

SandDroid User's Manual

SandDroid

SandDroid is an automatic Android application analysis system which combines static and dynamic analysis techniques. The home page shows as below.

SandDroid - An automatic Android application analysis system.

Static Analysis:

- **Basic Information Extraction:** file size, file hash, package name, SDK version, etc
- **Certification Analysis:** Parse the certification and check if it's from AOSP.
- **Category Analysis:** Classify the APK to different categories based on the permission information
- **Permission Analysis:** Extract permissions (include customized permissions) and detect if the declared permission is used
- **Component Analysis:** List all the components (include dynamically registered broadcast receivers) and analyze if the component is exported
- **Code Feature Analysis:** Check native code, java reflection, dynamic loader usage
- **Advertisement Module Analysis:** Extract all the advertisement modules
- **Sensitive API Analysis:** List all the sensitive APIs and the caller code path
- etc...

Dynamic Analysis:

- **Network Data Record:** capture all the network data during the APK's running period
- **Http Data Recovery:** recover data from http flow
- **IP Distribution Analysis:** parse IP information based on the extracted URLs
- **File Operation Monitor:** record file path and data
- **SMS & Phone Call Monitor:** record sms sent and phone call
- **SMS Block Monitor:** record sms block behavior
- **Crypto Operation Monitor:** record crypto usage
- **Data Leakage Monitor:** data leakage
- etc...

Comprehensive Analysis :

- **Risky Behaviors Summary:** list risky behaviors
- **Risk Score:** Calculate the risk score based on the static and dynamic analysis result

Chrome & FireFox are recommended for a better display!

Developed by Botnet Research Team , Xi'an Jiaotong University
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Partners: VisualThreat , MobiSecLab

Figure 1 SandDroid home page

Overview

Click the **Overview** link in the navigation bar and you will see the over-view information of the analyzed Android applications.

Search

You can look for the Android applications in our database by using the *search* functionality.

Search

File MD5 Signature

Package Name Malware Name

Search All

Figure 2 Search Form

How to *search*:

- File MD5: the MD5 value of the Android application;
- Signature: the SHA-1 value of the Android application's signature;
- Package Name: the package name of the Android application;
- Malware Name: the malware family name of the Android application.

Apk Information Table

The searched results will show in the table which displays the brief information about the analyzed Android applications. Click the “detail icon” to see the detail analysis report.

Reports

Show 10 entries

Click to see the detail report

Date	MD5	Package Name	Malware	Risk
2015-01-31 01:57:35	A3B919B9C9E1A40F82AE6D1EB7D991BE	com.whirlscape.minuumkeyboard	✓	*****
2015-01-30 13:09:25	F929364A01DD719122EB99C16E04E747	net.dinglish.android.taskerm	✓	*****
2015-01-30 12:51:54	6B9009273475014F3EC21107B0036939	com.movie.tubecc432	✓	*****
2015-01-30 06:13:33	3AE7A8E2E43D84A560327B16BC3FDAB9	com.appvn	✓	*****
2015-01-29 23:51:44	C1CFF4842FC94AB37D4C57828CF59254	jackpal.androidterm	✓	*****
2015-01-29 23:51:14	259035733BBCB4981CD00BED07E807B0	net.cellagent	✓	*****
2015-01-29 23:49:14	AE8C5A1518548EA657346B351CFA2FA5	com.hisunflytone.android	✓	*****
2015-01-29 23:48:14	DDC67EDEB9E635830B3C24A17698DB91	net.xdevelop.protectord_t	✓	*****
2015-01-29 23:45:44	FB96315BCEC56CC3F041248E1DCE321B	com.iflytek.inputmethod	✓	*****

Showing 1 to 10 of 55,309 entries

First Previous 1 2 3 4 5 Next Last

Figure 3 Apk Information Table

Explanation of the apk Information table's columns:

- Date: the date when starts to analyze the apk;
- MD5: the MD5 value of the apk;
- Package Name: the package name of the apk;
- Malware: the malware name of the apk;
- Risk: the risk level of the apk.

IP Distribution

The *ip distribution map* shows geographical distribution of ip addresses extracted from all the analyzed Android applications.

