Mobile Device Forensics

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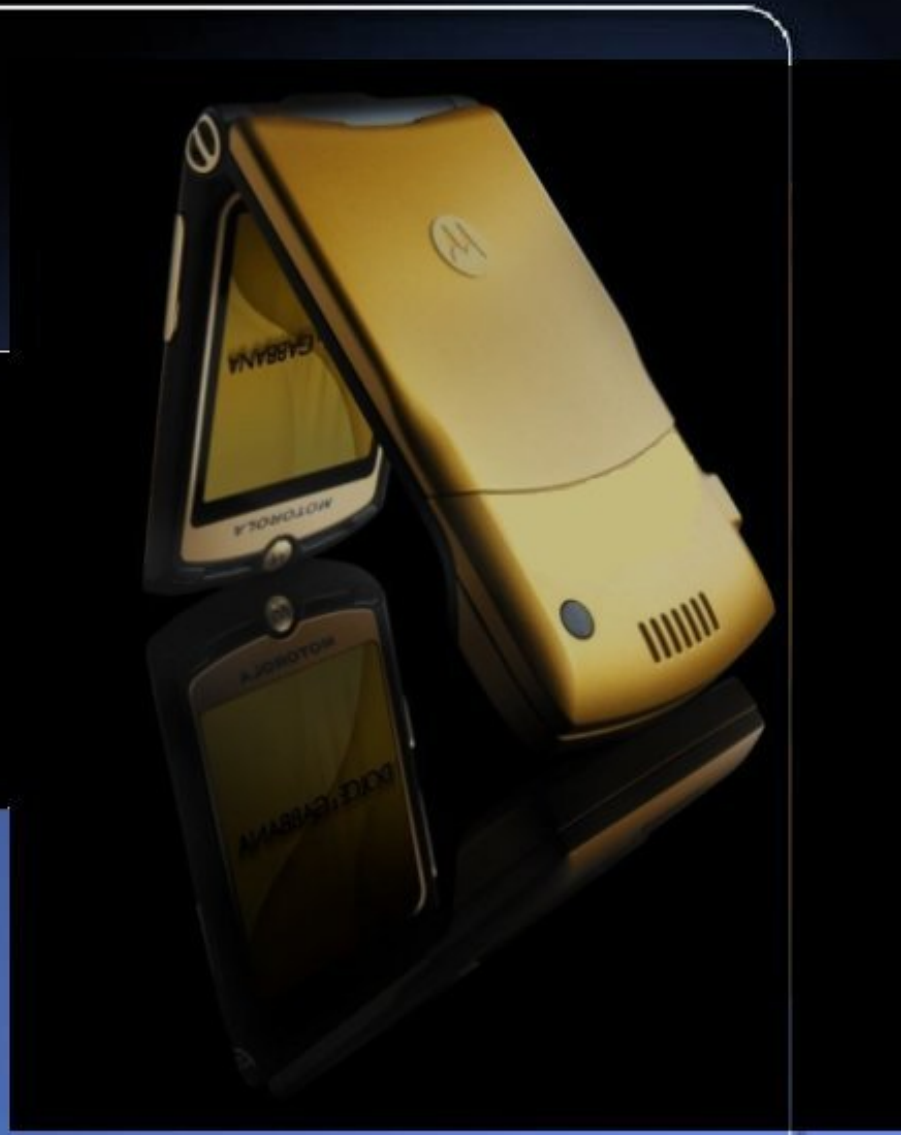

