# Packet Network Slicing using Segment Routing

**draft-peng-teas-network-slicing-04**

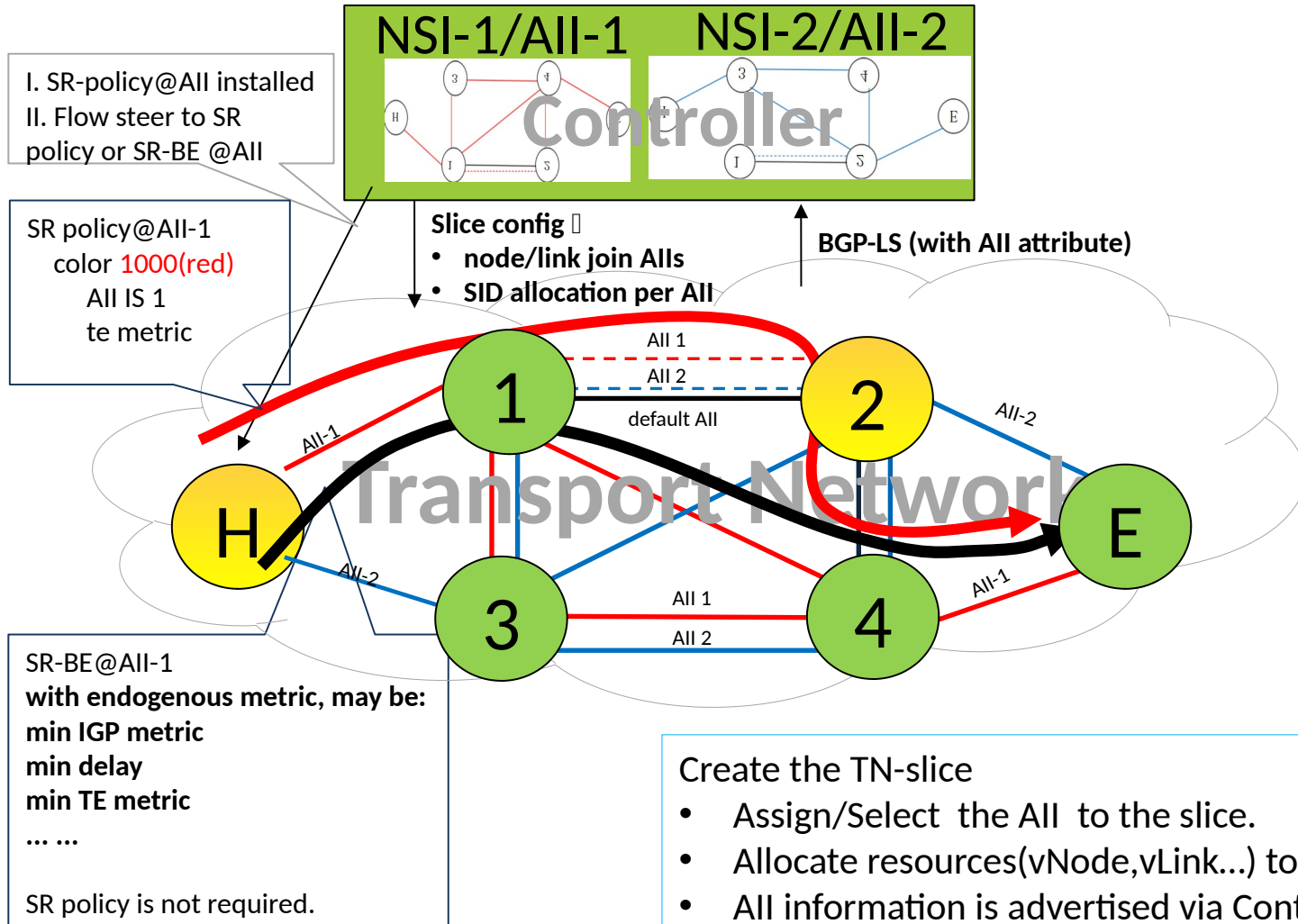Shaofu Peng(ZTE 〥

Ran Chen(ZTE)

Gregory Mirsky(ZTE)

