Unified IPv6 Transition Framework With Flow-based Forwarding

draft-cui-intarea-unified-v6-framework-01

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Motivation

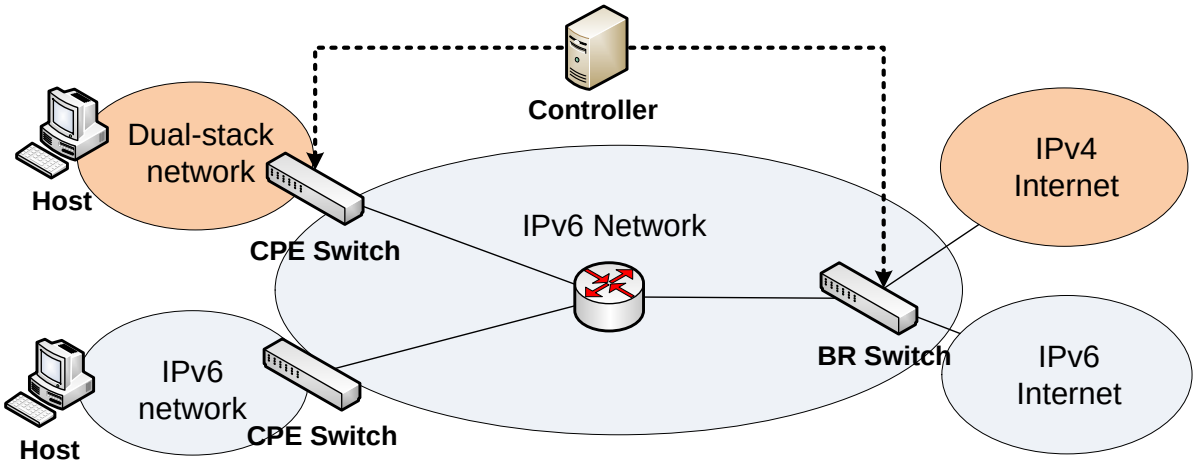
- Many IPv6 transition mechanisms for different requirements
  - tunneling: DS-Lite, Lightweight 4over6, MAP-E etc.
  - translation: NAT64, MAP-T etc.
- Combination of mechanisms is needed in order to fulfill requirements
  - Various implementations -> not cost-effective
- More flexible and cost effective if all these mechanisms can be implemented and deployed within a unified framework

