Segment Routing over IPv6 (SRv6)

The new network architecture via source-based routing based on IPv6

School of Advanced Networking by NAMEX

Webinar – November 15th, 2024

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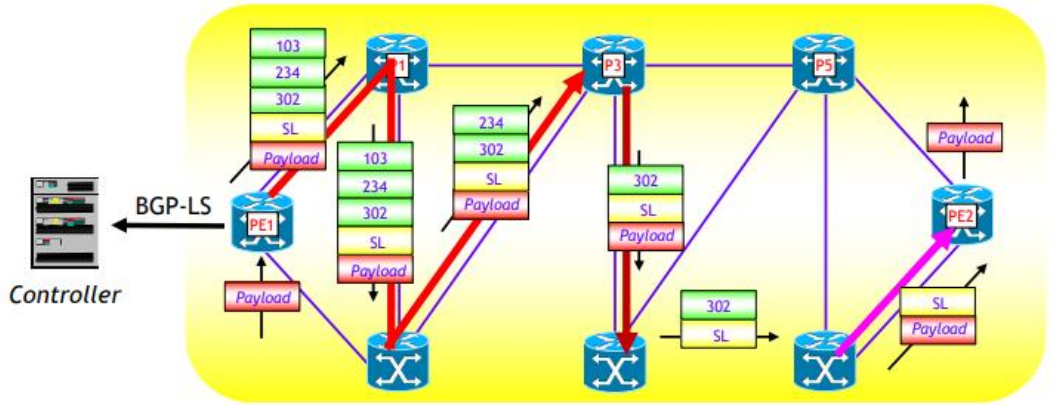
Who's Who

- Network Consultants
- Our company is MPAE
  Your Additional Engine
- We work on major routing and security manufacturer
- Total ninety years old
- Today working on SRv6, Non-Terrestrial Network, Network inside the body, Security and DDoS
- We build and operate public, academic, corporate and government networks
- Working with TCP/IP since 1985

..... Once Upon a Time #1

Cosa è il *Segment Routing*?

- *Segment Routing* è una variante moderna del (vecchio) *source routing*
- In una rete che utilizza il *segment routing*, il nodo di ingresso del traffico può aggiungere una intestazione costituita da una o più etichette MPLS o indirizzi IPv6
  - ogni etichetta MPLS o indirizzo IPv6 costituisce una "istruzione" di instradamento per i nodi attraversati dal pacchetto
- Due versioni disponibili
  - SR over MPLS (SR-MPLS)
  - SR over IPv6 (SRv6)



Venerdì 18/10

Segment Routing over MPLS (SR-MPLS)

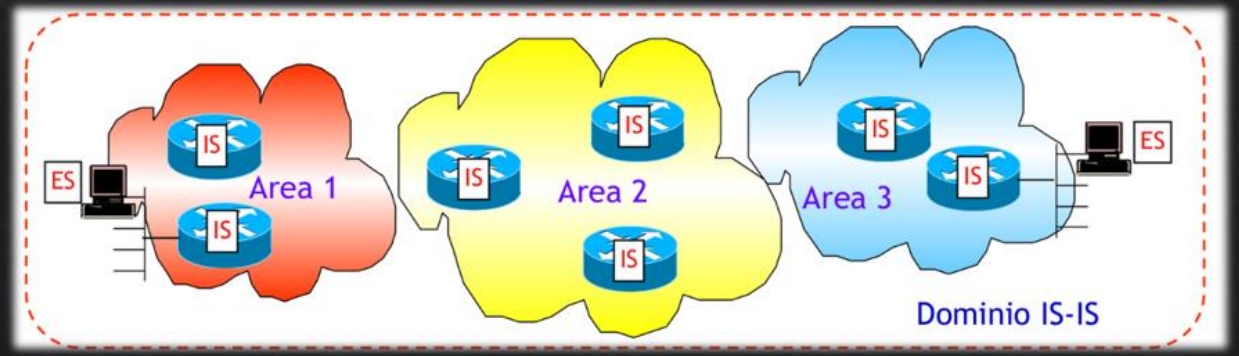
(Tiziano Tofoni)

