

# User Controlled SD-WAN Services using SRv6

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Speaker: Giulio Sidoretti



TOR VERGATA  
UNIVERSITY OF ROME



# Outline

- User Controlled SD-WAN Services (UCSS)
  - VPN Deployment Over GÉANT
  - Objectives
- SRv6
- Deployment Scenario
- EveryWAN Architecture
  - Controller/Edge Devices
  - Delay Monitoring
  - GUI

# User Controlled SD-WAN Services (UCSS)

- GÉANT Innovation Programme
- Development of an open source SD-WAN service to deploy VPNs over the GÉANT network

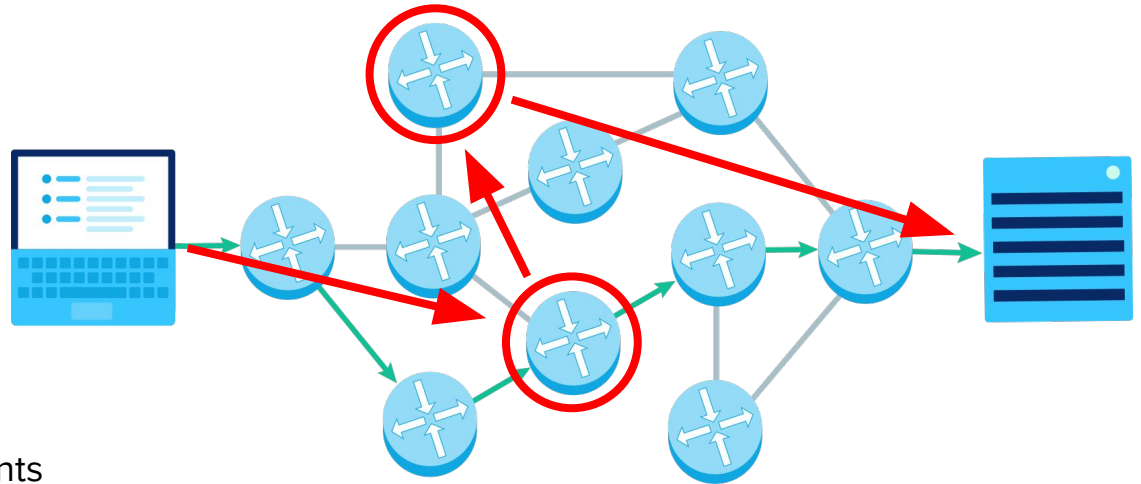
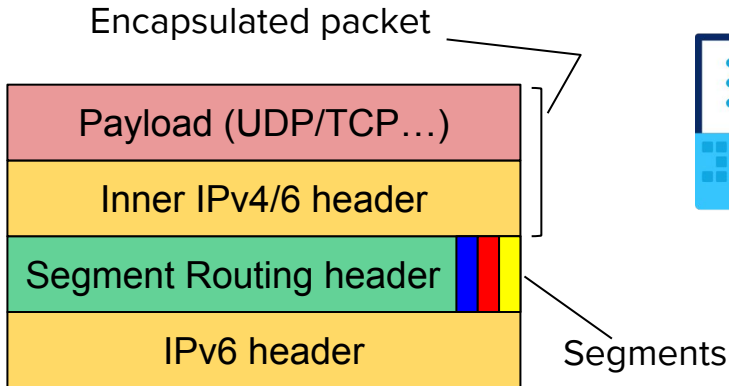


# Objectives

- VPNs created/controlled by the users
- Zero-touch provisioning
- Automatic monitoring of delay
- Use IPv6 for transport, carry IPv4 and/or IPv6
- Assess the end-to-end feasibility of IPv6 transport

