

# The Connected 5,000: Making the Transition to Business Ethernet Services

*The “Connected 5,000” characterizes enterprises with business-critical data networks that are ready to take advantage of Business Ethernet Services in order to cost-effectively boost bandwidth and simplify network management. This paper addresses the drivers, advantages and challenges to making this important transition.*

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## Table of Contents

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### **2** The Connected 5,000 - Networking in the Middle

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### **3** Key Drivers for Business IP Traffic Growth

---

*Figure: Business IP Traffic Drivers*

---

### **4** Today's Business Ethernet Services

---

*Figure: Business Ethernet Service Offerings*

---

### **6** Got Fiber?

---

*Figure: U.S. Business Fiber Availability*

---

### **7** Ethernet Service Provider Landscape

---

*Figure: Who's Providing Business Ethernet?*

---

### **8** Purchase Checklist

---

### **10** A Successful Transition

---

*Figure: Case Study - Radiology, Ltd.*

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### **12** Choosing a Future-Proof Solution

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## The Connected 5,000 – Networking in the Middle

Who do you rely on to design, implement, manage, and support your business-critical networks? Fortune 1000 companies and other large enterprises with up to thousands of networked sites count on numerous resources, including IT departments, consultants, network outsourcing specialists, plus dedicated account teams supplied by major service providers. In contrast, millions of SMBs (small and medium size businesses) with one or several sites typically depend on their own expertise, supplemented by remote customer service from their local providers.

Networking in the middle are enterprises that don't garner the attention of major service providers, nor get sufficient support from local providers. Vertical Systems Group estimates that there are about 5,000 U.S.-based enterprises caught in between. These "Connected 5,000" support networked applications that are just as mission-critical as those of larger enterprises, but they do it with smaller budgets, less staff and limited help from service providers. During major technology transitions, these entities are particularly challenged by resource limitations.

Today's technology transition from legacy network services to emerging Business Ethernet Services is well under way, driven by surging IP traffic and the ensuing demand for more bandwidth. Every major U.S. service provider has committed to Ethernet as the future ubiquitous standard for network services connectivity. Many enterprises have already made the transition to wide area Ethernet services to gain more scalable bandwidth capacity, reduce recurring bandwidth costs, and simplify network management.

Connected 5,000 enterprises are among those using or evaluating Ethernet network services. Industries represented in the Connected 5,000 include healthcare, financial services, business services, retail, insurance, manufacturing, transportation, travel, education, and local government entities. Connected 5,000 data network topologies span multiple sites within a metro area, across a region or nationwide. Frame Relay, ATM, Private Lines, DSL or other business network services are used to interconnect these locations, with T1 the most common service access rate. Traditional PBX systems and the public switched telephone network are the technologies widely used by the Connected 5,000 for voice applications. Network reliability, performance, and security top the list of service requirements, so network management and SLAs (Service Level Agreements) are important. However, these networks are stretched to capacity.

Is the solution Business Ethernet? This whitepaper discusses key drivers, outlines the services landscape and describes who's offering Ethernet to business customers. Also included is a "real world" case study of a Connected 5,000 company that has successfully migrated from a legacy network environment to a Business Ethernet solution.

## Key Drivers for Business IP Traffic Growth

Rapid growth of IP traffic is forcing changes in network infrastructures in order to handle the convergence of IP data, voice, and video traffic. As summarized below, there are several important drivers for the rise in business IP traffic.

- More Connected Sites**  
 Connectivity requirements are escalating, with more users, more locations, and more networked devices. The number of network endpoints continues to rise with the addition of remote branches, stores, kiosks, and SOHO (small office/home office) sites. Use of connected devices like laptops, PDAs (personal digital assistants) and smart phones is rapidly increasing. Also, the number of teleworkers is expected to expand in direct response to green business and government initiatives, as well as rising gas prices.

