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STRATEGIC MARKET PERSPECTIVE

Client/Server Systems Management Software

Client/Server Software Program

JULY 1995

Client/Server Systems Management Software

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Client/Server Systems Management Software

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Abstract

This report analyzes companies that supply systems management software. It focuses on those that offer products for client/server systems. It discusses underlying software frameworks, classification of systems management software components and technology trends. It also discusses changes taking place in user organizations, with particular emphasis on how client/server systems management software differs from traditional solutions. The report analyzes over 30 systems management software vendors, including systems vendors, who may resell packages.

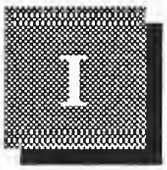
The report is intended for executives, marketing managers, system planners, investors and strategic analysts to understand the trends in systems management software, the strengths and weaknesses of major players and market projections.

Client/Server Systems Management Software provides market forecasts for systems management software for both the U.S. and the world, by platform.

The report contains 126 pages and 40 exhibits.

Table of Contents

Exhibits



Introduction

This section describes the purpose and scope of this report. It describes the research methodology and lists related reports published by INPUT.

A
Purpose of the Report

Client/server applications, databases, operating environments and network components present a new level of complexity in systems management, creating opportunities for systems and software vendors. *Client/Server Systems Management Software* anticipates changes in the systems management software market over the next five years, with emphasis on systems management solutions for client/server systems. This report gives system planners, marketing managers and investors insights into market trends, issues and vendors. For systems integrators and hardware manufacturers, it describes potential partners.

Future directions and trends in the systems management software market are discussed. The strategies, characteristics, strengths and weaknesses of systems management software vendors are described. The report also gives market forecasts.

B
Scope

1. Questions Answered

The report answers the following questions:

- What are the main categories of systems management software?
- Who are the leading vendors?
- What are their strengths and weaknesses?
- How is the systems management market changing?

- How big is the systems management software market?
- What opportunities are there for service providers in systems management?

This report focuses primarily on U.S. software vendors, but also includes reviews of some hardware manufacturers. It provides both U.S. and worldwide forecasts.

2. How Client/Server Systems Management Differs From Traditional Systems Management

In INPUT's *Definition of Terms*, systems management software falls into the systems control and data center management categories defined under systems software. However, the migration to client/server architectures and distributed systems requires new classifications, described in Chapter III. Additional definitions are in Appendix A.

Client/server systems management differs from traditional data center management and systems control in three major ways:

- Personnel administering a system tend to be scattered around a company, rather than in a centralized data center, although as new software solutions emerge to manage client/server networks, this will bring some system administrators back into data centers.
- Network, applications, database and systems management functions are becoming more integrated.
- Software frameworks are increasingly being used to integrate system management software applications and simplify integration with new networks and platforms.

3. Vendor Selection Criteria and Areas Not Covered

Vendors were selected for inclusion in this report if they were leading vendors, or if they were major companies with a significant strategy in systems management software, or if they represented an emerging opportunity. Some categories of software that have been omitted or not covered in depth include:

- Help desk software—This is a growing area addressed by several emerging companies
- Security software—There are many new applications associated with firewalls and the Internet, as well as DCE-based security applications and other distributed security schemes

- Storage management, backup and recovery software—Cheyenne and Legato are two software vendors that were omitted
- Systems management software that supports tape and disk management products—for example, StorageTek—was omitted
- Network management software from companies like Cabletron and UB Networks whose main business is supporting network equipment like hubs and routers

In addition, this report does not forecast the size of the market for the significant service opportunities that result from using client/server systems management software. In this report, the term "network management" is used to describe a category of software used to manage networks and network nodes, such as computers and routers. The terminology is not the same as the term "network management" that is defined by INPUT as part of an outsourcing or systems operations service.

4. Platform Selection Criteria

Measuring the market for systems management software that supports client/server applications is difficult, because systems evolve from single platforms like a mainframe or a workstation into client/server systems. Client/server systems management software either runs on a specific type of computer, or it is cross-platform and runs across networks, mainframes, minicomputers and PCs. The forecasts are divided by platform according to how the systems management software is licensed. If it is licensed for a specific platform like HP-UX on a minicomputer, then it is counted as minicomputer software. If the software is licensed to run on multiple platforms, such as PC LANs, departmental and enterprise computers, then it is counted as cross-platform.

C
Methodology

The research relies on interviews with vendors and software demonstrations. Reviews of published materials from vendors, on-line networks and users form the basis of this report. Over 30 software and systems vendors are reviewed.

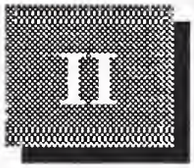
D
Related Reports

Related reports in INPUT's Client/Server Software Program include:

- *Middleware: Is DCE the Answer?*

- *Object-oriented Platforms for Client/Server Systems*
- *Client/Server Market Analysis, 1993-1998*
- *Client/Server Service Opportunities—Europe, 1993-1998*
- *Client/Server Impact On Major Project Contracting—Europe, 1993-1998*
- *Client/Server Trends in the Federal IT Market: 1994*

In addition, INPUT reviews vendor strategies in its Vendor Analysis Program and in its Client/Server Vendor Profiles. In 1993 and 1994, INPUT analyzed nine vertical markets in its Client/Server Software Program. INPUT's Market Analysis Program also provides vertical market forecasts and industry reports.



Executive Overview

This chapter summarizes the main findings in the report, giving an overview of systems management software market forecasts.

A Overview

Client/server systems management software products may be divided into the following categories:

- Network administration (network control)
- Systems administration (data center management)
- Information management (including database administration)
- Applications management

Software forecasts for each of these areas is provided. Note that the applications management category refers to software to administer, monitor and troubleshoot applications software, like SAP's R/3 system. It does not refer to services related to applications management as discussed in INPUT's Outsourcing Program.

Traditional systems management software for a single platform, like a minicomputer or a mainframe, typically fits into one of the above categories. Client/server systems management software may also fit into a single category, but increasingly the trend is toward software that can troubleshoot and monitor systems across the categories. This is because when a problem occurs in a client/server system, it may not be apparent where the cause lies. Client/server systems management software that can intelligently cross traditional software boundaries and pinpoint system troubles before they occur is in high demand.

The strategic directions of over thirty vendors are reviewed. A brief review of their product and marketing strategy is followed by an analysis

of their strengths and weaknesses, together with an outlook for the future.

B
Key Trends and Issues

1. Software Frameworks

The main technology trend is toward the creation of software frameworks using object-oriented technology on which systems management applications can be built. These frameworks promise more integrated, cross-platform, intelligent, flexible, scalable applications. Tivoli is the leading independent software framework vendor in the UNIX market. Many other vendors are building proprietary frameworks, focusing on interoperability with other systems. Long term (over the next ten years), unless they license their underlying frameworks widely or are already very large companies, they will be at a strategic disadvantage, as their development costs will not be amortized over a large enough installed base. Having a framework upon which others can develop provides a vendor with a reseller channel of VARs and other software vendors that can significantly augment its revenues and market presence. In the short term (over the next two to three years), proprietary frameworks will give their vendors agility and control. Long term, framework vendors may be locked into the expense of supporting many underlying operating systems and networks.

2. Applications Management Software

Systems management software that works with applications is an emerging opportunity that has traditionally been met with software from applications vendors. For example, performance management software for critical transaction processing applications has been an area of focus for systems management tools. Distributed applications are often more complex than those found on a single platform, requiring new types of systems management software. This may report system errors at the application level so that users can fix problems. Other application management software product opportunities are for performance optimization, software updating, user management, security and backup.

3. Windows NT

Many client/server systems are controlled from UNIX workstations using products like Sun's Solstice or HP's OpenView. As more Windows NT platforms are deployed for both servers and workstations, they will increasingly support systems management functions using Microsoft SMS with third-party enhancements as a foundation.

4. Greater Cooperation Among Vendors

The systems management market is one in which vendors must be able to offer either a very good point solution or a broad range of solutions. The integration of Computer Associates' CA-Unicenter and Hewlett-Packard's OpenView software reflects a move to integration between systems administration and network administration software. It also demonstrates the evolution of network management packages like OpenView into comprehensive systems management solutions that track applications, systems software, processes and components on a network.

5. Integration With Business Management

The true costs of client/server technology are difficult to estimate without strong asset management, systems accounting and reporting software. Initially, companies moved to client/server because they saw falling hardware costs; then they realized that personnel costs far exceeded those for centralized host environments. Now, with strong accounting and charge-back solutions emerging, users are starting to quantify accurately the impact of client/server technology on their business processes.

6. Systems Management for LAN/WAN Interfaces

Typically, systems management software has been internal to corporations. Network operators have dealt with systems management issues concerning WANs outside corporate firewalls. However, as more companies interconnect through both public networks and the Internet, they are taking greater responsibility for applications management across WANs. There are tremendous opportunities for vendors that can provide software to insulate corporate LANs from WAN problems. Security software is another major opportunity for both software vendors and systems integrators.

7. Seamless Integration of Systems Management Software Modules

Both across network layers and between applications, there is a trend to integrate software modules more smoothly, giving them consistent programming and user interfaces. One benefit of a framework like Tivoli's is that it obscures network complexity and enables new modules to be integrated quickly.

8. Distribution of System Administration Functions

Client/server system administrators tend to be more mobile than those who administer centralized systems, wearing pagers to receive alarms from systems management software. Distributed, international corporations increasingly need distributed management consoles, cross-

training of systems management staff and the ability to shift system loads around the globe. This means that not only must system administrators learn about new computing platforms and how to manage them, but secretaries and administrative staff must also be trained in elements of systems management, such as backup. The result is a system administration staff that permeates user departments, as well as operating the corporate computing infrastructure. Another trend is that system administration needs to be distributed to remote users and telecommuters.

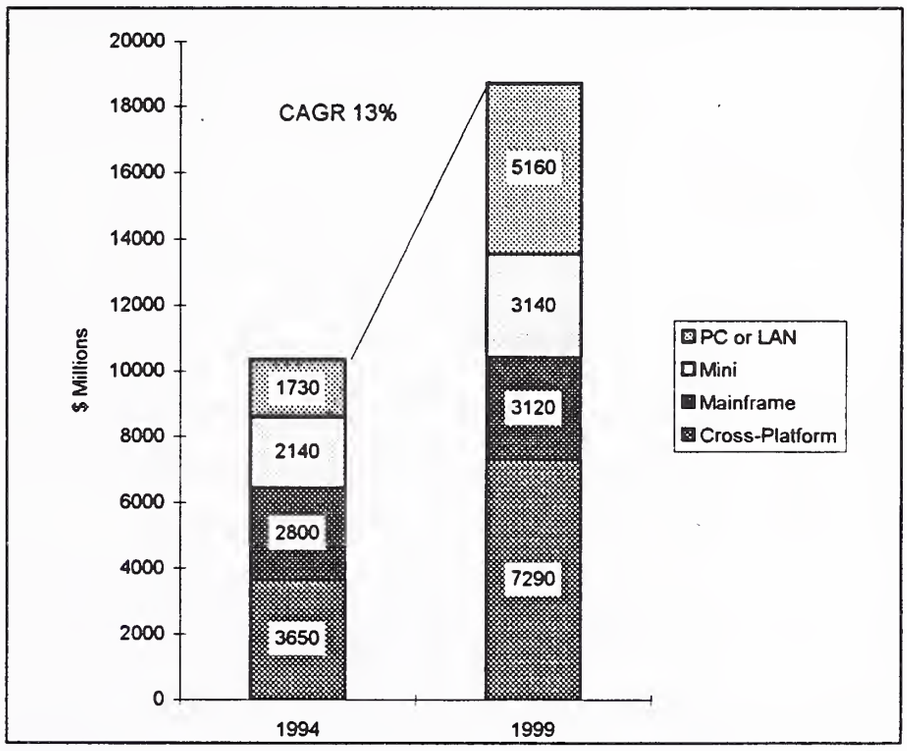
C
Markets and Applications

Systems management software is pervasive—even a single PC may have utilities for backup, disk management and virus detection. Exhibit II-1 shows a worldwide market forecast for systems management software divided by platform. A separate market for client/server systems management software has not been made. This is because systems evolution makes it difficult to predict which platform is most likely to support client/server systems. However, in general, most of the cross-platform systems management software will be used in client/server systems, as will a small proportion of all the other segments. Hence the size of the market for software that manages client/server systems now corresponds closely to the cross-platform market in size. In the future, a greater proportion of PC, minicomputer or mainframe products can expect to be integrated into client/server systems management solutions.

The worldwide market is expected to grow from $10.3 billion in 1994 to $18.7 billion in 1999, with a CAGR of 13%. This shows slower growth than some other segments of the client/server software market, such as visual development tools, in part because systems management software for proprietary platforms is already a well-established market. Also, as software prices fall, there is less opportunity for revenue growth than in some of the other client/server segments like middleware.

Exhibit II-1

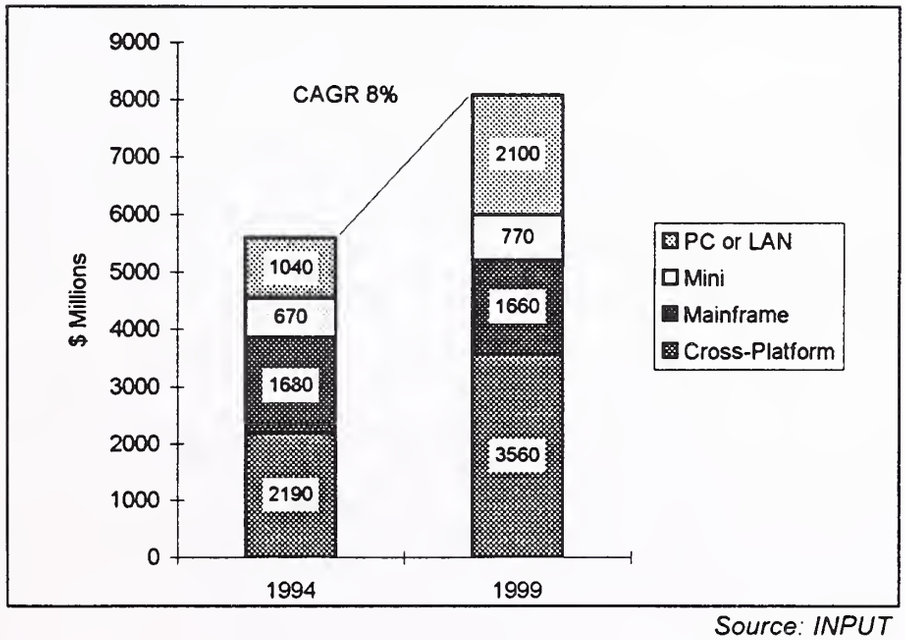
Worldwide Market Forecast for Systems Management Software, 1994-1999, by Platform



Source: INPUT

Exhibit II-2

U.S. Market Forecast for Systems Management Software, 1994-1999, by Platform



Source: INPUT

The U.S. systems management software market is expected to grow from $5.6 billion in 1994 to $8.1 billion in 1999, with a CAGR of 8%. Growth is higher overseas where markets are less saturated because they lag the U.S. in technology adoption and there are more opportunities for software that can administer new client/server systems.

D
Vendor Summary

Over 30 vendors are analyzed in this report. They range from emerging vendors of point solutions and frameworks to established vendors who have acquired companies so as to move into client/server technology. More than most areas of the software industry, this is an area where technology companies get acquired by stronger players. The vendors have been divided into four categories, each differing in criteria for success and risks.

Microsoft's SMS systems management platform for Windows NT will be the most significant development in client/server systems management over the next few years as third-party vendors enhance the basic platform. PC LAN vendors like Microsoft, Symantec and Intel will see tremendous growth, particularly with the advent of Windows NT. Novell could suffer because of Microsoft's competitive thrust with NT. However, INPUT believes that the LAN management opportunity is great and that Novell will flourish in the Windows NT market. Although Novell has a large installed base of Netware with IPX/SPX protocols, a significant percentage of Novell users rely on TCP/IP, the leading protocol for client/server networks based on Windows NT and UNIX.

Tivoli is an emerging company in the UNIX market that is licensing an underlying framework as well as developing applications. Companies like Candle and Compuware that have their own frameworks may consider broader licensing of their technology, so that they, too, can attract a wide following of resellers and integrators.

Systems vendors like HP and IBM are leading the way in attracting third-party developers to their platforms. This not only sells hardware, but helps them set industry standards. Computer Associates, a mainframe leader, is rapidly gaining acceptance in client/server markets with CA-Unicenter and building significant alliances with leaders like HP and Microsoft.

E
Recommendations

1. Recommendations For Users

This report shows the wide range of tools that a user must consider when planning to purchase systems management software. Users need to:

- View systems management software as a way to reduce costs, rather than an additional overhead expense
- Be pro-active and anticipate system failures
- Manage assets with floating licenses and asset management software
- Use the reports generated by systems management software to plan capacity requirements, allocate system administration resources and develop budgets
- Use software that visually depicts problems and solutions
- Make full use of mobile technology such as pagers and notebook computers to enable system administration professionals to make the best use of their time
- Have a migration plan for systems management software from traditional to client/server systems. Sometimes users will develop elaborate plans for new systems, but forget to include system administration personnel and software in them.
- Include software that can support multiple layers and troubleshoot applications as part of the systems management portfolio
- Train administrators in using rules and scripts to automate routing operations, overriding vendor default configurations if it improves usability

2. Recommendations For Vendors

Independent software vendors must consider whether they need to leverage their technology more widely through indirect sales or through partnering with larger hardware manufacturers. Companies that resist licensing their technology risk being overtaken in the race for integrated platforms based on objects. Vendors need to:

- Make full use of object technology, intelligent agents, scripts and rules to automate routine procedures. Sell software with a wide range of pre-configured examples.
- Justify software sales with economic models and examples of how appropriate use of systems management software improves a company's financial performance
- Support customers with services, either directly or through a network of VARs, systems integrators and other technology partners
- Educate resellers in their product, and manage any channel conflicts
- Look continually for acquisitions of either companies or software licenses to broaden their product line. Market products as part of a product line.

Many of the established systems management vendors are vulnerable to more agile companies encroaching on their markets with newer technology and lower priced products. The successful established vendors aggressively acquire emerging growth companies to broaden their product lines. Companies with proprietary frameworks need to consider cross-licensing them so that they gain a critical mass of third-party products that can integrate with their applications.

3. Recommendations For Systems Integrators and VARs

Systems integrators need to build solutions on frameworks, either their own or third-party technology on which they have chosen to standardize. This gives them the flexibility to customize solutions rapidly and attract third-party software developers to fill gaps in the product line. The value that a systems integrator can add to systems management software products is customization and integration with installed software. A systems integrator can also pick from a range of alternative solutions to provide a customer with "best-of-breed" solutions.

By standardizing on a few key systems management platforms, systems integrators and VARs have the opportunity to build innovative systems management solutions for clients. Systems integrators have an excellent opportunity to enhance systems management products with upgrades, maintenance and services. Remote management, support for mobile users, wide-area systems management and intelligent applications management are growth areas that provide opportunities for systems integrators and VARs.

4. Opportunities For New Products and Services

Systems management offers new opportunities for services and, in turn, new services such as Internet services create a demand for systems management software. Some new services that may be considered are license management to ensure that a company has an appropriate number of software licenses, asset management to ensure that companies resell their computers before they become obsolete, and planning functions based on reports from systems management software.

The Internet and mobile computing are two areas where remote system administration software is needed. Broadband telephony systems offer challenges. The integration of PBXs and fax machines with office networks is another area of opportunity.

F
Conclusions

No single software vendor can supply the range of solutions required by an enterprise for systems management. This is likely to be true for the foreseeable future. The majority of systems management vendors grow by both internal development and acquisition.

Products will continue to be built along architectural layers, supporting networks, operating environments, information management systems and applications. However, many vendors will choose to develop new products that cross these layers to provide functional solutions in such areas as event monitoring, backup and recovery and software upgrading.

Some mainframe vendors are seeing revenues decline as data centers are consolidated, but the client/server market creates new opportunities at different price points from the mainframe market. Pricing affects maintenance and support costs, as well as product licensing terms and conditions. Mainframe vendors need to re-evaluate their distribution channel strategies and consider focusing on indirect sales. They may need to restructure their sales forces to take advantage of market opportunities. They need to understand how to leverage product development and distribution.

The systems management software market is not growing as fast as some other segments of the software market, such as object-oriented platforms, development tools and middleware. The market for frameworks is saturated with the emergence of Tivoli and the increased presence of companies like HP. Companies with their own frameworks may have an opportunity to cross-license their products, if they choose partners with complementary strengths. Point solution vendors need to team up with major players or face being acquired.

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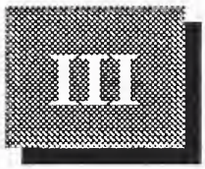


The Systems Management Environment and Buyer Motivation

This chapter describes the main product categories for systems management software products. It also provides a discussion of user issues and shows how personnel roles are changing. This section also identifies trends in user organizations and discusses the motivation for moving to client/server systems management.

A
Systems Management Software

1. Traditional Systems Management Software

Systems management software traditionally falls into four categories, with related terms from INPUT's *Definition of Terms* in parentheses:

- Applications management
- Information management (including database administration)
- Network administration (network control)
- System administration (data center management)

In this report, INPUT includes all the above categories under systems management, in contrast to the approach that only refers to "system administration" as "systems management." INPUT's broader choice reflects the trend toward integration of the above categories in a client/server environment for some systems management applications.

Applications management traditionally includes applications upgrade, troubleshooting and maintenance. In a client/server environment, application event monitoring is more complex and requires software that

can distinguish between applications and system-level software problems. **Information management** supports databases, data dictionaries, information repositories, data standards, database interfaces, database performance and electronic documents. The focus in a client/server environment is on networks of databases, managing transaction processing across heterogeneous systems and on new types of information management systems for multimedia, video, time-series, and real-time information feeds and images. **Network administration** traditionally provides the system administrator with logical views of the network and shows the status of network equipment. In a client/server environment, network administration software is extended to manage all levels of software and a variety of hardware components on a network. It also identifies potential and existing network performance bottlenecks. **System administration** supports user accounts, computer system problem resolution and configuration of peripherals, such as printers. The trend in client/server systems is toward directories that support user access to a range of applications. There is also more emphasis on distributed security.

2. Client/server Systems Management

Client/server systems management software administers, monitors and supports client/server applications, platforms and networks. It detects problems, shows system status, identifies potential points of failure and provides reports that help system administrators manage client/server systems.

Applications management includes support for SAP's R/3 or Oracle Applications. However, the bulk of applications management software supports the installation, upgrading, troubleshooting and conversion of custom applications. For packaged applications, troubleshooting software is provided largely by applications software vendors, who are increasingly integrating their tools with systems and network management products. However, a significant third-party market for software products that support packaged applications is rapidly emerging. For custom applications, the application developer—typically a user, systems integration firm or professional services company—may incorporate systems management modules. For both packaged and custom applications, object-oriented software components that support critical systems management functions will increasingly play a role. They can rapidly be tailored to support a specific network configuration.

Information management in client/server environments deals with many more types of data than in a traditional data processing environment. Sound, images, drawings, time-series, objects, software libraries, electronic documents and full-text databases need to be managed in a client/server environment as the programming

environment becomes richer with greater use of multimedia. Database tools increasingly automate lower-level support for data elements, records and forms. Data management is evolving into object management.

