

Internet Protocol Version 6

The Internet Gets a Facelift

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Introduction

- The transition from IPv4 to IPv6 involves many RFCs and drafts.
- Types of testing include Functional, Conformance, Performance, Scalability, Interoperability, and Service testing.
- There are three transition methods -- Translation, Tunneling, and Dual-Stack

Different deployment scenarios:

- Tunneling of IPv6 traffic over IPv4 core network
- Dedicated Link-Layer or MPLS in the IPv4 core network to carry IPv6 traffic
- Dual-Stack Network or dedicated IPv6 backbone

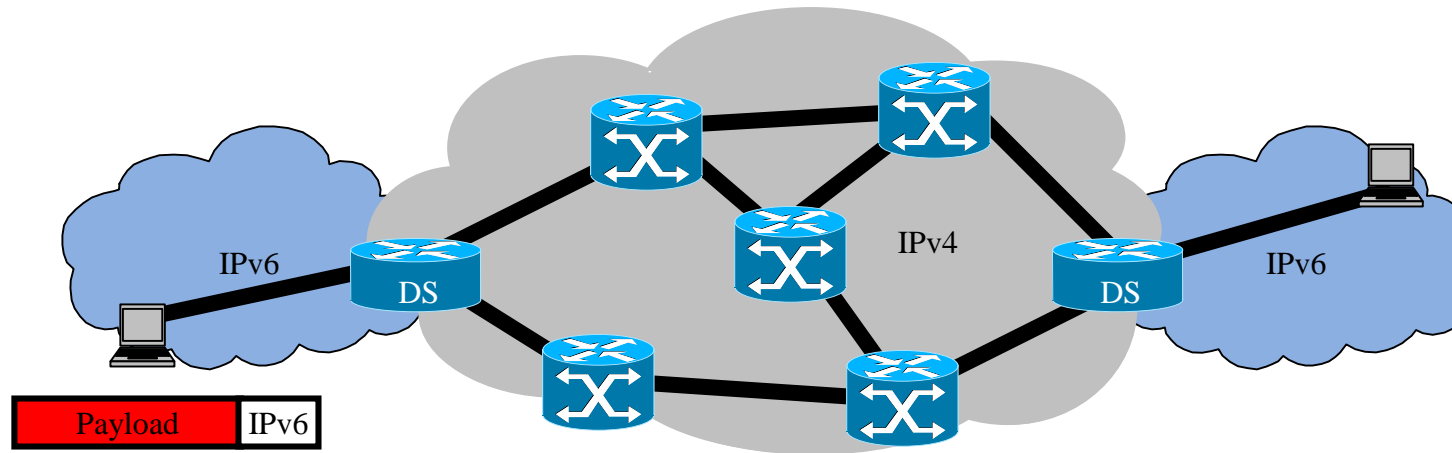
In this presentation, the focus is on functional test scenarios:

- Tunneling based on RFC-2185 and RFC-2529
- IPv6 control plane test scenario based on draft-ietf-ngtrans-bgp-tunnel
- IPv6 user plane test scenario based on draft-ietf-ngtrans-bgp-tunnel



Tunneling: What the Standards Say

RFC-2185 and RFC-2529: Configured and Automatic Tunneling



RFC-2185 and RFC-2529 specify two types of addresses: Native IPv6 addresses and IPv4 compatible addresses.

Cannot be converted to IPv4...

Native IPv6

1080:0:FF:0:8:800:200C:417A

Can be converted between IPv4 and IPv6...

