Faster Simpler NETWORKS

Scalable Solutions for Evolving Networks

Intel responds to the changing network model with products, technologies and industry standards efforts that span from the home to the enterprise

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Executive Summary

The ever-changing computing industry is going through another cycle in its evolution. The networking paradigm that originated with centralized mainframes and later shifted to isolated LANs has transformed again in response to the globalization of information and communication.

Unlike the network view of old – which focused on the single dimension of shared infrastructure devices, such as hubs, adapters and switches – today's network paradigm is a multi-dimensional, dynamic model that encompasses three interrelated elements: network devices, client/server systems on the network, and the management aspect. This new model has been driven by sweeping changes in communication methods and business practices – evident most visibly in the vast and rapid growth of email and the Internet, as well as LAN-specific applications such as Notes, SAP* and Oracle.**

Intel Corporation's commitment to "faster, simpler networks" is designed to accommodate this paradigm shift. Intel's overall objective is to design solutions that address the needs of users and businesses in computing environments as small as the home and as large as the enterprise.

This paper provides an overview of Intel's vision for the future of networking solutions. Intel's networking strategy is to deliver a full set of best-in-class, scalable solutions for evolving networks. These solutions complement Intel's efforts to "deploy, manage and protect" desktop PCs and servers, a comprehensive strategy for increasing network reliability and lowering the total cost of ownership (TCO) of PC computing.

Introduction

The computing industry never has been characterized by equilibrium. Constantly in flux, it has reshaped in response to rapidly emerging technologies, and in reaction to dynamically changing user needs and business practices.

Today, from the home to the multi-national corporation, evolving networks are changing the face of computing. Several interrelated industry trends are driving this evolution:

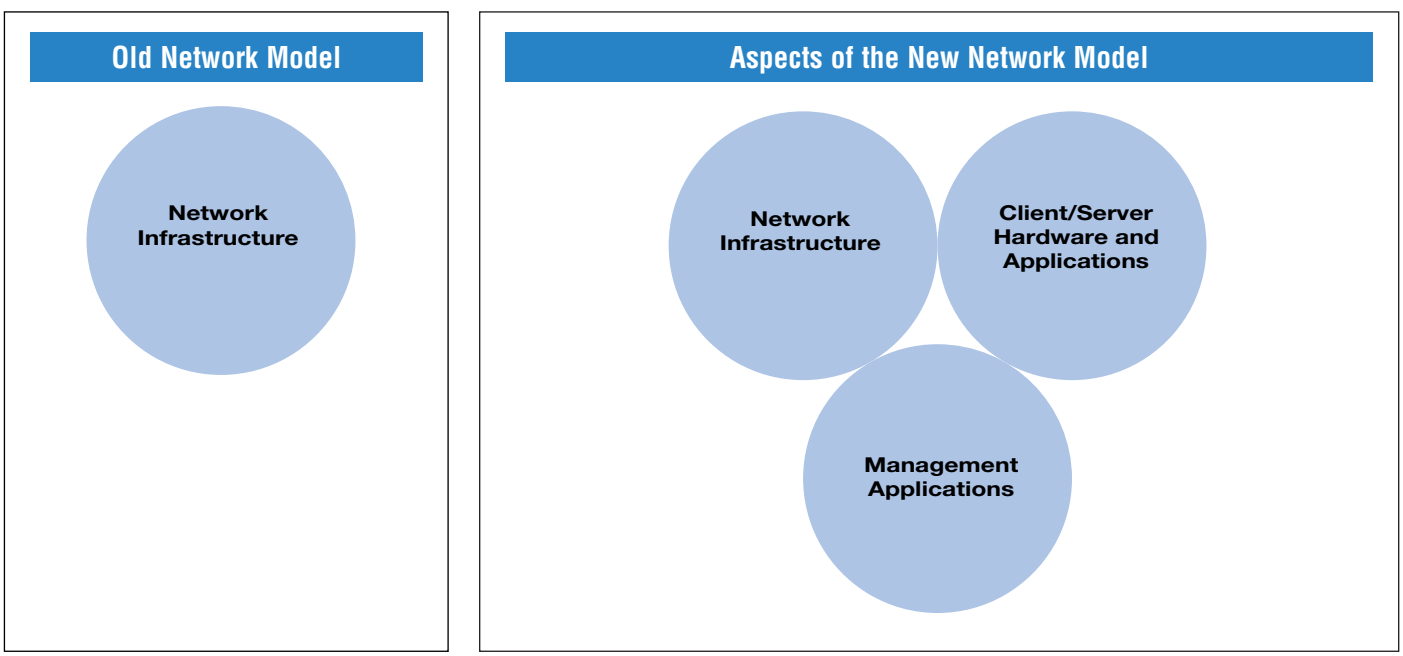
- *Communications methods, protocols, business practices and business models are changing*
- *Processors are becoming increasingly powerful, spawning richer applications*
- *New networking environments are emerging, particularly in small businesses and homes, and networks as a whole are growing more complex and sophisticated*
- *The view of the network is shifting from an infrastructure focus to a multi-dimensional models*

The evolution toward a multi-dimensional model is key to Intel's networking strategy. In the past, the "network" was viewed as essentially a collection of infrastructure devices. This notion is becoming an artifact due to the rapid and dramatic ways in which business is changing.

Only a decade ago, for example, paper memos and an "In" basket were accepted and common methods of business communication. Today, the immediacy of email is nearly ubiquitous. In the past, news typically traveled by newspaper; today, the Internet offers instantaneous news updates. Even enterprise organizations large enough to justify the cost of a private WAN for communication have embraced change. Today, many businesses large and small reduce their costs by taking advantage of the Internet as a public WAN.

The shifting landscape is manifest in other areas as well. For example, whereas in the past virtually all employees tended to occupy desks at an employer's site, today's business model is characterized by escalating entrepreneurship, telecommuting and worker mobility. Technology advances have also played an important part in the evolution; most notably, the ever-increasing processing power and mobility of the PC.

