



本署行動通信裝置鑑識（手機取證）業務現況及發展

吳炳標

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壹、前言

檢警調等機關運用行動通信裝置鑑識（「手機」取證）之辦案方法查緝毒品犯罪，已有一段時日（約自智慧型手機於我國市佔率、持用率大幅超越傳統 2G 手機

之民國 100 年間起），而智慧型手機持用人大量、全面使用「即時通訊『APP』」（即「應用軟體」，我國最多人用的即時通訊 APP，如 LINE、WeCHAT）來取代原本撥打電話以進行人際之通訊聯繫，也不過是近 5、6 年間之事，這當然要拜智慧型手

1. 本文作者為本署檢察事務官。



機之功能如光速般快速進步所賜，因此，傳統調取電話通聯紀錄進行通訊監察（監聽）之辦案方法，對越來越多不再「打電話」之智慧型手機持用人而言，顯然已無用武之地（無法取得任何情資）；加以即時通訊 APP 係利用行動網路傳遞訊息，目前尚無先進技術得以對持用人使用即時通訊 APP 之過程進行「掛線監聽」，而記錄持用人一言一行、一舉一動之智慧型手機中，理當有持用人實施犯行之相關紀錄或軌跡，因此，越來越多之案例，檢警調會透過正當搜索扣押程序，扣得嫌疑人之智慧型手機，並利用合法取證工具，對手機內容進行取證。

貳、辦理業務緣起

本署對持續追求有效取得並掌握毒品犯罪之證據以利刑事追訴、處罰之最佳途徑，一向不遺餘力。按本署檢察官位處首善要津之檢察機關，職司大臺北都會地區之犯罪偵查主體，深知現今行動通訊科技所提供之服務種類及技術水準逐年提高，「行動通信裝置」（以一般人持用之智慧型手機為代表）已成為個人工作、生活中不可或缺之聯繫工具，並充分瞭解現今最大的時代變革，莫過於多數人已改用「即時通訊 APP」彼此溝通、聯絡，撥打電話

之方式雖未至全面淘汰，卻已不再是常用之通信媒介。緣本署緝毒專組檢察官過往向來是督導「緝毒資料庫」大量收集通聯紀錄、分析人際脈絡，供警調、海巡、憲兵等辦案夥伴（友軍）實施通訊監察（掛線監聽），然這樣的辦案模式榮景不再，目前之偵查能量亦無法依循過往方式，直接「監聽」人手一機上看不見、摸不著、無線傳輸之即時通訊。

換言之，檢察官已意識到「行動通信裝置鑑識」（手機取證）逐漸成為打擊毒品犯罪的一種可行、必要之偵查方法。回顧過往，本署檢察官有取證之需要時，均將扣案之手機交由內政部警政署刑事警察局（科技犯罪防制中心），或法務部調查局（資通安全處轄下之鑑識實驗室）、臺北市警察局或新北市警察局刑事警察大隊（資訊室或科技偵查組）執行。據了解，警察部門在 100 年間就以其資訊業務經費購置手機取證器材（實體機器），調查局則於 96 年間「鑑識實驗室」正式掛牌運作數年後，開始購置手機取證設備（實體機器）。隨著智慧型手機軟體功能快速進步發展，手機廠商、品牌、款式相互爭鳴（蘋果之 iPhone、安卓之 Android 兩大作業系統陣營對壘之情勢逐漸明朗）以及大陸地區智能手機在市場崛起等因素之影響，實

體機器的「硬件實力」已不敷所需，同時，手機取證工具作為一項駭客工具，勢需定期更新，以期逐步追趕手機及 APP 突飛猛進之升級幅度，換言之，可得支援取證之機種、款式越多，該工具將更具辦案價值。

參、手機取證簡介

本署推展手機取證之執行對象，即所謂「行動通信裝置」，包括行動電話（手機）、平板電腦及相關之 SIM 卡、記憶卡（例如：插入行車紀錄器、監視錄影設備、無人機者均屬之）、搭配手機使用之 GPS 裝置及隨身碟等，核心工作則係對「行動通信裝置」進行數位鑑識，簡言之，是要將「行動通信裝置」內之電磁紀錄、數位內容，儘可能完整地加以擷取、備份、檢閱，俾利查得有效之情資做為證據。因手機取證只是各類「數位鑑識」工作之其中一種，以下敘述將只專注於「手機取證」部分之介紹。