☰ IP Distribution

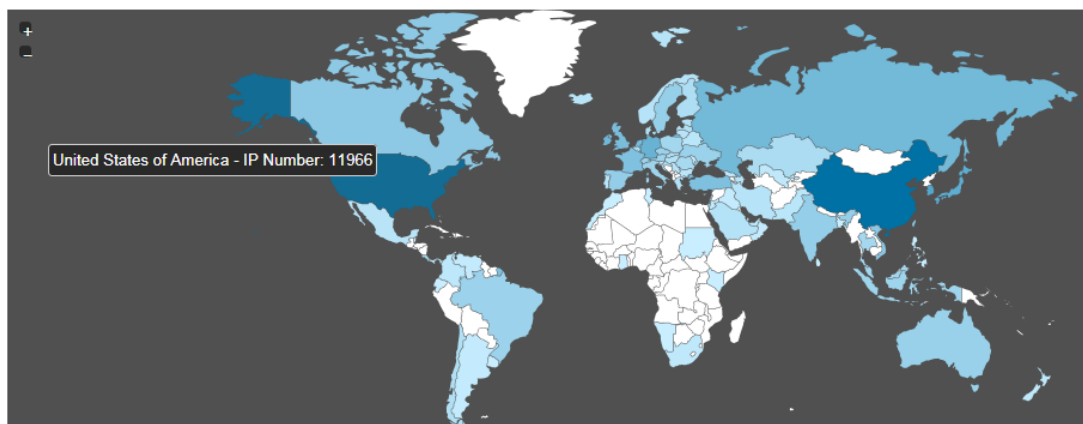


Figure 4 IP Distribution Map

Top 20 Used Permissions

The following chart shows top 20 used permissions in all the analyzed Android applications.

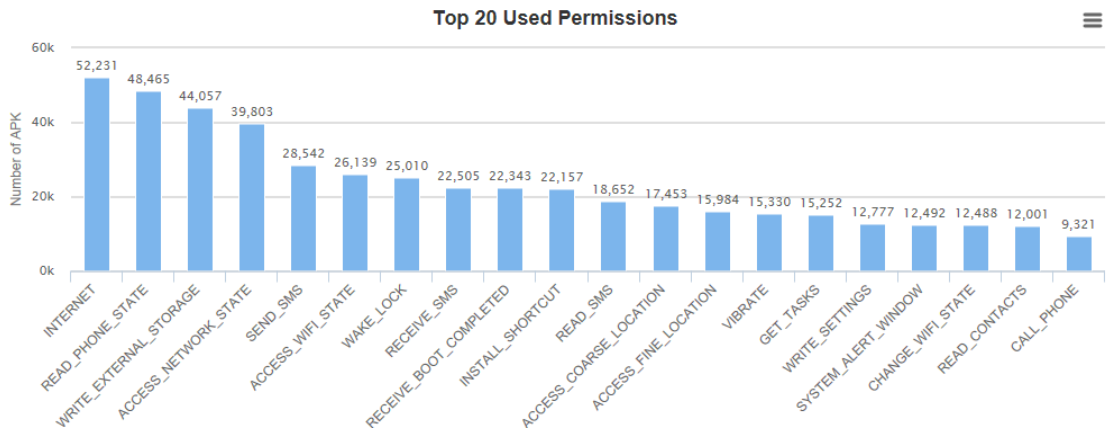


Figure 5 Top 20 Used Permissions

Top 20 Malware Families

The following chart shows top 20 malware families in all the analyzed Android applications.

