Welcome to

Hacking today

Henrik Lund Kramshøj, internet samurai
hlk@solido.net

http://www.solidonetworks.com

Formålet med foredraget

Don’t Panic!

Skabe forståelse for hackerværktøjer samt penetrationstest metoder

webbaserede angreb

netværkssikkerhed

lidt kryptografi

Hacker - cracker

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Det korte svar - drop diskussionen

Det havde oprindeligt en anden betydning, men medierne har taget udtrykket til sig - og idag har det begge betydninger.

Idag er en hacker stadig en der bryder ind i systemer!

ref. Spafford, Cheswick, Garfinkel, Stoll, ... - alle kendte navne indenfor sikkerhed

Hvis man vil vide mere kan man starte med:

- *Cuckoo's Egg: Tracking a Spy Through the Maze of Computer Espionage*, Clifford Stoll
- *Hackers: Heroes of the Computer Revolution*, Steven Levy
- *Practical Unix and Internet Security*, Simson Garfinkel, Gene Spafford, Alan Schwartz

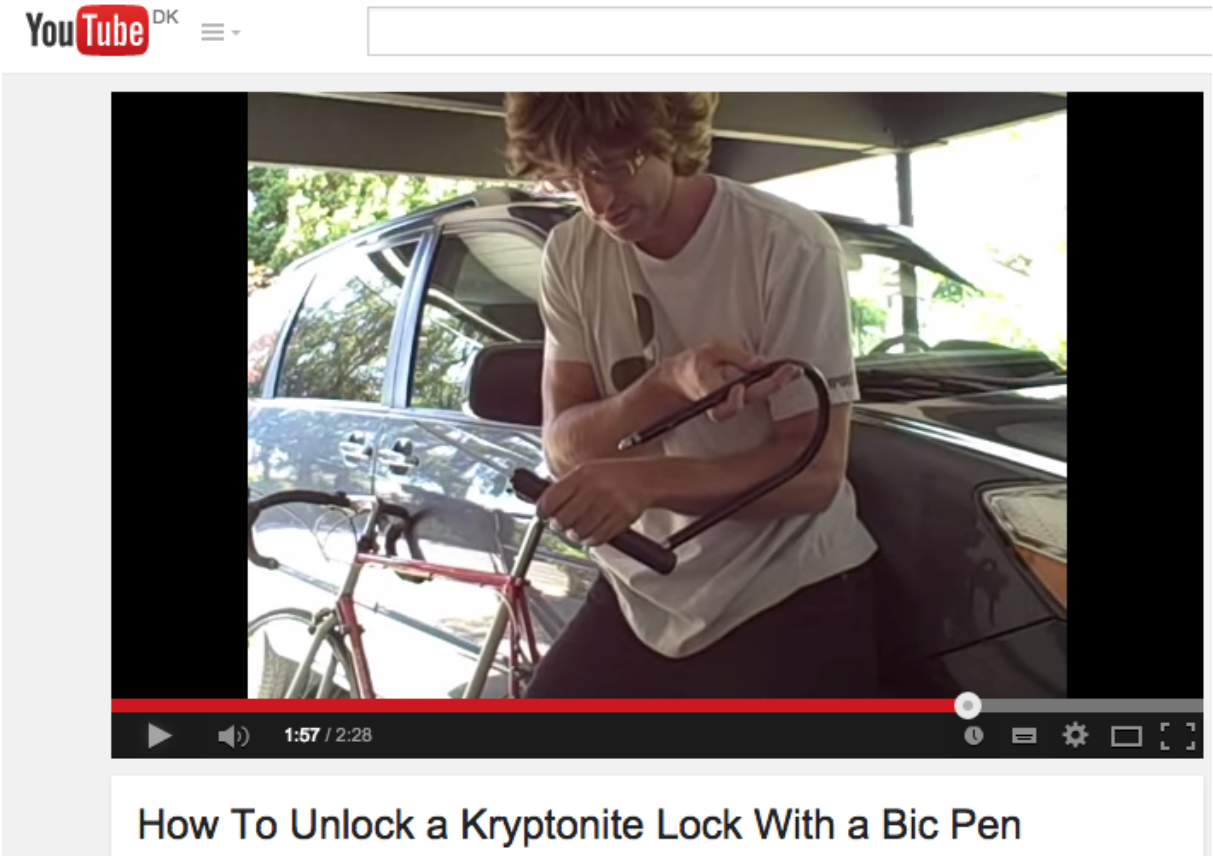
Hacking er magi

Hacking ligner indimellem magi

Hacking er ikke magi

Hacking kræver blot lidt ninja-træning

Movie:Kryptonite lock - old



Just search for: kryptonite lock bic pen

`https://www.youtube.com/watch?v=LahDQ2ZQ3e0`

Hacking eksempel - det er ikke magi

MAC filtrering på trådløse netværk

Alle netkort har en MAC adresse - BRÆNDT ind i kortet fra fabrikken

Mange trådløse Access Points kan filtrere MAC adresser

Kun kort som er på listen over godkendte adresser tillades adgang til netværket

Det virker dog ikke ☺

De fleste netkort tillader at man overskriver denne adresse midlertidigt

Derudover har der ofte været fejl i implementeringen af MAC filtrering

Myten om MAC filtrering

Eksemplet med MAC filtrering er en af de mange myter

Hvorfor sker det?

