UI Redressing Attacks on Android Devices Revisited

Marcus Niemietz
mail@mniemietz.de

ABOUT ME

- Horst Görtz Institute for IT security
- 3curity GmbH: Trainings, Pentests
- German book about UI redressing
- Speaker at Black Hat, BlueHat, PHDays, Zeronights, OWASP, ...
- Twitter: @mniemietz
- mail@mniemietz.de

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4. New browserless attacks
5. Mitigation techniques against Tapjacking
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1. Introduction

INTRODUCTION

- July 1999: German broadband connections for private customers via Deutsche Telekom
  - Decreased the number of phone-based malware
- End of 2009: Dialers are back

  New target: Mobile phones

INTRODUCTION

- "Attacks" on mobile phones via
  - Trojan horses
  - Applications with the permission to do phone calls

INTRODUCTION

- Example: WhatsApp Messenger
  - GPS/Network-based location
  - Send SMS/MMS messages
  - Directly call phone numbers
  - Record audio using the microphone
  - Read contact data
  - ...


INTRODUCTION
Is an application without phone call permissions able to do a phone call?
blackhat
ASIA 2014

INTRODUCTION

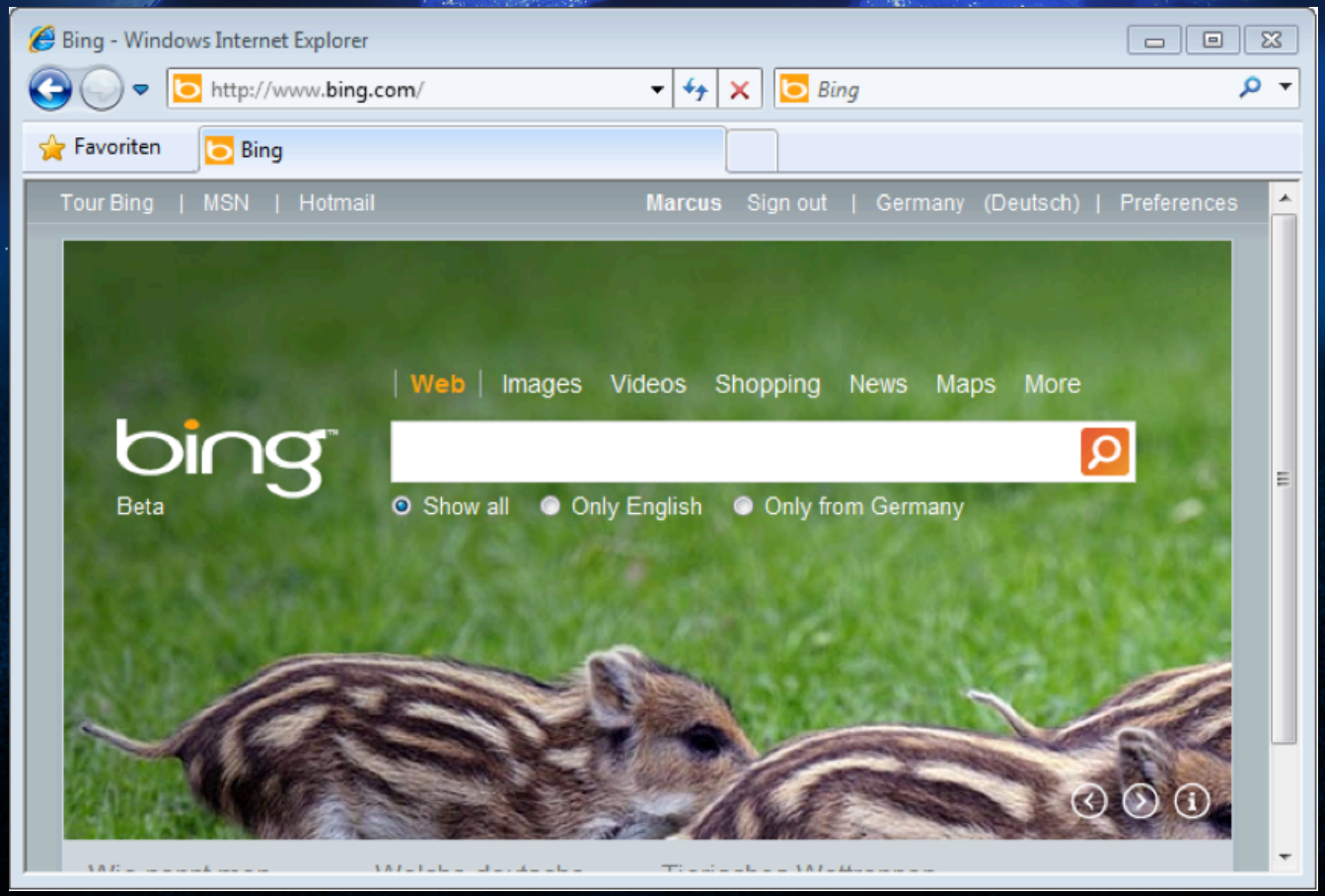
2. UI redressing: Public knowledge

UI REDRESSING

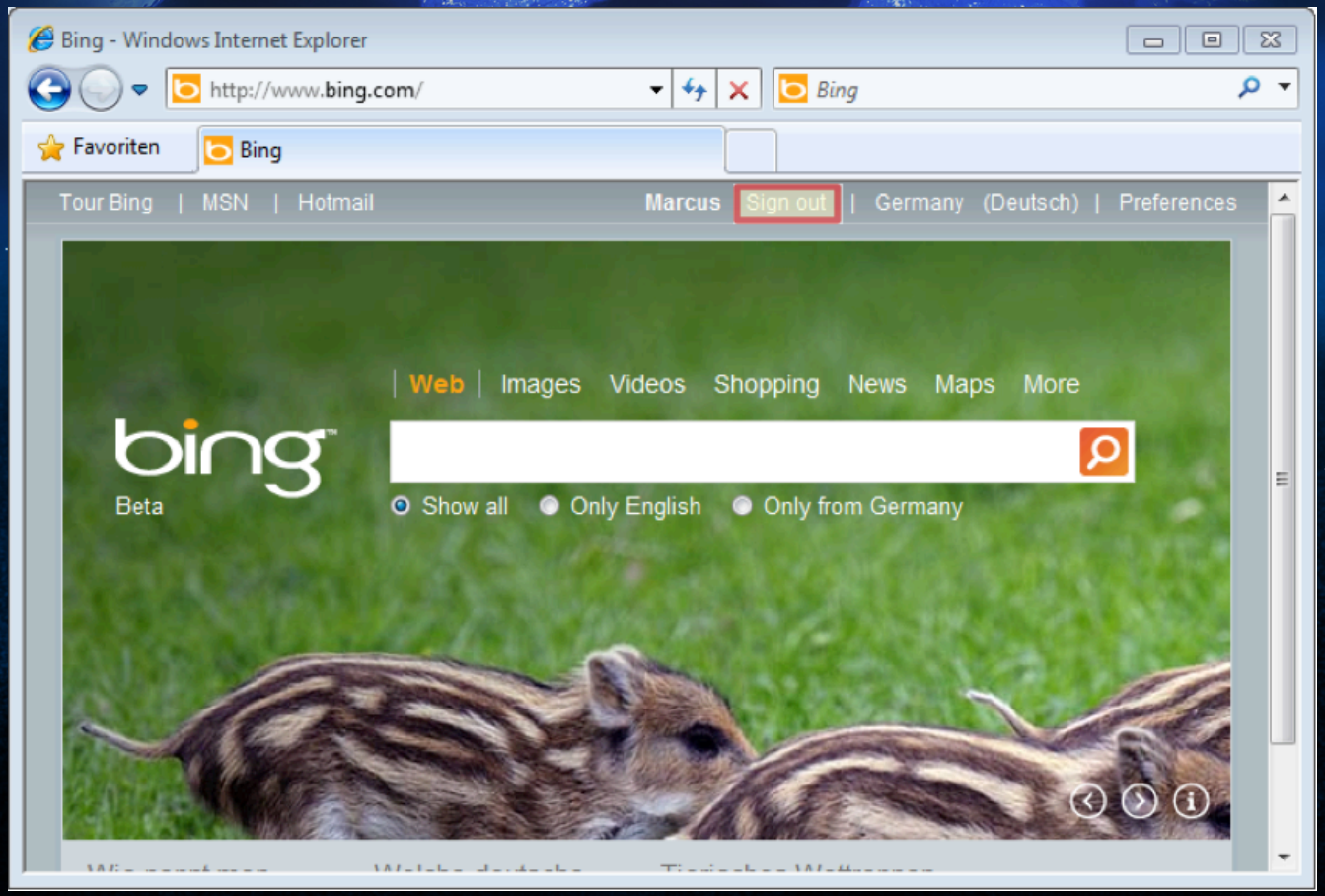
- Known since 2002
- Overlooked problem until 2008 → Clickjacking
- Clickjacking ⊂ UI redressing
  - Subset with attacks like Cursorjacking, Filejacking, Tabnabbing and Tapjacking
  - In general:
    The victim has to use a Web browser

UI REDRESSING

UI REDRESSING



UI REDRESSING



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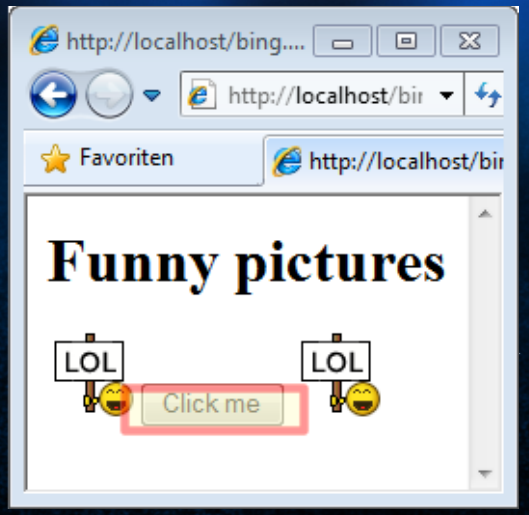

