IPv6 Deployment in Operator's Network

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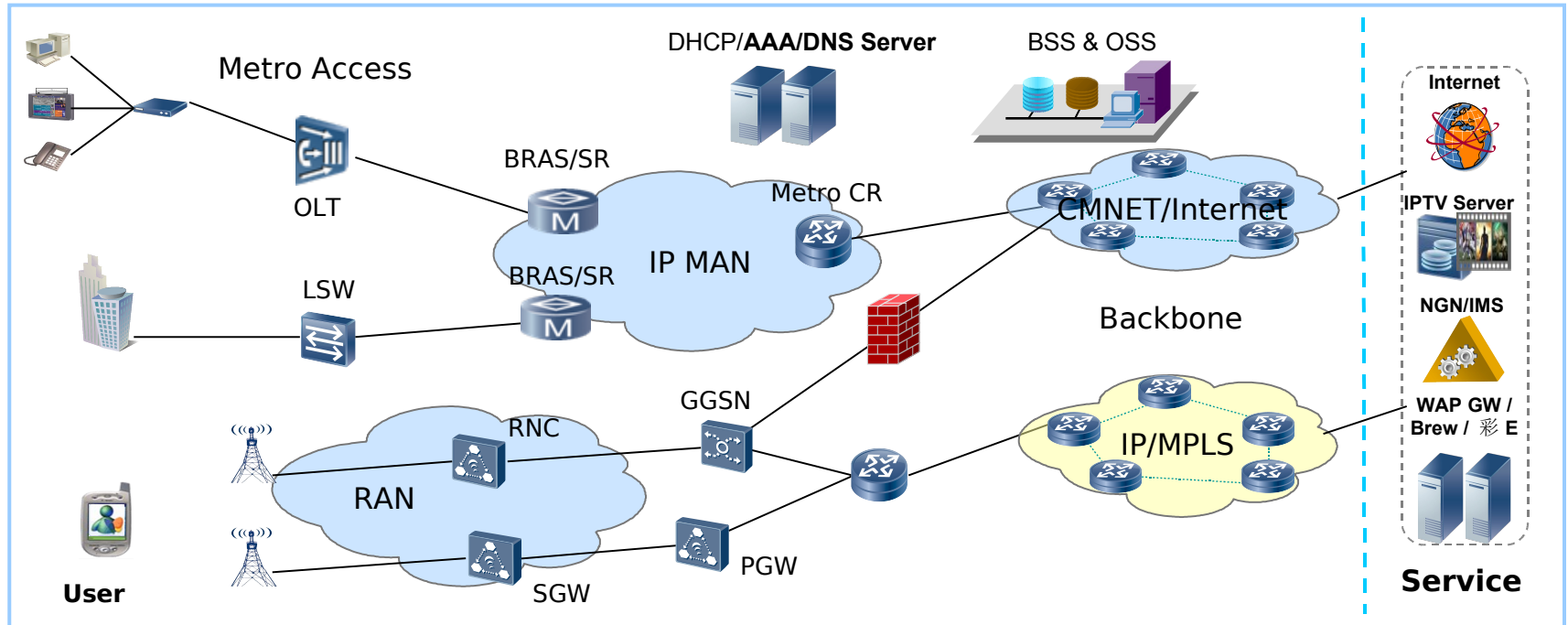
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Agenda

- **Overview**

- **Typical IPv6 Deployment Scenarios**

- **Summary**

Overview

- **IPv6 deployment considerations:**
  - Different scenarios in full service network
 - IPv6/IPv4 Coexist and Transit
  - IPv6 Mobility

Agenda

- **Overview**

- **Typical IPv6 Deployment Scenarios**

- **Summary**

IPv6 Migration Scenarios

■ **Every Provider's situation is different. There are three typical IPv6 deployments for different scenarios.**

