Microsoft® Visio® 2000

The Microsoft® Visio® 2000 Network Diagramming Solution

White Paper

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Introduction

Organizations today are increasingly dependent on their networks for day-to-day work, systems management, internal and external communications, security, and human resources data. Meanwhile, new technologies and e-business initiatives have created new stresses on infrastructures, requiring increased size, complexity, and monitoring. We know from recent well-publicized cases that the cost of a network failure can be astronomical, both in lost dollars and damaged reputations. Clearly, networks have evolved far beyond the simple communication structures they once were. Today s networks must offer genuine competitive advantages.

This paper discusses how IT professionals can readily document, design, discover, and diagnose networks using Microsoft® Visio® 2000 technology designed specifically for network managers. It will show how the Visio 2000 network diagramming solution can help network professionals:

- Document and troubleshoot existing networks.
- Design new systems.
- Facilitate IT projects.

Expanded responsibilities and decentralized systems

Information Technology (IT) departments are expected to maintain a seamless networking environment during crunch times, corporate moves, physical expansions, system updates, and mergers. Network professionals must manage physical assets, monitor traffic, and optimize performance, all while anticipating and preventing problems. Meanwhile, the trend toward client/server computing accelerates the growth of remote area networks. Network professionals must keep end users happy by providing them with the services they need to do their jobs. But today s decentralized environments are harder to control than traditional mainframe worlds, where system-management tools were well-tested and reliable.

Ironically, as networks expand in size and complexity, IT departments are often pressured to automate procedures, reduce staff, and restrain budgets. Among the challenges facing network managers are:

- Maintaining large, complex networks.
- Managing a decentralized enterprise from a central network operations center.
- Migration of communications to the corporate intranet.
- Insufficient documentation of current and legacy systems.
- Major upgrades to operating systems, such as Microsoft Windows® 2000.
- Evolving technologies, such as VoIP (voice-over-IP).
- Internet and e-business initiatives.
- Mobile, worldwide workforces and outsourcing.
- High employee turnover and frequent organizational changes.

The network documentation dilemma

Ask any IT or network professional about the quality of their network documentation, and you are likely to hear these responses: *(1) We ve got hand drawings, spreadsheets, and text files, but they don t reflect the same data. (2) We can t share information with other departments. (3) We re using CAD. Implementation was a nightmare, and we got a low return on our investment. (4) We have no written documentation; we just don t have time.*

Every network manager recognizes the importance of accurate network documentation. Applications running on the network may enable mission-critical tasks. Internal and external communications require a robust, well-maintained network. Corporations need deep knowledge about their networks to remain agile in the face of new technologies and changing business objectives.

Yet few network managers have time to document their systems. Instead, these professionals are continually managing crises like downed servers or struggling to implement a new technology. Even as documentation lags behind network changes by as much as six months, documenting networks is rarely made a top priority.

Adding to the challenge, documenting a network can be tedious work. When done with pen and pencil or in basic drawing software, creating network diagrams can be time-consuming and difficult. The resulting drawings cannot be updated easily, and they quickly grow obsolete. Because they need to document networks and update existing documentation quickly, network managers need tools with high capabilities, but low learning curves.

The need for simple, effective network diagramming tools

Network professionals need to gather vital information and have it instantly on hand for troubleshooting, maintaining, and reporting on networks. They need detailed visuals to help identify trade-offs and ensure that proposed systems meet key requirements. The need for accurate information about network assets is more intense than ever, and yet many network design and documentation tools are either highly limited drawing tools or overly complex, costly high-end systems.

Network professionals need tools that are designed especially for network diagramming tools that are easy to use, yet sophisticated enough to keep up with the demands of today s global, complex environments. These individuals include:

- Network solution providers and system integrators who plan and implement IT structures.
- IT/IS managers who document networks for effective troubleshooting, planning, and disaster recovery.
- Network engineers who manage daily operations and communicate network designs to others.
- Novell and Windows network administrators who administer network directories.
- Help desk staff who need to know the location and details of each piece of equipment.
- Pre- and post-sales network service providers and networking services firms.

Visualizing a network can enable professionals to develop better solutions to complex issues like network architecture. Information professionals who design, develop, sell, document, or maintain networks and directory structures need to create conceptual, logical, and physical views of their systems. They want to build robust, efficient IT systems that demonstrate a clear return on investment.