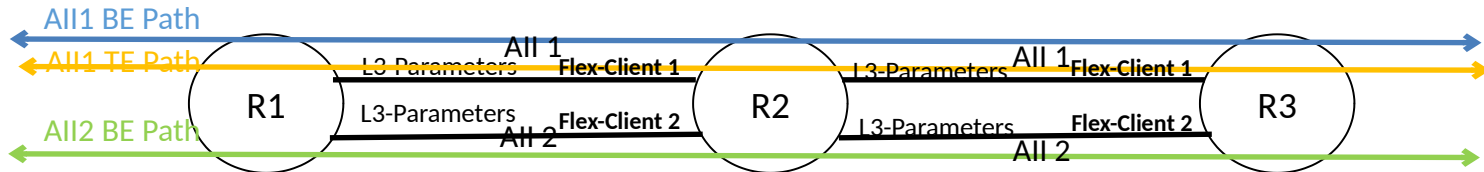Fengwei Qin(China Mobile)

# AII Overview

- **AII** (Administrative Instance Identifier): Explicit virtual network identification , it could be used as **a TN-slice identifier**, it indicates the topology, computing, storage resources of the **dedicated virtual network**.
  - AII is the identifier of the **dedicated Virtual Networks for the slice.**
  - Support the **End-to-End Slicing**.
  - **Identifier the Unified NSI** across multi-domain of TN .
  - **AII is one of constraint criteria of the color template (draft-ietf-spring-segment-routing-policy) , and color template with AII provides a more flexible control .**
  - Uniform Color template (Centralized and distributed, intra and inter domain) for overlay service mapping to underlay resource.
  - AII meet the link requirements from 3GPP.  It is **independent** of the existing domain partition of the network, i.e., any intra- or inter-domain link, and it is also **independent** of the existing underlay frame or routing technologies (IGP, BGP, Segment Routing, Flex-E, etc.), i.e., any L2 or L3 link is the candidate resource.
- There is no modification to the forwarding table(dataplane), except QoS policy per Slice.

# AII as a TN-slice Identifier



NSI-1/AII-1   NSI-2/AII-2

Controller

I. SR-policy@AII installed
II. Flow steer to SR policy or SR-BE @AII

SR policy@AII-1
color 1000(red)
AII IS 1
te metric

Slice config 
• node/link join AIIs
• SID allocation per AII

BGP-LS (with AII attribute)

Transport Network

AII 1
AII 2
default AII

AII-1
AII-2
AII-2
AII-1

AII 1
AII 2

SR-BE@AII-1
with endogenous metric, may be:
min IGP metric
min delay
min TE metric
... ...

SR policy is not required.

Create the TN-slice
• Assign/Select the AII to the slice.
• Allocate resources(vNode,vLink...) to AII
• AII information is advertised via Control plane .

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# AII as a Set of TN-slice Resource Identifiers

