Welcome to

Penetration testing IV cryptography og cracking

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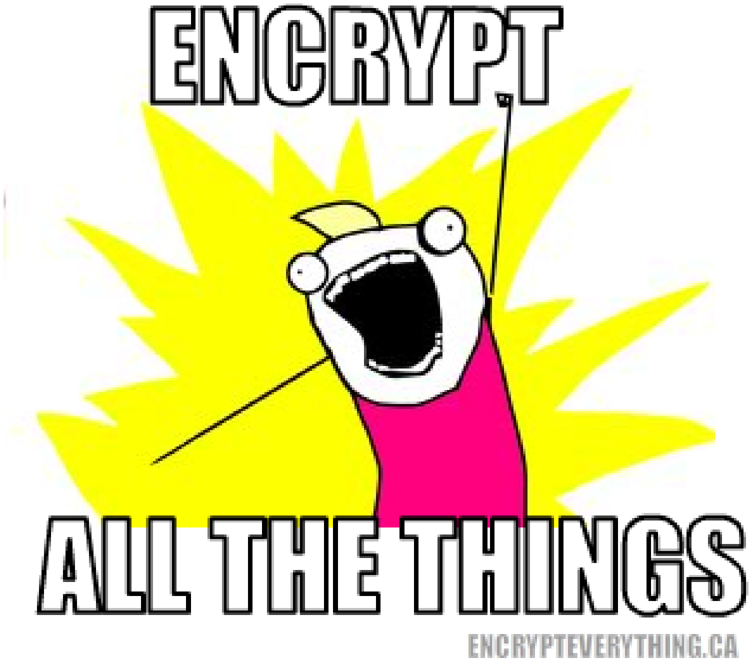
http://www.solidonetworks.com

Formålet idag



Introducere nogle almindelige protokoller og deres krav

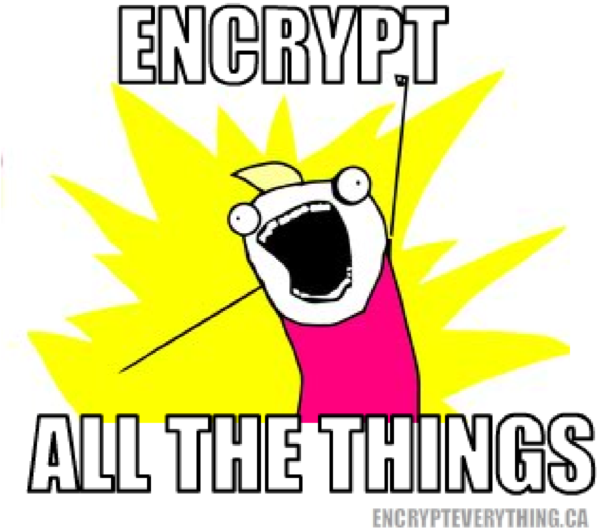
Introducere basale penetrationstest værktøjer indenfor kryptografi

Skabe en grundig forståelse for praktisk anvendelig kryptografi

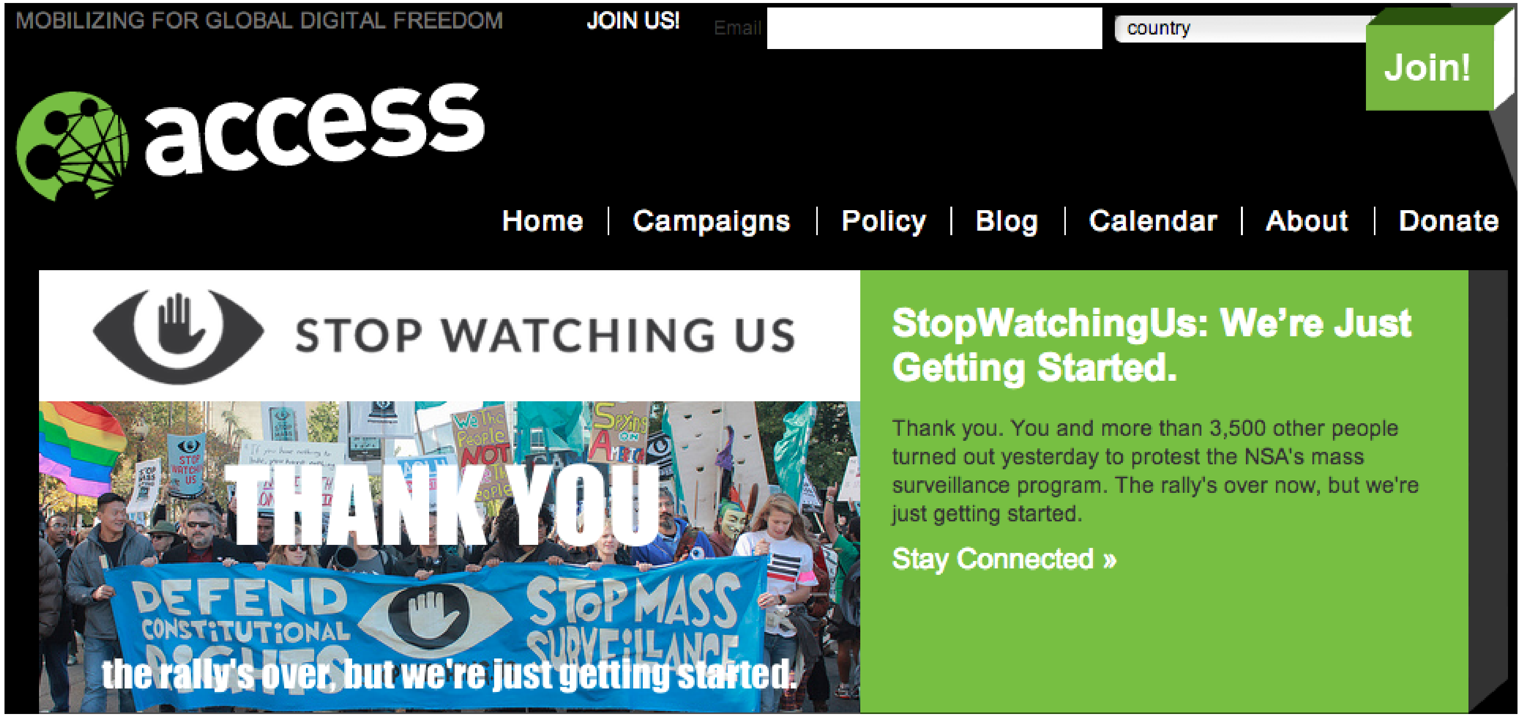
Generic advice

Recommendations

- Lock your devices, phones, tables and computers
- Update software and apps
- Do NOT use the same password everywhere
- Watch out when using open wifi-networks
- Multiple browsers: one for Facebook, and separate for home banking apps?
- Multiple laptops? One for private data, one for work?
- Think of the data you produce, why do people take naked pictures and SnapChat them?
- Use pseudonyms and aliases, do not use your real name everywhere
- Enable encryption: IMAP**S** POP3**S** HTTP**S** TOR OpenPGP VPN SSL/TLS



Stop watching us!



MOBILIZING FOR GLOBAL DIGITAL FREEDOM

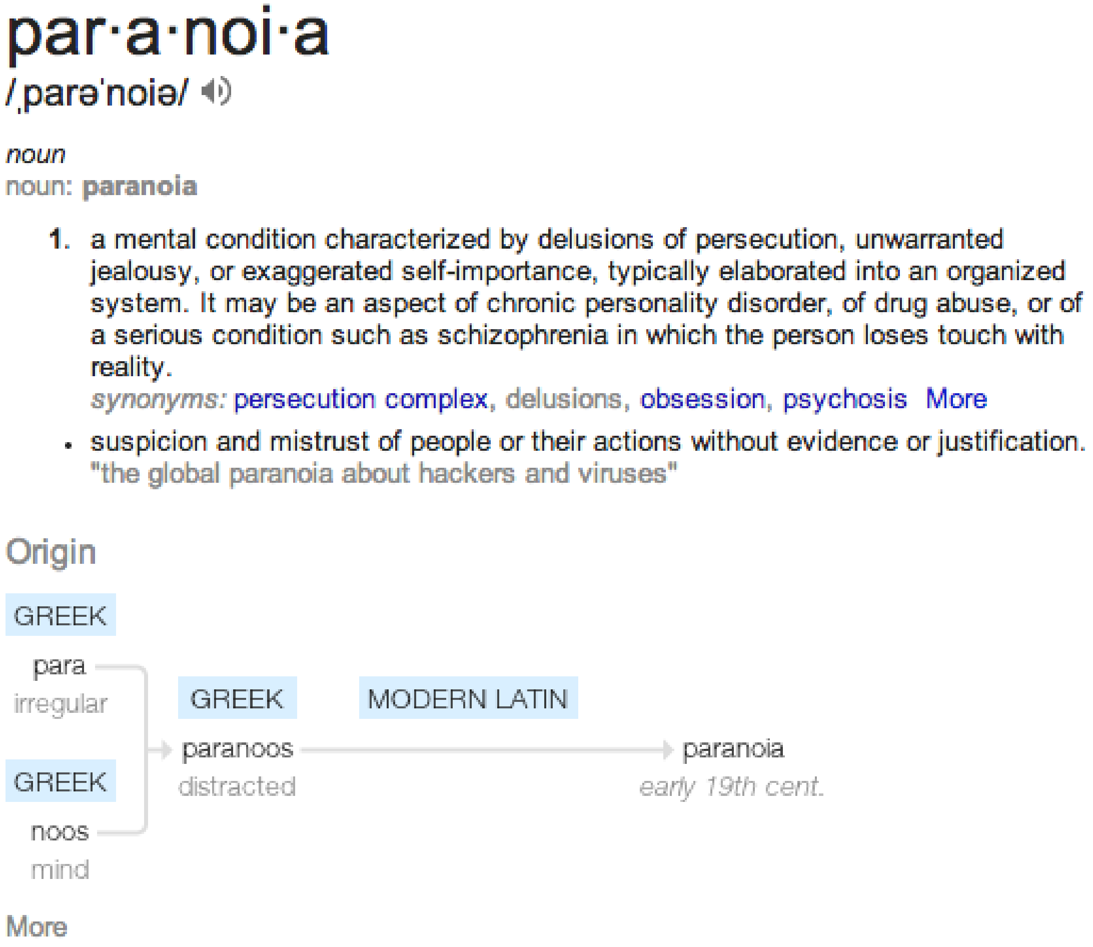
JOIN US!
Email
country
Join!
access
Home | Campaigns | Policy | Blog | Calendar | About | Donate
STOP WATCHING US
THANK YOU
DEFEND CONSTITUTIONAL RIGHTS
STOP MASS SURVEILLANCE
the rally's over, but we're just getting started.

StopWatchingUs: We're Just Getting Started.

Thank you. You and more than 3,500 other people turned out yesterday to protest the NSA's mass surveillance program. The rally's over now, but we're just getting started.

Stay Connected »

Appropriate paranoia



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

GREEK para irregular + GREEK noos mind → GREEK paranoos distracted → MODERN LATIN paranoia *early 19th cent.*

More

Source: google paranoia definition

Face reality

From the definition:

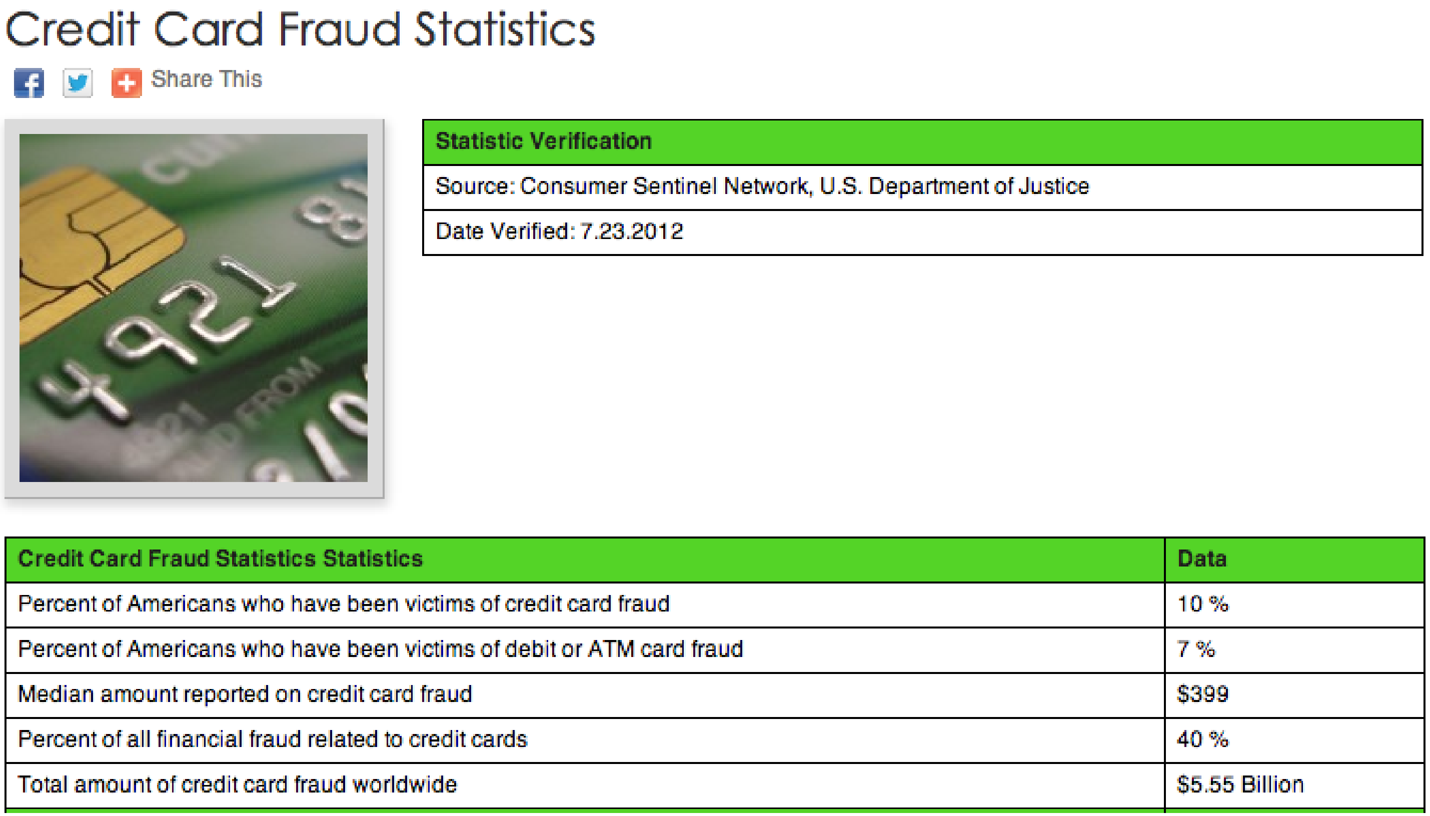
> suspicion and mistrust of people or their actions **without evidence or justification**. **”the global paranoia about hackers and viruses”**

It is not paranoia when:

- Criminals sell your credit card information and identity theft
- Trade infected computers like a commodity
- Governments write laws that allows them to introduce back-doors - and use these
- Governments do blanket surveillance of their population
- Governments implement censorship, threaten citizens and journalist

You are not paranoid when there are people actively attacking you!

Credit card fraud and identity theft statistics



Credit Card Fraud Statistics

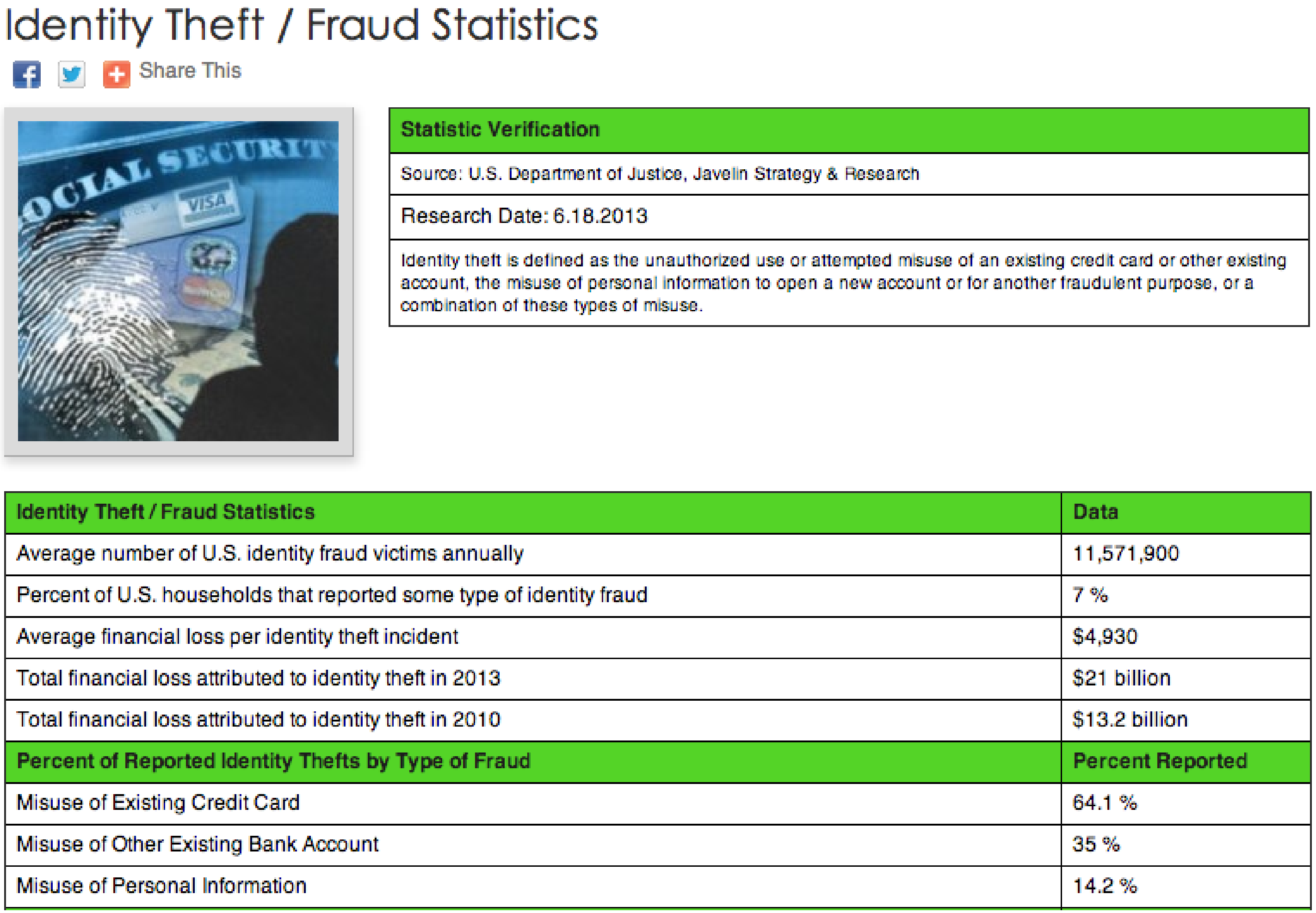
Share This

Statistic Verification
Source: Consumer Sentinel Network, U.S. Department of Justice
Date Verified: 7.23.2012

Credit Card Fraud Statistics Statistics	Data
Percent of Americans who have been victims of credit card fraud	10 %
Percent of Americans who have been victims of debit or ATM card fraud	7 %
Median amount reported on credit card fraud	$399
Percent of all financial fraud related to credit cards	40 %
Total amount of credit card fraud worldwide	$5.55 Billion

Source: `http://www.statisticbrain.com/credit-card-fraud-statistics/`

Identity theft statistics



Identity Theft / Fraud Statistics

Share This

Statistic Verification
Source: U.S. Department of Justice, Javelin Strategy & Research
Research Date: 6.18.2013
Identity theft is defined as the unauthorized use or attempted misuse of an existing credit card or other existing account, the misuse of personal information to open a new account or for another fraudulent purpose, or a combination of these types of misuse.

Identity Theft / Fraud Statistics	Data
Average number of U.S. identity fraud victims annually	11,571,900
Percent of U.S. households that reported some type of identity fraud	7 %
Average financial loss per identity theft incident	$4,930
Total financial loss attributed to identity theft in 2013	$21 billion
Total financial loss attributed to identity theft in 2010	$13.2 billion
Percent of Reported Identity Thefts by Type of Fraud	**Percent Reported**
Misuse of Existing Credit Card	64.1 %
Misuse of Other Existing Bank Account	35 %
Misuse of Personal Information	14.2 %

Source: `http://www.statisticbrain.com/identity-theft-fraud-statistics/`

Use protection - always

WHAT IF I TOLD YOU
PROTECTING YOURSELF FROM CRIMINALS AND GOVERNMENTS IS THE SAME THING
memegenerator.net

A vulnerability can and will be abused

What if I told you:

Criminals will be happy to leverage backdoors created by government

It does not matter if the crypto product has a weakness to allow investigations or the software has a backdoor to help law enforcement. Data and vulnerabilities WILL be abused and exploited.

Why think of security?

Privacy is necessary for an open society in the electronic age. Privacy is not secrecy. A private matter is something one doesn't want the whole world to know, but a secret matter is something one doesn't want anybody to know. Privacy is the power to selectively reveal oneself to the world. A Cypherpunk's Manifesto by Eric Hughes, 1993

Copied from `https://cryptoparty.org/wiki/CryptoParty`

Formål: Hvorfor gør vi det her?

Et demokrati fordrer borgere med frihed som har evnen til at tage beslutninger, som ikke skal være bange for overvågning.

Et demokrati fordrer borgere som aktivt vælger hvornår de afgiver personlige data om deres liv og færden.

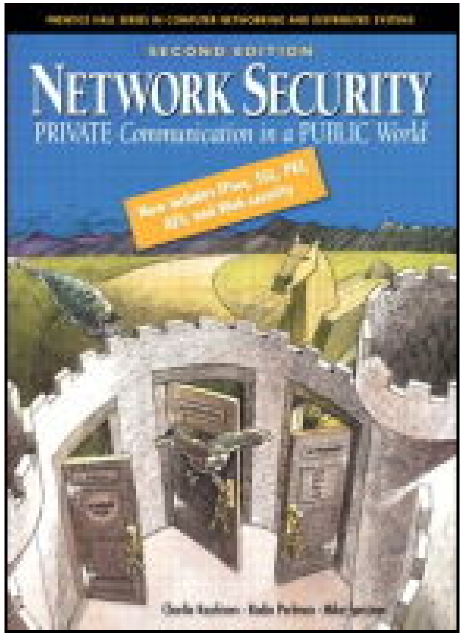
Kryptografi er en fredelig protest mod indsamling at data som misbruges enten til kriminelle formål, kommercielle formål eller under dække af beskyttelse mod terror, ekstremisme, nazisme, misbrug af børn, ... Le mal du jour / dagens onde.

Du bestemmer - det er demokrati

Derudover stalking, ekskærester, arbejdsgivere, forældre, ...

Rejsen starter

Hvor skal vi nu starte denne rejse?



Private Communications in an Public World

Anbefalelsesværdig bog som gennemgår grundlaget for kryptering, teknikker og protokollerne der bruges på internet idag, herunder: IPsec, SSL/TLS, PGP, PKI, AES m.fl.

First advice

Use technology

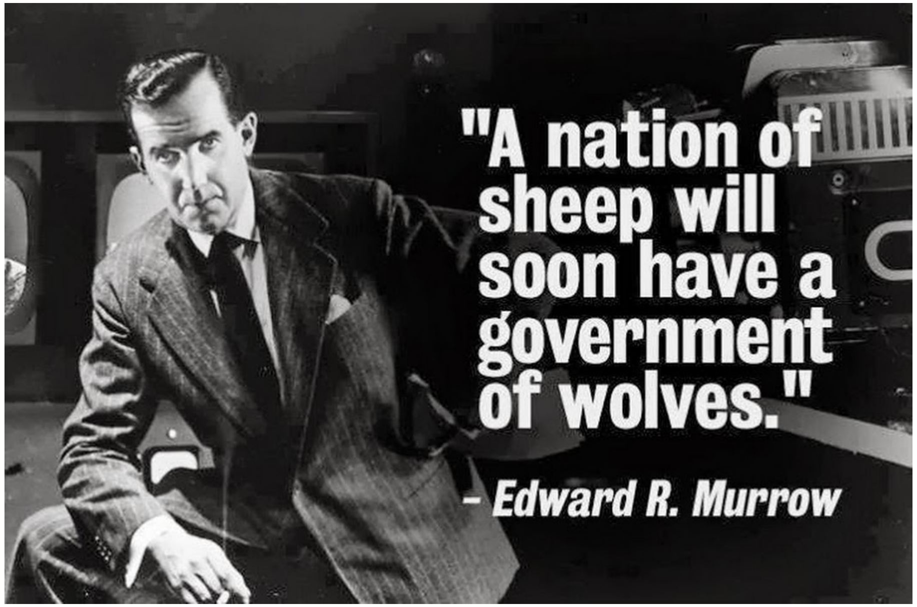
Learn the technology - read the freaking manual

Think about the data you have, upload, facebook license?! WTF!

Think about the data you create - nude pictures taken, where will they show up?

