

# Comparative Evaluation of Major IR Systems for Preservation

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# Outline

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- Introduction
- Evaluation criteria
- Comparative Evaluation of Major IR Systems for Preservation
- Future work



# Introduction

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- Major open source IR systems (Fedora, DSpace, EPrints, Greenstone, etc) are used widely at home and abroad at present.
- Many institutions plan to build or are building digital preservation systems based on open source IR systems too.
- IR systems are different...
- How to make a choice?



# Major Open Source IR Systems

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- Fedora
- DSpace
- Eprints
- Greenstone
- aDORe
- DAITSS
- .....



# Evaluation criteria

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- OAIS mapping
  - functional model, information model*
- Preservation metadata
  - *PREMIS,...*
- Identifier
- Trust
  - Integrity, Authenticity...



# Evaluation criteria

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- Complex object and Versioning
- Packaging format
  - METS, MPEG21 DIDL...
- Ingest and export data
- Interoperability
  - OAI-PMH, OpenURL...
- Extensibility



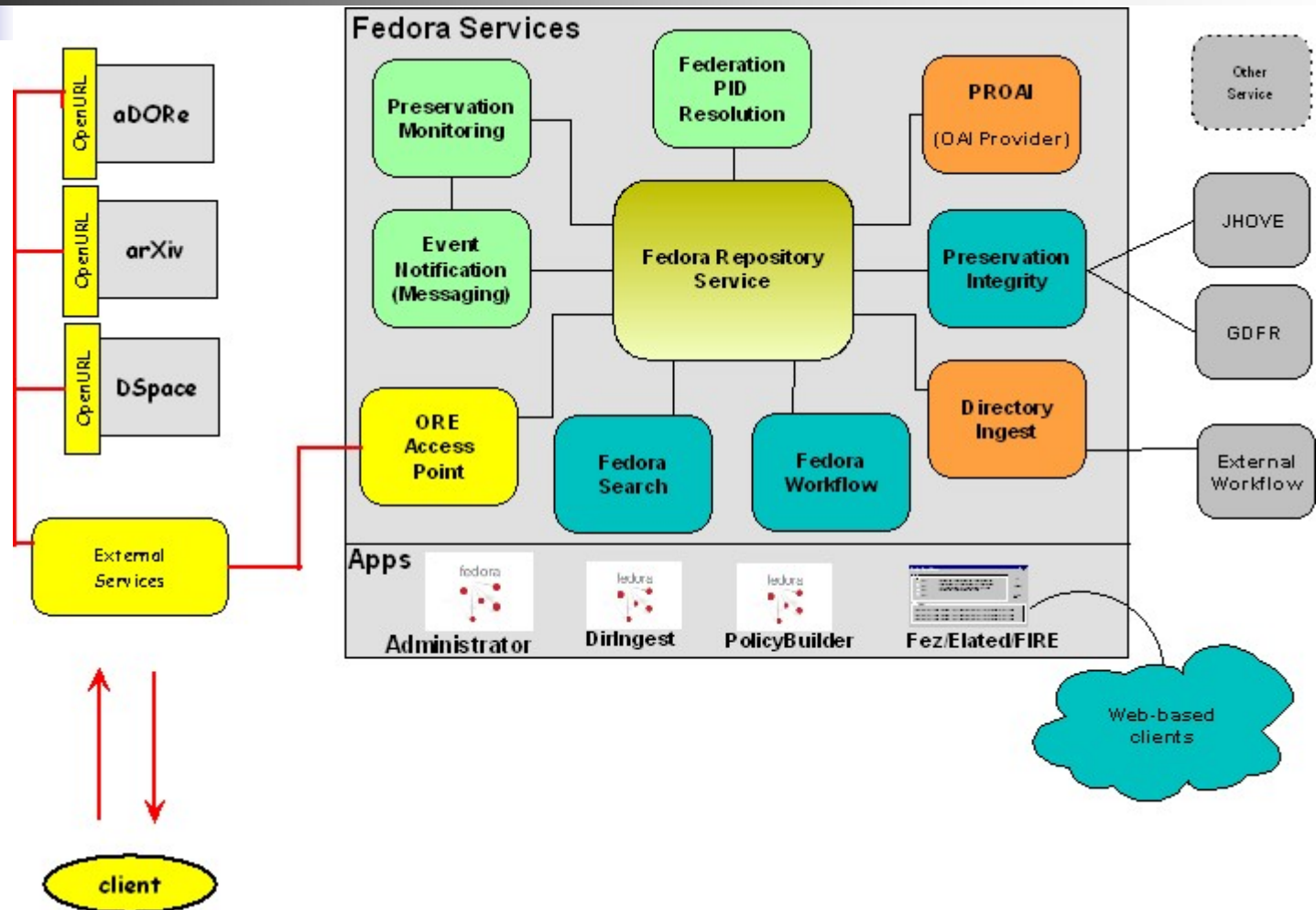
# Comparative Evaluation of Major IR Systems for Preservation

