



The Story of IPv6 at FPT Telecom

Dat Nguyen Thanh – FPT Telecom
datnt11@fpt.com.vn

TABLE OF CONTENTS:

- FPT TELECOM OVERVIEW
- DEPLOY IPv6 IN CORE NETWORK
- DEPLOY IPv6 AT BNG (BROADBAND NETWORK GATEWAY)
- DEPLOY IPv6 AT CPE (CUSTOMER PROVIDED EQUIPMENT)
- RESULTS
- CASES STUDY

FPT TELECOM OVERVIEW

NO.1 STORAGE SERVICES IN VIETNAM

NO.2 ISP IN CAMBODIA

TOP 3 ISP IN VIETNAM

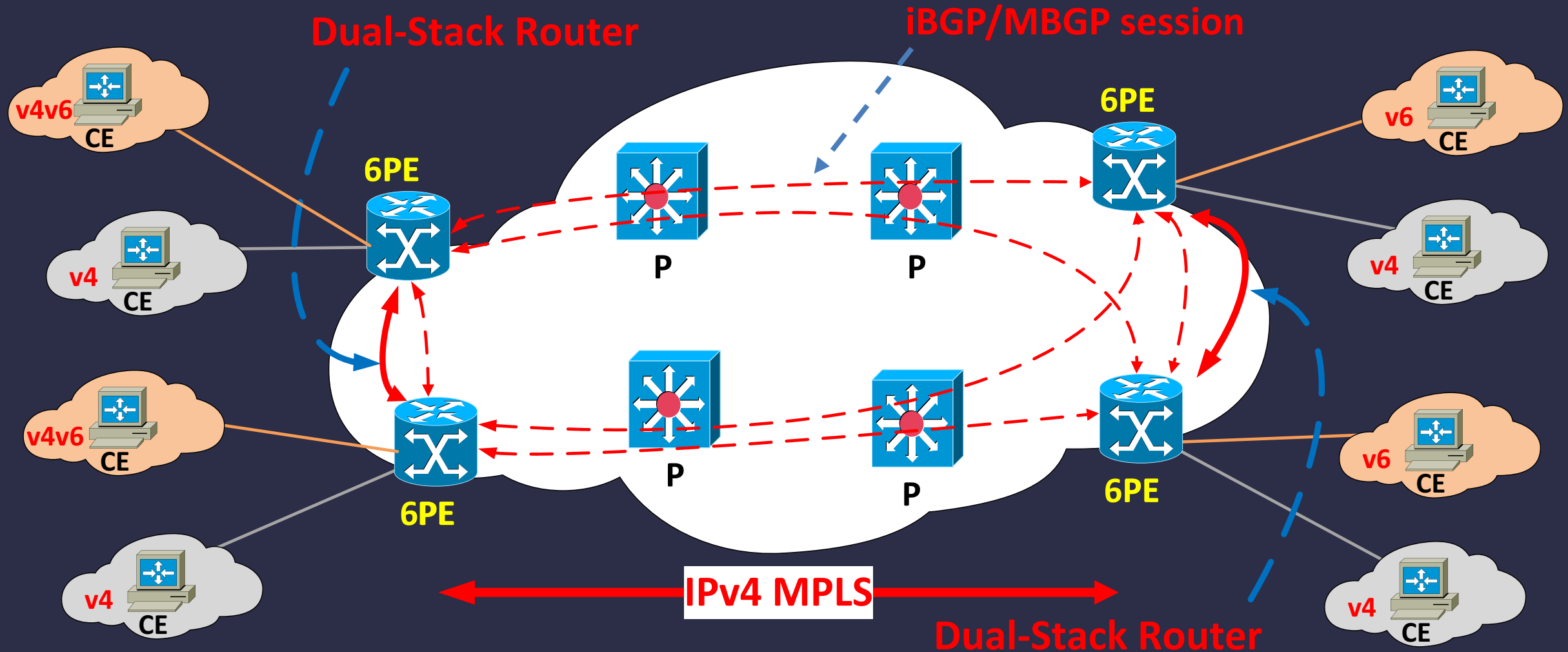
1,6 million broadband subscribers.

Services:

- High-speed Internet access
- IPLC
- VoIP
- IPTV
- Cloud
- OTT Services
- IoT products

