

**Magellan Open Management: Fit and Flexibility**

The objective of this workshop is to describe specific products which support the Magellan Open Network Management strategy. It illustrates how this comprehensive set of standards-based management products are designed to fit into the individual infrastructures of Magellan customers, without sacrificing functionality, flexibility, or scalability. Areas covered are:

- the background of the fit and flexibility requirements for network management products;
- the current status of open interface standards and open platform offerings;
- a description of Magellan interface product offerings, including SNMP agents, OSI agents, NMS application programming interfaces (APIs), the Magellan data provider interface, and MagellanView; and
- a description of the open platforms on which Magellan management applications are available, followed by a specific example of how OMS for Passport is designed with the flexibility to fit in a multi-vendor, multi-service environment.

About the presenter:

Charles Kemp is a product manager in the Magellan Network Management group and is responsible for Passport open management applications. Charles joined Nortel Technology (formerly Bell-Northern Research) as a software designer in 1989 and worked on the DPN-100 Network Administration System (NAS), and as a software designer on Magellan NMS Architect. Charles also worked in the Magellan Network Management Global Technical Support group before joining Magellan Global Product Management.

Agenda

- **Introduction**
 - fit and flexibility
 - industry directions
- **Interfaces (fit)**
- **Platforms (flexibility)**

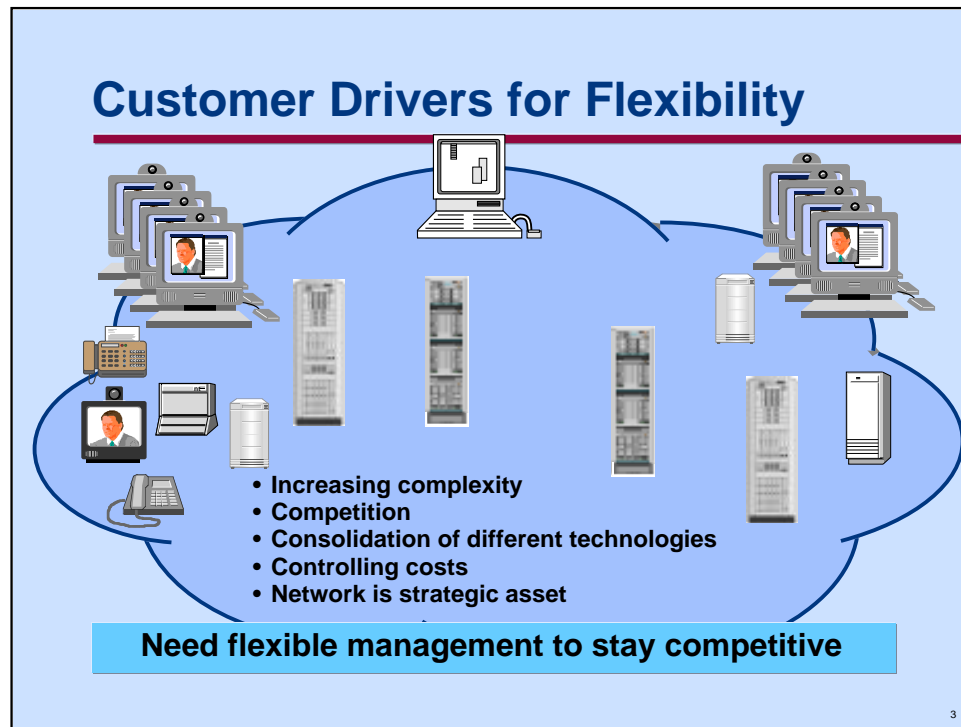
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Network operators want choices in the selection of their management solutions. They are demanding that equipment vendors' networking equipment include management options that fit with their preferred network management system. This is typically achieved through the use of standardized interfaces and open network management platforms. Network operators look for a range of possible solutions which ensure that management solutions are flexible, deliver functionality to their end-customers, and provide a competitive advantage. This workshop addresses the fit and flexibility requirement for network management solutions.

The first section describes why "fit and flexibility" is required, and presents an overview of the current status of simple network management Protocol (SNMP) and open system interconnection (OSI), as well as a market share survey of leading open network management platforms.

The interfaces section provide overviews of each of the Magellan interface products. Products which are designed to fit into the customer's existing network management solutions and processes.

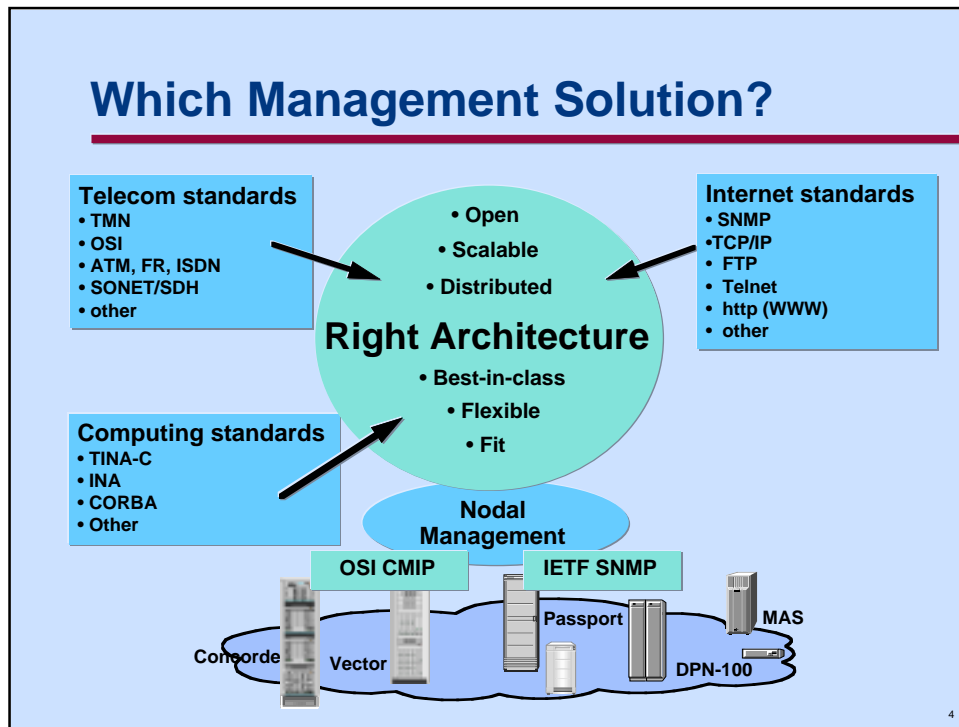
The final section on open platforms describes the portfolio of open platforms which are supported by Magellan's open management product offerings.



Network management has undergone significant change over the past few years. In the past, network equipment vendors delivered vendor-specific management solutions that worked with a single type of equipment. As network operators incorporated equipment from multiple vendors into their network, they were forced to incorporate vendor-specific management systems, each with their own unique management applications and methodologies. This resulted in inefficient and expensive network management. Network management became part of the complexity problem. New technologies and services were difficult to introduce because the management applications could not easily adapt to handle them.

It has become obvious that vendor-specific management solutions are no longer acceptable. Network providers, driven by competitive pressures to rapidly deploy new services and technologies, are moving towards multi-vendor networks. Network management has a much higher profile within organizations, specifically because the networks themselves are increasingly viewed as strategic business resources. There is strategic importance placed on choosing management solutions that will allow the organization to meet its business objectives.

Given that solutions need to integrate into existing network operating environments, adapt to a dynamic networking environment, and evolve with evolution plans, network operators are turning to network management standards to solve the problem. The rationale is that standardized interfaces will allow the introduction of any vendor's equipment into the network and will interwork with the existing network management systems. This allows new technologies to be introduced without requiring major changes to the existing network management processes.



Once we focus on network management standards to solve the problems of fit and flexibility, the next question is—which standard or combination of standards is the right architecture for a particular network management scenario? The goal is to have a management solution that can be simply integrated into an existing network. The reality is that network management standards are at different stages of development and market acceptance. The vision is not yet reality.