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The latest version of the following:

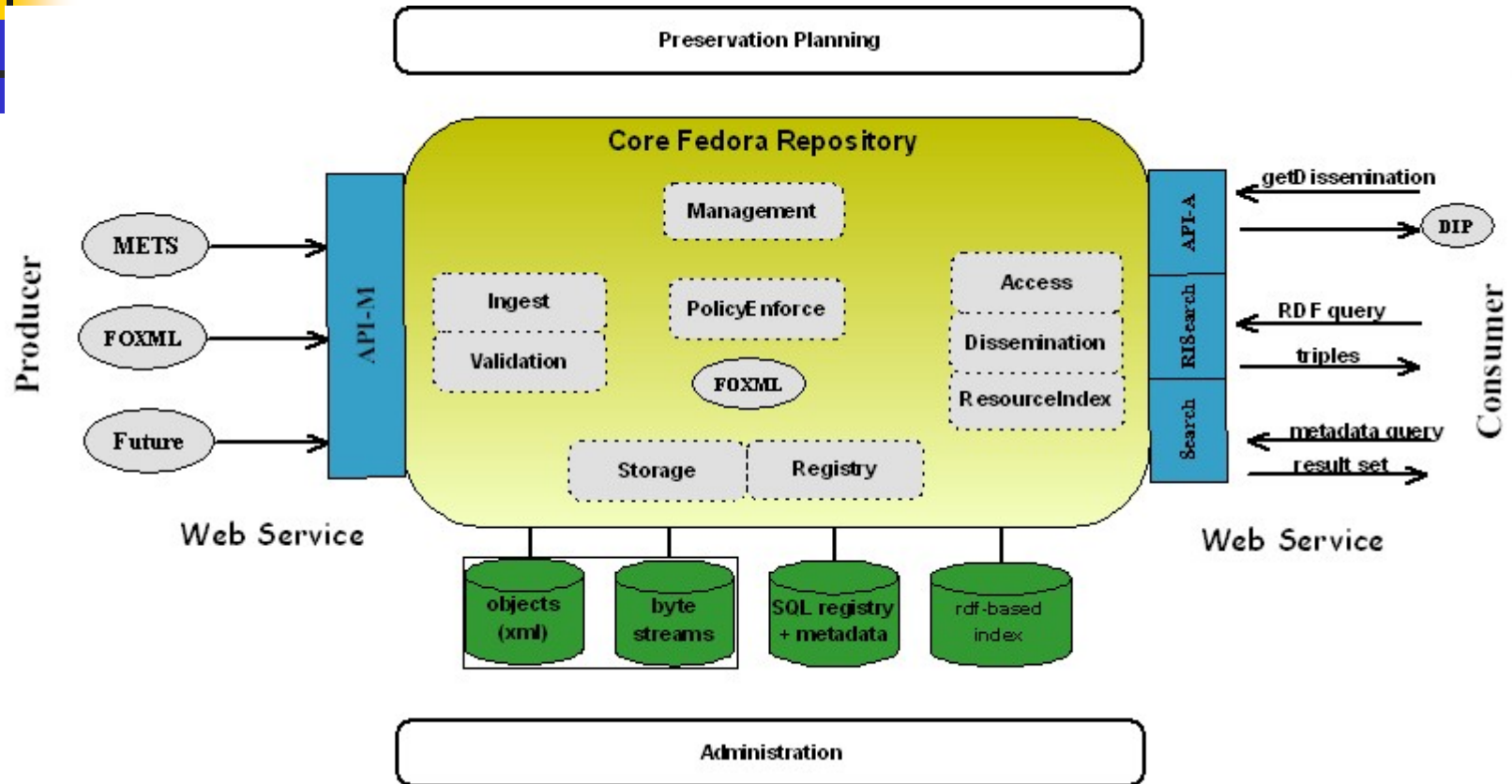
- Fedora (2.2.1 )
- DSpace (1.4.2 )
- Eprints (3, briefly)

