IPv4
There's life in the old dog yet

Heiko Frank

Principal Systems Engineer A10 Networks

14th of November 2019

Reliable Security Always™

Would you use this car for a Highspeed Highway to transport tons of load?

Details Volkswagen Golf 1

- Produced from 1974 - 1983
- Over 6 million Golf 1
- First engine only 50 HP
- Max Speed 145 km/h
- Acceleration from 0-100: 18s

DoD Standard Internet Protocol (IPv3)

- Department of Defense Standard Internet Protocol
- Introduced 1979
- 32 Bit Addresses
- Comprises Layer 3 and 4
- RFC 760 in 1989 which describes Fragmentation and Datagrams

Internet Protocol (IPv4)

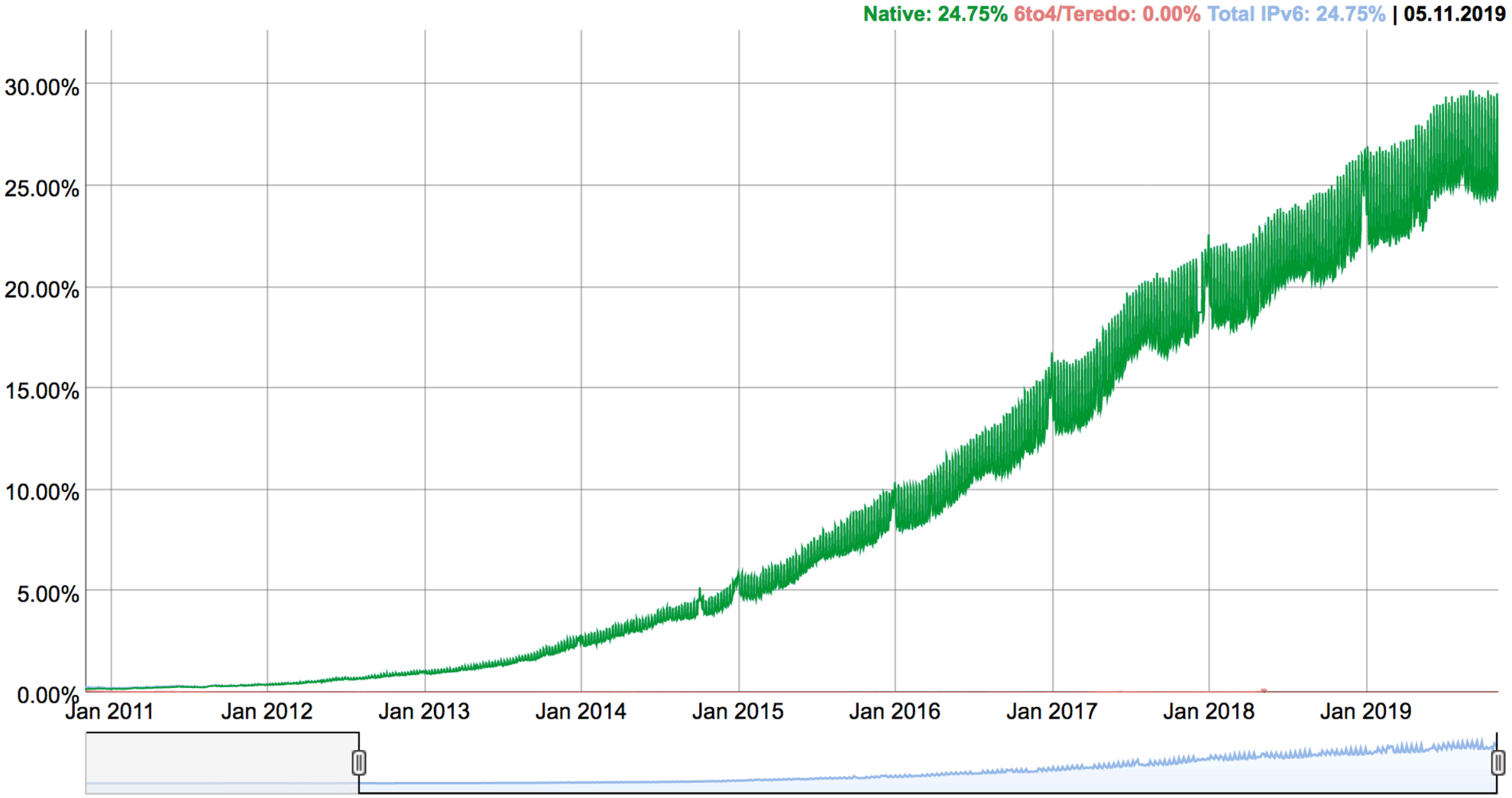
- RFC 791 September 1981
- 32 Bit addresses
- Definition of layer 4 TCP / UDP
- Since 1983 single protocol for Arpanet
- Classless Inter-Domain Routing (**CIDR**) since 1993

