NATIONAL ETHERNET: ACHIEVING BUSINESS CONTINUITY

Technology briefing

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NATIONAL ETHERNET FOR BUSINESS CONTINUITY

According to insurance company research, the chances of a business going bankrupt are greatly increased after a major fire. What's particularly unfortunate about this finding is that many disaster related business failures can be avoided by a basic disaster recovery plan.

Although the world is getting more disaster prone, business continuity and disaster technologies are getting more affordable and more powerful by leaps and bounds. With cost-effective wide area National Ethernet services, advanced disaster recovery methods can now be deployed by both large and small companies for a fraction of the cost that is incurred with traditional Frame, ATM and leased line networks.

Business continuity – a plan for every enterprise

This guide looks at the ability of National Ethernet to enable powerful business continuity plans in three areas:

1. Consolidated backup facilities. With enough high speed network bandwidth, it's possible to backup all an enterprise's critical data into a secure and consolidated backup facility.
2. Remote data replication. When conventional backup and restore routines don't provide enough business continuity, remote replication of data to a live or standby data centre is recommended.
3. Resilient enterprise architectures. Event-driven, distributed application architectures are great for ecommerce and they can also be a potent tool for reducing business disruptions and the effects of disasters on IT operations.

There are as many types of recovery plans as there are types of enterprises. Larger enterprises and financial services companies can afford dedicated "hot" data centres that contain a mirror image of live data from production systems. Recovery in this case can take place in minutes if all goes well. Companies with less urgent continuity requirements may arrive at a recovery plan that stretches out for hours or days, not minutes.

The effect of the WAN on business continuity

Business continuity and disaster recovery are largely a matter of eliminating single points of failure in a company's operating infrastructure. If major systems and processes are made

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Traditional WAN Data Services vs National Ethernet	
Frame, ATM and Private Line Networks	**National Ethernet**
Expensive recurring charges and equipment costs	Often the lowest cost per Megabit of wide area data
Painfully slow to upgrade	Can be rapidly upgraded using software controls
Operationally complex	Very streamlined – standard RJ45 interface creates plug and play WAN
Protocols are incompatible with LANs	WAN protocols are standard 802.3 Ethernet – use any hub, router or switch for WAN access
Limited bandwidth	Scales from 10 to 1,000Mbps in small increments

redundant, then high levels of continuity and rapid recovery are possible. Traditional WAN networks using Frame Relay, ATM and Leased Lines have often been major obstacles for continuity planners because they create isolated islands of non-redundant data and applications. Due to the cost and inflexible nature of traditional circuit-based WANs, the amount of bandwidth available in the wide area is typically less than 10% of the bandwidth available in enterprise LANs that support buildings and campuses.

Circuit-based WANs are slow and complex relative to needs of LAN-based business applications. They are also expensive and time consuming to configure and change. Conventional WANs use a set of protocols, devices and network management systems that have very little in common with the low-cost standards-based technologies found in Ethernet LANs. For years the high costs and low speeds of circuit based WAN links have limited the ability of enterprises to deploy effective business continuity methods.

National Ethernet: The business continuity enabler

National Ethernet breaks the bottleneck imposed by traditional Frame, ATM and private line services, by giving enterprises LAN-quality connectivity across the wide area, enabling a new generation of cost effective business continuity and disaster recovery methods. With National Ethernet, enterprises can now connect sites throughout a city or across the country at speeds of up to 1 Gigabit/s, far surpassing traditional WAN services in terms of bandwidth, compatibility, ease of deployment and cost efficiency.

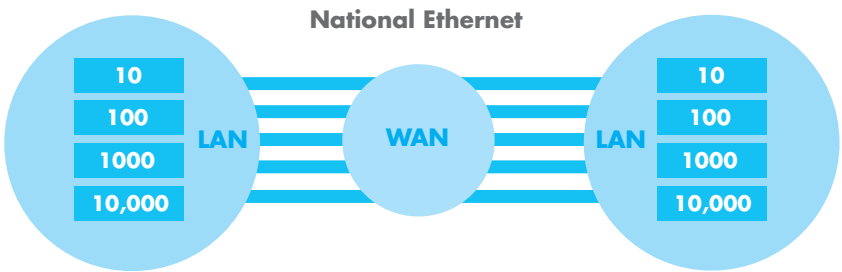
National Ethernet is accessed by standard Ethernet interfaces that are found on low cost LAN routers and switching devices that are widely used for office and industrial applications. In addition to its low installation and

