WAN Optimization – Enabling Business Agility for the Extended Enterprise

Table of Contents

Chapter 1 Introduction 3

Chapter 2 Key Challenges Faced by Enterprises in a Globalized World 3

Chapter 3 WAN Optimization and its Role to the Enterprises 5

Chapter 4 The WAN Optimization Strategy for an Enterprise 8

Chapter 5 Conclusion 10

1. Introduction

It may sound cliché, but globalization remains a key shaper of the world we live in, the effects of which continue to have an intimate effect on the ways with which we lead our lives, none more so than in the business realm. Indeed, the globalized business landscape of today has heralded in an age of exciting opportunities and limitless potential, by radically altering and expanding the marketplace, and the ways of doing business.

Amid this transformation, information technology (IT) has emerged as a major cornerstone in the modern business context, whereby communication and operational efficiency within and between organizations have been vastly improved; qualities, no doubt, brought about by greater connectivity within what is essentially a "condensed world". Today, IT has become the critical tool and operational mainstay with which enterprises in a global economy run their businesses, in particular, for their extended network of offices across the world.

This paper will seek to address the challenges faced by enterprises as they cope with the evolving demands brought about by globalization, and the key role played by IT in this process. We will also look at the technology known as WAN optimization, and assess its contribution and merits in maximizing the performance and efficiency of the extended system of offices among enterprises nowadays.

2. Key Challenges Faced by Enterprises in a Globalized World

Going "Global" and Managing Multiple" Partners

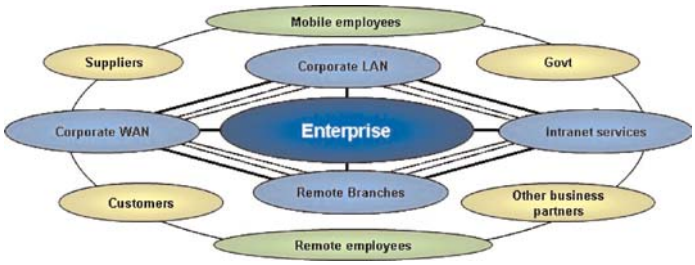
Enterprises are increasingly expanding the reach of their businesses across the globe as a result of globalization, whereby national boundaries have ceased to exist and foreign investments are more than welcomed, particularly in the emerging economies. This business evolution on the enterprise front has brought up two issues; firstly, the influx of massive foreign investments into rapidly developing regions such as South Asia, East Asia, and ASEAN has fuelled tremendous economic growth for these countries.

In a way, the massive investments pouring in sets off a chain reaction, whereby the opportunities created by the excellent growth of these markets attract even more foreign enterprises to set up globalized offices in these countries. This inevitably leads to an expansion in WAN coverage, with enterprises looking to increase the connectivity to these branch offices located halfway across the globe. Moreover, enterprises themselves are also expanding their presence within their home country, which is a result of greater business opportunities brought about by the booming economies.

Secondly, having set up shop in a foreign land, enterprises are more likely to get into collaboration with their local counterparts for strategic reasons, by leveraging on their localized resources and technical know-how. In this sense, conducting business in this globalized era has slowly become a complex affair involving multiple parties, such as the addition of a "third party" as a local partner, compared to typical business relationships involving a vendor and a client. With such existing complexities, many enterprises are beginning to understand that such collaborations will only work if multiple communications channels with the relevant parties are all maintained at an optimal level.

Chart 1

Impact of Globalization on Enterprises



Source: Frost & Sullivan

The Branch "Headquarters" and Employees on the Move

Speaking of globalized enterprises, the definition of a branch office has somewhat changed in light of the increasing diversion of resources globally, by the enterprises. What used to be a clear distinction between the head office and the branch offices is becoming more ambiguous, with more enterprises witnessing phenomenal business growth rates of their foreign markets. In fact, in order to sustain their business competitiveness, these enterprises often find themselves in a conundrum of sorts, whereby their branch offices may require just as much, if not even more, resources as their head office.

