RSAConference2015

San Francisco | April 20-24 | Moscone Center

CHANGE

Challenge today's security thinking

SESSION ID: MBS-T07R

Android Security Data from the Frontlines

security@android.com

aludwig@google.com

#RSAC

Goal of this talk

Provide insight into overall Android security strategy.

Discuss data that is being used to guide our efforts.

Enable you to make more informed risk decisions.

Strategy

Data

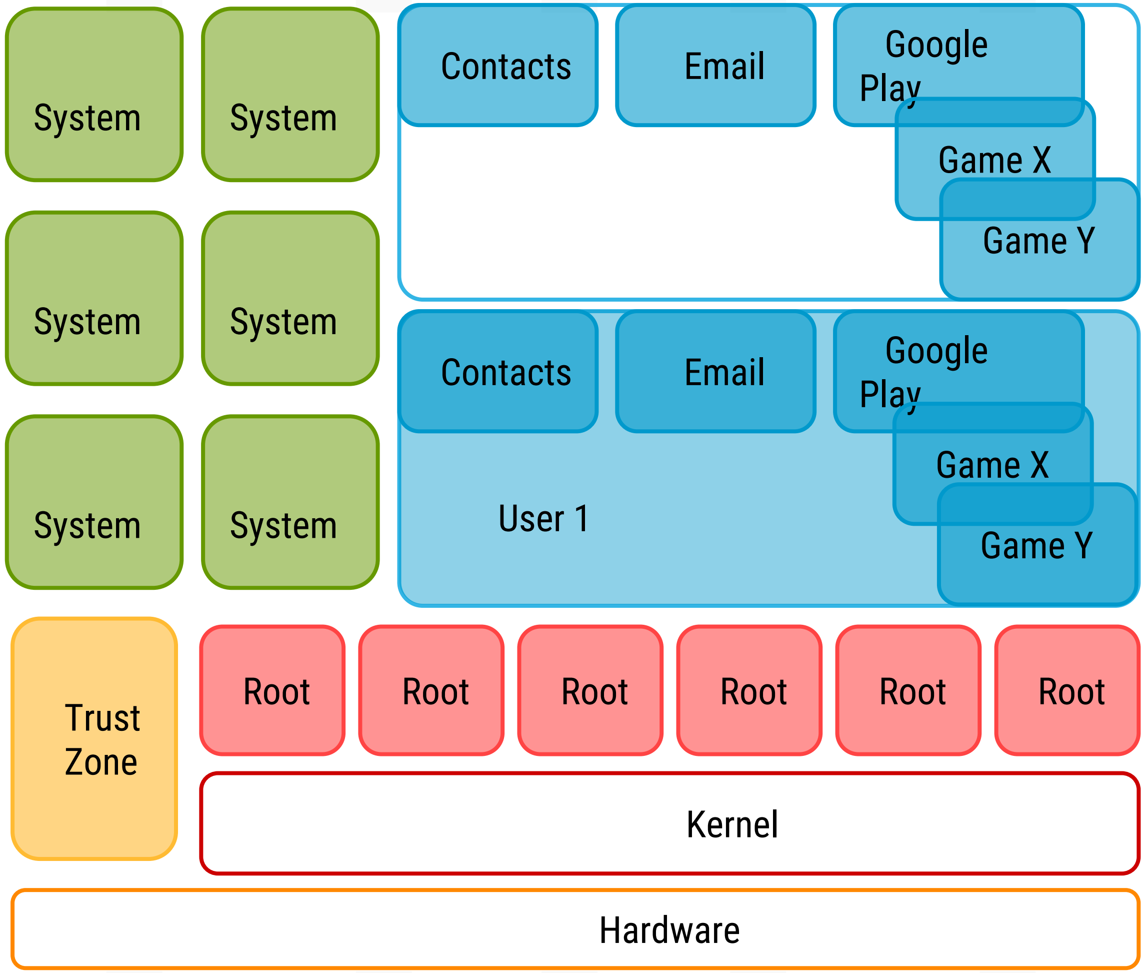
The Android Security Model

Application Isolation
Sandboxes
Permissions
Trustzone

Platform Hardening
SELinux
ASLR
Exploit mitigation

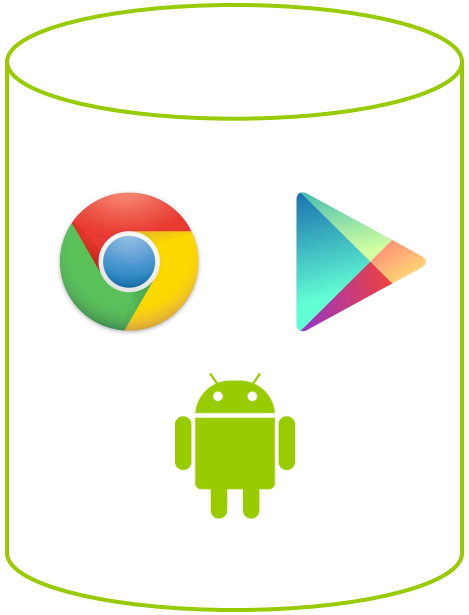
Device Integrity
Data Encryption

Android For Work
Profiles
Enterprise services



See RSA Conference Presentation from 2014, or https://source.android.com/devices/tech/security/ for more information

Google Security Services for Android



- Google Play
- Safebrowsing for Chrome
- Verify Apps
- Android Safety Net
- Device Manager

Decisions are based on billions of data points (including apps, developers, app behavior, relationships, and third-party analyses) captured every day.

An Open Security Ecosystem

< > **millions**

lines of code in
Android Open Source

thousands

of unique devices

hundreds

of OEMs, ISVs, and
security solutions

billions

of users protected

Layered Ecosystem Security Strategy

Trusted Android Platform

On-device defenses against attacks

Google Security Services

Comprehensive, integrated suite of security services available to all

Open Ecosystem

Embracing security innovation for long term security advantage

Clarity in the Data

Strategy

Data

Malware myths and assumptions

Most devices aren’t protected.

Malware is increasing.

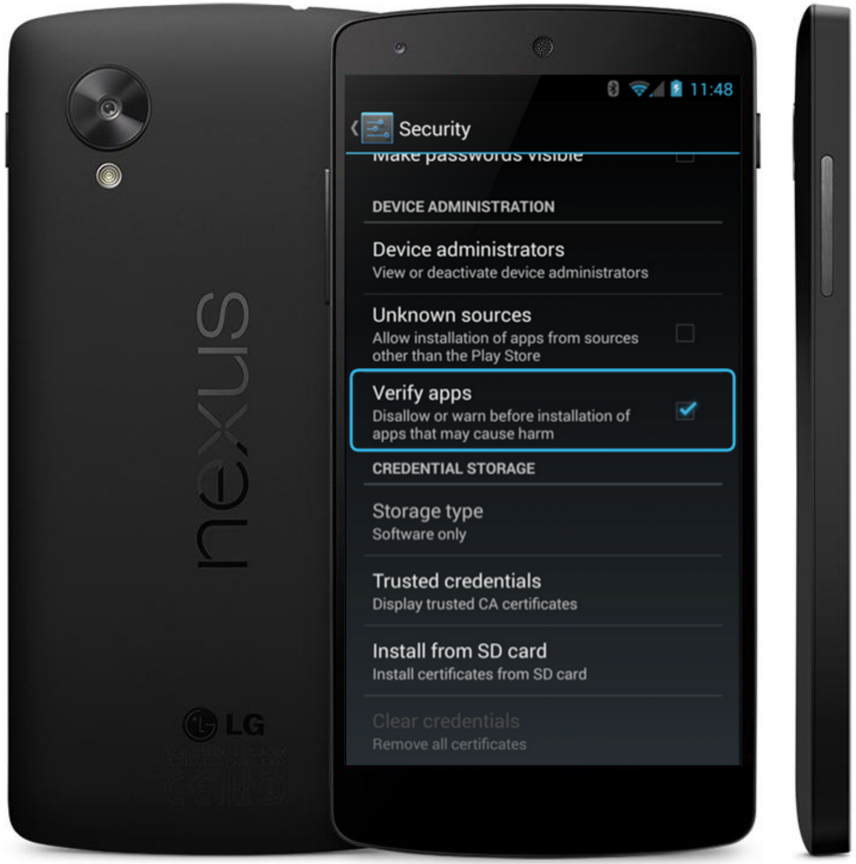
(All) malware can compromise everything.

The problem is too hard, the bad guys are going to win.

What does the data show?