National Ethernet is in many senses the ideal low latency approach to wide area connectivity in network dependent enterprises.

maintenance costs, National Ethernet also has the advantage of being software provisioned, which means that WAN bandwidth can be easily adjusted up or down in small increments to meet the needs of dynamic enterprise business processes and business continuity procedures. National Ethernet is in many senses the ideal low latency approach to wide area connectivity in network dependent enterprises, delivering unprecedented levels of bandwidth in a service that changes at the speed a business requires.

CONSOLIDATED BACKUP FACILITIES

The move from direct system/storage interconnection to network-based storage has made the job of continuity planning a lot easier. Storage network products typically fall in the category of Storage Area Networks (SAN) or Network-Attached Storage (NAS).



When servers have their direct-connect storage moved to the network, backup local or remote disk arrays can be brought online rapidly in the event of a major failure. With National Ethernet providing city-wide and nationwide LAN-grade connectivity, enterprises can leverage their SAN resources and make them available across the Wide Area Network. Now a central backup storage centre can be accessed by servers spread throughout the region or country in the event that a local storage network fails. In this case, the remote server is mapped directly to the backup storage over the National Ethernet link - which appears like a normal 802.3 connection to system and storage components.

The latest IP-based SAN infrastructures give continuity planners a range of choices in backup storage approaches. With an IP SAN, midrange servers and storage arrays can be interconnected across National Ethernet with cost effective iSCSI protocols. High end servers and storage arrays can be connected across the same wide area Ethernet infrastructure with Fibre Channel over IP (FCIP). IP and National Ethernet can seamlessly connect data centres throughout the enterprise for remote access to iSCSI and fibre channel arrays. This allows IT managers to use all their high-speed LAN based resources over the wide area in the event of an emergency.

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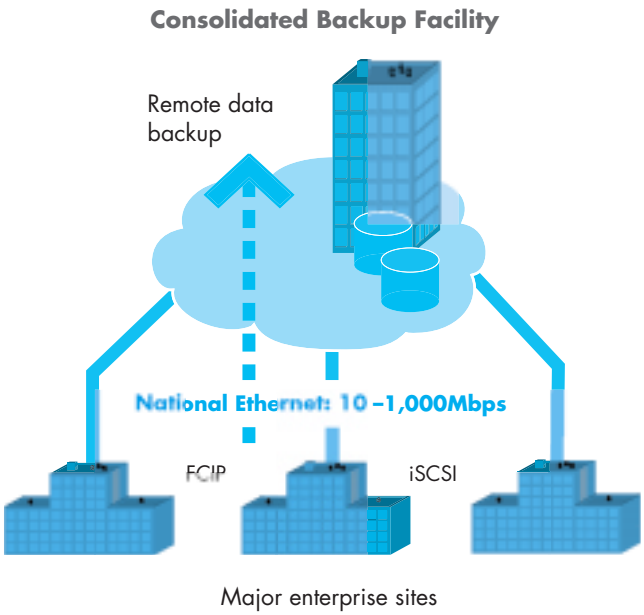

Better backups

In any disaster or major IT failure, the big question is: will the data backups work? The answer is only known after there is a frantic scramble to locate removable and fixed media that contain backup datasets, followed by a nerve wracking process of data restoration. The quality and capacity of backup media is improving all the time but there are many cases in distributed IT environments where data backups cannot be located in a timely manner, or in other cases the restoration process fails for any number of reasons.

To combat the frailties of backup and restore procedures, many enterprises are creating consolidated data backup and recovery centres that are staffed by technicians who are fully focused on the task of reliable backup and restore. A consolidated backup centre is a secure and well managed central repository for all the enterprise's critical data. Because the consolidated approach is a well-engineered and well-managed operation, it can often achieve a better total cost of ownership when compared to ad hoc backup plans where each data centre, department and workgroup is responsible for backup and restore. Since consolidated backup centres are typically remote from main enterprise sites, they also eliminate the need for expensive, time consuming off-site tape and removable media vaulting.

