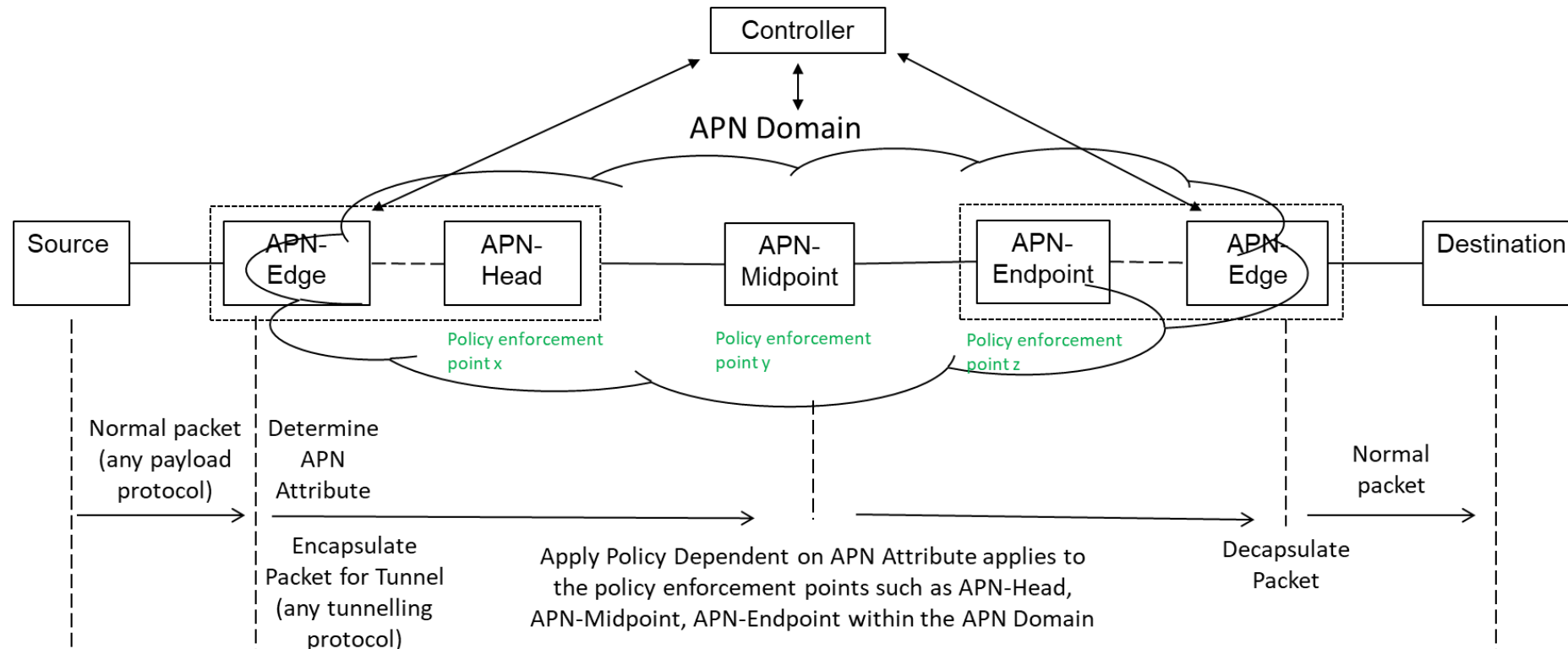# Use cases

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15 mins + 5 mins questions (50/120)
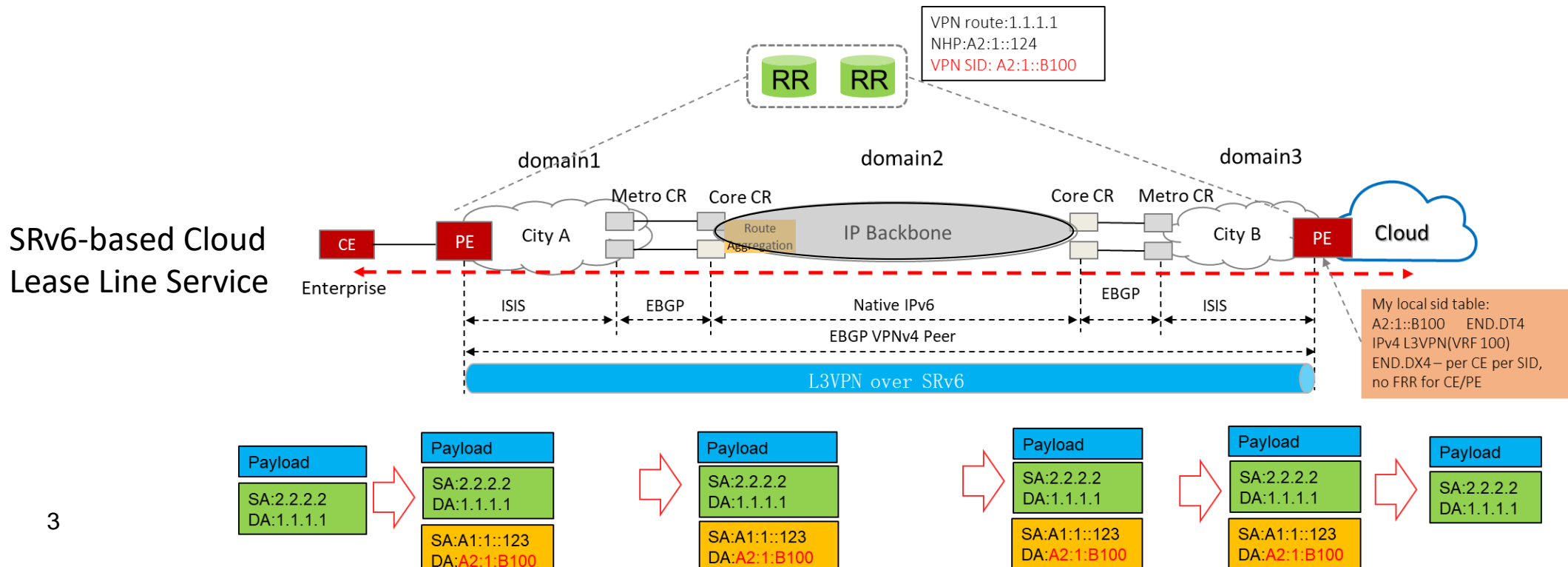
What APN can enable?

- With the APN attribute in the tunnel header,
  - ➢ the fine grain policy enforcement can be performed based on the structured APN attribute encapsulated in the tunnel header at the intermediate nodes/policy enforcement points, such as
    - ✓ performance measurement
   - ✓ traffic steering in the intermediate segment of a tunnel

An APN Domain may span multiple network domains controlled by the same operator

Use case example illustration - SRv6-based Cloud Lease Line Service

- Take the "SRv6-based Cloud lease Line Service" as **an illustrative example** to show how APN is needed and can be beneficial.
- Enterprises usually buy "SRv6-based Cloud lease Line Service" to interconnect their local sites to Cloud.
- The "SRv6-based Cloud lease Line Service" usually needs to go **across multiple domains**, which are **owned by one operator** and controlled by multiple controllers and an orchestrator/super-controller.
