Attacking Smartphone Privacy Using Local Covert Channels

Jean-François Lalande Steffen Wendzel

Ensi de Bourges, France

Augsburg University of Applied Sciences, Germany

8th of March 2013

Hochschule
Augsburg University of
Applied Sciences

Introduction

Privacy protection is one of the hot topics for smartphones:

- Private data comprises:
  - phone identifiers (IMEI)
  - contacts, phone numbers (MSISDN)
  - sms content
  - files, passwords, ...
- Data leakages enable to:
  - Sell collected information
  - Attack other targets using the collected information
- Malware can use the phone's capabilities (e.g., send SMS)

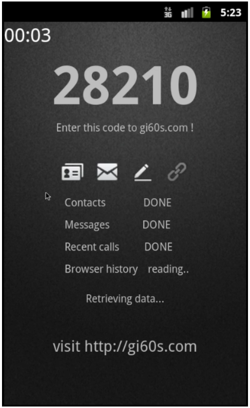
[4] Morrow reports: 64% of the enterprises surveyed by Infonetics had data lost or stolen due to the use of mobile devices...

Outline

Examples of typical malware

Gone in 60 seconds [1]:

- the user launches the application
- **backups user's data** (contacts, messages, history)
- launches the uninstall process



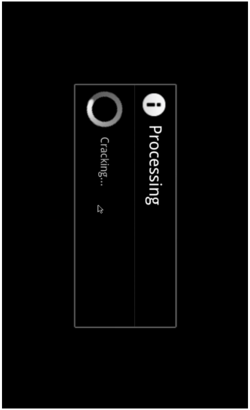
Examples of typical malware

Gone in 60 seconds [1]:

- the user launches the application
- backups user's data (contacts, messages, history)
- launches the uninstall process

Walkinwat (fake version of Walk and Text):

- the user launches the application
- **displays a "processing" screen**
- complains with a license error
- indeed, sent SMS to all your contacts !



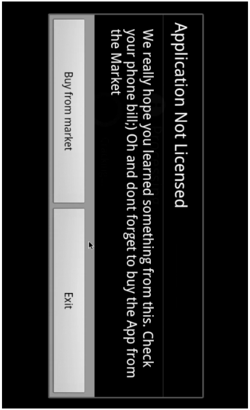
Examples of typical malware

Gone in 60 seconds [1]:

- the user launches the application
- backups user's data
  (contacts, messages, history)
- launches the uninstall process

Walkinwat (fake version of Walk and Text):

- the user launches the application
- displays a "processing" screen
- **complains with a license error**
- indeed, sent SMS to all your contacts !



Malware countermeasures

A lot of efforts to defend private data:

- classical virus signature detection
- introduction of fine grained security policies
- dynamic tainting propagation mechanisms
- static analysis of the source/bytecode of applications
- collaborative constraint generation at execution time
- ...

Malware countermeasures

A lot of efforts to defend private data:

- classical virus signature detection
- introduction of fine grained security policies
- dynamic tainting propagation mechanisms
- static analysis of the source/bytecode of applications
- collaborative constraint generation at execution time
- ...

For example Taindroid [2]:

- applies taints on resources
- taints variable of a program when accessing the resource
- propagates the taint over the program
- notifies the user if the taint leaks, e.g. via internet or SMS

Covert channels

What about security if the malware exploits covert channels ?

Covert channels

What about security if the malware exploits covert channels ?

Covert channels are channels that:

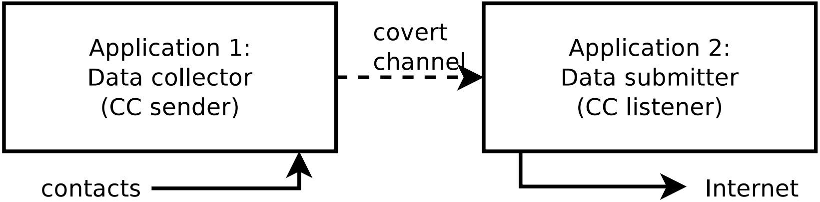
- unforeseen by a system's design
- exploit application/OS/hardware capabilities
- escape classical detection solutions

Our goal is to show that:

- covert channels can help to build a unnoticeable malware
- defeats security tainting solutions

Malware design

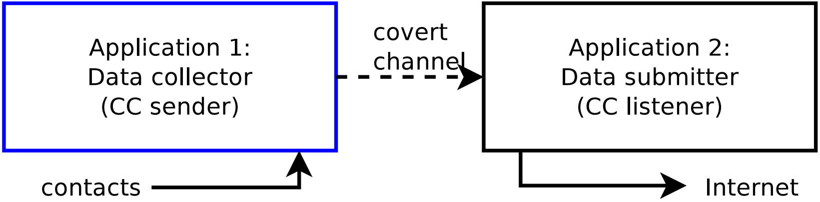
Our proposal, similar to Marforio et al. [3]:



- Data collector: gets private data
- Data submitter: leaks collected data
- covert channel: local hidden communication path

