WHITE PAPER

Business Applications of Wide Area Ethernet

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Introduction

When enterprises use Ethernet as a wide area networking solution, they have the potential to realize significant gains in network performance and cost savings. To understand this potential, it's helpful to visualize specific applications of the technology. This paper will examine applications of Ethernet solutions from the perspectives of business, functional applications and infrastructures. It will explore how this innovative approach to networking can result in performance improvements and business benefits.

A quick note on terminology — wide area Ethernet is also known as "Metro Ethernet" or "Carrier-Class Ethernet." While these are both legitimate terms, the technology itself is often used in settings far more extensive than a single metro area. Metro Ethernet also sometimes refers to a specific municipal program to provide Ethernet within city limits. Wide area Ethernet is much more than that.

Overview: Ethernet as a Wide Area Networking Technology

Ethernet is a well-known local area network (LAN) technology, but the Ethernet protocol can also be used to establish wide area networks (WANs) or even national network infrastructures for an organization. Figure 1 compares how an Ethernet solution and traditional IP-based network would handle an enterprise with three remote locations. Data that travels from one LAN to another is switched by Ethernet devices that send the data to designated end points on the network according to their respective media access control addresses (MAC addresses). Though the system might be miles wide, devices on the network see each other as MAC addresses on a local network. It's like a giant LAN, though the middle passage – the "core Ethernet network" – is a shared infrastructure provided by a third party. The connections between the LANs are "virtual private LANs," (VLANs), where data moves in encrypted "tunnels."

Due to its ability to operate at the physical "layer 2" of the network, wide area Ethernet is typically faster and less complex to manage than IP-based alternatives. IP networks rely on IP routing and "layer 3" of the open system interconnection (OSI) stack, which tends to add latency and greater system management burdens on the IT department.

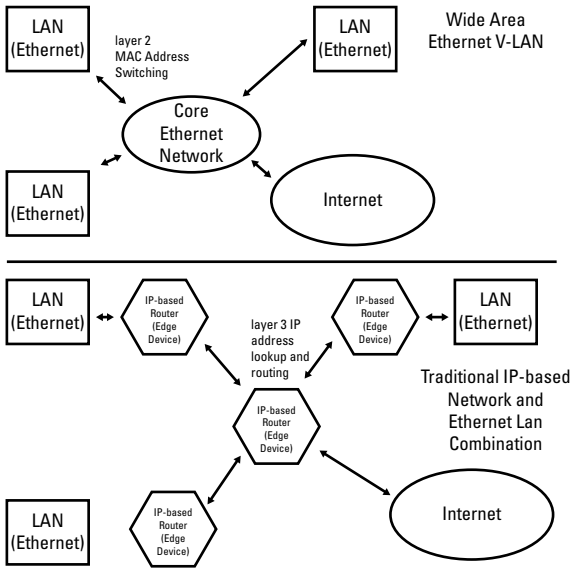

Figure 1:

Comparison between a wide area Ethernet VLAN solution and a comparable IP-based network connecting three LANs and the Internet.

The Business Perspective

Wide area Ethernet makes several business advantages possible. These include increased agility and streamlined management of multiple locations, as well as cost-effective business continuity plans. Figure 2 shows a typical corporate computing scenario where two previously separate entities joined in a merger. Each has its own network infrastructure and wide area connections using IP-based technology. There's nothing wrong with this setup, but it presents multiple obstacles for a company seeking greater agility, improved economies in managing multiple locations and business continuity.

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Business agility is a broad topic, but its essence involves a company's ability to execute strategic plans quickly enough to capitalize on shifts in the business environment. For example, the company shown in Figure 2 might want to make more acquisitions. In this network configuration, however, each acquisition would simply add more complexity and rigidity to the enterprise. The company's ability to make changes to its infrastructure would become increasingly costly and time-consuming. Tactical moves such as opening new locations or centralizing transaction processing would be slow and difficult, inhibiting business agility.

