APPSEC EUROPE

Calm down, HTTPS is not a VPN!

(but also a VPN gives you less privacy as you probably thought)

Dirk Wetter

@drwetter

about:me

- Independent security consultant
  - ~20 yrs profession
  - Security since the beginning
    - Strong networking / Unix background
    - Consulting since 2003
  - Privacy: important to me
  - Hobbies
    - OWASP
      - AppSec Research 2013
    - testssl.sh

whatis:allabout

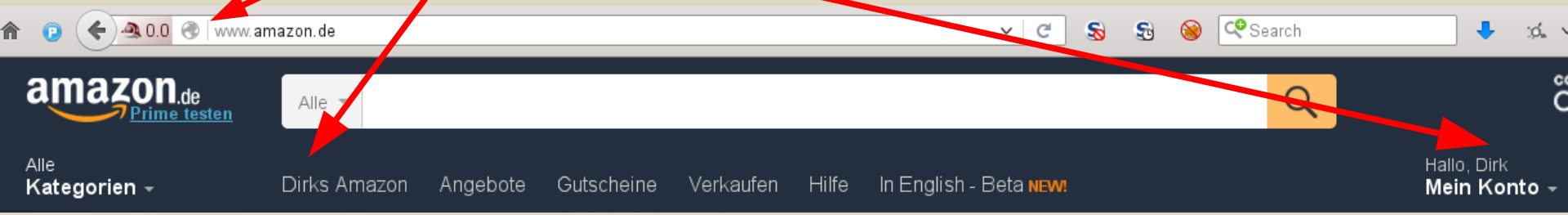
- **Motivation**
  - Over reaction privacy + SSL
    - Not talking about security = C I A
  - Clean up fundamental misconception
    - Different angles to look from

nottalking:about

Troy Hunt 2011 @ https://www.troyhunt.com/ssl-is-not-about-encryption/

nottalking:about

WTH?



WTH?

nottalking:about

mesg.ebay.de/mesgweb/ViewMessages/0

Hallo | eBay Plus | WOW! Angebote | Verkaufen | Hilfe ZUM JUBELSOMMER-SHOP > Mein eBay

ebay Stöbern in Kategorien Finden... Alle Kategorien Finde

Mein eBay: Nachrichten

Aktivität | Nachrichten (4) | Konto Teilen Sie uns Ihre Meinung mit

Posteingang

- Alle Nachrichten (4)
- Von Mitgliedern
- Von eBay (4)
- ! Hohe Priorität

Gesendet

Papierkorb

Archiv

Ordner

- Mein Ordne..
- Ordner hinzufügen+

Weitere Optionen

Nachrichten speichern
Mitglied finden und kontaktieren

Posteingang: Alle Nachrichten

Finden Posteingang: Al

Alle | Ungelesen | Gekennzeichnet

Löschen | Archivieren | Markieren als | Verschieben nach

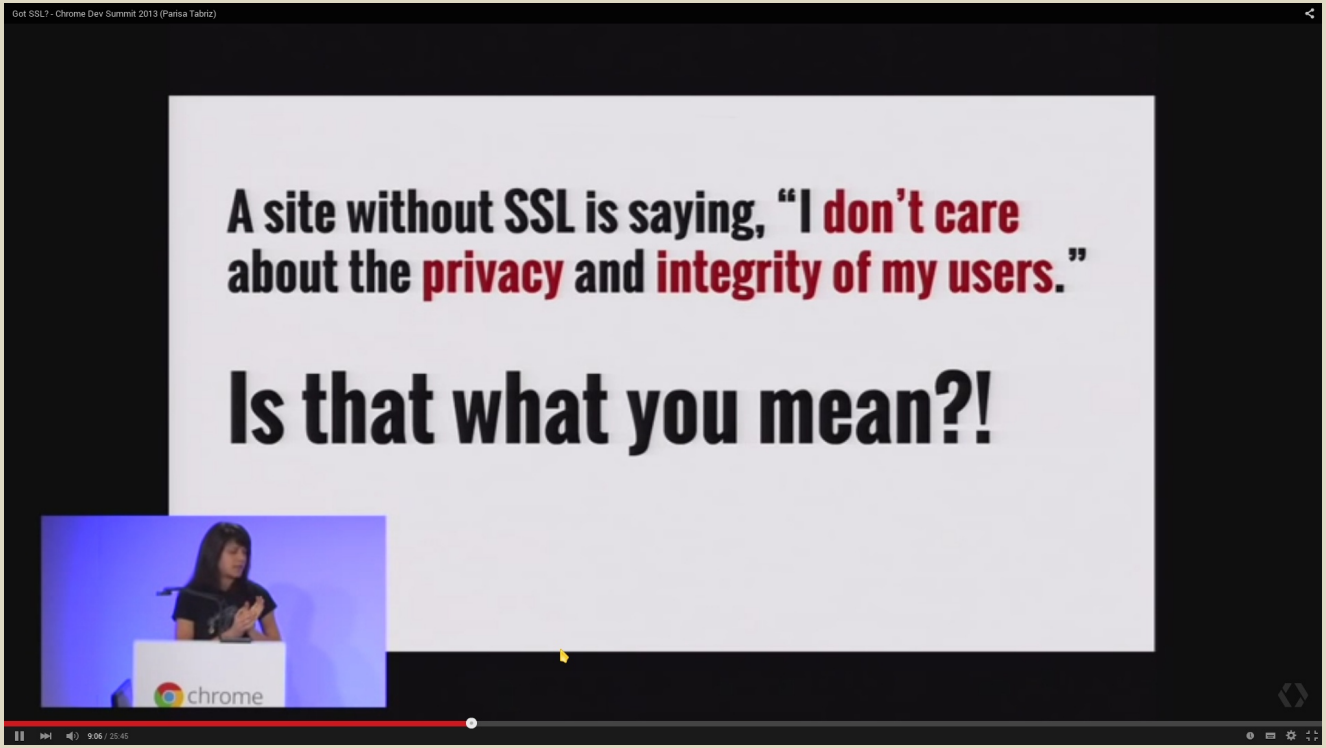
Von	Betreff	Angebot endet a
eBay	Hier finden Sie die Angaben des Verkäufers zum Widerrufsrecht Transparent '	--
eBay	Sie haben eine Rückerstattung erhalten für:	
eBay	Sie haben eine Nachricht:	
eBay	Rückgabe gestartet:	
eBay	Sie haben Ihre persönlichen Daten aktualisiert	--
eBay	Helfen Sie uns, Ihr eBay-Konto zu schützen	--

