

**Chapter
1**

**CICS
CONCEPTS
AND FACILITIES**

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Objectives

You will learn:

- C Features/facilities of CICS.
- C CICS terminology.
- C Compare batch and on-line processing.
- C Features of file support in an on-line environment.
- C Differences between conversational and pseudo-conversational programming techniques.
- C Multi-threaded versus single-threaded programs.
- C On-line processing / real time processing.
- C CICS and EJB: Enterprise Java Beans.
- C Web access.
- C JAVA and CICS.
- C 3270 bridge mechanism.
- C CICS TCP/IP support.
- C DB2 enhancements.
- C DB2 group attach.

1 CICS: Purpose and Facilities

CICS:

- C Stands for Customer Information Control System.
- C Permits application programs to access files and data over a communication network.
- C Runs under the control of the operating system.
- C Is referred to as a data base/data communication (DB/DC) system.
- C Is a solution for managing all the control involved with online execution.
- C Is a table driven online control system - PPT, PCT, RCT, etc.
- C Is a transaction oriented system.

1.1. CICS Terms

Terminal	A hardware device from which data can enter or leave CICS over a communication channel.
Logical Unit (LU)	The VTAM term for the end point of a data transmission.
Transaction	<p>When CICS is described as an online transaction processing system, transaction is used in the ordinary sense of an interaction between two participants.</p> <p>However, transaction also has a specific meaning in CICS. It means the processing executed for one specific type of request.</p> <p>Transactions are identified by a transaction identifier or, often, transaction code.</p>
Task	Is one instance of the execution of a particular transaction type.

2 Software Functions Required for On-line Processing

The following functions are required for on-line processing:

- C Finding and loading programs.
- C Associating programs with a terminal.
- C Starting the execution for the first program related to the requested function.
- C Providing resources for each task- memory, file accesses.
- C Freeing resources after the work is completed.
- C Providing file security and integrity.

3 Typical On-line Systems

The following systems/facilities are typical to on-line systems:

- C Inquiry - CICS.
- C Batch order - CICS.
- C Complex inquiry/order entry - CICS.
- C Remote batch entry - CICS.
- C Time sharing - TSO, VM, Not CICS.
- C Message switching.
- C Real time system.

4 Characteristics Unique to On-line Systems

The following characteristics are unique to on-line systems:

- C Input is random and unpredictable.
- C Service time is random/unpredictable.
- C Sensitive to system performance.
- C Critical requirement for restart/recovery.
- C Time dependent.
- C Dissimilar data/users.
- C Resource competition.
- C Subject to more frequent hardware errors.

5 What is CICS

The following components and functionality define CICS:

- C DB/DC system.
- C Terminal oriented.
- C Transaction oriented.
- C Conversational.
- C Multi-tasking.
- C Multi-application.
- C Table oriented.
- C Configuration at initialization time.
- C RDO: Resource Definition On-line.

6 Batch versus On-line

Application Programming - Batch

The facilities/characteristics of application programming in a batch environment include:

- C Start
Read Transactions
Process
(Separate passes for EDIT, UPDATE, REPORT)
UNTIL END-OF-FILE

- C Contiguous storage for:
 - I/O
 - WORK AREAS
 - INSTRUCTIONS

- C Operating system service requests may be reentrant.

Application Programming - Online

The facilities/characteristics of application programming in a online environment include:

- C Single transaction:
PROCESS - EDIT, UPDATE, TERMINAL RESPONSE

- C Non-contiguous storage:
 - I/O
 - WORK AREAS
 - CONTROL BLOCKS

- C CICS Service Requests must be quasi-reentrant.

7 System Management Functions

CICS provides the capability for the following system management functions:

- C Task.
- C Storage.
- C Program.
- C Time.
- C Terminal.
- C File.
- C Transient data.
- C Temporary storage.
- C Journal.

8 Basic Definitions

The following concepts/definitions are fundamental to understanding how CICS functions:

Transaction

Task

Module

Reentrant

Multiprocessing

Multitasking

Multithreading

Response time



9 Task Management

CICS provides the capability for the following task management functions:

- C Multitasking.
- C Task organization.
- C Task termination.
- C Task synchronization.
- C Internal control functions:
 - Runaway task detection.
 - Time out detection.
- C Maximum number of tasks:
 - Available address space.
 - Maximum tasks specified.

