

# Public IPv4 over Access IPv6 Network

draft-cui-software-host-4over6-04

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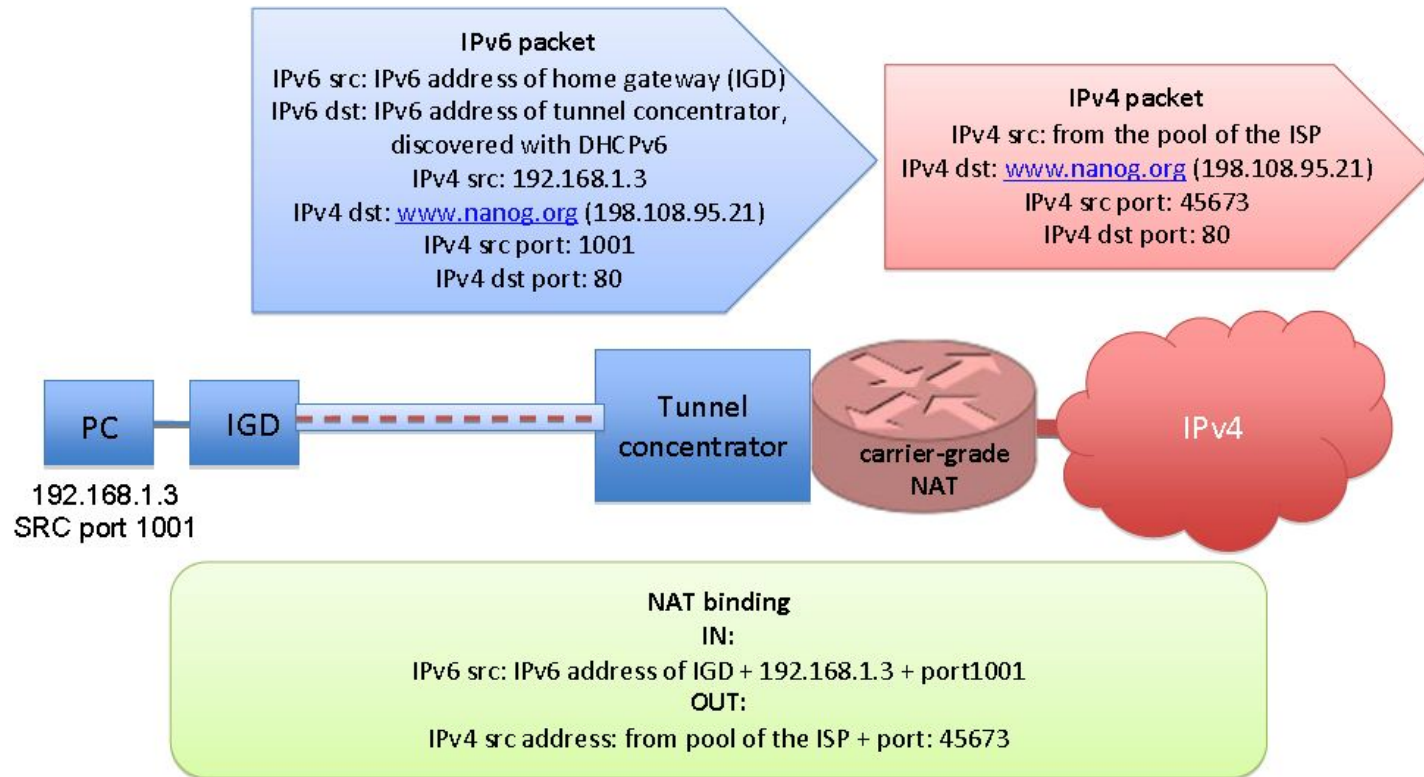
# Outline

- Introduction
- Basic idea & use cases
- Key issues & elements
- Example of public 4over6
- DHCPv4 over IPv6 tunnel
- CPE case study
- Summary

# Introduction

- When upgrading to IPv6, ISP needs to sustain IPv4 service for network users
  - CP/SP's lag on supporting IPv6 contents/apps
  - IPv6 User's demand to connect with IPv4
- IPv4 connectivity Requirement
  - Support all existing IPv4 apps
  - Ability to be visited by IPv4(e.g., app server)
  - Full bi-directional IPv4 connection
- Leverage ISP's existing IPv4 address blocks