Verify Apps

- ✓ Apps are verified prior to install
- ✓ Provides periodic background scans
- ✓ Warn for or block Potentially Harmful Applications



Security

Make passwords visible ☐

DEVICE ADMINISTRATION

Device administrators
View or deactivate device administrators

Unknown sources ☐
Allow installation of apps from sources other than the Play Store

Verify apps ☑
Disallow or warn before installation of apps that may cause harm

CREDENTIAL STORAGE

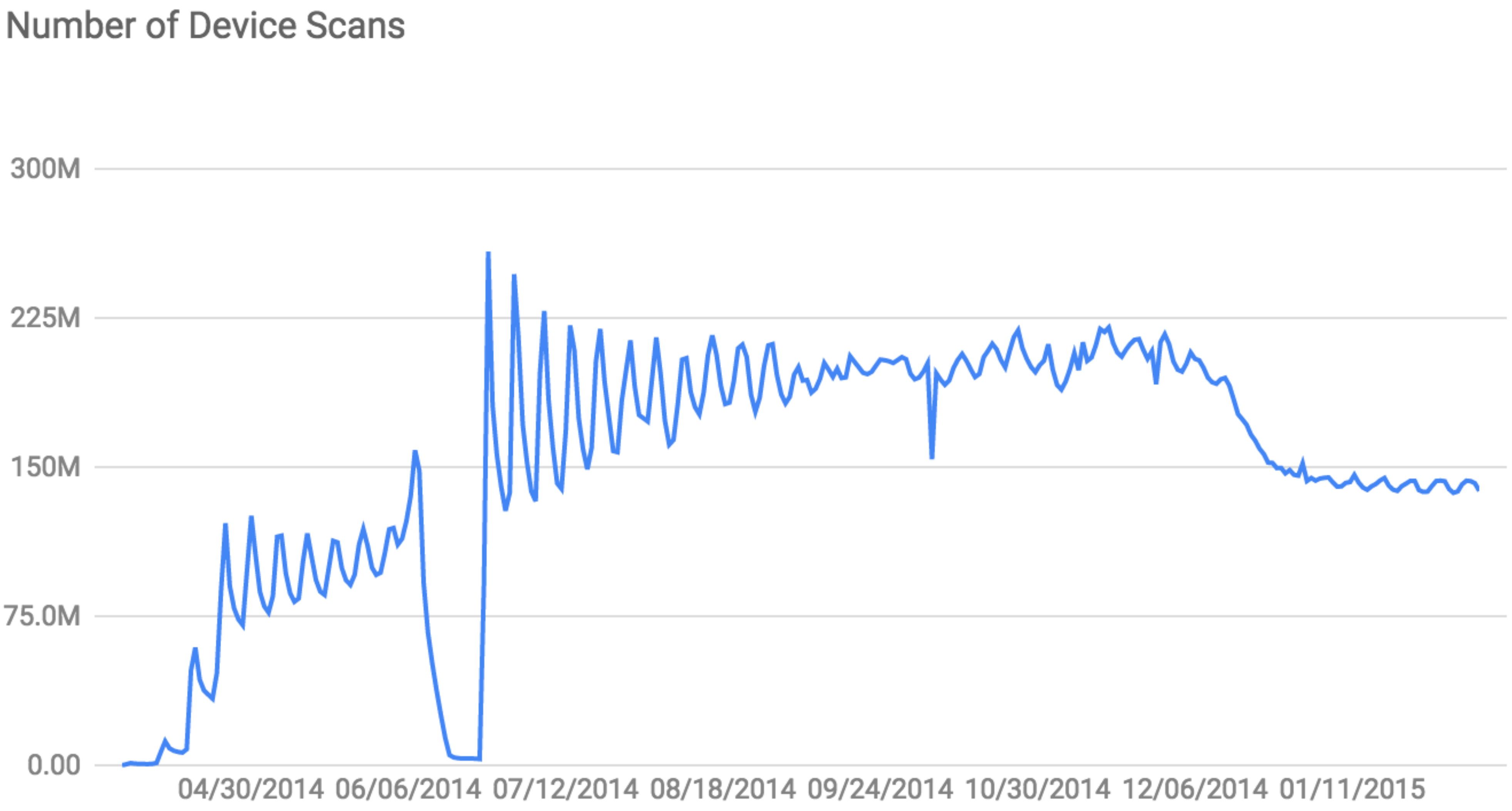
Storage type
Software only

Trusted credentials
Display trusted CA certificates

Install from SD card
Install certificates from SD card

Clear credentials
Remove all certificates

