

# Understanding VPN Multicast

Ron Bonica



Copyright © 2006 Juniper Networks, Inc.

Proprietary and Confidential

[www.juniper.net](http://www.juniper.net)

1

## Let's Start With Some Very Simple Concepts



Juniper your Net

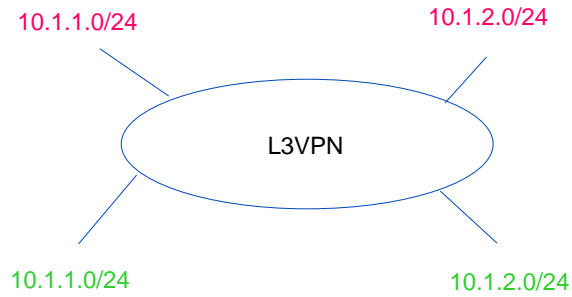
Copyright © 2004 Juniper Networks, Inc.

Proprietary and Confidential

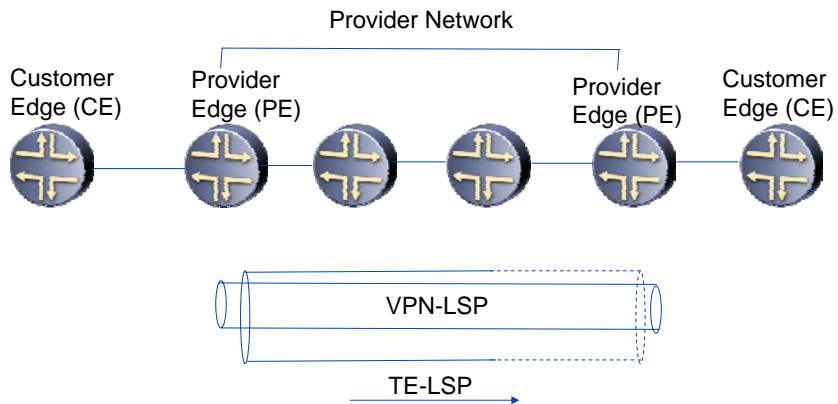
[www.juniper.net](http://www.juniper.net)

