

# Motivation for developing SA46T and SA46T-AS

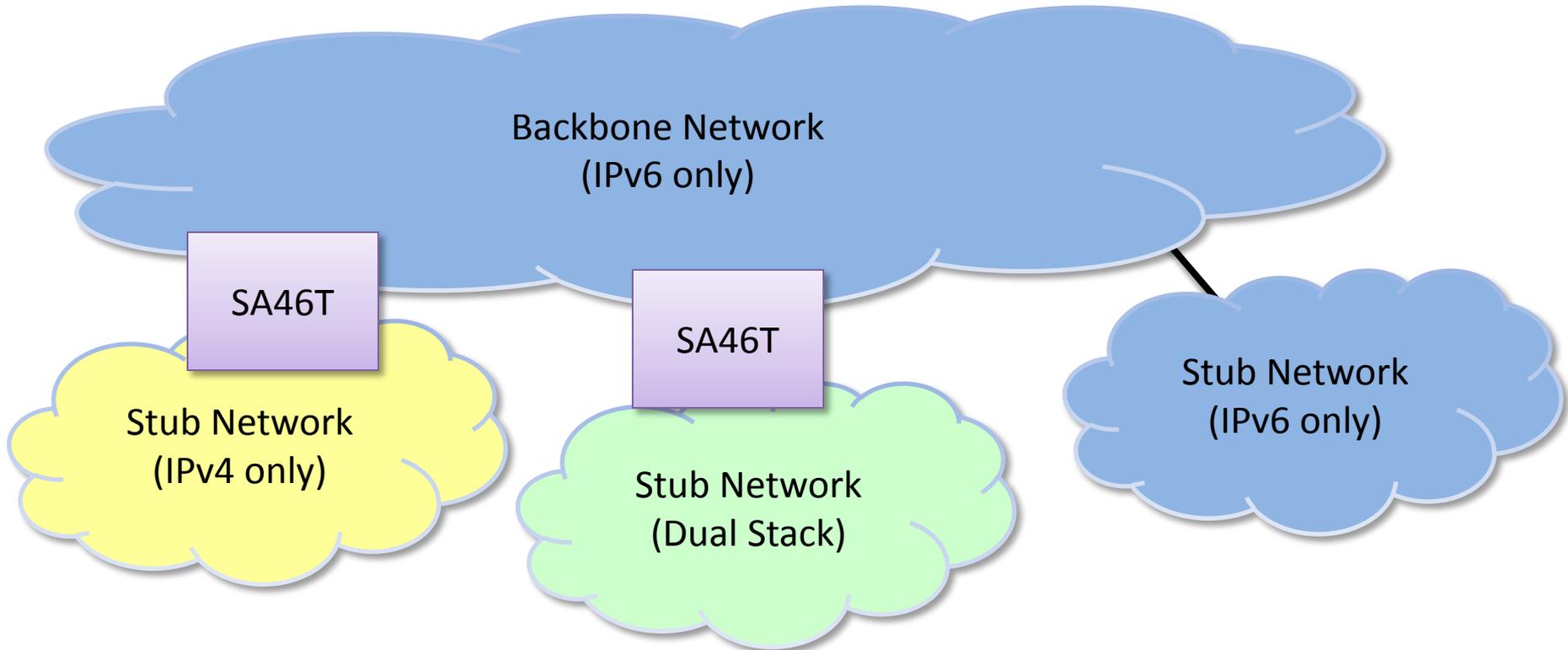
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Fujitsu Limited

IETF softwire interim, Beijing, September 2011

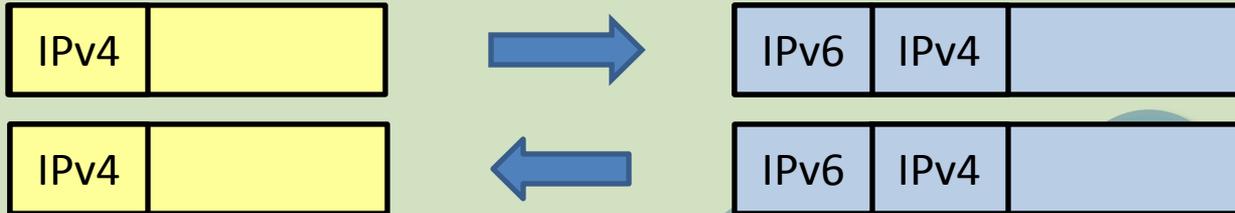
# Network Configuration



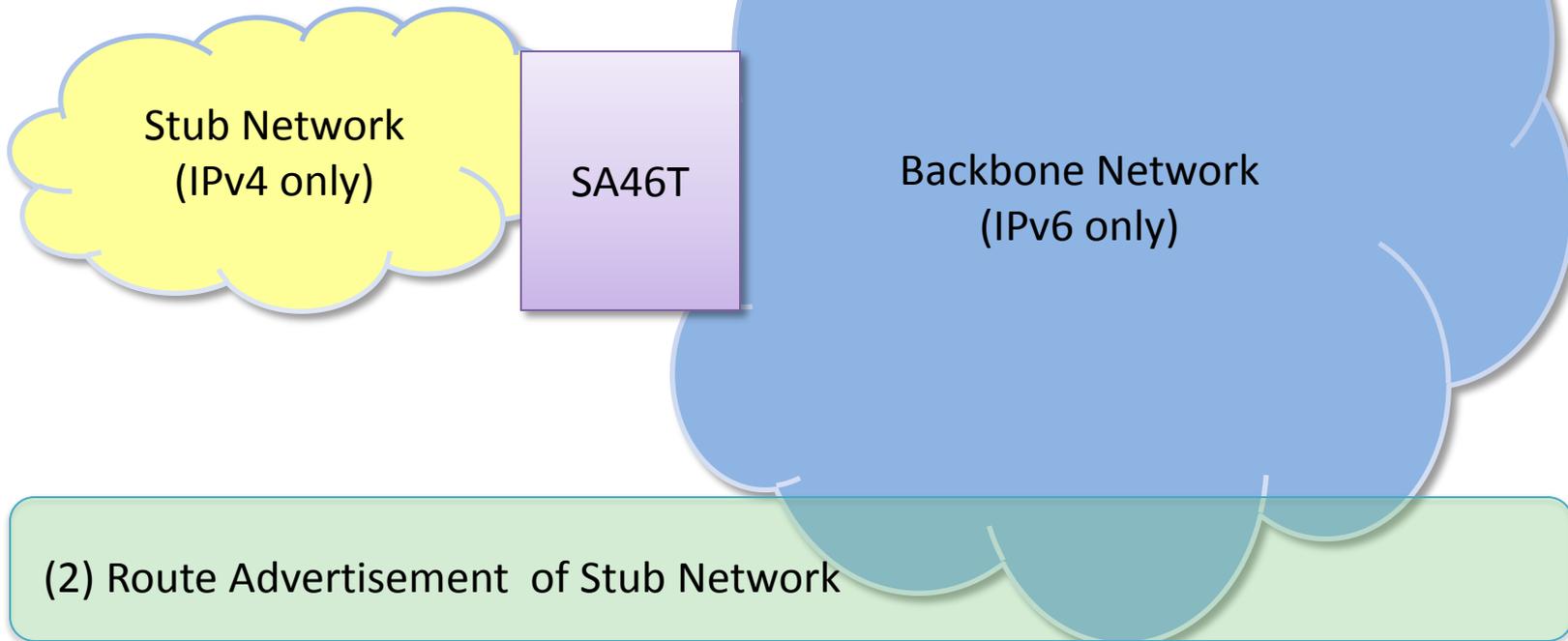
SA46T: Stateless Automatic IPv4 over IPv6 Tunneling

# Function of SA46T

(1) Encapsulation / Decapsulation of IPv4 packet



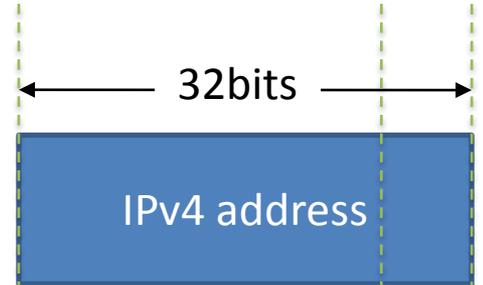
(1-1) Return ICMP Packet too big message (if exceed MTU)



