

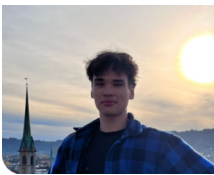
qh:// - The Quite Ok HTTP Protocol

A HTTP-inspired protocol built for ease and efficiency

Students



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Introduction: The World Wide Web is built on HTTP (Hypertext Transfer Protocol), the core application protocol. First introduced in 1991, HTTP has evolved considerably to support the demands of modern web applications. However, this evolution has also increased the protocol's complexity. For example, HTTP/2 introduced HPACK and HTTP/3 implemented QPACK, both of which use dynamic header compression tables. While these mechanisms improve performance, they also introduce additional implementation complexity and require maintaining stateful compression contexts across connections.

Objective: In this thesis, we want to address the following research questions:

- Can a web protocol designed for simplicity achieve performance within 10-15% of HTTP/2 and HTTP/3 for typical web workloads?
- Can static header compression match the wire efficiency of dynamic compression schemes (HPACK/QPACK)? What is the trade-off between compression ratio and implementation simplicity?
- Can standard network analysis tools like Wireshark provide sufficient protocol visibility, reducing reliance on protocol implementation logging for debugging?

Conclusion: QH demonstrates that simplicity and competitive performance are not mutually exclusive. Using static header compression designed through empirical analysis, QH achieves 38.8% smaller wire format than HTTP/1.1 while remaining within 7-11% of HTTP/2 and HTTP/3, quantifying the cost of simplicity as a modest efficiency loss for eliminating dynamic state synchronization. The custom Wireshark dissector enables direct inspection of all protocol fields without specialized debugging tools, demonstrating that protocol simplicity directly translates to improved operational visibility.

QH Client example

Own presentation

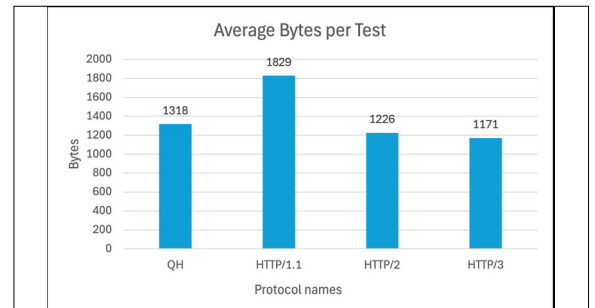
```
qh v main [==] via v1.25.1
< go run examples/client/main.go
09:20:20.641 INFO main.go:19 |QH Protocol Client starting
09:20:20.641 INFO main.go:30 |Keylog file created path=qh_client_keylog.txt
09:20:20.650 INFO client.go:249 |Found valid QOTP public... host=qh.gianhunold.ch key=rcuD0yZ8IjPdP/Cj3WEZzejUuvwLPVxEuvER0sDORQ=
09:20:20.650 INFO net_darwin.g:41 |setting DF for IPv6 only
09:20:20.650 INFO listener.go:196 |Listen listenAddr=[::]:64940 pubKeyId=0xd38071...
09:20:20.650 INFO client.go:149 |Attempting connection with out-of-band key (0-RTT)
09:20:20.650 INFO client.go:181 |Connected to QH server addr=qh.gianhunold.ch:8090 resolved=127.0.0.1:8090
09:20:20.650 INFO main.go:71 |Testing request method=GET path=/image
09:20:20.859 INFO main.go:185 |
--- Response for GET /image ---
Version: 0
StatusCode: 200
Content: application/octet-stream
Body (527277 bytes): JFIFHH
XICC_PROFILE
HLinomntRGB XYZ 1acspMSFTIEC sRGB... (truncated)
09:20:20.860 INFO main.go:147 |Saved response to file path=examples/client/downloaded_files/downloaded_cloud.jpeg bytes=527277
```

Advisor
Prof. Dr. Thomas Bocek

Subject Area
Software Engineering -
Core Systems, Internet
Technologies and
Applications,
Communication
systems

Benchmark average bytes

Own presentation



Wireshark dissector output

Own presentation

```
QOTP Protocol Data
  Message Type: Data
  Version: 0
  Connection ID: 0xfc4fdccc77887f4
  Encrypted Data [...]: 92cc74520ddbeef051ff4e78a2e5fc
  Decrypted Data: 20010000000000001071682e6769616e
  QH Protocol
    [QH Version: 0]
    [Type: Request]
    [Operation: GET]
    [Host Length: 16]
    [Host: qh.gianhunold.ch]
    [Path Length: 7]
    [Path: /status]
    [Header Length: 55]
    [Body Length: 0]
```