



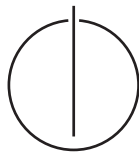
DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Master's Thesis in Informatics

**Analysis of Android Cracking Tools and  
Investigations in Counter Measurements  
for Developers**

Johannes Neutze





DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

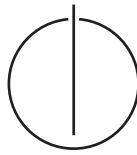
Master's Thesis in Informatics

**Analysis of Android Cracking Tools and  
Investigations in Counter Measurements  
for Developers**

**Analyse von Android Crackingtools und  
Untersuchung geeigneter  
Gegenmaßnahmen für Entwickler**

---

Author: Johannes Neutze  
Supervisor: TODO: Supervisor  
Advisor: TODO: Advisor  
Submission Date: TODO: Submission date



I confirm that this master's thesis in informatics is my own work and I have documented all sources and material used.

Munich, TODO: Submission date

Johannes Neutze

## Acknowledgments

# Abstract

# Contents

<b>Acknowledgments</b>	<b>iv</b>
<b>Abstract</b>	<b>v</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Licensing . . . . .	1
1.2 Motivation . . . . .	1
1.3 Related Work . . . . .	1
<b>2 Foundation</b>	<b>2</b>
2.1 Android . . . . .	2
2.1.1 History . . . . .	2
2.1.2 Basics of Android . . . . .	2
2.1.3 Evolution of the Android Compiler . . . . .	2
2.1.4 Root on Android . . . . .	2
2.2 License Verification Libraries . . . . .	3
2.2.1 Amazon . . . . .	3
2.2.2 Google . . . . .	3
2.2.3 Samsung . . . . .	3
2.3 Reengineering Tools . . . . .	4
2.3.1 Dex . . . . .	4
2.3.2 baksmali . . . . .	4
2.3.3 Java . . . . .	4
2.3.4 Diff . . . . .	4
<b>3 Cracking Android Applications with LuckyPatcher</b>	<b>6</b>
3.1 What is LuckyPatcher and what is it used for? . . . . .	6
3.2 Operation . . . . .	6
3.3 What patterns are there and what do they do? . . . . .	6
3.4 What are Patching Modes are there and what do they do? . . . . .	6
3.5 Learnings from LuckyPatcher . . . . .	7



<b>4</b>	<b>Counter Measurements for Developers</b>	<b>8</b>
4.1	Basic Approaches . . . . .	8
4.1.1	Simple Approaches . . . . .	8
4.1.2	Obfuscation . . . . .	8
4.1.3	Modify the Library . . . . .	8
4.1.4	Tampar resistant . . . . .	8
4.1.5	Junkbyte Injection . . . . .	9
4.1.6	Checken ob ganzer code abläuft und dann nacheinander elemente aktivieren . . . . .	9
4.1.7	Hidden Classes . . . . .	9
4.2	Additional Software . . . . .	9
4.2.1	Dexguard . . . . .	9
4.2.2	Dexprotector . . . . .	9
4.3	Additional Hardware and Verification . . . . .	9
4.3.1	Remote Verification . . . . .	9
4.3.2	Secure Elements . . . . .	9
<b>5</b>	<b>Conclusion</b>	<b>10</b>
5.1	Android . . . . .	10
5.1.1	History . . . . .	10
5.1.2	Basics of Android . . . . .	10
5.1.3	Evolution of the Android Compiler . . . . .	10
5.1.4	Root on Android . . . . .	10
5.2	License Verification Libraries . . . . .	11
5.2.1	Amazon . . . . .	11
5.2.2	Google . . . . .	11
5.2.3	Samsung . . . . .	11
5.3	Reengineering Tools . . . . .	12
5.3.1	Dex . . . . .	12
5.3.2	baksmali . . . . .	12
5.3.3	Java . . . . .	12
5.3.4	Diff . . . . .	12
	<b>Glossary</b>	<b>14</b>
	<b>Acronyms</b>	<b>15</b>
	<b>List of Figures</b>	<b>16</b>
	<b>List of Tables</b>	<b>17</b>

# 1 Introduction

sis is a text

## 1.1 Licensing

Was ist licensing und warum? allgemein

## 1.2 Motivation

enthält als Abschluss SCOPE

## 1.3 Related Work

related work

## 2 Foundation

sis is a text

### 2.1 Android

sis is text

#### 2.1.1 History

sis is text

#### 2.1.2 Basics of Android

sis is text

#### 2.1.3 Evolution of the Android Compiler

sis is text

#### Java Virtual Machine

sis is text

#### Dalvik Virtual Machine

sis is text

#### Android Runtime

im Moment abwärtskompatibilität dex in oat (tools zum extrahieren nennen)

#### 2.1.4 Root on Android

what is it? how is it achieved? what can i do with it? (good/bad sides)

## 2.2 License Verification Libraries

What is a lvi? why are they used? connection to store

### 2.2.1 Amazon

Amazon DRM

#### Implementation

sis is text

#### Functional Principle

sis is text

#### Example

anhand eigener app

### 2.2.2 Google

License Verification Library

#### Implementation

sis is text

#### Functional Principle

sis is text

#### Example

anhand eigener app

### 2.2.3 Samsung

Zirconium

### **Implementation**

sis is text

### **Functional Principle**

sis is text

### **Example**

anhand eigener app

## **2.3 Reengineering Tools**

main tools

### **2.3.1 Dex**

mein custom script erklären

### **2.3.2 baksmali**

<https://github.com/JesusFreke/smali>

### **2.3.3 Java**

#### **Androguard**

<https://github.com/androguard/androguard>

#### **jadx**

<https://github.com/skylot/jadx>

### **2.3.4 Diff**

<https://wiki.ubuntuusers.de/diff>

-N: Treat absent files as empty; Allows the patch create and remove files.

