Segment Routing based Solution for Hierarchical IETF Network Slices

draft-gong-teas-hierarchical-slice-solution-00

L. Gong (China Mobile)
W. Cheng(China Mobile)
C. Lin (New H3C Technologies)
M. Chen (New H3C Technologies)
J. Dong (Huawei Technologies)
R. Chen (ZTE Corporation)
Y. Liang(Ruijie Networks Co., Ltd.)

IETF-114

Background

- ✓ **Network slicing**

  partition a physical network into multiple isolated logical networks of varying sizes

- ✓ **IETF Network Slice**

  defined by [I-D.ietf-teas-ietf-network-slices] with general principles of network slicing

- ✓ **Network Resource Partition (NRP):**

  collection of resources in the underlay network. A NRP support one or a group of IETF network slice services

- ✓ **hierarchical IETF network slices**

  a network slice can be further sliced into other network slices. [I-D.dong-teas-hierarchical-ietf-network-slice] describes the possible scenarios :

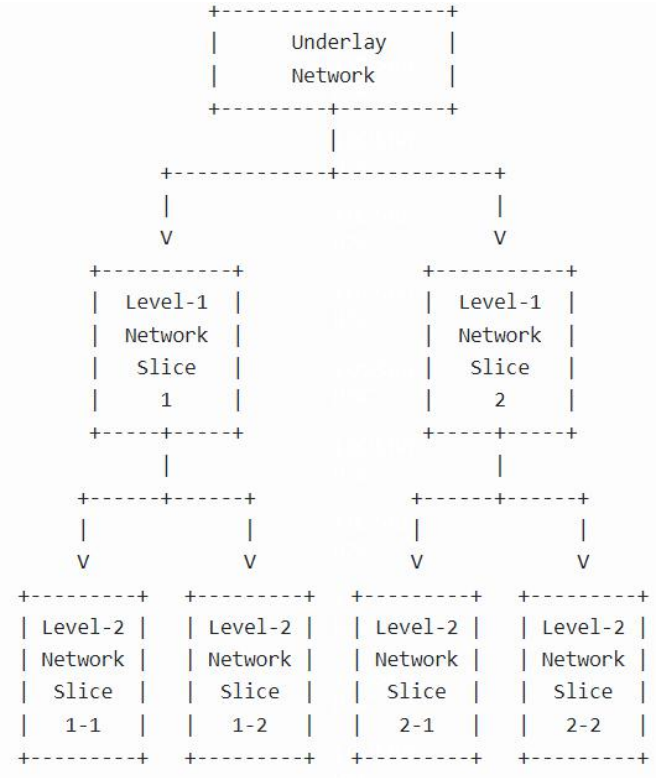
  level-1 can be industry slices; level-2 can be customer slices

This draft proposes a **two- level hierarchical IETF network slices solution** based on **Segment routing**.

Level-1 network slice : realized by associating Flex-Algo with dedicated sub-interfaces

Level-2 network slice :realized by using SR Policy with additional NRP-ID on data plane

Two-level Hierarchical IETF Network Slices Architecture



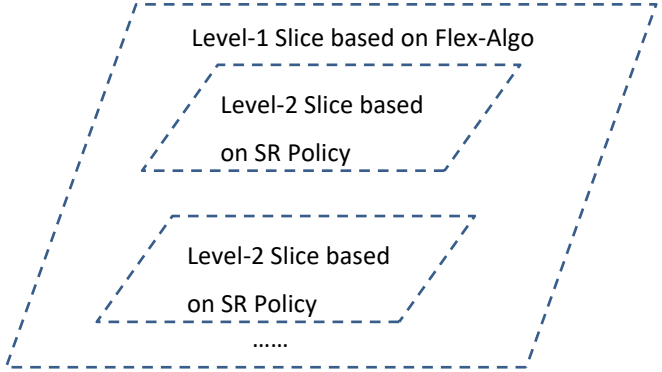
2 Level hierarchical Slice based on Segment routing

✓ **Level-1 network slice**

Topology for Level-1 network slice: associated with a **Flex-Algo**

(All the nodes belong to the level-1 NRP participate in the associated Flex-Algo)