The network diagramming solution in Visio 2000

Based on the re-architected Visio 2000 engine, Visio 2000 tools provide a common graphics technology for network diagramming across departments and disciplines, helping IT professionals transform raw data into visual understanding. Using the Visio 2000 solution, network professionals can:

- Automatically discover network devices and data.
- Quickly assemble network diagrams using intelligent, data-driven shapes.
- Create accurate, up-to-date network documentation.
- Maintain links from network diagrams to asset databases.
- Leverage existing CAD diagrams to update and build networks.
- Accurately track assets and costs.
- Diagram directory hierarchies to produce migration scenarios.

The Visio 2000 network diagramming solution comprises these industry-standard tools:

Microsoft Visio 2000 Professional Edition, ideal for creating high-level logical designs for presentations and proposals. Use Professional Edition to diagram a small- or medium-sized network manually.

The Visio 2000 library of network equipment shapes, more than 18,000 exact-replica equipment shapes drawn to port-level detail.

Microsoft Visio 2000 Enterprise Edition, designed to automatically discover and diagram large networks and exact network topologies. Enterprise Edition includes Professional Edition and Visio 2000 Network Equipment as well as built-in automation for maintaining current, detailed documentation.

Documenting a Network: Two Levels of Support

High-quality network documentation enables professionals to successfully:

- Simplify troubleshooting.
- Support successful proposals and budget requests.
- Enhance training.
- Retain critical knowledge in the organization.
- Plan additions and enhancements.
- Prepare for major upgrades.
- Prevent outages and downtime.
- Recover from disaster.

To accomplish these tasks, network managers typically require several levels of network diagramming support. First, they need high-level logical diagrams to include in presentations and proposals, and they need to be able to create these diagrams quickly. The high-level network diagrams need to be accurate, but they do not need to show specific network equipment in detail.

Second, network managers need complete, detailed documentation for effective asset management, troubleshooting, and reports. These diagrams must include detailed information about the equipment on a network, such as a device s model, tracking number, and network address.

High-Level Diagrams for Communicating Network Designs

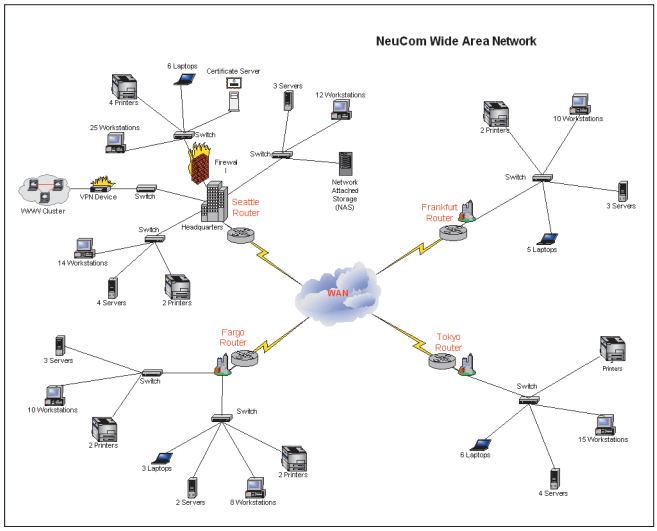

Figure 1: *With Microsoft Visio 2000 Professional Edition, network professionals can drag and drop network device shapes onto the page. Using the Logical Network Diagram template, they can assemble a network diagram quickly.*

With Microsoft Visio 2000 Professional Edition, users can create network diagrams for presentations and proposals by dragging generic, logical network shapes onto a page. Because they exclude unnecessary detail, the diagrams are useful for communicating a design to a non-technical audience, and for obtaining agreement from various departments. Users drag and drop network device shapes like racks, chassis, and network cards onto the drawing and connect them. The Logical Network Diagram template enables users to assemble a network diagram as easily as drawing a simple organization chart (Figure 1). Network professionals can then paste the diagrams into reports, specifications, presentations, or any Microsoft Office document.

Building intelligence into diagrams

The Visio 2000 network shapes are SmartShapes® symbols, which have built-in intelligence so that they resize without distorting and put text where it belongs. Meanwhile, SmartConnectors technology automatically reroutes lines as devices are added and ensures that cables stay connected as devices are moved.

