

Qwest Metro Optical Ethernet for ISPs

Delivering Scalable, High Bandwidth Connectivity Across Metro Areas

The Internet Service Provider (ISP) business model has changed, with convergence and consolidation increasingly defining requirements. ISPs demand flexible and affordable bandwidth for converged IP applications to improve productivity and profitability through expanded service offerings to existing customers and bundled services to attract new customers. ISPs must improve operational efficiency – centralizing servers and consolidating traffic – to remain competitive. Dynamic enterprise needs are driving network infrastructure that can adapt quickly and easily, but of course availability, resiliency, and security are still absolutes.

QMOE®, Qwest Metro Optical Ethernet, is a highly scalable transport solution that is designed for ISPs to support their business customers. QMOE delivers highly reliable switched Ethernet connectivity across a metropolitan area network, with greater service flexibility and lower cost than traditional solutions, such as SONET-based private line services and ATM.

QMOE is backed by Qwest's commitment to service excellence, which includes technical expertise, responsive account management, and a next generation world-class network supported by Service Level Agreements that exceed customer's expectations for quality, value, and reliability.

New, Converged Applications Drive End-User Customer Demand

Regardless of the industry, enterprise customers are rapidly adopting bandwidth-intensive applications to improve employee productivity, placing ever-mounting pressure on ISP networks. These applications are evolving and accelerating the demand on network resources, and increasingly are considered business critical. As an example, Voice over IP (VoIP) has been eclipsed by unified communications, and the usage of web and video conferencing is exploding, demanding large amounts of bandwidth and low latency performance.

At the same time every industry and vertical market has its own set of new requirements that change the way business is being done. In healthcare for instance, Electronic Medical Records (EMR) applications, Picture Archival and Communications Systems (PACS), and Computerized Physician Order Entry (CPOE) systems are rapidly being adopted and consuming large amounts of bandwidth. Consider the significant advances in medical imaging applications to support life-saving medical procedures, and one can see the significant demands placed on data networks.

In addition, there is now a business expectation for ubiquitous employee access to applications and data regardless of where they are physically hosted. The re-emergence of the Application Service Provider (ASP) model, complete with Web-based tools, is an opportunity to provide enterprise applications to support a variety of business functions. As a result software vendors have re-engineered their applications taking full advantage of Service Oriented Architectures (SOA) and other network-based computing approaches. Obviously ISPs will require more bandwidth to deliver these applications.

Across many industries, business transactions are now more routinely performed over trusted ISP networks. ISPs must therefore prioritize their customers' mission-critical traffic for the network to operate efficiently without compromising application performance. Such traffic prioritization capabilities can open new revenue opportunities as services are bundled or configured to meet individual enterprise needs.

To meet these business dynamics, QMOE is a carrier-grade Ethernet transport service that provides the solid, cost-effective network foundation ISPs need to serve multiple customers, between locations and across metro areas. QMOE enables ISPs to seamlessly connect enterprises to their backbone, with greater service flexibility to upgrade speeds or add new locations very quickly. ISPs could oversubscribe their QMOE aggregation ports in order to drive reduced overall operating costs. Additionally, the Quality of Service (QoS) feature allows ISPs to differentiate their service to their customers driving potential new revenue opportunities.

