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
   a. Match candidate pairs
3. Connectivity Checks
4. Nominate candidate pair
5. Keeping paths alive

![ICE Deployment Scenario](image-url)
Purpose of this Draft

- Make it possible to use QUIC in a p2p setting
- Possible use cases:
  - Building block for WebRTC over QUIC
  - ... 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

⊕ No need to change any ICE / QUIC stacks
⊕ Requires running a (non-QUIC) signaling server
⊕ Lots of round trips
Mode 2

1. Gather candidates
2. **Exchanges candidates between peers**
   a. Match candidate pairs
3. Connectivity Checks
4. Nominate candidate pair
5. Keeping paths alive
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 Frame {
    Type (i) = 0x1ce,
    Length (i),
    Data (...),
}

- QUIC then migrates the connection to the nominated candidate pair

⊕ No (non-QUIC) signaling server needed
⊕ What if ICE Connectivity Check and QUIC Path Probe disagree?
Mode 3

1. Gather candidates
2. **Exchanges candidates between peers**
   a. Match candidate pairs
3. **Connectivity Checks**
4. Nominate candidate pair
5. Keeping paths alive
Mode 3: Use Connection Migration to Probe Paths

- Use a proxied QUIC connection for signaling
- 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.

<table>
<thead>
<tr>
<th>Feature</th>
<th>QUIC v1</th>
<th>QUIC Multipath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client can probe (multiple) paths</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Server can probe paths</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Concurrent data transfer on multiple paths</td>
<td>❌</td>
<td>✔️</td>
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</tbody>
</table>
What's next?

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