When enterprise sites are interconnected via National Ethernet, the consolidated backup centre can remotely back up servers, network storage and end user systems using standard LAN-based backup software. In the event of a failure anywhere in the enterprise, data can be restored rapidly from the consolidated recovery centre via National Ethernet links. To minimise disruption, a consolidated centre can back up live data to tape backup silos, removable disks or storage arrays, using iSCSI, FCIP and any remote backup/restore software that will run over Ethernet.

REMOTE DATA APPLICATION

As businesses move towards highly automated, event-driven IT architectures, the business risk of systems failure increases dramatically. In this environment, the emphasis shifts from periodic backup/archive to redundant parallel IT operations that can keep going even in the face of a major data centre failure.

The shift from lengthy recovery procedures to continuous operations is driven by the fact that down time has become exceedingly expensive in the ebusiness era. In many businesses, an hour of down time can cost thousands of pounds. (In some financial companies, each hour of down time is calculated to cost more than £100,000!) With conventional backup and restore recovery plans, there is typically a delay of hours or days, even, before data is restored. In this case, time is definitely money.

Remote asynchronous replication

For enterprises that need faster recovery than can be achieved with conventional backup/restore, it's possible to continuously replicate live production data to a remote backup system. One such method is remote asynchronous replication, which is of particular value for ensuring the continuity of major databases and transaction processing systems across large distances. This approach sets up a "loose" relationship between the primary and backup systems so that writes to disk in the primary (live) system are decoupled from writes to disk on the replicated system. In "delta" asynchronous replication, only data changes that occur since the prior replication pass are copied, conserving network and system resources. Normally, asynchronous replication has very little impact on the primary server or storage system, but if there is inadequate WAN bandwidth, a bottleneck is created that will slow the production system down.

Using National Ethernet links, asynchronous replication of SAN arrays and other network storage can take place over very long distances (e.g. up to 1000km or more). In the event of failure, asynchronously replicated data can be accessed remotely or locally, ensuring high levels of business continuity. Although asynchronous data replications traditionally run on expensive WAN data services, in many cases a better solution is to use National Ethernet. This way, the cost per Megabit of WAN connectivity is low and bandwidth can be incrementally added in small steps as asynchronous replication volumes grow.

The low cost and provisioning flexibility of National Ethernet is opening up remote data replication to a much wider range of enterprises.

Remote synchronous replication

Remote asynchronous data replication can provide very reliable recovery but due to the slightly delayed nature of the copy process it is possible to lose a small amount of transaction data. When the highest level of business continuity is required, remote *synchronous* data replication is likely to be the best solution. The term "synchronous" in this context means that the remote backup data is in lockstep with the primary application. The primary application does not complete a transaction until the remote replication is in synch. It is possible with this approach to experience a major data centre failure and not lose a single transaction. But the act of executing duplicate writes on local and remote backup systems can have a considerable performance impact on both the systems and the networks involved.

Remote synchronous replication has traditionally been deployed over limited Metro area distances using very expensive fibre optic links. But with the advent of National Ethernet and new IP-based synchronous fibre channel extension products, it is now possible to conduct synchronous mirroring between locations separated by hundreds of kilometres, throughout the UK. The low cost and provisioning flexibility of National Ethernet is opening up remote data replication to a much wider range of enterprises.

Standby data centre

One approach to remote replication is to create a remote "standby" replica of the primary data centre. Transactions are mirrored synchronously into this hot backup facility and the main data centre "fails over" to this site in the event of a major failure or catastrophe. Ideally, the remote stand-by data centre is on a different power grid, which means that there is an advantage if the two data centres are not in the same city. If data centres are located in different cities, there is also the advantage of possible cost savings. For instance, a London based data centre can be mirrored by a redundant data centre located in the Midlands where costs are lower.

With newer IP SAN products and National Ethernet, it is now possible to cost effectively connect multiple regional data centres with each other or a remote standby centre, creating a multi site data replication architecture. National Ethernet essentially creates a single LAN between data centres, allowing full synchronous mirroring and two way interaction between load balancing programs, systems management software and other data centre applications.

A completely redundant hot standby data centre can play an important role in business continuity but it comes at a very high price.

