QUIC-Aware Proxying

draft-ietf-masque-quic-proxy-01

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Agenda

Protocol recap

Design Team encryption proposal

Loop issue
Protocol recap

Client tells proxy about inner QUIC connection’s CIDs (using capsules!)

Proxy may reuse target-facing ports

Client and proxy may skip encapsulation and encryption for proxied SH packets — avoiding cumulative MTU overhead issues

**Forwarded mode** packets on the wire use virtual CIDs instead of the inner connection’s real CIDs
Protocol recap
Need for encryption

Traffic analysis recognizing packets on both sides of a forwarding proxy

Client

Ingress Proxy

Egress Proxy

Server

Client-to-proxy-A

(Client-to-proxy-B) (Forwarded with virtual CIDs)

Client-to-target
Design team proposal
PR #99

Goal: analyze the threat of traffic analysis on forwarded mode, and propose a mechanism for adding encryption to forwarded mode
Design team proposal

PR #99

Proposed solution:

- Add "packet transforms" for forwarded mode
- Define the "scramble" transform, using AES-128 block ciphers
- Prevents passive byte recognition attacks; like tunneling, does not prevent passive timing attacks or active injection/corruption attacks
Design team proposal
PR #99

STREAM(44): HEADERS
:method = CONNECT
:protocol = connect-udp
:scheme = https
:path = /target.example.com/443/
:authority = proxy.example.org
proxy-quic-forwarding = ?1; accept-transform=scramble,null; \
    scramble-key=:abc...789=:
capsule-protocol = ?1

...

<--------- STREAM(44): HEADERS
:status = 200
proxy-quic-forwarding = ?1; \
    transform=scramble; \
    scramble-key=:ABC...321=:
capsule-protocol = ?1
Design team proposal
PR #99

The base proposal does not cover transforms to add padding or chaff packets to avoid timing attacks

Techniques to prevent timing attacks would need to be analyzed and designed even for tunneled mode

New transforms can be defined to handle work in this area
Design team proposal

PR #99

Next steps

Renaming "null" transform to "identity"

Are we ready to merge the PR and close the design team?
Open issue: CID loops

Issue #88

Clients can create forwarding loops if:

• Proxy shares a client-facing IP (VIP) with other proxies; and

• Proxy reuses target-facing sockets for multiple tunnels; and

• Client picks Virtual Client Connection ID
Open issue: CID loops

Issue #88

- Prohibiting VIP sharing is incompatible with some deployments

- Eliminating target-facing port sharing may necessitate additional target-facing IPs for sufficient port space

- Proxy-chosen Virtual Client CIDS require clients to receive QUIC packets with CIDS it doesn’t generate. May affect ability to demultiplex. Complicates capsule exchange. (PR#104)
Proxy-chosen Virtual Client CIDs

PR #104

**Client**

- REGISTER_CLIENT_CID ->

**Proxy**

<- ACK_CLIENT_CID
(Virtual Client CID)

- ACK_CLIENT_VCID ->

- REGISTER_TARGET_CID ->

<- ACK_TARGET_CID
(Virtual Target CID)