Network Management Enters a

Will XML bring new methods to the data

A paradigm shift—a phrase bandied about by suppliers to illustrate a dramatic change in product design and capabilities—appears to be on the horizon in the network and systems management space. For more than a decade, customers have yearned for tools that would provide them with a cohesive view of all of their network and system elements. Suppliers have tried to fulfill such desires, but the ever-expanding reach of enterprise management and the various ways equipment vendors have used to identify management information largely thwarted those efforts.

Standards were needed, and after several failed attempts to deliver them, there is reason to hope standardization will arrive. A new alternative—one based on World Wide Web technology—is emerging. Just as the Web has dramatically altered the way companies build daily business applications, it has the potential to change the way equipment vendors design their management applications. Rather than be locked into proprietary interfaces that hinder interoperability and increase development costs, suppliers are moving toward

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madness of integrated systems?

NEW MILLENNIUM

by Paul Korzeniowski

Web-based systems that ease integration.

Integrated network and systems management has been an ongoing issue for enterprises. "As networks have become more integral to business operations they have also become larger and more difficult to manage," says Allan Anderson, product manager with Computer Associates International Inc., Islandia, NY. As corporations expanded their network reach beyond branch offices to telecommuters and traveling executives, the number of possible trouble spots doubled and even tripled. Movement away from centralized to distributed processing has increased the number of places where information resides.

Ideally, network managers want their management tools to sift through all of the potential problem spots for them, and not only identify defective equipment, but begin the process of fixing it.

When a problem does occur, a network manager needs to quickly sift through a vast array of potential causes and pinpoint the malfunctioning device. The possibilities are endless, including computers that have stopped working, network bandwidth that has overflowed, servers that have fallen behind the number of transactions they need to process, a wireless connection that has dropped transmissions, a database that has been overrun with complex queries, or a desktop workstation that has been overloaded with too many applications.

Ideally, network managers want their management tools to sift through all of the potential problem spots for them, and not only identify the defective equipment, but begin the process of fixing it. Instead, suppliers have addressed management issues in a piecemeal fashion. For example, one management tool may outline how a desktop computer is functioning, a second gauges how quickly a router processes packets, a third determines if a server has sufficient memory to process graphics files quickly, a fourth examines the health of a wireless connection and a fifth outlines which queries a database management system (DBMS) processes.

The Search for Intergrated Solutions

Underscoring the cost to companies owing to the vast range of management tools available, Dataquest Inc., a San Jose, CA-based market research firm, estimates companies will spend $14.6 billion on management packages this year and that number will grow to $28.8 billion in 2003. Systems management–examining what is happening with desktop computers and servers–represents the largest slice of this space, and Patrol from BMC Software Inc., Houston, TX, OpenView from Hewlett-Packard Co., Palo Alto, CA, Tivoli Management Environment (TME) from Tivoli Systems Inc., Austin, TX, and Unicenter TNG from Computer Associates, are the leading tools (see "Leading System Management Suppliers," Page 59).

Because there are so many tools, pinpointing problems has meant bouncing from application to application, testing each individual component until, eventually, uncovering the problem. This process is inefficient and increases the workload in network control centers, where highly skilled, expensive technicians must wade through potential problem spots.

Aware of the desire among users for integrated management systems, vendors have delivered framework packages. These systems provide open APIs that third parties can use to send management data from their devices to a central location for processing. For instance, within a management framework, a router supplier can transmit information about the health of its devices to a central console to be viewed by a network manager.

Spectrum from Cabletron Systems Inc., Rochester, NH, Computer Associates' Unicenter TNG, HP's OpenView and Tivoli's TME emerged as the leading framework packages, and some companies have used them to integrate both their network management and system data.

For instance, Teranet Land Information Services Ltd., Toronto, Ontario, has 750 employees that provide property information to various federal, municipal and provincial agencies throughout Canada. The company operates an asynchronous transfer mode (ATM) network that ties together 13 locations, a frame relay network that relies on IBM Corp.'s System Network Architecture to link 24 sites and another frame relay network running TCP/IP that connects 49 sites. Users rely on variations of Windows (95/98/NT) to access information stored on IBM mainframes and HP-UX and Windows NT servers.

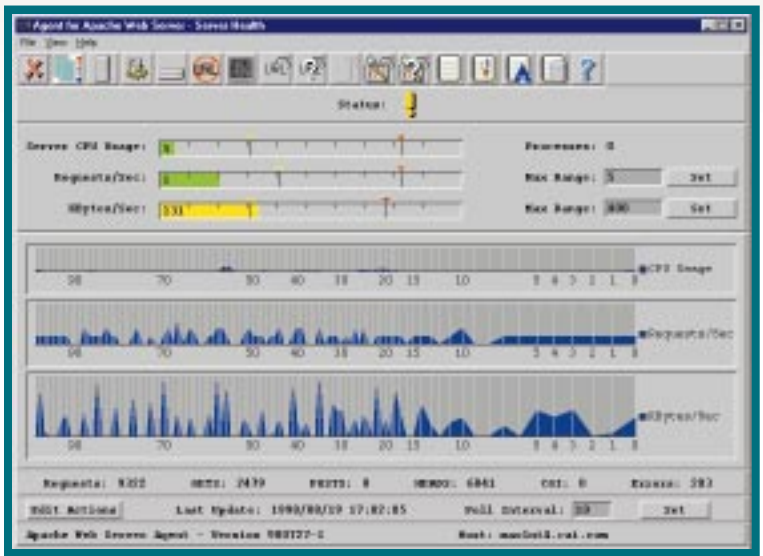
In 1996, Teranet Land Information Services searched for a management framework and selected Cabletron's Spectrum. "We felt the Cabletron package offered a higher level of inte-

