

# Point-to-Point



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## CIO Update: Is Your LAN Ready for IP Telephony?

CIOs and networking managers are interested in insights on how their enterprises can plan, design, implement and maintain the most effective campus LAN architecture to satisfy current and future network computing requirements. To help those executives with their planning, Gartner discusses how it is now possible to run business-quality voice traffic over LANs. However, due to differences in quality of service (QoS) requirements and reliability issues, small and midsize business (SMB) LANs are closer to being ready for IP telephony than are large enterprise networks.

Convergence technology has advanced to the point where it is possible to run business-quality voice traffic over LANs. However, many network

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## CIO Update: Why a Small Business Bet on IP Telephony

Many CIOs and networking executives are interested in insights on when an emerging network technology will be feasible for implementation, and how strategic plans can be enhanced to include new technology directions and migrations. To help those executives with their planning, Gartner presents a case study that illustrates how IP telephony has matured to the point at which it is now a viable solution for small businesses. IP telephony can support advanced features, such as computer-telephony integration (CTI) and unified messaging, and is an ideal solution for small and midsize businesses that are concerned about scalability.

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managers are still wary of IP telephony, and the commercial deployment of IP PBXs is still in the early stages. Most concerns focus on the LAN's capability to reliably transport voice traffic. Issues such as QOS, high availability, power to IP telephones and size of the enterprise are all factors that must be considered when assessing whether the LAN is ready for IP telephony.

### Quality of Service

In flat networks built strictly with Layer 2 devices, 802.1p is the key QOS mechanism used for prioritizing voice traffic over data traffic. However, due to the industry hype that abounded during the mid-to-late 1990s, many network managers are unsure that this relatively simple technology can enable business-quality voice over LANs.

First, asynchronous transfer mode (ATM) vendors claimed that ATM to the desktop was the only way to deliver voice over the data infrastructure. When it became clear that ATM was not about to displace Ethernet at the desktop, major equipment manufacturers focused on policy-based networking as a means of enabling voice/data convergence, and attempted to lock in customers with plans for complex and proprietary end-to-end solutions.

Therefore, for many network managers, it is a tremendous leap of

faith to accept that 802.1p (a protocol commonly found on inexpensive workgroup switches) is capable of supporting business-quality voice in converged LANs. Nonetheless, Gartner estimates that more than 90 percent of all IP telephony installations during the past 18 months have been in environments of less than 100 users, where 802.1p is the enabling technology in those Layer-2-only networks. Gartner estimates that approximately 50 percent of all SMB LANs have been built with switches that are capable of supporting the 802.1p protocol (or an equivalent proprietary solution), and are therefore ready to support IP telephony.

Larger networks require Layer 3 support, which introduces complexity into the QOS scenario. In Layer 3 networks, either Diffserv code points or the type of service bits are used for classifying real-time vs. non-real-time traffic. That information is located deeper in the Ethernet frame than the 802.1p field and, therefore, requires more processing power than is found in Layer 2 devices. The Layer 3 devices must be capable of classifying and prioritizing traffic at wire speed, so as not to introduce intolerable latency levels for real-time traffic.

What is needed are distributed Layer 3/4 hardware-based switches, where packet forwarding and prioritization

decisions are made on individual I/O modules (see the sidebar, "Layer 3/4 Switches Suitable for Converged Voice/Data LANs"). Software-based routers and early Layer 3 switches where these functions are performed centrally are not adequate for supporting IP telephony in heavily trafficked networks.

Besides the hardware requirements, the switches must support the ability to map the Layer 2 priority settings (via 802.1p) to the Layer 3 priority settings (via Diffserv or type of service). Also, the Layer 3/4 switches should support buffer management techniques (weighted fair queuing and strict priority queuing are the most common) for prioritizing the voice packets. Gartner estimates that 85 percent of today's large-enterprise LANs will require hardware or software upgrades before they are ready to support IP telephony.

### Reliability and Availability

Reliability and availability criteria are also more difficult to address in larger networks than in smaller Layer-2-only LANs. In a small network, where the IP PBX and the workgroup switches are located in a single wiring closet, one uninterruptible power supply (UPS) can provide sufficient backup and redundancy for those devices. However, to address those issues in larger, distributed LANs, enterprises should consider UPS systems (or

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## Layer 3/4 Switches Suitable for Converged Voice/Data LANs

- Avaya Cajun P882
- Cisco Catalyst 6509 (with Policy Feature Card and distributed Cisco Express Forwarding modules)
- Enterasys Networks ER16
- Extreme Networks Blackdiamond
- Foundry Networks BigIron
- Nortel Networks Passport 8600
- Xylan OmniCore 5000

direct current power) for each wiring closet (buildingwide UPS systems are also an option). In networks with Layer 3 devices, enterprises should aim to maximize redundancy by deploying solutions such as Virtual Router Redundancy Protocol and quickly converging routing protocols — such as OSPF (Open Shortest Path First).

### Powering Telephone Handsets

Most IP telephones can be powered via one of two options — by power supplied via an alternating current adapter or in-line via the Ethernet cable. The IEEE is working on a standard for power over Ethernet cables (802.3af) that will allow Ethernet switch manufacturers to power IP phones from other vendors.

