Energy Efficient Ethernet

Packet loss in protocol based speed change

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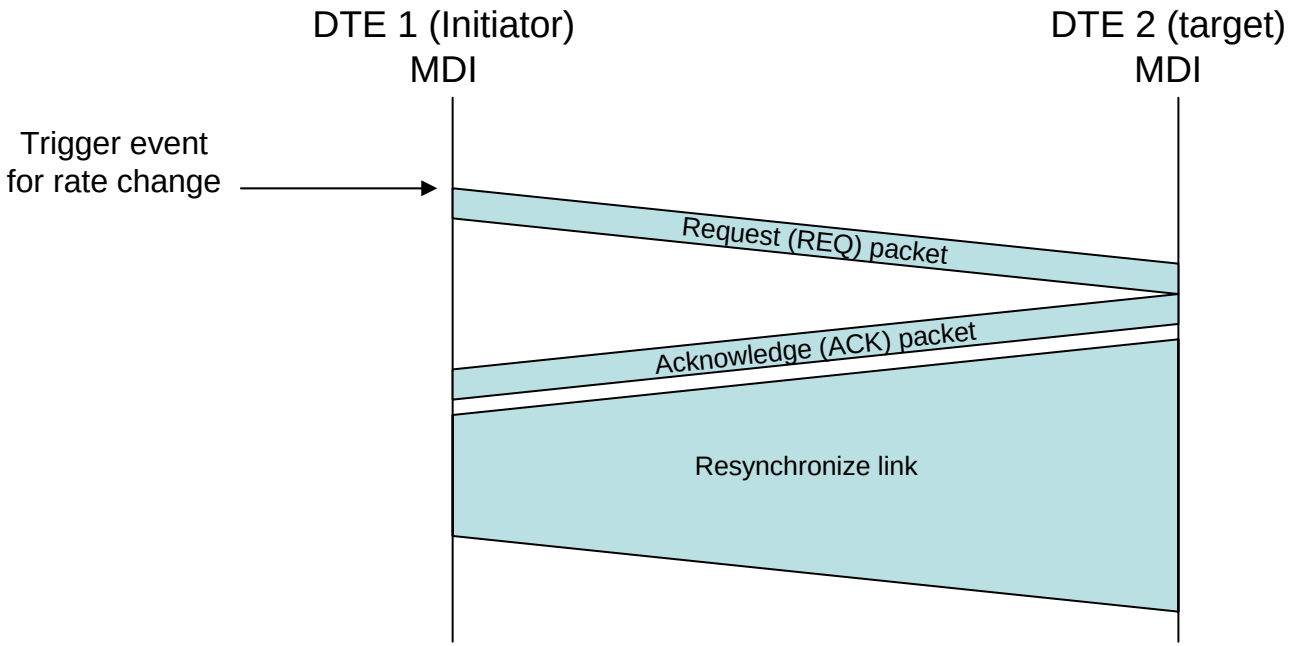
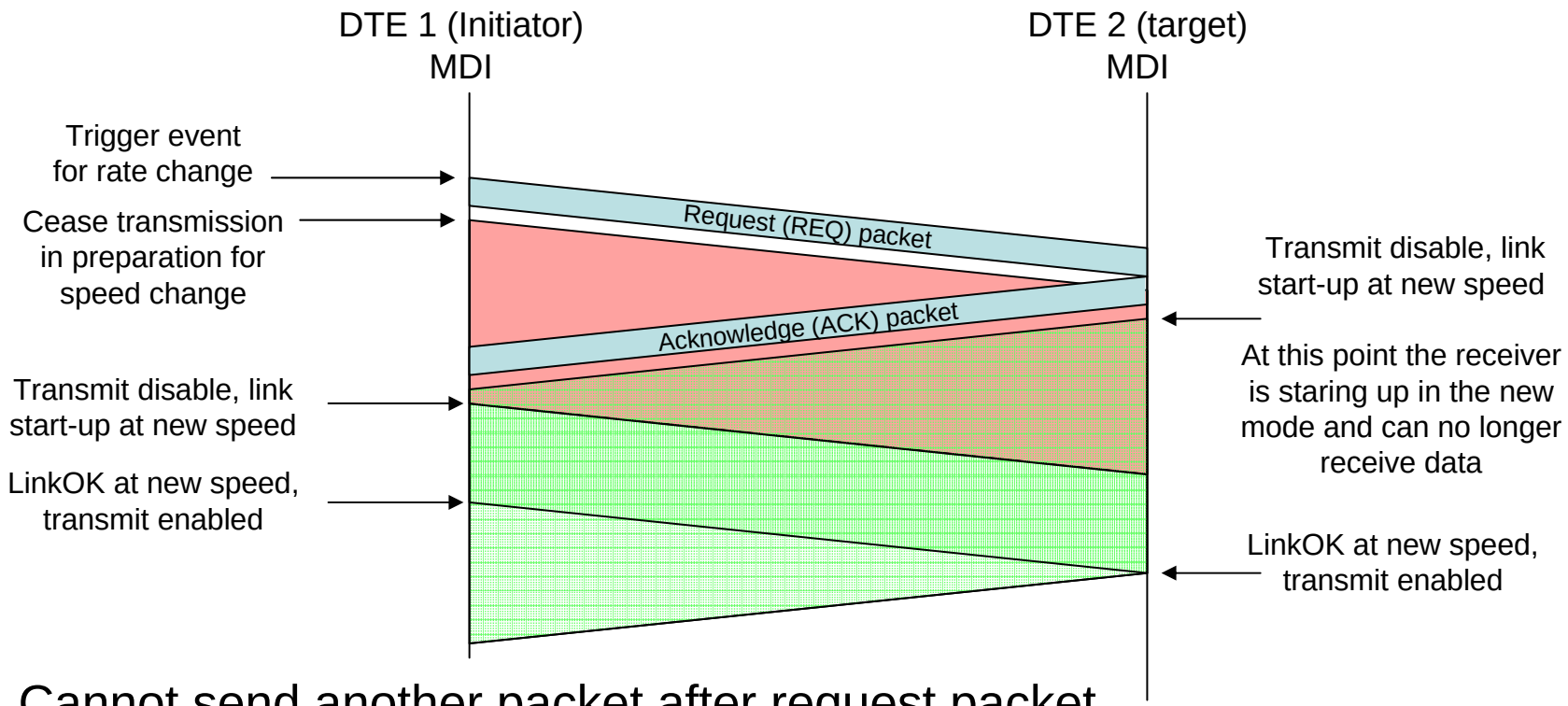
Link disable time – initial model



