Linux Hardening

Locking Down Linux To Increase Security

Michael Boelen
michael.boelen@cisofy.com

‘s-Hertogenbosch, 1 March 2016
Meetup: Den Bosch Linux User Group

CISOFY
AUDITING-HARDENING-COMPLIANCE

Goals

1. Learn **what** to protect
2. Know some **strategies**
3. Learn **tooling**

Focus: Linux

Agenda

Today

1. System Hardening
2. Security Auditing
3. Guides and Tools

Bonus: Lynis demo

Michael Boelen

- Open Source Security
  - **rkhunter** (malware scan)
  - **Lynis** (security audit)
- 150+ blog posts at **Linux-Audit.com**
- Founder of CISOfy

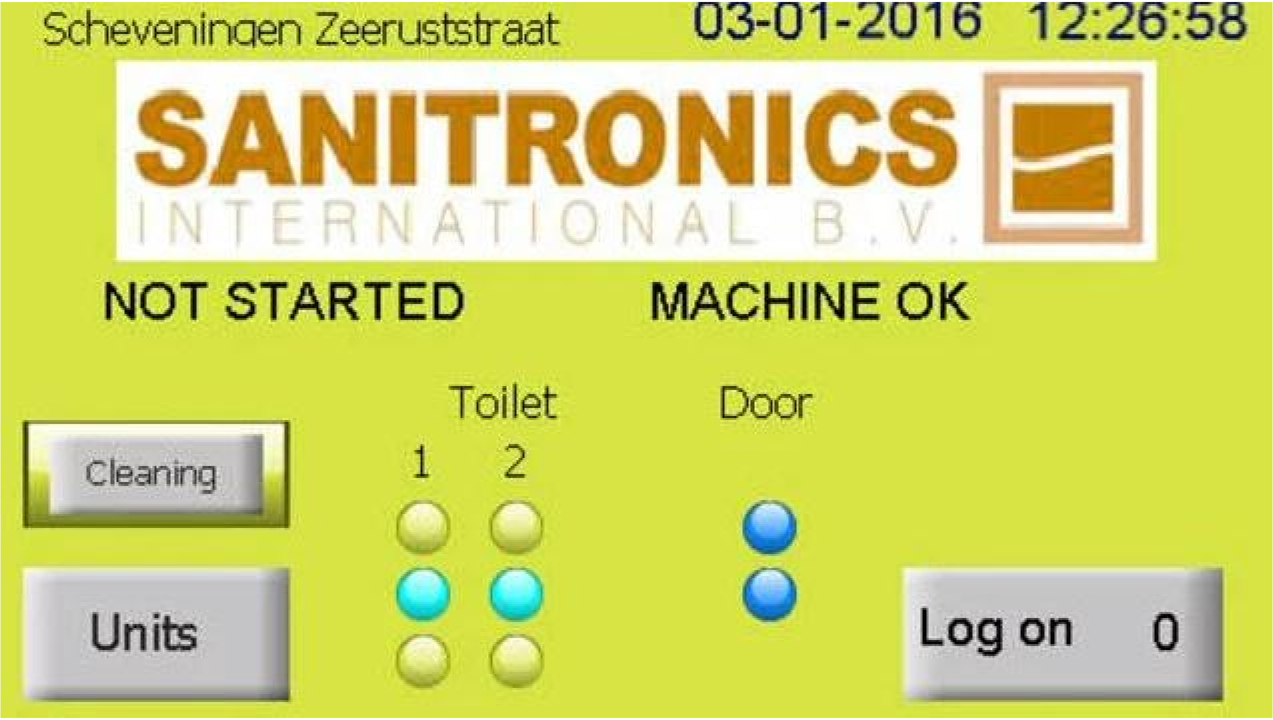
System Hardening

Q: What is Hardening?

Q: Why Hardening?