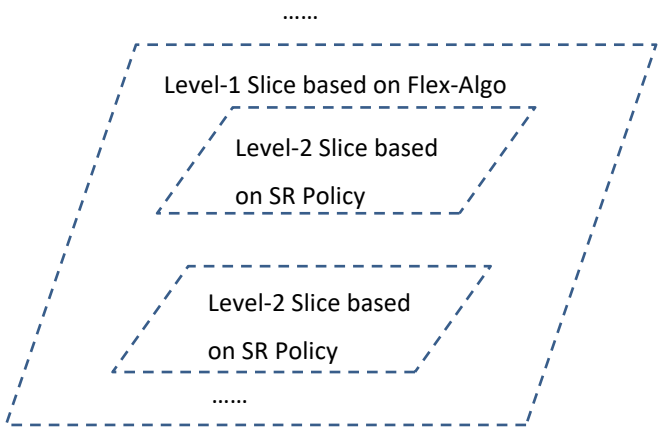
Traffic Forwarding: Traffics of the level-1 network slices are steered into the Flex-Algo paths by using Prefix-SIDs or SRv6 locators



✓ **Level-2 network slice**

Topology for Level-2 network slice: Specify the path on the level-1 NRP through SR policy.

Traffic Forwarding: Traffics of the level-2 network slice are steered into the SR Policies



network resources for the two-level network slices

bandwidth resource of a physical interface is partitioned in a hierarchical manner

✓ **Bandwidth for Level-1 network Slice**

is guaranteed by layer-3 sub-interfaces with dedicated bandwidth.

layer-3 sub-interface is

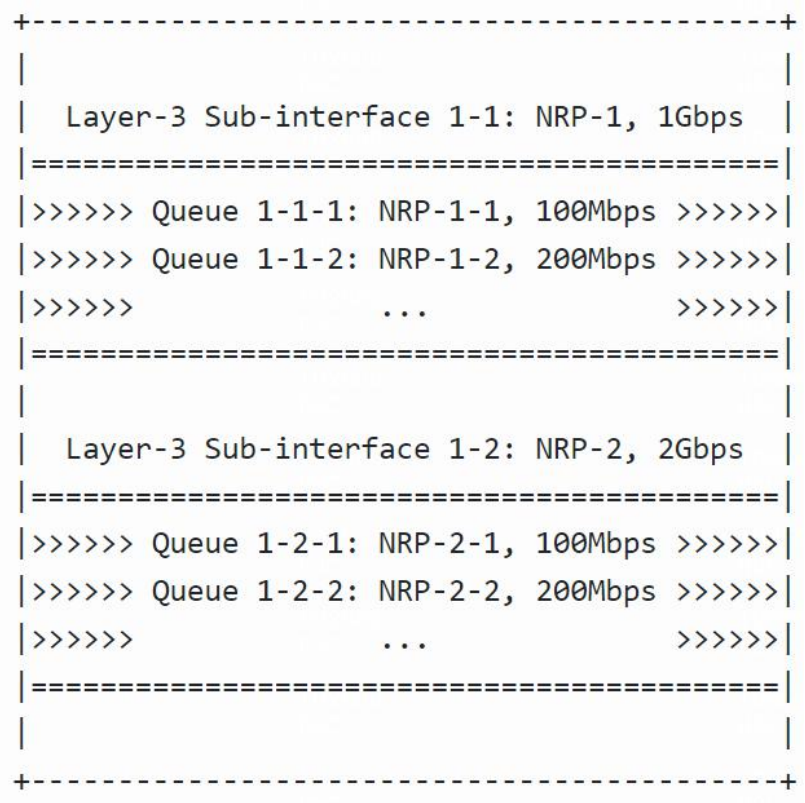
- included by the Flex-Algo which is associated with the level-1 NRP
- excluded by irrelevant Flex-Algos

Data plane Identifier: Prefix-SIDs or SRv6 locators associated with Flex-Algo

✓ **Bandwidth for Level-2 network Slice**

is guaranteed by HQoS queues with dedicated bandwidth under the layer-3 sub-interface of level-1 NRP