More importantly perhaps, there is also the issue of increased expectations from the branch offices that enterprises have to deal with these days. Gone are the days when it was widely accepted that the business and employee functions stationed at the branch offices are less critical to an enterprise as

compared to those at the head office. Nowadays, not only do the operations at the branch offices warrant the allocation of greater resources, but, the employees at these offices, especially at the regional headquarters, are expecting to attain real-time updates, as well as high-speed application delivery similar to their head office counterparts. There has also been a trend, whereby enterprises are shifting many of their key functions to their branch offices in view of lower operating costs and consolidation of similar processes. This highlights the need for many of these enterprises to not only expand their WAN coverage, but to further enhance the performance and capabilities of the burgeoning network, so as to cope with the escalating business demands. Henceforth, the challenge exists for enterprises to strike a fine balance between their expansion plans, and maintaining an optimal level of operational efficiency.

Even within an office, enterprises are also facing greater organizational mobility among their employees, especially with the mushrooming advent of portable devices and remote accessibility. Since their employees are becoming more mobile, enterprises have to be certain that the productivity levels of these out-of-office employees are not being adversely affected. In fact, similar to their global offices, enterprises are also starting to acknowledge the importance of enhancing the performance aspects of these “mobile offices”.

The Need for Speed

The story in this paper will be incomplete without looking at how IT has developed in accordance with the changing business dynamics experienced by the enterprises, and how it has played a pivotal role in bringing globalization and the business world together. With businesses becoming more globalized and complex, it is unsurprising perhaps to note that the demands for, and expectations on IT have risen in tandem, in particular, the enterprise need for higher speed connectivity. The essence of time is often cited as a key factor in determining the success of a business, and in this current age of businesses spanning the globe, and across multiple partners, the real challenge lies not only in linking up these disparate components together, but also in getting maximum efficacy and output from these connected parts. Thus, enterprises have moved beyond simply looking for connectivity for their businesses, but they are increasingly more concerned about the performance of these connections as well.

The Advent of More Powerful Applications: A Bane or a Boon?

With the constant move toward the consolidation of the relationship between IT and the business world, IT solutions will not only become more powerful in order to cope with the increasing demands from businesses, but it is also inevitable that they will turn out to be more draining on the IT infrastructure as well. For instance, common applications such as file sharing, video, voice, messaging, and business applications such as CRM, SCM, and ERP are slowly infiltrating the networks of many enterprises, and becoming a permanent fixture for business operations. However, enterprises are finding that these powerful software applications may not necessarily be a boon to their businesses; on the contrary, having a powerful application that slows down the entire work process may actually cause an overall negative business impact, regardless of the value-addition that the application may potentially bring into the business.

In light of that, there is a real need for enterprises to find effective and efficient ways to enhance their WAN performance in order to ensure optimal application delivery. For instance, with branch offices becoming more common these days, employees are more likely to be liaising with their counterparts who are located halfway across the globe, for tasks, which may involve the usage of a powerful application requiring huge transfers of data and updates. As such, if enterprises are unable to smoothen and enhance the application delivery process, they may find themselves saddled with unproductive employees facing frequent lag problems, and worse still, working with the wrong dataset updates.

Increasing Bandwidth: Solving or Masking the Problem?

When it comes to enhancing network performance, it is possibly not wrong to comment that many people still possess the erroneous belief of increasing bandwidth as a viable solution to improve WAN performance. However, more often than not, these believers will come to realize that the situation is not that simple; greater bandwidth may enhance the throughput potential running across the networks, but it does not mean that this will lead to a more efficient transportation of data or delivery of applications on the WAN.

In a way, an argument can be put forth that increasing bandwidth only serves to mask the issue of rising loads on WAN networks everywhere, rather than truly eliminating the root cause of the problem. If we were to use the analogy of traffic on an expressway to represent network traffic, with greater bandwidth, what materializes is basically a wider expressway with additional lanes for more traffic to pass through. However, this approach leaves out a significant point;

the importance of managing the traffic itself, such as filtering or diverting any unnecessary traffic hitting the expressway in the first place. Thus, this method is flawed since it only tackles the issue of throughput capability but not that of throughput efficiency, which is clearly the underlying problem affecting many networks at present.

With the traffic load rising at an alarming pace on WAN networks due to greater connectivity and use of more powerful applications these days, increasing the throughput capability within the WAN alone is just not going to solve the problem. This is especially so if one considers the fact that the rate of bandwidth increment has been lagging behind the exponential growth of traffic loading on WAN networks in recent times. As such, enterprises are better served if they were to focus their attention toward enhancing throughput efficiency, which looks at managing WAN traffic in an efficient and effective manner, so as to cut down the unnecessary network traffic and maximize the potential of the bandwidth resource that is being utilized.