Introduction

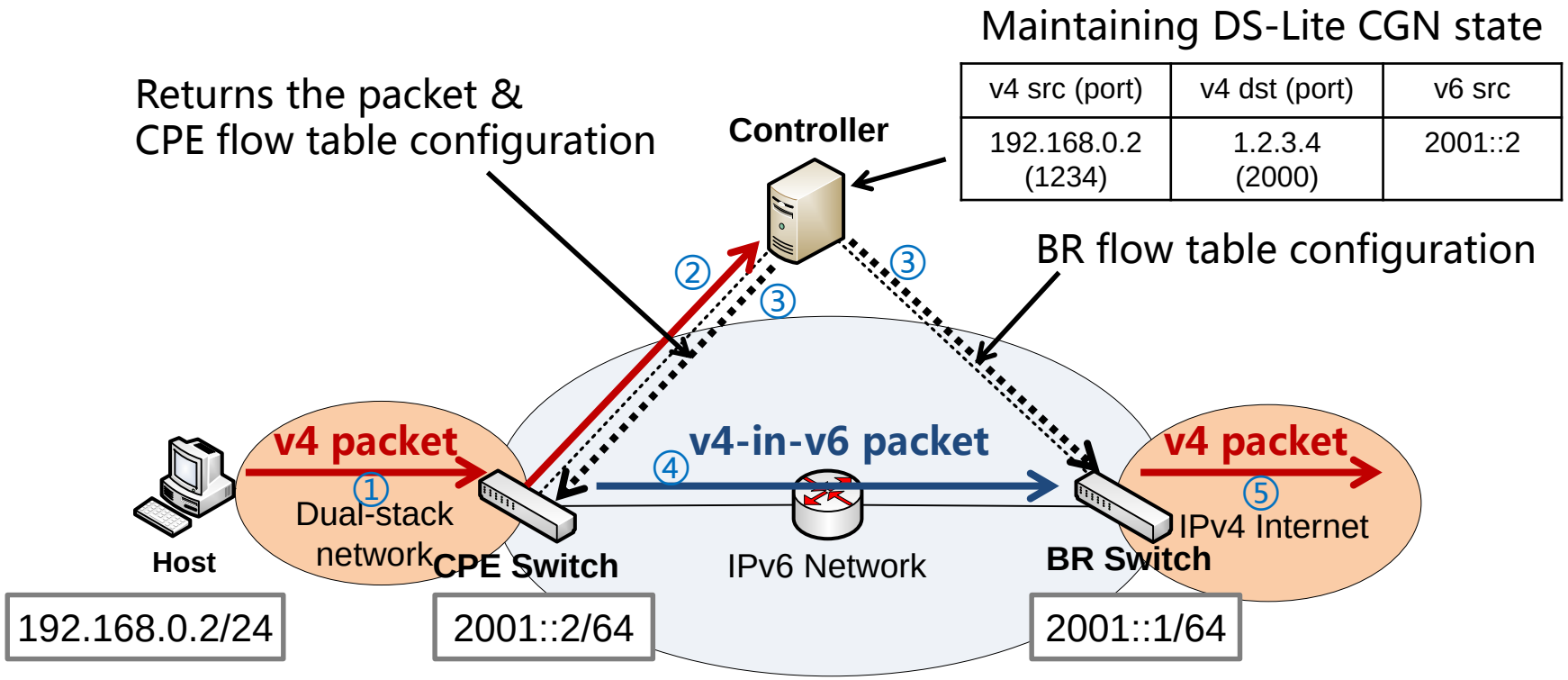
- Design a unified framework for IPv6 transition
  - Can implement current transition mechanisms
  - Unify multiple transition mechanisms
- Flow-based Forwarding, Separate control plane and data plane
  - Centralized controller to decide network behavior

