A Whole Lotta Preservin’ Goin’ On

By Sonoe Nakasone and Ben Pennell

https://goo.gl/WORvz5

Rough outline

1. Presentation ~ 1 hr

   Definitions: Digital Curation, Digital Preservation, Digital Provenance
   Digital Curation Lifecycle
   Metadata
   Access, Use, Discoverability
   Carolina Digital Repository

2. Bagger Workshop ~ 1 hr

https://goo.gl/WORvz5

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Zoning out is OK

Slides will be provided

Digital Curation
Digital Preservation
Digital Provenance

Digital Curation is the custodianship and management of digital objects throughout their life. The digital curation lifecycle is **ongoing and iterative**.

Images: http://www.clipartkid.com/magnifying-glass-plastic-handle-FN8UNs-clipart/

“Digital preservation combines policies, strategies and actions that **ensure access to digital content over time**.”

(ALCTS Preservation and Reformatting Section)

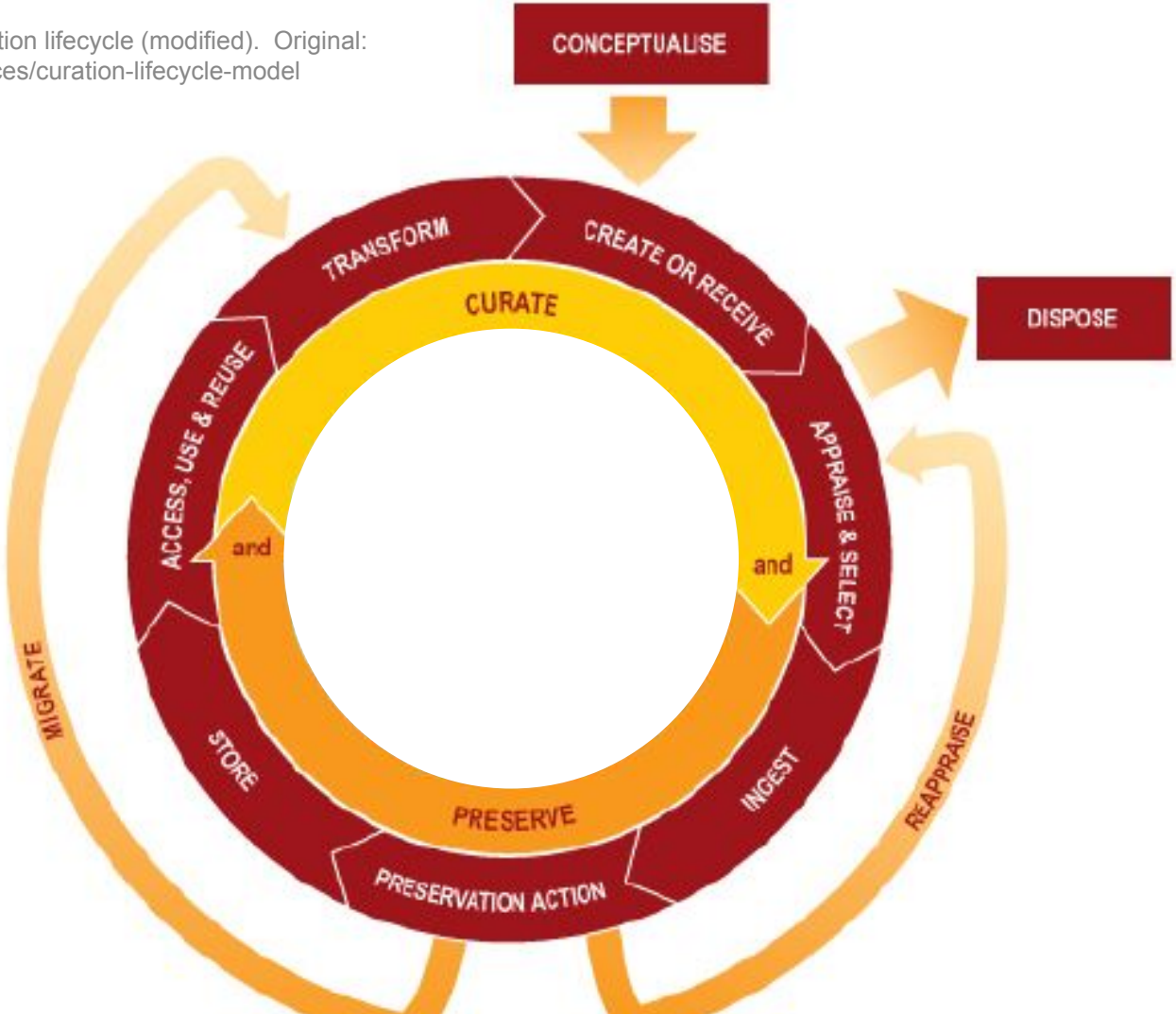
Definition: http://www.ala.org/alcts/resources/preserv/defdigpres0408
Image: http://www.clipartkid.com/images/23/jam-clipart-and-illustrations-a89xCY-clipart.jpg