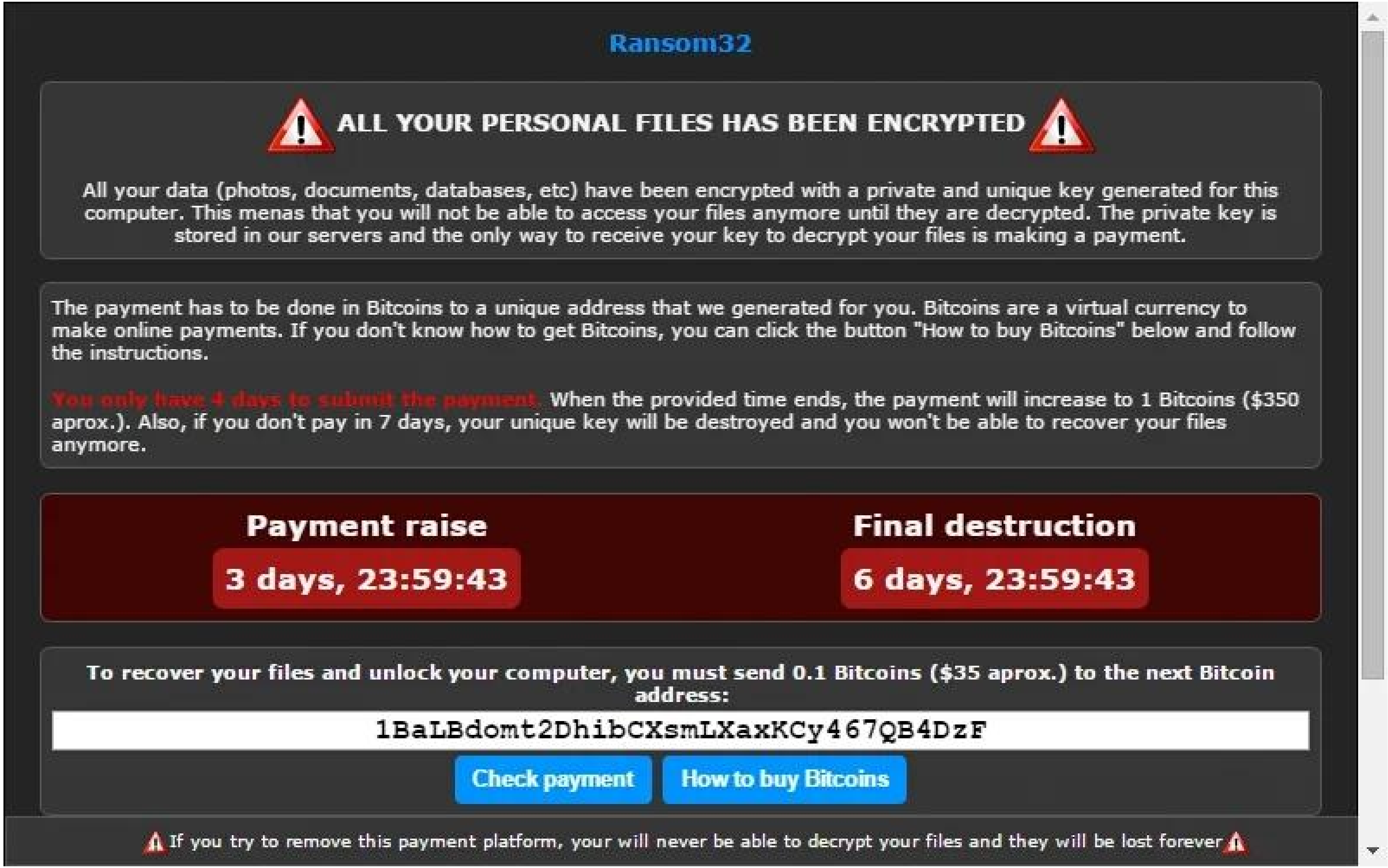
North-South
Road
Isenga
Dunla
WESTFOLD
Emnet
East
Emnet

Q: What if we don’t?



Scheveningen Zeeruststraat 03-01-2016 12:26:58

NOT STARTED MACHINE OK



Ransom32

⚠ ALL YOUR PERSONAL FILES HAS BEEN ENCRYPTED ⚠

All your data (photos, documents, databases, etc) have been encrypted with a private and unique key generated for this computer. This menas that you will not be able to access your files anymore until they are decrypted. The private key is stored in our servers and the only way to receive your key to decrypt your files is making a payment.

The payment has to be done in Bitcoins to a unique address that we generated for you. Bitcoins are a virtual currency to make online payments. If you don't know how to get Bitcoins, you can click the button "How to buy Bitcoins" below and follow the instructions.

You only have 4 days to submit the payment. When the provided time ends, the payment will increase to 1 Bitcoins ($350 aprox.). Also, if you don't pay in 7 days, your unique key will be destroyed and you won't be able to recover your files anymore.