Solution Architecture

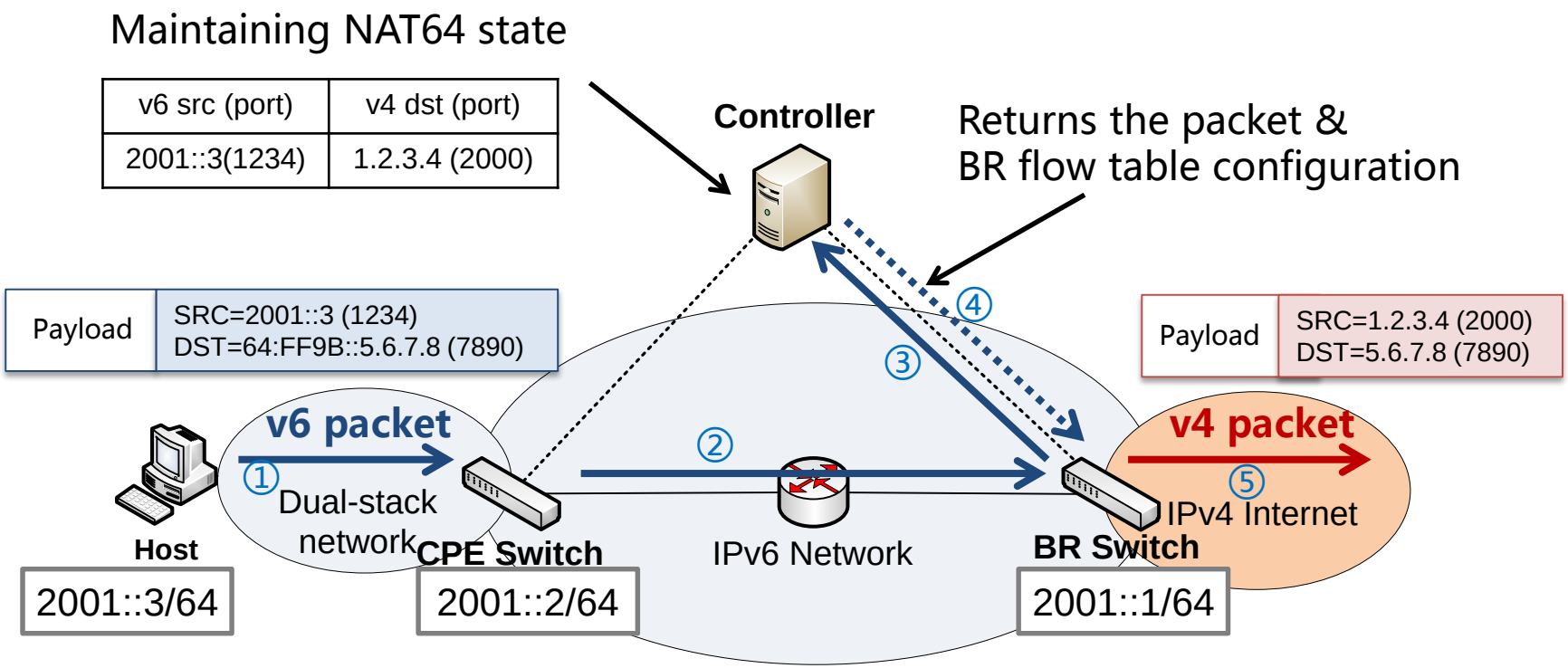
- CPE/BR Switches
  - Deployed at the border of network
  - When received a new flow, forward to controller
  - Perform flow-based forwarding function
    - Packet processing: forwarding, tunneling, translation, etc
- Controller
  - Configure switches' flow tables
- End hosts in the local network : not impacted



Example: DS-Lite



Example: NAT64



Next Step

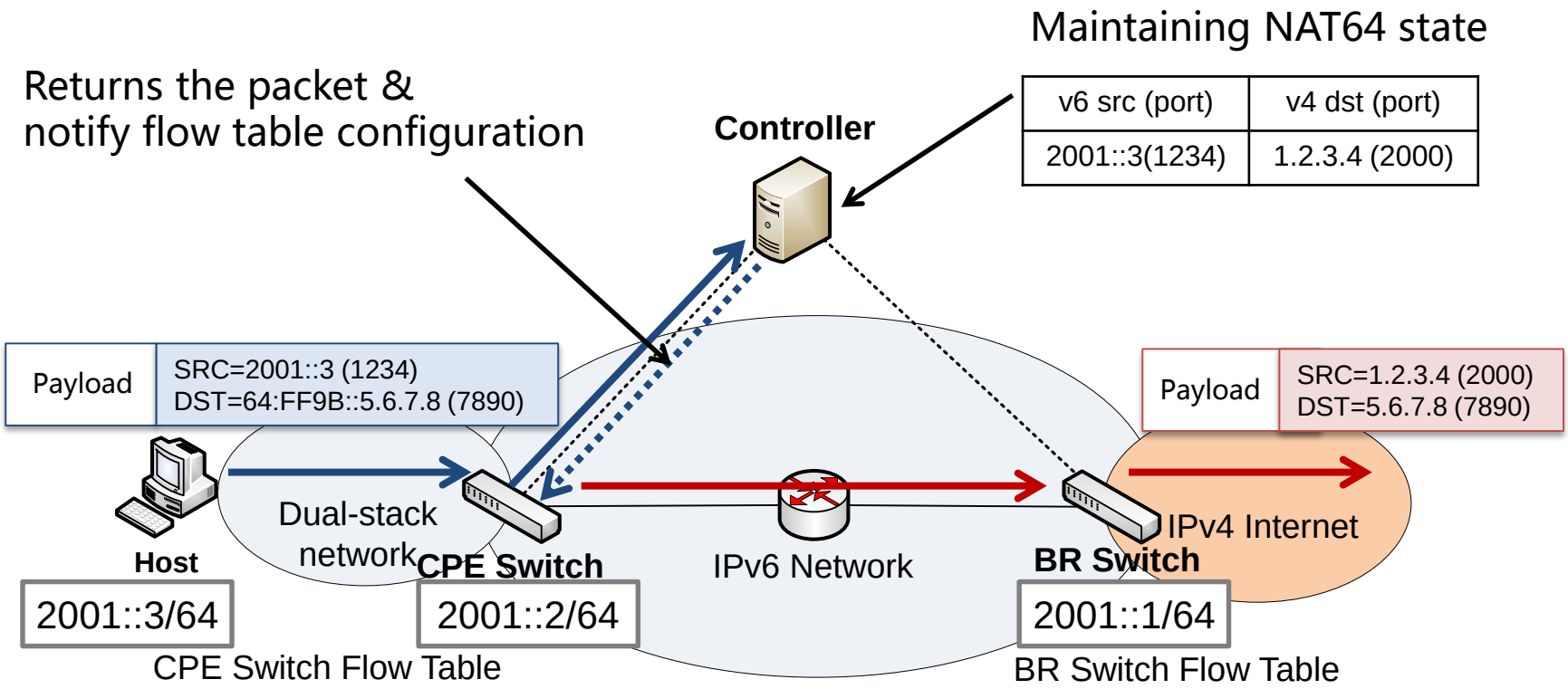
- -01 fixed issues mentioned in int-area ML
- Finding a home
  - Softwire?
- Any comments?

