Welcome to

It-sikkerhedsupdate

2020

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Slides are available as PDF, kramse@Github

it-sikkerhedsupdate-2020-short.tex in the repo security-courses

slides are available on Github

Goal for today

What are the things on the table for a responsible it-security strategy. Which subjects are most important, and what are the threats, if you dont get started immediately with the top 10 priorities.

- Plan:
- Approx 2h including break
- Inspiration for solving the tasks, prioritizing the tasks
- I dont have tailer made solutions or easy answers for your organisation
- Less presentation, more dialog

Happy New Year

- Same problems
- Repeat last year?
- ... or try something new!
- 2020 was 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

Paranoia defined

par·a·noi·a

/ˌparəˈnoiə/

noun
noun: **paranoia**

1. a mental condition characterized by delusions of persecution, unwarranted jealousy, or exaggerated self-importance, typically elaborated into an organized system. It may be an aspect of chronic personality disorder, of drug abuse, or of a serious condition such as schizophrenia in which the person loses touch with reality.
   synonyms: persecution complex, delusions, obsession, psychosis More
   - suspicion and mistrust of people or their actions without evidence or justification.
   "the global paranoia about hackers and viruses"

Origin

More

Source: google paranoia definition

Hackers don’t give a shit

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

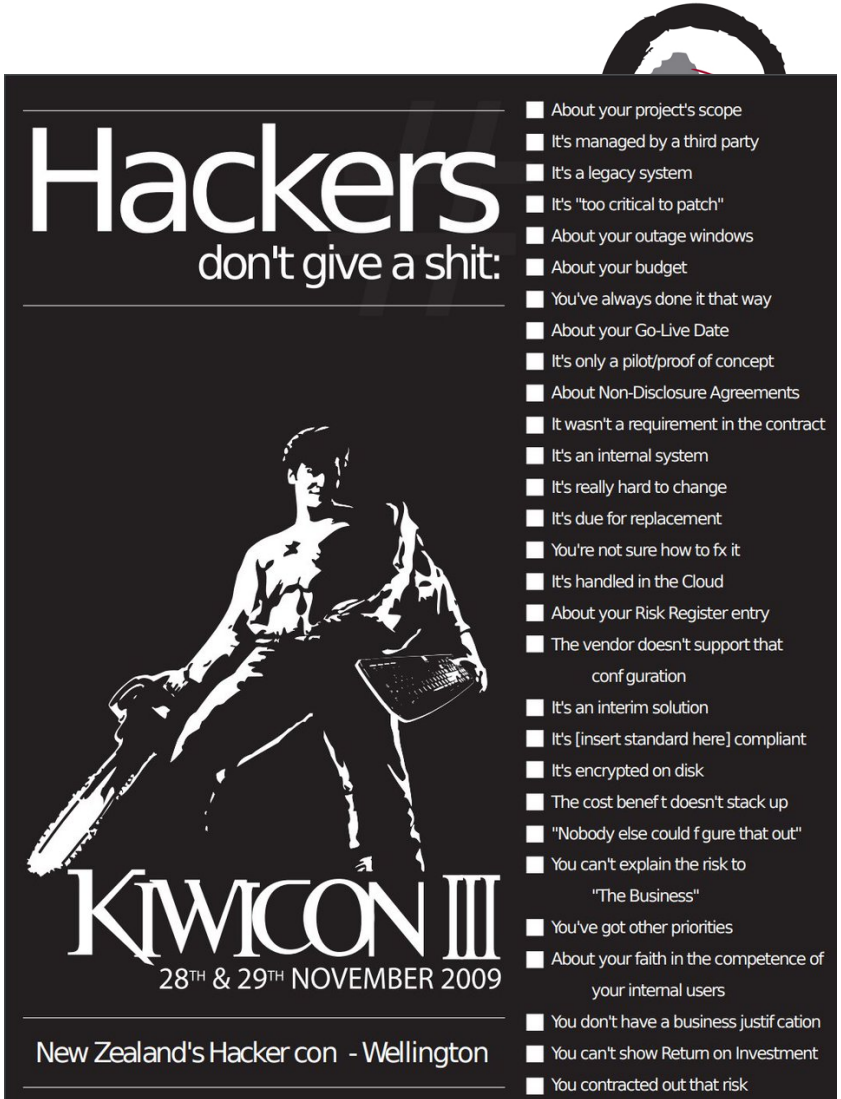
Your network is a research network, under construction, being phased out, ...