Payment raise

3 days, 23:59:43

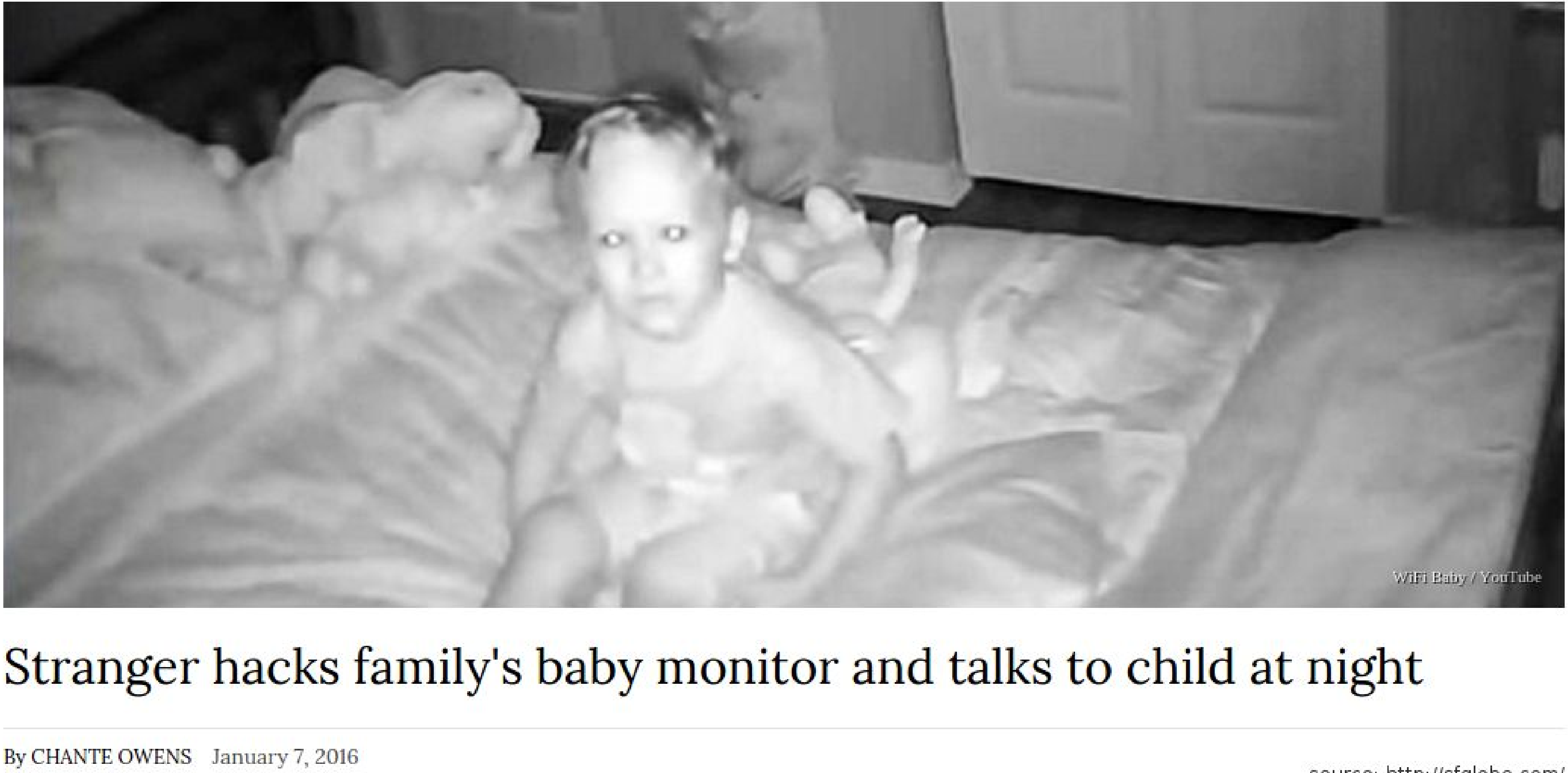
Final destruction

6 days, 23:59:43

To recover your files and unlock your computer, you must send 0.1 Bitcoins ($35 aprox.) to the next Bitcoin address:

1BaLBdomt2DhibCXsmLXaxKCy467QB4DzF

⚠ If you try to remove this payment platform, your will never be able to decrypt your files and they will be lost forever ⚠