….. Once Upon a Time #2

First of all: IS-IS is ……

All'interno di una rete OSI si possono individuare 4 entità

- ✓ L'**area** è un'entità logica formata dall'insieme di router e collegamenti all'interno di essa. Le aree sono connesse per formare un backbone
- ✓ Gli **End System (ES)** sono nodi che non hanno capacità di routing (host)
- ✓ Gli **Intermediate System (IS)** sono nodi che hanno capacità di routing
- ✓ Il **dominio** è un insieme di reti OSI che contengono un certo numero di aree poste sotto un unico controllo amministrativo



Da ITNOG8 in Bologna
Lunedì 06/05

SRv6
Our future network

Network Request for the future

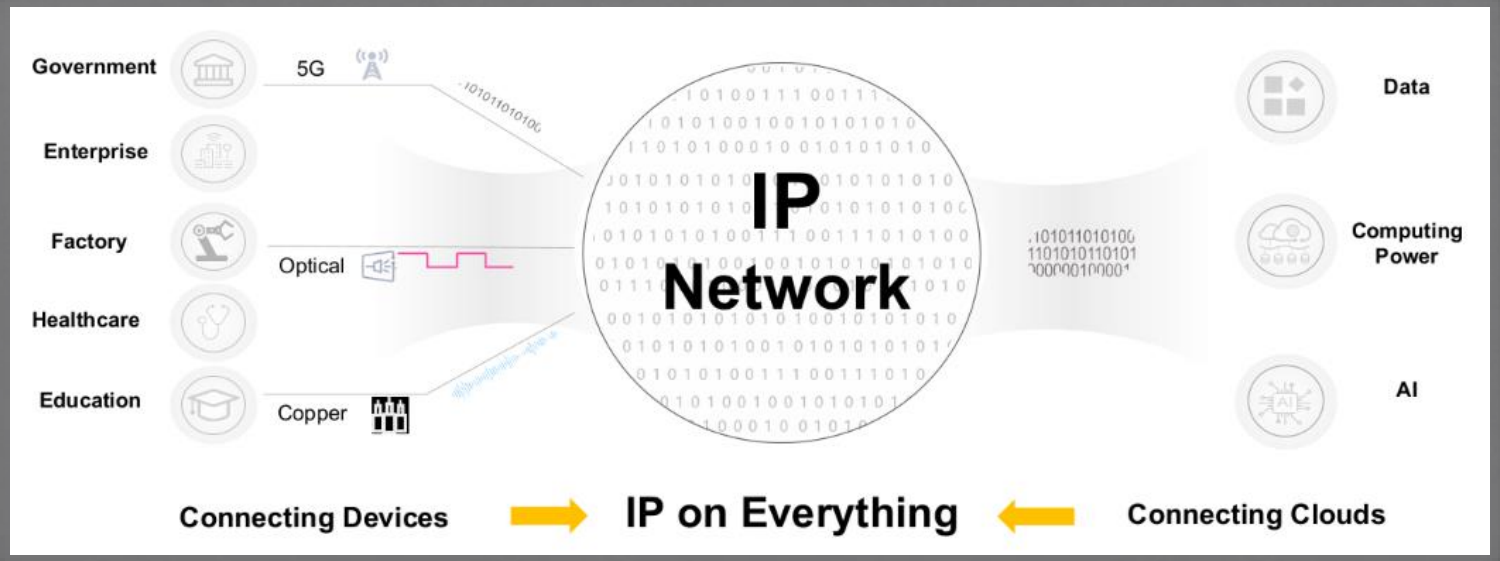
Our future network will be Intent Driven/Based Network (IDN/IBN)

- Elastic architecture (Fabric)
- Dedicated network experience (Slicing)
- **Any2any connection (SRv6)**
- Intent driven (SDN)
- Highly Intelligent (AI)

Why IPv6

- Internet Protocol (IP) is the protocol by which devices connect to each other in most networks
- Each device needs at least one IP address that identifies it from others (just like each person need an ID)

IP address **ID**



SRv6 is a networking technology that combines Segment Routing with IPv6 to create a more efficient and flexible way to route traffic in modern networks.

