WEBTRANS WG
IETF 109

Virtual Meeting

Monday, November 16, 2020

09:00 - 11:00 UTC

1:00 - 3:00 AM Pacific Time

Mailing list: webtransport@ietf.org
Jabber Room: webtrans@jabber.ietf.org
MeetEcho link: http://www.meetecho.com/ietf109/webtrans/

IETF 109 Meeting Tips

https://www.ietf.org/how/meetings/109
https://datatracker.ietf.org/meeting/agenda

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IETF 109 Meeting Tips

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Definitive information is in the documents listed below and other IETF BCPs. For advice, please talk to WG chairs or ADs:

- BCP 9 (Internet Standards Process)
- BCP 25 (Working Group processes)
- BCP 25 (Anti-Harassment Procedures)
- BCP 54 (Code of Conduct)
- BCP 78 (Copyright)
- BCP 79 (Patents, Participation)
- https://www.ietf.org/privacy-policy/(Privacy Policy)

About this meeting

- Agenda: https://datatracker.ietf.org/doc/agenda-109-webtrans/
- CodiMD (for notes): https://codimd.ietf.org/notes-ietf-109-webtrans
- Jabber Room: webtrans@jabber.ietf.org
- Secretariat: mtd@jabber.ietf.org
- WG Chairs: Bernard Aboba & David Schinazi
- Jabber Scribe:
- Note takers:

Agenda

- 16:00 – 16:10 Preliminaries, Chairs (10 minutes)
  - Note Well, Virtual Bluesheets
  - Jabber Scribe, Etherpad Note Takers
  - Speaking Queue Manager (David Schinazi)
  - Agenda Bash
- 16:10 - 16:15 W3C WebTransport Update, Will Law, (5 minutes)
- 16:15 - 16:25 WebTransport Developer Feedback, Luke Curley (10 minutes)
- 16:25 - 16:40 WebTransport Overview and Requirements, Victor Vasiliev (15 minutes)
  - https://tools.ietf.org/html/draft-ietf-webtrans-overview
- 16:40 - 16:55 WebTransport using HTTP/2, Eric Kinnear (15 minutes)
  - https://tools.ietf.org/html/draft-kinnear-webtransport-http2
- 16:55 - 17:10 WebTransport over QUIC, Victor Vasiliev (15 minutes)
  - https://tools.ietf.org/html/draft-vvv-webtransport-quic
- 17:10 - 17:30 WebTransport over HTTP/3, Victor Vasiliev (20 minutes)
  - https://tools.ietf.org/html/draft-vvv-webtransport-http3
- 17:30 - 18:00 Wrap up and Summary, Chairs & ADs (35 minutes)

W3C WebTransport Update

- The WorkGroup Charter has been published at https://w3c.github.io/webtransport-charter/charter.html
- WG created https://www.w3.org/groups/wg/webtransport
- Inaugural meetings held during W3C TPAC in October.
- Meetings are held bi-weekly at an alternating timeslot of 07:00 and 16:00 PT. For all info regarding meetings along with joining instructions, please see the wiki at https://www.w3.org/wiki/WebTransport
- Editors announced
  - Bernard Aboba (Microsoft Corporation)
  - Victor Vasiliev (Google)
  - Yutaka Hirano (Google)
- CFC issued to adopt WICG specification as WebTransport WG deliverable. The repository can be found at https://github.com/w3c/webtransport and the formatted spec at https://w3c.github.io/webtransport/

WebTransport Developer Feedback (10 minutes)

Presentation End: 16:15

Luke Curley

WebTransport origin trial

Available in Chrome & Edge 84-88!

https://web.dev/quictransport/

Uses QUIC draft-29 (requires M85+).

Updated Demo (requires Chrome M87+):

https://webrtc.internaut.com/quic/newtrial2.html

API Introduction (Starts at Slide 33):

https://docs.google.com/presentation/d/1xx1MLjxY-ZiWQBxivJCITmvKrHdW3AMuz-DxDOrAcdw/

Developer Feedback

Luke Curley <kixelated@gmail.com>
Twitch / Amazon IVS

Problem

Head of line blocking!

Contribution uses RTMP.

