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Incremental CGN For IPv6 Transition

draft-jiang-incremental-cgn

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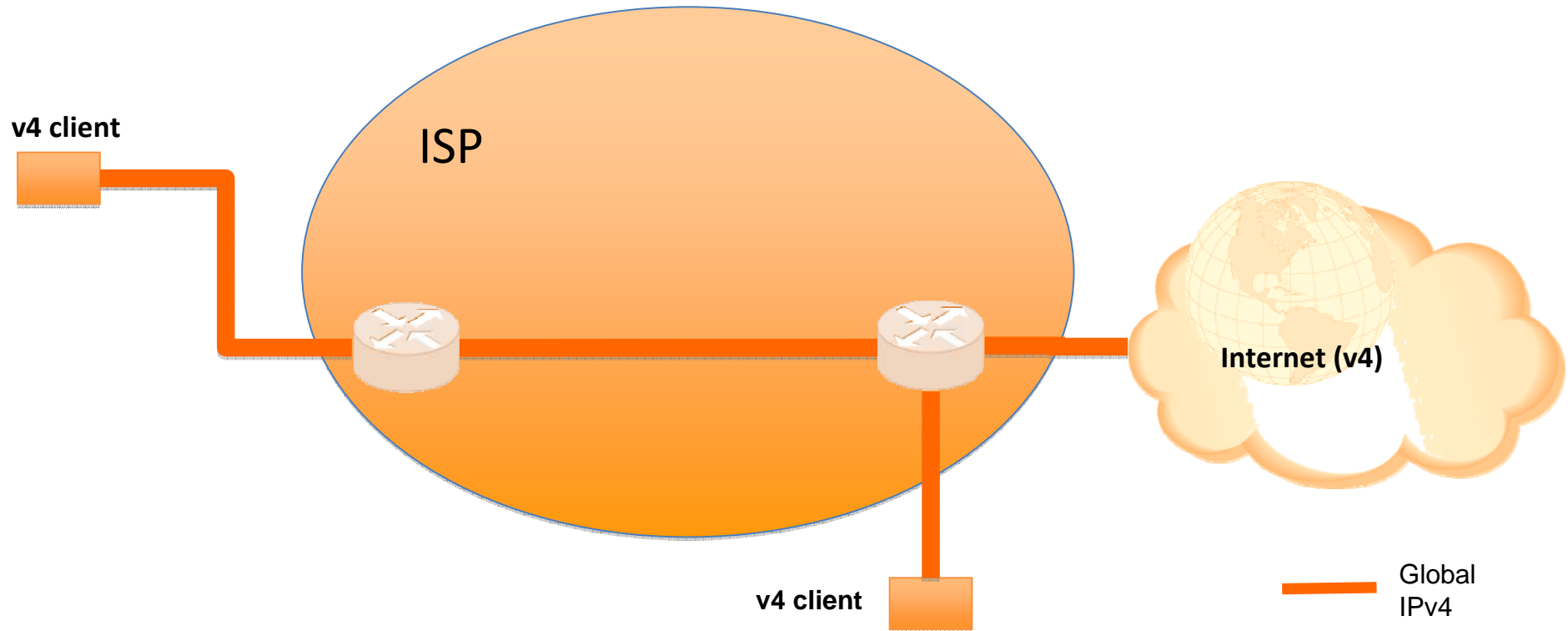
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Motivation

- **Many ISPs are deeply invested in IPv4, and very reluctant to disturb existing operations.**
 - True even if they understand the need to deploy IPv6 soon.
- **A deployment scenario is needed that**
 - meets immediate pressure on IPv4 resources,
 - preserves existing operations,
 - actively encourages IPv6 adoption.
- **A combination of CGN and easy support of IPv6-in-IPv4 tunnels meets these needs.**
 - Not discussing the disadvantages of CGN here.
 - But CGN must not become an excuse for delaying IPv6.
- **This is an operational model, not a protocol proposal.**