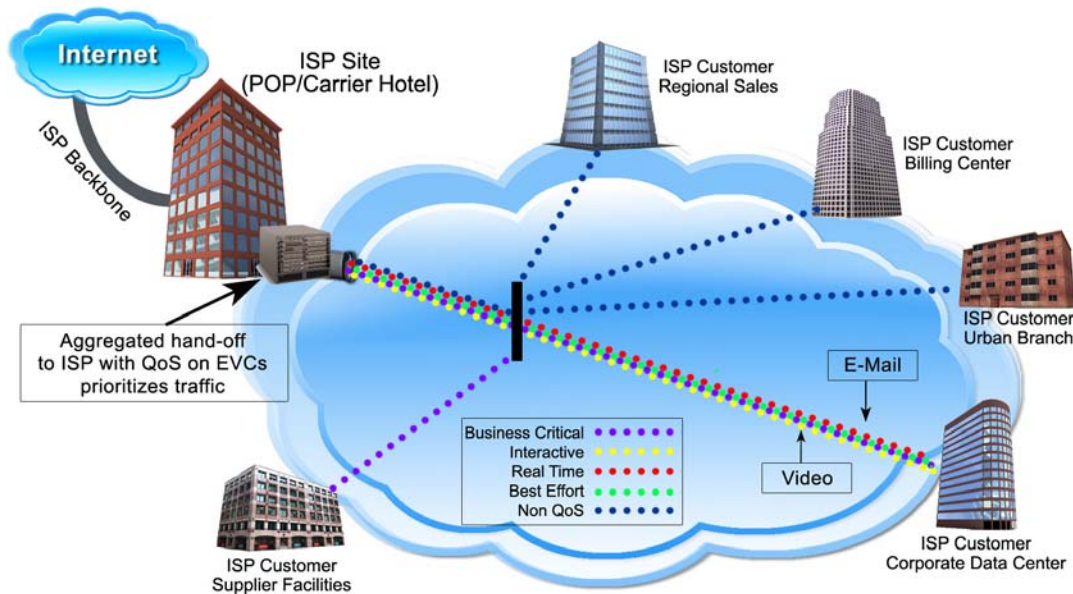
Support for Converged Customer Applications

Application	Description	Network Requirements	QWEST SOLUTION
Web Hosting	Web hosts provide storage space on a server for e-commerce, online education, e-mail and other business applications such as Customer Relationship Management (CRM).	<ul style="list-style-type: none"> ▪ Large bandwidth to support fast file transfer (FTP) ▪ Network Security ▪ Quality of Service ▪ High Availability ▪ Low latency 	QMOE provides secure, high bandwidth connectivity to support multiple enterprise hosting needs. QoS allows ISP traffic prioritization. Ethernet is widely used for Storage Area Network (SAN) applications.
Streaming Audio and Video	Audio, video or both that are transmitted as a continuous stream to an end-user. Aids in online conferencing (e.g. collaboration, e-commerce, distance learning and corporate training).	<ul style="list-style-type: none"> ▪ High capacity network ▪ Secure network ▪ Broadcast and unicast capabilities ▪ Low latency ▪ Quality of Service 	QMOE can support large files including content-rich applications with low latency and jitter for uninterrupted delivery. Traffic can also be prioritized across the network with QoS.
Customer Care Solutions/ Contact Centers	“Click-to-talk” solutions that use IP telephony to provide customer support from within web portals are becoming more popular.	<ul style="list-style-type: none"> ▪ Real time connections to call center applications ▪ High Availability ▪ Scalable bandwidth ▪ Quality of Service 	QMOE seamlessly extends access to applications across a metro area. The service is ideal for integrating voice, video, and data to eliminate network overlays.
VoIP / Unified Communications	Digital voice, video, conferencing and other applications.	<ul style="list-style-type: none"> ▪ High availability ▪ Low latency ▪ Quality of Service 	QMOE supports high bandwidth applications with low latency. Optional QoS ensures smooth, seamless voice and video transmission based on CoS prioritization.
Business Continuity / Disaster Recovery	Regulations now drive even more stringent requirements for data back-up and recovery in most enterprises.	<ul style="list-style-type: none"> ▪ Private, secure networking ▪ High availability and survivability ▪ Flexible capacity to accommodate large planned and unplanned data transmissions 	QMOE service can include high capacity, redundant trunk connections enabling switching in the event of a detected failure.

Qwest Metro Optical Ethernet

QMOE combines the simplicity and ubiquity of Ethernet with the speed and reliability of optical fiber to deliver flexible, highly scalable connectivity across a metropolitan area. QMOE is ideal for seamlessly converging data, voice, video, and Internet traffic from multiple sites with the utmost of privacy and security.

QWEST Metro Optical Ethernet Network



Data travels over the QMOE infrastructure as native Ethernet. Traffic flows through multiple Ethernet virtual circuits (EVCs) that are logically partitioned across the shared network infrastructure. When complemented by stateful packet inspection firewalls, intrusion prevention systems, anti-virus solutions and other similar functions, security can be further enhanced across the network.