Try something new, go to your management

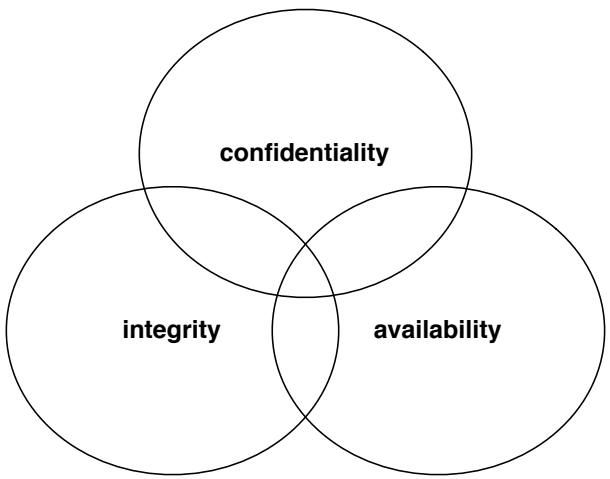
Bring all the exceptions, all of them, update the risk analysis figures - if this happens it is about 1mill DKK

Ask for permission to go full monty on your security

Think like attackers - don’t hold back



Confidentiality Integrity Availability



We want to protect something

Confidentiality - data is kept a secret

Integrity - data is not subjected to unauthorized changes

Availability - data and systems are available for authorized users when they need them

Security engineering a job role

On any given day, you may be challenged to:

- Create new ways to solve existing production security issues
- Configure and install firewalls and intrusion detection systems
- Perform vulnerability testing, risk analyses and security assessments
- Develop automation scripts to handle and track incidents
- Investigate intrusion incidents, conduct forensic investigations and incident responses
- Collaborate with colleagues on authentication, authorization and encryption solutions
- Evaluate new technologies and processes that enhance security capabilities
- Test security solutions using industry standard analysis criteria
- Deliver technical reports and formal papers on test findings
- Respond to information security issues during each stage of a project's lifecycle
- Supervise changes in software, hardware, facilities, telecommunications and user needs
- Define, implement and maintain corporate security policies
- Analyze and advise on new security technologies and program conformance
- Recommend modifications in legal, technical and regulatory areas that affect IT security

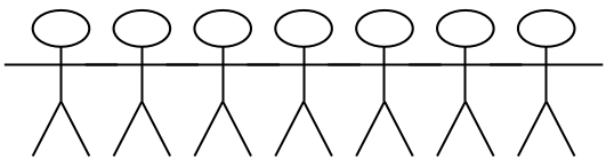
Source: https://www.cyberdegrees.org/jobs/security-engineer/
also https://en.wikipedia.org/wiki/Security_engineering

Focus 2020

- User management - including administrative users
- Asset management
- Laptop security
- VPN everywhere
- Penetration testing
- Firewalls and segmentation
- TLS and VPN settings, encryption
- DNS and email security
- Syslog and monitorering
- Incident Response and response

I hope you have a team, otherwise choose a few at a time

Focus 2020: User management



- Relevant for alle organisationer
- Er måden vi sikrer godkendte brugere kan udføre opgaver
- Kodeord bruges til at forhindre uautoriseret adgang
- Har I styr på brugerid?
- Hvor er brugere oprettet?
- Hvor hurtigt kan I fjerne "een bruger"eller "deaktivere en bruger"alle steder!
- Er det et kludetæppe - ja, mange steder er det

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

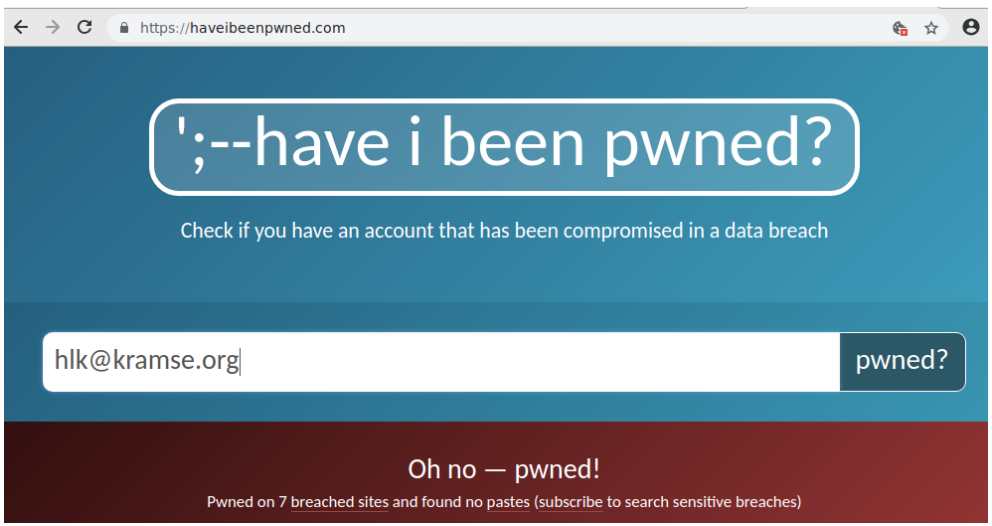
Generelt minimer brugere andre steder end i den centrale database

