

CICS<sup>®</sup> Transaction Gateway for Windows<sup>®</sup>



# Administration

*Version 3.1*



CICS® Transaction Gateway for Windows®



# Administration

*Version 3.1*

**Note!**

Before using this information and the product it supports, be sure to read the general information under "Appendix B. Notices" on page 133.

**First edition (September 1999)**

This edition applies to Version 3.1 of CICS Transaction Gateway for Windows, program number 5648-B43. It will also apply to all subsequent versions, releases, and modifications until otherwise indicated in new editions.

This edition replaces SC34-5448-00. Material that was not in that book is indicated by vertical lines to the left of the material.

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## About this book

This book contains the following chapters:

- Chapter 1 introduces the CICS Transaction Gateway and summarizes the benefits of using it, and the functions it provides.
- Chapter 2 discusses planning issues including the hardware and software requirements of CICS Transaction Gateway, and various migration issues.
- Chapter 3 describes how to install your CICS Transaction Gateway.
- Chapter 4 describes how to configure your CICS Transaction Gateway.
- Chapter 5 describes how to set up security for the SSL and HTTPS protocols in the CICS Transaction Gateway.
- Chapter 6 describes how to operate the CICS Transaction Gateway, including starting and stopping the CICS Transaction Gateway.
- Chapter 7 provides an introduction to the Terminal Servlet provided with the CICS Transaction Gateway.
- Chapter 8 describes problem determination for CICS Transaction Gateway.
- Appendix A describes how to view the online information in the CICS Transaction Gateway and CICS Universal Clients library, and how to print and order books.

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## Who should read this book

This book is intended for anyone involved with the planning, installation, customization, or operation, of a CICS Transaction Gateway.

It is assumed that you are familiar with the operating system under which your CICS Transaction Gateway runs.

An understanding of Internet terminology would also be helpful.

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## Conventions and terminology used in this book

References to paths in this book use the OS/2<sup>®</sup> and Microsoft<sup>®</sup> Windows<sup>®</sup> convention of a backslash (\) as delimiter, instead of the / delimiter used on the AIX<sup>®</sup> and Solaris platforms.

In this book, 'CICS on open systems' is used to refer to the following CICS server products, subject to availability:

- CICS for HP-UX

- CICS for Sun Solaris
- TXSeries for AIX
- TXSeries for HP-UX
- TXSeries for Solaris.

---

## Prerequisite and related information

For information on the books available for this product, refer to “Appendix A. The CICS Transaction Gateway and CICS Universal Clients library” on page 127. That chapter also gives details of how to view and print softcopy books, and how to order printed copies from IBM.

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## How to send your comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book, or any other CICS documentation:

- Visit our Web site at:

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## Chapter 1. Overview

The IBM CICS Transaction Gateway provides secure, easy access from Web browsers and network computers to business-critical applications running on a CICS Transaction Server or TXSeries™ server using standard Internet protocols in a range of configurations.

CICS Transaction Gateway is a robust and scalable complement to a Web server, and as such can be implemented as an e-business connector for IBM WebSphere™, which is a runtime environment for Java™ servlets.

The CICS Transaction Gateway is provided for the OS/2, Windows NT®, AIX, Solaris, and OS/390® platforms. The CICS Transaction Gateway is also provided for Windows 95/98, but on these platforms it can only be used for development purposes and not for production.

Figure 1 shows how a web-client can access CICS programs and data. Note that the CICS Transaction Gateway is shown as installed on a Web server machine. This is necessary only if you are using the CICS Transaction Gateway with Java applets.

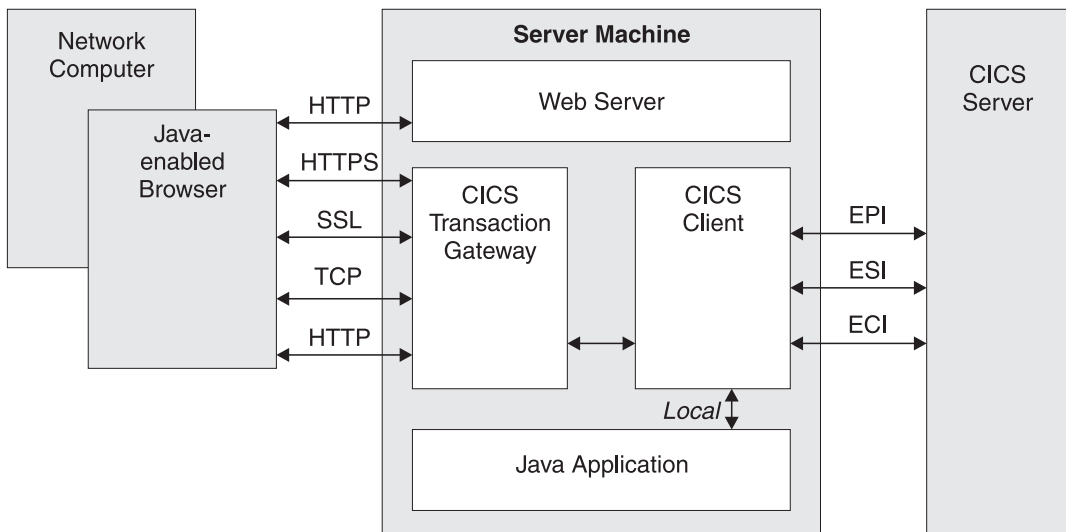


Figure 1. CICS Transaction Gateway

Communication with the CICS Transaction Gateway is based on the following protocols:

## Overview

- TCP/IP sockets
- Hypertext Transfer Protocol (HTTP)
- Secure Sockets Layer (SSL)
- HTTP over SSL (HTTPS)

TCP/IP sockets and SSL provide an efficient method of communication for intranet applications. Where firewalls exist, HTTP and its secure alternative HTTPS, are effective communication protocols for Internet applications (see “Network security” on page 14).

---

## What the CICS Transaction Gateway provides

The CICS Transaction Gateway provides the following:

1. A **Java gateway application** that is usually resident (for security reasons) on a Web server workstation. It communicates with CICS applications running in CICS servers through the ECI (External Call Interface), EPI (External Presentation Interface), or ESI (External Security Interface) interfaces provided by the CICS Universal Clients. This Java application was previously available in the IBM CICS Gateway for Java.
2. A **CICS Universal Client** that provides the ECI, EPI, and ESI interfaces, as well as terminal emulation function. The **ECI interface** enables a non-CICS Client application to call a CICS program synchronously or asynchronously as a subroutine. The **EPI interface** enables a non-CICS Client application to act as a logical 3270 terminal and so control a CICS 3270 application. The **ESI interface** enables a non-CICS Client application to invoke services provided by advanced program-to-program communication (APPC) password expiration management (PEM). The CICS Universal Clients allow communication with CICS Servers over the TCP/IP, APPC, NetBIOS, and other protocols, depending on the platform. See Table 2 on page 21 for more information.
3. A **CICS Java class library** that includes classes that provide an application programming interface (API), and are used to communicate between the Java gateway application and a Java application (applet or servlet). The class **JavaGateway** is used to establish communication with the Gateway process, and uses the Java sockets protocol. The classes **ECIRequest**, **EPIRequest**, and **ESIRRequest** are used to specify the ECI, EPI, and ESI calls respectively that are flowed to the gateway.
4. A **Terminal Servlet** that allows you to use a Web browser as an emulator for a 3270 CICS application running on any CICS server. The Terminal Servlet can be used with a Web server or a servlet engine that provides support equivalent to Java Servlet Development Kit (JSDK) Version 1.1 or later. This is an enhanced version of the function that was provided by the

CICS Internet Gateway in IBM CICS Clients Version 2. The Terminal Servlet provides an alternative to using the EPI programming interfaces.

5. A set of **Java EPI beans** for creating Java front-ends for existing CICS 3270 applications, without any programming.

The CICS Transaction Gateway can concurrently manage many communication links to connected Web browsers, and can control asynchronous conversations to multiple CICS server systems. The multithreaded architecture of the CICS Transaction Gateway enables a single Gateway to support multiple concurrently connected users.

---

## Java technology

This section discusses the Java language, including the types of program that can be developed, and the security implications.

### The Java language

The Java language can be used to construct Java *servlets*, Java *applets*, and Java *applications*.

Java is an interpreted object-oriented language, similar to C++ which can be used to build programs that are platform-independent in both source and object form. Its unique operational characteristics, which span Web browsers as well as Web servers, enable new and powerful functions in Internet applications.

To achieve platform independence, the Java language allows no platform dependent-operations, and it excludes some C++ functions such as a preprocessor, operator overloading, multiple inheritances, and pointers. All Java programming is encapsulated within classes, and the Java Development Kit (JDK) includes special classes that are critical to assuring platform independence, include GUI functions, input/output functions, and network communications.

The Java compiler produces an intermediate bytecode format that is machine independent. This, in turn, is processed at execution time by a Java interpreter. The interpreter also inspects the bytecode at execution time to ensure its validity and safety to the machine environment. Because of the isolation the Java interpreter provides, it is sometimes referred to as a Java Virtual Machine (JVM).

### Java applets

A Java applet is a small application program that is downloaded to, and executed on, a Java-enabled Web browser or network computer. A Java applet

## Overview

typically performs the type of operations that client code would perform in a client/server architecture. It edits input, controls the screen, and sends transactions to a server that performs data or database operations.

Applets are started using the <applet> HTML tag; this gives the applet control and specifies the display area to be used by the applet. When a Java-enabled server is downloading a page and encounters this tag, it also downloads the applet bytecode, in the same way that it downloads an image that is referenced by an HTML image tag. The Java-enabled browser then interprets and executes the applet bytecode. The applet may edit screen input, generate screen output, and communicate back to the computer from which it was downloaded. Multiple applets can execute concurrently.

An example of applet processing is an applet in constant communication with a server to receive stock trade information, which it would update in a window on the screen.

The downloading of applets should not have a significant performance impact on the response time to end users since the applets are typically not very big. Applets may even improve overall browser performance by eliminating iterations with the Web server. Also, just as images are cached in Web browsers, applets are cached, minimizing the frequency of applet downloading.

## Java servlets

Java servlets are small Java applications that run on a Web server machine, unlike Java applets, which are downloaded to a Web browser.

Java servlets have become popular as a replacement for CGI (Common Gateway Interface) programs. The advantage of a Java servlet over a CGI application is that they can execute more quickly since they are invoked as threads in a daemon process, meaning that they are persistent in memory and can fulfill multiple requests.

There are three ways in which you can run servlets:

### **Invoking the servlet by URL (Uniform Resource Locator)**

The URL for a servlet typically has the following form:

```
http://machine-name:port/servlet/servlet-name
```

This method is used when you do not need the user to enter any information. Request parameters can be encoded in the URL, in the form of a query string.

### **Invoking the servlet with a form**

This method involves creating an HTML form in a web page:

```
<FORM METHOD="GET" ACTION="/servlet/servlet-name">
  attributes
</FORM>
```

This method is used when you need the user to enter information.

### Invoking the servlet with a server-side include

A server-side include is processed by the Web server before the web page is sent to the user. In the HTML source, a server-side include looks like the following:

```
<SERVLET NAME="TerminalServlet" >
<PARAM NAME="request" VALUE="send">
<PARAM NAME="transaction" VALUE="CECI">
<PARAM NAME="display" VALUE="none">
</SERVLET>
```

## Java applications

A Java application is a program that executes locally on a computer. It has platform-dependent capabilities in addition to those of an applet. It can access local files, create and accept general network connections, and call native C or C++ functions in machine-specific libraries.

## JavaBeans™

The JavaBeans API, developed by Sun Microsystems, allows you to write component software in Java. Components are self-contained, reusable software units that you can visually compose into applets or servlets using visual application builder tools, such as VisualAge® for Java. Any JDK Version 1.1-compliant browser or tool supports JavaBeans.

JavaBeans components are called beans. Most builder tools allow you to maintain beans in a palette or toolbox. You can select a particular Bean from the toolbox, drop it onto a form, modify its appearance and behavior, and define how it interacts with other beans. You can compose your selected Bean and other beans into an applet, servlet, or new Bean, and all this can be done without writing any code. For more information on JavaBeans, see the Sun Web site ([www.java.sun.com](http://www.java.sun.com)).

The CICS Transaction Gateway provides **EPI Java beans** based on high-level EPI interfaces. These beans allow you to easily create Java programs (applets and applications) that access data from existing CICS 3270 applications, without any programming. Using a bean composer tool, such as VisualAge for Java, you can quickly and easily create new Java front-ends that can connect to CICS, run transactions, display data from 3270 screens, and send user input back to the CICS server. For more information, see the *CICS Transaction Gateway Programming* book.

## Overview

### Firewalls

A current design consideration in the use of Java applet communication is the impact of *firewalls*. This is the term given to a configuration of software that prevents unauthorized traffic between a trusted network and an untrusted network. Firewalls are put in place to protect company assets from outside intrusion, but they can also limit legitimate communications as well. Firewalls come into play in two ways:

1. The general accessibility of a server to outside users - inbound restrictions
2. The ability of end users inside a firewall to perform certain network functions outside their firewall - outbound restrictions.

A CICS Transaction Gateway configuration is well suited to avoid problems in the first area since the Gateway processor can be placed outside the firewall and be connected through the firewall to the CICS server. Outbound firewalls that end users may have to contend with can be a problem. A large company might use a firewall to limit the types of connections and protocols that can be used.

The use of Java on an Intranet (a local implementation of the Internet) works very well since firewalls are typically not a factor. However, when designing Internet applications for end users outside a company, you should determine if end user firewalls will be an implementation factor. If so, then alternative processing for those users, such as executing the Java code as a Java servlet on the Web server, may be necessary. Also you should consider the use of the HTTP and HTTPS protocols supported by CICS Transaction Gateway, see “Secure Sockets Layer (SSL)” on page 14 and “HTTPS” on page 15.

### Web browsers and network computers

The CICS Transaction Gateway requires a Java-enabled Web browser, that is JDK version 1.1 enabled, for example, Netscape Navigator 2.0.2 or later on OS/2, Netscape Communicator 4.5.1 or later on Windows and AIX. For more information, refer to “Web browsers” on page 20.

The Web browser communicates with the Web server using HyperText Transport Protocol (HTTP) requesting HyperText Markup Language (HTML) pages to be downloaded. These HTML pages can include calls to Java applets (see “Java applets” on page 3) or servlets; multiple applets can run concurrently.

You may find that each browser displays the same information differently.

A network computer is a low-cost computer for the Internet user, it does the same things as a Web browser.

## Web servers

A Web server is a software program that responds to information requests generated by Web browsers. When a request from a browser is received, the Web server processes the request to determine the action to take:

- Return the requested document
- Deny the request
- Pass the request through for further processing by an external application. The request might be, for example, to a database to perform a search request, or to a more dynamic form of information delivery such as Lotus Domino™.

Communication between a Web server and an external application is transparent, you need to know only the URL of the Web server to direct a request to it. Also, all Web servers can handle requests from many browsers concurrently.

Specialized servers can also be configured to limit access to a restricted set of users, or to provide security for purchase of goods or services.

Web servers exist for almost every platform and are available from many suppliers. For information on the Web servers supported by CICS Transaction Gateway, see “Web servers” on page 19.

---

## How the CICS Transaction Gateway accesses CICS

This section describes how the CICS Transaction Gateway allows access to CICS programs and data.

For **Java applets**, access is achieved as follows:

1. The Web browser or network computer requests an HTML page from the Web server using the HTTP (Hypertext Transfer Protocol) protocol.
2. The Web server returns the HTML page containing a tag identifying a Java applet.
3. The browser starts requesting relevant Java classes from the Web server.
4. The Web server returns Java classes, including CICS Transaction Gateway classes as requested.
5. As classes are returned, the Java applet starts.
6. At some point the Java applet creates a **JavaGateway** object to connect to the CICS Transaction Gateway. This establishes communication between the browser and the long running Gateway process using Java's sockets protocol.

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7. The Java applet creates an **ECIRequest**, **EPIRequest**, or **ESIRequest** object containing respectively ECI, EPI, or ESI calls and sends it to the Gateway using the **JavaGateway.flow** method.
8. The Gateway receives the request, unpacks it, and makes corresponding ECI, EPI, or ESI calls to the CICS Universal Client.
9. The CICS Universal Client passes the ECI, EPI, or ESI calls to the intended CICS server.
10. The CICS server processes the call, including verification of the userid and password if required, and passes control and user data to the CICS application program.
11. When it has finished processing, the CICS application program returns control and data back to CICS, which passes it back to the Gateway.
12. The Gateway packs these results and returns them to the Java applet running on the Web browser.

For **Java servlets**, access is achieved as follows:

1. The Web server loads and initializes the servlet. This may be done when the Web server starts, or the first time a request is made to the servlet. The servlet may at this point create a **JavaGateway** object to connect to the CICS Transaction Gateway.
2. When the servlet is invoked by an appropriate HTTP request, the Web server calls its **Service** method with details of the request.
3. The Java applet creates an **ECIRequest**, **EPIRequest**, or **ESIRequest** object containing respectively ECI, EPI, or ESI calls and sends it to the Gateway using the **JavaGateway.flow** method.
4. The Gateway receives the request, unpacks it, and makes corresponding ECI, EPI, ESI calls to the CICS Universal Client
5. The CICS Universal Client passes the ECI, EPI, ESI calls to the intended CICS server.
6. The CICS server processes the call, including verification of the userid and password if required, and passes control and user data to the CICS application program.
7. When it has finished processing, the CICS application returns control and data back to CICS, which passes it back to the Gateway.
8. The Gateway packs these results and returns them to the Java servlet.
9. When the servlet receives the results of the requests it has made to the CICS Transaction Gateway, it generates a HTTP response to be returned to the Web browser.

**Note:** Not all of the ECI, EPI, and ESI calls are supported by **ECIRequest**, **EPIRequest**, and **ESIRequest** respectively. For more information, refer to *CICS Transaction Gateway Programming*.



---

## The CICS Transaction Gateway: threading model

The CICS Transaction Gateway provides a multithreaded model for handling network connections, and assigning threads for requests from and replies to Java clients. The following components are involved in the threading model:

### ConnectionManagers

A ConnectionManager manages all the connections from a particular Java client (applet or application). When it receives a request, it allocates a Worker thread from a pool of available Worker threads to execute the request. The size of the initial ConnectionManager resource pool is defined by the **Initial number of Connection Manager threads** configuration setting. You can specify the maximum size of the ConnectionManager pool with the **Maximum number of Connection Manager threads** setting, see “Using the configuration tool” on page 38. You can also specify these limits when you start the CICS Transaction Gateway, see “Starting the Gateway with user-specified options” on page 91.

### Workers

A Worker is the object that actually executes a request from a Java client. Each Worker object has its own thread, which is activated when there is some work to do. When a worker thread is finished it goes back into the pool of available worker threads. As with the ConnectionManager, the Worker resource pool has an initial size that is specified using the **Initial number of Worker threads** setting. You can specify the maximum size of the Worker pool with the **Maximum number of Worker threads** setting, see “Using the configuration tool” on page 38. You can also specify these limits when you start the CICS Transaction Gateway, see “Starting the Gateway with user-specified options” on page 91.

The threading model is illustrated in the following figures:

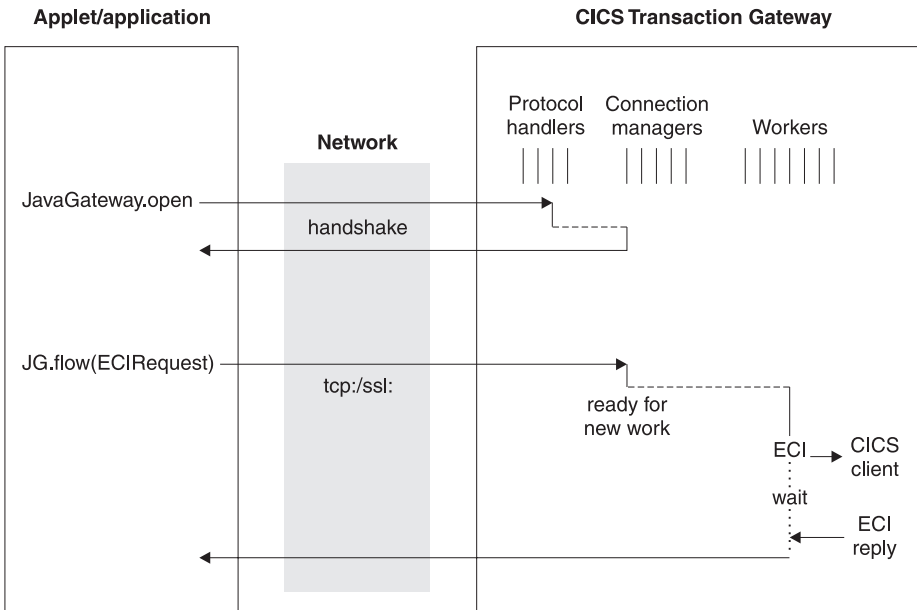


Figure 2. CICS Transaction Gateway threading model for tcp/ssl

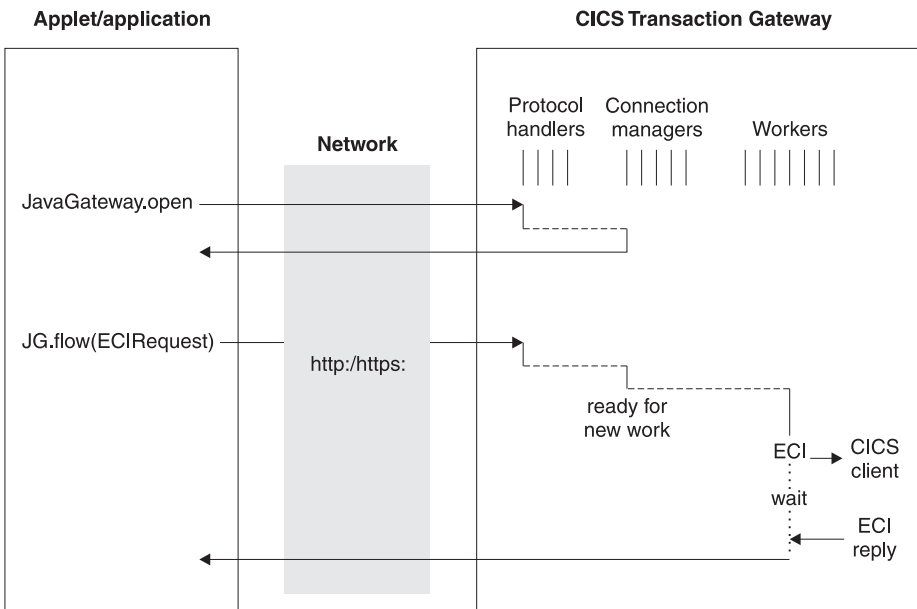


Figure 3. CICS Transaction Gateway threading model for http/https

Table 1 shows thread limits that should be considered when setting the number of Connection Manager and Worker threads on the various platforms:

*Table 1. Thread limits on CICS Transaction Gateway platforms*

Platform	System-wide limit of the maximum number of threads	Process limit of the number of threads
OS/390	This may be restricted by the total number of MVS™ Task Control Blocks (one is created per OpenEdition thread)	Governed by the OpenEdition parameters: MAXTHREADS and MAXTHREADTASKS
OS/2	4095	Governed by the THREAD parameter in config.sys
Windows 95/98/NT	No limit	Limited by the amount of virtual memory available for the process (by default a thread has 1M of stack meaning that 2028 threads can be created per process)
AIX	262,143	32768
Solaris	No limit	No limit

You can set the stack size of the Java threads using the Java `-oss` and `-ss` options. Note that the amount of memory allocated per thread can be the limiting factor, because memory can run out before the thread limit is reached.

For more information on the use of the Java `-oss` and `-ss` options, refer to the *CICS Transaction Gateway Programming* book.

---

## The external access interfaces (EPI, ECI, ESI)

The external access interfaces allow non-CICS applications to access and update CICS resources by initiating CICS transactions, or by calling CICS programs. When used in conjunction with the CICS communication facilities, they enable non-CICS programs to access and update resources on any CICS system. This supports such activities as developing graphical user interface (GUI) front ends for CICS applications, and allowing the integration of CICS systems and non-CICS systems.

The external presentation interface (EPI) allows you to develop GUIs, either for existing CICS systems or for new applications. It is particularly useful for developing new GUI front ends for existing CICS transactions, which need

not be changed. The application can use the EPI to communicate with a CICS transaction, and can exploit the presentation facilities of the client system to communicate with the end user.

The integration of CICS and non-CICS systems usually involves passing user-defined data between the programs of the non-CICS system and a CICS program, and the external call interface (ECI) can be used for this.

In any of these cases, the choice between EPI and ECI is not always clear-cut, because both interfaces can be used to pass data between a non-CICS application and a CICS program. However, the mechanism is different in the two cases: 3270 data streams for EPI; application-defined formats in a COMMAREA for ECI.

