DATA ACQUISITION

Chapter 8

OBJECTIVES

- ❑ Explain ways to determine the best acquisition method
- ❑ Describe contingency planning for data acquisitions
- ❑ Explain how to use acquisition tools
- ❑ Explain how to validate data acquisitions
- ❑ Describe RAID acquisition methods
- ❑ Explain how to use remote network acquisition tools
- ❑ List other forensic tools available for data acquisitions

DETERMINING THE BEST ACQUISITION METHOD

- Types of acquisitions
  - **Static acquisitions** and **live acquisitions**
  - ***Static acquisition*** is the method used for retrieval of nonvolatile data. This type of acquisition is used to recover forensic data from hard drives, USB thumb drives, diskettes and discs.
  - ***Live acquisition*** is the examination of a system while it is running. Volatile computer forensic data is collected from RAM and during the live acquisition phase of the investigation.
- Four methods of acquisition
  - Bit-stream disk-to-image file
  - Bit-stream disk-to-disk
  - Logical disk-to-disk or disk-to-disk data
  - Sparse data copy of a file or folder

DETERMINING THE BEST ACQUISITION METHOD (CONTINUED)

- Bit-stream disk-to-image file
  - Most common method
  - Can make more than one copy
  - Copies are bit-for-bit replications of the original drive
  - ProDiscover, EnCase, FTK, SMART, Sleuth Kit, X-Ways, iLook
- Bit-stream disk-to-disk
  - When disk-to-image copy is not possible
  - Consider disk's geometry configuration
  - EnCase, SafeBack, SnapCopy

DETERMINING THE BEST ACQUISITION METHOD (CONTINUED)

- Logical acquisition or sparse acquisition
  - When your time is limited
  - Logical acquisition captures only specific files of interest to the case
  - Sparse acquisition also collects fragments of unallocated (deleted) data
  - For large disks
  - PST or OST mail files, RAID servers

DETERMINING THE BEST ACQUISITION METHOD (CONTINUED)

- When making a copy, consider:
  - Size of the source disk
    - Lossless compression might be useful
    - Use digital signatures for verification
  - When working with large drives, an alternative is using tape backup systems
  - Whether you can retain the disk
  - Time allocation
  - Where the data/evidence is located

****consideration to be taken in order to determine the data acquisition method**

CONTINGENCY PLANNING FOR IMAGE ACQUISITIONS

- Create a duplicate copy of your evidence image file
- Make at least two images of digital evidence
  - Use different tools or techniques
- Copy host protected area of a disk drive as well
  - Consider using a hardware acquisition tool that can access the drive at the BIOS level
- Be prepared to deal with encrypted drives
  - **Whole disk encryption** feature in Windows Vista Ultimate and Enterprise editions

USING ACQUISITION TOOLS

- Acquisition tools for Windows
  - Advantages
    - Make acquiring evidence from a suspect drive more convenient
      - Especially when used with hot-swappable devices
  - Disadvantages
    - Must protect acquired data with a well-tested write-blocking hardware device
    - Tools can’t acquire data from a disk’s host protected area

ACQUIRING DATA WITH A LINUX BOOT CD

- Linux can access a drive that isn't mounted
- Windows OSs and newer Linux automatically mount and access a drive
- Forensic Linux Live CDs don't access media automatically
  - Which eliminates the need for a write-blocker
- Using Linux Live CD Distributions
  - Forensic Linux Live CDs
    - Contain additionally utilities

ACQUIRING DATA WITH A LINUX BOOT CD (CONTINUED)

- Using Linux Live CD Distributions (continued)
  - Forensic Linux Live CDs (continued)
    - Configured not to mount, or to mount as read-only, any connected storage media
    - Well-designed Linux Live CDs for computer forensics
      - Helix
      - Penguin Sleuth
      - FCCU (Federal Computer Crime Unit)
- Preparing a target drive for acquisition in Linux
  - Linux distributions can create Microsoft FAT and NTFS partition tables

ACQUIRING DATA WITH A LINUX BOOT CD (CONTINUED)

