SRv6/IPM

New Use-Cases & Deployments

Clarence Filsfils

SRv6 Kick-Off – February 2017 - Rome

We Built a Rich Ecosystem

Network Equipment Manufacturers

CISCO · HUAWEI · NOKIA · ciena · JUNIPER NETWORKS · ZTE · ARRCUS · ERICSSON · H3C

Merchant Silicon

CISCO Silicon One

Access: A100   Edge: K100
Core: Q200, P100
ToR/Spine: G100, G200

BROADCOM
DNX – Jericho
XGS – Tomahawk

MARVELL

NVIDIA

Open-Source Applications

Pyroute2 · IPTABLES SERA · GoBGP · exa BGP · eBPF · cilium · WIRESHARK · FRRouting · SNORT · GoBMP

SR v6 uSID

Open-Source Networking Stacks

SONiC · Linux · FD.io · PP · P4 · OPEN Compute Project · Kubernetes · OvS Open vSwitch · VyOS

Smart NIC / DPU

intel · NVIDIA

Partners

kaloom · TREND MICRO · ENEA Qosmos Division · NoviFlow · ixia A Keysight Business · Spirent · Red Hat · f5 · 6WIND · KEYSIGHT TECHNOLOGIES

We Led Standardization

- SR Architecture – RFC8402

- IPv6 SR header – RFC 8754

- Network Programming – RFC 8986

- **SRv6 uSID [link] – RFCXXXX**

- BGP Services – RFC 9252

- ISIS - RFC9352

- OAM – RFC 9259

- Policy Architecture – RFC 9256

- PCEP – RFC 9603

- BGP-LS – RFC 9514

- Flex Algo – RFC 9350

- Performance Management – RFC 9503

- SRv6 SID Block – RFC 9602

- SR Policy Provisioning via BGP [link] – RFC XXXX

- SR Policy Advertisement in BGP-LS [link] – RFC XXXX

- BGP Color-Aware Routing [link] – RFC XXXX

SRv6 uSID & IPM in SONiC (Mature, Deployed, Rich Ecosystem)

- SRv6 uSID
  - L3VPN (IPv4/IPv6): Static & BGP (RFC9252)
  - Underlay Traffic Engineering: Static & IS-IS (RFC9352)
  - Headend static traffic steering over SRv6 SID List
  - SRv6 SID Manager (F3216/GIB/LIB/WLIB)
  - Contributors: Cisco, Alibaba, Microsoft, Broadcom, Nvidia

In Production at Alibaba
(Eddie Ruan - Paris2024)

Use-Case
Rita Hui - Paris2025

- IPM
  - 3L: Latency (histogram), Loss (Absolute), Liveness (in HW)
  - Spray & FL Specific: Across ECMP & Per-ECMP
  - Global Routing Table and Customer VRF
  - DSCP: Measurement per traffic type
  - IPM & SRv6 uSID: deterministic per ECMP path measurements

We Led Productization with Skin in the Game

- 2016: uSID idea is found

- 2019: uSID productization is triggered across Cisco Portfolio

- 2021: first uSID deployments

- 2025: uSID is Proposed Standard, all vendors have joined uSID
  - 2019 plan was proved correct and no implementation change was required!
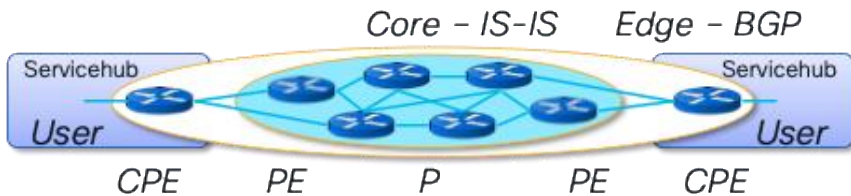
- >85k Cisco routers deployed

Recent Public Updates

- Multi-domain SRv6: Customer Edge is a separate uSID domain from the Backbone Core for security.

- SRv6 + Flex Algo together with DCO and RON for L2 Ethernet Private Line (EPL).

- L2 EPL over SRv6 Transport replaces DWDM.

[LINK](#)

- Converges all services into a SRv6 single network

- Network as a service (Naas): one stop shop for B2B/Enterprise customers

- Adoption of the latest SRv6 innovations in terms of Assurance and automations.

[LINK](#)

Recent Public Updates

Historically we had separate IP networks for our services which resulted in complexity in delivering the best experiences for our clients. We partnered with Cisco, adopting their Agile Services Networking architecture from end-to-end and implementing Silicon One based 8000 series routers, Which perfectly aligned with our sustainability and business goals. In our journey so far, we have been able to converge 20 MPLS networks into 1 **SRv6** network with an astounding 50% reduction in power.