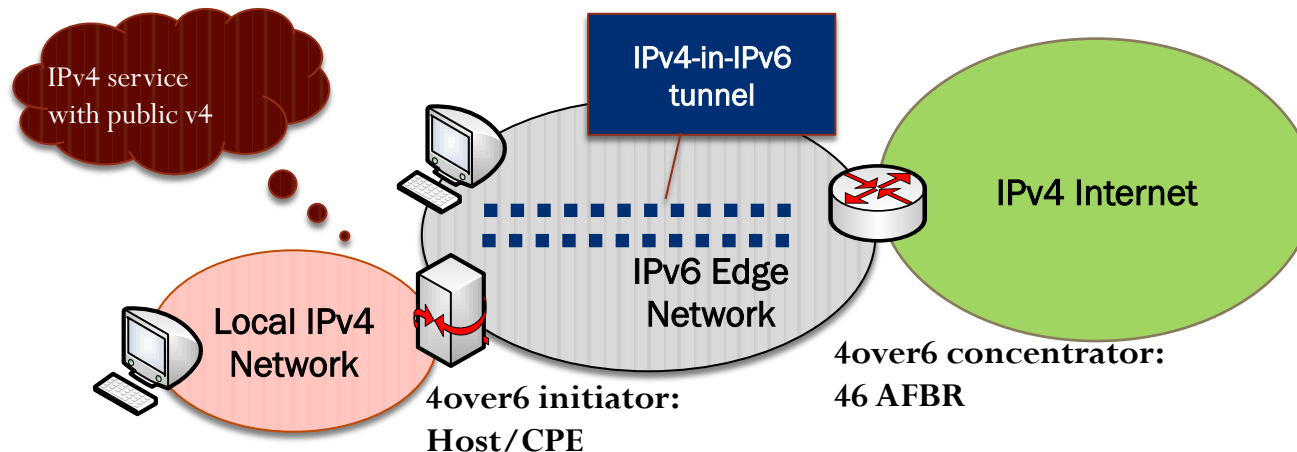
# DS-lite: what we have now



- User-side: private IPv4 address
- AFTR: CGN address+port translation
- What's missing?

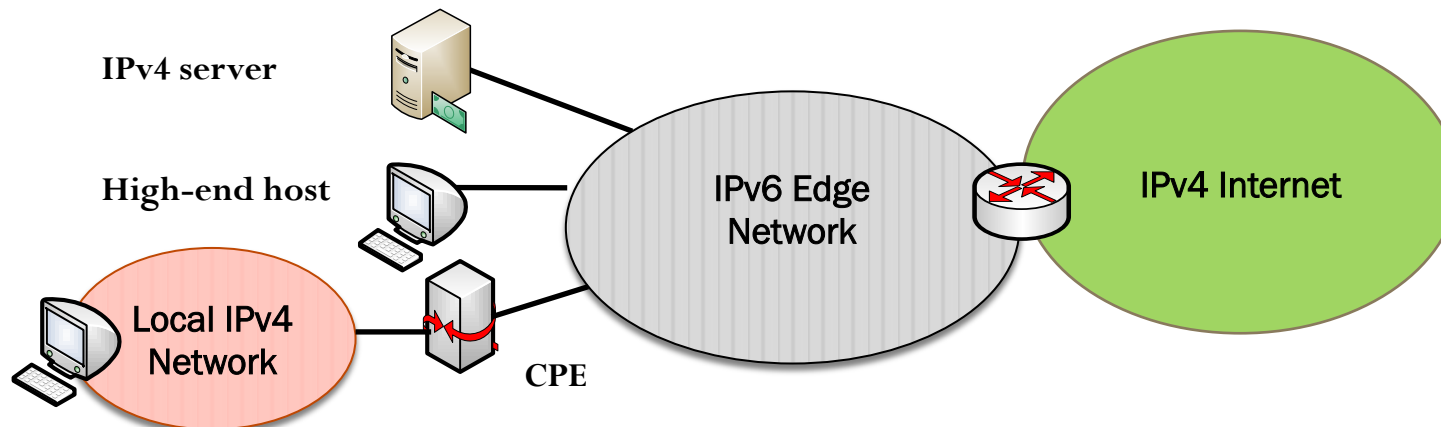
# Basic idea of Public 4over6

- Allocate public address to user side
  - host directly-connected to IPv6, or local IPv4 network
- IPv4-in-IPv6 tunnel between user and 46AFBR for data forwarding
- Address availability consideration
  - The more users switch to IPv6, the more IPv4 addresses we can collect & re-allocate to IPv6
  - Value-added service beyond DS-lite



