

Realizing Network Slices in IP/MPLS Networks

draft-bestbar-teas-ns-packet-02

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Agenda

Updates

Review

Next steps

Updates (since last presented at IETF109)

- New terminology added
- Merged with I-D: <draft-peng-teas-network-slicing>
- Received useful feedback from the WG
 - Addressed comments from J. Halpern, L. Contreras, R. Chen and J. Dong
- New co-authors have joined

Key Terminology

- Slice Policy:
 - A policy that enables the instantiation of mechanisms in support of IETF network slices
 - The enforcement of a slice policy results in the creation of a slice aggregate
- Slice aggregate:
 - A collection of packets that match a slice policy selection criteria and are given the same forwarding treatment
 - A slice aggregate MAY be comprised of one or more IETF network slice traffic streams
 - The mapping of one or more IETF network slices to a slice aggregate is maintained by the IETF Network Slice Controller

Realizing an IETF network slice

Slice customer intent :

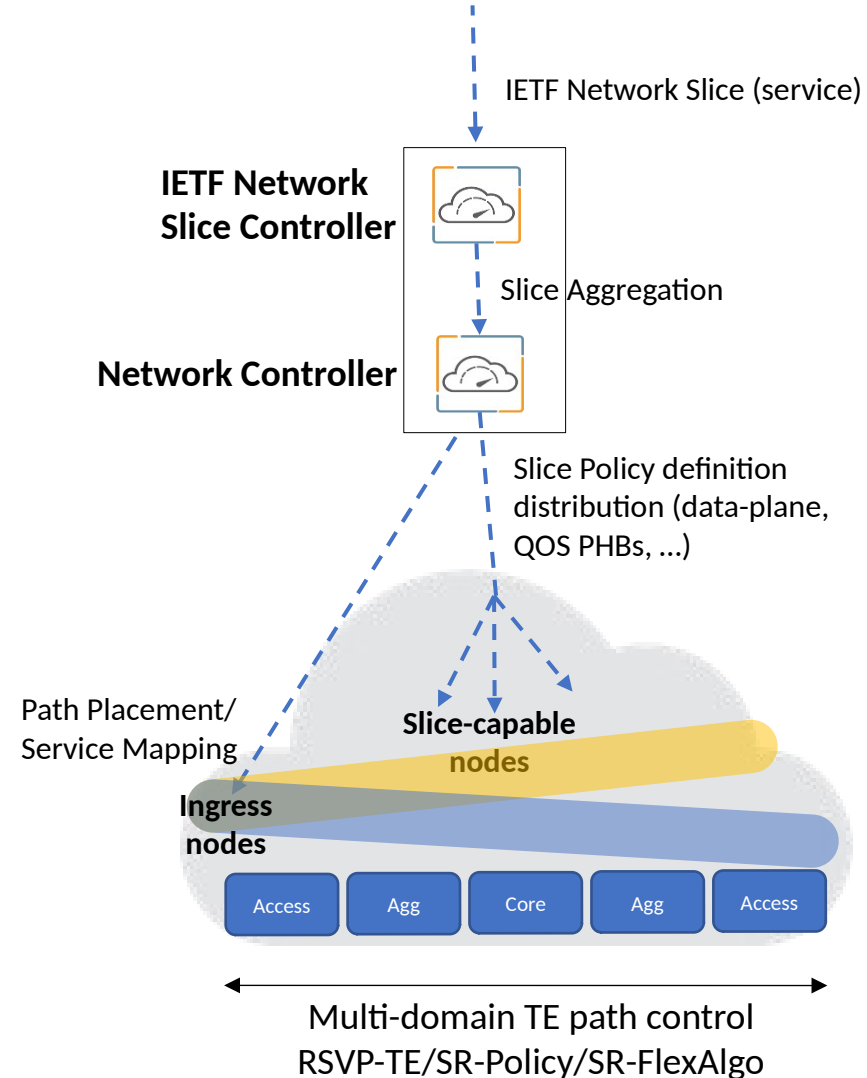
- IETF network slice requirements
- IETF network slice end-points

IETF Network Slice Controller/Network Controller:

- Creates and manages the IETF network slice
- Aggregates multiple IETF network slices
- Maps a suitable topology and resource allocations to the slice aggregate
- Pushes service mapping on PEs for slice aggregate traffic steering
- Instantiates and pushes Slice Policy definitions on select network elements

