



## **IBM Netfinity ESCON Adapter**

### ***Executive Summary***

Enterprises today carry vast amounts of data and, in enterprises with mainframes, as much as 70% of that data is stored on a mainframe. Servers running business-critical applications have to interact regularly with mainframes to retrieve and update databases and files. Thus it is essential to have the means to conduct efficient, high-bandwidth, quick-response-time and bulk-data transfers between your servers and mainframes.

And in today's rapidly evolving enterprise environment, where IT administrators are decentralizing their assets and centralizing their skills, it is essential that you have complete control over your networked systems to help you reduce the total cost of ownership—from deployment, through physical management and support to retirement or disposal of assets.

Moreover, it is essential to be able to use your stored data in ways that help you increase sales, extend customer reach and identify new business opportunities. To do this you must be able to convert your raw data into "knowledge" through data warehousing and data mining.

To accomplish these goals, it is best to consolidate your LAN-to-mainframe gateways, invest in the optimum and preferred platform for running data warehousing and data mining applications, and use powerful, reliable and function-rich servers. IBM understands your needs and today offers a clear, comprehensive solution: IBM Netfinity® servers and the new IBM Netfinity ESCON® Adapter.

Backing up this solution, IBM's acclaimed service and support programs help keep your IBM Netfinity server systems up and running—and you in business.

This paper provides an overview of the new IBM Netfinity ESCON Adapter and its role in IBM's enterprise solution.

## **Host-to Network Connectivity**

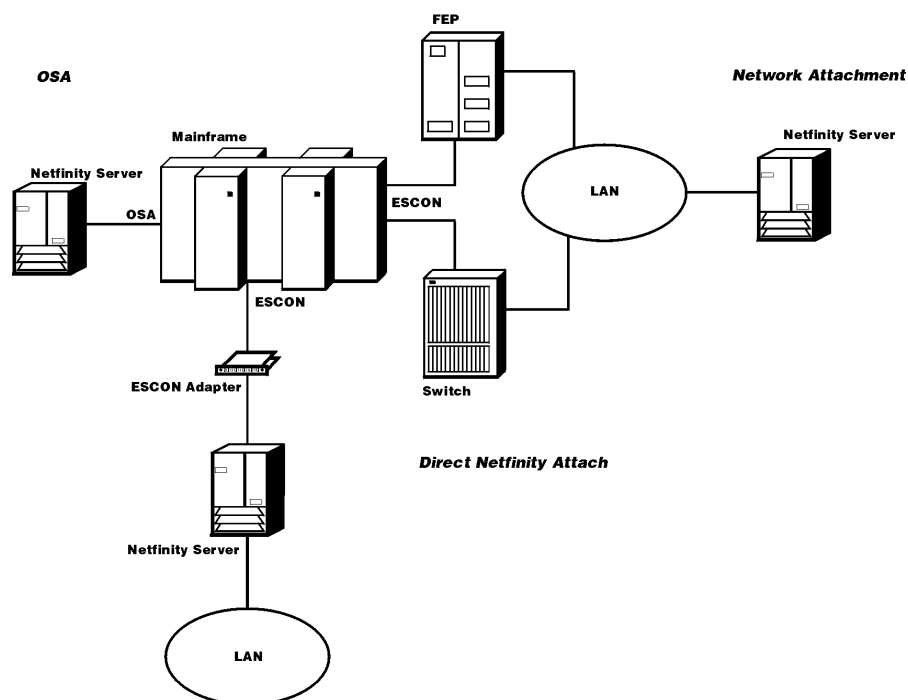
Flexible mainframe gateway connectivity is accomplished in the three following ways, which are illustrated in the figure below.

The primary method employed in the traditional mainframe SNA connection is through front-end processors (FEPs) with attachment to switches and routers as appropriate.

Connection can also be accomplished through open systems architecture (OSA) utilizing Ethernet or FDDI technology.

This paper provides insight into another approach, using an IBM Netfinity ESCON adapter integrated into a Netfinity server and directly channel attached to an S/390® mainframe, as shown in the figure below.

