



*Mikro***Tik**

MPLS/VPLS Applications

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Who am I ?

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Agenda

- What is MPLS ?
- Why use it ?
- Gotchas
- Application Examples
- Questions

What is MPLS ?

Multi

Protocol

Label

Switching

MPLS is a “label” based packet switching protocol.



What does that mean ?

With traditional IP routing, the packet forwarding decision is based on inspecting the IP header and performing a route table lookup.

MPLS routers instead use **Labels** to decide how to forward packets, effectively “switching” the packets between the endpoints.

MPLS is NOT a routing protocol, MPLS works with routing protocols like OSPF and BGP to determine the path it will use to label switch packets.

What are the benefits?

- Label lookups are more efficient than Route lookups
- Higher Efficiency = Higher Throughput
- Ability to implement managed WAN (VPN) services that can be sold to clients = Higher Profit
- Ability to transparently bridge across large networks
- Ability to reserve bandwidth across backhaul network



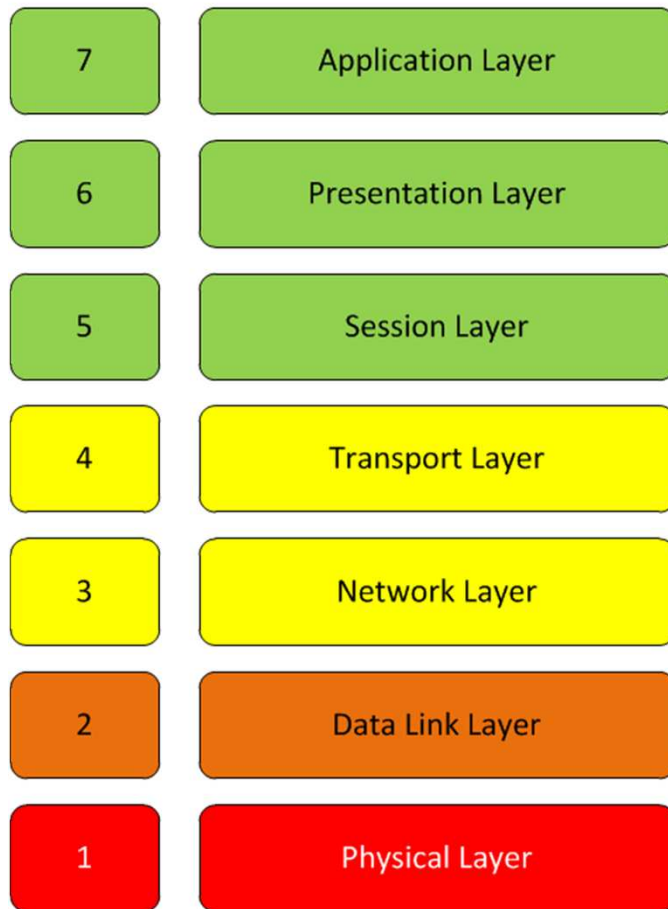
How much faster?

It heavily depends on your hardware and configuration, but in our testing:

- MPLS forwarding is around 45% faster than Routing at similar CPU usage
- VPLS tunnels are around 60% faster than EoIP at similar CPU usage

How does it work ?

OSI Model



MPLS operates between the **Data Link** and **Network** layers of the OSI model.

MPLS is referred to as a Layer 2.5 protocol



MPLS Labels

- An additional 4 byte packet header
- Describe the next hop
- Swapped during forwarding