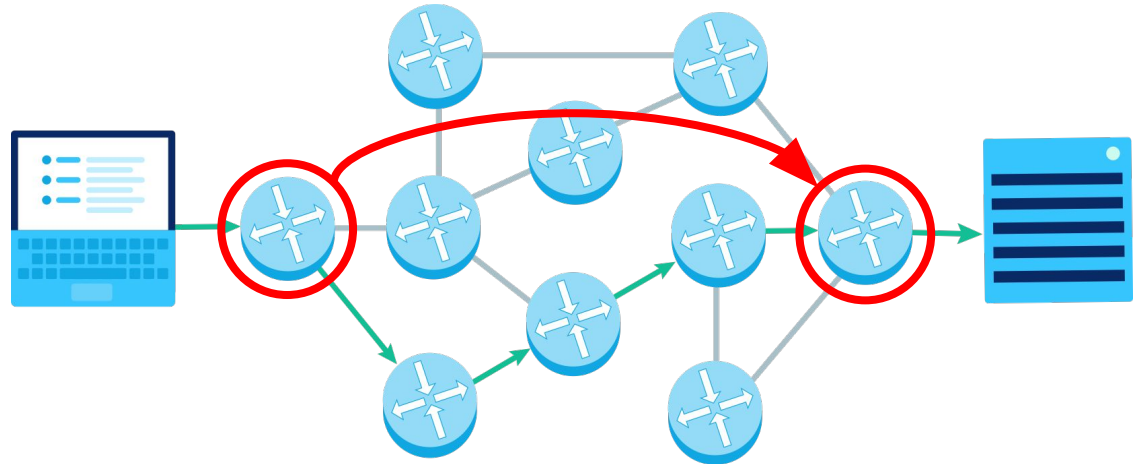
# SRv6 (Segment Routing over IPv6)

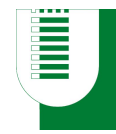
- Source Routing
- Traffic engineering
- Virtual Network Functions (VNFs) Chaining



# SRv6 (Segment Routing over IPv6)

- Source Routing
- Traffic engineering
- Virtual Network Functions (VNFs) Chaining
- Tunneling (VPNs)

