THIN CLIENTS, TCP/IP AND THE CHANGING FACE OF THE AS/400

A Perle Systems Discussion Paper.

perle
Essential Network Connectivity

CONTENTS

Thin Clients. Why All The Fuss?

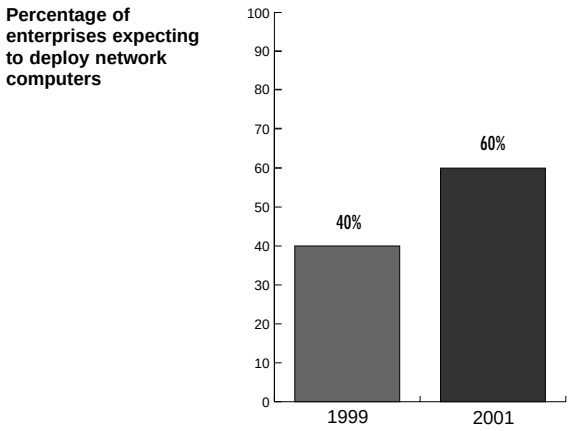
There's certainly no shortage of material covering the debate on thin client computing. It's a subject that has been eagerly embraced by the computer press, publicly waging the "battle of the bulge", as today's fat solutions cross swords with a slim new generation of open systems.

But are we really witnessing the dawn of a new technological era or is this simply a small storm in a cup of Java? Unfortunately, only time will tell. Changes in the dynamics of the marketplace, user requirements and the new technologies involved could mean that the pendulum swings either way. Meanwhile, many of us need to make decisions today that will influence the shape of our businesses tomorrow. Practical decisions involving programming languages, network configurations, communications protocols and remote network access. Java or RPG? Ethernet or Token-Ring? TCP/IP or SNA? Routers or remote controllers? And in a market that appears to be becoming more and more polarized, the pressure is on to make these choices now.

So, should you join the weight-watchers, or do you feel comfortable staying as you are? The Gartner group estimates that by the year 2001, 60% of all enterprises will be using Network Computers (see figure 1), while opponents of thin clients see them as nothing more than a return to dumb terminals, too big for their bandwidths and supported by a programming language that is limited and unproved.

Figure 1 - Growth in NC Deployment

(Source Gartner Group)



But, perhaps this whole issue is not actually about taking sides, or making black and white choices. Maybe we still don't have enough information about thin clients to make any binding decisions about our future. It could be that the best position will be taken by those who prepare for the future without abruptly abandoning the tried and tested foundations of existing structures. When the future of a market is uncertain, flexibility quickly becomes a strength.

This discussion paper sets out to address the implications of Open Network Computing in an AS/400 Area Network. It takes a look at the variety of computing choices that come under the thin client umbrella, examines the critical role of TCP/IP in the open systems debate and discusses the position taken by IBM with regards to the thin client revolution.

Universal Access. It's What Open Networking Is All About.

Today, Universal Access has become a critical component of network architecture. A fact of everyday life for organizations of all sizes, in every sector, as timely access to business-critical applications and data becomes essential to maintain a competitive advantage.

Central to this market explosion is the most famous example of a Wide Area Network, the Internet, which in turn has led to corporate offspring in the shape of intranets and extranets. The key to this more open and distributed style of communication? The replacement of proprietary protocols by TCP/IP, the Internet protocol, which has also become the protocol suite of choice for most corporate wide area networks. And now, thin clients, which are typically TCP/IP-based devices, seem to be setting the stage for the next step in the evolution of this network architecture.

So, What Is A Thin Client Anyway?

Thin clients are simply information appliances, with no more brain than your average microwave, until they get paired up with a network server and start downloading, with the aid of programming languages like Java. They are plug-in-and-away-we-go devices that rely on 'central' intelligence to function and put themselves forward as a simpler and more cost-effective alternative to the more independent style of PC computing. Think of a thin client as a kind of "shape-

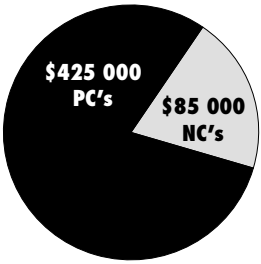
shifter"; powerless alone, but particularly effective once it's assumed the body of the host.

A thin client, we are told, will be cheaper to purchase than a PC. Its total cost of ownership will be lower, because it will be configured, managed, maintained and upgraded centrally, (see Figure 2). And overall security will be significantly improved because, without an integral hard drive, information cannot be removed or added through the appliance itself.

