Use Cases and Requirements for
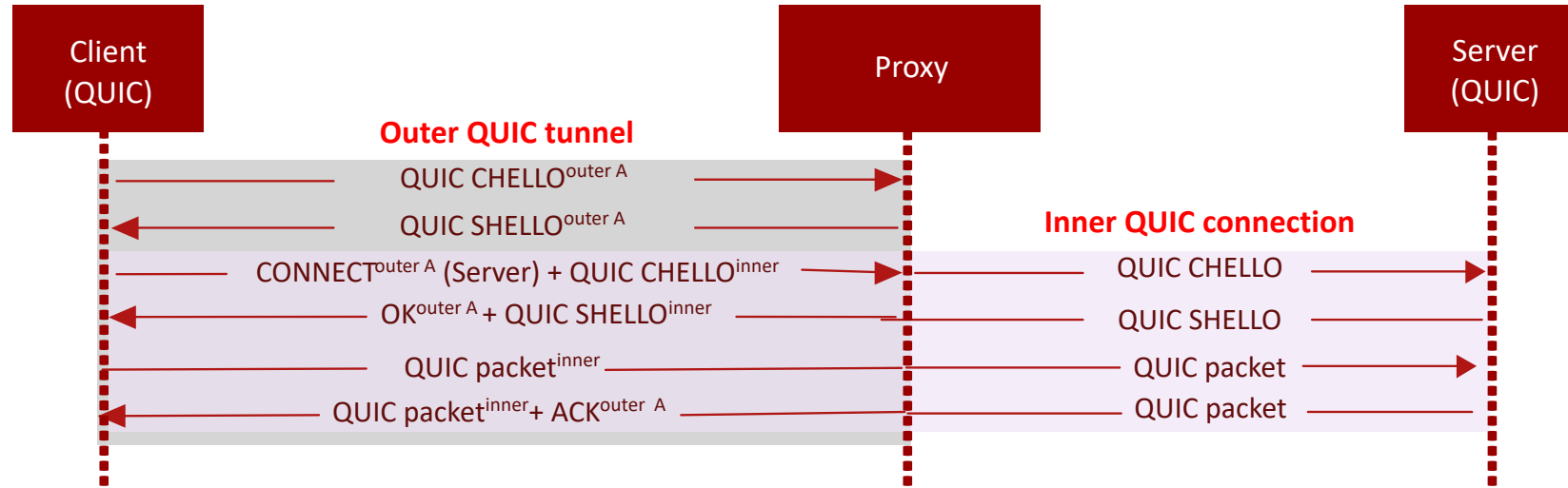# QUIC as a Substrate

Goal

— Use QUIC a substrate/tunnelling protocol to proxies/VPN server/load balancers...
  — Utilize QUIC's ability to multiplex, encrypt data, and migrate between network paths

— Make network support functions collaborative and explicit
  — Client and/or server selects proxy and function
  — Tunnelling and encryption protects information exchanged with a proxy from other network interference

