SRv6

Technology and Industry Status

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Cisco Fellow

Simplicity Always Prevails

~~LDP~~

~~RSVP-TE~~

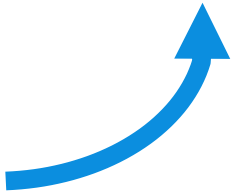
~~Inter-AS Option A/B/C~~

~~MPLS~~

~~UDP/VxLAN~~

~~NSH~~

Furthermore with more scale and functionality



Deployments at record-speed

- 100M SRv6 subscribers with 2.5 years of commercial service
- China is pervasively deploying SRv6
- ~100 deployments, 10 with PR

SoftBank	Indosat	China Unicom	MTN Uganda
Iliad	China Telecom	China Bank	Noia
Rakuten	Bell Canada	Cernet2	Line

Rich Eco-System

- 25 HW linerate implementations
  - Cisco Systems, Huawei, Juniper, Nokia, ZTE, Arrcus, Kaloom
  - Broadcom, Barefoot, Intel SmartNIC, Marvell, Mellanox,
  - Spirent, Ixia
  - Multiple Interop Reports
- 11 open-source platforms/ Applications
  - Linux, FD.io VPP, P4, iptables, nftables, snort, SERA, ExaBGP, GoBGP, GoBMP, Contiv-VPP

Mature Standardization

- Proposed Standard
  - RFC 8402 SR Architecture
  - RFC 8754 SRv6 DataPlane
  - RFC 8986 SRv6 Network Programming
- Last steps to Proposed Standard RFC
  - ISIS
  - BGP

