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Chip-Off Technique in Mobile Forensics

Vikas Razdan[1]

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Abstract:

In the era of digital age, one in every of the foremost important new areas of forensics is mobile forensics, specifically the power to extract valuable information in the form of data using automated techniques from mobile devices that have suffered physical damage and are totally non-functional. Digital forensic methodologies involve various techniques of obtaining data from smartphones which are as follows Joint Test Action Group technique. logical extraction, backup extraction, filing system extraction, , Serial Peripheral Interface technique, when all such methods fail CHIP-OFF is the only technique which include chip extraction and reading data from it. CHIP-OFF FORENSICS may be successful for the smart phone devices that have received waterlogged and fire damage. In chip-off thermal based technique is used to physically remove the microchip from the smart device and this methodology is employed when other techniques as mentioned above fail. In such cases it's mandatory to unsolder the NAND non-volatile storage chip, as it contains all the valuable user data. In most of the cases the NAND chip remains fully functioning. There's vast sort of packages of contemporary NAND chips exist (TSOP48, TLGA52, BGA100, BGA152, etc.). In order to read physical image of information out of chip it's necessary to settle on appropriate smartphone adapter and browse physical image (dump) to a file using various forensic software's, at the tip of process when physical image is converted to logical image, it's a time for further forensic analysis.

Keywords: *Mobile Forensics, NAND memory chip, Rework Station Data Extraction, Smartphone, Kit Adapters.*

Authors:

1. *Certified Computer Hacking Forensic Investigator, Cyber Forensic Analyst, Jammu and Kashmir Government and Associate Member of National Cyber Safety And Security Standards, INDIA*

Introduction

Chip-off technology is an advanced data extraction and analysis technique which involves substantially removing chip from a theme device using specialized equipment and then acquiring the data. Chip Off technique can be used for smartphones and other digital devices that hold data using flash memory technology **(Digital Forensic Corp, 2018).** The Chip-off system is relatively successful on devices that have sustained physical damage and aren't functional. Chip-off is an invasive forensic acquisition which needs specialized technical tools and experts to soundly remove the chips, produce forensic images of their contents, and duly realign their contents into coherent data. Taking out the chip from the device needs microscope precision skills, making any small mistakes will result in losing all data permanently. After removing the chip connection with the system is done with the help of smartphone kit adapters.

Chip unsoldering is that the most significant part of chip-off process. The chip mustn't be overheated as it will delete all data. It's recommended to use rebuilt station. Even the best rebuilt station with automatic temperature regulator allows unsoldering chips with safety. To extract a chip it's recommend heating it to 240 °C then use a blade to extract it from a smartphone board. NAND non-volatile storage is found on the retrieved circuit board, using appropriate heat and chemicals, the microchip is physically taken out. The chip which is physically removed is cleaned and the forensic image/dump of the chip is then acquired by using an various imaging software's like Oxygen Forensics, XRY, Belkasoft, Magnet Forensics, Autopsy and using desired smart phone kit adapter it's connected to the PC. With the help of available software's, in-depth analysis is carried out and valuable artifacts from the Chip are retrieved **(www.ilearncana.com; indianexpress.com).**

Figure No. 1: Chip off Technology

Objectives

To retrieve and extract the data stored from the smart phones and other digital devices that hold data and have suffered physical damage and are completely non-functional.

Methodology

Chip-off involves physically removing flash memory chips from a mobile device.

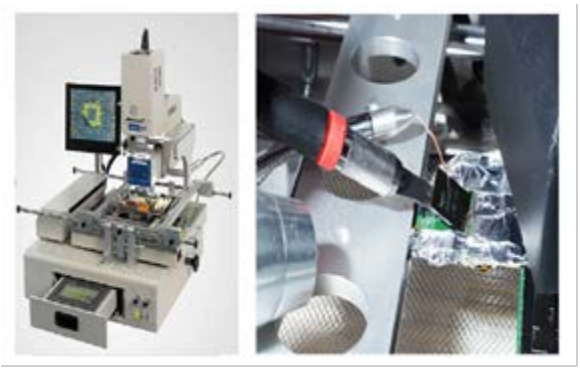

Figure No. 2: Rework Station

Chip-off method is divided in six parts which includes the opening of the device using heat and air combination to remove its back and front covers, battery screws, other connections, etc. to retrieve the motherboard in such a way that the chip mustn't be overheated as it will delete all data. It's recommended to use rebuilt stations with automatic temperature regulator which helps in unsoldering the chip with safety **(www.gillware.com).**

