

NDNLP Implementation of Best-Effort Link-Layer Reliability

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Background

- Based upon “Hop-By-Hop Best Effort Link Layer Reliability in Named Data Networking” by S. Vusirikala, et al.
- [A Practical Congestion Control Scheme for NDN](#)
- Modifications in Redmine issue #3823
 - No packet number transmitted, only frame number (sequence number)
 - RTO timeout uses traditional TCP RTO equation ($SRTT + 4 * RTTVAR$)
 - After maximum retx reached or a loss, a notification will be sent to the strategy layer.
- The sender sends notifications to strategy layer based upon network-layer packets, not fragmented link-layer packets.
- Sequence numbers are required for all packets when BELRP enabled.

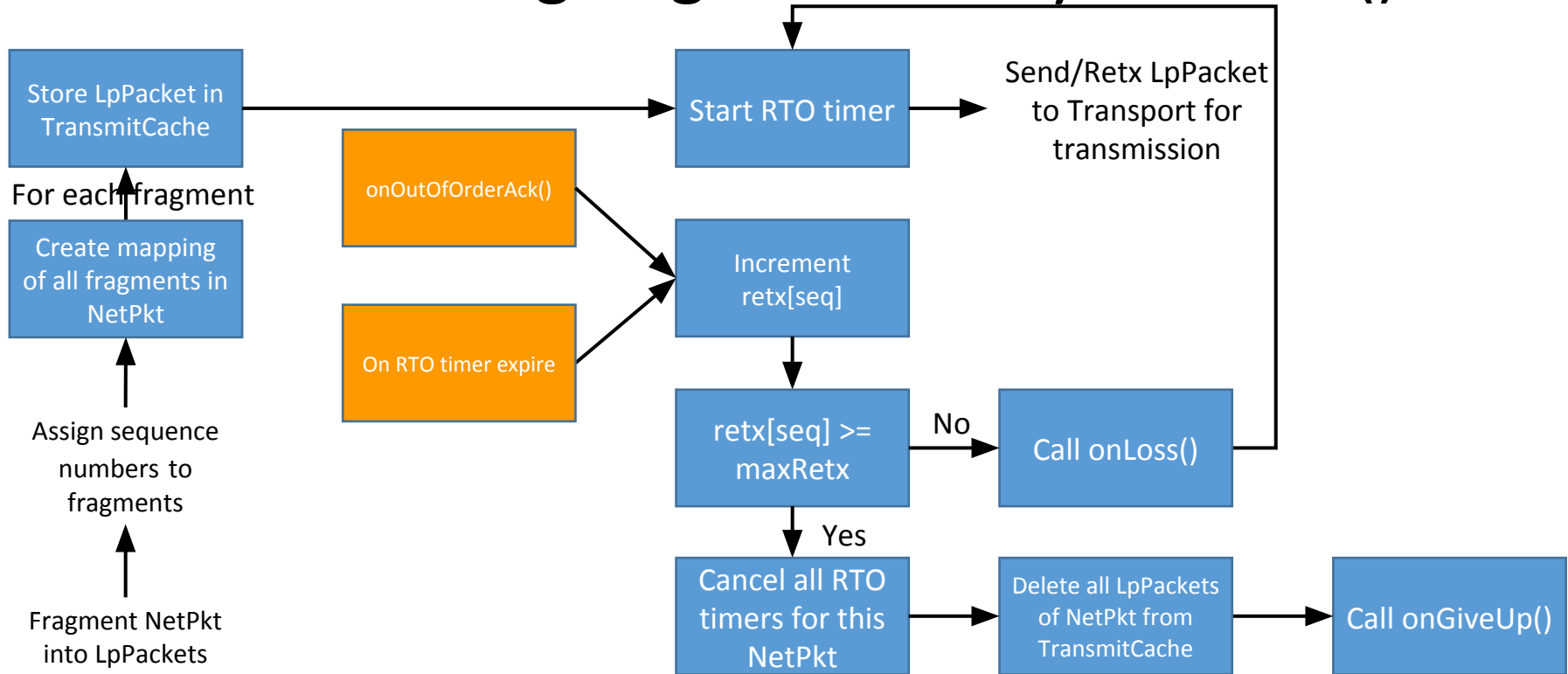
Terminology and Definitions

- This protocol is designed to form part of the NDN link protocol (NDNLPv2) system, as such it has some special terminology:
 - A link-layer frame is called an LpPacket.
 - The sequence number of a frame is called a Sequence (note the capitalization).
 - A NetPkt is a network-layer packet (Data or Interest).
- The NFD Face system is composed of ***Transport*** and LinkService modules.
 - The Transport module handles the transmission of LpPackets on the link and is protocol-specific.
 - The LinkService module handles features common to every Transport, such as Sequence assignment and fragmentation.
 - This protocol is designed to be part of the LinkService.