IPv4 Compatible IPv6 - v6[v4]

0:0:0:0:0:0:13.1.68.3 or ::13.1.68.3

These RFCs also specify two methods for creating tunnels: Configured and Automatic

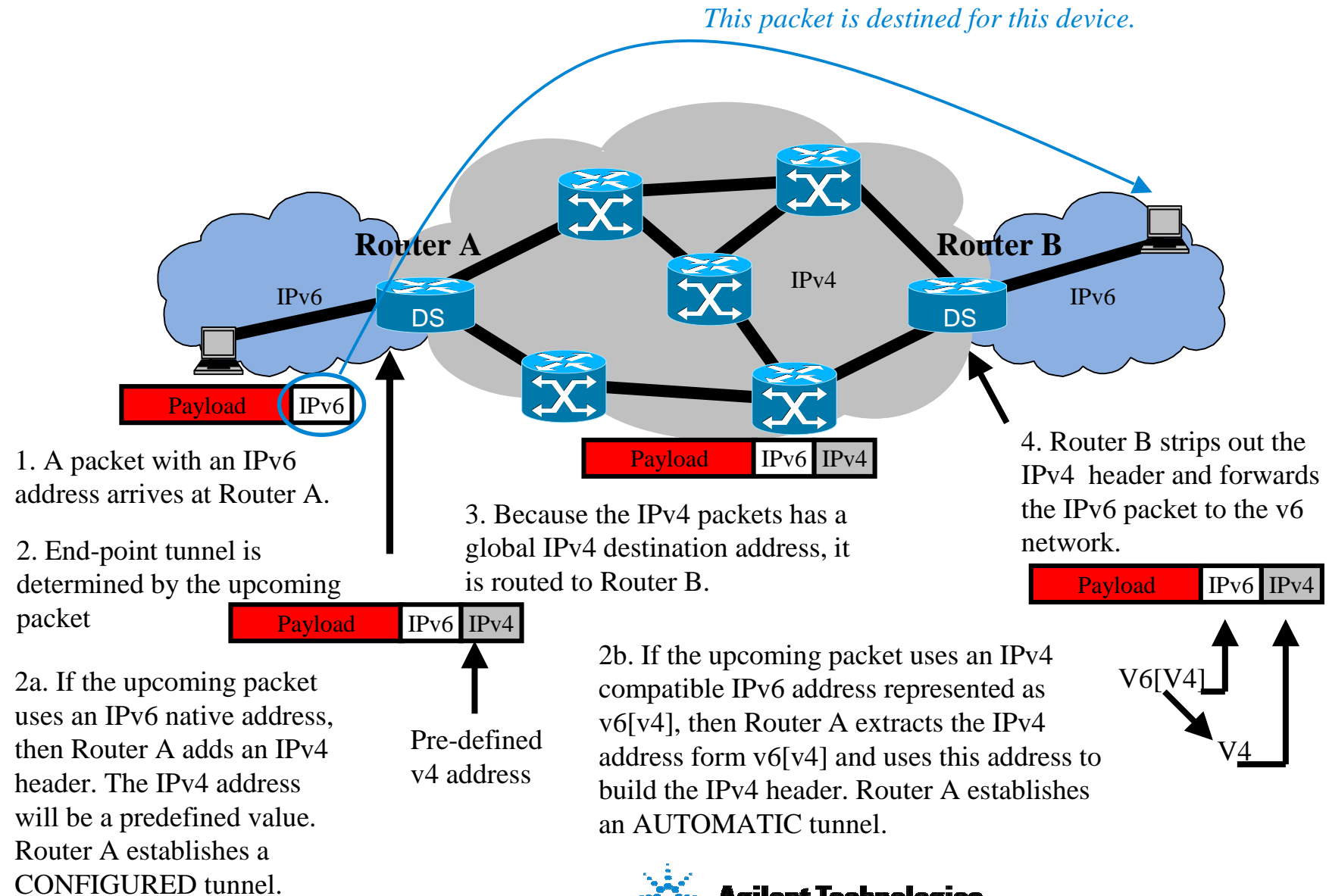
Router uses a configured v4 tunnel to carry the v6 packet...

