

Conference Analysis

In-depth reports on leading IT conferences

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[This is the first in a two-part series covering the expansive Networld+Interop 98 show—Ed.]

Introduction

Networld+Interop is billed as the “definitive networking event.” Formerly, Interop and Networld

were two separate conventions. They combined a few years ago.

Networld+Interop is about one-fifth the size of COMDEX Fall. That, alone, is a positive, not a negative. It is aimed specifically at networking professionals. If that is your interest, this is your show. In addition, the number of exhibits is manageable—unlike COMDEX. The exhibit floor can actually be covered in the three days of the show.

In addition to the exhibits, the show included four conferences.

The General Conference contained 40 sessions in seven tracks:

- Network management and operations
- High speed routing and switching
- Intranets and networked applications

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- Media
- IP design and deployment
- Security, case studies, and industry test results

The ISP Forum was aimed at Internet Service Providers and network managers. It addressed such subjects as

- New technologies
- Business issues
- New services for customers
- The future of the industry

CommUnity explored the convergence of technologies in four tracks:

- Data, voice and video applications for the enterprise
- Converged platforms for enterprise networks
- The role of network service providers
- Integrated transport for data, voice, and video

The Engineers Conference focused on:

- The latest developments in final-mile access
- Systems performance
- Network routing and switching
- Various technologies

On the **exhibit floor**, a few of the several themes jumped out at us.

Asynchronous Digital Subscriber Line (ADSL) is a fairly new technology for providing megabit speeds over local loop copper wire. It is now touted as a contender for “last mile” network access from homes and offices. A number of booths had ADSL products. While trials have been running for five years and implementations are just starting. Potential uses include video conferencing, distance learning, audio/video streaming, and telemedicine.

In his keynote speech, John Sidgmore of UUNET predicted that all major telcos (including his) would roll out ADSL this year.

Gigabit Ethernets have arrived for short distances (3-5 kilometers) and metropolitan distances (50 km). They are aimed at bursty traffic (50-150 meg files, such as CAD or video files) around office complexes and within cities.

- Virtual Private Networks (VPN)

VPNs use tunneling to provide secure transmissions (via encrypted messages and authenticated users) over the Internet. They were touted at many booths as the future point-to-point transmission medium for e-commerce, telecommuting, remote project teams, and communities of interest.

The importance of VPNs were mentioned in several sessions reviewed in this issue of CAN.

- Quality of Service (QoS).

The Internet is called a “best effort” communication medium. Delivery cannot be guaranteed. QoS, on the other hand, will guarantee service delivery times or bandwidth for different classes of service. The initial offerings provide classes of service by running IP over ATM, using the ATM classes of service capabilities.

QoS is the topic of one of the sessions reviewed in this issue of CAN (see page 4).

- Voice, fax, and video over IP.

There were many diverse offerings in this arena. Internet telephony servers, for example, are now available to handle interactive voice response, voice messaging, speech recognition, and on and on.

The fact that Rob Glaser of RealNetworks was selected as a keynote speaker (reviewed below) indicates the growing importance of voice over IP.

Keynote 1: Taking the Internet to the Next Level

John Sidgmore, CEO of UUNET Technologies and Vice Chairman and Chief

Operating Officer of WorldCom.

Since Mr. Sidgmore joined UUNET in 1994, annual revenue has grown from \$7 million to nearly a \$1 billion. In 1995 UUNET went public, and in 1996 they merged with MFS Communications in a deal valued at \$2 billion. Later that year, they were acquired by WorldCom for \$14 billion. Now they plan to merge with MCI in a deal valued at over \$40 billion.

Mr. Sidgmore feels we are in the middle of the biggest change in the history of communications, and are stretching all the boundaries. It is like the dawn of transportation and aeronautics at the beginning of this century.

The change will not abate. It is accelerating. No matter how you measure the Internet—hosts, traffic volume, users, networks connected, etc.—all charts show the same rapid, exponential growth. The really rapid acceleration began with the Web in 1994. This is still a very young industry with a long way to grow.

Even the PC industry was nothing compared to the Internet. Moore's law says that ICs will double in capacity roughly every 18 months, but Internet bandwidth demand doubles every three and a half months, which means around 1,000 percent annual growth. Mr. Sidgmore believes this is unprecedented.

Voice traffic grows at about 8 percent annually. At the present growth rates, Internet will be half of the world bandwidth by the

year 2000. After 100 years of deploying voice infrastructure, it will have been overtaken by the Internet in only a few years. By 2003, the Internet will be more than 90 percent of all bandwidth in the world. A year later it will be more than 99 percent. Voice will become irrelevant, a niche market.

This represents a scaling and growth challenge that is unprecedented in history. As UUNET engineers say "if you are not scared by this, you do not understand."

Some people expect the growth rate to slow down, but Mr. Sidgmore feels one can make the opposite case. Current bandwidth growth has come simply from adding new subscribers, but new high-bandwidth, multimedia applications will push demand even faster than today. UUNET will continue to build bandwidth aggressively on the assumption that this is the case.

The Internet is the first ubiquitous network, giving you the ability to access everyone—customers, suppliers, etc. This will revolutionize many industries, including telecommunications. The old order that has ruled telecommunications for over 100 years is being overturned by two factors. The first is revolutionary de-regulation around the world. New players like Quest can enter the market. The old companies will be able to stall a bit, but not stop this wave.

The Internet is the second force driving change in the

telecommunications industry, again with free-for-all competition. The bottom line is that the Internet is much cheaper than the switched-circuit telephone network, and it is improving at a faster rate, because it is attracting the best and the brightest—the intellectual and financial capital. UUNET is growing as fast as it can raise capital.

Fifty percent of the international minutes that get counted as voice today are actually FAX. This is low-hanging fruit for the Internet, and it will begin moving over quickly this year. Voice messaging applications will also move to the Internet. The phone companies are afraid—this is a unique time at which the old order can be overthrown.

The UUNET acquisition of CompuServe and ANS was about the Internet, about getting new skills and capacity. The MCI deal is not about the Internet per se—it was about increasing their basic telecommunications network capacity—in the US and internationally.

New business-model breakthroughs are made possible by the ubiquity of the Internet. Internet shopping, as exemplified by Amazon.com, is one. Such basic changes take time. (Look how long it took us to move to ATM banking). Internet shopping will dominate because it allows the consumer to be in charge, to decide what content they access and when. The central planning/broadcast model will die quickly. Also users are

increasingly untethered and mobile. Faster local access will also cause breakthroughs, for example, allowing much more telecommuting.

These changes are about leveling the playing field. Small companies can now recruit and sell globally. On the other hand, the sword cuts both ways. Agility and speed to market win in this world, and the Internet will allow large companies to act as quickly and offer the same good customer service as small companies. Small companies will look big, large companies will look small, and the playing field will be leveled.

Quality and efficiency, not control of distribution channels, will be the key to success.

ISPs will offer new services such as multicasting, FAX, extranets (VPNs), and voice over IP. Access speed will begin increasing this year—all of the phone companies will offer Digital Subscriber Line service this year. Mr. Sidgmore also predicts that international growth rates will begin to approach those of the US because of deregulation. This will also lead to an explosion in caching and mirroring.