- Preparing a target drive for acquisition in Linux (continued)
  - **fdisk** command lists, creates, deletes, and verifies partitions in Linux
  - **mkfs.msdos** command formats a FAT file system from Linux
- Acquiring data with dd in Linux
  - dd (“data dump”) command
    - Can read and write from media device and data file
    - Creates raw format file that most computer forensics analysis tools can read

ACQUIRING DATA WITH A LINUX BOOT CD (CONTINUED)

- Acquiring data with dd in Linux (continued)
  - Shortcomings of dd command
    - Requires more advanced skills than average user
    - Does not compress data
  - dd command combined with the split command
    - Segments output into separate volumes
- Acquiring data with dcfldd in Linux
  - dd command is intended as a data management tool
    - Not designed for forensics acquisitions

ACQUIRING DATA WITH A LINUX BOOT CD (CONTINUED)

- Acquiring data with dcfldd in Linux (continued)
  - dcfldd additional functions
    - Specify hex patterns or text for clearing disk space
    - Log errors to an output file for analysis and review
    - Use several hashing options
    - Refer to a status display indicating the progress of the acquisition in bytes
    - Split data acquisitions into segmented volumes with numeric extensions
    - Verify acquired data with original disk or media data

CAPTURING AN IMAGE WITH PRODISCOVER BASIC

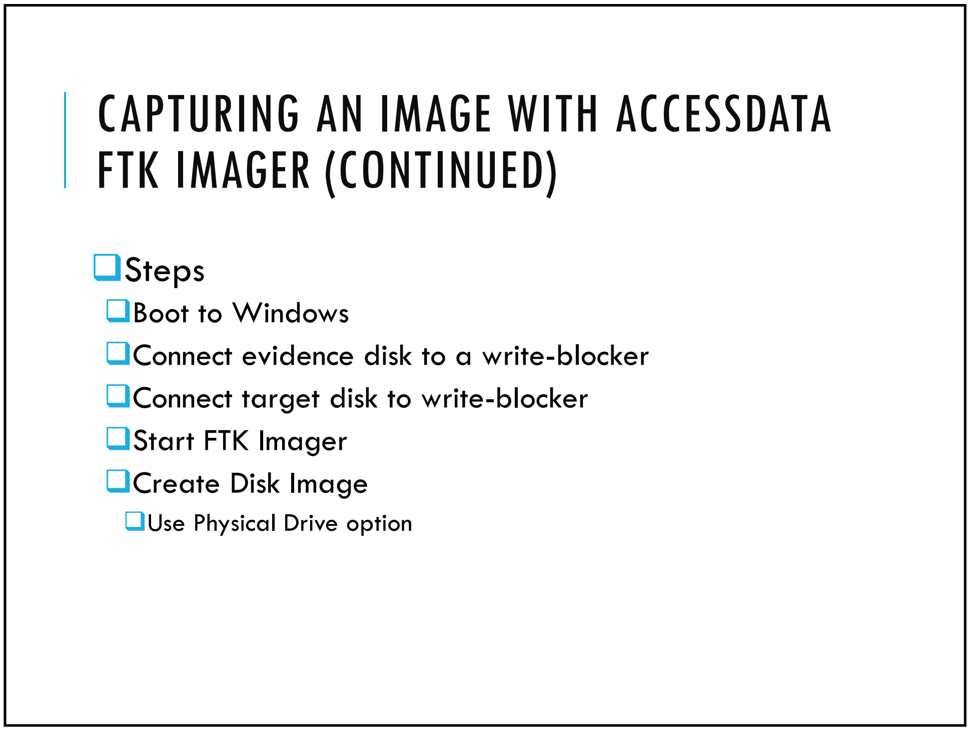
- Connecting the suspect's drive to your workstation
  - Document the chain of evidence for the drive
  - Remove the drive from the suspect's computer
  - Configure the suspect drive's jumpers as needed
  - Connect the suspect drive
  - Create a storage folder on the target drive
- Using ProDiscover's Proprietary Acquisition Format
  - Image file will be split into segments of 650MB
  - Creates image files with an .eve extension, a log file (.log extension), and a special inventory file (.pds extension)