# Fedora service framework





# Fedora — OAIS mapping



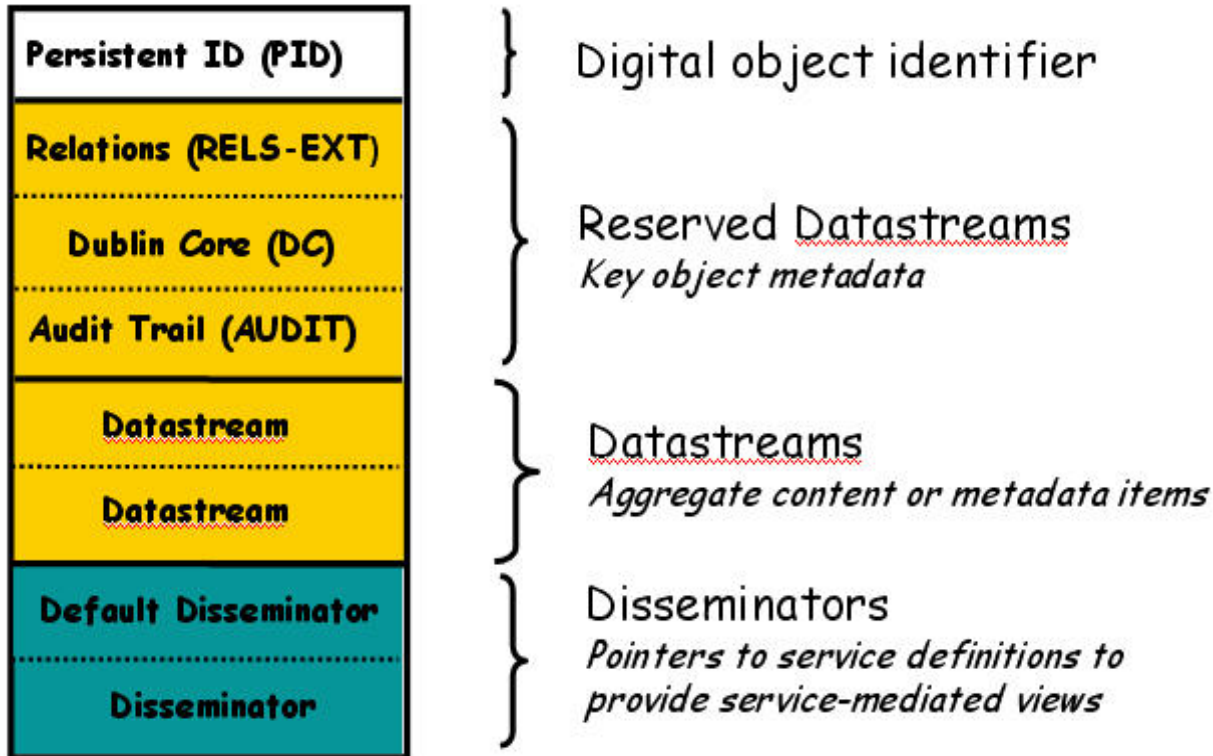
Coming from:

<http://www.fedora.info/download/2.2.1/userdocs/server/features/serviceframework.htm>



# Fedora Digital Object Model

## Container View





# Fedora — Information Model

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## **Preservation Description informaton:**

- Reference informaton: PID, a persistent, unique identifier for the object
- Context informaton: Relations: RELS-EXT
- Provenance information: Audit Trail
- Fixity information: checksums

## **Packaging information:**

- FOXML, METS



# Fedora — Information packages

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- SIP

FOXML, METS, and more in the future (MEPG21 DIDL)

- AIP

FOXML

- DIP

FOXML, METS , and more in the future (MEPG21 DIDL)



# Fedora

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- Preservation metadata
  - *PREMIS* (event management)
- Identifier
  - PIDS and Fedora URIs
- Trust
  - Integrity, Authenticity: checksum, audit trail, versioning, content model and object format validation (**active**), event management (**active**)

Working Group Preservation – FedoraWiki.