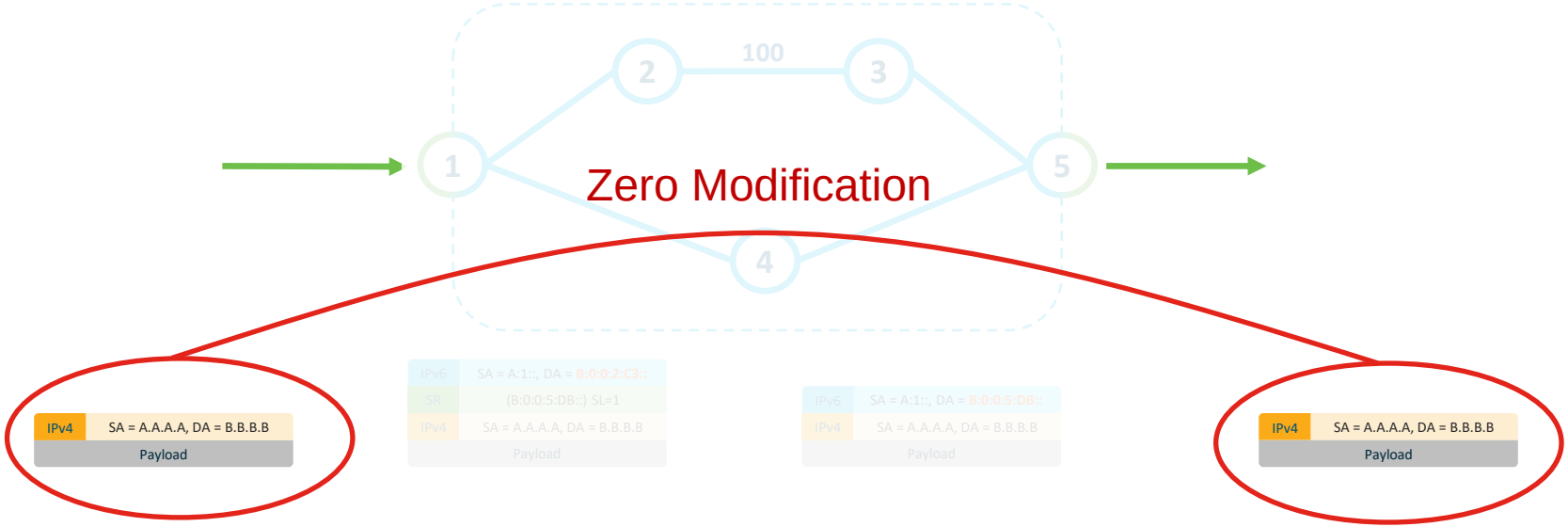
Rich FCS roadmap

- We started SR-MPLS in 2012, SRv6 in 2017
- From an FCS and deployment viewpoint,
  the core of any SR deployment is at parity SR-MPLS vs SRv6
  - TILFA
  - uLoop Avoidance
  - Flex-Algo: Low-Cost/Low-Delay Slicing
  - PerfMon: Link Latency (for Low-Delay slice)
  - ODN/AS into Flex-Algo
  - Seamless Inter-Domain SRv6 with summarizing and slicing
  - L3VPN (IPv4 and IPv6), IPv4 Internet, IPv6 Internet, PW
  - VPN GW to interconnect “new” SRv6-VPN buildup with legacy VPN

SRv6 - Reminder

End-to-End Integrity

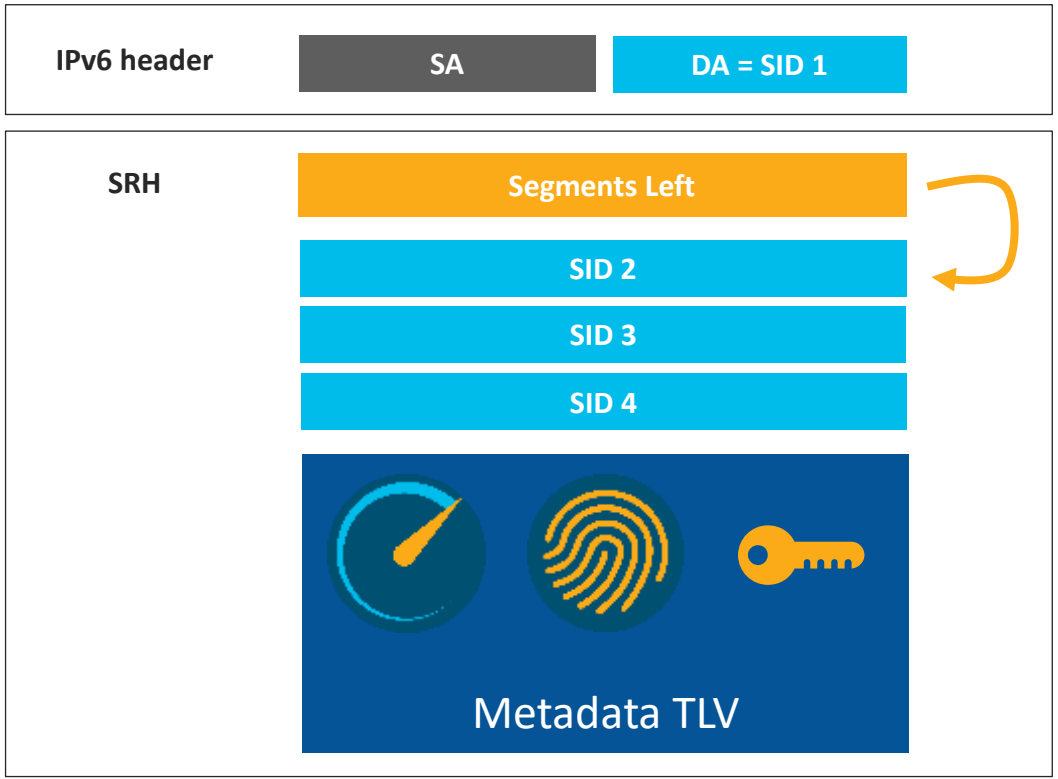
- End-to-end integrity principle is strictly guaranteed
  - Inner packet is unmodified
  - IPv6 header added at ingress and removed at egress of the domain



Network Program

- A network program is a list of instructions (128-bit SRv6 SID)
- An instruction can be bound to any behavior
  - TE/FRR: END, END.X
  - VPN: END.DX, END.DT
- Often a single instruction is enough and is encoded in DA (without SRH)