### **External Presentation Interface (EPI)**

The EPI allows a non-CICS application program to be viewed as a 3270 terminal by a CICS server system to which it is connected; both an EPI application and a CICS terminal can schedule transactions in a CICS server. The application can be using the facilities of several servers at the same time, and can act as if it were many different 3270 terminals. The application can schedule CICS transactions, and for these transactions it is the principal facility.

With CICS servers that support access through the EPI, other CICS transactions running in the server can use the CICS START command to schedule transactions that use the non-CICS application as their initiating terminal. When a non-CICS application uses the EPI to start a transaction in a CICS server, 3270 data streams and events are passed between the server and the application. The application can present the contents of the terminal I/O to its user in any manner appropriate to the application's operating environment. Transactions can be routed to other CICS systems by standard transaction routing. Resources on other CICS systems can be accessed by function shipping.

Note that server transactions can be existing transactions that use 3270 input and output (with some restrictions).

### **External Call Interface (ECI)**

The ECI allows a non-CICS application to call a CICS program in a CICS server. The application can be connected to several servers at the same time, and it can have several program calls outstanding at the same time.

The CICS program cannot perform terminal I/O, but can access and update all other CICS resources. The same CICS program can be called by a non-CICS application using the ECI, or by a CICS program using EXEC CICS

LINK. Data is exchanged between the two programs by means of a COMMAREA, in a similar way to CICS. The user can specify the length of the COMMAREA data to optimize performance.

Calls may be made synchronously or asynchronously. Synchronous calls return control when the called program completes, and the information returned is immediately available. Asynchronous calls return control without reference to the completion of the called program, and the application can ask to be notified when the information becomes available.

Calls may also be *extended*. That is, a single logical unit of work may cover two or more successive calls, though only one call can be active for each logical unit of work at any time. If it uses asynchronous calls, the application can manage many logical units of work concurrently.

The called program can update resources on its own system, it can use distributed program link (DPL) to call CICS programs on other systems, and it can access resources on other CICS systems by function shipping, by distributed transaction processing (DTP), or (in the CICS Transaction Server for OS/390 or CICS Transaction Server for VSE/ESA™ environment) by the front end programming interface (FEPI).

For more information on the external access interfaces, see *CICS Family: Client/Server Programming*.

## External Security Interface (ESI)

The ESI allows a non-CICS application to invoke services provided by advanced program-to-program communication (APPC) password expiration management (PEM).

APPC PEM with CICS provides support for an APPC architected sign-on transaction that signs on user IDs to a CICS server and processes requests for a password change by:

- Identifying a user and authenticating that user's identification
- Notifying specific users during the authentication that their passwords have expired
- Letting users change their passwords when (or before) the passwords expire
- Telling users how long their current passwords will remain valid
- Providing information about unauthorized attempts to access the server with a particular user identifier.

To use APPC PEM, the CICS Universal Client must be connected to the CICS server over APPC. An external security manager (ESM), such as resource access control facility (RACF), must also be available to the CICS server. ESI

calls can be included within your ECI or EPI application. Only CICS servers returned by the **CICS\_EciListSystems** and **CICS\_EpiListSystems** functions are acceptable.

---

## Network security

The CICS Transaction Gateway supports the use of the Secure Sockets Layer (SSL) and HTTPS protocols to provide secure communication, which is critical to successful Internet operation.

Network security and its implementation on CICS Transaction Gateway is discussed in detail in “Chapter 5. Security” on page 71; the following sections summarize the functions provided by SSL and HTTPS.

### Secure Sockets Layer (SSL)

SSL is a **Handshake Protocol** developed to provide security and privacy over the Internet. The use of the SSL protocol ensures:

#### Confidentiality

The data to be exchanged between the client and the server is encrypted, so only that client (your application or applet) and that server (the CICS Transaction Gateway) can make sense of the data.

SSL uses public key encryption as a secure mechanism to distribute a secret key between the server and the client. Public key encryption is a technique that uses a pair of asymmetric keys for encryption and decryption. In the case of SSL, a secret (symmetric) key is passed between the client and server (using public key cryptography), which is then used to encrypt and decrypt all traffic along the SSL connection. This encryption protects the data from other parties trying to eavesdrop, as no other parties will have the secret key needed to decrypt the data. This ensures that private information such as a credit card number is transferred securely.

#### Integrity

The message transport includes a message integrity check based on a secure hashing algorithm. This algorithm is performed when the message is sent, and again when it is received. If the two hash values do not match, the receiver is warned that the message may have been tampered with.

#### Accountability

Accountability is ensured by digital signature, so that if something goes wrong, you can identify which party is accountable.

## Authentication

The CICS Transaction Gateway's implementation of the SSL protocol provides *server authentication*, so that when a client establishes a connection with the CICS Transaction Gateway, it is required to authenticate the server's details. *Client authentication* can also be enabled, in which case the server will authenticate the client's details,

The authentication mechanism is based on the exchange of digital certificates (X.509v3 certificates). These digital certificates contain information about an entity, like the system name and public key, and the server's digital signature. Digital certificates are issued by a Certificate Authority (CA), and encrypted using the CA's private key. If you can decrypt the certificate using the CA's public key, you know that the information contained within the certificate can be trusted, that is, that the certificate really does belong to whoever claims to own it.

## HTTPS

Most current browsers support a URL access method, HTTPS, for connecting to HTTP servers using SSL. HTTPS (HTTP+SSL) is a variant of HTTP for handling secure transactions.

A secure connection is typically made with a URL similar to "https://someAddress" The default HTTPS port number is 443, as assigned by the Internet Assigned Numbers Authority.

## Keys and Certificates

The SSL protocol uses public key cryptography, which has been recommended for use with the ISO authentication framework, also known as the X.509 protocol. This framework provides for authentication across networks.

The most important part of X.509 is its structure for public key certificates. A trusted Certification Authority (CA) assigns a unique name to each user and issues a signed certificate containing the name and the user's public key.

The CICS Transaction Gateway allows you to obtain externally-signed certificates from a CA, or to establish yourself as a CA to allow you to issue "self-signed" X.509 certificates. Externally-signed certificates are more suitable for Internet use, while self-signed certificates may be suitable for internal use within an organization.

The X.509 digital certificates are “encapsulated” into a Java classfile, which can then be used by the SSL and HTTPS protocols. These Java classfiles are referred to as *KeyRing* classes.

The CICS Transaction Gateway includes the iKeyman tool for the management of KeyRing classes. Using this tool, you can create KeyRing files, generate certificates, store certificates in KeyRings, and perform various other management functions. See “Chapter 5. Security” on page 71 for more information.

## Security exits

Security Exits are provided that enable the user to define security operations such as public key encryption. They may also be used for data compression. Some example source files that demonstrate these functions are provided.

The security exit mechanism can also be used to authenticate/analyze an X.509 client certificate when client authentication is enabled.

For more information, refer to the *CICS Transaction Gateway Programming* book.

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## CICS Transaction Gateway and object request brokers

Some Web servers contain an object request broker (ORB) that conforms to the Object Management Group’s (OMG) Common Object Request Broker (CORBA) standard. If you have such a Web server, you can develop servlet objects that can be invoked from a remote browser using the CORBA Internet InterORB Protocol (IIOP). IIOP is transmitted to the browser using HTTP.

Some browsers also include an ORB, which enables them to run programs that issue IIOP requests. This capability is used by Java applets that communicate by using the Java Remote Method Invocation (RMI), a binding mechanism that ultimately maps to the IIOP. With this technology an applet can communicate with servlets using IIOP and have the servlets invoke CICS transactions.

---

## Other functions

CICS Transaction Gateway also provides a sophisticated **load balancing** facility on Windows platforms that allows the transaction workload from a large population of browsers to be distributed across multiple CICS regions or CICS servers. For more information refer to the *CICS Universal Client for Windows Administration* and *CICS Family: Client/Server Programming* books.



**Host on-Demand** is supported, providing a means of accessing CICS 3270 applications via EPI on a Java-enabled Web browser. IBM eNetwork™ Host on-Demand Version 2.0, or later, is required.

Support is provided for a **local CICS Transaction Gateway**. This enables a Java program to communicate with a locally installed CICS Transaction Gateway, without use of a network. Refer to “Preparing to use local CICS Transaction Gateway support” on page 68 for information on how to configure a local CICS Transaction Gateway.

---

## Support for the Euro

The CICS Transaction Gateway supports the use of the Euro character in data flows. The CICS Transaction Gateway class `CicsCpRequest` will attempt to return the name of a Java encoding that is suitable for a Euro-enabled JDK and equivalent to the codepage/Coded Character Set Identifier (CCSID) that the CICS Universal Client passes to the CICS server (see the *CICS Universal Client for Windows Administration* book).

For example, if the CICS Universal Client passes the CICS Server a codepage of 5348 (a Euro-enabled version of codepage 1252), then the Java encoding returned to the Java client will be `Cp1252`. Java encoding `Cp1252` is Euro-enabled if the JDK itself is Euro-enabled. For further information on Euro support for Java programs, refer to the appropriate Java documentation.



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## Chapter 2. Planning before installation

This chapter helps you plan the installation of CICS Transaction Gateway by discussing the hardware and software requirements including the Web servers and browsers that are supported. The CICS servers to which CICS Transaction Gateway can connect are listed and possible migration issues are discussed.

**Please refer to the product README file for any late changes to hardware and software requirements.**

---

### Hardware requirements

The CICS Transaction Gateway runs on any hardware capable of running the relevant operating system and other prerequisite software.

The hard disk requirement for your CICS Transaction Gateway (including documentation) is **26MB**.

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### Software requirements

The operating system requirements for your CICS Transaction Gateway are as follows:

#### **CICS Transaction Gateway for Windows 98**

- Windows 95, with Euro Product Update and Year 2000 Update
- Windows 98, with Year 2000 Update
- Windows 2000

#### **CICS Transaction Gateway for Windows NT**

- Windows NT Workstation Version 4.0 or later, with Service Pack 5
- Windows NT Server Version 4.0 or later, with Service Pack 5
- Windows 2000

**Java Development Kit (JDK)** Version 1.1.8, or later is supported.

The CICS Transaction Gateway installation includes long filenames, and must therefore be installed on an enhanced file system, for example, NTFS.

---

### Web servers

CICS Transaction Gateway has been tested with the following Web servers:

## Planning

- Lotus Domino Go Webserver™ 4.6.2 or later for OS/2, Windows NT, AIX, or Solaris
- Microsoft Internet Information Server Version 4.0 for Windows NT, Windows 95, and Windows 98
- Sun Webserver Version 2.0 for Solaris
- IBM HTTP Server (Apache) Version 1.3 for Windows NT, AIX, and Solaris
- WebSphere Advanced Server for OS/390 (included in OS/390 V2 R8)
- Netscape Enterprise Server Version 3.6 for Windows NT, AIX, and Solaris

If you are going to run the terminal servlet supplied with CICS Transaction Gateway, you will need a Web server or a servlet engine that provides servlet support equivalent to Java Servlet Development Kit (JSDK) Version 1.1 or later, for example:

- IBM WebSphere Application Server, Advanced or Enterprise Edition, Version 2.02 or later for Windows NT, AIX, or Solaris.

**Note:** Domino Go WebServer Version 4.6.2 does not support JSDK 1.1

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## Web browsers

The CICS Transaction Gateway should work with any JDK Version 1.1 compliant Java-enabled browser. This includes the following:

- OS/2: Netscape Version 2.0.2 with 1.1 patch
- Windows NT, 98, 95: Microsoft Internet Explorer Version 4.0.1, or later (Note that HTTPS as transport does not work.)
- Windows NT, 98, 95: Netscape Version 4.0.8, Netscape Communicator Version 4.51
- AIX: Netscape Version 4.0.8, Netscape Communicator Version 4.51
- Solaris: HotJava™ Browser Version 1.1

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## Universal CICS Clients

CICS Transaction Gateway incorporates CICS Universal Clients Version 3.1. You cannot use CICS Clients Version 2 with CICS Transaction Gateway.

The CICS Universal Clients can communicate with CICS servers using a number of protocols:

**TCP/IP**            Transmission Control Protocol/Internet Protocol (TCP/IP) is supported on all platforms.

**APPC**             Advanced Program-to-Program Communication (APPC) is supported on all platforms.

- TCP62** TCP62 is supported on the OS/2 and Windows platforms, this allows APPC communication over a TCP/IP network.
- NetBIOS** Network Basic Input/Output System (NetBIOS) is supported on the OS/2 and Windows platforms.

Refer to the *CICS Universal Client for Windows Administration* book for more information on protocols, communication products that support these protocols, and also application development language support.

## CICS servers

A CICS server runs real-time multi-user applications and manages the associated resources and data. CICS servers can run on a range of platforms, from workstations to highly parallel mainframe systems.

CICS Transaction Servers, and TXSeries Servers, contain CICS servers and CICS Clients, and can contain system management products.

For more general information see the CICS Web site:

<http://www.ibm.com/software/ts/cics/>

The CICS Universal Client component of the CICS Transaction Gateway can connect to CICS servers using a variety of protocols. Table 2 shows the protocols available to CICS Universal Client for Windows NT for connecting to CICS servers.

*Table 2. Availability of protocols for connecting to CICS servers*

CICS Server	Protocol
CICS for MVS/ESA™ Version 4 Release 1	APPC, TCP62
CICS Transaction Server for OS/390 Version 1 Release 2, and later	APPC, TCP62
CICS for VSE/ESA Version 2 Release 3	APPC
CICS Transaction Server for VSE/ESA Version 1 Release 1	APPC
CICS Transaction Server for OS/2 Warp, Version 4.1, and later	NetBIOS, TCP/IP, APPC
Transaction Server for Windows NT Version 4, TXSeries Version 4.2 for Windows NT	TCP/IP, APPC, DCE (CICS Universal Client for Windows NT only)

## Planning

Table 2. Availability of protocols for connecting to CICS servers (continued)

CICS Server	Protocol
TXSeries Version 4.3 for Windows NT	TCP/IP, APPC, DCE, (CICS Universal Client for Windows NT only) Local Named Pipes (CICS Universal Client for Windows NT only)
'CICS on Open Systems' (see "Conventions and terminology used in this book" on page xi for a definition)	TCP/IP, APPC, DCE (CICS Universal Client for Windows NT only)
CICS for OS/400® Version 4 Release 4 and later	APPC

**Note:** The connectivity for Windows 95/98 is the same as for Windows NT.

For more information on connectivity between CICS Universal Clients and CICS servers, refer to the *CICS Universal Client for Windows Administration* book.

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### CICS server PTF requirements

For signon capable terminals, you must ensure that you have the appropriate PTF level applied to any CICS servers being used. You should refer to the CICS Transaction Gateway/CICS Universal Client README file for the latest details and check the PTFs for the CICS servers.

To provide complete support for timeouts, if you are using any TXSeries or Transaction Server on UNIX® and Windows NT platforms, it must include the appropriate PTF level. You should refer to the CICS Transaction Gateway/CICS Universal Client README file for the latest details and check the PTFs for the CICS server.

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### Migration issues

This section discusses migration issues that you will encounter if you previously used a product related to CICS Transaction Gateway.

#### Migrating from CICS Client Version 2

If you are a user of CICS Clients Version 2 migrating to CICS Transaction Gateway, you may have customized versions of the following configuration files:

File	Default Name
------	--------------

<b>Keyboard mapping file</b>	CICSKEY.INI
<b>Color mapping file</b>	CICSCOL.INI
<b>Windows settings</b>	CICSTERM.INI

When you install CICS Transaction Gateway, your customized files are preserved, even though CICS Clients Version 2 is deleted. You are also give the option of backing up the CICS Client.

In CICS Transaction Gateway Version 3.1 the configuration file, (ctg.ini), is used instead of the client initialization file (CICSCLI.INI). To convert the client initialization file, you can run the configuration conversion tool (CTGCONV), see “The configuration conversion tool” on page 63. However, for CICS Transaction Gateway for Windows NT and CICS Transaction Gateway for Windows 98 the client initialization file is converted to the correct format automatically when you install the CICS Transaction Gateway.

### Migrating from CICS Universal Client Version 3.0

Before you install CICS Transaction Gateway, you may already have installed CICS Universal Clients Version 3.0. You may have customized versions of the following configuration files:

<b>File</b>	<b>Default Name</b>
<b>Keyboard mapping file</b>	CICSKEY.INI
<b>Color mapping file</b>	CICSCOL.INI
<b>Windows settings</b>	CICSTERM.INI

When you install CICS Transaction Gateway your customized files are preserved, even though the old CICS Universal Client Version 3.0 is deleted.

In CICS Transaction Gateway Version 3.1 the configuration file, (ctg.ini), is used instead of the client initialization file (CICSCLI.INI). In CICS Universal Client for Windows NT and CICS Universal Client for Windows 98 the Workload Manager configuration file is also replaced by ctg.ini. To convert the client initialization file, you can run the configuration conversion tool (CTGCONV), see “The configuration conversion tool” on page 63. However, for CICS Transaction Gateway for Windows NT and CICS Transaction Gateway for Windows 98 the client initialization file and Workload Manager files are converted to the correct format automatically when you install the CICS Transaction Gateway.

### Migrating from CICS Transaction Gateway Version 3.0

In CICS Transaction Gateway Version 3.1 the configuration file, (ctg.ini), is used instead of the Gateway.properties file. To convert the file, you can run the configuration conversion tool (CTGCONV), see “The configuration conversion tool” on page 63. However, for CICS Transaction Gateway for Windows NT and CICS Transaction Gateway for Windows 98 the Gateway.properties, client initialization file and Workload Manager files are converted to the correct format automatically when you install the CICS Transaction Gateway.

### Migrating from CICS Gateway for Java

If you are a user of CICS Gateway for Java migrating to CICS Transaction Gateway, you may have a customized version of the Gateway.properties file. To convert this file, you can run the configuration conversion tool (CTGCONV), see “The configuration conversion tool” on page 63. However, for CICS Transaction Gateway for Windows NT and CICS Transaction Gateway for Windows 98 the Gateway.properties file file is converted to the correct format automatically when you install the CICS Transaction Gateway.

When you install over CICS Clients Version 2, the CICS Gateway for Java is not automatically deleted, so you will need to delete it.

Due to the renaming of the CICS Transaction Gateway package, you must change all import statements in your programs and recompile them. Therefore you must change all occurrences of:

```
import ibm.cics.jgate.client.*   to: import com.ibm.ctg.client.*
```

```
import ibm.cics.jgate.epi.*     to: import com.ibm.ctg.epi.*
```

```
import ibm.cics.jgate.security.* to: import com.ibm.ctg.security.*
```

Programs written for the CICS Gateway for Java prior to Version 2.0.1 that use the Session interface need to be modified because the parameter to the Session.handleReply method was changed to TerminalInterface instead of a Terminal object. Existing programs must be changed then recompiled.

Due to a change in the ClientSecurity and ServerSecurity interfaces, any user classes that implement these methods need to be changed. The methods called to generate handshake data are now passed the TCP/IP address of who they are handshaking with. Also, an AfterDecode method has been added to both interfaces.



## Migrating from CICS Internet Gateway

The functionality of the CICS Internet Gateway component of CICS Clients Version 2 has been incorporated in CICS Transaction Gateway as a Java Terminal servlet, rather than a CGI application.

Migration from the CICS Internet Gateway is described in “Migrating from the CICS Internet Gateway” on page 117.

## Migrating from CICS gateway for Lotus Notes

CICS Clients Version 2 included the CICS gateway for Lotus Notes, also known as CICS Link for Lotus. This is not available in CICS Transaction Gateway or in CICS Universal Clients Version 3.

For inter-operation of CICS and Lotus Notes<sup>®</sup>, you are recommended to use the MQSeries<sup>®</sup> Enterprise Integrator, which incorporates superior function to the CICS gateway for Lotus Notes. It offers a common API that can be used to integrate Lotus Notes with IMS or MQSeries as well as CICS; it supports the EPI and ECI, and can be driven directly from a Web browser connected to Lotus Domino.

MQSeries Enterprise Integrator is included in MQSeries and CICS Connections for Domino. For more information, visit the Web site at:  
<http://www.lotus.com/>

and follow the **Products** link.



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## Chapter 3. Installing CICS Transaction Gateway

This chapter describes how to install CICS Transaction Gateway for Windows.

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### Installing CICS Transaction Gateway on Windows platforms

This section applies to installing CICS Transaction Gateway on Windows 95, Windows 98 and Windows NT.

Before you install CICS Transaction Gateway on Windows NT, you must be logged onto the machine with Administrator privileges. You may have Administrator privileges by being a member of the local Administrators group, or by being a domain administrator.

#### Types of installation

For CICS Transaction Gateway you can select one of the following types of installation:

<b>Typical</b>	Installs the runtime component of CICS Transaction Gateway, and the documentation, but not the development kit.
<b>Compact</b>	Installs only the runtime components of the CICS Transaction Gateway.
<b>Custom</b>	Allows you to select which components of the product to install and to specify the language for the message files.

#### Installing CICS Transaction Gateway

It is strongly recommended that you exit all Windows programs before running the Setup program.

#### CAUTION:

**Be very careful if you are installing CICS Transaction Gateway onto a workstation that already has a CICS for Windows NT server installed. Both products have some files of the same name, therefore you must ensure that the installation of the CICS Transaction Gateway does not affect the server. This is particularly important with respect to environment settings.**

Remember, if installing onto Windows NT, you must be logged on with Administrator privileges.

1. Insert the CICS Transaction Gateway CD-ROM in the CD-ROM drive. If you are installing via a network drive, connect to that drive.

## Installing CICS Transaction Gateway

2. Enter a Run command like the following:

`d:\SETUP`

where *d:* is a CD-ROM, or network drive.

The InstallShield Wizard is prepared and then a Welcome panel is displayed.

3. Select **Next** and the Software License Agreement panel is displayed.
4. To accept the License Agreement, select **Yes**.
5. If you have a Version 2 or Version 3.0 CICS Client on your system, you are asked whether you wish to remove this old version. Select **Next** to upgrade to Version 3.1. This will remove the Version 2 CICS Client and will convert your old customized (\*.ini) files to the new format. If you want to back up your Version 2 CICS Client, select **Cancel** at this point.
6. If you are upgrading from Version 2, the Delete panel is displayed. Select **Select All** and then **Delete**.

**Note:** If you installed the CICS Gateway for Java in Version 2, this will not be deleted automatically. Before you delete the CICS Gateway for Java you may want to save the Gateway.properties file.

7. If you have backed up a Version 2 CICS Client, start the installation program again, and select **Next** and **Yes** on the introductory panels.
8. The Choose Destination Location panel is displayed.  
If you want to install into a different directory from the default, select **Browse**, and enter the required directory in the Choose Folder panel. Select **Next** to install into the default folder.
9. On the Setup Type panel, select a Typical, Compact, or Custom setup:
  - To install CICS Transaction Gateway with the runtime and documentation components, select **Typical**
  - To install just the runtime component of CICS Transaction Gateway, select **Compact**.
  - To choose individual components of the CICS Transaction Gateway including the development kit and documentation, select **Custom**.

**Note:** If you select a Typical or Compact installation, no programming samples are installed. Also, message files are installed in the language to match your locale.

10. Select **Next**.
11. If you selected a Custom setup, a Select Components panel is displayed. Select the check box next to each component you want to install. The **Space Required** and **Space Available** fields are updated as you select components.

To select sub-components of **Development Kit**, select that component, then select **Change**, and the Select Sub-components panel is displayed. Select the check box for each component you want to install, and select **Continue**.

Select **Next**.

12. If you selected a Custom installation, the Choose Language panel is displayed. On this panel a language is already selected according to your locale. If you need to install the CICS Transaction Gateway files in another language, select the radio button for that language. Select **Next**.
13. The Select Program Folder panel is displayed. If you want to install into a different folder from the default, enter the name of another folder, or select one from the existing folders list. Select **Next** to proceed.
14. The Select Components panel is displayed. Select check boxes depending on whether you want Setup to:

### **Update the PATH**

If you do not select this check box, you will have to set the PATH manually

### **Install the client as a Windows NT service**

If you do not select this option, you cannot run CICS Universal Client for Windows NT as a Windows NT service.

### **Install the CICS Transaction Gateway as a Windows NT service**

If you do not select this option, you cannot run CICS Transaction Gateway for Windows NT as a Windows NT service. If you select this option, CICS Universal Client for Windows NT will also run as a service.

Select **Next**.

15. The COM panel is displayed. Choose which type of COM object you want to register. You can register CICS Universal Client COM API resources as either:

### **In process**

This refers to .dll files. This is the preferred type.

### **Out of process**

This refers to .exe files. For backward compatibility with older CICS Universal Client applications, you should choose **Out of process**.

For information about registration of COM objects, see “Registering COM libraries” on page 34.

16. The Install Java panel is displayed. To function properly, the CICS Transaction Gateway requires a Java Virtual Machine (JVM). You can use the one you have already, but it is recommended that you install the

## Installing CICS Transaction Gateway

supplied IBM JRE to ensure compatibility and the best performance. Select a radio button to install the IBM JRE, or use another JVM.

