[qlog] structured event logging

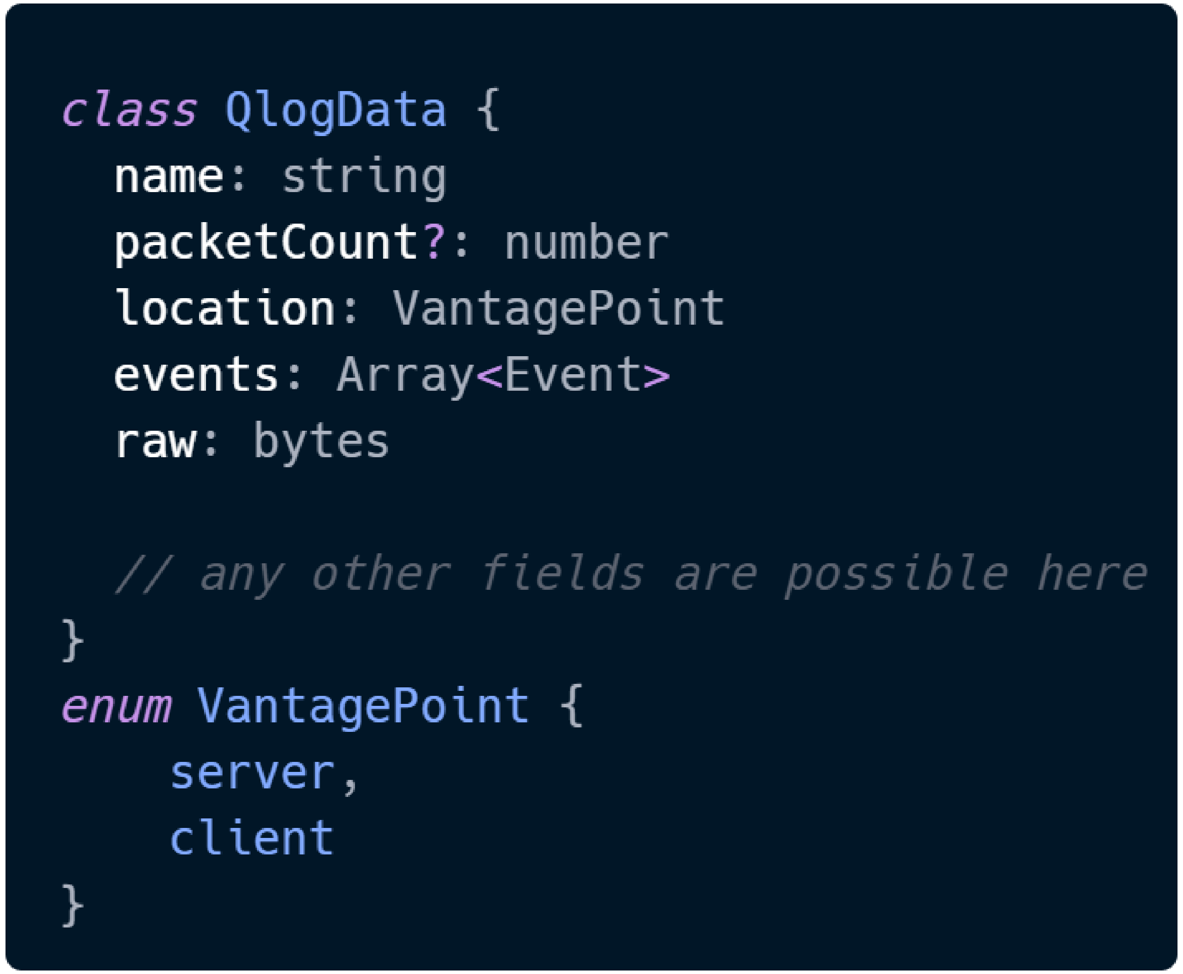
the Superman update

Robin Marx robin.marx@kuleuven.be

Only editorial changes

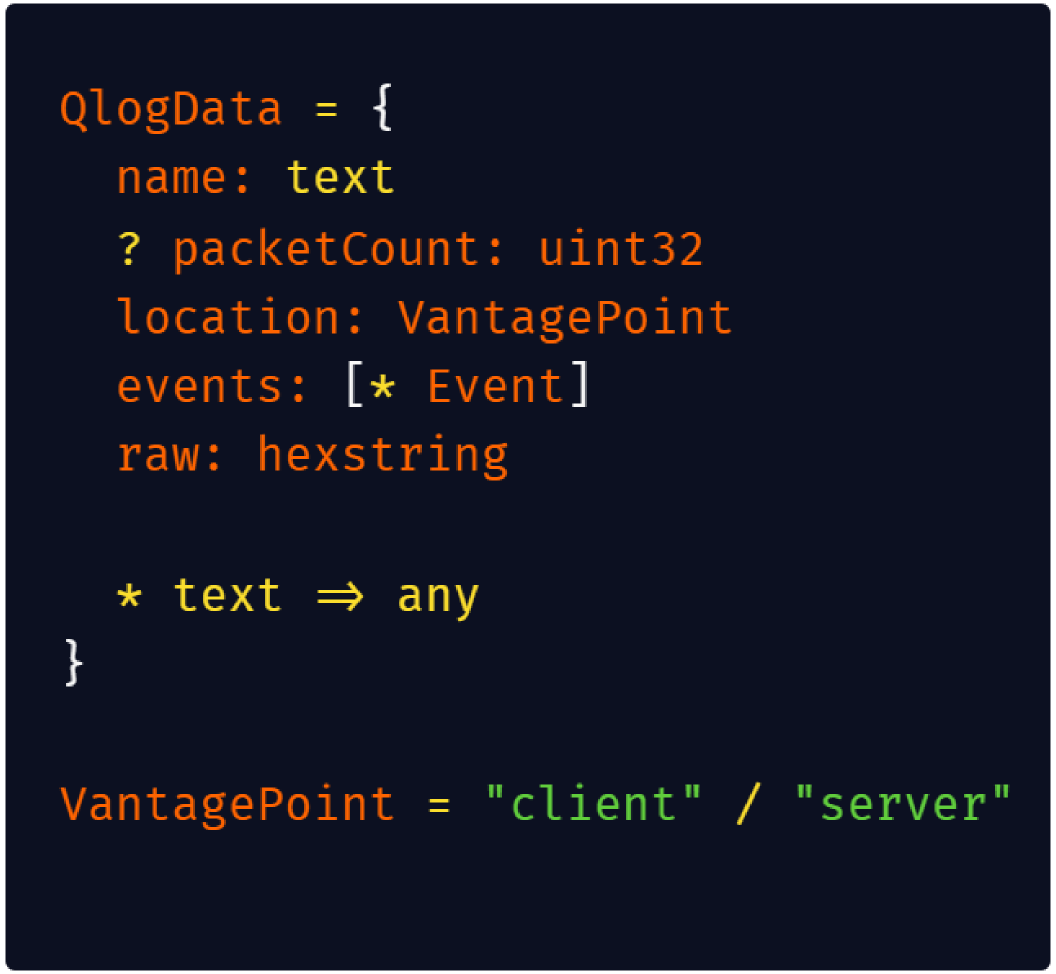
https://www.ietf.org/archive/id/draft-ietf-quic-qlog-main-schema-02.html
https://www.ietf.org/archive/id/draft-ietf-quic-qlog-h3-events-01.html
https://www.ietf.org/archive/id/draft-ietf-quic-qlog-quic-events-01.html

Easy to go from TypeScript to CDDL



```
class QlogData {
  name: string
  packetCount?: number
  location: VantagePoint
  events: Array<Event>
  raw: bytes

  // any other fields are possible here
}
enum VantagePoint {
    server,
    client
}
```



```
QlogData = {
  name: text
  ? packetCount: uint32
  location: VantagePoint
  events: [* Event]
  raw: hexstring

  * text => any
}

VantagePoint = "client" / "server"
```

TypeScript-inspired

Concise Data Definition Language (**CDDL**, RFC 8610)

https://datatracker.ietf.org/doc/html/rfc8610
https://github.com/quiclog/qlog/tree/master/CDDL/schema

CDDL has other nifty features

regexp operator

```
enum CryptoError {
    crypto_error_{TLS_ALERT}
}
```

```
; from "crypto_error_0x100" to "crypto_error_0x199"

CryptoError = text .regexp "crypto_error_0x1[0-9][0-9]"
```

unwrap operator ~

```
Event1 = {
  ? field1: text
  field2: uint32
}

Event2 = {
  ? field1: text
  field2: uint32
}
```

```
Event1 = {          Event2 = {
  ~SharedFields       ~SharedFields
}                   }

SharedFields = {
  ? field1: text
  field2: uint32
}
```

https://datatracker.ietf.org/doc/html/rfc8610
https://github.com/quiclog/qlog/tree/master/CDDL/schema

CDDL has other nifty features: extension sockets

Main schema

```
class Event {
  time: number
  name: string

  data: any
}
```

```
Event = {
  time: float64
  name: text

  data: $ProtocolEventBody
}
```

HTTP/3 document

```
HTTPEvents = HTTPParametersSet /
             HTTPFrameCreated /
             HTTPPushResolved

$ProtocolEventBody /= HTTPEvents
```

