

# Generic Data Services and 802.3ah Infrastructure

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# Two Main Service Types

- Data Communications Services – Services that provide communications for customer generated data or information – Infrastructure usage that is billed for
  - Examples: “Private Line”, “Frame Relay”, ”Internet”, etc.
- Data Content Services – Services that provide communications for data that is not generated by the customer or is of a specific type of interactive content
  - The infrastructure usage does not get billed for
  - Examples: “Voice”, “WEB Content”, “Pay per View”, etc.

# Service And Infrastructure Not Same

- Services May be Low OSI Level (L1), Upper Level (L2/L3), Or Application (L7/8)
- Upper Level and Application Services Use Multiple Lower Levels of Infrastructures
- Service and Operations Management Specific to Level of Service
- **Lower Level Infrastructure Operations and Management is Specific to Lower Levels – Invisible to Upper Layer Services**

# Generic Data Communications

- Four Types or Models
  - Private Line – TDM Private Line
  - Virtual Private Line – Frame Relay, ATM
  - Best Effort – Internet, Internet Access
  - Virtual Private Network – Private IP, IP VPN
- Distinguishing Attributes
  - Connection Type, Bandwidth Type, Service OSI Level, Infrastructure Level, Availability, Reliability, Stability, Security/Segregation, Routing Autonomy, **Operations/Network Management**, Customer Cost Structure, Service Provider Margin

# Private Line

- Connection Type - **Connection Oriented**
- Bandwidth Type – **Fixed**
- Service OSI Level – **OSI Level 1**
- Infrastructure OSI Level – **OSI Level 1**
- Availability – **High** (Up to 99.99%)
- Reliability – **High** ( $10e - 10$  Bit Error Rate)
- Stability – **High** ( ps per bit )
- Security/Segregation – High ( Physical/Time Domain Segregation)
- Routing Autonomy – Fixed Provisioning
- Operations/Network Management – **Physical Level (Out of Band)**
- Customer Cost Structure – High with distance charges
- Service Provider Margin – High Revenue / High Margin (No Statistical Gain) **Highest Growth at High Bandwidths**

# Virtual Private Line

- Connection Type - **Connection Oriented**
- Bandwidth Type – **Fixed, Tiered, and Burstable**
- Service OSI Level – **OSI Level 2**
- Infrastructure OSI Level – **Virtual OSI Level 1**
- Availability – **High** (Up to 99.9%)
- Reliability – **Moderate** ( $10e - 4$  Frame Loss /  $10e-8$  Cell Loss)
- Stability – **Moderate** ( 10s ms Latency Variance )
- Security/Segregation – **High** ( Full Encapsulation)
- Routing Autonomy – Fixed PVC / Self Autonomous
- Operations/Network Management – **Virtual Physical Level (Out of Band to Customer Traffic)**
- Customer Cost Structure – High Without Distance Charges
- Service Provider Margin – High Revenue / Moderate/High Margin (Moderate Statistical Gain) **High Growth at Low Bandwidths**

# Best Effort

- Connection Type – **Connectionless Oriented**
- Bandwidth Type – **Tiered, and Burstable**
- Service OSI Level – **OSI Level 3**
- Infrastructure OSI Level – **OSI Level 3**
- Availability – **Low to Moderate** (Up to 99.9%)
- Reliability – **Low** ( $10e - 2$  Data Error Rate)
- Stability – **Low** (100s ms Latency Variance)
- Security/Segregation – **Low to None** (All Customer Traffic Intermingled)
- Routing Autonomy – **Self Autonomous**
- Operations/Network Management – **In Band to Customer Traffic**
- Customer Cost Structure – **Low Without Distance Charges**
- Service Provider Margin – **High Revenue / Low Margin** (High Statistical Gain) **High Growth at Low Bandwidths**