17. If you do not choose to use the IBM JRE, the Select JVM panel is displayed, and this displays the different JVMs you have on your system. Select the radio button for the JVM you wish to use, or select the **Enter the path to another Java environment** radio button. If you select the latter, the Java Path panel is displayed. Enter the fully-qualified path to your JDK, for example, C:\JRE1.1.8\BIN\JRE.EXE
18. If you do not have TCP62 installed, the Install Option panel is displayed, asking you whether you wish to install TCP62. TCP62 allows SNA support over TCP/IP. If you have already installed IBM eNetwork Personal Communications, you already have TCP62 support. Select **Install TCP 62 support** if required, and select **Next**.
19. CICS Transaction Gateway files are copied to your hard disk. If you chose to install the documentation, Adobe Acrobat Reader is installed for you, if you do already have it installed, or have a down-level version.
20. The Setup Complete panel is displayed. You are given the opportunity to view the README file, and to start the configuration tool. Select **Finish** to complete the setup. (If you chose to install TCP62 support, you are only given the option to restart the system.)

## Uninstalling CICS Transaction Gateway

This section describes how to uninstall CICS Transaction Gateway. You can uninstall all of the CICS Transaction Gateway or just individual components of the products.

On Windows NT, you must have Windows NT administrator privileges to uninstall CICS Transaction Gateway.

You can uninstall all of the CICS Transaction Gateway products in two ways:

1. Using **Add/Remove Programs** in the Windows Control Panel. **IBM CICS Transaction Gateway** is shown in the list of programs, and also **TCP 62** if you chose to install it.
2. Running Setup again and selecting the **Uninstall** option.

When you run Setup after you have already installed CICS Transaction Gateway the CICS Transaction Gateway Utility Setup panel is displayed. This gives you the following options.

**Add/Remove** This allows you to add new components, or remove installed components from the current installation, including the TCP62 component.

<b>Reinstall</b>	This allows you to repeat the last installation to restore missing files and settings. This does not include the TCP62 component.
<b>Uninstall</b>	This allows you to completely uninstall CICS Transaction Gateway.

If you uninstall a product then when you re-install, the Setup program presents the installation directories of the uninstalled product as the default.

### Problems during installing or uninstalling

You may experience problems when installing or uninstaling, for example if there is a system crash. In such cases you can enter the following command to clean up the installation:

```
setup.exe CLEAN
```

This command will delete registry entries and directories of CICS Transaction Gateway, allowing you to perform the install or uninstall cleanly.

### Updating CICS Transaction Gateway

After installing CICS Transaction Gateway, you can update your software with updated versions of the product, or corrective service software, which provides fixes for your installed software.

For corrective service software information, go to our Web site at:

<http://www.ibm.com/software/ts/cics/>

and follow the **Support** link.

You install updated versions of CICS Transaction Gateway, or corrective service software using SETUP.EXE, in the same way as for the initial installation.

When you update with a newer version of CICS Transaction Gateway, Setup retains any customized (\*.ini) files from the older version.

### Silent installation

You can use a so-called silent installation to install CICS Transaction Gateway without going through any of the Setup panels. It is only necessary to run the setup program—no user input is required.

In a silent installation, the Setup program uses the information in a response file (setup.iss by default) to determine the installation options. CICS

## Installing CICS Transaction Gateway

Transaction Gateway can therefore easily be installed with the same installation options on many workstations.

**Note:** You cannot install the IBM JRE using a silent installation.

You must perform the following to create and verify the response file for a silent installation:

1. Plan the setup
2. Create the response file
3. Play back the silent setup
4. Check for errors.

### Planning the setup

Before creating the response file, you should decide on the setup options that are required. Refer to see “Installing CICS Transaction Gateway on Windows platforms” on page 27 for information on the installation dialogs.

### Creating the response file

To create a response file, run setup with the record parameter:

```
setup -r
```

All your setup choices are then recorded in the response file, which is called setup.iss by default, and is written to the Windows directory.

However, you can also use the -f1 parameter to specify the name and location of the response file created, for example:

```
setup -r -f1d:\install\cicscli.iss
```

Note that you can specify setup parameters using either a hyphen (-) or a slash (/).

The response file is a plain text file that you can edit if necessary.

### Playing back the silent setup

To perform a silent setup, you run setup.exe with the -s parameter. No messages are displayed during silent setup, but setup information is written to a log file named setup.log in the same directory as setup.exe.

You can use the -f1 and -f2 parameters with setup.exe to specify the name and location of the response file and the log file. For example:

```
setup -s -f1d:\install\cicscli.iss -f2d:\install\setup.log
```



You do not need to specify the `f1` parameter if the response file is in the same directory as `setup.exe`.

To verify that a silent setup succeeded, look at the `ResultCode` value in the `[ResponseResult]` section of `setup.log`. The `ResultCode` value will indicate a successful setup (0) or an error code, as described in the next section.

### Checking for errors

The `ResultCode` value in the `[ResponseResult]` section of `setup.log` can contain values as follows:

0	Success
-1	General error
-2	Invalid mode
-3	Required data not found in the response file
-4	Not enough memory available
-5	File does not exist
-6	Cannot write to the response file
-7	Cannot write to the log file
-8	Invalid path to response file
-9	Not a valid list type
-10	Not a valid list type (string or number)
-11	Unknown error during setup
-12	Dialog boxes are out of order
-51	Cannot create the specified folder
-52	Cannot access the specified file or folder
-53	Invalid option selected

### Upgrading silently

If you need to install CICS Transaction Gateway over an existing installation, you can also do this silently.

To run an upgrade silent installation, use the following parameters, separated by semicolons, *before* the `-s`, `f1`, and `f2` parameters:

<b>UPGRADE</b>	Specifies that the response file will be used to upgrade an existing installation
<b>CICSCLI=<i>path</i></b>	Specifies the name and location of the configuration file to be used.
<b>CICSCOL=<i>path</i></b>	Specifies the name and location of the color mapping file to be used.
<b>CICSKEY=<i>path</i></b>	Specifies the name and location of the keyboard mapping file to be used.

The `CICSCLI`, `CICSCOL`, and `CICSKEY` parameters are optional. If they are not specified, the `.ini` files from the existing installation will be copied to the

upgraded installation. If these parameters specify the default names for the .ini files (ctg.ini, cicscol.ini, cicskey.ini) the files in the existing installation are overwritten.

For example:

```
setup UPGRADE;CICSCLI=ctg.ini;CICSCOL=cicscol.ini;CICSKEY=cicskey.ini  
-s -f1d:\install\cicscli.iss -f2d:\install\setup.log
```

### Restrictions of silent installation

You cannot use a silent installation for uninstalling or adding or removing components of CICS Transaction Gateway, as can be done using the Utility Setup panel.

---

## Registering COM libraries

COM libraries are provided with CICS Transaction Gateway and these must be registered at installation time. Registration registers the COM classes, associated ProgIDs, and the type libraries for each of the libraries.

Visual Basic will only use the type libraries if you register them to each Visual Basic Project. It is recommended that you do this to make full use of the features and performance enhancements of these type libraries. For more information refer to *CICS Universal Clients COM Automation Programming*.

VBScript does not use type libraries. All the COM libraries support automatic registration and de-registration and you may register in-process or out-of-process libraries, during the installation of CICS Transaction Gateway. If both the in-process and out-of-process libraries are registered, by default Visual Basic and VBScript will use the in-process versions.

### Registering in-process servers

To register in-process servers use the Microsoft supplied program REGSVR32. For example to register the ECI COM libraries enter the command:

```
REGSVR32 CCLIECI.DLL
```

to de-register enter the command:

```
REGSVR32 /U CCLIECI.DLL
```

### Registering out-of-process servers

To register the out-of-process servers, run the executable and, when a window appears indicating that registration has been done, close it. For example to register the EPI libraries run the program CCLOEPI. To unregister the

| out-of-process servers, run the executable with the /unregister parameter. For  
| example to unregister the EPI libraries run the program **CCLOEPI /unregister**.



---

## Chapter 4. Configuring CICS Transaction Gateway

This chapter describes the following:

- “Configuring your programming environment for CICS Transaction Gateway”
- “Setting the time” on page 38
- “Using the configuration tool” on page 38
- “The configuration conversion tool” on page 63.
- “Editing the configuration file” on page 65.
- “Configuring the client keyboard mapping” on page 68.
- “Configuring the client screen colors and attributes” on page 68.
- “Preparing to use local CICS Transaction Gateway support” on page 68.

---

### Configuring your programming environment for CICS Transaction Gateway

The Java Virtual Machine (JVM) uses the CLASSPATH environment variable to find classes, and zip or jar archives containing classes. To allow the JVM to access class files, you must specify the full path of directories containing class files or archives.

To compile and run Java applications for use with the CICS Transaction Gateway, add the full path of the following to the CLASSPATH environment variable:

- ctgclient.jar
- ctgserver.jar (if you are using a local gateway)

These archives are in the classes subdirectory of the directory where you installed the CICS Transaction Gateway.

#### Setting the CLASSPATH

To set the CLASSPATH environment variable, enter a command like the following:

```
set CLASSPATH=c:\ibmvaj\classes;d:\ctg\classes\ctgclient.jar
```

This command makes the classes in directory c:\ibmvaj\classes, and in archive d:\ctg\classes\ctgclient.jar accessible by the JVM.

## Configuring CICS Transaction Gateway

Under Windows NT you can also set and change the CLASSPATH environment variable from the Environment tab dialog in the System dialog in the Control Panel.

To display the value of the CLASSPATH environment variable, use the set CLASSPATH command.

---

### Setting the time

You must set your locale to match your timezone to get the right time. For example, if you set your locale to en\_US, Java is set to the time in the United States.

---

### Specifying which JVM to use

You use the ctgjava command to set the location of the JVM that CICS Transaction Gateway uses. The command has the following options:

```
ctgjava /s=jvmlocation [/v]
```

where *jvmlocation* is a fully qualified path. The option /v displays the location of the JVM currently being used.

---

### Using the configuration tool

You use the configuration tool to set configuration parameters for the CICS Transaction Gateway and CICS Universal Clients.

To start the configuration tool, click on its icon, or enter the **ctgcfg** command. The configuration tool will use the JVM specified by the ctgjava command, see “Specifying which JVM to use”.

When you start the configuration tool for the first time, a number of TaskGuides help you in setting up a new configuration. The TaskGuides let you:

1. Create CICS server definitions, and define the protocols to be used by the CICS Universal Clients
2. Decide which protocols to use with the CICS Transaction Gateway
3. Configure the Workload Manager.

Default settings for the CICS Universal Clients are created.

## Configuring CICS Transaction Gateway

The configuration is stored by default in the `ctg.ini` file in the `bin` subdirectory where you installed the CICS Transaction Gateway. You can edit this file directly, but it is recommended that you use the configuration tool to perform configuration.

The configuration file contains equivalent entries to the `Gateway.properties` file of CICS Transaction Gateway Version 3.0 and CICS Gateway for Java.

If a configuration file already exists when you start the configuration tool, the settings in the file are loaded into the configuration tool.

### The configuration tool interface

The user interface of the configuration tool consists of a menu bar, toolbar, tree structure, and Settings panel.

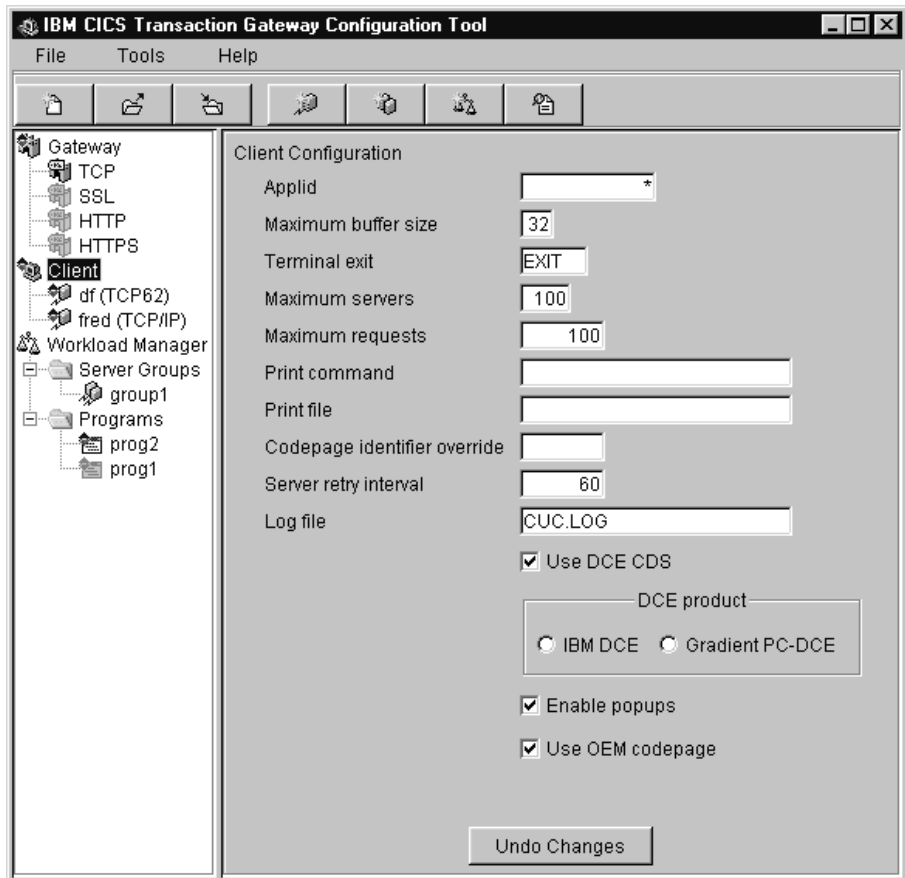


Figure 4. The configuration tool

## Configuring CICS Transaction Gateway

**Note:** On your platform, the configuration tool may not appear exactly as shown in Figure 4 on page 39.

### Tree structure

The tree structure (see Figure 4 on page 39) allows you to navigate through all of the settings in your configuration. The types of root node are as follows:

- Gateway**            Contains up to four subnodes, that is, one for each protocol the CICS Transaction Gateway can use (TCP, SSL, HTTP, and HTTPS).
- Client**             Contains a subnode for each of your server definitions.
- Workload Manager**
  - Contains two subnodes:
    - Server groups**   Server groups are used to group together CICS server definitions with different port numbers. These server instances are used by the Workload Manager to balance workload across CICS servers. Each server group subnode contains the server definitions associated with that server group.
    - Programs**        Contains a number of subnodes, one for each program associated with the Workload Manager. Each program subnode contains the server definitions with which the program is associated.

### Menu bar

The menu bar contains the **File**, **Tools**, and **Help** pull-downs.

The **File** pull-down has the following options:

- New**                Creates a new configuration.
- Open**             Opens an existing configuration.
- Save**             Saves the current configuration. If a new configuration has been created, the file name is `ctg.ini` (in the `bin` subdirectory).
- Save As**         Allows you to override the default path and name of the configuration file.
- Exit**             Exits the configuration tool. You are asked whether you want to save the configuration.

The **Tools** pull-down has the following options:



**Trace Settings** Displays the Trace Settings dialog.

**New Server** Starts the TaskGuide for creating new server definitions.

**Delete Server** Deletes a server node from the tree structure.

### **New Server Group**

Creates a new Server group for the Workload Manager.

### **Delete Server Group**

Deletes a Server group subnode from the Workload Manager node.

### **New Program to Bias**

Allows you define a new program for biasing by the Workload Manager.

### **Delete Biased Program**

Deletes a program subnode from the tree structure.

The **Help** pulldown has the following options:

**Context Help** Displays online help information according to the current screen context, for example, for a particular configuration setting.

**Contents** Displays the contents list for the online help information.

**Index** Displays a subject index for the online help information.

### **Toolbar**

The toolbar has the same functionality as that of the menu bar, except that it does not include the **Save As** or **Exit** options. The icons have hover helps, so that when you move the cursor over them, a text box describing the option appears.

### **Settings panels**

When you select nodes in the tree structure, the relevant settings panel is displayed. The settings in these panels correspond to parameters in the ctg.ini file.

On each settings panel there is an **Undo Changes** button that allows you to undo changes you have made.

## **Configuring CICS Transaction Gateway settings**

To display the Gateway Settings panel, select the Gateway node in the tree structure. The settings map to the parameters in the Gateway section of the ctg.ini file.

## Configuring CICS Transaction Gateway

Using the configuration tool, you can provide preset values for any parameter that can be specified using a Gateway command line option.

If a parameter defined using the configuration tool is specified via the associated command line option when the Gateway is started, the command line setting *takes precedence*.

### General Gateway settings

The general Gateway settings are:

**Initial number of Connection Manager threads:** Enter the initial number of ConnectionManager threads. The default is 10.

You can override this setting with the `ctgstart -initconnect` command.

**Maximum number of Connection Manager threads:** Enter the maximum number of ConnectionManager threads. The default is 100.

If this value is set to -1, no limits are applied to the number of ConnectionManager threads.

You can override this setting with the `ctgstart -maxconnect` command.

For information on threading limits, see Table 1 on page 11.

**Initial number of Worker threads:** Enter the initial number of Worker threads. The default is 20.

You can override this setting with the `ctgstart -initworker` command.

**Maximum number of Worker threads:** Enter the maximum number of Worker threads. The default is 200.

If this value is set to -1, no limits are applied to the number of Worker threads.

You can override this setting with the `ctgstart -maxworker` command.

For information on threading limits, see Table 1 on page 11.

**Time shown in messages:** Select this check box to enable timing information in messages. (Timings are shown to millisecond accuracy.)

Timing information is enabled by default.

## Configuring CICS Transaction Gateway

You can override this setting with the `ctgstart -notime` command.

**Enable reading input from console:** Select this check box to enable the reading of input from the console.

Reading of input from the console is enabled by default.

You can override this setting with the `ctgstart -noinput` command.

**Display TCP/IP hostnames:** Select this check box to enable the display of TCP/IP hostnames.

You can override this setting with the `ctgstart -nonames` command.

**Let Java clients obtain generic ECI replies:** Select this check box if you wish Java clients to be able to obtain generic ECI replies from the CICS Transaction Gateway.

Generic replies are those obtained using the `Call_Type: ECI_GET_REPLY` or `ECI_GET_REPLY_WAIT`. Specific replies are those obtained using the `Call_Type: ECI_GET_SPECIFIC_REPLY` or `ECI_GET_SPECIFIC_REPLY_WAIT`. This setting does not apply to local Gateways.

**Timeout for in-progress requests to complete:** Enter a value in milliseconds.

When a Java-client program disconnects from the Gateway, the Gateway may still be processing requests on behalf of that program. If work is still in progress, the `ConnectionManager` that was managing requests on behalf of that Java-client waits for in-progress requests to complete for up to the timeout period. If after this period there are still requests in progress, the `ConnectionManager` continues its processing and marks itself as available for use by a new connection. By default this timeout is set to 1000 milliseconds, but you may enter a value to override that default.

If this value is set to zero, the `ConnectionManager` does not wait for in-progress requests to complete.

**Worker thread available timeout:** Enter a value in milliseconds.

When a `ConnectionManager` accepts a request, it must allocate a `Worker` thread to execute that request. If however, a `Worker` does not become available within the timeout period an error message is sent rejecting that request and the request is not executed. By default, this timeout is set to 1000 milliseconds, but you can enter a value to override that default.

## Configuring CICS Transaction Gateway

If this value is set to zero, the request is rejected, if a Worker is not immediately available.

### TCP protocol settings

Select the **TCP** subnode to display the settings for TCP:

**Enable protocol handler:** Select this check box to configure the CICS Transaction Gateway for using this protocol.

**Port:** Enter the TCP/IP port number for the protocol:

For TCP, the default is 2006.

For HTTP, the default is 8080.

For SSL, the default is 8050.

For HTTPS, the default is 443.

You can override this setting for the TCP protocol with the `ctgstart -port` command.

**Handler wakeup timeout:** Enter a value in milliseconds.

This setting controls how frequently the protocol handler wakes from accepting inbound connections. When it wakes, it checks to see whether the Gateway is being stopped, and so this value affects the time taken for the Gateway to shutdown cleanly. If you set this value to zero then the handler only wakes when a new connection is accepted, and so the Gateway will not shutdown cleanly until that time.

**Connection timeout:** Enter a value in milliseconds.

When a new connection has been accepted, this value specifies how long the protocol handler waits for a ConnectionManager thread to become available. If a ConnectionManager thread does not become available, then the connection is refused. If this value is set to zero, a connection is refused if a ConnectionManager is not immediately available.

**Idle timeout:** Enter a value in milliseconds.

This setting specifies how long a connection is allowed to remain dormant. The idle timeout period is counted from when a request was last flowed down the connection. When the idle timeout has expired, the connection is

disconnected, though if work is still in progress on behalf of the connection, it may be left connected. If this value is not set, or is set to zero, then idle connections will not be disconnected.

**Drop working connections:** Select this check box to specify that a connection can be disconnected, due to an idle timeout or a PING/PONG failure **even** if work is still in progress on behalf of this connection.

**SO\_LINGER setting:** Enter a SO\_LINGER setting for any Socket used by this handler. If this value is not entered, or set to zero, then SO\_LINGER is disabled for any Sockets used by this protocol handler.

**Ping time frequency:** Enter a value in milliseconds.

This value specifies how often a PING message is sent by the Gateway to an attached client to check that client is still active. If a PONG response has not been received by the time the next PING message is due to be sent, then the connection is disconnected. Again, if work is still in progress on behalf of the connection it may be left connected. If this value is not set, or is set to zero, then PING messages are not sent.

### SSL protocol settings

Select the **SSL** subnode to display the settings for SSL. The settings are the same as for TCP, with the following in addition:

**Require security:** Select this check box if you wish your Gateway to only accept connections that use security classes.

When a Java-client program connects to the Gateway, it can specify a pair of security classes that should be used on the connection. However, by default a Gateway also accepts connections from programs that do not specify this pair of security classes.

You can control which security classes are valid by controlling the set of xxxServerSecurity classes that can be accessed by your Gateway.

For more information on CICS Transaction Gateway security exits, see “Security exits” on page 16.

**KeyRing classname:** Enter the class name of the server KeyRing.

The server KeyRing should consist of a valid x.509 certificate that is used to identify this server to connecting clients. This KeyRing class is generated using the SSL tools supplied with this product.

## Configuring CICS Transaction Gateway

For more information about SSL and its associated KeyRing classes, see “Chapter 5. Security” on page 71.

**KeyRing password:** Enter the Password for the server KeyRing class you specified during the creation process.

**Use client authentication:** Select this check box to enable client authentication for the CICS Transaction Gateway. The default is that client authentication is disabled.

When client authentication is enabled, any connection attempted to either the `ssl:` or `https:` handler requires the client to present its own Client Certificate (also known as a Digital ID).

For information on how to obtain Client Certificates for the clients, see “Configuring SSL clients” on page 81.

The default port for SSL is 8050.

### HTTP protocol settings

Select the **HTTP** subnode to display the settings for HTTP. The settings are the same as for TCP, except that there is no Ping time frequency setting.

The default port for HTTP is 8080.

### HTTPS protocol settings

Select the **HTTPS** subnode to display the settings for HTTPS. The settings are the same as HTTP, except that HTTPS has Require security, KeyRing classname KeyRing password, and Use client authentication settings.

The default port for HTTPS is 443.

### Configuring Client settings

To display the Client Settings panel, select the Client node in the tree structure. The settings map to the parameters in the Client section of the ctg.ini file.

#### **Applid**

Enter up to 8 characters, or leave this field with the default value of \*.

This value specifies the applid of the CICS Universal Client workstation in the form in which it will be autoinstalled as a system at the CICS server. The name must be unique within the CICS server system. The value of \* automatically generates a name that is guaranteed to be unique.

**Note:** If the client is to be autoinstalled to more than one CICS server, and if you enter a specific name for the applid, that name must be unique with respect to all servers it is connected to. If the name is not unique, then attempts to connect to a server may be rejected because another client has already been installed using the same name. If a name of \* is used, the client may be known by a different unique name at each server.

If the client is to communicate with a given server via APPC, then this applid may be overridden at the time the client is installed at the server by the Local LU name for the client.

#### **Maximum buffer size**

Enter a number of kilobytes, in the range 4 through 32. The default is 32 KB.

This value specifies the size of the transmission buffers in which application or terminal data will flow. The value should be large enough to cater for the largest possible COMMAREA or terminal input/output area (TIOA) to be used. The value does *not* include an overhead of 512 bytes needed by the clients for some protocols.

This setting need normally be specified only for clients running in a memory-constrained environment.

#### **Terminal exit**

Enter a character string of between 1 and 4 characters. The default is EXIT.

## Configuring CICS Transaction Gateway

The string, when entered at a terminal emulator at any time and place where a transaction name can be entered, causes the terminal emulator to terminate. The string must not contain any blank characters.

The string is case-sensitive. If a terminal emulator has uppercase translation in its CICS terminal definition, you should enter this string in uppercase.

### **Maximum servers**

Enter a value in the range 1 through 256. The default is 10.

