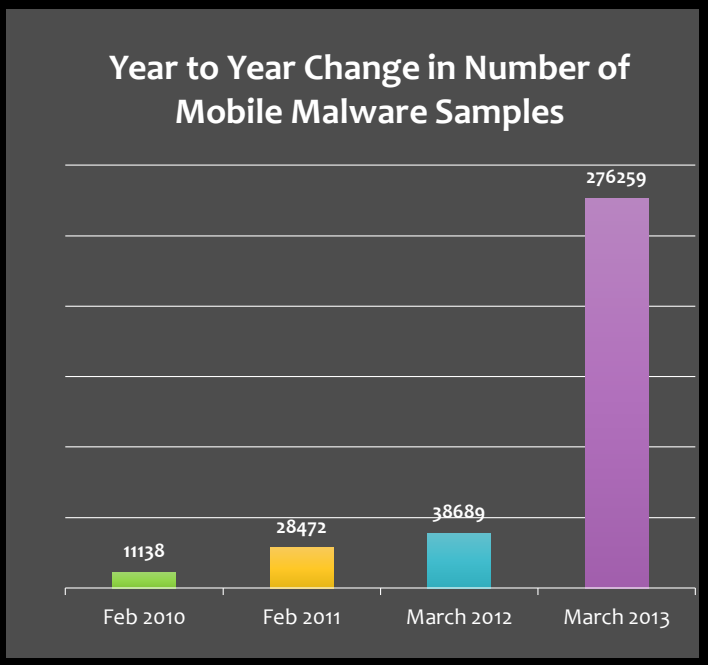
Mobile Malware and Spyware: Working Through the Bugs

Detective Cindy Murphy
608-267-8824
cmurphy@cityofmadison.com

The Mobile Malware Threat

- 155% increase in mobile malware from 2010 to 2011
- 614% increase in mobile malware from March 2012 to March 2013
  - Total samples across all platforms
- Android represents for 92% all known mobile malware infections



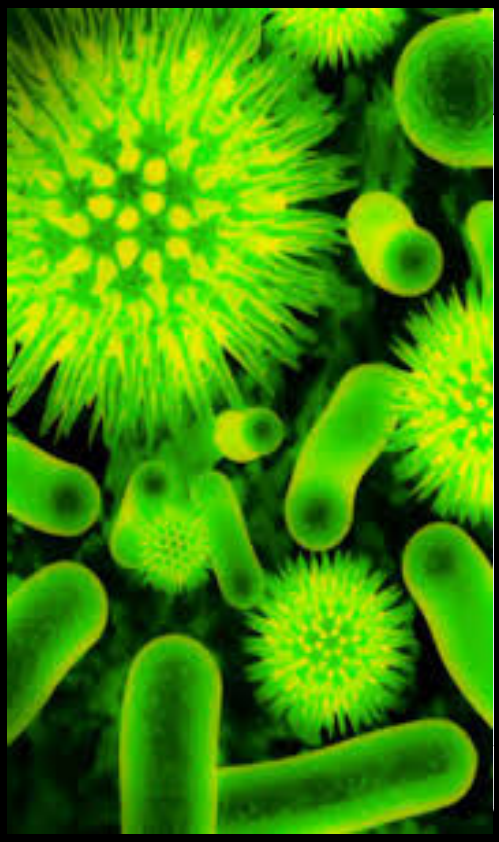
http://www.juniper.net/us/en/local/pdf/additional-resources/3rd-jnpr-mobile-threats-report-exec-summary.pdf

Types of Mobile Malware & Potentially Unwanted Applications

- Malware
  - Backdoor
  - Trojan
  - Worm
  - Ransomware
- Potentially Unwanted Applications (PUA)
  - Adware
  - Trackware
  - Spyware

Mobile Malware Infection Vectors

- Third-party App Store repositories
  - Androids with outdated OS versions
  - Jailbroken iPhones
  - Unlocked Windows Phones
- Malicious websites - "drive-by" download installation
- Direct victim targeting through e-mail, SMS, and MMS
  - "Smishing"
- Official App Stores
- Emerging Methods
  - QR Codes
  - NFC Chips



