

# **Why Be Dumb?**

## **Network Computers as Replacements for AS/400 Terminals**

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## Introduction

*Dumb terminals* is the unkind—but commonly used—name for the devices that millions of people still use to interact with computers. IBM, which has sold millions of dumb terminals, prefers nicer names such as *fixed-function* or *non-programmable terminals*. Even IBM's marketing police can't stop the technicians inside its own development labs from calling terminals *stones*—a blunt reference to their low level of on-board intelligence. Regardless of what they are called, millions of people still use these utilitarian devices to deliver information to their desktops.

No one knows exactly how many ordinary terminals are still being used with AS/400 computers. There are certainly over 5 million in use and possibly more than 10 million. Most use the 5250 communications protocol that was designed specifically for the AS/400 and its predecessors. Some use the less sophisticated ASCII protocol. There are even a few cases where AS/400 owners have attached 3270 mainframe terminals to AS/400s through external controllers.

Over the past twenty years, the sale of 5250 terminals has been a nice business for IBM. In recent years, new sales have been declining in favor of PCs. By 1996 the designers in charge of 5250 terminals realized that AS/400 owners wanted devices that would offer the graphical interfaces of PC applications without all the attendant cost and complexity.

The answer appeared to lie in evolving 5250 terminals into devices similar to the X terminals used with many Unix computers. This would involve including a microprocessor in these new devices, but allowing the AS/400 to continue to handle data storage and most of the application processing.

During the same period of time, two other developments were rocking the world of information technology: the evolution of the Internet/World Wide Web and Sun's Java language. Industry visionaries all quickly came to the conclusion that the Web and Java would make an entirely new style of computing possible. A similar line of thinking was embraced by Oracle, Sun, IBM, Netscape, and many others: a new network computing model would shift an increasing percentage of data storage and processing into a vast network that would one day link most of the world's computers to each other.

An important part of this vision is the concept of the network computer or NC. This new class of device will provide the functionality of PCs without the cost and complexity that now accompanies them. NCs include a display, keyboard and mouse, and a control unit built around a powerful microprocessor. Anything else is optional such as disk drives, backup devices, printers, and CD or diskette drives.

The advanced capability of NCs comes through a high-speed network connection to local servers and to the Internet. The Java language provides a way to get sophisticated software applications delivered to NCs as they are needed through a network.

The concept of network computers was in its formative stages when IBM's 5250 development team presented their plan for a new device to Bob Dies, then the AS/400 Division General Manager. He recognized that the new intelligent 5250 being proposed was effectively a network computer. Dies began development of the new device based on a belief that IBM was a natural leader for the NC movement. IBM CEO Lou Gerstner became so enamored with the concept that he asked Dies to form a new division to manage the effort.

Given this history, it is not surprising that the resulting product line that IBM calls Network Stations are especially well suited as replacements for AS/400 terminals. Network Stations have evolved to do much more than emulate 5250 terminals and have become the market leader in the early stages of the evolution of network computers.

The goal of this report is to explain to current AS/400 users why network computers now represent an alternative to ordinary terminals that must be understood and evaluated. Because of its unique history, there will be some emphasis on the IBM Network Station, but AS/400 owners should not consider it their only choice. ❖

## Why Be Dumb

During the 1970s and 1980s, the most common way to interact with computers was through terminals. PCs have been steadily taking their place, but there are still tens of millions of ordinary computer terminals in use around the world. The growing popularity of PCs is due to graphical interfaces, the availability of personal productivity applications, and access to the Internet through browsers. The downside of PCs is the high cost of supporting them. The cost of PC computing has thus limited the rate at which PCs are replacing ordinary terminals.

Network computers represent a middle ground that offers some of the advantages of each. NCs deliver much of the capability of PCs, but their cost and convenience are closer to ordinary terminals. The point has been reached where organizations need to consider whether NCs should be their preferred choice when replacing ordinary terminals.

Most terminals in use today are not candidates for immediate replacement. They provide access to applications at a low cost with high reliability. Many are used in situations where anything that costs even slightly more would be unnecessary. For example, a terminal at a loading dock that is used only a few times per day for simple updates or inquiries probably does not need to be replaced.

On the other hand, there are a growing number of situations where NCs need to be considered, including:

- More workstations are needed due to expansion.
- Users are not satisfied with the functionality offered by terminals.
- Existing terminals are being leased and the term expires soon.
- Users would benefit from graphical interfaces to their applications.
- An intranet or extranet is in place or is planned.
- Users need e-mail but don't want the character-based systems offered on terminals.
- Access to the Internet is desirable.
- There is an interest in using Lotus Domino on the AS/400.
- Failure rates or poor performance is unacceptable.
- There is reluctance to expand the use of PCs due to cost.
- Outdated PCs are being used along with emulation cards.

