Linux Systems *Compromised*

Understanding and dealing with break-ins

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CISOFY
AUDITING-HARDENING-COMPLIANCE

Agenda

Today

1. How do “they” get in
2. Rootkits
3. Malware handling
4. Defenses

Michael Boelen

- Security Tools
  - ○ Rootkit Hunter (malware scan)
  - ○ Lynis (security audit)
- 150+ blog posts
- Founder of CISOfy

How do “they” get in

Intrusions

- Passwords
- Vulnerabilities
- Weak configurations

Why?

Ingredients: Pork with Ham, Salt, Water, Modified Potato Starch, Sugar, Sodium Nitrite
SPAM®
Classic
U.S. INSPECTED AND PASSED BY DEPARTMENT OF AGRICULTURE
Serving Suggestion
NET WT 12 OZ (340g)
Glorious SPAM®!
BRAND

Keeping Control

- Rootkits
- Backdoors

Rootkits 101

Rootkits

- (become | stay) **root**
- (software) **kit**

Rootkits

- Stealth
- Persistence
- Backdoors

How to be the best rootkit?

Hiding ★

In plain sight!

/etc/sysconfig/…

/tmp/mysql.sock

/bin/audiocnf

Hiding ★★

Slightly advanced

- Rename processes
- Delete file from disk
- Backdoor binaries

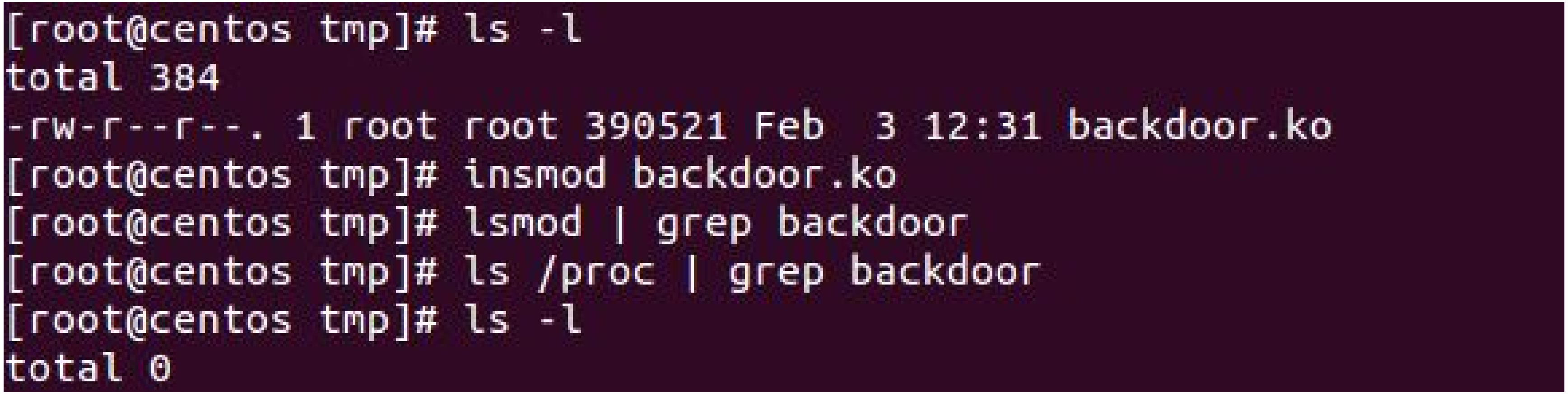
Hiding ★★★

Advanced

- Kernel modules
- Change system calls
- Hidden passwords

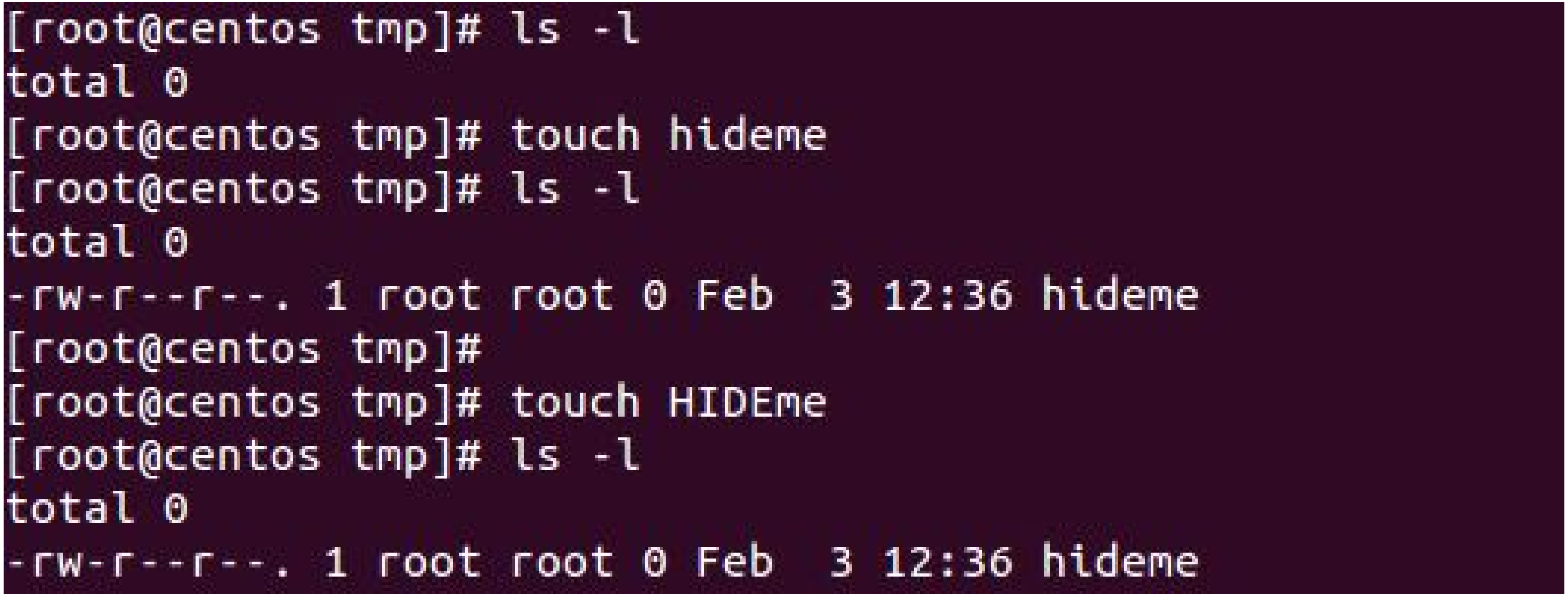
Demo

Demo



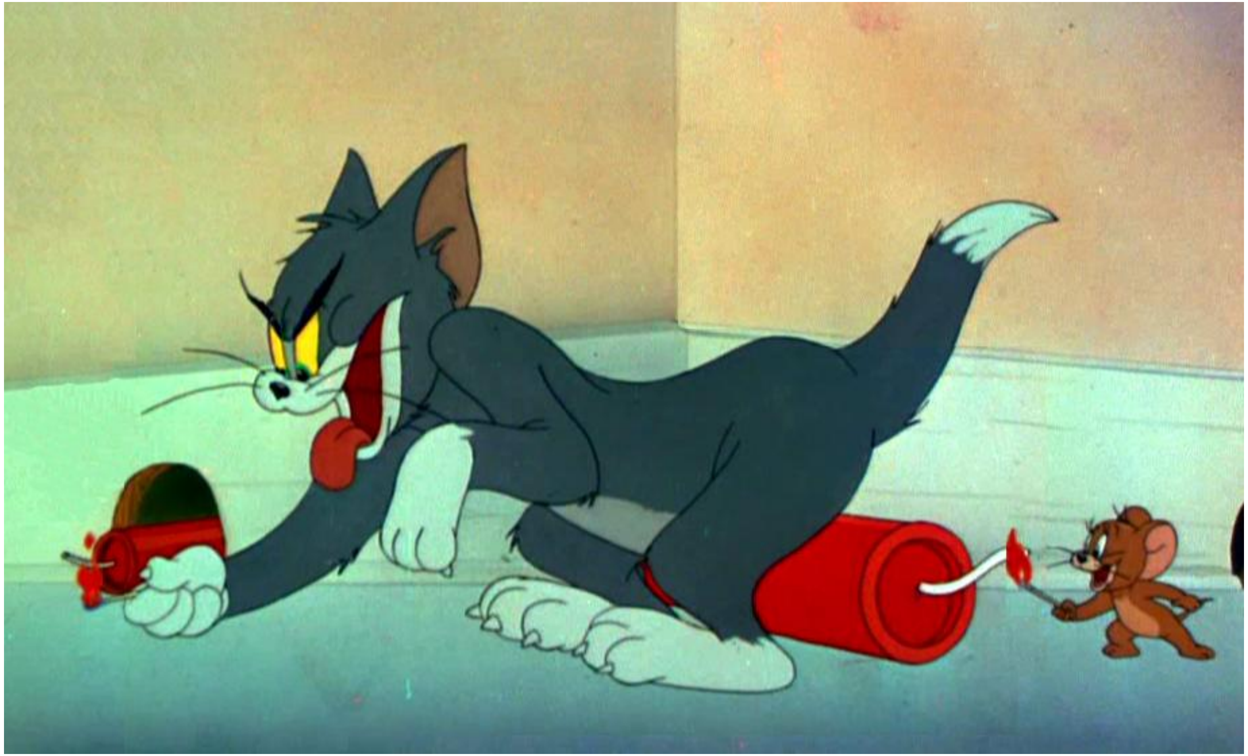
```
[root@centos tmp]# ls -l
total 384
-rw-r--r--. 1 root root 390521 Feb  3 12:31 backdoor.ko
[root@centos tmp]# insmod backdoor.ko
[root@centos tmp]# lsmod | grep backdoor
[root@centos tmp]# ls /proc | grep backdoor
[root@centos tmp]# ls -l
total 0
```

