Welcome to

# It-sikkerhedsupdate

## 2019

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Slides are available as PDF, kramse@Github
it-sikkerhedsupdate-2019.tex in the repo security-courses

slides are available on Github

# Formålet idag


Hvad skal en ansvarlig it-sikkerhedsstrategi være for 2019. Hvilke emner er de vigtigste, og hvad er truslerne, hvis man ikke straks kommer i gang med de 10 vigtigste punkter.

- Planen for idag:
- 4 timer, med pauser
- Mindre præsentation, mere dialog
- Inspiration til at løse opgaverne, prioritere opgaverne
- ... har desværre ikke løsningerne til allesammen skræddersyet til jer

# Happy New Year 2019

.

- Same problems
- Repeat last year?
- ... or try something new!
- 2019 will become a nightmare of break-ins and data leaks
- GDPR is here and the snow ball is rolling

**Try not to panic, but there are lots of threats**

# Hackers don’t give a shit

Your system is only for testing, development, ...

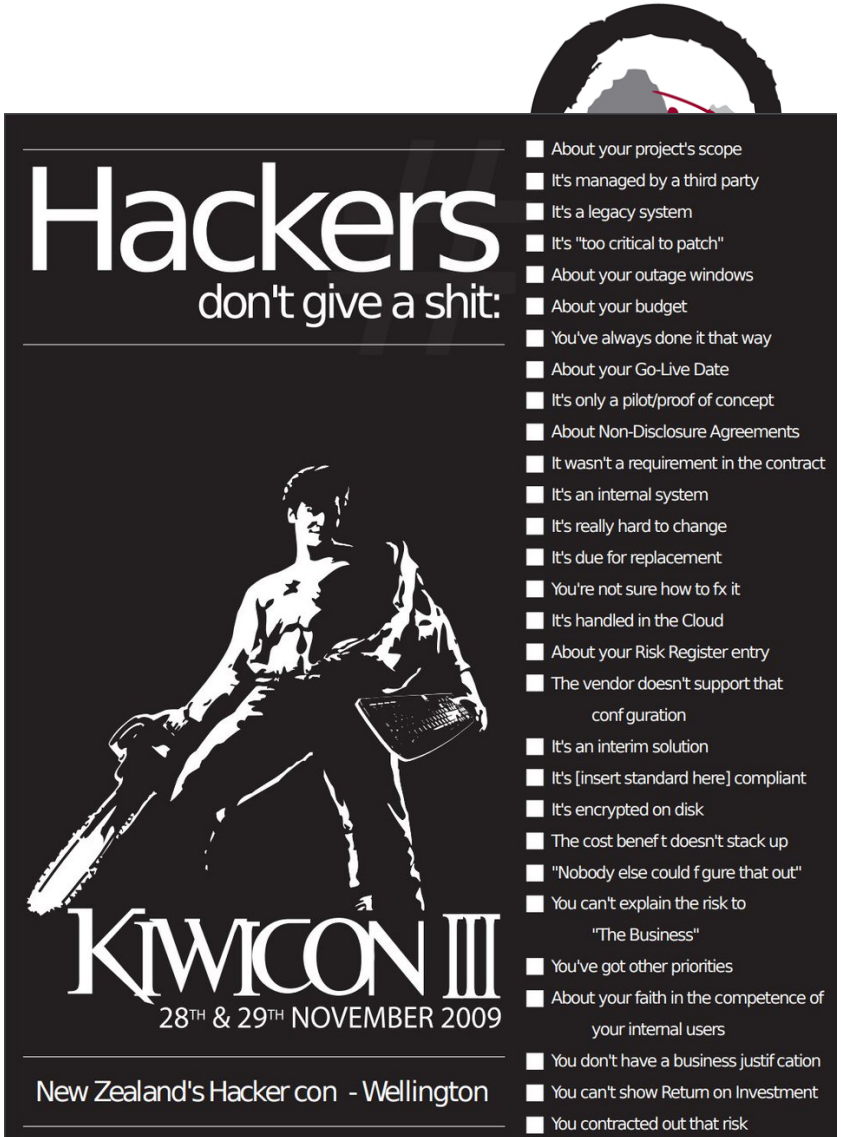
Your network is a research network, under construction, being phased out, ...

Try something new, go to your management

Bring all the exceptions, all of them, update the risk analysis figures - if this happens it is about 1mill DKK

Ask for permission to go full monty on your security

**Think like attackers - don’t hold back**

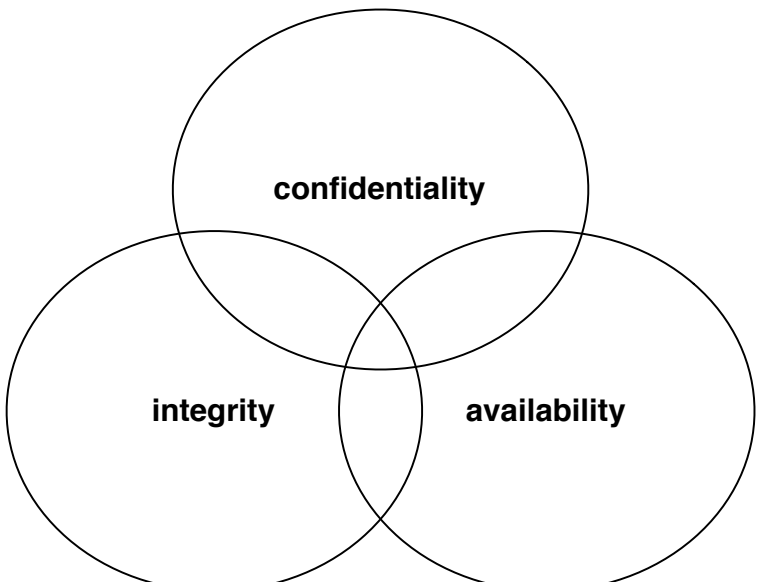


# Fokus 2019

- Brugerstyring
- Asset management
- Laptop sikkerhed
- VPN alle steder
- Penetration testing
- Firewalls og segmentering
- TLS og VPN indstillinger
- DNS og email
- Syslog
- Incident Response og reaktion

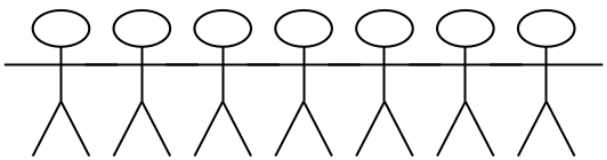
Håber ikke I er alene om det, ellers vælg et par stykker ad gangen

# Fokus 2019: Brugerstyring




- Relevant for alle organisationer
- Er måden vi sikrer godkendte brugere kan udføre opgaver
- Kodeord bruges til at forhindre uautoriseret adgang

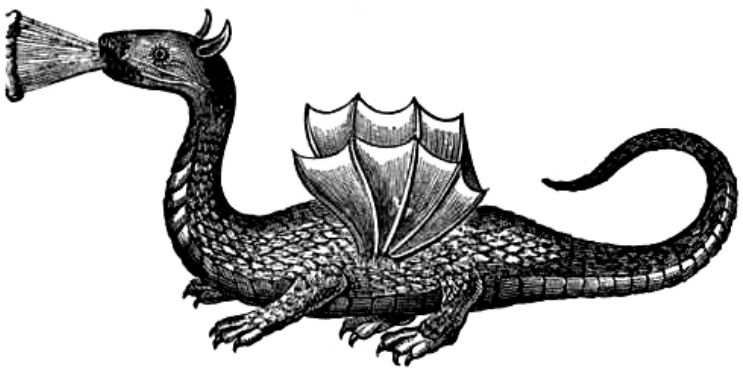
# Brugerstyring



- Har I styr på brugerid?
- Hvor er brugere oprettet?
- Hvor hurtigt kan I fjerne "een brugerdeaktivere en bruger"alle steder!
- Er det et kludetæppe - ja, mange steder er det

