Practical Security and Crypto: Why Mallory Sometimes Doesn't Care

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RedTeam Pentesting, Dates and Facts

- ★ Founded in 2004
- ★ Specialisation exclusively on penetration tests
- ★ 8 penetration testers

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"Laptop: A computer designed to allow employees to easily store vast amounts of customer data in the backseat of a taxicab"

(The Devil's Infosec Dictionary)

What is a Pentest?

- ★ Attacking a network or product with the owner's consent
- ★ Question: How deeply can a real attacker penetrate the security?
- ★ Same methods as the "bad guys"
- ★ Conducted from the attacker's perspective
- ★ Individualised search of security vulnerabilities
- ★ Detailed documentation from the beginning

Encryption? Uhm...

Many communication channels are still used unencrypted

- Network: HTTP, FTP, POP3/IMAP, SMTP, VoIP
- Wireless: DECT, RFID, Wireless Keyboards
- E-Mail: PGP/GPG, S/MIME? No one uses it

Saving Database Space

Passwords stored as MD5 hashes

```
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```
SELECT user WHERE username='$username' AND
       password=SUBSTR(MD5($password),8,8)
```

128bit MD5 hash $\longrightarrow 2^{128}$ possible hashes
32bit substring $\longrightarrow 2^{32}$ possible hashes
$\Rightarrow \frac{2^{128}}{2^{32}} = 2^{96}$ hashes with the same substring

In Need of More Characters

Random string generation: Using a 5bit value as an array offset

```
ALPHABET = [
  "A", "B", "C", "D", "E", "F", "G", "H", "I", "J",
  "K", "L", "M", "N", "O", "P", "Q", "R", "S", "T",
  "U", "V", "W", "X", "Y", "Z"
]
```

Example:

`10111 = 23 = "X"`

`11100 = 28 =` ...Oh. We need more characters.

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  "U", "V", "W", "X", "Y", "Z", "A", "B", "C", "D",
  "E", "F"
]
```

Example:

```
10111 = 23 = "X"
11100 = 28 = "C" = 2
```

Random(ness) Creativity: Session IDs

Random session IDs in a web portal.

1. `TvWjLeJjGhPvAhJjNgBuPiFkRqJmHOL`

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Every second character is upper case

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Only one character changed for three session IDs

Random(ness) Creativity: Session IDs

Requests from different IP addresses

From 192.168.1.23:
TvWjLeJjGhPvAhJjNgBuPiFkRsJmHOL

From 10.100.1.42:
TvWjLdBhGbHvAhJlMgBuPiFkRtJmHOL

Random(ness) Creativity: Session IDs

"Secret" key: dahfbhvagjhk

```
192.168.1.23 = 192168001023

dahfbhvagjhk
192168001023
------------
ejjghpvahjjn = eJjGhPvAhJjN
```

TvWjLeJjGhPvAhJjNgBuPiFkRsJmHOL

Layered Security . . . by Obscurity

- ★ Networked device with proprietary application (Windows based)
- ★ Encrypted disks, encrypted network communication. AES256.
- ★ Device boots up and works without user intervention

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Question: Where are the encryption keys?

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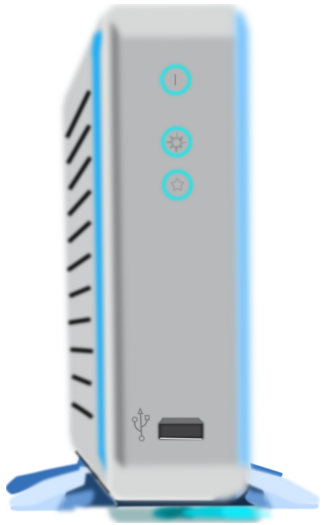
- ★ Which contain the application in obfuscated directories (`\.private\OS\Win32\bin\.plugins\lib\...`)
- ★ Which contains the crypto keys for the network communication in an obfuscated file

Hardware Hacking

- ★ Storage device with hard disk
- ★ Crypto module in the device doing "hardware" encryption
- ★ Crypto module gets unlocked at boot time by the system using the storage device
- ★ How can we get at the data?



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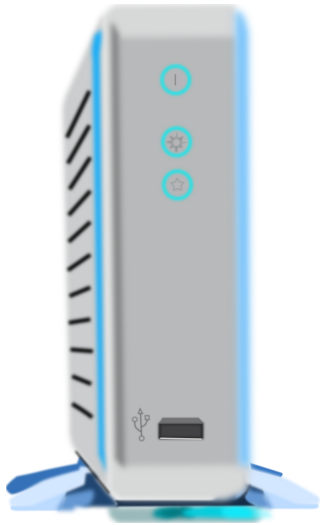
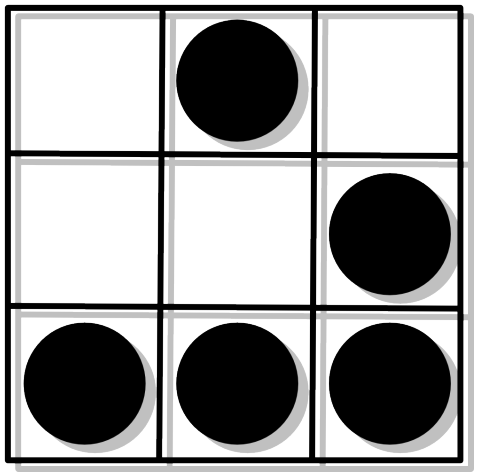
- Solution:
  - The crypto module is directly connected to the HD
  - Start the system, let it unlock the crypto module
  - Without disconnecting the power supply, connect the HD plus the crypto module to another computer
- Lesson learned: Hardware design is important, too



Other Examples

- File permissions on sensitive data: SSH keys, OpenVPN keys...
- Client side security: e.g. Java client getting passwords from remote server and comparing locally
- Lower layer crypto, higher layer attack:
  - Weak passwords (brute force)
  - Unsalted password hashes: rainbow tables
  - Web: e.g. Cross Site Scripting (XSS), Cross Site Request Forgery (XSRF)...
  - Generally application layer attacks



Thank you for listening. Questions?