The overall objective is to select a network management solution that is:

Open: Products based on accepted industry standards that allow the integration of products from different vendors. Includes both interfaces and open management platforms.

Scalable: A management architecture that can grow and adapt to support very large network sizes.

Distributed: The ability to fit different organizational requirements, for centralized or decentralized management hierarchies.

Fit: The ability to fit within the customer's existing environment rather than having the customer adapt their environment and processes to fit a particular vendor's management applications.

Flexible: Network management systems must also have the flexibility to address a range of current organizational requirements, as well as the complex networking environments of the future. Network management systems need to efficiently support all types of network organizations, whether centralized or distributed, and different vendors' equipment.

Best-in-class: Organizations are facing ever-increasing pressures to deliver quality levels of network services coupled with greater productivity and reduced operating costs. In order to gain the competitive advantage, network providers are looking for the best-in-class solutions to incorporate into an overall, winning management strategy.

The slide is titled "Open Interface Market Review" in a large blue font, underlined with a red line. Below the title, the text "OSI" is followed by three bullet points: "• Fault standard finalized", "• Performance standard finalized", and "• Balance still pending". Below this, the text "SNMP" is followed by two bullet points: "• SNMPV1 available 1989" and "• SNMPV2 in progress". A blue box with white text "The de facto standard in the network management industry" has an arrow pointing to "SNMP". At the bottom, a blue box with white text says "There are two options: SNMP or OSI". A small number "5" is in the bottom right corner.

Open Interface Market Review

OSI

- Fault standard finalized
- Performance standard finalized
- Balance still pending

SNMP

- SNMPV1 available 1989
- SNMPV2 in progress

The de facto standard in the network management industry

There are two options: SNMP or OSI

5

Open interface market review

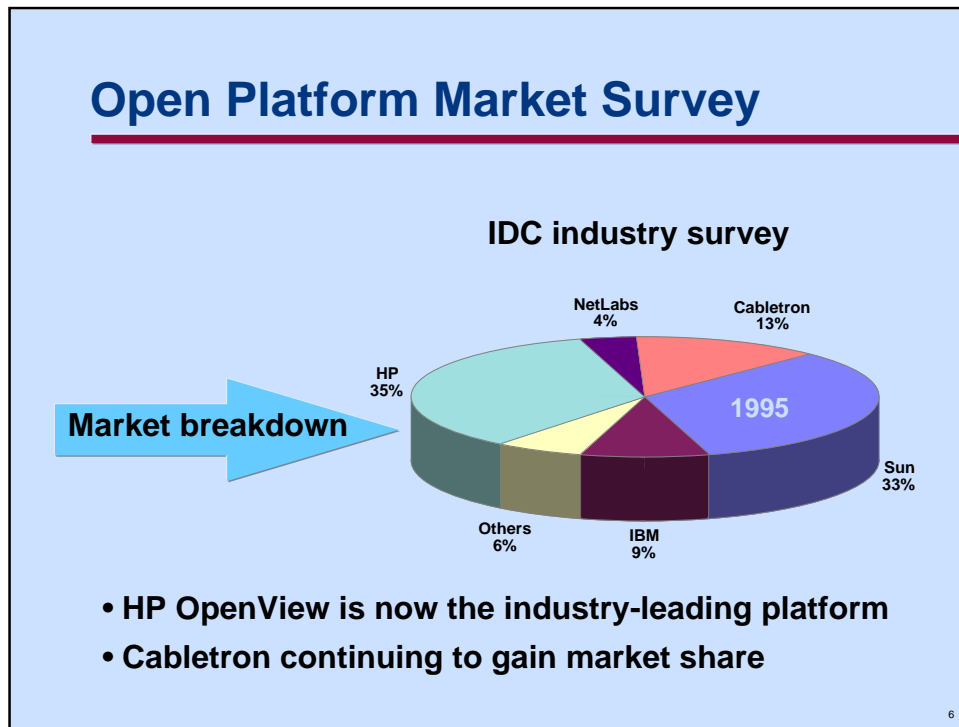
Nortel has been committed to standards-based network management directions for many years. This has been displayed with our involvement in:

- the ITU (previously called CCITT) committees that establish OSI network management standards;
- the NM Forum which is made up of equipment and management vendors who are working through the issues of managing multi-vendor networks; and
- the Internet Engineering Task Force (IETF) work groups who are establishing the various RFCs for SNMP.

SNMP has become the de facto industry standard. This is based on two overriding facts:

- The majority of network operators have either purchased or are planning to purchase an open platform management system based on an SNMP management capability
- Over 300+ equipment vendors have embraced SNMP. The majority of open platform applications are SNMP based.

Nortel is continually monitoring the situation to ensure that we are delivering the capability sets that map to both our customers' requirements and the industry direction.



Open platform vendors support many of the IETF standards. The proprietary aspects of the various equipment vendors are handled through SNMP enterprise MIBs. These proprietary aspects are typically defined and managed by equipment vendor applications. To facilitate the development of applications, open platform vendors deliver developers' kits which can be used to create both specific and value-added functionality.

Open platform vendors provide applications which assist in the management of a network. These applications typically address issues related to fault and performance management, and are generally geared towards local area networks (LANs). The expectation of the open platform vendors is that additional functionality will be provided by the network equipment vendors, delivering platform integrated functionality that complements the open platform vendor's applications.

In addition, third party vendors deliver applications like trouble ticket systems and trouble-shooting applications. Overall, this aspect of the industry is growing exponentially and needs are being addressed as business opportunities present themselves.

The pie chart above shows industry breakdown of UNIX-based management systems for the first half of 1995. HP OpenView has surpassed Sun as the market leader.

Our own survey of existing and potential customers reveals that most are implementing either HP or IBM as the open management platform of choice. The split appears to be based on those who have a heavy IBM implementation as opposed to those who do not. Cabletron's Spectrum platform has made significant gains in market share over the past couple of years and it looks like this trend will continue.

Management Strategy

- **Deliver functionality on commercially available management platforms**
- **Maintain advantages of Magellan NMS**
- **Allow value-added functionality to be used in all platform environments**
- **Implement applicable standards and market influences**
- **Deliver published interfaces**

Deliver on what our customers need

7

The previous slides presented requirements for standardized interfaces and open platforms. To address these requirements, Magellan is delivering a comprehensive suite of management capability.

- **Delivery of management functionality as part of commercially available platforms**

During 1996, Magellan OMS will be delivered, enabling customers to take advantage of a commercially available open platform to manage Magellan equipment.

- **Maintain NMS for its industrial-strength capability suite**

NMS has evolved over the years to manage some of the most complex data networks in the world. Its capability suite is currently unmatched in the industry today.

- **Consolidate value-added functionality such that it can be used in the various management scenarios**

In the past, Magellan NMS has included a suite of functionality that addressed all basic and value-added management needs. With the introduction of Magellan OMS, the same value-added management needs are required. Rather than re-invent this functionality, Magellan NMS will be packaged such that value-added functionality can be utilized regardless of the management scenario chosen.

- **Implement applicable standards and market influences**

This has always been part of Magellan's management strategy and this tradition will continue. The latest example being the move towards industry open platforms. Future demonstration will include Nortel's TINA-compliant implementation.