- Congestion causes back-pressure and increases latency.

Distribution uses HLS.

- Congestion causes buffering and increases latency.

Solution

Deliver media via multiple streams.

- Multiplexed to avoid head-of-line blocking.
- Prioritized to deliver important media first.

QuicTransport!

- Wrote our own QUIC implementation.
- Production experiments starting next year.

HTTP/3

Why not HTTP/3?

- HTTP push is… difficult.
- Different APIs for contribution and distribution.
- Would not have CDN support.

Why QuicTransport?

- QUIC provides a great API and set of features to build upon.
- Datagrams are a potential fallback.

Chrome Bugs

Found numerous bugs.

- 1123766 - No graceful close for unidirectional streams.
- 1123772 - Remotely initiated bidirectional streams are unusable.
- 1123769 - Locally initiated bidirectional streams are write-only.
- 1129597 - QuicTransport uses an entire CPU core.

Stream state machine is difficult to implement

- ex. half-closed

Desired Functionality

Stream prioritization.

Not all streams are equally important.

BBR2

Better congestion control for emerging markets.

Datagram Congestion Control?

Need back-pressure to avoid excess loss.

Developer Feedback

Bernard Aboba
Microsoft Corporation

Requirements and features for WebTransport Use-Cases

Category	Use-case	Description	Reliable	Unreliable	Ordered	Unordered
Machine learning	Speech translation/emotion analysis -	Sending audio/video data from client to server for analysis and receiving translated data/text/audio in return.	✓	☐	✓	☐
Machine learning	Security camera analysis	data and/or video sent to cloud service for analysis. Service may return data instructions.	✓	☐	✓	☐
Multiplayer gaming	Game play instrucitons	sent from client to cloud based game engine. Some instructions are time sensitive (such as location data) , others are stateful (avatar selection). Dataflow is bi-directional. Client/Server and p2p flows.	☐	✓	☐	✓
Multiplayer gaming	AR gaming	requires real-world interaction, including virtual theatre - geo-separate actors with virtual backgrounds.	✓	✓	✓	✓
Low latency live streaming	Unidirectional Broadcast	one to many - sports events, news, wagering, latency equivalent to social media delay and quality to support UHD, HDR, HFR, DRM.	✓	☐	✓	☐
Low latency live streaming	Bi-directional few-to-few video chats	reduced connection time/complexity compared to WebRTC. Example - Apple Facetime	✓	☐	✓	☐
Cloud Game Streaming	Streaming a server-rendered game to a thin client	Transmitted to client with minimal latency. Google Stadia is an example	✓	☐	✓	☐
Cloud Game Streaming	Bi-directional game play instructions	Both server-client and p2p.	☐	✓	☐	✓
Server-based video conferencing	MCU/SFU video conferencing	Simpler session establishment.Censorship circumvention - preventing fingerprinting and identification during session establishment.	✓	☐	✓	☐
Remote desktop	Remote tech support for IT admins	Transmission of screen capture/sharing and control instructions. Collaborative work on a shared screen. Including scaling to very large audiences. Online document sharing.Remote assistance temporarily "taking over" control of a system	✓	☐	✓	☐
Multimedia Web communications	Time Synchronized Multimedia Web communications	Combining geo-separate singing and/or instruments together online with precise time synchronization	✓	✓	✓	✓
Data transfer	IOT sensor and analytics data transfer	Efficient and intermittent transmission of data. For example - sending a 1 bit flag, GPS position updates, mouse clicks on site etc. Sensor data upload - including filters, aggregation, triggers.	✓	✓	✓	✓
Publication/Subscription Services	Enhanced Pub/Sub deployments	Social feeds - Twitter etc, Financial tickers. Messaging platforms, including Enterprise messaging infrastructure	✓	☐	✓	☐

Source: W3C WebTransport WG TPAC 2020 slides

WebTransport Use Cases

Low Latency Streaming

Game streaming: Client/Server + P2P

Remote Desktop: Client/Server + P2P

Large scale events (10K+ participants)

Enterprise: Company meetings

Consumer: concerts, political gatherings, sporting events, etc.