Router automatically “creates” a v4 tunnel with a v4 address equivalent to the v6 address. Simply add the v4 address to the start of the v6 packet and send...

	v6 native	v6[v4]
Configured	Yes	Yes
Automatic	N/A	Yes



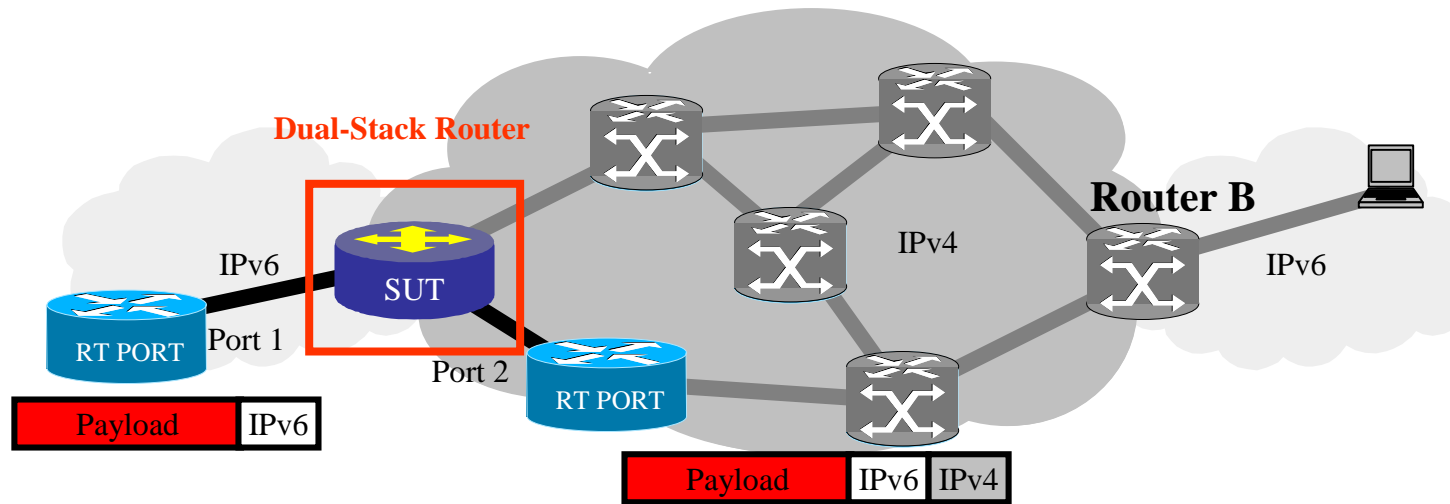
Tunneling: How Does It Work?



Tunneling: Functional Test

GOAL:

The SUT properly encapsulates IPv6 packet inside IPv4 packet depending on the type of address.



How to test CONFIGURED Tunnel?

1. The IPv4 address of the Dual-Stack Router B is manually configured in the SUT.
2. Port 1 generates a IPv6 packet. The destination address is an native v6 address.
3. IPv4 packets containing IPv6 traffic are captured. We checked that the SUT has correctly build the IPv4 header with the pre-defined v4 address.

How to test AUTOMATIC tunnel?

4. A topology using an IGP for v4 is defined behind the Port 2.
5. Port 1 generates an IPv6 packet. The destination address is an IPv4 compatible v6 address represented v6[v4]. We make sure that the v4 address is part of the defined topology.
6. We capture on Port 2 the IPv4 packet containing IPv6 packet. We make sure that the SUT was able to extract the v4 address from the v6[v4].