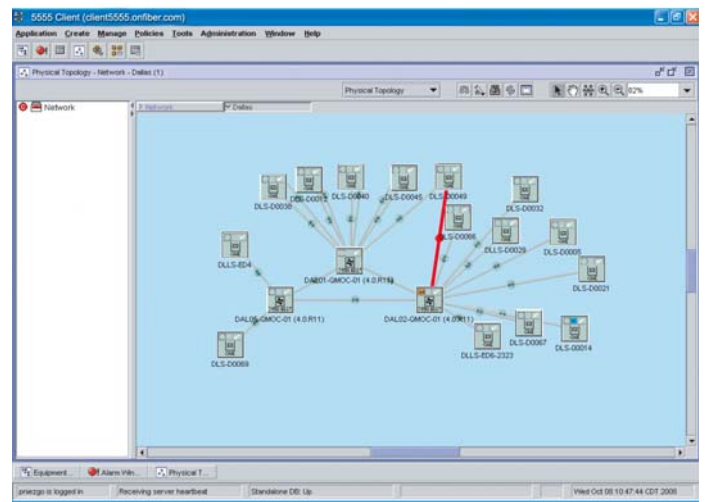
QMOE offers an optional Quality of Service (QoS) feature that enables ISPs to prioritize network traffic for seamless flow of data, such as voice and video applications that must have low latency connections to deliver acceptable quality. The QoS option, offered in 5 Mbps increments, provides four levels of traffic prioritization with Class of Service (CoS) queues ranging from Business Critical to Best Effort, enabling ISPs to design service level guarantees targeted to their customer's specific application needs.

QMOE is available in point-to-point and multipoint service configurations with transmission speeds as low as 10 Mbps and up to 1 Gbps. The service can be scaled from 10 Mbps to 100 Mbps in 10 Mbps increments, and from 100 Mbps to 1000 Mbps in increments of 100 Mbps. QMOE also offers a 150 Mbps option for

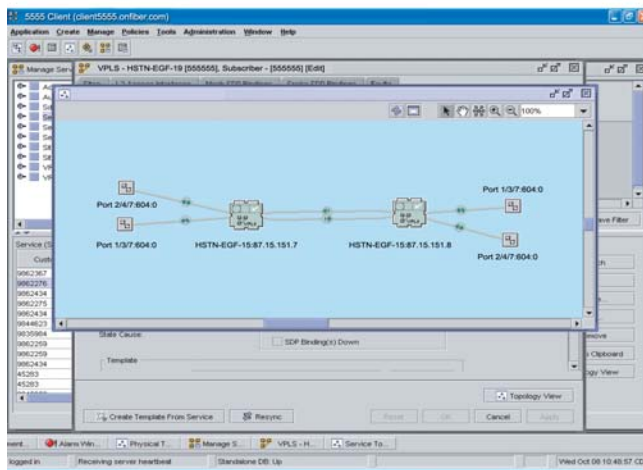
replacement of OC-3 services. This bandwidth granularity allows an ISP to configure a bandwidth profile to precisely meet network needs and the needs of its customers.

Metro Area Layout

The QMOE network is proactively managed by a professional team of Qwest personnel. The Qwest Network Operations Center monitors the customer's services with the Alcatel-Lucent 5620 Service Aware Manager (SAM) that provides an effective and efficient tool to ensure reliable performance. SAM provides a single platform that offers detailed element, network and service management capabilities, enabling Qwest to quickly monitor individual links and services. In addition to the traditional Element Management System (EMS) fault, configuration, performance and security functions, SAM can provision service routing on edge devices from other equipment manufacturers (Qwest provided), resulting in timely changes to the QMOE service. The system minimizes the risk of costly human errors from entering Command Line Interface (CLI) commands with predefined wizard steps on the QMOE service configurations. The GUI provides a network view that enables fast troubleshooting in the event of an outage as shown on the Metro Area Layout example illustration.



Topology View of QMOE Service



The Alcatel-Lucent 5620 SAM allows Qwest to quickly drill deeper into the service level topology to look at a customer's connections to identify faults at the physical and logical layers, generating corresponding service alarms and alerting NOC personnel of potential network events. The NOC will perform root cause analysis with SAM's diagnostic tools across Ethernet and underlying transports, conducting L2 Operations, Administration and Maintenance (OAM) and Internet Control Management Protocol (ICMP) for segment and end-to-end connectivity. Service parameter tests ensure adherence to service performance objectives by using rule-based alarms to detect network and service degradation. SAM is a flexible and effective tool in the Qwest arsenal that is relied upon to maintain the integrity and reliability of the QMOE service in order to support carrier-grade applications, so that ISPs can focus on growing their business profitably.