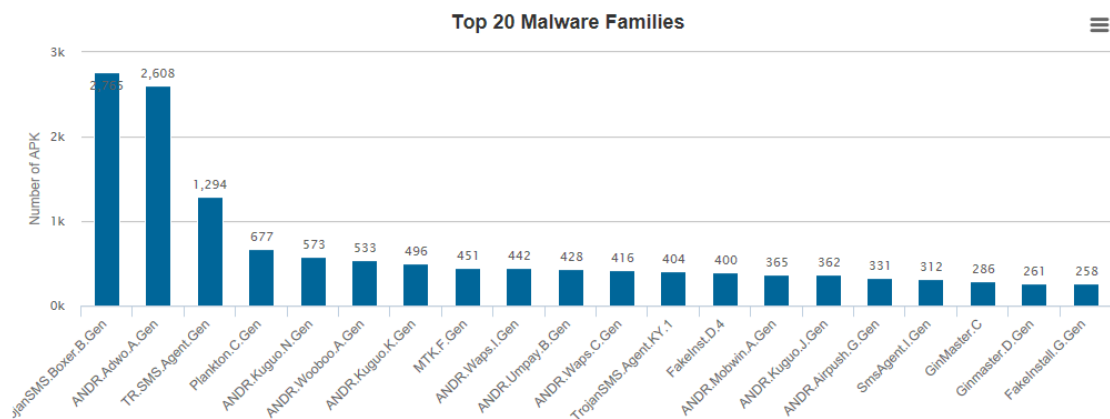


Figure 6 Top 20 Malware Families

Top 20 Advertisement Module Used

The following chart shows top 20 advertisement modules used in all the analyzed Android applications.

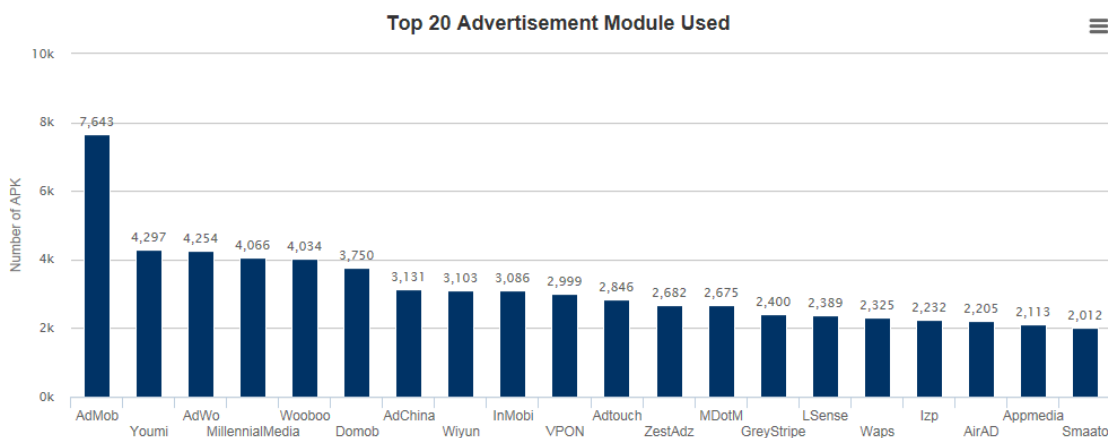


Figure 7 Top 20 Advertisement Module Used

Upload Page

You can upload an apk or a zip file on the *Upload* page and the file size limits to 50MB.

Detail Report

As shown in Figure 3, you can click the detail icon to see the detail analysis report.

General Information

The icon on the right is the Android application's icon. You can download the pcap file and log file captured during dynamic analysis.

General Information

Analysis Start Time	2015-01-30 12:51:54
Analysis End Time	2015-01-30 12:54:33
File MD5	6B9009273475014F3EC21107B0036939
File Size	12.97 MB
File Name	movietube.apk
Package Name	com.movie.tubecc432
Version Code	440
Version Name	4.4.0
Min SDK	7
Target SDK	19
Max SDK	N/A
Pcap File	Download
Logcat File	Download



Click to download the pcap file

Click to download the log file

Figure 8 General Information

Risk Score

The risk score, between 0 and 100, represents the risk level. The higher the score is, the riskier the Android application is.

Risk Score



Figure 9 Risk Score

Risky Behaviors

As shown in Figure 10, Risky Behaviors table displays the suspicious embedded in this Android application.

Risky Behaviors

Encrypt or Decrypt data
Executes a Internet request
Exist unused permissions
Gets geographic location
Gets the alphabetic name of current registered operator

Figure 10 Risky Behaviors

Malware Detected by VirusTotal

The malware detection results are based on the VirusTotal.

Malware Detected by VirusTotal

AVG	✔
Ad-Aware	Android.Adware.Youmi.A
AntiVir	Adware/ANDR.Youmi.A.Gen
Baidu-International	✔

Figure 11 Malware Detected by VirusTotal

Certificate

The certification content is extracted from the META-INF/*.RSA of the Android application.

