CERT.be

M3AAWG
MESSAGING MALWARE MOBILE

BetterCrypto · org

Applied Crypto Hardening

David Durvaux

Brussels, 12th June 2014

Why better crypto?

The NSA

The only part of government that actually listens.

But of course...

- It is not only the NSA, who intercepts
- Other nations now have a blueprint (thanks to Snowden) in case they did not have the technical skills yet
- Criminals now have a blueprint,...
- Everyone has!
- So, what can we do?

Don’t give them anything for free

It’s your home, your fight!

Who (authors of bettercrypto)

Wolfgang Breyha (uni VIE),
David Durvaux (CERT.be),
Tobias Dussa (KIT-CERT),
L. Aaron Kaplan (CERT.at),
Florian Mendel (IAIK/A-Sit)
Christian Mock (coretec),
Daniel Kovacic (A-Trust),
Manuel Koschuch (FH Campus Wien),
Adi Kriegisch (VRVis),
Ramin Sabet (A-Trust),
Aaron Zauner (azet.org),
Pepi Zawodsky (maclemon.at),

And many other contributors!!

Agenda

- Introduction to BetterCrypto project
- Practical Settings
- Testing
- Conclusion

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

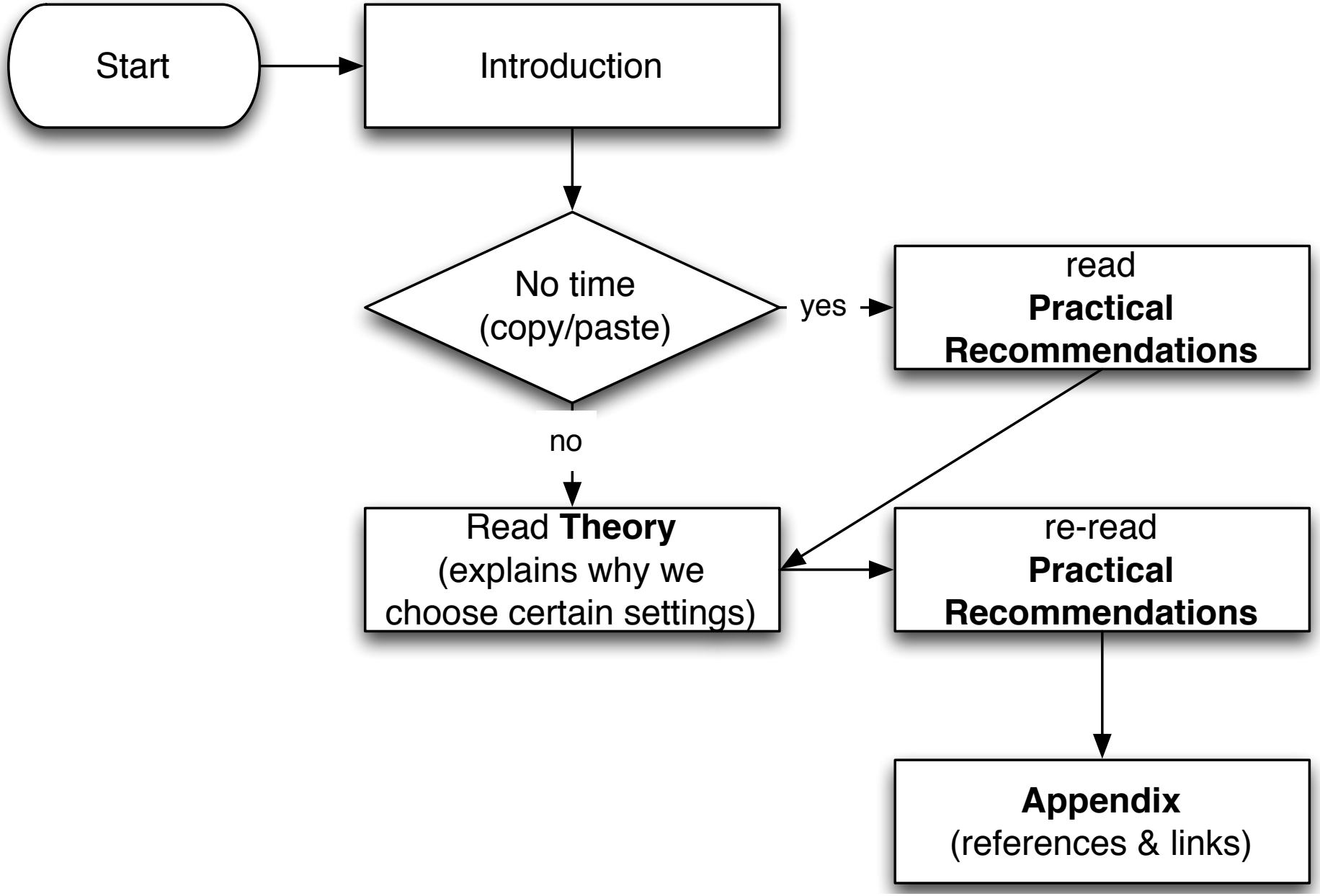
In brief

- Community effort to produce best common practices for typical servers
- Continuous effort
- From diverse areas of expertise: sysadmins, cryptologists, developers, IT security pros
- Open Source (CC-BY-SA)
- 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 the bettercrypto guide?



