LIBRARY OF CONGRESS

May 1, 2020

# Would You Like To Save Your Game?

## A Case Study

David Gibson, Amanda May, and Laura Drake Davis

# Project Background/Metadata

**David Gibson, Library Technician**

# Video Game Collection At A Glance

- ~7000 video game titles
  - 2000 CD-ROMs
  - 5000 console titles
  - ~100 magnetic media (e.g. floppy disk, cassette based)
- ~3000 strategy guides
- ~1100 periodicals
- 30 gaming platforms
- Advertising materials
- Source code excerpts

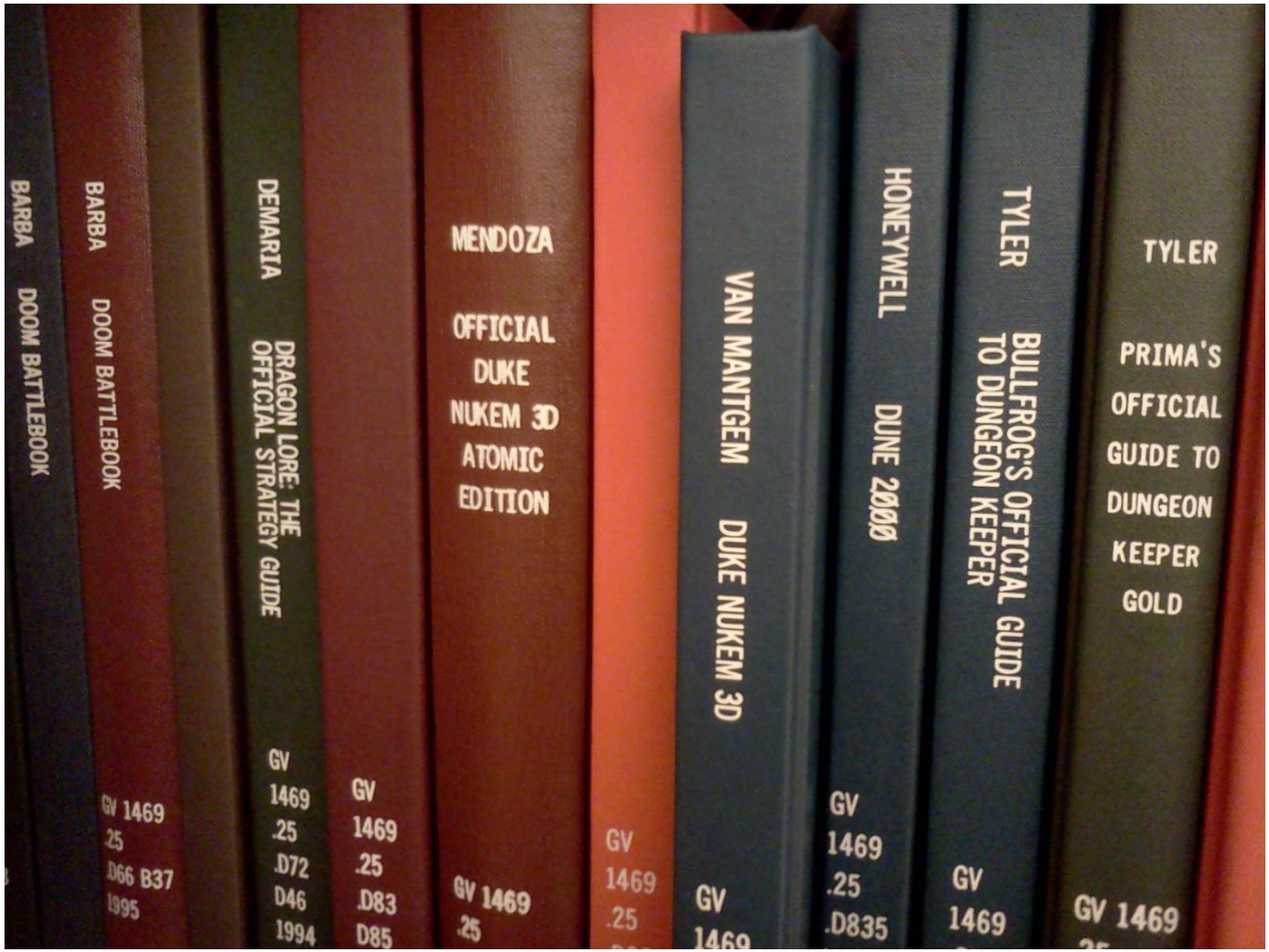
# Two primary modes of acquisition

- Copyright deposit
- Private donation

**In 2006, 1,857 games were transferred to Moving Image section from the Machine Readable Reading Room…**

# Games Transferred From Machine Readable Reading Room

# Bound Strategy Guides



# Gift Collections

# Periodicals

# Note on Project Scope

- The scope of this project includes:
  - Development of an overall workflow for describing and processing video games
  - Development of cooperative relationship with the Preservation Reformatting Division
  - Development of cataloging workflows
  - Development of preservation reformatting workflows
  - Development of an initial access strategy for video games
  - Development of ingest workflows
- The scope of this project does not include emulation
  - The scope of the current project provides the groundwork for future projects