This value specifies the maximum number of servers that can be accessed concurrently from the client.

### **Maximum requests**

Enter a value in the range 1 through 10 000. The default is 90.

This value specifies the maximum number of concurrent items that may be executing on the client, when an item is defined as a terminal emulator, an EPI terminal or an ECI unit of work.

This value is used to detect runaway situations where an application could, in error, submit an excessive number of requests to a server. The actual limit may be less than this setting if other operating system limits (for example, memory constraint or communication sessions), come into effect.

### **Print command**

Enter a character string, from 1 to 256 characters long.

The specified string is a command specific to the operating system under which the client is running. When a request to print is received at the client, the client generates a temporary print file with a unique name per print request.

The parameter string is appended with the temporary file name, and the resultant command executed. This allows, for example, print requests to be copied to a file, directed to a local printer, formatted for inclusion into documentation, and so on.

A command file may be necessary to act as an interface between the syntax of the invocation command defined here, and more general operating system syntax. For example, if the desired final command was COPY printfile LPT2, a



simple command file would be required to reorder the parameters. It is the responsibility of the Print Command to delete the temporary print file after it has finished processing it.

See also the **Print file** description for more information.

### **Print file**

Enter a character string, 1 to 256 characters long.

This option is applicable only if the Print Command setting is omitted.

The specified string identifies a file to which output from print requests received at the client is directed. Each print request is appended to the end of the current file.

If both this setting and **Print command** are omitted, the default action is to direct the print data to LPT1.

**Note:** This setting acts only as a default. The terminal and print emulators provide options to override this value.

### **Codepage identifier override**

Enter a value indicating a Coded Character Set Identifier (CCSID) to override your local codepage identifier.

You should use this setting if your platform has been updated for Euro support, and the CICS Server has Euro support. For example, for Latin-1 countries, use a CCSID value of 858 to indicate that the codepage 850 includes Euro support. For codepage 1252, specify a CCSID value of 5348.

Note that CICSTERM will always display characters based on the local codepage of the workstation, regardless of the value specified by the **Codepage identifier override** setting.

Also note that if you use the CCSID to change the codepage identifier used, data that was stored previously in the server may be modified when retrieved to the Client, if it includes characters for which the code points produce different characters.

On Windows it is not necessary to supply a CCSID, as you can use the **Use OEM codepage** setting to provide support for Euro enabled codepages. If **Codepage identifier override** is specified, it overrides the codepage value generated using the **Use OEM codepage** setting. You might do this, for

## Configuring CICS Transaction Gateway

example, to switch back to codepage 850 or 1252 to indicate to the CICS server that the Euro should not be used.

### Server retry interval

Enter a number of seconds. This is the time in seconds between attempts by the client to reconnect to a server to which it was connected. The default interval is 60 seconds.

When the client becomes aware that a server it was connected to is no longer active, it attempts to reconnect to the server 1 second after it becomes inactive. Subsequent retry attempts then occur at the interval defined by **Server retry interval**.

### Log file

Enter the name of the log file to be used for problem diagnosis.

If not specified, the log filename defaults to cicscli.log in the Client \BIN subdirectory.

### Use DCE CDS

Select this check box to use the Cell Directory Server (CDS) of DCE to locate CICS servers. The CDS is used, provided DCE is installed and configured on the client machine. The CICS Universal Client can then communicate with any of the located CICS servers using DCE Remote Procedure Calls (RPC).

If you do not select this check box, you must make appropriate settings for CICS servers as required in the Server settings. In any case, you must select which type of DCE you want to use by selecting the **IBM DCE** or **Gradient PC-DCE** radio button.

This setting is provided because searching the CDS for CICS servers may take some time, particularly with a large DCE cell.

### IBM DCE

Select this radio button if you want to use IBM DCE.

### Gradient PC-DCE

Select this radio button if you want to use Gradient DCE.

### Enable popups

Select this check box to enable the display of popup messages at startup.

You can also change this setting dynamically by using the CICSCLI /n and CICSCLI /e commands.

### Use OEM codepage

Select this check box if you want the CICS Universal Client to call the Windows operating system OEM codepage function to get the codepage identifier (for example, 850). If the workstation is Euro enabled, then codepage 850 is mapped to 858 within the client to indicate to the CICS Server that the Euro symbol can be used.

If you do not select this check box, the CICS Universal Client uses the Windows operating system ACP function to get the ASCII identifier (for example 1252). This should be used for Latin-1, Japanese, Korean and Simplified Chinese systems to provide appropriate conversions. If the workstation is Euro enabled, then codepage 1252 is mapped to codepage 5348.

## Configuring Server settings

To display the Server Settings panel, select a Server node in the tree structure. The settings map to the parameters in a Server section of the ctg.ini file.

### Server name

Enter a name of between 1 and 8 characters. This provides a communications-protocol-independent name for the server, local to the client.

Requests to access the server from ECI, EPI, ESI, or terminal emulators reference the server through this name.

### Description

Enter a description for the server of between 1 and 60 characters. This description is optional.

The description is returned to applications running on the client via the CICS\_EpiListSystems and CICS\_EciListSystems functions. (See the *CICS Family: Client/Server Programming* book).

### Initial transaction

Enter a transaction identifier of between 1 and 128 characters.

This string is case-sensitive and identifies the initial transaction (and any parameters) to be run when the terminal emulator connects to the server. If you do not enter anything, no initial transaction is run. The first four

## Configuring CICS Transaction Gateway

characters, or the characters up to the first blank in the string are taken as the transaction. The remaining data is passed to the transaction on its invocation.

### Model terminal definition

Enter a string of between 1 and 16 characters.

The string is case-sensitive and specifies the name of a model terminal definition at the server, identifying the characteristics of terminals to be autoinstalled from the client. If the model cannot be located at the server, or you do not enter anything, a default terminal definition is used. This default is server-specific.

The interpretation of the Model terminal definition setting is server-specific. For example, for a CICS for OS/2 server, the value is validated (by the server) as a 1- to 4-character string identifying a model entry in the CICS terminal definition control tables with a terminal name set to the value specified on this parameter. For a TXSeries for AIX server, the value is 1 to 16 characters, and is the DevType for a CICS terminal definition entry to be used as the model.

### Use Windows credentials for security

Select this check box if you want to use the Windows NT password for CICS security.

To use to use this feature, you must do the following:

1. Change to the directory `\Program Files\Common Files\IBM\IBM Integrated Sign ON`
2. Enter `bthdinst -i CICSCLI`
3. Reboot.

When uninstalling you **must** uninstall in the following sequence:

1. Change to the directory `\Program Files\Common Files\IBM\IBM Integrated Sign ON`
2. Enter `bthdinst -u CICSCLI`
3. Reboot
4. Uninstall in the usual way.

For more information, refer to “Network Provider Interface (NPI)” on page 89.

### Use upper case security

Select this check box to specify that any userid or password from an ECI application or resulting from a user prompt is converted to uppercase.

This setting is disabled by default.

### **TCP/IP**

Select this option to specify TCP/IP as the protocol for the server connection.

### **SNA**

Select this option to specify SNA as the protocol for the server connection.

### **TCP62**

Select this option to specify TCP62 as the protocol for the server connection.

### **NetBIOS**

Select this option to specify NetBIOS as the protocol for the server connection.

### **DCE**

Select this option to specify DCE as the protocol for the server connection.

### **Named Pipe**

Select this option to specify Local Named Pipe as the protocol for the server connection.

Protocol settings displayed on the panel change according to the protocol button you select.

### **TCP/IP settings**

To display these settings, select the **TCP/IP** option.

**Hostname or IP address:** Enter the character or numeric TCP/IP identifier for the host on which the CICS server is running. For example, `cicssrv2.company.com` (HostName) or `9.20.4.1` (IPAddress).

Hostnames are mapped to IP addresses either by the name server or in the hosts file in the `etc` subdirectory. It is, however, better to use a Hostname in case the IP address changes.

The `\etc` subdirectory is located as follows:

**OS/2**    `c:\mptn\etc`

### **Windows NT**

`c:\winnt\system32\drivers\etc`

## Configuring CICS Transaction Gateway

### Windows 95/98

c:\windows\etc

**Port:** Enter a numeric value in the range 0 through 65 535 defining the port number at the server to which the client should connect. The default value is 0.

A value of 0 indicates that the SERVICES file in the TCP/IP \etc subdirectory should be used to locate the port number for the service CICS using a protocol of TCP.

The \etc subdirectory is located as follows:

**OS/2** c:\mptn\etc

### Windows NT

c:\winnt\system32\drivers\etc

### Windows 95/98

c:\windows\etc

If no entry can be located in the SERVICES file, a value of 1435 is assumed, this being the TCP/IP architecture assigned port for CICS Universal Clients.

**Connection timeout:** Enter a value in the range 0 through 3600, specifying the maximum time in seconds that establishing a connection is allowed to take; the default value of 0 means that no limit is set by the client.

A timeout occurs if connection establishment takes longer than the specified time. The TCP/IP socket is closed and the return code passed back to the client application is either ECI\_ERR\_NO\_CICS or CICS\_EPI\_ERR\_FAILED.

**Send TCP/IP Keepalive packets:** Select this check box if you want TCP/IP to periodically send KeepAlive packets to the server to check the connection.

### SNA settings

To display these settings, select the **SNA** option.

**Use LU alias names:** Select this check box to use LU alias names.

Selecting this setting enables the **Partner LU name** and **Local LU name** to be specified as alias names instead of real LU names. This means, for example, that it is possible to switch between servers without stopping the CICS Universal Client. The default is that LU alias names are not used.

**Partner LU name:** Enter the LU Name of the server as it is known to the APPC configuration at the CICS Universal Client.

This can be a qualified 17-character name, for example, ABC3XYZ4.PQRS1234. Alternatively, you can enter an alias name, as long as **Use LU alias names** is selected.

**Local LU name:** Enter the name of a local LU to be used when connecting to the server. The same LU can be used for all server connections.

You can enter an alias name, as long as **Use LU alias names** is selected.

**Mode name:** Enter between 1 and 8 characters specifying the mode name to be used when connecting to the server. Omitting this setting results in a blank mode name.

A value of \* can be specified if a blank mode name is required.

### TCP62 settings

To display these settings, select the **TCP62** option.

**Partner LU name:** Enter the LU Name of the server as it is known to the SNA configuration at the client. This must be a qualified 17-character name, for example, ABC3XYZ4.PQRS1234.

**Local LU name or template:** Enter a real LU name or a template for the name of a local LU to be used when connecting to the CICS server.

If you enter a template, you must fill in the **IP address mask for LU name template (optional)** field.

A template contains template replacement characters, that is, asterisks (\*), and is used to dynamically generate an LU name. For example, a template of CTS8BC\*\* indicates that a name must be dynamically generated to replace the two asterisks. An algorithm based on the template, IP address mask, and the workstation IP address, is used to create a unique Local LU name of, for example, CTS8BC38.

With dynamic name generation for the Local LU name, you can use the same configuration on all CICS Client machines because different Local LU names are generated on the basis of the IP address of the client machine. Therefore, you do not have to define multiple LUs within VTAM.

If several hundred clients are to use dynamic LU name generation to connect to the CICS server, you should have more template replacement characters in your Local LU name, for example, CTS8\*\*\*\*. In fact, CICS Transaction Server for OS/390 uses the last four characters of the LU name as the connection name, so these characters must be unique.

## Configuring CICS Transaction Gateway

You can use the eNetwork Personal Communications **sxmap convert** utility to display the LU name that is generated from a specified internet IP address, IP address mask, and LU name template.

**IP address mask for LU name template (optional):** Enter an IP address mask in big-endian, that is, most significant byte first order. This must be a hexadecimal number, for example, FFFFFFF80.

This address mask is used in dynamic LU name generation. See the description of **Local LU name or template** for more information.

This parameter is ignored if **Local LU name** is not a template. The default is 00000000.

**Mode name:** Enter between 1 and 8 characters specifying the mode name to be used when connecting to the server. Omitting this setting results in a blank mode name.

A value of \* can be specified if a blank mode name is required.

If ModeName is not specified, a default mode name of TCP62 is used.

You can use the **Maximum logical SNA sessions**, **Maximum SNA RU size**, and **SNA pacing size** settings to define the mode specified by **Mode name**.

If you specify a mode that is already specified in the eNetwork Personal Communications configuration file, the mode is not redefined. If the same mode is specified on two different TCP62 server connections, the mode definition is taken from the first server to be connected.

### Common TCP62 settings

To display these settings, select **Common TCP62 Settings**

**Fully qualified CP name or template:** Enter a fully-qualified CP name, or a template for the fully-qualified CP name, of the node to be started.

If you enter a template, you must fill in the **IP address mask for CP name (optional)** field.

A template contains template replacement characters, that is, asterisks (\*), and is used to dynamically generate a CP name. For example, a template of USIBMJKA.CP62\*\*\*\* indicates that a name must be dynamically generated to replace the four asterisks. An algorithm based on the template, IP address mask and the workstation IP address, is used to create a unique CP name of, for example, USIBMJKA.CP62AH38.



With dynamic name generation for the CP name, you can use the same configuration on all CICS Client machines because different CP names are generated on the basis of the IP address of the client machine. Therefore, you do not have to define multiple CPs to VTAM.

If several hundred clients are to use dynamic CP name generation, you should have more template replacement characters in your template, for example, USIBMJKA.CP\*\*\*\*\*.

The net ID part (the first part) of the template must not contain any template replacement characters.

**IP address mask for CP name (optional):** Enter an IP address mask in big-endian, that is, most significant byte first order. This must be a hexadecimal number, for example, FFFF8080.

This address mask is used in dynamic CP name generation. See the description of **Fully qualified CP name or template** for more information.

This parameter is ignored if **Fully qualified CP name or template** is not a template. The default is 00000000.

**Anynet domain name suffix:** Enter the AnyNet<sup>®</sup> domain name suffix. This parameter is used with the partner (**Partner LU name**) to determine the IP address of the host associated with that LU.

For example, if the domain name suffix is `sna.ibm.com` and the partner LU name is `NETID.LUA` a `gethostbyname` call is issued for `hostname LUA.NETID.sna.ibm.com` to obtain the IP address of the node that has the LU name `NETID.LUA`.

The default is `sna.ibm.com`.

**Remote node inactivity timeout:** Enter a number of seconds between 1 and 65535. The default value is 30 seconds.

This configuration setting controls the time that eNetwork Personal Communications waits before polling inactive connections. Refer to the eNetwork Personal Communications documentation for details on how this parameter behaves.

### Advanced TCP62 settings

To display these settings, select **Advanced TCP62 Settings**.

## Configuring CICS Transaction Gateway

**Maximum logical SNA sessions:** Enter a value in the range 1 through 255. The default value is 8.

This parameter is used for TCP62 to define the number of logical SNA sessions.

**Maximum SNA RU size:** Enter a value in the range 256 through 4096. The default value is 1024.

This parameter is used for TCP62 in defining the mode specified by the **Mode name** setting.

**SNA pacing size:** Enter a value in the range 0 through 63. The default value is 8.

This parameter is used for TCP62 in defining the mode specified by the **Mode name** setting.

### NetBIOS settings

To display these settings, select the **NetBIOS** option.

**Applid:** Enter the NetBIOS name of the server. For CICS for OS/2 this is specified in the Local System Appl ID field in the system initialization table (SIT).

The name is case-sensitive.

**Adapter:** Enter a numeric value in the range 0 through 3 specifying which LAN adapter the client should use. The default is 0.

### DCE settings

To display these settings, select the **DCE** option.

**CICS region:** Enter the name of a region on the CICS server. This must be a region name defined in the resource definitions for the CICS server.

**IBM DCE:** Select this radio button if you want to use IBM DCE.

**Gradient PC-DCE:** Select this radio button if you want to use Gradient DCE.

### Local Named Pipe settings

To display these settings, select the **Named Pipe** option.

**Named Pipe Name:** Enter a name of up to six alphanumeric characters that match the **NamedPipeName** attribute specified by the TXSeries for Windows NT server in its Listener Definition.

### Configuring the Workload Manager

To display the Workload Manager Settings panel, select the Workload Manager node in the tree structure. The settings map to the parameters in the Workload Manager section of the ctg.ini file.

For information on how to use the Workload Manager see the *CICS Universal Client for Windows Administration* book.

It is particularly important to understand what is meant by **Server Group**. Server groups are used to group together a number of CICS server definitions with different TCP/IP ports. A server group is equivalent to one physical CICS server (otherwise known as a CICS region). This is needed for CICS on AIX which often has multiple listeners (due to a limit of 256 concurrent connections on one port).

The Programs node is used to show which servers/server groups are set up to use a specific program.

#### Enable the Workload Manager

Select this check box to enable the Workload Manager. The default is that the Workload Manager is disabled.

#### Round robin

Select this radio button to select a round-robin algorithm for this server.

The round-robin algorithm assumes that all CICS servers (regions) are equally valid for selection. In the round-robin algorithm, when the client is initially started, it reads from the registry a list of all possible CICS servers to which any ECI request can be sent. An indication of the last server selected is also maintained. When a new ECI request arrives, the next server in the list is selected as the target for that ECI request. The next server indicator is then advanced until the last server has been selected, at which point the first server is selected again as the target for a request.

#### Biasing

Select this radio button to select a biased algorithm for the Workload Manager.

## Configuring CICS Transaction Gateway

The biasing algorithm provides a means of balancing workload by specifying that workload should be biased in favor of particular CICS servers (regions). For example, if there are two servers and one has a bias of 75 and the other 25, then program requests are sent in a ratio of 3:1 to the first server. If a server fails, the internal biasing calculation changes. If two servers are available, one with a bias of 100 and the other with a bias of 0, then all requests are sent to the first server. If the first server becomes unavailable, all requests are now directed to the second server. The bias value of 0 means use only if no other server is available.

Another way of looking at biasing is:

$$\text{probability a server will be selected} = \frac{\text{bias for server}}{\text{total bias for all servers}}$$

The biasing algorithm only works for ECI calls and does not work for EPI calls. If you attempt to run an EPI application while the biasing algorithm is selected, the round-robin algorithm is used instead.

### Region timeout

Enter a value in seconds between 0 and 3600. The default is 60 seconds.

When a CICS server (region) is selected as the target of a client request, and that server is unavailable, the server is flagged as invalid, and is no longer included in the list of target regions for requests. The Region timeout value specifies the number of seconds after which an invalid region can once more be included in the list of target regions.

There are two options on the **Tools** menu that allow you to configure server groups and programs. These options are only enabled when you select the Workload Manager node.

### Configuring a server group

This panel allows you to define which servers belong to a particular server group.

To add a new server group, you select the **New Server Group** option.

To change the members of a server group, select the server group from the tree selection.

In the case of a new server group, enter a name in the **Server group name** field.

To add a server to a group, select a server from the **Servers not in server group** list on the right and then select the arrow button (<<).

To remove a server from a group, select the server from the **Servers in server group** list and then select the arrow button (>>).

### Configuring programs

This panel allows you to define which servers are used for biasing in the workload management of a particular program.

To add a new definition, you select the **New Program to Bias** option.

To change a definition, select the program from the tree selection.

In the case of a new definition, enter a name in the **Program name** field.

To disable workload management for the program, deselect the **Manage workload for this program** check box.

To add a server to the list of servers used for biasing, select a server or server group from the **Servers not used for biasing** list on the right and then select the arrow button (<<).

To remove a server from the list, select a server from the **Servers used for biasing** list on the left and then select the arrow button (>>).

In the **Bias value** fields, you can enter a bias value for the server.

In the **Ratios** fields, percentage bias values for each server are shown. This field contains **Standby** if the bias value is 0, which means use only if no other server is available.

### Manage workload for this program

Select this check box if you want to enable load balancing for the selected program.

If you disable load balancing for a particular program, the Workload Manager connects to the server specified in the ECI call, rather than randomly selecting a new server.

### Trace settings

To configure the trace settings, select the **Trace** option from the **Tools** menu.

## Configuring CICS Transaction Gateway

### Trace Settings

Select check boxes to specify the CICS Transaction Gateway and CICS Universal Client components that will be traced when tracing is turned on.

<b>Trace everything</b>	All components.
<b>Client API level 1</b>	The client API layer (level 1).
<b>Client API level 2</b>	The client API layer (level 1 and 2).
<b>CICSCLI command line</b>	The CICSCLI command interface.
<b>CICSTELD</b>	CICSTELD process.
<b>CICSTERM and CICSPRINT</b>	CICSTERM and CICSPRINT emulators.
<b>CPP classes</b>	The C++ class libraries.
<b>Client daemon</b>	CICS Universal Client daemon.
<b>Transport layer</b>	Interprocess communication.
<b>Protocol drivers</b>	Protocol drivers (TCP, SNA, and so on).
<b>Workload Manager</b>	The Workload Manager.
<b>REXX API</b>	The REXX API.
<b>CICS Client Service</b>	The CICS Universal Client Windows NT service.
<b>Java Gateway</b>	The CICS Transaction Gateway. If you only have a CICS Universal Client, you will not see this setting.

You can also specify trace components by using the `/m` parameter on the CICSCLI command (except the Java Gateway component). Any component tracing specified using CICSCLI overrides that specified with the configuration tool. If component tracing is not specified either by the CICSCLI command or the configuration tool, a default set of components is traced, namely: **Protocol drivers**, **Client daemon**, and **Client API level 1**. If you select any of the check boxes, this overrides the default set of components.

For the API component, you can specify the level of information to trace. The **Client API level 1** check box specifies that basic API-related information is traced, for example, before and after ECI, EPI, and ESI calls. The **Client API level 2** check box specifies that additional API trace entries are produced in addition to those of level 1.

Note that the CICSCLI `/d=nnn` command is used to set the maximum size of the data areas to be traced. The trace data may be truncated if you set `nnn` lower than the size of data expected.

### Java gateway trace file

Enter the pathname of a trace file to which trace messages will be written, if tracing is enabled. If no path is specified, the trace is written to the ctg.trc file in the bin subdirectory where CICS Transaction Gateway is installed.

You can also specify a trace file using the -file option on the ctgstart command.

The trace file is not appended to each time the CICS Transaction Gateway starts, the file is overwritten.

### Client trace file

Enter the pathname of a trace file to which trace messages will be written, if tracing is enabled.

You do not have to enter an extension for the filename, as a file of type .BIN is always generated (or .WRP if the trace file wraps).

If no path is specified, the trace is written to the ciccli.bin file. This is in the Client \BIN subdirectory.

You can convert the binary trace file to an ASCII file using the CICSFTRC command.

### Maximum Client wrap size

Enter a value in the range 0 through 999 kilobytes. The default is 0.

This value specifies how large the trace file will grow on disk before wrapping. If the default value of 0 is specified, wrapping of trace is disabled.

---

## The configuration conversion tool

You use the configuration conversion tool (CTGCONV) to convert the configuration files of previous versions of CICS Transaction Gateway, IBM CICS Universal Clients, and CICS Gateway for Java to the new format of the CICS Transaction Gateway Version 3.1 configuration file.

The conversion tool converts the following:

<b>Gateway.properties</b>	Properties file of CICS Transaction Gateway Version 3.0 and CICS Gateway for Java.
<b>CICSCLI.INI</b>	Client initialization file of CICS Clients Version 2 and Version 3.0.

## Configuring CICS Transaction Gateway

**CICSX.INI** Workload Manager configuration file of CICS Universal Clients for Windows Version 3.0.

The conversion tool produces one output file called `ctg.ini` by default. Samples from this file are shown in “Editing the configuration file” on page 65.

The old files are renamed with the `.BAK` extension, but a banner is inserted into them stating that they are obsolete.

### Using the conversion tool

The parameters of `CTGCONV` are:

```
CTGCONV /c=file [/g=file] [/l=file] [/o=file]
```

for each parameter, *file* can be:

- a filename with extension, in which case the Client \BIN directory is assumed. The extension must be `.INI`, except for the CICS Transaction Gateway input file, which has the `.properties` extension.
- a full pathname.
- a directory name (without \ at the end), in which case the default filename is assumed.

**/c=*file***

Specifies the client initialization file to be converted. This parameter is mandatory.

If *file* specifies a directory, a filename of `CICSCLI.INI` is assumed.

If the parameter is not specified, the `CICSCLI` environment variable is used to locate the client initialization file. If `CICSCLI` is not set, the file `Client \BIN\CICSCLI.INI` is assumed.

**/g=*file***

Specifies the `Gateway.properties` file to be converted.

If you do not specify the `/g` parameter, no Gateway section is created in `ctg.ini`.

**/l=*file***

Specifies the Workload Manager configuration file to be converted.

If *file* specifies a directory, a filename of `CICSX.INI` is assumed.

If the parameter is not specified, the `CICSX_CONFIG_URL` environment variable is used to locate the Workload Manager configuration file. If `CICSX_CONFIG_URL` is not set, the default name in the Client \BIN directory is assumed.



If no Workload Manager configuration file exists, no Workload Manager section is created in `ctg.ini`.

`/o=file`

Specifies the pathname of the converted file. The default is `Client\BIN\ctg.ini`.