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Agenda

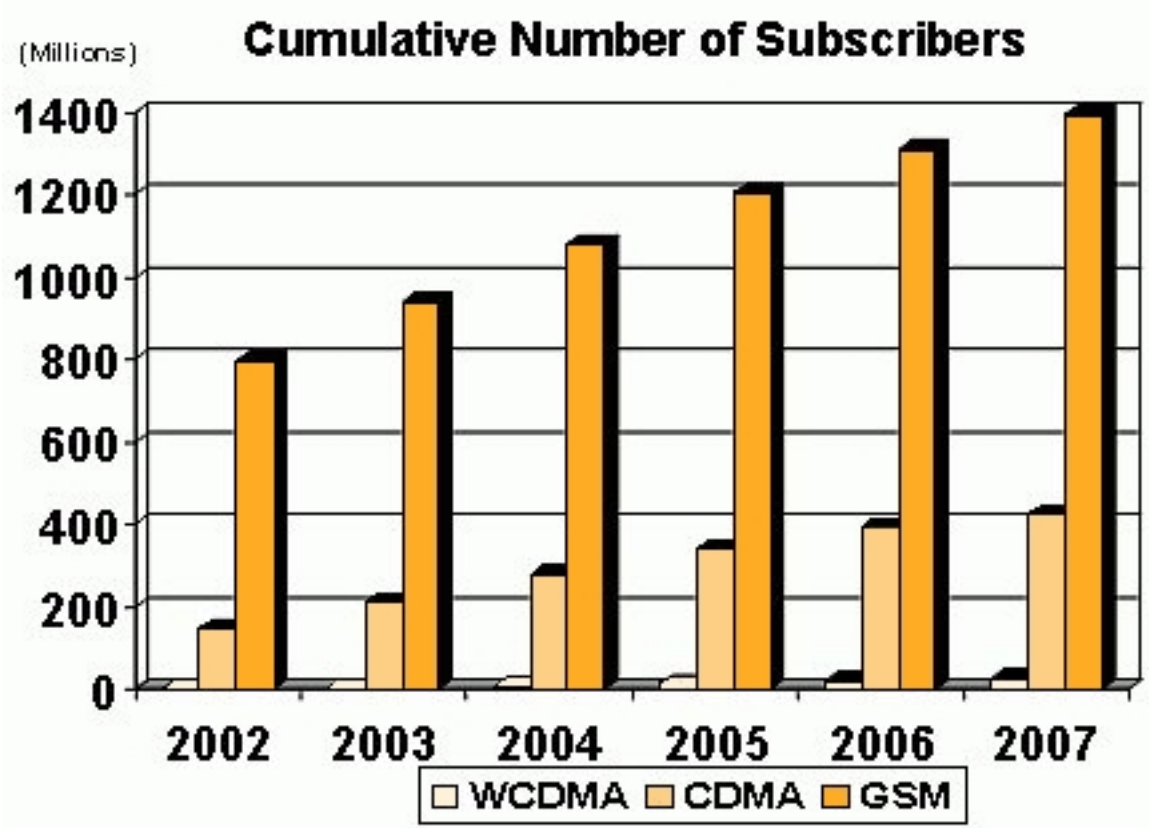
- Overview
- Tools and Devices
- Device Architecture
- Preservation
- Acquisition
- Digital Evidence
- Tool Validation
- Requirements
- Conclusions

Introduction

- Mobile devices are an evolving form of computing, used widely for personal and organizational purposes
- These compact devices are useful in managing information, such as contact details and appointments, corresponding electronically, and conveying electronic documents
- Over time, they accumulate a sizeable amount of information about the owner
- When involved in crimes or other incidents, proper tools and techniques are needed to recover evidence from such devices and their associated media