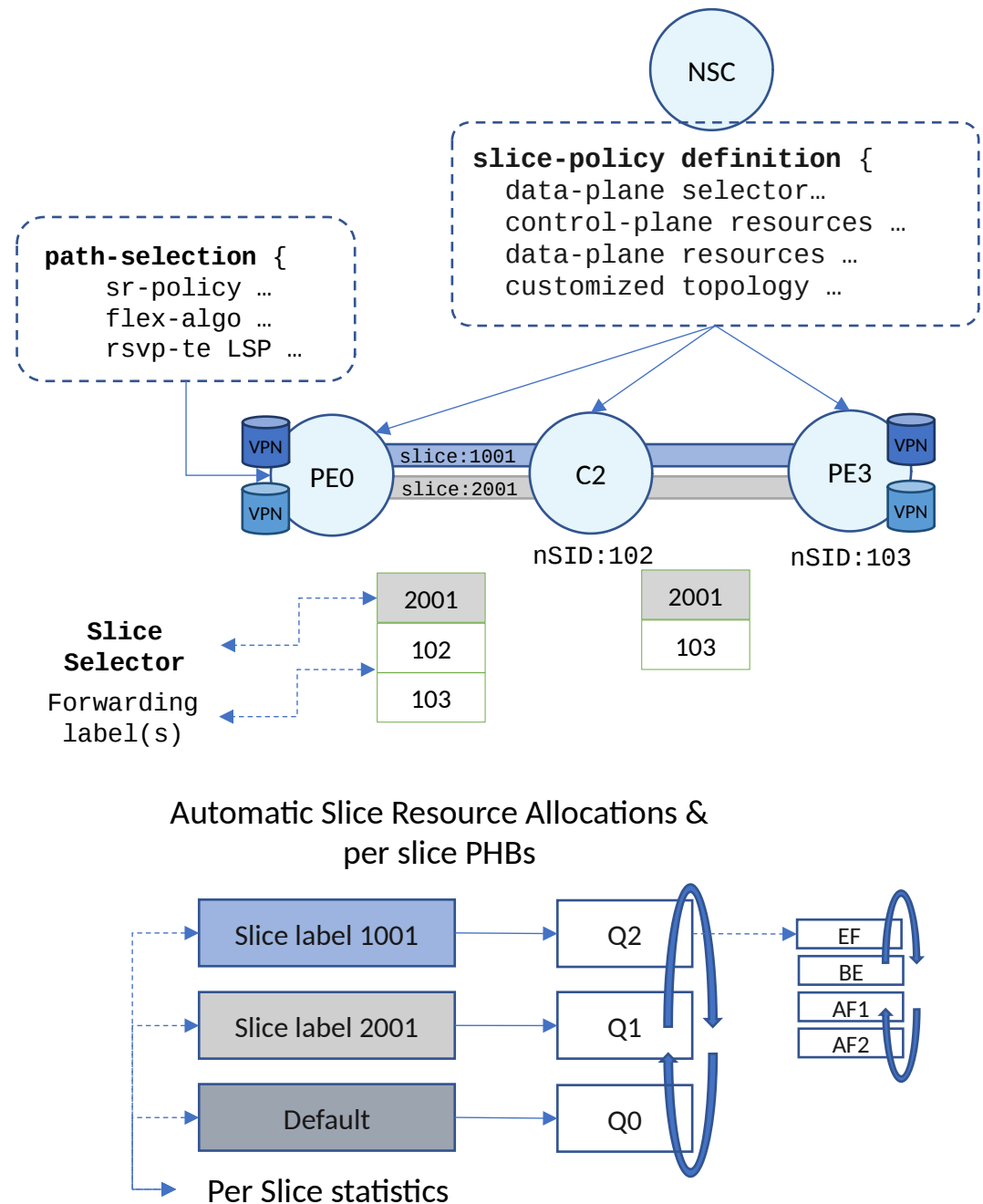
Network Controller initiated paths within a slice:

- Instantiated on-demand
- Uses slice aggregate topology and suitable optimization functions
- Path setup can be SR-Policy/FlexAlgo/RSVP-TE LSPs or ...



