
NATIONAL SECURITY AGENCY
PEEPING WHILE YOU'RE SLEEPING
The NSA
The only part of government
that actually listens.

Don‘t give them anything for free

It‘s your home, you fight

M3AAWG
MESSAGING MALWARE MOBILE

BetterCrypto · org

Applied Crypto Hardening

David Durvaux
Aaron Kaplan

Brussels, 9th June 2014

CERT.at

CERT.be

Recording…

[ADD DISCLAIMER HERE]

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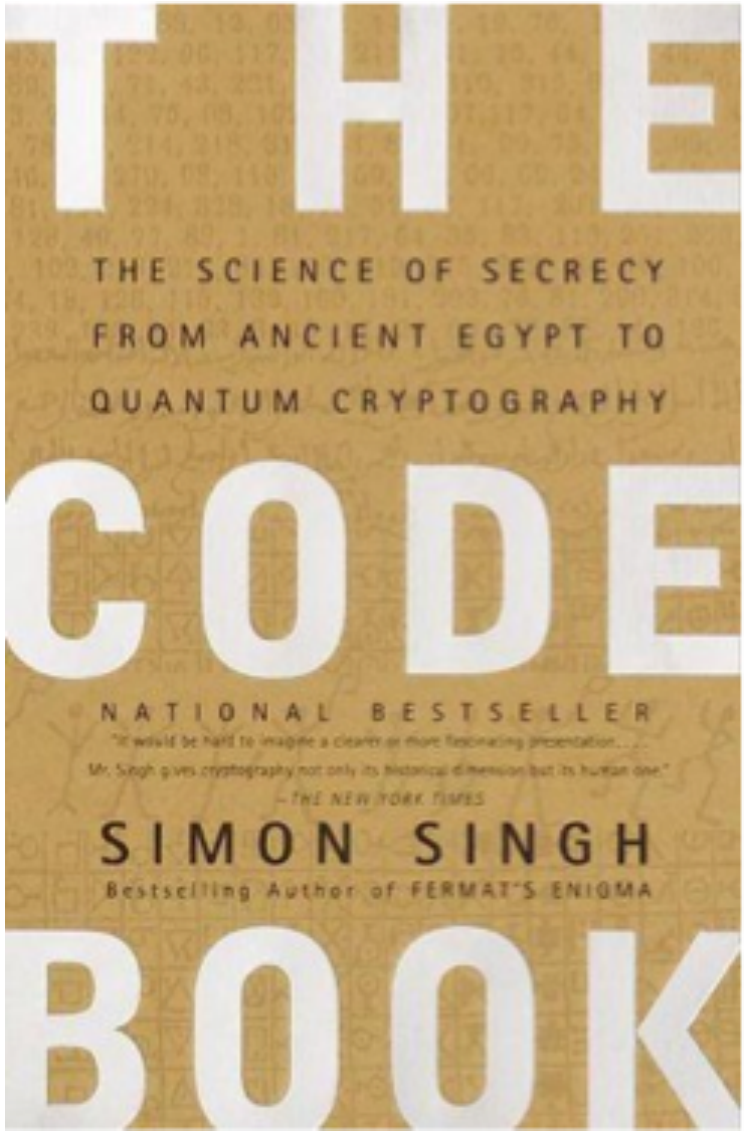
Agenda

- Pieces of History
- Introduction to BetterCrypto project
- Cryptography in a nutshell
- Practical Settings
- Testing
- Demo
- Conclusion



Pieces of History

Caesar

- Vigenère Cipher

Mary Queen of Scots

- Trial against Queen Elizabeth
- Was executed after her code was broken (1587)

Enigma

- Secret in code book

Bundesarchiv, Bild 101I-241-2173-09
Foto: Grupp | 1943/1944

BetterCrypto

Why?

- Crypto is cryptic
- A lot of difficult concepts
- A lot of algorithms
- A lot of parameters
- …

The Idea

- Really difficult for systems administrators
  - A “cookbook” can help!
    - That’s BetterCrypo

That's not…

- A crypto course
- A static document

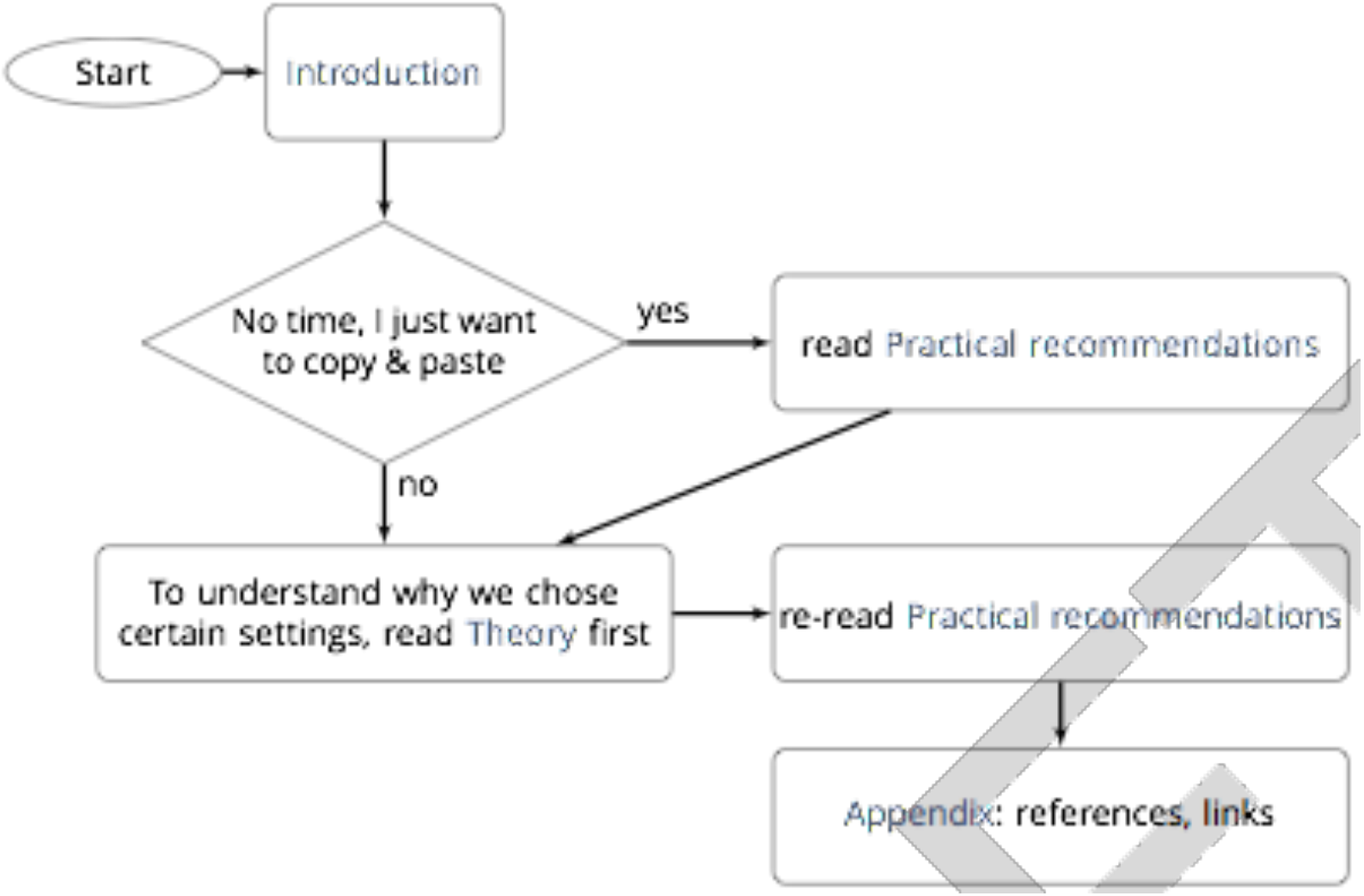
In short

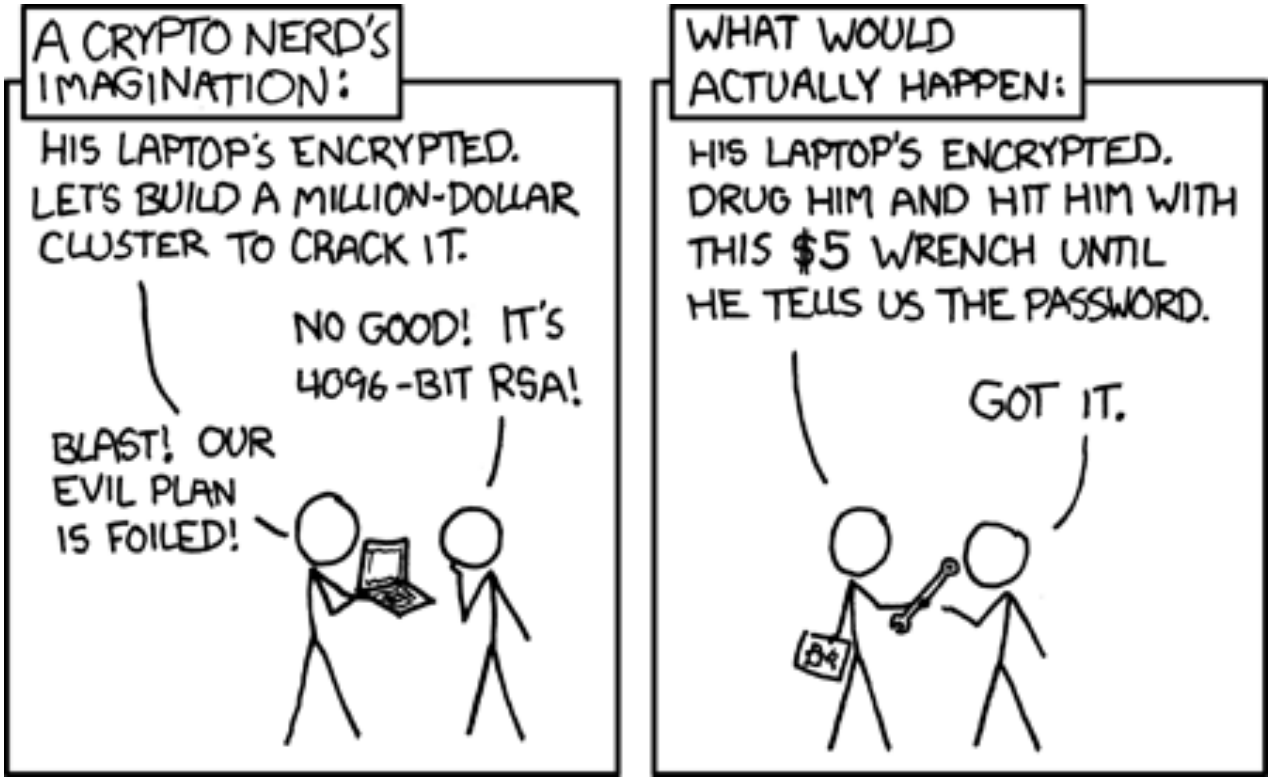
- Community effort to produce best practices
- Continuous effort
- Mixed expertises
- Open to comments / suggestions / improvements

2 parts

- First part = configurations
  - The most important part
  - Cover as many tools as possible
- Second part = theory
  - Explain and justify choose we made
    - Transparency

How to use?


