Flexible, High-Performing, Security-Rich, and Scalable Connectivity with CICS Transaction Gateway Products

IBM Redbooks Solution Guide

The IBM® CICS® Transaction Gateway (CICS TG) product suite is the flexible, high-performing, security-rich, and scalable connector technology for all CICS servers. CICS TG based solutions are production proven in customer environments worldwide, with successful deployments across every major industry. This IBM Redbooks® Solution Guide gives an overview of the possibilities of the IBM CICS TG.

Three CICS TG products are available to suit a wide range of requirements (Figure 1). The CICS TG products give application developers intuitive programming interfaces to access CICS business logic from multiple languages. The products also use standard CICS intercommunication facilities, thus requiring minimal configuration changes to get started.

- IBM CICS Transaction Gateway for z/OS®
- IBM CICS Transaction Gateway for Multiplatforms
- IBM CICS Transaction Gateway Desktop Edition

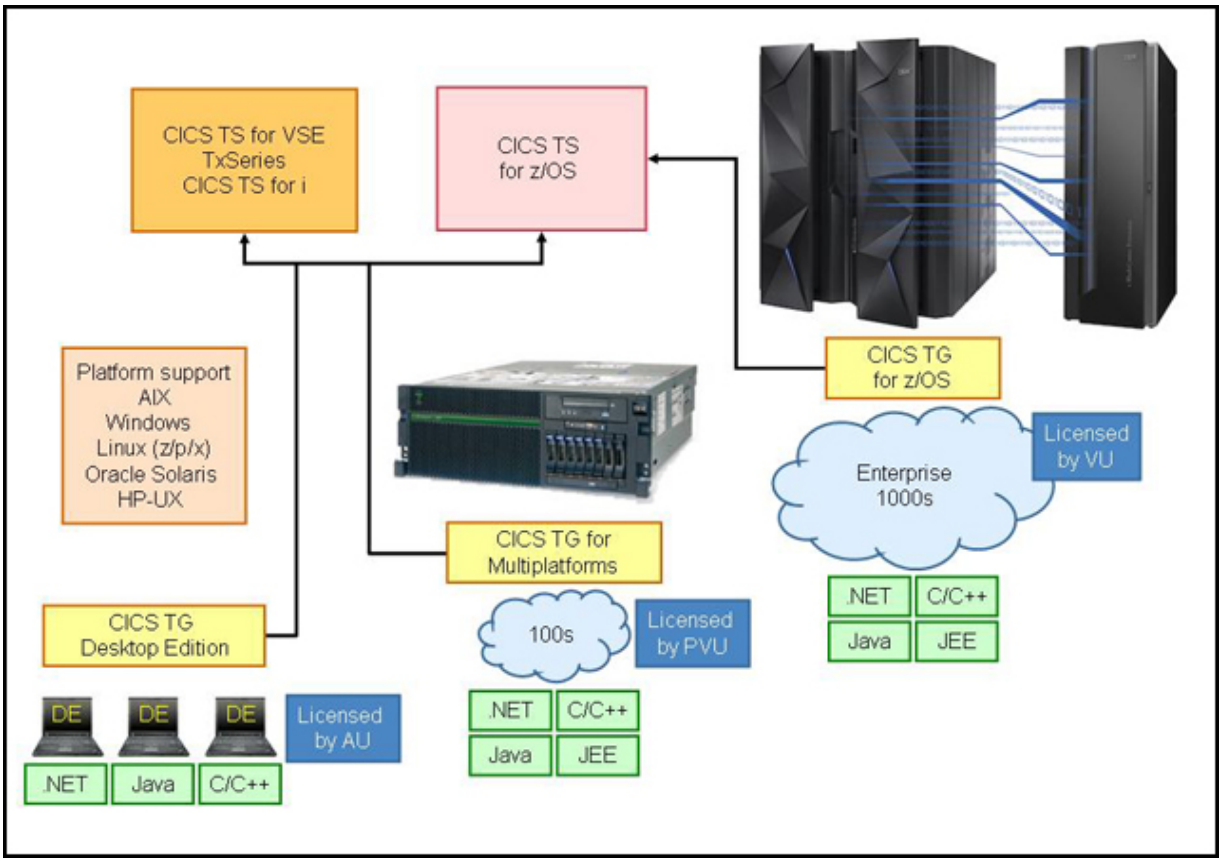

Figure1. The IBM CICS Transaction Gateway products

Did you know?

