INTRODUCTION TO MOBILE FORENSICS

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DeSales University

BACKGROUND

- Cellular Industry
- Police Officer
- Internet Crimes Against Children Task Force Detective
- FBI Task Force Officer
- Private Sector
- Adjunct Professor
- Full-time Instructor at DeSales University

BACKGROUND

- B.S. in Information Systems
- M.A. in Criminal Justice/Digital Forensics
- Over 1000 hours of training
- Specialized training in JTAG and chip-off
- Several certifications
- Testified in court as an expert in computer crime and digital forensics

BACKGROUND - CERTIFICATIONS

- International Information Systems Security Certification Consortium – Certified Information Systems Security Professional (CISSP) and Certified Cyber Forensics Professional (CCFP)
- CompTIA – A+, Network+, Security+, CompTIA Advanced Security Practitioner (CASP)
- EC-Council Certified Ethical Hacker (CEH), Computer Hacking Forensic Investigator (CHFI)
- International Society of Forensic Computer Examiners (ISFCE) Certified Computer Examiner (CCE)
- International Assurance Certification Review Board (IACRB) Certified Computer Forensics Examiner (CCFE)
- Guidance Software EnCase Certified Examiner (EnCE)
- AccessData Certified Examiner (ACE)

WHAT IS A MOBILE DEVICE?

- Cellular phones
- Tablet computers
- MP3 players
- e-Readers
- Wearable devices

Why are we interested in mobile devices?

MOBILE DEVICES

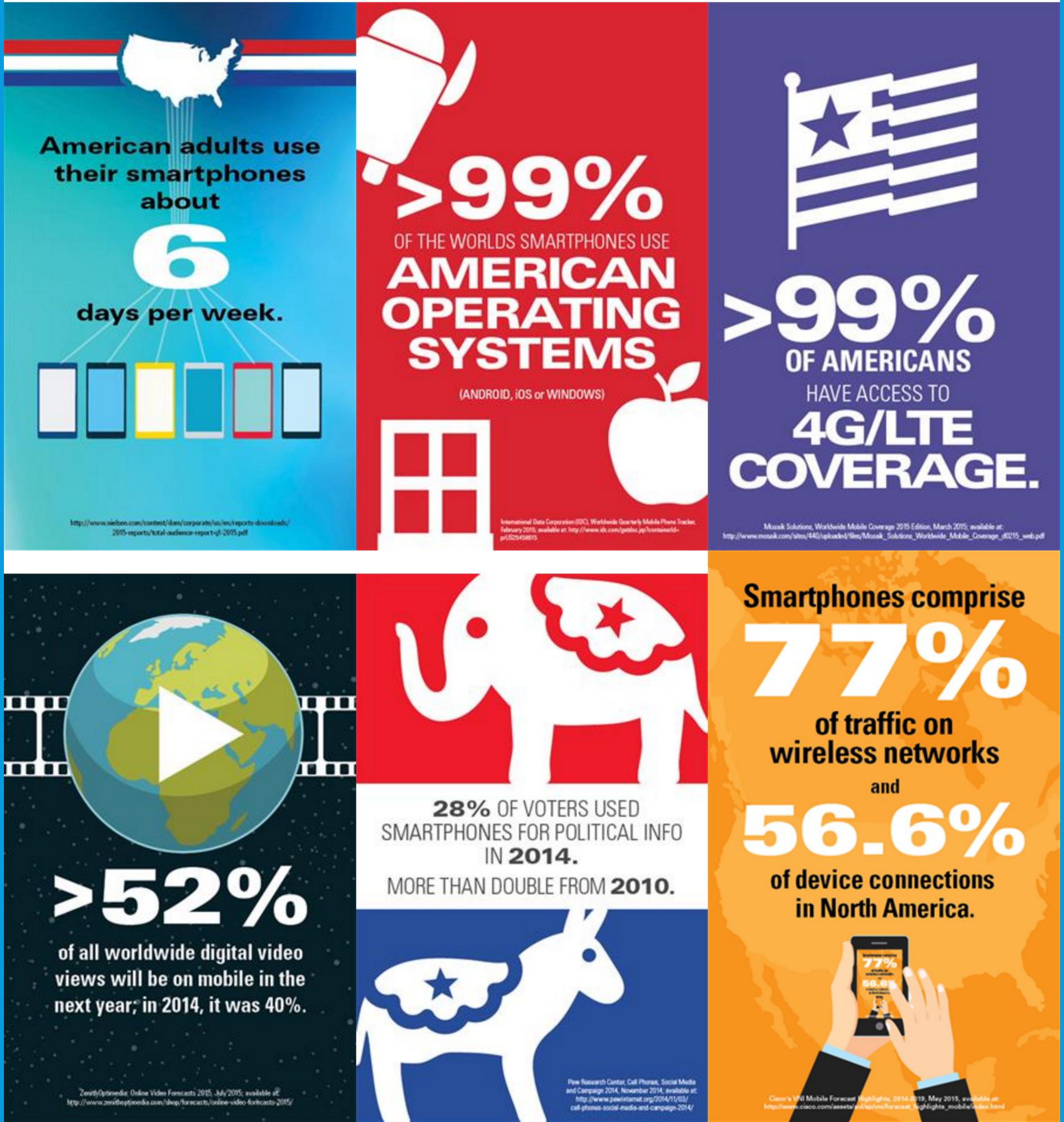
- More than 7 billion cellular subscriptions worldwide
- Portio Research Ltd. predicts there will be 8.5 billion by the end of 2016
- The majority of people have a cell phone (or phones)
- Most people always have their cell phone with them
- Cell phones are small computers which can store an immense amount of data
- Many households no longer have desktop or laptop computers

INTERESTING FACTS

- According to the CTIA:
  - 4 out of 10 Americans live in a wireless-only household
  - 1 in 10 Americans access the Internet exclusively from a smartphone
  - More than 90% of devices sold in the U.S. in 4Q2013 were smartphones
  - More than 335,650,000 active wireless lines as of Dec. 2013

INTERESTING FACTS

- More than 6 billion text messages and more than 330 million multimedia messages occur each day in the United States (as of December 2013, according to CTIA)
- Apple announced that users send over 40 billion iMessages per day (Februrary 2014)
- In 2016, Apple announced that users send an average of 200,000 messages per second.



American adults use their smartphones about 6 days per week.

http://www.nielsen.com/content/dam/corporate/us/en/reports-downloads/2015-reports/total-audience-report-q1-2015.pdf

>99% OF THE WORLDS SMARTPHONES USE AMERICAN OPERATING SYSTEMS

(ANDROID, iOS or WINDOWS)

International Data Corporation (IDC), Worldwide Quarterly Mobile Phone Tracker, February 2015; available at: http://www.idc.com/getdoc.jsp?containerId=prUS25450615

>99% OF AMERICANS HAVE ACCESS TO 4G/LTE COVERAGE.