Users can store detailed attributes with each shape to more easily troubleshoot problems areas, generate cost estimates, and perform quick inventories. With one-click access, users can view the manufacturer, product name, description, model number, and properties of network shapes. They can add fields to manage additional properties. Visio 2000 uses layers that allow the user to isolate specific components in diagrams, such as all computers made by one manufacturer.

Planning and designing high-level networks

Accurate diagramming can improve the initial planning and engineering of networks. Using Microsoft Visio 2000 Professional Edition, network managers can design LANs and WANs using shapes that represent the latest network technologies. Shapes include thin clients, VPN devices, firewalls, flat screen monitors, palm devices, DVD players, and a range of other network devices. Network designers can quickly pop in a node of a proposed network and instantly see the new structure. Similarly, by including prices in custom properties for network shapes, users can quickly print a bill of materials for any new structure.

Detailed Documentation for Troubleshooting and Managing Networks

The first step toward creating accurate, detailed documentation is knowing what devices you have and where they are located. Whether a network spans a small enterprise or several continents, it s often physically impossible to visit and document every device. Network managers may need detailed WAN connectivity, port-to-port data link, VLAN, Spanning Tree, protocol, and services diagrams. Infonetics Research[1] reports that asset management consumes 28% of the typical network manager s time, while troubleshooting takes up another 27%. Clearly, tools that help automate these tasks will dramatically improve a network s performance while freeing network managers to plan improvements.

Discovering a network automatically

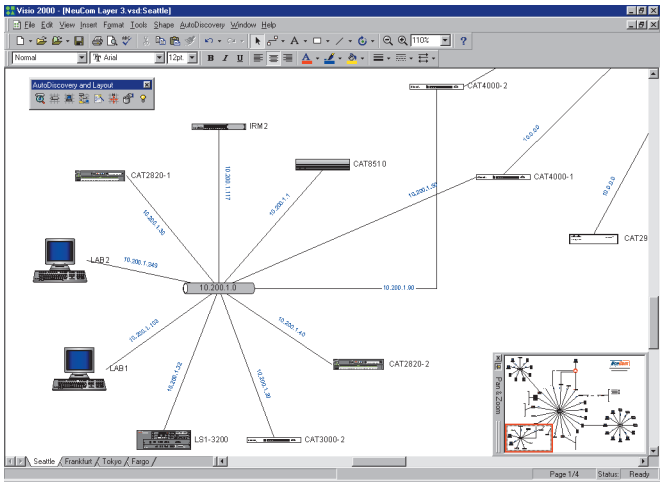

Figure 2: *AutoDiscovery technology makes documenting networks fast and easy. Starting with a single router, the user can automatically build a database of all layer 3 (IP network) devices.*

The AutoDiscovery technology in Microsoft Visio 2000 Enterprise Edition makes documenting networks fast and easy. Starting with a single router, Enterprise Edition can automatically build a comprehensive database of all the devices at the local or enterprise level, including layer 2 (data link), layer 3 (IP network), Cisco VLAN, Spanning Tree, and frame relay information (Figure 2). This unique Simple Network Management Protocol (SNMP) technology runs without network interruption to gather both connectivity and device interface information including IP addresses, Subnet Masks, MAC addresses, and speeds. Using the Discovery Wizard, users can discover an entire enterprise network at once, or a specific subnet or device type. Users can schedule unattended discovery to run at specified times. The built-in AutoLayout feature automatically turns discovered data into diagrams.

Visio 2000 Network Equipment (included in Enterprise Edition) includes more than 18,000 exact-replica network equipment shapes drawn to port-level detail. Shapes represent the latest networking technologies from more than 370 leading vendors, including 3Com, Cisco Systems, Hewlett-Packard, and Nortel Networks. Each shape includes product-specific properties, such as vendor name, part number, model, and physical description. Shapes automatically snap to one another in intelligent ways, and they auto-align to reflect how actual equipment is deployed in a rack, for instance. An optional annual subscription service ensures that your shape library stays up-to-date.

With the built-in network object Database Viewer, users can delete and rename objects in the database, set Committed Information Rates for Data Link Connection Identifiers, set interface speeds, and change a device class.