While bandwidth is increasing very rapidly, it is necessary to add 1,000 percent per year just to stay even. This is from new users and applications as discussed earlier, and computer-computer transactions which do not exist today will be an even greater impetus to growth. We will also

be increasingly mobile, and have many IP devices per person online at all times. Agents will be continuously active. Traffic is also bursty. The bottom line is that Mr. Sidgmore does not feel we can keep up with bandwidth demand.

The flat price of \$20 per month will not suffice to cover this growth because long-distance, not local access, is the biggest problem. Today, home users are constrained by modem speeds. In the future, you may have Asymmetric Digital Subscriber Lines providing 1 Mb/sec local access, but you cannot guarantee that same rate to Germany at a low, fixed cost—it will not scale. Content must be kept locally, so caching and mirroring must grow rapidly.

On a more controversial note, Mr. Sidgmore suggested that we might have long-distance charges. For example, you might get access to local content for \$20 per month or pay \$30 per month for global access.

He is scared, but is also confident that new technology will save us because we are getting new entrepreneurs, new ideas, and new investment. In the future we will rethink network design with the goal being IP from the start rather than traditional telecommunication. We will also move to a purely optical core network, but it is still unclear what will be between the optical core and the IP layer—the switches, routers and protocols, etc. (In the long run, we will have optical routers, but that will take some time). This intermediate

layer will not be the sole province of telephone manufacturers like Lucent. Traditional IP companies like Cisco will compete with them, leading to rapid innovation.

Everyone's core business is threatened. The phone companies have a lot of capital and the IP companies a lot of ideas.

In summary, we must remember that although we have had rapid change and growth, it is nothing compared to what we can expect in the future [because of all of the intellectual and financial capital that is being invested.] That, coupled with a lack of central planning and regulation, promises unpredictable, explosive growth. In fifty years, people will look back on this as the golden age of communications.

Quality of Service (QoS) Economics 101

Sue Almeida, Strategic Networks

This session presents a snapshot of quality of service (QoS) in today's public services and addresses the issues facing Internet Service Providers (ISPs) in providing end-to-end QoS.

Today's enterprises currently manage five separate networks, sometimes up to 30.

- A transport network for interoffice data communication (frame relay, ATM),
- A separate voice infrastructure

- A separate infrastructure for remote access (primarily via modems at central site taking remote dial-up calls)
- A video conferencing network over ISDN
- A public Internet infrastructure.

Some companies have yet another infrastructure for running EDI with business partners (currently EDI, but moving to Internet-based extranets).

Managing all these networks is not only expensive but is also not conducive to the way we will soon be doing business. Enterprises spend two-thirds of their telecom budget on people and pipes. This model wastes both.

- Enterprises are evolving to a model where all users (large/small, remote/central, fixed/mobile) plug into a suite of Internet-based services, to get:
- Public Internet access
- Remote access
- E-commerce and interaction with customers
- Extranet (to plug in easily to partners)
- Running services between their sites.

IP has become *the* network layer (layer 3) converged protocol. Even SNA networks are moving to an IP structure. The evolution is happening underneath this layer.

Drivers

From a service provider viewpoint, competition is the driver due to deregulation around the world. The ISP market has grown as well. The traditional ISPs are being joined by large full service providers, such as telcos that have acquired ISPs or others. These new entrants offer Internet access as part of their overall portfolio. The ISP market has had low barriers of entry, so there are now many entrants.

As a result, all service providers face market share erosion, market churn, reduced loyalty, and a margin squeeze—especially for transport-only services, which have become a commodity. These business issues drive ISPs, so they have to come out with new innovative services while rethinking architectures and operational support. The current model for ISPs, unfortunately, has been “the more customers you add, the more money you lose.” So there is an effort to move to the next generation of infrastructure and operational systems.

Strategies

The strategies for service providers is to move up the value chain, toward providing solutions and services rather than technologies. There is also a move to bundled and managed services, to take out the complexity of the network infrastructure, so that user enterprises can focus on their business.

The fast emerging public network services can be seen in three trends:

- Internet-based virtual private networks (VPNs). Actually, these are already available. Large ISPs offer extensive remote access, intranet, and extranet services today. But this is evolving.
- Tiered and customized services, where companies can subscribe to different performance and security levels and pay different prices depending on what they need for a given set of users. In a nutshell, this is the world we are heading toward.
- Converged services, where ISPs run multiple services, such as voice and video as well as IP, over converged packetized networks. The convergence of voice and telephony is unleashing a slew of value-added services—not just Web hosting or email—but database management, service bureaus, application rental, and most importantly, voice over IP.

Why is all this happening? Because plain voice is becoming a thin sliver of the pie, while data and video are ramping up. Therefore, investment dollars, management attention, and R&D are shifting to packet technology. At the same time, many digital technological advances are approaching today’s telephony

capabilities, and tomorrow will be better-than-telephony.

Service providers are thus offering business users native subscriber services, such as IP telephony or unified messaging, as a unified, value-added service offering. When enterprises want to run these kinds of services themselves, ISPs need to have an infrastructure that allows running these converged applications on top of the public network services.

Getting to Internet-based VPNs.

We need security, high performance, performance control, customer views (so that enterprise managers can see into their slice of the VPN so it is no longer a black hole), service level agreements, and policy-based management (they cannot get to a dynamic extranet view of the world with today's administrative processes). These are the building blocks.

Building blocks related to quality of service are:

- Engineering a high-performance network: how well you design the infrastructure. Today's networks must be low latency, have low packet loss on wide area transport, non-stop availability, low blocking rates for dial-up (to achieve a high probability of making a connection), very few dial-up disconnects, and high dial-up speeds. It is these characteristics that form

the foundation for a high performance network.

- Mechanisms for more deterministic and granular classes of service, quality of service, and quality of access. Today, we have numerous approaches vying for adoption. Numerous debates are raging, such as RSVP not being scalable for end-to-end QoS, while MPLS, which will be implemented this year, can scale more. Also being rolled out this year is RSVP signaling being mapped onto an ATM infrastructure to use ATM's QoS mechanisms. In the meantime, we have "types of service," which means using bits in the IP packet to set priorities and create classes of service. A number of implementations will appear in the middle of this year, 1998. This piece is not resolved yet, so we are not seeing the desired level of granularity is service offerings yet. But we will toward the end of the year.
- Service level agreements so that ISPs back up their offerings with guarantees, as well as ways to monitor performance so that enterprises know they are getting what they are paying for.

- Policy-based management, which allows people to be members of many different extranets, even signing up for a temporary one to work on a six-month team project.

Today, the Internet has come to be called "best effort" Internet. There are no performance controls and no security, so it provides a best effort service. Many large service providers already provide Internet-based VPNs. Tunneling technologies are in place for remote access, there are service level agreements, and there are mechanisms to view your performance within your VPN.