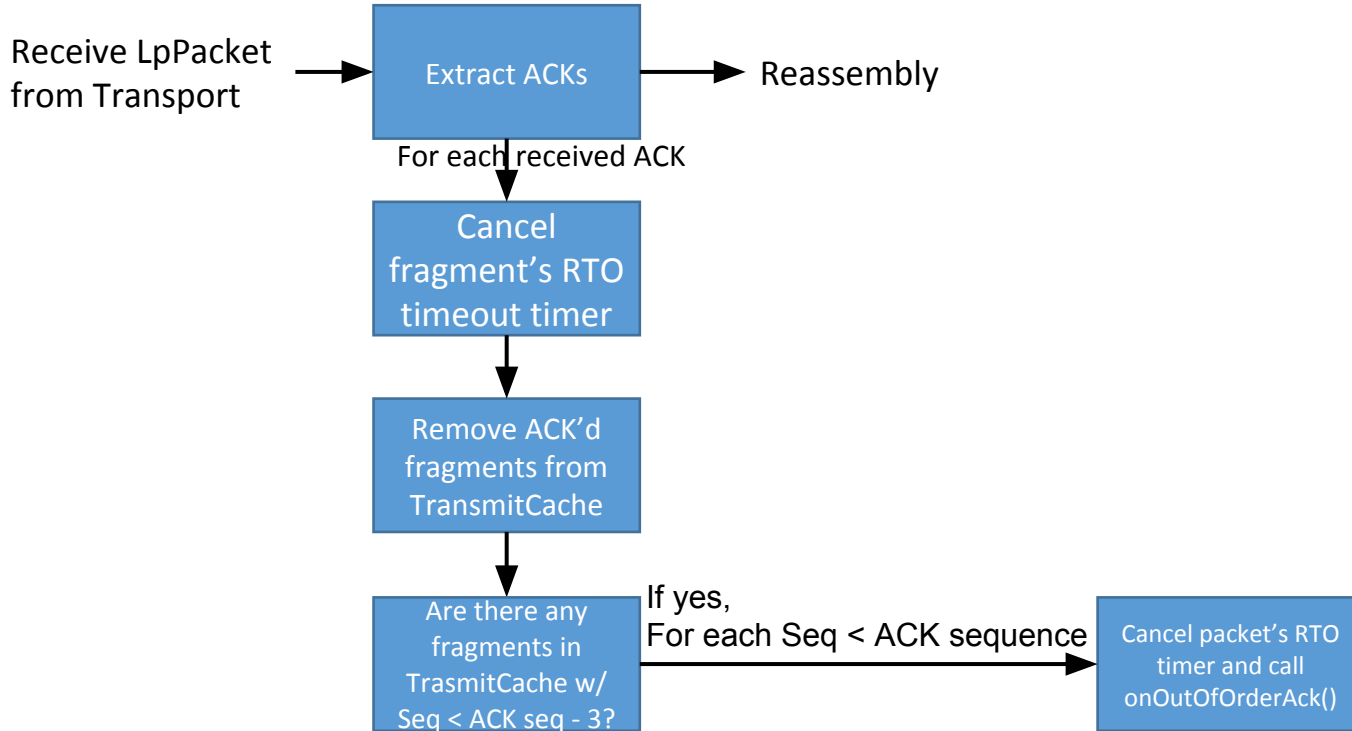
Packet Format

- The following headers fields need to be added to NDNLDP:
 - Ack (64-bit unsigned integer)
 - This field may be repeated within the same packet, containing different values. For example:
 - LpPacket ::
 - Ack :: 123
 - Ack :: 456
 - Ack :: 789

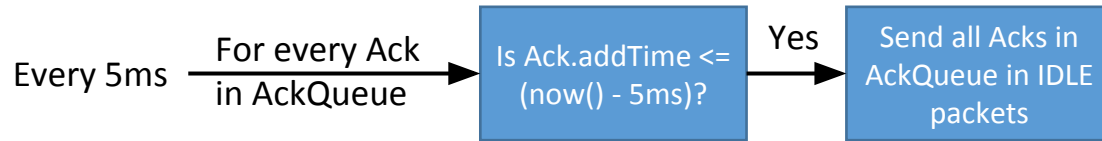
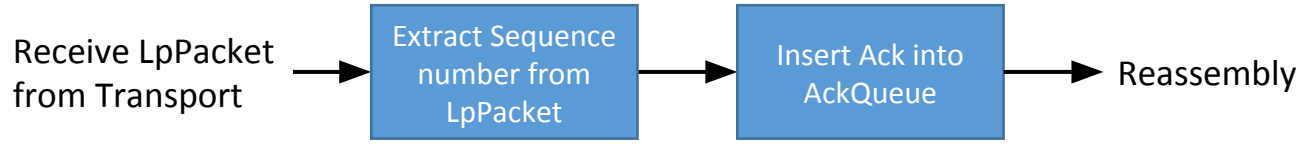
Sender - onOutgoingNetworkLayerPacket()



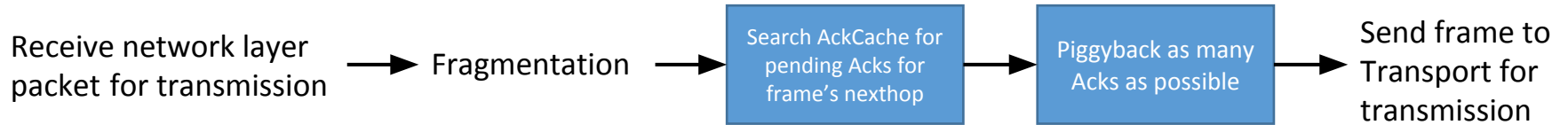
Sender - onReceiveLpPacket()



Receiver - onReceiveLpPacket()



Receiver - Send Subsystem



RTO Calculation

- RTO is calculated using the standard TCP RTO formula ($SRTT + 4 * RTTVAR$).
- RTT is measured as the difference between the time the fragment was transmitted and the time an ACK was received for it.
- Fragments with one or more retransmissions are not taken into account when calculating the RTO.