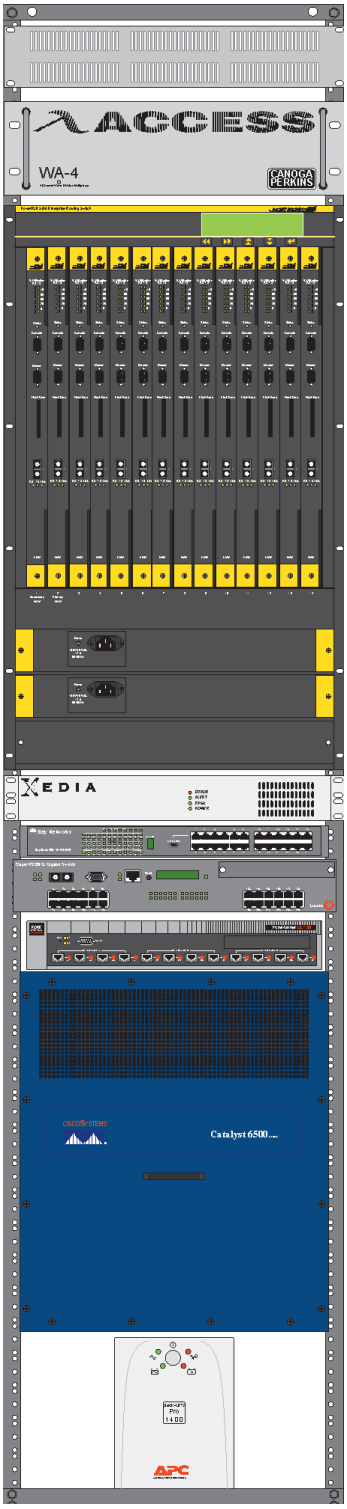

Figure 3: *The exact-equipment shapes in Visio 2000 enable network professionals to examine a close-up view of a rack, showing the actual modules in a chassis.*

Managing assets intelligently

Existing asset database tools are difficult to implement and require a huge time investment to run. As a result, asset databases tend to become obsolete quickly. Visio 2000 can create critical asset documentation that can be updated in an instant.

Users can easily manage the data stored in network shapes using the Properties window. The window contents are specific to the selected device, allowing users to easily customize data and properties, such as equipment details, asset tracking numbers, maintenance history, network type and address, workstation details, and cables. The Properties window auto-populates with new data during the AutoDiscovery process.

For automatic asset management, users can link device shapes through ODBC to any ODBC-compliant asset database. The Property Reporting Wizard uses data asset fields from network shapes to create inventory lists, bills of materials, and other vital reports. Users can then save this data as a Microsoft Excel spreadsheet for further analysis. Meanwhile, the Network Database Wizard can create a Microsoft Access database from any network diagram. Any changes to the diagram are reflected in the database and vice versa.

Troubleshooting networks

It s not uncommon for network professionals to spend 80% of their troubleshooting time identifying network problems. Critical time is lost while they struggle to pinpoint throughput, latency, packet flooding, and protocol problems using inadequate documentation. Accurate, detailed network documentation can speed diagnosis and shorten troubleshooting time. In addition, documentation can help network managers trace the expected route of data across a network so they can notice early warning signs and prevent breakdowns.

To facilitate troubleshooting, shapes include information such as type of router and which operating systems are on a router. Properties associated with shapes provide instant access to data, such as asset number, purchase date, and vendor telephone number. In addition, Visio 2000 software s exact-equipment shapes enable the professional to examine a close-up view of a rack, showing the actual modules in a chassis (Figure 3).

Updating diagrams automatically

On most networks, change is constant. Accurate, easy updating is as important as initial diagramming. Microsoft Visio 2000 Enterprise Edition provides two powerful tools that help you track and document changes efficiently.

Guided Updating. Using Guided Updating change management technology, network professionals can automatically rediscover a network to note any changes since the last discovery. The Guided Update window displays a list of network components that were added, modified, or deleted since the last discovery, including devices, interfaces, network objects, and data link connections. And, instead of having to overwrite a previous diagram, users can selectively view and update diagrams, retaining the layout and formatting options they applied previously.

New AutoLayout Support. Visio 2000 makes it possible for network professionals to create easy-to-read diagrams automatically from information gathered during the AutoDiscovery process. They can specify a starting point for a diagram (such as a network backbone or router) and the number of router hops they want to include. Enterprise Edition builds the diagram using new AutoLayout technology.