# Challenges To Cataloging Video Games

One title ported to many platforms

# Challenges To Cataloging Video Games

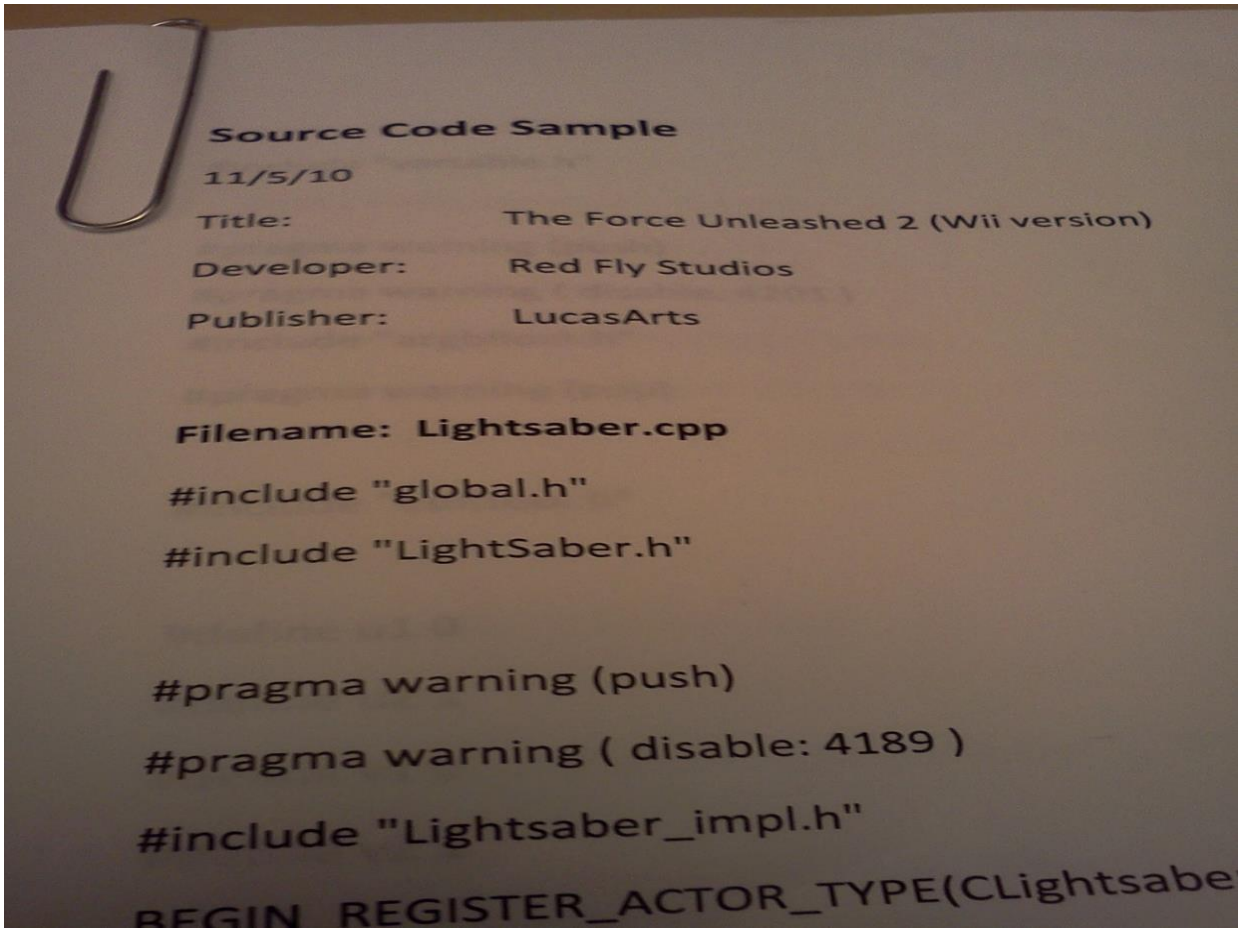
## Foreign language titles

# Challenges To Cataloging Video Games

DVDs and VHS of game play/documentation

# Challenges To Cataloging Video Games

## Source code excerpts



**Source Code Sample**

11/5/10

Title: The Force Unleashed 2 (Wii version)

Developer: Red Fly Studios

Publisher: LucasArts

**Filename: Lightsaber.cpp**

```
#include "global.h"
#include "LightSaber.h"

#pragma warning (push)
#pragma warning ( disable: 4189 )
#include "Lightsaber_impl.h"
BEGIN_REGISTER_ACTOR_TYPE(CLightsabe
```

# Best Practices for Cataloging Video Games

## Using RDA and MARC21

**Version 1.0**

**June 2015**

Online Audiovisual Catalogers. (2015). Best Practices for Cataloging Video Games Using RDA and MARC21 Version 1.0 [PDF file].

Retrieved from https://olacinc.org/sites/capc_files/GameBestPractices.pdf

# General Characteristics of Video Games

- Platforms and formats
  - 250 field
- Editions and expansions
  - 250 field
- Content type
  - 336 field
- Media type
  - 337 field
- Carrier type
  - 338 field
- Systems requirements
  - 538 field

Online Audiovisual Catalogers. (2015). Best Practices for Cataloging Video Games Using RDA and MARC21 Version 1.0 [PDF file].

Retrieved from https://olacinc.org/sites/capc_files/GameBestPractices.pdf

# Advantages of Using RDA

- Ability to describe resource more granularly
- Ability to describe resource's relationships
- Discrete elements allow for better machine manipulation and re-purposing of the data (for linked data purposes)

Online Audiovisual Catalogers. (2015). Best Practices for Cataloging Video Games Using RDA and MARC21 Version 1.0 [PDF file].

Retrieved from https://olacinc.org/sites/capc_files/GameBestPractices.pdf

# Prioritizing For Preservation

- What materials are most at risk?
- What do we have the capability to preserve with the tools available?
- What might we be able to readily provide access to in the future?

# Prioritizing For Preservation

- Focus on CD-ROMs
- 2004 study of Longevity of CD Media by LOC Preservation Research and Testing Division
  - Increasing Block Error Rate (BLER) over 7 year testing period
  - Three consistent failure types:
    - Spots appearing on media
    - Disappearance of metal layer
    - Peeling or flaking of metal layer

Shahani, Chandru J., Basil Manns, Michele Youket, "Longevity of CD Media: Research at the Library of Congress", Preservation Research and Testing Division, Washington, DC.

# Chop Suey (1995, Magnet Interactive Studios)

# Chop Suey ILS Record

MARC | System | History

☑ Suppress from OPAC

Leader: 02972cmm a22004697a 4500 | 006

005: 20190128111029.0 | 007: c:o cga|||||||

008: 170511 s 1995 ___ cau ___ c q__ g _ _ _____ eng _ d

| | Tag | I1 | I2 | Subfield Data |
|---|---|---|---|---|
| | 906 | | | ‡a 7 ‡b cbc ‡c copycat ‡d 4 ‡e ncip ‡f 19 ‡g y-gencompf |
| | 925 | 0 | | ‡a acquire ‡b 1 shelf copy ‡x policy default |
| | 955 | | | ‡a vb26 09-24-97 ‡c vb30 2002-10-11 (rev vb27 2002-10-24) ‡d vb27 2002-10-24 ‡e vb30 2002-11-13 to BCCD ‡i qm03 2017-05-11 DO NOT MODIFY THIS RECORD |
| | 010 | | | ‡a tes2017602101 |
| | 020 | | | ‡a 0793997089 |
| | 024 | 1 | | ‡a 086162970887 |
| | 035 | | | ‡a (OCoLC)ocm35244444 |
| | 040 | | | ‡a OMI ‡c OMI ‡d OCL ‡d OCLCQ ‡d DLC |
| | 042 | | | ‡a lccopycat |
| | 090 | | | ‡a GV1469.27 |
| | 245 | 0 | 0 | ‡a Chop Suey / ‡c developed by Magnet Interactive Studios. |
| | 250 | | | ‡a Macintosh CD-ROM. |
| | 264 | | 1 | ‡a [Canoga Park, CA] : ‡b Magnet Interactive Studios, ‡c [1995] |
| | 264 | | 4 | ‡c ©1995 |
| | 300 | | | ‡a 1 computer disc : ‡b sd., col. ; ‡c 4 3/4 in. + ‡e 1 user's guide (16 pages : color illustrations ; 17 cm) |
| | 336 | | | ‡a two-dimensional moving image ‡2 rdacontent |
| | 336 | | | ‡a computer program ‡2 rdacontent |
| | 337 | | | ‡a computer ‡2 rdamedia |
| ➔ | 338 | | | ‡a computer disc ‡2 rdacarrier |
| | 344 | | | ‡a digital ‡b optical ‡2 rda |
| | 380 | | | ‡a Adventure video game. |
| | 511 | 0 | | ‡a Narrated by David Sedaris. |
| | 538 | | | ‡a System requirements: 68030 CPU (68040 CPU recommended); 8MB RAM (4MB free) or greater; System 7.0 or greater; Apple Quicktime (supplied); Apple multimedia runner (supplied); Apple sound manager (supplied); 13" monitor w/256 color; double-speed CD-ROM drive. |
| | 538 | | | ‡a Disc characteristics: CD-ROM. |

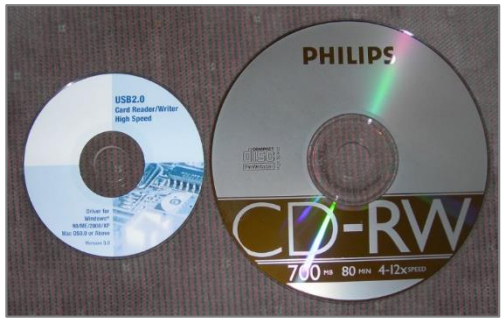
# Preservation Reformatting

**Amanda May, Digital Conversion Specialist**

# Preservation Reformatting Division

- Digital:
  - Digitization of brittle books and foreign newspapers
  - Microfilm digitization
  - **External media reformatting**
- Microfilm
  - Custody, preservation, duplication
- 23 staff