### **Mainframe Connectivity Options**



## **IBM Netfinity ESCON Adapter**

The first to fully implement IBM's Multi-Path Channel (MPC) protocol—called MPC+—the IBM Netfinity ESCON Adapter can improve performance by 40% while reducing CPU cycles by more than 60% over previous ESCON channel protocol (*eNetwork Connection* newsletter, February 1998). It also provides nondisruptive fail-safe recovery. By supporting the ESCON Multiple Image Facility and Director Services, the adapter enables multiple Netfinity users to access multiple mainframes efficiently. Internal buffer memory in this "intelligent board" allows channel activity without continually interrupting the server.

## *The best of both worlds: mainframe-stored data and Netfinity server-based applications*

The ESCON Adapter uses IBM's ESCON Enabler Technology chipset, executes IBM's Internal Code Control Unit Image and utilizes the 32-bit 80960CF RISC Processor. And with an RS232 port for remote support capability, the ESCON Adapter is enabled to coexist with Netfinity Manager™.

Furthermore, as one of the Options by IBM products, the ESCON Adapter is specifically designed, compatibility-tested and optimized for Netfinity systems for easy configuration, installation and setup. Options by IBM assume the term of the on-site, limited three-year warranty on your Netfinity system for seamless coverage.

### ***Channel-attached Netfinity Co-processor***

A Netfinity server running Microsoft® Windows NT® can support up to two of the new 200-Mbps IBM Netfinity ESCON Adapters. Channel attachment is accomplished through the use of PCI bus-based channel-attachment adapters. Each IBM Netfinity ESCON Adapter can support up to 64 S/390 subchannels. Thus it is possible to have up to 2 physically separate channel connections and 128 logical subchannels between the server and the mainframe.

A Netfinity server attached to a mainframe by an IBM Netfinity ESCON Adapter is an excellent platform for high-speed, high-volume data applications. It helps eliminate delays imposed by intermediate controllers and LANs that can significantly slow down such operations.

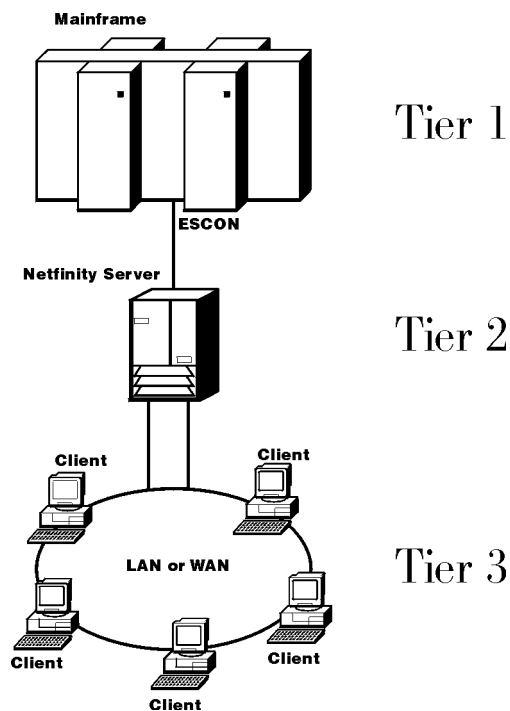
Each adapter supports an independent ESCON channel connection across standard IBM ESCON optical fiber cable. With high-speed, bidirectional, full-duplex bulk data transfer across ESCON channels, you will see near-zero error rates across the channel, thus obviating performance-sapping corrupted frames and retransmissions. Plus, data-streaming operation supports block sizes significantly larger than those supported by LAN protocols.

LAN protocols cannot perform data streaming, which is continuous transfers of very large block sizes, because they do not support such block sizes. For example, the typical maximum block size for FDDI is around 4,096 bytes, and that for Fast Ethernet is 1,518 bytes. The Netfinity ESCON Adapter, however, can transfer blocks of 64,000 bytes. In addition, all LAN schemes enforce a mandatory "inter-frame" gap between the transmission of consecutive frames. There can also be a "media access" delay between transmissions while the transmitting station ensures that it has full use of the LAN's actual physical layer. As well as all of these are the headers and trailers mentioned previously, and preambles that have to be appended to each data frame sent over a LAN. The combined effect of the small block sizes, the gaps, delays and header/trailer overhead is such that the actual data transfer rate possible across a high-speed LAN is significantly less than with a direct ESCON channel connection.