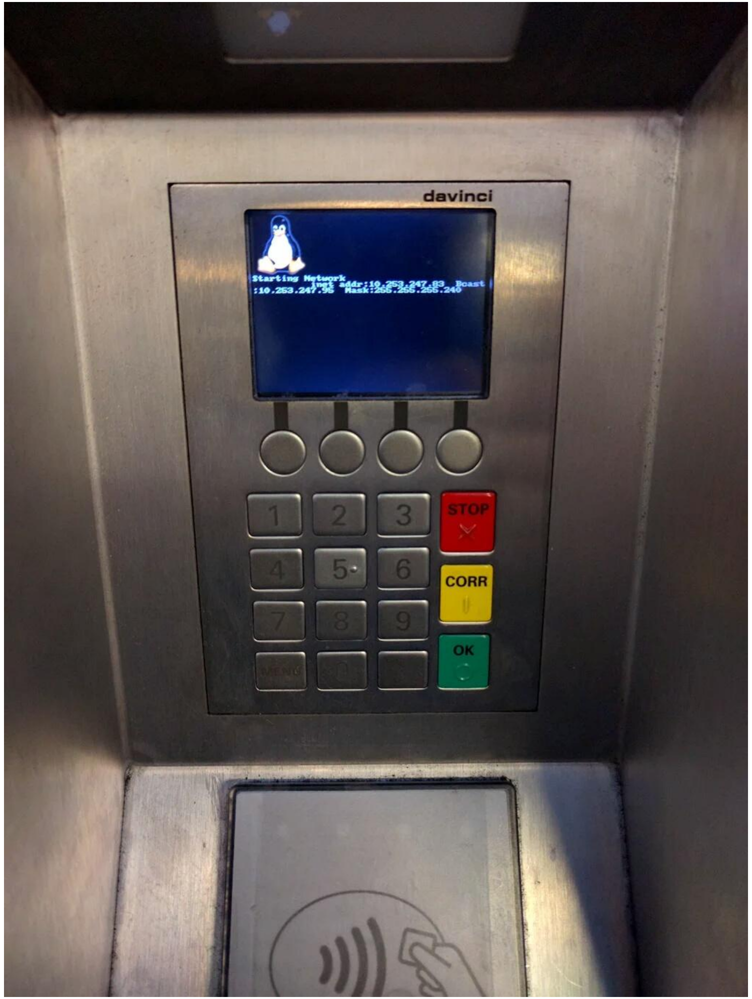


WiFi Baby / YouTube

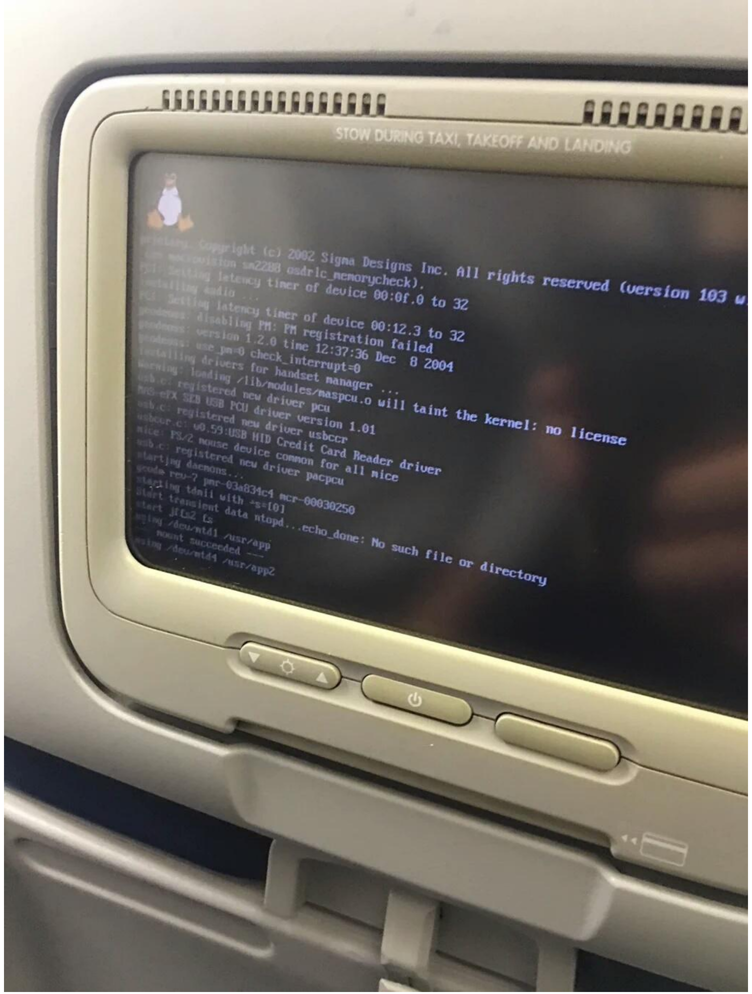
Stranger hacks family's baby monitor and talks to child at night

By CHANTE OWENS January 7, 2016

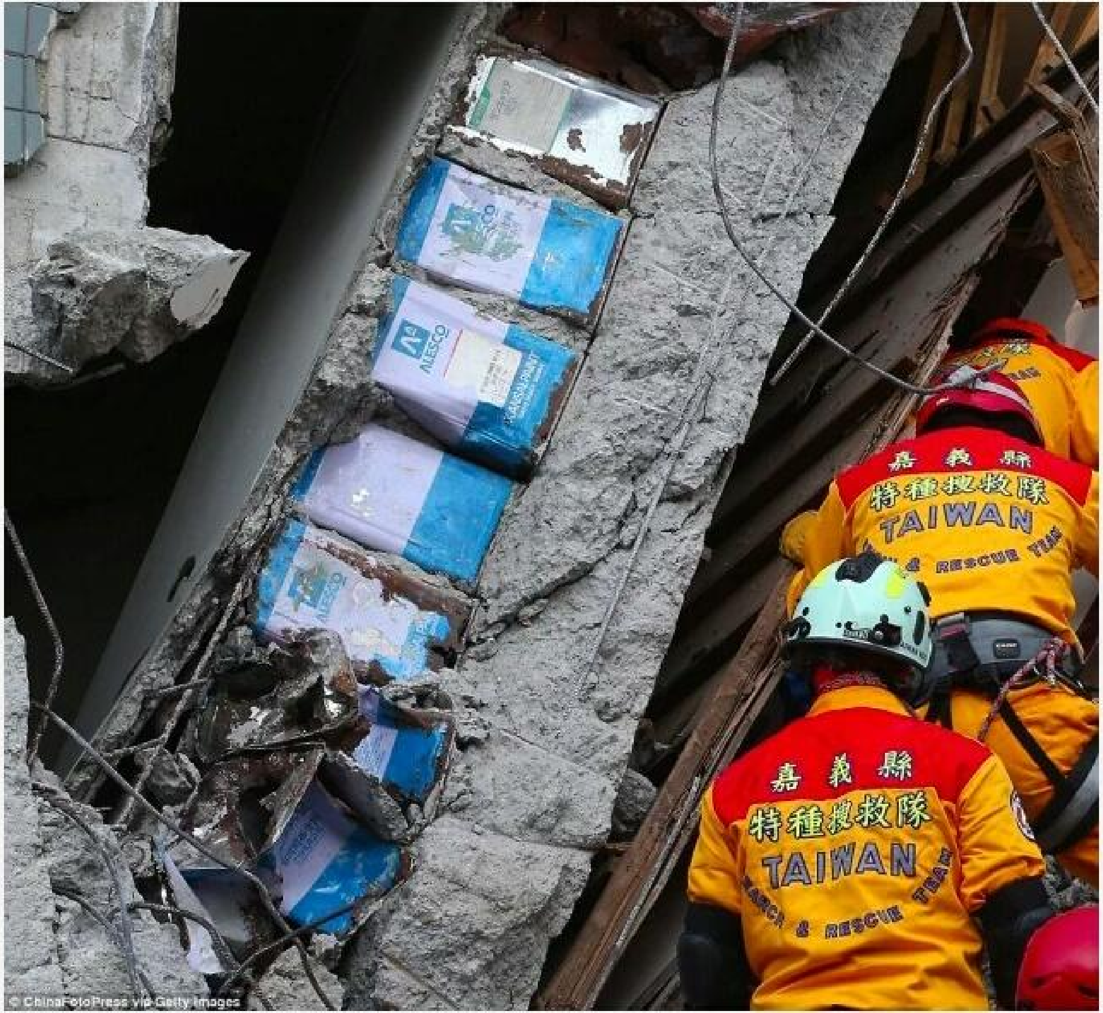
source: http://sfglobe.com/



```
Starting Network
            inet addr:10.253.247.83  Bcast
:10.253.247.95  Mask:255.255.255.240
```

