Collaborative Resources

PEER FORUM I: DISK IMAGING
December 7-8, 2017 at The Museum of Modern Art

The following notes came out of Peer Forum I: Disk Imaging, a discussion as part of the Media Conservation Initiative at MoMA. These notes represent the views of the speakers and participants who attended this meeting.

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Background

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Duryee, Alexander: "An Introduction to Optical Media Preservation" The Code4Lib Journal Syndication. April 16, 2014. Accessed July 22, 2015. http://journal.code4lib.org/articles/9581.

Erway, Ricky. “You’ve Got to Walk Before You Can Run: First Steps for Managing Born-Digital Content Received on Physical Media,” OCLC Research (2012).

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Kirschenbaum, Matthew G. “An Old House with Many Rooms”: The Textual Forensics of Mestery_House.dsk. Mechanisms.

Kirschenbaum, Matthew, Richard Ovenden, Gabriela Redwine. “Digital Forensics and Born-Digital Content in Cultural Heritage Collections,” Council on Library and Information Sources (2010). http://www.clir.org/pubs/abstract/reports/pub149

Lee, Christopher A. and Kam Woods, Matthew Kirschenbaum, and Alexandra Chassanoff, “From Bitstreams to Heritage: Putting Digital Forensics into Practice in Collecting Institutions,” BitCurator Project (2013). http://sils.unc.edu/sites/default/files/news/From%20Bitstream%20to%20Heritage%20S%20%282%29.pdf

Lee, Christopher A., Sunitha Misra, and Kam Woods. “A Web Service for File-Level Access to Disk Images”, Code4Lib Journal 25 (2014).

McDonough, Jerome P.; Olendorf, Robert; Kirschenbaum, Matthew; Kraus, Kari; Reside, Doug; Donahue, Rachel; Phelps, Andrew; Egert, Christopher; Lowood, Henry; Rojo, Susan https://www.ideals.illinois.edu/handle/2142/17097

Woods, Kam, Christopher Lee, Oleg Stobbe, Thomas Liebetraut and Klaus Rechert. 2015. Functional Access to Forensic Disk Images in a Web Service. In Proceedings of the 12th International Conference on Digital Curation (191-195). Chapel Hill, NC: University of North Carolina, School of Information and Library Science.

Woods, Kam, Christopher A. Lee, and Sunitha Misra. 2013. Automated Analysis and Visualization of Disk Images and File Systems for Preservation. In Proceedings of Archiving 2013. Society for Imaging Science and Technology. Springfield, VA. 239-244.

Woods, Kam, and Christopher A. Lee. 2012. Acquisition and Processing of Disk Images to Further Archival Goals. In Proceedings of Archiving 2012 Springfield, VA: Society for Imaging Science and Technology. 147-152.

Woods, Kam, Christopher A. Lee, and Simson Garfinkel. 2011. Extending Digital Repository Architectures to Support Disk Image Preservation and Access. In Proceedings of the 2011 Joint Conference on Digital Libraries.

George Blood Audio, Video, Film. 2014. Preserving Write-Once DVDs. Producing Disc Images, Extracting Content, and Addressing Flaws and Errors. http://www.digitizationguidelines.gov/audio-visual/documents/Preserve_DVDs_BloodReport_20140901.pdf

Olsen, Porter. 2015. Hacking MITH's Legacy Web Servers: A Holistic Approach to Preservation on the Web. http://mith.umd.edu/hacking-miths-legacy-servers/

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Kim, Yunhyong and Ross, Seamus. 2012. Digital Forensics Formats: Seeking a Digital Preservation Storage Container Format for Web Archiving. The International Journal of Digital Curation Volume 7, Issue 2. http://www.ijdc.net/index.php/ijdc/article/view/217/286

Walsh, Tim. “How to Access Digital Files from the Nineties. A Case Study by Tim Walsh” http://www.cca.qc.ca/en/issues/3/technology-sometimes-falls-short/49023/how-to-access-digital-files-from-the-nineties

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Formats and Registries

JISC report examining the principles and practices associated with forensic disk imaging
https://fido.cerch.kcl.ac.uk/wp-content/uploads/2012/11/FIDO-Forensic-Disk-Imaging-Report-v1.pdf