Mosaik Solutions, Worldwide Mobile Coverage 2015 Edition, March 2015; available at: http://www.mosaik.com/sites/440/uploaded/files/Mosaik_Solutions_Worldwide_Mobile_Coverage_d0215_web.pdf

>52% of all worldwide digital video views will be on mobile in the next year; in 2014, it was 40%.

ZenithOptimedia; Online Video Forecasts 2015, July 2015; available at: http://www.zenithoptimedia.com/shop/forecasts/online-video-forecasts-2015/

28% OF VOTERS USED SMARTPHONES FOR POLITICAL INFO IN 2014.

MORE THAN DOUBLE FROM 2010.

Pew Research Center, Cell Phones, Social Media and Campaign 2014, November 2014; available at: http://www.pewinternet.org/2014/11/03/cell-phones-social-media-and-campaign-2014/

Smartphones comprise 77% of traffic on wireless networks and 56.6% of device connections in North America.

Cisco's VNI Mobile Forecast Highlights, 2014-2019, May 2015, available at: http://www.cisco.com/assets/sol/sp/vni/forecast_highlights_mobile/index.html

Photo from ctia.org

EVOLUTION OF CELL PHONES

- Over the years, cell phones
  - Have become smaller and lighter
  - Are less expensive (devices and service)
  - Are much faster
  - Use less power

CRIMES

- What crimes can be committed using a mobile device?
  - Crimes against children
  - Drugs
  - Harassment
  - Terroristic threats
  - Murder
- Civil wrongs can also be perpetrated using mobile devices

MOBILE FORENSICS

- Defined:
  - “a branch of digital forensics relating to recovery of digital evidence or data from a mobile device under forensically sound conditions” (Wikipedia)
- Digital forensics “is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relation to computer crime” (Wikipedia)

What does forensically sound mean?

FORENSICALLY SOUND

- Definition from a popular text book:

“term used extensively in the digital forensics community to qualify and justify the use of particular forensic technology or methodology”

COMPUTER FORENSICS VS. MOBILE FORENSICS

- Mobile forensics and computer forensics are different
- There are unique challenges involved in mobile forensics that are not usually involved in computer forensics

MOBILE FORENSICS CHALLENGES

- Many different types of hardware
- Large number of mobile operating systems
- Security features

MANUFACTURERS

- Apple
- BlackBerry
- HTC
- LG
- Motorola
- Samsung
- ZTE

MOBILE PHONE OPERATING SYSTEMS

- Android
- BlackBerry OS
- iOS
- Windows Phone
- Many different proprietary operating systems

What operating system does your phone use?

What are the phases of mobile forensics?

MOBILE FORENSICS PROCESS

- Seizure
- Acquisition
- Examination/analysis

SEIZURE

- Ensure that appropriate legal authority exists before seizing
- Determine the make, model, and IMEI/MEID/serial number
- Determine the goals of the examination
- Wear gloves when handling evidence

WHERE IS THE DATA STORED?

- Data can be stored in four different locations:
  - On the phone
  - On the SIM card inside the phone
  - On the memory card inside the phone
  - In the “cloud”
  - In the cellular provider’s records

What is a SIM card?