What is coming is class of service, end-to-end service, and policy-based management. Eventually we will have fully interoperable, interconnected Internet VPNs, much as we have today with telephony from the many telcos around the world. It is transparent to users, there is one-stop shopping, and a single bill. It will take some time to get to this point on Internet-based services due to technical issues (security and QoS), but more importantly, business processes among ISPs, such as billing, provisioning, and settlement.

Getting to converged networks.

Today's service provider networks are essentially lots of network clouds:

- The telephony-centric network—circuit switching over traditional

transmission infrastructure

- An evolving transport network for data—frame relay and leased ATM over multi-service ATM backbone are very common today.
- Multiple Internet networks—public and special purpose-built one for VPNs, where “purpose-built” means engineered for higher performance. Tomorrow it will mean providing QoS as well.

With the advances in packet switching and leveraging voice over packets, we are seeing the traditional transmission infrastructure moving to this multi-service environment. There are also some ISPs that are wrapping their IP services around an ATM core. At the same time, another wave of technology is aimed at pure IP over Sonet or optical technologies. There is a swing toward leveraging fewer infrastructures and packet switching infrastructures running over networks designed for high performance for data and packetized voice.

Mark Akass, Equant

Equant is a \$1 billion company with 7,000 employees worldwide and 1,000 corporate customers to whom they provide data, voice, and IP messaging services. They market to global companies, such as managing the Sabre network. They differentiate themselves by providing their

service around the world with a single operation, with end-to-end control of their maintenance organization, their network technology, their and planning rules.

Today, customer service has become a hot area in ISPs. Instead of getting beeped at night to handle an emergency, customer service managers are aiming to prevent fires at their customers' sites. The packaging of services is going to become a key differentiator.

Facts of life today

Network service quality is mission critical to companies today. If a network goes down, it could kill a business fairly quickly. People cannot afford to have major network failures. In the past, companies had a central site with satellite offices. When a satellite went down, it was the only site affected. Today, if you lose a VPN, the whole business application goes down. Thus, it is higher priority to business. Managers therefore need to ask: *What is our business risk with this network?*

Capacity management is becoming a key issue. Like cars, you need a six-year anti-corrosion guarantee with networks. People now assume that networks should work, whereas network uptime formerly was a differentiator. When customers turn over their network to a provider, they still need to manage the risk as if they were running the network themselves. Therefore, service providers must provide their customers with data on what is happening on the VPN.

Legacy systems tend to create black holes where you cannot see what is going on. As you add different levels of service, they need to be integrated. In order to provide a complex portfolio of services, it is not enough to plug it in and sell it. There must be integration between the service layers.

End-to-end security on VPNs is coming, but to achieve this end-to-end control requires constraints.

Today's customers are not buying single services. They are buying packages of services, which they want à la carte. They want them put together in different ways. So service providers have to customize their services around each customer's problems. From the customers' point of view flexibility is becoming a determinant of QoS.

Boundary issues: How do boundaries between service providers affect quality of service? Boundaries occur in many places. There are boundaries between the service layers, between geographic splits, among alliance companies, and links into the Internet. QoS issues apply to how you deliver a service and report it. It is not just about SLA reporting; it is about how the services are delivered in the first place.

Boundaries do create QoS problems, and the more boundaries you have, the worse it gets. You can live with them, but you have to minimize their effect on your business. Try to have a control point on each side of the boundary. You will have a

problem at the transport level just plugging together two networks from two providers. If they use the same network switches, you can reduce some of the problems.

You can force the situation by building an overlay network or by choosing partners with the same basic network as yourself. But, if one network is managed by two different companies, you still have problems because the planning and engineering rules in a configuration table have to be set by someone. The way you plan and set your engineering rules in a network determines quality. So planning rules end-to-end need to be addressed.

Boundaries also come in at the service level, not just the technical level. All the people in the partnering companies—in marketing, planning, engineering, etc.—need to work *together*. You need supportive management on both sides of a boundary for the networking to succeed. It is a challenge because it is more likely to have problems. If you are working in a global company, you know that just getting sales teams working together is difficult enough.

To deliver good service, you have to reengineer your processes. A lot of this is process driven. We all know how difficult it is to reengineer your own processes. Trying to reengineer end-to-end with partners is even more difficult.

Who owns a bill is an issue. If you are billing for multiple levels of service among several providers, who owns the bill? This is part of QoS. Who will

collect the billing data, who will validate it, and who will handle billing inquiries? These areas can create major frustrations for customers. Billing is a top priority, and is becoming a major customer service issue.

Boundaries create ambiguity of ownership, and this ambiguity potentially causes a quality problem, a problem for end-to-end management, and QoS delivery and reporting problems (due to a break in the information flow). So avoid them, where you can.

QoS is a big area of differentiation for service providers. Today, most providers have legacy systems that have led to piecemeal solutions, such as custom-built reporting capabilities. When these work customers might perceive a quality service, but the provider's overhead goes up and up. When their cost base is linked to their volume, they have to reengineer, or they will go out of business.

There are very few standard packages of QoS bundles in the marketplace today. There have only been a few announcements in terms of standard network path availability guarantees or standard reports. There have been tools to give visibility to customers, but they can be expensive, are only for one customer, etc. So we are moving away from these labor-intensive types of reports into automatic data collection.

Anything that negatively impacts people, processes, and technology leads to poorer service. The three have to be

addressed in parallel. And it is best to use off-the-shelf packages as far as possible so that changes can be made quickly.

Service Level Agreements (SLAs). All customers want them, but to be meaningful, you have to track performance and then make business commitments—that is, offer levels of guarantees. In some parts of the world, it is impossible to give a guarantee that, say, a circuit will be fixed in 24 hours. In such cases, the best you can do is give customers information, such as “Of our 500 circuits in that area, we average fixes within 36 hours, but it depends on whether the circuit is in the city or in the country.” Gaps appear among local access carriers, so there are tiers of service based on country, rather than global guarantees of service.

In countries where the local carriers are willing to give guarantees, your service provider can give fixed end-to-end guarantees. Other countries require more flexibility. So while a service provider might own ownership of a problem end-to-end, they cannot guarantee resolution where they have no control.

Bringing together different service layers requires collecting data from different sources. Also, a QoS guarantee is a snapshot. The sales cycle for buying a major VPN is from six months to two years. Customers estimate their data needs, but those generally go up much faster than anticipated, and often in unexpected places. QoS

guarantees are based on specific assumptions. If those are wrong, the QoS guarantees become invalid. So you have to manage the process. Watch upgrades and moves, update your SLA. It is best to manage SLAs as a process, not as a one-off. It is not a precise science. Polling is not accurate.

The data for an SLA comes from many sources. On the network itself, there are accounting records (to get frame relay reporting, for example). Due to the volume of traffic, it cannot be done dynamically. Real-time spot samples can be taken, so that customers can see transit times from point to point. You can do averaging. From help desk, you have data on trouble tickets to determine, for example, how quickly you get out to do site repairs. On voice, you can do test calls. On LANs, you can put boxes on premises to track the data for management consoles.

In today's world, companies do not put business critical applications on the Internet.

The next step above giving customers data about their VPN is to give them more value add, "so what" advice, such as capacity management advice on when to upgrade their network.

