Tunnels and Checksums

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Joe Touch
strayalpha.com

UDP CS rules

- ATOMIC
  - UDP CS if acting as L4
  - OMIT if acting as L2

- Non-ATOMIC
  - Never UDP CS each fragment
  - Reassembled result
    - Reassembled CS required if this is the “real” L4
    - OMIT if this layer acts as L2

Reasoning – in order

1. IPv6 assumes L2/L4 checks for errors

2. Tunnels are L2s - but over other L2s

3. Nodes don't mangle, transmission and reassembly does
   i.e., true L2s check transmission; all L2s check reassembly
   so **tunnels that don't reassemble don't need checks**

4. UDP CS needed when L4;
   UDP CS needed when L2
   only **upon reassembly and** ***only*** **on that result**

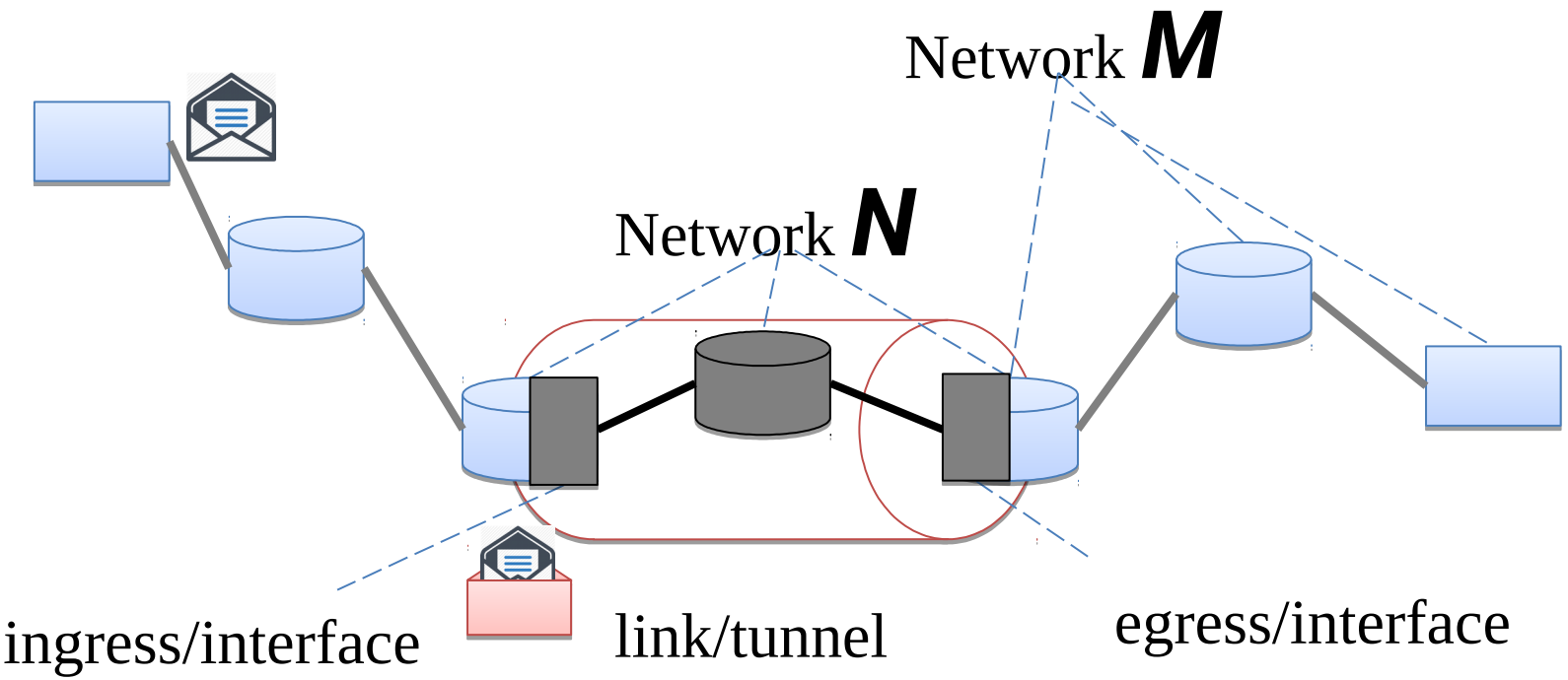
Some details follow…

1. IPv6 assumes others check

- IPv6 has header-only checksum
  - Assumes L2 checks hop errors
  - Assumes L4 checks E2E errors
  - Because “nodes don’t mangle,”
    but packets (at any layer) can be lost
- Which is why UDPv6 requires UDP CS
  - UDPv6 refers to UDP in the IPv6
  - UDPv6 is thus L4
  - L4 needs to check E2E errors
- And why UDP as L2 requires UDP CS
  - But only when there isn’t another layer that does so already…

