

# OPTICAL DISK FILE TRANSFER MANUAL

**Digital Preservation Unit**

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# THE WORKFLOW

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## PART I: PREPARATION

### [STEP 1] Create Tracking Database

Create a working database on Google Sheets. This sheet will help keep track of the optical disks that have been imaged and their results.

If the content is coming from Special Collections Research Center (SCRC), add another sheet to the Preservation Imaging and Logical Transfer Inventory found [here](#). Content from SCRC should come with a finding aid. Incorporate any information you find necessary from the finding aid into the working database.

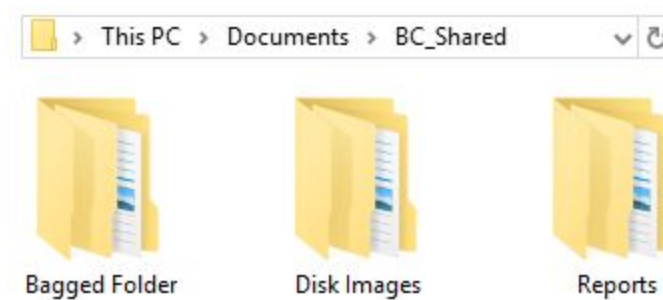
Barcode all media, reconciling the finding aid with items sent to Buhr. Notify the Digital Preservation Librarian of any discrepancies. If the media has a storage case or container, the media item and storage case or container should be given the same barcode and added to the working database.

Input the following information into the working database:

- ▶ Last handled: date the media/media image was last handled
- ▶ Collection: John Sayles
- ▶ Unique ID: copy from the inventory spreadsheet
- ▶ Barcode: barcode of media
- ▶ Label: label on the media
- ▶ Type: type of media
- ▶ Imaging Results: drop down
- ▶ Bad Sectors: note any bad sectors from the imaging results
- ▶ Mount Results: drop down (based on Brunnhilde results)
- ▶ Virus Check Results: drop down (based on Brunnhilde results)
- ▶ Bag Check: write “Y” or “N” for whether package was bagged or not
- ▶ Reports Created: “Y” or “N” for whether reports directory for SCRC and the Digital Preservation Librarian have been copied from the *metadata* folder
- ▶ Transfer Check: write “Y” or “N” for whether bag was transferred or not to DeepBlue
- ▶ Notes: any information regarding the disk (e.g. bent slider) or tools (e.g. Brunnhilde froze)

### [STEP 2] Prepare Main Directories

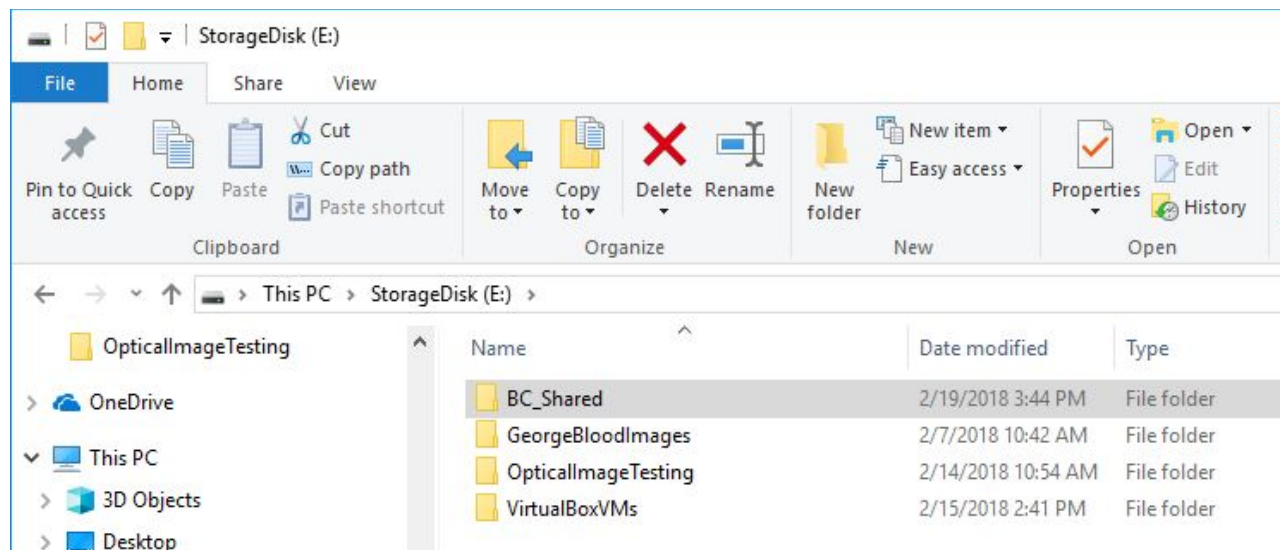
Prepare three directories named *Disk Images*, *Reports*, and *Bagged* in the *BC\_Shared* folder, which is the folder shared by the BitCurator Virtual Machine (BC VM) and the host computer. It is *BC\_Shared* on the host computer and *sf\_BC\_Shared* on the BC VM.



- These directories distinguish the folder you generate when you create a disk image, the final bagged folder created through Bagger, and the reports that will be sent off to Special Collections and the Digital Preservation Librarian.

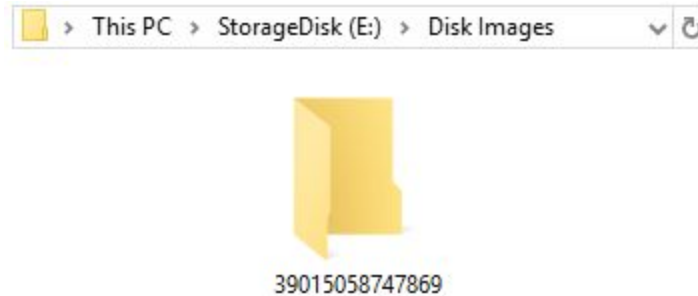


- The *sf\_BC\_Shared* folder can be found on Darth's StorageDisk (E:) or Ms. Pacman's Document folder on the host computer (image below). It is on the BC desktop on the VM (image above).

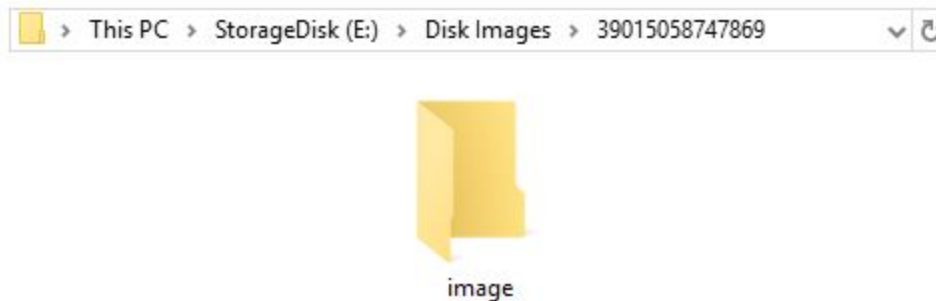


### [STEP 3] Prepare Media Directory

- ▶ Create a new folder inside the *Disk Images* folder. Use the barcode scanner to scan the barcode number on the media as the file name.

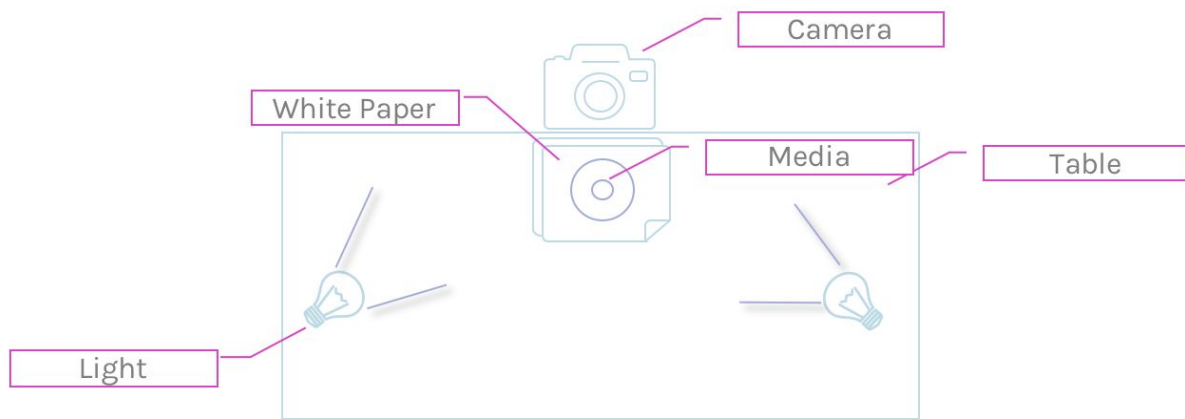


- ▶ Within that new folder, create a new folder called *image*. Other folders will be generated using Brunnhilde on the BC VM.