**Du er FYRET!!!!!**

# Local administrator?



- Findes der systemer som er helt åbne, med lokal administrator
- Er det stadig nødvendigt

# Centraliseret brugerstyring

Active Directory, mange danske virksomheder bruger det

LDAP central brugerstyring

... men brug det endnu mere

- Konfigurer applikationer til central styring
- Fjern applikationer som ikke tillader central styring
- Overvågning på fejlslagne logins, og godkendte logins

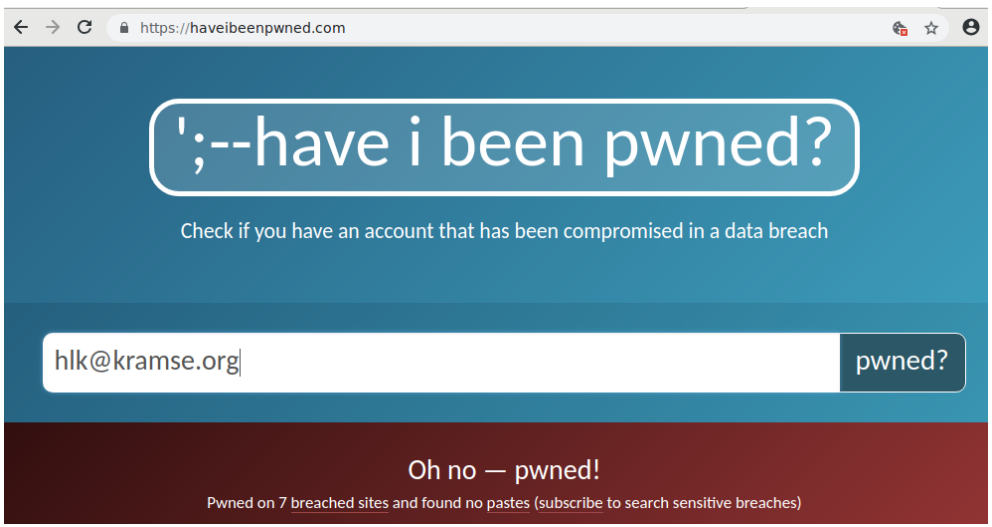
Generelt minimer brugere andre steder end i den centrale database

Hvad med ILO, DRAC, temperaturovervågning - en fælles password database, med begrænset adgang, måske?

# Passwords vælges ikke tilfældigt


Source: `https://wpengine.com/unmasked/`

# Your data has already have been owned by criminals




Your data is already being sold, and resold on the Internet

Stop reusing passwords, use a password safe to generate and remember

Check you own email addresses on `https://haveibeenpwned.com/`

Go ahead try the web site - hold up your hand if you are in those dumps

# Brug mere sikre passwords

Pwned Passwords overview

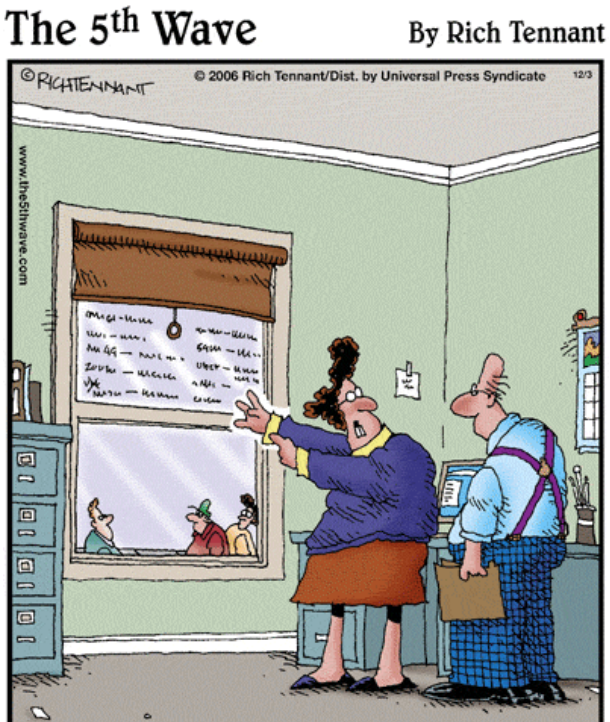
Pwned Passwords are more than half a billion passwords which have previously been exposed in data breaches. The service is detailed in the launch blog post then further expanded on with the release of version 2. The entire data set is both downloadable and searchable online via the Pwned Passwords page.

I kan forhindre brugere i at vælge passwords der ALLEREDE er lækket

I kan bruge deres API eller download

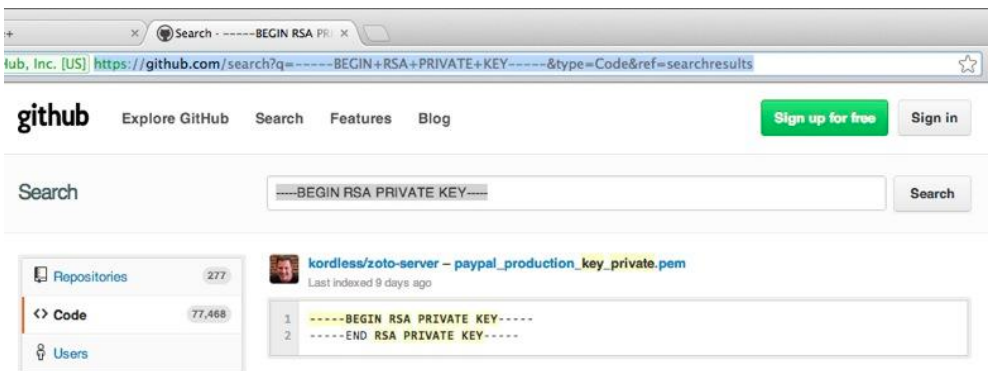
`https://www.troyhunt.com/introducing-306-million-freely-downloadable-pwned-passwords/`

# Formål: sund paranoia - Opbevaring af passwords




"Don't be silly — of course my passwords are safe. I keep them written on my window, but then I pull the shade if anyone walks in the room."

# Github Public passwords?




Sources:

https://twitter.com/brianaker/status/294228373377515522

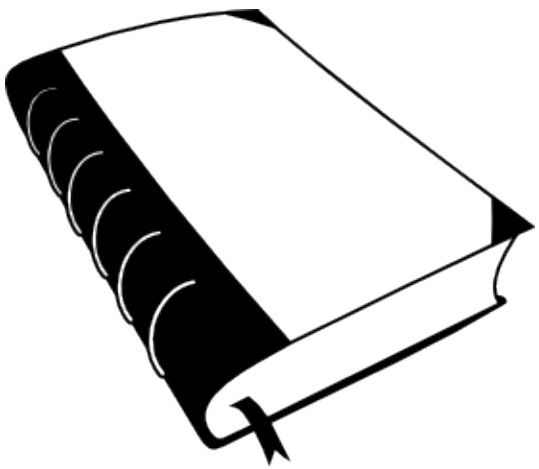
http://www.webmonkey.com/2013/01/users-scramble-as-github-search-exposes-passwords-security-details/

http://www.leakedin.com/

http://www.offensive-security.com/community-projects/google-hacking-database/

Use different passwords for different sites, yes - every site!