Demo



```
[root@centos tmp]# ls -l
total 0
[root@centos tmp]# touch hideme
[root@centos tmp]# ls -l
total 0
-rw-r--r--. 1 root root 0 Feb  3 12:36 hideme
[root@centos tmp]#
[root@centos tmp]# touch HIDEme
[root@centos tmp]# ls -l
total 0
-rw-r--r--. 1 root root 0 Feb  3 12:36 hideme
```

Continuous Game



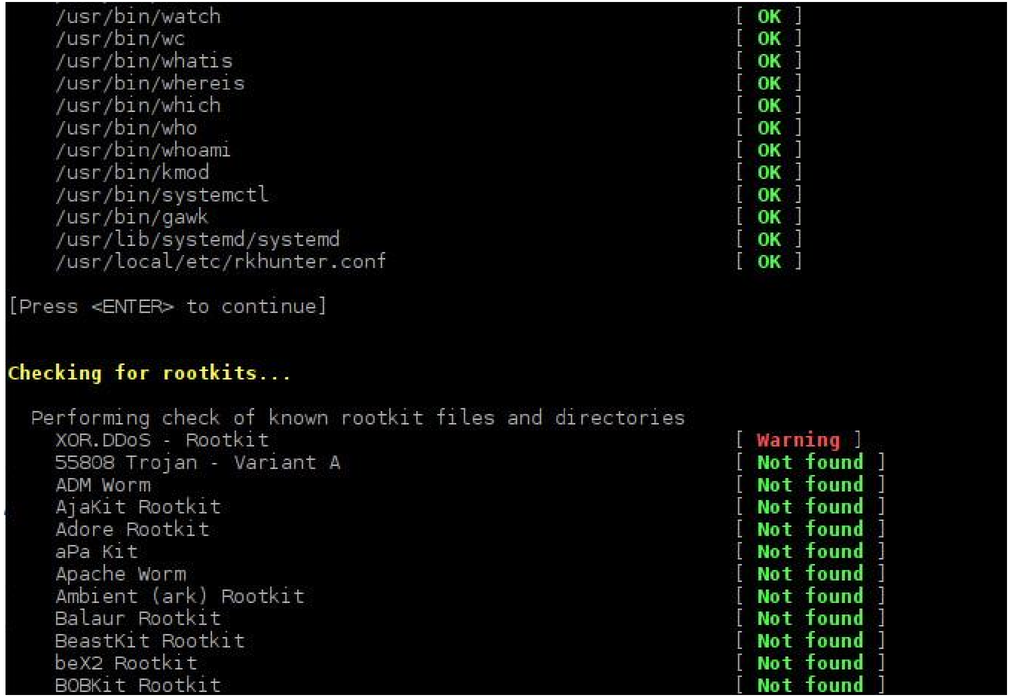
Detection

Challenges

- We can’t trust **anything**
- Even ourselves
- No guarantees

Rootkit Hunter

Detect the undetectable!



```
    /usr/bin/watch                                              [ OK ]
    /usr/bin/wc                                                 [ OK ]
    /usr/bin/whatis                                             [ OK ]
    /usr/bin/whereis                                            [ OK ]
    /usr/bin/which                                              [ OK ]
    /usr/bin/who                                                [ OK ]
    /usr/bin/whoami                                             [ OK ]
    /usr/bin/kmod                                               [ OK ]
    /usr/bin/systemctl                                          [ OK ]
    /usr/bin/gawk                                               [ OK ]
    /usr/lib/systemd/systemd                                    [ OK ]