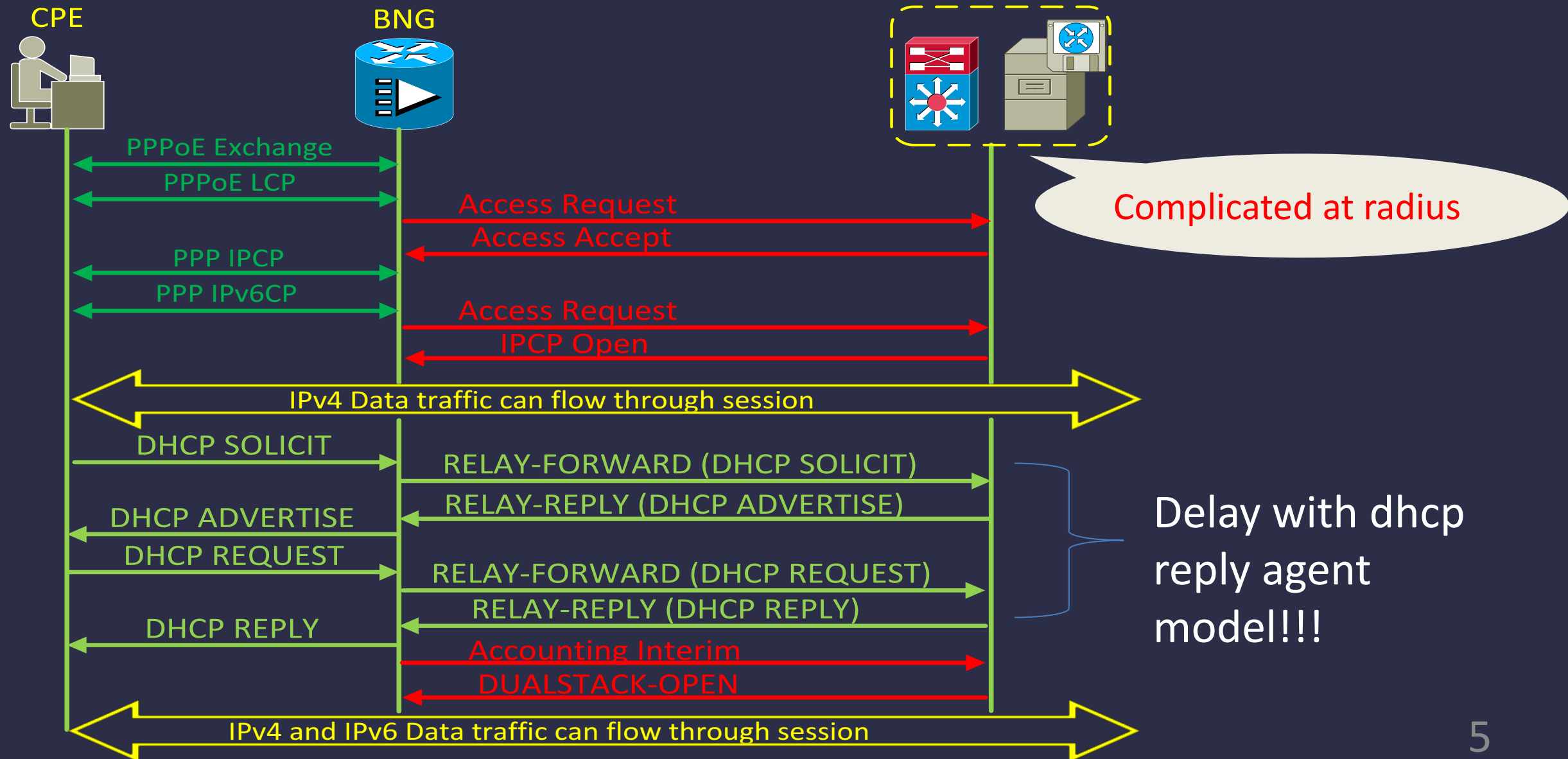
Website: www.fpt.vn

DEPLOY IPv6 IN CORE NETWORK

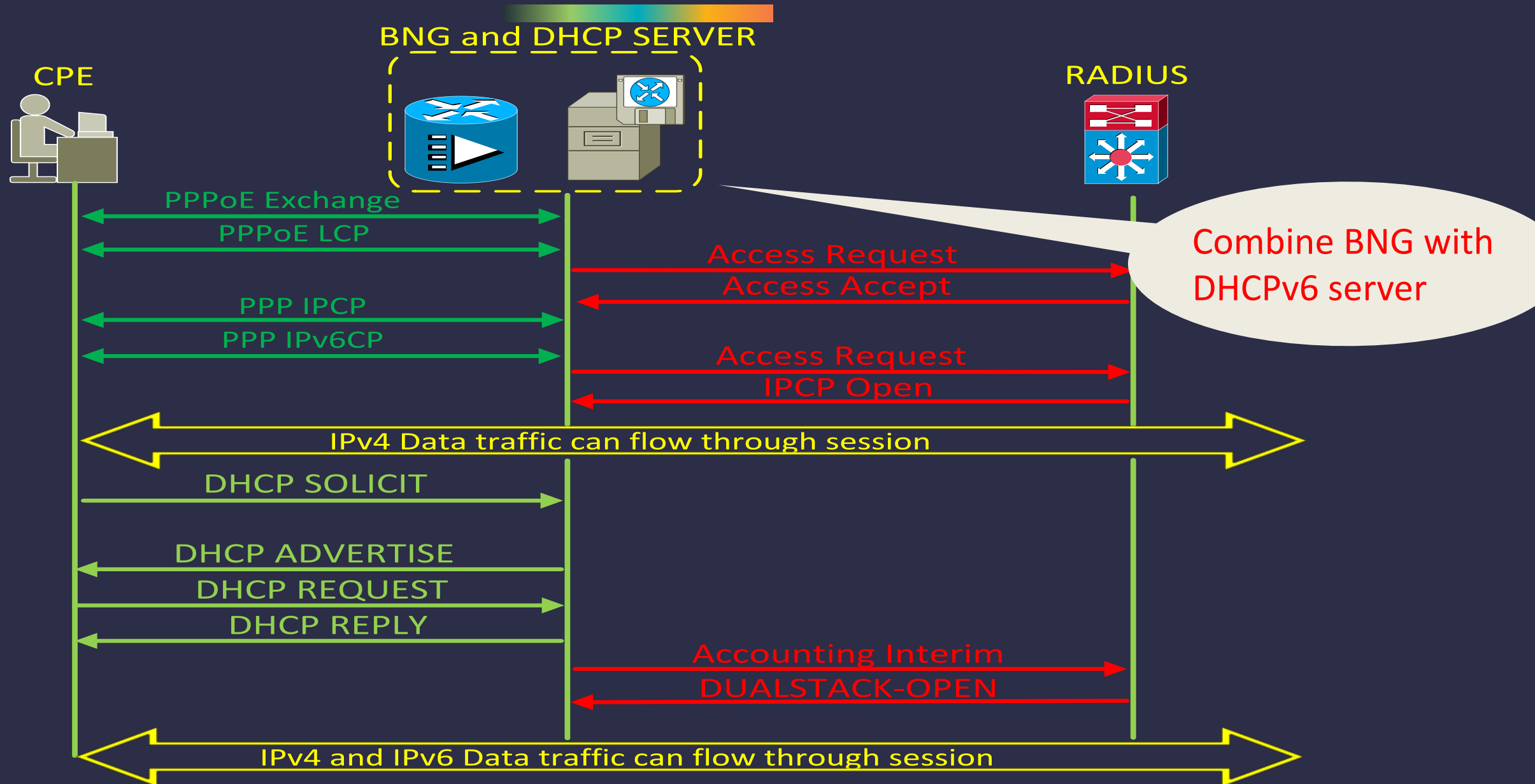


DEPLOY IPv6 IN BNG

RADIUS and DHCP SERVER



