

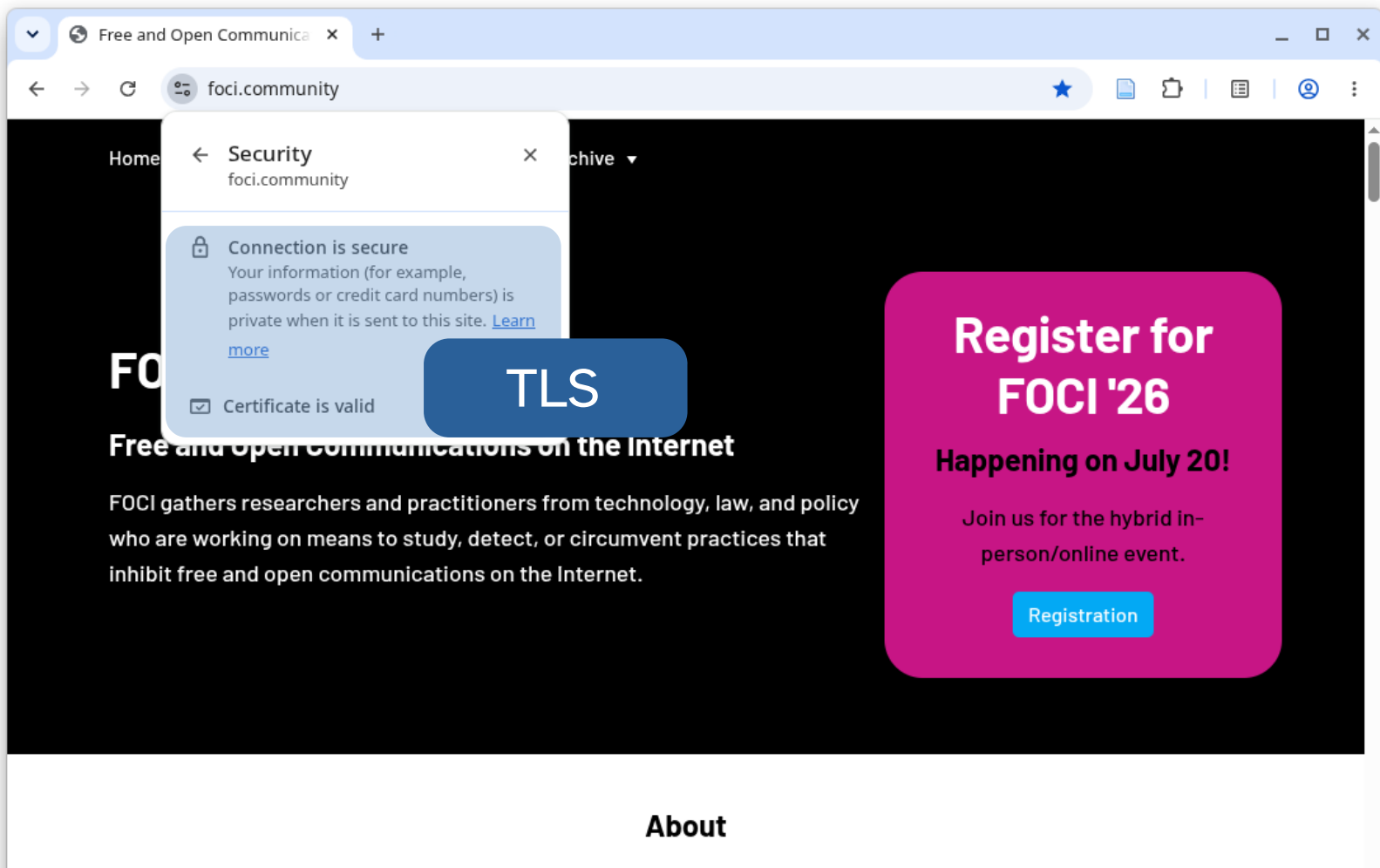
# On Russia's Early Introduction of QUIC SNI Censorship

**Nico Heitmann, Niklas Niere, Felix Graf Lange, Juraj Somorovsky**  
*Paderborn University*

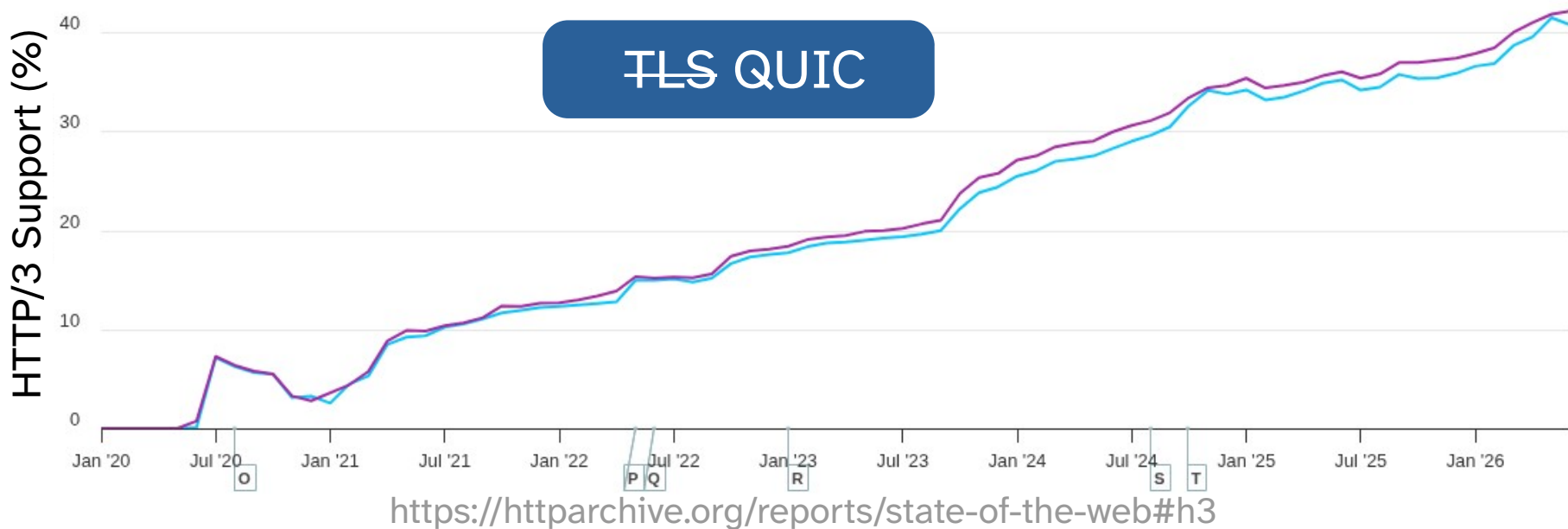
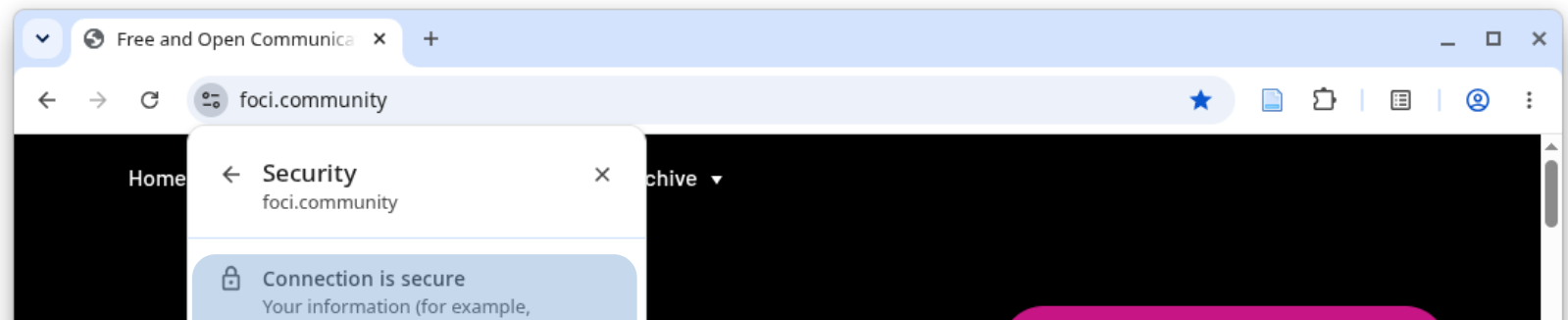
July 20, 2026



