

FEDORA Digital Repository Implementation at UVa

**or, You've All Heard About Fedora,
Here's What We're Doing with It**

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DLF Spring Forum
May 15, 2003**

Background

In 1999, The UVa Library's Digital Library Research and Development (DLR&D) group read an article in [D-Lib](#) about the Fedora (Flexible and Extensible Digital Object and Repository Architecture) system, designed by Carl Lagoze and Sandra Payette of the [Cornell Digital Library Research Group](#).

By the summer of 2001 UVa built an “alpha” testbed that included 500,000 data objects and a variety of disseminators for electronic finding aids, TEI-encoded etexts of letters and books, and for XML-encoded structured collections of art, architecture and archeology images, and a set of social science data.

Background

In late 2001, The UVa Library Digital Library Research and Development Group began collaboration with the Cornell Digital Library Research Group to develop Fedora under a \$1,000,000 [Andrew W. Mellon Foundation grant](#). A number of deployment partners signed on to test deploy the system during its development.

On May 16, 2003, release 1.0 of the [Fedora](#) digital object repository management system was made available under a Mozilla Public License through the [project web site](#). The UVa Library is also launching its first phase production repository within the UVa domain.

Fedora Architecture

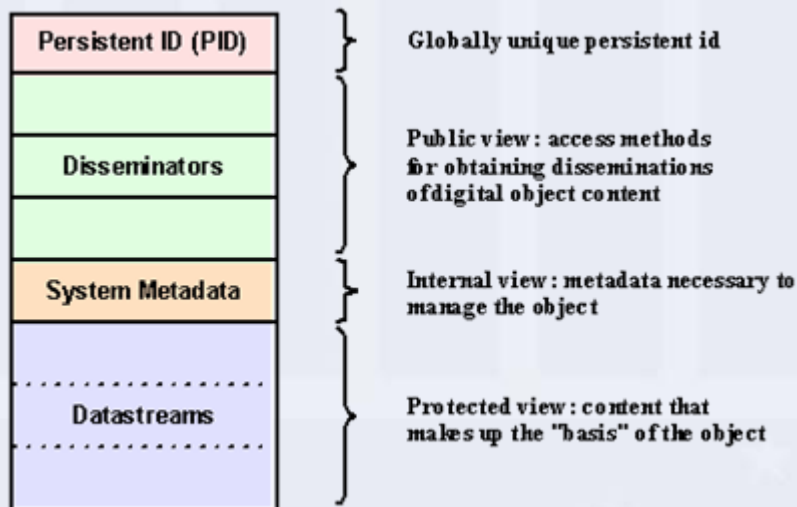
- Fedora is written in Java 1.4.
- A Fedora repository is exposed as a Web service and is described using Web Services Description Language (WSDL).
- Digital object behaviors are implemented as linkages to distributed web services that are expressed using WSDL and implemented via HTTP GET/POST or SOAP bindings.
- Digital objects are encoded and stored as XML using the Metadata Encoding and Transmission Standard (METS).

Fedora Architecture

- The Fedora architecture is based on object models that represent data objects (units of content) or collections of data objects.
- The objects contain linkages between datastreams (internally managed or external), metadata (inline or external), and behaviors that are themselves code objects and link to disseminators (processes, mechanisms, and external software).
- Object models can be thought of as containers that give a useful shape to information poured into them; if the information fits the container, it can immediately be used in predefined ways.

Object Models

- A Fedora object has four basic components:
 - A persistent identifier or PID. Handles are not currently used.
 - A set of disseminators that define a set of behaviors the object can perform.
 - A set of descriptive and administrative metadata about the object and its content.
 - One or more datastreams that define the content of the object.
- Objects “subscribe” to the same object model if they share the same basic object structure by having the same number and type of datastreams (content streams) and by having the same set of disseminators or behaviors.