- Turn off features you don't use
- Turn off network connections when not in use
- Update software and applications
- Turn on encryption: IMAP**S**, POP3**S**, HTTP**S** also for data at rest, full disk encryption, tablet encryption
- Lock devices automatically when not used for 10 minutes
- Dont trust fancy logins like fingerprint scanner or face recognition on cheap devices

Government backdoors is not news



Nothing new really, see for example D.I.R.T and Magic Lantern

D.I.R.T - Data Interception by Remote Transmission since the late 1990s
`http://cryptome.org/fbi-dirt.htm`
`http://cryptome.org/dirty-secrets2.htm`

They will always use *Le mal du jour* to increase monitoring

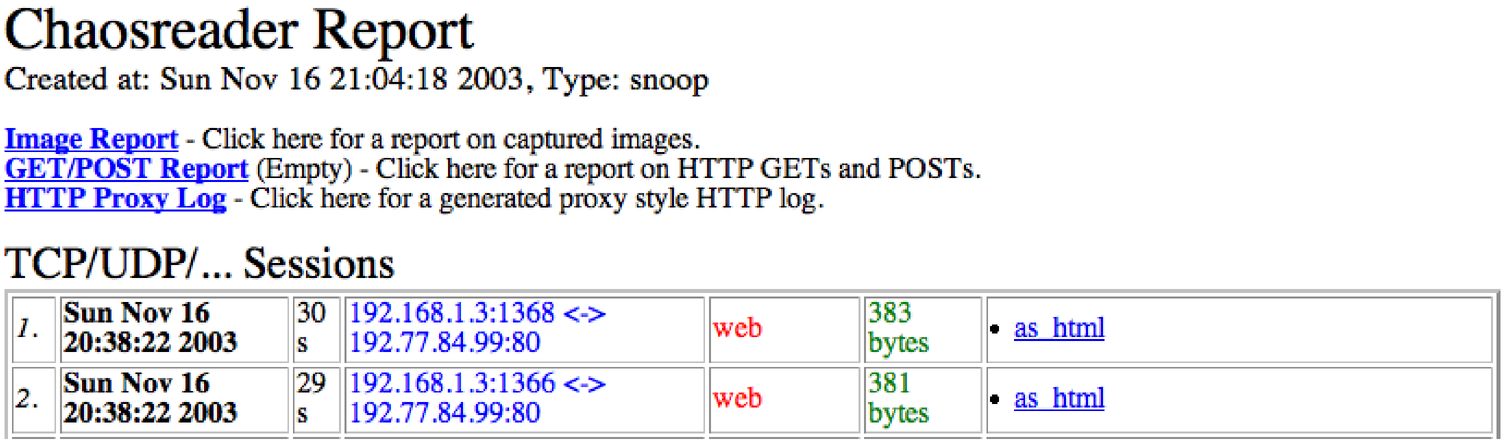
Government monitoring is not news

FBI Carnivore
”... that was designed to monitor email and electronic communications. It used a customizable packet sniffer that can monitor all of a target user’s Internet traffic.” http://en.wikipedia.org/wiki/Carnivore_(software)

NarusInsight ”Narus provided Egypt Telecom with Deep Packet Inspection equipment, a content-filtering technology that allows network managers to inspect, track and target content from users of the Internet and mobile phones, as it passes through routers on the information superhighway. Other Narus global customers include the national telecommunications authorities in Pakistan and Saudi Arabia, ...”
http://en.wikipedia.org/wiki/NarusInsight

Chaosreader

Chaosreader



Chaosreader Report

Created at: Sun Nov 16 21:04:18 2003, Type: snoop

Image Report - Click here for a report on captured images.
GET/POST Report (Empty) - Click here for a report on HTTP GETs and POSTs.
HTTP Proxy Log - Click here for a generated proxy style HTTP log.

TCP/UDP/... Sessions

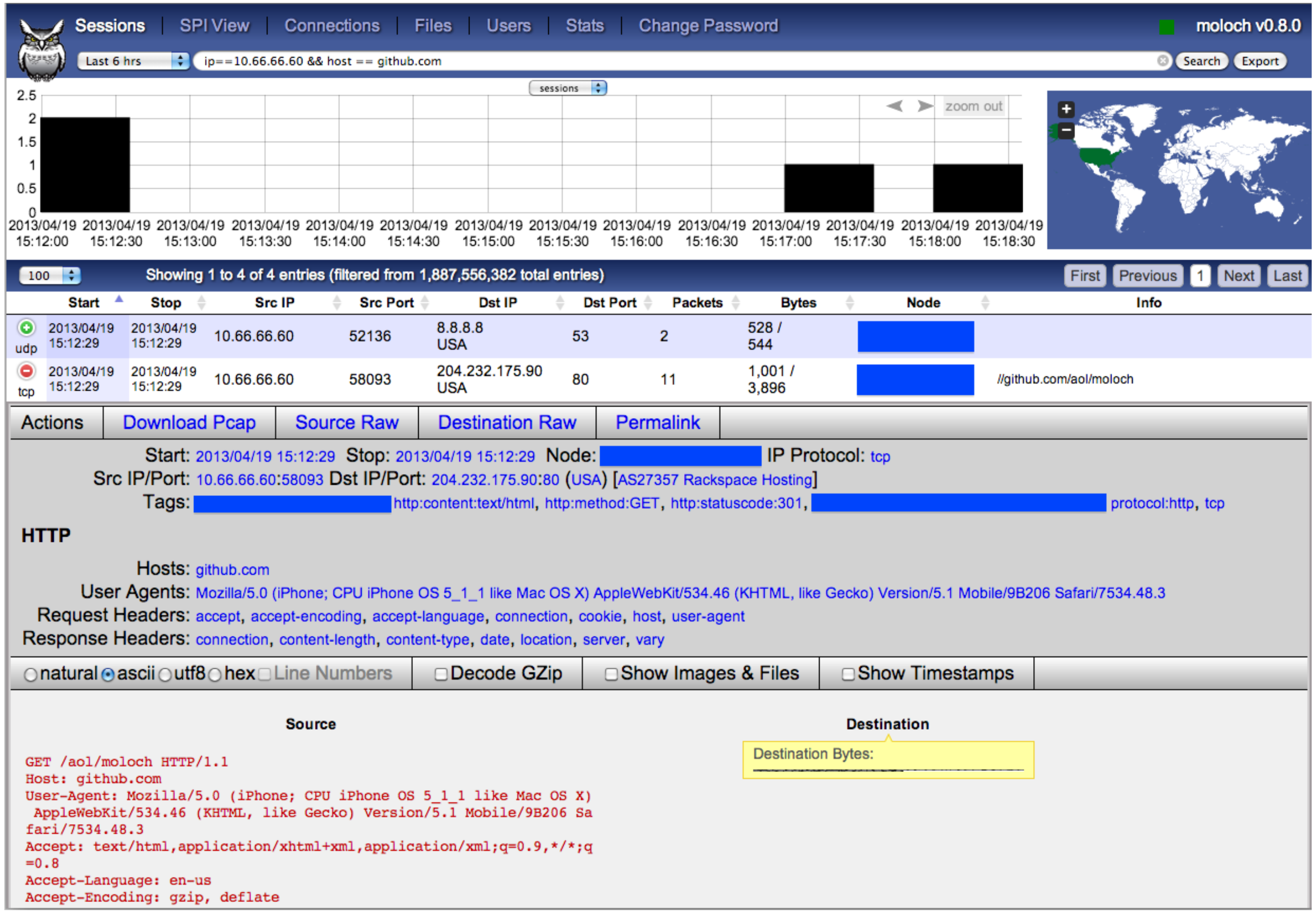
1.	**Sun Nov 16 20:38:22 2003**	30 s	192.168.1.3:1368 <-> 192.77.84.99:80	web	383 bytes	• as_html
2.	**Sun Nov 16 20:38:22 2003**	29 s	192.168.1.3:1366 <-> 192.77.84.99:80	web	381 bytes	• as_html

Med adgang til et netværksdump kan man læse det med chaosreader

Output er HTML med oversigter over sessioner, billeder fra datastrømmen osv.

`http://chaosreader.sourceforge.net/`

Big data example Moloch



ip==10.66.66.60 && host == github.com

Showing 1 to 4 of 4 entries (filtered from 1,887,556,382 total entries)

	Start	Stop	Src IP	Src Port	Dst IP	Dst Port	Packets	Bytes	Node	Info
udp	2013/04/19 15:12:29	2013/04/19 15:12:29	10.66.66.60	52136	8.8.8.8 USA	53	2	528 / 544	[redacted]	
tcp	2013/04/19 15:12:29	2013/04/19 15:12:29	10.66.66.60	58093	204.232.175.90 USA	80	11	1,001 / 3,896	[redacted]	//github.com/aol/moloch

Start: 2013/04/19 15:12:29 Stop: 2013/04/19 15:12:29 Node: [redacted] IP Protocol: tcp

Src IP/Port: 10.66.66.60:58093 Dst IP/Port: 204.232.175.90:80 (USA) [AS27357 Rackspace Hosting]

Tags: [redacted] http:content:text/html, http:method:GET, http:statuscode:301, [redacted] protocol:http, tcp

HTTP

Hosts: github.com

User Agents: Mozilla/5.0 (iPhone; CPU iPhone OS 5_1_1 like Mac OS X) AppleWebKit/534.46 (KHTML, like Gecko) Version/5.1 Mobile/9B206 Safari/7534.48.3

Request Headers: accept, accept-encoding, accept-language, connection, cookie, host, user-agent

Response Headers: connection, content-length, content-type, date, location, server, vary

○ natural ● ascii ○ utf8 ○ hex □ Line Numbers □ Decode GZip □ Show Images & Files □ Show Timestamps

Source

```
GET /aol/moloch HTTP/1.1
Host: github.com
User-Agent: Mozilla/5.0 (iPhone; CPU iPhone OS 5_1_1 like Mac OS X)
 AppleWebKit/534.46 (KHTML, like Gecko) Version/5.1 Mobile/9B206 Sa
fari/7534.48.3
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q
=0.8
Accept-Language: en-us
Accept-Encoding: gzip, deflate
```

Destination

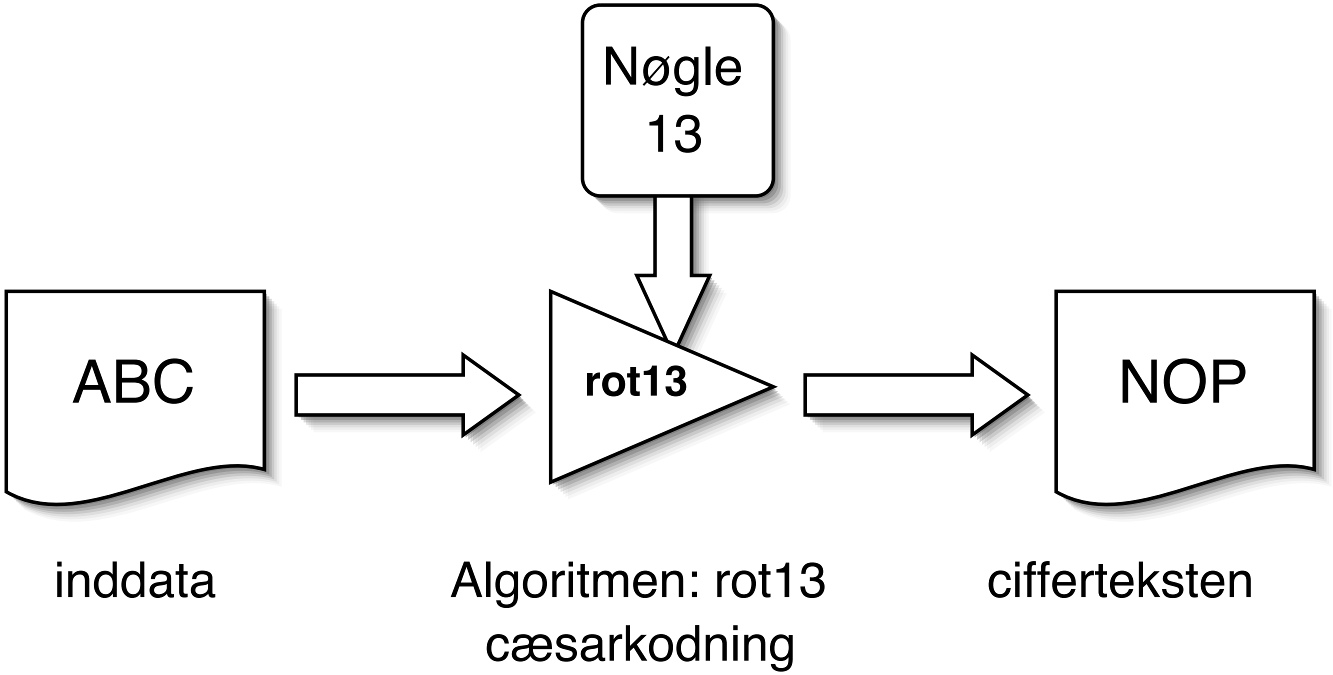
Destination Bytes:

Picture from `https://github.com/aol/moloch`

Kryptering step 1 - eksisterende programmer

Vi vil nu snakke overordnet om kryptering - uden matematik ☺

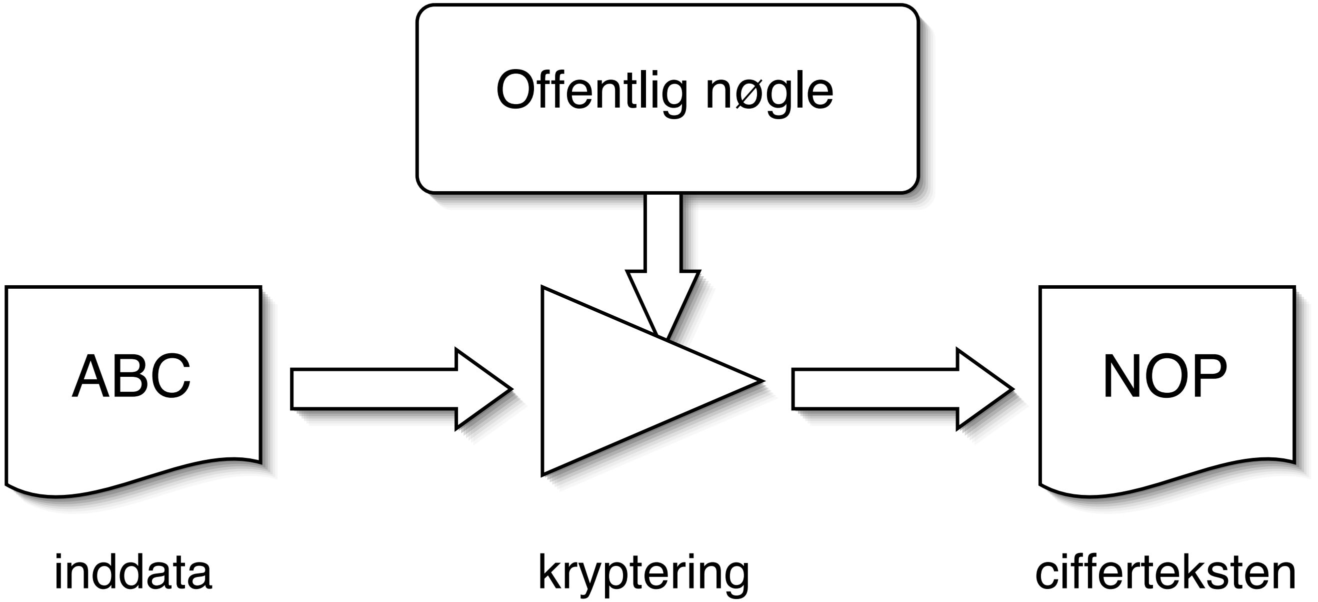
Kryptografi



Kryptografi er læren om, hvordan man kan kryptere data

Kryptografi benytter algoritmer som sammen med nøgler giver en ciffertekst - der kun kan læses ved hjælp af den tilhørende nøgle

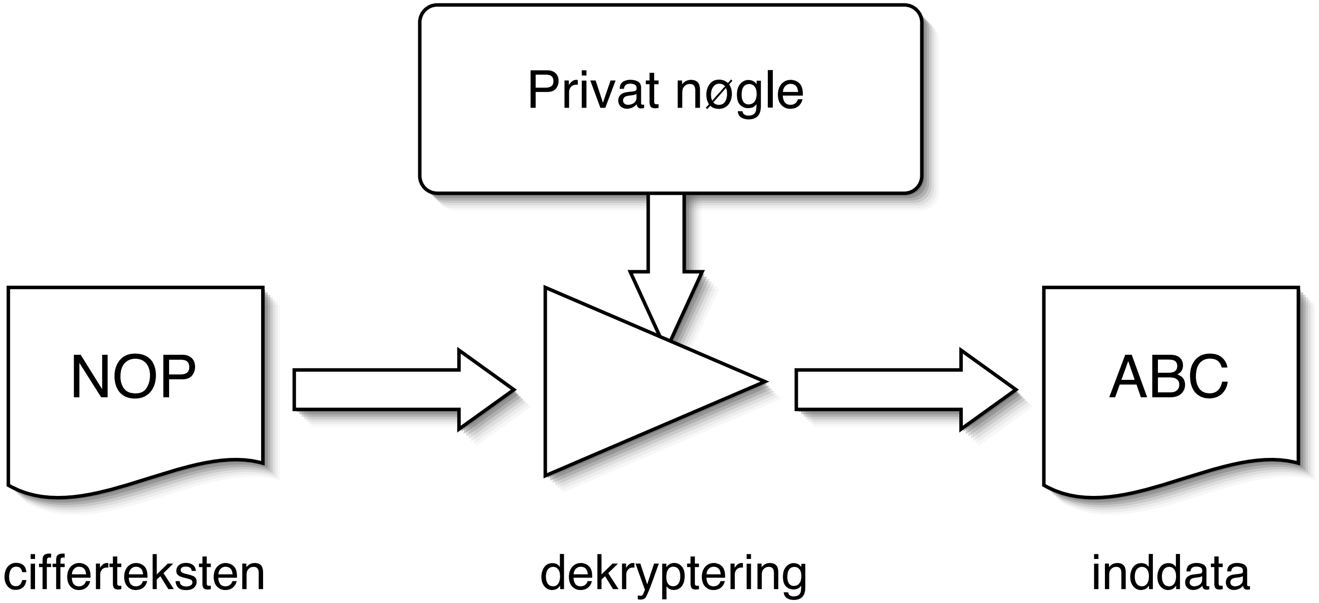
Public key kryptografi - 1



privat-nøgle kryptografi (eksempelvis AES) benyttes den samme nøgle til kryptering og dekryptering

offentlig-nøgle kryptografi (eksempelvis RSA) benytter to separate nøgler til kryptering og dekryptering

Public key kryptografi - 2



offentlig-nøgle kryptografi (eksempelvis RSA) bruger den private nøgle til at dekryptere

man kan ligeledes bruge offentlig-nøgle kryptografi til at signere dokumenter - som så verificeres med den offentlige nøgle

Kryptografiske principper

Algoritmerne er kendte

Nøglerne er hemmelige

Nøgler har en vis levetid - de skal skiftes ofte

Et successfuldt angreb på en krypto-algoritme er enhver genvej som kræver mindre arbejde end en gennemgang af alle nøglerne

Nye algoritmer, programmer, protokoller m.v. skal gennemgås nøje!

Se evt. Snake Oil Warning Signs: Encryption Software to Avoid
`http://www.interhack.net/people/cmcurtin/snake-oil-faq.html`

Kryptering

Formålet med kryptering

kryptering er den eneste måde at sikre:

fortrolighed

autenticitet / integritet

DES, Triple DES og AES

AES

Advanced Encryption Standard

DES kryptering baseret på den IBM udviklede Lucifer algoritme har været benyttet gennem mange år.

Der er vedtaget en ny standard algoritme Advanced Encryption Standard (AES) som afløser Data Encryption Standard (DES)

Algoritmen hedder Rijndael og er udviklet af Joan Daemen og Vincent Rijmen.

```
http://en.wikipedia.org/wiki/Advanced_Encryption_Standard
http://csrc.nist.gov/encryption/aes/
```

Secure protocols

Securing e-mail

- Pretty Good Privacy - Phil Zimmermann
- OpenPGP = e-mail security

Network sessions use SSL/TLS

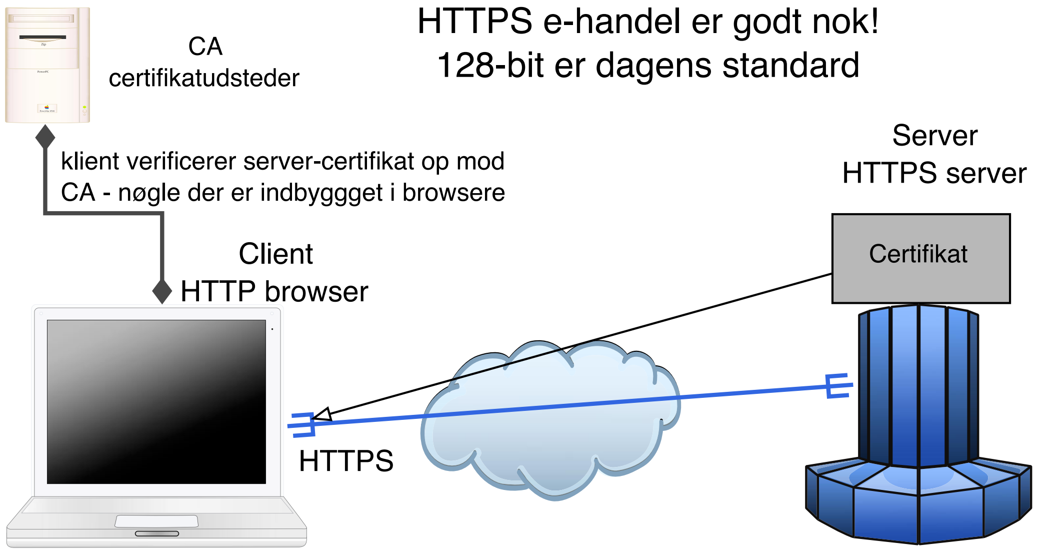
- Secure Sockets Layer SSL / Transport Layer Services TLS
- Encrypting data sent and received
- SSL/TLS already used for many protocols as a wrapper: POP3S, IMAPS, SSH, SMTP+TLS m.fl.

Encrypting traffic at the network layer - Virtual Private Networks VPN

- IPsec IP Security Framework, se også L2TP
- PPTP Point to Point Tunneling Protocol - dårlig og usikker, brug den ikke mere!
- OpenVPN uses SSL/TLS across TCP or UDP

Note: SSL/TLS is not trivial to implement, key management!

SSL og TLS


CA
certifikatudsteder
HTTPS e-handel er godt nok!
128-bit er dagens standard
klient verificerer server-certifikat op mod
CA - nøgle der er indbyggget i browsere
Server
HTTPS server
Certifikat
Client
HTTP browser
HTTPS

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

Postservere til klienter

Når vi skal hente post sker det typisk med POP3 eller IMAP

- POP3 Post Office Protocol version 3 RFC-1939
- Internet Message Access Protocol (typisk IMAPv4) RFC-3501

Forskellen mellem de to er at man typisk med POP3 henter posten, hvor man med IMAP lader den ligge på serveren

POP3 er bedst hvis kun en klient skal hente

IMAP er bedst hvis du vil tilgå din post fra flere systemer

Jeg bruger selv IMAPS, IMAP over SSL kryptering - idet kodeord ellers sendes i klartekst

SMTP bruges til at sende mail mellem servere

POP3 - e-mail i Danmark

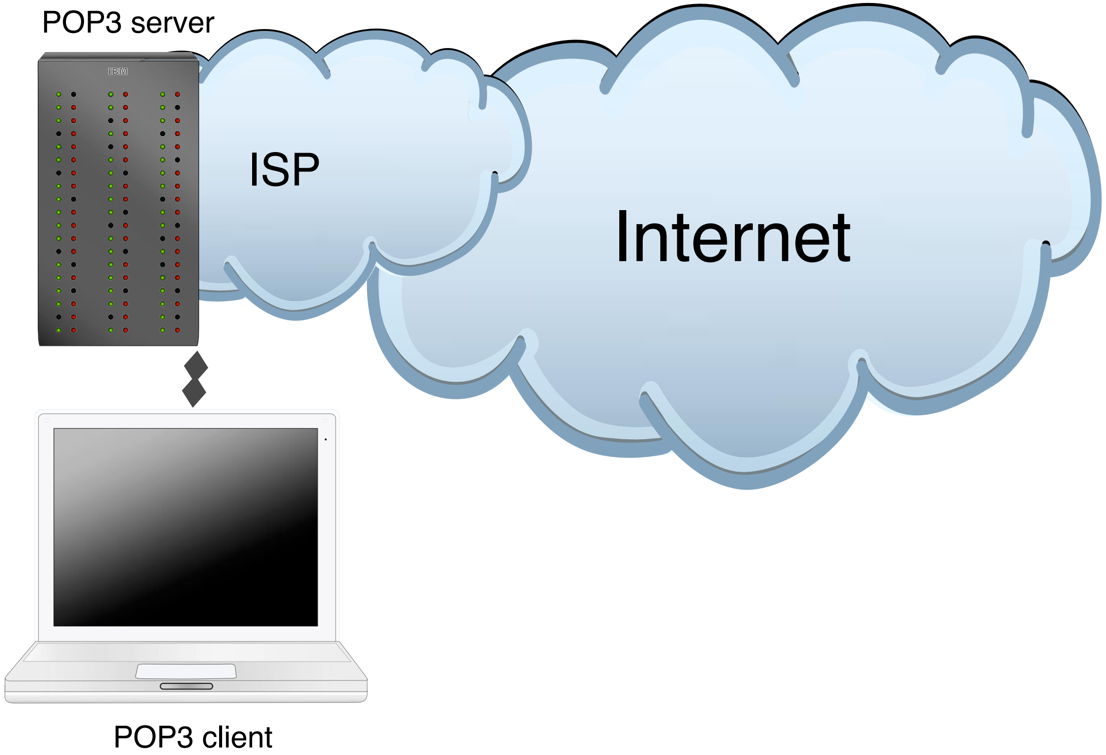
POP3 sender brugernavn og kodeord i klartekst - ligesom FTP

bruges dagligt af næsten alle privatkunder

alle internetudbydere og postudbydere tilbyder POP3

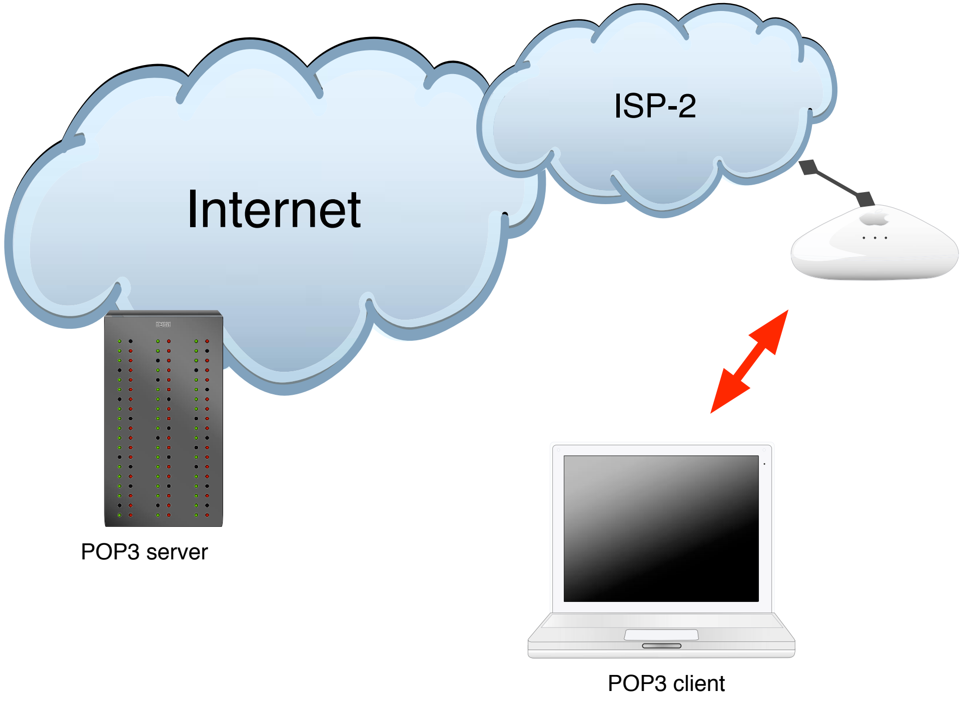
der findes en variant, POP3 over SSL/TLS

POP3 i Danmark



Man har tillid til sin ISP - der administrerer såvel net som server

POP3 i Danmark - trådløst



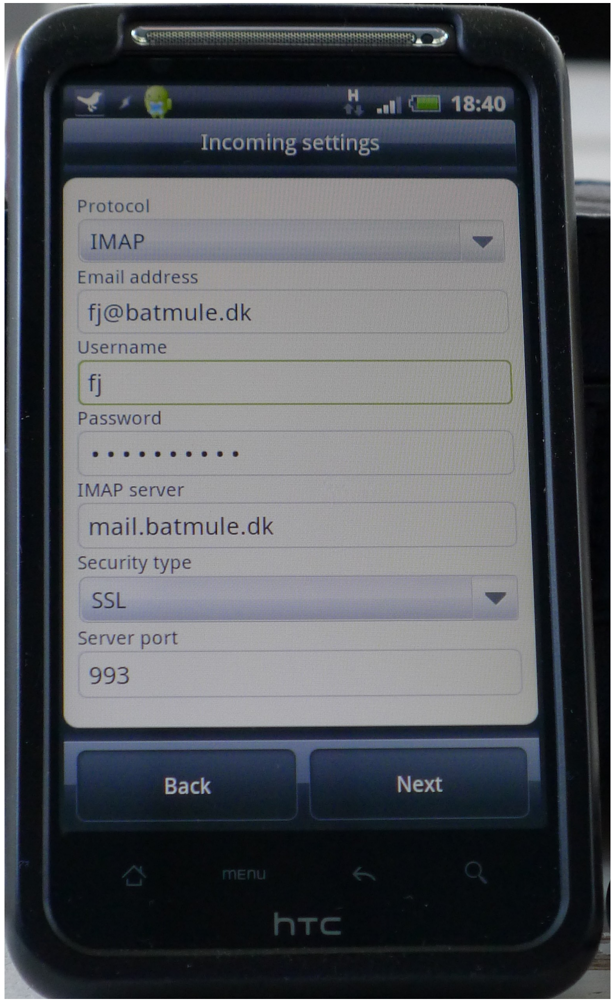
Har man tillid til andre ISP'er? Alle ISP'er?