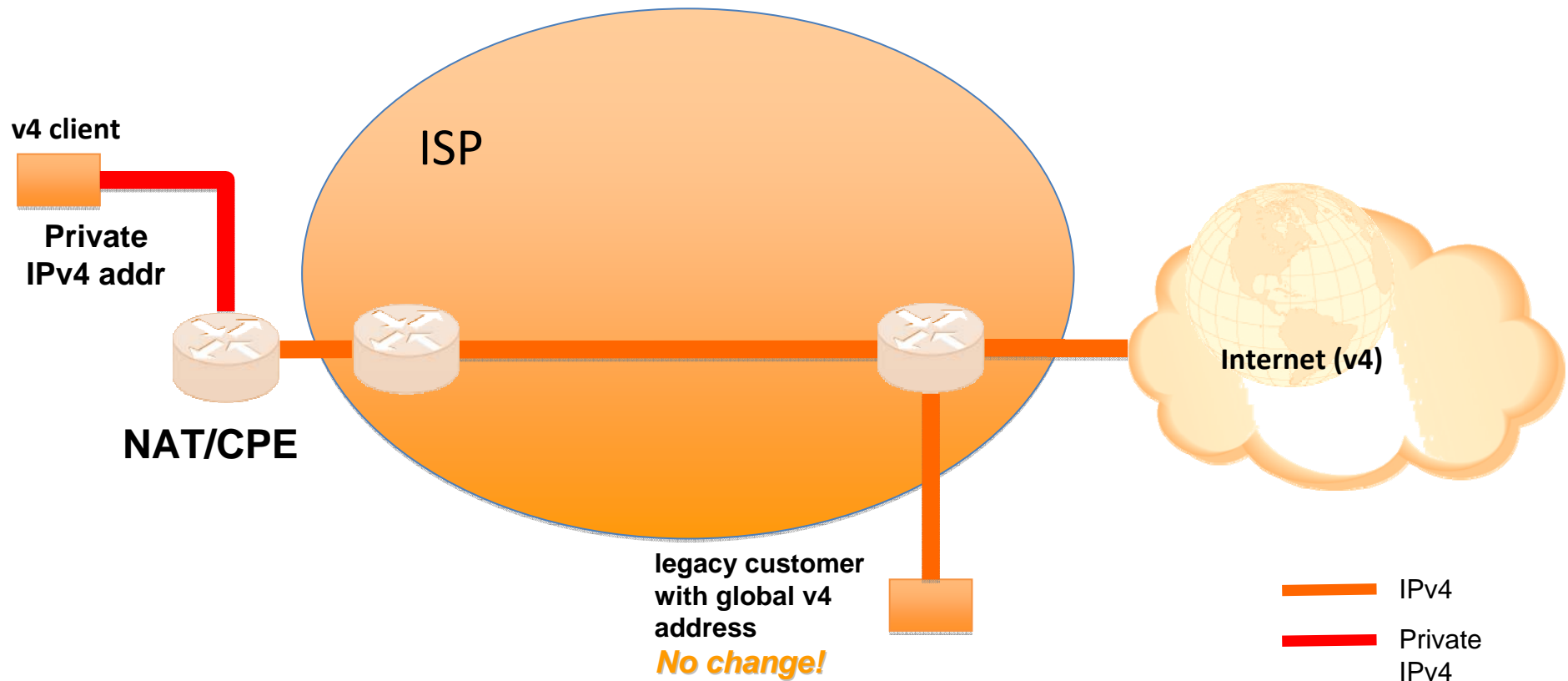
Traditional IPv4 (1983~1995)

- Global IPv4 Internet
- ISP IPv4 Forwarding Network
- Clients have global IPv4 prefix to access Internet directly



IPv4 Network with NAT/CPE (1996+)