BetterCrypto CipherSuite

- 2 cipher suites
  - version A
    - stronger
    - fewer supported clients
  - 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 preferably 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
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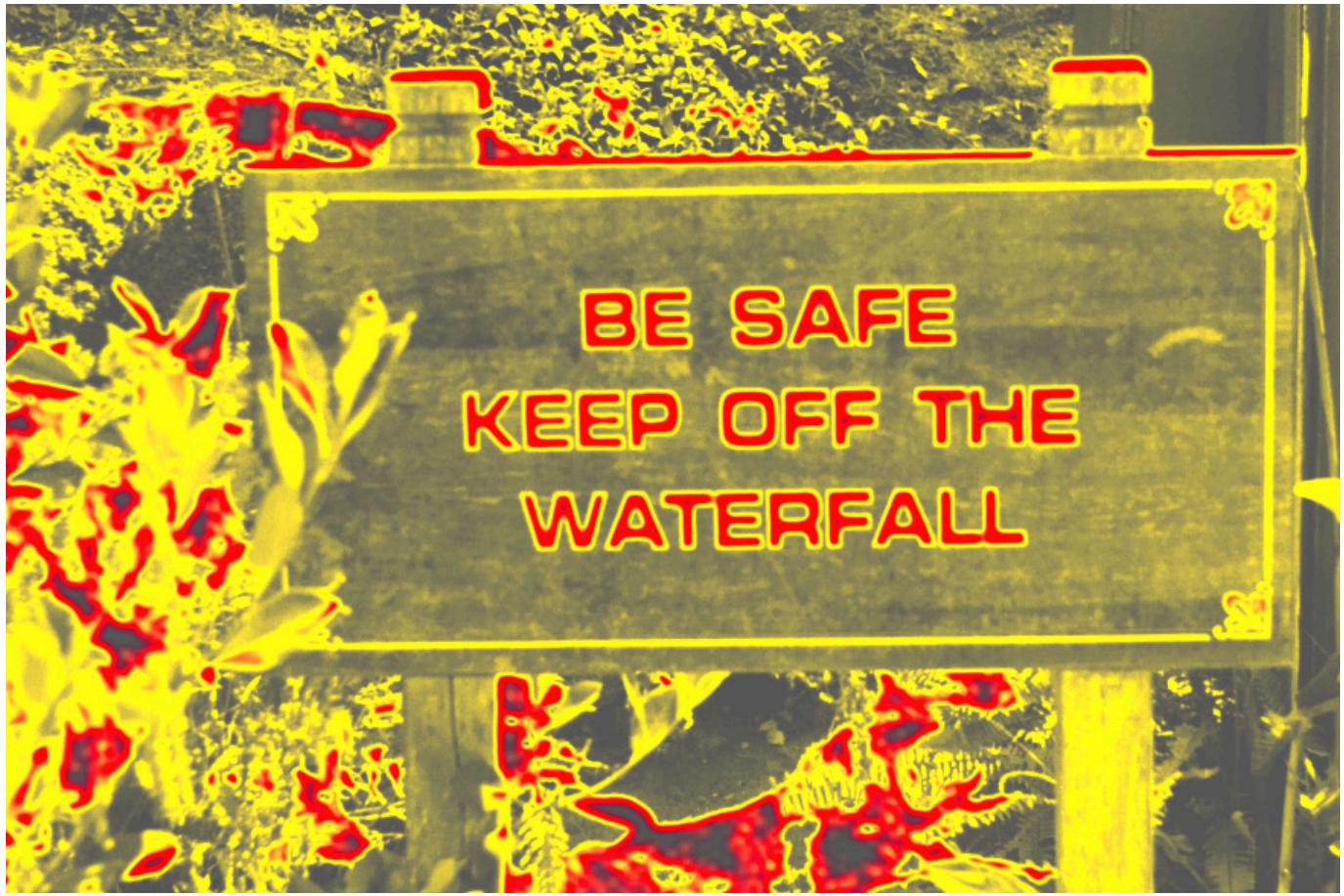
OpenSSL 0.9.8y	TLS 1.0	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x39) FS	256
OpenSSL 1.0.1e	TLS 1.2	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030) FS	256
Opera 17 / Win 7	TLS 1.2	TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 (0x6b) FS	256
Safari 5.1.9 / OS X 10.6.8	TLS 1.0	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014) 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

