BGP/MPLS L3VPN's Deployment Scenario's

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Layer 3 VPN's

- RFC2547bis
- BGP/MPLS IP VPN's
- Other options
  - Virtual/logical Routers - simpler to understand perhaps, but scaling issues.
Influencing Deployment

- Cost ~2 x IP connectivity
- Expected to be 1:1 in 2-3 years

Predicted Revenue for IP VPN Services – Asia Pacific

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$1.69b</td>
<td>24.9%</td>
</tr>
<tr>
<td>2004</td>
<td>$2.11b</td>
<td>25.4%</td>
</tr>
<tr>
<td>2005</td>
<td>$2.72b</td>
<td>28.7%</td>
</tr>
<tr>
<td>2006</td>
<td>$3.36b</td>
<td>23.4%</td>
</tr>
<tr>
<td>2007</td>
<td>$4.06b</td>
<td>20.9%</td>
</tr>
<tr>
<td>2008</td>
<td>$4.62b</td>
<td>13.7%</td>
</tr>
<tr>
<td>2009</td>
<td>$5.14b</td>
<td>11.5%</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan IP VPN Market: Revenue Forecasts (Asia Pacific), 2003-2009
Layer 3 VPN's (2547bis BGP/MPLS VPN's)

Provider provisioned VPN

- ISP runs backbone for customer
  - Customer can be another ISP!

- **Attractive to**
  - Customer who do not want to run their own backbone

- **Not attractive to**
  - Customer who doesn’t trust carrier
  - Customers who’s jobs are threatened
Traditional VPN's

- CPE based
- Customer controlled
- No value add for provider
Provider provisioned VPN's - PPVPN

- PE based
- Customer outsource backbone

- Value add for provider
- Single Site Provisioning (BGP, + Route refresh + Route Target Filtering)

Company RED

Company Blue

Provider backbone

Company RED

Company Blue
Sharing Network backbones

- Infrastructure built by one department
- Shared by other departments
- Cost effective government spending

Examples
- Gov’t backbones
- Industry Aligned

Ministry of Agriculture

Gov’t backbone

Ministry of Education
InterAS VPN's

- Requires Co-operation
- Opportunity for global coverage
Site Connectivity

- Partial or Full Mesh is supported
- Full Mesh is more cost effective and competitive with traditional solutions
Overlapping VPN's

- Suites application / service providers
L3 VPN Terminology

PE router

CE routers

P router

PE router

CE routers
**CE-PE interaction**

- Any L2 connection, Any routing protocol
- CE peers at layer 3 with PE

![Diagram](Image)
Customer View of L3VPN

- Make the cloud look like a router
- Single site provisioning
VRF - Virtual Routing and Forwarding instance

- VRF per VPN on PE
- Logical Interface packet arrives on defines the VRF used

**PE Default Table**

<table>
<thead>
<tr>
<th>Dest IP</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Some IP</td>
</tr>
<tr>
<td>Net ID</td>
<td></td>
</tr>
</tbody>
</table>

**RED Routing Table**

<table>
<thead>
<tr>
<th>Dest IP</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Net ID's</td>
<td>Label A Serial 0</td>
</tr>
<tr>
<td>10.1.0.0 /8</td>
<td></td>
</tr>
</tbody>
</table>

**Blue Routing Table**

<table>
<thead>
<tr>
<th>Dest IP</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>XYZ Net ID's</td>
<td>Label X Serial 1</td>
</tr>
<tr>
<td>10.1.0.0 /8</td>
<td></td>
</tr>
</tbody>
</table>
PE-PE interaction

- iBGP between PE's carries routing information
- Assigns label per VPN
LSP establishment

- Per VPN via BGP label assignment
- PE - PE set up via LDP or RSVP (saves state)
InterAS VPN's

- VRF-to-VRF
- MBGP between ASBR (not OSPF)
- MBGP between PE's
VPN as backup

- Do you want PE to appear as
  - Intra Area Router (Sham Links)
  - ABR
  - ASBR
Issues

- **BGP scaling**
  - RR, often separate from IP RR

- **Inter-AS scaling**
  - MBGP between PE’s is desirable

- **Management**
  - Usual MPLS, OAM, root cause automation.
  - Overlap NOC with VPN? Addressing?

- **QoS**
  - Carriers mapping 4+ queues
Further Reading

1. http://www.juniper.net/solutions/literature/white_papers/
3. www.mplsnc.com