

Karsolink IPv6 Deploy

The post IPv4-runout ISP experience

AS204471

WHO we ARE?

- ▶ The network KARSOLINK is run by 2S Computers, founded in 2014 by two partners.
- ▶ Three owners & 2 employers
- ▶ We operate mostly in Trieste province in the north-est of Italy on the border with Slovenija.
- ▶ RIPE Members as a LIR since 2021
- ▶ AS204471

OUR WORK from 2018 to 2024

- ▶ Small WISP with less than 300 users
 - ▶ ISP/WISP with 1000 customers
- ▶ Very limited budget
 - ▶ Bigger budget
- ▶ Running on Mikrotik ROS6
 - ▶ Mikrotik ROS7
- ▶ FTTH Uplink - 500Mbps and a /28
 - ▶ Redundant 10G Uplinks and own ASN & resources
- ▶ NATed IP to customers
 - ▶ NATed, public IP, public networks, and IPv6 networks to customers
- ▶ Selling just FWA access
 - ▶ Selling FWA and FTTC/FTTH - Dual-stack backbone with a virtual overlay

WHY IMPLEMENTING IPv6?

THE MOTIVATION

- ▶ **Why not?**
- ▶ Lack of IPv4 addresses
 - ▶ Should we **invest** and buy IPv4 resources? - What will the value of a /24 be in 10 years?
- ▶ Offering customers free **public IP** assignments
- ▶ Get rid of NAT
 - ▶ Improving user experience
 - ▶ Cheaper network operations
 - ▶ Faster CPE, without NAT sessions table limits
- ▶ Get rid of private addresses
- ▶ End-to-end connectivity
- ▶ Routing only network
- ▶ **Natural network evolution path**

IPv6, FIRST STEPS

- ▶ Check if all the equipment supports IPv6
- ▶ Check if router software modules are supporting IPv6
 - ▶ IPv6 PD over PPPoE is not supported by PPPoE Server in ROS6
- ▶ IPv6 address plan: build a dual-stack network and add IPv6 to the running IPv4 network
 - ▶ Wait for the IPv4 traffic to reduce naturally
- ▶ Backbone
 - ▶ Initial setup
 - ▶ Basic security (Firewall, PtP /126, Spoofing guard,...)
 - ▶ Announce the network
- ▶ DNS
 - ▶ Local forwarders
 - ▶ Authoritative servers
- ▶ RADIUS
 - ▶ User portal
 - ▶ DNS filtering / Parental control

MAIN PROBLEMS in MASS DEPLOY

- ▶ Most CPEs has IPv6 disabled by default
- ▶ Not all CPEs support PD /56 and /48 -> Change CPE or upgrade the firmware
- ▶ Assign static IPv6 delegations to all RADIUS customers (RIPE-690)
- ▶ Security -> direct access to CPE management web page
- ▶ IPv6 was disabled on many hosts (They thought that was causing problems...)
- ▶ Some customers are concerned about the security of IPv6, mainly because a friend told them so. Many do not see the benefit of implementing it, and it could be a cost.

VENDOR SPECIFIC PROBLEMS

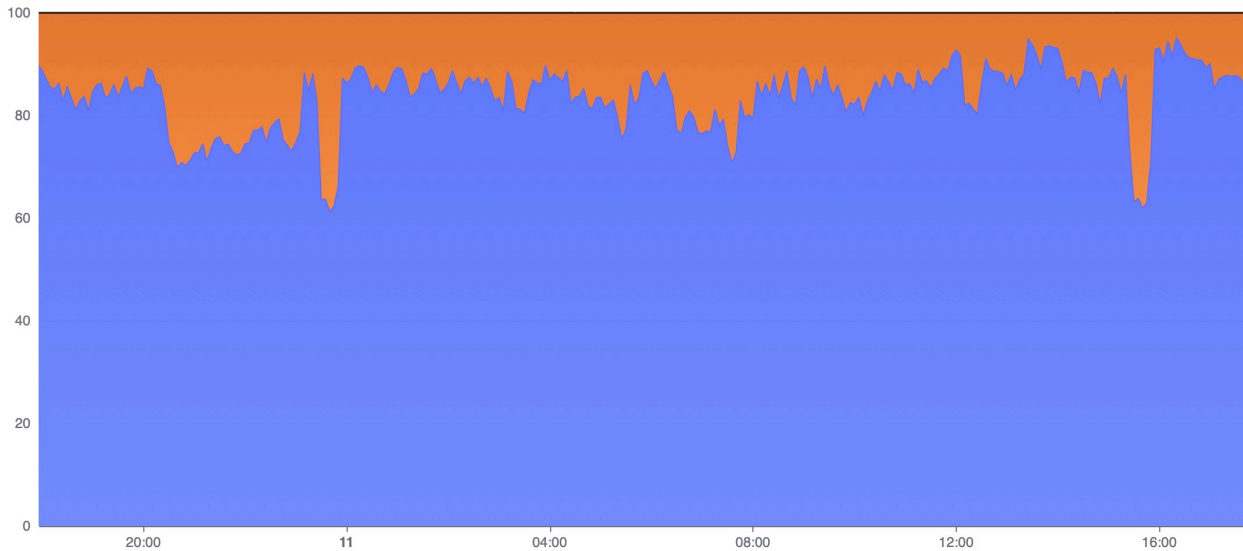
- ▶ Some parts of the backbone cannot be yet migrated to IPv6 or dual-stack
 - ▶ MPLS/LDP/VPLS/BGP-VPLS are not yet ready in ROS7
- ▶ IPv6 PD over PPPoE is not supported by PPPoE Server in ROS6
- ▶ IPv6 accounting on Mikrotik is in beta testing in ROS 7.15
 - ▶ Need to modify the RADIUS server and the customer portal
 - ▶ Helped the static delegations