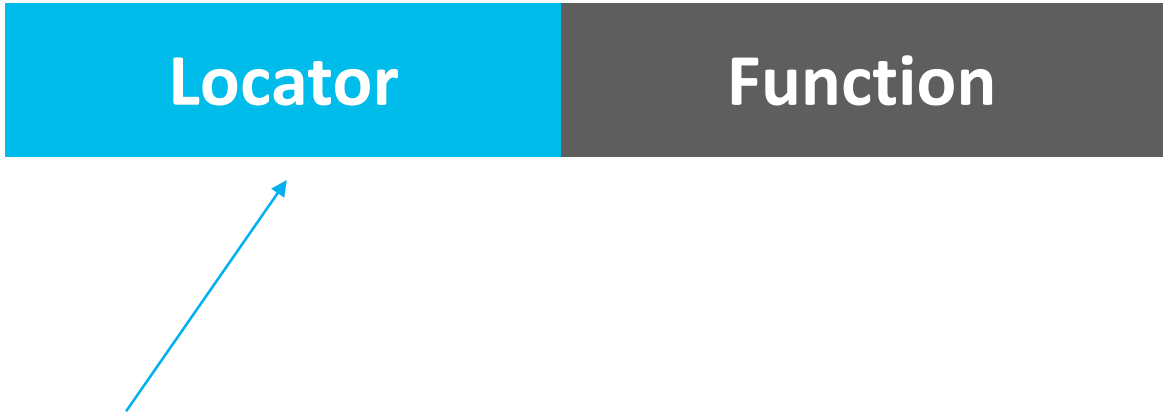
SRv6 Header



Optimized for HW
e.g. FRR, TE & VPN

Optimized for SW
e.g. NFV, VM, CN

SRv6 SID – Instruction of the network program



Locator is routed up to the parent of the SID

SRv6 SID – Instruction of the network program

Opaque ID mapped to a behavior applied @ packet

Any behavior can be imagined

SRv6 MicroProgram

- Any instruction can hold a micro-program
- Ultra-scale and minimum MTU overhead
- HW linerate and widespread adoption: Custom and Merchant
  - Facilitate legacy HW reuse
- 100% leverage of SRH and SRv6 Network Program

SRv6 Deployed Use-Cases

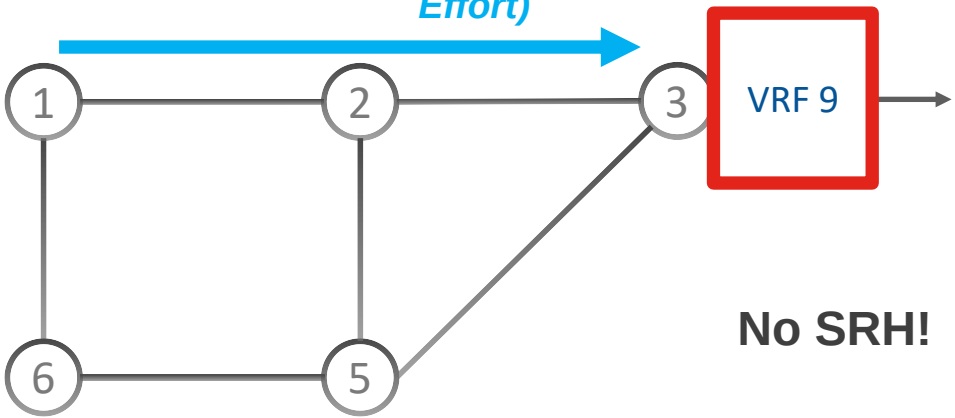
Deployed Use-cases

• TILFA (99% of the cases)	0 or 1 SID
• Micro-Loop Avoidance (99% of the cases)	0 or 1 SID
• VPN via Best-Effort Inter-Domain slice	1 SID
• VPN via Low-Delay Inter-Domain slice	1 SID
• DC VPN with Group-Based Policy	1 SID
• VPN with Service Chain via Inter-Domain slice	2 SID’s

VPN over Best-Effort 5G Slice

Network Program: B:0:0:3:V9::