“Digital Provenance is **chronology** related to management of a digital object. Digital provenance typically describes **agents responsible** for digital objects and **key events** that occur over the course of the digital object’s life cycle”

(Li and Sugimoto 2014 (Abridged))

Definition: http://dcpapers.dublincore.org/pubs/article/view/3709/1932
Image: http://www.clipartkid.com/chain-by-nicubunu-golden-chain-oov5nG-clipart/

Digital Curation Centre Curation lifecycle (modified). Original: http://www.dcc.ac.uk/resources/curation-lifecycle-model



Closer look: Digital Curation Lifecycle

conceptualization and creation

conceive and plan the creation of digital objects, including data capture methods and storage options

produce digital objects and assign administrative, descriptive, structural and technical archival metadata

Definitions: http://www.dcc.ac.uk/digital-curation/what-digital-curation
Images:
http://www.clipartkid.com/idea-book-transfer-express-articles-about-custom-transfers-ySrCnY-clipart/
http://www.clipartkid.com/painting-board-clipart-2x6ch2-clipart/

appraise and dispose

evaluate and select for long-term preservation

dispose of objects not selected for preservation

Definitions: http://www.dcc.ac.uk/digital-curation/what-digital-curation
Images:
http://www.clipartkid.com/evaluate-clipart-evaluation-rate-excellent-Q43gda-clipart/
http://www.clipartkid.com/painting-board-clipart-2x6ch2-clipart/


VOLUME
10
1
2
3

unintentionally modifying digital objects

tools to help:

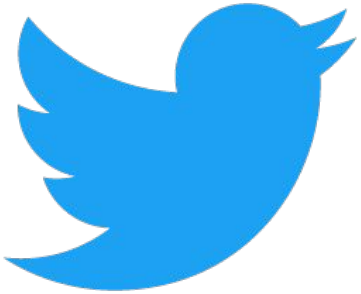
write blockers

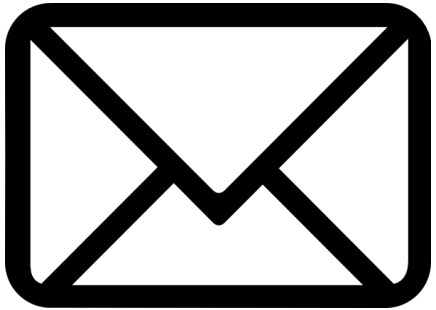
disc images

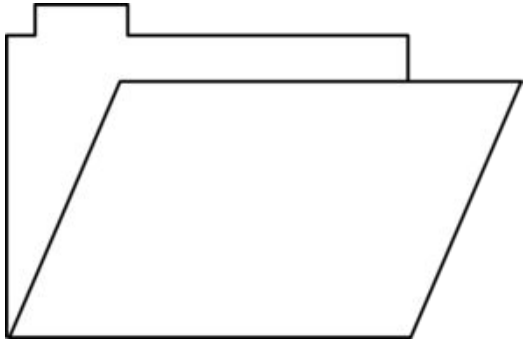
Images: http://www.freeimages.com/photo/data-protection-floppy-1461884

```
Prof. Lopez
SSN: xxx-xx-xxxx
DOB: yyyy-mm-dd
Credit card: xxxx xxxx xxxx xxxx
Email: xxxxx@gmail.com
Employee id: xxxxxxxxx
```

