ADSL Application Notes

NetWorld+Interop 98 Las Vegas
May 5 – 7, 1998

ADSL HOT SPOT

ADSL Forum

Note: The ADSL Forum is merely providing the Hot Spot booth facility for ADSL Forum Members to demonstrate certain of their product applications to parties who may have an interest in this. The ADSL Forum does not endorse any ADSL Forum Member products or applications for any use or purpose, or as complying with specifications. The ADSL Forum shall have no liability whatsoever for any representation, warranty, action or statement by any ADSL Forum Member or any other party regarding such products, applications, demonstrations or any aspect thereof, whether based on theories of contract, tort, strict liability or otherwise.

Enabling Real World Applications With ADSL

The need for speed is certainly the first thing that pops into one's mind when the Internet or remote access are the topics of discussion. A product technology debate over the best way to deliver that speed inevitably follows. ADSL vs. cable, vs. ISDN, vs. dialup, vs. satellite: there are more options today then ever before, why ADSL? ADSL is a perfect fit for Internet and remote LAN access as a product technology because of the comprehensive set of features it offers. ADSL technology leverages the best of the modem and networking worlds to bring the user to the network. ADSL has been designed from the ground up as a platform to offer a wide variety of data services. It's not just a bandwidth band-aid for the next year, it's an enabler of applications that will transform the very Internet and enterprise networks themselves. In much the same way that real time access to information across the corporate LAN has changed the business landscape forever, real time access to information remotely over ADSL will change the way we connect to the business and Internet forever as well.

Rate Adaptation And The Copper Infrastructure

With 750 million copper lines installed the world over, copper modem technologies like ADSL start out way ahead of the competing access products like cable modems and satellite which require huge infrastructure investments to reach ubiquity. ADSL bandwidth is inherently flexible. ADSL can adapt to varying line conditions to offer the best performance possible. Not all copper lines are created equal. Here ADSL out shines existing copper technologies like ISDN and dialup by not only offering more bandwidth but also a variety of speeds and ensured quality by adapting to line conditions. ADSL allows service providers to target their services.

Security

ADSL connections to the Internet and corporate networks via the service provider are dedicated. With new real time access to information, real time security is a must. Not only does the ADSL end user have real time access to data, but hackers now have real time access to the user. ADSL comes through again by offering secure point to point connectivity over the copper line just like a dialup modem or T1 connection. These point-to-point connections can then be mapped securely to an ISP or corporate network.

Always On

Real time means "available all the time" to the end user that is tried of waiting to connect and authenticate with ISDN and dialup modems. ADSL connects the user to the network at all times. "Always on" means that services are now just a keystroke away. This means instant access to email and new services like real time news feeds, audio, and more.

Asymmetry

ADSL is the first technology uniquely suited to remote access. ADSL offers far greater bandwidth downstream from the network than to the network. This means that it is designed to perfectly meet the requirement of Internet and remote LAN access where the user is typically downloading more than they are uploading. ADSL not only offers more bandwidth but offers it in the right proportions for the application.

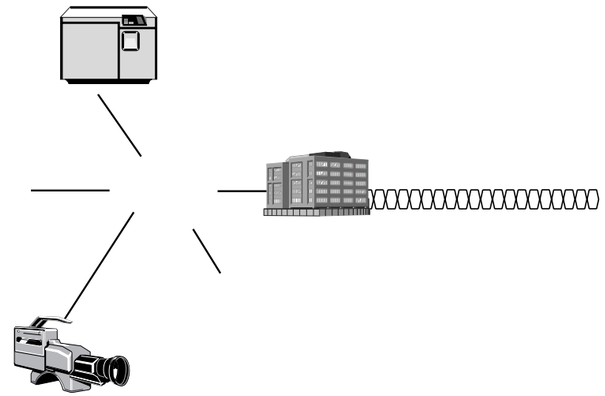
Video on Demand

The Benefits

When is the best time for you to learn? Is it mornings, evenings or weekends? Can you afford to go to the best universities to get the training you need? Video on demand will allow you to attend courses when you are best able to absorb the information. It also can bring the instructor to you instead of the other way around.