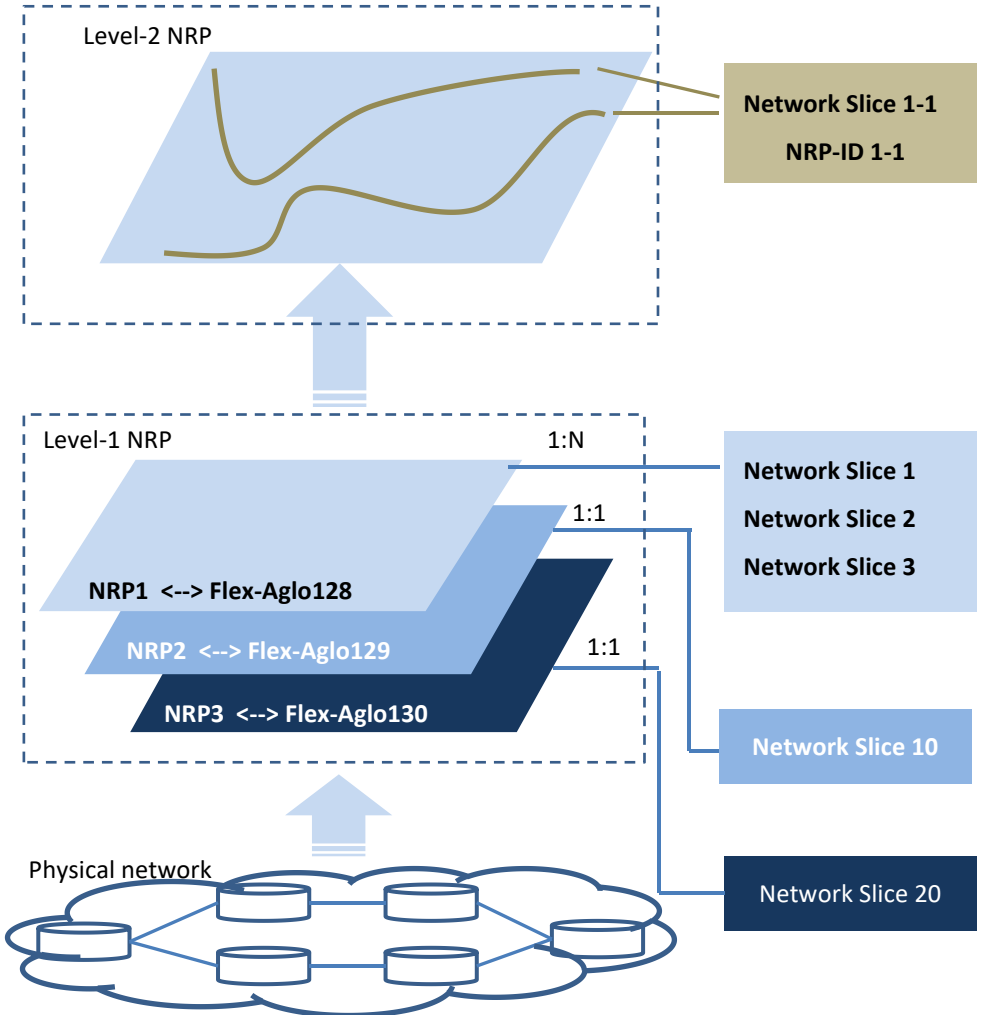
Data plane Identifier: NRP-ID associated with HQos Queue



NRP vs Network Slice

Each NRP can be used to support one or a group of network slice

- ✓ **Level-1 NRP**
  - **1:N**. multiple level-1 network slices share one level-1 NRP means these level-1 network slices associate one Flex-Algo
  - **1:1**. One Level-1 NRP supports one Level-1 network slice
- ✓ **Level-2 NRP**
  - **1:1**. One Level-2 NRP supports one Level-2 network slice



Example --- Slice service planning and requirements

Slice Service Planning

✓ **2 Level-1 slice**

- **Slice1 for education** -- FlexAlgo 128
- **Slice2 for healthcare**. -- FlexAlgo 129

