



WebSphere software

CICS delivers IP interconnectivity.

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Introduction

As part of a multirelease initiative, IBM CICS® Transaction Server for z/OS, Version 3.2 introduces a new TCP/IP-based intercommunication protocol as an alternative to that provided through intersystem communication (ISC). This paper looks at the new intercommunication facility, which supports distributed program link (DPL) and external call interface (ECI) requests to be routed over a TCP/IP network (see Figure 1).

This paper is for IBM System z™ technical managers, system architects and CICS system administrators who are responsible for setting the overall strategic direction for CICS transaction-processing systems and their use of the enterprise networking infrastructure.

From SNA to TCP/IP

The IBM Systems Network Architecture (SNA) networking standard describes a complete protocol stack for interconnecting computers and their resources, and it has provided reliable and efficient networking for CICS clients for more than 30 years. SNA is still widely used by many enterprises and has been implemented on the majority of commonly available operating systems.

The data formats and protocols used by ISC allow intercommunication with remotely connected systems using local or wide area networks based on SNA. This includes remote CICS systems on a variety of operating systems, ranging from IBM z/OS® to Microsoft® Windows®, and remote IBM IMS™ systems on z/OS. By contrast, multiregion operation (MRO) enables CICS systems running in the same z/OS sysplex to communicate with one another using optimized networking facilities based on CICS cross-memory facilities or intercommunication through the IBM Parallel Sysplex® coupling facility. MRO does not, however, support intercommunication with IMS or CICS systems outside the local z/OS sysplex environment.

TCP/IP provides an open, flexible and adaptable network-communications framework, which is supported today by many skilled professionals and tools. It is currently managed by the Internet Engineering Task Force (IETF), an open organization. Because of its openness and adaptability, the TCP/IP protocol suite has become the foundation for the set of technologies that form the basis of the modern Internet. The convergence of IBM mainframe capabilities with Internet technology, connectivity and standards (particularly TCP/IP) is continuing to change the face of information technology. This evolution has allowed many enterprise networks to benefit from the readily available set of IP-based wide area networks (WANs) and associated skills, the wide choice of networking appliances, and the advances in network capacity, such as those provided by Gigabit Ethernet networks.

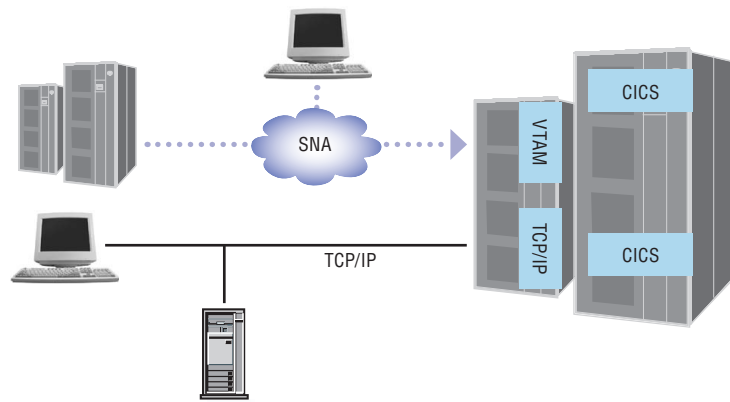


Figure 1. SNA and TCP/IP as network choices for the System z platform

CICS and IP interconnectivity

In previous IBM CICS Transaction Server releases, communication between CICS regions that were not in the same sysplex had to be made using SNA-based WANs. With the latest release of CICS Transaction Server, this requirement no longer applies to DPL requests, and it is now possible to use a TCP/IP communications link instead. This capability is known as IP interconnectivity (IPIC).

Support for DPL over IPIC is similar to that provided for DPL requests over ISC. For example, two-phase commit and the passing of communication areas (COMMAREAs) or containers are both supported. The new function builds on existing CICS TCP/IP access protocols, which already include HTTP, Java™ Remote Method Invocation (RMI) over Internet Inter-Orb Protocol (IIOP) and the external call interface (ECI) over TCP/IP.