DEPLOY IPv6 IN BNG



DEPLOY IPv6 AT CPE

Devices inside CPE receives IPv6 LAN from CPE via DHCPv6 PD or ND/RA

DHCPv6 prefix delegation

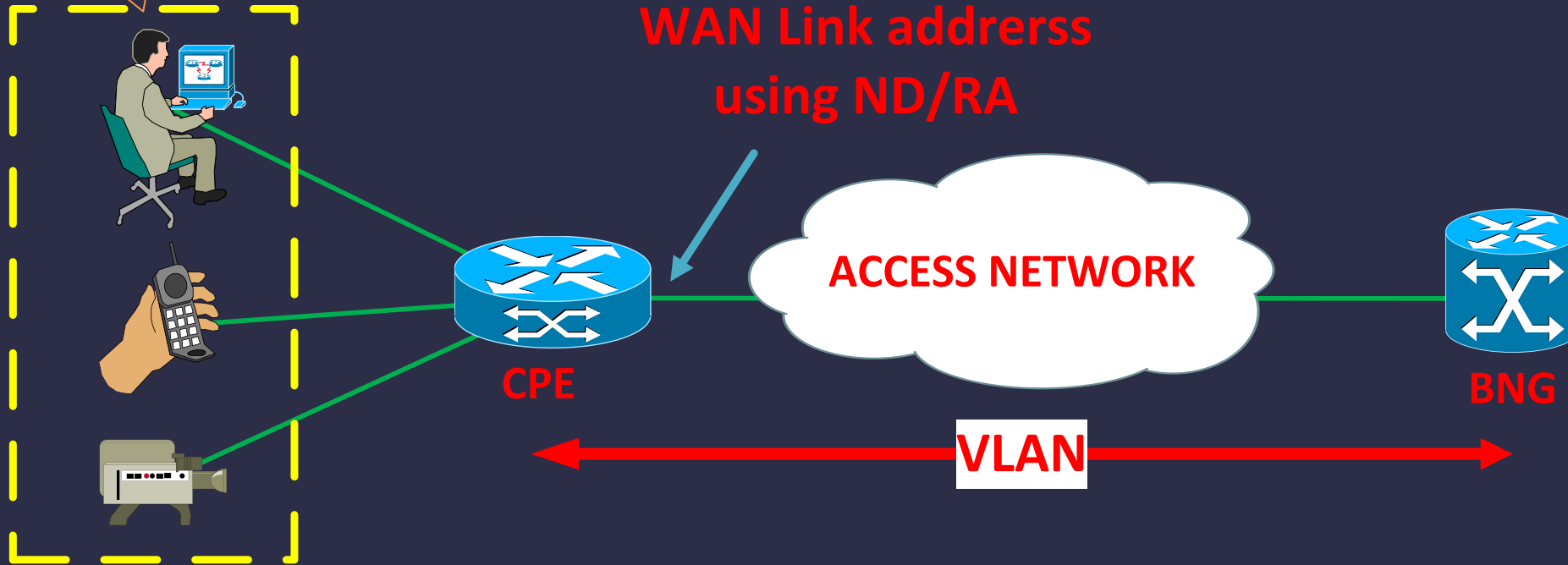
