

**AMNESTY INTERNATIONAL**

Digital Forensic Analysis Services Report

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# 1. Executive Summary

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## 1.1 Background

On July 10, 2017, Amnesty International requested that SecureWorks conduct forensic analysis of a Samsung Galaxy Note II. Amnesty International wished to know if an application by the name of "Bylock" had been installed on the device.

On August 3, 2017 SecureWorks acquired an image of the device at Amnesty International's premises on Easton Street, London, UK.

Contemporaneous notes, made at the time of acquisition, and analysis notes pertaining to this report are maintained and kept by SecureWorks and can be produced upon request by a relevant authority.

## 1.2 Objectives

Amnesty International and SecureWorks personnel established the following engagement objectives:

- 1) Determine whether the application named "bylock" was or had ever been installed on the device.

## 1.3 Findings

As a result of analysis conducted on the image of the device, SecureWorks concludes that there is no evidence that the bylock application was ever installed on the device.

It should be noted that SecureWorks can only comment on the data that was available at the time of acquisition and using the extraction methods available at the time of analysis.

Details on the process used to come to this conclusion can be found in section 2.

## 2. Analysis Details

### 2.1 Technical Findings for Samsung Galaxy Note II

This section contains the technical findings of the investigation related to the Samsung Galaxy Note II.

IMEI	Attributes
353627055929742	Model: GT-N7100 Galaxy Note II
	Vendor: Samsung GSM
	Version: 6.2.1.17
	Internal Build: 4.6.1.17



Figure 1 – Front view of the device



Figure 2 – Internal back view with battery removed



Figure 3 – Manufacturer label in battery compartment

### 2.1.1 Acquisition Details

Cellebrite's UFED4PC software was used to carry out an acquisition of the device only. No SIM card or External storage was provided. The following details describe the method used.

UED4PC Version 6.3.5.2

Extraction Type: Physical – Android ADB

Connection Type: Cable No. 100

Extraction started: 2017-08-03 09:07:35 UTC

Extraction completed: 2017-08-03 09:44:15 UTC

## 2.1.2 Binary Image

The UFED4PC produced a binary image file with the following attributes:

Image File Name	Attributes
blk0_mmcbk0.bin	Size (in bytes): 15758000128 MD5: 00c9c0b8b03c42e2d6f2996c4fc02a92 SHA1: c519c9ee28d613e029904974cfe61bd0bd9276e2

This binary image file was analysed as detailed in the following sections.

## 2.1.3 Evidence of Installed Applications

There are several files and locations within the internal storage of an Android device that can provide evidence that an application was installed or used. During the examination of the aforementioned device, the following locations were examined for such evidence.

- USERDATA (ExtX)/Root/data/Application Folders
- USERDATA (ExtX)/Root/dalvik-cache/\*.dex files
- USERDATA (ExtX)/Root/system/packages.xml
- USERDATA (ExtX)/Root/system/packages.list
- USERDATA (ExtX)/Root/system/netpolicy.xml
- USERDATA (ExtX)/Root/system/usagestats/usage-20170704
- USERDATA (ExtX)/Root/system/usagestats/usage-20170705
- USERDATA (ExtX)/Root/system/usagestats/usage-20170709
- USERDATA (ExtX)/Root/system/usagestats/usage-20170802
- USERDATA (ExtX)/Root/system/usagestats/usage-20170803
- USERDATA (ExtX)/Root/system/usagestats/usage-history.xml
- USERDATA (ExtX)/Root/system/usagestats/usage-20170802.bak (deleted)
- USERDATA (ExtX)/Root/system/usagestats/usage-history.xml.bak (deleted)
- USERDATA (ExtX)/Root/system/batterystats.bin
- USERDATA (ExtX)/Root/data/com.sec.android.app.launcher/databases/launcher.db
- USERDATA (ExtX)/Root/data/com.android.providers.downloads/databases/downloads.db
- USERDATA (ExtX)/Root/system/dmappmgr.db

The following sections present our findings for each of the above locations.