BitCurator





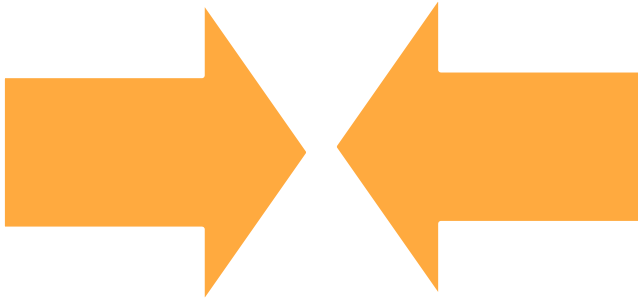


Images:
https://icons8.com/web-app/13963/Twitter
http://www.clipartkid.com/email-clipart-wfZOB4-clipart/
https://en.facebookbrand.com/assets/f-logo
http://www.clipartkid.com/folder-black-and-white-clip-art-at-clker-com-vector-clip-art-online-pyDThp-clipart/

ingest & store

Open Archival Information System (OAIS) Reference Model

.



Conceptual Framework
Content Standard
Interoperability

OAIS: http://dx.doi.org/10.7207/twr14-02

SIPs, AIPs (and DIPs)

- Submission Information Packages (SIP)
- Archival Information Packages (AIP)
- Dissemination Information Packages (DIP)

Images:
http://www.clipartkid.com/dips-royalty-free-stock-image-image-12438266-ON0X2c-clipart/
http://www.freeimages.com/photo/big-ape-1386762
http://images.freeimages.com/images/previews/3a1/four-friends-sipping-from-a-single-tender-coconut-1306100.jpg

Submission Information Package (SIP)

```
myfirstbag/
|-- data
|   \-- 27613-h
|       \-- images
|           \-- q172.png
|           \-- q172.txt
|-- manifest-md5.txt
|     49afbd86a1ca9f34b677a3f09655eae9 data/27613-h/images/q172.png
|     408ad21d50cef31da4df6d9ed81b01a7 data/27613-h/images/q172.txt
\-- bagit.txt
     BagIt-Version: 0.97
     Tag-File-Character-Encoding: UTF-8
```

Wikipedia: https://en.wikipedia.org/wiki/BagIt

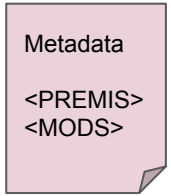
Bagit bags
METS manifests

Archival Information Package (AIP)

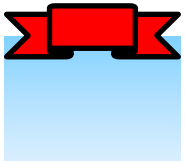
Object

Structural and semantic information

Preservation Information
Descriptive information



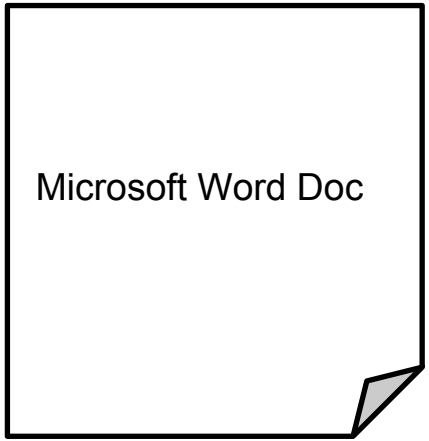
Packaging information



preserve and transform

- ❑ virus scanning
- ❑ fixity checks
- ❑ replication
- ❑ distribution
- ❑ normalization
- ❑ migration

Checksums and fixity checks



2550 4446 2d31 2e37 0a0a 3420 3020 6f62
6a0a 2849 6465 6e74 6974 7929 0a65 6e64
6f62 6a0a 3520 3020 6f62 6a0a 2841 646f
6265 290a 656e 646f 626a 0a38 2030 206f
626a 0a3c 3c0a 2f46 696c 7465 7220 2f46
6c61 7465 4465 636f 6465 0a2f 4c65 6e67

39b7c937b152203bdc597dc3a10e4b2

Why do files change?

—

Intentional change

Accidental change

Loss during moves and migrations

Data degradation

Break!

5 min

Stand, stretch, pee

Metadata

Important throughout the lifecycle.

