IPv6 at CERN

Edoardo Martelli

HEPiX IPv6 meeting

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IPv6 service

History

CERN started using IPv6 in 2001, but for many years there was no reason for it. Relegated in labs and small networks.

2003: Received RIPE allocation and deployed it in the External Network
2009: CERN IPv6 prefix reachable from the whole IPv6 Internet
2010: Large deployment of virtual machines drastically reduce availability of IPv4 addresses. IT decides to implement IPv6 dual-stack in the Campus and Datacentre networks
2014: IPv6 deployment completed

IPv6 service definition

- Dual Stack configuration
- One IPv4 and one IPv6 address for every device
- User controlled DNS resolution:
  - AAAA for device.cern.ch or device.ipv6.cern.ch
- Addresses assigned by DHCPv6 to registered MAC addresses only. No SLAAC
- Access to IPv6 Internet
- Same security as IPv4

Netops

- All IPv6 information stored in the IT Network database (LANDB) together with IPv4 information

- Router configurations, DNS zones, DHCPv6 servers configurations: all built by the CERN Network Provisioning System from the content of LANDB

Webreq (end-users interface)

Interface(s) Information

>>Network Service HELP<< >>Network Interface Card(s) HELP<<

Interface Name	IP Address	Service Name	Internet Connectivity
[redacted].CERN.CH	128.141.194.239 2001:1458:202:229::100:14	S31-S-PU12	Y

Subnet IPv4 Mask: 255.255.255.0 **Default IPv4 Gateway:** 128.141.194.1	**Name IPv4 Servers:** 137.138.16.5, 137.138.17.5 **Time IPv4 Servers:** 137.138.16.69, 137.138.17.69
Subnet IPv6 Netmask: 64 **Default IPv6 Gateway:** 2001:1458:202:229::1	**Name IPv6 Servers:** 2001:1458:201:1000::5, 2001:1458:201:1100::5 **Time IPv6 Servers:** 2001:1458:201:1040::69, 2001:1458:201:1140::69
IP Aliases: MARIT	
Interface belongs to set(s): [redacted]	
Bound Interface Card(s): 70-85-C2-CB-FF-65/ETHER-AUTO-10/100/1000	

Outlet	CERN Network Domain	Medium
0021/02	GPN	GIGABITETHERNET

CERN Central Firewall Configuration: None

Users control

End users can control the configuration of the DNS and firewall openings with two flags:

IPv6 DNS and firewall = Yes
- publish the IPv6 address (AAAA record) in the zone cern.ch
- activate IPv6 openings in the central firewall

IPv6 DNS and firewall = No
- publish the IPv6 address (AAAA record) in the zone ipv6.cern.ch
- deactivate IPv6 openings in the central firewall