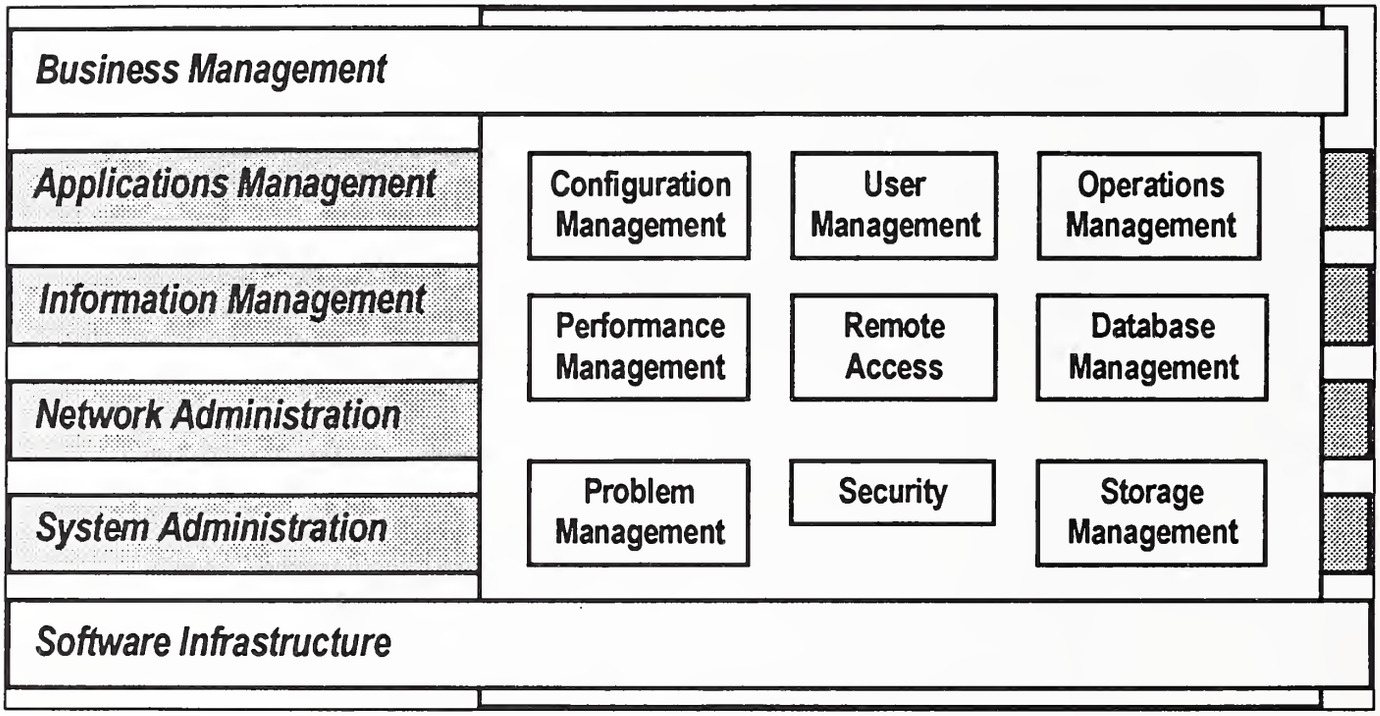
HP's OpenView, IBM's NetView, Sun's Solstice and Digital's POLYCENTER products have rapidly gone beyond **network management** to incorporate systems and applications software. **System administration** software like CA-Unicenter supports heterogeneous computing environments. A recent release of CA-Unicenter for OpenView integrates CA-Unicenter with HP's OpenView network administration tools. CA is also working with Microsoft on the Windows NT platform. The distinction between network and system administration blurs in a client/server environment.

Exhibit III-1 shows the four traditional layers with "Business Management" above and "Software Infrastructure" below. Increasingly, systems management software products that function across applications, information, network and system layers are being developed. In traditional systems, these functions were performed for one layer only. For example, problem management software could locate a failed network computer, but could not show the application process causing the failure.

The **business management** layer includes software that integrates systems management software with business functions like decision support, planning, analysis and accounting. As systems become more complex, the reports from systems management functions are used by accountants, senior management and others to make investment decisions. Accounting, asset management, capacity planning and charge back represent systems management functions that integrate with business planning systems. The **software infrastructure** layer reflects the trend to building inter operable systems management components on a common software platform. Tivoli is an example of a software framework provider.

Exhibit III-1

Systems Management Software Product Categories



Source: INPUT

In Exhibit III-1, the smaller boxes show functional descriptions of systems management software. Each function takes on a new meaning in a client/server environment and can cross the traditional systems management categories. For example, configuration management in a mainframe environment emphasizes memory and storage requirements. Configuration management in a client/server environment also includes the configuration of network layers and interfaces between software components. Exhibit III-2 defines the functions shown in Exhibit III-1 in more detail.

Exhibit III-2

Systems Management Software Functions

Category	Functions
Business Management	Asset management, inventory tracking, accounting and charge-back Capacity management, capacity planning and forecasting
Configuration Management	Software distribution and updating, version control Memory, disk, display, sound, video, software upgrades Data distribution and management, software usage reporting and license management
Database Management	Data repository, data dictionary administration, database performance tuning Database compression, defragmentation, archiving and retrieval
Operations Management	Automated operations, data center support Job scheduling, computer operations scheduling Printer, router, hub and peripheral management Cabling, wireless and infrared communications support LAN and WAN administration, file management, file purging schedules
Performance Management	Hardware and software tuning, database tuning, database and application partitioning Network performance analysis and tuning, performance profiling
Problem Management	Network troubleshooting, down-time analysis, equipment failure records Event and alarm management and monitoring, fault diagnosis
Remote Access	Remote systems management tools, remote user support, lights-out support tools
Security	Access management and password administration, authorization Authentication of users, interfaces to other peripherals and systems Setting up and monitoring trusted domain, security reporting and auditing
Software Infrastructure	Includes frameworks into which systems management applications can be integrated Menus and software libraries to integrate systems management components Agent technologies, scripting languages and systems management programming tools Graphical representation of devices, networks, events for management console Administration controls, user interface and menu systems
Storage Management	Backup and recovery, disk and tape management, storage architecture, hierarchical storage management
User Management	Adding users, cell and administrative domain setup and management, user directory management, mail directory management

Source: INPUT

B
Client/Server Network Management Architecture

In client/server networks, management hardware and software is typically administered from one or more management consoles. At each console, the administrator can view the status of a network, understand where there are problems and monitor network components. As networks evolve, multiple consoles are distributed and become more specialized. Consoles for managing enterprise networks and departmental networks emerge. The trend is toward multiple distributed consoles, so that networks can be administered remotely—in some cases by an outside vendor of systems management services.

One aspect of a client/server systems management console is to track events using the SNMP (Simple Network Management Protocol) architecture, as shown in Exhibit III-3. This architecture is useful for observing and reporting on network components. Network devices such as workstations, servers and routers support management information bases (MIBs), typically numbers representing status, to store information that can be collected by SNMP network agents. A hierarchy of agents sends information back to a management console. The information is interpreted by the network management software and displayed on management consoles.

A trend is for MIBs to be used by software vendors as well as equipment vendors so that the networks can be monitored. Increasingly, SNMP network agents are being used in applications and databases so that these, too, can be tracked on a management console. Databases like Oracle support knowledge modules and MIBs. Sequent, for example, supports MIBs for clusters of computers as well as single machines.

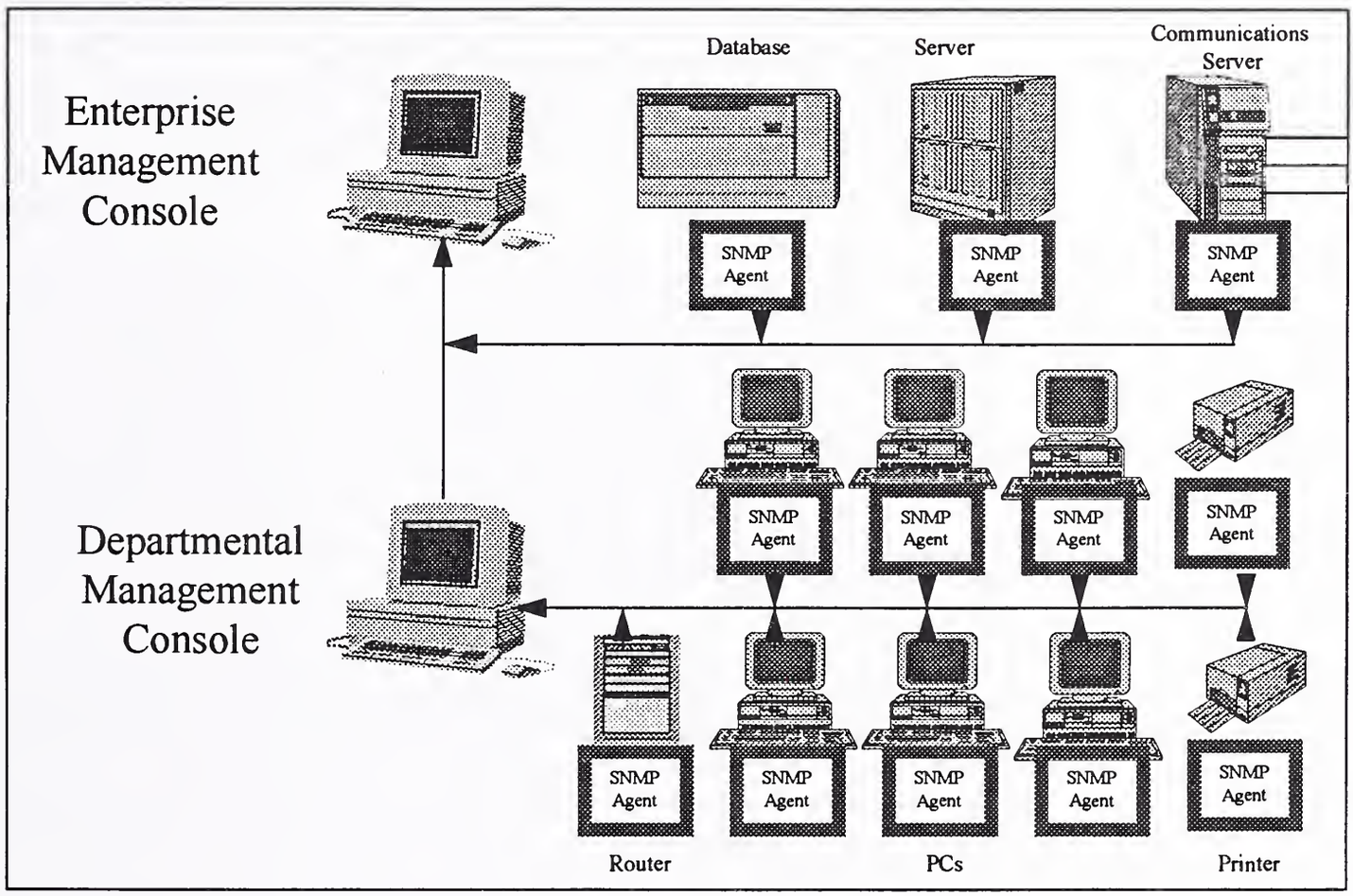
Products based on the second generation of SNMP protocols are expected to emerge later in 1995. They are expected to provide improved distributed systems support. SNMP is not without its problems, a main drawback being that it consumes network resources as the devices are polled. Initial implementations of SNMP relied on a management workstation polling network devices. Increased software monitoring means that the nodes themselves will increasingly send information back to the console when they are in trouble. Maps of networks have tended to reflect physical connectivity, but increasingly, maps will group different types of system components in logical maps—for example, all UNIX servers may be grouped together.

An increasingly popular complement to SNMP is to place RMON (remote network monitoring) devices on the network that can collect information for a particular segment and then feed that back to the operator as

needed. This has the advantage of consuming less bandwidth and being able to report problems on specific network segments over a period of time.

Exhibit III-3

Typical Client/Server Network Management Architecture



Alternative agent models are based on CMIP (Common Management Information Protocol) or proprietary architectures. In the PC environment, the DMI (Desktop Management Interface) provides support for remote PC administration.

C
Types of Customers

Systems management is required by all computing installations, large and small. Client/server computing has forced vendors of PC, UNIX, proprietary minicomputer and mainframe systems management products to redesign and integrate their software. They are addressing system complexity.

Within one company there may be different types of customers who generally fall into one of the following categories:

- Mainframe-centric customers—These typically surround mainframes at the heart of their enterprises with other servers, PCs and workstations. They tend to like client/server systems management software that is compatible with that found on the mainframe. This can lead to highly automated centralized control. These customers are prime candidates for client/server systems management software from traditional mainframe systems management tool vendors like Computer Associates, Legent (to be part of CA), BMC Software and Platinum Technologies.

- Open systems-centric customers—These customers typically run their enterprises on UNIX or Windows NT servers. The UNIX customers often use network management tools that come from their hardware vendors such as HP's OpenView and IBM's NetView for AIX. The Windows NT customers are likely to use Microsoft's SMS. These companies are likely to expand their systems management capabilities with tools that fit with their existing frameworks. They tend to have both X-Windows terminals and PCs on their networks, the former being simpler to administer centrally.

- PC-centric customers—These typically run their enterprises on PC LANs. They tend to have many local administrators that use PC-based systems management consoles. Most of these are running Intel-based PCs, but a few run Macintosh networks. In these networks, administrators typically start with tools from a network vendor, such as Novell. They then add modules as needed. Although there are many new system administration tools for this class of networks, they lack maturity. A downside is that the networks tend to be less robust than UNIX networks and harder to troubleshoot. Also, PC networks don't support the range of comprehensive frameworks, like HP's OpenView, that are found in more mature environments. However, Windows NT with Microsoft's SMS is driving new systems management products for this environment. For installations up to a few hundred users, homogeneous Macintosh networks tend to be easier to manage than PC networks because Apple has bundled networking into its systems; however, systems management tools are less readily available. Vendors from outside the traditional PC markets are entering the space for systems management products: for example, Digital Equipment has strong tools for bridging the Macintosh, PC, Open VMS and UNIX platforms with systems management solutions.

D
Customer Motivation and Issues

Many customers have a well-established base of tools for managing and monitoring individual system components. Hence users are tempted to integrate old systems management tools with new ones. In time they find these solutions hard to maintain and they seek new systems management products that are specially designed for client/server applications and networks. Exhibit III-4 summarizes the main reasons customers move to client/server systems management software.

Exhibit III-4

Reasons Customers Move to Client/Server Systems Management Software

- Regain central control for some functions
- Reduce administration costs
- Offload some system administration tasks to users
- Gain flexibility in configuring systems
- Integrate existing systems management software into a common framework
- Increase security
- Improve asset allocation and capacity management

Source: INPUT

These issues are discussed below in more detail.

1. Central Control

Many IT managers want mainframe-style control over their client/server networks. They want the security and ease of managing a centralized system to apply to heterogeneous client/server environments. Vendors are addressing this desire by extending mainframe products to support other platforms. IBM, for example, provides RACF, its mainframe security software, on OS/2. Also, leading mainframe software vendors are acquiring or developing software products that can manage client/server networks from a central location. These approaches provide new classes of products that support both mainframes and client/server systems.

2. Reduced Administration Costs

Despite tremendous growth in the number of computers in an organization, investment in systems administration staff has not been

high. Indeed, many organizations, like Texas Instruments, have consolidated mainframe data centers to reduce costs. Other organizations find that X-Windows terminals or diskless PCs offer lower cost support than networked PCs. Administrators need the ability to combine systems management functions for mainframe, midrange and PC/workstation environments on one console to reduce costs. They also need to distribute consoles so that tasks can be switched between them, depending on workload. Other cost savings can be achieved by integrating notification with pager, e-mail and voice systems so that administrators can be located and informed rapidly. Client/server systems management tools that support system migration, flexible network configurations and roaming administrators enable fewer administrators to cope with more tasks.

3. Offloading Tasks to Users

Client/server systems management tools are redefining the roles of system administrators and supporting staff. To avoid slow response and becoming overloaded, some IS groups are depending on users to perform system administration tasks. Centralized system administration is best suited for tasks that need to be supported throughout an enterprise. However, there are tasks that are best managed by user organizations. For example, adding applications software for workgroup computing may be handled by a user group rather than by central IS.

In a mainframe environment, backup may be performed automatically in a highly centralized system. In a client/server network, there may be different levels of backup. some of which are administered centrally and some of which are performed by non-technical staff on departmental machines. So that control is not lost completely, client/server systems management software that reports staff activities back to a central group is often desirable. For example, a user group may add a PC to a network, but it may need to be reflected in central asset management software and be monitored from a central location.

4. Flexible Administration

Client/server systems management software must be flexible so that it can readily accommodate changes in network configurations that occur because of consolidation, system updates or acquisitions. Centralized control is unlikely to return. A disadvantage of the centralized approach is that it is generally unmanageable, given organizational structures. Managing resouces centrally may place an undesirable processing burden on the server and lead to network congestion and poor response times for users. Also users like to have flexibility to add their own applications without the help of a central organization on local PCs. Client/server

system administration software needs to address central, departmental and individual workstation support.

5. Integrating Point Solutions

In client/server systems, tools that have been appropriate for either the client or server environment may need to be integrated and extended to support multiple platforms and the underlying connectivity software. The reality is that there are very good point solutions for particular systems management problems. Users are looking to vendors to integrate point solutions into common menu systems, interoperable system management applications and standard frameworks.

6. Security

In a client/server network, security is driving many IS managers to implement new software for user authentication, protection from outside threats and innoculation against viruses and unintentional network events.

7. Capacity Management

Customers want to pro-actively plan capacity so that they can avoid system failures and anticipate where support staff should be placed. Systems management software can anticipate where networks are likely to become congested, when disk space is likely to be full and where computers are performing too slowly. This helps managers know where to place resources when upgrading systems. Using software to manage software licenses and computing assets helps managers plan new license purchases and upgrades.

E
The Impact of Client/Server Systems Management on Personnel Roles

Client/server systems bring together PC and LAN administrators with traditional data center management, resulting in significant role changes for system administrators, as shown in Exhibit III-5. The first column shows a job role, the second column shows how this is likely to be carried out in a tradtional terminal-based environment, usually connected to a mainframe or minicomputer, and the third column shows how this is likely to be carried out in a client/server environment.

Systems management for mainframes and minicomputers focuses on the data centers that support them. PC systems management revolves around the LAN. Standalone PCs were administered by a roving professional or office administrator who configured software on individual computers.

Exhibit III-5

Job Role Comparison

Job Role	Terminal Environment	C/S Environment
Main data center operators	Backup, storage management, account control for mainframes, computer operations scheduling, performance tuning	Backup of servers, client workstations, portable computers.
Divisional data center operators	Backup, storage management, account control for minicomputers, performance tuning	Integration and updating of software for mid range systems—typical applications that need to be managed include electronic mail, Internet nodes, image storage and retrieval, office automation
Desktop administrator	Link terminals with cables, program function keys and set up central machines to interface with terminals. Replace terminals if broken	Client workstation installation, configuration and support. Add memory, disk capacity, communications devices, software and peripherals.
Network administrators	Network monitoring of communications and computer outages	Printer, fax, telecommunications, videoconferencing integration
Database administrators and database system administrators	Data dictionary administration and database tuning	Object repository administration, database load monitoring and balancing across different platforms: client and server, multiple servers.
Knowledge workers, secretarial and office administrators	No role	Scripting to automate tasks, data administration, local backups or backup scheduling for local machines.

Source: INPUT

Depending on a company's organizational structure, its historical approach to systems management and the availability of skilled personnel, its role for systems management personnel will vary widely. Some companies want system administrators to be specialized; others prefer administrators to serve fewer users, but have broader skills. Some companies separate network and system administration; others prefer to combine them. There is no consensus in the industry on optimal organizational structures for administering client/server systems.

F

The Impact of Client/Server Systems Management on Users

With client/server systems, there is often a non-systematic approach to managing failure on PCs and workstations. Untrained users get involved in fixing their own problems, and in supporting printers and backing up systems. Poor systems management of client/server systems leads to significant lack of user productivity, a hidden cost. It is often cost-effective to have users fix minor problems but they need to be trained and given system management responsibilities where appropriate.

Users also want to be able to describe problems accurately in non-technical jargon. Systems like electronic mail and Lotus Notes can be customized to create problem reporting systems. In addition, organizations may also invest in trouble reporting software. Customizing trouble reporting systems for specific user environments represents a growing professional services opportunity.

User organizations may need reports from systems management software to plan their budgets, assign staff and understand how they can solve system problems better. Whereas reports are typically circulated to users from accounting and marketing departments, IS departments may prefer to keep system administration reporting to themselves. Better reporting on systems management by system administrators is one way that communications between IS and user groups can be improved.

Users need to be able to simplify support of software that they have customized themselves. Systems may be extended by user organizations, but the appropriate systems management tools are not in place. Popular office suite software, like Microsoft Office, may be integrated with databases by users. This type of solution may require new or modified systems management software.

Information integration is critical for users. Software to integrate information from word processors, Lotus Notes, spreadsheets, databases, data warehouses and other sources needs to be supported with administration tools.

In summary, as users customize their own tools, systems management tools must support them. Client/server systems require more integrated tools with the intelligence to pinpoint potential problems before they occur.

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Trends, Issues and Opportunities

This chapter describes both short term (next two years) and long-term (next five years) trends and issues. It reviews general short-term trends, then discusses trends, issues and opportunities for each software category. Long-term trends, issues and opportunities are summarized.

A
Short-Term Trends, Issues and Opportunities

1. General Technology Trends

Exhibit IV-1 summarizes the key short term technology trends that will affect systems management in the 1995-1996 timeframe.

Exhibit IV-1

Short-Term General Trends, Issues and Opportunities

Trends	Issues and Opportunities
Size of corporate network is increasing	A large installation of network nodes for many Fortune 100 companies using TCP/IP is around 5000 nodes Corporate network sizes will double in the 1995-1996 timeframe. Tivoli claims to support 50,000 nodes HP, with Netlabs, claims to support 80,000 nodes Corporate networks are tiny compared with telephone networks, public on-line networks and the Internet
Rules-based, intelligent problem-solving systems management software	Intelligent agents, rule and knowledge bases diagnose problems Tools combining strong user interfaces with rules will help administrators Rules can be combined in systems management software for users

Continued ...

Exhibit IV-1 Cont.

Trends	Issues and Opportunities
Heterogeneous, cross-platform management	Mainframe systems management vendors are acquiring client/server vendors UNIX vendors are expanding to support Windows NT and PC LANs PC system administration software is incorporating higher end platforms Smaller vendors must focus on developing for a primary platform and find partners to help them develop or market cross-platform solutions Larger vendors will be able to port their software across multiple platforms Larger vendors need programs to attract smaller vendors.
Integration of application management, information management, network administration and system administration software	Users want to troubleshoot a problem with an integrated set of tools. Tools are appearing from both applications vendors and systems software developers that can troubleshoot multiple layers
Realistic animation and visualizaton	User interfaces are becoming more visual Quality of graphic artwork is rising —instead of having a printer icon, a systems management package may show an image of a specific printer, such as an HP Laserjet IV Graphics are improving from simple plots to animated, 3-D graphical charts that can be incorporated into other applications
64-bit file systems	In the Windows world, 32-bit addressing is emerging In the workstation environment and above, software needs to support 64-bit addressing 64-bit addressing enables much larger networks and databases to be addressed —16,000,000 Terabytes as opposed to 4 Gigabytes of data Systems management software, in particular storage management packages, must consider the impact of 64-bit systems and applications
Scalability from palmtop to international public telephone networks	Scalable systems management software will need to be cross-platform Systems management software is increasingly taking into account telephony systems Mobile users with notebook computers, cellular phones and PDAs require systems administration support, at a minimum for inventory tracking PBXs require systems management software to support directories and caller features Advanced intelligent public telephone networks (AINs) support features like caller-ID that are being used in telemarketing systems, for example. Systems management software for corporate systems that can support AIN features provides an opportunity.