A load balancing approach to continuity

A completely redundant hot standby data centre can play an important role in business continuity but it comes at a very high price, especially considering that the capacity of the backup site is not used most of the time. An alternative to standby centres is found in *load balanced* data centre mirroring.

In the load balanced model for data centre redundancy, intelligent replication software is used to dynamically mirror and load balance applications across two or more fully functional centres that are remote from each other. Typically, each data centre has enough capacity to handle all the data processing of its own applications plus a remote centre's applications. Any application that runs in one data centre is also mirrored in the other for backup purposes. If one centre fails, the other centre has a complete copy of all data. (In the most advanced form of data centre mirroring, individual applications can be load balanced across both data centres, but this is not as common as keeping individual applications within centres.)
With National Ethernet for connectivity, up to 1,000Mbps of LAN-quality connectivity is available for synchronous mirroring and coordination of fully operational and mirrored centres.

Mirroring and load balancing between live data centres has several advantages over the hot standby approach. In the hot standby scenario, it is necessary to regularly exercise and test the backup site. Testing is time consuming and effort intensive and no amount of testing can guarantee that the backup centre will perform as expected when a fail-over occurs. With fully operational mirrored data centres, it is certain that centres are working

Data Recovery Methods

Methods	Recovery Time
Hot recovery facility with remote *synchronous* data mirroring	Minutes
Hot recovery facility with remote a*synchronous* data replication	Minutes or hours
Standard tape or disk based backup/recovery	Hours or days
Cold recovery centre – empty space with only electricity, lighting and air conditioning	Days
No recovery plan	You may never recover!

National Ethernet lets continuity planners move away from complex, expensive, traditional WAN methods to a high performance Ethernet and IP infrastructure.

and ready to assume each other's loads at any time. In the load balancing approach, one of the data centres can be taken off line while it is upgraded or maintained. The redundancy also creates economies of scale in the areas of training, capital purchases and operations management.

In general, National Ethernet lets continuity planners move away from complex, expensive, traditional WAN methods to a high performance Ethernet and IP infrastructure that seamlessly connects storage, servers and data centre resources across wide areas.

A RESILIENT ENTERPRISE ARCHITECTURE

Since the 9/11 disaster in New York, more and more enterprises are moving to a "split operations" model, where one or more data centres back up each other. Each centre can handle its own work and some of the work from other centres. Once this type of backup architecture is mastered, there are many direct and indirect benefits to be realised.

Backup data centres are central to business continuity but for maximum resilience, it is necessary to look at the overall enterprise IT architecture itself. By using the low cost, high speed WAN connectivity of National Ethernet in conjunction with distributed event-driven enterprise computing methods, it is possible to create a highly resilient architecture that can keep functioning even if major facilities are damaged or incapacitated.

"N-tier" distributed computing deploys web services and other forms of XML integration using J2EE or .NET programming models for event driven functionality. N-tier architectures separate the various components of application programs into front end, mid tier and back end components. Front end servers host a user interface, also referred to as the "presentation layer"; mid tier servers run application code; and back end servers handle database and transaction processing.

The various tiers of an N-tier model can be very flexibly deployed across multiple enterprise sites, adding another dimension to business continuity planning. Front, mid and back components can be combined on a single server or host system or distributed on large and small servers. It's very possible in a typical N-tier architecture to locate front end web servers in one city, applications servers in a regional ISP and back end servers in a headquarters data centre.

One key aspect of the N-tier approach is modularity. Each tier of the architecture is built of modular servers. When additional capacity is needed, servers are added to each tier, on an as needed basis. Modular systems are generally much more resilient than large, centralised monolithic systems because they have no central point of failure. Business continuity planners can take advantage of the modular and distributed nature of N-tier models by designing applications that are not inherently dependent on any specific hardware or location. If extra capacity is built into an N-tier system at each