Certificate

Content	Owner: CN=YiKui, OU=K.U.I, O=K.U.I, L=ShenZhen, ST=GuangZhou, C=86 Issuer: CN=YiKui, OU=K.U.I, O=K.U.I, L=ShenZhen, ST=GuangZhou, C=86 Serial number: 4d6a5cef Valid from: Sun Feb 27 22:17:19 CST 2011 until: Mon Feb 14 22:17:19 CST 2061 Certificate fingerprints: MD5: F9:03:49:79:FE:8E:7F:8F:B5:6B:29:7B:8A:9A:8C:FB SHA1: 67:C8:F0:38:46:E1:79:13:A2:3C:D0:FA:64:1D:FB:9F:3D:4B:E5:CD SHA256: A8:87:A8:A8:2E:76:9C:06:24:C5:82:40:53:62:D5:D6:85:B3:CB:DB:18:39:84:F8:72:38:0C:AF:A9:FD:83:1B Signature algorithm name: SHA1withRSA Version: 3
Sha1	67C8F03846E17913A23CD0FA641DFB9F3D4BE5CD

Figure 12 Certificate

Classification

Classify this Android application based on permissions using ID3, NaiveBayes, Decision Table, J48 algorithms respectively and calculate the probability that which category the Android application belongs to.

Classification

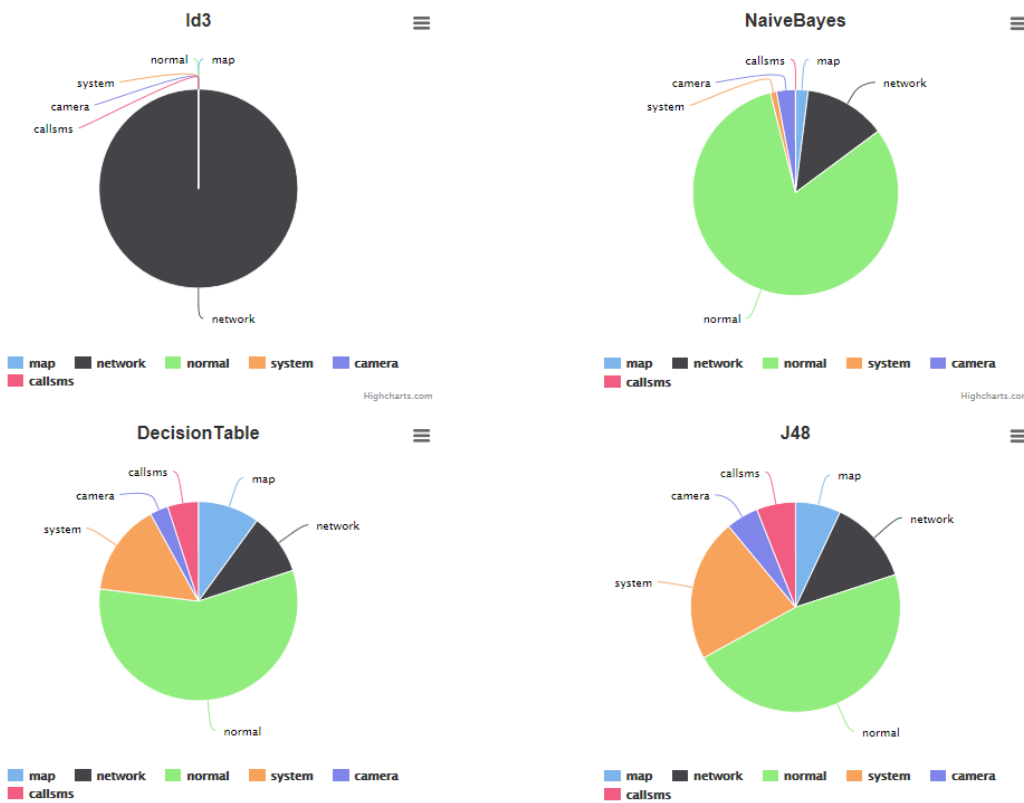


Figure 13 Classification

Code Features

As shown in Figure 14, Code Features table shows whether the Android application utilizes techniques including Native Code, Dynamic Loader, Java Reflection and Crypto.