Internet Protocol (IPv6)

- IETF stated to work on IPv6 in 1995
- Official published in RF 2460 December 1998
- 128 Bit Addresses
- Simplification of the Header

Since 1998 till now

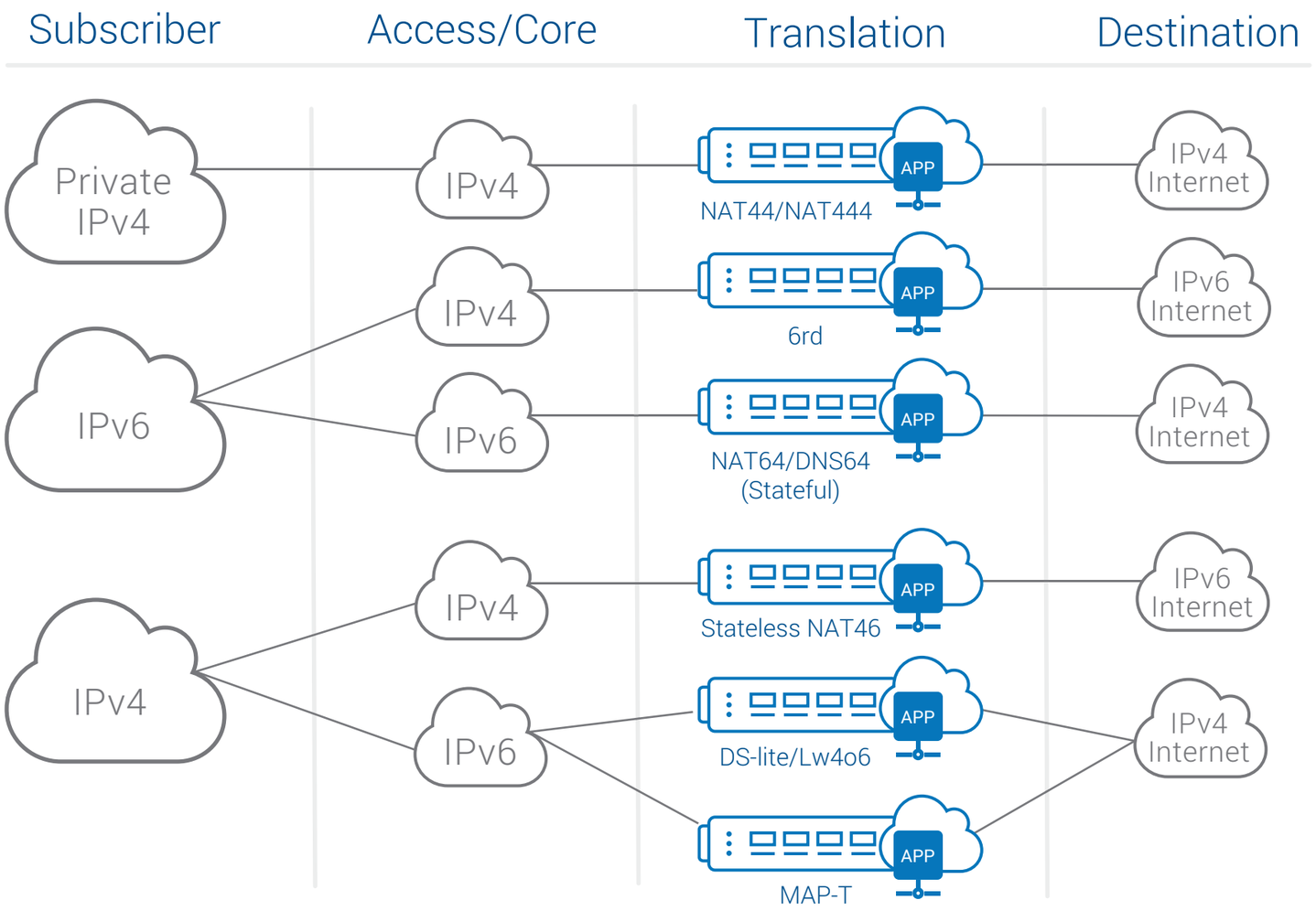
IPv6 Requests to Google



Source: https://www.google.de/ipv6/statistics.html

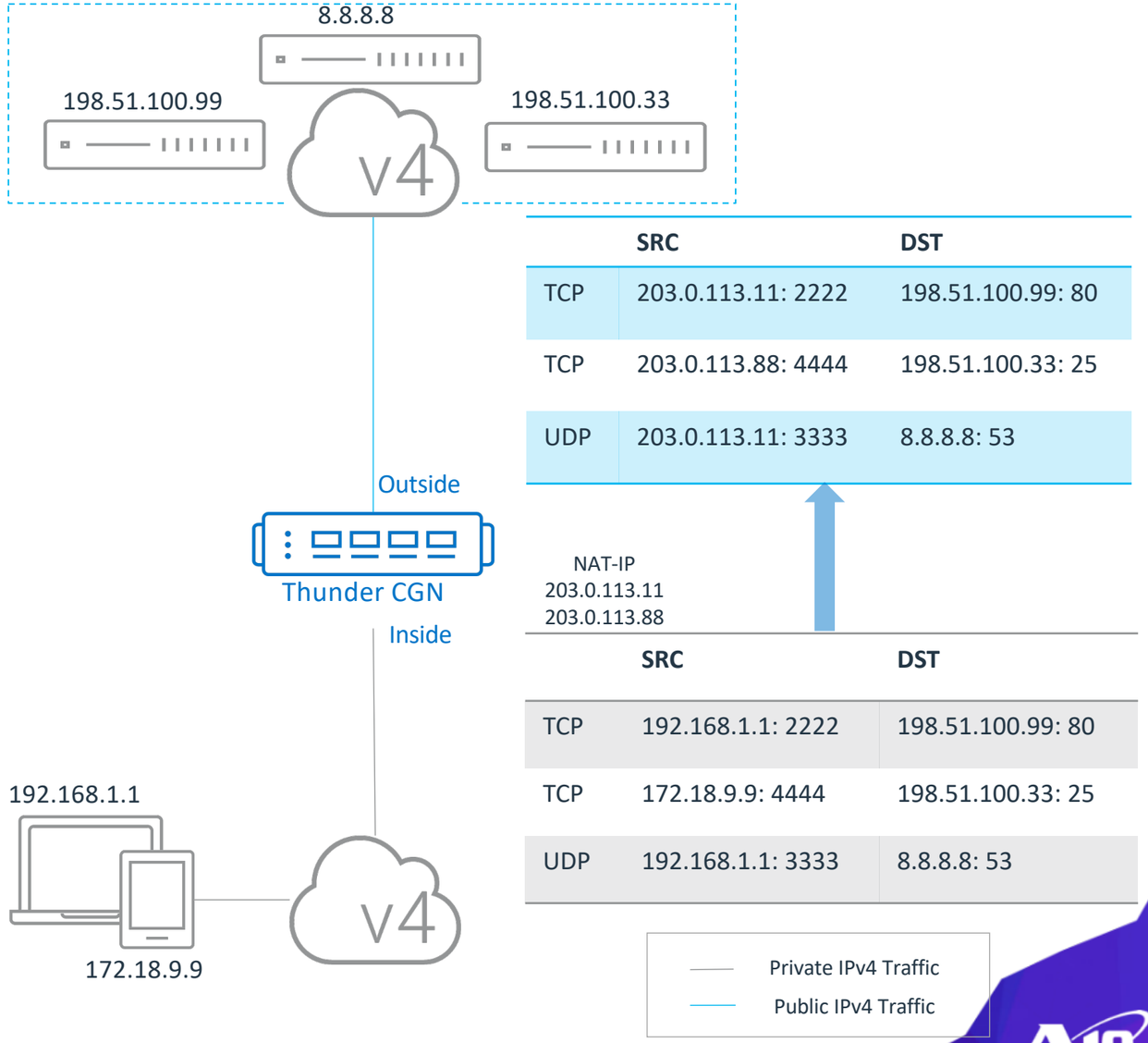
IPv4 Preservation & IPv6 Migration Options

IPv4 Preservation & IPv6 Migration Solutions



Large Scale NAT Operation : Sticky NAT

- Uses the same external IP address mapping for all sessions associated with the same internal IP address
- If all user sessions are cleared, then a different NAT IP may be assigned