Android Safety Net verifies over 1 billion devices

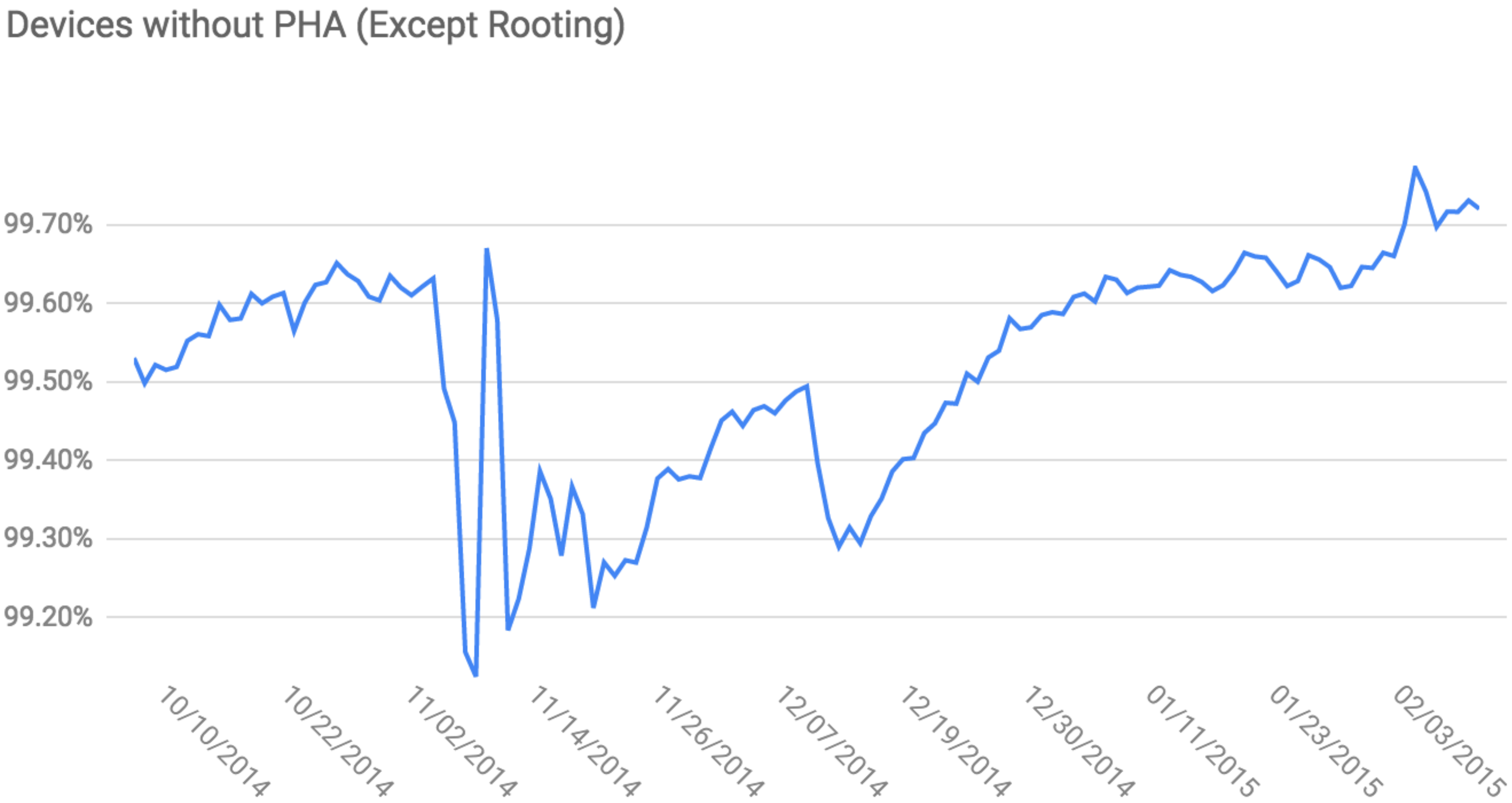


Source: Google Safety Net Data

Google™

RSAConference2015

Less than 1% of devices have a PHA installed

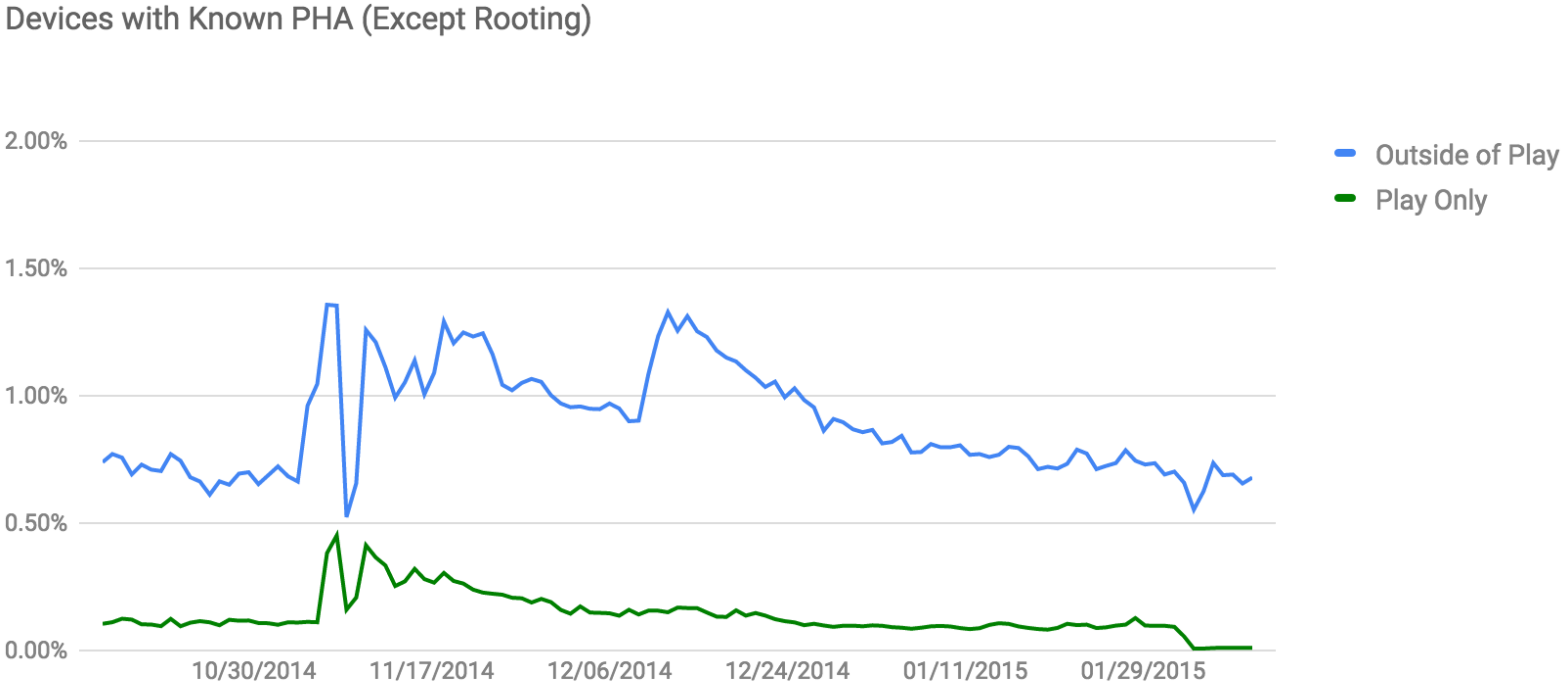


Source: Google Safety Net Data

Google™

RSAConference2015

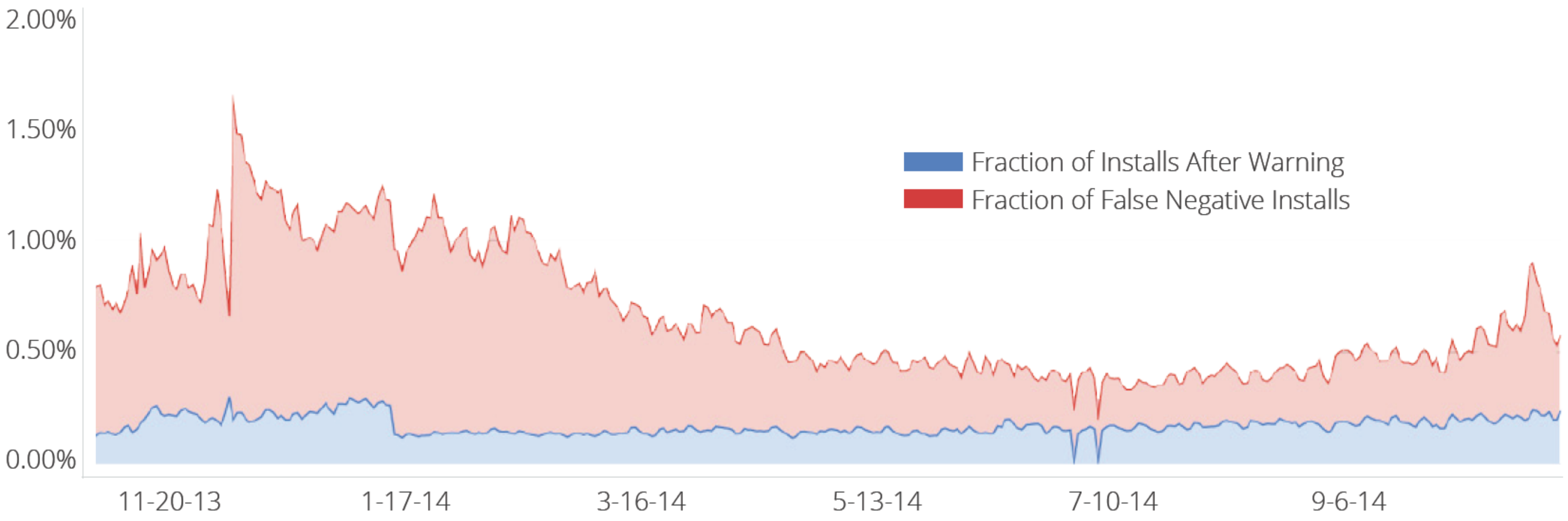
Use of Google Play reduces PHA exposure



Source: Google Safety Net Data

Rate of install of PHAs was reduced by 50% in 2014

Fraction of Installs that Result in Known PHA Being Installed (Excluding Russia)

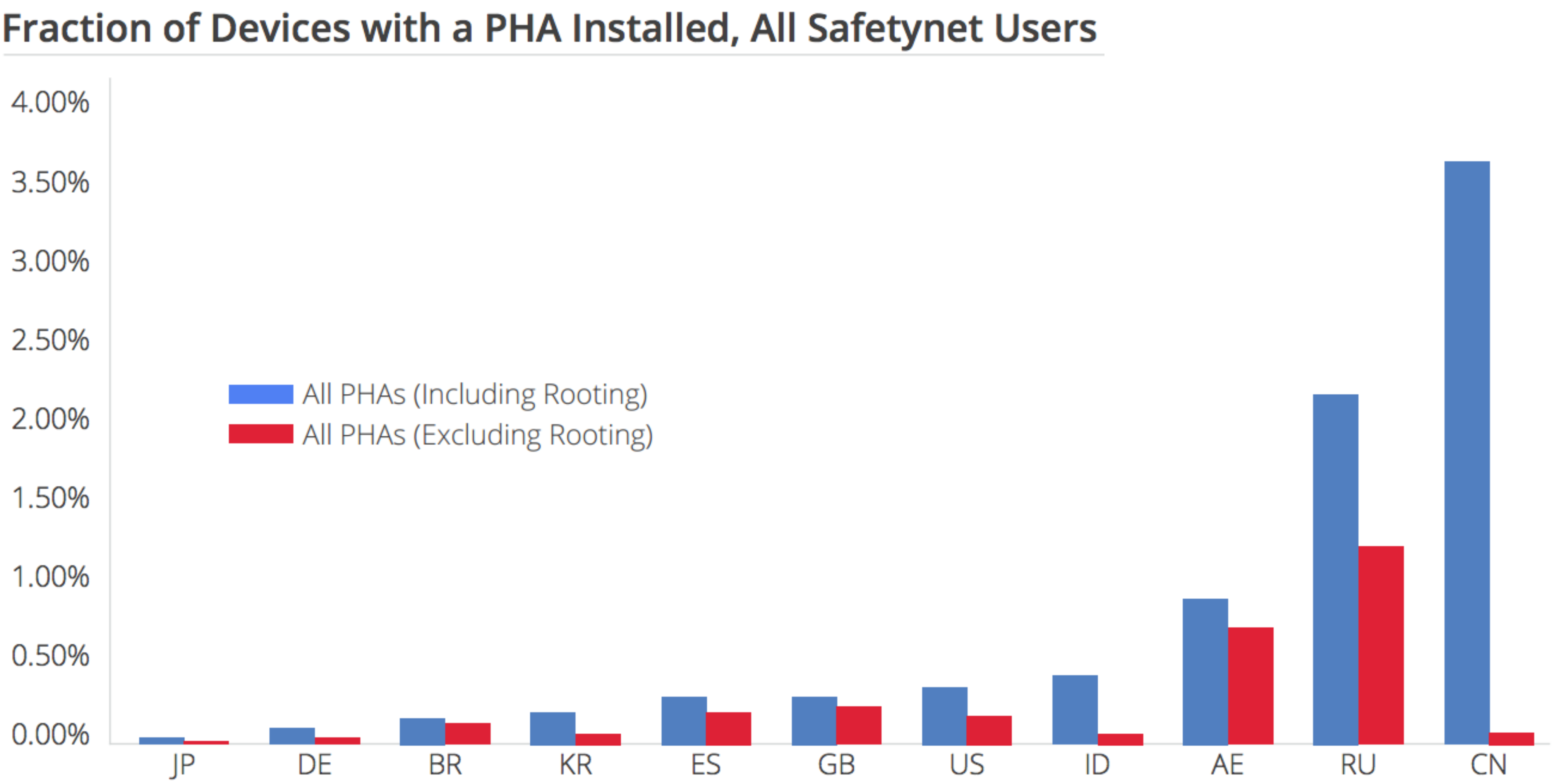


Source:https://source.android.com/devices/tech/security/reports/Google_Android_Security_2014_Report_Final.pdf

