

HTTP/3

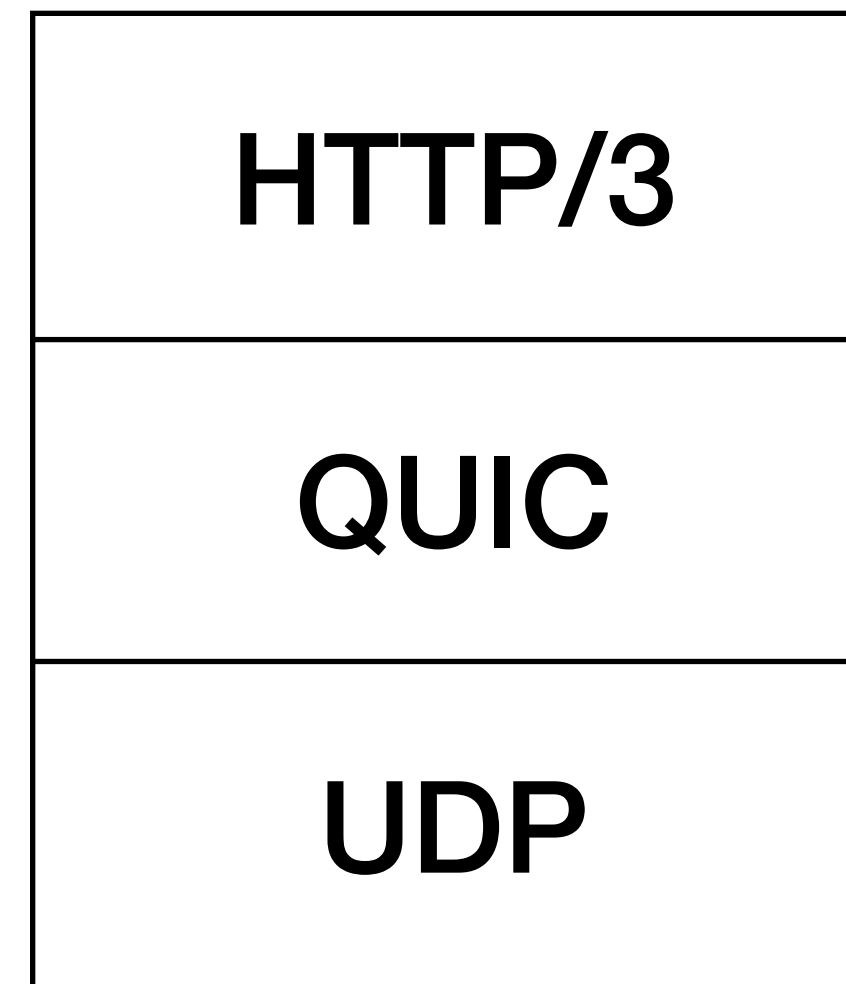
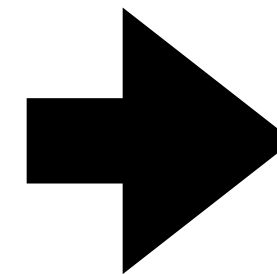
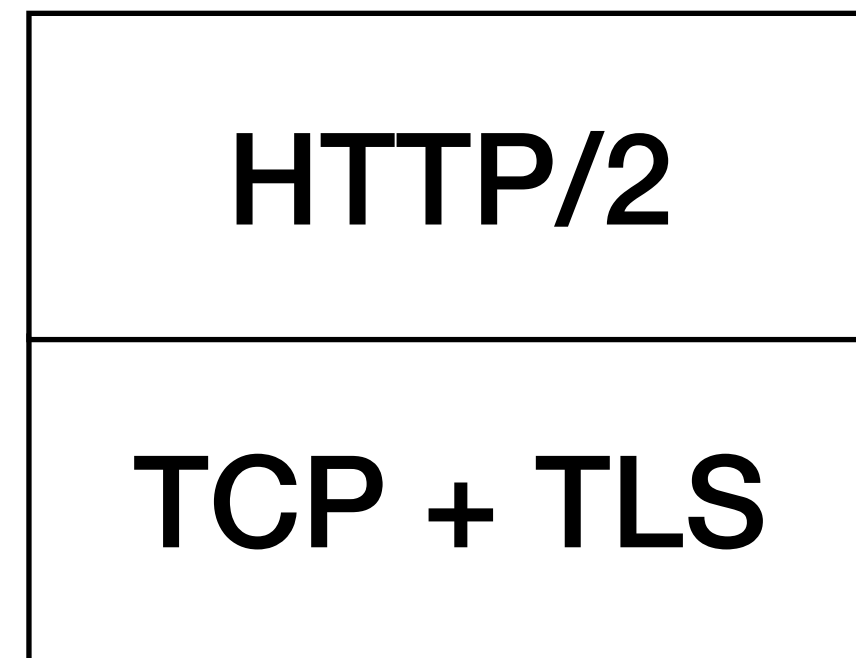
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HTTP/3 and QUIC

Multiplexing
Prioritization
Header Compression

Encryption



Header Compression

Encryption
Multiplexing
Prioritization

Standardizing progress

- 2020-06-09 WG Last Call (draft-29)
- 2020-09-25 Submitted to IESG for Publication (draft-31)
 - QUIC: A UDP-Based Multiplexed and Secure Transport
 - QUIC Loss Detection and Congestion Control
 - Using TLS to Secure QUIC
 - Hypertext Transfer Protocol Version 3 (HTTP/3)
 - Version-Independent Properties of QUIC
 - QPACK: Header Compression for HTTP/3

HTTP/2

- 2014-07-31 WG Last Call (draft-14)
- 2014-12-16 Submitted to IESG (draft-16)
- 2015-05-14 RFC Published (draft-17)

