Quick-Start for DCCP

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(Individual Submission)

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QS for DCCP

- Similar to QS with TCP [RFC 4782].
- Sender MAY use a Quick-Start request:
  - At start of a connection.
  - In the middle of a connection.
- SHOULD send the request on a packet that requires an acknowledgement (DCCP-Request, DCCP-Response, or DCCP-Data).
- MUST NOT make a subsequent Quick-Start Request within four RTTs.
  - CCID-3 responds slowly to changes.
QS-Requests processed identical to TCP.

On receipt of QS-Request:
- Receiver SHOULD immediately send a QS-Response.

Receiver aligns feedback to end of period with Quick-Start Packets.

```
| 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 |
+------------------------------------------------------------------+
| Type= tbd | Length=8 | Resv. | Rate | TTL Diff | Request |
|           |         |       |       |          |         |
+---------------------------------------------------------------+
| QS Nonce |                                             | R     |
+---------------------------------------------------------------+
```
Using QS-Response with CCID-3

- Sender SHOULD NOT ignore a feedback packet with QS-Response option.

- Sender enters QS-Mode.
  - Sending host sets Quick-Start sending rate
    \[ QS\text{-}sendrate = R \times \frac{s}{s + H} \]
  - CCID 3 is rate paced protocol.
    QS packets are naturally rate paced.

- Sender exits QS Mode when either:
  - A feedback packet acknowledging one or more Quick-Start packets.
  - Detection of a loss event.
  - A period of one RTT after receipt of QS-Response.

- If no reported loss (or ECN marking), enters Quick-Start Validation Phase
Unlike TCP, TFRC receives a feedback once per RTT.

Add a new Quick-Start Validation Phase.
- Period to affirm capacity used by QS packets did not introduce congestion.
- Sender tentatively permitted to continue sending at QS-sendrate.
- Limited to a maximum of 1.5 RTTs (or loss, or feedback for QS Packets)

At the end of the Quick-Start Validation phase:
- Sender stops using the QS-sendrate.
- Uses the standard congestion control mechanisms.
Reported Loss during Quick-Start Mode or Validation Phase

- If no feedback received within Quick-Start Mode or Validation Phase:
  - MUST return to minimum of original rate (at start of QS Mode) and one half of QS-sendrate.

- If a feedback packet arrives reporting packet loss:
  - MUST immediately leave the Quick-Start Mode or Validation Phase.
  - Enters congestion avoidance phase.
  - Re-calculate send rate $X$:
    $X = \max(\min(X_{\text{calc}}, \min(2\times X_{\text{recv}}, 2 \times QS_{\text{recv}}-\text{rate})), s/t_{\text{mbi}})$.
Some Results
Protocol Issues

- After idle, must requested QS rate consider current loss event rate?
  - Is it appropriate use QS after receiving a loss-event, as a way of getting more capacity than allowed by the throughput equation?

- Need to consider implications of alternate paths, etc
  - Examine if there are specific issues

- Need to consider implications of over-shoot
  - QS approved capacity was not actually available, and DCCP sends at a higher rate for several (≤1.5 extra) RTTs.

- Other issues? Simulation…
Next Revision

- CCID-3 feedback timer
  - Receiver can use window counter not feedback timer expiry.

- Add CCID-2 text (should be easy)

- Which WG?
  - TSVWG or DCCP?