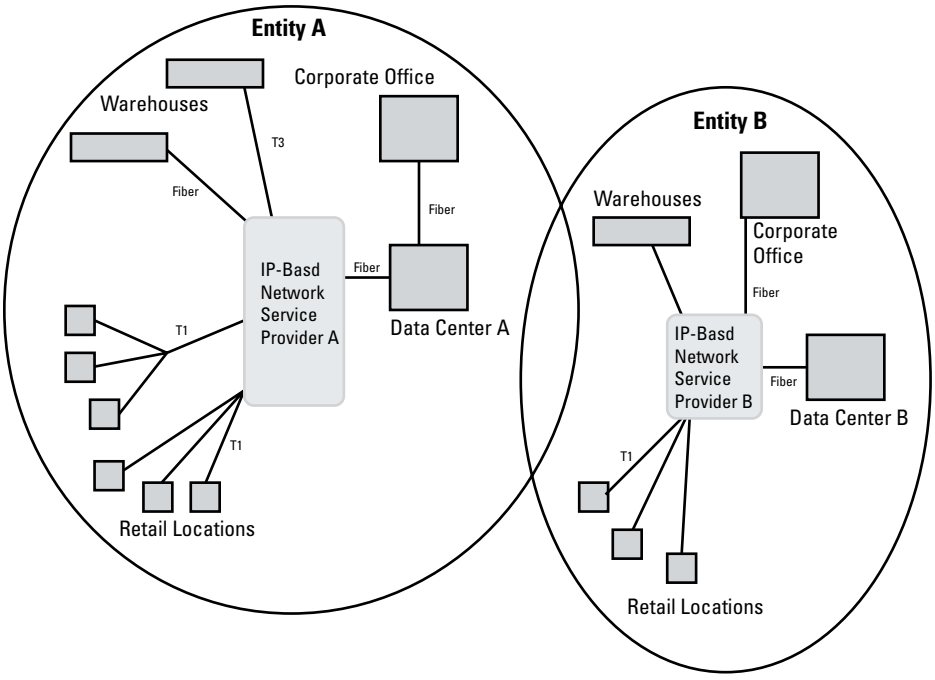

Figure 2:

Network of a corporation formed by the merger of two separate entities.

Managing multiple locations is a challenge in the duplicative network of Figure 2. A dynamic, growing business will want to open and close locations rapidly, shifting operations to geographies that favor the market. This is possible with the network they have, but it will be an inefficient, costly process. Each new location will require dedicated IP network equipment and personnel or contractors to manage it. Variations in bandwidth availability will create two tiers of locations: those with high-speed bandwidth and those without. As organizations grow more virtualized and reliant on bandwidth-intensive technologies, such as unified communications and rich media, workers with slow connections will be excluded, affecting productivity, morale and management cohesion.

It will also take serious effort to sustain an effective business continuity plan in the network depicted in Figure 2. Business continuity refers to the ability of an organization to maintain operations in the event of a catastrophic event such as a tornado, earthquake or terrorist attack. In most cases, the business continuity plan consists of continuous backups of critical data in multiple locations as well as the potential activation of "hot sites" that can resume operations quickly, if not instantly, if there is a problem. Business continuity is a responsibility of IT leadership, and most take it quite seriously. The problem with business continuity is that it, too, is subject to limitations in IT agility. As businesses evolve,