- **Deliver interfaces that can be utilized by customer-created applications**

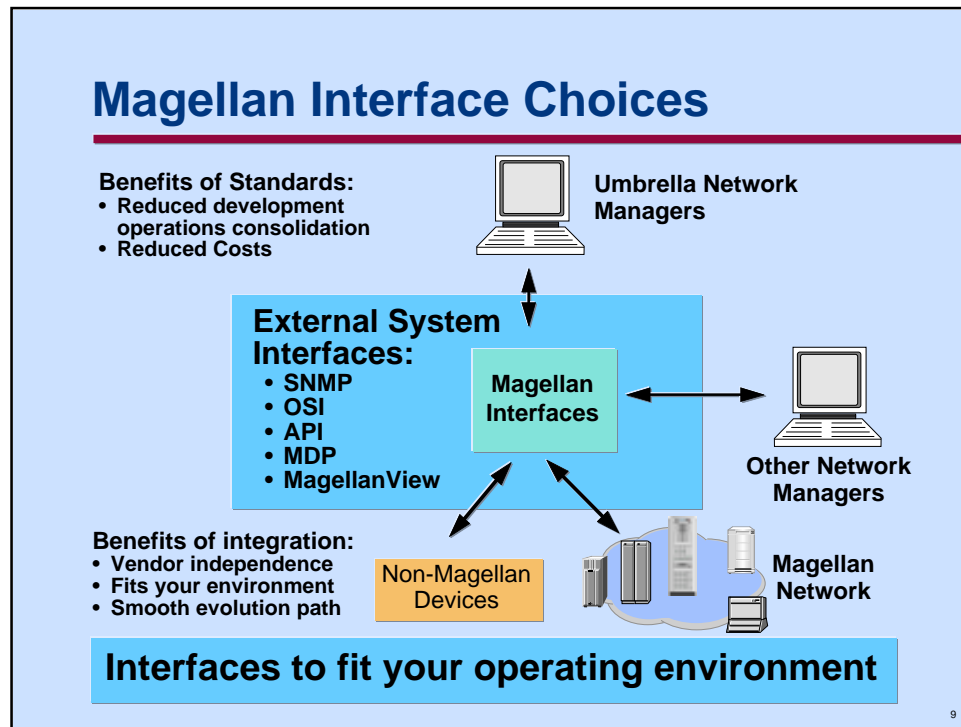
Magellan has always addressed the need to have a machine-to-machine interface. It started with DPN-100 and the MDI interface and continues today with standards-based interfaces.

Agenda

- Introduction
- Interfaces (fit)
 - SNMP
 - OSI
 - APIs
 - Magellan data provider
 - MagellanView
- Platforms

8

This section will present how Magellan management can fit into the customer's environment. Interfaces to the Magellan management data facilitate this capability. All available interfaces will be described.



Nortel is a recognized leader in the definition and implementation of standards across its product platforms, including the Magellan network management systems and interfaces. By implementing proprietary interfaces and adopting standards such as SNMP and OSI, Magellan provides customers the means to fit Magellan equipment into their existing customer network infrastructures, and the flexibility to interwork with other network management systems.

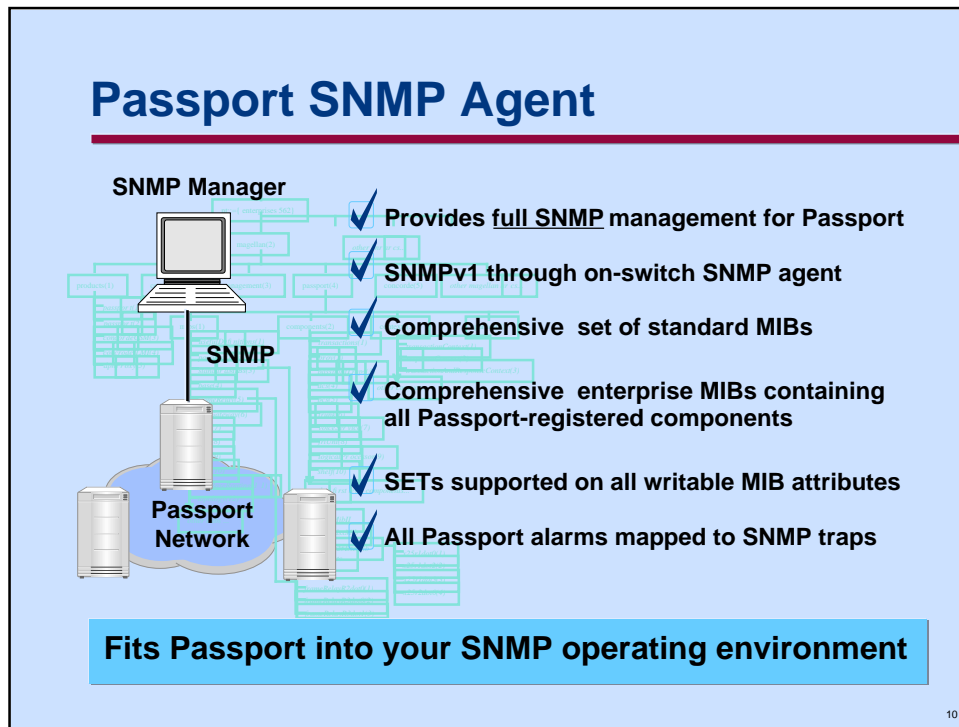
Most organizations use data networking equipment from a variety of vendors and have a preferred network management system. For example, some network operators have opted to manage their multi-vendor network using **SNMP**. They are looking to maintain their uniform management environment and can do so with Magellan's DPN-100, MAS, Passport, and Vector SNMP agents.

In addition Magellan features an **OSI** agent for fault management of Magellan DPN-100 and Passport networks from OSI-compliant open platform management systems. A CMIP agent is also available for Concorde and planned for Vector.

The Magellan application programming interfaces (**APIs**) provide interfaces for those who want to integrate Magellan NMS into their own network management applications. For example, network operators use the expert advisor API to connect to their trouble ticketing system. The five OSI-NM functional areas are supported with APIs that exchange data with external systems or applications.

The Magellan data provider (**MDP**) collects statistical and accounting information and provides customizable interfaces that allow MDP to fit into your network operating environment and work with custom planning and billing tools.

MagellanView is provided for corporations that have decided to use IBM's NetView umbrella network management system to manage SNA, DPN-100 and possibly other non-SNA network devices. MagellanView provides a NetView host fault management capability for DPN-100, MAS and Passport switches.



Passport is a world class switch which can now be fully managed by the simple network management protocol (SNMP). It can be simply integrated into your multi-vendor SNMP environment, providing fault, performance, and configuration management. Passport SNMP agent capabilities include:

MIB Support

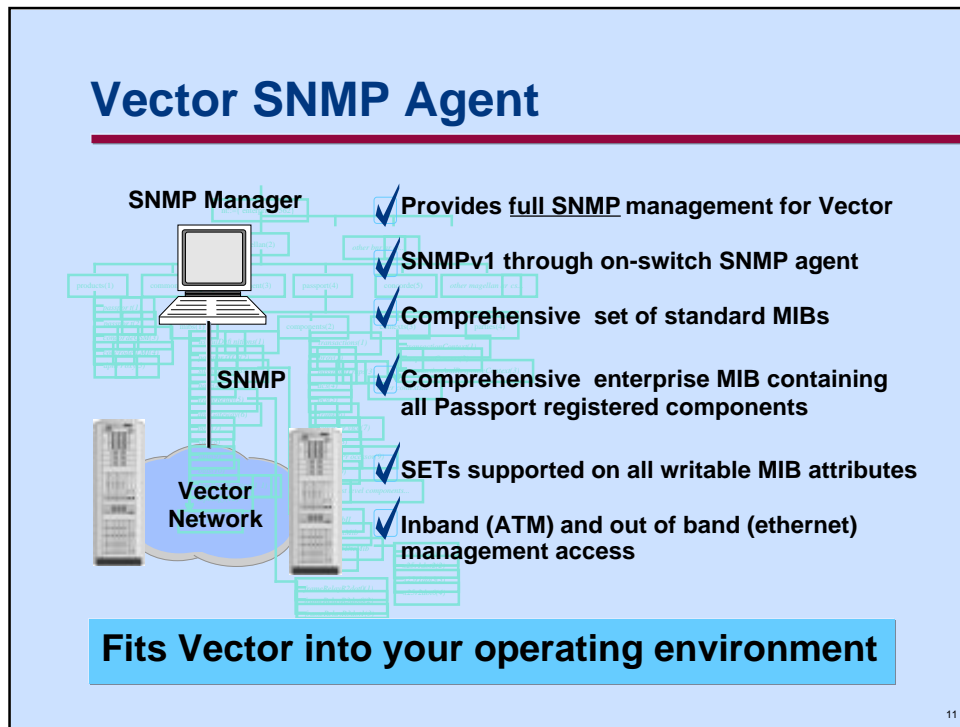
- Integrated support for applicable standard MIBs
- All Passport information available through enterprise MIBs