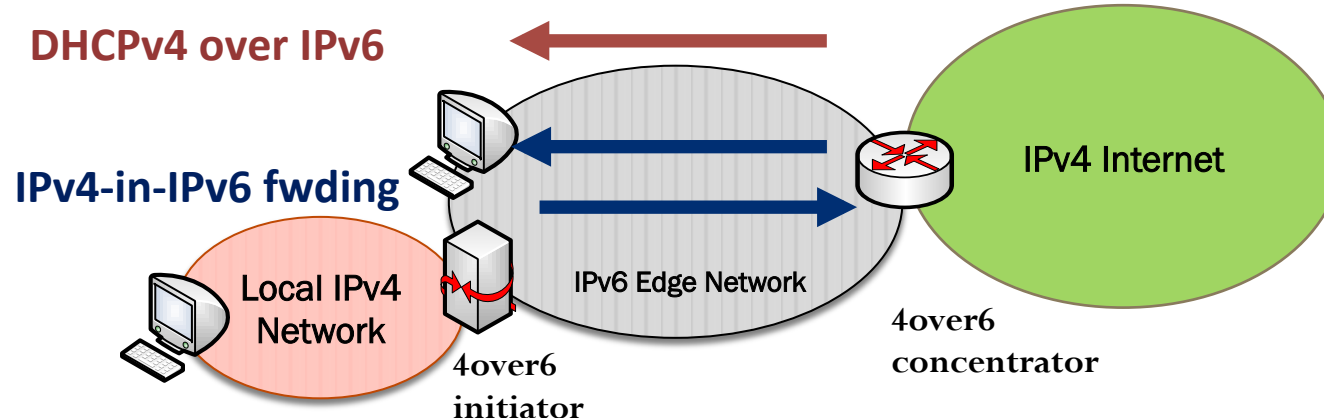
# Use cases

- **high-end user(host/local network):** own global IPv4 address to support various apps
- **Servers:** Move IPv4 servers to IPv6 networks without loss of IPv4 clients
- **Having global IPv4 addresses will be a Value-Added Service beyond basic DS-lite**
- **ISP with enough IPv4 addresses to support (part of) its users**



# Key issues

- IPv4 address allocation over IPv6
  - Static/DHCP over IPv6 tunnel
- Data forwarding
  - IPv4-in-IPv6 encapsulation & decapsulation
  - For encapsulation of inbound packets on concentrator
  - (Allocated IPv4 addr, user IPv6 addr) mapping on the concentrator