### [STEP 4] Photograph Media

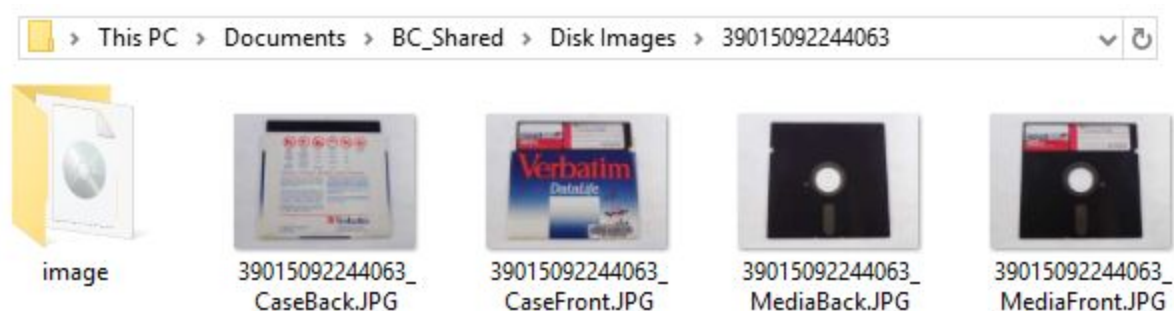
- ▶ Next, set up your photographing station by placing a white piece of paper under the cloth to make the backdrop as white as possible.
  - ▷ Make sure to put the paper as close to edge of the table as possible.
  - ▷ If there is lint or other debris on the white backdrop, use tape to make it as clean as possible.
  - ▷ An iron is available for removing wrinkles. Keep it on the synthetic setting and use towels to protect the material from full heat.
- ▶ Place the media you are photographing about an inch or two away from the edge of the table.
- ▶ Point the lights at a 45 degree angle towards the media, but not so directly that the reflection of the light is too strong.
  - ▷ You can also adjust the strength of the lights by moving them closer to or further away from the object.



- ▶ Attach the camera to the tripod and angle the camera lens so that it can capture a flat image of the media.
  - ▷ You may not be able to get it completely flat without photographing outside of the white backdrop. Get it as flat as possible.



- ▶ Zoom into the media to ensure that there is only the white backdrop in the background.
- ▶ Photograph the front and back sides of the media.
- ▶ Photograph the front and back sides of the storage case for the media. This is especially important if the case contains relevant writing or a barcode. (However, both the media and its case should have a unique ID handwritten on them).
  - ▷ Take 3 sets of photos (resulting in a total of 12 photos per media and case) that are set to different exposures.
    - To set the exposure, turn the camera on.
    - Then, click the button with the +/- signs that is situated on the right hand side of the camera.
    - Take photos of the front and back of the media at exposures 0.0, +0.3, and +0.7.
    - You can also use the timer function to help prevent blurry photos, especially with optical disks. This function is opposite the exposure function mentioned above.
  - ▷ Upload images to the computer using the camera cable.
  - ▷ Select the photos with the most similar lighting of the highest quality. Move them into the appropriate barcode folder and delete all the photos on the camera before unmounting.
  - ▷ Rename the photos with the barcode underscore and description of the image.
  - ▷ Some descriptions you can use are:
    - MediaFront
    - MediaBack
    - CaseFront
    - CaseBack
    - Notes01
  - ▷ An example for an optical disk would "1234567890\_MediaFront"



Save the photographs you have taken of the media in the barcoded folder for the disk image. These will later be dragged into the metadata folder that Brunnhilde generates.

## PART II: DISK IMAGING

### [STEP 5] Configure Hardware for Disk Imaging

#### CD/DVD

Insert the CD/DVD into computer disk drive.

The computer will detect the media once inserted and open a new window. Exit out of it.

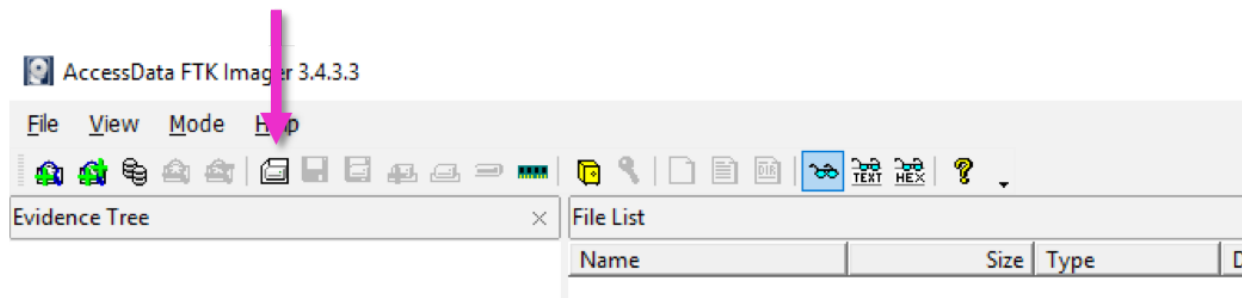
### [STEP 6] Create Disk Image and Generate Checksums

#### FTK IMAGER

- ▶ Open FTK Imager on the host computer desktop.

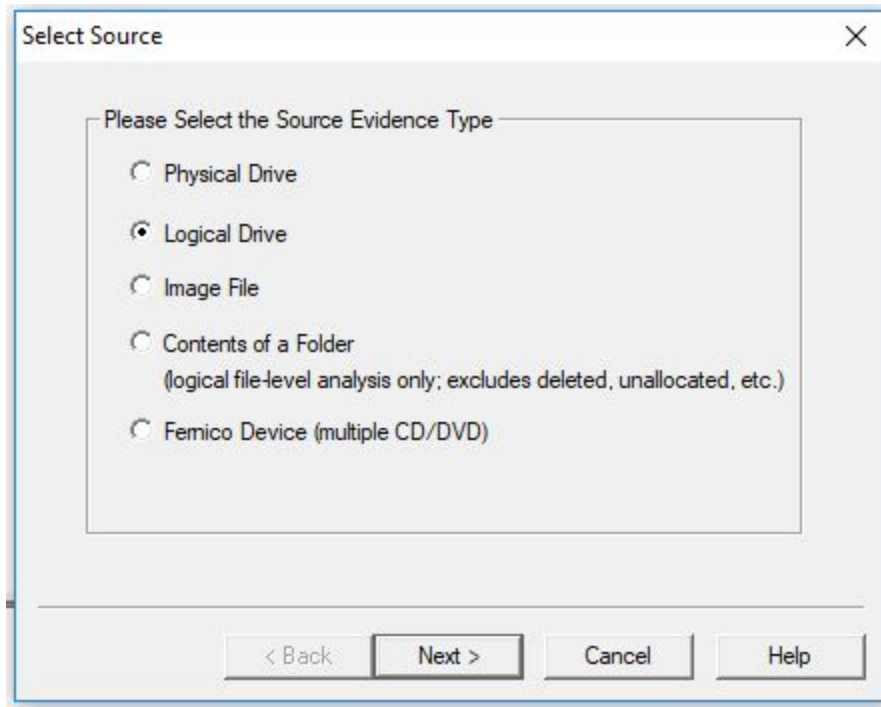


- ▶ It may prompt you to enter the username and password or ask permission to start the program. Enter in the information and FTK Imager will open.
- ▶ Once FTK Imager is open, click the "Create Disk Image" icon (see picture below).