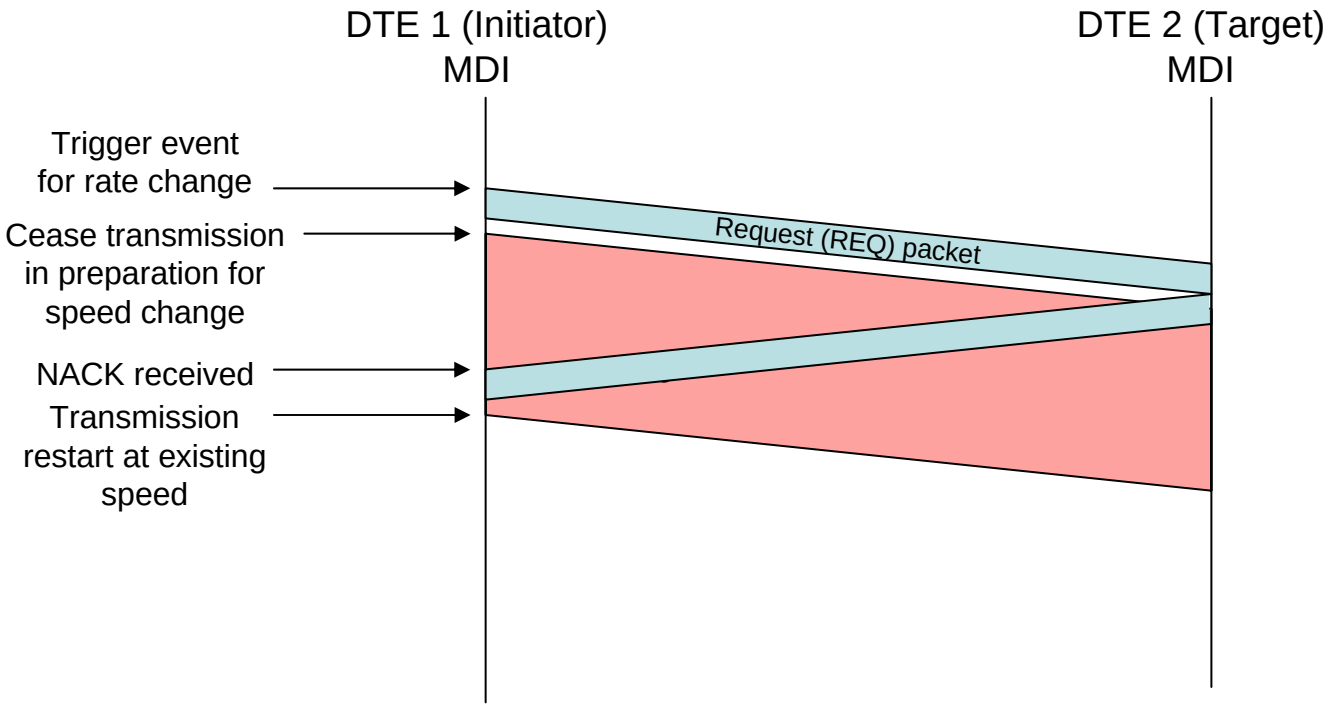
Speed change request – accepted



- Cannot send another packet after request packet
  - Soon after receiving Request packet the receiver will drop link to start new mode
- Additional details of delays not shown
  - Wait for maximum length packet before transit
  - Response time in DTEs to packets
  - See http://www.ieee802.org/3/eee_study/public/may07/law_1_0507.pdf