## 2.1.4 Testing

To confirm that relevant artefacts would be found in the above locations, had the bylock application ever been installed on such a device, a copy of the bylock application was obtained and installed on a similar device. This is henceforth referred to as the "test device".

Both devices were examined using the same tools and techniques for evidence of application artefacts.

## 2.1.5 USERDATA (ExtX)/Root/data/Application Folders

This directory is typically where application data is stored on an Android device. For each application installed a directory is created here, named with the application name.

On the test device, as a result of the installation, a folder was created here with the name "net.client.by.lock", as seen in Figure 4

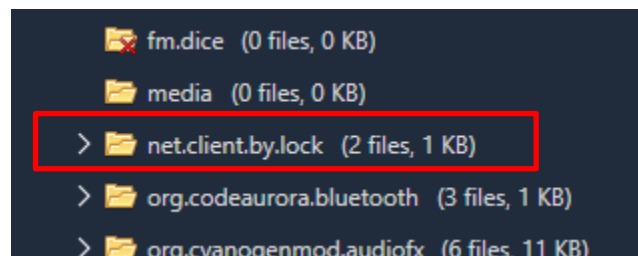


Figure 4- bylock folder shown on test device

No such directory was identified on the subject device.

To verify this finding, we examined the binary image produced via UFED4PC using a standard digital forensics tool called "X-Ways Forensics". The details of this tool are:

Software Name: X-Ways Forensics

Software Vendor: X-Ways Software Technology AG

Software Version: 19.0

Manual inspection using this tool revealed no indication of a folder named "net.client.by.lock" on the subject device.

## 2.1.6 USERDATA (ExtX)/Root/dalvik-cache/\*.dex files

The Dalvik cache is an area within an Android device that contains .dex files which are compiled Android application code files. Traces of applications can be found in the .dex files. If an application was installed and then deleted, traces may reside in this location.

On the test device, a file existed here called "USERDATA (ExtX)/Root/dalvik-cache/profiles/net.client.by.lock" as seen in Figure 5

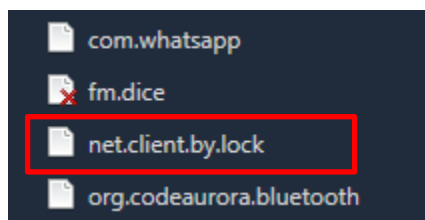


Figure 5 - bylock file in Dalvik cache of test device

The Dalvik cache within the subject device was reviewed and no such file was found. This finding was verified via the X-ways Forensics tool.

## 2.1.7 Database File examination

The following SQLite databases were examined for evidence of application usage associated with the bylock app. Each database was manually extracted from the image, and examined with an SQLite Database viewer called "DB Browser for SQLite".

### 2.1.7.1 Launcher.db

Entries related to application usage were identified in a table named "App Order". No reference to the application name "net.client.by.lock" was identified.

### 2.1.7.2 Downloads.db

Entries related to application usage were identified in a table named "downloads". No reference to "net.client.by.lock" was identified.

### 2.1.7.3 Dmappmgr.db

Entries related to application usage were identified in a table named "ApplicationControl". No reference to "net.client.by.lock" was identified.

## 2.1.8 "Packages" Files

Both the Packages.list and Packages.xml files contain details about applications installed. These files were extracted from the binary image and manually examined for any information related to the bylock application.

No such data was found.

### 2.1.9 Usage Files

Usage files contain statistics about the usage of applications on an Android device, such as the amount of time that the application was active.

These files were extracted from both devices and manually examined for usage statistics related to the bylock application.