To get help on using `CTGCONV`, enter: `CTGCONV /?`

During conversion, the input files are renamed so that the last three characters of the file extension become `.BAK`. Any file with that name is overwritten, and any output file that exists before the conversion is renamed in the same way.

Redundant parameters are removed from the old configuration files, and other parameters are given new names in the converted file.

---

### Editing the configuration file

Although it is recommended that you use the configuration tool you can perform the configuration by editing the configuration file.

The configuration file is used for both CICS Universal Clients and CICS Transaction Gateway, and contains the following sections:

1. GATEWAY (CICS Transaction Gateway only)
2. CLIENT
3. SERVER
4. DRIVER
5. LOADMANAGER (CICS Universal Client for Windows NT only)

These sections have the format:

```
SECTION sectionname [=value]
    property1=value
    property2=value
    ...
    propertyN=value
ENDSECTION
```

You must restart both the CICS Universal Client and the CICS Transaction Gateway to pick up any changes to the configuration file.

The following sections give examples of the properties in each section. For information on the properties, refer to the descriptions of the corresponding settings in the configuration tool.

# Configuring CICS Transaction Gateway

## GATEWAY section

```
SECTION GATEWAY
# -----
# Properties file for the CICS Transaction Gateway
# -----

    initconnect=1 # Initial number of ConnectionManager threads
    maxconnect=100 # Maximum number of ConnectionManager threads
    initworker=1 # Initial number of Worker threads
    maxworker=100 # Maximum number of Worker threads
    trace=on # Enable extra tracing messages
    notime=on # Disable timing information in messages
    noinput=on # Disable the reading of input from the console
    nonames=on # Do not display TCP/IP hostnames

# -----
# Entries to define the protocols which this CICS Transaction Gateway daemon will
# accept.
#
# Entries for a particular protocol begin with protocol@<protocol-name>.
# followed by which property is being set. The following properties MUST be set
# for each protocol handler to be used :
#
# (1) protocol@<protocol-name>.handler = ....
#     The name of the class which provides the handler for this protocol
#
# (2) protocol@<protocol-name>.parameters = ....
#     The parameters passed to the protocol handler. The possible parameters
#     vary upon the protocol handler.
#

    protocol@tcp.handler=com.ibm.ctg.server.TCPHandler
    Protocol@tcp.parameters=port=2006;sotimeout=1000;
    connecttimeout=2000;idletimeout=600000;pingfrequency=60000

    protocol@http.handler=com.ibm.ctg.server.HttpHandler
    Protocol@http.parameters=port=8080;sotimeout=1000;connecttimeout=2000;
    idletimeout=120000;requiresecurity

    protocol@ssl.handler=com.ibm.ctg.server.SslHandler
    Protocol@ssl.parameters=port=8050;sotimeout=1000;connecttimeout=2000;
    Idletimeout=600000;pingfrequency=60000;keyring=ServerKeyRing;keyringpw=default;
    clientauth=off;

    Protocol@https.handler=com.ibm.ctg.server.HttpsHandler
    Protocol@https.parameters=port=443;sotimeout=1000;
    connecttimeout=2000;Idletimeout=120000;keyring=ServerKeyRing;keyringpw=default;
    clientauth=off;

# -----
# Advanced settings.

    ecigenericreplies=off
```

```
workertimeout=10000
closetimeout=10000
```

```
ENDSECTION
```

## CLIENT section

```
SECTION CLIENT = *
#-----
# Client section - This section defines the local CICS client. There
# should only be one Client section.

        MaxServers = 1           # Only allow one server connection
        MaxRequests = 90        # Limit the maximum server interaction
        MaxBufferSize = 32     # Allow for a 32K maximum COMMAREA
#       CCSID=850
#       CPName = ABCD1234.EFGH5678 # The TCP62 client's fully qualified CP name
#       DomainNameSuffix = cicstcp.ibm.com # Domain name suffix for TCP62 server
```

```
ENDSECTION
```

## SERVER section

```
SECTION SERVER = cicssnal
#-----
# Server section - This section defines a server to which the client may
# connect. There may be several Server sections.

        Description = A SNA Server # Arbitrary description for the server
        Protocol = SNA             # Matches with a Driver section below
        NetName = ABCDEFGH        # The server's Alias Name
        LUAliasNames = Y
        LocalLUName = WXYZ9999    # The client's local LU name
        ModeName = LU62PS        # The SNA communications mode name
```

```
ENDSECTION
```

## DRIVER section

```
SECTION DRIVER = SNA ; TCPIP, NETBIOS, SNA, TCP62
#-----
# Driver section - This section defines a communications protocol DLL
# used to communicate with a server. There may be
# several Driver sections.

        DriverName = CCLWNTSN     #CCLWNTNB, CCLWNTSN, etc.
```

```
ENDSECTION
```

**Note:** The DRIVER section does not correspond to any settings in the configuration tool. The configuration tool selects the correct protocol drivers automatically.

## Configuring CICS Transaction Gateway

### LOADMANAGER section

```
SECTION LOADMANAGER
  Type=1
  Timeout=100
  BIAS=EC01;REGION1;20;CICSTCP5;20
  NOBALANCE=EC01
ENDSECTION
```

---

### Configuring the client keyboard mapping

The keyboard mapping for terminal emulator operation is defined in a file called CICSKEY.INI by default. A sample mapping file is supplied, but it is recommended that you create your own customized mapping file.

You can identify which keyboard mapping file is used with the environment variable CICSKEY, or with the -f parameter of the CICSTERM command.

For information on configuring the keyboard mapping file, refer to the *CICS Universal Client for Windows Administration* book.

---

### Configuring the client screen colors and attributes

A color mapping file is used to provide alternative representations in hardware environments where it is not possible to exactly replicate 3270 screen attributes, for example, blinking or underscore. The color mapping file therefore defines how 3270 screen attributes are emulated on the client hardware.

The screen colors and attributes are defined in a file called CICSCOL.INI by default. A sample mapping file is supplied, but it is recommended that you create your own customized mapping file.

You can identify which color mapping file is used with the environment variable CICSCOL, or with the -c parameter of the CICSTERM command.

For information on configuring the color mapping file, refer to the *CICS Universal Client for Windows Administration* book.

---

### Preparing to use local CICS Transaction Gateway support

Before you can run an application that uses the **local** CICS Transaction Gateway support, you must ensure that your environment is correctly configured. The following requirements must be met:

1. **A correctly configured Java environment**

## Configuring CICS Transaction Gateway

A Java application that makes use of the **local** CICS Transaction Gateway support can be considered a normal Java program and so is executed with the standard JDK java executable. Therefore your environment must be correctly set so that the Java binaries, libraries, and classes can be found. You should refer to the JDK documentation for the correct environment settings.

### 2. **Correct settings to allow the CICS Transaction Gateway binaries to be found**

The CICS Transaction Gateway .class files need to be available. You should set your CLASSPATH environment variable to include the CICS Transaction Gateway's ctgserver.jar and ctgclient.jar archives. Also, the relevant binaries must be available.

You should set your PATH environment variable to include the CICS Transaction Gateway's bin subdirectory so that CTGJNI.DLL can be found by your application.

**To run the application:** enter the JDK java command.



---

## Chapter 5. Security

This chapter describes how to set up CICS Transaction Gateway to use the network security protocols SSL and HTTPS.

Some other security functions relevant to CICS Transaction Gateway for Windows NT are also discussed.

- “Overview” provides an overview of network security concepts and terminology. It introduces the concepts of encryption keys, digital certificates, and KeyRings.
- “SSL and authentication” on page 75 describes the SSL protocol and the types of authentication it provides.
- “The ctgikey tool” on page 77 introduces iKeyMan, the tool provided by CICS Transaction Gateway for managing your digital certificates.
- “Using externally-signed certificates (SSLight)” on page 78 describes how to obtain externally-signed digital certificates and store them in KeyRing files for use by the CICS Transaction Gateway.
- “Using self-signed certificates (SSLight)” on page 83 describes how to generate self-signed digital certificates for use by the CICS Transaction Gateway
- “Configuring CICS Transaction Gateway for SSL and HTTPS” on page 87 describes how to configure CICS Transaction Gateway to use the secure protocols.
- “Network Provider Interface (NPI)” on page 89 discusses a function that allows signing on to a CICS server with the same user ID and password used to log onto Windows NT.

The implementation of SSL provided by CICS Transaction Gateway is written in pure Java, and is referred to as **SSLight**. Another implementation, **System SSL** applies only to the CICS Transaction Gateway on OS/390 and can only be used for SSL servers on that platform.

---

### Overview

The CICS Transaction Gateway provides comprehensive support for secure communication, which is critical to successful Internet operation. The secure network protocols allow your client applets and applications to communicate securely with your CICS Transaction Gateway using SSL. The SSL and HTTPS

## Overview of security concepts

protocols were introduced in “Chapter 1. Overview” on page 1; this chapter provides more detail about setting up your CICS Transaction Gateway to use these protocols.

The following are the characteristics of secure communication:

- **Confidentiality**

Confidentiality means that the contents of messages remain private as they pass over the Internet, or your intranet. Confidentiality is ensured through encryption of messages.

- **Integrity**

Integrity means that messages are not altered while being transmitted. Any router along the way can insert or delete text or garble the message as it passes by. Without integrity, you have no guarantee that the message you sent matches the message received. Integrity is ensured by encryption and digital signature.

- **Accountability**

Accountability means that both the sender and the receiver agree that the exchange took place. Without accountability, the receiver can say the message never arrived. Accountability is ensured by digital signature, so that if something goes wrong, you can identify who is accountable.

- **Authenticity**

Authenticity means that you know who you are talking to and that you can trust that person. Authenticity requires verifying identity, so that you can make sure that others are who they say they are. Authentication is achieved by using digital signatures and digital certificates.

### What is encryption?

Encryption ensures confidentiality in transmissions sent over the Internet. In its simplest form, encryption is the scrambling of a message so that it cannot be read until it is unscrambled later by the receiver. The sender uses an algorithmic pattern, or *key*, to encrypt the message, and the receiver uses a decryption key to unscramble the message.

There are two kinds of keys that can be used for encryption (as well as for digital signature and authentication):

1. Symmetric
2. Asymmetric

With *symmetric keys*, the sender and receiver share some kind of pattern, which is used by the sender to encrypt the message, and by the receiver to decrypt the message. The risk involved with symmetric keys is that you have to find a safe transportation method to use when sharing your secret key with the people with which you want to communicate.



With *asymmetric keys*, you create a key pair. This key pair consists of a *public key* and a *private key*. Unlike symmetric keys, these are different from each other, and the private key holds more of the secret encryption pattern than the public key.

A sender can broadcast its public key to whomever it wants to communicate with securely. It retains the private key and protects it with a password. Only the sender can decrypt a received message encrypted with its public key, because only it has the private key.

A protocol like SSL uses both asymmetric (also known as public key) cryptography and symmetric key cryptography. Public key cryptography is used for the TCP/IP handshake. During the handshake the master key is passed from the client to the server. The client and server make their own session keys using the master key. The session keys are then used to encrypt and decrypt data for the remainder of the session.

### Digital signatures and digital certificates

A *digital signature* is a unique mathematically computed signature that ensures accountability.

A *digital certificate* allows unique identification of an entity; it is essentially an electronic ID card, issued by a trusted third party.

A digital certificate serves two purposes: it establishes the owner's identity, and it makes the owner's public key available. A digital certificate is issued by a trusted authority, a certification authority (CA), for example VeriSign Inc, Thawte. It is issued only for a limited time, and when its expiration date has passed, it must be replaced.

A digital certificate is made up of:

- The public key of the person being certified.
- The name and address of the person being certified, also known as the *Distinguished Name (DN)*.
- The digital signature of the CA.
- The issue date.
- The expiration date.

The Distinguished Name is the name and address of a person or organization. You enter your Distinguished Name as part of requesting a certificate. The digitally-signed certificate includes not only your own Distinguished Name, but the Distinguished Name of the CA, which allows verification of the CA.

## Overview of security concepts

To communicate securely, the receiver in a transmission must trust the CA that issued the certificate that the sender is using. As a result, any time a sender signs a message, the receiver must have the corresponding CA's *signer certificate* and public key designated as a *trusted root key*. As an example, your Web browser will have a default list of signer certificates for trusted CAs. If you want to trust certificates from another CA, you must receive a certificate from that CA and designate it as a trusted root key.

If you send your digital certificate containing your public key to someone else, what keeps that person from misusing your digital certificate and posing as you? The answer is: your private key. A digital certificate alone is never proof of anyone's identity. The digital certificate only allows verification of the owner's identity by providing the public key needed to check the owner's digital signature. Therefore, the digital certificate owner must protect the private key that belongs with the public key in the digital certificate. Otherwise, if the private key were stolen, anyone could pose as the legitimate owner of the digital certificate.

### Obtaining a digital certificate

You can obtain a certificate in two ways:

1. Buy a certificate from a CA
2. Issue yourself a certificate, that is, act as your own CA.

#### Buying a certificate from a CA

If you plan to conduct commercial business on the Internet, you should buy a server certificate from a CA such as VeriSign Inc (the home page is at <https://www.verisign.com/>).

When you submit a certificate request to VeriSign, you are expected to prove who you are before they issue you a certificate. Although the approval process is necessary to protect you, your organization, and VeriSign, it may take longer than you would like. VeriSign will digitally sign your certificate request and return the unique certificate to you through e-mail.

Obtaining an externally-signed certificate is described in "Using externally-signed certificates (SSLight)" on page 78.

**Note:** VeriSign server certificates cannot be shared among servers on different machines.

#### Issuing certificates yourself

If you act as a CA, you can sign your own or anyone else's certificate request. This is a good choice if you only need the certificates within your own

organization, and not for external Internet commerce. In such a scenario you might want to allow access only to a carefully controlled group of key people within your intranet.

Your key people would have browsers such as Netscape Navigator, that can receive your self-signed CA certificate and designate it as a trusted root. They would then be able to trust your communications and share information safely.

Generating a self-signed certificate is described in “Using self-signed certificates (SSLight)” on page 83.

### KeyRings

So where are digital certificates and their associated keys kept? The answer is that public keys, private keys, certificates and trusted root keys are kept in a *KeyRing* file.

The CICS Transaction Gateway uses Java classes to hold certificate and key data on both the SSL server and SSL clients. The CICS Transaction Gateway daemon (which acts as an SSL server) uses a server KeyRing, for example, **ServerKeyRing.class**, while all SSL clients use a client KeyRing, for example, **ClientKeyRing.class**. The SSL and HTTPS protocols require access to these Java classes to establish secure connections. You establish this access when you configure the CICS Transaction Gateway, see “Configuring CICS Transaction Gateway for SSL and HTTPS” on page 87.

Subsequent sections in this chapter tell you how to:

- Create your KeyRing files.
- Obtain your digital certificates
- Receive the digital certificates into the KeyRing files.

---

### SSL and authentication

SSL allows the client to authenticate the identity of the server, which is called *server authentication*.

SSL Version 3 also allows the server to authenticate a client, which is called *client authentication*. This is used if the server needs to ensure who a client is before responding. If SSL client authentication is set up, the server requests the client’s certificate whenever the client makes an SSL connection. The server validates the DN information in the client request with the DN information in the client’s certificate before serving the document.

## Overview of security concepts

SSL uses a security handshake to initiate the TCP/IP connection between the client and the server. During the handshake, the client and server agree on the security keys that they will use for the session and the algorithms they will use for encryption. The client authenticates the server. In addition, if the client requests a document protected by SSL client authentication, the server requests the client's certificate. After the handshakes, SSL is used to encrypt and decrypt all of the information in both the client request and the server response, including:

- The URL the client is requesting
- The contents of any form being submitted
- Access authorization information like user names and passwords
- All data sent between the client and the server

SSL handshaking is illustrated in Figure 5.

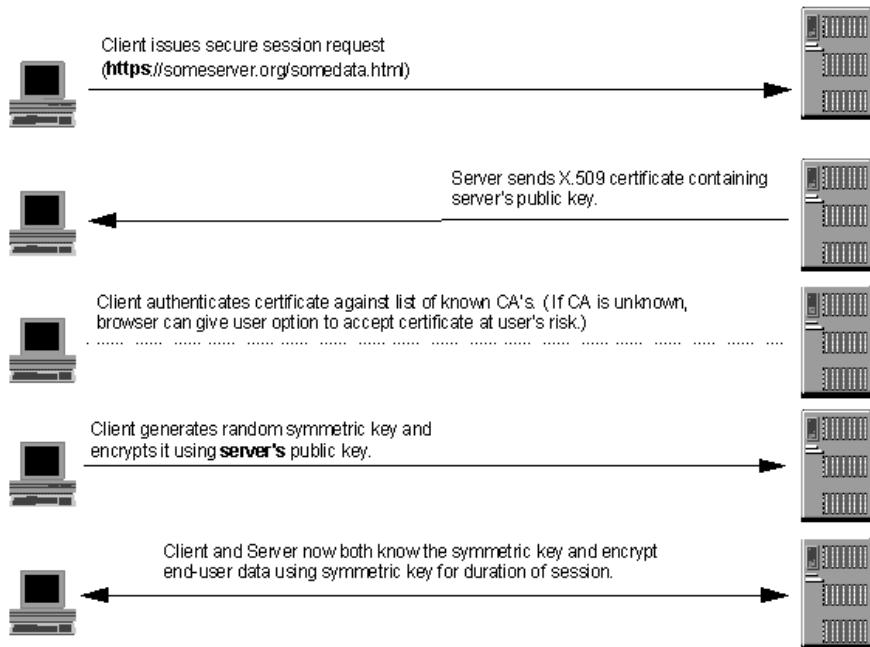


Figure 5. SSL handshake with server authentication

---

## HTTPS

HTTPS is a unique protocol that combines SSL and HTTP. You need to specify `https://` as an anchor in HTML documents that link to SSL-protected documents. A client user can also open a URL by specifying `https://` to request an SSL-protected document.

Because HTTPS (HTTP + SSL) and HTTP are different protocols and usually use different ports (443 and 8080, respectively), you can run both SSL and non-SSL requests at the same time. As a result, you can choose to provide information to all users using no security, and specific information only to browsers who make secure requests. This is how a retail company on the Internet can allow users to look through the merchandise without security, but then fill out order forms and send their credit card numbers using security.

A browser that does not have support for HTTP over SSL will naturally not be able to request URLs using HTTPS. The non-SSL browsers will not allow submission of forms that need to be submitted securely.

---

### The ctgikey tool

CICS Transaction Gateway provides a tool, **iKeyman** for maintaining your digital certificates. You use the **ctgikey** command to set up the correct environment (including the JAVA\_HOME environment variable ) and invoke iKeyman.

With iKeyMan, you can:

- Request and receive a digital certificate from a CA, see “Using externally-signed certificates (SSLight)” on page 78.
- Generate self-signed certificates, see “Using self-signed certificates (SSLight)” on page 83.
- Add certificates to your KeyRing files.
- Change your KeyRing password.
- Set a private key as the default.
- Delete keys.
- Export a key by copying it to a file.
- Import a key from an exported copy and add it to a KeyRing.

### Distributing iKeyman to client workstations

Although the majority of KeyRing management will be performed on the CICS Transaction Gateway machine, it may be necessary to supply the iKeyman tool to clients connecting to your SSL server. The client machines must have the minimum level of CICS Transaction Gateway Java support, which is JDK/JRE Version 1.1.8. They also require a script or command file to invoke the iKeyman Java startup class.

As an example, the following is the Windows NT command line for invoking iKeyman with the JDK:

## Overview of security concepts

```
java.exe -classpath  
"e:\jdk118\lib\classes.zip;e:\ikeyman\cfwk.zip;e:\ikeyman\gsk4cls.jar;e:\ikeyman  
\swingall.jar;" -Dkeyman.javaOnly=true com.ibm.gsk.ikeyman.Ikeyman
```

or, to invoke with the JRE:

```
jre.exe -classpath  
"e:\jdk118\lib\classes.zip;e:\ikeyman\cfwk.zip;e:\ikeyman\gsk4cls.jar;e:\ikeyman  
\swingall.jar;" -Dkeyman.javaOnly=true com.ibm.gsk.ikeyman.Ikeyman
```

These examples assume that the client workstation has the following files in the ikeyman directory:

- cfwk.zip
- cfwk.sec
- gsk4cls.jar
- swingall.jar
- ikminit.properties

All of this files can be found in the bin subdirectory where CICS Transaction Gateway is installed.

**Note:** You must ensure that cfwk.zip is the first IBM-supplied archive to appear in your CLASSPATH setting.

---

## Using externally-signed certificates (SSLight)

The CICS Transaction Gateway can function as an SSL server, with the ability to authenticate SSL clients and accept externally-signed certificates from Certificate Authorities such as VeriSign Inc.

This section describes how to configure both an SSL server and SSL clients using the certificate management interface, iKeyMan. This is written in pure Java, so it can be distributed to a number of client/server workstations that have a suitable JVM installed.

Configuring your SSL server and clients involves: creating the KeyRing classes, obtaining the digital certificates, and receiving them into the KeyRing classes.

A **server KeyRing class** contains a Server Certificate and the corresponding private key, along with a number of signer certificates. The Server Certificate is a digital certificate that is used to identify the SSL server to connecting clients.

A **client KeyRing class** contains as a minimum, the signer certificate of the SSL server, along with a client x.509 certificate, if client authentication is required.

### Configuring your SSL server

This section describes how to obtain a Trial (Test) Server Certificate from the VeriSign Web site ([www.verisign.com](http://www.verisign.com)). VeriSign allow the use of a trial Server Certificate for the period of 14 days. As this is a demonstration Server Certificate, it is not signed by the trusted VeriSign Certificate Authority, but a VeriSign Test CA.

All SSL clients will need the VeriSign Test signer certificate root key installed in their client KeyRing(s), or in the case of HTTPS connections, the repository in the browser.

The examples in this book assume you are using Netscape Communicator Version 4.5.

Obtaining a full VeriSign Server Certificate follows the same procedures as described here for the trial version.

### Creating the server KeyRing

The first step is to create a server KeyRing class, which will eventually contain your signer certificates along with your Server Certificate (and its associated private-key). This repository is password-protected and you are given an indication of the password “strength” when the .class is created with iKeyMan. It is recommended that a sequence of alphanumeric characters is used; this makes the password more robust to “brute force dictionary” attacks.

To obtain the certificate:

1. Start `ctgikey`.
2. Select **Key Database File**.
3. From **Key Database Type**, select **SSLight key database class**.
4. Enter `ServerKeyRing.class` as the **File name**
5. In **Location**, enter a suitable location to store your `ServerKeyRing.class`.
6. Select **OK**.

The generated `ServerKeyRing.class` contains, by default, a number of the popular signer certificates including the VeriSign root signer certificate along with its Test signer certificate. It also contains VeriSign Class 1 through 4 Public Certification Authority signer certificates, which enables the Server to verify clients with VeriSign Client Certificates. This is explained in more detail in “Configuring SSL clients” on page 81.

## Using externally-signed certificates

### Preparing a certificate request

Before you can obtain a Server Certificate from [www.verisign.com](http://www.verisign.com), the SSL server must make a Certificate Request and store it locally:

1. From iKeyMan, select **Create**.
2. Select **Create New Certificate Request**.
3. You must fill out the certificate request. Some fields are optional, but you must fill in at least the following (examples are shown):

<b>Key Label</b>	verisignServerCert
<b>Key Size</b>	1024
<b>Common Name</b>	servermachine.hursley.ibm.com
<b>Organization</b>	IBM UK
<b>Country</b>	GB

4. Specify the name of a file in which store to store the certificate request and select **OK**. iKeyMan will then generate a public/private keypair, which may take some time depending on your processor speed.

### Obtaining the Server Certificate

The next stage is to connect to the VeriSign Web site and request a Trial Server Certificate. Point your browser at <http://www.verisign.com> and continue to the page at: <https://digitalid.verisign.com/server/trial/trialIntro.htm>. You are now ready to enroll for your Trial Server Certificate.