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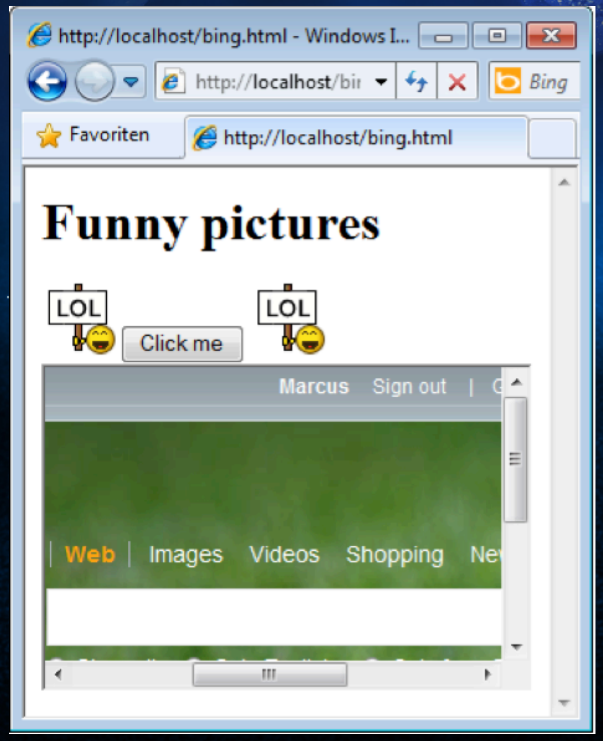
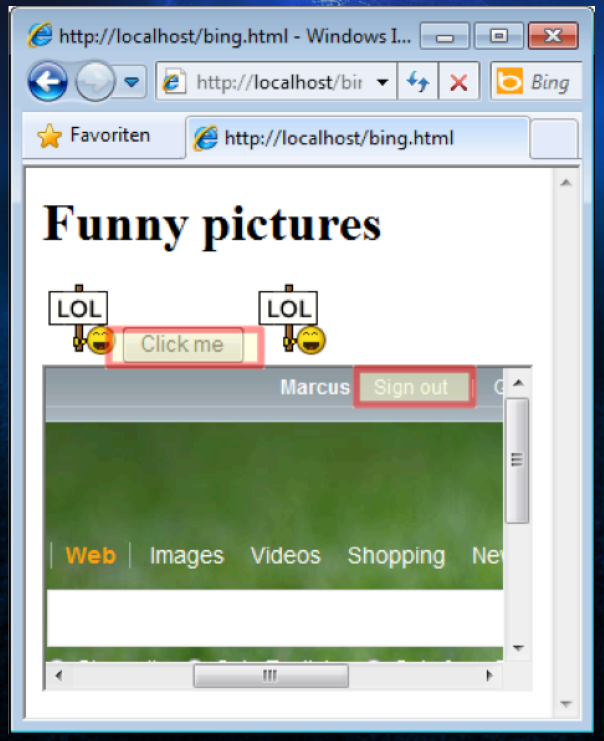
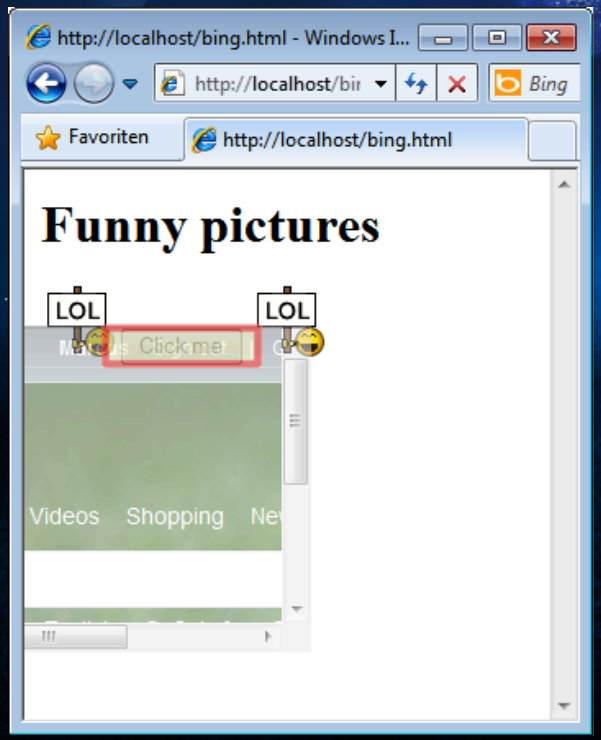
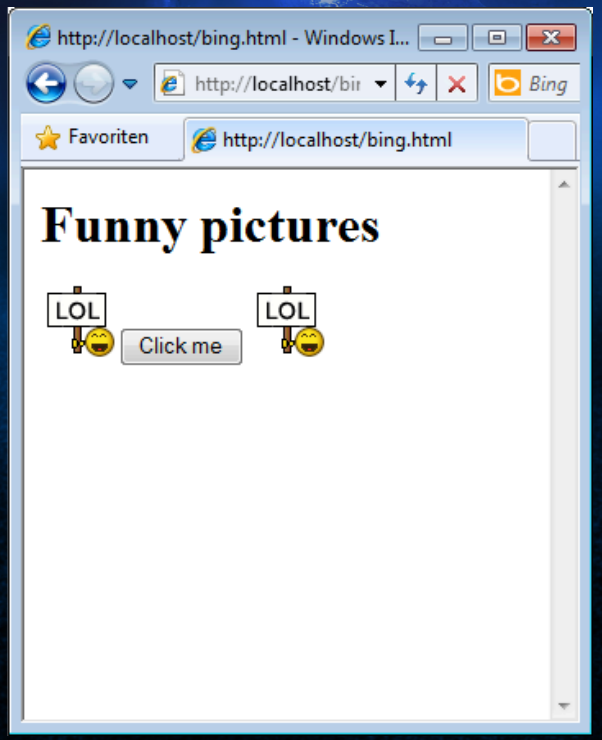




UI REDRESSING





UI REDRESSING

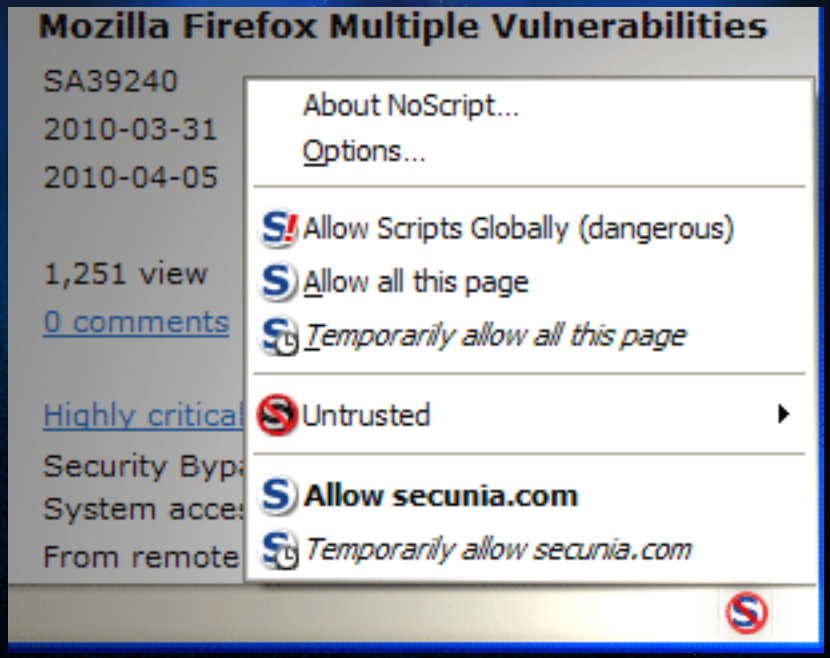
- Clickjacking
- Strokejacking
- Drag-and-Drop
- Content extraction
- Event-recycling
- SVG maskings

UI REDRESSING

- Classic Clickjacking
- Likejacking and Sharejacking
- Nested Clickjacking, Double Clickjacking
- Cookiejacking, Filejacking
- Eventjacking, Classjacking
- Cursorjacking, Tabnabbing
- Combinations with CSRF, XSS, and CSS