[http://www.fedora.info/wiki/index.php/Working\\_Group:\\_Preservation](http://www.fedora.info/wiki/index.php/Working_Group:_Preservation)

The logo consists of a vertical black line on the left, a horizontal black line at the bottom, and three overlapping squares: a yellow one at the top left, a red one at the middle left, and a blue one at the bottom left. The word "Fedora" is written in a blue serif font to the right of the vertical line.

# Fedora

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- **Complex object and Versioning**  
a generic digital object model, Content versioning
- **Packaging format**  
FOXML, METS, and more in the future
- **Ingest and Export data**  
FOXML, METS , and more in the future
- **XML Storage (FOXML)**

The logo consists of a vertical black line on the left, a horizontal black line below it, and three overlapping squares: a yellow one at the top left, a red one at the middle left, and a blue one at the bottom left. The word "Fedora" is written in a blue serif font to the right of the vertical line.

# Fedora

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- **Interoperability**

OAI-PMH, SOA, web services

- **Extensibility**

SOA, Web Service Interfaces

- **Other**

Journaling - backup or mirror repository



# Fedora – Our Practice

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- Design and development of a massive digital resource management system (DRMS) based on Fedora 1.2
- Digital material: different types (ebook, e-journal, audio and video, etc), different metadata requirement, different index & search service





# Fedora – Our Practice

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- Our work
  - Cataloging and Preservation Toolkit
  - The virtual collection service
  - Index & search service
  - Interoperable service
  - Other service...
- Application: MathDL, MachDL...



# 中文数学数字图书馆

Digital Library on Chinese Mathematics



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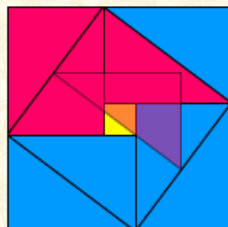
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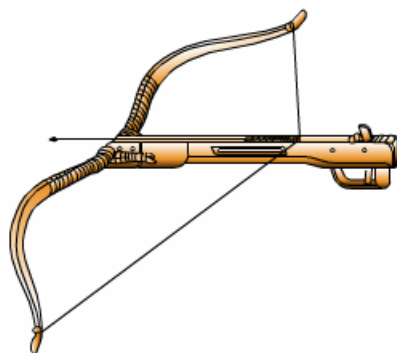
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### 人物专题