Cisco Systems is currently the only equipment vendor that offers an in-line power option integrated with its switches (via a module on the Catalyst 6509 and a version of the Catalyst 3500), but its pre-standard implementation locks users into Cisco IP phones. The other IP phone manufacturers offer in-line power solutions that are external to the Ethernet switches.

Deploying in-line power in conjunction with Ethernet switches that have redundant power (either via UPS systems or other solutions) ensures that a phone system will work in the event of a power outage. That is the main factor that will drive large enterprises to deploy in-line power. However, SMBs commonly power their IP phones via alternating current adapters, leaving them vulnerable to power outages.

### Single Cable to the Desktop

To save on Ethernet switch ports, a single cable should be used to transport voice and data traffic to desktops. The IP phone should be plugged into the Ethernet switch, and the PC should be connected to an Ethernet port on the phone.

### Does IP Telephony Add a Lot of Bandwidth to LANs?

IP telephony does not add a lot of LAN bandwidth. IP telephony conversations consume approxi-

mately 80 Kbps of bandwidth (64 Kbps for the voice and approximately 16 Kbps for control information and other overhead associated with packetizing the traffic).

### Bottom Line

- Before deploying IP telephony, enterprises should ensure that their Layer 2 switches support 802.1p and that their Layer 3/4 switches are capable of supporting wire-speed packet classification and prioritization.
- Enterprises should limit their initial deployments of IP telephony to Layer-2-only networks (where QOS and redundancy requirements are simpler) and then, if appropriate, expand their implementations to include Layer 3 components.

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*For related articles published in Point-to-Point, see:*

- *Cross Talk*, "Cisco Takes Its First Step Toward Office-in-a-Box," 23 February 2001
- "CIO Update: Networking 2001 and Beyond — Advantage Small and Midsize Businesses," 26 January 2001

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## CIO Update: Why a Small Business Bet on IP Telephony (continued from page 1)

### Background

In November 1999, Oswald & Yap (O&Y), a high-tech, California-based law firm, deployed an IP telephony system for its 12 attorneys and 13 support personnel. Voice communications is paramount for all businesses, but particularly so for law firms that structure their revenue models on billable time. Therefore, O&Y's implementation of IP telephony is a significant endorsement for that emerging technology.

### The Problem

O&Y was planning its move to new offices and was faced with a PBX decision. Its seven-year old Nortel Networks solution was at the end of its lease and could be purchased for approximately \$4,000. However, O&Y saw value in the ease of scalability and the new capabilities inherent in IP telephony and ultimately purchased 3Com's NBX 100 Communications System (for approximately \$36,000, which included the cost for the LAN infrastructure).

### The Objective

Anticipating rapid growth, O&Y needed a system that would scale easily and inexpensively. It was also seeking a reliable communications solution that would eliminate the expense of installing a separate cabling infrastructure for its telephones. Additionally, the firm wanted a system that would position it to take advantage of advanced functions, such as unified messaging and CTI.

### The Approach Taken

As a midsize law firm with no in-house technical talent, O&Y relied heavily on a network integrator to deliver its voice and data solutions. It selected an integrator that was using the NBX for its own internal voice communications. The integrator built a Layer-2-only LAN infrastructure for O&Y that is based on 3Com's SuperStack II workgroup switches. Initially, the integrator connected two NBX call control chassis and 38 NBX phones to the network.

Before selecting 3Com's NBX, however, O&Y considered alternative solutions.

- Cisco proposed its Call Manager system, but could not ship products in time to meet O&Y's implementation schedule.
- O&Y considered an NT-based solution, but because of reliability concerns, it decided against running its phone system on a PC platform.
- As a means for qualifying the expertise of its potential network integrator partners, O&Y considered only integrators that were already running IP telephony systems in their own businesses.

At most of O&Y's desktops, voice and data run over a single cable, with an NBX phone connected to the SuperStack switch port and a PC

connected to the phone. That approach enables O&Y to implement a basic CTI application, so that when a client calls in, an attorney's contact management software pops up a screen that recounts his or her most recent conversation with that client. Some O&Y attorneys that prefer not to use the CTI application are using separate cables for the phone and the PC. However, should availability of switch ports become an issue in the future, all desktops will integrate PCs and phones via a single cable, regardless of whether they choose to use the CTI application. The integrator configured the workgroup switches for 802.1p support to ensure that real-time voice traffic was prioritized over bursty data traffic.

O&Y is benefiting from the NBX's unified messaging capabilities, which enable voicemail messages to be converted to .wav files and stored in folders or forwarded as attachments via e-mail. Therefore, O&Y employees can now access voicemail and e-mail via the Microsoft Outlook messaging software.

Because 3Com's in-line power solution was unavailable at the time of O&Y's initial deployment, power was supplied to the IP phones via alternating current wall outlets. O&Y has been satisfied with that solution and finds it to be more cost-effective than the in-line power option from 3Com (at an additional \$70 per port.)