CICS TG products provide application integration for approximately half of all customers using CICS server products today, processing billions of transactions each day, worldwide.

Each CICS TG product enables integration for Java applications, servlets, or applets, .NET Framework-based applications, C, C++, and COBOL applications.

Both CICS TG for z/OS and CICS TG for Multiplatforms provide integration for JEE-certified application servers, with exclusive features for IBM WebSphere® Application Server products, such as identity propagation and cross component trace (XCT). These two server-grade CICS TG products can be scaled to suit the capacity and availability requirements of the application workload. The CICS TG Desktop Edition product is licensed for single users, and is aimed at providing direct connectivity to CICS servers for desktop applications.

Running on IBM z/OS and Microsoft Windows, Linux, and UNIX operating systems, CICS TG products provide connectivity to all IBM CICS server products.

- CICS Transaction Server for z/OS
- TXSeries for Multiplatforms
- CICS Transaction Server for IBM z/VSE®
- CICS Transaction Server for i

Business value

CICS TG products deliver integration technology and have a long track record of reliable and robust connectivity for all CICS server products. Application developers use standard tools such as Eclipse, the IBM Rational® Application Developer family, and Microsoft Visual Studio. System administrators use standard facilities on their platform of choice for installation, maintenance, and configuration.

CICS TG products use industry-standard transports and standard CICS intercommunication facilities, offering maximum flexibility to adapt solutions as business requirements evolve over time. As networking technology advances, CICS TG products transparently reap benefits delivered through the TCP/IP and secure socket libraries. As server hardware and operating systems advance, CICS TG components and applications automatically benefit through optimizations in compilers and Java run time. Examples include EC12 processor optimizations, large page support with 64-bit Java and zAAP offload on z/OS, or IBM POWER7® processor optimizations on IBM AIX®.

CICS TG application programming interfaces (APIs) provide developers with intuitive access to CICS business logic and data. Portability of application code across hardware and operating systems delivers longevity for the initial investment as platform technologies evolve. For example, application code that is originally developed for use with CICS TG for Multiplatforms on UNIX or Windows might be reused in a larger scale deployment with CICS TG for z/OS. In a three-tier solution, applications developed for different runtime environments can share access to CICS servers through the same Gateway daemon.

The JEE-certified CICS Connectors offer flexibility when you choose a Java Platform, Enterprise Edition application server vendor, and fully use unique features of the IBM WebSphere Application Server products. Java Platform, Enterprise Edition applications deployed to IBM PureApplication™ System integrate with CICS business logic and data through CICS TG, using the Web Application pattern.

CICS TG for z/OS uses the unique capabilities that are offered by z/OS, using the qualities of service and scalability offered by IBM System z® Parallel Sysplex®. Support for industry-standard hypervisors also enables deployment of CICS TG for Multiplatforms to virtualized servers, including Linux for System z and Workload Partitions (WPARs) on IBM AIX.

Solution overview

CICS TG programming interfaces provide a tight coupling between applications, although the CICS TG runtime components provide scalability, availability, and security for the solution. Tight coupling is appropriate when a well-defined relationship exists between the CICS business logic and the non-CICS applications. Web Services are more appropriate when a loose coupling is required. Loose coupling is appropriate for exposing business logic when the partner system is unspecified.