2

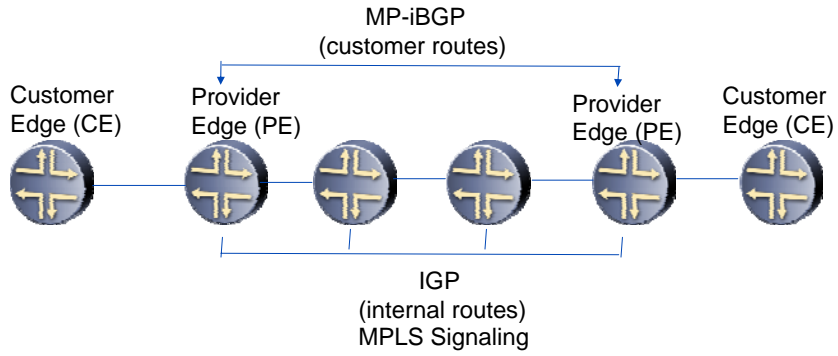
## L3VPN - Unicast



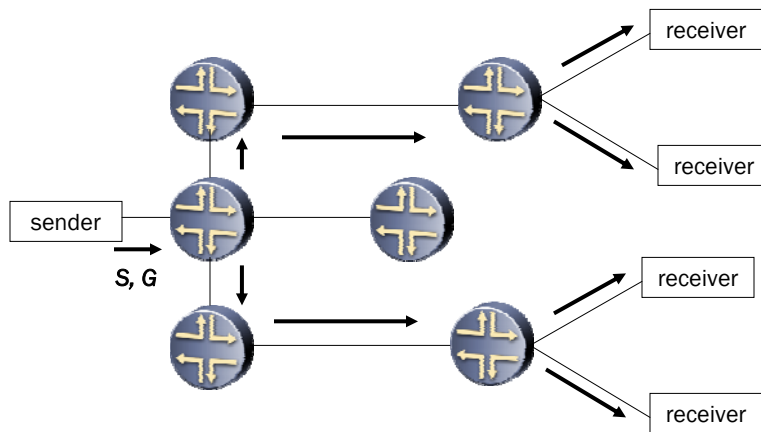
## L3VPN Unicast Forwarding



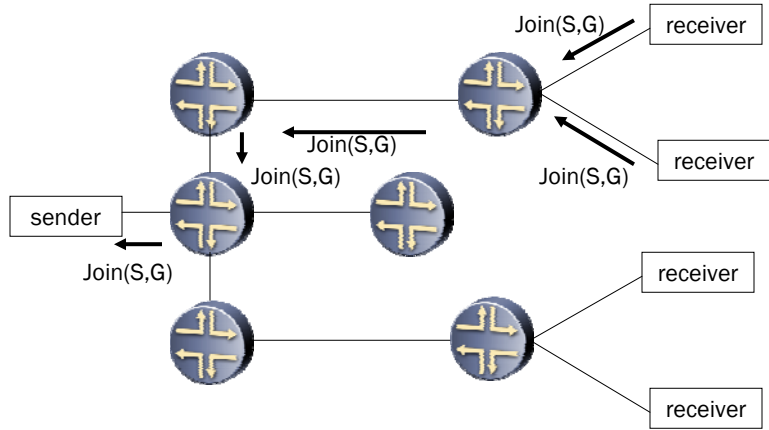
## L3VPN Unicast Routing



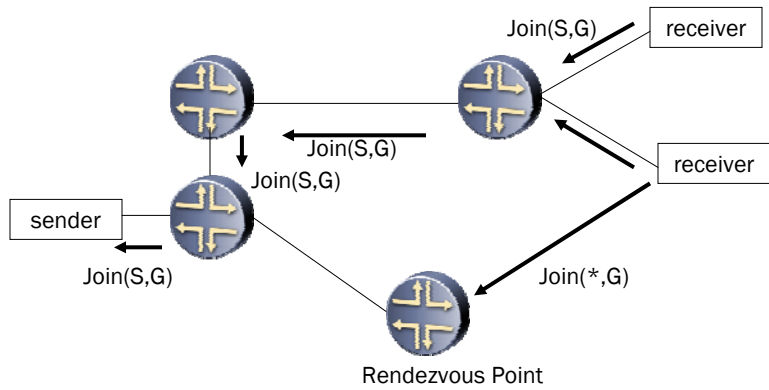
## IP Multicast Forwarding



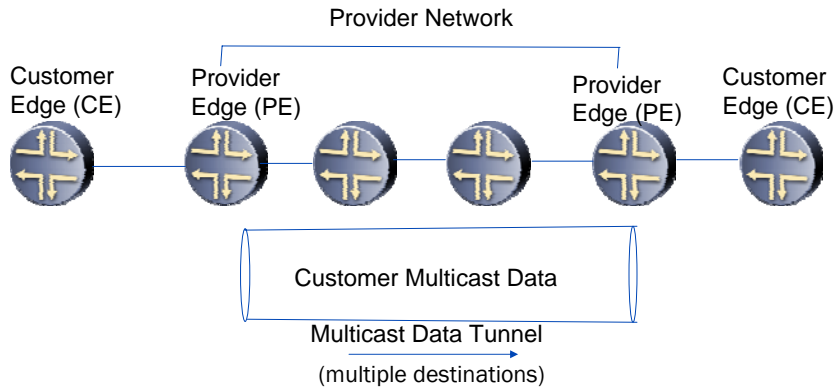
## IP Multicast Routing (SSM)



