Computer Forensics

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Objectives

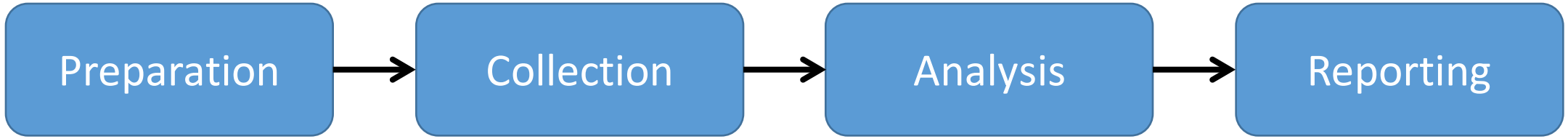
- Digital forensics vocabulary
- Methodology
- Use of investigation tools

Example

- "Prove that email **NOT** was received"
- Easy to prove that an email was received:
  - Look at email servers for logs
- Does not finding traces mean that it was not received?
  - Maybe the investigation was not complete
  - Maybe it was (cleverly) deleted
- Reason for third-party logs ☺

What is Computer Forensics?

- Interpretation of computer media for digital evidence
- Who uses it: Industry, Government, Individual
- Simplified Process Model:



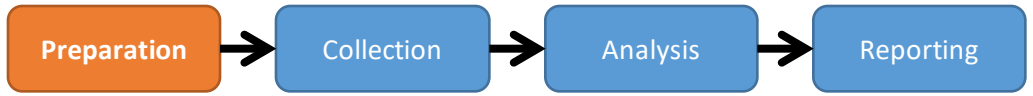
Principles of Computer Forensics

- Anything done to a system changes it!
  - Running systems
- Collection process should retain data integrity
  - How can you prove that you did not change it during the investigation
- All activities should be logged
- Hire an expert or become one ☺

Questions to cover

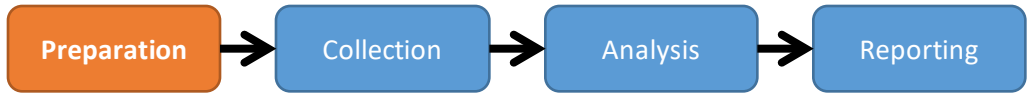
"I keep six honest serving-men
(They taught me all I knew);
Their names are What and Why
and When
And How and Where and Who."

Rudyard Kipling



Questions to cover

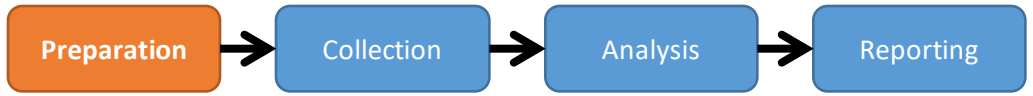
- Has something happened at all?
  - Hacked vs Bugs vs Random effect
- When did it happen and for how long?
- What happened with what effects?
  - Read vs Delete vs Modification
- Who did it and why?
  - IP vs Username
- How did he do it?



Data sources

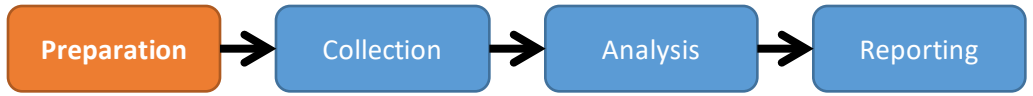
- Make a list of possible data-sourcing
  - Brainstorming
  - e.g., Hard disk, flash drives, mobile phones, scanners, RAM, etc.