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/`

They have an API you can integrate to

Brug mere sikre passwords

Pwned Passwords overview

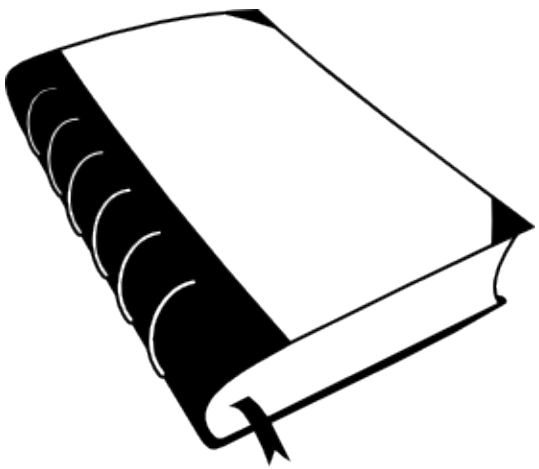
Pwned Passwords are more than half a billion passwords which have previously been exposed in data breaches. The service is detailed in the launch blog post then further expanded on with the release of version 2. The entire data set is both downloadable and searchable online via the Pwned Passwords page.

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/`

Focus 2020: 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

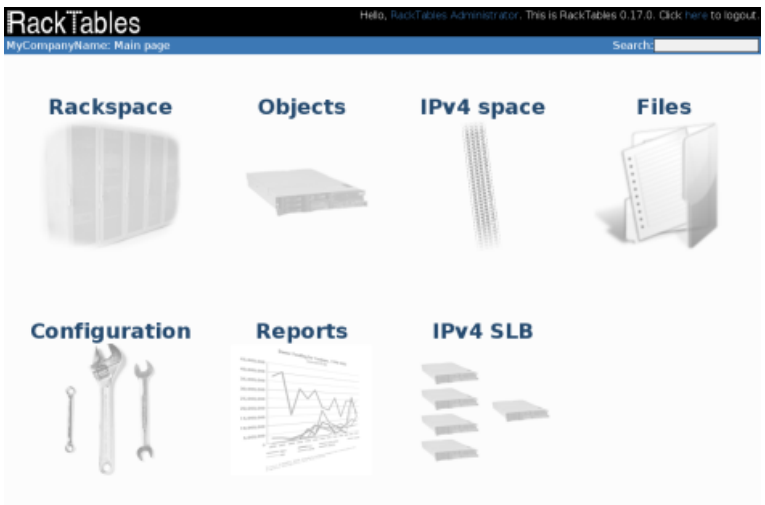
Hvad er asset management

> 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 - eksempelvis forretningskritiske data
- ...

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

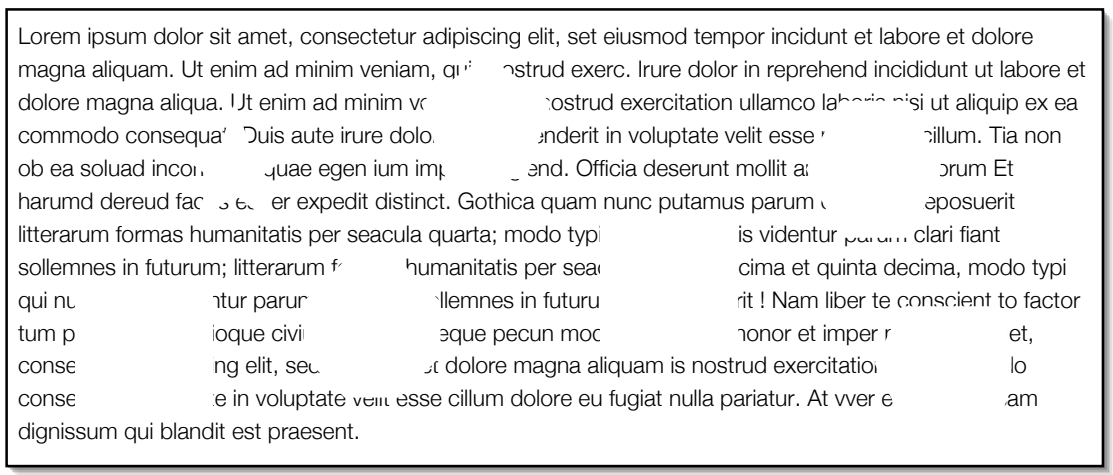
Focus 2020: Laptop sikkerhed

- 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, må der downloades data til offline
- 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!

