Network Connection

FORMERLY
THE APPC CONNECTION

IBM

THE IBM NETWORKING SOFTWARE NEWSLETTER

Inside

Turner Broadcasting Leverages IBM Communications Server

TCP/IP and SNA integration reduces network complexity and saves money

In today's multiprotocol environments, it is essential for businesses to have integrated communications systems. That becomes even more important if your organization is involved in the communications business.

Turner Broadcasting System (TBS) is a major distributor of news and entertainment products around the world, and the leading supplier of programming for the basic cable industry in the United States. Headquartered in Atlanta, Georgia, Turner Broadcasting employs 8,500 people worldwide. In 1995, the Turner networking organization began looking for a way to reduce costs and gain better management control over its network. To reduce line costs, the company decided to consolidate its existing network to a single TCP/IP network.

"As part of our network consolidation to TCP/IP, we needed to run our SNA-based international shipping and inventory system over TCP/IP," says Dan Chura, manager of Legacy Systems at TBS. The system is used to connect TCP/IP locations in international cities to a VTAM® mainframe in Atlanta.

TCP/IP AND SNA INTEGRATION FOR ISIS ORDER PROCESSING

Operating out of Los Angeles, Turner Entertainment Distribution Services (TEDS) uses an application called International Shipping and Inventory System (ISIS), which provides Turner Entertainment with an automated order processing system for international contracts, contract reporting,

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Application

International Shipping and Inventory System (ISIS) for a major international entertainment network

Software

IBM OS/2®, Communications Server for OS/2 Warp™, OS/2 Access Feature, and DB2/2™

Executive Viewpoint

It is my pleasure to welcome you to this first issue of *Network Connection*. This newsletter will show you how IBM Networking Software solutions can address your business challenges and help you take advantage of new business opportunities. *Network Connection* will also provide information about technical tips, techniques, and new technologies to help you streamline your network and plan for the future.

But *Network Connection* is much more than just a way for IBM to talk to you. We are also listening to you. Tell us what you like or dislike about the newsletter, and tell us what you want to see more of. Listening to our customers and business partners has always been a key to our success.

The IBM products and solutions described in this issue offer proof that we listen to you. Our Enterprise Communications family, introduced this past spring and recently enhanced, represents part of our continuing initiative to deliver the networking solutions you have asked for.

You also wanted access to the power and resources of SNA host computers from Internet- and intranet-based workstations, so we upgraded IBM TCP/IP to give you power and flexibility in a multiprotocol environment. We also put the Telnet 3270 function in the Communications Server products and delivered the IBM Internet Connection Corporate Kit for Windows® 3.1 and Windows 95.

You said you wanted to communicate in a variety of operating environments, so we are currently beta-testing Windows NT™ versions of both our Personal Communications and Communications Server products. (They will soon be generally available.) And we recently enhanced our market-leading NetWare® for SAA® for LAN-to-host communication in networks using the Novell® NetWare product.

In this issue you will find an easy and effective way to give us your opinions and suggestions: the Networking Usage and Requirements survey. Please take a few minutes to complete it; it will help us better understand your business needs and continue to provide you with superior IBM Networking Software solutions. (For every completed survey we receive, we will send a token of appreciation from IBM Networking Software.)

Thank you for using IBM Networking Software to solve your business challenges, and thank you for your feedback through the Networking Usage and Requirements survey. We will continue to listen and work with you to provide superior solutions for our customers.

Al Zollar

Al Zollar
General Manager, IBM Networking Systems

Personal Systems:
IBM's Magazine for Personal Computer Professionals

As the premier information delivery channel between IBM and personal computer professionals in IBM's largest accounts, *Personal Systems* magazine's mission is to provide solutions, technical support, and product information that is vital for meeting real-world challenges in today's rapidly evolving technology arena.

By offering in-depth technical information straight from product developers, testers, and support providers, *Personal Systems* has become the first place personal computer professionals look for technical solutions. Each issue contains the latest information on new products, advanced technical topics on everything from operating systems to workstation networking, and timely solutions to everyday problems.

Personal Systems is published every other month and is available free to qualified customers within the United States. To subscribe, send an E-mail request to **lia@vnet.ibm.com** or call Superior Fulfillment at 218-723-9477.

We're back!

Welcome to *Network Connection*, the newsletter for customers, business partners, and everyone interested in IBM's Networking Software products. With a new design and a new name, we're here to carry on the tradition of supplying the high-quality information you're used to receiving from *APPC Connection*.

In addition to a new look and a new name, *Network Connection* will offer a wider range of topics, providing news about IBM's Enterprise Communications family (Personal Communications, Communications Server, NetWare for SAA); wireless communications (ARTour™); and IP- and Internet-based solutions such as TCP/IP and the Corporate Kit. You get all of this in addition to the APPC, APPN®, and SNA coverage you're used to. There will even be updates about IBM Networking Hardware solutions in each issue.

Even with a wider variety of articles, we know you still want current, in-depth technical material to help you do your job. We plan to run technical articles in each issue and, while space might not allow for detailed coverage, we'll refer frequently to Web sites where you can get all the details you need.

And speaking of the Web, in the next few months you'll be able to read *Network Connection* online, giving you faster and more convenient access to the news and information you need to meet your networking challenges.

Now, just sit back and enjoy the first issue of *Network Connection*, where you'll read about recent product enhancements from Personal Communications, Communications Server, NetWare for SAA, and TCP/IP. You'll also read an exciting article by David Kaminsky, Adam King, and Matt MacKinnon about how to access Java™ applets from an SNA intranet using the CPI-C interface. And you'll learn how Turner Broadcasting used IBM Networking Software to link remote TCP/IP networks with data and applications on an SNA host.

Finally, please take a moment to complete the Networking Usage and Requirements survey. It will help me continue to provide information that meets the networking challenges and needs of your organization. Just return the completed survey, and we'll send you a gift as a token of our appreciation.

Our goal is to serve you with relevant, up-to-date information about IBM Networking solutions. We welcome your comments and suggestions about how *Network Connection* can serve you even better. Just send E-mail to **appcnews@vnet.ibm.com** or fax to 919-254-9132.

It's good to be back, and we look forward to helping you get the best investment from your IBM Networking products.