Markus Reber, Executive Vice President of Networks, Swisscom

Sustainability is always top of mind, so we are pleased to continue our innovation partnership with Cisco and leverage new Cisco 8000 Series solutions based on the Silicon One P100 device that can help us meet net zero goals. Simplifying networks through convergence with power-efficient platforms that can support 800G, segment routing with **SRv6**, and assurance will help us build futureproof networks for high-quality experiences for our customers in a sustainable way.

Dariusz Solowiej, VP Network Technology & Customer Operations, Arelion

Cisco has been instrumental in advancing our business objectives through strategic partnerships and reshaping our future state architecture. This collaboration supports our vision of connecting 100 million homes and 600 million mobile and enterprise customers. With Agile Services Networking — encompassing comprehensive **SRv6**, an expanding network of edge data centers, and cloud-native BNG, all seamlessly integrated with an AI-enabled automation framework — we are equipped with the future-proof IP network architecture needed to manage the anticipate four-fold increase in traffic.

Puneet Garg, CTO, Reliance Jio

LINK

…and SRv6 powers the Outernet!

RIVADA SPACE NETWORKS

Rivada & Cisco Creating Blueprint for Advanced Data Networking from Space.

LINK

In collaboration with Cisco, Rivada is ready to converge the Outernet with traditional terrestrial networks. Cisco provides high performance routing using IOSXR based NCS540, NCS55/5700 and 8000 product line, to build agile service network (ASN) with rich **SRv6**/EVPN feature set, advanced QoS, robust Security and AI enabled automation. Built with standardized API, the solution will be able to provide end to end network slicing and service assurance across non-terrestrial and terrestrial networks.

SRv6 in the Front-End DC
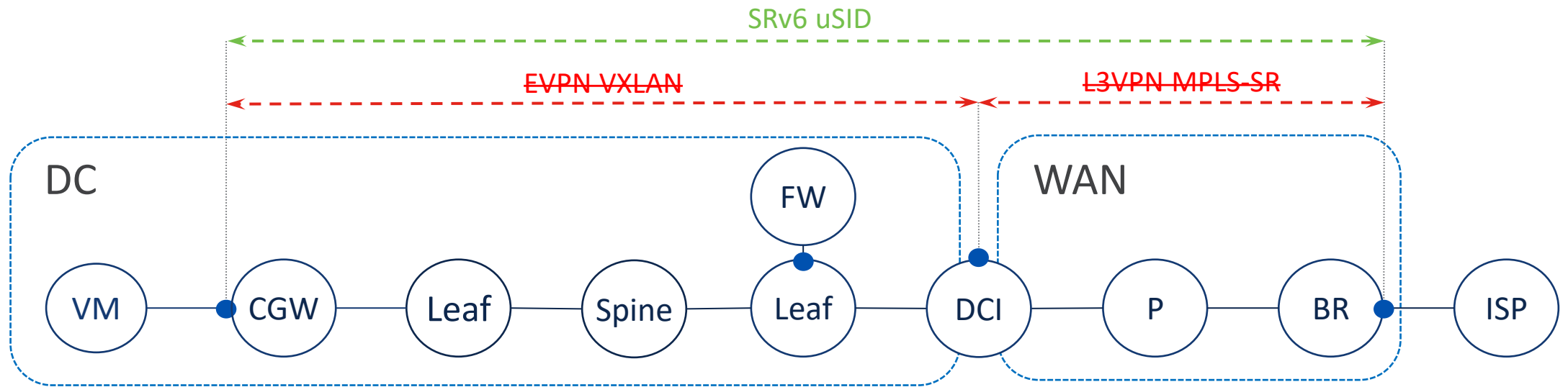
- Unified End-to-End design from the DC Front End, through the metro, up to the Peering with SRv6 (and Firewall Service insertion). Replaces the legacy design with VXLAN in the DC and SR-MPLS in the metro network.

- Alexey Gorovoy from Nebius

LINK

SRv6 for AI Back-End DC

- **Traffic nature enables Deterministic Path Selection**

  - Predictable Elephant Flows

- **GPU is in control of the end-to-end path**

  - Essence of SRv6: the application controls the end-to-end path as a network program in the DA

- **Ultra Resilient: Immune to BGP state**

  - SRv6 uSID instructions may be used as "explicit/static"

- **Ultra Scalable: SRv6 is stateless**

  - RSVP-TE/ATM/TDM that are [n^2]

- **Ultra Convergence: GPU switches SRv6 path in nsec**

  - RSVP-TE/ATM/TDM need to first signal paths

- **Rich Ecosystem based on IETF Standard**

- **Easier to troubleshoot: a few well-known SR instructions with clear standard**