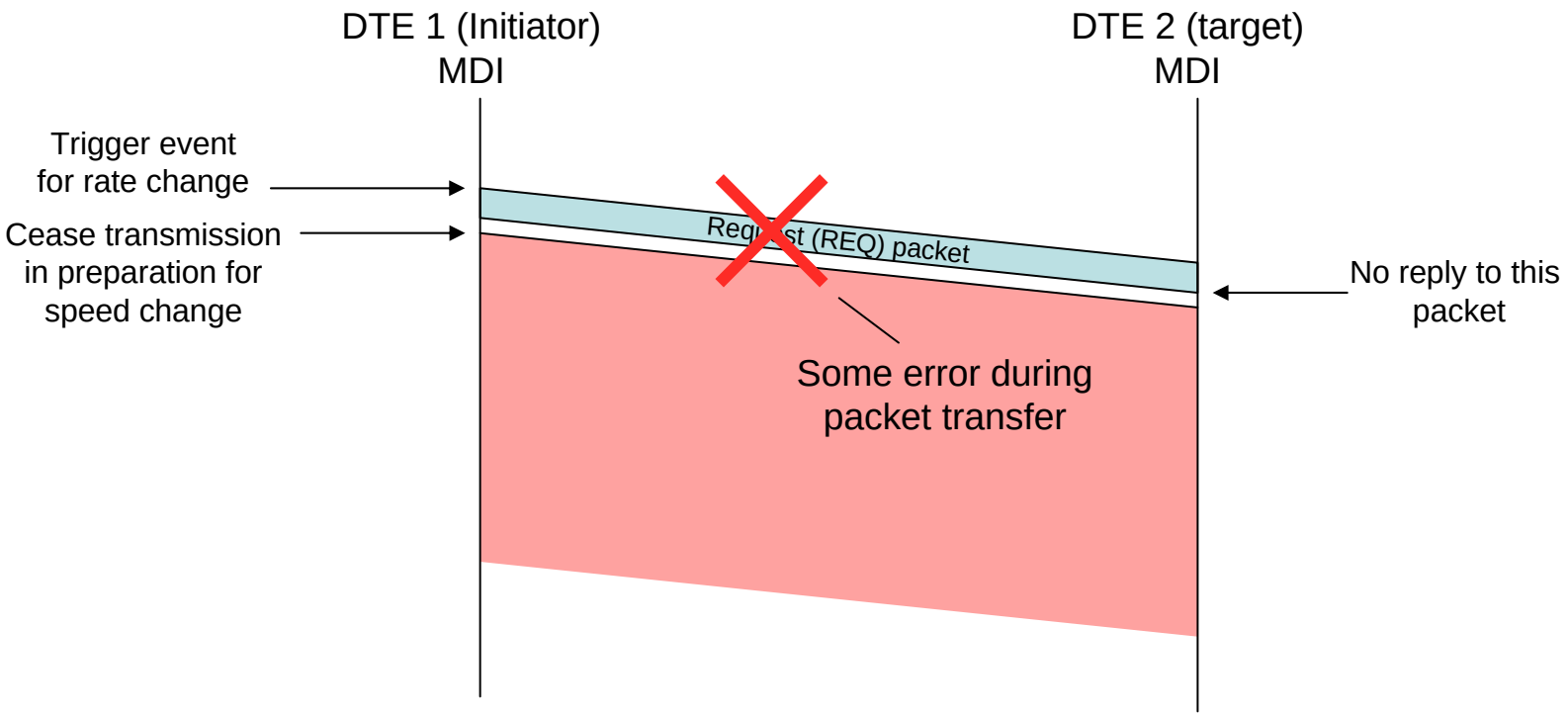
Speed decrease request – rejected

(Can't reject speed increase request)



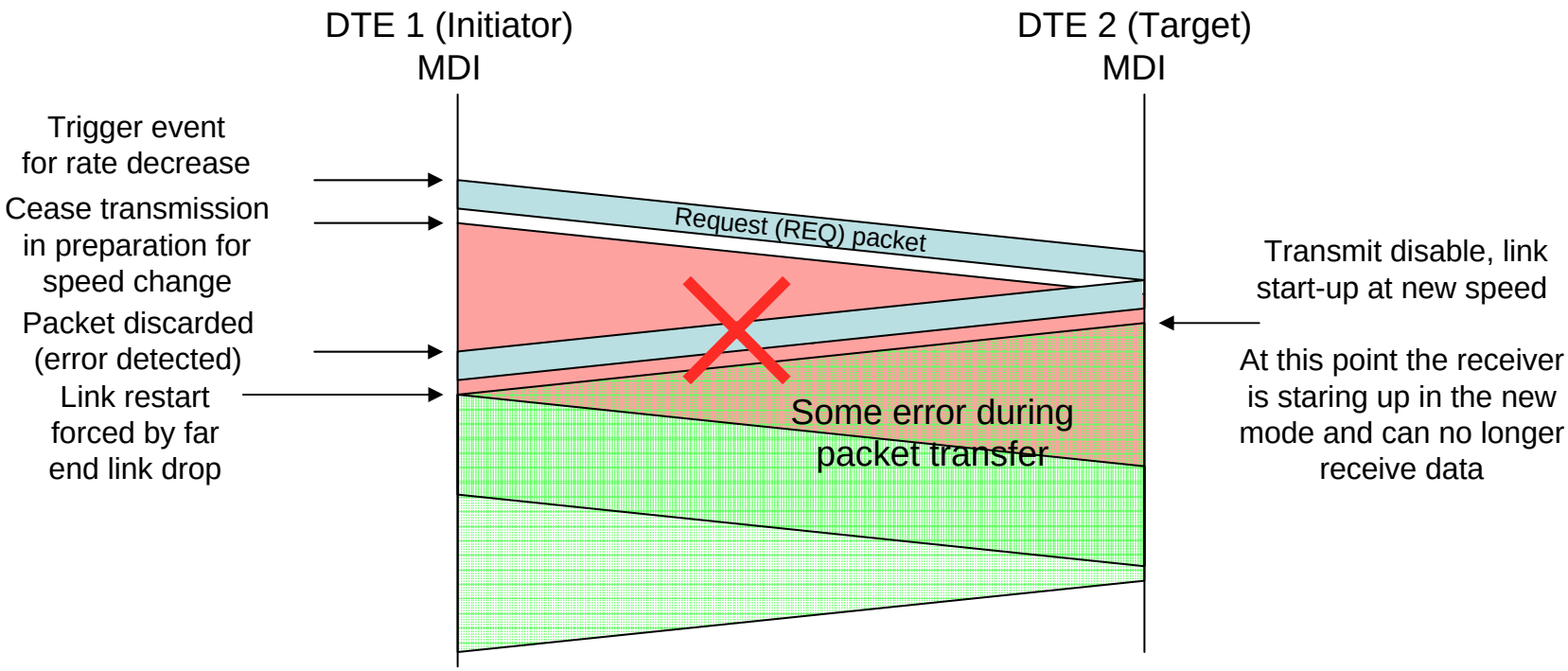
- Initiator cannot send another packet after speed decrease request
  - Soon after receiving Request Target may drop link to start new mode
- Target rejects request since it still needs to operate at current speed
  - Negative acknoledge (NACK) packet send back by Target
- When NACK received Initiator starts transmitting data packets again