Driven by these influences, today's networking paradigm is based on the notion of the "connected PC" – desktop PCs and servers vitally linked to the universal global network. Intel understands that this new paradigm requires striking a balance between the network devices, the client and server systems connected to the network, and the management solutions needed to control network and PC hardware.



The old network model focused only on the infrastructure. The new networking paradigm encompasses all aspects of the network: infrastructure devices, client/server hardware and applications, and management applications.

A Networking Paradigm for the Next Millennium

In the multi-dimensional networking paradigm – which encompasses network devices, clients and servers and management – the connected PC is the mechanism that enables global communication and information exchange.

The following standards, tools and technologies are evolving in support of this paradigm:

- *Ethernet as the accepted communications method (10Mbps, 100Mbps and now including Gigabit Ethernet)*
- *TCP/IP as the standard networking protocol*
- *Shift toward a "client-to-any-server" model*
- *Increasing server performance*
- *Shift from shared segments (hubs) to switched segments (switches)*
- *Routers installed at the periphery of the network, with virtual private networking (VPN) technology used to reduce the cost of remote communications*
- *LAN-on-motherboard technology as an alternative to the NIC*
- *Networking products and PCs fully instrumented for manageability (Wired for Management)*

Intel believes that the new networking paradigm dictates the need for powerful, flexible solutions that deliver the following:

- *Adaptability and flexibility, including the ability to scale bandwidth, optimize hardware and balance the performance of the network with the performance of client and server PCs*
- *Products built to be effectively and intuitively manageable and managed*
- *Performance, including the ability to allocate bandwidth and maintain security*
- *A design appropriate to the application; for example, small-business solutions tailored to small-business practices, and branch office solutions tuned to the needs of users in branches*
- *An effective balance between performance and control*

Intel's Networking Business Strategy

Intel's efforts in the networking arena focus on delivering industry standards-based technologies that support the transition to higher-bandwidth networking and reduce TCO. Intel's strategy recognizes the need for solutions that address a number of key areas, including performance, control, productivity, speed, security, reliability, flexibility, lower costs and ease of use. Intel further recognizes that solutions must take into account the "whole network" – even the PC architecture – not just the network infrastructure.

Intel's networking business strategy comprises five key areas of commitment:

- *Deliver best-in-class, scalable solutions for evolving networks*
- *Provide solutions that meet the needs of users and businesses in computing environments as small as the home and as large as the enterprise*
- *Provide solutions for the new networking paradigm as the view of the network shifts from an infrastructure focus to a multi-dimensional model*
- *Bring all areas of Intel expertise into play to develop intelligent networking solutions, addressing not only network infrastructure devices but also client/server systems and management solutions*
- *Deliver powerful, flexible solutions that help companies and end users achieve an effective balance between performance and control*

Intel is uniquely qualified to provide a comprehensive set of intelligent networking solutions that support the growth of the "connected PC" model. The benefits of Intel's expertise include:

- *Cutting-edge, high-performance silicon integrated in network infrastructure products, desktop PCs and servers*
- *Award-winning management tools to help IT staff get control of their networked PCs, servers and infrastructure systems, with a focus on a "virtual IT" model in which any networked PC can be managed from anywhere*

- *World-class manufacturing capabilities to minimize the cost of networking products*
- *Development of industry specifications and industry standards (such as the Wired for Management Baseline Specification) that help businesses lower TCO*
- *Strategic industry alliances that address key user issues and business concerns*
- *Extensive, established product distribution channels that deliver Intel solutions to customers*

Intel capitalizes on these strengths to deliver networking solutions that effectively link the three elements in the new networking paradigm – the hardware devices on the network, the client PCs and servers connected to the network, and the management technologies needed to effectively control the network.

Intel's award-winning products and technologies are based on a long track record of success dating back to 1979, when it co-developed the original Ethernet specification with Digital Equipment Corp. and Xerox Inc. In 1982, Intel released its first networking component, the 82586 network controller. In 1990, sensing the growing importance of connected PCs, Intel formed a division devoted to networking. Today, Intel offers a full range of solutions that meet the needs of networked users across varied environments.

Intel technologies and initiatives

Intel helps define and influence the evolution of networking by fostering technologies and initiatives that aim to benefit the industry as a whole.

Virtual IT

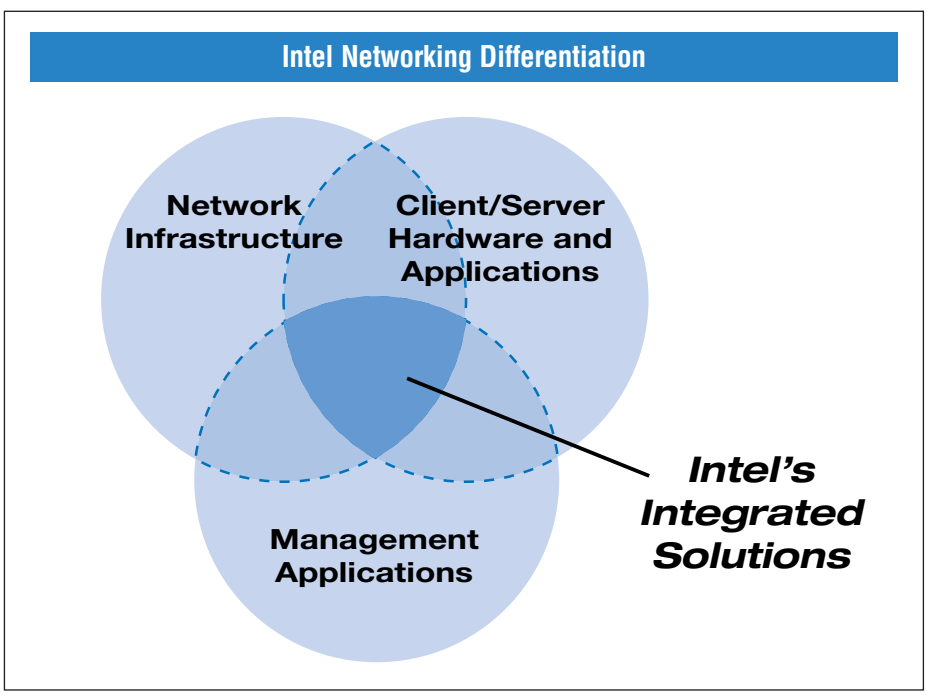
Intel recognized early on that the ability to reach over the wire and take control of a PC remotely is critical, both because many computing environments lack onsite IT support and because of increasing worker mobility. Intel's expertise in remote control technology has been integrated in networking solutions such as Intel LANDesk® products and Intel Device View for Web, supporting a "virtual IT" model in which any connected network device can be managed from anywhere.