Moreover, from a business perspective, it does not make financial sense for enterprises to procure higher bandwidth for their networks since bandwidth is still a rather costly resource, especially in countries with less-developed IT infrastructure. Thus, together with the afore-mentioned shortcomings associated with having more bandwidth, the dependency on bandwidth, both from the operational and business standpoints, is not going to sustain the business competitiveness of an enterprise in the long run.

3. WAN Optimization and its Role to the Enterprises

Having highlighted the key issues faced by enterprises in the current globalized world, questions have arisen regarding the availability of solutions for enterprises to keep up with the IT demands of the business world. Indeed, the crux of the challenge really is to identify that one solution, which is able to address the problem, most adequately and suitably.

In this aspect, when it comes to WAN performance, there are a rather limited number of solutions available in what is essentially a nascent market currently. The slow development of the WAN optimization market can be attributed to the fact that awareness and interest in the technology only truly picked up in the past few years, amid greater importance being given to other more pressing IT needs such as network infrastructure and security. With the shift to a globalized business landscape, enterprises are finding it hard not to pay attention to enhancing their WAN performance, hence leading to a marked improvement in the level of activity coming from both the enterprises, as well as IT vendors.

Right from the onset, solutions in this segment have looked at significantly increasing the effective data throughput on WANs. For instance, the initial wave of products such as Wide Area File Services (WAFS) solutions looked at how applications and throughput could be accelerated over long-distance links. In recent years though, the limelight has gradually shifted to a technology that has evolved, but yet retains the same objective in improving the throughput efficiency. Unlike the WAFS though, this newer technology is architecturally different and not file-oriented; this technology is what is commonly known now as WAN optimization.

The Technology behind WAN Optimization

Spurred by the heightened awareness and demand of products enhancing WAN performance, there has been an increasing market interest in WAN optimization. Indeed, WAN optimization is fast becoming the unofficial technology label for products relating to WAN performance, with people often confusing WAN optimization with WAFS. The objective of the technology is to simply maximize the full potential of a WAN. Specifically, WAN optimization products can be defined by their ability to accelerate a broad range of applications accessed by the enterprise users across a WAN by compressing and prioritizing data, staging data in local cache memory, eradicating redundant transmissions, and streamlining chatty protocols. In addition, there has also been some recent focus on the evolution of WAN optimization appliances, and the protocol stack technologies that they utilize to achieve effective link capacity.

Features of the Technology

Broadly speaking, although WAFS and WAN optimization do differ in terms of their architectural approaches toward TCIP/IP WAN limitations, WAN optimization products do actually contain WAFS features such as data compression and caching, and the cutting down of data transmission through chatty applications.

Data Compression and Caching

This refers to the process whereby repeated traffic patterns are identified before being subsequently stored and cached either on a disk or in the main memory, locally, thus reducing the referencing and accessing time required for these processes to take place.

Common Sequence Data Reduction

As for tackling the issue of chatty applications such as CIFS, Notes, and SQL, WAN optimizers liberally use common sequence data reduction, where only data blocks, which have never been transferred before will be transmitted. The protocols on these high traffic load applications are also spoofed, so that non-data commands will not have to do roundtrips on the WAN, thus once again, reducing the amount of unnecessary traffic across the throughput.

Protocol Enhancing Proxies

Through the use of protocol enhancing proxies between the optimizers, WAN optimization products are able to eliminate TCP/IP latency resulting from the requirement of data to be sent in "windows" whose maximum load is only 64KB. These proprietary tools basically terminate TCP/IP traffic at each end of the link, and then proceed to transfer the data across on the proxies that employ much bigger windows, thus allowing more data to be sent over the link concurrently.

Selective Acknowledgements

WAN optimizers are also intelligent enough to mitigate packet loss events by adopting selective acknowledgements, whereby only packets that are lost are retransmitted, and the packets are subsequently reordered upon delivery.

By adopting these measures, WAN optimization products have managed to significantly increase the efficient use of bandwidth, as well as the overall WAN performance.