Figure 2 - Comparative costs NC's vs PC's

(Source Gartner Group)

Total costs associated with operating 10 NC's vs 10 PC's over 5 years



A thin client is basically a graphical appliance that grants high-speed access to a variety of graphical applications such as web pages, a corporate intranet or extranet and Lotus Notes. It also provides terminal-emulation for 5250 and 3270 environments and, if the market continues in its current direction, it will develop its Java-based enterprise-wide solutions, such as executive information systems, word processors and spreadsheets, for consumption by an ever widening audience.

The thin client/server computing arena can be a little daunting, with the term "thin client" referring to a number of different approaches to this workgroup style of computing. For the sake of clarity, we'll take a look at them here:

Web Browsers

The trend towards universal clients results from the success of the Internet and, at its most basic level, the function of a thin client is to send and receive e-mail and to access the World Wide Web, without the expense of a stand-alone computer purchase. Using web browsers, applications are accessed on a simple aim-and-shoot basis. And, because web browsers can run on a wide variety of computer platforms, they are viewed as a universal user interface.

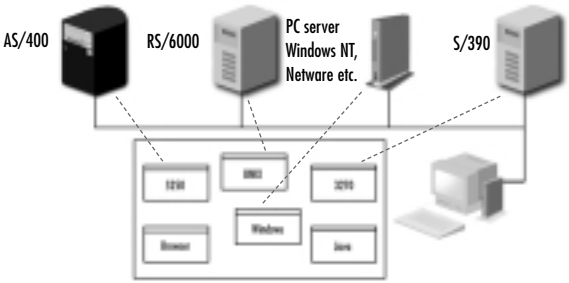
Windows Terminals

These allow users to run Windows applications on a central server and display them on the client screen. This type of thin client will usually be connected to a single Windows NT host, running all applications. Web browsing, running Java and access to mainframes and minicomputers can be achieved via the Windows NT server.

Network Computers

NCs enable users to run a multitude of thin clients such as web browsers, telnet sessions (TN5250, TN3270) Java clients etc. from their desktops, to access mainframes, AS/400s and other servers, (see Figure 3). They are distinguished from windows terminals by the location of their applications. NCs actually run all applications locally, after downloading them from a boot server.

Figure 3 - NC's allow users to access multiple servers & hosts



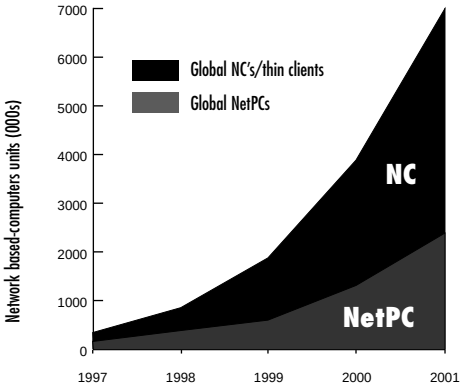
NetPC's

Essentially a slimmer version of the PC, the NetPC was initially developed by Microsoft, in response to the thin client movement. Just like other thin clients, the NetPC has no obviously accessible upgrade slots or floppy disc entry. The difference is that it runs the Windows operating system and Windows applications on its local processor.

Research shows that the NC and the NetPC are the front runners in the thin client appliance stakes and that the NC will likely win out in overall shipping

volumes. Together they will enjoy a healthy increase in units shipped, rising from just under a million at the beginning of 1998 to over 7 million by 2001 (see Figure 4) accounting for over 11% of all desktop systems shipped.

Figure 4 - NC growth expects to exceed NetPC growth (Source Datamonitor)



Universal Access And Thin Clients. The Missing Link.

Through a thin-client desktop, users achieve effective and efficient universal access to all corporate resources, whether they are intranet, extranet or Internet-based. However, to bring thin clients to the desktop, a TCP/IP backbone must first be implemented and this will of course have far-ranging implications in the traditional SNA-centric AS/400 environment.

So, lets turn our thoughts to the relatively youthful transmission protocol, TCP/IP and see how it's measuring up to IBM's old-timer architecture, SNA.

TCP/IP, From Rags To Riches.

The origins of TCP/IP date back over twenty years to a US Defense Department project which sought to achieve interoperability between diverse vendor systems. When the Defense Department subsequently specified TCP/IP support as an essential part of any equipment purchase, computer system vendors began to offer it on virtually every commercial computer system. Alongside this, TCP/IP also served as the network architecture for the Internet and for the majority of UNIX

systems. However, at the time, the Internet was largely unknown and unused and UNIX was not widely distributed. TCP/IP consequently remained in the background for years.