Conducting a search across the usage files from the test device produced positive results as seen in Figures 6 and 7

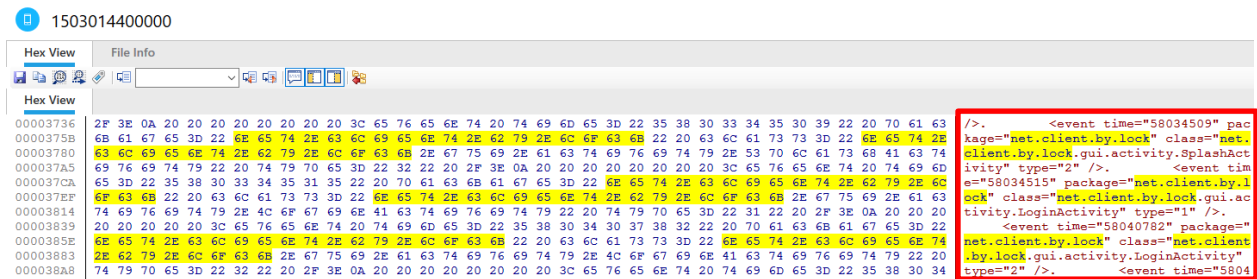


Figure 6 - Positive results in usage stats files from test device



Figure 7 - Close view of results from usage stats file from test device

No such statistics were found on the subject device.

### 2.1.10 Batterystats.bin

The Batterystats.bin file maintains statistics on battery consumed by individual applications.

Examining this file on the test device produced positive results as seen in Figures 8 and 9:

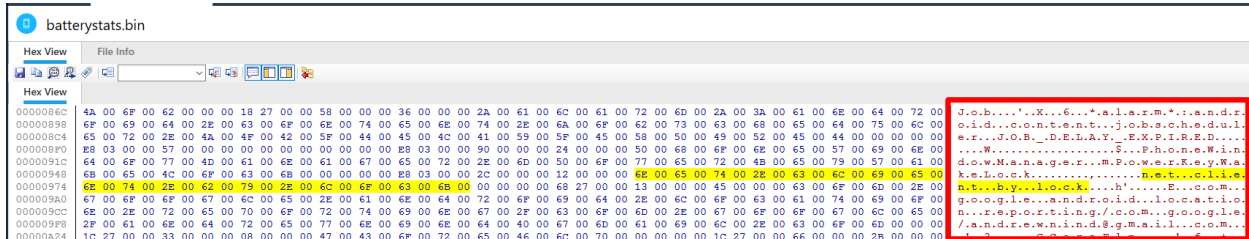


Figure 8 - Positive results in batterystats.bin from test device

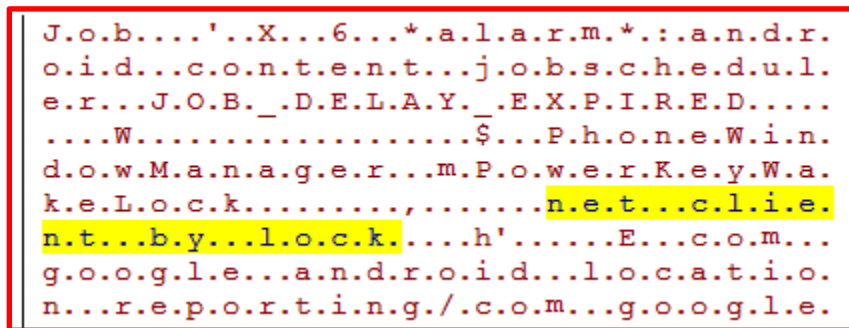


Figure 9 - close view of results in batterystats.bin from test device

No statistics relating to the bylock app were found on the subject device.

### 2.1.11 Deletion of the application on the test device

The application was uninstalled from the test device and re-examined for artefacts.

Whilst the application folder was deleted after uninstallation, both Cellebrite and X-ways still present the folder marking it as deleted.