# QUIC and HTTP/3



# QUIC and HTTP/3



# Russia Censors QUIC — since 2022



serfreeman1337

Mar 2022

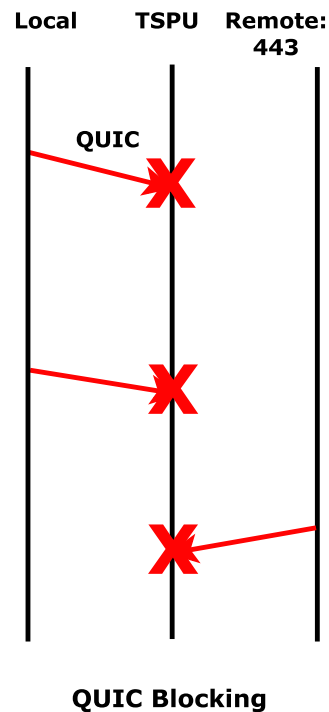
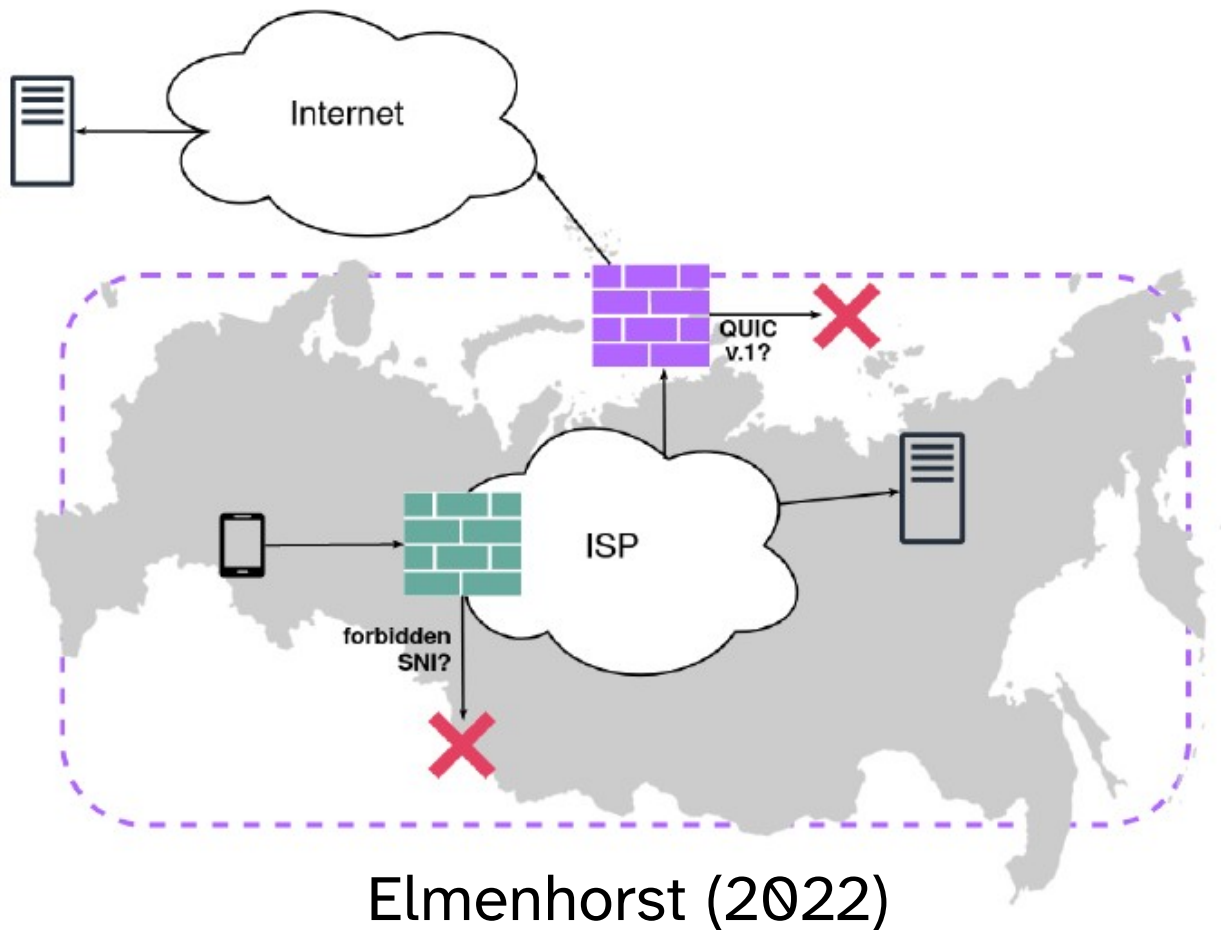
Не устанавливается соединение по QUIC для зарубежных сайтов. Не приходит ответ от сервера на Initial пакет.

Проверял на сайтах google (в том числе youtube), [cloudflare-quic.com](https://cloudflare-quic.com) <sup>752</sup> и [quic.nginx.org](https://quic.nginx.org) <sup>621</sup> .  
При этом [vk.com](https://vk.com) <sup>68</sup> продолжает работать по HTTP/3.

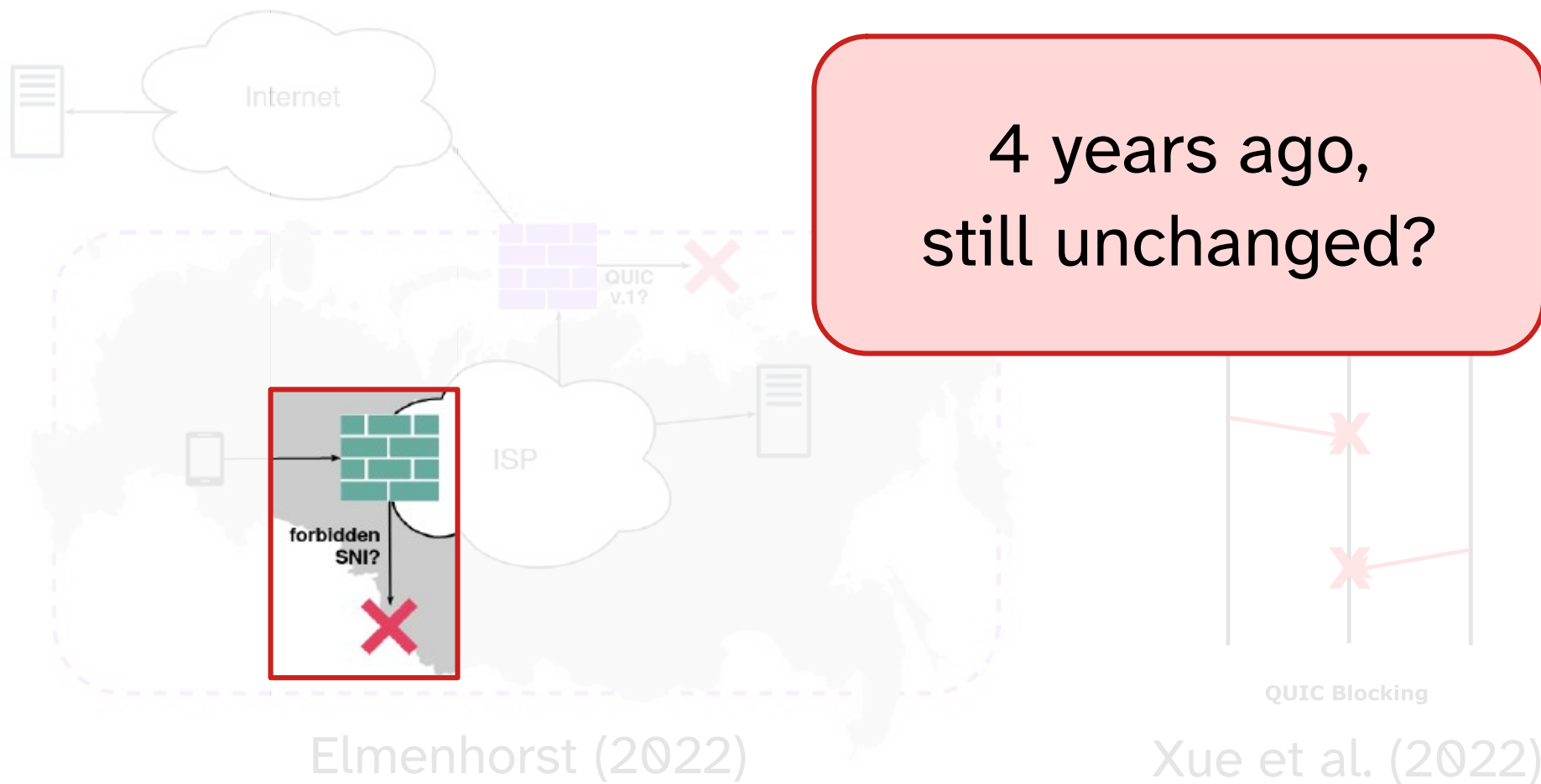
Заметил на операторах Yota, Мегафон и проводном МТС.