# Fokus 2019: Asset management



Free graphics by Lumen Design Studio

- Specielt relevant for mellemstore til store organisationer
- Hvilke assets har vi?
- Hvordan sikrer vi at vi ikke mister værdierne

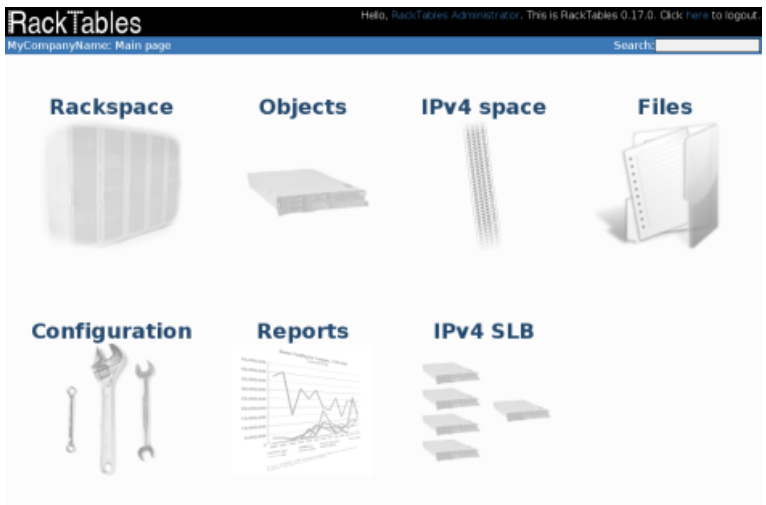
# Hvad er asset management

CIS Control 1:
Inventory and Control of Hardware Assets Actively manage (inventory, track, and correct) all hardware devices on the network so that only authorized devices are given access, and unauthorized and unmanaged devices are found and prevented from gaining access.

Source: `https://www.cisecurity.org/`

- Hardware - både indkøbte, opkoblede, udlånte, stjålne ...
- Software - licenser, indkøb, brug, opgraderingspriser
- Virtuelle arkiver
- ...

# Hardware asset management

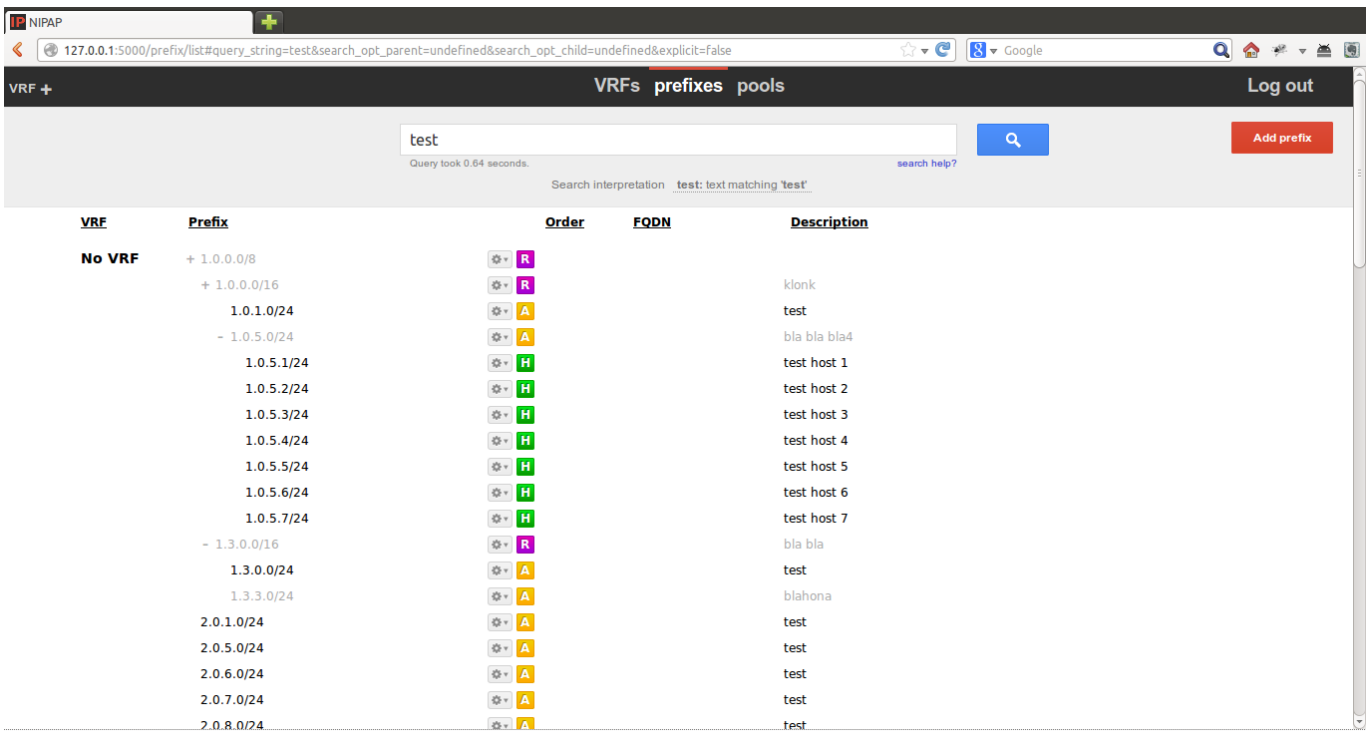



- Der findes mange systermer
- Det anbefales at bruge specialiserede systemer, a la RackTables:
  Have a list of all devices you've got, Have a list of all racks and enclosures, Mount the devices into the racks, Maintain physical ports of the devices and links between them

# Software asset management - virtuelle arkiver


- Software - licenser, indkøb, brug, opgraderingspriser
- Virtuelle maskiner - er en server et asset, eller er det data?
- IP adresser
- Data arkiver - GDPR

# IP Address Management IPAM




- Anbefaler Nipap `http://spritelink.github.io/NIPAP/`

# Har du styr på dependencies

.

- Skal det være helt flot så få også styr på dependencies
- Er jeres produktion afhængig af andres moduler, biblioteker osv.
- Tænk tilbage til Heartbleed, gik flere år før de sidste opdateringer kom

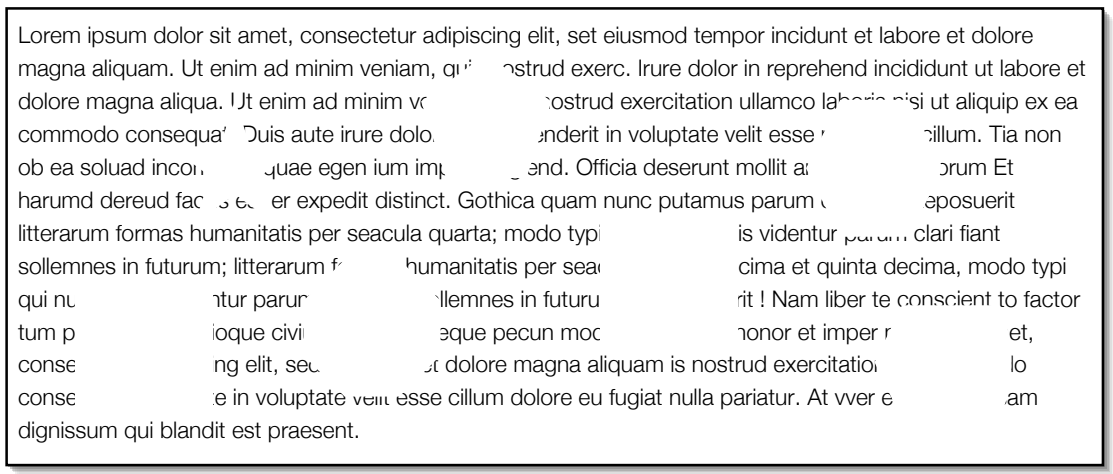
# Fokus 2019: Laptop sikkerhed

- Relevant for alle
- Hvordan sikrer vi at vi ikke mister værdierne, hardware og data typisk

# Secure Laptops

- Laptops (og mobile enheder)
- Hvad kendetegner en laptop?
- Hardware naturligvis, en Macbook koster officielt mere end en brugt mellemklassebil
- - og husk brugen af laptops
- Er laptops sikre, og hvad betyder det?

# Are your data secure - data at rest




Stolen laptop, tablet, phone - can anybody read your data?

Do you trust ”remote wipe”

How do you in fact wipe data securely off devices, and SSDs?