- Due to management reasons, the network information in the intermediate domain cannot be advertised to other domains, so the ingress node cannot set up an appropriate E2E path.
  - **the intermediate domain** is treated as a black box and **no fine grain traffic steering and other services**

VPN route:1.1.1.1
NHP:A2:1::124
VPN SID: A2:1::B100

RR RR

domain1   domain2   domain3

Metro CR   Core CR   Core CR   Metro CR

SRv6-based Cloud Lease Line Service

CE   PE   City A   Route Aggregation   IP Backbone   City B   PE   Cloud

Enterprise

ISIS   EBGP   Native IPv6   EBGP   ISIS

EBGP VPNv4 Peer

L3VPN over SRv6

My local sid table:
A2:1::B100   END.DT4
IPv4 L3VPN(VRF 100)
END.DX4 – per CE per SID,
no FRR for CE/PE

Payload	Payload	Payload	Payload	Payload	Payload
SA:2.2.2.2 DA:1.1.1.1	SA:2.2.2.2 DA:1.1.1.1	SA:2.2.2.2 DA:1.1.1.1	SA:2.2.2.2 DA:1.1.1.1	SA:2.2.2.2 DA:1.1.1.1	SA:2.2.2.2 DA:1.1.1.1
	SA:A1:1::123 DA:A2:1:B100	SA:A1:1::123 DA:A2:1:B100	SA:A1:1::123 DA:A2:1:B100	SA:A1:1::123 DA:A2:1:B100	

# Performance measurement in the IP Backbone – No APN

- Issues:

  - Core CR: Multiple IOAM flows according to the 5-tuple information are created.