Solution Recap

- A Slice Policy enforces per slice aggregate:
 - Data-plane Slice Selector
 - Data-plane resources
 - Control-plane resources (bandwidths, priorities, shared-resource groups)
 - Customized topology for SA aware TE
- Dissemination of the Slice Policy Definition:
 - Programmed via Netconf/gRPC interface(s)
 - Exchanged in IGP and/or BGP
 - Configured directly on device(s)
- Multiple options for path control techniques within a slice (SR-Policy, Flex-algo, RSVP, ...)

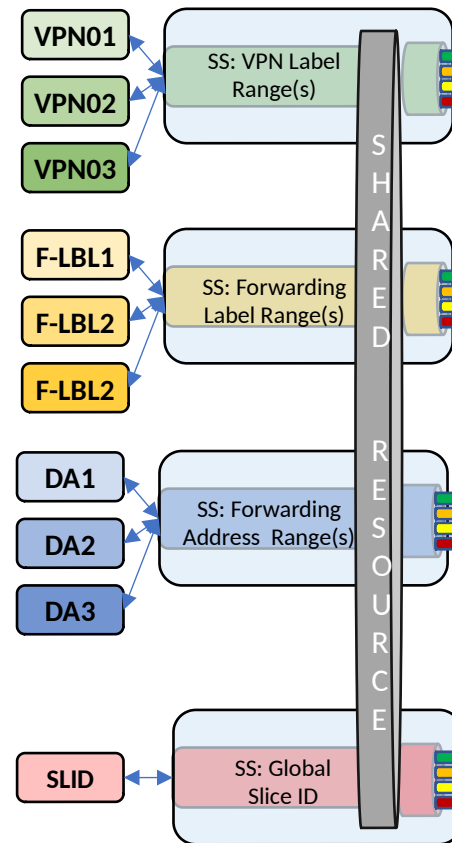


Slice Policy Data-plane Slice Selectors

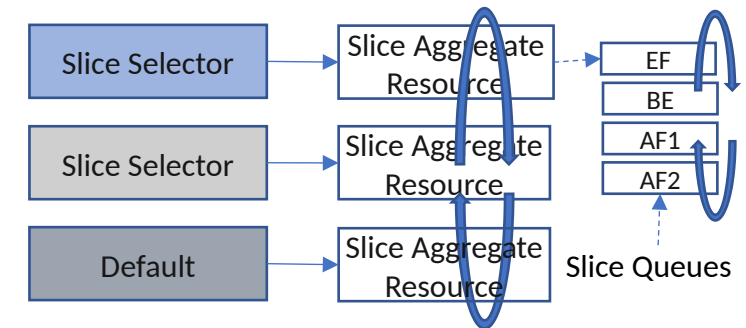
The Slice Selector is carried in the packet & identifies a specific slice aggregate

Slice Selector options (IP/MPLS):

- A range of MPLS forwarding label(s) (for each destination) mapping to a Slice
- A range of MPLS VPN service label(s) mapping to a single Slice
- A global Slice-ID, for example:
 - as defined in I-D.kompella-mpls-mspl4fa or I-D.draft-dekraene-mpls-slid-encoded-entropy-label-id and draft-filsfils-spring-srv6-stateless-slice-id
- A multi-field packet selector
- A set of IP destination(s)