- Problem:
  - “Data integrity” -> one must build systems to ensure that it has not been changed
  - e.g., external logging, HSM,



Remote and secure data

- How to investigate the “cloud”?
  - Ask for remote access is not easy, even for governments
- Encrypted disks are hard to investigate
  - Remember TPM?
- Prepare for future investigation
  - IDS-like systems

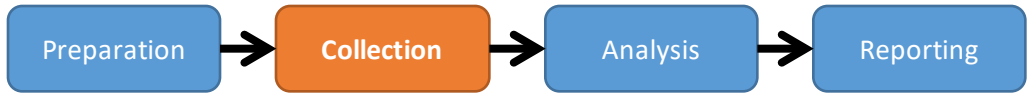


Actions

- Conduct a search for evidence:
  - E.g., Data, Logs, Passwords, Waste paper basket ☺
- Package evidence:
  - When possible, duplicate the systems
    - E.g., make a copy of the hard drive
- Limit access to the collected data
  - Maybe the who is an insider

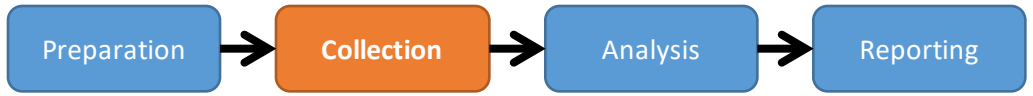
The order of volatility

- Registers, CPU caches
- Routing tables, time-based caches (e.g., arp), kernel statistics
- Running processes
- Memory, Temporary file systems (e.g., ramdisks)
- Media in use
- Remote data (USB drives)
- Backup data, read-only drives (e.g., DVDs)



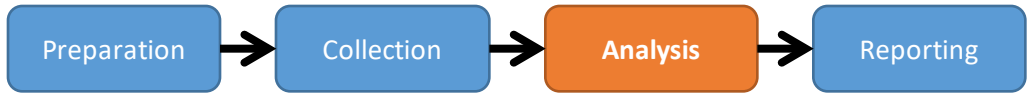
Practical actions for systems

- Show active processes
- List network configuration
- Dump memory (including swap area)
- Stop system
- Duplicate HDD



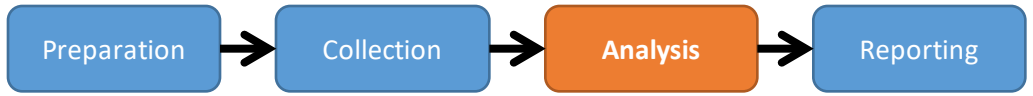
Time difference

- Systems might not have synchronized clocks
- DON’T change the time for investigated systems



Methods of hiding data

- OS-level:
  - Use dot-files, mark as hidden/system
- Change extension/naming: “password.txt” -> “fun.png”
- Unallocated disk sectors
- Steganography (usable for small data, e.g., secrets)
- Encryption
- Fun stuff: encryption + steganography



HDD Analysis

- If possible (e.g., magnetic HDD) look at the physical level: platter, interfaces, etc.
- Second, look at low-level partitions, volumes, etc.
- Look at the boot process (ROM-> BIOS->BOOTLOADER->KERNEL)
- Inspect virtualization configuration (if implemented)
- Inspect OS configuration

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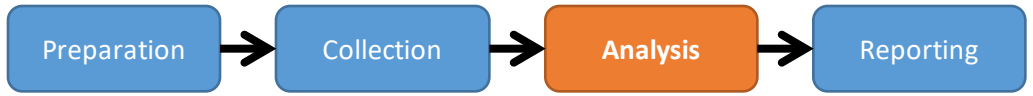
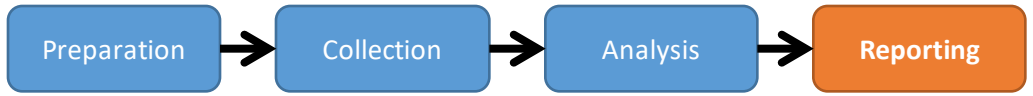


Report

- Info of investigator/ Confidence levels
- Identification of case: Date, ID, etc.
- Subject of examination: system, network, etc.
- Summary of findings
- Procedural history: steps taken, detailed findings
- Results and conclusion: server was hacked by X, from Y to Z timeframe, A&B data was accessed; etc.
- Annex



Bibliography

- http://www.fim.uni-linz.ac.at/lva/IT_Recht_Computerforensik/Introduction_to_Computer_Forensics.pdf
- https://www.cs.nmt.edu/~df/