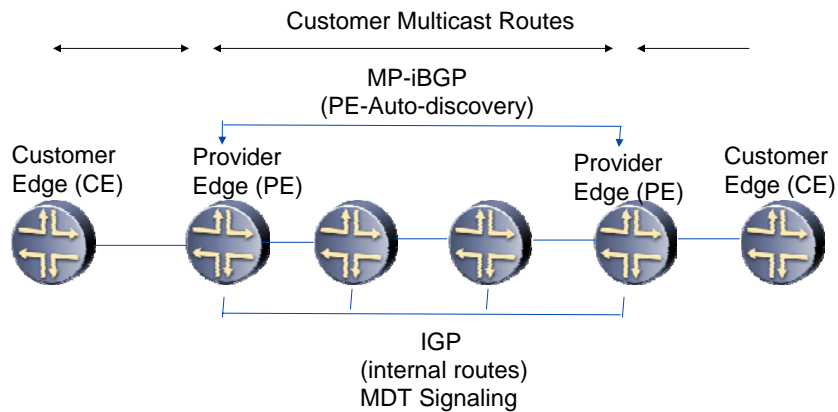
## IP Multicast Routing (ASM)



## L3VPN Multicast Forwarding



## L3VPN Unicast Routing



## Design Tension

---

- L3VPN scales because the service provider's interior routers do not carry customer routes
- Multicast works because the service provider's routers know where the listeners are
- How much state should the SP routers carry?
  - Trade off between amount of state and multicast efficiency

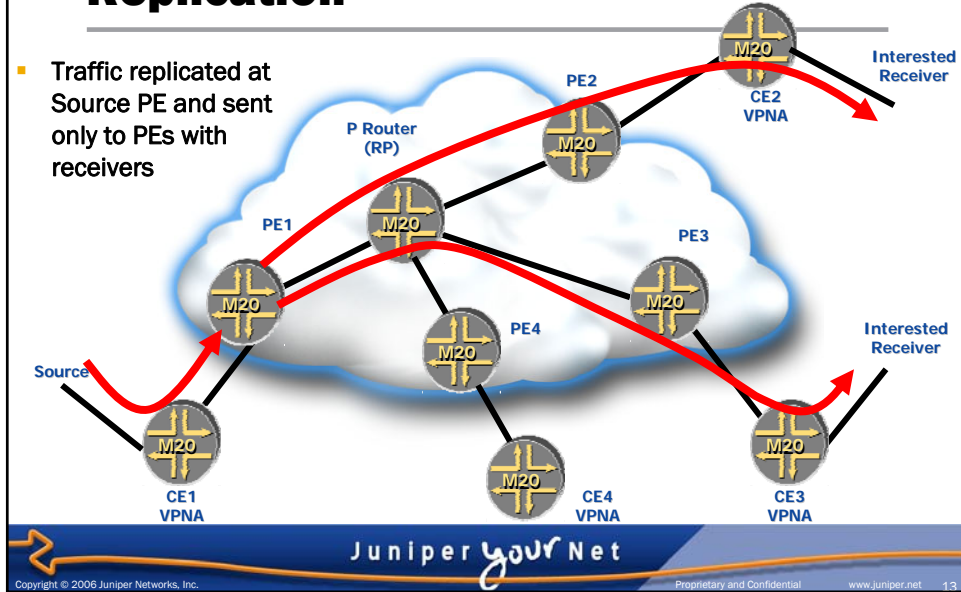
## MVPN Design Approaches

---

- Traffic Flow Options
- Service Provider Tunneling Options
- Service Provider Tunnel Setup Options
- Customer Route Distribution Options