Source: INPUT

A problem with diagnosing problems is that as platforms, networks, databases and applications proliferate, the number of possible

configurations grows exponentially. For example, with four operating systems, four databases, three networking environments and five applications integrated into a system this would result in 240 feasible software configurations. Contrast this to an environment on a mainframe with one OS, one or two databases, one networking environment and five applications that would give five to ten possible configurations. This increased complexity will drive users to select a few key vendors, resulting in a shake-out of client/server platforms. This means that systems management vendors must be able to change the platforms they support quickly to adjust to shakeouts in the market.

Silicon Graphics and Digital are some of the leaders in 64-bit file systems. These provide the ability to address more entities than 32-bit systems. They can therefore support larger file systems and databases, making a system administrator's job more difficult. There is an opportunity for tools that can manage massive file systems.

Telecommunications networks require extensive network management support that goes far beyond that found in the typical corporate network. Most network management vendors will find opportunities in supporting elements of telco and cable TV systems, but will be unable to supply comprehensive solutions because of the sheer scale. It is therefore imperative that vendors of network management solutions are clear as to the scope of their solution when supporting public networks. LAN and WAN management is becoming more integrated. The division between telecommunications and data communications management is being bridged as companies place information on the World Wide Web. Only a few systems management solutions can manage smooth interfaces between LANs and WANs. This presents an emerging opportunity for both software vendors and system integrators. The next section summarizes the key short term product trends, by categories defined in Chapter III.

2. Business Management Trends and Issues

Exhibit IV-2 focuses on business management trends and issues. Business process reengineering results in businesses redefining their systems management operations, and emphasizing:

- Cost reduction
- Capacity planning
- Application performance

Certain systems management functions may need to produce executive-level reports that can assist with business planning.

Exhibit IV-2

Business Management Trends and Issues

Trends	Issues and Opportunities
Increasing accuracy of planning information	Departments may purchase additional machines on expense accounts, making central asset management and tracking difficult. Client/server asset management software tracks license numbers, network hardware and software, making it easier to forecast demand for new systems. Balancing accuracy and timeliness of data with the cost of data collection is a major challenge for accountants, auditors and systems planners.
Closer management of client/server costs	Costs of client/server systems are often hard to understand. By combining accounting and charge-back software, greater cost control can be obtained.
Change to usage-based software pricing	Some users, particularly those who do not use software often, or who want to share licenses across an enterprise, find usage-based pricing attractive.
New charge-back strategies	In centralized host environments, charge-back is typically for resource usage, such as disk space, CPU usage and class of service. In a client/server environment, more emphasis may be put on network-related charges, such as access speeds.
Formalized level of service agreements	Increasingly, more formal methods of specifying level of service are created between users and IT managers. This enables IT organizations to define priorities.

Source: INPUT

3. Software Infrastructure Trends and Issues

The underlying software infrastructure affects the ability of a systems management software developer to:

- Program the systems management software so that it can be deployed in modules
- Add or delete features quickly
- Transport the application to other networks and systems
- Reuse code
- Attract high quality programmers

There is debate as to whether a common underlying development platform for vendors is required, short term it may not be, long term—as in the operating systems market—it may become a competitive necessity. It is, however, important for systems management software to be easily

integrated with other products and for it to be able to handle events, alarms and communications through standard interfaces.

Exhibit IV-3 summarizes some of the software infrastructure issues. The main influence on the market is Microsoft's introduction of Windows 95.

Exhibit IV-3

Software Infrastructure Trends and Issues

Trends	Issues and Opportunities
Growth of Windows NT	Windows NT integrated tools like OpenView for HP-UX will appear. Microsoft's SMS software for Windows NT will fuel a large third-party market.
Growth of Windows 95	A key initiative of Microsoft and others is the Desktop Management Interface that provides Windows 95 machines and software with sufficient intelligence to be monitored from applications compatible with the Desktop Management Task Force's standards.
Creation of object-oriented frameworks and cross-platform infrastructures	Tivoli, Candle and others are creating object-oriented frameworks upon which systems management tools can be built.
Mainframe support for open connectivity	MVS and VM operating systems support C++ and POSIX standards that make it easier to develop client/server applications that reside partially on servers.

Source: INPUT

4. Configuration Management Trends and Issues

Exhibit IV-4 summarizes configuration management trends and issues. Configuration management addresses how hardware and software is configured, on individual machines as well as across networks. It is particularly challenging in a client/server environment to plan for capacity. To gain the most from high-speed network communications, they need to ensure that PCs attached to the network have adequate memory, disk capacity and displays to successfully view and process the data. For example, many major corporations are upgrading their networks to bring Fast Ethernet 100 Mbps communications to the desktop. Analysis of network requirements can be handled by capacity planning software.

Making the network perform well as a whole is much harder than getting individual network components to perform well. Sizing is more critical in a client/server environment than in a simpler system. The market has to develop tools that can help sales representatives configure systems, given a customer's existing resources, business requirements and budget. From the initial sales demonstration, sizing is a continuous task that takes place at regular intervals to ensure that systems grow gradually. At different phases of development, different types of sizing and capacity

monitoring software will be required. Typical phases are pre-sales, installation support, post-sales tuning, routine sizing to manage existing applications, and special sizing studies to support new systems.

Software distribution is an active area for new systems management software. It is particularly critical when a new version of a popular package—for example, Windows 95—becomes widely available. Central distribution is essential to ensure that users are upgraded uniformly. Software distributors will distribute software electronically with security certificates that enable them to track inventory and sales.

Exhibit IV-4

Configuration Management Trends and Issues

Trends	Issues and Opportunities
Simplified configuration management in Windows 95	Windows 95 will support plug-and-play systems that can be automatically configured using software to simplify systems configuration and management. The MacOS has supported this since its inception.
Software distribution from a central location over networks	Vendors increasingly provide installation scripts and network licenses that enable client software applications to be installed centrally. Version control is a key benefit of installing systems centrally. If an installation takes 15 minutes and there are 60,000 users, it could take 21 months to install sequentially, assuming 24-hour, 7-day-a-week operation. For large sites, vendors must ensure that updates can be made in parallel, so that the installation time has minimal impact on users.
International licensing and use of global licenses	A multinational company may seek a floating license that supports users worldwide. It can save on license charges by sharing per-user license fees across time zones—for example, a 10-user license may support 10 European users, 10 U.S. users and 10 Indian users at different times of day.
Network optimization to plan system configurations	Classical network optimization technology and simulation is increasingly being applied to systems administration and capacity planning. In optimizing network performance, the tools required are quite different from those used to optimize a particular computer. Sometimes it is better to run multiple small computers rather than a few larger ones.

Source: INPUT

License management controls the use of software rather than the copying of software. It controls the number of users that can use a particular product. Copying software is no longer the critical issue, it is how much software is used. Another direction in license management is to be able to integrate license fees with charge-back software so that organizations can get billed for software as they use it. In excess of 800 software vendors use software licenses to control the number of people who can use their products. License management is particularly popular in engineering, financial services and publishing software. There is a trend away from concurrent user pricing to number-of-user licenses. In the UNIX market,

concurrent user pricing fixes the number of licenses at the number of simultaneous users.

For some applications, such as software development, there are many developers, but few using the same tool concurrently. Vendors, such as Purify,have moved from concurrent user licensing to licensing based on the number of users. In an organization with 50 developers, where all use the software, but only five use it at once, 50 user licenses would be required under a number-of-users scheme and a five-user license would be required under a concurrent licensing scheme. Prices are generally adjusted somewhat to compensate for the number of users that are licensed. Named user licenses are another variation, where each licensed user has to be named, this further restricts use of the software.

Systems management organizations need to become more service-oriented, acting as an information utility that can reconfigure client/server systems without disrupting the users, applications, or processes. Service companies that support customers on high-speed networks, like EDS, will have an advantage in this market.

5. Database Management Trends and Issues

The database market is evolving and splitting into sub markets that include object-oriented databases, full-text databases, multimedia archives, and electronic filing cabinets, as well as traditional databases. Increasingly, organizations are focusing on managing the corporate memory, or the information that drives the enterprise. This requires investment in software like Lotus Notes and World Wide Web servers.

Systems management vendors, as well as database vendors, are providing solutions for database monitoring in a client/server system. Early systems indicated where there were bottlenecks, how many database accesses were being made and who was using the database. More sophisticated systems now track specific transactions and can report to users problems in terms of the information stored in the database.

As objects are being integrated into databases, systems management tools that track links between objects are being developed. Data dictionaries are evolving into information repositories that can be tapped by systems management tools to analyze system problems.

Third-generation client/server systems that link databases with messaging systems like Lotus Notes and the World Wide Web offer new opportunities for system administration software vendors. Exhibit IV-5 summarizes database management trends and issues.

Exhibit IV-5

Database Management Trends and Issues

Trends	Issues and Opportunities
Increase in object-oriented databases and multimedia	Whereas traditional database management required standardization of records, fields and formats, the increase in complexity surrounding object-oriented databases means that corporations must decide on how information stored in them is managed. It is one thing to define programming standards and keep information in a repository, it is another to make databases interoperable by standardizing on objects that are added after a system is deployed.
Database and network management vendors increase cooperation	Companies that make software for viewing database performance on a network may get squeezed between major database vendors and systems management vendors like IBM and HP.
Systems management tools for database and application monitoring	There is likely to be a shakeout as different classes of vendors tap into the market for monitoring database performance, especially for products based on Oracle or Sybase where there is fierce competition. Tools will be differentiated based on level of integration with a user's existing application and systems management environment.
On-line analytical processing (OLAP) grows as users want to analyze information in databases	OLAP tools from companies like Arbor Software, the SAS Institute and Cognos create new opportunities for systems administration tools that can manage data links between remote systems and troubleshoot OLAP-based applications. These systems are often financially based, providing mathematical modeling as part of the solution. They may overlap with data warehousing systems.
Data warehousing grows as companies combine legacy data to create new systems	Data warehousing involves taking data from multiple systems and combining it in a new system. This process requires its own set of systems management tools, to ensure that system interfaces between old and new databases are compatible, links are robust and performance is acceptable. Load balancing, status reporting and auditing provide opportunities for vendors of systems management tools that choose to support data warehousing.
Parallel databases support faster performance, larger amounts of data and parallel processes	Parallel databases offer new opportunities for systems management vendors, particularly in areas of data migration and warehousing. There are also parallel query systems, which may or may not be integrated with parallel databases.

Source: INPUT

6. Operations Management Trends and Issues

Operations management includes traditional data center management. Whereas the early 1990s saw the data center being downsized, now data centers are consolidating and being redefined as a hub for client/server activity. Job scheduling is an emerging area for client/server systems management. Increasingly, firms are finding that spare capacity on PCs may be harnessed in a network using client/server tools. Users are

automating their tasks with scripts and are tiring of using the mouse as the main user interface. Managing and scheduling scripts is moving from being a casual programmer's task to being under the control of systems management professionals.

Exhibit IV-6 summarizes the trends in operations management, as described initially in Exhibit III-1.

Exhibit IV-6

Operations Management Trends and Issues

Trends	Issues and Opportunities
Job scheduling becomes part of the client/server environment	Job scheduling on mainframes focused on allocation of scarce resources. For performance in UNIX workstation networks, engineers and other users may schedule jobs across multiple machines. In the PC environment, PCs are often perceived as individual resources and running jobs across them is less common than in the workstation environment. In the future, certain applications may be scheduled to run across multiple machines, particularly messaging, communications and distributed applications. WinFax Pro is an application that schedules the task of sending faxes across multiple machines.
Some LAN management functions become more server-centric	LAN administration will increasingly be integrated with enterprise server systems management. For example, distributed management consoles will enable both data center managers and LAN administrators to access network management software.

Source: INPUT

7. Performance Management Trends and Issues

Exhibit IV-7 summarizes performance management trends and issues. Performance management tools were initially developed to ensure that code could run fast. This is particularly true of UNIX environments, where there are public domain tools for tracking performance. This has resulted in a plethora of point solutions suitable for programmers. After system deployment, there are many tools for established mainframe platforms, but in the client/server market, new tools are required.

Performance data may be collected in different ways, no single tool will suffice. Performance data may be sent as an alarm, it may be monitored in real-time for a given timeinterval, or it may be logged to a report. Client/server commercial systems require integrated tools to optimize business performance. The challenge—for example, in a production environment—is to create systems that can produce a given number of objects per hour, rather than to. In a customer service organization, tools that can optimize performance to enable representatives to provide responses within a given time are needed.

Exhibit IV-7

Performance Management Trends and Issues

Trends	Issues and Opportunities
Improved disk performance monitoring for low-end as well as high-end systems	Disk access is often a bottleneck in information retrieval applications. Managing disk performance is an opportunity in a client/server application because there are multiple storage sources that may be distributed throughout a network.
Improved network performance monitoring	Specialized network optimization products are attempting to solve network performance problems, both pre- and post-installation, however,they need to be integrated with mainstream systems management products.
Evolution of transaction performance monitoring tools	There is an emerging opportunity for tracking transaction performance in a distributed client/server system. Whereas tools track performance for a single database or transaction monitor, it is much more difficult to optimize performance when a user is accessing multiple databases.
Increased specialization of products for different phases of systems management	Performance monitoring is managed at different phases of client/server systems implementation with different classes of tools. Too often, networks are not monitored until there are problems. More products to help plan and configure networks are being deployed.

Source: INPUT

8. Problem Management Trends and Issues

Exhibit IV-8 summarizes trends in problem management. System load, long-running process tracking, machine failures, mail gateway bottlenecks, backup failures, disk capacity, database table usage, job scheduling failures, transaction performance and application objects are just some of the areas tracked. The main trend in problem management is to more precise reporting using on-screen or printed graphics, rather than overloading the reader with lengthy text-based reports.

Exhibit IV-8

Problem Management Trends and Issues

Trends	Issues and Opportunities
Increased use of trouble reporting systems based on messaging	E-mail has traditionally been the preferred way to report problems, but specialized trouble reporting systems are gaining acceptance. Remedy Corporation, for example, provides trouble ticket software that is increasingly being integrated with systems management software. There are opportunities to integrate problem management and reporting with messaging systems of all kinds.
Increased use of help desk systems and databases.	Help desk functions are becoming more automated, and specialized vendors like Scopus are emerging to address software support for help desks. Integrating help desk software with other systems management tools is a significant challenge and opportunity.
Increased automation	Scripts to automate problem tracking are being programmed with more powerful visual tools, whereas in the past UNIX shell scripts were the preferred automation technique. Automating problem reporting and management is critical to keeping staffing costs low.
Pro-active reliability planning and early warning of problems	By monitoring problems in advance of system failure, system reliability can be understood and resources can be deployed in advance to avoid problems.
Intelligent logging of critical data	Logs of problems can be very long, there is a movement toward more intelligent logging software that keeps a history of significant failures rather than every event that happens in a system. Users typically need customizable logs.

Source: INPUT

9. Remote Access Trends and Issues

Networking provides corporations with the ability to support many systems remotely. This may be done by internal staff, or by a services company. Companies can consolidate data center staff and run lights-out operations. For example, J.C. Penney has made three of its four data centers light-out operations that are administered remotely. Data General has made lights-out data management a key strategic initiative.

Exhibit IV-9

Remote Access Trends and Issues

Trends	Issues and Opportunities
Lights-out data management implementation	There is a trend in some large organizations whose networks resemble complex telephone networks to manage resources remotely, with minimal staff actually in the data centers, which can be kept dark, hence the term lights-out data management.
Remote systems management for mobile, at-home and branch office users	From single PCs to enterprise networks, there are tools for managing systems remotely. Increasingly, small organizations and consumers will not be able to afford their own systems management staff This offers an opportunity for remote support.
Telecommuters have additional systems management requirements	Telecommuters require systems administration support to enable them to connect to corporate LANs.
Offshore development is increasing	Offshore developers can be supported with remote software, bearing in mind that there are legal constraints on exportability of some software. Developers can use differences in time zones to fix problems a round the clock and quickly for their customers.
Mobile system use is increasing	Notebook computers, PDAs and information appliances require their own tools for systems management to synchronize files, provide backup and recovery and update software. Power management provides another opportunity for systems management tools. Both users and their supporting networks need administration.

Source: INPUT

Another key aspect of remote systems management is support for mobile users and home office workers. Synchronization of files between desktop and portable computers has typically been the responsibility of notebook computer tool vendors. Increasingly, IT departments are being asked to synchronize systems in applications that range from order processing to sales support to inventory processing. Exhibit IV-9 summarizes remote access trends.

10. Security Trends and Issues

Exhibit IV-10 reviews security trends and issues. A key notion in distributed systems is that of trust. If domain A trusts domain B, then a user or application that is authenticated on domain B is automatically authenticated on domain A.

Exhibit IV-10

Security Trends and Issues

Trends	Issues and Opportunities
Increased demand for security for third-generation client/server systems that loosely couple databases with messaging	Distributed systems connected by messaging systems like the World Wide Web are likely to use one of two alternatives to authenticate users. The competing standards, which are being harmonized come from Terisa Systems, a joint-venture of RSA Data Security and Enterprise Integration Technologies, and Netscape.
Demand for simplified, enterprise-wide authentication	Ensuring that users are who they say they are is the process of authentication, typically administered by passwords. MIT's Kerberos and RSA's data security algorithms are two of the most popular technologies to create enterprise-wide security. DCE supports Kerberos.
Security risks are increasing	Client/server systems provide increased security risks, especially between computers. Firewalls to protect corporate data from external systems and users are rapidly being installed.
Randomly generated passwords are being used	Some corporations are adopting password schemes that rely on a card that randomly generates a password. This saves the user having to change the password frequently, a procedure that can lead to forgotten passwords.
Encryption is becoming more widespread for keys, financial transactions and sensitive documents	Increasingly, data will be encrypted to protect it when traveling between enterprises, and also within organizations. An issue is to what extent the government will want to decrypt data in the interests of national security. Efforts by the government to define encryption schemes have been attacked by industry, and many privacy issues need to be resolved. International encryption standards need to be reviewed, given the growth of the Internet and government restrictions on exporting certain classes of encryption techniques.

Source: INPUT

11. Storage Management Trends and Issues

With large client/server networks it can be hard to find files when they are archived. This becomes a particular problem in organizations that store their backup data at a central site. Hierarchical storage management (HSM) systems define different levels of data storage. For example, some may be on disk, others on more remote servers and still others on tape or optical storage. Whereas HSM has been widely implemented for mainframe systems, it is only now being implemented for client/server systems. Some of the leading applications are in image processing, where storing unnecessary large files can waste significant disk space. Exhibit IV-11 summarizes storage management product trends.

Exhibit IV-11

Storage Management Trends and Issues

Trends	Issues and Opportunities
Implementation of client/server backup systems	Systems from companies like Legato and Cheyenne address heterogeneous backup across client/server networks.
Emergence of backup for databases	Companies are emerging that are focusing on backing up databases intelligently.
Demand for hierarchical storage management (HSM)	In mainframe and minicomputer environments, creating storage hierarchies for disk and tape management is routine. However, for client/server environments, the hierarchy may include local PC storage and cover a wider range of media, such as DAT tapes, storage silos, magneto-optical and optical drives. Deciding how to configure hierarchical storage systems is a challenge, particularly where different types of media, such as image and sound, are involved.

Source: INPUT

12. User Management Trends and Issues

There is renewed emphasis on user management, as companies implementing client/server technology realize the costs of support. User management is uppermost in the minds of many systems integrators and IS managers—a change from recent years when networking and standards were considered more important. Exhibit IV-12 summarizes user management trends and issues.

Exhibit IV-12

User Management Trends and Issues

Trends	Issues and Opportunities
Integration of user directories	Already, mail directories can be integrated with networking directories. With an increase in X.500-compatible directories these may be extended to support mail systems, PBXs, human resources systems and access to other systems.
Requirements for user training in systems administration, upgrading and support	Training users to perform simple systems management tasks can save on overall systems administration costs. Users may need to know how to manage, organize, back-up and purge files, depending on how these functions are managed.

Source: INPUT

B
Long Term Trends, Issues and Opportunities

Exhibit IV-13 summarizes longer term issues and trends that will affect systems management beyond 1996, to the turn of the century.

Exhibit IV-13

Long Term Trends and Issues

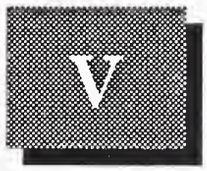
Trends	Issues and Opportunities
Shakeout among framework vendors	Which underlying frameworks will survive and which will become industry standards? As more cross-platform systems management platform environments like Tivoli's TME emerge, it is unclear which will survive. A key issue for vendors that are developing their own frameworks to minimize royalty payments to vendors like HP and Tivoli will be how long they can exist with proprietary platforms.
Support for distributed objects based on CORBA, OLE and OpenDoc implementations	New paradigms for systems management will be required to support massive distributed applications based on object frameworks.
Taligent or NeXT framework support	An open issue is the impact of Taligent and NeXT on systems management software. Virtually none of the main systems management software vendors support these environments to date. Depending on how their market position evolves, they may provide new systems management opportunities.
Management of a business process or workflow	Not only do applications require systems management, but entire systems processes do.

Source: INPUT

For heterogeneous client/server networks, UNIX workstations are often the preferred platform for monitoring events and alarms from servers, bridges, routers and channel service units. Increasingly Windows NT workstations will be used in this role, though they are unlikely to displace the UNIX installed base. They will be used primarily for LAN maangement to support Windows clients. Given the rate of change and variables involved, point-to-point software integration that allows a particular client to work with a particular server over a particular network often proves limited. Supporting new business initiatives can take too long, cost too much, and require too great a depth of technical skill across multiple platforms. Point-to-point client/server solutions can add another layer of complexity, becoming "islands of integration" that are difficult to manage and change. Over the next five years, established point solutions will become integrated into frameworks. New point solutions will emerge that will in turn be integrated into frameworks.

Some of the new areas for systems management will be in the boundaries between LAN and WAN interfaces. Security systems designed to protect

Internet connections will be combined with enterprise security. The firewall vendors that protect public networks are partnering with LAN vendors protecting PC networks. The extent to which corporations will cooperate on inter-enterprise systems management remains an open issue, that in some cases will be resolved by outsourcing systems management operations to a third party. Information utilities that support users with systems management, on-line services and connectivity will change the way many branch offices, home offices and small businesses manage their networks over the next ten years.



Vendors

This chapter reviews the corporate positioning and product marketing strategies of over 30 vendors. For most of them it provides strengths, weaknesses and an outlook. Appendix B gives vendor names and addresses.