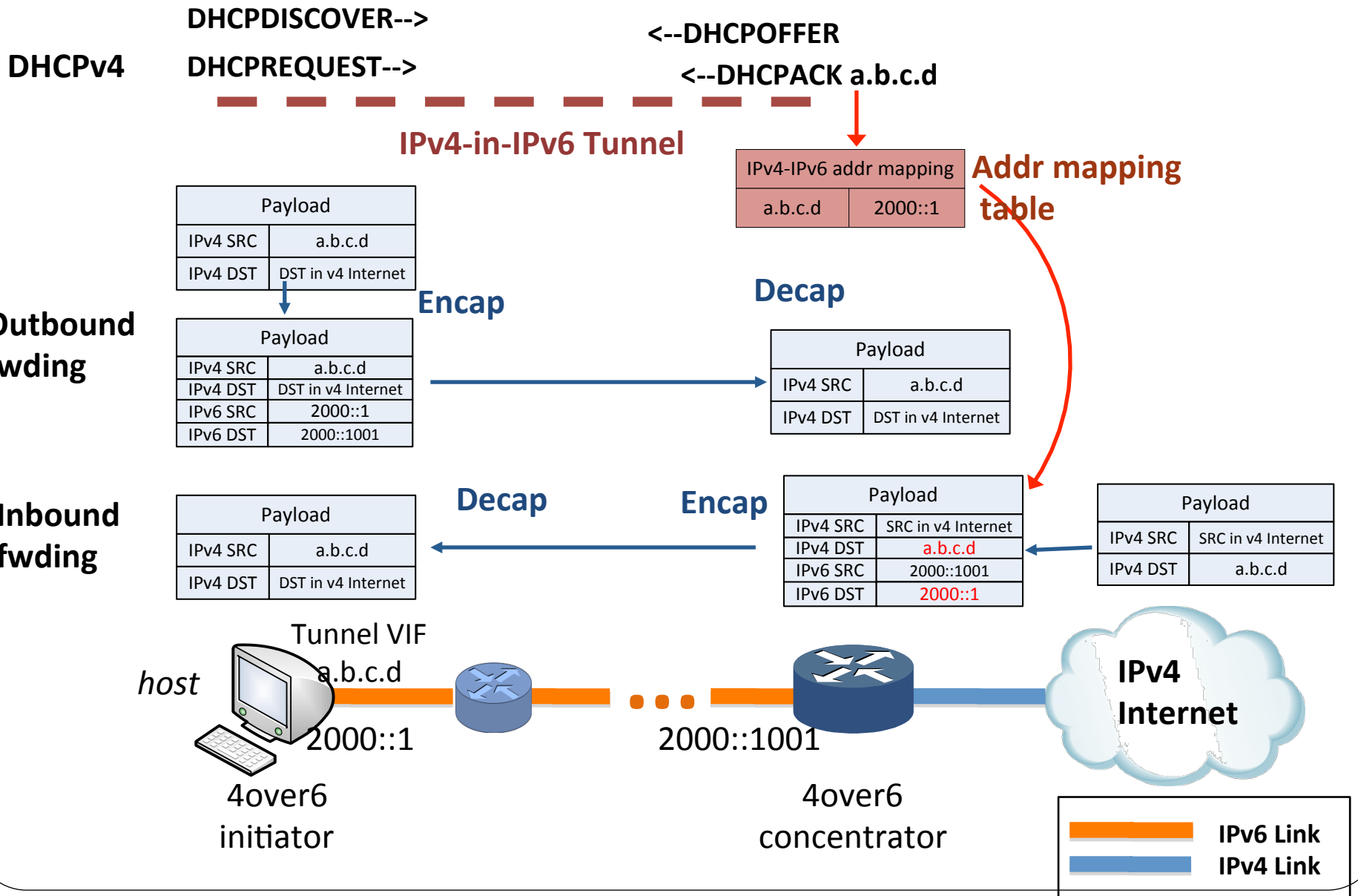


# Public 4over6 elements

- 4over6 initiator
  - 2 cases with slight differences
    - Direct-connected host
    - NATed CPE: private v4 in local network
  - DHCP client supporting tunneled DHCPv4
  - IPv4-in-IPv6 encap & decap
- 4over6 concentrator
  - DHCP server supporting tunneled DHCPv4
  - IPv4-IPv6 address mapping
  - IPv4-in-IPv6 encap & decap