Approach
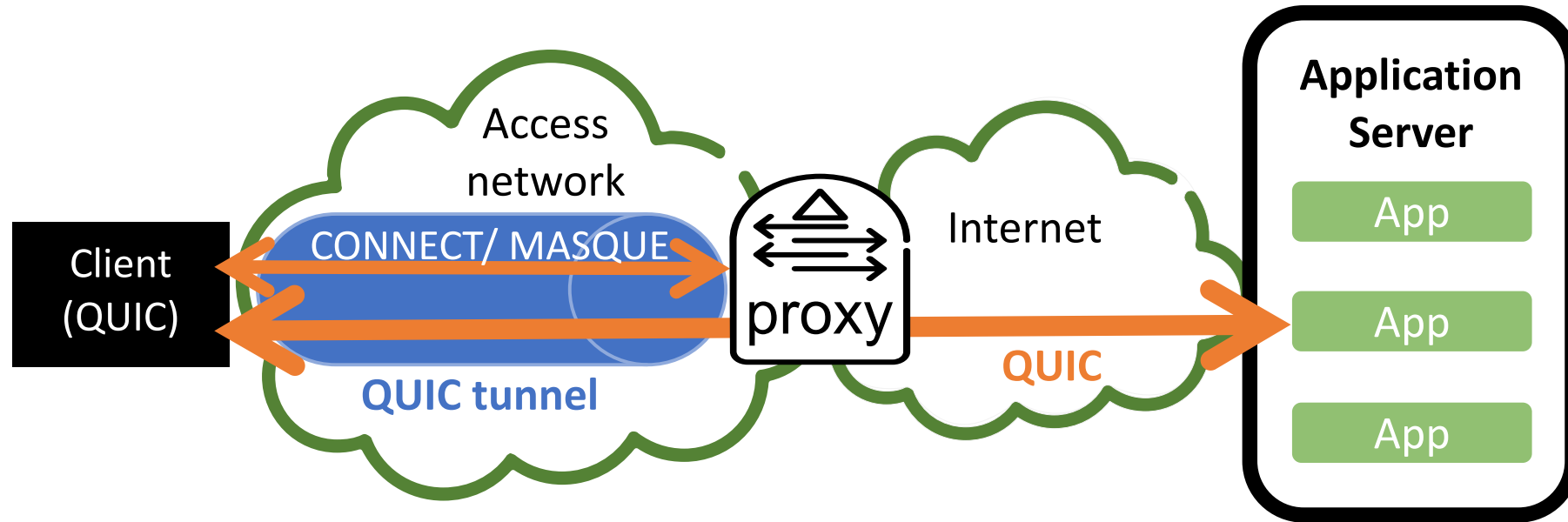
— Client explicitly opens QUIC tunnel connection to proxy
   — use of HTTP CONNECT and MASQUE for forwarding, authentication, and configuration
— QUIC proxy provides secure forwarding and performance enhancement services
   — e.g. congestion control support (mobile/satellite), access policy enforcement, load balancing/mobility, multi-hop chaining/onion routing
— QUIC proxy may optionally also open a tunnel to server (if supported by server)

Connection Establishment

Client (QUIC)   **Proxy**   **Server (QUIC)**

Outer QUIC tunnel

Inner QUIC connection

QUIC CHELLO$^{outer\ A}$

QUIC SHELLO$^{outer\ A}$

CONNECT$^{outer\ A}$ (Server) + QUIC CHELLO^{inner} QUIC CHELLO

OK$^{outer\ A}$ + QUIC SHELLO^{inner} QUIC SHELLO

QUIC packet^{inner} QUIC packet

QUIC packet^{inner} + ACK$^{outer\ A}$ QUIC packet

Usage Scenarios
draft-kuehlewind-quic-substrate

- **Obfuscation via Tunnelling**
  - Client knows proxy and connects to request forwarding
    - Client and proxy have a trust relationship and can optionally authenticate each other (see MASQUE)
  - Server is not aware of the proxy and does not see the clients IP address
- **Advanced Support of User Agents**
  - Proxy provides additional functionality (located "close" to the client e.g. access network)
  - Clients request function and may provide information to the proxy; optionally server can be aware
  - **Security and Access Policy Enforcement**
- **Frontend Support for Load Balancing and Migration/Mobility**
  - (Reverse) proxy may or may not be under the the same administrative domain as the service provider
  - Proxy supports load balancing and/or mobility without terminating the e2e/app security association
  - **IoT Gateways**
- **Multi-hop Chaining (aka Onion Routing)**

Requirements and Open Issues

— Trust and authentication
— Control protocol and support functions
— Discovery

Drafts

— QUIC as a Substrate - https://tools.ietf.org/html/draft-kuehlewind-quic-substrate-00
— MASQUE - https://tools.ietf.org/html/draft-schinazi-masque
— HTTP Transport Authentication - https://tools.ietf.org/html/draft-schinazi-httpbis-transport-auth-00

— Also, previous and related drafts:
    — HELLIUM - https://tools.ietf.org/html/draft-schwartz-httpbis-helium
    — HINT - https://tools.ietf.org/html/draft-pardue-httpbis-http-network-tunnelling
    — QUIC Datagram - https://tools.ietf.org/html/draft-pauly-quic-datagram