### ***Three-tier Client/Server Architecture***

By channel-attaching a Netfinity server running Windows NT to a mainframe, you will have essentially two servers working in tandem—with one server, the mainframe, acting as a

"super-server" (or enterprise server) to the Netfinity server. PCs and other workstations accessing applications such as SAP R/3 running on the Netfinity server are the clients and represent the third (and lowest) tier of the architecture. Within this hierarchy, the Netfinity server hosting the non-mainframe applications (such as Microsoft Windows NT or Novell intraNetWare applications) is the second tier, with the mainframe thus becoming the top (or first) tier. In this type of configuration, much of the interactions are between tiers two and three: that is, client-to-Netfinity server-resident applications. In many instances the applications running on the Netfinity server will require data from the mainframe or might need to update a mainframe database. Such transactions will be realized, typically, via application-to-application communication between tiers two (Netfinity server) and one (mainframe). These transactions will be performed across highly reliable, high-throughput ESCON channel connections. This hierarchy is illustrated in the figure to the right.



## **Channel-attached Application Servers**

Mainframes are no longer the only servers of choice for running business-critical applications such as enterprise resource planning and data warehousing and data mining for business intelligence. These applications are now being complemented by a new generation of client/server applications centered around powerful, reliable and function-rich servers. New business-critical applications from companies such as SAP, Oracle, PeopleSoft, Baan and J.D. Edwards are now being deployed on IBM Netfinity servers running Windows NT. These servers are also being widely used as Web servers, focal points for intranets, database servers and communications servers.

Servers running business-critical applications or acting as Web servers, in many cases, have to regularly interact with mainframes to retrieve and update databases and files. This is not surprising, given that enterprises with mainframes may have as much as 70% of that data on a mainframe. Thus it is essential to have the means to conduct efficient, high-bandwidth, quick-response-time, bulk-data transfers between servers and mainframes.

Direct channel attachment is a strategic, high-performance, reliable and cost-effective way to realize Windows NT-to-mainframe communications. Utilizing the ESCON channel connections (up to 200 Mbps), the Netfinity server becomes essentially a co-processor to the mainframe, with both systems achieving rapid data access and bidirectional data interchange.

Channel attachment can also provide unparalleled performance, robust resilience and easier overall management. With IBM's highly acclaimed Communications Server for Windows NT™, a channel-attached server and the applications running on it will have multiple ways to communicate with the mainframe. These communications options include SNA, TCP/IP, APPN®, High Performance Routing (HPR) and Java™.

## **Mainframe Gateway Server Consolidation**

With today's powerful, high-capacity and high-availability Netfinity servers and the IBM Netfinity ESCON Adapter technology, it is no longer necessary to have multiple distributed LAN-to-mainframe servers. Instead, by centralizing your Netfinity servers in the data center, you can reduce the number of servers, improve performance and provide a more fault-tolerant configuration depending on the high-availability requirements of the environment.

Distributed mainframe gateways, deployed on a departmental or regional basis, were the norm in the early 1990s. Gateway consolidation was not practical since most servers did not have sufficient capacity or the robustness to support very many users. The SNA output from these distributed gateways was transported to the mainframe across a bridged or routed multiprotocol network.

Much has changed since then. Netfinity ESCON channel-attached servers, running IBM's feature-rich Communications Server for Windows NT or Microsoft's SNA Server, have the scalability, availability and all of the requisite gateway functions to accommodate the exacting mainframe access demands of contemporary IBM-centric networks.

Consolidating distributed gateway functionality into a channel-attached, high-performance Netfinity server will enable you to instantly realize considerable hardware and software savings. In addition to eliminating the various dispersed gateways, a channel-attached Netfinity server can also take the place of the current network-to-mainframe gateway. Server consolidation will also greatly simplify network management and administration, as well as reducing overall network complexity. The new, consolidated network will have fewer potential points of failure and consequently be more robust and reliable. Downtime is one of the costliest problems faced by enterprise businesses, at the cost of several thousands of dollars for each minute lost, depending on the application you are running. Centralizing and consolidating the mainframe functions should, moreover, significantly increase network efficiency, maximize end-to-end throughput and improve response times.

Other potential benefits of server consolidation include the following:

- Facilitate fully integrated, seamless Web-to-mainframe access via IBM's Host On-Demand, browser-based access to SNA software.
- Realize the dynamic Plug and Play routing capabilities of APPN and HPR.
- Obviate the need to transport SNA traffic across TCP/IP-based intranets. Instead, SNA-to-TCP/IP conversion, via the tn3270(E) standard can be performed in the channel-attached Netfinity server.