  - As opposed to proprietary black box
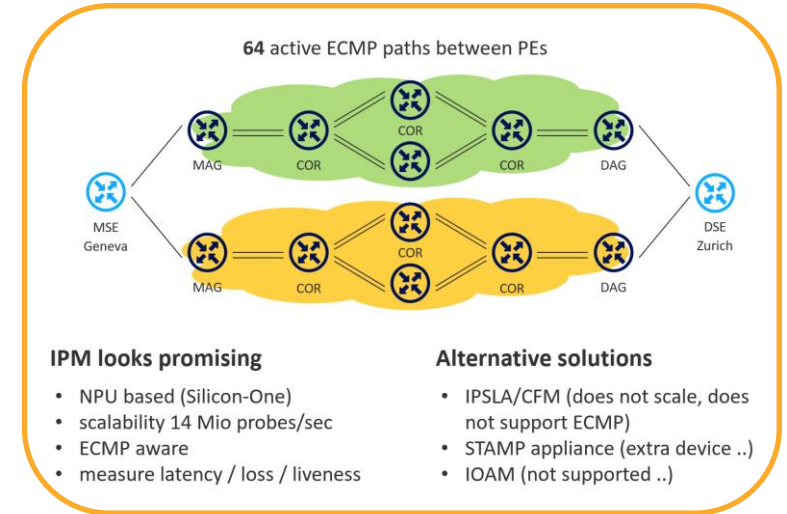
Agile SRv6 Overlay

- MPLS-VPN was restricted to physical PE (No Cloud, No Host)

- SD-WAN focused on reducing cost (Best-Effort Internet service)

- Agile SRv6 Overlay

  - Rich SLA: SRv6 Flex-Algo and SRv6 TE

  - Rich Service Chaining: stateless Firewall insertion - Nebius use-case

  - Rich Segmentation: network programming vs ACL

  - Rich Security: tight IPSEC/SRv6 integration

  - Rich Deployment: physical (PE or CE) and virtual (Cilium, VPP, Linux)

- Visit the Cisco Demo booth

Decentralized SDN – Traffic Engineering

- **Mike Valentine – Goldman Sachs**
  - SRv6 Flex-Algo PIM Tree and SRv6 Tree SID

- **Akash Agrawal – Rakuten**
  - Automated Capacity Planning and BW Guarantees

- **Bart Janssens - Colt**
  - Client API to Path Customization through Colt Infrastructure

- **Visit the Cisco Demo booth**

IP Measurement (IPM) Update

- **IPM/8k with XR & SONIC**

- **Rolf Schmid - Swisscom**
  - IPM/8k testing – XR (& SONiC)

- Visit the Cisco Demo booth

64 active ECMP paths between PEs

IPM looks promising
- NPU based (Silicon-One)
- scalability 14 Mio probes/sec
- ECMP aware
- measure latency / loss / liveness

Alternative solutions
- IPSLA/CFM (does not scale, does not support ECMP)
- STAMP appliance (extra device ..)
- IOAM (not supported ..)

IPM Testing
SRv6/uSID + IPM = path control + path monitoring

Lab Setup with IPM enabled Cisco 8000
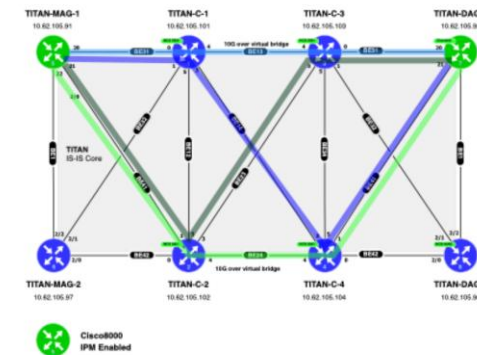
IPM provides nice measurement capabilities
- Latency histogram to study the latency over time and across paths.
- Absolute loss using standard IETF Alternate Marking method
- Spray mode for aggregate measurements across all ECMP Paths.
- Specific flow label for individual ECMP Paths.
- SRv6 SID list for deterministic ECMP path
- GRT and Customer VRF
- DSCP support to measure a given traffic class/type

The power of SRv6 uSID and IPM
- IPM Session with SRv6 SID list for deterministic per ECMP path measurement.
- Measure all SR Traffic Engineering Policies