Signs & Symptoms of Mobile Malware Infection

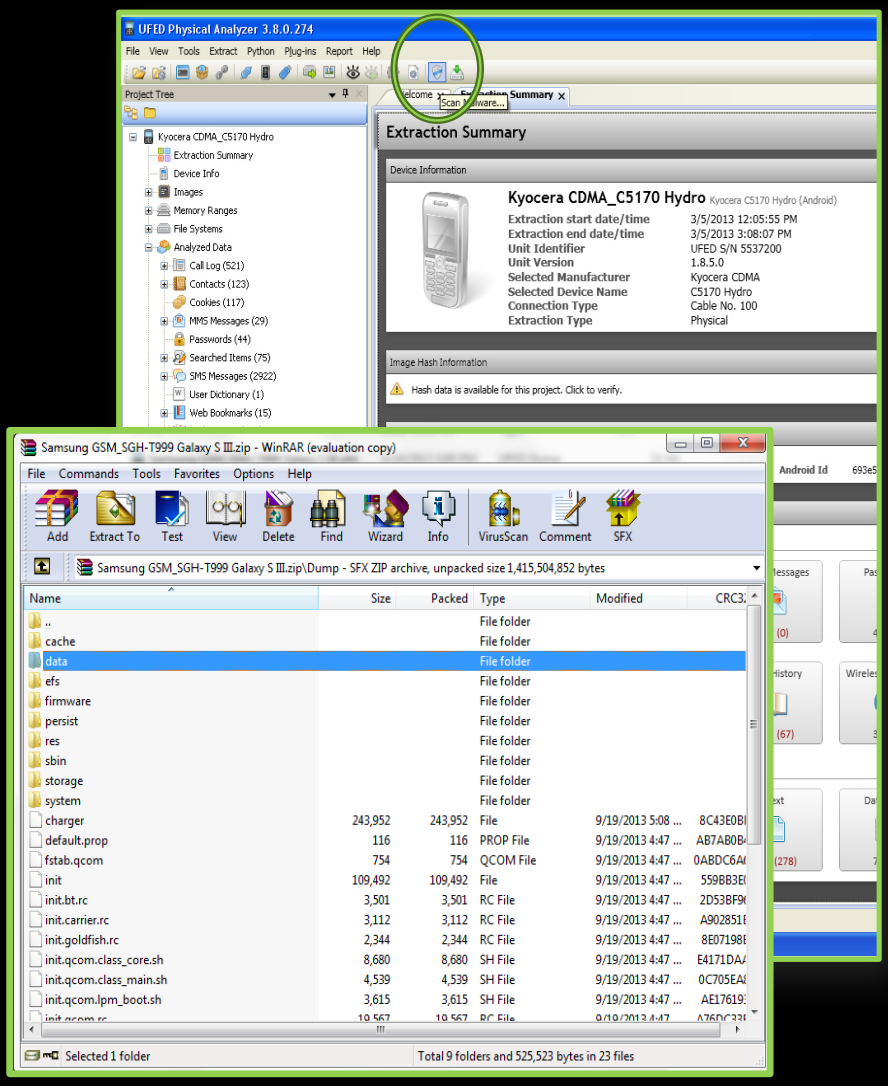
- Poor Battery Life
- Dropped Calls and Call Disruption
- Unusually Large Phone Bills
- Data Plan Spikes
- Performance Problems
- Unexpected Device Behaviors
- RISKY user behavior
  - Pirated apps for free
  - Porn surfing
  - “Free” Money Apps
- AT RISK users

OUCH!?

- What are the implications of + hits on a case?
- Can the presence of malware or spyware actually potentially help the investigation?

Mobile Malware Detection

- Cellebrite Physical Analyzer
  - Bit Defender
- With Other AV Tools:
  - Perform a file system extraction
  - Scan the file system extraction with one or more AV tools
  - If the extraction is a .zip, be sure to unzip first!

