Using QUIC to traverse NATs

IETF 117

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draft-seemann-quic-nat-traversal

QUIC v1 (RFC 9000)

- Assumes that the server is always publicly reachable
- The client might be behind a NAT
- Defines how to handle NAT rebindings
- Defines how a client can actively migrate to a different path

ICE (RFC 8445)

1. Gather candidates
2. Exchanges candidates between peers
3. Connectivity Checks
4. Nominate candidate pair
5. Keeping a path alive

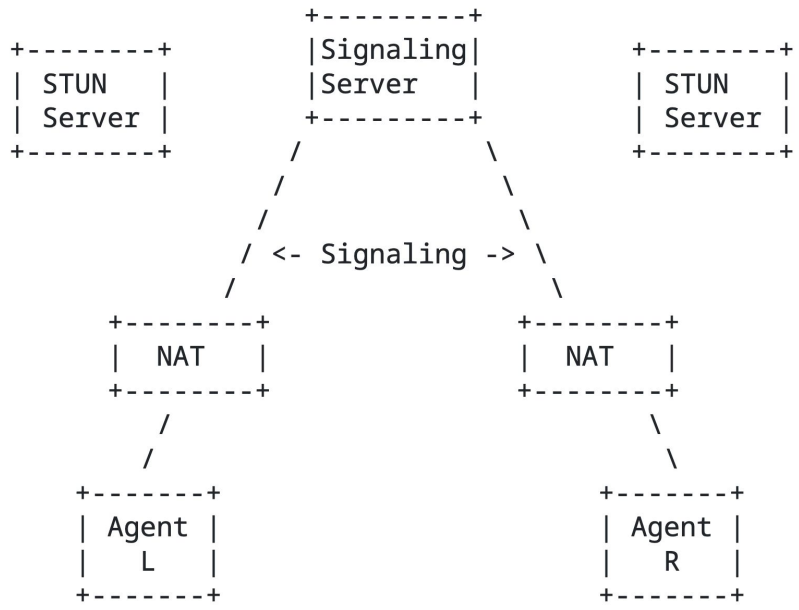

Figure 1: ICE Deployment Scenario

Purpose of this Draft

- Make it possible to use QUIC in a p2p setting
- Possible use cases:
  - Building block for WebRTC over QUIC
  - p2p WebTransport
  - … lots of other p2p protocols

Mode 1: Use External Signaling Channel

- Run ICE to completion first
- Then run a QUIC handshake on the nominated address candidate pair

⊕ (Deployment) simple

⊖ Requires running a separate signaling server

⊖ Lots of round trips

Mode 2: Use a Proxied QUIC Connection

- Use a proxied QUIC connection for signaling (e.g. CONNECT-UDP)
- Signal using a new QUIC frame type: ICE frame
- ICE performs:
  - Connectivity Checks
  - Candidate Nomination
- QUIC then migrates the connection to the nominated candidate pair

```
ICE Frame {
    Type (i) = 0x1ce,
    Length (i),
    Data (...),
}
```

⊕ No (non-QUIC) signaling server needed

⊖ What if ICE Connectivity Check and QUIC Path Probe disagree?

Mode 3: Use Connection Migration to Probe Paths

- Use a proxied QUIC connection for signaling (e.g. MASQUE)
- Do signaling using a new QUIC frame type: ICE frame
- Use QUIC connection migration to probe paths
  - Requires the server to send a probe packet to create NAT binding
- QUIC then migrates the connection to the nominated candidate pair

Does this require QUIC Multipath?

Probably not necessary. But potentially beneficial.

	QUIC v1	QUIC Multipath
Client can probe (multiple) paths	✅	✅
Server can probe paths	❌	❌
Concurrent data transfer on multiple paths	❌	✅

What's next?

- This is a -00 version
- Interest in the WG?
- Lots of work necessary