TCP RST Diagnostic Payload

draft-boucadair-tcpm-rst-diagnostic-payload/

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M. Boucadair , T. Reddy, & J. Xing

The Problem

- TCP connections can be reset by ***a peer*** for various reasons
- TCP connections may also be reset by ***on-path devices*** (NATs, Firewalls, etc.)
- However, the receiver has ***no hint about the reasons*** why the connection was reset
- Troubleshooting and ***diagnostic may be complicated***
  - It is not always possible to have a contact for (real) problems such as receiving unusual number of RSTs from peers in a given network

Design Rationale

- ***Leverage an existing provision*** in the base TCP specifications (now consolidated in RFC 9293)

```
| "TCP implementations SHOULD allow a received RST segment to
| include data (SHLD-2)."
```

- ***Ease deployability*** by avoiding any negotiation during 3WHS
- ***Compact encoding*** by signaling only a reason code on the wire for registered reasons
- ***Accommodate proprietary*** reasons, when needed:
  - Include a brief human-readable description
  - Include a vendor-specific code and its PEN
- ***Does not change*** any other parts of RST handling
- It is ***harmless***, RST with/without reason code can be sent (allowed by 9293)

Examples

Figure 2 depicts an example of an RST diagnostic payload that is generated to inform the peer that the TCP connection is reset because an ACK was received from that peer while the connection is still in the LISTEN state (Section 3.10.7.2 of [RFC9293]).

```
   19 3039 # unsigned(12345)
   A1      # map(1)
      01   # unsigned(1)
      02   # unsigned(2)
```

Figure 2: Example of an RST Diagnostic Payload with Reason Code (CBOR Encoding)

Figure 3 depicts the same RST diagnostic payload as the one shown in Figure 2 but following the CBOR diagnostic notation.

```
[
  12345,
  {
    1: 2
  }
]
```

Figure 3: Example of an RST Diagnostic Payload with Reason Code (Diagnostic Notation)

Figure 4 shows an example of an RST diagnostic payload that includes a free description to report a case that is not covered by an appropriate code from the IANA-maintained registry (Section 5.2).

```
[
  12345,
  {
    3: "brief human-readable description"
  }
]
```

Figure 4: Example of an RST Diagnostic Payload with Reason Description (Diagnostic Notation)

The Encoding is not Frozen, though

- Other alternate encoding designs can be considered. For example:
  - TLV
  - Plain text
  - Etc.

- Each has their own pros and cons, mainly:
  - Amplification impact
  - Need or not of a kernel library and availability of such library (if needed)
  - Impact of conversion on CPU
  - Integration with traffic visualisation tools

Next Steps

- Request WG Adoption

- Linux maintainers require an IETF document to consider including it
  - … Which is fair and reasonable
  - Jason commit to complete it in the Linux kernel