Technical

Structural

Preservation

Provenance

(Descriptive)

(Administrative)

Technical Metadata

file properties

creation and origin

migration

FITS (File Information Tool Set)

ex. EXIF tool to extract file headers

Structural Metadata

hierarchy, order, and other relationships between objects and object parts

```
structMap>
  <div ID="_5623a76a-841a-4c1e-9909-c0dc55075a25" TYPE="Aggregate Work" LABEL="Aggregate Work"
DMDID="_c4f7caa1-6122-4937-8f77-9027de73a616" ADMID="_8eb946c0-4f7d-4849-8a6a-a83c5b5ebb32">
      <div ID="_bff7a0be-6d05-4182-a595-add9de51c9fa" TYPE="File" LABEL="pdf.pdf">
        <fptr FILEID="_56010778-c7dd-4b23-ade4-6e45ed2384af"/>
      </div>
            <div ID="_71d79686-8867-459a-bea4-8c5d762963dd" TYPE="File" LABEL="agreements.txt"
ADMID="_c07e17a5-c32f-4f8f-9e1f-6fca20166253">
        <fptr FILEID="_841fbf17-0725-442f-abdc-c5eeb9494071"/>
      </div>
   </div>
</structMap>
<mets:structLink>
    <mets:smLink xlink:arcrole="http://cdr.unc.edu/definitions/1.0/base-model.xml#defaultWebObject" xlink:from="#d_cdmid_344"
xlink:to="#d_cdmid_332"/>
</mets:structLink>
```

Preservation metadata

- ❑ virus scanning
- ❑ fixity checks
- ❑ replication
- ❑ distribution
- ❑ normalization
- ❑ migration

Preservation Metadata Maintenance Activity (PREMIS)


```
<eventType>
    http://id.loc.gov/vocabulary/preservationEvents/virusCheck
  </eventType>
  <eventDateTime>2015-02-13T15:55:32</eventDateTime>
  <eventDetail>File passed pre-ingest scan for viruses.</eventDetail>
  <linkingAgentIdentifier>
    <linkingAgentIdentifierType>Name</linkingAgentIdentifierType>
    <linkingAgentIdentifierValue>
      ClamAV (ClamAV 0.98.5/20062/Thu Feb 12 17:12:36 2015)
    </linkingAgentIdentifierValue>
    <linkingAgentRole>Software</linkingAgentRole>
  </linkingAgentIdentifier>
</event>
```

Provenance metadata

chain of custody - Agents / responsible parties for actions

original media location

manifests of accessions

deposit agreements

PROV-DM (data Model) and PROV-O (ontology)

Putting it together...

Example workflow for a hard drive

1. Repository staff receive a hard drive with 14 TB of data.
2. A curator uses a write blocker to access the drive for a preliminary assessment.
3. Once determined in scope for the collection, the curator decides to make a disc image of the hard drive to do further appraisal and selection.
4. Once the curator has deselected out of scope materials, the objects are packaged into a SIP using Bagger and ingested into the repository
5. The repository runs virus scans, fixity checks, and many other microservices are run on the object. All actions are recorded in the PREMIS log.
6. Periodically, the system performs preservation services. The curator reevaluates files for retention and migration needs on a 5 year schedule or as needed.

Access, Use, Discovery

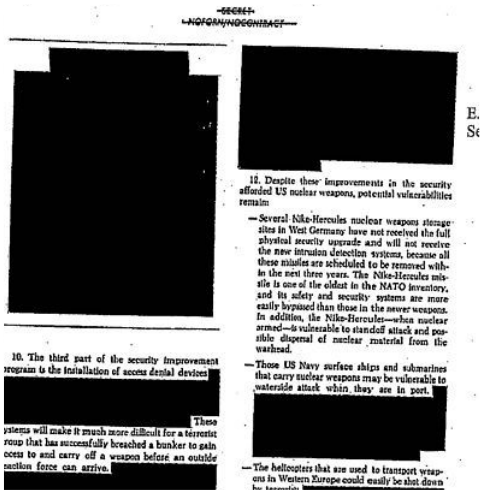
access controls, encryption, redaction, versioning

rights, licensing

descriptive metadata, linking, web discoverability

sharing, harvesting, open data

access controls



~~SECRET~~
~~NOFORN/NOCONTRACT~~

10. The third part of the security improvement program is the installation of access denial devices [redacted] These systems will make it much more difficult for a terrorist group that has successfully breached a bunker to gain access to and carry off a weapon before an outside reaction force can arrive.

