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Mega Label - Expansion of MPLS Label Range

draft-li-mpls-mega-label-00

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Requirement Scenarios

- **Scenario 1: LDP Multi-Topology for MRT FRR**
 - The number of internet route is around 500,000,
 - When MPLS labels are allocated in the default topology, blue and red multi-topology simultaneously, the required labels will reach at least 1.5million.
- **Scenario 2: Label Allocation in VPN**
 - In some L3VPN deployment, the number of private route already reaches the several ten thousands.
 - When label allocation per prefix method used, it leads to the required label amount exceeding the existing MPLS label range.
 - In E-VPN, the MAC route could not be aggregated like IP route, which result in an even worse bottleneck
- **Scenario 3: Virtual Network Instance**
 - VXLAN in NVO3, extends the number of virtual network instances to 24bits,
 - The 2^{20} label range of MPLS is not enough to support the possible virtual network instances.

Framework of Mega Label

- **Label Stack for Expansion of Label Range**

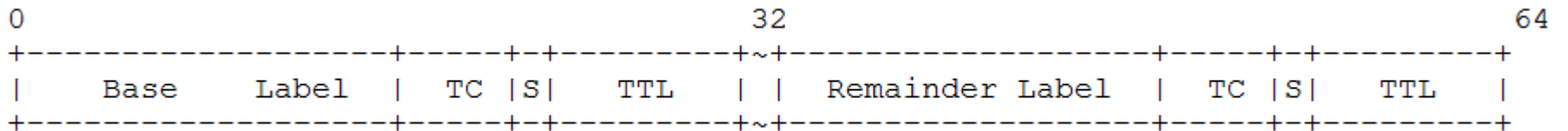


Figure 1: Encapsulation of Mega Label

- Base Label:
 - The outer layer label for the Mega Label, could be multiple
 - Unit is M (2^{20}).
- Remainder Label:
 - The inner layer label for the Mega Label, only one
 - A ordinary MPLS label, value is between 16-1M
- If there are N Base Labels and the value of Remainder Label is K, then the value of the Mega Label is $N * 1M + K$

Framework of Mega Label (cont.)

- **Data Plane**

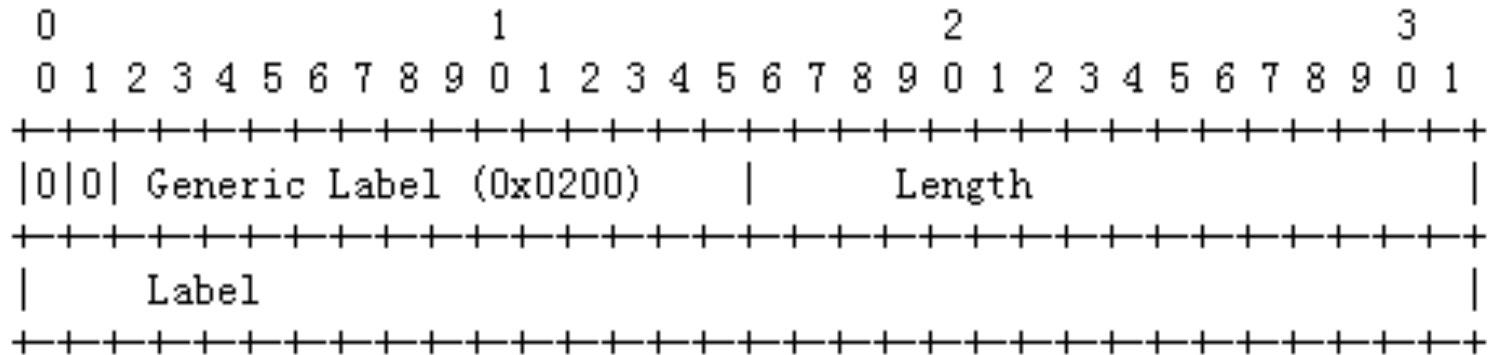
- When carrying a Base Label, lower layer of label(s) need to be de-capsulated and until the Remainder Label is reached.
- Calculate the value of the Mega label indicated by Base Label(s) and the value of Remainder Label, and then lookup its forwarding table and forward the packet accordingly.
- The value of EXP/TTL/S field in the Base Label should be consistent with the lower layer Remainder Label.