Creating custom reports

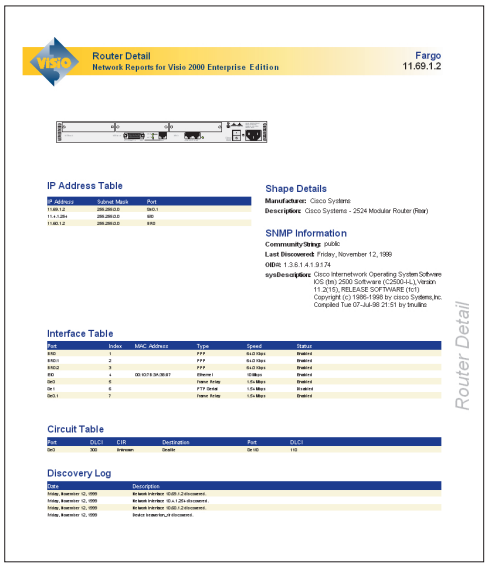

Figure 4: *Network troubleshooting is made easier and more accurate by comprehensive reports on all discovered servers, switches, routers, and other hardware.*

Visio 2000 Enterprise Edition includes a complete reporting module that can automatically turn discovered data into professional documents. Property fields are used to store and automatically generate reports on critical data. Users can quickly inventory IP addresses, summarize frame relay data, or track changes to network topology. Troubleshooters can quickly view a comprehensive report of all discovered servers, switches, routers, and other hardware on their networks (Figure 4). Rapid data collection and scheduled discoveries increase the speed and accuracy of reports. Data can be displayed in 20 presentation-quality reports that are proposal-ready. Users can customize reports with a corporate logo or font or create a bindery of reports, including a table of contents.

Sharing diagrams

Users can print large, wall-sized diagrams of an entire network or a diagram of a single rack. The common file format for all editions of Visio 2000 enables easy file exchange across organizations. Users can easily paste network diagrams into any Microsoft Office document or e-mail message.

Expanded Internet support. The Visio 2000 network diagramming solution includes the ability to save any network diagram in HTML or VML and post it on an intranet or the Internet. Users can create a diagram with several hyperlinked pages that drill down to details about specific devices. Embedding hyperlinks in drawings or reports and posting them on an intranet keeps communication flowing among business managers, engineers, consultants, and vendors.

Facilitating Special Projects

Frequently, IT managers must initiate and complete special projects while continuing daily network maintenance. Special projects might include merging voice and data networks, deploying Windows 2000, or implementing e-commerce initiatives. Visio 2000 network diagrams can help managers clarify processes, plan scenarios, and gain agreement from business decision-makers. Consultants, IT managers, enterprise architects, and executives can reach agreement more quickly when they capture and visualize the processes required to effect an implementation of a new technology.

Deploying voice-over-IP

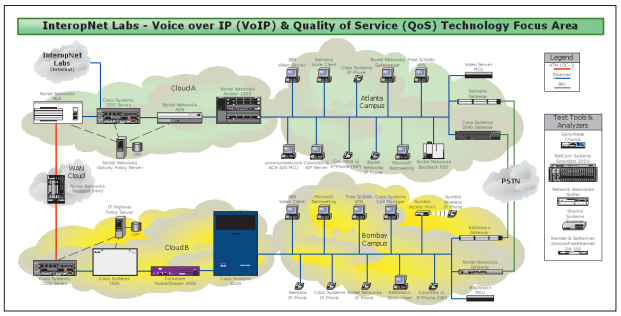

Figure 5: *Visio 2000 IT tools help consultants, managers, network architects, and executives reach agreement by capturing the processes required to implement new technologies like VoIP.*

With the emergence of VoIP technology, voice and data networks are converging. Meanwhile, wireless telecommunication and computer telephony integration (CTI) are changing the way businesses communicate. Planning and implementing these broad-scale changes will require significant changes to IT software and hardware infrastructures. Companies will need solid plans in order to take advantage of the promise of these new technologies.

Using the Visio 2000 AutoDiscovery technology, the organization s existing layer 2, layer 3, and frame relay networks can be documented and high-level network changes designed prior to implementation (Figure 5). Then, the planning team can drill down to detailed plans that use thousands of manufacturer-specific equipment shapes from leading network and telecommunications vendors. As new equipment is installed, diagrams can be selectively updated as often as necessary using Guided Updating change management technology.