Google™

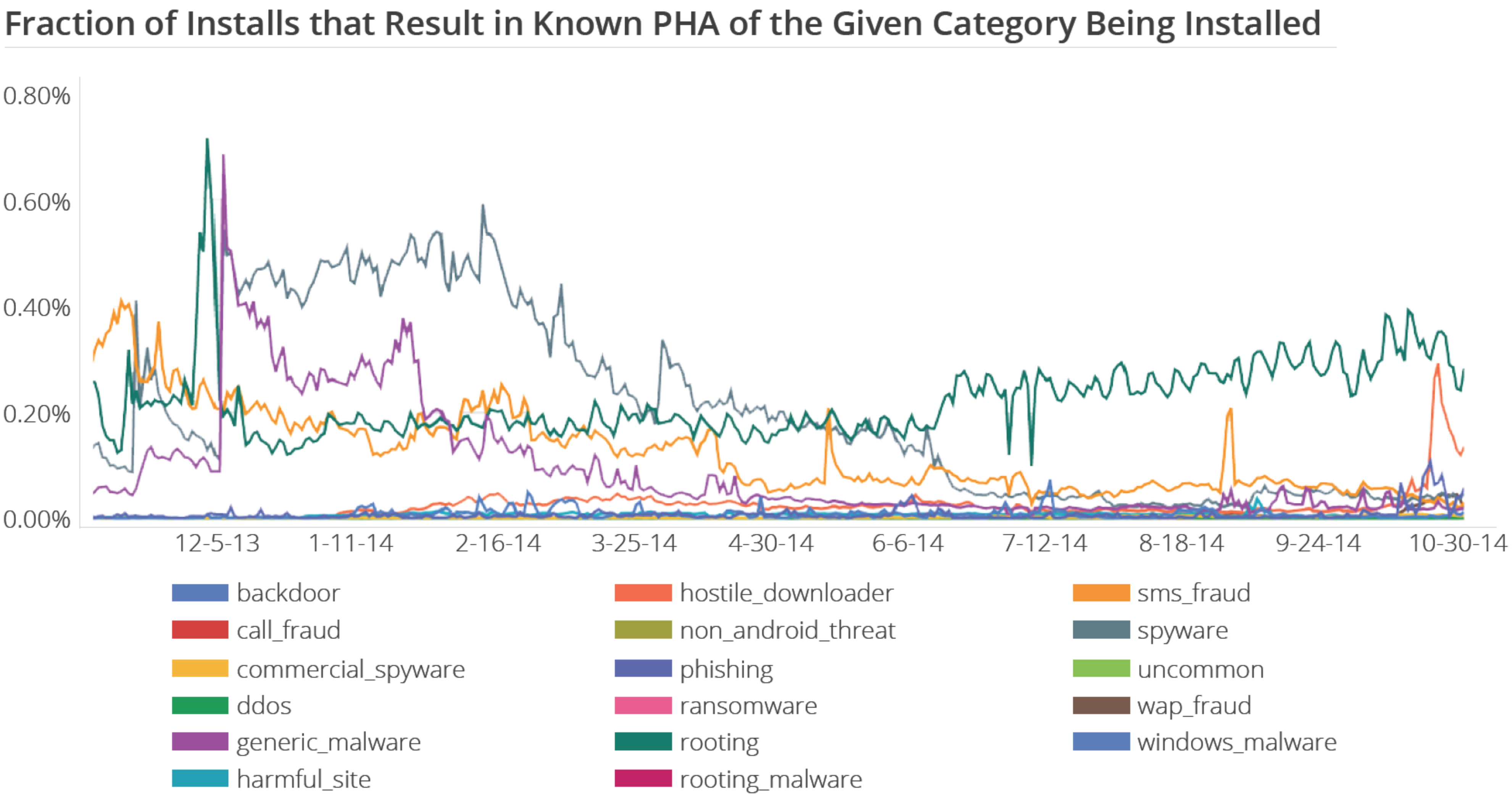
RSAConference2015

Regional variations are significant (and unique)



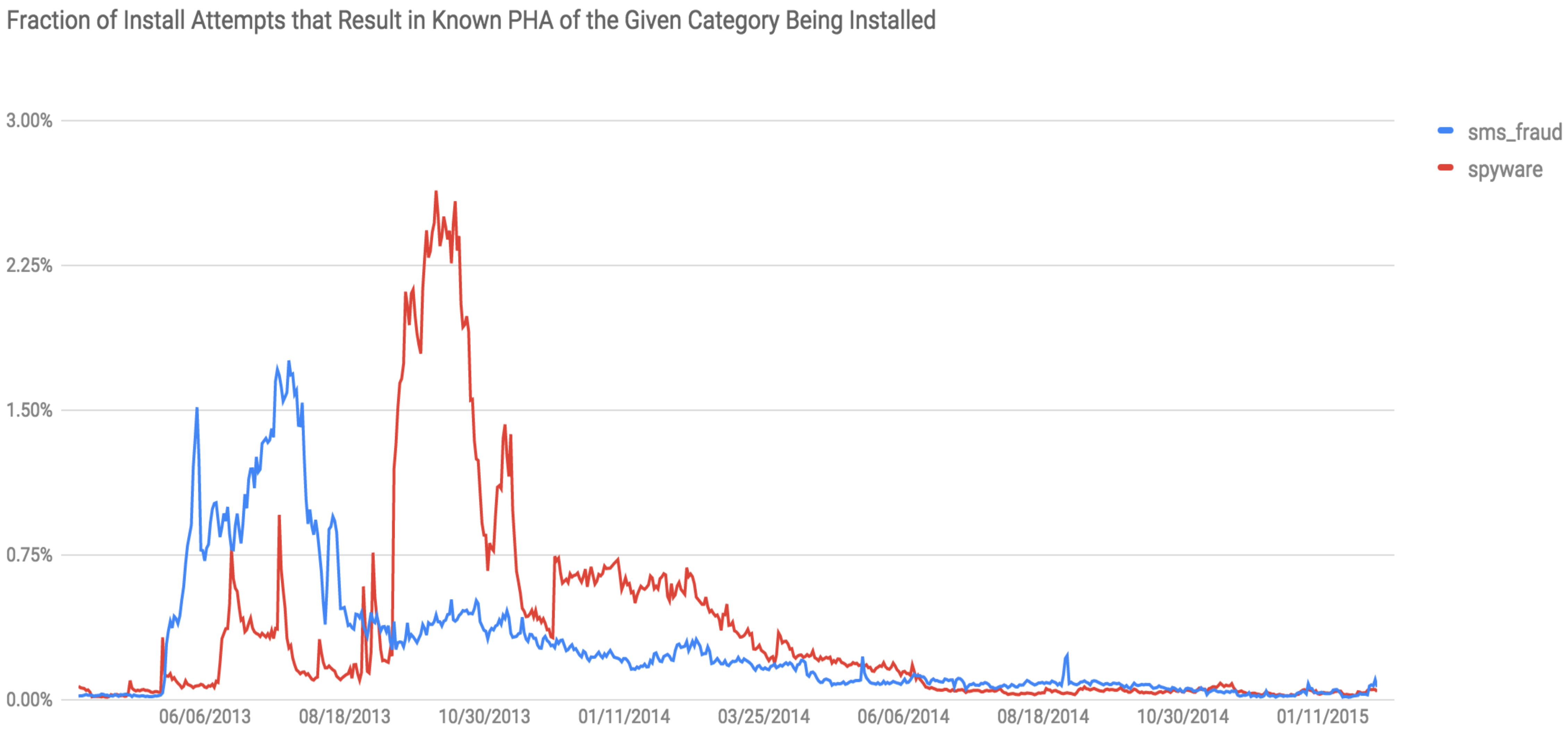
Source:https://source.android.com/devices/tech/security/reports/Google_Android_Security_2014_Report_Final.pdf