## The Case for Network Computers

It could be dumb to spend more money on dumb terminals at this point in time. For a small additional cost, it is now possible to get a device that will do more in the near term and will be a good investment over time.

In a perfect world, every terminal user could be given a 333 Mhz Pentium II-based PC and access to technicians to help them use it. In practice, the cost of doing so is usually too high, even when less powerful PCs are considered. Even when cost is not the driving issue, there is not always enough technical expertise around to support PCs and their networks.

With network computers it is possible to introduce PC functionality to a new group of users in stages. The initial investment is lower with this approach but just as importantly so are training and support costs.

### ***Running Existing Applications***

The first benefit of network computers is their ability to do a better job running existing applications. For example, applications running on the AS/400 through network computers allow users to have multiple sessions. Users can then get information from multiple screens without having to do passthrough.

### ***Graphical Interface***

Network computers make it possible to add a graphical interface to existing applications, which improves productivity. A new breed of software aids are available that can turn the typical character-filled AS/400 green screens into PC-style point-and-click user interfaces. Doing so does not require rewriting the applications. Leading products that offer this capability include Jacada from CST and J Walk from Seagull.

### ***Web Browsing Software***

Network computers offer Web browsing software. One of the reasons Web browsing has become so popular is that it does not require a PhD in computer science to use a browser. So many people have become familiar with the browser interface that there is a growing trend to use it as the primary way to interact with applications. The common term for browser-based internal applications is *intranet*. When people outside an organization are allowed to access browser-based applications, the resulting system is often called an *extranet*.

### ***Domino***

Lotus Domino has emerged as an excellent tool for creating and managing browser-based applications. Domino is both a language for creating Web-based applications and a body of software for managing the application on the server. Domino is an outgrowth of Lotus Notes; so it is also capable of acting as the server for PCs that have the Notes software installed on them. A large number of independent software vendors have developed applications with Domino as their foundation.

Domino can now run on newer AS/400e computers under OS/400 V4R2. Older AS/400 computers can run Domino on the optional Integrated PC Server (IPCS) coprocessor cards that can be installed on many AS/400 models. Either way, Domino gives AS/400 computers a leading-edge capability as the server for applications that use a Web interface. This in turn makes it more attractive to use NCs as AS/400 workstations since the world of Domino applications is now available to the AS/400 community.

### ***E-mail***

At the moment, the most popular use for the Internet and browsers is e-mail. By replacing terminals with NCs, an organization increases the number of browser-based devices. This in turn can make it easier to get everyone to use e-mail. Terminal-based e-mail is available but is not nearly as attractive as Web-based e-mail. This is especially true if the people sending e-mail want to attach documents that require a PC to read. With NCs the full Internet-based

e-mail experience is available including the ability to embed Web addresses within a message.

The enhanced e-mail capability of NCs alone can justify their use as terminal replacements. The e-mail capability included within Domino is the most popular and advanced one on the market. It is very easy now for AS/400 users running OS/400 V4R2 to move up to the best there is without spending a great deal.

### **Save Space**

It doesn't always matter, but NCs take up a great deal less space than PCs. With an NC, each person has a customized workplace that can be accessed from any device. This is a great advantage when workers move around a department, building, or facility and need to get access to their desktops.

#### **CATweb Navigator: A True Network Computing Solution for CAD/CAM Environments**

Explosion of interest in the Internet has led virtually every major company to create an Internet presence in some capacity. From developing a Web site to providing information to potential customers to selling products and services through electronic commerce, most businesses today recognize the value of the Internet.

The Internet, however, has not been as helpful for those who want to use it in conjunction with designing or accessing CAD/CAM systems. Those that need to access CAD/CAM models must either use a heavily loaded PC to download all the parts of a complex assembly or model—literally hundreds of megabytes worth of data and files—or use a PC or network computer with plug-ins to view what only amounts to a static image.

CATIA has long been IBM's worldwide CAD/CAM product that generates digital 3D engineering images. In October 1997, IBM introduced CATweb technology and literally opened up the doors of CATIA to the Internet. There is no other product on the market today like CATweb that gives network computers that are loaded with a Java-enabled browser the ability to dynamically view CAD/CAM images without plug-ins.