Business IP Traffic Drivers	
<b>More Connected Sites</b>	More remote business locations / SOHO sites More teleworkers More devices - e.g., laptops, PDAs/smart phones Regional or global site expansion
<b>Business Development</b>	E-Commerce initiatives Supply chain expansion Mergers, acquisitions or partnerships
<b>New Applications</b>	VoIP implementations Video - e.g., conferencing, streaming video, etc. Web-enabled applications Specialized - e.g., Retail, Banking, Education, etc.
<b>Industry or Government Regulations</b>	HIPAA Homeland Security Sarbanes-Oxley No Child Left Behind
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- Business Development**  
 E-commerce applications are a necessity for purchasing and selling products or services over the Internet. IP networks and Extranets are critical business resources used to interconnect disparate entities as a result of supply chain expansion, company mergers or partnerships.
- New Applications**  
 Enterprise network managers cite VoIP among the most important new applications that they are using or planning to implement. Use of business video for applications like conferencing and training is also growing. Additionally, web-enabled broadband applications are displacing traditional client-server environments, and facilitating operations like data storage and recovery. IP applications for industry-specific or specialized business functions are also more widely available.

- **Industry / Government Regulations**

Compliance with industry and government regulations is triggering a significant amount of new IP traffic, as well as the need to reliably and securely transport sensitive information. Examples include HIPAA (Health Insurance Portability, and Accountability Act), Sarbanes-Oxley, No Child Left Behind, Check 21, Homeland Security, and new on-line IRS filing regulations.

## Today's Business Ethernet Services

Understanding how Ethernet Services are offered is critical to choosing the best service. Hundreds of different types of services are currently available in the U.S., but there are no industry-wide standard definitions, so it is often difficult to compare services.

To facilitate service evaluation, Vertical Systems Group segments Business Ethernet Services as shown in the table below. Service offerings can be categorized into three segments based on the number of network sites, site connectivity and service functionality requirements.

### Point-to-Network

**Dedicated Internet Access (DIA)** is the most widely used Business Ethernet service. DIA services provide an Ethernet connection from a single enterprise site to the public Internet via a service provider network. The purchase driver for DIA is straightforward - broadband Internet access at a lower cost per bit than high-capacity alternatives like a T3 ATM or OC-3 link. DIA access rates range from as low as 1 Mbps up to GigE, although

10 Mbps or 100 Mbps are the most common speeds available. Many Ethernet service providers bundle features like email, website hosting or voice features with their DIA services. Ethernet DIA links are also used by some enterprises to build "do-it-yourself" or DIY IP VPNs. Ethernet DIA services are competitively priced based on speed and features (e.g., email accounts, voice minutes, hosting, etc.).

**E-Access** services are just emerging and offered by a limited number of Ethernet providers. These services

supply Ethernet access connections from an enterprise site to a non-Ethernet service. The most common E-Access application is the replacement of T1 access lines that connect to IP or MPLS VPN services. E-Access integration is provider-dependent based on Ethernet service availability so pricing is usually on an individual case basis.

Business Ethernet Service Offerings		
Site Connectivity	Network Scope	Service Type
Point to Network	1 Site	Dedicated Internet Access (DIA) E-Access to Network Services
Point to Point	2 Sites	Private Line (EPL) Virtual Private Line (EVPL)
Multipoint to Multipoint	3+ Sites	LAN Virtual LAN / VPLS
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### Point-to-Point

**Ethernet Private Lines (EPLs)** are offered as either a MAN (Metropolitan Area Network) or WAN (Wide Area Network) service. MAN EPLs, which are offered by many Ethernet providers, connect two enterprise customer sites that are located within a single metro area. WAN EPLs, which have more limited availability, link sites that are in two different metro areas. Enterprises use EPLs to replace traditional point-to-point Private Lines or to support hub-and-spoke applications. Another application for EPLs is to connect DIY IP VPN sites. EPLs range from 10 Mbps up to Gigabit speeds. Some providers also offer Sub-10 Mbps EPLs (e.g., 4 Mbps, etc.). Like traditional private lines, pricing for Ethernet private lines is based on the distance between the endpoints and the speed of the connection.

**Ethernet Virtual Private Lines (EVPLs)** add CoS (Class of Service) capabilities to Ethernet private lines. CoS functionality enables the transport of multiple traffic types with different QoS (Quality of Service) requirements over separate EVCs (Ethernet Virtual Circuits) on the same physical connection. A key advantage is improved application performance. For example, delay-sensitive voice traffic can be assigned a different CoS than traffic like data storage backup that does not require stringent transport parameters. EVPLs are priced like EPLs based on distance and speed, with additional charges for each EVC.