肆、業務內容 — 手機取證對犯罪偵查之助益

按本署轄區設籍者稠密、活動者繁多，若調轄內約有 9 成以上之人常態性使用智慧型手機，並不為過，也可以說，時代的演變，反映在人們高度依賴智慧型手機之使用習慣上，最為明顯。所以，辦案

人員此刻即需有高度警覺，使用智慧型手機作為遂行詐欺、貪污、洗錢、毒品交易、人口販運等犯罪活動媒介之情形，可以想見也將日益增加。

犯罪偵查中一般所稱之「手機取證」，其實是相當廣泛之行動通信裝置鑑識工作的一環，主要目的是以刑事訴訟法所要求證據之取得、證據能力，乃至證據鏈之連結的規格，將檢察官於偵查中指揮司法警察（官）以標準作業程序執行搜索、扣押而得之行動通信裝置（例如手機），透過專業鑑識工具之運作，將該等裝置內所有資訊予以備份後，從中搜尋、挑選相關之各類情資（電磁紀錄），以期作為認定犯罪事實之證據。

按行動通信裝置（智慧型手機）內之各類資訊與持用人之日常活動息息相關，包括通訊錄（contacts）、通聯資料（call logs，撥出、接收、未接來電）、文字簡訊（SMS）、多媒體訊息（MMS）、GPS 地址（GPS locations）、電子郵件（e-mail）、瀏覽紀錄（browser history）、安裝之 APP（application files）、聲音（audios）、圖像（images）、影片（videos）等，以上電磁紀錄、數位內容若能有系統加以整理出來，想必能有助於辦案人員釐清行動通信裝置持用人是否涉及犯罪並勾勒其犯罪軌跡。



伍、購置經費

如前所述，本署檢察官為偵查犯罪，向來均將所扣得之行動通信裝置逕送調查機關或警察機關進行取證，然而，往往需面臨排隊等候（因為警調機關也有自己之案件需要動用鑑識資源）或有洩密疑慮等問題。為有效改善上述情形，本署自民國 102 年（提報構想書）、103 年（編列總體說明書及編纂綱要計畫書）間起，透過法務部科技發展組向科技部（原行政院國科會）提報 104 年度科技發展計畫—計畫名稱為「開發建置雲端毒品智慧情資分析系統」（與本署「緝毒資料庫」業務相關）—旋獲科技部審議通過，挹注新臺幣 225 萬元，全數編入本署 104 年度預算內動用；依據該計畫，本署緝毒專組除開發、建置、維護「緝毒資料庫」，持續、大量累積持用人之行動電話門號通聯紀錄、犯罪事實等情資進行資料探勘及分析外，亦已考量到「必須針對現行智慧型手機所發展出之即時通訊 APP，其透過無線網路進行聯繫之資訊內容，難以直接匯入資料庫進行分析」此一困境之解決方案。經向警調機關資訊單位多方徵詢及觀摩，本署爰以此項科技計畫經費，透過採購程序，購得行動通信裝置鑑識工具（套裝軟體，品牌：Cellebrite，型式：UFED 4PC 及 Physical / Logical Analyzer）。

陸、市場調查

本署購置 C 牌（Cellebrite 公司出品）取證工具前，已經多方徵詢警調先進之意見及並積極參加市售取證工具廠商會參展之展會、說明會，希望從各該工具參展人之說明，認識各種工具之優劣及能耐。本署緝毒專組對運用此類工具之看法是，希望該工具完全合法，並能切合辦案機關執法需要。從 Cellebrite 公司之官方網站，可確定該公司之成立與其手機取證工具之研發，首要目標就是在協助執法機關有效率地從智慧型手機內查得足供證據之用的數位情資。市面上另有 X 牌（XRY，MSAB 公司出品）、O 牌（Oxygen 公司出品）、M 牌（Megnet 公司出品）等品牌取證工具，據警調鑑識技術人員表示，上開各種品牌各擅勝場，有在分析方面較擅長者，有在執行速度上較佳者，其中差別僅在市佔率多寡而已。未來，希望本署能有充裕經費，將以上各種品牌之工具均予購置，相信能達到各工具間功能互補之效果。