Install trends for PHAs vary by capability



Source:https://source.android.com/devices/tech/security/reports/Google_Android_Security_2014_Report_Final.pdf

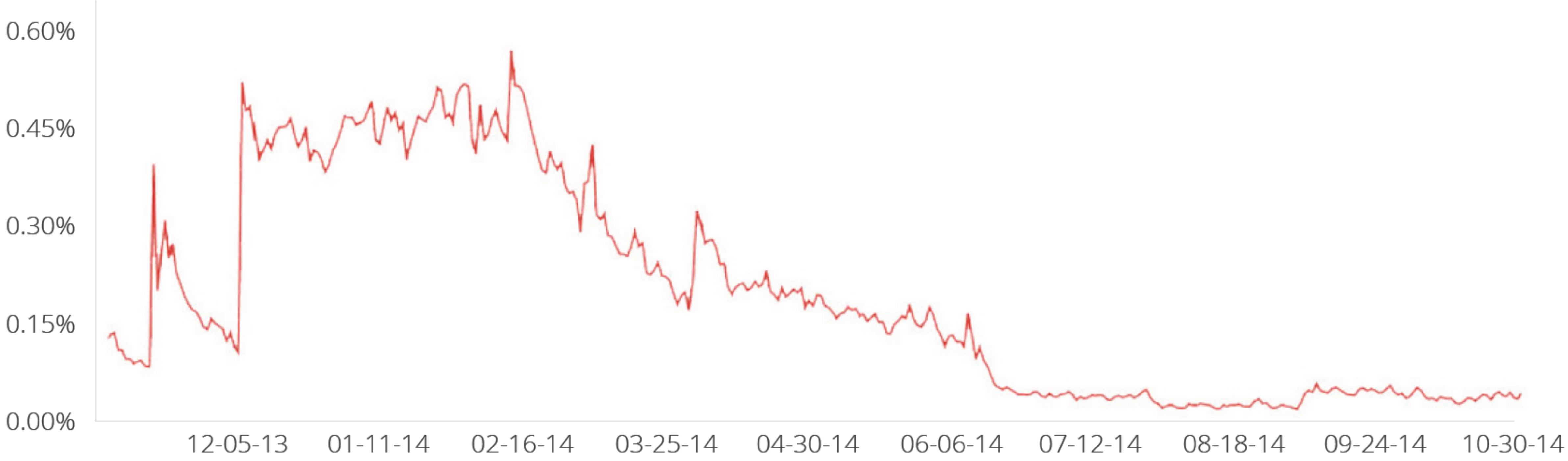
Install trends have a characteristic shape by "type"



Source: Google Safety Net Data

Spyware installs are down 90% in 2014

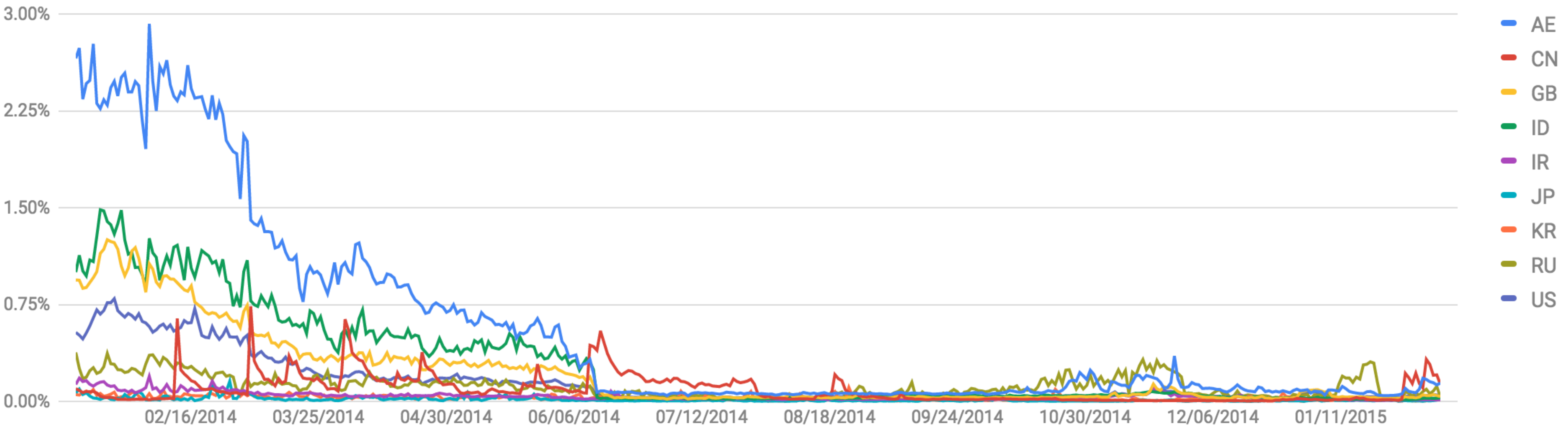
Fraction of Installs that Result in Known Spyware Being Installed, Worldwide



Source:https://source.android.com/devices/tech/security/reports/Google_Android_Security_2014_Report_Final.pdf

Spyware installs were reduced across major locales

Fraction of Install Attempts that Result in Known PHA Being Installed (Top Countries)

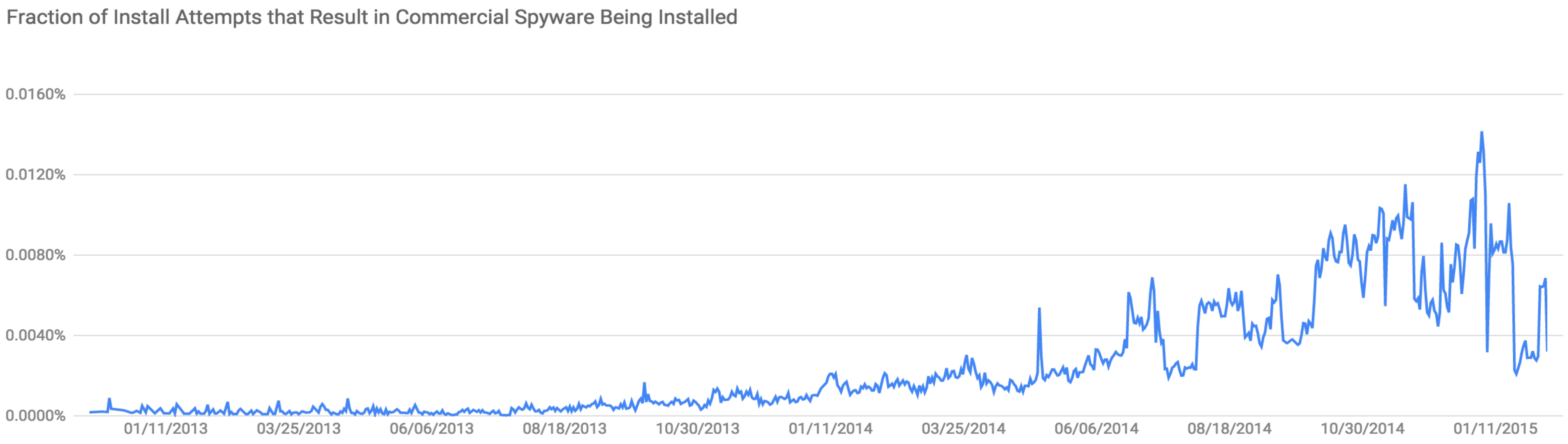


Source: Google Safety Net Data

Google™

RSAConference2015

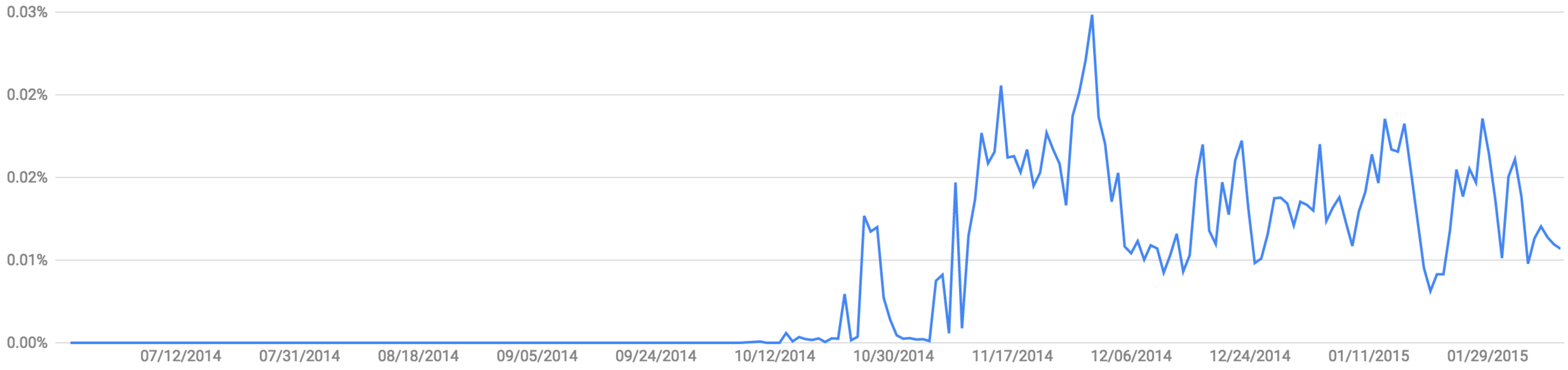
Commercial spyware is less than 0.02% of installs