(Personally taken)

talking:about

- HTTPS
  - 2013: Google @ Chrome Dev Summit

(later revised)



Got SSL? - Chrome Dev Summit 2013 (Parisa Tabriz) https://www.youtube.com/watch?v=sJ8EX61fFWQ

talking:about

- HTTPS
  - 2013: Google @ Chrome Dev Summit
  - 8/2014: Google's power

Google | Webmaster Central Blog

HTTPS as a ranking signal

For these reasons, over the past few months we've been running tests taking into account whether sites use secure, encrypted connections as a signal in our search ranking algorithms. We've seen positive results, so we're starting to use HTTPS as a ranking signal. For now it's only a very lightweight signal — affecting fewer than 1% of global queries, and carrying less weight than other signals such as high-quality content — while we give webmasters time to switch to HTTPS. But over time, we may decide to strengthen it, because we'd like to encourage all website owners to switch from HTTP to HTTPS to keep everyone safe on the web.

Safe? From what??

http://googlewebmastercentral.blogspot.com.au/2014/08/https-as-ranking-signal.html

talking:about

- HTTPS
  - 2013: Google @ Chrome Dev Summit
  - 8/2014: Google's power
  - 6/2015: „HTTPS everywhere for IETF“

https://www.chromium.org/Home/chromium-security/marking-http-as-non-secure

talking:about

- “The IETF has recognised that the act of accessing public information required for routine tasks can be privacy sensitive and can benefit from using a *confidentiality* service, such as is provided by TLS. [BCP188] The IETF in its normal operation publishes a significant volume of public data (such as Internet-drafts), **to which this argument applies**.”

https://trac.tools.ietf.org/group/iesg/trac/wiki/HttpsEverywhere

- „HTTPS everywhere for IETF“

Roy Fielding: *Browsers don't send singular messages containing anonymous information. They send a complex sequence of messages to multiple parties with an interaction pattern and communication state.*

Tony Hain: *While I don't object to making the IETF content available via https/tls, this proposed statement reads as political knee-jerk BS that is both unnecessary and uncalled for. What the statement MUST focus on is 'data integrity', and SHOULD NOT stop to fear mongering over 'privacy'. "It is public data ..."*

networking lesson:one

OSI LAYERS	EXAMPLE PROTOCOLS
APPLICATION LAYER	HTTP, FTP, IRC, SSH, DNS
PRESENTATION LAYER	SSL, FTP, IMAP, SSH
SESSION LAYER	VARIOUS API'S, SOCKETS
TRANSPORT LAYER	TCP, UDP, ECN, SCTP, DCCP
NETWORK LAYER	IP, IPSec, ICMP, IGMP
DATA-LINK LAYER	Ethernet, SLIP, PPP, FDDI
PHYSICAL LAYER	Coax, Fiber, Wireless

```
▶ Internet Protocol Version 4, Src: [redacted]  IP  [redacted], Dst: 81.169.199.25 (81.169.199.25)
▶ Transmission Control Protocol, Src Port: 57221  TCP  L), Dst Port: 443 (443), Seq: 1, Ack: 1, Len: 184
▼ Secure Sockets Layer  SSL
  ▼ TLSv1.2 Record Layer: Handshake Protocol: Client Hello
      Content Type: Handshake (22)
      Version: TLS 1.0 (0x0301)
      Length: 179
    ▼ Handshake Protocol: Client Hello
        Handshake Type: Client Hello (1)
        Length: 175
        Version: TLS 1.2 (0x0303)
      ▶ Random
        Session ID Length: 0
        Cipher Suites Length: 18
      ▶ Cipher Suites (9 suites)
        Compression Methods Length: 1
      ▶ Compression Methods (1 method)
        Extensions Length: 116
      ▼ Extension: server_name
          Type: server_name (0x0000)
          Length: 15
        ▼ Server Name Indication extension
            Server Name list length: 13
            Server Name Type: host_name (0)
            Server Name length: 10
            Server Name: testssl.sh
      ▶ Extension: Unknown 23
      ▶ Extension: renegotiation_info
      ▶ Extension: elliptic_curves
      ▶ Extension: ec_point_formats
```