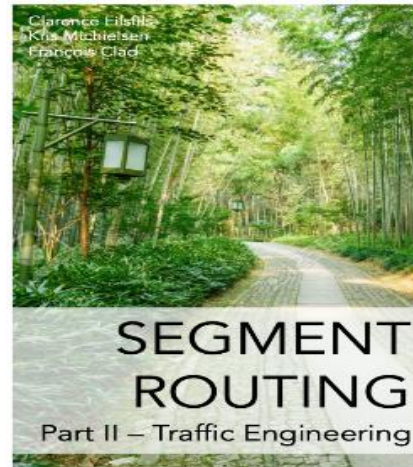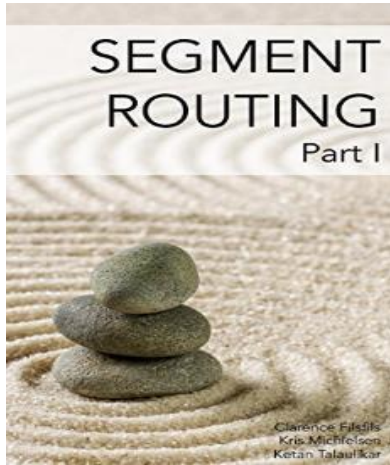**Next step: Trial in TITAN production network**

SRv6 Mobile User Plane
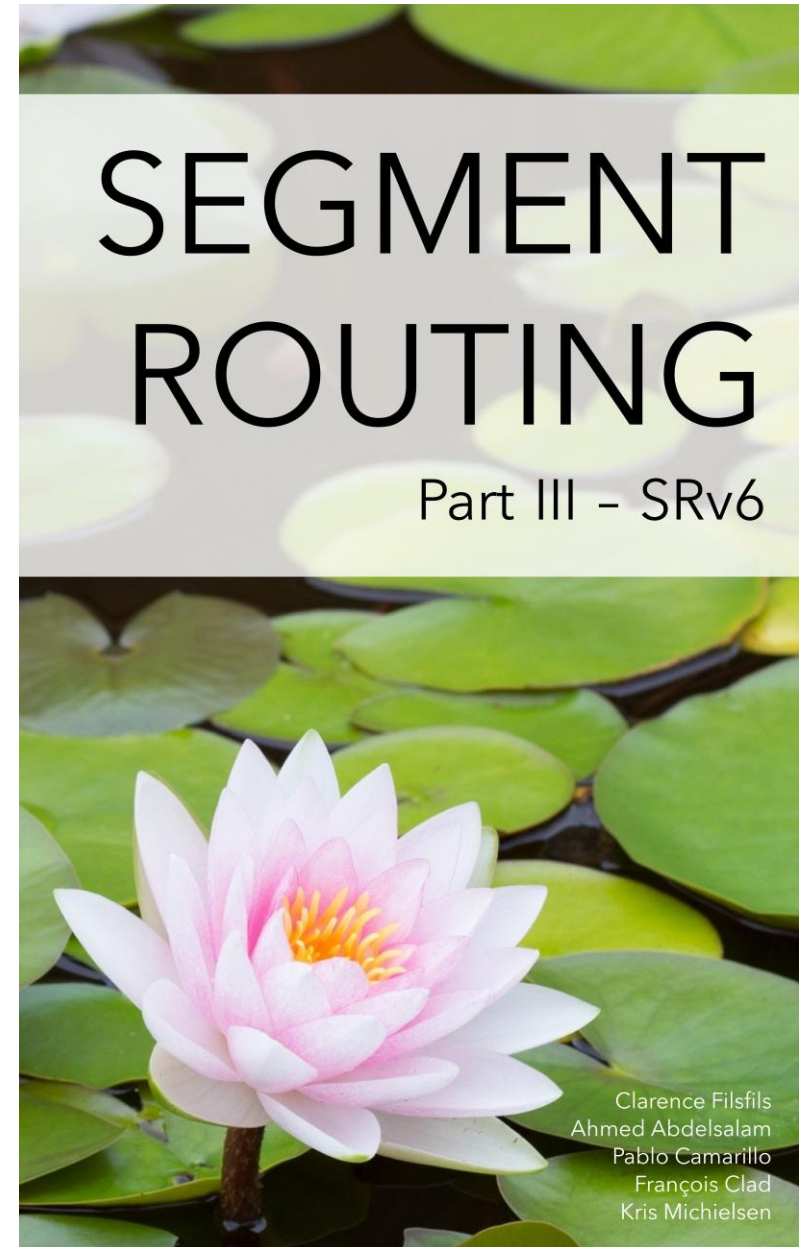
- Satoru Matsushima – Softbank

- Jakub Horn

Join our next uSID/IPM event – October 2025 in Nice

Stay up-to-date

segment-routing.net

https://www.amazon.com/dp/B0D6GWWRWH

Simplicity Always Prevails

IP is better than ever

SRv6 uSID

IPM

Build Anything End-to-End

Measure Everything