Standard IP Packet

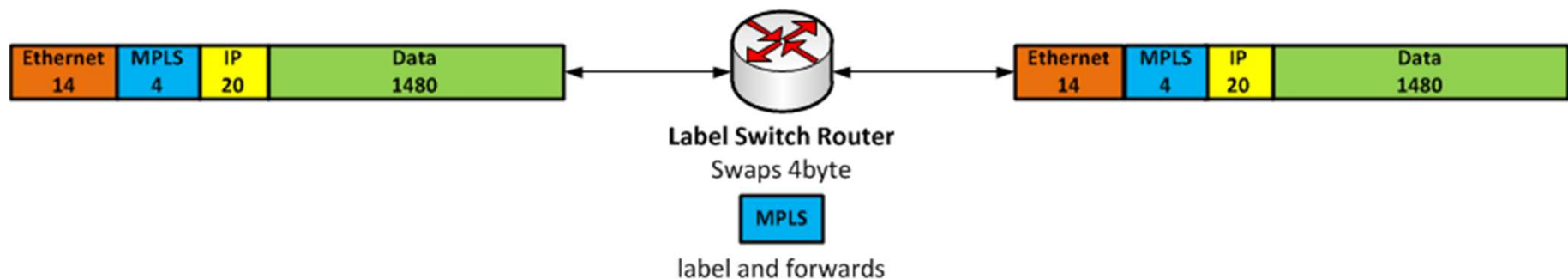
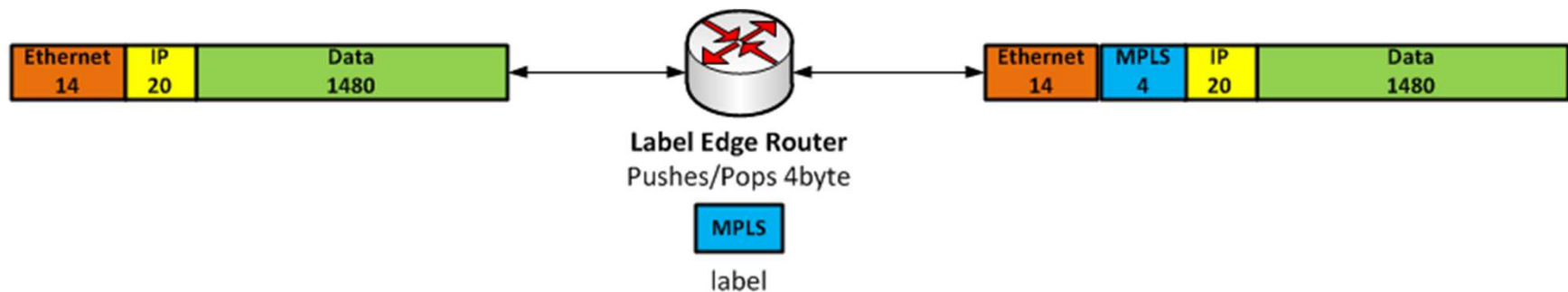


MPLS Labeled Packet



Two types of MPLS nodes

- Label Edge Router (LER) – Pushes(Adds) or Pops(Removes) labels
- Label Switch Router (LSR) – Forwards labeled packets

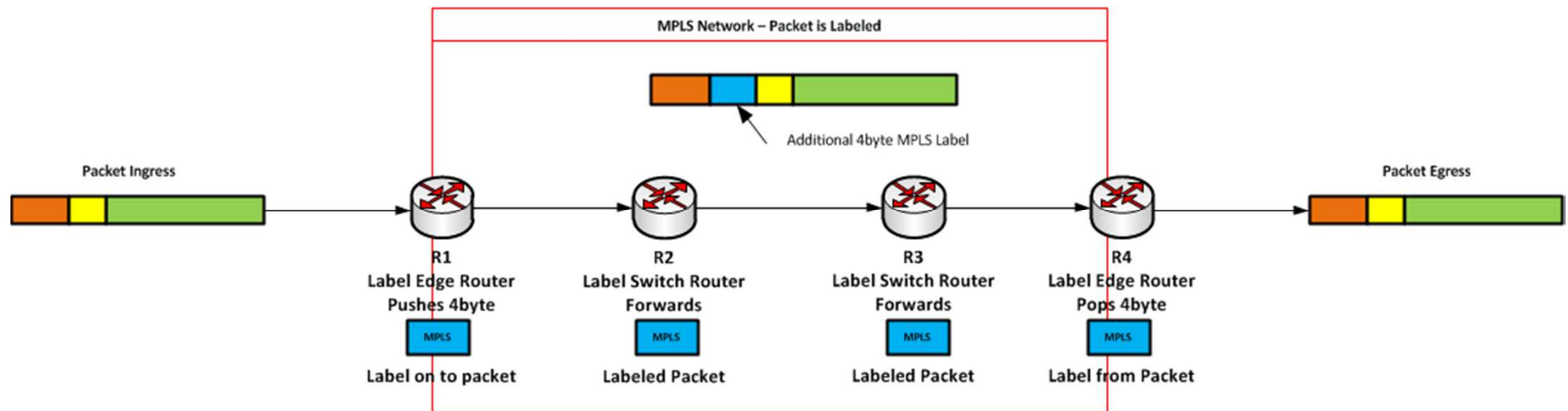


Label Distribution

- Label Switch Routers exchange Label information using the Label Distribution Protocol (LDP)
- Used to form the label switched path
- LDP uses TCP/UDP port 646, this must be accepted in firewall rules