Start
Introduction
No time, I just want to copy & paste
yes
read Practical recommendations
no
To understand why we chose certain settings, read Theory first
re-read Practical recommendations
Appendix: references, links



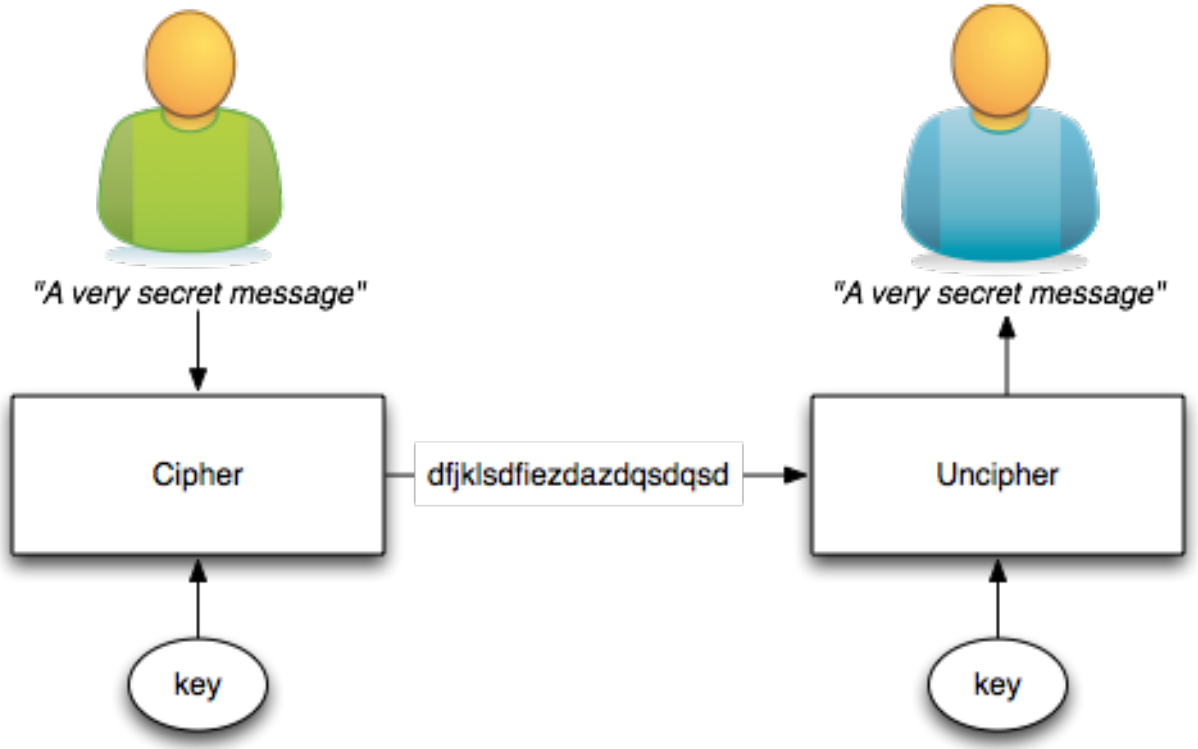
Crypto in a nutshell

Goals

- 2 types of goals:
  - protect the contact of the message
  - identify the author
- Can be combined