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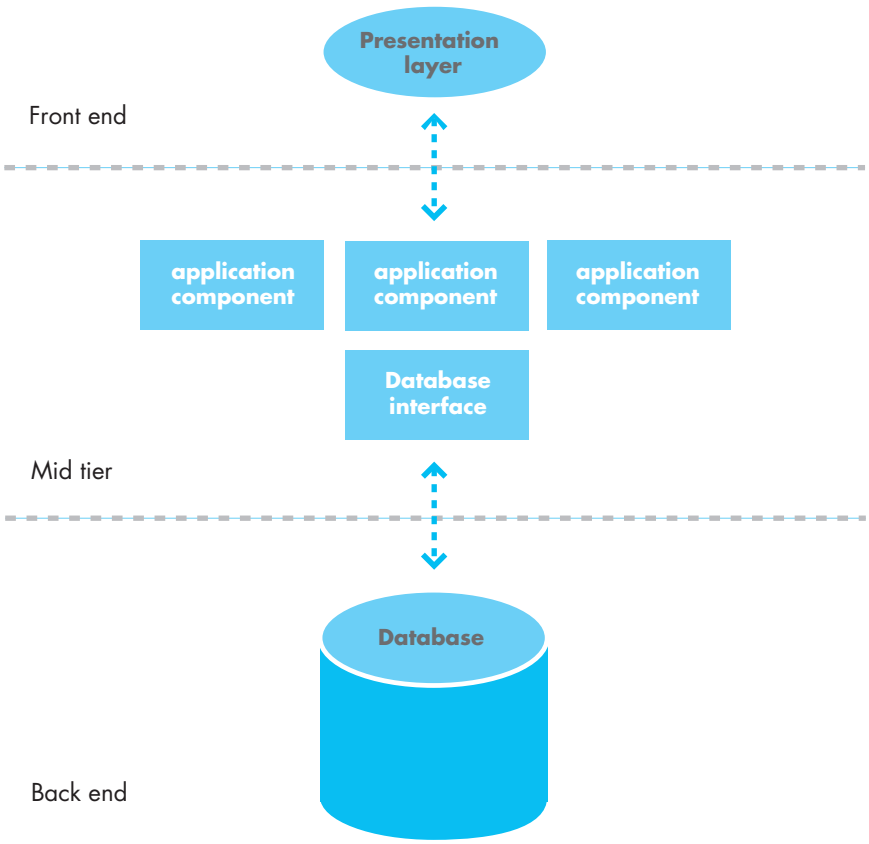


tier, then there is the ability to move applications and data around when disaster strikes, to ensure business continuity.

In addition to software design, the key to tiered IT is to have enough bandwidth between vertical tiers and within horizontal layers to let servers communicate seamlessly, regardless of distance or location. For instance, if mid tier application servers in a particular data centre are taken off line by a fire, applications can be immediately moved to mid tier servers in another location. In this case the front end and back end servers can keep running as usual, as long as there is enough bandwidth to sustain the new traffic patterns. When an N-tier network is designed for resiliency and redundancy, it is possible to load balance work across servers in each tier to take advantage of the extra capacity that is built in.

With conventional Frame, ATM and Leased Line networks, the cost of bandwidth may be too high to allow fully meshed high performance N-tier computing. With National Ethernet, it is possible to create a full or partitioned mesh of 10 - 1,000 Mbps Ethernet links that connect all the tiers of the architecture on all sites without bottlenecks or excessive latencies. Because it uses software provisioning controls, National Ethernet is generally a great deal more flexible in the way it can adapt to the changing needs of an N-tier architecture. It generally takes weeks or longer to upgrade or re-provision Frame, ATM or private line WANs. With National Ethernet the

If planners anticipate various disaster scenarios, they can use the resiliency of the IP network to provide very effective responses to a wide range of disasters.

network links can be turned up or down in a matter of a few days. To achieve end-to-end enterprise IT resilience with N-tier, continuity planners should examine each site and create a plan for network connectivity, processing capacity and recovery procedures. Each site should know where there is extra capacity in the N-tier system that can be used in the event of failure. Because the N-tier model gives all users and servers any-to-any access to each other, any group of users can dynamically access any group of servers in the enterprise – as long as there is adequate bandwidth. And to use the bandwidth fully, network administrators must ensure that routers and firewalls do not block "unusual" traffic patterns that may occur during infrastructure failure and recovery.

