A Service Provider's Implementation of 6VPE with Live Demonstration

Cody Christman - Principal Network Architect
Tim McInis - Senior Network Architect
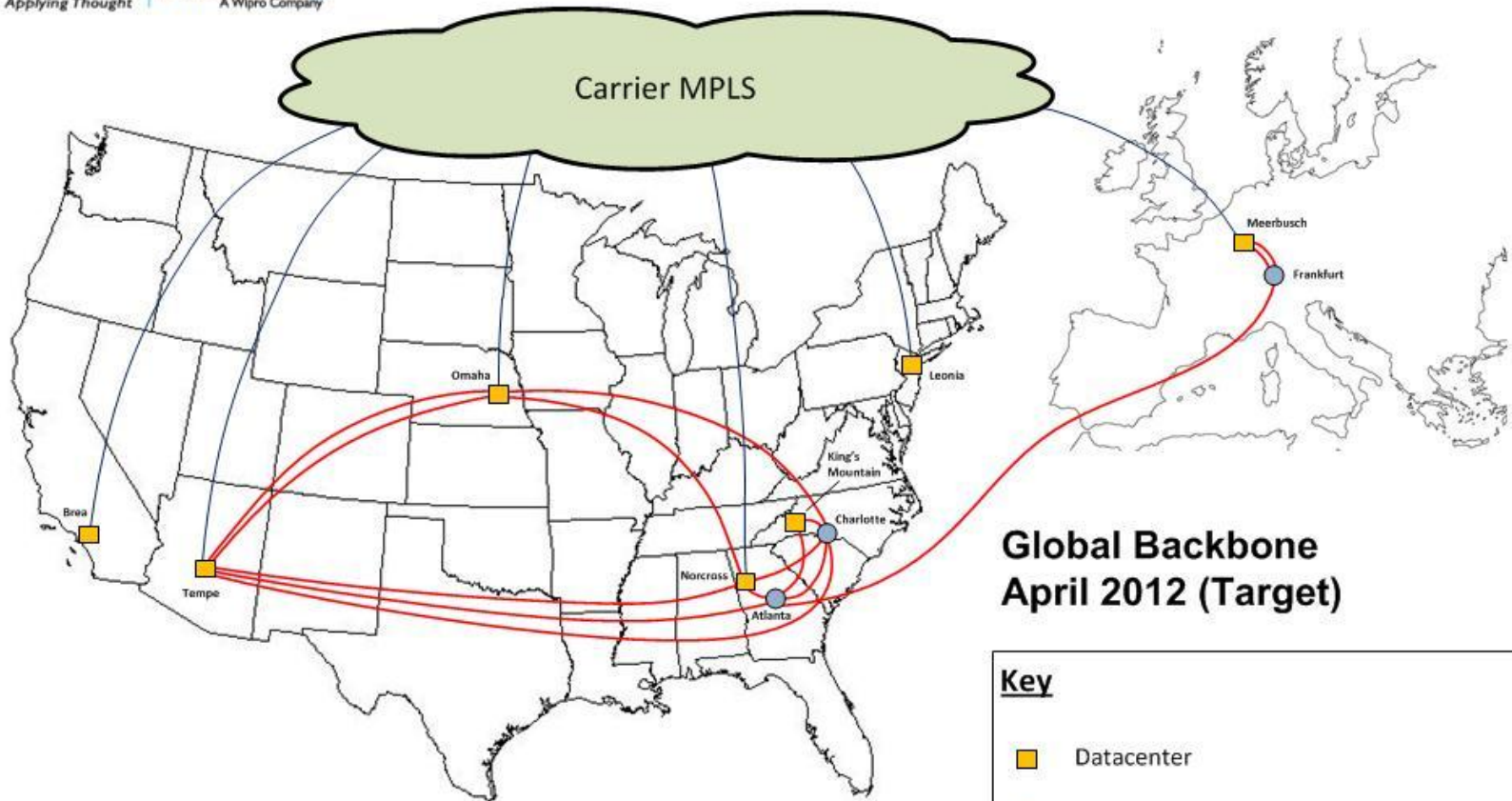
Wipro Infocrossing