UI REDRESSING

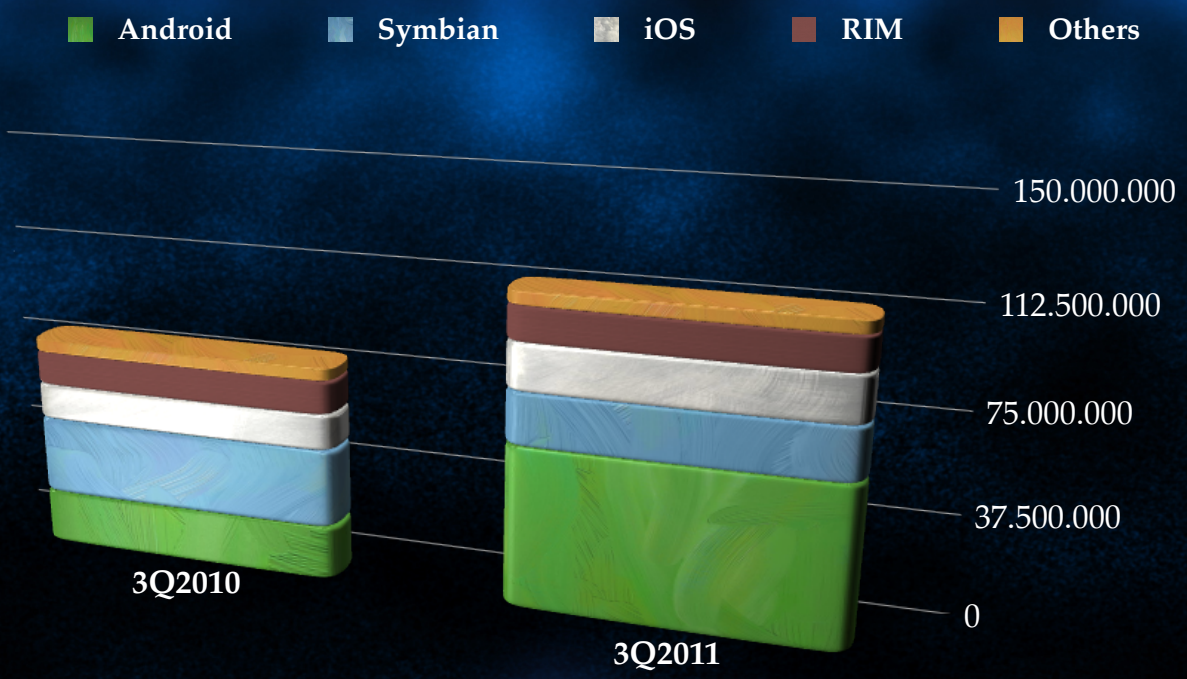
- Countermeasures
  - Frame buster
  - HTTP header
    - X-Frame-Options
    - CSP
  - NoScript



3. UI redressing: Porting to Android

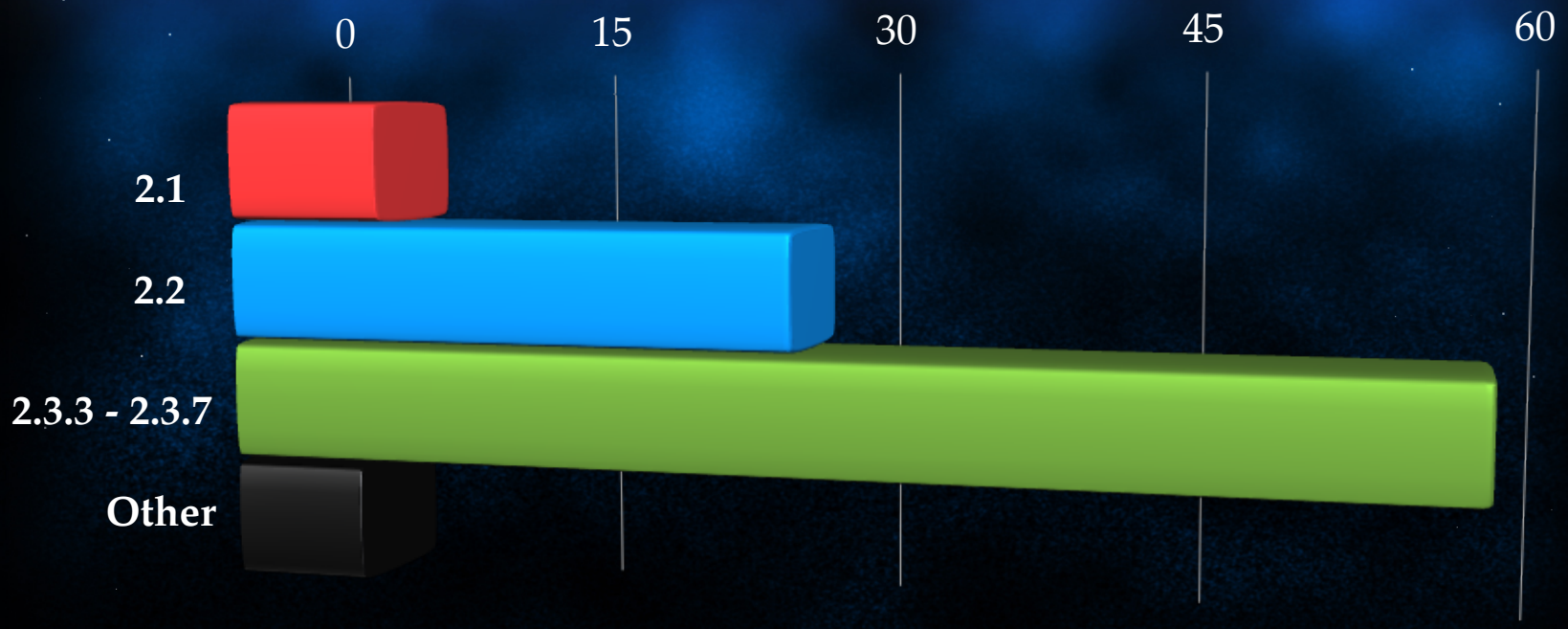
UI REDRESSING

- Android
  - By Gartner (November 2011)
  - 2012: Android 66,4%, iOS 19,1% – 2013: Android 78,4%, iOS 15,6%