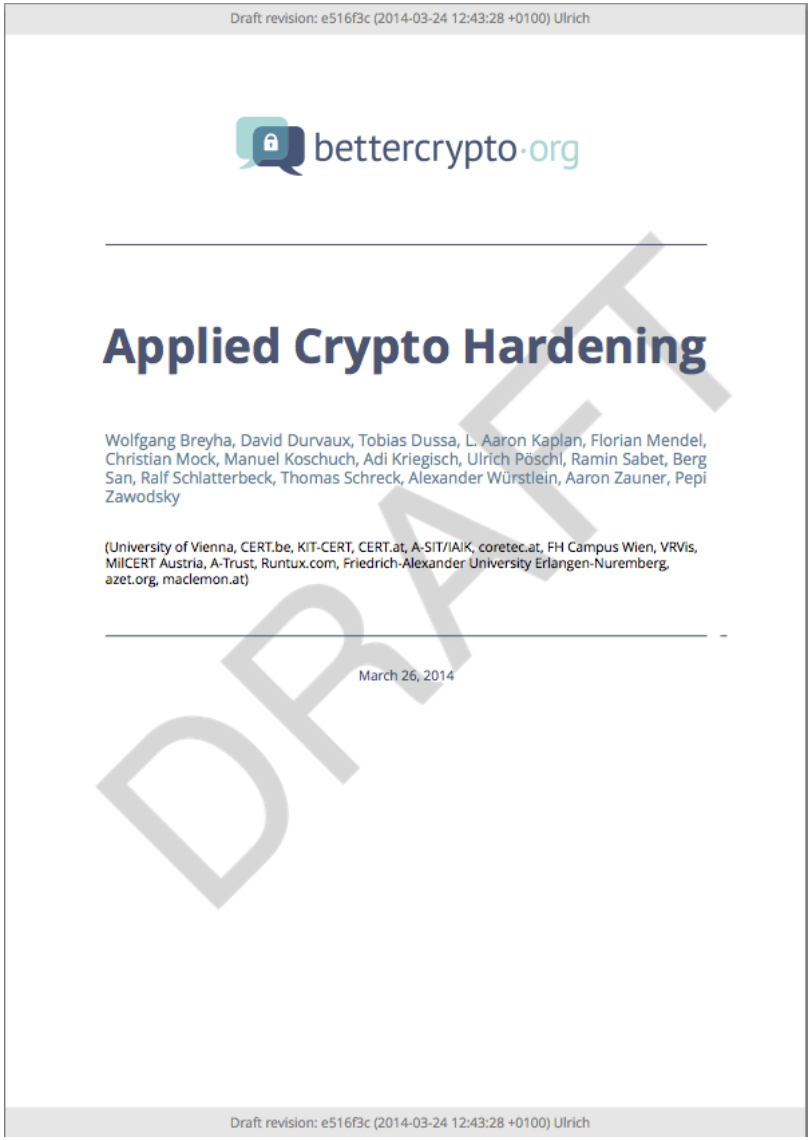


Practical Settings

Tools covered

- Web servers
- SSH
- Mail Servers
- VPNP
- GP/GPG
- IPMI/ILO
- Instant Messaging
- RDBMS
- Proxy
- Kerberos
- …

Let's have a look



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

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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

Mail Encryption

- GPG / PGP – end to end protection
  - Use public / private crypto to protect your emails
  - Chain of trust
  - Independent of the mail client / transport layer
  - Can be used to verify author and/or protect content
- STARTTLS for SMTP – in transit

Mail Server

- SMTP make use of opportunistic TLS
- 3 modes for mailservers
  - Mail Submission Agent (MSA)
  - Receiving Mail Transmission Agent (MX)
  - Sending Mail Transmission Agent (SMTP client)

Mail Server

- Correct DNS configuration without CNAMEs
- Enable encryption
- NO self-signed certificates

SMTP client mode

- Hostname used as HELO must match the PTR RR
- Setup a client certificate
- Common name or alternate subject name must match the PTR RR
- Don‘t touch cipher suite

MSA

- Listen on port 587
- Enforce SMTP AUTH
- No SMTP AUTH on unencrypted connections
- (use recommended cipher suites)

Postfix: MX & SMTP client

- In main.cf
  - Enable opportunistic TLS

```
# TLS parameters
smtpd_tls_cert_file=/etc/ssl/certs/ssl-cert-snakeoil.pem
smtpd_tls_key_file=/etc/ssl/private/ssl-cert-snakeoil.key
# use 0 for Postfix >= 2.9, and 1 for earlier versions
smtpd_tls_loglevel = 0
# enable opportunistic TLS support in the SMTP server and client
smtpd_tls_security_level = may
smtp_tls_security_level = may
smtp_tls_loglevel = 1
# if you have authentication enabled, only offer it after STARTTLS
smtpd_tls_auth_only = yes
tls_ssl_options = NO_COMPRESSION
```