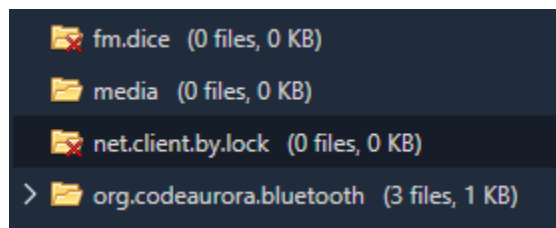
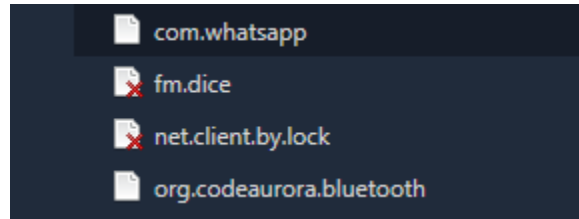


Figure 10 - application folder showing as deleted by cellebrite

Similarly, review of the Dalvik cache, shows that the file is still presented by Cellebrite and X-ways marking it as deleted.



**Figure 11 - dalvik cache file showing as deleted by Cellebrite**

After uninstalling the bylock application from the test device, a keyword search for the term "net.client.by.lock" returned 550 results. Conducting the same keyword search on the subject device returns no results. A partial view of these results can be seen in Figures 12 and 13.

Search [550 results]				
Find: net.client.by.lock				
#	Offset	Length	Value	Source
14	0x12178126C	0x24	net.client.by.lock	/Root/system/batterystats-checkin.bin
15	0x12178209C	0x24	net.client.by.lock	/Root/system/batterystats-checkin.bin
16	0x1217B18EC	0x24	net.client.by.lock	/Root/system/batterystats-checkin.bin
17	0x1217B1944	0x24	net.client.by.lock	/Root/system/batterystats-checkin.bin
18	0x1217B1978	0x24	net.client.by.lock	/Root/system/batterystats-checkin.bin
19	0x12388C2BE	0x12	net.client.by.lock	
20	0x12388C2E6	0x12	net.client.by.lock	
21	0x12388C319	0x12	net.client.by.lock	
22	0x12394229C	0x24	net.client.by.lock	/Root/system/procstats/state-2017-08-20-03-49-34.bin
23	0x12394B740	0x24	net.client.by.lock	/Root/system/procstats/state-2017-08-20-03-49-34.bin
24	0x125F4E86C	0x12	net.client.by.lock	

**Figure 12 - keyword search results for test device**

Search [0 results]				
Find: net.client.by.lock				
#	Offset	Length	Value	Source

**Figure 13 - keyword search results for subject device**

## Appendix A: Points of Contact

### A.1 Client Contacts

Client Contacts	
Company Name	Amnesty International
Company Address	1 Easton Street WC1X 0DW London
Company Contact Name	Chris Cole
Contact Title	Information Security and Networks Officer
Contact Telephone Number	0203 036 5055
Contact Email Address	chris.cole@amnesty.org

### A.2 SecureWorks Contacts

SecureWorks Contacts	
Primary Consultant Name	Andrew Nind
Primary Consultant Title	Incident Response Consultant
Primary Consultant Telephone Number	+44 7834 806 621
Primary Consultant Email Address	<a href="mailto:anind@secureworks.com">anind@secureworks.com</a>

## Appendix B: Report Control Activity

### B.1 Report Revision and Review History

Date	Version	Description	Author
2017-08-16	0.1	Initial Draft	A Nind
2017-08-18	0.2	Draft Reviewed	J Thoburn
2017-08-21	0.3	Updated Draft	A Nind
2017-08-21	0.4	Draft Reviewed	A Papadopoulos
2017-08-21	0.5	Updated Draft	A Nind
2017-08-22	1.0	Interim Version Released	A Nind
YYYY-MM-DD	1.1	Interim Version Updated	
YYYY-MM-DD	2.0	Final Version Released	

### B.2 Report Distribution History

Date	Version	Description	Sender	Recipients
2017-08-22	1.0	Sent interim version via encrypted email	A Nind	Chris Cole, Amnesty International
YYYY-MM-DD	2.0	Sent final version via encrypted email	SCWX-Team-Member	<POC-Name-1>, <POC-Organization-1> <POC-Name-2>, <POC-Organization-2>