WAN Link addresss using ND/RA

ACCESS NETWORK

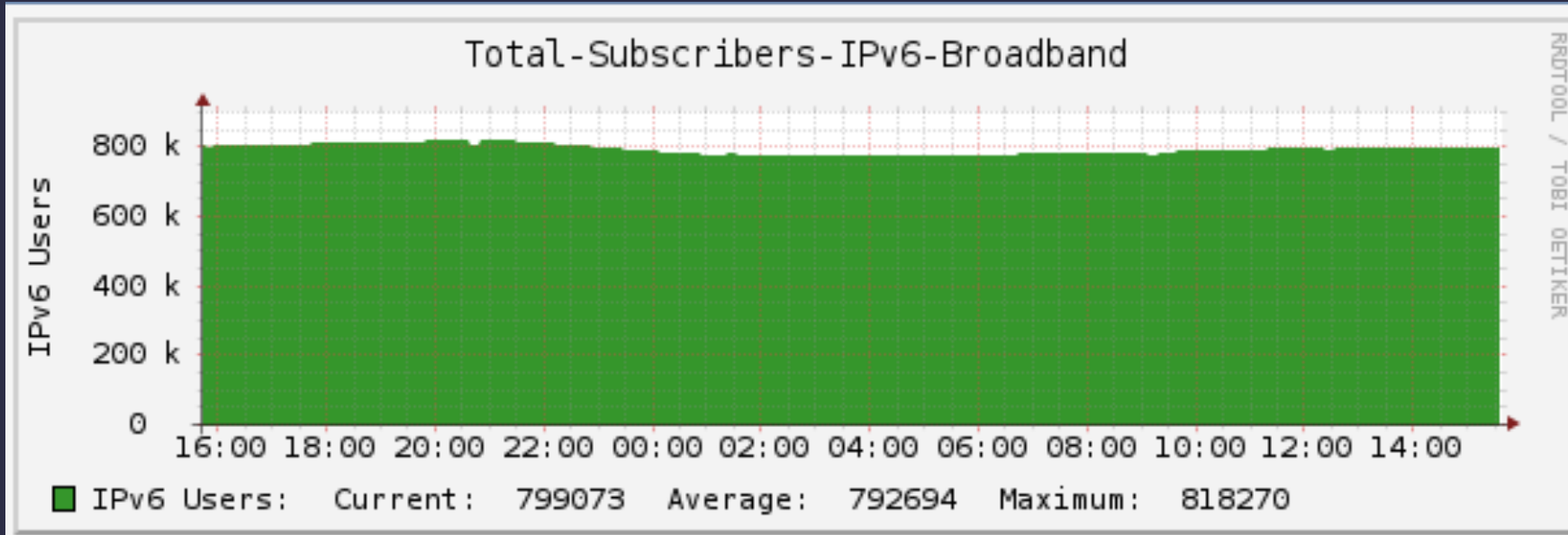
CPE

BNG

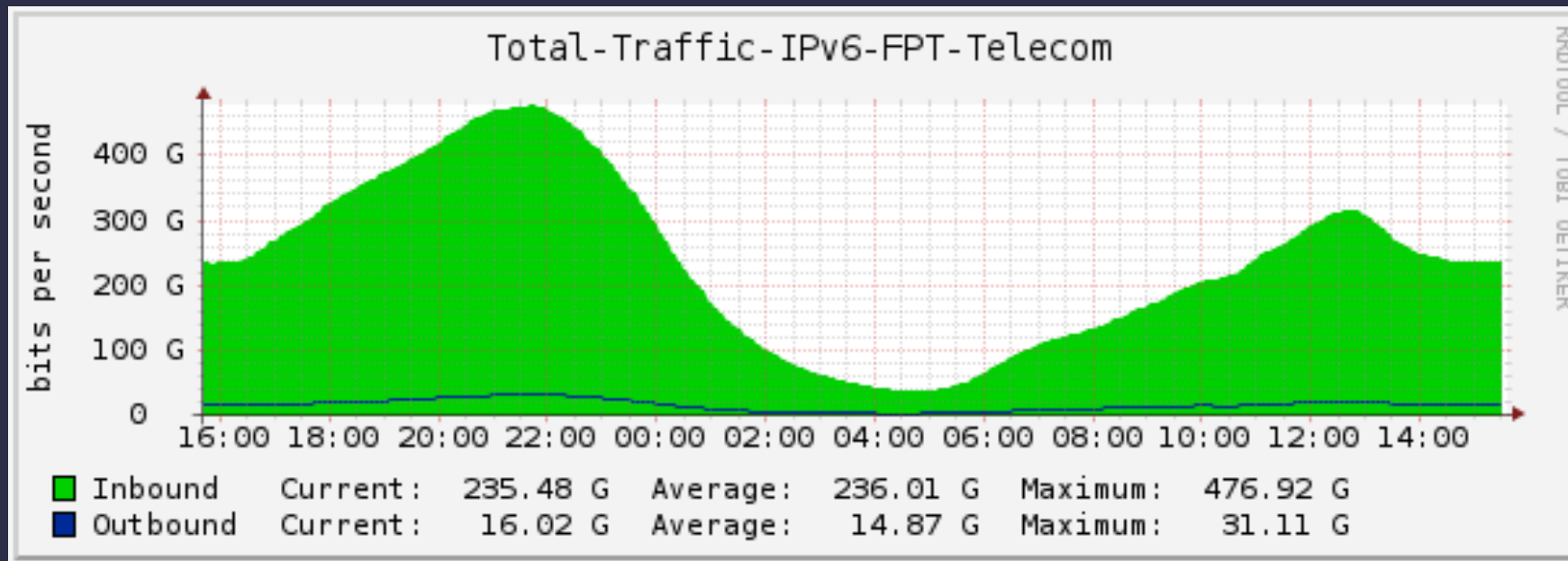
VLAN



RESULTS



818k
IPv6 subscribers