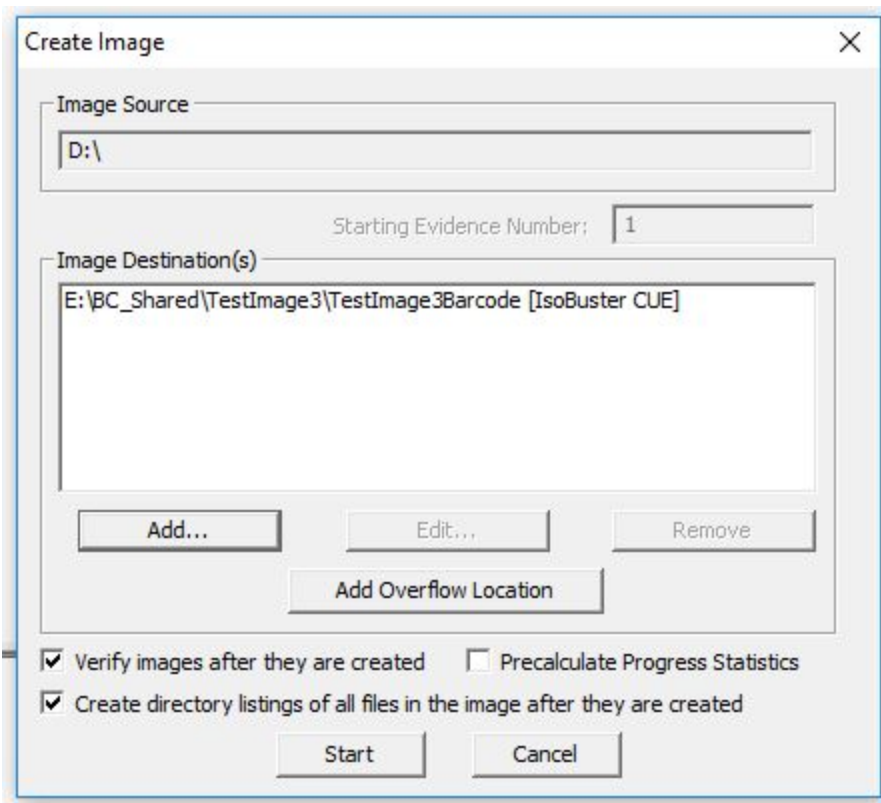


- ▶ A dialogue box will prompt you to select a source. Select "Logical Drive" and click "Next".

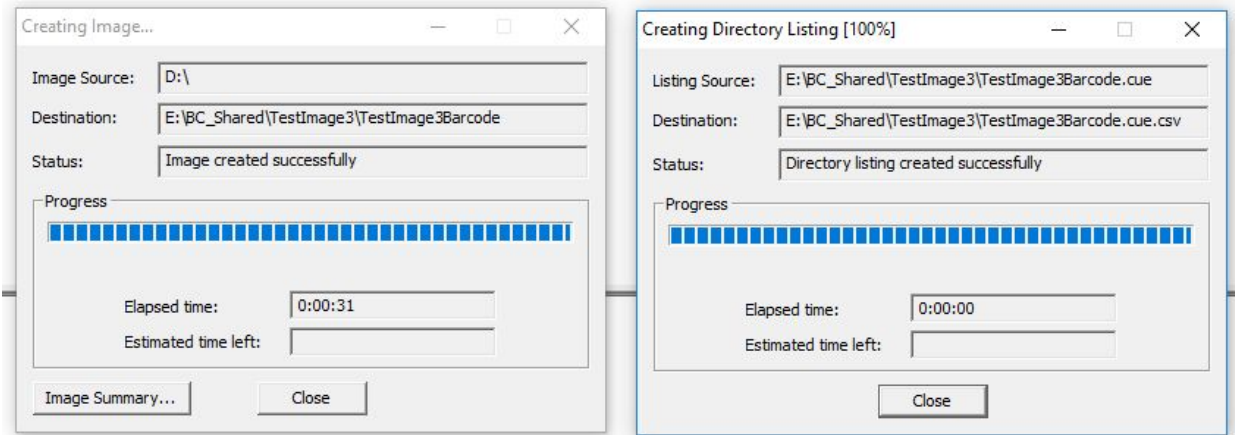




- ▶ Then, you will be prompted to select the source drive. Select “D:\” (this will always be the disk drive) and click “Finish”.
- ▶ Another dialogue box will pop up that says “Create Image”. The “Image Source” should automatically be set to the disk drive.
- ▶ Click “Add” under “Image Destination(s)” and then “browse” in the next window.
- ▶ Find the barcode directory created earlier for media photos under StorageDisk(E:) and select the *image* folder created in [\[Step 2\]](#).
- ▶ This will take you back to the original “Create Image” dialogue box. Make sure that everything is checked except for the “Precalculate Progress Statistics” (see image below). Then click “Start”.



- ▶ This will begin the imaging process. Once the imaging is complete, another dialogue box will open called “Creating Directory Listing [100%]”. You may not recognize when the imaging is complete because the dialogue box notifying its completion looks almost identical to the “Creating Image...” dialogue box and appears in the same exact location.
  - ▷ FTK does not tell you if a disk is unable to be imaged. It will freeze instead. If it does, mark it as “unsuccessful” under the “imaging-result” column on the Preservation Imaging and Logical Transfer Inventory spreadsheet and move on to the next disk. You can try this disk again at a later time as it might succeed the second time.
- ▶ Click “Close” twice in both windows after you recognize that the “Completed Directory Listing” dialogue pops up (see image below).

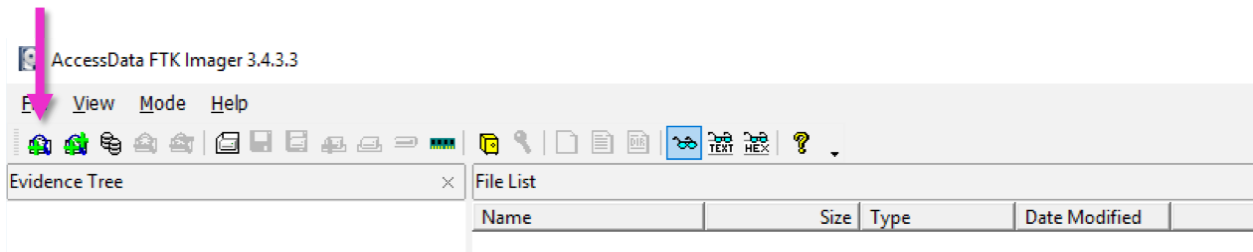


- ▶ Eject the disk from the computer.

### VERIFYING ONE ISO FILE

(Instructions for images with more than one ISO files are below)

- ▶ Click “Close” twice in both windows after you recognize that the “Completed Directory Listing” dialogue pops up (see image below).
- ▶ Next, click on the “Add Evidence Item” icon.








- ▶ In the “Select Source” dialogue box, select “Image File” and click “Next”.
- ▶ In the next “Select File” dialogue box, select browse and find the ISO file you just created.
- ▶ Click “Finish”.

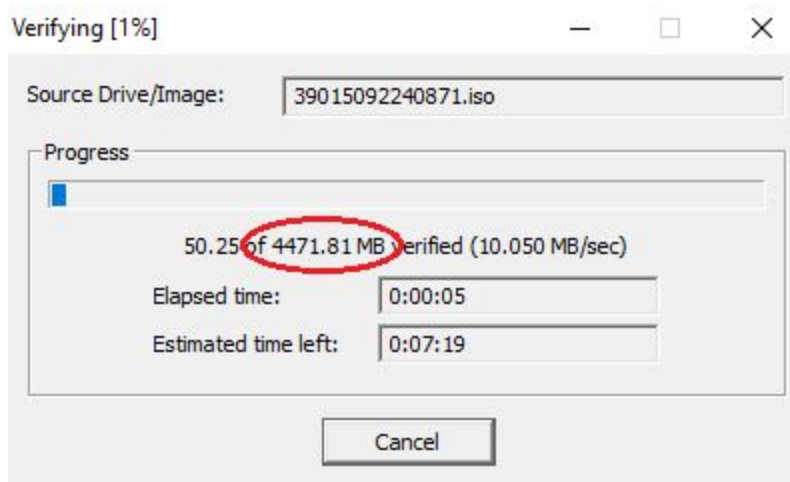
- ▶ An item will appear in the “Evidence Tree” section. Right click the ISO image file and select “Verify Drive/Image”.
  - ▷ A dialogue box titled “Drive/Image Verify Results” will pop up and you will see a variety of information, one of which is the “Bad Sector List”.
  - ▷ If there are any bad sectors, record the number of bad sectors in the working spreadsheet. If not, leave the bad sectors space blank.
- ▶ Once you are finished, right click the ISO image file again and select “Remove Evidence Item”. Minimize FTK Imager. Minimizing the program is more convenient since you will have to log back in everytime it starts up.

#### VERIFYING MULTIPLE ISO FILES

- ▶ If there is a lot of data on a disk, FTK will create multiple ISO files in the image folder.
- ▶ Select the first ISO file (the only one without trailing numbers in the file extension) that was created and follow the directions above to verify the number of bad sectors. Check that the file size is the same size as all the ISO files for the optical disk combined instead of the sole ISO file selected for verification. Note the number of bad sectors on the spreadsheet and remove the ISO file from the evidence tree..