Transmission of Data

As mentioned earlier, recent developments in the WAN optimization space have also resulted in the need to bring the technology to the next level of performance; in particular, industry watchers are banking on WAN optimization to move up the protocol stack to application shaping technologies that adopt a session layer approach to expedite this quantum leap in WAN performance.

The early generation WAN optimizers operated at the packet level, whereby traffic from Layer 3 and below is compressed through the reduction of duplications in the data streams. However, by operating at such micro level, the devices performing the compression may not be able to understand the needs of the traffic since it is essentially broken up into numerous basic components in the form of packets during transportation. This often results in a best-efforts performance that is not application aware, which is not always good enough since businesses are becoming more application-centric these days.

On the other hand, solutions have tried tackling the issue from the other end of the spectrum by targeting application specific traffic at Layer 7. Once again, this results in a less than optimal performance for the WAN since data compression only happens for individual applications as a whole. Such a macro focus means that there is a possibility that only some applications will get optimized.

Having presented the two extreme ends, it goes without saying that sometimes straddling the middle ground may be a good thing, just like in the case of WAN optimization. Indeed, WAN optimization has been found to be ideal at Layer 5, which is the session layer. At this level, appliances get to leverage on a more balanced approach, whereby not only will they be able to provide a view of the macro picture at once, but they are also exposed to the micro level , allowing them to differentiate between what needs to be accelerated and what does not. At the session layer, examination of the application data streams takes place before they merge, so as to identify and eliminate any redundancies that are missed at Layers 2 or 3. Similarly, because the technology looks at the application data streams, it is also able to compress more types of traffic as compared to their application-specific Layer 7 counterparts.

The technique that operates at the session layer is often known as the application shaping method. The reason for this moniker is simple; at this interactive layer, the session is able to furnish the application with information pertaining to the availability of services, and in turn, the application will provide feedback to the network on its requirements. Having such a balanced approach means that session layer application shaping literally provides the best of WAN optimization performance, and its application focus is also highly relevant in the application-driven, highly virtualized business world of today.

WAN Optimization in the Business Context

Having looked at both the business and technological aspects of WAN optimization, it is only right for us to establish the link between enterprises and WAN optimization by looking at the technology's direct and indirect impact on the enterprises of today.

Greater Throughput Efficiency

As discussed earlier, one central theme encapsulating the current business landscape is the importance of throughput efficiency, in view of businesses becoming more globalized,

and application-centric. In this sense, WAN optimization has a direct impact on the businesses by maximizing the bandwidth utilization in the enterprises, and in the process, increasing the efficacy of business processes and operational efficiency of enterprises having offices globally. The technology also helps to address any major discrepancies in the network performance between offices, such as the traffic between head and the branch offices, so as to maintain a level of performance equilibrium across all its offices. For instance, WAN optimizers will help to speed up data transfer between employees located in extreme ends of the world, and also enable an enterprise to have real-time information updates and exchanges between its global offices, and the time saved in these processes will definitely enhance a business's competitiveness.

Better Application Performance

Moreover, besides the expanding nature of WANs, enterprises are also becoming more dependent on applications to drive their businesses. Furthermore, in order to cope with the increasing demands and complex nature of businesses, many of these applications are becoming more powerful and laden with more features and technical capabilities, thus exacerbating much heavier load on an enterprise's IT infrastructure. In light of this, WAN optimization products, which support application-shaping capabilities, will allow enterprises to increase the performance of their WANs in delivering these applications efficiently and effectively.

Higher Employee Productivity

With WAN optimization technology leading the way to greater WAN performance, it will no doubt create both a direct and indirect impact on employees of an enterprise. In terms of direct impact, the greater efficiency of the enterprise network experienced by employees will contribute to them being able to speed up their individual working processes, since resources will be made more readily available to them. As a result, it will lead to increased productivity for each employee, and inevitably, the enterprise as a whole.

Stronger Employee Empowerment

WAN optimization also has an indirect impact on employee performance, which is achieved by enhancing the individual empowerment of each employee. For most employees, frustration at work is often attributed to operational glitches impeding the flow of their work processes, from sluggish network performance, resulting in application lag, to instances of data transfer taking place at snail-pace speeds. Thus, with WAN optimization helping to enhance network performance and speed up IT interaction across offices, employees will have less likelihood of experiencing such hiccups in their networks, which gives them more motivation and greater confidence to carry out their tasks properly, and according to the timeline set.