Larry Kunz

Larry Kunz,
Editor, *Network Connection*

Become an IBM Certified Enterprise Communications Specialist

The Professional Certification Program from IBM is pleased to announce a new worldwide software technical certification role—the IBM Certified Enterprise Communications Specialist. This one-test certification measures a technical professional's skills to plan, install, configure, use, and support the Enterprise Communications family of products, which includes IBM Communications Server and IBM Personal Communications clients. All you have to do is pass either Test 551 (OS/2 Enterprise Communications) or Test 552 (AIX® Enterprise Communications), and you can become an IBM Certified Enterprise Communications Specialist.

IBM provides a variety of education to help you prepare for the test. You can customize your education by selecting either of the following methods:

1) An Interactive Enterprise Communications CD-ROM provides computer-based training for planning, installing, configuring, and troubleshooting Enterprise Communications products. This comprehensive CD-ROM also includes product demonstrations, sales information, and customer testimonials. For instructions on how to obtain this CD-ROM, visit the following Web site:
http://www.raleigh.ibm.com/ecf/ecfupcd.html

2) Communications Server Study Guides provide product information and self-study units on a variety of topics. Guides are available for the AIX and OS/2 Communications Servers, as well as all the other IBM Software Servers, at the following Web site:
http://www.software.ibm.com/sw-sell/besteam/studyguides

Passing either Test 551 or Test 552 means that you have also passed one of the three tests required to become an IBM Certified Network Communications Engineer. This certification measures your skills to install, configure, and maintain any two of the following connectivity environments: Network Operating Systems, Enterprise Communications, and Internet Connection.

The Professional Certification Program from IBM provides technical professionals with a structured program leading to an internationally recognized qualification. Earning a certification in this program can give your employer and colleagues confidence that you are keeping up with today's rapidly changing technology.

Certification testing is administered by Sylvan Prometric™ worldwide and by IBM Education and Training in Europe. For the telephone number of the testing location nearest you or for more information about the program, visit the following Web site: **http://www.training.ibm.com/ibmedu/certif.htm.**

If you are in North America, you can obtain the program catalog *Roadmap to Success* by calling Sylvan Prometric at 1-800-959-EXAM (1-800-959-3926).

Energize Your Business Network with IBM Enterprise Communications

• New solutions to integrate existing and emerging network technologies

The **IBM Enterprise** Communications family delivers an industry-leading communications solution, featuring a simplified product line of communications clients and servers that support diverse application and network environments. The product line provides a quick and easy way to integrate existing SNA, TCP/IP, and LAN-based networks with new Internet and intranet solutions.

There are two branches of the Enterprise Communications family: the Communications Server family and the Personal Communications family. Both are continuously being expanded with new and enhanced products that deliver cross-platform independence, provide innovative solutions for networking computing, and provide superior flexibility for dynamic environments.

NEW RELEASES ARE NOW AVAILABLE

IBM has recently updated its Enterprise Communications family with several new releases and beta programs. The beta programs include Communications Server for Windows NT and Personal Communications for Windows NT. IBM has also updated Communications Servers for OS/2, AIX, and OS/390™ with multiprotocol, connectivity, availability, and performance enhancements. In addition, the Internet Connection Corporate Kit for Windows 3.1 and Windows 95, Version 5.0 is available.

THE COMMUNICATIONS SERVER FAMILY

The Communications Server family of products enables you to integrate global, heterogeneous networks while giving you the flexibility to use and move critical applications across the organization regardless of the underlying protocols. Communications Server products provide a variety of functions:

♦ **A powerful communications gateway for connecting diverse application network environments**. Communications Server can act as a gateway between your internal network and the Internet, bringing Internet access to users whether they are running over an SNA, APPN, NetBIOS, IPX, or TCP/IP network. Likewise, a Web browser application running on either an SNA or TCP/IP desktop can use Communications Server to connect to an intranet server.
♦ **A strategic vehicle for rapid deployment of new and enhanced business applications**. Communications Server enables the fast, cost-effective deployment of new business applications regardless of the underlying network protocol. You can connect SNA and TCP/IP networks and add new applications without impacting users or having to install new hardware.
♦ **A flexible platform for developing distributed and client/server applications**. Communications Server supports all key distributed and client/server APIs and incorporates advanced routing technology to support network-intensive applications such as multimedia and collaborative computing.

The Communications Server product line includes solutions for the following server environments:
♦ OS/390
♦ AIX
♦ OS/2 and OS/2 Warp
♦ Windows NT
♦ Novell NetWare

In addition, Communications Server products are fully interoperable with OS/400® networks.

THE PERSONAL COMMUNICATIONS FAMILY

The Personal Communications line of products provides premier host connectivity, industry-leading emulation, extensive connectivity, and APIs to support client/server applications. Personal Communications clients support connectivity to S/390®, AS/400®, and S/36™ hosts over multiple networks, multiple operating systems (OS/2, DOS, Windows 3.1, Windows 95, and Windows NT), and multiple server platforms.

COMMUNICATIONS SERVER FOR WINDOWS NT BETA PROGRAM

The Communications Server for Windows NT (CS/NT) beta program is currently available to a limited set of users. CS/NT is an open product that offers the same industry-leading functions already available in the existing Communications Servers. Such functions include an outstanding SNA gateway, integrated multiprotocol gateways for SNA and TCP/IP, plus LAN-to-host, LAN-to-LAN, and LAN-to-Internet communications combined in a single product. CS/NT provides unparalled reliability, performance, and availability to handle mission-critical applications. The non-beta version of CS/NT will be available in 2Q97.

PERSONAL COMMUNICATIONS FOR WINDOWS NT BETA PROGRAM

The Personal Communications for Windows NT beta program enables Windows NT users to have the same multiprotocol connectivity, application development, and emulation support as users of Personal Communications for the OS/2, DOS, Windows 3.1, and Windows 95 platforms. The non-beta version of Personal Communications for Windows NT will be available in 1Q97.

COMMUNICATIONS SERVER FOR OS/2 WARP 4.1

IBM Communications Server for OS/2 Warp (CS/2) is an all-in-one communications package that gives users stability for running critical applications, while enabling controlled growth in emerging network computing environments. CS/2 enables TCP/IP sockets applications—such as Web browsers, Lotus Notes®, and SAP™ R/3—to communicate over SNA and TCP/IP networks. It also enables SNA applications—such as DB2®, CICS™, and emulator programs—to communicate over SNA and TCP/IP networks.