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## The Results Achieved

The migration to the NBX went smoothly. Because O&Y was moving to a new facility, its integrator was able to install, configure and thoroughly test the system in the new building without interfering with O&Y's day-to-day operations. O&Y did a flash cut to the NBX — it did not run its Nortel system in parallel with the NBX or have it available as a backup.

O&Y's NBX now supports 65 IP phones, and the growth has been achieved without any additional investment in the NBX system. That is in contrast to the Nortel system, which would have required an additional \$20,000 hardware upgrade for it to support O&Y's growth objectives.

Operational ease of use is another benefit of O&Y's IP telephony system. Employees are able to make their own moves, adds and changes (MACs) in minutes simply by unplugging their IP phones from their Ethernet ports and plugging them into others. Features on the IP phones are also configurable via Web browsers, so that employees can customize the features that they use most often. Gone are the days of scheduling and paying a PBX or key system technician to perform MACs.

One attorney at O&Y is testing the NBX's capability to support IP phones remotely. That teleworker is using an NBX phone connected to a digital subscriber line modem in his home office. The phone operates just as if it were connected directly to the Ethernet network at O&Y, using four-digit dialing and delivering features such as voice conferencing and voicemail.

## Critical Success Factors and Lessons Learned

O&Y experienced a system outage as a result of a power spike. Originally, the NBX was connected to a low-grade uninterruptible power supply (UPS) that did not provide sufficient protection. After replacing components that were damaged, O&Y installed a higher-quality UPS system, which has prevented further problems.

O&Y found that it took its integrator three to four months to implement new features on the NBX. However, O&Y attributes that time to the firm being an early adopter of the product, and because the integrator first needed to attend 3Com training before it could upgrade O&Y's system.

## Bottom Line

- Small businesses in need of a voice system should strongly consider an IP-based PBX.

- IP-based PBX solutions enable small businesses to implement functions such as unified messaging and CTI, capabilities that can be prohibitively expensive for them to implement with traditional PBXs and key systems.
- However, at this early stage in IP telephony, very few network integrators have experience in building LANs that can support voice and data traffic.
- Therefore, businesses that seek to deploy IP PBX must ensure that they partner with a network integrator that has voice and data expertise.

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*For related articles published in Point-to-Point, see:*

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# CIO Alert: Will Your Network Survive the Impact of Peer-to-Peer File Sharing?

Many CIOs and networking executives are beginning to worry about the impact on their networks due to peer-to-peer (P2P) file sharing. And their concerns are justified, for P2P can put an additional burden on Internet access services. P2P will generally result in lower service levels and higher prices for Internet access. Gartner strongly recommends that enterprises should avoid uncontrolled growth of P2P traffic.

P2P is a style of networking in which a group of computers communicate directly with each other rather than depending on interactions managed via central servers and networks. A new generation of enormously scalable P2P applications has emerged to satisfy a variety of spontaneous communications, including:

- Short real-time messages (for example, AOL Instant Messenger and Short Message Service messages on cell phones)
- Collaborative computing
- File sharing, pioneered by music enthusiasts such as Napster's Shawn Fanning, that enable and encourage users to share unlimited content via point-to-point file transfers

All P2P applications generate network traffic patterns that may be hard to predict and manage from a network administrator's point of view. Short, spontaneous messages from AOL Instant Messenger users

have trivial impact, because network designs are optimized for short, "bursty" traffic. However, Internet-based, file-sharing P2P applications such as Napster and others encourage frequent sharing of very large files and are a threat to planned Internet access (see the sidebar, "Some Peer-to-Peer Internet File Sharing Applications").

Internet service providers (ISPs) did not count on P2P file-sharing applications when designing their access capacity for 2000 to 2005, nor did enterprises allocate enough Internet bandwidth to support a flood of large file transfers. ISPs assumed that the typical user would log in for just a few hours per week, to perform basic e-mail and Web surfing. This has proved to not be the case. The first generation of P2P file-sharing applications is already so demanding of bandwidth that all ISPs and local-exchange carriers will be challenged. Broadband makes the situation worse by raising user expectations and their appetite for bandwidth. By 2002, more than half of global Internet users will regularly sign on to at least two P2P Internet applications (0.7 probability).

## Throughput Demands

P2P users with high-speed broadband connections can easily download more than a gigabyte of music files per day in the background while performing other tasks, even on the same PC. Although legal developments will change what users can access, downloading will continue and expand. Users who were

waiting for a legal resolution and commercial offerings will come online, and more types of content will be shared through new opportunities, such as hybrid multimedia chat rooms.

A typical one- to five-minute musical piece will vary from 1 MB to 8 MB, depending on quality. Entire albums can be reasonably encoded in single files ranging from 30 MB to 50 MB. New audio formats such as WMA (Windows Media Audio) can provide better compression than MP3; however, the large "installed base" of MP3 files will not be swiftly converted to new formats. Users need time to learn to optimally configure new formats for real savings, and also need more powerful workstations, because format conversion is a slow process that consumes large amounts of disk space.