- **L3  Interface Slice Isolation**
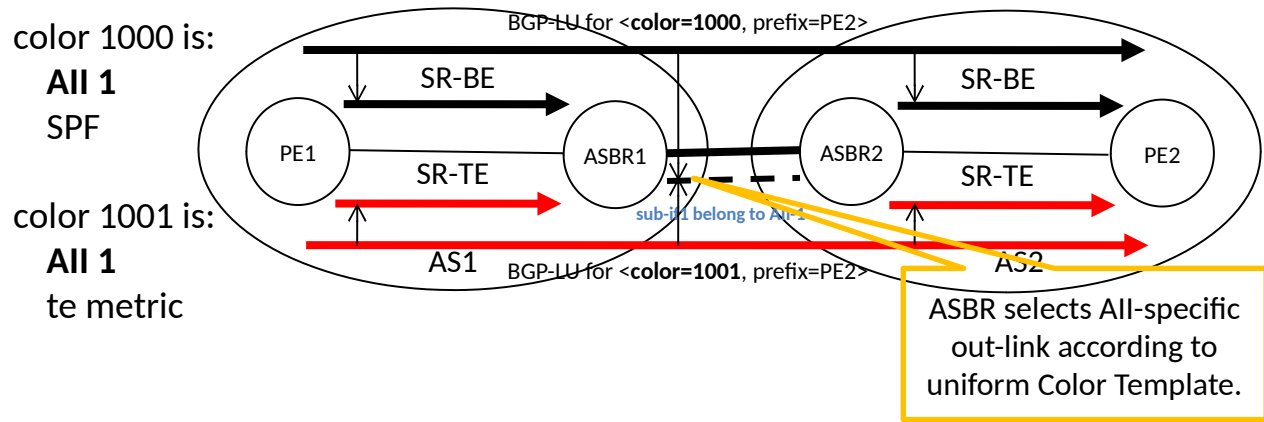


- **L2  Interface Slice Isolation**
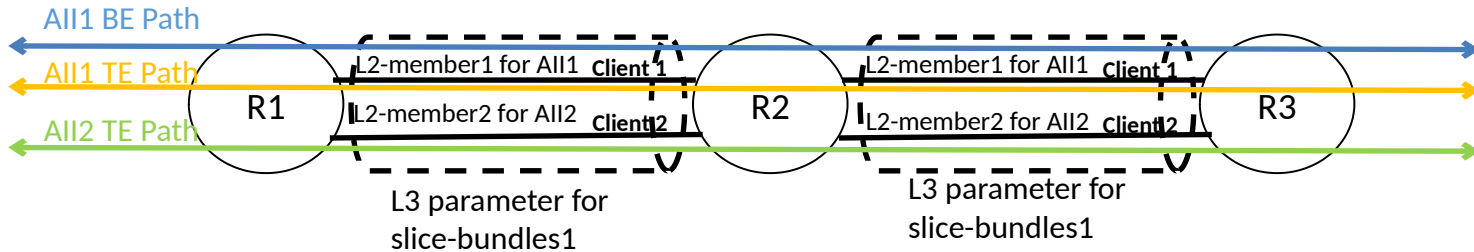


- Only bundle interface join IGP instance.

- Bundle members could be any interface type.

- Control-plane packets will always be forwarded over the same path.

- Data-plane packets will be forwarded on the specific bundle member.

- **Resource Isolation**
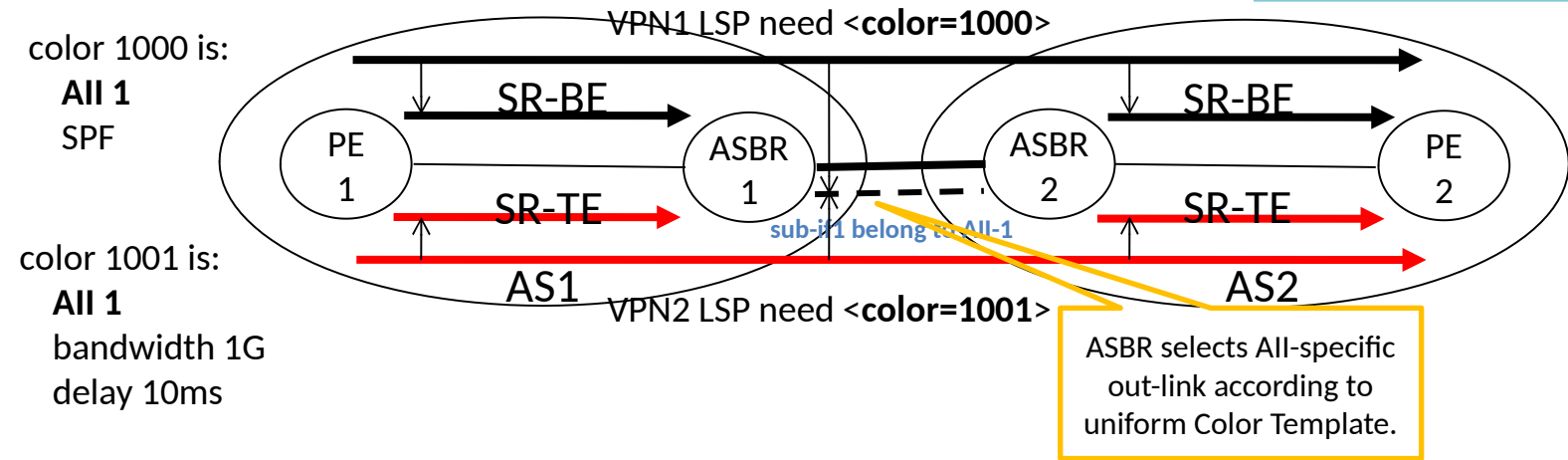
- SIDs are allocated  per AII,  and the resource (such as bandwidth ) is allocated to AII.

- AII is one of constraint criteria of the Color Template (draft-ietf-spring-segment-routing-policy) , and color template with AII and other traditional criteria, such as bandwidth, delay,  affinity, provide a more flexible control .

# AII for Multi-Domain Deployment

color 1000 is:
**AII 1**
SPF

color 1001 is:
**AII 1**
te metric

BGP-LU for <**color=1000**, prefix=PE2>

SR-BE

PE1    ASBR1    ASBR2    PE2

SR-TE

sub-if1 belong to AII-1

AS1    BGP-LU for <**color=1001**, prefix=PE2>    AS2

ASBR selects AII-specific out-link according to uniform Color Template.