Backup

Q & A

- How can Switch & Controller communicate
  - Use protocols that are able to carry flow information and flow table configuration
    - Openflow, NETCONF, etc.
- Relationship with Openv6 (http://datatracker.ietf.org/doc/draft-liu-openv6-architecture/)
  - This work is a specific use case of Openv6 on IPv6 transition

NAT64 + Tunneling Scenario



CPE Switch Flow Table

Match Field	Action Set
Outbound v6 packet V6 DST= 64:FF9B::5.6.7.8 (7890)	**Translate v6 header to v4 header**: V4 SRC=1.2.3.4 (2000) V4 DST= 5.6.7.8 (7890); **Add v6 header:** V6 DST=2001::1 V6 SRC=2001::2
Inbound v4-in-v6 packet V4 DST=1.2.3.4 (2000)	**Remove v6 header;** **Translate v4 header to v6 header:** V6 SRC=64:FF9B::5.6.7.8 (7890) V6 DST=2001::3 (1234)

BR Switch Flow Table

Match Field	Action Set
Outbound v4-in-v6 packet	**Remove v6 header**
Inbound v4 packet : V4 DST=1.2.3.4 (2000)	**Add v6 header:** V6 DST = 2001::2 V6 SRC = 2001::1

Auto Processing of Flows

Switch	Flow type	Matched actions	Processing
CPE	Outbound IPv4	v6 header encapsulation	1. Add v6 header
		NAT44 + v6 header encapsulation	1. NAT44: local v4 to global v4 2. Add v6 header
	Outbound IPv6	NAT64 + v6 header encapsulation	1. NAT64: v6 header to v4 header 2. Add v6 header
	Inbound IPv4	NAT64 + v6 header decapsulation	1. Remove v6 header 2. NAT64: v4 header to v6 header
	Inbound IPv6	v6 header decapsulation	1. Remove v6 header
		NAT44 + v6 header decapsulation	1. Remove v6 header 2. NAT44: global v4 to local v4
BR	Outbound IPv6	v6 header decapsulation	1. Remove v6 header
		NAT44 + v6 header decapsulation	1. Remove v6 header 2. NAT44: local v4 to global v4
	Inbound IPv4	v6 header encapsulation	1. Add v6 header
		NAT44 + v6 header encapsulation	1. NAT44: global v4 to local v4 2. Add v6 header