With the growth of the UNIX operating system and the explosion of the World Wide Web, TCP/IP has since matured into its current position as the de facto standard for wide area networking, evolving from a limited range of interoperability services to a full protocol suite for enterprise networks. Both IBM and Microsoft have responded by integrating TCP/IP into their network designs.

The TCP/IP Attractions.

Advocates would argue that TCP/IP wins out over proprietary SNA in a number of different ways :

- TCP/IP has a broad-based appeal. It is the basis of the Internet, the most successful Wide Area Network in the world.
- TCP/IP is the foundation of today's thin clients and therefore the basis of a truly open system of communication.
- TCP/IP's Internet Protocol reaches further, more flexibly than any other protocol. Routing packets just about anywhere on earth over the global Internet, it doesn't have to resort to pre-planned paths. IP simply finds its own way.
- TCP/IP networks are easy to configure, manage, maintain and scale, have good error-detection and recovery mechanisms and because of the market maturity, associated hardware and software products are competitively priced.
- TCP/IP's networking role is growing, while SNA's limits itself increasingly to central server applications only.

And The Drawbacks?

From a client perspective, the arrival of TCP/IP is generally welcomed. For an information system manager or network administrator, the implications can run

much deeper and the choices are likely to be far more complex. In an enterprise where SNA applications are still critical to the operation of the business, it may continue to run parallel to the newer TCP/IP applications. On the other hand, a business commitment to a more open and distributed strategy may result in a complete replacement of SNA by TCP/IP. Whichever way you look at it, SNA and TCP/IP are two very different forms of connectivity and migration from one to the other can cause potential difficulties for both the remote user and the network manager.

What About SNA?

Systems Networking Architecture was originally built for enterprise use and has proved itself to be a reliable and manageable way of running large WAN's. It is a centralized, hierarchical networking scheme that describes unique roles for different components of the system, providing efficient service to networked applications. SNA was originally developed for the mainframe marketplace. The next generation of SNA, referred to as APPN (Advanced Peer-to-Peer Networking), has inherited many of its predecessor's features and is now a standard feature of the AS/400 environment. This process of evolution has developed SNA into a networking architecture that embraces both traditional, centralized mainframe networking and modern, peer-orientated networking. Opponents of SNA and APPN would disagree, suggesting that they are both outdated legacy architectures, whose days are numbered. Supporters retaliate with the claim that SNA has worked for years, and offers businesses reliability, performance and data security that TCP/IP simply cannot match and that its role will simply evolve further to reflect a changing networking marketplace.

TCP/IP. Takeover Or Integration?

As multi-vendor solutions proliferate, the need for protocol consolidation nevertheless becomes more pronounced. But how do you decide which way to turn? Standardizing on a single protocol would certainly seem to make things simpler, and TCP/IP would be the most obvious choice. However, when it comes to the AS/400, cutting out SNA completely in favor of TCP/IP will not always be the practical solution. It is important to examine the individual needs of your own business both now and into the future, taking into account the possible turns that the marketplace in general, and IBM in particular, could also take.

Where Does IBM Stand On All Of This?

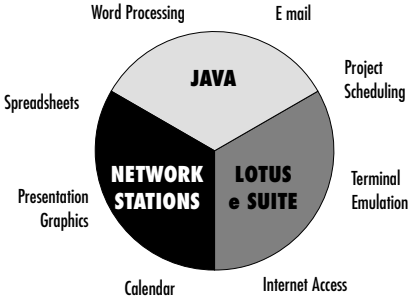
It would seem that IBM has joined the ranks of the diet-conscious and is slimming down as it sets its sights on the world of thin clients. Capitalizing on the inherent strengths of the AS/400 (reliability, scalability, security and a solid database), IBM appears to be grooming its midrange mainstay for the role of server to a new generation of thin clients in a TCP/IP-dominated open computing environment. IBM's move towards the more open systems of the wide area network world of TCP/IP is witnessed in three main areas :

Java Speak
IBM is certainly demonstrating a taste (some would say an addiction) for Sun's Java. The company is putting enormous development resources into the Java programming language, which can now run on an AS/400. Some would say that the safe AS/400 bet is on Java connectivity. And it certainly does appear that any future enhancements of RPG will be limited to those that allow it to co-exist in IBM's new Java-driven application environment. Others favor RPG, stating that no matter how much better Java is in other areas, RPG wins hands down in transaction-processing applications that handle high volumes of business-critical data.