Value for Money

Last but not least, from a business perspective, it also makes more financial sense for enterprises to adopt WAN optimization since the technology will help them maximize the return on investment (ROI) value of bandwidth being utilized, both in terms of actual costs savings, as well as business competitiveness in the long run. By promoting the efficient usage of bandwidth, enterprises are thus able to increase the value they are getting from their bandwidth, since WAN optimization products are able to cut down on any redundant data transmissions running across the network, as well as trim down any unnecessary activity happening on the network. This is especially crucial for businesses with offices in the developing countries, wherein bandwidth costs are still very high.

Key Features of a WAN Optimization Solution

So what differentiates a WAN optimization product from another? And what are these key differentiators that may possibly boost the value of a WAN optimization product over that of another? These are often questions posed by the enterprise decision makers as they go about assessing the various merits and demerits of the IT solutions available to them. However, more often than not, this task is made even harder by the fact that many IT solutions in the market are offering similar technologies, and the technical capabilities of these products do not differ much either. As such, it is of utmost benefit for enterprises to be aware of the key features associated with WAN optimization that may eventually determine its value, which the product may bring to the enterprise.

Security

In WAN optimization, one of the discerning features to look out for will be the vendor's consideration of data security as it travels through the WAN optimized traffic. There are two key areas of security concern here pertaining to the WAN optimization setup; the first being the notion of "good versus bad traffic" and the second refers to the link between the two WAN optimizers, when data is transferred through the proprietary protocol enhancing proxies.

A WAN optimization solution will be more efficient if traffic passing through it has already been filtered through, such that bad traffic containing malicious threats such as spyware and spam are all blocked from proceeding. In this way, not only will the entire network be protected, but it will also effectively cut down on the amount of traffic passing through.

The second area of concern pertains to the link between WAN optimizers, during which the TCIP/IP traffic is discontinued by the optimizers, and the data transfer is continued through the proprietary proxies. Once again, although adopting such a method will enhance the data transfer speeds, it is equally important to assess how data is being protected while it is being transferred across the optimizers, such as through the method of encryption. If WAN optimization technology is able to address the above security issues adequately, then it is fair to say that its contribution to an enterprise will be much greater than a solution that considers neither.

Optimization of SSL-encrypted Traffic

In addition to security, there is also the issue of whether the WAN optimization solution can be used to optimize SSL traffic as well, in addition to the normal traffic that is typically covered by products existing in the market currently. For instance, many banks and e-commerce firms run their businesses through transactions made through the SSL protocol. As such, similar enterprises will often have to deal with SSL-encrypted traffic. The value of a WAN optimization solution will definitely increase if vendors were to enhance the capabilities of their WAN optimizers, such that these appliances are able to read the encrypted data streams, especially for application processing purposes.

Enterprise Content Distribution Network

Having a solution such as Enterprise Content Distribution Network (ECDN) implemented alongside your WAN optimization solution will further enhance throughput efficiency at the branch offices by taking into account the intensity of traffic passing through the network at different periods of the day. Moreover, leveraging the ECDN functionality on the WAN optimization infrastructure offers a cost-effective solution, which cuts down on the need to install dedicated servers or devices to cater to the function specifically. Basically, ECDN provides enterprises with a policy-based scheduler of daily, weekly, or monthly operations that will ensure and deliver smooth network operations in areas such as rolling out anti-virus signature updates, operating system migration, and sharing of CAD files, without overloading network resources during peak usage hours. This is made possible by pre-caching relevant data in accordance to its periods of peak usage at the branch offices, so that it will be made readily available; instead of having to travel all the way back to the main system.

Multi-path Load Balancing

With the expansion of WANs, , it will be useful for enterprises to be able to ensure that the performance across the numerous network links are equally optimal, and having a multi-path load balancing solution will ensure this possibility. Such a feature will enable a WAN optimization device to perform load balancing between two or more links, thus causing all network links to attain equally optimal throughput performances. This capability is also becoming more pertinent during a time, whereby demand and expectations across head and branch offices are becoming increasingly homogeneous.