Surveillance support

- Operational state available for all components
- Alarm correlation, Passport isolates and generates alarms for a single troubled component
- Detailed alarms include trouble-shooting information
- All Passport metrics available for performance graphing
- *The mapping of the full suite of Passport alarms to SNMP traps, providing immediate trouble notification and reducing the need for polling*

Provisioning

- All Passport data provisionable via SNMP set commands



The Vector ATM switch can be fully managed by the simple network management protocol (SNMP). It can be simply integrated into your multi-vendor SNMP environment, providing fault, performance, and configuration management. Vector SNMP agent capabilities include:

MIB support

- Integrated support for applicable standard MIBs
- All Vector information available through enterprise MIB

Surveillance support

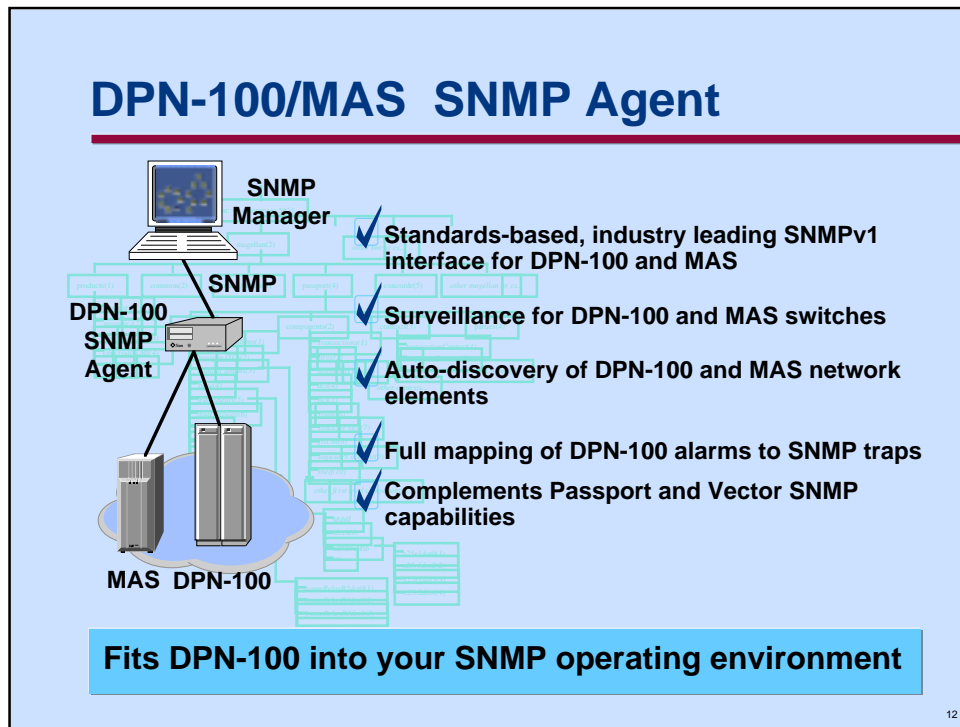
- Operational state available for all components
- Environmental alarms
- Vector metrics available for performance graphing

Provisioning

- All Vector data provisionable via SNMP set commands

Management Access

- Inband (ATM)
- Out of band (ethernet)

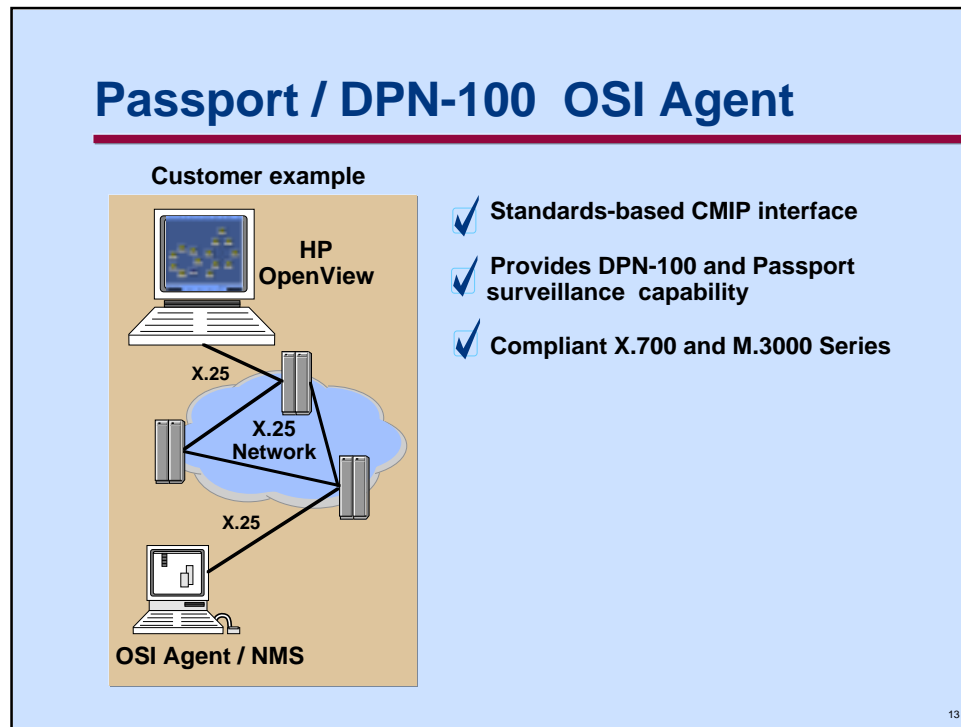


The DPN-100 SNMP proxy agent for DPN-100 and MAS switches provides an SNMPv1 interface and services for SNMP managers. The DPN-100 SNMP agent operates on a SUN workstation and communicates to the DPN-100 network through the Magellan NMS. This interface provides fault and real-time performance management of DPN-100 and MAS switches. The DPN-100 SNMP provides a standardized means of incorporating DPN-100 and MAS switches into your existing network management infrastructure or strategic evolution plans. It also complements the SNMP capabilities of Magellan Passport and Vector switches, allowing customers to integrate the management of Vector, Passport, DPN-100, and MAS.

The DPN-100 SNMP agent provides capability for your SNMP manager applications to:

- retrieve surveillance management information from DPN-100 and MAS switches;
- receive unsolicited DPN-100 alarms and logs in the form of SNMP traps;
- perform alarm clearing in the DPN-100 network;
- automatic discovery of network elements and ports;
- retrieve and graph DPN-100 performance metrics; and
- read-write support for the MIB II system and SNMP groups.

The DPN-100 SNMP agent is currently available, and is being deployed live.