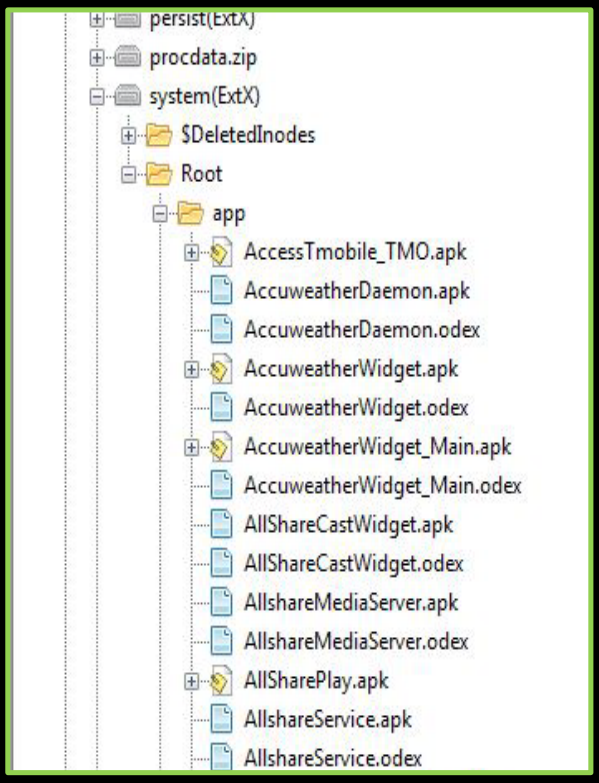


If you still suspect a problem…

- Don’t Stop Digging!!
- Beyond scanning for malware:
  - Check Installed Apps for suspicious .apk files
  - Check Downloads folder(s) for suspicious files
  - Check browser history for visits to BAD sites
  - Check for links from SMS, MMS, & Email
  - Examine activity on phone around the suspected time of infection
  - Research any error messages or notifications that might give you clues about infection
- Malware scanning won’t always catch the BAD
  - Spyware and for pay applications often considered legitimate

