Detecting Malware Initiating Traffic on Mobile Devices

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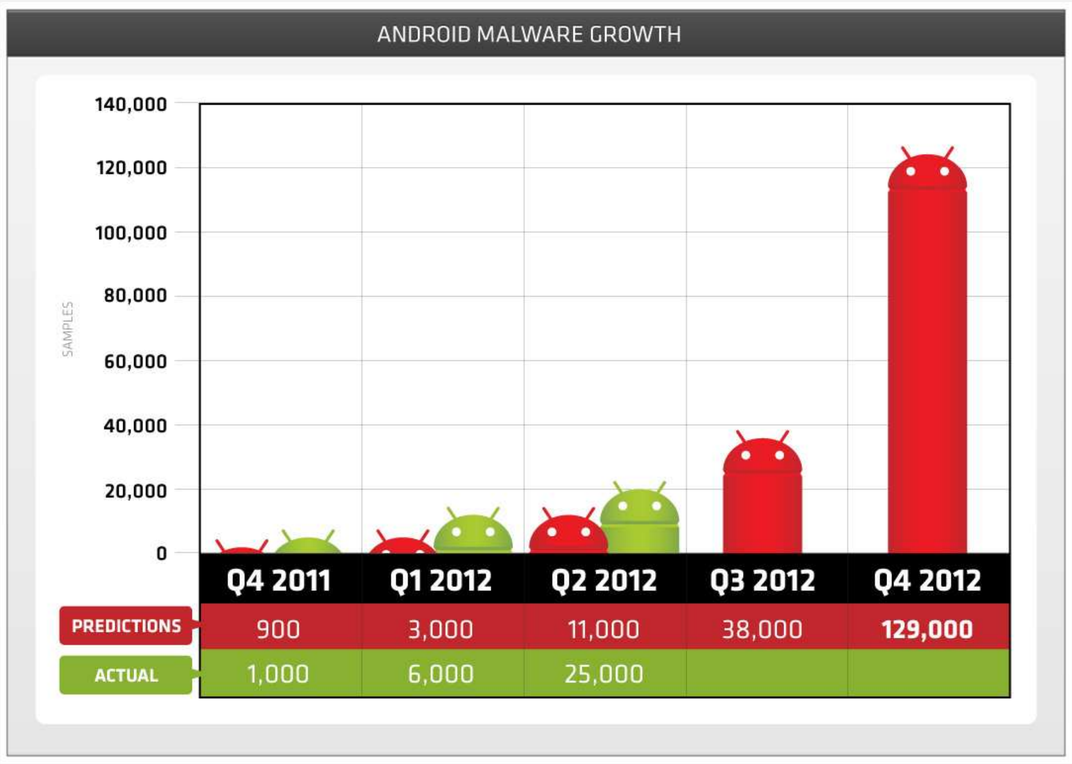
Motivation

- Android is the most popular mobile OS
- Easy to install and write new apps with any functionality
- Anti-malware solutions are still insufficient [1]
- Mobile malware is on the rise [2]