A
Vendor Classification

There are common strategic initiatives among vendors. Almost every vendor of systems management tools in the UNIX market supports the leading industry frameworks: HP's OpenView, IBM's NetView for AIX, Sun's Solstice and Digital's POLYCENTER. In the Windows NT environment, vendors are lining up to support Microsoft's SMS.

Vendors that support data management partner with the leading relational database vendors, Oracle, Sybase, Informix, Microsoft and IBM, with the first two in the list the current choice of emerging and open systems software suppliers. Mainframe data management companies typically support IBM's DB2, IMS, VSAM and CICS.

Large systems management vendors almost always grow by acquisition, enabling them to adopt new technologies once they have been proven. A risk of this approach is that developers leave the company once it has been acquired. Mainframe systems management vendors that have been able to successfully move into the client/server arena by acquisition include Compuware, Boole & Babbage, Sterling Software and Legent.

Vendors are classified into one of four categories, as shown in Exhibit V-1. In Exhibit V-1, the first column describes the class of vendor, the second column gives names of typical vendors in the category and the final column gives the role of the vendor in the systems management software market. The following four exhibits give the factors considered critical to their market success. They also give the risks for vendors.

Exhibit V-1

Vendor Classification

Vendor Classification	Representative Vendors	Vendor Role
Open Framework Vendors	Computer Associates, HP, IBM, Intel, Microsoft, Novell, Sun, Tivoli	Integrate third-party products into their frameworks
Proprietary Framework Vendors	BMC, Boole & Babbage, Candle, Compuware, Legent, OpenVision, Platinum Technology, Sterling Software	Use their own framework primarily to integrate their own tools or sell a product line made up of point solutions
Hardware Suppliers	Amdahl, AT&T, Bull, Data General, Digital, HP, IBM, ICL, Siemens-Nixdor— this category also includes storage management, network equipment and peripheral suppliers	Supply system management tools to support their hardware
Point Solution Vendors	4th Dimension Software, BGS, Elan, Eventus, Globetrotter, Informix, Landmark Systems, McAfee, Oracle, Raxco, Spire (ASI), Sybase, Symantec, Unison	Supply point solutions that are integrated into other vendors' frameworks

Source: INPUT

Exhibit V-2 gives critical success factors and risks for open framework vendors. The key to their success is the ability to attract partners, both for development and for systems integration.

Exhibit V-2

Open Framework Vendors' Success Factors and Risks

Critical Success Factors	Risks
• Attract many point solutions • Strong developer support program • Strong training and technical support for developers • Wide licensing of framework • Significant installed base of management console software that can be used to access third-party solutions	• May compete with third-party developers as framework vendors' products mature • Investment in framework may be costly and require capital • Licensing the framework without supporting applications may not be profitable • Developers may choose an alternative platform • Framework may be marketed too late, typically it will need to be pre-marketed before it is ready to gain developer cooperation

Source: INPUT

Exhibit V-3 gives critical success factors and risks for proprietary framework vendors. The key to their success is the ability to leverage the technical advantages of their framework to make flexible systems. They also need to keep close to users.

Exhibit V-3

Proprietary Framework Vendors' Success Factors and Risks

Critical Success Factors	Risks
• Flexible technology • Ability to create new solutions rapidly • Strong porting organization to move rapidly to new platforms • Strong relationships with users	• Investment in framework becomes too heavy and distracts from enhancing systems management applications • Framework grows obsolete and vendor cannot migrate away from it to newer technology • Failure to provide a wide enough range of solutions supporting the framework • Growth by acquisition cannot be sustained as valuation of software companies gets too high

Source: INPUT

Exhibit V-4 gives critical success factors and risks for hardware suppliers. The key to their success is the ability to package systems management solutions with their hardware that provide value to the customer. In the Windows NT market, it is relatively inexpensive for a PC vendor to integrate hardware with Microsoft's SMS and some extra software.

Exhibit V-4

Hardware Suppliers' Success Factors and Risks

Critical Success Factors	Risks
• Ability to attract many third-party software suppliers • Creative packaging of hardware and software solutions • Interfaces to a wide range of hardware and software platforms that belong to other vendors	• The value added by hardware manufacturers is not high enough and users prefer to purchase from software vendors with more specific solutions. • Users prefer to be independent of hardware platforms and to deal with a cross-platform independent software vendor. • The hardware manufacturer lacks sufficient expertise to support systems management tools adequately.

Source: INPUT

Exhibit V-5 gives critical success factors and risks for point solution vendors. The key to their success is the ability to develop innovative solutions that larger, more established vendors will want to remarket.

Exhibit V-5

Point Solution Vendors' Success Factors and Risks

Critical Success Factors	Risks
• Keeping up with technology • Ability to attract high-calibre designers and engineers; this is usually easy in the early stages of a company when stock options are available, but becomes harder as a company matures • Providing innovative solutions that can be widely licensed to other vendors • Gaining the cooperation of indirect distribution channels, such as systems integrators and value-added resellers • Proving to customers that their solution is cost effective	• New vendors will emerge that render their products obsolete. • They lack a sufficient range of products to attract major customers. • There is inability to attract high-calibre personnel to support products.

Source: INPUT

B
Vendor Assessment

This section reviews over 30 vendors; it describes the strengths and weaknesses of many of them. For other vendors, a few key points are highlighted. There are many systems management vendors, so vendors have been selected to provide a representative sample.

1. 4th Dimension Software

4th Dimension Software is an Israeli company that markets the CONTROL line of job scheduling software for distributed environments. Its strategy is to grow by supporting more platforms in the open systems market. It focuses on ease of installation and compatible user interfaces across multiple platforms to simplify user training. 4th Dimension is particularly strong in HP sites. Its products are able to operate across legacy mainframes and minicomputers as well as newer UNIX environments. The CONTROL family of products is licensed to 1,100 sites worldwide.

4th Dimension is making significant inroads in the job scheduling arena for companies that want to provide the same software on multiple platforms. Besides HP and UNIX systems, it also supports VAX VMS and AS/400 sites. Major development and marketing agreements have been signed in the last year with companies such as HP, Sun, Digital, IBM, Pyramid, Amdahl, AT&T and Unisys.

2. Amdahl

Amdahl Corporation is the leading supplier of UNIX operating system software for mainframes, including machines from IBM and Hitachi. In 1993, Amdahl announced that it would resell Sun hardware. It is committed to the open systems marketplace and its system management tools are useful for companies that want to support both mainframe and Sun Solaris environments.

Amdahl provides the A+ Systems Management Tools to manage its hardware and provide backup, software distribution, asset/configuration management and storage management. A+View is its high-end systems management product. In performance management, A+UMA and OpenTune use the Computer Measurement Group's standards for performance measurement. The A+ Information Management suite distributes, accesses and maintains applications across an enterprise. It manages Amdahl's System/390 mainframes, SPARC-based servers and other systems. Amdahl's strategy is to leverage hardware sales through its software. The company had an early start in UNIX systems management, with its UTS version of UNIX for mainframes, but its focus on UTS has waivered over the years as it found faster growing market opportunities with Sun hardware.

Strengths

- Performance management expertise for high-volume transaction processing environments
- Supporting mainframes, both with UTS and traditional mainframe operating systems, to newer SPARC-based machines
- Professional services—Amdahl provides consulting support for systems management on its hardware platforms

Weaknesses

- Amdahl has not promoted its open systems mainframe solutions widely, nor the systems management tools that run on them. Software is mainly for Amdahl machines, even though it can run on IBM or Hitachi mainframe hardware.
- Amdahl's traditional business is vulnerable to downturns in the mainframe market and data center consolidation. To counteract this, Amdahl resells Sun equipment. Amdahl needs to provide system management tools that can support data centers as they consolidate.

- Amdahl needs more third-party alliances with software manufacturers and systems integrators. This is changing as companies like Boole & Babbage work with Amdahl to recommend its software.

Outlook and Assessment

Amdahl is an example of a hardware vendor that has not leveraged its software technology widely. Amdahl needs to have a stronger software marketing strategy for its UTS applications, including systems management software. The alliance with Sun and the resurgence of mainframes in client/server systems has revived Amdahl. It needs more strategic partnerships to create solid platforms for client/server applications that require a mainframe. It needs to broaden its platforms by emphasizing mainframe connectivity. In the future, one can expect Amdahl to increase its visibility in client/server software.

3. AT & T

AT&T has its main computing systems division in AT&T GIS, formerly NCR. In this division, AT&T is focusing its strategy on moving data with its "Get it, Move it, Use it" campaign. In systems administration, AT&T relies heavily on third-party software vendors, although it provides some tools as part of the operating system. AT&T can be expected to strengthen its performance when networking expertise becomes a critical element in a sale. As client/server networks become more like public telephone networks, AT&T will have a competitive advantage because it understands very large network systems management.

AT&T has smaller ventures that provide systems management software. For example, AT&T CommVault is a venture that provides storage servers with their own system management software.

AT&T needs to leverage its smaller organizations, subsidiaries, resellers and divisions that sell system management products by integrating them better into the GIS business. AT&T missed an opportunity in the early 1990s by not emphasizing its ability to support systems management. In mid-1994 it licensed HP's OpenView for its OneVision Network Management Solution. AT&T expects to migrate its StarSENTRY Systems Manager installations to OneVision. StarSENTRY is based on technology from NetLabs (to be acquired by disk drive vendor Seagate), which recently announced it was licensing technology to HP for inclusion in OpenView.

4. BGS

BGS provides real-time monitoring, performance management and capacity analysis of UNIX, OS/2, NT, AS/400 and MVS/VM operating

systems with its BEST/1 product line. BGS has over 30,000 installations worldwide of BEST/1 products.

5. BMC Software

Strategy

BMC has recently undergone a new corporate image campaign to transform it from a mainframe systems management tool vendor to an open systems applications management vendor. BMC has traditionally been a vendor of performance management, data availability and recovery tools for large data processing systems that rely on IBM's DB2, IMS/DB and CICS. BMC has over 40 MVS products. In 1995, BMC's main thrust is to introduce its first products for open systems data management on UNIX, Windows NT and OS/2. It plans more than a dozen new products to be released on open platforms in 1995 and 1996. It is focusing on providing tools for:

- Database administration
- Advanced change management
- Data warehouse population
- Recovery management
- Utility functions

In the database administration market, the first open systems tools are MetaDESK and MetaMANAGE, which support CA-Ingres, IBM's DB2 range of databases, Informix, Oracle, Rdb, SQL Server and Sybase. The main areas of focus are in database administration, advanced change management, data replication and movement, recovery management and utilities. BMC's data management platforms for open systems, in order of rollout, are Sun, HP, AIX, OS/2 and Windows NT. Its priorities for client workstation platforms are Windows 3.1, Windows 95, Windows NT and for the UNIX environment, Motif.

BMC acquired Patrol Software to bring client/server application management to its customers. Patrol monitors applications, databases, operating systems and networks around the clock. Digital Equipment is a reseller of Patrol. Patrol works with the leading UNIX systems management tools, including CA-Unicenter. BMC has software for managing databases such as Oracle and Sybase using HP's OpenView network management software. BMC has started an aggressive partnering program to encourage applications and development tool vendors to create software libraries, called knowledge modules, that

support Patrol. Unlike some other monitoring software, the knowledge modules may be programmed using Patrol, and BMC provides a scripting language to assist developers in supporting their products. They are available for leading databases. Patrol is based on intelligent agent technology that interprets the information in the knowledge modules.

BMC recently announced that it is working with Novell to provide NETMAXER, a network optimization product for Novell's NetWare for SAA platform. This will be used to enhance performance of NetWare to mainframe connections. BMC is expanding its relationships with partners, to have more indirect resellers such as VARs, systems integrators and applications software vendors.

Strengths

- Aggressive, focused management
- Financially strong, with strong investment in R&D (25% of revenues on R&D and support)
- Strong focus on IBM mainframe administration with clear understanding of corporate systems management market
- Investing heavily in client/server and open systems markets to provide a range of solutions from workgroup through enterprise solutions
- Leverages partnering relationships, integrates products with leading vendors of systems and network management frameworks, and is a developer for many of the leading database vendors and hardware manufacturers

Weaknesses

- Late into client/server market, though BMC is now catching up, with Patrol. It needs similar acquisitions to gain a stronger following in the client/server market.
- Core business is vulnerable if mainframe market declines rapidly, as data centers consolidate.

Outlook and Assessment

BMC can continue to leverage its knowledge of IBM systems and work closely with IBM on AIX and AS/400 products. Its strategy is to expand by creating more products for database and application management in the Windows NT and LAN markets. It has a good opportunity to acquire some of the point solutions vendors at the lower end and integrate their products into the BMC product line.

Recently it has enhanced its corporate image in the open systems market with its alliances with HP and its acquisition of Patrol. To date, the Patrol acquisition and open systems campaign are proving successful and are helping BMC maintain its growth rates. BMC makes heavy use of agents in the Pacific Rim, with direct sales offices in Japan and Australia.

6. Boole & Babbage

Strategy

Boole & Babbage's strategy is to automate the system administrator's job. Following a major change of management in the early 1990s, Boole & Babbage is expanding from selling mainframe systems management products into the client/server arena. In the last year its sales growth has accelerated and its client/server revenues doubled. Its main systems management product families are:

- MainView a mainframe product line
- Storage management software
- Ensign a client/server product line
- COMMAND/POST, an alert management product line for UNIX, SNMP and mainframe equipment, as well as networking software

It acquired COMMAND/POST, a UNIX-based product for monitoring alarms at the network and systems level from over 200 different network devices and computer platforms. This is now its main product for open systems. It runs on Sun workstations and interacts with HP's OpenView. Plans are to make it run on IBM RS/6000 platforms.

Ensign was launched at the end of 1994 as B&B's Unix system administration product line, acquired from Norwegian Sysnet Corporation. Ensign focuses on enabling data center managers to delegate system management tasks to remote managers, yet at the same time be able to override their decisions should it become necessary. It has realistic icons in its user interface to simplify user training. Ensign Local Manager will be launched to support remote site administrators. It does not rely on external frameworks. Ensign currently supports leading UNIX platforms. The goal of Ensign is to automate many of the routine UNIX system administration tasks. Additions to Ensign in 1995 include Novell NetWare support, Kerberos-based security, performance management features and wider distribution through market leaders.

Boole & Babbage has over 10,000 customers and has worldwide distribution.

Strengths

- Boole & Babbage rebuilt its management team in the early 1990s. This team is now getting established and has a strong background in open systems. The company is starting to see the results of its transition to open systems.
- Recently set up a Federal Government and Business Partners program to expand distribution channels
- Ensign has lower price and simpler installation than CA-Unicenter, and fewer computer resources are required.
- Mainframe and storage management software, particularly strong in event monitoring and alert management
- Working with IBM on systems management for mainframe parallel processing machine management, which should poise it for client/server systems management of applications like data warehousing, where parallel servers are part of the solution

Weaknesses

- Boole & Babbage is late into the client/server market, however, it is making strategic acquisitions that should be attractive to its existing customers.
- Prefers to use its own infrastructure, and does not rely on standard frameworks.
- Needs more partners and independent software vendors, although it did expand its alliances with its Business Partners program in 1994

Outlook and Assessment

Boole & Babbage has started to grow faster and expand from its mainframe and minicomputer base. It needs to continue with its acquisition strategy to bring client/server products into its portfolio. It is trying ambitiously to compete with CA-Unicenter, in the UNIX market with Ensign, as it has competed with CA in the mainframe market in the past. Boole & Babbage is neither a point solutions player nor a framework provider. It is trying with its client/server line to do both. To succeed, it needs to convince its installed base that it has a strong framework into which it can integrate other products. A concern is that it has not attracted enough third-party developers for its Ensign product, and that compared with CA-Unicenter it will appear to lack support for some third-party modules. However, this may be compensated for by ease of administration, an aggressive direct sales force and price.

7. Bull

Strategy

Bull licenses its systems management software to other hardware manufacturers. Bull's object-oriented Integrated Systems Management (ISM) framework means that its modules have a degree of consistency between them.

ISM's six optional software modules cover:

- System operation
- Database and applications management
- PC-Workgroup management
- Network management
- Security services
- Telecommunications network administration for telephone companies

Bull has several customers that have licensed its ISM software for inclusion in their products including 3Com, Epoch, France Telecom, Bay Networks, CAP SESA, SEMA and Remedy. It is licensed by other hardware manufacturers such as Tandem, which supports its machines from a Silicon Graphics Indy workstation. Both the Tandem and SGI machines are binary compatible, making it easy for Bull to support both platforms.

Strengths

- Scalable solutions from desktop to massive telecommunications networks
- Ease of applications integration—applications software vendors can write to log files, rather than complex APIs
- Strong object-oriented framework architecture that can be ported to other platforms, extended and modified relatively easily

Weaknesses

- Uncertainty hangs over Bull's future as it seeks partners to acquire it.
- It Suffers from lack of visibility in the market for systems management tools.

Outlook and Assessment

Bull has the most scalable solution of any systems management vendor, going from desktops to public telephone networks. It also supports mainframe, UNIX and PC environments. Bull needs to be more aggressive with resellers and third-party software vendors if it is to be a global player. The market is crowded with the many point solution vendors linking their products into other frameworks. Bull needs to attract these point solution vendors to its platform if it is to have a truly portable framework. It is late in the market to try to do this in the way that HP has done. However, there may be some niches, like fail-safe computing or transaction processing for communications systems, that Bull can address with Tandem.

8. Candle Corporation

Strategy

Candle's OMEGACENTER product line provides database and systems management, with support for applications management. Candle is strong in performance and availability monitoring across enterprise networks. It also has products in data management and database administration. Its flagship product for single-platform solutions is OMEGAMON, the last word (or letter!) in real-time performance monitoring. Starting with MVS, it is now deployed on a wide range of minicomputer and UNIX platforms. OMEGAMON AF is the AS/400 version and it provides a role model for future Candle products. IBM's Automation Center/400 was developed for IBM as a version of OMEGAMON AF. IBM also uses Candle software in its Parallel Query Server.

Candle has invested in an object-oriented framework based on C++ and relational database technology, Candle Technologies (CT), announced in 1991. CT lays the foundation for OMEGAMON on UNIX. CT incorporates open systems POSIX standards as well as DCE. It runs on UNIX and MVS machines.

The Candle Command Center (CCC) is the focus of Candle's interoperable object-oriented systems management products. It is based on the Object Management Group's (OMG's) CORBA standard. CCC can either be a point solution or a framework for managing multiple administrative functions. It can manage desktops, UNIX environments and mainframes. It can also be managed from Windows NT, AIX or MVS hubs. Multiple Command Centers can be networked.

Long term, Candle wants to make a rules-based platform that enables agents to be sent to federated databases in a network. This means that

the agents will behave according to rules set up at the databases, enabling very large networks to be managed with distributed control. CCC's scalability is the result of its underlying object-oriented architecture. Whereas many system administrators write UNIX shell or other scripts to customize system management to their environment, Candle provides integrated support for visual programming that saves time for the administrator. The first Candle Command Centers will support UNIX—that is, AIX, HP-UX and Solaris. LANs and distributed databases (Oracle and Sybase initially) will be supported by the end of 1995.

Candle has a very close working relationship with Microsoft on Windows NT, SMS and the interaction between OLE and CORBA. Candle's submission to the object management group for integrating Microsoft's OLE and with the OMG's CORBA resulted in a 54-to-3 vote in favor of Candle's approach.

Candle supports over 5,000 data centers and approximately 70,000 customers worldwide.

Strengths

- Strong in IBM environments, including AS/400 and parallel servers. Also supports Tandem databases.
- Strong architecture and user interface design—the user interface supports drag-and drop on visual elements like maps, as well as on more conventional icons
- Experience in enterprise systems management requirements, particularly in performance monitoring
- Wide direct distribution with many sales offices in the U.S.
- The inference engine underlying its object-oriented architecture enables rules to be configured quickly for different application environments.
- With internal development, candle does not have the problem of retaining engineers after an acquisition, as do some of its competitors.

Weaknesses

- Candle is a late entrant to the UNIX market and supports only a few leading platforms.
- Candle is just starting to leverage relationships with major vendors. It tends to sell directly, which provides high margins, but can also slow system deployment.

Outlook and Assessment

Candle's CCC is likely to provide a solid architecture for distributed systems management that should enable it to easily customize products. Its work with IBM and Microsoft positions it to become a leading vendor of object-oriented solutions for systems management. Its CCC architecture will enable it to scale up to very large networks.

9. Computer Associates

Strategy

CA (Computer Associates) is the leading independent software vendor in systems management for the mainframe. Its strategy is to grow by acquisition and be pervasive, supporting heterogeneous client/server networks. CA's most recent acquisition, subject to approval, is of Legent an event mentioned elsewhere in this report.

CA-Unicenter is CA's systems management product that has evolved from mainframe environments to the UNIX and Windows NT platforms. CA-Unicenter is based on combining many systems management solutions from different vendors under a structured menu system and integration framework. It ties together the widest range of systems management tools from any vendor.

Software derived from network management frameworks, like HP's OpenView, Sun's NetManager and IBM's NetView, focus on viewing a network and then finding out what is happening to software and hardware on the network. CA's approach tends more toward automating specific tasks performed by system administrators.

CA-Unicenter/STAR uses an OS/2 or Windows workstation to manage enterprise computing platforms. A spreadsheet and modeling capabilities are included in its user interface to graph data and create reports. It monitors security, including IBM's RACF and CA's Top Secret or CA-ACF2 assets. It also provides workload scheduling, tape management, event management, problem reporting or resource accounting.

CA-Unicenter/125 is for HP 700 workstations and CA-Unicenter/325 is for larger HP 9000 and 800 servers. CA-Unicenter for OpenView enables OpenView to be viewed from CA's menus, and vice versa. In addition, CA-Unicenter for OpenView enables security breaches and alarms detected by CA-Unicenter to be reflected in OpenView's map of the network. Event notification can then be made by sending messages from OpenView to system administrators that can fix the trouble.

Development partners working with CA-Unicenter include:

- Bradmark Technologies, an HP software vendor that is branching out into open systems with a Windows-based monitor for distributed database servers
- DAZEL Corporation, for report distribution based on DCE
- Transarc Corporation, for transaction monitoring for OLTP based on DCE
- Level 8 Systems, specializing in database monitoring for the financial services market

CA is also working with vendors that support peripherals like backup and storage devices.

Strengths

- Size: $3 billion in revenues
- CA is strong in managing operating systems, monitoring network events and optimizing performance.
- Wide distribution through its direct sale force
- Can run CA-Unicenter from a UNIX, OS/2 or Windows platform
- CA-Unicenter supports many third-party products and standards, including OLE and CORBA to integrate Windows and object-oriented applications.
- Mainframe installed base that can be leveraged
- CA provides mainframe-like security tools for distributed environments that can be centrally administered; the first integrated products run on HP workstations and servers.

Weaknesses

- Centralized approach to systems management. Despite making CA-Unicenter more distributed, CA is still focusing on solutions for centralized systems management.

- As a mainframe market leader for many years, CA has been able to use its position to renegotiate terms with customers and lock customers into its products This has caused the company to gain the negative image, of being hard to deal with and predatory. In the last two years the company has tried hard to shed this image. It continues to offer incredible pricing deals to its major customers and system integrators, one of the latest being with CSC.

- Some customers want lower priced, more modular solutions than CA-Unicenter.

- The lack of integrated object-oriented framework to unify the look and feel of solutions that run under CA-Unicenter makes it hard for users to learn the different system components.