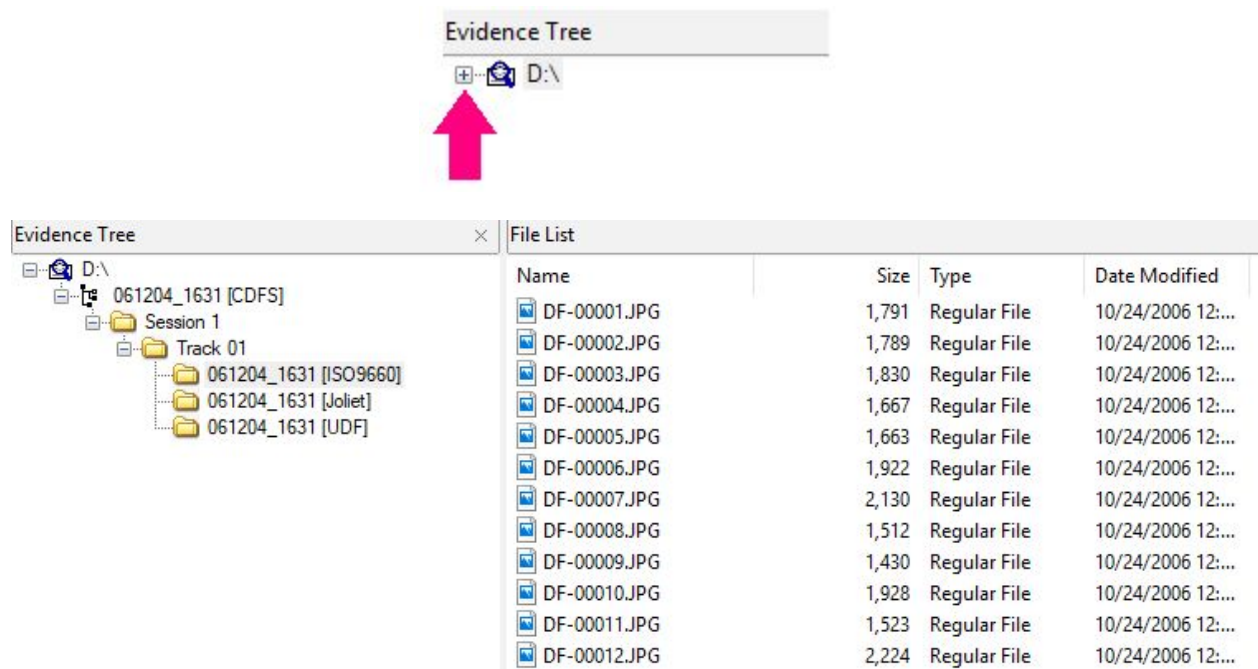
 39015092240871.iso	5/23/2018 1:07 PM	Disc Image File	1,048,576 KB
 39015092240871.iso01	5/23/2018 1:07 PM	ISO01 File	1,048,576 KB
 39015092240871.iso02	5/23/2018 1:07 PM	ISO02 File	1,048,576 KB
 39015092240871.iso03	5/23/2018 1:07 PM	ISO03 File	1,048,576 KB
 39015092240871.iso04	5/23/2018 1:07 PM	ISO04 File	384,832 KB

- ▷ An ISO file for optical disks is ~1GB. Verification in this case should exceed 1GB as pictured below.

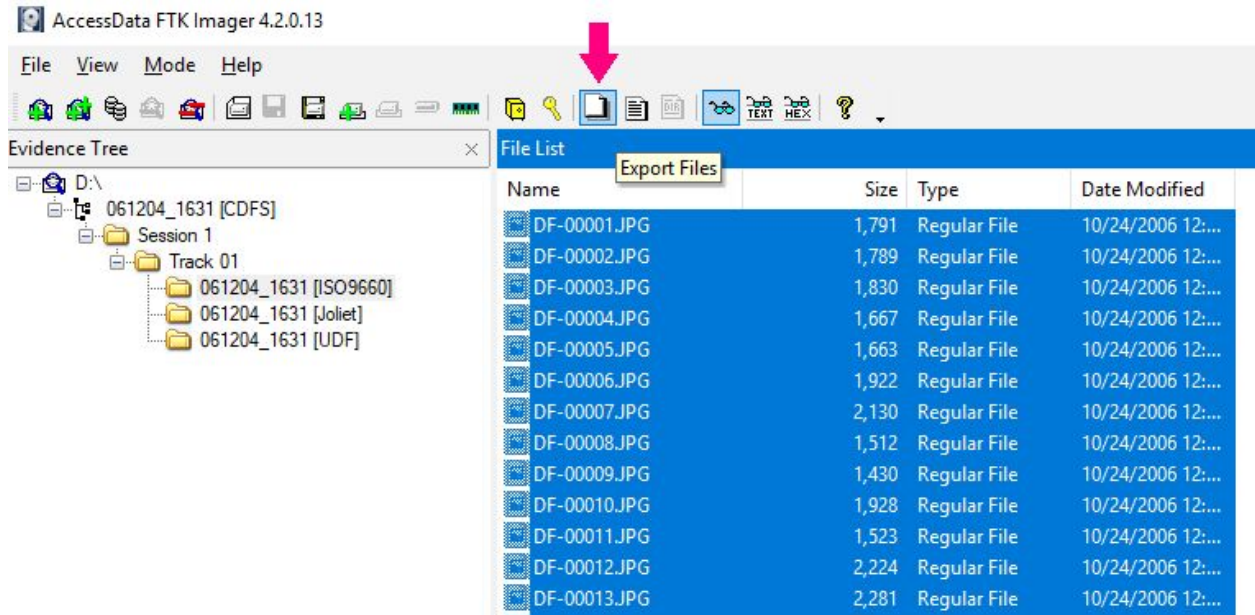


- ▶ You will need to export files from the disk using FTK before moving to Brunnhilde. Normally, with one ISO file, this process would happen during Brunnhilde [\[Step 7\]](#).

- ▶ Go back to the original barcode directory and create a new directory within the folder titled “carved\_files”. The files from the disk will be manually extracted and placed into this folder.
- ▶ Insert the disk into the optical drive and open it up in FTK Imager’s evidence tree, selecting “Logical Drive” and “D:/” instead of “Image File”. Files will need to be extracted manually from the disk since the ISO files are chunked into different pieces.
- ▶ Expand the tree using the + sign to the left of the ISO file until you get to the file level.



- ▶ Highlight all the files using the “Shift” + “End” and click the “Export Files” icon near the middle of the tool bar:

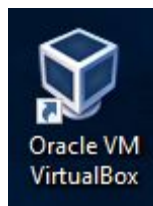


- ▶ A window will appear titled “Browse For Folder”. Search for the appropriate barcode directory again, this time selecting the “carved\_files” directory you created. Click “OK”. A progress bar for the export will appear.
- ▶ Once you are finished, right click the ISO image file and select “Remove Evidence Item”. Minimize FTK Imager. Optical disks may take a long time.

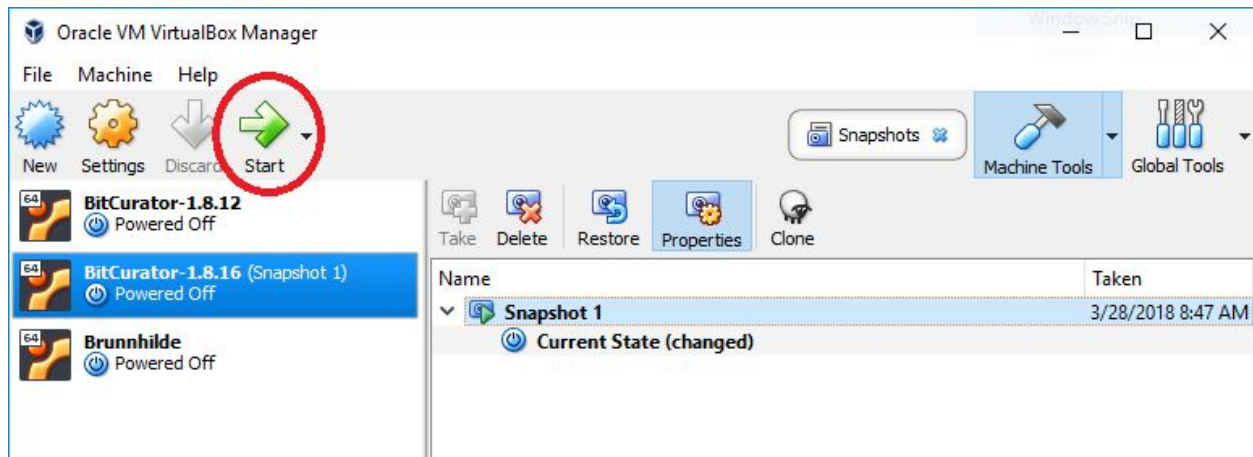
## PART III: BRUNNHILDE

### [STEP 7] Navigating to the BitCurator Virtual Machine

- ▶ In order to run Brunnhilde, you must access the BitCurator (BC) environment using a virtual machine (VM). The BC VM has already been set up by the Digital Preservation Librarian.
- ▶ Double click the “Oracle VM VirtualBox” on the host computer’s desktop.