CAPTURING AN IMAGE WITH PRODISCOVER BASIC (CONTINUED)

- Using ProDiscover's Raw Acquisition Format
  - Select the UNIX style dd format in the Image Format list box
  - Raw acquisition saves only the image data and hash value

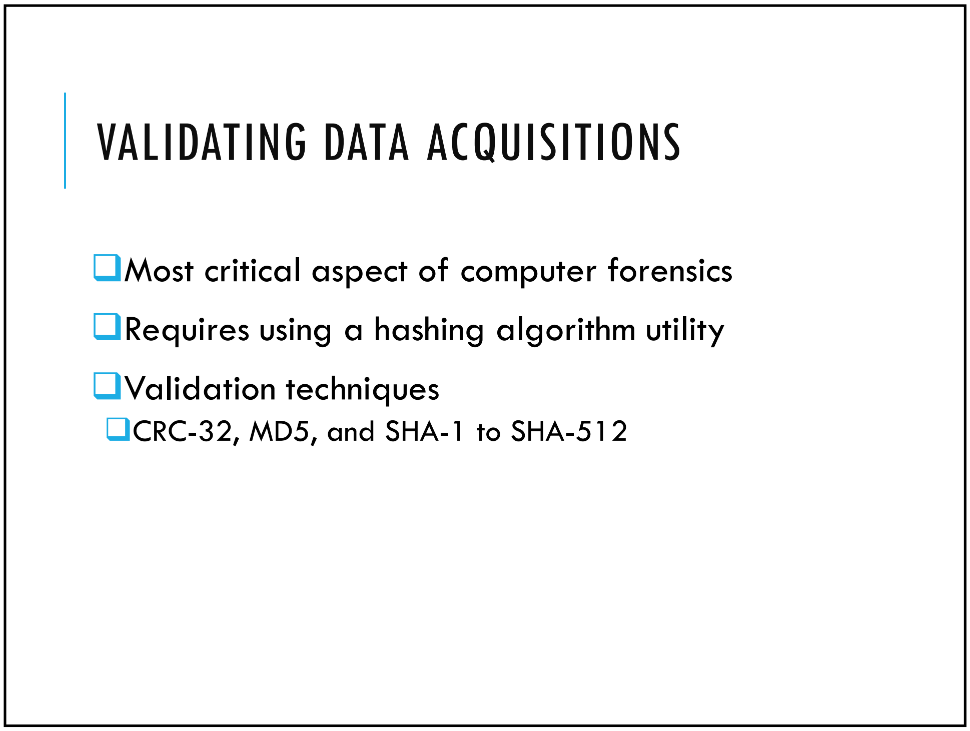
CAPTURING AN IMAGE WITH ACCESSDATA FTK IMAGER

- Included on AccessData Forensic Toolkit
- View evidence disks and disk-to-image files
- Makes disk-to-image copies of evidence drives
  - At logical partition and physical drive level
  - Can segment the image file
- Evidence drive must have a hardware write-blocking device
  - Or the USB write-protection Registry feature enabled
- FTK Imager can't acquire drive's host protected area



CAPTURING AN IMAGE WITH ACCESSDATA FTK IMAGER (CONTINUED)

- Steps
  - Boot to Windows
  - Connect evidence disk to a write-blocker
  - Connect target disk to write-blocker
  - Start FTK Imager
  - Create Disk Image
    - Use Physical Drive option



VALIDATING DATA ACQUISITIONS

- Most critical aspect of computer forensics
- Requires using a hashing algorithm utility
- Validation techniques
  - CRC-32, MD5, and SHA-1 to SHA-512

