



# CICS

customer information control system

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## About the Tutorial

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CICS stands for Customer Information Control System. CICS was developed in 1968 by IBM. CICS allows users to develop and execute online application in an MVS environment. CICS has become the most commonly used server for Internet applications.

CICS is a transaction processing system which is also called as Online Transaction Processing (OLTP) Software. CICS is a data communication system that can support a network containing hundreds of terminals.

## Audience

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This tutorial is designed for software programmers who would like to understand the concepts of CICS starting from scratch. This tutorial will give you enough understanding on CICS from where you can take yourself to higher levels of expertise.

## Prerequisites

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Before proceeding with this tutorial, you should have a basic understanding of COBOL programming. A basic knowledge of MVS and TSO/ISPF subsystem will help you grasp the concepts of CICS better.

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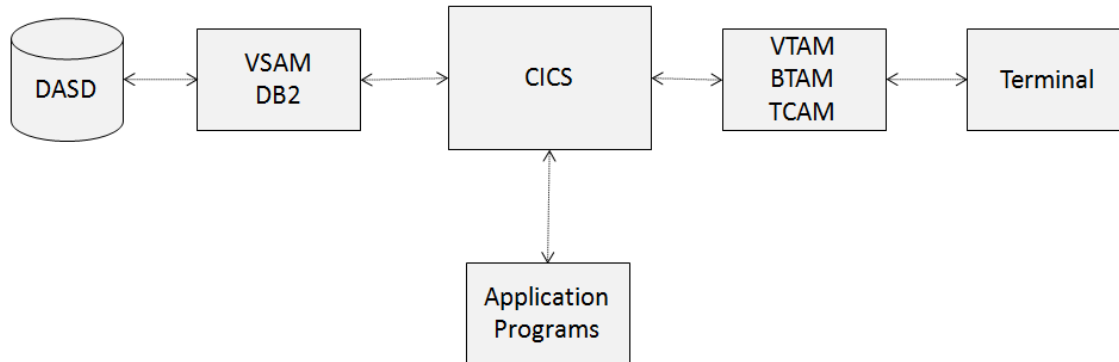
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# 1. CICS – OVERVIEW

CICS is a DB/DC system which is used in online applications. CICS was developed because batch operating system can execute only batch programs. CICS programs can be written in COBOL, C, C++, Java, etc. These days, users want information within seconds and in real time. To provide such quick service, we need a system which can process information online. CICS allows users to communicate with the back-end system to get the desired information. Examples of online programs include online banking system, flight reservation, etc. Following image shows the components of CICS and how they are inter-related:



## Functions of CICS

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The main functions performed by CICS in an application are as follows:

- CICS manages requests from concurrent users in an application.
- Although, multiple users are working on CICS system but it gives a feel to user that he is the single user only.
- CICS gives the access to data files for reading or updating them in an application.

## Features of CICS

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The features of CICS are as follows:

- CICS is an operating system in itself, as it manages its own processor storage, has its own task manager which handles execution of multiple programs, and provides its own file management functions.
- CICS provides online environment in batch operating system. Jobs submitted are executed immediately.
- CICS is a generalized transaction processing interface.
- It is possible to have two or more CICS regions at the same time, as CICS runs as a batch job in the operating system at the back-end.

## 2. CICS – ENVIRONMENT

CICS itself acts as an operating system. Its job is to provide an environment for online execution of application programs. CICS runs in one region or partition or address space. CICS handles scheduling for programs running under it. CICS runs as a batch job and we can view it in the spool by issuing the command PREFIX CICS\*. There are five major services which are provided by CICS. All these services together perform a task.

### CICS Environment

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Following are the services which we will be discussing in detail step by step:

- System Services
- Data Communication Services
- Data Handling Services
- Application Programming Services
- Monitoring Services
- System Services

CICS maintains control functions to manage the allocation or de-allocation of resources within the system which are as follows:

- **Task Control** – Task control provides task scheduling and multitasking features. It takes care of the status of all CICS tasks. Task Control allocates the processor time among concurrent CICS tasks. This is called **multitasking**. CICS tries to prioritize the response time to the most important task.
- **Program Control** – Program Control manages loading and releasing of application programs. As soon as a task begins, it becomes necessary to associate the task with the appropriate application program. Although many tasks may need to use the same application program, CICS loads only one copy of the code into memory. Each task threads its way through this code independently, so many users can all be running transactions that are concurrently using the same physical copy of an application program.