• RFC 8402	SR Architecture
• RFC 8986	SRv6 Network Programming
• RFC 8754	IPv6 Segment Routing Header
• RFC 9252	SRv6 VPN
• RFC 9256	SR Policy Architecture
• RFC 9259	OAM in SRv6
• RFC 9352	IS-IS Extensions
• RFC 9513	OSPFv3 Extensions
• RFC 9514	BGP-LS Extensions
• RFC 9603	PCEP Extensions
• IESG review	BGP SR policy
• AD Evaluation	SRv6 Compression

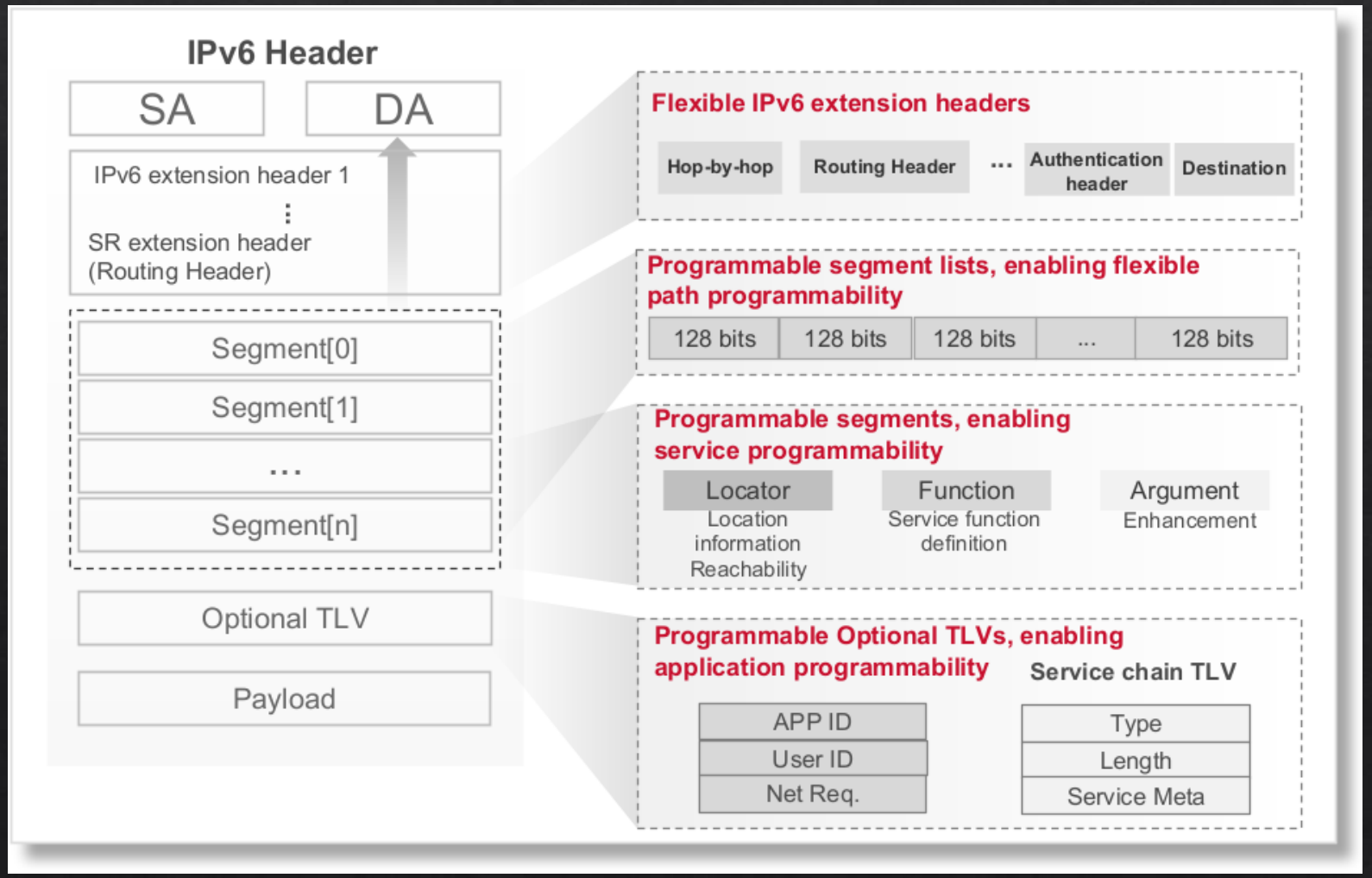
RFC9602
5f00::/16

10 + 1 RFCs on SRv6 are released, 2 more is coming

IPv6 Enhanced Has Become Mature in Standards

SRv6 Standards are already stable

SRv6 Header (Core)



Programmable Paths

Flexible segment list orchestration provides definable service paths

Programmable Services

VPN, VAS, and SFC service information can be flexibly defined

Programmable Applications

Extension header + Optional TLV enables networks to be aware of applications.