Feedback on Low Latency Streaming

- Gaming and remote desktop use cases (QuicTransport)
- Competition: WebRTC (data channel and/or RTP audio/video)
  - Support for both client/server and P2P use cases
  - Ability to support both client/server and P2P with a single code base more important than removal of ICE dependency
  - Strong interest in RTCQuicTransport (P2P) extension to QuicTransport
- Feedback
  - QuicTransport performance issues
    - Performance a major motivation for migration from data channel, but...
    - High CPU utilization on low end HW (e.g. game consoles)
    - High loss rate with datagrams
      - QuicTransport not an improvement over data channel backpressure issues (solved at application layer).
  - DevOps issues
    - Support for connection migration and draining
  - Bandwidth allocation between datagram flows and streams
    - Example: ensure that control traffic is not choked off by A/V

Feedback on Event Streaming

- Http3Transport use case, competing against HLS
- Desire to leverage cloud infrastructure and CDNs
- Problem: Http3Transport ecosystem concerns
  - Will Http3Transport be supported on mobile platforms?
  - Will Http3Transport be widely supported in browsers?
    - Complexity of protocol and pooling with HTTP/3 raises interop concerns.
  - Will Http3Transport be supported in HTTP/3 servers?
    - Interest among HTTP/3 server vendors?
    - May require frameworks (e.g. python + aioquic or node.js (no QUIC support on the horizon)
  - Will Http3Transport be supported by CDNs?
  - Will Http3Transport (or HTTP/3) be embraced by enterprise?
    - HTTP/2 not widely deployed today.
    - Concern about Http2Transport viability as a fallback

WebTransport Overview and Requirements (15 minutes)

Presentation End: 16:45

Victor Vasiliev

https://tools.ietf.org/html/draft-ietf-webtrans-overview

Goal of this document

“To assist in the coordination with owners of the WebTransport API, the group will initially develop an overview document containing use cases and requirements in order to clarify the goals of the effort. The requirements will include those arising from the WebTransport API.”

(from the charter)

Updates since last IETF

- All of the old issues still open at <https://github.com/ietf-wg-webtrans/draft-ietf-webtrans-overview/issues>
- Adding headers as a part of the model

PR #4: headers

https://github.com/ietf-wg-webtrans/draft-ietf-webtrans-overview/pull/4

- Adds HTTP-style headers to WebTransport as a common requirement for all transports.
- Proposed headers:
  - Origin
  - :scheme, :authority, :path
  - :status

Discussion

WebTransport using HTTP/2 (15 minutes)

Presentation End: 16:55

Eric Kinnear

https://tools.ietf.org/html/draft-kinnear-webtransport-http2

Http2Transport

draft-kinnear-webtransport-http2-01

Alan Frindell, Eric Kinnear, Tommy Pauly,
Victor Vasiliev, Guowu Xie

WEBTRANS

IETF 109, November 2020, Virtual

Since IETF 108

GitHub issue discussion

Pull requests

Holding for document update

Need WG decisions

#5 Unidirectional streams

> All transport protocols MUST provide datagrams, unidirectional and bidirectional streams in order to make the transport protocols easily interchangeable.

Do we want to use half-closed (local | remote) streams?

Or simply bar endpoints from sending data in one direction for a unidirectional stream

Establishing different types of streams requires metadata, does this impact our choices for HTTP/3 mapping vs. QUIC equivalent?

#5 Unidirectional streams

> All transport protocols MUST provide datagrams, unidirectional and bidirectional streams in order to make the transport protocols easily interchangeable.

Additional field in WTHEADERS to specify uni/bi-directionality

Unidirectional streams start in “half-closed” state

Maps nicely to HTTP/3 and QUIC

#3 New streams without additional roundtrips

> Each new stream would require a WebSocket handshake to agree on application protocol used, meaning that it would take at least one RTT to establish each new stream before the client can write to it.

HTTP/2 can establish a new WebTransport stream with a single RTT

HTTP/3 and QUIC may not be able to do this, inversion of the usual situation

Need to be able to allow the experience to degrade gracefully, while ensuring the application remains fully aware of what features are available

- Spectrum of Require/Prefer/Avoid/Prohibit

#6 Datagrams

> The WebTransport sender is not expected to retransmit datagrams, though it may if it is using a TCP-based protocol or some other underlying protocol that requires reliable delivery.