- **Storage Control** – Storage Control manages acquiring and releasing of main storage. Storage control acquires, controls, and frees dynamic storage. Dynamic storage is used for input/output areas, programs, etc.
- **Interval Control** – Interval Control offers timer services.

## Data Communication Services

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Data Communication Services interface with telecommunication access methods such as BTAM, VTAM, and TCAM for handling data communication requests from application programs.

- CICS releases application programs from the burden of dealing with terminal hardware issues through the use of Basic Mapping Support (BMS).
- CICS provides Multi Region Operation (MRO) through which more than one CICS region in the same system can communicate.
- CICS provides Inter System Communication (ISC) through which a CICS region in a system can communicate with the CICS region on another system.

## Data Handling Services

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Data Handling Services interface with data access methods such as BDAM, VSAM, etc.

- CICS facilitates servicing of data handling requests from application programs. CICS provides application programmers a set of commands for dealing with data set and database access and related operations.
- Data Handling Services interfaces with database access methods such as IMS/DB, DB2, etc. and facilitate servicing of database requests from application programs.
- CICS facilitates management of data integrity by control of simultaneous record updates, protection of data as task ABENDs and protection of data at system failures.

## **Application Programming Services**

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Application Programming Services interface with application programs. The application programming services of CICS provide features such as command level translation, CEDF (the debug facility) and CECI (the command interpreter facility). We will be discussing more in detail in upcoming modules.

## **Monitoring Services**

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Monitoring Services monitor various events within CICS address space. It provides series of statistical information that can be used for system tuning.

# 3. CICS – BASIC TERMS

We must have knowledge of the basic terms used in CICS to get a better understanding of how it works. Application programs use CICS for communication with remote and local terminals and subsystems.

## IBM 3270 Terminal

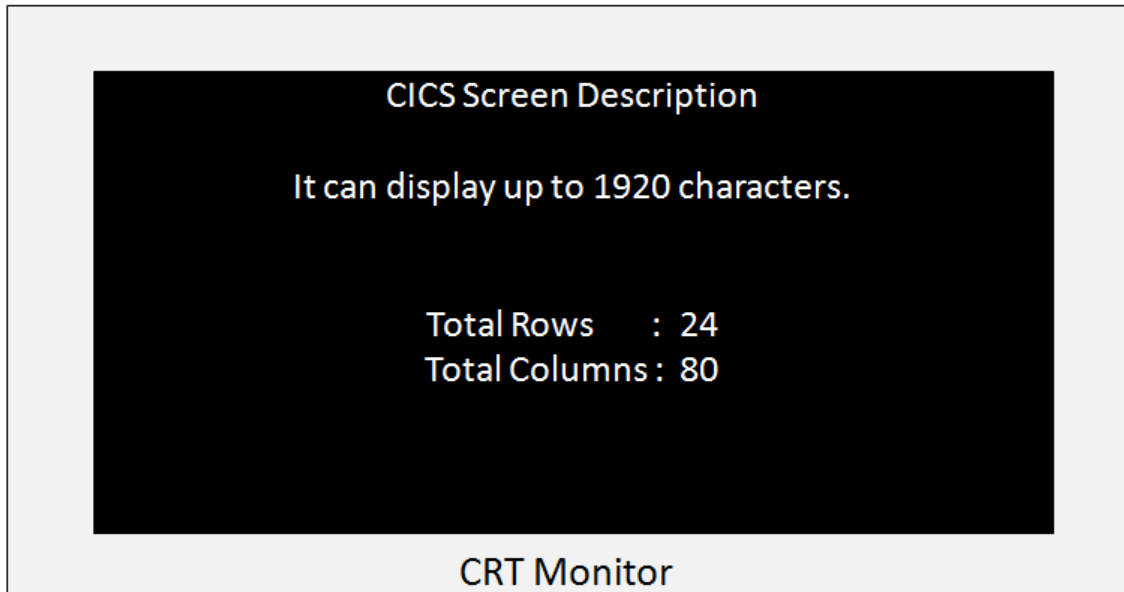
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The 3270 Information Display System is a family of display and printer terminals. 3270 terminals were being used to connect to the mainframe via IBM controllers. Today, 3270 emulation software is available which means that even normal PCs can be used as 3270 terminals. 3270 terminals are dumb terminals and do not do any processing themselves. All processing needs to be done by the application program. IBM terminals consist of the following components:

## CRT Monitor

The CRT monitor displays the output or the input fields of the application program. A screenshot of a 3278 Model of CRT monitor is shown below. It has the following characteristics:

- It is capable of displaying 1920 characters.
- Each of these 1920 character positions is individually addressable.
- A COBOL application program can send data to all the positions on the screen.
- The display characteristics like intensity, protected, non-protected of the field can be set using BMS which we will be discussing in detail in upcoming modules.