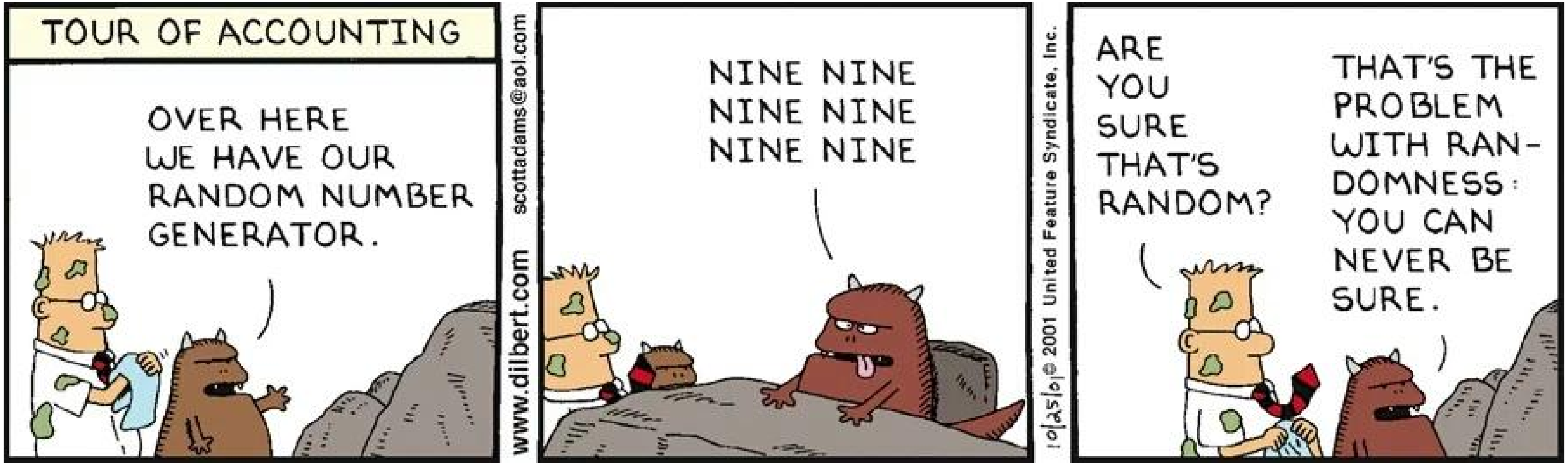


```
[illegible] Copyright (c) 2002 Sigma Designs Inc. All rights reserved (version 103 w
[illegible] sm2288 osdrlc_memorycheck).
PCI: Setting latency timer of device 00:0f.0 to 32
Installing audio ...
PCI: Setting latency timer of device 00:12.3 to 32
[illegible]: disabling PM: PM registration failed
[illegible]: version 1.2.0 time 12:37:36 Dec  8 2004
[illegible]: use_pm=0 check_interrupt=0
Installing drivers for handset manager ...
Warning: loading /lib/modules/maspcu.o will taint the kernel: no license
usb.c: registered new driver pcu
MAS-eFX SEB USB PCU driver version 1.01
usb.c: registered new driver usbccr
usbccr.c: v0.59:USB HID Credit Card Reader driver
mice: PS/2 mouse device common for all mice
usb.c: registered new driver pacpcu
starting daemons...
geode rev-7 pmr-03a834c4 mcr-00030250
starting tdmil with -s=[0]
Start transient data ntopd...echo_done: No such file or directory
start jffs2 fs
using /dev/mtd1 /usr/app
    mount succeeded ---
using /dev/mtd4 /usr/app2
```



© ChinaFotoPress via Getty Images

Tin cans within the structural columns in the Weiguan Jinlong apartment complex in Taiwan (via China Foto Press)


TOUR OF ACCOUNTING
OVER HERE WE HAVE OUR RANDOM NUMBER GENERATOR.
scottadams@aol.com
www.dilbert.com
NINE NINE NINE NINE NINE NINE
10/25/01 © 2001 United Feature Syndicate, Inc.
ARE YOU SURE THAT'S RANDOM?
THAT'S THE PROBLEM WITH RANDOMNESS: YOU CAN NEVER BE SURE.