Code Features

Code Feature	Used
Native Code	✓
Dynamic Loader	✗
Java Reflection	✓
Crypto	✓

Figure 14 Code Features

Permissions

Display the permissions declared in the *AndroidManifest.xml*.

Permissions

Permission Name	Protection Level	Threat Level	Customized	Duplicated	Used	Description
android.permission.ACCESS_COARSE_LOCATION	dangerous		✗	✗	✓	Allows an app to access approximate location derived from network location sources such as cell towers and Wi-Fi.
android.permission.ACCESS_NETWORK_STATE	normal		✗	✗	✓	Allows applications to access information about networks
android.permission.INTERNET	dangerous		✗	✗	✓	Used for permissions that provide access to networking services. The or other related network operations. Allows applications to open network sockets.

Figure 15 Permissions

Components

Display the components declared in the Android application.

Activities

Name	Main Activity	Exposed
com.kui.fruitpuzzle.FruitPuzzleActivity • android.intent.action.MAIN	✔	✘
net.youmi.android.AdActivity	⊕	⊕

Services

N/A

Broadcast Receivers

Name	Dynamically Registered	Exposed
net.youmi.android.em	✘	⊕

Content Providers

N/A

Figure 16 Components

Features

Display the features declared in the *AndroidManifest.xml*.

Features

- android.hardware.sensor.accelerometer
- android.hardware.touchscreen

Figure 17 Features

Libraries

Display the libraries declared in the *AndroidManifest.xml*.

Libraries

N/A

Figure 18 Libraries

Advertisement Modules

Display the advertisement modules used in this Android application.

Advertisement Modules

- [AdColony](#)
- [AdMob](#)
- [Chartboost](#)
- [Domob](#)
- [Flurry](#)
- [HeyZap](#)
- [InMobi](#)
- [JumpTap](#)
- [MillennialMedia](#)
- [Mobclick](#)

Figure 19 Advertisement Modules

IP Distribution

The geographical distribution of the ip addresses extracted from the Android application.

IP Distribution

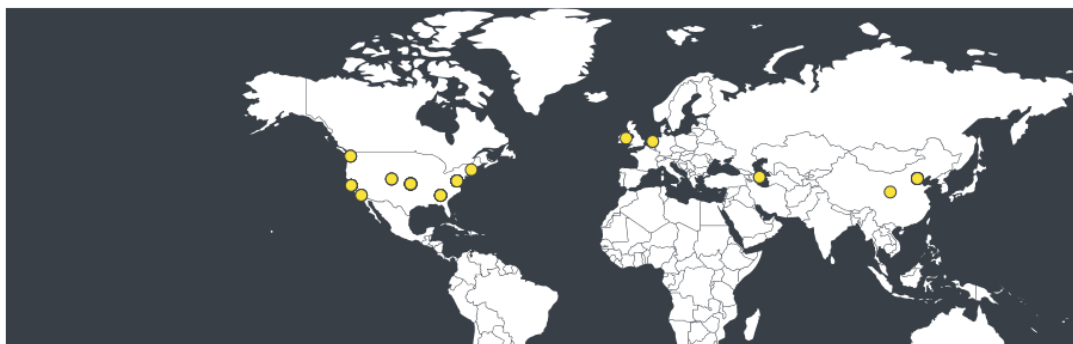


Figure 20 IP Distribution

Urls

Display urls embedded in this Android applicaton and corresponding country name and ip address.

Urls

Country	Uri	IP
Azerbaijan	https://www.facebook.com/dialog/feed?app_id=181821551957328&link=	37.61.54.158
Azerbaijan	http://twitter.com/home?status=	37.61.54.158
China	http://e.admob.com/imp?ad_loc=@gw_adlocid@&qdata=@gw_qdata@&ad_network_id=@gw_adnetid@&js=@gw_sdkver@&session_id=@gw_sessid@&seq_num=@gw_seqnum@&nr=@gw_adnetrefresh@&adt=@gw_adt@&aec=@gw_aec@	203.208.37.13

Figure 21 Urls

Sensitive Files

Display the sensitive files in this Android application.

Sensitive Files

File Path	File Type	APK
assets/cha.so	zip archive data, at least v2.0 to extract	☑
assets/com.so	zip archive data, at least v2.0 to extract	☑

Figure 22 Sensitive Files

Native Codes

Display the information about calling native codes, such as library name, caller code, etc.