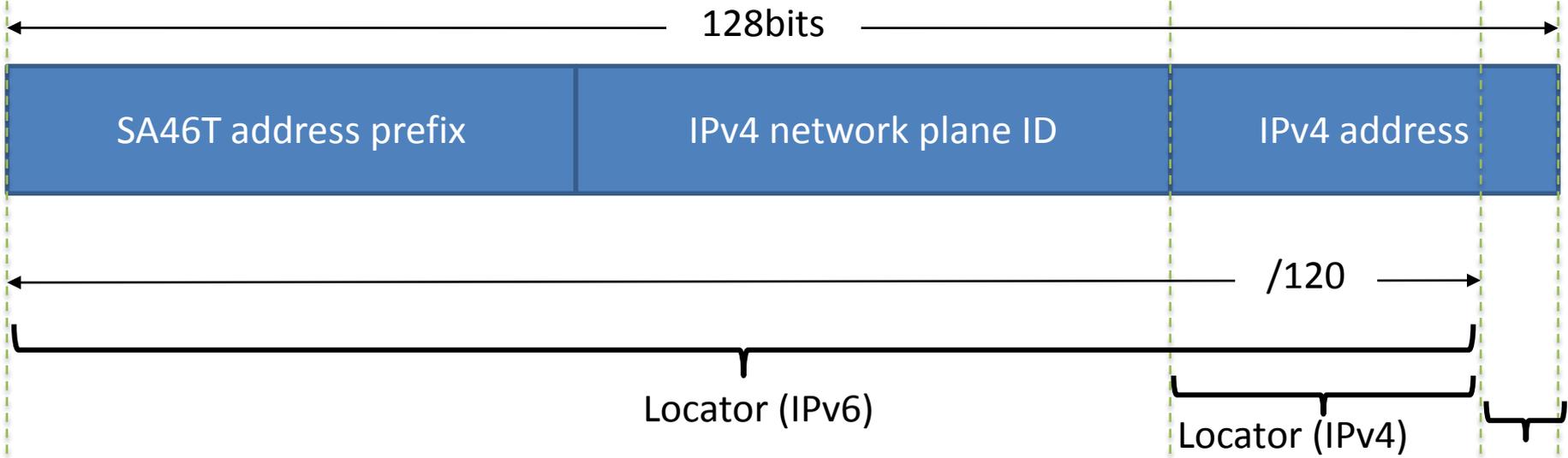
(2) Route Advertisement of Stub Network

# SA46T address architecture and routing

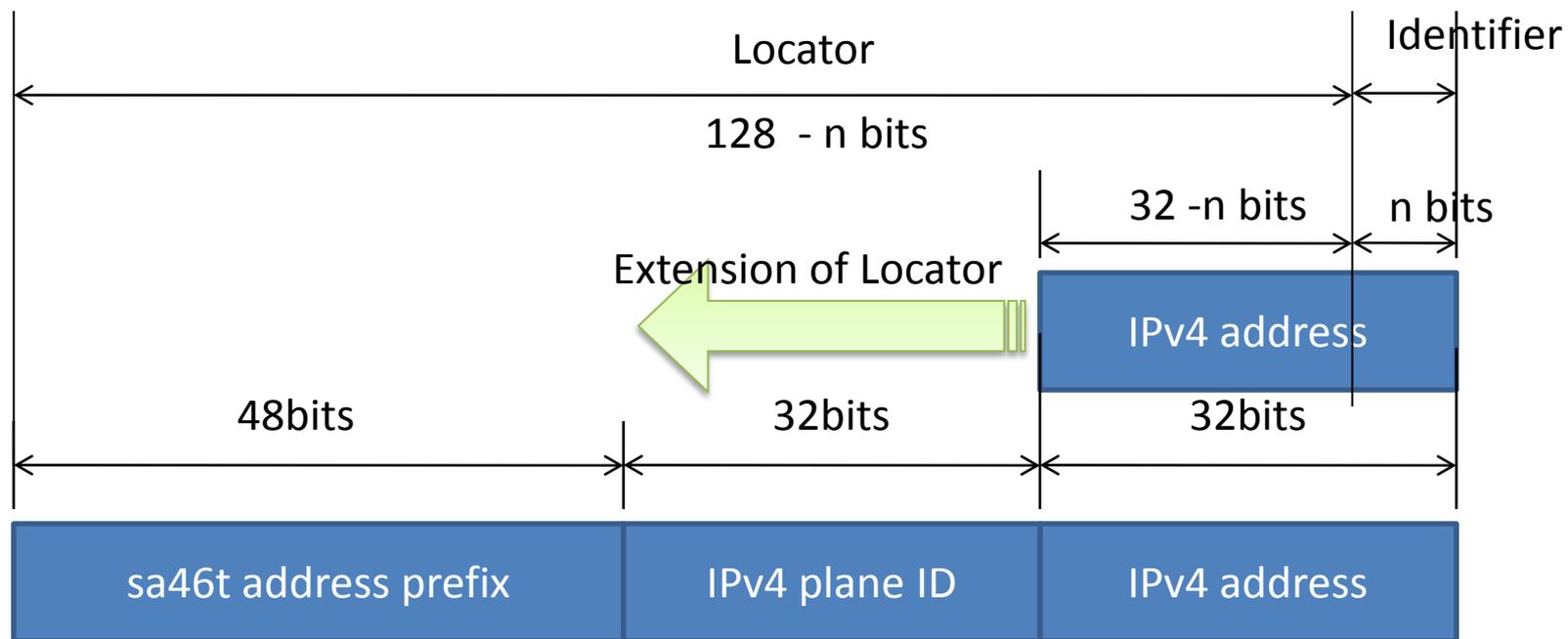
■ IP address of inner IPv4 header



■ IP address of outer IPv6 header (SA46T address)

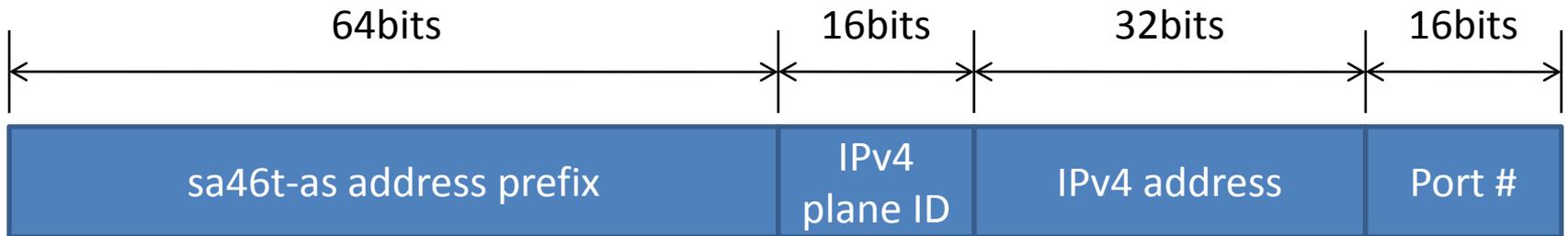
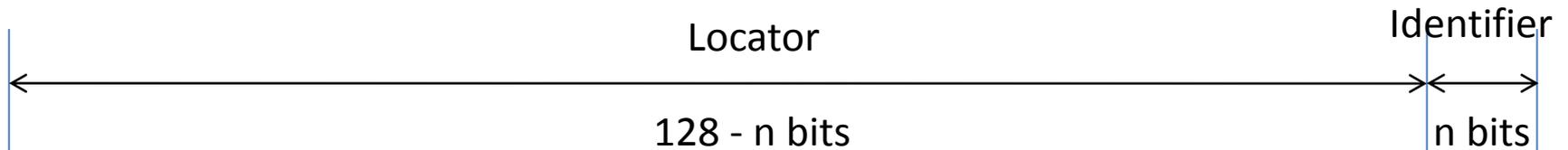


# SA46T architecture

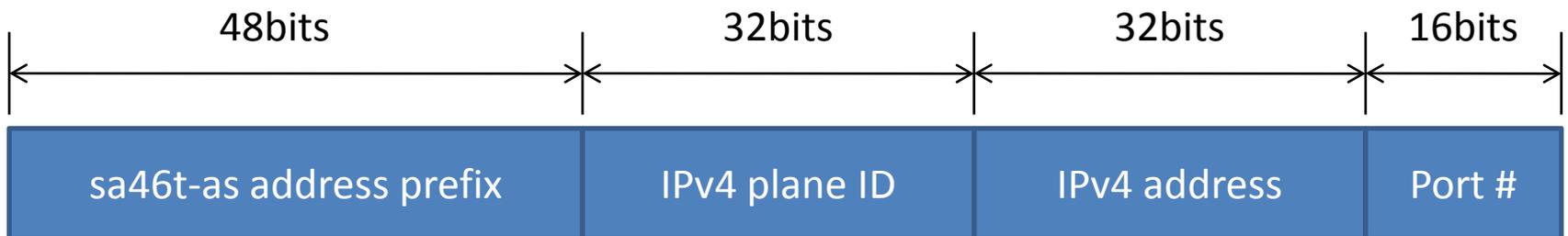


- (1) Expand Locator part of IPv4 address to fit in IPv6 address (128bits)
  - Relation of locator and identifier is remain the same
  - Routable with same manner of IPv4
- (2) Add IPv4 network plane ID to the locator part
  - Make unique IPv4 private address in IPv6 space