## **Data Warehousing and Data Mining**

Enterprises today are awash in data. Most of this data is not, unfortunately, in a form that can be readily exploited to help an enterprise make strategic or tactical decisions that will result in increased sales, extend customer reach or identify new business opportunities. To do this you must be able to convert your raw data to "knowledge" through data warehousing and data mining. Data warehousing can consolidate data from various sources, refine it, purge overlaps and augment the original data with supplemental information such as demographic profiles. Data mining, on the other hand, is the process of extracting patterns buried within a data warehouse by using complex algorithms, providing the business user with new ways of viewing customers.

Powerful, multi-processor server systems such as IBM Netfinity server products, running operating systems like Windows NT, are excellent platforms for running data warehousing and data mining applications. Individual processors can work in tandem, executing many complex queries in parallel. However, much of the raw data that needs to be housed in a data warehouse is likely to reside on mainframes. There are many advantages to keeping the raw data on the mainframe and using the mainframe as a "data server." Most enterprises store and manipulate (for example, billing) much of their raw data on mainframes. Mainframe storage is a cost-effective and reliable media for storing extremely large amounts of data. In addition, there are robust, proven methodologies and disciplines for systematically backing up and archiving mainframe-resident data.

## **Enterprise Resource Planning**

As reported in a recent issue of *Information Week* (6 August 1998), strong growth in the enterprise resource planning (ERP) market is expected to continue past 2002. The worldwide market for enterprise applications is expected to grow from almost \$15 billion this year to more than \$50 billion by 2002, according to a study done of Global 1000 companies from AMR Research. This growth is expected because vendors are expanding ERP applications to include previously untapped areas such as human resources, automated sales and customer support. The study also noted that today at companies using ERP applications, only 10% to 15% of employees are using the software. Vendors hope to increase usage to as much as 60% before 2003. The leading vendors—SAP, PeopleSoft, Baan, J.D. Edwards and Oracle—earn 64% of the total ERP revenue and have achieved growth of 61% during the past year. SAP, the top vendor, could see \$5 billion in revenue for 1998.

ERP systems have been implemented on IBM technology for more than 4,000 customers. IBM offers leading technology for ERP systems, providing maximum performance, reliability, scalability and data integrity. In addition, IBM's limited, three-year on-site warranty<sup>1</sup> provides service support 24 hours a day, 7 days a week, 365 days a year to meet your ERP availability requirements.

<sup>1</sup>For terms and conditions or copies of IBM's limited warranty, call 1 800 772-2227 in the U.S. Limited warranty includes International Warranty Service in those countries where this product is sold by IBM or IBM Business Partners (registration required). Telephone support may be subject to additional charges.

## **SAP R/3 with Channel-attached Netfinity Servers**

SAP R/3, with more than 1,000 proven, industry-specific business modules, is one of the most popular and strategic means of implementing next-generation, business-critical *total business* information management systems. SAP R/3, which is inherently client/server based, offers tightly integrated programming solutions that embrace all aspects of an enterprise's day-to-day operations, including accounting, production, materials control, sales and distribution, human resources, quality control, project management and plant maintenance.

SAP R/3 supports many operating systems, including Windows NT, MVS and OS/390®, and is being widely used in S/390 mainframe environments in the three-tier client/server configuration discussed earlier in this paper. In such configurations, IBM Netfinity servers are becoming the preferred platform to be the SAP R/3 application server. The SAP R/3 business logic will run on the application server, and the graphical user interface will be handled by presentation software running on each client machine. The application server interacts with SAP R/3 modules on the mainframe to access mainframe-resident applications and DB2® databases.

## *The best of both worlds: mainframe-stored data and Netfinity server-based applications*

Again as discussed previously, Netfinity servers with SAP R/3 applications can be channel attached to mainframes using Netfinity ESCON Adapters. Direct channel attachment is the most prudent, high-performance, reliable and cost-justifiable way to implement application server-to-mainframe communications. Channel attaching the application server eliminates the slowdowns and bandwidth bottlenecks caused by LAN connections and intermediary mainframe gateways such as FEPs. Netfinity ESCON Adapters support IBM's latest and most efficient channel protocol, MPC+, which greatly minimizes the overhead associated with channel transfers. Moreover, MPC+ allows the bandwidth of multiple channel connections to be synergistically combined to achieve high-throughput, zero-delay, fault-resilient, full-duplex mainframe communications.