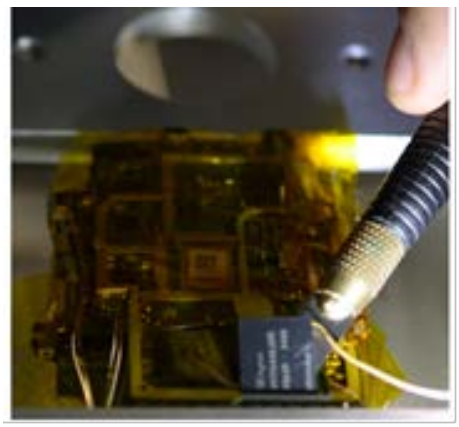

Figure No. 3: Chip Extraction from Circuit Board

To extract a chip from a smartphone board it's recommend heating it to 240 °C using the appropriate heat (disordering) and chemicals (adhesive removal) and then physically chipping off the memory chip from the smartphone board using blade

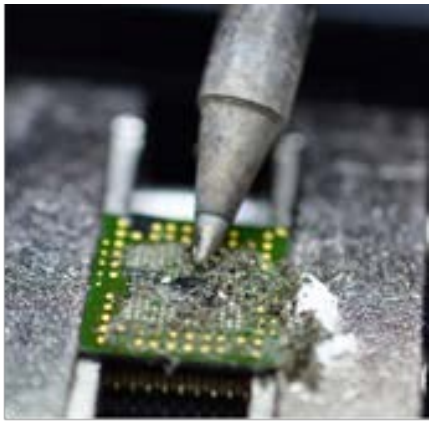

Figure No. 4: Heating Compound with Solder

While unsoldered the chip from the board, it should be gutted by means of emulsion. The most effective way is to melt it with hot air and remove with solder wick.

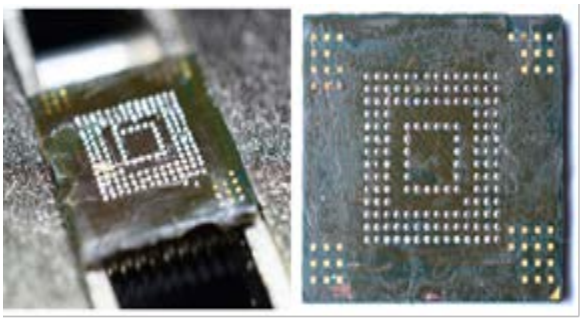

Figure No. 5: Compounded Chip and Cleaned Chip

Figure No. 6: Smarthone Kit Adapter

The removed chip is gutted and reballed if necessary and by means of smart phone kit adapters, it is connected to the PC, the forensic image/ dump of the chip is also acquired by using desired imaging/extraction software tools like UFEED, Oxygen Forensics, XRY, Belkasoft, Magnet Forensics, and Autopsy. The further analysis is conducted with the help of these standard software's at the laboratory and artifacts from the Chip are retrieved.

Type of data recovered from chip-off dumps analysis **(www.ultratecusa.com, 2020; Ence and Cantrell, 2018)**

- Call data
- Contacts
- Emails
- Instant messaging
- Locational data
- MMS
- Multimedia including images, and audio sometimes videos
- SIM data
- SMS
- Web history

Figure No. 7: Oxygen Forensic Software

Figure No. 8: Data Recovered

Conclusion

The Chip-Off technique has come up with excellent results to recover data from your damaged, faulty or non-functional mobile phones when traditional methods have been failed/exhausted or are not possible. Success rates have remain high and the Chip-Off technique in Mobile forensics works effectively and the technology is mostly used by investigating agencies to collect artifacts from the mobile phones that could correlate it with the crime **(Data, 2021; www.ligsuniversity.com).**

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