Marketing - producenterne sætter store mærkater på æskerne

Manglende indsigt - forbrugerne kender reelt ikke koncepterne

Hvad *er* en MAC adresse egentlig

Relativt få har forudsætningerne for at gennemskue dårlig sikkerhed

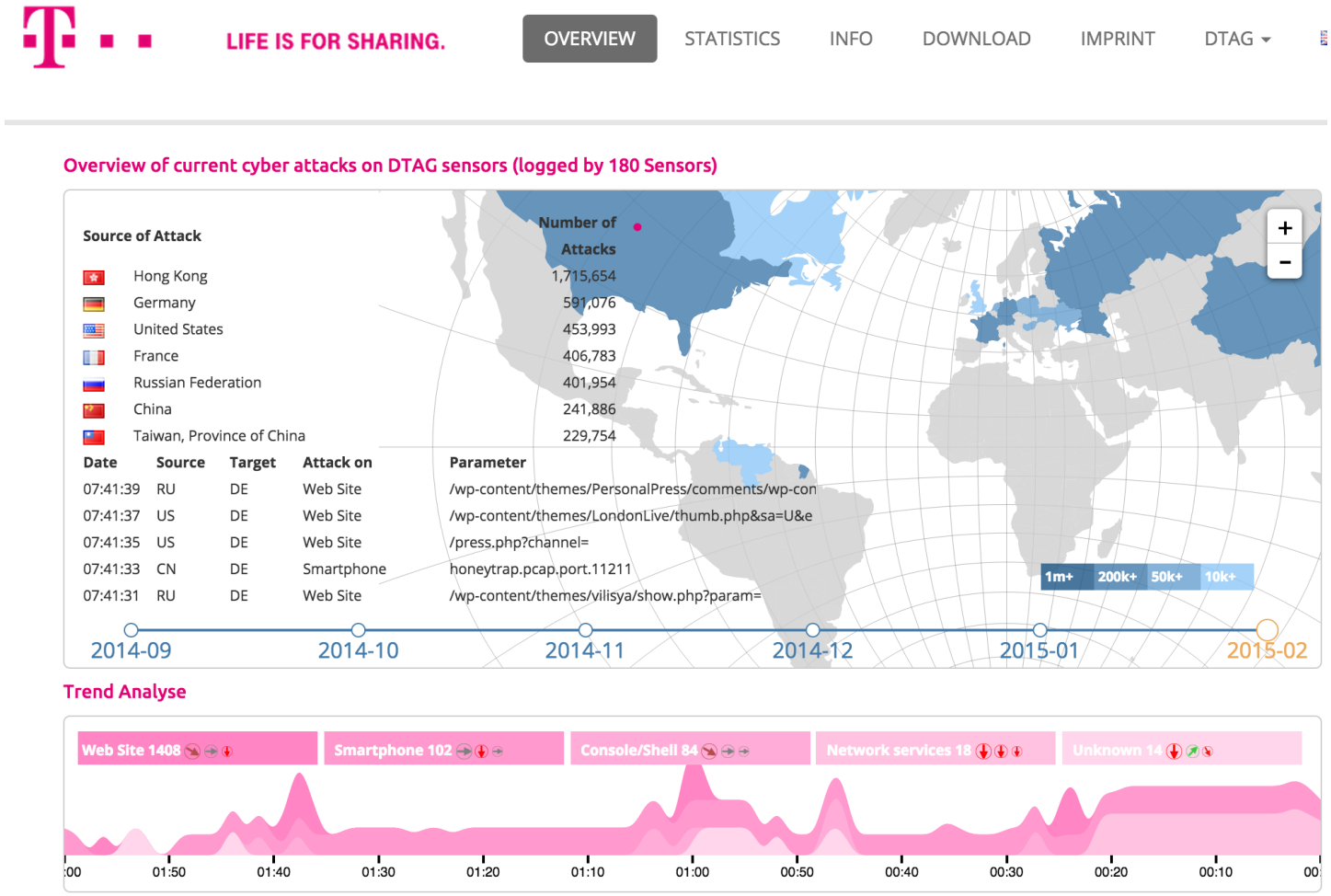
Løsninger?

Udbrede viden om usikre metoder til at sikre data og computere

Udbrede viden om sikre metoder til at sikre data og computere

MAC filtrering

Attack overview



http://www.sicherheitstacho.eu/?lang=en

Heartbleed CVE-2014-0160

The Heartbleed Bug

The Heartbleed Bug is a serious vulnerability in the popular OpenSSL cryptographic software library. This weakness allows stealing the information protected, under normal conditions, by the SSL/TLS encryption used to secure the Internet. SSL/TLS provides communication security and privacy over the Internet for applications such as web, email, instant messaging (IM) and some virtual private networks (VPNs).

The Heartbleed bug allows anyone on the Internet to read the memory of the systems protected by the vulnerable versions of the OpenSSL software. This compromises the secret keys used to identify the service providers and to encrypt the traffic, the names and passwords of the users and the actual content. This allows attackers to eavesdrop on communications, steal data directly from the services and users and to impersonate services and users.

Source: `http://heartbleed.com/`

Heartbleed hacking

```
06b0: 2D 63 61 63 68 65 0D 0A 43 61 63 68 65 2D 43 6F  -cache..Cache-Co
06c0: 6E 74 72 6F 6C 3A 20 6E 6F 2D 63 61 63 68 65 0D  ntrol: no-cache.
06d0: 0A 0D 0A 61 63 74 69 6F 6E 3D 67 63 5F 69 6E 73  ...action=gc_ins
06e0: 65 72 74 5F 6F 72 64 65 72 26 62 69 6C 6C 6E 6F  ert_order&billno
06f0: 3D 50 5A 4B 31 31 30 31 26 70 61 79 6D 65 6E 74  =PZK1101&payment
0700: 5F 69 64 3D 31 26 63 61 72 64 5F 6E 75 6D 62 65  _id=1& card˙numbe
0710: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX  r=4060xxxx413xxx
0720: 39 36 26 63 61 72 64 5F 65 78 70 5F 6D 6F 6E 74  96&card˙exp˙mont
0730: 68 3D 30 32 26 63 61 72 64 5F 65 78 70 5F 79 65  h=02&card˙exp˙ye
0740: 61 72 3D 31 37 26 63 61 72 64 5F 63 76 6E 3D 31  ar=17&card˙cvn=1
0750: 30 39 F8 6C 1B E5 72 CA 61 4D 06 4E B3 54 BC DA  09.l..r.aM.N.T..
```

- Obtained using Heartbleed proof of concepts - Gave full credit card details
- ”can XXX be exploited- yes, clearly! PoCs ARE needed
  without PoCs even Akamai wouldn’t have repaired completely!
- The internet was ALMOST fooled into thinking getting private keys from Heartbleed was not possible - scary indeed.

Why is heartbleed different?

Great PR, name, web site, logo

OpenSSL is very widespread

OpenSSL has been criticized before

The spotlight is now on a lot of products, infrastructure

BOTH Open Source products and Proprietary products hurt by this

TL;DR
OpenSSL is everywhere and an example of our dependency on weak components

Key points after heartbleed

Source: picture source

`https://www.duosecurity.com/blog/heartbleed-defense-in-depth-part-2`

- Writing SSL software and other secure crypto software is hard
- Configuring SSL is hard
  check you own site `https://www.ssllabs.com/ssltest/`
- SSL is hard, finding bugs "all the time"`http://armoredbarista.blogspot.dk/2013/01/a-brief-chronology-of-ssltls-attacks.html`
- Rekeying is hard - slow, error prone, manual proces - Automate!
- Proof of concept programs exist - good or bad?