CATweb Navigator works with CATIA to generate images that can be accessed over the Internet/intranet/extranet by a NC. Using CATweb Navigator, any user can access and manipulate CATIA data from anywhere, at anytime, in seconds. With CATweb Navigator Version 2, a NC can dynamically access a CATIA 3D assembly or model for remote viewing, manipulation, and query. Even hyperlinks attached to models can be used to access other Internet objects. CATweb Navigator allows a NC to access what is essentially a photograph or snapshot image and allows new views to be generated on the fly in seconds.

Not only is CATweb Navigator an elegant solution for NCs, it is also a global one that dovetails perfectly with IBM's e-business solution. Many NCs, located all over the world, can view the same CATIA models and information at the same time through CATweb Navigator. If a CAD/CAM design is changed just minutes prior to access by a client, the image will reflect the change.

CATweb Navigator enhances the value proposition of the NC because:

- Users can access designs in realtime, thereby saving the high costs associated with changes made after the fact as well as missed deadlines.
- Ease of use allows non-engineering types to successfully use the product.
- Security risks are diminished.
- A higher quality product can be generated because current data is being used.
- Images can be accurately viewed when a reviewer sign-off is needed.
- The concern for version control is significantly reduced.
- There is no application software that needs to be maintained on NCs.

- NCs are considerably less expensive than PCs to purchase and maintain. ♦

## The Java Connection

A network computer can be thought of as a stripped-down PC whose permanent storage, external devices, and software are provided by servers. Sharing storage and devices not only saves money, but it vastly reduces support costs. The software that NCs use is stored within the network and sent to them as needed. The Java language developed by Sun Microsystems is gaining rapid acceptance as the best mechanism for distributing software through a network to NCs and PCs.

Most, but not all, network computers can run applications written in Java. For example, the IBM Network Station model 1000 offers an integrated Java capability. The less expensive model 300 can run simple Java applets and applications, such as browser add-ins, but cannot run Java-based GUI applications. Spending a little extra for a NC with Java capability will usually be worth it in the long run.

Java is one of the most exciting developments ever in information technology. It holds out the promise of writing software once that can be run on any computer. Java has wonderful potential. Currently, only a small number of industry-strength production Java applications are on the market, and their performance tends to be slower than those written in other languages.

Lotus e-Suite is one of the first major Java applications to become available. e-Suite provides developers with a set of Java personal productivity applications that can be integrated with other software.

As the number of Java applications increases, the value of network computers will increase. Applications written in Java are stored on servers and then sent through the network to other computers as needed. By design they do not require that the remote computers have disks or other permanent storage devices. Both the logic and any data needed are included in the Java applets that are sent through the network.

The invention of Java led directly to the concept of network computers. If a universal language were available that could work with intelligent devices that were much simpler than PCs, then why not develop a class of devices just for this purpose?

### Food Processor Begins Conversion to Network Computers

Changes in production plans happen daily at Winona, Ontario-based E.D. Smith. This fine fruit and sauce processor found that fixed-function terminals limit communications between employees who rarely see each other in around-the-clock operations. The company's production and administrative operations are spread over several buildings. E.D. Smith has found that its system—an IBM AS/400 linking about 165 fixed-function terminals, 80 PCs, and 30 printers—does not meet its information needs. The company is in the process of replacing all of its fixed-function terminals and some PCs with IBM Network Stations.

The switch to network computers will allow everyone to use Office Vision/400 to communicate all manufacturing and quality information between shifts and between buildings. Employees also won't have to run from dumb terminals to PCs in order to view faxes. Beverly Russell, Director of Information Systems at E.D. Smith, commented, "By connecting network computers to our AS/400 server, we get centralized configuration, and we also eliminate concerns about various versions of software, different drivers, and viruses." Russell anticipates that the payback on network computers will come within a year. With NCs, workers can access their own desktop and user preferences from any machine anywhere in the plant. The lack of moving parts makes the NCs ideal for the plant floor, where, says Russell, "...the hardware we're currently using occasionally gets a tomato-sauce bath." ♦

## What About Windows Applications

When all popular applications are available as Java applets, then NCs will be able to do everything that PCs can. Since that will not be the case for a number of years, it is important to understand the other alternatives available for running non-Java applications on NCs. Applications written to interface with browsers can, of course, run on NCs today. Those written to run on PCs under one of the Windows operating systems are a different story.

It has been possible for some time to run Windows applications on a server and have the application interface provided at an intelligent workstation using a middleware product from Citrix called *WinFrame*. There are currently a number of limitations to this approach. At this time WinFrame only runs under Windows NT release 3.51. The newer NT 4.0 release is not yet supported. Windows 95 applications can be run under WinFrame; however the user interface currently provided by WinFrame looks more like Windows 3.1 than Windows 95. This may create the need for a small amount of retraining of anyone used to Windows 95.

