Hardware Write Blocker Security Exploration

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Agenda

- Introduction
- Related work
- Contributions
- Methodology
- Experimental results
- Discussion
- Limitations
- Future work

Introduction

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- 80 to 90% legal cases involve digital evidence (Rogers, 2006)
- Imaging is critical
- It was the goal of this research to explore and test the security of these devices
  - The Tableau TD3 was chosen as a proof of concept, as it is widely used by industry

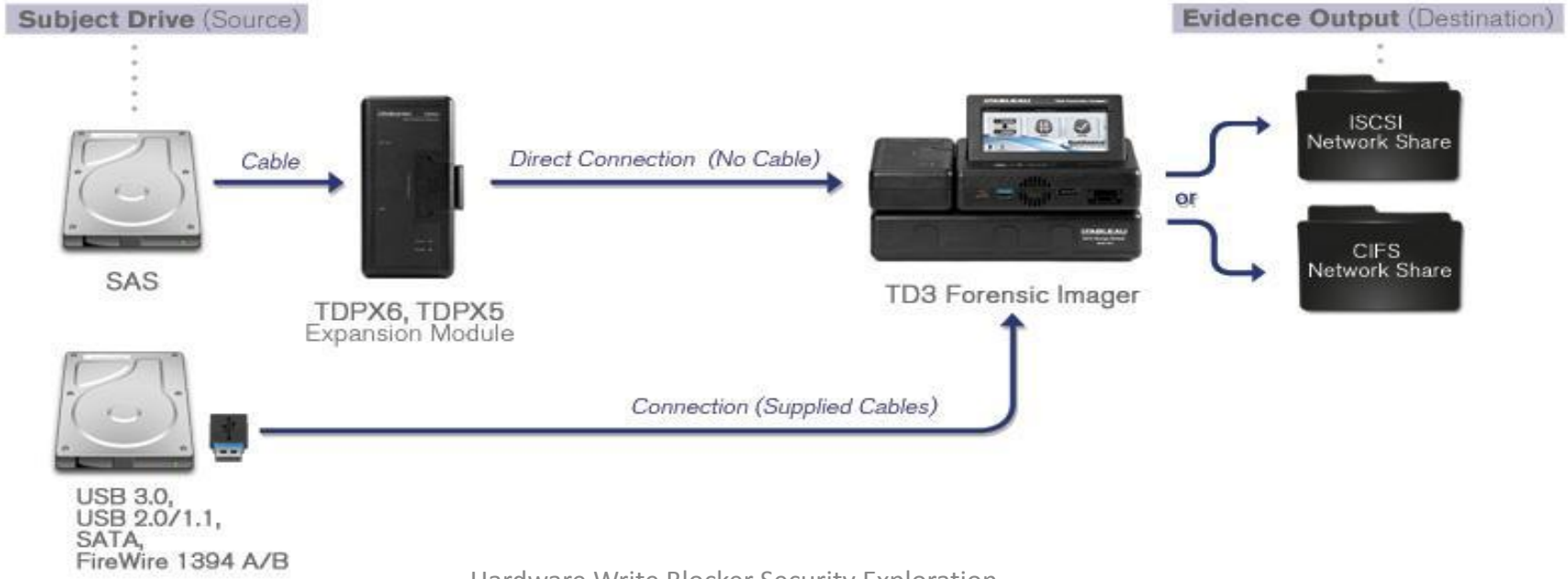
Contributions

- This research will highlight the oversight and the need to test forensic tools
- Little work has been done in this domain we hope that by showing this proof of concept others will also begin to think about this problem as a true threat

Note: This is not an attack against the tool and manufacturers

Related work

- Digital Forensic Tool Testing
  - Forensic tool growth
  - National Institute of Standards and Technology (NIST) is responsible for the bulk of tool testing
  - Department of Homeland Security did their own testing of the forensic soundness of TD3 (DHS, 2014)

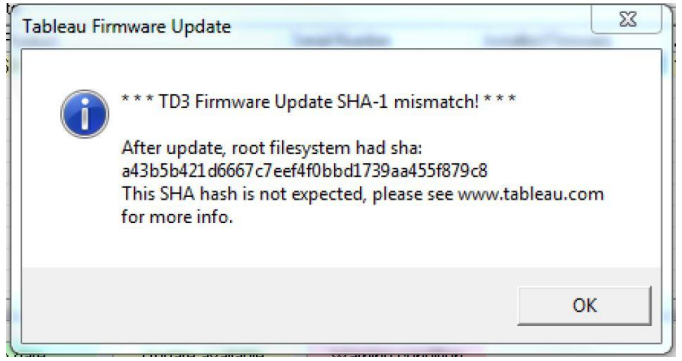


Related work cont.