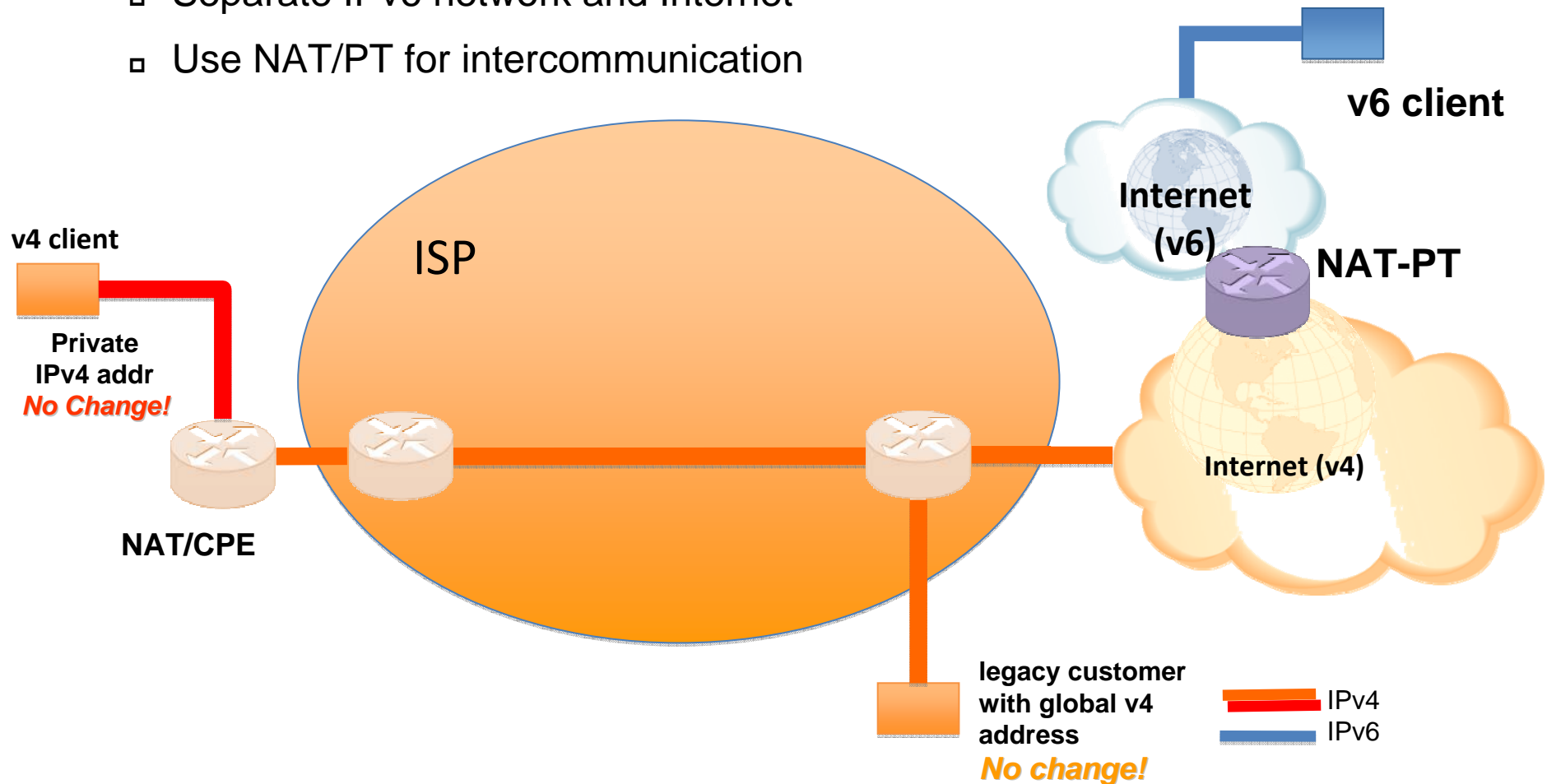
- Short of global IPv4 addresses: one address per customer
- Many IPv4 clients use private IPv4 addresses
 - Access IPv4 network through NAT/CPE devices



IPv6 Network and Internet (1998+)