Functional Routing Test Scenario

Technology Background

IPv4 IGP Routing Protocol

OSPFv2

IS-IS

RIP

IPv4 EGP Routing Protocol

BGP-4

IPv6 IGP Routing Protocol

OSPFv3

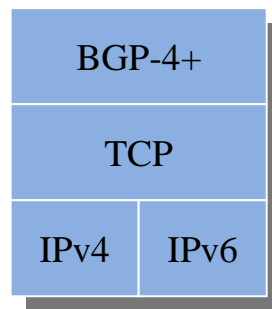
IS-ISv6

RIPng

IPv6 EGP Routing Protocol

BGP-4+

Extensions to existing routing Protocol

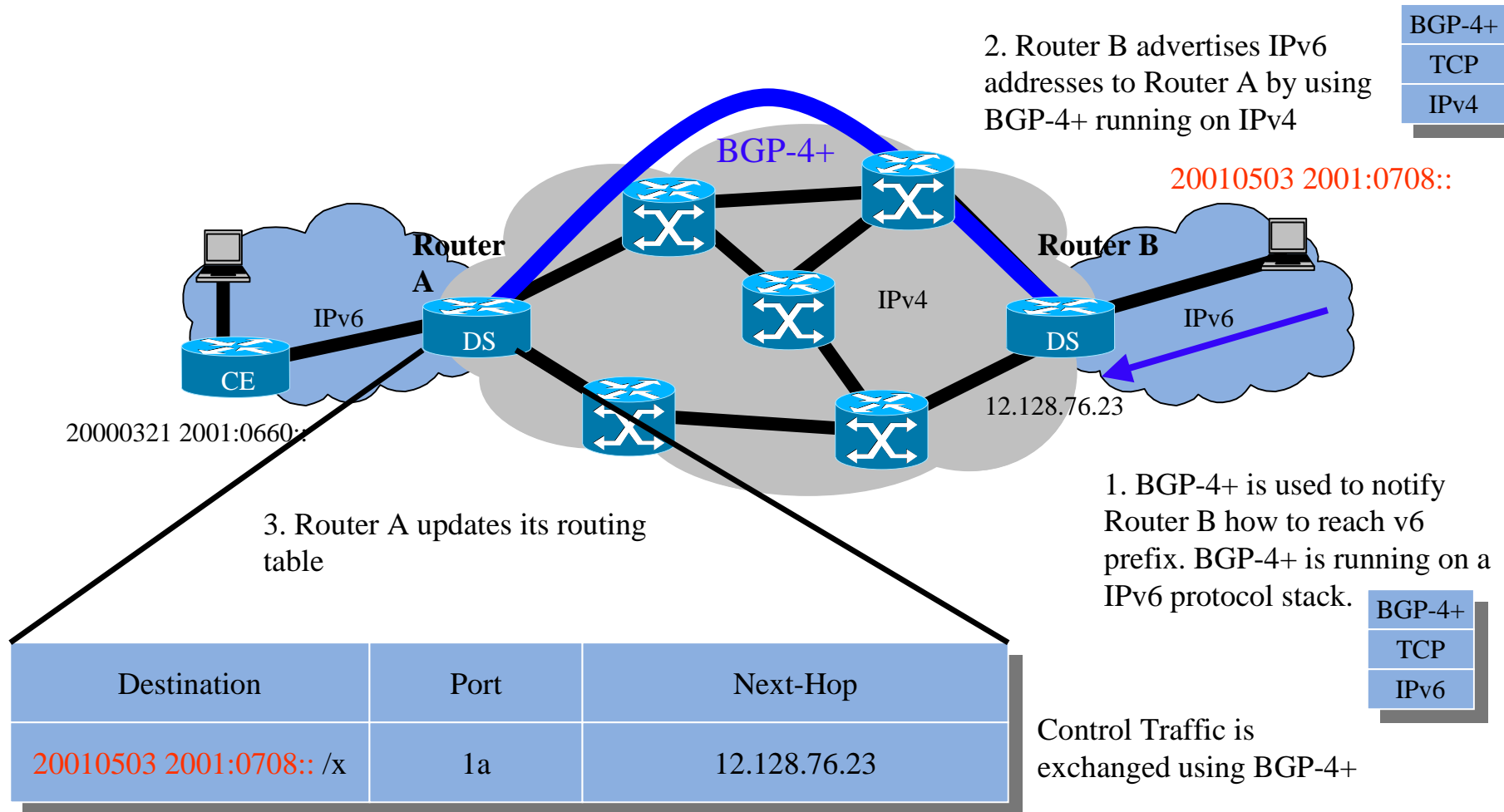


