CONFERENCE ANALYSIS

NETWORLD + INTEROP
**Part 2: Customer Support and
Community Building**

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Reported by Larry Press

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Introduction

This is the second of two issues on Networld+Interop (N+I). The previous issue covered keynote talks that emphasized the convergence of data and telephone networks and highlighted related sessions and products. This issue presents keynotes that focused on the importance of using the Internet to support relationships with customers, suppliers and other electronic commerce stakeholders. Supporting and creating such relationships is not a new idea; networking pioneer J.C.R. Licklider wrote of the emergence of communities of common interest, as opposed to communities of common location, in the early 1960s, and his words ring true to those attempting to create communities among their customers and business partners. The keynotes of Michael Dell of Dell Computer and Eric Schmidt of Novell stressed customer support and relationships. The final N+I keynote speaker, Charles Wang of Computer Associates, spoke of the company's new technology and its philanthropy.

This issue covers several conference sessions, including one squarely centered on support: Automating Customer Support with Self-Service. As telephone and data networks converge, corporate call center and support requests coming over the network have to be dealt with promptly and uniformly. Two keynote speakers, Michael Dell and William Esrey (see part I of issue 448) suggested that companies outsource their networks in order to concentrate on strategic issues and value addition. This issue covers a very practical session on considerations in outsourcing the development and hosting of Web applications. We also report on sessions devoted to hot topics on today's IT radar screen: public software, storage area networks (see part I of issue 448), and XML (extensible markup language). The session floor displayed emerging products for wireless local area netowrks (LANs) and extranets, and 3Com Corporation gave a briefing on its wireless product plans.

Keynote 1: Building the Infrastructure for the 21st Century

Michael Dell, Chairman and CEO, Dell Computer

Michael Dell began with a short description of the success of his company: Dell is the number-one supplier of desktop computers to U.S. businesses and number-two supplier of servers globally. Its global revenue is $18.2 billion. It became a Fortune 100 company in fewer than 15 years and has averaged 54% annual growth for the last 10 years. Ziff-Davis Market Intelligence just ranked computer system vendors serving U.S. businesses with over 500 employees and found Dell number one by far.

Mr. Dell did not dwell on past success, but on the future, emphasizing Internet commerce, often using Dell as a case study. Dell has always based its business on direct customer sales and support. Customer contact and information, and information about their needs and desires are strategic to Dell, making the Internet an excellent tool for achieving this. It is integrating manufacturing, delivery, service and support on the Internet, and its daily Internet sales now exceeds $14 million, accounting for about 25 percent of its revenue. While this is impressive, it is just a beginning. There are expected to be 200 million Internet users this year. Internet commerce will grow rapidly, and we are moving from dial-up telephone to always-on high-bandwidth connectivity. Mr. Dell quoted the following figures from an IDC market forecast of Internet commerce:

IDC Internet Commerce Market Forecast

	1998	2003
Business to Consumer	$15 billion	$1,118 billion
Business to Business	$35 billion	$182 billion

A consumer or a business is now able to consider a much wider variety of alternatives in making purchases, and information is replacing physical assets. For example, if Dell had perfect customer-demand information, it could eliminate inventory. As it is, Dell has cut inventory from 30 to 40 days to six days over the last five years. Virtual integration, in

which collaborating companies do what they do best, is also facilitated by network connectivity.

Mr. Dell spoke of the company's Premier Pages in which it creates custom Web sites for its customers. The goal is for these tailored sites to bring together all the information a customer needs in its interaction with Dell. It began with 2,500 Premier Sites in the first quarter 1998 and expects to have 15,000 by the end of 1999.

Dell also stressed online support, making all of its internal knowledge bases, expert systems, diagnostic tools, discussion forums and upgrade libraries available over the Internet. Twenty-five percent of its support incidents occur on line. Dell receives about 50,000 support-related e-mails per month and serves 160,000 file downloads for updates. It also responds to 100,000 order status requests via e-mail each week.

Dell Computer's is the world's largest Internet commerce site using Windows NT. The traffic has multiplied 11 times during the last three years (revenue has grown 14 times). It has 100 terabytes of data on 350 Dell servers in four data centers on three continents and handles 2.5 million visitors who spend $100 million each week. Up time is between 99.999% and 99.9999%.

Dell uses the same products it sells, and it works with alliance partners to provide software for complex server environments. Drawing on the company's experience with this large Web site, Mr. Dell feels it has an excellent opportunity to become dominant in the high-end server market. It will offer 64-bit products, 8-way processors, scalable cluster systems, storage area networks, Unix-based systems, etc. He feels the Internet-based direct business model will work well at the high end, giving the company a competitive edge over IBM, Compaq and others while cutting costs and deepening customer relationships.

Dell Computer is moving to customer-specific online "stores." The customer will control policy decisions regarding standard configurations and supported hardware and software that are to be offered their employees. The Dell site will enforce customer authorization and workflow policies. And support will be tailored to the customer's installed base and requirements.