Design of Models and Disseminators

- Fedora developers met with image and text content and format specialists, application developers, and user service librarians to understand what media files we have and how our users expect to find them and use them.
- Specifications were set for:
 - Datastreams (formats, variation in deliverables [EAD vs. TEI vs. Ebooks, page images vs. documentary images])
 - Metadata
 - Discovery (metadata vs. full-text searching, presentation of results sets, etc.)
 - Delivery (must support static and on-the-fly file delivery, and varied end user download and printing requirements)

Image Object Model

- The [General UVa Image Object Model](#) design includes four separate datastreams (or basis):
 - Preview- sized images
 - Screen-sized images
 - A MrSID version
 - The “Delivery Master” (the image that was used to derive the other datastreams)
- The disseminators that define the functionality of the object by describing a set of behaviors or Behavior Definitions. The uvaImage disseminator consists of five behaviors
 - getPreview – retrieve the preview size of the image
 - getScreen – retrieve the screen size of the image
 - getImageViewer – retrieve the screen size of the image but with additional image manipulation tools
 - getSizedImage(x,y) – retrieve the specified size of the image
 - getDeliveryMaster – retrieve the delivery master (or ascertain its off-line location)

Persistent ID (PID)

Disseminators

Disseminator	Behavior Definition	Behavior Mechanism
uvalmage	genImageBdef	genImageBmech
	getPreview	HTTP GET
	getScreen	HTTP GET
	getImageViewer	TBD
	getSizedImage(x,y)	get_mrsid_url.pl
	getDeliveryMaster	TBD
uvaMetadata	uvaMetaBdef	TBD
	getDescriptive	TBD
	getTechnical(ds)	TBD
	getDigiprov(ds)	TBD
	getRights(ds)	TBD
	getSource(ds)	TBD

System Metadata

uvalibadmin	Administrative metadata
uvalibdesc	Descriptive metadata

Basis

Datastream(s)

DS1	pointer to thumbnail size image
DS2	pointer to screen size resolution image
DS3	pointer to MrSID image
DS4	TBD

Text Object Model

- All electronic texts in the Central Repository will be encoded as TEI in XML. Each digital object will also contain descriptive and administrative metadata about the object as a whole and about each of its datastreams. The uvaMetadata disseminator will be available on every object and will provide the capability to retrieve descriptive and administrative about the object and its content. The [UvA General Text Object Model](#) contains five datastreams:
 - Static XML version of text – points to the raw XML version of the text.
 - Static XHTML version of text – points to an XHTML version of the text or to a placeholder indicating that a static version does not exist and will be dynamically generated.
 - Static PDF version of text – points to PDF version of the text or to a placeholder indicating that a static PDF version does not exist and will be dynamically generated.
 - Static PDB version of text – points to PDB version of the text or to a placeholder indicating that a static PDB version does not exist and will be dynamically generated.
 - Static LIB version of text – points to LIB version of the text or to a placeholder indicating that a static version does not exist and emails a request to have one externally generated.

Text Object Model, continued

- It is desirable to have a single behavior definition for all electronic text, but with multiple implementations (behavior mechanisms) for each different type, sharing the same behavior definition. The General Text Behavior Definition defines eight basic behaviors for all electronic texts:
 - `getPreview` – display a “preview” representation of the text that represents a bibliographic citation.
 - `getTreeView(level)` – display an XML DOM node tree representation of the text down to the specified level in the text.
 - `getChunk(idref)` – get a chunk of XML specified by the idref; this behavior retrieves the specified XML fragment from the text.
 - `getChunks(XPath)` – get multiple chunks of XML specified by the XPath expression; this behavior may retrieve multiple XML fragments from the text.
 - `getStaticView` – display static HTML view of text; the static view would be a view just of the text itself.
 - `getDynamicView` – display the text in an interactive HTML form; the dynamic view would include the full set of support tools available for the particular type of text.
 - `getPrintable(format)` – download a version of the file in the specified format; at present, three formats would be allowed including .pdf, .pdb, and .lib.
 - `getDeliveryMaster` – download raw XML text of delivery master

Persistent ID (PID)