Malware design

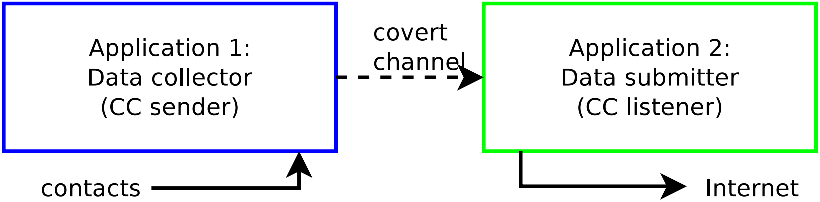
Our proposal, similar to Marforio et al. [3]:



- Data collector: gets private data
- Data submitter: leaks collected data
- covert channel: local hidden communication path

Malware design

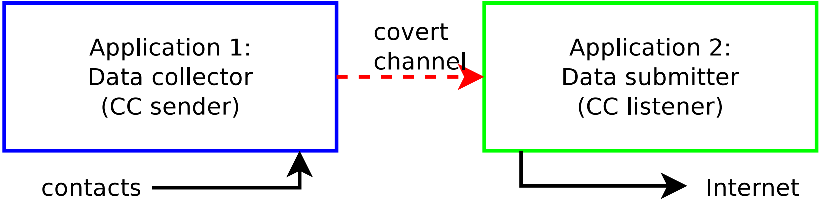
Our proposal, similar to Marforio et al. [3]:



- Data collector: gets private data
- Data submitter: leaks collected data
- covert channel: local hidden communication path

Malware design

Our proposal, similar to Marforio et al. [3]:



- Data collector: gets private data
- Data submitter: leaks collected data
- covert channel: local hidden communication path

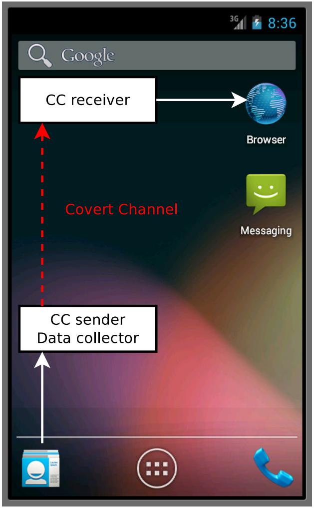
Required permissions

Required permissions

INTERNET

GET_TASKS

READ_CONTACTS

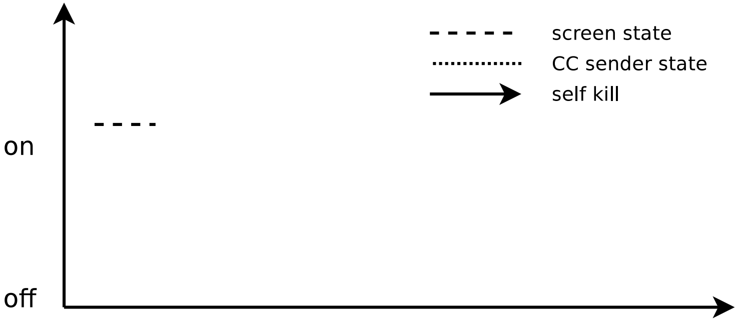


- The user will not suspect each app independently
- Automatic tools will miss the information flow
- How works the CC?

Why GET_TASKS permission is needed?

The covert channel is based on observable events:

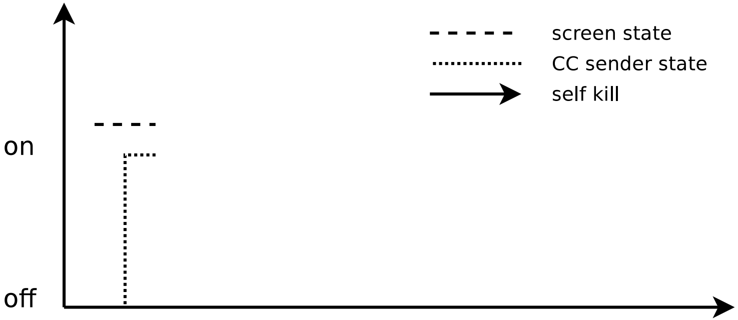
- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

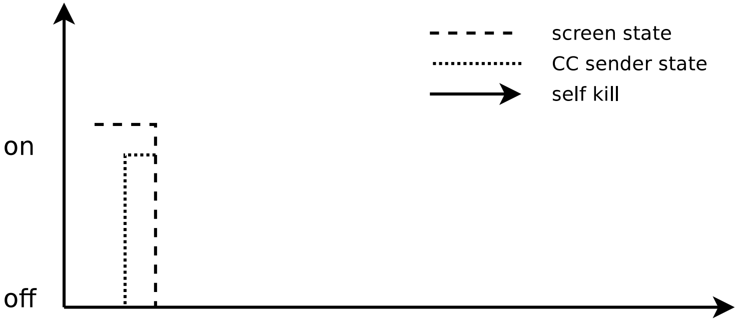
- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