Mr. Dell and an associate demonstrated Dell's new Premier Commerce sites. The end user sees only the configurations, options and prices that apply to his or her company. (Thirty-five thousand non-Dell products can also be optionally included.) The look and feel is similar to that of its retail site (www.dell.com), but once a purchase is requested, the system does not ask for a credit card, rather it routes the requisition to the appropriate manager in the user's company for approval. The system also incorporates the customer's purchasing and internal billing procedures. Dell expects the system to save time, money and data-entry errors. It also makes online purchase history data available for customer management. A customer can see summary data or drill down to the level of the individual purchase order.

On the support side, the customer can retrieve the original configuration, current warranty status, installed drivers and utilities, and Year 2000 compliance for any machine. All Dell help desk tools, and animated simulations of upgrade and maintenance procedures are also online. The next step is the automation of receivables and payables. Dell will soon begin working on integration between its system and its customer's ERP systems. Dell shapes its IT strategy to support customer interfaces. It always thinks of rolling out a new system internally, then putting it on the Web two or three months later. The boundary between Dell and its customer's organizations is blurring.

The Internet is the first point of contact for every Dell customer. Its Web strategy is its company strategy. This has not caused problems with its direct sales force. Rather, the sales team is now doing higher level, presumably more lucrative, tasks. Dell's goal is to have 50% of its business online within the next few years. Eventually that may go as high as 70 percent or even 100 percent.

Keynote 2: Building Relationships: The Next Internet Wave

Dr. Eric Schmidt, Chairman and CEO, Novell Inc.

Schmidt began by recapping Novell's progress during the year, including the integration of Netware and the Novell Directory Service (NDS) with IBM hosts, Lucent PBXs and Microsoft

Windows NT. He mentioned that Novell's Groupwise collaboration suite has 17 million installed seats and is growing very quickly. Novell is also the largest seller of IP caching software. The Netware 5 upgrade is one of the fastest in industry history. (He did say Novell was having trouble upgrading one Netware 2 customer whose server has been running continuously for nine years.) It would seem that Novell's slide has been stopped, but it is still in a very competitive market.

Schmidt outlined two "waves" of networking. The first wave concentrated on expanding connectivity, and it peaked in June 1995 with the Netscape IPO and the launch of Java. The second wave is concerned with relationships and is defined around fixing the scaling and explosive growth problems of the first wave's "success disaster." Establishing relationships requires personal profiles, identity control, directories and trust. Crime and security are also serious issues.

The hookup and infrastructure wave was driven by Metcalfe's Law, which stated that the utility of a network is proportional to the square of the number of people on it. For the second wave, it is the square of the number of identities you manage that determines the value of the network. Schmidt gave eBay as an example of a company that manages (brokers) relationships. Transaction-based sites are ephemeral because it is easy to click away to another site, but relationship-based sites will grow constantly stronger, he said.

First-wave companies spoke of site visits and hits, but second-wave companies will talk about how many customer profiles they have and manage, according to Schmidt. Novell is focusing on directory services because the second wave will be characterized by the need to manage huge numbers of customer profiles, along with profiles of users, routers/switch ports, client devices and other objects. The importance of customer profiles and relationships is indicated by a new class of company in this arena, called "infomediaries." (For more on infomediaries, see *Net Worth: Shaping Markets When Customers Make the Rules* by John Hagel and Marc Singer, Harvard Business School Press, 1999.) Their importance is also indicated by the number of companies offering free products, services and other incentives for user-profile registration. If you can get a new PC for your profile, it must be worth around $500.

As Herbert Simon pointed out, we are in an attention economy. Information consumes the attention of its recipients — a wealth of information creates a poverty of attention. One hundred years ago, people anxiously awaited the arrival of the Sears catalog. Twenty years ago, they still read advertisements. Today we are inundated by people vying for our attention. Will we end up with one huge store or many small ones? What will happen when there are 10 amazon.coms? Schmidt feels they will compete on customer service, branding and support — the management of their relationships.

Schmidt said the Internet is as taken for granted by today's teenager as television or radio or newspapers were by earlier generations. He sees the move to a wired economy and culture as inevitable, noting that the defining document of this presidency, the Starr Report, was first distributed on the Internet.

Schmidt made several concrete predictions. Security architectures and VPNs will be available in the future; XML will be used for augmentation of HTML and for data interchange; packet-switched telephony will win over circuit-switched; naming taxonomies will appear; and public key infrastructure systems will only succeed if they are easy to use. The future will see complex applications on the server and complete mobility for the user. The Internet, as he envisions it, will support business and personal communities, and on the commercial side, you will be a "mass market of one."

If a company is to address and service you as a unique individual, your identity and your profile must be reliably linked in order to establish the trust on which the next wave will depend. Schmidt stated that 2 percent of Visa card transactions are fraudulent. That would be intolerable on the Internet. A digital passport will have to travel with you in cyberspace. Without a directory, you cannot use, trust or manage your network. Once we establish this layer of the network, he said, applications will explode, creating our second wave.

According to Schmidt, last Christmas was the last one when a retailer did not have to have a Web presence. Forty percent of Americans bought something on line, and IDC predicts there will be 700 million Web devices in 2003. On-line travel sales will exceed PC purchases this year. A trusted, self-service model must work if we are to scale up so quickly.