- ▶ Select the “BitCurator-1.8.16 (Snapshot 1)” VM and click “Start”.
  - ▷ If you have already used this, it will automatically be highlighted when you launch the VirtualBox and all you will have to do is click “Start”.



- ▶ Once the BC VM loads, you can use all the tools that come in the BC package and access the `sf_BC_Shared` folder located on the BC VM desktop.
- ▶ When you are ready to shut everything down, click on the power button at the top right hand corner of the BC VM screen, scroll all the way down on the dropdown menu and select “Shut Down...”.

#### BEFORE YOU START

- ▶ Confirm that BitCurator is in WRITABLE mode.
- ▶ The drive icon at the top right hand corner of the screen will be red if writable mode is activated.
- ▶ We are setting BitCurator to writable due to a mounting related quirk that the read-only mode creates.



#### **[STEP 8] Run Brunnhilde**

Brunnhilde is available as a Graphical User Interface (GUI) and in command line. Instructions for both are included and contain directions for how to handle one or multiple ISO image files.



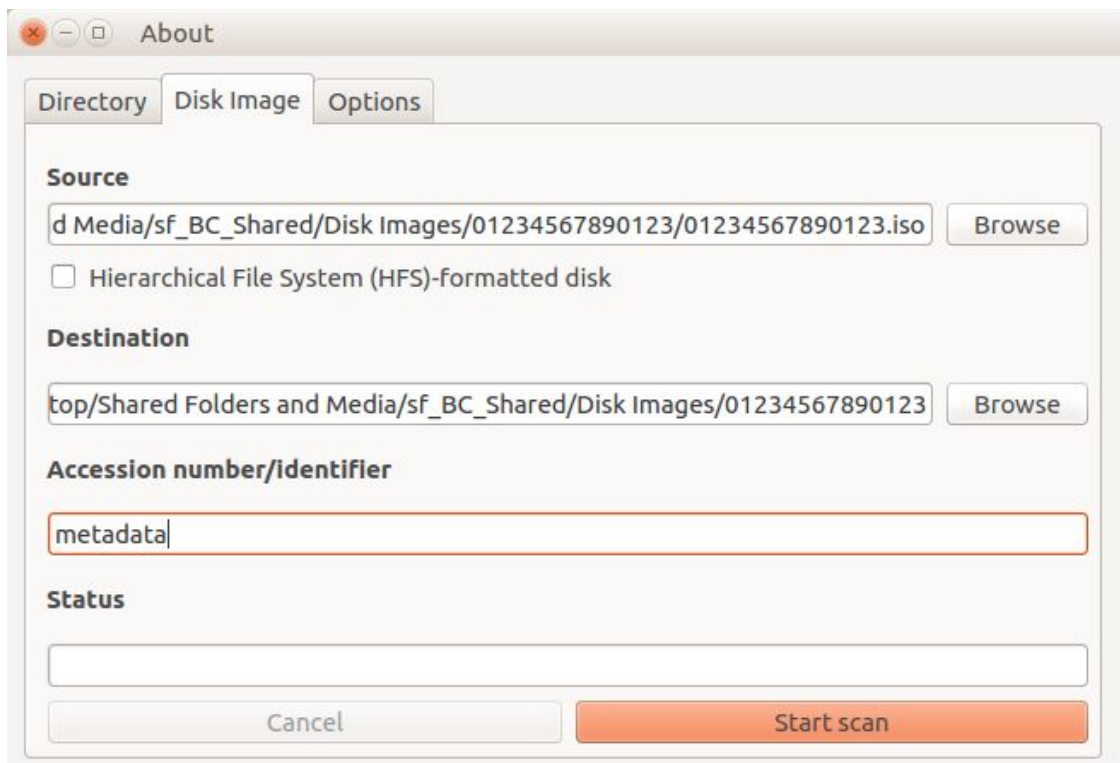
## BRUNNHILDE GUI

- ▶ Open the Brunnhilde GUI in the *Forensics and Reporting* folder. Brunnhilde GUI is only available on Darth.



For One ISO File:

- ▶ Choose the “Disk Image” tab and input the following information:
  - ▷ In the “Source” section, select the disk image.
  - ▷ In the “Destination” section, store the image in the barcoded folder that matches the respective media.
  - ▷ In the “Accession number/Identifier” section, input the following output file name:
    - “metadata”



The screenshot shows the 'About' dialog box of the Brunnhilde GUI, with the 'Disk Image' tab selected. The dialog has three tabs: 'Directory', 'Disk Image', and 'Options'. The 'Disk Image' tab contains the following fields and buttons:

- Source:** A text field containing 'd Media/sf\_BC\_Shared/Disk Images/01234567890123/01234567890123.iso' and a 'Browse' button.
- ☐ Hierarchical File System (HFS)-formatted disk
- Destination:** A text field containing 'top/Shared Folders and Media/sf\_BC\_Shared/Disk Images/01234567890123' and a 'Browse' button.
- Accession number/Identifier:** A text field containing 'metadata'.
- Status:** An empty text field.
- At the bottom, there are two buttons: 'Cancel' and 'Start scan'.



For Multiple ISO Files:

- ▶ Choose the “Directory” tab and input the following information:
  - ▷ In the “Source” section, select the *carved\_files* directory associated with the barcode.
  - ▷ In the “Destination” section, store the barcoded folder that matches the respective media.
  - ▷ In the “Accession number/Identifier” section, input the following output file name:
    - “metadata”

The screenshot shows the 'Brunnhilde' application window with the 'Directory' tab selected. The interface includes three sub-tabs: 'Directory', 'Disk Image', and 'Options'. The 'Source' field contains the path 'olders and Media/sf\_BC\_Shared/Disk Images/39015092241044/carved\_files' with a 'Browse' button. The 'Destination' field contains the path 'top/Shared Folders and Media/sf\_BC\_Shared/Disk Images/39015092241044' with a 'Browse' button. The 'Accession number/Identifier' field contains the text 'metadata'. The 'Status' field shows 'Processing'. At the bottom, there are 'Cancel' and 'Start scan' buttons.