Source: Google Safety Net Data

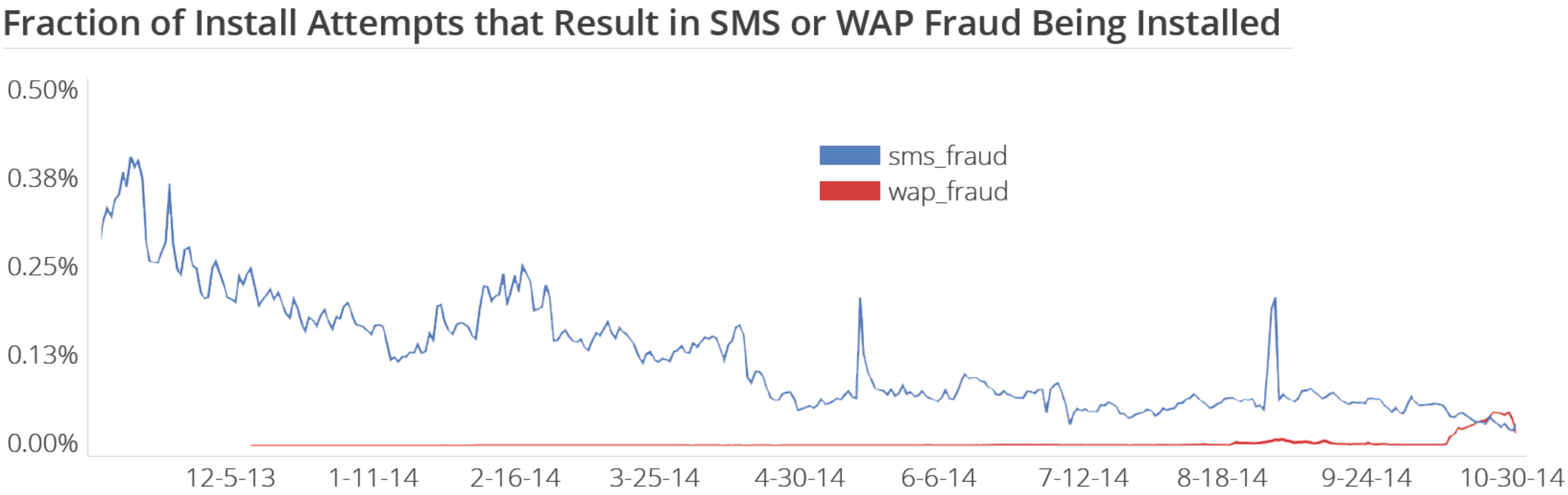
Ransomware is less than 0.03% of installs

Fraction of Installs that Result in Ransomware Being Installed



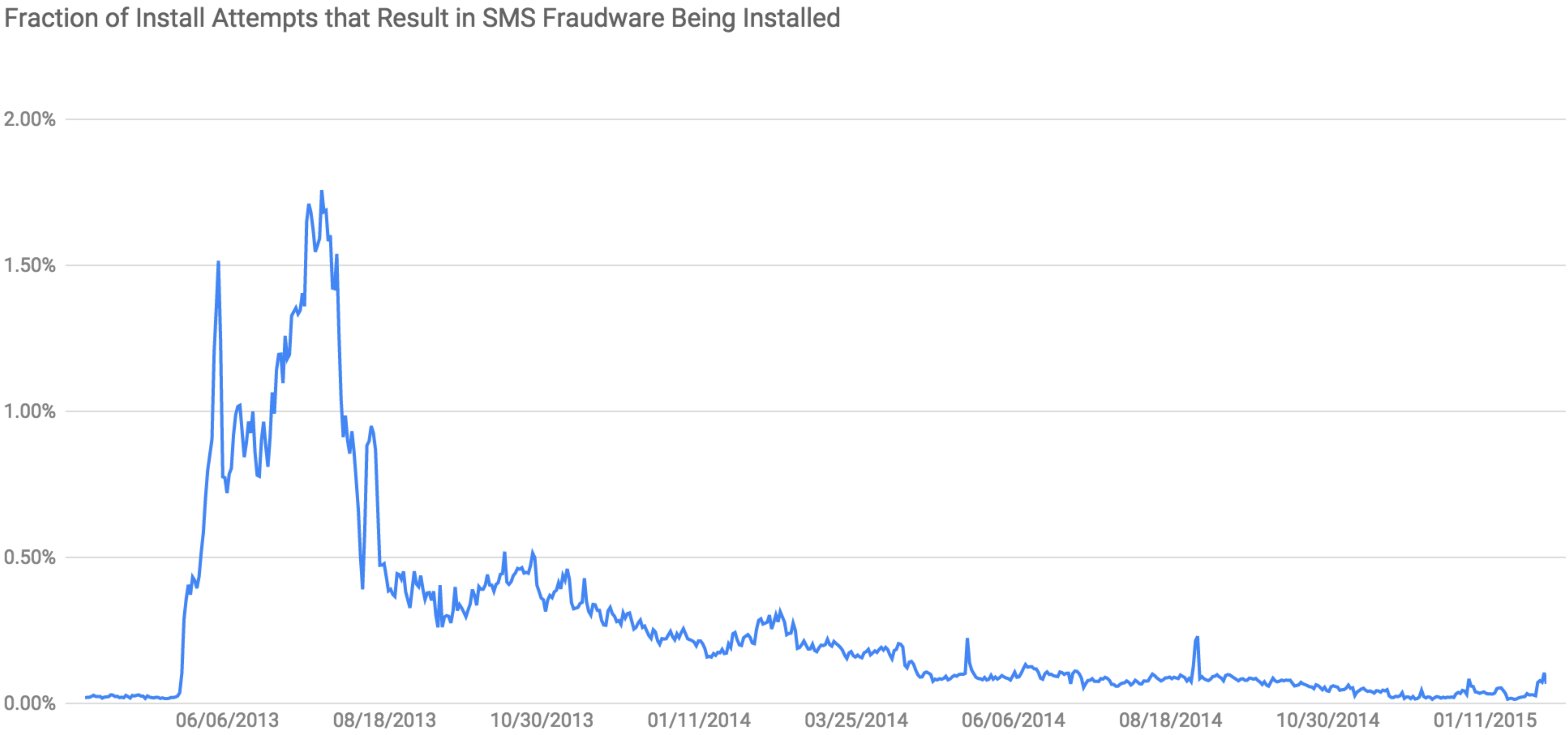
Source: Google Safety Net Data

SMS Fraudware installs are down over 60% in 2014



Source:https://source.android.com/devices/tech/security/reports/Google_Android_Security_2014_Report_Final.pdf

SMS Fraudware installs are down over 90% since 2013



Source: Google Safety Net Data

Google™

Overturning Malware Myths and Assumptions

Android users have built-in protection.

Risky devices get better protection.

Mobile malware can be classified and isolated.

Mobile malware is not increasing.

The good guys can win.

Let’s try that on a harder problem.

Exploitation myths and assumptions

All devices have vulnerabilities.