Lost REQ packet



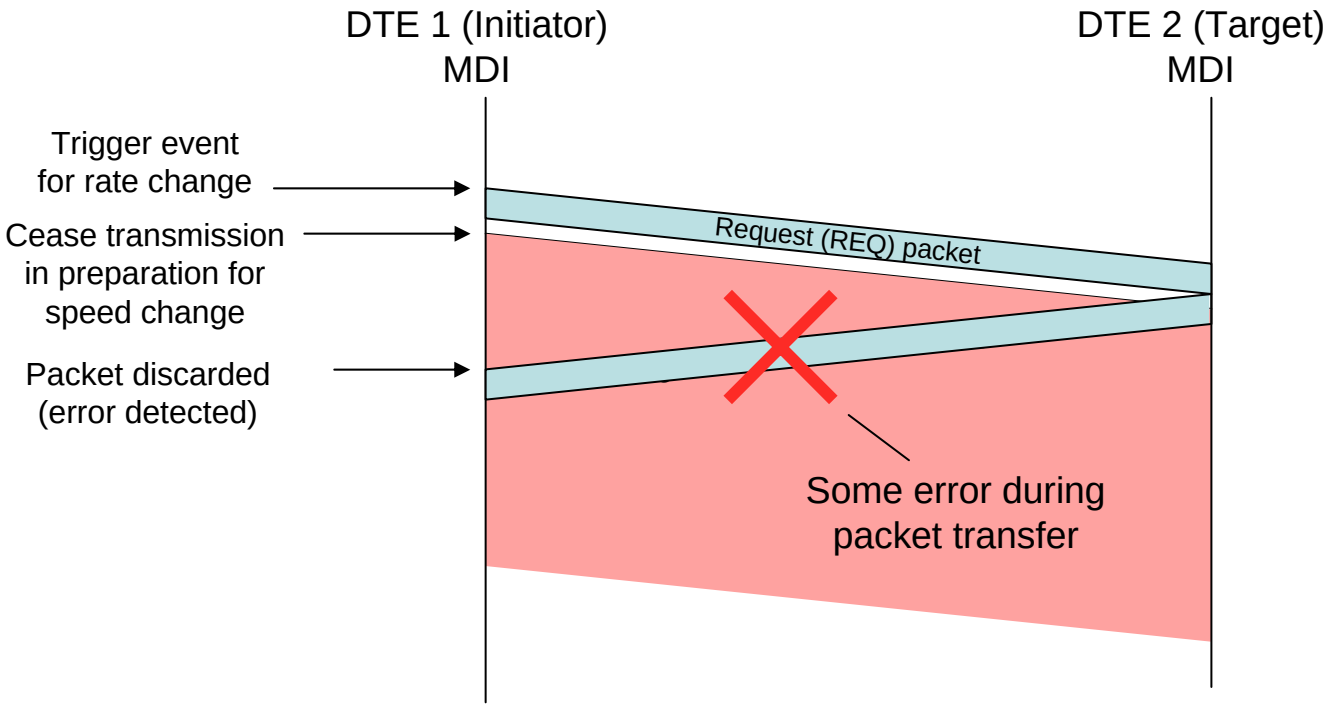
- Error event somewhere during Request packet transfer
- Due to loss of packet Initiator will just keep waiting