# SA46T-AS addressing architecture

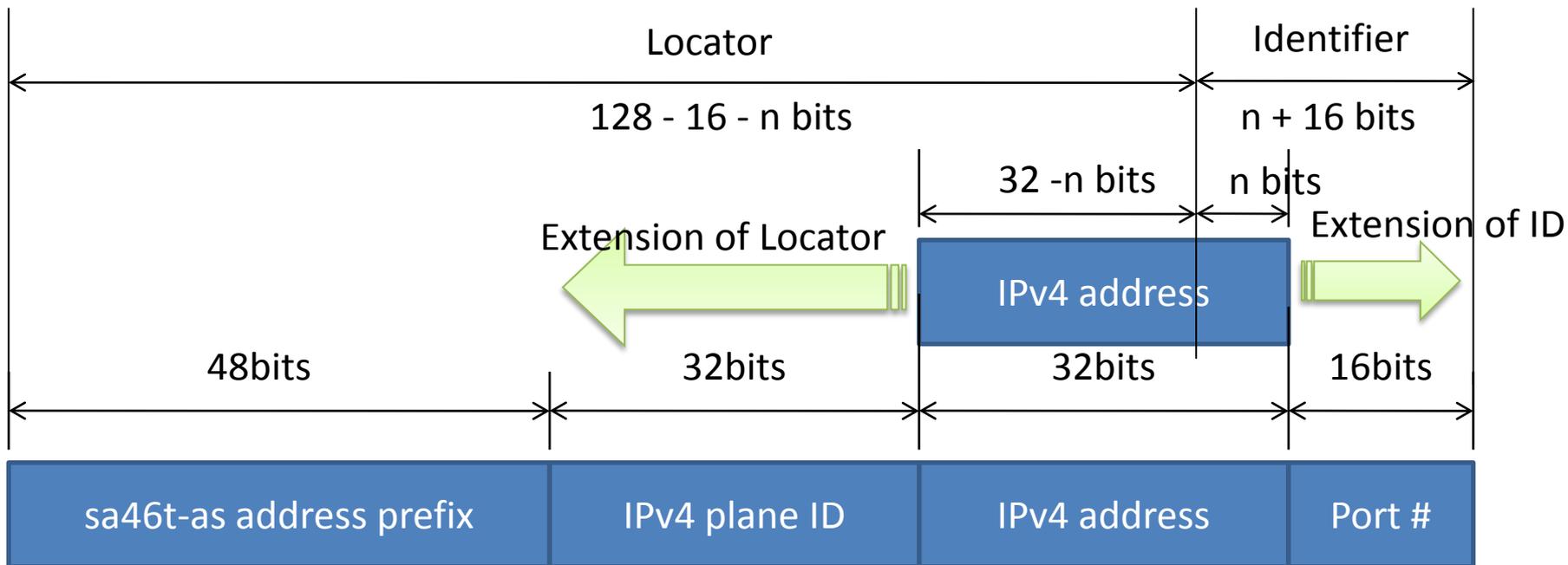


16bit plane ID -> 65535 (still > 4095)



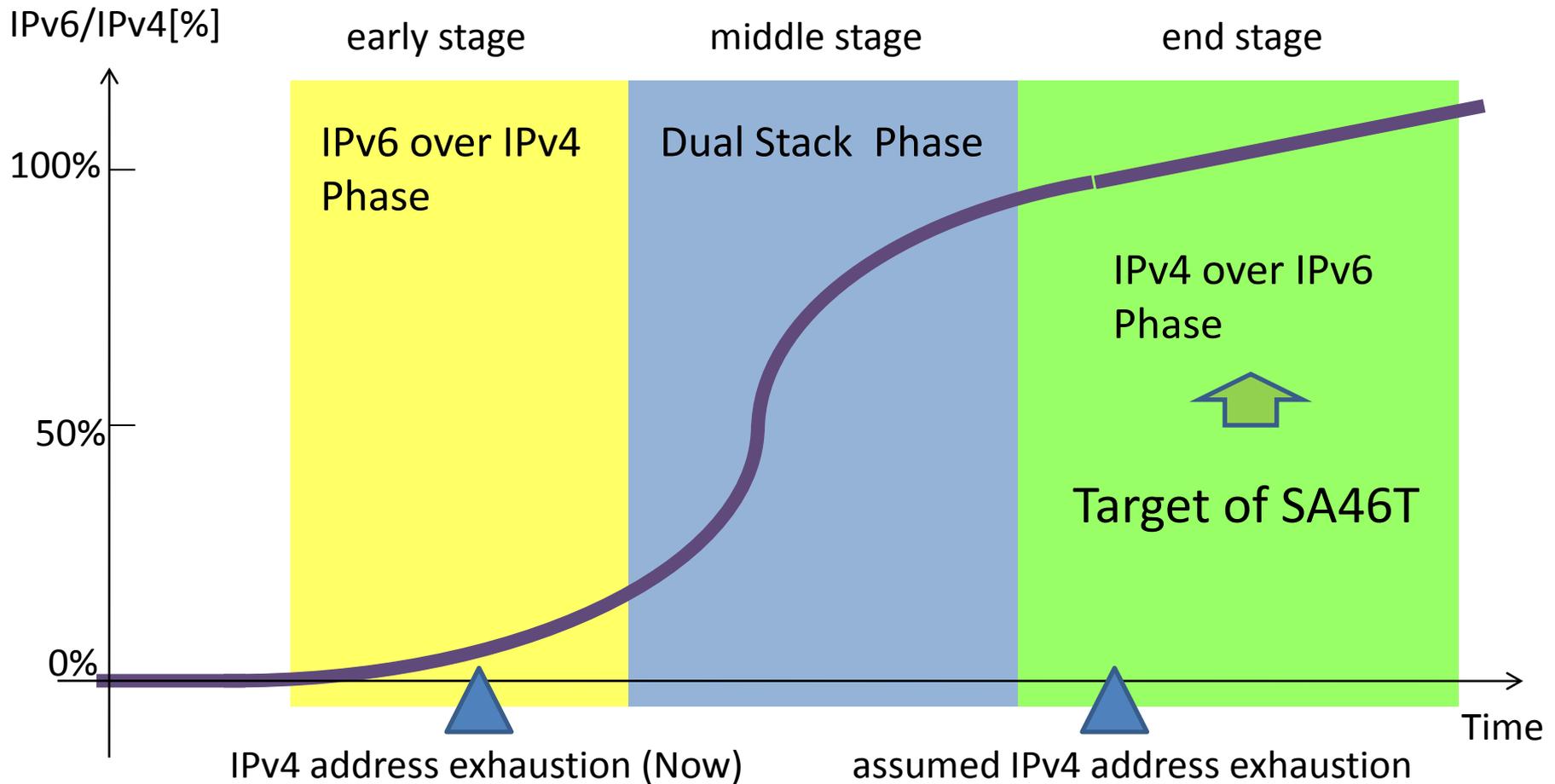
32bit plane ID -> 4.3 billion

# SA46T-AS architecture



- (1) Expand Locator part of IPv4 address to fit in IPv6 address (128bits)
  - Relation of locator and identifier is remain the same
  - Routable with same manner of IPv4
- (2) Add IPv4 network plane ID to the locator part
  - Make unique IPv4 private address in IPv6 space
- (3) Expand Identifier part of IPv4 address with Port number

# Image of IPv4 to IPv6 transition

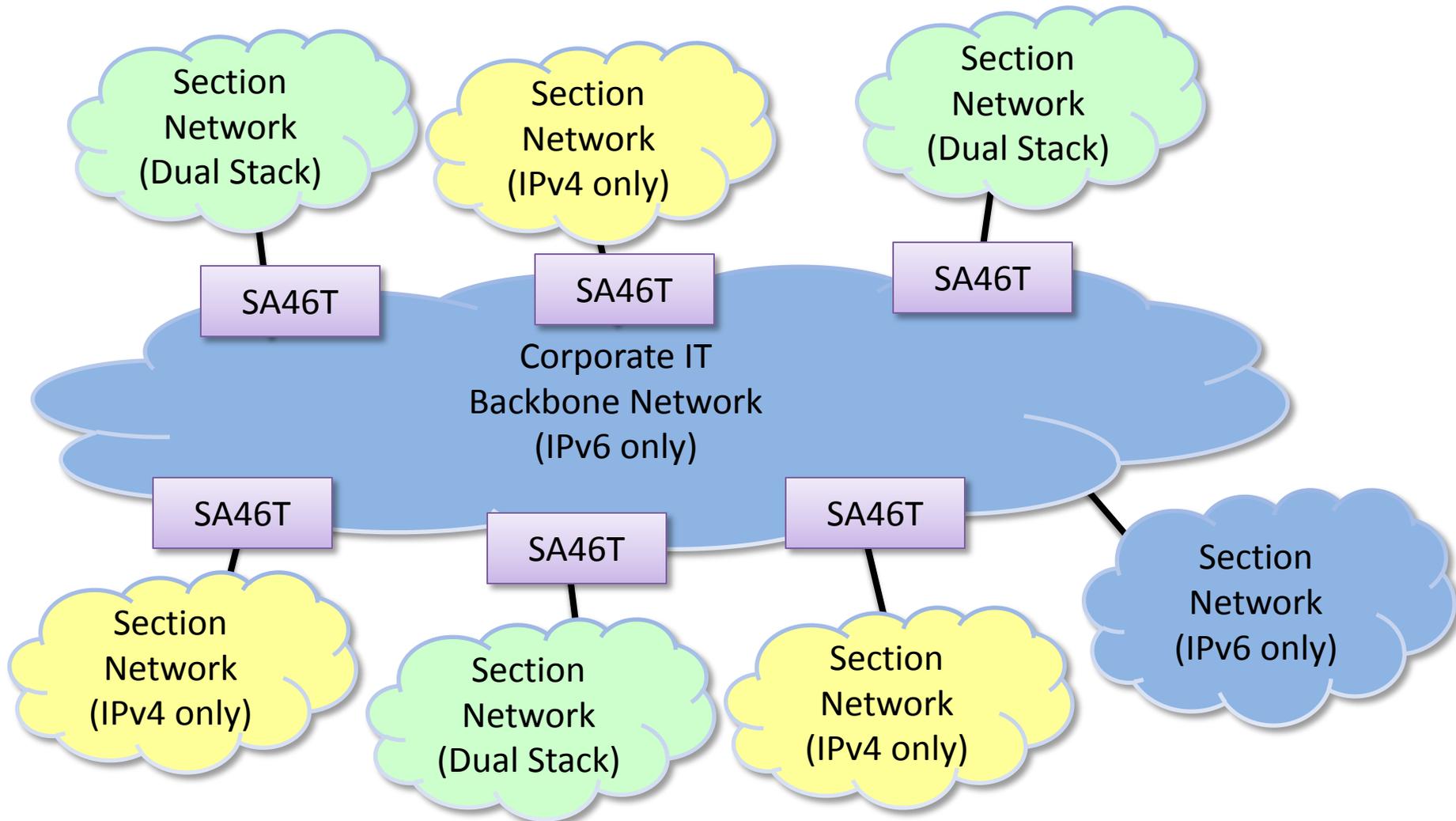


Time when SA46T contributes has advanced.