Intel's virtual IT strategy maps closely to the industry trend toward IT outsourcing. A growing number of companies – from small businesses to enterprise companies – rely on outside organizations such as software providers, help desk providers and resellers for technology and application support. Intel recognizes that networking products, and especially management solutions, must be designed differently to make this model work optimally.

Wired for Management initiative and baseline specification

Intel has invested extensive resources in the Wired for Management (WfM) initiative since launching the effort in 1996. WfM is a far-reaching endeavor to lower the cost of business computing – including costs for system management and support – without compromising flexibility or performance.

The Wired for Management Baseline Specification is a reference designed to help manufacturers build business systems that can be centrally managed to reduce TCO.



Intel applies its expertise in all three areas of the new networking paradigm to develop integrated solutions that deliver scalability, performance, control and effective balance among all elements of the network.

The baseline specifies a minimum set of management interfaces to enable capabilities that include remote configuration and installation of operating systems and software applications, remote control and diagnostics, and after-hours maintenance. PC manufacturers can build on the baseline to offer additional capabilities and value to their customers. And customers can use these features to more effectively reduce TCO without sacrificing PC performance.

The specification spans a full range of business PCs, addressing the management requirements of desktop and mobile PCs as well as services. Support for the Desktop Management Interface (DMI) is a key part of the specification. It also includes Wake on LAN* functionality and a pre-boot execution environment (PXE) to further enhance the remote manageability of WfM-compliant platforms.

Virtual Private Networking

In order to realize the enormous potential offered by the global Internet, Intel has developed products and technologies that enable companies to use the public Internet for secure LAN-to-LAN communications. Using powerful tunneling and encryption technologies with standard WAN routing protocols, Intel Express Routers enable businesses to create secure Virtual Private Networks (VPNs) using the public Internet. VPN technology opens doors that may not have been available to businesses before, offering them the tangible benefits of communication security and dramatically reduced WAN costs.

Businesses can use this secure tunneling technology to safely and easily set up private LAN-to-LAN routing over the public Internet. Using two or more routers to establish a VPN offers clear advantages over a private connection, including significant cost savings. These benefits can easily justify the cost of a remote WAN connection, even for one-person offices such as might be staffed by a company's corps of field representatives.

Adaptive Technology

Intel has applied its silicon expertise to optimizing network performance by integrating Adaptive Technology in its LAN adapters and switches.

Adaptive Technology optimizes adapter silicon by dynamically tuning adapter performance to network conditions on an ongoing basis, thus maintaining peak performance as the computing environment evolves.

Applied to switches, Adaptive Technology ensures optimal throughput by dynamically assigning the best switching mode of each port based on the level of network traffic. This optimization maximizes throughput, improves network stability, enhances productivity and extends the overall life of a company's networking products.

Delivering solutions through the channel

Delivering total solutions to end customers is a key piece of Intel's commitment to networking. Intel recognizes that resellers are a critical piece of the equation. Customers get satisfaction not only from the actual product solutions, but also because resellers can install, maintain and manage those products effectively. End customers are thus assured that a broad scope of support options is available to them.

To make this model successful, Intel invests in these resellers by providing a broad array of programs and services designed to augment their product needs.

Intel relies on the expertise of its reseller channel to deliver solutions tailored to specific networking environments.

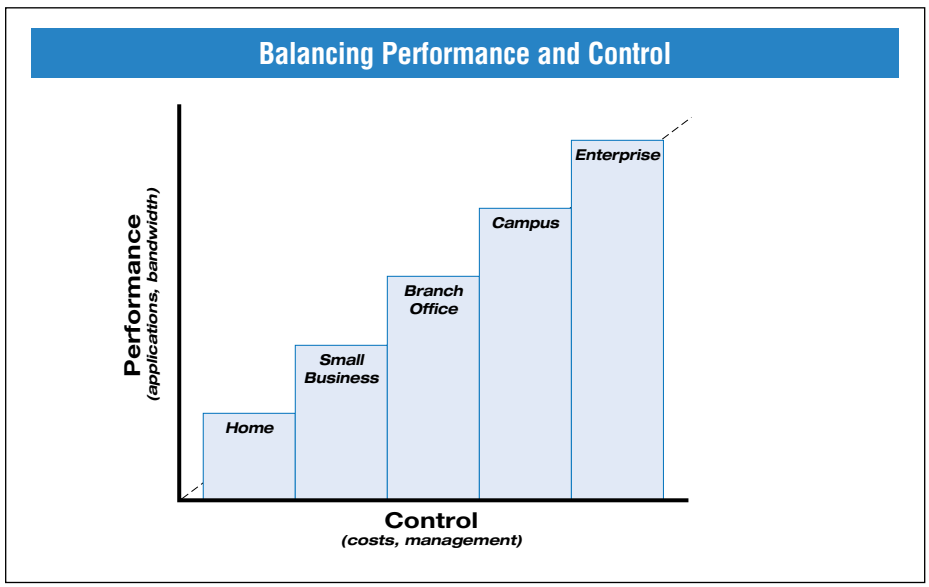
Addressing the Full Spectrum of Networking Environments

The evolution toward the connected PC model is changing the definition of networking. Networking today runs the gamut of user environments – from the home, to the small business, to the branch office, to the campus, to the enterprise – enabling virtually all PC users for increased productivity and an effective presence in the global economy.