Lost ACK packet



- Error event somewhere during ACK packet transfer
- Due to loss of packet Initiator will just keep waiting
- Link will restart anyway due to Target dropping link
  - Could maybe use this approach to remove need to for ACK packet

Lost NACK packet



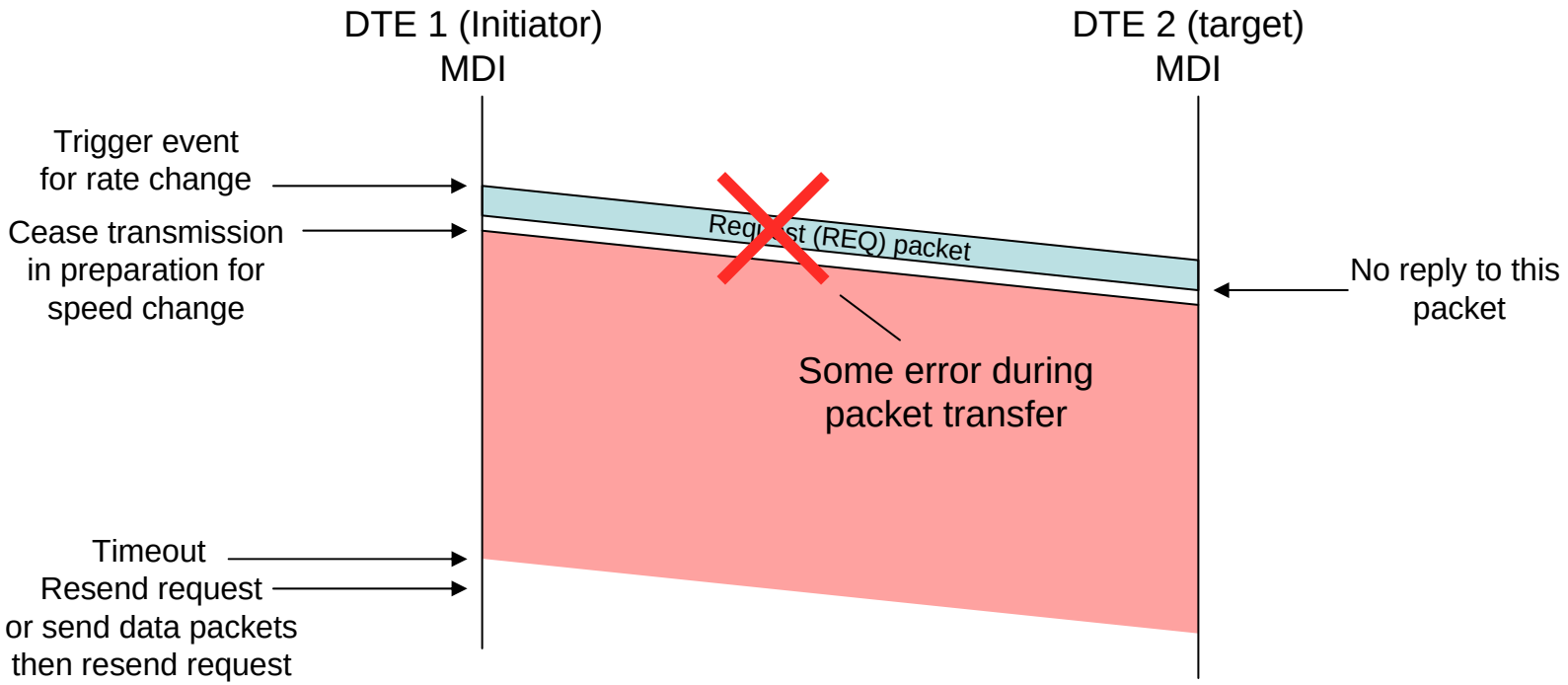
- Error event somewhere during NACK packet transfer
- Due to loss of packet Initiator will just keep waiting
- Do we need a duty cycle limit of Speed decrease request
  - DTE1 could flood REQs requiring NACKs that use DTE2s bandwidth

Options

- Timers
  - After sending request max time to ACK/NACK
    - Round trip + response time + max packet