Mark Fisher, Concentric Networks

AT&T's recent frame relay outage sensitized people about the issues.

Concentric is an ISP that has been building for the past 18 months a high-performance U.S. backbone to service virtual private networks of enterprises for video conferencing, extranets, and wide area networks. Real QoS standards are not yet available.

Concentric is most interested in VPNs that require tailoring; that is most of them. But they have had some experience putting IP traffic on top of an ATM backbone network. They have been able to manage it in the short-term through smart engineering, but now they want to implement first-available types of QoS protocols. They host intranets as well and DSL services.

The essence of their strategy about VPNs is that there is a near-perfect combination of the beneficial characteristics of public and private networks. Up until the Internet, this was accomplished via a secure private network, although it was not ubiquitous and flexible. The Internet is ubiquitous and flexible, but not secure.

So they created an IP VPN that marries the characteristics of the two; it will sit adjacent to the Internet and allow sites to have predictable performance and security while networking across the Internet among sites. It will be some time before individual service providers will let you manage services from disparate networks and get seamless SLAs you might want. So providers are attempting to guarantee QoS—frame-relay-like performance

levels and security—on their VPNs while allowing access to the Internet's ubiquity.

Concentric's network is an ATM backbone network anchored by 20 super points-of-presence (super POPs) around the U.S. These super POPs aggregate different kinds of traffic—dial traffic, dedicated voice/video traffic, and other access technologies, (such as regional Bell company frame relay services), and DSL access services. This approach allows them to aggregate certain kinds of traffic and makes it possible to achieve predictable performance.

More than half their traffic remains on their private network, the other reaches out to the public Internet.

They believe that network performance is a key differentiator, in several categories, such as guaranteeing dial success rates, latency across the network, and throughput.

Their old legacy network was a frame relay network; the latency was highly variable in peak and off-peak periods. In fact, it was too high to support some applications. When they implemented their ATM backbone, they drove latency down and created fixed, or predictable, latency. Thus they can now support video—which cares about latency and jitter (the variance in flight time as they traverse the network). They guarantee latency of 125 milliseconds (similar to ISDN network) and jitter is less than 10 milliseconds.

Their current SLAs now address latency across the network, uptime on the network, business dial connection success rates, and connect speed. For the dial network, they use third-party data from Inverse Network Technologies—the J.D. Powers of the Internet. For dedicated network SLAs, they are also working with INT to do sampling over a given time. INT publishes report cards on major ISPs.

Concentric also acknowledges where they have missed guarantees and credit the customers' accounts proactively to put teeth into their SLAs.

In summary, managing for business-class QoS requires, in the short run, solid engineering using robust technologies (such as ATM), actively monitoring the network, managing capacity planning, and managing to SLAs. In a few years the field can implement emerging standards, then service providers can be somewhat optimistic about network-to-network SLAs, from different providers, which can be passed on to end users. Today no frame relay service provider will support an SLA from another provider.

Providers are looking to be able to manage QoS on an application basis, and per traffic type.

Bandwidth is being addressed by vendors who are building out "phenomenal" amounts of backbone capacity in the U.S. Bandwidth is being driven into the ground alongside railroad tracks throughout the U.S. One strand of fiber is purported to be able to

carry all the voice traffic in the U.S. today.

Providers are looking to provide more sophisticated network management, such as letting companies request bandwidth on-the-fly, for video conferencing, pay a premium, but know it can be provisioned quickly.

Alternatives being considered is IP on Sonet—no need for ATM at all—but it does not help with QoS. Today, ATM is relied on heavily for QoS offerings.

Tomorrow's Call Center

Blair Pleasant, Pelorus Group

Tomorrow's call center will be a customer interaction center, not a call center, with customers contacting in many ways—through the Web, email, video kiosks, as well as via telephone and fax.

The center will need to provide the same level of service no matter how customers interact. Companies now have parameters for interacting with phone-in customers, such as, they should not wait more than two minutes before their call is escalated to someone who can help them. The same should hold true for customers who contact the center through the Web or email. They should not have to wait longer to receive a response.

Centers also need management reporting procedures so that email and Web interactions do not fall through the cracks. We know how many

phone calls are abandoned or not answered. We need tools to measure this for electronic interactions as well.

Many products handle email and Web contacts. They come from third-party vendors, such as Genesis, Adante, and Mustang.

The new centers will use computer telephony integration (CTI). Pleasant recently completed a report on CTI and the call center. She believes that a call center without CTI is like a Ferrari with a lawnmower engine. CTI provides many tools for agents—desktop telephony ("soft phone"), voice/data transfer, intelligent routing—making the agents so much more responsive to callers. CTI is crucial

With CTI, you can bring the intelligence dispersed throughout the company to the agent's desktop. The agent can see who the caller is, their past issues, the products they have, their operating environment, and so on. It helps agents provide more personalized service, even customized add-on and cross selling.

Call centers will become call centers without walls.

■ **CAN Comment** > *CC WOW, for short. Maybe this is a new acronym!*

In addition to formal call centers, companies have employees who help informally. It is important to make them part of the call center without walls, and give them the same tools.

Centers will also employ intelligent routing, or skills-based

routing. All customers want to feel understood and receive individualized service. Intelligent routing helps achieve this. Based on the customer's input to voice response prompts or their automatic number identification (ANI), their call can be matched with their data base entry and routed to the most appropriate agent. It makes customers much happier, and speeds up calls.

Remote agents, and work-at-home agents, will be used much more widely in the next few years in call centers. These are growing quickly because many people prefer to work at home. You can get more experienced experts at times by tapping this market, but they need the same tools as if they were in the call center so they can be just as responsive to customers.

We are going to be integrating all these technologies into the center, so it is important to work with vendors who provide system integration and consulting services.

These will be key in the coming years.

Robert Young, AnswerSoft Inc.

Unfortunately, many companies only think of call centers as telephone call centers. But this seems to be changing. Centers are opening up to include other ways to interact with customers. The call center of the future has the same three goals as today: happy customers,

customers who spend more money with you, and efficient center operations. The center will just use new ways to interact with customers. To reach these goals, companies should accommodate, automate, and integrate.

Accommodate the ways customers want to interact. If a call center is closed, customers want other ways to interact with the company, such as via the Web. Providing various options can give a competitive edge. Customers expect more; if you do not give them what they expect, they will go elsewhere.

People are more comfortable interacting in different ways with companies—letter, fax, phone, online chat, video conference, email, and so on. You must provide multiple options. In the future, you will give your customers options on how they can interact with you.

When Wells Fargo moved to online communication with customers, costs dropped from \$1.07 per minute to interact with customers in a branch to one cent per minute to interact via the Web site. In addition, many potential clients preferred the Web. Furthermore, the Web encouraged customers to consolidate their accounts (formerly dispersed among different banks), so they could easily see everything at once.

Normally, people bank near where they live. When they move, they change banks. But Wells Fargo found that by dealing with customers electronically, those

customers did not change banks when they moved. This was a surprise benefit.