Disseminators

Disseminator	Behavior Definition	Behavior Mechanism
uvaText	uvaTextBdef	uvaTextBmech
	getPreview	TBD
	getTreeView(level)	TBD
	getChunk(idref)	TBD
	getChunks(XPath)	TBD
	getStaticView	TBD
	getDynamicView	TBD
	getPrintable(format)	TBD
	getDeliveryMaster	HTTP GET/FTP
uvaMetadata	uvaMetadataBdef	uvaMetadataBmech
	getDesc(ID)	TBD
	getTech(ID)	TBD
	getDigiprov(ID)	TBD
	getSource(ID)	TBD
	getRights(ID)	TBD

System Metadata

uvalib:admin	Administrative metadata
uvalib:desc	Descriptive metadata

Datastreams

Datastream(s)	
DS1	pointer to XML text
DS2	pointer to static XHTML version of text
DS3	pointer to PDF version of text/placeholder
DS4	pointer to PDB version of text/placeholder
DS5	pointer to LIB version of text/placeholder

Effect on Production

- Development of new file naming conventions across the Library.
- Documentation of deliverable file formats and sizes.
http://iris.lib.virginia.edu/dl/reports/best_practices.html
- Development of [UVa Metadata](#), documentation of minimum metadata standards, and mappings to TEI, EAD, VRA Core, and Dublin Core.
- Development and introduction of the [General Descriptive Modeling Scheme \(GDMS\)](#) and a GDMS Tool to create structured representations of collections of objects.
- Development of a workflow and tools for batch processing of deliverable files and loading into repository directory trees.
- Development of batch tools to create Fedora objects, creating the linkages between media files, metadata, and disseminators.

Discovery

- Indexing and searching are handled outside of Fedora.
- The current UVa implementation uses Tamino and OpenText. OpenText will be updated to XPAT, and Tamino has proved to be a poor fit for use with full-text, so other products (such as [Ipedo](#)) are under review.
- The web-based discovery interface uses external indexes to build a results set; the interface uses XSLT to format results, in combination with JavaScripts that build menus on-the-fly to display metadata and available functions.

Delivery

- When objects are selected for viewing or downloading, calls are sent to Fedora via URL parameters to retrieve the objects, which are formatted using XSLT.
- The majority of the current Fedora disseminators use a combination of Perl programs and XSLT to format the objects for display.
- Other disseminators include wrapping a zooming and panning Java applet around an image; generating a downloadable JPEG from the MrSID file; and delivering downloadable versions of XML EAD files for partnering institutions.

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Digital Library: Collections

Ten-squat-a-way, The Open Door, Known as The Prophet, Brother of Tecumseh**artist:** George Catlin**owner:** Smithsonian American Art Museum**subject:** portrait**medium:** oil**extent:** 29 x 24 in.**credit:** Smithsonian American Art Museum, Gift of Mrs. Joseph Harrison, Jr.**tribe:** Shawnee**creation:** 1830**identifier:** 1985.66.279**Related Texts**

William H. Truettner, The Natural Man Observed: A Study of Catlin's Indian Gallery (Washington, D.C.: The Smithsonian Institution Press in cooperation with the Armon Carter Museum and The National Collection of Fine Arts, 1979).

"The 'Shawnee Prophet,' is perhaps one of the most remarkable men, who has flourished on these frontiers for some time past. This man is brother of the famous Tecumseh, and quite equal in his medicines or mysteries, to what his brother was in arms; he was blind in his left eye, and in his right hand he was holding his 'medicine fire,' and his 'sacred string of beads'; in the other. With these mysteries he made his way through most of the North Western tribes, enlisting warriors wherever he went, to assist Tecumseh in effecting his great scheme, of forming a confederacy of all the Indians on the frontier, to drive back the whites and defend the Indians' rights; which he told them could never in any other

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Digital Library: Collections

Chair and Cloud

alternate title: Editorial Montaner y Simón.

alternate title: Fundació Antoni Tàpies.

creator: Tàpies, Antoni,

contributor: Domènech i Montaner, Lluís,

subject: Office buildings. , Modernist. , Public art , Outdoor sculpture , Sculpture

notes: Building originally a publishing house for Montaner y Simón; designed by Lluís Domènech i Montaner, 1879.

identifier: S-20-Tap-3.4

location: Barcelona, Spain ;C/Arago, 255, Eixample.41.4172.167

creation: 1990

medium: Steel and aluminum mesh.