1. Select **Continue**.
2. Select **Continue** again, and you are presented with **Step 2 of 5 - Submit CSR**.
3. Paste the contents of your certificate request file into the text box provided. The contents of your certificate request should look similar to:

```
-----BEGIN NEW CERTIFICATE REQUEST-----
MIIB1jCCAT8CAQAwZUxIDAeBgNVBAMTF2Nocm1zdHAuaHVyc2xleS5pYm0u
Y29tMRswGQYDVQQLExJDbG11bnRzICsgR2F0ZXdheXMxDzANBgNVBAoTBk1C
TSBVSzETMBEGA1UEBxMKV01uY2hlc3R1c3RlcjEOMAwGA1UECBMFSGFudHMxETAP
BgNVBBETCFNPMjEgMkpOMQswCQYDVQGEwJHJqjCBnzANBgkqhkiG9w0BAQEF
AAOBjQAwYkCgYEAkAth9Ar6k6ijNZ3JxdPGH6yikiwYtUA0RZDLZBSpaSEx
4qNKN/CrdF1LgFYbZcN5NGCeC4sC478NhT+1tf5dnR3pNWBzEzmWn5mN01H
tqJ3oib0UmDui+tQc2J9z6iRBKjkcQwJp1Jp0sp5KKsev1ahAETL7LmqMIq
pJ1zKi0CAwEAAAMAOGCSqGSIb3DQEBAUAA4GBAHaMHpizPs8Q3bi3I6dh
4yw0UNhojt1S1+ffiph3hK981MHJuMztr0UMBL1/SZGNw850JRiWuDjGYUQW
inJ0uNH34IUsnygBmt78+W1XT5nJuayg+UrAc5Ao2H8QZpRE5Sfaoc81QcvY
p1TggCdMxpYN7I33LrZD13Po0TT8gjxQ
-----END NEW CERTIFICATE REQUEST-----
```

4. Select **Continue**.



5. The next page allows you to verify the contents of your certificate request. You must also provide the personal details requested. If a full VeriSign Server ID (rather than a trial version) were being requested these details would be used to authenticate your application.
6. When you have entered your details, and have read the VeriSign agreement, select **Accept**.
7. The next stage (**4 of 5**) is to install the Test signer certificate root on any browser that you will be using to connect to the SSL server. In the case of SSL connections from Java applets to the CICS Transaction Gateway this is not necessary, as the client applet requires a client KeyRing class, which by default will contain the Test signer certificate. However, the HTTPS protocol uses the repository in the browser, hence your need to install the Test signer certificate. Note that you do not need to install the Test signer certificate if you apply for a full VeriSign Server Certificate.

The VeriSign Trial Server Certificate will be e-mailed to the address specified in your personal details. This can typically take between one and three hours.

### Receiving the Server Certificate into the server KeyRing

When you have obtained the Server Certificate, you must “receive” it into the server KeyRing using iKeyMan.

1. First copy and paste the Server Certificate data into a blank text file, using a text editor, and save the file as verisignServerID.arm.
2. From iKeyMan, select **Personal Certificates** from the pull-down menu, this is located below the **Key database content** label.
3. Select **Receive...**
4. Locate the text file containing your Server Certificate data; this will be in Base64-encoded ASCII.
5. Select **OK**.
6. Select **Key Database File** then **Exit**.

The **ServerKeyRing.class** is now ready for use with the CICS Transaction Gateway. It contains the default signer certificates along with your VeriSign Server Certificate and its corresponding private key.

### Configuring SSL clients

In normal (default) operation the CICS Transaction Gateway uses only server authentication when performing an SSL handshake. and the client need only accept the presented Server Certificate. For server authentication to work, the client KeyRing class, or in the case of HTTPS, the browser certificate repository, must contain the signer certificate of the Server Certificate. In our example, the signer certificate is the VeriSign Test signer certificate.

## Using externally-signed certificates

As with the server KeyRing class, when you use iKeyMan to generate a client KeyRing class it will contain a default selection of the most popular signer certificates.

In addition to server authentication, the CICS Transaction Gateway also supports client authentication. With this option enabled, any connection attempted to either the ssl: or https: handler requires the client to present its own Client Certificate (also known as a Digital ID).

The following sections describes how to obtain a VeriSign Digital ID and generate the necessary client KeyRing class.

### Obtaining the Client Certificate

In contrast to obtaining Server Certificates, it is not necessary to use iKeyMan to generate any form of certificate request. VeriSign provide a method of obtaining a Class 1 Digital ID using either Netscape or Internet Explorer browsers.

Once the Client Certificate has been obtained and installed in the browser repository, it is possible to export the certificate data, together with its associated private key, into a secure vault known as a #PKCS12 file. This file is password protected and can be imported into a client KeyRing class using the iKeyMan tool.

1. Using Netscape Communicator Version 4.5, point your browser to [www.verisign.com](http://www.verisign.com) and follow links for **Individual Certificates**.
2. Once you have reached the HTML page at <https://digitalid.verisign.com/client/class1Netscape.htm>, fill in the details as requested. The details will be used by VeriSign to authenticate the client application.
3. Select **Accept**.
4. Netscape will now generate a private key - it will request a password to protect this private key.
5. VeriSign will e-mail information for downloading and installing the Class 1 Digital ID to the address you submitted in your application.

During the installation process, Netscape Communicator allows you to store the Client Certificate in a password protected file (#PKCS12 format). The iKeyMan tool supports #PKCS12 format files and allows you to import certificates (along with their private key) into a client KeyRing class.

### Creating the client KeyRing

To create a client KeyRing class:

1. Start ctgikey.

2. Select **Key Database File**.
3. From **Key Database Type** select **SSLight key database class**.
4. Enter `ClientKeyRing.class` as the **File name**.
5. In **Location**, enter a suitable location to store your `ClientKeyRing.class`.
6. Select **OK**.

A `ClientKeyRing.class` has now been created containing the default signer certificates, which are as follows:

```
VeriSign Class 1 Public Primary Certification Authority
VeriSign Class 2 Public Primary Certification Authority
VeriSign Class 3 Public Primary Certification Authority
VeriSign Class 4 Public Primary Certification Authority
RSA Secure Server Certification Authority
Thawte Personal Basic CA
VeriSign Test CA Root Certificate
Thawte Personal Premium CA
Thawte Premium Server CA
Thawte Personal Freemail CA
Thawte Server CA
```

### Importing the Client Certificate into the client KeyRing

To import the #PKCS12 vault file containing the Client Certificate:

1. Select **Personal Certificates** from the pulldown selector below the **Key database content** label.
2. Select **Import...**
3. Set **Key file type** to PKCS12 file.
4. Locate the stored #PKCS12 file.
5. Select **OK**.
6. Select **Key Database File** then **Close**.
7. Select **Key Database File** then **Exit**.

The `ClientKeyRing.class` is now ready for use with the CICS Transaction Gateway. It contains the default signer certificate along with your VeriSign Client Certificate (Class 1 Digital ID) and its corresponding private-key.

---

## Using self-signed certificates (SSLight)

The CICS Transaction Gateway provides a mechanism for you to “self-sign” your certificates. You establish yourself as your own Certification Authority and generate the X.509 digital certificates for the server (CICS Transaction Gateway) and client (browser) side.

This section describes how to configure both an SSL server and SSL clients using the certificate management interface, iKeyMan.

## Using self-signed certificates

### Configuring the SSL server

Configuring your SSL server involves: creating the server KeyRing class, generating the self-signed certificate, and receiving it into the KeyRing class.

#### Creating the server KeyRing

The first step is to create a server KeyRing class file to hold the Server Certificate and key information.

1. Start ctgikey.
2. Select **Key Database File - New**.
3. From **Key Database Type**, select **SSLight key database class**.
4. Enter ServerKeyRing.class as the **File name**.
5. In **Location**, enter a suitable location to store your ServerKeyRing.class.
6. Select **OK**.

#### Generating the Server Certificate

Now you are ready to create the self-signed Server Certificate and store it along with its private key in your server KeyRing class:

1. From iKeyMan, select **Personal Certificates** from the pull-down menu, this is located below the **Key database content** label.
2. Select **New Self-Signed...**
3. You must fill out the certificate details. Some fields are optional, but you must fill in at least the following (examples are shown):

<b>Key Label</b>	exampleServerCert
<b>Version</b>	X509 V3
<b>Key Size</b>	1024
<b>Common Name</b>	clientmachine.hursley.ibm.com
<b>Organization</b>	IBM UK
<b>Country</b>	GB
<b>Validity Period</b>	365 (days)

4. Select **OK**. iKeyMan will then generate a public/private keypair, which may take some time depending on your processor speed.
5. When iKeyman has successfully created the self-signed Server Certificate, it will appear in the Personal Certificates window. The certificate will be named according to the **Key Label** specified during the generation process, in this example exampleServerCert.
6. With **exampleServerCert** highlighted, select **View/Edit**. Notice that the Certificate information in the **issued to** and **issued by** textboxes are the

same, hence the certificate requester (issued to) is the same as the signer (issued by). To establish SSL connections with a server presenting this certificate, the client must trust the signer of the `exampleServerCert`. To do this the client key repository must contain the signer certificate of the site presenting `exampleServerCert`.

### Exporting the Servers signer certificate

Now export the signer (public) certificate of the SSL server.

1. With `exampleServerCert` highlighted, select **Extract Certificate...**
2. Select the **Data type** of the exported certificate, this is typically Base64-encoded ASCII data.
3. Enter the name/location of the exported certificate, our example uses `exampleServercert.arm`.
4. Select **OK**.

The exported certificate should be stored in a safe place, and imported into any client key repository that needs to handshake with this particular SSL Server Certificate.

### Configuring the SSL clients

If the SSL handler used by the CICS Transaction Gateway is configured to support only server authentication, you do not need to generate a self-signed Client Certificate. In this case the client `KeyRing` class need only contain the signer certificate of the Server, which is the certificate file exported in our example, `exampleServercert.arm`.

The following steps describe the process of creating a client `KeyRing` and importing the Server's signer certificate.

#### Creating the client `KeyRing`

1. Start `ctgikey`.
2. Select **Key Database File - New**.
3. From **Key Database Type**, select **SSLight key database class**.
4. Enter `ClientKeyRing.class` as the **File name**
5. In **Location**, enter a suitable location to store your `ClientKeyRing.class`.
6. Select **OK**.
7. Once the `ClientKeyRing.class` has been generated you should see the list of default Signers.

## Using self-signed certificates

### Importing the server's signer certificate

The next stage is to import the server's signer certificate:

1. Select **Add**.
2. Locate the stored Server Base64-encoded ASCII certificate file, in our example, `exampleServercert.arm`.
3. Give this signer certificate a unique label, for example, My Self-Signed Server Authority.
4. Select **OK**. This new signer certificate should be added to the list of default signers.

The generated `ClientKeyRing.class` can be used with the CICS Transaction Gateway's SSL protocol, which is configured to support server authentication. If the HTTPS protocol is used to establish a secure connection from the applet; the particular browser where the applet is running will need to import the `exampleServercert.arm` into its key/certificate repository.

Refer to your browser online help for importing Base64-encoded ASCII certificate files.

### Generating a Client Certificate

Client authentication requires the client `KeyRing` class to also contain a self-signed Certificate that is used to identify the connecting client.

Following the same steps as for generating a self-signed Server Certificate, create (or open an existing) client `KeyRing` class (`ClientKeyRing.class` in our example), then:

1. From `iKeyMan`, select **Personal Certificates** from the pull-down menu, this is located below the **Key database content** label.
2. Select **New Self-Signed...**
3. Fill out the certificate details.
4. Select **OK**. `iKeyMan` will then generate a public/private keypair, which may take some time depending on your processor speed.
5. Like the SSL server, the client needs to install its signer certificate in the SSL server's key/certificate repository. This allows the SSL server to verify the client's details. With `exampleClientCert` highlighted, select **Extract Certificate...**
6. Select the **Data type** of the exported certificate, this is typically Base64-encoded ASCII data.
7. Enter the name/location of the exported certificate, our example uses `exampleClientcert.arm`
8. Select **OK**.

The exported certificate should be stored in a safe place, and imported into any client key repository that needs to handshake with this particular SSL Client Certificate.

### Migrating old self-signed certificates

CICS Transaction Gateway Version 3.0 only allowed the use of self-signed certificates, and did not support externally signed certificates.

In CICS Transaction Gateway Version 3.1 you can use old self-signed certificates, because the KeyRing class files created with Version 3.0 can be imported into the iKeyman tool.

### Restricting access to the server KeyRing

The contents of the server KeyRing are password encrypted; however it is highly recommended that you:

- Ensure correct file permissions are in place
- Restrict access, where applicable, to the CICS Transaction Gateway machine.

It is not good practice to share certificates among servers. You do not want servers to share a private key, particularly if they are running on different machines. A private key should never be communicated to others.

---

## Configuring CICS Transaction Gateway for SSL and HTTPS

The CICS Transaction Gateway supports various protocols for communicating with its clients, including TCP, HTTP, SSL, and HTTPS. To use the SSL and HTTPS protocols, you must enable them using the configuration tool (see “Using the configuration tool” on page 38). The SSL and HTTPS protocols will then be started when the CICS Transaction Gateway is executed. You can specify that just one of the security protocols is used, or both. With these handlers specified, when the CICS Transaction Gateway is started, it listens for SSL requests on port 8050, and for HTTPS requests on port 443.

The settings that are specific to the SSL and HTTPS protocols are:

#### **KeyRing classname**

This setting specifies the name of the server KeyRing classfile. CLASSPATH must be set so that this class can be found.

#### **KeyRing password**

This setting specifies the password used to decrypt the encrypted server KeyRing.

## Using self-signed certificates

### Use client authentication

This setting specifies that client authentication is to be used. The default is that server authentication is used.

Using the configuration tool will create the necessary entries in the configuration file. Full examples of SSL and HTTPS protocol entries are contained in the sample configuration file CTGSAMP.INI.

The CICS Transaction Gateway provides two default KeyRing class files that can be used to establish SSL and HTTPS connections. The **ClientKeyRing** and **ServerKeyRing** are both encrypted using the password **default**, and are only recommended for use in testing environments. Therefore, to use the SSL and HTTPS protocols, we recommend that you generate your own KeyRings, as described in preceding sections.

### Specifying the client KeyRing

Which secure protocol is used will determine whether a client KeyRing is required. The HTTPS protocol is designed for secure communication from within a Java applet, where the browser (client) itself has the necessary functionality to establish a secure connection with the CICS Transaction Gateway (server). For this reason the HTTPS protocol only requires a server-side KeyRing to be specified, the client side is handled by the browser software.

The SSL protocol is designed at a much lower level in which the CICS Transaction Gateway has code to handle the server and the client in a secure fashion. The SSL protocol requires a KeyRing classfile for both the server *and* the client.

The client KeyRing is specified by setting a static field in the `SslJavaGateway.class`. This class forms part of the CICS Transaction Gateway client-side code.

The `SslJavaGateway.class` provides two methods: one for "getting" and one for "setting" the client KeyRing:

```
public static void setKeyRing(String strSetKeyRing, String strSetKeyRingPW)
public static String getKeyRing()
```

To set the client KeyRing class to be used by the SSL protocol, your client application or applet would make a static call to the following method:

```
SslJavaGateway.setKeyRing(CLASSname, PASSword);
```

where:



- CLASSname denotes the classname of the Java KeyRing class generated for the client
- PASSword is used to decipher the embedded X.509 certificate.

The SslJavaGateway.class also provides the “getter” method `getKeyRing()` to return the CLASSname of the currently specified client KeyRing.

Using the SSL/HTTPS protocols to establish a connection from a client application or applet to the CICS Transaction Gateway is no different from using the TCP or HTTP protocols. The client application or applet simply “flows” its request to the CICS Transaction Gateway using the relevant URL. For example, for SSL the application would use `ssl://transGatewayMachine:8050`, or for HTTPS it would use `https://transGatewayMachine:443`.

See the *CICS Transaction Gateway Programming* book and the CICS Transaction Gateway programming interface HTML pages for further information regarding the design and implementation of client-side programs.

---

### Network Provider Interface (NPI)

Network Provider Interface (NPI) allows you to sign on to a CICS server using the same user ID and password that you use to log onto Windows NT. The CICS server authenticates and authorizes using your domain information, which is stored encrypted in memory.

However, the security information will only be kept synchronized if you sign on to a CICS server that supports NPI, in which case the domain controller is used to authenticate the user ID.

When you install CICS Universal Client for Windows NT, the use of NPI is not enabled. You enable or disable the use of NPI for each CICS server with the **Use Windows credentials for security** configuration setting. To use Windows credentials for security you must also:

1. Change to the directory `\Program Files\Common Files\IBM\IBM Integrated Sign ON`
2. Enter `bthdinst -i CICSCLI`
3. Reboot.

When uninstalling you **must** uninstall in the following sequence:

1. Change to the directory `\Program Files\Common Files\IBM\IBM Integrated Sign ON`
2. Enter `bthdinst -u CICSCLI`
3. Reboot

## Using self-signed certificates

4. Uninstall in the usual way.

If NPI is enabled, but the user ID and password cannot be obtained when signing onto the CICS server, a popup is displayed to prompt for the information.

If you run CICS Transaction Gateway as a Windows NT service, NPI will only work if you assign a logon user account to the service, rather than use the system account.

### Restrictions

Windows NT allows the use of longer user IDs and passwords than those allowed by CICS servers. Therefore, if you wish to use NPI, you may need to use a shorter user ID and password to log onto Windows NT.

---

## Chapter 6. CICS Transaction Gateway operation

This chapter describes:

- “Starting the Gateway”.
- “Stopping the Gateway” on page 93.
- “Running CICS Transaction Gateway as a Windows NT service” on page 93.

---

### Starting the Gateway

You start the Gateway at the operating system command prompt of the computer on which you have installed it.

First, set your working directory to the CICS Transaction Gateway’s bin directory.

You can start the CICS Transaction Gateway in two ways:

- “Starting the Gateway with preset options”
- “Starting the Gateway with user-specified options”.

#### Starting the Gateway with preset options

To start the Gateway with predefined options: Type `ctgstart` at the command prompt and press Enter, or select the **CICS Transaction Gateway** icon. This command runs the Gateway with the JVM specified by the `ctgjava` command or that specified at install time.

When you start the Gateway in this way, the default configuration settings, or those you configured using the configuration tool, are used. (see “Using the configuration tool” on page 38).

A Gateway console session is started, and the following message is displayed:

```
CCL6500I: Starting the Gateway with default values.
```

This is followed by lines showing the values being used:

```
CCL6502I: [ Initial ConnectionManagers = 1, Maximum ConnectionManagers = 100,  
CCL6502I: Initial Workers = 1, Maximum Workers = 100, Port = 2345 ]
```

#### Starting the Gateway with user-specified options

The user definable options on the start command are:

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```
-port=port_number
-initconnect=number
-maxconnect=number
-initworker=number
-maxworker=number
-trace
-notime
-tfile=pathname
-noinput
-nonames
```

where:

**-port**

Specifies a TCP/IP port number for the tcp: protocol.

**-initconnect**

Specifies an initial number of ConnectionManager threads.

**-maxconnect**

Specifies a maximum number of ConnectionManager threads. If this value is set to -1, no limits are applied to the number of ConnectionManager threads.

**-initworker**

Specifies an initial number of Worker threads.

**-maxworker**

Specifies a maximum number of Worker threads. If this value is set to -1, no limits are applied to the number of ConnectionManager threads.

**-trace**

Enables extra tracing messages (see “Using trace” on page 124.)

**-notime**

Disables timing information in messages (times are shown to millisecond accuracy).

**-tfile=*pathname***

If tracing is enabled, writes the trace messages to the file specified in *pathname*. If no path is specified, the trace is written to the ctg.trc file in the bin subdirectory where CICS Transaction Gateway is installed.

**-noinput**

Disables the reading of input from the console.

**-nonames**

Disables display of TCP/IP hostnames.

**-x** Enables full debug tracing. This includes everything traced by the -trace option, plus additional information. This option will decrease performance significantly.

To override the startup defaults type `ctgstart` at the command prompt, followed by the start-up options you require, and press Enter. Options specified on the command line **override** those specified using the configuration tool.

The following startup message is displayed:

```
CCL6501I: Starting the CICS Transaction Gateway with user specified values.
```

This is followed by lines showing the values being used, for example:

```
CCL6502I: [ Initial ConnectionManagers = 10, Maximum ConnectionManagers = 100,
CCL6502I: Initial Workers = 10, Maximum Workers = 100, Port = 2345 ]
```

To get help on the startup options, enter:

```
ctgstart ?
```

---

## Stopping the Gateway

To stop the Gateway:

- If you have **not** started the Gateway with the `-noinput` parameter, you can stop the Gateway by typing the correct character and pressing the Enter key in the Gateway console session. The allowable characters may be localized for your country; the default characters allowed are the Q or - characters.

You can determine which characters will stop the Gateway by simply pressing the Enter key in the Gateway console session. A message like the following is displayed:

```
CCL6508I: Type Q or - to stop the CICS Transaction Gateway.
```

- If you **have** used the `-noinput` parameter, you must stop the Gateway process using some other method, for example:
  - Enter Ctrl-C in the Gateway console session
  - Use the NT Task Manager

**Note:** If you try to close the CICS Transaction Gateway console window by using either the 'X' close-window icon, or the **Close** menu item, a Full thread dump is produced. This is an effect common to all Java applications, including the CICS Transaction Gateway.

---

## Running CICS Transaction Gateway as a Windows NT service

When you install CICS Transaction Gateway, the daemon process is installed as a Windows NT service. Running CICS Transaction Gateway as a Windows NT service has several advantages:

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- You can have the CICS Transaction Gateway service started automatically at Windows NT startup, without having to log on to the computer.
- You can log off from Windows NT and keep CICS Transaction Gateway running, thereby avoiding restarting the CICS Transaction Gateway and its connection to CICS when you log on to Windows NT again.
- Relevant messages associated with running CICS Transaction Gateway as a service are recorded in the Application log and System log of the Windows NT Event Viewer when the service is started and stopped.

CICS Transaction Gateway is registered as a Windows NT service during installation. After installation, the Services dialog box in the Control Panel contains the **CICS Transaction Gateway** service.

There is also a utility, **ctgservice**, that allows you to remove and install the CICS Transaction Gateway service.

CICS Universal Client for Windows NT is also registered as a Windows NT service during installation, for more information, see “CICS Universal Client service” on page 96.

### Starting and stopping the service

To start the CICS Transaction Gateway service, select the service in the Services dialog box, and select **Start**. A message is displayed and the service is started.

To stop the CICS Transaction Gateway service, select the service in the Services dialog box, and select **Stop**. A message is displayed and the service is stopped.

### Startup parameters for the CICS Transaction Gateway service

You may choose to start the CICS Transaction Gateway service automatically at Windows NT startup.

To specify automatic startup, select **Startup** in the Services dialog box. The Service panel is then displayed:

**Note:** You must have Administrator authority to configure service startup.

Select the **Automatic** radio button, and make sure that the **System Account** radio button is selected.

The Service panel also allows you to specify a Manual startup for the service, and to disable the service.

For more information on services and their configuration, refer to the Windows NT documentation.

## CICS Transaction Gateway service and console messages

The CICS Transaction Gateway service reports only standard Windows service messages to the system application log.

Like other Windows NT services, when the CICS Transaction Gateway service is running, no console output is available. This means that CICS Transaction Gateway trace and debug messages will not be available as console output. However, you can overcome this problem by specifying the **ctgstart -tfile** parameter, which allows redirection of trace messages to a text file.

When installing the CICS Transaction Gateway service, you should ensure that the **-noinput** command line parameter is passed. By default, the Gateway checks Standard.in() for keyboard input (such as "Q" to stop the Gateway). The default setting will throw an exception in the Gateway code, as Standard.in() is not available when running as a service.

## The ctgservice utility

The ctgservice utility allows you to install and remove the CICS Transaction Gateway service, and pass startup parameters to the ctgstart command.

The ctgservice utility uses the JVM specified by the ctgjava command, see "Specifying which JVM to use" on page 38.

The syntax of ctgservice is as follows:

```
ctgservice [-i] [-r] [-c] [?]
           [-ACTGParam1 -ACTGParam2...]
```

where:

- i Installs the CICS Transaction Gateway service.
- r Removes the CICS Transaction Gateway service.
- c Runs the CICS Transaction Gateway as a console application, that is, the CICS Transaction Gateway will run in a console window as it does when started with the ctgstart command. If you do not specify this option, you will not see any console messages.
- ? Displays help information for ctgservice.
- A Specifies a parameter to be passed to the ctgstart command. All ctgstart command line parameters can be passed; each parameter must be prefixed with -A. Note that the -noinput parameter is always required when

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running the CICS Transaction Gateway as a service. This prevents the standard.in() being read in the Java code, and hence prevents an exception.

The following is a typical example of a ctgservice command:

```
ctgservice -i  
-A-noinput -A-x -A-tfile="e:\theGateway\myTrace.txt"
```

This example would install the CICS Transaction Gateway and specify the -noinput, -x and -tfile parameters for the ctgstart command (-A).

You can test the CICS Transaction Gateway and ctgstart parameters by running the service in "console" mode. The service must already be installed on the system. The command ctgservice -c will then run the CICS Transaction Gateway in the console window (identical in operation to running the normal ctgstart script), using the values it was installed with. These values are stored statically in the Windows NT registry.

**Note:** If you find that the message:

```
IBM CICS Transaction Gateway error: 0, Cannot create Java Virtual Machine
```

is displayed when you run ctgservice, this is probably because you have a JVM referenced in the PATH setting before the JVM required by the CICS Transaction Gateway. Make sure that your PATH setting includes \jdk1.1.8\bin; before any other JVM references.

## CICS Universal Client service

The CICS Transaction Gateway service requires that the CICS Universal Client service is installed and started, therefore:

- Starting the CICS Transaction Gateway service (via the Control Panel) results in the CICS Universal Client service starting.
- Stopping the CICS Universal Client service (via the Control Panel) results in the CICS Transaction Gateway service also stopping.

---

## Stopping the CICS Universal Client

If you wish to stop and restart your CICS Universal Client, you must first stop the CICS Transaction Gateway, otherwise you will experience unpredictable behavior of both the CICS Transaction Gateway and CICS Universal Client.

When the CICS Transaction Gateway has stopped, you may stop and restart the CICS Universal Client as necessary before restarting the CICS Transaction Gateway.



---

## Chapter 7. CICS Transaction Gateway Terminal Servlet

This chapter describes how to use the Terminal Servlet to access CICS 3270 applications using a Web browser.

- “What is the CICS Transaction Gateway Terminal Servlet?” tells you what a servlet is, and in particular what the CICS Transaction Gateway Terminal Servlet does.
- “Installing and configuring the Terminal Servlet” on page 99 discusses how you install and configure the Terminal Servlet.
- “Using the Terminal Servlet” on page 105 describes what you can do with the Terminal Servlet, and how to invoke it from your Web pages.
- “CICS Transaction Gateway Terminal Servlet samples” on page 111 describes how to use the samples supplied with the Terminal Servlet.
- “Properties and parameters reference” on page 112 provides a complete reference to the servlet properties you can specify for the Terminal Servlet.
- “Migrating from the CICS Internet Gateway” on page 117 describes what you need to do to migrate from using the CICS Internet Gateway to using the Terminal Servlet.
- “CICS Transaction Server for OS/390 Web Interface” on page 120 describes how HTML templates generated for use by the CICS Web Interface can be used by the Terminal Servlet.

It is advisable to read through all of this chapter before configuring and using the Terminal Servlet.

---

### What is the CICS Transaction Gateway Terminal Servlet?

Servlets are Java programs that run on a Web server machine, inside a Java-enabled Web server or servlet engine, for example, WebSphere Application Server (see Figure 6 on page 99). Java servlets have become popular as alternatives to Common Gateway Interface (CGI) programs—the Terminal Servlet is a replacement for the CICS Internet Gateway shipped with IBM CICS Clients Version 2, which was a CGI program.

A servlet can be loaded automatically when the Web server is started, or loaded when the first client request for the services of the servlet is made. Unlike CGI programs, servlets are persistent, that is, once they are loaded they stay running, waiting for additional client requests. This makes servlets faster than CGI programs, as no time is wasted in creating and destroying processes.

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Being Java programs, servlets are portable across operating systems. And, because the servlet interface is a standard, they can be used with different Web servers on different platforms.

The Terminal Servlet allows you to access CICS 3270 applications using a Web browser. You create Web pages that invoke the Terminal Servlet to start a CICS transaction, display screen information sent from a CICS server, and send screens back to CICS.

The Terminal Servlet can:

- **Behave like a simple terminal emulator.**

The CICS screen is displayed in the browser as part of an HTML form. When you press one of the buttons in the form, the form is submitted and data is sent to CICS.

- **Substitute data from a CICS screen into HTML template files.**

An HTML template file is used to determine how CICS data appears in the browser. The Terminal Servlet replaces variables in the HTML template file with CICS screen information, and the resulting output is sent to the browser. For more information, see “Using variable substitution” on page 108.

- **Using server-side includes, incorporate variable information in a Web page, or drive a terminal emulator without user interaction.**

Server-side includes are statements in an HTML file (.shtml) that are processed by the Web server before the Web page is returned to the browser. For example, you can use a server-side include to invoke the Terminal Servlet to display the value of fields in a CICS screen. For more information, see “Invoking the servlet with a server-side include” on page 107.

- **Map CICS screens to Web pages.**

Using the page mapping properties of the Terminal Servlet, you can associate particular Web pages with particular CICS screens. For example, you can specify the Web page to be displayed when the terminal is idle, and no transaction is running. For more information, see “Page mapping properties” on page 114.

Like EPI programming, the Terminal Servlet allows you to create new front ends to existing CICS transactions. However, it also allows you to exploit the power, flexibility, and platform-independence of Java programming.

**Note:** The Terminal Servlet does not support DBCS fields in 3270 data streams.

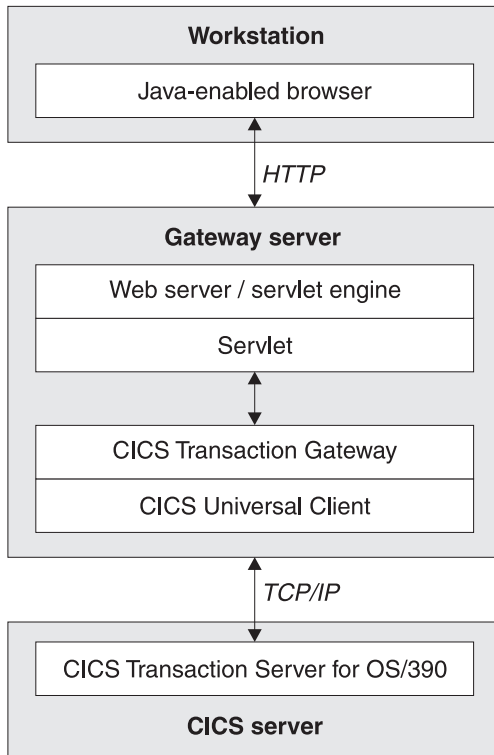


Figure 6. CICS Transaction Gateway using Terminal Servlet invoked by URL

---

## Installing and configuring the Terminal Servlet

This section discusses how to install the Terminal Servlet on the Web server machine, and set the initialization parameters of the Terminal Servlet.

The procedure for installing and configuring the Terminal Servlet will vary according to the Web server. However, you will need to do at least the following:

- Configure the Web server's CLASSPATH and PATH settings
- Add the Terminal Servlet to the Web server's configuration
- Configure the servlet initialization parameters
- Consider other configuration options, such as security, logging, and whether the Web server can process server-side includes.

An example of installing and configuring the Terminal Servlet on a particular Web server is given in any configuration document that may be available, see "Sample configuration documents" on page 129. The principles described in that document should apply to other Web servers also.

## CICS Transaction Gateway Terminal Servlet

Regardless of the Web server you use, you should refer to its documentation for guidance in installing and configuring servlets.

### Configuring the Web server's CLASSPATH and PATH settings

You must ensure that the two CICS Transaction Gateway jar files (**ctgclient.jar** and **ctgserver.jar**) are in the Web server's classpath. In the case of WebSphere Application Server, you do this in the Java Engine section of WebSphere's Administration tool.

If you do not make the correct classpath settings, you may get a message to the effect that you cannot update the servlet, and that the class **com.ibm.ctg.servlet.TerminalServlet** cannot be loaded.

You must also ensure that the CICS Transaction Gateway bin subdirectory is in the Web server's path.

### Adding the Terminal Servlet to the Web server's configuration

To add the Terminal Servlet to the Web server's configuration, you must provide a Servlet Name and associate this servlet instance with the Terminal Servlet class, which is **com.ibm.ctg.servlet.TerminalServlet**. In the case of WebSphere Application Server, you do this in the Servlet Configuration section of WebSphere's Administration tool.

You can configure more than one instance of the Terminal Servlet. Each of them would have a different Servlet Name, but would refer to the same Servlet Class. In fact, you must create a different Terminal Servlet instance for each CICS server that you want to connect to. Each instance of the Terminal Servlet may use different initialization parameters, and this can be useful when configuring for different CICS servers.

### Configuring the servlet initialization parameters

After adding the Terminal Servlet to the Web server's configuration, you must set up the initialization parameters for the Terminal Servlet. In the case of WebSphere Application Server, you do this in the Servlet Configuration section of WebSphere's Administration tool.

The following sections give some insight into how the Terminal Servlet works, which will help you in setting appropriate servlet initialization parameters.

The full set of initialization parameters are listed in "Properties and parameters reference" on page 112. However, to start with, you should consider setting some of the following parameters:

Table 3. Servlet initialization parameters

Parameter name	Notes
<b>servlet@propertyFile</b>	<p>The servlet can load configuration information from a properties file. A sample <code>servlet.properties</code> file is supplied, in the subdirectory <code>\samples\Java\com\ibm\ctg\servlet</code>.</p> <p>To use a properties file, set this parameter to the full path name of the properties file you want the Terminal Servlet to load. If you specify a properties file then you may want to use this file for all other servlet parameters. In this case, <b>servlet@propertyFile</b> is the only parameter that you need to set.</p>
<b>servlet@extendedLogging</b>	<p>The servlet writes logging information, for example, error messages, to the standard servlet log. Set this property to true to write more information to the log file. You may find this helpful when first configuring the servlet, but it should be turned off once the servlet is set up correctly.</p>
<b>pool@maxTerminals</b>	<p>Set this property to the maximum allowable number of connections to the CICS server. You should ensure that the CICS server has sufficient free tasks to handle this number of concurrent connections. You should also ensure that the CICS Client <b>Maximum requests</b> configuration setting is at least as large as this property.</p>
<b>pool@serverName</b>	<p>Each instance of the Terminal Servlet can connect to only one CICS server. This gives you more control of resource usage and security. Set this property to the name of the required CICS server, as defined by the appropriate <b>Server name</b> setting in your configuration. If this property is not set, the default CICS server is used.</p>
<b>pool@gatewayUrl</b>	<p>Set this property if you want the servlet to connect over the network to the CICS Transaction Gateway.</p>

Apart from the name of the property file, all the servlet properties can either be loaded from a properties file or set as servlet initialization parameters. Initialization parameters override properties file entries.

The servlet property names are not case sensitive.

### Terminal pooling

The Terminal Servlet uses a pool of terminals, and the servlet configuration properties allow you to control the behavior of the terminal pool. The default

## CICS Transaction Gateway Terminal Servlet

behavior is that a new terminal is connected to CICS whenever a user requires one, up to the **pool@maxTerminals** limit. When the user has finished with the terminal, it is disconnected.

If the **pool@minTerminals** property is set, this number of terminals is connected to CICS when the servlet starts, and up to that number may be connected to CICS but not in use at any time. This allows new users to be allocated a terminal immediately, without waiting for a connection.

Setting the **pool@reusingTerminals** property allows terminals to be reused, that is, when a user session ends, the terminal may be allocated to a new user instead of being disconnected. This property has no effect if **pool@minTerminals** is 0. Any transaction running on the terminal is ended and the screen is cleared, before it is reused. However, if a user has signed on to CICS (using CESN for example), the terminal will still be signed on when it is reused. For this reason, do not set this property unless you are sure it is suitable for your environment.

The **pool@idleTimeout** property allows terminals that have been allocated to a user to be released if they have not been used for the specified timeout period. This property defaults to 0, that is, no timeout.

Using a display request with the values: **pool@connectedTerminals**, **pool@freeTerminals**, and **pool@terminalsInUse**, you can query the number of terminals that are connected, free, or in use for a particular instance of the Terminal Servlet.

### Page mappings

Page mappings tell the Terminal Servlet what Web page to display for a particular CICS screen or terminal state.

The servlet's choice of which page to display is based on the current page mapping settings, the current screen handler class, and the state of the terminal.

The Terminal Servlet first looks at the page mapping properties to see if there is a specific page set for the current state of the session, as follows:

Session State	Page Mapping Property
an error has occurred	<b>page@error</b>
the terminal is idle - no transaction is running	<b>page@idle</b>
the terminal has been disconnected	<b>page@disconnected</b>

Session State	Page Mapping Property
there is a screen handler for the current screen	Page mapping for the class name of the screen handler

If no specific page is found, the page identified by the page mapping property **page@default** is used. If this is not set, an error message is displayed instead.

The value of a page mapping property can be set in two ways:

1. A URL, for example:  
`http://webserver/index.html`
2. A template file to be loaded for variable substitution. This must start with "file://", for example:  
`file://d:/pages/template.html`

If you set the **servlet@templateDir** property, template filenames can be specified relative to the template directory.

Example settings for page mapping properties are as follows:

```
page@error=http://server/errors.html
page@idle=http://server/idle.html
page@disconnected=/ctglab/html/servlet/epissam.html
page@default=file://epissam1.html
```

To set a page mapping for a particular screen, you must create a Screen Handler bean that can recognize that screen. Then, you must set the **pool@handlerPath** property to ensure that the Screen Handler bean is loaded by the Terminal Servlet. If, for example, you have created a Screen Handler bean called `MAP1ScreenHandler` in a package called `testmaps`, then the page mapping property for that screen handler is:

```
page@testmaps.MAP1ScreenHandler.
```

The name of the class is case sensitive. As for the standard page mappings, you set the property to the name of the Web page to display, for example:

```
page@testmaps.MAP1ScreenHandler=http://server/test.html
```

A page mapping can also be set in a request parameter to the Terminal Servlet, in which case it applies only to that request and overrides any page mappings associated with the instance of the servlet being used. You can query the current setting of a page mapping with an appropriate request (see "Displayable properties" on page 116).

### Screen Handler beans and terminal disconnection

For a terminal to be disconnected successfully, it must exit from running transactions. The Terminal Servlet's default behavior for achieving this is to

## CICS Transaction Gateway Terminal Servlet

send the AID (Attention identifier) PF3 key to CICS. However, if you will be running transactions for which this will not work, you should create one or more Screen Handler beans that know how to exit the relevant screens.

You can generate Screen Handler beans automatically from BMS maps using the BMS Map Conversion Utility (BMSMapConvert) supplied with the CICS Transaction Gateway, or you can write your own classes. For information about Screen handlers and how to create them, see the *CICS Transaction Gateway Programming* book.

To load screen handlers into the servlet, set the **pool@handlerPath** property. The handler path can include .jar files, .zip files and directories, although sub-directories will not be searched. For example, in the servlet properties file you might add:

```
pool@handlerPath=d:\handlers\handlers.jar;d:\handlers\test
```

to load screen handler classes from a .jar file and from a directory. See the sample properties file for more information on setting this property.

You can also specify a default screen handler (using the property **pool@defaultHandler**), which is used to exit from a screen if no other screen handler recognizes it. The sample default screen handler is **com.ibm.ctg.epi.DefaultScreenHandler**, which sends the AID PF3 to CICS. The source for this class can be found in the directory `samples\java\com\ibm\ctg\epi`. Any screen handler bean that can be loaded from the classpath or from the handler path can be used as the default screen handler.

The servlet will not keep trying to exit a running transaction indefinitely. The property **pool@exitRetryLimit** controls how many attempts it makes to exit the transaction. The default value of this property is 10, but you should ensure it is large enough for your environment. If the servlet finds there is still a transaction running on the terminal after this many attempts to exit, the terminal is assumed to be 'dead' and it will not be disconnected or allocated to a user. The only way to discard dead terminals is to unload the servlet, stop and restart the CICS Transaction Gateway, and load the servlet again.

If you have configured the servlet properly and provided Screen handler beans, you should not have any dead terminals.

### Considering other configuration options

Other configuration options that you should consider are:

- **Security**

You may need to control access to the Terminal Servlet.



- **Logging**

The Terminal Servlet writes log information to the standard servlet log. You can set logging on or off.

- **Session tracking**

You should configure the Terminal Servlet to use session tracking.

- **Server-side includes**

You may wish to configure your Web server to process server-side includes.

**Note:** IBM WebSphere Application Server, Version 1.01, does not fully support input or output of DBCS data by servlets, and other servlet engines may have the same restriction. In this situation, the Terminal Servlet displays DBCS characters as ??? (question marks).

### Loading the Terminal Servlet

After you have configured the Terminal Servlet and saved the settings, you must load it. You can choose whether to load it immediately, or each time your Web server starts up.

If you have not configured the Terminal Servlet properly, error messages are displayed when Web server attempts to load the Terminal Servlet. For more information refer to the Terminal Servlet section in the *CICS Transaction Gateway Messages* book.

---

## Using the Terminal Servlet

This section describes how to use the Terminal Servlet. It describes the different ways in which the Terminal Servlet can be invoked, and also how to develop the Web pages that use the Terminal Servlet.

### Connecting to CICS and starting a transaction

An instance of the Terminal Servlet can only connect to one CICS server. For each CICS server that you want to allow access to, you will have created an instance of the servlet. You might also have created instances of the servlet that have different initialization parameters.

To start a transaction on the CICS server, you must invoke the Terminal Servlet with a suitable request.

### Invoking the Terminal Servlet

There are three ways to invoke the Terminal Servlet:

- by URL
- with an HTML form

## Using the Terminal Servlet

- with a server-side include.

In each case, you need to know the name of the servlet instance that you want to use, and you pass the servlet one or more request parameters that tell it what action to take. The parameter names and values are the same in all cases, but the way you specify them is different.

To start a transaction on the CICS server, the parameters you must provide are:

Parameter Name	Parameter Value
request	send
transaction	the transaction ID of the transaction you want started. Note however that ATI transactions cannot be started for the Terminal Servlet.

The servlet will allocate a terminal to the user, if it is required.

The full set of request parameters are listed in “Request parameters” on page 115.

### Invoking the servlet by URL

To invoke a servlet instance called TerminalServlet, link to the URL:

`http://your_webserver/servlet/TerminalServlet`

where *your\_webserver* is the hostname of your Web server.

You can encode request parameters in the URL in the form of a query string, for example:

`http://your_webserver/servlet/TerminalServlet?request=send&transaction=CECI`

You should use this method of invoking the servlet when you do not need the user to enter any information.

### Invoking the servlet with an HTML form

With this method, you create an HTML form in a Web page. For example:

```
<FORM METHOD="GET" ACTION="/servlet/TerminalServlet">  
(Tags to place text entry areas, buttons, and other prompts go here)  
</FORM>
```

is a form that would invoke the servlet called TerminalServlet. The METHOD can be GET or POST. The various elements of the form have names and values, and these are sent to the servlet when the form is submitted. If you

know you want to set a particular request parameter, add it as a hidden item in the form, for example: `<input type="hidden" name="request" value="send">`. Hidden inputs are always sent to the servlet. In general, the name of a form element is the name of a request parameter, and its value is the value of the request parameter.

This is the only way to send user-entered information to the servlet.

The supplied sample, `epissam3.html`, illustrates the HTML form method, see “CICS Transaction Gateway Terminal Servlet samples” on page 111.

### Invoking the servlet with a server-side include

A server-side include is processed by the Web server before the Web page is sent to the user. The servlet is invoked, and any output it generates is included in the Web page in place of the server-side include tags. The user only sees the servlet output in the Web page.

In the HTML source, a server-side include of the servlet looks like this:

```
<SERVLET NAME="TerminalServlet" >
<PARAM NAME="request" VALUE="send">
<PARAM NAME="transaction" VALUE="CECI">
<PARAM NAME="display" VALUE="none">
</SERVLET>
```

A server-side include can be used to add variable information to a Web page, or to drive a terminal to perform some action whenever a Web page is displayed, without any user involvement.

You can add as many server-side includes to a Web page as you wish, but **note**:

- Server-side includes in one page may be processed in parallel. You can therefore not be sure in which order they are performed, although usually this is the order in which they occur in the source.
- The servlet stores session information that allows it to access the terminal allocated to a user. If the user session is invoked by a server-side include, subsequent server-side includes in the same page will not be able to access the session information. Once the page has been sent to the user, the session is established, and a page with multiple server-side includes will work correctly.

The supplied sample `epissam2.shtml`, illustrates the server-side include method, see “CICS Transaction Gateway Terminal Servlet samples” on page 111.

## Using the Terminal Servlet

### What happens next?

When the servlet has been invoked from a form or by linking to a URL, some output must be sent back to the browser. To decide what should be displayed to the user, the servlet uses the page mapping properties that you have set up, see “Page mappings” on page 102.

### Displaying screens and fields

There are two ways to include CICS screen information in a Web page:

- server-side includes
- *variable substitution*.

You can mix the two approaches if you want to.

#### Using server-side includes

Your Web server must be configured to process server-side includes. You create SHTML pages that contain server-side includes that invoke the servlet. The output from the servlet is inserted into the page in place of the server-side include.

For example, to display the screen (as part of an HTML form):

```
<SERVLET NAME="TerminalServlet" >  
<PARAM NAME="display" VALUE="screen">  
</SERVLET>
```

or to display the contents of the 22nd field on the screen:

```
<SERVLET NAME="TerminalServlet" >  
<PARAM NAME="display" VALUE="22">  
</SERVLET>
```

#### Using variable substitution

You create HTML template files that the servlet will load. The servlet replaces variables in the file with CICS screen information, and the resulting output is sent to the browser. You use page mapping properties to tell the servlet what template file to load (see “Page mappings” on page 102).

For example, a template file for the CESN signon screen might look like:

```
<html>  
<head>  
<title>CICS Signon</title>  
</head>  
<body>  
<h1>CICS Signon</h1>  
<form method="POST" action="/servlet/TermServlet">
```

```
<input type="hidden" name="request" value="send">
<pre>
  Userid: <input type="text" name="USERID" value="&USERID;" size="8" >
  Password: <input type="text" name="PASSWORD" value="&PASSWORD;" size="8" >
</pre>
<input type="submit" name="DFH_ENTER" value="Sign on">
<input type="submit" name="DFH_PF1" value="Help">
<input type="submit" name="DFH_PF3" value="Exit">
</form>
</body></html>
```

where the variables are &USERID; and &PASSWORD;. You can identify fields by number - to use names for fields, as in this example, you must have a Screen Handler bean which can recognize the screen and set fields by name.

Page mapping property values can be the names of HTML template files or any URL. So that the servlet knows that a page mapping property identifies an HTML template, you should set it to the value `file://template_filename`, for example: `file://d:/html/templates/test.html`.

### What can be displayed?

Any piece of information that can be displayed by a server-side include can also be used for variable substitution, and vice-versa. The variable name used in a template is the same as the value of the **display** parameter in the server-side include.

Generally, you can display:

- The screen, as part of an HTML form
- A field - identified by number, or by name, if you have a Screen Handler bean for it
- Servlet configuration settings
- The number of terminals that are currently connected, in use, and free.

The full set of properties that can be displayed is listed in “Properties and parameters reference” on page 112.

### Sending the screen back to CICS

To send the screen back to CICS you must invoke the servlet with the **request** parameter set to “send”. You do not need to provide a **transaction** parameter - it is ignored if a transaction is already running. To update the screen with new information before sending it back to CICS, you specify further request parameters that identify the fields (by name or number) and what they should be set to.

## Using the Terminal Servlet

For example, the following server-side include:

```
<SERVLET NAME="TerminalServlet" >
<PARAM NAME="request" VALUE="send">
<PARAM NAME="USERID" VALUE="sysad">
<PARAM NAME="PASSWORD" VALUE="sysad">
<PARAM NAME="display" VALUE="none">
</SERVLET>
```

would set the fields named USERID and PASSWORD to the values given, and then send the screen to CICS. In an HTML form, you might use the form element `<input type="text" name="USERID" value="" size="8">`. When the user submits the form, the request parameter USERID is set to the value that they entered.

### Setting the AID

The default AID is Enter.

To set the AID from an HTML form, include a Submit button, specified like this:

```
<input type="submit" name="DFH_PF3" value="Exit" >.
```

If the user presses the button, the servlet is sent the request parameter "DFH\_PF3" with the value "Exit" (which the servlet ignores). The AID is set to PF3. In a server-side include, you could set the AID like this:

```
<SERVLET NAME="TerminalServlet" >
<PARAM NAME="request" VALUE="send">
<PARAM NAME="DFH_PF3" VALUE="ignored">
<PARAM NAME="display" VALUE="none">
</SERVLET>
```

The full set of request parameters is listed in see "Properties and parameters reference" on page 112.

### Disconnecting

When the servlet has allocated a terminal to a user, it is retained until:

- The servlet is invoked with the parameter "request" set to "disconnect"
- The user's session on the Web server expires
- If the **pool@idleTimeout** property has been set, the terminal is automatically disconnected if it is not accessed for the specified period of time.
- The CICS Client is stopped
- The connection to the CICS server is lost - or the server goes down
- The servlet is unloaded by the Web server.

You should try to explicitly release terminals when they are no longer required.

Note that when a user has established a session with the servlet and been allocated a terminal, any instance of the servlet to which the user has access can continue the session. The same terminal is used until the user disconnects or the session is ended for some other reason. The page mappings and other properties used for any particular request are those set for the instance of the servlet that is processing the request.

Properties that can be set as request parameters, for example, page mappings, override the settings for the servlet, but usually only apply to the current request, and do not affect requests by other users or subsequent requests by the same user.

---

### CICS Transaction Gateway Terminal Servlet samples

This section describes how to use the samples provided with the Terminal Servlet.

#### Setting up the samples

The samples assume that you have configured the Terminal Servlet on your Web server with the instance name 'TerminalServlet'. If you have used a different instance name, you will need to edit each of the sample HTML files and change 'TerminalServlet' to the correct name.

Copy all the sample HTML files to a suitable directory on your Web server.

Edit the sample properties file `servlet.properties` and set the following properties, using the instructions in the file:

1. `page@disconnected`
2. `page@default`
3. `page@demo.MAPINQ1ScreenHandler`
4. `pool@handlerPath`

Set the servlet initialization parameter `servlet@propertyFile` to the filename of the file `servlet.properties`.

To pick up the changes, unload and load the servlet.

#### Using the Terminal Servlet samples

These samples show you some of the ways you can use the CICS Transaction Gateway Terminal Servlet.

## CICS Transaction Gateway Terminal Servlet samples

### Basic Terminal Emulation

This sample shows you how to use the servlet as a replacement for a CICS terminal. It uses a server-side include to display the CICS screen as part of an HTML form. If you do not want to use server-side includes, change the value of the **page@default** property in the sample properties file to **file://[filename of epissam1.shtml]**.

The next two samples use the transaction EPIC, which is a sample transaction supplied with the CICS Transaction Gateway. You can find the source code for the program `epiinq.ccs` and for the map `epiinq.bms` in the subdirectory `samples\server`. They also use the sample screen handler beans supplied in the file **sample.jar**. You must compile both the program and map on your CICS server system and define a transaction EPIC to run the program `epiinq`.

### Server-Side Includes Sample (epissam2.shtml)

This sample shows you how to use server-side includes to display information from a CICS screen and to drive the terminal.

### HTML Template Sample (epissam3.shtml)

This sample shows you how to use an HTML template file.

### Administrator information sample (epissam4.shtml)

This sample shows you how to display information that might be useful to an administrator.

---

## Properties and parameters reference

This section describes the Terminal Servlet properties

### Servlet configuration properties

In general, these properties can be specified either in a properties file or as servlet initialization parameters when you configure the Web server. The names are not case sensitive. Values given as servlet initialization parameters override settings loaded from a properties file. Apart from the **servlet@debug** and **servlet@extendedLogging** properties, these settings cannot be changed while the servlet is running. However, using the request parameter **display**, you can query the current settings of a property, see “Displayable properties” on page 116.

#### **servlet@propertyFile**

The full path name of a properties file to load. This property can only usefully be set as a servlet initialization parameter.

#### **servlet@debug**

If set to true, turns tracing on for all instances of the servlet. You can



turn tracing on or off while the servlet is running, and output is directed to standard output. Note that turning tracing on seriously impacts performance!

### **servlet@extendedLogging**

If set to true, turns extended logging on. Output is directed to the servlet log.

### **servlet@allocateTimeout**

The maximum time in milliseconds that the servlet will wait for a terminal to be allocated to a user. The default is 20000 (20 seconds).

### **servlet@templateDir**

The name of a directory from which HTML template files can be loaded. Setting this property prevents users from viewing files that are not in the template directory or its subdirectories. If you do not set this property, the servlet can load any file on the Web server that it has access to.

### **servlet@coloring**

If set to Y, colored fields are displayed in the color indicated in the 3270 datastream.

Due to the limitations of HTML, unprotected fields cannot be colored and always appear as black text on a white background.

If the property is not specified, the Terminal Servlet displays the screen with black text on a white background.

### **pool@maxTerminals**

The maximum number of terminals that can be connected to CICS concurrently. The default value is 5.

### **pool@minTerminals**

The number of terminals that should be kept connected to CICS when not in use. The default value is 0.

### **pool@serverName**

The name of the CICS server to connect to. If this property is not set, the default CICS server, as defined in your configuration is used.

### **pool@deviceType**

The terminal model definition to use. If this property is not set, the default is used.

### **pool@handlerPath**

The path from which Screen Handler beans are loaded. You can include directories, .jar files, and .zip files, but subdirectories are not searched.

### **pool@defaultHandler**

The screen handler to use to exit screens when no specific handler is

## Properties and parameters reference

found. If you set this to be one of the Screen Handlers loaded from the Screen Handler path, make sure that the handler path is set before the default handler.

### **pool@idleTimeout**

The maximum time in milliseconds to allow a terminal to be left idle before it is automatically disconnected. The default value is 0, meaning no timeout.

### **pool@exitRetryLimit**

The number of times that the servlet will try to exit a running transaction during terminal disconnection. This prevents the servlet looping, if a screen cannot be exited.

### **pool@reusingTerminals**

If set to true, released terminals are kept connected for the next user. The default behavior is to disconnect terminals when a user session ends. You must also set **pool@minTerminals** for this property to have any effect.

### **pool@gatewayUrl**

The URL of the CICS Transaction Gateway that the servlet should connect to. The default is to use a local Gateway, that is `local://`.

### **screen@cursoring**

If set to true, JavaScript sets the screen cursor position. The default setting is false.

### **screen@stripBlanks**

If set to true, the Web Browser formats the field text.

### **screen@stripEmptyRows**

If set to true, screen rows that do not contain data are removed.

## Page mapping properties

Page mappings associate Web pages with particular screens or terminal states. Page mappings can be specified in a properties file, or as servlet initialization parameters, when you configure the Web server. However, using the request parameter **display**, you can query the current settings of a page mapping, see “Displayable properties” on page 116.

Standard page mapping properties	Value
<b>page@disconnected</b>	The page to show when the terminal is disconnected.
<b>page@error</b>	The page to show when an error occurs
<b>page@idle</b>	The page to show when the terminal is idle, that is, no transaction is running

Standard page mapping properties	Value
<code>page@default</code>	The page if no other page is specified.
<code>page@screen</code>	The page to show for this screen.

### Request parameters

These parameters are set only when a request is made. You can also specify any other property that can be set on a request, for example:

**`servlet@extendedLogging`.**

Parameter name	Parameter value
<code>request</code>	Set to "send" to send a screen to CICS or "disconnect" to end a session  If required, a new terminal session is started.
<code>display</code>	The name of a property that can be displayed, see "Displayable properties" on page 116.
<code>translateText</code>	Set to "true" to translate the characters <, > and & to &lt;, &gt; and &amp; respectively. This is used when text is displayed.
<code>transaction</code>	The transaction ID of a transaction to be started. This is only used if the request is "send" and the terminal state is idle.  ATI transactions cannot be started for the Terminal Servlet.
<code>transactionData</code>	Additional parameters to pass to a transaction. This is only used if the request is "send" and the terminal state is idle, and a transaction was specified.
<code>DFH_CURSOR</code>	The field where the screen cursor should be placed, as a field index (a number), or the name of the field, if a screen handler bean is available for the current screen.  This parameter name must be in upper case.
<code>DFH_ENTER</code> , <code>DFH_CLEAR</code> , <code>DFH_PA1 - 3</code> , <code>DFH_PF1 - 24</code>	The value is ignored.  Use one of these parameters to specify the AID key to be sent to CICS. This must be in upper case.
A field index	The text to be set in the field.  Use to set the contents of a field when you know the field index.

## Properties and parameters reference

Parameter name	Parameter value
usingSession	Set to false if no terminal session is required.  If this parameter is set, any terminal used for this request is discarded after use.
matchOnIdle	Set to false by default.  Normally the servlet only attempts to find a ScreenHandler for the current screen when the terminal state is 'client', that is, a conversational or pseudo-conversational transaction is expecting a response. Setting this property to true causes the servlet to check the current ScreenHandler every time the screen changes regardless of the state. You may want to do this if you have transactions that use BMS maps, but which are not conversational or pseudo-conversational. If you have a large number of ScreenHandlers, the servlet may run more slowly when this property is set to true. For this reason, the default value is false.

In addition, if a Screen Handler bean is available for the current screen, you can set any properties on that bean by specifying them in the request. For beans generated by BMSMapConvert, the field names defined in the BMS map are properties that can be set to the required text in the field.

### Displayable properties

The following table shows the values that can be specified for the "display" request parameter or used for variable substitution, see "Using variable substitution" on page 108.

Display values	Displays
none	Nothing. Use to suppress output from a server-side include.
screen	The screen - as part of an HTML form.
errorMessage	If an error has occurred, the error message.
errorCause	If an error has occurred, further information about the error.
DFH_CURSOR	The name of the field where the cursor is, if it can be determined, otherwise the field index.
a field index	The field text

Display values	Displays
a screen handler property name	The value of the property if it can be determined.
any of the servlet configuration properties listed above	The value of the property for the current servlet instance.
any page mapping property	The value of the property for the current servlet instance.
any request parameter, except for "request" and "display"	The value of the property for the current request.
pool@connectedTerminals	The current number of connected terminals, for this servlet instance.
pool@freeTerminals	The current number of connected terminals that are not in use, for this servlet instance.
pool@terminalsInUse	The current number of terminals allocated to users, for this servlet instance.

---

### Migrating from the CICS Internet Gateway

This section describes how to migrate from using the CICS Internet Gateway to using the Terminal Servlet.

Before you perform migration you should be familiar with the concepts of the Terminal Servlet as described in this chapter.

The CICS Internet Gateway reads settings from a configuration file, which is called **cigd.ini**.

#### CICS Internet Gateway default settings

CICS Internet Gateway	Terminal Servlet equivalent
<b>Cursor</b>	The Cursor key equivalent. There is no equivalent setting for the Terminal Servlet. Instead, you can use JavaScript to set the position of the cursor. To allow this, set the servlet property <b>screen@cursoring</b> to true.
<b>Info</b>	Filename for the information file for the server (for AIX and Windows NT). There is no equivalent setting for the Terminal Servlet.
<b>Error</b>	Filename for the error file for the server. There is no equivalent setting for the Terminal Servlet.

## Properties and parameters reference

<b>Trace</b>	Filename for the trace file for the server. There is no equivalent setting for the Terminal Servlet. Servlets write logging information to the servlet log provided by the Web server. See your Web server documentation to find out where this file is. If trace is turned on it is written to the standard output. Depending on your Web server, this may be directed to a file.
<b>MaxUsers</b>	The maximum number of users. The equivalent servlet property is <b>pool@maxTerminals</b> .
<b>TimeOutCICS</b>	The “Wait for CICS ” timeout. The servlet property <b>servlet@allocateTimeout</b> limits the time that the servlet will wait for a terminal to be connected to CICS. There is no limit on the time the servlet will wait for CICS to respond in other situations.
<b>TimeOutGateway</b>	The “Wait for Gateway” timeout. There is no equivalent setting for the Terminal Servlet.
<b>TimeOutInternet</b>	The “Wait for Internet” timeout. The servlet property <b>pool@idleTimeout</b> limits the time that the servlet will let a terminal be unused before it is disconnected.

### CICS Internet Gateway override settings

<b>CICS Internet Gateway</b>	<b>Terminal Servlet equivalent</b>
<b>AutoExit</b>	Normally, the Terminal Servlet does not disconnect the terminal when a transaction ends. If this is the behavior you want, set the page mapping property <b>page@idle</b> to the URL /servlet/TerminalServlet?request=disconnect, replacing TerminalServlet with the name of an instance of the Terminal Servlet on your Web server.
<b>ExitAid</b>	The Exit key equivalent. The servlet uses Screen Handler beans to exit running transactions. You can generate and customize Screen Handler beans for specific CICS screens, and you can create a default Screen Handler that knows how to exit a range of transactions. The supplied sample DefaultScreenHandler exits using the AID PF3.

<b>ExitPage</b>	The URL for the HTML exit page. Use the page mapping property <b>page@disconnected</b> to specify a page to be displayed when the terminal is disconnected.
<b>ImbedHTML</b>	Allows Imbedded HTML. The servlets default behavior is to write out the contents of CICS screens as is, that is, text taken from the CICS screen is assumed to be correct HTML. If the characters <, >, or & are present on the CICS screen, this may cause problems. To translate the characters <,>, and & to &lt; &gt; and &amp; respectively, set the request parameter <b>translateText</b> to true. No translation is performed when sending data to CICS.
<b>Header</b>	The filename for the HTML header. There is no equivalent setting for the Terminal Servlet.
<b>Trailer</b>	Filename for the HTML trailer. There is no equivalent setting for the Terminal Servlet.
<b>GraphicKeys</b>	Display the keys as GIFs. There is no equivalent setting for the Terminal Servlet.
<b>PAKeys</b>	Display the PA keys. There is no equivalent setting for the Terminal Servlet.
<b>PFKey24</b>	Display extra row of PF keys. There is no equivalent setting for the Terminal Servlet. Output from the Terminal Servlet is inserted into a Web page that you provide. The sample file epissam1.shtml is provided as a starting point.

### CICS Internet Gateway <FORM> actions

The CICS Internet Gateway is invoked by an HTML form. To invoke the Terminal Servlet instead, change the <FORM> action to `/servlet/servlet` where *servlet* is TerminalServlet or another name.

#### Query the current gateway settings

You can query the various servlet properties individually. See “Displayable properties” on page 116 for details.

#### List the available CICS systems

The servlet does not provide this function. Each Terminal Servlet instance can connect to only one CICS server. You should configure an instance of Terminal Servlet for each CICS server that you want to allow users to connect to.

## Properties and parameters reference

### Start a transaction

You must add a hidden <FORM> element setting the name "request" to the value "send", as in Table 4

Table 4. Terminal Servlet equivalents of <FORM> actions

CICS Internet Gateway <FORM> element name	Terminal Servlet equivalent
SystemName	None
TranName	transaction
TranData	transactionData
AutoExit	page@idle=/servlet/TerminalServlet?request=disconnect is equivalent to AutoExit=On
ExitAID	None
ExitPage	page@disconnected
ImbedHTML	translateText=true is equivalent to ImbedHTML=Off
Anything else	None

See "Properties and parameters reference" on page 112 for more information.

### Administration functions

You can query the number of terminals that are in use and turn trace on and off. However, these functions cannot be restricted to administrators.

---

## CICS Transaction Server for OS/390 Web Interface

The CICS Web Interface, included in CICS Transaction for OS/390 Version 1.2, is a collection of transactions and programs supporting direct access to CICS transaction processing services from Web browsers.

If you have generated HTML templates for use by the CICS Web Interface, they can also be used as HTML templates by the Terminal Servlet. You will have to make some changes to invoke the servlet instead of the CICS Web Interface, but the format is basically the same.

To use the template file:

1. Copy the template file to a directory on the Web server.
2. Edit it to change the <FORM> action to /servlet/TerminalServlet and add a hidden <FORM> element with name "request" and the value "send".
3. Generate a Map class and Screen Handler bean for the BMS map that the HTML template refers to.



4. Compile the generated Java source files.
5. Copy the compiled class files to a suitable directory on the Web server.
6. Set the servlet property **pool@handlerPath** so that it will load the new classes.
7. Set a page mapping property to associate the new Screen Handler bean with the HTML template file.

## Properties and parameters reference

---

## Chapter 8. Problem determination and problem solving

Problem determination is not to be confused with problem solving, although while investigating a problem you may find enough information to solve the problem. Examples of the types of problem that can arise are:

- End-user errors
- Programming errors
- Configuration errors.

---

### Preliminary checks

Before investigating the problem, it is worth checking to see whether there is an obvious cause:

- Has the system run successfully before?
- Have you made any changes to the configuration of the system or added new features or programs?
- If you have migrated from using a Version 2 CICS Client, or the earlier CICS Gateway for Java, are you sure that the configuration files were migrated successfully?
- Is your CLASSPATH path set correctly? (See “Configuring your programming environment for CICS Transaction Gateway” on page 37.)
- Is the CICS Universal Client environment set correctly?
- Are there any messages explaining the failure?
- Can the failure be reproduced?

---

### Problems during installing or uninstalling

With CICS Transaction Gateway on Windows platforms, you may experience problems when installing or uninstalling, for example, if there is a system crash. In such cases you can enter the following command to clean up the installation:

```
setup.exe CLEAN
```

This command will delete registry entries and directories of CICS Transaction Gateway, allowing you to perform the install or uninstall cleanly.

## Problem determination

---

### What to do next

If you think the problem is in the CICS Transaction Gateway, you need to collect as much information as possible and contact your support organization.

If you started the Gateway without **trace** enabled, you need to stop the Gateway, restart it with the **trace** option, and recreate the problem.

If you suspect the problem is in the CICS Universal Client or elsewhere in the network, you should follow the problem determination procedures provided with those other products. CICS Universal Clients problem determination is described in the *CICS Clients Universal Administration* book for your platform; for CICS Servers, see the *Problem Determination* book for the relevant server.

### Using trace

The CICS Transaction Gateway trace records information passing between the browser and the Gateway.

To route messages and trace information to a file, specify:

```
ctgstart -trace -tfile
```

when starting the Gateway, which generates a `ctg.trc` file in the `bin` directory. For more information on starting CICS Transaction Gateway, see “Starting the Gateway” on page 91.

To produce a full debug trace, you can use the `ctgstart -x` option.

### Program support

To obtain program support for the CICS Transaction Gateway you need to report the problem against the **CICS Universal Client** version you are using.

Different levels of program support are available and you should check what level you have before contacting IBM. Warranty and support information is provided in the *License* documents you get with the product; some products also include a **Service and Support** card, or visit our Web site at:

<http://www.ibm.com/software/ts/cics/>

and follow the **Support** link.

### Messages

The CICS Transaction Gateway messages have a *CCL* prefix; which has traditionally been used for CICS Clients.

For a list of the messages generated by the CICS Transaction Gateway, see the *CICS Transaction Gateway Messages* book.

---

### Problems with the JDK AppletViewer

When using AppletViewer to run any of the CICS Transaction Gateway sample applets from your local file system, the message CCL6664E Unable to load relevant class to support the *protocol* protocol may be displayed.

To solve this problem, select **Applet** from the AppletViewer menu; then select **Properties**; then set both **Network Access** and **Class Access** to Unrestricted.

---

### Terminal Servlet problems

A servlet log is provided by the servlet engine that runs the Terminal Servlet, and all instances of the servlet write to the same log. For WebSphere the servlet log is:

```
\WebSphere\Appserver\logs\servlet\servletservice\event_log
```

The Terminal Servlet writes to the log when it is started or stopped, and whenever an error occurs. When the servlet engine initializes or destroys an instance of the servlet, it is also recorded in the servlet log.

Using the **servlet@extendedLogging** property, you can control whether extended logging is performed. If extended logging is turned on, additional information is written to the servlet log, that is, the servlet writes to the log every time it receives a request. This can provide further valuable information, but you should turn extended logging off when not required, as it slows down the servlet.

Using the **servlet@debug** property, you can control whether tracing is performed for the Terminal Servlet. If tracing is turned on, full Gateway trace is turned on for every servlet instance. The destination of the trace output depends on the servlet engine. For WebSphere, you must enable trace by editing the file:

```
\WebSphere\AppServer\properties\bootstrap.properties
```

and setting the following:

```
java.debug=true
```

## Problem determination

and trace output will be written to the  
\\Websphere\AppServer\logs\jvm\_stdout.log and jvm\_stderr.log files. You  
should turn this tracing off when not required, as it slows down the servlet.

You can turn both extended logging and tracing on while the Terminal Servlet  
is running. For more information on Terminal Servlet properties see  
“Properties and parameters reference” on page 112.

---

## Appendix A. The CICS Transaction Gateway and CICS Universal Clients library

This chapter lists all the CICS Transaction Gateway, CICS Universal Clients, and related books, and discusses the various forms in which they are available.

The headings in this chapter are:

- “CICS Transaction Gateway books”
- “CICS Universal Clients books” on page 128
- “CICS Family publications” on page 128
- “Book filenames” on page 129
- “Sample configuration documents” on page 129
- “Other publications” on page 130
- “Viewing the online documentation” on page 130

---

### CICS Transaction Gateway books

- *CICS Transaction Gateway for OS/2 Administration, SC34-5590*  
This book describes the administration of the CICS Transaction Gateway for OS/2.
- *CICS Transaction Gateway for Windows Administration, SC34-5589*  
This book describes the administration of CICS Transaction Gateway for Windows 98 and CICS Transaction Gateway for Windows NT.
- *CICS Transaction Gateway for AIX Administration, SC34-5591*  
This book describes the administration of the CICS Transaction Gateway for AIX.
- *CICS Transaction Gateway for Solaris Administration, SC34-5592*  
This book describes the administration of the CICS Transaction Gateway for Solaris.
- *CICS Transaction Gateway for OS/390 Administration, SC34-5528*  
This book describes the administration of the CICS Transaction Gateway for OS/390.
- *CICS Transaction Gateway Messages*  
This online book lists and explains the error messages that can be generated by CICS Transaction Gateway.  
You cannot order this book.

## The CICS Transaction Gateway and CICS Universal Clients library

- *CICS Transaction Gateway Programming, SC34-5594*

This book provides an introduction to Java programming with the CICS Transaction Gateway.

There are also additional HTML pages that contain programming reference information.

---

### CICS Universal Clients books

- *CICS Universal Client for OS/2 Administration, SC34-5450*

This book describes the administration of the CICS Universal Client for OS/2.

- *CICS Universal Client for Windows Administration, SC34-5449*

This book describes the administration of the CICS Universal Client for Windows 98 and CICS Universal Client for Windows NT.

- *CICS Universal Client for AIX Administration, SC34-5348*

This book describes the administration of the CICS Universal Client for AIX.

- *CICS Universal Client for Solaris Administration, SC34-5451*

This book describes the administration of the CICS Universal Client for Solaris.

- *CICS Universal Clients Messages*

This online book lists and explains the error and trace messages that can be generated by CICS Universal Clients.

You cannot order this book.

- *CICS Universal Clients C++ Programming, SC33-1923*

This book describes how to write object oriented programs for the ECI and EPI in the C++ language.

- *CICS Universal Clients COM Automation Programming, SC33-1924*

This book describes how to write object oriented programs for the ECI and EPI according to the Component Object Model (COM) standard.

---

### CICS Family publications

- *CICS Family: Client/Server Programming, SC33-1435*

This book describes the programming interfaces associated with CICS client/server Programming— the External Call Interface (ECI), the External Presentation Interface (EPI), and the External Security Interface (ESI). It is intended for application designers and programmers who wish to develop client applications to communicate with CICS server systems.



---

## Book filenames

Table 5 show the softcopy filenames of the CICS Transaction Gateway and CICS Universal Client books.

*Table 5. CICS Transaction Gateway and CICS Universal Clients books and file names*

<b>Book title</b>	<b>File name</b>
CICS Universal Clients Messages	CCLHAB
CICS Universal Client for AIX Administration	CCLHAD
CICS Universal Client for OS/2 Administration	CCLHAE
CICS Universal Client for Windows Administration	CCLHAF
CICS Universal Client for Solaris Administration	CCLHAG
CICS Transaction Gateway for OS/390 Administration	CCLHAI
CICS Transaction Gateway Messages	CCLHAJ
CICS Transaction Gateway Programming	CCLHAK
CICS Transaction Gateway for Windows Administration	CCLHAL
CICS Transaction Gateway for OS/2 Administration	CCLHAM
CICS Transaction Gateway for AIX Administration	CCLHAN
CICS Transaction Gateway for Solaris Administration	CCLHAO
CICS Universal Clients C++ Programming	CCLHAP
CICS Universal Clients COM Automation Programming	CCLHAQ
CICS Family: Client/Server Programming	DFHZAD
<b>Note:</b> The File names in this table do not include the 2-digit suffix.	

---

## Sample configuration documents

A number of sample configuration documents are available in the Portable Document Format (PDF) format.

These documents provide step-by-step guidance to help you, for example, in configuring your CICS Universal Clients for communication with CICS servers, using various protocols. They provide detailed instructions that extend the information in the CICS Transaction Gateway and CICS Universal Client libraries.

As more sample configuration documents become available, you can download them from our Web site; go to:

<http://www.ibm.com/software/ts/cics/>

## Other publications

and follow the **Library** link.

---

## Other publications

The following International Technical Support Organization (ITSO) Redbook publication contains many examples of client/server configurations:

- *Revealed! CICS Transaction Gateway with more CICS Clients Unmasked, SG24-5277*

This book supersedes the following book:

- *CICS Clients Unmasked, GG24-2534*

You can obtain ITSO Redbooks from a number of sources. For the latest information, see:

<http://www.ibm.com/redbooks/>

You can find information on CICS products at:

<http://www.ibm.com/software/ts/cics/>

---

## Viewing the online documentation

You can access all of the documentation provided with CICS Transaction Gateway and CICS Universal Client in our online library. You need Adobe Acrobat Reader and a suitable Web browser to use the online library (and you may need to configure these).

To get to the online library:

- On Windows and OS/2, select the **Documentation** icon.
- On AIX and Solaris, run the **ctgdoc** script.

and the library home page is displayed.

The online library allows you to link to:

- CICS Transaction Gateway and CICS Universal Clients books in PDF format.
- Programming reference documentation in HyperText Markup Language (HTML) files (provided for CICS Transaction Gateway only).
- README files.
- Sample configuration documents in PDF format.
- Translated books in PDF format. (You may find that not all books are translated for your language.)
- The CICS Web site.

Guidance information on using Acrobat Reader is also provided.

Updated versions of the books may be provided from time to time, check our Web site at:

<http://www.ibm.com/software/ts/cics/>

and follow the **Library** link.

### Viewing PDF books

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- Printing all or part of PDF documents on a PostScript printer.

You can find out more about Acrobat Reader at the Adobe Web site:

<http://www.adobe.com/acrobat/>

## Viewing the online documentation

---

## Appendix B. Notices

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