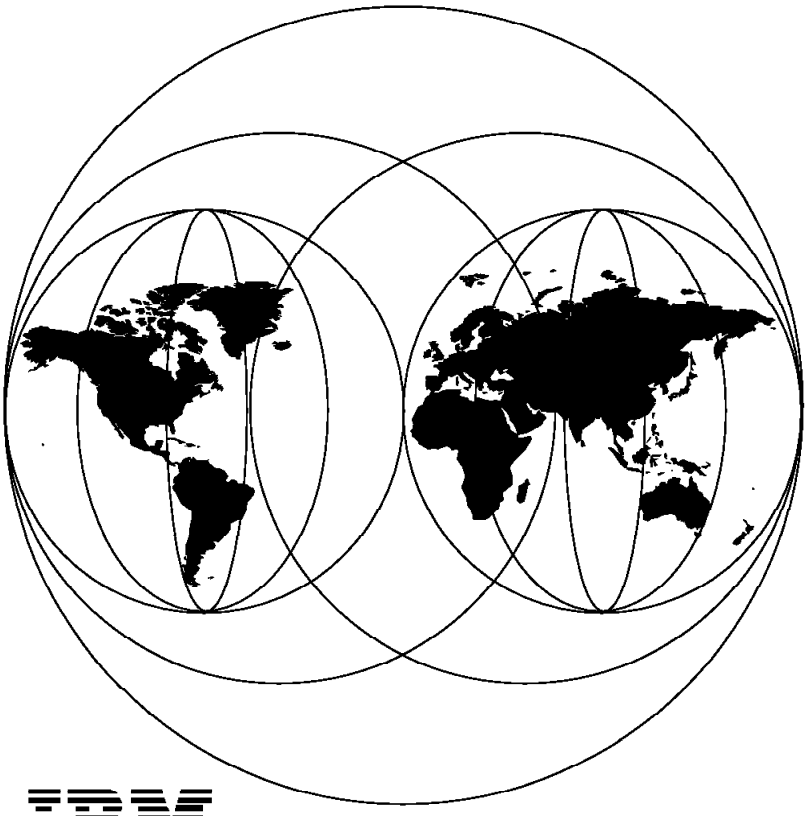
International Technical Support Organization SG24-5014-00

Network Operations Management - Which Platform? The Principles

February 1996



IBM

International Technical Support Organization
Raleigh Center

International Technical Support Organization

SG24-5014-00

Network Operations Management - Which Platform? The Principles

February 1996

Take Note!

Before using this information and the product it supports, be sure to read the general information under “Special Notices” on page ix.

First Edition (February 1996)

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

An ITSO Technical Bulletin Evaluation Form for reader’s feedback appears facing Chapter 1. If the form has been removed, comments may be addressed to:

IBM Corporation, International Technical Support Organization
Dept. HZ8 Building 678
P.O. Box 12195
Research Triangle Park, NC 27709-2195

Abstract

This redbook describes a structured method for selecting an operating system platform to be used for enterprise-wide Network Operations Management.

The book covers the method in detail, along with the criteria that should be used in making such a decision. It also includes an overview of managing-system concepts, to explain some differences in the terminology used in various managing and managed systems environments.

This book should be read in conjunction with *Network Operations Management - Which Platform? The Practice*, SG24-5015, which shows how the method and criteria can be applied to the platform environments currently available. The books are available together, as a kit, by ordering form number GK2T-1303.

(45 pages)

Contents

Figures

Special Notices

This publication is intended to help managers and technical architects in an organization to select an operating system platform, to perform Network Operations Management. The information in this publication is not intended as the specification of any programming interfaces that are provided by any products mentioned in this book. See the PUBLICATIONS section of the IBM Programming Announcement for these products for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM′s product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM′s intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM (VENDOR) products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer′s ability to evaluate and integrate them into the customer′s operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

AIX	AS/400
IBM	MVS/ESA
OS/2	OS/400
PowerPC	SystemView

The following terms are trademarks of other companies:

C-bus is a trademark of Corollary, Inc.

Preface

This document is intended to help managers and technical architects to structure their process for making a decision on which platform to choose for enterprise network management.

The book presents a set of criteria against which the different management platforms can be evaluated, and describes a method which can be used to perform the evaluation and arrive at a decision.

How This Document Is Organized

The document is organized as follows:

- Chapter 1, “Introduction”

  This first chapter describes the objectives of this book, and who it is aimed at. There is a detailed explanation of the scope of the book.

- Chapter 2, “IT Environments”

  The different managed IT environments are defined in this chapter, so that the terms will be familiar when they are used later in this book, and in *Network Operations Management - Which Platform? The Practice*, SG24-5015.

- Chapter 3, “The Decision Criteria”

  This chapter is devoted to a detailed examination of the criteria which should be used, when deciding on an enterprise management platform.

- Chapter 4, “The Method”

  The methodology for using the decision criteria is explained in detail in this chapter.

- Chapter 5, “SystemView Series”

  The final chapter describes IBM′s SystemView Series initiative, and its likely effect on the process for choosing a platform for Network Operations Management.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *IBM Systems Management: Strategy and Direction* (available from MKTTOOLS as SMTECHWP TERS3820, or ask your IBM rep)

International Technical Support Organization Publications

- *Network Operations Management - Which Platform? The Practice*, SG24-5015

A complete list of International Technical Support Organization publications, known as redbooks, with a brief description of each, may be found in:

International Technical Support Organization Bibliography of Redbooks, GG24-3070.

To get a catalog of ITSO redbooks, VNET users may type:

```
TOOLS SENDTO WTSCPOK TOOLS REDBOOKS GET REDBOOKS CATALOG
```

A listing of all redbooks, sorted by category, may also be found on MKTTOOLS as ITSOCAT TXT. This package is updated monthly.

How to Order ITSO Technical Publications

IBM employees in the USA may order ITSO books and CD-ROMs using PUBORDER. Customers in the USA may order by calling 1-800-879-2755 or by faxing 1-800-445-9269. Most major credit cards are accepted. Outside the USA, customers should contact their local IBM office. For guidance on ordering, send a PROFS note to BOOKSHOP at DKIBMVM1 or E-mail to bookshop@dk.ibm.com.

Customers may order hardcopy ITSO books individually or in customized sets, called BOFs, which relate to specific functions of interest. IBM employees and customers may also order ITSO books in online format on CD-ROM collections, which contain books on a variety of products.

ITSO Redbooks on the World Wide Web (WWW)

Internet users may find information about redbooks on the ITSO World Wide Web home page. To access the ITSO Web pages, point your Web browser to the following URL:

```
http://www.redbooks.ibm.com/redbooks
```

IBM employees may access LIST3820s of redbooks as well. The internal Redbooks home page may be found at the following URL:

```
http://w3.itso.ibm.com/redbooks/redbooks.html
```

Subscribing to Internet Listserver

IBM redbook titles/abstracts are now available through Internet E-mail via the IBM Announcement Listserver. With an Internet E-mail address, anyone can subscribe to an IBM Announcement Listserver. All it takes is a few minutes to set up a profile, and you can get news (in ASCII format) from selected categories.

To initiate the service, send an E-mail note to:

```
announce@webster.ibmlink.ibm.com
```

with the keyword subscribe in the body of the note (leave the subject line blank). A category form and detailed instructions will be sent to you.

To obtain more details about this service, employees may type the following:

```
TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET LISTSERV PACKAGE
```

Note: INEWS users can select RelInfo from the action bar to execute this command automatically.

Acknowledgments

This project was designed and managed by:

Fergus Stewart
International Technical Support Organization, Raleigh Center

The authors of this document are:

Hugo Garcia
IBM Canada

Michael Haas
IBM Germany

Richard Mahony
IBM UK

Rita Steffes-Holländer
IBM Germany

This publication is the result of a residency conducted at the International Technical Support Organization, Raleigh Center.

Thanks to the following people for the invaluable advice and guidance provided in the production of this document:

Steve Breese
Shawn Walsh
Gail Wojton
International Technical Support Organization, Raleigh Center

Hiroshi Kanazashi
IBM Japan

Holly Tallon
IBM USA

Chapter 1. Introduction

The objective of this book is to provide a structured method, to enable you to select a platform which will be used to perform enterprise-wide Network Operations Management.

The section following this introduction explains who we think would benefit from using the book, the type of environment for which it is applicable, and what we mean by Network Operations Management. This should enable you to decide whether the content is likely to be of interest to you.

Feedback

If there are areas which this book does not cover, but which you would like to see covered, please use the feedback form, found at the front of the book to let us know.

When deciding which platform to choose as your management focal point it will be necessary to weigh the functions of products available on one platform, against those available on another. In an extreme case, the results of this analysis could change overnight, as new product announcements on one platform make it look more attractive than it had previously. This is an unavoidable consequence of the fast-changing IT environment.

This book discusses two ways in which the effects of this can be minimized.

- We define in a later section the decision criteria against which you should match the various candidate platforms.

  If you decide which of these criteria are the most important for your installation you should have some smoothing factor to iron out the impact of new announcements. Only announcements that affect the criteria you regard as the most important would represent grounds for re-thinking the platform decision.

- The rapid advance in product functions would not present a problem if all the platforms offered the same function. There would still be other factors that would make one platform more attractive than another, as a candidate for the focal point, hardware characteristics, availability of skills, and scalability, for example. But most of the things that can change at short notice would cease to be so crucial.

  IBM′s intention is to make the same set of functions available on all the candidate platforms, and this is explained in Chapter 5, “SystemView Series” on page 23.

1.1 Audience

This section will enable you decide whether this book will be of interest to you, and others in your organization.

1.1.1 Level

This document is intended for the people in an organization who will decide which platform should be used as a focal point, to manage the processes detailed in Appendix A, “The SystemView Disciplines” on page 29 across their enterprise. It is intended for use by the manager who wishes to make this choice, and by the technical architect who may advise on the decision.

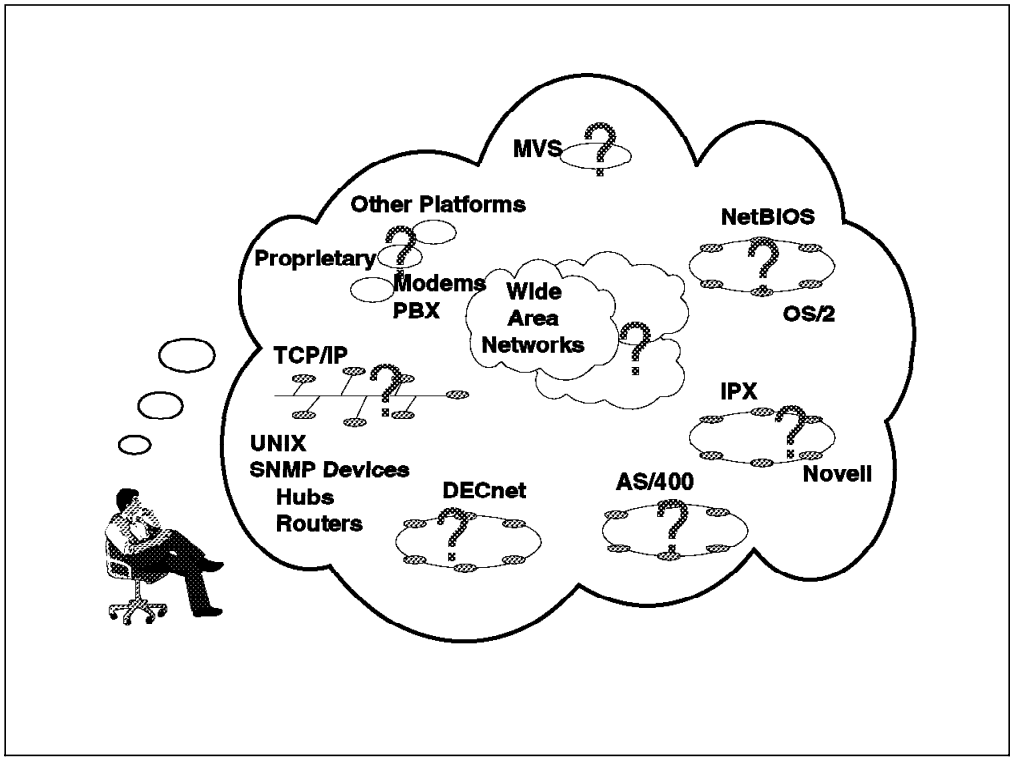


Figure 1. Which Platform Should Be Used as the Manager?