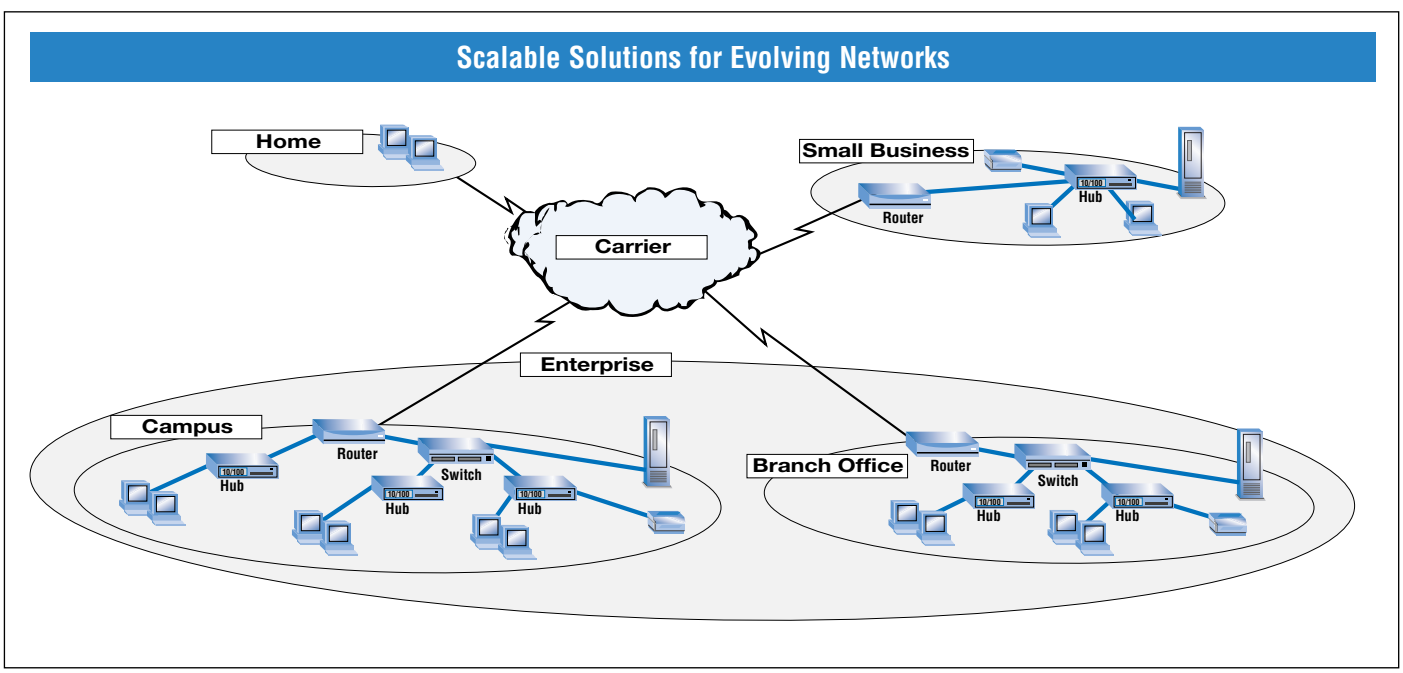
Intel recognizes that each segment is influenced by its own set of industry forces, and that each environment has specific computing requirements. Application demands, bandwidth demands, the need for manageability and costs scale up as network requirements grow increasingly more sophisticated and complex.

The evolving home networking environment

Household members of all ages today use home PCs for such activities as word processing, personal finance management, email, playing games and Internet-based research. To accommodate their increasing desire for information, communication and entertainment, an estimated 14 million U.S. households have opted for the convenience of multiple PCs.[1] More are expected to follow suit as prices continue to fall into the sub-$1,000 zone for a well-equipped system. However, many multi-PC households don't have the luxury of multiple peripherals; thus, they need a way to share them.



The need for performance and control increases as the complexity of the network grows.



Networking today encompasses a broad range of environments.

A home network makes it possible to connect two or more PCs so they can communicate and share valuable resources, such as printers, files, modems, simultaneous Internet access, multi-user games, applications and CD-ROM drives.

The benefits of a home network are measured in convenience, time savings, reduced hassles, lower cost and higher entertainment value. Intel predicts that the advantages of networking home PCs will become even more apparent as hardware evolves and an increasing number of shared applications emerge for the home environment.

A home network equips households to realize greater benefit from the limitless ways in which evolving computing technologies are expected to enhance their lives in the future, for example:

- *Remote access to home-control functions such as lighting, heating and security*
- *Home intercom systems operated PC-to-PC*
- *Touch-pad screens built into appliances (such as refrigerators) that can access weather, stock and other information through the home network's Internet connection*
- *Voice-activated television access and tracking*

Understanding consumer needs

Studies show that consumers will judge a home networking solution by the following criteria:

- *Ease of installation and use*
- *No need for new wiring or structural modifications*
- *Accessibility from anywhere in the home*
- *Affordable cost*
- *Fast, high-bandwidth Internet connections, with headroom for growth*

New Intel business unit focuses on home networking

Intel recognizes that trends in home PC use make a compelling case for simple network solutions that help consumers share resources effectively. Intel has responded to this changing PC market segment by creating a new business unit within the company called the Home Networking Operation (HNO) to explore potential opportunities.