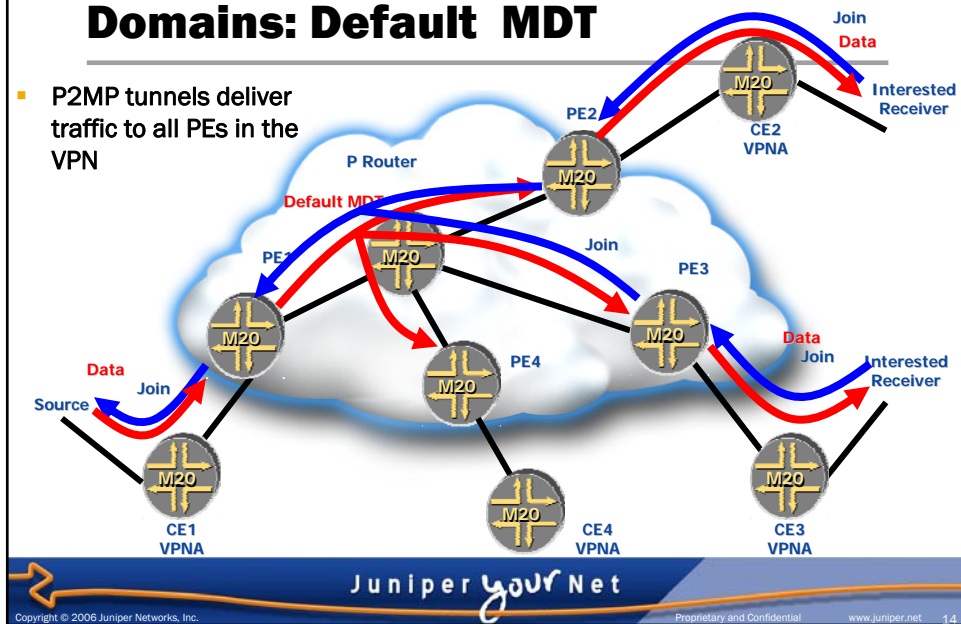
## MVPN Traffic Flow- Ingress Replication

- Traffic replicated at Source PE and sent only to PEs with receivers



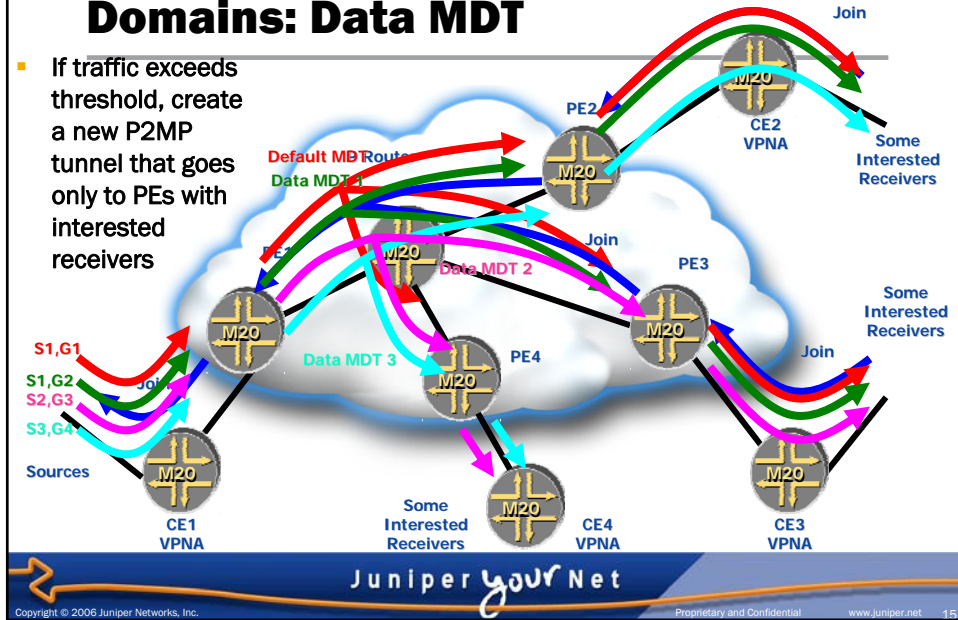
## MVPN Traffic Flow- Multicast Domains: Default MDT