QMOE Gives ISPs an Advantage

Flexibility / Scalability of Bandwidth Profiles and Port Types Based on Needs

QMOE offers four Port Types: Scalable Ethernet
TLS (Transparent LAN Service)
Service Provider Port
Service Multiplexer Port

Simplified Connectivity and Network Management

Aggregation Ports (Service Provider and Service Multiplexer) allow ISPs to reduce the need for multiple interconnects and effectively manage logical connections

High Availability is Supported by 99.9% Service Level Agreement

In order to achieve its SLA objectives Qwest typically provisions a failover uplink

Management and Monitoring

Qwest has a state-of-the-art Alcatel-Lucent service-aware management system that provides flexible provisioning and data collection to monitor network performance by trained NOC professionals

Quality of Service (QoS)

QoS offers four Class of Service queues to prioritize traffic, with Business Critical at the top for prioritization of latency-sensitive applications such as VoIP. For example, enterprise can prioritize full Business Critical traffic on point-to-point EVCs up to 300 Mbps, providing for an emulated Ethernet private line service.

Other CoS options support Interactive, Real Time and Best Effort applications, customers can select their appropriate traffic distribution based on a choice of eight QoS templates. Finally, CoS can be applied to all traffic on a port, or in the case of an aggregation port, individual EVCs, providing ISPs the flexibility to differentiate services with their customers.

Technical Expertise and Customization

The AdaptiveBuild[®] process leverages Qwest's fiber assets and technical engineering expertise in the National System Design Center to develop purpose-built network solutions to meet specific customer needs.

QMOE Benefits

Convenience - Securely connects multiple customers across a metropolitan area with the ease and familiarity of Ethernet to IP applications

Versatility - Supports customers' demand for advanced IP applications

Scalability - Meets customers' specific bandwidth requirements for efficient network management

Reliability - Delivers 99.9% availability SLA guarantee

Control - Customers control routing and traffic prioritization

Support – Qwest values its customers and dedicates award-winning* professional resources to assist them with their communication needs

* **PILOTHOUSE - 2008 AWARDS** (Best Network Performance & Reliability, Best Value, Best Overall Carrier Performance). **ATLANTIC ACM ATLANTIC-ACM 2007 AWARDS** (Best in Class Operations for Customer Service and a tie for Network Performance).

* **“Leaders” quadrant of the Gartner Magic Quadrant for Network Service Providers** (The Magic Quadrant is copyrighted 2008 by Gartner, Inc. and is reused with permission. The Magic Quadrant is a graphical representation of a marketplace at and for a specific time period. It depicts Gartner's analysis of how certain vendors measure against criteria for that marketplace, as defined by Gartner. Gartner does not endorse any vendor, product or service depicted in the Magic Quadrant, and does not advise technology users to select only those vendors placed in the "Leaders" quadrant. The Magic Quadrant is intended solely as a research tool, and is not meant to be a specific guide to action. Gartner disclaims all warranties, express or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.)

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QMOE: Enabled by Alcatel-Lucent 7450 Ethernet Service Switch

With industry leading density and performance, the Alcatel-Lucent 7450 Ethernet Service Switch router supports scalable, reliable and predictable SLA-based Carrier Ethernet services. The Alcatel-Lucent 7450 ESS router, part of the Service Routing platform, overcomes the limitations imposed by traditional Ethernet switches while minimizing operating expenses to reduce the total cost of ownership.

- Dramatically improves network stability, scalability, availability and performance
- Quality of Service management enables support for different traffic types
- Superior provisioning tools speed deployment of new Ethernet services

For additional information please [contact your Qwest Representative](#) or go to www.Qwest.com

disclaimers

Qwest® Metro Optical Ethernet from Qwest Communications Corporation is available in selected areas. Qwest services are only provided subject to the rates, terms and conditions of an executed services agreement between Qwest and its customer. Minimum one-year commitment required. Rates vary depending on speed and term commitment selected. Installation charge may apply. Additional equipment may be required. Additional restrictions apply.