Oblique view of building



Front view with rooftop artwork



Detail of wire



View of sculpture



Detail, three bays of building.



American Studies Information Community

Lewis, Meriwether []

Original Journals of the Lewis and Clark Expedition, 1804-1806

Vol. 1

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- + [The ORIGINAL JOURNALS OF LEWIS AND CLARK](#)
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 - + [\[Clark:\]](#)
 - + [\[Orderly Book; Clark:\]](#)
 - [\[Lewis:\]](#)
 - + [\[Clark:\]](#)
 - + [Chapter V](#)
[AMONG THE MANDANS](#)
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[AMONG THE MANDANS](#)
 - + [Chapter VII](#)
[FROM FORT MANDAN TO THE YELLOWSTONE](#)
 - + [Chapter VIII DAOT I](#)

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Lewis, Meriwether []

Original Journals of the Lewis and Clark Expedition, 1804-1806

Vol. 1

[Clark:]

25th. Sept. —

A FAIR Morning the Wind from the S. E. all well,
raised a Flag Staff & made a orning or Shade on a
Sand bar in the mouth of Teton River, for the purpose
of Speaking with the Indians under, the Boat Crew on
board at 70 yards Distance from the bar The 5 Indians
which we met last night Continued, about 11 OClock the
1t. & 2d. Chief Came we gave them Some of our Provisions to
eat, they gave us great Quantitis of Meet Some of which was
Spoiled we feel much at a loss for the want of an interpeteer
the one we have can Speak but little.

Met in Council at 12 oClock and after Smokeing, agreeable
to the useal Custom, Cap. Lewis proceeded to Deliver a
Speech which we [were — Ed.] oblige[d] to Curtail for want
of a good interpeteer all our party paraded, gave a Medal to
the Grand Chief Calld. in Indian *Un ton gar Sar bar* in French
Beuffe nure [Beuffe noir] Black Buffalow. Said to be a good
Man, 2[nd] Chief *Torto hon gar* or the *Parti sin* or Partizan
bad the 3rd. is the *Beffe De Medison* [Beuffe de Medecine]
his name is *Tar ton gar Wa ker* 1[st]. Considerable Man,
War zing go. 2[nd]. Considerable Man *Second Bear* — *Mato*
co que par.

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Vol. 1

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1804] TETON TO MANDANS

Perogues with 5 men — 3 & 2 Ind^s) (which left the boat with great reluctance) to Shore with a view of reconciling those men to us, as Soon as I landed the Perogue three of their young Men Seased the Cable of the Perogue, (*in which we had presents &c*) the Chiefs Sold! [*each Chief has a soldier*] Hugged the mast, and the 2^d Chief was verry insolent both in words & justures (*pretended Drunkenness & staggered up against me*) declaring I should not go on, Stateing he had not received presents sufficient from us, his justures were of Such a personal nature I felt My self Compeled to Draw my Sword (*and*

American Studies Information Community

Catlin, George [1796-1872]

Die Indianer Nord-Amerikas und die während eines achthährigen Aufenthalts unter den wildesten ihrer Stämme erlebten Abenteuer und Schicksale

Images 1 through 10

[Start of book](#) | [Previous 10 images](#) | [Next 10 images](#) | [End of book](#)



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Results for search term "sioux": 123 hits