**Brunnhilde**

Directory | Disk Image | Options

**Source**

olders and Media/sf\_BC\_Shared/Disk Images/39015092241044/carved\_files

**Destination**

top/Shared Folders and Media/sf\_BC\_Shared/Disk Images/39015092241044

**Accession number/Identifier**

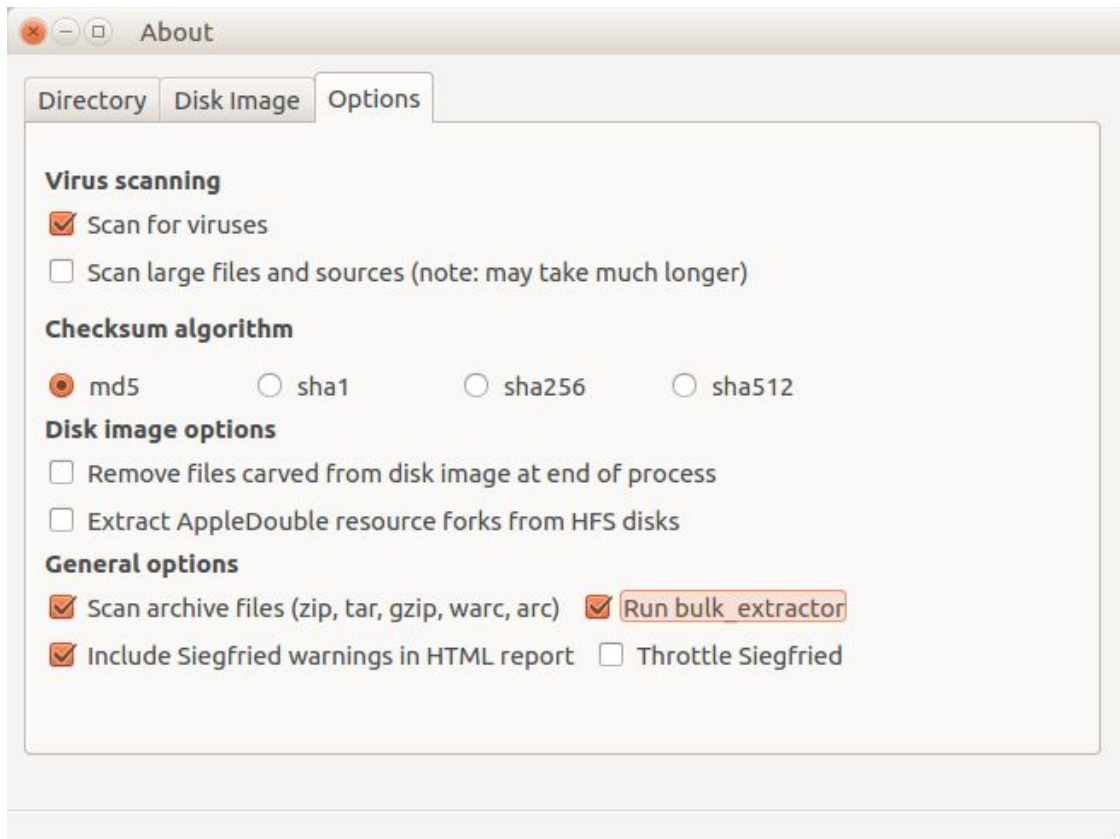
metadata

**Status**

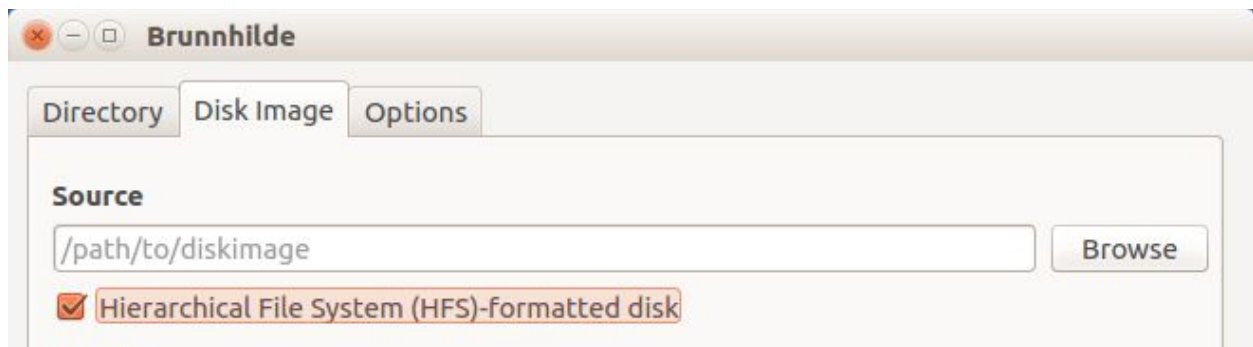
Processing

For both:

- ▶ In the options tab, make sure the following boxes are checked/selected:
  - ▷ Scan for viruses
  - ▷ md5
  - ▷ Scan archive files (zip, tar, gzip, warc, arc)
  - ▷ Include Siegfried warnings in HTML report
  - ▷ Run bulk-extractor



- ▶ Go back to the “Disk Image” or “Directory” tab and click “Start scan” on the bottom right.
  - ▷ Time duration depends on file size. It typically lasts a second or two but can last anywhere from a few seconds to minutes.
- ▶ Once the scan is completed, click “OK” to close the box that appears saying “Finished Brunnhilde scan complete.”
  - ▷ Sometimes, the scan will not work even though it creates the *metadata* folder you wanted it to create. If this happens, click the box that says “Hierarchical File System (HFS)-formatted disk and scan again. Check the *metadata folder* and note what occurred on the working database.



### BRUNNHILDE COMMAND LINE

Open Brunnhilde in the *Forensics and Reporting* folder.



Information on command line options is listed on Brunnhilde's Github [page](#) under "Usage" and on the "DPL Software Information" page in the shared *Digital Preservation Lab* Documentation Folder on Google Drive.

*For One ISO File:*

- ▶ `brunnhilde.py -b -d --hash MD5 -z [image file file path] [barcode directory file path] metadata`

*For Multiple ISO Files:*

- ▶ `brunnhilde.py -b --hash MD5 -z [carved_files directory file path] [barcode directory file path] metadata`
  - ▷ This points Brunnhilde towards directory *carved\_files*, making "-d" (for disk image) unnecessary.

If a disk is HFS formatted, type in "--hfs" before "--hash"

- ▶ `brunnhilde.py -b --hfs --hash MD5 -z [carved_files directory file path] [barcode directory file path] metadata`

Drag the image file or directory into the command line interface for file paths. Do not type it out as it may result in an error.

```

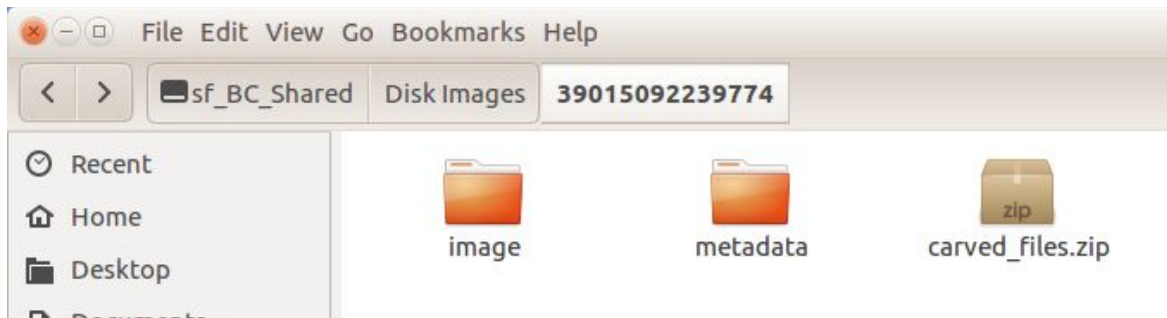
bcadmin@ubuntu:~$ cd ~/
bcadmin@ubuntu:~$ brunnhilde.py
usage: brunnhilde.py [-h] [-a] [-b] [--ssn_mode SSN_MODE] [-d] [--hfs]
                    [--resforks] [--tsk_imgtype TSK_IMGTYPE]
                    [--tsk_fstype TSK_FSTYPE]
                    [--tsk_sector_offset TSK_SECTOR_OFFSET] [--hash HASH]
                    [-l] [-n] [-r] [-t] [-V] [-w] [-z]
                    source destination basename
brunnhilde.py: error: the following arguments are required: source, destination,
basename
bcadmin@ubuntu:~$ brunnhilde.py -b -d --hash MD5 -z '/media/sf BC_Shared/Disk Images/ReadyForBagging/39015092242513/image/39015092242513.img' 

```

Hit “enter” on the keyboard. Any errors and reports (virus scan) will be shown on the command line.

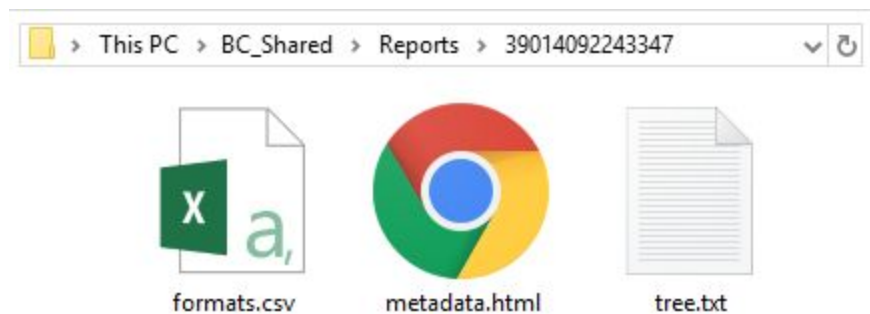
#### DIRECTORY CLEAN-UP

- ▶ Open File Explorer, navigate to the barcode folder and then the *bulk\_extractor* folder. Click on the “view items as a list” icon in the upper righthand corner to change the display of the files. Filter by “size” and delete all files measuring 0 bytes.
  - ▷ These clutter up the *bulk\_extractor* folder and do not provide us with any useful information about the disk image.
- ▶ Drag the photos taken earlier that are in the barcoded file into the newly created *metadata* folder.
- ▶ In the *metadata* folder, drag the *carved\_files* directory into the same level as *metadata* and *image*.
- ▶ Right-click on *carved\_files* and select “Compress...”. In the new window, keep the filename as *carved\_files* and select “.zip” as the extension. Hit “Create” and delete the unzipped *carved\_files* directory.