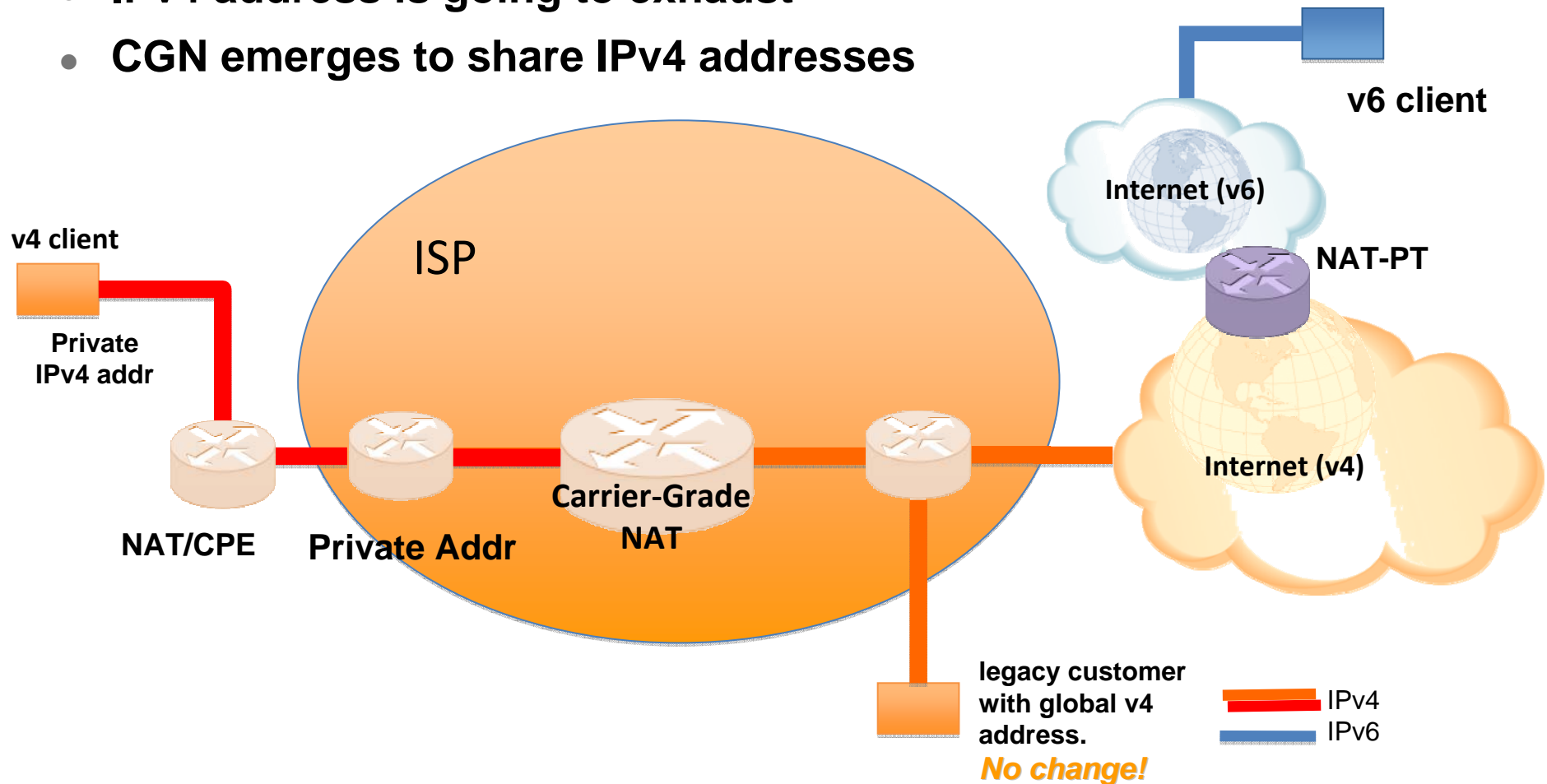
- Assuming no dual stack deployment by this ISP