network slice and NRP are 1:1

Requirements

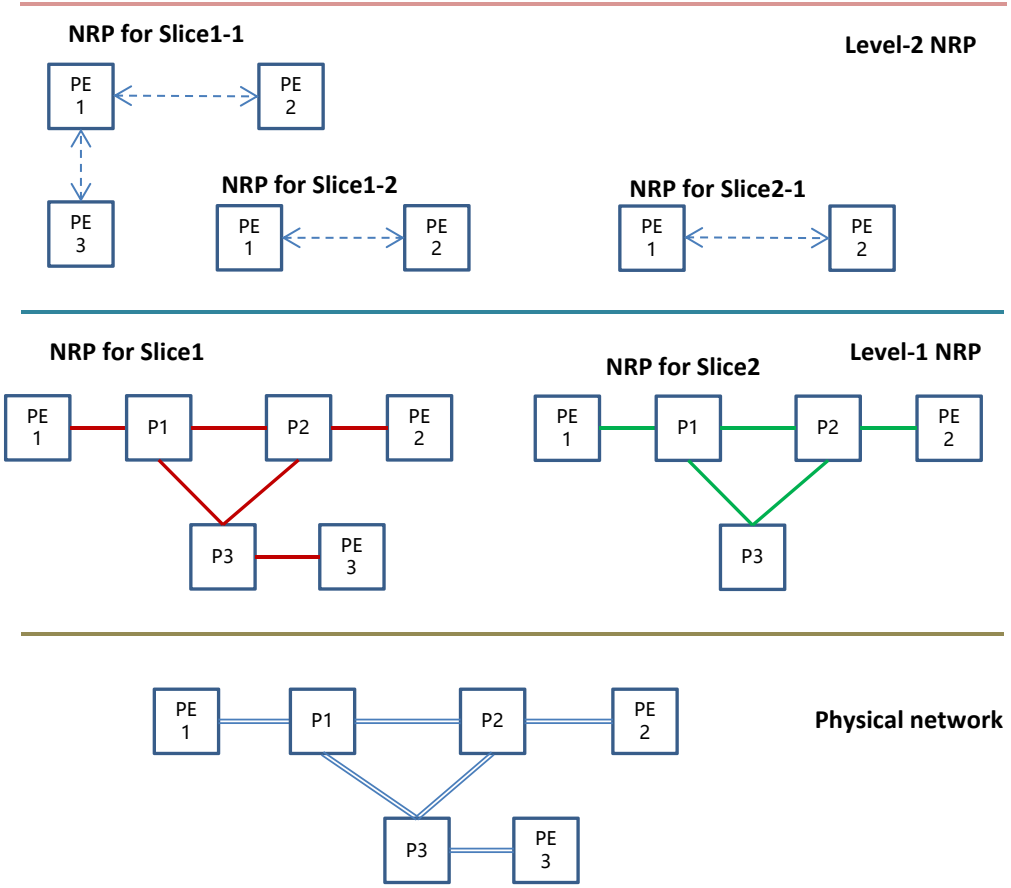
✓ **Slice1**

2 customer require **Level-2 slice**

- **University 1**. interconnection between PE1 and PE2 and interconnection between PE1 and PE3
- **University 2**. interconnection between PE1 and PE2