UI REDRESSING

- Android
  - Android.com; 14 days; 1 Feb. 2012



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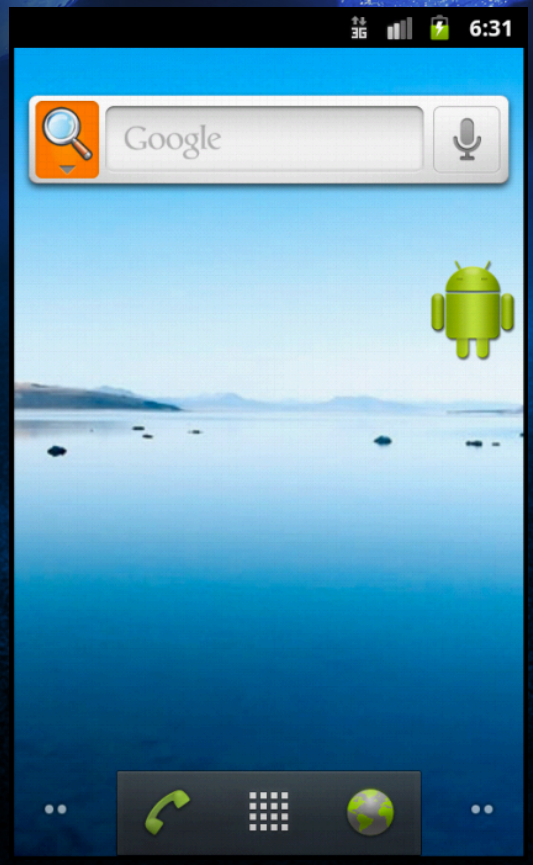
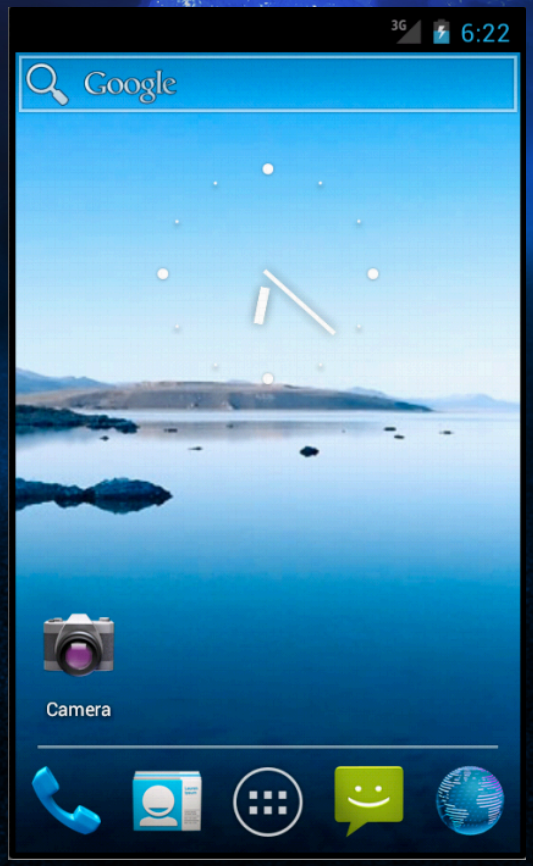