刘仙洲 (1890-1975)  
河北完县人, 工程教育家, 机械工程专家



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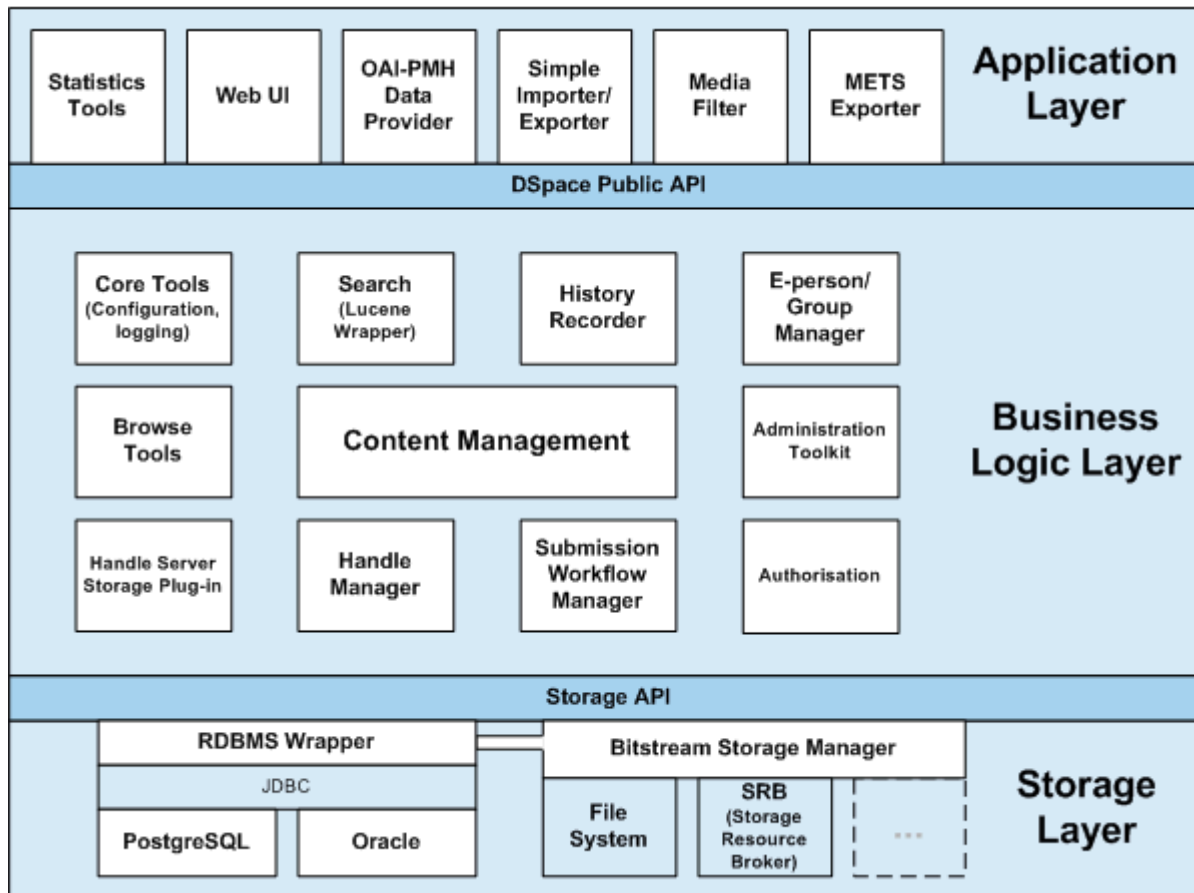


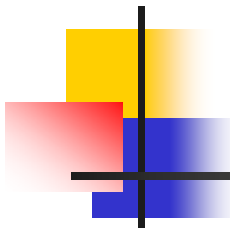
# Fedora — our practice

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- A universal way to handle complex object
- More scalable and flexible to do extensions on it.
- More IT professional requirements.

# DSpace — System Architecture





# DSpace — OAIS mapping

## *(function model)*

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- **Ingest**

Web UI, batch import (workflow)

- **data management**

RDBMS: E-people, Authorisation, Authentication, Metadata indices.

- **archival storage**

RDBMS+Bitstream Store (**active work on AIP and Asset Store**)