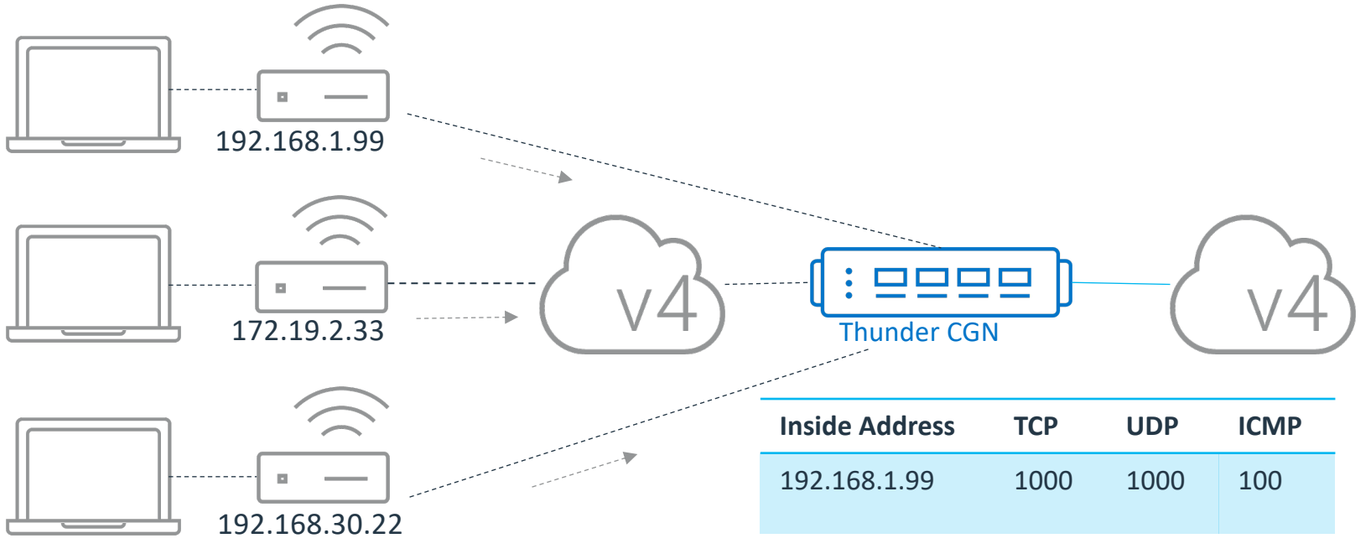


	SRC	DST
TCP	203.0.113.11: 2222	198.51.100.99: 80
TCP	203.0.113.88: 4444	198.51.100.33: 25
UDP	203.0.113.11: 3333	8.8.8.8: 53

	SRC	DST
TCP	192.168.1.1: 2222	198.51.100.99: 80
TCP	172.18.9.9: 4444	198.51.100.33: 25
UDP	192.168.1.1: 3333	8.8.8.8: 53

User Quotas

- Internal user is assigned to a NAT IP as part of sticky NAT, as long as ports for that NAT IP are available
- User-Quota limits the number of NAT port mappings that are allowed for individual internal IP addresses
- Configurable for protocol TCP, UDP and ICMP
- Ensures Fairness in sharing global address resources (ports) per user



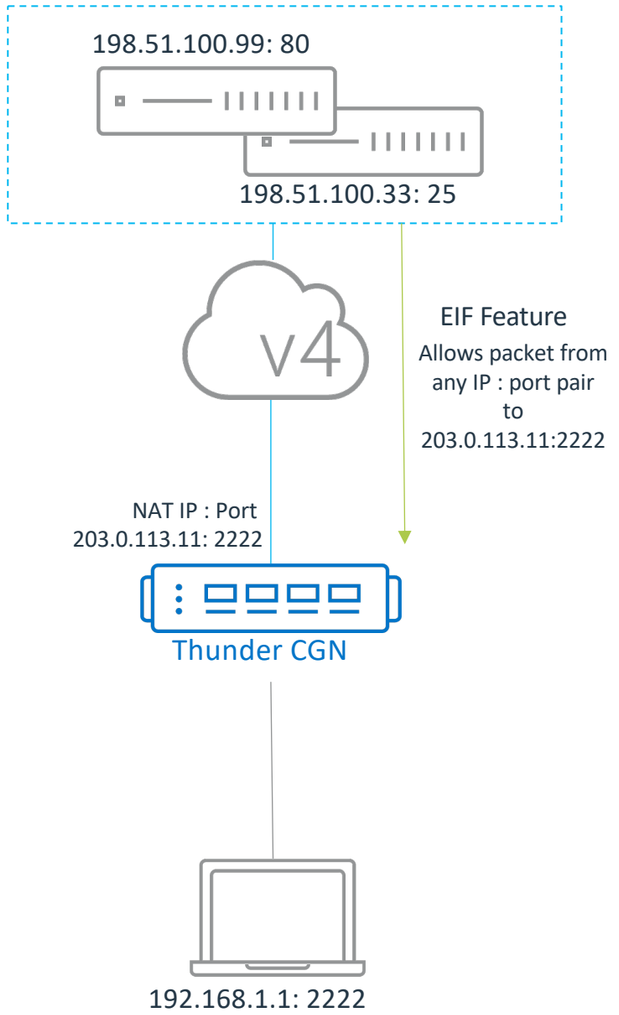
Inside Address	TCP	UDP	ICMP
192.168.1.99	1000	1000	100
172.19.2.33	100	300	10
192.168.30.22	900	500	100

User Quotas assigned per IP address

Private IPv4 Traffic
Public IPv4 Traffic

Endpoint Independent Mapping (EIM) & Endpoint Independent Filtering (EIF)