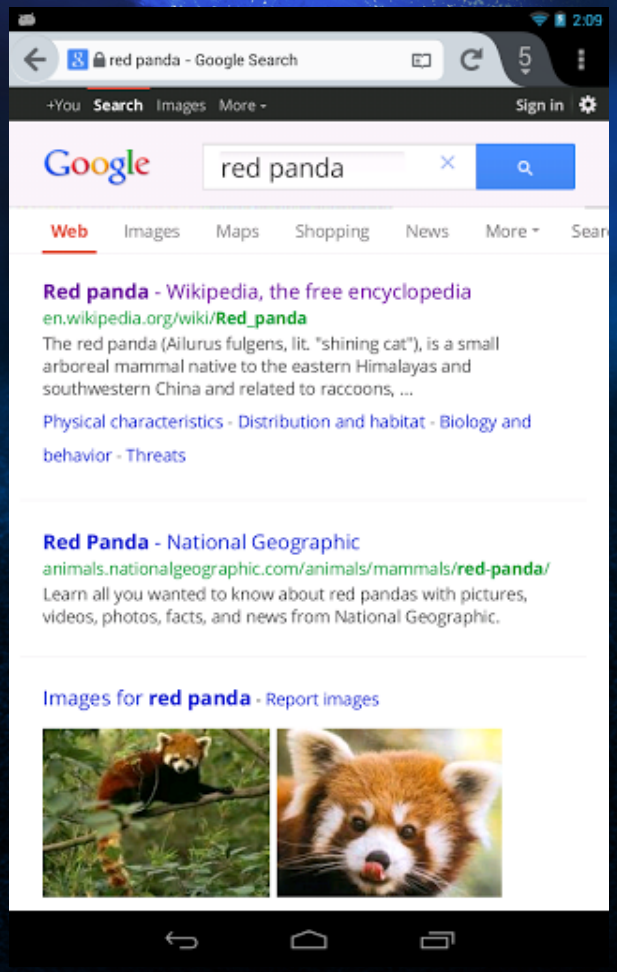
ANDROID 2.3.3



ANDROID 4.0

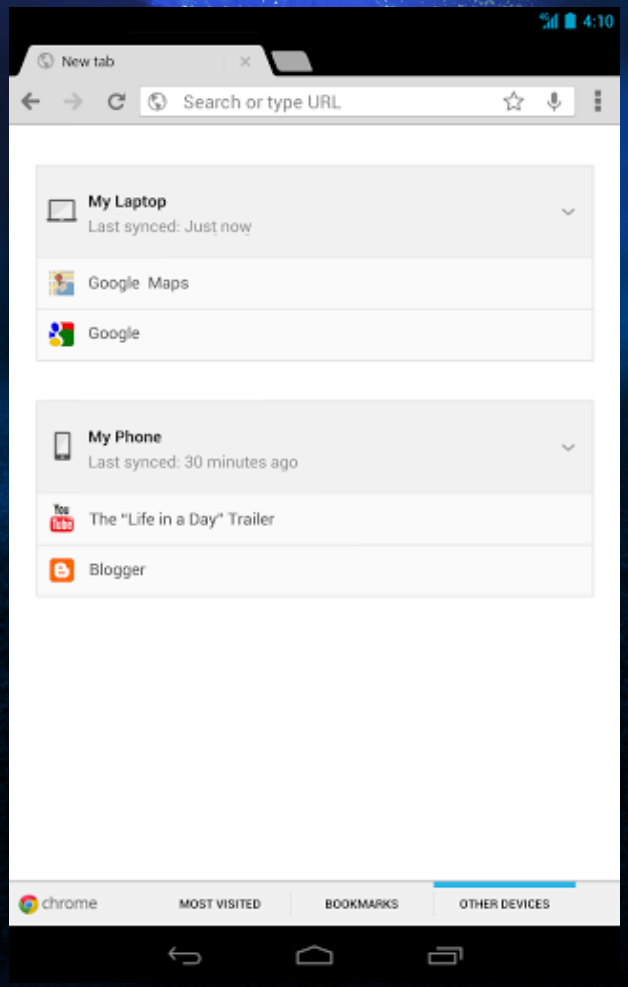
UI REDRESSING

Firefox



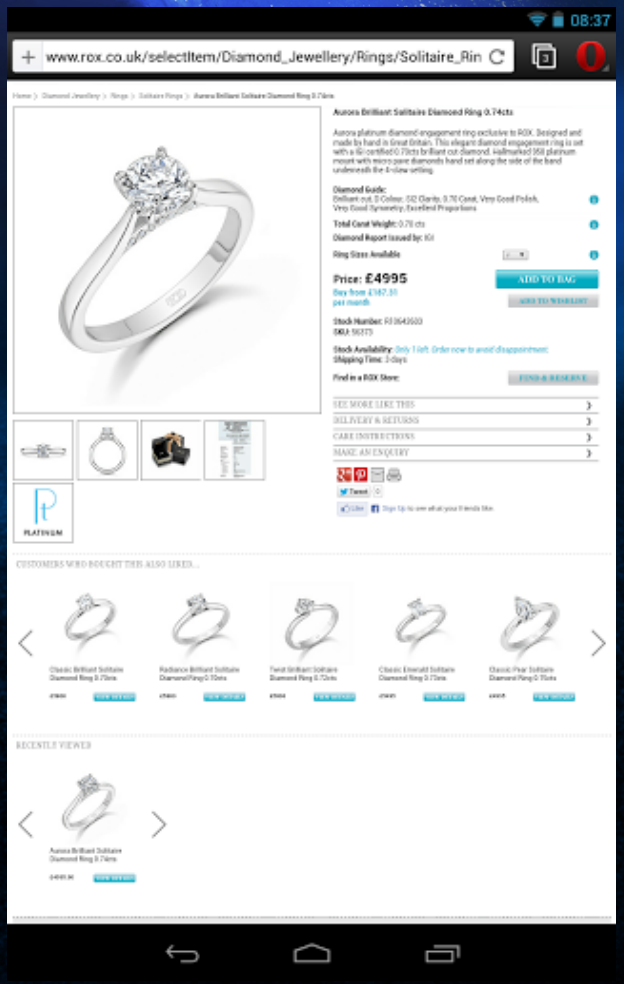
UI-REDRESSING

Chrome



UI-REDRESSING

Opera



UI REDRESSING

~~Safari~~

~~Internet Explorer~~

UI REDRESSING

- Classic Clickjacking, Classjacking, Strokejacking

- Browsers only have to support
  - Frames
  - CSS
  - JavaScript

UI REDRESSING

- Nested Clickjacking, Filejacking, Tabnabbing, Content extraction, Event-recycling and SVG maskings

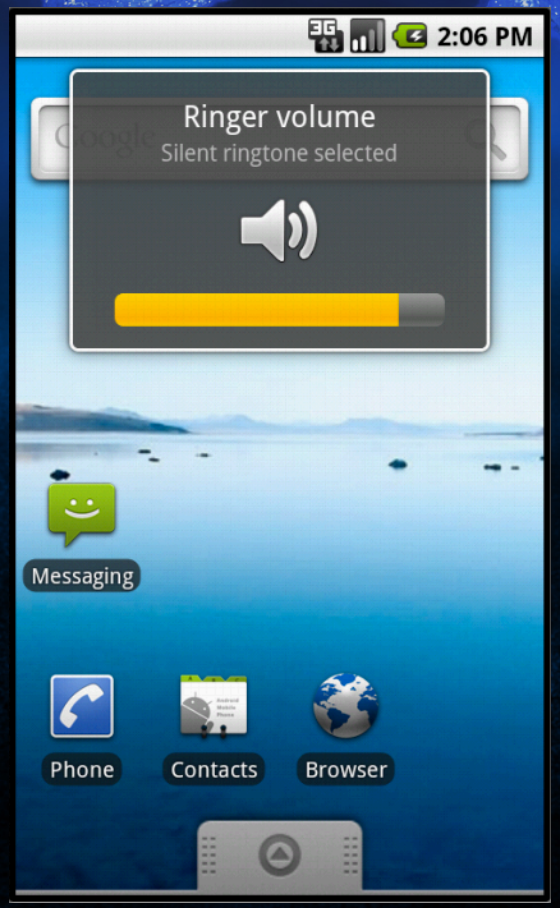
- Browser-specific features required (e.g. HTML5 attributes)

UI REDRESSING

- Non-transferable attacks
  - Cursorjacking 
  - Double Clickjacking
  - Cookiejacking 

