



Securing Mobile Devices & Protecting the Privacy of Users

Martina Lindorfer

Technische Universität Wien

martina@iseclab.org

<https://martina.lindorfer.in>

@lindorferin



TECHNISCHE
UNIVERSITÄT
WIEN

Vienna | Austria

About Me



- Assistant Professor at TU Wien (Security & Privacy Division) since October 2018
- Postdoc at the University of California, Santa Barbara 2016-2018
- PhD from TU Wien 2011-2016
- Researcher at SBA Research 2013-2015



Research Interests

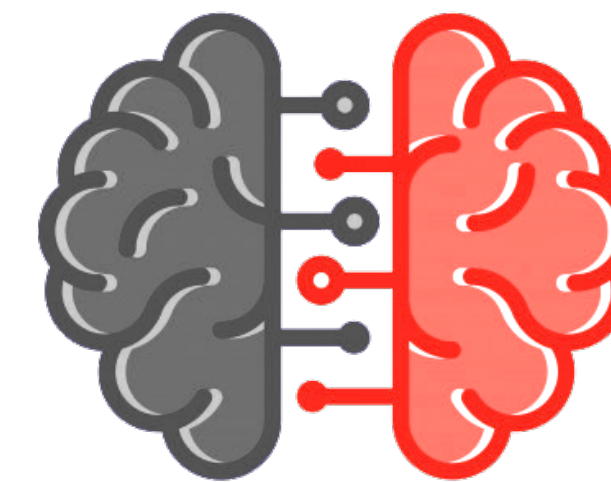


**Malware
Analysis**



**Privacy Leak
Detection**

**System
Security**



**Machine
Learning**



Research Goals



- Systematic study of mobile apps and operating systems for
 - malicious & harmful behavior
 - privacy leaks
 - vulnerabilities
- Build scalable analysis techniques
- Provide large-scale datasets to the community
- Advance the state-of-the-art of dynamic analysis approaches

Research Impact



Users



Developers



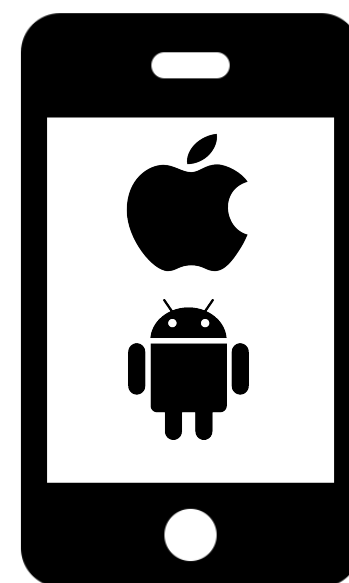
Media



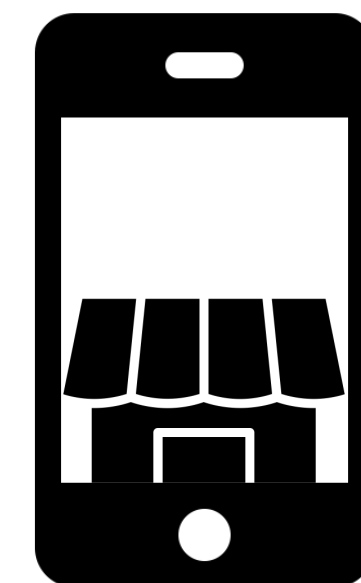
Law Enforcement



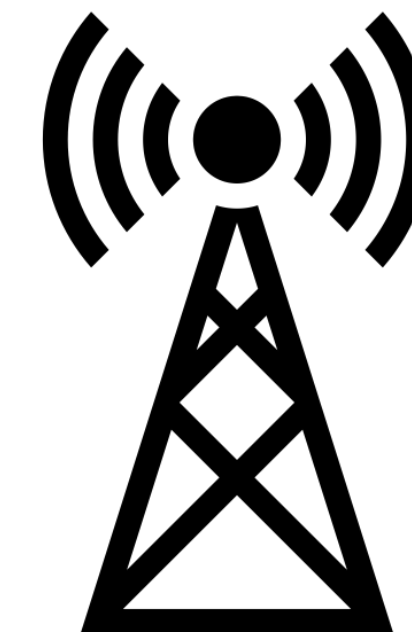
Regulators



OS Vendors



App Stores



ISPs

Threats to Users' Privacy



- Targeted advertising
- Price discrimination
- Sensitive information
- Trust developer to secure information?

→ Increasing interest from regulators

"If you are not paying for it,
You are the product."