Deler man et netværksmedium med andre?

Brug de rigtige protokoller!

SSL/TLS (1)

Istedet for POP3 brug POP3s, Istedet for IMAP brug IMAPs



Incoming settings

Protocol
IMAP

Email address
fj@batmule.dk

Username
fj

Password
•••••••••••

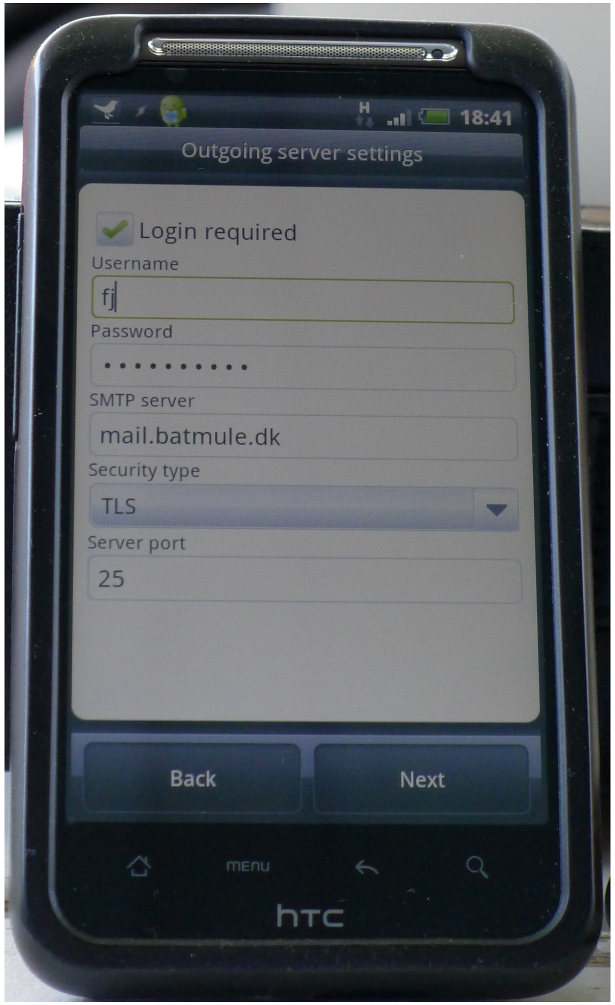
IMAP server
mail.batmule.dk

Security type
SSL

Server port
993

SSL/TLS (2)

SMTP kan erstattes med SMTP+TLS



18:41

Outgoing server settings

☑ Login required

Username: fj

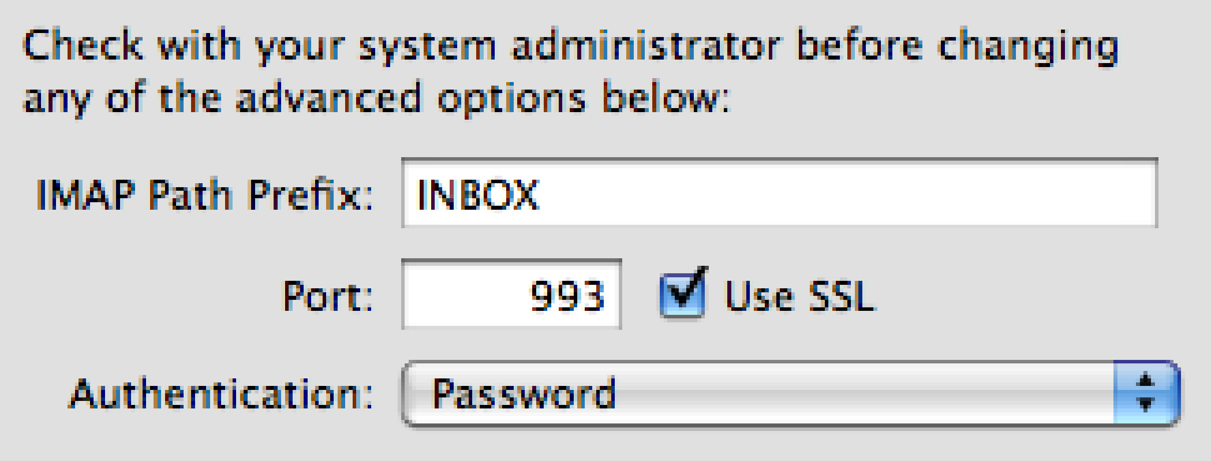
Password: •••••••••••

SMTP server: mail.batmule.dk

Security type: TLS

Server port: 25

SSL/TLS udgaver af protokoller



Check with your system administrator before changing any of the advanced options below:

IMAP Path Prefix: INBOX

Port: 993 ☑ Use SSL

Authentication: Password

Mange protokoller findes i udgaver hvor der benyttes SSL

HTTPS vs HTTP

IMAPS, POP3S, osv.

Bemærk: nogle protokoller benytter to porte IMAP 143/tcp vs IMAPS 993/tcp

Andre benytter den samme port men en kommando som starter:

SMTP STARTTLS RFC-3207

SSL

> The ’S’ in HTTPS stands for ’secure’ and the security is provided by SSL/TLS. SSL/TLS is a standard network protocol which is implemented in every browser and web server to provide confidentiality and integrity for HTTPS traffic.

Nu vi snakker om kryptering - SSL overalt?

Kan vi klare det på vores servere? ▮

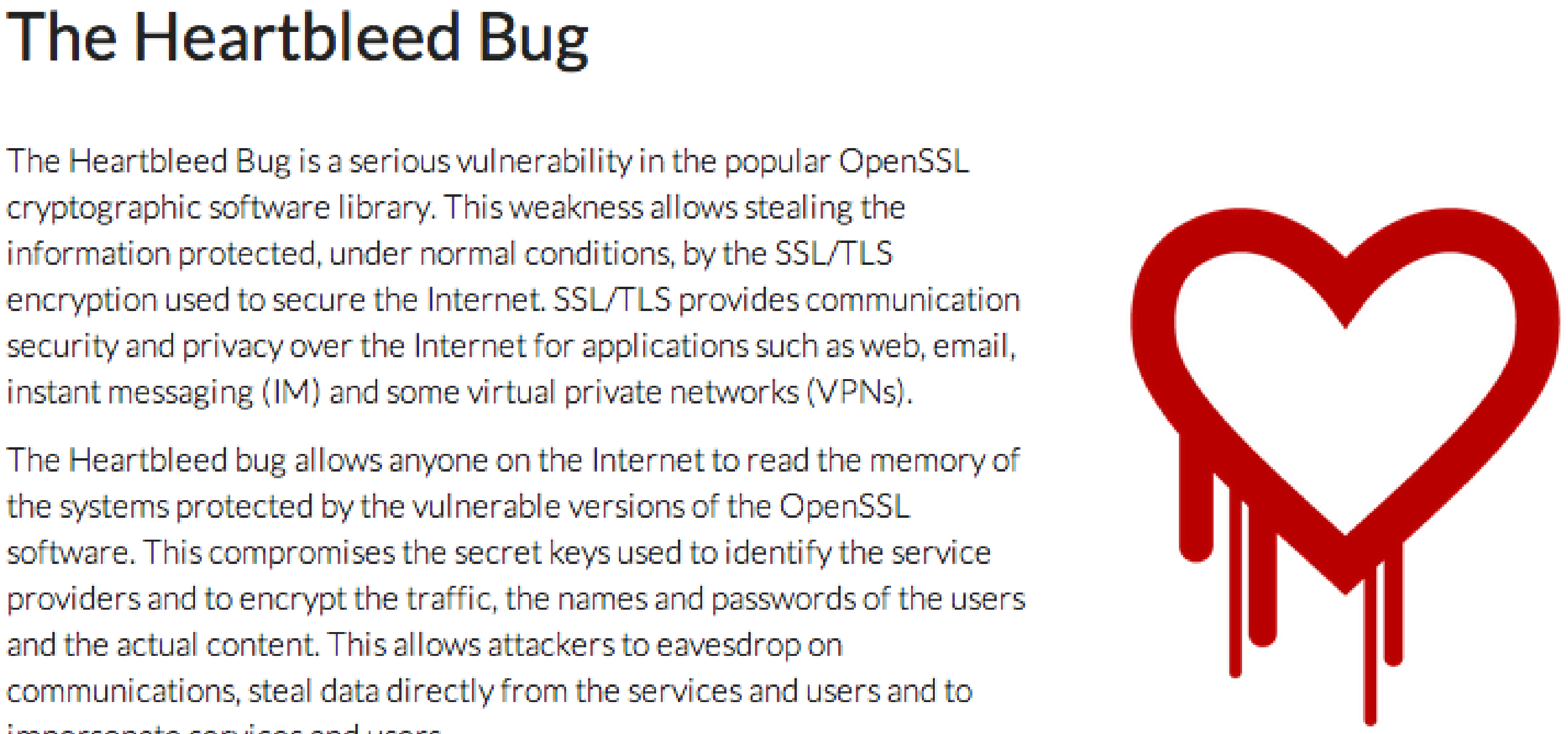
Google kan:
`http://www.imperialviolet.org/2010/06/25/overclocking-ssl.html`

Men alt for få gør det

▮

Næste spørgsmål er så hvilke rod-certifikater man stoler på ...

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 is yet another bug in SSL products

```
What versions of the OpenSSL are affected?
Status of different versions:

* OpenSSL 1.0.1 through 1.0.1f (inclusive) are vulnerable
* OpenSSL 1.0.1g is NOT vulnerable
* OpenSSL 1.0.0 branch is NOT vulnerable
* OpenSSL 0.9.8 branch is NOT vulnerable

Bug was introduced to OpenSSL in December 2011 and has been out
in the wild since OpenSSL release 1.0.1 on 14th of March
2012. OpenSSL 1.0.1g released on 7th of April 2014 fixes the bug.
```

It’s just a bug - but a serious one

Why is heartbleed different?

Great PR, name, web site, logo

OpenSSL is very widespread

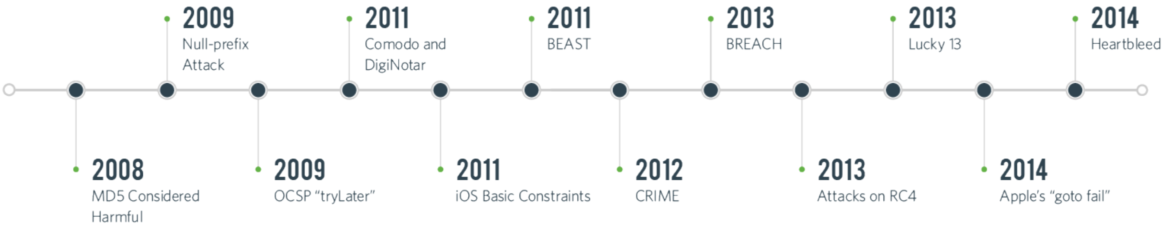
OpenSSL has been criticized before

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 - god or bad?

Proof of concept programs exist - god or bad?

Some of the tools released shortly after Heartbleed announcement

- https://github.com/FiloSottile/Heartbleed tool i Go
  site http://filippo.io/Heartbleed/
- https://github.com/titanous/heartbleeder tool i Go
- http://s3.jspenguin.org/ssltest.py PoC
- https://gist.github.com/takeshixx/10107280 test tool med STARTTLS support
- http://possible.lv/tools/hb/ test site
- https://twitter.com/richinseattle/status/453717235379355649 Practical Heartbleed attack against session keys links til, https://www.mattslifebytes.com/?p=533 og ”Fully automated here ”
  https://www.michael-p-davis.com/using-heartbleed-for-hijacking-user-sessio
- Metasploit er også opdateret på master repo
  https://twitter.com/firefart/status/453758091658792960
  https://github.com/rapid7/metasploit-framework/blob/master/modules/auxiliar
  scanner/ssl/openssl_heartbleed.rb

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.

Analysis of the heartbleed bug

- analyse af problemet i koden
  `http://blog.existentialize.com/diagnosis-of-the-openssl-heartbleed-bug.html`
- IDS regler Detecting OpenSSL Heartbleed with Suricata
  `http://blog.inliniac.net/2014/04/08/detecting-openssl-heartbleed-with-suric`
- god beskrivelse af hvordan man kan fixe hurtigere hvis man har automatiseret infrastruktur
  `https://www.getpantheon.com/heartbleed-fix`
- Mange blogindlæg om emnet - eksempelvis
  `http://blog.fox-it.com/2014/04/08/openssl-heartbleed-bug-live-blog/`
- ”nse script ssl-heartbleed.nse committed to nmap as rev 32798. ”
- You can now use Masscan to scan the whole internet for the Hearbleed vulnerability in under 6 minutes `https://twitter.com/jedisct1/status/453679529710460928` og `https://github.com/robertdavidgraham/masscan/commit/23497c448b0a1c7058e8`

Heartbleed Conclusions

Nothing new, but more focus on problems?
Really is there something new in this?

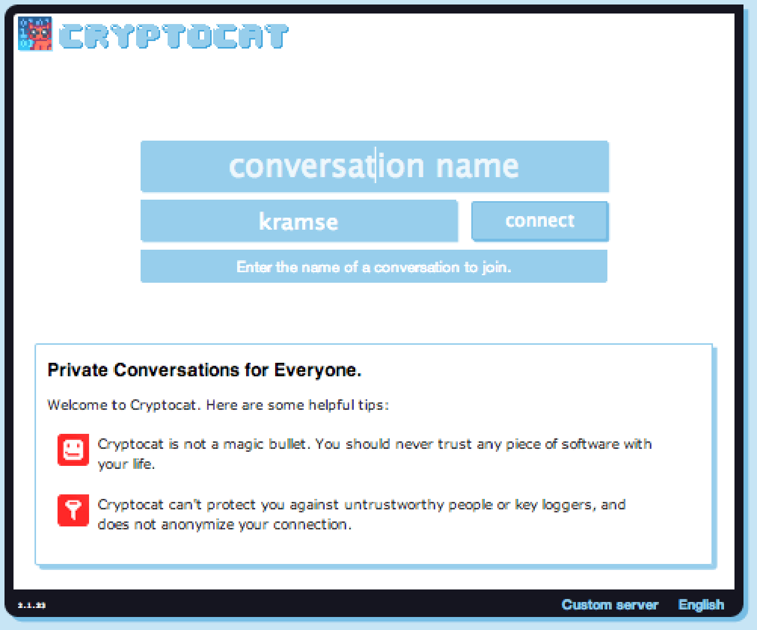
Software has bugs - stay vigilant, implement defense in depth

Software need funding - especially software used in our critical systems

Security needs proof of concepts and open communication
Akamai fix that wasn't good enough!

TL;DR Fund more security audits, stop using untested/unaudited software

Audits



Private Conversations for Everyone.

Welcome to Cryptocat. Here are some helpful tips:

Cryptocat is not a magic bullet. You should never trust any piece of software with your life.

Cryptocat can't protect you against untrustworthy people or key loggers, and does not anonymize your connection.

Truecrypt audit

`https://isecpartners.github.io/news/2014/04/14/iSEC-Completes-Truecrypt-Audit.html`

Cryptocat audit

`https://blog.crypto.cat/2013/02/cryptocat-passes-security-audit-with-flying-colors/`

Compare SSL

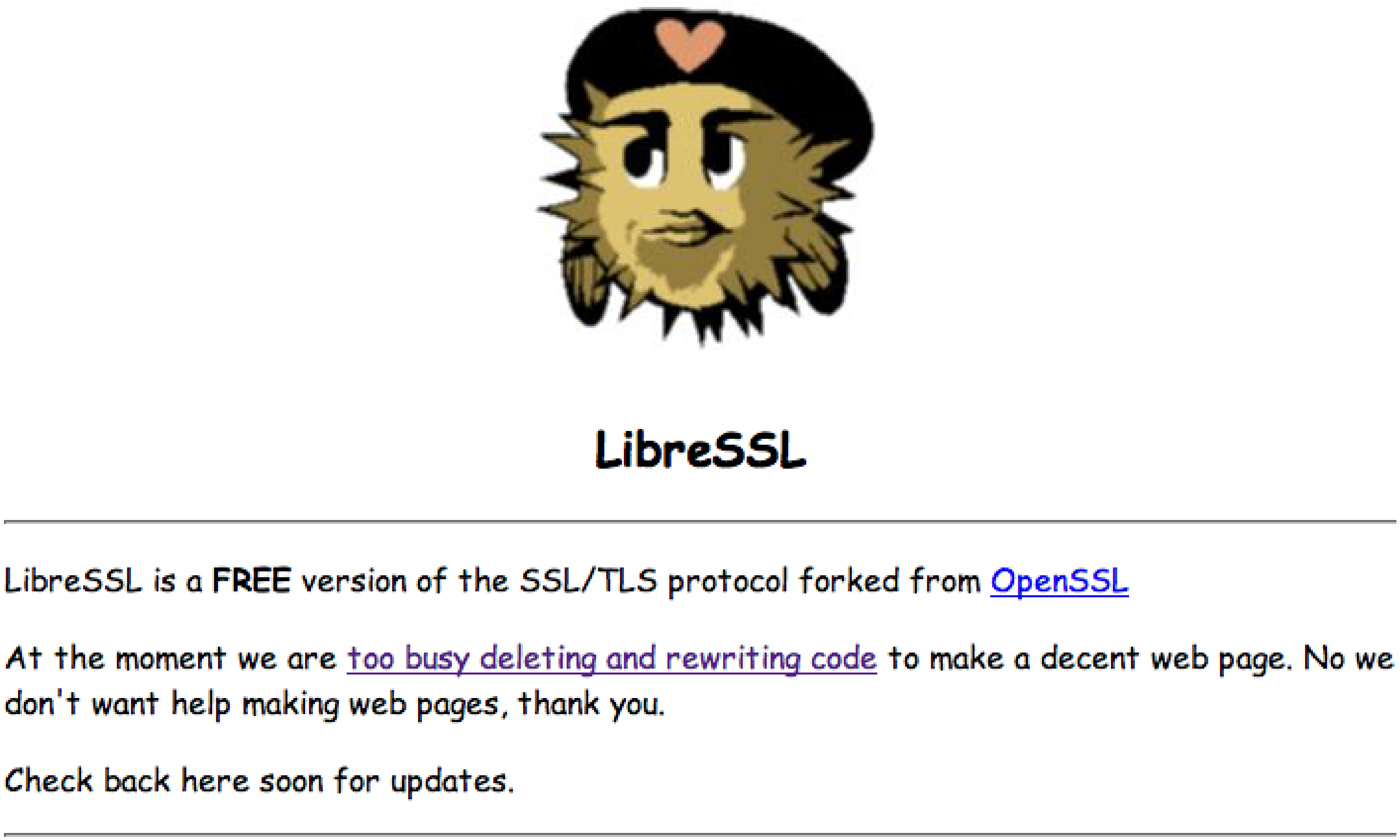
```
/* Read type and payload length first */
 if (1 + 2 + 16 > s->s3->rrec.length)
   return 0; /* silently discard */
 hbtype = *p++;
 n2s(p, payload);
 if (1 + 2 + payload + 16 > s->s3->rrec.length)
   return 0; /* silently discard per RFC 6520 sec. 4 */
 pl = p;
```

Ditch OpenSSL - write our own?

SSL implementations compared - above code from OpenSSL copied from this:
`http://tstarling.com/blog/2014/04/ssl-implementations-compared/`

LibreSSL announced, OpenBSD people
`http://www.libressl.org/` and `http://opensslrampage.org/`

LibreSSL



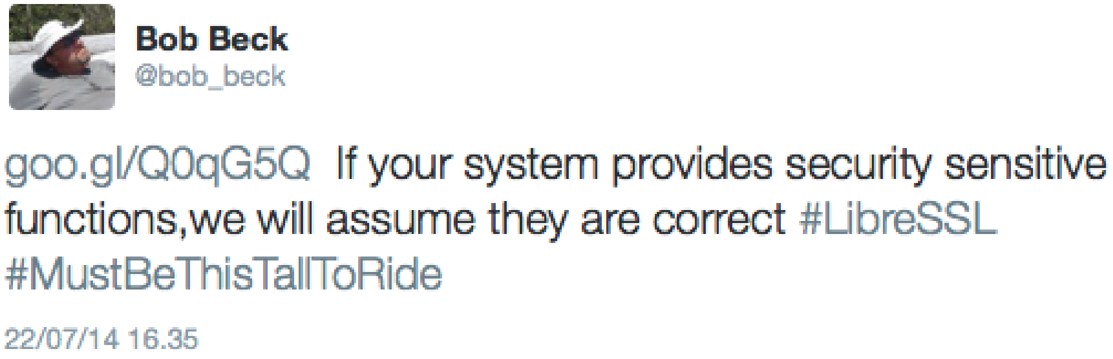
LibreSSL

LibreSSL is a **FREE** version of the SSL/TLS protocol forked from OpenSSL

At the moment we are too busy deleting and rewriting code to make a decent web page. No we don't want help making web pages, thank you.

Check back here soon for updates.

LibreSSL takes the hard decisions!



Bob Beck
@bob_beck

goo.gl/Q0qG5Q If your system provides security sensitive functions,we will assume they are correct #LibreSSL #MustBeThisTallToRide

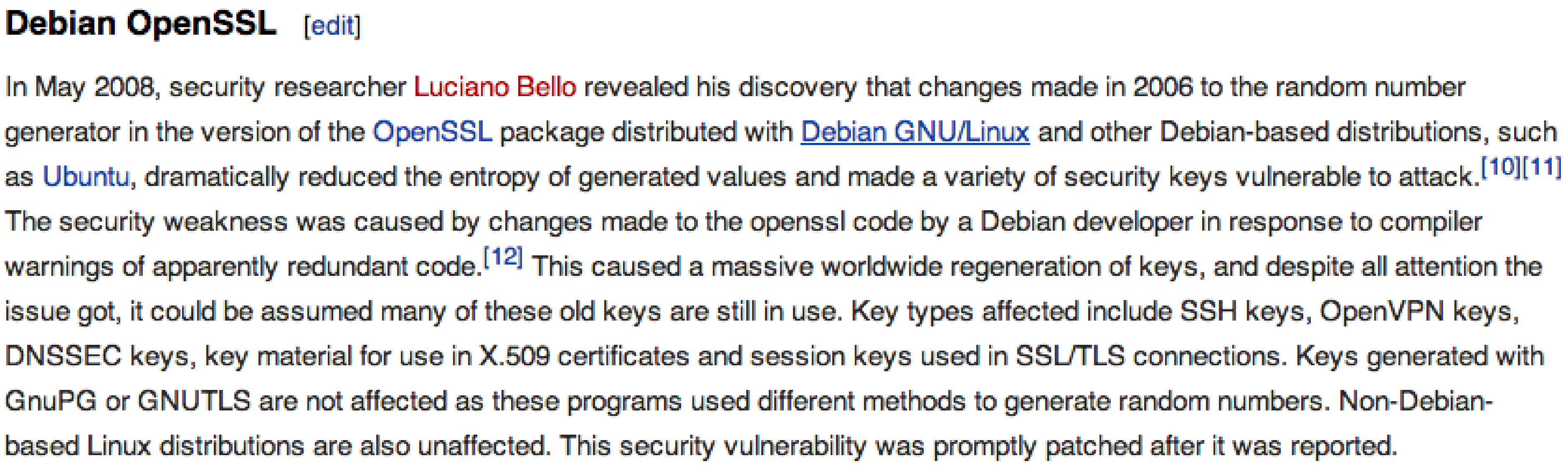
22/07/14 16.35

LibreSSL was first created for OpenBSD, and planned for next release 5.6

LibreSSL has released portable versions, but makes drastic changes:

- Requires PRNG ”Linux introduces getrandom(2) syscall (helpful for LibreSSL)”
  OpenSSL tried workaround which was not that great.
- LibreSSL does not support DOS, VMS anymore - booo fucking hooo
- LibreSSL does not support FIPS mode ”It’s gone and it’s not coming back.”
  `http://opensslrampage.org/post/83555615721/the-future-or-lack-thereof-of-li`

PRNG



Debian OpenSSL [edit]

In May 2008, security researcher Luciano Bello revealed his discovery that changes made in 2006 to the random number generator in the version of the OpenSSL package distributed with Debian GNU/Linux and other Debian-based distributions, such as Ubuntu, dramatically reduced the entropy of generated values and made a variety of security keys vulnerable to attack.[10][11] The security weakness was caused by changes made to the openssl code by a Debian developer in response to compiler warnings of apparently redundant code.[12] This caused a massive worldwide regeneration of keys, and despite all attention the issue got, it could be assumed many of these old keys are still in use. Key types affected include SSH keys, OpenVPN keys, DNSSEC keys, key material for use in X.509 certificates and session keys used in SSL/TLS connections. Keys generated with GnuPG or GNUTLS are not affected as these programs used different methods to generate random numbers. Non-Debian-based Linux distributions are also unaffected. This security vulnerability was promptly patched after it was reported.