Most vulnerable operating systems in 2014

Operating system	# of vulnerabilities	# of HIGH vulnerabilities	# of MEDIUM vulnerabilities	# of LOW vulnerabilities
Apple Mac OS X	147	64	67	16
Apple iOS	127	32	72	23
Linux Kernel	119	24	74	21
Microsoft Windows Server 2008	38	26	12	0
Microsoft Windows 7	36	25	11	0
Microsoft Windows Server 2012	38	24	14	0
Microsoft Windows 8	36	24	12	0
Microsoft Windows 8.1	36	24	12	0
Microsoft Windows Vista	34	23	11	0
Microsoft Windows RT	30	22	8	0

An average of 19 vulnerabilities per day were reported in 2014, according to the data from the National Vulnerability Database (NVD).

Source:

`http://www.gfi.com/blog/most-vulnerable-operating-systems-and-applications-in-2014/`

Most vulnerable applications in 2014

Application	# of vulnerabilities	# of HIGH vulnerabilities	# of MEDIUM vulnerabilities	# of LOW vulnerabilities
Microsoft Internet Explorer	242	220	22	0
Google Chrome	124	86	38	0
Mozilla Firefox	117	57	57	3
Adobe Flash Player	76	65	11	0
Oracle Java	104	50	46	8
Mozilla Thunderbird	66	36	29	1
Mozilla Firefox ESR	61	35	25	1
Adobe Air	45	38	7	0
Apple TV	86	29	49	8
Adobe Reader	44	37	7	0
Adobe Acrobat	43	35	8	0
Mozilla SeaMonkey	63	28	34	1

Not surprisingly at all, web browsers continue to have the most security vulnerabilities because they are a popular gateway to access a server and to spread malware on the clients.

Source:

`http://www.gfi.com/blog/most-vulnerable-operating-systems-and-applications-in-2014/`

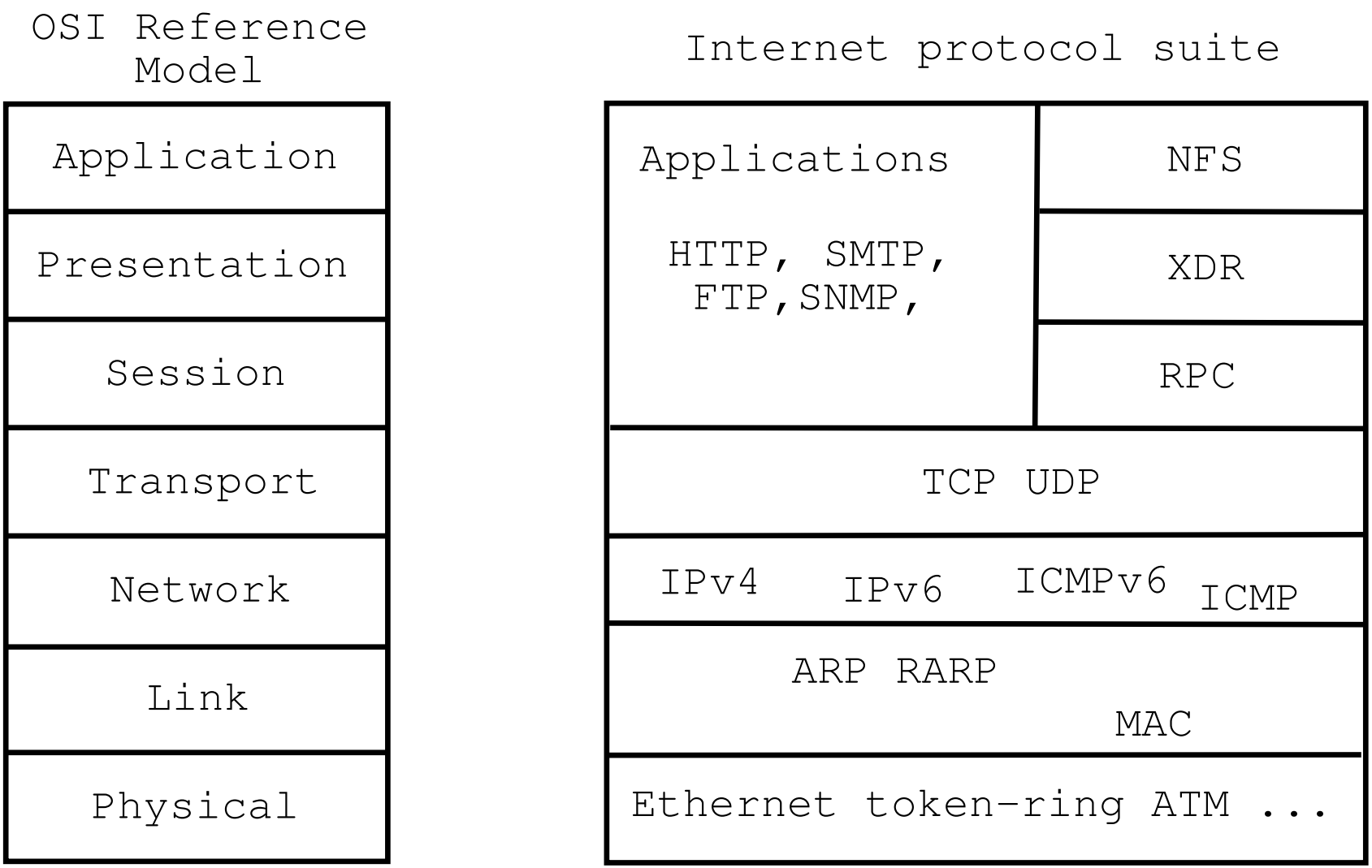
Hackerværktøjer

Vi benytter en del værktøjer:

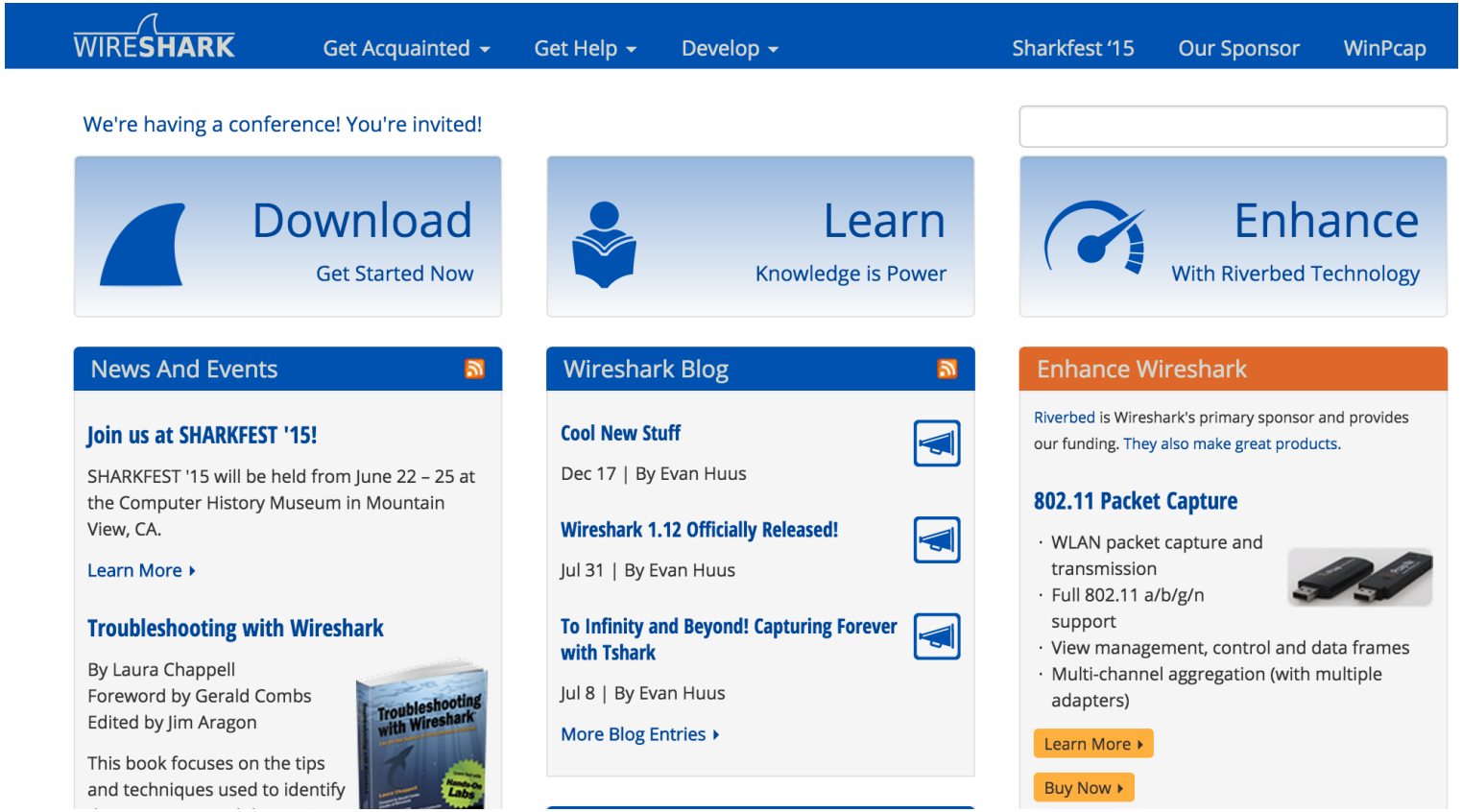
- Nmap - `http://www.insecure.org` portscanner
- Wireshark - `http://http://www.wireshark.org/` avanceret netværkssniffer
- Kali Linux `http://www.kali.org/`
- Burp is a highly recommended commercial Web proxy EUR 275/user/year 2.000DKK `http://portswigger.net/burp/help/suite_gettingstarted.html`