柒、手機取證工具運用

一般而言，行動通信裝置（手機）取證過程中，允許對該等裝置操作之權限越多，能擷取（extraction / acquisition）之數位內容就越完整、全面，且該等裝置因其作業系統版本及廠牌型式（在我國目前擁有市佔率之手機廠

商所採用之作業系統，可概分為 iOS 及 Android，兩方均有其擁護者）之不同，所能擷取到之資料深度、廣度亦有所不同。

以下就本署購置之行動通信裝置鑑識工具之操作及運作過程，略述如下：

一、Android 作業系統：

對該等裝置進行必要之調校後（最重要者，係喚醒「開發人員模式」，並點選 debug mode），開啟 UFED 4PC 套裝軟體，精準找出行動通信裝置之廠牌型號，程式會偵測出由淺到深不同之擷取方法，此時視需要（儘量朝全機備份之目標，常常只有唯一一種方式可選）選定後，即開始進行取證。取證完成，亦即備份檔擷取成功後，程式會總整為分門別類、層次分明之官方報告。全程所耗時間主要需視該行動通信裝置容量多寡而定。

二、iOS 作業系統：

僅適用 Apple 品牌行動通信裝置，取證方法為 advanced logical extraction。開啟 UFED Physical Analyzer 套裝軟體，依程式指示逐步操作。Apple 品牌行動通信裝置亦可使用 UFED 4PC 進行取證。

捌、本署實施現況及效益

目前行動通信裝置（手機）取證業務已投入本署各類刑事案件（不限於緝毒案件）之偵查實務工作，在所有檢察機關中，

本署係首開先例且係迄今唯一有能力自行執行取證作業之檢察署。統計自 105 年 1 月至 12 月由本署檢察事務官實施取證作業所受理之手機數量，已超過 60 支，106 年度截至 11 月中旬止，亦已超過 120 支。

主要效益，則呈現在全部過程均在署內作業，除能於最短時間內提出檢察官偵查犯罪初步所需清查之各類數位情資（俾利成為證據）外，並能同時兼顧重大、矚目或敏感案件需低調、隱密偵查之要求，大幅降低偵查行動洩密之可能性。目前本署檢察事務官室有檢察事務官專責執行取證作業，並已依考試組別（電子資訊組為主）及工作意願，組成「手機取證小組」，就檢察官於偵辦各類案件時，如認有實施該等裝置取證作業之必要，得依檢察官之指揮（如開立進行單），以輪分、抵案方式，執行取證作業。取出之全機備份資料，再由檢察官交該專案襄辦之檢察事務官勘驗，或再另行隨案交辦予襄辦檢察事務官勘驗。

另值得一提的是，本署發展手機取證業務之初衷，純係基於對未來辦案趨勢之預先規劃，趁執行科技計畫有額外經費之際，本署多方嘗試各項辦案技能之單純想法，充實本署之量能，協助檢察官掌握更多元、更全面之犯罪情資，而不用事事假手警調機關。然而，警調機關目前均有經過認證之鑑識實驗室正常運作中以及充足之資訊預算支應，本署人員之技術能力尚



無法與之匹敵；況且，本署是為辦案目的而實施手機取證，並無必要耗費心力解決技術問題，因此，未來本署人員操作手機取證工具勢必有機會經常遇到難以完整、全面取出情資之技術困境，經驗顯示，多數情形是來自於智慧型手機相關軟硬體翻新速度太快所致，倘檢察官對於署內已進行完畢之取證內容認為仍有不足時，大可再將本署無法達成之部分，交由專業之警調鑑識人員進一步依其專業技術加以克服。換言之，本署實施取證業務，從未抱持著要取代警調鑑識人員之地位，反而是在學習、吸納其多年經驗，儘可能逐步精進本署手機取證小組之技能，並且秉持「署內」、「快速」兩大目的及訴求，先行給予檢察官初步之結果，讓檢察官在最短時間內獲得初步辦案心證。