11. Despite these improvements in the security afforded US nuclear weapons, potential vulnerabilities remain:

— Several Nike-Hercules nuclear weapons storage sites in West Germany have not received the full physical security upgrade and will not receive the new intrusion detection systems, because all these missiles are scheduled to be removed within the next three years. The Nike-Hercules missile is one of the oldest in the NATO inventory, and its safety and security systems are more easily bypassed than those in the newer weapons. In addition, the Nike-Hercules—when nuclear armed—is vulnerable to standoff attack and possible dispersal of nuclear material from the warhead.

— Those US Navy surface ships and submarines that carry nuclear weapons may be vulnerable to waterside attack when they are in port. [redacted]

— The helicopters that are used to transport weapons in Western Europe could easily be shot down

redaction

versioning

encryption

access levels and roles

Images:
Central Intelligence Agency (CIA) [Public domain], via Wikimedia Commons (https://commons.wikimedia.org/wiki/File:Redacted_CIA_document.jpg)

rights and licenses

```
<premis>
  <rights>
      <rightsStatement>
            <rightsBasis>copyright</rightsBasis>
                  <copyrightInformation>
                        <copyrightStatus>under copyright</copyrightStatus>
                        <copyrightNote>copyright 1996</copyrightNote>
                  </copyrightInformation>
            </rightsBasis>
      </rightsStatement>
  </rights>
</premis>
```

descriptive metadata and discovery

sharing, harvesting, open data

Open Access

OAI-PMH

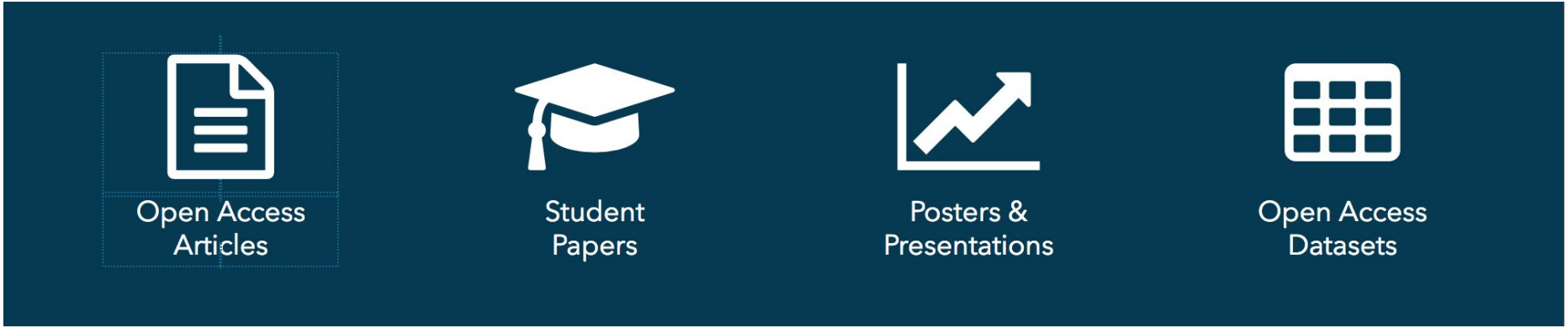
Web APIs

iiiF

An Example of Theory in Practice

A brief look at UNC Chapel Hill's digital repository

CAROLINADIGITALREPOSITORY



Preserves and provides access to born digital and at risk materials, including:

- Special collections materials
- Institutional repository
- Open Access Materials
- Content requiring long-term preservation

The repository provides:

- Preservation activities
- Arrangement and description tools
- Ingest of SIPS
- Flexible access controls

Implementation

Locally developed software

Using open source and community written tools

Built on top of a Fedora Repository

A couple of trends...

