IBM network management strategy

by M. M. Szabat
G. E. Meyer

This essay describes some major directions at IBM with respect to network management. It describes the network management environment and discusses four key initiatives of IBM's SystemView™ network management strategy. This strategy provides integrated applications and services, broadens the scope of network management products, provides open access to multivendor products, and delivers and supports complete solutions for customers.

Advances in networking and computing technologies have affected the management of many businesses. These advances have been integrated into the management structure and have become a vital part of the business operation. As a result, the management of networks is vital to a corporation's business activity.

This essay discusses the impact these advances have on requirements for the management of a business network and highlights IBM's strategy to provide network management options that can be custom-tailored to solve unique, continually changing system requirements.[1] Some of the major requirements include: ease of implementation, flexibility toward modification, and the ability to protect existing investments in hardware and software.

We provide a brief overview of the networking environment and industry trends that are influencing customer requirements in the 1990s. We discuss IBM's view of this environment and the four key initiatives of the IBM strategy: to provide integrated applications and services, to support a broad scope of coverage, to provide an open access system, and to deliver and support complete solutions.

Network management environment

The availability of high-capacity, high-quality, low-cost transmission of data, the rapid growth of local area networking, and the integration of multivendor voice and data networks have spurred tremendous network growth and opened new opportunities for information sharing, both within and outside the corporation. Companies are using their expanding information networks to help reduce costs, improve productivity, and, literally, to extend their business services.

Consider, for example, a manufacturer who has extended an on-line inventory and ordering system to a parts supplier to support just-in-time manufacturing principles, thereby reducing excess inventory on the manufacturing floor. Or, consider an airline company that has extended its central reservation system to remote travel agencies and, by networking services, into the home of the consumer. These typical corporations and many others have become dependent on their information network, not only to support, but to run their day-to-day business operations.

With this increased dependency, the availability and performance of the network become critical. Hence, a key part of managing the customer business becomes management of the network (for

example, those tasks that include functions that allow quick resolution of network failures to minimize network "down time," and the ability to measure and analyze network traffic patterns to prevent bottlenecks and ensure quick user response time).

However, the management of today's information networks is not a simple task. The primary objective of the network operator who is responsible for network management is to keep the end user "up and running." To support this objective, the network operator needs an end-to-end view of the network. That is, the operator needs a view from the fingertips of the end user (resting on a computer terminal) to the application or information the user is trying to access, wherever it is located in the network. That path could, and often does, cross multiple public and private telecommunications networks and several processing systems.

Due to corporate mergers, acquisitions, or simply different buying patterns within a given company, today's information networks are comprised of a mixture of hardware and software from many manufacturers. Because of the absence of standards, these manufacturers have developed their own management systems that have different user interfaces, different methods of representing management information, and, generally speaking, different levels of management capability, or rather manageability. The network operator whose responsibility it is to pinpoint a problem that is affecting a network user, must often learn to manipulate multiple management systems from different vendors to help piece together that end-to-end view. The complexity of this process can greatly impact the time it takes to get the network up and running again and, through dependency, the time it takes to get the business up and running again. To improve productivity and reduce this "time to repair," the network operator requires an integrated management system that will cross multivendor, multinetwork boundaries.

Because of this requirement, there is an industry-wide move toward standardization, both for the development of managing systems and for the representation and communication of management data. More simply put, these standards will help define how a resource that is being managed talks to a manager in a consistent and common manner.

The adoption and implementation of standards will indeed help to simplify the management task across multivendor networks. But this is not an overnight "fix." Standards must be set, vendors must implement them in their offerings, and customers must deploy these new solutions in their environments. All this takes time.

Businesses are looking for a multivendor network management solution today that will leverage their current investments and carry them to a more uniform standards-based solution tomorrow.

Network management directions

The objective of IBM's SystemView* network management strategy is to provide a management system that offers the broadest solution set for integrated multivendor management today and provides support for a fully integrated management system based on current and future industry standards.

Integrated applications and services

In September 1990, IBM announced SystemView, the IBM strategy for systems and network management. SystemView is an IBM initiative for the management of multivendor information systems, including host, database, storage, business administration, and network resources. Very simply, it is the blueprint for the next generation of management applications—applications that will function in a cohesive IBM management system.[2]

The SystemView framework and its supporting architectures will guide the development of current and future IBM management products. SystemView provides a platform on which customers and vendors can create value-added applications that operate as part of a cohesive IBM management solution as described in a later section on open access.