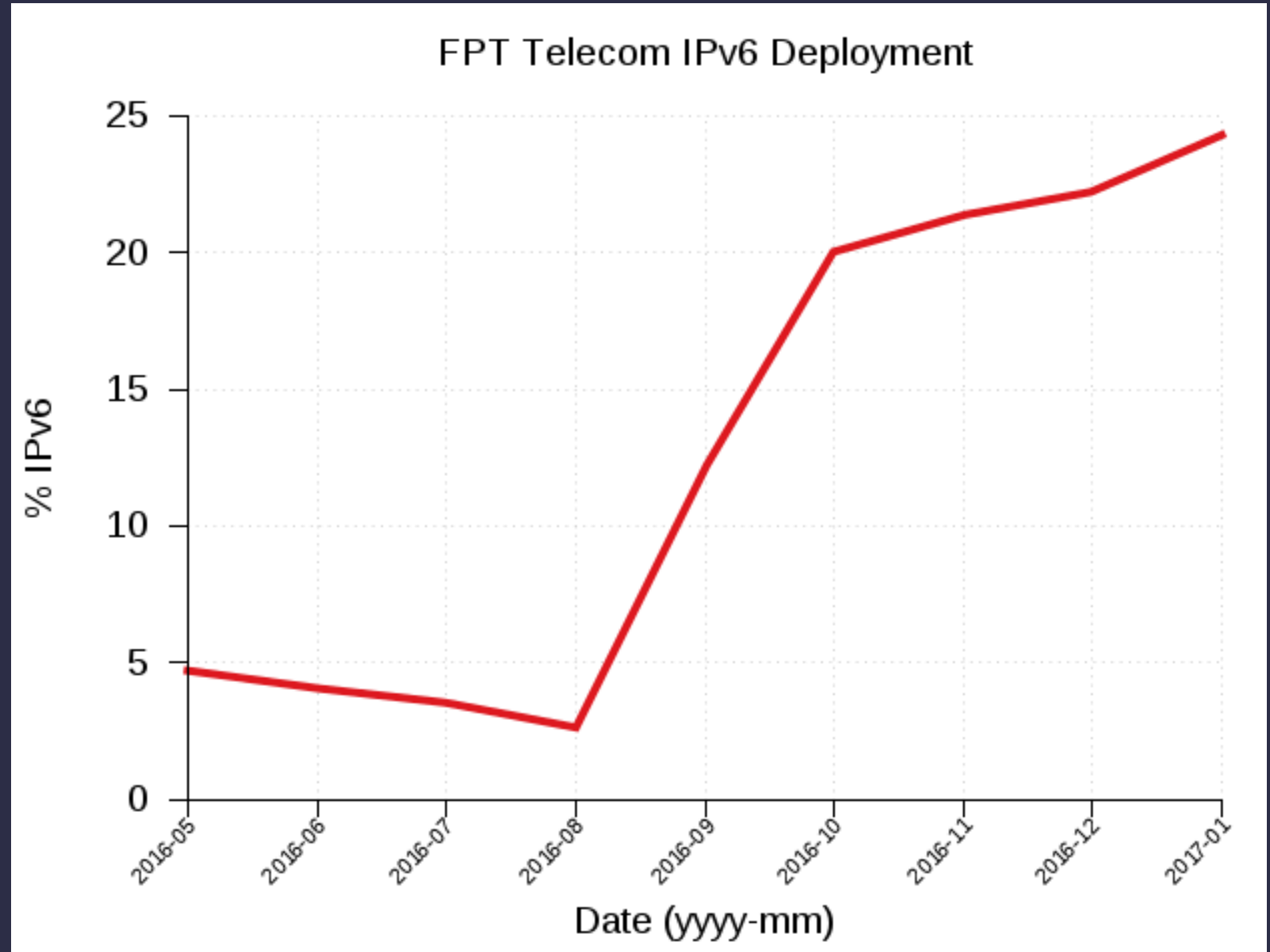


~477Gbps

RESULTS



IPv6 deployment : 24.30%
(16th/240 entries)



(World IPv6 Launch measurement at 11th Jan 2017)

CASE STUDY:



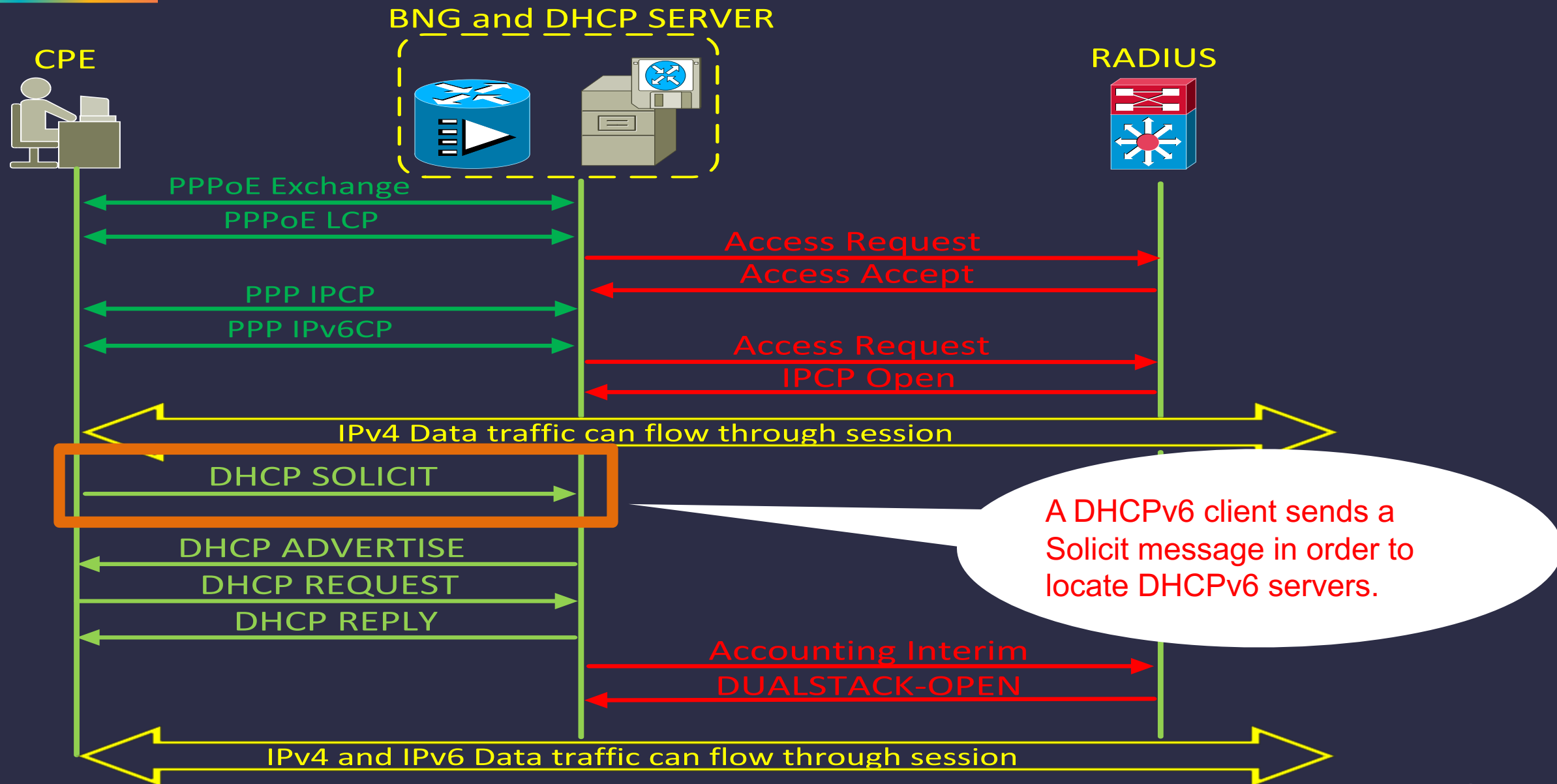
DHCP Unique Identifier (DUID)

CASE STUDY: DHCPv6 DUID



- ❑ Clients use DHCP Unique Identifier (DUID) in Solicit message to get an IP address from a DHCPv6 server
- ❑ Server compares DUID with its database and delivers configuration data (address, lease times, DNS servers,...) to client
- ❑ DUID must be globally unique!!!
- ❑ Three types:
 - LL: Link-layer address
 - LLT: Link-layer address + time
 - EN: Vendor-assigned unique ID based on Enterprise number