All CICS TG products provide the following APIs for multiple programming languages:

- External Call Interface (ECI): Provides access to CICS programs, with data encapsulated as COMMAREAs or channels and containers
- External Security Interface (ESI): Provides access to Password Expiry Management (PEM) capabilities, such as verify password or change password

The CICS TG for Multiplatforms and CICS TG Desktop Edition products additionally provide the External Presentation Interface (EPI) for access to CICS terminal transactions through virtual 3270 terminals. Integration with CICS TS for z/OS, or CICS TS for z/VSE terminal-based transactions does require an SNA APPC connection, provided through an extra product such as IBM Communications Server for Data Center Deployment, or IBM Host Access Client Package. EPI also offers integration with CICS TS for i terminal-based transactions using either a `TCPIP` or `SNA` (APPC) connection, and with TXSeries terminal-based transactions using a `TCPIP` connection.

Solution architecture

There are three models of deployment for CICS TG applications, where the location of the application relative to the CICS TG product installation influences which APIs an application might use. Figure 2 shows the CICS Transaction Gateway architecture options.

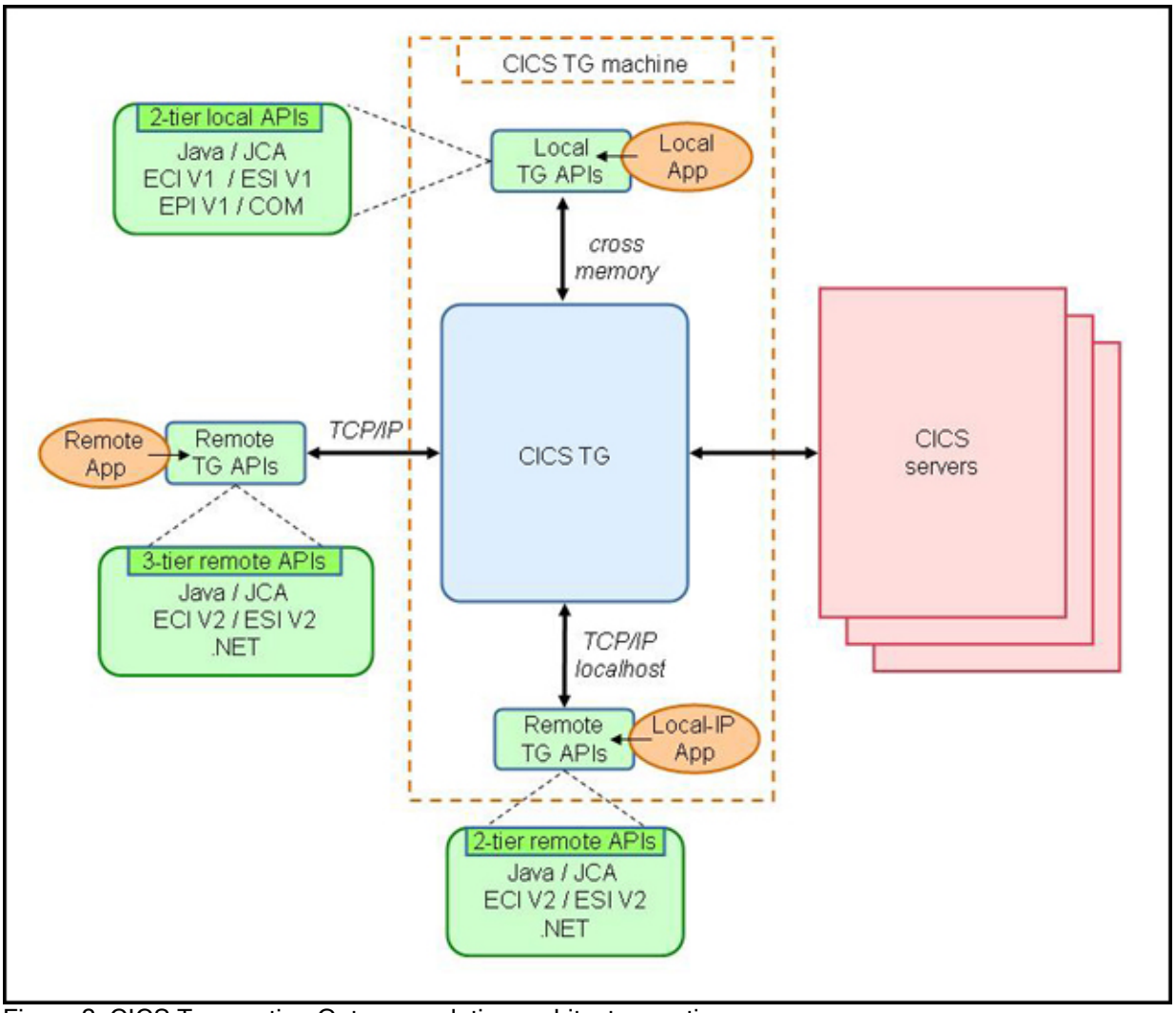

Figure 2. CICS Transaction Gateway solution architecture options

The three models of deployment can be summarized as follows:

- 3-tier remote mode
  - Application is on a separate machine to the CICS TG product installation
  - Application requests flow to CICS through a remote Gateway daemon component
- 2-tier remote mode
  - Application is co-located with the CICS TG product installation
  - Application requests flow to CICS through a co-located Gateway daemon
- 2-tier local mode
  - Application is co-located with the CICS TG product installation
  - Application requests flow directly to the CICS server

The 2-tier local mode represents the shortest end-to-end path length to process an application request. However, 3-tier remote mode provides greater qualities of service in terms of flexibility, availability, and scalability.

Although CICS TG Desktop Edition includes the remote mode API components for Java, ECI V2, ESI V2, and.NET Framework-based applications, the product license restricts their use to applications co-located with the product installation.

Usage scenarios