Automate the interaction process. The old way of serving customers was by phone, where the customer rep looked up their record on the database and got their information out of other files. In the future, these files will be gathered automatically before the agent picks up the call. The agent then only needs to update the data and focus on problem resolution and cross selling.

This type of automation can be applied to handling emails as well, with a “package” of information about a customer sent to an agent along with the email.

Integrate your systems. Typically, customer information is spread around in a company. In this complex environment, opportunities to really service a customer may be lost. It is desirable to have all the relevant data linked and integrated, so that it looks like one common set of data that is easily accessible.

For example, a screen could have key customer information along with key customer contacts, which include, dated and in sequence, the pages they viewed on your Web site, email to you, phone calls, and orders, perhaps via fax. The challenge is to not require someone to enter all this data. Technologies are coming to allow automatic gathering of this data. Web trackers were originally intended for companies to see which parts of their site was most often visited. Now, companies want to use this

software to track customer movements.

The same is true with email. Mustang now has a product to help companies route email. The key challenge is connecting all these interactions into one screen for agents.

Marissa Morrow, Lucent Technologies

Numerous issues are driving the evolution of the call center.

- *Resource acquisition and retention.* The number one issue is how to find people, train them, and keep them. This has led to “agent satisfaction” in addition to customer satisfaction. Do they have the right benefits, such as the right ergonomics, enough breaktimes, and a cool system to use?
- *Cost management.* Some 45-50 percent of call center costs are people costs. Another 45-50 percent are network oriented, while the remaining 5-10 percent are investments in technology. Companies are now focusing on network control: how to reduce the abandon rate, call time in queue, and keeping customers on the line just long enough to balance efficiency and effectiveness. One of the new strategies is to issue a busy signal when you are overloaded, rather than have customers sit

on the line for a long time. The presumption is that they will call back.

- *Productivity improvement.* You can use CTI to deliver information to the agent and thereby cut down on the duration of the call. Faster is better, whether it is keystrokes or file accesses.
- *Levels of accessibility.* How do customers want to interact with you? Customers no longer accept 9-to-5. They want around-the-clock access and in numerous modes.
- *Customer expectations.* These are driving the changes. The customer is king. We have taught people to raise their expectations. Just a few years ago, executives did not want customers’ calls handled by voice mail. Today, voice mail is used when customer reps are not available. LANs, ATMs, and voice response units have similarly changed expectations. Today they are accepted; yesterday they were not.

She then outlined some technologies for tomorrow’s call centers:

Computer-telephony integration (CTI) . Five years ago, everyone talked about CTI, but they were afraid to implement it. Today, every call center

requires CTI. And the standard screen pop is no longer enough. It is too simple. Agents are focusing more on selling to each customer, individually, so they need the customer’s history and experience with the company. Companies want to predict the caller’s requirement so that they can choose the agent who can best help that customer. That person could be the troubleshooter who last helped that customer. Or it might be to an agent who is good at handling customers who abandon calls (as this caller has done several times). CTI helps direct calls, which is very important.

Virtual call center. The goal is to have any agent, located anywhere, able to handle any call. This may not be practical, given the skills of the agents; however, if resources are geographically spread, skills-based routing makes better use of those resources, and can reduce costs.

The virtual call center can be used in three ways.

- For large call centers (100-500 agents). Rarely are call centers growing above 500 agents these days. One reason is that there are business recovery issues about 500. Distributed locations provide a fallback position.
- Small remote nodes can be from 0-100 agents.
- Agents at home. Resource acquisition is the issue. In certain cities, all competitors are vying

for the same resources. Companies need to look elsewhere, tapping non-traditional markets, such as retirees in Florida. They want to work part-time, logging in 3-4 hours a day, without commuting, without having to buy new clothes, and with a cup of coffee in their hand.

Virtual call centers not only need to be transparent to callers, they need to be transparent to agents and management.

Issues with virtual call centers:

- *Network ramifications.* One large company had 15 locations with a robust network structure, so they could easily connect the resources. But there is a cost; compare it with the benefits.
- *Management.* Will supervisors have subordinates spread across several sites? If so, their job is different than managing an all-in-one-place center.
- *Centralized administration.* How can you access remote systems to add agents, move agents, manage the telephony structure, etc. if you have a central control center?
- *Internet access.* Everyone wants to be here, but they often do not put in the processes to handle, say,

email efficiently and effectively. It is not acceptable to take 2-3 weeks to respond to email. The applications that seem to be working are real-time interactions, call back requests, and integrating voice over the Internet (although very few are doing this at the moment).

Internet access needs to be tested. Do not just let the river gush through. Pick a segmented market and focus on it first.

The goal is to integrate email, web response, web chat, and video response.

Today, Internet transactions account for some 5 percent of call center interactions. This is expected to increase to 30 percent by 2000. Those centers that allow Internet access today say that it draws in new customers that they would not otherwise reach.

Video call center. Today, there is lots of talk, very little action about video call centers. This is immature; where CTI was 6-7 years ago. The video kiosk is one option. The video call center, where you share voice and video across a Web connection, is another. It is expensive, which is the main current impediment.

Video kiosks are good for shopping. You can not only see the item of interest, but by just pushing one button, you can also see an agent and talk to them. You have the same personal interaction (perhaps more) as when shopping at a store. And for

the retailer, this is cheaper than opening a branch office.

The ultimate is turning Web-enabled TV into a video-enabled call center.

Evaluating new technology. There are six rules of success.

- *Do your homework.* Know your customer's expectations as well as the reality in the call center. Unfortunately, there are numerous IS and telecom managers who buy a call center system without asking the call center manager whether it will work.
- *Design a conceptual idea and then test it.*
- *Refine your idea and then test it again.*
- *Do not acquire technology for itself.*
- *Be sure that agents have a role in creating the functional design.* They need the ownership.
- *Experiment.* One software company radically experiments. For instance, they decided to give something away when they had to keep callers in queue for a certain length of time. The gifts only cost 5-6 cents to them, such as a CD ROM telephone directory. They would play an announcement that apologized for keeping the caller waiting, and offer options of several gifts. When the

caller accepted a gift, they were shifted to lower priority. So the manager could prioritize calls. But, what works for one center does not work for all.

■ **CAN Comment** > *The idea here is that if you keep your customers happy, they will keep coming back!*

Max Fiszer, MultiCall Inc.

Just because something is technologically possible does not mean it will occur. He once predicted that we would be a checkless society by 1985. It did not happen, although it was possible, because people did not want to give up float on their bank accounts.

He also predicted that IBM would not get in the PC business because he did not think they could make money in that business. They did, and he thus concluded that you cannot presume that people will react rationally.

His third prediction is that the Dow will be at 18,000 by 2000.

Call centers started as complaint centers. Companies made a few of their new hires “vice president” and funneled all complaints to them. It was a good notion, but since handling complaints was not desirable, companies began paying by the number of calls handled—this was the only thing that could be tracked. This shortened the calls. But if companies could correlate company revenues from a

collection department with length of calls, they would discover that shorter calls were not necessarily better calls. UCD systems also distributed calls to the longest idle agent. This might have been appropriate when paying for taking the most calls, but it had no correlation with skills.