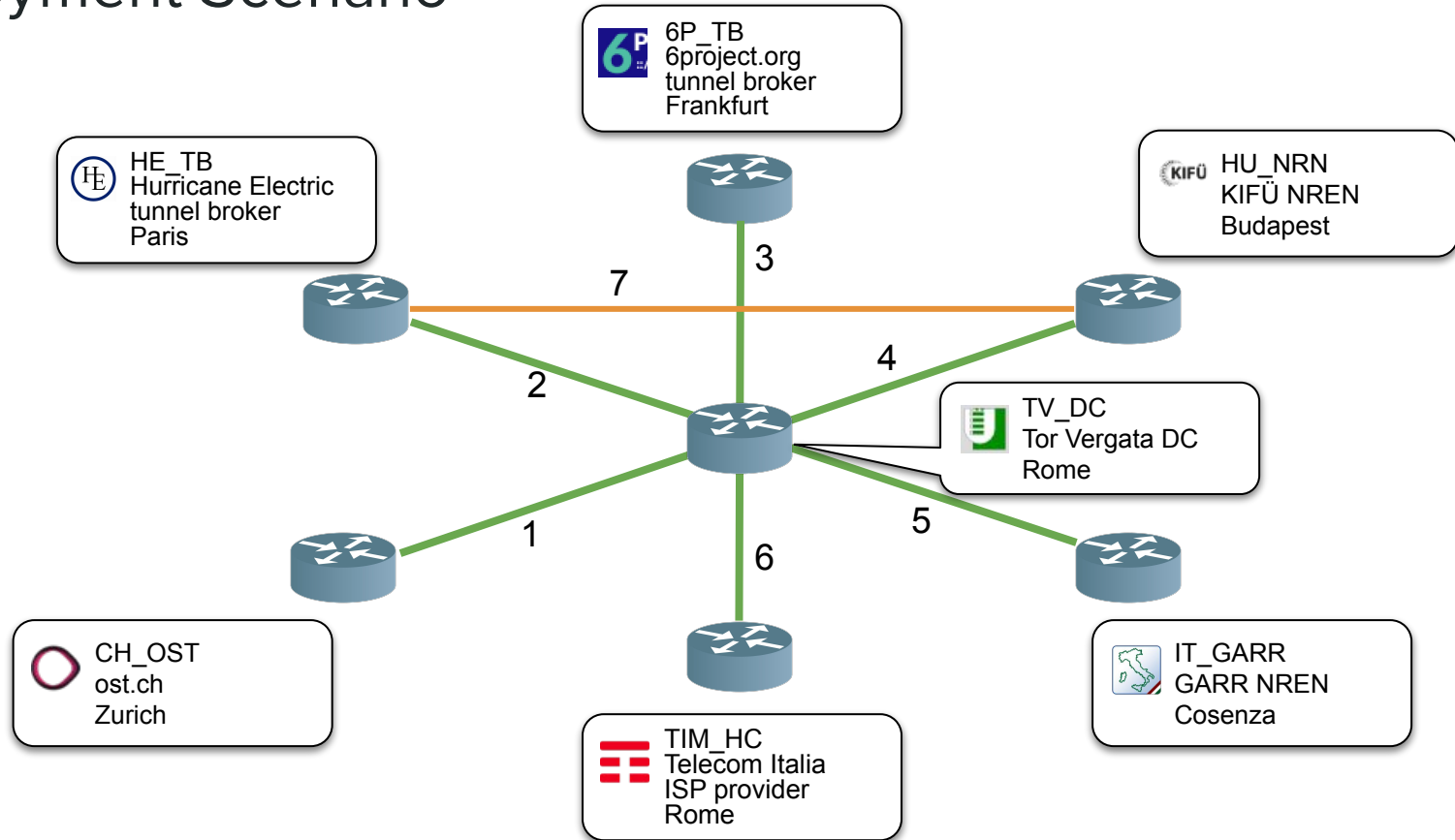




# Testbed sites for UCSS experiments



# Deployment Scenario

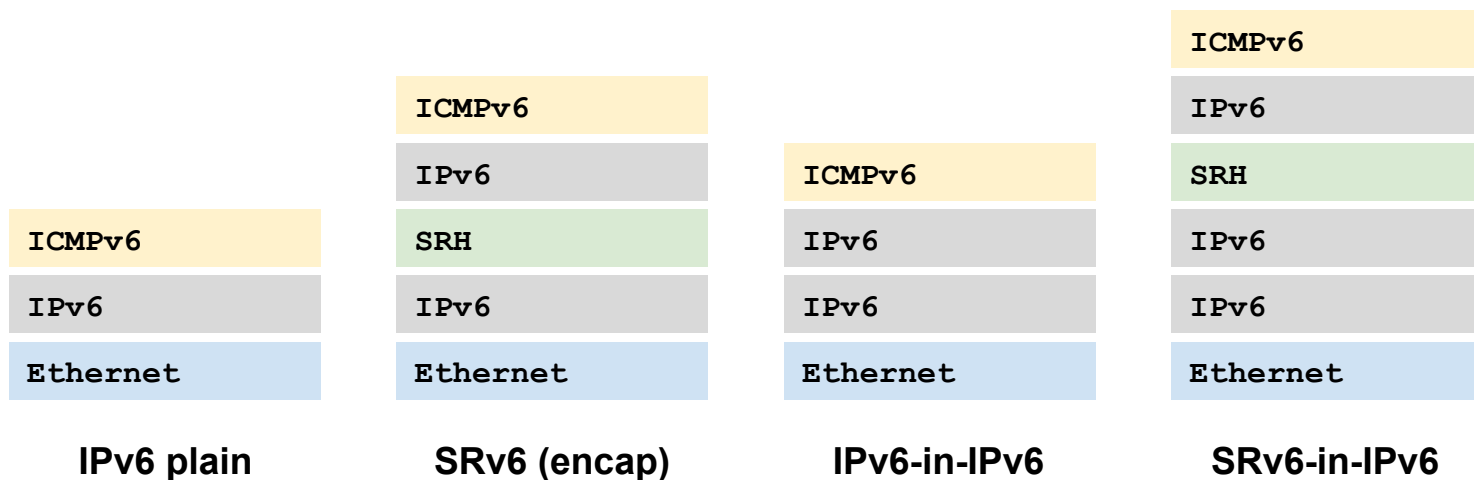




# Problem: end-to-end IPv6 transparency

## Packet types

Some sites only allow certain packets through the firewalls



# Problem: end-to-end IPv6 transparency

Packet types (Some sites only allow certain packets through the firewall)