E-commerce is about building connections between you and your suppliers and customers. Doing that requires content provision and management, quality of service, security, faster networks (bandwidth and caching), manageability of the network (decentralize for scalability and centralize for control), and profile management (customer relationships).

Novell's product line addresses many of these issues, and Schmidt and three colleagues demonstrated a key product, NDS. The demonstration showed a new employee being entered into a PeopleSoft human resources application. Information was automatically placed in his NDS record and his network account was created. Next, Novell Zen Works installed the computer applications he would be using. His Lotus Notes user ID and setup was also completed automatically. NDS works with many software packages and operating systems, and Novell is constantly adding new interoperability. The new user's desktop was also available using a Web browser.

The demo was based on NDS version 8, which had just been released. This version of NDS scales to 1 billion objects, and Schmidt and his colleague demonstrated it with a 100 million object database. They also demonstrated a transparent caching appliance, a small box that sits in front of a router. It was nearly plug and play, requiring only a little bit of configuration setting using a browser.

Schmidt concluded by discussing trust and identity. He showed a screen shot of a technology called "digital me," which will be on the Internet in June. You have a "card" with your personal information that you can copy and send to others. You can have different versions of your card for different communities — friends, family, customers, co-workers, etc. You have many different identities. This will be your personal wallet or passport. You will carry your credentials and authentication information with you to a Web site. You control your own identity information. Novell has evolved from local directories to network directories to cross platform directories to open, scalable directories. This lays the groundwork for personal identity management, and Novell plans to turn its attention to community identity next. The new rules of networking are the same as the old rules. The era of proprietary systems is over. We are entering a new era where no one is dominant, but all contribute, and there is room for many winning companies, said Schmidt.

When several audience questions centered on Novell vs. NT, Schmidt said he feels they fill different roles. NT should be used as an application server and Netware for file, print and directory service. He stated that he would rather have great products and poor marketing than the opposite. And he said that Novell has to fight Microsoft's image as a safe purchase (it is the IBM of the 90s). Dr. Schmidt bristled at a question regarding NDS adoption and Novell's strategy for competing with Microsoft Active Directory when it ships. There are approximately 40 million NDS users, and he suggested that the questioner ask Microsoft what its strategy was since Novell is the clear leader. (One wonders what would have happened had Microsoft rolled out Active Directory as a Windows NT version 4 upgrade.) Schmidt also committed to interoperability with Active Directory and others that appear. (There will surely be other, competing directory servers, for example from IBM and AT&T.)

Keynote 3: From Data to Knowledge

Charles B. Wang, Chairman and CEO, Computer Associates

Wang talked about the ways IT can help businesses compete and grow. He began by distinguishing between data, information and knowledge. To illustrate this distinction, Wang gave the example of an airplane. He said that all of the specifications of each part in an airplane would be data, a three-dimensional model of the plane would be information, and knowing how to use the plane to gain a competitive advantage would be knowledge. He would like to see IT move up this hierarchy, being used for "knowledge," not just for processing data and info.

Data exists in a myriad of places, many off the network. On the network, data is in many incompatible formats. Technology to find information and knowledge in this sea of diverse data must be open and rapidly changing. Artificial intelligence must be used to mine the data, seeking to infer interesting relationships and make predictions. The results must also be presented in an intuitive manner. As such, Computer Associates has acquired two companies, one with a neural network inference engine and the other with three-

dimensional animation and rendering capability. Wang showed a video compendium of the work of the latter. It consisted of short outakes from commercials and other animation the company had produced.

Computer Associates' products will increasingly use neural nets and creative graphical interfaces to present results, according to Wang. These have already been incorporated into its database and network management tools. For example, the latter will now predict server crashes.

Wang also described Computer Associates' philanthropic work. It has established a Web site for the recovery of missing children. He showed an example of the software used on photos of children to simulate the effect of aging, and he described a success story. Computer Associates missing children Web sites are now going international, beginning with Brazil and the Netherlands. The company also funds a program to correct cleft pallets, harelips and other cosmetic congenital birth defects. In addition to funding surgery, Computer Associates trains surgeons using computer-based training.

This talk felt a bit like institutional advertising, as if Computer Associates wanted to be sure the audience knew that it was not a legacy system company, but a player in the Web-enabled Internet arena. This was revealed both in the content and in Wang's quips about being 39 years old and blue bar paper.

Session 1: Automating Customer Support With Self-Service

Greg Stack, Senior Vice President, Technology Solutions Company
Paul Anderson, Independent Consultant and Writer
Pat Howard, CEO, SoundLogic

Your marketing department put up a Web site with an e-mail address for further information and a short form for customers to fill in if they would like someone to call them, and you received 407 e-mail queries and 46 call requests during the first 24 hours it was up. But

the marketing department may not have anticipated the heavy response and may not have put people and procedures in place to answer the questions. You need to think about who will answer the incoming questions? Will the answers to a question get the same answer via e-mail as via telephone? How long does the customer expect to wait for a phone call? How will the processing of this new inquiry source be coordinated with your current voice response, fax and automatic call distribution systems?