BGP-4+ carries v6 routing information on both protocol stack



Functional Routing Test Scenario

The Network: draft-ietf-ngtrans-bgp-tunnel

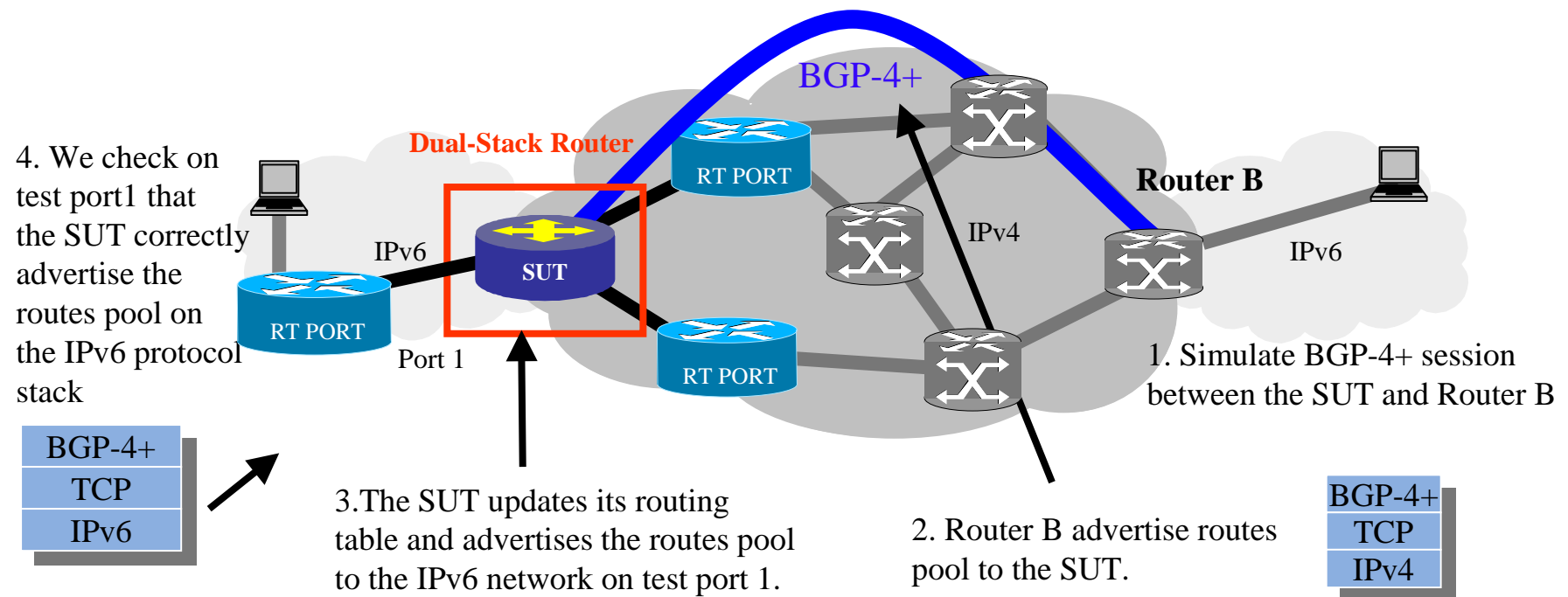


Functional Routing Test Scenario

In the test lab: draft-ietf-ngtrans-bgp-tunnel

GOAL:

Check implementation of BGP-4+ on IPv6 and IPv4.