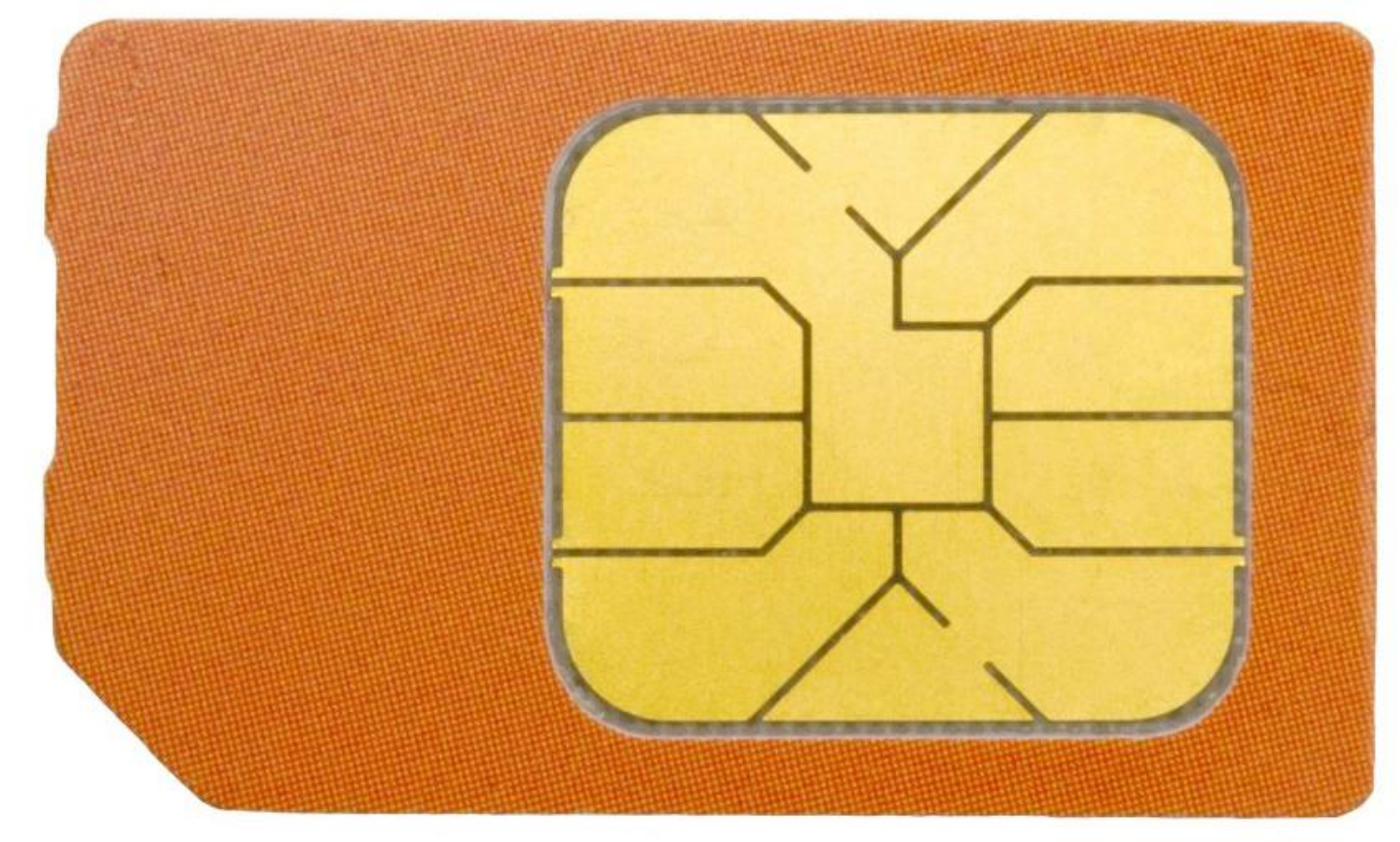


Photo from wisegeek.com

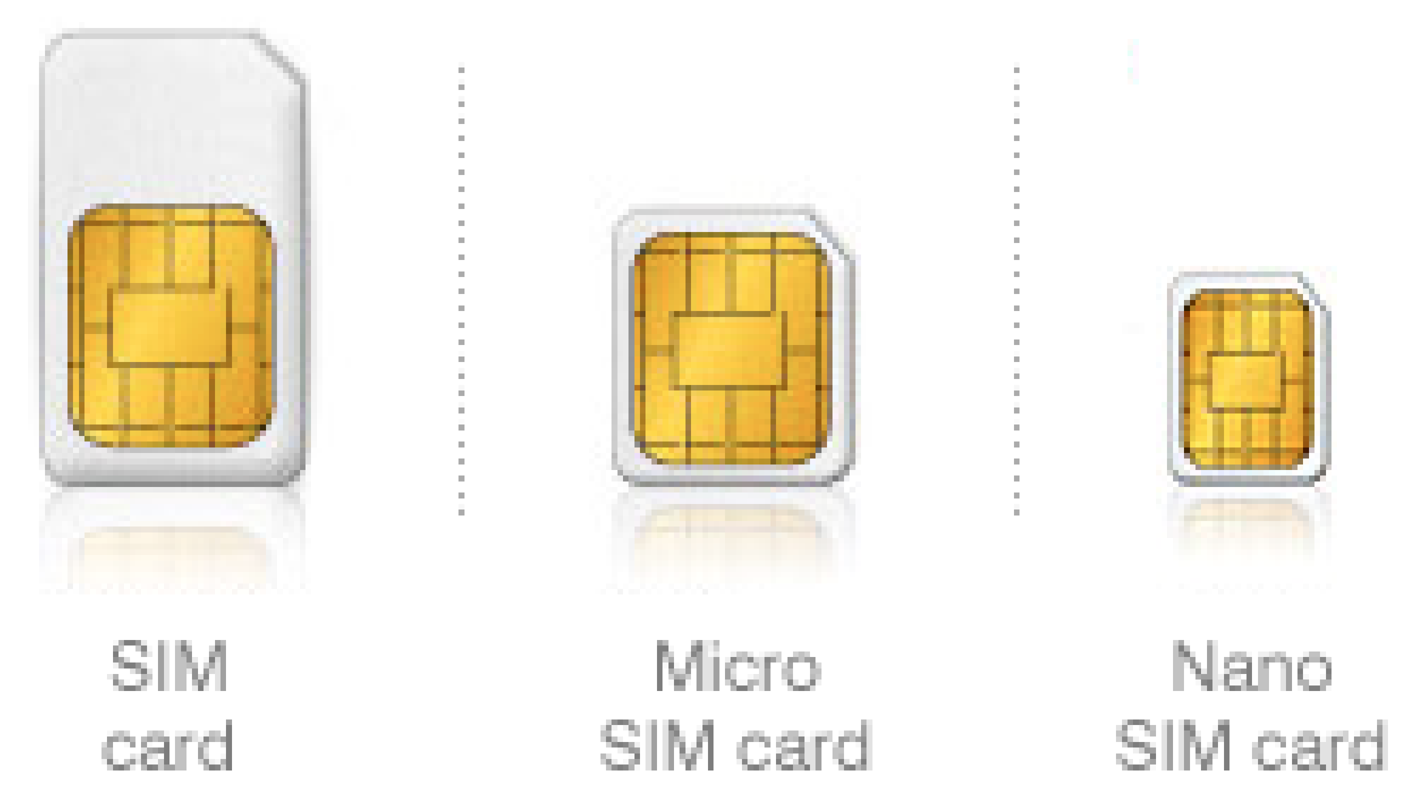


Photo from t-mobile.com

What is a memory card?

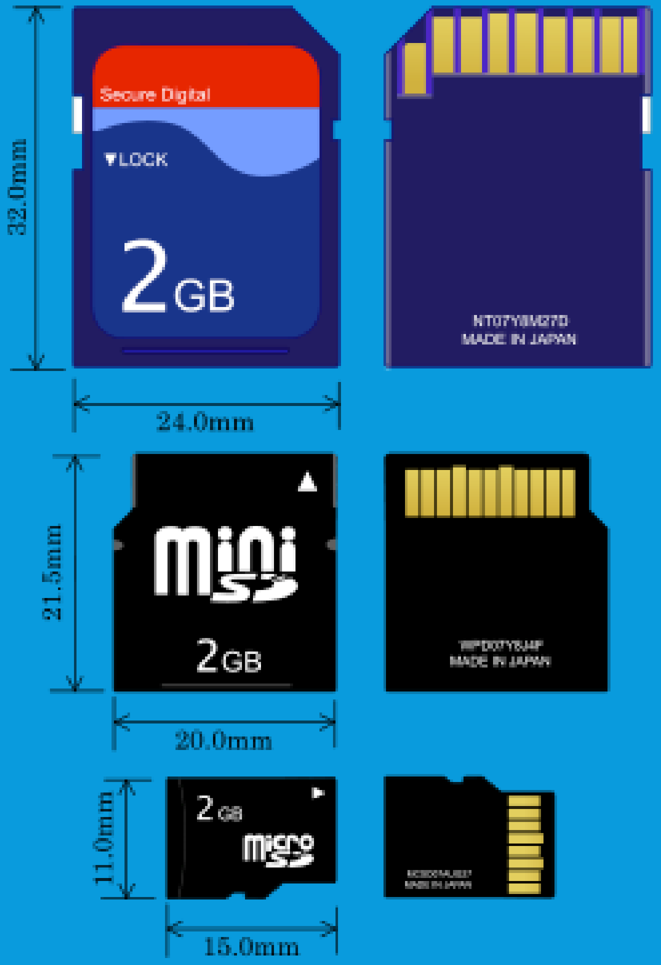


Photo from wikipedia.com

COMMUNICATION TYPES

- Phone calls
- SMS
- MMS
- Data

AVAILABLE RECORDS

- Depends on the carrier
- Call detail records (CDR)
- Detail records for SMS/MMS messages
- Detail records for data usage

Who are the major cellular carriers?

CELL PHONE PROVIDERS

- Verizon
- AT&T Mobility
- Sprint
- T-Mobile

How about regional carriers?