According to statistics, 70 percent of all customer interactions with companies take place in the call center. This is impressive, even if the figure is only 60 percent.

Tomorrow’s call centers will have sociological, technological, and economic effects.

Sociological changes. The Web is changing our entire society. Customers have high service expectations, not just in the U.S. but throughout the world. We expect to be coddled. We want an answer within five rings. Convenience shopping is growing. People shop from home, from work, using any means they can and from anywhere. The notion of teleworking is also growing because people want to do it.

Technological changes. CTI is the most essential technology here today. It will be pervasive soon. The Web also has technological impacts. In addition, the availability of technology is so wide that it will govern how call centers develop.

Economic changes. The Web is globalizing business. Small companies can sell worldwide, without direct contact with customers. Markets can be anywhere and competitors can be

anywhere as well. This is a tremendous change. Location is only important when selling bagels these days.

The major purpose is to differentiate yourself. You cannot treat all your customers alike because only 20 percent give you 80 percent of your business. So personalize your interactions.

The biggest concern in call centers is the level of expertise of the agents. It is too thin. It is more important to get to a person who knows the answer, and this is where a call center without walls could be a boon. Why not make the entire company a call center, including the president? Even the security guard could take calls at night, at least for directing desperate customers to someone who can help.

Today, most call centers are formal centers, with a supervisor and full-time call center employees. The prospect for the future is more informal centers, with many people doing call-center work part-time.

Today, the phone is the largest access tool; and it will continue to be so, because the personal voice is very important. Most automation today comes from voice automation. Gradually, there will be automation for the Web, but voice will continue to play a significant part.

Video may not become as important as some think because it represents a loss of privacy. People do not want to be “on screen, on guard” when they are on the phone. We should be

asking whether people really want to do business this way on a regular basis. Perhaps not.

The Internet will take a larger role in handling voice in addition to Web interactions. Voice is a complement but it should be reserved for people who buy large items. Email should be good enough for the lower ticket item purchasers. Big customers perhaps should have the option of immediate chatting online as well as voice. But it may not be wise to offer all these options to every customer because they do not all have the same value.

Multifunction call centers are like the entire company being a call center. A small travel agency is essentially a call center. The functions are identical. Many people fit the call center role.

Metrics are important, and they need to be kept for the best 20 percent of customers and for the remaining 80 percent of customers. These should not be intermixed, and they should not be the same. On the subject of abandoned calls, there are means today to call back those abandoned calls by capturing their ID and then passing this information onto agents to handle when they are not busy.

One hundred percent callback needs to be a measure for tomorrow.

The importance of service levels is the amount to knowledge that occurs during the interaction. Happy customers are great, but only if they help you achieve what you want to achieve.

If you have segmented agents by voice, email, video, and outbound, you have an unmanageable center. You need to be able to integrate them. Managing, even in an informal call center, is the most important aspect.

To mitigate technological challenges, try to buy architecturally integrated systems. An open architecture is a given today. Plan on growing. The blended call center—everyone as a call center—is the ultimate.

The Newest Value Added Service Offerings from Carriers, ISPs, and CLECs

Rod Nelson, AT&T Wireless Services

Wireless is pervasive. As he sat outside the convention center on a bench, many people walking by were talking on a phone. He was also on the phone.

AT&T Wireless has 8 million customers; it was formerly McCaw Cellular Communications. Headquarters are in Seattle and it has 6,500 locations and serves 75 major cities across Europe and Asia. It has the largest digital coverage in North America. Its first digital network was launched in 1993.

Estimates of subscribers for the three dominant wireless technologies in North America are

- TDMA has 4 million subscribers

- CDMA has 1.5 million subscribers
- GSM has 1 million

AT&T Wireless is growing at 150 percent per month, so nearly all new customers are digital, and customers are converting from analog to digital. The wireless scene in North America is digital. AT&T has 50 percent of its wireless traffic on the digital platform.

At McCaw, they used the cellular frequency band of 850 MHz in the radio spectrum. In 1994, when the FCC auctioned off PCS licenses, AT&T acquired frequencies for cities it did not service at 850. The vision back then was that PCS and cellular would be the same; so AT&T would offer the same features to both. PCS was not just not smaller, cheaper, lighter. Today they are the same, and all carriers have the same vision taking this path.

Their AT&T wireless PCS features, available at 850 and 1900 MHz, consist of:

- Caller ID—this has become a standard
- Longer battery life—this also is a fundamental benefit of digital service
- Message waiting—combined with voice mail lets you know how many messages are waiting
- Short message service—to send a message to a digital phone through an Internet email address or through AT&T's Web site

- Authentication—has eliminated the risk of fraudulent use of cell phones; phones can no longer be cloned
- Dual-band, dual-mode phone—this technology allows greater coverage of North America—180 million POPs by the end of 1998, and Canada will add 25 million from CanTel, Canada's Wireless carrier

Estimates predict strong digital wireless growth. It will become a strong mass market item in the next few years. Estimates range from 141 million to 158 million in three studies for 2006—up from 60 million today.

What is the engine for achieving that growth? Clarity, ubiquity, and lower costs. But for each carrier, growth will be propelled by value added and non-voice services.

Traditionally wireless has been in the outdoors—the macro-cell environment—on the road, on the move. But increasingly, AT&T has added micro-cells, to increase capacity to the outdoor network. Over the past ten years the field has transitioned from a mobile technology to a portable technology, primarily for people outdoors.

The new markets are:

- *Micro-cells in-building for business users.* AT&T is moving to in-building service, where micro-cells are built into campuses and industrial sites to provide wireless,

untethered communication, to supplement or replace a PBX. Customer studies show that productivity gains, elimination of telephone tag, and listening to messages make this an attractive option. This is a particular strength of TDMA technology, and is one place AT&T sees its growth accelerating. So this is a voice-based service.

- *Residential marketplace.* AT&T is developing a personal base station that can be installed in the home and enable one's cellular phone to operate as a cordless phone, without usage based tariffs. This is also a voice-based service.
- *Multi-band multi-mode phones.* Tri-mode means that the phones provide digital services at the 1900 band, digital services in the 850 band, and analog services in the 850 band. CDMA will follow TDMA in the same trend. Tri-mode handset sales will grow from 40 percent today to 100 percent by 2001. Costs will decline 10-20 percent a year.

The technology is available for multi-band, multi-mode phones that do not have a battery-life penalty, a form-factor penalty, or a usability

penalty. Usability is greater because it can follow you from your home anywhere in North America.

- *Non-voice wireless.* AT&T recently introduced PocketNet service, a platform and service that integrates voice and data into a handset. The future platforms for wireless data communications include notebook computers (tens of millions installed base), Windows CE or palmtop devices (several million installed base), and 60 million cellular phones. So one of the most popular wireless data platforms will be these phones. They are familiar to people. PocketNet uses a thin client model but adapts to the constraints of wireless. The phone has a micro-browser, like a scaled-down Netscape. It talks to a AT&T network server, which acts as a gateway to Web sites and AT&T services and applications—such as personal information management. You can access your calendar, contact list, or create appointments for the day. The service synchronizes between a handset, the network, and a desktop computer.

