# SNI Encryption

draft-huitema-tls-sni-encryption-02

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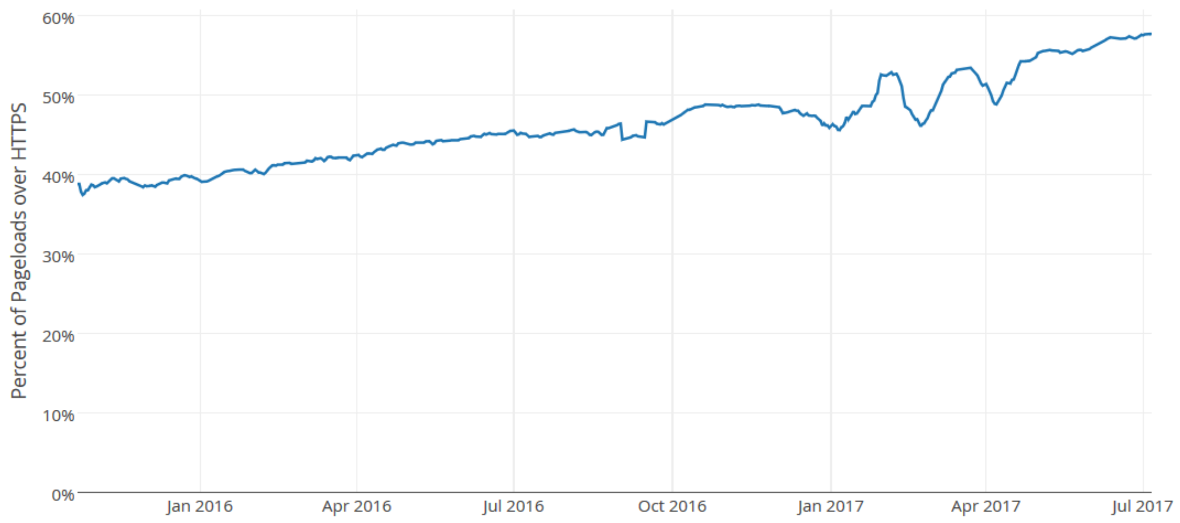
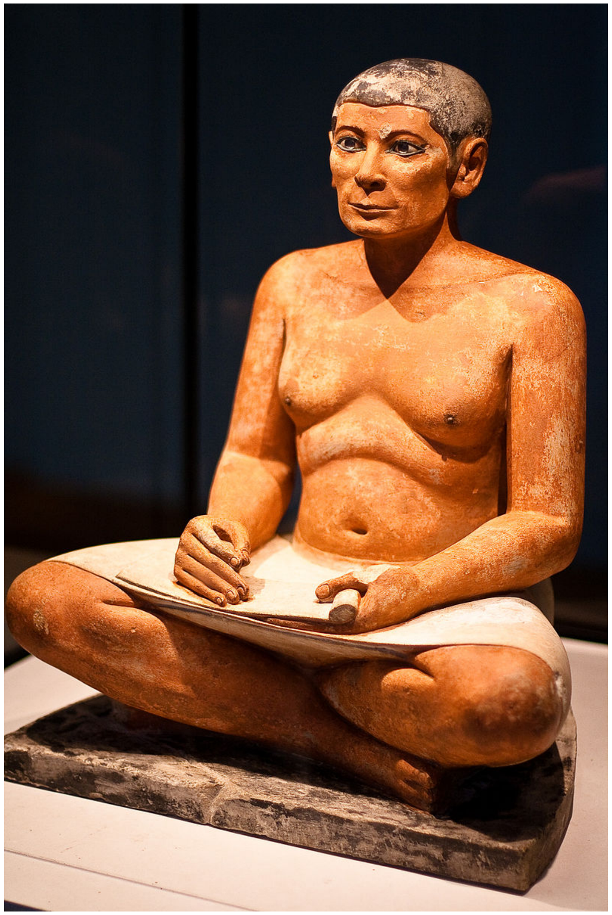
# Why SNI Encryption now?



- Deployment of HTTPS, SMTP/TLS, …
- Standardization of RFC 7858, DNS over TLS.
- Over 60% of traffic going to CND, multi-tenant data centers, etc.
- SNI sticks out as tool for Censorship and Surveillance

# Writing down attacks and options

- List of options, collected from many discussions
  - But first, eliminate the known-broken options.
- List of attacks, collected from the TLS mailing list.
  - If there are more, please send them.