Web Alarm View is a browser-based advanced application for the Spectrum Managment framework. Using Cabletron's Inductive Modeling Technology, it centralizes the results of fault-isolation data from anywhere in a network.

gration and more flexibility than any other package available," says Michael Smith, director of the company's data center.

Since purchasing the package, Teranet Land Information Services has connected eight standalone packages to Spectrum, a process Smith terms as "relatively" easy. "It does take a little bit of effort to get the various tools calibrated," Smith admits.

The integration has enabled the company to automate certain management functions. For instance, the management system will automatically open up a trouble ticket (a file noting when a problem occurred and what steps have been taken to resolve it) whenever a malfunction on the network occurs. Because of the automation benefits, the company is now moving to tie another eight packages into Spectrum. "We are now focusing on improving the integration of our desktop application [remote control, software distribution, software metering and so on]," Smith says.



Computer Associates' Unicenter TNG Web Management Option monitors and reports on numerous system parameters to ensure Web servers and sites are functioning properly.

A Role for Service Providers

Merrill Lynch Inc., Somerset, NJ, relies on Computer Associates' Unicenter TNG to integrate its management applications. "We examined the alternatives and felt the Computer Associates system would be easier and faster to install than other packages," says Frank McCarthy, assistant vice president at the financial services company.

Merrill Lynch has used Unicenter TNG to integrate management tools that oversee its servers, monitor its pagers and support its help desk. "Our training costs are less since our technicians are working with a consistent user interface," McCarthy says.

With network and systems management chores becoming more complex, corporations have been looking to outsource such functions rather than continue to fix problems in-house. Consequently, a growing number of telecommunications carriers have been developing network management services for their customers. "The service provider market will be the single-most important dynamic shaping the network and service management market over the next five years," says Elisabeth Rainge, research manager for International Data Corp. (IDC), Framingham, MA. IDC found that service providers accounted for 51% of network management spending in 1998, and expects that number to reach 71% in 2003.

Intira Corp., Pleasanton, CA, represents one of a new breed of companies developing such services. The service provider generally takes over the IT and network infrastructure needed to operate a firm's electronic commerce business. To support its customers, the company operates data centers in Pleasanton, New York City and St. Louis, where technicians oversee HP, IBM and Sun Microsystems Inc. servers running UNIX or Windows NT operating systems.

Intira needed a management platform that would consolidate a number of management applications and selected HP's OpenView. As opposed to a framework approach to network management, HP OpenView provides a building-block, or modular, approach. By doing so, customers are able to deploy solutions as their needs grow. "We felt the HP system offered us the most visibility into our network and systems," says Steve Sidore, vice president of operations and engineering at the e-business service provider. The company has used OpenView to link half a dozen packages, and its technicians try to improve the level of integration every day.

Although Teranet Land Information Services, Merrill Lynch and Intira have been satisfied with the level of integration their chosen platforms offer, that's not the case with all corporations. "Firms have found that management integration work is complex and time-consuming," says Stephen Elliot, industry analyst with Dataquest. In fact, many companies started down the path to integration and stopped because the work proved so difficult.

Web and Internet technologies are now emerging to ease the integration process. "Browsers have already emerged as inexpensive, easy-to-use alternatives to the proprietary user interfaces found in management packages," says Maureen Mellon, general manager at HP. Customers often find the proprietary command-line interfaces difficult to understand and their navigation hard to complete, and have been demanding–and receiving–devices that can be accessed, monitored and controlled by Web browsers. Browsers provide the flexibility of enabling users to access information from a wide range of places. So rather than having to drive into the office, a technician can view the corporate network if, for example, a problem arises in the middle of the night.

But the use of browsers has not been a panacea. "We're concerned about the security issues that browsers raise," says Intira's Sidore. "Just about anyone with a browser may be able

to access and change management data." In certain cases, companies permit users with browsers to view, but not change, corporate information. In other instances, they add security features such as encryption and authentication to the browser to be sure only authorized persons are using it; although the additions generally increase cost and lower performance.

HP's OpenView Observer illustrates transaction volume, end-user response time and percentage of service level agreement failures.

What the Browser Sees

The first set of Web-based management applications offered a browser-based view of simple, proprietary, static pages. While this was a good initial step, it did not fully address the problems associated with the integration of management information.