The following scenarios describe actual customer deployments, where CICS TG has been selected as the integration technology from a range of possible solutions. The flexibility offered by the CICS TG products is often cited as a winning factor when selecting integration middleware for CICS.

Retail banking

An expanding international banking group had a branch-based application that was founded directly on SNA network protocols to provide communications with a central mainframe. To apply modern levels of security, improve overall stability, and establish a scalable, robust, and extensible service, the group decided to migrate to a TCP/IP-based middleware technology.

After evaluating a range of options, the group chose to use CICS Transaction Gateway on z/OS, connecting each Windows desktop through the Internet Protocol network using the CICS TG, ECI Version 2, API. The solution included eight Gateway daemons running on four z/OS LPARs (two Gateway daemons per LPAR) to provide the required capacity and availability.

Within six months of the project starting, the new solution helped process nearly 15 million transactions per day. It now connects more than 3,000 branches with approximately 10 Windows desktop systems per branch. IBM CICS Transaction Gateway software helped the banking group deliver a stable, secure, and high-performance transaction processing solution for a significant proportion of its business. The success of this project made this solution a strong contender for future projects within the group.

Financial services

A key financial services provider, for multiple banks in a leading European economy, recognized the need to transform its core services to serve a rapidly expanding market. The provider recognized that sustained growth requires a standard but highly scalable solution for transforming 3270-based applications for web enablement. The solution must be flexible enough to accommodate new applications without disrupting existing applications and cope with significant increases in work load within relatively short periods of time.

CICS Transaction Gateway enabled a smooth transformation to the use of modern Java Enterprise Edition applications, running on WebSphere Application Server, and integrated with CICS Transaction Server for z/OS. CICS TG provides flexible configuration options, supporting a mixture of application and system architectures, allowing maximum optimization by multiple projects. CICS TG provides high performing and scalable access to CICS business logic, requiring minimal changes to CICS systems and applications. The final solution reduced costs, risk, and time-to-market by increased reuse of applications and skills (Figure 3).