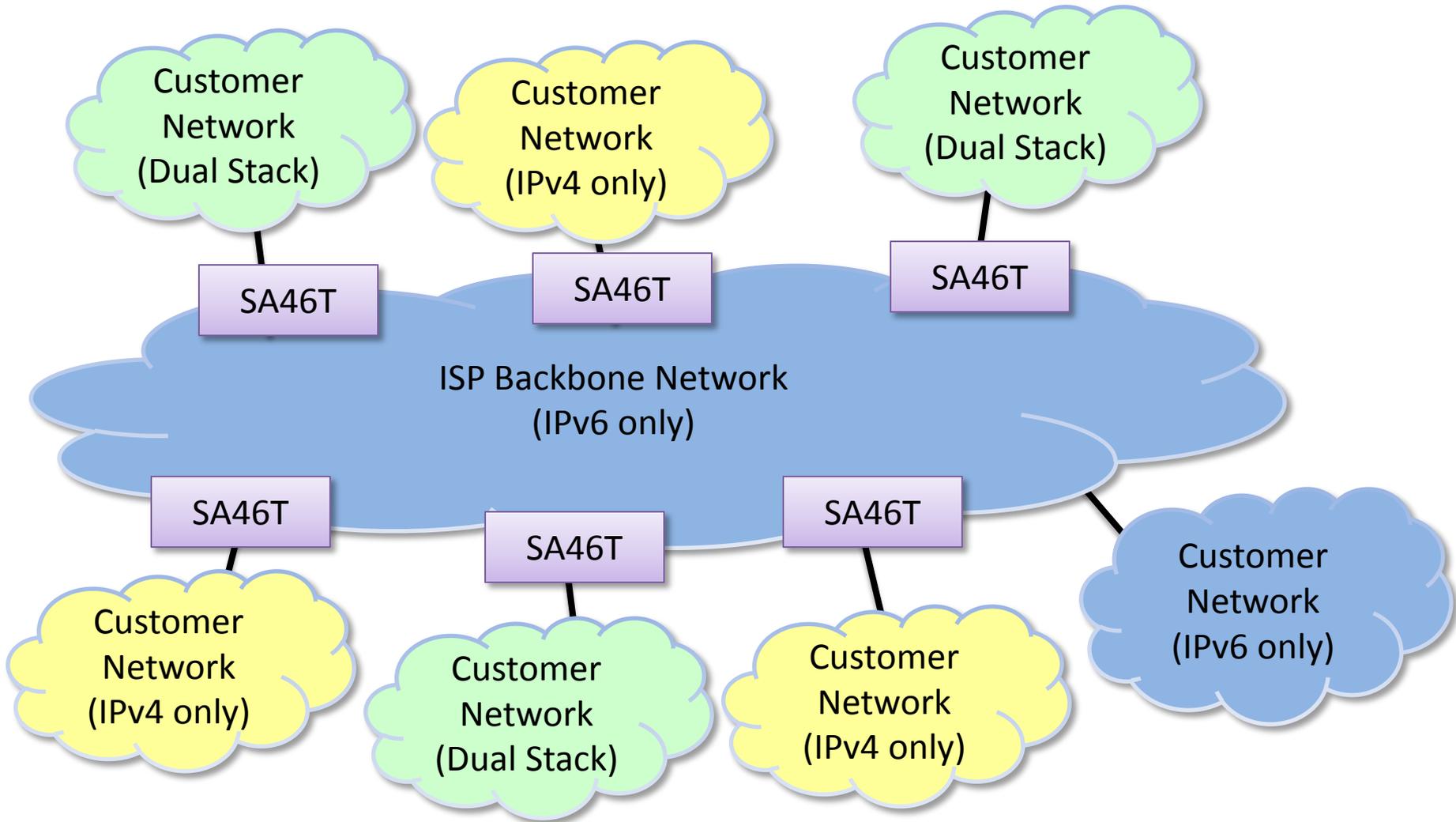
# Motivation for SA46T

- Can install into existing network
  - any IPv4 address, non dependency
- Less tunnel configuration
  - $N$ , not  $N^2$
- Simple install strategy
  - edge based solution
- Can treat both IPv4 Global and many IPv4 Privates
  - plane ID
- Can install into various networks
  - access, backbone, enterprise, datacenter