Applications need to know what they requested vs. what they got

Dedicated datagram stream?

New frame?

WTHEADERS per datagram?

#6 Datagrams

> The WebTransport sender is not expected to retransmit datagrams, though it may if it is using a TCP-based protocol or some other underlying protocol that requires reliable delivery.

Proposal for DATAGRAM frame in HTTP/2

See previous conversation about being aware of what features are available

Will be true for all fallbacks to TCP

What's next?

Bidirectional stream transport over HTTP/2 is interesting for WebTransport, also carries potential for TCP fallback from QUIC

Ability to coexist and [de]mux with HTTP flows on existing connections, shared congestion control

Traverses intermediaries, low complexity on top of HTTP/2

Remaining implementation details are less important than deciding on a direction as a WG

Questions?

WebTransport over HTTP/3
WebTransport over QUIC
(35 minutes)

Presentation End: 17:30

Victor Vasiliev

https://tools.ietf.org/html/draft-vvv-webtransport-http3

Http3Transport

...is like Http2Transport, but over HTTP/3!

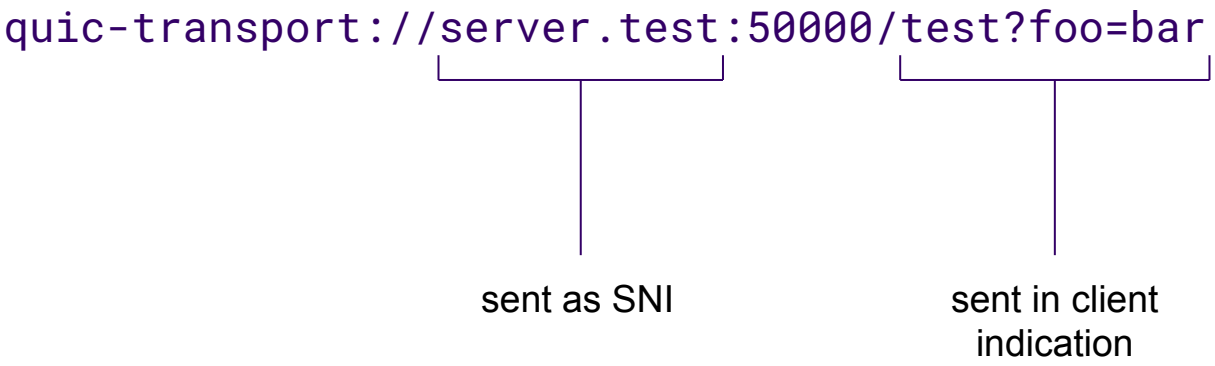
- Datagram support using draft-schinazi-quic-h3-datagram-03
- Draft is currently in process of being converged towards design choices outlined in draft-kinnear-webtransport-http2-01:
  - SETTINGS-based negotiation
  - Using stream IDs to associate WebTransport streams with a CONNECT stream
  - Pull request: https://github.com/vasilvv/webtransport/pull/21

QuicTransport

Minimal protocol on top of QUIC

- ALPN value (“wq”)
- URI scheme
- **New!** Fully-featured request and response headers.
  - Origin header for CORS
  - :scheme/:authority/:path for request URI
  - :status for response (same codes as HTTP)
- One dedicated QUIC connection per transport session

QuicTransport URI scheme



QuicTransport origin trial

Available in Chrome 84-88!

https://web.dev/quictransport/

Implements QUIC draft-27 (draft-29 starting Chrome 85).

The Great Transport Zoo
Episode 3

Transports proposed so far

- QuicTransport
  A QUIC connection with minimal additions required to make it work with Web security model.
- Http2Transport
  Virtual multiplexed transport inside an HTTP/2 connection.
- Http3Transport
  Virtual multiplexed transport inside an HTTP/3 connection.
- FallbackTransport (no draft currently)
  Simulation of multiplexed streams on top of WebSocket protocol

Which ones do we actually need?

