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IEEE 802.3 Ethernet in the First Mile Study Group

Proposal for Virtual Private Bridged Networks

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The Need and Purpose of EFM

- Last "Call For Interest" presentations made the Last Mile Access Requirements Clear:
  - High Bandwidth Broadband Access
  - Inexpensive Equipment
  - Low cost of ownership
  - Reliable
  - Secure
  - Profitable
- Conclusions:
  - Not Possible with the Current Solutions
    - e.g. xDSL, Cable Modem, ISDN
  - Is Possible with Ethernet!

The Model

- Carrier offers Ethernet Connectivity to the Customer
  - Avoid cost (equipment and ownership) and complexity of L3 and MPLS
- Carrier Customers:
  - Residential
  - Business (single or multi-site)
  - Service Providers: ISP/SSP/ASP
- Connectivity
  - Point to Point
  - Multi-point to Multi-point

Who Wants What?

- Who are the parties:
  - The Carrier
  - The Residential
  - The Business
  - Service Providers: ISP/SSP/ASP

What does the Carrier Want?

- Easy and Cheap way to get to the customer
  - Simple Transport Network
    - Low cost for core network and access devices
    - Low cost of ownership
  - Technology
    - Mature
    - Scalable Technology
      - 10Mbps to 10Gbps
    - Media Independent
      - Ethernet over POTS (10Base-S/HomePNA), Cat-3, Fiber, SONET/SDH, Air
- Achieve maximum utilization of core network
  - Ethernet allows statistical multiplexing
- Multiple Billable Services
  - Flat rate or Usage based
  - Use QoS and/or SLA for premium rates
- Security
- Reliability

What does the Residential User Want?

- Simple Broadband Access to ISP
  - Ethernet is the medium of choice due to price, maturity, and bandwidth
  - The only access device is the customer NIC
- Plug and Play - Zero Configuration
  - DHCP for IP address/gateway/DNS assignment
- Security/Privacy

What the Business Customer Wants:

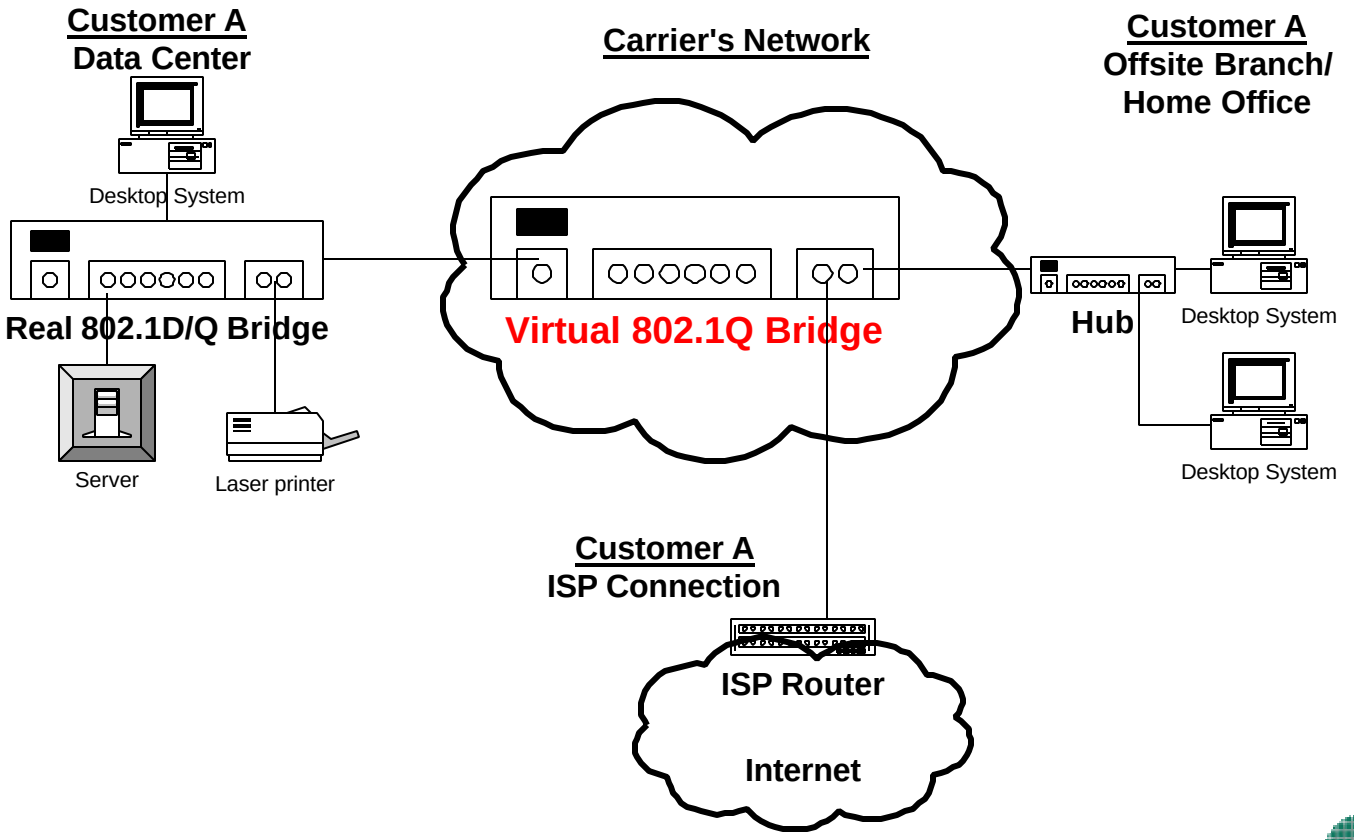
- Replace current (Virtual) Leased Lines with Multi-Site LAN Connectivity
- ISP/SSP/ASP Connectivity
  - Some LAN segments be unconnected for security purposes
- CPE Access Device
  - low cost and maintenance
- Full Control over VLANs and IP Address Space
  - Without coordination with the Carrier
  - Customer VLANs may extend between sites
- SLA with Minimum BW Guarantee/QoS
- Security

