (OCLC Research):
<http://www.dpconline.org/>
- RLG/NARA Task Force on Digital Repository Certification:
<http://www.rlg.org/>



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