IBM customers including Turner Broadcasting System in the United States, Drogerie markt in Germany, and Zahid Tractors and Heavy Machinery, Ltd., in Saudi Arabia are already benefitting from CS/2's multiprotocol capabilities. For example, Zahid Tractors uses CS/2 for LAN internetworking to run Lotus Notes from its central site to branches over its enterprise AS/400 APPN network.

New enhancements for CS/2 4.1 include the following:
♦ **Four new gateways** allow LAN-to-LAN internetworking between popular client/server applications without disrupting wide area networks. IPX and NetBIOS applications on a branch LAN can now communicate across TCP/IP or SNA networks to like applications on another branch LAN, without any changes to the application.

♦ **A TN3270E emulation server** provides a simple way for TCP/IP workstations to access host 3270 applications and print services without complicated and expensive host or network changes.
♦ **Integrated frame-relay support** enables users to take advantage of affordable frame-relay connections.
♦ **Automatic backup** complements existing High-Performance Routing (HPR) with superior availability. Now, if a line goes down, a backup link can be automatically activated so communications will not be interrupted if connections happen to fail.

COMMUNICATIONS SERVER FOR AIX

Communications Server for AIX (CS/AIX) provides industry-leading SNA Communications capabilities as well as multiprotocol network server functions for SNA and TCP/IP network integration. Connections can be made over WANs, LANs, or direct-attached channel.

With Communications Server for AIX 4.2, SNA and TCP/IP interoperability has been expanded by the delivery of the Sockets-over-SNA gateway. This gateway supplements the existing Sockets-over-SNA and APPC-over-TCP/IP access nodes and the APPC-over-TCP/IP gateway already provided by CS/AIX. This combination enables users to select the best SNA- or TCP/IP-based business application for their enterprise and run it over both types of networks.

CS/2 and Microsoft SNA Server Efficiency Comparison

IBM commissioned The Tolly Group® to compare the efficiency of the Communications Server for OS/2 Warp 4.1 3270 SNA gateway with Microsoft® SNA Server version 2.11 Service Pak 1 in several PC platforms and gateway configurations. Following are some of highlights of the comparison:

• **Communications Server for OS/2 Warp 4.1 delivers better throughput with lower CPU consumption than Microsoft SNA Server 2.11 in all configurations.**

• **With similar CPU utilization, Communications Server's single-Pentium™ processor configuration has twice the throughput of Microsoft SNA Server's dual-Pentium processor configuration.**

• **Communications Server's single-Pentium processor configuration has sub-100 ms response times that more than double the transaction load of Microsoft SNA Server running on quad-Pentium processors.**

• **Under all load conditions, Communications Server delivers faster response times than Microsoft SNA Server in all configurations tested.**

The complete report appears as document 6273 on The Tolly Group Web site (http://www.tolly.com). The report also appears on IBM's CS/2 home page at http://www.raleigh.ibm.com/cm2/cm2prod.html.

For example, organizations with SNA/APPN networks can now connect SNA users to the Internet through CS/AIX, enabling seamless Web browsing across SNA and TCP/IP networks. Organizations that use SAP R/3 can run R/3 on an AIX server and use CS/AIX on the same RS/6000™ to connect to R/3 clients over an SNA/APPN network.

CS/AIX now supports HPR so that CS/AIX can participate in an APPN HPR environment as an intermediate node. HPR provides throughput and efficiency with automatic re-routing around network failures, so users do not have to feel the impact at their desktop if a problem occurs at another location in the network.

Accessing the Internet in an SNA/APPN Environment

Do you want to access the myriad of information available on the Internet direct from your SNA or APPN network? It's easier than you think. With the SNA network you already have in place, you can:

- **Use Web servers and browsers for workgroup collaboration within an SNA intranet—without installing TCP/IP**
- **Connect your SNA/APPN business to the World Wide Web**
- **Allow users on IP LANs to access the Internet over SNA**
- **Run any TCP/IP application such as FTP, Telnet, SAP R/3, or Lotus Notes**

To find out how you can do all this, check the online presentation on IBM's Web site at http://www. raleigh.ibm.com/ecf/ecf_isna.html. You can download the presentation as a Freelance Graphics for OS/2 (.PRS) file. The presentation describes several options for accessing the Internet via an SNA, APPN, or HPR network through IBM's multiprotocol Communications Server products, Personal Communications products, and the 2217 Nways™ Multiprotocol Concentrator. Other topics include Lotus Notes and the Internet, as well as TN3270E and Internet gateways to enterprise applications and databases.

IBM Enterprise Communications Solutions Around the Globe

To find out how IBM customers around the world are using Enterprise Communications solutions, visit http://www.raleigh.ibm.com/ecf/ecfover.html. You can read about successful implementations at the following companies:

- **Turner Broadcasting System in the United States (also on page 1 of this newsletter)**
- **Drogerie markt in Germany**
- **Zahid Tractors and Heavy Machinery, Ltd. in Saudi Arabia**
- **Royal Bank of Trinidad and Tobago in Trinidad and Tobago**
- **North Carolina Farm Bureau Mutual Insurance in the United States**

Support has also been added for Dependent LU Requester (DLUR), which enables dependent LUs (LU0, 1, 2, 3 and dependent LU6.2) to operate unchanged in an APPN network. DLUR protects investments in 3270 emulation and other dependent LU applications while enabling the migration of new applications to LU6.2, APPN, and Sockets. DLUR also enables central management control of remote dependent LUs, while benefiting from an APPN network.

COMMUNICATIONS SERVER FOR OS/390
Communications Server for OS/390 (CS/390) is an integral part of the OS/390 base, a network-ready software server that provides robust, reliable, scalable, and manageable support for network-centric and client/server computing. CS/390 delivers leading-edge, open networking support for SNA, APPN, HPR, TCP/IP, and multiprotocol networking and is composed of VTAM 4.3, AnyNet® 4.3, and TCP/IP for MVS® 3.1.

Fundamental enhancements for CS/390 have improved performance, reliability, availability, and serviceability in TCP/IP 3.2. (See page 7 for more information about TCP/IP for MVS 3.2.) This new TCP/IP release brings the power and resources of S/390 mainframes to the Internet

and open multivendor networking environments. Because TCP/IP employs industry-standard applications, users can send messages, transfer files, share printers, and access remote resources without having to rewrite existing applications.