## Russian-language forum discussions (Mar. 2022)

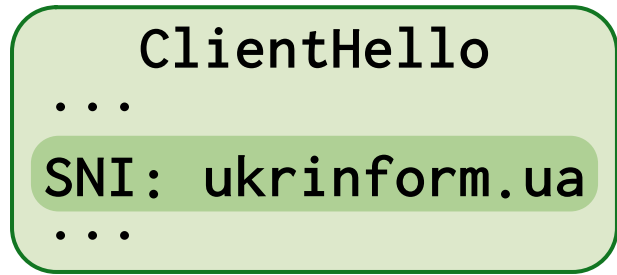
# Russia Censors QUIC — since 2022



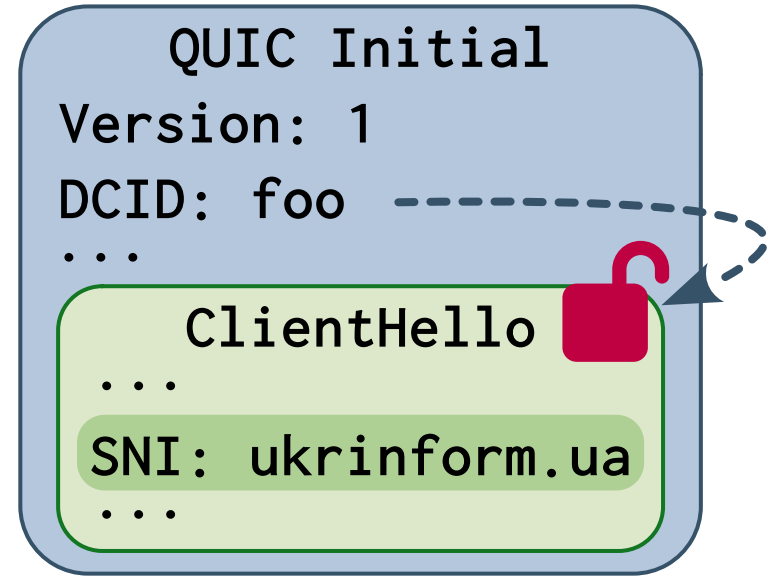
# Russia Censors QUIC — since 2022



# TLS and QUIC



TLS



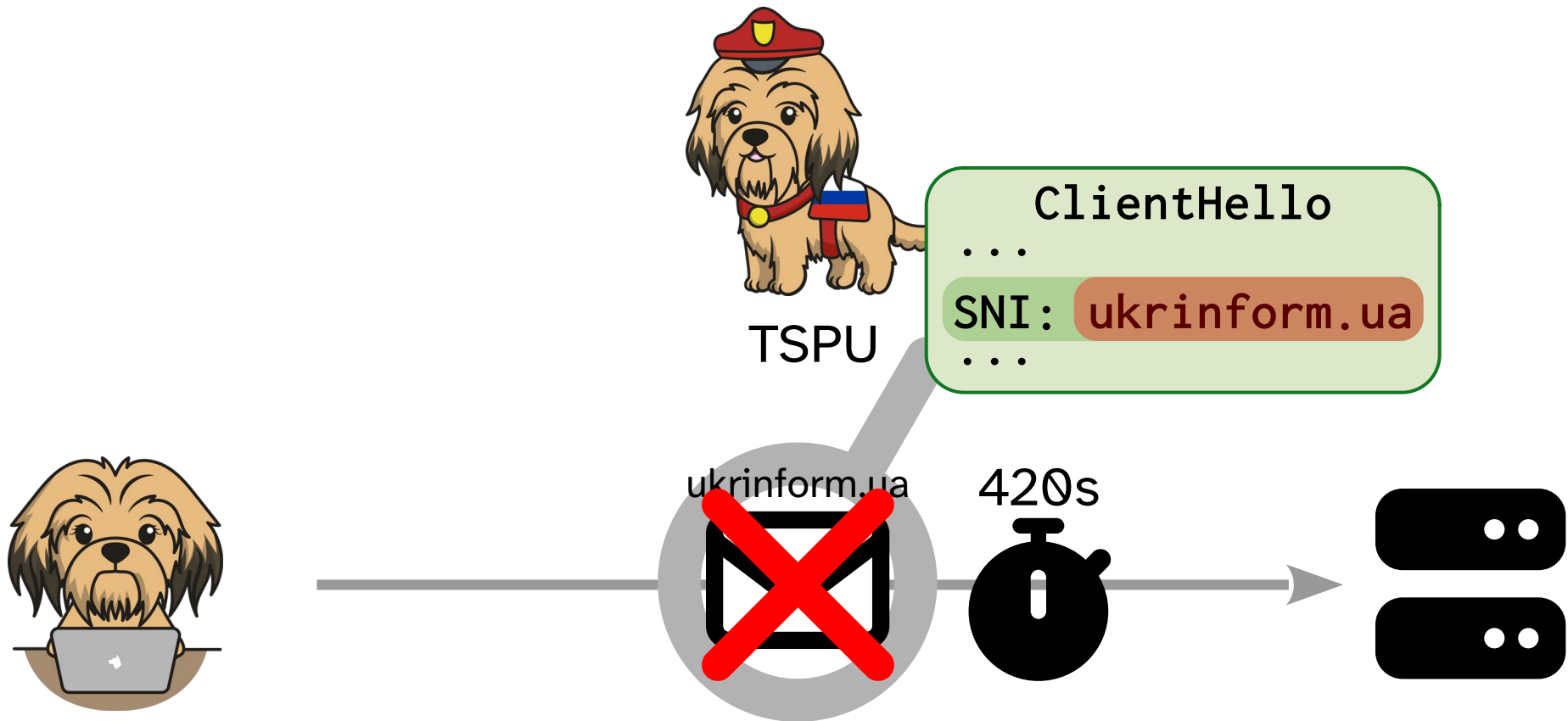
QUIC

QUIC Initial Packets ~~encrypted~~ obfuscated