Native Codes

Lib Name	Caller Code	Path Index
N/A	Lcom/unity3d/player/UnityPlayer;->loadLibrary(Ljava/lang/String;)Z	4
mono	Lcom/unity3d/player/UnityPlayer;->j()V	4
unity	Lcom/unity3d/player/UnityPlayer;->j()V	64

Figure 23 Native Codes

Dynamic Loaders

Display the information about dynamic loaders in this Android application.

Dynamic Loaders

Dex Path	Lib Path	Caller Code	Path Index
/data/app/com.cgs_multibility.games.supremeRacers-1.apk	N/A	N/A	N/A
0	0	Lcom/android/b/b;->b(Landroid/content/Context;)Ldalvik/system/DexClassLoader;	156

Figure 24 Dynamic Loaders

Crypto Operation

Display the information about crypto behavior in this Android application including algorithm used, plain text, cipher text, etc.

Crypto Operation

Operation	Algorithm	Key Encoded	Key Format	Plain Text	Cipher Text
encryption	AES/CBC /PKCS5Paddin g	33303231323130326469637564696162	RAW	357242043237511=37474F67E 82E692AA949C9BAA90D2A9D	\xe1\xe7\xe8\x7e3\xe96 \xc9\xee\xbd\x91q\xcf \xdbZ\x17\xb1'\$\xb4%v \xe5\xb9>\xf1IP\x09\x03\xf1" \xba\xdb\xf2N\x7f\x8e-\x98 \x9e\x12\x92\x8bW\x08\x1c \x91\xe9\x96O\xec\x03`D \xf0\x1b0\xbbH\x14L_

Figure 25 Crypto Operation

Socket Connections

Display the socket connection information including remote address and remote port.

Socket Connections

Remote Address	Remote Port
claco.kicks-ass.net	9999
claco.kicks-ass.net	2641
claco.kicks-ass.net	9999
claco.kicks-ass.net	2965

Figure 26 Socket Connections

File Operations

Display the information about file operations during dynamic analysis.

File Operations

Operation	File Path	Data
write	/data/data/installer.com.rockstar.gta3/shared_prefs/PREFERENCE.xml	<?xml version="1.0" encoding="utf-8" standalone="yes" ?>\x0a<map>\x0a<boolean name="isFirstRun" value="fal

Figure 27 File Operations

DNS Query

Display DNS query information during dynamic analysis, such as QName, QType and ip addresses.

DNS Query

QName	QType	IPs
ads.net2share.com	A	216.158.77.154, 104.237.51.202
s.net2share.com	A	78.46.100.240

Figure 28 DNS Query

HTTP Data

Display information about HTTP Data generated during dynamic analysis.

HTTP Data

Method	Host	Path	Status Line
GET	ads.net2share.com	/config/1.0/ad.json?app=cw	HTTP/1.1 200 OK
GET	ads.net2share.com	/temporary_api/1.0/ad.json?type=app&incent=true	HTTP/1.1 200 OK
POST	s.net2share.com:8888	/beacon	HTTP/1.1 200 OK

Figure 29 HTTP Data

Files Recovered From Http

Display information about files recovered from http traffic produced during dynamic analysis.

Files Recovered From Http

Domain	File Name	File Type	Is APK
japp.apkshare.com	_api_i_php_cid_004003index.html	ASCII text, with very long lines, with no line terminators	⊗

Figure 30 Files Recovered From Http

Execute Shells

Display the shell commands executed by this Android application.

Execute Shells

- /system/bin/getprop
- /system/bin/getprop
- /system/bin/getprop

Figure 31 Execute Shells

Started Services

Display the information of started services.

Started Services

- Intent { act=com.google.app.DebugService.hfquewffhwuf83hasdf.ACTION_START cmp=installer.com.rockstar.gta3/com.adeco.adsdk.app.DebugService (has extras) }
- Intent { act=com.google.app.DebugService.hfquewffhwuf83hasdf.ACTION_START cmp=installer.com.rockstar.gta3/com.adeco.adsdk.app.DebugService (has extras) }

Figure 32 Started Services

May Send SMS

Extract SMS sending information through static analysis.