Although IPIC does not change the flow of data as seen by the CICS application, it is important to realize that the CICS resource definitions are different. ISC requires CONNECTION and SESSION resource definitions, whereas IPIC requires an IPCONN definition, which controls the properties of both the send and receive sessions and the related facets, such as security or queuing. In addition, the ability of the CICS region to listen on a given TCP/IP port is controlled through a TCPIPSERVICE definition that is specific to a given TCP/IP access protocol. To help migrating from ISC to IPIC, a sample CICS tool helps to simplify the migration of CICS resource definitions to the new IPCONN and TCPIPSERVICE definitions that are required.

Moving forward with CICS intercommunication

There are two goals of modernizing a CICS network (see Figure 2). The first goal is to avoid the need to modify application programs. Because the majority of CICS applications are not themselves based on SNA, they should transition easily from running in an SNA network environment to running in a TCP/IP environment. In addition, although SNA is being replaced by IP at the networking level, IBM does not plan to discontinue CICS support for SNA or Virtual Telecommunications Access Method (IBM VTAM®).¹

The second goal of modernizing a CICS network is to provide the option of running a CICSplex without an SNA network behind it. Application capabilities based on 3270 terminals can be maintained using either Telnet 3270 emulation technology or wrapper technology, such as the Link3270 bridge and the CICS Service Flow Feature (SFF). These options enable assets to be wrapped and reused as components within a service oriented architecture (SOA). SNA-based CICS applications that directly use Logical Unit (LU) 0 or LU 6.2 facilities can continue to be accessed through an IP-based SNA networking technology such as the High Performance Routing/Internet Protocol (HPR/IP) technology provided by the Enterprise Extender feature of IBM Communications Server.

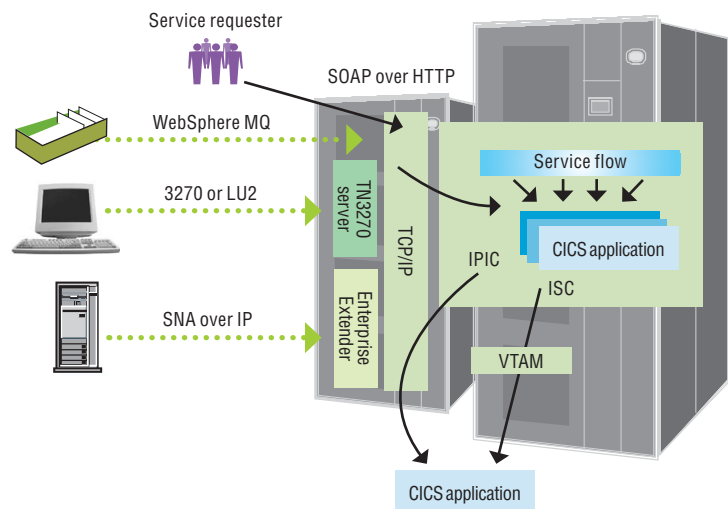


Figure 2. CICSplex processing using TCP/IP

Benefits of IPIC

The new IPIC support delivered by CICS Transaction Server V3.2 offers an alternative to the current ISC support and is available initially for DPL and ECI requests only (see Figure 3). It is not intended to replace the MRO facilities that provide optimized intercommunication facilities within a sysplex environment.