Outlook and Assessment

CA is a strong competitor, but also vulnerable to the many distributed systems management solutions being developed. It needs to continue its efforts to get systems management point solutions vendors to integrate their products with CA-Unicenter. It then must aggressively support its development partners with marketing and sales support programs. With software in virtually all major data centers and a formidable sales force, CA is expanding its distribution through indirect channels. CA's challenge is to efficiently distribute its software to non-traditional customers, who may be in user departments rather than in "glass-house" data centers.

When CA-Unicenter first came out, some system administrators with UNIX system experience felt it was too inflexible. Since then, CA has made major enhancements to the software in areas such as SNMP support, backup and recovery, and help desk support. CA-Unicenter is a highly successful and growing product for CA, with $300 million in revenues for fiscal year endup March, 1995.

For the last 10 years, CA has tried to become a major force in the UNIX market, yet has continued to be successful with mainframe data centers. With acquisitions like Ingres and its relationships with Sun and HP, CA is slowly reengineering its operations to become more agile in the open systems market. Working with HP to develop CA-Unicenter for OpenView should accelerate acceptance of CA-Unicenter in UNIX markets. Sun is also working closely with CA to integrate Solstice with CA-Unicenter. IBM is another strategic partner. At Spring Comdex, 1995, Microsoft and CA announced that they would work together on the Windows NT systems management platform. For Microsoft, it provides a route into the corporate market; for Computer Associates, it increases its penetration in Windows markets.

10. Compuware

Strategy

Compuware is strong in both services and software. Its traditional focus is on mainframe system application testing and maintenance. Its approach to systems management is to monitor systems and debug them. Compuware leans more toward application testing than some of the other systems management software vendors. It focuses on systems, network and database management.

It acquired EcoTOOLS to provide it with client/server systems management software. It is based on the EcoSPHERE underlying framework, as Compuware does not want to be dependent on HP's OpenView or Tivoli's TME. EcoTOOLS does provide some interoperability with network management systems. EcoTOOLS provides event management, performance monitoring, security monitoring and configuration management. It can be used to automate system administration tasks and provides reports for capacity planning. It monitors Oracle and Sybase databases. It supports leading UNIX platforms, including Amdahl's UTS and SCO UNIX, recently adding Pyramid and AT&T GIS as supported vendors. It supports both large and small customers, low-end systems being supported on SCO UNIX, and, more recently, Solaris.

Future directions for EcoTOOLS include more intelligent agent support, expanded reporting and more alliances with third-party software, platform and database vendors. Increasingly, EcoTools is being sold in support of the Uniface enterprise development tool product line, acquired by Compuware in 1994.

EcoCHARGEBACK provides the ability to bill users for system and database use. It can be integrated with SQL to extend its functionality. RemoteControl/2 enables OS/2-based LANs to be administered remotely. Compuware has an installed base of over 6,000 customers, that have licensed nearly 40,000 products, for its entire product line. Customers for Compuware's client/server products include Ford Electronics, NASDAQ (monitoring 1500 PCs, running SCO's UNIX), Xilinx, HBO (the entertainment company), Marine Terminals and Chevron. Competitors include BMC Software, Computer Associates and Landmark Systems.

Strengths

- Clear focus
- Strong in manufacturing markets, particularly automotive-related industries

- EcoSystems is well-integrated into Compuware's marketing strategy, leveraging the distribution strengths of other parts of the company.
- Agility—EcoSystems is energetic and agile, using its frameworks to rapidly modify software for customer needs
- Works closely with leading open systems vendors, making it a choice for Sybase and Oracle users

Weaknesses

- Lacking visibility outside its main markets, Compuware is perceived as a solutions vendor for established markets like manufacturing rather than a cross-industry systems management player.

Outlook and Assessment

Compuware's strength is that it combines innovative technology from EcoSystems with focused customer service and support in its main business. It is able to leverage the strengths of different divisions. As an example, it will use its Uniface enterprise development tool to bring in new systems management business.

Compuware's decision to build its own framework, rather than integrate with Tivoli's TME, enables it to be more flexible and keep ahead of its competition technically. However, long term it may be a liability if its development is not leveraged across enough products. In a few years, Compuware will need to decide if it should continue to invest in its own frameworks.

Compuware's focused approach, combined with professional services, has enabled it to maintain steady growth. Compuware's professional services business enables it to support customers with extensive solutions, though this limits its ability to continue its growth. Supporting customers directly makes it harder to support a broad range of customers. Compuware needs to consider more support via indirect channels.

11. Data General

Strategy

Data General (DG) with its Aviion line of UNIX servers, is positioning its Enterprise Management products as a platform for lights-out data center management. DG's strategy is to provide hardware and software to manage networks, systems and devices. DG bases its system management on HP's OpenView, CA-Unicenter and the Tivoli Management Environment. It markets the Clariion disk array that can be automatically operated by a remote console, hence its suitability for a

lights-out data center. DG's strategy is to cluster Aviion servers to provide additional reliability. In addition, hot-switching between pairs of servers is provided, should one fail. It has its own agent and object-oriented technology as a foundation for its Enterprise Management environment. Windows NT is the Enterprise Management console environment, reflecting a shift from the Aviion UNIX roots. A major driver in supporting Windows NT was to support three-tier client/server applications like SAP's R/3, whose applications server runs on Windows NT.

Typical DG customers include Star Enterprise (which markets under the Texaco brand name), PageNet (a national paging network), Foxworth-Galbraith (building services), and the Men's Wearhouse (retailing).

Strengths

- Technical expertise: strong in UNIX, high-availability systems, client/server architecture
- Success at making UNIX a commercially reliable and stable environment
- Third party software relationships with HP, Computer Associates, Hummingbird Communications, Legato Systems, BMC Software, Sterling Software, Tivoli Systems. There is strong ability to make these part of DG's Enterprise Systems Management product line.
- Data General resells CA-Unicenter and Tivoli's TME framework. DG is strong in partnering and leveraging the work of other developers.

Weaknesses

- Weak hardware processor—Data General chose the Motorola 88xxx family of processors that significantly affected its performance and compatibility with other systems.
- Larger vendors of UNIX systems like HP and Sun, tend to get new accounts, rather than DG, which is perceived as a legacy vendor.

Outlook and Assessment

DG has worked hard to create a position for itself in the open systems market. Its thrust into lights-out data management positions its products as solutions, provided by hardware, software and services. In the future, more companies are going to define their product lines in terms of solutions, rather than product functions and features. DG needs more than lights out data management, which competitors can also provide, to make it a major systems management player like HP. If it can migrate

from the 88xxx platform and develop its lights-out data management strategy into more niches, like remote LAN management, it would be a stronger player.

12. Digital Equipment Corporation

Strategy

Digital licensed IBM's NetView network management which it enhanced and renamed POLYCENTER NetView. POLYCENTER is Digital's family of systems and network management products for distributed computing. IBM and Digital have had joint marketing strategies on the product line since 1993. At the end of 1994, Digital announced that it would integrate POLYCENTER NetView with Novell's NetWare. In addition, POLYCENTER, which was designed for Digital's UNIX platform, will run on Open VMS.

Digital's strategy is to make POLYCENTER a major systems management platform for Windows NT. Digital and IBM have worked together with Microsoft to develop integrated systems and network management, in the POLYCENTER Manager for NetView, for Windows NT. This was to be due in early 1995 and enables a system administrator using an Windows NT workstation to control both enterprise and PC-LANs, as well as leading UNIX platforms and Open VMS. It will be particularly useful for companies migrating to Windows NT that need to support mixed networks. Digital, unlike many other vendors, also supports Macintosh computers. Digital's ManageWORKS product allows for the management of multivendor PC LANs from a Windows PC. Digital's AssetWorks builds on Microsoft's SMS to provide systems management for Windows NT networks.

Strengths

- Digital was early in developing software for managing heterogeneous networks and it supports a wide range of platforms, including Macintosh, legacy systems, Windows NT and PC LANs.

- Wide range of products—Digital is able to supply either from its own product line or from third parties a wide range of systems management products.

- Support services—Digital provides a full range of services to accompany its system management products that can include ordering and installing software upgrades, inventory management, and remote data center management.

Weaknesses

- Partnering—Digital has been slower than HP in signing up partners in the UNIX market.

- Lack of focus—Digital has both legacy systems and open systems to support, so it lacks focus in the systems management area. It currently positions products rather than solutions. Digital should consider combining its systems management strengths with its connectivity expertise to define customer solutions. For example, it could promote outsourcing of systems management services.

Outlook and Assessment

Digital is poised to be a major player in client/server systems management, with a renewed corporate emphasis on connectivity. Its close work with Microsoft on Windows NT and a growing PC business will give it a strong foothold in the Windows NT systems management market. A repositioning of its UNIX operating system and broad platform support, particularly in mixed environments that include VAX or Alpha platforms, would make Digital technically an attractive choice. Digital is now emphasizing its systems management products with its Utility services, these will help strengthen Its market position. However, the company needs a more focused marketing initiative to bring its systems management products to a wider market. It could use the POLYCENTER family of products strategically to support hardware sales for client/server systems management activities. Digital can also leverage its Internet firewall security services into broader systems management offerings.

13. Elan Computer Group

Elan is an emerging vendor of license management software that restricts the number of software users on a LAN. It has recently branched out into an emerging market, that of system administration for software that uses its license manager, and will provide tools for administering the World Wide Web on the Internet. Its SoftWatch software tool provides reports to system administrators on how frequently users access software.

Elan has a promising opportunity in a large market. Its challenges will be to focus on partnering and attracting major resellers. Its current products for software licensing are sold to developers; its system administration products will require different channels such as hardware manufacturers, larger systems management software vendors and systems integrators. It provides a point solution that can be licensed by major hardware manufacturers for integration into their systems management suites.

14. Eventus

Eventus is an emerging company that is representative of the many point solutions vendors. It provides software for monitoring Oracle databases from Windows PCs with its AdHawk tool. It also offers WatchWorks, a program for event monitoring of Oracle databases. It was founded by MITI (Long Beach, CA), a small company with a strong reputation for database tools, which remains as its marketing arm. Advantages of Eventus' products are low cost, ease-of-use and simple administration. Disadvantages are that they do not cover many functions. Eventus needs to develop partnerships with major framework providers, such as CA. Eventus can be expected to expand its product line with monitoring for Sybase and other leading database platforms. Platinum Technology could be another strong partner for Eventus.

15. Globetrotter Software

Globetrotter is an emerging company of software license management tools for developers. It has been providing license management since 1989.

Like Elan, it is branching out into the systems management area to provide automatic administration of software licenses. It is the leader in UNIX license management, with its FLEXIm product for Solaris, HP-UX, IBM's AIX, Digital's UNIX, Silicon Graphics' Irix and Microsoft's Windows. It provides graphical as well as written information for system administrators with its FLEXadmin tool to control the use of software licenses.

Globetrotter is used to having sophisticated customers like Texas Instruments that use their software worldwide. However, it see the less sophisticated user as a key customer. Software metering also provides new opportunities for Globetrotter.

16. Hewlett-Packard

Strategy

HP's strategy is to provide a complete IT management framework for networks, workstations, servers, databases and applications. HP's OpenView started as a network management package for HP networks, Network Node Manager being its flagship product released in 1989. OpenView has rapidly evolved into a cross-platform systems and network management framework into which single point solution products can be integrated. HP focuses on application management, network management and systems management. OpenView can run on Windows or UNIX.

In February 1995, HP announced that it would expand OpenView to provide a complete process-oriented framework for IT management, under its OpenView Solution Framework program. HP is attracting developers to write software for the first module in this series, the OpenView Operations Center. This will integrate components for operations and problem management. HP is actively looking for software developers to write integrated applications, database, systems and network management software solutions that can be integrated into Operations Center. General availability is expected in 1996, with developer and controlled releases in 1995. Other modules in the Solution Framework will be OpenView AdminCenter Release 2.0 and PCS/PerfView Release 4.0.

AdminCenter addresses configuration and change management, while PCS/PerfView, which is already available, addresses performance and resource management. AdminCenter solves the problem of adding a user to a system. Without integrated system management, a new user may be added to the network, E-mail, workflow and database systems separately. OpenView AdminCenter for HP-UX is already available, and by mid-1995 it should support AIX, Solaris and NetWare servers. Legent, Oracle, SAP and Unison Software are just some of the major software vendors already committed to Operations Center. Boole & Babbage, BMC Software, Computer Associates, Dun & Bradstreet, Axent Technologies (part of Raxco), Sybase and Innovus Technologies are expected to join.

HP is also working with Lotus to manage the workflow environment with Lotus NotesView. Lotus will use OpenView as its underlying platform. NotesView will address global Notes systems management, software distribution, configuration management and user account management. Banyan is another software vendor that has licensed OpenView to manage its Vines network. HP announced that it would work with CA on CA-Unicenter for OpenView. OpenView will be able to call CA-Unicenter from its menus, and vice versa.

HP has also licensed OpenView to hardware manufacturers, including Data General, Hitachi, IBM and Groupe Bull. For example, IBM's NetView/6000 is based on OpenView. Hitachi has licensed OpenView to manage storage devices. OpenView is installed on over 65,000 networks around the world. There are more than 200 OpenView network and systems management applications.

Strengths

- Strong partnering environment—HP has been able to attract leading developers and potential competitors.

- OpenView is widely installed, as the leading UNIX-based network management platform.

- HP-UX is the leading platform for companies that want to replace mainframes in corporate data centers with a UNIX solution. This provides an opportunity for OpenView to be accepted as the main network management framework for a corporation.

- HP supports a wide range of network devices, including hubs, routers and network hardware.

Weaknesses

- Some companies prefer to be independent of HP because they prefer to have their own frameworks and run on management consoles that HP does not support.

- HP is only just now opening up some of its APIs for software developers.

- OpenView cannot manage systems from a Macintosh or OS/2 console. It is designed for HP-UX workstations and Windows platforms.

Outlook and Assessment

HP's success with OpenView, can be attributed to its aggressive support for third-party developers, the strength of its underlying computing platform for IS departments and OpenView's support for electronic mail. The latter enables reports from OpenView to be widely broadcast and fuels the demand for more OpenView installations.

HP has a strong market position with OpenView, and its strategy to integrate more applications and database management into its framework is likely to be successful.

17. IBM

Strategy

IBM has multiple platforms that traditionally have had their own systems management solutions. IBM's NetView is its framework for integrating network management across client/server networks. NetView/6000 runs on its AIX-based workstations and competes with HP's OpenView, from which it is derived, and Digital's POLYCENTER, which is derived from it. The evolution is approximately, with suitable vendor modifications:

OpenView => NetView/6000 => POLYCENTER

IBM and Novell have been working together to make IBM's NetView for AIX network management platform also manage Novell NetWare LANs. NetView for OS/2 is designed for OS/2 LANs.

For the AIX workstation environment, IBM offers three different user interfaces:

- A traditional UNIX command line
- System Management Interface Tool (SMIT), a front-end tool that supports more than 160 UNIX commands
- Visual Systems Management (VSM), an object-oriented, drag-and-drop user interface

SMIT has evolved from a text-oriented user interface to a graphical one. IBM recently introduced Distributed SMIT (DSMIT) to support multiple workstations) DSMIT enables a user to administer several RISC System/6000s simultaneously, instead of having to log onto each one. It can also be used to manage Hewlett-Packard systems (running HP/UX Version 9.0) and Sun Microsystems computers (running SunOS 4.1.3). VSM enables administrators to manage systems by manipulating icons. It includes capabilities for managing users, printer queues, devices, and disks. These tools focus on managing the AIX platform.

IBM launched PTX, a performance toolbox for AIX, at the end of 1994. Its goal is to manage the performance of distributed systems. It will be able to manage servers from HP and Sun. It is expected that as PTX evolves it will incorporate more intelligence and become simpler to use.

The AS/400 has always been shipped with some systems management software as part of its OS/400 operating system. It is now it is being positioned as a midrange server with additional software to support client/server environments. SystemView augments the AS/400's systems management software and provides LAN management, operations management and automation of administrative tasks.

SystemView is being upgraded to KARAT, a cross-platform systems management platform that uses CORBA and IBM's DSOM standards. KARAT provides a uniform user interface across AIX, OS/2, OS/400 and MVS. KARAT includes some functions already found in SystemView on AIX/6000, MVS and OS/2 environments. IBM's strategy with KARAT is to migrate customers gradually to systems management based on objects. The first phase will support AIX and will support backup and recovery, archiving, network management, workload balancing, job scheduling, configuration management, performance monitoring and reporting, problem management, change management and software distribution.

Follow-on phases will support greater function and data integration for console automation and management. They will also support database management, security management and license management. KARAT will expand from being on AIX to MVS, OS/2 and OS/400 platforms.

Strengths

- Many systems management platforms with a large installed base ready to upgrade to client/server systems management
- Strong partnering arrangements with major software vendors like Candle and Platinum
- NetView/6000 is gaining momentum and moving from the network management area to support more applications.
- SOM/DSOM distributed object technology will give IBM an advantage in managing very complex networks. It can use these technologies to establish an early lead in object-oriented systems management solutions.
- Strong services and support

Weaknesses

- No integrated framework across all machines—it was hoped that OSF would do this with DME, but the project failed and third-party vendors are filling the gap.
- RS/6000s running AIX have lacked the momentum of HP in the UNIX market as a workstation for systems management.
- IBM must be more pro-active in licensing frameworks to other manufacturers to create industry standards; otherwise, solutions risk becoming proprietary
- IBM is losing the opportunity to make OS/2 a systems management platform for PC networks.
- Lack of support for Macintosh products

Outlook and Assessment

IBM is in a strong position to create new generations of systems management tools based on its object infrastructure. Partners like Candle are already taking advantage of its SOM/DSOM platform. It understands the data center and can use its expertise to create new products like KARAT. IBM can be expected to attract many partners

with KARAT. IBM has the strongest potential of any vendor to provide users with client/server systems management software that can be managed by data centers and IS departments.

18. ICL

ICL, owned by Fujitsu, is the U.K.'s original computer vendor, with a strong international presence, particularly in retailing, government, directory services and transaction processing. Like all hardware vendors, it supplies systems management software. However, its strategy is to partner with major players to provide software foundations for systems management. ICL Enterprises North America is chartered with developing partnering relationships for ICL's software technologies.

ICL's Advanced System Management software is part of its TeamWare family of products. ICL has licensed its ASM technology to Microsoft as part of its SMS systems management software for Windows NT. ICL has announced a follow-on product — TeamDistributor — that can manage mainframe, WAN and LAN connections from a U nix server.

Another ICL initiative is in X.500 directories to keep track of users, assets, passwords, corporate libraries, mailing lists and legal documents. ICL has a history in directory management since its acquisition several years ago of Computer Consoles, at the time the leader in directory management systems for telephone operators. Based on telephone directory technology that gives fast response times and rapid access to large lists, ICL's X.500 Open Directory System has been upgraded to provide standard interfaces to databases in client/server distributed environments. HP-UX platforms are currently supported with Pyramid (now SNI) and UnixWare (expected shortly).

ICL's AccessManager software provides single logon security, saving users from typing in their ID several times for different applications. It is initially available for client/server networks based on platforms like HP-UX, ICL UNIX servers and Solaris. PCs, and HP and Sun workstations are supported. It is intended to be a cross-platform solution that also supports mainframes and Digital VAX computers.

ICL, like Bull, can be expected to license components of its systems management software to third parties. EDS is a major partner, marketing ICL's software products. ICL is interested in broadening its distribution. ICL has industrial-strength technology, but weak distribution in most U.S. markets. It needs more visibility as a technology supplier. It needs to develop a brand image for its software products.

19. Intel

Strategy

Intel's strategy is to promote Smart Network Services (SNS). It sells the LANDesk Management Suite that provides SNMP support and enhances Novell's ManageWise. This software supports the Desktop Management Group's DMI interface. Intel's systems management has evolved from its communication board business that supports interconnection of LANs and WANs. It is designed to be run under Windows by a single administrator and it manages problems typically faced in a PC environment with printers, viruses, files, network traffic, inventory and software installation. It also works over WANs and modems to enable it to access LANs at remote sites.

Intel is distributing its software through resellers, retailers that address developers, like MicroAge, and regional VARs. It provides a shrink-wrapped off-the-shelf solution.

Strengths

- Wide distribution through regional VARs
- LANDESK is a low-cost, high-quality product that is easy to install and use.
- LANDesk runs on widely available Windows and NetWare platforms.
- Intel has financial and technical strength.
- Low pricing: $50 per node for enterprises with >100 nodes; $40 per node for >1,000 nodes

Weaknesses

- LanDesk is not in a mainstream Intel division, being based in Hillsboro, OR. In the past, Intel has had problems selling products that are not part of its microprocessor business, such as computer systems. Intel is not experienced in the software business,though it does have retail distribution of its modem boards.
- Little marketing visibility

Outlook and Assessment

Intel has a strong product strategy in that it addresses the real PC problems, which are quite different from the ones found in a data center. There is some question as to whether Intel can be a serious player in the

systems management software business, given its hardware orientation. It will require significant positioning and alliances to make it a mainstream corporate player. Its support and service channels do not match those of a traditional systems management software supplier. Intel prefers to rely on resellers and technical support via phone or bulletin board, rather than a user-oriented support team.

LANDesk Management Suite could be used by a reseller or systems integrator to complement its systems management product line. It provides LAN administrators with an alternative to Novell's software for NetWare management. Novell has left a gap in the market by not making its systems management software full-featured. Intel has rushed in to fill it. If Intel markets this product aggressively, it could be successful for homogeneous PC networks that run NetWare. It addresses a need for both small and large businesses and can be successful in the Windows NT market.

20. Landmark Systems Corporation

Strategy

Landmark provides performance management software for mainframes and Unix. Its main product is The Monitor (TMON). Landmark also has mainframe products to support CICS, VTAM, DB2 and MVS. Landmark has over 7,000 customer sites.

Strengths

- Global reach—software installed in over 70 countries
- Reseller program with different levels of involement from lead referral to full reseller
- Emphasizes service to customers, customer-driven products
- Focused approach—concentrating on leading UNIX platforms and mainframes; focused on performance monitoring
- Integration with leading systems management frameworks
- Modular, layered architecture

Weaknesses

- Small size, lack of visibility

Outlook and Assessment

Landmark is a promising company in its niche of performance monitoring. To grow further it needs to acquire or partner with a performance monitoring company for PCs so that it can broaden its product line. Its service and support capabilities are well-respected in the industry.

21. Legent

Strategy

Legent's strategy is to be the leader in distributed systems management for networks, applications and data. It has grown by acquisition from its founding in 1989 from the merger of Morino Associates and Duquesne Systems, two mainframe systems management vendors. In August 1992, it acquired Goal Systems, a provider of data center management, network performance and software distribution products. A key theme in Legent's strategy is evolution and enhancement of existing products. It has taken its top mainframe products and developed compatible solutions for NetWare, OS/2, UNIX and Windows NT.

Legent continues to grow by acquisition, acquiring Lachman Associates, a UNIX networking company, in May 1994, it is now known as the Lachman Networking division. The Lachman acquisition gave Legent remote network management software and over 80 UNIX OEMs.

Legent recently appointed Jerre Stead, formerly of AT&T and Square D, as its CEO. His focus is to get the company closer to the customer and expand sales. Legent has suffered in the past from being a patchwork quilt of different companies, sometimes lacking in corporate synergy. Under Stead, the company is improving its communications between organizations. Legent is divided into systems management, network management, applications management and services. It recently created a Distributed Systems Management division.