Hackerværktøjer er dem som gør noget anderledes for at opnå fordel

OSI og Internet modellerne



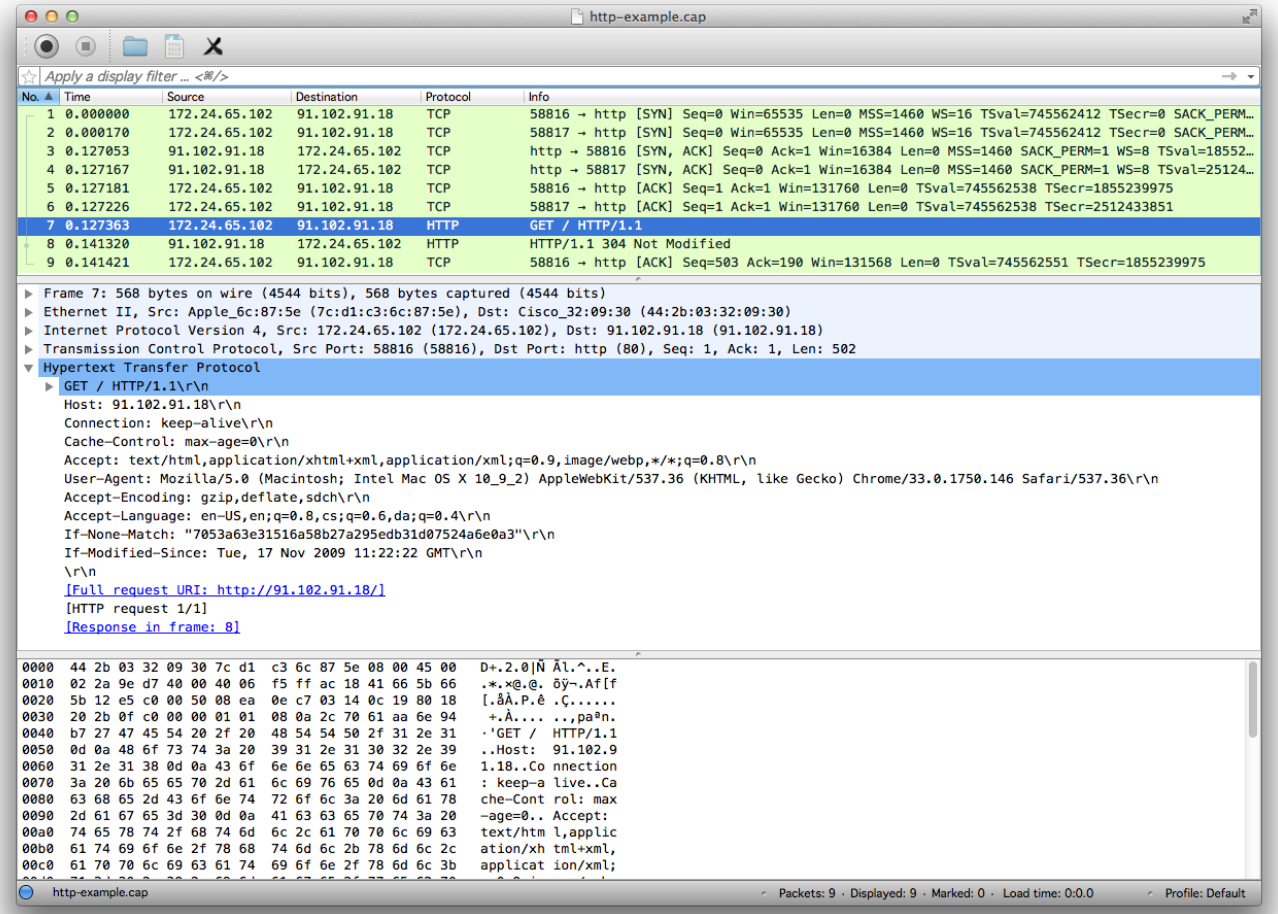
Wireshark - grafisk pakkesniffer



`http://www.wireshark.org`

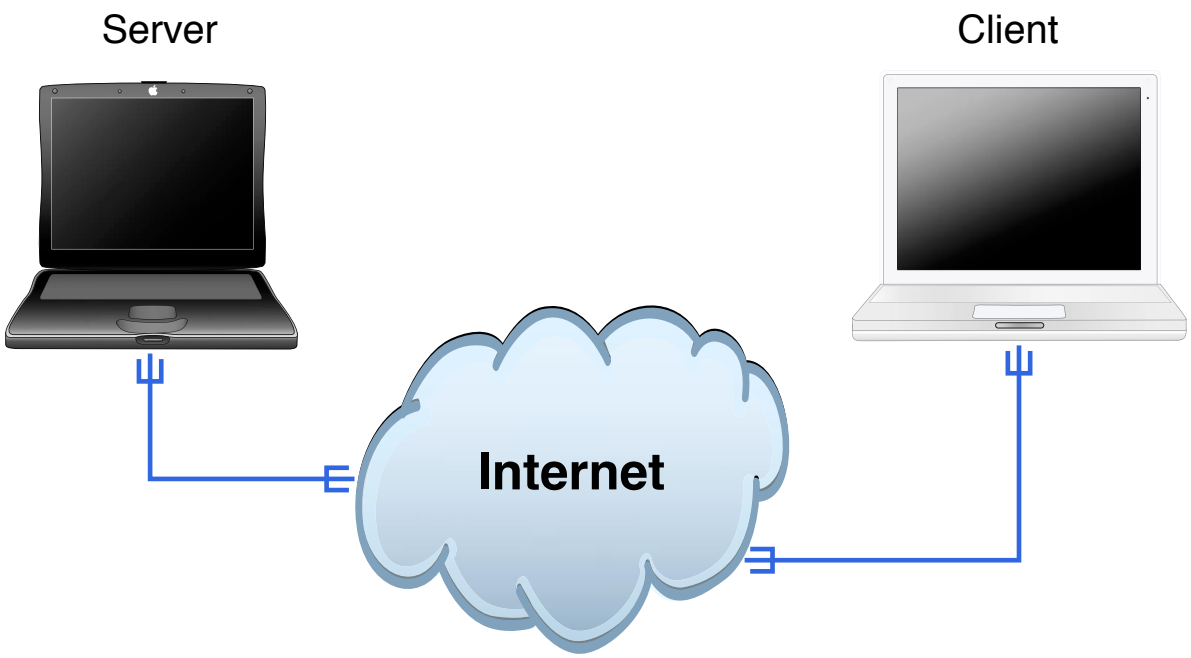
både til Windows og UNIX

Wireshark usage



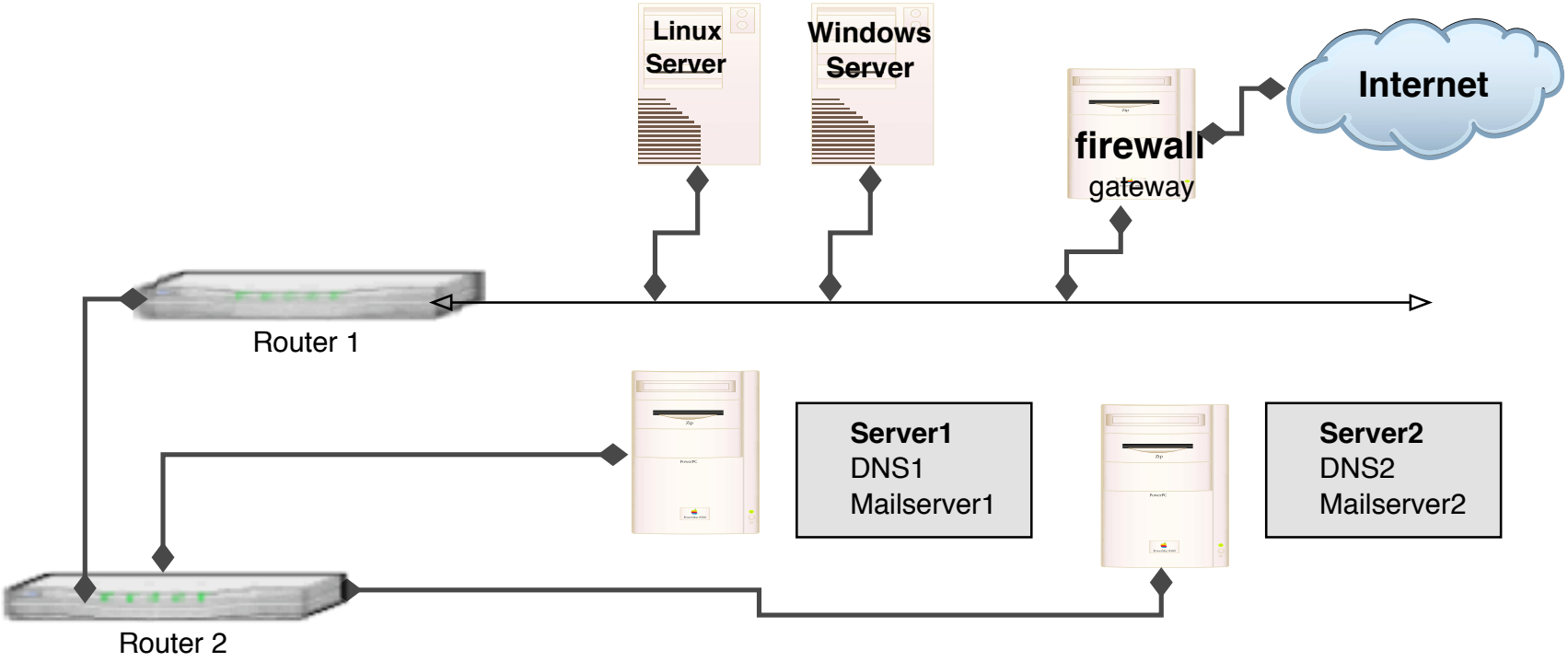
Wireshark: Filters, hexdump, protocol dissection, overview, coloring, advanced features