Overview of proposed transports

	Dedicated	**Pooled**
QUIC-based	QuicTransport	Http3Transport
TCP-based (fallback)	FallbackTransport	Http2Transport

WebTransport API update

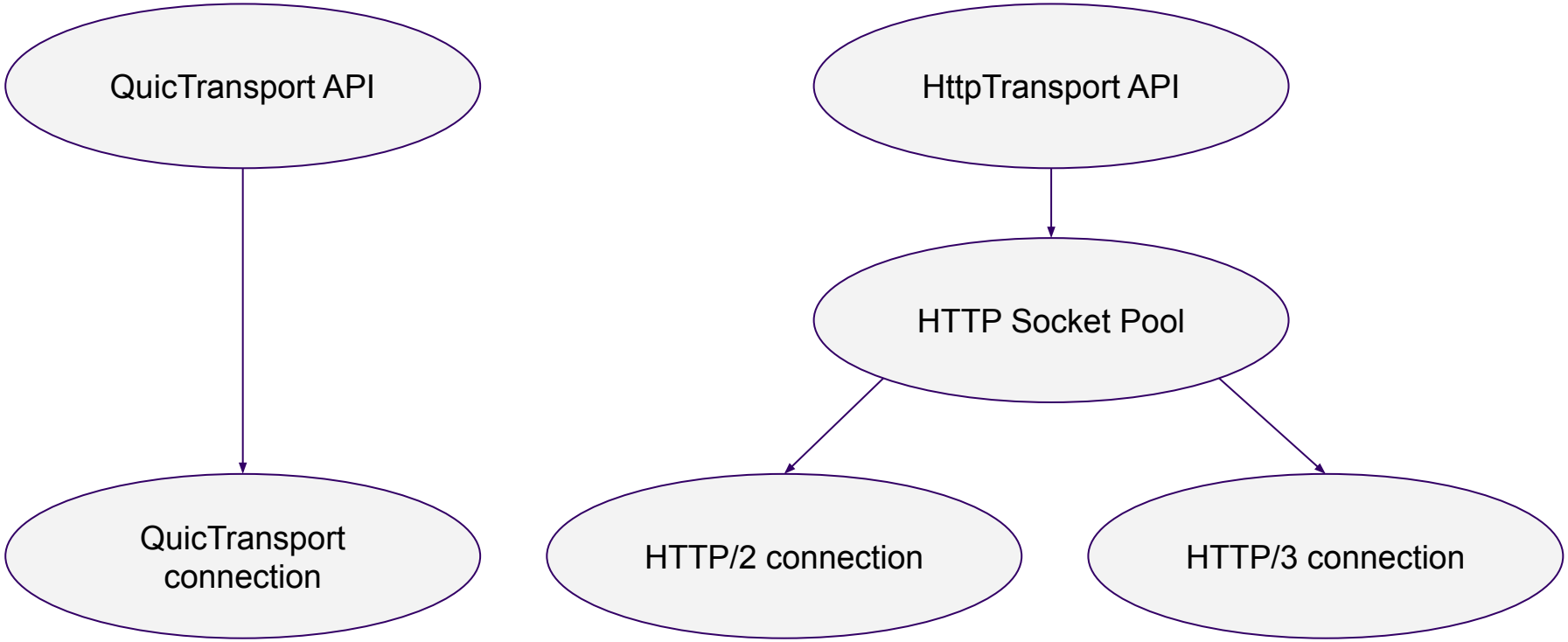
Old approach:

```
let transport1 = new QuicTransport("quic-transport://example.org/endpoint");
let transport2 = new Http3Transport("https://example.org/endpoint");
```