Dataplane Slice Selector variants



DiffServ Principles

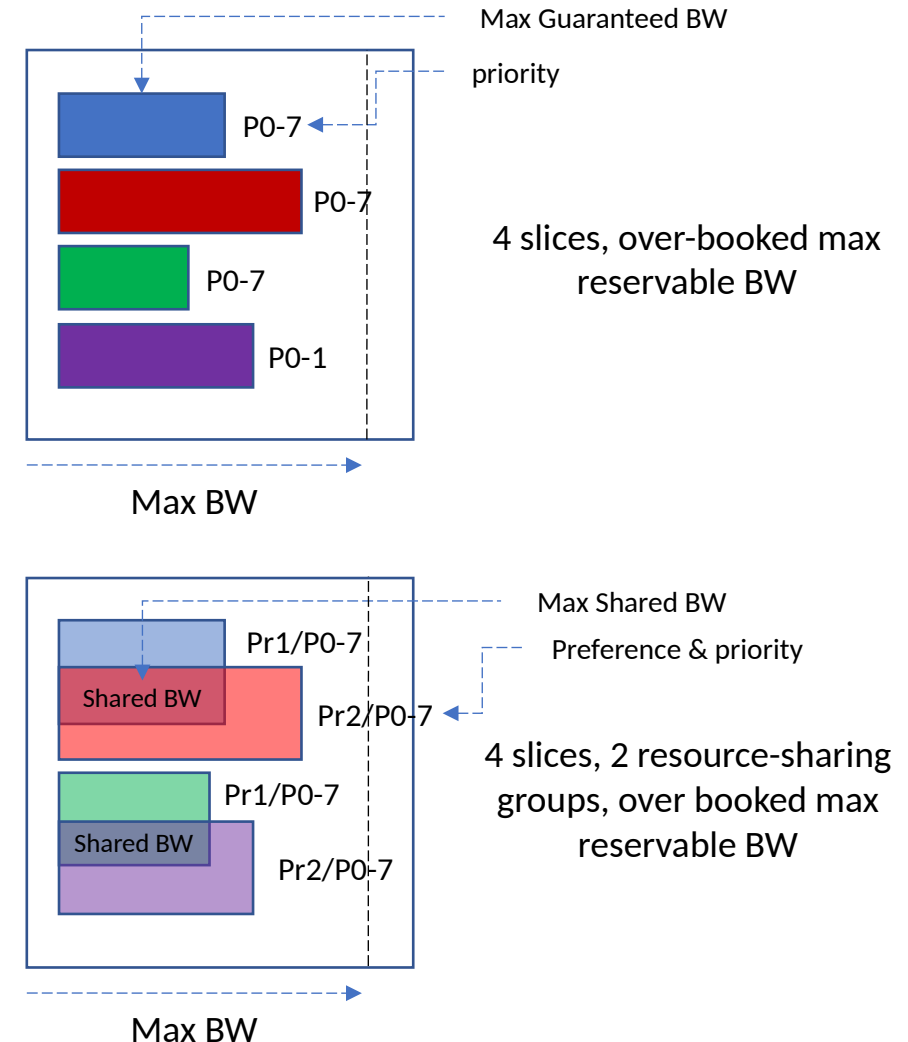
Slice Policy Resources

Control plane resource slicing

- A guaranteed allocation of BW for a slice aggregate
- Sets of slice aggregates may share reservable BW (a pool)
- Slices may have priorities to enforce which paths get rerouted during times of resource shortages
- IGP extension for slice aggregate TE defined in [I-D. draft-bestbar-lsr-slice-aware-te]

Data plane resource slicing

- Hierarchical differentiation of traffic classes within a slice aggregate
- Slice Policy definition can reference profile(s) local to the device
- Different profiles applicable to different interface members is possible



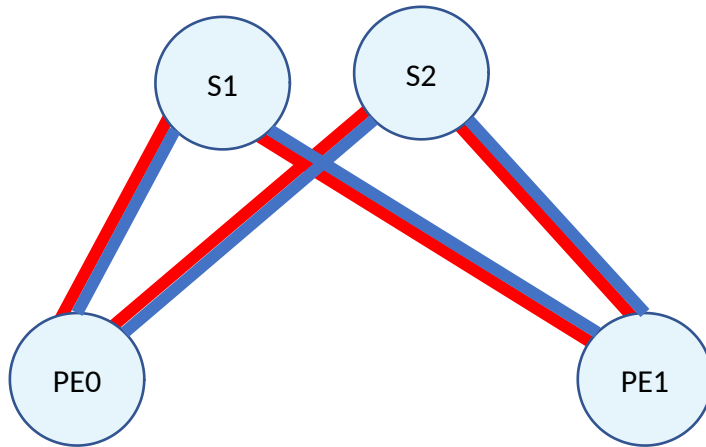
Slice Policy Topology

- Topology membership defines the network elements where slice aggregate forwarding treatment is enforced
- Topology also required for slice aggregate aware path selection
 - Computing paths over customized topologies
 - Facilitate slice aggregate aware TE
- Topology membership options:
 - Can reference existing topology – e.g. MT-ID + Flex-algo definition, TE Topology ID
 - User defined topology by defined customized filters – e.g. link affinities
- Same topology can be used by multiple slice aggregates