ClientHello
(taken at router)

4	22:18:50.817630	[redacted]	81.169.199.25	TLSv1.2	250 Client Hello
6	22:18:50.892125	81.169.199.25	[redacted]	TLSv1.2	1506 Server Hello
10	22:18:50.894294	81.169.199.25	[redacted]	TLSv1.2	1506 Certificate
12	22:18:50.895294	81.169.199.25	[redacted]	TLSv1.2	1443 Certificate Sta
14	22:18:50.915821	[redacted]	81.169.199.25	TLSv1.2	296 Client Key Exch

```
▸ Frame 10: 1506 bytes on wire (12048 bits), 1506 bytes captured (12048 bits)
▸ Ethernet II, Src: [redacted] ([redacted]), Dst: [redacted]
▸ Internet Protocol Version 4, Src: 81.169.199.25 (81.169.199.25), [redacted]
▸ Transmission Control Protocol, Src Port: 443 (443), Dst Port: 57221 (57221), Seq: 2881, Ack: 185, Len: 1440
▸ [3 Reassembled TCP Segments (3110 bytes): #6(1353), #8(1440), #10(317)]
▾ Secure Sockets Layer
  ▾ TLSv1.2 Record Layer: Handshake Protocol: Certificate
      Content Type: Handshake (22)
      Version: TLS 1.2 (0x0303)
      Length: 3105
    ▾ Handshake Protocol: Certificate
        Handshake Type: Certificate (11)
        Length: 3101
        Certificates Length: 3098
      ▾ Certificates (3098 bytes)
          Certificate Length: 1579
        ▸ Certificate (id-at-commonName=testssl.sh)
          Certificate Length: 1513
        ▸ Certificate (id-at-commonName=StartCom Class 1 DV Server CA,id-at-organizationalUnitName=StartCom
```

ServerHello / Certificate
(taken at router)

browser:other requests

- **Not the first obvious request**
  - DNS (clear text)

Source	Destination	Protocol	Length	Info
		DNS	70	Standard query 0x36db A testssl.sh
		DNS	221	Standard query response 0x36db A 81.169.199.25
		DNS	70	Standard query 0xc37d AAAA testssl.sh
		DNS	121	Standard query response 0xc37d

  - 3rd party involvement!

browser:TLS layer

- Not the first obvious request
  - DNS
  - OCSP (if not stapled)

```
http://ocsp.godaddy.com/

POST / HTTP/1.1
Host: ocsp.godaddy.com
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:47.0) [..]
Accept: text/html,application/xhtml+xml,application/xml [..]
Accept-Language: en-US,en
Accept-Encoding: gzip, deflate
Content-Length: 75
Content-Type: application/ocsp-request
Connection: keep-alive

<DER encoded OCSPRequest>
```

browser:TLS layer

- Not the first obvious request
  - DNS
  - OCSP (if not stapled)
    - 3rd party involvement!
    - RFC 6960
      - 4.1.1. ASN.1 Specification of the OCSP Request

```
CertID  ::=  SEQUENCE {
   hashAlgorithm        AlgorithmIdentifier,
   issuerNameHash       OCTET STRING, -- Hash of issuer's DN
   issuerKeyHash        OCTET STRING, -- Hash of issuer's public key
   serialNumber         CertificateSerialNumber }
```

browser:TLS layer

ClientHellos
(sniffed from router)

Firefox

```
▾ Handshake Protocol: Client Hello
    Handshake Type: Client Hello (1)
    Length: 185
    Version: TLS 1.2 (0x0303)
  ▸ Random
    Session ID Length: 0
    Cipher Suites Length: 26
  ▸ Cipher Suites (13 suites)
    Compression Methods Length: 1
  ▸ Compression Methods (1 method)
    Extensions Length: 118
  ▸ Extension: server_name
  ▸ Extension: Unknown 23
  ▸ Extension: renegotiation_info
  ▸ Extension: elliptic_curves
  ▸ Extension: ec_point_formats
  ▸ Extension: SessionTicket TLS
  ▸ Extension: next_protocol_negotiation
  ▸ Extension: Application Layer Protocol Ne
  ▸ Extension: status_request
  ▸ Extension: signature_algorithms
```

Chrome

```
▾ Handshake Protocol: Client Hello
    Handshake Type: Client Hello (1)
    Length: 192
    Version: TLS 1.2 (0x0303)
  ▸ Random
    Session ID Length: 0
    Cipher Suites Length: 34
  ▸ Cipher Suites (17 suites)
    Compression Methods Length: 1
  ▸ Compression Methods (1 method)
    Extensions Length: 117
  ▸ Extension: renegotiation_info
  ▸ Extension: server_name
  ▸ Extension: Unknown 23
  ▸ Extension: SessionTicket TLS
  ▸ Extension: signature_algorithms
  ▸ Extension: status_request
  ▸ Extension: signed_certificate_timestamp
  ▸ Extension: Application Layer Protocol Negotiatio
  ▸ Extension: Unknown 30032
  ▸ Extension: ec_point_formats
  ▸ Extension: elliptic_curves
  ▸ Extension: Unknown 24
```

browser:TLS layer

ClientHellos
(sniffed from router)

