

Unit 1. Introduction

Overview

- **What is CICS**
- **Why it was developed ?**
- **CICS Concepts**
- **Components Of CICS**
- **CICS Management Functions**
- **CICS Transaction Flow**

Figure: 1-1. Overview

Notes :

CICS

Customer

Information

Control

System

Figure 1.2. CICS

Notes :

CICS was introduced in 1968. It is matured and well established.

CICS has been enhanced with approx 15 major releases.

CICS is a subsystem of MVS.

CICS Applications are Platform Independence and portable.

What is CICS?

- **CICS stands for Customer Information Control Systems.**
- **It is a Database / Data Communication (DB / DC) system developed by IBM.**
- **It is also termed as Online Transaction Processing (OLTP) system.**
- **It acts as a Application / Transaction Server.**
- **It acts as a interface b/w the application program & the Operating system.**

Figure: 1-3. What is CICS?

Notes :

CICS itself is not a DB/DC System unless Applications accompany it. CICS acts as an interface between Application Programs and Operating System as the DB/DC Control System.

CICS is easy to use not only from an Application program point of view, but also from a system Programming point of view. This is one of the reasons why CICS is one of the most widely used DB/DC Control Systems. CICS provide the control and service functions of the Database/Data communication System as a package.

OLTP(Online Transaction Processing System)

Examples:
Money Exchange
Transportation Tickets
Medical services

TRANSACTION = Request for Service

Figure: 1-4. OLTP

Notes:

Earlier most Application programs ran in batch mode. Typically, this meant that they would read an input file of transactions, update a master file and produce printed reports. Users might have to wait several hours or longer for these reports. By the time they received their reports, intervening activity in the business would usually mean they were out of date.

The lengthy turnaround times associated with traditional batch systems were no longer adequate, users typically required accurate, up-to-date information within seconds. This can only be achieved with an on-line information processing system that gives users instant access to data held in files or databases. A system of this type is known as an **Online Transaction Processing (OLTP)** system or **Transaction Server System**

CICS Concept

The primary objective of CICS is to provide control & service functions of the DB / DC system as a package.

CICS is not a DB / DC unless the applications accompany it, because CICS provides only the control environment for the DB / DC system.

CICS is an interface between the application program and the Operating System.

Figure: 1-5 CICS concept

Notes:

CICS is general purpose transaction server.

Transaction: Receive a message from a terminal, Access data from a file or a database and then send a reply back to the terminal.

CICS provides many operating system-like functions.

CICS System Concept

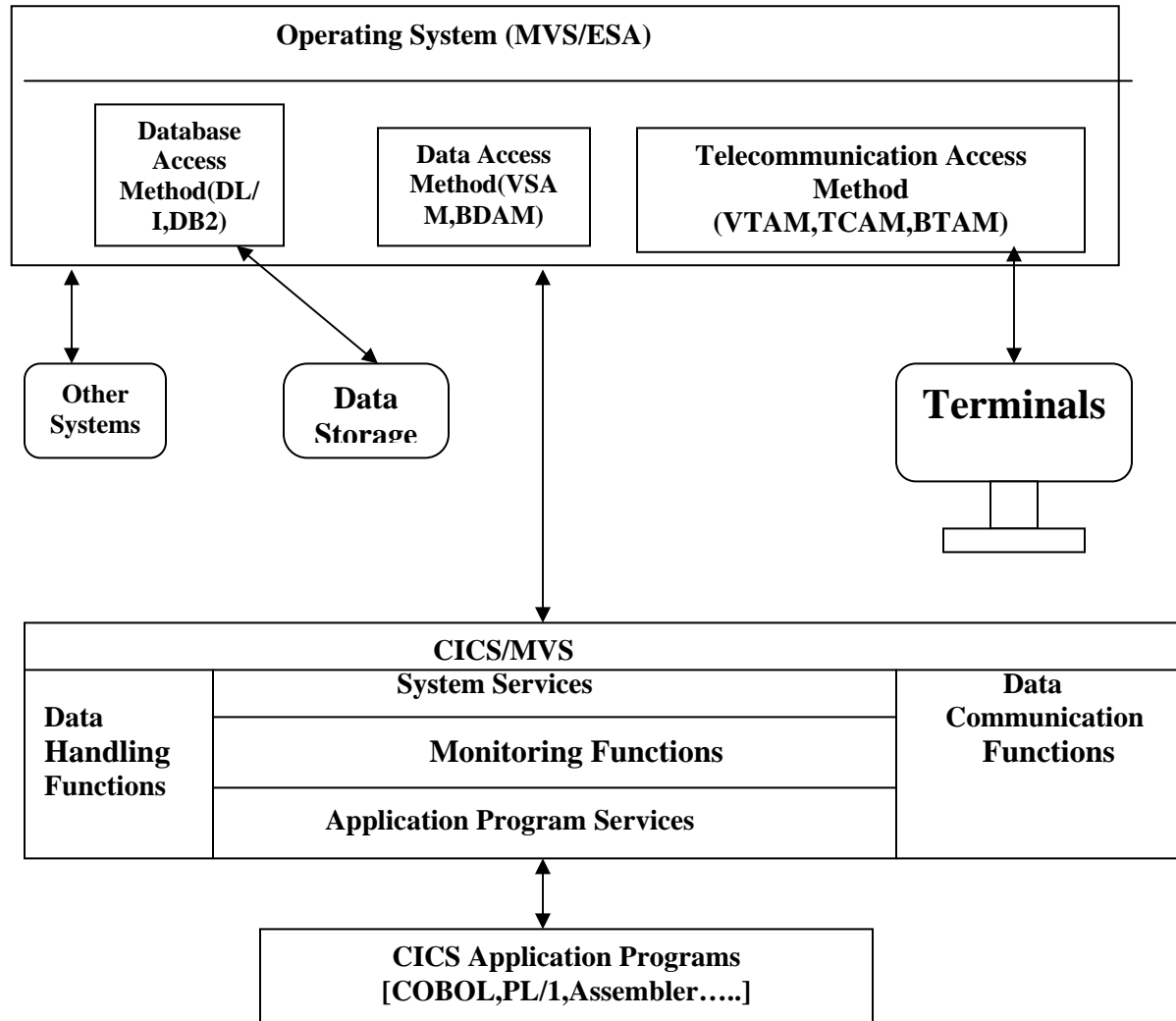


Figure: 1-6 CICS concept

Notes :