Demo: Wireshark



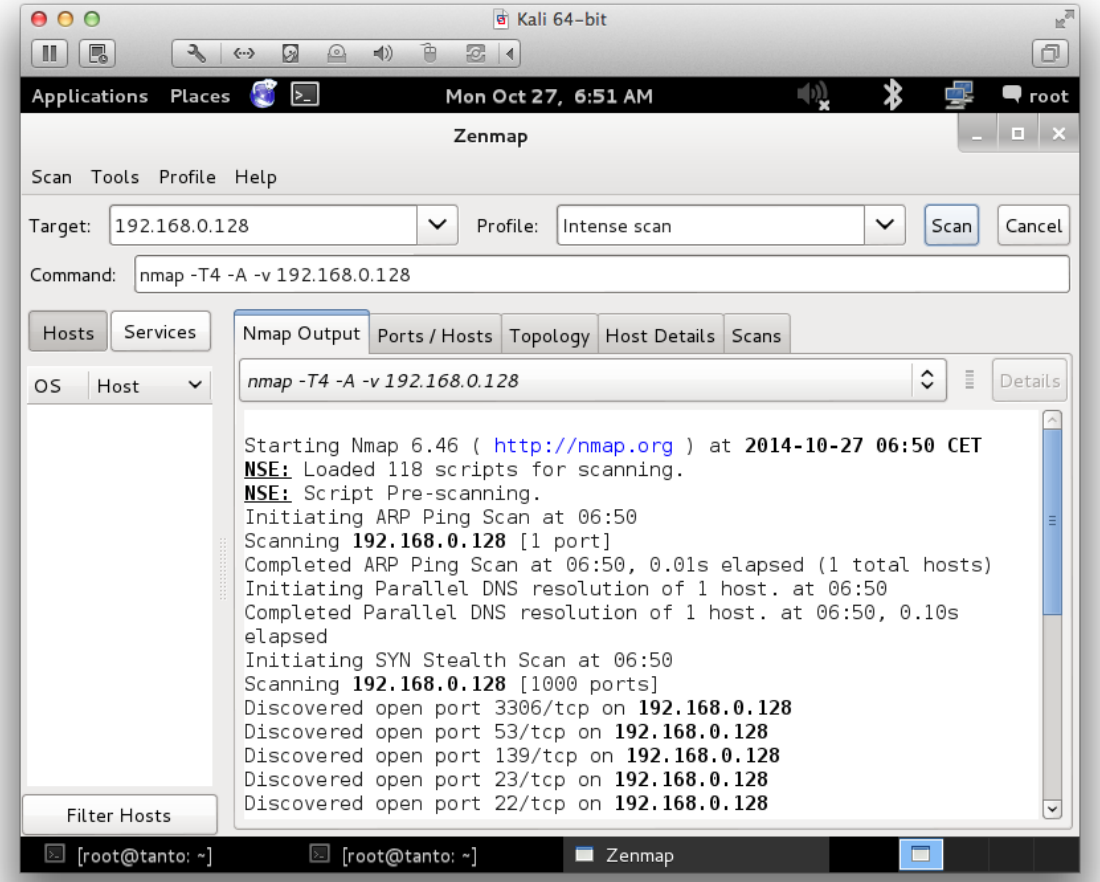
Wireshark

Network mapping

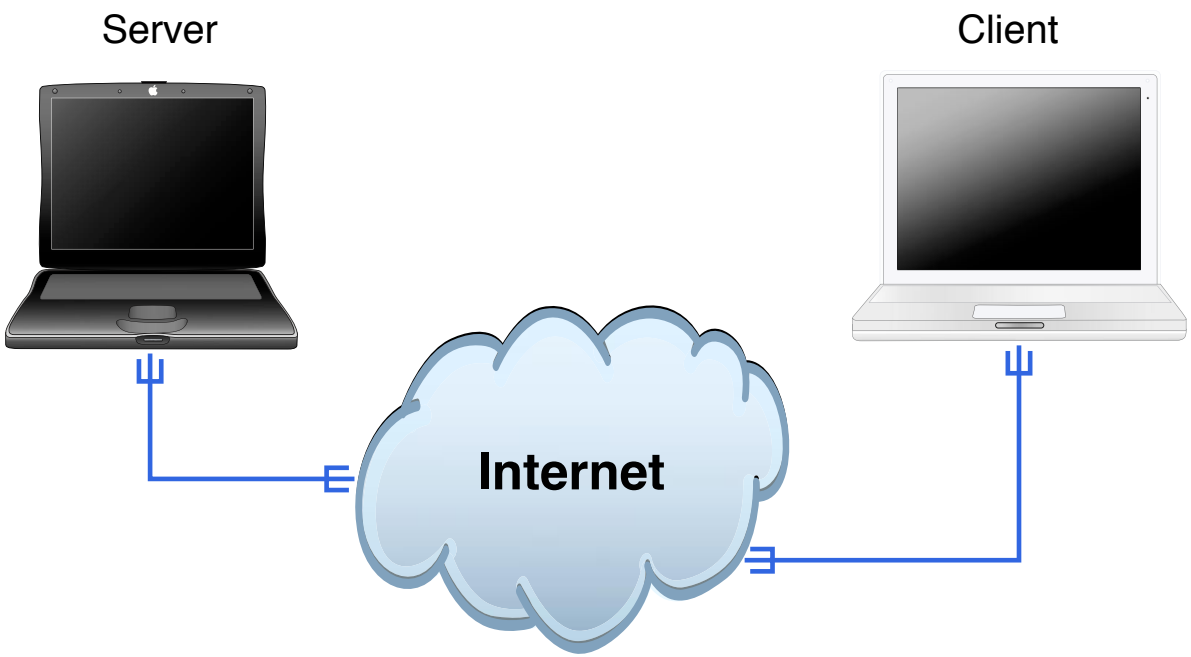


Ved brug af traceroute og tilsvarende programmer kan man ofte udlede topologien i det netværk man undersæger

Portscan med Zenmap GUI



Demo: Armitage og Metasploit



Armitage og Metasploit

FREAK March 2015

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”A group of cryptographers at INRIA, Microsoft Research and IMDEA have discovered some serious vulnerabilities in OpenSSL (e.g., Android) clients and Apple TLS/SSL clients (e.g., Safari) that allow a ’man in the middle attacker’ to downgrade connections from ’strong’ RSA to ’export-grade’ RSA. These attacks are real and exploitable against a shocking number of websites – including government websites. Patch soon and be careful.”