- Separate IPv6 network and Internet
- Use NAT/PT for intercommunication



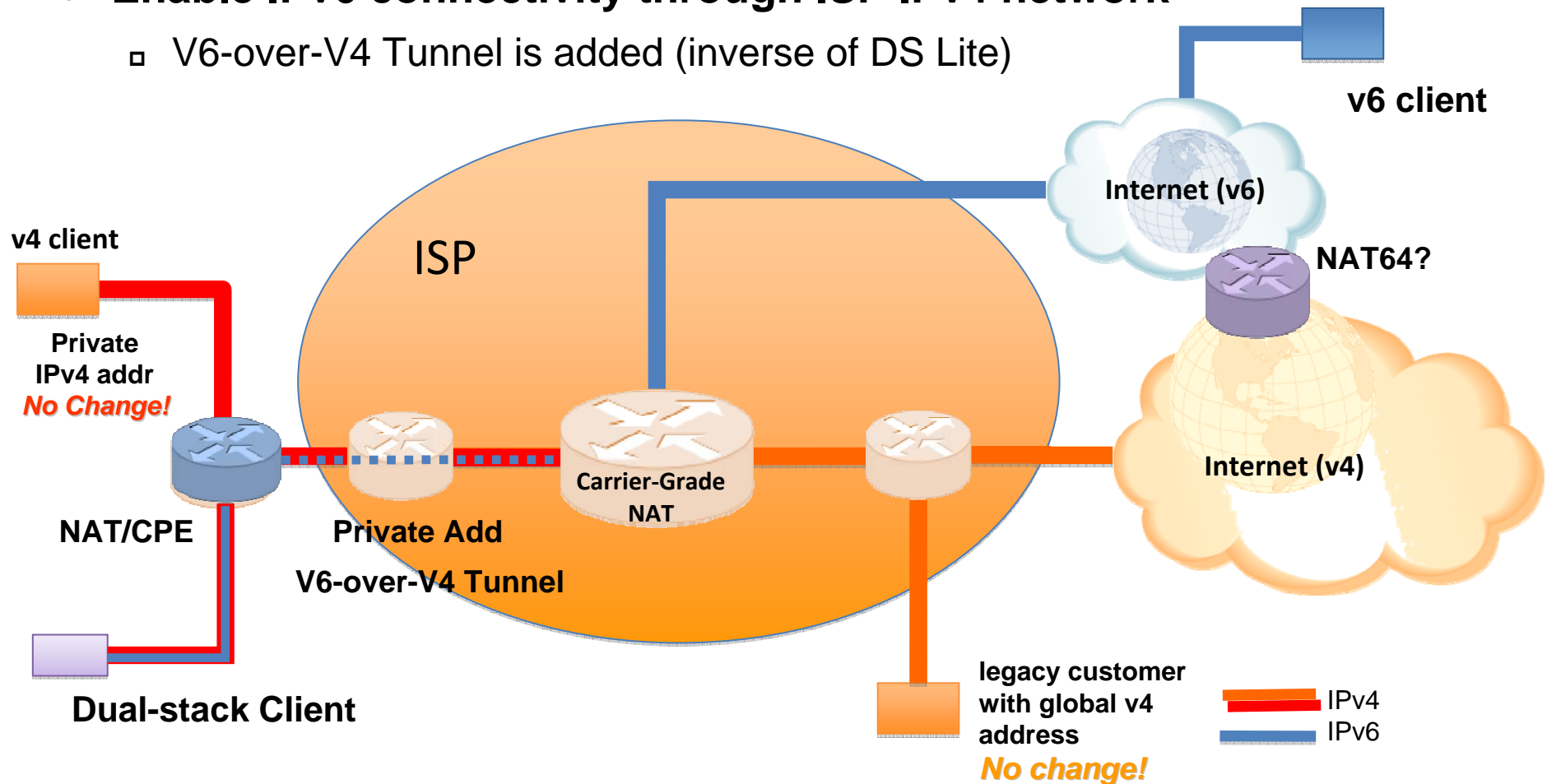
Carrier-Grade NAT (2008+)

- IPv6 global deployment is slower than expectation
- IPv4 address is going to exhaust
- CGN emerges to share IPv4 addresses



Incremental CGN Phase 1 (2009+)