IPIC connections offer similar capabilities and qualities of service to those provided by ISC but also build on the unique value of System z networking enhancements to provide the following additional benefits:

- *Secure encryption and authentication through the facilities of the Secure Socket Layer (SSL) protocol between CICS regions, and from Java clients directly into a CICS region*
- *Support for ECI-based Java clients to access CICS channels and containers*
- *Support for the tracking of work across the CICSplex using the facilities of CICS point-of-origin data providing for enhanced online problem determination and offline monitoring*
- *Enterprise Workload Management (EWM) support making end-to-end workload monitoring possible in heterogeneous environments such as J2EE Connector architecture (JCA) requests from IBM WebSphere® Application Server into CICS Transaction Server*
- *Fine-grained security control of the use of IP services through the IBM Communications Server facilities for STACKACCESS, and PORTACCESS control and NETACCESS zones*
- *Use of specialized Open Systems Adapter-Express (OSA-Express) hardware to get the most out of modern, high-capacity Gigabit Ethernet networks*
- *IBM HiperSockets™ network facilities for cross-memory, high-speed networking between logical partitions (LPARs) that are located on the same physical server*
- *Use of virtual IP address (VIPA) technology that decouples the IP address from the physical adapter, allowing an IP address to be easily moved around the sysplex²*

The implementation of IPIC in CICS Transaction Server for z/OS V3.2 is based on the established CICS TCP/IP support that has been widely used in CICS for several releases. The support for TCP/IP has been further enhanced in CICS Transaction Server V3.2 to provide additional monitoring and problem determination facilities accessible through CICSplex[®] System Manager. These new facilities include the ability to:

- *View the TCP/IP network across an entire network of CICS systems.*
- *View TCP/IP connections for all access protocols, including IPIC, HTTP, IIOP and ECI.*
- *Monitor the TCP/IP network resources being used by a CICS region and correlate these with TCP/IP socket usage information at the stack level.*
- *Dynamically correlate interrelated CICS tasks in different CICS systems connected through IPIC connections, by the use of point-of-origin data.*

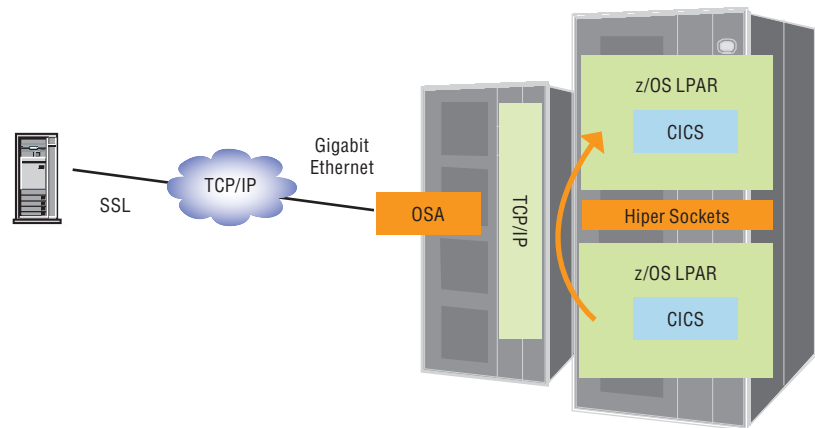


Figure 3. IPIC use of TCP/IP networking

CICS Transaction Gateway support for IPIC

Additional CICS access for Java clients over IPIC connections is provided through the facilities of the IBM CICS Transaction Gateway, Version 7.1 (see Figure 4). This new release of CICS Transaction Gateway enables remote Java clients to call CICS applications using an extended version of the ECI. Support is provided for interprogram data transfer using either traditional COMMAREAs or the new CICS Transaction Server, Version 3 channels and containers programming model. This new model enables applications to exchange large amounts of structured data, far greater than the traditional 32 KB COMMAREAs. The ability to use channels and containers is available only for Java clients that use the IPIC access protocol into CICS Transaction Server V3.2. Existing CICS Transaction Gateway access protocols, including external CICS interface (EXCI), SNA and ECI/IP, continue to support interprogram data transfer based on COMMAREAs.