Automatic processing of customer queries calls to mind unsavory images such as listening to Musak during long waits on hold, pressing endless trees of telephone keys to get to an irrelevant recording, and having dinner interrupted by unsolicited phone calls, but this is a fast-growing area, and your telephone, fax, and Internet systems will have to be integrated. This integration has been reflected in acquisitions of call processing companies by industry leaders such as Cisco and Lucent. Rather than thinking of automated customer-response systems as slightly shady cost centers, we should think of them as a means of serving and retaining good customers.

The first speaker of this session, Greg Stack, pointed out that with the growth of the Internet and its integration with the phone system, the number of transactions between customers and organizations will grow dramatically. Processing messages is costly — processing a phone call is $4 to $7 per contact. An automated voice response costs between $.1 and $1. An automated Web or e-mail response is around $.25, but human intervention raises the cost to as much as $10 — but not processing them promptly and well causes customer defection and even hostility. It is much cheaper to retain a customer than to find a new one.

Coping with increased traffic will require either more people or more automation and efficiency in processing. Stack predicts we will have customer and query history databases and rule-based systems utilizing natural language understanding and other techniques. The problem is multidimensional — multiple sources of customer input must be routed to the appropriate person or automated agent within the organization. Customer data and history must also be available to the person or program handling the query.

Many companies have a collection of separate legacy systems for call centers, voice response units, fax, Web forms, mail and e-mail. We must begin moving toward a rule-based system in which all data is shared in a middle tier between input sources and the resources that handle them, said Stack. The rules should consider the value of the customer (has he or she bought little/much recently, etc.), the situation (complaint, product query, etc.), the customer's preferences (e-mail, telephone, etc.) and recent contact history. The rules can be developed using data mining techniques, which may be able to identify characteristics leading to customer defection or loyalty. Only complex transactions from good customers would be handled by people.

Stack's company has a methodology for achieving this sort of integration. He presented data showing that companies with good service enjoy increased sales growth, market share, and return on equity and sales (though he did not describe the study leading to these results). The goal is to create loyal customers who are susceptible to cross-selling.

Paul Anderson began with a slide that listed 38 technologies — from IP telephony and speech recognition to telephone headsets and telephone dialers. He then went through seven platform models, giving contact information on companies that had products in each area. These were:

➙ PBX-based automated call distributor (ACD)

➙ PC as a PBX and ACD

➙ large ACD

➙ small- and mid-sized ACD

➙ telephony servers

➙ voice/data switches

➙ ATM PBXs

He followed this with a brief explanation of each of the 38 technologies on his opening slide, with contact information for relevant companies. This was quite valuable, but too long to reproduce here. Those interested in further detail should contact Anderson at www.digitalcallcenter.com.

Pat Howard gave a short talk in which he stressed strategic and management issues. He does not like the term "automate," because automatic systems should only be used when they can offer better service than human response. The goal should not be to reduce labor cost, and one should not push the technology to do all that it can do. One must always focus on the customer and the customer experience.

Time to market is a key consideration, because you are trying to differentiate yourself from your competitors. He recommends the strategy of not doing much, of selecting one or two thin applications and starting right away. Picking the "optimal" system and implementing a comprehensive solution may cause you to fall behind, and you will not be learning. Consider relatively few alternative vendors. Just go with your current value-added resellers (VARs) and vendors if they are satisfactory because that will save time. The same goes for hardware and operating systems. You should also keep your legacy systems intact, and increase the quality of your manned service at the same time as you install automated systems.

The bottom line is that Howard would suggest that time to market is the key issue, so you should move quickly. Do not get lost in technical details. Decide what constraints you wish to impose upon the system, for example, how long you are willing to have a customer wait on hold, and start a pilot system, listen to customer feedback, adjust the system and pilot again. He advises that one learn and change in action, not in contemplation.

Session 2: Considerations of Web Applications Outsourcing

Malcolm Mead, The Mead Group, Inc.

Faye Horowitz, Organic Online

Diane Andolesek, The Experience Music Project

This session was moderated by Malcolm Mead, a Web development consultant to a number of large corporate clients. Mead represented the outsourcing vendor's point of view. Diane Andolesek is responsible for a major Web site, and is an outsourcing client. Faye Horowitz began as a Web client and is now with a consulting firm — in fact, representing

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both points of view. The format was a shared presentation between Horowitz and Andolesek, with Mead as a commentator. Their focus was on complex, data-driven Web sites, not on the outsourcing of graphics and simple HTML for static Web pages. They also emphasized development more than hosting.

Horowitz began by stating reasons to outsource development. An organization may not have the time or budget to hire and train people with the necessary technical skills to implement an application. Even if you have skilled workers, they may be committed to other projects. An outsourcing vendor may have people with appropriate skills and might also be able to remain above the political battles within your organization. The consulting firm will be able to scale up or down to meet your needs over time. For example, a project may only require one month of a C++ programmer's time to develop a few COM objects.

Options for outsourcing hosting range from a server "hotel," where you are responsible for the server, to a complete application hosting service. Software, equipment and bandwidth costs are fairly easy to estimate and predict. Configuration and development is more difficult and must be carefully specified.

Horowitz offered some outsourcing tips:

➝ Don't think this is a short-term relationship. If you are uncomfortable with the vendor, get out as soon as possible.

➝ Don't rely on the vendor to generate the specification, and don't start coding until you have a detailed specification and a signed contract.

