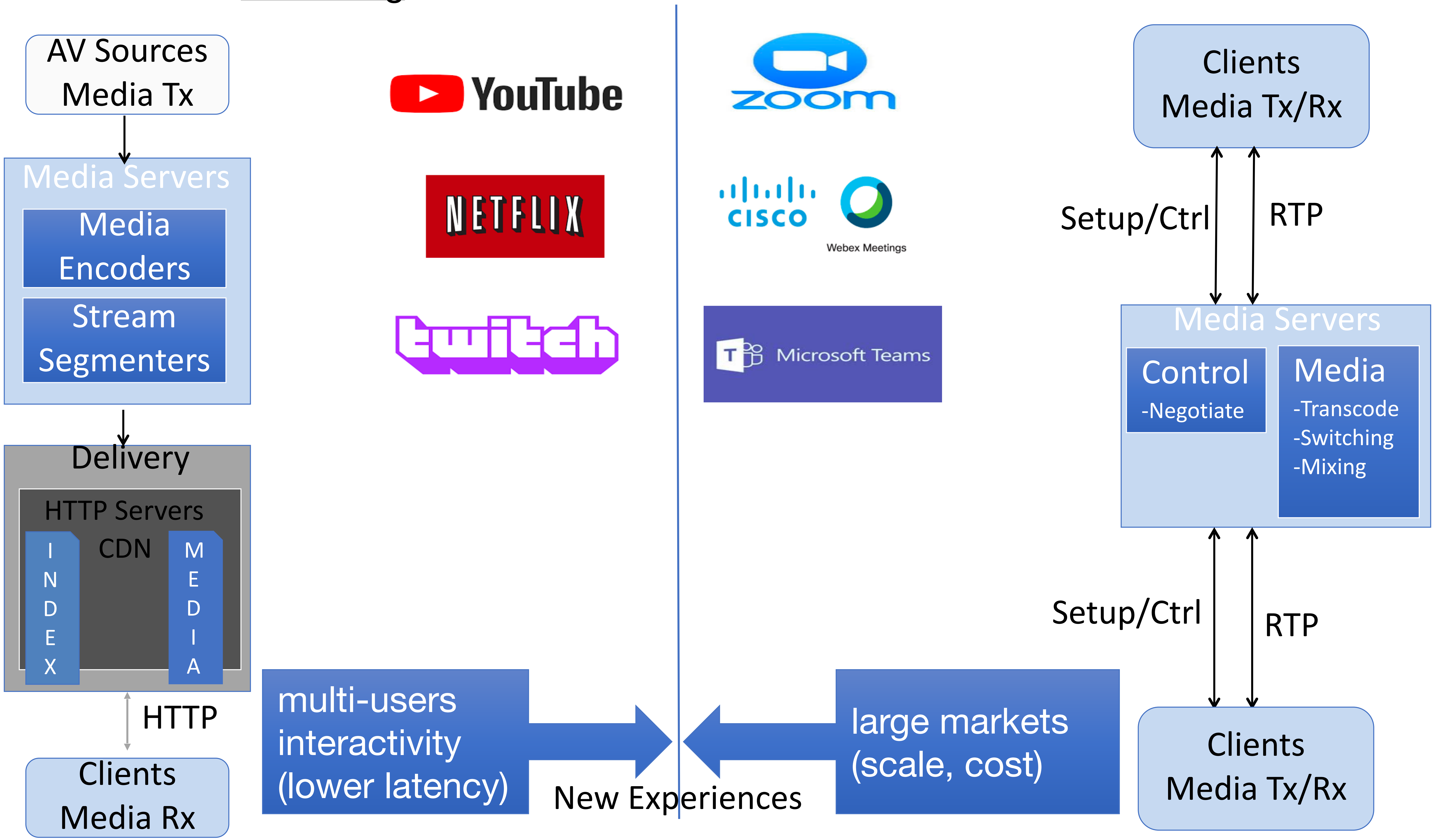
QuicR
Media delivery protocol over QUIC

IETF 114

Cullen Jennings. Suhas Nandakumar, Christian Huitema

Unifying Multimedia Streaming and Interactive Communication



Streaming

AV Sources
Media Tx

Media Servers
Media Encoders
Stream Segmenters

Delivery
HTTP Servers
CDN
INDEX
MEDIA

HTTP

Clients
Media Rx

Interactive Communication

Clients
Media Tx/Rx

Setup/Ctrl
RTP

Media Servers
Control
-Negotiate
Media
-Transcode
-Switching
-Mixing

Setup/Ctrl
RTP

Clients
Media Tx/Rx

multi-users interactivity (lower latency)

large markets (scale, cost)

New Experiences

Usecases (Lower latency, Interactivity, Scale)

- Watching a soccer game live, but at same time using your mobile phone to watch a feed of camera over the goal that is "real time"
- Large company wide meetings or conferences where lots of people are watching, but during the Q & A any of them can switch to become an active participant.
- E sports streaming where commentators and players can react real time to fans comments vs have a significant delay from when the fan makes a comment to when the fan hears or sees the commentator's reaction to it.
- < your favorite here >

QuicR

Publish/Subscribe based end-to-end encrypted media delivery protocol

Unifies streaming and interactive media flows

Caches and Relay Friendly

Common ingest and distribution protocol

Supports QUIC Streams and QUIC Datagrams (API controlled per media stream) - in end points and relays.