# What is External Media?



# Scope

- Machine Readable Collection (MRC): ~55,000 items
- Geography and Maps (GMD): ~75,000 items
- **MBRS: 7,000 videogames**
- Technical Reports Section: 5,000 items
- Many, many more:
  - International Collections (European, Asian, AMED, Hispanic)
  - Manuscript
  - American Folklife Center, Veterans History Project
  - Congressional Research Service
  - Law Library
  - Music Division
- External Media Surveys: 2009, 2013, 2020

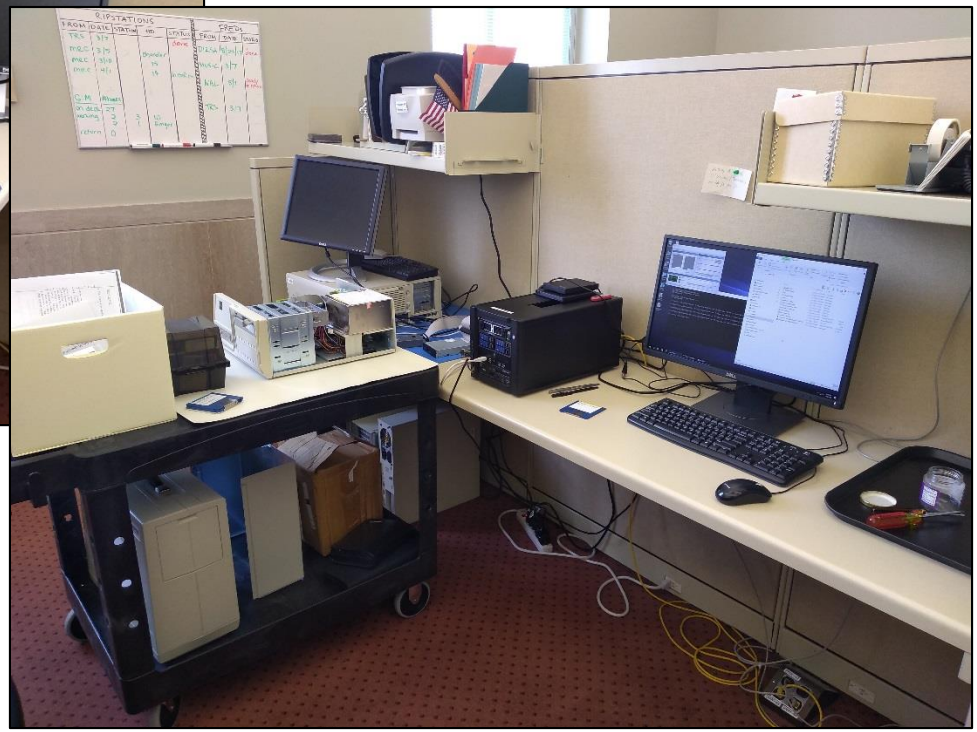
# Collection Examples

# Bit-Level Preservation

- Make a copy, keep it safe.
- Description
- Verification
- Hardware independence

# Combined Interests and Methods

# Preservation Reformatting Division



# Recovery Methods

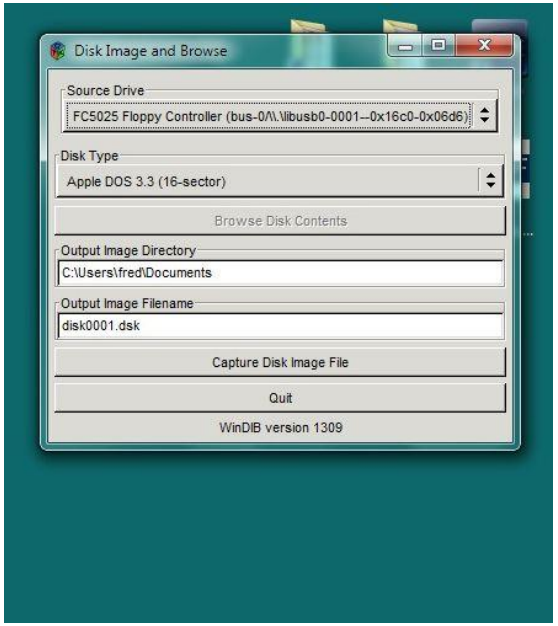
- Hardware
  - Ripstations
  - FREDs
  - KryoFlux
  - FC5025
  - Zip, Bernoulli drives
- Software
  - FTK Imager
  - Forensic Toolkit
  - BitCurator