REGIONAL CELL PHONE PROVIDERS

- US Cellular

MVNO

- Mobile virtual network operator
  - TracFone
  - NET10 Wireless
  - 420 Wireless
  - H2O Wireless
  - Republic Wireless

420 WIRELESS™

★ GSM ★ CDMA ★ MOBILE INTERNET ★

The Nation's First Marijuana-Friendly Phone Service

Helping Legalize Marijuana in The U.S. By Donating 20% Proceeds to NORML

AVAILABLE NOW

ON THE TOP 3G/4G NETWORKS IN THE NATION

★ SAVE MONEY ★ CONTRACT-FREE ★

Order Now

IDENTIFYING THE CARRIER

- FoneFinder
- WhitePages

NUMBER PORTABILITY

- Allows consumers to bring their phone number to a new carrier
- Neustar administers the Number Portability Administration Center

NON-TRADITIONAL PHONE SERVICE

- Google Voice

PRESERVATION REQUEST

- Investigators should consider submitting a preservation request to preserve records before they are no longer available
- Generally offer the investigator 90 days to obtain and serve legal process

OBTAINING RECORDS

- Legal Process
- Contact the service provider to determine the records that are available and any specific language that should be used
- Request instructions for interpreting records
- Consider using the term “communication log”
- Talk to your prosecutor

Evidence can be tangible OR intangible

SEIZING TANGIBLE EVIDENCE

- Evidence could be stored on a variety of different types of devices
- Evidence could be stored on multiple devices
- Evidence could be stored in multiple locations
- Be aware of very small and disguised devices

PROTECTING EVIDENCE

- Photograph items before seizing
- You may want to bring a forensic examiner with you when executing the search warrant
- Consider RAM capture for desktop and laptop computers
- Place cellular devices in Airplane Mode if possible
- Don't forget about fingerprints and DNA evidence

CELL PHONES

- General rules for cell phones:
  - If they are powered on, then leave them on
  - If they are powered off, then leave them off
- If they are on, place the device in a Faraday bag to prevent wireless communications

FOLD TOP OF FARADAY BAG OVER TWICE FOR PROPER SIGNAL SHIELDING

Photo from faraday-bags.com

Where can suspects hide evidence?