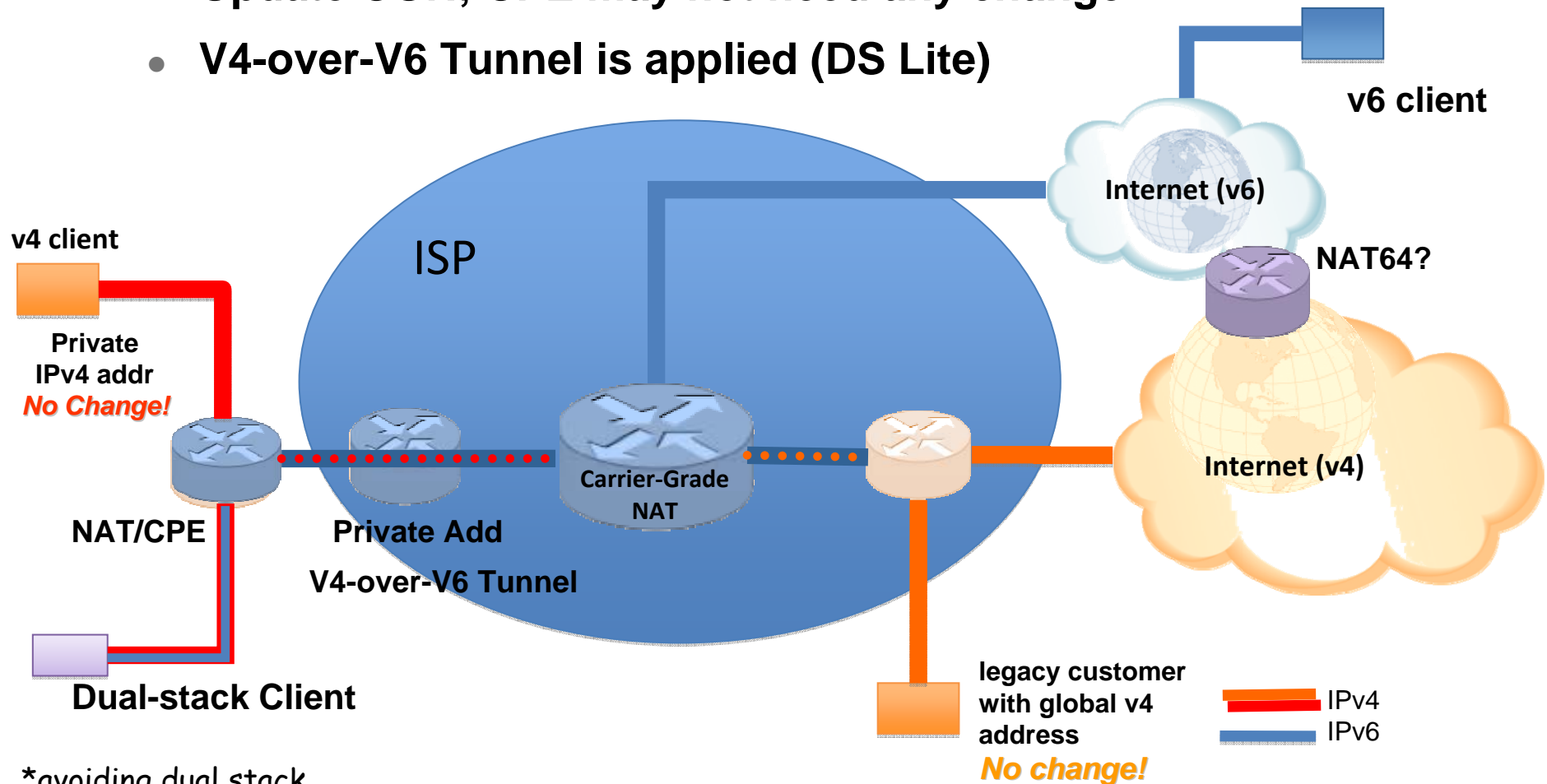
- CPE & CGN add more functions
- Enable IPv6 connectivity through ISP IPv4 network
 - V6-over-V4 Tunnel is added (inverse of DS Lite)



Incremental CGN Phase 2 (201x+)

When ISP decides to switch the whole network to IPv6*

- Update CGN; CPE may not need any change
- V4-over-V6 Tunnel is applied (DS Lite)



Details

- **Like 6RD and DS Lite, the CPE must know what's going on.**
 - New CPE for CGN users; legacy v4 customers can retain CPE.
- **ISP gains IPv6 experience and confidence during Phase 1, with no risk to IPv4 operations.**
 - Defers most IPv6 deployment effort to Phase 2.
 - Allows ISP never to run dual stack routing.
 - But does not prevent dual stack routing if preferred.
- **CPE may auto-detect the change from Phase 1 to Phase 2.**
- **Phase 1 tunnels could be 6RD, ISATAP or VET?**
 - MTU size at least 1500
- **Phase 2 tunnels are DS Lite**
 - No tunnels if ISP chooses dual stack deployment, but we are not recommending that.

Discussion

- **For IPv4 traffic, this solution inherits all problems of CGN (e.g., scaling, and the difficulty of supporting well-known ports for inbound traffic). Application layer problems created by double NAT are for further study.**
- **For IPv6 traffic, a user behind the CPE will see normal e2e IPv6 service. This should create an incentive for users and application service providers to prefer IPv6.**
- **Questions, clarifications?**
- **Where next?**