LINUX VALIDATION METHODS

- Validating dd acquired data
  - You can use md5sum or sha1sum utilities
  - md5sum or sha1sum utilities should be run on all suspect disks and volumes or segmented volumes
- Validating dcfldd acquired data
  - Use the hash option to designate a hashing algorithm of md5, sha1, sha256, sha384, or sha512
  - hashlog option outputs hash results to a text file that can be stored with the image files
  - vf (verify file) option compares the image file to the original medium

WINDOWS VALIDATION METHODS

- Windows has no built-in hashing algorithm tools for computer forensics
  - Third-party utilities can be used
- Commercial computer forensics programs also have built-in validation features
  - Each program has its own validation technique
- Raw format image files don’t contain metadata
  - Separate manual validation is recommended for all raw acquisitions

PERFORMING RAID DATA ACQUISITIONS

- Size is the biggest concern
  - Many RAID systems now have terabytes of data

UNDERSTANDING RAID

- **Redundant array of independent** (formerly “inexpensive”) **disks (RAID)**
  - Computer configuration involving two or more disks
  - Originally developed as a data-redundancy measure
- RAID 0
  - Provides rapid access and increased storage
  - Lack of redundancy
- RAID 1
  - Designed for data recovery
  - Ensures data is not lost and helps prevent computer downtime
  - More expensive than RAID 0

UNDERSTANDING RAID (CONTINUED)

- RAID 2
  - Similar to RAID 1
  - Data is written to a disk on a bit level
  - Has better data integrity checking than RAID 0
  - Slower than RAID 0
- RAID 3
  - Uses data stripping and dedicated parity
  - Dedicated parity provides recovery in the event of corrupt data
- RAID 4
  - Data is written in blocks

UNDERSTANDING RAID (CONTINUED)

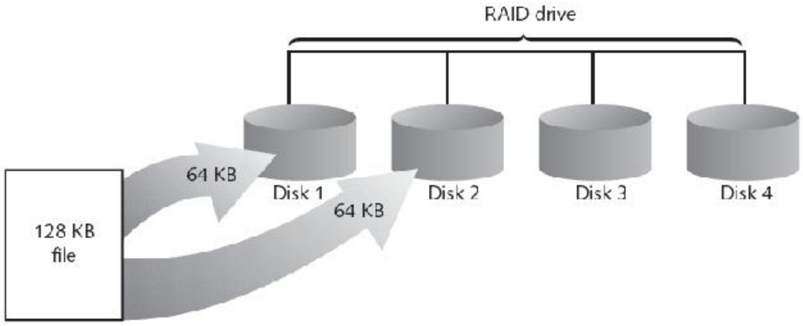


Figure 4-9 RAID 0: Striping

UNDERSTANDING RAID (CONTINUED)

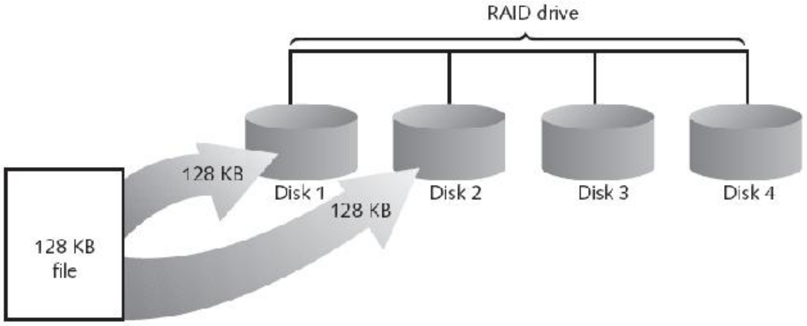


Figure 4-10 RAID 1: Mirroring

UNDERSTANDING RAID (CONTINUED)

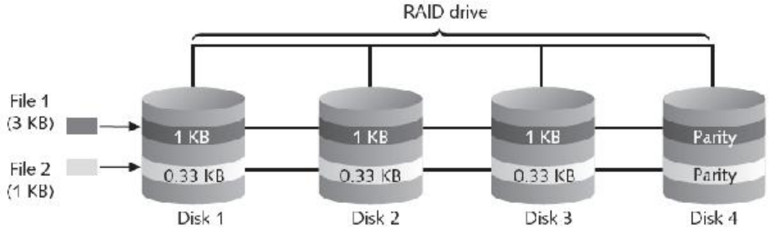


Figure 4-11 RAID 2: Striping (bit level)