For more information on home networking trends, visit Intel on the Web at www.intel.com/home/network/

The evolving small business networking environment

This environment encompasses a broad range of small-business settings – for example, a dental office, florist, restaurant or real estate office. Research indicates that half the world's work force today is employed by small businesses. An estimated 8.6 million small businesses operate in the United States alone, accounting for 59 million workers[2].

Savvy small-business professionals have long understood the correlation between computing technology and success. Today, they are beginning to recognize the compelling business advantages of a "connected" office.

Intel believes that small-business professionals have much to gain in terms of efficiency, profitability and their ability to compete by outfitting their companies for business networking. A network can boost productivity and profits by enabling PC users to share resources, such as files and printers, and by fostering better communication among employees, customers and suppliers through email and the Internet.

Customer needs in the small-business environment

Customer research indicates that business professionals in the small office environment have specific needs with regard to network technology – and no IT manager to address them. Their chief requisites, which are based in large part on the limited amounts of time, space, money and technical expertise available to them, are as follows:

- *"Plug-and-play" products designed for quick, easy installation and simple configuration, so as not to disrupt business*
- *Scalable solutions that accommodate business growth and help preserve a company's investment in equipment*
- *Low cost of entry*
- *Capabilities that include print and file sharing*

- *Shared Internet connections that enable small businesses to market their products and services through electronic commerce*
- *Reliability, because they're trusting their business to each technology component*
- *Compliance with accepted networking industry standards and protocols*

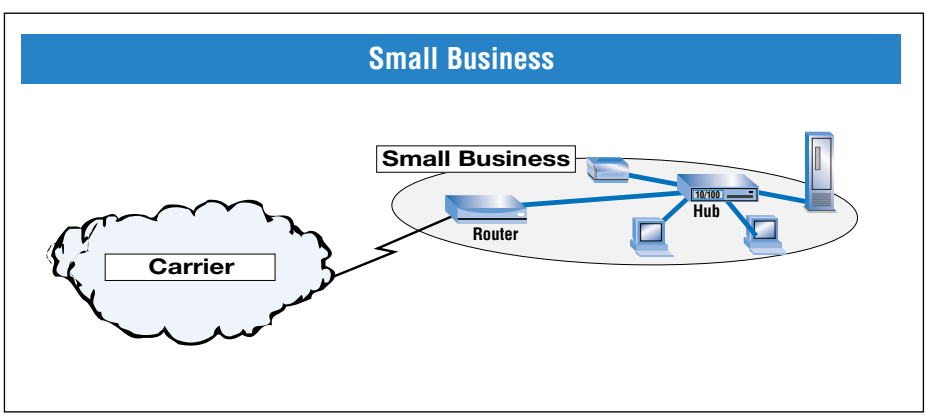
Intel network solutions for small businesses

The Intel InBusiness™ networking solutions were developed to help small businesses get connected and gain Internet access easily and affordably. Recognizing that small-business professionals can't force-fit a solution meant to be implemented by a trained IT staff, these solutions were designed from the ground up for users with limited technical expertise, office space and time to implement networking technology. Intel InBusiness products help customers manage their business, increase sales and compete effectively with rivals who formerly may have had a size advantage.

The Intel InBusiness family includes Ethernet and Fast Ethernet hubs, Ethernet switches and an Internet connectivity device that allows multiple simultaneous connections through one Internet Service Provider (ISP) account and one phone line. Complementing the Intel InBusiness lineup are Intel's established families of EtherExpress™ adapters for connecting PCs to network devices so files can be shared, and NetportExpress™ print servers, for enabling multiple users to share printers. Intel also offers versions of its LANDesk® Virus Protect software ideally suited to providing the safeguards against virus intrusion that are vital in the small-business environment.

These solutions for small-business environments deliver on Intel's networking strategy by featuring easy setup, scalability, economical pricing and a modular design that lends itself to the physical constraints of a small space. Intel networking solutions also support a choice in speed, number of ports and other variables, providing the flexibility to support a wide range of small-business needs.

For more information on small-business networking, visit Intel on the Web at www.intel.com/network/smallbiz/



The small business networking environment.

The evolving branch office networking environment

At a cursory glance, the branch office often seems similar in appearance to the small business environment. One important consideration differentiates these two environments, however. Unlike the small business, the branch office is not a standalone entity. A satellite of a larger organization, the branch office needs to connect in some fashion to a headquarters-type site that is geographically separate.

Until recently, most branch offices had only a LAN to share printers and files. As the drive toward enterprise-wide computing accelerates, however, these remote offices have embraced a WAN paradigm.

As recently as a decade ago, only very large organizations such as banks had branches because most companies couldn't afford to have employees disconnected from their business. Evolving technologies, such as VPN, have allowed more companies to establish branches because a remote site with just a few employees is now economically feasible. VPN, for example, allows remote sites to connect to the corporate office via the Internet, dramatically reducing connectivity costs.

This combination of added value and lower cost today easily justifies an investment in enabling technologies for branch networking.

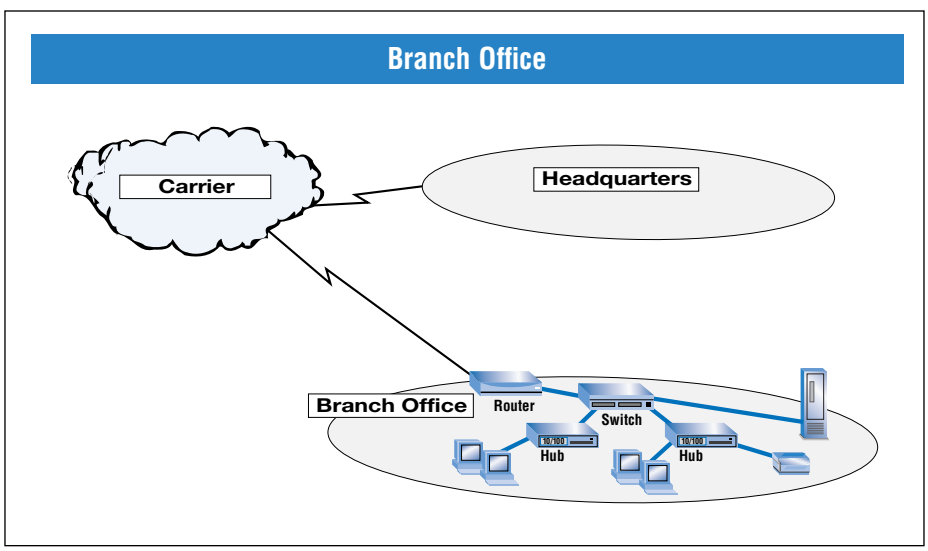
Understanding user needs in the branch office