Chrome 51

```
Cipher Suites (17 suites)
  Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (0xc02b)
  Cipher Suite: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (0xc02f)
  Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 (0xc02c)
  Cipher Suite: TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030)
  Cipher Suite: Unknown (0xcca9)
  Cipher Suite: Unknown (0xcca8)
  TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256 (0xcc14)
  TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256 (0xcc13)
  TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA (0xc009)
  TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA (0xc013)
  TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA (0xc00a)
  TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014)
  TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)
  TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)
  TLS_RSA_WITH_AES_128_CBC_SHA (0x002f)
  TLS_RSA_WITH_AES_256_CBC_SHA (0x0035)
  TLS_RSA_WITH_3DES_EDE_CBC_SHA (0x000a)
```

Firefox 47

```
Cipher Suites (13 suites)
  Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (0xc02b)
  Cipher Suite: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (0xc02f)
  Cipher Suite: Unknown (0xcca9)
  Cipher Suite: Unknown (0xcca8)
  Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA (0xc00a)
  Cipher Suite: TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA (0xc009)
  Cipher Suite: TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA (0xc013)
  Cipher Suite: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014)
  Cipher Suite: TLS_DHE_RSA_WITH_AES_128_CBC_SHA (0x0033)
  Cipher Suite: TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x0039)
  Cipher Suite: TLS_RSA_WITH_AES_128_CBC_SHA (0x002f)
  Cipher Suite: TLS_RSA_WITH_AES_256_CBC_SHA (0x0035)
  Cipher Suite: TLS_RSA_WITH_3DES_EDE_CBC_SHA (0x000a)
```

```
Extension: elliptic_curves
  Type: elliptic_curves (0x000a)
  Length: 8
  Elliptic Curves Length: 6
  Elliptic curves (3 curves)
    Elliptic curve: Unknown (0x001d)
    Elliptic curve: secp256r1 (0x0017)
    Elliptic curve: secp384r1 (0x0018)
```

```
Elliptic curves (3 curves)
  Elliptic curve: secp256r1 (0x0017)
  Elliptic curve: secp384r1 (0x0018)
  Elliptic curve: secp521r1 (0x0019)
```

browser:TLS layer

- **Browser TLS fingerprinting on the wire**
  - SSLlabs Client API (mod_sslhaf)
    https://api.dev.ssllabs.com/api/v3/getClients
  - 

    github.com/LeeBrotherston/tls-fingerprinting/

    https://blog.squarelemon.com/tls-fingerprinting/
    - Some fun:

```
prompt~:$ tls-fingerprinting/fingerprintls./fingerprintls -i <NW IF>
```

browser:TLS layer

- **Browser TLS fingerprinting on the wire**
  - Time skew (past, kind of….)

```
▾ Handshake Protocol: Client Hello
    Handshake Type: Client Hello (1)
    Length: 170
    Version: TLS 1.2 (0x0303)
  ▾ Random
      GMT Unix Time: Jun 26, 2016 15:22:24.000000000 CEST
      Random Bytes: 90f7cbf829e58feff7c534656155a7507db13e39543164db...
    Session ID Length: 0
    Cipher Suites Length: 52
  ▸ Cipher Suites (26 suites)
```

gmt_unix_time [ms]

```
▼ Random
    gmt_unix_time: Sep 12, 2089 03:04:57.000000000 CEST
    random_bytes: 5dd1e62fa2d5340e8384a06fb2dbef076ba0966cc34589c7...
```

server:URL

- At the console

✓	Method	File	Domain	Type	Transferred	Size	0 ms / 1.28 s / 2.56 s / 3.84 s
			github.com		14.89 KB		→ 672 ms
			assets-cdn.github.com		44.41 KB		→ 251 ms
			assets-cdn.github.com		58.03 KB		→ 331 ms
			assets-cdn.github.com		73.31 KB		→ 505 ms
			assets-cdn.github.com		115.79 KB		→ 632 ms
			avatars1.githubusercont...		1.55 KB		→ 465 ms
			assets-cdn.github.com		2.26 KB		→ 458 ms
			camo.githubusercontent...		0.65 KB		→ 308 ms
			github.com		0.17 KB		→ 177 ms
			collector-cdn.github.com		2.82 KB		→ 134 ms
			assets-cdn.github.com		3.94 KB		→ 62 ms
			github.com		0.08 KB		→ 315 ms
			live.github.com		—		→ 414 ms
			collector.githubapp.com		0.03 KB		→ 424 ms
			api.github.com		0 0.03 KB		→

?