Slice Policy Modes

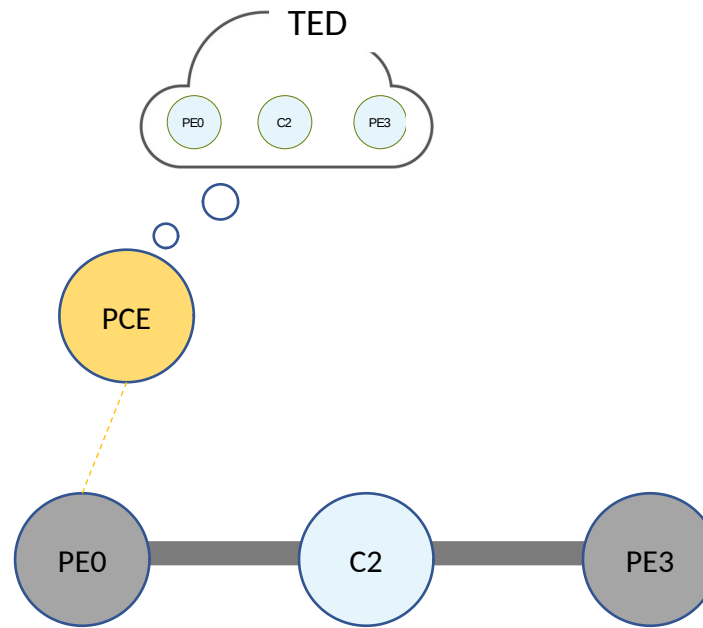
Hybrid Scenarios are also possible

Data-plane only slicing
Per Slice H-QoS



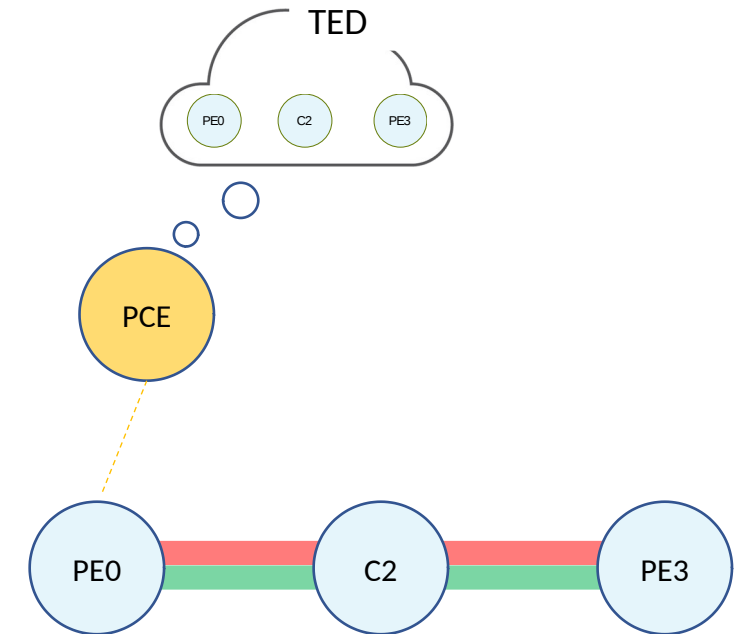
Slice specific data-plane resource allocation

Control-plane only slicing
Per Slice Traffic-engineering



Slice aware TE
Simple, common, 4-8Q EXP based
PHBs may still be deployed

Control & Data-plane slicing
Per Slice H-QoS & Traffic-engineering



Slice aware TE & Per Slice H-QoS, with
guaranteed control-plane & data-plane
resources

Next Steps

- We welcome further review and feedback from the WG
- The I-D is in stable state and authors ask for WG adoption

Relevant I-Ds

- Scalable Network Slicing over SR Networks, [I-D.bestbar-spring-scalable-ns]
- YANG Data Model for Slice Policy, [I-D.bestbar-teas-yang-slice-policy]
- Multi-purpose Special Purpose Label for Forwarding Actions, [I-D.kompella-mpls-mspl4fa]
- IGP Extensions for SR Slice Aggregate SIDs, [I-D. bestbar-lsr-spring-sa]
- IGP Extensions for Support of Slice Aggregate Aware Traffic Engineering, [I-D. bestbar-lsr-slice-aware-te]