NETCONF over QUIC

An introduction to the draft RFC and our test implementation

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Why?

- Very useful for deep space network management
- NETCONF is the current industry standard network configuration protocol (defined over SSH/TLS transport, which won’t work in space)
- QUIC provides a reliable transport on top of IP and is suitable for deep space

Intermezzo — QUIC

- Designed to replace TCP:
  - Reliable communication
  - Multiplexed data streams out-of-the-box
  - Powers HTTP/3 (a third of HTTP requests in October 2024 according to Cloudflare)
- QUIC streams:
  - Two kinds: unidirectional, bidirectional
  - Can be initiated by the client or the server
  - Cheap to create and tear-down (e.g. in a single packet, for short payloads)

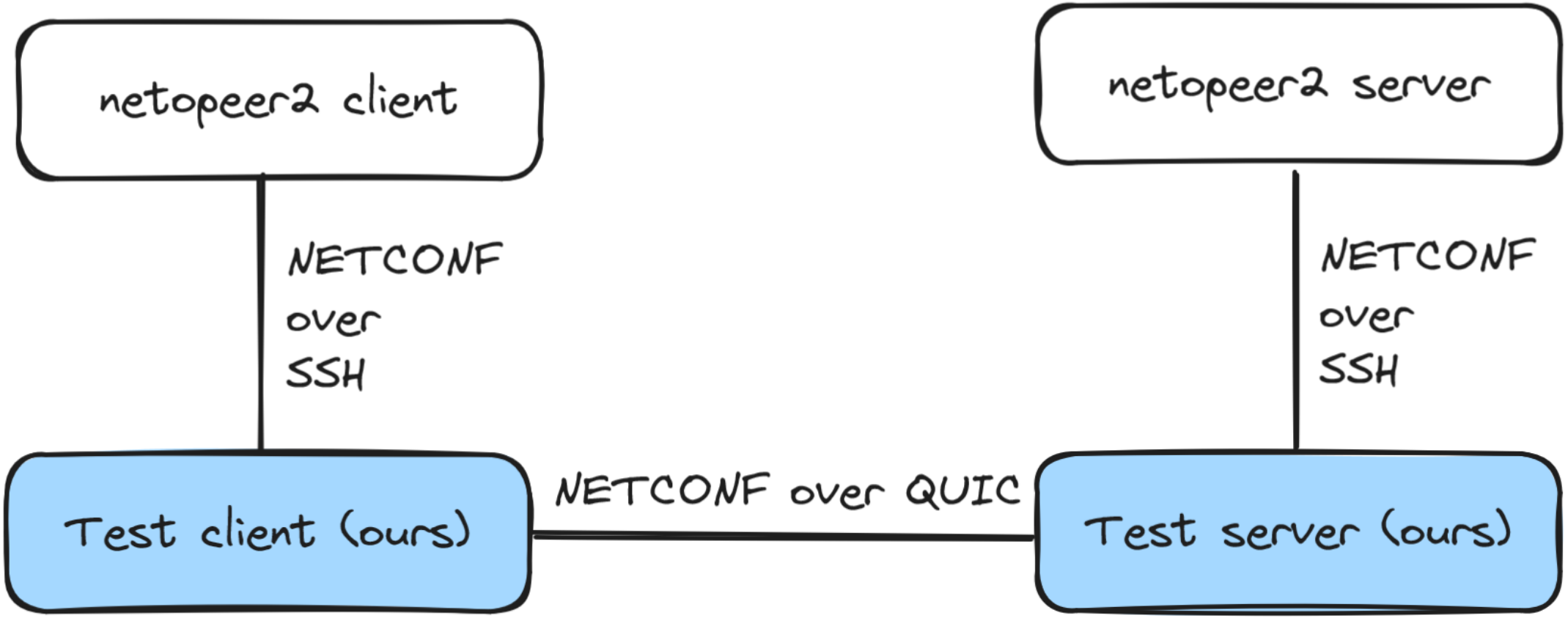
NETCONF mapping over QUIC

Note: the mapping is currently being discussed. This is a proposal by Marc Blanchet and me, and not yet fully incorporated in the draft RFC.

- Authentication happens during the handshake using TLS certificates.
- `<hello>` message exchanged in a bidirectional stream, started by the client. Framing is implicit (provided by the stream abstraction).
- `<rpc>` and `<rpc-reply>` exchanged in bidirectional streams, started by the client (each request gets its own stream). Framing is implicit.
- `<notification>` events are received in a single unidirectional stream, started by the server upon subscription. Framing of notification messages is analogous to NETCONF over SSH (RFC7589).

Test implementation

- Fully working NETCONF over QUIC, as a proxy to netopeer2 on both directions
- Meant as a POC, not for deployment



Demo

Implementation details

- Open source, available here along with usage instructions
- Written in Rust and using the Quinn implementation of the QUIC protocol
- Need more testing to ensure everything works properly
- Need to test the protocol bits with delays and disruptions (should work out-of-the-box)