Addressing - we'd like to have at least a /64 prefix !! often we get a shorter prefix... or even a /128 (a single address)

## Solution

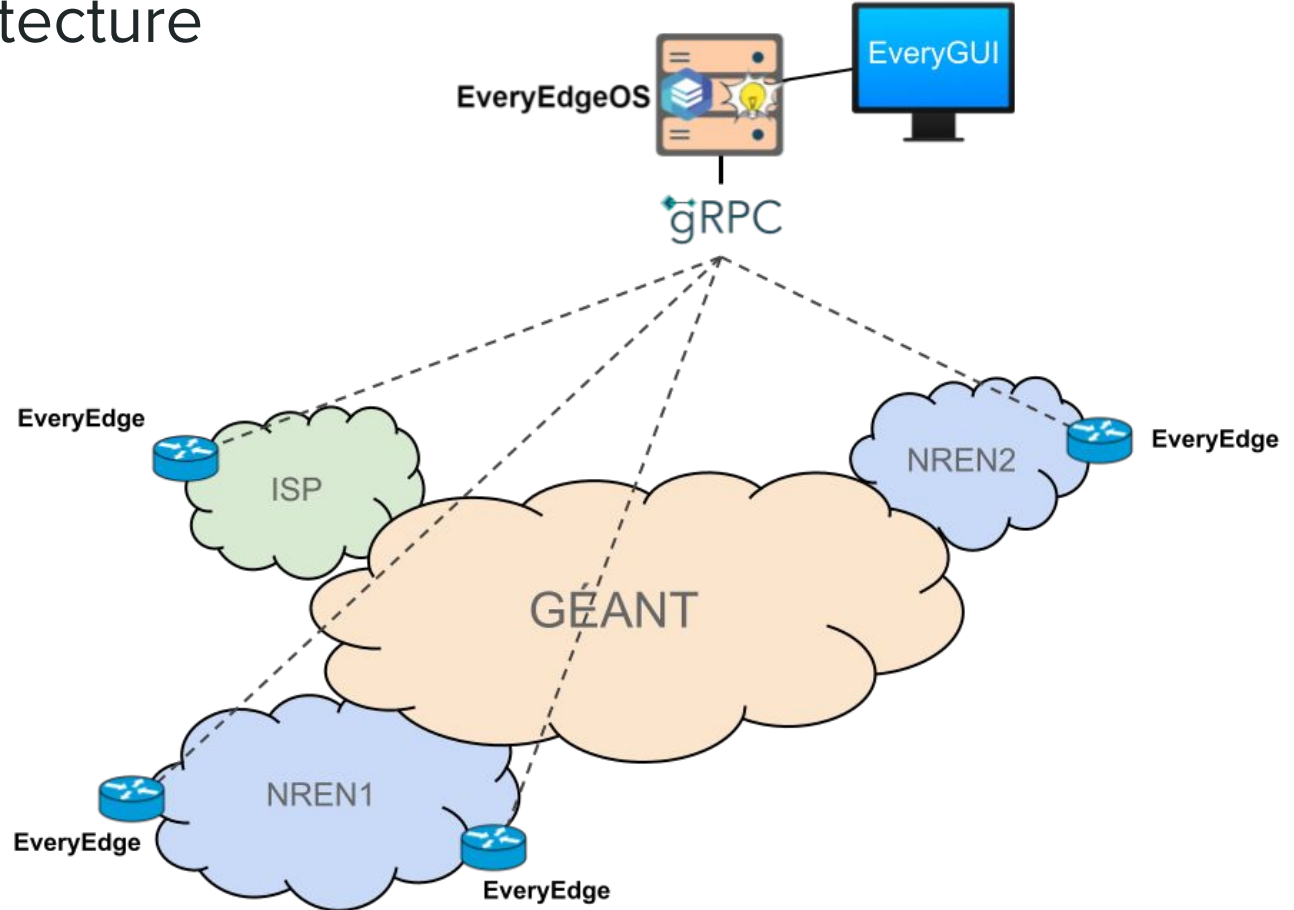
Different "transparency" scenarios have been classified and the tunnels have been configured accordingly by the controller