➝ Don't expect the vendor to take this project as seriously as you do. Your job is on the line, not the vendor's.

➝ Whether you or the vendor does it, maintenance may easily be twice the cost of development.

➝ Technicians are not project managers — and vice versa. The vendor should have both on your project team.

Andolesek outlined five phases of outsourcing: search for a vendor, preproduction, production, post-production and maintenance. The entire panel then discussed these stages.

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The search for a vendor begins with a brief scope-of-work document, which is used to develop a detailed request for proposal (RFP) covering the project schedule, deliverables, protocols for submission and estimate of charges. The RFP should not be shopped around on a shotgun basis, but sent only to firms whose work you have seen or heard about. You should make preliminary contact before sending them the RFP. Once you receive proposals, check references thoroughly, but take them with a grain of salt. You should also research the middleware tools they are planning to use. Contact and visit the tool vendor and other companies using their tools.

Make sure the vendor has done projects as large and complex as yours. Visit its office to see the facilities, tools and working relationships. Remember that you are entering into a long-term relationship. Be sure to meet the entire team that will actually be working on your project, and consider the possibility that some of them will be leaving in the near future. Note that the vendor will fish to see what you can spend — keep your cards close to your vest. The client has the upper hand at this stage of the negotiations.

During the preproduction phase, you will develop a detailed specification and schedule, clear definition of terms of acceptance, an understanding on non-disclosure and ownership of the code (be sure you own any third-party libraries used in your system) and other intellectual property, and a signed contract.

The initial version of the specification, with an emphasis on functionality and goals, should be provided by the client. It should include the primary target audience, overall business and strategic objectives, system architecture, measurable results, requirements for portability and scalability, and expectations for maintenance staffing and cost. The vendor will respond with technical details, and there may be several iterations, but the client should remain in control of the specification.

The schedule should reflect the specification. There should be regular milestones and client reviews, a realistic completion date, and a detailed statement of staffing during each phase of the project. It should not have large blocks of time and tasks, but many detailed steps. The schedule and project staffing plan should be reviewed by a trusted outsider, if possible.

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You should not begin production without a signed contract; however, interim agreements — a letter of intent and a statement of work — may be used to get the project started. Incentives for early completion and penalties for late completion should be included in the contract.

Clients must remain involved and in control during the production phase. They must deliver any information or other assets when the vendor needs it, and review intermediate results thoroughly and quickly. It must be clear who has to sign off on all milestones and intermediate results. Intermediate deliverables can include database schemas, forms and documentation as well as running code. You should be clear as to the state of the project and schedule at all times, and require proof of functionality on intermediate deliverables. Again, an outside evaluator can be helpful.

Post-production involves testing. Does the application work and look the way you thought it would? Does it meet performance guarantees? Test it on all platforms. Make sure it not only does what you want it to, but that it does not do things you do not want it to do. The tester should not be a member of the development team. Extensive documentation and training on both system operation and internals should also be delivered. (What sort of documentation would you expect with a $100,000 package?) There should be a postmortem meeting with the vendor to clarify what went well and what went wrong.

Maintenance begins the day the site is launched. The contract should provide for free support and a bug-fix guarantee for a period of time after production begins. Ongoing maintenance should also be covered in the initial contract. It should also state the degree of assistance to be provided if you decide to terminate the maintenance contract, and either transfer to another vendor or take the project in-house. The client had the upper hand during early negotiations, but the vendor has the upper hand at this point, and a large vendor will be more independent during maintenance than a small one.

Mead concluded with a brief discussion of the possibility of eventually bringing the application in-house. In that case, look for people with skill sets comparable to those of the

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people who have been working on your application. The same goes for changing vendors — look for comparable skills and be sensitive to the issues that were problematic between you and the initial vendor. Mead feels there will be a trend toward outsourcing of hosting, but said you should own the machines so you can more easily change vendors if necessary. Having a vendor host your application on their machine will work for a ramp up or trial, but is not a good long-run solution. If you outsource both development and hosting, it is good to have separate vendors for each to reduce dependency on one vendor.

There was considerable experience with outsourcing of Web development and hosting on this panel. One is left with the feeling that outsourcing is not a quick fix. More attention and management are needed for outsourced applications than those developed in-house because of the sometimes conflicting interests of the two organizations and communication slowdowns that may be caused by different assumptions and distance. One should not underestimate the cost of managing the process from vendor selection through maintenance. As Jakob Nielsen, expert in usability and human-computer interfaces, has pointed out (www.useit.com/alertbox/980628.html), Web applications may be strategic to an organization, and there is risk in outsourcing their development (less so for hosting).

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Session 3: When Is Public Software Good Enough

David Beckmeyer, CTO, Earthlink

Greg Olson, President and CEO, Sendmail, Inc.

Tim O'Reilly, CEO, O'Reilly Associates

An open-source operating system, Linux, is challenging Microsoft NT. Large companies have invested in Red Hat and Caldera, purveyors of Linux. IBM, Oracle and other major companies have Linux versions of their software. Dell will install it on your new server, and it is gaining share as a server operating system. Because of Linux, we tend to see open source software as the scrappy contender, which might unseat Microsoft.