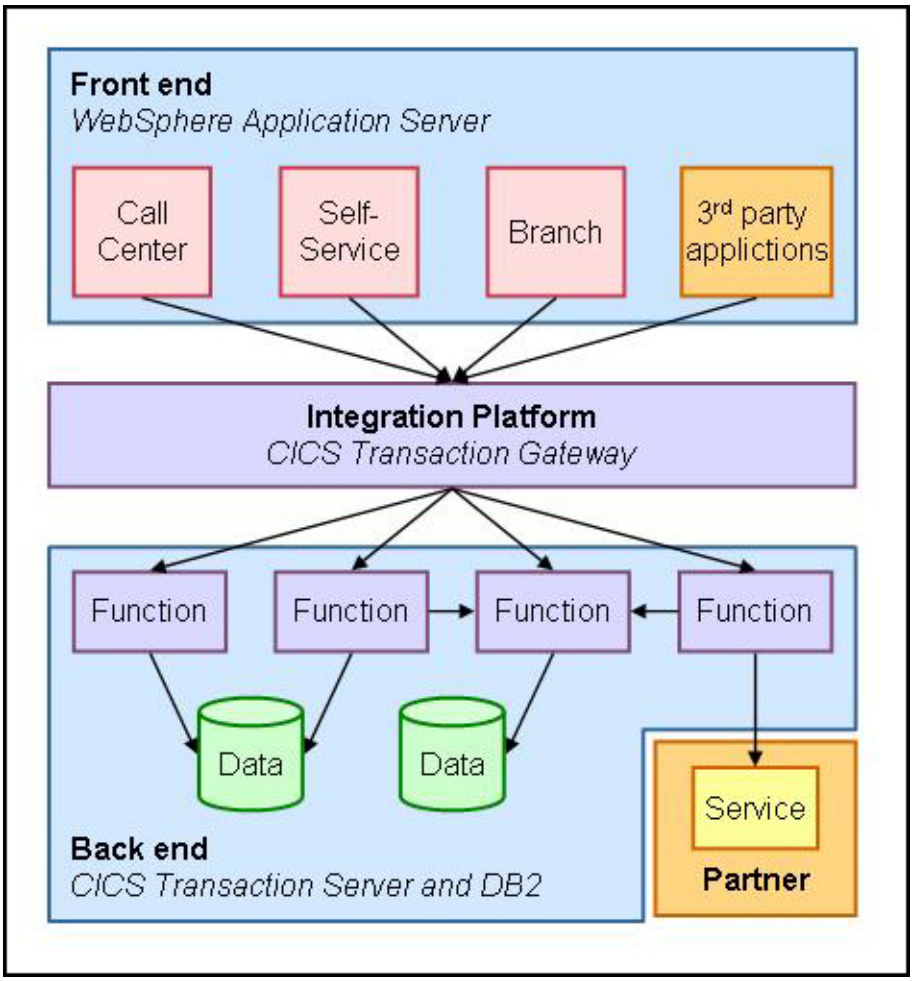

Figure 3. Scalable WebSphere Application Server integration solution

Following a successful implementation of this solution, the workload on the new system increased by 300% over two years. The peak number of transactions processed through the CICS TG integration platform in one day reached 12.5 million.

Integration

CICS Transaction Gateway integrates with a wide selection of IBM software:

- Middleware products, such as WebSphere Messages Broker and WebSphere Application Server
- Performance tuning and monitoring tools, such as CICS Performance Analyzer and IBM Tivoli® OMEGAMON® XE for CICS on z/OS
- Application development and testing products, such as Rational Application Developer and Rational Integration Tester

Figure 4 shows a summary of various product integrations.