TCP/IP for MVS 3.2 uses High-Performance Native Sockets (HPNS), which enables applications written for previous versions of TCP/IP for MVS to run unchanged. HPNS also exploits MVS functions to improve cross-memory communication, reduce context switches, decrease the number of data movements, and improve reliability and recovery. This leads to shorter CPU times in the transport areas.

INTERNET CONNECTION FOR WINDOWS 3.1 AND WINDOWS 95, VERSION 5.0
IBM now offers the IBM Internet Connection Corporate Kit for Windows 3.1 and Windows 95, Version 5.0 (http://www.ics. raleigh.ibm.com/kit/info.htm). The Corporate Kit provides the industry-standard TCP/IP protocols and leading-edge Internet applications that organizations need for complete access to their intranets and the Internet. With the Corporate Kit, organizations can share information within a department and across branch offices, remote sites, and mobile personnel.

The Corporate Kit includes the following industry-leading components:
- Netscape Navigator™ browser and E-mail utilities
- Adobe Acrobat® Reader
- First Floor's Smart Bookmarks

The Corporate Kit also includes a wide variety of terminal emulators and file transfer and print capabilities. Together, these applications can significantly improve user productivity while facilitating an organization's internal and external communication.

For more information

For more information about the Enterprise Communications family, visit **http://www.raleigh.ibm.com/ecf/ecfover.html**

•Connect Your System/390 to the Internet

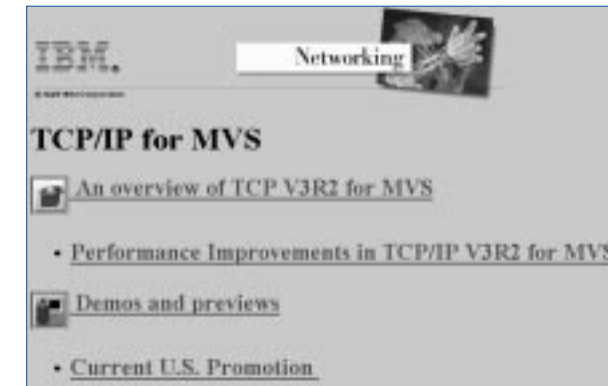•*TCP/IP for MVS Version 3 Release 2 is now available*

As TCP/IP continues to evolve, IBM's support for this increasingly popular protocol evolves right along with it. Today, IBM's new TCP/IP Version 3 Release 2 for MVS brings the power and resources of your System/390® to the Internet and open multivendor networking environments.

With a wide range of enhancements designed to improve TCP/IP performance, function, and usage, this new release provides a variety of benefits:
- Enables applications written for previous versions of TCP/IP for MVS to run unchanged
- Reduces path length and CPU time through an improved transport layer
- Increases TCP/IP reliability, availability, and stability with virtual IP addressing
- Enhances language support with improved translation tables
- Improves diagnostics and enables easier debugging
- Makes it easier to write TCP/IP applications with an enhanced industry-standard application interface

A TCP/IP BUILT FOR BUSINESS ENVIRONMENTS
Whether you are new to TCP/IP or upgrading your existing environment, TCP/IP for MVS can provide the features to ease your transition. TCP/IP for MVS provides extensive applications support, including client/server applications, industry-standard APIs, and network connectivity options. Applications and data can be shared transparently across MVS, UNIX®, VAX®, OS/2, Windows 95, Windows NT, Windows 3.1, DOS, and other environments. TCP/IP for MVS also includes support to connect CICS, IMS,™ and DB/2 applications to a TCP/IP or Internet network.

TCP/IP restructures the MVS TCP/IP environment and includes new functions that make it easier to write user application programs. Because TCP/IP uses industry-standard applications, you can send messages, transfer files, share printers, and access remote resources easier. In addition, this new release of TCP/IP for MVS uses High-Performance Native Sockets (HPNS) that enable applications written for previous versions of TCP/IP for MVS to run unchanged.

ENHANCED RELIABILITY, AVAILABILITY, AND SERVICEABILITY
TCP/IP for MVS provides the tools you need to help recover from system problems quickly and accurately:
- **Additional tracing capability**—The integrated MVS system component trace function lets your system analysts track problems dynamically through several key components by entering an MVS command.
- **Faster problem diagnosis**—TCP/IP interfaces issue standard MVS dumps containing information to aid in faster problem diagnosis.
- **Faster TCP/IP stack recovery**—The TCP/IP stack now recovers from certain types of failures.
- **Fewer program interruptions**—TCP/IP provides specific error numbers (errnos) to application programmers instead of abending the program.

SYSTEM SECURITY
TCP/IP for MVS enables you to control the remote log-in services provided by the Telnet server on the MVS computer. IP-address-to-LU-name mapping lets you tie groups of IP addresses to specific applications or even map a specific IP address to a specific SNA LU name. This means that you can easily access the applications you use most and that you have more control in determining who can access which applications.

HIGH-SPEED FILE TRANSFER
TCP/IP for MVS includes C File Transfer Program (CFTP) server, which enhances file-transfer capabilities. Now, you can send large files in less time, use less bandwidth when transferring files, and recover files more easily.

LAN AND CHANNEL INTERFACES
TCP/IP for MVS provides broad support for LAN and channel attachment interfaces, including Ethernet,™ Token Ring, PC Network, and FDDI. Channel-attachment support includes Channel-to-Channel (CTC) 3088 support, High-Performance Parallel Interface (HiPPI), ESCON®, HYPERchannel™ continuously executing transfer Interface (CETI), 3745 IP (CDLC), 900/950 support, and 3172 IP. TCP/IP 3.2 for MVS is available free of charge to existing licensees of TCP/IP 3.1 for MVS.

For more information

To learn more about TCP/IP for MVS, visit **http://www.raleigh.ibm.com/tcm/tcmprod.html**

Java Adds Robustness to SNA Intranets

• By David Kaminsky,

Adam King, and

Matt MacKinnon

This article describes how SNA intranets can include new technologies such as Java applets. You can download the toolkit described in this article from the IBM alphaWorks Web site at http://www.alphaworks.ibm.com.