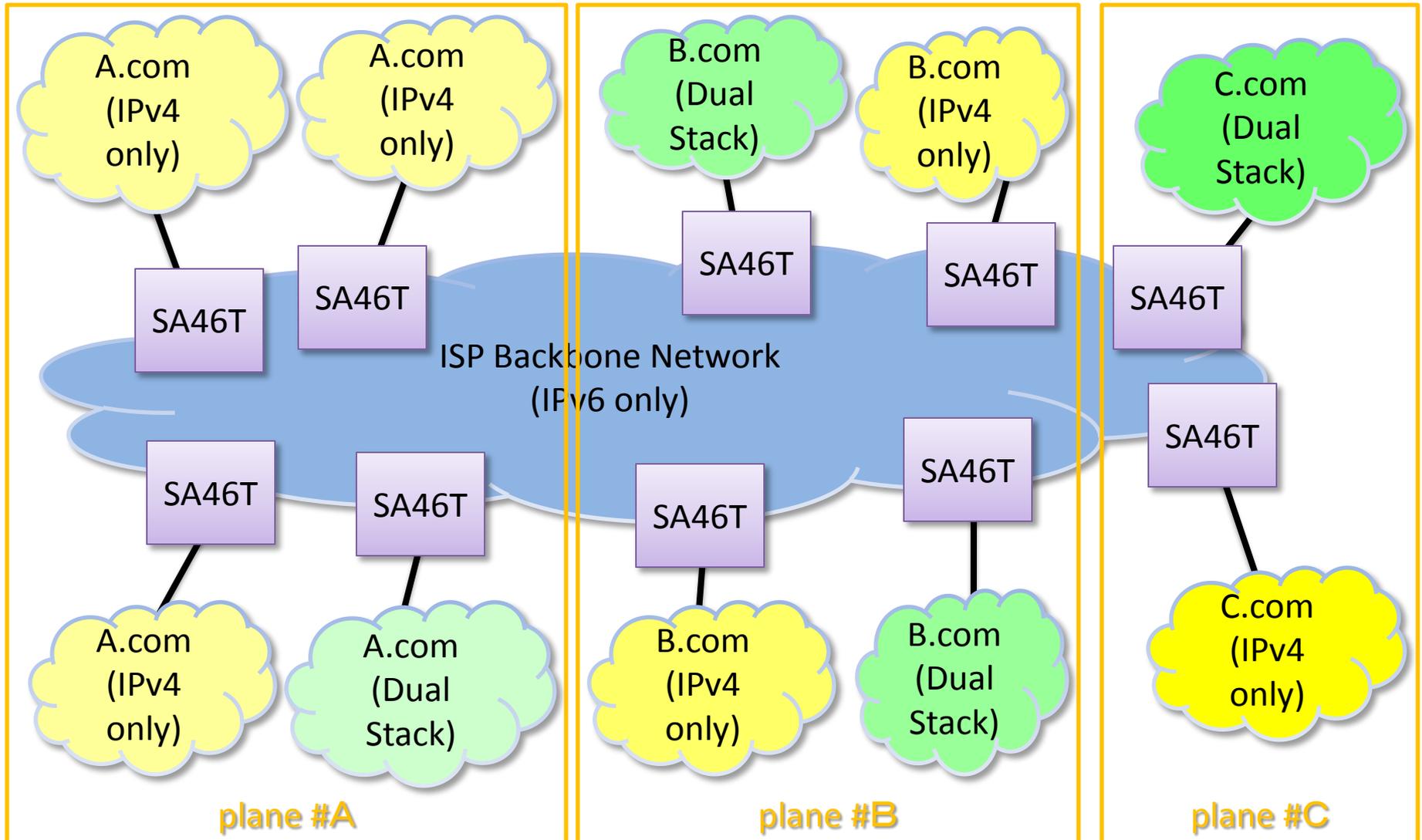
# Enterprise / Campus Network



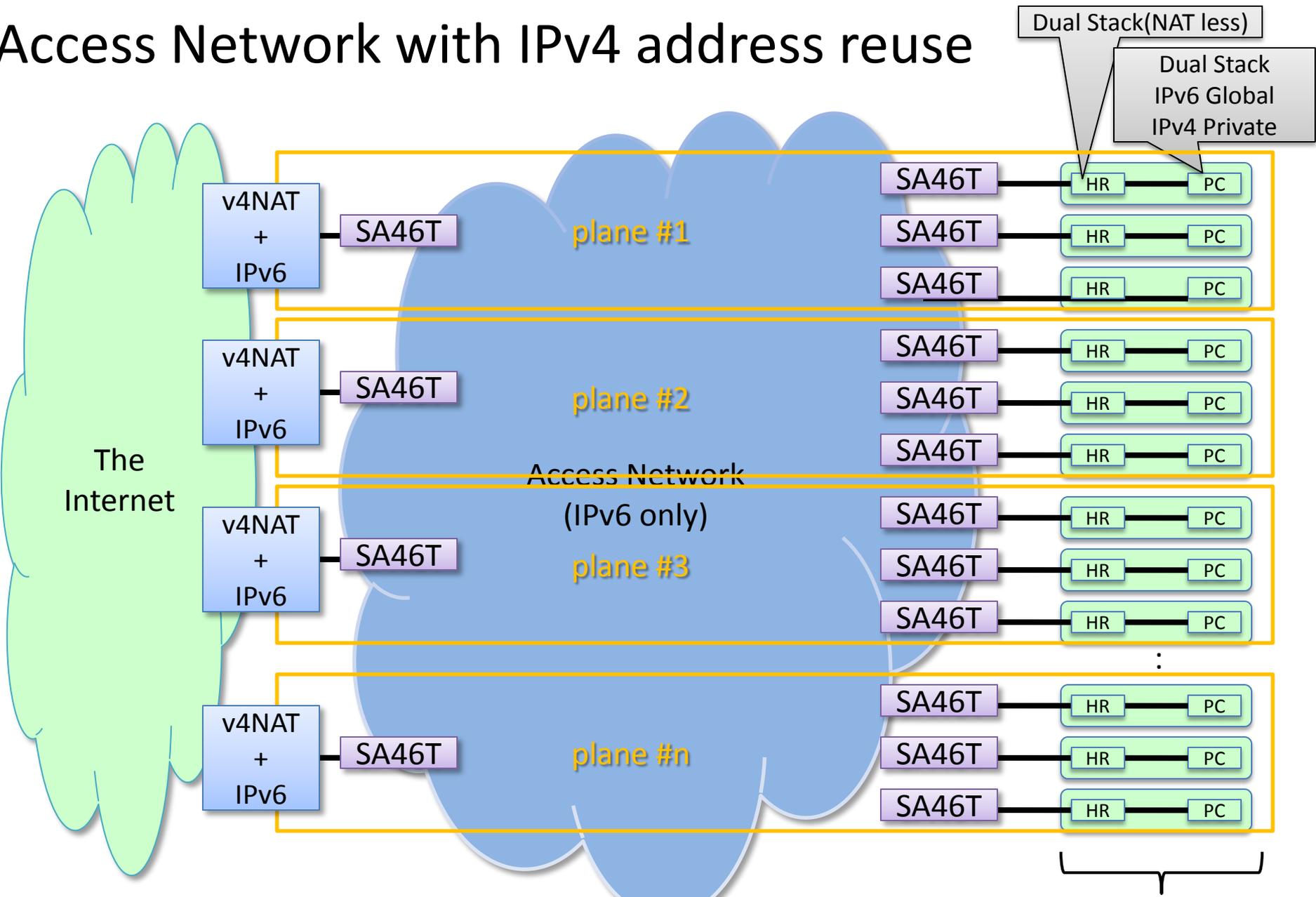
# ISP Backbone Network



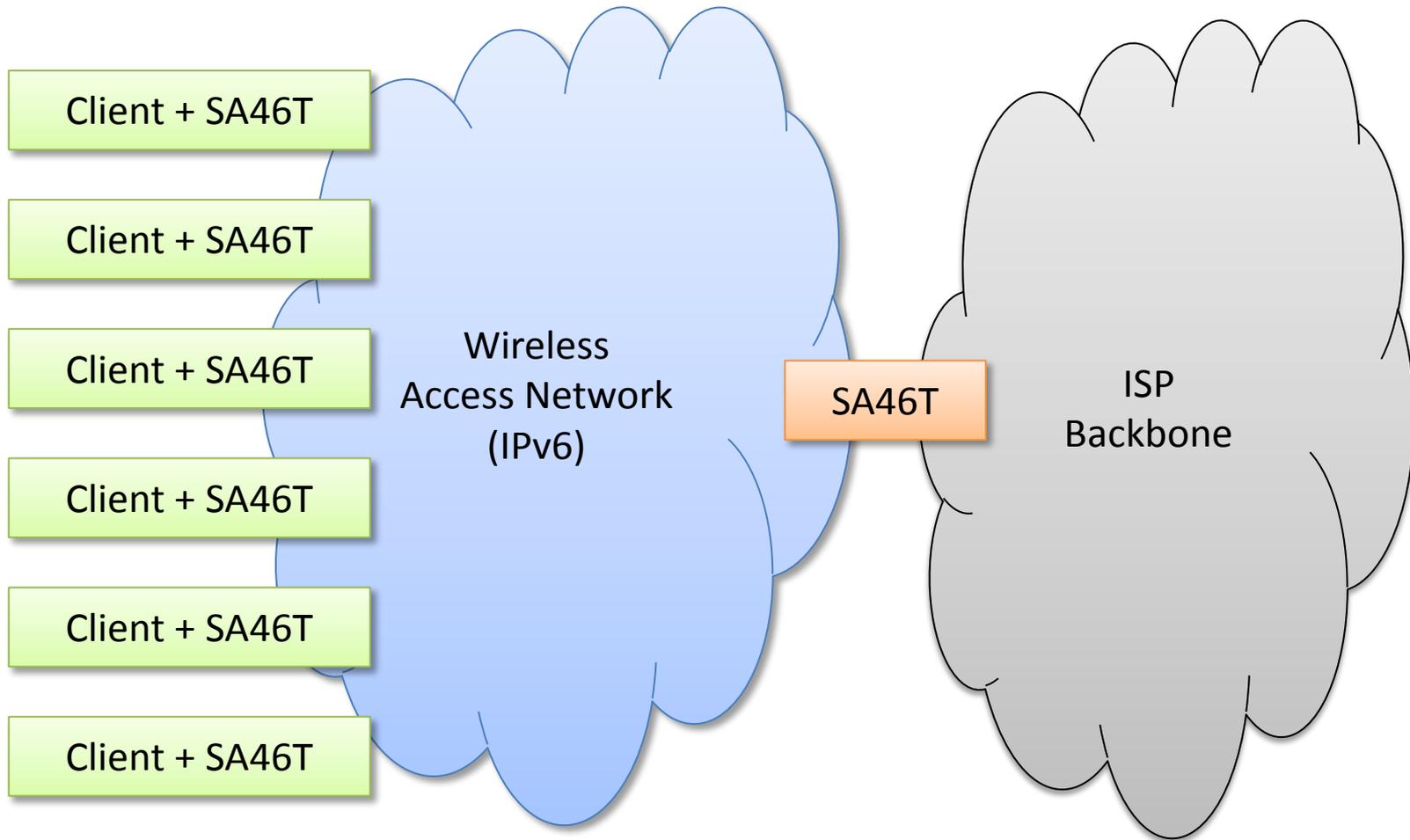
# VPN service by ISP



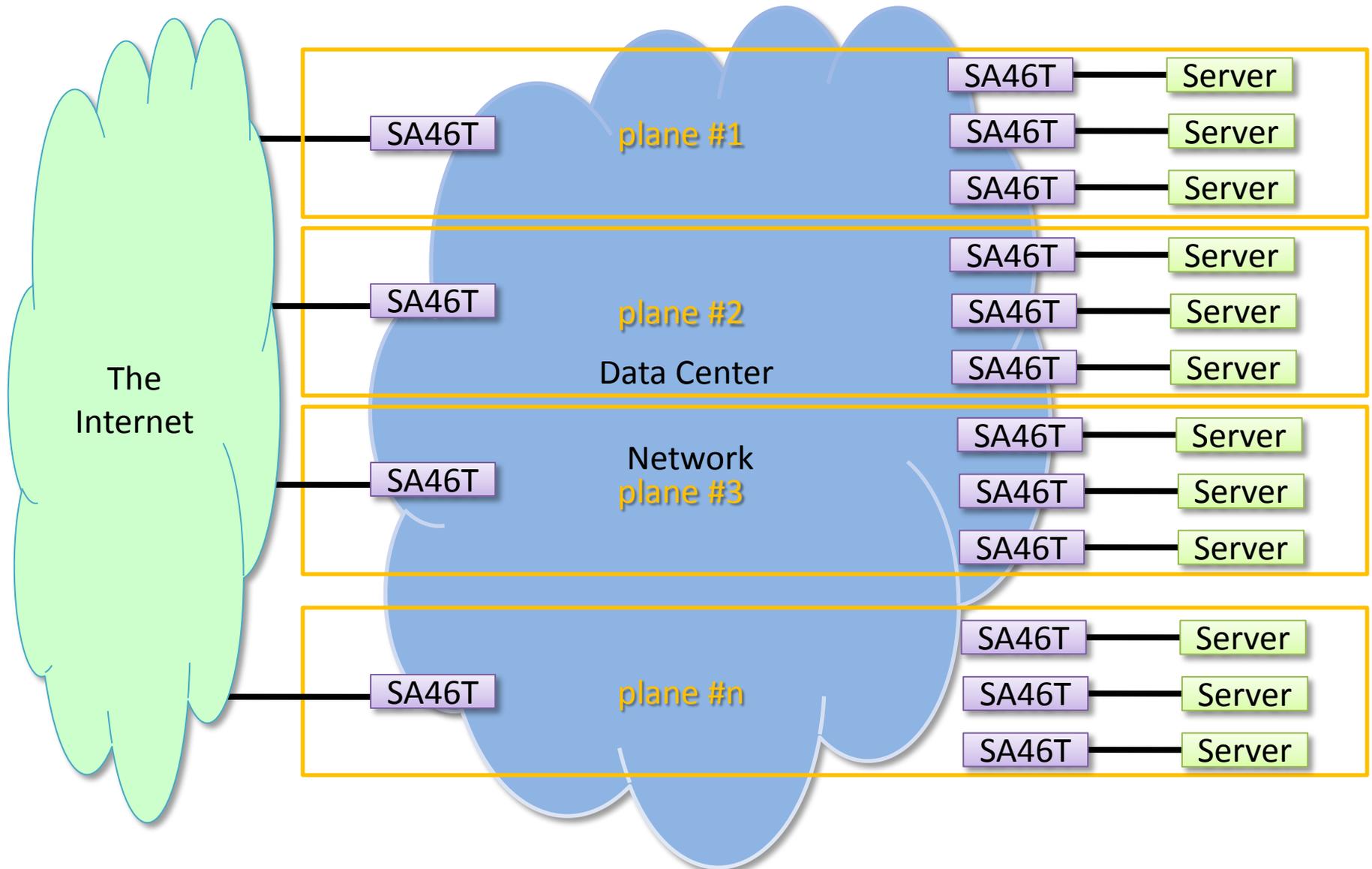
# Access Network with IPv4 address reuse