### Multipoint-to-Multipoint

**Ethernet LAN** services provide switched connectivity among three or more sites. The most common application for Ethernet LANs is native LAN connectivity for enterprise sites that are located within a single metro area (e.g., MAN service). Fewer Ethernet LAN services are available for enterprises that have WAN topologies that are nationwide or span multiple metro areas across the country. Purchase decisions for multipoint-to-multipoint Ethernet services are more complex than for single-site Ethernet DIA or two-site EPL applications. Key network-wide purchase decision factors include application performance, security and network management. Pricing per site for multipoint-to-multipoint services are based on the port speed plus access and features. A standard SLA (Service Level Agreement) may be included in the base service price. Price premiums typically apply for negotiated SLA terms or for sites that are managed by the service provider.

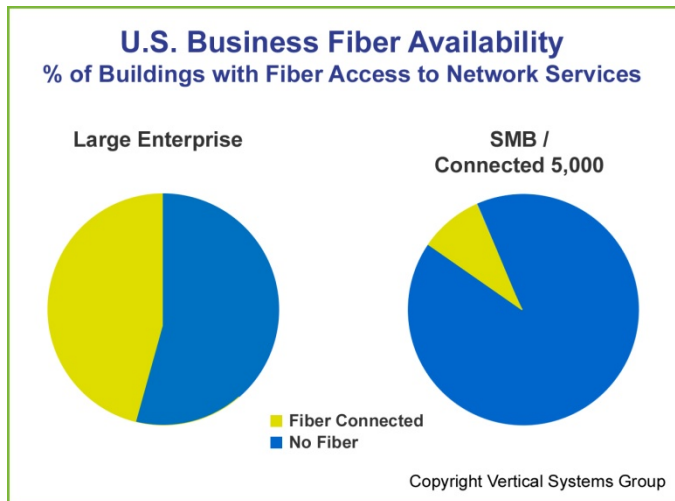
**Ethernet Virtual LAN** services and **VPLS** (Virtual Private LAN Service) use EVCs and are geared for networks requiring meshed multi-site network topologies. Common applications for these services include IP convergence and migration for Frame Relay/ATM networks. VPLS technology addresses scalability and connectivity limitations that hamper the extension of Ethernet multipoint services from the MAN to the WAN environment. Enterprises using VPLS services control their own WAN routing tables, which is an important purchase consideration for applications with strict security requirements. In comparison, IP/MPLS VPN services require service provider

management of WAN routing configurations. Pricing for Ethernet Virtual LAN or VPLS services is dependent on the scope of the network, SLAs and management requirements.

## Got Fiber?

Fiber is the preferred Ethernet access technology used to deliver services to business customers. A primary advantage of fiber access is bandwidth scalability up to Gigabit speeds. A key attribute for providers is that fiber can be provisioned for higher data rates over longer distances than copper-based services like T1 or DSL.

The major disadvantage with business fiber is availability. Unlike copper, which is nearly ubiquitous throughout the U.S., fiber is primarily concentrated in densely-populated metropolitan areas and major business centers. SMB and Connected 5,000 sites are underserved as compared to large



enterprise sites. Although nearly half of Large Enterprise buildings are fiber-connected, just 11% of SMB / Connected 5,000 sites are in buildings with direct fiber access to network services.

Active build outs of fiber are currently in progress, but most of these efforts are focused on residential video services, like Verizon FiOS and AT&T U-verse, rather than business markets. It will take years to connect every U.S. business site with fiber, and particularly

to light up the vast majority of Connected 5,000 sites that currently lack fiber access.

There are several alternatives when fiber is not readily available. An Ethernet provider may build out to a customer's site if there is close proximity to its network, and depending on the business case for construction. Another option for Ethernet providers to reach customer sites that are not fiber-connected to their own networks is to lease dark fiber or purchase services from suppliers that have access to those sites. In this case, the customer traffic is backhauled between the provider networks.