- **Control Plane**

- MPLS label distribution protocols, including LDP, RSVP-TE and MP-BGP, need to be extended to enabling Mega label allocation for one FEC

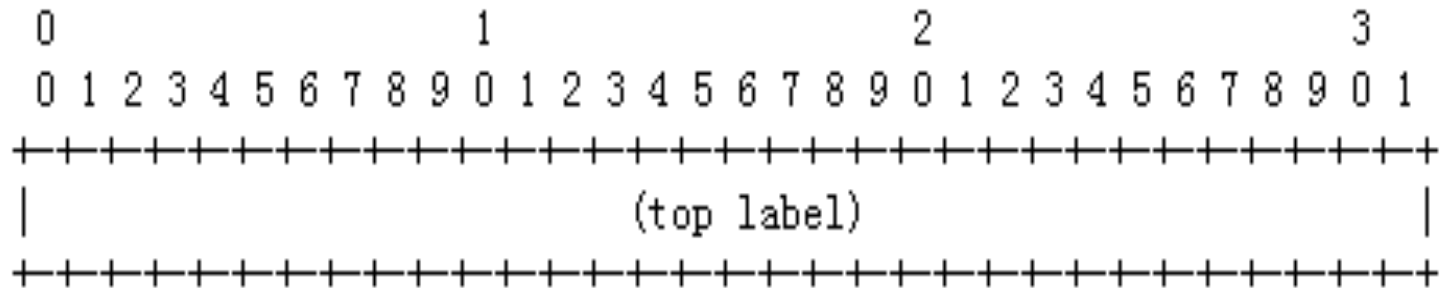
Inconsistency of Existing MPLS Label Distribution (1)

- LDP (RFC 5036): Generic Label TLV



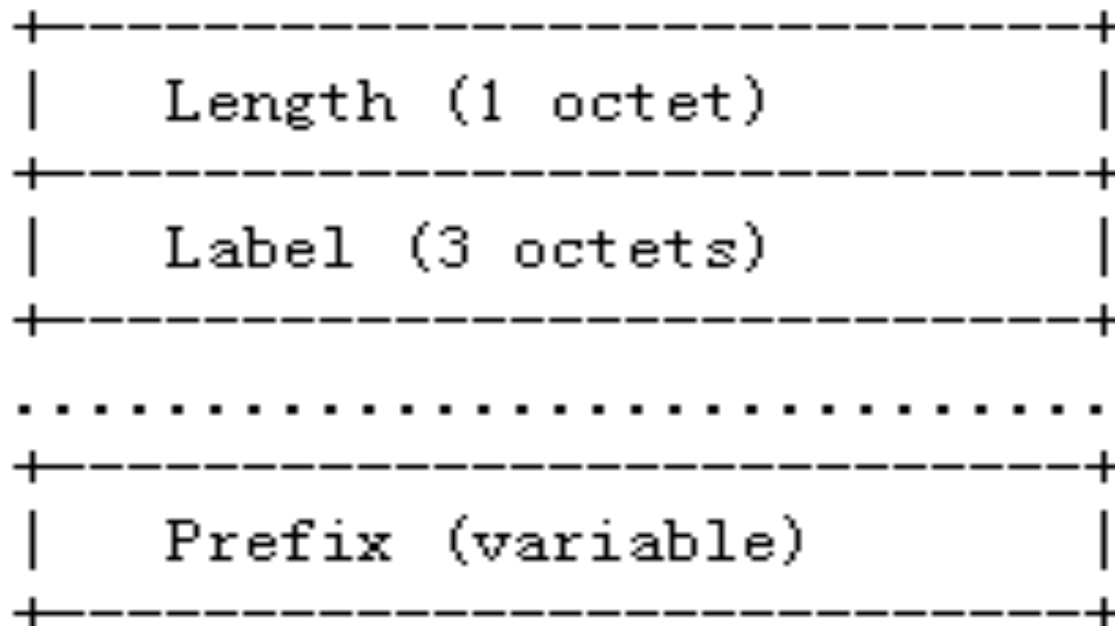
- RSVP-TE(RFC 3209): Label Object

LABEL class = 16, C_Type = 1



Inconsistency of Existing MPLS Label Distribution (2)

- MB-BGP(RFC 3107): Label Stacks
 - Over thought?
 - Scalability?