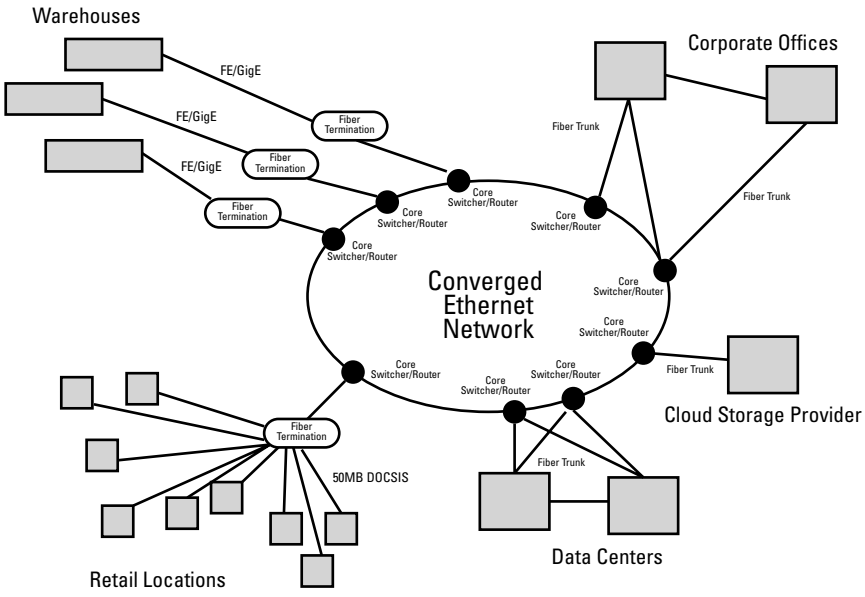

Figure 3:

The organization from Figure 2, now using a wide area Ethernet solution for its network.

Wide area Ethernet offers an organization new options for agility, location management and business continuity.

continuity plans have to change with them. If the network and related infrastructure are overly rigid, the continuity plan will inevitably lag in operational changes. In some cases, with personnel churn and budget cutting, the continuity plan can get dangerously out of sync with the business – a scenario that can lead to true disaster.

Wide area Ethernet offers this organization new options for agility, location management and business continuity. As shown in Figure 3, the adoption of wide area Ethernet connects all sites to a central converged Ethernet network operated by a cable carrier. All locations are connected to the converged fiber core, either directly through fiber trunks or through fast connections emanating from fiber terminations. In the case of the retail locations, they can take advantage of cable's Ethernet over DOCSIS to replace T1s and enjoy a 50-MB connection to other parts of the network. The warehouses each have their own connection to a fiber termination, making it possible for two of the three to be connected even if one link goes down. The data centers are linked to the network and to one another in a full mesh, while the two corporate locations have a partial mesh connection. A cloud storage provider can be added easily to the network if necessary.

The network is Ethernet from end to end. The effect of this transformation is to make the whole network faster, more cost-effective and simpler to manage. Fewer personnel are needed to maintain the connections and the hardware is more uniform. It would be simplistic to state that Ethernet is a cure-all, but the technology does enable a number of important business capabilities.

Agility benefits from the shift to Ethernet. It is now far easier to change operations quickly and connect systems to one another. If the company acquires other businesses, they can be added to the contiguous Ethernet core and become a seamless part of the bigger whole. With multiple locations all connected to a central core at high speed, it is relatively simple to open, close or move locations in accordance with agile planning. If the company wants to establish a logistics hub in a new location, it's not a huge project to plug it into the network. As operations evolve, the logistics hub can move from place to place without causing a major network transformation every time it relocates.

Business continuity also becomes a great deal more manageable with a wide area Ethernet solution. Ethernet makes flexible and effective business continuity planning possible by simplifying and reducing friction in connecting pieces of an IT infrastructure. In the scenario shown in Figure 3, the multiple high-speed connections between the data centers and the core allow for a relatively straightforward arrangement of continuous off-site backups, site mirroring and other business continuity techniques. With this low-cost transformation of connections, wide area Ethernet enables the IT department to keep the business continuity plan in step with changing business operations.

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Functional Applications

A number of functional applications in the enterprise can benefit from wide area Ethernet. These include voice over IP (VoIP), video conferencing and transactional services. There are many others, but these examples show the potential of the technology. VoIP and video conferencing, sometimes combined to form a "unified communications" (UC) solution, are powerful tools for employees who want to collaborate remotely. It's also a good way to save on voice phone costs, facilities and travel expenses. With UC, people can work together regardless of where they are located.

Wide area Ethernet provides a solution to the UC network challenge by flexibly connecting locations at high speeds but with relatively low maintenance costs.

UC can be a bit of a hassle in network terms, however. Bursts of traffic from peak calling loads and streaming video have to be managed carefully or they can disrupt a network. It is possible, to have UC in a network powered by IP technology. It's just more costly and cumbersome to install and maintain.