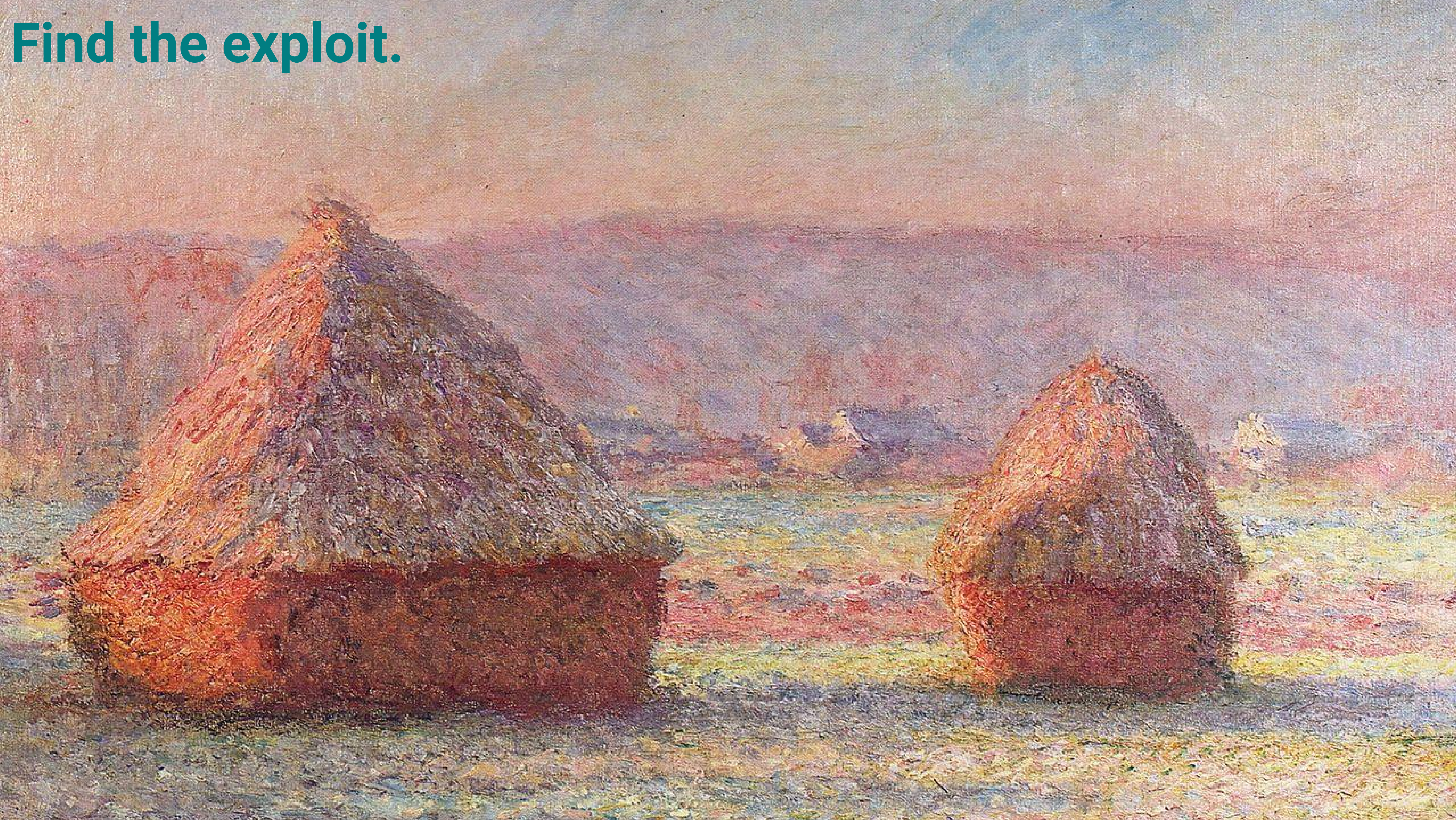
All vulnerabilities can be exploited.

Exploitation can’t be seen or stopped.

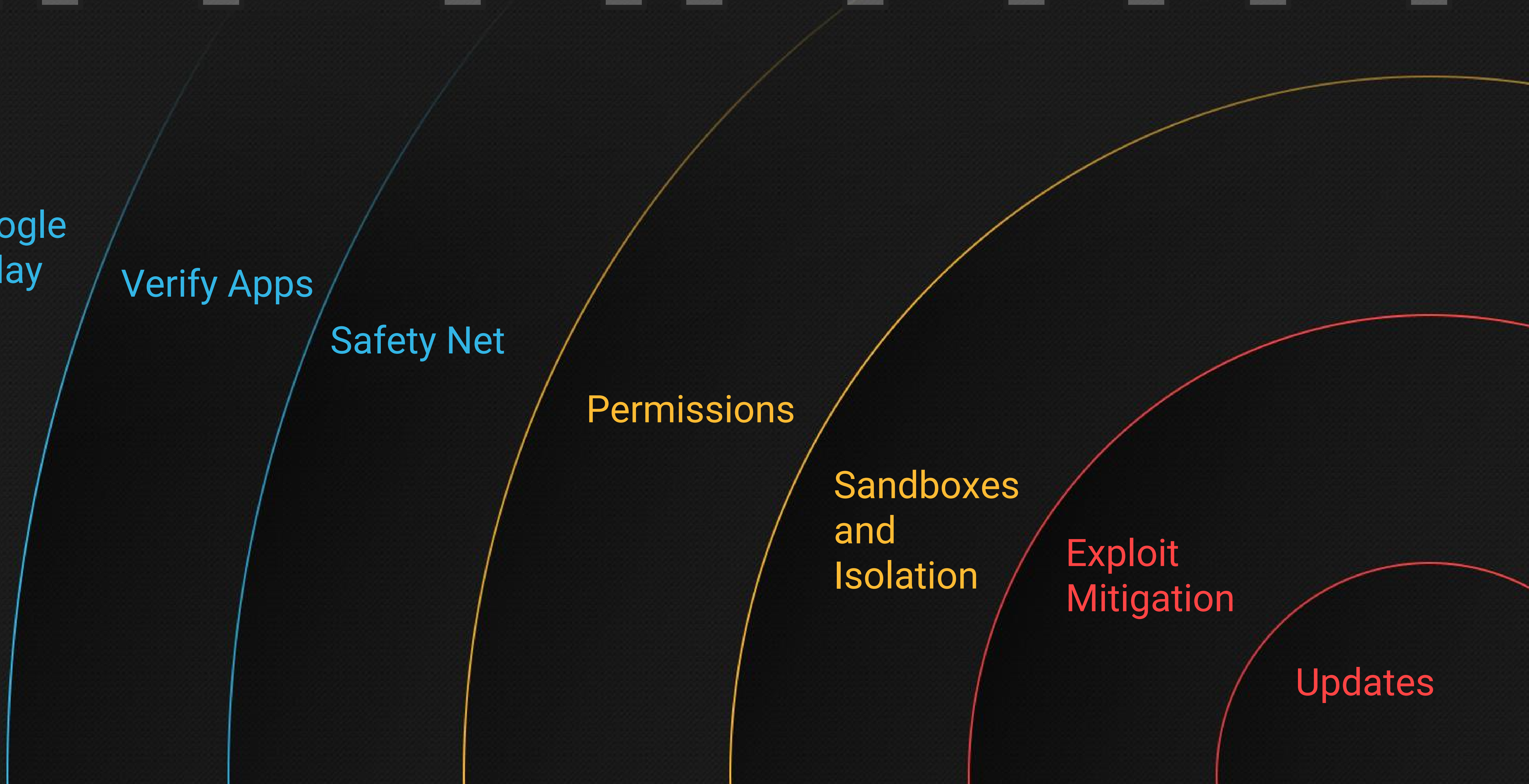
The bad guys will win.

What does the data show?

Find the exploit.



Multiple Security Layers Provide Protection and Insight



Google Play

Verify Apps

Safety Net

Permissions

Sandboxes and Isolation

Exploit Mitigation

Updates

Some exploits can be seen (and stopped)

Vulnerability	News Headline	Unique APKs	Peak exploitation after public release (per install)	Exploitation before public release (absolute)
Master Key	99% of devices vulnerable	1231	< 8 in a million	0
FakeID	82% of Android users at risk	258	<1 in a million	0

Masterkey data collected from 11/15/2012 to 8/15/2013 and previously published at VirusBulletin 2013. Fake ID data collected data collected from 11/15/2012 to 12/11/2014 and previously published at

Source: Google Safety Net Data

Platform level failed exploit detection

In a heterogeneous ecosystem, logging failed attacks on patched devices may provide insight into the exposure of unpatched devices.

Note: Your mileage may vary.