Microsoft is working on a new product, called *Windows-based Terminal Server*, that should overcome most of the current limitations of the WinFrame approach. The code name for this project was *Hydra* before beta testing began late in 1997. Microsoft plans to make Windows-based Terminal Server (a.k.a. Hydra) available by the end of the second quarter of 1998.

Windows-based Terminal Server was created by Microsoft as an extension of WinFrame. Microsoft licensed the Citrix technology in order to do this. It will run under Windows NT 4.0. The Windows-based Terminal Server interface will resemble Windows 95 and will be compatible with the Windows 98 operating system due for release later this year.

When the technological dust all settles over the next few months, it will be possible to run Windows applications on NCs without the annoying past limitations. A server running NT 4.0 will be required as the host for the Windows applications. This can be either a standalone Intel-based server or an Integrated PC Server within an AS/400.

### Wiring Manufacturer Connects with Network Computers

Group Dekko, a manufacturer of pre-wired electrical circuits, has installed IBM Network Stations to replace aging 5250 terminals. Group Dekko uses 20 networked AS/400 business systems to operate its more than 50 manufacturing facilities in the US, Canada, and Mexico. Before the replacement with Network Stations, workers accessed the enterprise manufacturing package on the AS/400 through 5250 terminals running on the shop floor.



Director of MIS Chris Edwards felt that replacing the terminals with PCs would be too expensive. Rather than simply getting new terminals, Edwards chose the network computers because of their flexibility. Edwards said that the Network Station provides workers with "...multiple 5250 sessions and multiple windows, plus a pathway to the Internet and Java applications. And its ruggedness makes it ideal for a shop floor environment like ours." Group Dekko users also appreciated the network computer's graphical user interface, since they look at the screen all day. The improved color and screen resolution are much easier on the eyes.

Edwards estimated that the company could cut maintenance costs by about 70% since administration is done centrally at the server. He is now moving to replace PCs with the Network Stations. ♦

## Where's the Catch?

In a short period of time, network computers have progressed from a visionary dream into a viable working product. While network computers are still a work in progress, they are ready for serious consideration right now, especially as replacements for ordinary terminals.

As a relatively new concept, network computers still have limitations. In many cases, these limitations will be resolved relatively quickly as is the case with the ability to run Windows applications under NT 4.0. Other current limitations include:

- *E-mail*. Not all popular e-mail systems are yet supported. Within a matter of months this should cease to be an issue.
- *Browsers*. Today network computers tend to offer the Netscape Navio browser, Sun's HotJava browser, the browser built into Lotus e-Suite, or other specialized browsers. The two most popular browsers, Netscape Navigator and Microsoft Explorer, are not yet available on most network computers.
- *Plug-ins*. The capability of browsers is often supplemented by additional code called *plug-ins*. The browsers offered on network computers do not currently tend to support browser plug-ins.
- *Twinax connectivity*. At this point, the IBM Network Station cannot be attached to an AS/400 using twinax cables. This feature is, however, likely to become available by the end of the second quarter of 1998.
- *Fonts and colors*. The software that controls many network computers currently offers a limited number of fonts and colors, making the appearance of applications less attractive than PCs (but still much better than dumb terminals). This issue will diminish rapidly as new software releases become available.
- *Java performance*. Applications written in Java do not currently perform as rapidly as those written in other languages.
- *Mobile computing*. Laptops, hand-held computers, and other mobile devices cannot easily be replaced with network computers.
- *Device support*. CDs, diskettes, and tape drives can be made available to users from the server but are not usually directly supported by network computers.

## What to Do

The main purpose of this report has been to increase awareness so that AS/400 owners at least consider network computers when deciding which workstation should be provided to

users. Once the decision-makers are aware of the basic issues surrounding network computers, it will make sense for them to take some of the following actions:

- *Stop buying new terminals.* This does not suggest that all existing terminals require immediate replacement, only that money spent on new terminals might be better spent elsewhere.
- *Think hard before buying more PCs.* A certain number of full-function PCs are needed in almost every organization. The question is whether everyone needs one. NCs now offer a nice middle ground between PCs and terminals.
- *Do more research.* It is easy to follow the rapid evolution of network computers. The Web is filled with useful information, and trade journals constantly cover the subject since it is of interest to so many people.
- *Talk to a dealer.* Network computers are almost always sold through dealers, rather than direct sales people or retailers. Most dealers can provide useful information on advantages and disadvantages. Dealers all sell PC products as well so that they will tend to recommend network computers only if they are appropriate.
- *Try a few.* Network computers are not very expensive. Given the potential benefits and savings, it makes sense for most organizations to buy a few and try them out.