Hardening Basics

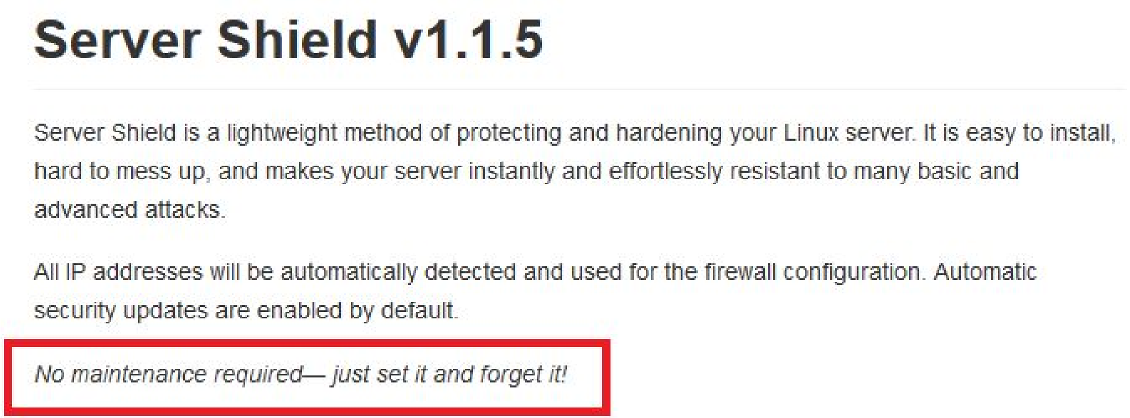
Hardening

- New defenses
- Existing defenses
- Reduce weaknesses (attack surface)

Photo Credits: http://commons.wikimedia.org/wiki/User:Wilson44691

Myth

After hardening I’m done



Server Shield v1.1.5

Server Shield is a lightweight method of protecting and hardening your Linux server. It is easy to install, hard to mess up, and makes your server instantly and effortlessly resistant to many basic and advanced attacks.

All IP addresses will be automatically detected and used for the firewall configuration. Automatic security updates are enabled by default.

No maintenance required— just set it and forget it!

Fact

- Security is an **ongoing process**
- It is **never finished**
- New attacks = **more hardening**
    - POODLE
    - Hearthbleed

Hardening

What to harden?

- Operating System
- Software + Configuration
- Access controls

Hardening

Operating System

- Packages
- Services
- Configuration

Hardening

Software

- Minimal installation
- Configuration
- Permissions

Hardening

Access Controls

- Who can access what
- Password policies
- Accountability

Hardening

Encryption

- **Good**: Encryption solves a lot
- **Bad**: Knowledge required
- **Ugly**: Easy to forget, or do it incorrectly

Technical Auditing

Auditing

Why audit?

- Checking defenses
- Assurance
- Quality Control

Common Strategy

1. Audit
2. Get a lot of findings
3. Start hardening
4. …….
5. **Quit**

Improved Strategy

1. Focus
2. Audit
3. Focus
4. Harden
5. **Repeat!**

Hardening Resources

Options

- Guides
- Tools (SCAP / Lynis)
- Other resources

Hardening Guides

- Center for Internet Security (CIS)
- NIST / NSA
- OWASP
- Vendors

Hardening Guides

Pros

Free to use

Detailed

You are in control

Cons

Time intensive

Usually no tooling

Limited distributions

Delayed releases

Missing follow-up

Tooling

Tools

Tools make life easier, right?

Not always...

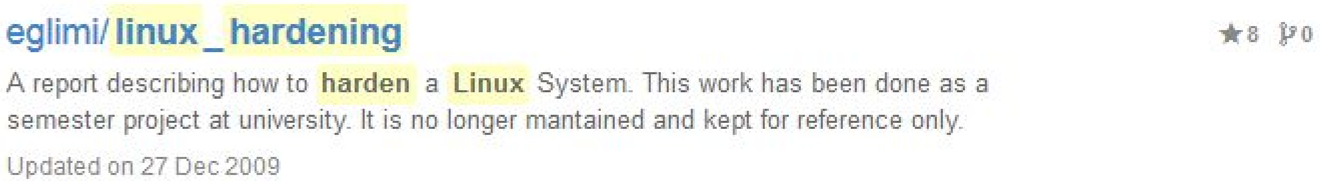
Tools

Problem:

There aren’t many *good* tools

Tools

Cause 1: Usually outdated



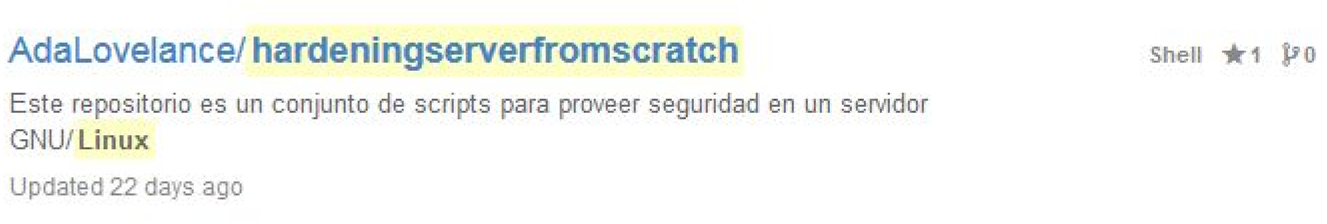
eglimi/linux_hardening ★ 8 ⑂ 0

A report describing how to **harden** a **Linux** System. This work has been done as a semester project at university. It is no longer mantained and kept for reference only.