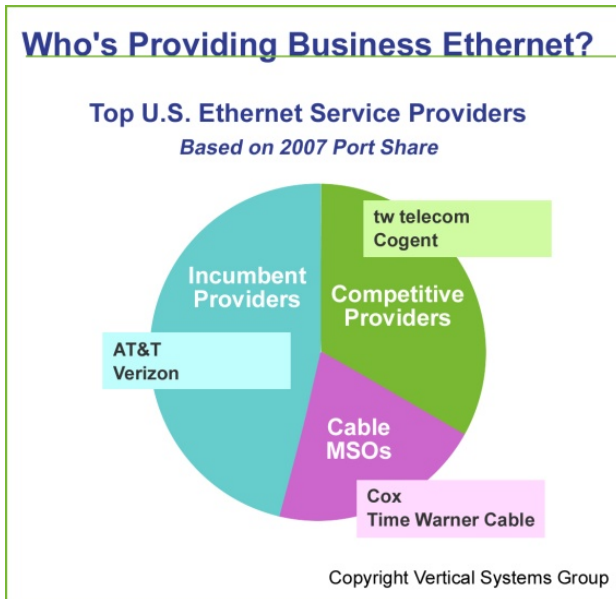
Other alternatives used by service providers to deliver Ethernet to business customers include SONET/DWDM, Ethernet over TDM (T1, T3), Ethernet over Copper, HFC/Coax and wireless technologies. Most Ethernet service providers utilize a mix of these access solutions based on their existing fiber footprint, target customer base, scope of services, port speeds offered, costs to deploy and operations costs.

## Ethernet Service Provider Landscape

More than eighty service providers offer Business Ethernet Services in the U.S. There are three distinct types of providers, which are differentiated by their service coverage, service offerings and target customers: **Incumbent Providers**, **Competitive Providers**, and **Cable MSOs**.

**Incumbent Carriers** represent the largest provider segment, supplying 46% of all U.S. Ethernet ports installed at enterprise customer sites. The top two providers in this segment, AT&T and Verizon, are the primary suppliers of data, Internet, voice and wireless services to large U.S.-based enterprise customers. Leveraging their extensive fiber and SONET facilities, Incumbents focus on helping large nationwide and global enterprises make the transition from legacy voice and data services to emerging services like Ethernet or IP/MPLS VPNs. The primary challenge for Incumbents is the

cannibalization of their existing T1 services, which generate more revenue per bit than higher capacity Ethernet services.



**Competitive Providers** are the second largest suppliers of Ethernet services for business customers, delivering one-third (34%) of U.S. Ethernet ports. The leading providers in this segment are tw telecom (formerly Time Warner Telecom) and Cogent. Competitive providers focus on the networking needs of the Connected 5,000, and other medium to large U.S. enterprises. The majority of Competitive providers have little or no embedded base of services to protect, so they are more aggressive than Incumbents in delivering cost effective Ethernet solutions. Competitive providers typically have either

regional or nationwide fiber networks. Many also utilize access alternatives to fiber like Ethernet over T1 or Ethernet over Copper to gain an edge in service coverage. The range of services offered by Competitive providers varies widely; some focus on specific applications (e.g., DIA), others offer bundled solutions (e.g., data and voice), and several focus on vertical markets (e.g., financial, etc.).

**Cable MSOs** provide the remaining 20% of U.S. customer ports. Cox and Time Warner Cable are the two largest Cable MSOs offering business Ethernet services. Cable MSOs use Ethernet technology extensively throughout their transport networks for voice, video on demand and video distribution. Deployments of Ethernet services geared for business customers are concentrated within regions where MSOs have strong presence as suppliers of residential services and extensive HFC (hybrid fiber coaxial) infrastructure

in place. With service reach limited to their respective geographies, business Ethernet services from Cable MSOs are targeted at SMBs with regional network requirements. For these customers, Ethernet is offered as a business-class service alternative to standard DOCSIS (Data Over Cable Service Interface Specifications) offerings for Internet access.

## Purchase Checklist

According to Vertical Systems Group's research, the number one reason why enterprises are purchasing Ethernet services is to increase network bandwidth capacity. Nearly as important is the need to reduce recurring monthly network services costs. What you'll pay for Business Ethernet services is based on your network's scope, applications, bandwidth requirements, features and contract terms.

Consider the following questions when developing a purchase checklist to evaluate potential Business Ethernet providers:

### Geographic Network Scope

- ✓ How many sites are in your enterprise's network?
- ✓ Are the sites located within one metro area, or are they in different cities across the country, or in many locations throughout the world?

Expect to have more single-provider options for MAN services than multi-site WAN networks. MAN services are also less costly than WAN services.