# Wireless Access Network



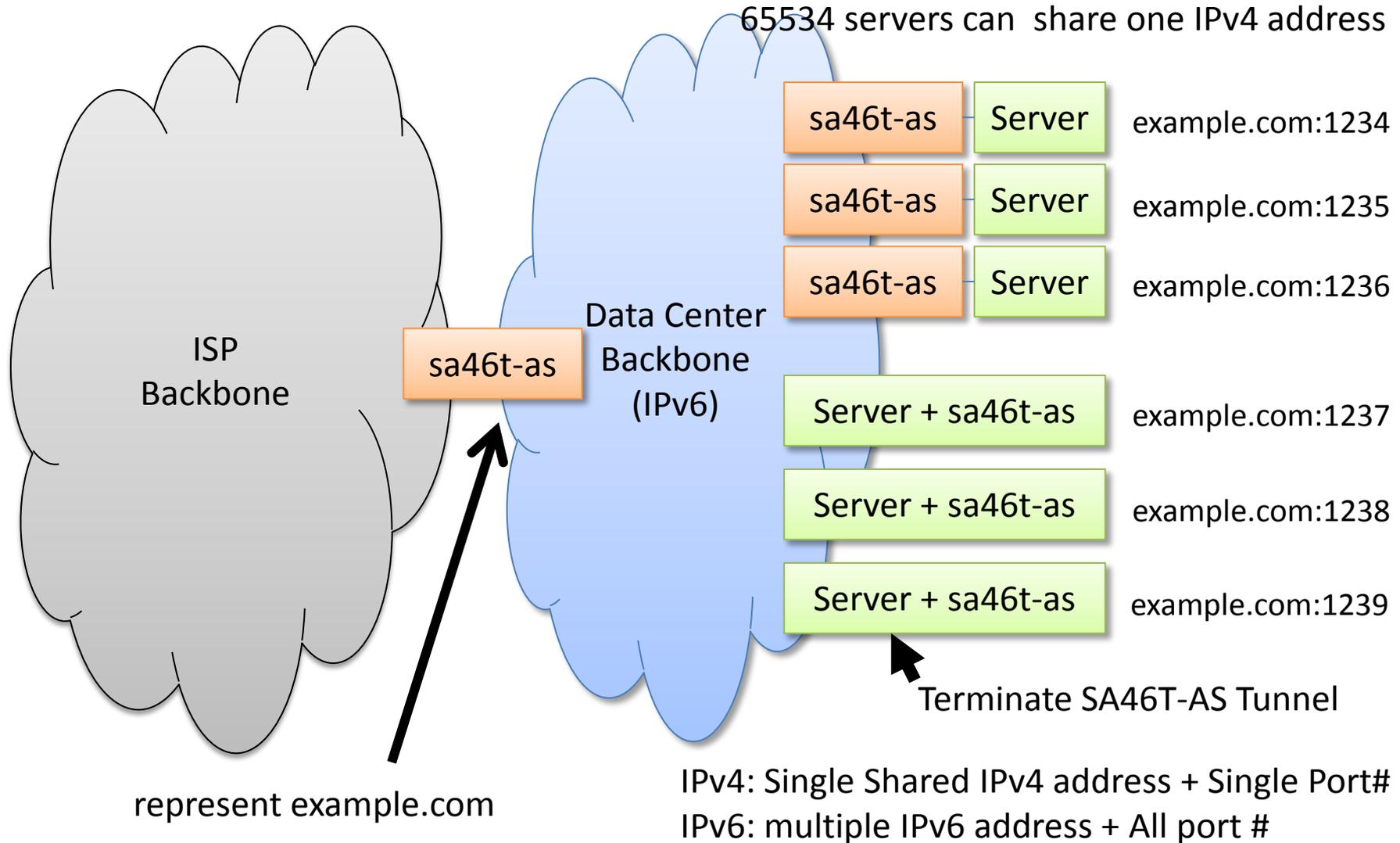
# Data Center Network for Private Cloud (Private address)



# Motivation for SA46T-AS

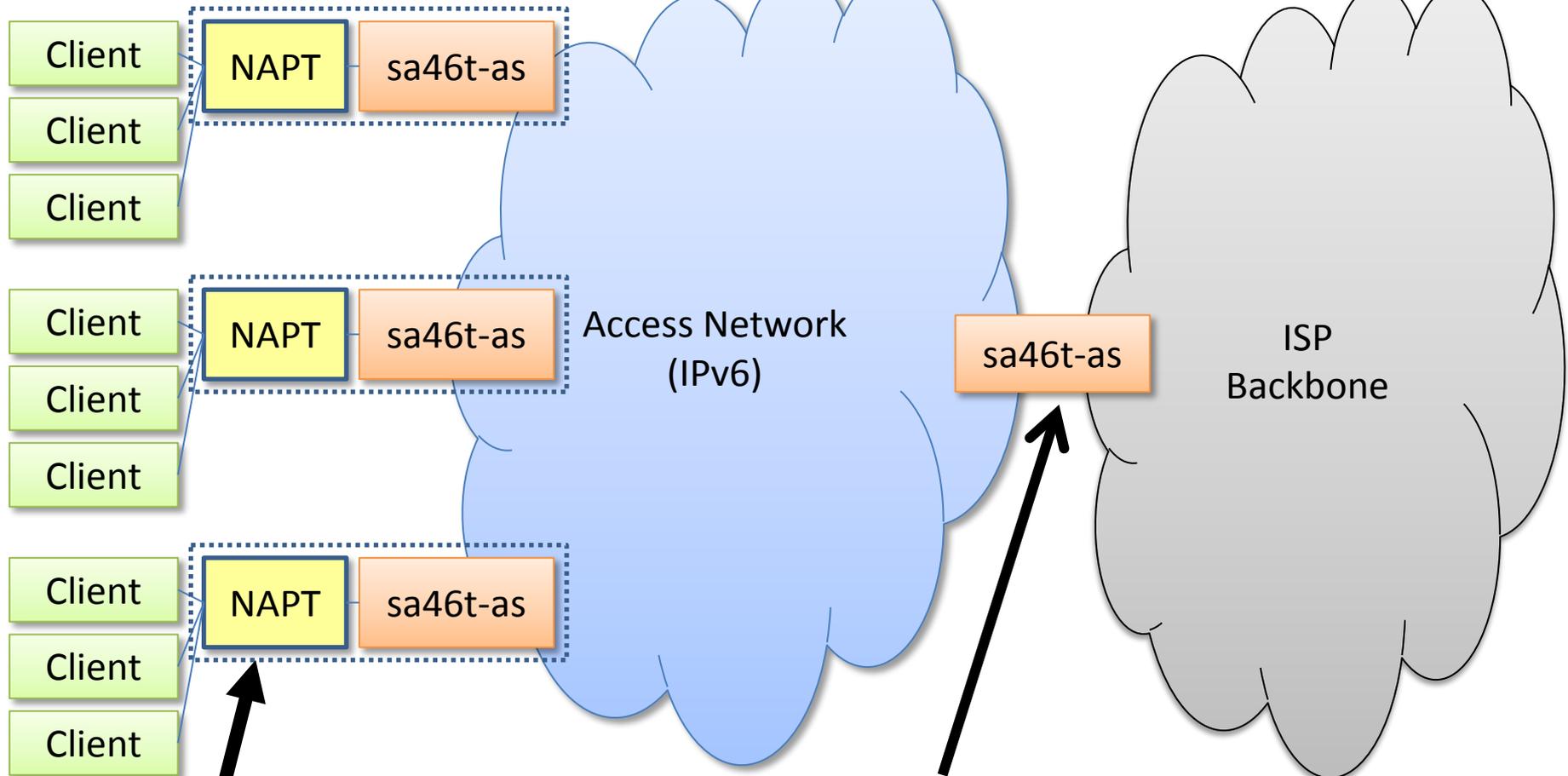
- IPv4 address exhausted became real at IANA and APNIC
- For insurance, IPv4 address sharing mechanisms may require in future, preparing for technology development is needed now
- Target: both servers and clients
  - NAT/NAPT less solution for server, without application dependency
    - allocate IPv4 address + port number to a server
  - NAT/NAPT combined solution for clients
  - NAT/NAPT less solution for client (wireless)
  - maybe P2P systems

