QUIC Packets

Packet can have >=0 frames,
frame is in 1 packet (doesn't span multiple packets)

⭕ : seen in captured pcap (youtube, ngtcp)

Frame types and packets they are found in

Packet types:

```
I:  Initial (Section 17.2.2)

H:  Handshake (Section 17.2.4)

0:  0-RTT (Section 17.2.3)  Quic long header 0-RTT    optional
                            packet

1:  1-RTT (Section 17.3)

ih:  A CONNECTION_CLOSE frame of type 0x1d cannot appear in Initial
     or Handshake packets.
```
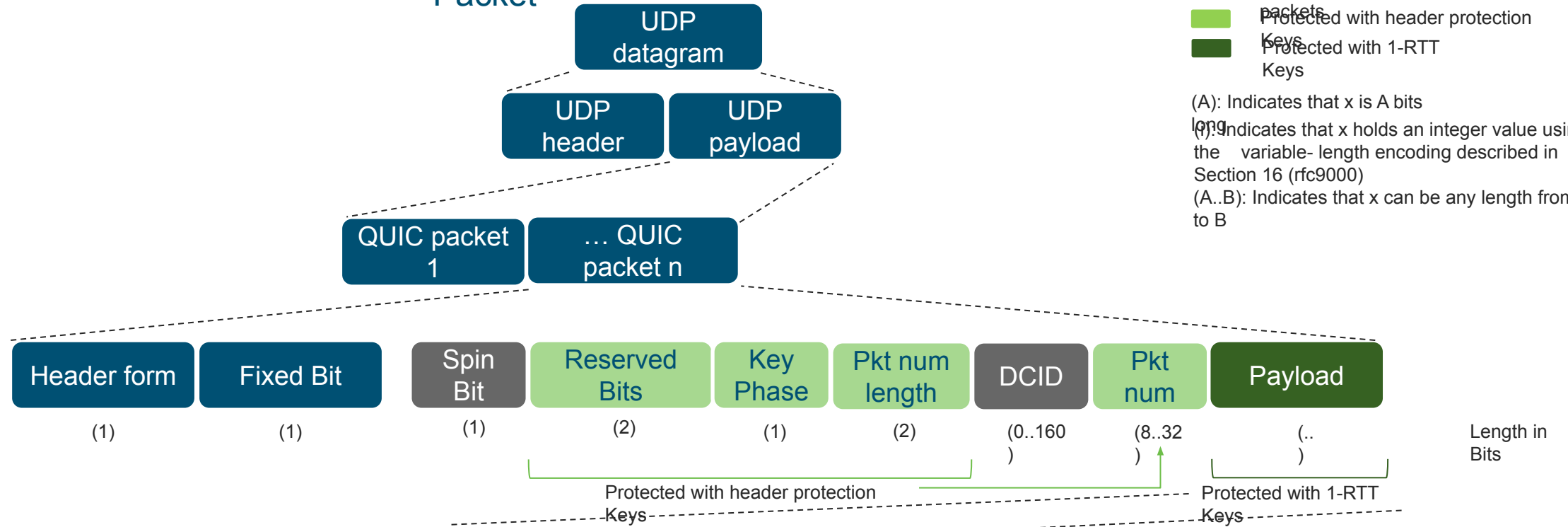
Except the initial cid change from server, no multiple connection id's
are seen for browser captured packets.
Ngtcp has NCI frames and multiple cid's

Type Value	Frame Type Name		Definition	Packets
0x00	PADDING	⭕	Section 19.1	IH01
0x01	PING	⭕	Section 19.2	IH01
0x02 – 0x03	ACK	⭕	Section 19.3	IH_1
0x04	RESET_STREAM	⭕	Section 19.4	__01
0x05	STOP_SENDING	⭕	Section 19.5	__01
0x06	CRYPTO	⭕	Section 19.6	IH_1
0x07	NEW_TOKEN	⭕	Section 19.7	___1
0x08 – 0x0f	STREAM	⭕	Section 19.8	__01
0x10	MAX_DATA	⭕	Section 19.9	__01
0x11	MAX_STREAM_DATA	⭕	Section 19.10	__01
0x12 – 0x13	MAX_STREAMS	⭕	Section 19.11	__01
0x14	DATA_BLOCKED		Section 19.12	__01
0x15	STREAM_DATA_BLOCKED	⭕	Section 19.13	__01
0x16 – 0x17	STREAMS_BLOCKED		Section 19.14	__01
0x18	NEW_CONNECTION_ID	⭕	Section 19.15	__01
0x19	RETIRE_CONNECTION_ID		Section 19.16	__01
0x1a	PATH_CHALLENGE		Section 19.17	__01
0x1b	PATH_RESPONSE		Section 19.18	__01
0x1c – 0x1d	CONNECTION_CLOSE	⭕	Section 19.19	ih01
0x1e	HANDSHAKE_DONE	⭕	Section 19.20	___1

https://tools.ietf.org/html/draft-ietf-quic-transport-29#section-12

QUIC Short Header (1-RTT) Packet

```
                        UDP
                      datagram

              UDP              UDP
             header          payload

                    QUIC packet    … QUIC
                         1        packet n
```

Header form	Fixed Bit		Spin Bit	Reserved Bits	Key Phase	Pkt num length	DCID	Pkt num	Payload
(1)	(1)		(1)	(2)	(1)	(2)	(0..160)	(8..32)	(..)

Length in Bits

Protected with header protection Keys

Protected with 1-RTT Keys

```
              Frame 1      … Frame n
```

There are 21 types of frames and STREAM Frames are one of them

STREAM Frame

Frame Type	Stream ID	Offset	Length	Stream Data
(i)	(i)	(i)	(i)	(..)

Length in Bits

OFF bit	LEN bit	FIN bit

3 low-order bits of the frame type