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**Option B Inter-domain**

color 1000 is:
**AII 1**
SPF

color 1001 is:
**AII 1**
bandwidth 1G
delay 10ms

VPN1 LSP need <**color=1000**>

SR-BF

PE 1    ASBR 1    ASBR 2    PE 2

SR-TE

sub-if1 belong to AII-1

AS1    VPN2 LSP need <**color=1001**>    AS2

ASBR selects AII-specific out-link according to uniform Color Template.
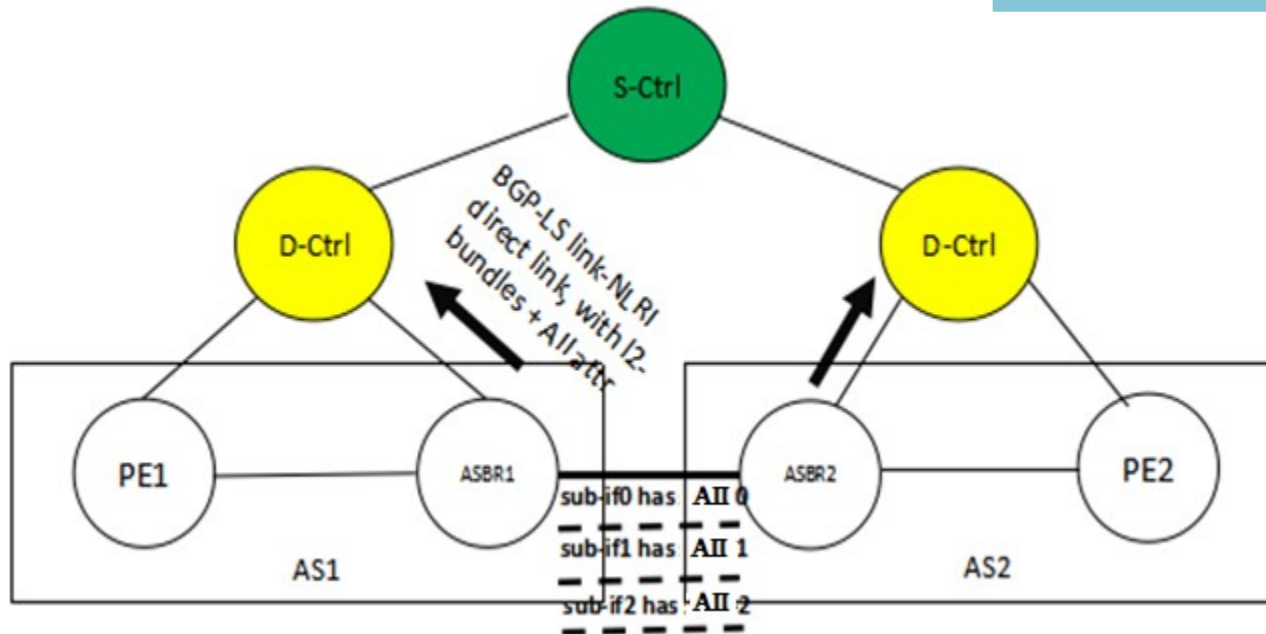
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# All for Multi-Domain Deployment Cont.

E2E SR-TE with SDN Controller



- BGP-LS advertised link-state NLRI containing AII information.
- For the inter-domain link, BGP-LS can advertise DIRECT protocol type, or firstly put inter-domain interconnections to IGP instance, then always import data from IGP protocol source.
- Controller supports computation of E2E TE path based on TE-DB with AII attribute.

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# Combined with SR Flex-algorithm