This framework defines a common systems structure that will apply across the SystemView Systems Application Architecture* (SAA*) platforms (Multiple Virtual Storage/Enterprise Systems Architecture, or MVS/ESA*; Operating System/400*, or OS/400*; and Operating System/2* Extended Edition, or OS/2* EE). A similar structure is also

under consideration for the Advanced Interactive Executive* (AIX*) platform. Specifically, IBM expects that there will be a management application set for each of these platforms that will:

- Have a common "look and feel" to the end user
- Have a common understanding of managed object definitions
- Be built on a platform to which vendors and customers can write applications
- Support multivendor environments
- Cooperate with other management systems where they coexist in a customer enterprise

The function and coverage of these application sets will vary according to operating system platform and customer requirements. The broad set of products available today form the basis for the SystemView solutions. As the SystemView specifications evolve, these products will similarly evolve to conform to the specifications. Product functions will be preserved, and the ability to automate management tasks will be enhanced.

IBM's most comprehensive enterprise network management platform is NetView*.[3] NetView is the network management and automation platform for the SystemView IBM System/390* environment. NetView Graphic Monitor Facility is the first product to comply with the SystemView end-user dimension. It was recently enhanced to allow commands to be entered from the graphics screen, as well as to display the status of physical and logical devices throughout the multivendor network.[4]

New data technologies are being developed to meet the needs of a comprehensive enterprise management system. Recent enhancements to NetView Version 2 include the Resource Object Data Manager, which provides SystemView data dimension services for the MVS operating system environment. This is called a control information base (CIB). It forms the basis of a more powerful and sophisticated automation engine and works in an integrated way with our graphics capabilities.[5]

SAA SystemView System Manager/400 is the platform for centralized systems management functions on the Application System/400* (AS/400*) system. It provides functions for the management of a network of AS/400 systems, for the management of multiple attached personal computers (PCs) through PC support, and for the management of the AS/400 system by another system using NetView. System Manager/400, together with OS/400, currently provides a centralized, integrated solution for the change and problem management disciplines defined by SystemView.

The IBM LAN Network Manager and IBM LAN Station Manager provide function for the management of local area networks. The LAN Network Manager, an OS/2 application, provides a new graphics interface based on the Graphics View/2

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(GV/2) product (a SystemView end-use platform), thus making LAN Network Manager a SystemView Level 1-conforming product. LAN Network Manager, working with NetView Version 2, delivers enhanced command support that enables comprehensive control of token ring LANs from a central support site. The LAN Station Manager software acts as an agent for network devices, and will work with the LAN Network Manager to provide enhanced management capability in the areas of security and asset control.

The management protocol between the LAN Network Manager and the LAN Station Manager is based upon CCITT X.700, which is also included in the Open Systems Interconnection (OSI) standards. The LAN Network Manager and the LAN Station Manager communicate using Common Management Information Services/Common Management Information Protocol (CMIS/CMIP) over connectionless local area network logical link control (LAN LLC). LAN LLC provides a data link control function that is common to all LAN types. LAN vendor implementation of CMIS/CMIP over logical link control (CMOL) will enable IBM to enhance management support for both token-ring and Ethernet environments.

IBM also recently introduced a new management system, AIX NetView/6000, to meet immediate

customer needs in the distributed LAN environment based on the Transmission Control Protocol/Internet Protocol (TCP/IP).

AIX NetView/6000 is a managing system based on the Simple Network Management Protocol (SNMP). It operates on the IBM RISC System/6000* family of power workstations and power servers. It is a comprehensive management platform that extends the breadth and scalability of the IBM NetView family of management products.

Today, IBM provides a broad range of end-to-end support, which includes voice and data networks.

AIX NetView/6000 provides management of TCP/IP LAN devices such as workstations and servers, as well as LAN internetwork devices such as bridges, hubs, and routers, where SNMP is the predominant management protocol.

AIX NetView/6000 is a fully functional standalone manager for SNMP environments. It can also work in concert with NetView on the IBM System/390 for centralized management of integrated wide area and local area environments that support a wide variety of management protocols.[6]

As part of its initiatives, SystemView has established the Personal System/2* (PS/2*) with OS/2 as the end-user workstation for SAA environments, GraphicsView/2 as a program to use for depicting the network layout (the configuration topology), NetView as the network management and automation platform for the IBM System/390 environment, and SAA SystemView System Manager/400 as the platform for centralized systems management functions on the AS/400 system. It supports interoperability with AIX environments.

As the SystemView architectures unfold, IBM plans to protect customer software and networking investments by: developing product-to-product connections to achieve enhanced integration within the IBM System/390 NetView family of products; working with IBM Business Partners to create additional automation capabilities based on existing and new NetView functions; continuing to actively participate in the standards bodies to ensure consistency and coexistence with international network management standards; and continuing active participation in the Open Software Foundation Distributed Management Environment technologies, including the consolidated management application programming interface (CM-API). The CM-API, also called XMP by X/Open**, is based on X.700 network management standards, and is intended to permit applications and managed objects to exchange management information in a manner independent of transport protocol.