PRONOM Format Registry
https://www.nationalarchives.gov.uk/PRONOM/Default.aspx
Direct link to search PRONOM by format:
https://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=new

DROID tool to programmatically access PRONOM:
http://www.nationalarchives.gov.uk/information-management/manage-information/preserving-digital-records/droid/

Siegfried tool, similar to DROID, for programmatically accessing PRONOM through command line:
Description: https://www.itforarchivists.com/siegfried
Demo video: https://asciinema.org/a/ernm49loq5ofuj48ywlvg7xq6

DPC File Formats and Standards master page:
http://www.dpconline.org/handbook/technical-solutions-and-tools/file-formats-and-standards

Harvard Wiki about Disk Image Formats:
https://wiki.harvard.edu/confluence/display/digitalpreservation/Disk+Image+Formats

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Disk Imaging and Environments

Definition / History

Link to A (Brief) History of Disk Imaging slides:
https://goo.gl/mmLKn5

Disk imaging / simple definitions on Forensics Wiki:
http://forensicswiki.org/wiki/Disk_Imaging

Imaging (Old) IDE Disks — Harder than Imagined (article by Klaus Rechert about a case of multiple imaging passes on drives producing different MD5 checksums)
http://bw-fla.uni-freiburg.de/wordpress/?p=788

Tools

BitCurator Environment (includes several imaging and analysis tools):
https://wiki.bitcurator.net/ (download the Quickstart Guide for directions on getting started)

FTK Imager No-cost forensic imaging tool to run on Windows
https://accessdata.com/product-download/ftk-imager-version-4.1.1

Disktype and supported type list:
http://disktype.sourceforge.net/

(Older) survey of forensic disk image formats:
http://www.dfrws.org/sites/default/files/survey-dfrws-cdesf-diskimg-01.pdf

Isolyzer
http://openpreservation.org/blog/2017/07/12/update-on-isolyzer-udf-hfs-and-more/
Isolyzer GitHub repository - readme.md contains information and resources on common optical media filesystems:
https://github.com/KBNLresearch/isolyzer

Floppy Disks
Python-based Tool for trying to identify disk file system formats from kryoflux raw stream files
https://github.com/euanc/DiskFormatID

Ghost
https://support.symantec.com/en_US/article.TECH140190.html

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Workflows

Yale's Born Digital Archives Accessioning Service (includes workflow and q/a documentation) - separate process for non-archival media
https://guides.library.yale.edu/c.php?g=300384&p=3593184

Python script for reporting from Guymager log files:
https://github.com/euanc/GuymagerLogParser

Write Blocking and Disk Cloning Devices

Forensic Recovery of Evidence Device (FRED) - specialized PC to acquire materials
https://www.digitalintelligence.com/products/fredselect/

Standalone forensic imager:
https://www.digitalintelligence.com/products/forensic_imager_tx1/

Software write blocking may be a path for you to explore, but software write blocking in *general* is a fallacy
http://mykeytech.com/softwarewriteblocking2-4.pdf
http://www.forensicswiki.org/wiki/Write_Blockers

Emulation and Emulators

Emulation-as-a-Service [EaaS] original project page
http://bw-fla.uni-freiburg.de/

Emulation-as-a-Service [EaaS] Recent installation and setup guide
http://openpreservation.org/blog/2017/09/15/getting-started-with-emulation-the-eaas-desktop-application/

Quick link to EaaS setup (simplest - requires installing Docker)
http://eaas.uni-freiburg.de/docs/install/docker.html

Example of EaaS running at Rhizome
http://archive.rhizome.org/theresa-duncan-cdroms/

Introduction to an emulation-based preservation strategy for software-based artworks
http://www.tate.org.uk/download/file/fid/105887

Cory Arcangel's *Bomb Iraq* on the web
http://media.rhizome.org/emulating-bomb-iraq-arcangel/index.html

SuperClock!
https://www.macintoshrepository.org/2366-superclock-4-0-4

QEMU image support guide (includes simple explanation of qcow):
https://en.wikibooks.org/wiki/QEMU/Images
Download page
https://www.qemu.org/