But, O'Reilly noted, in the network world, the situation is reversed. The Internet is built on

the back of open-source software from the original TCP/IP protocol stack, DNS server, e-mail server, Web client, Web server, Perl interpreter, etc. The question is not whether open source will catch up, but whether it will maintain its lead in these areas. Take Sendmail for example. It is the dominant e-mail server on the Internet. In August, 1998, it ran on 78.1% of all Internet mail servers.

Sendmail evolved in typical open, Internet style for over 18 years, but over a year ago, Sendmail author Eric Allman and Greg Olson founded Sendmail, Inc., a commercial venture. Their business model is based on two versions. The commercially supported version is geared toward the Internet service provider (ISP) and large corporate and government customer. Smaller customers, universities, the developer community and people in developing nations typically work with the open-source version, which the Sendmail Consortium (www.sendmail.org), an open community of users and developers, supports. Sendmail has enhanced the commercial version for ease of management, installation and configuration, and has provided technical support and training. The two products are synergistic. The first release of new versions is always open source, and new features move between the two. They are now devoting four times more programming resources to the open-source version than it was a year ago.

Beckmeyer is from a large ISP. Since Sendmail and other Internet software is mission-critical to Earthlink, it considers source ownership as mandatory. When Earthlink began, only open-source software was available. Earthlink found that in order to achieve redundancy for reliability and rapid growth, it had to make changes and extensions to the software. Some of those have been fed back to the open-source community, others have not. This is a business decision. Earthlink balances the advantages of remaining standard and gaining the expertise and support of the Sendmail Consortium against the drawback of having to make its extensions available to competitors.

O'Reilly pointed out that open-source software plays a role in keeping standards open. If, say, Microsoft Exchange replaced Sendmail as the dominant e-mail server, would open standards such as SMTP continue to be viable? If it were not for Apache, would Microsoft

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and Netscape have taken over the HTTP standard? If companies follow their own interest, open source and open standards may erode, creating a software tragedy of the commons, according to O'Reilly.

O'Reilly also suggested that the Linux community is "fighting the last war" in trying to develop desktop applications while the next war is electronic commerce. However, one wonders whether electronic commerce can attract the sort of community interest and excitement needed for a successful open source project. A program must also be well designed, with cleanly partitioned modules if it is to catch on with an open source community.

Linux and Apache are free; and books, an expert community, and other support material are available. The same goes for Perl — there are many application libraries. Companies working with networked applications (are there any that are not?) should at least consider using open source software. For more discussion on the topic, see www.opensource.org.

Session 4: What to Look for When Implementing SANs

Doug Fierro, Manager, Network Solutions, EMC Corporation

Jeff Vogel, Vice President of Marketing and Systems Integration, McData Corporation

Kevin Collins, Project Manager, SAN Management, HP Open View

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Doug Fierro began with four admonitions:

➙ Think heterogeneous — plan in advance for heterogeneous networks.

➙ Test full interoperability

➙ Centralize management functions — there should be one point of control for the entire installation

➙ Develop strategic partnerships within the industry and between customers and suppliers

To illustrate heterogeneity, he showed a typical installation with a broad mix of servers, server clusters, mainframes, disks, RAID arrays and tapes from 19 manufacturers. The storage devices (disk and tape) were attached to specific machines. They also used several operating systems, each with different backup software. The goal is to place all that storage

in a conceptual "cloud" that can be accessed by any server, with centralized management. There should be a single point for disaster recovery and backup and restore. The cloud acts as a unified, scalable resource for the entire environment.

The storage management problem is severe today, but it will be exacerbated by rapid growth in the future. IDC projects 12 to 15 times growth in installed multiuser terabytes from 1998 to 2002. That translates into around 300 terabytes installed in the average Fortune 500 company. Unix and NT will account for the bulk of that growth, and that is where most of the SAN focus has been.

SANs use the same sort of networking technology as other IP networks. They are composed of switches, hubs, bridges and storage devices connected over Fibre Channel. The Fibre Channel standards have not been set in stone, so adapter cards and drivers have been under development for several years. Lone wolf vendors will not succeed — they need partnerships to ensure integration and interoperability. Standards committees and associations are important, and there is a Fibre Alliance, which focuses on integration and interoperability. The goal is to drive things into official standards. The SAN must also be secure.

Jeff Vogel began with a list of customer requirements including storage consolidation, manageability, cost savings, scalability, data sharing among machines, simplified backup and recovery, faster access times and zero downtime. The starting point is understanding your applications and having appropriate expectations, including those for availability. Downtime is a bottom-line expense, and zero down time is achievable. He agreed that while there are now many vendors, plug and play claims must still be verified because Fibre Channel standards are still evolving. The industry has spent several years and a lot of money building host adapters and drivers.

A typical installation requires:
➥ Host adapters and drivers
➥ RAID arrays and controllers

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→ Network devices

→ Tape and disk drives

→ Cabling

→ Storage management tools

→ System integration and testing

→ Customer service and support

You should start with the goal of consolidation, of replacing SCSI. He again emphasized the need to test host adapters and drivers — it is clear that this has been a problem in the past, and one should not assume that it has been solved. An experienced consultant or internal team is helpful.