No.	Time	Source	Protocol	tcp.len	Info
9	0.488264	192.30.252.128	TLSv1	1424	Server Hello
11	0.488600	192.30.252.128	TCP	1424	[TCP segment of a reassembled PDU]
13	0.488963	192.30.252.128	TLSv1	740	Certificate
16	0.685187	192.30.252.128	TLSv1	1424	Server Hello
18	0.686210	192.30.252.128	TCP	1424	[TCP segment of a reassembled PDU]
20	0.686343	192.30.252.128	TLSv1	740	Certificate
22	0.686688	192.30.252.128	TLSv1	59	Change Cipher Spec, Encrypted Handshake Message
25	0.824495	192.30.252.128	TLSv1	59	Change Cipher Spec, Encrypted Handshake Message
26	0.829847	192.30.252.128	TCP	0	https→57893 [ACK] Seq=3648 Ack=699 Win=18 Len=0 TSval=1703186353 TSec
28	0.903982	192.30.252.128	TLSv1	1397	Application Data
29	0.905035	192.30.252.128	TLSv1	1093	Application Data
31	0.906372	192.30.252.128	TLSv1	1397	Application Data
32	0.907511	192.30.252.128	TLSv1	1397	Application Data
34	0.908545	192.30.252.128	TLSv1	1397	Application Data
35	0.909799	192.30.252.128	TLSv1	1397	Application Data
37	0.910736	192.30.252.128	TLSv1	1397	Application Data
38	0.912703	192.30.252.128	TLSv1	1397	Application Data
40	0.913213	192.30.252.128	TLSv1	1397	Application Data
41	0.914432	192.30.252.128	TLSv1	1397	Application Data
43	1.037719	192.30.252.128	TLSv1	1424	Application Data
44	1.039844	192.30.252.128	TLSv1	1424	Application Data
46	1.040534	192.30.252.128	TLSv1	1424	Application Data
47	1.040750	192.30.252.128	TLSv1	1424	Application Data
49	1.040959	192.30.252.128	TLSv1	617	Application Data
64	1.205252	151.101.12.133	TLSv1	1404	Server Hello
66	1.206187	151.101.12.133	TLSv1	1404	Certificate
68	1.206278	151.101.12.133	TLSv1	289	Server Key Exchange
70	1.208046	151.101.12.133	TLSv1	1404	Server Hello
72	1.208751	151.101.12.133	TLSv1	1404	Certificate
74	1.209500	151.101.12.133	TLSv1	289	Server Key Exchange
77	1.210589	151.101.12.133	TLSv1	1404	Server Hello
79	1.211100	151.101.12.133	TLSv1	1404	Certificate
81	1.211443	151.101.12.133	TLSv1	289	Server Key Exchange
87	1.248198	151.101.12.133	TLSv1	266	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
89	1.280657	151.101.12.133	TLSv1	266	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
90	1.280890	151.101.12.133	TLSv1	1404	Server Hello
93	1.281183	151.101.12.133	TLSv1	1404	Certificate
95	1.281635	151.101.12.133	TLSv1	289	Server Key Exchange
97	1.291319	151.101.12.133	TCP	1404	[TCP segment of a reassembled PDU]
98	1.292950	151.101.12.133	TLSv1	1385	Application Data
100	1.294535	151.101.12.133	TCP	1404	[TCP segment of a reassembled PDU]
101	1.294851	151.101.12.133	TLSv1	1385	Application Data
103	1.295366	151.101.12.133	TCP	1404	[TCP segment of a reassembled PDU]
104	1.296902	151.101.12.133	TLSv1	1385	Application Data
106	1.297744	151.101.12.133	TCP	1404	[TCP segment of a reassembled PDU]
107	1.299285	151.101.12.133	TLSv1	1404	Application Data

github.com

github.com

assets-cdn.github.com

assets-cdn.github.com

assets-cdn.github.com

assets-cdn.github.com

Wireshark

No.	Time	Source	dport	Protocol	tcp.len	Info
9	0.488264	192.30.252.128	57893	TLSv1	1424	Server Hello
11	0.488600	192.30.252.128	57893	TCP	1424	[TCP segment of a reassembled PDU]
13	0.488963	192.30.252.128	57893	TLSv1	740	Certificate
16	0.685187	192.30.252.128	57894	TLSv1	1424	Server Hello
18	0.686210	192.30.252.128	57894	TCP	1424	[TCP segment of a reassembled PDU]
20	0.686343	192.30.252.128	57894	TLSv1	740	Certificate
22	0.686688	192.30.252.128	57893	TLSv1	59	Change Cipher Spec, Encrypted Handshake Message
25	0.824495	192.30.252.128	57894	TLSv1	59	Change Cipher Spec, Encrypted Handshake Message
28	0.903982	192.30.252.128	57893	TLSv1	1397	Application Data
29	0.905035	192.30.252.128	57893	TLSv1	1093	Application Data
31	0.906372	192.30.252.128	57893	TLSv1	1397	Application Data
32	0.907511	192.30.252.128	57893	TLSv1	1397	Application Data
34	0.908545	192.30.252.128	57893	TLSv1	1397	Application Data
35	0.909799	192.30.252.128	57893	TLSv1	1397	Application Data
37	0.910736	192.30.252.128	57893	TLSv1	1397	Application Data
38	0.912703	192.30.252.128	57893	TLSv1	1397	Application Data
40	0.913213	192.30.252.128	57893	TLSv1	1397	Application Data
41	0.914432	192.30.252.128	57893	TLSv1	1397	Application Data
43	1.037719	192.30.252.128	57893	TLSv1	1424	Application Data
44	1.039844	192.30.252.128	57893	TLSv1	1424	Application Data
46	1.040534	192.30.252.128	57893	TLSv1	1424	Application Data
47	1.040750	192.30.252.128	57893	TLSv1	1424	Application Data
49	1.040959	192.30.252.128	57893	TLSv1	617	Application Data
64	1.205252	151.101.12.133	41684	TLSv1	1404	Server Hello
66	1.206187	151.101.12.133	41684	TLSv1	1404	Certificate
68	1.206278	151.101.12.133	41684	TLSv1	289	Server Key Exchange
70	1.208046	151.101.12.133	41685	TLSv1	1404	Server Hello
72	1.208751	151.101.12.133	41685	TLSv1	1404	Certificate
74	1.209500	151.101.12.133	41685	TLSv1	289	Server Key Exchange
77	1.210589	151.101.12.133	41686	TLSv1	1404	Server Hello
79	1.211100	151.101.12.133	41686	TLSv1	1404	Certificate
81	1.211443	151.101.12.133	41686	TLSv1	289	Server Key Exchange
87	1.248198	151.101.12.133	41684	TLSv1	266	New Session Ticket, Change Cipher Spec, Encrypted Handshake
89	1.280657	151.101.12.133	41685	TLSv1	266	New Session Ticket, Change Cipher Spec, Encrypted Handshake
90	1.280890	151.101.12.133	41687	TLSv1	1404	Server Hello
93	1.281183	151.101.12.133	41687	TLSv1	1404	Certificate
95	1.281635	151.101.12.133	41687	TLSv1	289	Server Key Exchange
97	1.291319	151.101.12.133	41684	TCP	1404	[TCP segment of a reassembled PDU]
98	1.292950	151.101.12.133	41684	TLSv1	1385	Application Data
100	1.294535	151.101.12.133	41684	TCP	1404	[TCP segment of a reassembled PDU]
101	1.294851	151.101.12.133	41684	TLSv1	1385	Application Data
103	1.295366	151.101.12.133	41684	TCP	1404	[TCP segment of a reassembled PDU]
104	1.296902	151.101.12.133	41684	TLSv1	1385	Application Data
106	1.297744	151.101.12.133	41684	TCP	1404	[TCP segment of a reassembled PDU]
107	1.299285	151.101.12.133	41684	TLSv1	1404	Application Data