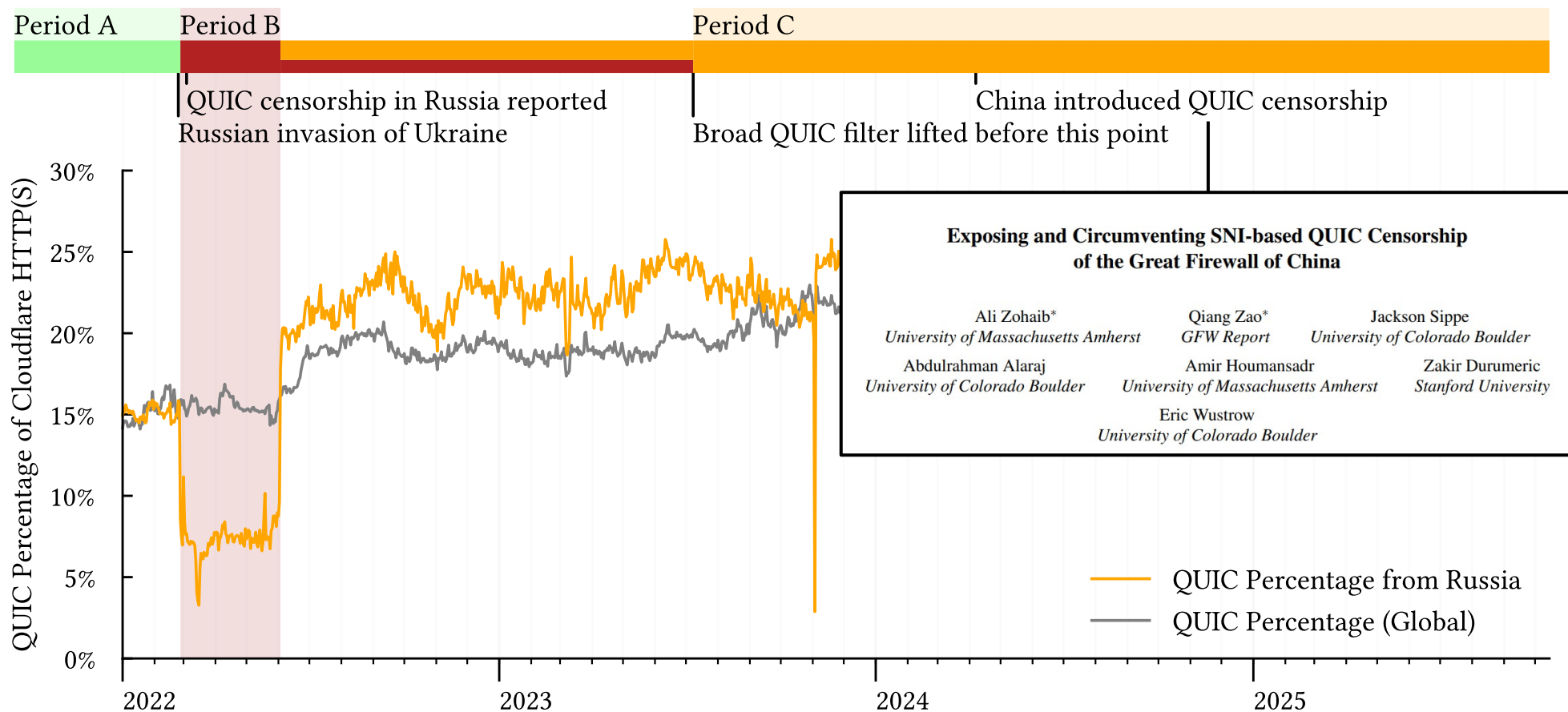


SNI also readable in QUIC

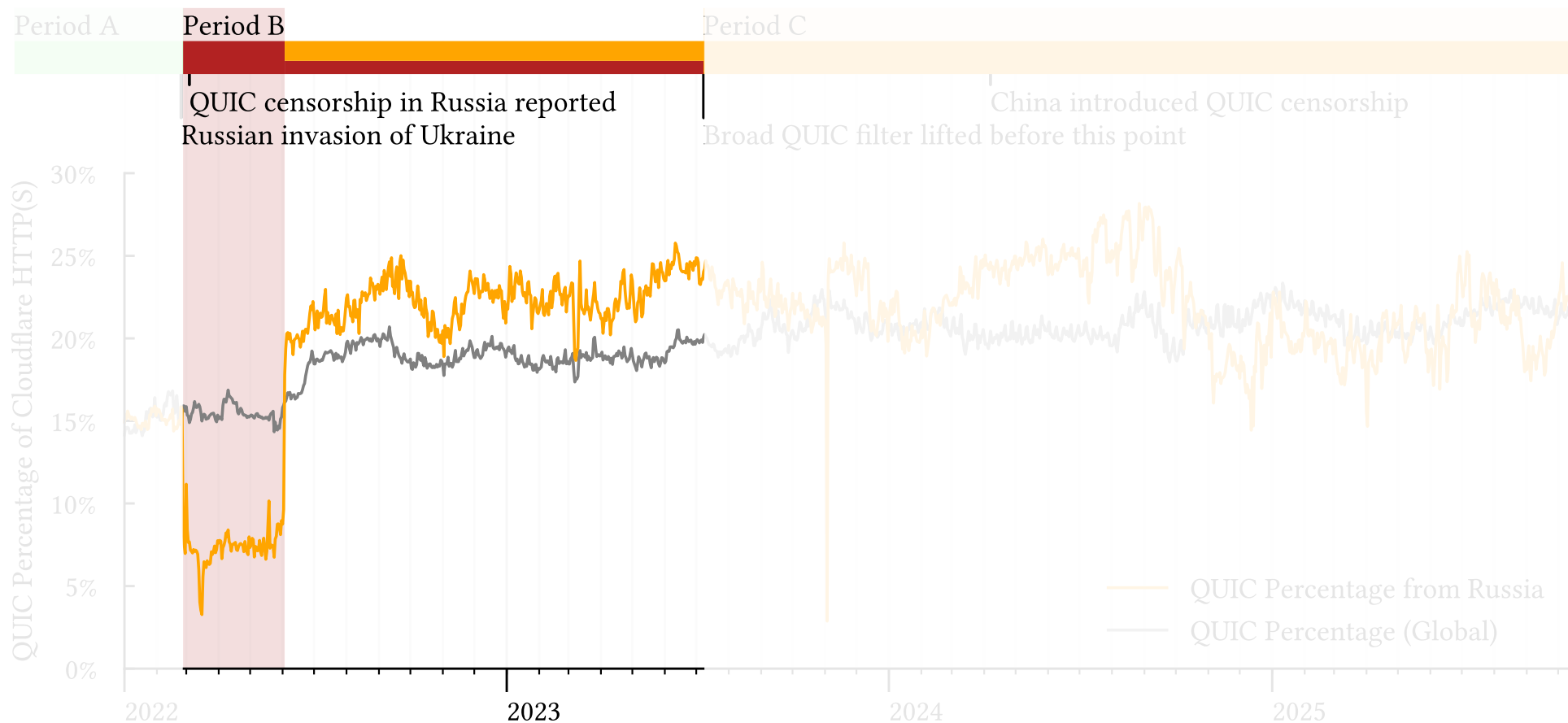
# Russian TLS Censorship



# Russian QUIC Censorship



# Russian QUIC Censorship



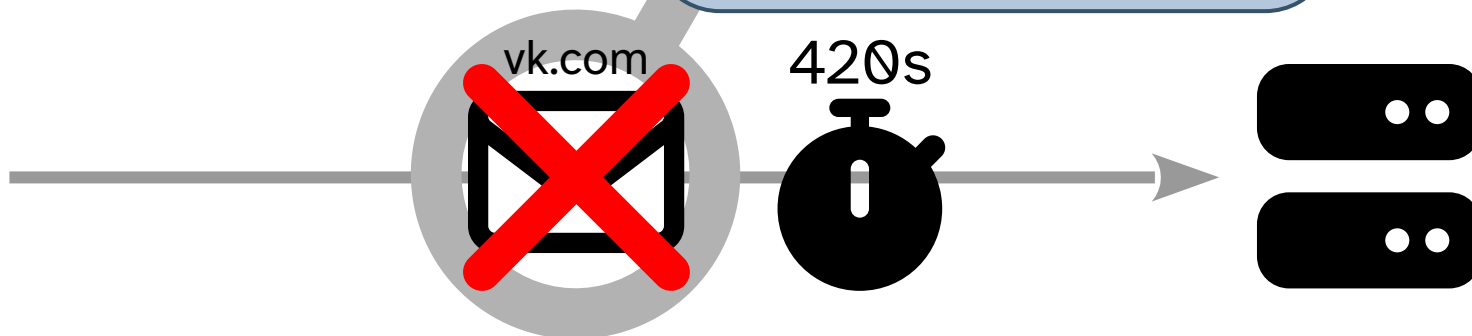
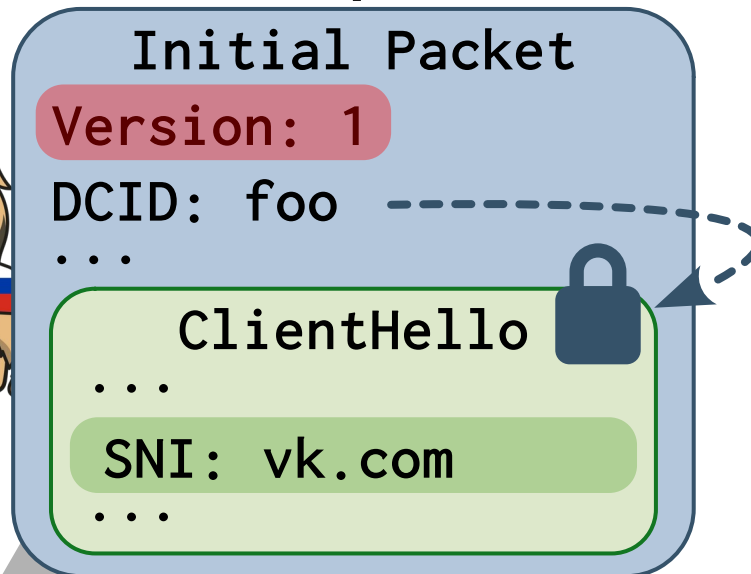
# Period B: Broad QUIC Censorship

