Introduction to Computer Forensics and Security

6G7Z1009

“Digital Evidence”

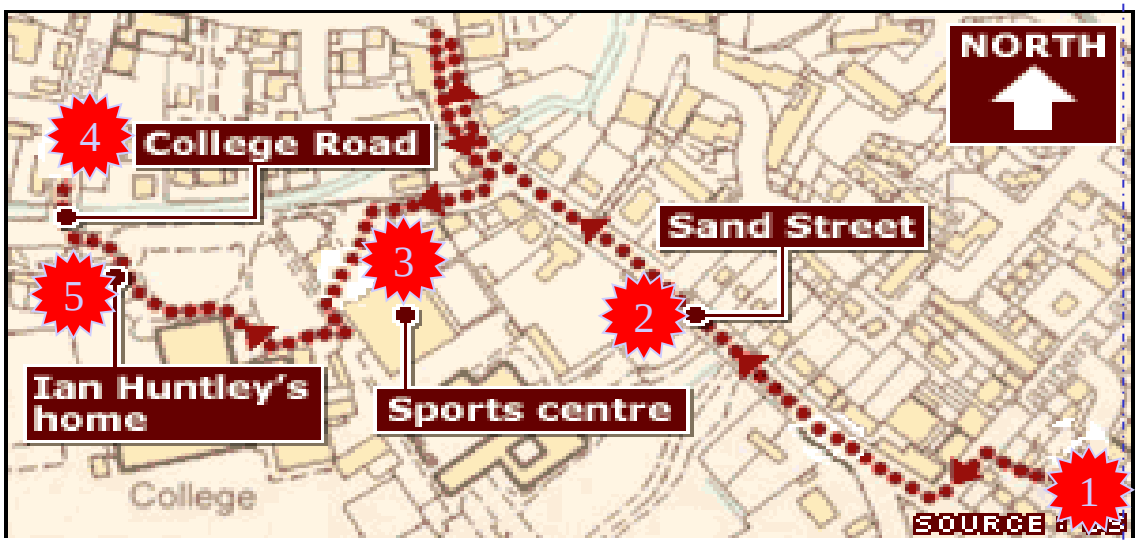
Introduction

Computer forensics investigators are "detectives of the digital world."

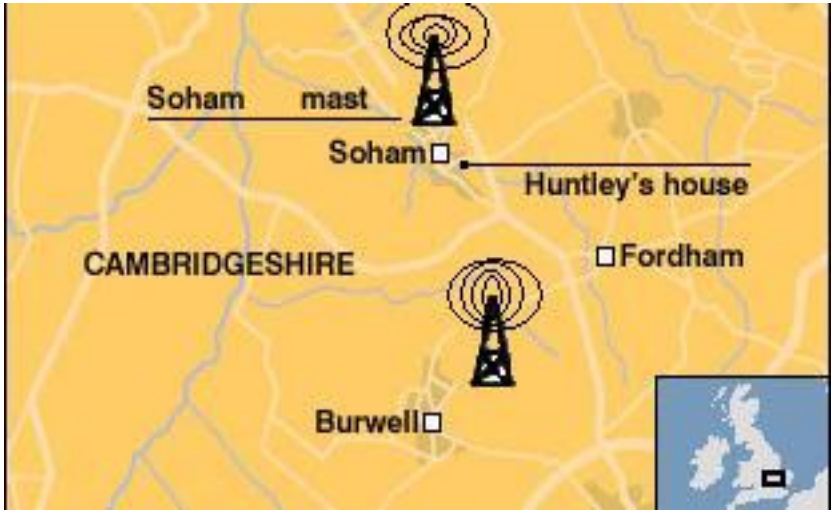
Objectives

- Critical analysis of a real crime scene scenario
- Explain the different types of evidence
- Identify how electronic evidence differs from physical evidence
- Identify different types of electronic evidence
- Identify issues related to the Admissibility of Evidence

Case Study



1. 18:15 Holly & Jessica left Holly's house.
2. 18:25 The girls seen in sand street.
3. 18:28 CCTV photographs the girls crossing the sport centre car park.
4. 18:32 Last sighting of the girls on college road.
5. **18:46 Jessica's mobile phone switched off.**



Evidence Basics

- Evidence is proof of a fact about what did or did not happen
- Three types of evidence can be used to persuade someone:
  - Testimony of a witness
  - Physical evidence
  - Electronic evidence
- Both cybercrimes and traditional crimes can leave cybertrails of evidence.

Types of Evidence (Cont.)