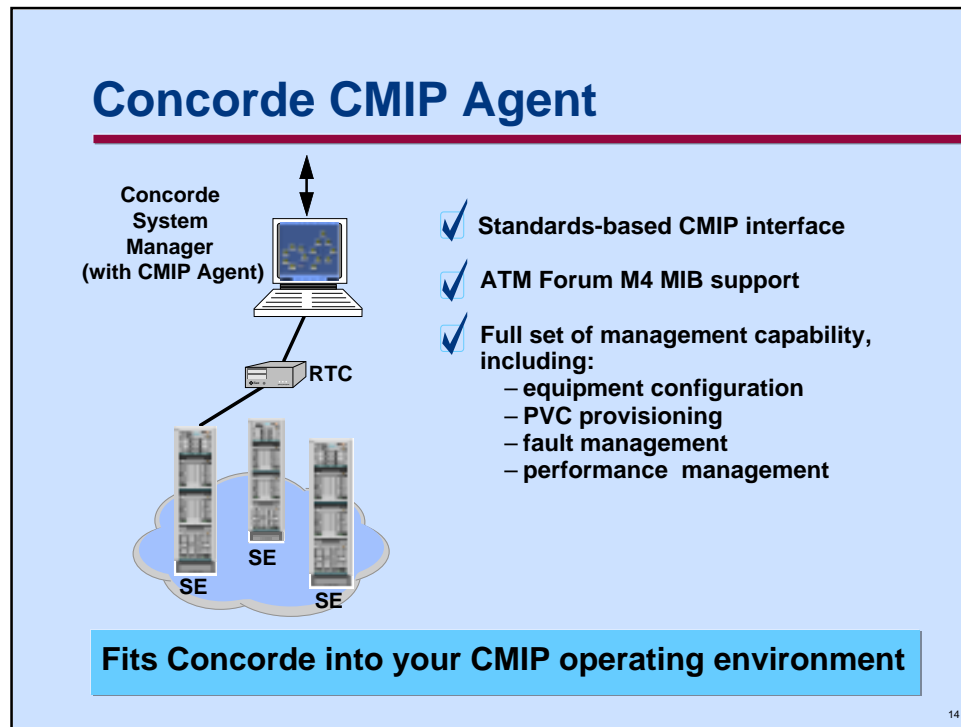


The Magellan open systems interconnect (OSI) agent for Passport, DPN-100 and MAS switches provides a protocol and service interface for the customer's preferred OSI management system. This provides surveillance capabilities for the external management system of Passport, DPN-100 and MAS switches. The first release of the OSI agent is available and being deployed live.

An integrated view of Magellan management data is provided through an object model based upon OSI 10165-2 and CCITT M.3100 specifications. The objects are fully defined using GDMO (Guidelines for the Definition of Managed Objects).

The types of functionality supported includes:

- GET: full GET capabilities for all modelled objects including return of selected attributes and navigation of the management information tree;
- sieve creation and deletion: allows creation (and subsequent deletion) of event forwarding discriminators controlling alarm reporting;
- scoping and filtering: BASE, NEXT and ALL levels of scoping as well as AND/OR Boolean filters are supported; and
- multiple managers/associations: the agent allows more than one manager to establish associations at any given time. A single Manager may establish multiple associations

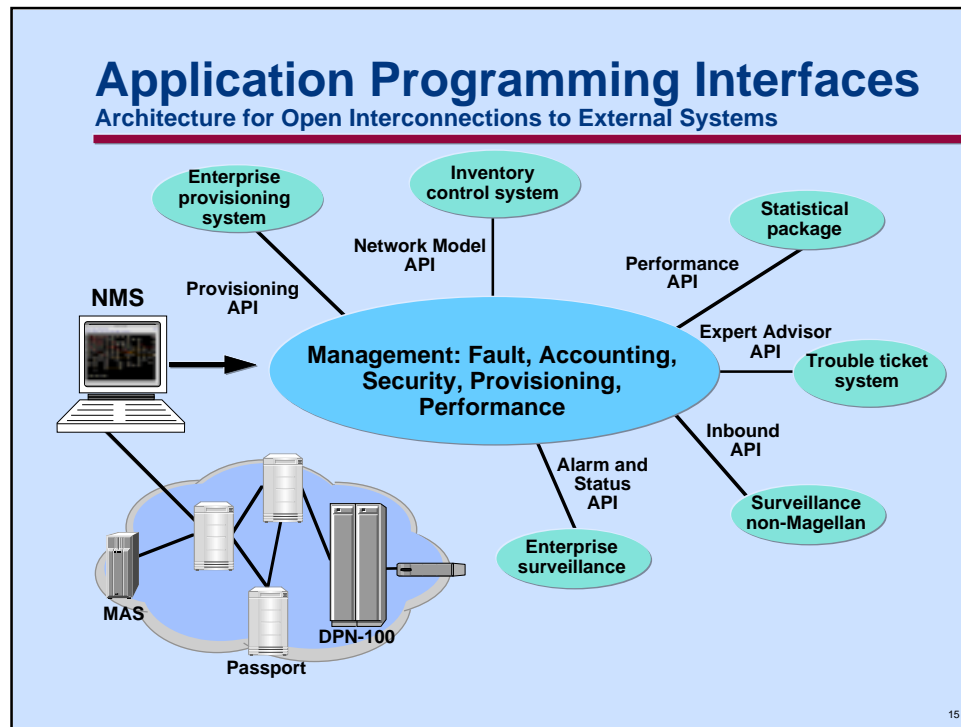


Concorde's CMIP interface is based on the ATM Forum's M4 interface specification. Concorde's CMIP agent runs on the Concorde System Manager (CSM), which provides network level control for all Concorde switching elements (SEs) via the Concorde real-time-controller (RTC).

Concorde's CMIP interface provides a full set of management capabilities including:

- equipment configuration (bays, shelves, cards etc.);
- port configuration - SONET Path/Line/Section;
- interface configuration - UNI, BICI;
- PVC provisioning -VCI/VPI assignment, traffic parameters, QOS, traffic policing etc;
- fault reporting/notifications;
- performance monitoring; and
- usage data collection and reporting.

Concorde's CMIP interface will be available in Concorde Release 3.0, scheduled for release this year.

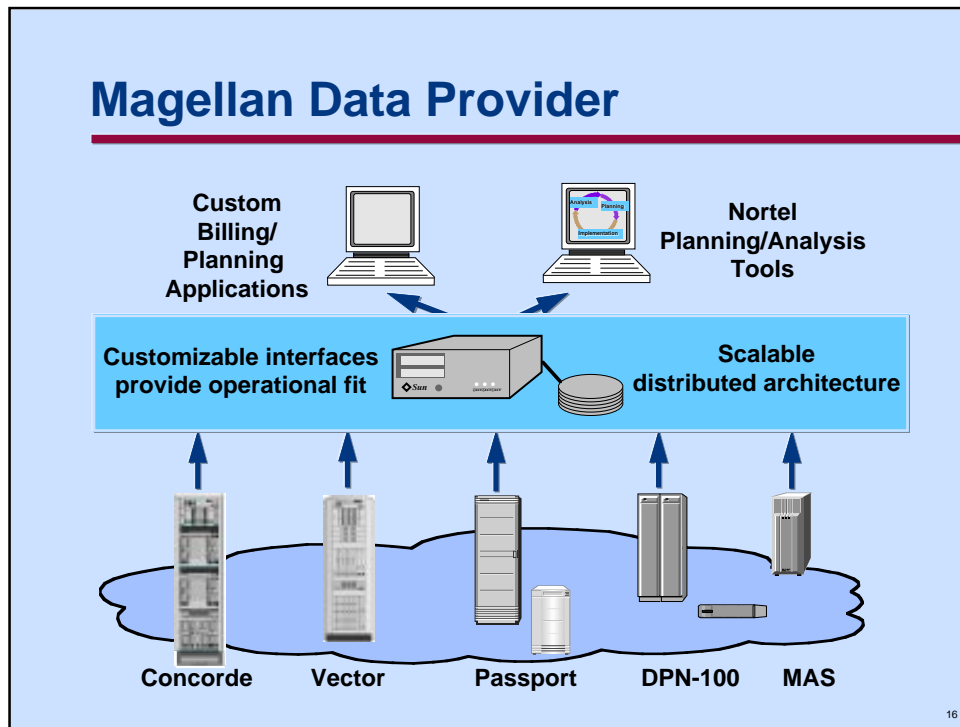


NMS application programming interfaces (APIs) are open, published interfaces supporting the five OSI-NM functional areas. They allow other network management systems and custom programs external to the Magellan NMS application to access the full range of Magellan network data, including all data that the network may contain about non-Magellan devices.