Port = 443

Length  $\geq 1001$

Version = 0x00000001

**All** international QUIC traffic blocked



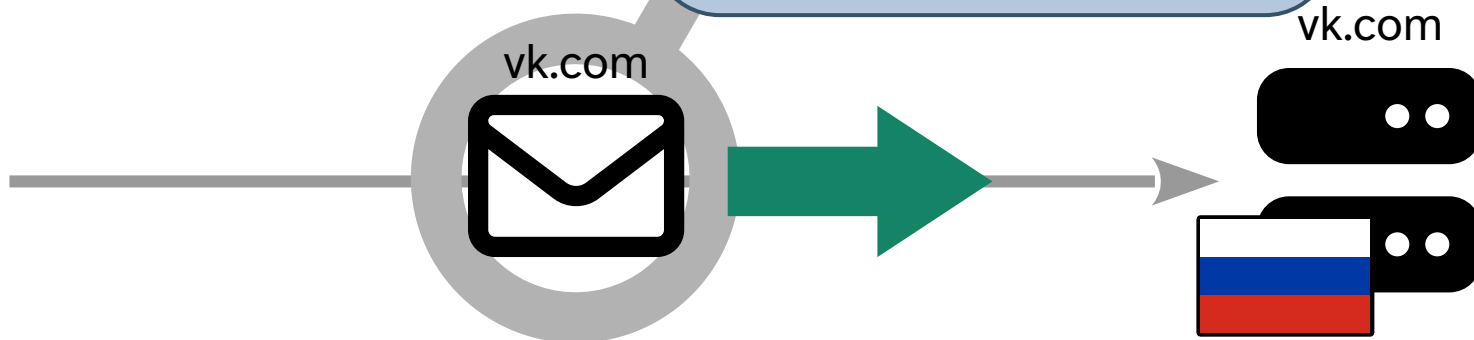
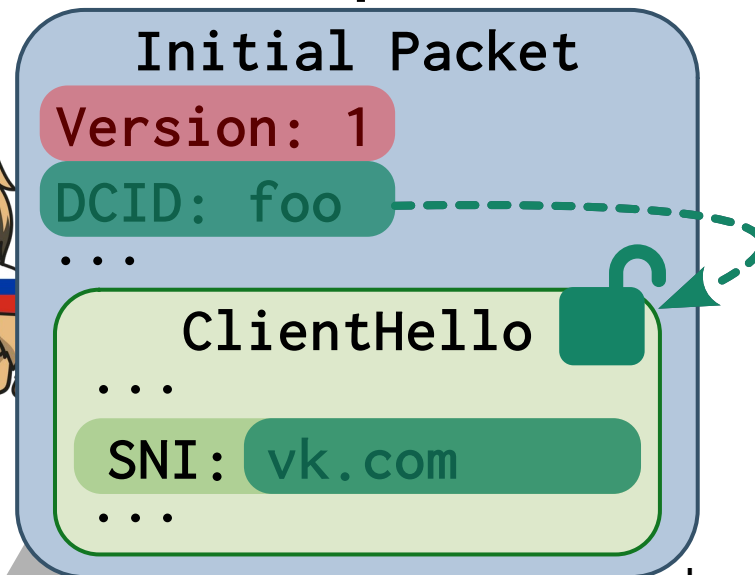
# Period B: Broad QUIC Censorship

Port = 443

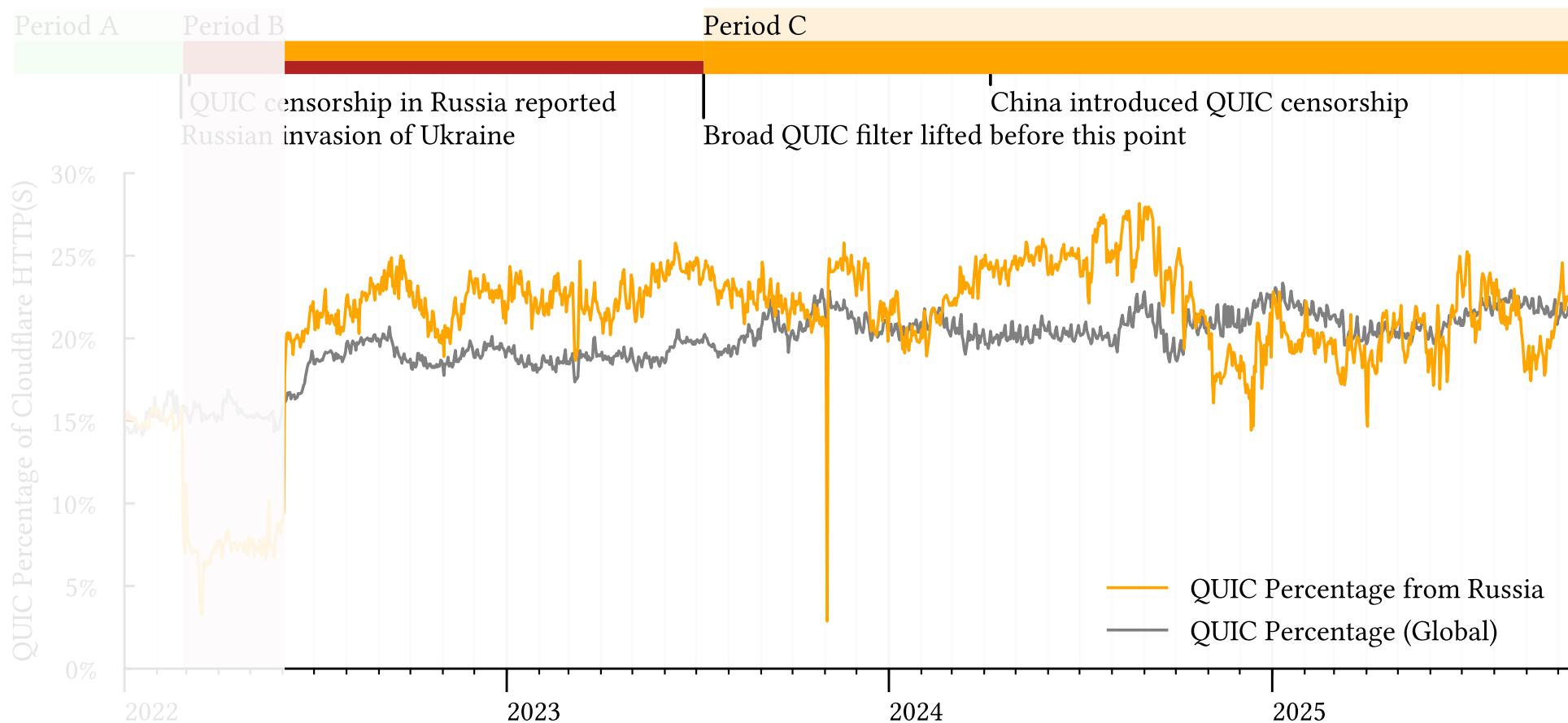
Length  $\geq 1001$

Version = 0x00000001

vk.com allowed **domestically**



# Russian QUIC Censorship



# Vantage Points

Germany:

- Berlin

Russia:

- Moscow
- Saint Petersburg
- Novosibirsk



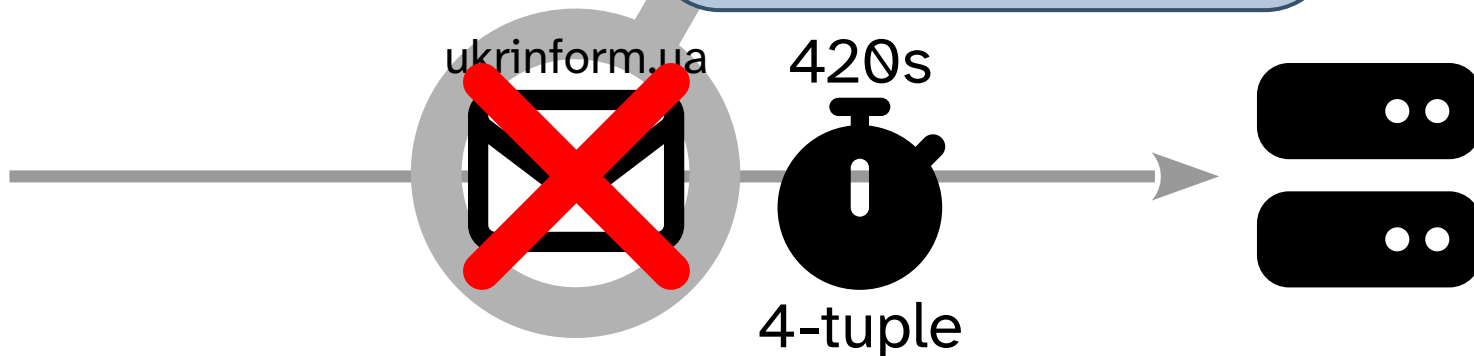
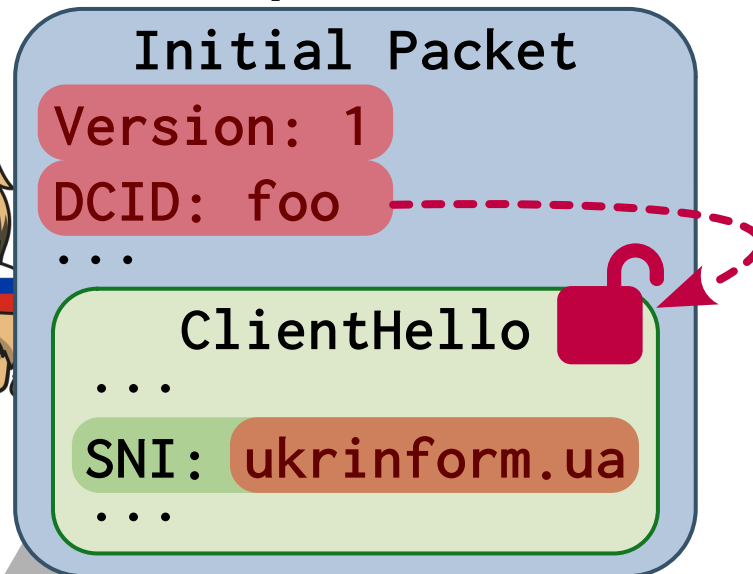
# Period C: QUIC SNI Censorship