➢ **PNAT: Only IPv6 Addresses can be allocated to Users**

➢ **DS-Lite: Each User obtains both IPv6 and private IPv4 addresses.**

➢ **Incremental CGN: IPv6 Addresses are assigned to the Users who prefer IPv6.**

PNAT from China Mobile
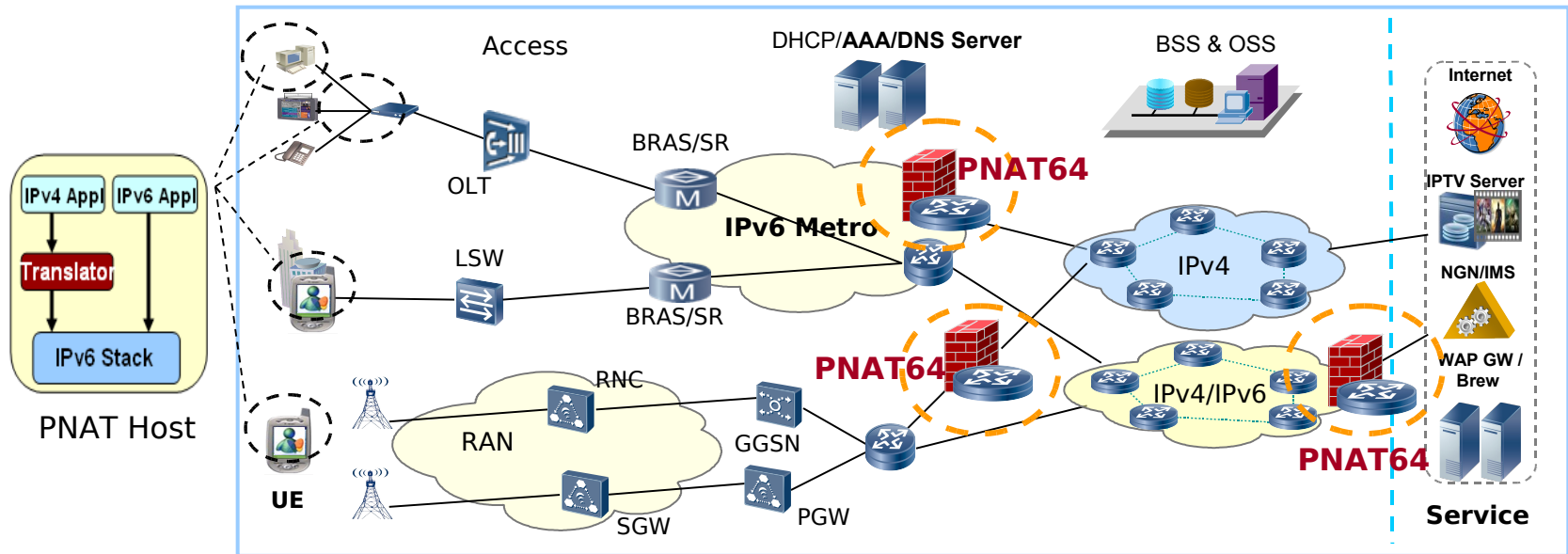
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- Provider deploys IPv6 access networks in order to simplify network operations.
- Provider allocates IPv6 Addresses to Users. IPv4 applications access their peers through IPv6 networks with assistance of PNAT module located on hosts.
- PNAT64 gateway provides protocol translation and ALG for special application too.
- PNAT64 gateway may deploy in two locations, one is in front of IPv4 server in the same ISP, the other is at the border between ISP IPv6 network and IPv4 backbone, for contents in the other ISP.