奉本署歷任檢察長指示，基於檢察一體、資源共享之理念，亦十分樂意與其他

檢察署合作，進行行動通信裝置取證作業之經驗分享、交流並提供協助。

玖、展望

未來，行動通信裝置取證工具勢將面臨使用年限屆至（前述科技計畫期間為1年）、維護更新服務將停止之問題。今（106）年承蒙士林地檢署贊助，本署業已購置取證工具新年度1年期之維護更新（期限至106年11月28日止），自得延續該等工具預期發揮之功能，107年度承蒙檢察長支持，亦已購置1年期維護更新（期限至107年11月28日止）。參考警調機關均另行編列資訊預算購買套裝軟體以維護更新服務之現狀，如認行動通信裝置（手機）取證業務有繼續執行之必要，可考慮預留相關業務經費逐年購買維護更新服務，期使該項科技利器能持續、及時、有效提供檢察官優質之辦案輔助。



107.2.8 毒品資料庫暨數位採證室



107.2.8 第三辦公室及數位採證室揭牌儀式

Current Status and Future Development of Forensic Evidence Gathering from Mobile Devices in Taipei District Prosecutors Office

Ping-piao Wu

I. Introduction

II. Background

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VIII. Current Status and Benefits of Forensic Evidence Gathering from Mobile Phones

IX. Prospects

Yangmingshan National Park/Wei-Chun Chen



I. Introduction

Law enforcement authorities (including prosecutors, police officers, and investigators) have been collecting forensic data from mobile devices to track down drug dealings and other crimes since 2011 (when the smartphone market share significantly exceeded traditional 2G handsets in Taiwan). During the past five to six years, smartphone users have communicated with each other via instant messaging apps (such as LINE and WeChat), instead of making phone calls. The rapid advancement of smartphone functionality has rendered the traditional approach of phone tapping useless. However, there is no state-of-the-art solution to monitor communication over mobile instant messaging apps on a real-time basis. That said, smartphone communication activities one should leave records of the users. Prosecutors, police officers and investigators are increasingly gaining access, through legal search and seizure procedures, to the smartphones owned by suspects in order to gather forensic evidence on these devices.

II. Background

The Taipei District Prosecutors Office continues to pursue the most effective ways of gathering forensic evidence in order to crack down on drug crimes through criminal law procedures. Our prosecutors play a pivotal role in the investigation of crimes in the Greater Taipei area. We are fully aware that mobile devices (notably smartphones) have become an integral part of work and life, as the service menus empowered by technology improve over time. One of the most significant changes up to date is that phone calls are no longer the most frequently-used communication method. Rather, instant messaging apps are the main communication platform for most people. In the past, prosecutors in the Anti-Drug Division oversaw the collection of a massive amount of communication records and used the drug tracking database to analyze the network of contacts and activities, and they assisted in the wiretapping by police officers, investigators, coast guards and military police officers. However, this is a thing of the past.

Investigation via this route no longer yields satisfactory results, as the bulk of communication over smartphones has gone to instant messaging.

In sum, prosecutors realized that forensic evidence over mobile communication devices should be a necessary and feasible method to combat drug crimes. In the past, prosecutors at the Taipei District Prosecutors Office passed seized handsets to the Criminal Investigation Bureau of the Ministry of the Interior's NPA, the Technology Crime Prevention Center of the Ministry of Justice's Investigation Bureau, the Forensics Laboratory of the Taipei City Police Department of Cyber Security, or the Information Technology Division of the New Taipei City Police Department's Criminal Investigation Corps for evidence gathering. In 2011, these police departments used the information technology budgets to purchase instruments for gathering forensic evidence on mobile devices. In 2007, after the launch of the Forensics Laboratory a few years before, the Investigation Bureau began to procure instruments for gathering forensic evidence on mobile devices. However, hardware alone is no

longer sufficient to cope with the rapid advancement of smartphone software functionality, the mushrooming of mobile phone manufacturers (amid the competition between the iPhone and Android operating systems), and the emergence of smartphones from China. Meanwhile, it is necessary to regularly update the hacking tools used to collect forensic evidence on mobile devices, in order to keep up with the upgrades in mobile phones and apps. In other words, the more models and makes a tool can support, the more valuable it is for crime investigations.

III. Forensic Evidence

Gathering on Mobile Phones

The Taipei District Prosecutors Office's efforts in evidence gathering and digital forensics from mobile communication devices covers mobile phones, tablets, SIM cards, memory cards (e.g. those for dashcams, CCTV systems, and drones), GPS devices, and memory sticks for mobile phones. The purpose is to retrieve, backup, inspect and review, as



much as possible, all the electromagnetic records and digital contents on a mobile device in order to collect useful intelligence as evidence. However, evidence gathering from mobile phones is only part of digital forensics.