RSVP-TE Mega Label Object (Example)

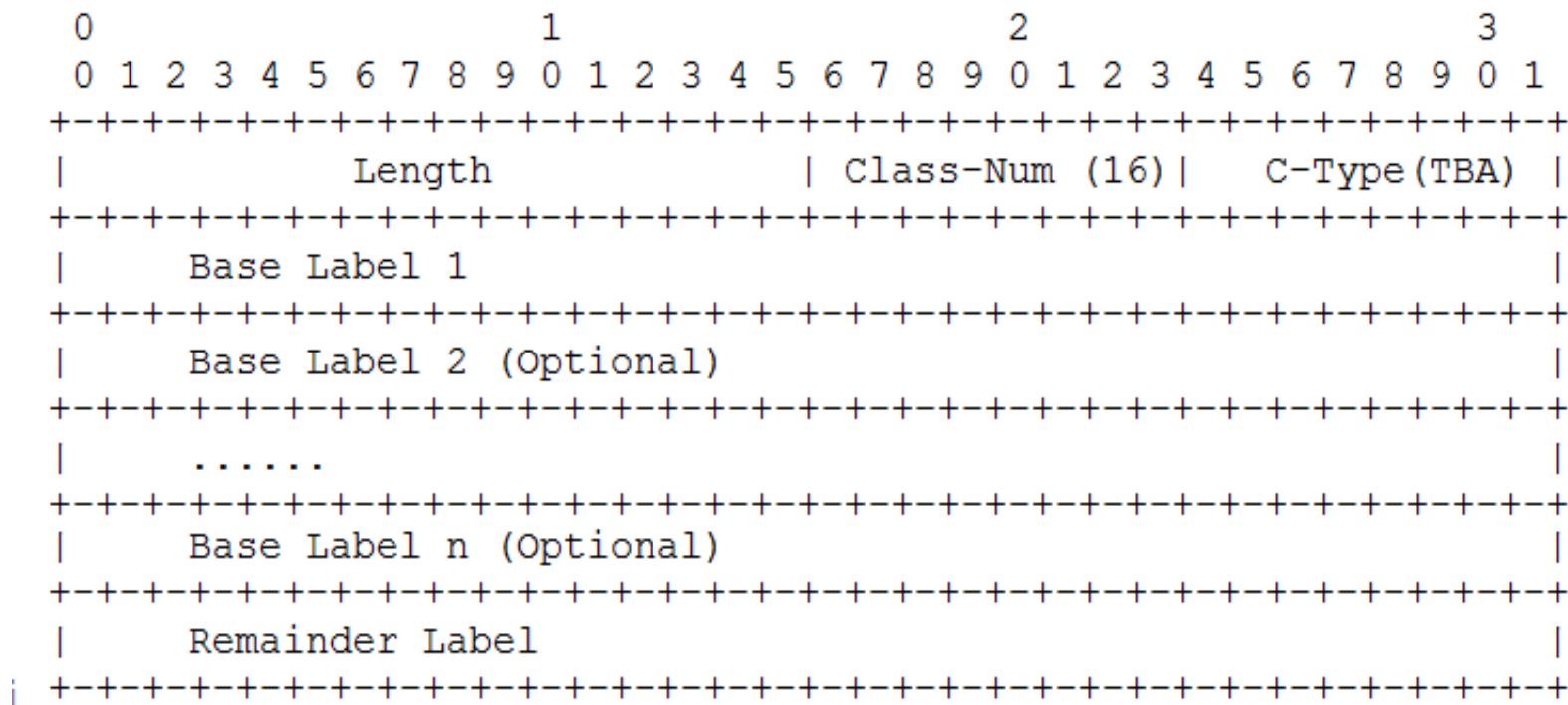


Figure 3. RSVP-TE Mega Label Object

- **Label Stacks SHOULD also be distributed by LDP and RSVP-TE.**
- **Scalability: What usage for the label stack can be hided.**

Next Steps

- **Merge requirements with Big Label**
- **Discuss the better option for Big Label**
- **Solicit comments & feedbacks**

Thank you