10 Program Control Table

The Program Control table has one entry for every transaction ID in the system.

It contains the following information:

- C Initial program ID.
- C Length of transaction work area - TWA.
- C Priority.
- C Security.
- C Usability status - enabled/disabled.
- C Purge ability status during a storage crunch.

The Program Control table is searched by task control during task initiation.

11 Storage Management

CICS storage manage performs the following functions:

- C Storage acquisition.
- C Storage disposition.
- C Storage accounting of Dynamic Storage Area - DSA.

12 Program Management

CICS program management performs the following functions:

- C Loads and deletes programs.
- C Provides asynchronous program services:
 - Linking.
 - Transferring control.
- C High level program support.
- C Abend processing.

13 Processing Program Table

The Processing Program Table has one entry per program.

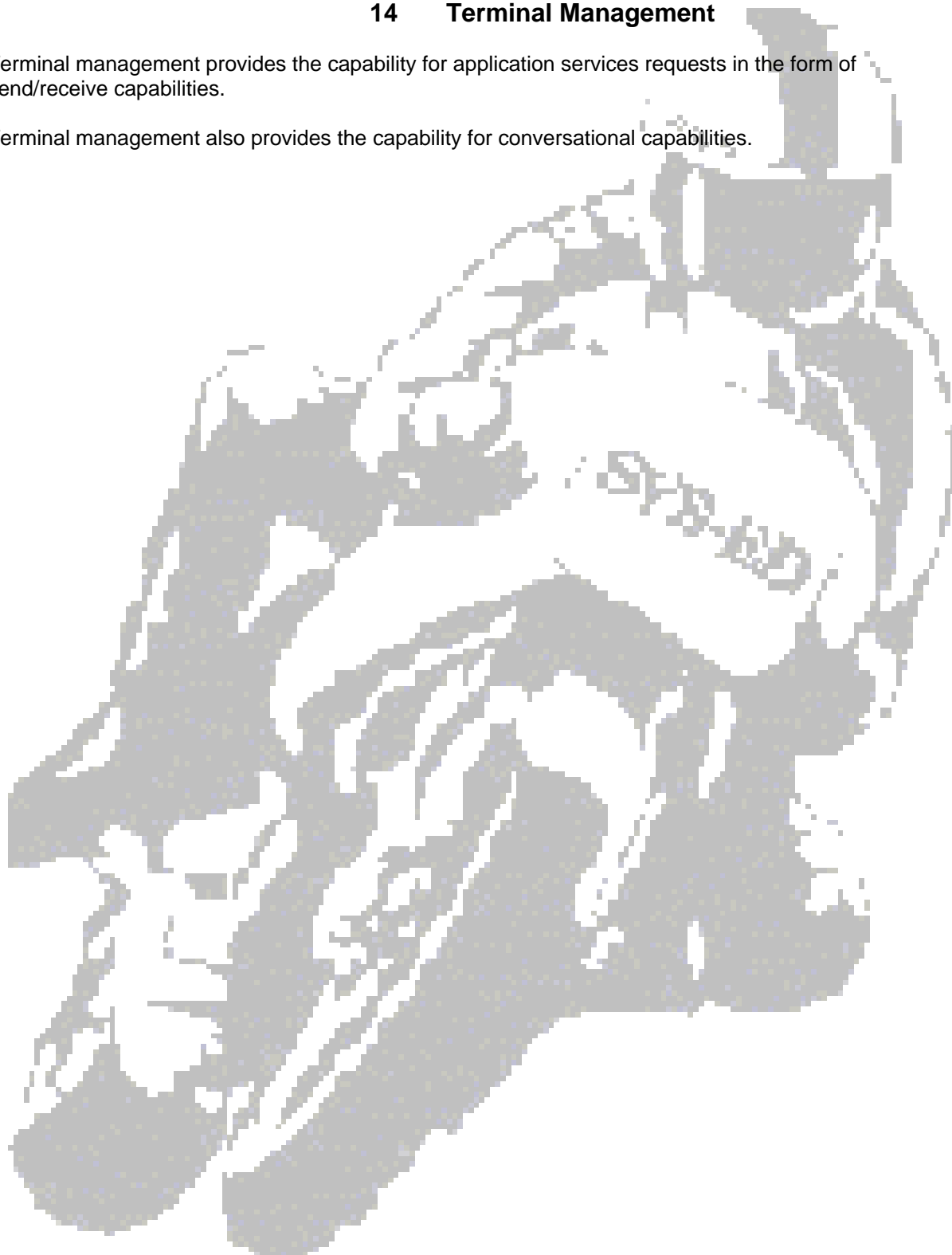
The table is searched each time a program is called.