Forwarding



L2 VPN Services - VPLS

Virtual Private LAN Service

aka Pseudowire aka Ethernet over MPLS

- MultiPoint-to-MultiPoint Layer 2 VPN
- All nodes in a VPN need to be interconnected (Meshed)
- Acts like a virtual switch, forwarding packets to the appropriate LER
- Adds an extra Label to the packet



VPLS Considerations

- Typically uses LDP to exchange tunnel information
- A routed IP path must exist between endpoints
- All nodes in between must be configured as LSR's
- MTU on all router interfaces in the path must be large enough to transmit encapsulated packets
- Does not scale well when using LDP to exchange tunnel information

Scaling VPLS

Use BGP based VPLS

- Used to exchange tunnel information between nodes
- Each node needs BGP session to “Master” BGP router
- Master BGP router is configured as a Route Reflector, reflecting routing information to all parties
- VPLS tunnel information is exchanged using special BGP attributes
- LDP still used to exchange path information between LSR's

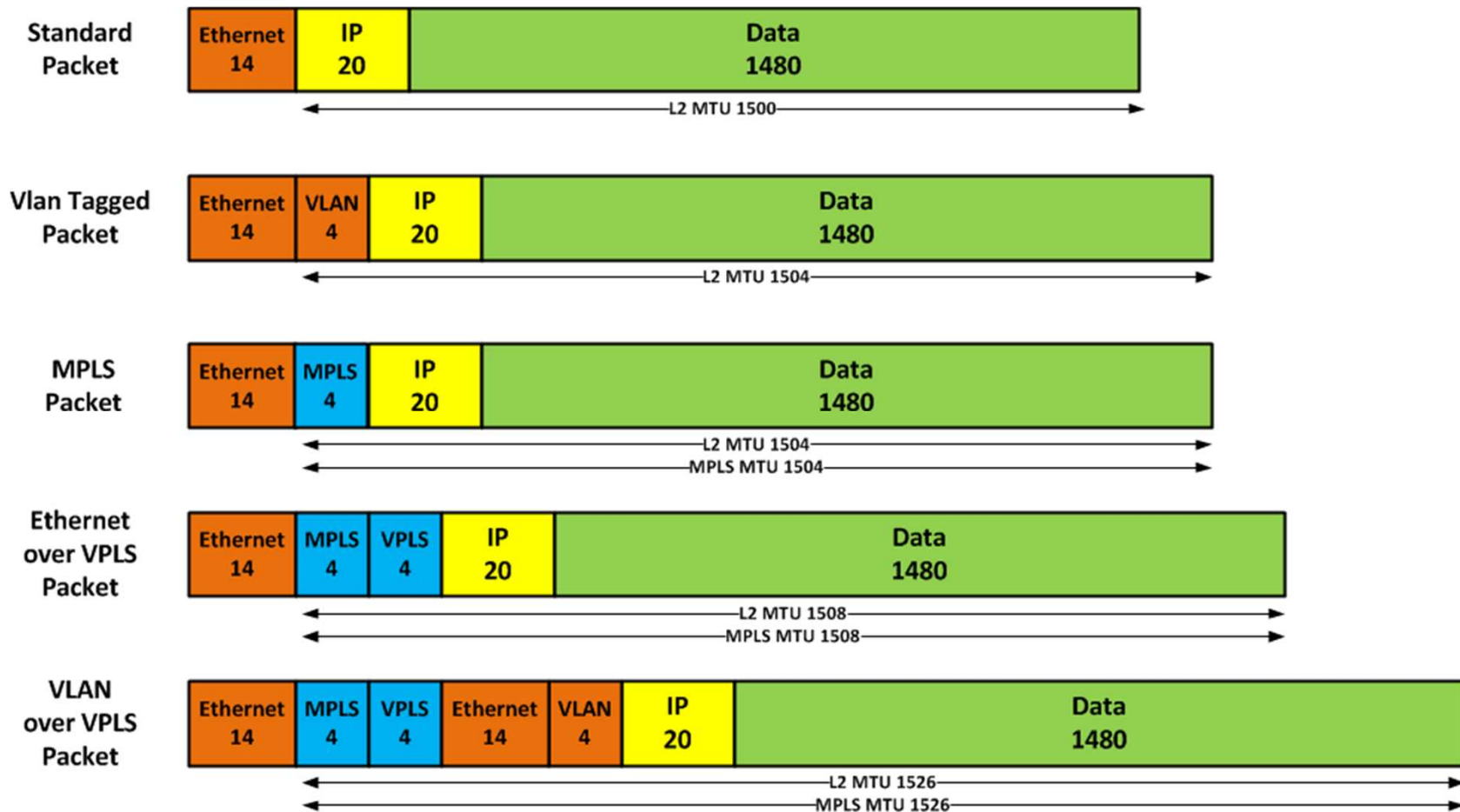


MTU Considerations

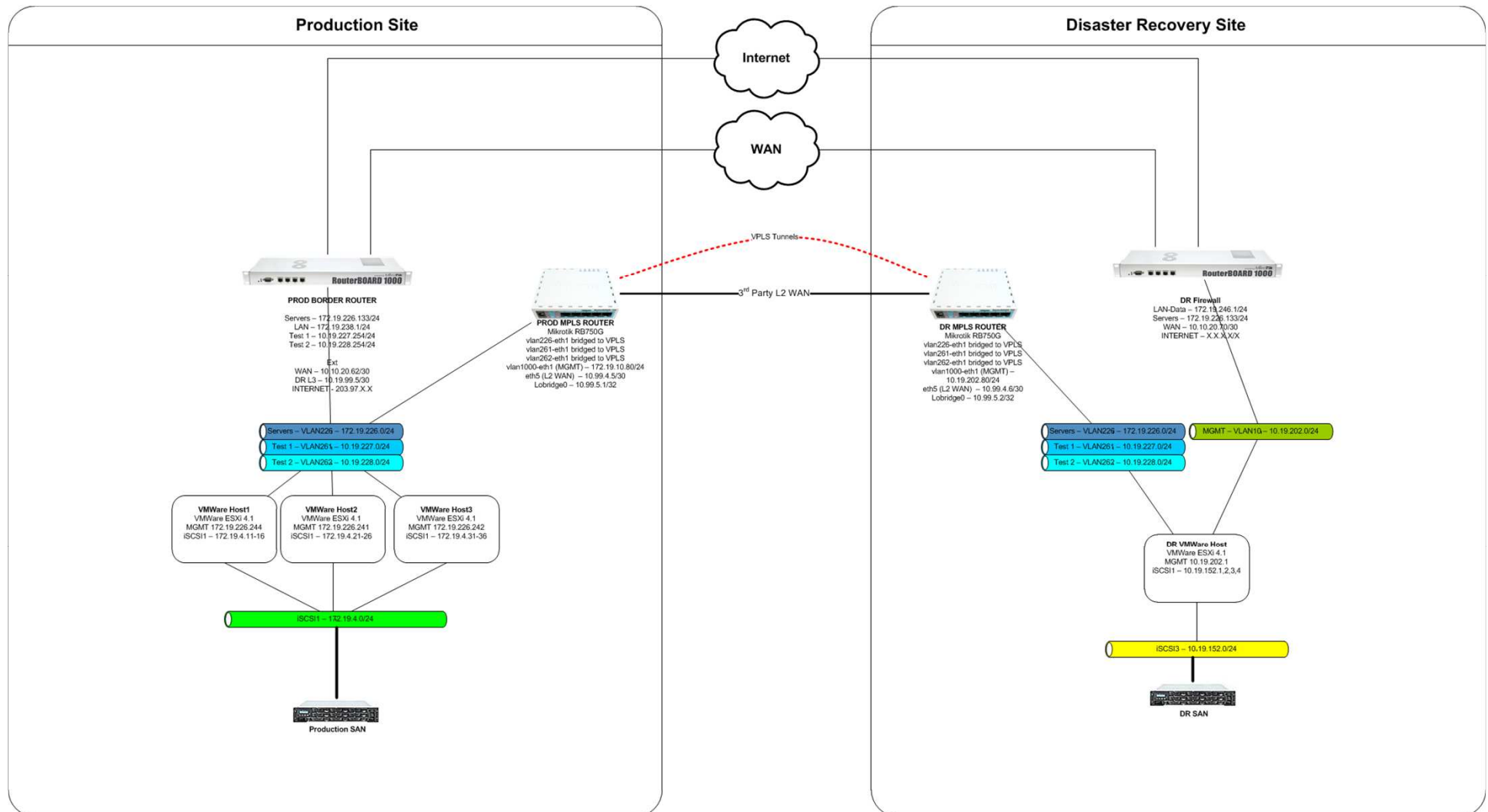
Maximum Transmission Unit

- VLAN adds a 4byte “Tag” to each packet
- MPLS adds a 4byte “Label” to each packet
- VPLS adds a 4byte “Label” to each packet