Postfix: MSA

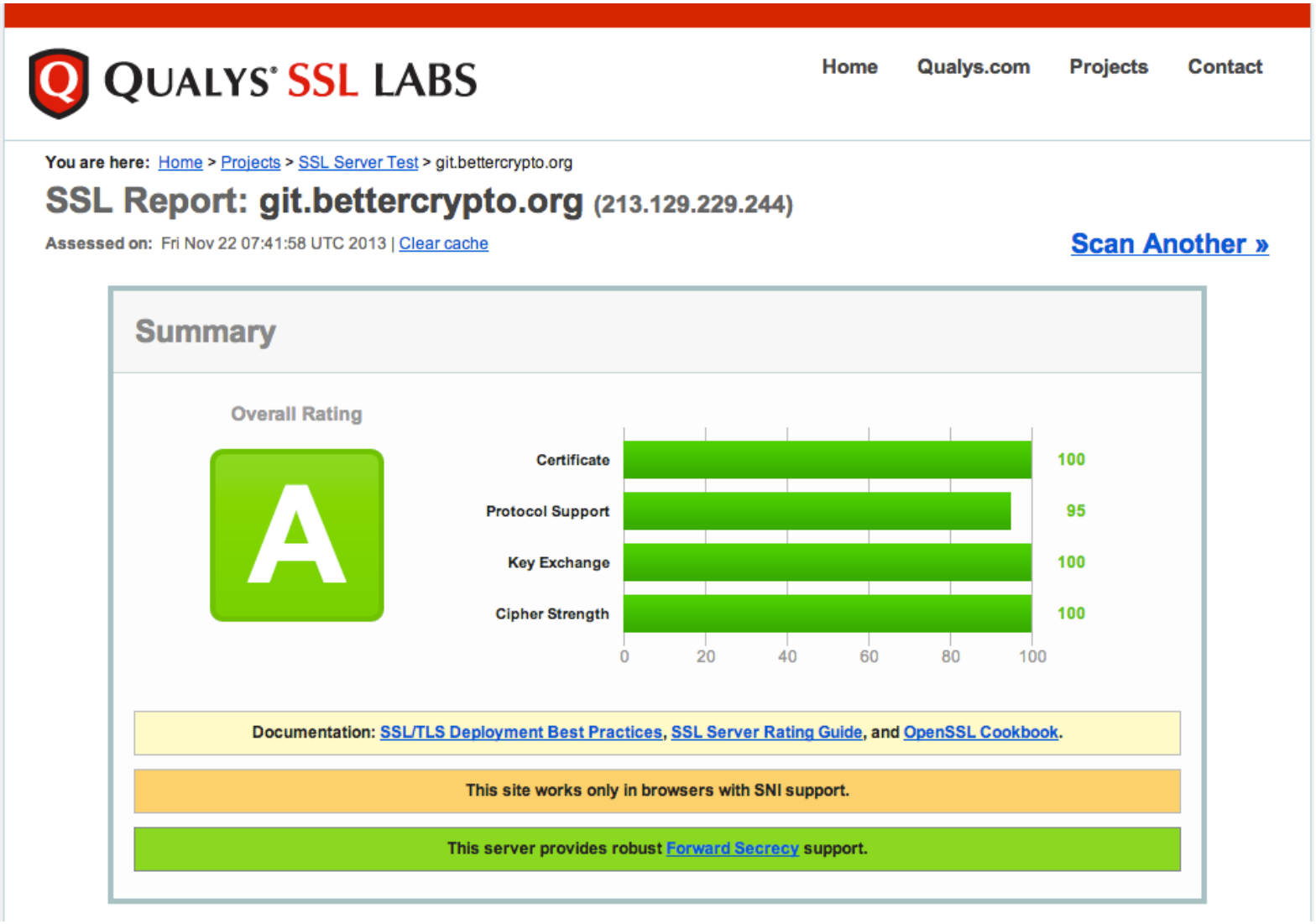
- Define ciper suite:

```
smtpd_tls_mandatory_protocols = !SSLv2, !SSLv3
smtpd_tls_mandatory_ciphers=high
tls_high_cipherlist=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
```

- Configure MSA SMTP:

```
submission inet n - - - - smtpd
  -o smtpd_tls_security_level=encrypt
  -o tls_preempt_cipherlist=yes
```

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

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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

Future ideas

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

Current state as of 2014/05/31

- ✓ Solid basis with Variant (A) and (B)
- ✓ Public draft was widely presented at the CCC, RIPE meeting, IETF Strint workshop, Linuxdays, ..., M3AAWG
- 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!**

Thank you!

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

- Contact
  - david@autopsit.org — @ddurvaux