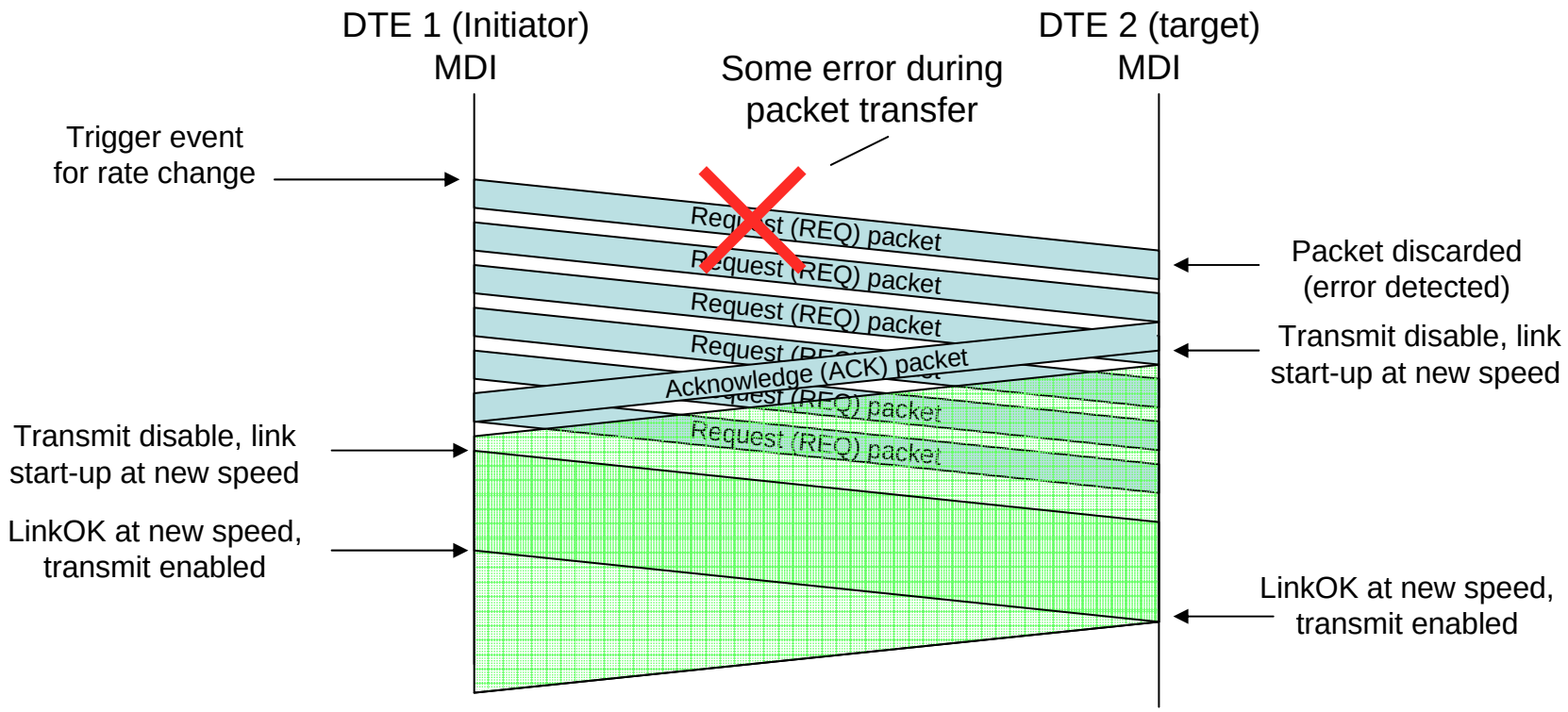
      Details http://www.ieee802.org/3/eee_study/public/may07/law_1_0507.pdf
  - Timeout and resume operation after this time
- Keep transmitting REQ/ACK/NACK
  - Send some number of time
  - Keep sending until response from far end