It should enable the manager to structure their consideration of which is the appropriate platform to use, and give them a feeling for how the relative strengths of the platforms compare, using a number of decision criteria.

It should help the technical architect understand how the various candidate focal point platforms match against these decision criteria, at a slightly greater level of technical detail.

This book does not address these issues at the level of implementation, it does not explain how to implement the processes which we have considered.

1.2 The Disciplines Which are Covered

The main focus of this book concerns the selection of a focal point platform for two functions:

- Monitoring the status of all the components required for the delivery of the service
- Being able to issue commands to those components

In SystemView terms, this addresses a major part of Operations Management and subsets of Configuration Management, Problem Management and

Performance Management. The relationship to the SystemView disciplines is shown in Appendix A, “The SystemView Disciplines” on page 29, but the scope is described in more narrative terms below.

We have focussed on monitoring and the ability to issue commands for the following two reasons:

- These are the logical processes with which to start. They provide a central view of the status of the components that make up the enterprise, and the ability to seek additional information, or to trigger some action at those components. This provides some control over a heterogeneous environment.
- The connectivity that is needed for enterprise-wide monitoring provides a basic infrastructure that can then be used by other processes.

We did not limit the discussion to one SystemView discipline, because the Systems Management processes are all closely related. Even if we tried to address only one SystemView process, there are inevitably elements of other processes that would have to be allowed for.

Our focus is on monitoring, and the issuing of commands, but certain elements of other processes also have to be considered. We have made a decision on which aspects of Configuration Management, Problem Management and Performance Management to consider. The aspects we have covered reflect what seems to be a sensible cutoff point in order to get an initial scope for enterprise-wide management that is practical, useful, and a suitable base for further exploitation.

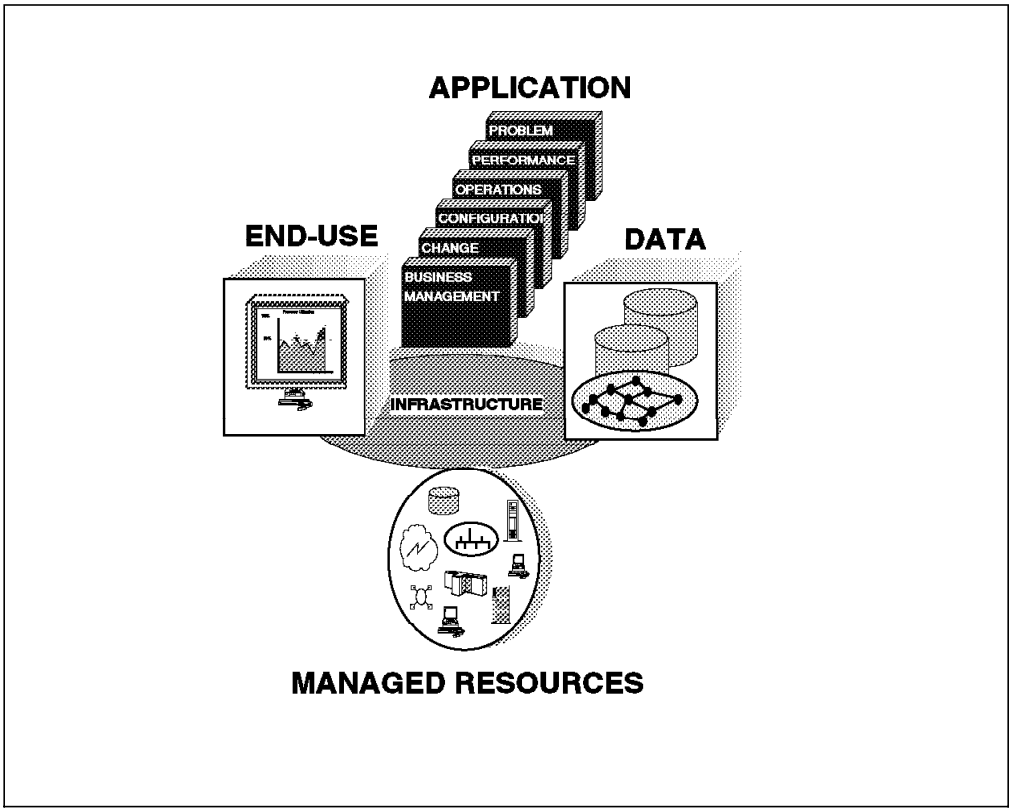


Figure 2. SystemView Processes and Dimensions

1.2.1 Knowing What Is to Be Monitored

We are assuming that the initial requirement is to have a central view, across the whole enterprise, of the status of all the components required for the delivery of an IT service to endusers. A component can only be monitored if some record represents it, an object, or some more traditional representation. The set of these records represents the topology of the enterprise. The ease of building these records on a given platform is one aspect of Configuration Management that we address.

The topology of the enterprise will change; components will be added, deleted, and moved. This clearly affects centralized monitoring, and a technique for dealing with this is the other aspect of Configuration Management which we consider.

1.2.2 Changes of Status

When a component changes status a record of some form will flow to the focal point. This is the record that will be used to update the status of the component, as it appears on the User Interface. If a record indicates a problem, it should also be used, ideally, to create or update a problem record. Raising such a problem record is clearly a part of Problem Management; we go no further into that process.

1.2.3 Taking Action

To complement centralized monitoring you must be able to issue commands from the focal point. Such commands could be triggered in many ways, three common examples are:

- Issue them manually
- Issue them in response to some event occurring on a component
- Issue them based on timers

We have included a consideration of the way in which commands can be issued from the various focal point platforms.

However, in order to make the scope of this book manageable, we have not considered the way in which such commands could be combined to achieve Systems Management functions.

To implement disaster recovery on a system component, from a focal point platform, it is necessary to issue some sequence of commands to functions that run on that component, or on some manager with responsibility for it. We have considered how commands, in general, could be sent from the focal point, but we have not considered how the commands would achieve the recovery. In particular, we have not considered which functions on the component, or on its manager, would need to be invoked, and we have not considered the sequence of commands that would be needed to invoke them.

1.2.4 Inadequate Performance

If all we monitored was whether a component was available, or not, we would get an incomplete view of the status of the service. A component shown as available could be unusable because its performance was inadequate. We have included within the scope of this document a slight extension into Performance

Management, so that status can reflect not just whether the component is up or down, but whether it is performing acceptably.

Other processes can also affect whether a component that is available, is actually usable. For example, a component might have a status of up but be unusable because of some security access problem. Our scope does not include these other processes. We have excluded them because we believe that they would make the discussion in the following sections unwieldy. We also believe that the subset we have used gives a scope that can be implemented manageably, as one project, and has the benefits that we explained above.

1.3 Processes Not Covered

This book will not cover the change management (software and data distribution) and business management (for example, security and budgeting) SystemView disciplines. For the other four SystemView disciplines, we will not cover the following aspects:

- Operations Management
  - Workload planning
  - Workload balancing
  - Recovery procedures
- Problem Management
  - Problem management record creation
  - Problem determination and analysis
  - Problem tracking until resolution
  - Problem impact analysis
  - Unresolved problem escalation
- Configuration Management
  - Configuration design (physical environment, network, hardware, software and logical grouping of resources)
  - Resources and attributes definition
  - Configuration database creation
  - Directory services
  - Configuration database access
  - Configuration information reports
- Performance Management
  - Capacity planning
  - Trend analysis
  - Service level forecasting
  - Correlation of performance information
  - Performance history and summary data
  - Performance tuning and balancing
  - Service attainment reports against plan

1.4 Assumptions

We assume you have already implemented the Systems Management processes covered in this book. They may have been implemented with a scope that extends across the enterprise, or built up from smaller scopes.

You may be monitoring SNA and TCP/IP environments separately, with the relevant operational consoles side by side, with one group responsible for both. Or you may have the same operational consoles separated from one another, with responsibility split between two or more groups. The discussion that follows in Chapter 3, “The Decision Criteria” on page 11 does not assume either of these divisions of responsibility. It *does* assume that the process is already defined and implemented in some way.

Managing enterprise-wide is a matter of process, organization and data, as well as product. To choose the right focal point platform you have to know the processes that you want to implement; we make no suggestions about what your monitoring process should consist of.

These processes may include selection of:

- Number of operators and consoles
- Time span of operating
- Depth and width of monitoring and/or control
- Degree of centralization (of responsibility, skill etc.)

We assume that, given the choice, your preference is to use management code written, tested and maintained by a third party, rather than developing your own code. We assume that this is true even if the bought-in code only fits, say, 80% of your requirements.

Chapter 2. IT Environments

This chapter discusses the different IT environments that we consider in this book. The degree of difficulty in selecting a management platform depends largely on the environment that needs to be managed. In general, the more complex the managed environment is, the more difficult it is to select a management platform.