Encrypt disk and storage devices before using them in the first place!

# Circumvent security - single user mode boot

Unix systems often allows boot into singleuser mode
press command-s when booting Mac OS X

Laptops can often be booted using PXE network or CD boot

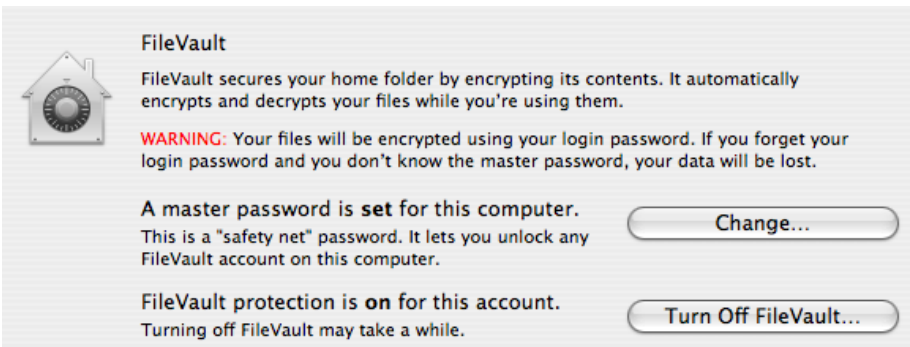
Mac computers can become a Firewire disk
hold t when booting - firewire target mode

Unrestricted access to un-encrypted data

Moving hard drive to another computer is also easy

Physical access is often - **game over**

# Encrypting hard disk




Becoming available in the most popular client operating systems

- Microsoft Windows Bitlocker
- Apple Mac OS X - FileVault
- FreeBSD GEOM og GBDE - encryption framework
- Linux LUKS distributions like Ubuntu ask to encrypt home dir during installation
- Some vendors have BIOS passwords, or disk passwords

# Attacks on disk encryption

Firewire, DMA & Windows, Winlockpwn via FireWire
Hit by a Bus: Physical Access Attacks with Firewire Ruxcon 2006

Removing memory from live system - data is not immediately lost, and can be read under some circumstances
Lest We Remember: Cold Boot Attacks on Encryption Keys
`http://citp.princeton.edu/memory/`

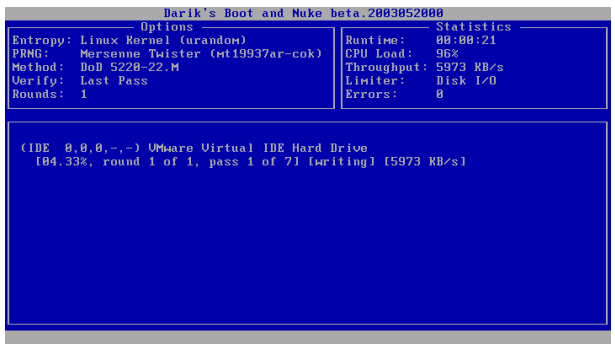
This is very CSI or Hollywoord like - but a real threat

VileFault decrypts encrypted Mac OS X disk image files
`https://code.google.com/p/vilefault/`

FileVault Drive Encryption (FVDE) (or FileVault2) encrypted volumes
`https://code.google.com/p/libfvde/`

So perhaps use both hard drive encryption AND turn off computer after use?

# … and deleting data




Getting rid of data from old devices is a pain

Some tools will not overwrite data, leaving it vulnerable to recovery

Even secure erase programs might not work on SSD - due to reallocation of blocks

I have used Darik's Boot and Nuke ("DBAN") `http://www.dban.org/`

# 2018 attack

| Drive | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Impact |
|---|---|---|---|---|---|---|---|---|---|---|
| Crucial MX100 (all form factors) | ✗ | ✗ | ✗ | | | | | | | ✗ Compromised |
| Crucial MX200 (all form factors) | ✗ | ✗ | ✗ | | | | | | | ✗ Compromised |
| Crucial MX300 (all form factors) | ✓ | ✓ | ✓ | | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ Compromised |
| Samsung 840 EVO (SATA) | ✗ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✗ | ✓ | ∼ Depends |
| Samsung 850 EVO (SATA) | ✗ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ∼ Depends |
| Samsung T3 (USB) | | | | ✗ | | | | | | ✗ Compromised |
| Samsung T5 (USB) | | | | ✗ | | | | | | ✗ Compromised |

[1] Cryptographic binding in ATA Security (High mode)
[2] Cryptographic binding in ATA Security (Max mode)
[3] Cryptographic binding in TCG Opal
[4] Cryptographic binding in proprietary standard
[5] No single key for entire disk
[6] Randomized DEK on sanitize
[7] Sufficient random entropy
[8] No wear leveling related issues
[9] No DEVSLP related issues

*self-encrypting deception: weakness in the encryption of solid state drives (SSDs)*
`https://www.ru.nl/publish/pages/909282/draft-paper.pdf`

# Recommendations - Comply Everywhere, Act Anywhere

**Laptop storage must be encrypted**

Firewall must be enabled

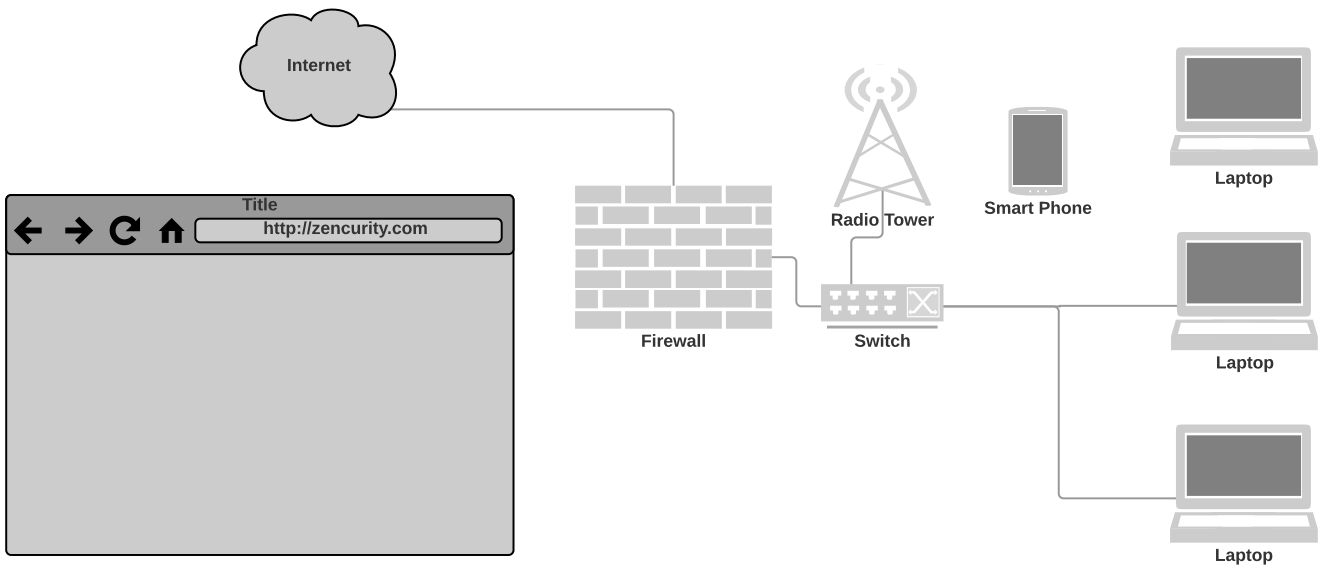
Next suggestion:

- Try sniffing data from a laptop, setup Access Point/Monitor port
- Portscan your laptopging networks - use Nmap
- Write an email to everyone in your organisation:
  "Hi All, we need to identify laptops without full disk encryption
  - come see us, we have christmas cookies left, Best regards IT"