4. New browserless attacks

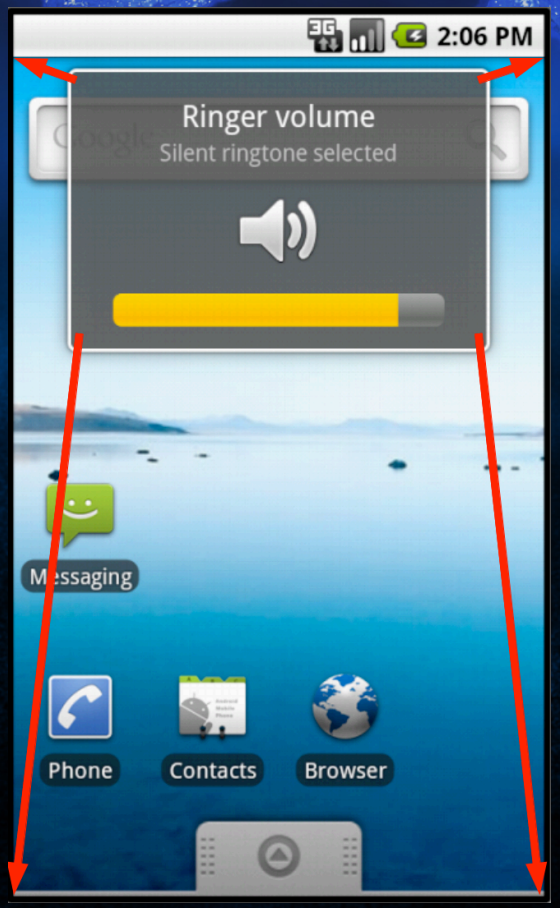
NEW BROWSERLESS ATTACKS



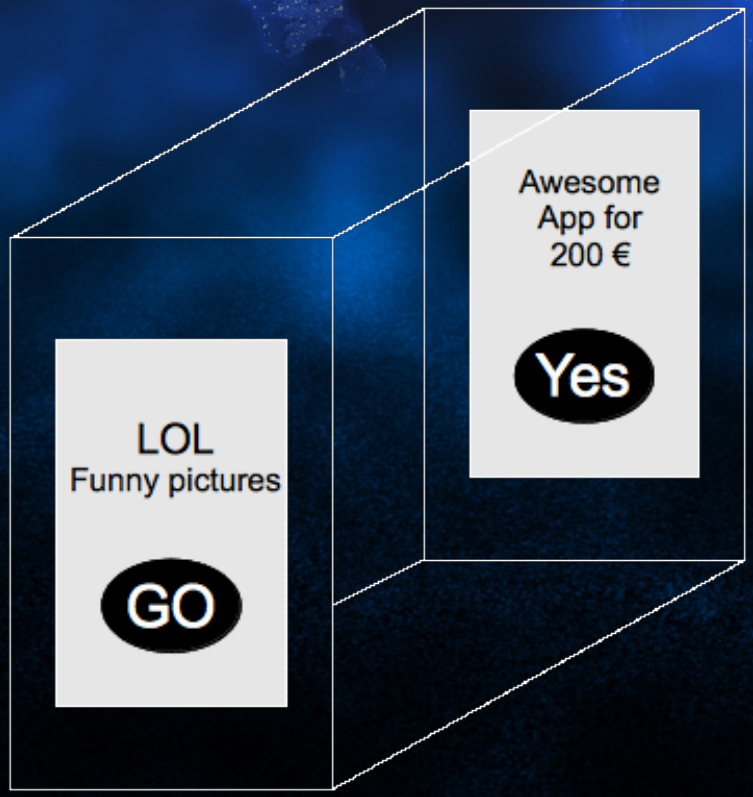
NEW BROWSERLESS ATTACKS

- Crucial point
  - An application can open another application
  - A touch gesture on such a message or notification will be passed through to the underlying application
    - Similar to Clickjacking
- Idea
  - Create a notification message, which looks like a normal application

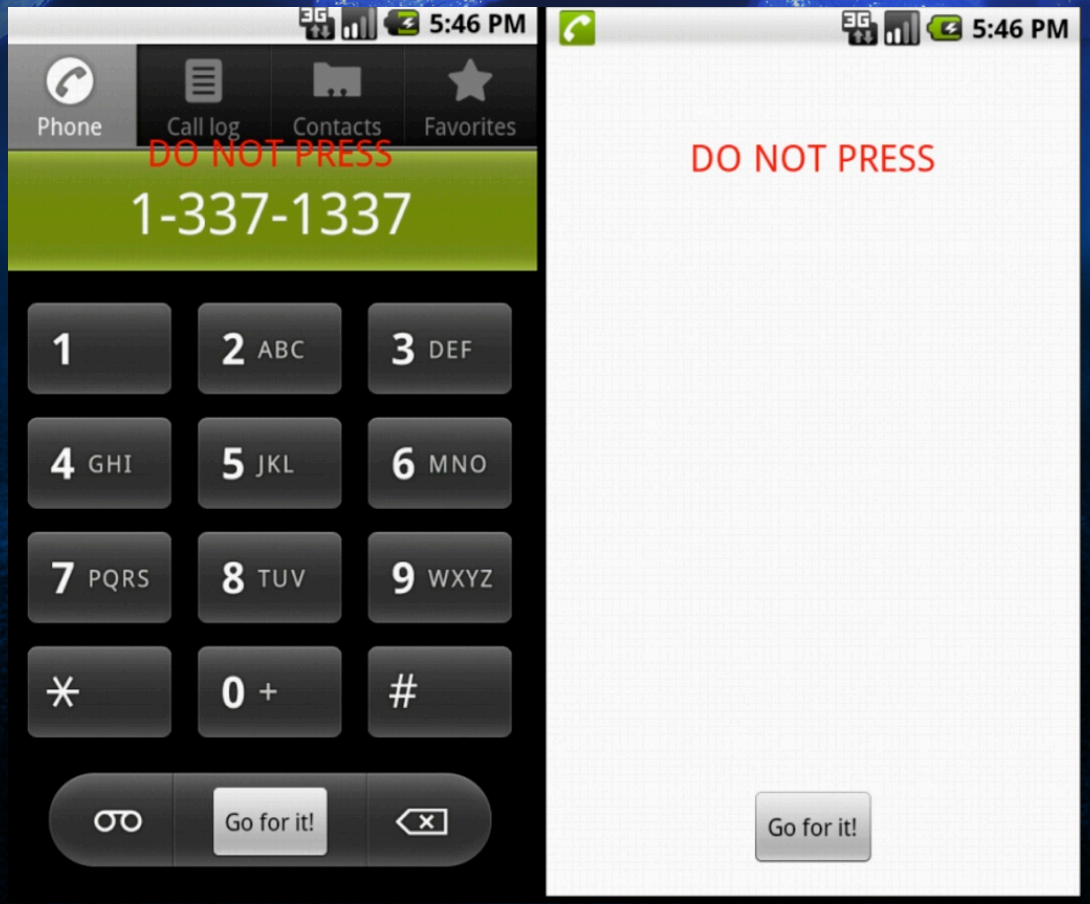
NEW BROWSERLESS ATTACKS



NEW BROWSERLESS ATTACKS



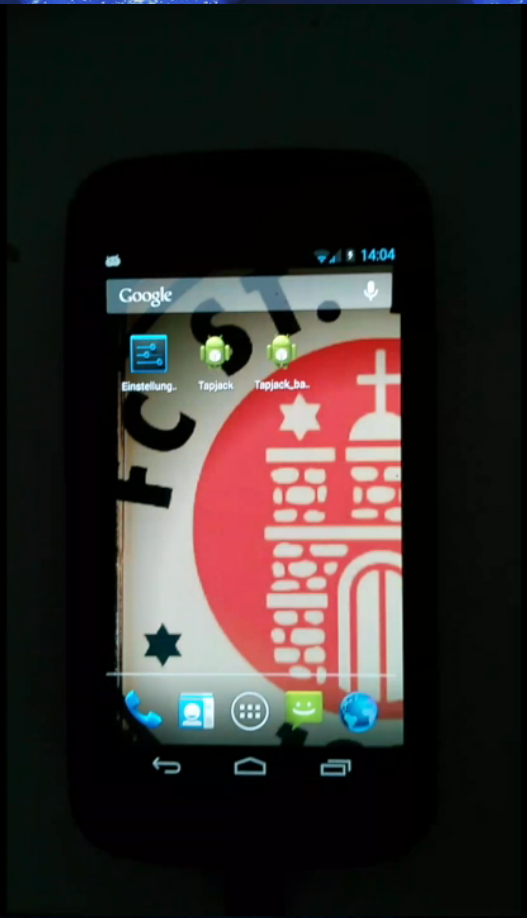
NEW BROWSERLESS ATTACKS



NEW BROWSERLESS ATTACKS

- What an attacker can do
  - Contact data manipulation
  - Native browser utilization
  - Touch gestures logging
  - Predefined phone calls
  - Installing applications in the background ~~*FIXED*~~