Legent provides mainframe systems management products, but has recently branched out into the UNIX market, partnering with Sun and HP. Legent is working with Sun to ensure that its systems management applications are compatible with Sun's NetManager. Other partners include Microsoft, IBM and the Powersoft division of Sybase.

The key to Legent's distributed management products is its underlying Cross Platform Environment (XPE) architecture, introduced in 1993. In 1994, products based on XPE started to roll out for mainframes, UNIX and client/server environments. This framework allows Legent to move its software to new hardware platforms quickly. It also provides integration of different systems management modules.

A new product is its AgentWorks line of object-oriented systems and network management tools that uses intelligent agents. AgentWorks originated with Digital Analysis (Herndon, VA), a company acquired by Legent, and joint work done with IBM to investigate the use of intelligent agents under a project code-named Mercury. This product pushes SNMP agent technology to monitor higher levels of software. AgentWorks is modular and monitors mixed UNIX environments, Oracle databases, SNMP and CMIP components. Its Agent Factory developer toolkit enables software developers to incorporate SNMP agents into their products. AgentWorks architecture enables it to work across heterogeneous networks easily, as XPE is ported to different platforms. It has a modern, clean design for its user interface and Legent is working on making it even easier to use, set up and administer.

Legent has more than 12,000 customer sites worldwide and a portfolio of 150 products. It has installed over 60,000 systems management products worldwide.

Strengths

- Size
- Strong customer focus, with a range of professional services, including training and consulting
- Wide range of products

Weaknesses

- May lack innovation internally and be forced to acquire technologies from outside the company. Its customer focus will drive it to short-term solutions. It spends 14% of revenues on maintaining existing services and product license, versus 10% on software development.
- Lack of synergy between divisions—Jerre Stead hosted the first meeting where heads of different divisions came together. Traditionally, Legent has been run as a collection of independent units, with little marketing synergy.

Outlook and Assessment

Legent has an opportunity to strengthen its distributed systems management market share under its new management. It has downsized its mainframe operations to increase its investment in client/server opportunities. Customers are likely choose Legent when they want to buy point solutions from an established vendor that can integrate them under a common framework. Currently, Legent has some strong technologies,

with intelligent agents and networking infrastructure. A major challenge will be to keep investing in technology as it also invests in being closer to customers.

Legent's future direction for its XPE framework is to support CORBA standards. Tivoli is a competitor to Legent in that both companies strategically want to monitor UNIX environments and integrate applications, database, systems and network management. Legent's Partners Plus Program offers support for a range of professional services companies and resellers. Legent is directing its products at users rather than the OEM market, as is Tivoli.

Since this assessment was written, CA indicated its intention to purchase Legent for approximately $1.7 million.

22. McAfee and Associates

Strategy

McAfee's strategy is to become a leading vendor of software suites for network security and management in PC and LAN environments. McAfee is emerging as a leading vendor of network security management products for PC and Windows NT platforms. It started with a product to protect PCs from viruses, VirusScan, and is the current market leader in this niche. In 1994, McAfee acquired two companies, Brightworks and Automated Design Systems, for network security management. BrightWorks integrates software distribution, asset management and software distribution. NetTools supports NetWare and LAN Manager networks for print management security, configuration management and user administration. McAfee supports help desks with a diagnostic and trouble reporting system.

McAfee has seen success in offering its software via an electronic bulletin board and is now expanding into retail distribution. Another initiative is to become a leading systems management tool vendor for Windows NT. McAfee has licensed over 20,000 sites, encompassing over four million PCs.

Strengths

- Electronic distribution via software download, complemented by telemarketing

- Innovative pricing that relies on a subscription service for technical support and updates to its anti-virus products. A subscription typically lasts for two years.

- Highly profitable, with pre-tax margins of 40-50%
- Agile, able to move quickly to acquire emerging companies that can satisfy market needs

Weaknesses

- The company is relatively unknown; it needs more visibility and large partners.

Outlook and Assessment

McAfee is a very promising company that is targeting the emerging Windows NT and Windows 95 markets. Its product line currently includes simple network management tools, but the company is enhancing its product suites. It expects expansion to come from network monitoring, software distribution and security management software.

23. Microsoft

Strategy

Microsoft's enterprise strategy is to provide scalable solutions froWindows 95 on the desktop to Windows NT servers. Microsoft released its SMS (Systems Management Server) in the fourth quarter of 1994. SMS runs on Windows NT with Microsoft's SQL Server database. It provides a suite of LAN management tools into which other systems management tools can be integrated. It includes hardware and software inventory, remote maintenance from a single point on the network, software distribution, network monitoring and support for Windows, NetWare, Macintosh and OS/2. New features for 1995 include scripts for migrating users to Windows 95. They will help system administrators to understand what is needed to upgrade networked PCs to Windows 95. SMS will also support remote management of networks that makes it ideal for supporting branch offices.

SMS supports standard network management software like HP's OpenView, Digital's POLYCENTER and IBM's NetView/6000. It also supports the Desktop Management Interface.

Strengths

- Large installed base of Windows on the desktop
- Strong distribution channels for SMS; shrink-wrapped packaging that is easily distributed

- SMS tests have reported it as being simpler to use than traditional Unix administration tools

Weaknesses

- Windows NT has been slower to penetrate accounts than expected, but sales can be expected to rise dramatically in 1995.

- UNIX is still the network and systems management console platform of choice for many large organizations with client/server distributed systems.

Outlook and Assessment

Clearly, SMS is an important product into which many tools will be integrated. Microsoft has the beginning of a strong product line for managing the operating system and networking layers of a Windows network. It has developed many third-party relationships and supports leading network management products to interface with enterprise systems.

Long term, SMS's biggest competitor is likely to be Novell or Intel. However, in the short term, there is little competition in the LAN market for a competing framework. SMS will fuel the growth of Windows NT as a systems management platform. Any vendor in the Windows NT market must consider how it will work with Microsoft's SMS.

24. Novell

Strategy

Novell's strategy is to make network computing pervasive. Smaller organizations can use Novell's basic NetWare administration. Larger organizations are more likely to manage NetWare from IBM, Sun or HP network management environments.

At the end of 1994, Novell introduced its Information Access and Management group. Within this group is the Management Products division. It provides Novell's Distributed Management Services, for managing enterprise information systems. It includes a network management menu system that manages SNMP agents and the NetWare Management System as well as agents for devices and servers. LANalyzer is a network analysis tool for troubleshooting. NetWare Navigator provides software distribution and updating. In summary, Novell provides rudimentary tools for managing its software and devices attached to it.

In addition, NetWare provides Network Management Services for low end customers as add-on modules. ManageWise is a comprehensive package for managing both NetWare 3 and NetWare 4 networks.

Strengths

- Very strong balance sheet—at fiscal year end Novell had over $860M in cash and no long-term debt. It is one of the top five independent software companies.
- Strong installed base of NetWare
- Focus and leadership under CEO Frankenberg is becoming apparent as the company is reorganized and non-strategic projects are canceled
- Systems management tools are part of NetWare, with a modular approach to added functionality
- Novell is moving up to larger networks.

Weaknesses

- In the past, Novell has done a poor job of integrating NetWare with UNIX. With its new strategy of being pervasive, it must be careful not to repeat such mistakes.
- Novell is perceived as facing stiff competition from Microsoft, which will integrate Windows NT and Windows 95 with its own networking environment.
- Whereas most of the enterprise is moving to TCP/IP as an underlying infrastructure, Novell's installed base at the low end largely supports its own IPX/SPX protocols. With the advent of the Internet, which uses IP nodes, Novell may be pressured to convert its installed base of software to TCP/IP. This could either present a tremendous upgrade opportunity (Novell offers TCP/IP in its higher-end systems) or Novell could rapidly lose its installed base. Much depends on how it upgrades its customers.
- Novell is not as close to users as is Microsoft. Microsoft has successfully gained customer loyalty through its Office, Home and database product offerings. Novell has yet to establish brand loyalty in the minds of users, not just system administrators. Its brands are fragmented - (WordPerfect, UnixWare, Novell).
- Novell has been slow to deploy its X.500 directory services project, NetWare Directory Services, which could form part of the foundation of a strong systems management architecture for Novell.

Outlook and Assessment

Novell has a good opportunity to provide network management tools at the low end, as well as with larger networks, as its SuperNOS strategy for public networks is implemented. It needs to add integrated support for applications and databases, as Tivoli is doing in the UNIX environment to ensure that it retains its substantial installed base. If it does not do this, Windows NT with Microsoft's SMS will becomes a much more formidable competitor. Another area of opportunity is in UNIX systems administration. Novell needs to work more closely with or even acquire some of the leading open systems tools providers.

Novell now has an opportunity to pursue integrating UnixWare and NetWare. This is particularly true as organizations want to link units across the globe using NetWare. It should provide new systems and network management opportunities.

Novell's strategy to be pervasive is risky. Many pervasive strategies do not work; notably, over a decade ago, AT&T is strategy to make Unix pervasive and lost the desktop to Microsoft. In general, well-defined segmented strategies, even if they eventually cover all markets, are more profitable and easier to execute.

25. OpenVision

Strategy

OpenVision was founded by ex-Oracle employees and funded to acquire systems management client/server software companies. It started with a comprehensive scheme to integrate 19 products by giving them a common user interface look and feel and a common back-end architecture. This proved too ambitious. As software developers associated with specific products left the company, OpenVision could take a more objective view and decide which products were worth additional resources and investment. This resulted in the company focusing its efforts on 12 products.

Revenues for 1994 were approximately $30 million. The company has just over 200 employees and has open requisitions for over 30 people. One of the biggest challenges that a company at this stage of development faces is to attract and retain quality talent.

Strengths

- Energetic sales force
- Company is growing profitably

- Range of products
- Focused on client/server, with emphasis on UNIX

Weaknesses

- Security products have strong technology, but are proving harder than expected to commercialize and market successfully
- Over-stretched technical resources and vision
- It is challenged to manage the product portfolio and assign appropriate resources to each product, it's easy to lose focus.

Outlook and Assessment

After some initial disappointment that it could not execute its grand vision, OpenVision is now more realistic and is selling its products as point solutions. OpenVision needs to understand the resources required to support its technology. Its initial engineering plans were too ambitious in that they required the user interface and back-end architecture of many products to be altered so that they could fit together. This is a risk of not having a cohesive software engineering team.

Early product announcements define its place in the market, but it must be careful not to overhang the market too far and disappoint customers. Customers that are early adopters, like Wells Fargo Bank, will work closely with OpenVision to help it define its products, but others will not have the patience to wait for bug fixes and improvements. Provided it can show steady progress, with modern software and a focus on client/server, its prospects are strong long term. In the short term, it needs to focus on first ensuring that its products are robust, then getting more partners and alliances to help distribute and support its products.

26. Platinum Technology

Strategy

Platinum Technology, reviewed for its middleware products in INPUT's Client/Server Program, is also developing products for client/server systems management software. Its main focus is on data management, though it is now expanding into systems management with emphases on job management, software distribution, performance monitoring and event management. These products are marketed under the PLATINUM Open Enterprise Management System (POEMS) initiative.

In performance monitoring and event management, PLATINUM SQL Spy is its PC product, PLATINUM UniVision its UNIX product and

PLATINUM Detector is for mainframes. Platinum supports the Tivoli/Enterprise Console and is integrating it products under that framework.

Its recent acquisition of Aston Brooke software has brought it UniVision, a monitoring and performance measurement tool for leading UNIX platforms. This incorporates agent software. Currently, the products within UniVision are DBVision and ServerVision. To date, these only run on UNIX-based X-Windows workstations. They provide extensive graphical displays. DBVision is Platinum's main tool for monitoring distributed Oracle databases. Platinum has numerous other tools that support the data administrator. Its main thrust in 1995 is with Enterprise DBA, the foundation for an enterprise data administration platform that integrates multiple tools. ServerVision collects performance information from client/server network devices. It monitors Oracle resources, file sizes, workload trends and alarms. Future versions of the product are expected to add more performance and alert management features, rules-based diagnosis of problems, and integration with other network and systems management tools. Windows NT and OS/2 support are developments anticipated later in 1995 or 1996.

Platinum also acquired AutoSystems Corporation (Boulder, CO), a vendor of UNIX-based job scheduling software, to add to its open enterprise systems management line. This software forms the basis for Tivoli's Tivoli/Workload. AutoSystems AutoSys, batch job scheduling software, brings with it an installed base of 100 customers that can help move Platinum more rapidly into the enterprise.

Strengths

- Strong marketing organization, aggressively expanding into new markets via acquisition
- ServerVision provides extensibility for users and a consistent user interface. It is still an immature product, but with more integration into standard frameworks it can provide value in tracking and analyzing the history of events and alerts.
- With its modular product line, a customer can purchase software incrementally to fit a budget. Platinum aims to make its solutions scalable, or acquire technology to fill in gaps in its own product lines
- Strong strategic relationships are emerging with Oracle, Sybase, MDI (a Sybase company) and Tivoli.

Weaknesses

- Moving into the UNIX market is not going to be easy for Platinum, except where it can leverage its Oracle support software. Platinum's typical user is in data management, so with its enterprise administration tools it will need to redirect its marketing efforts toward system administrators. However, with recent acquisitions, Platinum can move aggressively toward capturing an installed base of system administrators.

Outlook and Assessment

Platinum is aggressive and energetic, with strong marketing execution. To date, Platinum has grown in the systems management area by acquiring small companies with promising technology and by internal development. In the future, one may expect Platinum to acquire larger companies that can introduce it to new markets.

Platinum has a good near-term opportunity to provide a systems management product line, but long term, as Tivoli and its other partners increase their market presence, Platinum needs to make a careful assessment of its market position. By expanding into applications management, for applications based on databases, Platinum would face less competition. It will be well-positioned to manage specific applications built on databases, given its strength in database support. Competitors are likely to include Legent, Computer Associates and Boole & Babbage.

27. Raxco

Strategy

Raxco is a systems management software and services vendor that has recently refocused its image and its direction with a new division, Axent Technologies. It plans to focus on client/server security. Axent has in turn purchased Datamedia, a vendor of security products for DOS and Windows platforms. The parent company, Raxco, sells help desk, asset management and network monitoring software.

Raxco has identified a promising market opportunity. In the past, it has had difficulty in sustaining its growth and in being able to capitalize globally on its technology. Datamedia has about 50,000 users and Axent has about 5,000 customers in 15 different countries. Raxco's roots are in the Digital Equipment market, where it serves approximately 25,000 customers worldwide. Its international strategy is mainly through agents, although in Europe it has its own sales offices.

Axent's main product is the OmniGuard suite of security modules for Windows, NetWare, UNIX and VAX VMS platforms. Plans are to support

leading mainframe security products like RACF, CA-ACF2 and CA-Top Secret.

Strengths

- Ability to pick strategic opportunities
- Strong in Digital environments
- Midrange and low-end environments
- Government agencies (U.S. Treasury and the U.S. Navy) are customers

Weaknesses

- Lacks capital for the rapid expansion required
- Needs more distribution partners, VARs and systems integrators

Outlook and Assessment

Raxco has targeted the client/server security market that is attracting major players, such as hardware manufacturers. It can be expected to face fierce competition. OpenVision is potentially strong in the security market.

OmniGuard has an open architecture that enables it to integrate with leading systems management frameworks, such as HP's OpenView. It has worked well to provide interfaces to other software programs; now it needs to work on its distribution relationships with major systems integrators and hardware manufacturers. Long term, this could make an attractive acquisition opportunity.

As a small company of about $35 million Raxco cannot afford to have multiple identities in the marketplace. In setting up Axent, it is clearly trying to distance its client/server products from its legacy software. However, it sends a confused company image in positioning Axent as part of Raxco, its not clear where the control and authority really lies. With strong management, Axent can be successful, but it may be limited in it is access to capital as long as it remains a Raxco division. An alternative would be to rename Raxco as Axent and position the whole company as migrating to client/server.

28. Siemens-Nixdorf

Strategy

Siemens-Nixdorf (SNI) provides the Transview (formerly DSM) line of products for enterprise application, network and operating systems management. Strategically, SNI is positioning Transview as an enterprise systems management solution for its installed base. SNI's customers can get a complete systems management solution integrated with custom software and applications from one vendor.

In the U.S., SNI is targeting retail and financial environments using its systems management software, where it has an installed base. With the recent acquisition of Pyramid, SNI will be a strong player in the massively parallel server market, for applications such as data mining and data warehousing. SNI has an opportunity to manage these applications with its Transview software. Another key differentiator is that Siemens can also manage its HICOM telephone systems from its Transview software.

Transview Control Center integrates other packages into a general framework that is based on SNMP agents, Siemens agents and OSI networking agents. It uses an X-Windows display. Its Transview SAX product line is designed for open systems administration. A key module provides software distribution across networks, with its central software residing on SNI's SINIX (Unix) machines. It can track IBM MVS/ESA servers and shortly will support HP, IBM, AT&T and Sun Unix-based servers. It also supports popular PC operating systems, including Windows, OS/2 and DOS. It supports applications like SAP's R/3 as well as custom applications.

Strengths

- Retail and financial market strengths in the U.S., wider markets in Europe, particularly Germany
- Becoming more of a global player with the acquisition of Pyramid
- Financial depth of parent company
- SNI has developed some proprietary systems management software using standards and off-the-shelf software where appropriate. This must be built upon to offer a systems management product that is superior to competitors.
- Strong support for legacy systems
- Clean, well-designed user interface

- Strong in retail and branch banking

Weaknesses

- SNI tends to lag behind other systems management products in the U.S. market. It is addressing its tardiness by supporting other UNIX platforms, and must continue expanding its reach across mobile, PowerPC-based and newer Windows platforms.

- Unlike Bull, which has licensed its system management software to Tandem, SNI is not yet licensing its systems management software to other players. SNI needs to consider the opportunities and risks of licensing its software to other players, particularly in its retail and banking markets.

Outlook and Assessment

SNI has seen disappointing performance in recent years as it revamps its product line. However, the company is now rapidly addressing the client/server market and has the potential for a very successful turnaround. The acquisition of Pyramid is a major win. It is under constant pressure from competitors like IBM and AT&T GIS in the retailing space. SNI has to be able to use its systems management software in these markets as a key strategic advantage that can put it ahead of the competition. To do this, it must continue to support custom applications at a very high level to simplify dramatically the role of a system administrator.

By working across its divisions, Siemens has the opportunity to provide a wide range of systems management solutions that go beyond the traditional IT environment. In the retail market it can manage everything from point-of-sale systems to data mining. In the telephony market, it has the potential to offer major customers integrated telephone and computer systems administration. The challenge for Siemens is to leverage its strengths across its divisions.

29. Spire Technologies

Strategy

Spire is a U.S. distributor for an Australian company, Australian Software Innovations (ASI), that has recently entered the U.S. market. It offers SYSMON, a system event monitoring tool that can track operating system and database events across networks. It started by supporting Oracle 6 and 7. SYSMON runs on UNIX systems from HP, IBM, Sun, Sequent, Silicon Graphics, Data General, and Digital (both Ultrix and UNIX). Its main competitors are BMC (with Patrol), Compuware (with

EcoTools) and Legent. ASI has 800 installations of SYSMON in Australia, Europe and Asia, and is now entering the U.S. market. Other ASI products sold by Spire include ASI-Accounting, which provides resource accounting, and LOGMON, to monitor log'ins and log out inactive users.

Spire is a reseller of WordPerfect and Lotus 1-2-3 for UNIX. It is experienced in licensing and support.

Strengths

- Experienced in supporting multiple UNIX platforms
- Energetic, creative

Weaknesses

- Under capitalized
- Low visibility in corporate accounts needs to work with hardware manufacturers and major systems integrators

Outlook and Assessment

In 1995, Spire expects to provide interfaces to CA-Ingres, Sybase and Informix. Spire also sells OpenVision's OPENV*SECUREMAX auditing and security software for UNIX. Spire needs to work with leading system integrators and major hardware manufacturers to penetrate corporate accounts.

30. Sterling Software

Strategy

Sterling runs its business as a collection of focused divisions that each have products with brand name identities. It grows by both internal development and acquisition. Sterling's strategy is to support both legacy and emerging markets. In client/server systems management, it sees the mainframe as the data repository for many applications and wants to provide centralized support that gives system administrators mainframe-like control over their client/server networks. It acquires and extends the life of established software packages by making them part of a product line.

In July 1993, Sterling acquired Systems Center, a leader in data communications and systems management software, for approximately $156 million in a stock-for-stock acquisition. Since then, Sterling has formed a Systems Management Group that incorporates three divisions in

its Enterprise Software Group, namely Storage Management, VM Management and Operations Management.

The Storage Management Division markets its SAMS branded products to automate storage management. The division's strategy is to extend its enterprise storage solutions to a wider range of platforms, including PCs and LANs. The product line includes client/server software SAMS:Vantage for mainframes, SAMS:Expert for LANs and SAMS:Control for central storage administration on heterogeneous networks.

In its mainframe VM Management division, Sterling sees the VM platform as a strategic element of many client/server networks because its main uses are for applications development, communicating applications like IBM's OfficeVision, and decision support platforms like Focus and SAS. Sterling has approximately 5,000 product licenses installed worldwide for its VM systems management product line.

The network management products are sold under the SOLVE brand name by the Operations Management Group. Products to support NetWare LANs have been introduced recently. This division also sells configuration and change management packages, as well as help desk support software. Sterling's SOLVE:Netmaster works with HP's OpenView, and Sterling is expected to announce more OpenView-compatible products.

Sterling's customers are those with mainframes, particularly in government, banking, financial, telecommunications and transportation (airline) markets. Its Operations Management division has an unusually high proportion of its business (two-thirds) outside the U.S.. Sterling works closely with IBM on many projects and committees, but also competes with some systems management products. Its main competitors are Legent, Boole and Babbage & Peregrine Systems.

Strengths

- Brand-name identity for products
- Focused product line for each division, resulting in focused expertise
- Knows how to acquire companies and integrate them into existing or new product lines. This is coupled with expertise in reviving and supporting legacy products.
- Mainframe, particularly VM, and storage management expertise

- Sterling tends to support the services that surround a product—for example, it supports service-level agreements for data center managers, outsourcers and systems integrators who need to guarantee a level of performance as part of a contractual arrangement with a client.

Weaknesses

- Technology—Sterling is not a technology innovator; in general it prefers to sell established products to known markets.

- Marketing—Sterling's corporate image is that of a legacy vendor and needs updating

Outlook and Assessment

In the mainframe VM market, Sterling is the market leader. Its products appeal to companies that want centralized management. Sterling is weak in distributed systems management, although it has introduced client/server and NetWare products. Sterling is branching out into the UNIX market, and more products that support HP's OpenView can be expected.

Sterling has continued to grow by running the company as independent divisions and working closely with customers. This has enabled each division to focus on key products. However, as the cost of selling goes up and customers want multiple products from a single vendor, Sterling may need to rethink its organization and sell its system management products with other products and services. For example, the company's electronic commerce customers will increasingly need systems management tools that can manage both internal and external systems; this is an area that Sterling could leverage.

31. SunSoft, a Sun Microsystems Company

Strategy

SunSoft has recently combined its network management and systems management activities, resulting in Solstice, an integrated framework for systems and network management. Solstice was introduced in January 1995. The four components of Solstice are:

- Solstice AutoClient - for centralized management of desktops. This saves a network administrator from working at a client machine. Instead, the machine can be administered from a central workstation. It enables set-up, installation and repair of client machine software.