- EIM allows connections from inside host to use same NAT IP : port pair regardless of the destination
- EIF filters out packets not destined to the internal address : port pair
  - Decides who from the external realm can connect to the internal host
  - Provide as much transparency as possible to the applications
- EIM & EIF provide support for peer-to-peer applications like Bit torrent and P2P communication protocols like SIP and RTP



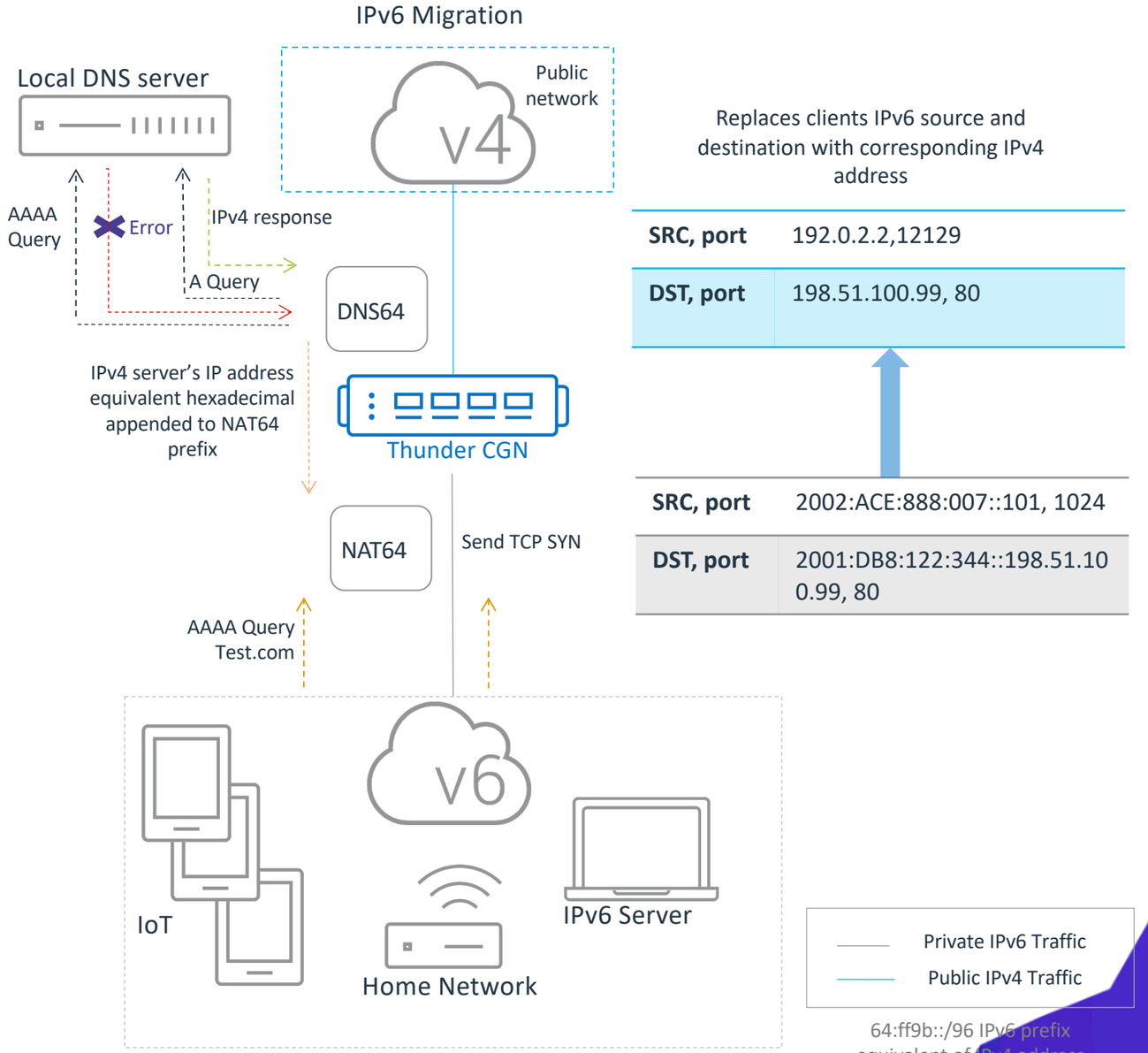
NAT IP	DST
203.0.113.11: 2222	198.51.100.99: 80
203.0.113.11: 2222	198.51.100.33: 25