DOSBox
https://www.dosbox.com/information.php?page=0

MAME multi-purpose emulation framework
http://mamedev.org/

Fuse Emulator
http://fuse-emulator.sourceforge.net/

Mobile Device Imaging and Analysis

Why it's getting harder to extract data from iOS devices:
https://blog.elcomsoft.com/2017/09/new-security-measures-in-ios-11-and-their-forensic-implications/

Tools to image iPhones and Android devices:
https://www.magnetforensics.com/magnet-acquire/ (note their warnings on how little you'll get!)
https://www.blackbagtech.com/blacklight.html (*logical* acquisition and analysis of some devices)

Forensic Analysis for iOS Devices
https://www.sans.org/reading-room/whitepapers/forensics/forensic-analysis-ios-devices-34092

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Metadata and System Metrics

PREMIS: Metadata on preservation activities around digital objects
https://www.loc.gov/standards/premis/

Wikidata
www.wikidata.org
https://www.wikidata.org/wiki/Wikidata:Introduction

Wikidata for digital preservation
https://guides.library.yale.edu/WikidataDigitalPreservation
http://openpreservation.org/blog/2016/09/30/wikidata-as-a-digital-preservation-knowledgebase/

TOTEM Project
http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=15739
See report/model in this google doc

Cataloging

McDonough, Jerome P. "'Knee-Deep in the Data': Practical Problems in Applying the OAIS Reference Model to the Preservation of Computer Games." *Proceedings of the 45th Hawaii International Conference on System Sciences* (2012).[1]
https://www.computer.org/csdl/proceedings/hicss/2012/4525/00/4525b625.pdf

Documentation

Rough Draft of Denver Art Museum Disk Imaging Procedures (subject to change)

{File System information}

For Windows
https://regripper.wordpress.com/
For Mac
https://github.com/bolodev/osxripper

{Processor serial number BIOS}
For Microsoft
BIOS [Basic Input Output System interface between hardware and operating system]
http://www.dell.com/support/article/us/en/04/sln284433/what-is-bios-and-how-to-update-the-bios-on-your-dell-system?lang=en

https://www.intel.com/content/www/us/en/support/articles/000005547/boards-and-kits/desktop-boards.html

{System Reports}
For Mac OS
https://support.apple.com/en-us/HT203001

{DFXML of Disk Images}
https://wiki.bitcurator.net/index.php?title=Generating_DFXML_Output

{Hardware Validation/Failure}
S.M.A.R.T Status [Self Monitoring Analysis and Reporting Technology] for disk drive health and potential problems
For Windows
http://smartlinux.sourceforge.net/smart/index.php
For Mac
https://www.techwalla.com/articles/how-to-check-a-macs-smart-status

Other

Software Preservation Network
http://www.softwarepreservationnetwork.org/

Rendering Matters Report
http://archives.govt.nz/rendering-matters-report-results-research-digital-object-rendering

Rendering Matters Report Visual Examples
http://archives.govt.nz/resources/information-management-research/rendering-matters-report-results-research-digital-object-0

NESTOR (Network of Expertise in long-term Storage of digital resources in Germany)
http://www.langzeitarchivierung.de/Subsites/nestor/EN/Home/home_node.html

Brightsign
https://www.brightsign.biz/

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Optical drives and media
Opti Drive Control testing
http://www.optidrivecontrol.com/

Floppy disks
Description of IBM MFM encoding (very common floppy disc filesystem) standard from National Semiconductor Corporation, 1989:
http://info-coach.fr/atari/hardware/_fd-hard/AN-505.pdf

Solid State Drive (SSD) performance test specification from 2017:
https://www.backblaze.com/blog/hard-drive-stats-for-2017/

"Challenges of Removable Media In Digital Preservation" by Eddy Colloton, Resources list

Margaret Hedstrom, Christopher Lee, Judith Olson, and Clifford Lampe (2006) "The Old Version Flickers More": Digital Preservation from the User's Perspective. *The American Archivist*: Spring/Summer 2006, Vol. 69, No. 1, pp. 159-187.
https://doi.org/10.17723/aarc.69.1.1765364485n41800