  - However, since the 5-tuple is already encapsulated, it has to be resolved, which is "expensive".

  - If it needs to be done in the domain 3, 5-tuple needs to be resolved again.
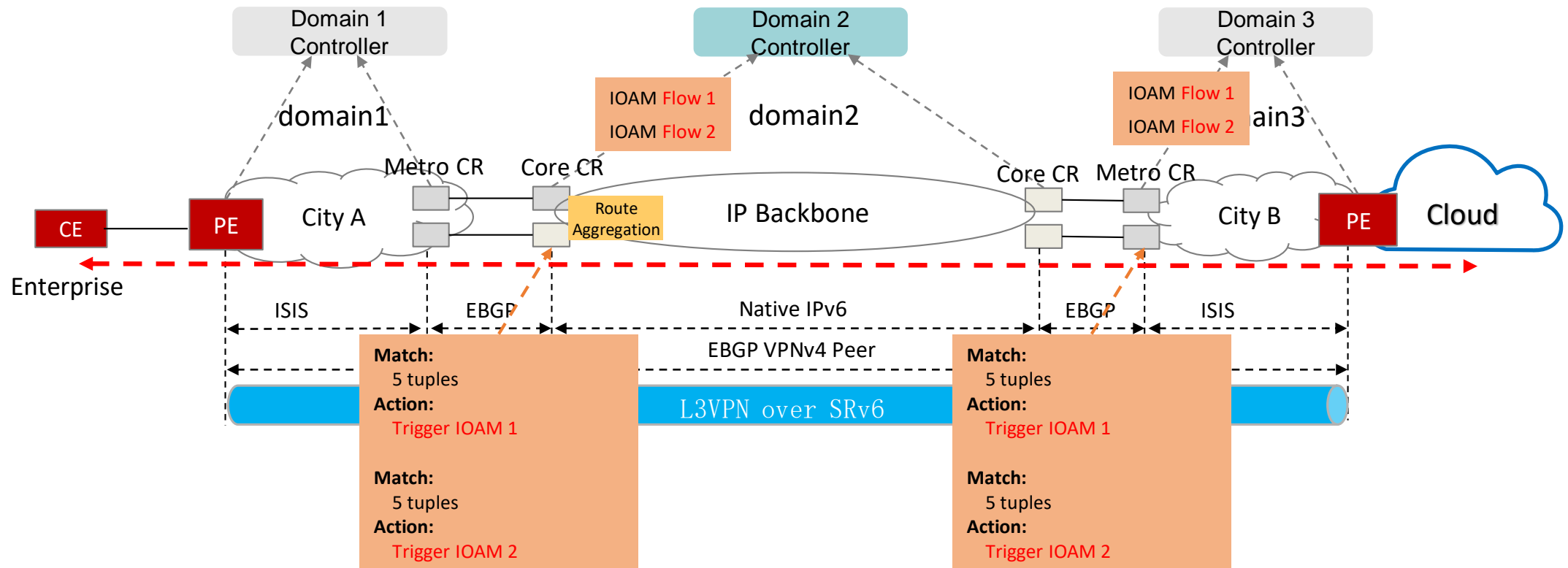
# Performance measurement in the IP Backbone – With APN

- With APN:

  - APN attribute is encapsulated at the PE device, and the Core CR only needs to look at the APN attribute to trigger the IOAM performance measurement, no need to further resolve the 5 tuples