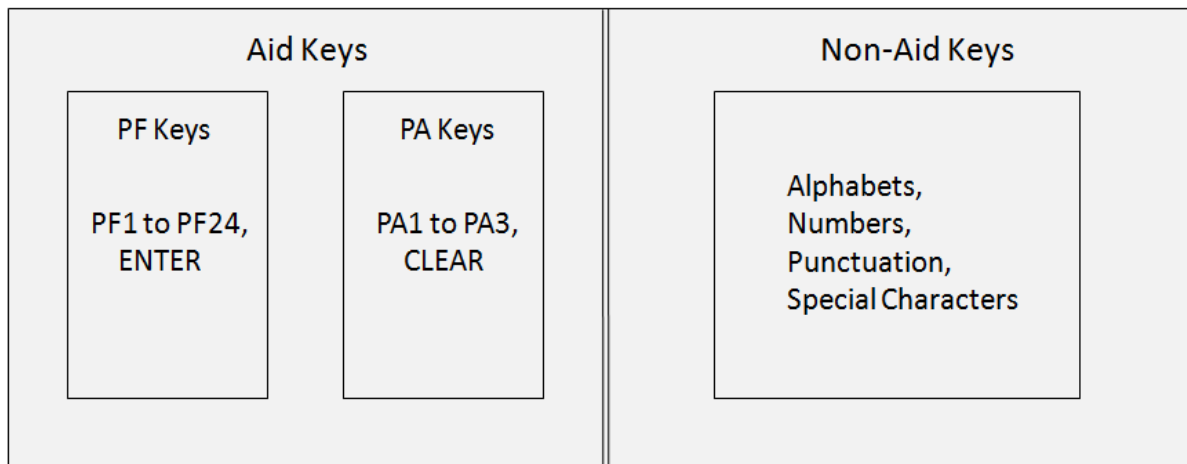


## Keyboard

IBM keyboard keys are divided into following two categories:

- **Non-AID Keys** – All other keys for alphabets, numeric, punctuation etc. are Non-Aid keys. When the user types text or numbers using non-aid keys, CICS will not even know if the user is typing anything or not.
- **AID Keys** – AID keys are known as Attention Identifier Keys. CICS can detect only AID keys. After typing all the input, only when the user presses one of the AID keys, CICS takes control. AID Keys : ENTER, PF1 to PF24, PA1 to PA3, CLEAR. AID keys are further divided into two categories:
  - **PF Keys** – PF keys are known as function keys. PF keys allow transfer of data from terminal to CICS. PF Keys are ENTER and PF1 to PF24.
  - **PA Keys** – PA keys are known as Program Access keys. PA keys do not allow transfer of data between terminal and CICS. PA Keys are PA1 to PA3 and CLEAR.

## Keyboard



## Transaction

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A CICS program is invoked through a transaction. A CICS transaction is a collection of logically related programs in an application. The whole application could be logically divided into several transactions.

- Transaction identifiers which are 1 to 4 characters long are used to identify the transactions which the users want to do.
- A programmer links one program to the transaction identifier which is used to invoke all the application programs for that particular transaction.

## Task

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A Task is a unit of work which is specific to a user.

- Users invoke an application by using one of the transaction identifiers. CICS looks up for the transaction identifier to find out which program to invoke first to do the work requested. It creates a task to do the work, and transfers control to the mentioned program.
- A transaction can be completed through several tasks.
- A task can receive data from and send data to the terminal that started it. It can read and write files and can start other tasks also.



## Task vs. Transaction

The difference between a transaction and a task is that several users can invoke a transaction but each user initiates his own task.

## LUW

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LUW stands for Logical Unit of Work. LUW states that a piece of work should be done completely or not done at all. A task can contain several Logical Unit of Works in CICS. We will discuss more about it in upcoming modules.

## Application

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An application is a series of logically grouped programs to form several transactions which is used to complete a specific task for the end-user.

# 4. CICS – NUCLEUS

The five CICS system components described earlier are a convenient grouping of CICS system programs, each of which performs its own specialized functions. The core of CICS known as the CICS Nucleus which consists of IBM-supplied CICS Control Programs and Control Tables.