The branch office shares a common list of computing needs with the small office discussed in a previous section of this paper. These needs include 10/100Mbps connections for file sharing, print sharing and email. In addition, users in a branch office require networking solutions designed for ease of installation, use and remote management, because they typically don't have the luxury of onsite IT support. At the same time, however, branch users need the sophistication and applications of a larger networking environment.

Users in remote offices today also need a WAN connection of some kind to enable communication and information exchange with the main corporate network, which could include connections with regional offices as well as the company's home office. A company can establish a private WAN to connect its branches, for example, using high-speed modems and leased lines, or take advantage of the public Internet for less expensive WAN connections, such as VPNs. Many companies are choosing the latter option because the cost of WAN and LAN connectivity is a major concern when branch offices are numerous.

Branch offices also require network solutions that support the following:

- *Scalability to accommodate changing computing needs and business practices*
- *Reliability to keep communications open and systems up and running, because a staff with limited technical expertise can't afford repeated network crashes or connection problems*
- *High levels of Internet traffic to support frequent communication with the home office and other remote sites*
- *Sufficient LAN bandwidth for increasingly demanding applications*
- *Compliance with industry standards and protocols to ensure seamless business communications with the corporate network*
- *Reasonable cost of entry*



Using the public Internet, branch offices can create a Virtual Private Network (VPN) for secure communications with a central site.

Intel network solutions for the branch office

Intel's networking product strategy dovetails closely with customer requirements in the branch office environment for affordable LAN and WAN connectivity. Intel's easy-to-use, cost-effective and high-performance routers, standalone hubs and stackable hubs are tailored to evolving needs in both small and large branch offices. Support for VPN technology in Intel's router solutions ensures that business PC users located anywhere can communicate safely and securely via the Internet, eliminating the need for more expensive WAN connections.

To address the lack of local technical support in the typical branch office, Intel designs its routers and hubs for easy implementation, configuration and management, including simple installation wizards and Windows* OS- and Web-based tools. Intel's dual-speed hubs and routers also support seamless integration into 10Mbps and 100Mbps networking environments, providing companies with an easy mechanism for migrating to higher bandwidth.

To deliver on another key vector in its networking strategy, Intel offers a range of Ethernet and Fast Ethernet LAN adapters that provide high-performance connectivity and a seamless migration path. On the management side, Intel's solutions strategy includes the LANDesk family of products designed with capabilities that are critical in the branch environment. For example, LANDesk Management Suite provides flexible management of remote nodes, enabling a headquarters site to support

branches. LANDesk Server Manager Pro helps maximize the uptime of business-critical servers and provides unique remote management. LANDesk Virus Protect provides centrally managed, proactive protection for clients, servers and remote PCs.

For more information on branch office networking solutions, visit Intel on the Web at http://www.intel.com/network/branch/index.htm

The evolving campus networking environment

The term campus as it applies to networking typically refers to an environment in which employees are united by site but separated by functional workgroups, such as engineering, manufacturing, finance or public affairs. The workgroups operate both at a local level and as a collective, connected business entity. At the high end of the scale, a large corporation's campus might encompass a thousand or more users and a handful of separate buildings. A law firm operating out of five floors of a building offers a smaller-scale example of a campus environment.

This often-complex environment usually constitutes a series of interconnected LANs and a WAN connection, and it will generally comprise large numbers of employees, some of whom are likely to be mobile users. Corporate application and database servers are likely to be located in centralized data centers, and high-speed fiber connections are the norm between floors and buildings. A campus environment may have branch offices that are hundreds or thousands of miles distant, with WAN access to headquarters and an ISP.

Intel recognizes that scalability is critical to reducing TCO in the campus environment. This need to support evolving environments is the rationale behind designs such as stackable hubs and switches, as well as flexible 10/100Mbps solutions that ease the transition to higher bandwidth. Intel also recognizes that centralized management and virus protection solutions are critical at the campus level to minimize costs and maximize productivity.

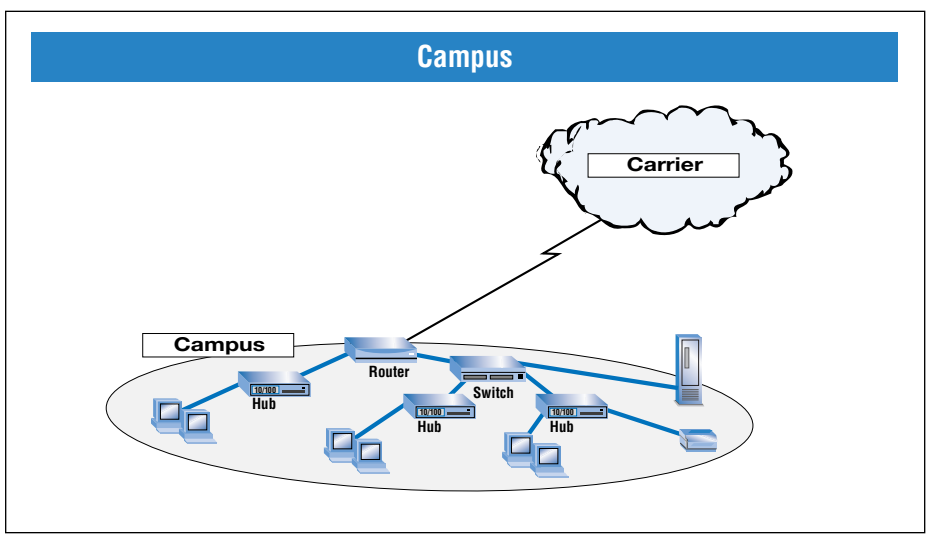
Understanding user needs in the campus environment