UNDERSTANDING RAID (CONTINUED)

- RAID 5
  - Similar to RAIDs 0 and 3
  - Places parity recovery data on each disk
- RAID 6
  - Redundant parity on each disk
- RAID 10, or mirrored striping
  - Also known as RAID 1+0
  - Combination of RAID 1 and RAID 0

UNDERSTANDING RAID (CONTINUED)

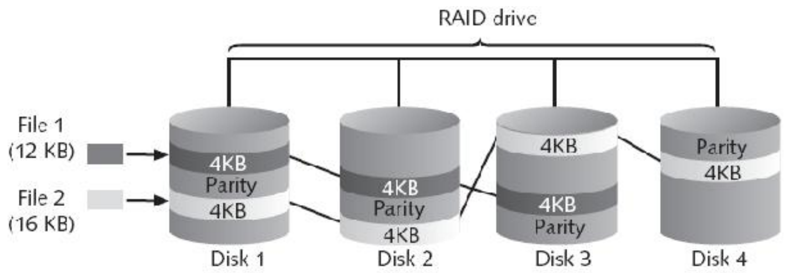


Figure 4-12 RAID 5: Block-level striping with distributed parity

ACQUIRING RAID DISKS

- Concerns
  - How much data storage is needed?
  - What type of RAID is used?
  - Do you have the right acquisition tool?
  - Can the tool read a forensically copied RAID image?
  - Can the tool read split data saves of each RAID disk?
- Older hardware-firmware RAID systems can be a challenge when you're making an image

ACQUIRING RAID DISKS (CONTINUED)

- Vendors offering RAID acquisition functions
  - Technologies Pathways ProDiscover
  - Guidance Software EnCase
  - X-Ways Forensics
  - Runtime Software
  - R-Tools Technologies
- Occasionally, a RAID system is too large for a static acquisition
  - Retrieve only the data relevant to the investigation with the sparse or logical acquisition method

USING REMOTE NETWORK ACQUISITION TOOLS

- You can remotely connect to a suspect computer via a network connection and copy data from it
- Remote acquisition tools vary in configurations and capabilities
- Drawbacks
  - LAN's data transfer speeds and routing table conflicts could cause problems
  - Gaining the permissions needed to access more secure subnets
  - Heavy traffic could cause delays and errors

REMOTE ACQUISITION WITH PRODISCOVER

- With ProDiscover Investigator you can:
  - Preview a suspect's drive remotely while it's in use
  - Perform a live acquisition
  - Encrypt the connection
  - Copy the suspect computer's RAM
  - Use the optional stealth mode
- ProDiscover Incident Response additional functions
  - Capture volatile system state information
  - Analyze current running processes

REMOTE ACQUISITION WITH PRODISCOVER (CONTINUED)

- ProDiscover Incident Response additional functions (continued)
  - Locate unseen files and processes
  - Remotely view and listen to IP ports
  - Run hash comparisons
  - Create a hash inventory of all files remotely
- PDServer remote agent
  - ProDiscover utility for remote access
  - Needs to be loaded on the suspect

REMOTE ACQUISITION WITH PRODISCOVER (CONTINUED)

- PDServer installation modes
  - Trusted CD
  - Preinstallation
  - Pushing out and running remotely
- PDServer can run in a stealth mode
  - Can change process name to appear as OS function

REMOTE ACQUISITION WITH PRODISCOVER (CONTINUED)

- Remote connection security features
  - Password Protection
  - Encryption
  - Secure Communication Protocol
  - Write Protected Trusted Binaries
  - Digital Signatures

REMOTE ACQUISITION WITH ENCASE ENTERPRISE

- Remote acquisition features
  - Remote data acquisition of a computer's media and RAM data
  - Integration with intrusion detection system (IDS) tools
  - Options to create an image of data from one or more systems
  - Preview of systems
  - A wide range of file system formats
  - RAID support for both hardware and software