Intranets are hot. So is good barbecue, and while we know what goes into good barbecue, there is a lot of disagreement about what makes up a good intranet. While newer technologies such as Internet Protocol (IP) help boost user productivity, Systems Network Architecture (SNA) provides robustness and reliable access to the 70 percent of all business data that still resides on mainframes.

Today, you can make existing SNA intranets more versatile by applying Internet technologies like Java, the network-enabled computing environment developed by Sun® Microsystems. Java is especially useful because it uses small chunks of executable code—called Java applets—that can be dynamically downloaded from a server (rather than installed on clients). On top of that, Java applets are platform-independent, so they can work in a variety of environments.

The bad news for SNA users is that Sun chose to release Java with IP bindings, not SNA bindings. The good news is that we at IBM have recently removed this limitation by creating a Java binding to CPI-C: an open API for SNA's LU6.2. Although most SNA applications use LU2, we chose to develop an LU6.2 binding first, because it can run on peer workstations, which helps make it a relatively simple learning platform. Using the skills developed during our LU6.2 work, we plan to push forward to other communications protocols.

THE JAVA/CPI-C API
We designed our API to mimic the C version of the CPI-C API, to help leverage C programmers' learning investment. To current CPI-C programmers, the calls to the CPI-C library will look extremely familiar. Preserving the look of the actual calls,

however, requires some additional work by the programmer, such as creating objects to hold some of the output parameters. This is necessary to resolve an unavoidable conflict: Java uses pass-by-value function calls and CPI-C uses pass-by-reference function calls. Because Java is an object-oriented language, we believe it is natural to create objects to hold CPI-C parameters, even though this creates a small amount of additional work for the programmer.

So far, we have implemented the 16 CPI-C calls needed to write the five classic transactions: Pipeline, Credit Check, Inquiry, File Transfer, and Database Update. With this foundation in place, implementing the remaining calls in the next version of CPI-C should be straightforward.

JAVA CPI-C HANDLES CLASSIC TRANSACTIONS
To give you a sense of the API, we will describe how it works for two of the five classic transactions: the Pipeline and Database Update. We based our transaction code on that found in *CPI-C Programming in C*, an excellent reference written by John Q. Walker and Peter J. Schwaller.

For the Pipeline transaction, we begin by importing the CPI-C package, our Java/CPI-C bindings. A CPI-C object is the interface to our LU6.2 code. It contains many constants defined in CPI-C, such as the length of a conversation ID, along with methods that are passed through to the native CPI-C calls.

We must instantiate at least one CPI-C object per class to enable application access to the CPI-C methods. Each type of parameter has its own class, and each of these classes has associated constants defined as class data members. For example, the CPICReturnCode class has the success return code, CM_OK, defined in it.

Whatever data the program wants to send must first be converted from its object type (because Java understands objects) into a C-style array of bytes that can be handled by the CPI-C Send function. In fact, for each call, the CPI-C library must convert the Java types to a C type. Java has methods that enable the CPI-C library to make such conversions easier. For example, the library can convert a Java string into a Java array of bytes, which can be accessed by a native method.

We must convert our application data into an array of bytes, because our toolkit does not perform automatic marshalling. However, our toolkit does automatically convert symbolic destination names and conversation IDs from Java strings to C-strings as necessary.

CPI-C calls are made almost exactly as in C. As shown in Figure 1, the only noteworthy differences are that we need to preface every CPI-C call with the name of the CPI-C object and that none of the parameters are prefixed by the pass-by-reference (&) symbol.

In the server code, we need to instantiate classes to hold the CPI-C parameters, many of which have only an integer as instance data. We also must allocate a byte array to hold the

Figure 1) Sample CPI-C calls for Java

```
//
// Initialize CPI-C
//
cpic_obj.cminit(              /* Initialize_Conversation        */
        conversation_ID,      /*  O: returned conversation ID   */
        sym_dest_name,        /*  I: symbolic destination name  */
        cpic_return_code);    /*  O: return code from this call */
//
// ALLOCATE
//
cpic_obj.cmallc(              /* Allocate Conversation          */
        conversation_ID,      /*  I: conversation ID            */
        cpic_return_code);    /*  O: return code from this call */
//
// SEND
//
cpic_obj.cmsend(              /* Send_Data                      */
        conversation_ID,      /*  I: conversation ID            */
        stringBytes,          /*  I: send this buffer           */
        send_length,          /*  I: length to send             */
        rts_received,         /*  O: was RTS received?          */
        cpic_return_code);    /*  O: return code from this call */
//
// DEALLOCATE
//
cpic_obj.cmdeal(              /* Deallocate                     */
        conversation_ID,      /*  I: conversation ID            */
        cpic_return_code);    /*  O: return code from this call */
} // end main method
} // end the class
```

received data. The CPI-C Receive call returns a Java array of bytes, while the Pipe transaction expects a string. We can translate the array of bytes into a string by using the String class-constructor that takes an array of bytes as an argument.

A CUSTOMIZED TOOLKIT
In the other classic transaction, Database Update, a client requests information from a server, modifies the information, and returns it to the server. This is a conversational transaction—it includes multiple Send and Receive calls within a single conversation. More interesting than the transaction itself is the use of an extended CPI-C class. Java enables us to take advantage of inheritance and extend the CPI-C class to include two new actions. We created a CPICClassic5 class that *extends* (Java's term for inheritance) the CPI-C class, and we also added the new actions to the CPICClassic5 class.

When a user instantiates a CPICClassic5 object (rather than a CPI-C object), the user receives all of the CPI-C methods, augmented by the code developed for this transaction. The user of the CPICClassic5 object cannot distinguish between the native CPI-C methods and the added function.

This example illustrates an important point: because our CPI-C toolkit is object-oriented, users can customize and

extend it to fit their needs, seamlessly extending the base function. C does not offer this opportunity.

MINIMAL IMPACT ON NETWORK PERFORMANCE
Because some users are concerned about Java performance, we conducted an experiment to determine Java's impact on overall network performance. Using the Update transaction, we discovered that switching from C to Java results in a small, constant performance loss on the client (about 5.2 milliseconds per transaction in our test). The difference is so slight that it will be unnoticed during interactive work.