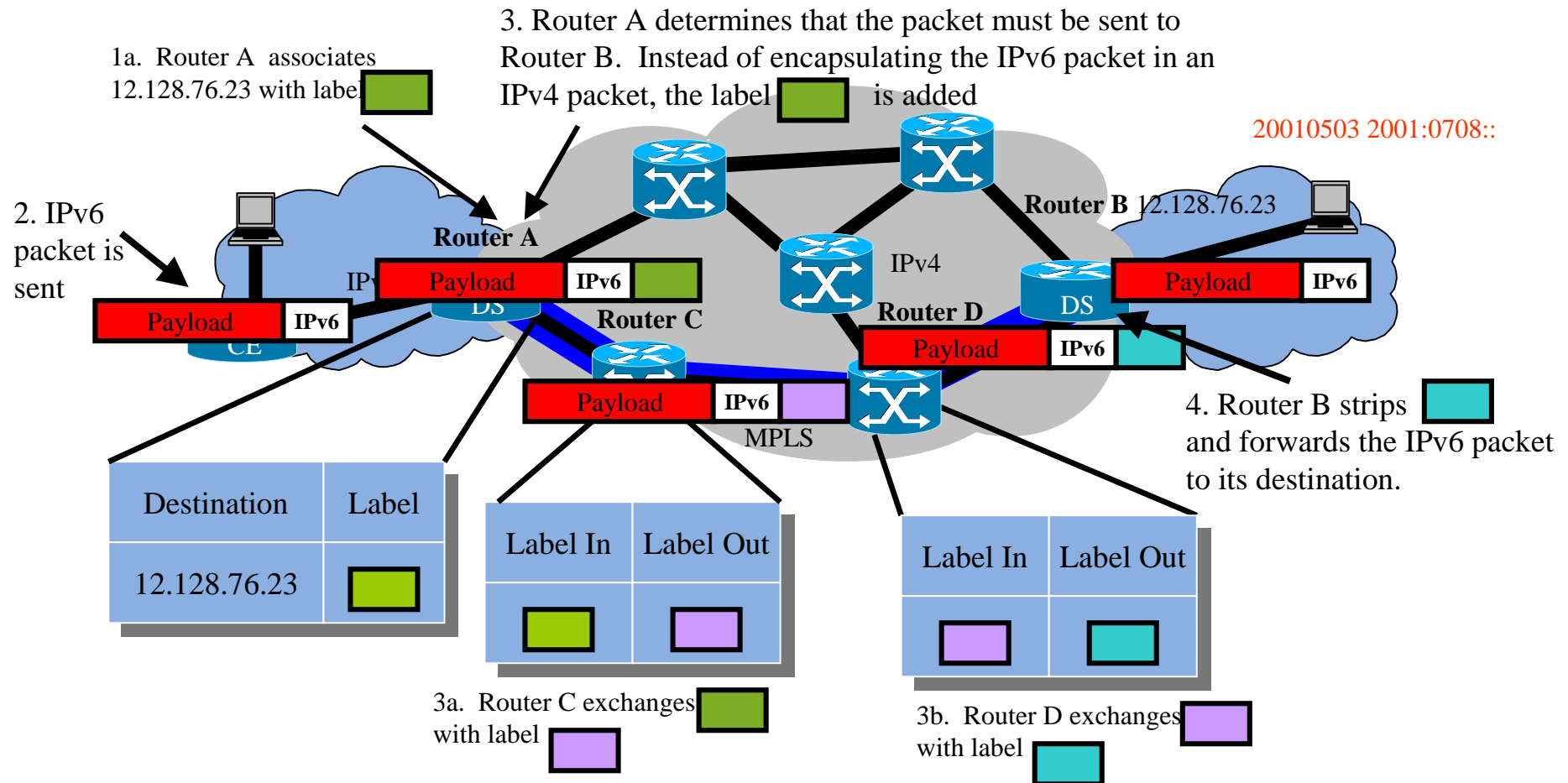


Functional Test Scenario

The Network: draft-ietf-ngtrans-bgp-tunnel

IPv6 User Traffic is forwarded using MPLS

1. A tunnel is built from Router B to Router A by advertising the IPv4 address: 12.128.76.23...



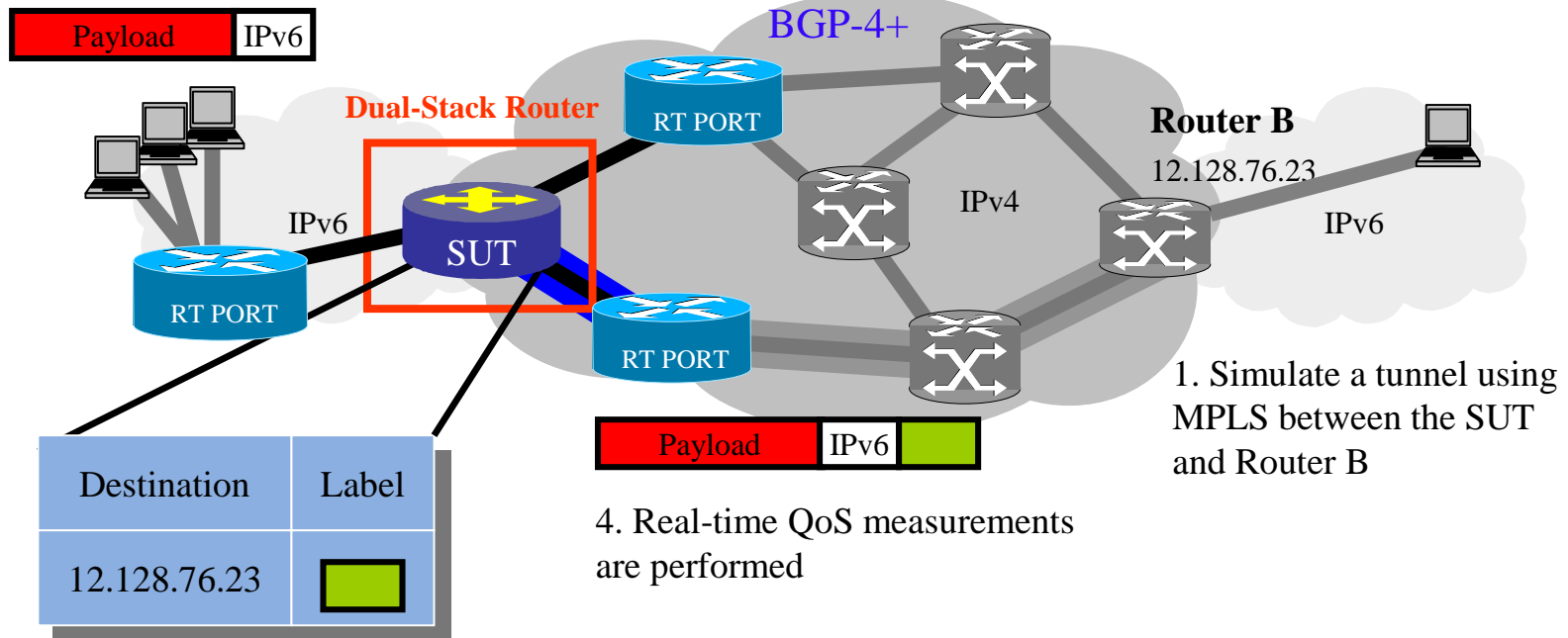
Destination	Port	Next-Hop
20010503 2001:0708:: /x	1a	12.128.76.23



Functional Test Scenario

In the test lab: draft-ietf-ngtrans-bgp-tunnel

3. IPv6 packets are sent at wire-rate



2. The SUT associates the address of Router B with a label



Summary

- **Main test areas: overall performance and transition**
- **Need as many test scenarios for transition as the RFC and drafts indicate**
- **Need scalable test equipment supporting v4 and v6 routing protocols that generates integrated user traffic with control traffic**
- **More test scenarios available at:**
www.agilent.com/comms/RouterTester



Question & Answer Session



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