Video on demand will tap into the power of the Internet. You will be able to download video clips off the World Wide Web and stream the video real time. This will fundamentally change the ways that companies communicate with their customers. Advertising, sales, customer training and shopping will be dramatically affected by video on demand.

In this fast paced world it has become increasingly difficult for individuals to schedule their time efficiently. It is no longer necessary to schedule your time around some prescheduled programming. Video on demand puts the control in the user's hands. You get the programming at your convenience when you want it. You will be able to make the choices that suit your individual needs. ADSL and video on demand will positively change the ways that you work, educate and entertain yourself.



Video on Demand

The Challenge

Imagine having the ability to access any video program that you are interested in whenever you want to view it. You could watch a new first run movie or view your favorite movie classic. You could take a video-training course from the best instructors in your chosen field of study. You could take a video tour of your dream home or electronically visit a vacation spot to see if it is the right one for you. You can take an electronic drive in the car that captures your interest or go on line and play the latest video game. Imagine that you can do all of that and more over your existing telephone line and still be able to place and receive telephone calls at the same time.

The Solution

Video on demand is no longer just a figment of your imagination. It is real and it will be available to you soon using Asymmetric Digital Subscriber Line (ADSL) technology. ADSL technology turns your ordinary telephone line into a high bandwidth communications channel.The ADSL technology is applied to the copper wire that connects your business or residence to your local telephone service provider. Up to 8Mbps of video data can be sent to your location over ADSL equipment. This can be accomplished simultaneously with independent telephone traffic over the same copper loop.

Filters applied at both ends of the copper loop assure high quality voice traffic. The video information is sent as data at a frequency that is higher than the voice frequency band. By placing this video traffic at the higher frequency you get dual use out of the copper. This is very important, as there is not enough copper deployed to provide separate facilities to all of the potential customers. It is not likely that customers would give up their telephone service to get video on demand. The filters would be placed at the building entrance and at the protector block in the telephone company central office. The ADSL equipment will be provided in the form of a modem or as an expansion card for the customer's PC. It could also be provided as part of a television set top box or a network computer. Video on demand can occur in either or both the PC and TV environment.

By attaching the ADSL equipment to an Asynchronous Transfer Mode (ATM) backbone network, you will be able to access video content form any server in the world that is also attached to the network. The Internet core network is now being converted to an ATM switch fabric. An ATM fabric is ideal from mix voice, video and data traffic.ADSL Digital Subscriber Line Access Multiplexes (DSLAMs) are equipped with highspeed ATM ports, which can connect directly to the core switched network.

The video will be providing in digital format using a Motion Picture Experts Group (MPEG) encoder. An MPEG decoder located in your computer or set top box will convert the content back into a high quality video program. In fact, MPEG video encoding can provide studio quality video.

Telephone companies have conducted numerous ADSL trials globally. These trials have proven that ADSL works well in video-on-demand applications. With highspeed ADSL service it will be possible to view both stored and streaming video. You will be able to tune into CNN from your PC or connect to stored video resident on a specific server.

Enabling Real World Applications With ADSL

Investment Protection

ADSL has a huge leg up on the competition when you consider that the ADSL modem you buy today will give you years of good service with ever increasing bandwidth as the Internet and corporate data pipes get bigger in coming years. ADSL services are rolling out today to give the user high-speed access to the network at rates the backbone can handle but at a fraction of ADSL's total bandwidth potential. This means that the ADSL service can grow with the network as the backbone grows over time.

These are some of the key features that make ADSL the best all around contender for remote access requirements. These features underpin the applications demonstrated in the Hot Spot booth such as: Distance Leaning, high-speed/always-on Internet connectivity,Telecommuting, Video on Demand,Video Conferencing… ADSL meets the challenges of existing and new remote access applications without compromising user security and investment.

The ADSL Advantage

	Dialup	ISDN	ADSL	Cable	Satellite
Rate adaptation	++	+	++	+	+
Security	++	++	++	—	—
Always On	-	-	++	++	++
Investment	—	—	++	++	++
Bandwidth	—	-	+++++	++	++

The "+" marks are varying degrees of suitability, the more "+" the better the technology is at solving the problem or providing the feature stated. ADSL gets the most pluses and fewest minuses.