CASE STUDY: DHCPv6 DUID



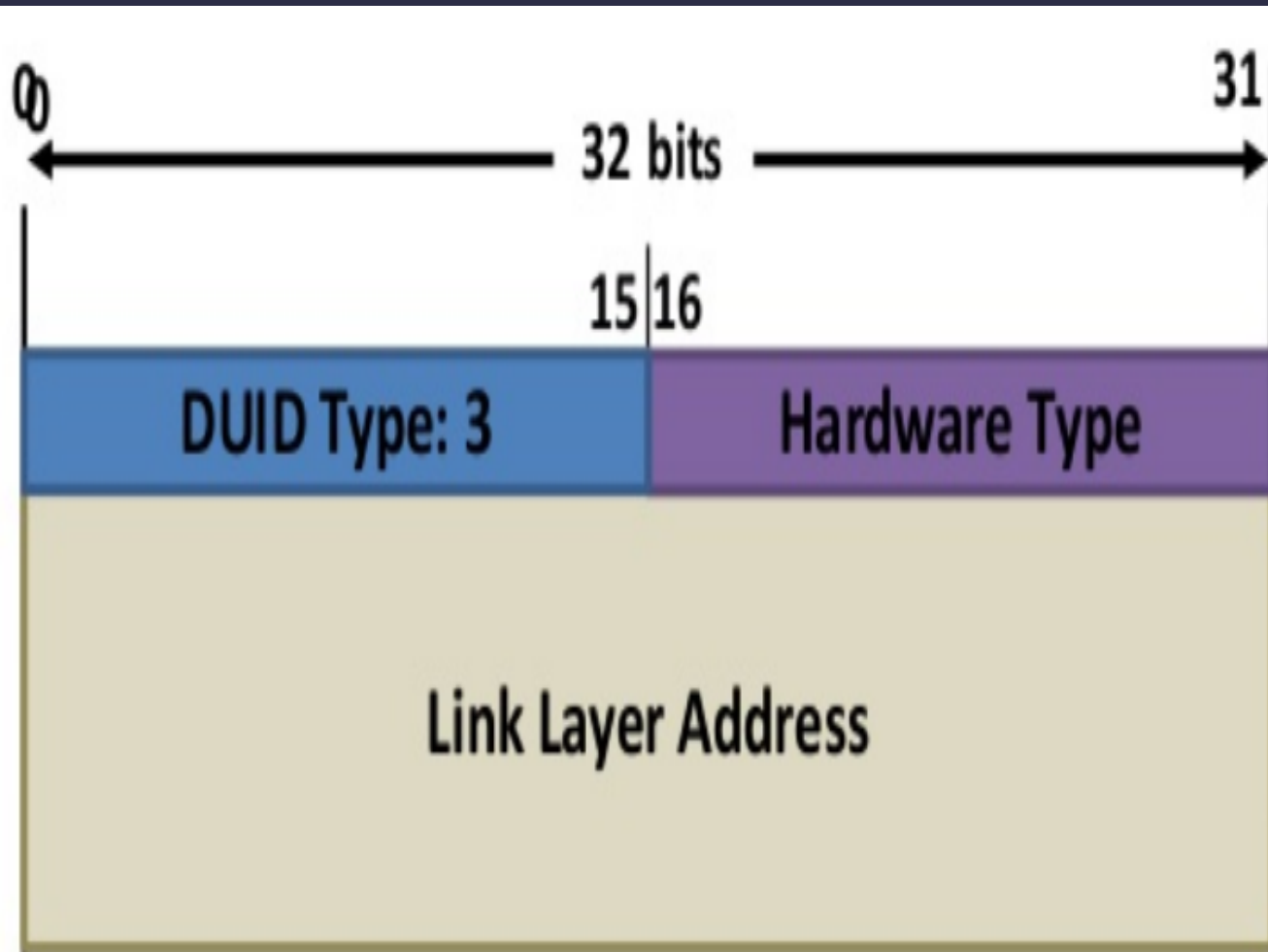
CASE STUDY: DHCPv6 DUID

No.	Time	Source	Destination	Protocol	Length	Info
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	142	Solicit XID: 0x94ea5c CID:...
...	2016-0...	fe80::2a0:a50f:fc7d:d4a9	fe80::e543:444...	DHCPv6	170	Advertise XID: 0x94ea5c CI...
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	178	Request XID: 0xe73c70 CID:...
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	178	Request XID: 0xe73c70 CID:...
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	178	Request XID: 0xe73c70 CID:...
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	178	Request XID: 0xe73c70 CID:...
...	2016-0...	fe80::e543:4440:8e39:5398	ff02::1:2	DHCPv6	178	Request XID: 0xe73c70 CID:...

> Frame 9955: 142 bytes on wire (1136 bits), 142 bytes captured (1136 bits) on interface 0
> Ethernet II, Src: Cambridg_3c:ab:c6 (a8:58:40:3c:ab:c6), Dst: JuniperN_4b:14:f7 (3c:61:04:4b:14:f7)
> PPP-over-Ethernet Session
> Point-to-Point Protocol
> Internet Protocol Version 6, Src: fe80::e543:4440:8e39:5398, Dst: ff02::1:2
> User Datagram Protocol, Src Port: 546 (546), Dst Port: 547 (547)
v DHCPv6
 Message type: Solicit (1)
 Transaction ID: 0x94ea5c
 v Client Identifier
 Option: Client Identifier (1)
 Length: 10
 Value: 00030001a8583561abc6
 DUID: 00030001a8583561abc6
 DUID Type: link-layer address (3)
 Hardware type: Ethernet (1)
 Link-layer address: a8:58:35:61:ab:c6
 > Elapsed time
 > Identity Association for Prefix Delegation
 > Vendor Class
 > Option Request

DHCPv6 Unique Identifier (DUID)

CASE STUDY: DHCPv6 DUID



DUID LL

```
> Frame 9955: 142 bytes on wire (1136 bits), 142 bytes captured on interface 0
> Ethernet II, Src: Cambridg_3c:ab:c6 (a8:58:40:3c:ab:c6), Dst: 01:00:00:00:00:00
> PPP-over-Ethernet Session
> Point-to-Point Protocol
> Internet Protocol Version 6, Src: fe80::e543:4440:8e39:5301, Dst: fe80::e543:4440:8e39:5301
> User Datagram Protocol, Src Port: 546 (546), Dst Port: 546 (546)
  DHCPv6
    Message type: Solicit (1)
    Transaction ID: 0x94ea5c
    Client Identifier
      Option: Client Identifier (1)
      Length: 10
      Value: 00030001a8583561abc6
      DUID: 00030001a8583561abc6
      DUID Type: link-layer address (3)
      Hardware type: Ethernet (1)
      Link-layer address: a8:58:35:61:ab:c6
    Elapsed time
    Identity Association for Prefix Delegation
    Vendor Class
    Option Request
```

CASE STUDY : DHCPv6 DUID

Link-layer address:

aabb:ccdd:eeff



CPE A

DUID:
00030001aabb3561eeff



ACCESS NETWORK



DHCPv6 Server

Same DUID!!!! -- > Only 1 CPE receive DHCPv6 PD

DUID:

00030001aabb3561eeff



CPE B

Link-layer address:

aabb:xyyy:eeff

By default, the DHCPv6 server will replace the existing client entry (CPE A) with a new entry (CPE B)