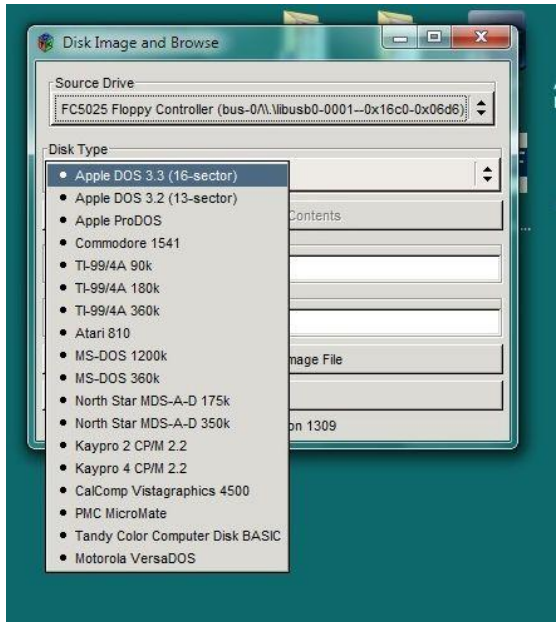
# Ripstation

# Forensic Recovery of Evidence Device (FRED)

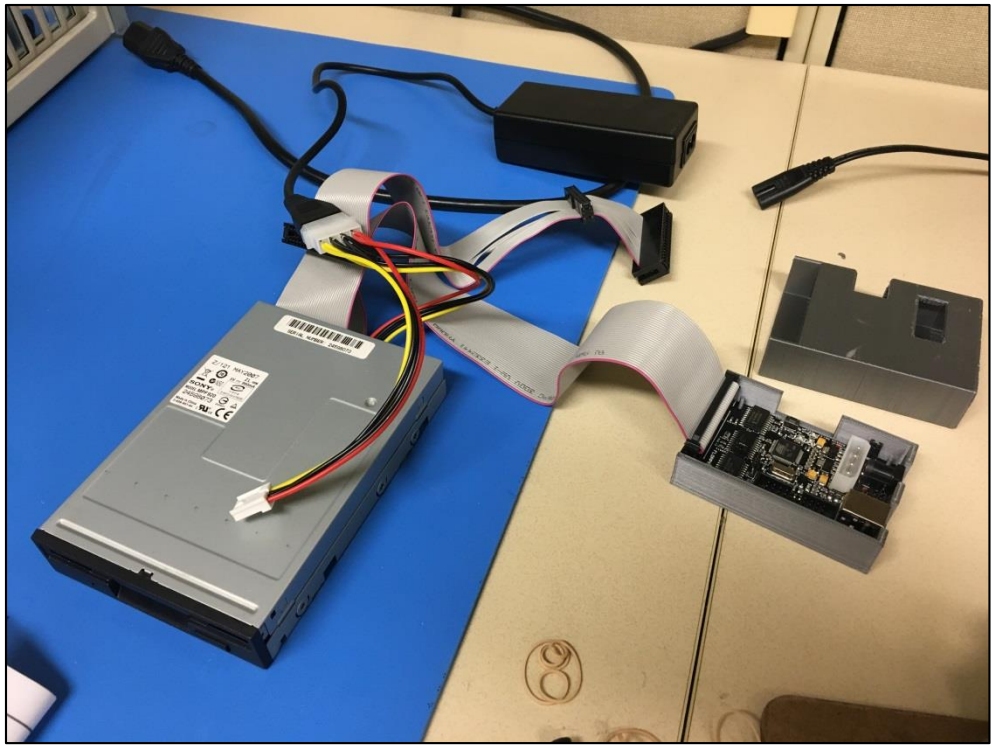
# Franken-Station

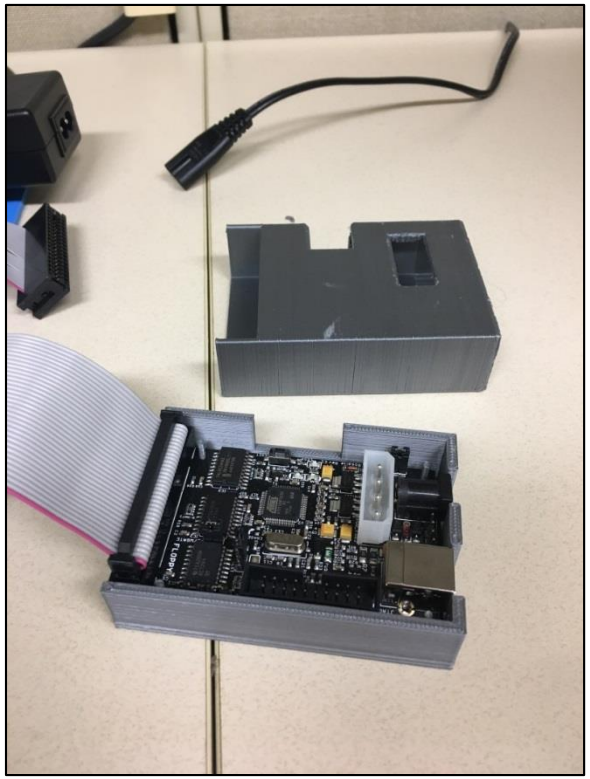
# FC5025


Disk Image and Browse
Source Drive
FC5025 Floppy Controller (bus-0/\\.\libusb0-0001--0x16c0-0x06d6)
Disk Type
Apple DOS 3.3 (16-sector)
Browse Disk Contents
Output Image Directory
C:\Users\fred\Documents
Output Image Filename
disk0001.dsk
Capture Disk Image File
Quit
WinDIB version 1309

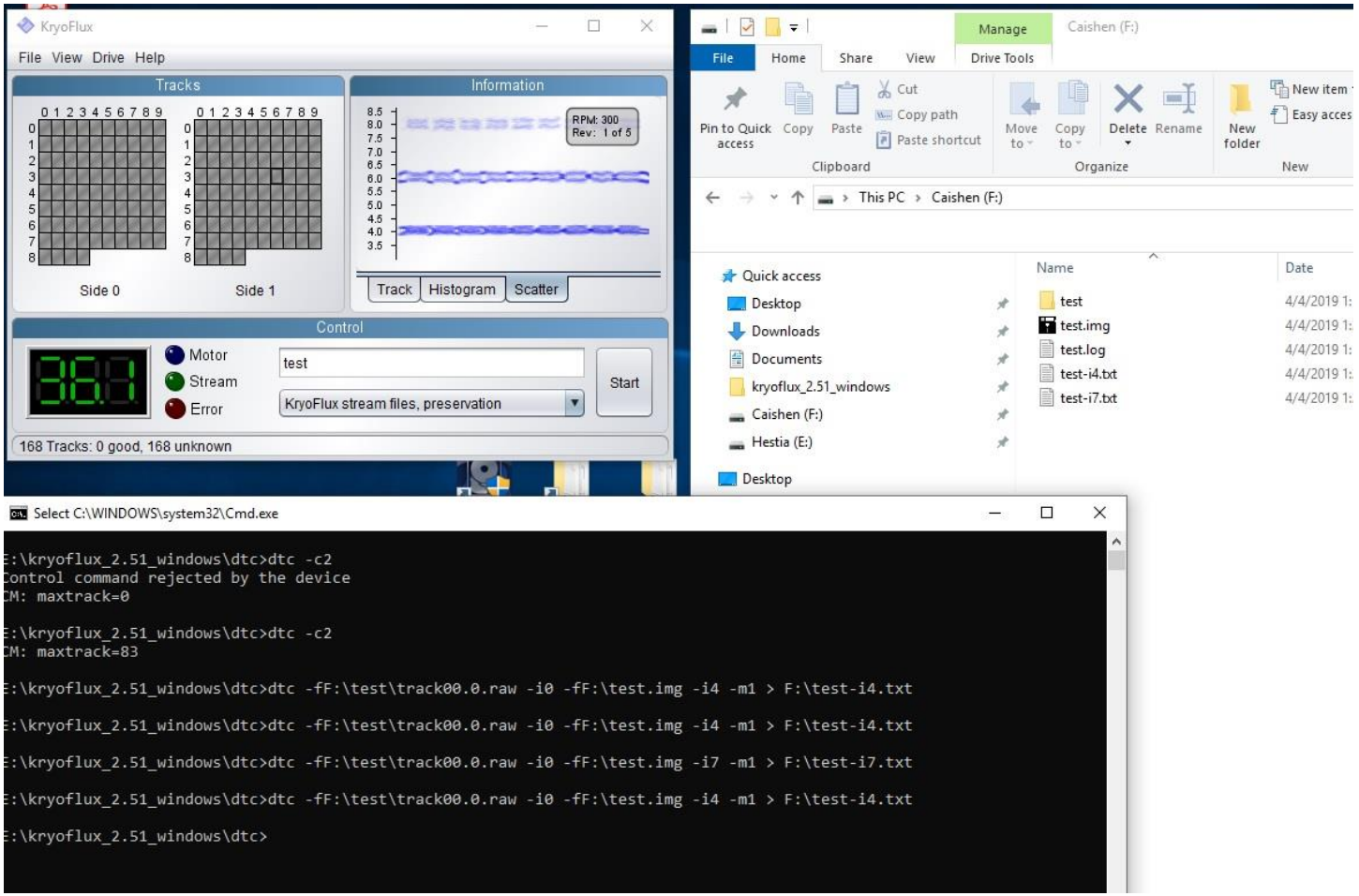

Disk Image and Browse
Source Drive
FC5025 Floppy Controller (bus-0/\\.\libusb0-0001--0x16c0-0x06d6)
Disk Type
Apple DOS 3.3 (16-sector)
Apple DOS 3.2 (13-sector)
Apple ProDOS
Commodore 1541
TI-99/4A 90k
TI-99/4A 180k
TI-99/4A 360k
Atari 810
MS-DOS 1200k
MS-DOS 360k
North Star MDS-A-D 175k
North Star MDS-A-D 350k
Kaypro 2 CP/M 2.2
Kaypro 4 CP/M 2.2
CalComp Vistagraphics 4500
PMC MicroMate
Tandy Color Computer Disk BASIC
Motorola VersaDOS

