

Segment Routing for Enhanced VPN Service (VPN+)

draft-dong-spring-sr-for-enhanced-vpn-02

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Motivation

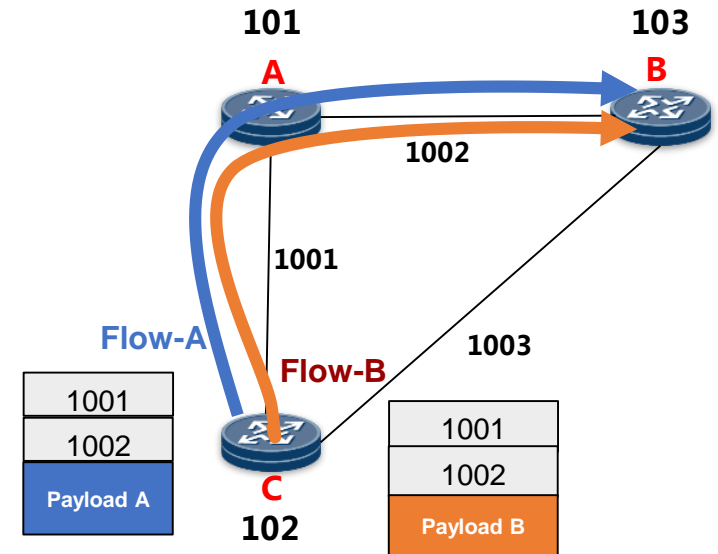
- VPNs have been widely deployed to support multi-tenancy in operator networks
 - Separated tenant address spaces
 - Separated routing & forwarding tables
- Emerging services have demanding requirement on SLA (e.g. bandwidth, latency, jitter, etc.)
 - Need enhanced mechanisms to meet the SLA requirement
- Enhanced VPN aims to:
 - Enable multiple tenants with demanding services in a shared network
 - Ensure high performance with reasonable cost and scalability
 - Provide a solution for transport network slicing
- Framework of Enhanced VPN: draft-dong-teas-enhanced-vpn

Enhanced VPN

- Integration between overlay VPN and underlay network
 - Could work with existing overlay VPN signaling
 - L3VPN, L2VPN, EVPN, etc.
- Enhancement in forwarding plane is needed
 - Guaranteed SLA comes from guaranteed resource & deterministic scheduling
 - Several candidate technologies:
 - FlexE, dedicated queues, TSN/Detnet, etc.
- Control plane should take advantage of forwarding plane enhancements
 - Build virtual networks with enhanced characteristics
 - Provide abstraction of different forwarding plane technologies
 - Scalability needs to be taken into consideration

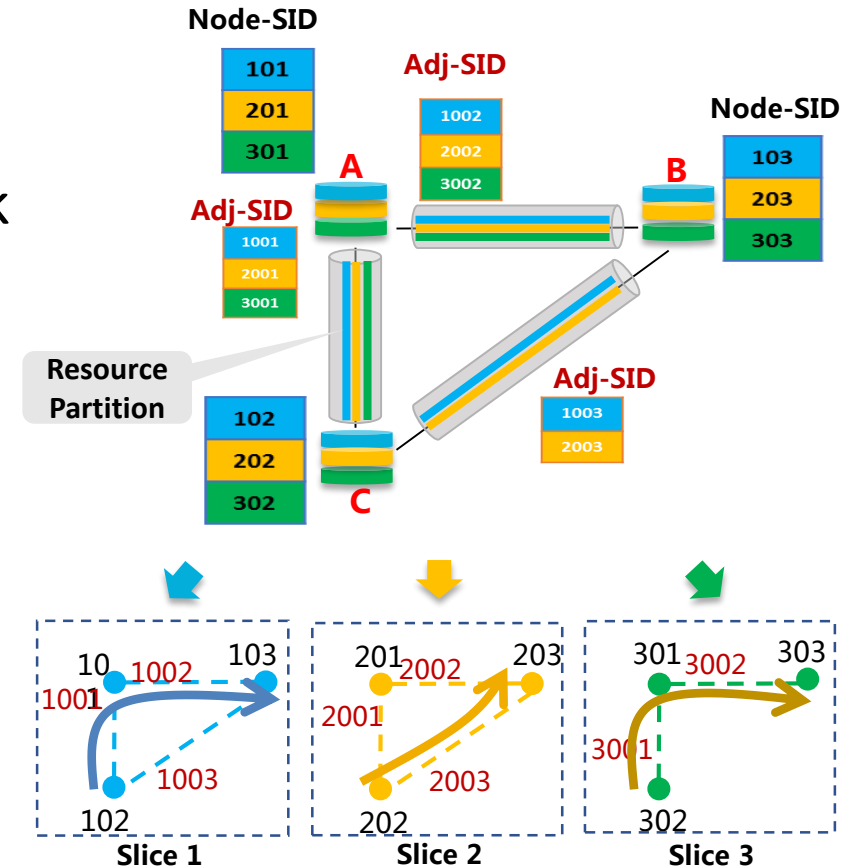
Can SR support enhanced VPN?