Wide area Ethernet provides a solution to the UC network challenge by flexibly connecting locations at high speeds but with relatively low maintenance costs. The packet tagging capabilities of wide area Ethernet make it possible to segregate UC or voice traffic, allowing it to flow unimpeded on specific virtual VLANs within the shared core network.

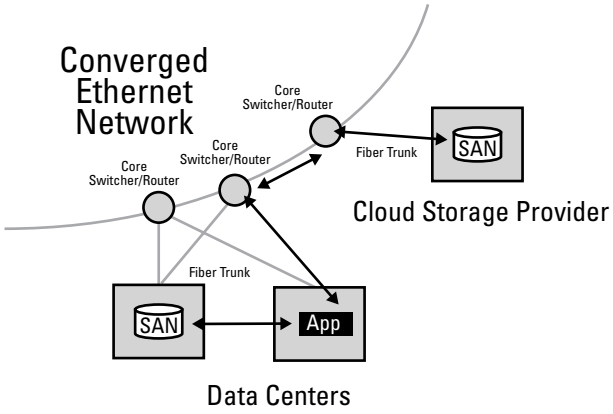

Figure 4:

Data center and storage-area network (SAN) connectivity through wide area Ethernet.

Transactional services refer to a business's ability to route commercial transactions, such as credit card processing, through a flexible, centralized interface. Centralized transaction processing allows the business to leverage its transaction processing volume and get the best deals on credit card processing. In many cases, though, it is too difficult to implement transaction services on a heterogeneous network infrastructure. Wide area Ethernet, with its ability to contain multiple secure VLANs and its flexible architecture, makes it possible to connect many locations to a single transaction processing facility. Locations can come and go, but wide area Ethernet maintains simplicity, speed and cost-effectiveness in maintaining connections to the transaction service.

Structural Applications

From the perspective of the IT department, wide area Ethernet can benefit several structural applications that serve business operations. For instance, wide area Ethernet is helpful in the creation of flexible, powerful data center storage area network (SAN) connections, dynamic application integration and cloud computing. Each of these projects can be executed by a standard IP-based network technology. However, wide area Ethernet provides a rapid, economical deployment of the kind of high-performance, reliable network connections the IT department needs in each case.

Data storage needs continue to grow rapidly in today's enterprises. To cope with the ever-expanding need for more storage, many enterprises have created large SANs, which consist of vast arrays of reliable hard disk drives. The beauty of a SAN is that it makes large amounts of storage available to multiple software applications regardless of which server is running the application.

Service orientation and application integration require maximally performing networks on all levels.

In an earlier generation of IT, each application had to have its own dedicated storage. This was inefficient and complex to manage. With the SAN, storage can be provisioned where needed over a high-speed network. With wide area Ethernet, the capability gets even more robust. As Figure 4 shows, it is possible to connect an application in one data center with a SAN in another, as well as with a cloud-based SAN.

Application integration (the process of connecting diverse pieces of software) is facilitated greatly by wide area Ethernet. Application integration today is mostly based on open standards such as XML (e.g., service-oriented architecture, or SOA) that are theoretically network-agnostic. This means that applications only relate to one another through logical addresses (e.g., a URL for each application), without any concern for physical location. The particulars of the network shouldn't matter. However, the reality is quite different. Service orientation and application integration require maximally performing networks on all levels. When one enterprise application needs data or procedural functionality from another application, the reliability and integrity of that connection – as well as its ability to be changed rapidly – are extremely important. Integrated applications that connect through a slow, unpredictable or unreliable network are an anathema to IT managers.

Conclusion

Wide area Ethernet solutions provide new ways of accomplishing business objectives through information technology. Whether those objectives are technical in nature, as they are with unified communications, or business-related, where agility is prioritized, the Ethernet solution plays a role in making them a reality. Understanding where Ethernet fits into a business strategy requires analysis and subjective thinking. Ethernet is not a one-size-fits-all panacea for business and IT challenges, and there are surely situations where it is not optimal. However, as a general matter, the ability of Ethernet to deliver a high-speed, reliable network infrastructure that is also flexible and cost-effective makes it a powerful tool in the hands of experienced IT and business managers.

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