SRC	DST
192.168.1.1: 2222	198.51.100.99: 80
192.168.1.1: 2222	198.51.100.33: 25

Private IPv4 Traffic
Public IPv4 Traffic

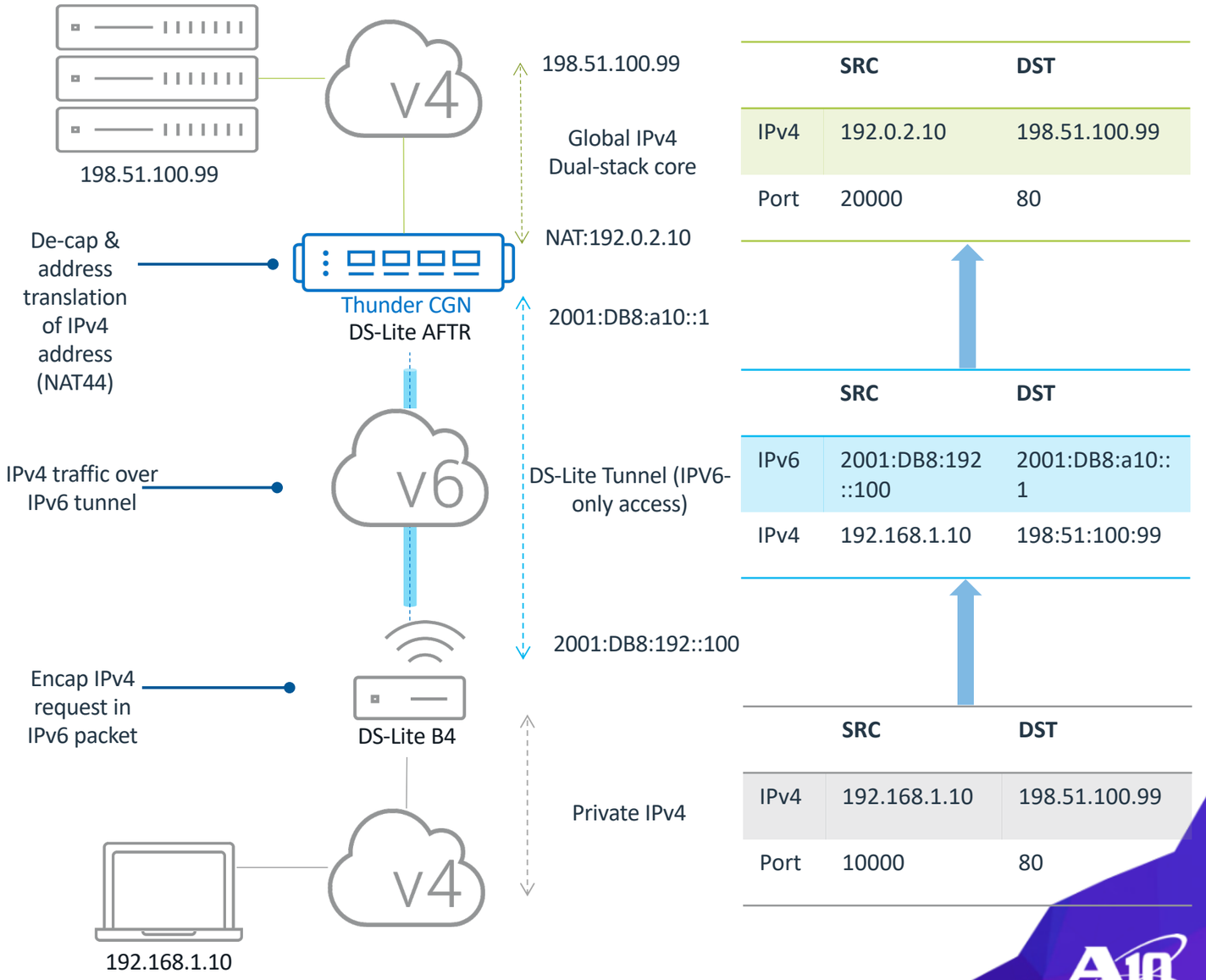
NAT64/ DNS64

- NAT64 provides translation between IPv6 clients and IPv4 destinations
- Typically used with DNS64
- DNS64 is used to dynamically synthesize AAAA records for IPv4-only destinations
  - External IPv4 and IPv6 DNS servers are supported
- Enables IPv6-clients to connect to IPv4 destinations using their domain names

