Overlay Networks

Outline
Tunneling
Virtual Private Networks
Routing Overlays
PlanetLab
Tunneling

Virtual Private Network
VPN (cont)

Network 1 \(\rightarrow\) Internetwork \(\rightarrow\) Network 2

10.0.0.1

<table>
<thead>
<tr>
<th>IP header, Destination = 2.x</th>
<th>IP header, Destination = 10.0.0.1</th>
<th>IP header, Destination = 2.x</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP payload</td>
<td>IP payload</td>
<td>IP payload</td>
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</tbody>
</table>

VPN (cont)

VPN A /Site 2
VPN B /Site 2
VPN A /Site 1
VPN B /Site 1
VPN A /Site 3
VPN B /Site 3

Provider network
Multicast

Triangle Inequality
PlanetLab

- 550 machines spanning 250 sites and 28 countries
  - nodes within a LAN-hop of > 1M users
- Supports *distributed virtualization*
  - each of 450 network services running in their own *slice*

Slices
Per-Node View

Virtual Machine Monitor (VMM)

Extending Slices to NLR
Extending Slices to NLR

NLR + PlanetLab
User Opt-in