2.1 Types of IT Environments

We distinguish the following three different IT environments:

- LAN Workgroup

  This environment comprises PCs connected by LANs, where the LAN supports a group of people (for example, in a department). The typical IT resources found in LAN workgroup environments are:

  - PC-based file servers (for example, Novell NetWare and IBM LAN Server)
  - PC desktops that access file server resources (for example DOS, Windows and OS/2)
  - LAN bridges and hubs

- Distributed

  This environment consists of multiple LANs connected to each other, to form a dispersed internetwork. The typical IT resources found in distributed environments are:

  - PC-based file servers
  - UNIX systems
  - Mid-range systems (for example, DEC and AS/400)
  - PC desktops
  - LAN bridges and hubs
  - Routers

- Centralized

  This environment consists of multiple LANs and WANs connected to a host, where the host acts as a centralized server and data repository. Centralized environments include the IT resources found in distributed environments plus:

  - Mainframe systems
  - Communication controllers (for example, the IBM 3745 controller)
  - Switches (for example, ATM switches)

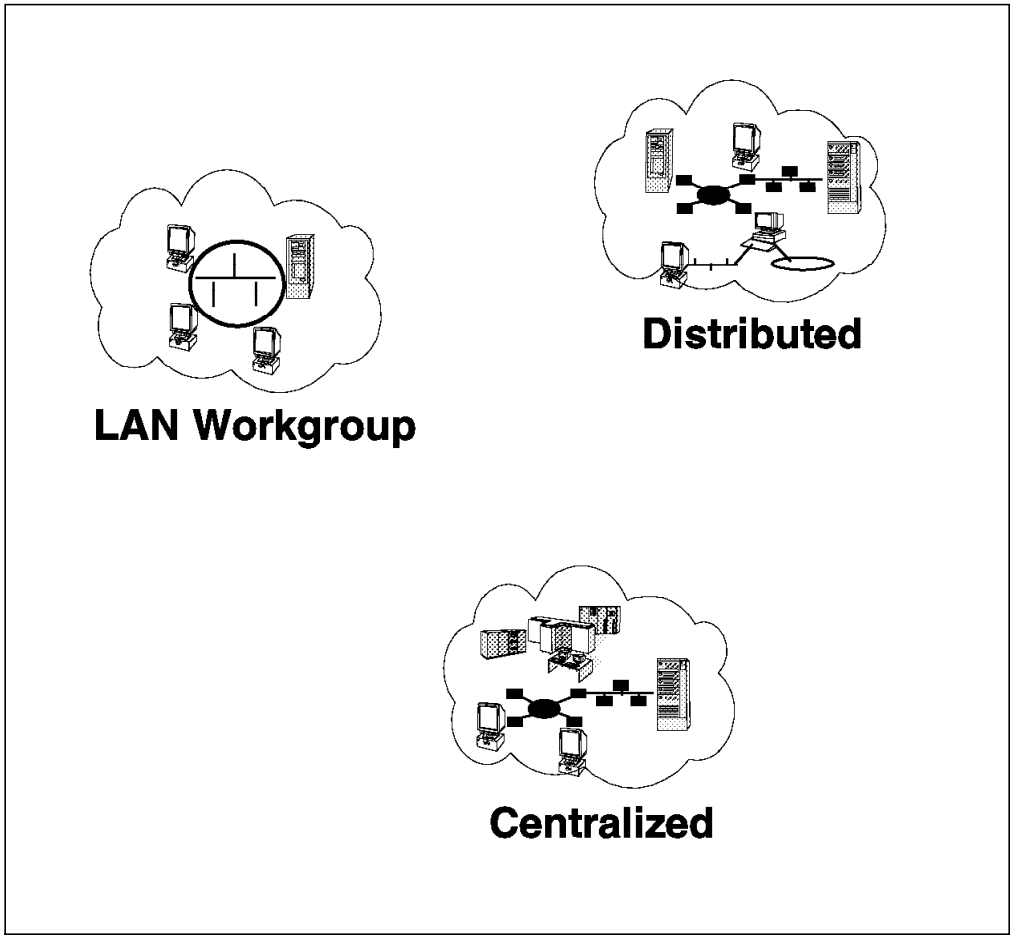


Figure 3. Categorization of IT Environments

2.2 Complexity in the Managed Environment

The methodology discussed in this book, which will enable you to select a management platform, becomes more important if your environment has one or more of the following characteristics:

- Multiple heterogeneous resources
  - IBM LAN Servers
  - Novell NetWare servers
  - OS/2 PCs
  - DOS/Windows PCs
  - UNIX systems from multiple vendors
  - Mid-range systems
  - Mainframe systems
- Wide variety of network devices
  - Hubs
  - Routers
  - Communication controllers

  - Switches
- Multiple network protocols
  - TCP/IP
  - SNA
  - IPX
  - NetBIOS
- Networks spanning large distances
- Large number of devices to be managed
- Client/Server applications

The above criteria indicate that customers with the following IT environments can benefit from this book:

- Growing LAN workgroup environment that has become more complex
- Distributed
- Centralized

The more homogeneous your IT environment is, the easier it is to choose a management platform. The more complex your IT environment is, the more relevant this book is to help you select an enterprise-wide management platform.

Chapter 3. The Decision Criteria

This chapter describes the criteria against which a given platform should be evaluated, when choosing a focal point platform. The order in which the criteria are presented here is not significant. To use these decision criteria, an organization will first need to assign priorities to the criteria, and these will vary from enterprise to enterprise. The procedure for assigning priorities is covered in Chapter 4, “The Method” on page 17.

3.1 The Criteria

The description of the decision criteria below is not intended to be comprehensive, but will provide a good working basis.

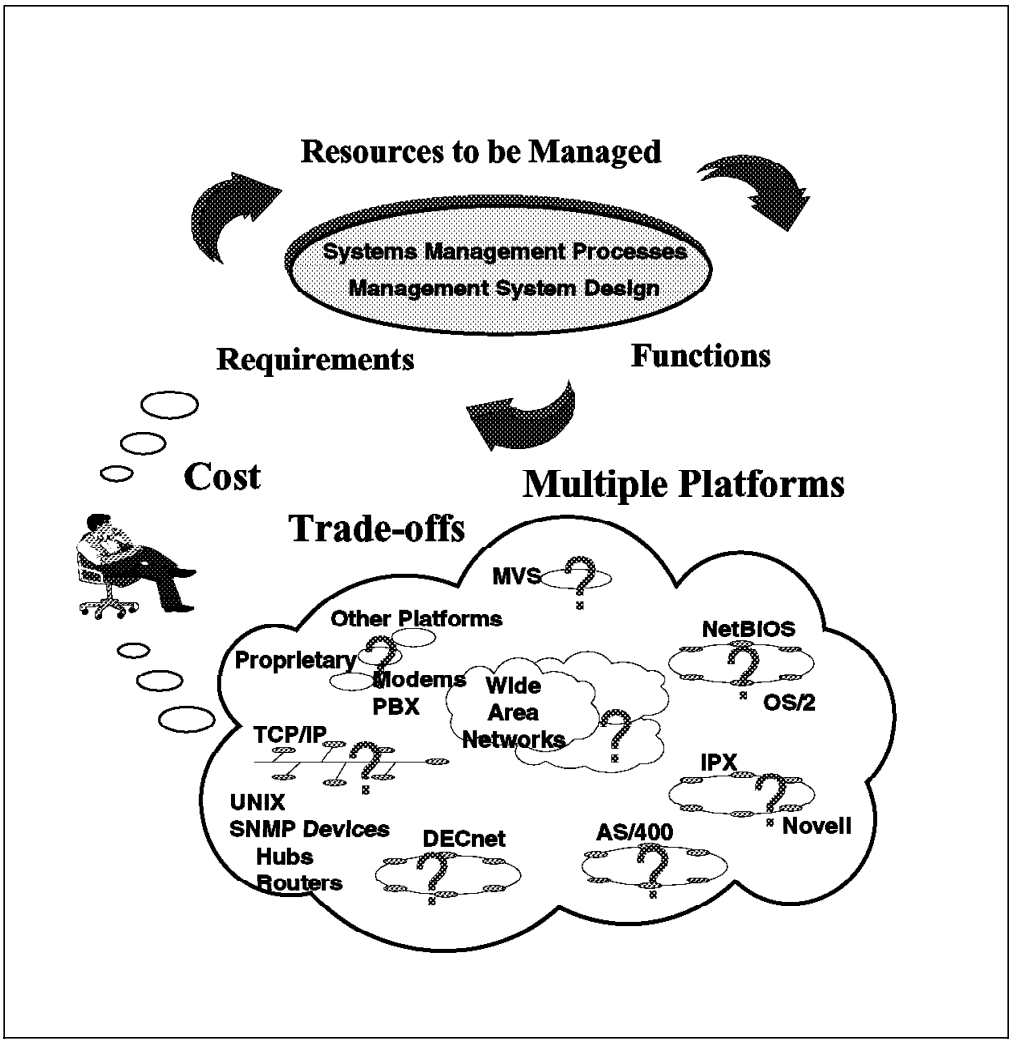


Figure 4. Decision Criteria Need to Be Applied to the Environment

3.1.1 Costs

- Skills
  - Startup

    This is the cost of the skills needed to set up the management platform, including both internal staff and external resources (hired temporarily for the initial setup). If the enterprise does not currently use a given platform, the startup skills cost for that platform will be relatively high (compared to a platform that is already being used by the organization).
  - Ongoing

    This is the cost of the skills needed to run and maintain the management platform, both internal staff and external resources hired on a permanent basis.
  - Availability in the marketplace

    This is the cost of hiring and retaining the skills needed to run the management platform. The more abundant the skills are in the market, the lower this cost will be.
  - Education

    This education cost depends on the match of the platform's required skills to the organization's existing skills. This cost is lower if the skills match is good (less education required).
- Software
  - Startup

    This is the cost of the software needed to set up the desired platform as the focal point manager.
  - Ongoing

    This is the cost of the software upgrades needed to maintain the enterprise management platform.
- Hardware
  - Startup

    This is the cost of the hardware needed to set up the desired platform as the focal point manager.
  - Ongoing

    This is the cost of the hardware upgrades needed to continue to run the enterprise management platform as the demands on the platform grow.
- Other Costs
  - Any other costs which are relevant to the management platform decision:
    - Migration from an existing platform
    - Development of in-house applications, for required functions
    - Environmental setup (raised floor, power, etc.)

3.1.2 Investment Protection

The key considerations for this criterion are:

- Is the management platform ″strategic″?
- Is it possible to grow with this management platform?
- What are the migration paths to this platform, and from this platform to other platforms?

3.1.3 Integration with Other Processes/Applications

- Degree of integration provided by the management platform between the core processes considered in this book and other system management processes (change, problem). One example is the ability to provide information about problems to feed the problem management process.
- Interfaces and user exits provided by the management platform to enable the integration of applications that handle different system management processes.

3.1.4 Scalability

This is the ability of the platform to increase capacity to handle a larger number of homogeneous nodes. Ideally a management platform should be able to support larger networks by simply upgrading its hardware resources (adding more memory, upgrading the CPU).

3.1.5 Existence of Third-Party Applications

This refers to the availability of applications written by other vendors that run on the management platform (for example, the NetView Association).

3.1.6 Reliability/Availability/Serviceability (RAS)

- Reliability depends on the stability of the environment provided by the operating system and the applications running on it. Another factor that contributes to better reliability is the degree to which the operating system enforces a structured way to apply changes to the platform.
- Availability is the provision of functions to keep the system and its applications running, when there are problems. One example is hot backup of the manager (by parallelism, function backup, hot backup of operating system, etc.). Another example is data backup and recovery.
- Serviceability refers to how easy it is to apply maintenance to the system and keep track of software and hardware changes.

3.1.7 Function

The following management platform functions should be evaluated:

- Breadth

  Breadth is the variety of resources that can be managed. In other words, it is the variety of different types of nodes that the management platform can discover and monitor.

- Depth

  Depth refers to the extent of the management capabilities. Some examples that illustrate the depth of functions of the management platform are:

  - Depth of status monitoring (to what extent can a given resource be monitored - up/down status only versus advanced monitoring of system hardware and software components).
  - Depth of actions that can be taken for managed resources (restart, query configuration, modify configuration, run commands, etc.).
- Cooperation with other managers
  - Interoperability between similar managers (on the same platform) to distribute workload between them.
  - Interoperability between managers running on different platforms, where one manager is the focal point platform and the other is the intermediate manager that handles resources that are not natively supported by the focal point manager. In this sense the intermediate manager function is sometimes referred to as the mid-level manager or as the proxy agent.