Customers can develop applications which utilize Nortel's APIs to manipulate:

- **Alarms and status API** - allows retrieval of alarms and state information
- **Network model API** - allows retrieval of network model topology data, and the reception of component state change notifications
- **Problem event API** - allows retrieval of problem types, problem instances, and problem instance facts, and the reception of problem, event, and fact value
- **Performance API** - allows retrieval of alarms, operator commands, statistics, catalogs, and site and node lists
- **Provisioning API** - allows retrieval of service data and the creation and modification of service data
- **Inbound alarms API** - allows direct injection of NM data into NMS providing an interface for the management of third party devices

Shown above are a few examples of custom applications that may utilize the NMS APIs. These applications can be developed by the customer, developed by Nortel, or provided by an umbrella NMS.



Network performance data is essential to enable the network operator to effectively, proactively forecast network requirements and respond to network conditions. The Magellan data provider (MDP) collects accounting and performance information from DPN-100, MAS and Passport. It will be expanded to include Vector and Concorde switches in 4Q96 and 1Q97 respectively.

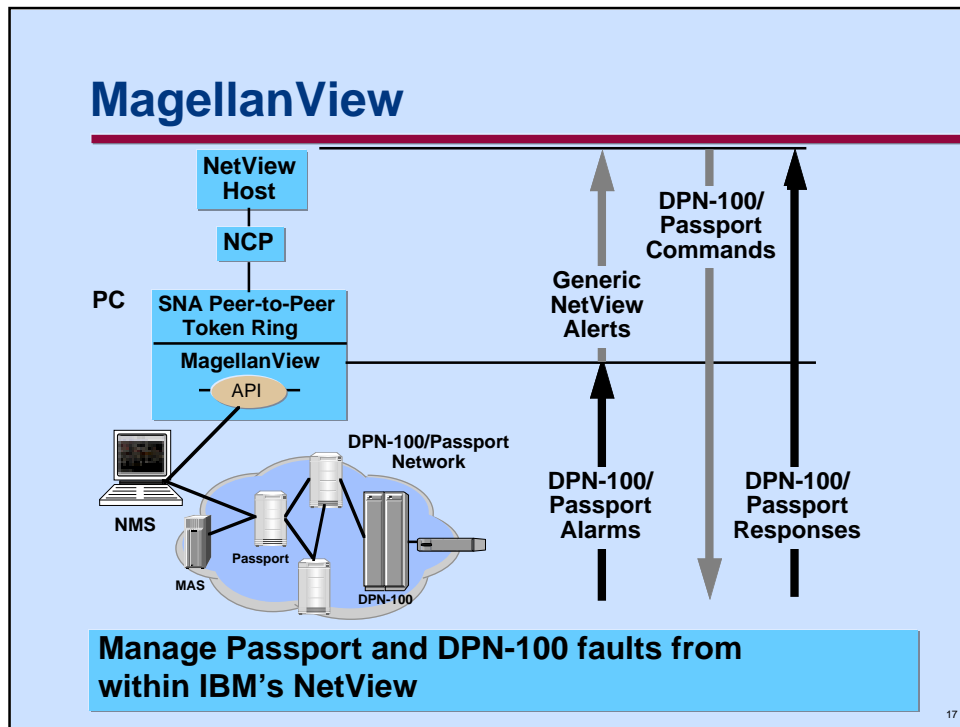
The Magellan data provider is both customizable and scalable.

Customizable

Data is collected from the network to the MDP host. The customer is capable of specifying the output format. This flexibility permits the network provider to generate records in either the published format or their own bulk data format, addressing both business and accounting needs.

Scalability

The MDP has a distributed architecture which scales to support very large networks simply by adding more processing power. Unlike most SNMP applications, data spooling is used instead of constant polling. This allows needed scalability without the concerns of network and equipment resource problems.



MagellanView is a PC software package that supports customers who use a host-based IBM NetView to manage Passport, DPN-100 and MAS switches. MagellanView is implemented as a service point within the standard NetView architecture. From the NetView console, network operator can both monitor the Magellan network and issue commands to individual devices.

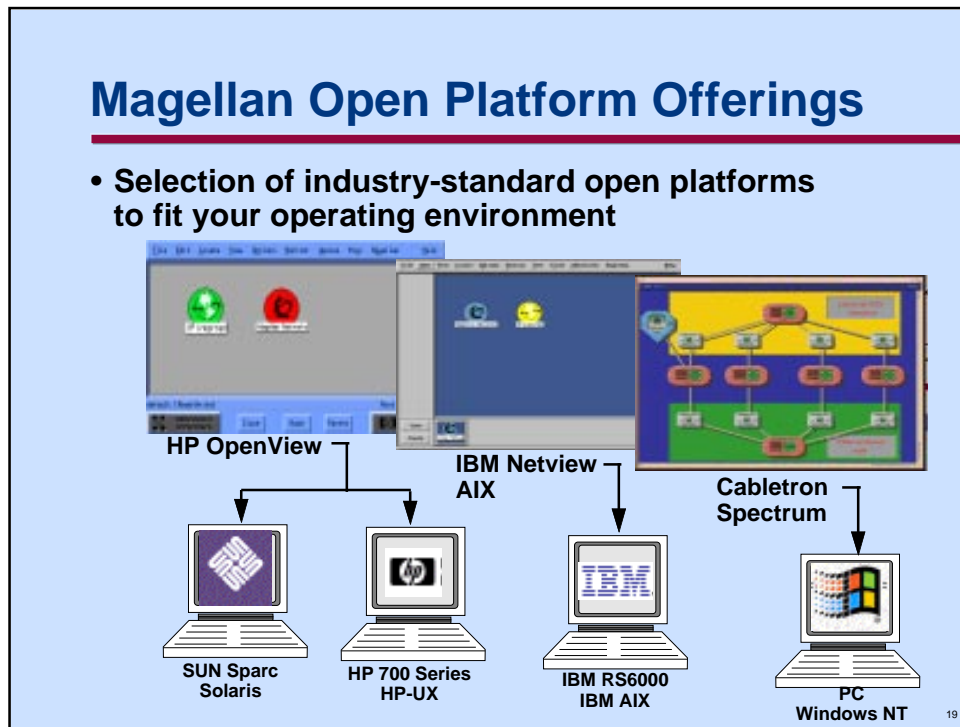
Network information for MagellanView is obtained through the Magellan NMS using NMS APIs. MagellanView is currently available and is deployed live in customer networks.

Agenda

- Introduction
- Interfaces
- **Platforms (flexibility)**
 - platform portfolio
 - multiservices enterprise example (OMS for Passport)

18

This section will present the flexibility that Magellan network management brings to the customer's operating environment. The Magellan management portfolio includes applications which operate on various management platforms. An example of the applications for HP OpenView will be shown.

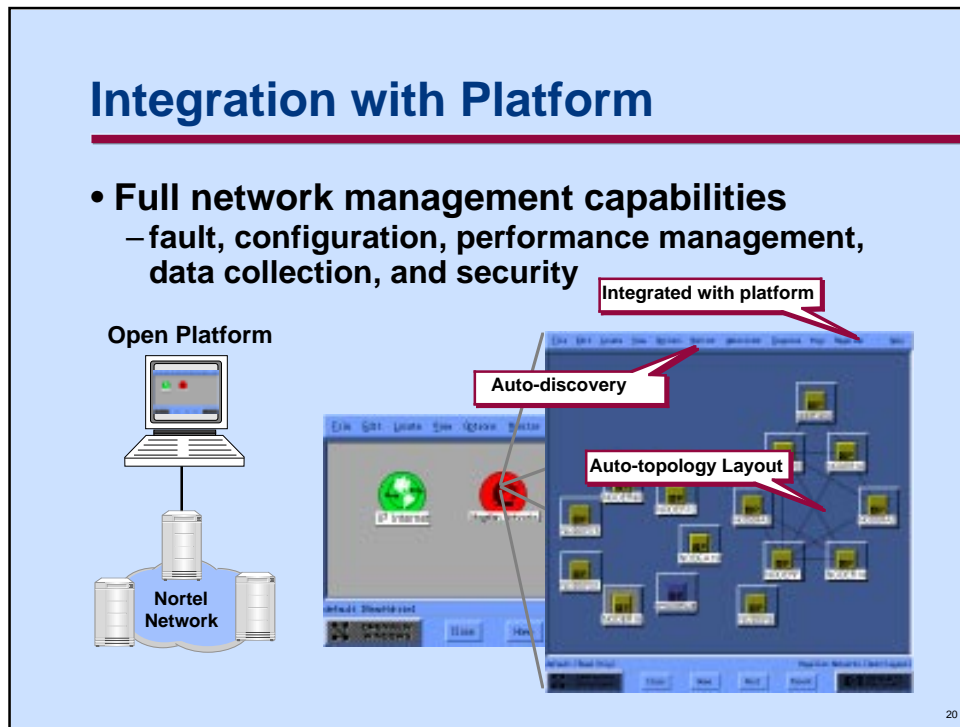


Each customer network is unique and as a result has different network, hardware, software, and user requirements. Requirements are likely to change rapidly as business realities and business thrusts change.

