MPLS Encapsulation for SFC NSH
draft-malis-mpls-sfc-encapsulation-01

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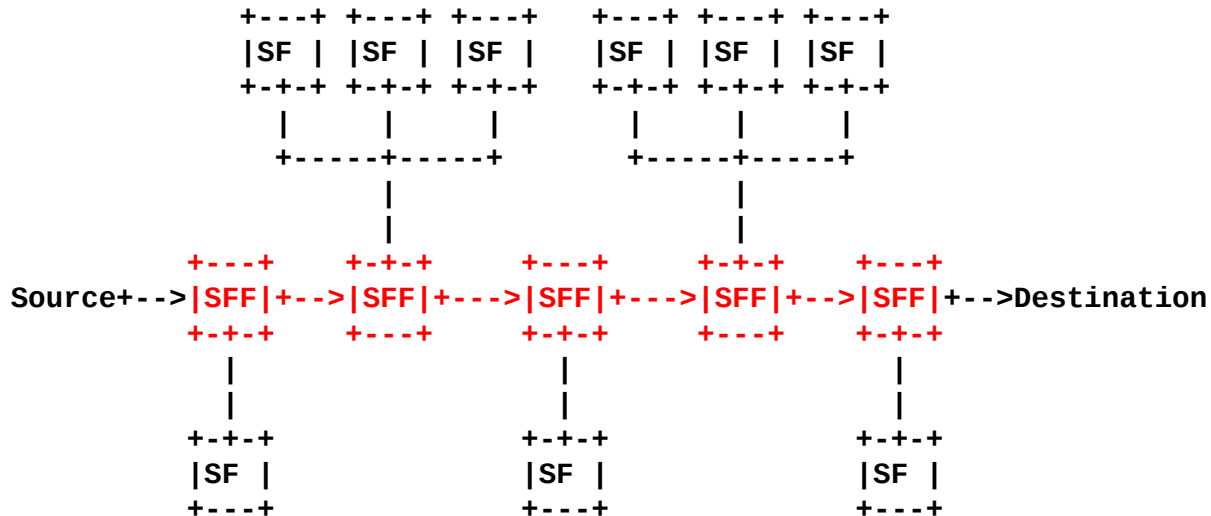
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Basic Intention of the Draft

- Defines an encapsulation used to transport SFC packets that use the NSH from one SFF to the next SFF over an MPLS infrastructure
- Red indicates MPLS-enabled nodes (LSRs) and links in the diagram (adopted from RFC 7665)