It is important to note that there is no performance impact on the server. In our benchmarks, the server was written in C and was identical for both clients. Thus, implementing the client in Java does not reduce the number of server transactions. Writing the server in Java, however, will impact server performance.

Figure 2 lists the CPI-C calls that have been implemented to date. This list includes all the calls necessary to implement the five classic transactions. (For a complete list of CPI-C calls, refer to the Walker-Schwaller book.)

JAVA AND SNA: FLEXIBILITY AND RELIABILITY
As we have demonstrated, it is a straightforward design exercise to create a Java-callable CPI-C library. The biggest problem—the conflicting method-calling conventions—can be solved by passing objects. More importantly, we have shown that Java need not be considered an IP-only tool. While enterprises continue looking to SNA for reliability and stability, it is clear that intranet technologies such as Java can work together with SNA. We expect that most enterprises can benefit from combining Java's strengths—such as platform independence and dynamic download—and SNA's mission-critical reliability across corporate networks.

David Kaminsky, Adam King, and Matt MacKinnon work on advanced technology Java projects at IBM's networking laboratory in Research Triangle Park, North Carolina.

For more information
Visit the IBM alphaWorks Web site at
http://www.alphaworks.ibm.com

Figure 2) CPI-C calls implemented to date

```
cmaccp    Accept Conversation
cmallc    Allocate Conversation
cmcfm     Confirm
cmcfmd    Confirmed
cmdeal    Deallocate Conversation
cmecs     Extract Conversation State
cminit    Initialize Conversation
cmrcv     Receive
cmsdt     Set Deallocate Type
cmsend    Send
cmserr    Send Error
cmsmn     Set Mode Name
cmspln    Set Partner LU Name
cmssl     Set Sync Level
cmsst     Set Send Type
cmstpn    Set TP Name
```

Affordable Network Computing Across the Enterprise

• The IBM 2210 Nways Multiprotocol Router family enables powerful, cost-effective routing

As traditional corporate computing resources evolve into distributed networks, organizations are seeking innovative ways to boost their employees' productivity while enabling them to collaborate more effectively. A key factor in meeting this challenge is the successful removal of communications barriers among employees as well as customers, suppliers, and business partners. Network computing streamlines connections between all these people through a wide range of components, such as:
- Internal intranets based on the Internet Protocol (IP)
- Links to the Internet or World Wide Web
- Multiprotocol LANs
- ATM and switching technology
- Core business applications that rely on SNA

Today, IBM offers a family of routers that can help you cost-effectively implement network computing throughout your enterprise. The IBM 2210 Nways Multiprotocol Router family provides an extensive range of connectivity, protocols, and price granularity for a broad range of remote locations, branch offices, and regional sites. Using these affordable routers, you can quickly and easily connect even the smallest remote sites to the corporate intranet or Internet.

ENTRY, MIDRANGE, AND HIGH-END MODELS OF THE 2210
Four new low-cost entry models of the 2210 support all major protocols, including SNA, to provide a very economical multiprotocol routing solution for the smallest offices in your

enterprise. The new models are ISDN-ready and give you the ability to select the lowest priced network service—from frame relay, ISDN, or X.25—and then, with a simple software configuration change, select another service if your requirements change. The models provide one Ethernet port and the choice of using either one serial WAN port or one ISDN BRI port for added flexibility. The entry models will be available in 1Q97.

The midrange models of the 2210 have one LAN port (Ethernet or Token Ring) and two serial WAN ports for larger branch offices. Some midrange models also provide a single ISDN BRI port.

The high-end models of the 2210 double the connectivity and performance of the midrange models, with up to two LAN ports and four serial WAN ports to support large branch offices and regional locations. In addition, the high-end models include an open adapter slot that supports any one of the following adapters: ISDN BRI, ISDN PRI, 25-Mbit/sec ATM, and 4- and 8-port WAN concentration.

A COMMON SET OF SOFTWARE FUNCTIONS
All models of the 2210 use a common set of software functions called IBM Nways Multiprotocol Routing Services (Nways MRS). Nways MRS is part of IBM's family of multiprotocol services products that also supports the IBM 2216 Nways Multiaccess Connector, the IBM 8210 Nways Multiprotocol Switched Services (MSS) Server, and the IBM 8260 Nways MSS Module.

Together, the multiprotocol services software and associated hardware products provide the combined benefits of switching, distributed routing, bridging, and virtual LANs while enabling the implementation of Switched Virtual Networking (SVN)—IBM's comprehensive, high-performance framework for enterprise-wide network computing.

The 2210 at a Glance

- **An extensive range of connectivity options and protocols** to link remote locations, branch offices, and regional sites into a cohesive, cost-effective multiprotocol network
- **Reduced costs** for implementing either WAN or ISDN access for Ethernet LANs
- **ATM Forum-compliant LAN emulation and Classical IP** to facilitate the migration from existing LAN investments to ATM technology
- **High Performance Routing (HPR)** to enable the native transport of SNA traffic in a multiprotocol environment, providing an outstanding way to consolidate SNA, TCP/IP, and multiprotocol networks

For more information
Visit the IBM 2210 home page at
http://www.raleigh.ibm.com/220/220prod.html

and order tracking. ISIS is an OS/2 multithread Presentation Manager® application, and the relational database used in conjunction with ISIS is IBM's DB2/2™, an SNA application. ISIS currently serves only European contracts but will be expanding because of Turner Broadcasting's switch to an IP network.

Juan Miqueli, technical specialist at Turner Broadcasting, chose IBM's Communications Server for OS/2 Warp to enable users from international locations to communicate with the SNA shipping and inventory application over TCP/IP to the central-site SNA host. With the removal of private lines for SNA traffic to London, Amsterdam, and Los Angeles, Turner Broadcasting has saved approximately $8,000 (U.S.) per month.

EXPANDED SOFTWARE CAPABILITY

IBM Communications Server is a vital component of IBM's Software Server series. This comprehensive collection of software capabilities (developed by IBM and Lotus®) provides enterprises with complete solutions in a network computing environment. To enable SNA and TCP/IP integration, Communications Server includes AnyNet technology, which is based on the open industry standard Multiprotocol Transport Networking (MPTN) architecture.