# KryoFlux

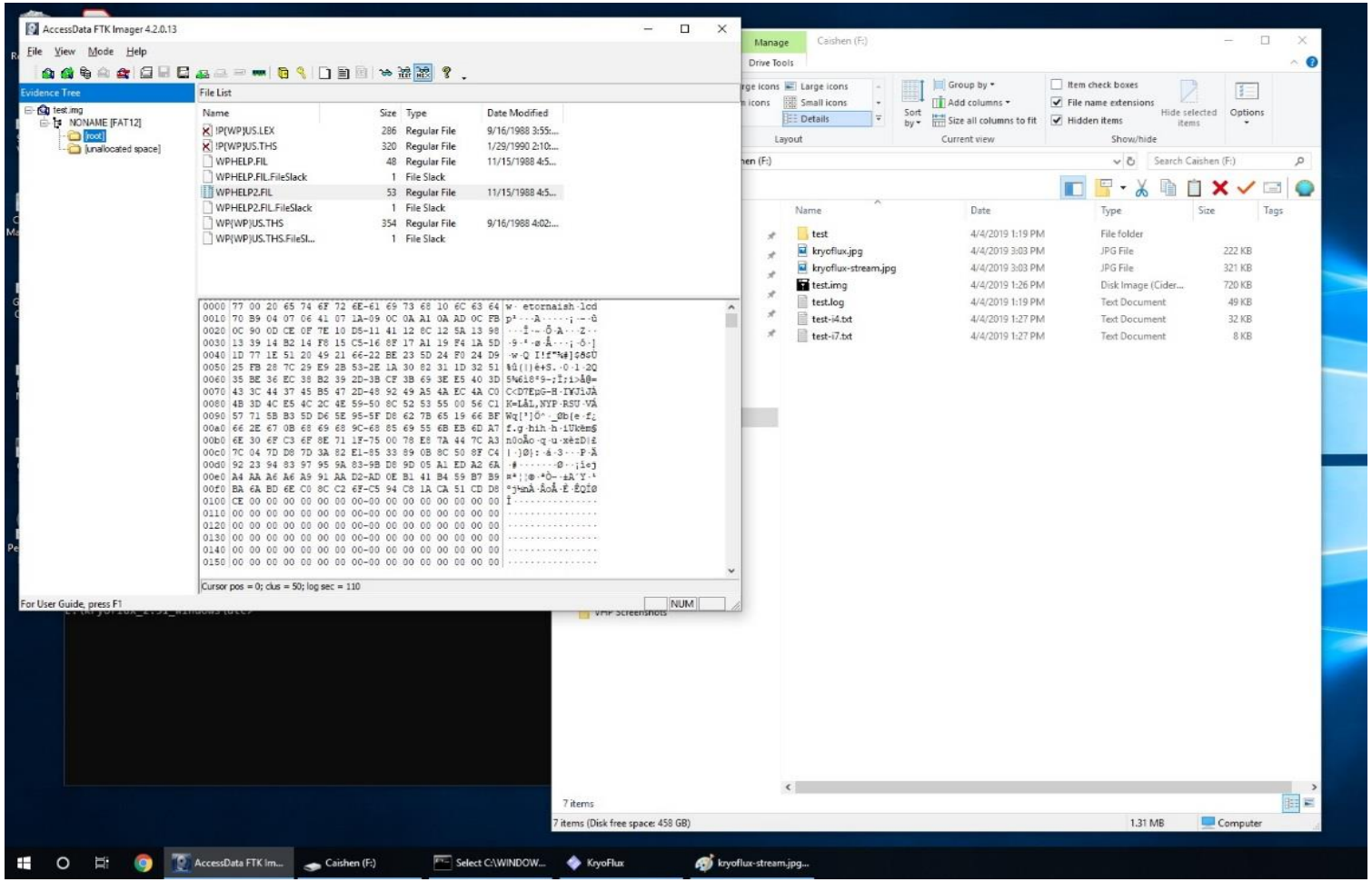




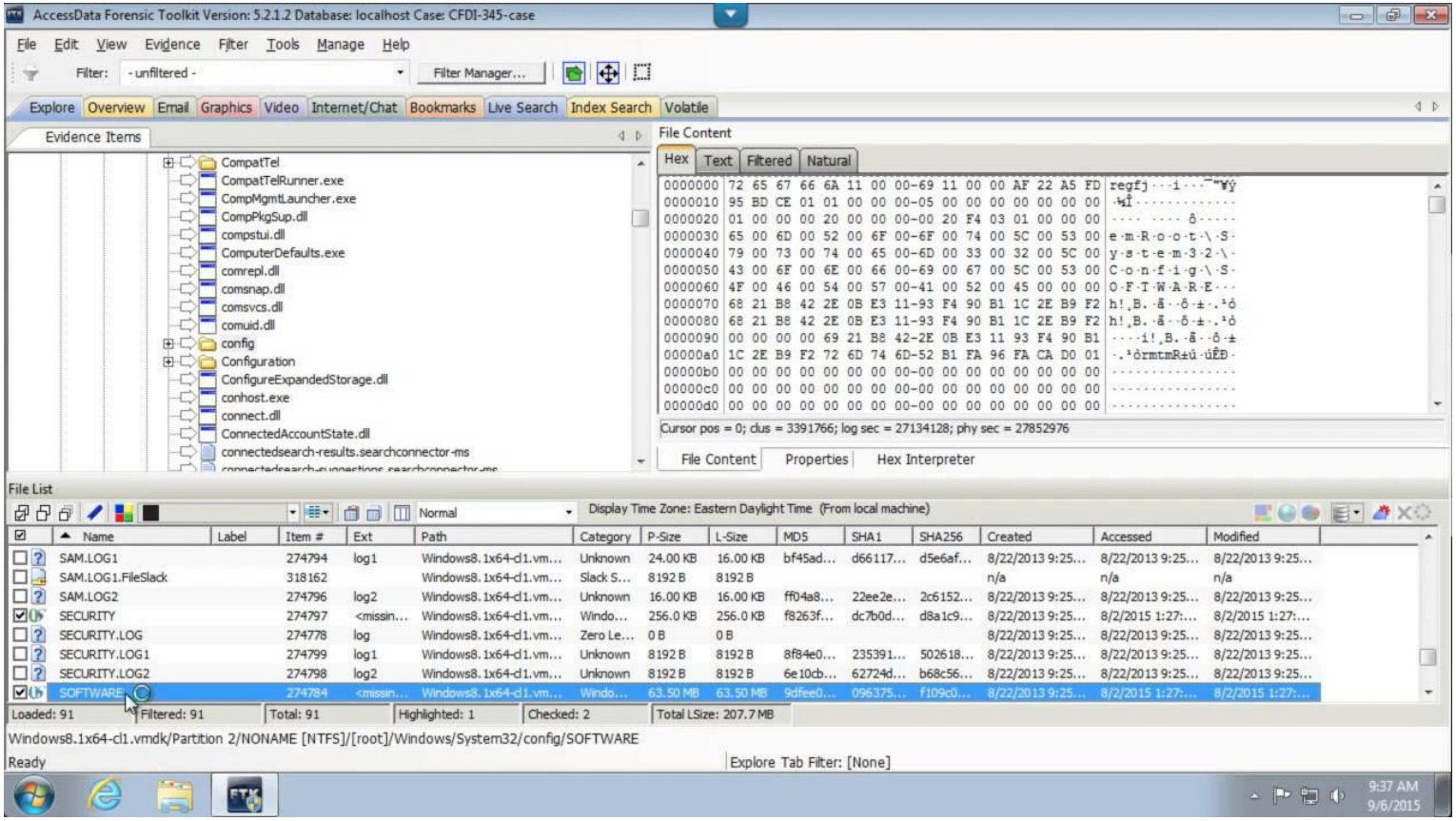
# KryoFlux


KryoFlux
File View Drive Help
Tracks
Side 0
Side 1
Information
RPM: 300
Rev: 1 of 5
Track Histogram Scatter
Control
Motor
Stream
Error
test
KryoFlux stream files, preservation
Start
168 Tracks: 0 good, 168 unknown
Manage
Caishen (F:)
File Home Share View Drive Tools
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organize
New folder
New item
Easy access
New
This PC › Caishen (F:)
Quick access
Desktop
Downloads
Documents
kryoflux_2.51_windows
Caishen (F:)
Hestia (E:)
Desktop
Name
Date
test
test.img
test.log
test-i4.txt
test-i7.txt
Select C:\WINDOWS\system32\Cmd.exe
E:\kryoflux_2.51_windows\dtc>dtc -c2
Control command rejected by the device
CM: maxtrack=0
E:\kryoflux_2.51_windows\dtc>dtc -c2
CM: maxtrack=83
E:\kryoflux_2.51_windows\dtc>dtc -fF:\test\track00.0.raw -i0 -fF:\test.img -i4 -m1 > F:\test-i4.txt
E:\kryoflux_2.51_windows\dtc>dtc -fF:\test\track00.0.raw -i0 -fF:\test.img -i4 -m1 > F:\test-i4.txt
E:\kryoflux_2.51_windows\dtc>dtc -fF:\test\track00.0.raw -i0 -fF:\test.img -i7 -m1 > F:\test-i7.txt
E:\kryoflux_2.51_windows\dtc>dtc -fF:\test\track00.0.raw -i0 -fF:\test.img -i4 -m1 > F:\test-i4.txt
E:\kryoflux_2.51_windows\dtc>