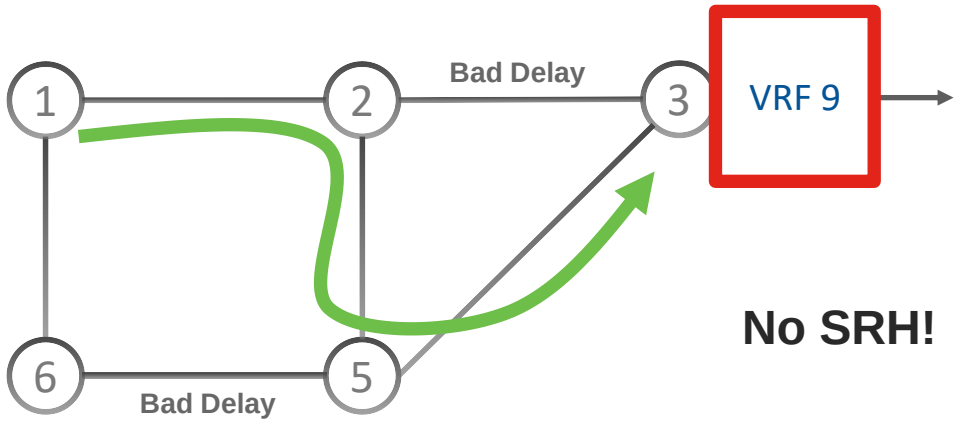
B::/40 locator block is associated with ISIS base algo (Low Cost, Best Effort)



VPN with Low-Delay 5G Slice – Flex-Algo Option

Network Program: D:0:0:3:V9::

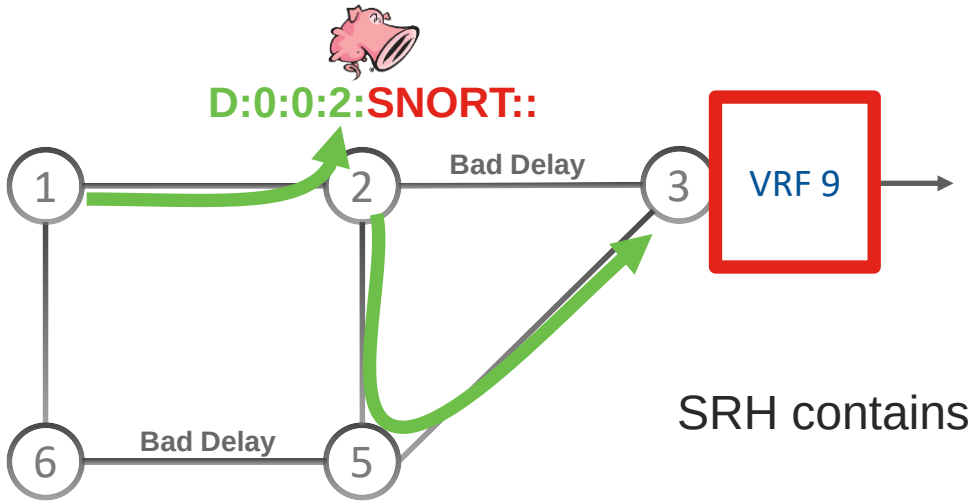
D::/40 locator block is associated with Low Delay Flex-Algo