Broadened scope of coverage

IBM's primary focus over the past five years has been to broaden the coverage of its network management products. Today, IBM provides a broad range of end-to-end support, which includes voice and data networks from both a physical and a logical viewpoint.

Members of the NetView family of products (such as NetView, NetView Access Services, NetView Performance Monitor, NetView Distribution Manager, and NetView File Transfer Program) provide functions in the areas of operations, performance, network change, and problem management. Links to other IBM products (such as Information/Management and Service Level Reporter) cover configuration and business functions. The Distributed Console Access Facility (DCAF) and Multi-Terminal ASCII Emulator (MTAE) provide remote help-desk and multivendor operations control. Operations Planning and Control/Advanced (OPC/A) provides for the automation of scheduling jobs, tasks, and manual activities. (This capability will be extended in the future to the Enterprise Systems Architecture [ESA] environment.)

NetView/PC* (for DOS and OS/2) and AIX NetView Service Point[7] (for AIX and UNIX**) provide a platform that extends NetView's management capabilities to multivendor, multiprotocol environments. More than 50 vendors have shipped NetView/PC applications. These applications cover a broad spectrum of multivendor requirements from tele-

communications devices, such as modems and multiplexers, to DECnet**. The NetView Voice Network Administrative Services products and HubView/PC** Plus (a NetView/PC application from TSB International) provide management of private telephone networks. The Multivendor Expert Manager (MAXM) from International Telemanagement Company is a high-function, graphics-based solution that provides concentrated and local management support for a broad and specific set of multivendor physical devices. NetView also works with the IBM TCP/IP and Open Systems Interconnection/Communication Systems (OSI/CS) products to provide management support for TCP/IP and OSI networks.

The IBM SystemView network management strategy involves joint cooperation between IBM and multiple outside vendors.

The IBM scope of coverage also reaches out to carrier networks. IBM has announced working relationships with AT&T and BT (British Telecom) that will allow our respective management systems to work together and provide support for integrated voice and data networks for our mutual customers.

In the LAN arena, IBM and Novell, Inc. are working together to enable NetView to manage distributed Novell NetWare** environments.

In addition, the IBM LAN Network Manager, the SAA SystemView System Manager/400, and the AIX NetView/6000 can function as a distributed point of control for their respective environments, as well as being able to communicate with NetView to provide a centralized, network management option.

Open access

The IBM SystemView network management strategy involves joint cooperation between IBM and multiple outside vendors. Since 1986, when NetView and the IBM SNA Open Network Management architectures were first introduced, IBM has been committed to working with other vendors to provide comprehensive management offerings to support multivendor networking environments.

The industry at large is working toward cooperative network management based on X.700 network management standards. This effort is supported by vendor groups such as the Network Management Forum. IBM is a member of this organization and is committed to the support and implementation of X.700 network management standards as they are developed. For example CMIS/CMIP over logical link control (CMOL), the X.700 CMIS/CMIP solution for the management of heterogeneous LAN environments, which was jointly defined by IBM and 3Com Corporation, has been accepted by the IEEE 802.1 committee for LAN management.

IBM is committed to allow customers the capability to place the management function wherever it is most appropriate in their networks, whether that is totally distributed, totally centralized, or somewhere on a continuum between these two extremes. We are currently offering a number of distributed management products (NetView/PC, LAN Network Manager, AIX NetView/6000, etc.) that can act as stand-alone managers and can also provide input to a centralized management system. The recent announcement by the Open Software Foundation (OSF) of IBM as a prime technology contributor to the Distributed Management Environment (DME) demonstrates our commitment to providing distributed management solutions with centralized options.

Today's enterprise networks are comprised of multiple network domains. Each domain is delineated by some networking protocol and, often, a unique network management schema (either proprietary or standards-based) that is optimized to that domain.

To help customers obtain the best value from their investments, IBM will continue to work with other vendors to provide cooperative management solutions based on existing products and standards. This includes support for OSI-, TCP/IP-, and SNA-based management protocols, as well as

for the SNA service point architectures that support other vendor proprietary protocols.

Over time, we expect to see increasing industry support for the X.700 management standards, particularly for communication and interaction between managing systems. The X.700 standards are independent of transport (that is, they can be implemented over OSI, TCP/IP, SNA, or LLC, for example) and are therefore best suited for management coordination across varied network domains.

Delivery and support of solutions

Customers have asked for comprehensive solutions that answer their management requirements for products, including those of IBM and Business Partners; services, including installation, customization, and on-site education; and support, including a telephone hot line to help customers with usage, customization, problem determination (PD), and problem source identification (PSI).