Deploying Microsoft Windows 2000

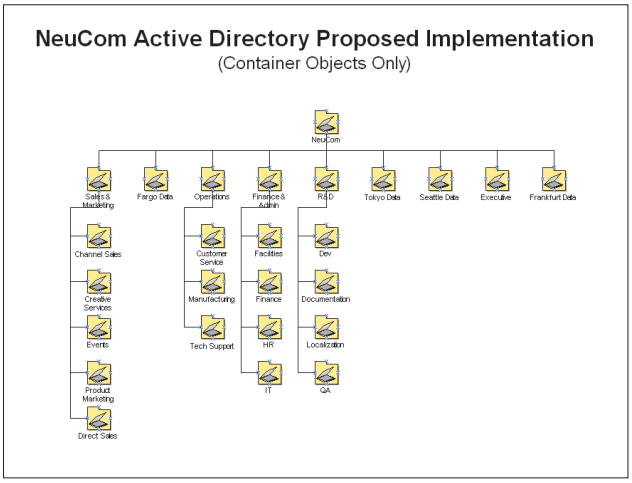

Figure 6: *Organizations can use the powerful AutoDiscovery technology in Visio 2000 to create a comprehensive drawing of existing directory and domain structures, and then export the information to create a directory services database in Active Directory.*

One of the most complex challenges facing today s IT teams is migrating to Windows 2000 and its Microsoft Active Directory service. The new technologies present a wholly new way of organizing and managing a network. Good planning tools that enable users to understand their current directory structures will be critical to a successful upgrade. Well-managed organizations can use the powerful AutoDiscovery technology in Microsoft Visio 2000 to create a comprehensive drawing of existing directory and domain structures (Figure 6). Visio 2000 can then export information in the drawing to create a directory services database in Active Directory. Thereafter, Windows 2000 administrators can use the Visio 2000 drawings to collaborate, update, and manage the implementation.

Supporting e-business goals

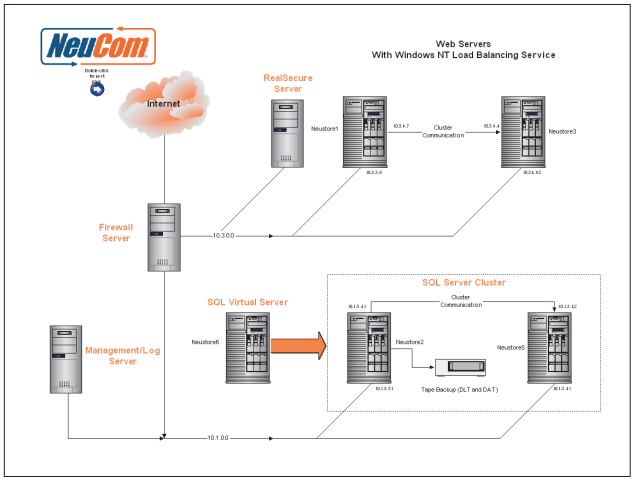

Figure 7: *The Visio 2000 solution enables IT professionals to design networks specifically for handling e-commerce transactions and Web activity. An implementation team can create detailed drawings of the Web, database, software, and network architectures that will support e-commerce.*

Most companies are including e-commerce businesses in their long-term strategy. IT groups who are charged with making e-business possible must collect business requirements and translate them into a supporting technology infrastructure. Even a basic e-commerce infrastructure will include Web-based applications for customers, transaction-control applications, database integration, firewalls, and additional hardware to manage the activity. In order to visualize these radically new business processes, organizations need tools that can easily depict the relevant network and directory services structures, and that can help them plan the hardware needed to support the e-business systems.

Visio 2000 network diagramming tools enable IT professionals to plan networks specifically for handling e-commerce transactions and Web activity. An implementation team can easily create detailed drawings of Web site, database, software, and network architectures that support the process (Figure 7). E-commerce managers can view the activity at critical points in order to prevent hardware overload and system crashes. They can quickly identify broken links, or use enhanced layout options such as collapsible branches to enable conceptual Web site design. Visio 2000 Professional Edition includes flexible Web diagramming with Web site shapes for rapid prototyping.

