Challenges of the SRv6 Deployments and Operations

Tianji Jiang / Yisong Liu

China Mobile

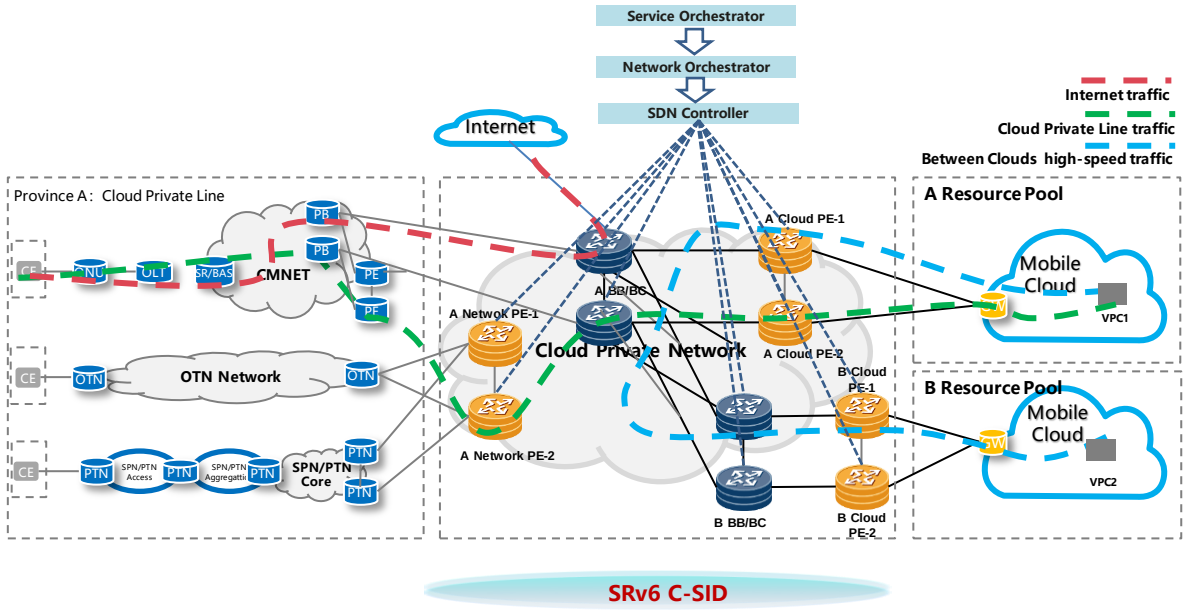
IETF-119 SRv6 Operations BoF, March 2024

Agenda

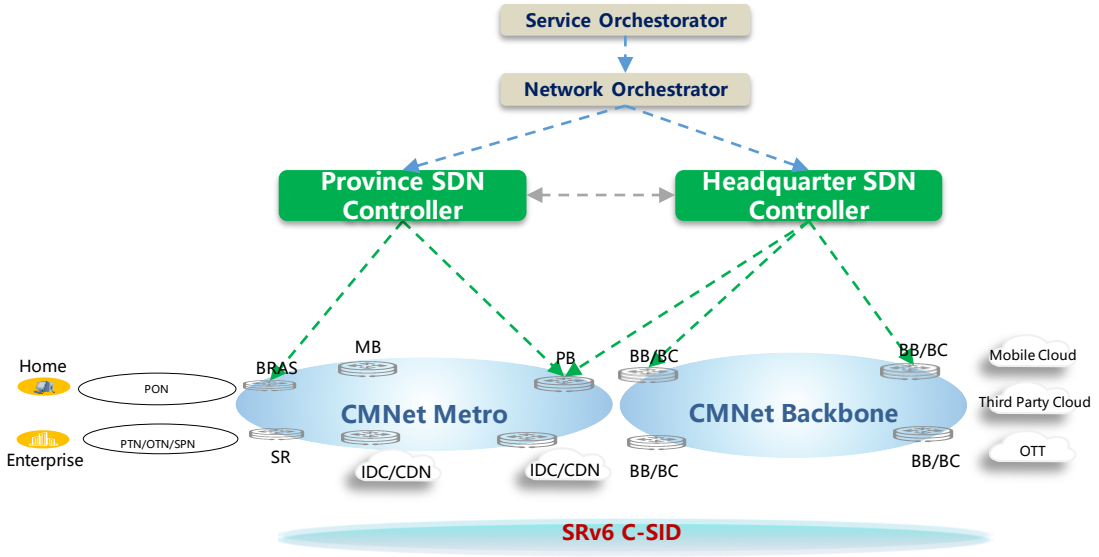
- China Mobile: A gigantic SRv6 network with C-SID Deployment
- The ‘horizontal’ challenge: Multi-vendor interoperability
- The ‘vertical’ challenge:
  - Day-0: The planning of Compressed SRv6 SID
  - Day-1: The deployment of the Inter-AS E2E network
  - Day-2: Achieving the operational excellence with protection & failure detection