PNAT64 Gateway
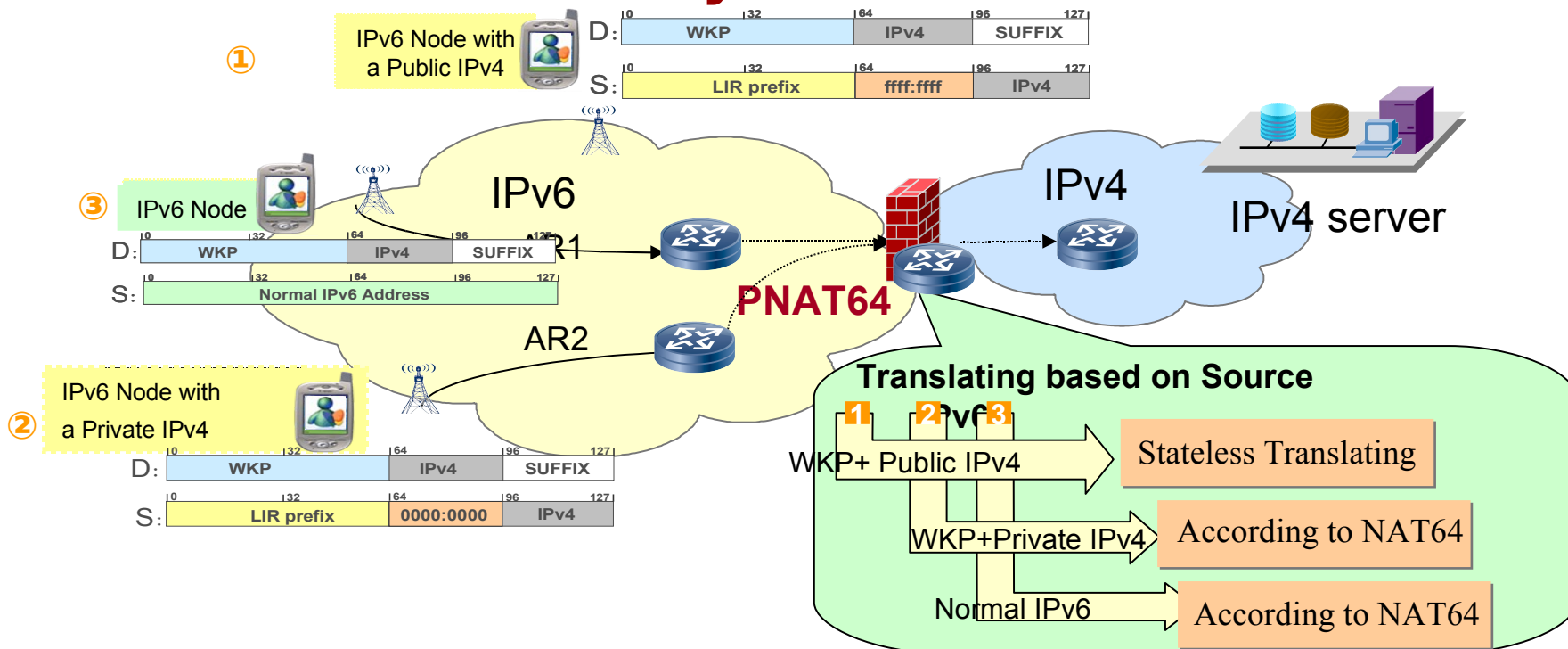
■PNAT64 extends NAT64. It translates the IPv6 packet with a WKP in its destination address. The translation operation is judged based on Source IPv6 Address:

1. if the prefix in Source IPv6 Address is a **Special LIR Prefix**,

    1.1 if a **PUBLIC** IPv4 is embedded (65-96 bit is all 1) ,PNAT64 acts as a **stateless translator** and picks out Public IPv4 as a DA of translated IPv4 packet

    1.2 else if a **PRIVATE** IPv4 is embedded (65-96 bit is all 0), PNAT64 acts as the normal NAT64 procedure, and creates a mapping entry.