## Advice to Enterprises

P2P applications enable individual users to act as a chat server, file server, post office and relay station. Security is on the honor system, and by design, these tools operate in the background unattended. If users are allowed to initiate P2P applications through the firewall, the application becomes, in effect, an open hole in the firewall, and its usage is at the whim of users on either side of the firewall. Enterprises should regard P2P applications as requiring management from four perspectives: user code of conduct, enterprise liability, network demand and security risk.

- Code of conduct: P2P applications demand more time and resources

from users, networks and workstations than do simpler, interactive Web browser transactions.

*Action Item: Use of P2P applications on company networks and during working hours will cause substantial resource competition for legitimate business functions; therefore, employees should be warned not to use unauthorized P2P applications as a condition of employment.*

- Enterprise liability: Internet-based P2P applications will evolve toward commerce platforms, but will start as informal sharing mechanisms. Using Napster as an example, individuals engaged in activities may be interpreted as receiving and dispensing stolen or restricted goods and material. P2P applications create long user sessions with adequate opportunities to trace users back to a point of origin. In our litigious society, enterprises have “deep pockets” of money, and therefore could be held financially accountable for the sharing activities of their employees if there is not a company policy in place to limit or prevent use of potentially libelous P2P applications.

*Action Item: Employment agreements must require employees to take accountability for personal, illegal use of Internet access, including P2P applications.*

- Network demand: The loose, random mesh of connections that P2P users create logically must be

carried on the enterprise network, which physically is a star topology concentrating the load at internal gateways and, ultimately, at the enterprise’s Internet connection. P2P through virtual private network (VPNs) will be a particular problem. For example, enterprises may find that their remote user VPN connections are overutilized and will pay for additional VPN resources, when in reality the traffic demand is coming from noncompany P2P applications that are being tunneled. Allowing users to make split tunnel connections can offload P2P demands on enterprise VPNs, but exposes remote users to the Internet.

*Action Item: Enterprises that choose to allow P2P applications must monitor bandwidth competi-*

*tion that could degrade core business activities.*

- Security exposure risk: P2P applications allow users to schedule tasks and transfers to and from other PCs on a voluntary basis. Even if a P2P application contains robust security features, it can become a new vector for malicious code, such as remote command execution, remote file system exploration or file-borne viruses. For example, the original Napster is simple and not extensible, but more-aggressive P2P applications, implemented as browser plug-ins running ActiveX and other vulnerable runtime environments, will bring back old security problems in new packages. Examples are Furi, a Gnutella client implemented in

## Some Peer-to-Peer Internet File Sharing Applications

Gnutella variants (original system was cloned and hacked)

- Linux: Gnut, Gtk-Gnutella, Hagelslag, UMX
- Macintosh: Mactella
- Windows: Aimster, Bodetella, Furi, Gnewtella, Gnotella, Gnumm, MyTella, N-Tella, Toadnode, UMX

Napster variants (original system was cloned and hacked)

- Linux: Gtk-Napster, iNapster, JNap, JNapster, Knapster
- Macintosh: Napster, MacStar, Macster, Rapster
- OS/2: Napster/2
- Unix: Gnapster, Gnome-Napster, Snap, TekNap
- Windows: Napster (original), audioGnome, FileNavigator, Gnumm, Hackster, JNap, JNapster, NapAmp, Napigator

Other

- Fileswap (like Napster)
- Freenet (like Gnutella, and predates Gnutella)
- Scour Exchange (video swapping)
- Swapoo (game swapping)

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## CIO Alert: Will Your Network Survive the Impact of Peer-to-Peer File Sharing? (continued)

Java; JNapster, a Napster client implemented in Java; and Hackster, a Napster client written entirely in VisualBasic.

*Action Item: P2P applications should be treated as intruders, and given the same level of scrutiny as the back-door hacking programs QAZ and Back Orifice.*

### Tactical Guidelines

Enterprises should follow a four-point plan to control the effects of P2P Internet applications:

- Establish a code of conduct

- Assess the enterprise liability caused by storage and trading of uncontrolled information on company systems
- Estimate the network traffic impact of P2P competing for bandwidth with business applications
- Develop a security and risk management plan for intrusions carried by P2P applications

### Bottom Line

- P2P applications create global, random meshed relationships between users and servers that

challenge the traditional view that network activity can be predicted, routed, shaped and managed.

- The popular view that Internet users create bursty traffic through sporadic links on Web pages or, at worst, download streaming files from predictable, cached, managed server sites, no longer applies.
- Networking vendors and enterprises must take action to avoid uncontrolled growth of P2P traffic.

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## Management Update: The Impact of P2P File Sharing on Service Providers

Many CIOs and networking executives are getting worried about the impact on their networks due to peer-to-peer (P2P) file sharing. And their concerns are justified, for P2P can put an additional burden on Internet access services. Internet and cable service providers must be prepared for the throughput impact of P2P computing.

### Random P2P Presents a Load of Challenges

Service providers expect Internet users to engage in “bursty,” asymmetric traffic and streams from audio and video sources on major sites designed and cached for broadcast delivery. Random P2P file sharing invalidates this planning and is

guaranteed to exacerbate bottlenecks throughout the Internet — particularly at the network’s edge, where users compete for access to local broadband nodes.

