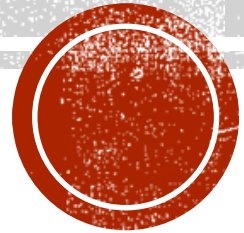
PRESERVING SNI PRIVACY

Yes, This Again



ENCRYPTED SNI

- Hostnames are interesting
  - Alcoholicsanonymous.org
  - Cia.gov
  - Glaad.org
- Encrypting hostnames during connection setup has been a "holy grail" of privacy
- SNI is an obvious place where the hostname leaks

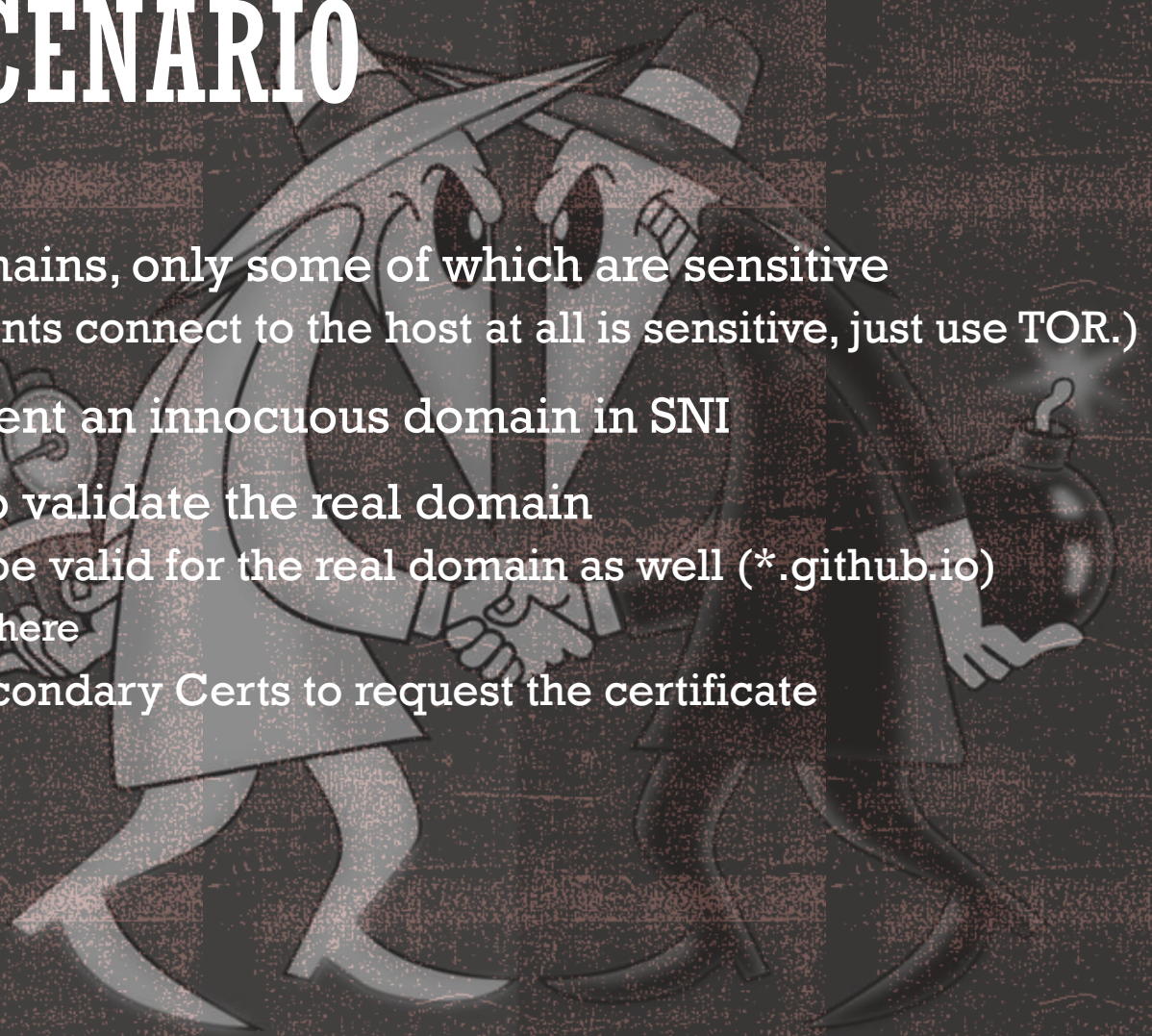
REALITY BITES

- Servers need SNI data to select certificates
- Hard to establish a shared encryption context before TLS
- Observer can see TLS certificate anyway
  - Fixed in TLS 1.3
- Active attacker can get the TLS certificate anyway
  - Still true in TLS 1.3

LOTS OF HOLES TO PLUG

- DNS leaks the hostname before the connection is even open
  - Doh!
- SNI leaks the hostname in the Client Hello
  - Secondary Certs
- Client doesn't know what innocuous hostnames are available
  - Alt-Svc SNI parameter
- Alt-Svc requires having spoken to the server before
  - ALTSVC DNS records

TARGET SCENARIO



- Host has many domains, only some of which are sensitive
  - (If the fact that clients connect to the host at all is sensitive, just use TOR.)
- Want client to present an innocuous domain in SNI
- Client still needs to validate the real domain
  - Certificate might be valid for the real domain as well (*.github.io)
    - 0-RTT is possible here
  - Otherwise, use Secondary Certs to request the certificate
    - 1-RTT best case

ALT-SVC EXTENSION FOR SNI

- Hypothetical Alt-Svc records for https://sensitive.example.com:

- Colocated Domain
- `h2="innocence.org:443";ma=2635200;persist=true;`**`sni=innocence.org`**

- Wildcard Subdomain
- `h2="www.example.com:443";ma=2635200;persist=true;`**`sni=www.example.com`**

- Omitting SNI
- `h2="alternative.example.com:443";ma=2635200;persist=true;`**`sni=""`**

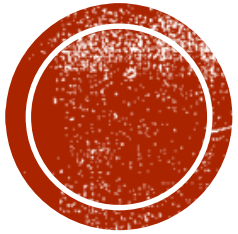
ALTSVC RECORDS IN DNS

Avoids clients making initial requests with “exposed” SNI

```
_https._443.www.example.com. 60S IN ALTSVC
     "h2=\"innocence.org:443\";ma=2635200;persist=true;
     sni=innocence.org“
```

Collateral benefits

- HTTP/QUIC connections without TCP exchange first
- Opportunistic Security without cleartext exchange first



QUESTIONS?