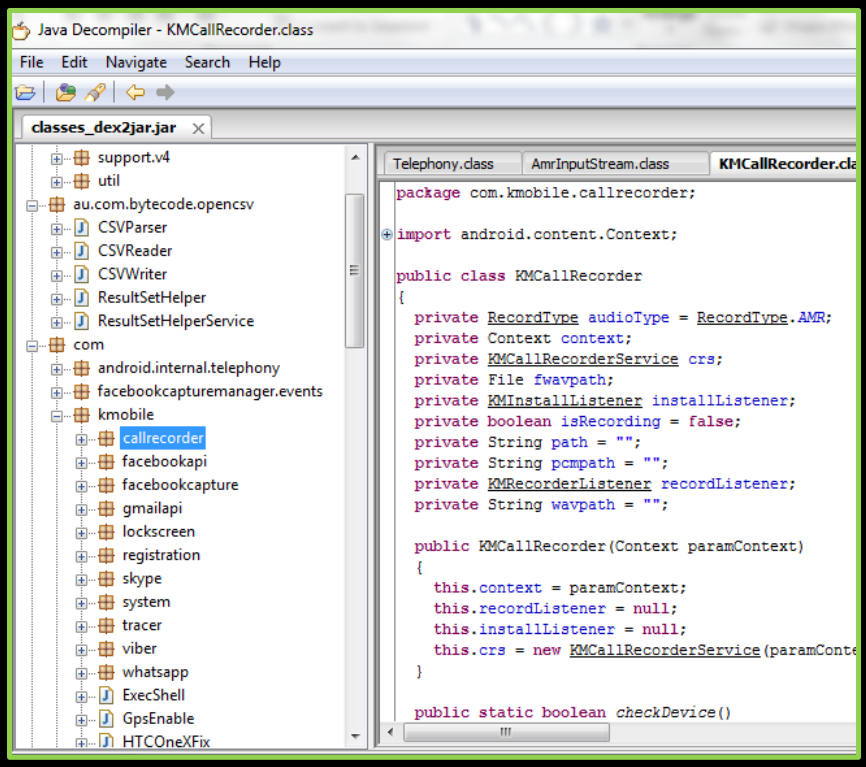
Finding the BAD…

- **Root\App** folder contains downloaded .apk files
- Most .apk files will be legitimate applications
- Individual suspicious .apk files can be exported for further examination
- ANY .apk file can be unpacked and decompiled or submitted to a sandbox site for analysis



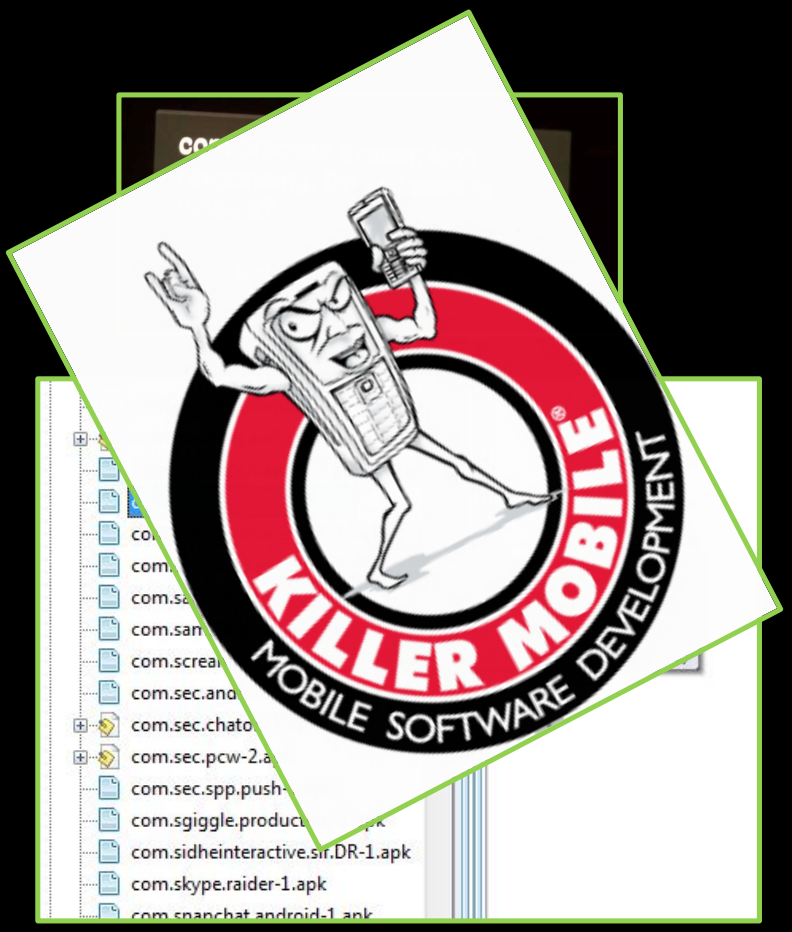
Mobile Malware Reverse Engineering & Analysis

- Mobile Malware Analysis & Reverse Engineering Tools:
  - Dexter
  - Anubis / Andrubis
  - APK Inspector
  - Dex2Jar
  - jd-gui
  - Santoku