RECON: Revealing Privacy Leaks (MobiSys 2016)



- Identify PII leaks on a wide range of devices through network flow analysis
- Collect data from real users
 - Analysis automation (“login walls”)
 - Feedback from users about detection accuracy
- Give users control over leaked information

<https://recon.meddle.mobi>

User Feedback Loop



ReCon

Personally Identifiable Information Leaks via Your Mobile Network

PII Type: **Location Tracking**

Recon helps identify following PII leakage, tap each type to view details. Or you can view [all](#).

Password **Full Name** Gender Email
Zipcode Last Name First Name Relationship
DateOfBirth Phone Number Device ID
MAC Address

Why should I care about Full Name? Your name reveals your identity to eavesdroppers

fullname=Jack B. Goodman is sent to gaana.com by app Gaana. **Correct**

What do you want ReCon to do with this leak in the future? **Tap to control**

Show data in the following date range
10/11/2015 - 10/11/2015

9:58 PM recon.meddle.mobi 40%

view details. Or you can view [all](#).

Password **Full Name** Gender Email
Zipcode Last Name First Name Relationship
DateOfBirth Phone Number Device ID
MAC Address

Why should I care about Full Name? Your name reveals your identity to eavesdroppers

fullname=Jack B. Goodman is sent to gaana.com by Gaana. **Correct**

What do you want ReCon to do with this leak in the future? **Tap to control**

Done

Is this correct?
Correct
NOT correct
I am not sure about this
The information is NOT about me

10:00 PM recon.meddle.mobi 39%

Why should I care about Password? Your password can be read by others over the Internet, and when using public/open WiFi hotspots.

password=rec***** is sent to 175.45.4.58 by app Hellotalk for 3 times. **Correct**

What do you want ReCon to do with this leak in the future? **Tap to control**

Action: Block the information
Destination: For above destination
Channel: when sending this information
Apply

when sending this information in clear
when sending this information over HTTP...

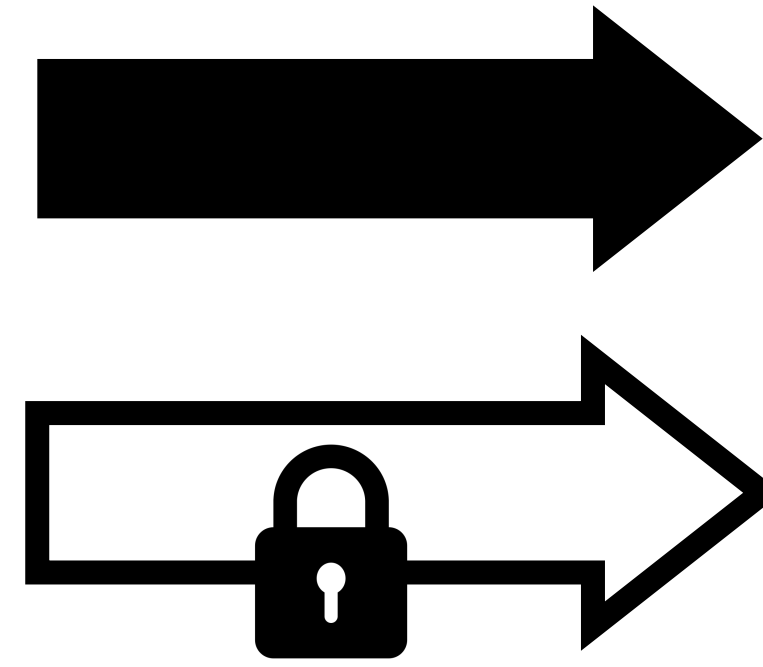
Privacy Dimensions



Information Type

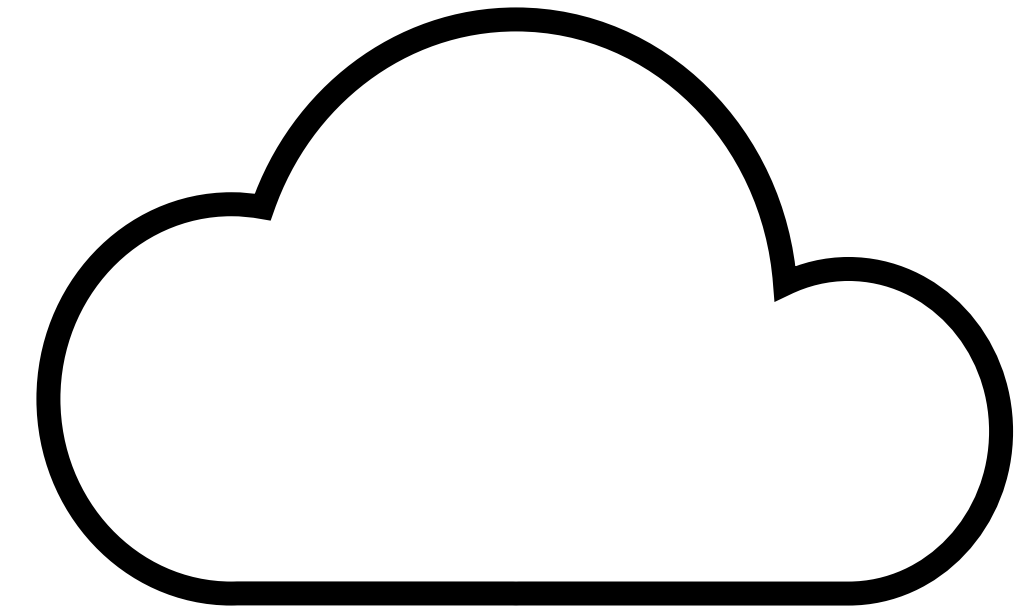
Tracking IDs
User information
Location
Installed apps
Passwords