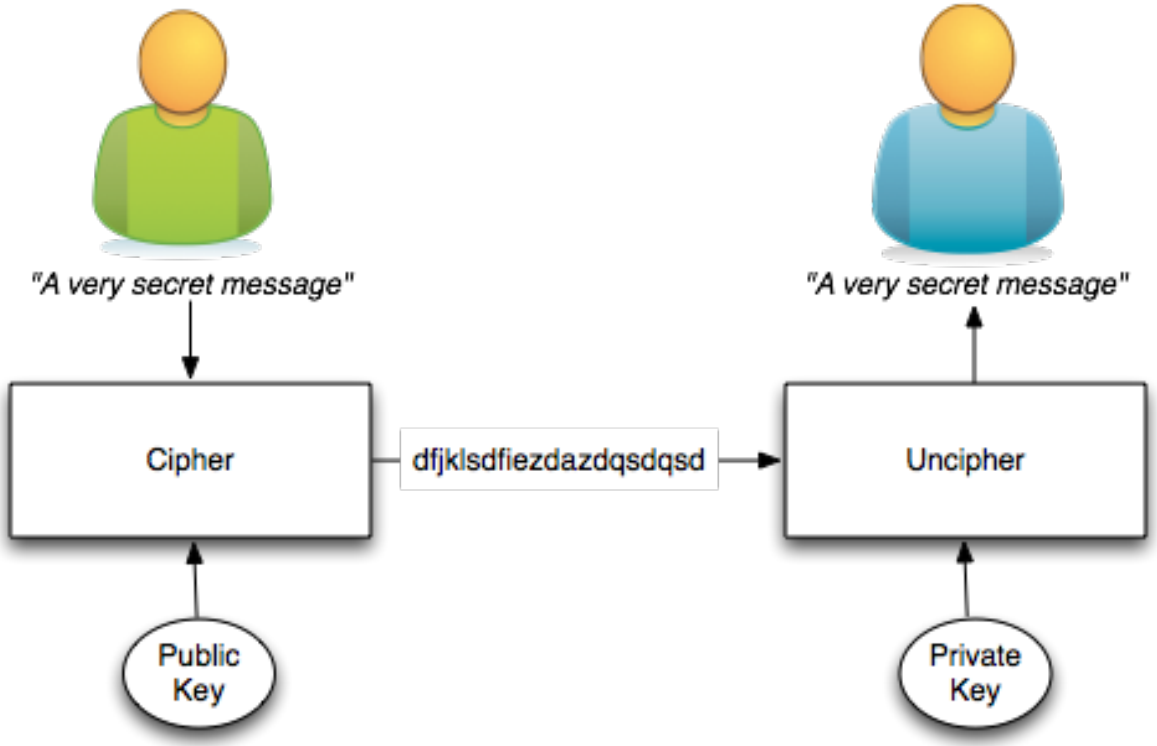
Symetric Ciphering

- The key is shared



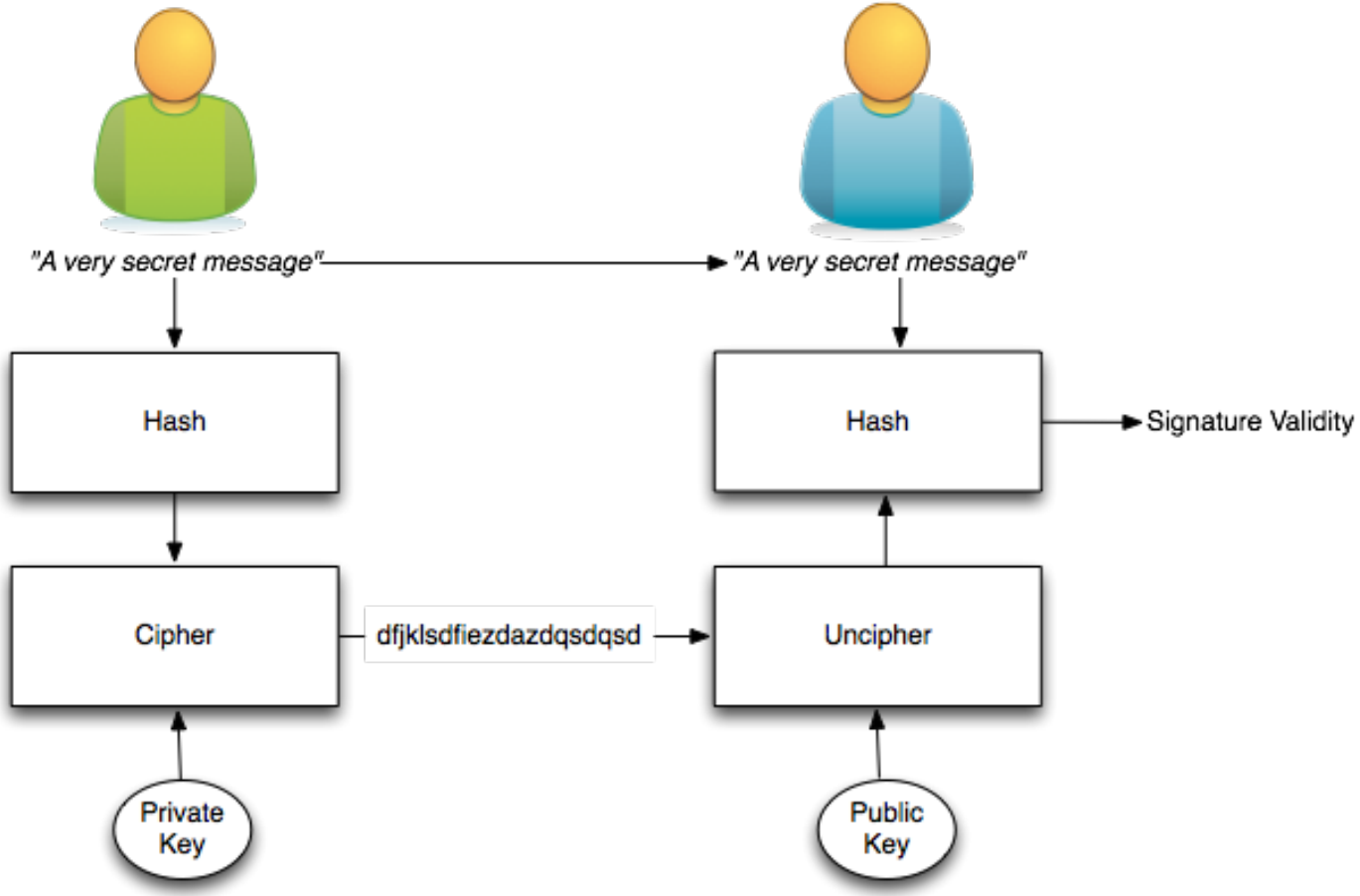
Asymetric Ciphering

- Public key is published
- Private key HAS to be secured



Signing

- Author identity is proved

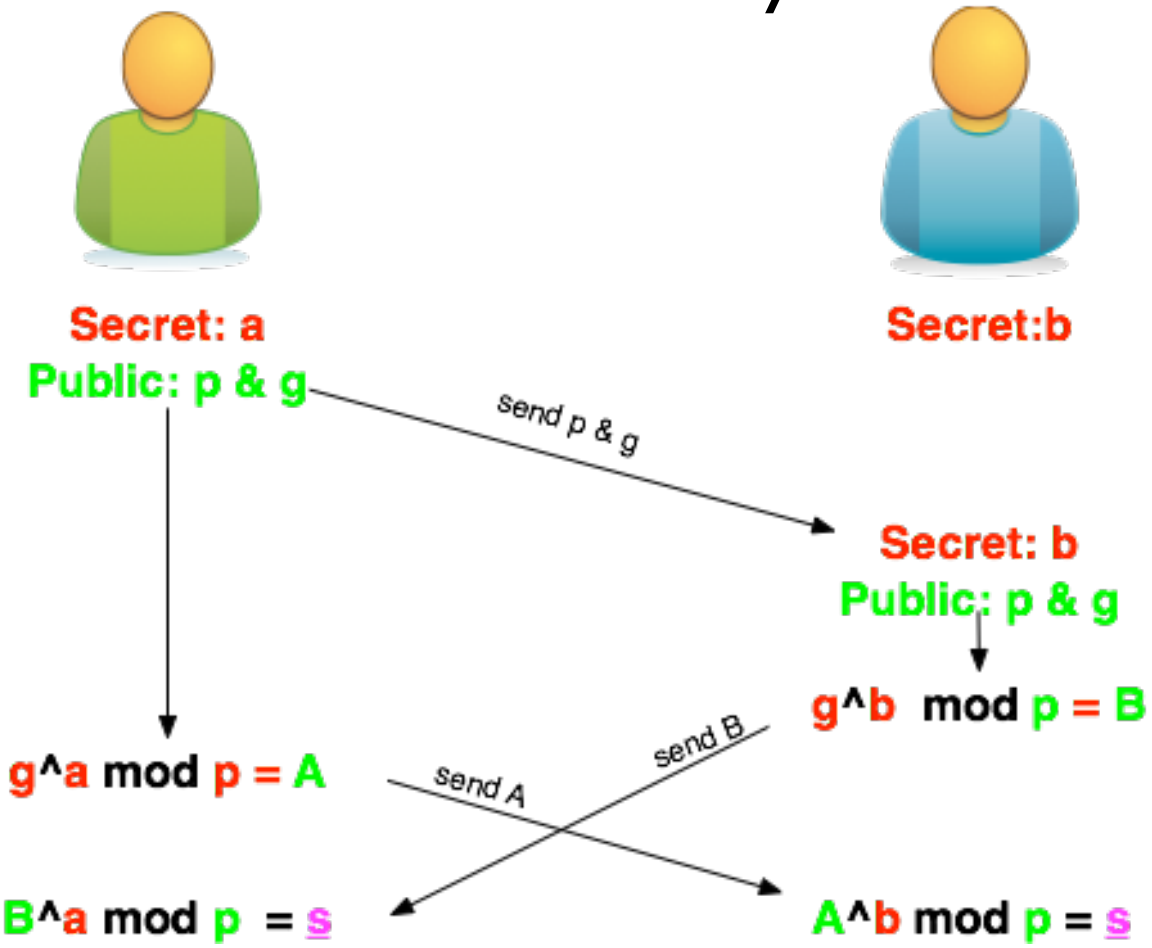


The asymmetric magic

- RSA "formula" : $c = m^e \mod(n)$
  - with
    - c which is the ciphertext
    - m is the cleartext message
    - e and n are the public key
  - Uncipher with $m = c^d \mod(n)$
    - d being the private key

Diffie-Helleman

- How to share a secret key?

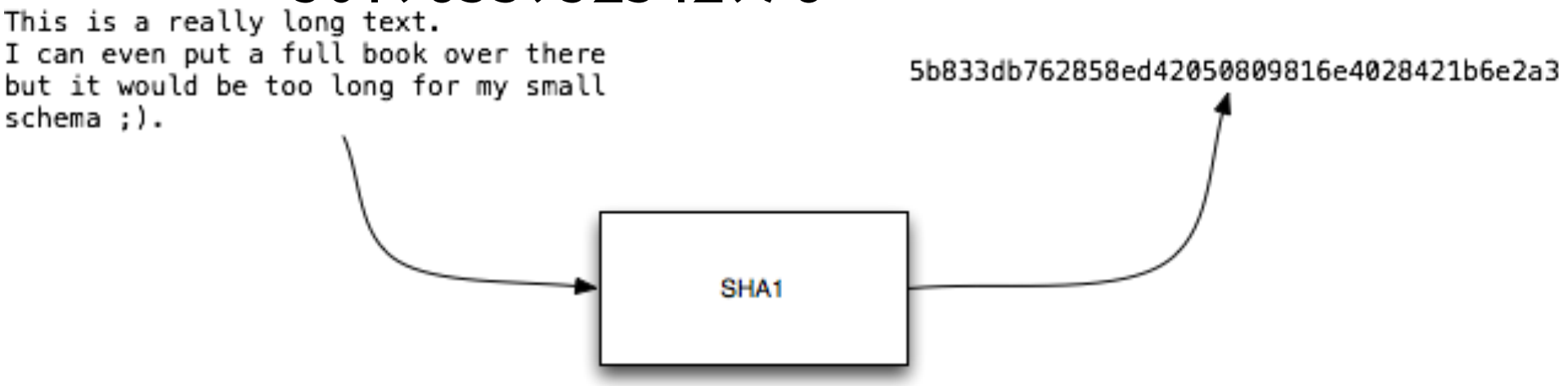


Ephemeral Diffie-Helleman

- Regular mode
  - Public and private keys are kept
- Ephemeral mode
  - New keys are generated each time
    - By one of the parties at least

Hashing

- Take long piece of data and produce a probably unique signature
- Probability of collision for SHA1:
  - 1 over 1461501637330902918203684832716283019655932542976



ECC

- Elliptic curve cryptography (ECC)
- Finding the discrete logarithm of a random elliptic curve element
  - Only knowing a base point
  - Assumed to be infeasible
- Reduced key length

Some thoughts on ECC

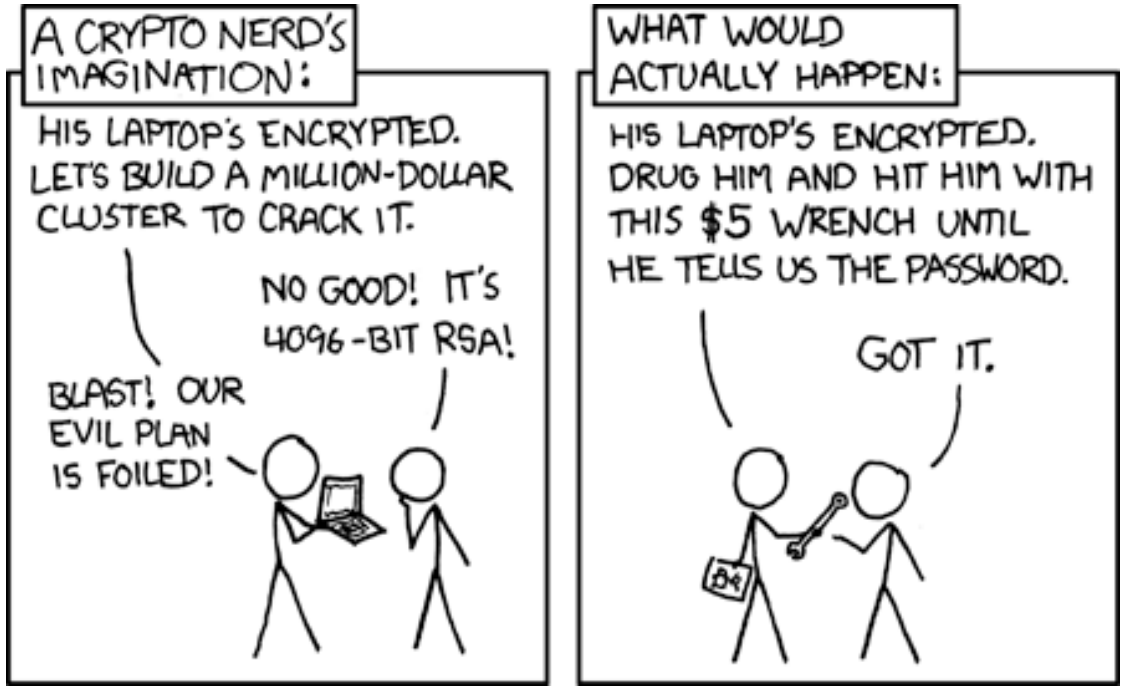
- Currently this is under heavy debate
- Trust the Math
- “Nothing Up My Sleeve Numbers”
- eg. NIST P-256 (http://safecurves.cr.yp.to/rigid.html)
- Coefficients generated by hashing the unexplained seed c49d3608 86e70493 6a6678e1 139d26b7 819f7e90.
- Might have to change settings tomorrow
- Most Applications only work with NIST-Curves