~~Port = 443~~

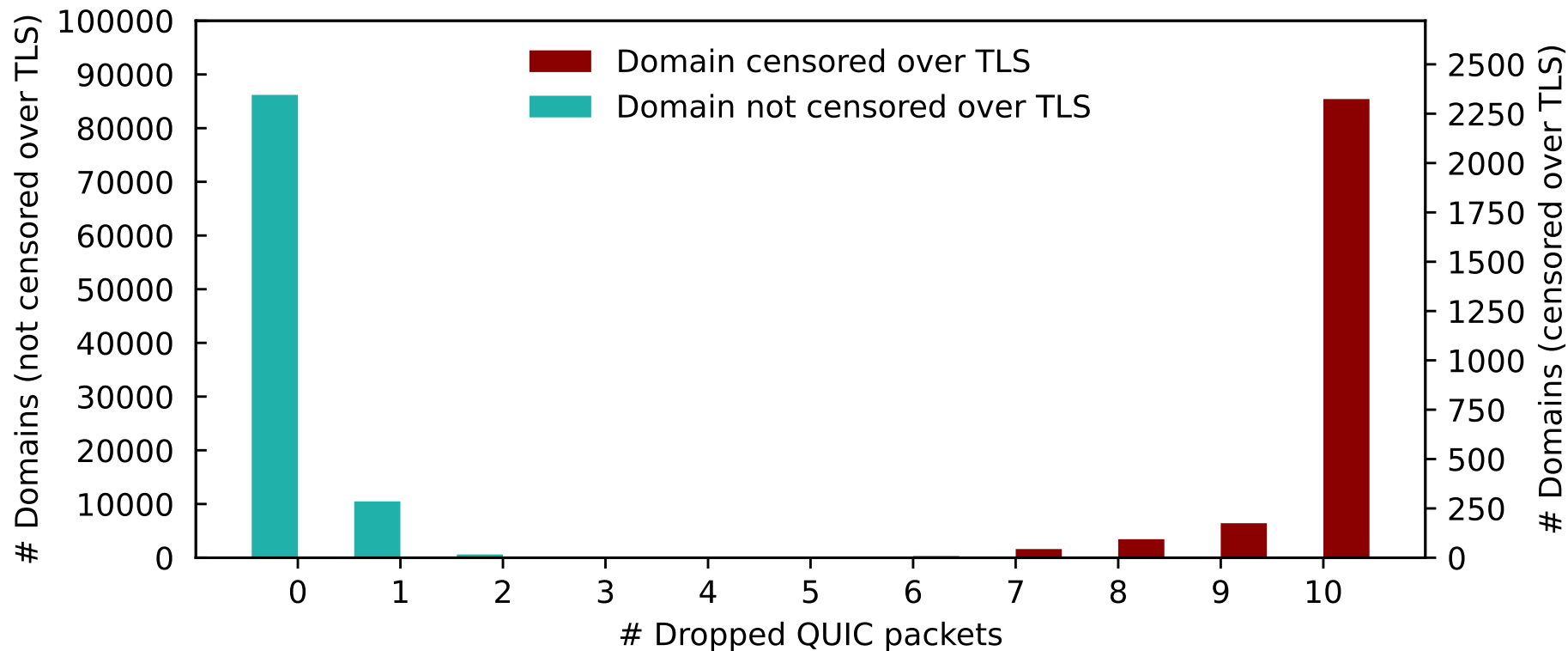
~~Length  $\geq$  1001~~

Version = 0x00000001

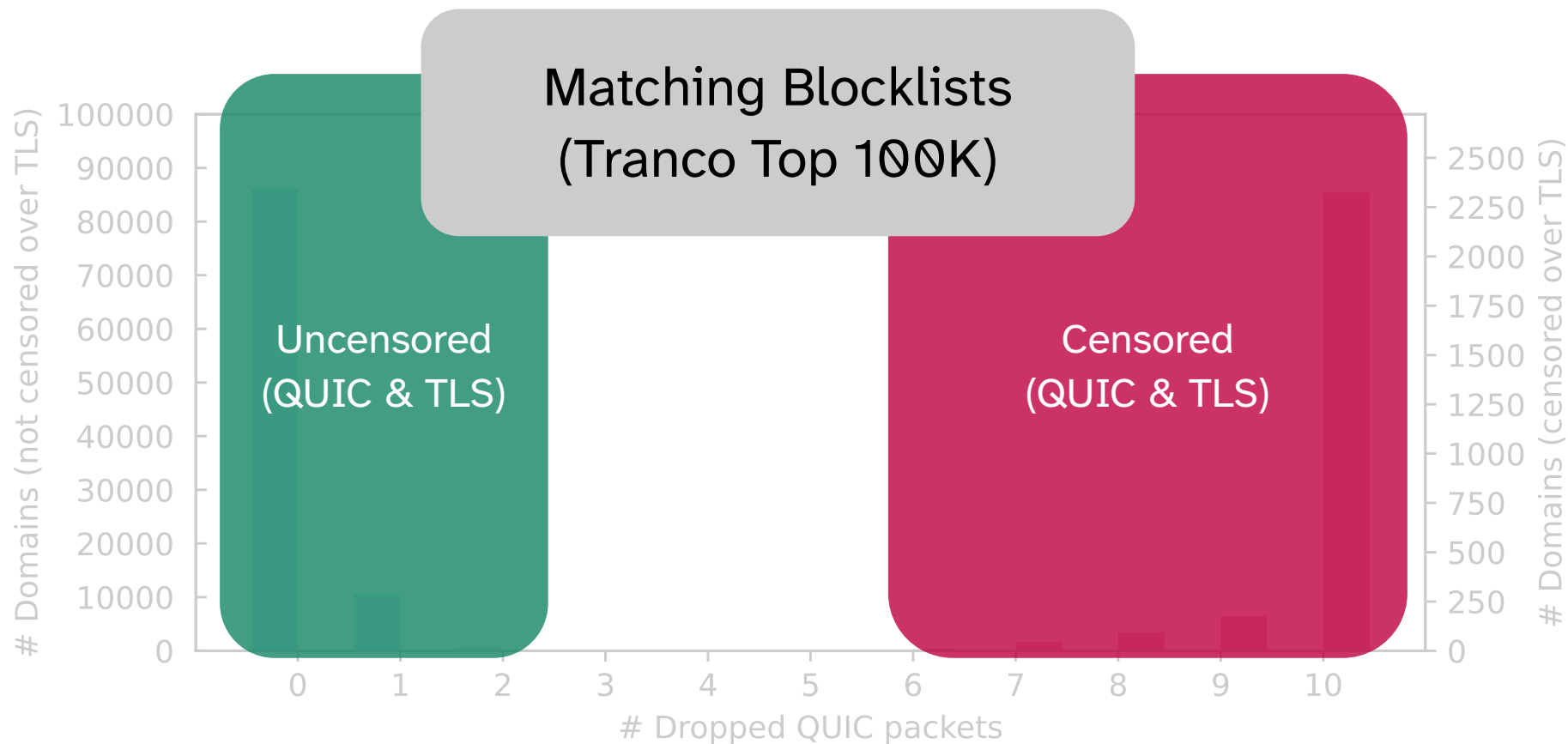
**International SNI censor**



# Comparison to TLS Censorship—Blocklist



# Comparison to TLS Censorship—Blocklist



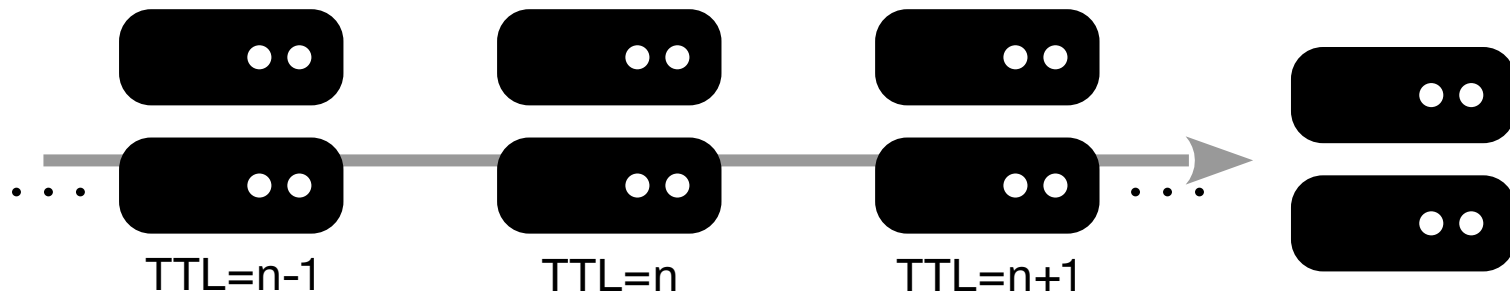
Our measurements (March–April 2026)

# Censor Location



TLS & QUIC Censor  
at identical network hop

TLS   
QUIC 



# Parsing/Circumvention

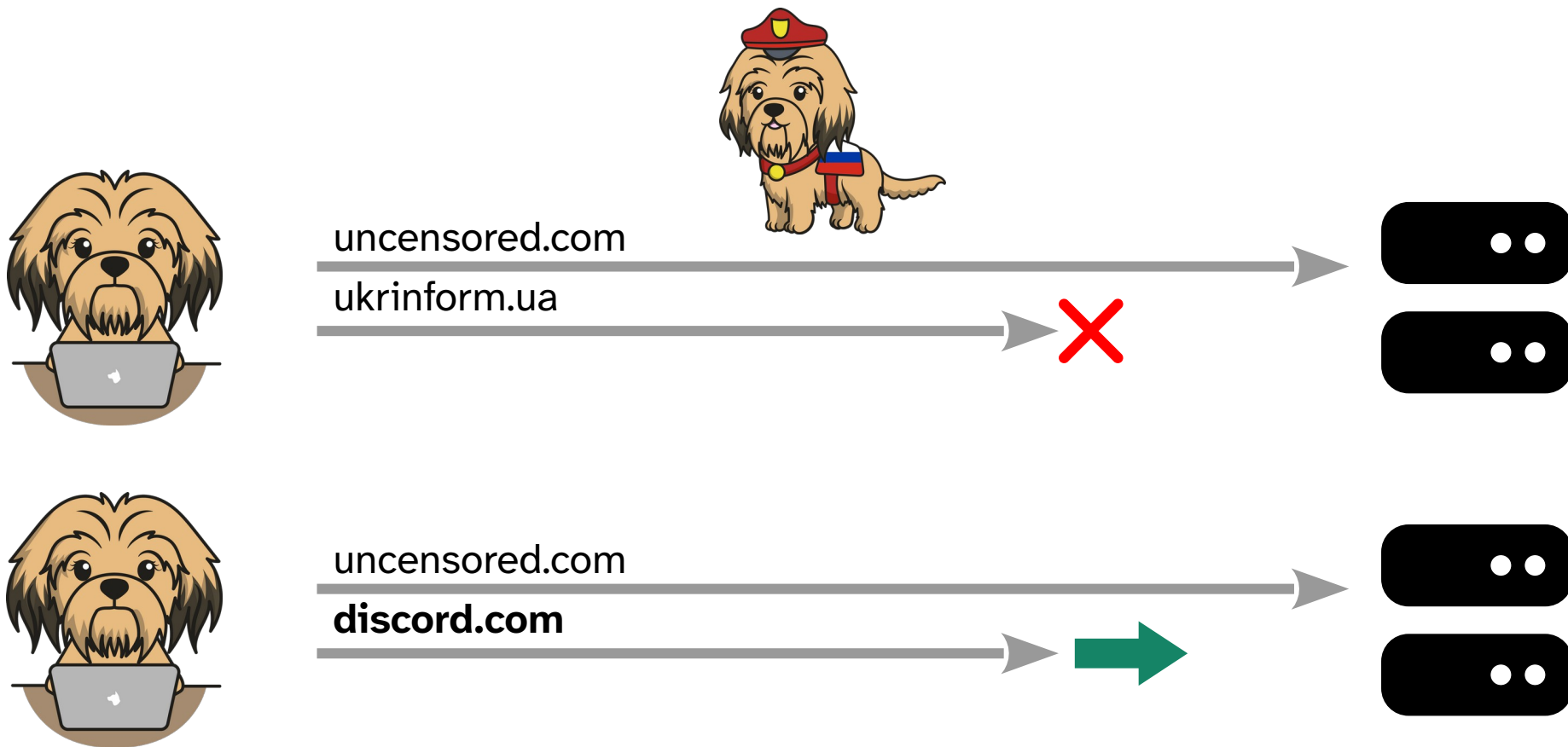
| No. | Description                         | Blocked? |     |     |                                                                                     |
|-----|-------------------------------------|----------|-----|-----|-------------------------------------------------------------------------------------|
|     |                                     | MOW      | SPE | NVS |  |
| 1   | Regular Initial with censored SNI   | ●        | ●   | ●   | ●                                                                                   |
| 2   | Remove last byte                    | ●        | ●   | ●   | ○                                                                                   |
| 3   | Version bytes 00000002, invalid MAC | ○        | ○   | ○   | ○                                                                                   |
| 4   | SCID & DCID empty (length 0)        | ○        | ○   | ○   | ●                                                                                   |
| 5   | DCID set to length 255              | ○        | ○   | ○   | ○                                                                                   |
| –   | SCID set to length 255              | ○        | ○   | ○   | –                                                                                   |
| 6   | Crypto frame len. 0, data unchanged | ○        | ○   | ○   | ●                                                                                   |
| 7   | ALPN with censored hostname         | ○        | ○   | ○   | ○                                                                                   |
| 8   | PING & PADDING before/after Crypto  | ●        | ●   | ●   | ○                                                                                   |
| 9   | ECH, outer SNI cloudflare-ech.com   | ○        | ○   | ○   | ○                                                                                   |
| 10  | QUIC version 2                      | ○        | ○   | ○   | ○                                                                                   |