### Business Application Requirements

- ✓ Does your network support data applications only, data plus voice, or data, voice and video?
- ✓ What are your plans to add new applications in the future?
- ✓ Which types of application connectivity are required: point-to-network, point-to-point or multipoint-to-multipoint?
- ✓ Do your applications have specific performance, security or backup requirements?

Ensure that potential Ethernet providers understand your business-critical applications and can handle their specific requirements.

### Bandwidth Requirements

- ✓ How much bandwidth do you need today?
- ✓ What's your projected traffic growth during the next three years?
- ✓ Do your sites have access to fiber-based services?

Bandwidth is a major pricing variable; the higher the speed of your access port, the higher the price. Native Ethernet speeds of 10 Mbps or 100 Mbps are more widely available than other speed options (e.g., 6 Mbps, 50 Mbps, 200 Mbps, etc.). Compare bandwidth alternatives based on average prices per bit; Ethernet bandwidth is almost always more cost-effective than legacy services, particularly at higher speeds.

Review the fiber footprints of potential service providers to determine if each of your network's sites is fiber-connected, and whether there is a price difference if they are not. Fiber-based ports scale easily and if your bandwidth needs are likely to increase in the next several years, having more speed choices and price points is an advantage when it's time to upgrade.

### Network Installation and Management Requirements

- ✓ Do you want a service provider to design, implement or manage your network?
- ✓ Which management functions do you want your service provider to handle?
- ✓ How important is customer care?
- ✓ Do you require application performance monitoring?
- ✓ What are your SLA requirements?

Most Ethernet service providers offer standard, as well as premium services like turn-key network management or custom SLAs. Service fees may be applied per site or based on the size of the network. Itemize your requirements in order to compare available management features and associated fees.

## A Successful Transition

*“This Ethernet solution has made a direct, positive impact on our ability to deliver excellent patient care and generate more revenue.”*  
Eric Nied,  
director of  
information  
technologies at  
Radiology Ltd.

Radiology Ltd. is Tucson, Arizona’s leading health care imaging services company, with ten remote centers that handle CAT scans, mammograms and MRIs. Each year, the firm processes more than 600,000 patient exams for more than 2,000 referring physicians.

Recent business challenges for Radiology Ltd. were to improve its efficiency in delivering exam results to doctors and patients, as well as to reduce operational expenses. Additionally, Radiology Ltd. needed to comply with federal HIPAA requirements, which entails ensuring the security of all patient data stored or transported. As the volume of patient data grew each year, the ability to fulfill these requirements was increasingly more difficult. As a result, a primary goal for Radiology Ltd. was to go filmless and paperless.

The company’s legacy solution for transporting images was to use couriers to deliver the film to select radiologists, and after the radiologists analyzed the film, transport it again using couriers to physicians who used the results to treat their patients. For business application connectivity between headquarters and imaging centers, Radiology Ltd. relied on T1 and T3 private lines from incumbent and other service providers, as well as microwave systems. For Internet access, the company used T1 DIA services from a nationwide ISP. Radiology Ltd. uses legacy voice systems that are expected to be replaced by VoIP within the next several years.

To transition from this environment, Radiology Ltd. required a reliable network infrastructure that would significantly increase bandwidth capacity and improve connectivity. After researching available options, the company selected tw telecom based on its commitment to design and implement a custom Business Ethernet network for the unique requirements of Radiology Ltd. Network capacity was so critical that tw telecom’s solution included fiber construction to all Radiology Ltd. sites. As shown on the following page, the network now has 100 Mbps Ethernet private lines to each imaging center and 1 Gbps connections for an Ethernet LAN that supports a new picture archiving communications system (PACS). At the headquarters site, Internet access was upgraded to a 30 Mbps Ethernet DIA service.

Radiology Ltd gained several benefits with the new solution, including improved productivity and lower operational costs. One of the most important benefits is that the time to access imaging data has been reduced from 1.5 days to 5 minutes, allowing physicians to more quickly diagnose cases. Performance of the network is reinforced by SLAs to comply with HIPAA requirements and the company’s business continuity procedures. The new Ethernet solution was also designed to be future-proof, or scalable for new applications like VoIP, without the need to reengineer the network.