**Scenario 1:**

**For inter-domain case, SDN controller can create VN for AII-AS based on AII, and VN for FA-AS based on FA respectively. SDN controller computes E2E segment lists, each containing multiple ASes and based on different technologies. However, for distribute mode, at boder node, an AII with** endogenous IGP-metric/delay/TE-metric can be mapped to the specific FA-id with the same metric.
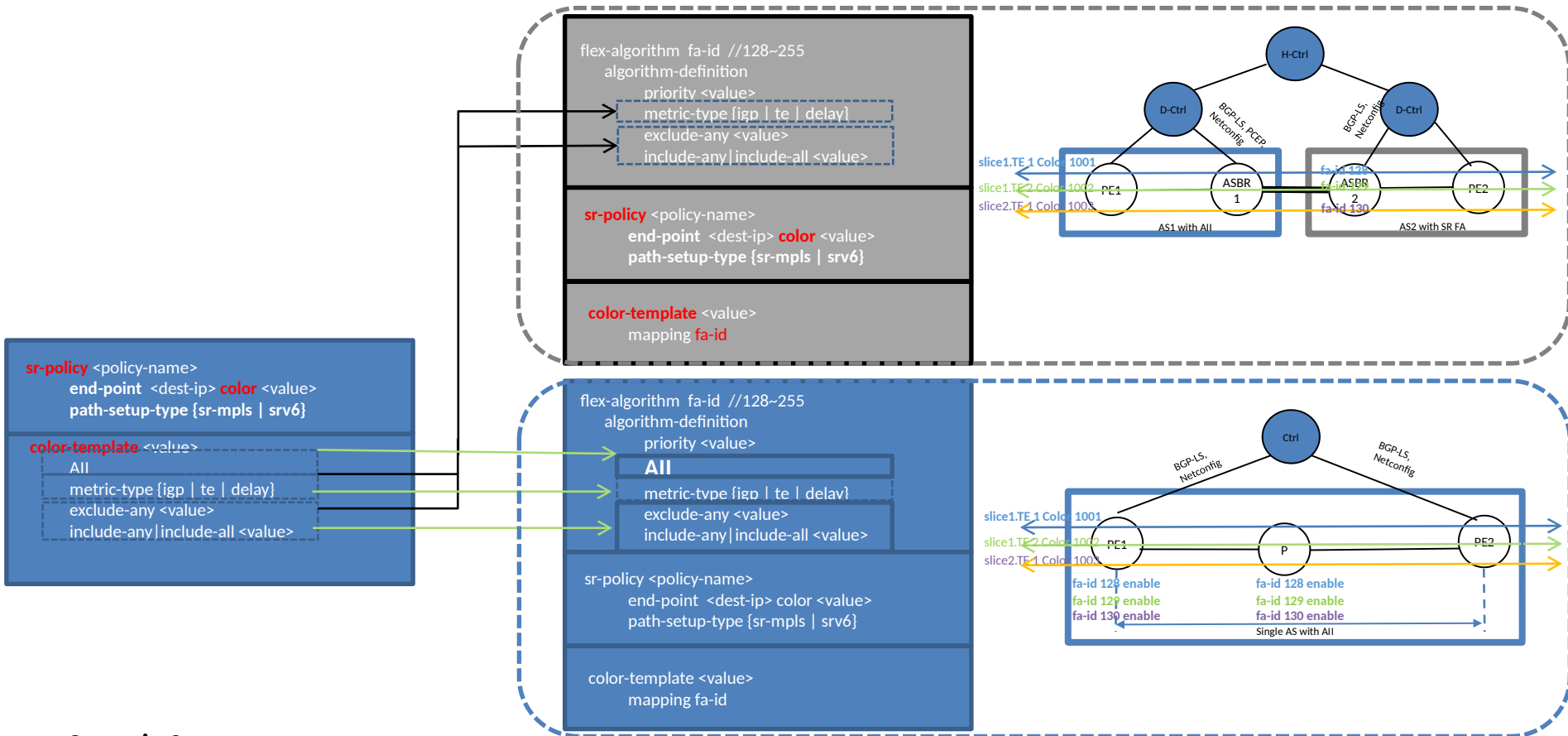


**Scenario 2:**

**For a single AII-AS, we can continue to apply SR FA to optimize label stack depth. In this case, a new criteria AII is added in FAD, same as adding AII to Color Template.**

# AII (TN-slice Identifier) codepoint

- Create a new top-level registry called "Network Slicing Parameters".
- Request a new sub-registry "AII (TN-slice Identifier)  codepoint"

| Slice Type （ High 8bits ） | Instance (Low 24bits ） | Description |
|---|---|---|
| 0(Normal) endogenous: IGP-metric | 0 | Reservered for Default Slice: the original physical network. |
| | nonzero | Normal Slice, for user defined. |
| 1(uRLLC) endogenous: delay | 0 | Resevered. |
| | nonzero | Slice suitable for the handling of ultra- reliable low latency communications, for user defined. |
| 2(TE) endogenous: TE-metric | 0 | Resevered. |
| | nonzero | General TE Slice, for user defined |

# AII (TN-slice Identifier) codepoint Cont.

| Slice Type （High 8bits） | Instance (Low 24bits） | Description |
|---|---|---|
| 3(eMBB) endogenous: TBD | 0 | Resevered. |
| | nonzero | Slice suitable for the handling of 5G enhanced Mobile Broadband, for user defined. |
| 4(MIoT) endogenous: TBD | 0 | Resevered. |
| | nonzero | Slice suitable for the handling of massive IoT, for user defined. |
| 5(V2X) endogenous: TBD | 0 | Resevered. |
| | nonzero | Slice suitable for the handling of V2X services, for user defined. |
| 6-255 | any | Unassigned. |

# Next Step

- Comments welcome.

# Thanks!