Magellan is addressing these requirements by providing open management applications on a number of industry-leading open platforms. For Passport, the network management applications are specifically designed to work on a selection of open platforms. This provides the customer with the flexibility to deploy the applications into an existing infrastructure and to keep existing operational paradigms. Network management is simplified through simple, intuitive, operational tools that are integrated with the customer's chosen platform.

By choosing leading open platforms for Magellan management applications, customers can take advantage of third party applications developed by integrated systems vendors (ISV).

Magellan will continue to meet our customers' requirements. Currently HP dominates the management platform market, thus the majority of our network elements reside on HP OpenView. Using Cabletron, with its focus towards the enterprise customer and its management capability available on Windows NT, we can manage Meridian 1 equipment as well as Magellan Passport equipment from a single platform. The decision to provide the management of an individual element on a particular platform will be business-dependant, based on customer demand.

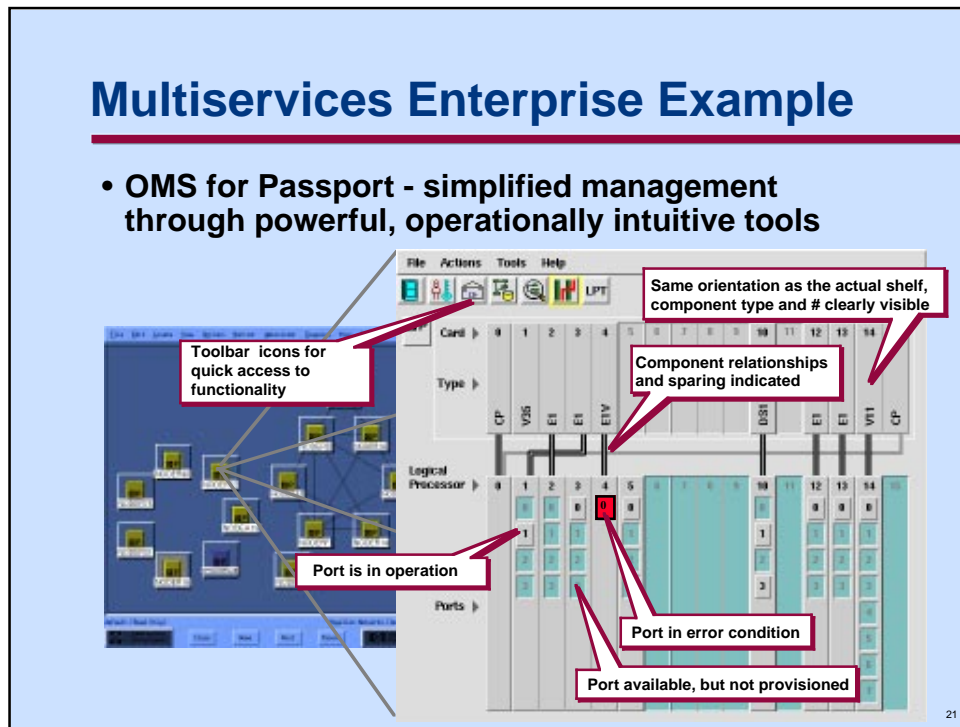


Many network operators are looking to vendors like HP, IBM, and Cabletron for their network management operating platform. These platforms include applications that typically address fault and performance management for IP devices. Additional capabilities are provided by the equipment vendor and third party integrated system vendors (ISVs).

Some equipment vendors deliver applications that simply run or co-exist on the open platform, but are not integrated and do not take full advantage of the platform. Other equipment vendors deliver only the SNMP interface. Magellan delivers the complete open management solution, including interfaces and a tight integration into the open platform.

Magellan's open platform applications are fully integrated with the platform providing the flexibility to co-exist with the customer's existing network management applications. This allows the customer to manage routers, FRADs and hubs from the same platform as Magellan switches, thereby reducing overhead, eliminating the need for extra capital investment, and allowing the possible re-use of generic management tools.

Standard platforms enhance the efficiency for network operators who are already familiar with their use. The Magellan open management applications conform to the look and feel of the respective platform. This, combined with simple, intuitive applications means reduced operator training.

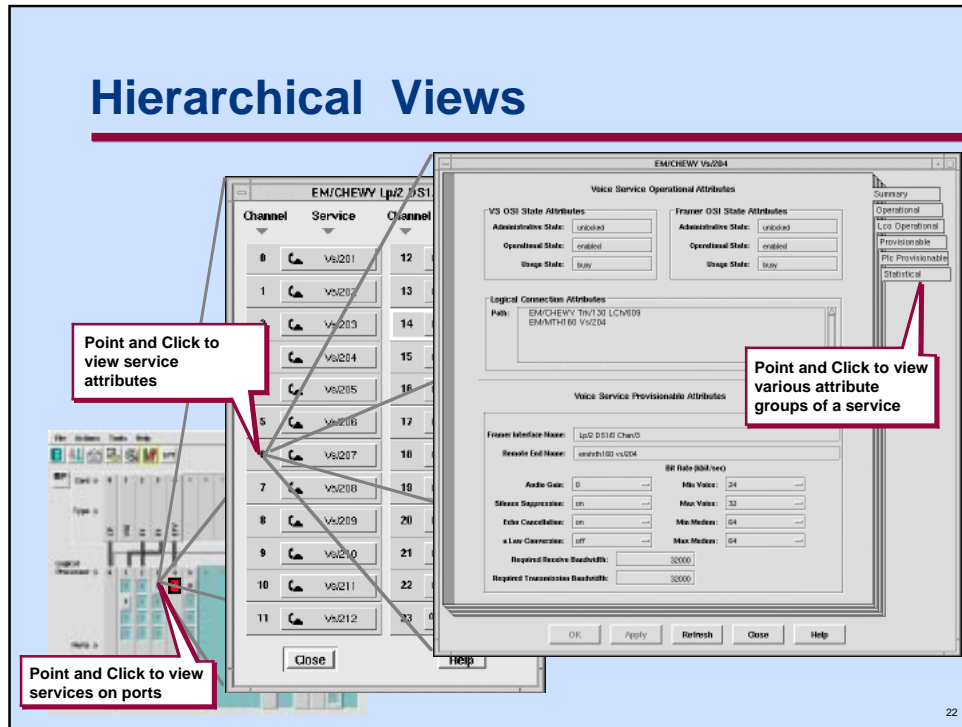


OMS for Passport was designed to meet the specific requirements of network operational staff. Network operators told Nortel they wanted shelf displays to have the following characteristics:

- representation of the physical shelf, without clutter;
- component relationships and sparing indicated, without clutter;
- component types and numbers clearly visible;
- components in trouble condition clearly visible;
- ports occupied with services; and
- hide unnecessary detail, “point and click” to get it if needed.

Network operators also wanted Nortel to:

- lower the complexity;
- lower the cost of training operations staff;
- increase efficiency; and
- lower probability of errors.



OMS for Passport allows for easy, mouse-driven surveillance. By clicking on a Passport component, its subcomponents are displayed in easy-to-read tables. At the subcomponent level, the user can point and click to see logical groupings of attributes (attribute view).