Snort Firewall, VPN & Low-Delay Slice

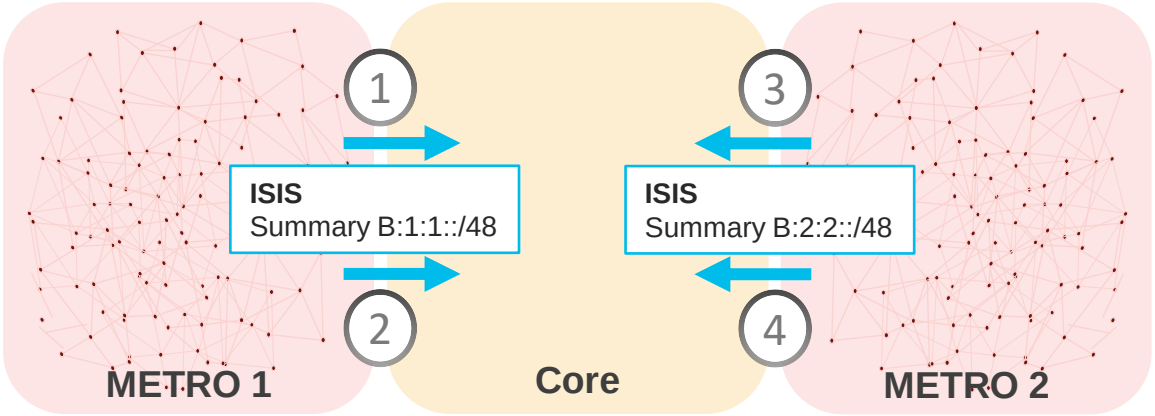
Network Program: D:0:0:2:SNORT:: then D:0:0:3:V9::

D::/40 locator block is associated with Low Delay Flex-Algo



SRH contains 1 Single SID

Prefix Summarization



- Back to basic IP routing and summarization
- No BGP inter-AS Option A/B/C

Benefits

- Seamless Deployment
- Hardware Linerate
- Routing Scale: power of IP summarization
- Low MTU Overhead: few SID’s
- Optimum Load-balancing
- Simplification
  - No MPLS, no VxLAN, no UDP trick for LB, no RSVP-TE, no LDP, no NSH
- Negligeable IPv6 address space consumption
  - Iliad < 1 billionth of FC/8 space
  - SBB < 1 millionth of current SBB public space

Conclusion

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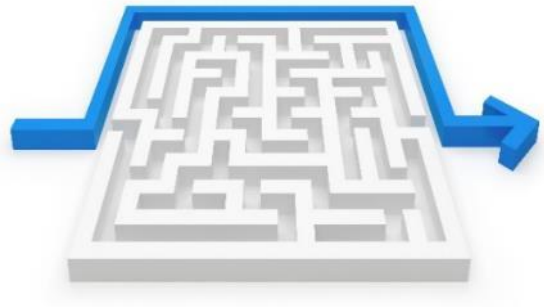
~~RSVP-TE~~

~~Inter-AS Option A/B/C~~

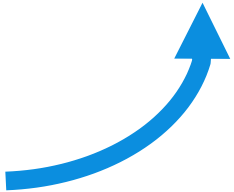
~~MPLS~~

~~UDP/VxLAN~~

~~NSH~~



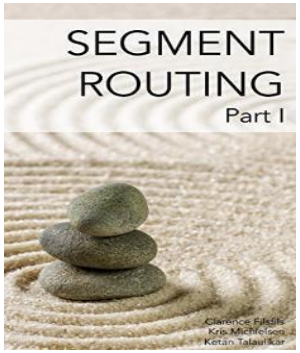
Furthermore with more scale and functionality



Deployment and Eco-system - @ record speed

- 100M live subscribers across > 12 major deployments
  - Softbank, Iliad, China Telecom, LINE corporation, Rakuten, Indosat Ooredoo, China Unicom, CERNET2, China Bank, MTN Uganda, and NOIA Network
- Mature industry
  - 25 HW linerate implementations across major vendors:
    Cisco Systems, Huawei, Nokia, Juniper, ZTE, Broadcom, Intel/Barefoot, Marvell, Mellanox, Arrcus, Kaloom, Spirent, Ixia
- Proposed Standards IETF RFC
  - RFC8402, RFC8754, RFC8986
- Mature open-source

Stay up-to-date



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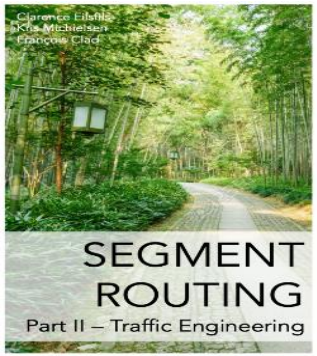

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SRv6 Part III Coming by end CY21

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Thank you!

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