Networking storage is a paradigm shift, and vendors are refranchising. They are making large investments in training, and users will have to do the same. Ask vendors about training, and make that a consideration in evaluating proposals.

Vogel described several early adopter success stories. His own company has moved its SAP/R3 system to a SAN that EMC supplied. Four Sun database and application servers share the SAN. Another early adopter is R.L. Polk, a 130 year-old company, with a DMV-driven database of information on over 200 million automobiles in North America. It has concentrated on serving automobile companies in the past, but are now branching out. Its goal is 50% annual growth, and it expects to have 122 terabytes of storage in three years. Storage is a strategic resource for Polk, and its entire operation has been converted to a SAN using back-end equipment from two vendors to serve a mix of Sun, Silicon Graphics and Dell machines. Another example was a telecommunication company which has Compaq and Sun machines using a SAN for billing. Another was Crossland Mortgage, which began by tying 16 Compaq NT servers into a SAN as a first step before migrating over 100 servers. These companies are running a variety of applications using SQL-server, Oracle, SAP and other software.

Collins also feels SANs have the potential to improve manageability, availability, disaster recovery time, media management and performance while accommodating rapid growth

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and cutting cost and head count. He envisions a gradual migration of storage and storage management from workgroups to a central location behind the "glass wall." It cannot be done over night because organizational change and training are necessary — you may need fewer LAN administrators and more people in the data center.

He sees deployment in three, increasingly complex phases. The first is a small proof of concept. Start with a simple, homogeneous configuration. Focus on data sharing and getting backup traffic off the LAN and on being able to manage and monitor servers, storage and interconnect devices from a central console. In phase two you will move to finer-grained management control, some integration of SAN and general network management (the elements are the same — managing topology, events, assets, problem resolution, etc.), and some support of multiple operating systems and devices. In the third phase, move to policy-based SAN management with service-level goals and agreements; automatic response to external events; automatic load balancing across the SAN; increased integration of SAN and network management; and full, heterogeneous interoperability. This sounded like a phased plan for industry evolution as well as for users. Neither users nor the industry are ready for the third phase, yet.

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Collins outlined several increasingly complex architectures, beginning with bridges and moving to hubs, switches, and redundant networks for reliability. Gateways to remote sites are another option, getting beyond the 10 kilometer Fibre Channel limitation and enabling extremely remote backups. Eventually you are shooting for an environment in which you have a pool of all the organization's pool of storage, accessible from anywhere.

Collins reiterated the need for standards for data access methods, data content, and policies. He mentioned the Storage Networking Industry Association (www.snia.org) in addition to the 20-company FibreAlliance (www.FibreAlliance.com). Sun is also leading Project StoreX, a 14-company standardization effort based on Java. While this standards effort proceeds, rollout is beginning. He concluded by mentioning several examples of successful early systems ranging from 1 to 2.5 terabytes.

Have you implemented a SAN in your organization? Do not feel bad if you have not, because the feeling after watching this panel was that they are just becoming ready for prime time, just emerging from slideware to early adaptability. The success stories we heard were compelling, but between the lines it was clear that there have been quite a few interoperability-failure horror stories as well. The requirements that SANs hope to address are clearly important today and will be more so tomorrow. These requirements are part of what may be a growing general trend to centralization for all the reasons mentioned in this session. SAN developments should be watched, but do not expect fully interoperable, multivendor solutions any time soon.

Session 5: The State of the XML Industry: In Perspective

Parand Tony Darugar, Binary Evolution Inc.

Darugar described XML, the extensible markup language, and discussed its motivation and application.

HTML is a set of tags for specifying the way a document will appear when it is rendered by a Web client or browser. It evolves slowly, and is controlled by standards committees and software companies. XML is a system for defining new sets of tags that are appropriate for your application. It does not define a tag set; it is a system for defining tag sets. In other words, XML lets you make up a custom tag set that is appropriate to your application, whereas HTML is a set of given tags. XML is a compatible subset of SGML, the Standard Generalized Markup Language, which has been used in publishing and other industries for many years.

Darugar used a stock quote as an example of a simple XML document:

```
<stock-quote market="NYSE">
    <symbol>BINE</symbol>
    <price type="ask" value="125.6875"/>
    <when>
       <date>3/15/1999</date>
```

```
    <time>4:01PM</time>
  </when>
  <change>+5.3</change>
  <volume>5412400</volume>
</stock-quote>
```

The example uses tags with attributes, like HTML, but, unlike HTML, the tags make the structure or meaning of the document explicit. For example, we see that the characters 125.6875 specify the stock price. Unlike HTML, all tags must have a beginning and end and be properly nested.