## [STEP 9] Reports

- ▶ Go to the Reports folder created earlier and create a new directory with the barcode as the filename. Make a copy of the “tree.txt”, “formats.csv”, and “metadata.html” from the metadata folder.
  - ▷ The “tree.txt” and “metadata.html” files will be in the metadata folder while the “formats.csv” file will be in the csv\_reports folder in the metadata folder.
  - ▷ This is the package of reports that will be sent to Special Collections.



## PART IV: BAG AND TRANSFER TO STORAGE

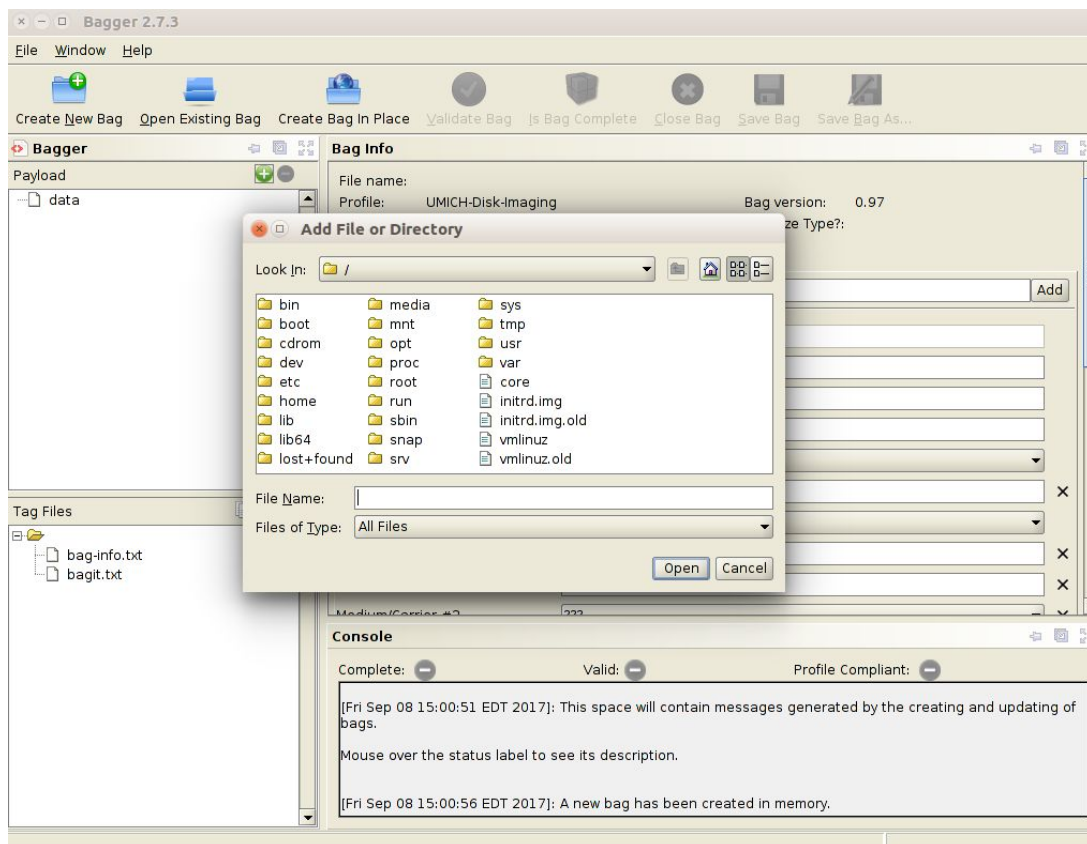
### [STEP 10] Package SIP Using BagIt

\*\*\*NOTE: It is important to follow these steps in order to ensure that the metadata saves properly.

- ▶ Now, switch from the BC VM to the host computer’s desktop and open the “bagger.bat-Shortcut”.

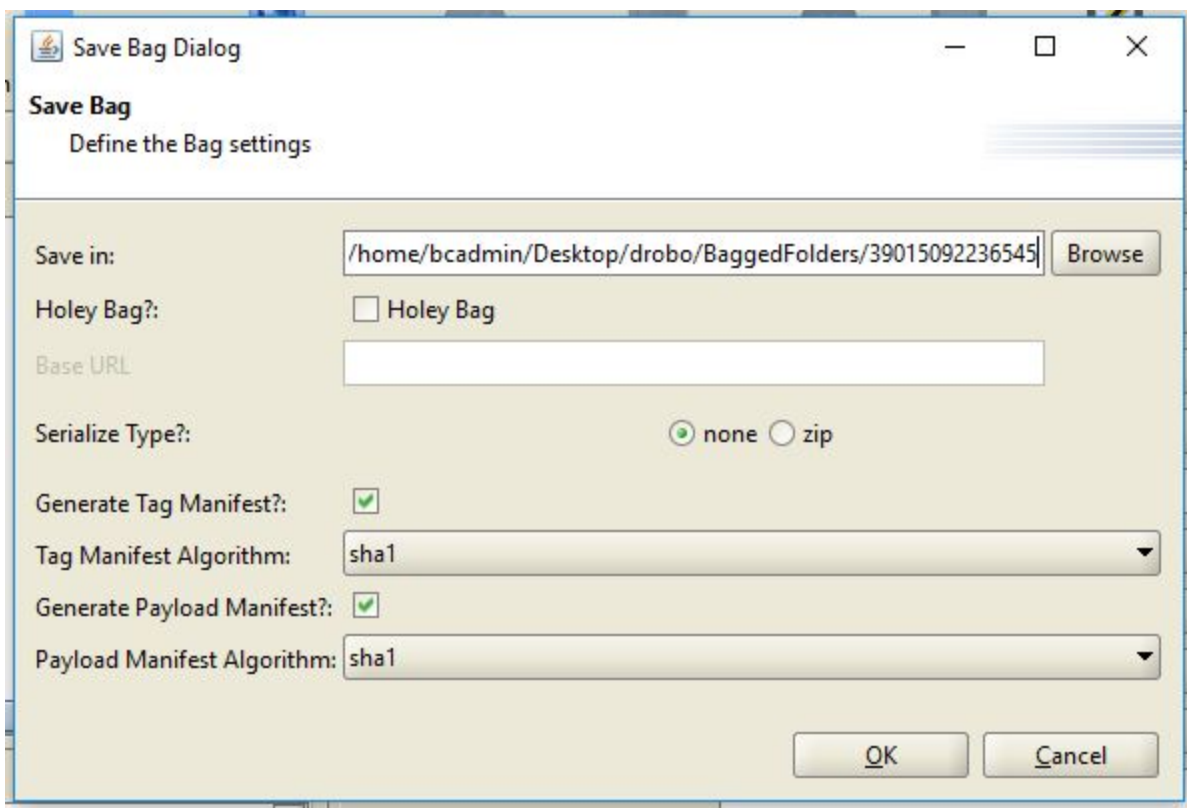


- ▶ On the upper lefthand corner, click “Create New Bag”.
- ▶ Select the “UMICH-DISK-Imaging Profile”.
- ▶ Click on the small green plus sign on the upper left-hand side.
  - ▷ You will be prompted to “Add File or Directory”.
  - ▷ Select the parent folder containing the disk image and metadata (do not double click).
  - ▷ Click “Open”.



- ▶ Under the “Payload” section on the left, the folder you selected will show. Select (only click once) the folder prior to saving your bag.
  - ▷ It is recommended that you do this in the beginning in case you forget to do it at the end.
- ▶ Fill out the profile with metadata by consulting the Imaging Metadata Report.
- ▶ Once you are finished selecting the parent folder and filling out the metadata, click “Save Bag As...”

