Anticensorship in the Network Infrastructure

Eric Wustrow
University of Michigan
Background | Internet Censorship

- Pervasive censorship
- Substantial censorship
- Selective censorship
- Changing situation
- Little or no censorship
Censor ... controls client’s network, but not external network
... blocks according to a blacklist
... allows HTTPS connections to non-blocked sites
Telex | Overview

User's Computer | ISP Infrastructure | Websites

Browser → Censor → Router

Request for permitted site → Request for prohibited site

NotBlocked.com unobjectionable site (permitted by censor)
Blocked.com prohibited site (blocked by censor)
Telex | Overview

User’s Computer | ISP Infrastructure | Websites

Browser | Telex Client | Router

Request for **permitted** site | Request for **prohibited** site

- **NotBlocked.com**
  - unobjectionable site (permitted by censor)

- **Blocked.com**
  - prohibited site (blocked by censor)
Telex | Overview

User's Computer  ISP Infrastructure  Websites

Browser  Telex Client

Request for permitted site

ISP Infrastructure:

Invisible Tag

Router

Censor

Request for prohibited site

Websites:

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Invisible Tag

Telex Station

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Request for permitted site  Request for prohibited site
Telex | Overview

User’s Computer | ISP Infrastructure | Websites

- Browser
- Telex Client

- Router
- Invisible Tag
- Proxy Server
- Telex Station

Censor

Request for permitted site → NotBlocked.com (unobjectionable site, permitted by censor)

Request for prohibited site → Blocked.com (prohibited site, blocked by censor)
Prototype | Test Deployment

Single Telex Station on lab-scale “ISP” at Michigan

Hosted sites

- **NotBlocked.telex.cc**
  - Unobjectionable content *

- **Blocked.telex.cc**
  - Simulated censored site
    - only reachable via Telex

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not in my backyard
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Inline Blocking

Asymmetric flows
Telex v2: Passive tap

User’s Computer

ISP Infrastructure

Websites

- Browser
- Telex Client
- Invisible Tag
- Proxy Server
- Telex Station
- NotBlocked.com (unobjectionable site, permitted by censor)
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Request for **permitted** site

Request for **prohibited** site
New architecture -- passive ISP tap

Client

TLS Handshake

ISP Proxy

Server

Plaintext: “GET / HTTP/1.1\r\nX-Ignore: \x81\x28\x66 …”

Ciphertext: “\x95\x1f\x6b\xe2 …”

ACK [seq=Y, ack=X]

Plaintext: “PROXY OK” [seq=Y, ack=X, len=M]

Ciphertext: “\x95\x1f\x6b\xe2 …”

ack != Y?


Ciphertext: “\x95\x1f\x6b\xe2 …”

Plaintext: “HTTP/1.1 200 OK … <html> …”
New architecture -- passive ISP tap

• Pros
  – No inline blocking required, only passive tap
  – Works with asymmetric flows (client -> server)

• Cons
  – Censor can use active attacks
    • (though we can use “active defenses”)

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• Future work
  – Looking for ISPs willing to help
    • Technical feedback
    • Prototype deployment
  – Strategies for optimal deployment
  – Improving traffic analysis defense
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https://telex.cc

Eric Wustrow
Colleen M. Swanson
Scott Wolchok
Ian Goldberg
J. Alex Halderman