2. Else the source address is a normal IPv6, PNAT64 acts as the normal NAT64 procedure.

DS-Lite (with NAT44)
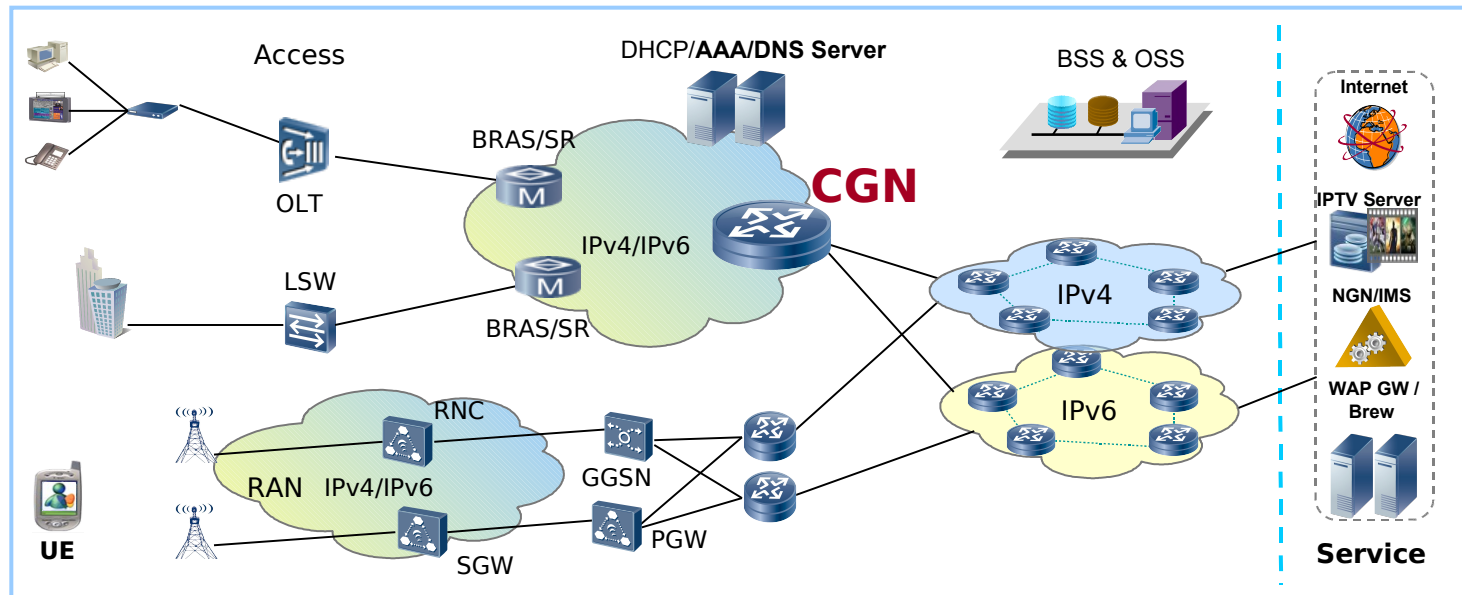
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Draft-ietf-softwire-dual-stack-lite-01

- Phase-1: Access networks are IPv4 only with NAT44 deployed. Users are assigned private IPv4 addresses.

- Phase-2: Access networks are running IPv4-IPv6 dual-stack. Users may be assigned with IPv6 addresses in order to access IPv6 contents.

- Phase-3: Access networks are IPv6 only with DS-Lite devices deployed. Users' IPv4 traffic is tunneled through IPv6 networks toward IPv4 networks.

Incremental CGN
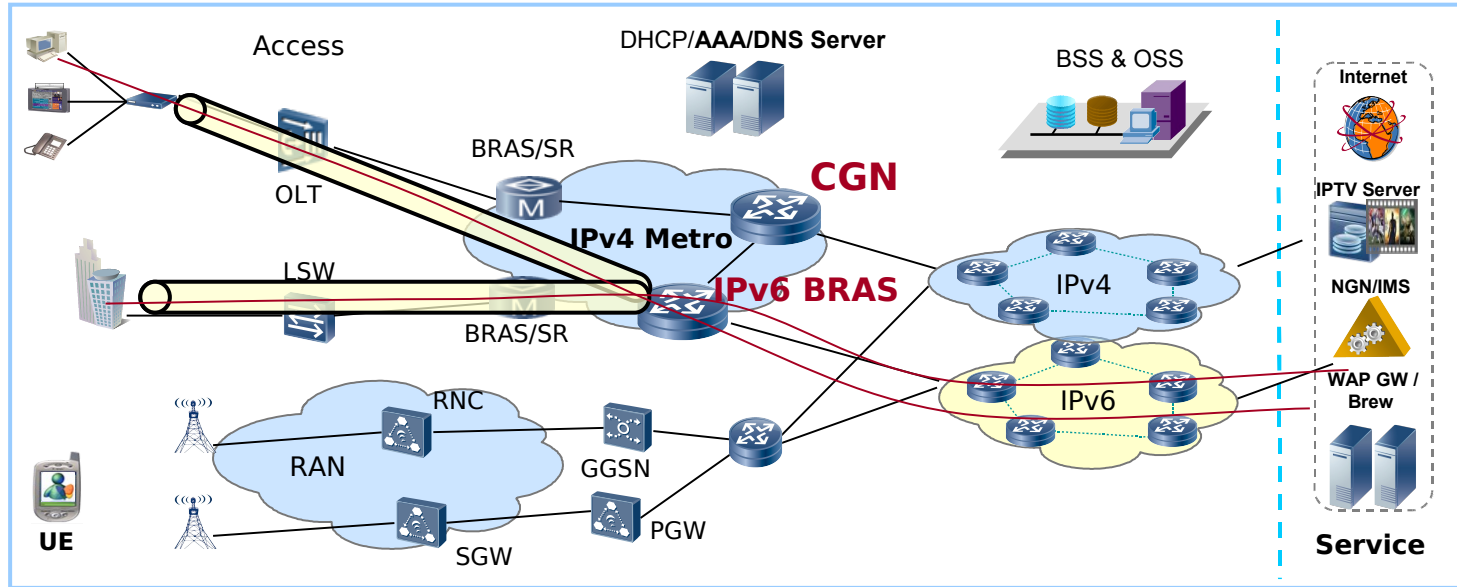
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- A rapid IPv6 deployment in IPv4 infrastructure.