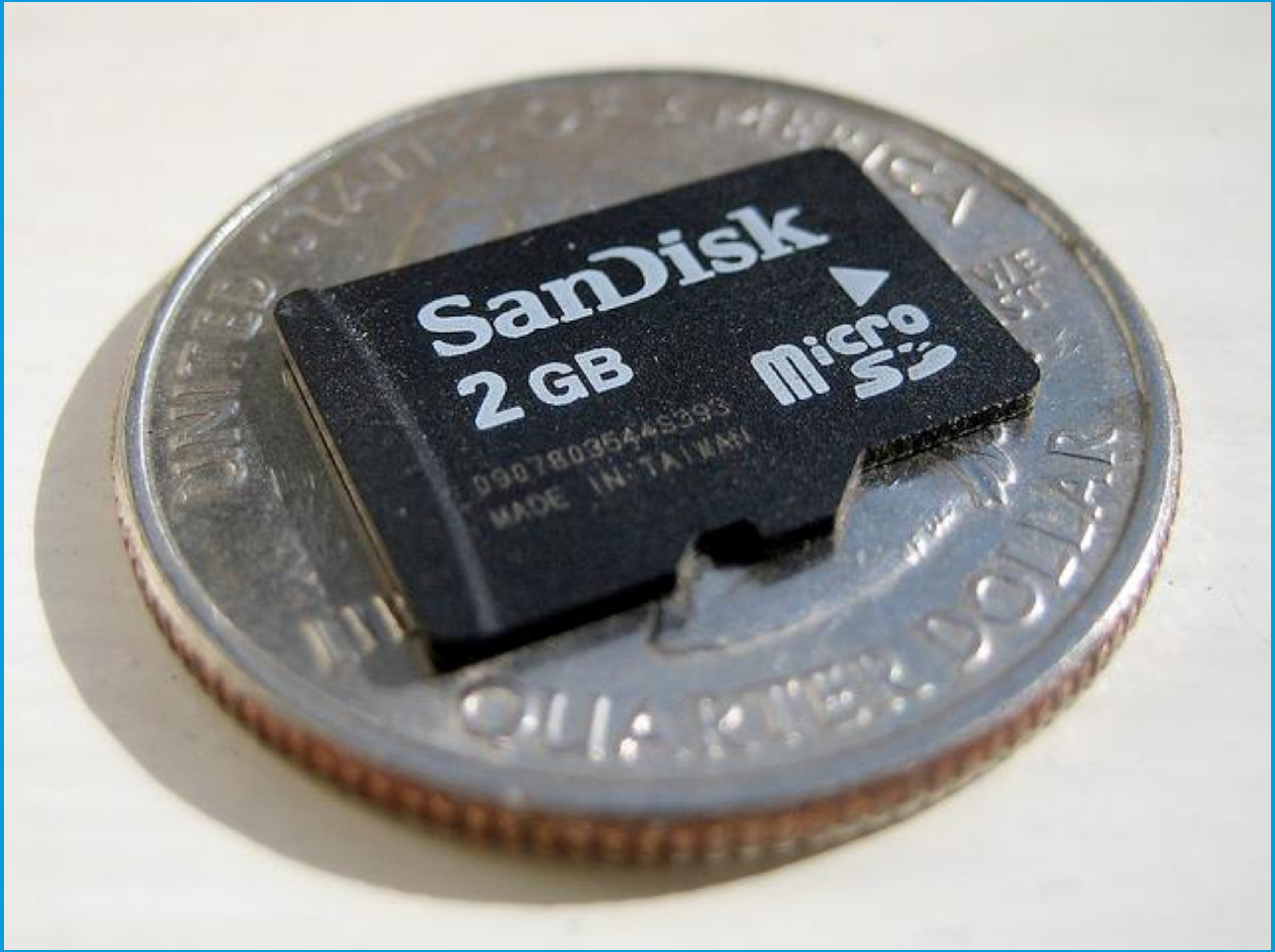


Photo from rascalmicro.com

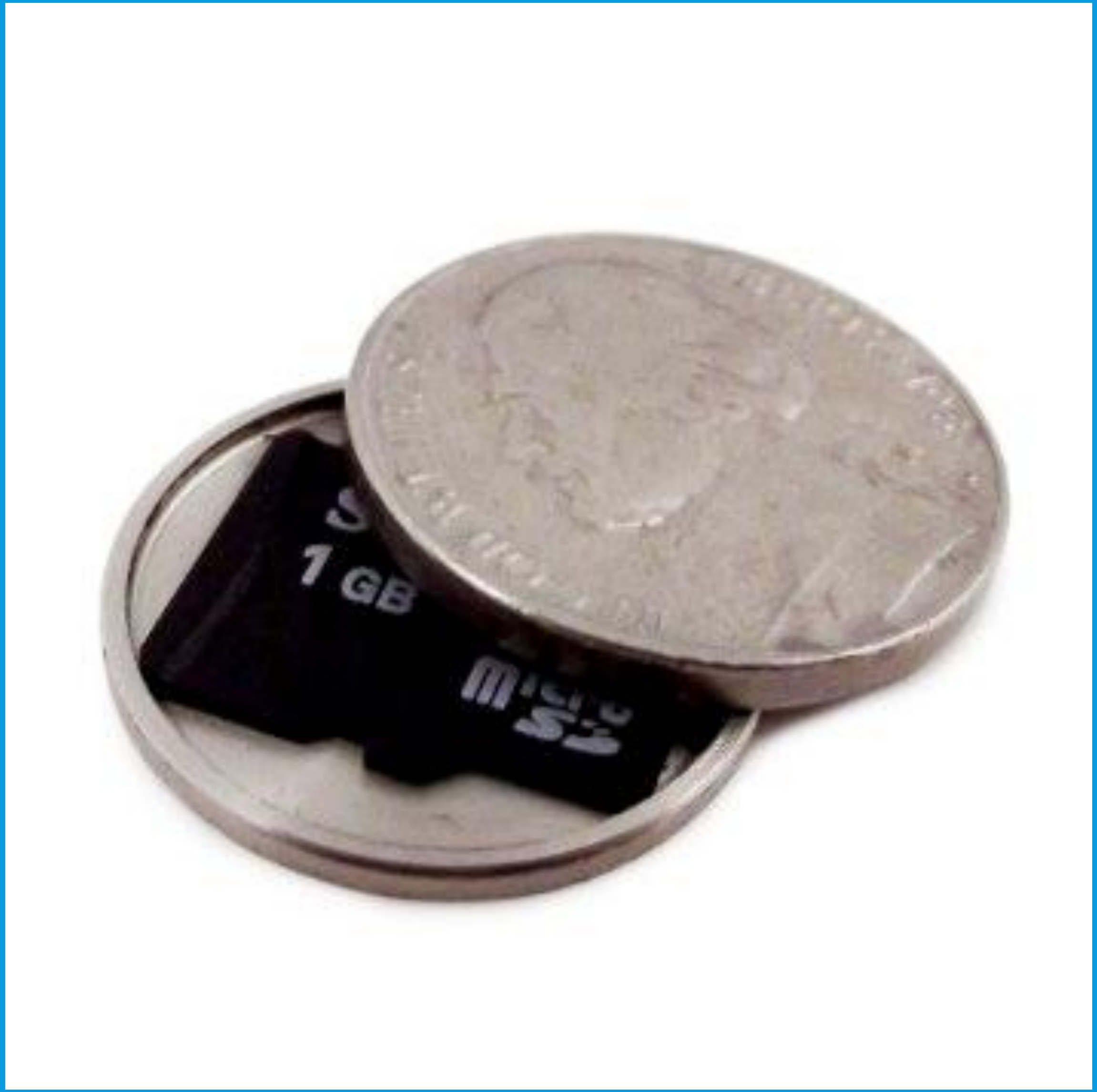


Photo from amazon.com

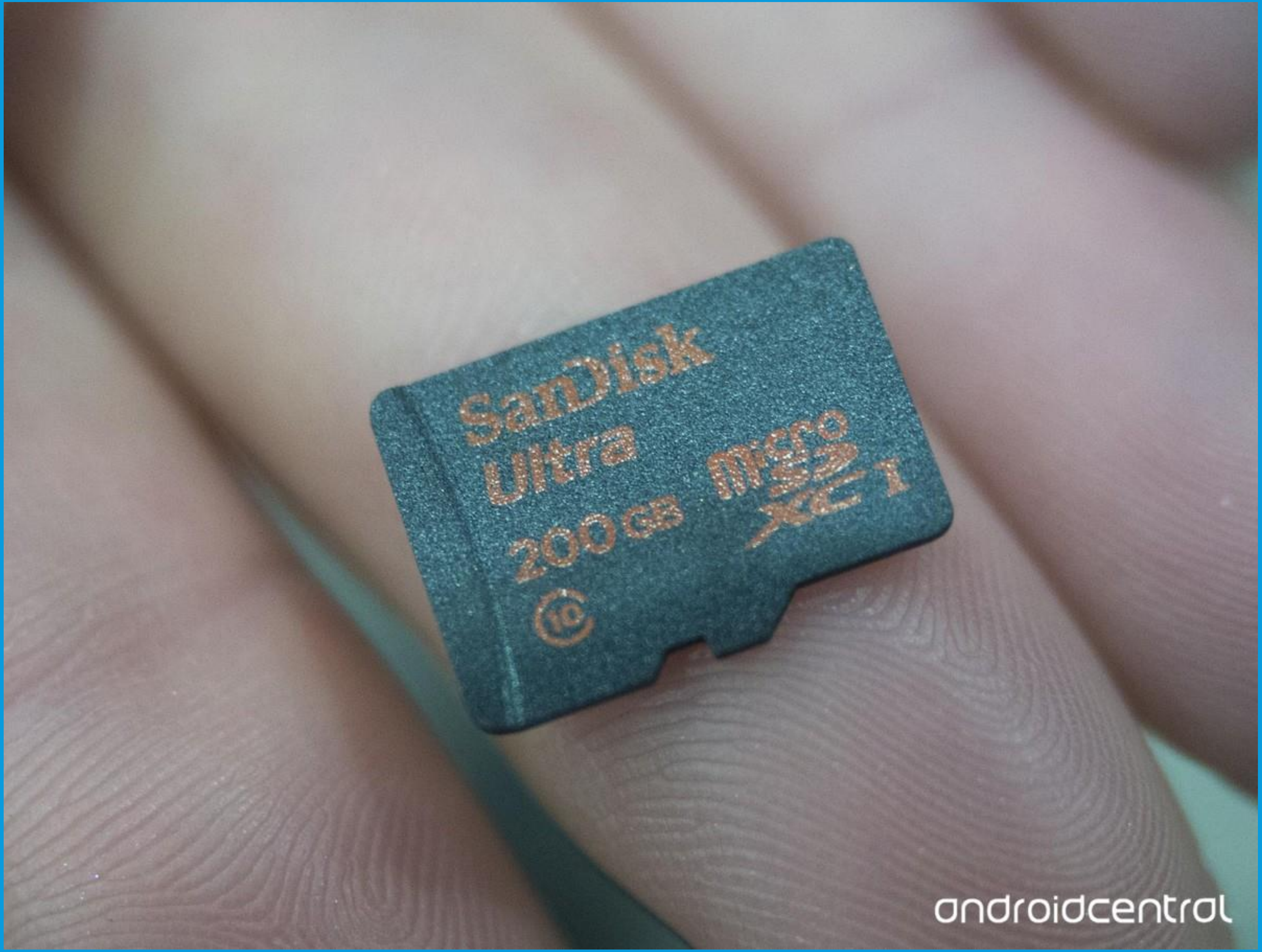


Photo from androidcentral.com

HOW MUCH DATA IS 200GB?

