Ethernet Service Provision (ESP)

- **An Ethernet Service Provider supplies Ethernet Layer 2 services among Customers' sites.**
- **A number of vendors are providing equipment for this purpose.**
- **A number of ESPs exist, and use various technologies to deliver various services.**
  - **Ethernet over SONET**
  - **Ethernet over various L3 tunneling protocols**
  - **Q-in-Q Ethernet over Ethernet**
- **IETF's Provider Provisioned Virtual Private Networks (PPVPN) Working Group is defining L2-VPNs.**

IETF's L2-VPNs

- **PPVPN WG is working on standardizing both L3-VPNs and L2-VPNs.**
  - **draft-ietf-ppvpn-vpls-requirements-00 describes the requirements for Layer 2 and Layer 3 VPNs.**
  - **Architectures for meeting the L2-VPN requirements include draft-lasserre-vkompella-ppvpn-vpls-02, draft-elwin-ppvpn-l2tp-arch-00.**
- **These drafts do not assume that bridges, as defined by IEEE 802.1, are essential to providing the service.**
- **They do assume that devices which learn MAC addresses and forward packets based on that learned information are essential, but these are not bridges.**

IETF's L2-VPNs

- **Working group's inattention to bridging, seems to be driven by two common, though not universal, phobias:**
- **ATM LAN Emulation (LANE)**
  - **ATM LAN Emulation was a disaster because it was much too complex.**
  - **Therefore, "LAN Emulation over MPLS" is a terrible idea.**
- **Spanning Trees**
  - **IEEE 802.1D is completely opaque, and way too complex for such a simple job.**
  - **Routing protocols are much better than spanning trees because they find a better route, and because they scale to larger networks.**

Metro Ethernet Forum

- **Industry consortium to promote interoperability of Metro Ethernet Service Providers.**
- **http://www.metroethernetforum.org/**
- **MEF is defining a number of requirements, e.g.:**
  - **Operations And Maintenance (OAM) protocols to perform functions such as Traceroute and Ping, both end-to-end and across User-Network Interface (UNI).**
  - **Line Management Interface (LMI) protocols between customer and provider to verify and/or manage connectivity.**
  - **Point-to-point, multipoint-to-multipoint, and point-to-multipoint services.**
- **MEF is reluctant to generate standards.**

Some Problems To Be Addressed

- **How can bridges supply this service? (Hint: “Q-in-Q”)**
  - **What are the semantics of the outer Q (or similar) tag?**
  - **What are the semantics of the inner Q (or similar) tag?**
- **What *exactly* are the services offered to a Customer?**
  - **Which L2 protocols are carried end-to-end through the provider network?**
  - **Which L2 protocols are blocked by the provider network.**
  - **Which L2 protocols are operated between the customer and the provider?**
  - **Which L2 protocols need to do more than one of the above?**
  - **Is there more than one common answer? Are there options?**

Some Problems To Be Addressed (2)

- **How does one convey a customer's BPDUs across an L2 Provider network?**
  - **Provider bridges use a different set of MAC addresses for control traffic?**
  - **Edge bridges translate customer BPDUs' MAC addresses on entry and exit?**
  - **Edge bridges encapsulate/decapsulate customer BPDUs on entry and exit?**

Some Problems To Be Addressed (3)

- **How do bridges interact with Ethernet-over-L3 tunneling technologies?**
  - **Persuade PPVPN to define “Ethernet emulation over MPLS”?**
  - **Write “This is how to implement L2-VPNs with bridges” addendum to L2-VPN RFCs?**
  - **Try to persuade PPVPN WG to define the service in terms of bridges?**
- **How do you build very large networks of bridges?**
  - **There is a strong desire for providers’ networks to be larger than RSTP or MSTP can handle.**
  - **There is a great deal of activity in non-standard means to scale up L2 networks.**

Some Problems To Be Addressed (4)

- **How do you signal the need to forget MAC addresses across the L3 “cloud” at the center of most architectures?**
- **How do you signal the need to forget MAC addresses on scales smaller than all of the customers carried over a single provider spanning tree?**
- **How do you avoid and/or accomplish learning both the provider’s “outer” and the customer’s “inner” .1Q tag when learning MAC addresses?**

Some Problems To Be Addressed (5)

- **How do you (not) handle loops in the customer's network without extending the provider's spanning trees into the customer's network.**
- **How do you handle more than 4094 customers?**
- **How do you fulfill the perceived need for providing a provider VLAN that connects a few ISP routers to a number of subscribers so that the subscribers can converse with the routers, but not with each other? (MEF's point-to-multipoint service)**
- **How are VLAN-IDs used across the UNI?**