SRv6 Advantages

Control Protocols

5+ >> 2

IGP, LDP, BGP
RSVP-TE, LDP

IGP, BGP

Encapsulation Protocols

4+ >> 1

MPLS, VXLAN
GRE, L2TP, IP

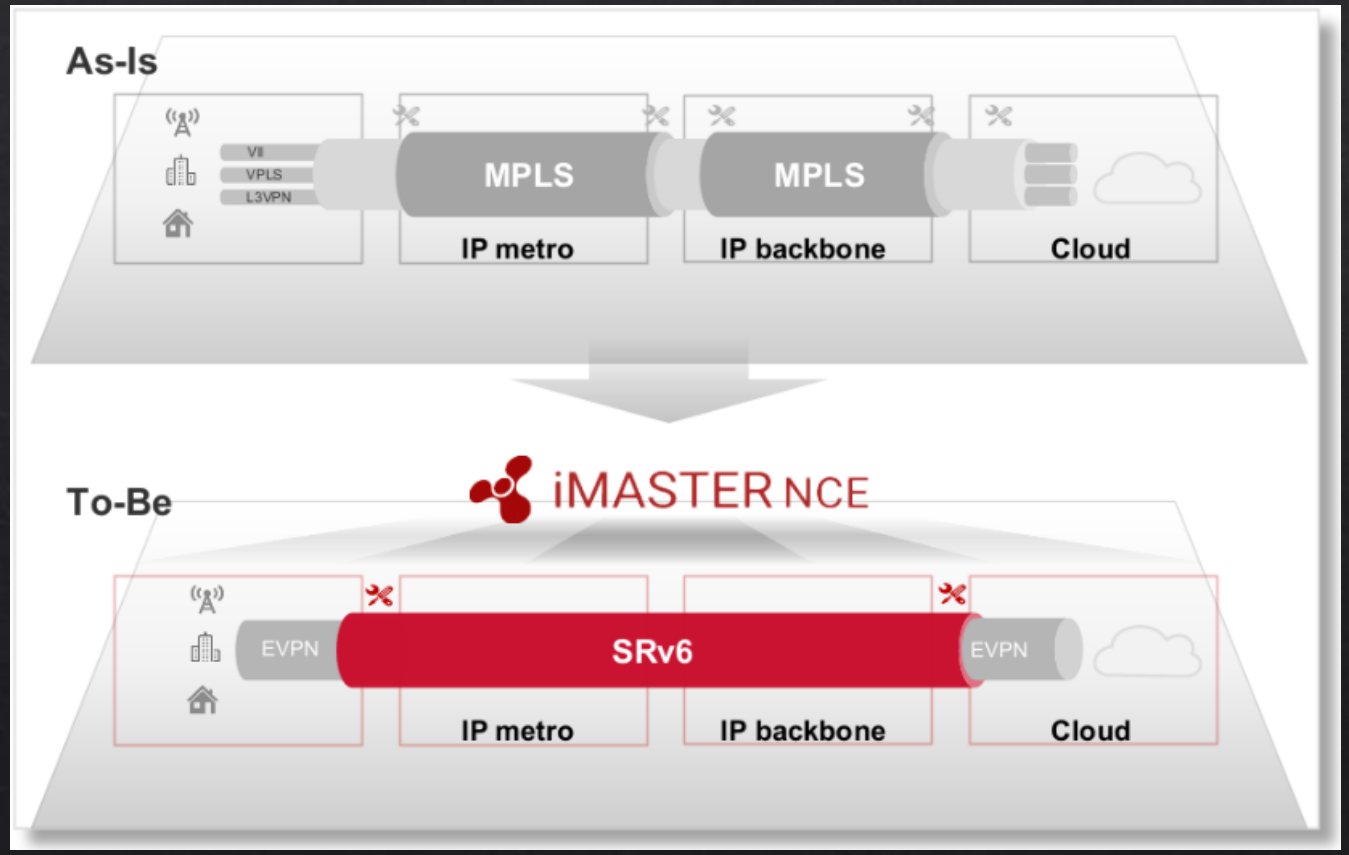
IP

Service Configuration