- P2MP tunnels deliver traffic to all PEs in the VPN



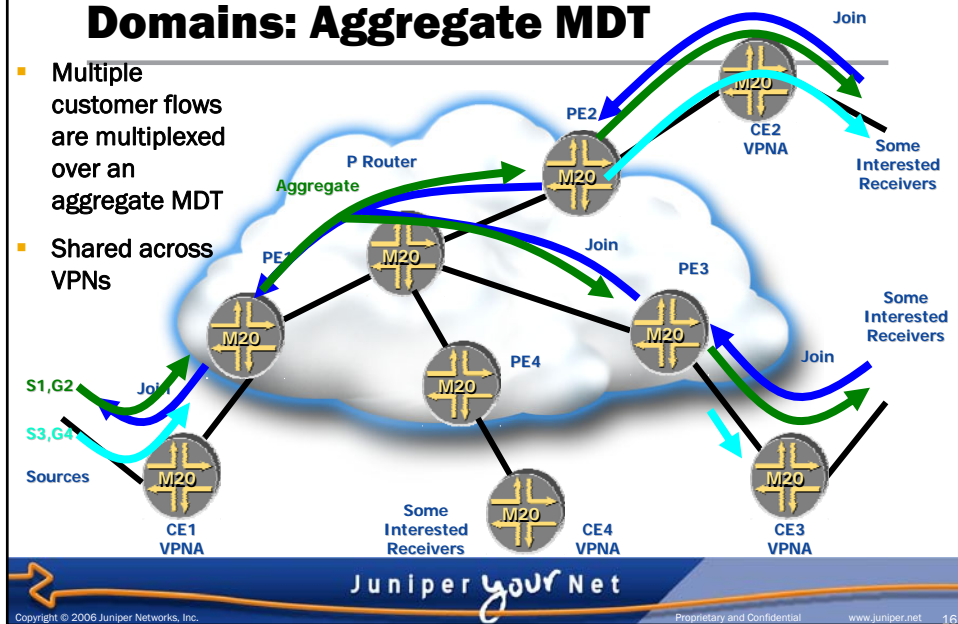
## MVPN Traffic Flow- Multicast Domains: Data MDT

- If traffic exceeds threshold, create a new P2MP tunnel that goes only to PEs with interested receivers



## MVPN Traffic Flow- Multicast Domains: Aggregate MDT

- Multiple customer flows are multiplexed over an aggregate MDT
- Shared across VPNs





## Let's Look At The Last Four Slides Again

---

- As is the case with unicast L3VPN, the customer and provider maintain unique routing domains
  - Where are the C-PIM adjacencies?
  - Where are the P-PIM adjacencies?
  - Where are the tunnels through the SP network?
  - Where are the points of replication?
- Depending upon the forwarding strategy, the customer and provider routing domains interact differently
  - What is the mapping of customer multicast groups to tunnels through the provider network?

## Service Provider Tunneling Options

---

- P2MP MPLS LSP
  - RSVP or LDP signaled
- GRE tunnel in which destination address of outer header is a multicast group

## **Service Provider Tunnel Setup Options**

---

- Single source multicast
  - Single source discovered via BGP or static configuration
  - Receiver sends join directly towards source
- Any source multicast
  - Receiver discovers the source by sending PIM towards a Rendezvous Point
- In all cases, the result is a shortest path tree

## **Customer Route Distribution Options**

---

- PE routers form PIM adjacency
- C-Joins converted to BGP advertisements

## Many Flavors of VPN Multicast

---

- Traffic Flow (4 Options)
- Tunneling (2 Options)
  - MPLS (2 tunnel setup options)
  - GRE (2 Options – ASM/SSM)
- Customer route advertisements (2 Options)
- This makes at least 32 major permutations
- And that's not all
  - PIM-SM vs BIDIR

## So Which Option Is Best?

---

- It depends....
  - Number of multicast flows
  - Size of multicast flows
  - Network topology
  - Distribution of receivers and receiver behavior

## So What Next?

---

- Operator community will drive vendors to implement a few options
- An ounce of operational experience is worth a pound of analysis ;-)

## Recommended Reading

---

- draft-ietf-l3vpn-ppvnp-mcast-reqts
- draft-ietf-l3vpn-2547bis-mcast
- draft-raggarwa-l3vpn-2547bis-mcast-bgp



## Understanding VPN Multicast