## Control Programs

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CICS nucleus is constructed by the control programs and corresponding control tables. It provides unique advantages. It makes the CICS system highly flexible and thus easy to maintain. Following are the important control programs of CICS:

### TCP

TCP is known as Terminal Control Program.

- TCP is used to receive messages from the terminal.
- It maintains hardware communication requirements.
- It requests CICS to initiate the tasks.

### KCP

KCP is known as Task Control Program.

- KCP is used to simultaneously control the execution of tasks and its related properties.
- It handles all the issues related to multi-tasking.

### PCP

PCP is known as Program Control Program.

- PCP is used to locate and load programs for execution.
- It transfers the control between programs and in the end, it returns the control back to the CICS.

## FCP

FCP is known as File Control Program.

- FCP is used to provide application programs with services like read, insert, update or delete records in a file.
- It keeps exclusive control over the records in order to maintain data integrity during record updates.

## SCP

SCP is known as Storage Control Program. It is used to control allocation and de-allocation of storage within a CICS region.

## Control Tables

---

CICS consists of IBM-supplied CICS control programs and tables. These tables need to be updated accordingly with the application information for successful execution of CICS application programs. Following are the important Control Tables:

### TCT

TCT is known as Terminal Control Table.

- When we login to a CICS terminal, an entry is made in the TCT table.
- TCT contains the terminal ID's that are connected to current CICS region.
- Terminal Control Program along with terminal control table recognize the incoming data from the terminal.

### PCT

PCT is known as Program Control Table.

- It contains the Transaction IDs (TRANSID) and the corresponding program names or program IDs.
- TRANSID is unique in PCT table.

## PPT

PPT is known as Processing Program Table. PPT contains Program name or Mapset name, Task Use Counter, Language, Size, Main storage address, Load library address, etc.

- Program or Mapset name is unique in a PPT table.
- CICS receives the transaction and a corresponding program name is allocated to the transaction from the PCT. It checks if the program is loaded or not. If it is loaded, then the task use counter is increased by 1. If the program is not loaded, then the program is first loaded and the task use counter is set to 1. It gets the load library address from the PPT table.

## FCT

FCT is known as File Control Table.

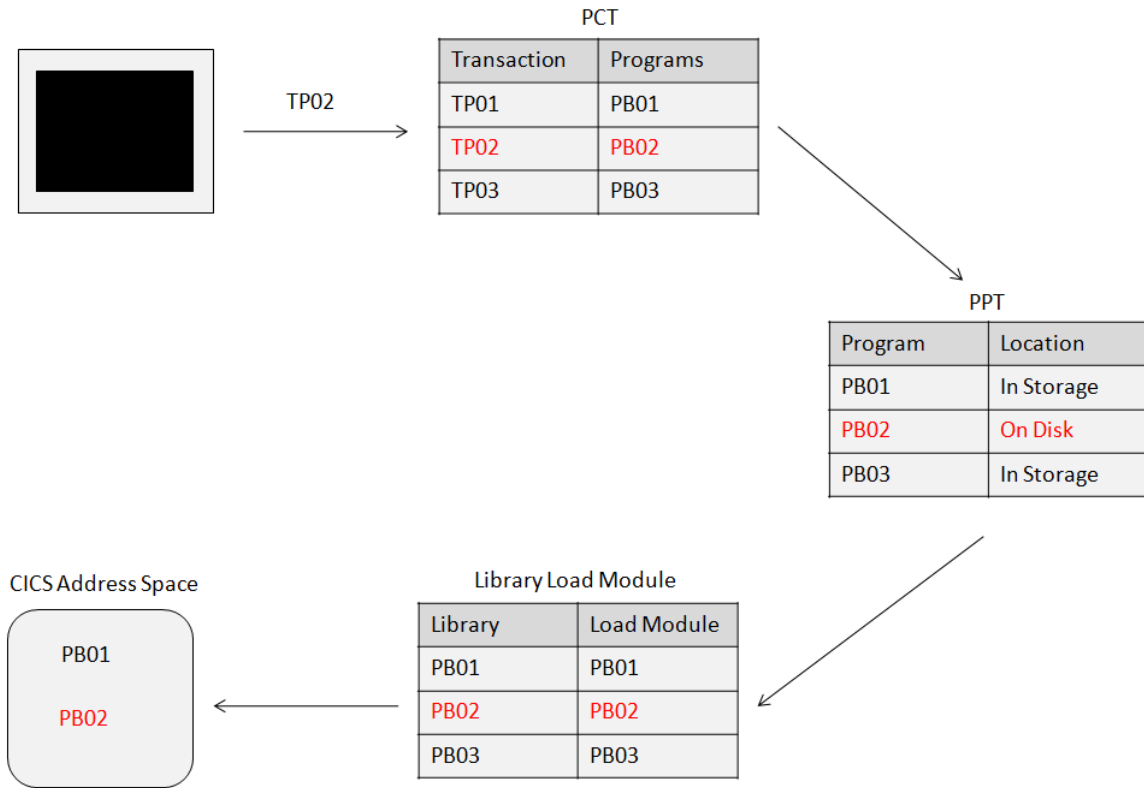
- It contains File names, File type, record length, etc.
- All the files used in a CICS program must be declared in FCT and they are opened and closed by CICS itself.