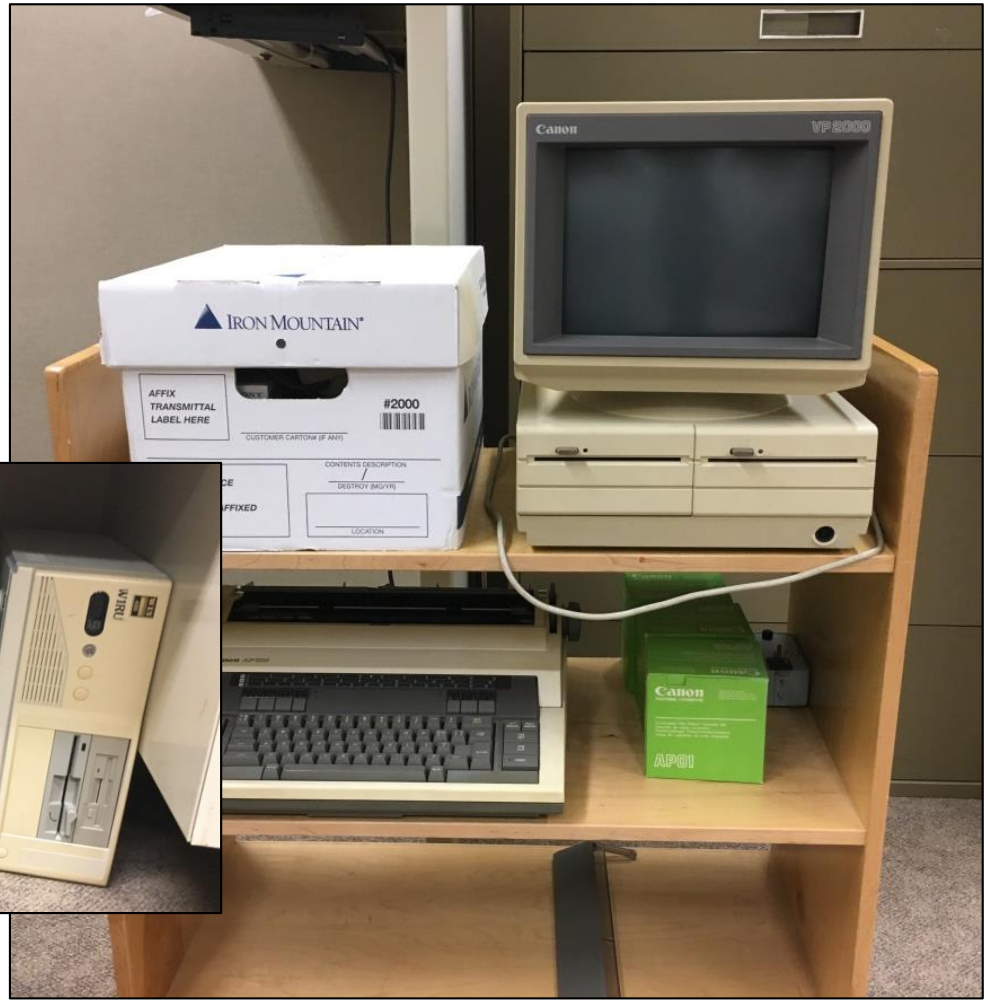
# KryoFlux


AccessData FTK Imager 4.2.0.13
File View Mode Help
Evidence Tree
File List
test.img
NONAME [FAT12]
[root]
[unallocated space]
Name Size Type Date Modified
!P(WP)US.LEX 286 Regular File 9/16/1988 3:55:...
!P(WP)US.THS 320 Regular File 1/29/1990 2:10:...
WPHELP.FIL 48 Regular File 11/15/1988 4:5...
WPHELP.FIL.FileSlack 1 File Slack
WPHELP2.FIL 53 Regular File 11/15/1988 4:5...
WPHELP2.FIL.FileSlack 1 File Slack
WP(WP)US.THS 354 Regular File 9/16/1988 4:02:...
WP(WP)US.THS.FileSl... 1 File Slack
Cursor pos = 0; clus = 50; log sec = 110
For User Guide, press F1
NUM
Manage
Caishen (F:)
Drive Tools
Layout
Current view
Show/hide
Search Caishen (F:)
Name Date Type Size Tags
test 4/4/2019 1:19 PM File folder
kryoflux.jpg 4/4/2019 3:03 PM JPG File 222 KB
kryoflux-stream.jpg 4/4/2019 3:03 PM JPG File 321 KB
test.img 4/4/2019 1:26 PM Disk Image (Cider... 720 KB
test.log 4/4/2019 1:19 PM Text Document 49 KB
test-i4.txt 4/4/2019 1:27 PM Text Document 32 KB
test-i7.txt 4/4/2019 1:27 PM Text Document 8 KB
7 items
7 items (Disk free space: 458 GB)
1.31 MB
Computer
AccessData FTK Im...
Caishen (F:)
Select C:\WINDOW...
KryoFlux
kryoflux-stream.jpg...

# Forensic Toolkit (FTK)



# Parts and Peripherals



# Parts and Peripherals

# Videogame Project

- Planning and Testing
  - Annual Call for Preservation
  - Home videogame collection
- Pilot
  - Testing different formats
- Preservation Package
  - Disk image
  - Exported files
  - Scans of all materials
    - Packaging
    - Manuals
    - Media
    - Accompanying materials

# Videogame Project

- First Batch
  - Monopoly and Chop Suey
  - Capture all accompanying documentation
- Second Batch
  - Blues Clues, Curious George
  - Failure!
  - Better documentation, honing workflows
- Third and beyond
  - Routine and settling in for the long haul
  - Box by box