What do the Service Providers (ISP/ASP/SSP) Want?

- New Service/Revenue Stream
  - e.g. Broadband Internet Access
- The SP needs customer Identification Mechanism
  - VLAN ID can provide this
- Need to provide per customer:
  - Billing
  - Security
  - SLA and QoS Enforcement

Technology: Virtual IEEE 802.1Q Ethernet Bridging

- From the customer's perspective, the Carrier is providing him/her with a Private Bridged Network between multiple sites.



Carrier Network Reliability

- Use existing IEEE standards:
  - IEEE 802.1s Multiple Spanning Tree for:
    - Loop Prevention
    - Redundancy
  - IEEE 802.1w Rapid Reconfiguration for:
    - Fast Recovery
  - IEEE 802.3ad Link Aggregation for:
    - Increased Availability and Bandwidth
- No need to develop new protocols

Using the VLAN Tag

- The VLAN Tag can facilitate:
  - Customer Identification to the SP
    - For SP access control, billing, etc.
  - Inter-VLAN Segregation of traffic
    - For customer security
  - Intra-VLAN Switching
    - A requirement for multi-site multi-departmental business

Issues Using the VLAN Tag

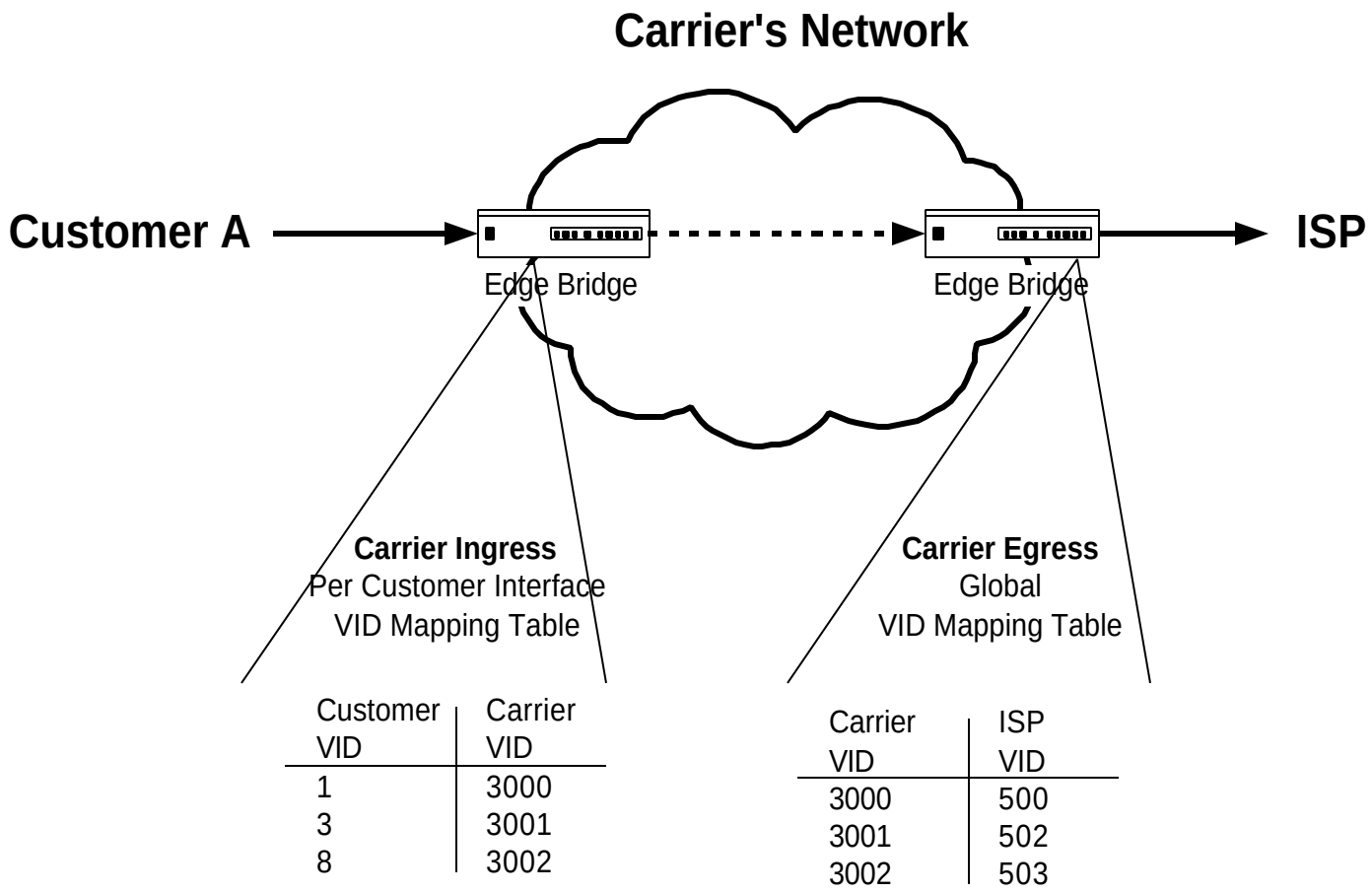
- **Issue #1:**