Service-specific Attribute Views

- **Real-time attribute groups**
 - service summary attributes
 - operational attributes
 - provisionable attributes
 - statistical attributes
- **A mouse “click” between attribute groups**
 - easy-to-find information, customer feedback to form groups

Voice Statistics Attribute Example

The screenshot displays a web-based interface for 'Voice Service Statistical Attributes'. It is divided into several sections:

- Logical Connection Statistical Attributes:** Includes 'Packets Sent' (7115) and 'Bytes Sent' (16206) on the top left, and 'Packets Received' (7109) and 'Bytes Received' (17954) on the top right.
- Framer Statistical Attributes:** Includes 'Total Cells' (155238704), 'Audio Cells' (12), 'Silence Cells' (155239032), 'Media Cells' (0), 'LRC Errors' (0), and 'Frames Under Run' (0) on the bottom left.
- Frames To Network:** Includes '32 kbit/s', '24 kbit/s', and '16 kbit/s' on the bottom right.
- Summary Panel:** A vertical sidebar on the far right with buttons for 'Operational', 'Loc Operational', 'Provisionable', 'Plc Provisionable', and 'Statistical'.

An attribute view allows operators to look at all the attributes that are contained in a logical grouping. The groupings available include statistical metrics, provisioned data and operational states.

Simplified Service Monitoring

- Object-oriented design allows information to be viewed from different perspectives

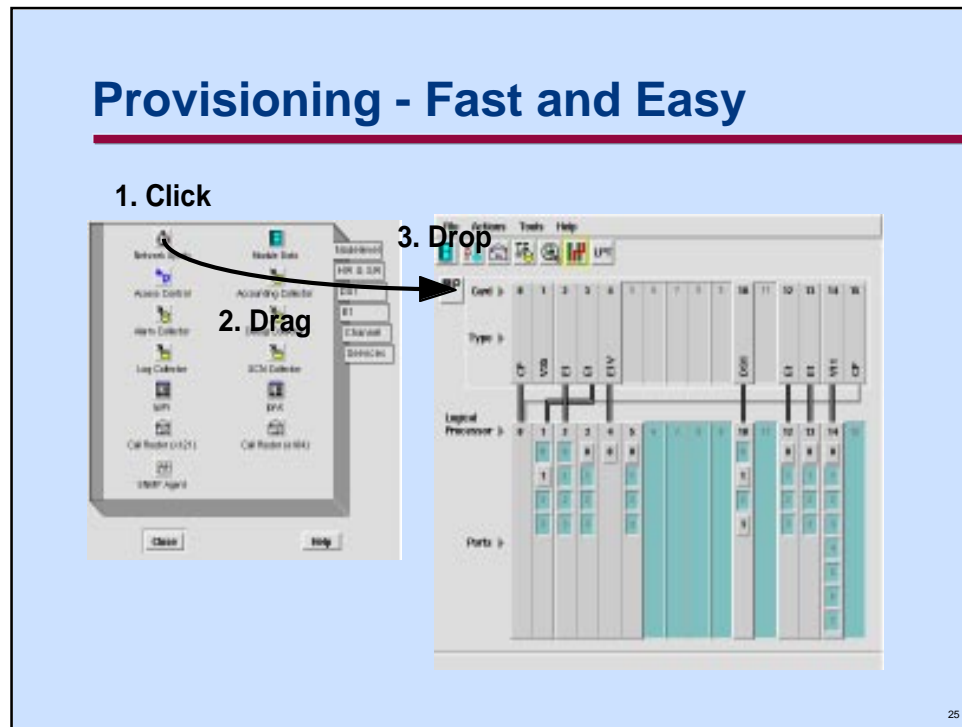
Service locator tool

- Ignores physical component hierarchy
- Organizes from a service perspective
- Helps shift operations toward a service orientation
- Necessary approach to ATM multimedia adaption of services

Service	Ip	Port	Chan	Location
vs201	2	1	0	FrUni
vs202	2	1	1	FrUni
vs203	2	1	2	Trunk
vs204	2	1	3	Trunk
vs205	2	1	4	Trunk
vs206	2	1	5	Trunk
vs207	2	1	6	Trunk
vs208	2	1	7	Trunk
vs209	2	1	8	Trunk
vs210	2	2	1	Trunk
vs211	2	2	2	Trunk
vs212	2	2	3	Trunk
vs213	2	2	4	Trunk
vs214	2	2	5	Trunk
vs215	2	2	6	Trunk
vs216	2	2	7	Trunk
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vs273	2	2	64	Trunk
vs274	2	2	65	Trunk
vs275	2	2	66	Trunk
vs276	2	2	67	Trunk
vs277	2	2	68	Trunk
vs278	2	2	69	Trunk
vs279	2	2	70	Trunk
vs280	2	2	71	Trunk
vs281	2	2	72	Trunk
vs282	2	2	73	Trunk
vs283	2	2	74	Trunk
vs284	2	2	75	Trunk
vs285	2	2	76	Trunk
vs286	2	2	77	Trunk
vs287	2	2	78	Trunk
vs288	2	2	79	Trunk
vs289	2	2	80	Trunk
vs290	2	2	81	Trunk
vs291	2	2	82	Trunk
vs292	2	2	83	Trunk
vs293	2	2	84	Trunk
vs294	2	2	85	Trunk
vs295	2	2	86	Trunk
vs296	2	2	87	Trunk
vs297	2	2	88	Trunk
vs298	2	2	89	Trunk
vs299	2	2	90	Trunk
vs300	2	2	91	Trunk
vs301	2	2	92	Trunk
vs302	2	2	93	Trunk
vs303	2	2	94	Trunk
vs304	2	2	95	Trunk
vs305	2	2	96	Trunk
vs306	2	2	97	Trunk
vs307	2	2	98	Trunk
vs308	2	2	99	Trunk
vs309	2	2	100	Trunk

Flexibility is the key to working in a multi-vendor, multi-service environment. OMS for Passport provides the capability to view all the switch data for a particular type of service. For example, the user could choose to view all the trunk or FrUNI service data for the switch. The Service Locator tool provides this capability, allowing operators to ignore the physical component hierarchy and organize the data from a service perspective.

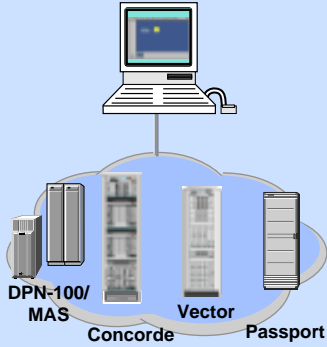
This provides an efficient means to locate and isolate problems which are related to a particular service.



OMS for Passport uses a simple drag-and-drop method to provision Passport components and services, making it one of the easiest to use provisioning applications on the market today. Users are presented with a graphical representation of the Passport shelf and a display of template icons. Each template icon represents a particular set of configuration data.

To provision a service or component, the user selects the corresponding icon and drags it onto an unprovisioned service or component.

Fit and Flexibility with Magellan



- ✓ **Strategic fit**
 - integration into your current environment
 - flexibility to address evolution plans
- ✓ **Open and industry-leading technologies**
 - standardized interfaces
 - leading open platforms
- ✓ **Cost-effective scalability**
 - event-driven architecture
 - distributed client-server model
- ✓ **Improve service for network users**
 - ease-of-use
 - controls complexity
 - reduces downtime
 - reduces costs

Fits into your existing infrastructure and provides flexibility to keep your network competitive

26

For more information on network management, visit any of the following:

- Network Management workshops
 - Magellan Network Management Overview and Directions
 - Closing the Loop on Network Planning
 - Magellan ServiceMonitor and VPN Service Management
- Network Management whiteboard clinics
 - discuss your network management questions and requirements with product managers and software designers
- Hands-on workshops
 - Planning and Analysis Tools
 - Secure Access Server
- Inform '96 Demonstration Center