- DHCP server allocates Private IPv4 for users. Users visit IPv4 Internet via CGN(NAT44).

- Users who prefer IPv6 connect IPv6 Internet using 6-in-4 tunnel between CPE and IPv6 BRAS.

- Solution for both IPv4 depletion and avoiding hardware upgrade of many legacy equipments in access and metro network.

# Automatic Discovery of Tunnel Concentrator
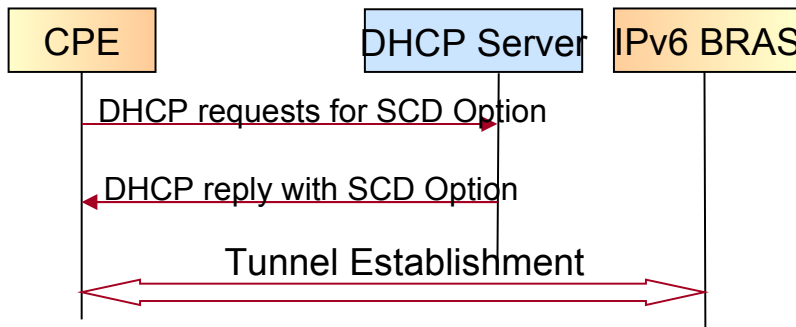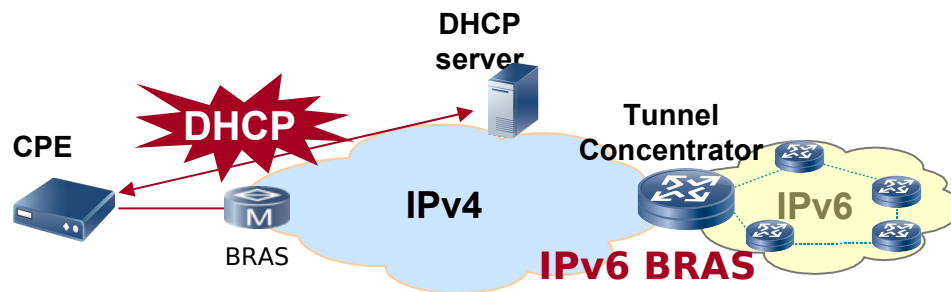
SCD Option in DHCP or PPP

Code	Length	T-Type	Prefer
IPv4 Address			
Sub-Option			

T-Type	Tunnel type which users connect to Tunnel Concentrator	
Prefer	This indicates the preference level for Tunnel Concentrator	
Sub-Option	To provide complementary tunnel information - Protocol Type - IPv6 Prefix - GRE Key	

draft-guo-softwire-sc-discovery-01

- **First of all, CPE must discover IPv6 BRAS automatically.**
- **IPv6 BRAS Discovery using DHCP SCD Option (or extending PPP).**
  - SC information is stored in the DHCP Server.
  - When a DHCP server answers a client request message, SCD Option can be carried in a DHCP reply message.
- **GRE key in Sub-Option may be assigned to CPE, which used to authenticate user in IPv6 BRAS.**