Thwaite ed., Lewis & Clark Journals v.7: e Zoue [Sioux] River near the Mandans. Got to the Amen
 Thwaite ed., Lewis & Clark Journals v.7: little Zoe [Sioux] prairie the hunters met us with fo
 Thwaite ed., Lewis & Clark Journals v.7: owers, of the Sioux City (Iowa) Academy of Sciences an
 Thwaite ed., Lewis & Clark Journals v.7: ements of the Sioux (except seceders) yet you will pro
 Thwaite ed., Lewis & Clark Journals v.7: of the Teton Sioux to stop the expedition. See our vo
 Thwaite ed., Lewis & Clark Journals v.7: commences the Sioux country. The next river of note is the B
 Thwaite ed., Lewis & Clark Journals v.7: the Big Sioux river, which heads with St. Peters and w
 Thwaite ed., Lewis & Clark Journals v.7: between the Sioux rivers and the St. Peters. The country o
 Thwaite ed., Lewis & Clark Journals v.7: I-pox and the Sioux have reduced them to their present state
 Thwaite ed., Lewis & Clark Journals v.7: — the Sioux possess the south west of the Missouri,
 Thwaite ed., Lewis & Clark Journals v.7: band of Sioux, and the second which we had seen called
 Thwaite ed., Lewis & Clark Journals v.7: w occupy, the Sioux bands rove in the country to the M
 Thwaite ed., Lewis & Clark Journals v.7: down, by the Sioux, their number is about 500 men, th
 Thwaite ed., Lewis & Clark Journals v.7: red on by the Sioux; but they have pledged themselves
 Thwaite ed., Lewis & Clark Journals v.7: since, by the Sioux & Ricaras, against the Mandans
 Thwaite ed., Lewis & Clark Journals v.7: Kansas, Sioux, and others; and if it be not broken dow
 Thwaite ed., Lewis & Clark Journals v.7: , Sioux, and Foxes of the Mississippi, and the R
 Thwaite ed., Lewis & Clark Journals v.7: solute of the Sioux being denied the permission to tr
 Thwaite ed., Lewis & Clark Journals v.7: ther bands of Sioux, on the river St. Peter's and the
 Thwaite ed., Lewis & Clark Journals v.7: 03-306; Sioux, 1, 169, 220.
 Thwaite ed., Lewis & Clark Journals v.7: Arkeechetar, Sioux chief, 6, 99.
 Thwaite ed., Lewis & Clark Journals v.7: Arshkane, Sioux chief, 6, 99.
 Thwaite ed., Lewis & Clark Journals v.7: , Stone Sioux) Indians, Siouan tribe,
 Thwaite ed., Lewis & Clark Journals v.7: te, tribe of Sioux, 1, 169.
 Thwaite ed., Lewis & Clark Journals v.7: 89, 95; among Sioux, 1, 267; Indians
 Thwaite ed., Lewis & Clark Journals v.7: (White Man), Sioux tribe, habitat,
 Thwaite ed., Lewis & Clark Journals v.7: ntewahneajah, Sioux chief, 6, 99.
 Thwaite ed., Lewis & Clark Journals v.7: Chatongdotah, Sioux chief, 6, 99.
 Thwaite ed., Lewis & Clark Journals v.7: Sioux tribe, habitas, 1
 Thwaite ed., Lewis & Clark Journals v.7: hwockkondepe, Sioux chief, 6, 99.
 Thwaite ed., Lewis & Clark Journals v.7: womb Indians, Sioux tribe, 6, 99.



Future

- Further development of a heterogeneous Collection Object Model, with core behaviors that should be applicable across entire collections (getInventory, getPIDs, etc.)
- Migration of the image and text collections into Fedora, and transformation of the prototype delivery applications into Fedora disseminators.
- Development of object models and disseminators for data sets.
- Future authoring and delivery services will be developed on top of the repository for users:
 - An improved GDMS XML authoring tool that is usable by faculty.
 - Distributed repository storage in affiliated user's "home directories" elsewhere in the University environment.
 - A "shopping cart" for the repository that allows users to create and retain persistent sets.
 - Linkages between repository disseminators and commercial tools.