Choosing resilient applications

An IT architecture with a high bandwidth National Ethernet backbone is the ideal environment for highly resilient distributed applications that take advantage of the flexible, any-to-any nature of IP. Voice over IP is an excellent example of an application that is naturally resilient. In a typical IP network, the redundant nature of the backbone topology means that IP phones have multiple call paths between them without any special effort or expense for the enterprise. If a disaster destroys part of the infrastructure, IP phone calls are automatically rerouted to alternative paths.

Unlike traditional PBXs, which run on centralised proprietary hardware, IP PBXs leverage standard network and server hardware and can typically be relocated to another part of the enterprise, if the main IP PBX location is incapacitated. If planners anticipate various disaster scenarios, they can use the resiliency of the IP network to provide very effective response to a wide range of disasters. If cost efficient, high bandwidth National Ethernet is used as a connectivity for the IP network, the various components of the IP telephony systems can be relocated and immediately resume operations, without disruptions to enterprise phone users.

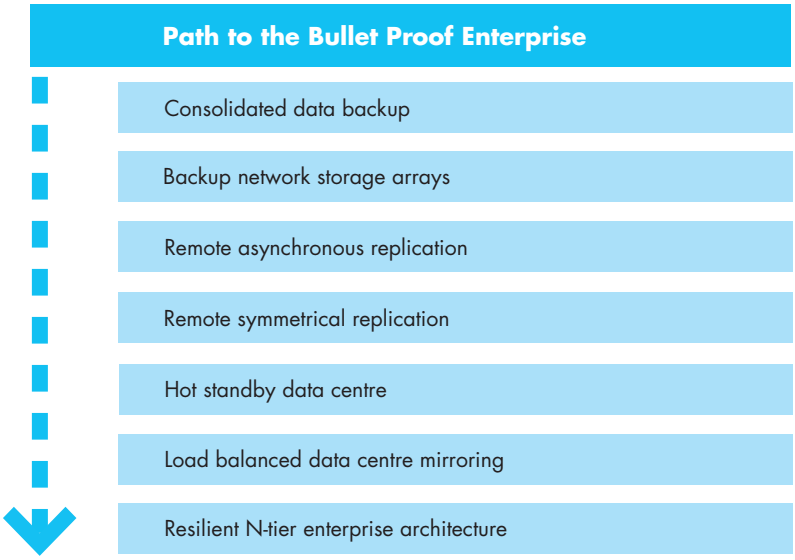
Virtual web contact centres

Virtual web contact centres help enterprises create high levels of customer support with a highly distributed team of human agents and

A virtual web contact centre keeps track of all customer contacts, whether by voice, fax or Internet, in a central database that ensures consistent customer service.

automated programs. The virtual contact centre is web based and any agent can log onto the system from any PC that gives Internet or intranet access to the contact centre server. Virtual contact centres give customers a high level of service because they enable multichannel contacts through phone, email, messaging, fax, web call back, web chat and so on. Customers appreciate the multi channel nature of virtual call centres because they do not always prefer the phone as their primary contact channel. A virtual web contact centre keeps track of all customer contacts, whether by voice, fax or Internet, in a central database that ensures consistent customer service.
The customer agents who work in virtual contact centres can be distributed across multiple sites and branch offices and they can also work at home. The multichannel, distributed nature of this approach makes it highly resilient in a number of threat and failure scenarios. In the event that an office is shut down, virtual call centre workers can be relocated to other offices or to their homes with very little impact on customer service.

Although the virtual contact centre agents need very little bandwidth to connect to the contact centre server, this application runs best when it's integrated at the application level with CRM programs, supply chain systems and other back office and front office applications. This integration is necessary because the full customer service can only be achieved when agents have real time information about inventory levels, distribution centre schedules, shipping activities, production bottlenecks and other operations the length and breadth of the enterprise. High levels of IT integration and network bandwidth translate into superior customer relations.



If IP telephony, virtual call centres, and N-tier event driven applications are to reach their full potential in terms of performance and resiliency, they require a mesh of high quality, low cost bandwidth between all major sites. By extending enterprise LANs seamlessly across wide area distances, National Ethernet from THUS provides the ideal infrastructure for enterprise integration and comprehensive, proactive business continuity plans.

"In the next 10 years, Ethernet will inexorably take over the metropolis." Michael Howard, principal analyst of Infonetics.