- C When the program is in use its use count is incremented.
- C When the program is not in use but is resident, its location in memory is noted and the use count is set to 1.
- C When the program is not in use and not resident, program control acquires program storage, loads the program and sets the use count to 1.
- C The information in the table includes:
 - Program ID.
 - Source language.
 - Residency status.
 - Use count.
 - Program size.

14 Terminal Management

Terminal management provides the capability for application services requests in the form of send/receive capabilities.

Terminal management also provides the capability for conversational capabilities.



15 TCT: Terminal Control Table

In general, there is one entry for each control unit, line, and terminal.

An optional user area called the Terminal Control Table User Area (TCTUA) may be appended to any table entry for storing terminal oriented data during execution.

Information in the table entry includes:

- C Terminal ID.
- C Priority.
- C Type.
- C Address of message area and of COMMAREA.
- C Current status.

16 File Management

File management supports the following access methods:

- C VSAM.
- C SAM - Transient Data.

File management provides the following services:

- C Read, write, rewrite, delete.
- C Deblocking.
- C Variable length records.
- C Exclusive control.
- C Random and sequential retrieval.
- C DL/I and SQL interfaces for IMS and DB2.

16.1. File Control Table

The file control table provides one entry for each data set.

Each entry contains:

Data set organization	VSAM or DL/I.
Accessing Options	READ, UPDATE, BROWSE, etc.
Data set characteristics	Block size, RKP, etc.
Usability status	Enabled, open, close, and disabled.
Journaling and Logging	Automatically enabled.

17 Basic Mapping Support

Basic mapping support provides:

- C Application related service.
- C Device independence.
- C Simplifies application programming.
- C Terminal paging.
- C Text message and map for prompts and data fields handling.

18 Temporary Storage Management

Temporary storage management provides the capability for:

- C Storage and retrieval facility.
- C Sequential or direct.
- C Main or DASD storage.
- C Terminal paging.
- C Message routing.

19 Transient Data Management

Transient data management

- C Queuing facility:
 - Intrapartition.
 - Extrapartition.

- C ATI: Automatic task initiation.

- C Trigger level.

20 Destination Control Table

One table for each extrapartition or intrapartition Transient Data Queue.

An extrapartition TDQ has one DCT entry in the region which writes the TDQ; another table in the region which reads the queue.