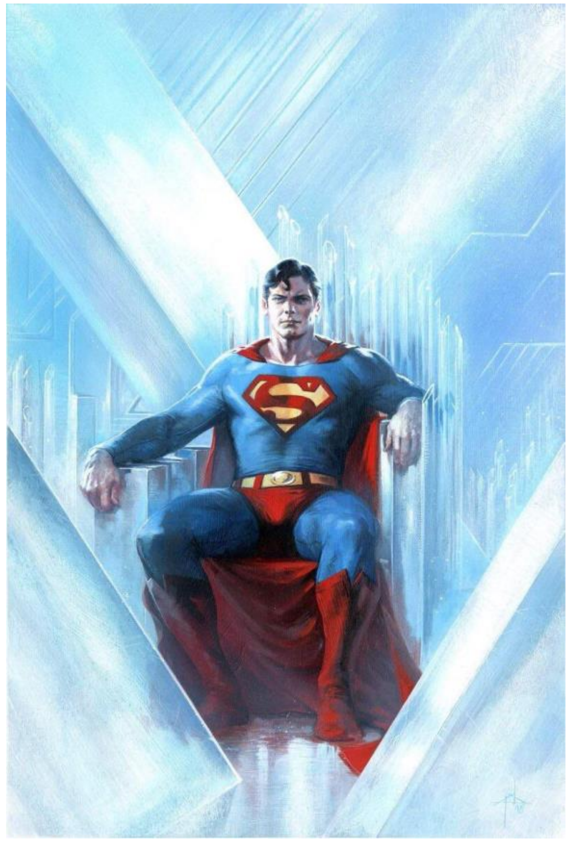
https://datatracker.ietf.org/doc/html/rfc8610
https://github.com/quiclog/qlog/tree/master/CDDL/schema

Tip of the iceberg

- Several other useful features
  - uint32 = uint .size 4
  - hexstring = text .regexp "([0-9a-f]{2})*"

  - TODO: Specify metadata ("importance" of an event: core/base/extra)
    - Using .feature control operator of RFC9165

- Big consistency updates to the documents overall
  - Fixed all ID-nits problems (mainly too long lines)
  - Proper identifiers/naming for all code blocks and examples
  - Proper names for all events and data structures



https://datatracker.ietf.org/doc/html/rfc8610
https://datatracker.ietf.org/doc/html/rfc9165

But why?

CDDL allows/will allow us to automatically:

- Extract definitions from draft documents
- Validate full schema, across documents
  - Using existing CDDL tooling
- Generate dummy qlog JSON files (easy examples!)

- Generate other schema representations (e.g., JSON-schema, proper TypeScript, Protobuf, …)
- Validate qlog files themselves (e.g., catch typo's, missing required fields, …)
  - With integration in tools such as qvis

Good for:

- Creating new/updating old QUIC + H3 qlog implementations
- Extend qlog to new features and protocols
  - WebTransport, MASQUE, MultiPath, …
  - Maybe TCP, HTTP/2, TLS, … down the line

https://rubygems.org/gems/cddl
https://github.com/quiclog/qlog/tree/master/CDDL/schema
https://gist.github.com/lnicco/3418e0d7cab2363e3600ff7c6b9988a1

Direct Next Steps

More editorial stuff

- Align terminology with QUIC, H3 and QPACK docs (#174)
  - Lots of leftovers from older drafts
  - Especially for QPACK (HTTP Headers → fields, etc.)
- Writing better prose
- Update descriptions of some events

  (e.g., connection_state_updated)

Missing events/fields

- Again mainly QPACK (#199) but also **TLS** (several issues)
- Events that show where we were blocked (#132)
- CPU/threading info (#152)
- Other smaller things (e.g., #186, #168, #135, #119, #57, etc.)

Editor's can propose most of this ourselves, but we need QPACK support!

https://github.com/quicwg/qlog/issues/174
https://github.com/quicwg/qlog/issues/199
https://github.com/quicwg/qlog/issues/132
https://github.com/quicwg/qlog/issues/152
https://github.com/quicwg/qlog/projects/1#column-15587393

Road to RFC / Big Open Questions

Design

- Split up main schema? (#197)
  - Move QLOGDIR and .well-known/qlog/ to separate document?
- Versioning and extensibility
  - Versioning of qlog files (#156)
  - Support new Transport Parameters (#176)
  - Support new Protocols (#146)
  - Define where new documents should/could live (#170)
- Security and Privacy considerations (#142)
  - Should we define anything?
  - If yes: what? **High-level guidance vs per-field indicators**?
  - Doesn't seem to be much prior work on this, *feels too big to tackle alone / in qlog*

We need WG guidance on these!

https://github.com/quicwg/qlog/issues/197
https://github.com/quicwg/qlog/issues/156
https://github.com/quicwg/qlog/issues/176
https://github.com/quicwg/qlog/issues/146
https://github.com/quicwg/qlog/issues/170
https://github.com/quicwg/qlog/issues/142