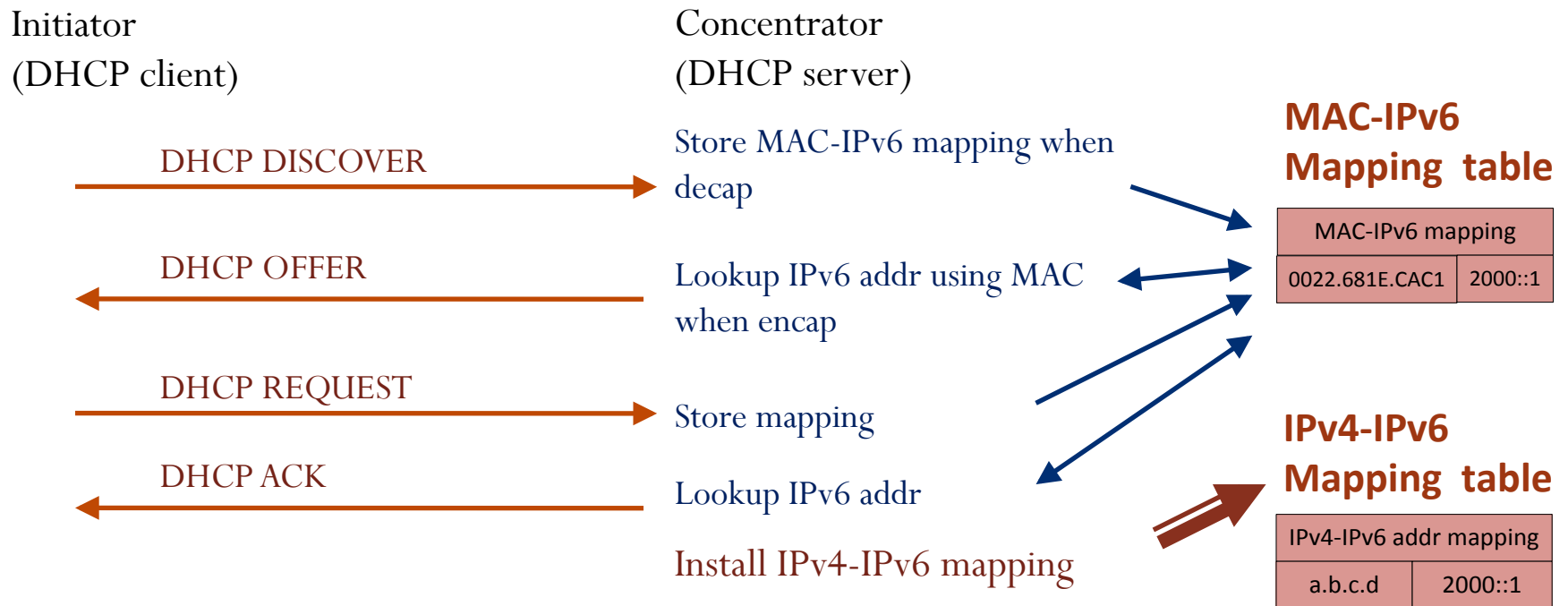


# Example of public 4over6



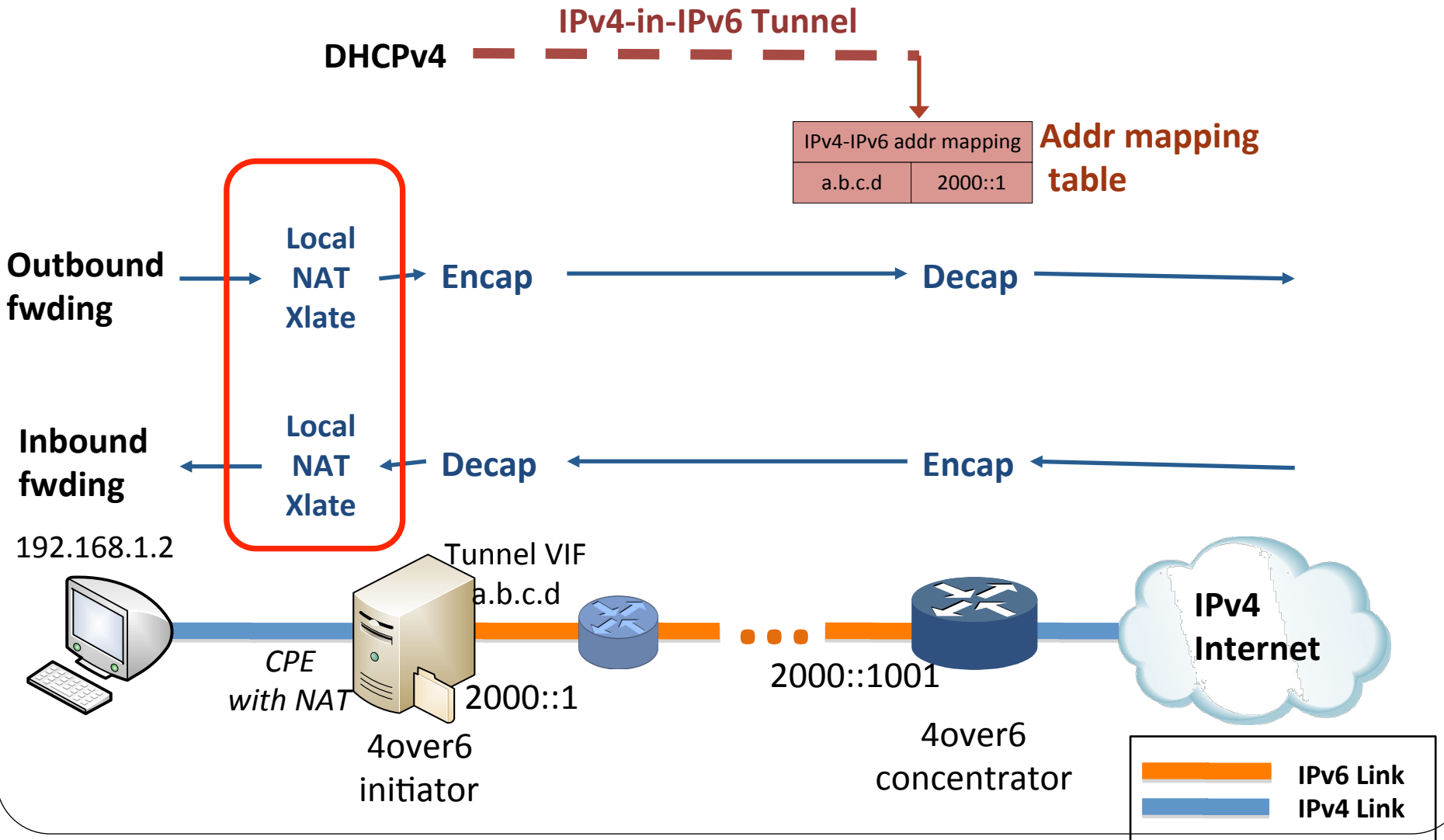
# DHCPv4 over IPv6 tunnel

- What's tricky here: before DHCP allocation, the initiator doesn't have IPv4 addr, and the concentrator doesn't have the IPv4-IPv6 mapping for encapsulation
- Store MAC-IPv6 mapping temporarily before decap DHCP
- Use MAC address to look up IPv6 address when encap DHCP



# CPE case

---Similar to Host initiator case, with a local NAT