IV. Benefits of Forensic Data Gathering from Handsets to Crime Investigations

Taipei is a densely populated city with vibrant activities. Approximately 90% of the people here regularly use smartphones. The heavy reliance on smartphones in daily life is a reflection of the changing times. Understandably, crime investigators should be aware that smartphones will increasingly be used for fraud, corruption, money laundry, drug dealing, and human trafficking.

Forensic evidence gathering from mobile phones is an integral part of forensics on mobile communication devices. The purpose is to acquire evidence so that the chain of evidence meets the requirements of the Code of Criminal Procedures. Prosecutors instruct judi-

ciary police officers to conduct search and seizure operations by following standard procedures. All the information on the seized mobile devices (e.g. handsets) is backed up with professional forensics tools. This is followed with a thorough screening of the intelligence on the electromagnetic records, in order to collate evidence for crimes.

Smartphones carry information that is highly relevant to the day-to-day lives of the owners. Such information includes contacts, call logs (for outbound, inbound and missed calls), text messages, MMS (multimedia messages), GPS locations, e-mails, browser histories, application files, audios, images, and videos. If all the electromagnetic records and digital contents can be systematically organized, it will assist investigators to clarify the involvement of device owners in crime and keep track of crime trails.

V. Budgets

As described above, our prosecutors typically forward the seized mobile devices to investigation agencies or police stations for evidence gathering. How-

ever, there is often a queue (because investigators and police officers must utilize forensic resources for their own cases) or concerns over confidentiality. To resolve these issues, the Taipei District Prosecutors Office developed a proposal in 2013 and produced a summary report in 2014, and forwarded the report to the Ministry of Science and Technology (previously the National Science Council of the Executive Yuan) via the Technology Development Division of the Department of Justice. Our 2015 Technology Development Plan, titled Deployment of a Smart Analytics System on the Cloud for Drug Related Intelligence is related to our drug tracking database. Our proposal was immediately passed by the Ministry of Science and Technology. The funding of NT\$2.25 million was completed and incorporated into the 2015 budget. The plan was to continue the development, deployment and maintenance of our drug tracking database by accumulating the Big Data of mobile communication records and crime details for data mining and analytics. Meanwhile, it was also necessary to resolve the problem that the information conveyed over instant messaging on smartphones could

not be directly ported into the database. After consulting with police and investigation agencies and observing the practice of information technology specialists, the Taipei District Prosecutors Office decided to use the budget for technology development to purchase mobile communication forensics tools (packaged software from Cellebrite, model UFED 4PC, and a Physical/Logical Analyzer).

VI. Market Survey

Before the purchase of forensics tools from Cellebrite, the Taipei District Prosecutors Office consulted with experts from police and investigation agencies and visited a number of trade exhibitions for information on the pros and cons of various off-the-shelf tools. The Anti-Drug Division hopes that the tools we use are completely legitimate and cater to law enforcement requirements. The official website of Cellebrite indicates that the company is dedicated to the R&D of forensic tools for mobile phones to assist law enforcers to efficiently acquire digital evidence and intelligence from smartphones. Other



vendors active in this market are XRY, MSAB, Oxygen, and Megnet. According to technicians with police and investigation authorities, all these brands have advantages, although their market shares vary. Some are stronger in analytics whilst others are quicker in implementation speed. We hope to have sufficient funding to eventually procure all the tools from different brands, as they complement each other.

VII.Utilization of Forensic Tools for Mobile Phones

Generally speaking, the greater the authority to access and operate mobile devices, the more complete the digital contents extracted and acquired will be. In addition, the depth and width of the data extracted can vary on different operating systems (iOS vs. Android), mobile phone brands, and models.

Below is a description of the functions and mechanisms of the forensic tools for mobile phones currently in used by the Taipei District Prosecutors Office.