IPv6 DEPLOY MAIN BENEFITS

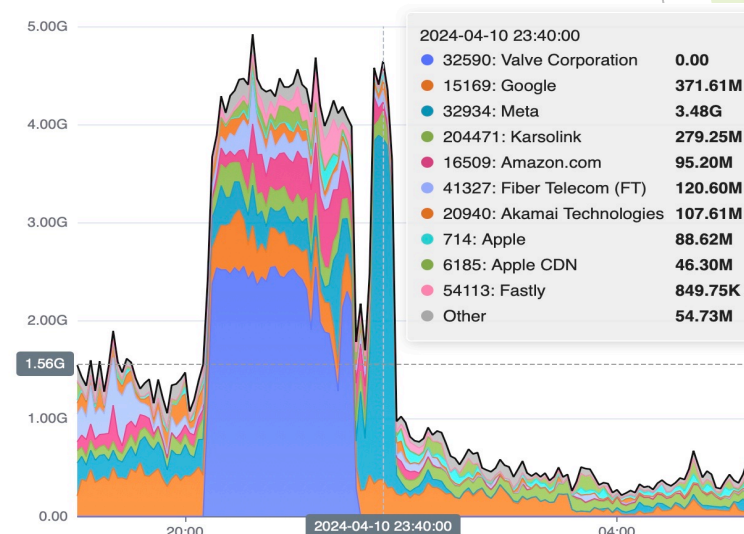
- ▶ Reduced IPv4 traffic from 20% to 30%
 - ▶ Reduced traffic logs.
 - ▶ Reduced loads on NAT devices.
- ▶ Increased performance: traffic in IPv6 is routed ONLY!
- ▶ Greater efficiency and failover
- ▶ Easier debugging
- ▶ No more ISP NAT & CPE NAT!!
- ▶ It could become a business case.

IPv4 vs IPv6 Traffic comparison

- ▶ IPv6 adoption differs from region to region, from 27% to 80%
 - ▶ It mainly depends on when the customer joined the network and the CPE that is using
- ▶ The current total IPv6 adoption rate is 49%



ETYPE	MIN	MAX	AVERAGE	~95TH
IPv4	1.51Gbps	15.74Gbps	5.94Gbps	12.88Gbps
IPv6	215.67Mbps	4.92Gbps	1.29Gbps	4.37Gbps



SRC AS	MIN
32590: Valve Corporation	16.00bps
15169: Google	16.48Mbps

NEXT IDEAS

- ▶ Deploy of test-ipv6.karsolink.com
- ▶ Migrate RADIUS authentication to dual-stack
- ▶ Migrate internal backbone to IPv6 ONLY
 - ▶ Most of the routers will be stateless
 - ▶ IPv4 with IPv6 next hop (Static routes only in ROS7)
- ▶ Become an IPv6 beta tester for our VoIP provider
- ▶ IPv6 DAY
 - ▶ Invite the customers with their CPEs
 - ▶ Change or upgrade and configure IPv6 on the CPEs
 - ▶ Speak to the customers and convince them that it could be an investment
 - ▶ EAT & DRINK!

THANK YOU!

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Let us know if we should do it differently. 😊