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          +---+ +---+ +---+      +---+ +---+ +---+
          |SF | |SF | |SF |      |SF | |SF | |SF |
          +-+-+ +-+-+ +-+-+      +-+-+ +-+-+ +-+-+
            |     |     |          |     |     |
            +-----+-----+          +-----+-----+
                  |                      |
                  |                      |
          +---+       +-+-+      +---+       +-+-+       +---+
 Source+-->|SFF|+-->|SFF|+--->|SFF|+--->|SFF|+-->|SFF|+-->Destination
          +-+-+       +---+      +-+-+       +---+       +-+-+
            |                      |                      |
            |                      |                      |
          +-+-+                  +-+-+                  +-+-+
          |SF |                  |SF |                  |SF |
          +---+                  +---+                  +---+
```

Encapsulation Details

- SFF Label is very similar to a PW, VPN, or other service label
  - Like a VPN label, no control word
- SFF Label identifies the SFF instance at the downstream LSR
  - Allows more than one SFF instance at the downstream LSR
  - SFF label(s) advertised by downstream LSR to upstream LSR (standard MPLS label advertisement)
  - Label advertisement mechanism(s) could include LDP, RSVP, YANG, BGP, PCEP, etc. (see later slide)
- Because there can be multiple transport labels, works with MPLS-based Segment Routing (SR-MPLS)
  - Works with draft-guichard-sfc-nsh-sr

Transport Label(s)
SFF Label
NSH Header and Payload
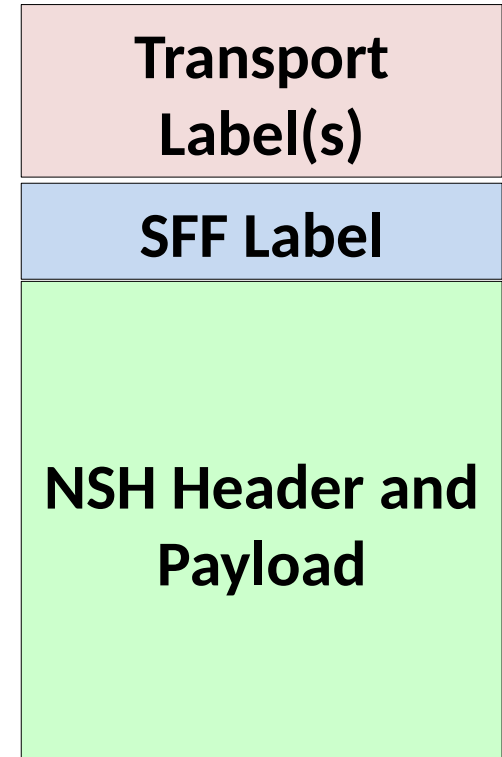
ECMP Considerations

- ECMP forwarding through the MPLS infrastructure may or may not be desirable for a particular SFC flow
  - Should be avoided for flows that require in-order delivery
- First nibble of the NSH provides protection to prevent unintended ECMP
  - Never equal to 0100 or 0110 to avoid appearing like an IP header to ECMP logic
- If ECMP is desired, MPLS has native mechanisms to provide entropy
  - Entropy label (RFC 6790)
  - Flow-aware transport label (RFC 6391)
- A recommendation between these options is for future study

OAM Considerations

- OAM at the SFC layer is handed by SFC-defined mechanisms (see RFC 8300)
- OAM may be required at the MPLS layer
- If so, standard MPLS-layer OAM mechanisms may be used, such as GAL (RFC 5586)

Comparison with draft-ietf-mpls-sfc

- draft-malis-mpls-sfc-encapsulation transports SFC packets with the NSH between SFFs over an MPLS infrastructure
  - Supports ALL SFC features, including per-packet metadata
- draft-ietf-mpls-sfc uses the MPLS label stack to "logically represent" the NSH for interim deployments in an MPLS infrastructure that doesn't support the NSH
  - No NSH in packets
  - Encodes the SFC Service Path Indicator and Service Index as "labels" in the label stack
    - SPI and SI labels require processing different from normal label operations, see Section 6
  - No per-packet metadata, only per-flow metadata
  - Metadata requires control plane extensions or a new MPLS special purpose label that carries the metadata in a dedicated packet

Comparison with draft-xuclad-spring-sr-service-programming

- draft-malis-mpls-sfc-encapsulation transports SFC packets with the NSH between SFFs over a general MPLS infrastructure
  - Supports both traditional label swapping and SR-MPLS
  - The usual MPLS state (LIB, etc.) at every LSR when label swapping
  - Intended for SFC infrastructures; SFC NSH is present in every packet
- draft-xuclad-spring-sr-service-programming is intended to support generalized service programming in SR domains
  - Services are associated with SIDs
    - More general than SFC in that "services" could be more than just service functions as defined by the SFC WG
  - Works with both SR-MPLS and SRv6
  - Doesn't support MPLS label swapping, no MPLS state in the routers
  - NSH is available, using the NSH Carrier TLV, if using standard SFC-defined SFs

Next Steps

- Progress the FFS items
  - ECMP recommendation
  - Control plane for SFF label advertisement
    - Already been in touch with authors of draft-ietf-bess-nsh-bgp-control-plane to discuss adding MPLS labels to the Service Function Instance Route to support this draft
    - Other control plane options?

- Start working towards adoption in the MPLS WG