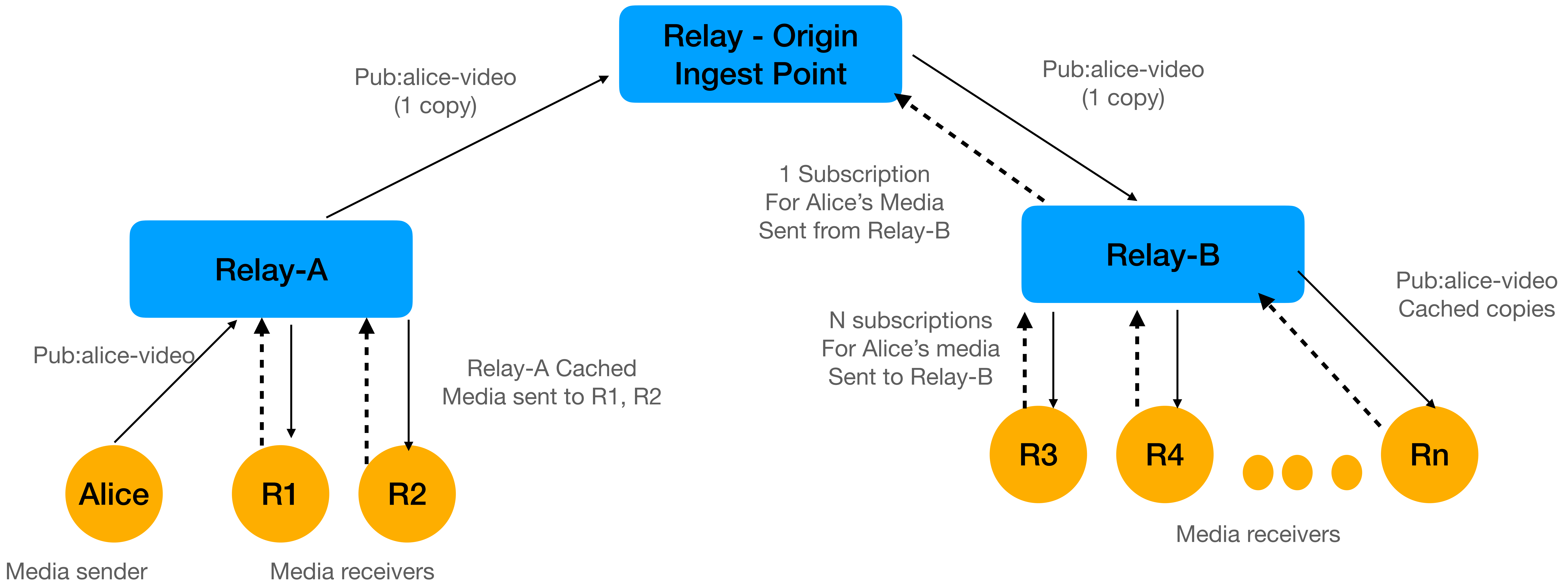
Control streams for configuring media streams and Media Streams for delivering media

Knobs to rate control/react to congestion at media senders (sources, relays)

QuicR - Pub/Sub Protocol

- Media Senders **post media objects and segments** as named resources
- Media Receivers **request for the same** by sending subscribes to the name
- **QuicR Names ~= HTTP Resource Names**
  - Unique and specific to a domain
  - Identify a cacheable resource
  - Authorized for use
    Names support **prefixing/wildcarding,** allowing clients make one request with prefix than multiple requests for each resource
    - Eg: Get me all video from channel-22 [channel-22/video/*]

QuicR Ingest/Distribution Topology



Relay - Origin Ingest Point

Pub:alice-video (1 copy)

Pub:alice-video (1 copy)

1 Subscription For Alice's Media Sent from Relay-B

Relay-A

Relay-B

Pub:alice-video Cached copies

Pub:alice-video

Relay-A Cached Media sent to R1, R2

N subscriptions For Alice's media Sent to Relay-B

Media sender

Media receivers

Media receivers

- - - - - - ▶ **Subscriptions to Media, quicr://abc.com/channel-22/alice/***

⟶ **Media publish flow**

QuicR - Relays

Store/Selective Forward Behavior

Handles name subscriptions

Distributes media objects matching name/name-prefix to subscribers

Has no access to media, but can read transport metadata (authenticated)