- **Access**

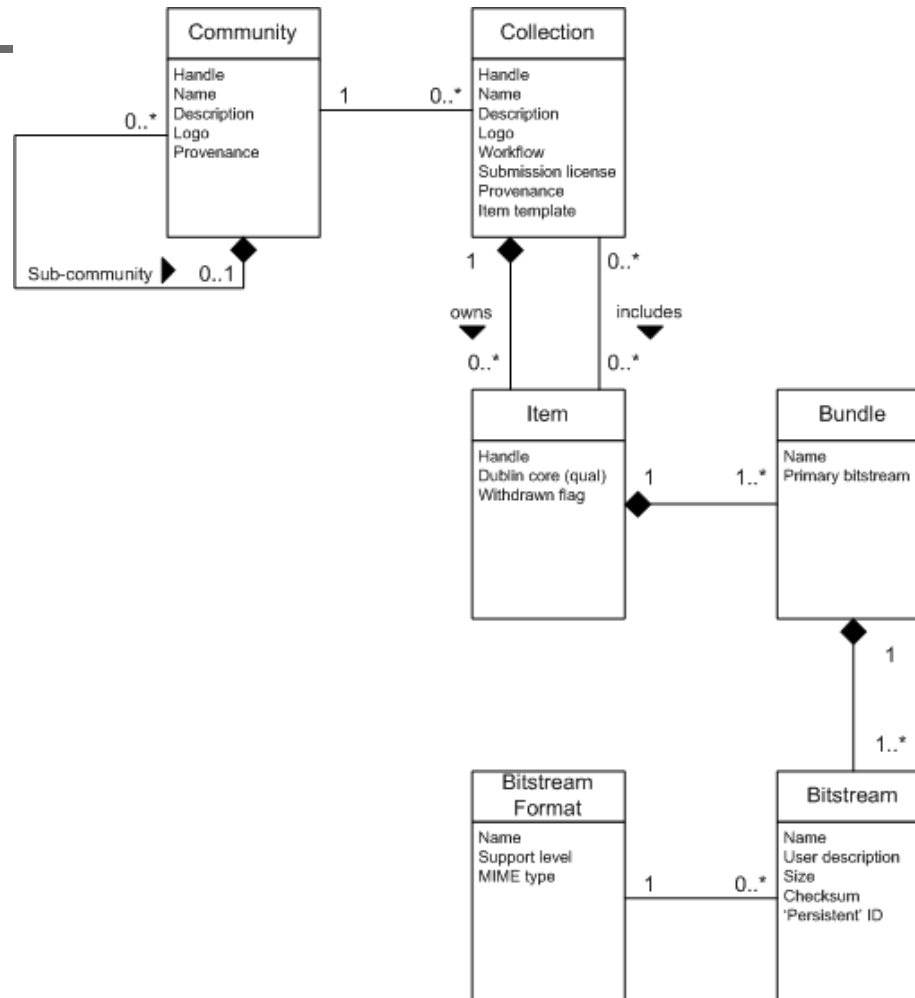
search and browse, OpenURL, RSS, OAI-PMH, batch export...

- **preservation planning, administrative and management roles** (**active work on policy system and history system**)

ECDL 2003, Robert Tansley, etc. DSpace as an Open Archival Information System: Current Status and Future Directions

From DSpace Wiki. <http://wiki.dspace.org/index.php/DevelopmentAreas>

# DSpace — Data Model





# DSpace — OAIIS mapping

## *(information model)*

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- Content data object: Bitstream
- Representation information: Bitstream Format
- PDI
- Reference information: Handle as default AIP Identifiers and content information Identifiers, QDC
- Context information: Structural Metadata (Bundle), QDC
- Provenance information: Administrative Metadata, history system (**RDF data**)
- Fixity information: checksum
- Packaging information
  - AIP is currently a logical object that is located in DB tables and files.  
(**active work on METS-based AIP**)
- AIC: community, collection





# DSpace — Metadata

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- Descriptive Metadata
  - QDC
- Administrative Metadata
  - preservation metadata, provenance and authorization policy data.
- Structural Metadata



# DSpace — Identifier

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- DSpace uses the CNRI Handle System for creating objects identifiers by default.
- Support Other identifier schemas (**active**)

Making identifiers 'pluggable' (Handles, ARKs...)

From DSpace Wiki. <http://wiki.dspace.org/index.php/DevelopmentAreas>



# DSpace

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- Trust

Integrity, Authenticity..., Checksum Checker, history system(**active**), event mechanism (**active**)

- Complex object and Versioning

no support yet (**active work on METS-based AIP, versioning support**)

- Packaging format

package plugins and Crosswalk plugins (**active work on METS-based AIP**)

- Ingest and export data

package plugins and Crosswalk plugins (DIM, METS)

From DSpace Wiki. <http://wiki.dspace.org/index.php/DevelopmentAreas>



# DSpace — Interoperability

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- Supports OAI-PMH Data Provider
- supports the OpenURL protocol from SFX, RSS
- SRU/W, Web Services (**active**)
- Other Network Interfaces (**active**)



# DSpace — Extensibility

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- Provides plugin manager
- Provides Content management API
- Modularity mechanism (**active**)
- AddOn mechanism (**active**)
- Extension framework (**discussion**)