With technologies such as AnyNet, enterprises can run all of their applications over a single protocol, reducing the need to maintain parallel networks just to run different types of applications. At Turner Broadcasting, Miqueli worked with IBM to test the SNA-over-TCP/IP gateway in IBM Communications Server for OS/2 Warp and the SNA-over-TCP/IP access node in the OS/2 Access Feature of the server.

SIMPLIFIED NETWORK ACCESS

Communications Server for OS/2 Warp was installed on the boundary of the remote TCP/IP networks and the central-site SNA network, enabling the SNA application to run over connected IP and SNA networks. The Communications Server OS/2 Access Feature was installed in the remote site's TCP/IP workstations.

IBM Communications Server enables Turner employees around the globe to cost-effectively communicate with the company's headquarters in Atlanta.

Chura states, "The multiprotocol function in Communications Server for OS/2 Warp gives us the ability to run our SNA application over TCP/IP."

Miqueli adds, "With Communications Server, our existing SNA application remained accessible to end users over our IP router network, with no modification to the application. Routing traffic, rather than bridging it, resulted in easier management and more control. And our line costs are significantly reduced as a result of our network consolidation."

The OS/2 Access Feature is currently used at TBS offices in London, Amsterdam, Paris, and Los Angeles. Soon it will be installed in the company's other worldwide locations, including Hong Kong, Mexico City, Toronto, and Sydney.
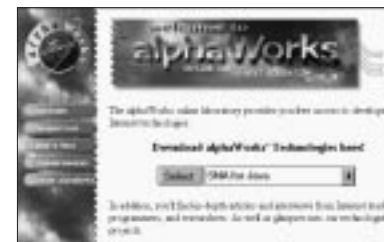
For more information

To learn more about IBM's Communications Server family of products, visit

http://www.raleigh.ibm.com/ecf/ecfover.html

Get IBM's Latest Internet Technologies

Where can you find some of the hottest new Web technologies? Try alphaWorks, an IBM Web site that features advanced Internet and Java technologies. A combined online laboratory and Web site, alphaWorks provides the Internet community with free access to a variety of advanced software technologies. With alphaWorks, users can preview, use, and experiment with next-generation Internet technologies still under development.

According to John Patrick, IBM's vice president of Internet Technology, "The Internet community benefits from early access to new and developing technologies, and the user feedback will help us assess and refine those technologies quickly. In the long run, alphaWorks will help us get final products to market faster than we have in the past."

New technologies from IBM's vast research efforts and from individual developers are posted on a regular basis. IBM plans eventually to make alphaWorks open to third-party developers who want to place their own alpha-stage technologies on the site. In addition, alphaWorks contains in-depth articles and interviews from Internet leaders, programmers, and researchers—as well as a glimpse into ongoing projects at IBM. For an example of such a project, see page 8.

For more information

For free access to new Internet technologies, visit
http://www.alphaworks.ibm.com or contact
alphaWorks@alphaWorks.ibm.com

NetWare for SAA 2.2 Leads the Way in LAN-to-Host Connectivity

• New intranet capabilities improve user access to host-based information

The industry's most popular LAN-to-host gateway software, NetWare for SAA , just got better with new features that significantly improve its ease of use and manageability while offering support for several new connectivity options. This new version also features tighter integration with Novell Directory Services™ (NDS™), expanded Internet and intranet capabilities, and enhanced client support.

The result of an alliance between IBM and Novell, NetWare for SAA Version 2.2 integrates seamlessly with Novell NetWare or IntranetWare™ environments, providing users with increased access to business-critical information residing on IBM S/390s and AS/400s. The gateway software operates as a NetWare Loadable Module (NLM) on either a stand-alone server or a production server.

SIMPLIFIED ADMINISTRATION AND MANAGEMENT

Because NetWare for SAA offers full integration with NDS, it greatly simplifies administrators' client configuration and management tasks. For example, configuration data is automatically pulled from client profiles in NDS. Other new capabilities enable administrators to manage users from a single console. NetWare for SAA also includes load-balancing technology to ensure equal client distribution among multiple servers. This increases server performance and yields faster response time.

Administration is also simplified by the SAA Services Manager (SSM), the software utility that monitors NetWare for SAA gateways for user accessibility, user demand, and gateway traffic. This diagnostic capability provides an element of security to administrators and reliability to end users.

IMPROVED SUPPORT FOR CORPORATE INTRANETS

Enhancements to NetWare for SAA 2.2 enable users to further leverage the IP support found in IntranetWare to build a complete corporate Internet and intranet solution. New features include the following:

♦ TN3270E support to give users host access across TCP/IP
♦ FTP server and AFTP/FTP gateway to enable users to retrieve host files by using a Web browser
♦ 32-bit client support for OS/2, Windows 95, and Windows NT

For more information about NetWare for SAA, contact your Novell Authorized Reseller. In the U.S. and Canada, call 1-800-NETWARE (1-800-638-9273) or visit the NetWare for SAA 2.2 Web site at
http://iamg.novell.com/iamg/products/saa/nwsaatoc.htm.

Multiprotocol Switched Services Wins Big at Networld+Interop

IBM's Multiprotocol Switched Services (MSS) server was honored as the Grand Winner of the Best of Show awards at Networld+Interop® in Atlanta. The editors of *Data Communications* and *LAN Times* chose MSS as the Grand Winner because it will enable corporations to tightly integrate their switched, bridged, and routed packet-based LANs with cell-based ATM networks. It supports a variety of protocols and standards, including Multiprotocol Over ATM (MPOA), LAN Emulation (LANE), and IP and IPX routing.

"Our winners reflect the trend toward new IP and ATM capabilities that will be used in corporate networks to increase bandwidth, as well as provide greater security and control," says Lee Keough, editor-in-chief of *Data Communications*.

In addition to winning Grand Winner, IBM MSS also won Best of Show in Network Infrastructure, a category that includes all LAN and campus switches, hubs, routers, and other connectivity devices. For Grand Winner, MSS beat numerous other products, including Cisco's® Stratacom® BPX-ST.

"The Best of Show Awards are an integral and important part of the Networld+Interop Conference," says Michael Goodman, general manager, Networld+Interop. "They help extend the purpose of the show, which is to showcase products and services in the networking arena that help customers expand their business."

MSS is a key component of IBM customer networks, and continues to enhance IBM's Switched Virtual Networking (SVN) offerings.