AT&T also provides access to white page sites to look up phone numbers in the U.S. They have two-way email, allowing faxing of attachments or a message to a nearby fax, which acts as a printer. You can forward messages and attachments, and so on. It uses a CDPD (cellular data packet data) network in 70 large U.S. cities.

This is where AT&T thinks devices are going in the future.

The wish list of the future might have speech recognition for dialing numbers and the ability to communicate with other devices in an untethered fashion—such as communicating to your palmtop device, linking it to the network. Another accessory might be a digital camera to take electronic postcards. Or, if you are lost on the way to a meeting, you can show the other person your location over the phone and she can tell you how to get to her site. Wireless digital telephony makes sense, perhaps more sense than from a fixed location. With wireless, you can position the phone and turn it around, showing people where you are in real time.

AT&T sees the convergence of a wireless phone and an advanced computing device as the key to understanding the third generation of wireless services. The next generation is alphabet soup: wideband CDMA (W-CDMA), time division multiple access (TDMA), and IMT-2000—the set of requirements

that defines the next generation of wireless services.

For voice, these requirements include quality comparable to wireline, security and confidentiality comparable to wireline, and use of a hierarchical cell concept with private and public cells operating in the same space (such as public cells overlaying private cells in campuses or homes). It specifies data rates of 144 kbps for fast-moving vehicular applications, 384 kbps for pedestrian use, and 2 Mbps for indoor applications—all within one system architecture.

Standards were due in 1998; the process is underway to establish the framework. But it will be a real race. Japan has very aggressive plans for introducing services based on these requirements in 2000. Europe and the U.S. plan to introduce services in 2001 to 2002.

The original goal was a single revolutionary standard; however, this is unlikely because the needs of different carriers and markets differ. AT&T sees IMT-2000 as a service vision, not a particular frequency band or technology. AT&T found that they already meet 85 percent of these service vision requirements. Voice quality will exist, so will security. In fact, wireless will be more secure. In addition, the hierarchical framework exists.

The gap today is in the higher bandwidth data services. This will be the engine of growth for subscribership and usage beyond 2000. A question not yet answerable is “What would subscribers be willing to pay to

send an electronic postcard or make a video call or download full-color maps of their destination?” The current trend is that they will not pay much more than they would pay today.

For the third generation, companies are looking to new spectrum (UMTS or wideband CDMA) for those markets and to implementation in existing spectrum (EDGE, a wider-band TDMA technology capable of providing these wider bandwidth services).

The first generation of cellular was analog, voice telecom only. Second generation is digital, with dual-band and dual-mode voice plus the beginnings of data. Third generation is adding very robust and economical data.

Networks become increasingly evolve from hardware to software-intensive and software-defined applications. The Internet is the model. Value added services in the transmission of content is where growth will come. In ten years, the network will be based on software with Internet and data communications standards, open programming languages, and very intelligent voice and data terminals. This is a significant transition from today’s voice-oriented network.

The challenges for vendors of this new generation of wireless include balancing the networks, maintaining investments in current networks while transitioning to the new services, and making sure the transitions happen at the right pace.

Chuck Poston, Worldcom

The last three to four years have been phenomenal and the last two have had radical changes. Two years ago, T-1 was considered significant bandwidth. Within the last six months, Worldcom is seeing exponential growth in customer requirements for bandwidth. DS-3s are commonplace now. OC-3 orders are coming from government and Internet and commercial customers. And they are starting to see OC-12.

They also see the evolution of traditional data applications. The things that seem to be driving this is the Internet and email. In the future, bandwidth requirements will go straight up as Worldcom is not yet seeing video application requests.

The traditional telco model had long-haul carriers pick up transmissions from a local carrier, take them across the wide area, and hand them over to another CLEC on the other end, which provides the last mile. The problem with this traditional model—which long-haul carriers still follow—accountability, single point-of-contact, and the ability to deliver services quickly are missing.

Worldcom has a new paradigm, which it believes other telcos will adopt. The new model has one provider that has local presence, wide area presence, and potential presence overseas (not through consortiums but through owning facilities). Worldcom has fiber in over 80 cities and 4,000-

5,000 lit buildings. This allows delivery of services close to the end user. In addition, Worldcom has two significant builds overseas.

One is Gemini, which is a Sonet ring across the country. It will have a southern and northern route at the end of this year between New York and London. The pan-European build will connect London, Frankfurt, Paris, and Amsterdam. The second phase will focus on Germany.

The model is facilities-based, delivering service end-to-end from major metropolitan areas. The customers are businesses, which believe they need worldwide presence, with on-net presence in major metropolitan areas and off-net for all others. Others telco will adopt this model in the future, Worldcom believes.

A value-added service offered by Worldcom since June is the Intelenet suite of services, which offers DS-1 to the customer site. The customer can then divide this up as they choose—for Internet, voice, frame relay, and leave some room for further expansion. This approach permits cost savings and high flexibility. The reception of Intelenet has been great, accounting for one-half the services they sell. A follow-on service will be DS-3, available by fall.

Worldcom can now provide inter-lata and intra-lata services using their metro frame-relay services. It is designed for customers with a large local presence and some long distance requirements. It can be delivered without an NNI. It is well

received where companies have some number of offices that need to communicate with headquarters in the same lata and some long distance requirements as well. It is like standard frame relay, except that sites that do not need WAN services have reduced prices. One of the largest expenses of a carrier is the optronics put on fiber. If your circuits do not touch that wide area, you should not have to pay for those costs.

Another managed service is SNA over frame-relay, which is router-based. It has been well received. It can be fully managed or not; the type of management is up to the customer. Worldcom also offers an ATM switch-to-switch managed service, but it has not been successful because those organizations using ATM are at the leading edge. They see it as a significant investment on their part, so they do not want a managed service, yet.

The Internet products come from UUNET, Worldcom's subsidiary. They offer virtual private networks which are router based and have security. The routers are managed by them; they are secure, and they provide firewall security. So Worldcom helps companies put VPNs together. VPNs are phenomenal. In a matter of minutes, they permit you connect to another user.

Currently, this takes weeks or months. The prerequisite, however, is that everyone have Internet presence. This will happen. VPNs are the wave of the future. The biggest downside

today is their security, but this will be solved too.

Worldcom also offers Web hosting and integrated access, via Intelenet. They see an increase in shared access using the Internet because most applications do not require full bandwidth. So customers are dividing up DS-1 bandwidth among multiple applications.

What we see evolving is that carriers expanding their presence on the Internet, as are the regional Bell operating companies, offering a full suite of services, which are international and facilities based. Telcos are also moving into the managed services arena in the Internet and for data.

Mike Rouleau, Interprise Network Services (US West)

US West is offering new services that enable customers to access the Internet faster, using new technologies called DSL. They are in the process of rolling out megabit service, which is their version of DSL, across 14 states. DSL is about making a market happen—the types of applications that will arise when users can get one million bits per second to the desktop, the kinds of support such customers will require, and the types of services telcos need to create to tap this resource.