MOW: Moscow    SPE: Saint Petersburg    NVS: Novosibirsk

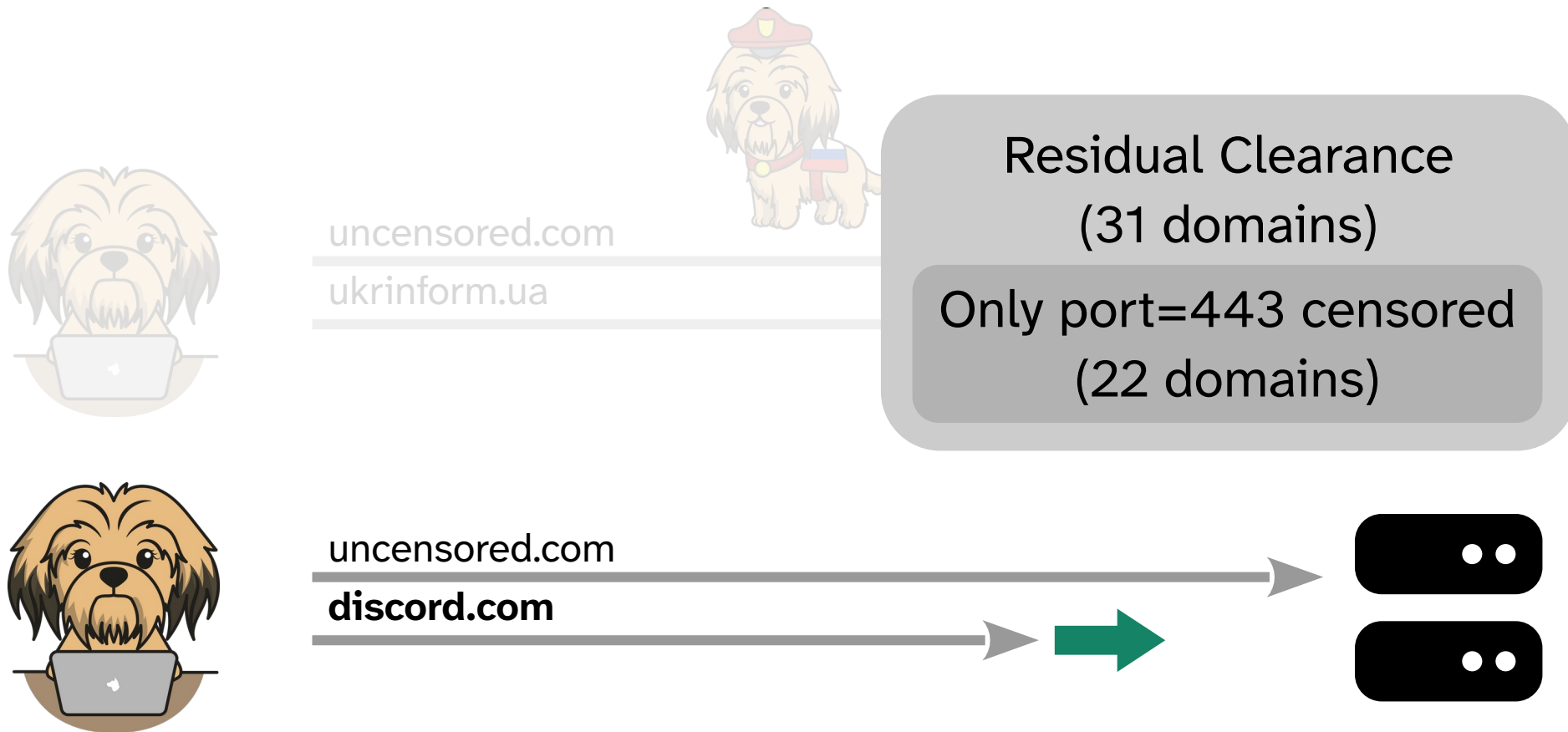
○ not blocked    ● blocked



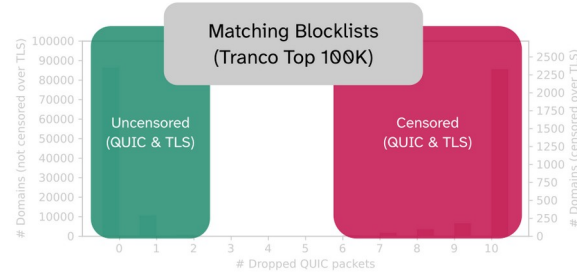
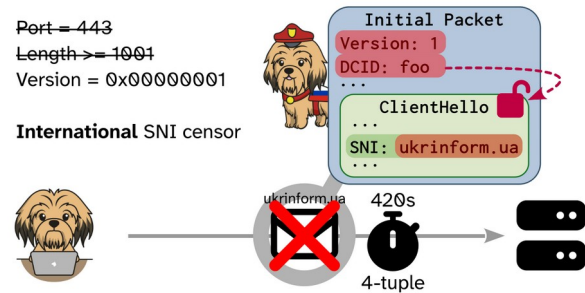
# Domain-specific Behavior



# Domain-specific Behavior

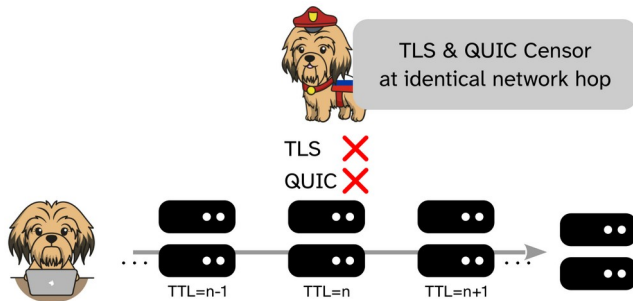


# Are TSPU devices responsible?



| No. Description                       | Blocked? |     |     |
|---------------------------------------|----------|-----|-----|
|                                       | MOW      | SPE | NVS |
| 1 Regular Initial with censored SNI   | ●        | ●   | ●   |
| 2 Remove last byte                    | ●        | ●   | ●   |
| 3 Version bytes 00000002, invalid MAC | ○        | ○   | ○   |
| 4 SCID & DCID empty (length 0)        | ○        | ○   | ○   |
| 5 DCID set to length 255              | ○        | ○   | ○   |
| – SCID set to length 255              | ○        | ○   | ○   |
| 6 Crypto frame len. 0, data unchanged | ○        | ○   | ○   |
| 7 ALPN with censored hostname         | ○        | ○   | ○   |
| 8 PING & PADDING before/after Crypto  | ●        | ●   | ●   |
| 9 ECH, outer SNI cloudflare-ech.com   | ○        | ○   | ○   |
| 10 QUIC version 2                     | ○        | ○   | ○   |

MOW: Moscow SPE: Saint Petersburg NVS: Novosibirsk  
○ not blocked ● blocked

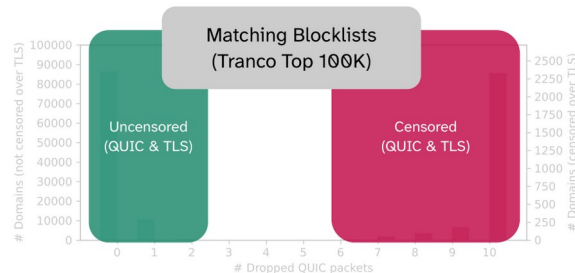
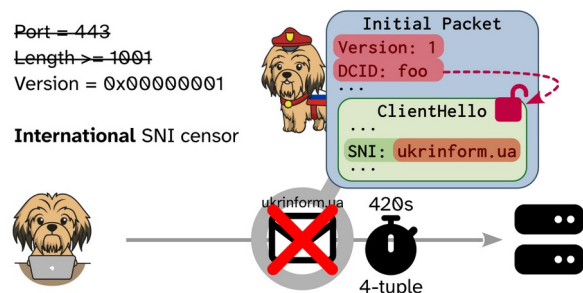


Uniformity between VPs

Consistency with TLS

# Takeaways

- Large-scale QUIC censorship in Russia



| No. Description                       | Blocked? |     |     |
|---------------------------------------|----------|-----|-----|
|                                       | MOW      | SPE | NVS |
| 1 Regular Initial with censored SNI   | ●        | ●   | ●   |
| 2 Remove last byte                    | ●        | ●   | ●   |
| 3 Version bytes 00000002, invalid MAC | ○        | ○   | ○   |
| 4 SCID & DCID empty (length 0)        | ○        | ○   | ○   |
| 5 DCID set to length 255              | ○        | ○   | ○   |
| – SCID set to length 255              | ○        | ○   | ○   |
| 6 Crypto frame len. 0, data unchanged | ○        | ○   | ○   |
| 7 ALPN with censored hostname         | ○        | ○   | ○   |
| 8 PING & PADDING before/after Crypto  | ●        | ●   | ●   |
| 9 ECH, outer SNI cloudflare-ech.com   | ○        | ○   | ○   |
| 10 QUIC version 2                     | ○        | ○   | ○   |

MOW: Moscow SPE: Saint Petersburg NVS: Novosibirsk  
○ not blocked ● blocked

- Deployed **before** China's QUIC Censorship