github.com

github.com

assets-cdn.github.com

assets-cdn.github.com

assets-cdn.github.com

Wireshark

server:URL

- Network difficult:
  - length not visible (MTU)
    - HTTP/ 1.1: pipelining
      - But: source port TCP
    - Keepalive
    - 304
  - SSL session ID / TLS session tickets

Wireshark

server:URL

- connection to 3rd parties

✓	Method	File	Domain	Type	Transferred	Size	0 ms / 1.28 s / 2.56 s / 3.84 s
200	GET	testssl.sh	github.com	html	14.89 KB	59.21 KB	→ 672 ms
200	GET	github-760a9497[illegible]f2883d6febd885...	assets-cdn.github.com	css	44.41 KB	183.18 KB	→ 251 ms
200	GET	github2-622bce26a47[illegible]c8a581fe1e...	assets-cdn.github.com	css	58.03 KB	252.20 KB	→ 331 ms
200	GET	frameworks-06e65f5639cc5[illegible]d1aaa...	assets-cdn.github.com	js	73.31 KB	201.44 KB	→ 505 ms
200	GET	github-ee4ac88329bd04835855a[illegible]	assets-cdn.github.com	js	115.79 KB	357.59 KB	→ 632 ms
200	GET	8036727?v=3&s=40	avatars1.githubusercont...	png	1.55 KB	2.07 KB	→ 465 ms
200	GET	octocat-spinner-32.gif	assets-cdn.github.com	gif	2.26 KB	3.01 KB	→ 458 ms
200	GET	68747470733a2f2f62616467657...	camo.githubusercontent...	svg	0.65 KB	0.65 KB	→ 308 ms
200	GET	show_partial?partial=tree/recently[illegible]	github.com	html	0.17 KB	0.22 KB	→ 177 ms
200	GET	api.js	collector-cdn.github.com	js	2.82 KB	7.80 KB	→ 134 ms
200	GET	ZeroClipboard.v2.1.6.swf	assets-cdn.github.com	x-sho...	3.94 KB	5.26 KB	→ 62 ms
200	GET	counts	github.com	json	0.08 KB	0.10 KB	→ 315 ms
101	GET	ODAzNjcyNzpkNDA2YmMxYzl5O...	live.github.com	plain	—	0 KB	→ 414 ms
200	GET	page_view?dimensions[page]=h...	collector.githubapp.com	gif	0.03 KB	0.05 KB	→ 424 ms
200	POST	stats	api.github.com	json	0 0.03 KB	0.00 KB	→ 5

browser:referer

https://www.owasp.org/index.php/Content_Security_Policy_Cheat_Sheet

Page Discussion

Content Security Policy Cheat Sheet

Content Security Policy (CSP) is an important standard by the W3C that is aimed to pr

References

Specifications of the CSP standard can be found the following locations:

- Latest Revision - https://w3c.github.io/webappsec/specs/content-security-policy/
- Latest Version (CSP2) - http://www.w3.org/TR/CSP2/
- CSP 1.0 - http://www.w3.org/TR/2012/CR-CSP-20121115/