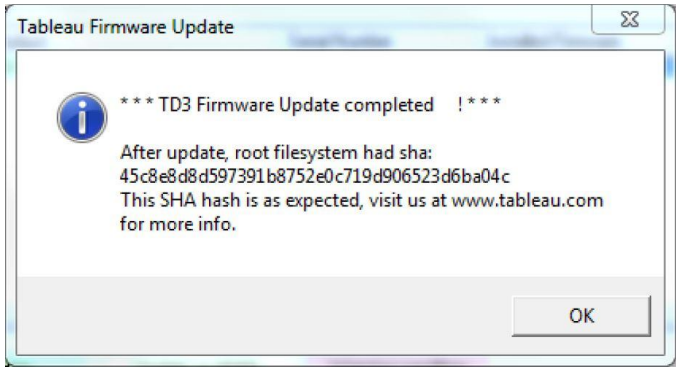
- Anti Forensics
  - Only about 2% of published research is related to anti forensics (Baggili et al.2012)
    - data hiding
    - artifact wiping
    - trail obfuscation
  - Examples of tool security
    - Ditto forensic field station [3]
    - Encases's software suite

Methodology

- Gaining root access
  - Reconnaissance on device
  - Explore SD card
- Attack Vector (Firmware Update)
  - Firmware Update can be modified
  - Modified Firmware Flags
- Integrity attack scripts construction
  - Developed scripts to corrupt data



Before Firmware Modification



After Firmware Modification

Methodology cont.

Algorithm 1 Process detection and execution of integrity attack using DD.

```
previous ⇐ 0
while TRUE do                                                    ▷ Loop runs until 'break'
    current = getCurrentCPUUsageOfGismo();                       ▷ Value between 0 and 100
    if ((current − previous) < −10) && (current < 1) then        ▷ Checks CPU drop (curr − prev) & done (curr < 1)
        execProgram();                                           ▷ In our test, we run DD
        Break Loop;
    else
        sleep(1);                                                ▷ Sleep for 1 s to not use all CPU
        previous ⇐ current;
    end if
end while
```

Methodology cont.

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Testing

Phase I (Pre firmware update)

- Source drive hashed
- Disk to disk duplication
- Destination drive hashed

Phase II (Post firmware update script not running)

- Duplicate process Phase I

Phase III (Post firmware update script running)

- Duplicate process Phase I & II
- Destination drive hashed again

CALIBRATION (script not running) PHASE HASH VALUES

Destination drive hash pre-firmware update (Phase I)

MD5:1ac…137b4e

SHA1:76393…bfb502

Destination drive hash post-firmware update (Phase II)

MD5:1ac…137b4e

SHA1:76393…bfb502

SCRIPT RUNNING PHASE HASH VALUES

Destination drive hash shown to the user (Phase III)

MD5:1ac…137b4e

SHA1:76393…bfb502

Actual hash value of the destination drive

MD5:d352609773231d546b29766611ee0035

SHA1:f8976d0b3b2f8dfbe3936e417bb03182902723e7

Discussion

How plausible is physical access?

- Social engineering
- Insider threat

Ramifications of compromising device like TD3

- Potential for compromising the authenticity of the collected evidence
- Hash values accepted method to validate the authenticity of a duplication (Kerr 2001)
- Possible network security breach (reverse shell, viruses, malware)

Discussion Cont.

- Possible Phishing Vectors
  - Email
  - Twitter feed

XRY & XAMN v6.13.1

M

MSAB <info@msab.com> sent by MSAB <info=msab.com@mail1.atl161.mcsv.net>
Monday, March 30, 2015 at 12:07 PM

Enterprise Vault Manage Add-ins...

Dear Customer,

We are contacting you to let you know that both XRY & XAMN v6.13 have been updated.

There is a newer v6.13.1 release available which can be downloaded from the MSAB Customer Portal:
http://msab.us2.list-manage1.com/track/click?u=779f73ecba

For full details of the changes please visit the News section of the MSAB Customer Forum:
http://msab.us2.list-manage1.com/track/click?u=779f73ecbac2c

For a video about what's new in XRY v6.13 please visit:
http://msab.us2.list-manage1.com/track/click?u=