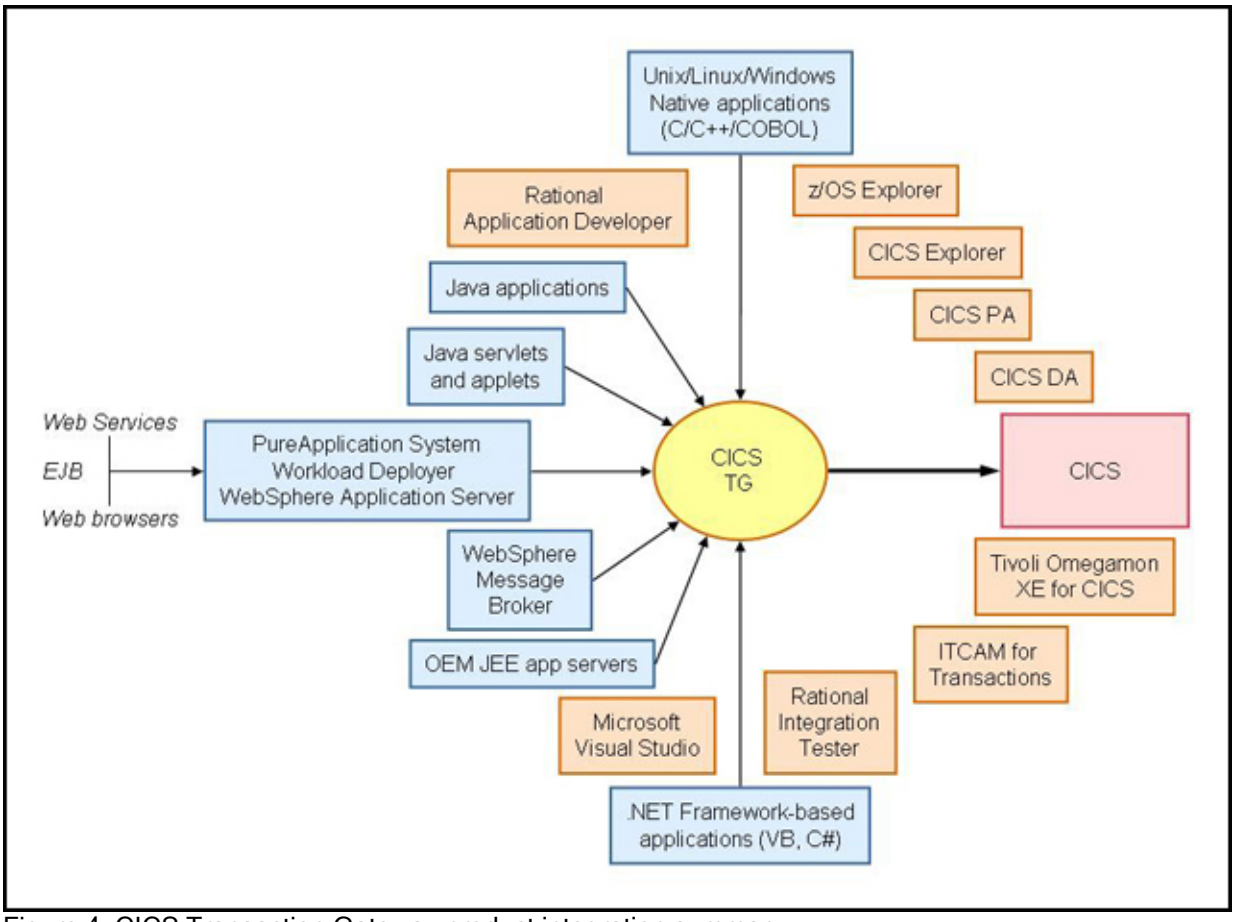

Figure 4. CICS Transaction Gateway product integration summary

CICS portfolio

CICS Performance Analyzer (CICS PA) takes SMF type 111 records, generated by CICS TG for z/OS, and offers a powerful range of options for summarizing large sets of historical statistics, potentially generated by multiple Gateway daemons. The following predefined reports are available from CICS PA:

- Activity Summary
- Usage and Capacity
- Configuration Summary
- Client Workload
- CICS Workload

Custom reports can be defined based on conditions, defined in terms of CICS Transaction Gateway statistics and threshold values.