RFC 2616

server:URL

- **Scary research**
  - WF = website fingerprinting!
  - (sometimes disputed)

server:URL

Privacy Vulnerabilities in Encrypted HTTP Streams

George Dean Bissias, Marc Liberatore, David Jensen, and Brian Neil Levine

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Abstract. Encrypting traffic does not prevent an attacker from performing some types of traffic analysis. We present a straightforward traffic analysis attack against encrypted HTTP streams that is surprisingly effective in identifying the source of the traffic. An attacker starts by creating a profile of the statistical characteristics of web requests from interesting sites, including distributions of packet sizes and inter-arrival times. Later, candidate encrypted streams are compared against these profiles. In our evaluations using real traffic, we find that many web sites are subject to this attack. With a training period of 24 hours and a 1 hour delay afterwards, the attack achieves only 23% accuracy. However, an attacker can easily pre-determine which of trained sites are easily identifiable. Accordingly, against 25 such sites, the attack achieves 40% accuracy;

server:URL

Touching from a Distance: Website Fingerprinting Attacks and Defenses

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ABSTRACT

We present a novel web page fingerprinting attack that is able to defeat several recently proposed defenses against traffic analysis attacks, including the application-level defenses HTTPOS [15] and randomized pipelining over Tor [18]. Regardless of the defense scheme, our attack was able to guess which of 100 web pages a victim was visiting at least 50% of the time and, with some defenses, over 90% of the time. Our attack is based on a simple model of network behavior and out-performs previously proposed ad hoc attacks. We then build a web *site* fingerprinting attack that is able to identify whether a victim is visiting a particular web site with over 90% accuracy in our experiments.

server:URL

I Know Why You Went to the Clinic: Risks and Realization of HTTPS Traffic Analysis

Brad Miller[1], Ling Huang[2], A. D. Joseph[1], and J. D. Tygar[1]

[1] UC Berkeley
[2] Intel Labs

Abstract. Revelations of large scale electronic surveillance and data mining by governments and corporations have fueled increased adoption of HTTPS. We present a traffic analysis attack against over 6000 webpages spanning the HTTPS deployments of 10 widely used, industry-leading websites in areas such as healthcare, finance, legal services and streaming video. Our attack identifies individual pages in the same website with 89% accuracy, exposing personal details including medical conditions, financial and legal affairs and sexual orientation. We examine

Lemmy: Motorhead Frontman Dead | TMZ.com - Mozilla Firefox

Lemmy: Motorhead Fro...

https://www.tmz.com/2015/12/28/

Search

TMZ NEWS SPORTS VIDEOS PHOTOS WATCH TMZ Sign In

Ghostery found 27 trackers
www.tmz.com

- ~~Amazon Associates~~ — Advertising, Affiliate Marketing
- ~~ChartBeat~~ — Analytics
- ~~Crazy Egg~~ — Analytics
- ~~Criteo~~ — Advertising, Search
- ~~Disqus~~ — Widgets, Commenting System, So...
- ~~DoubleClick~~ — Advertising

Pause Blocking | Whitelist Site | ?

Home ➡ Lemmy: Motorhead Frontman Dead

LEMMY MOTORHEAD FRONTMAN DE

12/28/2015 4:32 PM PST BY TMZ STAFF

Getty

- ~~Amazon Associates~~
- ~~ChartBeat~~
- ~~Crazy Egg~~
- ~~Criteo~~
- ~~Disqus~~
- ~~DoubleClick~~
- ~~Dynamic Yield~~
- ~~Facebook Connect~~
- ~~Facebook Social Graph~~
- ~~Google Analytics~~
- ~~Gravity Insights~~
- ~~Kaltura~~
- ~~Kixer~~
- ~~Krux Digital~~
- ~~NetRatings SiteCensus~~
- ~~Omniture (Adobe Analytics)~~
- ~~Optimizely~~
- ~~Outbrain~~
- ~~Pinterest~~
- ~~Quantcast~~
- ~~ScoreCard Research Beacon~~
- ~~ShareThis~~
- ~~Taboola~~
- ~~Tumblr Buttons~~
- ~~Twitter Badge~~
- ~~Twitter Button~~
- ~~ZergNet~~

V TMZ

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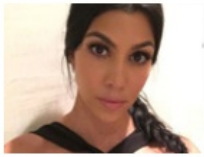
AROUND THE WEB

Gwen & Blake: Breaking Up Because Of No Pregnancy



Justin Bieber & Kourtney Kardashian Sleeping Together: Taking Relationship To Next Level?

Leo DiCaprio Parties HARD In St. Barts, HARD!

real:privacy killers

```
✖ Blocked loading mixed active content "http://w.sharethis.com/button/buttons.js" [Learn More]
✖ Blocked loading mixed active content "http://ll-assets.tmz.com/fonts/tmz/liberation-mono/regular.ttf" [Learn More]
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/woff/RobotoCondensed-Regular1.woff" [Learn More]
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/ttf/RobotoCondensed-Regular1.ttf" [Learn More]
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/woff/Roboto-Regular1.woff" [Learn More]
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/ttf/Roboto-Regular1.ttf" [Learn More]
✖ Blocked loading mixed active content "http://ll-assets.tmz.com/fonts/tmz/roboto-condensed/light.ttf" [Learn More]
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/white_f_facebook.svg" on a secure page [Learn More
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/white_tbird_twitter.svg" on a secure page [Learn M
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/white_comment_tmz.svg" on a secure page [Learn Mor
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/woff/SourceSansPro-Bold.otf.woff" [Learn More]
✖ Blocked loading mixed active content "http://tmz.vo.llnwd.net/o28/fonts/ttf/SourceSansPro-Bold.ttf" [Learn More]
✖ Blocked loading mixed active content "http://cdn.kixer.com/ad/load.js" [Learn More]
✖ Blocked loading mixed active content "http://www.zergnet.com/zerg.js?id=34754" [Learn More]
✖ Blocked loading mixed active content "http://cdn.api.twitter.com/1/urls/count.json?url=http%3A%2F%2Fwww.tmz.com%2F2015%2F12%2F28%2Flemmy-motorh
  _=1451412906818" [Learn More]
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/icon-facebook.svg" on a secure page [Learn More]
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/icon-twitter.svg" on a secure page [Learn More]
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/icon-youtube.svg" on a secure page [Learn More]
⚠ Loading mixed (insecure) display content "http://tmz.vo.llnwd.net/o28/assets/svg/social_2015/icon-instagram.svg" on a secure page [Learn More]
```