UNDERSTANDING NATIONAL ETHERNET

Ethernet is perhaps the most remarkable success story in the network industry. It has overtaken virtually everything in its path in the local area and it's now well on its way to dominating metropolitan and national area networks. Ethernet WAN connections worldwide reached 750,000 in 2002 and Infonetics Research predicts it will grow 337% to 3.3million by 2006.

According to Michael Howard, principal analyst of Infonetics: "In the next 10 years, Ethernet will inexorably take over the metropolis." Clearly, need for faster networks and more flexible provisioning of WAN bandwidth gets ever greater as internal LAN connectivity migrates to Gigabit Ethernet and application traffic patterns get increasingly dynamic. From an end user standpoint, National Ethernet is as simple as a standard RJ45 or optical connector. But as with any enterprise infrastructure technology, National Ethernet does have a number of architectural and deployment issues for IT and network designers to consider.

The most common type of National Ethernet deployment is a point-to-point layer 2 link between two sites. These sites can be in the same city or in widely separated cities. In some cases the Ethernet WAN link can simply be bridged into existing LANs on either side of the wide area. If broadcast filtering and traffic control is desired, the Ethernet WAN link can be terminated by a layer 3 router on either side. Various LAN switching and VLAN methods can also be used to control traffic across National Ethernet links. The key point is that the WAN now looks like a standard 802.3 link on either end.

The bandwidth into sites can be provisioned at 10, 100 or 1000 Mbps. Virtual LANs (VLANs) are then configured between these sites, running as trunks over the MPLS network at bandwidths from 2-1000mb to suit the customer's applications and budget. Trunk bandwidth can be re-graded within a few days to suit your needs. The bandwidth that National Ethernet delivers is up to wire speed, with none of the contention ratios or sharing limitations of conventional first generation broadband connections (e.g. ADSL). The VLANs are very much like VPNs in the sense that each customer's traffic is logically isolated from other traffic on the WAN backbone and on the access pipe where multiple VLANs terminate at a site. National Ethernet bandwidth is completely symmetrical, overcoming the limitations imposed by current asymmetrical broadband services that typically limit upstream traffic to 256Kbps. This makes it highly suitable for real time applications with peer-to-peer relationships.

National Ethernet is highly suitable for voice over IP and video conferencing/streaming applications.

Suitability for enterprise applications

National Ethernet may be suitable for virtually any application environment that utilises LAN connectivity, including high performance transaction processing, financial services, OLAP/BI, ERP, CRM, computer aided engineering, digital content creation and so on. Enterprise applications should see no effective difference between an Ethernet LAN link and an Ethernet WAN link.

Because it has reasonably low latencies (e.g. less than 80ms), National Ethernet is also highly suitable for Voice over IP and video conferencing/streaming applications. As with any layer 2 environment, delay sensitive applications over National Ethernet will benefit from QoS and traffic management services provided at high layers of the network stack.

This guide is part of a series on advanced Wide Area Network solutions from THUS. For additional information, please see these publications:

NATIONAL ETHERNET: ARE YOU READY?

A managers' guide for those interested in preparing for and deploying National Ethernet in UK enterprises.

NATIONAL ETHERNET: FACILITATING THE REAL TIME ENTERPRISE

Along with event driven IT systems, advanced business intelligence and flexible capacity planning, National Ethernet is a key factor in the realisation of low-latency Real Time Enterprises.

NATIONAL ETHERNET: EXTENDING THE ENTERPRISE

A guide to using National Ethernet to extend business critical IT applications to supply chain partners, customers and virtual workgroups across the UK.

NATIONAL ETHERNET: ACHIEVING BUSINESS CONTINUITY

A "how to" primer on using advanced National Ethernet connectivity to create a resilient "bullet proof" IT infrastructure.

EVOLVING TO MPLS VPNs

An in depth look at the state of today's enterprise network and how the evolution from PVC circuits to packet-based IP virtual private networks pave the way for a powerful new peer-to-peer voice, video, CRM and workgroup applications – and the ability to give time sensitive interactive applications and ERP, back office and transaction processing systems, a higher level of traffic priority on a cost effective, IP-based any-to-any mesh network.

For further information on National Ethernet please call 0800 027 0585
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