CICS Deployment Assistant (CICS DA) is able to discover and visualize Gateway daemon address spaces running anywhere within the Sysplex, and shows CICS TG in a wider context of CICS, IBM DB2®, and WebSphere MQ resources.

IBM CICS Explorer® (and z/OS Explorer) can use the CICS TG plug-in to provide visibility of multiple Gateway daemons running as part of any CICS TG product on any platform. A system administrator has live access to many runtime attributes for each Gateway daemon and its associated CICS connections, and the ability to actively verify basic connectivity.

WebSphere products

CICS TG for z/OS and CICS TG for Multiplatforms provide the CICS resource adapters for use with the WebSphere Application Server family of products. They allow Java Platform, Enterprise Edition application developers to use CICS resources through the standard JCA interfaces.

The ECI resource adapter represents the most popular means of CICS integration for Java Platform, Enterprise Edition application developers, providing access to CICS business logic and data through a standard CICS program link. It also provides options for transactional behavior, including distributed two-phase commit, which is based on the eXtended Architecture (XA) specification from The Open Group. Combined with CICS TG for z/OS in a high availability configuration, XA transaction support delivers a robust, scalable solution maximizing the highest qualities of service available.

The EPI resource adapter enables Java Platform, Enterprise Edition application developers who target WebSphere Application Server for Multiplatforms to access terminal-based transactions on any CICS server.

WebSphere Message Broker includes a CICS node enabling integration with a remote-mode CICS Transaction Gateway configuration. This allows WebSphere Message Broker to immediately use established CICS TG solutions, or build scalable and highly available CICS connectivity through a new CICS TG solution.

IBM Integration Designer, an Eclipse based software development tool that renders your current IT assets into service components for reuse in service-oriented architecture (SOA) solutions, bundles the CICS TG for Multiplatforms product, licensed for application development and test purposes.

PureApplication System

CICS TG enables integration of Java Platform, Enterprise Edition applications deployed to a private cloud with CICS servers outside the cloud. IBM PureApplication System provides Virtual application patterns that include Virtual application pattern components. Transaction Processing components include the Existing CICS Transaction Gateway component, allowing Java Platform, Enterprise Edition applications deployed within the cloud to access CICS business logic through an existing Gateway daemon, running outside the cloud.

The Existing CICS Transaction Gateway component is available within the IBM Web Application Pattern, which provides a set of components that are typical for web applications. After building the virtual application in the Virtual Application Builder, you can deploy the application and the system determines the underlying topology configuration. The Existing CICS Transaction Gateway component is also included in the Virtual application builder of IBM Workload Deployer appliance.

Tivoli products

Two products in the IBM Tivoli Monitoring portfolio can monitor CICS TG to help with problem identification, resolution, and prevention:

- IBM Tivoli OMEGAMON XE for CICS on z/OS delivers a range of capabilities for z/OS or CICS system administrators:
  - Deep-dive monitoring of CICS TG instances running on z/OS
  - Remote mode and WebSphere Application Server for z/OS applications
  - Alerts for communication problems between CICS TG for z/OS and CICS TS for z/OS
  - Up-to-the-second details about transaction rate, I/O, and CPU consumption
  - Trend analysis to assist with future capacity planning
  - Easy access to monitoring tools of other System z applications

- IBM Tivoli Composite Application Manager for Transactions provides transaction tracking and visualization capabilities. It helps to identify transaction response and availability issues, enabling faster problem resolution through the following features:
    - End-to-end analysis of transaction response time and performance
    - Full transaction tracking of flows through CICS TG on both z/OS and Multiplatforms
    - Identification of connections from WebSphere through CICS TG to CICS (and onwards)
    - Automatic identification for points of slowdown and deviation from typical response times

Rational products

IBM Rational Application Developer includes CICS TG for Multiplatforms, licensed for application development and test purposes. The J2C tool also provides wizards to assist with the generation of Java classes from COBOL copy books, enabling Java application developers to work intuitively with data structures originating from CICS COBOL business logic.