Education

The Challenge

The Information Superhighway promises to revolutionize educational opportunities for our children. But gaining access to this wealth of knowledge can be slow and costly for schools.

A traditional analog modem is relatively inexpensive, but offer speeds of only about 28.8 Kbps. A T-1 line offers great speeds – 1.544 Mbps – but T-1 lines can be cost prohibitive.

The Solution

Cutting-edge asymmetric digital subscriber line (ADSL) technology offers schools a faster on-ramp to the Information Superhighway – at a cost within reach. With ADSL, students spend less time waiting and more time learning.

ADSL uses existing telephone wires to transmit and receive data digitally at lightning-quick speeds. Typical speeds for downstream data are 2.560 Mbps. Upstream data flows at a rate of 1.088 Mbps. That's nearly 100 times faster than 28.8 analog modems and more than 40 times faster than ISDN. What's more, ADSL is cost-effective. For about $100 per month, schools can have T-1 speeds for a fraction of the cost – all over conventional telephone lines.

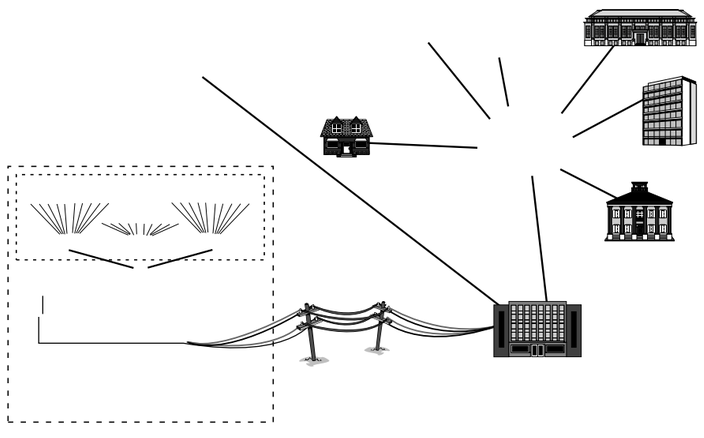
The Benefits

ADSL offers schools a fast and cost-effective on-ramp to the Information Superhighway. Once there, the learning possibilities are endless.

Using ADSL technology, schools can connect to and from:

- the Internet
- other schools, community colleges and universities
- local and national libraries
- homes of teachers and other students
- district offices

Following is a diagram showing how a typical school can be connected in a network using ADSL technology.



Video Conferencing

The Challenge

The need to meet face-to-face in business can now be extended via the availability of mature video conferencing equipment.

Video conferencing can enhance the customer experience, improve operation efficiency, and create significant saving in travel cost and time. Like the telephone, video conferencing helps remove the barriers of physical location. Video conferencing enables face-to-face access in real-time, rather than incurring the time to travel.

Video conferencing provides an additional tool to improve communications with multiple sites within a business, or with other businesses, in applications such as meetings, telecommuting, training, or services, which can all be enhanced through face-to-face communications. Businesses which operate multi-nationally, despite their physical location, can benefit from video conferencing.

Users also demand that solutions be standardized to enable interoperability, be easy to configure, use, and manage within the existing environment, and also meet purchase and operational cost targets. These examples show how video conferencing can help save operation costs, save time, and improve efficiency.

The Solution

The video conferencing needs of businesses is solved by providing LAN-based systems to the users, and a router with an LAN to ADSL connection to the central office over the existing copper loop. The ADSL router allows multiple users in the business to access the Internet at speeds of 6.1M bits/sec, without the requirement of a dedicated leased-line or T1 connection.

In addition, the high throughput provided by an ADSL connection supports video conferencing and several other applications simultaneously such as web browsing, email, or additional video conference calls.

The Benefits

Video conferencing requires access to high speed communications media. ADSL is the optimum media solution for video conferencing due to its ability to make use of the approximately 750 million lines currently available to virtually every location on the planet.

In addition, ADSL has the ability to adapt itself to the connection quality and offer between 1.5M and 6.1M bits/sec downstream from the network, and between 176K and 640K bits/sec upstream. This provides the bandwidth required in order to transfer the video and audio data for a video conference call.

