Locating Cell Phones

- Least Precise to Most
  - Call Detail Records
  - (Drive Testing)
  - Google Location Services
  - E-911 Records
  - Phone Based Location
  - Find my iPhone

Call Detail Records

“The Evidence”
Call Detail Records (CDRs)

• What are they?
  • Legal proof of a service provided
  • A technical road map of a call
  • A financial transaction record

Call Detail Records (CDRs)

• How to get them
  • Account holder can request with notarized letter
  • Via subpoena
  • Via discovery
    • Always get copies of the original files
  • Contact us for specific subpoena language...It is free.

Call Detail Records (CDRs)

• How are they used?
  • Associate a phone call with a cell tower
  • Show connections between phone numbers
  • Show frequency of connections
  • Show "user" activity
Call Detail Records (CDRs)

- What can they contain?
  - Voice call activity
  - Call forwarding information
  - Text message transaction
  - Data transactions

- How are they used?
  - Most common type of evidence in "Cell Phone Location Maps"
  - IMPORTANT
    - You have the location of the cell tower, NOT the phone
    - A tenuous relationship to the phone's location
    - NOT triangulation @#$^&*!!!
What About Burner Phones?

![Image of various phone brands]

Burner Phone F.A.Q.s

• What are they?
  • Pre-Paid Phones
    • No verification of identity needed
    • No valid “Subscriber” information
    • How to you get the records?
  • Seller may reveal the phone company

• Getting the records
  • Finding the carrier for the phone number
    • [www.fonefinder.net](http://www.fonefinder.net)
      • Who owns the number
      • No Porting Information
  • All burner phones have a phone company
    • T-Mobile
    • Metro PCS
    • Verizon
    • Etc.
Burner Phone FA.Qs

- Getting the records
  - Subpoena the carrier
    - Pre-paid phone records may be a shorter retention period than a post-paid phone.
    - 90 to 180 days in many cases

Cell Phones

The Flip Phone
(Invented by Star Trek writers)

- Simplest form –
  - Just a 2 way radio

- Newer form
  - Calls
  - Texts
  - Some small apps
The Smart Phone
Powerful handheld computer
• Still a 2 way radio
• Plus
  • Camera
  • Texts
  • Millions of Apps

How does a cell phone work?

Communications
• Walkie-Talkie
  - Channel (Frequency) 1060
  - Channel (Frequency) 395
Registration

• On Power up
  • Phone tunes to a known frequency and begins to listen.

The Hook Up: Choosing a Tower

• How does the phone choose a tower?
  Pick me!
  No pick me!

• when equidistant, no way to know.
The Hook Up: Choosing a Tower

- Occlusions

The Hook Up: Choosing a Tower

- Channels must be available
  - Let it Snow!

Choosing a Tower: Moving Around

- Hand offs
  - No record of intermediate hand offs
  - May get starting and ending cell towers
How the Cellular System Works

The Cellular System: Cell Site

• A Cell Site
  • Antennas
    • Send and receive signals to and from cell phones
  • Base Station Transceiver
    • Manages the tower and calls on the tower
    • Talks to the phone via network cables
Cell Tower Sectors

- Sector Layout and Azimuth
- Cell towers can have from 0 to 6 sectors
- Most common is three sectors
- Azimuth is the direction the antenna points
Cell Tower Coverage

Cell Coverage
- Area size is determined by customer needs
  - More people, more towers
  - More cows, less towers

Subscriber Density
- As subscribers increase:
  - Coverage size per tower gets smaller
  - Each cell site may have 200 channels (100 calls)
  - Need more towers with smaller radius versus one large tower.
How Far?

- How far can a cell phone be from a tower and still make or receive a call?
  - Assuming a perfectly flat earth, extremely tall cell tower, maximum legal power output, and no other cell towers in the area:
    - GSM (AT&T or T-Mobile) = 22 miles
    - CDMA (Sprint, Verizon, etc.) = 35 Miles
  - Limiting factors
    - Terrain, ground clutter, proximity of other towers, signal strength, cell phone being used, tower height, radio frequency...and the list goes on...

Real World Issues

- Concrete/metal building
- Man-made obstruction
- Natural obstruction
- Weak signal due to distance
Example (Sprint Towers Atlanta)

Examples

Viewing KML / KMZ files

• What are they?
  • Work product output from some police and private experts
  • Google Earth File format
    • Can be opened using Google Earth Professional
    • Now a free program
Case Example: CDR and Phone Location

Drive testing

E-911 Location
Google Location Services

Capabilities: Examples

• Google is watching
  • Location activity
  • Full route

Capabilities: Examples

• Google is listening
  • Location activity
  • Full route
Find my iPhone – Device Based

Highly qualified experts in computer, cell phone, cellular location, GPS, and cyber risk forensics.