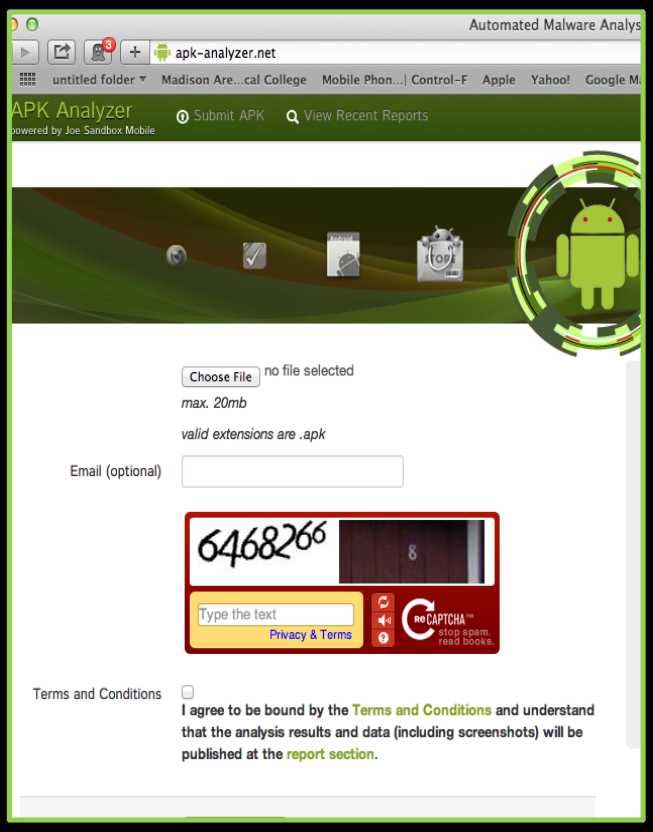
Locating Problem .apk files

- Phone errors may give important clues about infection with malware or spyware.
- Check for the associated .apk file in Root\Apps
- Export the suspicious application for further analysis



.apk Analysis using Online Sandboxes

- Export suspected malware .apk files to a well marked folder such as “Suspected Malware”
- Submit suspicious files for analysis
- Review results to determine what the .apk file is doing



Static Analysis of .apk Files

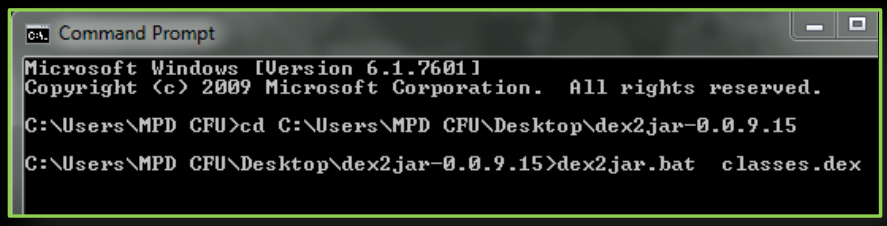
- .apk files can be analyzed locally in a static manner
- .apk File Format:
  - The .apk file is a zipped package based on JAR file format
  - It contains compiled programming code and additional information
  - We can look inside to see what the .apk is programmed to do!
- "Unpacking" & "Decompiling"

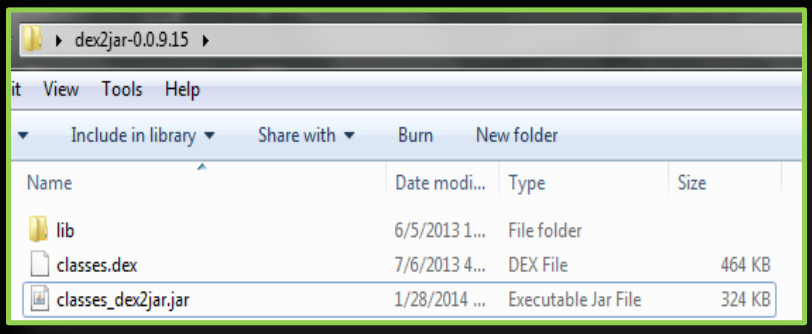
Static Analysis Step 1: "Unpacking" the .apk file

- The contents of an .apk file can be viewed by "unpacking" it
  - Simply rename the file to .zip and open it to unpack the .apk file
  - The **classes.dex** file is needed for the next step.