# Address sharing for servers with SA46T-AS



# Address Sharing for clients with SA46T-AS

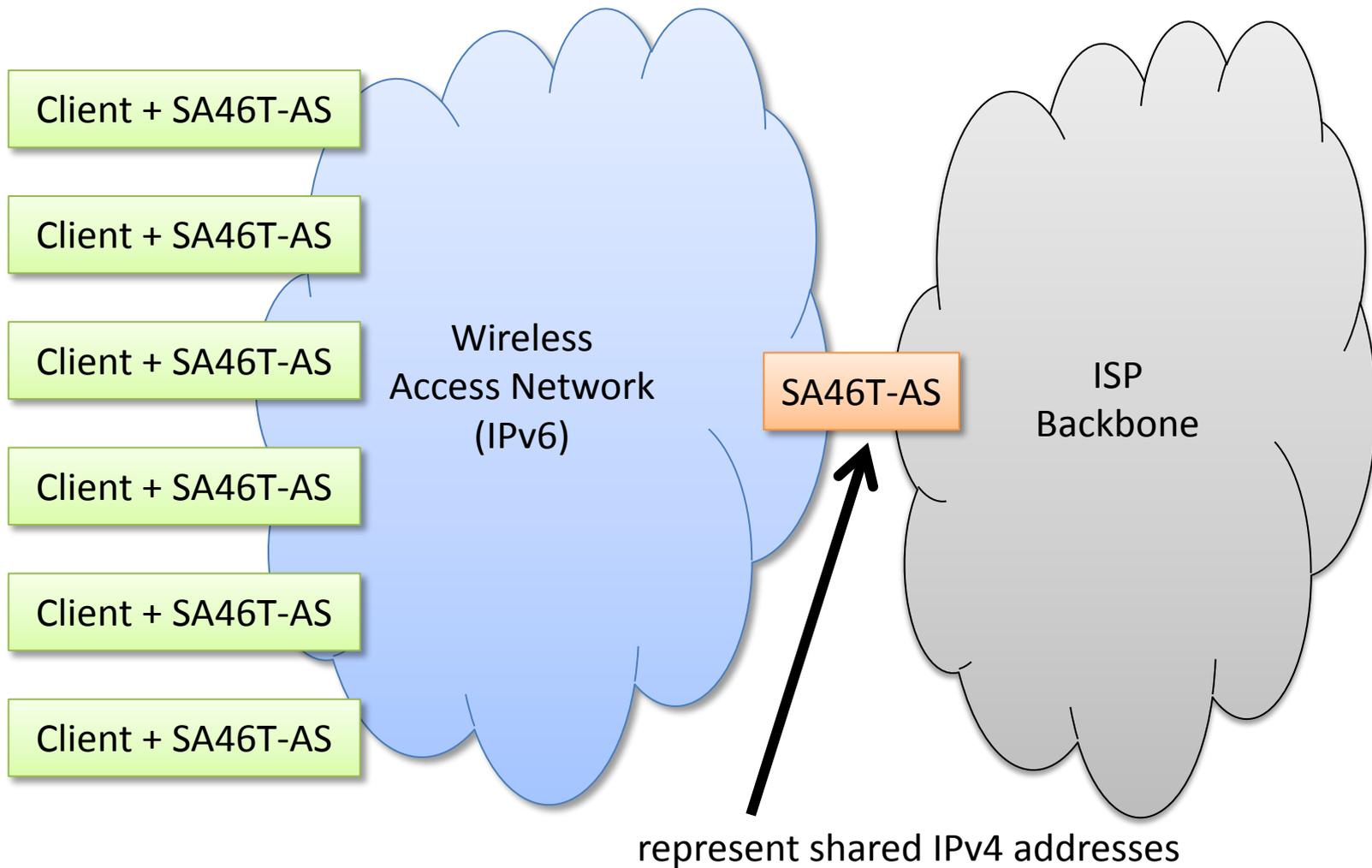
Subscribers can share one IPv4 address



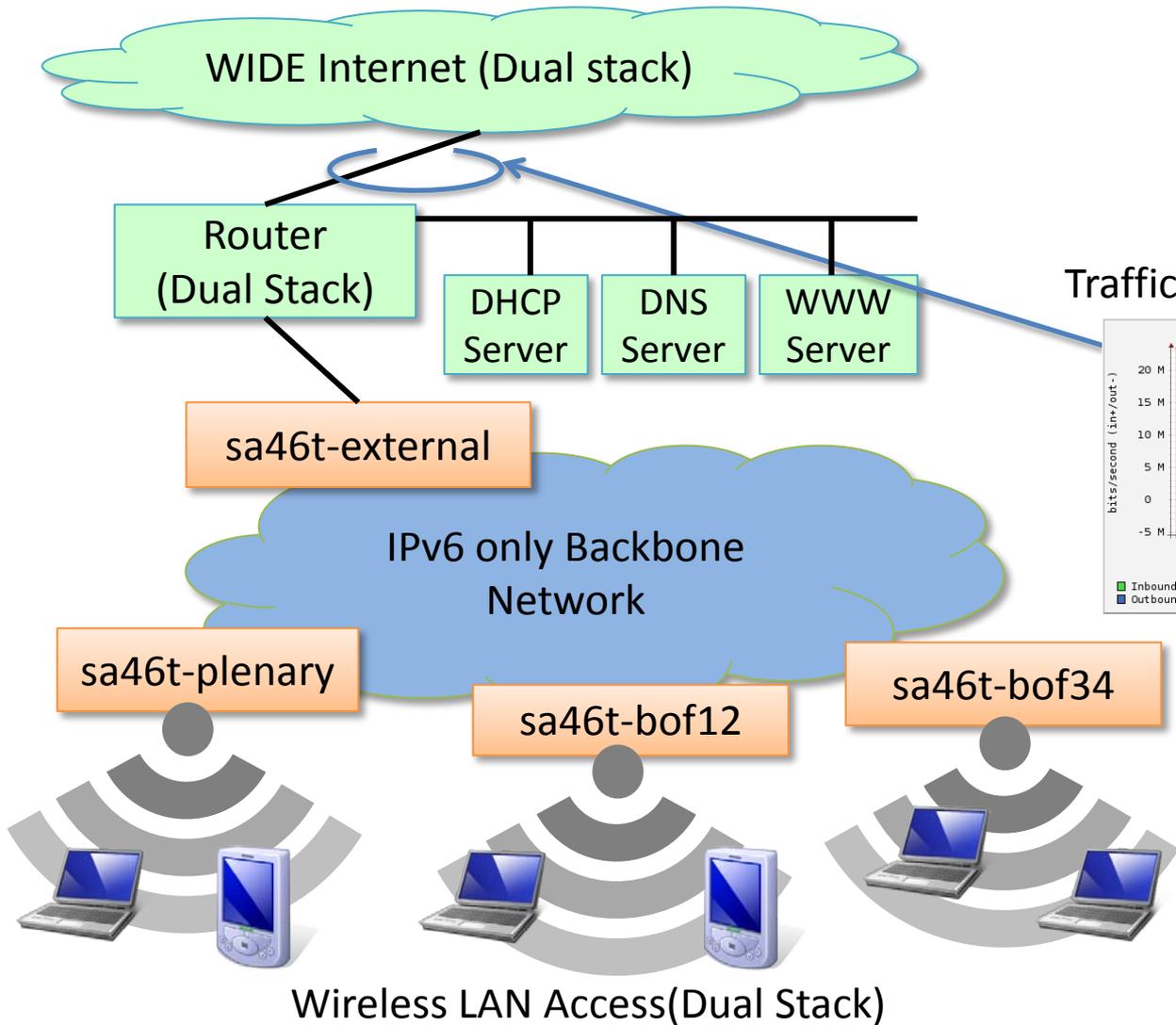
maybe installed in the same box

represent shared IPv4 addresses

# Address Sharing for clients with SA46T-AS

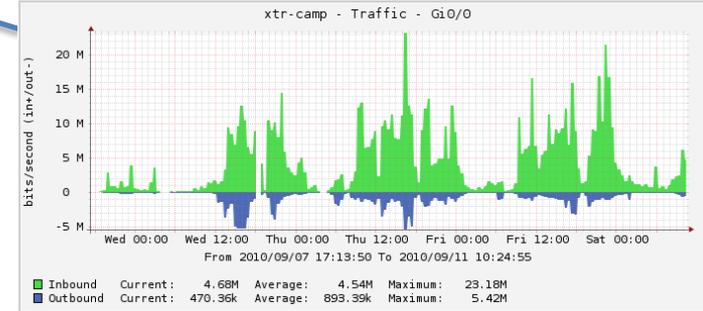


# sa46t experiments at WIDE camp



## Overview

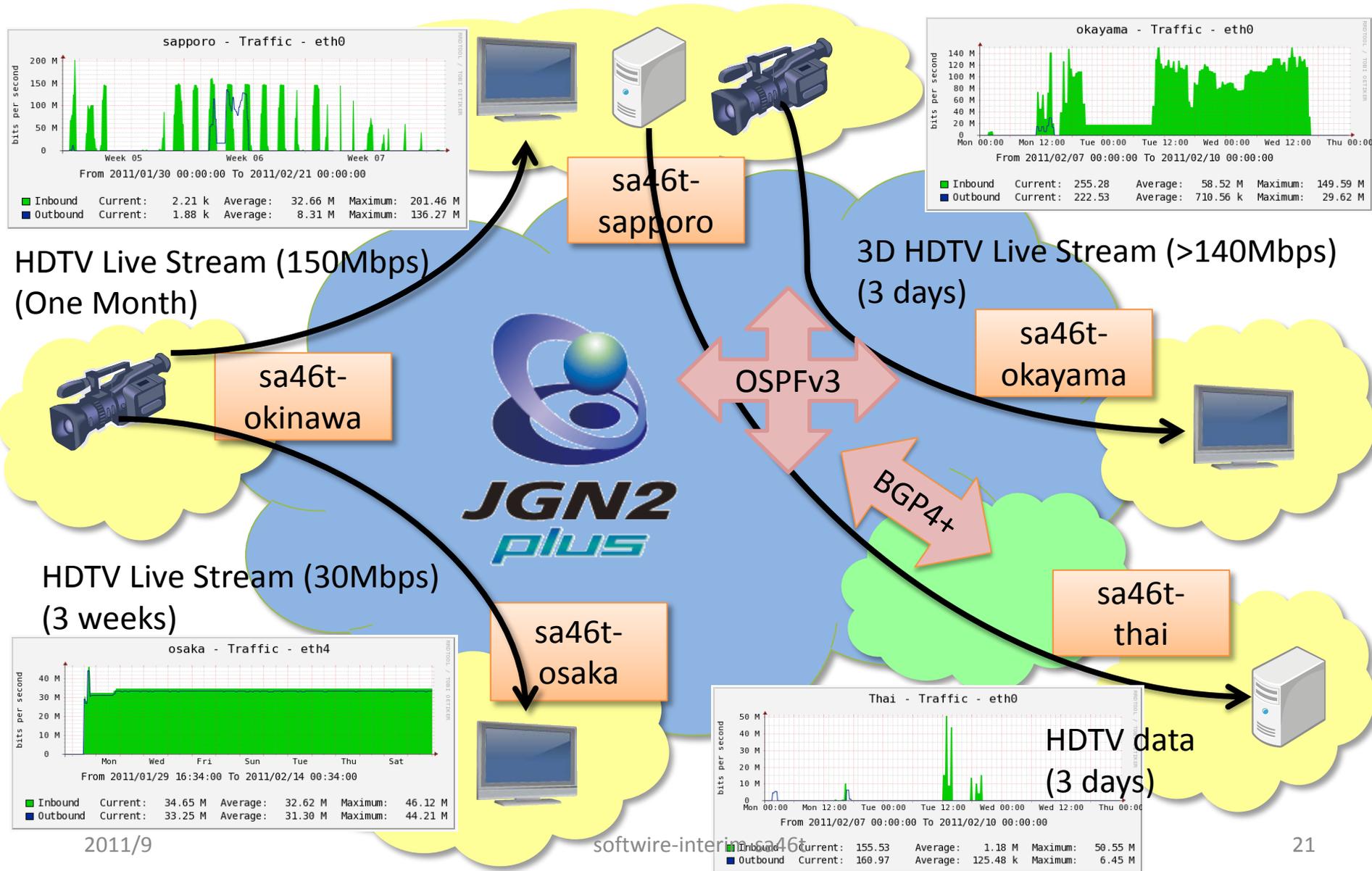
- 4.5 days in September 2010
- provide both IPv4 & IPv6
- Using single IPv4 plane
- Clients Join via Wireless LAN



## Results

- 191 people attended
- 275 clients joined
- sa46t Work fine, very stable
- >230 million IPv4 packets encaped by sa46t

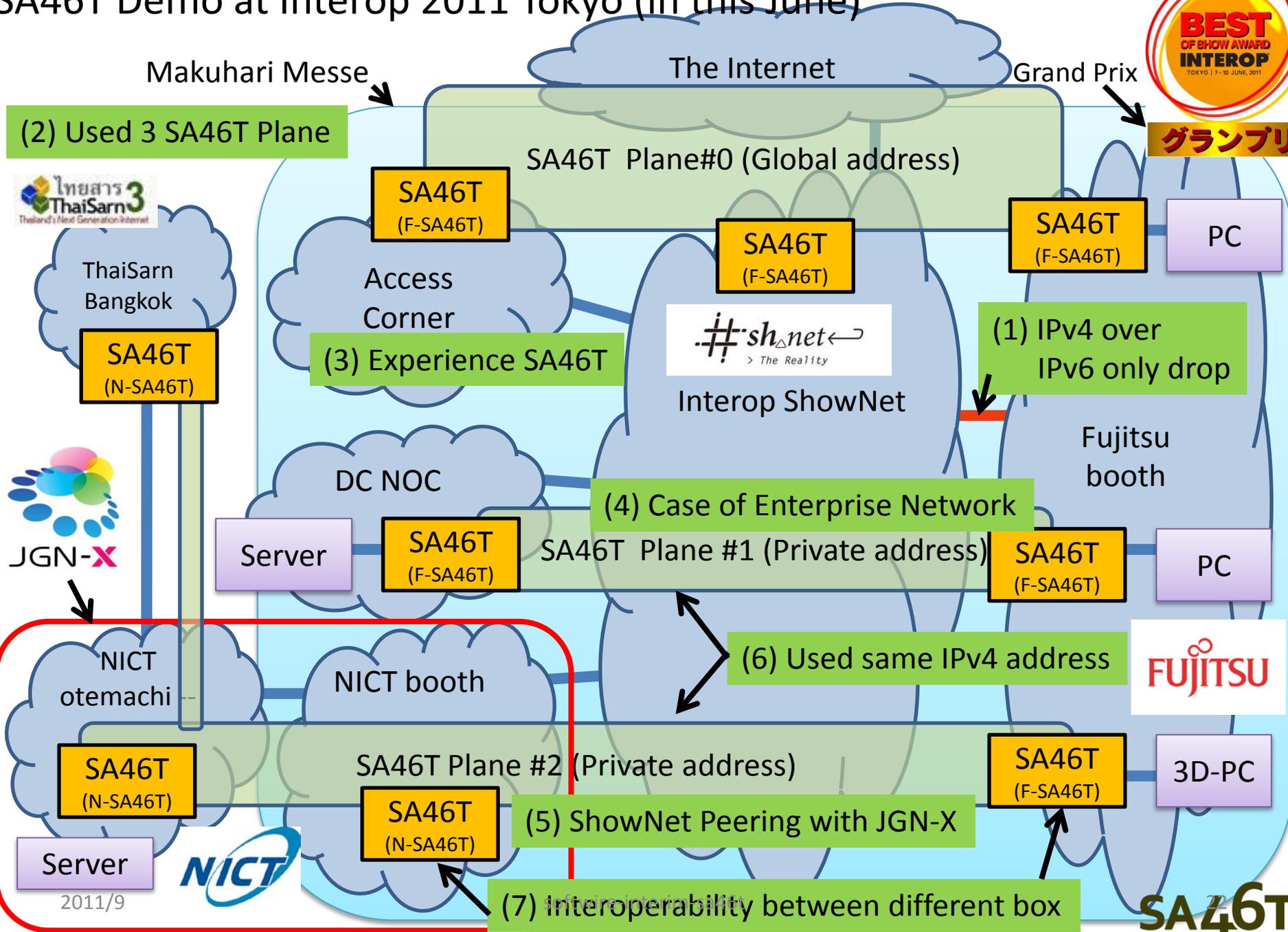
# sa46t experiments at NICT JGN2Plus Testbed



# SA46T Demo at Interop 2011 Tokyo (in this June)



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# Other experiments/information

- The information from Thailand is exists
  - APAN meeting
  - "Research Network Infrastructure to Support Future Internet Technology in Thailand"
    - <http://www.apan.net/meetings/India2011/Session/Slides/fit/3-2.pdf>
- SA46T is used formal service in WIDE camp network in this month (non experiments)
- Install SA46T to existing network
  - To Fujitsu Kawasaki factory in Japan
  - There is no trouble, nobody care about SA46T
- SA46T experiments are supported by
  - WIDE Project, NICT JGN-X Team, Interop Tokyo NOC Team, etc
  - SA46T is given Grand Prix of Best of show award, Interop Tokyo

# position of SA46T and SA46T-AS

- One of tunneling technology
  - GRE, IP in IP, etc
  - but focus only on IPv4 over IPv6
  - Can support IPv4 multicast
    - see draft-matsuhira-sa46t-mcast-00
- Can combine with NAT
  - CGN with SA46T, may tunnel option of DS-Lite
  - CPE NAT with SA46T-AS, A+P capability
  - off course, non NAT solution may possible
