AT&T Switched Ethernet Service℠

Next Generation of Switched Ethernet

Overview Version
Contents

- **Introduction: AT&T Carrier Ethernet and Industry Recognition**
- What’s New vs. Legacy OPT-E-MAN® Service or Metro Ethernet Service?
- **AT&T Switched Ethernet ServiceSM Product Overview**
- Design Choices
- In-Depth Design Considerations
  - How to approach Network Design
  - Private Line vs. VPLS (E-Line vs. E-LAN)
  - Per Packet Class of Service
- Class of Service and Pricing
- Business Continuity Options
- **Access to WANs and Out of Franchise**
- Network infrastructure
- Glossary
AT&T Carrier Ethernet Services Principles
Making Our Network Work For You

**Broad Range of Endpoints**
- One of the Broadest Footprints in the Industry
- Deep 22 State Access Coverage
- Extensive interconnections with certified Ethernet access suppliers
- Global VPLS in 30+ Countries

**Consistent application deployment and scaling**

**AT&T Network Coverage**
- 360+ Metro Markets
- Access to Internet, VPN and Wide Area Networks
- Available as dedicated, VPLS, and as an addition to Optical Rings

**Resilient Global Network**
- Carrier Ethernet powered by AT&T MPLS
- State-of-the-Art SONET and Wave Optical Networks
- Options for Ethernet over Copper

**Superior network performance to optimize and grow your business**

**AT&T Network Performance**
- Industry Leading SLAs
- Flexible traffic performance using standard classes of service
- Available up to 10 Gbps

**Unified, Flexible Services**
- Flexible Management Options
- Ease of Migration & Hybrid Networking
- Future Proof – The Network that changes with you

**Reduce operations costs and save time**

**Rich Solution Options**
- Customer controls IP routing
- Broad Portfolio – “Mix and Match”
- Management Tools
Carrier Ethernet Arrangements
Access and Network Solutions for Metro and Wide Area

<table>
<thead>
<tr>
<th>One Site</th>
<th>E-Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Access through the local facilities to long haul VPN and Internet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Two Sites</th>
<th>E-Line</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ethernet Point to Point using the Ethernet framing for data transport</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Three or More Sites</th>
<th>E-LAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Virtual Private LAN Service</td>
</tr>
<tr>
<td></td>
<td>Multi-point irrespective of distance</td>
</tr>
</tbody>
</table>

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Product Overview
AT&T Ethernet – Industry Recognition

AT&T Wins the 2014 U.S. Business Communication Services Company of the Year Award

“AT&T has emerged as the leader in the whole range of business services markets that Frost & Sullivan tracks regularly as a part of its Business Communication services coverage, which includes – ... Wavelength Services and Ethernet...” Document Title: 2014 U.S. Business Communication Services Company of the Year Award Publication Date: December 2013

AT&T U.S. WAN Services Very Strong

“In the U.S., AT&T is very strong in data WAN services, because the carrier draws on extensive access resources that include incumbent local network status in 22 states, competitive access networks across the rest of the country, national wireless 3G and 4G broadband networks, and switched/dedicated Ethernet access options across the country and internationally.” “Current Analysis, “AT&T U.S. Wan Services,” November 2013

AT&T Market Leader for “Business Ethernet” Services

AT&T remains the U.S. market leader for Business Ethernet services mid-year 2013 with 20.9% of ports

AT&T Switched Ethernet Service℠

Ethernet Virtual Private LAN Service (VPLS) to connect 3 or more sites, or Ethernet Private Line (EPL) to connect two sites or access to Internet or WAN networks.

Benefits

• **Performance**
  24x7 proactive monitoring and maintenance with industry-leading SLAs

• **Agility**
  Committed bandwidth, managed NPE, multiple configurations

• **Control**
  Ethernet switching with customer LAN interface, multiple CoS

• **Security**
  AT&T network security
**AT&T Switched Ethernet Service**

**Product Overview**

**What is it?**

- AT&T Switched Ethernet Service offers Ethernet connectivity for customers with multiple locations in a metro area, with a variety of configurations to meet your needs with flexibility to grow and adapt as your needs change:
  - Ports offered in 3 sizes: 100 Mbps, 1 Gbps, & 10 Gbps
  - Committed Information Rate (bandwidth) offered in 21 sizes: 2 Mbps to 10 Gbps
  - Six classes of service offering the right performance / SLA for your applications
  - Optional Class of Service prioritization for integrated voice and data networks
  - Ethernet Private Line (EPL/EVPL) for connections between two locations
  - Virtual Private LAN Service (VPLS) for connections between 3 or more locations

**How does it work?**

- Each customer location is served by an Ethernet port
- Ports are connected via the MPLS-based core network using highly secure Ethernet Virtual Connections (EVCs) to enable Virtual Private Networks (VPNs)
AT&T Switched Ethernet Service℠