    Note: See Appendix B, “Managing Systems Concepts” on page 35 for definitions of intermediate manager, proxy agents, and other terms used.
- Automation
  - Automation of actions in response to events and alerts/traps.
  - Scheduling of actions (timer-driven events).
  - Command line interface to invoke functions from automation routines (for example, REXX procedures, shell scripts).
- Multi-User Support
  - The ability of the platform to support a number of operators.
- Exception Monitoring
  - Ability to monitor thresholds and generate alerts for exceptions.
  - Ability to dynamically present exception conditions to operators in multiple ways (console messages, pager messages, graphical user interface).
- Ease of Extensibility
  - How easy it is to extend the functions of the management platform (application building tools).
- Scope of Extensibility
  - APIs for development of applications
  - Application development toolkits
  - User exits
  - Common repository of management data to be shared by applications
  - Command line interface
- Logging Facilities
  - The ability of the platform to log events and activities for auditability and reporting purposes.
- Protocol Support
  - Network protocols (for example, SNA, TCP/IP, IPX, NetBIOS)
  - System management protocols (for example, SNMP, CMIP, SNA MSU)

3.1.8 Graphical User Interface (GUI)

This criterion considers the following features of the management platform's graphical user interface:

- Ease of navigation
- Ease of application launching
- Desktop structure
- Ease of customization of different network views
- Presentation of exceptions
- Monitoring of network subsets
- Shielding from the nature of the managed resources (so that the operator does not need to be an expert on the devices being managed)
- Use of the same user interface for all applications
- Online help and manuals

3.1.9 Handling Complexity

This refers to the ability of the platform to support a complex environment. This criterion is defined as the ability to:

- Support a variety of:
  - Networking protocols
  - Networking devices
  - Operating systems
- Cope with geographical distribution of nodes.
- Offer agents with systems management functions that are adequate for the degree of distribution of intelligence (client/server environments have intelligence distributed to the client systems).
- Handle the rate of change in network topology (nodes being added and removed). This refers to how well the management platform dynamically updates the network status to reflect topology changes.

3.1.10 Security

This is the capability of the platform to control access to management functions in different ways:

- By person (user ID privileges)
- By machine (run functions only from selected machines)
- Scope of commands (limit what commands can be run)
- Span of control (limit what resources can be managed)

3.1.11 Compliance to Open Standards

There are multiple open systems standards that are relevant for a management platform. An organization should decide which ones are important.

- Frameworks:
  - OSF's DME (Open Software Foundation Distributed Management Environment)

  - SystemView
  - Desktop Management Task Force (DMTF) specifications
  - NMF's (Network Management Forum) OMNIpoint specification
- User interfaces:
  - X-Windows
  - Motif
- Relational databases:
  - SQL (Structured Query Language)
- Object technology:
  - OMG's CORBA (Object Management Group Common Object Request Broker Architecture)
- APIs:
  - Carnegie-Mellon's SNMP APIs
  - X/Open XMP API
  - DMTF's DMI (Distributed Management Interface)

3.1.12 National Language Support

Support for your local language.

Chapter 4. The Method

The criteria that we believe you should consider in choosing a focal point platform for enterprise-wide management are defined in Chapter 3, “The Decision Criteria” on page 11. This section describes the method that we recommend you should use with those criteria.

To use the method you will need to refer to *Network Operations Management - Which Platform? The Practice*, SG24-5015. It includes an assessment of how the various candidate platforms relate to the criteria, and it gives some examples. The examples show how the method can be applied to various IT environments; their characteristics are taken from real organizations.

The reason for including these assessments and examples in another book is that they depend on factors that will change. As explained in Chapter 1, “Introduction” on page 1, product announcements can change the strength of a platform as focal point manager from one day to the next, so the currency of the content of *Network Operations Management - Which Platform? The Practice*, SG24-5015 is certain to change. The criteria and the method suggested here should be valid over a longer period, as they are independent of product functions.

Network Operations Management - Which Platform? The Practice, SG24-5015 may be updated in the future to reflect changes in the function of the platforms and management applications. If we find from further experience that some refinement of this method is desirable, we shall update this book.

4.1 What Will the Method Do?

There is no right or wrong choice of focal point platform that will be valid for your environment and for all other environments. This may seem an obvious statement but it is very important. A particular platform is right for you because it fits your environment and your priorities, not because there is a general rule which says ″The right platform to use is X″. In the same way there can be no method that will tell you, ″You should use X″. Any method that did that would be mechanical, and inadequate for reflecting what is unique about your particular requirements.

What our method **can** do, is help you to structure your consideration of which factors are most important to you, and to assess how well the candidate platforms match your requirements.

This method may not tell you ″You should use X″, but it should lead you to understand ″I should use X, because .....″.

4.2 Preliminary Steps

There are three very important preliminary steps. They may seem obvious, but in our experience they are not always considered.

1. Decide whether you need to manage on an enterprise-wide basis.

   There are certainly products available, which will allow you to manage in this way. Indeed, there is a choice of products to enable you to do this; that

is why there is a need for this book. But just because the products now make this possible does not mean that you have to do it. We believe that many customer installations will continue to divide management function across two or more platforms, and will meet their objectives perfectly adequately.

We believe that many customers will continue to have LANs managed by one team, and wide area networks managed by another. There are several possible reasons for operating in this way.

For example, in a large IT environment, with many devices and many exception conditions to be handled, there might be too much activity for one operator to manage. This need not be an issue of product function. The product might present the status information very clearly, and give powerful support to help the operator, but the number of cases to be handled might be more than a single operator can deal with.

Alternatively, there might be organizational reasons. If several groups are involved today with managing the various parts of the IT service, which one will have responsibility for operating the new focal point? How will the other, various responsibilities be re-assigned? Will the groups be merged? There is no reason to take on the work of tackling these issues just because there are products which offer you enterprise-wide management options. In short, we recommend that you move to enterprise-wide management only if you have a business requirement to do so.

2. Make a realistic assessment of your existing processes.

   There is no aspect of network management or systems management where the introduction of a product, on its own, will solve a problem for you. If you feel pain today from problems caused by the monitoring of your services it may be due to problems in your existing systems management processes. We have explained in 1.4, “Assumptions” on page 6 that we are assuming installations will have systems management processes in place before they use the technique described in this book. You would do better to concentrate first on your systems management processes if you have none today, or if they need revision.

   For example, in some environments it is the case that losses of availability in a service are due to problems in the definition of responsibilities. The user may experience the loss of a service that depends on functions manned by two parts of an organization. If the user′s problem occurs at the point where the responsibilities of the two groups meet it may be that neither group sees a problem in their sphere. Or it may be that the user′s problem is of a type for which neither group has responsibility.

   In such a case the problem could be addressed by re-defining the responsibilities of the groups. More generally, if there are problems in your existing processes, then implementing the products to provide enterprise-wide management will not, on its own, solve them.

3. Decide which platforms are the candidates for you to use as your enterprise-wide management focal point.

   In our experience there are normally two, sometimes three, candidate focal point management platforms in any given customer enterprise. This selection is normally based on the major platforms that are already in use, and the skills that are therefore available in your staff, for operation and support.

If you are in doubt about which platforms are the best candidates for you, read the sections in *Network Operations Management - Which Platform? The Practice*, SG24-5015 that discuss the various platforms and how they support enterprise-wide management.

4.3 Using the Criteria

Once you have considered the points above, we suggest that you use the criteria as shown below. We recommend very strongly that you formally document each step of the process. You may well need to iterate some of the steps of the process: you will find this harder to do, effectively, if you have not kept a note of the reasons for your decisions. This sounds obvious but all too often it is forgotten.

1. Consider the criteria in Chapter 3, “The Decision Criteria” on page 11 and weight them, according to their importance for your environment.

   We have provided a blank table in *Network Operations Management - Which Platform? The Practice*, SG24-5015 which can be used to record your weighting.

   In our experience there is a frequent tendency for someone faced with this task to say ″All these criteria are vital″. We agree that all of them may be very important, but deciding whether the criteria are vital is not the task. What needs to be done is to assess which are the most important in your environment.

   To force this weighting, we suggest that you allocate weights to the criteria which add up to 100, and we suggest that you allocate a weight of at least fifteen to at least three of the criteria. This ensures that 45% of the available weight goes to three criteria, and leaves 55% to be shared among the other 10. Do not assign a weight of less than five to any one of the criteria, unless you want to rate it as zero.

   Remember when you use the criteria, that the expansion we have shown for each criterion in Chapter 3, “The Decision Criteria” on page 11 is for illustration, and is not meant to list *all* aspects of that criterion. We strongly recommend that you expand the definitions of the criteria, to make clearer aspects that are of particular importance to your installation. For example, if you think there is a crucial standard that is not made explicit in our list shown under Compliance to Open Standards, then include it.

   Note that, in our experience, very different weights are decided for these criteria depending on whether someone with a business, or technical role assigns them. Neither the one, nor the other, is right. It depends on your priorities. A valid choice of focal point platform could be made with a selection of weights biased towards technical issues, and an equally valid choice could be made with criteria biased towards business issues. You need to ensure that the weights you assign reflect the balance of business and technical judgements that you feel are appropriate for your enterprise. We recommend that you involve people with technical and business viewpoints in the process of assigning the weights.

2. Review the assessments of the candidate platforms contained in *Network Operations Management - Which Platform? The Practice*, SG24-5015.

   The descriptions in that book explain how the various platforms match against the criteria. They are written in terms of function, not in terms of relative merit. They cannot be written in terms of relative merit, as any

function is only better than another, when measured against some objective, and the objective is specific to a given environment.

3. For each criterion rate each candidate platform on a relative scale of one to three.

   A platform scores three on this scale if it is the best fit with your requirements. If the alternative platform is not a good match it scores two. If it is a significantly poorer fit with your requirements, it scores one.

   Remember that this is a relative measure, not an absolute one. It could be that both platforms have considerable function addressing your requirements. A value of 1 is not an indication of total lack of a function, and a value of 3 does not say that the platform is a perfect match with your requirements. The reason for using a scale from 1 to 3 is explained below.

   If platform X has significantly more function than platform Y, and it is function that you need, then score them as three and two. If the difference between them is really significant, in terms of function that you need, then score them as three and one.

   The overall rating for each criterion goes on the form, alongside the weights already filled in. As some of the criteria have a number of aspects we have provided blank forms in *Network Operations Management - Which Platform? The Practice*, SG24-5015 for carrying out this analysis at a greater level of detail. There is an additional form in that book, for each of the Cost, RAS, Function and GUI criteria.

   The reason we have used a scale of one to three is that a larger scale gives an unrealistic impression of precision. It is valid, and relatively easy to decide, that platform X and platform Y meet your minimum requirements, but that X has advantages, for you, over Y. It is much more difficult on a scale of, say, one to ten, to say that X scores eight and Y scores six. A scale larger than the one to three that we recommend may tempt you to make distinctions between the various options that are more subtle than the method can deliver.

   With a larger scale you will also find it harder to remember that you are assessing relative levels of support. Scoring a platform as three does not say it is perfect for your requirements; it only says that it has the best fit, for the criterion under consideration, of the platforms you are considering.

   If you decide that platform X addresses some criteria better than platform Y do not worry whether you score it three points for X and two for Y, or two for X and one for Y. It will not make any difference. In one of the next steps you will be multiplying the score by the weighting you have decided for this criterion. The effect on the final score will be the same whether you score it three-two or two-one.

   You should, however, be consistent. It can affect the outcome if you use three-two for some criteria and two-one for others. Our recommendation is that you score it three-two.

   It is particularly difficult to remember that 3 means best available fit with the requirements when considering the cost criterion. Somehow, it seems unnatural to say that the more attractive, lower cost, option scores three, whereas a more expensive one scores two, or even one. It may be hard to remember, but that is the way the method works. The score assigned here will be multiplied by the weighting you have defined, and the best choice

drawn out by the method will be the one that scores the highest number of points overall; therefore three *is* a better score for Cost!