This report is meant as a general introduction to the subject of network computers for the AS/400 community. D.H. Andrews Group will be writing a more detailed and technical report on this subject in a few months. We have taken our own advice and are conducting a test ourselves that includes a beta version of Microsoft's Windows-based Terminal Server. The next report will cover the coming avalanche of software and hardware improvements that are due in the second quarter of 1998.

### **Construction Firm Builds Network Computer Base**

At the Fort Wayne, Indiana, headquarters of the construction engineering firm Shambaugh & Son, network computers are becoming a common sight. Users there are accessing AS/400 business applications as well as PC server applications through IBM Network Stations. The company, which has branches across the US, had decided to replace terminals with the network computers because they provide low-cost access to multiple servers simultaneously.

Kevin Dunn, Information Systems Manager at Shambaugh, was happy to avoid the cost and maintenance of replacing terminals with PCs. "Upgrades that require software installation at several workstations with a personal computer network can be centralized at the server with a network computer system," says Dunn.

Easy access to the Internet is another benefit of network computers, especially for retrieving up-to-date information on product specifications and pricing. Moving away from green screens has also allowed Shambaugh to access graphical spreadsheets, word processing, and more user-friendly e-mail. ♦

## **Summary**

Network computers and the AS/400 were made for each other:

- Network computers require a reliable, high-function server.
- IBM's Network Station was designed in IBM's Rochester laboratory as a 5250 replacement.

- Both focus on simplicity and ease of use.
- Many AS/400 owners now limit the use of PCs because of cost/complexity.

In the near term, NCs can provide value through added functionality, mostly through the browser capability. In the longer term, the value of network stations will increase as Java applications become commonplace and as Windows-based Terminal Server makes it possible to run PC applications.

What does *not* make sense today is investing more in terminals: buying additional ones, extending twinax wiring beyond where it is currently installed, renewing leases for 5250s, or buying more PCs in situations where NCs would be more than adequate.

In addition to IBM, several vendors sell NC hardware including NCD (Network Computing Devices), Wyse, Neoware Systems, and Sun. IBM has clearly staked out a position as the current market leader. One reason is that IBM is less interested in the profit it might make on selling the NCs themselves than in promoting the concept of network computing. IBM is not doing this for the general benefit of humankind, but because it is good business. What IBM might give up in margin on the workstation when customers select NCs will be more than offset by the opportunity to sell more server capacity, middleware, and services.

Oracle is following the same logic—they are not interested in profits from hardware sales but care deeply about the impact of the new network computing model on the industry. Both organizations feel that everyone can win in a larger market.

NCs will not always be a better choice than terminals or PCs. Each has a profile of strengths and limitations. NCs are most likely to be selected over dumb terminals in situations where:

- Graphical interfaces are preferred.
- Improved internal communication is desirable.
- A Web browser interface will be useful.
- Personal productivity applications are not heavily used.
- Increased functionality will improve productivity.

NCs may be preferable to PCs where:

- Total cost is an issue.
- Many people are all doing the same thing, such as in a call center.
- Access to technical support people is limited.
- Users have a low tolerance for dealing with technological problems.
- Applications are or could be written in Java.

If any of these conditions are present, network computers are an option worthy of consideration. \*

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### About D.H. Andrews Group

For over 13 years, D.H. Andrews Group has been helping organizations make more effective use of computer technology. Much of the consulting practice focuses on replacing older applications with newer and more effective ones based on a mix of technologies including PCs, AS/400 systems, Unix computers, and mainframes. D.H. Andrews Group has pioneered the development of management techniques to speed up the implementation of improved applications.

D.H. Andrews Group helps organizations plan their use of information technology and then assists in the implementation of new systems. We are also widely recognized for our clearly written computer industry reports on current technologies including client/server, LANs, networks, Internet computing, and the IBM AS/400.

### D.H. Andrews Group Reports

D.H. Andrews Group has been a leading independent publisher of computer industry reports since 1987. Over 800,000 copies of our reports have been published in a variety of languages including Italian, German, Japanese, Korean, Dutch, and Danish. Recent reports include *IBM's Server Strategy*, *Lotus Notes And Domino*, *IBM's San Francisco Project: Java Building Blocks for Business Application Developers*, *The Internet Impact*, *AS/400 Grows Up*, and *Why Buy A Network Computer Today*.

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