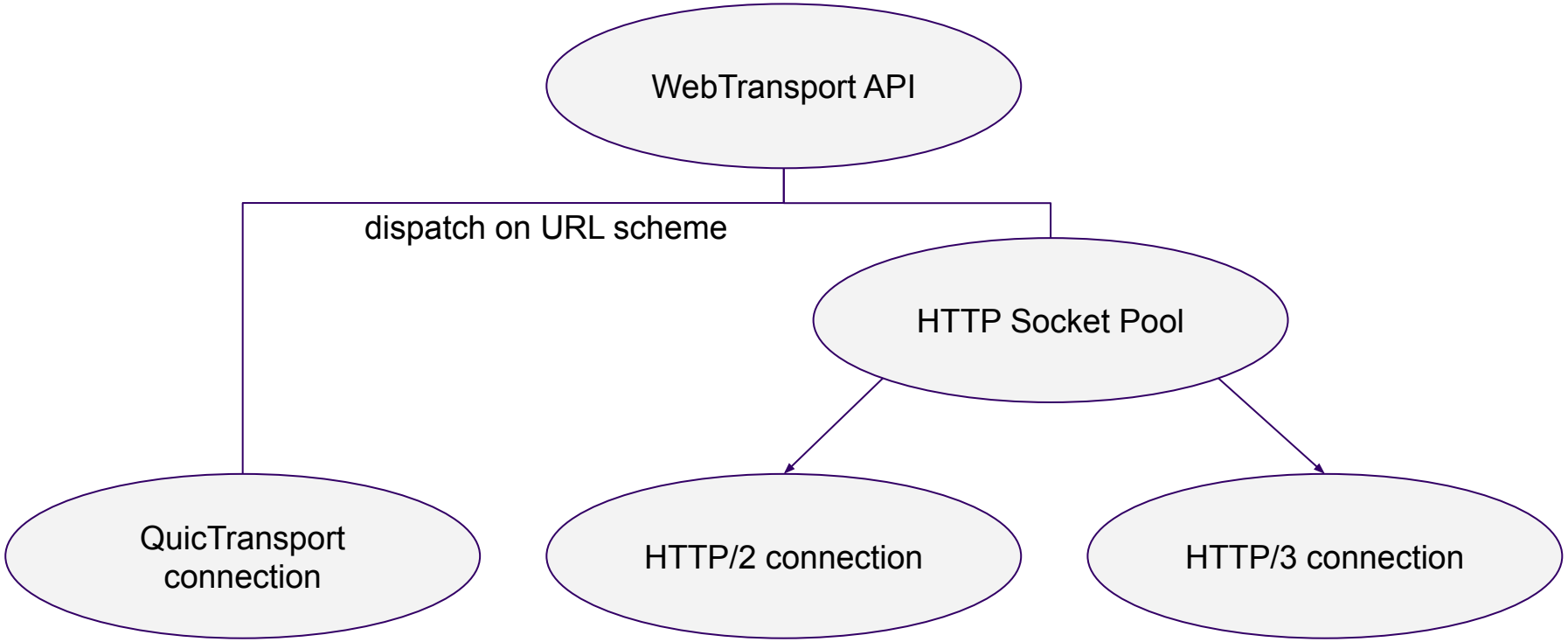
New approach:

```
let transport1 = new WebTransport("quic-transport://example.org/endpoint");
let transport2 = new WebTransport("https://example.org/endpoint");
```

WebTransport (older model)



WebTransport (new model)



Observation

With the recent revision of QuicTransport, there's even less differences between QuicTransport and Http3Transport.

Pooling remains key differentiator between two.

Unified WebTransport Idea

What if we completely abstract protocol selection away?

```
let transport = new WebTransport("wt://example.org/endpoint");
```

This would produce a QUIC connection offering [“h3”, “wq”] as ALPN, and an HTTP/2 connection being potentially raced in parallel.

Doing this allows us to completely separate the question of what WebTransport semantics are from the wire protocol selection.

Path Forward?

Noting that the marginal cost of implementing QuicTransport is now minimal, can we simplify question of “which ones do we actually need”?

Yes, into two questions:

1. Is pooling connections worth it?
2. Is TCP fallback necessary?

Discussion

Adoption Calls, Wrap-up, and Summary (30 minutes)

Session End: 18:00

Bernard Aboba

David Schinazi

Adoption Calls

We're going to hum for adoption of:

- QuicTransport - draft-vvv-webtransport-quic
- HTTP3Transport - draft-vvv-webtransport-http3
- HTTP2Transport - draft-kinnear-webtransport-http2

➡️ But first, open discussion!

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But first, open discussion!

Thank you

Special thanks to:

The Secretariat, WG Participants & ADs

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