- 3,500,000 Word documents
- 55,000 PowerPoint presentations
- 120,000 high resolution photos
- 45,000 songs
- 100 full length movies

Photo from tricksdaddy.com

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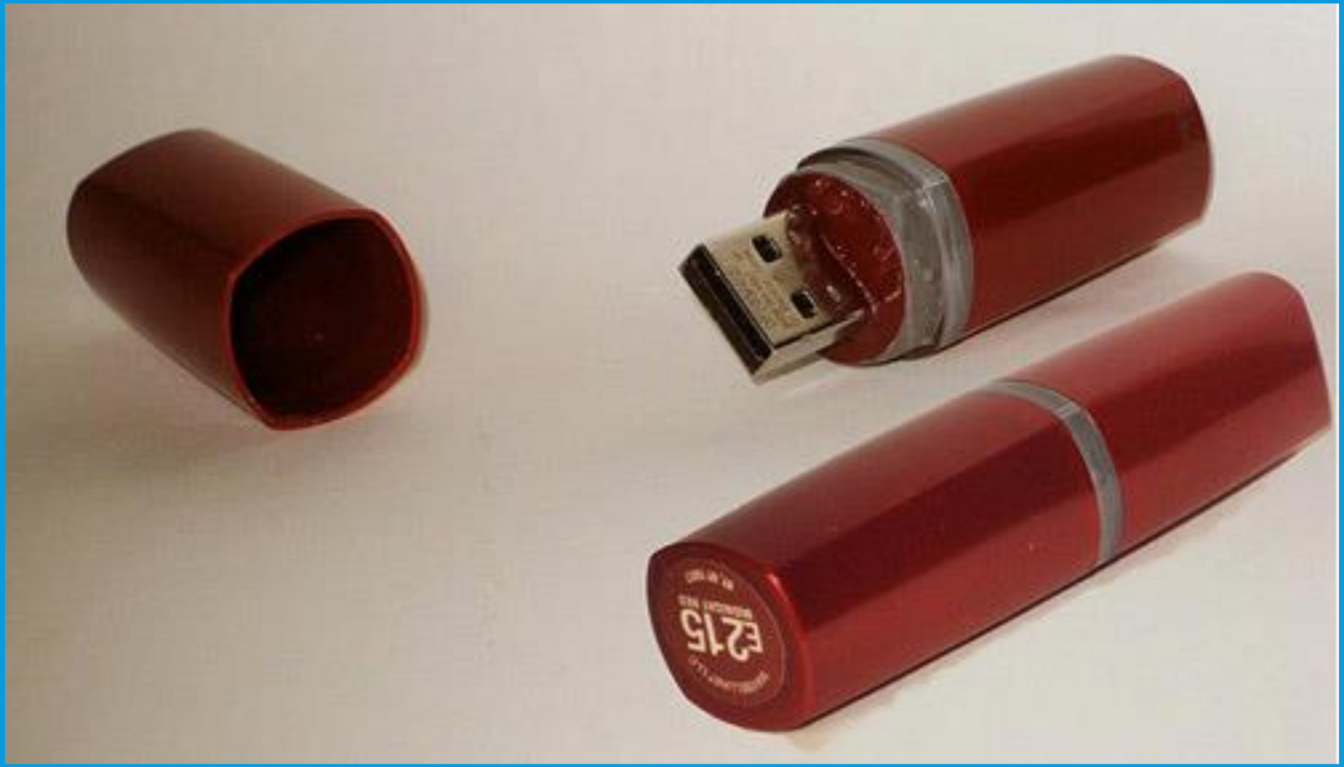

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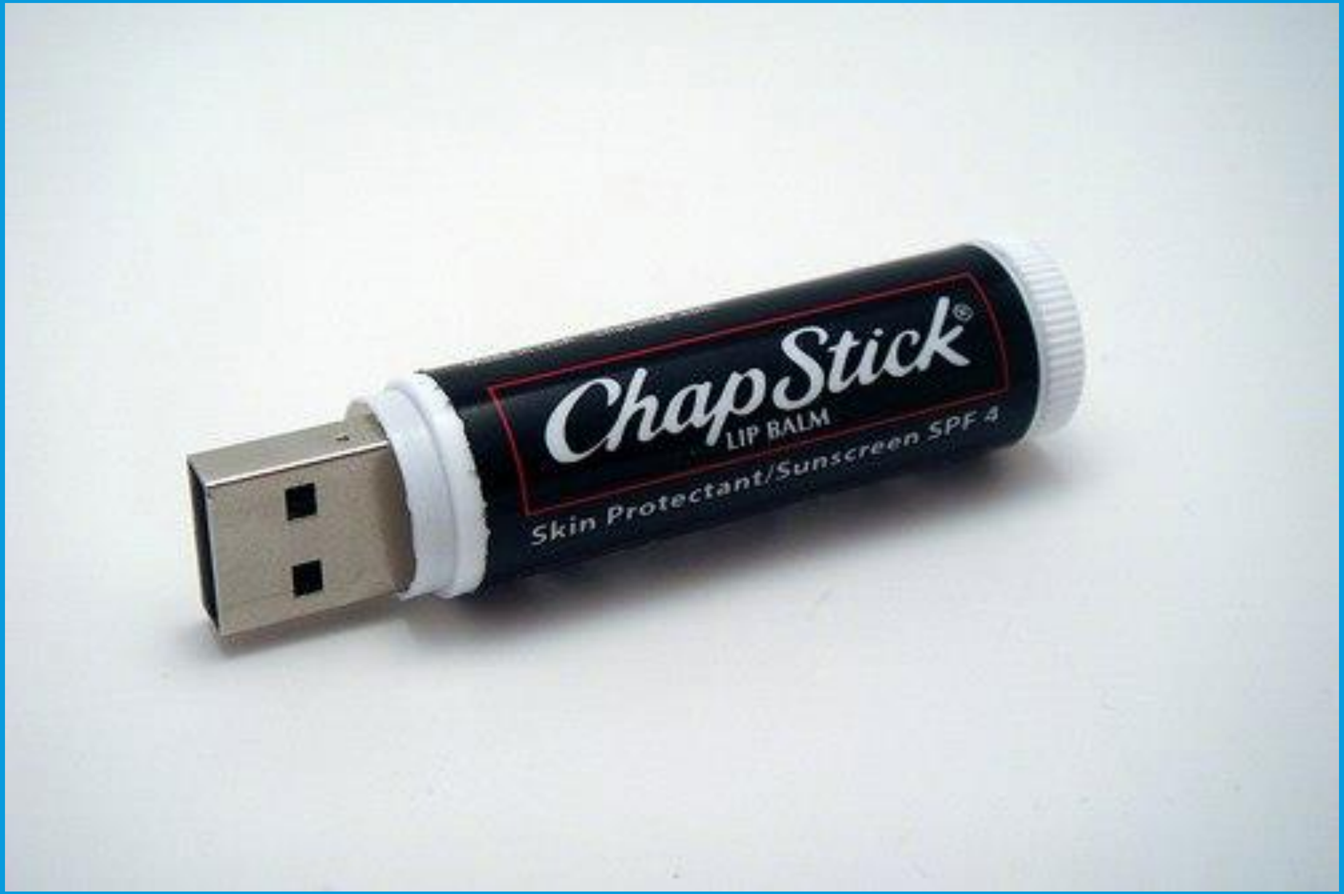


Photo from wonderhowto.com

Photo from bestbuy.com

EXAMINATION/ANALYSIS

- The examination/analysis will depend on the type of data you are looking for

ANALYZING TANGIBLE EVIDENCE

- Prevent officers from “taking a peek” at the evidence
- Submit the evidence to a qualified examiner
- You may need the examiner’s assistance when reviewing the results

What types of data will be found?