# Problem: end-to-end IPv6 transparency

TV_DC to	CH_OST	IT_GARR	HU_NRN	HE_TB	6P_TB	TIM_HC
ping6	OK	OK	OK	OK	OK	OK
icmpv6 - srh encap	NO	only OUT	OK	OK	OK	OK
icmpv6 - srh insert	NO	only OUT	NO	OK	OK	OK
icmpv6 - ip6-in-ip6	OK	NO	OK	OK	OK	OK
tcp6 iperf	OK	NO	OK	OK	OK	OK
tcp - srh encap	NO	only OUT	OK	OK	OK	OK
tcp - srh insert	NO	NO	NO	OK	OK	OK
tcp - ip6-in-ip6	OK	NO	OK	OK	OK	OK
ip6srh-in-ip6	OK	NO	OK	OK	OK	OK

# EveryWAN Architecture

Open source  
toolset for SD-WAN  
with SRv6

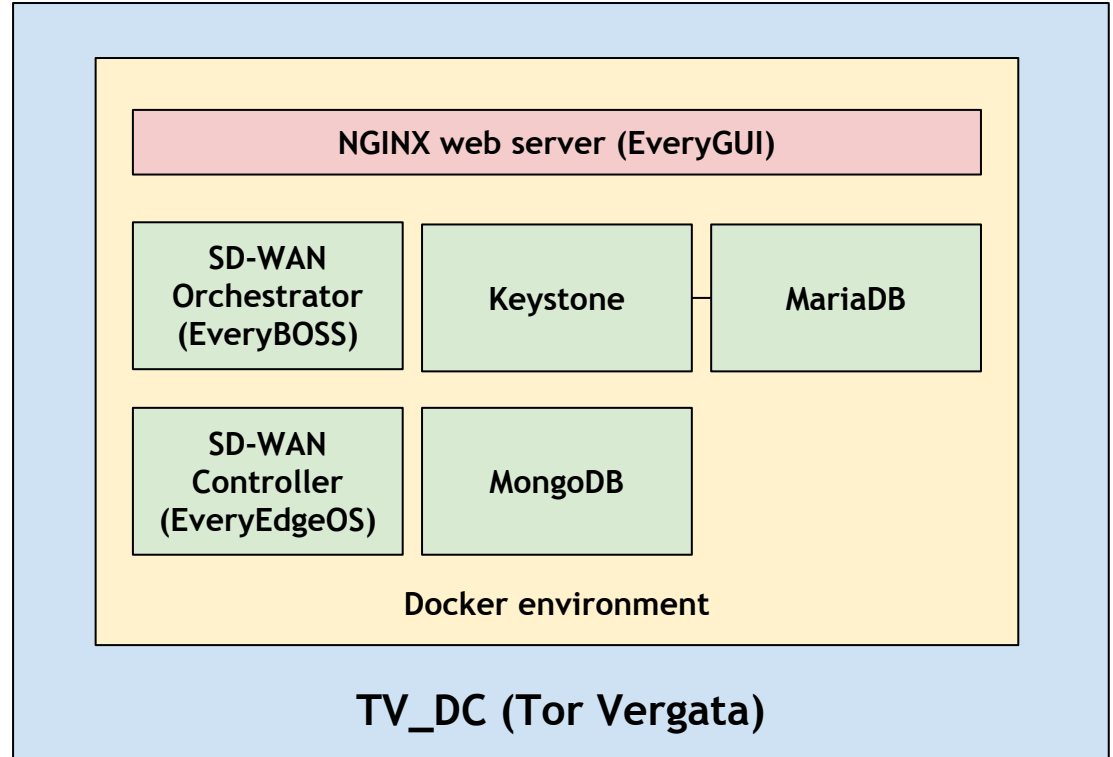


# EveryEdgeOS Controller

Deployed in the Tor Vergata node

Also includes all management components as dockerized applications

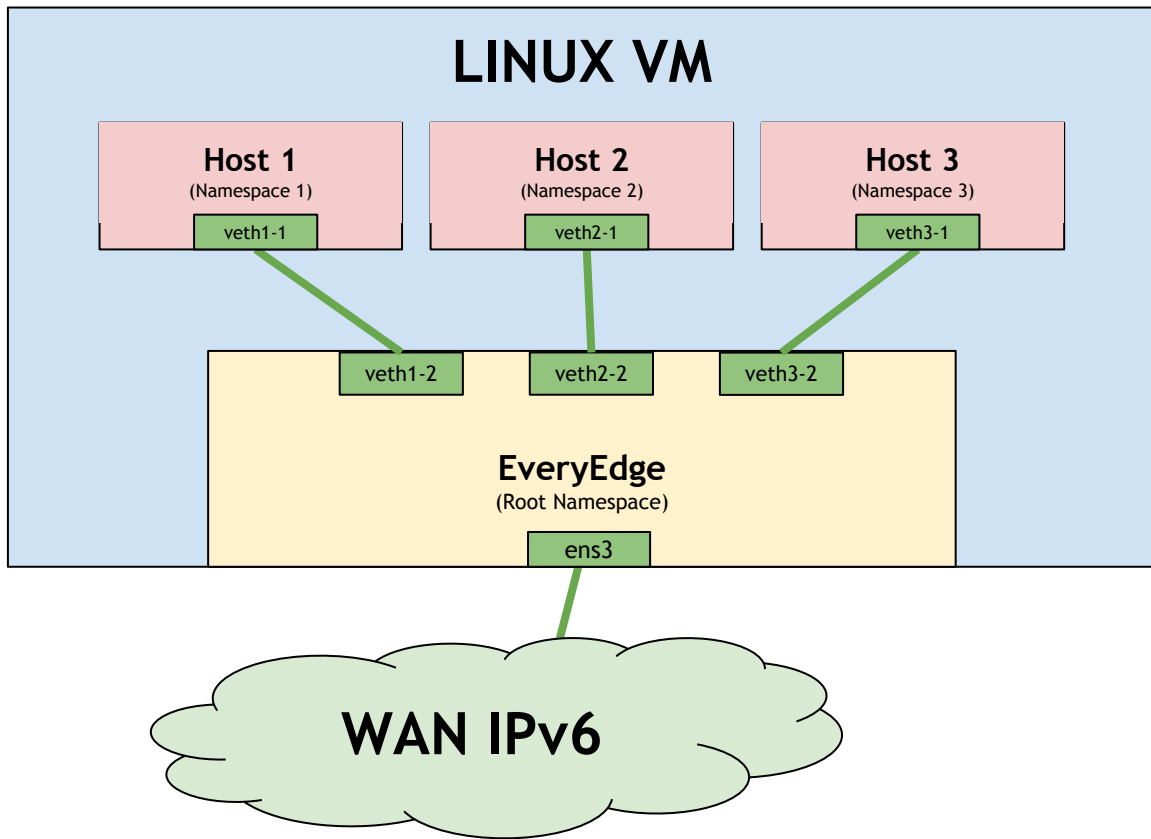
The NGINX webserver serves as GUI for the user