Kind Regards

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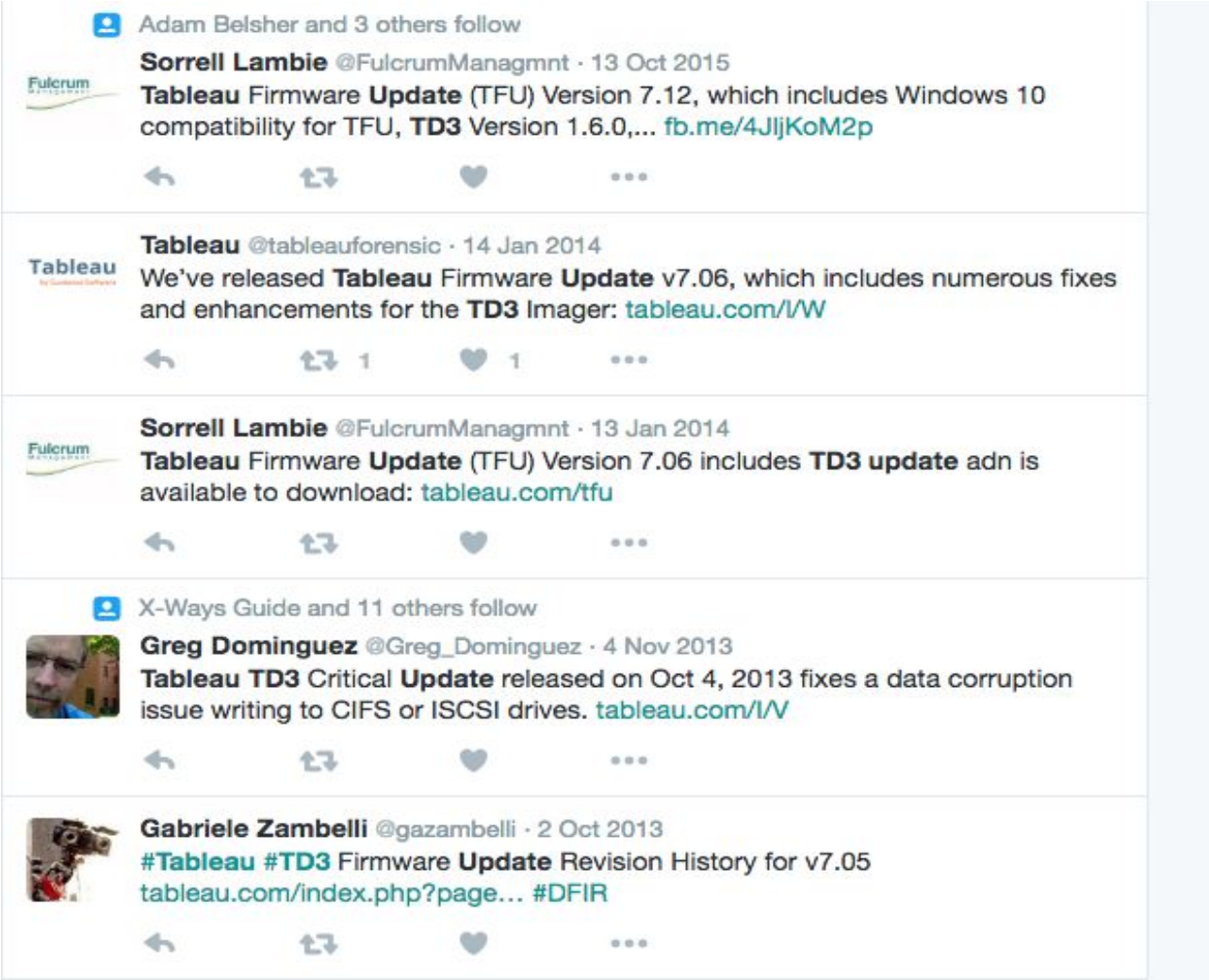
Discussion Cont.



Limitations

- Physical access required
- Firmware Upgrade Hash Error (circumvented as seen above)
- Digital signature warning (Windows)
- DD command wipes drive (would be better to flip a bit or remove particular types of files)
- OS on device is limited in its tools, and some are proprietary. This limits the potential exploits as well as requires a more detailed approach (reverse engineering)

Future Work

- Continue to test security of TD3
  - Web Interface
  - Further develop script
  - Network (reverse shell)
- Explore the domain of where penetration testing meets forensic tools
  - Develop a methodology for testing security in forensic tools
  - Develop standards for both hardware and software forensic tools

Questions?

- Thank you to Google for the scholarship
- Thank you DFWRS community for your time and input
- Thank you to University of New Haven for feedback
- Thank you to MITRE for your feedback

Resources

[1] Rogers, M. (2006). Dcsa: A practical approach to digital crime scene analysis. West Lafayette, Purdue University, .

[2] DHS (2014). Test results for digital data acquisition tool:tableau td3 forensic imager version 1.3.0. URL: https://www.dhs.gov/sites/default/files/publications/ 508_Test%20Report_NIST_Tableau%20TD3%20Forensic%20Imager%201.3.0_August%202015_Final_0.pdf.

[3] Baggili, I., BaAbdallah, A., Al-Sa, D., & Marrington, A. (2012). Research trends in digital forensic science: An empirical analysis of published research. In Digital Forensics and Cyber Crime (pp. 144{157). Springer.

[4] Ditto Exploit http://www.cru-inc.com/products/wiebetech/ditto_forensic_fieldstation/