Motivation

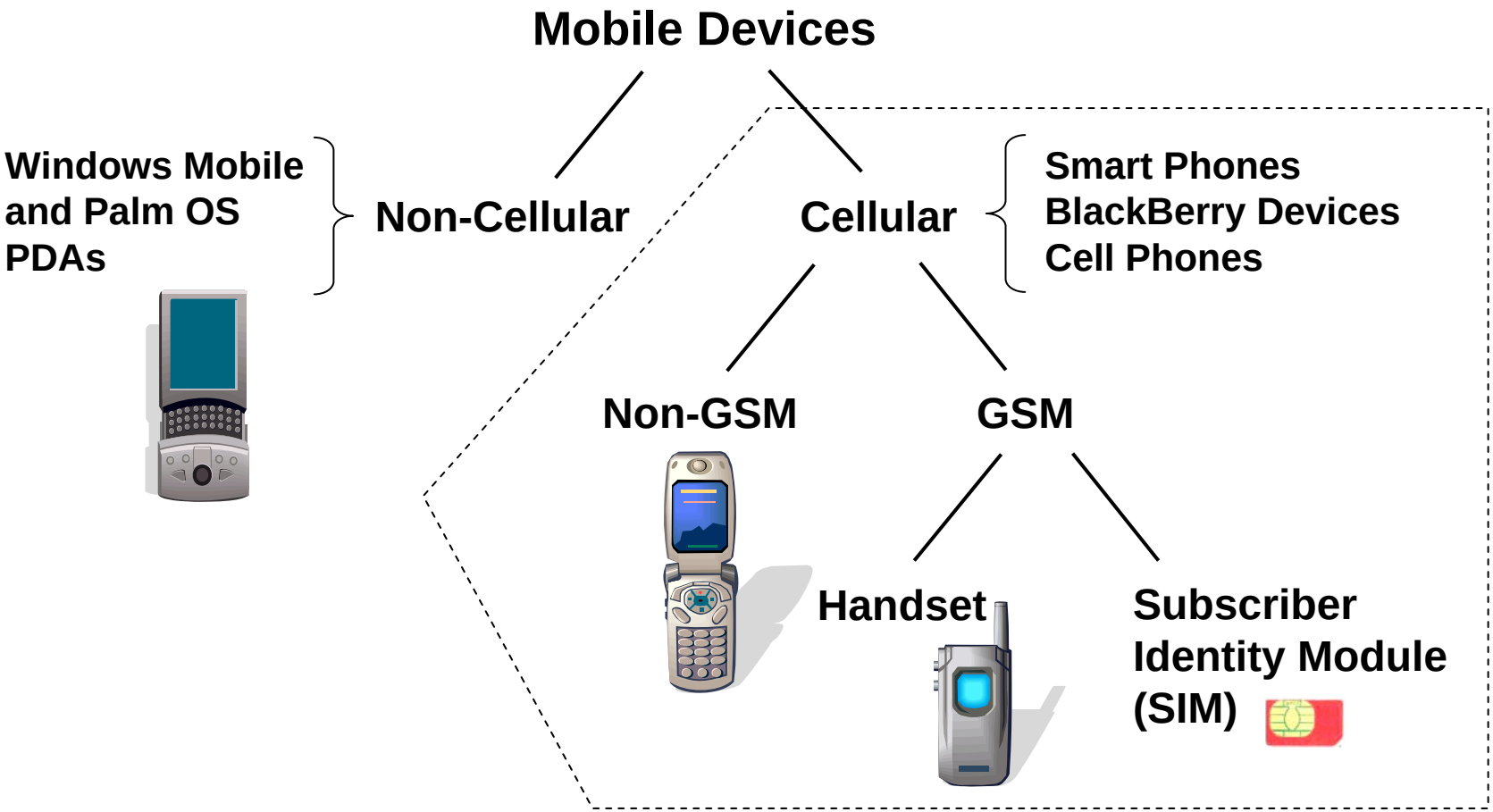
- AT&T rolled out the first cellular network in 1977 for 2,000 people in Chicago, with phones the size and weight of a brick
- Approximately 2 billion mobile phones are in the world today – 2 times the number of personal computers
- 1.1 billion handsets were sold in 2007
- Gartner estimates that about 1.9 trillion text messages were sent in 2007 and 2008 predictions reach the 2.3 trillion mark.



Footnotes

- A considerable number of software tools exist, but the range of devices addressed is often by:
  - a manufacturer's product line (e.g., Acquisition support for Nokia devices only)
  - an operating system family (e.g., Palm OS devices, Symbian devices)
  - a specific type of acquisition protocol (e.g., CDMA phones)
- The means of acquiring data may also range from connections via cable only to include infrared and Bluetooth alternatives
- Facilities for examination or reporting may not be provided, requiring other means to perform those tasks

Simplified Tool Classification



Device/SIM Architecture

- Internal Memory
  - Smart Phones
    - Flash ROM
      - OS
      - Pre-loaded applications
      - Safe-store folder
    - RAM
      - Program Memory
      - Object Store
  - Cell Phones
    - Flash
      - OS
      - User allocated space
- SIMs
  - Smart card that provides users with extended non-volatile storage
    - Processor
    - ROM
    - RAM
  - Essential element for GSM network authentication
  - Essential for GSM device functionality

Preservation

- **Inactive Device**
  - Leave off until in a protected laboratory setting
  - Seize all associated cables and media (i.e., SIMS, SD cards, CF cards)
- **Active Device**
  - Power it off
    - May trigger authentication mechanisms
    - May change the current state of the device
  - Faraday Bag
    - Not proven 100% effective
    - Must use a portable battery supply or a shielded cable charger
  - Acquire device on-site
- **Caveats**
  - Improperly shielded active devices may result in:
    - Overwritten data that is not recoverable
    - Updated LOCI data

Netherlands Forensic Institute
http://www.holmes.nl/MPF/FlowChartForensicMobilePhoneExamination.htm