China Mobile: SRv6 C-SID Deployment

Cloud Private Network



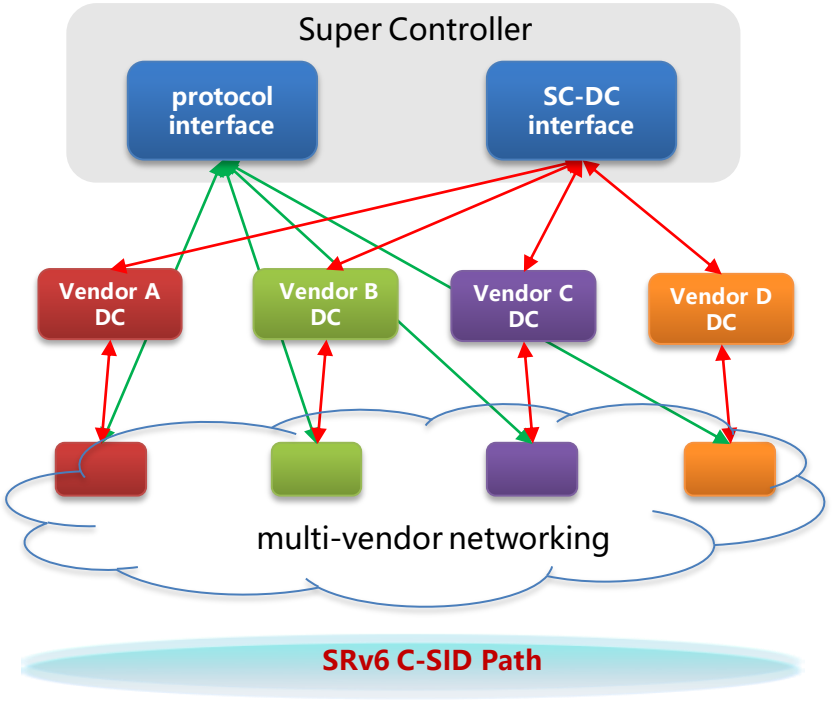
CMNet

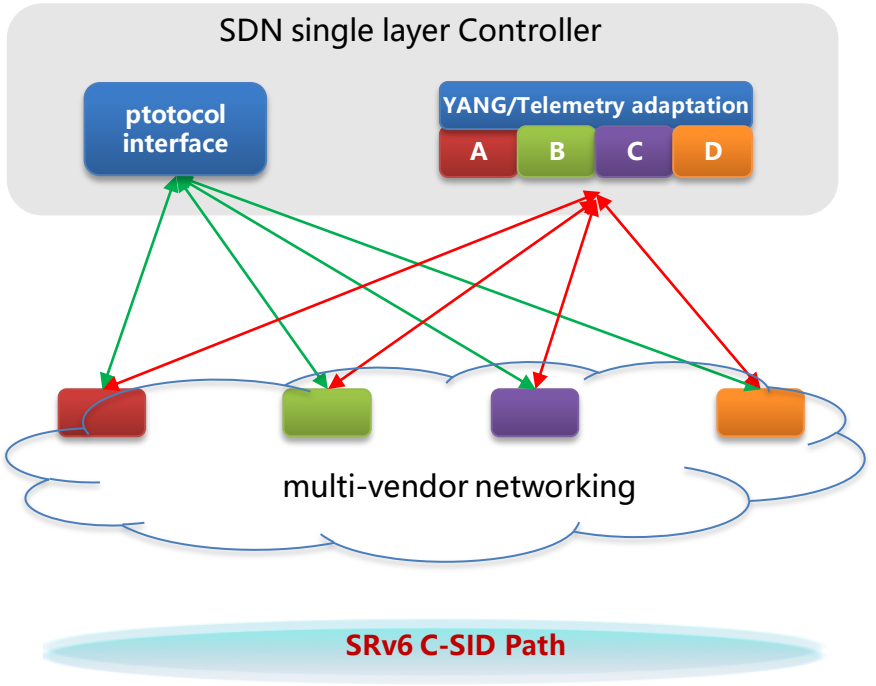


- China Mobile deployed SRv6 C-SID in Cloud Private Network
- Beyond 800+ nodes in Cloud Backbone Network
- Single AS and Single layer SDN Controller to distribute SRv6 C-SID

- China Mobile deployed SRv6 C-SID in CMNet
- Beyond 10k+ nodes in CMNet backbone and metros