IBM's Networking Conferences Are a Hit

In-depth information to help shape your networking strategy

IBM recently sponsored an in-depth networking conference that combined two popular conferences into one—the Networking Systems Technical Conference and the APPC/APPN Technical Conference. Held from September 30th to October 4th in Anaheim, California, the dual conference attracted more than 1,200 attendees, including a large representation of IBM networking customers from around the world.

The conference focused on IBM's vision of the future of networking and highlighted emerging technologies and strategies for implementing those technologies. It also provided an excellent forum for attendees to talk with technical experts and voice their opinions about IBM's future plans.

LEVERAGING NETWORKING INVESTMENTS WITH NEW TECHNOLOGY

A key theme of the conference was that IBM has a variety of solutions for leveraging SNA and multiprotocol networks across the corporate enterprise. Especially important was the integration of APPN and High Performance Routing (HPR) technology to help extend the capabilities of existing customer networks. Throughout the conference, IBM pointed out ways that customers could connect their networks with organizational intranets and the Internet to exploit business opportunities, regardless of the underlying networking protocols.

The conferences' two keynote speakers carried on this theme. Steve Mills, general manager of IBM's Software Solutions Division, presented IBM's vision of network computing and its plan to maintain technical leadership in that arena. The other keynote speaker was Rick McGee, vice president of Strategy and Business Development for IBM's Networking Hardware Division, who described how IBM's multiprotocol networking solutions—including leading networking technologies such HPR and APPN—were transforming corporations around the globe. For an example of such a transformation, see the article about Turner Broadcasting on Page 1.

IN-DEPTH NETWORKING EDUCATION

Integral to the conference's success was a series of in-depth education sessions designed to facilitate an open dialogue

between IBM technical experts and customers. During these sessions, customers got up to speed on the latest technical topics while honing their networking skills. Nearly 200 different sessions were available to help attendees learn about the best solutions for their particular networking challenges.

The Networking System Technical Conference path included three primary session tracks:

1) Networking technologies—Featured LANs, WANs, and ways of protecting existing infrastructures while working through migration issues

2) Systems management—Described the total IBM systems management solution for enterprise-wide, cross-platform, heterogenous environments

3) The Internet—Explored networking breakthroughs in application accessability and the emergence of global network connections

The APPC/APPN Technical Conference portion featured two in-depth session tracks:

1) Programming—Provided comprehensive coverage of application development tools and technologies

2) Networking—Encompassed APPN and HPR, and discussed the issues of migrating to these performance-boosting technologies

In addition to the elective sessions, there was also a complete configuration and performance lab where IBM was running APPN and HPR over an ATM network. Customers viewed demonstrations and got hands-on experience with a variety of IBM networking products—with plenty of IBM technical experts to answer questions.

> **For more information**
> To learn about future conferences, send E-mail to **conf@tucvm2.vnet.ibm.com** or call **1-800-IBM-TEACH** (**1-800-426-8322**) and ask for "Conferences."

Upcoming Events

COMDEX® Pacific Rim
Vancouver, BC
JANUARY 21-23, 1997
http://www.comdex.com
....

ComNet® 97
Washington, DC
FEBRUARY 3-6, 1997
....

COMDEX France
Paris
FEBRUARY 4-7, 1997
http://www.comdex.com
....

Networks Expo
Boston, MA
FEBRUARY 18-20, 1997
....

COMDEX Mexico
Mexico City
FEBRUARY 25-28, 1997
http://www.comdex.com
....

SHARE Winter Technical Conference
San Francisco, CA
MARCH 2-7, 1997
http://www.share.org
....

Uniforum/Enterprise Communications
San Francisco, CA
MARCH 12-14, 1997
....

CeBit™ 97
Hannover, Germany
MARCH 13-19, 1997

APPN Implementers Workshop (AIW 13)
Raleigh, NC
MARCH 24-27, 1997
http://www.raleigh.ibm.com/app/aiwhome.htm
....

NetWorld+Interop
Singapore
APRIL 7-11, 1997
http://www.sbexpos.com/interop/
....

COMDEX Japan
Tokyo
APRIL 8-11, 1997
http://www.comdex.com
....

COMDEX Rio
Rio de Janeiro, Brazil
APRIL 8-13, 1997
http://www.comdex.com
....

Database and Client/Server World
Toronto, Canada
APRIL 15-17, 1997
....

COMDEX U.K.
London
APRIL 22-25, 1997
http://www.comdex.com
....

NetWorld+Interop
Las Vegas, NV
MAY 6-8, 1997
http://www.sbexpos.com/interop/
....

IBM Technical Interchange
St. Louis, MO
MAY 12-16, 1997
http://www.developer.ibm.com/events/ti_97/

NetWorld+Interop
Frankfurt, Germany
MAY 13-15, 1997
http://www.sbexpos.com/interop/
....

Database and Client/Server World
Boston, MA
MAY 20-22, 1997
....

COMDEX Spring
Atlanta, GA
JUNE 2-5, 1997
http://www.comdex.com
....

NetWorld+Interop
Tokyo, Japan
JUNE 2-6, 1997
http://www.sbexpos.com/interop/
....

APPN Implementers Workshop (AIW 14)
San Jose, CA
JULY 14-17, 1997
http://www.raleigh.ibm.com/app/aiwhome.htm
....

Networking Systems Technical Conference (NSTC) and APPC/APPN Technical Conference (AATC)
Miami, FL
OCTOBER 20-24, 1997

What Customers are saying about IBM's Technical Networking Conferences

"I enjoyed the smaller, more personal style of this conference. I think it provided more access to the 'experts' for those who had questions."—Kenn Krech

"It's been even better than I expected. The quality of information was surprisingly good, due largely to the level of expertise and the attitude of the people dispensing it. I really feel I'll be able to go back and do something with what I've learned."—Cathy Frank, Advantis

"A very good conference covering all the subjects I could dream of."—D. Stansfield, SITA

"I like the in-depth knowledge you can get on a particular subject and access to the product developers."—James Sporer, University of Wisconsin

"Our organization not only attends every year, but we actually depend on it to keep abreast on technologies and processes."—Lee Lowe, State Farm Insurance

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Network Connection
IBM Network Technology Marketing
Department AYRA/501, P.O. Box 12195
Research Triangle Park, NC 27709 USA

G325-0219-00