Acquisition

- **SIM**
  - **PC/SC Reader acquires data objects defined by the GSM 11.11 standard**
- **Internal Memory**
  - **Physical**
    - **Physical acquisition implies a bit-by-bit copy of an entire physical store (e.g., a memory chip),**
    - **Advantages**
      - **Allows deleted files and any data remnants present to be examined, which otherwise would go unaccounted**
  - **Logical**
    - **Logical acquisition implies a bit-by-bit copy of logical storage objects (e.g., directories and files) that reside on a logical store (e.g., a file system partition).**
    - **Advantages**
      - **System data structures are normally easier for a tool to extract and provide a more natural organization to understand and use during examination**

Evidence Sources

- Phonebook
- Calendar
- To do list

- Electronic mail
- Instant messages
- Web information

- Electronic documents
- Photos
- Videos
- Audio
- Graphics

- Subscriber identifiers
- Equipment identifiers
- Service Provider

- Last dialed numbers
- Phone number log

- Short text messages
- Enhanced messages
- Multimedia messages

- Last active location (voice and data)
- Other networks encountered

Tool Validation

- **CFTT – Computer Forensics Tool Testing Program provides a measure of assurance that the tools used in the investigations of computer-related crimes produce valid results.**
- **Tool validation results issued by the CFTT project at NIST provide information necessary for:**
  - **Toolmakers to improve tools**
  - **Users to make informed choices about acquiring and using computer forensic tools**
  - **And for interested parties to understand the tools capabilities**
- **The CFTT project is further described at: http://www.cftt.nist.gov/**

Mobile Forensic - CFTT Documents

- **Mobile Device Imaging Specs**
  - **Requirements:** *GSM Mobile Device and Associated Media Tool Specification*
  - **Test Plan:** *GSM Mobile Device and Associated Media Tool Specification and Test Plan*
- **Test Setup Documents**
  - **Setup and Test Procedures:** *GSM Mobile Devices and Associated Media Tool Setup and Test Procedures*
- **Test Reports**
  - **Tool Test Reports: Results available later in the year**

http://www.cftt.nist.gov/mobile_devices.htm

Core Requirements

Internal Memory

- Device Recognition
  - Cable, Bluetooth, IrDA
- Non-Supported Devices
  - Error message
- Connectivity Errors
- Report Generation
  - GUI, Report
- Logical Acquisition
  - Tool supported data objects

SIM

- Media Recognition
  - PC/SC, proprietary reader
- Non-Supported SIMs
  - Error message
- Connectivity Errors
- PIN
- Report Generation
  - GUI, Report
- Logical Acquisition
  - Tool supported data objects

Optional Requirements

Internal Memory / SIM Acquisition

- Data Presentation
  - GUI, Report
- Case Data Protection
- Physical Acquisition
- Access Card Creation
- Log File Generation
- Foreign Language
- Remaining Number of PIN/PUK attempts
- Stand-alone Acquisition
- Hashing
  - Overall Case File, Individual Acquired Files

Core Assertions – Data Objects

SIM Data Objects

- Service Provider Name (SPN)
- Integrated Circuit Card Identifier (ICCID)
- International Mobile Subscriber Identity (IMSI)
- Mobile Subscriber International ISDN Number (MSISDN)
- Abbreviated Dialing Numbers (ADN)
- Last Dial Numbers (LDN)
- Short Message Service (SMS)
- Enhanced Message Service (EMS)
- Location Information (LOCI)
- General Packet Radio Service (GPRS) location

Internal Memory Data Objects

- International Mobile Equipment Identifier (IMEI)
- Personal Information Management (PIM) data:
  - Address book
  - Calendar entries
  - To-Do list
  - Memos
- Call Logs
- SMS text messages
- MMS messages
- File Storage: graphic, audio, video

Conclusions

- **Multiple tools are needed to cover the widest range of available mobile phones**
- **Understanding of proper seizure and preservation techniques are paramount**
- **Practice in mock examinations can help gain an in-depth understanding of a tool and subtleties of use, and also provides the opportunity to customize settings for later use**
- **Quality control and tool validation for Mobile Device Forensic tools is significant for proper data acquisition and reporting**

Sponsor Information

<u>Supporting Organizations</u>

Office of Law Enforcement and Standards (OLES)

National Institute of Justice (NIJ) &

Other Law Enforcement Organizations

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Thank You!

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- http://www.cftt.nist.gov/mobile_devices.htm
- http://csrc.nist.gov/mobiledevices/projects.html