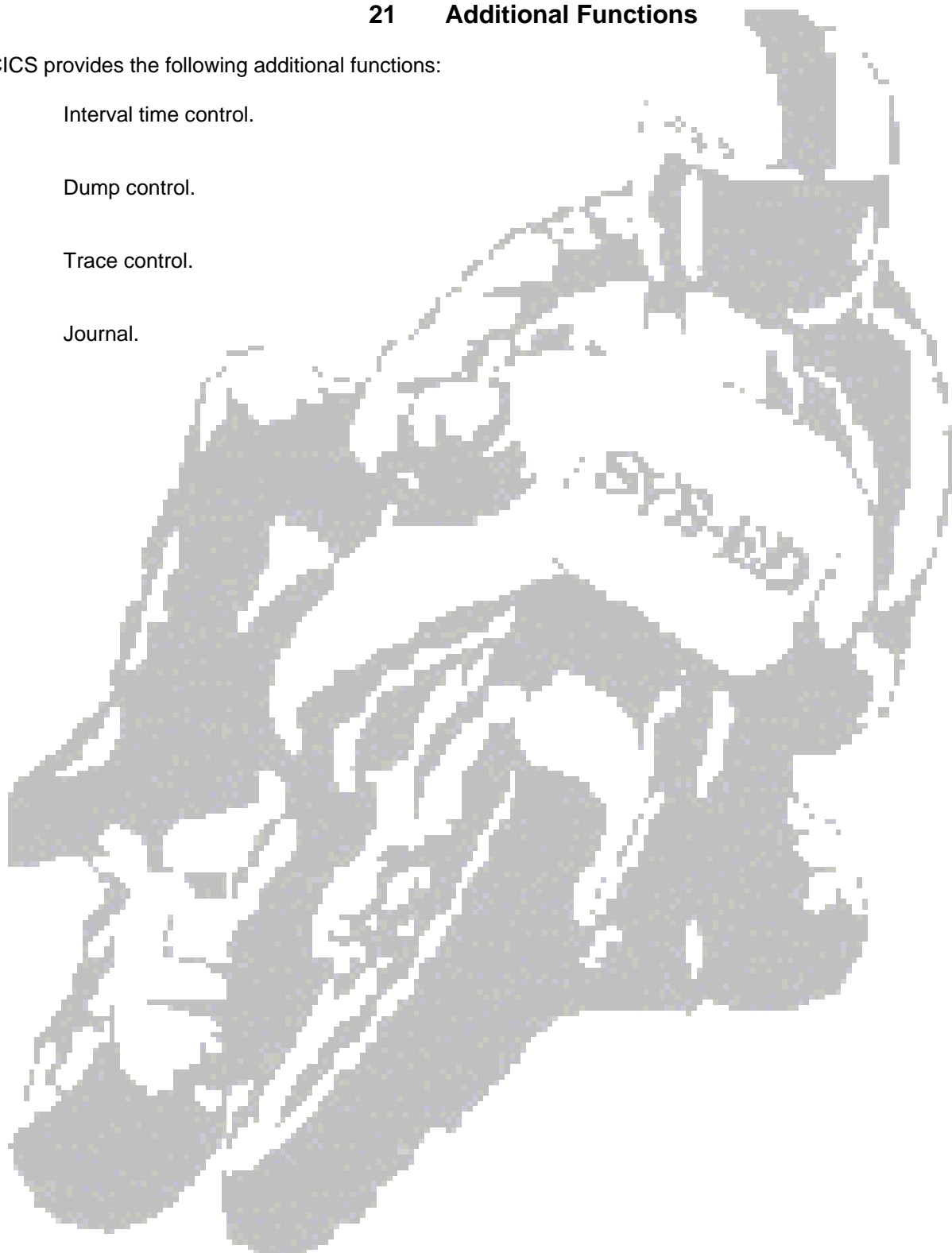
Each entry includes the following:

- C Destination characteristics - block size, etc.
- C Automatic transaction initiation information for intrapartition queues.
- C Usability status.

21 Additional Functions

CICS provides the following additional functions:

- C Interval time control.
- C Dump control.
- C Trace control.
- C Journal.



22 EJB: Enterprise Java Beans

CICS TS already had extensive support for e-business; CICS Version 2 supports Enterprise JavaBeans.

CICS is positioned in the IBM Software Strategy for e-business as a large scale integration and business logic server. CICS has been upgraded/retrofitted to evolve from CICS COBOL and 3270 based programming model to e-business technologies.

CICS is evolving from the 3270 procedural COBOL world to a web-based, object-oriented Java environment.

23 Web Access

CICS TS V1.3 supports Web access to CICS programs and 3270 transactions either directly or through a gateway. It also supports access to CICS programs from CORBA clients using the standard IIOF protocol.

Both HTTP and IIOF can exploit SSL(Secure Socket Layer protocol) for network privacy and integrity and for client authentication. In addition CICS applications can be written in Java.

Web browsers, applets, servlets and desktop applications can access CICS applications. There is support for standard protocols across the Internet, intranets or extranets. Access can be via a gateway or direct to CICS.

24 Gateway

CICS TS offers a number of ways for accessing CICS applications from a Web browser.

- C It offers direct access to CICS without use of a Gateway or intermediate Web server.
- C It offers indirect access via the CICS Transaction Gateway for those customers who prefer a 3-tier solution.

CICS TS provides for access to existing 3270 applications without requiring any change to the application code. The end-user interface can be customized to improve and enhance the end-user's experience as compared to a 3270 interface.

CICS TS supports web-aware applications that have been specifically written for the web and which generate HTML or XML pages. These applications can be written to use existing business logic by wrapping the existing programs with code that generates the HTML.

This support also includes the ability to run Java applets, servlets or any Java application, on the workstation or intermediate server, that communicate, via the CICS Transaction Gateway, with either 3270 or DPL applications.

25 JAVA and CICS

Java is a language which provides server-side programming. IBM is transforming CICS into an e-business application server which will support both the standard CICS programming models and Enterprise JavaBeans. This will also include support for Enterprise Java APIs.