But how do we know "price" is a valid tag? A Document Type Definition (DTD) defines the tags used in the document, what their order must be, and what their nesting rules are. It is a grammar for a class of documents, like a Backus-Naur Form definition of a programming language. The following DTD defines the tags used in Darugar's

example:

```
<!ELEMENT stock-quote (symbol, price+, when) >
 <!ATTLIST stock-quote market (NYSE|NASD|AMEX) "NYSE">
<!ELEMENT symbol (#PCDATA) >
<!ELEMENT price (#PCDATA) >
 <!ATTLIST price
      type  (ask|bid)   "ask"
      value CDATA       #IMPLIED
 >
<!ELEMENT when (date, time) >
<!ELEMENT date (#PCDATA) >
<!ELEMENT time (#PCDATA) >
```

An organization can define a DTD for internal applications or two or more parties may agree on a common DTD and use it for data exchange. The DTD also allows a program to automatically check the validity of a corresponding XML document. Unlike SGML, the DTD

is optional in XML. Without it, the application is responsible for checking validity, though the parser can still check for proper tag balancing and nesting. XML also drops the SGML restriction that the entire document be defined.

Since XML does not contain display information, there is a style sheet standard (Extensible Style sheet Language, XSL), which allows one to define display characteristics for XML documents. You can define the way each tag should be rendered as well as manipulate the document, for example, reordering elements.

If you have HTML applications in which the data is structured, XML can be used as a replacement. That would enable programs to find specific data within a document, and there are already XML parsers for most programming languages to simplify this task. XML can also facilitate data interchange. For example, if all of the recipes on the Internet used the same DTD, it would be easy to retrieve them and isolate the ingredient lists. Darugar cited examples of interchange in various scientific and commercial applications, spending the most time on OpenMLS, a format for real estate data exchange in XML (www.openmls.com).

Internet Explorer 5.0 supports XML and XSL, and so will the next version of the Netscape browser. There are also editors, application servers and other tools for XML. We can expect easy-to-use graphical tools in the future. Databases also support XML — data is automatically received into and served from the database as XML. The XML standard is fairly mature today, but XSL is somewhat behind.

Many people have jumped on the XML bandwagon. (Several of the N+I keynote speakers blessed it.) To succeed as an enabler of killer applications, industries and other groups of organizations that must exchange data will have to agree on DTDs. For further information see www.XML.com, www.XMLToday.com, and www.w3.org/XML.

On the Show Floor

Networld+Interop was formed by merging the Networld and Interop Conferences. From its inception, Interop was geared toward demonstrating the interoperability of IP-based products. As such, a show network was set up, and all vendors had to connect to and operate over it. If you could not interoperate, you could not participate. There were also small "hot spots" on the show floor, which were dedicated to interoperability with specific protocols. There were four hot spots this year. We covered two in part I of this issue and cover two here.

The Wireless LAN Interoperability Demo hot spot featured connectivity using the IEEE 802.11 protocol (grouper.ieee.org/groups/802/11/index.html). It was organized by the University of New Hampshire Interoperability Laboratory (www.iol.unh.edu), and featured interoperating products from 15 vendors. The vendors demonstrated radio base stations, which could connect clients up to 200 feet away within a room or building, network interface cards (PCMCIA and expansion bus), and diagnostic devices. At the show, they only ran at 2mb/s, but products for 11mb/s 802.11 products should be out soon. Prices will be considerably higher than twisted pair connections, but wireless convenience and flexibility may justify the difference. The Wireless LAN Alliance (www.wlana.com) is a good source of information.

The Extranet hot spot, demonstrated ten companies products working together to create a secure extranet. No one company is capable of doing it all, so different vendors provided software for secure transmission and commerce, intrusion detection, key management, application, mail and Web service, LDAP directory service, and the centralized distribution, updating and management of software on client machines. Open standards for security and communication were used throughout the hot spot.

I met with 3Com for a briefing on its planned wireless offerings for home and office LANs and in the wide area. It has already introduced Internet-enabled Palm VII for the personal WAN market and a CDMA-telephone gateway for the carrier WAN market. Office LAN

products will be available in Fall 1999 and home LAN products in Winter 1999. Both of these will use IEEE 802.11. Products for "personal area" networking, for example a point-point connection between a portable device and a printer, will be available in Spring 2000. These will use Bluetooth (www.bluetooth.com), a low-cost, low-power 1mb/s technology.

3Com foresees a large wireless market and has reorganized to pull all wireless projects together. It is already a formidable force in the wide-area, LAN hub and switch and personal organizer markets, so it expects to do well here. Its CDMA product was first to market in its class, and the Palm VII product provides Internet connectivity and e-mail for a starting price of $9.99/month. The office LAN product will be full-featured and allow seamless roaming and easy, comprehensive management. It has not yet set the LAN product pricing, and is faced with the dilemma of balancing the prices of the access point and interface cards because if the Ethernet 802.11 standard is successful, customers will be able to mix and match components from different vendors. The home LAN product is being developed jointly with Microsoft and will feature ease of setup and shared Internet access, presumably using the same technology as will be added in the forthcoming Windows 98 upgrade.

Its wireless LAN products will face formidable competition. In the office it will be more convenient than wired products, but it will cost more. Furthermore, since many offices use switched connections and are running at 100mb/s, 11mb/s of shared bandwidth will seem slow. In the home, wireless connectivity will have to compete with twisted pair Ethernet and systems using existing telephone and power wires (3Com will support these as well as wireless). In both cases, 3Com wireless products will be competing against the company's wired products, and in the home, they will be competing against offerings from consumer electronic companies. All that competition will be good for us consumers.

About the Reporter

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