Static Analysis Step 2: "Decompiling" the .apk file

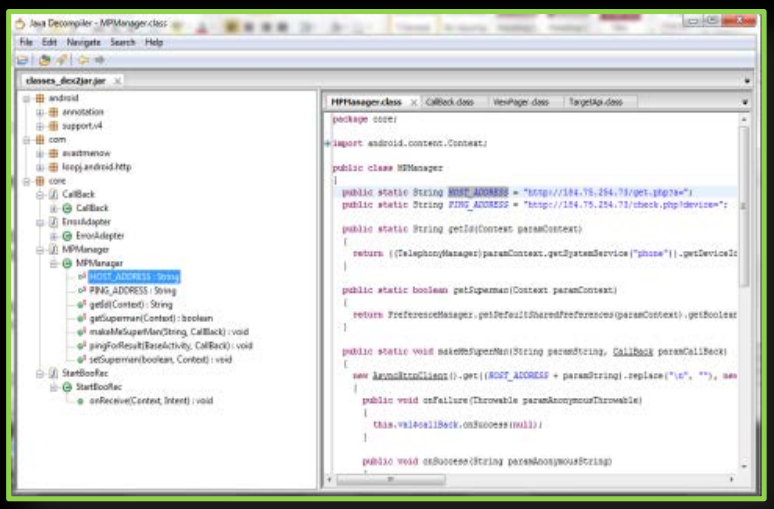
- Locate and copy the **classes.dex** file
- Copy the **classes.dex** file into **dex2jar** directory
- Open a command prompt and navigate to the "dex2jar" folder
- Execute the batch file "**`dex2jar.bat classes.dex`**"
- This command will create a file named "**classes_dex2jar.jar**" in the dex2jar directory





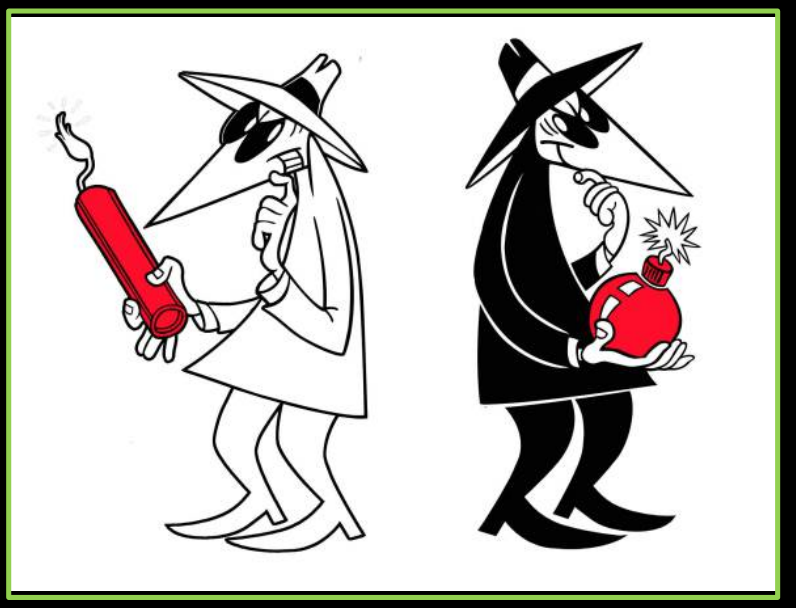
Static Analysis Step 3: Viewing Decompiled Code

- Use “**jd-gui**” Java Decompiler to view the data you unpacked and decompiled in the previous steps
- Navigate to and open the **classes_dex2jar.jar** created in the previous step
- View contents to reveal the underlying code and see what the .apk file is doing



