Protocol Number Option in UDP Options

draft-daiya-tsvwg-udp-options-protocol-number

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- New transport protocols are implemented based on UDP.
  - e.g. QUIC
- New transport protocols are used as transport protocol for existing applications.
  - e.g. HTTP over QUIC, DNS over DTLS, DNS over QUIC
- The UDP layer does not have field to specify UDP-based transport protocols separately from the port number
  - ip_proto=17(UDP) & port=443 => HTTP over QUIC ?
  - ip_proto=17(UDP) & port=853 => DNS over DTLS ?
  - ip_proto=17(UDP) & port=853 => DNS over QUIC ?
Protocol Number Option

- Provide the UDP layer with information on the protocol type of the packet encapsulated
- Allow the transport endpoint to identify the protocol of the packet that UDP encapsulates
- **When using the UDP-based transport protocol, allow end hosts to identify the protocol**
  - ip_proto=17(UDP) & port=443 & proto_num=quic => HTTP over QUIC
  - ip_proto=17(UDP) & port=853 & proto_num=dtls => DNS over DTLS
  - ip_proto=17(UDP) & port=853 & proto_num=quic => DNS over QUIC
### Use case

Use for demultiplexing transport protocols based on UDP

If a new transport protocol based on UDP is used as a transport for HTTP, it will not be possible to demultiplex with only UDP layer information.

<table>
<thead>
<tr>
<th>HTTP</th>
<th>QUIC</th>
<th>UDP</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>port=443</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HTTP</th>
<th>New Transport</th>
<th>UDP</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>port=443</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>UDP Opt</th>
<th>HTTP</th>
<th>QUIC</th>
<th>UDP</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>proto_num=quic</td>
<td></td>
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<th>New Transport</th>
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<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>proto_num=X</td>
<td></td>
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</table>

Protocol numbers in the options area allow identification of transport layer protocols.
Next Step - Discussion of details

Format of Protocol Number

- Integer format
  - Need numbers that can represent transport protocols based on UDP such as QUIC
  - There are several choices.
    - Create a new registry for protocol numbers
    - Allocate ip protocol type to transport protocol based on UDP.
- String format
  - May not fit the binary format UDP options.
  - The matter of what string to use exists just as when using integer format.
Thank you
Additional slides
Current DTLS and QUIC demultiplexing methods

Multiplexing Scheme Updates for QUIC [RFC 9443]

Can be demultiplexed by the first byte of the payload
Use case

- **Normal DNS**
  - DNS -> UDP -> IP
  - dst_port=53

- **DNS over DTLS**
  - DNS -> DTLS -> UDP -> IP
  - dst_port=853

- **DNS over QUIC**
  - DNS -> QUIC -> UDP -> IP
  - dst_port=853
Next step?

- WG GitHub issue before WG adoption?
  - or on my GitHub repos?
Problem when new UDP-based transport protocols are used

Unknown which transport protocol is being transmitted.

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The next transport protocol can be indicated by `proto_num`

Unknown which transport protocol is being transmitted.

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**HTTP over QUIC**

```
udp &
dst_port=443
```

**HTTP over X**

```
udp &
dst_port=443
```

---

**HTTP over QUIC**

```
proto_num=quic &
dst_port=443
```

**HTTP over X**

```
proto_num=X &
dst_port=443
```
DNS over DTLS

Normal DNS

dst_port=53

DNS over DTLS

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DNS over QUIC

dst_port=853

DNS over DTLS

next_proto=dtls & dst_port=853

DNS over QUIC

next_proto=quic & dst_port=853

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