`https://en.wikipedia.org/wiki/Random_number_generator_attack#Debian_OpenSSL`

Secure Shell - SSH og SCP

Hvad er Secure Shell SSH?

Oprindeligt udviklet af Tatu Ylonen i Finland,
se `http://www.ssh.com`

SSH afløser en række protokoller som er usikre:

- Telnet til terminal adgang
- r* programmerne, rsh, rcp, rlogin, ...
- FTP med brugerid/password

Do NOT USE FTP

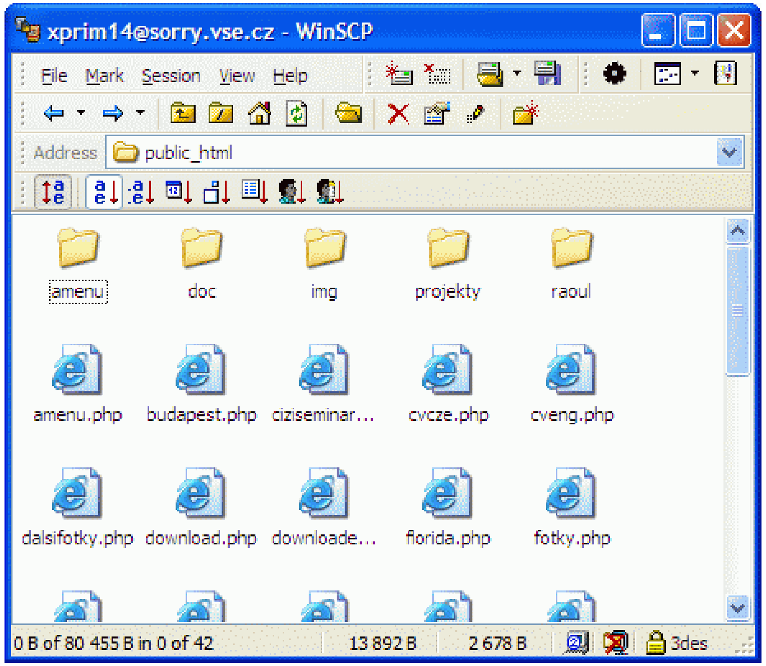
File Transfer Protocol - filoverførsler

FTP bruges især til:

- FTP - drivere, dokumenter, rettelser - Windows Update? er enten HTTP eller FTP
- Opdatering af websites
- Overførsel af data mellem virksomheder
- Serveren er indbygget i de fleste serveroperativsystemer

FTP sender i klartekst
USER brugernavn og
PASS hemmeligt-kodeord

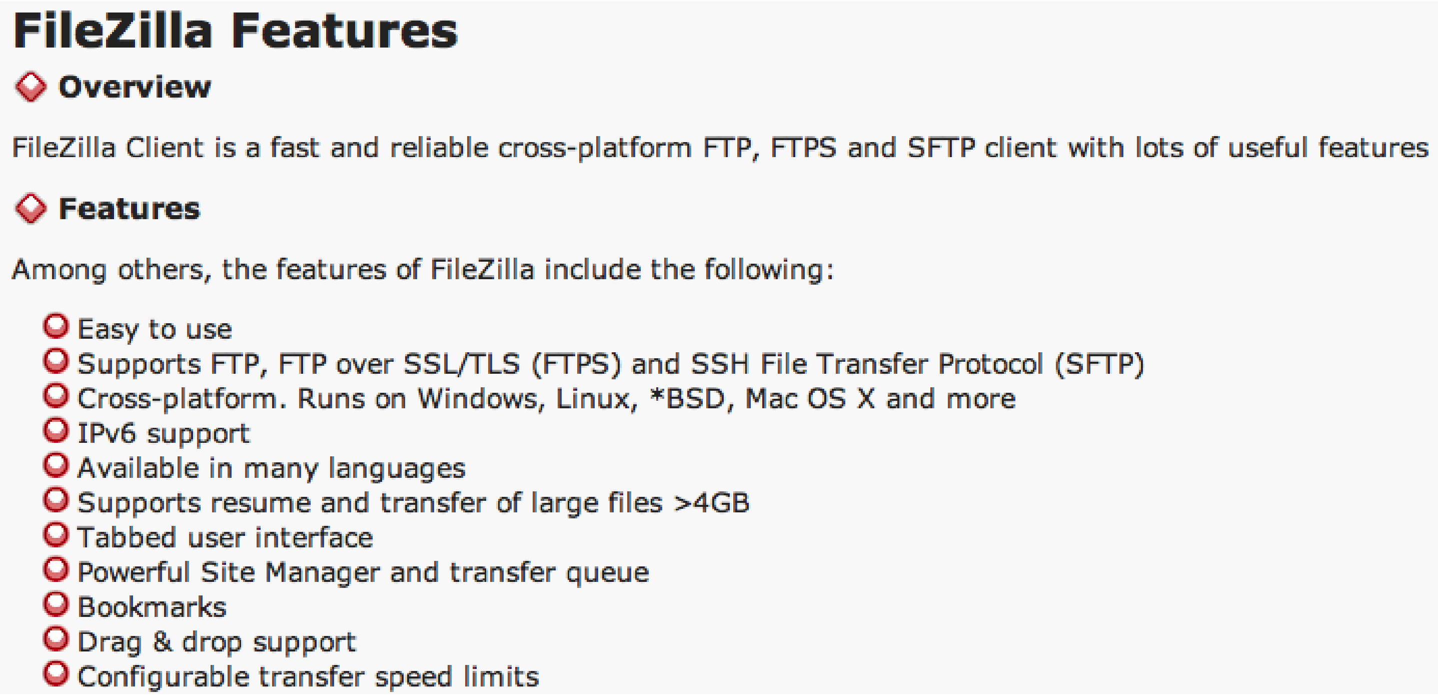
Grafisk Secure Copy - WinSCP



benytter Secure Shell protkollen (SSH)

screenshot fra
`http://winscp.vse.cz/eng/screenshots/large/explorer.gif`

Filetransfer programs FileZilla - SFTP



FileZilla Features

Overview

FileZilla Client is a fast and reliable cross-platform FTP, FTPS and SFTP client with lots of useful features

Features

Among others, the features of FileZilla include the following:

- Easy to use
- Supports FTP, FTP over SSL/TLS (FTPS) and SSH File Transfer Protocol (SFTP)
- Cross-platform. Runs on Windows, Linux, *BSD, Mac OS X and more
- IPv6 support
- Available in many languages
- Supports resume and transfer of large files >4GB
- Tabbed user interface
- Powerful Site Manager and transfer queue
- Bookmarks
- Drag & drop support
- Configurable transfer speed limits

Stop using FTP! Dammit!

Lots of programs support SFTP and SCP for secure copying of data

`http://filezilla-project.org/`

Simple Network Management Protocol

SNMP er en protokol der supporteres af de fleste professionelle netværksenheder, såsom switche, routere

hosts - skal slås til men følger som regel med

SNMP bruges til:

- *network management*
- statistik
- rapportering af fejl - SNMP traps

sikkerheden baseres på community strings der sendes som klartekst ...

det er nemmere at brute-force en community string end en brugerid/kodeord kombination

brute force

hvad betyder bruteforcing?
afprøvning af alle mulighederne

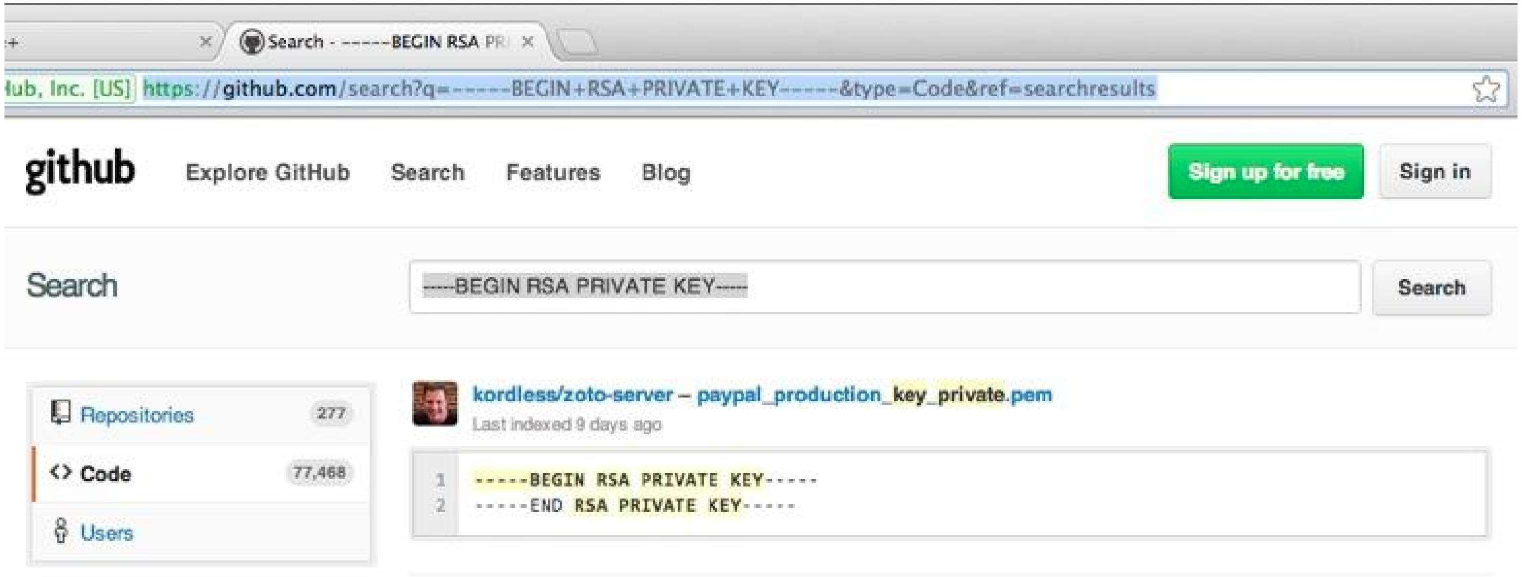
```
Hydra v2.5 (c) 2003 by van Hauser / THC <vh@thc.org>
Syntax: hydra [[[-l LOGIN|-L FILE] [-p PASS|-P FILE]] | [-C FILE]]
[-o FILE] [-t TASKS] [-g TASKS] [-T SERVERS] [-M FILE] [-w TIME]
[-f] [-e ns] [-s PORT] [-S] [-vV] server service [OPT]

Options:
  -S        connect via SSL
  -s PORT   if the service is on a different default port, define it here
  -l LOGIN  or -L FILE login with LOGIN name, or load several logins from FILE
  -p PASS   or -P FILE try password PASS, or load several passwords from FILE
  -e ns     additional checks, "n" for null password, "s" try login as pass
  -C FILE   colon seperated "login:pass" format, instead of -L/-P option
  -M FILE   file containing server list (parallizes attacks, see -T)
  -o FILE   write found login/password pairs to FILE instead of stdout
...
```

Formål: sund paranoia

The 5th Wave
By Rich Tennant
©RICHTENNANT
© 2006 Rich Tennant/Dist. by Universal Press Syndicate
12/3
www.the5thwave.com
"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."

Opbevaring af passwords

January 2013: Github Public passwords?



https://github.com/search?q=-----BEGIN+RSA+PRIVATE+KEY-----&type=Code&ref=searchresults

-----BEGIN RSA PRIVATE KEY-----

kordless/zoto-server – paypal_production_key_private.pem

Last indexed 9 days ago

```
-----BEGIN RSA PRIVATE KEY-----
-----END RSA PRIVATE KEY-----
```

Sources:

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

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

http://www.leakedin.com/

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

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

NT hashes

NT LAN manager hash værdier er noget man typisk kan samle op i netværk

det er en hash værdi af et password som man ikke burde kunne bruge til noget - hash algoritmer er envejs

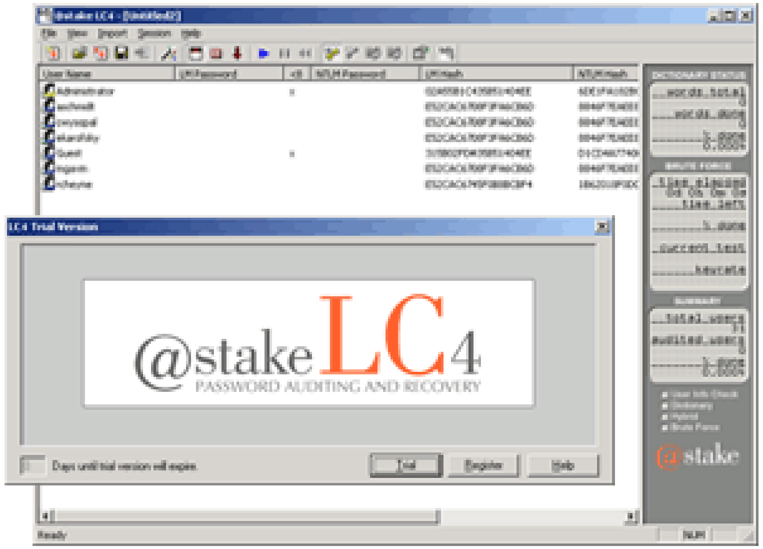
opbygningen gør at man kan forsøge brute-force på 7 tegn ad gangen!

en moderne pc med l0phtcrack kan nemt knække de fleste password på få dage!

og sikkert 25-30% indenfor den første dag - hvis der ingen politik er omkring kodeord!

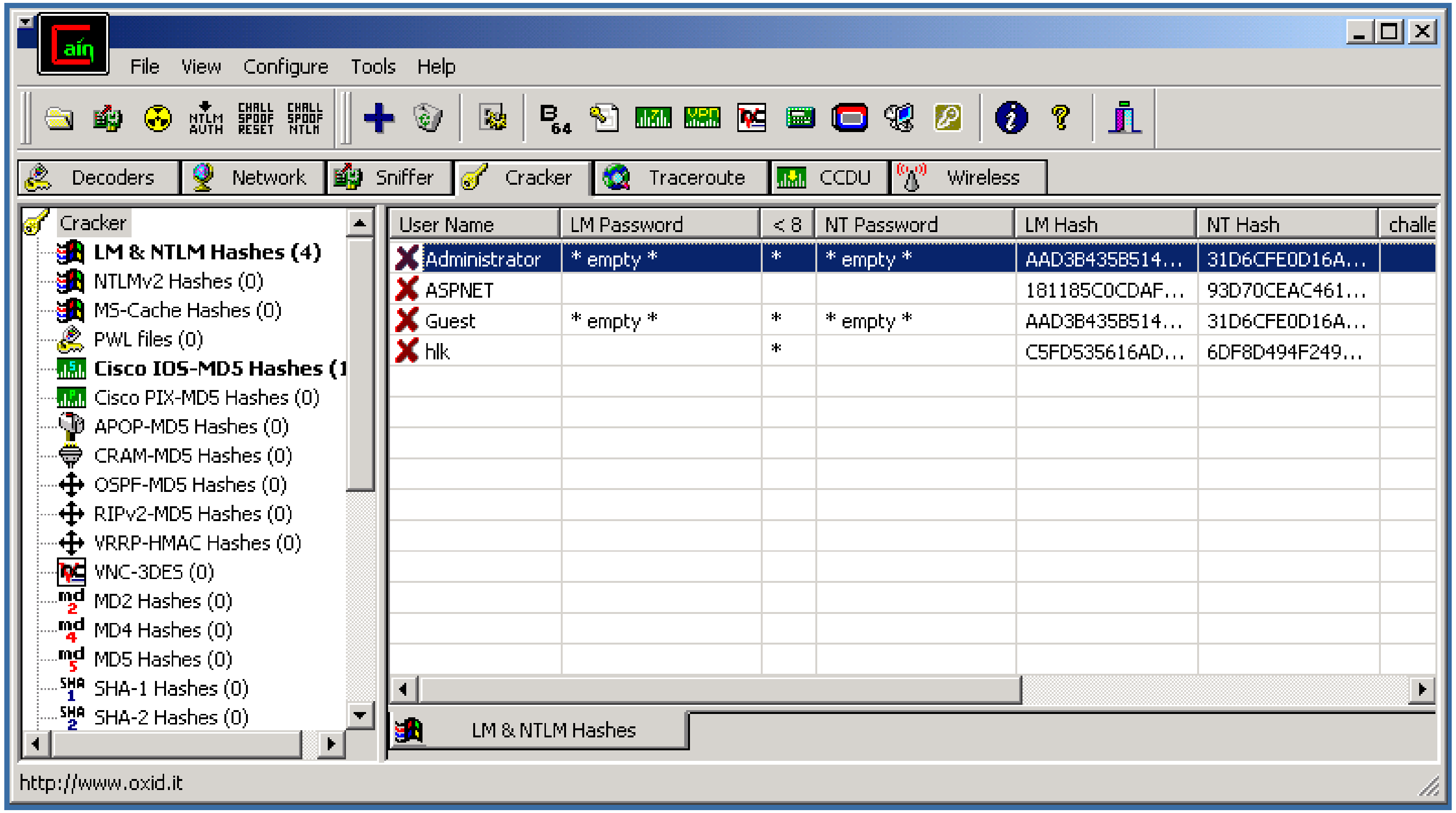
ved at generere store tabeller, eksempelvis 100GB kan man dække mange hashværdier af passwords med almindelige bogstaver, tal og tegn - og derved knække passwordshashes på sekunder. Søg efter rainbowcrack med google

l0phtcrack LC4



```
Consider that at one of the largest technology companies, where policy
required that passwords exceed 8 characters, mix cases, and include
numbers or symbols...

L0phtCrack obtained 18% of the passwords in 10 minutes
90% of the passwords were recovered within 48 hours on a Pentium II/300
The Administrator and most Domain Admin passwords were cracked
http://www.atstake.com/research/lc/
```

Cain og Abel



User Name	LM Password	< 8	NT Password	LM Hash	NT Hash	challe
Administrator	* empty *	*	* empty *	AAD3B435B514...	31D6CFE0D16A...	
ASPNET				181185C0CDAF...	93D70CEAC461...	
Guest	* empty *	*	* empty *	AAD3B435B514...	31D6CFE0D16A...	
hlk		*		C5FD535616AD...	6DF8D494F249...	

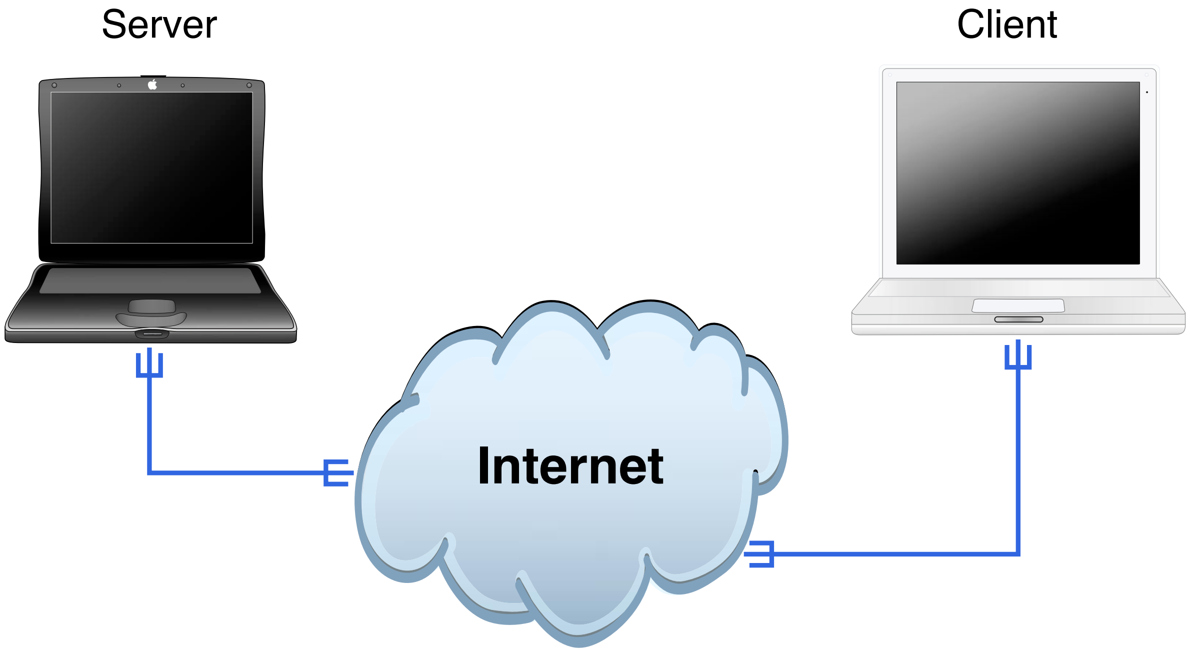
Cain og Abel anbefales `http://www.oxid.it`

John the ripper

> John the Ripper is a fast password cracker, currently available for many flavors of Unix (11 are officially supported, not counting different architectures), Windows, DOS, BeOS, and OpenVMS. Its primary purpose is to detect weak Unix passwords. Besides several crypt(3) password hash types most commonly found on various Unix flavors, supported out of the box are Kerberos AFS and Windows NT/2000/XP/2003 LM hashes, plus several more with contributed patches.

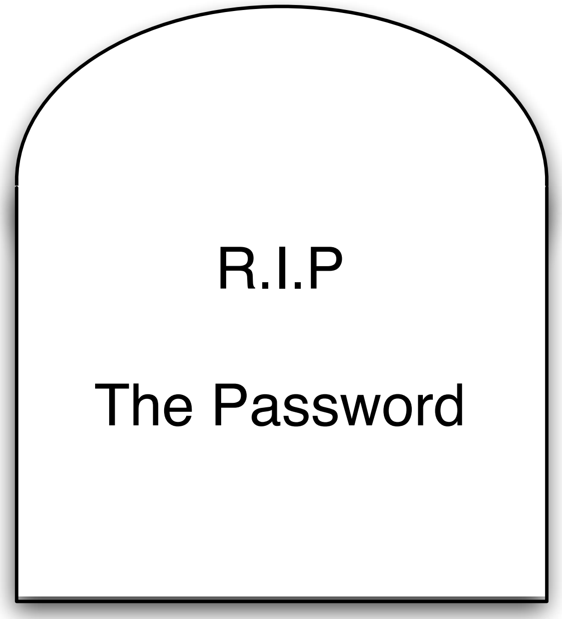
UNIX passwords kan knækkes med alec Muffets kendte Crack program eller eksempelvis John The Ripper `http://www.openwall.com/john/`

Demo: Cain og Abel



Cain og Abel

Are passwords dead?



Can we stop using passwords?

Muffett on Passwords has a long list of password related information, from the author of crack `http://en.wikipedia.org/wiki/Crack_(password_software)`

`http://dropsafe.crypticide.com/muffett-passwords`

Google looks to ditch passwords for good

”Google is currently running a pilot that uses a YubiKey cryptographic card developed by Yubico

The YubiKey NEO can be tapped on an NFC-enabled smartphone, which reads an encrypted one-time password emitted from the key fob.”

Source: `http://www.zdnet.com/google-looks-to-ditch-passwords-for-good-with-nfc-based-replacement`

WEP sikkerhed

AirSnort is a wireless LAN (WLAN) tool which recovers encryption keys. AirSnort operates by passively monitoring transmissions, computing the encryption key when enough packets have been gathered.

802.11b, using the Wired Equivalent Protocol (WEP), is crippled with numerous security flaws. Most damning of these is the weakness described in ” Weaknesses in the Key Scheduling Algorithm of RC4 ” by Scott Fluhrer, Itsik Mantin and Adi Shamir. Adam Stubblefield was the first to implement this attack, but he has not made his software public. AirSnort, along with WEPCrack, which was released about the same time as AirSnort, are the first publicly available implementaions of this attack. `http://airsnort.shmoo.com/`

major cryptographic errors

weak keying - 24 bit er allerede kendt - 128-bit = 104 bit i praksis

small IV - med kun 24 bit vil hver IV blive genbrugt oftere

CRC-32 som intergritetscheck er ikke *stærkt* nok kryptografisk set

Authentication gives pad - giver fuld adgang - hvis der bare opdages *encryption pad* for en bestemt IV. Denne IV kan så bruges til al fremtidig kommunikation

Source: *Secure Coding: Principles and Practices*, Mark G. Graff og Kenneth R. van Wyk, O'Reilly, 2003

Konklusion: Kryptografi er svært

STANFORD UNIVERSITY

Cryptography

Professor Dan Boneh
Computer Science Department
Stanford University

Enroll / Login Now
Enroll in this online class for free with a Coursera account

Åbent kursus på Stanford

`http://crypto-class.org/`

WEP cracking - airodump og aircrack

airodump - opsamling af krypterede pakker

aircrack - statistisk analyse og forsøg på at finde WEP nøglen

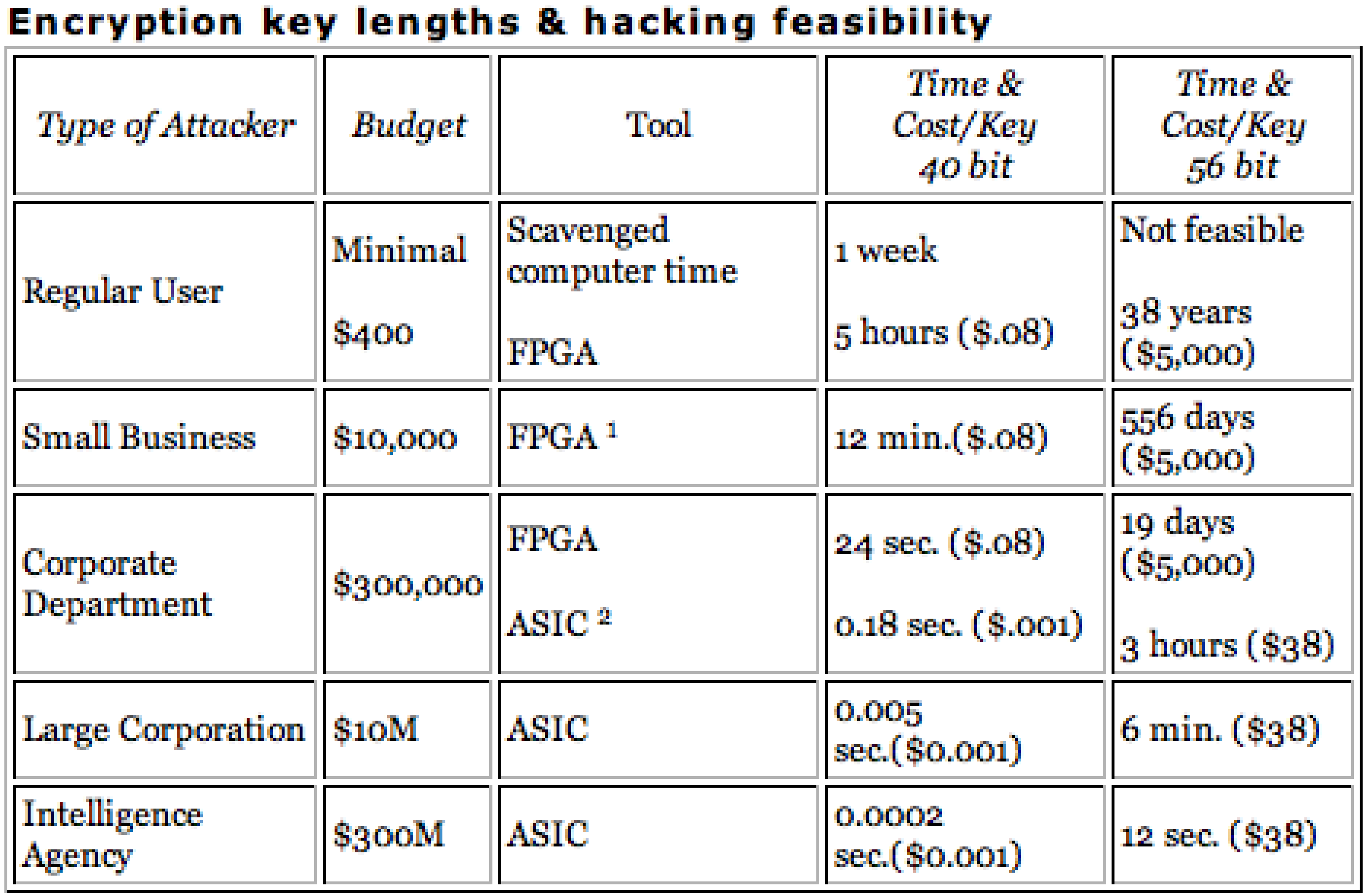
Med disse værktøjer er det muligt at knække *128-bit nøgler*!