Updated on 27 Dec 2009

Tools

Cause 2: Limited in their support



AdaLovelance/ hardeningserverfromscratch

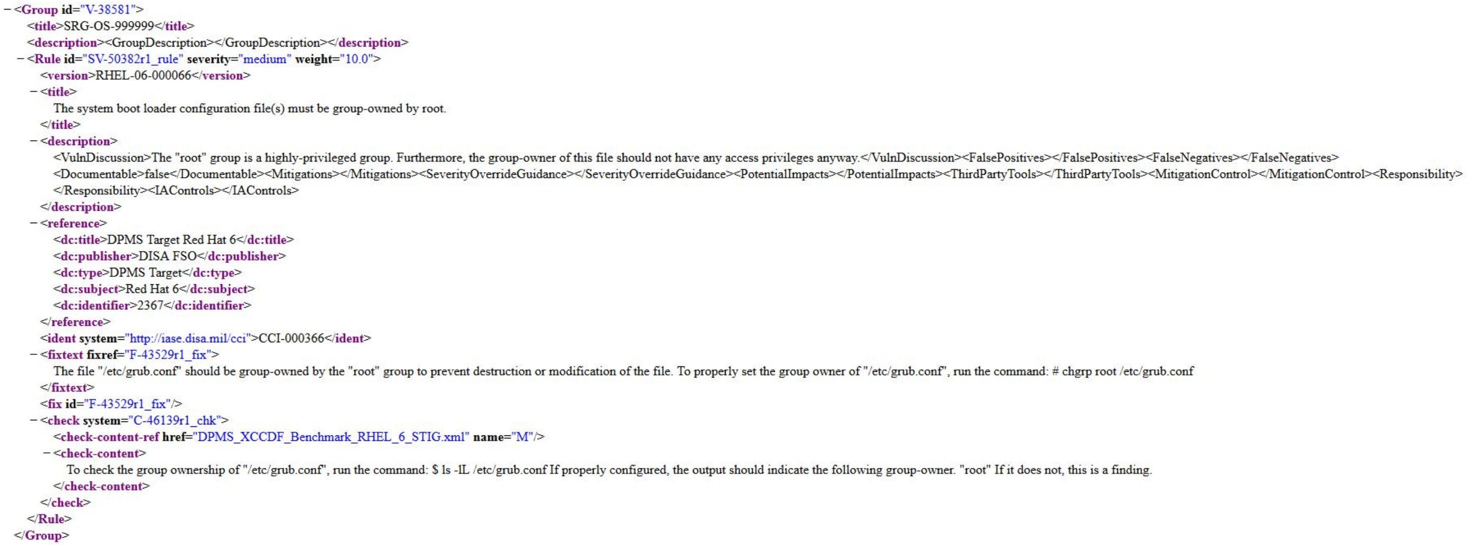
Shell ★1 ⑂0

Este repositorio es un conjunto de scripts para proveer seguridad en un servidor GNU/Linux

Updated 22 days ago

Tools

Cause 3: Hard to use



```
- <Group id="V-38581">
    <title>SRG-OS-999999</title>
    <description><GroupDescription></GroupDescription></description>
  - <Rule id="SV-50382r1_rule" severity="medium" weight="10.0">
      <version>RHEL-06-000066</version>
    - <title>
        The system boot loader configuration file(s) must be group-owned by root.
      </title>
    - <description>
        <VulnDiscussion>The "root" group is a highly-privileged group. Furthermore, the group-owner of this file should not have any access privileges anyway.</VulnDiscussion><FalsePositives></FalsePositives><FalseNegatives></FalseNegatives>
        <Documentable>false</Documentable><Mitigations></Mitigations><SeverityOverrideGuidance></SeverityOverrideGuidance><PotentialImpacts></PotentialImpacts><ThirdPartyTools></ThirdPartyTools><MitigationControl></MitigationControl><Responsibility>
        </Responsibility><IAControls></IAControls>
      </description>
    - <reference>
        <dc:title>DPMS Target Red Hat 6</dc:title>
        <dc:publisher>DISA FSO</dc:publisher>
        <dc:type>DPMS Target</dc:type>
        <dc:subject>Red Hat 6</dc:subject>
        <dc:identifier>2367</dc:identifier>
      </reference>
      <ident system="http://iase.disa.mil/cci">CCI-000366</ident>
    - <fixtext fixref="F-43529r1_fix">
        The file "/etc/grub.conf" should be group-owned by the "root" group to prevent destruction or modification of the file. To properly set the group owner of "/etc/grub.conf", run the command: # chgrp root /etc/grub.conf
      </fixtext>
      <fix id="F-43529r1_fix"/>
    - <check system="C-46139r1_chk">
        <check-content-ref href="DPMS_XCCDF_Benchmark_RHEL_6_STIG.xml" name="M"/>
      - <check-content>
          To check the group ownership of "/etc/grub.conf", run the command: $ ls -lL /etc/grub.conf If properly configured, the output should indicate the following group-owner. "root" If it does not, this is a finding.
        </check-content>
      </check>
    </Rule>
  </Group>
```

Tool 1: SCAP

SCAP

- **S**ecurity
- **C**ontent
- **A**utomation
- **P**rotocol

SCAP

Combination of:

- Markup
- Rules
- Tooling
- Scripts

SCAP features

- Common Vulnerabilities and Exposures (CVE)
- Common Configuration Enumeration (CCE)
- Common Platform Enumeration (CPE)
- Common Vulnerability Scoring System (CVSS)
- Extensible Configuration Checklist Description Format (XCCDF)
- Open Vulnerability and Assessment Language (OVAL)

Starting with SCAP version 1.1

- Open Checklist Interactive Language (OCIL) Version 2.0

Starting with SCAP version 1.2

- Asset Identification
- Asset Reporting Format (ARF)
- Common Configuration Scoring System (CCSS)
- Trust Model for Security Automation Data (TMSAD)

Complexity?