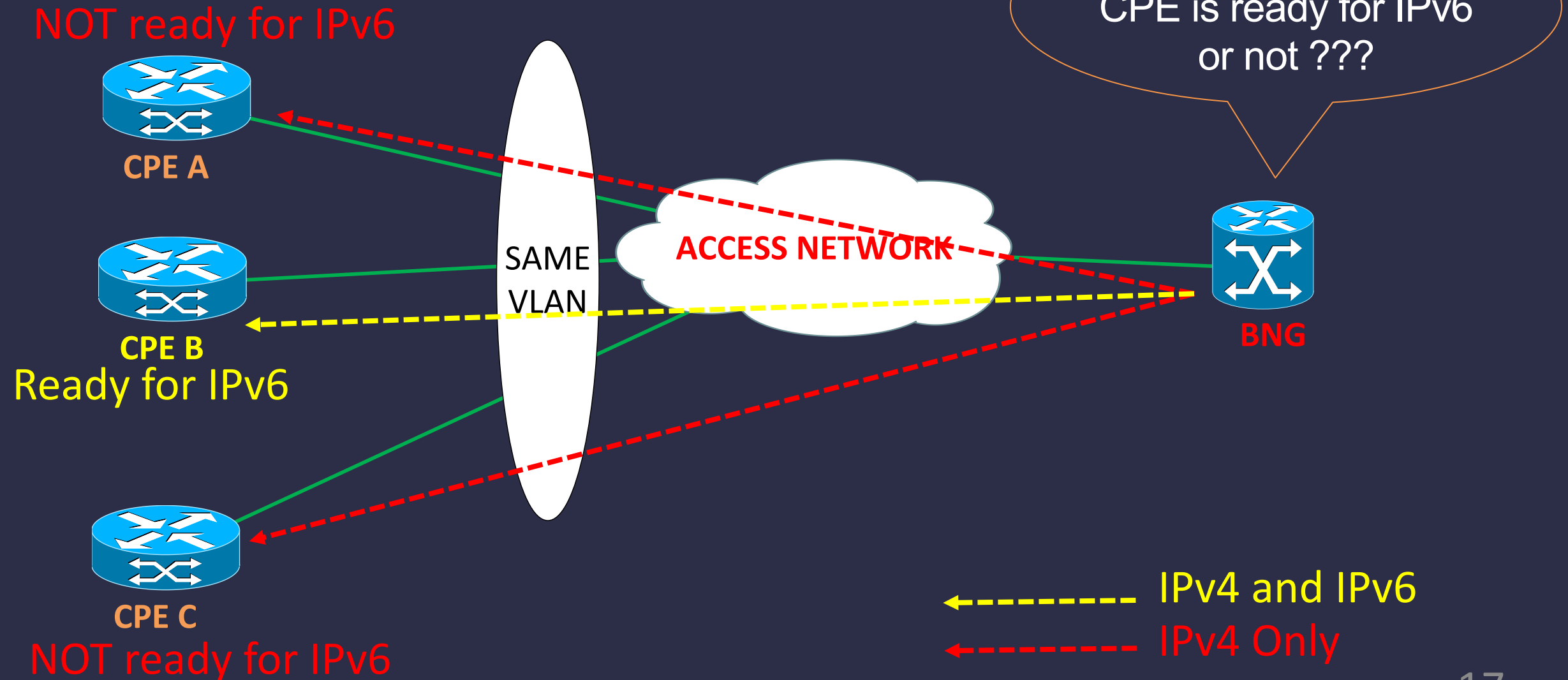
→ The CPE's vendor must fix DUID generate process

CASE STUDY:

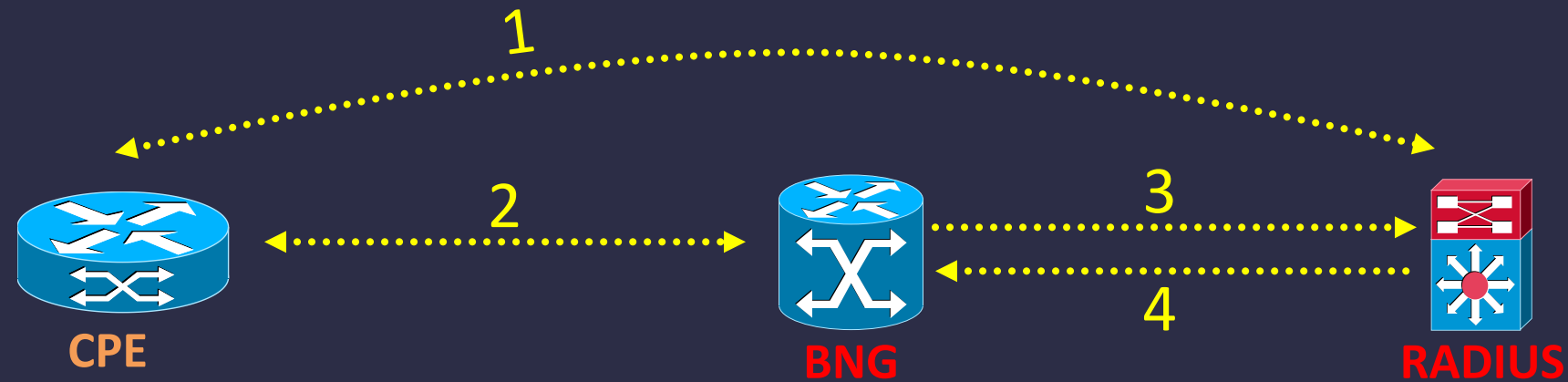


Deploy IPv6 for selected CPE

CASE STUDY: Deploy IPv6 for selected CPE



CASE STUDY: Deploy IPv6 for selected CPE



1 - By using TR069, Radius know CPE's model, firmware version, subscriber's username configed on the CPE

2, 3 – After finished PPPoE process (2), BNG send Access Request to Radius (3). Subscriber's username are included.

4 – From the information at the 1st step, Radius send IPv4 or dual IPv4/IPv6 dynamic profile to the BNG



THANKS FOR WATCHING

HAVE A NICE DAY