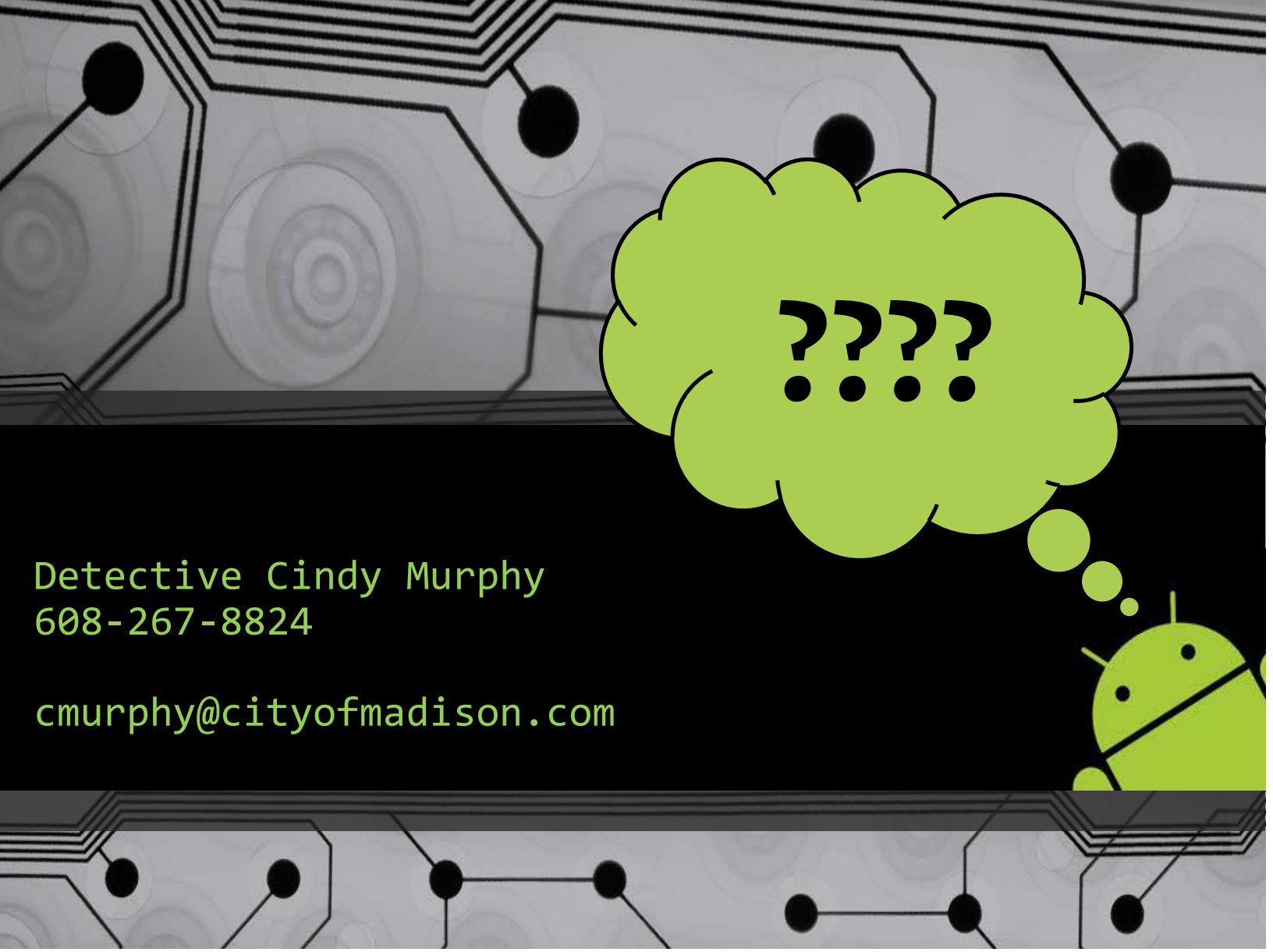
Mobile Spyware

- Generally advertised for
  - Catching cheating spouses
  - Monitoring and protecting children
  - Monitoring employees
- Must have physical control of the target device to install
- Many, Many, Many varieties
  - mostly cheap or free
- Mobile malware scans may or may not detect the presence of spyware



Carrier Family Monitoring Tools

- Verizon – Family Locator Plan
- US Cellular – Family Protector Plan
- AT&T Family Tracker
- Sprint – Family Locator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Detective Cindy Murphy
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cmurphy@cityofmadison.com