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

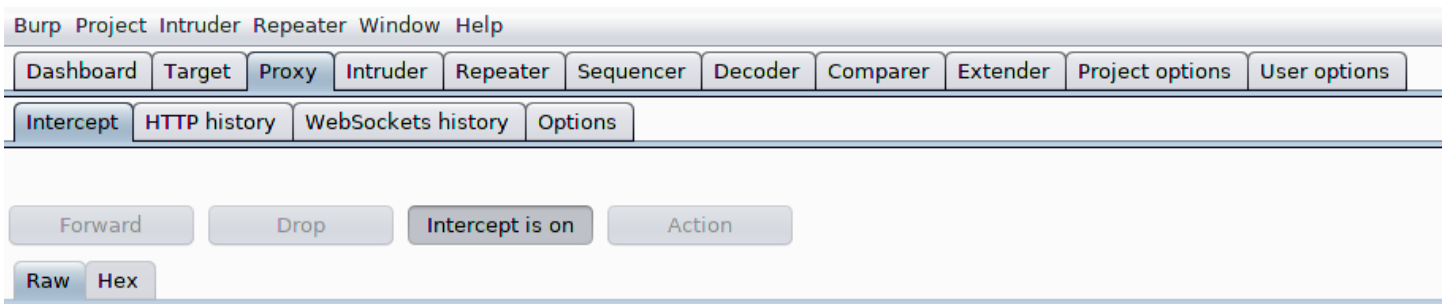
Laptop storage must be encrypted

Firewall must be enabled

Next suggestion:

- Try sniffing data from a laptop, setup Access Point/Monitor port
- Portscan your laptop - 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"

Focus 2020: Penetration testing



- Relevant hvis du driver et netværk, specielt hvis det er forbundet til internet eller stort
- Du bliver hele tiden testet - internet-tinnitus
- Penetration testing
- Kontrol af sikkerheden med aktive værktøjer
- Brug Nmap pakken til at checke åbne porte
- Køb Burp Suite hvis du har et web site du tjener penge på

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, and begin at the bottom.

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)
        Port ID TLV (2), length 8
          Subtype Local (7): Eth1/47
        Port Description TLV (4), length 12: Ethernet1/47
        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 which flaws available

Check *Security Assessment of Cisco ACI*
`https://www.ernw.de/en/whitepapers/issue-68.html`

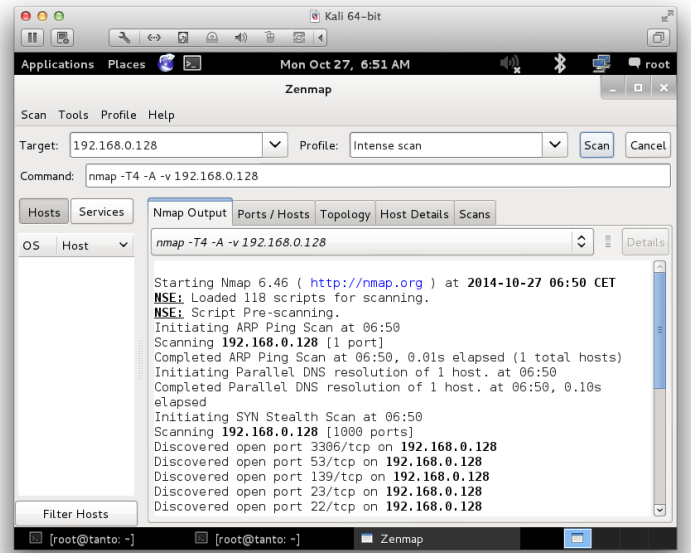
Hackertools are for everyone!

- Hackers work all the time to break stuff, Use hackertools:
- Nmap, Nping `http://nmap.org`
- Wireshark - `http://www.wireshark.org/`
- Aircrack-ng `http://www.aircrack-ng.org/`
- Metasploit Framework `http://www.metasploit.com/`
- Burpsuite `http://portswigger.net/burp/`
- Kali Linux `http://www.kali.org`

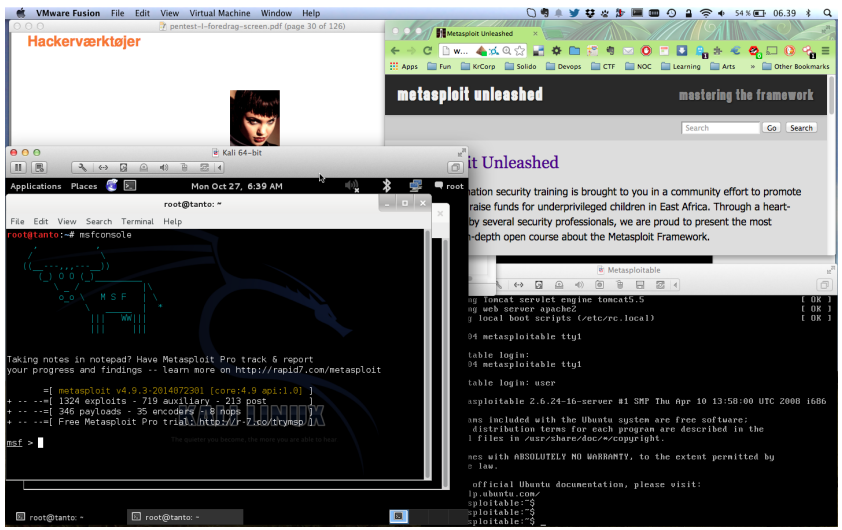
Most popular hacker tools `http://sectools.org/`