April 11, 2012

Agenda

- Wipro Infocrossing overview – 6VPE use case

- 6PVE overview

- IPv6 & MPLS

- Live 6VPE demonstration

- Questions
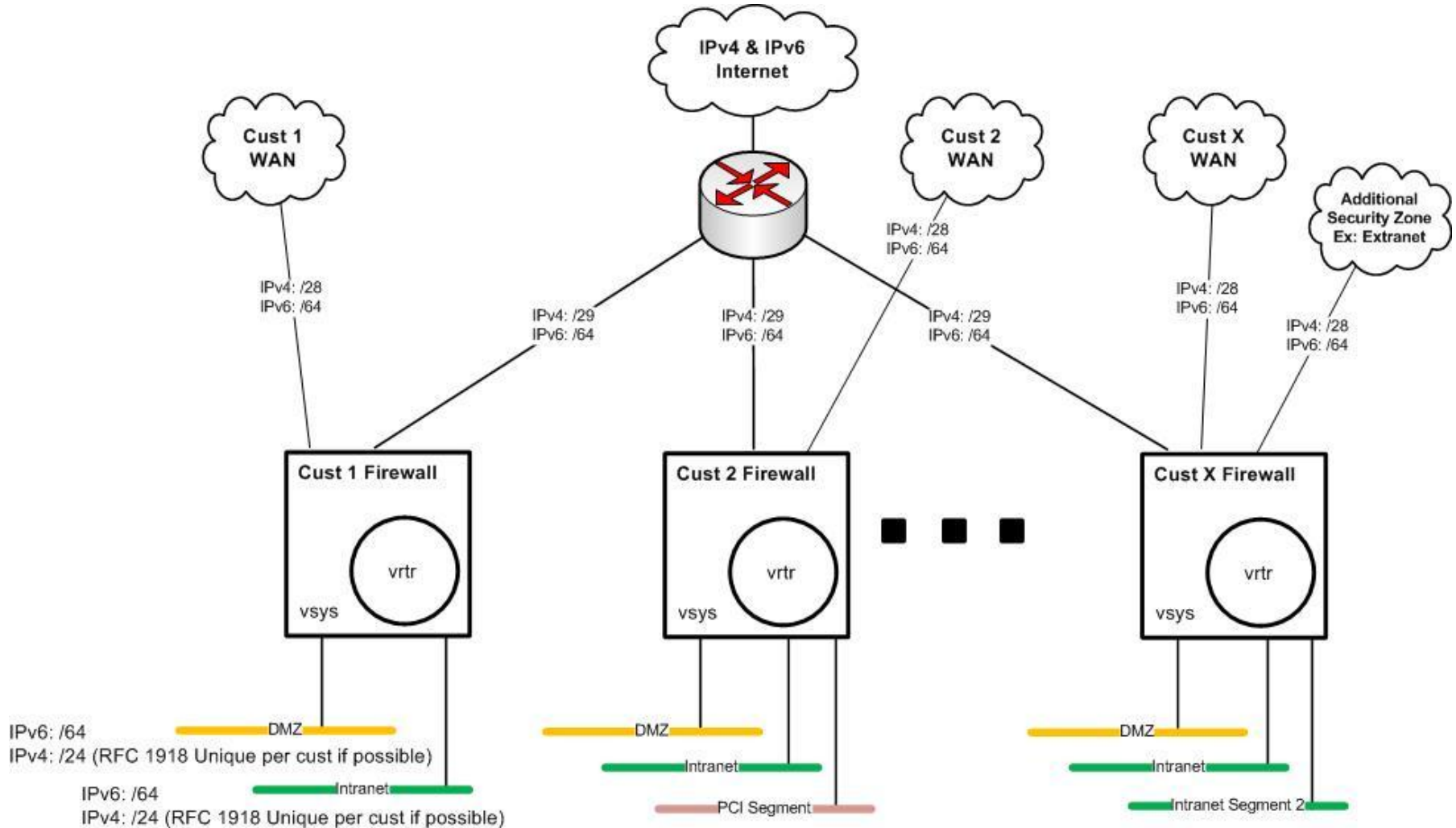
Wipro Infocrossing Backbone

Global Backbone
April 2012 (Target)

Key

- 🟧 Datacenter
- 🔵 Core POP – Carrier Hotel
- ─── 10Gbps, 1Gbps and Fractional 1Gbps Circuits