-a: Treat all files as text; Allows the patch update non-text (aka: binary) files.

-u: Set the default 3 lines of unified context; This generates useful time stamps and context.

-r: Recursively compare any subdirectories found; Allows the patch to update subdirectories.

script erklären

## 3 Cracking Android Applications with LuckyPatcher

<http://lucky-patcher.netbew.com/>

### 3.1 What is LuckyPatcher and what is it used for?

wer hat ihn geschrieben?  
auf welcher version basiere ich  
su nicht vergessen  
was kann er alles  
was schauen wir uns an?

### 3.2 Operation

wo arbeitet er?  
warum dex und nicht odex anschauen?  
patterns und patching modes grob erklären (modi von luckypatcher die verschiedene operationen (pattern) auf app anwenden) => vorgehensweise zur

### 3.3 What patterns are there and what do they do?

was greift jedes pattern an? wie wird der mechanismus ausgeklingt? was ist das result?

### 3.4 What are Patching Modes are there and what do they do?

kombination von patterns.  
welche modes gibt es? welche patterns benutzen sie?  
welche apps getestet und welche results?

### 3.5 Learnings from LuckyPatcher

was fällt damit weg?

erklären warum (2) 5.1.2 Opaque predicates zb nicht geht, da auf dex ebene einfach austauschbar

simple obfuscation for strings? x -> string (damit name egal)



## 4 Counter Measurements for Developers

am besten mit example

### 4.1 Basic Approaches

siehe masterarbeit 2

#### 4.1.1 Simple Approaches

##### Root Detection

<http://stackoverflow.com/questions/10585961/way-to-protect-from-lucky-patcher-play-licensing>

##### LuckyPatcher Detection

<http://stackoverflow.com/questions/13445598/lucky-patcher-how-can-i-protect-from-it>

##### Sideload Detection

<http://stackoverflow.com/questions/10809438/how-to-know-an-application-is-installed-from-google-play-or-side-load>

#### 4.1.2 Obfuscation

master1

#### 4.1.3 Modify the Library

google

#### 4.1.4 Tamper resistant

google

#### **4.1.5 Junkbyte Injection**

master1

#### **4.1.6 Checken ob ganzer code abläuft und dann nacheinander elemente aktivieren**

master1 - testen

#### **4.1.7 Hidden Classes**

master1

### **4.2 Additional Software**

sis is text

#### **4.2.1 Dexguard**

master2

#### **4.2.2 Dexprotector**

master2

### **4.3 Additional Hardware and Verification**

sis is text

#### **4.3.1 Remote Verification**

#### **4.3.2 Secure Elements**

# 5 Conclusion

sis is a text

## 5.1 Android

sis is text

### 5.1.1 History

sis is text

### 5.1.2 Basics of Android

sis is text

### 5.1.3 Evolution of the Android Compiler

sis is text

#### Java Virtual Machine

sis is text

#### Dalvik Virtual Machine

sis is text

#### Android Runtime

im Moment abwärtskompatibilität dex in oat (tools zum extrahieren nennen)

### 5.1.4 Root on Android

what is it? how is it achieved? what can i do with it? (good/bad sides)

## 5.2 License Verification Libraries

What is a lvi? why are they used? connection to store

### 5.2.1 Amazon

Amazon DRM

#### Implementation

sis is text

#### Functional Principle

sis is text

#### Example

anhand eigener app

### 5.2.2 Google

License Verification Library

#### Implementation

sis is text

#### Functional Principle

sis is text

#### Example

anhand eigener app

### 5.2.3 Samsung

Zirconium

### **Implementation**

sis is text

### **Functional Principle**

sis is text

### **Example**

anhand eigener app

## **5.3 Reengineering Tools**

main tools

### **5.3.1 Dex**

mein custom script erklären

### **5.3.2 baksmali**

<https://github.com/JesusFreke/smali>

### **5.3.3 Java**

#### **Androguard**

<https://github.com/androguard/androguard>

#### **jadx**

<https://github.com/skylot/jadx>

### **5.3.4 Diff**

<https://wiki.ubuntuusers.de/diff>

-N: Treat absent files as empty; Allows the patch create and remove files.

-a: Treat all files as text; Allows the patch update non-text (aka: binary) files.

-u: Set the default 3 lines of unified context; This generates useful time stamps and context.

-r: Recursively compare any subdirectories found; Allows the patch to update subdirectories.

script erklären

# Glossary

**computer** is a machine that. . .

# Acronyms

**TUM** Technische Universität München.



## List of Figures

## List of Tables