    /usr/local/etc/rkhunter.conf                                [ OK ]

[Press <ENTER> to continue]


Checking for rootkits...

  Performing check of known rootkit files and directories
    XOR.DDoS - Rootkit                                          [ Warning ]
    55808 Trojan - Variant A                                    [ Not found ]
    ADM Worm                                                    [ Not found ]
    AjaKit Rootkit                                              [ Not found ]
    Adore Rootkit                                               [ Not found ]
    aPa Kit                                                     [ Not found ]
    Apache Worm                                                 [ Not found ]
    Ambient (ark) Rootkit                                       [ Not found ]
    Balaur Rootkit                                              [ Not found ]
    BeastKit Rootkit                                            [ Not found ]
    beX2 Rootkit                                                [ Not found ]
    BOBKit Rootkit                                              [ Not found ]
```

Dealing with malware

Activate your plan!

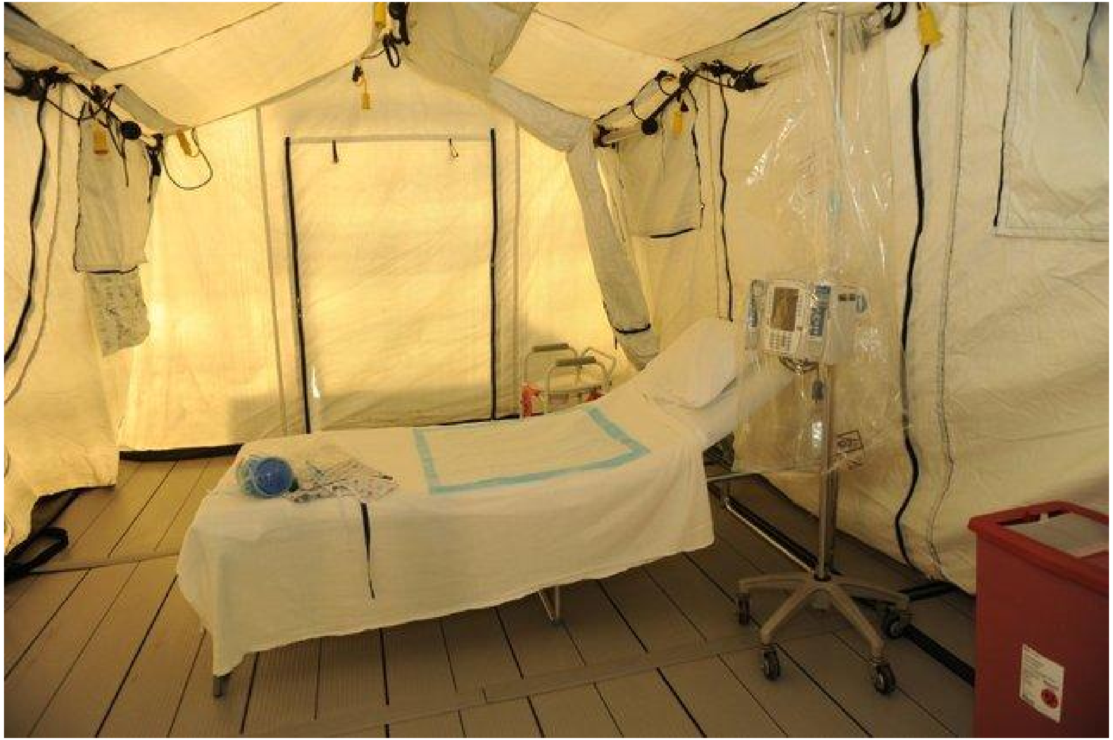
- Owner?
- Risk?
- What if we pull the plug?