# Case Study

## Radiology Ltd.

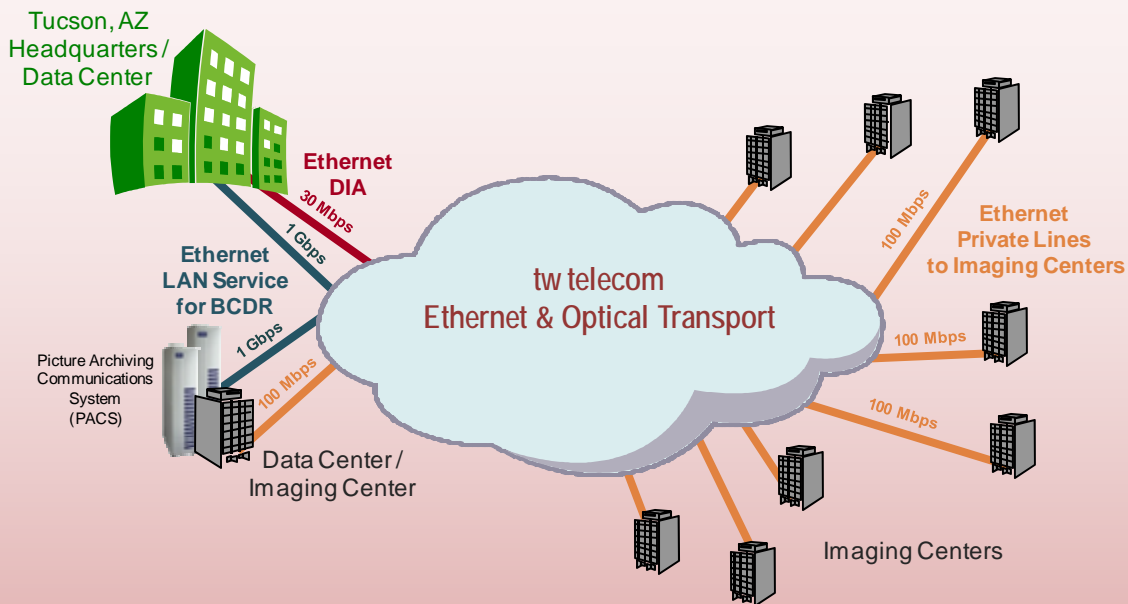
### Business Challenges

- Provide services at 10 Imaging Centers for 600,000+ patient exams per year
- Manage 2 Data Centers: 30+ terabytes of patient data; growing 20% annually
- Access to data for 2,000+ referring physicians
- Business Continuity / Disaster Recovery (BCDR)
- HIPAA compliance

### Legacy Configuration

- T1 and T3 Private Lines for connectivity between Imaging Centers and PACS
- T1 Dedicated Internet Access (DIA)
- Microwave for backup
- Manual transport of images to physicians

### Business Ethernet Services Solution



### Solution Benefits

- ✓ Decreased operational expenses for delivery of services to physicians
- ✓ Reduced time to access imaging data from 1.5 days to 5 minutes
- ✓ Improved emergency reads and analysis by 45 minutes per case
- ✓ Facilitated more cost-effective filmless / paperless record management
- ✓ Improved performance of PACS and BCDR applications
- ✓ Enables compliance with HIPAA regulations
- ✓ Future-proof solution for new applications like VoIP

## Choosing a Future-Proof Solution

Making the transition to a Business Ethernet solution is an important decision. Major advantages to using Ethernet technology for wide area networking are scalable, low cost bandwidth and simplified network configurations. Connected 5,000 and other enterprises are also realizing business benefits such as increased productivity and more efficient operations. Moreover, as the emerging worldwide standard for network services connectivity, Ethernet is a robust platform for future business applications.

New enabling technologies will continue to advance Ethernet service capabilities throughout the next several years. Business Ethernet providers plan to deploy more service offerings, additional functionality and expanded management capabilities. The challenge for enterprise customers, particularly those networking in the middle, is to select a service provider that understands their requirements, and has the resources necessary to support a successful transition to Business Ethernet.

### About Vertical Systems Group



#### **Networking is our specialty.**

Vertical Systems Group, founded in 1986, is recognized worldwide as a leading market research and strategic consulting firm specializing in defensible quantification of the networking industry.

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