Android Safety Net

Detect

- ✓ SMS Abuse Tracking
- ✓ 0-day detection
- ✓ Failed exploit detection
- ✓ SELinux logs analysis
- ✓ Rare App Collection

Protect

- ✓ Real-time SMS Warnings
- ✓ Certificate Pinning
- ✓ Certificate Blacklisting
- ✓ Inter-app firewall
- ✓ SELinux policy update

11:48

Security

Make passwords visible

DEVICE ADMINISTRATION

Device administrators
View or deactivate device administrators

Unknown sources □
Allow installation of apps from sources other than the Play Store

Verify apps ☑
Disallow or warn before installation of apps that may cause harm

CREDENTIAL STORAGE

Storage type
Software only

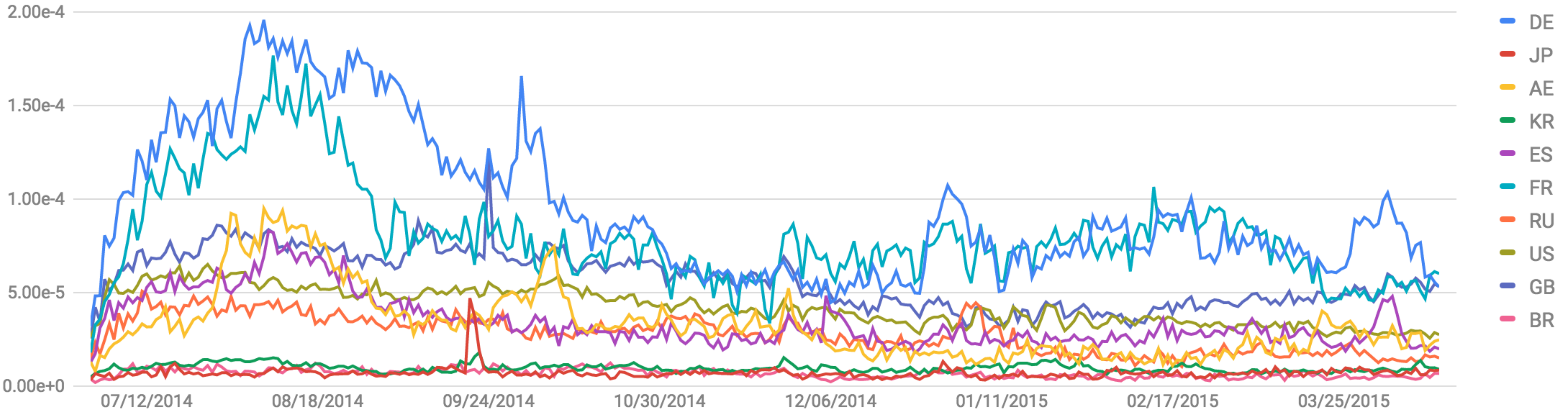
Trusted credentials
Display trusted CA certificates

Install from SD card
Install certificates from SD card

Clear credentials
Remove all certificates

Network behaviors may indicate attempted MiTM

Fraction of SSL Connections Downgraded to SSLv3 for Top Countries

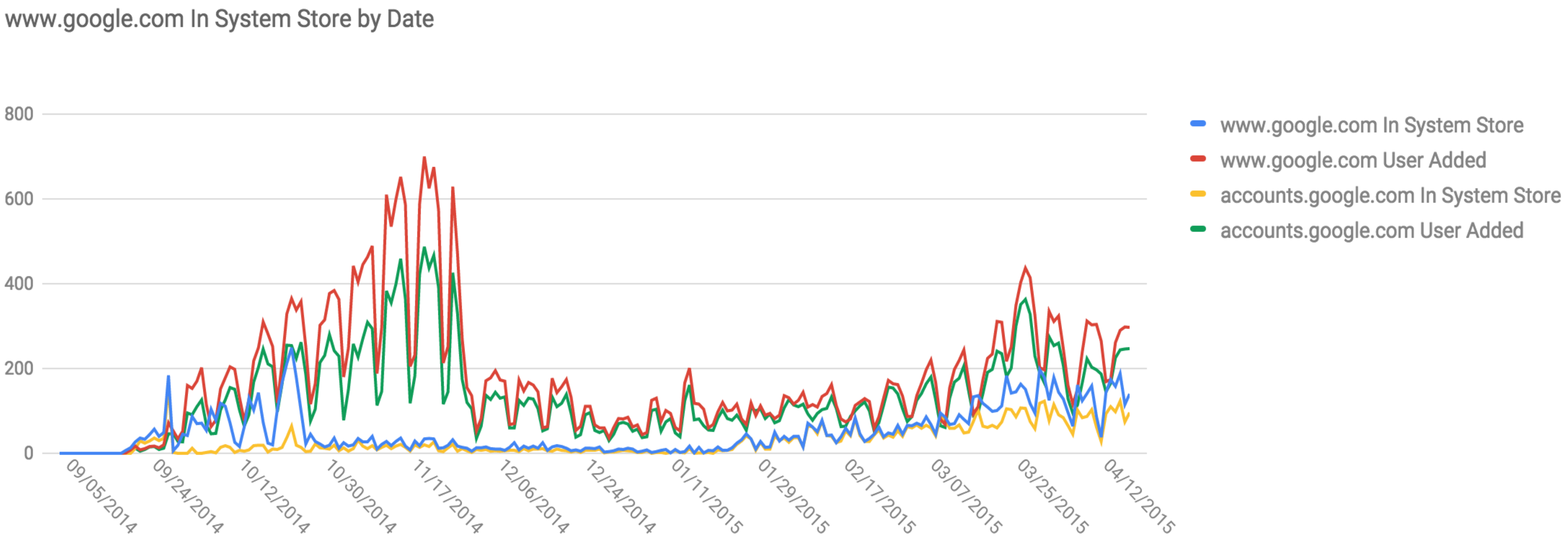


Source: Google Safety Net Data

Google™

RSAConference2015

Local state may indicate compromise

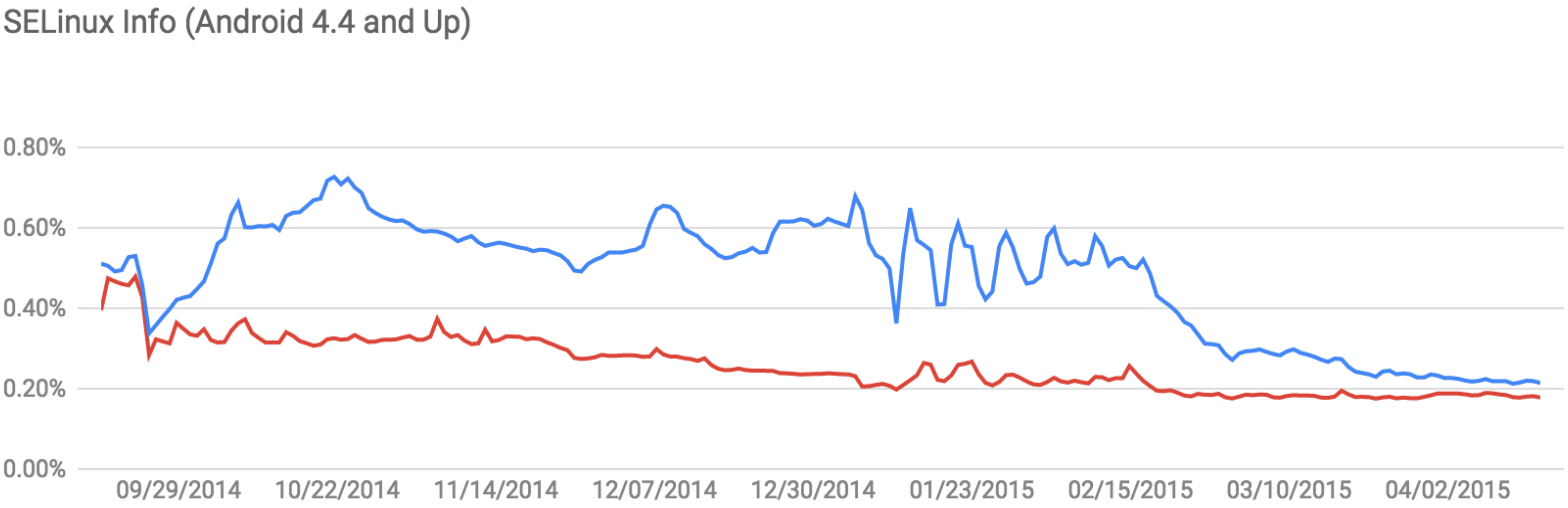


Source: Google Safety Net Data

Google™

RSAConference2015

Key elements of security model



Source: Google Safety Net Data

Exploitation myths and assumptions

Multiple layers of protection.

Some vulnerabilities are not exploited.

So far, limited evidence of malicious exploitation.

The good guys can win if we use layers of protection wisely.

Conclusion(s)

Strategy:

- Multiple layers of protection for Android ecosystem
- Multiple layers of protection for Android users

Data:

- Less than 1% have a PHA; <.15% for Google Play users
- Overall install rate reduced by 50% in 2014
- Specific types / families reduced even more:
  - SMS by 90%
  - Spyware by 60%
- Exploitation of vulnerabilities still below visibility thresholds

Android

Data From the Front Lines

aludwig@google.com
security@android.com