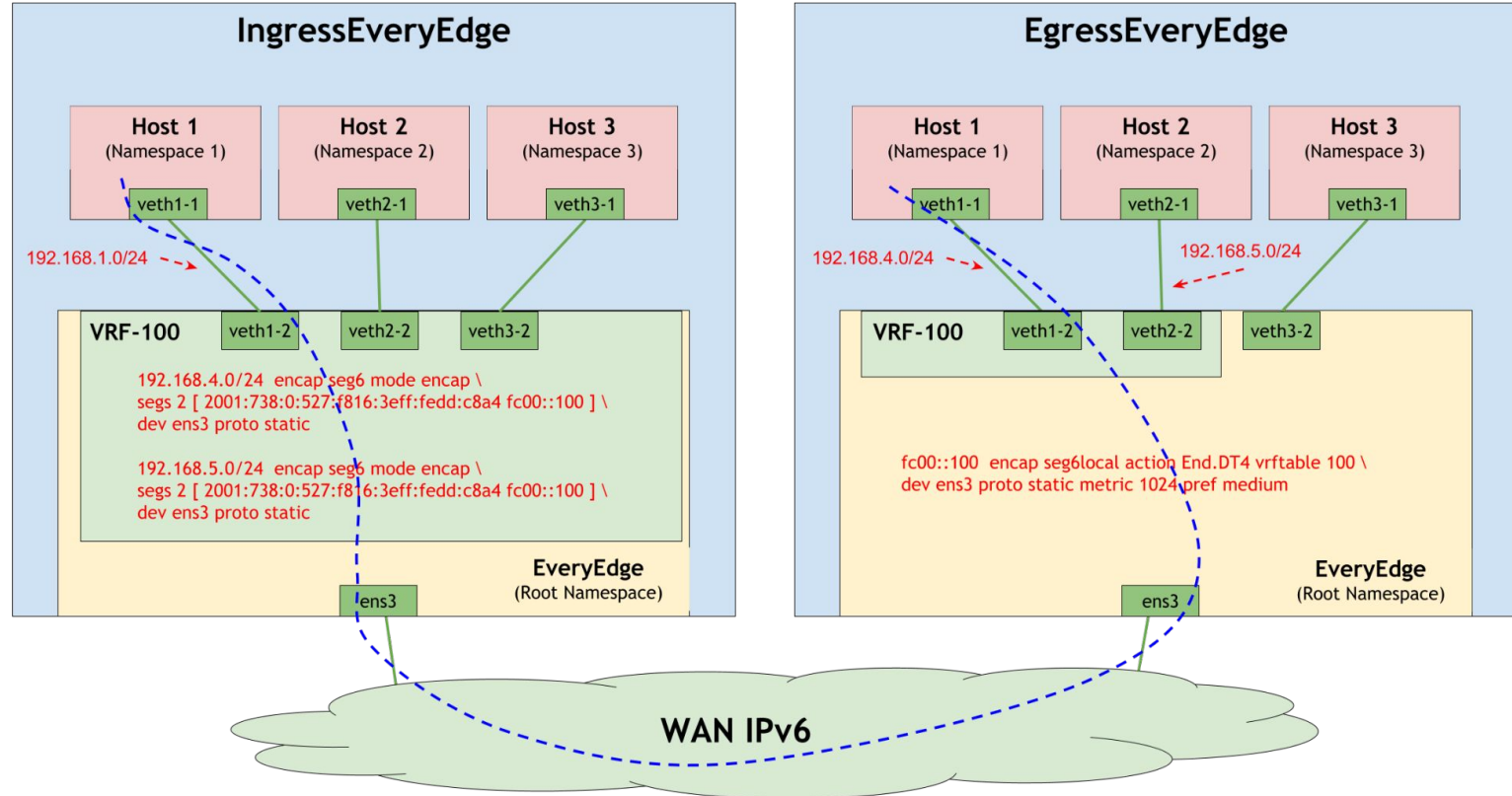
# EveryEdge Device

Edge device registers to the controller's gRPC interface

User hosts emulated using Linux namespaces



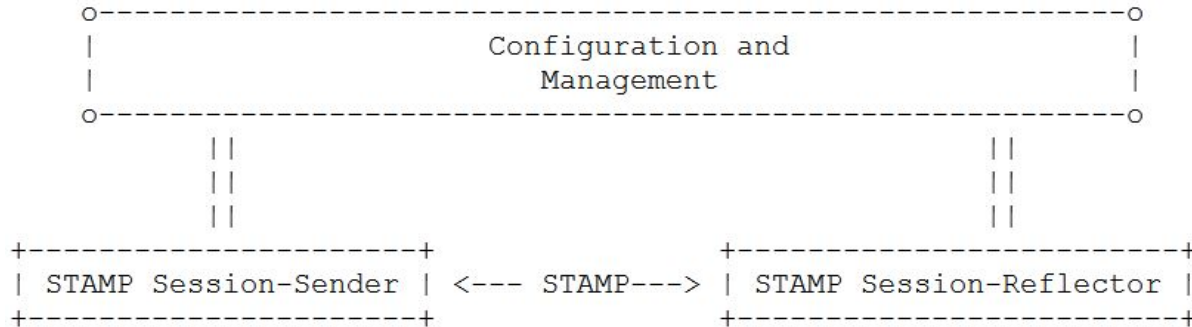
# SRv6 Tunnels



# Delay Monitoring

## Simple Two-Way Active Measurement Protocol (STAMP)

- Measurement session initiated by controller between two edge nodes
- STAMP UDP packet encapsulated in SRv6