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?
- Includes scripting, and a lot of useful scripts by default
- Often when a new vuln is published, there will be a test script for Nmap

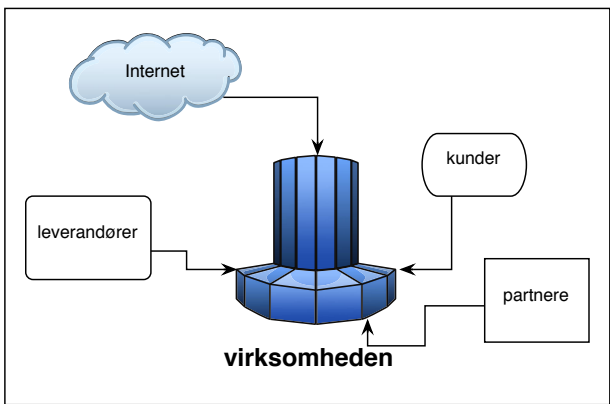


Hackerlab setup



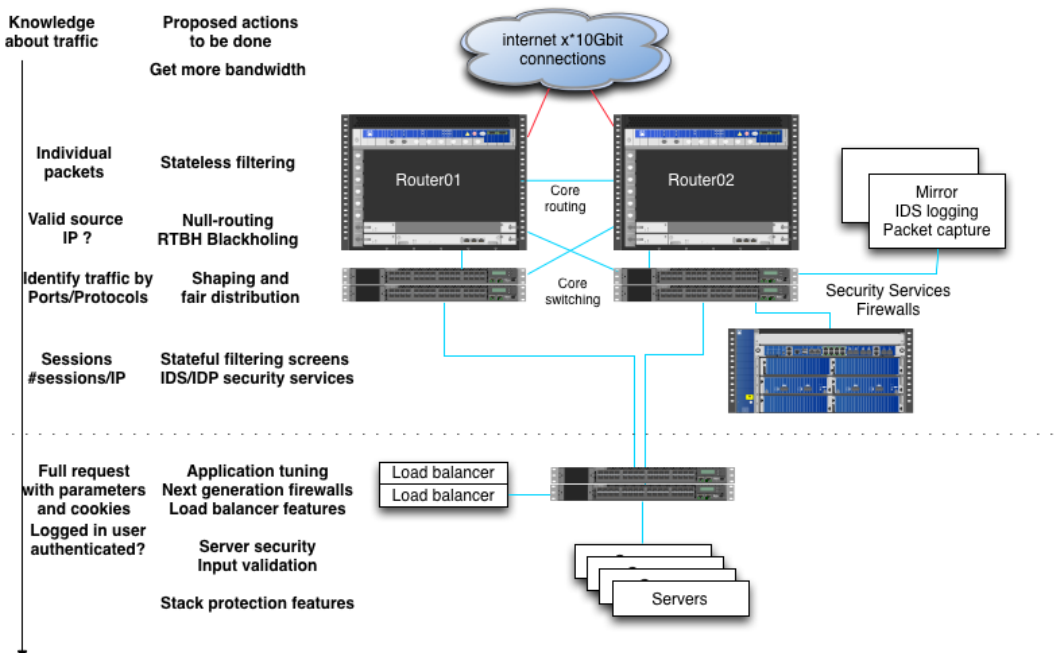
- Create hacker labs, encourage hacker labs!
- Software Host OS: Windows, Mac, Linux
- Virtualisation software: VMware, Virtual box, HyperV pick your poison
- Hackersoftware: Kali Virtual Machine `https://www.kali.org/`

Focus 2020: 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?
- Segmentering af netværk er en solid sikkerhedsforanstaltning

Big firewalls



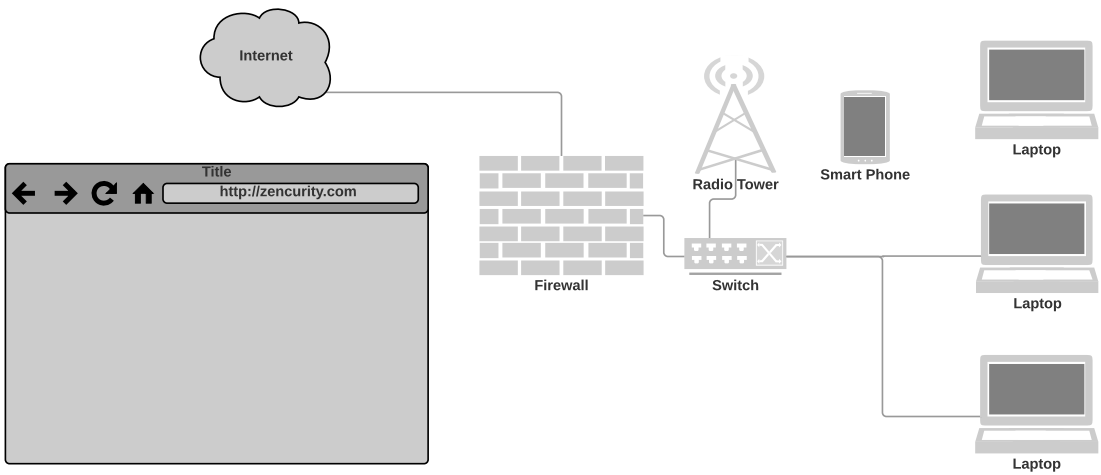
Big firewalls are not a single device

PS also check for updates to your network devices, at least once a year ☺

Focus 2020: 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

Maybe use VPN more - or always!