  - If it needs to be done in the domain 3, nothing extra needs to be done, but only look at the APN attribute
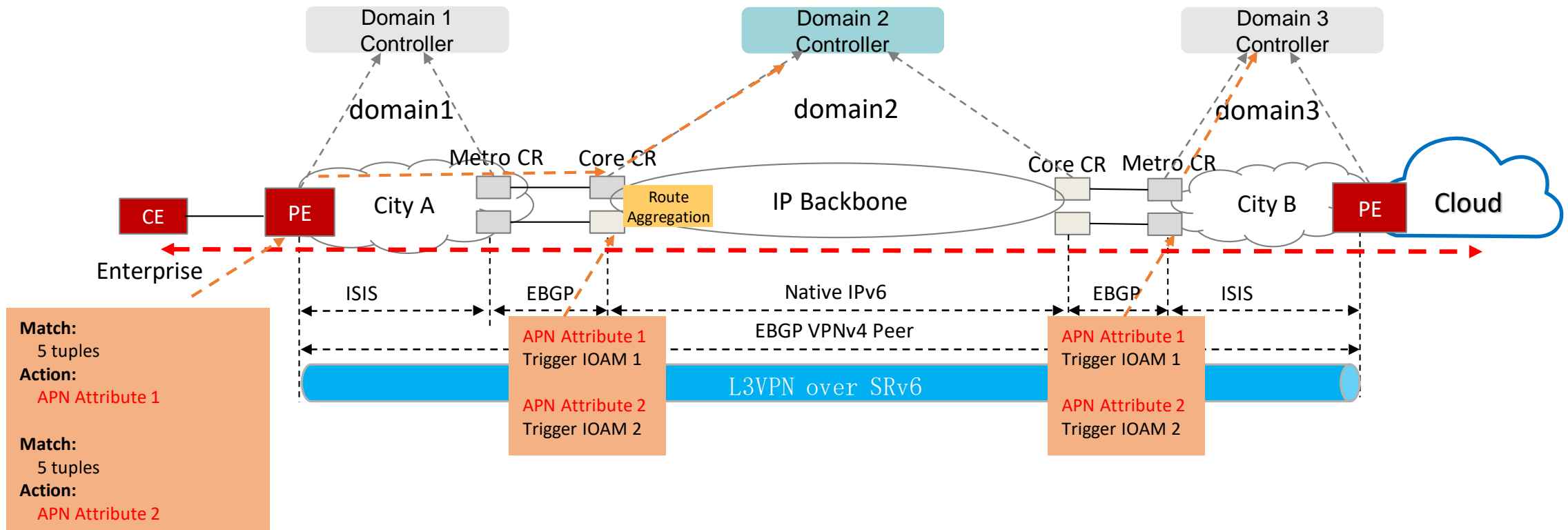
# Traffic Steering in the IP Backbone – No APN

- Issues:
  - Due to management reasons, the network information in the intermediate domain cannot be advertised to other domains
    - the ingress node can not set up an appropriate E2E path, the intermediate domain is treated as a black box and no fine-granular traffic steering
  - The traffic steering policy in the intermediate domain/IP backbone can only be set up based on the 5-tuple of the inner packets at the route aggregation node (core CR), wherein the 5-tuple has to be resolved and this is very "expensive"
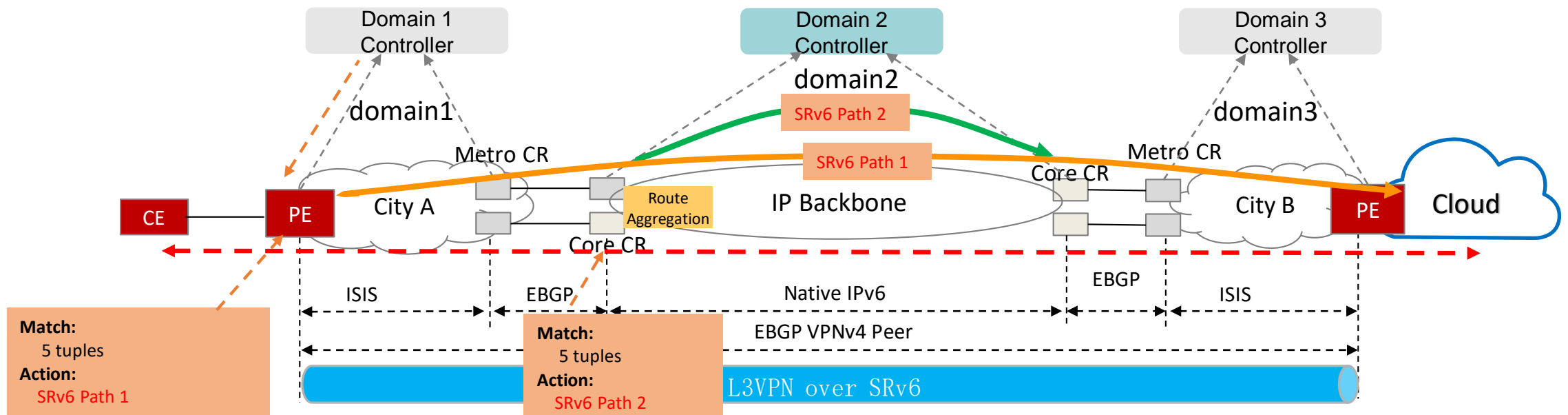
Traffic Steering in the IP Backbone – With APN

- With APN:

  - APN attribute is encapsulated at the ingress node.