SSL

- [Explain]

Forward Secrecy-Motivation:

- Three letter agency (TLA) stores all ssl traffic
- Someday TLA gains access to ssl-private key (Brute Force, Physical Force)
- TLA can decrypt all stored traffic



Perfect Forward Secrecy

- DHE: Diffie Hellman Ephemeral
- Ephemeral: new key for each execution of a key exchange process
- SSL private-Key only for authentication
- Alternative new ssl private key every x ~~days~~ months
- Pro:
  - Highest Security against future attacks
- Contra:
  - Elliptic Curve
  - Processing costs

Stream vs Block Cipher

- Stream cipher
  - Generate an “infinite” key stream
  - Difficult to correctly use
    - Re-use of keys
  - Faster
- Block cipher
  - Cipher by block with padding
  - Could include integrity protection

RNGs

- RNGs are *important*.
- Nadia Heninger et al / Lenstra et al

	Our TLS Scan		Our SSH Scans	
Number of live hosts	12,828,613	(100.00%)	10,216,363	(100.00%)
...using repeated keys	7,770,232	(60.50%)	6,642,222	(65.00%)
...using vulnerable repeated keys	714,243	(5.57%)	981,166	(9.60%)
...using default certificates or default keys	670,391	(5.23%)		
...using low-entropy repeated keys	43,852	(0.34%)		
...using RSA keys we could factor	64,081	(0.50%)	2,459	(0.03%)
...using DSA keys we could compromise			105,728	(1.03%)
...using Debian weak keys	4,147	(0.03%)	53,141	(0.52%)
...using 512-bit RSA keys	123,038	(0.96%)	8,459	(0.08%)
...identified as a vulnerable device model	985,031	(7.68%)	1,070,522	(10.48%)
...model using low-entropy repeated keys	314,640	(2.45%)		

- Entropy after startup: embedded devices

RNGs

- Weak RNG
  - Dual EC_DRBG is weak (slow, used in RSA-toolkit)
  - Intel RNG **?** Recommendation: add System-Entropy (Network). Entropy only goes up.
- Tools (eg. HaveGE http://dl.acm.org/citation.cfm?id=945516)
- RTFM
  - when is the router key generated
  - Default Keys ?
- Re-generate keys from time to time

Some algorithms

- Symetric Ciphering
  - DES / 3DES
  - AES (Rijndael)
  - Camellia
- Asymetric Ciphering
  - RSA
  - PGP (GPG)

Some algorithms

- Hash
  - SHA1
  - SHA256
  - SHA512
- Key Exchange
  - Diffie Helleman

Algorithm vs Implementation!

- Heartbeat

Heartbeat

```
/* Enter response type, length and copy payload */
        *bp++ = TLS1_HB_RESPONSE;
            s2n(payload, bp);
        memcpy(bp, pl, payload);
```

- payload (pl) and payload_length (payload) are controlled by attacker
- memcpy will copy a part of the victim memory to the reply…

Cost of encryption

```
$ time openssl enc -e -a -aes-128-cbc -in ./rfc791.txt \
-out /tmp/rfc.aes -k "Super Key" -S 01EF

real   0m0.014s

user   0m0.004s

sys    0m0.003s


$ time gpg -a -u 57AB3358 -r 77659F3E -e ./rfc791.txt

real   0m0.069s

user   0m0.048s

sys    0m0.008s
```

GPG is 4,93 time slower!

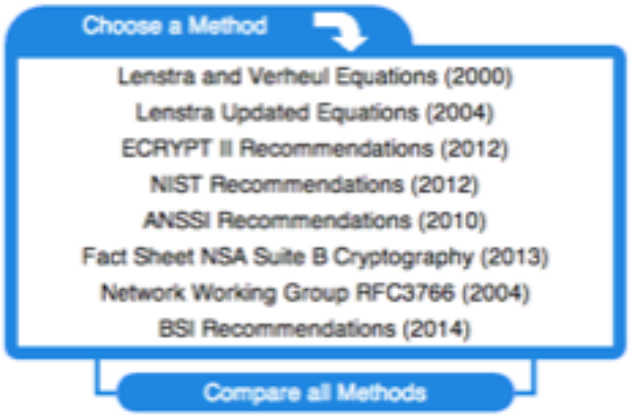
Keylengths

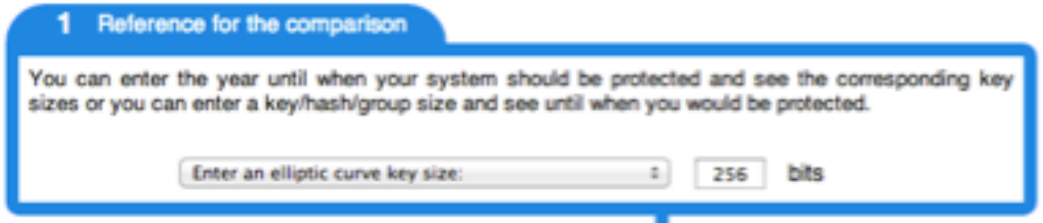
On the choice between AES256 and AES128: I would never consider using AES256, just like I don't wear a helmet when I sit inside my car. It's too much bother for the epsilon improvement in security."

— Vincent Rijmen in a personal mail exchange Dec 2013

Keylengths

- http://www.keylength.com/
- Recommended Keylengths, Hashing algorithms, etc.
- Currently:
  - RSA: >= 3248 bits (Ecrypt II)
  - ECC: >= 256
  - SHA 2+ (SHA 256,…)
  - AES 128 is good enough





Method	Date	Symmetric	Asymmetric	Discrete Logarithm Key	Discrete Logarithm Group	Elliptic Curve	Hash
[1] Lenstra / Verheul	2084	135	7813 6816	241	7813	257	269
[2] Lenstra Updated	2090	128	4440 6974	256	4440	256	256
[3] ECRYPT II	2031 - 2040	128	3248	256	3248	256	256
[4] NIST	> 2030	128	3072	256	3072	256	256
[5] ANSSI	> 2020	128	4096	200	4096	256	256
[6] NSA	-	128	-	-	-	256	256
[7] RFC3766	-	136	3707	272	3707	257	-
[8] BSI (signature only)	> 2020	-	1976	256	2048	250	256

BetterCrypto CipherSuite

- 2 cipher suites
  - version A
    - stronger
    - less supported client
  - version B
    - weaker
    - more “universal”

Some general thoughts on settings

- General
  - Disable SSL 2.0 (weak algorithms)
  - Disable SSL 3.0 (BEAST vs IE/XP)
  - Enable TLS 1.0 or better
  - Disable TLS-Compression (SSL-CRIME Attack)
  - Implement HSTS (HTTP Strict Transport Security)

Cipher Suite A

- TLS 1.2
- Perfect forward secrecy / ephemeral Diffie Hellman
- Strong MACs (SHA-2) or
- GCM as Authenticated Encryption scheme

ID	OpenSSL Name	Version	KeyEx	Auth	Cipher	MAC
0xC09F	DHE-RSA-AES256-GCM-SHA384	TLSv1.2	DH	RSA	AESGCM(256)	AEAD
0xC06B	DHE-RSA-AES256-SHA256	TLSv1.2	DH	RSA	AES(256) (CBC)	SHA256
0xC030	ECDHE-RSA-AES256-GCM-SHA384	TLSv1.2	ECDH	RSA	AESGCM(256)	AEAD
0xC028	ECDHE-RSA-AES256-SHA384	TLSv1.2	ECDH	RSA	AES(256) (CBC)	SHA384