The Domino Effect
Domino is IBM's new TCP/IP-dependent version of Lotus Notes and is another example of an area of considerable investment for the company. Lotus' eSuite WorkPlace offers users a single point of access to the applications they use most often : e-mail, calendar and address books, word processing and spreadsheet programs, presentation graphics and project scheduling, terminal emulation and Internet access and browsing. These eSuite applications are launched from the Lotus WorkPlace desktop environment, which is also a Java application.

Thin Client Development
IBM is a major proponent of the Network Computer solution, attributing significant resource to its own thin client , the Network Station and responsible for a lot of the energy behind the Network Computer movement. As the Network Computer craze enters its second year, IBM's Network Station is already performing competitively for an increasing number of AS/400 customers.

Figure 5 - IBM embraces the open network



IBM, Thin Clients And The Remote User.

Overwhelmingly, IBM has demonstrated its commitment to the new era of thin-client computing and all the necessary developments are being made to ensure seamless integration of these new standards into the central AS/400 site.

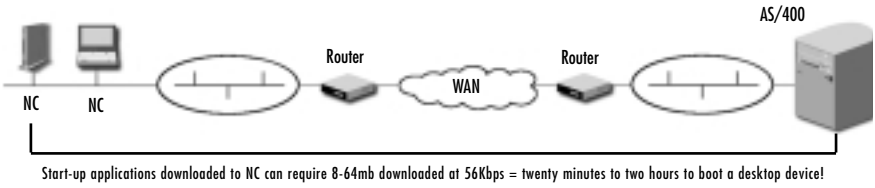
However, in the headlong rush to smarten up the AS/400 for its new role as thin client host, it may be that IBM has focused rather too close to home, on the needs of the LAN, without placing sufficient emphasis on the issues involved in Remote Access over the Wide Area Network, an arena that is after all central to the development of the thin client marketplace.

IBM has so far neglected to address the issue of delivering efficient thin client computing to the outer reaches of the network. That is, making these new open network computing tools accessible to the myriad of remote users attached to AS/400 via WAN links. This is somewhat paradoxical, considering the fact that IBM has historically maintained a significant competitive advantage by providing seamless integration of remote users to midrange hosts via their 5251, 5294, 5394 and latterly 5494 Remote Workstation Controller platforms. These devices have always delivered simplicity, reliability and manageability at the remote site. Something that PCs in a routed network have yet to achieve.

Instead of capitalizing on the success of its Remote Controller solution, IBM seems to have taken the path of least resistance, offering the same solution for integrating thin clients in remote sites that is put forward by the majority of its competitors. This solution demands the wholesale replacement of Twinax workstations with NCs, operating in an IP -based routed network. It gives no

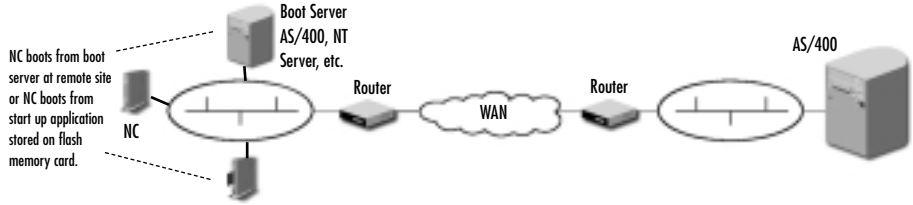
quarter to the investment that users have already made in Twinax, nor does it provide for the efficient and cost- effective deployment of NCs at remote sites. Clearly, it is not practical to download start-up applications over the corporate WAN to NCs installed at remote sites. (see figure 6)

Figure 6 - Booting NC's across the WAN is not practical.



For effective deployment of remote NCs, the IBM solution therefore requires a boot server, with storage and file transfer capabilities, at each remote site. This is far from cost effective. Alternatively, each remote NC must have its own storage capability, to provide start-up applications. This solution is both costly and cumbersome to manage (see figure 7).

Figure 7 - Booting NC's at remote site is not cost effective.



If the NC is to become the natural successor of the Twinax terminal, which currently proliferates at remote sites the world over, then a controller solution that supports NCs as well as Twinax - a Network Controller solution - makes a lot more sense. A Network Controller platform would meet the overwhelming need of the midrange user, for seamless transition from Twinax to thin clients, if it addressed the two key requirements for support of open network computing at remote sites :

1. The routing of IP traffic to and from the remote user

2. The Provision of local boot server functionality for NC's.

THE PERLE 594E NETWORK CONTROLLER.