4. Round the values in the subsidiary tables and transfer them to the main table.

   The values which you may have calculated in the detailed subsidiary tables for cost, GUI or function are averages. They will, therefore, probably not be whole numbers. There is obviously more than one way to transfer this value to the main table, if the average is not a whole number. The options are:

   a. Transfer the number including any numbers after the decimal point, in which case 2.5 is transferred as 2.5
   b. Truncate the number, in which case 2.5 is transferred as 2
   c. Round the number, in which case 2.5 is transferred as 3

   We used the third of these options. We do not use the first option as we feel that keeping the decimal point in the process introduces a false feeling of precision. As explained above, this process is intended to identify the *relative* match with your requirements of two or more platforms, not to give an absolute measure of how good they are. For example, if the AIX platform scores 2.8 for the Function criterion and OS/2 scores 2.6, it is not clear what a .2 difference between them means. It seems a narrower difference than the method can really distinguish. We would carry them both forward to the main table as three.

   We use the third option rather than the second only because it is a more common way of handling statistics.

5. Multiply the weights by the scores.

   Work through the table, multiplying the weights by the one to three values you have just assigned.

6. Total the values in the main table.

   Total the results obtained from the last step. The platform that scores the higher total is the one that most closely meets your requirements. Sometimes, however, there may be no significant difference between the scores. That case is considered next.

What to do if there is no clear result from the table:

1. Think again about the weights.

   It may be worth thinking again about the weight that has been given to the various criteria. This is particularly worth doing if the weights reflect the views of only one part of the organization. As explained above, the method works best if the criteria reflect a balanced view of all your requirements, technical and business.

   If you only change the weights there is no other work to re-do; the 1 to 3 scores will not be affected.

2. Try weighting the different aspects of the function criteria.

   The Function criterion has many aspects. It may be worth giving some weighting to each of the aspects of which it is composed - Breadth, Depth, Cooperation with other managers, etc.. If you do this we suggest you use a technique like that used above. In other words, choose weights that add up to 100, with a weight of at least 15 given to at least 3 aspects of the criterion.

This may change the 1 to 3 score of the function criterion. It is obviously only worth doing if you have given the function category a relatively high weight.

3. Reconsider the 1 to 3 scores against one or more of the criteria.

   There may be several reasons to do this. For example, you may consult some other part of your organization which is involved in the categories to which you have given a high weighting.

   If you have not already done so, you might ask the operators about the problems they have. They will have views on issues such as the following:

   - Which parts of the IT environment generate the most activity for them.
   - Which parts of the IT environment are the most unstable.
   - Which parts are the hardest to manage.

   For example, if they say that protocol X generates the most work for them, whereas protocol Y rarely requires attention, then you might re-work your 1 to 3 scores for some of the criteria, to reflect this. You might give a higher score to the platform that is better at managing protocol X.

   Alternatively, you might re-work a section in more detail. For example, you might analyze the cost category in greater detail, even if this means doing design level work for your candidate platforms.

4.4 What to Do Next?

The method leads you to identify the platform that best meets your requirements, but it does not produce a design for you. There are some issues associated with setting up a working, practical solution that the method cannot address. For example:

- It does not address the process and organization issues mentioned above.
- It does not consider such detailed technical issues as performance.

  For some functions it may be that a design based on one platform may have performance issues that need consideration. This factor will become more and more important in the future.

Over the coming months and years it is certain that there will be increased flexibility available for you to design how you want to run your management functions. Among other options it will be possible to run functions with the user interface running as a client on one platform, and the associated application running as a server on another platform. These options have already begun to be available, and can provide vital functions. But where functions are split in this way, the performance and availability issues clearly need closer attention than for solutions where all the function runs on a single platform.

In more complex cases, where volumes are high, design work will be needed to assess these performance and availability issues of the proposed design. There might be two options, one built on two platforms, and one built completely on one platform. More detailed analysis might show that the performance or availability issues of the design built on two platforms outweigh its benefits over the simpler design. The general method in this book cannot replace the need for such detailed design work, in complex environments.

Chapter 5. SystemView Series

This section contains some of the material from the IBM white paper called *IBM Systems Management: Strategy and Direction*. That document provides details on IBM′s systems management technical direction which establishes a set of goals, based on underlying technologies defined by the Object Management Group′s Common Object Request Broker Architecture (such as the System Object Model) and others under development. We have extracted the sections which we feel are most relevant for the issues associated with choosing a management platform. Please refer to that document, if you need more information.

Over time, current IBM products are evolving into a single systems management solution, called IBM SystemView Series, with scalable function for key managing and managed platforms. SystemView Series will enable integrated, task-oriented systems management function and will include:

- Comprehensive application coverage (selectable by customer)
- Integration (achieved through common technology)
  - On the graphical user interface
  - Among applications
  - Through shared objects for managed resources and application services
- Common instrumentation for agents
- Shared infrastructure across operating environments

5.1 Object-Oriented Approach

Future functions and services of SystemView Series will be developed using object-oriented technology. Object-oriented technology is well suited to systems management applications because object-oriented programming allows better modelling of the real world. Using an object-oriented approach, systems management application developers can use managed resource objects to closely match the features and characteristics of data-processing hardware and software resources that are to be managed. Modelling of application function as objects allows that function to be accessed and used by multiple applications allowing applications to be more tightly integrated and automated. Duplication of functions can also be avoided.

The technical approach to this will consist of:

- Standards-based, object-oriented infrastructure
- Application enabling framework
- Common definition for managed resources and services
- Integrated systems management applications running on these frameworks
- Support for common agent services

This approach is described in the following sections.

5.2 Provide Standards-Based, Object-Oriented Infrastructure

The key to delivering integrated systems management is a shared infrastructure across operating environments. The infrastructure that IBM is working with is System Object Model (SOM). SOM provides an object-oriented environment that is based on an implementation of the Object Management Group′s (OMG) Common Object Request Broker Architecture (CORBA). A future version of SOM will implement Version 2 of OMG CORBA; OMG CORBA V2 will provide interoperability so that applications that are developed in this environment will run across IBM′s platforms and on non-IBM OMG CORBA compliant platforms.

In terms of systems management, SOM is a powerful technology because it can provide applications with client/server support independent of the transport protocol being used or server location. An object-oriented infrastructure, like SOM, decouples common management services from the platform so that a management application can be written once, and run across many key platforms. Use of SOM provides a scalable solution, since management applications can now be spread throughout a distributed system. The SOM infrastructure and common management services are illustrated in Figure 5.

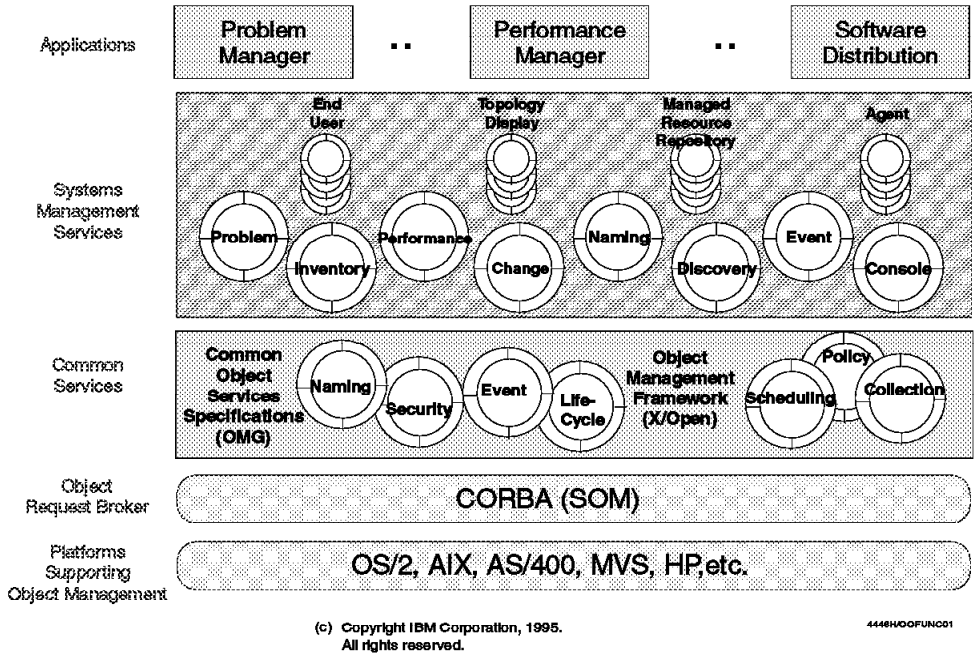


Figure 5. OO Functions and Services

Common systems management services will consist of OMG Common Object Services Standards (COSS), such as:

- Life-cycle, which provides for the creation, maintenance and deletion of managed objects
- Event management, which supports the generation and reliable delivery of event notifications
- Naming, which provides the ability to bind a unique name to an object

- Security, which will be an expansion of the DCE (Distributed Computing Environment) security service

Other common systems management services are also available and have been submitted to the X/OPEN standards group for management in an OMG CORBA environment. Among these are services for:

- Applying policy to managed objects
- Tracking instances of managed objects
- Providing support for the collections or groupings of objects
- Scheduling events for managed objects

Since these common management services will be based on industry standards, they are expected to be available from many vendors, including IBM.

5.3 Provide Integrated Systems Management Applications Running on These Frameworks

In addition to these systems management services, IBM will provide a complete set of integrated applications, consisting of task-oriented functions. The user interface will focus on the tasks and processes that the enduser performs, so that over time the user need not be aware of the products that are involved. Customers will be able to tailor this interface and select functions based on the tasks that they need to perform (such as a subset of problem, change, and configuration management or performance reporting).

Application functions will cover the full range of required systems management functions and will include:

- Business: security, financial, and asset management
- Change: control, software distribution, and license management
- Configuration: inventory, data/object modelling, and resource discovery
- Operations: job scheduling, print management, console operations, storage and data management, monitoring and controlling of workload resources and the physical network
- Performance: monitoring, diagnosis, reporting, and capacity planning
- Problem: identification, reporting, tracking, determination, resolution, and help desk services

While IBM has chosen to define systems management functions in this manner, these definitions can be mapped to customers′ systems management definitions or business models, including the telecommunication industry definitions of fault, configuration, accounting, performance, and security disciplines.

The goal of the SystemView Series user interface is to provide an integrated, easy-to-use, flexible, and customizable platform that gives all users access to systems management tasks through a common and consistent visual and interactive model that minimizes training requirements and maximizes users′ productivity. The user interface will be based on a workflow user model, the who, what, where, why, and how of systems management. The who is the person responsible for the task. The what is the activity or task to be performed. The when is a policy-based decision and can be scheduled or immediate. The

where is the target of the operation and may request a physical or logical location. The why is an event; the events may occur at a person's request or as an interruption to normal operations. The how is the work flow, the natural process for activities to be documented and performed. An example of this future interface is shown in Figure 6.

Figure 6 shows four windows. The upper left window displays the systems management tasks. When one of these tasks is started, the Activities sub-window will display the activities or data associated with that task. A network topology is shown in the upper right window. The lower right is a display of events of the managed resources in the topology, and the lower left is the work flow task. The intent of the work flow window is that the user can define work flow policies, display a work flow sequence that is in process of executing, and start a work flow task.