P2P models with a Napster-like directory service might be adapted to provide some predictive load information to Internet service providers (ISPs). However, the pure peer model of Gnutella and other serverless systems do not provide any direct means of audit unless the traffic can be identified down to a uniqueness of the protocols and sites being used. Network-based detection methods have their own challenges, as network protocols can be modified and network IDs can be spoofed.

### Napster and Gnutella Case Studies: Traffic Jams in the Making

Napster demonstrates that a simple application can dramatically change and expand public information sharing, and in the process, radically alter Internet traffic patterns. This simple program has six remarkable qualities that, when taken together, create one of the largest bandwidth monsters the Internet has seen to date:

- Runs efficiently on Windows 95 through 2000 with only moderate resource demand, unlike most commercial programs
- Is relatively stable and unlikely to crash

- Will work over any type of connection
- Its intuitive features and directory-based search facility make the program very easy to use without training
- No time limits
- The program works well in an unattended mode, meaning that users are not limited to actions they would perform while sitting in front of the screen.

Online delivery of music “sets” consisting of collections of programming ranging from a few minutes to more than an hour is already possible and feasible using state-of-the-art consumer-grade PCs and contemporary broadband Internet access. Even dial-up modem and Integrated Services Digital Network users are slowly and steadily building large shared libraries. Napster users register to a server when they come online. The Napster server offloads and accelerates title searches, and provides a basic census of online users. The entire user community can be searched for artists or titles in less than 30 seconds (which encourages more downloads).

Queuing multiple file transfers is a matter of pointing and clicking. Unofficial estimates put Napster membership at more than 20 million users. Gartner’s periodic audit (32 samples over a period of three weeks) indicated up to 12,306 worldwide peer servers or members were online

at any given time in a 24-hour period, advertising up to 8.25 terabytes of total storage containing more than 2 million shared MP3 files (see Figure 1). It should be noted that court rulings against Napster in February 2001 did not reduce the number of active users and files.

The Gnutella model differs from Napster in that no centralized directory services are involved. Millions of users have accessed Gnutella download sites, but there is no method to determine an active user count. Gnutella users find each other by discovery. When users start the program, they must know or find the address of at least one active peer. Once the user connects to one other peer, that second peer then advertises the connection to other peers. By default, a message should only be forwarded seven times, but in a large community (more than 2,000 peers and millions of shared files), the process still creates an enormous cascade of “hellos” and replies throughout the online community. Users can change the forward limit and conceivably could

generate trillions of pings per announcement. Although the Gnutella model is less efficient, it is also harder to control, and legal attacks against Napster are encouraging file-sharing users to move to Gnutella-style systems.

### Advice to Service Providers

#### Content Issues

ISPs cannot be expected to control everything that is being shared through P2P systems, but they still might be held liable for illegal content. In Napster’s case, court action did not take place against users, their companies or network carriers because the sheer number of violations was too large, the laws were vague and deals were struck before a full court battle was waged. In Gnutella’s case, it is currently impossible to gain an assessment of how many and what types of files are being shared. In any case, it is likely that future P2P applications may play in areas where the laws are more explicit, such as pornography.

**Figure 1  
Napster Online Statistics**

	Shared MP3 files (qty)	Shared drive space (GB)	Online users (qty)
Minimum	1,146,029	4,825	6,870
Average	1,633,585	6,838	9,842
Maximum	2,007,913	8,251	12,306

Numbers reflect activity during a 24-hour period  
Gathered 1 November through 21 November 2000

Source: Gartner Research

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## Management Update: The Impact of P2P File Sharing on Service Providers (continued)

*Action Item: ISPs must expand their proper usage policies to include definitions of P2P and the limits of ISP liability, and must be prepared to block P2P usage.*

### Backbone Issues

The Internet backbone's most performance-sensitive spots are its peering points between ISPs. "Traditional" Internet traffic designs assume that users make transactions not with each other, but with servers that can be mirrored, cached and otherwise optimized for predictable traffic flows across service provider boundaries. Increasing use of P2P applications will undermine backbone performance by causing unmanageable congestion at peering points.

*Action Item: ISPs must increase peering point capacity or offload P2P traffic onto peering points set aside for P2P usage.*

### Challenges for DSL Providers

P2P file sharing stresses the usability of asymmetric digital subscriber line connections because uploads can fully consume the limited bandwidth, particularly on those requested from other users. Furthermore, users on inexpensive digital subscriber line (DSL) — implemented as oversubscribed digital subscriber line access multiplexer (DSLAM) ports (up to 20 users per port) — face the risk of severe service degradation caused by P2P activity of users sharing the ports.

*Action Item 1: DSL providers need to upgrade DSLAM equipment to reduce port oversubscription and rethink consumer classes of service and pricing. Consumers and business users need to be given the choice to obtain undersubscribed ports (maximum ratio of two users per port) at a fair price.*

Although P2P presents a new challenge, it is also an increased opportunity to sell access.