March 16, 2012 – Cody Christman
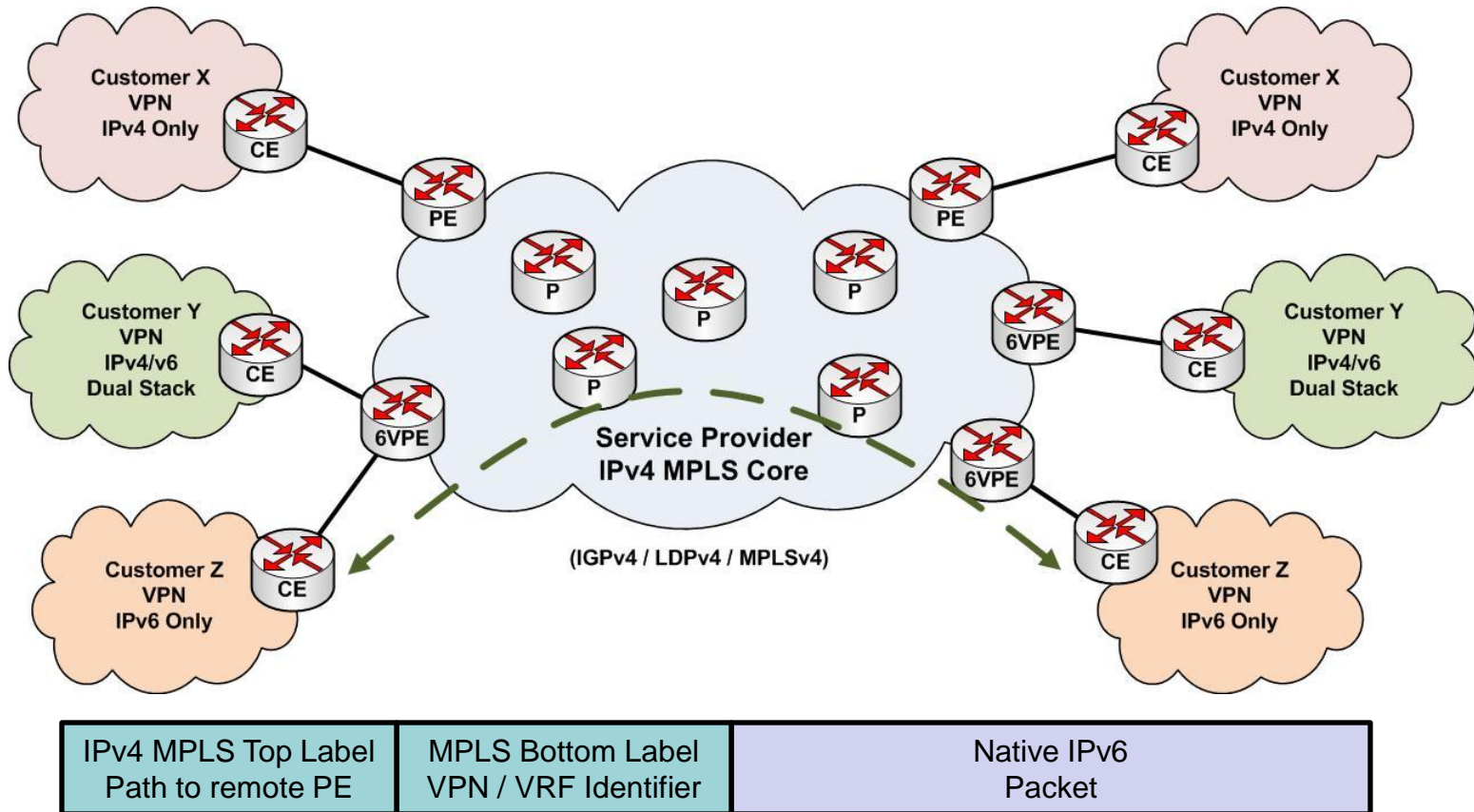
Wipro Infocrossing Datacenter

6VPE Overview

- MPLS/BGP Layer 3 VPNs ("RFC 2547 VPNs")
  - Largely replaced Frame Relay, ATM, private lines for enterprise WANs.
  - Used by Infocrossing to interface with customer WANs ("Option A" connection) and to provide private services across the Infocrossing backbone.

- 6VPE (IPv6 VPN Provider Edge) – RFC2547-like VPNs for IPv6.
  - 6VPE adds IPv6 support to existing MPLS VPN offerings.
  - IPv6 native or dual stack VPNs over an IPv4 MPLS core.
  - Implemented by simply adding IPv6 support to the VRF.
  - Logically separate routing table entries for VPN member devices.
  - Just like IPv4 VPNs, customers do not know the Service Provider's MPLS exists
  - Generally the same features & functionality as their IPv4 VPNs but dual stack.

- Major router vendors do not yet support IPv6 signaled MPLS.