Channel attaching a Netfinity SAP R/3 server to a mainframe can help dramatically expedite client response times: typically by an order of magnitude. ESCON/MPC+ empowered Netfinity SAP R/3 application servers can thus definitely turbo-accelerate your SAP system—thus further enhancing productivity, competitiveness and end-user satisfaction.

### ***Advantages of Channel-attached Netfinity SAP R/3 Application Servers***

- Tightly integrate Netfinity SAP R/3 application servers with mainframe data servers.
- Ultra-reliable, high-capacity data highway between the application server and the mainframe, which can sustain long-duration, high-speed data transfers.
- Eliminate performance bottlenecks introduced by LANs and intermediary controllers and gateways.
- Realize a seamless, high-throughput, three-tier SAP R/3 architecture endorsed and supported by both SAP and IBM.

IBM Netfinity servers are stable, reliable and complete Windows NT platforms for ERP implementations. Netfinity servers are powered to perform and scale for growth, are easy to implement, with the lowest initial acquisition costs.

Whether you are installing an ERP solution, or extending the reach of that ERP solution with Value Chain solutions or e-business, IBM is the expert. IBM has the latest knowledge of business applications and the best way to exploit their business benefits in the industry today. In addition, IBM has the products and services that help companies deal with business transformation and the accompanying information technology challenges like security, scalability and systems management—challenges that become extremely important for the new network computing era. We understand that you want business value, not just technology.

IBM has established strategic relationships with all the major ERP vendors. IBM Relationship Managers work directly with ERP vendor teams to help ensure that the value IBM brings to the ERP relationship is maximized. Areas of joint IBM and ERP vendor cooperation may include joint industry solutions, product development, incorporation of new technologies that enhance ERP functionality, and joint marketing activities. IBM International Competence Centers are co-located at ERP vendor headquarters locations for close working relationships leading to more effective business solutions for customers. IBM's expertise, combined with ERP vendor relationships, helps you minimize the risks of ERP projects and maximize the success.

IBM has the consultants, service offerings, tools, products and expertise to help customers implement and extend the ERP solution.

## **Conclusion**

Attaching Netfinity servers to the mainframe with an IBM Netfinity ESCON Adapter creates a truly synergistic and unparalleled three-tier client/server solution. Channel attachment tightly integrates Windows NT based application servers with the wealth of data and applications still running on mainframes.

A channel-attached Netfinity server functioning as a data warehousing and data mining co-processor to a mainframe is a strategic, optimum and compelling solution. A channel-attached Netfinity co-processor synergistically combines the best of all worlds—mainframes for managing huge amounts of data, and cost-effective, multi-way Netfinity servers to rapidly process and mine this data for the benefit of your enterprise business.

A channel-attached Netfinity server-based gateway consolidation solution cuts costs, improves network management, reduces network complexity, enhances throughput and seamlessly facilitates next-generation, intranet-based Web-to-mainframe integration.

Add to this industry-leading technology IBM's unsurpassed support and service, and you have an outstanding solution for your business needs. IBM's highly acclaimed HelpCenter® continuously brings new services to its customers, with 2,500 technical experts available at 10 call centers worldwide to help customers with network operating systems, configuration options, installation and setup, and diagnostic routines for IBM products.

## **Additional Information**

For more information on IBM Netfinity direction, products and services, refer to the following white papers, available from our Web site at [www.pc.ibm.com/netfinity](http://www.pc.ibm.com/netfinity).

*Lotus Domino Clusters Overview*

*Lotus Domino Clusters Installation Primer*

*Implementing IBM Netfinity Server Management*

*Integrating IBM Netfinity Manager with Microsoft System Management Server*

*Integrating IBM Netfinity Manager with Intel LANDesk Server Manager*

*IBM Netfinity System Management Processor*

*IBM Netfinity Hot-Plug Solutions*

*IBM Netfinity Storage Management Solutions Using Tape Subsystems*

*IBM Netfinity Technology Trends and Directions*

*IBM Netfinity Servers and Intel Architecture*

*IBM Netfinity 8-Way SMP Directions*

*IBM Netfinity Cluster Directions*

*IBM Netfinity Fibre Channel Directions*

*IBM Netfinity Server Ultra2 SCSI Directions*

*IBM Netfinity System Management for Servers*

*IBM Netfinity Server Quality*

*IBM Netfinity Predictive Failure Analysis*

*At Your Service...Differentiation beyond technology*



## **Appendix: Frequently Asked Questions about Channel-attached Application Servers**

Q: How do I implement a three-tier, SAP R/3 client/server architecture with a channel-attached Netfinity server?