IPv4 equivalent flag exists: **IPv4 DNS and firewall**

DHCPv4 and DHCPv6 leases always provided

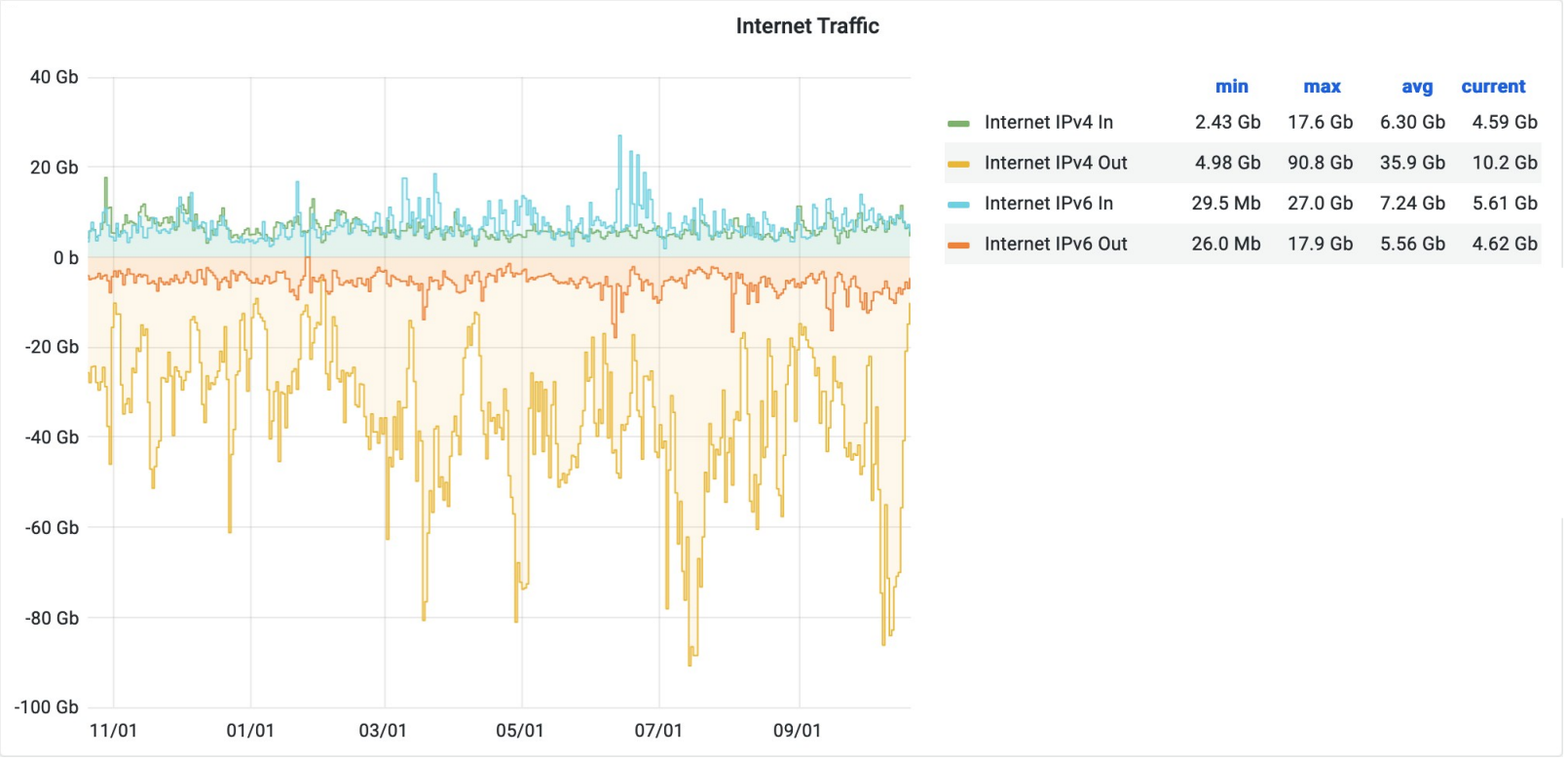
DHCPv6

- Only DHCPv6 is available at CERN. SLAAC is disabled
- Leases offered only to registered MAC addresses
- Problematic use of DUID in the first years: not all the clients used the DUIDs with the Link Layer address (-LLT or -LL)
- Availability of RFC6939 (encoding the client link-layer address in DHCPv6 Relay-Forward messages, option 79) on routers solved many problems
- No DHCPv6 client in Android not a show stopper so far

IPv6 statistics

CERN Internet Access

Incoming traffic: slightly more IPv6 than IPv4
Outgoing traffic: IPv4 7x more than IPv6

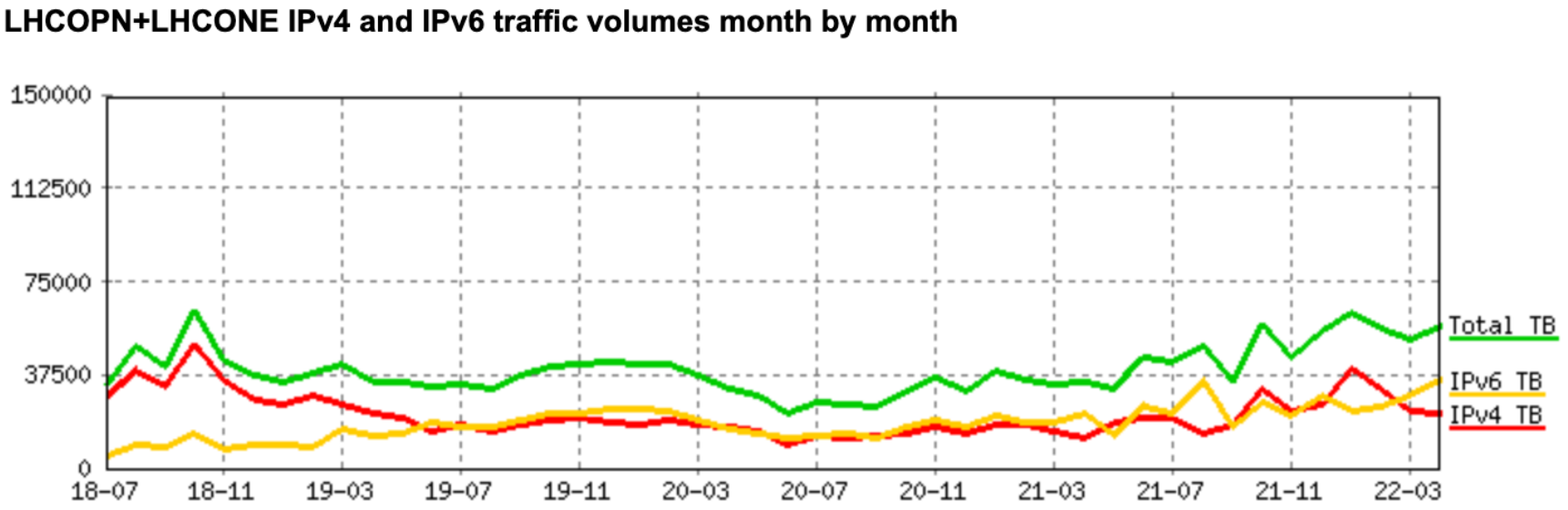


Source: https://monit-grafana.cern.ch/d/cScW82Tnz/00-overview?orgId=14&from=now-1y&to=now&var-source=long_term&var-bin=1d

LHCOPN and LHCONE

LHCOPN and LHCONE traffic measured on the CERN routers:

IPv6 surpassed IPv4 in June 2019. Still fluctuating around 50% since then



Source: https://twiki.cern.ch/twiki/bin/view/LHCOPN/LHCOPNEv4v6Traffic

Questions?

edoardo.martelli@cern.ch