

In this document we provide full results and data extracted by the analysis described in the paper:

***Going Native: Using a Large-Scale Analysis of Android Apps to Create a Practical Native-Code Sandboxing Policy***

SL	CB	Description
3,261	72	ioctl system call
1,929	39	Write file in the app's directory
1,814	35	Operations on sockets
1,594	5	Create network socket
1,242	144	Terminate process or thread group
1,203	0	Read file from sdcard
1,046	31	Create unix socket
895	11	Delete file in the app's directory
744	10	List files
710	0	Write to file on the sdcard
300	0	Timer and time related system calls
280	0	ptrace system call
221	0	Delete file from the sdcard
207	89	Change file permissions
198	0	Remove directory
183	3	kill or tkill system calls
138	0	Rename file
133	1	Create netlink socket
111	67	wait4 system call
105	111	Execute standard binary
95	11	Read file under "/proc/"
71	6	System calls related to inotify
29	1	Read file from a directory other than the app's directory and the sdcard
24	0	mknod system call
20	0	Change file ownership
5	0	usr26 system call
3	0	Delete file from "/tmp/"
3	1	restart_syscall system call
2	0	eventfd2 system call
2	146	Execute custom binary
2	0	Operations on the alarm device
2	5	Create symbolic link
1	5	Set uid or gid
1	0	iprio_set system call
1	0	perf_event_open
1	0	link system call

Table 1: Actions performed by apps in native code, through shared libraries (SL) and custom binaries (CB). This is the full version of Table 5 of the main paper.

Apps	Permission	Description
1,818	INTERNET	Open network socket or call method <code>java.net.URL.openConnection</code>
1,211	WRITE_EXTERNAL_STORAGE	Write files to the sdcard
1,211	READ_EXTERNAL_STORAGE	Read files from the sdcard
132	READ_PHONE_STATE	Call methods <code>getSubscriberId</code> , <code>getDeviceSoftwareVersion</code> , <code>getSimSerialNumber</code> or <code>getDeviceId</code> from class <code>android.telephony.TelephonyManager</code> or Binder transaction to call <code>com.android.internal.telephony.IPhoneSubInfo.getDeviceId</code>
79	ACCESS_NETWORK_STATE	Call method <code>android.net.ConnectivityManager.getNetworkInfo</code>
22	ACCESS_WIFI_STATE	Call methods <code>isWifiEnabled</code> or <code>getConnectionInfo</code> from class <code>android.net.wifi.WifiManager</code>
5	GET_ACCOUNTS	Call method <code>android.accounts.AccountManager.getAccountsByType</code>
5	ACCESS_FINE_LOCATION	Call method <code>android.location.LocationManager.getLastKnownLocation</code>
5	ACCESS_COARSE_LOCATION	Call method <code>android.location.LocationManager.getLastKnownLocation</code>
1	WRITE_SETTINGS	Call method <code>android.provider.Settings\$System.putString</code>
1	WAKE_LOCK	Call methods <code>stop</code> , <code>start</code> or <code>reset</code> from class <code>android.media.MediaPlayer</code>
1	CHANGE_WIFI_STATE	Call method <code>android.net.wifi.WifiManager.setWifiEnabled</code>

Table 2: The number of apps that performed actions in native code that need some Android permission. This is the full version of Table 7 of the main paper.

Does not Mention Root	Does Mention Root	Description
12	10	Custom executable (e.g., su -c sh /data/data/com.test.etd062.ct/files/occt.sh)
1	13	Reboot
2	12	Read system information
1	8	Change permission of file in app's directory
1	7	Remove file in app's directory
1	4	List files
0	3	Remount "/system"
0	2	Create directory in app's directory
1	0	Write file in the sdcard
0	1	Change network configuration
0	1	Stop app using am
0	1	Start service using am
0	1	Write file in "/system/" or "/sys/"
0	1	Change ownership of file to "root"
0	1	Opens sqlite database
0	1	Kill process
0	1	Write file in app's directory
0	1	Read system property
0	1	List running processes
0	1	Read file

Table 3: Types of command passed with the “-c” argument to `su`, separated between the apps that mention they need root privileges in their description or name and the ones that do not mention it. This is the full version of Table 8 of the main paper.

Apps	Description
7,423	Get path to the Android package associated with the context of the caller
6,896	Get class name
5,499	Manipulate data structures
4,082	Methods related to cryptography
3,817	Manipulate native types
3,769	Read system information
3,018	Audio related methods
2,070	Read app information
1,192	String manipulation and encoding
575	Input/output related methods
483	Reflection
417	Manipulate app's display, view, and theme
368	General operations, including UUID generation, regular expressions and manipulation of date and currency
142	Network
128	Read phone information
95	Check permission
67	Read and write system settings
51	Check debugger connected
49	Zip or Jar related methods
39	Read process information and manipulate thread
36	Exception handling
23	Wifi management
23	Graphics
22	Manipulation of shared preferences
14	Manipulate Intent
5	Get accounts
5	Obtain location
3	Message logging
3	Database
3	Bluetooth
1	XML
1	Starting a service
1	Manipulate Observable object
1	Check signature
1	GooglePlay services

Table 4: Groups of Java methods from the Android framework called from native code. This is the full version of Table 10 of the main paper.

Apps	Class
2,427	android.os.IServiceManager
740	android.media.IAudioFlinger
725	android.media.IAudioPolicyService
327	android.gui.IGraphicBufferProducer
303	android.gui.SensorServer
299	android.gui.SensorEventConnection
72	android.app.IActivityManager
60	android.hardware.display.IDisplayManager
17	android.gui.DisplayEventConnection
16	android.ui.ISurfaceComposer
16	android.os.IVibratorService
16	android.media.IAudioService
16	android.hardware.input.IInputManager
12	android.content.pm.IPackageManager
10	android.media.IMediaPlayer
9	android.media.IMediaPlayerService
5	android.view.IWindowManager
3	com.android.internal.view.IInputMethodManager
3	com.android.internal.telephony.IPhoneSubInfo
3	android.view.accessibility.IAccessibilityManager
2	android.view.IWindowSession
2	android.hardware.ICamera
1	android.os.IPowerManager
1	android.hardware.ICameraService
1	android.app.INotificationManager

Table 5: Classes of the methods invoked through Binder transactions. This is the full version of Table 11 of the main paper.