# Fokus 2019: VPN alle steder

- VPN er relevant for alle der har data af værdi
- Sikrer data der flyttes
- Virtual Private Network dækker over klienter der kobler op, og site-2-site

# Your Privacy




- Your data travels far
- Often crossing borders, virtually and literally

# Data found in Network data

Lets take an example, DNS

Domain Name System DNS breadcrumbs

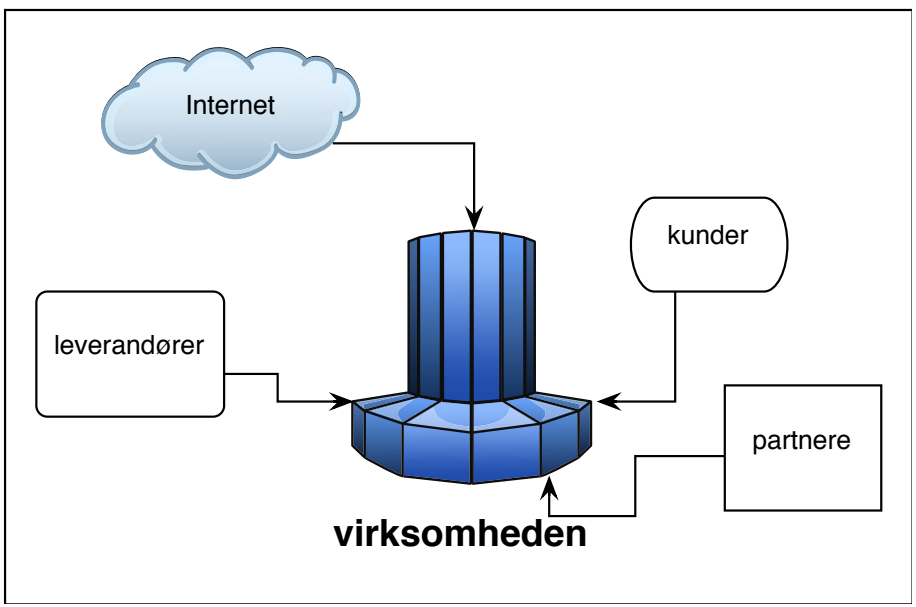
- Your company domain, mailservers, vpn servers
- Applications you use, checking for updates, sending back data
- Web sites you visit

Advice show your users,ask them to participate in a experiment

**Join this Wireless network SSID and we will show you who you are on the internet**

**Maybe use VPN more - or always!**

# Fokus 2019: Penetration testing




- Relevant hvis du driver et netværk, specielt hvis det er forbundet til internet eller stort
- Du bliver hele tiden "testet- internet tinnitus

# Start Attacking from the Inside

- Now imagine you were in control of a company laptop
- Do you have a large internal world wide network?
  Having a large open network may cost you 1.9 billion DKK - ref Maersk
- Try scanning everything, start in a small corner, expand
- Scan all you danish segments, one by one, then the nordic, then the world
- Yes, things may break - FINE, BREAKING is GOOD

**Better to break while we are ready to un-break**

# How to break stuff

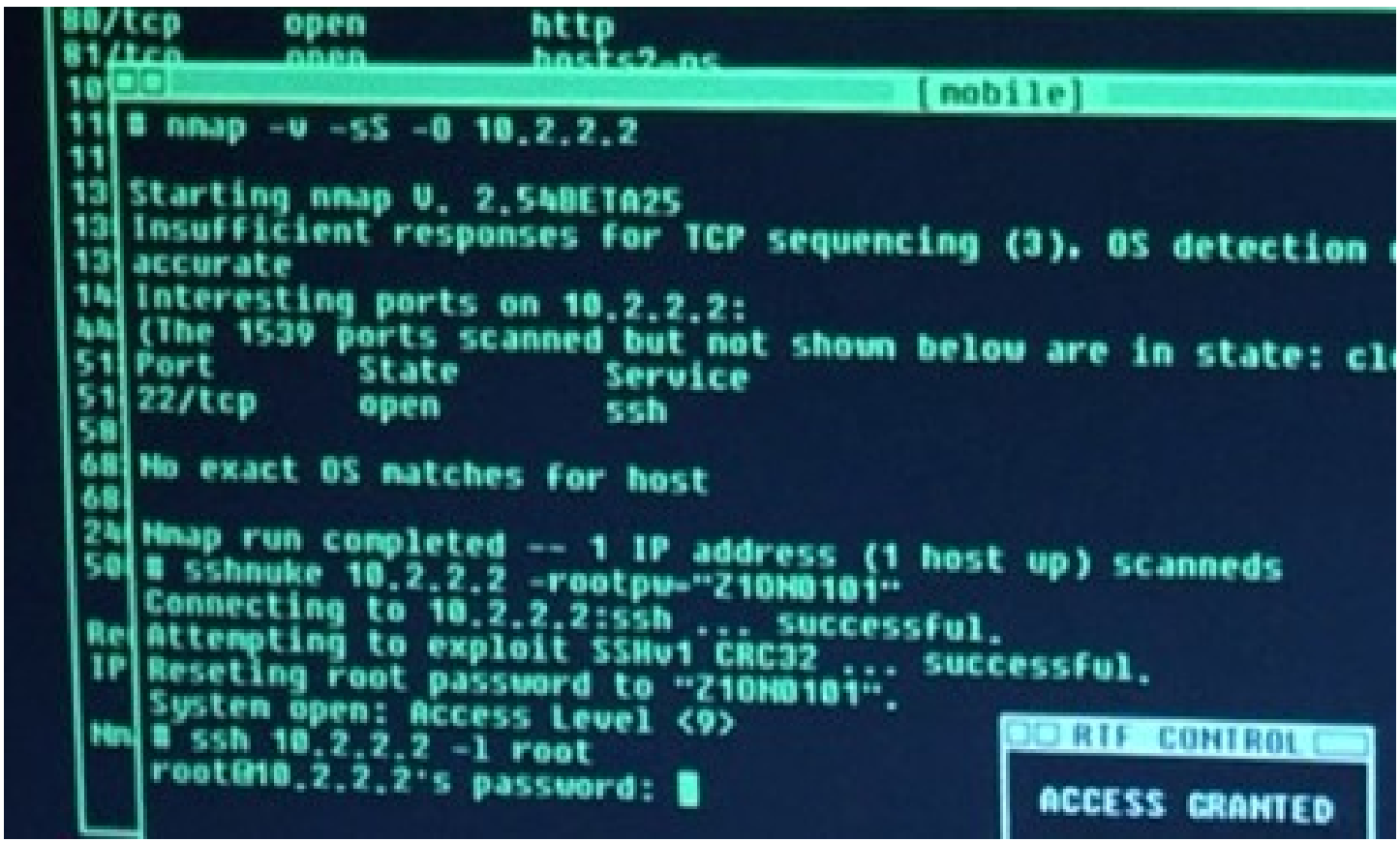
Think like an attacker

I sit here, but where am I connected:

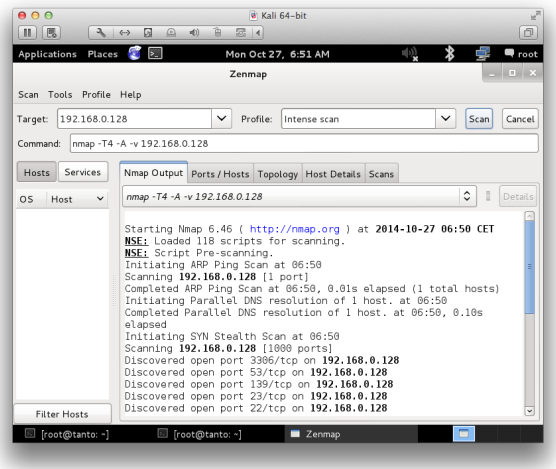
```
reading from file cisco-lldp-1.cap, link-type EN10MB (Ethernet)
16:39:43.468745 LLDP, length 328
        Chassis ID TLV (1), length 7
          Subtype MAC address (4): 70:ff:1a:01:03:02 (oui Unknown)
          0x0000:  0470 ea1a a0b3 2f
        Port ID TLV (2), length 8
          Subtype Local (7): Eth1/47
          0x0000:  0745 7468 312f 3437
        Port Description TLV (4), length 12: Ethernet1/47
          0x0000:  4574 6865 726e 6574 312f 3437
        System Description TLV (6), length 158
          Cisco Nexus Operating System (NX-OS) Software 14.0(2c) TAC support: http://www.cisco.com/tac Copyright (c) 2002-
2020, Cisco Systems, Inc. All rights reserved.
```