# Summary

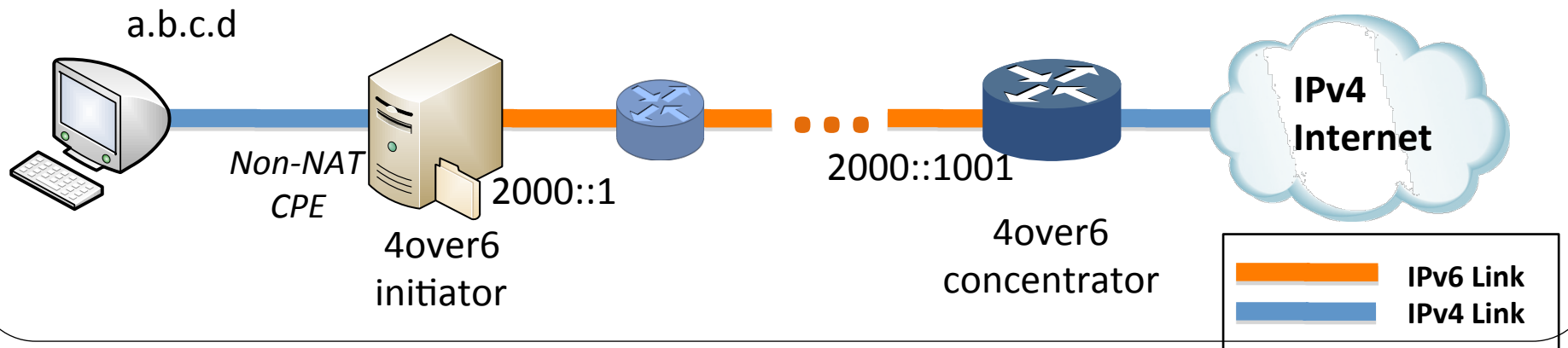
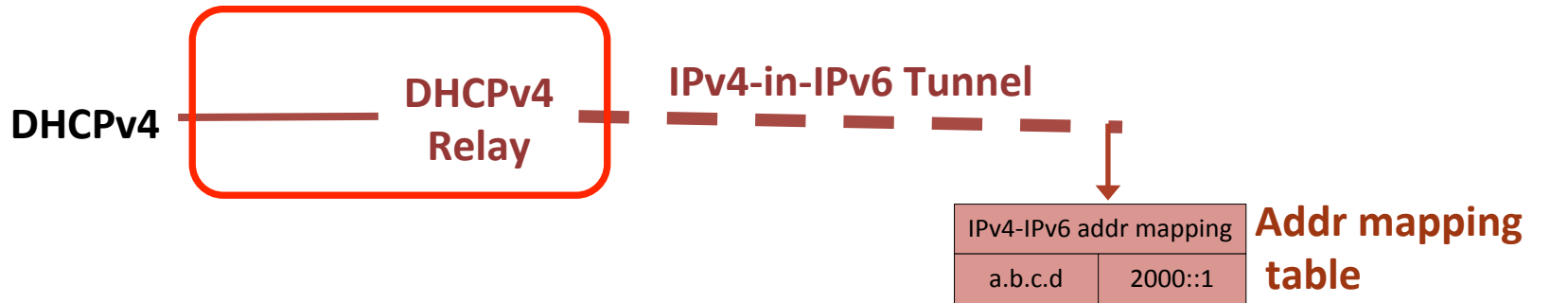
- Achievement of Public 4over6
  - Sustain IPv4 applications when users switch to IPv6
  - Support bidirectional IPv4 communication
  - Avoid CGN and support all apps
  - Avoid per-flow state maintenance on concentrator
- Ensure high-priority host/network to have full access to IPv4 without NAT
- Encourage IPv4 servers move to IPv6 without loss of IPv4 users