Open Access

Open Access Mandates
Open Educational Resources
Identifiers (ex. ORCID, UNF, GRID)

Tips:
UNC Open Access Policy
OER Commons
NCSU Alt-textbooks
GRID

Researcher Engagement

Research data
Data Management Plans (DMPs)
Data repositories

Tips:
Data Snafu
DMP Tool
NCSU Libraries Data Management
Figshare
SHARE

Mahalo for listening

By wpclipart.com - http://www.wpclipart.com/sign_language/American_ABCs/index.html, Public Domain, https://commons.wikimedia.org/w/index.php?curid=644254

Resources

How to use Bulk Extractor for Personally Identifying Information

BitCurator digital forensics software and information

PREMIS

Open Archives Information Systems (OAIS) Reference Model

Using PROV with OAIS and PREMIS

Pinecone: open source software for long term, short-term storage

DuraSpace technologies

AP Trust

Digital Preservation Network (DPN)

Archivematica

Conferences:

National Digital Stewartship Alliance's Digital Libraries Federation Conference

Open Repositories

Bibliography and Citations

Digital Curation Center (n.d.). What is digital curation? (n.d.). Retrieved December 22, 2016, from http://www.dcc.ac.uk/digital-curation/what-digital-curation

Digital Curation Center (n.d.). What is digital curation? (n.d.). Retrieved December 22, 2016, from http://www.dcc.ac.uk/resources/curation-lifecycle-model

Reference model for an Open Archival Information System (OAIS) (2nd ed.). (June 2012). Washington, DC: CCSDS Secretariat. https://public.ccsds.org/pubs/650x0m2.pdf

Digital Preservation Definition:

ALCTS Preservation and Reformatting Section, Working Group on Defining Digital Preservation (2007). Definitions of Digital Preservation. Retrieved December 22, 2016, from http://www.ala.org/alcts/resources/preserv/defdigpres0408

Digital Curation Definition:

Li, C., & Sugimoto, S. (2014). Provenance Description of Metadata using PROV with PREMIS for Long-term Use of Metadata. International Conference on Dublin Core and Metadata Applications, 147-156. Retrieved from http://dcpapers.dublincore.org/pubs/article/view/3709/1932

Bagger Workshop

with Ben Pennell

What's a bag?

A specific directory structure, used for transmission or preservation. Containing:

- The things you wanted shipped
- Information about the things that were shipped

Mixing up some metaphors

Amazon Boxes and Bagit Bags

What's a bag have to offer?

- It's standard - other people or systems can understand it
- Can tell if there are missing or unexpected files
- Detect changed files with checksums

Downloading Bagger

Go Here: https://github.com/LibraryOfCongress/bagger

Click on “Releases.” Download version 2.7.3

Or just go here: http://bit.ly/2ikjgXC

If you run into problems…

1) Make sure Java is installed. If not, install Java.
2) Make sure home path variable is set. Find your advanced system settings, navigate to environment. Add path and set home variable.

Running Bagger

1. Go to the location where you downloaded Bagger to
2. Go into the "bin" folder inside of it
3. Double click bagger.bat

Example bag

- Go to https://goo.gl/i87s3L
- Click the download icon in the top right corner
- Unzip treasures.zip where you downloaded it
- In Bagger, click the 

button
- Select the unzipped "treasures" folder and click Open.