# Virtual Private Network

- Connection Type – **Connectionless Oriented**
- Bandwidth Type – Tiered and Burstable
- Service OSI Level – **OSI Level 3**
- Infrastructure OSI Level – **Virtual OSI Level 3**
- Availability – **Moderate to High** (Up to 99.99%)
- Reliability – **Low to Moderate** ( $10e - 3$  Data Error Rate)
- Stability – **Low** (100s ms Latency Variance)
- Security/Segregation – **Low to Moderate** (Tag Address Insulation / Customer Traffic Intermingled)
- Routing Autonomy – Self Autonomous
- Operations/Network Management – **In Band to Customer Traffic**
- Customer Cost Structure – Moderate Without Distance Charges
- Service Provider Margin – Moderate Revenue / Moderate Margin (Moderate to High Statistical Gain) **Moderate at High Bandwidth**



# Content Services

- Wide Variety
- Value Added
- Upper OSI Layer Functions and Applications
- Uses Data Communications Services  
Functionality as Infrastructure
- Content delivery is defined by Infrastructure
- **Content Service / Operations Management  
is Separate From Data Communications  
Infrastructure Operations Management**

# Two Types of Content Services

- Simplex Broadcast Services – Service provider originates or provides the origination point for content that is provided simplex to the customer
  - Examples: “Cable TV”, “Video Streaming”, etc.
- Interactive – Service provider originates, provides the origination point, or a specialized functionality for content that is duplex, symmetrical or asymmetrical
  - Examples: “Voice” (symmetrical), “WEB Hosting” (asymmetrical), “Interactive Gaming” (asymmetrical), etc.

# Content Services Use of and Dependency on Infrastructure

- Content Services and Management are Independent of Infrastructure
  - Example: Dial Voice
    - **Communications infrastructure is low bandwidth dynamic switched circuits**
    - Management uses special function control protocol on segregated control plane infrastructure – SS7
    - Local service charges are for number of simultaneous calls supportable
    - Long distance services are for usage time outside of local
    - Management of infrastructure is invisible to service
- Content Services are Dependant on Infrastructure
  - Example: Dial Voice
    - Service is ubiquitous only because the infrastructure is – **Where the infrastructure does not reach, the service is not available**
    - Service is reliable and stable because the infrastructure is – **Where the infrastructure is unstable the “quality” is poor – Where the infrastructure is unreliable or overloaded the service is unreliable**

# 802.3ah is L1 Infrastructure

- 802.3ah Infrastructure Usage is Service Dependant
  - Examples:
    - “Ethernet Private Line” – 802.3ah provides physical link between customer’s data switch and service provider Ethernet over SONET transmission node – **802.3ah operations support of the edge link and is “out of band” at PHY** only not the customer’s data switch
    - “WEB Video Streaming” – 802.3ah provides the physical link between customer’s router/computer and the service provider’s point of presence service aggregation switch/router – **“Video” is not aware of 802.3ah link** except as a reliable and stable infrastructure – **802.3ah management is for the edge physical link only** not the video stream, routers or computer

# Business Ethernet Services Already Exist

- Several ILECs have provided low level **VPL** and **VPN** types of services to businesses for years
- “Legacy Free Service Providers” are providing native **Ethernet VPN** services between offices and “IP” access in Metro
- DWDM Service Providers are providing GbE Metro “**Private Line**” services over “dark fiber” or “dark wavelengths”.
- Several CLECs have started multiple Ethernet services to businesses, “**Private Line**”, “**VPL**”, “**Internet Access**”, “**VPN**”, “**Voice over IP**”, “**Video Multicast**”

# Already Existing Need for 802.3ah to Support Business Services

- Current technology does not provide management of the edge physical link – service management support is limited or non-existent – Service demarcation is limited to the transmission node or aggregation switch port.
- 802.3ah is needed to provide link and service management to a service demarcation at the customer “office”/site
- **Business services revenues and margins already justify the capital funding to deploy EFM technology if it supports the requirements of the existing services**

# 802.3ah for Residential Services Is More of A Future Need

- High bandwidth residential services is currently limited to the existing infrastructure
- Ethernet residential services requirements (Data Comm and/or Content) have not been defined yet
- **Residential revenues and margins make it difficult to justify capital funding to deploy EFM technology for services where today's "take rate" is low and new services markets are uncertain**

# 802.3ah Existing Market

- 802.3ah as L1 infrastructure is already needed for existing Ethernet services, “Private Line”, “Virtual Private Line”,
- Functional management characteristics must correspond to the generic service model, or it will not support that service
- **The market for 802.3ah is dependant on the services for which it will provide support**