Blandt andet fordi det reelt er 104-bit nøgler ☺

tommelfingerregel - der skal opsamles mange pakker ca. 500.000 er godt, og ofte kan der knækkes med lang færre

Links:
`http://www.cr0.net:8040/code/network/aircrack/` aircrack
`http://www.securityfocus.com/infocus/1814` WEP: Dead Again

Encryption key length



Encryption key lengths & hacking feasibility

Type of Attacker	*Budget*	Tool	*Time & Cost/Key 40 bit*	*Time & Cost/Key 56 bit*
Regular User	Minimal $400	Scavenged computer time FPGA	1 week 5 hours ($.08)	Not feasible 38 years ($5,000)
Small Business	$10,000	FPGA [1]	12 min.($.08)	556 days ($5,000)
Corporate Department	$300,000	FPGA ASIC [2]	24 sec. ($.08) 0.18 sec. ($.001)	19 days ($5,000) 3 hours ($38)
Large Corporation	$10M	ASIC	0.005 sec.($0.001)	6 min. ($38)
Intelligence Agency	$300M	ASIC	0.0002 sec.($0.001)	12 sec. ($38)

Source: `http://www.mycrypto.net/encryption/encryption_crack.html`

WPA cracking med Pyrit

Pyrit takes a step ahead in attacking WPA-PSK and WPA2-PSK, the protocol that today de-facto protects public WIFI-airspace. The project's goal is to estimate the real-world security provided by these protocols. Pyrit does not provide binary files or wordlists and does not encourage anyone to participate or engage in any harmful activity. **This is a research project, not a cracking tool.**

Pyrit's implementation allows to create massive databases, pre-computing part of the WPA/WPA2-PSK authentication phase in a space-time-tradeoff. The performance gain for real-world-attacks is in the range of three orders of magnitude which urges for re-consideration of the protocol's security. Exploiting the computational power of GPUs, *Pyrit* is currently by far the most powerful attack against one of the world's most used security-protocols.

`http://pyrit.wordpress.com/about/`

Also check out the Reaver brute force WPS
`https://code.google.com/p/reaver-wps/`

Wi-Fi Protected Setup, WPS hacking - Reaver

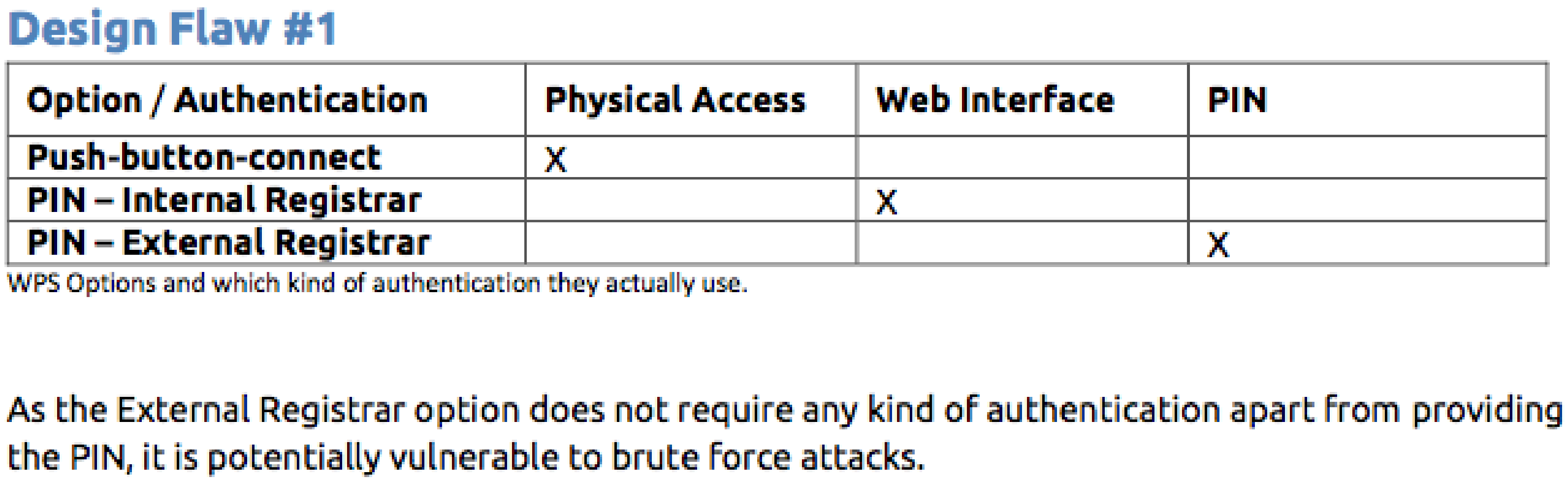
How Reaver Works Now that you've seen how to use Reaver, let's take a quick overview of how Reaver works. The tool takes advantage of a vulnerability in something called Wi-Fi Protected Setup, or WPS. It's a feature that exists on many routers, intended to provide an easy setup process, and it's tied 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



Design Flaw #1

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

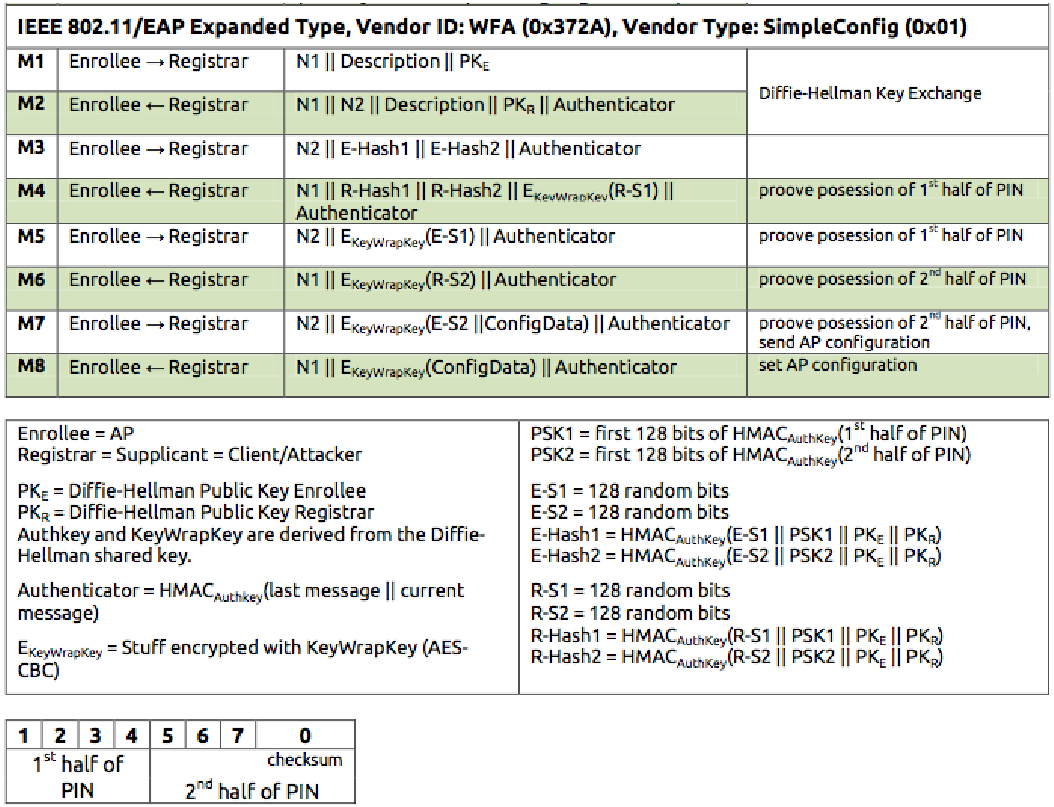
WPS Options and which kind of authentication they actually use.

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



<table>
<tr><th colspan="4">IEEE 802.11/EAP Expanded Type, Vendor ID: WFA (0x372A), Vendor Type: SimpleConfig (0x01)</th></tr>
<tr><td>M1</td><td>Enrollee → Registrar</td><td>N1 || Description || PK_E</td><td rowspan="2">Diffie-Hellman Key Exchange</td></tr>
<tr><td>M2</td><td>Enrollee ← Registrar</td><td>N1 || N2 || Description || PK_R || Authenticator</td></tr>
<tr><td>M3</td><td>Enrollee → Registrar</td><td>N2 || E-Hash1 || E-Hash2 || Authenticator</td><td></td></tr>
<tr><td>M4</td><td>Enrollee ← Registrar</td><td>N1 || R-Hash1 || R-Hash2 || $E_{KeyWrapKey}$(R-S1) || Authenticator</td><td>proove posession of 1st half of PIN</td></tr>
<tr><td>M5</td><td>Enrollee → Registrar</td><td>N2 || $E_{KeyWrapKey}$(E-S1) || Authenticator</td><td>proove posession of 1st half of PIN</td></tr>
<tr><td>M6</td><td>Enrollee ← Registrar</td><td>N1 || $E_{KeyWrapKey}$(R-S2) || Authenticator</td><td>proove posession of 2nd half of PIN</td></tr>
<tr><td>M7</td><td>Enrollee → Registrar</td><td>N2 || $E_{KeyWrapKey}$(E-S2 ||ConfigData) || Authenticator</td><td>proove posession of 2nd half of PIN, send AP configuration</td></tr>
<tr><td>M8</td><td>Enrollee ← Registrar</td><td>N1 || $E_{KeyWrapKey}$(ConfigData) || Authenticator</td><td>set AP configuration</td></tr>
</table>

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)

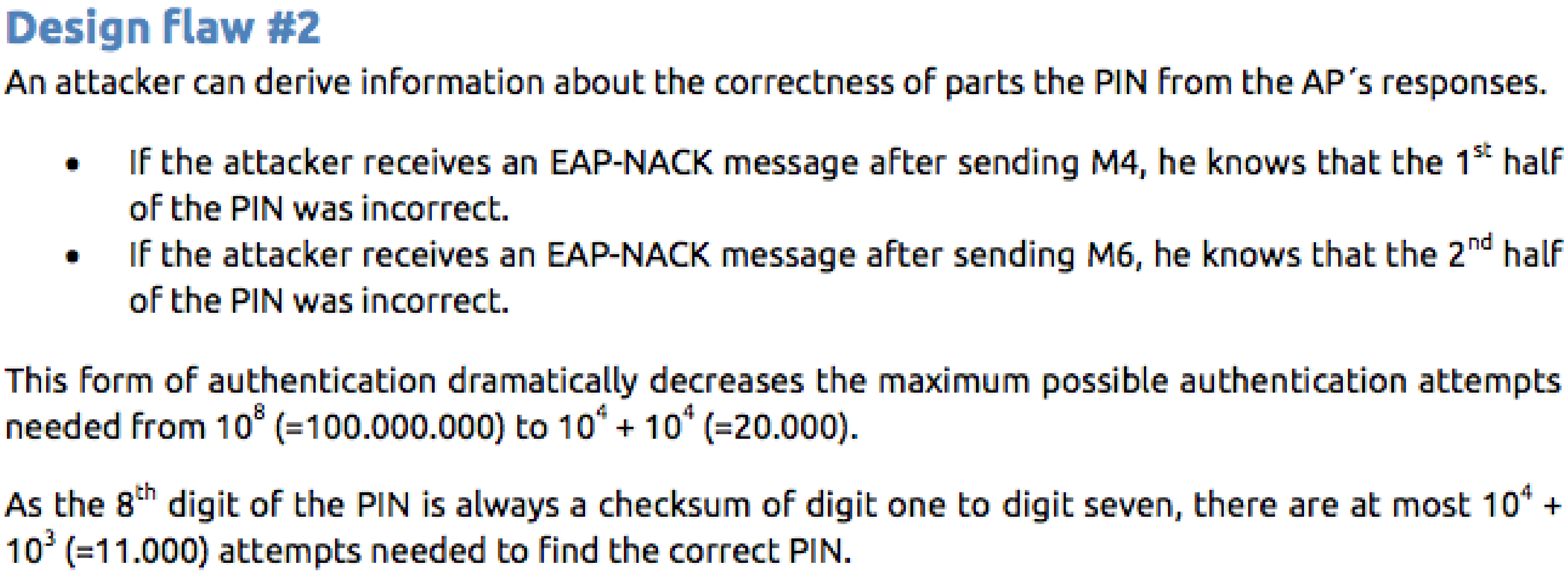
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>0</td></tr>
<tr><td colspan="4" rowspan="2">1st half of PIN</td><td colspan="3"></td><td>checksum</td></tr>
<tr><td colspan="4">2nd half of PIN</td></tr>
</table>

Reminds me of NTLM cracking, crack parts independently

Source:

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

WPS Design Flaws used by Reaver



Design flaw #2

An attacker can derive information about the correctness of parts the PIN from the AP´s responses.

- If the attacker receives an EAP-NACK message after sending M4, he knows that the 1st half of the PIN was incorrect.
- If the attacker receives an EAP-NACK message after sending M6, he knows that the 2nd half of the PIN was incorrect.

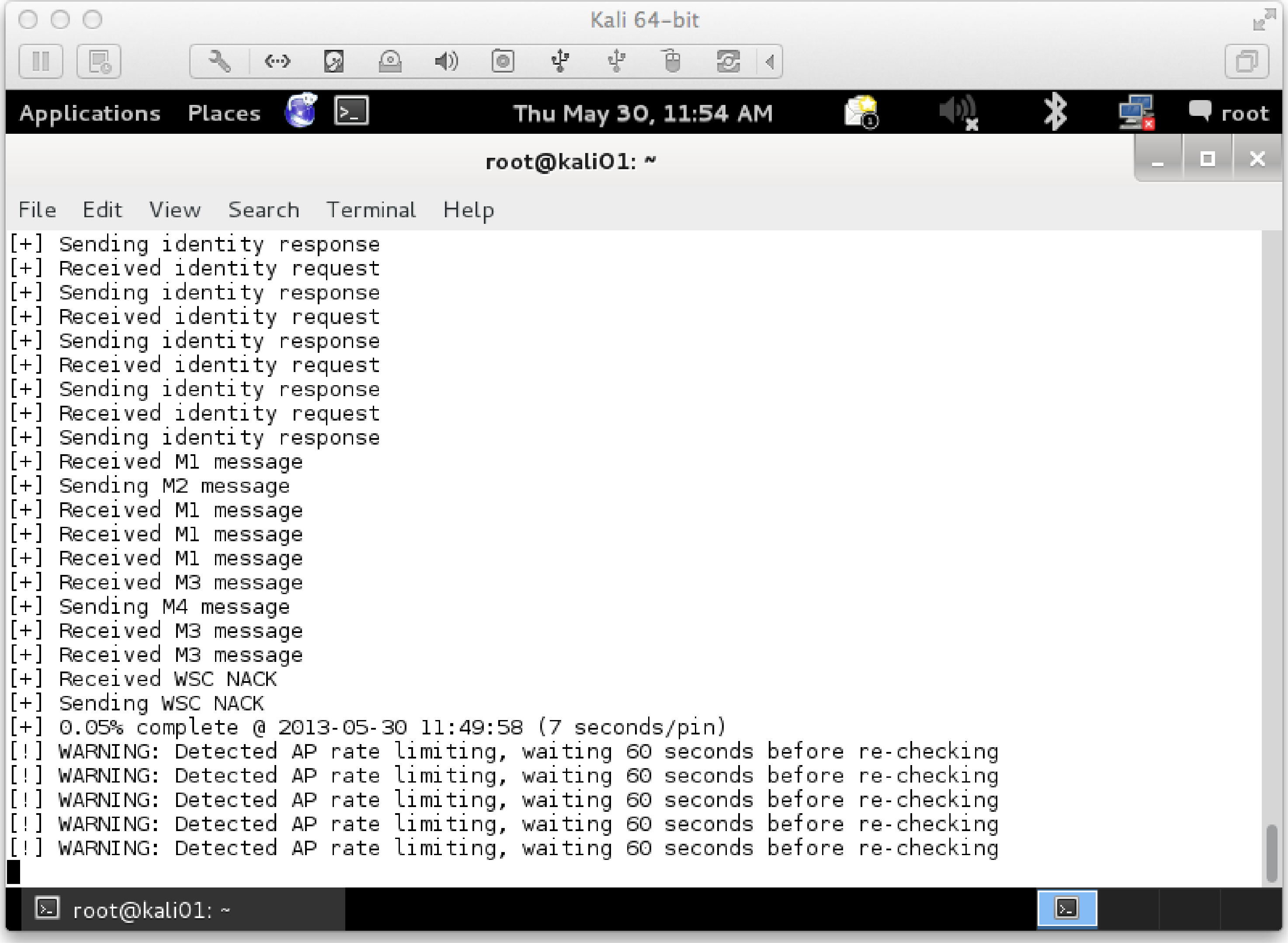
This form of authentication dramatically decreases the maximum possible authentication attempts needed from 10^8 (=100.000.000) to $10^4 + 10^4$ (=20.000).

As the 8th digit of the PIN is always a checksum of digit one to digit seven, there are at most $10^4 + 10^3$ (=11.000) attempts needed to find the correct PIN.

100.000.000 is a lot, 11.000 is not

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

Reaver Rate limiting



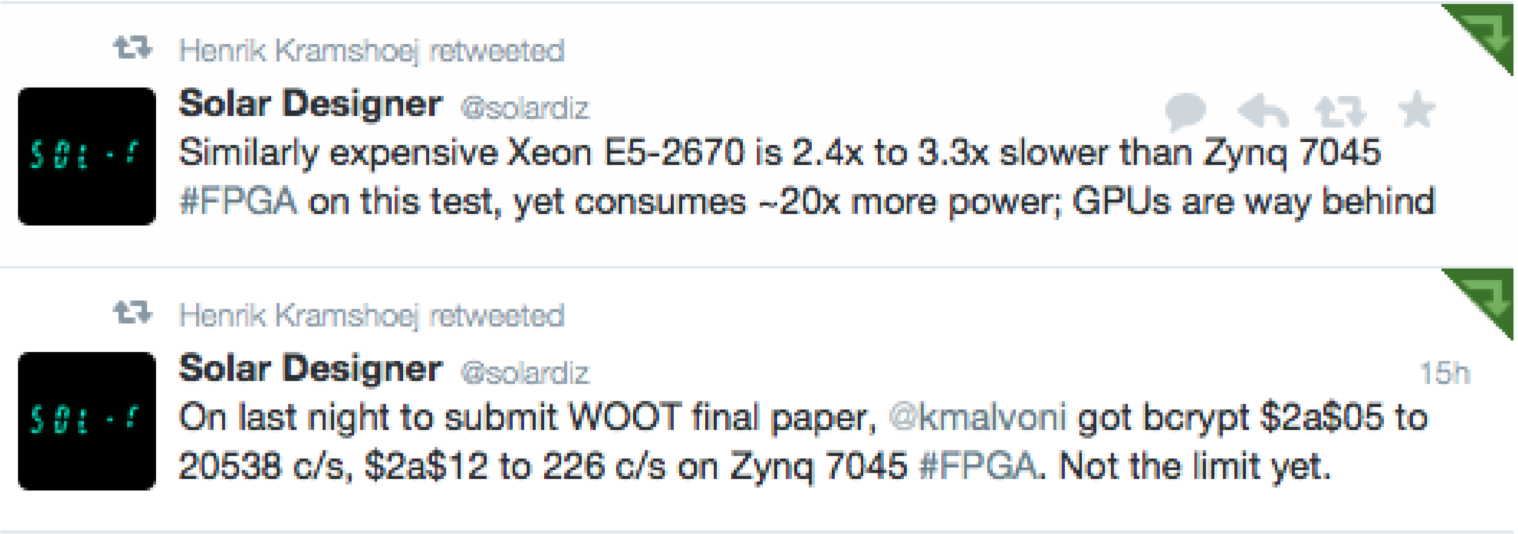
```
[+] Sending identity response
[+] Received identity request
[+] Sending identity response
[+] Received identity request
[+] Sending identity response
[+] Received identity request
[+] Sending identity response
[+] Received identity request
[+] Sending identity response
[+] Received M1 message
[+] Sending M2 message
[+] Received M1 message
[+] Received M1 message
[+] Received M1 message
[+] Received M3 message
[+] Sending M4 message
[+] Received M3 message
[+] Received M3 message
[+] Received WSC NACK
[+] Sending WSC NACK
[+] 0.05% complete @ 2013-05-30 11:49:58 (7 seconds/pin)
[!] WARNING: Detected AP rate limiting, waiting 60 seconds before re-checking
[!] WARNING: Detected AP rate limiting, waiting 60 seconds before re-checking
[!] WARNING: Detected AP rate limiting, waiting 60 seconds before re-checking
[!] WARNING: Detected AP rate limiting, waiting 60 seconds before re-checking
[!] WARNING: Detected AP rate limiting, waiting 60 seconds before re-checking
```

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



Henrik Kramshoej retweeted

Solar Designer @solardiz

Similarly expensive Xeon E5-2670 is 2.4x to 3.3x slower than Zynq 7045 #FPGA on this test, yet consumes ~20x more power; GPUs are way behind

Henrik Kramshoej retweeted

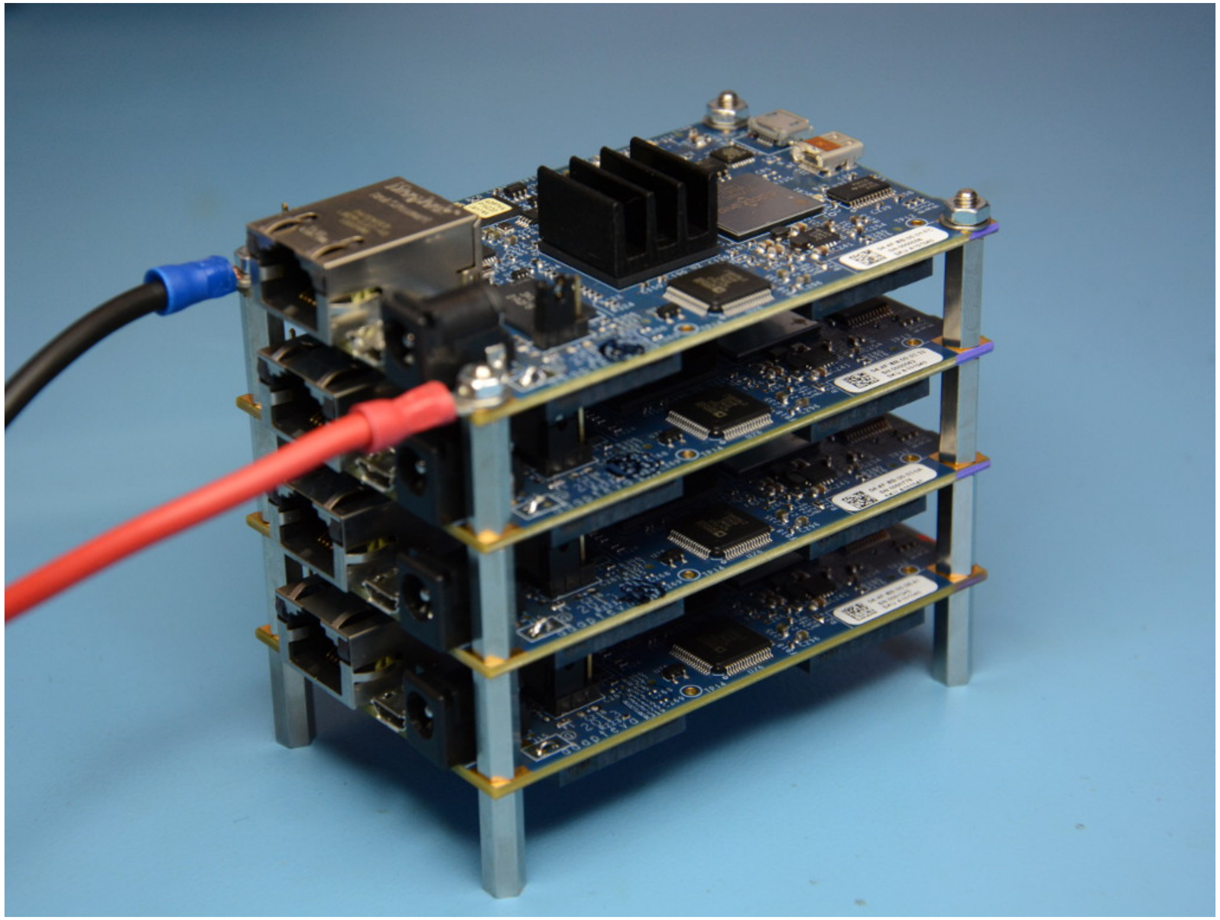
Solar Designer @solardiz 15h

On last night to submit WOOT final paper, @kmalvoni got bcrypt $2a$05 to 20538 c/s, $2a$12 to 226 c/s on Zynq 7045 #FPGA. Not the limit yet.

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

Warning: FPGA hacking - not finished part of presentation

Stacking Parallella boards



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

Forudsætninger

Bemærk: alle angreb har forudsætninger for at virke

Et angreb mod Telnet virker kun hvis du bruger Telnet

Et angreb mod Apache HTTPD virker ikke mod Microsoft IIS

Kan du bryde kæden af forudsætninger har du vundet!

