Driving Ethernet Deeper
Ethernet Business Services over DOCSIS
COX New Orleans (NOLA) Case Study

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Agenda

- Carrier Ethernet Business Services
- COX New Orleans Telecommuter Service
- Deployment Challenges and Service Evolution
- Summary and Q&A
Carrier Ethernet
Business Services
Business VPN Services

- Mass scale Carrier Ethernet Services adoption
- MPLS-based L3 VPN and L2 VPN services
- Advantages of L2 VPN services over L3 VPN:
  - Protocol Agnostic
  - No protocol sharing between SP and Customer
  - More customer control over their network
  - Simpler to deploy
- Standardized Carrier Ethernet L2VPN Services
Carrier Ethernet L2VPN Services

**E-LINE Services**
- Ethernet Private Line (EPL)
  - Replaces a TDM private line
  - Dedicated UNIs for point-to-point connections
  - Single Ethernet Virtual Connection (EVC) per UNI
  - The most popular Ethernet service due to its simplicity

**E-LAN Services**
- Ethernet Private LAN (EP-LAN)
  - Supports dedicated UNIs
  - Supports transparent LAN services
  - Supports multipoint Layer 2 VPNs

**VLAN-based**
- Ethernet Virtual Private Line (EVPL)
  - Replaces Frame Relay or ATM services
  - Supports service multiplexed UNIs (i.e., multiple EVCs per UNI)
  - Allows single physical connection (UNI) to customer premise equipment for multiple virtual connections

**E-TREE Services not shown here**
Carrier Ethernet Components

- **User-to-Network Interface (UNI)**
  - Physical demarcation between Subscriber and MSO

- **Network-to-Network Interface (NNI)**
  - Physical demarcation between individual Carrier Ethernet networks

- **Ethernet Virtual Circuit (EVC)**
  - Logical end-to-end service representation
Business Services Over DOCSIS

- Builds on standard defined by MEF
- Competitive advantage for Cable SPs due to HFC reach
- DOCSIS 3.0 offer new opportunities for BSOD
  - Higher speed with Channel bonding
  - Effective competition against T1, leased line and in some cases, fiber
- Multiple Deployment Options
  - Transparent LAN Services over DOCSIS
  - 802.1Q (Dot1Q) Based BSoD
  - MPLS based BSoD
COX New Orleans Telecommuter Service
COX New Orleans Telecommuter Application
Service Objectives and Requirements
- To provide telecommuters with Layer 2 Access to Central Office
- Use existing HFC access in Home Office
- Each Home Office contains:
  - IP Phone for Voice over IP traffic
  - PC for Data traffic
- VoIP and Data Traffic to use separate VLAN’s in CO
COX New Orleans Telecommuter Application Service Architecture

- H-VPLS to provide MAC learning and bridging at Central Location
- Transparent LAN Services over DOCSIS used on CM and CMTS
  - CMTS encapsulate all traffic from CM in a 802.1Q VLAN Tag
- Data traffic is untagged; VoIP is Tagged for service separation
COX New Orleans Telecommuter Application
Service Traffic Separation

- CMTS adds a TLS over DOCSIS tag to all traffic
  - Data Traffic is single tagged
  - VoIP is double tagged, with same S-VLAN as Data
- Flexible frame matching needed on upstream router
Deployment Challenges and Service Evolution
Service Deployment Challenges

- **End-to-End Traffic Isolation**
  - Centralized solution difficult to troubleshoot

- **Per Site CMTS Configuration**
  - CMTS manually configured for each site

- **L2 Problem Detection and Isolation**
  - End-to-end troubleshooting tools are mainly Layer 3
  - Cable Modem down, but L2 circuit active

- **High Availability and Load Balancing**
  - Only one forwarding interface per CMTS

- **Service Scale**
  - 4000 services (VLANs) total
Service Evolution

- Cable Labs compliant Business Services over DOCSIS (BSoD)
  
  1) Dot1Q-based BSoD
     - Similar to TLS over DOCSIS but supports:
       - Multiple VLAN’s for single CM
       - Provisioning through Cable Modem Config file
  
  2) MPLS-based BSoD
     - Enables MPLS PE functionality on CMTS
     - Provisioning through CM Config file
     - MPLS-based load balancing and High Availability
Dot1Q Based BSoD for Telecommuter Service

Changes from TLS over DOCSIS Design:
- Use multiple services flow with VLAN based Classification
- Assign per-traffic VLAN
- Use Cable modem Configuration file for CMTS side processing

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<th>Challenge</th>
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<td>Traffic Isolation</td>
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<td>Per site Configuration</td>
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<td>L2 Problem Detection</td>
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<td>CM Down Propagation</td>
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<td>High Availability and Load Balancing</td>
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<tr>
<td>Service Scale (CMTS)</td>
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MPLS Based BSoD for Telecommuter Service

- Changes from TLS over DOCSIS Design:
  - CMTS as MPLS PE !!!!
  - Use multiple services flow with VLAN based Classification
  - Assign per-service flow EoMPLS PW
  - Use Cable modem Configuration file for CMTS side processing

- Simplest End-to-End Design !!
Summary
Summary

- Business Services over DOCSIS picking steam
- Leverage existing HFC infrastructure for MEF Services
- Multiple deployment option for Business Services over DOCSIS
- TLS over DOCSIS for COX Telecommuter application
- Metro network key for end-to-end Layer 2 transport
- Dot1Q- and MPLS-based BSoD offers enhanced functionality and flexibility
Q & A