May Send SMS

Destination Number	Message Body	Caller Code	Path Index
N/A	N/A	Lcom/zplay/android/mm/d/a->a(Landroid/app/Activity; Ljava/lang/String; Ljava/lang/String; Lcom/zplay/android/mm/d/g;)V	260
N/A	N/A	Lcom/zplay/android/mm/model/SmsMng->a(J Ljava/lang/String; Ljava/lang/String;)V	108

Figure 33 May Send SMS

Send SMS

Display SMS sent information based on dynamic analysis.

Send SMS

Destination Number	Message Body
+79856842806	GNIM2A9pwtTVZ0t657sBKNYLkZuOo66U+p96D1f8utV3tK14sxGP04psFcDryKZ+p+6zhc8+p+FxkOso9ZS7lc0YIhDf7bEe krtGNbmO0ILj0W0/1xHaQg48daCreIa+p96j5e8OI+V2BKzIppA6NI+JgBTeCRFawgtC8orL8nCClex9RvCjNm5pPTuHleO 1i6SFY6et+Vw==

Figure 34 Send SMS

Block SMS

Display the information of the sms blocking behaviors.

Block SMS

Source Number	Message Body
null	
null	
null	
null	
null	http://glam-vids-nl.com/?cla=
null	http://glam-vids-nl.com/?cla=
null	FreeMSG
null	FreeMSG

Figure 35 Block SMS

Data Leakage

Display information about data leakage during dynamic analysis.

Data Leakage

Leak Type	Tag	Leak Data	Destination
File Write	TAINT_IMEI	<?xml version='1.0' encoding='utf-8' standalone='yes' ?>\x0a<map>\x0a<long name='session_end_time' value=''	/data/data/com.brokenscreen.crackscreen /shared_prefs/umeng_general_config.xml
File Write	TAINT_IMEI	<?xml version='1.0' encoding='utf-8' standalone='yes' ?>\x0a<map>\x0a<long name='a_start_time' value='1417	/data/data/com.brokenscreen.crackscreen /shared_prefs/umeng_general_config.xml
File Write	TAINT_IMEI	\x1b\x02\xef\xbf\xbd\x0aandroid_id\x18\x10d091934bbabe6486\x16 \xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbdR\x15\x02\x00 \x04imef\x18\x0f357242043237511\x16 \xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbd\xef\xbf\xbdR\x15\x02\x00 \x19,\x18\x0aandroid_id(\x10d091934bba	/data/data/com.brokenscreen.crackscreen /files/umeng_it.cache

Figure 36 Data Leakage

Sensitive APIs

Display information about sensitive APIs.

Sensitive APIs

- **API: Landroid/telephony/TelephonyManager;->getDeviceId**
- Description: Gets the unique device ID, IMEI for GSM and MEID for ESN or ESN for CDMA phones
- Caller Code: Lcom/umeng/analytics/social/f;->b(Landroid/content/Context;)Ljava/util/Map;
- Threat Level:
- Path Index: 62
- **API: Landroid/telephony/TelephonyManager;->getDeviceId**
- Description: Gets the unique device ID, IMEI for GSM and MEID for ESN or ESN for CDMA phones
- Caller Code: Lu/aly/bi;->f(Landroid/content/Context;)Ljava/lang/String;
- Threat Level:
- Path Index: 54

Figure 37 Sensitive APIs

Permission Usage

In Android, if you want to call some special functions, you have to declare corresponding permissions in AndroidManifest.xml. As shown in Figure 38, it displays information about permission used in this apk, such as callee code correspond to permission.

Permission Usage

- **Permission Name:** android.permission.ACCESS_NETWORK_STATE
- Used Type: Api
- Caller Code: Landroid/support/v4/net/ConnectivityManagerCompat\$GingerbreadConnectivityManagerCompatImpl;->isActiveNetworkMetered(Landroid/net/ConnectivityManager;)Z
- Callee Code: Landroid/support/v4/net/ConnectivityManagerCompat\$Gingerbread;->isActiveNetworkMetered(Landroid/net/ConnectivityManager;)Z
- Path Index: 0
- **Permission Name:** android.permission.ACCESS_NETWORK_STATE
- Used Type: Api
- Caller Code: Landroid/support/v4/net/ConnectivityManagerCompat\$HoneycombMR2ConnectivityManagerCompatImpl;->isActiveNetworkMetered(Landroid/net/ConnectivityManager;)Z
- Callee Code: Landroid/support/v4/net/ConnectivityManagerCompat\$HoneycombMR2;->isActiveNetworkMetered(Landroid/net/ConnectivityManager;)Z
- Path Index: 0

Figure 38 Permission Usage

Log Message

Display the logging messages during dynamic analysis.