Source: Matthew Green, cryptographer and research professor at Johns Hopkins Univ

`http://blog.cryptographyengineering.com/2015/03/attack-of-week-freak-or-factoring-nsa.html` `https://www.smacktls.com/` `https://freakattack.com/`

OpenSSL, LibreSSL, Apple SSL flaw exit exit exit!, Android SSL, certs certs!!!111, SSLv3, Heartbleed, MS TLS

PS From now on its TLS! Not SSL anymore, any SSLv2, SSLv3 is old and vulnerable

Wi-Fi Protected Setup, WPS hacking - Reaver

How Reaver Works Now that you've seen how to use Reaver, let's take a quick overview of how Reaver works. The tool takes advantage of a vulnerability in something called Wi-Fi Protected Setup, or WPS. It's a feature that exists on many routers, intended to provide an easy setup process, and it's tied to a PIN that's hard-coded into the device. Reaver exploits a flaw in these PINs; the result is that, with enough time, it can reveal your WPA or WPA2 password.

Hvad betyder ease of use?

Source:

`https://code.google.com/p/reaver-wps/`

`http://lifehacker.com/5873407/how-to-crack-a-wi+fi-networks-wpa-password-with-reaver`

WPS Design Flaws used by Reaver

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Design Flaw #1

Option / Authentication	Physical Access	Web Interface	PIN
Push-button-connect	X		
PIN – Internal Registrar		X	
PIN – External Registrar			X

WPS Options and which kind of authentication they actually use.

As the External Registrar option does not require any kind of authentication apart from providing the PIN, it is potentially vulnerable to brute force attacks.

Pin only, no other means necessary

Source:
`http://sviehb.files.wordpress.com/2011/12/viehboeck_wps.pdf`

WPS Design Flaws used by Reaver

IEEE 802.11/EAP Expanded Type, Vendor ID: WFA (0x372A), Vendor Type: SimpleConfig (0x01)			
M1	Enrollee → Registrar	N1 || Description || PK_E	Diffie-Hellman Key Exchange
M2	Enrollee ← Registrar	N1 || N2 || Description || PK_R || Authenticator	
M3	Enrollee → Registrar	N2 || E-Hash1 || E-Hash2 || Authenticator	
M4	Enrollee ← Registrar	N1 || R-Hash1 || R-Hash2 || $E_{KeyWrapKey}$(R-S1) || Authenticator	proove posession of 1st half of PIN
M5	Enrollee → Registrar	N2 || $E_{KeyWrapKey}$(E-S1) || Authenticator	proove posession of 1st half of PIN
M6	Enrollee ← Registrar	N1 || $E_{KeyWrapKey}$(R-S2) || Authenticator	proove posession of 2nd half of PIN
M7	Enrollee → Registrar	N2 || $E_{KeyWrapKey}$(E-S2 ||ConfigData) || Authenticator	proove posession of 2nd half of PIN, send AP configuration
M8	Enrollee ← Registrar	N1 || $E_{KeyWrapKey}$(ConfigData) || Authenticator	set AP configuration

Enrollee = AP Registrar = Supplicant = Client/Attacker PK_E = Diffie-Hellman Public Key Enrollee PK_R = Diffie-Hellman Public Key Registrar Authkey and KeyWrapKey are derived from the Diffie-Hellman shared key. Authenticator = $HMAC_{Authkey}$(last message || current message) $E_{KeyWrapKey}$ = Stuff encrypted with KeyWrapKey (AES-CBC)	PSK1 = first 128 bits of $HMAC_{AuthKey}$(1st half of PIN) PSK2 = first 128 bits of $HMAC_{AuthKey}$(2nd half of PIN) E-S1 = 128 random bits E-S2 = 128 random bits E-Hash1 = $HMAC_{AuthKey}$(E-S1 || PSK1 || PK_E || PK_R) E-Hash2 = $HMAC_{AuthKey}$(E-S2 || PSK2 || PK_E || PK_R) R-S1 = 128 random bits R-S2 = 128 random bits R-Hash1 = $HMAC_{AuthKey}$(R-S1 || PSK1 || PK_E || PK_R) R-Hash2 = $HMAC_{AuthKey}$(R-S2 || PSK2 || PK_E || PK_R)

1	2	3	4	5	6	7	0
1st half of PIN				2nd half of PIN			checksum

Reminds me of NTLM cracking, crack parts independently

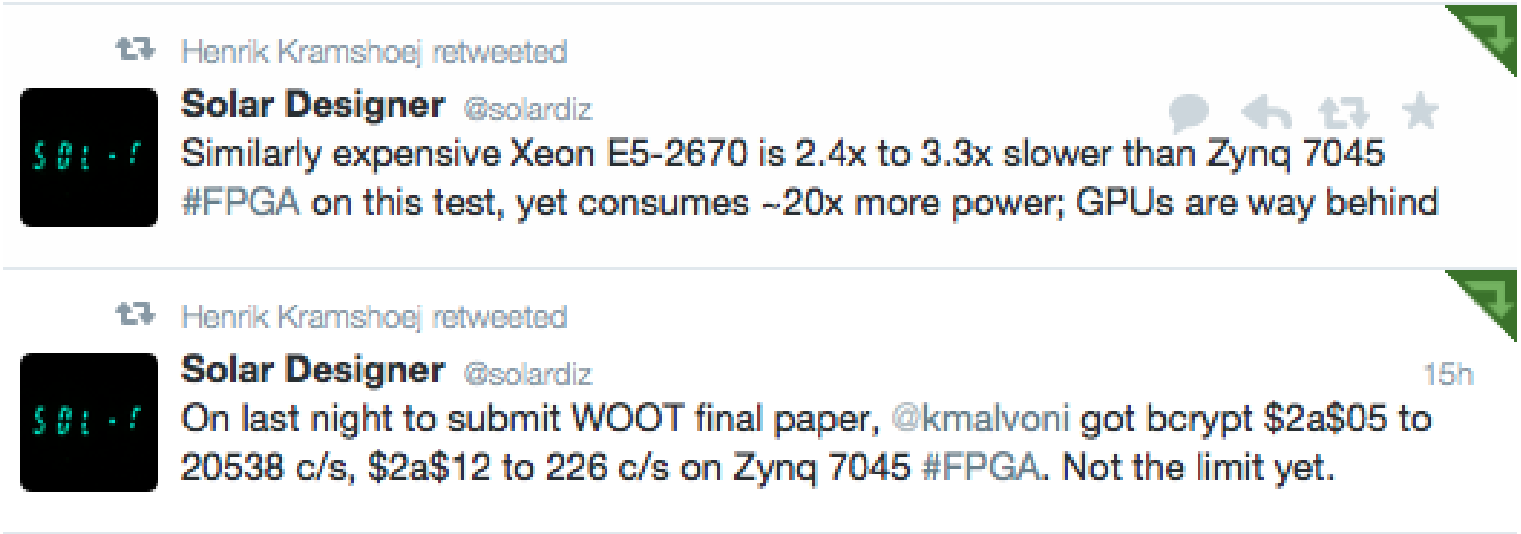
Source:
`http://sviehb.files.wordpress.com/2011/12/viehboeck_wps.pdf`