*Action Item 2: DSL incumbent local-exchange carriers and competitive local-exchange carriers should view the appeal of P2P applications as good reason to stop competing with each other and to cooperate on installations and quality of service. P2P users signing up for cable service are lost customers and will not be returning to DSL.*

### Challenges for Cable Providers

P2P file-sharing applications can cause dramatic congestion in regional and local network nodes that are designed to share bursty traffic, not high-speed sustained file transfers. For example, Napster users will selectively target cable peers because the average uplink speeds are faster, but cable providers are assuming that users will generate most of their traffic as downloads and tune their networks with moderate uplinks in mind.

*Action Item 1: Cable operators must accelerate investments in "neighborhood nodes" to reduce the number of users per shared segment.*

Cable providers setting throughput limits on users at some number of gigabytes per month need to rethink their classes of service, as a P2P user can exceed gigabyte monthly limits in a matter of a few days. In addition, cable providers offering unspecified and unmanaged high bandwidth access are at risk of new quality-of-service complaints.

*Action Item 2: Cable operators should review their classes of service and consider offering stepped throughput for light, medium and heavy consumer usage.*

### Bottom Line

- P2P applications create global, random meshed relationships between users and servers that challenge the traditional view that network activity can be predicted, routed, shaped and managed.
- The popular view that Internet users create bursty traffic through sporadic links on Web pages or, at worst, download streaming files from predictable, cached, managed server sites, no longer applies.
- Networking vendors and enterprises must take action to avoid uncontrolled growth of P2P traffic.

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## Cross Talk

**Too Much Ballast Is Weighing Down PSINet.** On 2 April 2001, PSINet said it would miss the filing deadline for its 2000 10-K report to the U.S. Securities and Exchange Commission. On 3 April the company said it would likely seek bankruptcy protection because of a cash shortage; trading on its stock was halted at \$0.19, down from a high of \$60.93 in March 2000.

In 1999, PSINet began calling itself an “Internet Super Carrier” after it acquired more than 50 companies since 1998. PSINet’s aim was to build a global network, get into point-of-sales services, enhance its e-commerce activities, launch itself as an application service provider and build a professional service business. Along the way, PSINet could claim many market firsts: it was the first to offer 100 percent Web hosting guarantees, the first Internet service provider (ISP) to offer multicurrency e-commerce services and the first independent ISP to have a global network. It sounded like a good strategy, but it has not worked. Instead of creating an Internet Super Carrier, PSINet has created an overburdened aircraft carrier that has taken a long time to change course. PSINet offered good network quality and highly competitive pricing, but its rapid growth may have gotten in the way of effective sales and ongoing service support. Many of PSINet’s lost customers reported they chose other providers because of slow or nonexistent responses from PSINet. Existing customers also reported slow responses to change and upgrade requests as well. PSINet has already begun selling off business units; it announced on 4 April 2001 it had sold its transactions unit to an investor group led by GTCR Golder Rauner for just under \$300 million and its stake in Decan Groupe to Getronics International for about \$34 million. More sales will likely occur, yet PSINet has said these sales will likely not keep it from having to file for bankruptcy. When that happens, predicting what the company will look like if and when it emerges from bankruptcy is all but impossible.

In Gartner’s opinion, using PSINet for any of its Internet access or hosting services as it teeters on the brink of bankruptcy is a bad idea because many other providers give equal or better value. Gartner therefore recommends that enterprises not enter into any new agreements with PSINet until it has shown it can either avoid bankruptcy, or make clear its strategy to exit bankruptcy. Gartner further recommends that enterprises with PSINet relationships begin looking at alternatives if they have not already done so.

Analytical source: Eric Paulak, Enterprise Network Strategies

**NTT DoCoMo’s i-mode Faces Major Hurdles in the United States.** Japanese wireless carrier NTT DoCoMo announced that it would begin to offer an i-mode-like mobile Internet service in the United States in 2001 through its strategic partner, AT&T Wireless. DoCoMo’s i-mode service has more than 20 million subscribers in Japan, and enables mobile phone users to exchange e-mail, check stock prices and share entertainment and information.

NTT DoCoMo, which dominates the wireless Internet in Japan with i-mode and is a leader in deploying third-generation wireless technology, has expanded its global sphere of influence via direct investment in operators in Hong Kong, Italy and the Netherlands. In acquiring a 16-percent stake in AT&T Wireless in late 2000 and subsequently licensing its i-mode technology platform to AT&T, NTT hopes to gain a toehold in the U.S. market, where a comparatively low wireless penetration rate makes it a desirable

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## Cross Talk (continued)

market for international carriers. However, things have gone slowly for NTT outside of Japan. In Hong Kong, for example, the local i-mode variant deployed by NTT has rolled out slowly.