- **Statistics**
  - 249 GET requests (!) to 81 Hosts
  - 49 x Mixed content blocked
  - 15 x loaded

another:problem

- **Mixed Content**
  - State of the (small) disaster:

Fix: `about:config`
`security.mixed_content.block_display_content`

Mixed Content Handling

Mixed Content Tests

Images	Passive	Yes
CSS	Active	No
Scripts	Active	No
XMLHttpRequest	Active	No
WebSockets	Active	No
Frames	Active	No

(1) These tests might cause a mixed content warning in your browser. That's expected.
(2) If you see a failed test, try to reload the page. If the error persists, please get in touch.

Related Functionality

Upgrade Insecure Requests (more info)	No

another:problem

- **Mixed Content**
  - State of the (bigger) desasters:

Mixed Content Tests	Webkit @ Android 5.0.1		IE 11 + Y to question	Android 4.0.3 and FF < 23
Images	Passive	Yes	Yes	Yes
CSS	Active	No	Yes	Yes
Scripts	Active	No	Yes	Yes
XMLHttpRequest	Active	Yes	No	Yes
WebSockets	Active	Test failed	No	N/A
Frames	Active	No	No	Yes

take:aways

- **Bottom line**
  - **Content** is being ~protected via HTTPS
    - Metadata leackage: IP address, port, hostname!!
    - Client side:
      - Browser version (TLS fingerprinting)
    - Server side:
      - Trackers!
      - Website fingerprinting: URLs somewhat deducible

take:aways

- **Bottom line, calm-down-part**
  - Confidentiality of data: HTTPS right thing to do
    - + integrity
  - Also benefit in terms of privacy
  - But real privacy is something different
    - Client side:
      - Src IP: Use TOR or VPN (server side limits)
      - don't mess with browser settings
    - Server:
      - Don't use trackers
      - Proper away logs

other:protocols

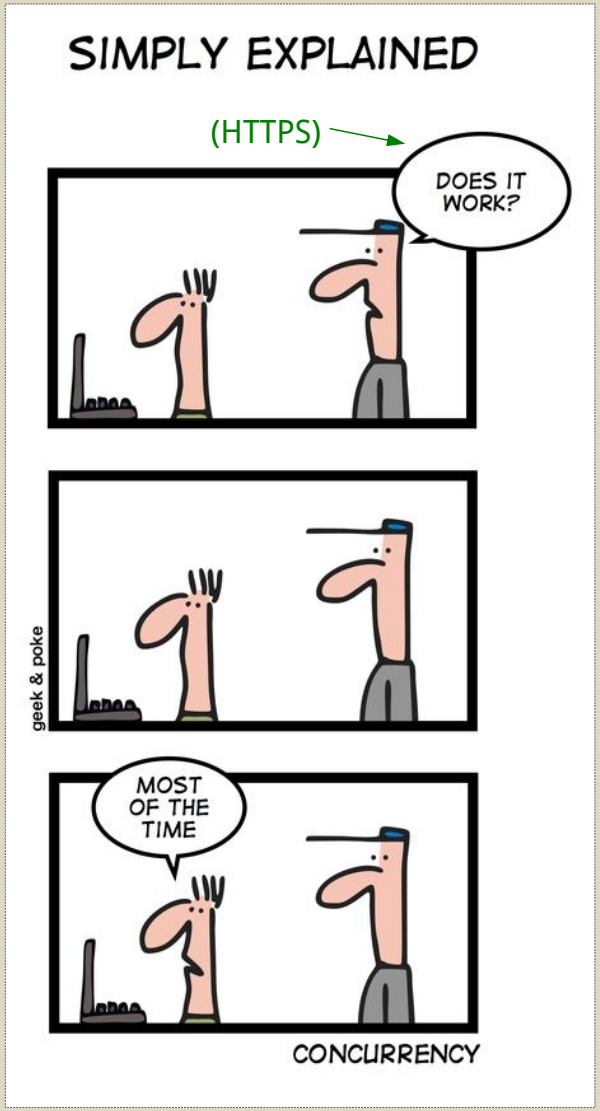
- **Usage HTTP+TLS:** not so bad!
  - SMTP+STARTTLS
    - ~60% encrypted, ½ of it (~30%) proper certificate validation
    - configured MTA as sender to hard fail?
  - IMAP/POP: (STARTTLS: 45-50%, *S: 54-65%)
  - Jabber: ~3% (!), S2S < 1%
  - VoIP, GSM: keep on dreaming
  - DNS – oh well

say:thanks

- **Mille grazie**

  dirk at owasp org / testssl sh

  @drwetter



Geek & Poke (Oliver Widder)