Konfigurationsfejl - ofte overset

Forkert brug af programmer er ofte overset

opfyldes forudsætningerne

er programmet egnet til dette miljø

er man udannet/erfaren i dette produkt

Eksempler på forudsætninger

Computeren skal være tændt

Funktionen der misbruges skal være slået til

Executable stack

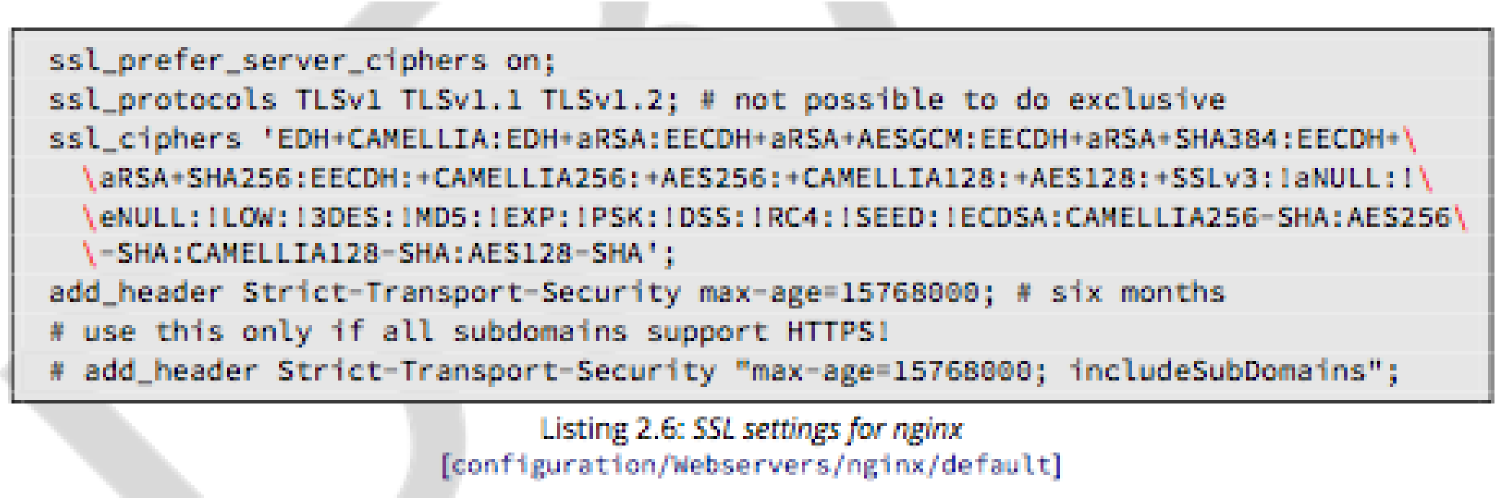
Executable heap

Fejl i programmet

Fejl i alfgoritmen

alle programmer har fejl

Bettercrypto.org



```
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";
```

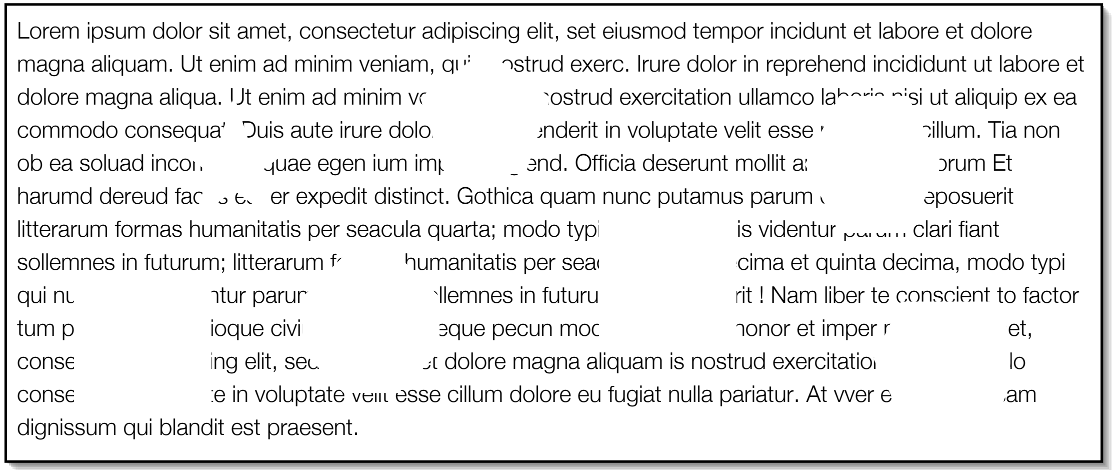
Listing 2.6: *SSL settings for nginx*
[configuration/Webservers/nginx/default]

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/`

Are your data secure - data at rest



Lorem ipsum dolor sit amet, consectetur adipiscing elit, set eiusmod tempor incidunt et labore et dolore
magna aliquam. Ut enim ad minim veniam, qu ostrud exerc. Irure dolor in reprehend incididunt ut labore et
dolore magna aliqua. Ut enim ad minim v costrud exercitation ullamco la isi ut aliquip ex ea
commodo consequa Duis aute irure dolo enderit in voluptate velit esse cillum. Tia non
ob ea soluad inco quae egen ium im end. Officia deserunt mollit a orum Et
harumd dereud fac er expedit distinct. Gothica quam nunc putamus parum eposuerit
litterarum formas humanitatis per seacula quarta; modo typi is videntur clari fiant
sollemnes in futurum; litterarum humanitatis per sea cima et quinta decima, modo typi
qui nu ntur parur llemnes in futuru rit ! Nam liber te conscient to factor
tum p ioque civi eque pecun moc honor et imper et,
conse ing elit, sec t dolore magna aliquam is nostrud exercitatio lo
conse e in voluptate velit esse cillum dolore eu fugiat nulla pariatur. At vver e am
dignissum qui blandit est praesent.

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

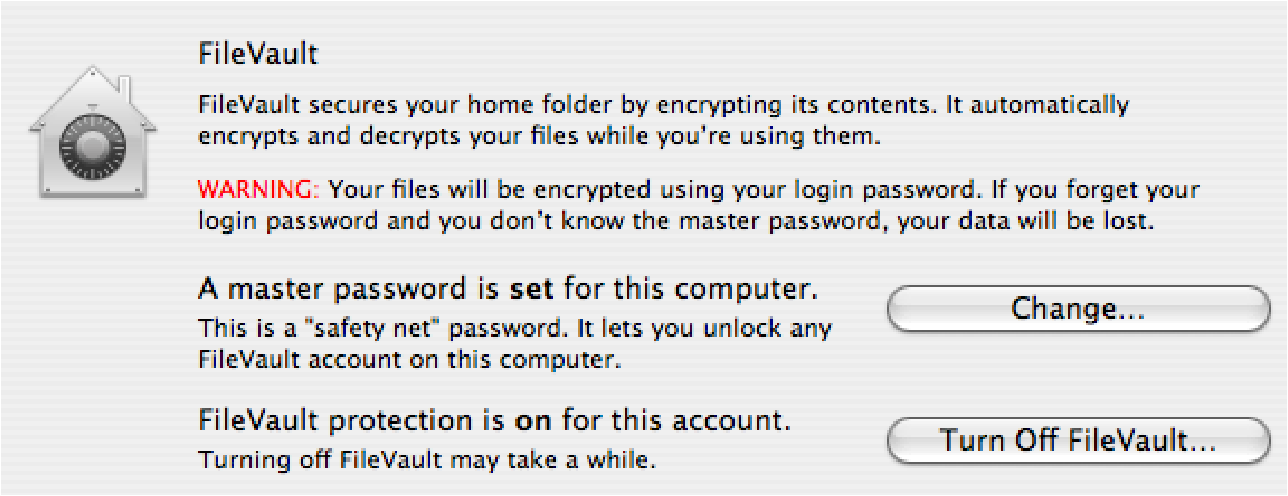
Mac computers can become a Firewire disk
hold t when booting - firewire target mode

Unrestricted access to un-encrypted data

Moving hard drive to another computer is also easy

Physical access is often - **game over**

Encrypting hard disk



FileVault

FileVault secures your home folder by encrypting its contents. It automatically encrypts and decrypts your files while you're using them.

WARNING: Your files will be encrypted using your login password. If you forget your login password and you don't know the master password, your data will be lost.

A master password is **set** for this computer.

This is a "safety net" password. It lets you unlock any FileVault account on this computer.

FileVault protection is **on** for this account.

Turning off FileVault may take a while.

Becoming available in the most popular client operating systems

- Microsoft Windows Bitlocker - requires Ultimate or Enterprise
- Apple Mac OS X - FileVault og FileVault2
- FreeBSD GEOM og GBDE - encryption framework
- Linux distributions like Ubuntu ask to encrypt home dir during installation
- PGP disk - Pretty Good Privacy - makes a virtuel krypteret disk
- TrueCrypt - similar to PGP disk, a virtual drive with data, cross platform
- 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/`

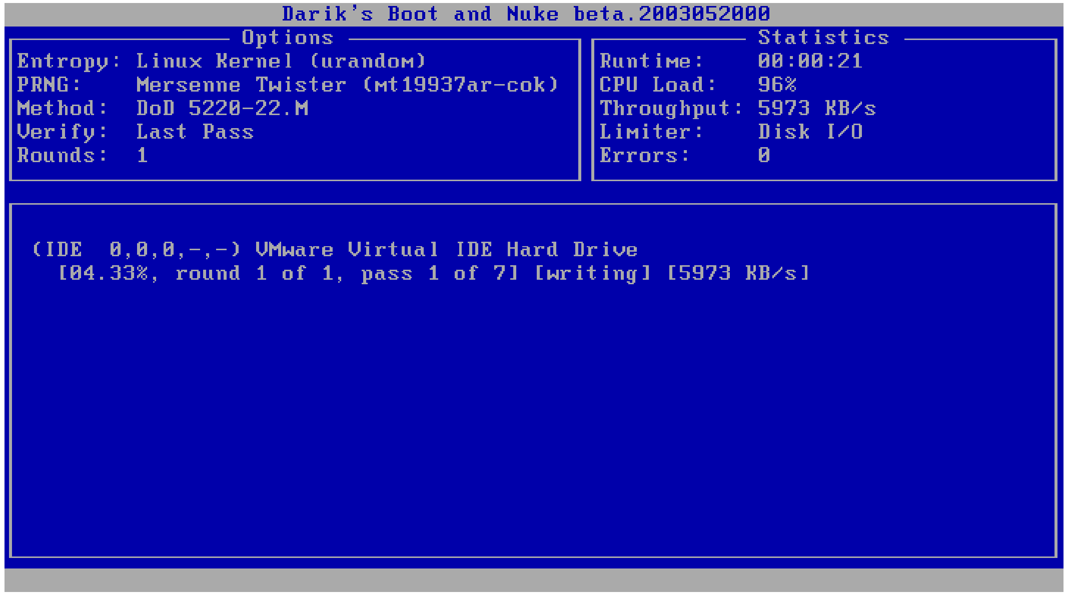
This is very CSI or Hollywoord like - but a real threat

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



```
                  Darik's Boot and Nuke beta.2003052000
                Options                                      Statistics
Entropy: Linux Kernel (urandom)              Runtime:    00:00:21
PRNG:    Mersenne Twister (mt19937ar-cok)    CPU Load:   96%
Method:  DoD 5220-22.M                       Throughput: 5973 KB/s
Verify:  Last Pass                           Limiter:    Disk I/O
Rounds:  1                                   Errors:     0

 (IDE  0,0,0,-,-) VMware Virtual IDE Hard Drive
   [04.33%, round 1 of 1, pass 1 of 7] [writing] [5973 KB/s]
```

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/`

Kom igang!

- Skriv på DVD - DVD brændere i mange laptops idag
- Gem på netværket - Dropbox, husk en yderligere backup!
- Brug Duplicity på egen server, eller tilsvarende services

Mat Honan epic hacking :-(

`http://www.wired.com/gadgetlab/2012/08/apple-amazon-mat-honan-hacking/all/`

Duplicity

What is it?

Duplicity backs directories by producing encrypted tar-format volumes and uploading them to a remote or local file server. Because duplicity uses librsync, the incremental archives are space efficient and only record the parts of files that have changed since the last backup. Because duplicity uses **GnuPG** to encrypt and/or sign these archives, they will be safe from spying and/or modification by the server.

`http://duplicity.nongnu.org/` duplicity home page

`http://www.gnupg.org/` The GNU Privacy Guard

Sikkerhedsteknologier

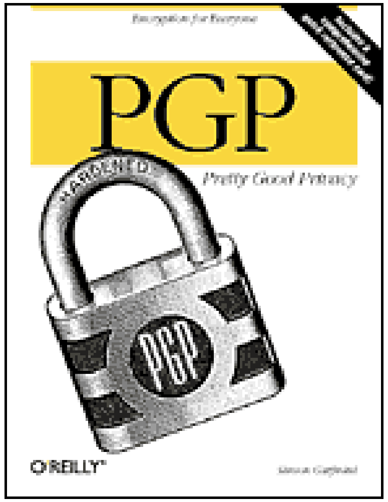
Brug alt hvad I kan overkomme:

- Firewalls: IPfilter, IPtables, OpenBSD PF
- Kryptografi
- Secure Shell - SSH
- betragt Telnet, Rlogin, Rsh, Rexec som døde!
- FTP bør kun bruges til anonym FTP
- Intrusion Detection - Snort
- Sudo
- Tripwire, mtree, MD5

Sikkerhedspolitikken er din ”plan” for sikkerheden - og er med til at sikre niveauet er ens

Firewalls hjælper ikke mod alle trusler

Basic tools - PGP



- Pretty Good Privacy - PGP
- Originally developed by Phil Zimmermann
- Now a commercial entity `http://www.pgp.com`
- Source exported from USA on paper and scanned outside - which was legal
- `http://www.pgpi.org`

Basic tools - GPG

Gnu Privacy Guard, GnuPG or GPG

Web site: `http://www.gnupg.org/`

Open Source - GPL license

Available for most popular operating systems

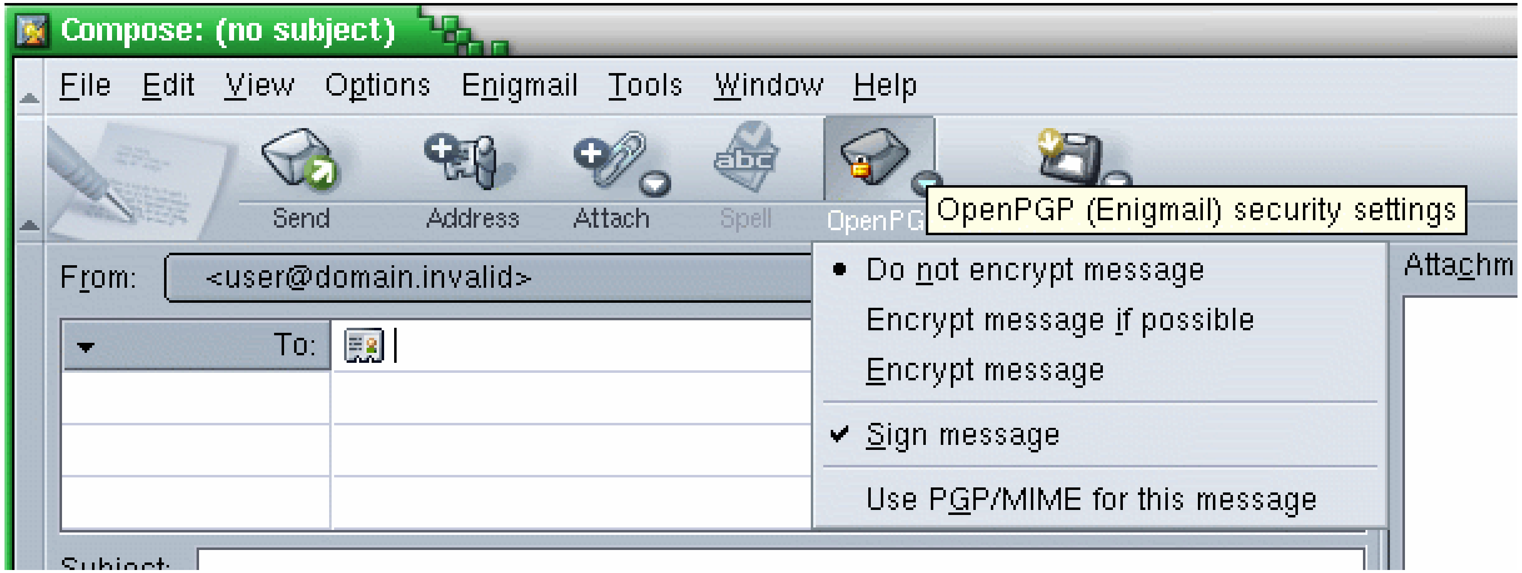
Highly recommended

GnuPG - verifikation af downloads

```
$ cd /userdata/download/src/postfix/
$ ls -l *.sig
-rw-r--r--  1 hlk  admin  152 13 Sep  2003 postfix-2.0.16.tar.gz.sig
-rw-r--r--  1 hlk  admin  152  3 May 13:34 postfix-2.1.1.tar.gz.sig
$ gpg --verify postfix-2.1.1.tar.gz.sig
gpg: Signature made Mon May  3 19:34:08 2004 CEST using RSA key ID D5327CB9
gpg: Good signature from "wietse venema <wietse@porcupine.org>"
gpg:                 aka "wietse venema <wietse@wzv.win.tue.nl>"
$
```

Det er nødvendigt at verificere arkiver med kildekode!

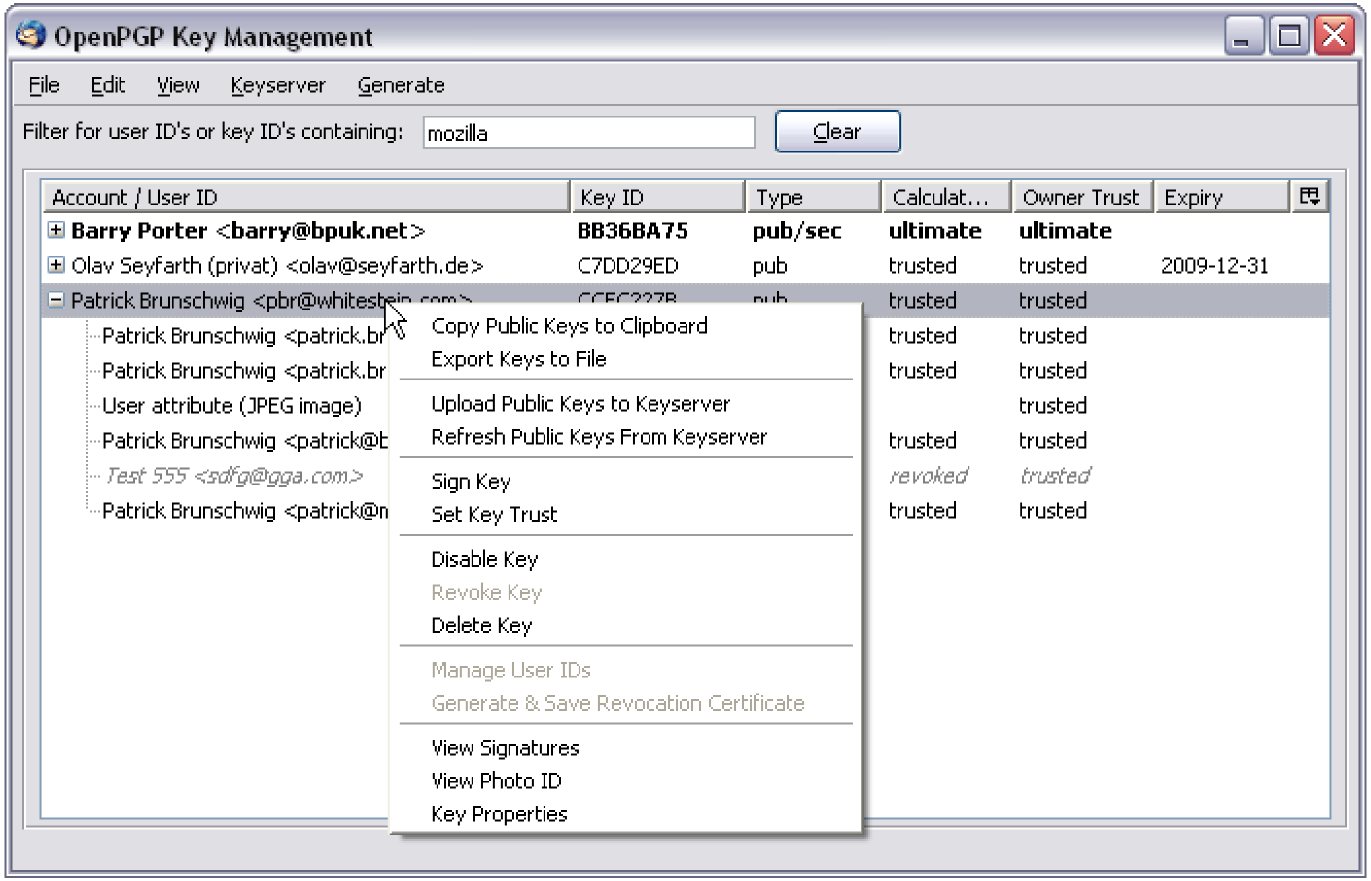
Enigmail - GPG plugin til Mail



● Do not encrypt message
Encrypt message if possible
Encrypt message
✓ Sign message
Use PGP/MIME for this message

- Enigmail is a plugin for the Thunderbird mail client
- Screenshot from `http://enigmail.mozdev.org`

Enigmail - OpenGPG Key Manager



Filter for user ID's or key ID's containing: mozilla

Account / User ID	Key ID	Type	Calculat...	Owner Trust	Expiry
⊞ **Barry Porter <barry@bpuk.net>**	**BB36BA75**	**pub/sec**	**ultimate**	**ultimate**	
⊞ Olav Seyfarth (privat) <olav@seyfarth.de>	C7DD29ED	pub	trusted	trusted	2009-12-31
⊟ Patrick Brunschwig <pbr@whitestein.com>	CCEC227B	pub	trusted	trusted	
Patrick Brunschwig <patrick.br			trusted	trusted	
Patrick Brunschwig <patrick.br			trusted	trusted	
User attribute (JPEG image)				trusted	
Patrick Brunschwig <patrick@b			trusted	trusted	
Test 555 <sdfg@gga.com>			*revoked*	*trusted*	
Patrick Brunschwig <patrick@m			trusted	trusted	

Key Manager built-int Enigmail is recommended

Generering af keys 1

Generering af key

```
$ gpg --gen-key
```

- Vælg ”DSA and Elgamal”
- Vælg passende keysize - 4096 skader næppe
- Vælg passende udløbsdato - ”no expire” vil virke for de fleste
- Brug din officielle mailaddresse i forbindelse med dit navn, så Email klienter kan finde din key aytomatisk
- Brug en god passphrase.
  En lang sætning som du kan huske, og som ikke kan gættes udfra kendskab til dig.
- Når nøglen genereres, så hjælp med at generere ”randomness” i systemet. Det får genereringen til at gå hurtigere, og det giver en bedre key.

samme spørgsmål i GUI programmerne, **og husk at lave et revoke certifikat!**

Generering af keys 2

Du har nu en GnuPG key klar til at blive signeret

Er du **sikker** på at du kan huske din passphrase?

