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by Oi Lam Siu - Tuesday, 17 December 2024, 9:05 AM

TrueCrypt was a widely used open-source encryption software, valued for its ability to secure sensitive data through encrypted volumes or full-disk encryption. However, it was discontinued in 2014.   The (anonymous) TrueCrypt authors warning that “Using TrueCrypt is not secure as it may contain unfixed security issues” (TrueCrypt, 2014). The Open Crypto Audit Project – TrueCrypt (Cryptanalysis) by Junestam and Guigo (2014) analysed the software to assess its vulnerabilities and validate this claim.

Key Findings from the Cryptanalysis

The audit confirmed several significant security flaws in TrueCrypt, largely supporting the authors’ warning. Below are the major vulnerabilities identified in the Cryptanalysis (Junestam & Guigo, 2014):

Vulnerability	Class	Severity	Description	Impact
Weak Volume Header Key Derivation Algorithm	Cryptography	Medium	The PBKDF2 key derivation algorithm uses a low iteration count (1000–2000), making it susceptible to brute-force attacks.	An attacker could decrypt volumes by brute-forcing the weak key derivation.
Sensitive Information Might Be Paged Out	Data Exposure	Medium	Encryption keys and sensitive data might be written to unencrypted memory or disk during low-memory situations	Key material could be retrieved from the system page file if the disk is not encrypted.
Multiple Issues in the Bootloader Decompressor	Data Validation	Medium	Implementation flaws such as integer mismatches and lack of bounds checking lead to out-of-bounds memory access.	Attackers with disk access could modify the bootloader, execute malicious code, or capture passwords.
Use of memset() to Clear Sensitive Data	Data Exposure	Medium	Insecure use of memset() instead of secure memory-clearing methods like RtlSecureZeroMemory() may leave sensitive data in memory.	Attackers could extract sensitive data through memory dumps.
Kernel Pointer Disclosure	Data Exposure	Low	A kernel pointer is disclosed to unauthenticated userland programs, enabling attackers to bypass Kernel Address Space Layout Randomisation (ASLR).	Facilitates exploitation of vulnerabilities by exposing kernel memory locations.
Integer Overflows in I/O Operations	Data Validation	Low	Unchecked user-provided values can cause integer overflows, leading to memory exhaustion or denial-of-service (DoS) attacks.	Attackers could crash the system or disrupt its operations.

Lack of Error Handling	Error Reporting	Informational	Functions like EncryptDataUnits() do not return error statuses, which could lead to unencrypted data being written during encryption failures.	Users might unknowingly store sensitive data without encryption.

Recommendations

Although no backdoors or malicious code were discovered, the audit highlights serious risks for users relying on TrueCrypt for data protection. These stem from outdated cryptographic methods, insufficient error handling, and a lack of maintenance. As such, TrueCrypt is not recommended for secure data storage. Key reasons include:

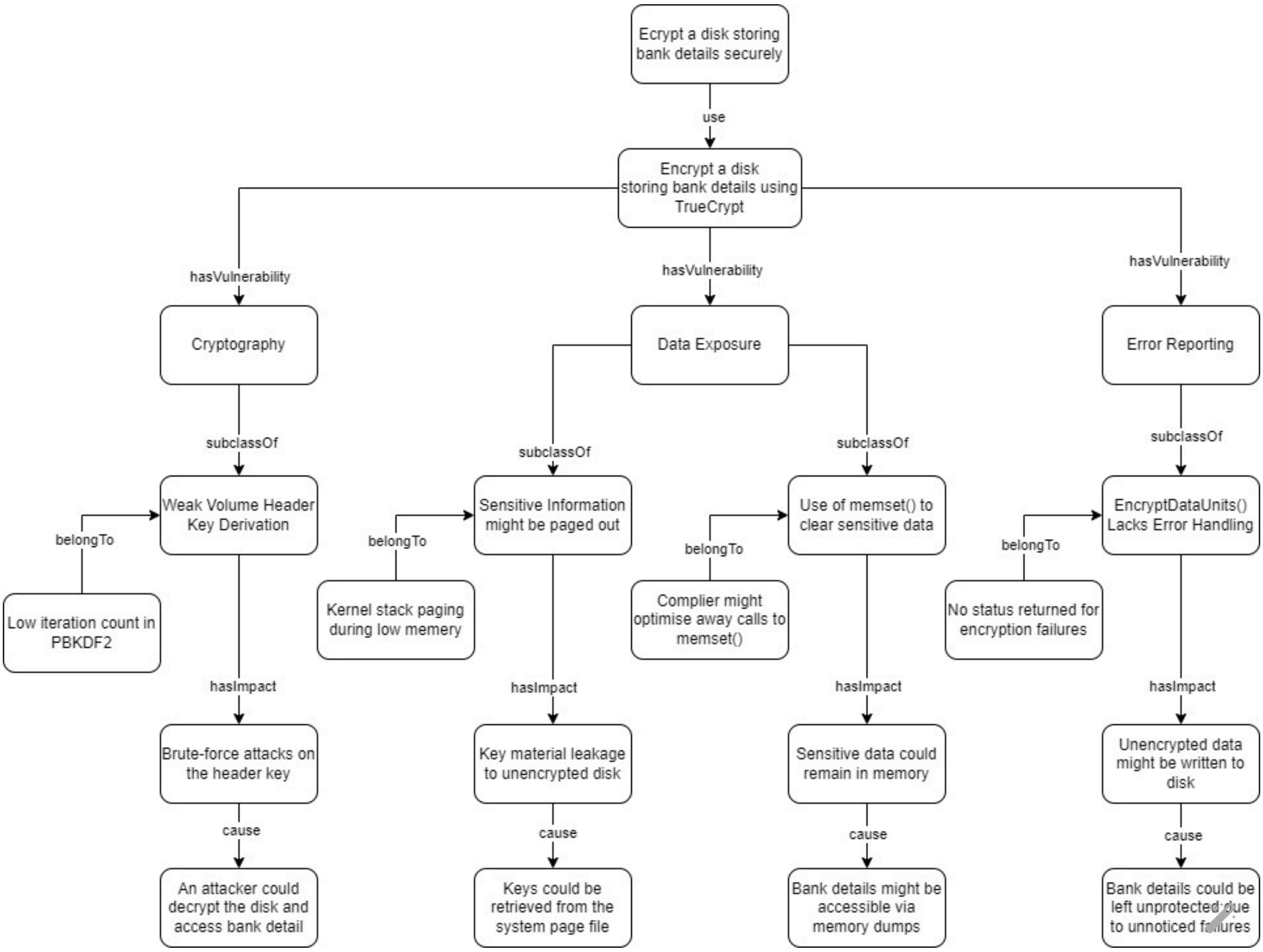
1. Outdated Security Practices: Weak cryptographic implementations and insecure APIs compromise reliability (Junestam & Guigo, 2014).

2. No Support or Updates: Without ongoing maintenance, TrueCrypt remains vulnerable to newly discovered exploits.

3. Modern Alternatives: Tools like VeraCrypt (a fork of TrueCrypt) offer enhanced security, updated cryptography, and active development (Rubens, 2014).

User Perspective: Encrypting Bank Details

If a user wishes to encrypt a disk storing bank details using TrueCrypt, the following ontology diagram identifies the weaknesses of TrueCrypt, as discussed in the cryptanalysis, which might negatively impact the security of the user’s goal.


Ecrypt a disk storing bank details securely
use
Encrypt a disk storing bank details using TrueCrypt
hasVulnerability
hasVulnerability
hasVulnerability
Cryptography
Data Exposure
Error Reporting
subclassOf
subclassOf
subclassOf
subclassOf
Weak Volume Header Key Derivation
Sensitive Information might be paged out
Use of memset() to clear sensitive data
EncryptDataUnits() Lacks Error Handling
belongTo
belongTo
belongTo
belongTo
Low iteration count in PBKDF2
Kernel stack paging during low memery
Complier might optimise away calls to memset()
No status returned for encryption failures
hasImpact
hasImpact
hasImpact
hasImpact
Brute-force attacks on the header key
Key material leakage to unencrypted disk
Sensitive data could remain in memory
Unencrypted data might be written to disk
cause
cause
cause
cause
An attacker could decrypt the disk and access bank detail
Keys could be retrieved from the system page file
Bank details might be accessible via memory dumps
Bank details could be left unprotected due to unnoticed failures

Conclusion

TrueCrypt's vulnerabilities and lack of support make it unsuitable for modern use, particularly for securing sensitive financial or personal data. Users should migrate to actively maintained alternatives like VeraCrypt, which address these issues and provide stronger protection.

Reference

Junestam, A. & Guigo, N. (2014) Open Crypto Audit Project Truecrypt Security Assessment. Open Crypto Audit Project.

Rubens, P. (2014) VeraCrypt a Worthy TrueCrypt Alternative. Available from: https://www.esecurityplanet.com/applications/veracrypt-a-worthy-truecrypt-alternative/

TrueCrypt (2014) Homepage. TrueCrypt. Available from: https://truecrypt.sourceforge.net

Bibliography

Li, H., Shi, Z., Pan, C., Zhao, D. and Sun, N., 2024. Cybersecurity knowledge graphs construction and quality assessment. Complex & Intelligent Systems, 10(1), pp.1201-1217.

W3C. (2015) IoT-Lite Ontology. Available from: https://www.w3.org/submissions/iot-lite/

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