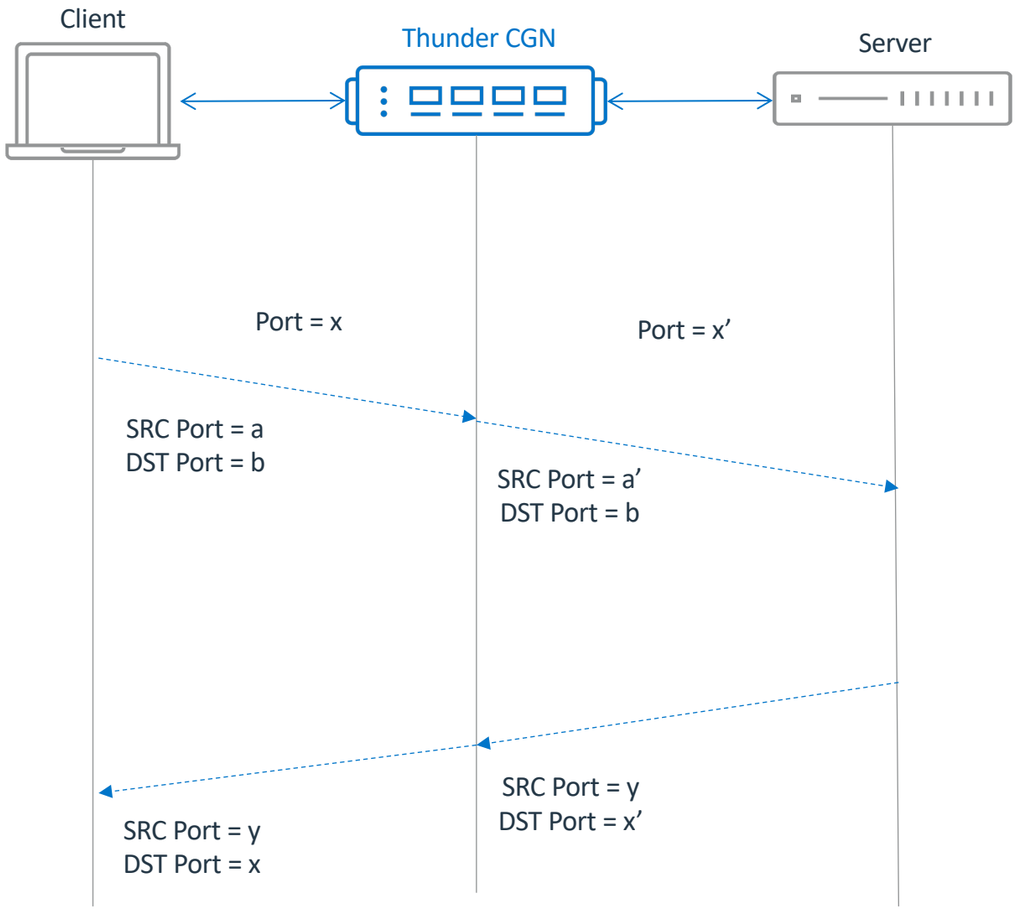


Dual-Stack Lite (DS-Lite)

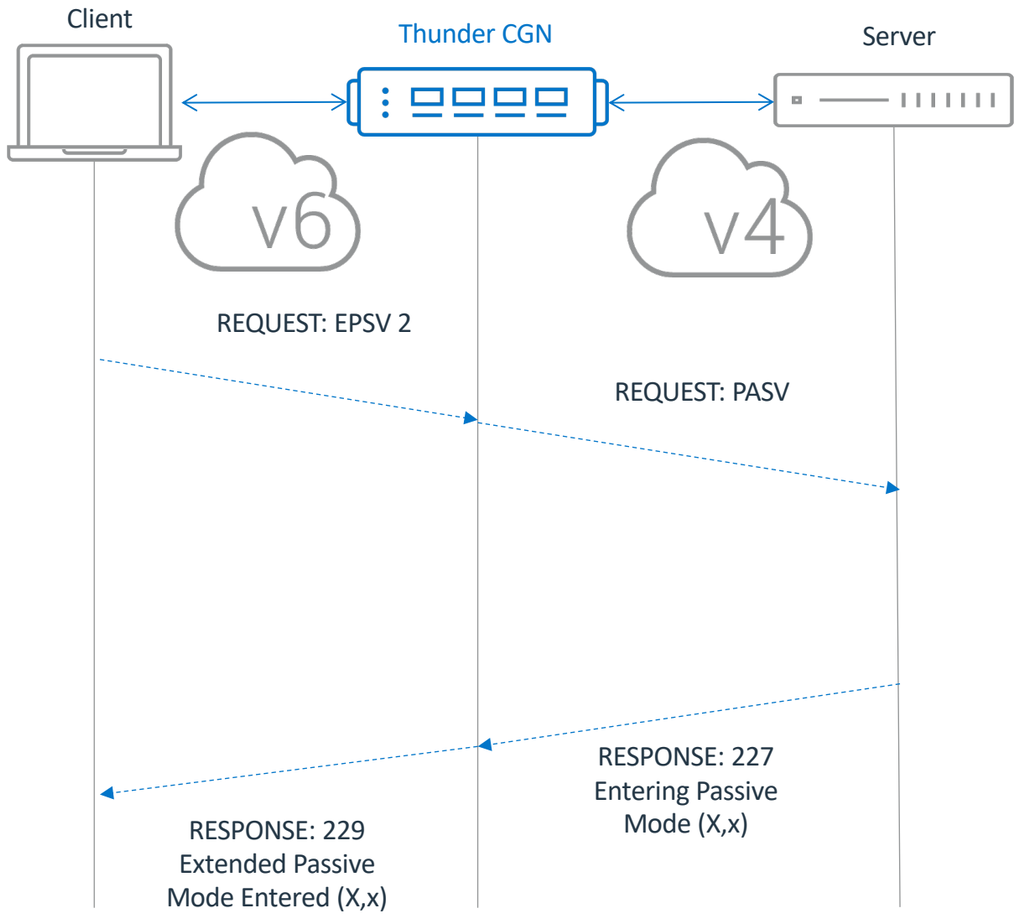
- Share IPv4 addresses by combining v4-over-v6 tunnel (RFC6333) and Network Address Translation (NAT)
- ACOS device acts as an end-point for IPv4 traffic tunneled through an IPv6 link