6+ >> 2

Segment-by-segment,
device-by-device

Service end nodes only



SRv6 Tipical Application

Recovery < 50 ms

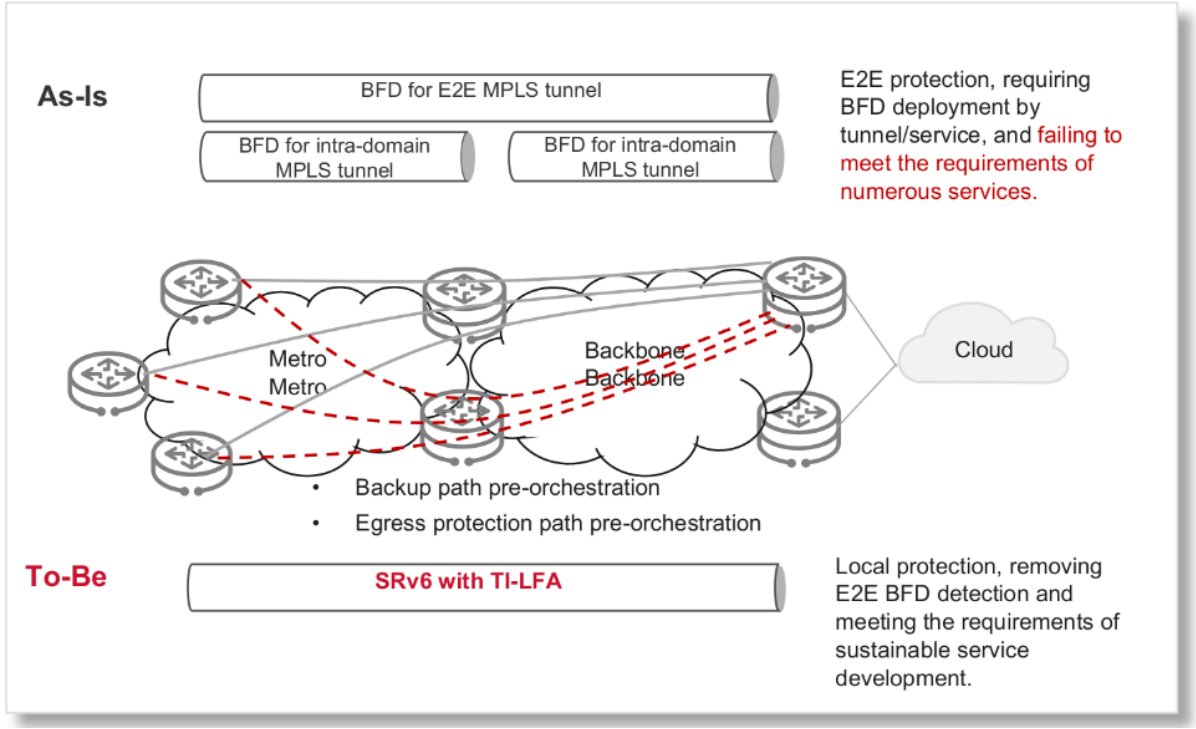
Local protection, fast detection, and fast recovery