- Circumstantial evidence: shows circumstances that logically lead to a conclusion of fact.
- Hearsay evidence: secondhand evidence.
- Material evidence: evidence relevant and significant to lawsuit.
- Immaterial evidence: evidence that is not relevant or significant.

Knowing What to Look For

- Technical knowledge of how data and metadata are stored will determine what e-evidence is found.
- For this reason, technical knowledge of investigators must keep pace with evolving data storage devices

Categories of Stored Data

- Courts recognize five categories of stored data:
  - Active, online data (Volatile Information)
  - Near-online data (Nonvolatile Information)
  - Offline storage/archives
  - Backup tapes
  - Erased, fragmented, or damaged data

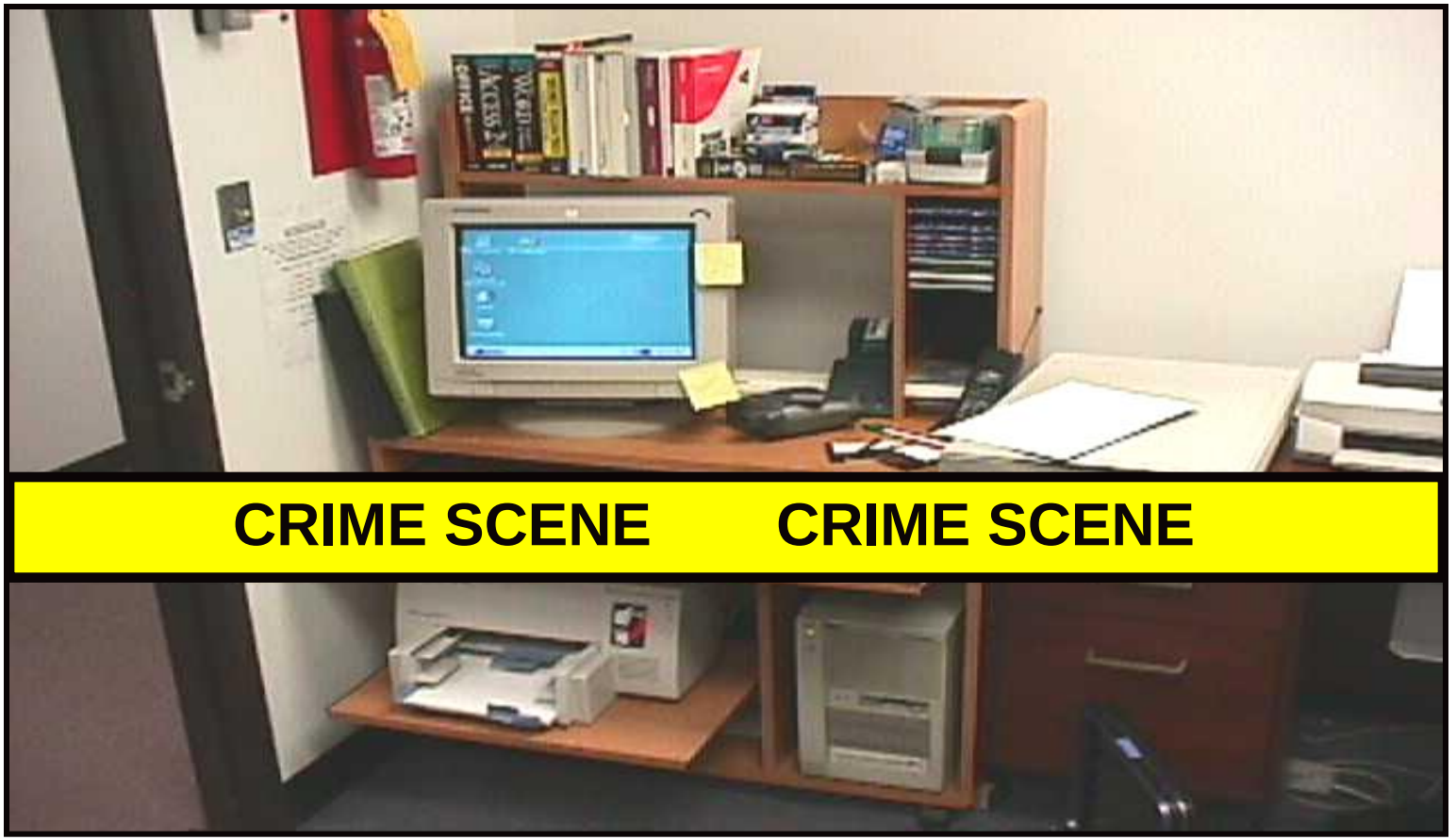
Volatile Information

- Volatile information is data that is lost once the system is rebooted
  - Currently logged-on users
  - The command –line histories of any open windows
  - The contents of clipboard when cut and paste is used
  - Currently open network connections to other systems
  - The current time and date
  - Currently running processes
  - Currently loaded DLLs, drivers, and other modules
  - Background processes and services that are running
  - Last boot time/system uptime
  - Some registry values
  - Currently open network ports
  - Mapped drives and printers