Easy Connections and Service Management

• Local access loop to customer is provisioned over fiber (all speeds)
  – Ethernet over Copper (EoCu) may be used when the CIR is 2 to 10 Mbps
• Handoffs to customer are electrical (100 or 1000BaseT) or optical (1G LX/LH and SX; 10G Base-SR/SW and 10G Base-LR/LW)
  – Demarcation point is patch panel (RJ45 or fiber SC)
  – Network Terminal Equipment (NTE) enables AT&T visibility to edge of network for SLA and maintenance
• 24x7 Ethernet Network Operations Center (ENOC)
  – Responsible for provisioning and maintenance activity
    • Customer Provisioning Center
    • Service Assurance Center
    • Multiple tiers of technical expertise
    • eMaintenance application offered via AT&T BusinessDirect® Web Portal
Who Uses AT&T Switched Ethernet Service℠?

• Customers use AT&T Switched Ethernet Service to connect multiple metro locations in a Metro Area Network (MAN) or to access their WAN services
  – Government, Education, Medical, Manufacturing, Financial, Entertainment, Service Providers, and System Integrators are some of the key customer market segments
• As the networking world evolves to IP/Ethernet-centric applications, every business (within the AT&T Switched Ethernet Service area) that needs multi-site connectivity is a potential candidate for AT&T Switched Ethernet Service
• Customers seeking the best combination of price and value choose AT&T Switched Ethernet Service over competitors:
  – Better availability & reliability via new carrier grade network
  – Competitive pricing with many service and configuration choices
  – Part of broad portfolio of reliable solutions from AT&T companies
Network Applications

- **Ethernet Private Line**
  - Expand your business to a 2nd location with LAN-like performance
  - Connect your primary data center to a back-up data center
  - Connect to an Internet Service Provider or another WAN service at Ethernet speeds
  - Use “virtual” EPL to support private line connections to multiple remote locations from a single hub port

- **Virtual Private LAN Service**
  - Bring all locations together in a single network with “any to any” LAN-like connectivity
  - Use “Virtual LAN” (VLANs) to segregate your network as needed by department, application, or location
  - Support a variety of applications by applying different priorities to your Ethernet frames (Real Time vs. Non-Critical) for performance and efficiency
Ethernet Private Line Service (E-Line)

- Creates a point-to-point “Virtual Private Wire Service” as if dedicated facility between two locations
- Symmetric bandwidth at each location to avoid flow mismatches
- Unlimited MAC addresses and unlimited BUM (Broadcast, Unidentified Unicast and Multicast) frames
- Can be used for extranet communications or connections to partner networks
- Offers six Classes of Service with variety of performance objectives (SLAs)
• Creates a Layer 2 Virtual Private LAN Service (VPLS) over an MPLS core allowing multiple LANs to appear as a single MAN/WAN

• Design metro hubs for concentrated resources: primary or back-up data centers, access to backbone or cloud networks

• Connect “any to any” or “hub and spoke” as needed

• Recommended option for Class of Service prioritization maximizes efficiency of integrated voice and data networks
AT&T Switched Ethernet Service<sup>SM</sup>

Six Classes of Service

- **Scalable** and highly **Secure MPLS** core featuring Juniper carrier-grade routers
- **High Density** deployment over ROADM and fiber for maximum footprint
- **Protected 10G Core** links to help ensure performance
- Point-to-point, point-to-multipoint, full multipoint
- 100Mb / 1Gig / 10Gig ports
- 2 Mb to 10 Gbps speeds
- **Jumbo frame** support (1G & 10G ports)
- **End to End SLAs**

### Real Time

**Service Level Agreements:**
- Latency: 5 ms
- Jitter: 3 ms
- Packet Delivery Rate: 99.995%
- Network Availability: 99.99%

**Service Level Objective:**
- MTTR: 4 hours

### Interactive

**Service Level Agreements:**
- Latency: 13 ms
- Jitter: 10 ms
- Packet Delivery Rate: 99.95%
- Network Availability: 99.99%

**Service Level Objective:**
- MTTR: 4 hours

### Business Critical High

**Service Level Agreements:**
- Latency: 20 ms
- Jitter: not offered
- Packet Delivery Rate: 99.9%
- Network Availability: 99.99%

**Service Level Objective:**
- MTTR: 4 hours

### Business Critical Medium

**Service Level Agreements:**
- Latency: 30 ms
- Jitter: not offered
- Packet Delivery Rate: 99.5%
- Network Availability: 99.99%

**Service Level Objective:**
- MTTR: 4 hours

### Not Shown:
Non-Critical (High and Low) Classes of Service; Non-Critical Low is only offered with Per Packet Class of Service
Anatomy of AT&T Switched Ethernet Port