✓ **Slice2**

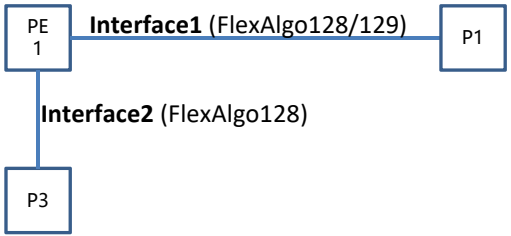
1 customer requires Level-2 slice

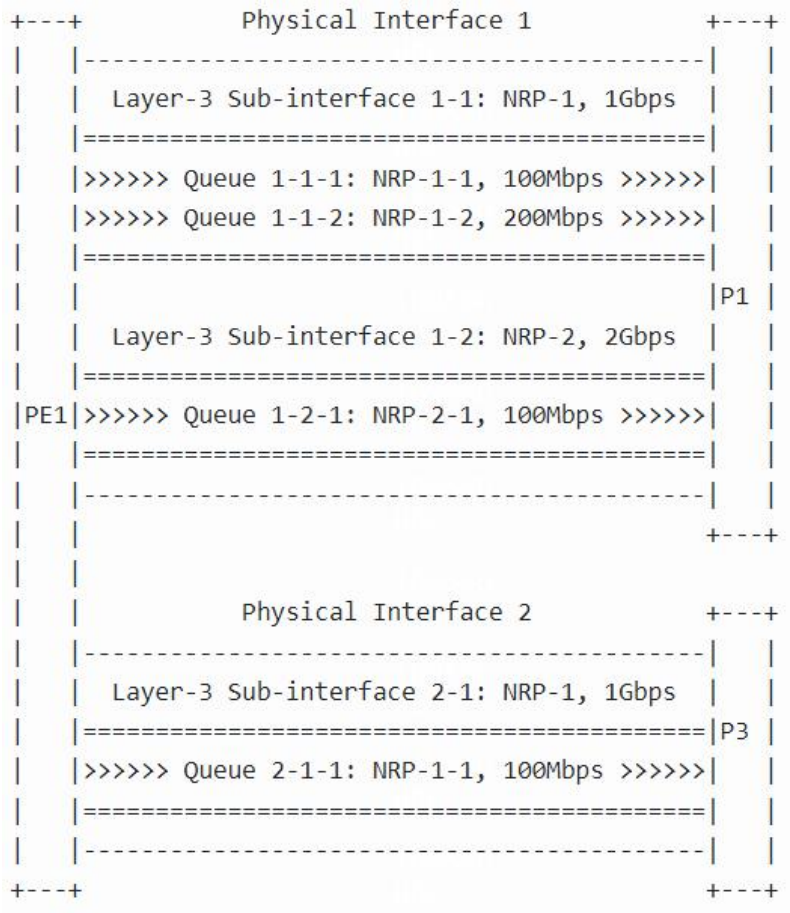


Example --- NRP of link bandwidth

Taking PE1 as an example

- ✓ **Interface1** connect to P1
  - **Sub-interface 1-1** for NRP-1
    - Queue 1-1-1, for NRP-1-1
    - Queue 1-1-2, for NRP-1-2
  - **Sub-interface 1-2**. -- NRP-2
    - Queue 1-2-1, for NRP-2-1
- ✓ **Interface2** connect to P3
  - **Sub-interface 2-1** for NRP-1
    - Queue 2-1-1, for NRP-1-1





Example --- Traffic forwarding

Taking PE1 as an example

✓ **Forwarding on Level-1 Slice**

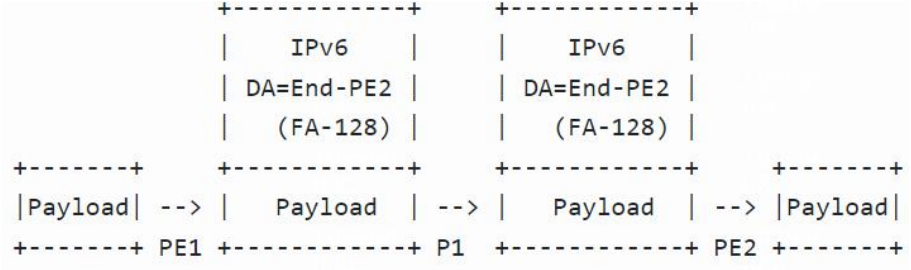
From University 1 (PE1) to University 2 (PE2) on **Slice1**

– **Encapsulation:**

Destination is END SID of PE2 associated with FlexAlgo128

– **Path**:

PE1->P1->PE2. through **layer-3 sub-interface**



Forwarding on Level-1 Slice

✓ **Forwarding on Level-2 Slice**

Form campus of university 1 at PE1 to campus at PE2 on **Slice1-1**

– **Encapsulation**

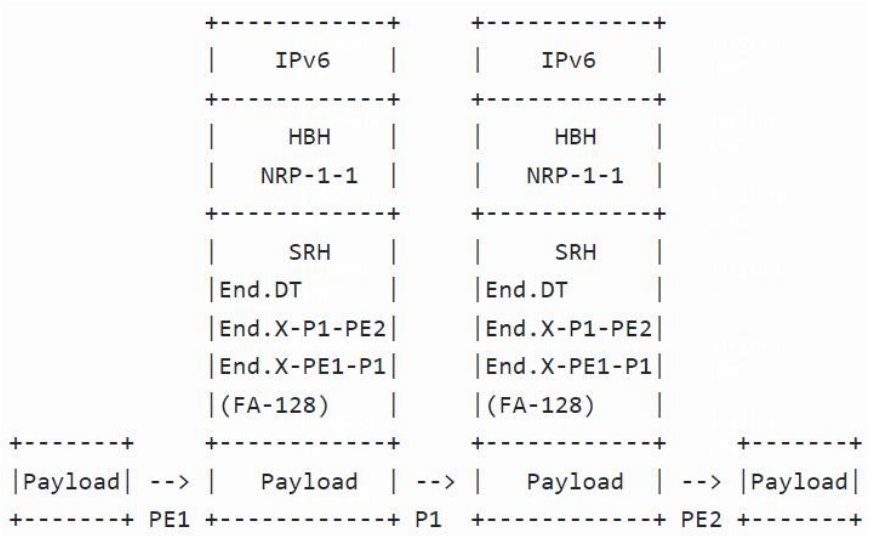
IPv6 Header

SHR: all segments are associated with Flex-Algo 128

HBH: carries the level-2 NRP-ID of Slice1-1

– **Path**

PE1->P1->PE2. through the **HQoS queue**



Forwarding on Level-2 Slice

Next Steps

- Any questions or comments are Welcome
- Seeking for feedback

Thank You