A: In a SAP R/3 architecture, the Netfinity server becomes the application server at tier two, which performs the actual SAP R/3 business logic and services all the clients. The mainframe, typically running DB2, becomes a high-capacity data server that provides the Netfinity based SAP R/3 application server with access to mainframe applications, files and databases. Enterprises thus get the best of both worlds—unrestricted access to data center resources while being able to gainfully utilize powerful, cost-compelling Netfinity servers as application servers. Channel attaching the Netfinity application servers to the mainframe enhances the highest possible throughput for SAP R/3 data exchanges between the application server and the data server, thus dramatically improving the overall response time enjoyed by the SAP R/3 client population.

Q: How do I channel attach a Netfinity SAP R/3 application to a mainframe?

A: The Netfinity server is attached using the Netfinity ESCON adapter, which supports ESCON channel connections. A Netfinity SAP R/3 application server can support up to two ESCON Adapters. The MPC+ support, embedded within the ESCON adapters, ensures that these two separate channel connections can be logically grouped together to combine their bandwidth, provide resiliency against connection failure and facilitate full-speed, full-duplex transfers.

Q: Do I need more than one channel connection between a Netfinity SAP/R3 application server and a mainframe?

A: No. However, you might require dual channels for highest availability and full-duplexing. One Netfinity ESCON Adapter will ensure that there is a high-bandwidth data path for high-speed data transfers between the application server and the data server. This single channel connection, with its high throughput, will satisfy most of the performance and high-availability demands of today's high-volume, business-critical, three-tier SAP R/3 systems. Given that the single mainframe channel is capable of half-duplex communications, two or more active channel connections are desirable for those environments where full-duplex, simultaneous, bidirectional data transfers between the application server and the mainframe are required for high-speed SAP R/3 transaction processing. Multiple channel connections also provide for load balancing and fail-safe redundancy.

Q: Can I use the Netfinity ESCON Adapters with IBM's new CMOS, S/390 Parallel Enterprise Servers?

A: Yes. These highly proven and widely deployed channel adapters work, and have been rigorously tested, with all IBM bipolar and CMOS mainframes, including the new G5 CMOS machines announced in June 1998. The Netfinity ESCON Adapters are supported and maintained by IBM.

*The best of both worlds: mainframe-stored data and Netfinity server-based applications*

Q: What protocols can I use between a Netfinity SAP R/3 application server and a mainframe across the channel?

A: The Netfinity ESCON Adapter is essentially protocol independent. The Netfinity ESCON Adapters support both TCP/IP and SNA/APPN. Hence, they can be used to support SAP R/3 data transfers between the Netfinity SAP R/3 application server and the mainframe using either TCP/IP or SNA/APPN.

Q: What devices does the Netfinity ESCON Adapter emulate?

A: The Netfinity ESCON Adapter has the ability to emulate S/390 control units. Support for the 3172, 3174 and 3088 is included in the current release.



© International Business Machines Corporation 1998

IBM Personal Computer Company  
Department LO6A  
3039 Cornwallis Road  
Research Triangle Park NC 27709

Printed in the United States of America  
9-98  
All rights reserved

For terms and conditions or copies of IBM's limited warranty, call 1 800 772-2227 in the U.S. Limited warranty includes International Warranty Service in those countries where this product is sold by IBM or IBM Business Partners (registration required).

References in this publication to IBM products or services do not imply that IBM intends to make them available in all countries in which IBM operates. IBM reserves the right to change specifications or other product information without notice.

IBM Netfinity servers and PC servers are assembled in the U.S., Great Britain, Japan, Australia and Brazil and are comprised of U.S. and non-U.S. parts.

APPN, Communications Server for Windows NT, ESCON, HelpCenter, IBM, Netfinity, Netfinity Manager, OS/390 and S/390 are trademarks of International Business Machines Corporation in the United States and/or other countries.

Java is a trademark of Sun Microsystems, Inc.

Microsoft, Windows, Windows NT and the Windows 95 logo are trademarks or registered trademarks of Microsoft Corporation.

Other company, product and service names may be trademarks or service marks of other companies.

THIS PUBLICATION MAY INCLUDE TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.