- ▶ In the “Save Bag Dialog”:
  - ▷ Navigate to the designated directory and create a file with the barcode as the title inside the parent folder:
    - Desktop → *Shared Folders and Media* → *sf\_BC\_Shared* → *Bagged Folders* → Enter Barcode
  - ▷ Make sure to leave “Holey Bag” unchecked.
  - ▷ Select the following in the options below:
    - none
    - Generate Tag Manifest?:
    - Generate Payload Manifest?:
    - SHA-1 (for “Tag Manifest Algorithm:” and “Payload Manifest Algorithm:”)

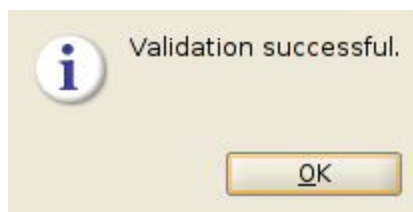
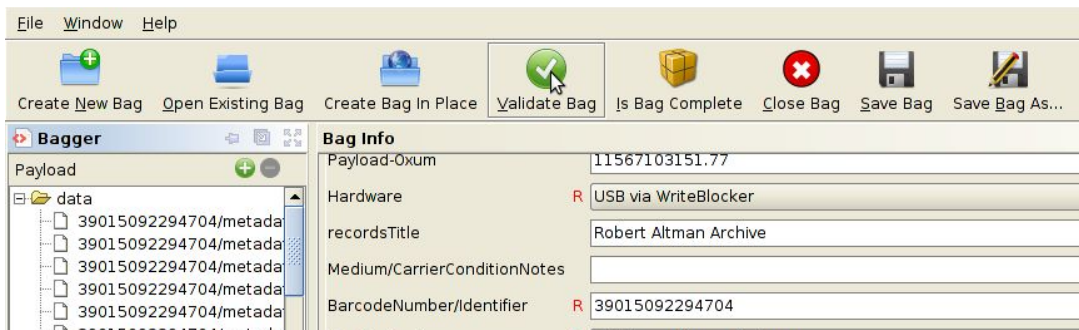


- ▶ Once all of the above are selected, click “OK”
- ▶ The Bag Info will then be generated. The results will appear in Bagger and the Bag will be created in the specified directory.



## [STEP 11] Validate Bag



- ▶ After the bag is generated, click “Validate Bag” to validate the bag you just created.



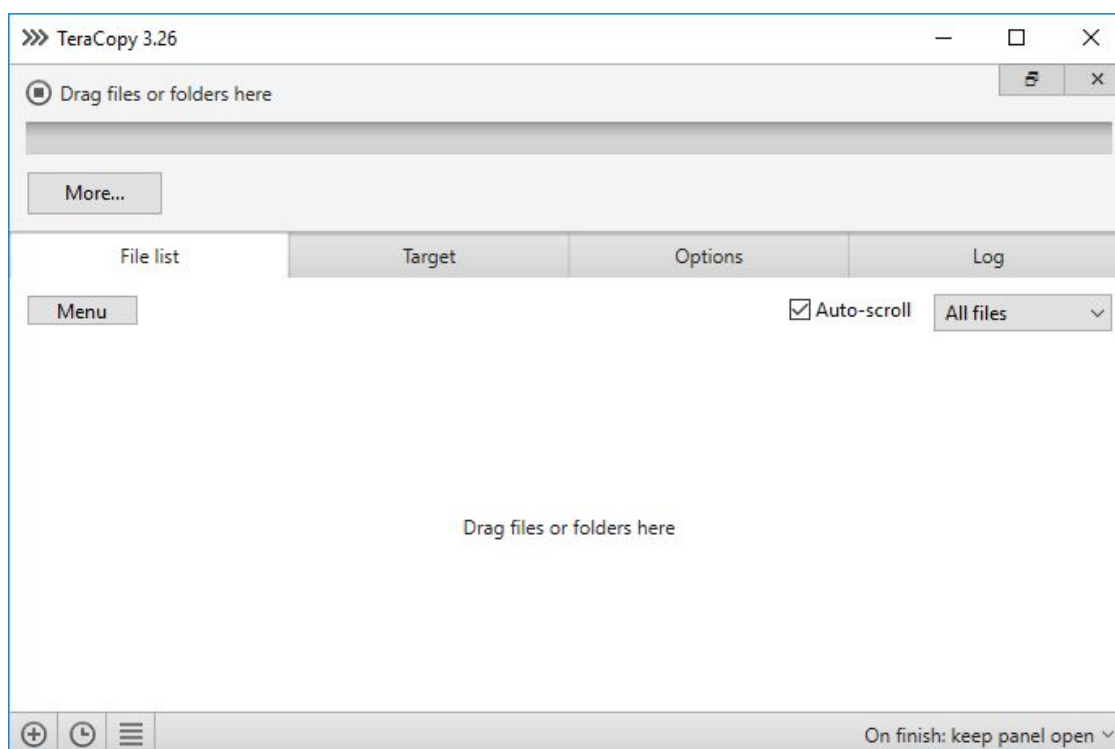
## [STEP 12] Transfer to the Network Attached Storage (NAS)

- ▶ At the end of the week, transfer bags to the NAS for eventual upload to Dark Blue.
- ▶ Search for “Tera” in Windows menu bar and select “Teracopy”. A window like this will appear:

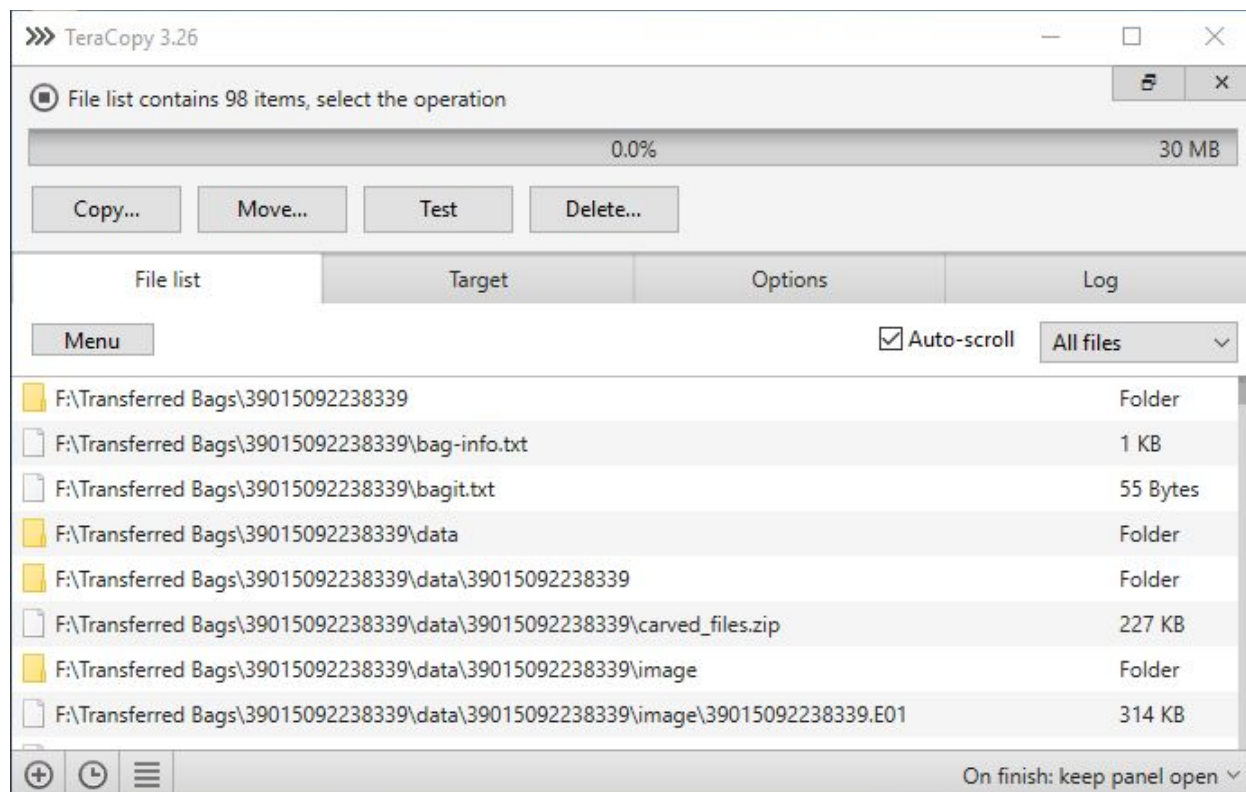


- ▶ Information from the previous transfer may load. If it does, click the  on the bottom left corner for a fresh window and the little “x” on the top right to exit out of the old window.
- ▶ Press the little window button  on the top right to extend the window. The new area is where files from *Bagged* are dragged. The screen should now look like this:





- ▶ Select the files from the “Bagged Folder” and drag and drop them into TeraCopy. Files will appear like this:



- ▶ Under the “Target” tab, select “Browse” → public(//192.158.255.10)(Z:) →

“TransferQueue”.

- ▶ “Options” tab should stay the same with “Prompt on filename collision” and “MD5” as default.
- ▶ Press “Copy...” near the top of the screen. Selecting “Move...” will remove directories from *Bagged* and move them onto the NAS.
- ▶ The “Log” tab reflects directories that have successfully/failed copying.
- ▶ When TeraCopy is finished, check the “TransferQueue” directory to see if files have been copied.
- ▶ Create a new Directory in *Bagged* named *UploadedtoDarkBlue* if it has not been created already. Move the bags you transferred using Teracopy into this new directory so you don’t copy it twice to the NAS.