Bag Info

Bag Info

File name: /Users/bbpennel/Desktop/treasures

Profile: <no profile>

Bag version: 0.97

Holey Bag?: false

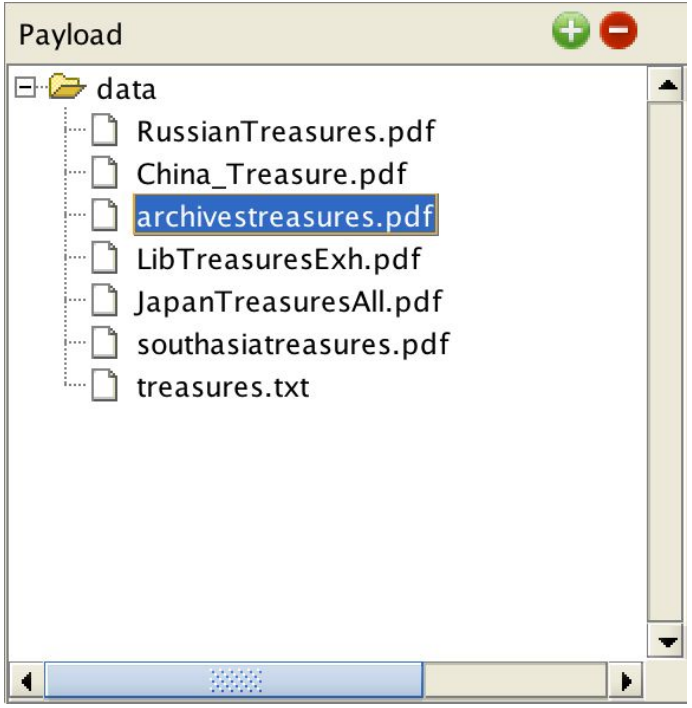
Serialize Type?: none

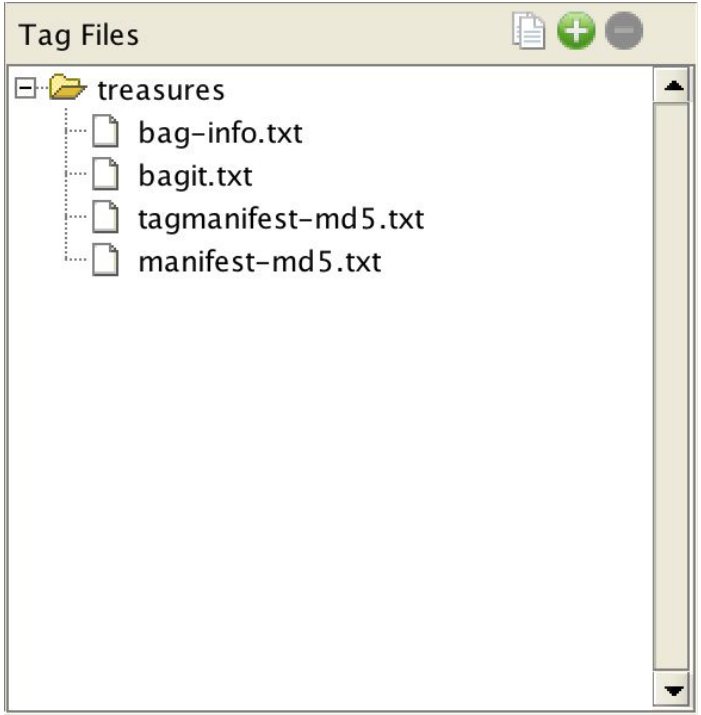
Bag-Info

Standard : Add

Payload-Oxum	966539.7
Bagging-Date	2017-01-03
Organization	University of Hawai'i
Bag-Size	944.1 KB
Title	Treasures from the University of Hawai'i Library

Bag structure





Bag inspection (TSA free!)

- In your file browser, go into the "treasures" folder
- Double click on manifest-md5.txt
- Double click on tagmanifest-md5.txt
- Double click on bag-info.txt
- Look inside the "data" folder

Bag validation

There are two types of validation in Bagger

- 

Valid Bag - Checks that all payload and tag files are present, have the right file sizes, there are no extra files, and performs a fixity check.
- 

Complete - Checks that all payload and tag files are present, there are no extra files, and they all have the correct file size.

Validation Experimentation

- Click on "Validate Bag" and "Is Bag Complete", observe results
- Open treasures.txt in Notepad, make a minor change to it and save
  - Click "Validate Bag" and "Is Bag Complete", what are the results?
- Delete treasures.txt
  - Click "Validate Bag" and "Is Bag Complete", what are the results?

Make a bag in place

- Download https://goo.gl/uyWyi2
- Unzip small-treasures.zip
- View the contents of the unzipped "small-treasures" folder
- In Bagger, click 

Create Bag In Place
- Select the "small-treasures" unzipped folder
- View the contents of the "small-treasures" folder again

Metadataing

In the "Bag Info" panel, try adding yourself as the author (hint, there is a checkbox and an add button)

Click on the "Save Bag" button to update the bag

You can view your new metadata by looking in bag-info.txt

Creating a totally new bag

1. Click 

Create New Bag
2. Click okay with no profile selected
3. Add some new files or folders to the bag 

4. Save the bag 

5. "Save in" - the name you provide will be the name of the bag
6. Serialize Type - Save the bag as a folder or zip file
7. Manifests - Whether to include or not, what kind of checksum

Other Bagger features

- Profiles - Can set up standard metadata templates to start from
- Console
- Holey Bag

Other resources

METS Manifests

Sections

Header

Descriptive metadata

Administrative metadata

File section

Structural maps

Structural links

Behavior

Advantages over bags

Associate metadata with objects

Include information about object structures and relationships

Embed identifiers

Pinecone

https://github.com/UNC-Libraries/pinecone

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stnakaso@ncsu.edu