UI REDRESSING



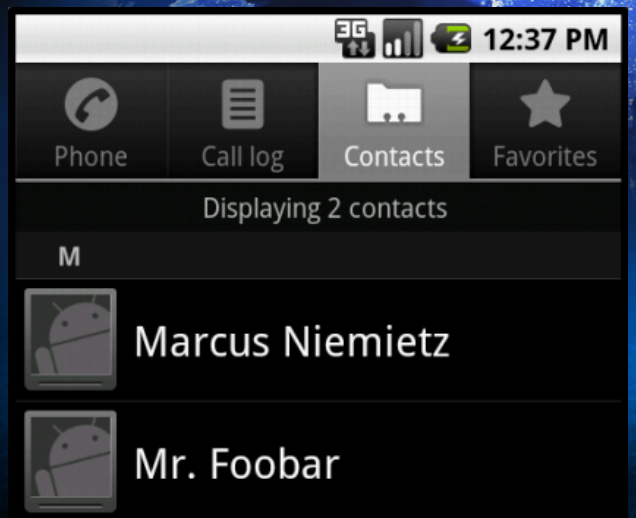
NEW BROWSERLESS ATTACKS

- All of these attacks are using the same technique
  1. There is a visible attacker's application in form of a notification in the foreground
  2. There is a target application in the background

NEW BROWSERLESS ATTACKS

- There is a limited number of operations like opening the phone call application
- Solution: Unauthorized home screen navigation attack
  - Substantially extend the limited set of attacks
  - An attacker needs more touch gestures of a victim

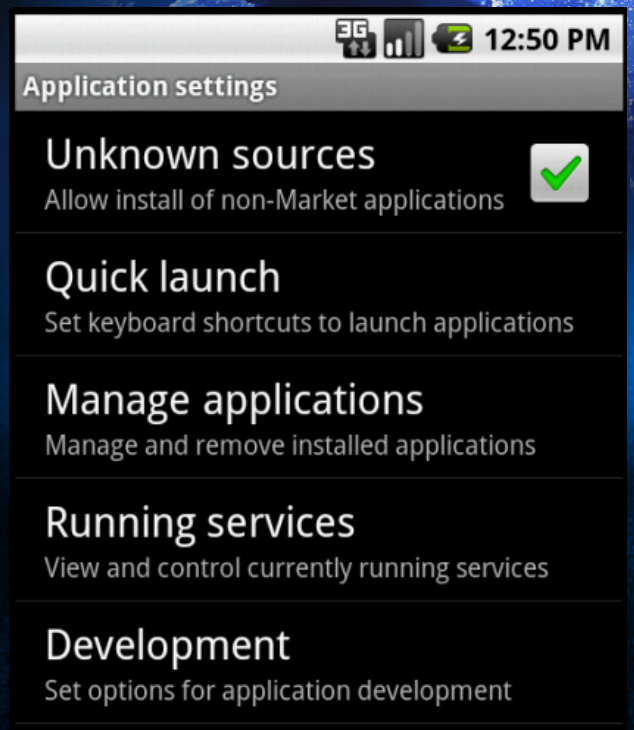
NEW BROWSERLESS ATTACKS



Manipulate contact data

Delete contact data:
4 touch gestures

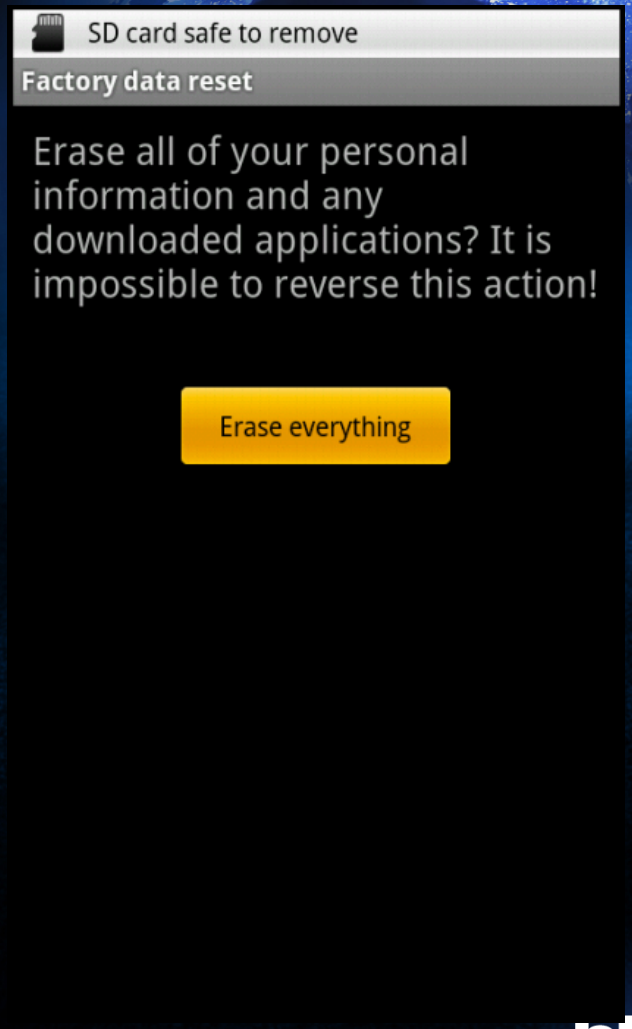
NEW BROWSERLESS ATTACKS



Application settings

Allow the installation of non-Market applications:
5 touch gestures

NEW BROWSERLESS ATTACKS



Wipe via „Factory Reset“

Just **6** touch gestures

5. Mitigation techniques against Tapjacking

MITIGATION TECHNIQUES

- Android touch filter
  - Blocks touch gestures received whenever view's window is obscured
  - `setFilterTouchesWhenObscured()` or, alternatively, with the attribute `android:filterTouchesWhenObscured`
- Not enabled by default and they are only available in Android versions higher than 2.2

6. Conclusion and outlook

CONCLUSION AND OUTLOOK

- Most of the existing UI redressing attacks can be used with very little effort
- An attacker can use UI redressing with and without a browser on a mobile phone
- Important: Dialers are back
- There are countermeasures like XFO, CSP, and `setFilterTouchesWhenObscured()`

Thank you for your attention.

Any questions?