Nonvolatile Information

- Nonvolatile information is information that will survive a reboot of the machine and still be available.
  - Most of the registry
  - File system objects
  - Items queued in the printer (interface to the print device)
  - Event Logs
  - Scheduled tasks
  - Application logs
- Nonvolatile information can be damaged by activity triggered by shutdown.
  - Script designed toerase log files on shutdown
  - Normal processing of the system with registry keys like run once
  - Batch files that remove or uninstall programs quietly on shutdown
- Power off boxes instead of running shut down

Knowing What to Look for



Knowing What to Look for (Cont.)

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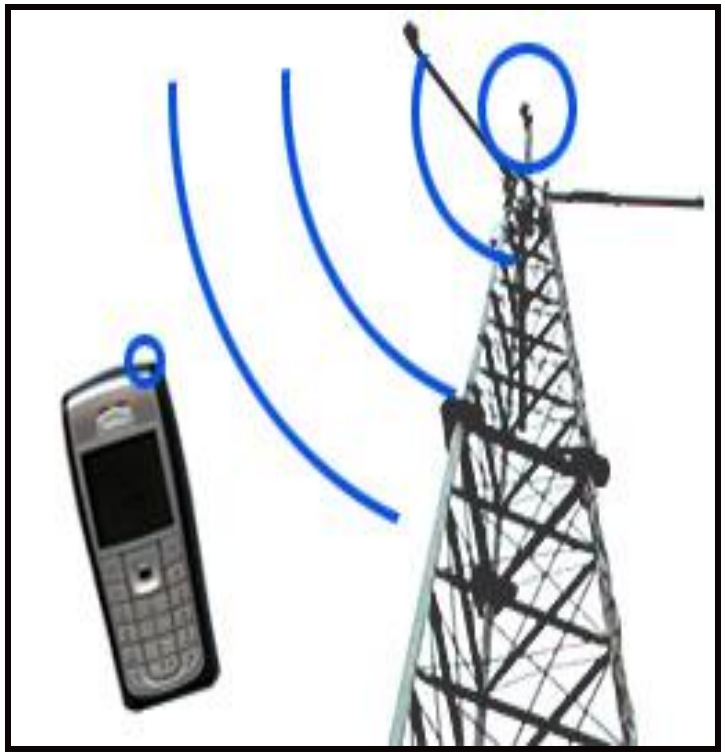

Knowing What to Look for (Cont.)

Knowing What to Look for (Cont.)

Admissibility of Evidence

- Goal of an investigation: collect evidence using accepted methods so that the evidence is accepted in the courtroom and admitted as evidence in the trial.
- Judge's acceptance of evidence is called *admission of evidence*

Admissibility of Evidence (Cont.)

- Evidence admissibility requires legal search and seizure and chain of custody.
- Chain of custody must include:
  - Where the evidence was stored
  - Who had access to the evidence
  - What was done to the evidence
- In some cases, it may be more important to protect operations than obtain admissible evidence

Search Warrant for Admissible Evidence

- A *search warrant* is issued only if law enforcement provides sufficient proof that there is *probable cause* a crime has been committed.
- Law officer must have a reasonable belief that a person has committed a crime
- The law officer must specify what premises, things, or persons will be searched.
- Evidence discovered during the search can be seized.

Search Warrants (Cont.)

- Two reasons a search can take place without a search warrant:
  - The officer may search for and remove any weapons that the arrested person may use to escape or resist arrest.
  - The officer may seize evidence in order to prevent its destruction.

Forensics Investigation Methods

- Methods used by investigators must achieve these objectives:
  - Protect the suspect system
  - Discover all files
  - Recover deleted files
  - Reveal contents of hidden files
  - Access protected or encrypted files
  - Use steganalysis to identify hidden data
  - Analyze data in unallocated and slack space
  - Print an analysis of the system
  - Provide an opinion of the system layout
  - Provide expert testimony or consultation

The Five Ws

- Answering the 5 Ws helps in criminal investigations:
  - Who
  - What
  - Where
  - When
  - Why

Questions?

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