REMOTE ACQUISITION WITH R-TOOLS R-STUDIO

- R-Tools suite of software is designed for data recovery
- Remote connection uses Triple Data Encryption Standard (3DES) encryption
- Creates raw format acquisitions
- Supports various file systems

REMOTE ACQUISITION WITH RUNTIME SOFTWARE

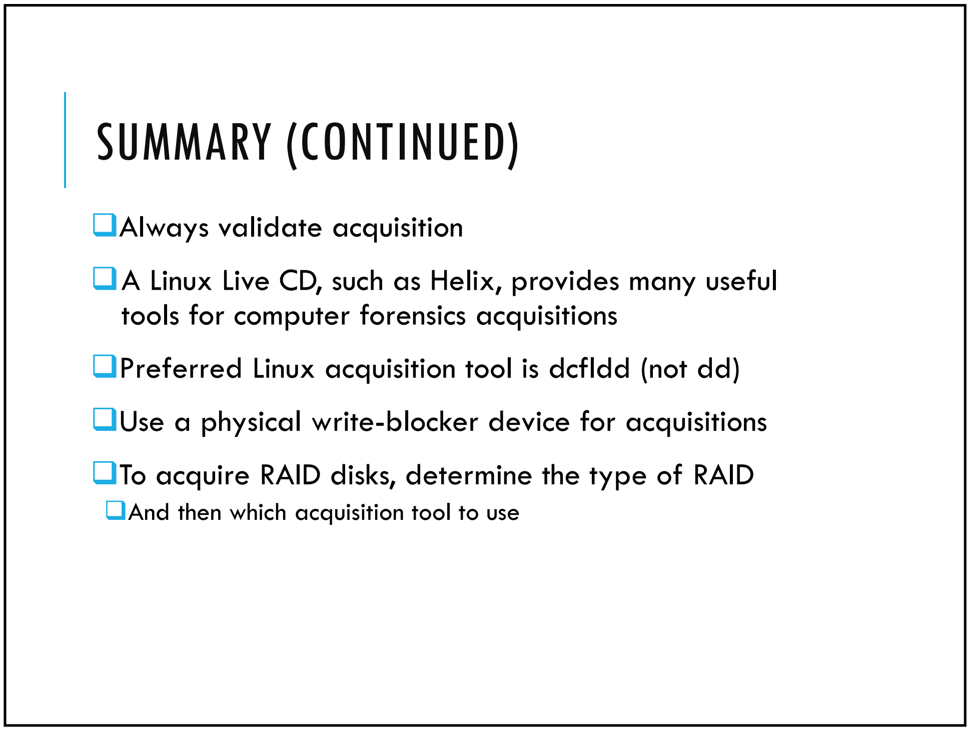
- Utilities
  - DiskExplorer for FAT
  - DiskExplorer for NTFS
  - HDHOST
- Features for acquisition
  - Create a raw format image file
  - Segment the raw format or compressed image
  - Access network computers’ drives

USING OTHER FORENSICS-ACQUISITION TOOLS

- SnapBack DatArrest
- SafeBack
- DIBS USA RAID
- ILook Investigator IXimager
- Vogon International SDi32
- ASRData SMART
- Australian Department of Defence PyFlag

SUMMARY

- Data acquisition methods
  - Disk-to-image file
  - Disk-to-disk copy
  - Logical disk-to-disk or disk-to-data file
  - Sparse data copy
- Several tools available
  - Lossless compression is acceptable
- Plan your digital evidence contingencies
- Write-blocking devices or utilities must be used with GUI acquisition tools



SUMMARY (CONTINUED)

- Always validate acquisition
- A Linux Live CD, such as Helix, provides many useful tools for computer forensics acquisitions
- Preferred Linux acquisition tool is dcfldd (not dd)
- Use a physical write-blocker device for acquisitions
- To acquire RAID disks, determine the type of RAID
  - And then which acquisition tool to use