Rational Integration Tester, a component of IBM Rational Test Automation Solution, includes a code-free solution for continuous integration testing of CICS programs through CICS TG. Conversely, it also provides a way to virtualize CICS server responses, enabling continuous integration testing of Java or JCA applications using the ECI API. Record and replay of ECI requests further facilitates the building of test cases based on real-world data, or automation of existing test cases.

Supported platforms

Each CICS TG product includes some runtime components that are supported on multiplatforms. Within the context of the CICS TG products, the term *multiplatforms* broadly refers to these operating systems and architectures:

- AIX (IBM POWER®)
- Windows (Intel)
- Red Hat Enterprise Linux (Intel, POWER, System z)
- Red Hat Enterprise Linux-compatible distributions (Intel)
- Red Hat Enterprise Desktop (Intel)
- SUSE Linux Enterprise Server (Intel, POWER, System z)
- SUSE Linux Enterprise Desktop (Intel)
- Solaris (SPARC)
- HP-UX (Itanium)

The specific releases of supported operating systems and hardware architectures are constantly evolving over time and vary with each new release of the CICS TG products. Therefore, this list represents a high-level summary.

Each release of CICS TG for z/OS requires a specific minimum release of z/OS, and is typically supported on subsequent releases of z/OS unless explicitly stated otherwise by IBM.

CICS TG for Multiplatforms and CICS TG Desktop Edition support the multiplatforms operating systems and architectures, but are also subject to licensing terms and conditions. For example, installing CICS TG Desktop Edition on a UNIX or Linux workstation is supported for a single user, but not for a UNIX or Linux server machine supporting multiple concurrent users.

CICS TG products typically support all in-support releases of all CICS server products, including these:

- CICS Transaction Server for z/OS
- TXSeries for Multiplatforms
- CICS Transaction Server for z/VSE
- CICS Transaction Server for i

Each CICS TG product includes runtime components for use by Java applications with supported releases of Java Standard Edition (SE). In addition to Java runtime environments supplied by IBM, any certified Java-compatible Java SE runtime environment is also supported. By contrast, the Gateway daemon must run under an IBM supplied Java runtime environment of a specified release, for a given CICS TG product and release.

Both CICS TG for z/OS and CICS TG for Multiplatforms products include JCA resource adapters for use with JEE-certified application server products such as IBM WebSphere Application Server. JEE-certified application server products, other than WebSphere Application Server, must successfully install and run the CICS TG JCA Install Verification and Test (IVT) program to gain entitlement to IBM support.

Both CICS TG for z/OS and CICS TG for Multiplatforms products include redistributable runtime libraries suitable for deployment on any of these Multiplatforms operating systems. This allows many types of remote applications to connect through a Gateway daemon, no matter which server platform is used.

The web page "Supported Software for CICS Transaction Gateway (CICS TG) products" provides links to the software requirements information center topic for all in-support releases of each CICS TG product. Each information center also includes a Hardware requirements topic.

Ordering information

Table 1 shows the ordering information for IBM CICS Transaction Gateway.

Table 1. Ordering part numbers

Product Identifier Description	PID number
IBM CICS Transaction Gateway for z/OS	5655-Y20
IBM CICS Transaction Gateway for Multiplatforms	5724-I81
IBM CICS Transaction Gateway Desktop Edition	5725-B65

Related information

For more information, see the following documents:

- IBM Redbooks: *The Complete Guide to CICS Transaction Gateway: Volume 1 Configuration and Administration*, SG24-8160
  http://www.redbooks.ibm.com/abstracts/sg248160.html
- IBM CICS Transaction Gateway product page
  http://www.ibm.com/software/products/us/en/cics-ctg
- IBM Offering Information page (announcement letters and sales manuals):
  http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter `CICS Transaction Gateway`, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

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