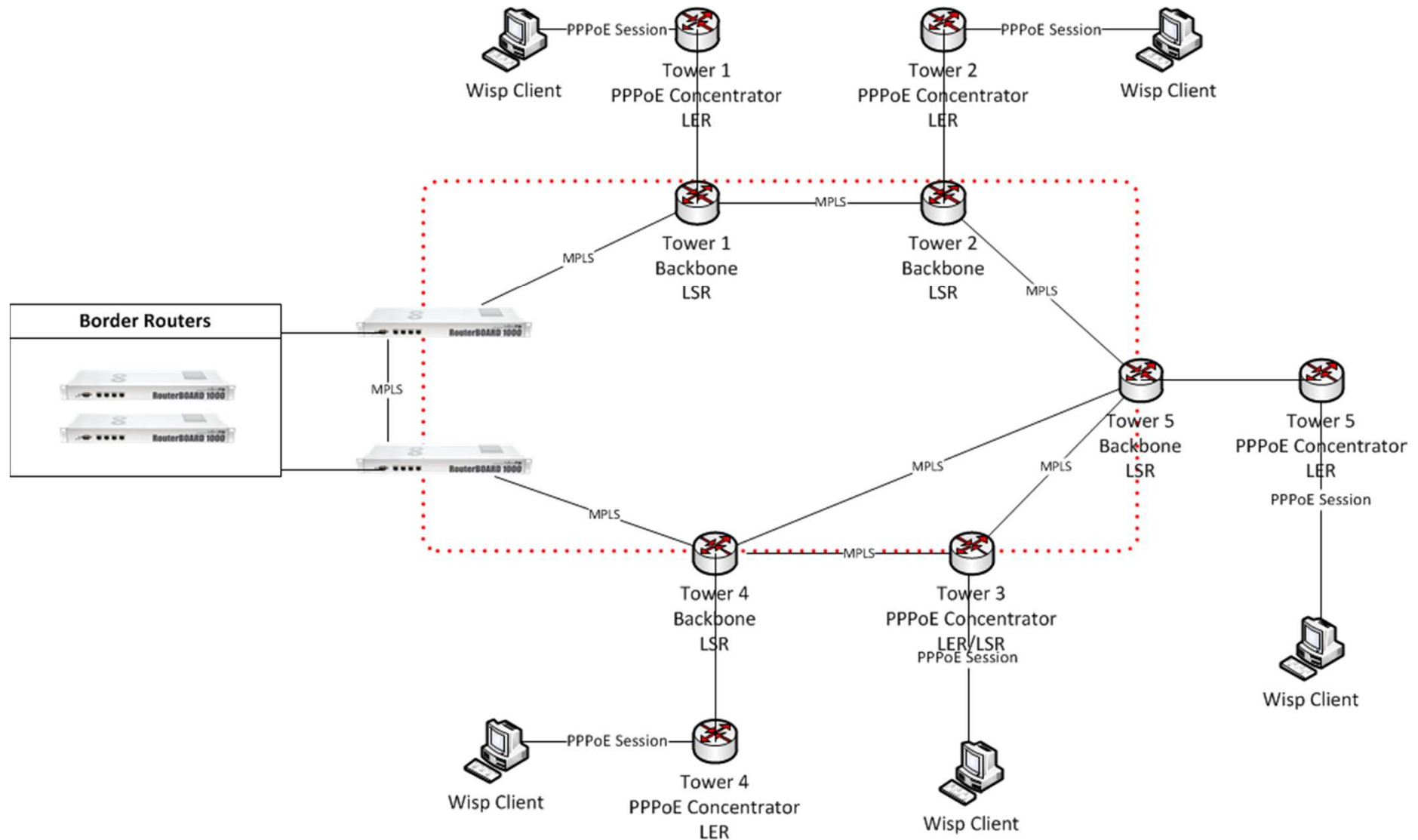
VLAN, MPLS, VPLS increase required MTU



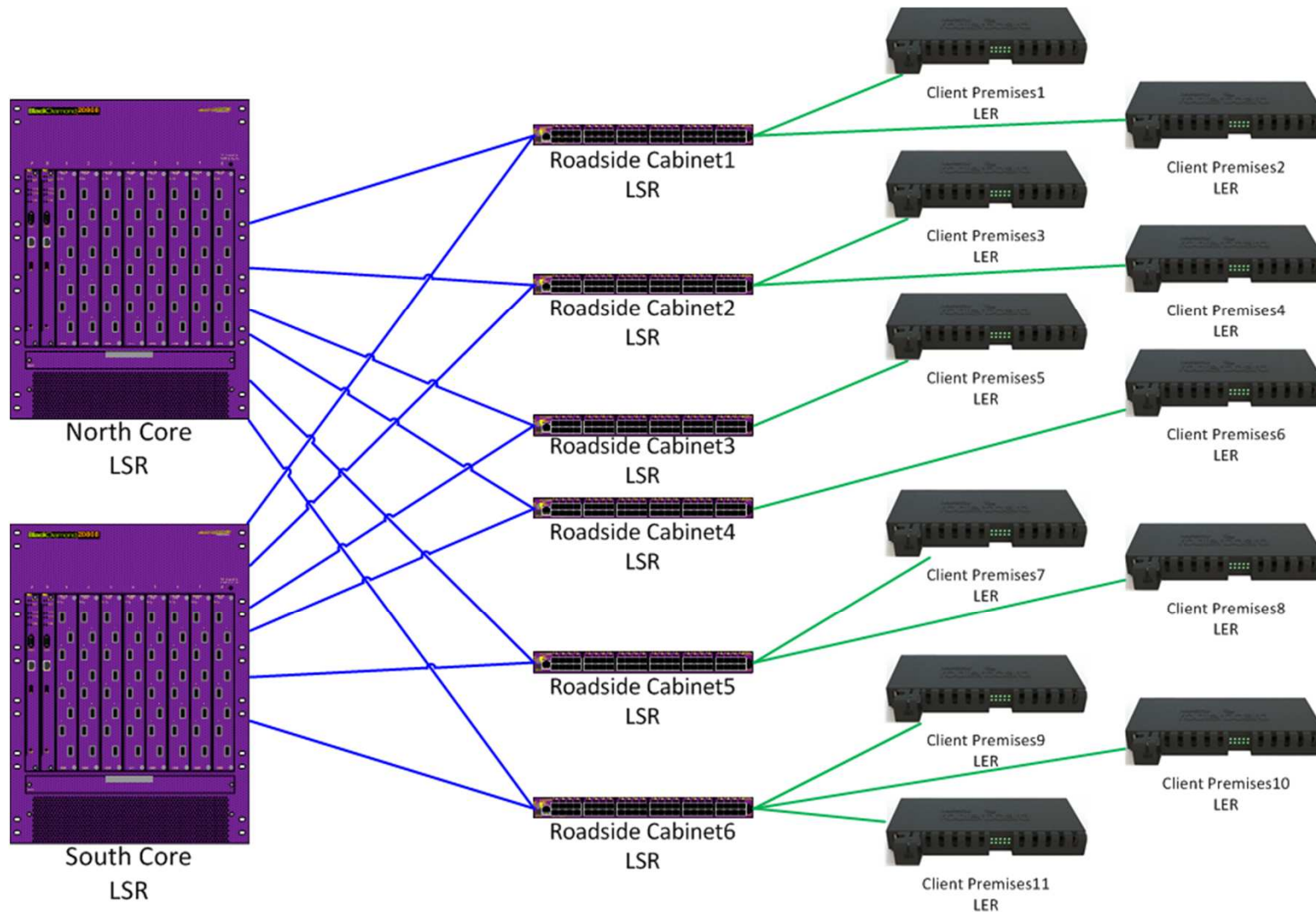
Application Example – VPLS for DR



Application Example – WISP Backbone



Application Example – FTTx Deployment



Questions ?

Thank-you for staying awake!

- Comments and feedback: andrew.thrift@btg.co.nz
- Recommended Reading:
 - Presentation – Janis Megis MPLS from US09 MUM
 - Mikrotik Wiki - Maximum Transmission Unit on RouterBoards
 - Mikrotik Wiki – MPLS Overview
 - Wikipedia - Multiprotocol Label Switching