...



Transport Security

Plaintext
or
Encrypted



Destination

First Party
or
Third Party

Privacy Leak Trends (NDSS 2018)



- Users are becoming more privacy aware, but are developers?
- Study 7,665 (512) app releases over 8 years
- Quantify privacy risk for a specific app version
- Consider personal privacy “preferences”

Privacy Dashboard



Security Impact



- Plaintext password leaks in > 25 apps
- Passwords sent to third parties
- Affects millions of users
- Responsible disclosure (3 months)



Developer Responses



“Thank you for responsibly disclosing this”

“We can’t fix this because our vendor went out of business”

“Sending passwords in plaintext is intentional”

“We do not claim to be a secure messaging app”

PANOPTISPY: Unexpected Media Leaks (PETS 2018)



- Identify & measure media (audio, images, video) exfiltration at scale
- Unexpected privacy leaks in media data
 - Finding 1: No evidence of audio/video surveillance
 - Finding 2: Server-side photo editing
 - Finding 3: Screen recording
 - Recording of users' interactions exposing private information

PANOPTISPY Reaction



These Academics Spent the Last Year Testing Whether Your Phone Is Secretly Listening to You

Kashmir Hill
7/03/18 1:00pm • Filed to: IT IS PARANOIA

263.4K 144 8

Uh-oh. Boffins say most Android apps can slurp your screen – and you wouldn't even know it

Your phone isn't listening to you, researchers say, but it may be watching e

There's a new conspiracy theory in town
By Makena Kelly | Jul 3, 2018, 3:36pm EDT

Your phone is probably spying on you

By Andy Meek, BGR

July 5, 2018 | 10:25am | Updated

59 59 SHARE

No, your smartphone is not lis

But it may be watching you

By Cal Jeffrey on July 3, 2018, 7:17 PM | 25 comments

may be spying on you spect

Elizabeth Weise, USA TODAY Published 12:04 p.m. ET July 5, 2018 | Updated 4:21 p.m. ET July 6, 2018

Smartphone apps don't listen to your conversations, but they do something equally creepy

The researchers found that while smartphone applications did not send audio clippings to third-party domains, they did send screenshots or screen recordings to them.

BusinessToday.In New Delhi Last Updated: July 4, 2018 | 22:14 IST

Yes, your phone is spying on you...but not how you think it is

Yahoo Finance Video • July 5, 2018

PANOPTISPY Reaction



These Academics Spent the Last Year Testing Whether Your Phone Is Secretly Listening

Kashmir Hill
7/03/18 1:00pm • Filed to: IT IS PARANOIA

Your phone isn't listening but it may be watching

There's a new conspiracy theory
By Makena Kelly | Jul 3, 2018, 3:36pm EDT

No, your smartphone isn't listening

But it may be watching you
By Cal Jeffrey on July 3, 2018, 7:17 PM | 25 comments

Smartphone apps do not record conversations, but they do something equally creepy

The researchers found that while smartphone applications did not send audio clippings to third-party domains, they did send screenshots or screen recordings to them.

BusinessToday.In New Delhi Last Updated: July 4, 2018 | 22:14 IST

Experts say most Android apps are spying on you

59 SHARE ▼

Experts say most Android apps are spying on you

ET July 6, 2018

“Google constantly monitors apps and analytics providers to ensure they are policy-compliant. When notified of our findings, they reviewed GoPuff and Appsee and took the appropriate actions.”

Smartphone is spying on you...but not how you think it is

Yahoo Finance Video • July 5, 2018



Thank you!

✉ martina@iseclab.org

🌐 <https://martina.lindorfer.in>

🐦 @lindorferin