  - **Customer Internal VLAN ID Conflicts within the Carrier**
    - Need to make customer-VIDs unique within the Carrier Network
  - **SP needs control over customer VID Assignments**
    - Need to map ISP VID assignment to Carrier VID assignment

Possible Solution:
Perform 2-way VLAN ID mapping at the Carrier Edge

- **Issue #2: 4K VLANs is not Enough!**

Possible Solution:
•Define new Tag Format with larger VLAN ID.
•Distinguish with new EtherType

VID Mapping at the Carrier Edge



Customer VID	Carrier VID
1	3000
3	3001
8	3002

Carrier VID	ISP VID
3000	500
3001	502
3002	503

Control Plane Domains

- Should Bridge Control Traffic pass across the Customer/Carrier Boundary, I.e. Common Control Plain?
  - STP/MSTP
  - GMRP
  - GVRP
  - Need to re-map VIDs in PDU Payload?
- Or should Bridged Control Traffic be terminated at the Customer/Carrier Boundary, I.e. separate Control Plains?
  - Carrier has its own Control Plain
  - Customer networks have their own
    - Problem for multi-site customers?

Need to talk to 802.1?

- VLAN ID under the scope of 802.1
- 802.3 to request from 802.1:
  - Increase VLAN ID space
  - Suggest how to perform remapping of VLAN IDs