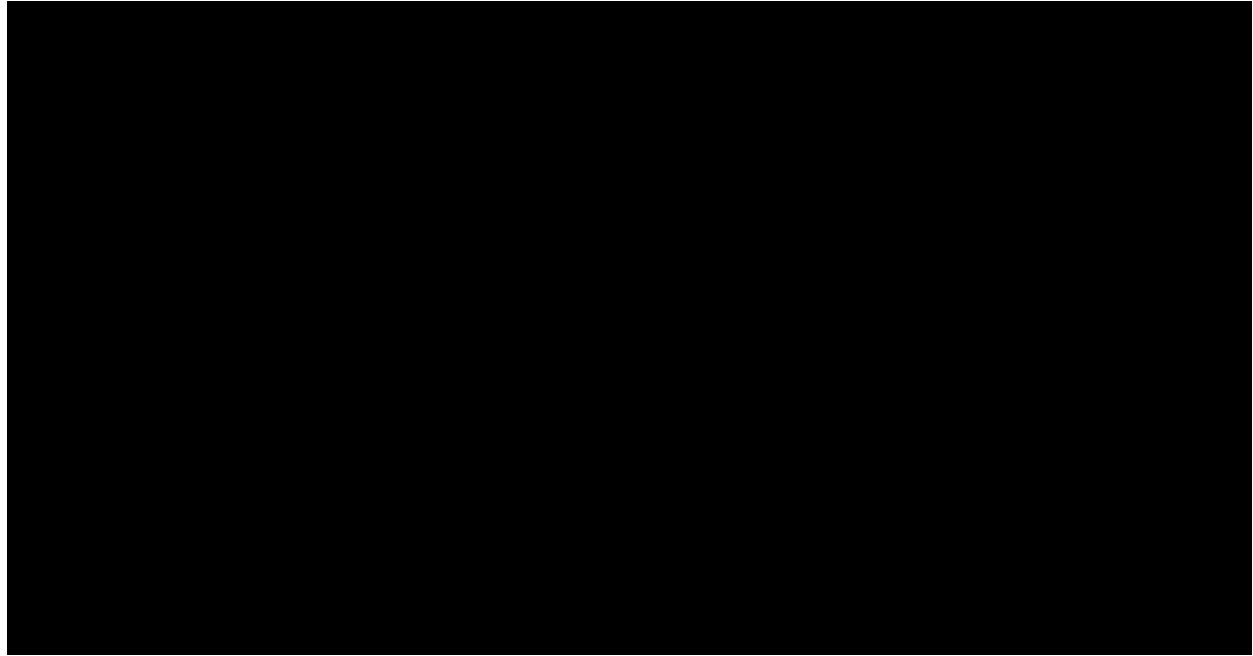


# GUI

Configure the edge devices

Configure VPN services

Visualise delay monitoring  
results



# Conclusions and lesson learned

The backbones of GÉANT and of the commercial ISPs are ready (transparent) for IPv6 and SRv6.

The access networks usually do not support IPv6 by default. We asked to enable IPv6, but often the IPv6/SRv6 transparency is not optimal (firewalls, misconfigurations...). Further on, we plan to consider ISPs' home networks.

The open source EveryWAN tool offers a usable GUI with the functionality needed to satisfy basic requirements for VPN services, including delay monitoring.

# Thank you

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UCSS and EveryWAN Team

Paolo Lungaroni

Carmine Scarpitta

Giulio Sidoretti

Francesco Lombardo

Andrea Mayer

Stefano Salsano

Marco Bonola



TOR VERGATA  
UNIVERSITY OF ROME