# Summary

- Changes from 00-04
  - Stateless 4over6 in 01 (July 2010)
  - WG asks us to accomplish the stateful version first
  - Deployment flexibility on CERNET2
- Request for adoption as a WG document
- Q&A

# Backups(1/3): Non-NAT CPE case

---Public address to host behind CPE



# Backups(2/3): Stateless 4over6

DHCPv6

DHCPv6 server

← NSP:IPv4 addr::suffix

←----- IPv4 addr

IPv4 allocation  
embedded in IPv6

IPv6 routing → NSP:IPv4 addr::/

NSP::/ ←

Payload	
IPv4 SRC	a.b.c.d
IPv4 DST	V4 DST

Payload	
IPv4 SRC	a.b.c.d
IPv4 DST	V4 DST
IPv6 SRC	2000::a.b.c.d
IPv6 DST	2000::v4 DST

Payload	
IPv4 SRC	a.b.c.d
IPv4 DST	v4 DST

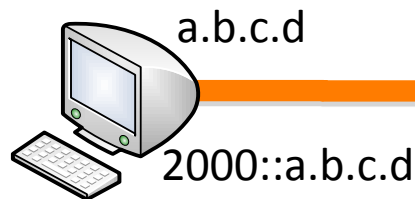
Payload	
IPv4 SRC	a.b.c.d
IPv4 DST	DST in v4 Internet

Payload	
IPv4 SRC	v4 SRC
IPv4 DST	a.b.c.d
IPv6 SRC	2000::v4 SRC
IPv6 DST	2000::a.b.c.d

Payload	
IPv4 SRC	V4 SRC
IPv4 DST	a.b.c.d

Outbound  
fwding

Inbound  
fwding



Encap

Decap

Decap

Encap

IPv4  
Internet

# Backups(3/3): comparison

- Public 4over6 vs. DS-lite
  - Public address vs. private address on user side
  - Bi-directional communication vs. user initiated communication
  - No NAT(or local NAT) vs. CGN
  - Address level state vs. flow level state
  - Sustain DHCPv4 as an IPv4 information carrier.
  - “De-ported DS-lite”
- Stateful 4over6 vs. stateless 4over6
  - Light-weight state vs. no state
  - IPv4/IPv6 addressing and routing: independent & flexible vs. IPv4-IPv6 coupling
  - Multiplexing: allocation on demand with Local NAT vs. “A+P” style multiplexing coupling in IPv6
  - Stateful 4over6 sustains DHCPv4 as an IPv4 information carrier