LOOPS (Local Optimizations on Path Segments) and its Geneve binding
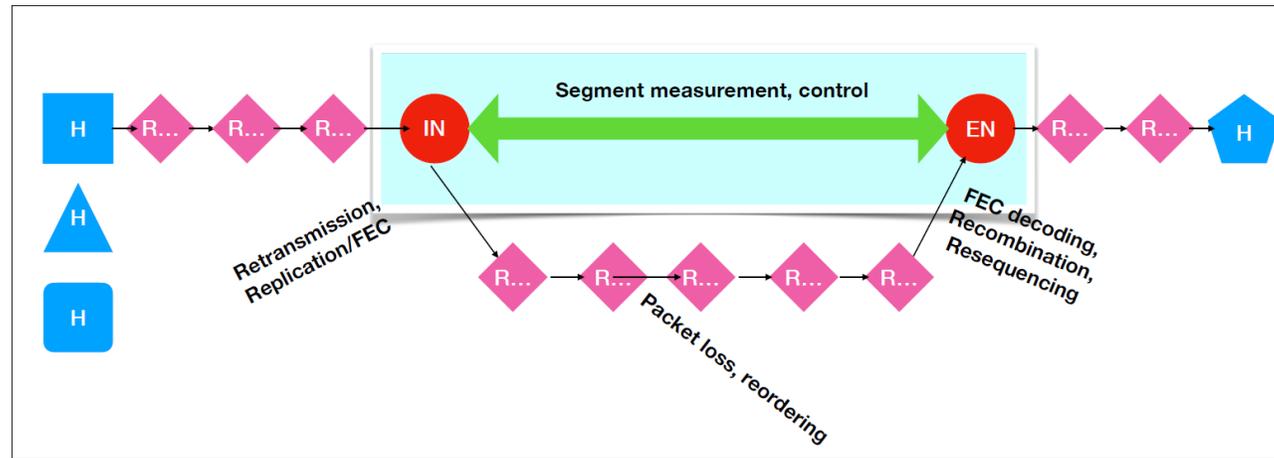
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Carsten Bormann

draft-bormann-loops-geneve-binding

draft-li-tsvwg-loops-problem-opportunities

draft-welzl-loops-gen-info

Recap: LOOPS aims to provide in-network loss recovery over specific segment to optimize packet delivery

Elements of LOOPS
- Information model for local **recovery**: in-network retransmission/FEC
    - Can be encapsulated in a variety of formats; define some of those
- Local **measurement**: e.g. segment forward delay/variation
    - To set recovery parameters
- Congestion **feedback**: drop-to-mark
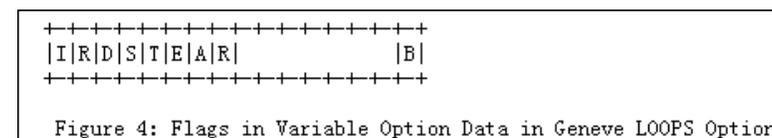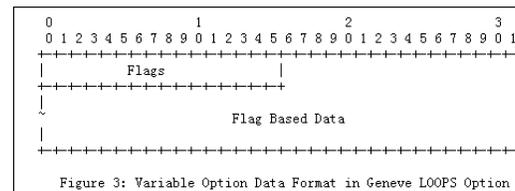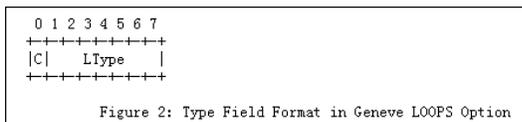   - ECN to inform end hosts about congestion loss

Recap: LOOPS is normally enabled over overlay tunnel
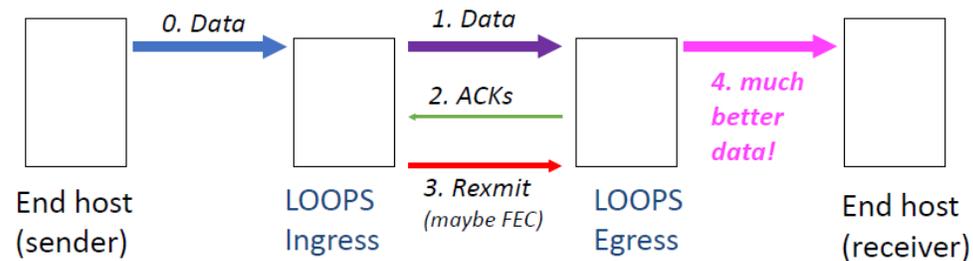
- Various scenarios:
  - Overlay path via cloud
  - SD-WAN based branch office interconnect
  - Improve multipath
  - Wireless subpath, e.g. satellite

How it relates to Geneve

- From IETF105 to IETF108:
  - IETF105: Non-WG-forming BoF. Explore the design space
  - IETF108: WG-forming BoF. Narrow down to MVP (Minimum Viable Protocol)
    - Some design space consensus (drop-to-mark, FEC default)
    - **For encapsulation: focus on Geneve encapsulation first**
- Solution sketch gives the whole picture of LOOPS function
  - Sequence space, Initial sequence number determination, ACK/NACK generation
  - Loss detection, Retransmission persistency, Local measurement
  - draft-welzl-loops-gen-info
- Geneve binding defines the format when embedding LOOPS to Geneve
  - Map the functions to Geneve, define data plane format, take care of Geneve specifics
  - draft-bormann-loops-geneve-binding-00

```
 0 1 2 3 4 5 6 7
+-+-+-+-+-+-+-+-+
|C|    LType    |
+-+-+-+-+-+-+-+-+

     Figure 2: Type Field Format in Geneve LOOPS Option
```

```
 0                   1                   2                   3
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             Flags                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                                                               ~
|                         Flag Based Data                       |
~                                                               ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 Figure 3: Variable Option Data Format in Geneve LOOPS Option
```

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|I|R|D|S|T|E|A|R|           |B|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 Figure 4: Flags in Variable Option Data in Geneve LOOPS Option
```

LOOPS BoF in IETF108

- **BoF Info**
  Friday, July 31, 2020 (UTC)
  11:00-12:40 (UTC) Session I
  Room 7
- **Chairs:** Spencer Dawkins, Andrew McGregor, Brian Trammell
- **Description:** LOOPS performs local optimizations within segments of an end-to-end path, in tunnels carrying aggregate flows. LOOPS recovers lost packets using retransmission and/or forward error correction (FEC), without requiring explicit cooperation from end hosts. After a non-WG-forming BOF at IETF 105 and further sharpening the charter proposal at **https://github.com/loops-wg/** to a Minimum Viable Protocol, this is now a WG-forming BOF.