Although the campus environment usually has the benefit of an onsite IT department, companies need scalable, manageable networking solutions that can be deployed with ease and confidence. The imperatives for this business environment can be summarized as follows:

- *Sophisticated yet affordable LAN/WAN connectivity that will be scalable as business demands grow and change*
- *Flexible networking solutions that accommodate multiple, diverse workgroups and varied application demands*
- *Sufficient bandwidth for increasing levels of business PC application and multimedia traffic, including the ability to migrate easily from 10Mbps to 100Mbps to Gigabit performance*
- *Management solutions that lower TCO, including effective remote management of branch offices, centralized management of the campus itself, ease of use, integration with other applications, and integration between the desktop and the infrastructure*
- *Reliable, affordable, high-volume Internet access*
- *Seamless integration among products and technologies to ensure transparent business communications and transactions throughout the campus*

Intel network solutions for the campus

Intel offers an array of solutions designed to adapt to evolving network needs at the campus level. To ensure flexibility, expandability and a seamless migration path to higher bandwidth, Intel's strategy is to offer scalable campus infrastructure solutions that support 10Mbps Ethernet, 100Mbps Fast Ethernet and Gigabit Ethernet.



The campus networking environment.

Intel's campus infrastructure products also support Layer 3 switching, a technology that combines the performance of switching with the control of routing, and Scalable Switching Technology, which increases the bandwidth of the high-performance backplane by 2.1Gbps with every switch added to a stack, enabling switching capacity to grow as the network evolves.

Intel, a founding member of the Gigabit Ethernet Alliance and the Fast Ethernet Alliance, will continue to expand its expertise and its development efforts in high-bandwidth networking solutions.

Specifically addressing the campus environment, Intel offers a scalable switch solution that reduces TCO with a low acquisition price and the expandability to accommodate changing business conditions. In addition, Intel routing switches supply increased performance and control when segments need these capabilities.

Intel further delivers on its networking strategy by designing its campus solutions for simple installation and intuitive centralized management. Web- and Windows-based tools save network administrators time and money, both at initial setup and throughout day-to-day network maintenance activities.

All of Intel's campus infrastructure product families – stackable hubs, scalable stackable switches, high-performance server and client adapters, and reliable print servers – support 10/100 autosensing. Intel's portfolio of campus networking solutions also encompasses a host of products in the LANDesk family, including strategic solutions for desktop management, server management and comprehensive virus protection.

For more information on campus networking solutions, visit Intel on the Web at http://www.intel.com/network/campus/index.htm

The evolving enterprise networking environment

The enterprise represents the top echelon in the hierarchy of networking environments, and as such, it embodies the highest levels of complexity and sophistication.

Typically, the enterprise network is characterized by several large regional sites, multiple campuses and numerous remote sites (such as branch offices), as well as extensive Internet, intranet and extranet activity. The bandwidth of its backbone is greater than the other environments discussed in this paper, and it is likely to have more subnets. The enterprise environment also has higher requirements for non-stop computing and deploys more complex applications. Some enterprise environments include a mainframe, while others rely exclusively on client/server computing.

Understanding the needs of enterprise IT managers

The overriding concern in enterprise environments is gaining control of the network and reducing TCO while maximizing uptime. To move in that direction, IT managers need integration, interoperability, manageability and unified control of the network across all areas, from desktops through the infrastructure. In addition, because these environments can run to tens of thousands of end stations, IT managers need technology that allows them to control those end stations without physically having to "touch" each one.

A successful enterprise computing strategy must also strike an effective balance between performance and control in all aspects of the network. For example, the greatest emphasis at high-performance desktops is likely to be on control – governed by mechanisms such as bandwidth and policy. At the backbone, raw bandwidth is likely to take precedence over control.

Intel responds to this need for balance through its management strategy, its network infrastructure strategy and its client and server strategies.

The needs of the enterprise environment can be summarized as follows:

- *Higher-bandwidth solutions to support faster desktops, servers and network backbones*
- *Sophisticated, affordable LAN/WAN connectivity that is scalable to meet evolving business demands*
- *Lower TCO through corporate standards and policy-based management*
- *Flexible networking solutions that accommodate multiple, diverse workgroups and varied application demands*

- *Effective remote management of branch offices*
- *Support for increasing levels of business PC application and multimedia traffic, including the ability to migrate seamlessly to higher bandwidth*
- *Reliable, high-volume Internet access*
- *Seamless business communications and transactions throughout the enterprise*