ADSL uses the existing phone lines, which are unique point-to-point connections with users and the network. Therefore security for the conference is not compromised, and service will never degrade due to the sharing of the line with other users.

The fact that both the American National Standards Institute or ANSI and the International Telecommunications Union or ITU are driving the standardization of ADSL ensures that global interoperability will be a reality.

Multi-Service Selection

The Challenge

Traditional dial-up data services have successfully allowed users to access a broad base of content — not only from the Internet, but also Corporate LANs and on-line databases containing data on such things as financial or medical records. The ability to access this information regardless of physical location has proven particularly beneficial to businesses that have extended their presence with branch offices and increased productivity through telecommuting. ADSL technology promises to increase this productivity even more, by delivering data services at speeds up to 300 times faster than traditional 28.8 Kbps modems. Yet as ADSL is adopted, it is important that remote workers retain the ability to freely and dynamically choose from various service providers.

The Solution

Dynamic service selection can be delivered with ADSL by employing 2 basic technologies:

- Layer 2 Tunneling Protocol (L2TP) to deliver data over trunks running from the Network Access Provider (NAP) to Network Service Providers (NSP).
- A web-based modem for end-user interface. Thus the user at anytime can terminate one session and open another connection to a different NSP listed in his menu of services.

Users can freely switch back and forth between an Internet connection and the content database, downloading and uploading information. In an actual home or office environment, POTS service would also be available simultaneously. In addition, if users need to add new services not currently on their menu, they can do so simply by entering information, which tells the digital subscriber line access multiplexer or DSLAM to map a new connection to a new service provider. The DSLAM dynamically routes sessions via L2TP on an individual, as needed basis.

On the customer end, a web-based interface makes this process entirely seamless. Specifically, the ADSL modem, with a web-server capability, provides users with a graphical list of destinations from which to choose using the simple click of the mouse.

Using Network Address Translation (NAT) built into ADSL modems, individual users connected to LANs can independently and simultaneously launch sessions through their Web page without affecting local traffic. This is because the NAT feature translates network IP addresses to an IP address allocated by the NSP during PPP session establishment. The ADSL modem can securely carry multiple PPP sessions, allowing different users on the LAN to access different NSPs simultaneously.

The Benefits

Properly configured in this manner, ADSL solutions can provide enormous speed advantages over traditional dial-up solutions, while at the same time continuing to provide service selection capabilities. This feature is central to the future growth of ADSL, because service selection will broaden the base of content available to end-users and thus drive widespread adoption of ADSL into the marketplace. Specific benefits include the following:

continued

Multi-Service Selection

- Users are given the freedom to choose from a broader base of content, thus driving adoption of ADSL.
- Users on Corporate LANs are given the added capability of accessing multiple applications simultaneously.
- With PVCs assigned on a per NSP basis as opposed to a per-customer basis, PVC management becomes much simpler for NAPs as their customer base expands.
- NAPs don't have to re-assign PVCs, easing network administration and making it more likely to get NSPs and users to sign on.

Multi-Service Selection

Real Estate

The Business Challenge

Real Estate professionals need better access to market and property specifications so they have the latest listing information and can provide this information to their clientele. Agents will then be able to better manage the time spent with clients and match properties to the specific needs of the buyer. Much of this information — due to its large graphic content, would be difficult to access easily and take an extraordinary amount of time to download over conventional modems.

The Solution

The solution is realized through an ADSL system which delivers the high speed downloading capabilities associated with DSL technology. The demo system in the Hot Spot booth has a standard windows PC with an ATM nic (network interface card) connected to the ATU-R. The client can browse the real estate information which is contained in a local web server.

The Benefits

ADSL allows any selling agent to provide much richer, detailed graphical content of listed properties. Meanwhile, the buyer can see each property — from several angles; external views, internal rooms and features — and determine if the property is suitable. This graphically rich environment is extremely bandwidth sensitive and would be next to impossible over today's conventional analog modems.

Why ADSL Met the Need

ADSL is the best technology to address this type of dramatic, time saving solution for agents over the existing copper network infrastructure that provides connectivity for every Real Estate listing office. For the first time,ADSL brings various potential properties right to the client. This allows the client to spend less time exploring more homes and expeditiously locate just the home they are looking for.Truly a win, win proposition.