TYPES OF DATA

- Address book
- Call history
- SMS
- MMS
- E-mail
- Web browser history
- Photos
- Videos
- Music
- Documents
- Calendar
- Notes
- Maps
- Social networking data
- Application data
- Deleted data

RULES OF EVIDENCE

- For evidence to be admissible, it must be:
  - Authentic
  - Complete
  - Reliable
  - Believable

PROPER FORENSIC PRACTICES

- Secure the evidence
- Preserve the evidence
- Document the evidence
- Document all changes

What about locked phones?

EASIEST METHOD FOR LOCKED PHONES

- What is the easiest way of dealing with a locked phone?
- Ask the suspect for the password!

SMUDGE ATTACK

- It may be possible to view the suspect’s pattern

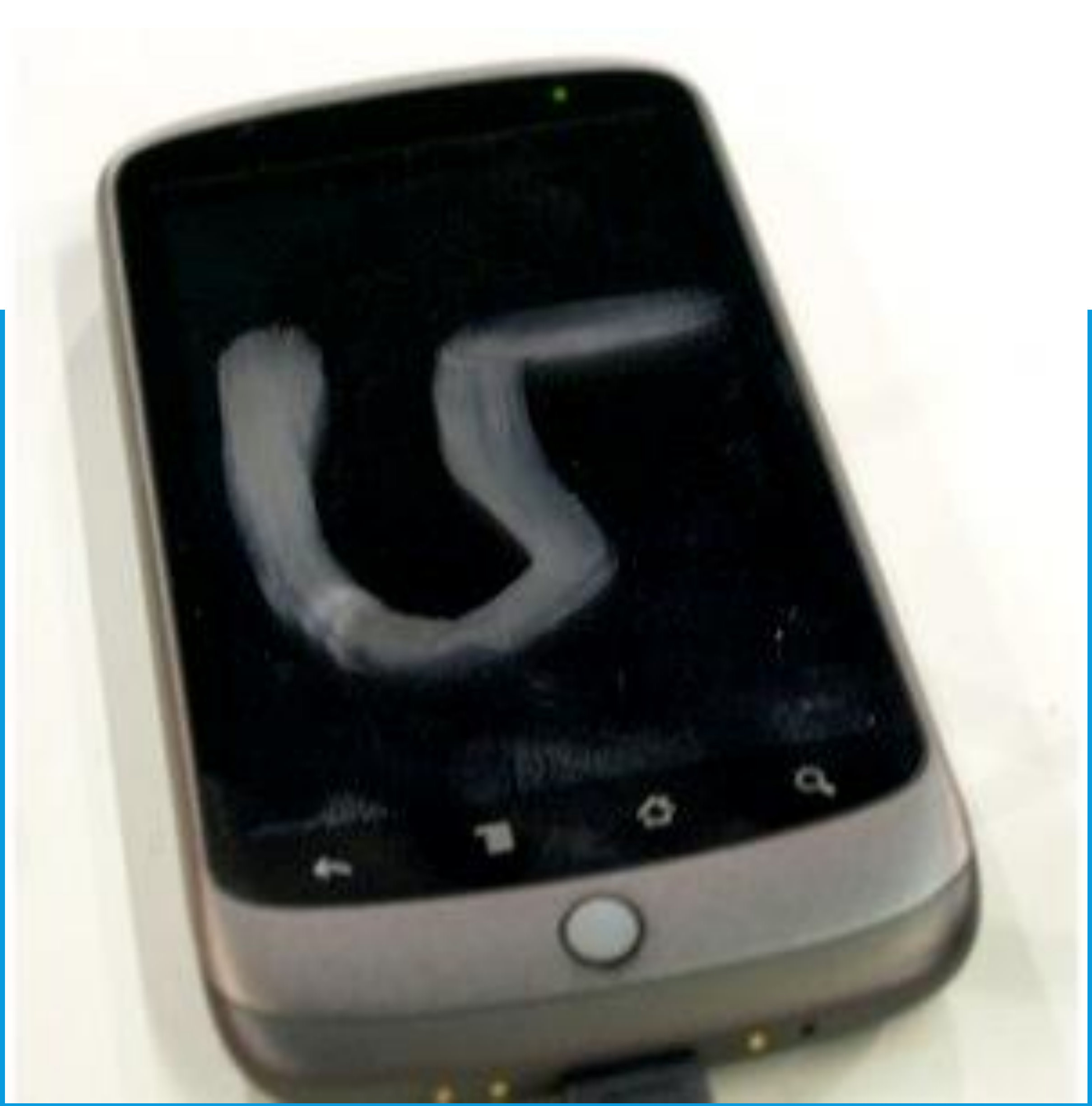


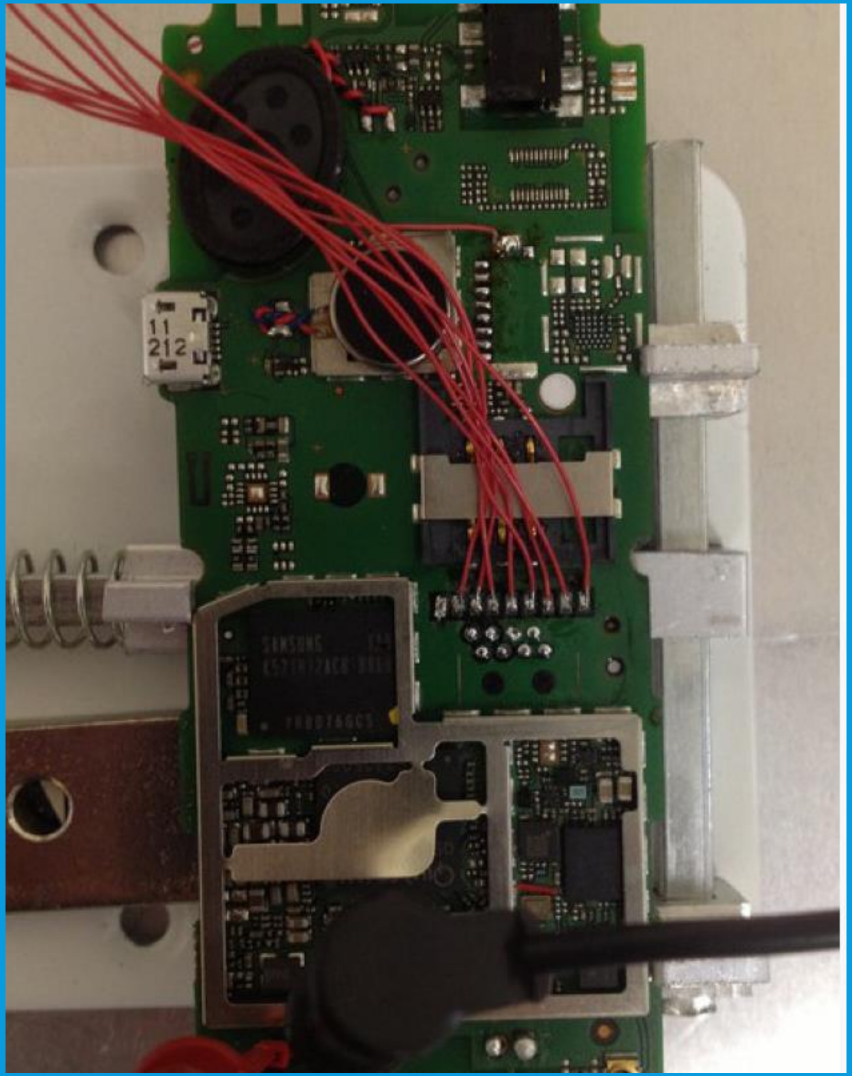
Photo from guardianproject.info

MICROSD CARD

- Even if the phone is locked, the examiner may be able to locate valuable evidence on the microSD card

JTAG

- Joint Test Action Group
- The examiner connects to TAPs (Test Action Ports) to obtain an extraction of a locked or damaged phone



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CHIP OFF

- The memory “chip” is removed from the device and placed in a special reader

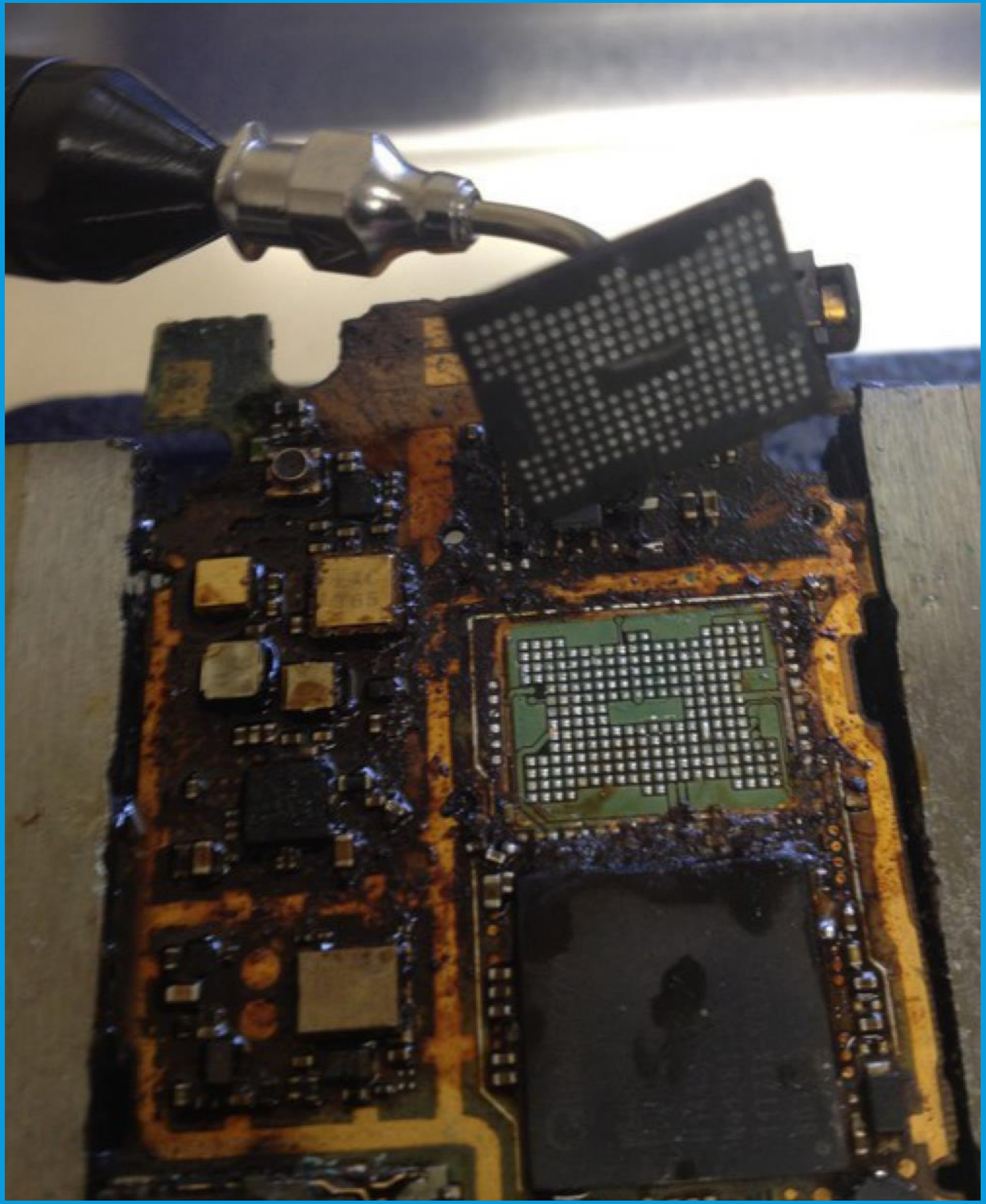

Photo from binaryintel.com

Photo from up48.com