ATS

9.0.x

- Supports draft 27 and 29
 - Only bugs will be fixed
-

master

- Same as 9.0.x at the moment
 - Open for any changes that are applicable for 9.0
 - Autest is available
-

quic_latest

- Open for any changes
- master + performance improvements and additional features

Performance - Throughput

9.0.x: h2load -n 100 -c 10 -m 10 https://localhost:8443/32m

HTTP/2

```
finished in 2.43s, 41.15 req/s, 1.29GB/s
requests: 100 total, 100 started, 100 done, 100 succeeded, 0 failed, 0 errored, 0 timeout
status codes: 100 2xx, 0 3xx, 0 4xx, 0 5xx
traffic: 3.13GB (3357292466) total, 2.81KB (2876) headers (space savings 90.87%), 3.13GB (3355443200) data
```

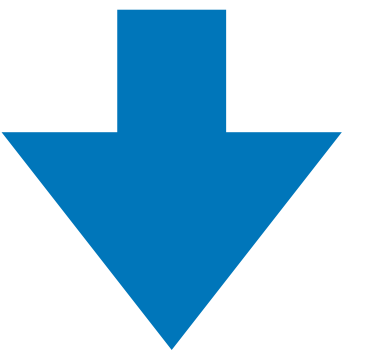
	min	max	mean	sd	+/- sd
time for request:	269.60ms	2.43s	1.61s	570.86ms	65.00%
time for connect:	2.71ms	6.89ms	4.64ms	1.42ms	60.00%
time to 1st byte:	137.78ms	508.46ms	276.62ms	110.39ms	70.00%
req/s	4.12	8.35	5.18	1.42	80.00%

HTTP/3

```
finished in 34.96s, 2.86 req/s, 91.56MB/s
requests: 100 total, 100 started, 100 done, 100 succeeded, 0 failed, 0 errored, 0 timeout
status codes: 100 2xx, 0 3xx, 0 4xx, 0 5xx
traffic: 3.13GB (3355985620) total, 19.92KB (20400) headers (space savings 35.24%), 3.13GB (3355443200) data
```

	min	max	mean	sd	+/- sd
time for request:	2.42s	34.94s	18.14s	10.08s	56.00%
time for connect:	12.65ms	19.12ms	16.56ms	1.72ms	70.00%
time to 1st byte:	16.74ms	26.77ms	21.88ms	3.79ms	70.00%
req/s	0.29	0.35	0.30	0.02	80.00%

14x SLOW



Performance - Req/s

9.0.x: h2load -n 1000 -c 10 -m 10 https://localhost:8443/32k

HTTP/2

```
finished in 45.97ms, 21751.42 req/s, 680.73MB/s
requests: 1000 total, 1000 started, 1000 done, 1000 succeeded, 0 failed, 0 errored, 0 timeout
status codes: 1000 2xx, 0 3xx, 0 4xx, 0 5xx
traffic: 31.30MB (32816300) total, 11.53KB (11810) headers (space savings 96.17%), 31.25MB (32768000) data
```

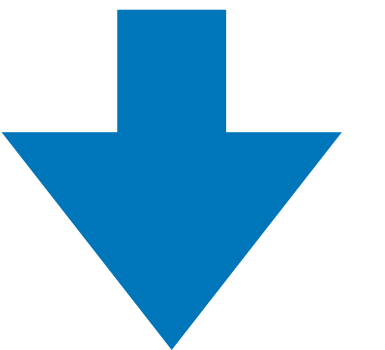
	min	max	mean	sd	+/- sd
time for request:	716us	14.32ms	3.43ms	2.22ms	81.00%
time for connect:	2.76ms	8.28ms	5.06ms	1.80ms	70.00%
time to 1st byte:	5.48ms	13.93ms	9.67ms	2.52ms	60.00%
req/s	: 2206.35	3477.32	2490.04	471.28	80.00%

HTTP/3

```
finished in 375.23ms, 2665.06 req/s, 83.81MB/s
requests: 1000 total, 1000 started, 1000 done, 1000 succeeded, 0 failed, 0 errored, 0 timeout
status codes: 1000 2xx, 0 3xx, 0 4xx, 0 5xx
traffic: 31.45MB (32977120) total, 193.36KB (198000) headers (space savings 35.50%), 31.25MB (32768000) data
```

	min	max	mean	sd	+/- sd
time for request:	3.46ms	137.66ms	28.61ms	15.34ms	84.20%
time for connect:	6.48ms	12.06ms	9.70ms	1.65ms	60.00%
time to 1st byte:	9.46ms	32.64ms	19.60ms	8.80ms	70.00%
req/s	: 266.60	389.63	331.86	45.28	50.00%

8x SLOW



Improvements

9.0.x → quic-latest

h2load -n 100 -c 10 -m 10 https://localhost:8443/32m

	9.0.x	→	quic-latest	
Time for request	18.14s	→	13.23s	27% DOWN
Time to connect	16.56ms	→	10.39ms	37% DOWN
Time to 1st byte	21.88ms	→	18.78ms	14% DOWN
Throughput	91.56MB/s	→	121.07MB/s	32% UP

Slow parts

- Small packet size
- Poor UDP packet handling
- Much work on UDP thread
- Slow ACK processing
- A lot of memory allocation
- Etc.

HTTP/2 8,000 blocks

HTTP/3 1,170,000 blocks

Number of IOBufferBlocks
(128MB download)

Need your help

- Where to start
 - Performance test with profiler
 - GitHub Issues
 - autest
 - Interop tests
 - <https://github.com/quicwg/base-drafts/wiki/20th-Implementation-Draft>