- Solstice Cooperative Consoles - for integrating management consoles across departments

- Solstice Enterprise Manager - for scalability across networks
- Solstice SunNet Manager - a network management platform for Intel-based systems

Strengths

- Has the widely licensed network infrastructure required to support SunNet Manager, ONC
- Strong penetration in workstation market
- Strong technology
- Strong third-party developer program in terms of attracting a large quantity of developers, although the quality of developers does not always match the volume

Weaknesses

- At the low end, Sun is vulnerable to Windows NT and Windows 95.
- Confusion between SunOS and Solaris platforms still exists, with some users reluctant to move from SunOS to Solaris.

Outlook and Assessment

Sun supports a wide variety of third-party tools, though sometimes customers find it difficult to choose appropriate solutions. Hence, Sun has resellers like Amdahl and Unisys that can provide corporate systems management expertise from a mainframe perspective. Sun's most serious competitor is HP; however, Sun can be more focused on workstations and midrange servers, whereas HP has broader product lines. Sun's platforms offer exceptional price/performance, and as long as this is soon it will have a successful systems management market.

32. Symantec

Strategy

Symantec, with its Central Point and Norton Utilities products, is a leading vendor of system administration tools. Norton Administrator for Networks moves Symantec from Norton Utilities for single PCs to LAN management. Symantec is moving to LAN markets and client/server solutions.

Strengths

- Wide software distribution channels for packaged software
- Ability to acquire companies, add value to them and successfully absorb them into the corporate culture
- Desktop tools are widely deployed
- Low price

Weaknesses

- Lack of enterprise presence and support structure
- Not perceived as a systems management vendor

Outlook and Assessment

Symantec has a strong business model for selling shrink-wrapped systems management software. Point solution vendors that want to sell shrink-wrapped PC solutions may consider licensing their software or selling their businesses to Symantec. Symantec is expected to be a strong player in the LAN systems management market long term, both through its internal growth and by acquiring companies that are a good fit with its business.

33. Tivoli Systems

Strategy

Tivoli started by providing systems management tools for UNIX systems, licensing its technology to Novell's UNIX Technology Group, the Open Software Foundation, SunSoft and Legent. Its Tivoli Management Framework is a proposed X/Open standard and is gaining wide acceptance as a systems management platform. TME includes a wide range of applications for software distribution, configuration management, event monitoring and problem reporting. It provides an object layer to manage users, clients, servers, databases and applications. The object layer insulates the complexity of a client/server network from the rest of Tivoli's software. The TMF layer is built from objects and provides toolkits that enable customers to create new systems management applications. At the highest level, Tivoli provides the Tivoli Management Environment (TME), a suite of intergated systems management products. Tivoli's Tivoli/Courier is a leading product for software distribution over LANs. Tivoli/Admin provides configuration and change management, Tivoli/Sentry monitors events and Tivoli/Enterprise Console provides a user interface for problem

management. Tivoli/Print manages print queueing. Tivoli recognizes the value of leveraging the work of other developers, selling Tivoli/EpochBackup from EMC Corporation and Tivoli/Workload for job scheduling from AutoSystems Corporation.

Tivoli's distribution strategy is to leverage its technology through OEMs and resellers, as well as selling directly. OEM customers include Data General, Informix, IBM, Siemens Rolm, Sybase and Unisys. Systems management tools from Axent, BGS Systems, CyberSAFE, Dazel, Landmark Systems, Softool and Unify integrate, with at least some parts of TMF. Users include Chase Manhattan, Circuit City Stores, GTE Data Services, Federal Express, Intel, Merrill Lynch, Motorola and United Parcel Service. These tend companies to be early adopters of new technology that make significant investments in leading edge information systems. Travoli's third-party software partners include Sybase, Informix, Landmark Systems and IBM.

As a framework vendor, Tivoli competes with IBM, Sun, HP, Microsoft and Novell. Computer Associates' CA-Unicenter and Legent's XPE are competitors that come from a mainframe background. OpenVision, Boole & Babbage, MAXM and Novadigm compete with point solutions.

Strengths

- Strong object-oriented modern software architecture enables modules to be integrated and easily customized
- Technology pioneer in client/server systems management
- Scalability to support thousands of clients and servers
- Understands how to leverage its technology through partners, resellers and standards organizations
- Attractive user interface
- Leading-edge, energetic image the company went public in the first quarter of 1995

Weaknesses

- Some third party developers shy away from building solutions on Tivoli's framework because they prefer not to pay royalties to Tivoli.
- Price is high, compared with PC solutions
- Narrow range of platforms covered to date, focusing on the UNIX environment

Outlook and Assessment

Tivoli has a promising technology solution and requires significant commitment from partners to make it successful. At year end 1994, Tivoli had licensed TME to 250 IS organizations representing 160 customers worldwide. Tivoli understands leverage, attracting strong partners. Tivoli needs to maintain significant investments in R&D to continue to compete successfully. If it can continue to leverage its frameworks and widen its developer network, its profitability will grow. Tivoli has managed to all but kill the DME initiative from the Open Software Foundation by providing a CORBA-compliant solution for the UNIX market.

34. Unison Software

Strategy

Unison has about 120 employees and provides software for job scheduling, workload management, performance optimization and backup for UNIX servers. Its main product is Unison Maestro, which automates job scheduling and tracks on-line jobs. This is an example of a point solution that can be integrated with HP's OpenView and IBM's NetView/6000. It supports leading UNIX platforms from Sun, HP and IBM. It is also targeting the Motorola 8000 series and SGI's Irix systems.

Strengths

- High-performance backup solutions, making use of parallel technology for parallel servers
- Focus on workload scheduling, both calendar and event based
- High performance, for enterprise networks

Weaknesses

- Small company
- Supports a limited number of platforms

Outlook and Assessment

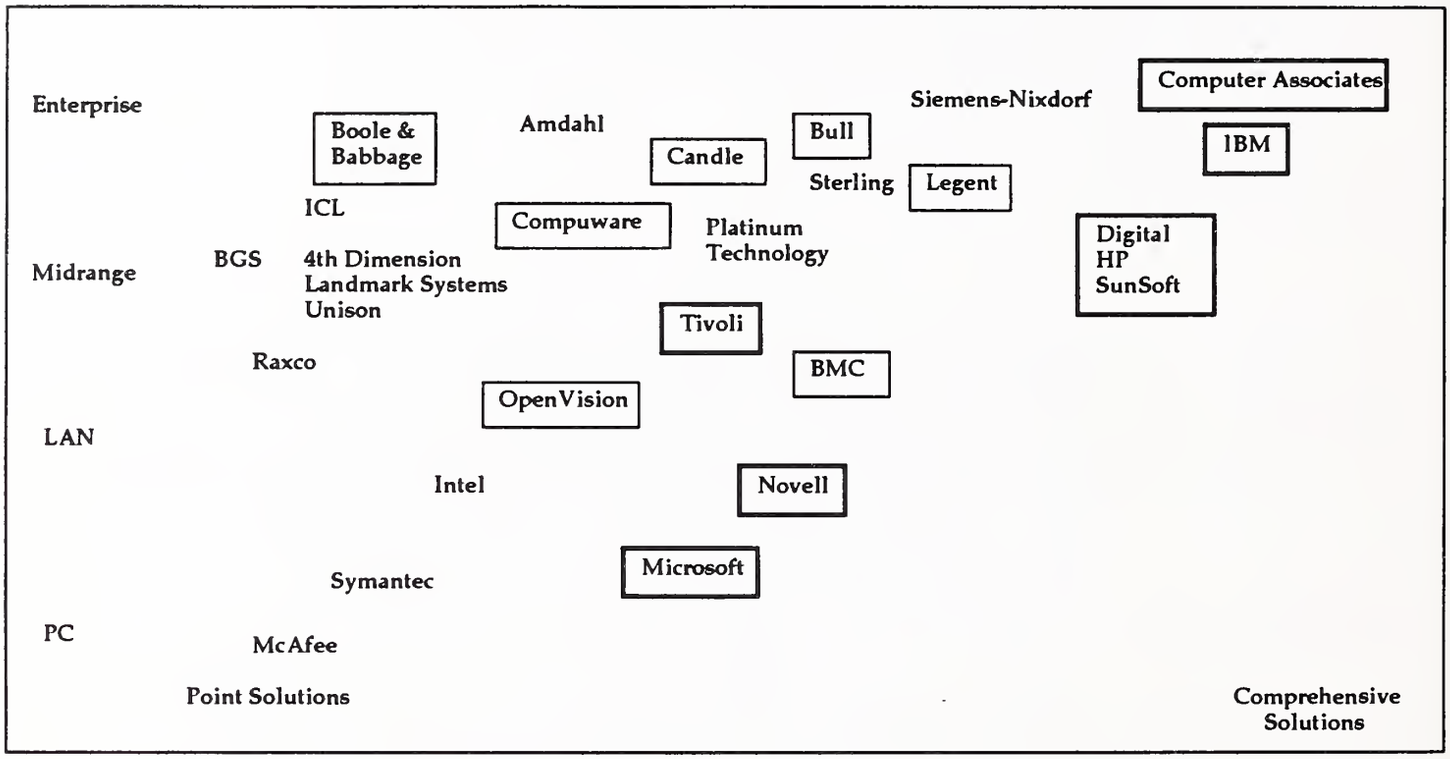
Unison is a promising company that could be an acquisition candidate for a major player. It is focused on the UNIX market. Its strategy is to provide the best workload management products.

D
Vendor Comparison

Exhibit V-6 positions vendors, showing the size of enterprise they support and their range of solutions.

Exhibit V-6

Vendor Positioning



Source: INPUT

The horizontal access classifies vendors according to whether they provide point solutions or a range of solutions. The broader the range of products offered, the further to the right they are plotted. The vertical axis shows primary types of systems on which the vendors sell their products. With cross-platform products, there is clearly a mixed product line from many vendors, so the positioning is approximate and reflects the company's heritage. Companies have boxes drawn around them if they offer a framework, the heavier line representing companies whose frameworks have wide acceptance. Those with lighter boxes are vulnerable to having proprietary infrastructures that they cannot afford to support if they do not license their technologies more broadly.

E
Vendor Revenue Analysis

Exhibit V-7 shows estimated 1994 calendar-year revenues for selected vendors with approximate worldwide revenue growth rates. Note that Computer Associates includes its ASK acquisition and that it sells other products besides systems management software. Sterling also has significant divisions that market electronic commerce services and development tools.

Exhibit V-7

Worldwide Software Vendor Revenues, Calendar Year 1994

Company	Annual Revenue Growth AAGR 93-94%	Estimated Calendar Year 1994 Revenues ($M)
BGS	7%	32
BMC Software	25%	329
Boole & Babbage	12%	132
Candle Corporation	16%	250
Computer Associates	17%	2400
Compuware	19%	330
Landmark Systems Corporation	-7%	40
Legent	16%	510
McAfee and Associates	94%	35
Raxco Inc.	-8%	35
Software Clearing House	18%	13
Sterling Software	14%	480
Tivoli Systems	125%	27

Source: INPUT estimates from public records

Exhibit V-8 shows the percentage of a vendor's revenues from software licenses in the second column, from maintenance in the third and from service in the fourth. Maintenance typically includes a contract for upgrading software and fixing problems, with technical support. It may also include some professional services, depending on the company. Service typically includes training, consulting and some contract programming if needed to integrate a product. The breakdown was for the last fiscal year (in most cases, fiscal 1994), based on vendors' financial results according to their definitions. As can be seen, it is typical to get between 40% and 70% of business from new licenses.

Major PC vendors like Novell and Microsoft sell new products through distribution channels, rather than having direct maintenance contracts. They, together with many emerging technology software vendors, prefer to use both their own and third party organizations to provide training, consulting and technical support for additional fees, which are paid for as needed by users.

Systems management is one client/server software category in which maintenance contracts are the norm, given the mainframe heritage of the larger vendors. This is less true for some of the PC-oriented client/server software products like PC-based development tools. Mainframe systems management vendors that gain their profits from long-term maintenance contracts are vulnerable long term to younger vendors, who shrink-wrap standard products and charge for upgrades and support as needed.

Exhibit V-8 reflects the way in which individual companies report their revenue. Some include professional services as part of maintenance.

Exhibit V-8

Percentage Of Vendor Revenues For Professional Services and Maintenance

Vendors	License as % of Revenues	Maintenance as % of Revenues	Professional Services as % of Revenues
4th (Fourth) Dimension	70	30	
BGS	50	42	9
BMC Software	57	43	
Boole & Babbage	49	49	
Computer Associates	68	32	
Compuware	37	32	31
Legent	58	42	
Platinum Technology	61	32	6
Sterling Software, Inc.	38	28	34
Tivoli Systems	79		21

Source: INPUT

F
Standards Bodies and Associations

The main standards bodies and associations that cover systems management are given below. Appendix B gives further details on addresses and contacts for these organizations.

1. Desktop Management Task Force

The desktop management task force was pioneered by Microsoft and others. After an initial frenzy of activity, as it starts to resolve desktop standards, it is becoming less active. In the Windows market, one can expect Microsoft to lead with *de facto* standards. One goal is to incorporate standard intelligence into PCs and other network devices that enable them to be monitored.

2. Internet Engineering Task Force—RDBMS MIB Working Group

The Internet Engineering Task Force has several standards groups working under it. The RDBMS MIB is aiming to standardize management of relational databases using SNMP, network management protocols. Contributors to the standard and task force members include Computer Associates, Digital, Gupta, IBM, Informix, Oracle, Progress Software and Sybase.

3. MOSES

MOSES is a group of users and vendors that shares information so that vendors can get obtain requirements efficiently through direct contact with users. Systems management is an area of keen interest for MOSES. MOSES was formed in April 1992 and started by publishing papers to explain systems management.

Founders of the group included Burlington Coat and US West, with systems management staff from Oracle and Sequent being key players. In late 1993, it became clear that writing papers was taking time and not keeping up with technology fast enough. These papers cover product feature requirements, job descriptions and procedures. UniForum took over publication of the papers. The group expects to continue its meetings through regional, rather than national, forums, starting in May 1995 in Boston. The goal is to inform attendees of problems and solutions in developing and supporting systems, systems management being a critical agenda item.

MOSES has lost some of its initial members, the initial investment being high in terms of time and publication costs. As their problems were

solved, members moved on. However, the group believes that it will continue to grow through branch networking.

4. SAGE

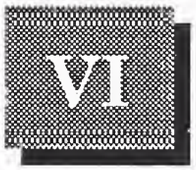
SAGE, the System Administrators Guild, is an organization of system administrators that provides publications via the technical UNIX organization, USENIX. Its intention is to support system administrators professionally by propagating knowledge of system administration to its members.

5. The NetView Association

The NetView Association is sponsored by IBM and Digital to encourage hardware manufacturers, software vendors, systems integration companies and professional services organizations to support NetView. PATHWORKS ManageWORKS is available in PATHWORKS V5 for DOS and Windows client software.

6. X/Open

X/Open publishes UNIX and open systems standards. It "brands" software that complies with its published specifications, Which are jointly defined by computer industry players. Tivoli was instrumental in defining its systems management framework standards. Its E405 document describes standards for internationalization of System Management Specifications, and its G410 document describes a Distributed Security Framework.



Market Forecasts

This chapter provides U.S. and worldwide forecasts for systems management software. It provides five-year projections for user spending.

A Worldwide Forecasts

Forecasts for systems management software products are broken down by category into applications management, information management, system administration and network administration. Projections are also made by hardware platform. Forecasts are based on user spending.

Applications management software for system administrators to monitor and support applications has traditionally been incorporated in applications software either by a systems integrator or an applications software vendor. It is becoming an area for third-party independent software and professional services vendors. As leaders in client/server applications emerge, third parties will be attracted to support them with systems management tools. This software category shows the greatest potential for growth.

Information management, which has had a heavy emphasis on database administration, is a shifting segment, with more emphasis being placed on document management, hypertext and multimedia and traditional chores associated with database maintenance becoming more automated.

System administration will continue to be the largest segment as more solutions for managing distributed networks emerge.

Network management is a maturing market, but new networking standards and the bridging of LANs using WANs is fueling growth.

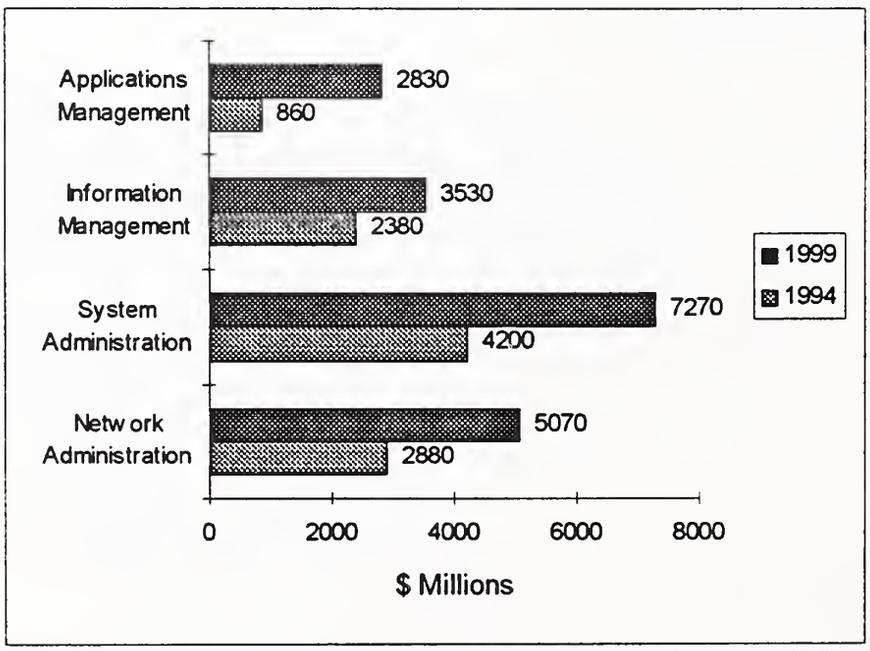
Worldwide market forecasts, by software category, are given below in Exhibit VI-1. The worldwide systems management software market is

expected to grow from $10.3 billion in 1994 to $18.7 billion in 1999, with a CAGR of 13%.

The greatest growth (27% CAGR) comes in the applications management area. The world market is growing faster than the U.S. market because the latter market is more mature and already has a strong installed base of systems management software. Many systems management vendors are aggressively expanding overseas, particularly in Latin America and the Pacific Rim. Information management software growth, projected at 15% from 1994 to 1995, will decline, giving a CAGR of 8% from 1994 to 1999. This reflects less emphasis on database administration, which is becoming more automated, and more emphasis on managing mixed information types such as documents, video, sound and messages.

Exhibit VI-1

Worldwide Systems Management Software Market, by Category, 1994-1999



Source: INPUT

Exhibit VI-2 shows the worldwide market for systems management software by platform. The platforms selected are cross-platform, mainframe, minicomputer and PC/LAN.

The cross-platform category includes:

- Software that runs on multiple platforms when it is deployed —for example, it may run on a Windows PC, but have other components on mainframes and UNIX servers

- Software that is licensed independently of a hardware platform —for example, it may be deployed on a UNIX machine, but the license may enable the user to deploy it on a PC without purchasing a new product

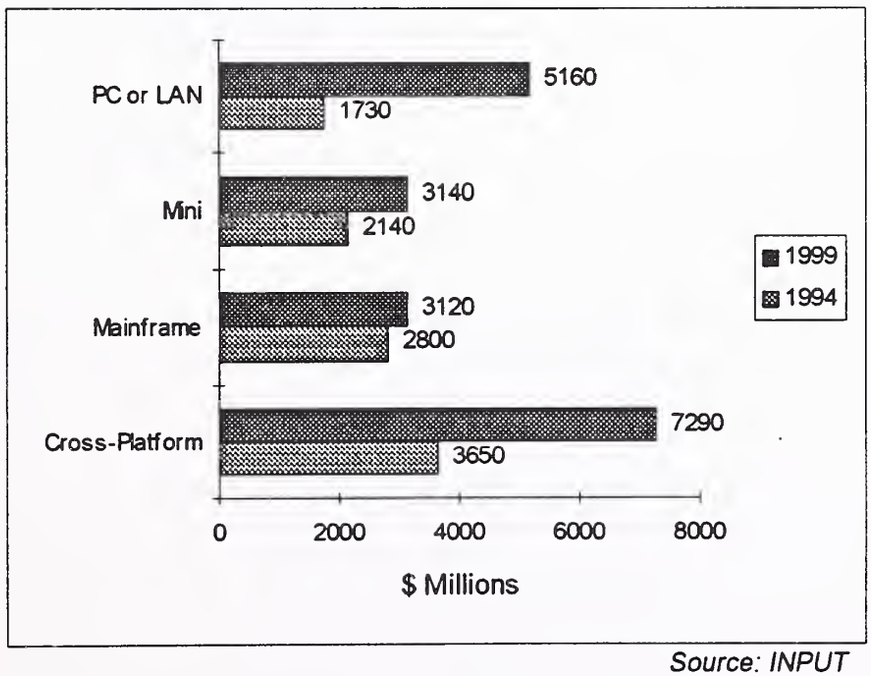
The mainframe, minicomputer and PC categories are described in INPUT's *Definition of Terms* and depend on the price of the underlying computer hardware. The PC category also includes software that runs exclusively on PC LANs and not on other networks.

The cross-platform market overlaps the client/server market. Some mainframe, minicomputer and PC systems management system administration tools may also be used in client/server systems. As systems evolve from single platform systems into client/server systems, the role of the systems management software changes and some tools may be used to manage both client/server and non-client/server systems at the same time. This presents forecasting difficulties, hence no forecast is given for client/server systems management software.

The PC segment shows a 24% CAGR from 1994-1999 and is accelerating. The largest segment is the cross-platform segment, which shows a corresponding growth rate of 15%.

Exhibit VI-2

Worldwide Systems Management Software Market, by Platform, 1994-1999



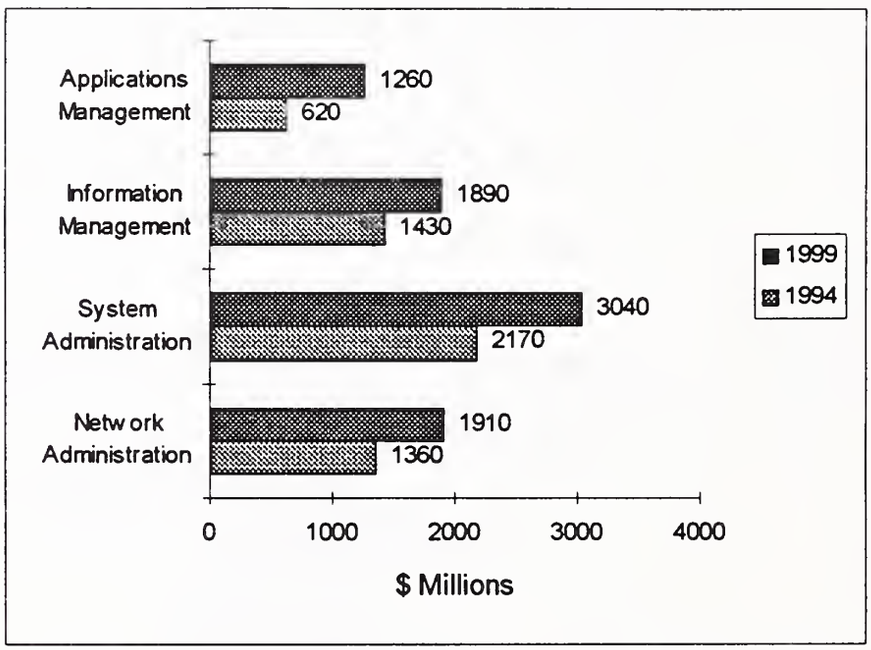
Source: INPUT

B
U.S. Forecasts

Exhibit VI-3 shows user spending on systems management software products by category for the U.S. market. The total market is expected to grow from $5.6 billion in 1994 to $8.1 billion in 1999, with a CAGR of 8%. This is slower than the worldwide growth rate of 13%. System administration, the largest category is growing at 7%. The volume of software is expected to increase, but falling prices will reduce the potential market size.