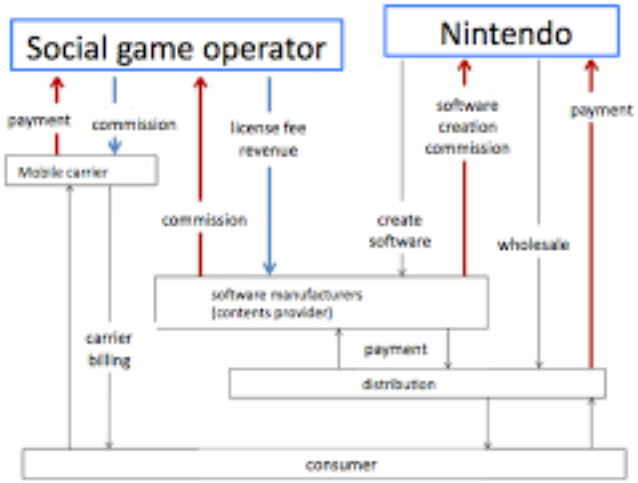
# Preservation Approach

**Laura Drake Davis, Digital Conversion Specialist**

# About the Preservation Approach

- Goal of this project is long-term preservation

- Distribution Models have a significant impact on the preservation approach



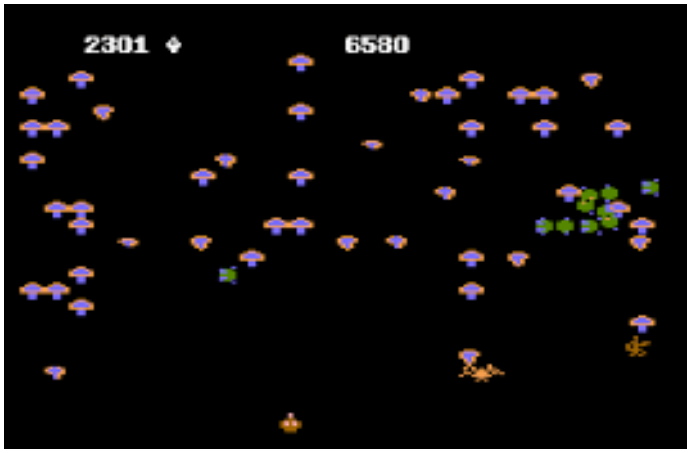

Yamazaki, Fumi. “Business Models of Japanese Social Game vs. Video Game Makers”.

# About the Preservation Approach

- Recommended Formats Statement -Software and Electronic Gaming and Learning
  https://www.loc.gov/preservation/resources/rfs/softgame.html

# Planning for Ingest and Access

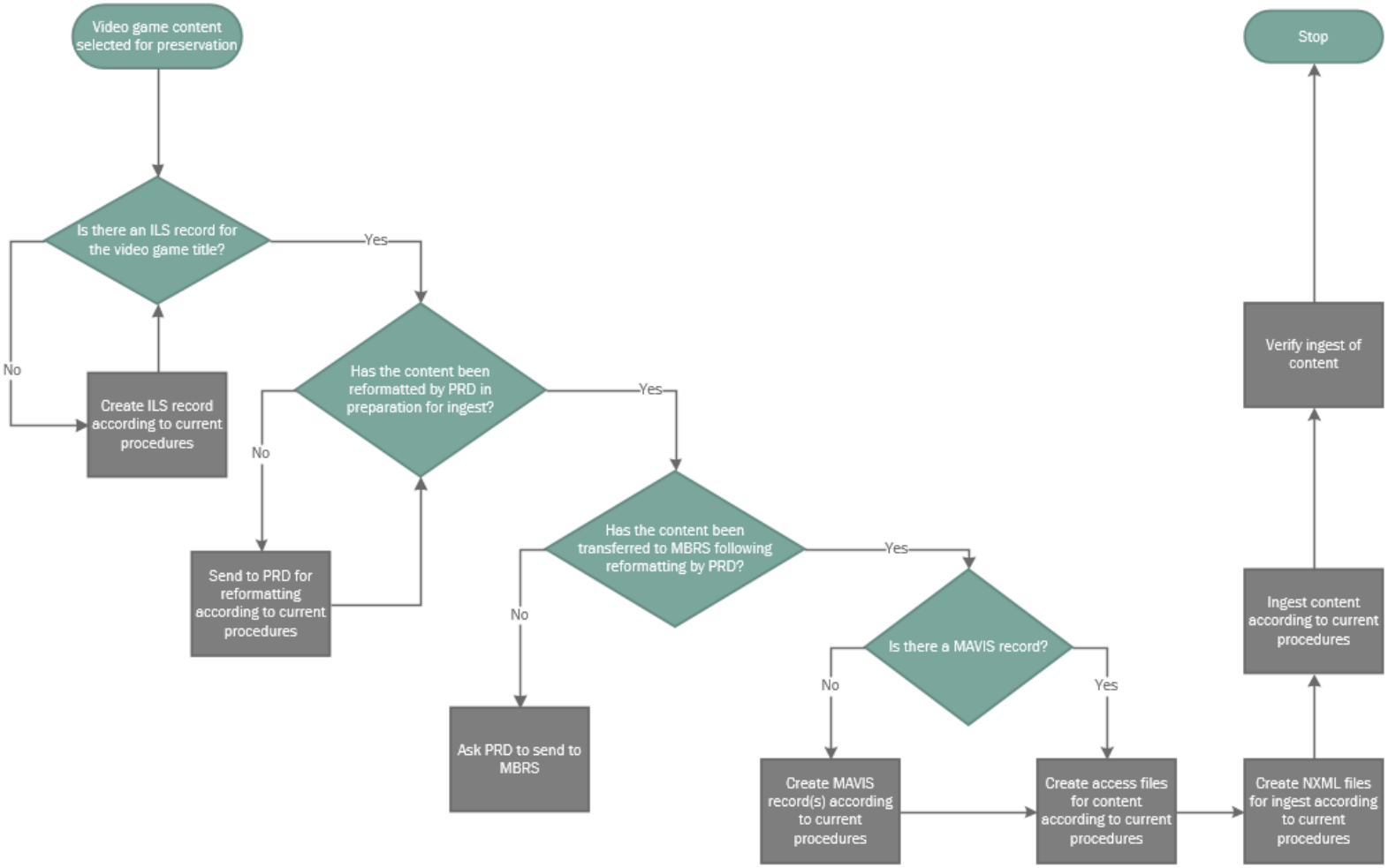
- Impact factors
  - Collection Management System
  - Requirements to Interact with the Media
  - What materials are immediately available



# Ingest Formats

- Game content – ISO image
- Scans – Tiffs for preservation, PDF/As for access
- Photographs – Tiffs for preservation, PDF/As for access