Når nøglen er genereret bliver der vist et kort sammendrag af indholdet
Dette *fingerprint* kan også fås frem med:

```
$ gpg --fingerprint addr@domain.dk
pub   1024D/D1EFBAA6 2003-01-20
      Key fingerprint = 0FAE F19D DB46 DF2E D93D  9B05 21A6 469B D1EF BAA6
uid                  Henrik Lund Kramshoej (work email) <hlk@security6.net>
uid                  Henrik Lund Kramshoej (Kramse) <hlk@kramse.dk>
uid                  [jpeg image of size 14412]
sub   2048g/6D08E6E6 2003-01-20
```

Signering af keys

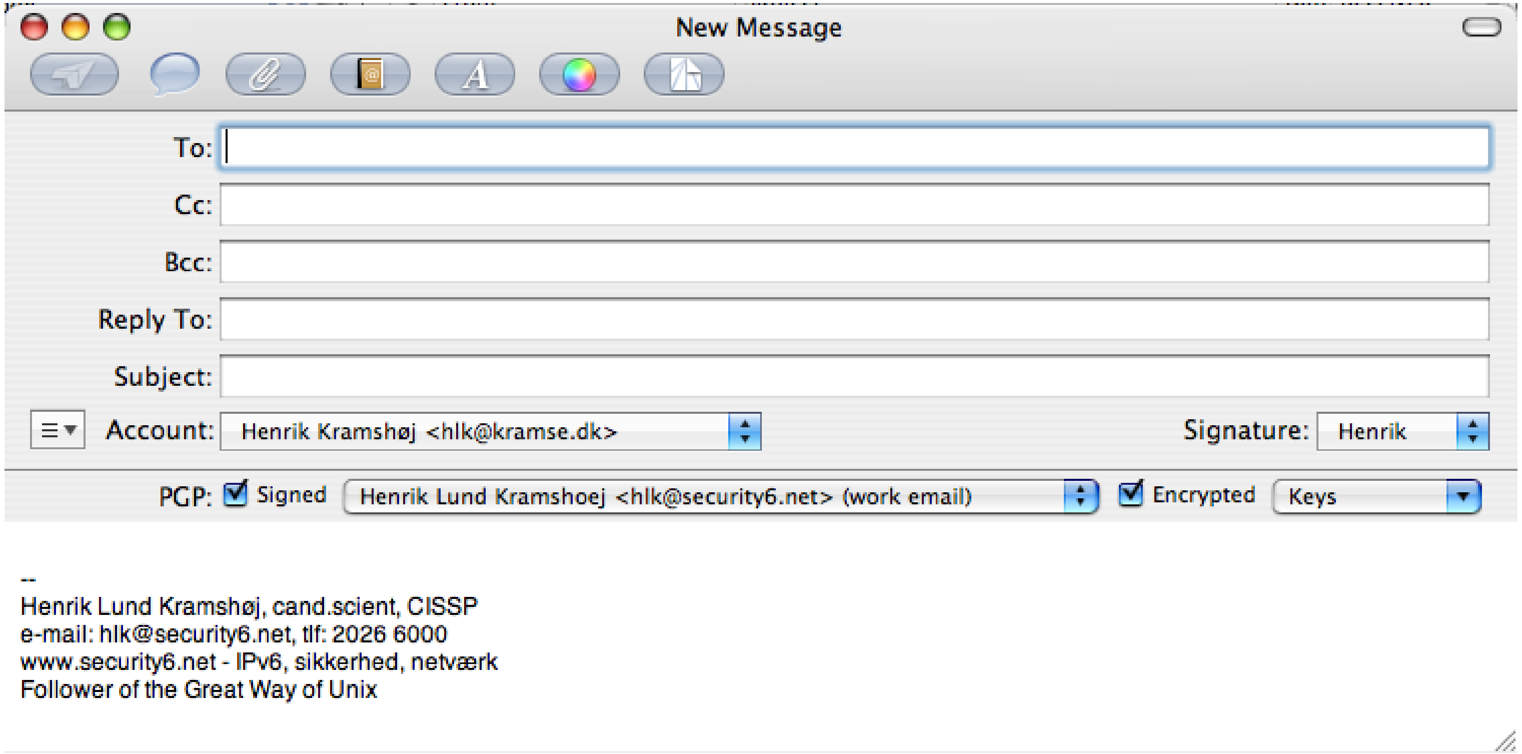
Keys signeres med:

```
gpg --sign-key addr@domain.dk  # Eller keyid
```

Husk at sikre at det nu også er den korrekte key i signerer
Kontroller med:

```
gpg --fingerprint addr@domain.dk
```

GPGMail plugin for Mac OS X Mail.app



New Message

To:

Cc:

Bcc:

Reply To:

Subject:

Account: Henrik Kramshøj <hlk@kramse.dk>

Signature: Henrik

PGP: ☑ Signed Henrik Lund Kramshoej <hlk@security6.net> (work email) ☑ Encrypted Keys

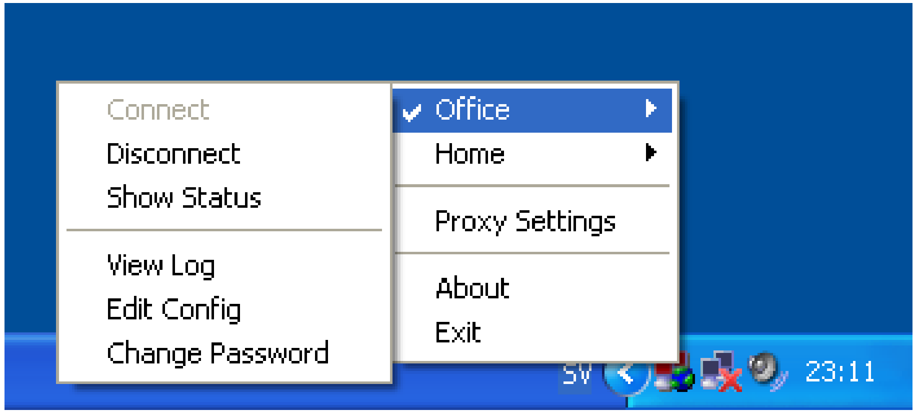
--
Henrik Lund Kramshøj, cand.scient, CISSP
e-mail: hlk@security6.net, tlf: 2026 6000
www.security6.net - IPv6, sikkerhed, netværk
Follower of the Great Way of Unix

- Uses GPG and is part of the GPGTools
- `https://gpgtools.org/`

Crypto Projects that Might not Suck

Steve Weis
PrivateCore
! `http://bit.ly/CryptoMightNotSuck`

VPN



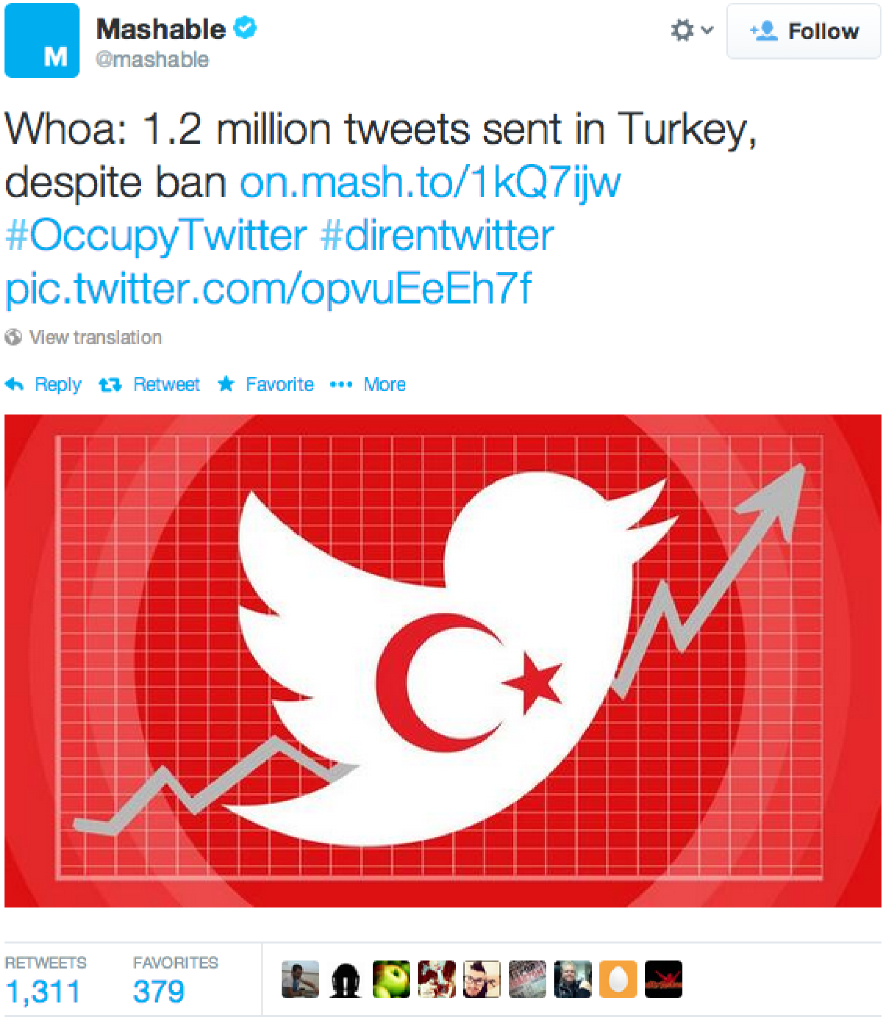
Virtual Private Networks are useful - or even required when travelling

VPN `http://en.wikipedia.org/wiki/Virtual_private_network`

SSL/TLS VPN - Multiple incompatible vendors: OpenVPN, Cisco, Juniper, F5 Big IP

IETF IPsec does work cross-vendors - sometimes, and is also increasingly becoming blocked or unusable due to NAT :-(

Turkey: Erdogan bans Twitter

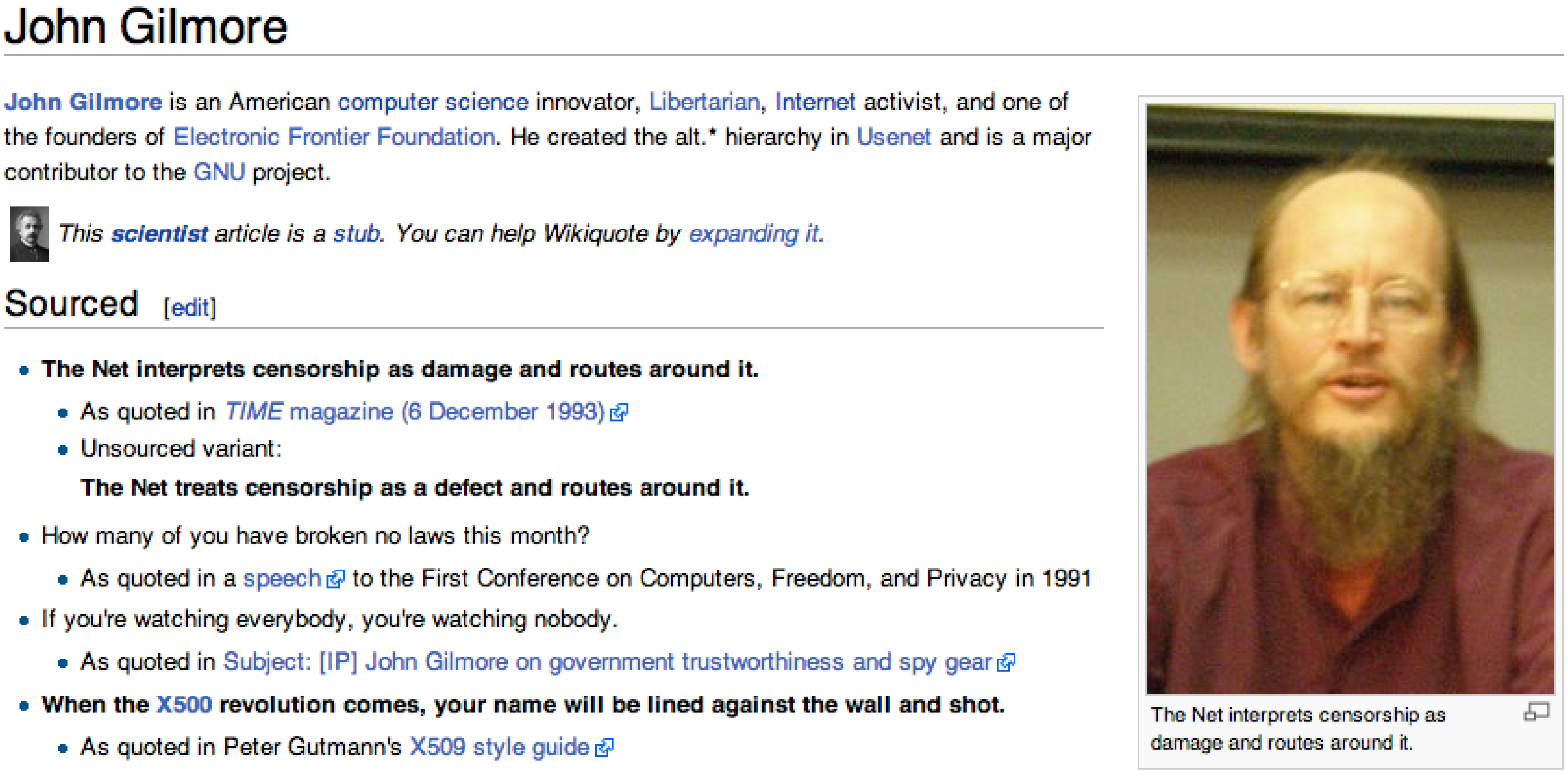


Whoa: 1.2 million tweets sent in Turkey, despite ban on.mash.to/1kQ7ijw #OccupyTwitter #direntwitter pic.twitter.com/opvuEeEh7f

RETWEETS 1,311 FAVORITES 379

Censorship on the internet - lol

The Net interprets censorship as damage and routes around it.



John Gilmore

John Gilmore is an American computer science innovator, Libertarian, Internet activist, and one of the founders of Electronic Frontier Foundation. He created the alt.* hierarchy in Usenet and is a major contributor to the GNU project.

*This **scientist** article is a stub. You can help Wikiquote by expanding it.*

Sourced [edit]

- **The Net interprets censorship as damage and routes around it.**
  - As quoted in *TIME* magazine (6 December 1993)
  - Unsourced variant:

    The Net treats censorship as a defect and routes around it.
- How many of you have broken no laws this month?
  - As quoted in a speech to the First Conference on Computers, Freedom, and Privacy in 1991
- If you're watching everybody, you're watching nobody.
  - As quoted in Subject: [IP] John Gilmore on government trustworthiness and spy gear
- **When the X500 revolution comes, your name will be lined against the wall and shot.**
  - As quoted in Peter Gutmann's X509 style guide

The Net interprets censorship as damage and routes around it.

http://en.wikiquote.org/wiki/John_Gilmore
http://en.wikipedia.org/wiki/John_Gilmore_(activist)

Directly connection Tor Users from Turkey

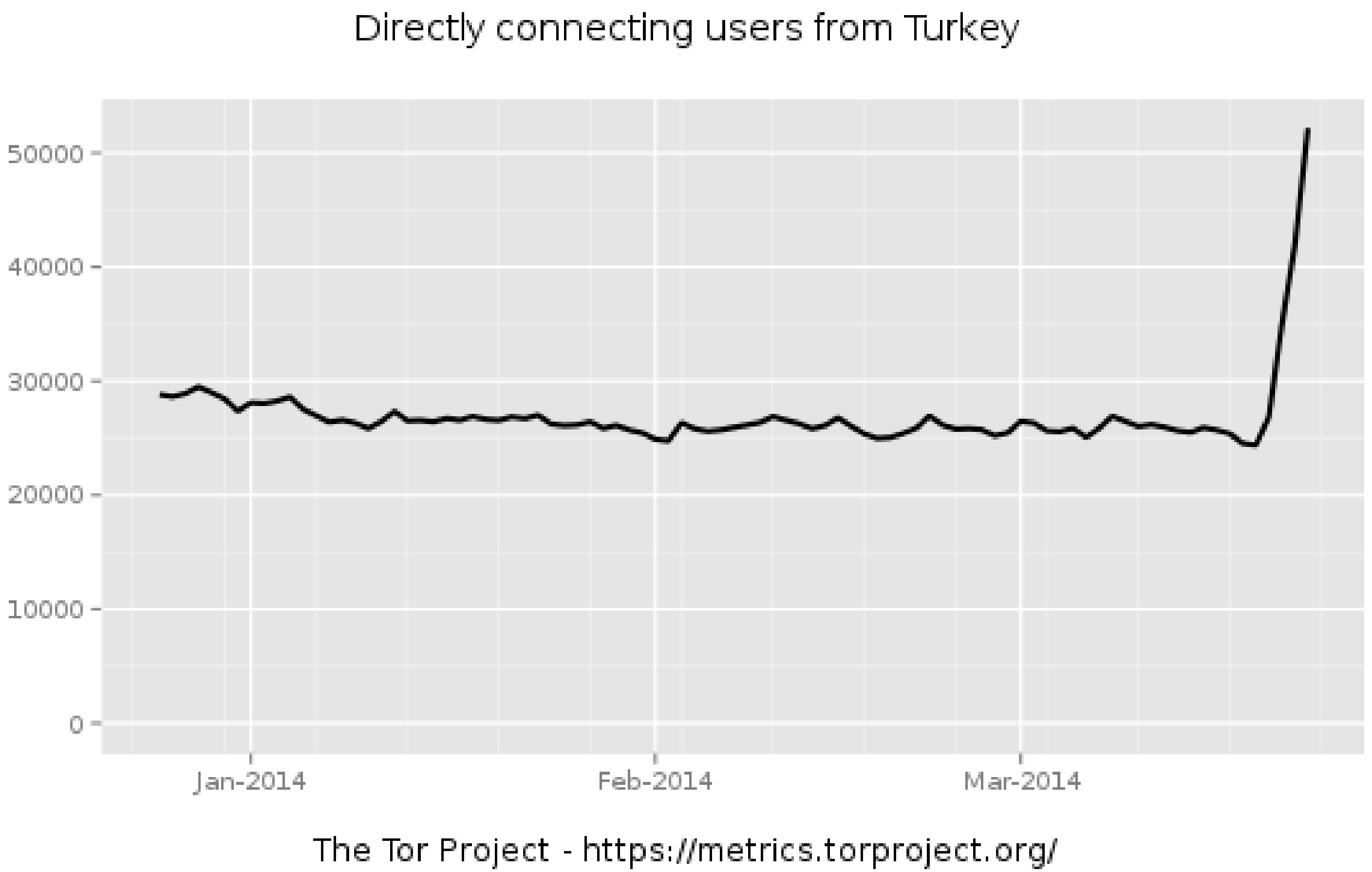


Image from `https://metrics.torproject.org`
via `https://twitter.com/runasand`

Directly connection Tor Users from Turkey +10.000

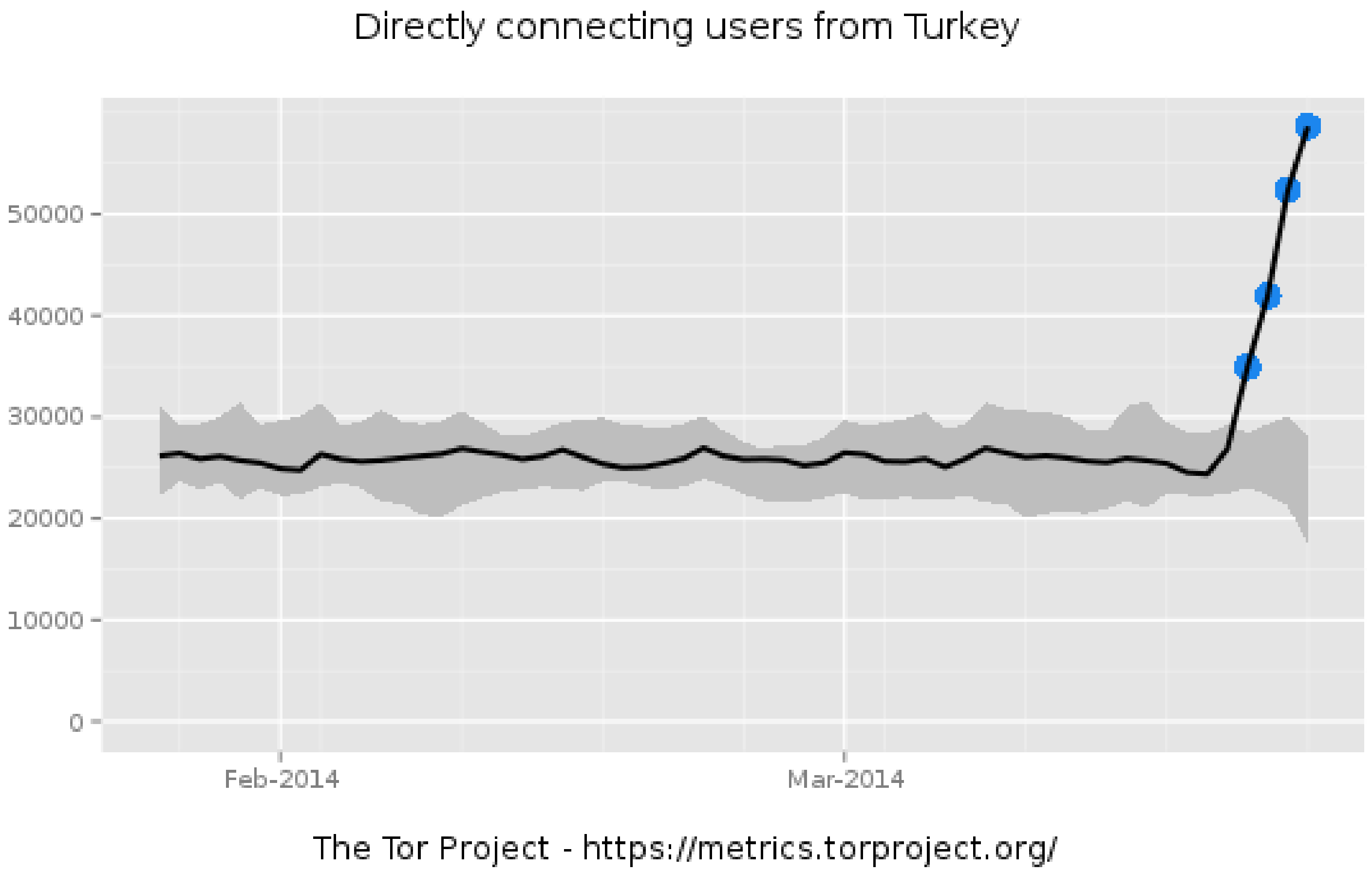
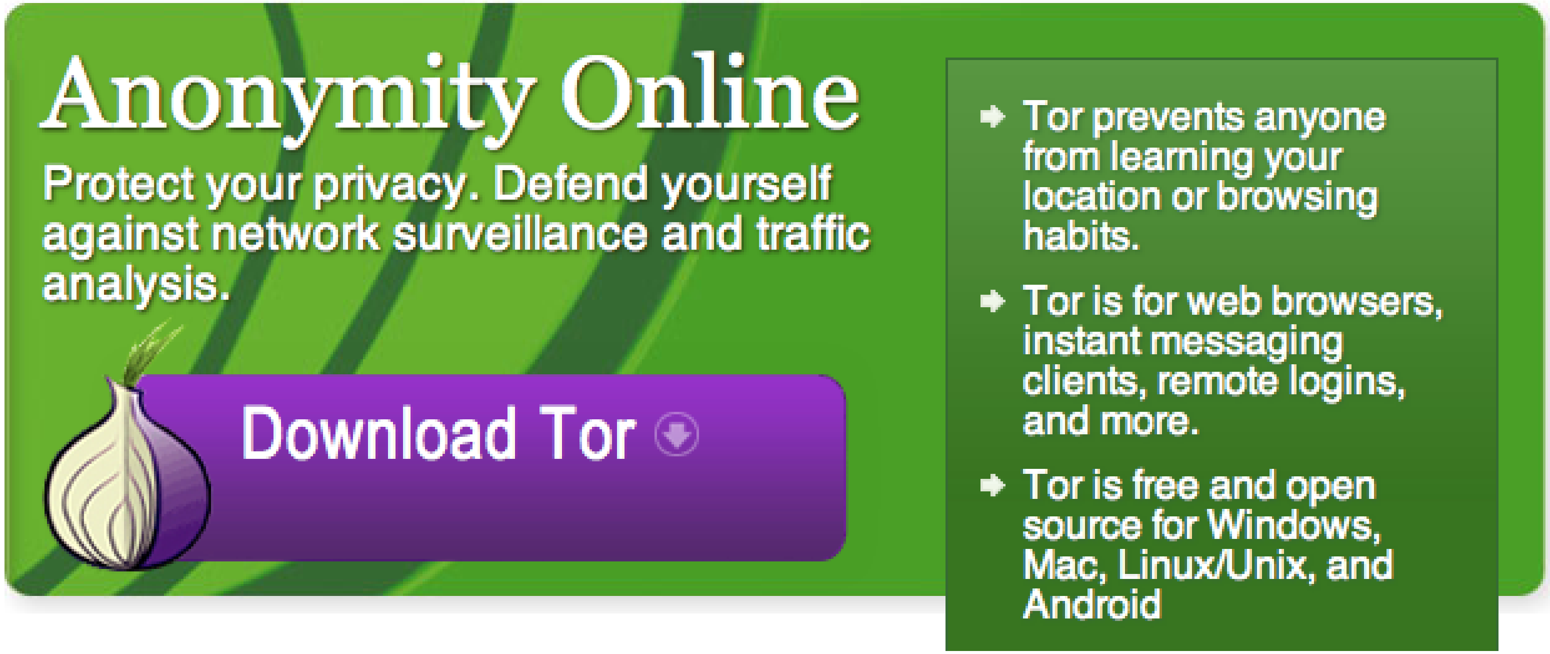


Image from `https://metrics.torproject.org` via `https://twitter.com/ioc32/status/448791582423408640`

Tor project



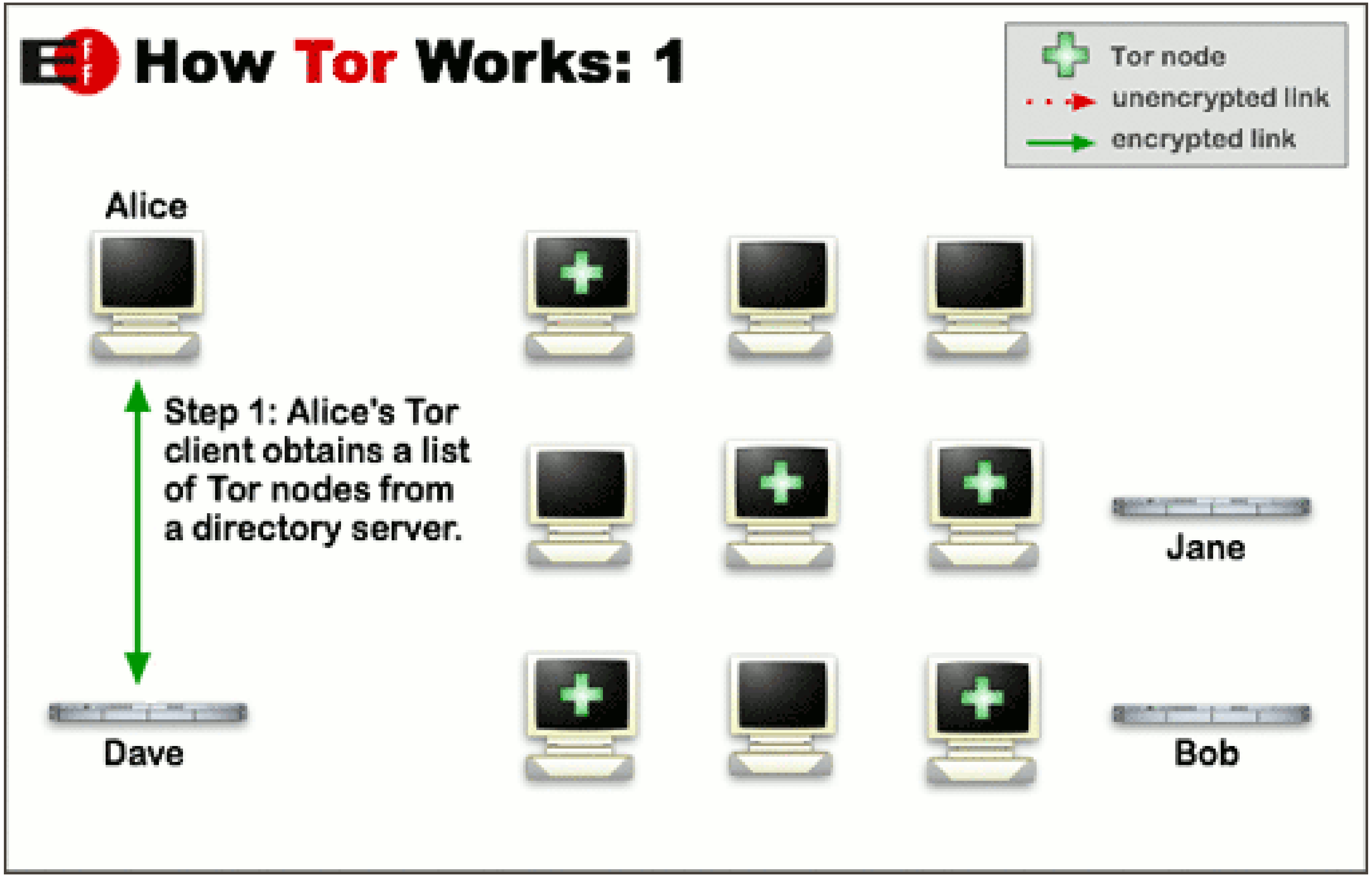
Anonymity Online

Protect your privacy. Defend yourself against network surveillance and traffic analysis.