To succeed with an i-mode-like mobile Internet service in the United States as much as NTT DoCoMo has in Japan, AT&T must overcome several challenges, including:

- Developing compelling, regionally targeted applications that are mobile-focused, rather than wireless versions of wired content
- Providing tangible revenue opportunities for application developers who might support AT&T's variant of i-mode
- Ensuring that dual-mode WML/XHTML browser-enabled devices are available at prices close to AT&T's voice-centric handsets
- Recognizing that users' expectations for acceptable Internet service (based on wired Internet use) is firmly established in the United States at a level well above that of Japan

NTT DoCoMo faces other challenges in duplicating its success in the United States. In Japan, NTT had first-mover advantage, but in the United States and Europe, it will not. Most of all, NTT must retarget and transform its offering from a consumer focus to a business focus to meet the U.S. market requirement — or hope that the U.S. consumer market changes drastically. In Japan, consumers use i-mode for news, guides, games, dating services and messages, including paging services. U.S. consumers still predominantly access the Web from more traditional computing devices (e.g., PCs). The U.S. business-to-business (B2B) market, however, creates demand for accessing enterprise applications via wireless Web services — e.g., supply chain and inventory management. NTT and AT&T would do well to include B2B in their North American i-mode strategy.

Analytical sources: Bob Hayward, Geoff Johnson, Phillip Redman and Bryan Prohm, Enterprise Network Strategies Pacific

**AT&T and British Telecom Must Change Themselves, Not Their Stock Prices.** Recently, AT&T and British Telecommunications (BT) reportedly restarted talks about a possible merger of some of their assets, such as their enterprise businesses.

AT&T and BT will likely continue to explore a possible merger, if only to address the financial troubles plaguing both companies. Senior managers face extreme pressure to improve the firms' share prices and performance and to reduce their debt. Gartner believes that a major management shuffle, possibly including the CEO, will soon occur at BT. However, moves designed to boost the stock price will likely not address fundamental problems of strategy and organization that need solving for long-term success. AT&T and BT's joint venture, Concert, offers a prime example. Concert has not achieved the success it should have. In Gartner's opinion, a large part of this failure stems from turf wars between AT&T and BT over who owns which geographic territories, who owns which accounts and who contributes what to the joint venture. AT&T and BT increasingly each strike out on their own — AT&T in Latin America, BT with its Farland network in Europe. Thus, AT&T Global Network Services, BT and Concert often end up competing with one another for potential customers. Like most international telecommunications alliances, Concert has not worked as well as planned, in spite of AT&T and BT being unusually compatible partners. Given these problems, moves such as merging the business units of AT&T and BT would likely solve little, except in the short term. A merger could potentially improve the share price temporarily

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through the merged unit having its own stock (unfettered by the slower growing consumer long-distance business) and through cost reductions, such as layoffs. However, the long-term health of AT&T and BT does not depend on placating Wall Street so much as resolving the fundamental problems — strategic, cultural and organizational.

Gartner believes that during 2001, a major change in Concert's structure will occur. Enterprises should consider Concert as a tactical choice for international services until its strategic direction becomes clear. Enterprises should sign short-term contracts and include strong service-level agreements.

Analytical source: David Neil, Enterprise Network Strategies

**AT&T Plans to Build Its DSL Market Position With Purchase of NorthPoint Assets.** On 22 March 2001, NorthPoint Communications announced an agreement to sell its assets to AT&T for \$135 million. The U.S. Bankruptcy Court approved the sale as a way to pay NorthPoint's creditors. Federal regulators must also approve the deal, which is expected to close by late May 2001. NorthPoint said it will lay off employees and transition customers to other digital subscriber line (DSL) providers.

AT&T agreed to buy NorthPoint's assets, not its ongoing operations. NorthPoint will not provide DSL service after the deal closes in May 2001 — or earlier if it cannot continue to fund operations. NorthPoint customers will need to transition to another DSL provider as soon as possible. Although that provider could be AT&T, enterprises would have to transition to AT&T's current DSL service as they would to any other provider.

In the long term, this move will benefit AT&T. To start with, the price it will pay for acquiring the assets of a company engaged in building out a nationwide network is very good — perhaps one-half or one-third of their real value. More importantly, the assets will help AT&T move more quickly to become a DSL provider rather than primarily a reseller (it now resells Covad Communications' and Rhythms NetConnections' services). To be sure, AT&T will still have partnerships and sell through other channels, but it will likely choose for its primary business model that of an end-to-end provider.

Gartner believes this end-to-end model will generally replace the wholesaler model, in which the DSL provider paid its competitor, the local-exchange carrier, for access to the local loop and shared profits with the reseller. Other interexchange carriers, such as WorldCom and Sprint, will likely move toward direct sales as well. Finally, this trend could affect the reseller arrangements that large carriers have with independent DSL providers. For example, WorldCom resells service from Rhythms, and SBC Communications resells Covad's service.

The NorthPoint assets will become part of the AT&T Network Services unit, and AT&T will likely use the assets to develop enterprise-quality services for teleworkers and for small and branch offices as well as a consumer service. This deal would appear to give AT&T a complete range of options for broadband Internet access, including DSL, cable modem service and fixed wireless. However, the cable modem service belongs to AT&T Broadband, and when AT&T Broadband is spun off by 2002, the two units may end up competing against each other in the broadband access market.