CiperSuite B

- TLS 1.2, TLS 1.1, TLS 1.0
- Allowing SHA-1

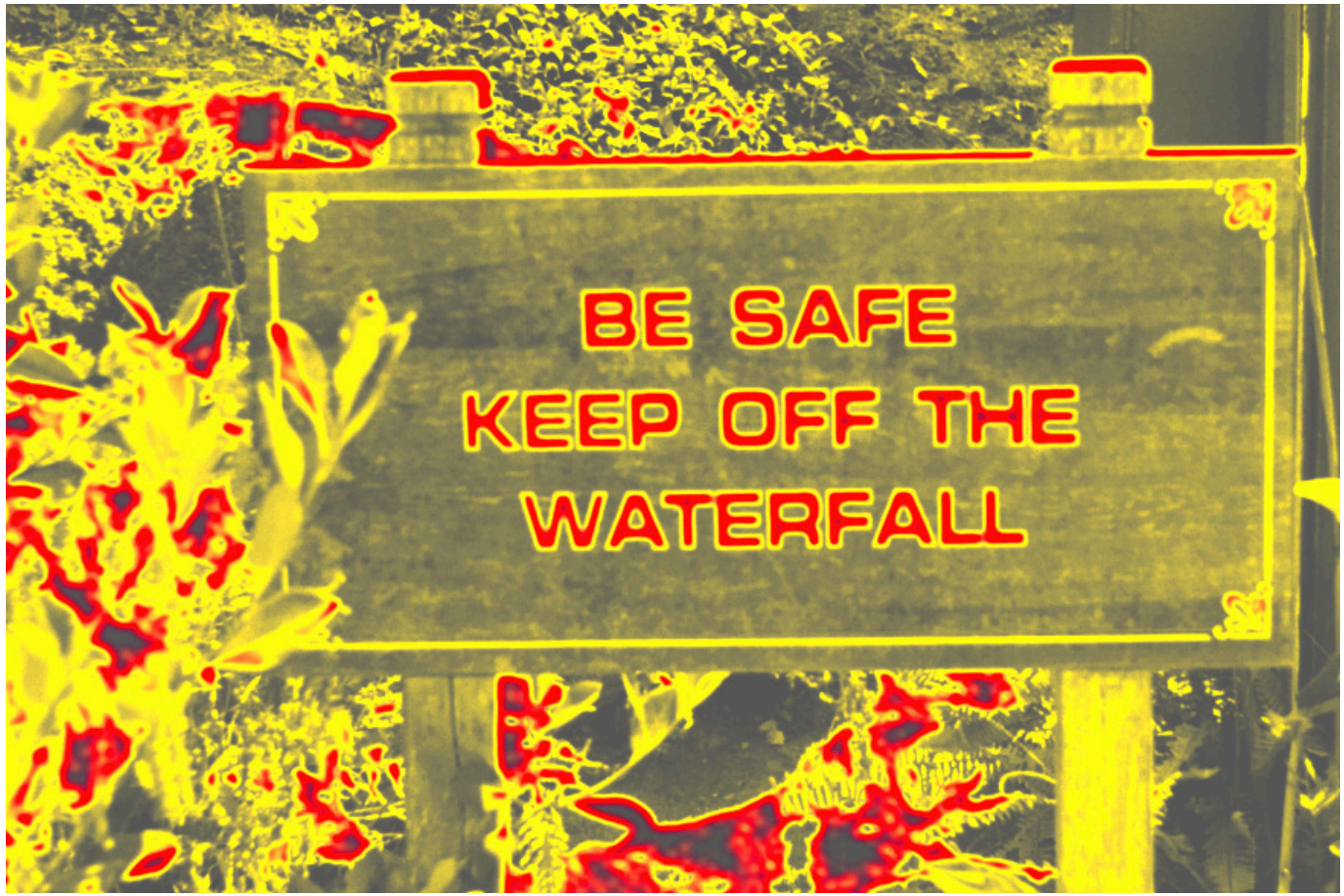
Cipher Suite B

ID	OpenSSL Name	Version	KeyEx	Auth	Cipher	MAC
0x009F	DHE-RSA-AES256-GCM-SHA384	TLSv1.2	DH	RSA	AESGCM(256)	AEAD
0x006B	DHE-RSA-AES256-SHA256	TLSv1.2	DH	RSA	AES(256)	SHA256
0xC030	ECDHE-RSA-AES256-GCM-SHA384	TLSv1.2	ECDH	RSA	AESGCM(256)	AEAD
0xC028	ECDHE-RSA-AES256-SHA384	TLSv1.2	ECDH	RSA	AES(256)	SHA384
0x009E	DHE-RSA-AES128-GCM-SHA256	TLSv1.2	DH	RSA	AESGCM(128)	AEAD
0x0067	DHE-RSA-AES128-SHA256	TLSv1.2	DH	RSA	AES(128)	SHA256
0xC02F	ECDHE-RSA-AES128-GCM-SHA256	TLSv1.2	ECDH	RSA	AESGCM(128)	AEAD
0xC027	ECDHE-RSA-AES128-SHA256	TLSv1.2	ECDH	RSA	AES(128)	SHA256
0x0088	DHE-RSA-CAMELLIA256-SHA	SSLv3	DH	RSA	Camellia(256)	SHA1
0x0039	DHE-RSA-AES256-SHA	SSLv3	DH	RSA	AES(256)	SHA1
0xC014	ECDHE-RSA-AES256-SHA	SSLv3	ECDH	RSA	AES(256)	SHA1
0x0045	DHE-RSA-CAMELLIA128-SHA	SSLv3	DH	RSA	Camellia(128)	SHA1
0x0033	DHE-RSA-AES128-SHA	SSLv3	DH	RSA	AES(128)	SHA1
0xC013	ECDHE-RSA-AES128-SHA	SSLv3	ECDH	RSA	AES(128)	SHA1
0x0084	CAMELLIA256-SHA	SSLv3	RSA	RSA	Camellia(256)	SHA1
0x0035	AES256-SHA	SSLv3	RSA	RSA	AES(256)	SHA1
0x0041	CAMELLIA128-SHA	SSLv3	RSA	RSA	Camellia(128)	SHA1
0x002F	AES128-SHA	SSLv3	RSA	RSA	AES(128)	SHA1

Compatibility (B suite)

Handshake Simulation

Bing Oct 2013	TLS 1.0	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) FS	256
Chrome 31 / Win 7	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Firefox 10.0.12 ESR / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 17.0.7 ESR / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 21 / Fedora 19	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 24 / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Googlebot Oct 2013	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 6 / XP No FS [1] No SNI [2]			Fail[3]
IE 7 / Vista	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 8 / XP No FS [1] No SNI [2]			Fail[3]
IE 8-10 / Win 7	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 11 / Win 7	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 11 / Win 8.1	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Java 6u45 No SNI [2]			Fail[3]
Java 7u25			Fail[3]
OpenSSL 0.9.8y	TLS 1.0	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) FS	256
OpenSSL 1.0.1e	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030) FS	256
Opera 17 / Win 7	TLS 1.2	TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 (0x6b) FS	256
Safari 5.1.9 / OS X 10.6.8	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Safari 6 / iOS 6.0.1	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028) FS	256
Safari 6.0.4 / OS X 10.8.4	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Safari 7 / OS X 10.9	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028) FS	256
Tor 17.0.9 / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Yahoo Slurp Oct 2013	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256



Practical Settings

Tools covered

- Webservers
  - Apache
  - lighttpd
  - nginx
  - Microsoft IIS

Tools covered

- SSH
  - Open SSH
  - Cisco ASA
  - Cisco IOS

Tools covered

- Mail servers
  - Dovecot
  - cyrus-imapd
  - Postfix
  - Exim

Tools covered

- VPN
  - IPSec
  - CheckPoint Firewall-1
  - OpenVPN
  - PPPTP
  - Cisco ASA
  - OpenSWAN
  - tinc

Tools covered

- PGP/GPG
- IPMI/ILO
- Instant Messaging
  - ejabberd
  - OTR
  - Charybdis
  - SILC

Tools covered

- Database systems
  - Oracle
  - MySQL
  - DB2
  - PostgreSQL

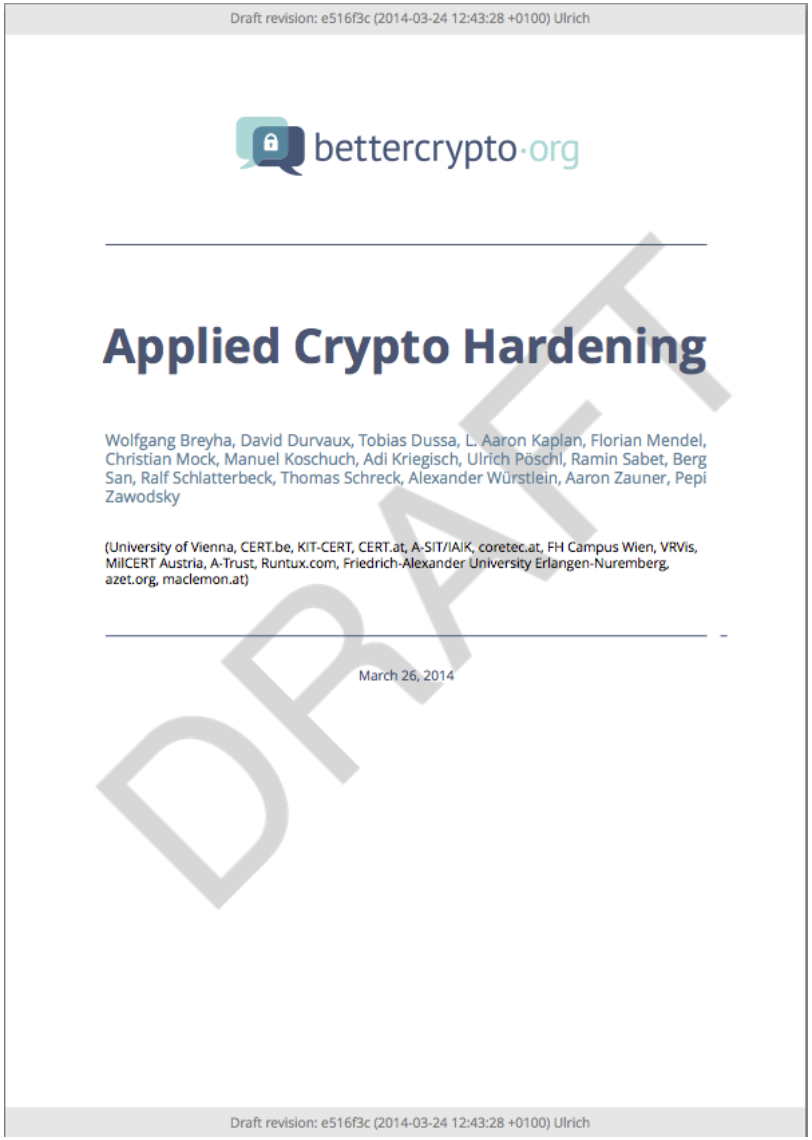
Tools covered

- Proxy
  - squid
  - Bluecoat
  - Pound
- Kerberos

Mail Encryption

- GPG / PGG
- [a little bit over there]

Let's have a look



Draft revision: e516f3c (2014-03-24 12:43:28 +0100) Ulrich

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Applied Crypto Hardening

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(University of Vienna, CERT.be, KIT-CERT, CERT.at, A-SIT/IAIK, coretec.at, FH Campus Wien, VRVis, MilCERT Austria, A-Trust, Runtux.com, Friedrich-Alexander University Erlangen-Nuremberg, azet.org, maclemon.at)

March 26, 2014

DRAFT

Draft revision: e516f3c (2014-03-24 12:43:28 +0100) Ulrich

Apache

Selecting cipher suites:

```
SSLProtocol All -SSLv2 -SSLv3
SSLHonorCipherOrder On
SSLCompression off
# Add six earth month HSTS header for all users...
Header add Strict-Transport-Security "max-age=15768000"
# If you want to protect all subdomains, use the following header
# ALL subdomains HAVE TO support https if you use this!
# Strict-Transport-Security: max-age=15768000 ; includeSubDomains

SSLCipherSuite 'EECDH+aRSA+AESGCM:EECDH+aRSA+SHA384:EECDH+aRSA+SHA256:EDH
    +CAMELLIA256:EECDH:EDH+aRSA:+SSLv3:!aNULL:!eNULL:!LOW:!3DES:!MD5:!EXP
    :!PSK:!SRP:!DSS:!RC4:!SEED:!AES128:!CAMELLIA128:!ECDSA:AES256-SHA'
```

```
<VirtualHost *:80>
 #...
 RewriteEngine On
      RewriteRule ^.*$ https://%{SERVER_NAME}%{REQUEST_URI} [L,R=
          permanent]
 #...
</VirtualHost>
```