Cracking passwords

- Hashcat is the world's fastest CPU-based password recovery tool.
- oclHashcat-plus is a GPGPU-based multi-hash cracker using a brute-force attack (implemented as mask attack), combinator attack, dictionary attack, hybrid attack, mask attack, and rule-based attack.
- oclHashcat-lite is a GPGPU cracker that is optimized for cracking performance. Therefore, it is limited to only doing single-hash cracking using Markov attack, Brute-Force attack and Mask attack.
- John the Ripper password cracker old skool men stadig nyttig

Source:
`http://hashcat.net/wiki/`
`http://www.openwall.com/john/`

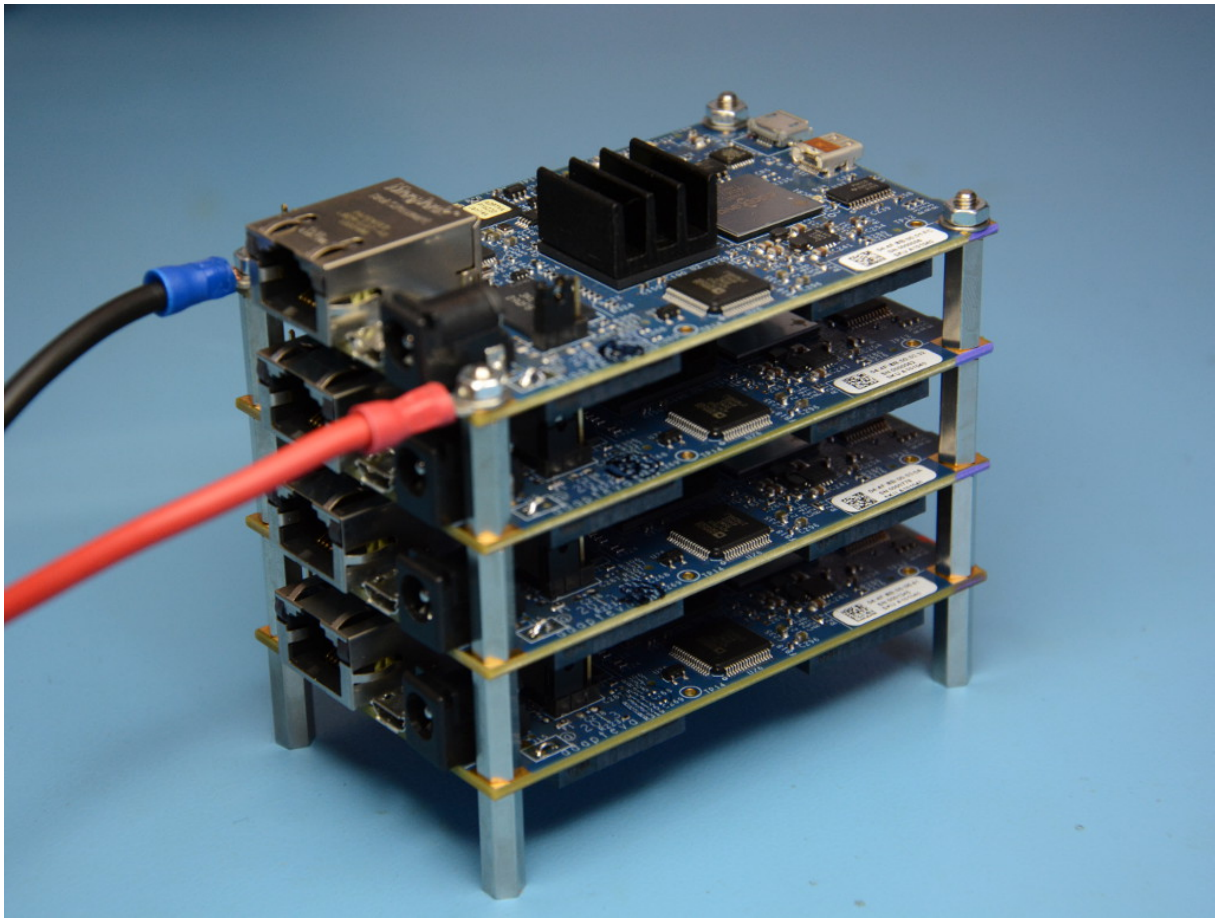
Parallella John



`https://twitter.com/solardiz/status/492037995080712192`

Warning: FPGA hacking - not finished part of presentation

Stacking Parallella boards



http://www.parallella.org/power-supply/

Bettercrypto.org pretty good advise

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SSL settings for nginx

```
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]

Overview

> ”This whitepaper arose out of the need for system administrators to have an updated, solid, well researched and thought-through guide for configuring SSL, PGP, SSH and other cryptographic tools in the post-Snowden age. ... This guide is specifically written for these system administrators.”

`https://bettercrypto.org/`

February and March 2015, Security Onion updates

Security Onion 12.04.5.1 ISO image now available, plus Suricata IDS engine 2.0.7

Learn NSM with Security Onion today - its free

Source:
`http://blog.securityonion.net/`

Kibana 4 february 2015

Highly recommended for a lot of data visualisation

Source: `https://www.elastic.co/products/kibana`

Focus for the near future

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- Walk through your infrastructure
  get a detailed view of data, flows, protocols, bandwidth, ports and services
- Create a list of critical phone numbers and contacts, enter it in your phone
- Automate updates for both clients and servers, goal update everything in hours
- Learn to run Nmap and Metasploit scripts - identify vulnerable servers

consider the fact we have multiple overlapping critical security incidents now!

How many incidents can your organisation handle in parallel?

Questions?

Henrik Lund Kramshøj, internet samurai
hlk@solido.net

http://www.solidonetworks.com

You are always welcome to send me questions later via email