Analytical source: Jay Pultz, Enterprise Network Strategies

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## Cross Talk (continued)

**Novell to Acquire Cambridge: The Next IBM or the Next Banyan?** On 12 March 2001, Novell announced a definitive agreement to acquire Cambridge Technology Partners for stock worth about \$266 million at the time of the announcement. Novell expects to close the deal in fiscal 3Q01, although regulators and Cambridge's shareholders must approve it first. In addition, Cambridge President and CEO Jack Messman, a Novell board member, will become Novell's CEO, replacing Eric Schmidt, who will continue as Novell's chairman and chief strategist.

Cambridge, a worldwide e-business consulting firm, and Novell, largely a software company, plan to merge because of the following circumstances:

- NetWare still contributes about half of Novell's \$1 billion in annual revenue.
- However, NetWare is losing market share, and nothing will likely reverse this trend.
- Novell's service, support and consulting organization is growing significantly and comes second to NetWare in overall revenue.
- Most of Novell's products to replace NetWare's revenue streams (e.g., DirXML and iChain) require consulting services to install.
- Externally focused deployments driven by e-business requirements represent Novell's greatest new opportunity outside its installed base.
- The market for worldwide system integration and implementation is growing at an annual rate of 22 percent.

With this acquisition, Novell's service revenue will become the single largest source of revenue for Novell in fiscal 2002 (0.9 probability). By 2005, this acquisition will produce one of the following results:

- Like IBM, Novell maintains its software product business, but services become its single largest source of revenue. Through 2005, Novell will follow the IBM model and continue to offer products and services as a single company (0.7 probability).
- Like Banyan, Novell ultimately exits the product business and converts itself into a pure consultancy. Here, Novell would spin off its products into separate independent businesses much as Novell has done with Volera (0.3 probability).

Gartner has the following concerns about this acquisition:

- The deal could accelerate the departure of Cambridge consultants — something a tough economy will help to mitigate.
- Cambridge's reputation has been badly tarnished since 1999, and the practice has become tactically focused.
- The Novell brand does not have clout in the e-business space.
- Cambridge does not maintain a practice in Novell's products.
- Like IBM, Novell must show it has a credible, integrated service organization and that Cambridge is not merely bolted on.
- Novell must keep Cambridge technology-neutral, and enterprises must be convinced that Novell's services are too.
- Novell will now directly compete with its consulting partners (e.g., Cap Gemini Ernst & Young).
- Novell must change its management mind set from product-oriented to service-oriented.
- Novell's significant investment in March First, another service vendor, has fared poorly.

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- To keep customers from becoming nervous, Novell must articulate a vision of where it is going, how this acquisition helps that vision and that it is fully committed to the future of its products.

Even following the IBM model, Gartner believes the transition will be difficult. Further layoffs will occur within six months of the completion of the acquisition (0.8 probability). Furthermore, Gartner expects several quarters of poor financial performance as Novell absorbs the acquisition and repositions.

Enterprises using Novell's products should not consider this acquisition as a reason to change purchasing decisions. Gartner reiterates that investments in Novell's core file, print, directory, and director-enabled desktop and access management services are viable through at least 2005 (0.7 probability). Enterprises using Cambridge's services should ensure that the consulting resources promised in contracts come with specific names and resumes as, during transitions, some turnover will occur.

Analytical sources: Neil MacDonald, Michael Maoz and Frances Karamouzis, Local Area Networking

**Guardent Discovery Expands Internet Security Weaknesses.** On 12 March 2001, Guardent, which provides security, privacy and data-protection solutions, announced that weaknesses remain in certain implementations of TCP (Transmission Control Protocol) that could allow malicious users to close down or hijack other users' Internet sessions.

The recent discovery by Guardent once again highlights weaknesses in the Internet's basic protocols that have been exposed repeatedly for more than a decade. Kevin Mitnick exploited some of these flaws — first detailed by Steve Bellovin of AT&T Labs in 1989 — in a famous series of attacks in 1995. In the past five years, a constant stream of vulnerabilities in other key elements of the Internet, such as the Domain Naming System and sendmail, have been identified and exploited. In 2000, widely publicized denial-of-service attacks exploited the Internet infrastructure's willingness to accept and forward clearly fraudulent packets of information. This latest discovery simply reminds us again that lowest-common-denominator solutions seldom lend themselves to high security. Security mechanisms to protect against exploitation of the Internet's basic protocols are widely available and steadily improving. Intrusion detection systems can detect, and alarm on, spoofing and hijacking attacks. Security protocols such as IPSec (IP Security) provide strong authentication and payload encryption. Application-level confidentiality and integrity protection represent the most important investment areas for enterprises that wish to eliminate dependence on uncertain network mechanisms — which become even more uncertain with the transition to wireless mobile commerce.

Enterprises should require the use of channel encryption via Secure Sockets Layer or TCP/IP and the use of digital signatures for all business-sensitive transactions moving over the Internet. Enterprises should use network-based intrusion detection whenever they allow inbound connections from untrusted networks. Closing the vulnerabilities Guardent has discovered will require patches for many network applications — some already available, others to become available by May 2001. Enterprises should closely monitor vendors' development of these patches and implement them as soon as they are available and tested.

Analytical source: John Pescatore, Information Security Strategies

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