Testing

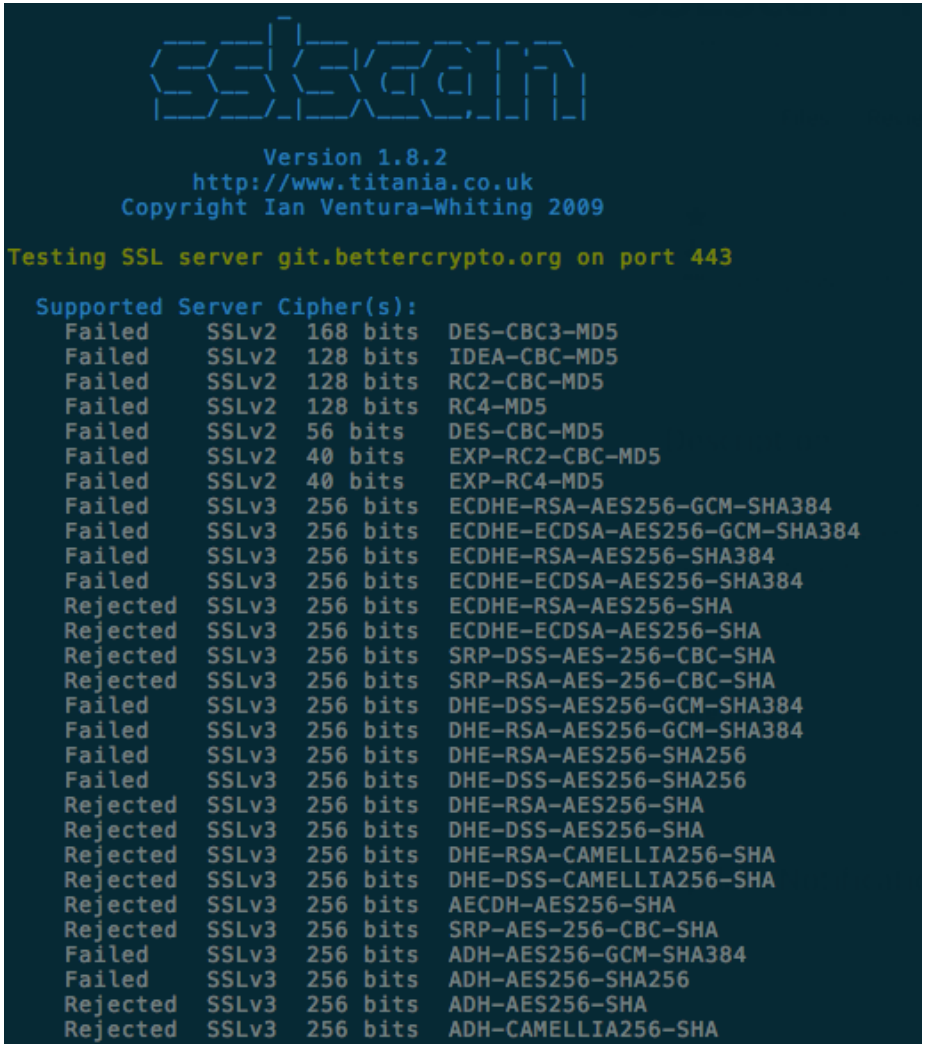
How to test? - Tools

- openssl s_client (or gnutls-cli)
- ssllabs.com: checks for servers as well as clients
- xmpp.net
- sslscan
- SSLyze

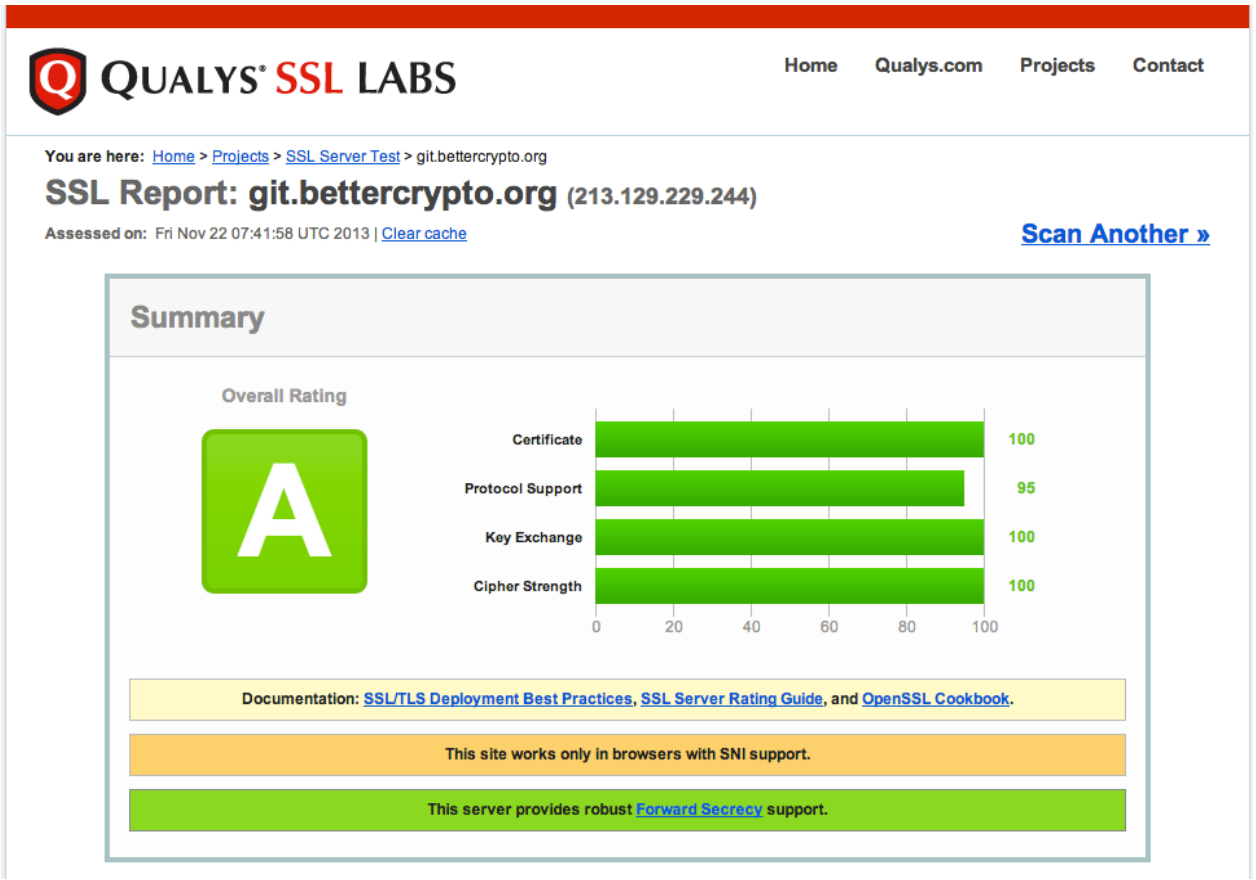
Tools: openss s_client

```
New, TLSv1/SSLv3, Cipher is ECDHE-RSA-AES256-GCM-SHA384
Server public key is 4096 bit
Secure Renegotiation IS supported
Compression: NONE
Expansion: NONE
SSL-Session:
    Protocol  : TLSv1.2
    Cipher    : ECDHE-RSA-AES256-GCM-SHA384
    Session-ID: 53D90B7D9D1FFC7EA98C105A2FC27F752B9CE9026CDAB57F4A7D4491C3C5ECC6
    Session-ID-ctx:
    Master-Key: 8F06DE9669BD6BF9628A38DF4F92C2CEBA6B7EA91F465164440CF31F7E8F55F2A67E7320B388D6E7AC4BC141C2FF3F68
    Key-Arg   : None
    PSK identity: None
    PSK identity hint: None
    SRP username: None
    TLS session ticket lifetime hint: 300 (seconds)
    TLS session ticket:
    0000 - fe 5b 93 84 a8 c6 ab 4a-74 b8 59 81 dc 3e 52 40   .[.....Jt.Y..>R@
    0010 - 0e dd f6 59 b4 a1 d2 54-65 df 9a 1b c9 fb 0d 2e   ...Y...Te.......
    0020 - 64 9c 65 cf 1c 0d d9 19-57 a6 cd 50 a5 d9 16 a4   d.e.....W..P....
    0030 - 17 b6 e8 38 ac e5 76 15-a4 9d d5 62 ee 51 55 09   ...8..v....b.QU.
    0040 - 52 36 58 84 04 0f 93 94-7b a9 dc e3 6f 8e 2f 7a   R6X.....{...o./z
    0050 - 9f bf 3d 4f a1 e1 bb 83-21 0f 7d f2 bd 02 48 a6   ..=O....!.}...H.
    0060 - 5a 96 82 fd dc a6 5a 55-77 b3 9f fb 60 0d 86 66   Z.....ZUw...`..f
    0070 - f1 68 42 e2 90 93 8b f6-25 aa 85 cf 08 07 c6 76   .hB.....%......v
    0080 - 06 62 37 32 09 4f ac 23-28 9c db b9 29 c0 23 1b   .b72.O.#(...).#.
    0090 - e4 c3 d2 a3 a4 b4 87 b5-0e 5c 68 16 73 07 96 90   .........\h.s...

    Start Time: 1385118946
    Timeout   : 300 (sec)
    Verify return code: 21 (unable to verify the first certificate)
---
```

Tools: sslscan



Tools: ssllabs



ssllabs (2)