- Current SR is mainly for explicit routing
 - SIDs are topological or service instructions
 - Different services share the same SID/SID list
- Based on DiffServ QoS for class-based traffic differentiation
- Does not have mechanism for per tenant/service traffic treatment and SLA guarantee
 - May not meet the requirement of demanding applications



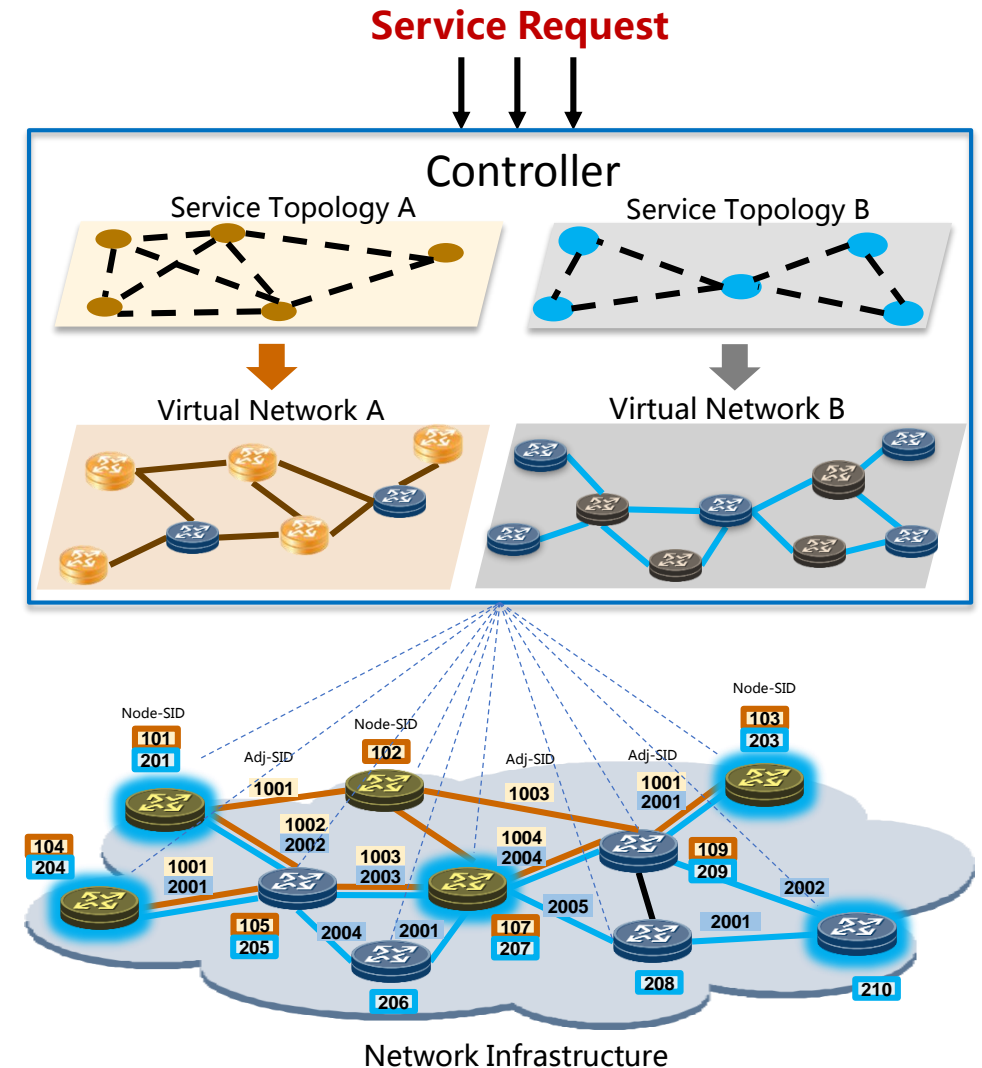
SR Enhancement with Resource Awareness

- Based on forwarding plane resource partitioning
 - E.g. allocate dedicated link resources for different virtual networks
- Different SIDs are used to identify different set of network resources
 - Multiple adj-SIDs for one link
 - Multiple prefix-SIDs for one node
- SR virtual networks are built with different set of SIDs
 - Traffic in different virtual networks are steered to isolated resources according to the SIDs used
- VPNs can map to dedicated or shared virtual networks



Control Plane

- Controller
 - Computes the virtual network topology and the resources needed according to service requirement
 - Instructs nodes to allocate per-segment resources and SIDs for the virtual network
- Distributed Control Plane
 - Distribute/report the information about the resources allocated and the associated SIDs
 - Build the virtual network topologies and forwarding entries on each node
- Protocol extensions will be done in relevant WGs
 - LSR, IDR, PCE, etc.



Updates Since IETF 101

- Add more details about the mechanism
- Describe the procedure with example diagrams
- Add control plane considerations
- Clarify the applicability to both SR-MPLS and SRv6
- Many editorial changes

Comments Received

- What extension to SR is needed?
 - SIDs are used to represent different set of network resources on network segments
- How is resource reserved in the network?
 - Controller computes the resources needed, then it instructs the involved nodes to reserve the resources in data plane
- Will this add more states to SR network?
 - Yes, but the states are necessary if it is aimed to provide guaranteed SLA using SR
- How is the scalability compared to TE-LSPs?
 - Still complies to SR paradigm, there is no per-path state in network, the scalability is better than E2E TE-LSPs.

Next Steps

- Solicit further comments and feedbacks
- Improve the draft accordingly
- WG adoption?