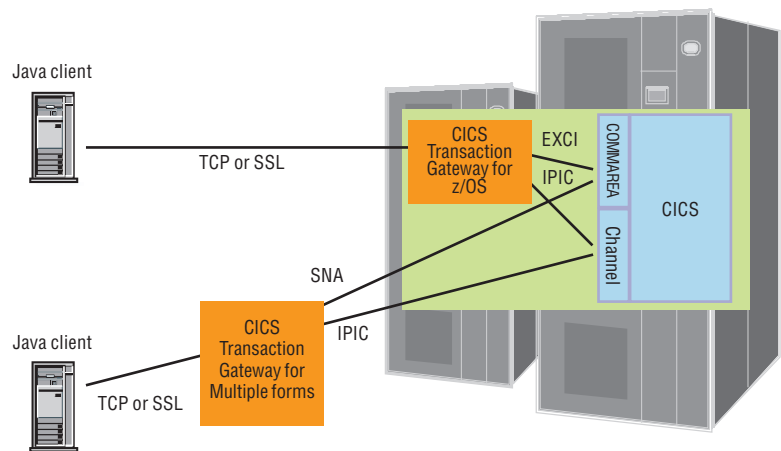


Figure 4. Network connectivity provided by CICS Transaction Gateway

The IPIC networking capabilities of CICS Transaction Server provide additional support for SSL and XA two-phase commit connections directly from a Java 2 Platform, Enterprise Edition (J2EE) application server into a CICS Transaction Server V3.2 system. This support provides extended opportunities for reusing existing CICS applications as services within comprehensive and sophisticated J2EE and Web services solutions that are hosted on powerful application servers such as IBM WebSphere Application Server.

The end-to-end network monitoring capabilities for enterprise applications are also significantly extended through the use of the IPIC access protocol. The CICS Transaction Gateway dynamically populates CICS point-of-origin data and EWLM information, providing J2EE applications with the same monitoring and problem determination facilities for TCP/IP that CICS Transaction Server V3.2 provides. This allows easier diagnosis of connectivity and networking problems using tools such as CICSplex System Manager.

The future

Enterprise customers typically rely on SNA today and are looking to take advantage of the latest fast, high-capacity IP networks. The roadmap for CICS IP interconnectivity provides communication between CICS regions and clients using native IP – in a majority of cases without changing applications.

Today, CICS Transaction Server for z/OS V3.2 supports DPL over IP, and this can be combined with CICS Transaction Gateway V7.1 to support Java clients. Future releases will allow customers to make considered decisions about their migration from SNA to IP.

All statements regarding IBM's plans, directions and intent are subject to change or withdrawal without notice.

Summary

The TCP/IP-based intercommunication protocol provided by CICS Transaction Server for z/OS, Version 3.2 delivers a number of advantages:

- *CICS Transaction Server continues to evolve as a highly optimized transaction-processing environment with a flexible and adaptable network-communications framework.*
- *Migration of SNA networks to IP allows CICS to put into effect a readily available set of IP-based WANs and associated skills, and the wide choice of modern networking appliances.*
- *The new IPIC protocol in CICS Transaction Server V3.2 allows simple migration of CICS applications accessed through DPL or ECI to take advantage of these IP-based networks for intercommunication with CICS systems or Java clients outside the local z/OS sysplex environment.*
- *New CICS facilities for monitoring, workload management and problem determination are enabled through the use of IPIC connections, with CICSplex System Manager providing the key interface for administering and managing these networks.*

Related reading

The following publications provide more information about modernizing the CICS environment:

- *IBM Redbooks® publication: A Structured Approach to Modernizing the SNA Environment, SG24-7334*
- *IBM white paper: Options for integrating CICS applications in an SOA, WSW11339-USEN-00*

For more information

To learn more, contact your IBM representative or IBM Business Partner, or visit:

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¹ Clients should consider the life expectancy of SNA hardware components in their networks when considering migration to TCP/IP.

² For transactional recovery reasons, TCP/IP load-balancing technology, such as Port Sharing or Sysplex Distributor, cannot be used to dynamically balance IPIC-based connections between CICS regions.