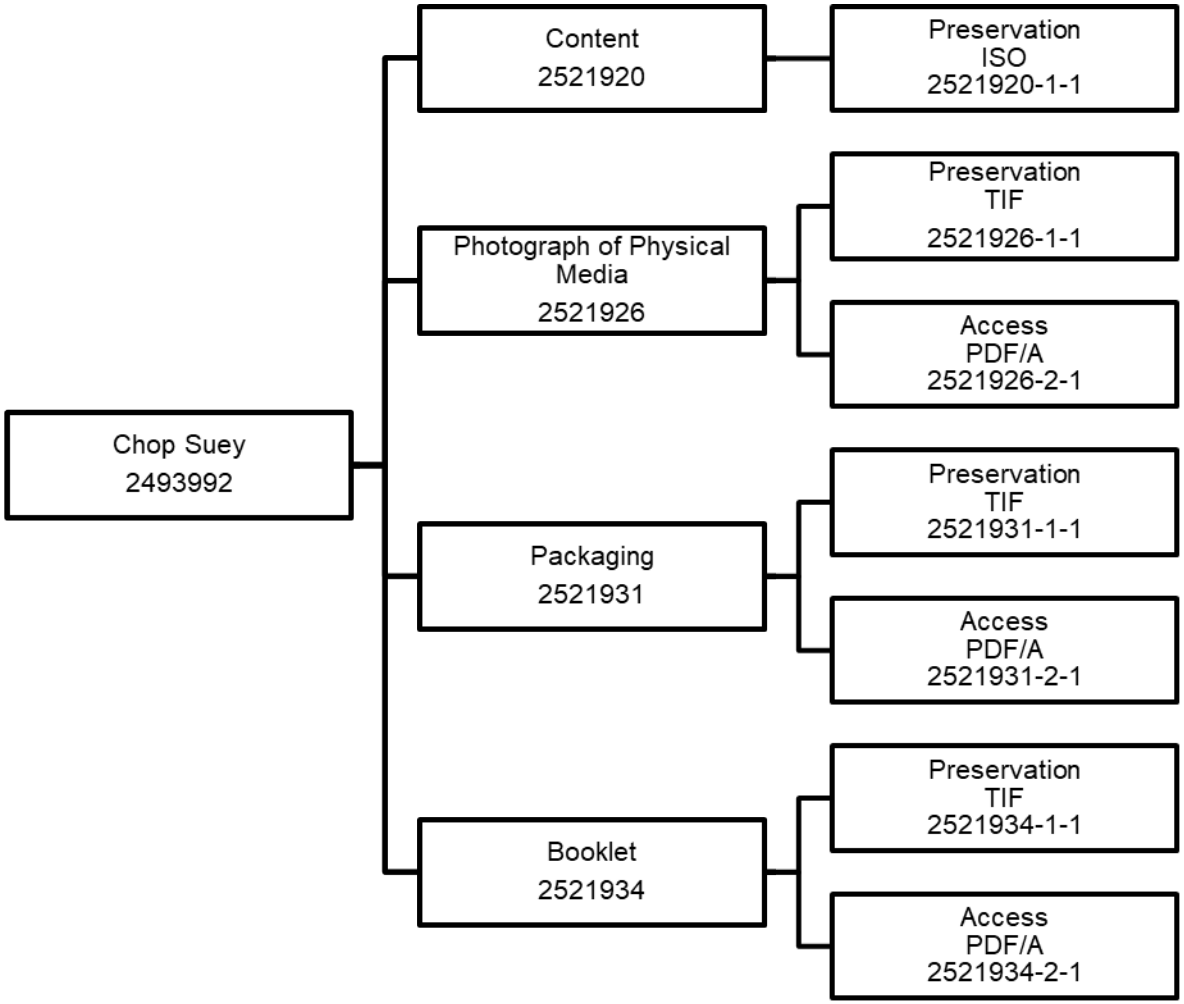
# Video Game Ingest Workflow



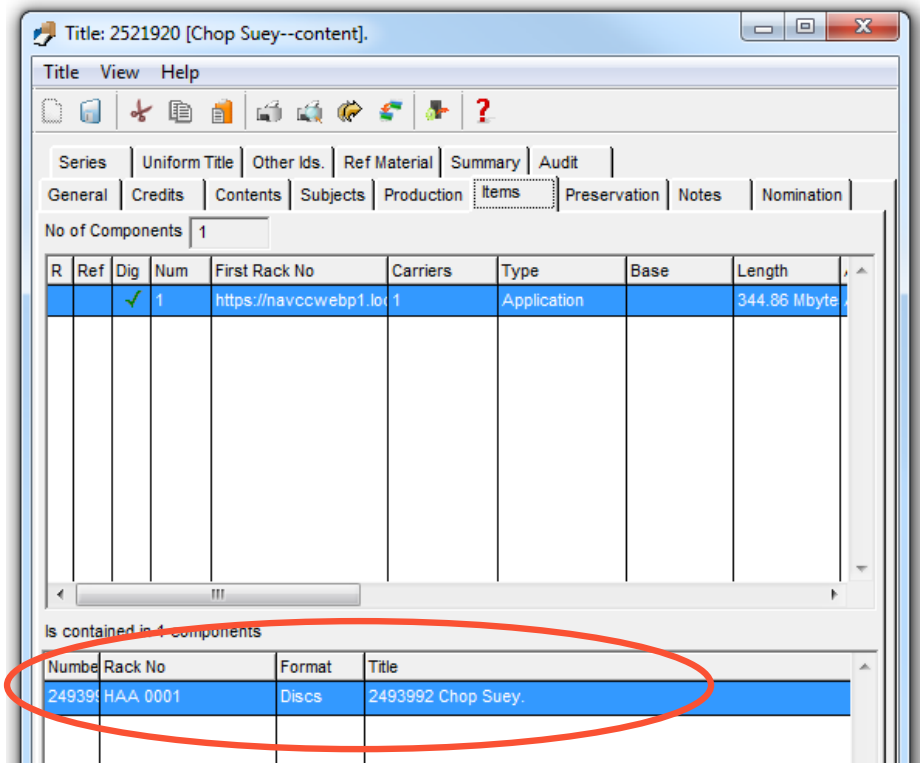
# Access, MAVIS Records, and Ingest

- MAVIS records required to ingest digital content
- For video games, access to the content is limited
  - Hardware/software requirements to access game itself
  - Copyright considerations
- MAVIS not designed to be a primary discovery point for collections items
- MAVIS record structure includes area for “reference materials” – not intuitive for users in discovering content
- Need to ensure users can identify and find content that is available to access now without need for additional software or hardware components

# MAVIS Title Display



# Relationship with Physical Media



Digital: 2521931-2 [Chop Suey--packaging]. of Titles List

Component View Help

Other Identifiers | Rights | Ref Material | Shot Log | Usage | Audit

General | Events | Notes | Files | Copy History/QA | Orders | Stock | Acquisition | Comp Contents

Title: [Chop Suey--packaging].

Item Id: 7894789

Description:

Category: B: Access/Browsing copy

Type: I: Image

Total File Size: 897.25 kbytes

No. Files: 1 ☑ Complete?

Collection:

File Relationship: SE: Sequential

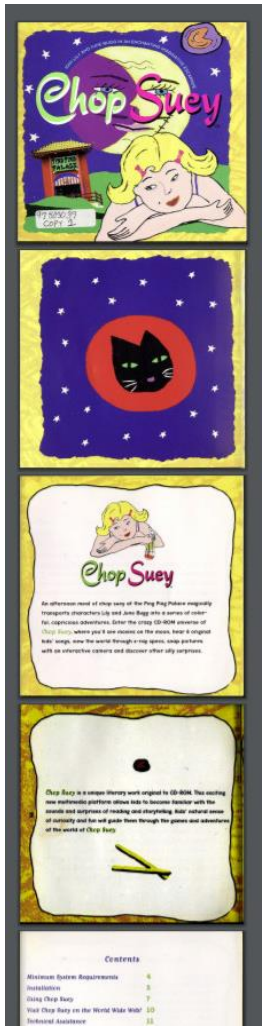
File Format: AP: Application/pdf Variant:

Resource Summary

| File | Res. Id. Type | Resource Identifier |
|---|---|---|
| 1 | URL | https://navccwebp1.loc.gov:8080/navcc/content/view.seam?id=146011 |
| 1 | URN | urn:navcc:contentId:1460115 |

Open Input... | Put File | Open File... | Get File | Link

| Language | Role |
|---|---|
| ENG: English | ORIG: Original Language |



# Lessons Learned and Summary

# Challenges

- Lack of devoted advocacy and resources
- Only receiving some of the games, not all
- Prioritization of titles and resources
- Not a lot use of existing metadata standards
- Access – limited access or no access to the games themselves
  - Copyright issues – intellectual property
  - Physical formats (console-based games)
  - Digital formats (aggregators used to create platform-specific versions)

# Opportunities

- Develop relationship with Preservation Reformatting Division
- Potential for partnerships with video game creators and distributors
- Highlight challenges of video game preservation and access

# Next Steps

- Continue to develop partnerships with video game creators and distributors
- Educate administration on the challenges of video game preservation and access
- Continue to develop partnerships with other institutions preserving video games
- Evaluate resources for emulation services
- Work with LC General Counsel Office to assess risks associated with providing access to actual games

# Questions?

David Gibson – dgib@loc.gov

Amanda May – ammay@loc.gov

Laura Drake Davis – ladavis@loc.gov

# References

Yamazaki, Fumi. “Business Models of Japanese Social Game vs. Video Game Makers”. https://www.serkantoto.com/2012/01/19/graphic-business-models-of-japanese-social-game-vs-video-game-makers-social-games/ Retrieved 5 November 2019.