- General purpose of IPv4 over IPv6 Tunneling
  - can apply access network, backbone network, enterprise network, data center network
  - plane ID is unique function for VPN like service

# Where SA46T/SA46T-AS in softwire charter?

1. Developments for Mesh softwires topology; the Mesh topology work will be reviewed in the L3VPN and IDR Working Groups
  - multicast , MIB module
2. Developments for 6rd:
  - multicast, operational specification, RADIUS attribute for 6rd server, MIB module, Gateway-initiated 6rd (GI-6rd)
3. Developments for Dual-Stack Lite (DS-Lite):
  - multicast, operational specification, RADIUS attribute for AFTR , proxy extensions; GI-DS-Lite; No NAT on AFTR , MIB module
4. Developments for stateless legacy IPv4 carried over IPv6
  - develop a solution motivation document to be published as an RFC
  - develop a protocol specification response to the solution motivation document; this work item will not be taken through Working Group last call until the solution motivation document has been published or approved for publication
5. Finalize discovery and configuration mechanisms for a gateway to use DS-Lite or 6rd; these discovery and configuration mechanisms must take into account other operating environments such as dual-stack and tunneling mechanisms not defined by the Softwires Working Group. Development of new mechanisms will involve the DHC and/or V6OPS Working Groups as appropriate

# Consideration

- SA46T and SA46T-AS is fundamental tunneling function
  - simple protocol / function specification
  - Can combine other technologies
- Many application may possible
- I believe that SA46T and SA46T-AS contribute to smooth transition to IPv6 and the continuance of IPv4 in near future.
  - The dependency between network transition and host transition can be separated.
- I believe that SA46T and SA46T-AS has the qualification of the IETF standard.

Thank you !