6VPE Functional Diagram

IPv4 MPLS Top Label Path to remote PE	MPLS Bottom Label VPN / VRF Identifier	Native IPv6 Packet

- When an IPv6 packet arrives from the CE router – The 6VPE router adds two labels to the packet (see above)
- Core "P" routers swap the top labels and forward until the remote 6VPE router is reached
- Remote 6VPE router removes the top label, looks up the appropriate VRF, removes the bottom label, and forwards the native IPv6 packet to the CE device

IPv6 & MPLS

- Major router vendors do not yet support native (IGPv6 / LDPv6 / v6 signaled) IPv6 MPLS

- Some Service Providers run IPv6 natively along side their IPv4 MPLS backbones

- IPv6 Traffic Engineering is not a major issue today on most networks due to lack of significant IPv6 traffic
  - Those that need/want IPv6 TE typically use 6PE
  - 6PE also used by others SPs simply to provide dual stack services w/o upgrading their core to IPv6

- Future options for IPv6 and MPLS:
  - Continue with 6PE and 6VPE – works but requires v4 address space
  - Dual MPLS planes (v4 & v6) – lots of complexity and dual set of LSPs
  - IPv6 core and tunnel IPv4 – opposite of 6PE/6VPE
  - Some other technique not known today – none of the above
  - Will ultimately depend on each SP's individual network requirements and available options

IPv6/MPLS Related Documents & References

- RFC 4364: "BGP/MPLS IP Virtual Private Networks (VPNs)"
  - Obsoletes RFC 2547
  - Foundation for BGP/MPLS L3 VPNs

- RFC 4659: "BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN"
 - 6VPE is an implementation of this RFC

- RFC 5036: "LDP Specification"
  - See below

- IETF draft-ietf-mpls-ldp-ipv6-06: "Updates to LPD for IPv6"
  - This draft updates RFC 5036

- RFC 4798: "Connecting IPv6 Islands over IPv4 MPLS Using IPv6 Provider Edge routers (6PE)"
  - Global routing table version of 6VPE – also used for IPv6 TE on IPv4 MPLS backbones

- IPv6 & RSVP-TE
  - IETF work is required here – Major router vendor adoption appears a ways out

Live Demonstration – Network Diagram
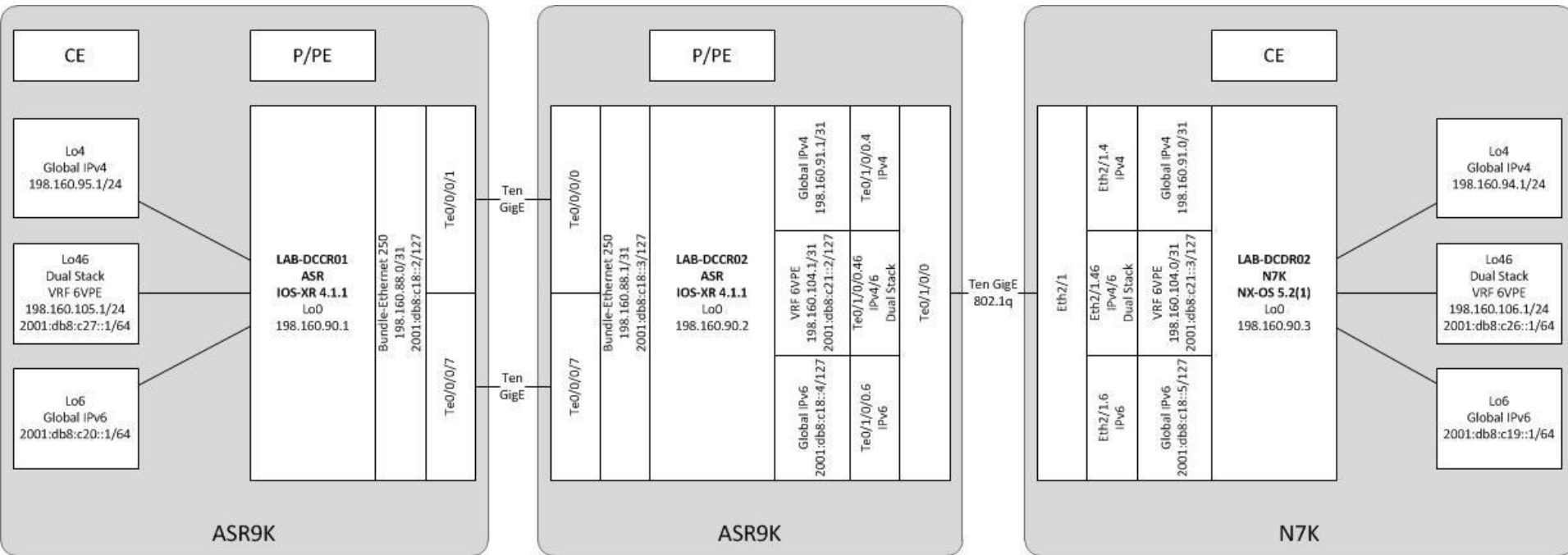
Thank you! Questions?

cody.christman@wipro.com
tim.mcinis@wipro.com