Metadata specifies - priority/best-before and drop/store encoded as 8 bit flags to handle congestion

Metadata includes group and object information to form full segments (and cache)

Fragmented media are sent as-is to keep latencies low (**pipelining**)

QuicR - Media objects

Media is divided in to groups of objects

For video, each group represent “group of pictures”

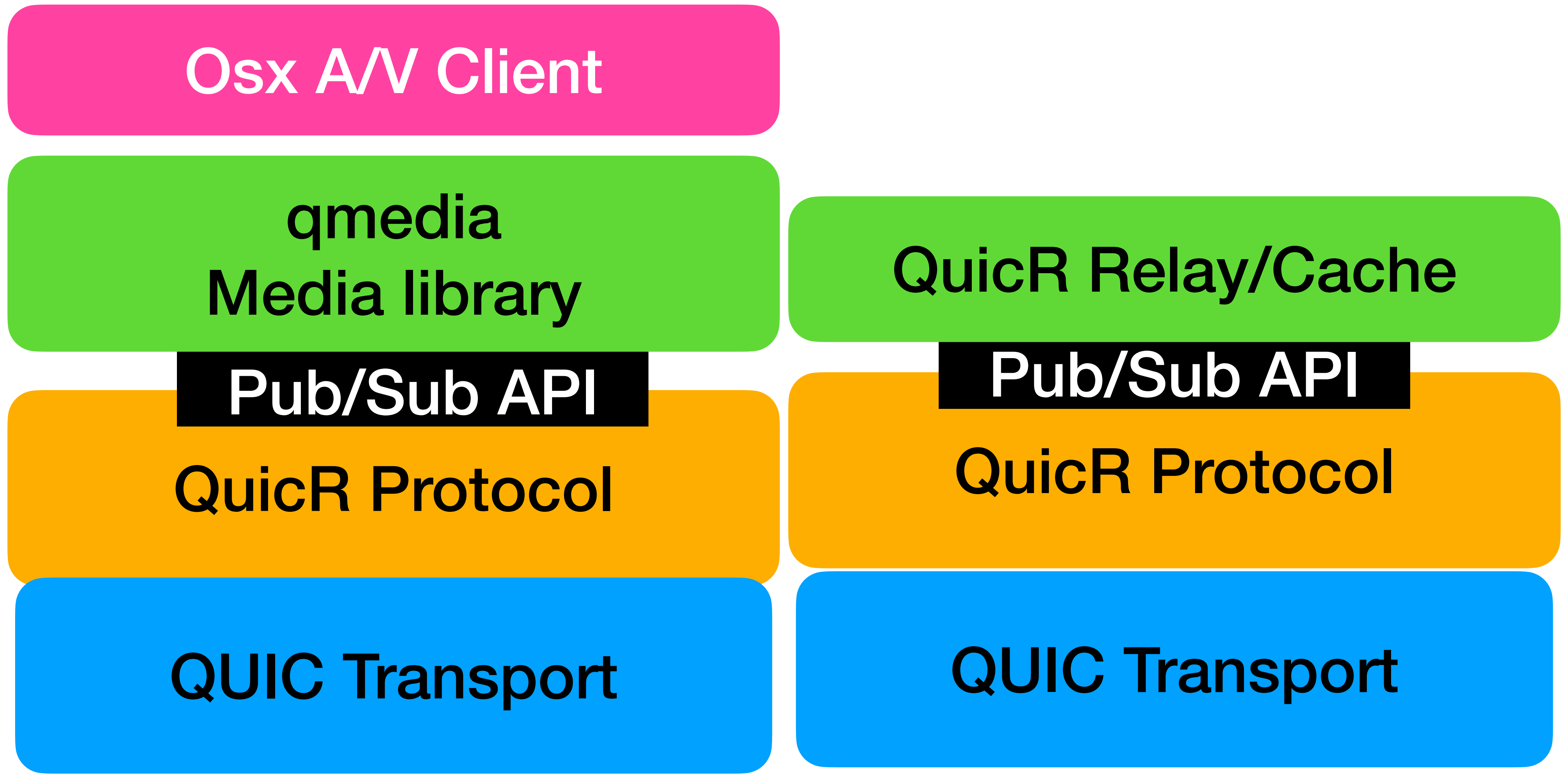
- [IDR frame, P1, P2, ….]