## Transaction

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When a transaction identifier TP02 is entered on the CICS terminal, first it checks if there is a program associated with this Transaction identifier in the PCT table. If it finds one, then it checks in the PPT table to find the location of the Program to execute it.

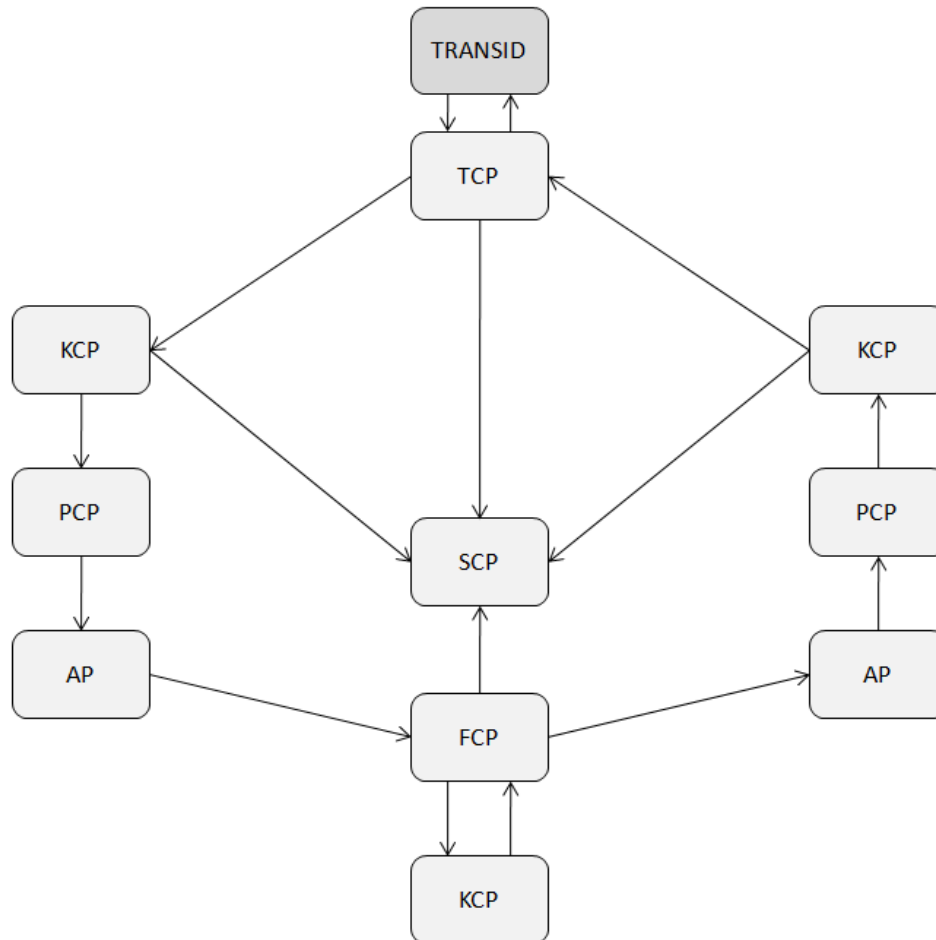
If the program is already available in the memory, it starts executing that particular program; if not, it loads the program to the memory from the secondary storage and then starts executing it.



## Transaction Life Cycle

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The transaction life cycle has the following steps:



### Step 1

The terminal operator initiates the transaction by typing a 1 to 4-character transaction-id and pressing the ENTER key.

### Step 2

The TCP periodically checks all the terminals for input. When a message is received, it does the following:

- Instructs the SCP to create a TIOA.
- Places the message in the TIOA.

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