(1)Android system

After the necessary calibration on the mobile phones (particularly by activating the developer's mode and clicking on the debug mode), the UFED 4PC packaged software is switched on to precisely identify the models and brands of the mobile devices. The program will detect a variety of extraction methods, from shallow to in-depth. The evidence gathering kicks off once a selection has been made. As our goal is to back up all the data on the devices, there is often just one valid option. Once the data has been extracted and a backup file has been created, the program will generate a report with detailed classifications in a well-defined hierarchy. The time it takes mainly depends on the storage capacity of the mobile devices.

(2)iOS system

Only Apple devices can run iOS. An advanced logical extraction is required to gather evidence. Once the UFED Physical Analyzer packaged software is started, the program will process the device step by step. It is also possible

to collect evidence with UFED 4PC on Apple devices.

VIII. Current Status and Benefits of Forensic Evidence Gathering from Mobile Phones

The collection of forensic evidence from mobile devices has been integrated into the investigation process for all criminal cases in the Anti-Drug Division and all other segments of the Taipei District Prosecutors Office. Up to now, we are the first and the only prosecutor's office in Taiwan that is able to gather evidence on our own. From January 2016 through December 2016, our investigator officers collected evidence from over 60 phones. As of the middle of November 2017, the number of mobile phones processed during the year

exceeded 120.

All the major benefits are evident throughout our procedures. We are now able to categorize the types of digital intelligence required for preliminary crime investigations in the shortest time possible for prosecutors. Meanwhile, we can keep the confidentiality of the material, sensitive, or high-profile cases throughout the investigation process, to greatly reduce the possibility of information leakage. Investigation officers in our offices are responsible for the forensic evidence gathering from mobile phones and they have formed a task force based on their qualifications (mainly in information technology) and work willingness. If deemed necessary by the prosecutors to collect evidence from mobile devices, the task force shall implement the procedures according to the instructions from the prosecutors (e.g. request

*From January 2016 through December 2016 our investigator officers collected evidence from over **60** phones.*

*As of the middle of November 2017, the number of mobile phones processed during the year exceeded **120**.*



letters). Members in the task force will rotate regularly and their contributions shall be noted. The backup data is then forwarded by the prosecutors to the investigator officers responsible for the cases or for further examinations.

It is worth noting that the Taipei District Prosecutors Office started to build its own resources and competences in the gathering of forensic evidence from mobile devices in response to the trends of crime investigations. We hoped to utilize the extra budget for our technology program in order to develop our competences and skillsets. The purpose is to assist our prosecutors to access a wider range of crime intelligence, without troubling police and investigation agencies for everything and anything. Meanwhile, the police and investigation offices all have certified and well-run forensics labs, supported with sufficient information and budgets. The technical capability in the Taipei District Prosecutors Office is still not comparable. Also, we seek to collect evidence from mobile phones for investigation purposes, and we do not intend to exhaust ourselves by resolving technical issues. As a result, our personnel are bound to experience,

more often than not, difficulties in extracting all the information from mobile phones. This is mostly due to rapid upgrades in hardware, software and firmware on smartphones. If prosecutors believe that the internally collected evidence is insufficient, they will forward jobs that we cannot complete in-house to forensic professionals in other police and investigation agencies. In other words, our efforts in the gathering of forensic evidence from mobile phones are not meant to replace the experts in the police and investigation organizations. Rather, our end game is to learn by drawing lessons from their years of experience in order to gradually improve our skills in this regard. We hope our prosecutors can establish a preliminary framework for investigations in the shortest time possible by providing them with initial results in-house and in little time.

Per the instructions from all of our previous head prosecutors, we are more than happy to share our resources and experiences with other prosecutor's offices by extending assistance in the gathering of forensic evidence from mobile devices.

IX. Prospects

The licenses for the forensic tools and the maintenance services we procured are set to expire (given the one-year timeframe of the technology development program abovementioned). In 2017, we purchased another year of licensing, maintenance and updates (until November 28, 2017) with sponsorship from the Shilin District Prosecutors Office. This has allowed us to continue using the tools for their intended benefits. In 2018, we purchased yet another year of maintenance and updates (until November 28, 2018) with support from the Head Prosecutors. As police and investigation organizations allocate budgets for the purchase of maintenance and update services on packaged software, we may also plan for such budgets on an annual basis if we think it is necessary to keep up with the internal processing and evidence gathering from mobile devices. The continued functioning of this technology can provide timely and effective support to prosecutors in their investigations.