Effective Management and Integration of Network

With the number of offices increasing for enterprises, it is most likely that in order for them to implement the WAN optimization solution throughout their business, they may have to set up numerous boxes across the world. Moreover, many of these offices may contain different technologies serving different business functions. Thus, such a large and complex network can only be managed effectively if various offices and technologies are integrated and put together properly. In this way, it becomes pertinent for an enterprise to have access to consolidated reporting tools that will generate reports in tandem under a single monitoring system that will aid the effective management of different technologies across offices.

As mentioned earlier, the seamless integration of WAN optimizers into the existing IT infrastructure will no doubt lead to an effective management of the entire network. One approach to achieving this will be to ensure that the same vendor is being used for WAN optimization solutions across the entire network, from the data center to the endpoint devices, since it will lead to greater integration. Any discrepancies may result in less than optimal performance coming from the network. As such, it is essential for enterprises to pick solutions, whereby effective management of the entire network can be administered by their IT departments.

Long-term Viability of the Vendor

Besides technological concerns, it is perhaps wise to assess

the profile of the vendor as well, to determine if working with a certain vendor will be beneficial and viable in the long run. Obviously, it will be detrimental to an enterprise's IT setup if the vendor responsible for its WAN optimization device eventually folds up or gets acquired by another bigger vendor in future. This will often mean incurring additional costs and efforts to find other suitable vendor to replace the incumbent one, which is typically the only option, since the business costs involved in non-adoption of the technology may be even greater than replacing it. Likewise, if the vendor gets acquired by another bigger vendor, it may affect the quality of Replacement-Support-Maintenance (RSM) being rendered to the enterprise in future.

The RSM Factor

In the pace of enterprises rapidly extending their global reach, RSM services have emerged as a crucial component in ensuring the business viability and functionality of the enterprises. It will also work in favor of enterprises to engage a vendor, whereby its RSM is made available across all the global offices under its corporate network. Without the strong RSM coming from the vendor, an enterprise may find itself having no one to turn to, and thus incurring more costs in the event of problems arising in the system. Having work delays caused by the lack of technical support will disrupt the business synergy and the overall performance of an enterprise, which will ultimately be detrimental to its business strategy in the long run, if the issues remain unresolved in the network.

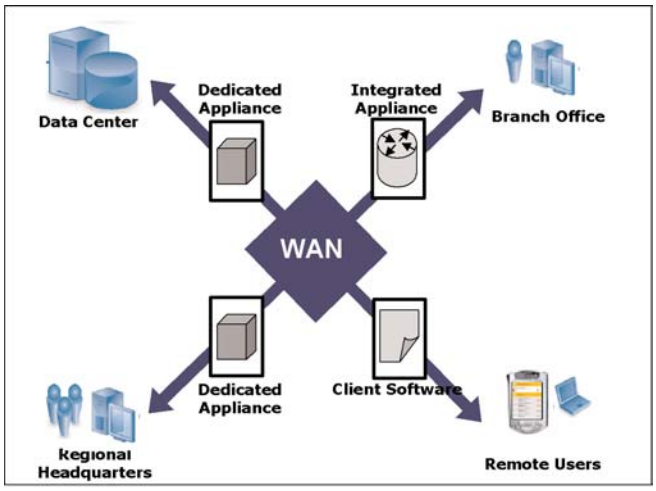
4. The WAN Optimization Strategy for an Enterprise

There are many ways through which a WAN optimization solution can be strategically adopted within an enterprise, especially with enterprise needs and network topology becoming more varied these days. It goes without saying that WAN optimization deployment can happen in different operational zones and locations, as well as catering to different uses, depending on where the enterprise has chosen to implement the technology.

However, it is important to note that the choice of equipment will very much be dictated by the objectives set by the enterprises for their WAN optimization deployment. These objectives can come in the shape of solutions, either to fix an isolated problem, such as revving up the performance at the data center, or to improve overall network performance across many different locations. Based on the current enterprise context, there are three key areas within an enterprise setup, which are commonly associated with WAN optimization deployment; the data center/regional headquarters, the branch offices, and the remote users (See Chart 1 below).