Providing enterprise network solutions

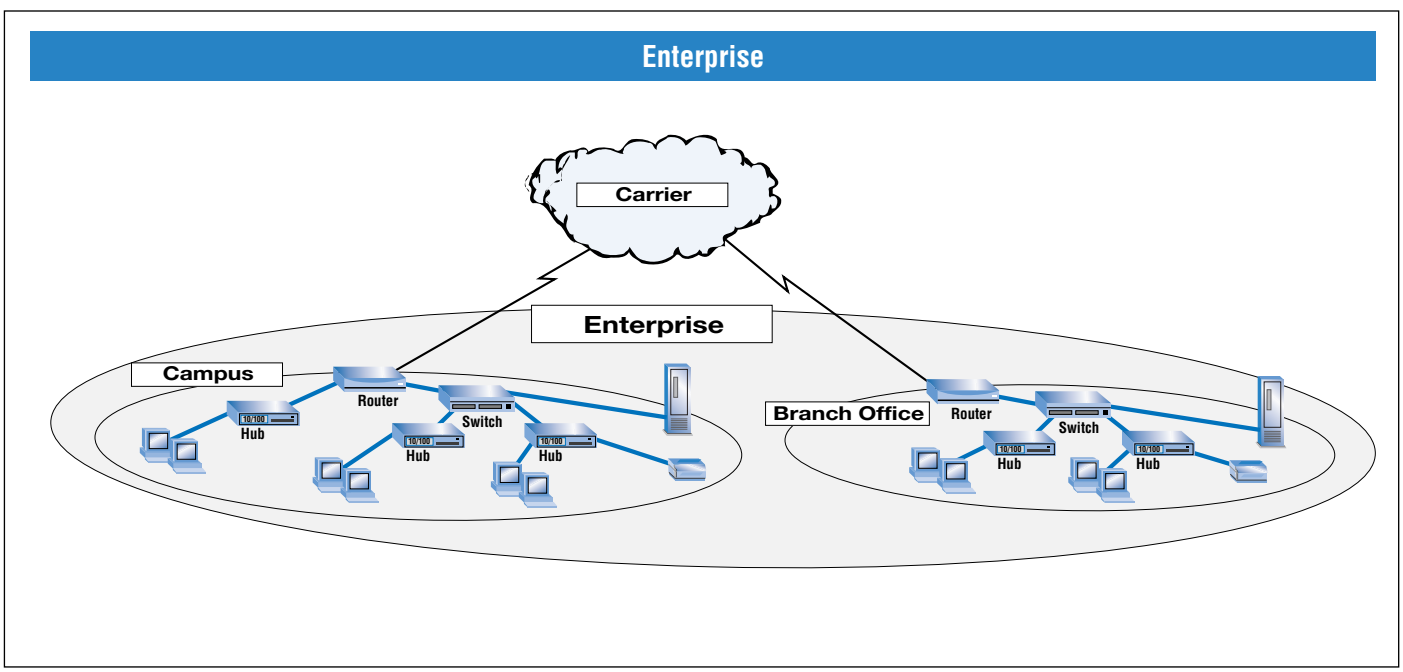
Intel adds value to the enterprise network in a variety of ways. One key way is through an array of scalable infrastructure products such as Intel Express Stackable Hubs and Switches that empower workgroups within the enterprise. Intel also offers an extensive family of network connections (both network adapters and LAN-on-motherboard components) that provide high-performance connectivity for servers and clients.

Through its relationships with key industry allies, such as Cisco Systems, Microsoft, IBM and HP, Intel further enables its infrastructure products with "snap-in" support for the enterprise. For example, an Intel Express switch that a company uses to run its workgroups can plug into a large chassis switch of the type used to connect all workgroups over the backbone.

Intel maintains similar alliances with key enterprise players on the management side. Specifically, Intel hardware and software management solutions not only provide an exceptional level of control over client/server systems but also integrate with existing enterprise management platforms to help companies achieve an optimal balance in managing their networks. This "snap-in" support for management consoles, such as Tivoli TME* and HP OpenView,* is a key element of Intel's enterprise strategy.

Intel Desktop Integrator Technology offers another important example of how Intel solutions integrate with enterprise applications. Through licensing agreements with Intel, help desk application providers are enabling their PC support solutions with this linking technology, which extends the benefits of innovative desktop management technologies to the help desk environment. Intel Desktop Integrator Technology lets IT professionals view and control managed PCs on the network directly from the help desk console.

By integrating with cost-saving Intel management tools such as PC systems discovery, PC diagnostics, remote control and inventory data, this approach serves to increase the rate of first-call problem resolution, provide reliable information without requiring end user participation, and reduce the number of trips to the desktop, resulting in lower TCO.



The enterprise networking environment.

Developing technologies and specifications that facilitate communication between the desktop and the enterprise is another important aspect of Intel's enterprise strategy. Intel works with key enterprise players to write specifications and technology that enable enterprise and desktop tools to share resources.

Intel delivers its enterprise solutions to customers through a network of premium VARs, PC makers and enterprise software makers. From a silicon perspective, enterprise networking can deliver the greatest benefit to users by taking advantage of Intel architecture-based desktop PCs and servers, especially high-performance systems based on Intel Pentium,® Pentium Pro and Pentium II processors.

To enable greater control over the network and thus deliver on Intel's strategic commitment to help companies lower TCO, Intel products allow CIOs to implement policy-based management. By designing policy-based management features such as centralized desktop configuration and control, Intel offers a powerful solution to IT managers who worry about the increasing tendency for employees to modify their desktop systems.

For more information on enterprise networking solutions, visit Intel on the Web at http://www.intel.com/network/scalable/index.htm

Conclusion

Intel is proactively responding to industry demand for faster, simpler networks by mapping its business strategy to the changing landscape of PC networking. This initiative addresses the key challenges that confront consumers and businesses today as the industry evolves toward a "connected PC" paradigm in which users are vitally linked to a universal global network.

Effective solutions for this new multi-dimensional model must balance performance, control and cost across the network to maximize the benefits of computing for specific customer applications. Today's networking solutions must also maintain an effective balance between the three aspects of the new network, including the infrastructure, client/server systems and management applications. By applying its engineering, silicon and business expertise to leading-edge products, technologies and standards efforts, Intel is delivering scalable, powerful and manageable solutions for evolving networks that span from the home to the enterprise.

*For more information on Scalable Solutions for Evolving Networks, visit Intel on the Web at http://www.intel.com/**network***

1 Intel estimate based on 1997 Dataquest* research.

2 Intel Segmentation Study, April 1997.

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