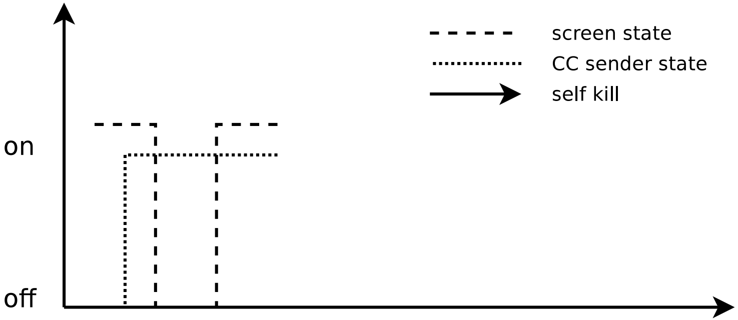
- The screen **turns off** $\Rightarrow$ starting transmission
- CC sender **is killed**: $\Rightarrow$ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

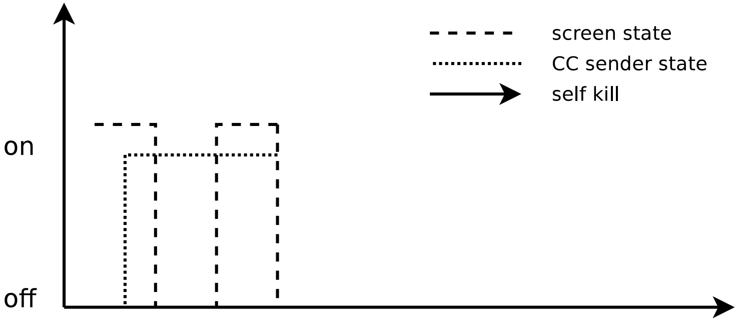
- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

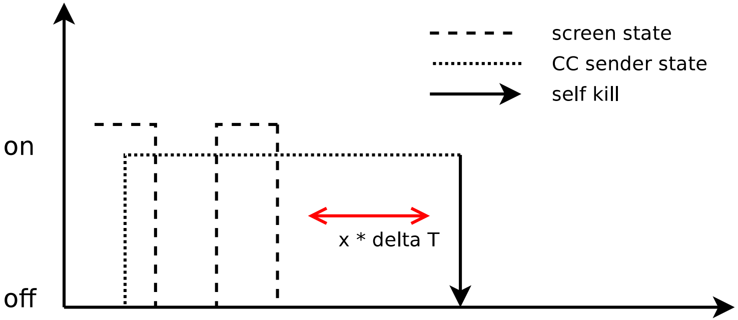
- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

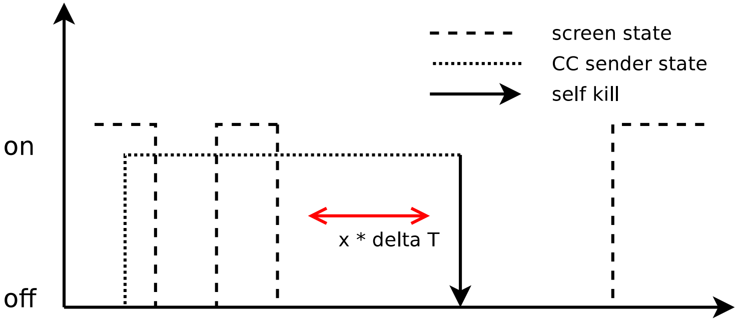
- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Why GET_TASKS permission is needed?

The covert channel is based on observable events:

- The screen **turns off** ⇒ starting transmission
- CC sender **is killed**: ⇒ ending transmission (GET_TASKS)



Demonstration

http://www.dailymotion.com/video/xy02g8

Conclusion and Future Work

The designed covert channel enables:

- to leak private data
- to minimize and separate required permissions
- to leak bytes, correlated with the user action

Conclusion and Future Work

The designed covert channel enables:

- to leak private data
- to minimize and separate required permissions
- to leak bytes, correlated with the user action

We are currently working on:

- Throughput measurements
- Energy consumption of our CC
- Creation of a CC without any required permission
- Evaluation of TaintDroid's capability to detect it

Questions

References

L. Botezatu.
All data stored on your smartphone ..... gone in 60 seconds.
MalwareCity, 2011.

W. Enck, P Gilbert, et al.
TaintDroid: an information-flow tracking system for realtime privacy monitoring on smartphones.
In 9th USENIX Symposium on Operating Systems Design and Implementation, pages 393–407. USENIX Association, 2010.

C. Marforio, H. Ritzdorf, et al.
Analysis of the communication between colluding applications on modern smartphones.
In 28th Annual Computer Security Applications Conference, pages 51–60. ACM Press, 2012.

B. Morrow.
BYOD security challenges: control and protect your most sensitive data.
Network Security, 2012(12):5–8, 2012.