# Solution 1: HTTP Fronting (Co-tenancy)

- Simple solution
  - TLS to “fronting.example.com”
  - HTTP to “hidden.example.com”
- Possible addition of Tunneling
  - CONNECT to hidden.example.com

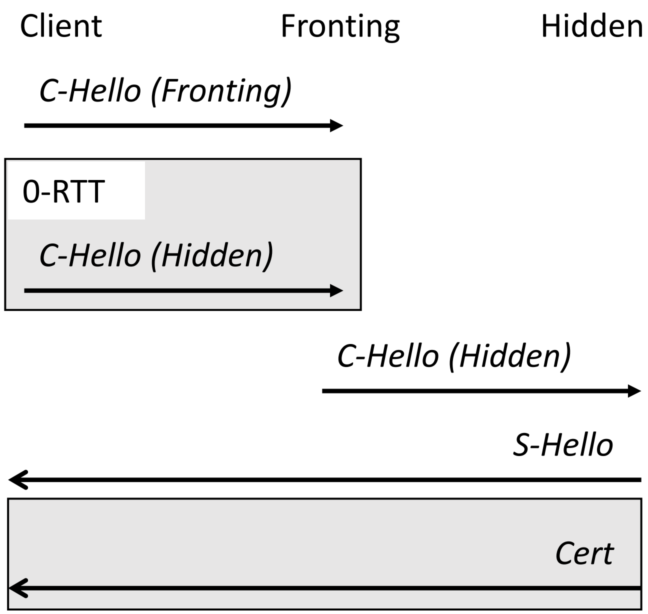
- Trust issue
  - Fronting delivers Hidden content
  - Fronting knows who connects to Hidden
  - What if?...
- Discovery issue
  - Who Fronts for Hidden?...

# Delegation Token Proposal

- Some new kind of Certificate:
  - "Fronting" is an authorized fronting service for "Hidden"
  - Type of Access
    - HTTPS Fronting
    - HTTPS CONNECT
    - Maybe TLS 1.3 solution
  - Expiration date
  - …
  - Signed by Hidden

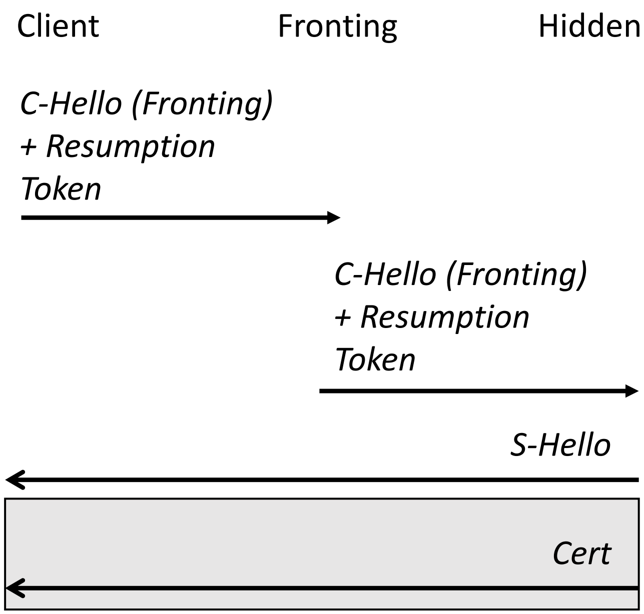
- Attack: Spoofing Hidden
  - Need strong proof of Hidden's identity
  - Maybe CT log reference + DNS TLSA as redundant proof
- Attack: Spoofing Fronting
  - Add IP addresses to CERT?
- Attack: DOS on Fronting
  - Add proof of agreement?
- Attack: Turncoat
  - Revocation, or short validity?

# Solution 2: TLS in TLS Quasi Tunnel



- Depends on TLS 1.3 features
  - 0-RTT
  - Encrypted certificates
- Requires changes in implementations
  - Expect C-Hello #2 in 0-RTT data…

# Solution 3: Combined Tickets



- Elegant solution
  - Requires Fronting to “understand” the ticket
    - E.g., Shared K_sni STEK?
- Requires ticket extension
  - Fronting SNI extension
- Only works for resumption
  - Use other process for initial connection, e.g. HTTP Connect, or TLS Quasi Tunnel

# Combined Ticket ?

```
struct {
    uint32 ticket_lifetime;
    uint32 ticket_age_add;
    opaque ticket_nonce<1..255>;
    opaque ticket<1..2^16-1>;
    Extension extensions<0..2^16-2>;
} NewSessionTicket;
```

- Define required extensions
    - Fronting SNI
- Define Client Behavior
- Other specifications
- Align with “Delegation Token”

# Is this IETF Work? (I think Yes)

- Standardize the “Delegation Token”
- Standardize the “Combined Ticket”
- Work on a common architecture
  - Maybe align combined ticket and delegation token