Configuration

Protocols

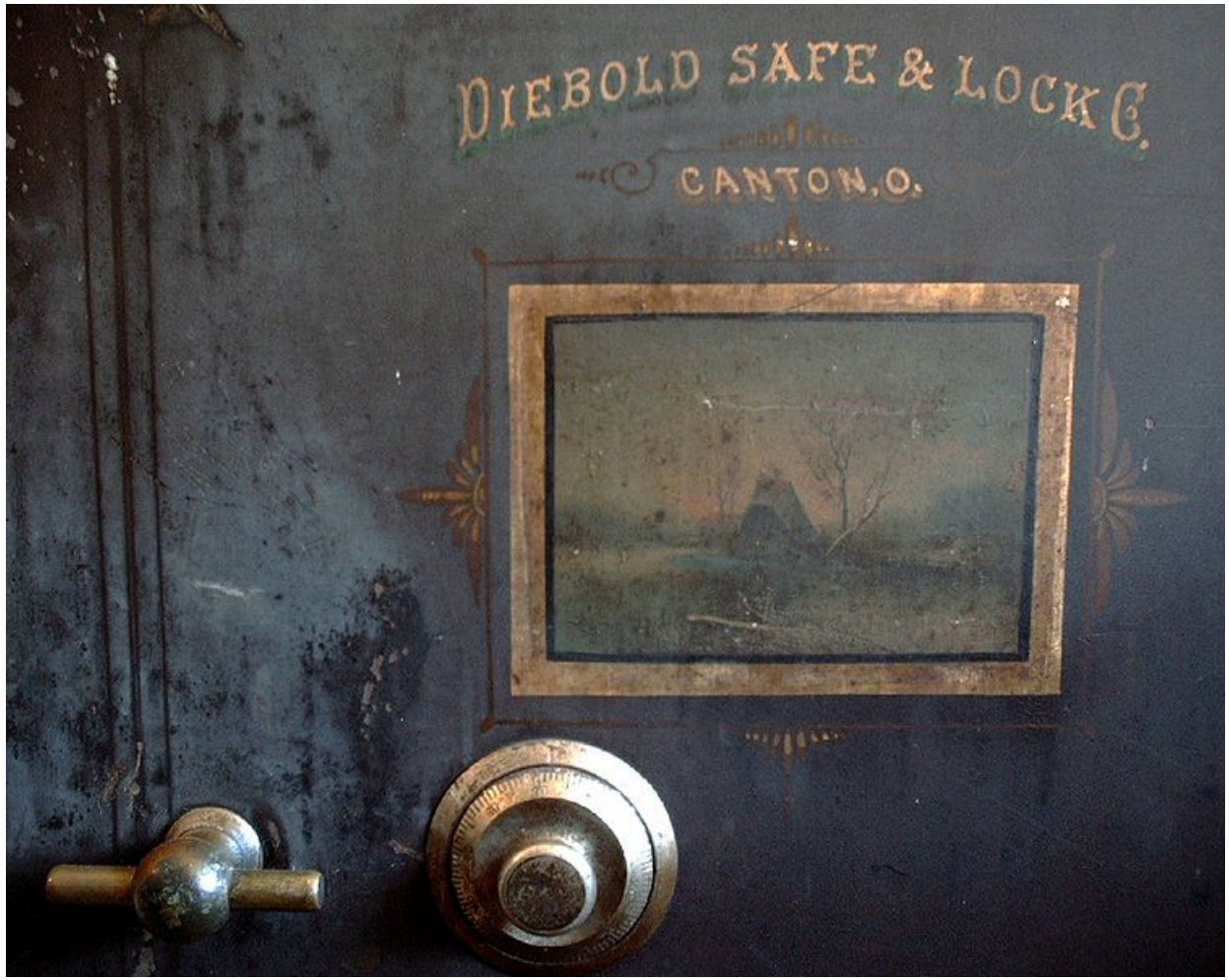
TLS 1.2	Yes
TLS 1.1	Yes
TLS 1.0	Yes
SSL 3	No
SSL 2	No

Cipher Suites (SSL 3+ suites in server-preferred order, then SSL 2 suites where used)

TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030) ECDH 256 bits (eq. 3072 bits RSA) FS	256
TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028) ECDH 256 bits (eq. 3072 bits RSA) FS	256
TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 (0x9f) DH 4096 bits (p: 512, g: 1, Ys: 512) FS	256
TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 (0x6b) DH 4096 bits (p: 512, g: 1, Ys: 512) FS	256
TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) DH 4096 bits (p: 512, g: 1, Ys: 512) FS	256
TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) ECDH 256 bits (eq. 3072 bits RSA) FS	256
TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) DH 4096 bits (p: 512, g: 1, Ys: 512) FS	256
TLS_RSA_WITH_AES_256_CBC_SHA (0x35)	256

Handshake Simulation

Bing Oct 2013	TLS 1.0	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) FS	256
Chrome 31 / Win 7	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Firefox 10.0.12 ESR / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 17.0.7 ESR / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 21 / Fedora 19	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Firefox 24 / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Googlebot Oct 2013	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 6 / XP No FS [1] No SNI [2]			Fail[3]
IE 7 / Vista	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 8 / XP No FS [1] No SNI [2]			Fail[3]
IE 8-10 / Win 7	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 11 / Win 7	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
IE 11 / Win 8.1	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Java 6u45 No SNI [2]			Fail[3]
Java 7u25			Fail[3]
OpenSSL 0.9.8y	TLS 1.0	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) FS	256
OpenSSL 1.0.1e	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030) FS	256
Opera 17 / Win 7	TLS 1.2	TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 (0x6b) FS	256
Safari 5.1.9 / OS X 10.6.8	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Safari 6 / iOS 6.0.1	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028) FS	256
Safari 6.0.4 / OS X 10.8.4	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) FS	256
Safari 7 / OS X 10.9	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028) FS	256
Tor 17.0.9 / Win 7	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256
Yahoo Slurp Oct 2013	TLS 1.0	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA (0x88) FS	256



Demo

GPG - Ciphering

```
echo "This is a really secret" \
  | gpg -a -u <your id>-r <his id> -e
```

```
-----BEGIN PGP MESSAGE-----
Version: GnuPG/MacGPG2 v2.0.22 (Darwin)
Comment: GPGTools - http://gpgtools.org

hQQMA5/oT2jaVoa7AR//bNnOZfw8Ci+AmzPa0MjQDLxNIPTSaVa30/9fm692XpYu
ynp/iRUFhcq2DPRoFWq71V9BABehzBzQAOrGZ6bZGTziVFkAfm4+79NvHGkEOaji
pf4CmlpyRE7yJWgIUd7TbIrKiC18yzA229YsC5QuTxqq+TFRiUpji/H3XVp/bTFu
tgHfAEagv5vdYCwlBmPuLc4oUSQ+zDoLEFw8AFaHaGMsCF/Pmq23kO8uj6Ku7PJQ
FYd/HHmvQGlXrBuQXcZMml3q1W4sz4T2ZZW8HTFO0J2s+OXwIK2rptHgU+f82Cw6
TFZmG9dLJoJeYr2OYK3YvOsIxjOhueqiNdTmVMTL5PiL96xXvIMmlRCDpQFOXOEL
iToSbl/M340jhODN8t2NgI2XXqsN5lBlNZPyeTb84Uf8ZpBrkKC3gf8L8V+8BOC0
hDT/aMKhe2BoeaPUeA/+rxb4IUo7oYgPl8PLT8bJStAG8EwsIKI6yUXl6vNSYBgF
eLofD3YHWg03pk4wgaQ2u5xjPz7216MhSr/33Vel/DDwTd+yfUdT4SGXVmPqvEbC
hxW+Dq7W0WGwGr8Ed3yMIfRJcq7NEFwnz7DXyZR3LPdi1TYvvr+S8hbKomppo9S6
8uM5oBBD2LFnHPXgU7aWGGksC+jZFvrbNmeDGJWegaITEAe7rKvKM1joiRHLNWYk
jnTySr+PKFHLwMMHCr8tfe2BTuRkdC4MQB0f3SL3ic0tLI1zUFpKXozN+H46EMbl
5o+rlgk+Kpb7UM5tbsBo+5E9e812TPp10fkc63IMpUlxUCD/IvQ4G4za3b60A/ev
DyRMs2wFaKKLV6g+cRUw8vmIbSFdBJlbodMcOwje8masAkk7kR/lM4IFZgu5v/xy
o3ne8khiZ7v0Dq49s6GLBXC51YYhKnIDcaJzebDFpopp7y2DisjPWbGkWVqs/QH8
mihe/7TbaHH0bjmoFGPGb29IX2wuejYZE3CZm02J9rZ9dFFTIjU7A0C9PnpzDT3p
Nde5iH4l4crMJ8GuXyh2rmwCXWN6BHnCeI69BIs77yxP+CWOewIM2arPzYeIztNH
```

GPG - Unciphering

- Let's save the ciphered text to msg.asc
- Then uncipher…

```
gpg -d msg.asc
```

```
You need a passphrase to unlock the secret key for
user: "David Durvaux <david.durvaux@belnet.be>"
8192-bit RSA key, ID DA5686BB, created 2010-12-04 (main key ID E84A32A0)

gpg: encrypted with 8192-bit RSA key, ID DA5686BB, created 2010-12-04
      "David Durvaux <david.durvaux@belnet.be>"
This is a really secret
```