Focus 2020: TLS og VPN indstillinger

```
  # Input from https://github.com/tykling/ansible-roles/blob/master/nginx_server/templates/tls.conf.j2#L6
  ssl_protocols                   TLSv1.2 TLSv1.3;
  ssl_ciphers                     ECDHE-RSA-AES256-GCM-SHA384:ECDHE-RSA-CHACHA20-POLY1305:ECDHE-
RSA-AES128-GCM-SHA256:ECDHE-RSA-AES256-SHA384:ECDHE-RSA-AES128-SHA256:ECDHE-RSA-AES256-
SHA;
  ssl_prefer_server_ciphers       on;
  ssl_session_cache               shared:SSL:10m;     ssl_session_tickets       off;   ssl_session_timeout    4h;
  ssl_stapling                    on;                 ssl_stapling_verify       on;
  resolver                        105.238.53.1;
  ssl_ecdh_curve secp384r1;                           ssl_dhparam /etc/nginx/dh4096.pem;
  add_header Strict-Transport-Security "max-age=31536000; includeSubDomains" always;
  add_header Referrer-Policy "no-referrer";  add_header X-Content-Type-Options "nosniff";
  add_header X-Frame-Options "DENY";  add_header X-XSS-Protection "1; mode=block";
  add_header Content-Security-Policy "default-src 'self'; script-src 'self; img-src 'self'; object-
src 'none'; font-src 'self'; frame-ancestors 'none' https:";
```

- De fleste har https nu, men er det konfigureret optimalt
- Anbefaler at alle indstillingerne gennemgås regelmæssigt!
- Lav et dokument med de indstillinger I bruger i jeres organisation

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/ - kræver hostnavn og til HTTPS
- sslscan kommandoen kan checke alle jeres TLS sites, også på IP