- Multi-AS and unified SDN Controller to distribute E2E SRv6 C-SID path

The ‘Horizontal’ Challenge: Multi-vendor Interoperability





The challenge:

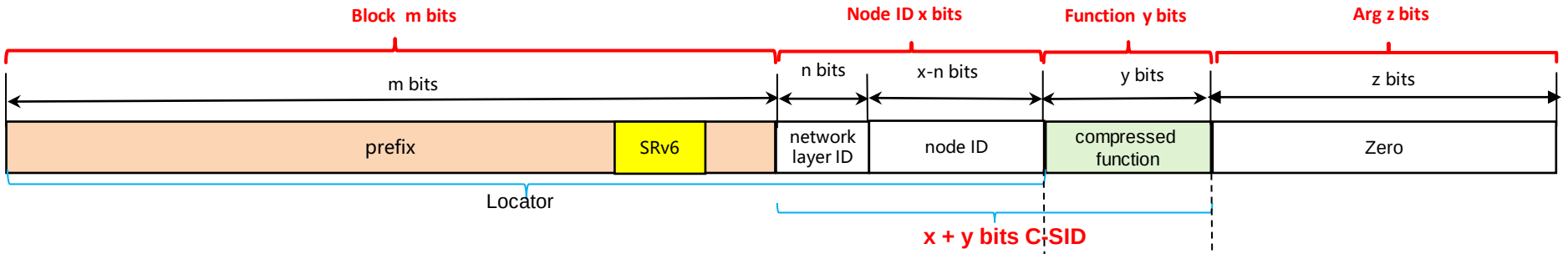
- Each vendor uses its proprietary controller to deploy the brand-name devices
- An operator has to deploy a super controller to manage the versatile device controllers of all the vendors
- increasing deployment complexity and might result in high failure probability

To remedy:

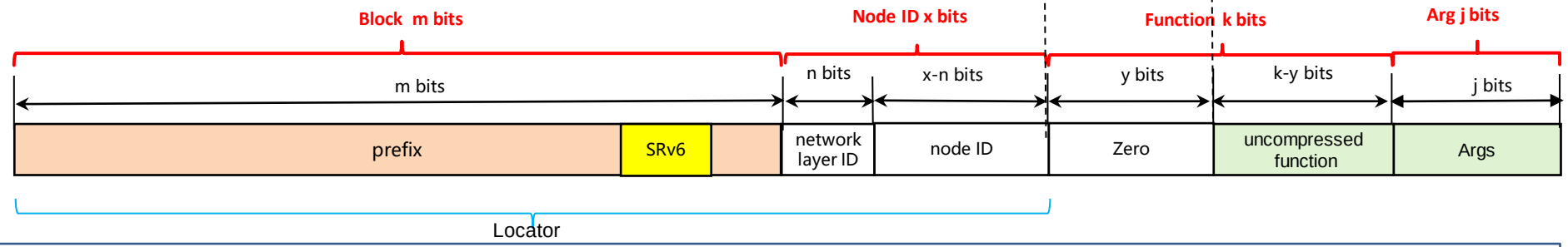
- The deployment of a fully decoupled single-layer controller for various vendors devices
- unified southbound interface and unified control protocol for greatly simplified deployment

The ‘vertical’ challenge: Day-0: Planning of Compressed SRv6 SID

compressed SID



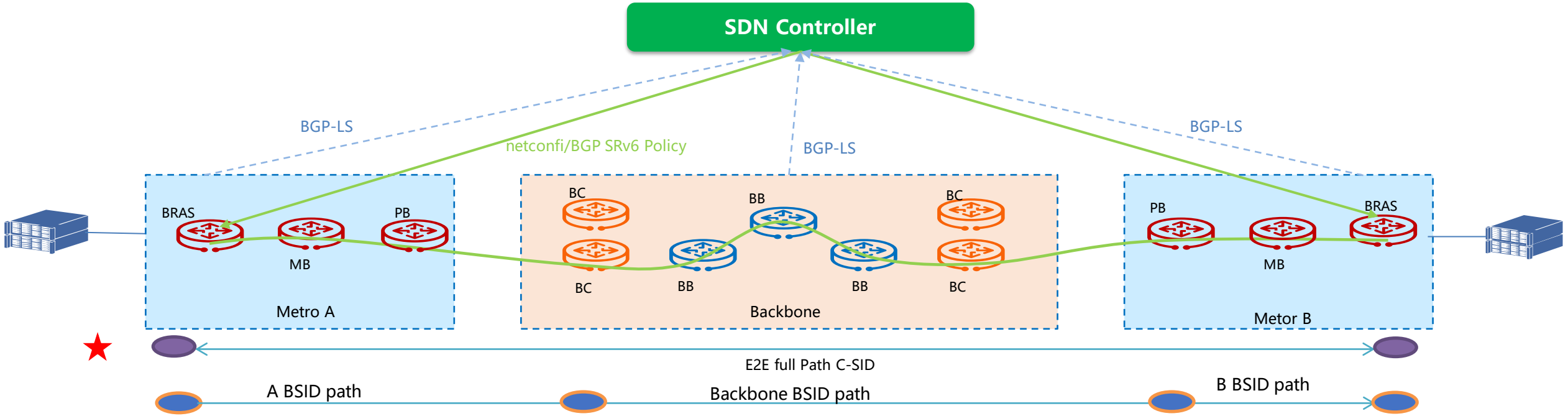
uncompressed SID



- Allocate separate prefix for SRv6 SID in IPv6 address space, due to the high aggregation of SIDs, boundary devices have simple ACL policy configuration to prevent SID information leakage
- Coexistence of uncompressed and compressed SID in the same locator(C-SID and 128 bits uncompressed SID in the figure as example)
- Allocate network layer IDs in Node ID field based on administrative regions like cities, counties etc. , and then continue to assign specific Node IDs in every administrative region