  - With the APN attribute, the fine-granular traffic steering in the IP backbone can be easily facilitated.

    - To match some field(s) of the APN attribute, a path with low-latency can be selected and steered into.

  - Other policy actions (such as IOAM) can also be triggered according to the APN attribute carried in the header.
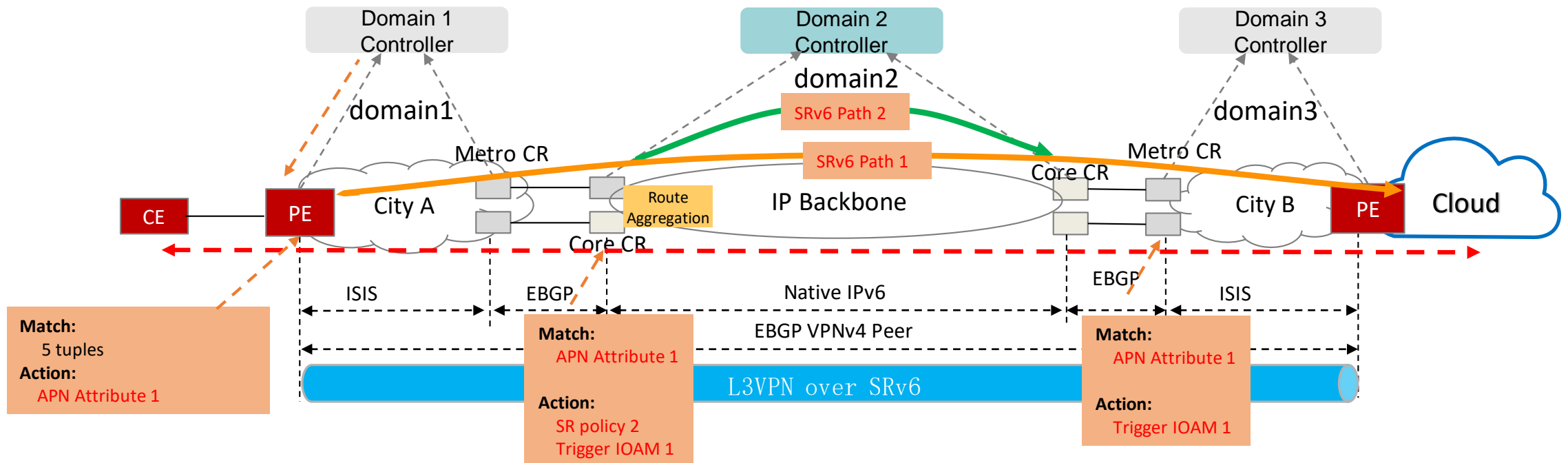
A list of some other usage scenarios

- SD-WAN scenario (https://tools.ietf.org/html/draft-yang-apn-sd-wan-usecase)
    - Operator-owned SD-WAN, fine-granular policy enforcement can be provided based on the APN attribute tagged at the CPE

- Home broadband scenario (https://tools.ietf.org/html/draft-zhang-apn-acceleration-usecase)
    - Key services/traffic can be tagged with APN attribute and steered into corresponding path that can satisfy its SLA requirements

- Mobile broadband scenario (https://tools.ietf.org/html/draft-liu-apn-edge-usecase)
    - Edge computing, CDN, 5G
    - The fine-granular information in the GTP-u tunnel can be further derived into APN attribute and tagged at the transport network tunnel header, and facilitate fine-granular policy enforcement within the IP transport network

In Summary

- The "SRv6-based Cloud lease Line Service" is taken as an illustrative example to show how APN is needed and can be beneficial to the enterprises that want to interconnect their local sites to Cloud.

- With APN attribute, the service provisioning can be facilitated in the intermediate domain without the need of resolving the 5 tuples that are encapsulated deeply, such as
  - to trigger performance measurement
  - to perform traffic steering into a policy

Thank you!