sslscan

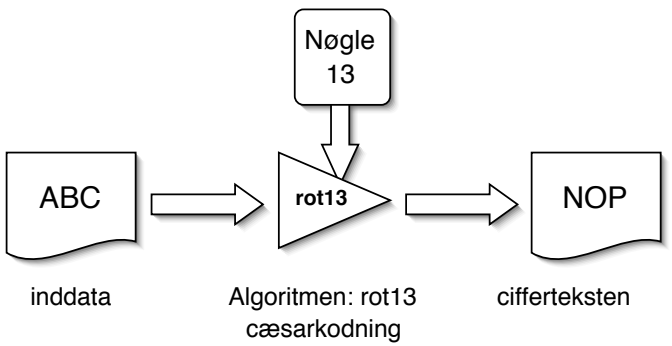
```
root@kali:~# sslscan --ssl2 web.kramse.dk
Version: 1.10.5-static
OpenSSL 1.0.2e-dev xx XXX xxxx

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

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

SSLscan can by IP and also SMTP STARTTLS and others

`https://sikkerpånettet.dk/`

VPN indstillinger



PPTP, fjern, kill on sight

Check hvert år:

- Certifikater/nøgler - ligesom TLS lange og rulles indimellem
- Algoritmer DES/3DES, SHA1, MD5 bye bye, husk både encryption og auth
- DH-Group - mindst +15 tak
- Check både client VPN og site-2-site

Anbefalinger til VPN

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
- Check både client VPN og site-2-site

Focus 2020: 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*

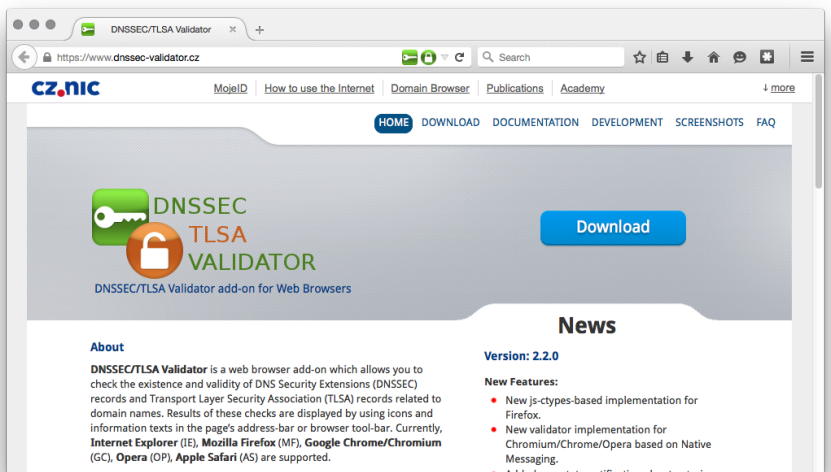
Various key attack types, clients and employees

- 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

DNSSEC get started now



"TLSA records store hashes of remote server TLS/SSL certificates. The authenticity of a TLS/SSL certificate for a domain name is verified by DANE protocol (RFC 6698). DNSSEC and TLSA validation results are displayer by using several icons."

DNSSEC and DANE

"Objective:

Specify mechanisms and techniques that allow Internet applications to establish cryptographically secured communications by using information distributed through DNSSEC for discovering and authenticating public keys which are associated with a service located at a domain name."

DNS-based Authentication of Named Entities (dane)

Email security 2020 - Goals

- SPF Sender Policy Framework

  `https://en.wikipedia.org/wiki/Sender_Policy_Framework`
- DKIM DomainKeys Identified Mail

  `https://en.wikipedia.org/wiki/DomainKeys_Identified_Mail`
- DMARC Domain-based Message Authentication, Reporting and Conformance

  `https://en.wikipedia.org/wiki/DMARC`
- DNSSEC Domain Name System Security Extensions

  `https://en.wikipedia.org/wiki/Domain_Name_System_Security_Extensions`
- DANE DNS-based Authentication of Named Entities

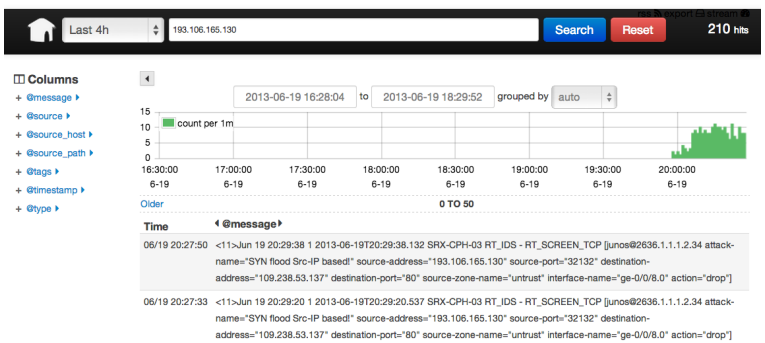
  `https://en.wikipedia.org/wiki/DNS-based_Authentication_of_Named_Entities`
- Brug allesammen, check efter ændringer!

Jeg er glad for at teste med `https://dmarcian.com/`

Focus 2020: Syslog og monitorering

- Vi har allesammen security incidents
- Vi skal kunne efterforske, derfor er et niveau af syslog vigtigt
- Også i dagligdagen til at sikre at systemerne kører optimalt

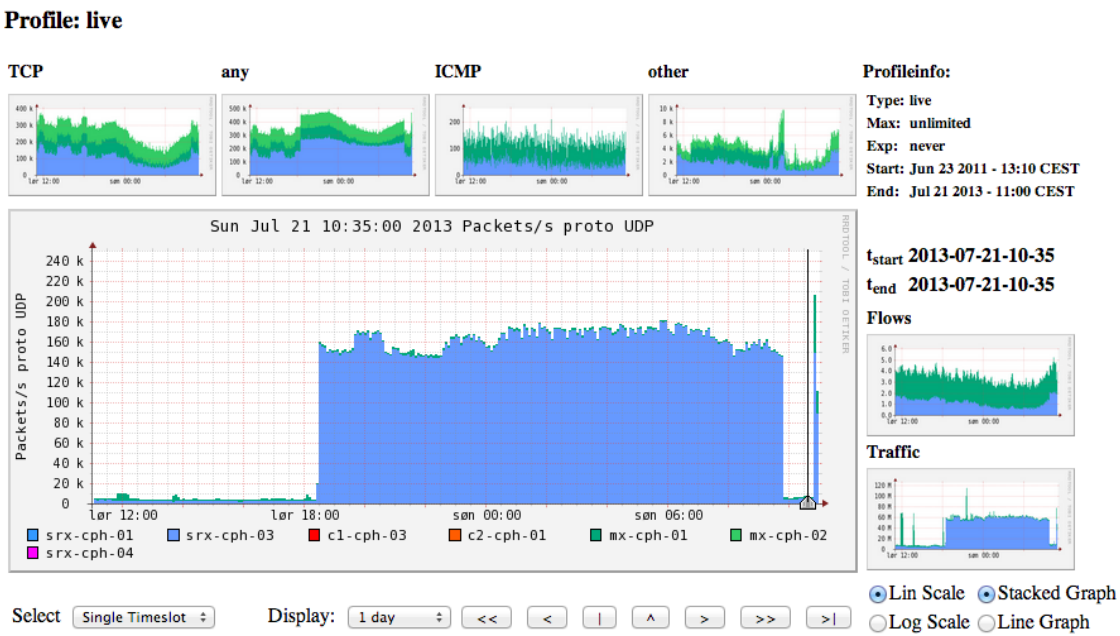
Network tools - examples



- Net + SSL/TLS: Zeek `http://www.bro-ids.org`
  Suricata `http://suricata-ids.org`
- DNS query logs, keep it for at least a week?
  - with DSC and PacketQ `https://github.com/DNS-OARC/PacketQ`
- Log with Elasticsearch?