ALG – FTP example



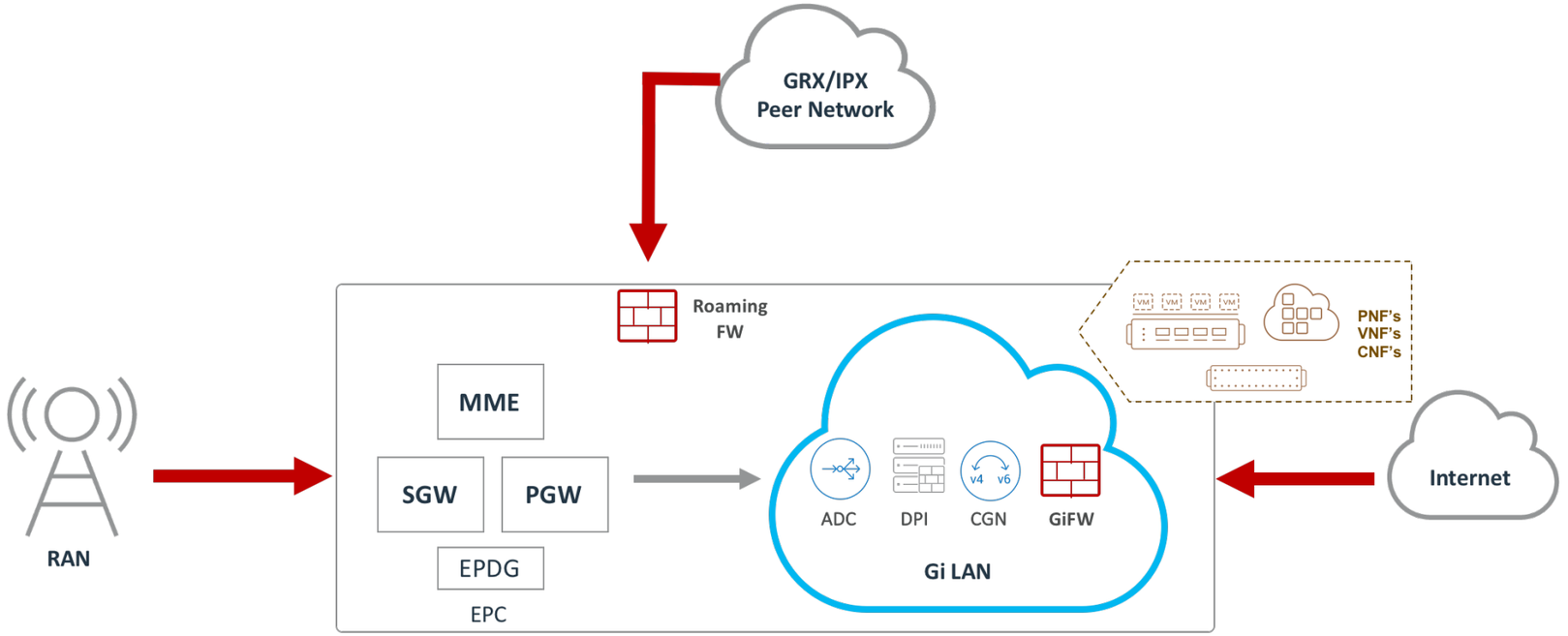
Depending on the mode (active/passive), IP address and port will be changed to NAT IP as assigned by the CGN device



Here, the CGN device translates the FTP messages using NAT64

What about the Future…?

- I don’t know
- But even in 5G Drafts and Blueprint NAT is there
- Slowly adaption of High Bandwidth Devices use IPv6



What about the Future…?

Thank You

A10

Reliable Security Always™