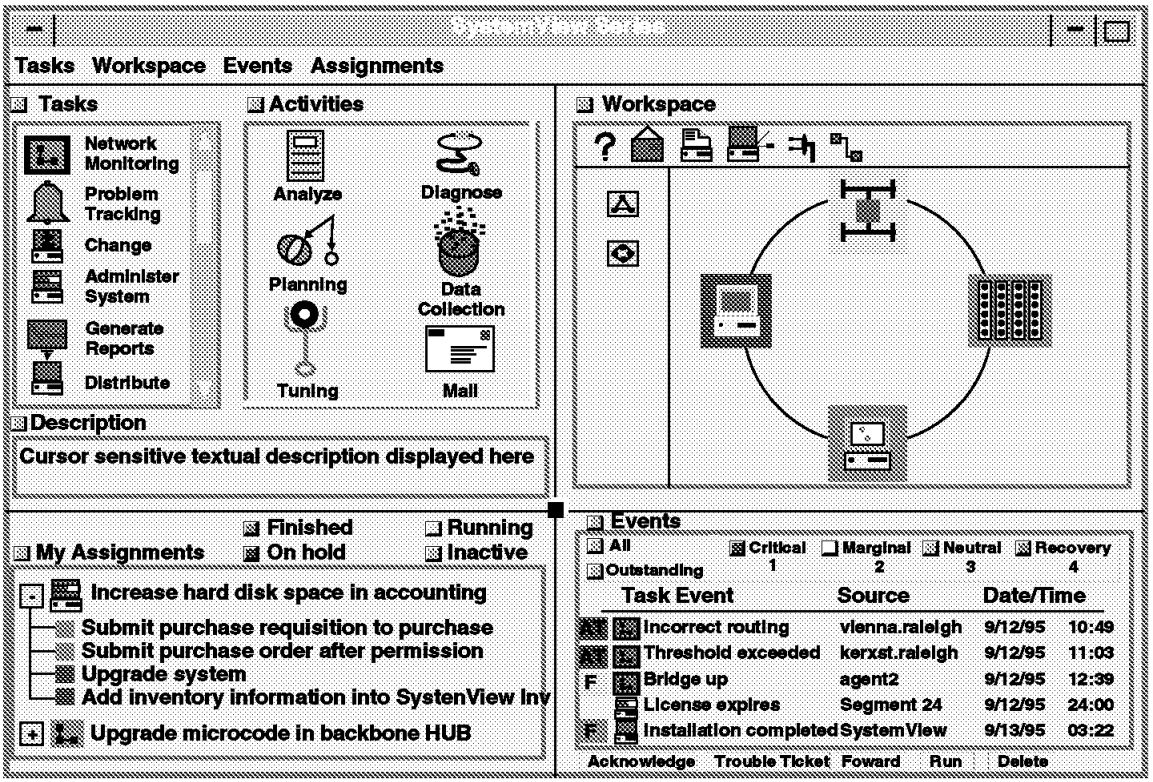


Figure 6. End User Interface

5.4 Support of Current Applications

IBM, customers, and other vendors today have extensive investments in current systems management applications. IBM will protect that investment in a number of ways:

- By continuing to support current applications. For example, IBM currently offers a broad set of management, automation, and security applications on MVS. Over time the underlying technology in these products will become part of SystemView for MVS.

- By delivering encapsulation services, which provide object interfaces to selected procedural functions. This allows object-oriented applications to access systems management applications that were implemented using procedural APIs.

  An example of encapsulation is to take the functions currently available in the Information/Management product (current procedural APIs) and make them available in the SOM/CORBA environment. Applications running on other platforms (like AIX, OS/2, HP) could then work with these functions as if they were local objects services.

- Providing migration tools so that current customer and vendor applications can operate in this new environment.

5.5 Relationship to Open Standards

IBM will use existing standards, where they exist, instead of inventing our own. IBM is working with standards groups like OMG, DMTF, and X/Open, as well as industry groups like Portable Operating System Interface for Computer Environments (POSIX), Internet Engineering Task Force (IETF), Service Providers Integration Requirements for Information Technology (SPIRIT), International Telecommunications Union (ITU), Open Systems Interconnection/International Organization for Standards (OSI/ISO), Telecommunications Intelligent Network Architecture (TINA) and Network Management Forum′s (NMF′s) OMNIPoint.

In addition, IBM will provide submissions for standards (like APIs, protocols, and data models), to the appropriate standards bodies. IBM and Tivoli have already submitted standards for policy, scheduling, collection, and event management to the Object Management Framework of X/Open.

5.6 SystemView Series and Management Platform Selection

As was explained above, the previous material in this chapter was taken for the IBM white paper called *IBM Systems Management: Strategy and Direction*. We would like to stress three points, in addition to the material from that source. These concern how management function can be divided between platforms. These points are:

- In general, we do not assume that you will want to manage every process for your service from the same platform. You may well want to monitor your service, enterprise-wide, from one platform, but manage, say, security, or change management, from another. One of the objectives of the SystemView Series is to provide the same set of function on all platforms, so that you can choose the right platform from which to manage each process.

- In order to manage your various processes enterprise-wide you will need to make use of intermediate managers. The reasons for this are explained in Appendix B, “Managing Systems Concepts” on page 35. The increased integration that SystemView Series will provide will help the management functions at the focal point and on the intermediate manager to work together more closely.

- There are really three platform choices that you need to consider when deciding how you want to manage your enterprise.

  – The focal point platform.

- The intermediate manager platform that is controlling each domain of your environment.
- The platform on which your operator's user interface is located.

The design of SystemView Series, with its use of SOM and DSOM, will make it easier to divide these functions across platforms, and make it easier to support the combination of platforms that you want to use.

Appendix A. The SystemView Disciplines

The scope of this book has been limited to Network Operations Management. This means that some parts of a number of the SystemView disciplines are covered. Here we have produced a complete list of the SystemView disciplines, and ***highlighted*** those we included in the scope.

A.1 Operations Management

This discipline covers the functions required to keep an operational environment working.

A.1.1 Workload Planning

- Definition of workload - when and on what type of system where batch, interactive and other work will be performed
- Definition of timed events
- Definition of systems and resources eligible for work
- Facilities to assist in workload balancing
- Simulation of anticipated workload to assist in planning
- Facilities to assist in workload plan loop analysis
- Analysis of workload results and adjusting of workload requirements as a result
- Reports providing analysis of workload plans, and results of execution

A.1.2 Operations Planning

- Relating of workload planning to service levels desired
- Assignment of workload to systems
- Definition of recovery procedures
- Definition of monitoring criteria (***Setting of monitoring variable***)

A.1.2.1 Workload Control

- Scheduling workload - submission of defined work on one or more systems on a timed or recurring basis
- Distribution of the work among eligible systems based on current load and other such status indicators
- ***Monitoring of system*** workload ***status*** relative to schedule
- Generation of alerts on pre-defined exception conditions - for example, late work
- ***Heartbeats provided to signal status of managed systems at specified interval***
- ***Signaling of an alert situation through*** paging or ***escalation mechanism***
- Analysis and adjusting of work in managed systems (recovery)

A.1.3 Operations Control

- ***Continuous monitoring of managed systems and resources***
- Remotely executing a program or procedure at a managed system
- ***View console output of a managed system*** or redirect console output to managing system
- Control managed systems keyboard from managing system
- ***View managed systems display from managing system***
- ***Start/Shutdown all functions in a managed system directly or on a timed basis***

A.2 Problem Management

This discipline covers the functions used to report and track problems.

A.2.1 Problem Policy and Process Definition

- Define Authority
  - Define access to data
  - Define physical access to facilities
  - Entitlement
- Establish Rules and Guidelines
  - Notifications
- Define and Implement Problem Management Process
  - Define problem management process
  - Implement problem management process model
- Define Roles and Responsibilities
  - Identify human resource requirements
  - Build job description
  - Define responsibility for automation
  - Escalation
  - Define filters, sieves and thresholds

A.2.2 Problem Recognition

- ***Detection***
  - Recognize a potential problem.
  - Log events and errors.
  - Record additional data associated with potential problems.
- ***Filtering***
  - Check for duplicate problems
  - Correlate events and errors
  - Priority analysis
  - Severity analysis

- Validate the contents/completeness of the record
- Create/open a problem management record

A.2.3 Problem Determination

- Problem Analysis
  - Search closed problem management records for similar problems
  - Search problem management database (open problems) for duplicate
  - Analyze all available data
  - Gather available data not part of the problem management record
  - Solution identification
- Communication
  - Assign problem owner
  - Notify potential affected parties

A.2.3.1 Problem Resolution

- Recover through retry
- Recover through bypass
- Restoration of service
- Restoration of resource
  - Apply solution
- Verify fix corrected the problem
  - Verify, that service is restored
  - Verify, that resource has been repaired
  - Undo bypass action
  - Notify affected parties
  - Close problem record

A.2.4 Management Review: Report and Control

- Impact Analysis
  - Measurement cost of outage
  - Trend analysis
  - Management reporting
  - Root cause analysis
  - Determine the impact of the problem management process
  - Problem aging
- Control
  - Escalate unresolved problem
  - Monitor vendor fix

A.3 Performance Management

This discipline covers the functions required to ensure that adequate performance is maintained.

A.3.1 Performance Policy Definition

- Define authorities and rules
- Identify performance components of service level agreements
- Define performance indicators of critical agents
- Define performance thresholds
- Define, validate and communicate performance expectations

A.3.2 Capacity Planning

- Collect workload requirements
- Merge requirements into service domains
- Trend analysis
- Model performance
- Forecast service levels and resource requirements

A.3.3 Collect Performance Metrics

- ***Activate measurement schedule***
- ***Activate the critical performance agents***
- Performance instrumentation
- Store data

A.3.4 Monitor and Analyze Performance

- ***Performance Monitoring and Control***
- End-to-end performance analysis
- Analyze trends, workload shifts, behavior
- Identify service level, threshold exceptions and problems
- Correlate of performance information
- Store history and summary data

A.3.5 Performance Tuning and Balancing

- ***Logging*** and notification of ***performance activity***
- Determine tuning or corrective action
- Evaluate performance tuning
- Workload balancing

A.3.6 Communication and Reporting

- Track and report the consumption of resources
- Produce reports on service attainment against plan
- Report on performance monitoring, tuning and tracking
- Track actions taken

A.4 Configuration Management

This discipline covers the functions required to manage the configuration of an operational environment.

A.4.1 Configuration Policy Definition

- Authority definition and control
- Rules definition - mandatory features, functions

A.4.2 Configuration Design

- Environmental/physical planning/modeling to determine effect of changes
- Design configuration profiles - general templates
- Design hardware configurations
- Design software configurations
- Logical design - grouping of resources to meet business objectives
- Application of configuration rules
- Develop proposed and updated system plans - unique configurations
- Create configuration database

A.4.3 Advise/Decide on Configuration

- Analyze model/actual configurations
- Recommend primary/alternate resource usage

A.4.4 Configuration Creation

- Description of personnel information - owner, responsibilities
- Description of financial information
- Description of location information
- Definition of resources and attributes
  - Physical inventory/connectivity
  - Logical inventory/connectivity
- Definition and modification of relationships
- Primary/alternate resource paths
- Directory services
- Identify potential results of changes to configuration

A.4.5 Validate Configuration Information

- Validate resource attributes
- Validate attributes across multiple resources
- Verify proposed changes

A.4.6 Prime Configuration

- Extract parameters from definition/description
- Send resource configuration parameters to resource

A.4.7 Refresh/Update Configuration Information

- ***Query*** and set ***attribute values***
- ***Refresh information from resources (vital product data, etc.)***
- ***Refresh topology from topology managers***
- Pass information to administrative processes
- Define and modify relationships
- ***Interface with configuration databases***

A.4.8 Refresh/Update Configuration Information

- Request configuration data
- Pass information to requestors
- Produce configuration reports

Appendix B. Managing Systems Concepts

This section defines some key terms which are used repeatedly throughout this book, and *Network Operations Management - Which Platform? The Practice*, SG24-5015. They relate to the division of management responsibility, in complex environments. The terms are illustrated in Figure 7 on page 37 and Figure 8 on page 38. These two figures are very similar but the words in them are different. The reason that they differ, despite the underlying ideas being the same, is that different groups of people have tended to work in the SNA and TCP/IP environments. Each group tends to use a different vocabulary for a number of concepts that are actually the same. The description below introduces both sets of terminology.