This will allow CICS customers to leverage their existing applications and retain all the mission critical CICS functionality. The IBM strategy is to provide an architecture for developing and deploying e-business applications with a product suite to match. The programming model supports J2EE and combines the benefits of Java Servlets and Java Server Pages for presentation and the Enterprise JavaBeans component model for integration and business logic.

The integration logic layer is deployed in an application server such as WebSphere Application Server or CICS TS. Business logic can be deployed in WAS or CICS TS or in an existing application running in CICS, IMS or an ERP system.

Data and other resources such as message queues are accessed using the appropriate Enterprise Java APIs. Application development and deployment are supported by development tools such as VisualAge for Java.

26 Compilers - Enhancement

The following enhancements have been made available to the compiler:

- C Integrating the CICS translator with the compilers simplifies compilation procedure and debugging.
- C IBM COBOL and PL/I compilers have been enhanced in order that any necessary CICS translation step is incorporated into the compilation process.
- C An XML parsing capability is provided for COBOL and PL/I.
- C File control control has been enhanced to improve local/remote transparency and eliminate deadlocks.

The function shipping mechanism has been changed to improve the local/remote transparency of a file control request.

27 3270 Bridge Mechanism

The concept underlying the 3270 bridge is that a pure BMS program never deals with 3270 datastreams or terminal I/O directly.

A BMS program uses the data structure that is populated by the BMS RECEIVE MAP command and passes the output in a data structure to BMS which will then be converted to a 3270 datastream and sent to the terminal. By substituting a bridge exit program for BMS, the bridge can format the data structure into whatever form it chooses and deliver it in whatever way is appropriate.

The 3270 bridge mechanism supports a majority of 3270 applications including pseudo-conversational transactions.

The COMMAREA contains the data structure and command vectors. The calling application builds a COMMAREA that contains data and command vectors indicating the type of interaction with the terminal. The calling program then LINKs to a CICS-supplied program that starts the 3270 transaction, running it in conjunction with a CICS-supplied bridge exit program.

Dynamic routing is supported for workload management.

28 CICS TCP/IP Support

CICS TCP/IP support has been enhanced to improve performance and systems management for HTTP and IIOP.

Most of the enhancements are to the CICS support for TCP/IP, generally driven by the requirements for support of EJB.

The enhancements include:

- C Support for ECI over native TCP/IP simplifies configuration.
- C Support for CORBA has been extended to allow distributed transactions and outbound calls.
- C Dynamic LU alias facilitates merging of SNA networks.

The socket domain makes asynchronous calls to the TCP/IP stack and receives notification of new inbound requests asynchronously. This enables the CICS listener tasks to perform other functions while waiting for input from a socket. Shared sockets are now also supported. This will enable CICS to hold onto a socket for longer than the CICS task lifetime. Subsequent requests can then use the socket without the overhead of reestablishing the connection every time.

29 DB2 Enhancements

The improved performance is achieved by running the transaction on its own OPEN Transaction Environment TCB in order to reduce the number of operating system task switches at the CICS-DB2 interface.

The path length reduction can be as much as 10%, or more if the transaction involves a significant degree of DB2 access. This enhancement requires DB2 V6. The DB2 program will have to be threadsafe as distinct from the usual CICS quasi-reentrant requirement.

Other than specifying in the program definition that it is threadsafe the performance benefit will be automatic.

30 DB2 Group Attach

The DB2 Group attach support allows a CICS system to connect to DB2 by specifying the name of a DB2 Datasharing Group instead of a specific DB2 subsystem. Connection will be made to one of the active members of the group residing on the same z/OS image as CICS.

This simplifies AOR cloning because all cloned regions can specify the same DB2 Datasharing Group name and be connected to an appropriate DB2 subsystem instance regardless of which MVS image they run on.

It also improves availability because CICS does not have to connect to an explicit DB2 which may be unavailable even though other cloned instances are up and running.

If the DB2 subsystem has failed when there were in-flight tasks in an in-doubt state, then CICS MUST reconnect to that specific DB2 subsystem when it restarts to resolve the in-doubt units of work.

When this situation occurs, CICS will insist on reconnecting to the specific DB2 instance that knows the status of the in-doubt units of work. The in-doubt state lasts for only a very short time and the probability of there being in-doubt transactions when a failure occurs is very low.