Any Topology

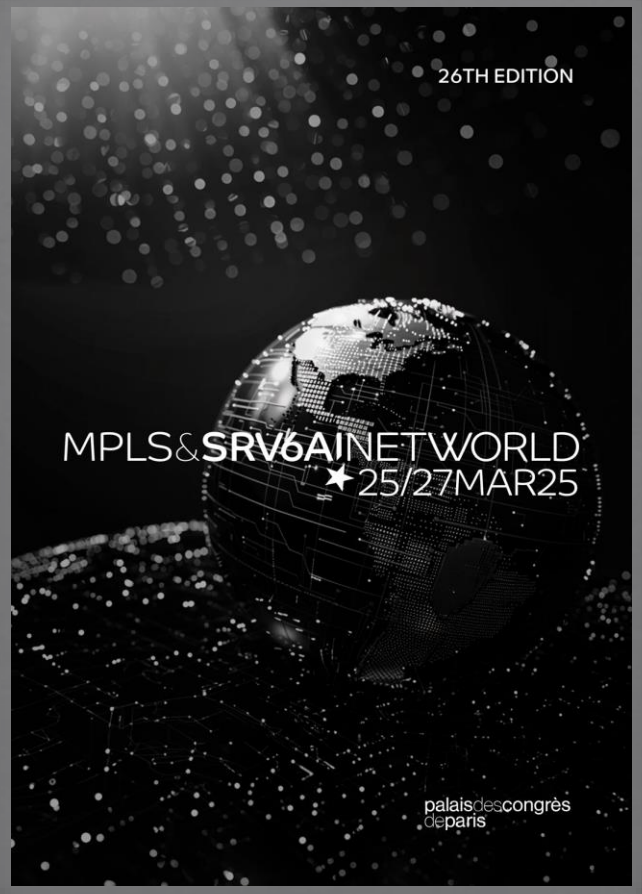
Unified protection for any topology

Numerous Services

One-time simple deployment, irrelevant to the number of tunnels or services



SRv6 Major Router Manufacturers



- ✓ Arista
- ✓ Ciena
- ✓ Cisco
- ✓ Ericsson
- ✓ H3C
- ✓ Huawei
- ✓ Juniper
- ✓ Nokia
- ✓ ZTE

EANTC
EUROPEAN ADVANCED NETWORKING TEST CENTER

Multi-Vendor MPLS SDN Interoperability Test 2024
https://eantc.de/wp-content/uploads/2023/12/EANTC-MPLSSDNInterop2024-TestReport-v1.3.pdf

SRv6
Tipical Domestic
Application

- ✓ AS44092 - National Operator
- ✓ > 30 K Users
- ✓ > 20 KIT FTTx /FWA
- ✓ 5 IXPs
- ✓ Network as a Fabric (NAAF)
- ✓ Implememed in about 18 mo.

SRv6
Main Benefits

- ✓ Simplified network operations
- ✓ Better integration with cloud and container environments
- ✓ Improved network programmability
- ✓ Native support for IPv6 networks
- ✓ Reduced protocol complexity
- ✓ AI Ready

Q&A

SRv6 Useful Links

- Cisco
  https://blogs.cisco.com/tag/srv6
- Huawei
  https://support.huawei.com/enterprise/en/doc/EDOC1100200080
- Juniper
  https://www.juniper.net/documentation/en_US/day-one-books/DayOne-Intro-SRv6.pdf


Thank You !
&
Happy SRv6