ASSISTANCE FROM THE MANUFACTURER

- You may be able to obtain assistance from the manufacturer
- FBI vs. Apple

INTANGIBLE EVIDENCE

- Intangible evidence can be just as valuable as tangible evidence (sometimes more valuable)
- Examples include
  - Email messages
  - Cloud storage
  - Social networking profiles

INTANGIBLE EVIDENCE

- Investigators should look for and seize intangible evidence
- Examples include
  - Email messages
  - Cloud storage
  - Social networking profiles

EMAIL

- GMail
- Hotmail/Outlook.com
- iCloud Mail
- Yahoo Mail
- Mail.com
- Inbox.com

CLOUD STORAGE

- Dropbox
- Google Drive
- Box
- Microsoft OneDrive

SOCIAL NETWORKING

- Facebook
- Twitter
- LinkedIn
- Pinterest
- Google Plus
- Tumblr
- Instagram

ADDITIONAL TRAINING

- Forensic Product Vendors – Cellebrite, XRY, Lantern
- DeSales University
- Internet Crimes Against Children Task Force
- Federal Law Enforcement Training Center
- United Stated Secret Service
- National White Collar Crime Center (NW3C)

DESALES UNIVERSITY

- Bachelor of Arts in Criminal Justice – Digital Forensics Track
- Master of Arts in Criminal Justice – Digital Forensics concentration
- Graduate Certificate in Digital Forensics

Questions?

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