The work began in the fall of 1996, when industry heavyweights Cisco Systems Inc., San Jose, CA, Compaq Computer Corp., Houston, TX, and Microsoft Corp., Redmond, WA, outlined plans for the Web-Based Enterprise Management (WBEM) specifications that would leverage Internet standards and technology to solve enterprise management issues. After outlining its goal and a working architecture, the group decided to hand the development work over to an independent consortium and selected Distributed Management Task Force (DMTF) Inc., San Jose, CA (`http://www.dmtf.org/wbem/index.html`). Founded in 1992, DMTF was developing specifications for the collection of management information from desktop PCs, and was concluding that process when industry leaders approached.

A key component of the WBEM initiative is the Common Information Model (CIM), an object-oriented information model that provides a conceptual framework within which management data may be modeled. The model is not bound to a particular product, and allows for the interchange of management information between management systems and applications, which can be either element manager-to-framework or framework-to-framework. In a CIM-compliant world, one can build applications using management data from a variety of sources. The specification enables management data to be collected, stored and analyzed using a common format, while allowing vendors to add proprietary extensions for value-added functions.

> While CIM is a strong foundation for solving common management data interchange problems, other amenities are still needed.

CIM comprises two parts: the CIM Specification and the CIM Schema. The CIM Specification outlines how to describe management data and map CIM to other management models such as Simple Network Management Protocol (SNMP) Management Information Bases (MIBs). The Schema defines how to store management information in a database.

While CIM is a strong foundation for solving common management data interchange problems, other amenities are still needed. Although vendors could use CIM as a data model, they can still retain their own proprietary encoding and transport mechanisms for exchanging data between applications. This would limit interoperability and force users to standardize on a single vendor's management software, according to DMTF.

DMTF had a couple of options for tackling data exchange problems. One possibility was to create a new application development standard. However, this approach would have continued to wedge network management issues into a narrow niche and drive up personnel and programming costs.

Finding the Right Language

Instead, the consortium decided to adopt eXtensible Markup Language (XML) as the glue for linking applications together. XML is a meta language that describes information and outlines how data is formatted and exchanged between servers and clients over a network. XML provides a way of identifying structured management information exchanges so applications can trade CIM data. With XML, a programmer can specify details about elements through document type definitions (DTDs) that provide a way to pass information between different vendors' products or send it directly to a Web browser. XML provides an application with access to diverse data sources and the ability to manipulate them many times without a trip back to a database.

The combination of CIM and XML should help companies identify network problems faster and more easily, according to industry watchers. "Rather than bouncing from one

element management application to another to pinpoint a trouble spot, network managers will be able to systematically test all potential trouble spots and identify the faulty devices," says Bob Quillin, vice president of marketing at Manage.com Inc., a Santa Clara, CA-based management vendor.

For instance, say the executive vice president of marketing, who works out of one of the firm's remote offices, calls the help desk and says he has been having problems accessing an intranet application that allows employees to place orders for computer equipment. The help desk technician needs to quickly examine each component along the link (the user's browser, his PC, his network connection, the local switch, the local router, the central remote access concentrator, the data center switch, the Web server's network connection, the server and the application), pinpoint the malfunction and take the necessary steps to improve response time.

With CIM, an enterprise management application will start at the lowest layer of the networking model and work its way up until the problem is identified, a process called root cause analysis. First, it checks the physical network connection (the local switch, the local router, the central office remote access concentrator, the data center switch) by sending a packet over the line. Next, it examines the network layer (the user's network connection, the Web server's connection) to determine whether or not there is a protocol problem. Then, the management tool looks at the server to determine how quickly it is processing information. Last, it examines the application layer (the browser, the intranet application) to determine if they are hung up.

Root cause analysis offers companies two main benefits. First, training requirements drop because technicians only need to know how to operate a browser rather than a series of proprietary user interfaces. Second, suppliers can build more sophisticated management applications, ones that examine problems and recommend solutions on an end-to-end basis rather than in a piecemeal fashion.

Root cause analysis is the ultimate goal for network management customers, but vendors still have to put a few pieces in place before firms can set up their management systems in this way. The DMTF needs to define data schemes (basically, outlines of how devices, such as routers or switches, function), a task the group is now in the process of wrapping up.

Leading System Management Suppliers

COMPANY	MARKET %
Computer Associates	28.6
Tivoli	19.2
BMC	11.1
Platinum	9.5
HP	3.7
Candle	3.7
Other	24.2

Source: Dataquest Inc., San Jose, CA

Also, vendors have to incorporate CIM and XML support into their products. A growing number, including Cisco, Computer Associates, HP, Microsoft and Tivoli, are moving in that direction. "In early 2000, the first wave of CIM-compliant products will start to arrive," says Jim Turner, director of marketing at Cisco.

Next, these devices have to be certified so they will work with one another. "We are struggling now to determine exactly what compliance means and how to test for it," says Winston Bumpus, DMTF Chairman.

Despite that issue, there is optimism about the impact CIM and XML will have on network and system management tools. "The integration of management information has been a long-standing problem for customers," says Dataquest's Elliot. "CIM and XML hold a lot of promise as a potential solution to it."

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