I love LLDP, but it does reveal software version, so flaws available

# Nmap the world

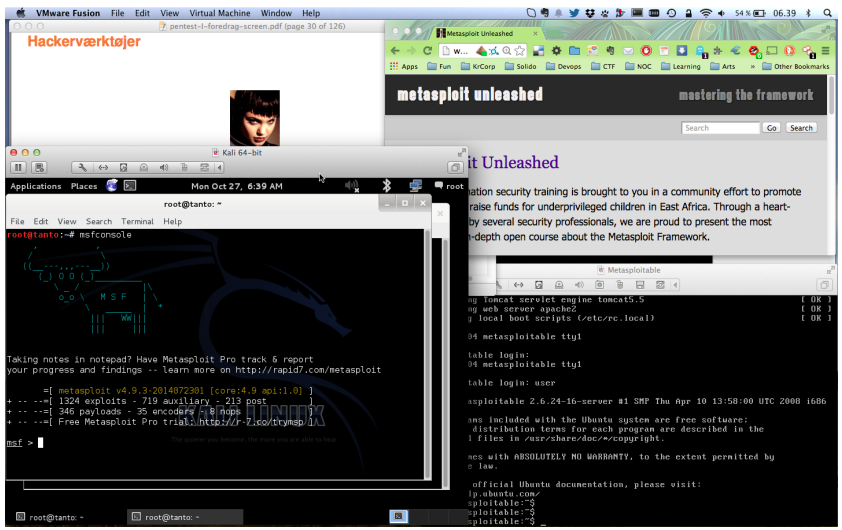


# Really do Nmap your world




- Nmap is a port scanner, but does more
- Finding your own infrastructure available from the guest network?
- See your printers having all the protocols enabled AND a wireless?

# Hackerlab setup

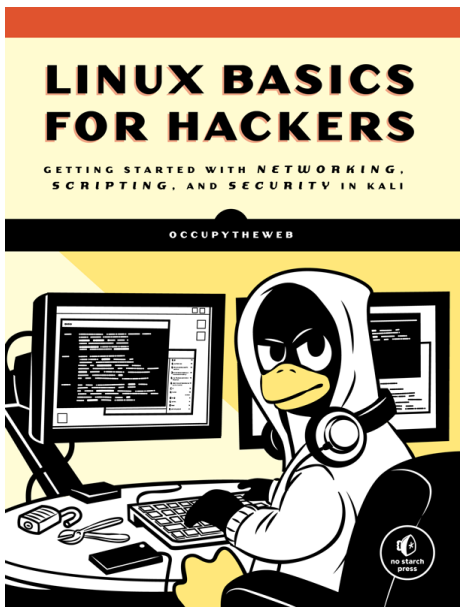



- Create hacker labs, encourage hacker labs!
- Software Host OS: Windows, Mac, Linux
- Virtualisation software: VMware, Virtual box, HyperV pick your poison
- Hackersoftware: Kali Virtual Machine `https://www.kali.org/`

# Hacking is not magic

- Hacking only requires some ninja training
- We have been doing this since 1995 when SATAN was released
- Listen, Plan, Act, Do hacking

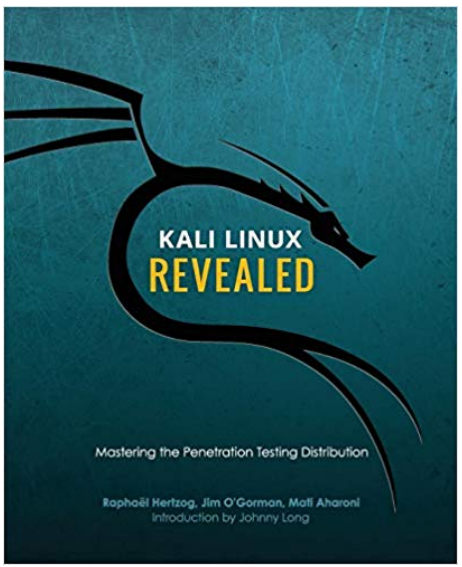
# Book: Linux Basics for Hackers (LBhf)




*Linux Basics for Hackers Getting Started with Networking, Scripting, and Security in Kali* by OccupyTheWeb December 2018, 248 pp. ISBN-13: 9781593278557

`https://nostarch.com/linuxbasicsforhackers`

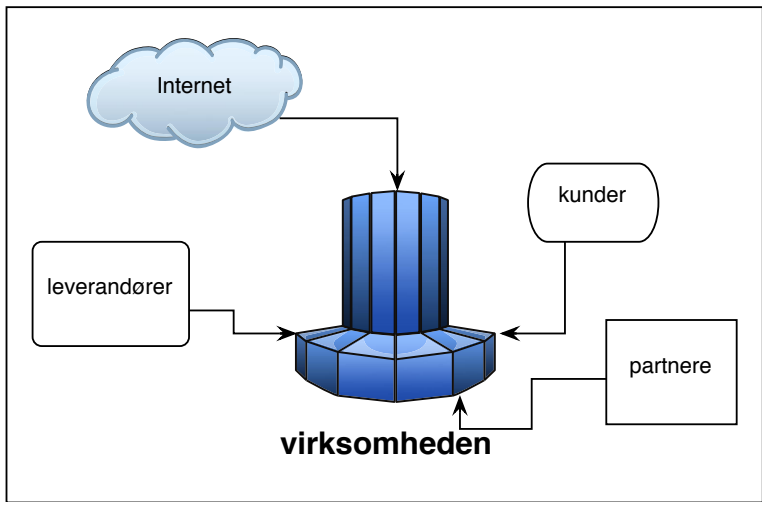
# Book: Kali Linux Revealed (KLR)




*Kali Linux Revealed Mastering the Penetration Testing Distribution*

`https://www.kali.org/download-kali-linux-revealed-book/`
Not curriculum but explains how to install Kali Linux