  `https://www.elastic.co/guide/en/elasticsearch/guide/current/index.html`

Network visibility: Netflow with NFSen



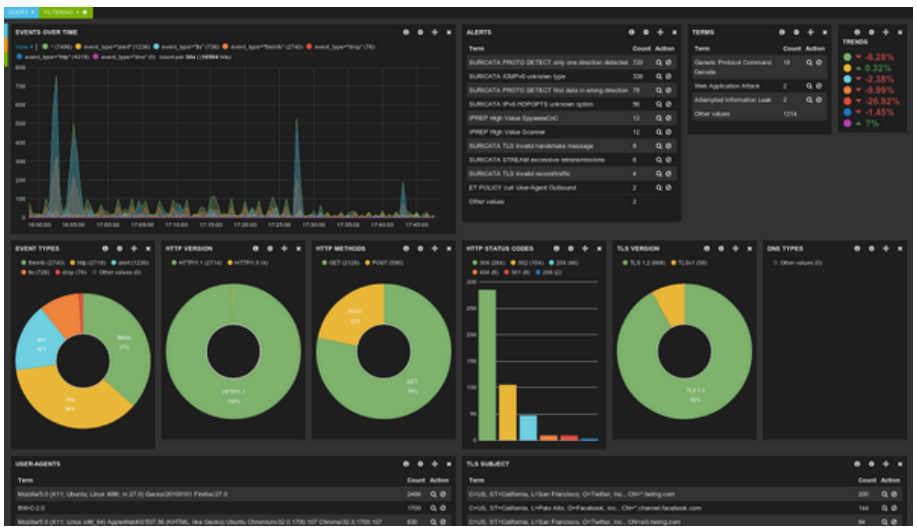
An extra 100k packets per second from this netflow source (source is a router)

Case: Maltrail

Maltrail is a malicious traffic detection system, utilizing publicly available (black)lists containing malicious and/or generally suspicious trails, along with static trails compiled from various AV reports and custom user defined lists, where trail can be anything from domain name (e.g. `zvpprsensinaix.com` for Banjori malware), URL (e.g. `http://109.162.38.120/harsh02.exe` for known malicious executable), IP address (e.g. `185.130.5.231` for known attacker) or HTTP User-Agent header value (e.g. `sqlmap` for automatic SQL injection and database takeover tool). Also, it uses (optional) advanced heuristic mechanisms that can help in discovery of unknown threats (e.g. new malware).

https://github.com/stamparm/maltrail

Suricata with Dashboards



Picture from Twitter
`https://twitter.com/nullthreat/status/445969209840128000`

How to get started

How to get started searching for security events?

Collect basic data from your devices and networks

- Netflow data from routers
- Session data from firewalls
- Logging from applications: email, web, proxy systems

Centralize!

Process data

- Top 10: interesting due to high frequency, occurs often, brute-force attacks
- *ignore*
- Bottom 10: least-frequent messages are interesting

Reklame: SIEM og log-analyse (5 ECTS)

Teaching dates: **26/11 2020**, 1/12 2020, 3/12 2020, 8/12 2020, 10/12 2020, 15/12 2020, 17/12 2020 Exam: Date 7/1 2021

Primary literature:

- Data-Driven Security: Analysis, Visualization and Dashboards Jay Jacobs, Bob Rudis ISBN: 978-1-118-79372-5 February 2014 https://datadrivensecurity.info/
- Crafting the InfoSec Playbook: Security Monitoring and Incident Response Master Plan by Jeff Bollinger, Brandon Enright, and Matthew Valites
- Intelligence-Driven Incident Response ISBN: 9781491934944 Scott Roberts
- Security Operations Center Building, Operating, and Maintaining your SOC ISBN: 9780134052014 Joseph Muniz

`https://kompetence.kea.dk/kurser-fag/siem-og-loganalyse?kust_id=5154`

`https://zencurity.gitbook.io/kea-it-sikkerhed/siem-and-log-analysis/lektionsplan`

Focus 2020: Incident Response og reaktion

- Fortsat fra logningen ... hvad så nu!
- Hvis du har en sikkerhedshændelse skal den håndteres
- jo hurtigere og mere effektivt det håndteres jo bedre

Lifeguard training photo by Margarida CSilva on Unsplash

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/2020/01/21/attackers-used-a-linkedin-job-ad-and-skype-call-to-breach-banks-defences/`

Øv krisesituationer

- Lav rollespil
- Lav tabletop exercises

Spørgsmål og mere debat

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