Many choices in configuration and feature options, but the service always has the components

- **Customer port connection (Port):** provides the physical connection and associated speed between the customer and the AT&T Switched Ethernet Service℠ core network
  - 3 choices: 100 Mbps, 1,000 Mbps (1 GigE) and 10,000 Mbps (10 GigE)

- **Committed Information Rate (CIR):** specifies the amount of bandwidth or “logical channel” that can be transmitted over the port / network
  - Offered in 21 increments from 2 Mbps to 10 Gbps and may be increased or decreased within the port speed without truck roll in most cases

- **Ethernet Virtual Connection (EVC):** creates a virtual connection or L2 virtual private network between 2 or more ports; there is no charge for standard EVCs
  - EVC also has a CIR that is <= than the port CIR; the sum of EVC CIRs cannot exceed the port CIR
  - Point to point EVC CIRs are symmetrical; multipoint EVC CIRs may vary at each port
How is Service Priced?

• AT&T Switched Ethernet Service℠ is offered under terms and conditions specified in the AT&T Interstate Guidebook

• Each port is priced according to service requirements with at least 2 rate elements:
  – 1. Customer Port Connection (Port): Basic or PPCoS Port(s); 100M/1G/10G
  – 2. CIR speed for the port(s); the CIR price will vary by CoS choice
  – 3. Optional features (if any): e.g. Diverse, Additional MAC, etc.
  – 4. Length of term plan: 1 year minimum on new ports; rates offered for 1, 2, 3, 4 or 5 year terms and month-to-month on expired terms only
  – There are no mileage charges but “regenerator” charge may apply for ports located far from the nearest core switch, as determined by AT&T engineers
  – Standard prices are shown in the AT&T Interstate Guidebook, available for internal or external viewing
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Business Continuity Options
Business Continuity Options for Redundancy

- Customers rely on Ethernet networks for mission critical applications
- AT&T Switched Ethernet Service℠ offers a variety of service configuration options designed to enable Business Continuity
  - Each customer may have a different design and recovery plan
    - Within the basic service offer, customers may make the following choices to support their continuity plans
      - EVCs that connect to both primary and secondary data centers
      - Request DC powered NTE and serve from customer DC power including back-up generator
      - Request “dual power supply” NTE and provide power from 2 sources and/or from a customer owned Uninterruptible Power Supply (UPS) system
    - Customers may also order more than one port and/or optional features on a port to create more robust networks, including:
      - Alternate Serving Switch, Diverse Access or Advanced Access Failover
AT&T Switched Ethernet Service℠

Access to Wide Area Network (WAN)
&
Out of Franchise
Access to Wide Area Services

• AT&T Switched Ethernet Service℠ can be used to connect to Wide Area Network Service Providers (WAN SPs) that provide interLATA services such as Layer 3 Internet or Virtual Private Network WAN services, or Layer 2 Ethernet-based WAN services
  – AT&T Switched Ethernet Service may be ordered as “baseline” or “total service”, according to the Service Provider and customer needs
  – Connection to WAN SP POP may be “VLAN based” (transports multiple VLANs on single port) or “port based” (supports a single VLAN between two customer ports), based on the service provider’s preferred connection options; physical connection may be at actual POP, AT&T Telco Collocation POP, or 3rd party data center
  – AT&T family of companies offer Managed Internet Service, AT&T Virtual Private Network, Private Network Transport, Ethernet Private Line WAN Service and OPT-E-WAN® Virtual Private LAN Service (VPLS) Service under these arrangements; refer to each respective service for details of its access options
Dedicated Internet Access Transport

- Internet Service Provider (ISP) subscribes to one or more 1 Gbps or 10 Gbps connections in a given AT&T Switched Ethernet Service℠ metro network, to support multiple end-user customers over a single connection (aggregation port)
  - ISP may include the end-user AT&T Switched Ethernet Service port that will be dedicated for Internet access as a single service (“total service”)
  - ISP may sell a “VLAN Only” service, allowing a customer that has their own AT&T Switched Ethernet Service port to establish an Ethernet Virtual Circuit to the ISP POP
  - Check the ISP for specifics of speeds and configurations offered
AT&T Switched Ethernet Service℠

Network Infrastructure
Core Network is Ethernet over MPLS (EoMPLS)

- Greater service flexibility and reliability via highly resilient core network
- Provides highly reliable connections while minimizing latency and jitter, key requirements of advanced IP-based services (such as VoIP and Video over IP)
- Enables large numbers of customer connections while meeting stringent SLA requirements
- More security from dedicated secure MPLS tunnel
- AT&T Switched Ethernet Service℠ is not an “MPLS service”; it is an Ethernet transport service built on an MPLS core network
Rethink Possible®