Chart 2

Network Topology for WAN Optimization Deployment



Source: Frost & Sullivan

Data Center/Regional Headquarters

With business processes becoming more complex and enterprises expanding at breakneck speeds, the data center has essentially become the nerve center for the extended enterprise. The amount of data going in and out of a data center has also risen considerably in the wake of enterprises having more offices, as well as applications becoming more powerful and traffic-hungry in order to feed the incessant demands of the businesses. Similarly, as we have seen earlier, the demands and expectations of branch offices, which serve as regional headquarters, have also put them on a par, if not higher, with their headquarters. Moreover, many of these regional headquarters are critical to an enterprise's presence in the regions they cover, thus ensuring that the operational efficiency of these offices becomes even more pertinent.

For critical operational zones such as the data center and the regional headquarters, it is thus advisable for enterprises to use dedicated appliances for their WAN optimization deployment. Installing such specialized boxes will enable an enterprise to get the maximum throughput efficiency out of their WAN optimizers, since with standalone boxes, attention will be focused solely on the function it is designed for. Moreover, having dedicated appliances will also grant enterprises with a certain level of flexibility with regards to WAN optimization, especially if they were to add additional

features such as security and application-specific software enhancements in future.

Branch Offices/Remote Users

The roles of small branch offices are also becoming increasingly enhanced, with demands of these offices constantly evolving and increasing, for businesses to adapt to their dynamic surroundings. Thus, there is definitely a need for WAN optimization devices, and a whole host of other IT solutions to be placed at these locations, if the enterprises need to ensure congruent and optimal operational performances across all their offices, in order not to affect the overall synergy of their businesses.

However, to cope with the requirements of the branch offices to be adaptive to their business environments currently, it is becoming more pertinent for enterprises to adopt a strategic outlook when determining and providing for their IT needs. Indeed, enterprises can no longer just cater to their current IT needs; with change being the only constant in the business world, enterprises will do well if they look ahead and think in the long run, ensuring their IT setup is always a step ahead of their businesses, instead of just merely being reactive to circumstances. This perspective is even more relevant and useful for branch offices since greater growth in resources, be it man power or functions, is expected to be diverted to these offshoots by increasingly globalized enterprises.

In this sense, having an integrated appliance that can offer features such as routing, unified security , WAN optimization, and access control will enable enterprises to not only serve their multiple IT needs at any given time, but also allow them to adopt more technologies, which may eventually become critical to their business operations in the near future. Having such a capability will greatly enhance an enterprise's level of technology adaptability, which will only make their businesses more effective and efficient in catering to the dynamic business world. Likewise, from a practical perspective, it also makes more financial, spatial, and administrative sense to have integrated appliances, rather than standalone ones, since firstly, they are cheaper to install and maintain. Secondly, they do not take up as much space as dedicated boxes, a crucial factor for branch offices, which are often constrained by space. Thirdly, having integrated boxes at the branch offices will allow for easier management by the head office, since they will not require any administration at these branches, unlike standalone boxes.

Similarly, employees are constantly on the move these days, and the increased mobility driven by the advent of mobile devices such as laptops and PDAs has definitely given enterprises another issue to think about. Currently, enterprises have to ensure that both the acceleration and security aspects of these endpoint devices are adequately covered in order for employees to carry out daily operations in the most optimal and safest environment possible. With multiple functions required at the endpoint, it becomes crucial for enterprises to have the option of an "all-in-one" client software solution, a technology convergence of both WAN optimization and security technologies. In this sense, it will only serve to benefit enterprises to engage a vendor that can provide the requisite WAN optimization and endpoint security capabilities on a common platform for their remote users.

5. Conclusion

It is fair to say that at present, WAN optimization is probably the best-fit IT solution for enterprises to operate efficiently, and enhance their business applications in a globalized business world. Moreover, enterprises have to accept the fact that real-time information and data exchange between people is no longer an "ideal" option to have in business operations; nowadays, real-time connectivity has become a critical tool, which many enterprises need for their businesses. Thus, with its ability to increase bandwidth efficiency, enhance WAN performance, maintain business synergy across the entire business, and improve employee productivity, WAN optimization looks poised to bring the integration of IT and business to a higher level, and allow enterprises to continue riding on the globalization phenomenon.

Finally, it is important to note that the technology is still very much in its infancy stage in the current WAN optimization market. Thus, for enterprises to make informed decisions on WAN optimization implementation, it is critical for users to understand the technology behind all the marketing glitz, and to make an astute assessment of how the technology can be best adapted to the needs of their own business setups.