# Fokus 2019: Firewalls og segmentering

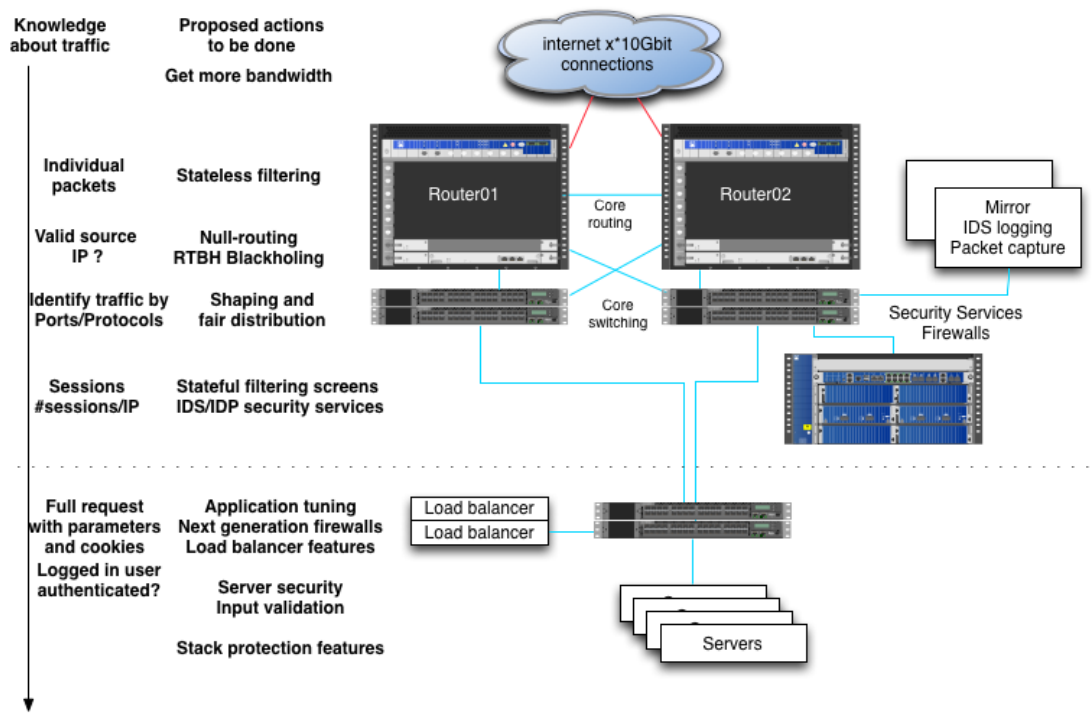



- Hvis du har et netværk, så bør du have en firewall
- En firewall tillader autoriseret trafik og blokerer resten
- Hvornår har du sidst set din løsning efter?
- Hvor lang tid tager det at se en 5.000 linier Cisco ASA config igennem?

# Imagine Attacks from the Inside

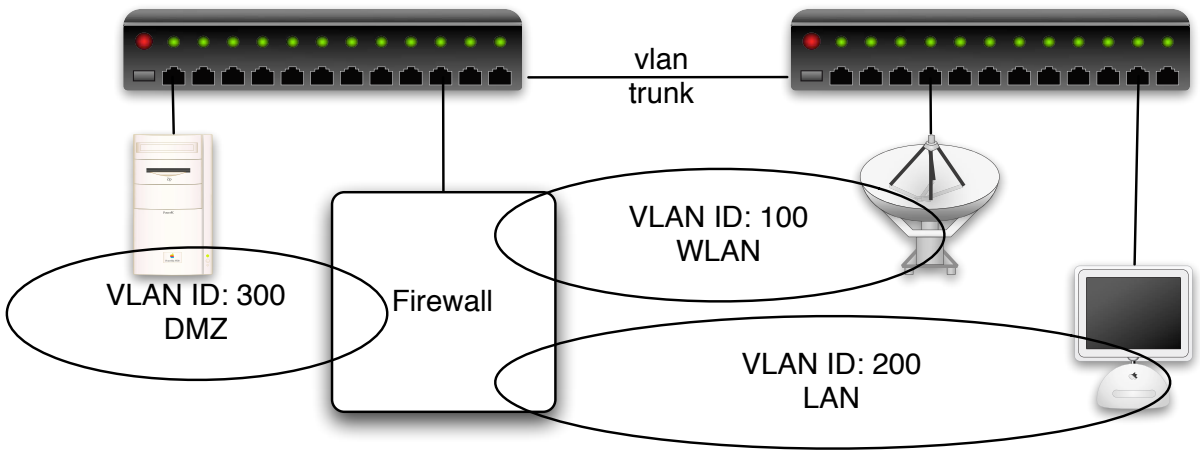
- Now imagine you were in control of a company laptop
- Do you have a large internal world wide network?
  NotPetya cost Maersk about 1.9 billion DKK
- entry thought to be via software update of M.E.Doc [uk] an Ukrainian tax preparation program
- Attackers are very creative and have a large attack surface to most companies

# Big firewalls




Big firewalls are not a single device

# IEEE 802.1q VLANs

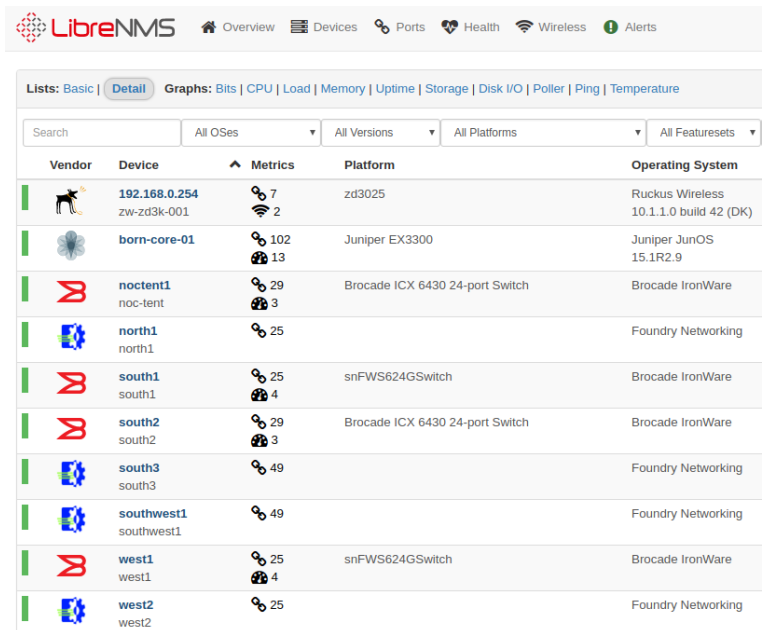



Med 802.1q tillades VLAN tagging på Ethernet niveau

Data skal omkring en firewall eller en router for at krydse fra VLAN1 til VLAN2

VLAN trunking giver mulighed for at dele VLANs ud på flere switches

# Netværk generelt




- Måske også på tide lige at se om der er opdateringer til switche
- Jeg anbefaler LibreNMS `https://www.librenms.org/`

# Fokus 2019: TLS og VPN indstillinger

```
ssl_prefer_server_ciphers on;
ssl_protocols TLSv1 TLSv1.1 TLSv1.2; # not possible to do exclusive
ssl_ciphers 'EDH+CAMELLIA:EDH+aRSA:EECDH+aRSA+AESGCM:EECDH+aRSA+SHA384:EECDH+\
  \aRSA+SHA256:EECDH:+CAMELLIA256:+AES256:+CAMELLIA128:+AES128:+SSLv3:!aNULL:!\
  \eNULL:!LOW:!3DES:!MD5:!EXP:!PSK:!DSS:!RC4:!SEED:!ECDSA:CAMELLIA256-SHA:AES256\
  \-SHA:CAMELLIA128-SHA:AES128-SHA';
add_header Strict-Transport-Security max-age=15768000; # six months
# use this only if all subdomains support HTTPS!
# add_header Strict-Transport-Security "max-age=15768000; includeSubDomains";
```

Listing 2.6: *SSL settings for nginx*
[configuration/Webservers/nginx/default]

- De fleste har https nu, men er det konfigureret optimalt
- Vi bruger også VPN til at forbinde sites, kontorer
- Anbefaler at alle indstillingerne gennemgås!

# SSL og TLS


Oprindeligt udviklet af Netscape Communications Inc.

Secure Sockets Layer SSL er idag blevet adopteret af IETF og kaldes derfor også for Transport Layer Security TLS TLS er baseret på SSL Version 3.0

RFC-2246 The TLS Protocol Version 1.0 fra Januar 1999

RFC-3207 SMTP STARTTLS

Det er svært!