Tunnel Establishment and Access Control
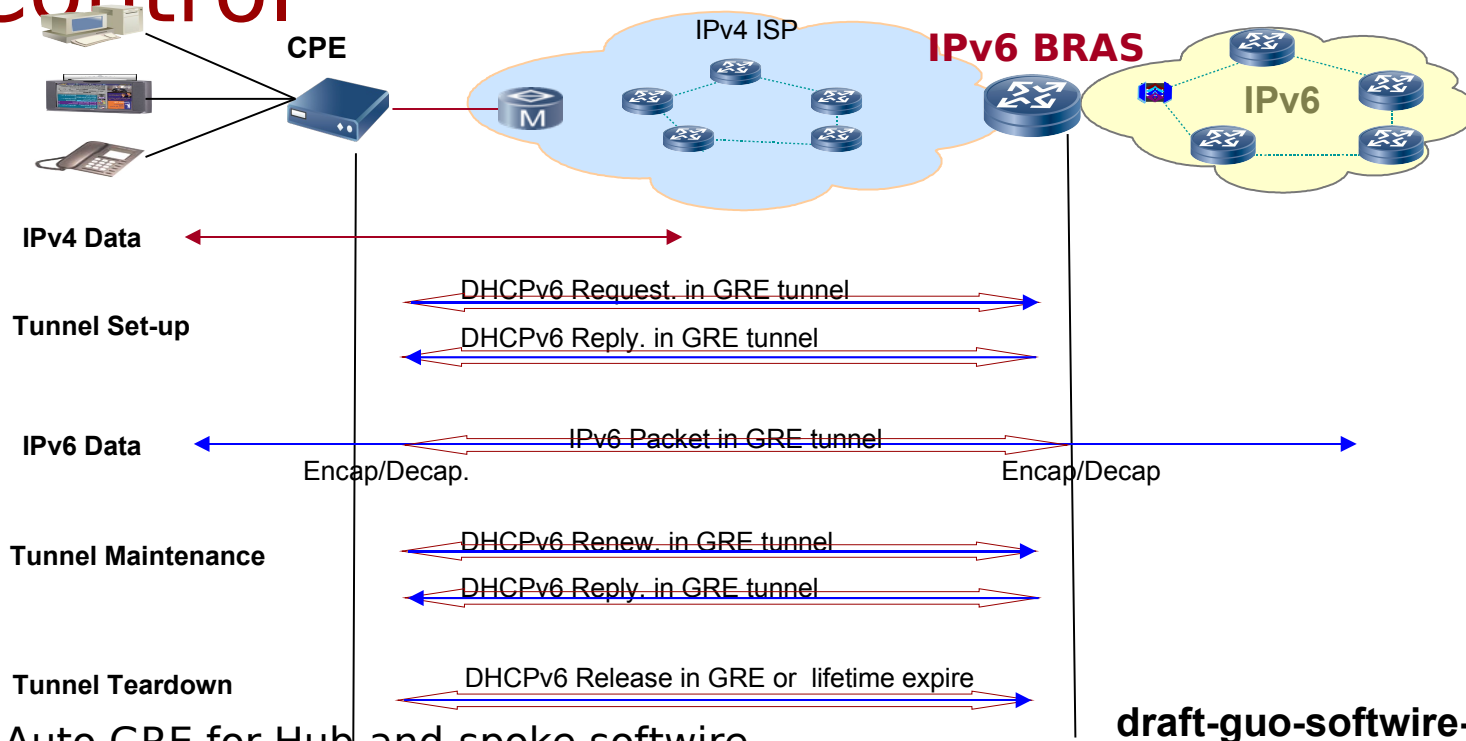
- Auto GRE for Hub-and-spoke softwire
  - DHCPv6 (PD) act as both configuration and signal protocol of tunneling
  - DHCP request/reply, renew, release message are respectively used to identify set-up, teardown state of the tunnel
- IPv6 Access Control
  - checks outer IPv4 address and GRE key binging information
  - checks inner IPv6 address in GRE tunnels
  - limits connection session number per user

Summary

- **Operators are facing multiple problems in their networks during IPv4 address depletion, IPv4 and IPv6 co-exist, and IPv6 transitions.**
- **Operators also have varies IPv6 transition technologies and strategies to consider.**
- **Operators' decisions must be based to the best of their own business, including sustaining and growing the current services, introducing new applications, and staying with competitive.**

Thank you

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