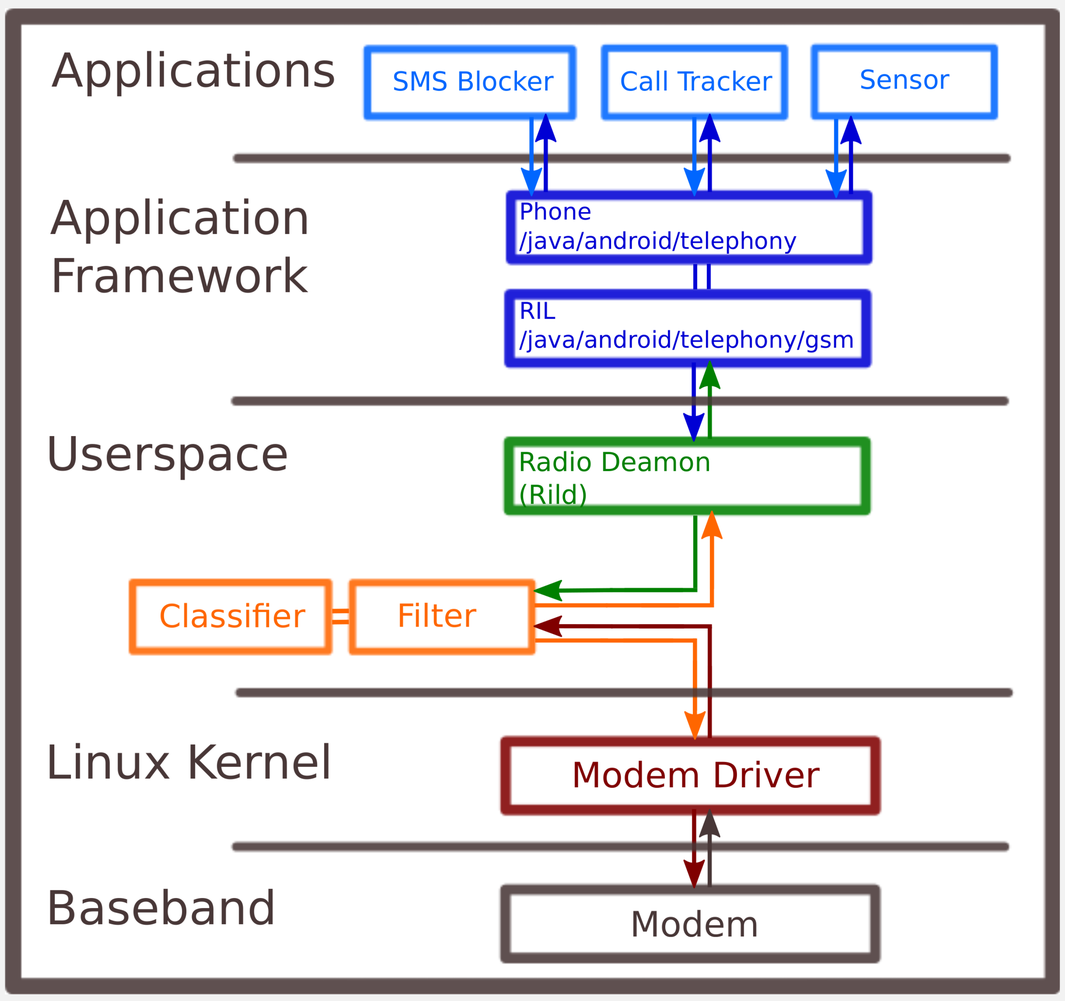


Mobile Malware Analysis

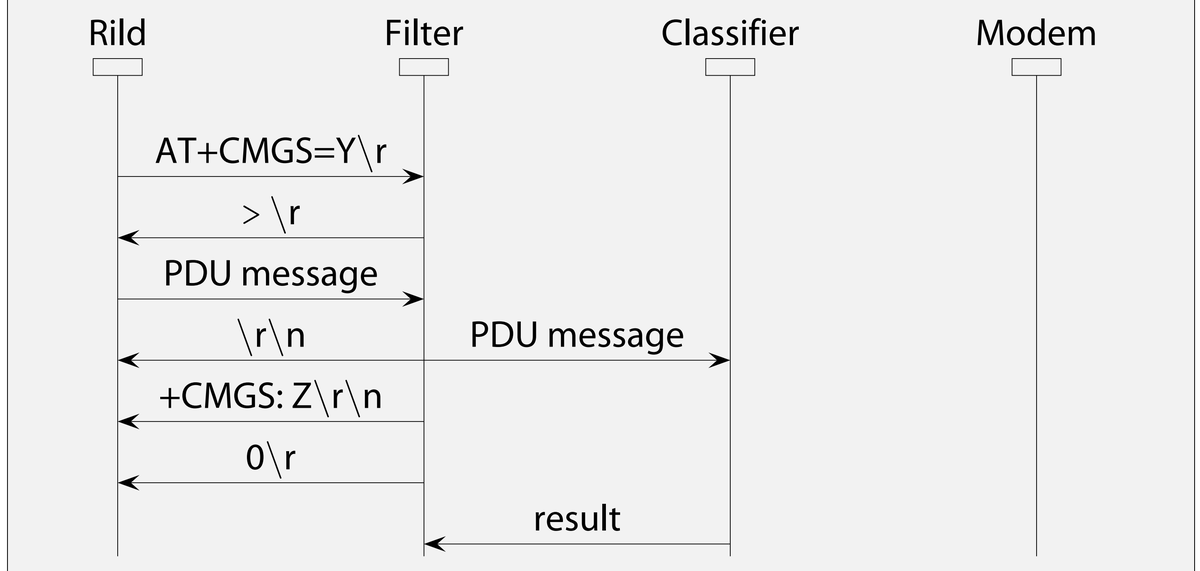
- We analyzed over 30 malware families targeting Android platform
- Samples found in the official Android google play market or alternative 3rd markets [3]
- We identified four categories:
  - Premium calls
  - SMS only
    - Premium SMS
    - SMS bombers - send many identical SMSs with intent to spam or DDOS a victim
    - Mobile spyware - reveal and monitor the identity of the user by obtaining IMEI, IMSI, model, product ID, operator name, location information, etc . . .
    - Botnets - remotely controllable apps
  - HTTP only - connect to a remote server via the Internet
  - RAT (mobile Remote Access Tool) - malware operating in userspace layer, attackers have full control of an infected device

Android Architecture

The filtering component responsible for network analysis is located in the userspace layer [4] and can be controlled via a Sensor App.



Our MITM for sending an SMS



Classifier

- List-based filtering is very efficient but easily avoidable
  - Blacklist
  - Whitelist
- Rule-based filtering checks regular call modes
- Pattern-based filtering is suitable for detecting constant botnets' commands
  - Regex matching
- Machine learning techniques help recognize unknown patterns
  - Support Vector Machine
- Challenge-response protocol ensures that a response has been generated by a person.

The Sensor App

- Inform a user about suspicious traffic
- Provide GUI
  - List all events from a local database
  - Whitelist calls, send blocked SMSs
  - Change blocking preferences

Conclusion

- Mobile malware has evolved considerably over time
- Filtering ingoing and outgoing traffic alone suffices for detection of relevant mobile malware
- Real-time approach with 95% detection rate
- For very low false positive rates is user interaction inevitable

Future Work

- Detect malware communicating over the Internet - block sending sensitive information to a remote server
- Support reputation based filtering - create trusted chains and buddy lists from user feedback
- Add security measures to protect the sensor

References

[1] Test Report: Anti-Malware solutions for Android. Magedeburg, 2012

[2] BYOD: A leap of Faith for Enterprise users?

[3] VirusTotal - Free Online Virus, Malware and URL Scanner. https://www.virustotal.com

[4] Mulliner, C. und Miller, C.: Injecting SMS Messages into Smart Phones for Security Analysis. In: Proceedings of the 3rd USENIX Workshop on Offensive Technologies (WOOT), Montreal, Canada, 2009

[5] 3GPP: SMS Specification. http://www.3gpp.org/ftp/Specs/archive/24_series/24.011