From DSpace Wiki. <http://wiki.dspace.org/index.php/ArchReviewFrameworks>



# DSpace

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- Preservation tools
  - TechMDExtractor (**awaiting integration**)
  - Workflow Pre-ingest Step (**awaiting integration**)
- Asset store
  - Standards-based AIP Storage layer for easier preservation (**active**)
- History system
  - ABC Harmony (**active**)
- Policy system (**active**)

From DSpace Wiki. <http://wiki.dspace.org/index.php/DevelopmentAreas>



# DSpace – Our practice (1)

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- E-journal digital preservation experiment based on DSpace 1.4:
- Type: IEEE database (CD)
- Scope: from the beginning to the end of 2005
- Feather: simple digital object (per article=one pdf file)
- Quantity: over 1,100,000 records
- Ingest Process:
  - Data check for viruses, integrity...
  - Verify format
  - Data analysis
  - Metadata extraction
  - Data prepare
  - Mass import



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## DSpace in Tsinghua University library

### Search

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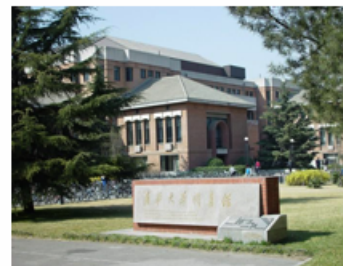
 

### Communities in DSpace

Choose a community to browse its collections.

[IEEE/IEE Electronic Library](#)

## Tsinghua University







# DSpace – Our Practice

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- Access
  - access control
- Some problems
  - Mass ingest
    - Index mechanism: performance
    - History system: record too much information in the DB
  - Too many database access
  - Local development and upgrade



# DSpace – Our Practice (2)

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- Institutional Repository
- Phase one: the construction of OAPS (Outstanding Academic Papers by Students) database based on DSpace 1.3.2.
- Type: Final Year Project report, Course report, SRT report,...
- Scope: 2005, 2006, 2007
- Feather: simple digital object
- Ingest Process:
  - Data check for viruses, integrity...
  - Data analysis
  - Metadata extraction
  - File normalization
  - Data prepare
  - Mass import or Web UI submit
- Access
  - access control



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**Search**

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# Eprints

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- repository functions of ingest, data management and dissemination
- Preservation Support in EPrints 3
  - Complex-Object Export: METS and DIDL plugins
  - History Module
  - Preservation Rights Declaration



# Eprints

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- Two related JISC-funded projects
  - PRESERV (PReservation Eprint SERVICES)
  - SHERPA Digital Preservation: Creating a Persistent Preservation Environment for Institutional Repositories
- The basic idea
  - Digital Preservation Services for Institutional Repositories can be provided by the third party.



# Summary

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- Fedora has better support for complex object and versioning at present.
- Fedora is more scalable and flexible to do extensions on it. But it requires more IT professional expertise.
- DSpace is actively exploiting some digital preservation R&D work.
- Fedora is a toolkit, and DSpace is an out of the box application. But they are learning from each other at present.



# Some observations

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- IR systems are developing continually, including some digital preservation R&D work.
- Some preservation features can be built into IR system, some through external services or extensions.
- digital preservation is complex and context related, local development or integration work is necessary, so interoperability and extensibility are important for IR systems.

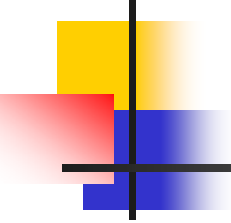


# Future work

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- Perfect the evaluation criteria
- Improve the evaluation methodology  
criteria and weight, survey and experiment
- Comprehensive evaluation of repository software for preservation  
fairly basic at present
- Guides for repository software selection and use

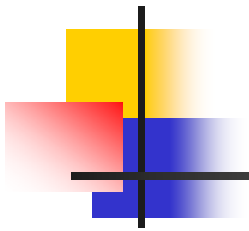




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If you have any suggestions or questions, please contact us:

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- Dong Li, [dongli@lib.tsinghua.edu.cn](mailto:dongli@lib.tsinghua.edu.cn)



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Thank You!