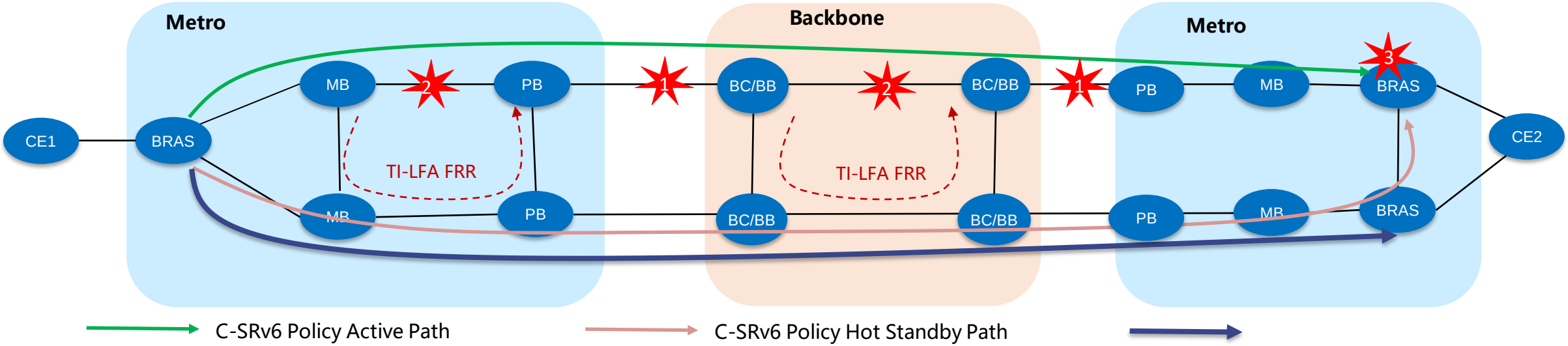
* SRv6 Deployment and Operation Problem Summary, draft-liu-srv6ops-problem-summary-01, March 2024.

The ‘vertical’ challenge: Day-1: Deployment of Inter-AS E2E Network



- SDN controller collects the topology and SID information of the entire network by BGP-LS, calculate the inter-AS compressed SRv6 Polcy that meets the SLA, and distribute the policy to the headend node
- SDN Controller distributes VPN configuration by netconf, and inject VPN traffic into the corresponding compressed SRv6 Policy based on color or routing policies
- Full path compressed SID list better than assigning BSID to every AS, fully utilize compression to improve packet transimission efficiency

The ‘vertical’ challenge: Day-2: Achieving operational excellence via Protection and Failure Detection



Protection	failure point	protection deployment	failure detection deployment
Hot-standby	1&2	• Establish the primary and backup paths(both use C-SID) • Detect failure in the primary path and the head node finish a quick switch	• Echo BFD or pathsegment to ensure BFD detection bidirectional paths consistency • Adjust the detection time according to the actual situation of the network to prevent network instability • Deploy the SRv6 BE escape mechanism, Used for both primary and backup paths to fail
VPN FRR	3	• Ingress PE establish C-SID path to both primary and backup egress PEs in advance • Detect failure in the primary egress PE, ingress PE finish a quick switch to backup egress PE by VPN FRR	
TI-LFA	2	• A fast rerouting protection mechanism based on IGP • Establish a backup path in advance • Switch quickly from adjacent upstream nodes to the backup path when detect failure • Repair list should use C-SID list	• BFD detection time is related to transmission distance delay, adjust the detection time according to the actual situation of the network to prevent network instability • If deploying hot standby at the same time, trigger local protection first, set the detection time path BFD is greater than local BFD

detailed information refer to : https://datatracker.ietf.org/doc/draft-liu-rtgwg-sr-protection-considerations/

In summary, we have to tackle both the ’horizontal’ challenge (i.e., multi-vendor interoperability) and the ‘vertical’ challenge (i.e., the holistic considerations of day-0 (planning), day-1 (deployment) and day-2 (operations).

The whole practice involves inevitably different technologies: SRv6 + SDN controller + BGP + IGP + VPN + v6Ops…

There is currently no suitable place in IETF to handle this type of interoperable & managerial challenges in a holistic way…

So, let’s form a WG, i.e., the SRv6-OPs, to get it under control & also share any best practice.

Thanks