Quarantine

VLAN

Bogus DNS

Looks Real™



Consider Research

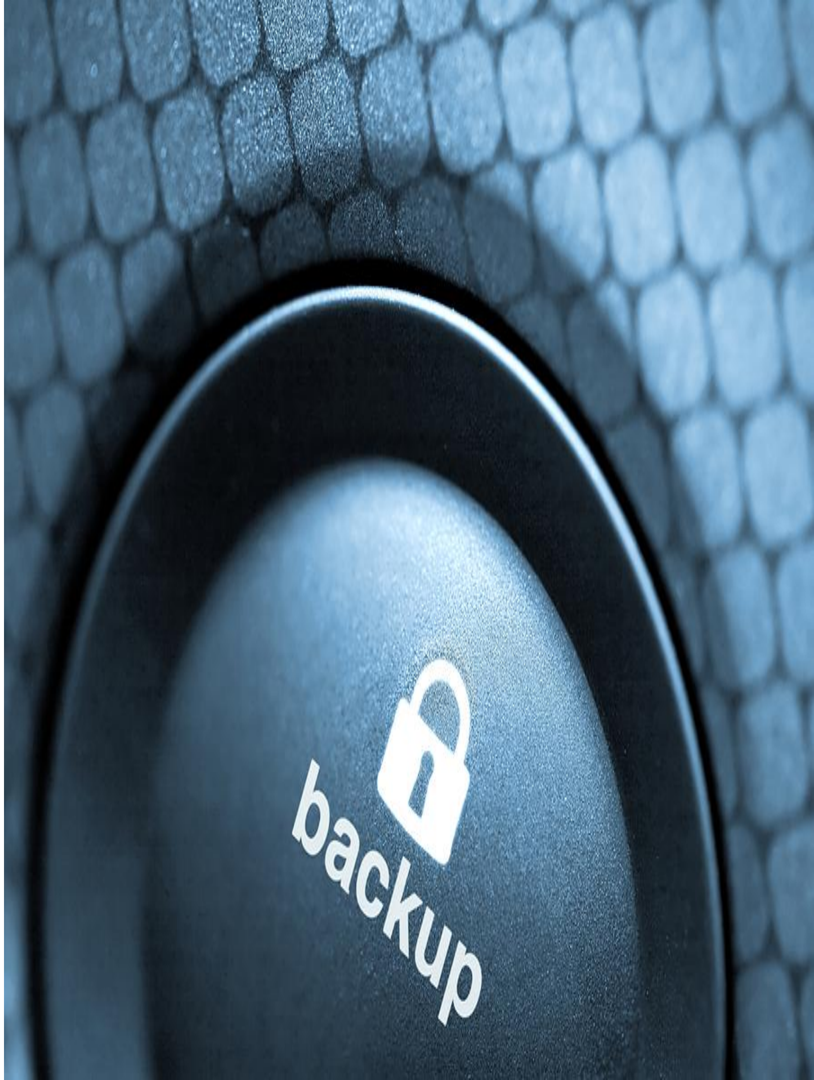
Memory dump

(Volatility)

Static analysis

Restore

Does it include malware?