For audio, each object belong to its own group

Each object is uniquely identified

Client’s can ask media per group instead of per object

QuicR Early Prototype



Osx A/V Client

qmedia
Media library

Pub/Sub API

QuicR Protocol

QUIC Transport

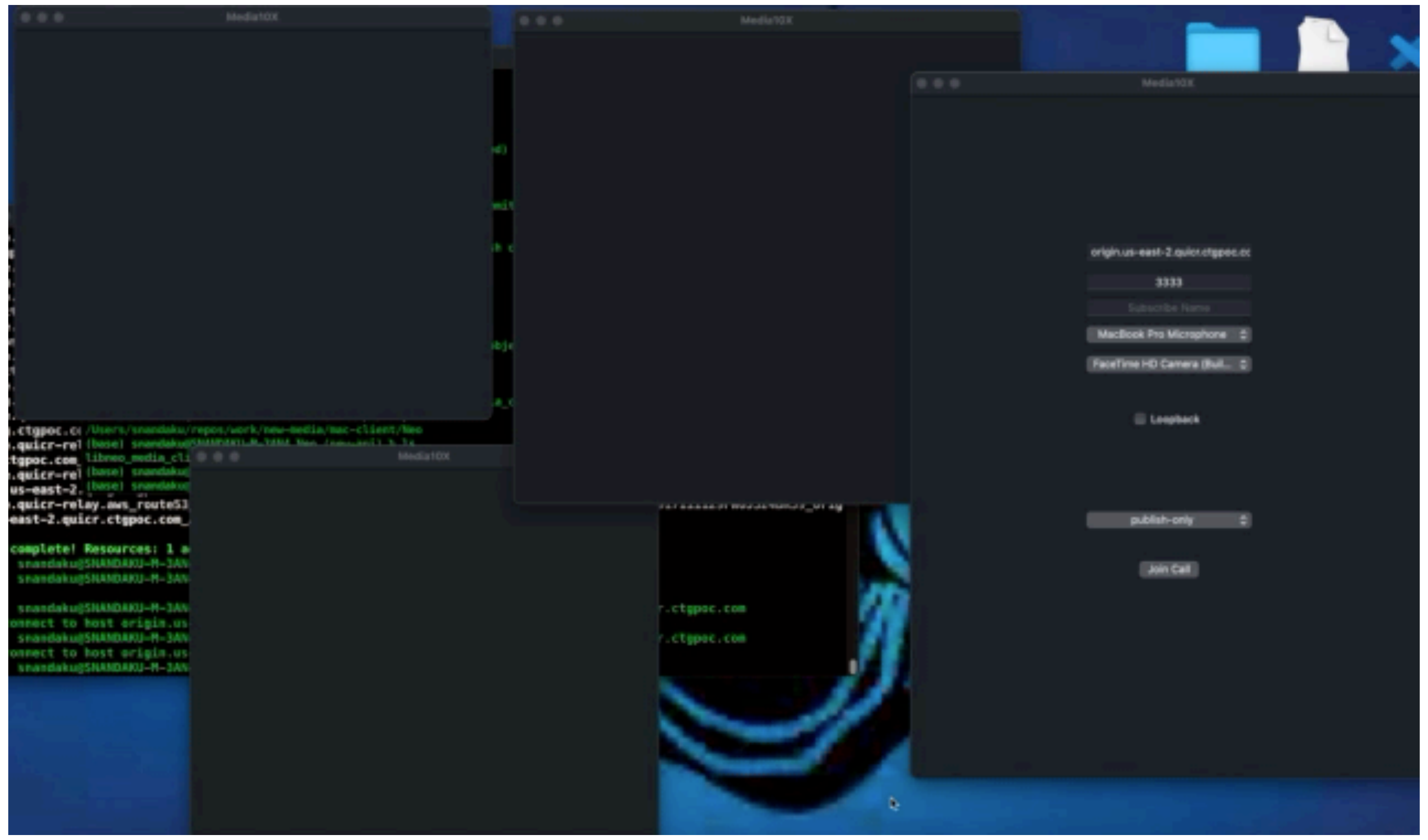
QuicR Relay/Cache

Pub/Sub API

QuicR Protocol

QUIC Transport

Media Client Stack with QuicR **Relay Stack with QuicR**



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tgpoc.com libneo_media_cli
.quicr-rel (base) snandaku
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onnect to host origin.us
 snandaku@SNANDAKU-M-3AN
```

origin.us-east-2.quicr.ctgpoc.cc

3333

Subscribe Name

MacBook Pro Microphone

FaceTime HD Camera (Buil...

□ Loopback

publish-only

Demo

- Relay deployed in Ohio AWS Cluster
- One media sender (opus 48khz, h264 720p)
- 3 media receivers
- Performance seems to be comparable to interactive experiences.

https://github.com/Quicr/qmedia/blob/main/README.md

Advantages

Support low latency media delivery comparable to RTP via

- efficient pipelining,
- Name prefixing,
- QUIC Datagram delivery

Support scalability comparable to streaming media

- RTP Scaling is expensive and may not be possible at this scale
- Effective use of relays/caches (akin to CDN)

Enables converged use-cases that needs seamless switching between interactive and streaming experiences

Unified Protocol across media contribution and distribution

<fin>