Log Message

Tag	Message
Ads	Starting ad request.
Ads	Use AdRequest.Builder.addTestDevice("B3EEABB8EE11C2BE770B684D95219ECB") to g
Choreographer	Skipped 78 frames! The application may be doing too much work on its main thread.
Choreographer	Skipped 309 frames! The application may be doing too much work on its main thread.

Figure 39 Log Message

May Log Message

Display the information about log message extracted via static analysis.

May Log Message

Tag	Message	Caller Code	Path Index
ActionBarDrawerToggle Honeycomb	1	Landroid/support/v4/app/ActionBarDrawerToggleHoneycomb;->setActionBar Description(Ljava/lang/Object; Landroid/app/Activity; I)Ljava/lang/Object;	78
ActionBarDrawerToggle Honeycomb	1	Landroid/support/v4/app/ActionBarDrawerToggleHoneycomb;->setActionBar UpIndicator(Ljava/lang/Object; Landroid/app/Activity; Landroid/graphics/drawable/Drawable; I)Ljava/lang/Object;	100
ActionBarDrawerToggle Honeycomb	1	Landroid/support/v4/app/ActionBarDrawerToggleHoneycomb;->setActionBar UpIndicator(Ljava/lang/Object; Landroid/app/Activity; Landroid/graphics/drawable/Drawable; I)Ljava/lang/Object;	136
ActionProvider(support)	2	Landroid/support/v4/view/ActionProvider;->setVisibilityListener (Landroid/support/v4/view/ActionProvider\$VisibilityListener;)V	82

Figure 40 May Log Message

ScreenShots

The screenshots of the Android application's running on the Android

device.

ScreenShots

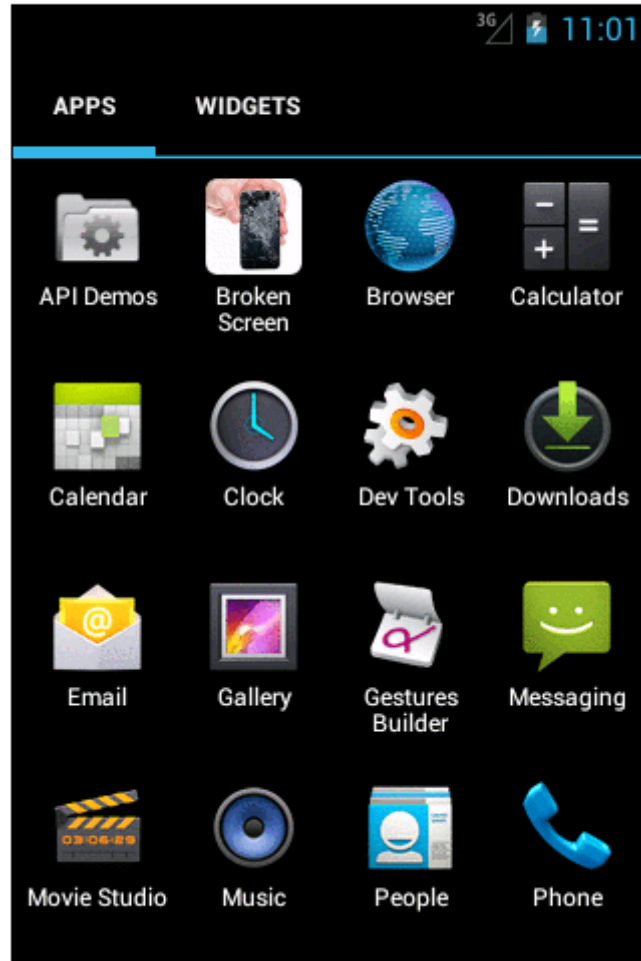


Figure 41 ScreenShots