Lost REQ packet - timer



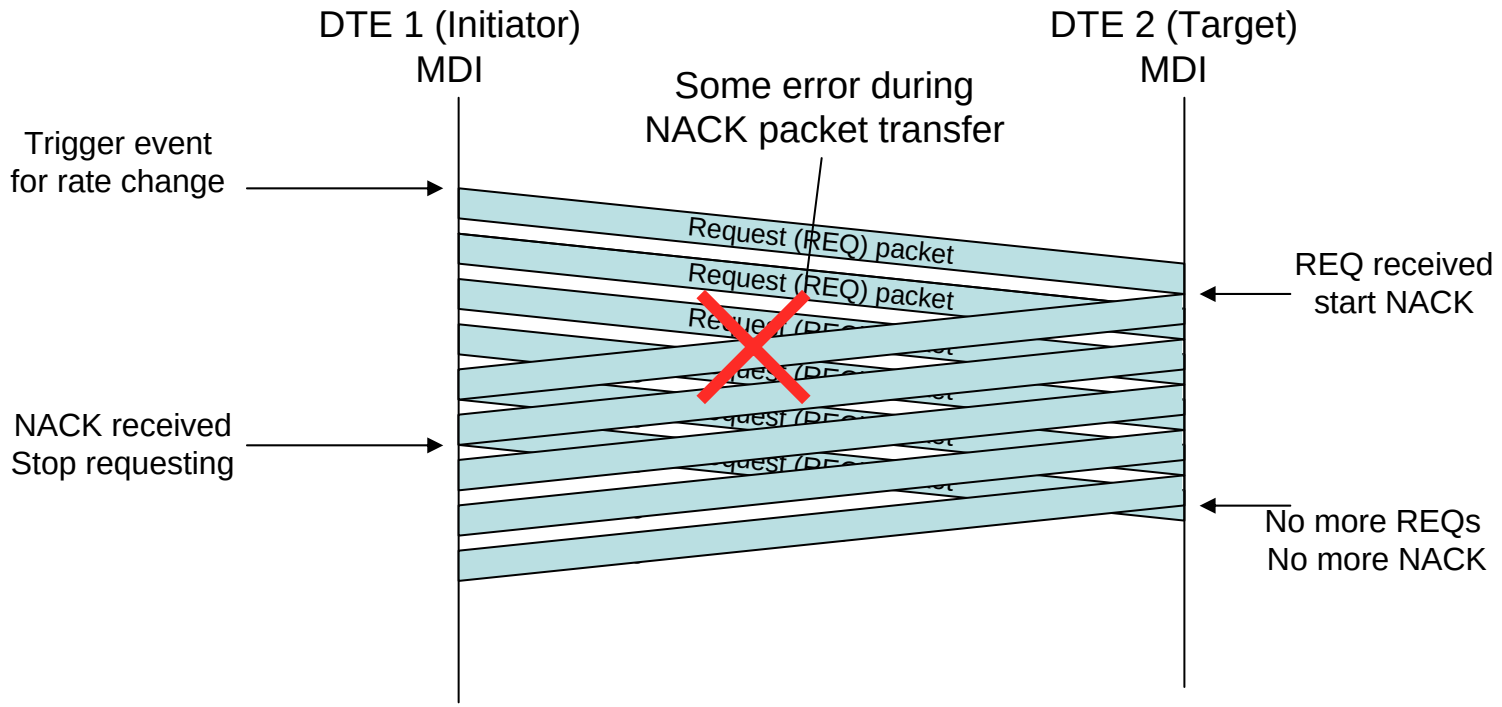
- Timeout a waste of bandwidth
  - Particularly if request is for speed increase
- What if delayed ACK and then link drop by Target
  - If after Initiator timeout could impact packets
  - Extremely unlikely: [1] packet error [2] on REQ packet [3] delayed ACK

Lost REQ packet - resend



- Only delay increase minimum packet size
- Might as well keep resending REQs
  - Alternative is to send nothing

Lost NACK packet – NACK per REQ



- Waste of bandwidth for Target
  - Particularly when target may need the bandwidth
    - Target NACKing seed decrease request

Summary

- Lost speed change REQ, ACK or NACK
  - Very rare event
  - But need to handle with minimum disruption
- Do we really need a ACK
  - Let the link drop be the ACK
- Timeout, repeat N times or keep repeating
  - REQ packets
    - Resend, sending nothing otherwise
  - NACK packets
    - Send once then if REQs continue send again
    - Minimum loss of bandwidth for NACKer