NetView Extra is a family of products, services, and support that provides a turnkey approach to network management.

IBM offers NetView Extra,[7] a family of products, services, and support that provides a turnkey approach to network management. These offerings provide a quick means of operational network management, with reduced effort. Their initial delivery will allow customers to manage their networks more efficiently and to optimize their use of resources by means of automation and easy-to-use graphical interfaces.

NetView Graphics and Automation is a group of products for customers who want to manage their SNA networks effectively, and who want a network management base on which they can build future enhancements. It includes NetView V2, Automated Network Operation (ANO/MVS) V1, and NETCENTER*.

NetView Multi-Vendor Operation is a group of products for customers who want a powerful, turnkey solution for managing their multivendor networks from a single console, and who want a network management base on which they can build future enhancements. It includes NetView V2, Automated Network Operations (ANO/MVS) V1, NETCENTER, Automated Problem Reporter, Information/Management V4R2, and NetView/PC and applications.

This new approach toward delivering product offerings serves two key purposes. It will provide true, off-the-shelf products, and will allow practical application of new product functions in our customers' environments.

Summary

The IBM SystemView network management strategy is to provide network management offerings that offer maximum flexibility for centralized and distributed management control, through a management system that is broad in scope, has open access, and is integrated. We have a strong and rich set of management offerings today, based on open management architectures and support for industry standards. We will continue to enhance these products to allow our customers to leverage their current investments and take advantage of new technologies as they unfold.

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**Trademark or registered trademark of X/Open Co., Ltd., UNIX Systems Laboratories, Inc., Digital Equipment Corp., TSB International, or Novell, Inc.

Cited references and notes

1. A more extensive coverage of topics presented in this paper is provided in an IBM White Paper titled *IBM Networking Directions*. Copies are available through IBM branch offices.

2. For information on SystemView, see *An Introduction to SystemView*, GC23-0576, and *SystemView Concepts*, SC23-0578, IBM Corporation; available through IBM branch offices.
3. For information on some of the more recent features offered by NetView, see B. W. Irlbeck, "Network and System Automation and Remote System Operation," *IBM Systems Journal* **31**, No. 2, 206–222 (1992, this issue); and K. D. Gottschalk, "NetView Version 2 Release 3 Graphic Monitor Facility: Network Management Graphics Support for the 1990s," *IBM Systems Journal* **31**, No. 2, 223–251 (1992, this issue).
4. For a discussion of this topic, see the paper by Gottschalk in Reference 3.
5. For a discussion of Resource Object Data Manager, see A. J. Finkel and S. B. Calo, "RODM: A Control Information Base," *IBM Systems Journal* **31**, No. 2, 252–269 (1992, this issue).
6. See J. H. Chou, C. R. Buckman, T. Hemp, A. Himwich, and F. Niemi, "AIX NetView/6000," *IBM Systems Journal* **31**, No. 2, 270–285 (1992, this issue).
7. See J. G. Stevenson, "Management of Multivendor Networks," *IBM Systems Journal* **31**, No. 2, 189–205 (1992, this issue).

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Mary M. Szabat, *IBM Networking Systems, 3039 Cornwallis Road, P.O. Box 12195, Research Triangle Park, North Carolina 27709.* Ms. Szabat joined IBM in 1982 as a specialist in production control and materials management for IBM display products. After three years in product scheduling and inventory planning assignments, Ms. Szabat spent a year in finance as a software service cost estimator. In 1986, Ms. Szabat was appointed to management in software testing, followed by a management position in product development in network management for IBM's NetView product. She is currently a strategist in the area of management of local area and wide area networks. Her primary focus is market introduction of system strategies and product and service offerings.

Gale E. Meyer *IBM Networking Systems, 3039 Cornwallis Road, P.O. Box 12195, Research Triangle Park, North Carolina 27709.* Ms. Meyer is Manager, Network Management Systems, Enterprise Management Networking Systems Line of Business. Ms. Meyer joined IBM as a programmer in Endicott in June, 1969. She advanced through the programming ranks, and in 1975 transferred from Endicott to Raleigh, North Carolina. She first entered management in 1977 as a project manager for a software development project. In May 1984, she received a management excellence award for her project leadership. Ms. Meyer then became a second-line development manager. During the summer of 1987, she was administrative assistant to Networking Systems executives. During 1988 through 1989, Ms. Meyer worked at Networking Systems headquarters in a staff position and in Programming Systems as a member of the SAA staff organization. In September of 1989, she returned to Raleigh as the product manager for IBM's TCP/IP products on MVS, VM, and OS/2. She was promoted to her current position as manager of Network Management Systems in April 1991.

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