The issues surrounding DSL and broadband services are the potential applications, integrating the speeds into offices or home offices, how telework might work, and how to use DSL for electronic commerce. Why would

a customer want faster access? US West looks at several customer groups:

- *Commercial small business Internet access:* Gain the same advantage as larger companies—larger bandwidth, easier integration and access
- *Residential Internet customer:* Capabilities to build out a home office, and also access family services online after work hours. Children's school reports will contain colorful graphics and explore the world.
- *Intranets:* The goal is secure point-to-point connections from company to people working at home via LAN-like access. Employees can also get the same access from home or on the road.
- *Private data networks.*

Some local exchange carriers want to use DSL as a T-1 replacement. Others want to provide a range of services. US West believes that DSL has three sweet spots:

- Residential customers can now get plain old telephone service (POTS) for \$15 a month, up to \$65 for ISDN.
- Power users or small businesses currently have other options, beginning with ISDN up to T-1.
- Large businesses have options up to OS-3.

DSL allows the same kinds of bandwidth with a reasonable price point. With ADSL capabilities, or rate adaptive DSL, they can deliver up to 7 Mbps, with the capability to integrate easily into existing applications.

US West has rolled out megabit services, deploying 226 wire centers servicing 5.5 million lines, in the past six months—which was incredibly fast. Their goal is to double this breadth. They offer three capabilities.

- Megahome service, for 256 kbps (\$40/month)
- Megaoffice at 512 kbps (\$60/month)
- Megabusiness at 768 kbps (\$80/month).

These bandwidths can incredibly change how people manage their business.

These services run over an ATM infrastructure and each connection is handed off to a host site connection, either the Internet or a corporate LAN. The host site connections run at T-1, fractional DS-3, or DS-3. Soon they will offer OC-3.

Customers can thus have IP services end-to-end over VPNs, private data networks, or the Internet. The bandwidth is “always on” and enables all kinds of new applications—push server- and video conferencing-based apps.

Network management becomes critical because these systems are disparate. No one gives end-to-end management. The goal is to make it like POTS—plain old telephone

service. This is a challenge, but they are needed in this direction.

They have learned that twisted pair does not mean a DSL-capable local loop exists. There are many things in a 100-year-old network that must be considered when rolling out DSL. Engineering characteristics are critical, and they change from locale to locale—such as from the desert of Tucson, Arizona to the snows of Brainard, Minnesota.

US West's engineers are also concerned about what happens to the spectro-compatibility of different equipment in their network. The engineering assumptions are key.

US West realizes that you cannot have point-to-point connections forever, and corporations do not want to be ISPs for their teleworkers. So US West is focusing on PPP over ATM, integrating more devices so that companies can have a USB interface, an Ethernet interface, or a PCMCIA card in a laptop. They aim to integrate their legacy networks so they can offload data traffic off their voice network to get customers the bandwidth as they need it.


IP telephony and fax are huge markets. They will have great impact on US West's network; DSL is one way to address this need. It is an enabler. ATM is critical, but customers do not want to deal with cells. They want to deal with interfaces they know and love—two wires plugged into a modem.

DSL is price competitive and allows customers to integrate the

data. PPP will play a huge role, so that customers can have on-demand access and bandwidth to any destination. USB will continue to grow as an interface.

PC manufacturers will integrate DSL into their computers quickly. Dell will soon offer a megabit-ready PC. Just plug it in and you're ready to go. Manufacturers will be able to build cards and deliver services through a digital loop carrier. These providers will rally quickly. Outside major metropolitan areas, inverse multiplexing over ATM will be huge. Thus, to offer a robust ATM network, US West will not have to supply fiber everywhere to support rural deployments.

ATM networks will finally play a key role in mass market applications. In addition, companies will continue to be bought and sold in this arena.



Conference Comparison

Visionarios '98

reviewed by Laurence I. Press

I had the opportunity to attend the Visionarios Conference, April 22-24 in Caracas, Venezuela. The conference was sponsored by Reacciun (the network of research centers and national universities of Venezuela). Reacciun was the first network in Venezuela, and networking pioneer Luis Germán Rodríguez was Executive Director of the conference.

It is interesting to see the differences between Visionarios and Interop. Of course Interop is much older and larger, but there are differences in emphasis as well. Interop focuses on technology and business (the trend at Interop has been from the former toward the latter over the years). The commercial exhibits are important and extremely informative, and the speakers are increasingly from corporations. Technology and business were certainly present at Visionarios, but so was an awareness of the potential role of the Internet in development—in healthcare, education, raising the quality of life (particularly in rural areas), and of increased economic productivity.

There is the hope that the Internet may help level the playing field between *developed* and *developing* nations, between the northern and southern hemispheres, in the same manner as John Sedgmore of UUNET predicted that it would level the playing field between large and small businesses in his Interop keynote.

The program was divided into three tracks: Education and Society, Economy and Productivity, and the Technological Platform. The theme of development was reflected in many of the talks. For example, one of the invited presentations was by Jesus Martinez, Director of the organization that controls the Internet in Cuba. Martinez described Cuban networking, but stressed that "the major component of the Internet is political." The Internet in Cuba, like anywhere else, reflects a balance between commercial and non-commercial emphasis, but, as Cuba's society is unique, so is its Internet. See <http://som.csudh.edu/fac/lpress/devnat/nations/cuba/> for more on Cuban networking.

Another invited speaker was Nick Kauser, Chief Technical Officer, AT&T Wireless Services. Kauser gave a most interesting overview of AT&T's short and long term view of the wireless IP market. He predicted rapid deployment of asymmetric wireless services beginning in the next year or two, and moving to higher speeds and different classes of customer (large business, medium business, multi-dwelling units, small business, SOHO and telecommuters, and mass residential) through time. Wireless connectivity is important in developing nations where wired infrastructure is poor or does not reach rural areas.

I was surprised by the high level of interest in Venezuela in open-source software. This emphasis is explained by the importance of open-source software on the Internet with programs like the Linux operating system, Apache Web server, and Perl interpreters for Web scripting. Eric Raymond, who was instrumental in convincing Netscape to open the source code for their Navigator browser, was an invited speaker. He is a proponent of open-source software, citing efficiency in debugging and adding features. His (strong) viewpoint is expressed in a paper entitled the "Cathedral and the Bazaar" located at <http://sagan.earthspace.net/~esr/writings/cathedral-bazaar/cathedral-bazaar.txt>.

I also gave an invited talk on the tracking of the global diffusion of the Internet. There are many organizations tracking Internet diffusion. Some of these track one aspect of the Net (like the number of hosts registered in each domain) and others go into greater depth in a more limited geographic or topical area. This presentation surveyed

these organizations and projects, and presented my own work which seeks to be global in geographic scope, but tracks six dimensions of Internet diffusion. For more on this topic, see <http://som.csudh.edu/fac/lpress/gdiff/>.

The Internet is an important topic throughout the world, in all nations. Conferences like Visionarios are increasingly common in developed and developing nations, and they provide an interesting perspective for a visiting American.

**And for more to in-depth coverage of Networld/Interop 98,
be sure to have a look at CAN #426.....**

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