Exhibit VI-3

U.S. Systems Management Software Market, by Category, 1994-1999

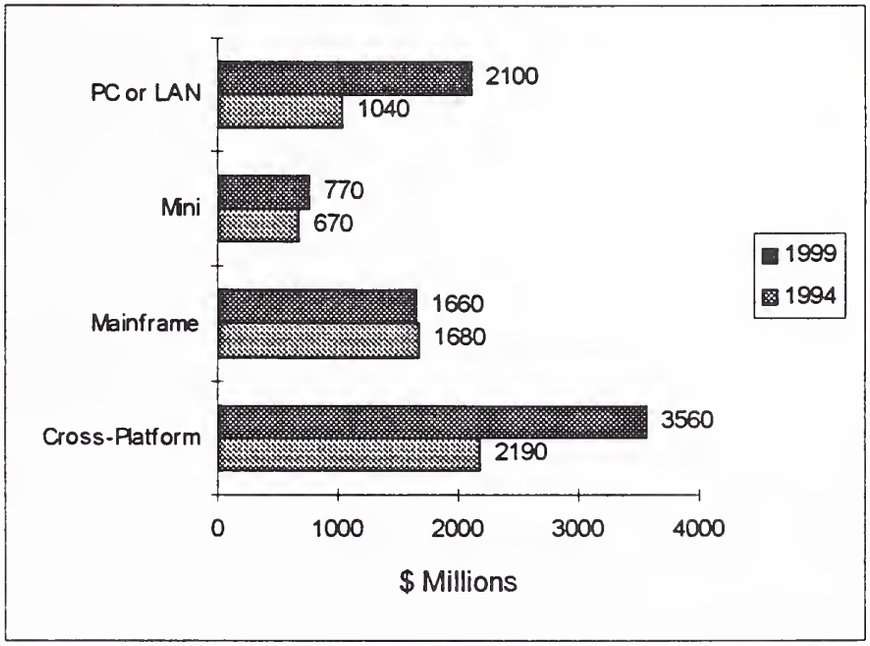


Source: INPUT

Exhibit VI-4 shows user spending on systems management software products by platform, for the U.S. market. The mainframe market is showing a slight increase in the U.S. from 1994 to 1995, with some vendors reporting growth and others a decline in their U.S. mainframe revenues. Consolidation of data centers is offset by expanding mainframe server requirements, resulting in a market segment that shows no compound growth from 1994 to 1999. The main reason for this lack of growth is greater price competition, the growth in the cross-platform market that includes some software that runs on mainframes, and lower hardware prices. In contrast, the worldwide mainframe systems management software market is still growing, with 2% CAGR projected from 1994 to 1999.

Exhibit VI-4

U.S. User Spending On Systems Management Products, by Platform, 1994-1999



Source: INPUT

The U.S. market is estimated to have been at 54% of the world systems management software market in 1994, and will decline to 43% in 1999.

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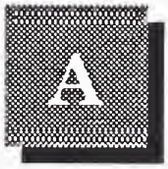

Definitions

This appendix provides definitions of vocabulary used in this report that is not in INPUT's *Definition of Terms*.

Agent	An agent is a set of instructions that can carry out tasks automatically. It is usually written in a high-level language script and may run across a network to send messages or find information.
Alert	An error message sent to a host computer or workstation when a problem is detected.
API	Application programming interface —this provides specifications for programmers.
CMIP	Common Management Information Protocol. A hierarchical secure network management protocol based on OSI. It is used primarily by banks, telecommunications companies and government organizations that need secure communications.
Component	Component refers to software component, a piece of software with documented interfaces that a programmer can use to build an application.
Environment Development	This is the software needed to build an application. It may include a visual editor, a forms designer, a report writer, a compiler, an interpreter, a debugger or a source code control system that enables programmers to share coding tasks.
Development Tools	Short for application development tools.
Distributed System	A system that runs across multiple computers.

Framework	A specification or implementation of software that can be used to build an application. It may consist of classes and methods. Motif and the Common Object Request Broker Architecture (CORBA) are examples of frameworks.
GUI	Graphical User Interface —A windowing system like Microsoft Windows or X-Windows with Motif that displays graphical objects.
MacOS	The operating system for the Apple Macintosh.
Messaging	A general term that describes communication that stores and forwards information. It may also support queues of objects waiting for an event in a network. An example of messaging software is electronic mail or software that supports on-line information services.
Open systems	In this report, it describes systems that can run on multiple UNIX and/or Windows operating systems, rather than proprietary environments like VMS (even Open VMS) or MVS (even with POSIX compatibility).
Operating Environment	Modern term for operating system plus its application development tools.
OS	Operating system.
Platform	This is the software or hardware that an application program runs on.
POSIX	A standard for operating systems to ensure some level of portability of software code that runs on it. Standards are published by X/Open.
SNMP	Simple Network Management Protocol. A widely implemented protocol for managing networks using agents.
Suites	Sets of applications or packages. Office suites typically consist of a word processor, a spreadsheet and a database or electronic mail package.

Visual Development Tools	An application development tool that can be used to create user interfaces. It may also create other applications.
Windows	Used in this report to refer to Microsoft's Windows if it starts with a capital letter. If it starts with a small letter it may refer to any software that controls the windows on a computer screen. A window may also be the window seen on a computer screen.

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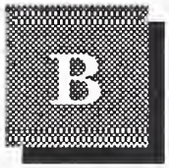

Vendor Names and Addresses

This appendix provides names and addresses of vendors and organizations mentioned in the report.

A
Vendors and Organizations

Exhibit B-1

Names and Addresses of Vendors

Company	Notes
4th Dimension Software	4th Dimension software is an Israeli company that specializes in job scheduling. It is strong in cross-platform licensing and supports midrange and high-end systems.
Amdahl Corporation 1250 E. Arques Avenue Sunnyvale, CA 94088-3470 Tel: 800-223-2215	Amdahl is an example of a hardware manufacturer that is investing in systems management software for client/server networks. Its strengths are in mixed mainframe and UNIX networks.
AT&T AT&T CommVault Systems 1 Industrial Way Eatontown, NJ 07724 Tel: 800-331-6207	AT&T has various divisions providing solutions for different aspects of systems management. Systems management for its own storage devices is in its CommVault division.
AT&T Global Information Solutions Dayton, OH	AT&T GIS has recently announced it will license HP's OpenView. AT&T relies heavily on third-party vendors for systems management software.
Australian Software Innovations Suite 301, 51 Rawson Street Epping, New South Wales Australia, 2121 Tel: 02-869-0244 Fax: 02-869-0280	Performance monitoring software sold in the U.S. by Spire Technologies and Open Systems Software Innovations (Aurora, CO). See Spire.
BGS Systems 128 Technology Circle Waltham, MA, 02254 Tel: 617-891-0000 Fax: 617-890-0000	Focuses on performance management for OS/2, UNIX and AS/400. Over the last three years, the main focus has been on client/server products.
BMC Software, Inc. 2101 City West Boulevard Houston, TX 77042-2827 Tel: 713-918-8800 Fax: 713-918-8000	Focuses mainly on mainframe products, but its recent acquisition of PATROL has made it a competitive client/server vendor for problem management and event monitoring.
Boole & Babbage 3131 Zanker Road San Jose, CA 95134-1933 Tel: 408-526-3000 Fax: 408-526-3055	Boole & Babbage focuses on event monitoring and managing alerts. It also provides software on mainframes, minicomputers and UNIX machines. Over the last few years it has re-invigorated its product line with client/server software.

Exhibit B-1 (cont'd)

Company	Notes
Bull HN Information Systems Technology Park Billerica, MA, 01821 Tel: 508-294-6000 Fax: 508-294-6440	Bull HN is the U.S. subsidiary of Groupe-Bull in France that is licensing systems management software to Tandem and others.
Candle Corporation 2425 Olympic Boulevard Santa Monica, CA 90404 Tel: 310-829-5800 Fax: 310-582-4208	OMEGAMON, an event and performance monitoring product, is Candle's main product line. Recently, Candle has developed its own object-oriented framework for client/server systems management and is working closely with Microsoft.
Computer Associates 1 Computer Associates Plaza Islandia, NY, 11788-7000 Tel: 516-342-5224 Fax: 516-342-5329	Leading mainframe systems management vendor that is successfully entering the client/server market with CA-Unicenter, its cross-platform systems management framework.
Compuware 31440 Northwestern Highway Farmington Hills, MI, 48334 Tel: 810-737-7300 Fax: 810-737-7108	Recently acquired EcoTools product for client/server systems management. Has strong services organization to complement systems management products for both mainframe and open systems environments.
Data General 4400 Computer Drive Westboro, MA, 01580 Tel: 508-366-8911 Fax: 508-366-1319	Minicomputer vendor with UNIX servers that are successfully being used for systems management. Data General has recently focused on lights-out data management as a strategic initiative.
Digital Equipment Corporation 110 Spitbrook Road Nashua, NH 03062 Tel: 603-881-1894 Fax: 603-881-2790	Has agreement with Microsoft to integrate SMS. POLYCENTER is its main network management product.
Elan Computer Group 888 Villa Street, Suite 300 Mountain View, CA, 94041 Tel: 415-964-2200	Emerging vendor of software for administering World Wide Web applications. Company's main business is developing license management software for developers.
Eventus 1250 Bayhill Drive, Suite 113 San Bruno, CA 94066 Tel: 415-871-0700 Fax: 415-871-0189	Eventus is an emerging vendor that represents the trend toward monitoring database activity from Windows.
Globetrotter Software 20300 Stevens Creek Blvd. Cupertino, CA, 95014 Tel: 408-255-5616	Company's main business is developing license management software for developers. It is developing the FLEXadmin tool to manage software licenses across multiple platforms.

Exhibit B-1 (cont'd)

Company	Notes
Hewlett-Packard 19310 Pruneridge Avenue Cupertino, CA 95014 Tel: 408-447-4042 Fax: 408-447-5809	HP's OpenView has seen success as a foundation for network management that has been licensed to IBM and others. It has now been extended to incorporate systems and applications management. HP has a strong third-party support program.
IBM Corporation 1 Old Orchard Rd. Armonk, NY 10504 Tel: 914-765-1900 Fax: 914-765-4190	IBM's KARAT is a new object-oriented systems management framework for its SystemView product line. NetView is IBM's network management product. IBM has a wide range of systems management tools for diverse platforms.
ICL Enterprises North America 11490 Commerce Park Drive Reston, VA 22091 Tel: 703-648-3300 Fax: 703-648-3380	ICL is a leading hardware and systems vendor. Its Enterprises division licenses software that can be marketed through other organizations like EDS.
Intel Corporation 5200 NE Elam Parkway Hillsboro, OR 97124 Tel: 503-681-8080 Fax: 503-696-2581	Intel has a LAN management package.
Landmark Systems 8000 Towers Crescent Drive Vienna, VA 22182-2700 Tel: 703-902-8000 Fax: 703-893-5568	Concentrates on monitoring mainframe and UNIX systems, with a recent emphasis on distributed systems.
Legent 575 Herndon Parkway Herndon, VA 22070 Tel: 703-708-3000 Fax: 703-708-3471	Legent has grown by acquiring a range of systems management tool vendors.
McAfee Associates 2710 Walsh Street Santa Clara, CA 95051 Tel: 408-988-3832 Fax: 408-970-9727	Started as a vendor of anti-virus software, it successfully sells software on-line. It is branching out into client/server security products.
Microsoft Corporation 1 Microsoft Way Redmond, WA 98052 Tel: 206-882-8080 Fax: 206-936-7329	Microsoft's SMS systems management software for Windows NT promises to be a key platform for vendors in that environment.
Novell 122 E 1700 South Provo, UT 84606 Tel: 801-429-7000 Fax: 801-377-9353	Novell supplies basic network administration tools for Netware as standard products, but is creating additional network management products.

Exhibit B-1 (cont'd)

Company	Notes
OpenVision 7133 Koll Center Parkway Pleasanton, CA 94566 Tel: 510-426-6400 Fax: 510-426-6486	Created to provide client/server system management tools. Provides products mainly for UNIX systems, with some VAX/VMS support. Main areas are operations, security, performance and storage.
Platinum Technology 1815 S. Meyers Rd Oakbrook Terrace, IL 60181 Tel: 708-620-5000 Fax: 708-691-0710	Platinum is a vendor of data administration tools and middleware. Its recent strategy is to become a leading vendor of enterprise management tools and it has acquired software vendors to do this.
Raxco (Axent Technologies) 2440 Research Blvd Rockville, MD 20850 Tel: 301-258-2620 Fax: 301-330-5756	Raxco has set up Axent to focus on security modules for client/server systems management.
Siemens-Nixdorf Information Systems 200 Wheeler Rd. Burlington, MA 01803 Tel: 617-273-0480 Fax: 617-221-0213	Siemens licenses a variety of systems management tools. It is strong in the U.S. in retail and branch banking.
Spire Technologies 311 North State Street PO Box 1970 Orem, UT 84059 Tel: 801-226-3355 Fax: 801-224-3847	Spire is a reseller for Australian Software Innovations, an emerging vendor in the U.S. with installations in Europe and Australia.
Sterling Software Systems Management Group 1800 Alexander Bell Drive Reston, VA 22091 Tel: 703 264-8000 Fax: 703 264-0840	Sterling has three systems management groups for storage management, VM and other mainframe operations management. It is investing in the client/server market.
SunSoft 2550 Garcia Avenue Mountain View, CA 94043-1100 Tel: 415-960-3200 Fax: 415-336-0362	Solstice framework for integrated systems and network management. SunNet Manager is a leading systems management environment in the UNIX market. It competes with HP's OpenView.
Symantec 10201 Torrey Avenue Cupertino, CA 95014 Tel: 408-253-9600 Fax: 408-253-4092	Symantec is a leading vendor of PC tools with Norton Utilities and Central Point software. It is moving into the Windows NT and LAN markets.

Exhibit B-1 (cont'd)

Company	Notes
Tivoli Systems 9442 Capital of Texas Highway North Arboretum Plaza One, Suite 500 Austin, TX 78759 Tel: 512-794-9070 Fax: 512-794-0623	Leading CORBA-based framework vendor for open systems. TME (the Tivoli Management Environment) is a modern, flexible set of applications for systems management. Tivoli licenses its software widely and also sells directly to major corporations.
Unison Software 5101 Patrick Henry Drive Santa Clara, CA 95054 Tel: 408-988-2800 Fax: 408-988-2236	Has UNIX backup, load balancing and job-scheduling software.

Exhibit B-2

Names and Addresses of Organizations

Company	Notes
Desktop Management Task Force (DMTF) Hillsboro, OR	Has developed an interface for network management — Desktop Management Interface (DMI).
NetView Association, The c/o Digital Equipment or IBM Tel: 603-881-0349 or Tel: 919-543-2939	IBM and Digital support this developer organization for NetView and POLYCENTER products.
Open Software Foundation (OSF) 11 Cambridge Center Cambridge, MA 02142 Tel: 617-621-7300 Fax: 617-621-8700	This group was set up by IBM, Digital, HP, Hitachi and others to develop a standard UNIX, which is marketed by Digital. Other software components have been licensed by some of the partners. The most popular product is X-Windows. DME is OSF's failed attempt to make a cross-platform systems management architecture, which has in some cases been superceded by Tivoli's framework.
SAGE, the System Administrators Guild c/o the USENIX Association 2560 Ninth Street, Suite 215 Berkeley, CA 94710 Tel: 510-528-8649 Email: office@usenix.org	SAGE supports the system administration profession with publications. It is administered by USENIX, the technical organization for UNIX software engineers.
X/Open 1010 El Camino Real, Suite 380 Menlo Park, CA 94025 Tel: 415-323-7992 Fax: 415-323-8204	Major hardware and software companies support its standard UNIX definition; notable omissions are Compaq, Dell and Microsoft.

C

Forecast Reconciliation

This appendix compares the forecasts provided in this report with those found in other INPUT publications, in particular those from the Market Analysis Program that track forecasts of software and services.

A
Reconciliation With Other INPUT Forecasts

This report estimates that the U.S. systems management market is growing from $5.6 billion in 1994 to $8.1 billion at a CAGR of 8% in the U.S. Exhibit C-1 shows the forecasts and growth rates for the operations management market, as reported in INPUT's *U.S. Market Forecast Compendium, 1994-1999*. The operations management market is growing from $5.6 billion in 1994 to $8.7 billion in 1999 with a CAGR of 9%. The operations management market is defined in INPUT's *Definition of Terms*.

Exhibit C-1

Market Forecast For Operations Management Software
U.S., 1994-1999

Platform	1994 $M	Growth 94-95 %	1995 $M	1996 $M	1997 $M	1998 $M	1999 $M	CAGR 94-99 %
Mainframe	2967	8	3204	3364	3532	3709	3894	5
Minicomputer	1849	8	1997	2097	2201	2311	2426	5
PC/Workstation	783	22	955	1194	1492	1865	2331	25
TOTAL	**5599**	**10**	**6156**	**6655**	**7225**	**7885**	**8651**	**9**

Source: INPUT

Exhibit C-2 compares the definitions used in this report with those used in INPUT's *Definition of Terms*. There is not a clean break between the definitions; INPUT's *Definition of Terms* has more emphasis on data centers and IS operations, whereas this report also includes PC and distributed systems management, which may or may not take place in data centers. The left-hand column gives INPUT's traditional definition; the right-hand column

shows where it is covered in this report. Details on the functions described in the right-hand column are given in Exhibit III-2. They also reflect new systems management applications that are not included in the left-hand column.

Exhibit C-2

Reconciliation of Systems Management Terms

INPUT *Definition of Terms*	This Report
Systems Software	**Systems Software**
Systems Control	*Operating Environments - OSs and NOSs*
Access Control, Security Systems	Security software that is used by system and network managers and administrators
	Remote Access, User Management
Data Center Management (Operations Management)	*System and Network Administration*
Capacity Management	Configuration Management
Computer Operations and Scheduling	Operations Management
Data Center Management	Operations Management
Disk Management	Storage Management
Downtime/Repair Monitoring and Management	Problem Management
Job Accounting	Business Management
Performance Monitors	Performance Management
Tape Management	Storage Management
Utilities	Operations Management
Other	
Database Management Systems	*Database Management Systems and Management Tools (part of Information Management)*
Data Dictionaries	Database Management Tools
Application Development Tools	*Application Development Tools*
	Software Infrastructure, Libraries and Frameworks for Systems Management Products
Other	*Applications Management, Information Management*

The forecast in Exhibit C-1 refers to the Data Center or Operations Management section in the left-hand column of Exhibit C-2. The forecast in this report includes the entire right-hand column. Given that Exhibit C-1 has narrower scope than Exhibit C-2, and the totals for the U.S. market are similar, one could argue that this report underestimates the data center market.

An explanation is that the traditional INPUT forecasts in the market forecast compendium did not take into account mainframe data center consolidation, the rapid growth of UNIX as a cross-platform systems management platform and the entrance of Microsoft into the Windows NT systems management market. The perspective of this report is that not all systems management will be carried out in the data center and that expenditures that would have been made for Data Center Management will be dispersed to purchase the newer types of systems management software described in this report.

INPUT's *U.S. Market Forecast Compendium, 1994-1999* places more emphasis on the growth of mainframe and minicomputer data centers than does this report, which emphasizes the potential growth of Windows NT as a systems management platform.

B
Worldwide Forecast Details

Exhibit C-3 provides details on the worldwide forecasts found in Chapter VI.

Exhibit C-3

Worldwide User Spending on Systems Management Products, by Software Category, 1994-1999

Platform	1994 $M	Growth 94-95 %	1995 $M	1996 $M	1997 $M	1998 $M	1999 $M	CAGR 1994-99
Network Administration	2880	15	3310	3810	4190	4610	5070	12
Systems Administration	4200	12	4710	5270	5900	6610	7270	12
Information Management	2380	15	2740	2800	2950	3080	3530	8
Applications Management	860	25	1070	1390	1810	2360	2830	27
TOTAL	**10320**	**15**	**11830**	**13270**	**14850**	**16660**	**18700**	**13**

Source: INPUT

Exhibit C-4 shows the worldwide market by platform.

Exhibit C-4

Worldwide User Spending on Systems Management Products, by Platform, 1994-1999

Platform	1994 $M	Growth 94-95 %	1995 $M	1996 $M	1997 $M	1998 $M	1999 $M	CAGR 1994-99
Cross-platform	3650	20	4380	4990	5650	6410	7290	15
Mainframe	2800	8	3030	3150	3210	3210	3120	2
Minicomputer	2140	8	2310	2490	2690	2910	3140	8
PC or PC LAN	1730	22	2110	2640	3300	4130	5160	24
TOTAL	**10320**	**15**	**11830**	**13270**	**14850**	**16660**	**18710**	**13**

Source: INPUT

C
U.S. Forecast Details

Exhibit C-5 shows the U.S forecasts by software category.

Exhibit C-5

U.S. User Spending on Systems Management Products, by Software Category, 1994-1999

Platform	1994 $M	Growth 94-95 %	1995 $M	1996 $M	1997 $M	1998 $M	1999 $M	CAGR 1994-99
Network Administration	1360	10	1500	1630	1750	1840	1910	7
System Administration	2170	10	2380	2600	2780	2920	3040	7
Information Management	1430	5	1500	1570	1660	1780	1890	6
Applications Management	620	16	720	850	980	1110	1260	15
TOTAL	**5580**	**9**	**6110**	**6650**	**7170**	**7650**	**8100**	**8**

Source: INPUT

Exhibit C-6 shows the user spending on systems management software products in the U.S. by platform. The software forecasts do not include systems management software that is normally bundled with the operating system, for example, password administration routines that come with a standard version of UNIX.

Exhibit C-6

U.S. User Spending On Systems Management Products, By Platform, 1994-1999

Platform	1994 $M	Growth 94-95 %	1995 $M	1996 $M	1997 $M	1998 $M	1999 $M	CAGR 1994-99
Cross-platform	2190	6	2330	2640	2960	3270	3560	10
Mainframe	1680	8	1820	1850	1840	1740	1660	0
Minicomputer	670	3	690	710	730	750	770	3
PC or PC LAN	1040	22	1270	1450	1650	1880	2100	15
TOTAL	**5580**	**9**	**6100**	**6650**	**7180**	**7640**	**8090**	**8**

Source: INPUT

Note in the above tables, rounding numbers to the nearest 10 means that the totals are not identical.

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