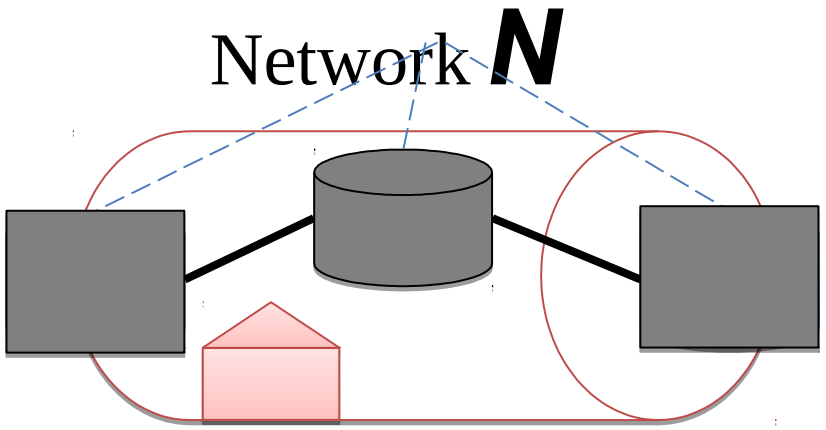
2. A tunnel *is* L2

- They look the same:



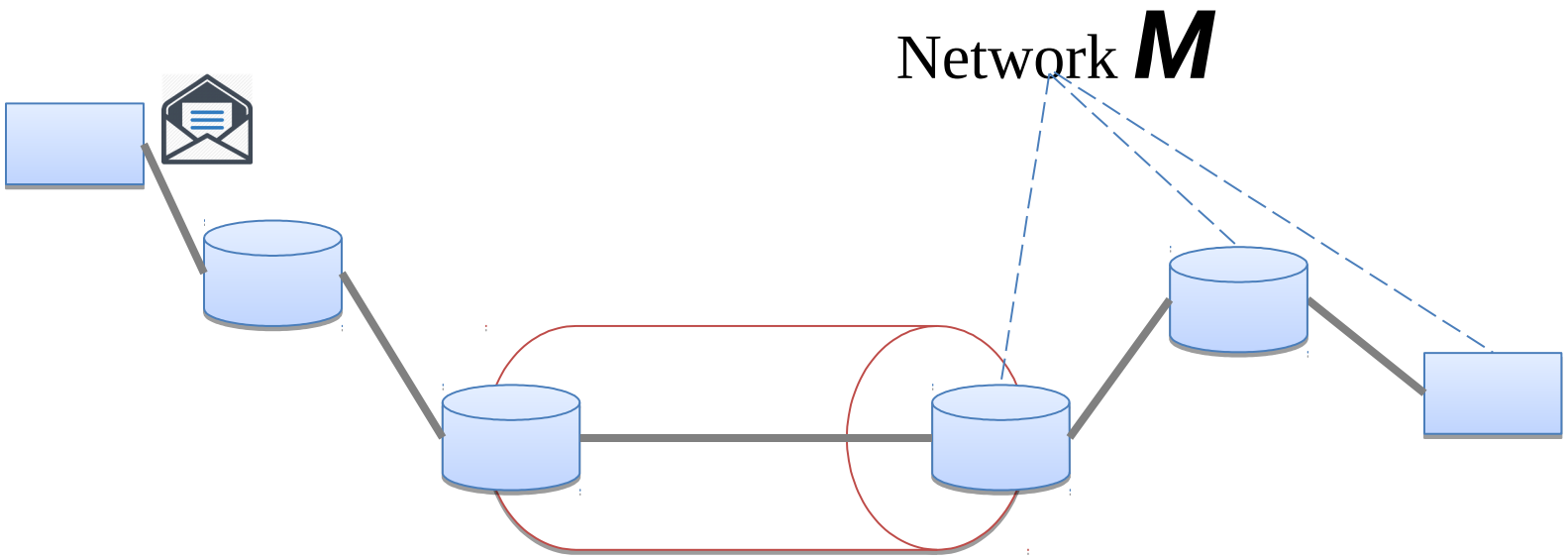
View from inside the next layer

- Link or tunnel
  - both look like a host-to-host path at layer N
  - ingress/egress or interfaces look like hosts



View from the upper layer

- Both look like a (L2) hop in a (L3) network M



3. Reassembly vs. checks

- Transmission as reassembly
  - Packets become sequence of symbols
  - Symbols represent bits or groups of bits
  - Transmission is reassembly of these groups
- Other reassembly
  - None for “atomic” packets (not fragmented)
  - IPv6 reassembles (but doesn’t check)
    - Still relies on L2 to check chunks, L4 to check whole

4. UDP CS rules

- ATOMIC
  - UDP CS if acting as L4
  - OMIT if acting as L2

Current IPv6 rules

- Non-ATOMIC
  - Never UDP CS each fragment (wasted effort!)
  - Reassembled result
    - Reassembled CS required if this is the “real” L4
    - OMIT if this layer acts as L2