B.1 Focal Points and Other Managers

Two key requirements in any design for enterprise-wide management are:

- Provide a central point from which enterprise-wide management can be performed.
- Provide function to support this central point, so that resources are used efficiently, and performance and availability are maintained.

The *focal point* is the place from which a given process is observed and managed, enterprise-wide. Any other systems it is responsible for managing are known as *target systems*.

In a fairly simple environment all the management function would normally run at the focal point, but Figure 7 on page 37 and Figure 8 on page 38 show cases where some management function runs elsewhere. The following are two main reasons why this might be done, in a complex environment:

1. To reduce the amount of processing carried out at the focal point.
2. To allow the focal point to manage devices whose protocols it does not understand.

B.2 The SNA Terms

The management roles to be introduced for the SNA environment are *entry point* and *service point*. The first of these is used to reduce the processing load at the focal point, and the second is used to handle the variety of protocols in a heterogeneous environment.

B.2.1.1 Reducing the Load with an Entry Point

The term entry point is defined as a part of the NetView for MVS architecture. It refers to a component which offloads management work from the focal point. An entry point saves load at the focal point by providing distributed network management. The work it removes from the focal point is as follows:

- Collecting status information

  In a large environment this might require considerable resource, for devices that require polling, or heartbeat functions. The load can be shifted from the focal point by using the entry point to perform these functions.

- Filtering

  You may not want all status changes to be reported to your focal point. For example, you might not be very interested in some types of event that have only a minor impact on your service. You could save load in the network, and at the focal point, by not forwarding information for this sort of event from the entry point.

- Thresholding

  There might be some events which you would normally filter out, but which become important if they happen often enough. An entry point can provide a thresholding function for them.

- Automation

  There may be some events for which you want to make an automated response. By automating the response at the entry point you make several savings.

  – You save the effort at the focal point that would otherwise have been needed.

  – You save the delay of passing the information through the wide area network, from the entry point to the focal point, and of passing the response back.

  – You save load on that network.

An entry point carrying out these functions for an MVS focal point would normally be another copy of NetView for MVS, but it could also be an OS/400. OS/400 playing this role has more limited functions than NetView for MVS.

B.2.1.2 Converting Protocols with a Service Point

In an SNA network the job of converting between the SNA network and networks with other protocols is carried out by a *service point*. This is an architected function which bridges the boundary between an SNA network and another protocol. The next few paragraphs explain what a service point is, and how it can be used.

The service point itself comes in two forms; it can either be a product in its own right, with its own product code, or it can be built into another product. In one or other of these forms there are versions for AIX, OS/2, DOS, and NetWare.

The service point has the ability to handle two-way communications, with an SNA focal point, using standard infrastructure, defined by NetView. This infrastructure consists of alerts used in communication with the focal point, and RUNCMDs sent from the focal point. The alerts use so-called Network Management Vector Transports (NMVTs), and the RUNCMDs carry commands that the focal point wants to issue to a component managed by the service point.

The service point does not understand any protocol except SNA. In order to communicate with some environment other than SNA an application built upon the service point is required. These can be obtained from IBM and from various other software suppliers.

Suppose that you want to manage environment X from the focal point in Figure 7 on page 37. To do this you need a service point application, based on the service point, which is able to access the user interface of the component X. This application must be able to read the interface of X, to find its status. It must

also be able to issue commands, sent by the focal point, to the interface of X. This provides a complete path from the non-SNA world of any component X to the focal point.

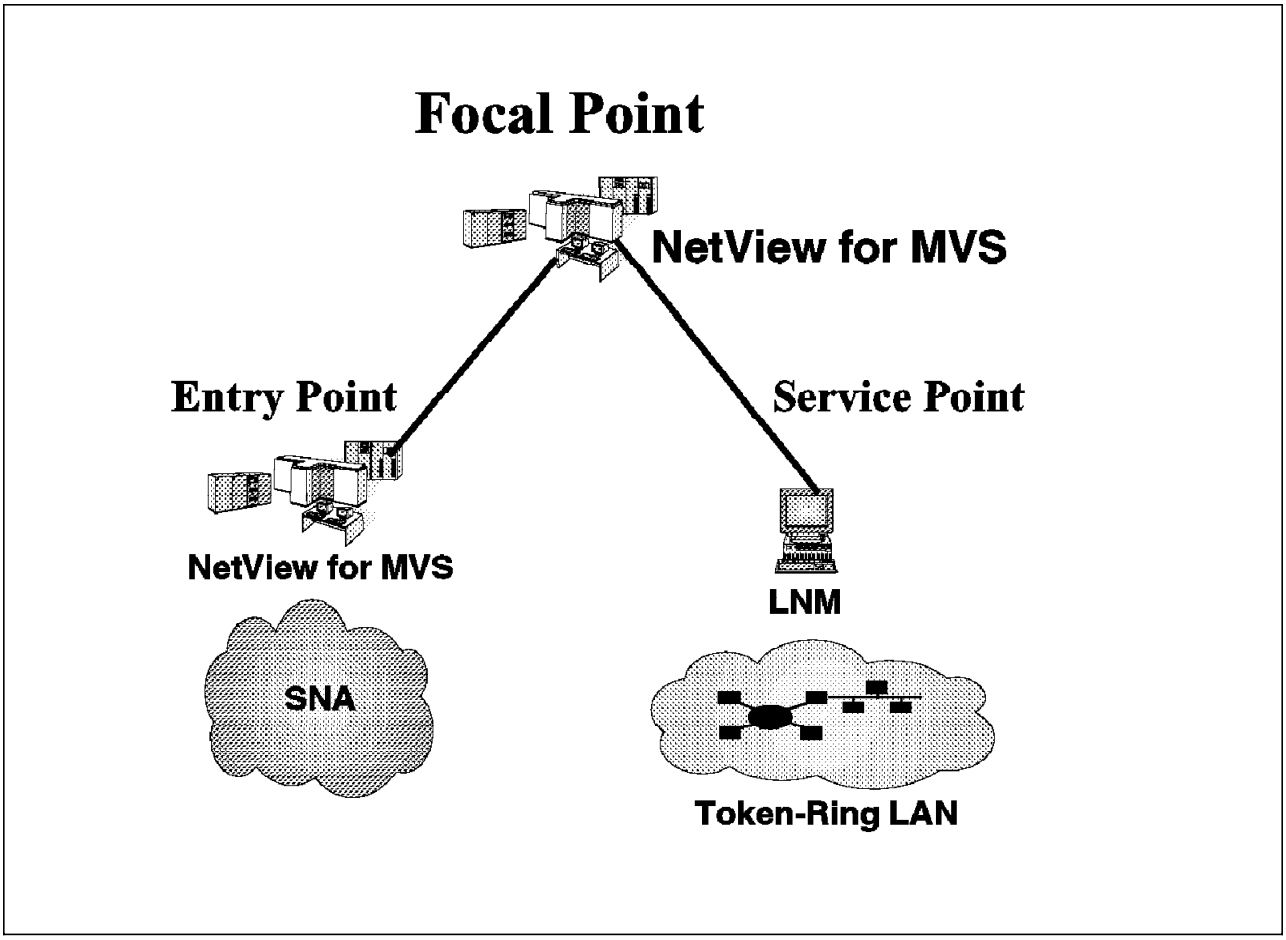


Figure 7. SNA Management Terminology

B.2.1.3 How a Service Point Works

Here is how the complete process works for a focal point to manage a component X.

1. If X changes status the service point application sees it.
2. This application passes the change of status to the service point, where it is turned into a NetView alert, or resolution. This travels through the SNA network as an NMVT.
3. The focal point receives the alert, and can use it for many purposes, including the following. These are only examples. The focal point might do other things too:
   - The focal point can update its view of the status of X.
   - The focal point can pass information on the change of status of X to your problem management system.
   - The focal point can decide that the change of status of X requires that the command XYZ should be issued, to the service point.

4. If the focal point decides that some action is required it issues a RUNCMD containing a command to be issued to X.
5. The service point receives the RUNCMD and strips out the command to be issued to X.
6. It passes this command to the service point application, which issues the command to X.
7. The service point application watches the user interface of X to see what reaction, there is to this command, if any.

B.3 The TCP/IP Terms

The functions carried out in this environment are essentially the same as those described for SNA. In a TCP/IP environment the focal point is often referred to as the *IP Manager*.