The strengths of Perle Systems lie in the controller marketplace. And the new Perle 594e offers the simpler and more flexible approach to remote connectivity that is needed by remote users in an open networking environment. As the first Network Controller to support the connection of thin clients in AS/400 environments, the 594e represents a whole new generation of controllers. And, in a marketplace that is as yet undecided on the future of the desktop in open systems computing, the 594e offers a logical route forward, letting users develop their remote sites without having to abandon the foundations of their existing network infrastructures. This is because the Perle 594e is the first and only controller that is built to support a customer's Twinax connectivity needs today and offer integrated IP routing and network computer boot server capabilities for the future. While consolidating the full functionality of Perle's award-winning 494E controller with the all-important inclusion of TCP/IP support for remote users, new components enable the 594e to provide users with a seamless transition to thin client computing as and when required.

Although many AS/400 users are still firmly rooted in Twinax-based environments, they are also interested in selecting products that can provide a future migration path for the deployment of IP clients alongside SNA clients at remote sites. In response, the Perle 594e sets a new standard for AS/400 remote office networking, by letting users take advantage of traditional and future networking options on one integrated platform (see figure 8 below).

The new Perle 594e will allow the typical AS/400 customer to integrate traditional SNA (Twinax and LAN workstations), Network Computers and other IP clients through a single Network Controller platform, without the need for additional routers, FRADs or network computer servers. This highly flexible, low-risk solution consists of three functional components :

- **Workstation Controller**

- Support for up to 168 Twinax devices, up to 160 Ethernet and/or 160 Token Ring LAN users and up to 48 ASCII dial-in users.

- Support for SDLC, X.25, X.21, Frame Relay, Frame Relay bridging, SNA or TCP/IP over Ethernet and token ring connections.

- Support for multi-session/multi-host configuration plus unique, software download capabilities.

- **IP Routing**

- Allows users to route IP traffic from the remote site to a corporate LAN, using Frame Relay protocol.

- Eliminates the need for routers or FRADs.

- Means remote users can access the entire corporate LAN from any IP device (PC, Network Computer, NetPC) running a thin client (e.g. web browser, Telnet, TN5250/3270).

- **NC Boot Server**

- Provides all the local boot server capabilities required by NCs connected to the 594e.

Avoids the significant delays inherent in downloading start-up applications over the corporate WAN to remote NCs.

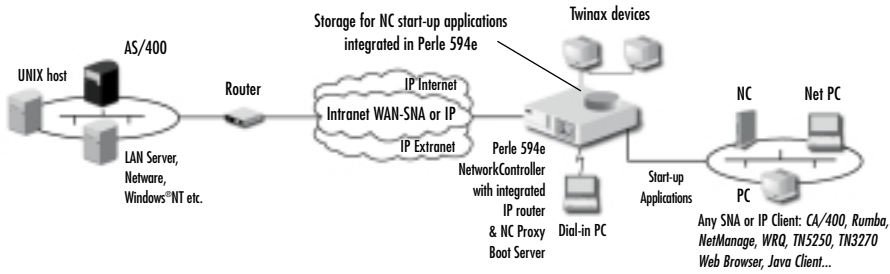
No need to deploy expensive boot servers with storage and file transfer capabilities at each remote sites.

Eliminates the need to incorporate costly and cumbersome internal program storage capabilities in remote NCs.

The Perle 594e, with integrated IP routing and NC proxy boot server capability, overcomes these obstacles and, in doing so, provides an integrated solution that is both more cost- effective and more practical than the alternative solutions, which make use of FRADs and routers or dedicated Network Computer servers.

So, by providing a unique platform for the remote office workspace, the Perle 594e brings all the benefits of the open system computing revolution to the remote desktop, while maintaining the full support for Twinax connectivity that AS/400 users still need today. And, most importantly, it does so in a single device.

Figure 8 - Perle 594e Network Topology



WHERE DO WE GO FROM HERE?

Whether we're talking revolution or evolution, the thin client movement is one that we ignore at our peril. The active participation of the computing giants in the development of open systems computing is reason enough to take note of the changes that are taking place.

If you cut through the arguments for and against the different manifestations of thin clients, there is one unifying factor, and that is TCP/IP. It emerges as the transport protocol of the new millennium, supporting a more open and distributed style of computing over ever widening networks.

Then, if you take a look at what IBM is up to in the AS/400 market, that little red "e" will point you firmly in the direction of thin clients and Java. What it won't do, however, is fully address the issues of remote connectivity over corporate networks.

So, if you're going to cover all your bases, by protecting your investment in existing technology without ignoring future trends, you're going to be looking towards the integration of the Perle 594e. The most flexible and lowest-risk response to the remote connectivity needs of the AS/400 marketplace.

If you would like to know more about the Perle 594e Network Controller, visit our website @ www.perle.com

89-4100