- Tor prevents anyone from learning your location or browsing habits.
- Tor is for web browsers, instant messaging clients, remote logins, and more.
- Tor is free and open source for Windows, Mac, Linux/Unix, and Android

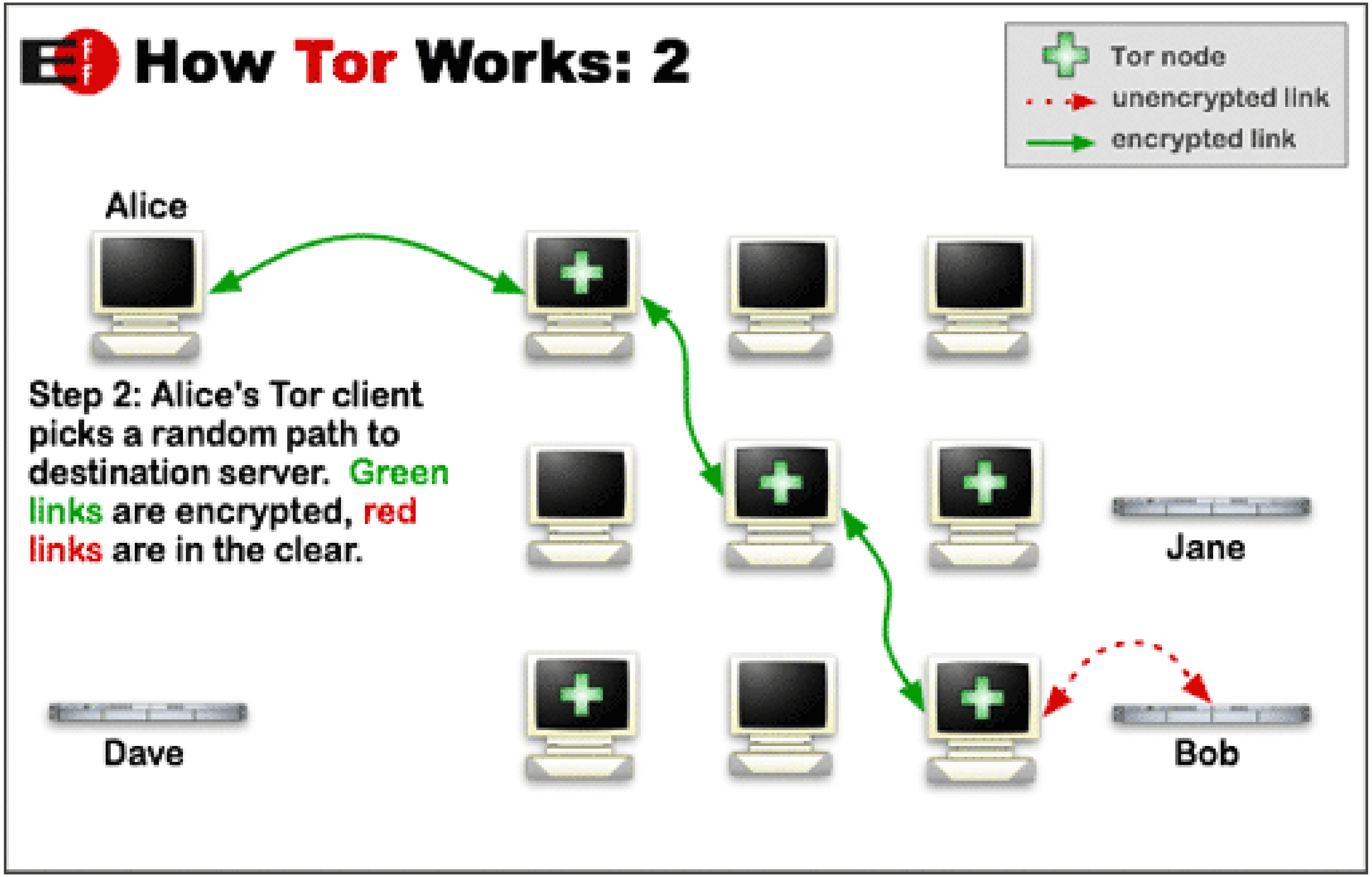
`https://www.torproject.org/`

Tor project - how it works 1


How Tor Works: 1
Tor node
unencrypted link
encrypted link
Alice
Step 1: Alice's Tor client obtains a list of Tor nodes from a directory server.
Jane
Dave
Bob

pictures from `https://www.torproject.org/about/overview.html.en`

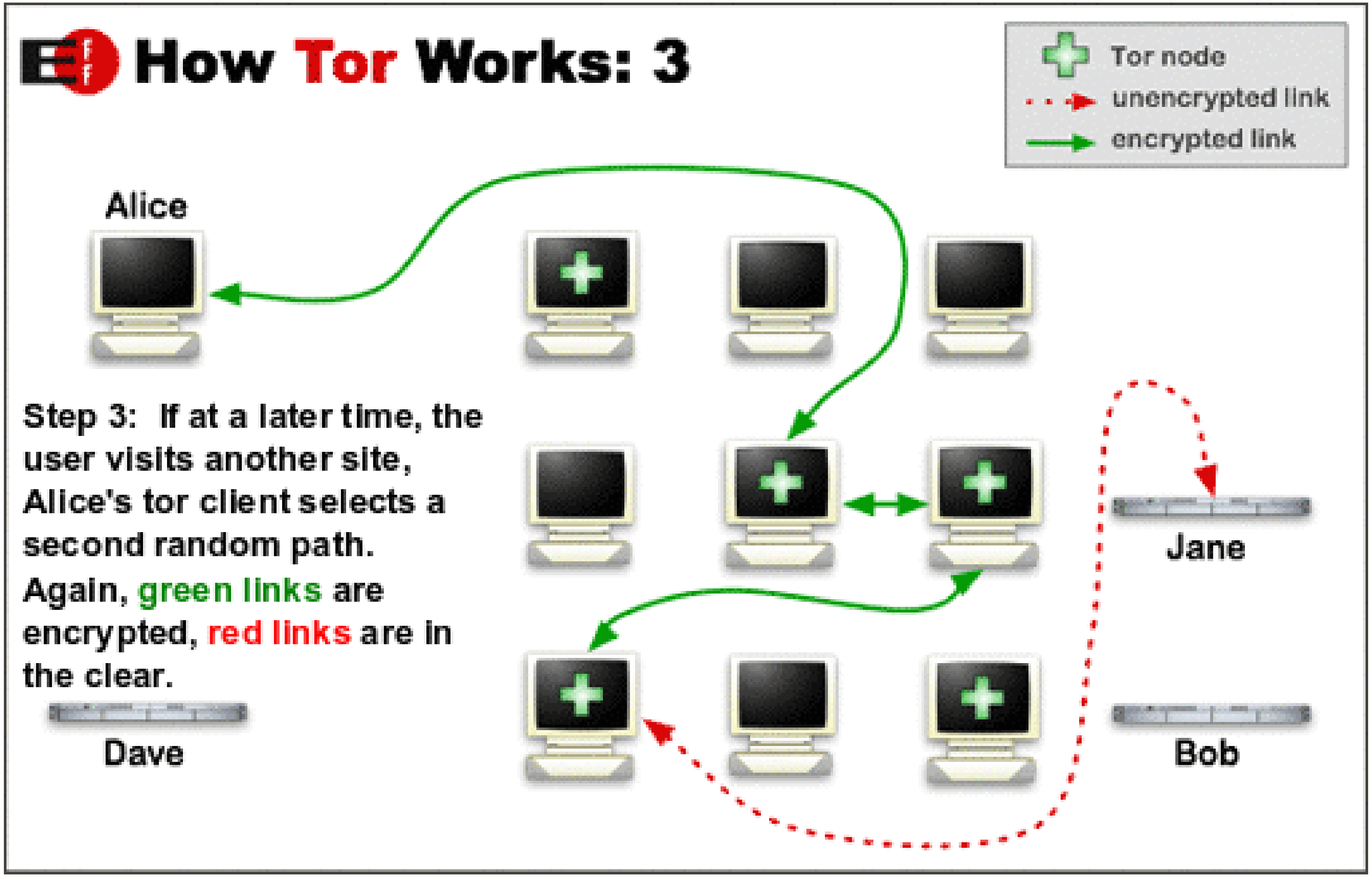
Tor project - how it works 2



How Tor Works: 2
Tor node
unencrypted link
encrypted link
Alice
Step 2: Alice's Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.
Jane
Dave
Bob

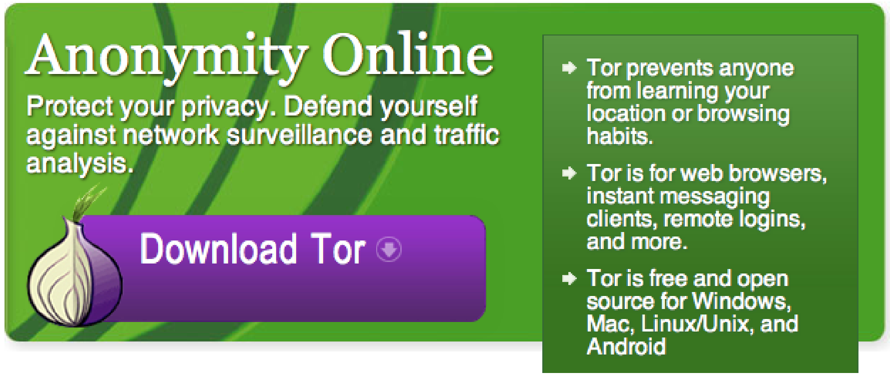
pictures from `https://www.torproject.org/about/overview.html.en`

Tor project - how it works 3


How Tor Works: 3
Tor node
unencrypted link
encrypted link
Alice
Step 3: If at a later time, the user visits another site, Alice's tor client selects a second random path. Again, green links are encrypted, red links are in the clear.
Jane
Dave
Bob

pictures from `https://www.torproject.org/about/overview.html.en`

Tor project install



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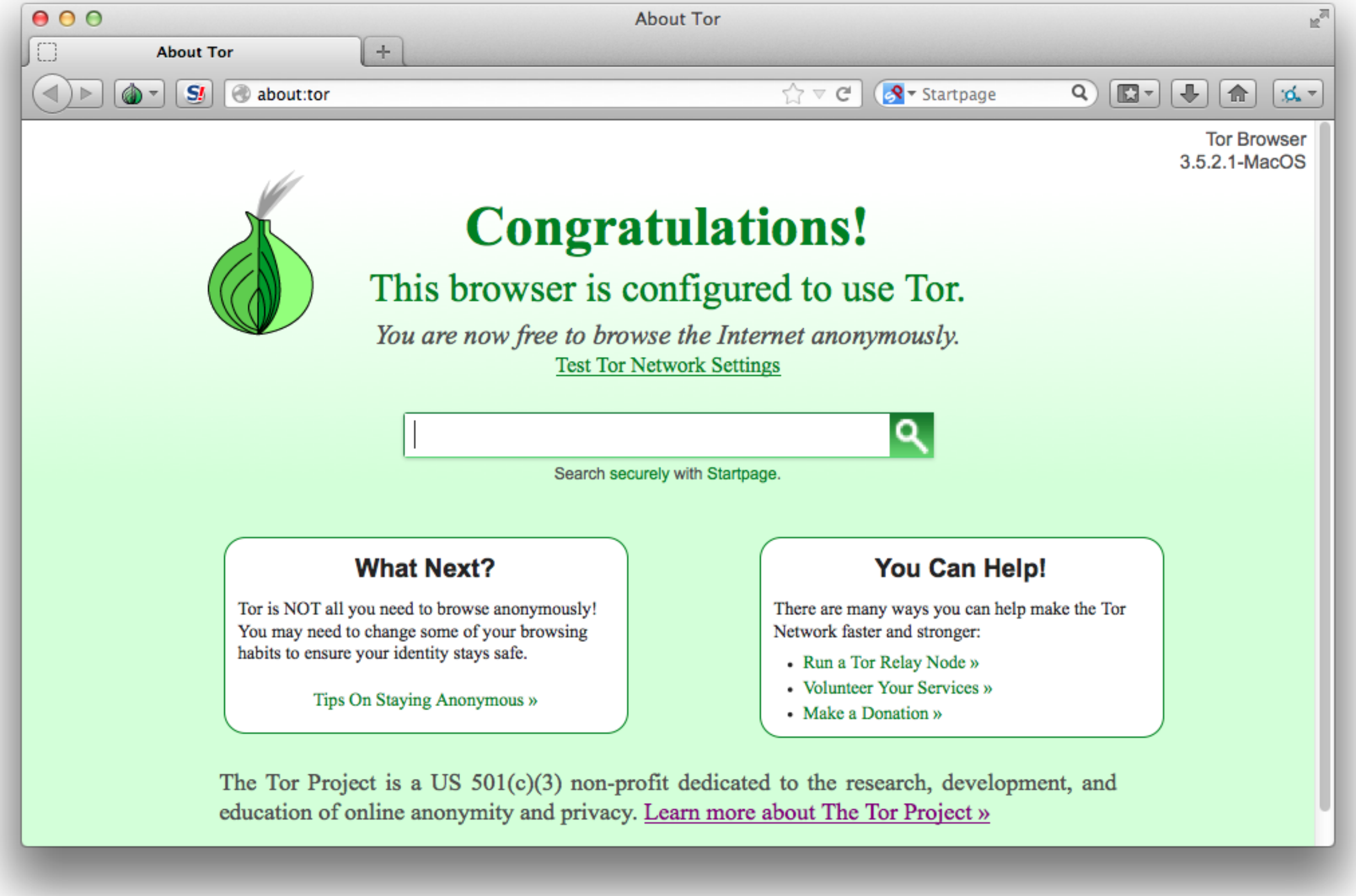
- Tor is for web browsers, instant messaging clients, remote logins, and more.
- Tor is free and open source for Windows, Mac, Linux/Unix, and Android

Der findes diverse tools til Tor, Torbutton on/off knap til Firefox osv.

Det anbefales at bruge Torbrowser bundles fra `https://www.torproject.org/`

Torbrowser - anonym browser



Tor Browser
3.5.2.1-MacOS

Congratulations!

This browser is configured to use Tor.

You are now free to browse the Internet anonymously.

Test Tor Network Settings

Search securely with Startpage.

What Next?

Tor is NOT all you need to browse anonymously! You may need to change some of your browsing habits to ensure your identity stays safe.

Tips On Staying Anonymous »

You Can Help!

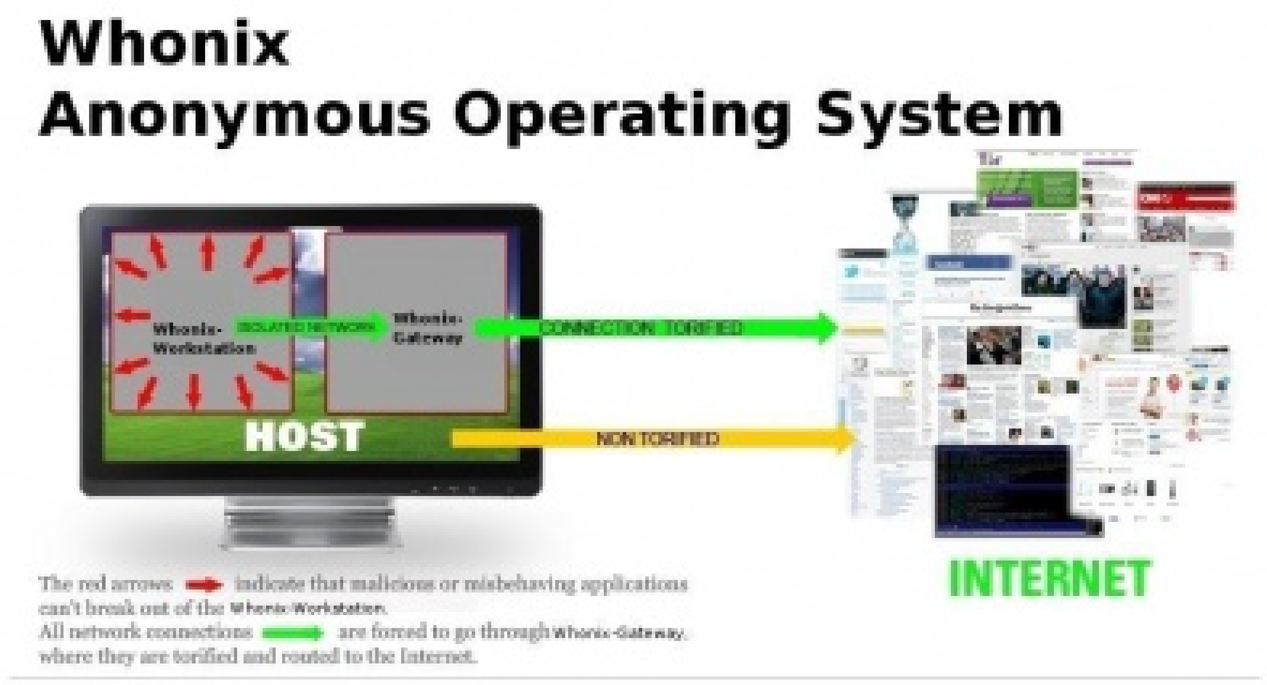
There are many ways you can help make the Tor Network faster and stronger:

- Run a Tor Relay Node »
- Volunteer Your Services »
- Make a Donation »

The Tor Project is a US 501(c)(3) non-profit dedicated to the research, development, and education of online anonymity and privacy. Learn more about The Tor Project »

Mere anonym browser - Firefox in disguise

Whonix - Tor to the max!

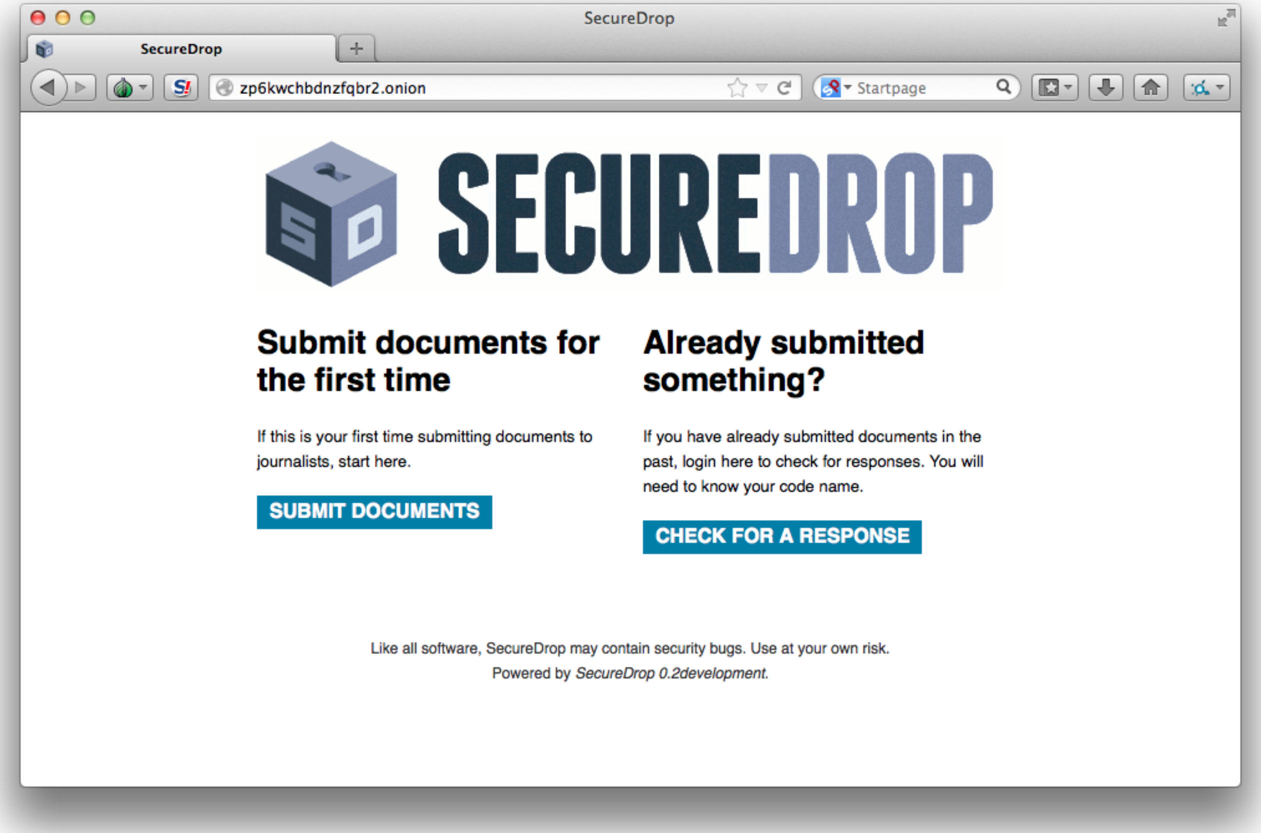


The red arrows 🡒 indicate that malicious or misbehaving applications can't break out of the Whonix-Workstation.
All network connections 🡒 are forced to go through Whonix-Gateway, where they are torified and routed to the Internet.

Whonix is an operating system focused on anonymity, privacy and security. It's based on the Tor anonymity network[5], Debian GNU/Linux[6] and security by isolation. DNS leaks are impossible, and not even malware with root privileges can find out the user's real IP. `https://www.whonix.org/`

Torbrowser er godt, Whonix giver lidt ekstra sikkerhed

Torbrowser - sample site



Submit documents for the first time

If this is your first time submitting documents to journalists, start here.

Already submitted something?

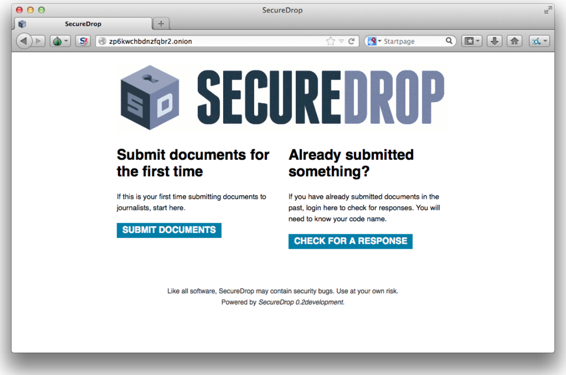
If you have already submitted documents in the past, login here to check for responses. You will need to know your code name.

Like all software, SecureDrop may contain security bugs. Use at your own risk.
Powered by *SecureDrop 0.2development.*

.onion er Tor adresser - hidden sites

Den viste side er SecureDrop hos Radio24syv `http://www.radio24syv.dk/dig-og-radio24syv/securedrop/`

SecureDrop



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Even if you dont want to use SD specifically, look at the technologies used.

- Hidden services with authentication key
- Jails/chroot/compartmented data
- AppArmor
- Google Authenticator
- Host based IDS, monitoring server

Multiple browsers

Firefox
chrome
Tor
Allow active content to run only from sites you trust
notscripts
Take control of the javascript, iframes, and plugins
TorProject.org
HTTPS Everywhere
whonix
PRIVACY & ANONYMITY OS

- Strict Security settings in the general browser, Firefox or Chrome?
- More lax security settings for ”trusted sites” - like home banking
- Security plugins like HTTPS Everywhere and NoScripts for generic browsing

HTTPS Everywhere

HTTPS Everywhere is a Firefox extension produced as a collaboration between The Tor Project and the Electronic Frontier Foundation. It encrypts your communications with a number of major websites.

`http://www.eff.org/https-everywhere`

DNSSEC trigger

Lots of DNSSEC tools, I recommend DNSSEC-trigger a local name server for your laptop

- DNSSEC Validator for firefox `https://addons.mozilla.org/en-us/firefox/addon/dnssec-validator/`
- OARC tools `https://www.dns-oarc.net/oarc/services/odvr`
- `http://www.nlnetlabs.nl/projects/dnssec-trigger/`

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)

`https://datatracker.ietf.org/wg/dane/charter/`

`http://googleonlinesecurity.blogspot.dk/2011/04/improving-ssl-certificate-security.html`

DNSSEC er ved at være godt udbredt - undtagen i DK

(findes på .dk zonen, men næsten ingen resolvere)

Det er ikke kun i Tyrkiet at websider censureres
Danmark har også DNS censur

ns1.censurfridns.dk
89.233.43.71 / 2002:d596:2a92:1:71:53::

ns2.censurfridns.dk
89.104.194.142 / 2002:5968:c28e::53

www.censurfridns.dk

Security for Journalists, via Silkie Carlo

Secure your mobile

Orbot:
Proxy With Tor

Orweb:
Private Web Browser

ChatSecure:
Private and Secure Messaging

ObscuraCam:
The Privacy Camera

Ostel:
Encrypted Phone Calls

CSipSimple:
Encrypted Voice Over IP (VOIP)

K-9 and APG:
Encrypted E-mail

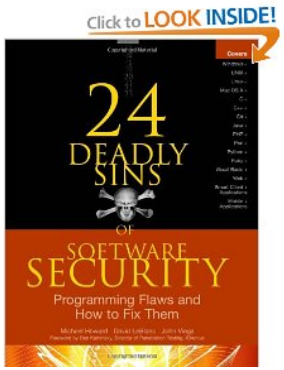
KeySync:
Syncing Trusted Identities

TextSecure:
Short Messaging Service (SMS)

Pixelknot:
Hidden Messages

Dont forget your mobile platforms `https://guardianproject.info/`

24 Deadly Sins of Software Security



24 Deadly Sins of Software Security af Michael Howard, David Leblanc, John Viega 2009

Obligatorisk læsning for alle udviklere

Denne bog er præcis og giver overblik på kun 432 sider

Buffer Overruns, Format String Problems, Integer Overflows, SQL Injection, Command Injection, Failing to Handle Errors, Cross-Site Scripting, Failing to Protect Network Traffic, Magic URLs Hidden Form Fields, Improper Use of SSL and TLS, Weak Password-Based Systems, Failing to Store and Protect Data Securely, Information Leakage, Improper File Access, Trusting Network Name Resolution, Race Conditions, Unauthenticated Key Exchange, Cryptographically Strong Random Numbers, Poor Usability

Open Mike night ...

Hvad glemte jeg? Kom med dine favoritter ☺

evalg, DNS censur, NemID bashing, malware sucks, Android malware, iPhone malware?

Did you notice how a lot of the links in this presentation uses HTTPS - encrypted

Questions?

Henrik Lund Kramshøj, internet samurai
hlk@solido.net

`http://www.solidonetworks.com`

You are always welcome to send me questions later via email

Reklamer: kursusafholdelse

Følgende kurser afholdes med mig som underviser

- IPv6 workshop - 1 dag
  Introduktion til Internetprotokollerne og forberedelse til implementering i egne netværk.
- Wireless teknologier og sikkerhed workshop - 1-2 dage
  En dag med fokus på netværksdesign og fornuftig implementation af trådløse netværk, samt integration med hjemmepc og wirksomhedsnetværk.
- Hacker workshop 2 dage
  Workshop med detaljeret gennemgang af hackermetoderne angreb over netværk, exploitprogrammer, portscanning, Nessus m.fl.
- Forensics workshop 2 dage
  Med fokus på tilgængelige open source værktøjer gennemgås metoder og praksis af undersøgelse af diskimages og spor på computer systemer
- Moderne Firewalls og Internetsikkerhed 2 dage
  Informere om trusler og aktivitet på Internet, samt give et bud på hvorledes en avanceret moderne firewall idag kunne konfigureres.