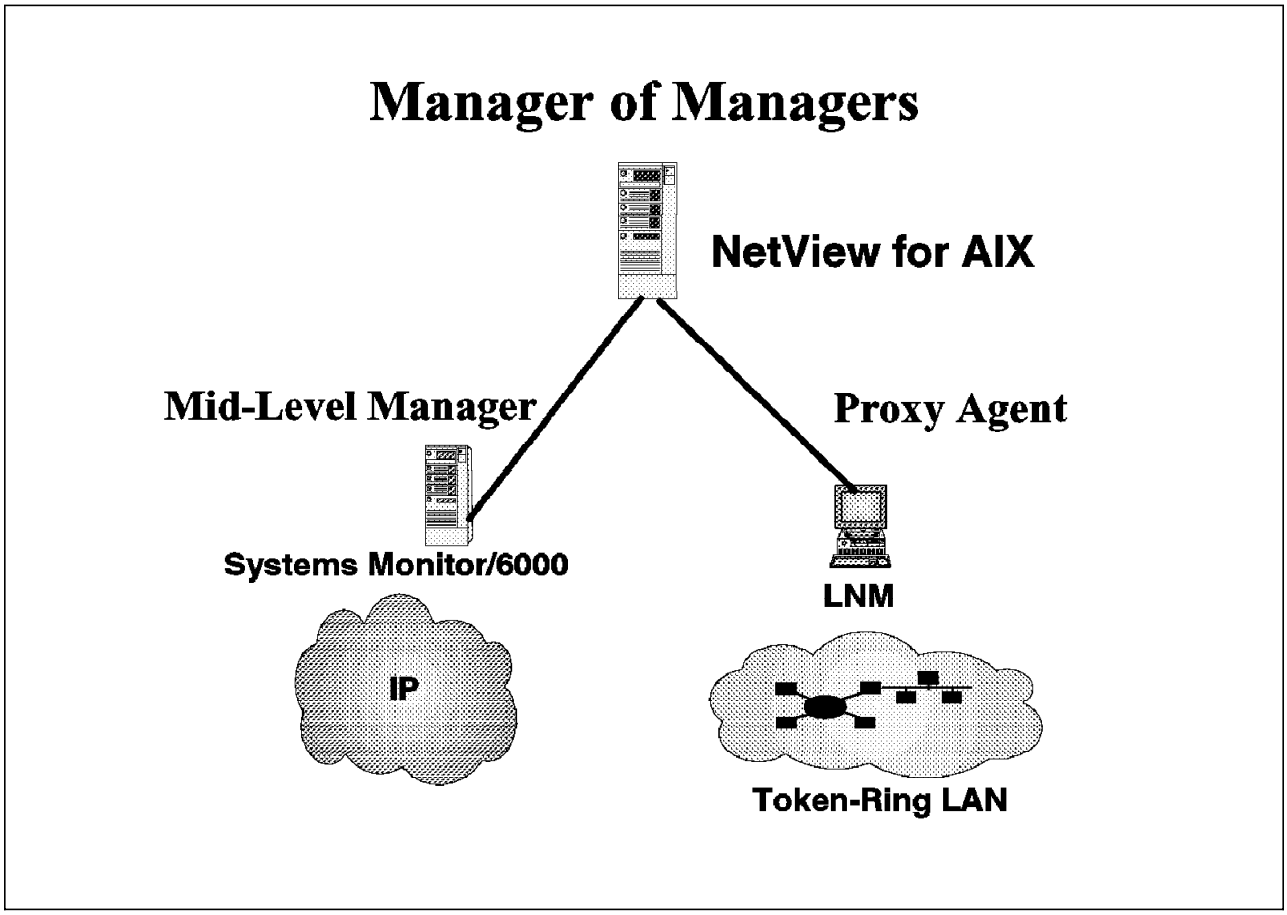


Figure 8. TCP/IP Management Terminology

B.3.1.1 Reducing the Load with a Mid-Level Manager

The function of offloading work from the focal point is handled by a mid-level manager. This is the role known as an entry point, in SNA. It is implemented for the same reasons as described before, but it has one added importance. SNMP is a polling architecture and to check the status of a group of TCP/IP devices it is necessary to poll them. In a large enterprise this could be expensive in

processor power, and in network resources: this cost can be avoided by the use of mid-level managers.

The function is implemented as the MLM (mid-level manager) feature on the various IBM Systems Monitor products.

The mid-level manager communicates with the IP Manager by sending SNMP traps. The IP Manager communicates with the mid-level manager by sending SNMP GETs and SETs.

B.3.1.2 Converting Protocols with a Proxy Agent

The function of converting between the protocols of the TCP/IP world and some other environment is handled by an SNMP proxy agent. This carries out the role described above for a service point in the SNA world. It communicates with the IP manager, using SNMP traps. The IP Manager communicates with the proxy agent using SNMP GETs and SETs.

If you want to manage an environment X from the IP Manager you install a proxy agent attached to the SNMP agent. This would normally run on a component of the environment X. The SNMP agent enables the IP manager to talk to this component using SNMP, and the proxy agent enables the IP Manager to manage it. The proxy agent provides a MIB extension specific to the characteristics of X and the IP Manager can interact with it using SNMP GETs and SETs. These GETs and SETs are directed at the variables in the SNMP MIB and the MIB extension. The IP Manager can now have two-way communication with X, with the proxy agent converting protocols, just as a service point does.

Proxy agents are provided by a number of IBM products, and by the members of the NetView Association.

B.4 Differences Between the Two Approaches

The main differences between management carried out by a service point and a proxy agent are as follows:

- The service point runs on a management platform *outside* the environment to be managed, for example on OS/2 or AIX.

  A proxy agent runs on a component in the environment to be managed. It communicates with a management platform outside its own environment.

- If a component X is being managed via a service point, by a focal point, the focal point has to send the actual commands implemented in the user interface of X. It can send *any* command implemented in the user interface of X. This is powerful, but the focal point has to know what commands X offers, and it has to know their syntax.

  An IP manager using a proxy agent to manage X sends commands to it by accessing the contents of the proxy agent's MIB extensions. The only functions available to the IP manager are those that the provider of the proxy agent has included in the MIB extensions. The IP manager does not need to know what commands X supports, or their syntax. This is less powerful than the service point implementation, but easier to use.

B.5 Intermediate Managers

As previously explained, the ideas behind the types of managers discussed for SNA and TCP/IP environments are essentially similar. We have therefore used one term to represent them all, where the precise differences are unimportant. We have used intermediate manager to represent any manager, working with a focal point or IP Manager, to distribute processing load, to handle protocol translations, or to control subsets of the whole environments.

B.6 Managing, Controlling and Monitoring

In addition to using standard terms for different types of manager (as discussed in the previous sections) it is also helpful to have standard terms for the functions carried out at those managers. This is most easily explained with a picture; please refer to Figure 9.

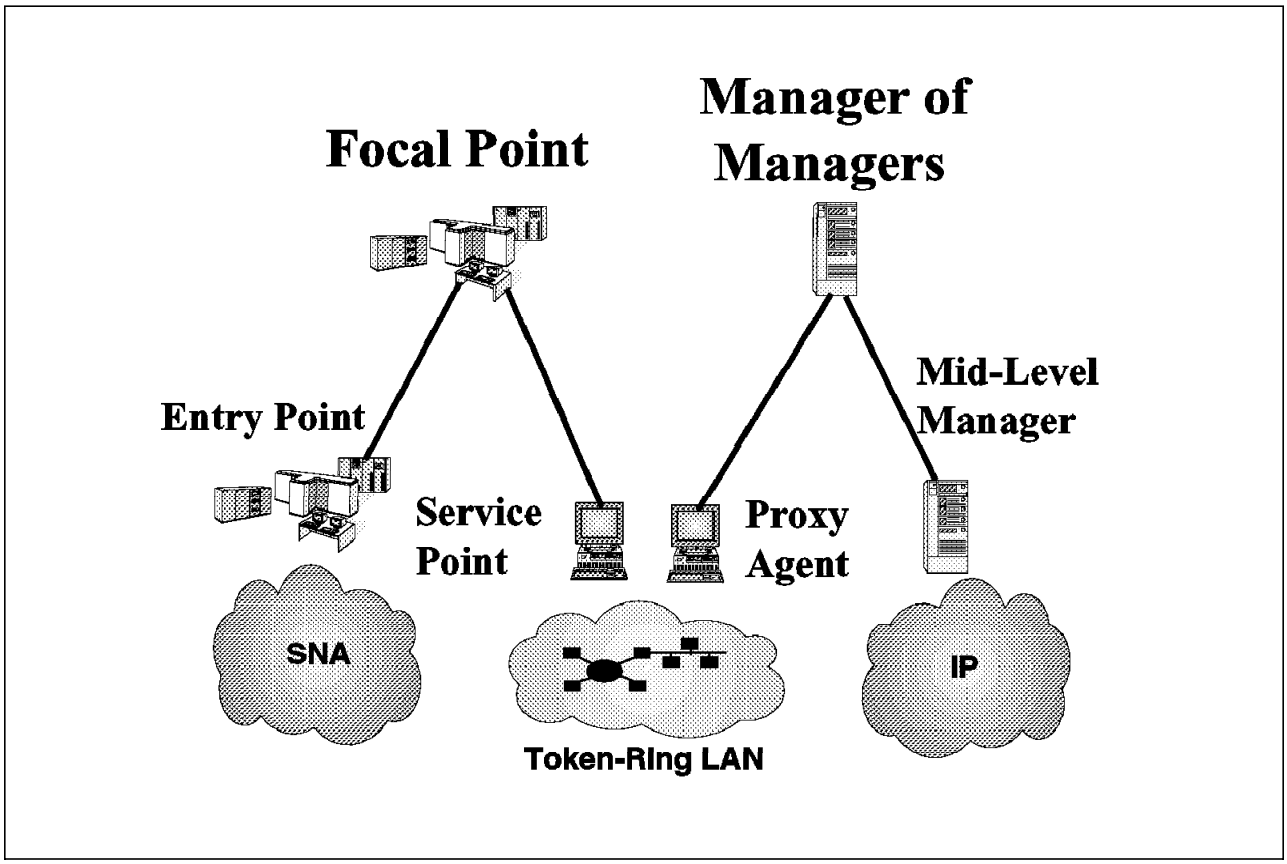


Figure 9. Which One Is the Manager?

The picture shows an example of a situation where three platforms are being used together to provide support for managing the TCP/IP part of an enterprise. It is quite common to hear statements being made which totally confuse the roles of the various components in a case like the one pictured.

For example, in the case shown, one person might say, ″We manage our TCP/IP devices from AIX″, because NetView for AIX is acting as a service point. Another person might say, ″We manage our TCP/IP devices from MVS″, because NetView for MVS is acting as the focal point. A third person, possibly an

operator, might say, ″We manage TCP/IP from OS/2″, because the operator′s interface is built on OS/2.

To avoid this confusion we have tried to use the following terminology for the functions of the various platforms:

- **Monitoring** This is the platform that provides the interface used by the people who have responsibility for overseeing the delivery of the service. Their monitoring interface might be attached to any of the types of manager discussed in the previous sections. In the picture it is attached to NetView for MVS at the focal point, but it could be attached to MVS at an entry point, or to AIX at an IP manager, or to AIX at a mid-level manager.
- **Managing** This is the platform where the focal point or IP manager functions run. It is the point to which information flows from *all* parts of the enterprise.
- **Controlling** This is the platform where some distributed level of management is running. It is the point to which information flows from some subset of the enterprise. Intermediate managers may be used to control parts of the enterprise; their efforts are coordinated and managed by the manager at the focal point.

Index

T

U

ITSO Technical Bulletin Evaluation RED000

International Technical Support Organization
Network Operations Management - Which Platform?
The Principles
February 1996

Publication No. SG24-5014-00

Your feedback is very important to help us maintain the quality of ITSO Bulletins. **Please fill out this questionnaire and return it using one of the following methods:**

- Mail it to the address on the back (postage paid in U.S. only)
- Give it to an IBM marketing representative for mailing
- Fax it to: Your International Access Code + 1 914 432 8246
- Send a note to REDBOOK@VNET.IBM.COM

Please rate on a scale of 1 to 5 the subjects below.
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction	____		
Organization of the book	____	Grammar/punctuation/spelling	____
Accuracy of the information	____	Ease of reading and understanding	____
Relevance of the information	____	Ease of finding information	____
Completeness of the information	____	Level of technical detail	____
Value of illustrations	____	Print quality	____

Please answer the following questions:

a) If you are an employee of IBM or its subsidiaries:

Do you provide billable services for 20% or more of your time? Yes____ No____

Are you in a Services Organization? Yes____ No____

b) Are you working in the USA? Yes____ No____

c) Was the Bulletin published in time for your needs? Yes____ No____

d) Did this Bulletin meet your needs? Yes____ No____

If no, please explain:

_____

_____

What other topics would you like to see in this Bulletin?

_____

_____

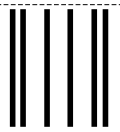
What other Technical Bulletins would you like to see published?

_____

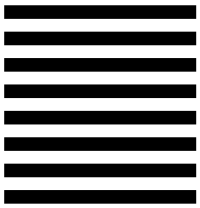
Comments/Suggestions: (THANK YOU FOR YOUR FEEDBACK!)

Name	Address
Company or Organization	
Phone No.	

Fold and Tape **Please do not staple** Fold and Tape



NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

IBM International Technical Support Organization
Department HZ8, Building 678
P.O. BOX 12195
RESEARCH TRIANGLE PARK NC
USA 27709-2195

Fold and Tape **Please do not staple** Fold and Tape

Printed in U.S.A.