GPG - Signing

```
echo "This is a really secret" \
  | gpg -a -u <your id>-r <his id>-s
```

```
You need a passphrase to unlock the secret key for
user: "David Durvaux <david.durvaux@cert.be>"
8192-bit RSA key, ID 57AB3358, created 2010-12-06

-----BEGIN PGP MESSAGE-----
Version: GnuPG/MacGPG2 v2.0.22 (Darwin)
Comment: GPGTools - http://gpgtools.org

owEBUASv+5ANAwACAcIpLB1XqzNYAcsgYgBThBnfVGhpcyBpcyBhIHJlYWxseSBz
ZWNyZXQgIAqJBBwEAAECAAYFAlOEGd8ACgkQwiksHVerM1jHGiAA2LHHYXTKvSDJ
iKKAOCc5P7YMRuodTYkHGPq3FGkR0k0yrXsFd3VwxyUoqWFodEOT675DhT/fJ2+t
eksFCrsY9jtq44OQJdxTSahA2FwlwloE+1x27oAPtKdzKF0TMzGxwVa+wPnly51s
5Vj51n16oMMhigSLZNU/aPe1B8GLI9RXiKeLAy6SW65cq5CU2YhfMhnwKsLk3flU
M/wXb7403NAqvCsRrdL8DWDxq7dvTmh1xFRJE53d5NxYI8l7K4SGwbIVs17e71a/
ZtPhrhacOWlYmwRXcS9qVewKt7Ri3DPdrsZ8CNVj1tJ9UcAE8fbe8RPlfJgVUF3i
AiOIJJZZgWVoVdknAoFjXpH3rHvQWXZicSRLmU33K/yoE5WAObSRQLMG18+EM1dc
MU4yFlUcRj0ZEkqAuwxgmFUeLiBF9fupqtBaJ+MiqctbFEZgbPamVcWfDS3ibt7G
3MGBDR/RLUvhDwqlg7nZxRVlEBPBNNB+rxT7sxDJTRNpqu2X67hITi9c4kIQn/jz
NEuhHZNHyy6cJtAf2nDWI7i8NnMf5znGja3nJlZzvC7RDcwFbXswHSIXZXZJYIjt
CPdKB7u5Sxzap4+SksnxIW+9Ny8mY3vK+VkI9FF42EfbpV0O7onJ3VwSegPZdsK8
kp67OhHlwlb2c/GJTYOZuoV+olpbbJwYwSS5rHYFoJUAMh5z2lOzKiNQSA3ZLOX7
SC63BrpK64sch0yJueEwlK1vVG5DWKXANV6x6rBEprzN6whc3+dYWe7ybF8ETuGD
TloVnFTwkBPNE+PEHQpUSHCRKxOkSxWF+nUYbWIbsPpMPl+obr56oaOErvR0CT53
```

GPG – Check Signature

```
gpg --verify sig.asc
```

```
gpg: Signature made Tue May 27 06:51:43 2014 CEST using RSA key ID 57AB3358
gpg: Good signature from "David Durvaux <david.durvaux@cert.be>"
gpg:                 aka "David Durvaux <david@durvaux.be>"
gpg:                 aka "David Durvaux <david@durvaux.net>"
gpg:                 aka "David Durvaux <david.durvaux@gmail.com>"
gpg:                 aka "David Durvaux <ddurvaux@people.ops-trust.net>"
gpg:                 aka "David Durvaux <david@autopsit.org>"
```

Differents way to sign / verify:
https://www.gnupg.org/gph/en/manual/x135.html

Other techniques

- Clearsigned Documents
- Detached Signatures

```
gpg (GnuPG/MacGPG2) 2.0.22; Copyright (C) 2013 Free Software Foundation, Inc.
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.

Please select what kind of key you want:
   (1) RSA and RSA (default)
   (2) DSA and Elgamal
   (3) DSA (sign only)
   (4) RSA (sign only)
Your selection? 1
RSA keys may be between 1024 and 8192 bits long.
What keysize do you want? (2048) 4096
Requested keysize is 4096 bits
Please specify how long the key should be valid.
         0 = key does not expire
      <n>  = key expires in n days
      <n>w = key expires in n weeks
      <n>m = key expires in n months
      <n>y = key expires in n years
Key is valid for? (0) 90
Key expires at Mon Aug 25 18:02:41 2014 CEST
Is this correct? (y/N) y

GnuPG needs to construct a user ID to identify your key.

Real name: Demo Key
Email address: demo@localhost
Comment: Demo
You selected this USER-ID:
    "Demo Key (Demo) <demo@localhost>"

Change (N)ame, (C)omment, (E)mail or (O)kay/(Q)uit? O
You need a Passphrase to protect your secret key.

We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
We need to generate a lot of random bytes. It is a good idea to perform
some other action (type on the keyboard, move the mouse, utilize the
disks) during the prime generation; this gives the random number
generator a better chance to gain enough entropy.
gpg: key 77659F3E marked as ultimately trusted
public and secret key created and signed.

gpg: checking the trustdb
gpg: 3 marginal(s) needed, 1 complete(s) needed, PGP trust model
gpg: depth: 0  valid:   7  signed:  21  trust: 0-, 0q, 0n, 0m, 0f, 7u
gpg: depth: 1  valid:  21  signed:  30  trust: 21-, 0q, 0n, 0m, 0f, 0u
gpg: next trustdb check due at 2014-08-11
pub   4096R/77659F3E 2014-05-27 [expires: 2014-08-25]
      Key fingerprint = 8D0B B43D 5F97 6AC0 66FF  1DEF DC5B 4FF1 7765 9F3E
uid                  Demo Key (Demo) <demo@localhost>
sub   4096R/A77F0BAA 2014-05-27 [expires: 2014-08-25]
```

GPG
Key generation

`gpg --gen-key`

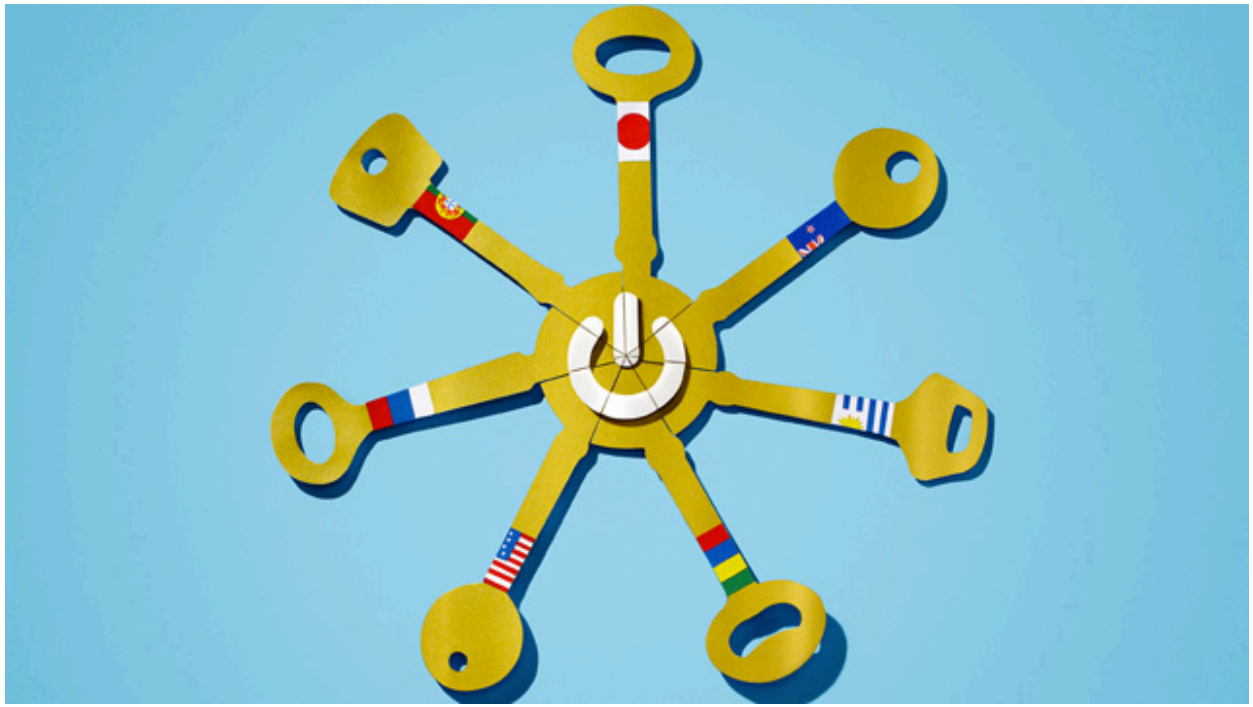
- Kind of Key
- Keylenght
- Expiration Period

GPG – Key signing

```
gpg --sign-key -u <your ID> <his id>
```

```
pub  4096R/77659F3E  created: 2014-05-27  expires: 2014-08-25  usage: SC
                     trust: ultimate      validity: ultimate
sub  4096R/A77F0BAA  created: 2014-05-27  expires: 2014-08-25  usage: E
[ultimate] (1). Demo Key (Demo) <demo@localhost>


pub  4096R/77659F3E  created: 2014-05-27  expires: 2014-08-25  usage: SC
                     trust: ultimate      validity: ultimate
 Primary key fingerprint: 8D0B B43D 5F97 6AC0 66FF  1DEF DC5B 4FF1 7765 9F3E

     Demo Key (Demo) <demo@localhost>

This key is due to expire on 2014-08-25.
Are you sure that you want to sign this key with your
key "David Durvaux <david.durvaux@belnet.be>" (E84A32A0)

Really sign? (y/N) y

You need a passphrase to unlock the secret key for
user: "David Durvaux <david.durvaux@belnet.be>"
8192-bit RSA key, ID E84A32A0, created 2010-12-04
```

GPG – Let's do it!



Let's do a key party!

GPG – Sending key

```
gpg --send-keys <key id>
```

GPG - Integration

- Enigmail (Thunderbird)
- GPGMail (Apple Mail)
- Symantec PGP
- …

Other nice user tools

- TrueCrypt
- KeePass

The Conclusion.

The Feavour works up towards Madness, and will ſcarcely endure to be touch'd. And what hope is there of Health when the *Patient* ſtrikes in with the Diſeaſe, and flies in the Face of the *Remedy*? Can Religion retrive us? Yes, when we don't deſpiſe it. But while our *Notions* are naught, our *Lives* will hardly be otherwiſe. What can the *Aſſiſtance* of the Church ſignify to thoſe *who* are more

Conclusion

Futur / Idea

- Configuration Generator (online)
- Other tools
- Other protocols

Current state as of 2014/05/31

- ✓ Solid basis with Variant (A) and (B)
- ✓ Public draft was presented at the CCC
- Section „cipher suites“ still a bit messy, needs more work
- Need to convert to HTML

How to participate

- We need: cryptologists, sysadmins, hackers
- Read the document, find bugs
- Subscribe to the mailing list
- Understand the cipher strings Variant (A) and (B) before proposing some changes
- If you add content to a subsection, make a sample config with variant (B)
- Git repo is world-readable
- We need:
  - Add content to an subsection from the TODO list
    → send us diffs
  - **Reviewers!**

Thanks you!

- BetterCrypto.org
- https://git.bettercrypto.org/ach-master.git
- http://lists.cert.at/cgi-bin/mailman/listinfo/ach

- Contact
  - aaron@XXX.org — [TWITTER]
  - david@autopsit.org — @ddurvaux