Ensuring a Clear Return on Investment

Losing track of and mismanaging computer resources costs organizations billions of dollars every year. Meanwhile, effective asset management can cut as much as $2800 from the $7000 in typical hidden annual costs per computer. Network downtime can result in millions of dollars in lost transactions, declining customer loyalty, and damaged reputations. Clearly, maintaining accurate records of an organization s information infrastructure is an economic necessity.

Complex network management tools can cost $50,000 or more. While important and necessary for large networks, these systems provide only rudimentary diagramming tools, are difficult to implement and maintain, and are often proprietary. Microsoft Visio 2000 can be implemented seamlessly, without disrupting network operations for a complex implementation. Network solutions providers can even install Enterprise Edition on laptops to facilitate audits, assessments, and implementation of new designs. And Visio 2000 is the ideal complement to a network management system.

Visio 2000 is designed for easy, cost-effective deployment across large enterprises. And Visio 2000 network diagrams can be shared across the Visio 2000 product line. It is delivered with the latest Microsoft Installer technology and is compatible with Office 2000, Office 97/98, Windows 95/98, and Windows NT® 4.0. Visio 2000 integrates with Microsoft BackOffice®, delivering intelligent diagrams linked to existing corporate data. This type of integration ensures that network diagrams can be accessible to an entire enterprise, converting the data in drawings into valuable corporate assets.

Saving time with enhanced usability features

Microsoft Visio 2000 is the most scalable Visio release to date. The redesigned Visio 2000 drawing engine makes it possible to diagram even large IT systems.

The Visio 2000 streamlined work environment helps users work more efficiently, with customizable toolbars, Microsoft Excel-like page tabs for easy navigation in multi-page drawings, pop-up shape tips, single-click color schemes, and real-time editing feedback. Reorganized stencils make locating a specific shape easier. Dynamic page-sizing allows users to stretch pages as they work. And new support for larger drawings allows users to document even the most complex networks with thousands of shapes.

Three auto-hide windows place key functionality where it s most needed, near the shapes. The Properties window allows instant-editing of asset tags, model numbers, and other data stored in shapes. The Drawing Explorer window facilitates browsing in diagrams. The Pan & Zoom window enables easy navigation in large diagrams.

Leveraging existing network diagrams

Many organizations have built a valuable library of electronic drawing files. Visio 2000 can import existing Autodesk AutoCAD DWG and DXF and Bentley MicroStation DGN files, as well as Corel CMX, CorelFLOW, CorelDraw 3-7, Micrografix, and Windows Draw files. Visio 2000 products can also import from and export to all common graphics formats, including AF2, AF3, AI, BMP, CDR, CFL, CGM, CMX, CSV, DIB, DRW, DSF, DWG, DXF, EMF, EPS, GIF, IGS, JPG, PCT, PCX, PNG, PS, TIF, and WMF formats.

With the Microsoft Visio 2000 solution, network managers can:

- Take advantage of existing Windows-based workstations and knowledge.
- Avoid purchasing special graphics hardware or difficult drawing packages.
- Increase productivity though intelligent drawing tools and automation.
- Improve data collection through links to other systems management software.
- Build custom automation solutions using built-in copies of Microsoft Visual Basic® for Applications 6.0.

Visio 2000 is Euro currency-ready. And because Visio 2000 products are easy to learn and use, IT teams can begin planning and documenting networks with little or no training.

Conclusion

Microsoft Visio 2000 s award-winning[2] diagramming solutions offer more than network diagramming. They enable IT professionals to document existing networks automatically, design network enhancements, enhance proposals with professional diagrams, monitor network performance, and handle troubleshooting and maintenance with unprecedented ease. Visio 2000 technology has become the standard for diagramming networks around the world. In fact, The NetWorld+Interop network operations team uses Visio 2000 technology to document their tradeshow networks.

In addition to the network documentation and reporting described in this paper, Visio 2000 allows users to create clear hierarchical diagrams of directory structures to help them plan and manage directory-enabled networks efficiently.

For more information

To learn more about Visio 2000 Professional Edition, Visio 2000 Enterprise Edition, and Visio 2000 Network Equipment, visit **www.microsoft.com/office/visio**.

1 *http://www.infonetics.com/*

2 *1999 Data Warehouse 100 (November 1999); Software Development Jolt Hall of Fame Award (May 1999); Network Magazine s Network Design Product of the Year (April 1999)*