Defense

Best protection

At least

- Perform security scans
- Collect data
- System Hardening

Frameworks / Patches

- SELinux
- AppArmor
- Grsecurity

Compilers

- Remove
- Limit usage

Harden Applications

- Use chroot
- Limit permissions
- Change defaults

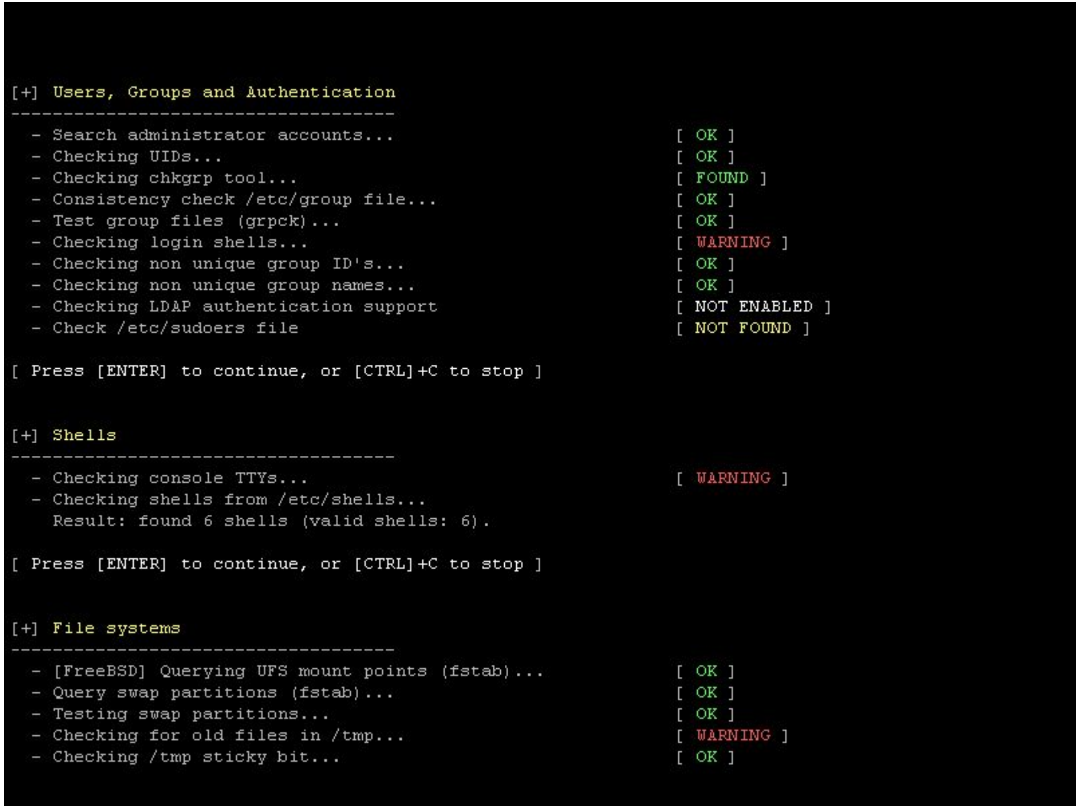
Kernel Hardening

- sysctl -a
- Don’t allow ptrace

Automation

Tip: Lynis

- Linux / UNIX
- Open source
- GPLv3



```
[+] Users, Groups and Authentication
------------------------------------
  - Search administrator accounts...                          [ OK ]
  - Checking UIDs...                                          [ OK ]
  - Checking chkgrp tool...                                   [ FOUND ]
  - Consistency check /etc/group file...                      [ OK ]
  - Test group files (grpck)...                               [ OK ]
  - Checking login shells...                                  [ WARNING ]
  - Checking non unique group ID's...                         [ OK ]
  - Checking non unique group names...                        [ OK ]
  - Checking LDAP authentication support                      [ NOT ENABLED ]
  - Check /etc/sudoers file                                   [ NOT FOUND ]

[ Press [ENTER] to continue, or [CTRL]+C to stop ]


[+] Shells
------------------------------------
  - Checking console TTYs...                                  [ WARNING ]
  - Checking shells from /etc/shells...
    Result: found 6 shells (valid shells: 6).

[ Press [ENTER] to continue, or [CTRL]+C to stop ]


[+] File systems
-------------------------------------------
  - [FreeBSD] Querying UFS mount points (fstab)...            [ OK ]
  - Query swap partitions (fstab)...                          [ OK ]
  - Testing swap partitions...                                [ OK ]
  - Checking for old files in /tmp...                         [ WARNING ]
  - Checking /tmp sticky bit...                               [ OK ]
```

Conclusions

Conclusions

- Good rootkits are hard to detect
- Use cost-effective methods
    - Detect
    - Restore
    - Learn
- Apply hardening

Success!

You finished this presentation

More Linux security?

Presentations

michaelboelen.com/presentations/

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