Stanford Dan Boneh udgiver en masse omkring crypto
`https://crypto.stanford.edu/~dabo/cryptobook/`

# Nmap efter SSL og TLS

**Example Usage**

```
nmap -sV -sC <target>
```

**Script Output**

```
443/tcp open   https   syn-ack
| sslv2:
|   SSLv2 supported
|   ciphers:
|     SSL2_DES_192_EDE3_CBC_WITH_MD5
|     SSL2_IDEA_128_CBC_WITH_MD5
|     SSL2_RC2_CBC_128_CBC_WITH_MD5
|     SSL2_RC4_128_WITH_MD5
|     SSL2_DES_64_CBC_WITH_MD5
|     SSL2_RC2_CBC_128_CBC_WITH_MD5
|_    SSL2_RC4_128_EXPORT40_WITH_MD5
```

Nu vi har lært Kali og Nmap at kende

- Find nemt alle ssl version 2 og 3
  `nmap --script ssl-enum-ciphers`
- Brug ssllabs https://www.ssllabs.com/

# sslscan

```
root@kali:~# sslscan --ssl2 web.kramse.dk
Version: 1.10.5-static
OpenSSL 1.0.2e-dev xx XXX xxxx

Testing SSL server web.kramse.dk on port 443
...
  SSL Certificate:
Signature Algorithm: sha256WithRSAEncryption
RSA Key Strength:    2048

Subject:  *.kramse.dk
Altnames: DNS:*.kramse.dk, DNS:kramse.dk
Issuer:   AlphaSSL CA - SHA256 - G2
```

Source: Originally sslscan from http://www.titania.co.uk but use the version on Kali

SSLscan can check your own sites, while Qualys SSLLabs only can test from hostname

# Weak DH paper

## Weak Diffie-Hellman and the Logjam Attack

**Good News!** Your browser is safe against the Logjam attack.

Diffie-Hellman key exchange is a popular cryptographic algorithm that allows Internet protocols to agree on a shared key and negotiate a secure connection. It is fundamental to many protocols including HTTPS, SSH, IPsec, SMTPS, and protocols that rely on TLS.

We have uncovered several weaknesses in how Diffie-Hellman key exchange has been deployed:

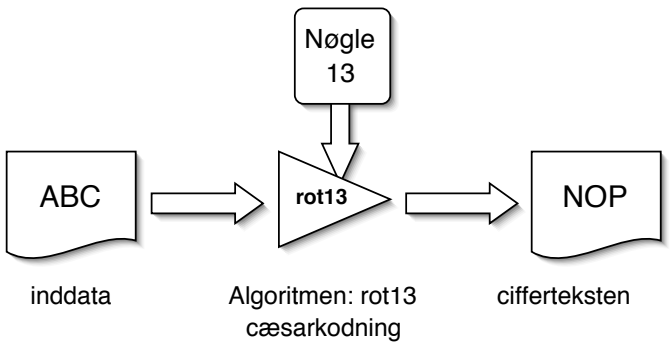
1. **Logjam attack against the TLS protocol.** The Logjam attack allows a man-in-the-middle attacker to downgrade vulnerable TLS connections to 512-bit export-grade cryptography. This allows the attacker to read and modify any data passed over the connection. The attack is reminiscent of the FREAK attack, but is due to a flaw in the TLS protocol rather than an implementation vulnerability, and attacks a Diffie-Hellman key exchange rather than an RSA key exchange. The attack affects any server that supports `DHE_EXPORT` ciphers, and affects all modern web browsers. 8.4% of the Top 1 Million domains were initially vulnerable.

2. **Threats from state-level adversaries.** Millions of HTTPS, SSH, and VPN servers all use the same prime numbers for Diffie-Hellman key exchange. Practitioners believed this was safe as long as new key exchange messages were generated for every connection. However, the first step in the number field sieve—the most efficient algorithm for breaking a Diffie-Hellman connection—is dependent only on this prime. After this first step, an attacker can quickly break individual connections.

   We carried out this computation against the most common 512-bit prime used for TLS and demonstrate that the Logjam attack can be used to downgrade connections to 80% of TLS servers supporting `DHE_EXPORT`. We further estimate that an academic team can break a 768-bit prime and that a nation-state can break a 1024-bit prime. Breaking the single, most common 1024-bit prime used by web servers would allow passive eavesdropping on connections to 18% of the Top 1 Million HTTPS domains. A second prime would allow passive decryption of connections to 66% of VPN servers and 26% of SSH servers. A close reading of published NSA leaks shows that the agency's attacks on VPNs are consistent with having achieved such a break.

Source: `https://weakdh.org/` and
`https://weakdh.org/imperfect-forward-secrecy-ccs15.pdf`

# VPN indstillinger




PPTP, hvis du bruger det så er det godt du er kommet :-D

Check hvert år:

- Certifikater/nøgler - ligesom TLS lange og rulles indimellem
- Algoritmer DES/3DES bye bye, husk både encryption og auth algoritmer
- DH-Group - +15 tak
- Check både client VPN og site-2-site

# Anbefalinger

Use the following guidelines when configuring Internet Key Exchange (IKE) in VPN technologies:
Avoid IKE Groups 1, 2, and 5.
Use IKE Group 15 or 16 and employ 3072-bit and 4096-bit DH, respectively.
When possible, use IKE Group 19 or 20. They are the 256-bit and
384-bit ECDH groups, respectively.
Use AES for encryption.

Paper:
`https://www.cisco.com/c/en/us/about/security-center/next-generation-cryptography.html`

- Certifikater/nøgler - ligesom TLS lange og rulles indimellem
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# Fokus 2019: DNS og email

- Vi er afhængige af email, modtagelse og afsendelse
- Når vi modtager skal det helst gå hurtigt
- Når vi sender skal vi ikke ende i spam mappen
- Phishing, hvem kan sende *fra vores domæne*

# Various key attack types, clients and employees

- Phishing - sending fake emails, to collect credentials
- Spear phishing - targetted attacks
- Person in the middle - sniffing and changing data in transit
- Drive-by attacks - web pages infected with malware, often ad servers
- Malware transferred via USB or email
- Credential Stuffing, Password related, like re-use of password, see slide about being pwned

**If we all wait a bit, and not click links immediately**

Hackers try to create "urgency", click this or loose money

# DNS er mere end navneopslag

består af resource records med en type:

- adresser A-records
- IPv6 adresser AAAA-records
- autoritative navneservere NS-records
- post, mail-exchanger MX-records
- flere andre: md , mf , cname , soa , mb , mg , mr , null , wks , ptr , hinfo , minfo , mx ....

```
        IN      MX      10      mail.zencurity.dk.
        IN      MX      20      mail2.zencurity.dk.
```

# SMTP Simple Mail Transfer Protocol

```
hlk@bigfoot:hlk$ telnet mail.kramse.dk 25
Connected to sunny.
220 sunny.kramse.dk ESMTP Postfix
HELO bigfoot
250 sunny.kramse.dk
MAIL FROM: Henrik
250 Ok
RCPT TO: hlk@kramse.dk
250 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
hejsa
.
250 Ok: queued as 749193BD2
QUIT
221 Bye
```

RFC-821 SMTP Simple Mail Transfer Protocol fra 1982

http://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol

# DNS query log?

Skal vi logge ALLE DNS opslag fra klienter?

- Uetisk?
- Smart hvis man vil spore hvor malware kom ind

# DNSSEC

- 
- 

# DMARC

- SPF
- DKIM
- DMARC

# Fokus 2019: Syslog

- 
- 

- 
- 

# Fokus 2019: Incident Response og reaktion

- 
- 

# Overlapping Security Incidents

New data breaches nearly every week, these from danish news site `version2.dk`

Problem, we need to receive data from others

Data from others may contain malware

Have a job posting, yes
- then HR will be expecting CVs sent as .doc files

or the other way

# Attackers used a LinkedIn job ad and Skype call to breach bank's defences

## The attack

One of these is the Chilean news site's claim that the attack started with a LinkedIn advert offering a developer role to which a Redbanc employee replied.

The attackers set up a Skype call to conduct an interview during which the individual was tricked into downloading a file called ApplicationPDF.exe, sent via a weblink, which subsequently infected the employee's computer.

`https://nakedsecurity.sophos.com/2019/01/21/attackers-used-a-linkedin-job-ad-and-skype-call-to-breach-banks-defences/`

# Spørgsmål og mere debat


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