List of Tables (Common Configuration Scoring System (CCSS))

Table 1. Access Vector Scoring Evaluation 8
Table 2. Authentication Scoring Evaluation 9
Table 3. Access Complexity Scoring Evaluation..10
Table 4. Confidentiality Impact Scoring Evaluation..11
Table 5. Integrity Impact Scoring Evaluation 12
Table 6. Availability Impact Scoring Evaluation 12
Table 7. General Exploit Level Scoring Evaluation...13
Table 8. General Remediation Level Scoring Evaluation 14
Table 9. Local Vulnerability Prevalence Scoring Evaluation...15
Table 10. Perceived Target Value Scoring Evaluation 15
Table 11. Local Remediation Level Scoring Evaluation..16
Table 12. Collateral Damage Potential Scoring Evaluation 17

SCAP Overview

Pros

Free to use

Focused on automation

Cons

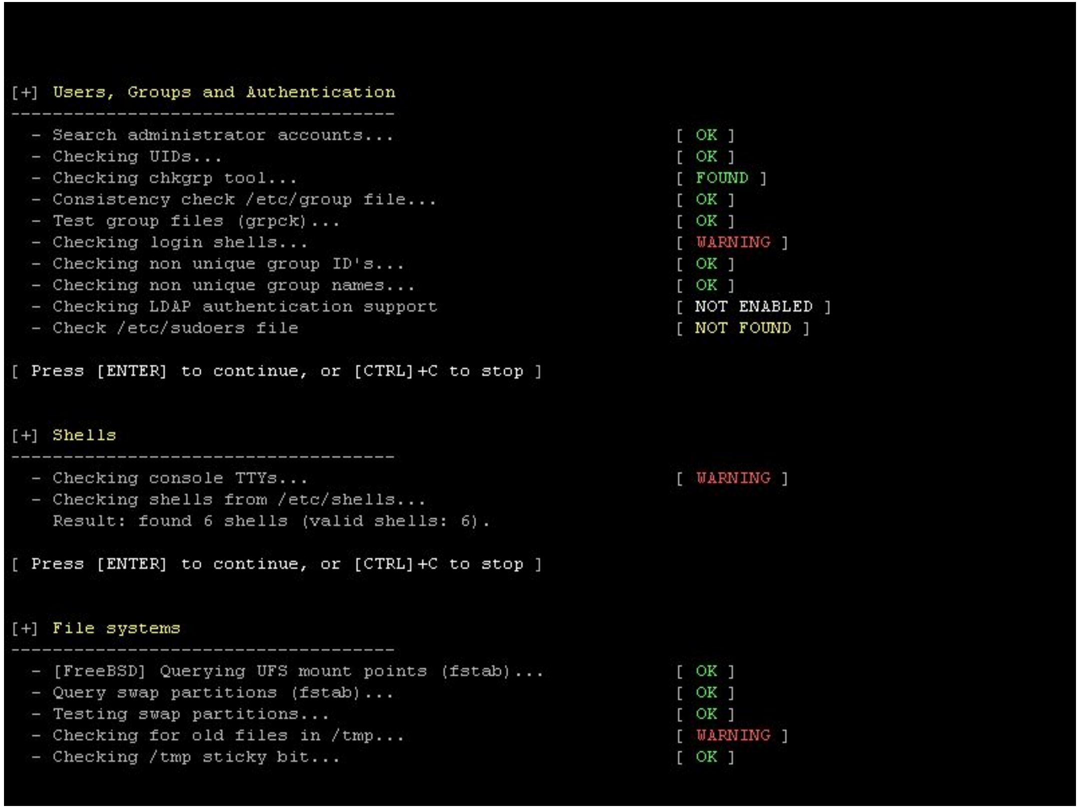
Limited distributions

Complexity

Hard to customize

Tool 2: Lynis

Lynis



```
[+] 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 ]
```

Lynis

Goals

- In-depth security scan
- Quick and easy to use
- Define next hardening steps

Lynis

Background

- Since 2007
- Goals
    - Flexible
    - Portable

Lynis

Open Source Software

- GPLv3
- Shell
- Community

Lynis

Simple

- No installation needed
- Run with just one parameter
- No configuration needed

Lynis

Flexibility

- No dependencies*
- Can be easily extended
- Custom tests

* Besides common tools like awk, grep, ps

Lynis

Portability

- Run on all Unix platforms
- Detect and use “on the go”
- Usable after OS version upgrade

How it works

1. Initialise
2. OS detection
3. Detect binaries
4. Run helpers/plugins/tests
5. Show report

Running

1. lynis
2. lynis audit system
3. lynis audit system --quick
4. lynis audit system --quick --quiet

Demo?

Conclusions

1. Know your crown jewels (properly)
2. Determine hardening level
3. Perform regular checks

Success!

You finished this presentation

Learn more?

Follow

● Blog	Linux Audit (linux-audit.com)
● Twitter	@mboelen

This presentation can be found on michaelboelen.com