Components of CICS

The 5 Major System components of CICS, which performs specialized services, are:

- **Data Communication Functions.**
- **Data Handling Functions**
- **Application program services**
- **System Services**
- **Monitoring Functions**

Figure: 1-7. Components of CICS

Notes:

Data-Communication Functions

- **This component provides an interface between CICS and terminals or other systems.**
- **It acts as an interface to telecommunication access methods like VTAM, TCAM, BTAM, etc.**
- **It frees the application programs from terminal hardware through Basic mapping Support (BMS) thus providing device and format independence.**
- **It provides Multi Region Operation (MRO), through which more than one CICS region in a system can communicate.**
- **Provides Inter System Communication (ISC), through which a CICS region in a system can communicate with other CICS regions systems or other non-CICS regions in other systems or the other non-CICS systems.**

Figure: 1-8. Data-Communication Functions

Notes:

VTAM (Virtual Telecommunication Access Method) is responsible for the flow of message between the Operating System (MVS or VSE) and the network of terminals.

VTAM and CICS run in separate address spaces under the control of Operating System.

VTAM doesn't perform any Application Program activity. CICS doesn't perform any terminal input and output activity, it "commands" VTAM to do it.

The advantage of this separation is that, CICS and Application programs are isolated from changes in the Network.

Data-Handling Functions

- **Provides an interface between CICS and data.**
- **Interface with data access methods such as VSAM and BDAM.**
- **Interfaces with database access methods like DB/2,SQL/DS and DL/I.**
- **Maintain data integrity by controlling simultaneous updates, providing data recovery facilities, etc.**

Figure:1-9. Data-Handling Functions

Notes:

Application Program Services

- **Provides the interface between CICS and Application Programs.**
- **Interface with COBOL, PL/1 and Assembler Programs.**
- **Provides command level translation.**
- **Provides Execution Diagnostic Facility (EDF), Command Interpreter, (CECI), Screen Definition Facility (SDF), Trace and Dump facilities, etc.**

Figure: 1-10. Application Program Services.

Notes :

CICS System supports many different user application programs. Loading and accessing these programs is controlled by this management function.

System Services

Provides an interface between CICS and operating system and carries out functions like loading and releasing of application programs, acquiring and freeing of storage, task scheduling, etc.

Figure: 1-11. System Services.

Notes :

System services provides the functions such as Storage Management to control the storage acquired by the Application programs, Time Management to perform the Transactions in certain amount of time or after an elapsed period of time and Trace Management is useful for Problem Analysis.

Monitoring Functions

Provides the function for monitoring the various events within CICS and the necessary statistics for system fine tuning.

Figure: 1-12. Monitoring Functions.

Notes:

CICS Management Functions

- **Terminal Management**
- **Security Management**
- **Task Management**
- **Program Management**
- **File Management**
- **Queue Management**
- **Recovery Management**
- **System Services**

Storage Management

Time Management

Trace Management

Application Program Interface (API)

Figure: 1-13. CICS Management Functions

Notes:

CICS Management Functions (Contd.1)

Terminal Management

Most CICS applications start when an end user enters data from a terminal. Terminal Management allows your applications to send or receive messages.

Security Management

You can restrict access to transactions and resources.

Task Management

CICS provides its own multi-user or multi-thread environment.

Program Management

A typical CICS system supports many different user application Programs. Loading and accessing these programs is controlled by this Management function.

File Management

Some applications use non-database files. File Management provides access to VSAM and direct access (BDAM) data sets.

Queue Management

Some applications have the requirement to store data into a queue for later retrieval. CICS supports two methods of queuing.

Recovery Management

You may ask CICS to protect selected resources, in the event of unexpected termination of the transaction or the system.

Figure: 1-14. CICS Management Functions.

Notes:

CICS Management Functions (Contd. 2)

System Services

Provides such generalized services as:

- **Storage Management**
Acquiring storage when CICS transactions needs it.
- **Time Management**
A service that allows CICS transactions to request that certain actions be performed at a certain time of day, or after an elapsed period of time.
- **Trace Management**
A service that can be very helpful in problem determination.
- **Application Program Interface (API)**
A 'layer' between application programs and CICS management functions.

Figure: 1-15. CICS Management Functions.

Notes :

CICS Control Programs and Tables

CICS Control Programs	CICS Control Tables
File Control Program(FCP)	File Control Table(FCT)
Journal Control Program(JCP)	Journal Control Table(JCT)
Task Control Program(TCP)	Program Control Table(PCT)
Storage Control Program(SCP)	
Terminal Control Program(TCP)	Terminal Control Table(TCT)
Transient Data Program(TDP)	Destination Control Table(DCT)
Temporary Storage Program(TSP)	Temporary Storage Table(TST)

Figure: 1-16. CICS Control Programs and Tables.

Notes :

CICS Transaction Flow

This section covers :

- **Management Functions and their Tables**
- **Transaction Identifier**
- **Flow between application program and CICS**
- **Difference between Task and Transaction**

Figure: 1-17. CICS Transaction Flow

Notes :

The following pages describe the CICS components and Transaction Flow.

Terminal Control

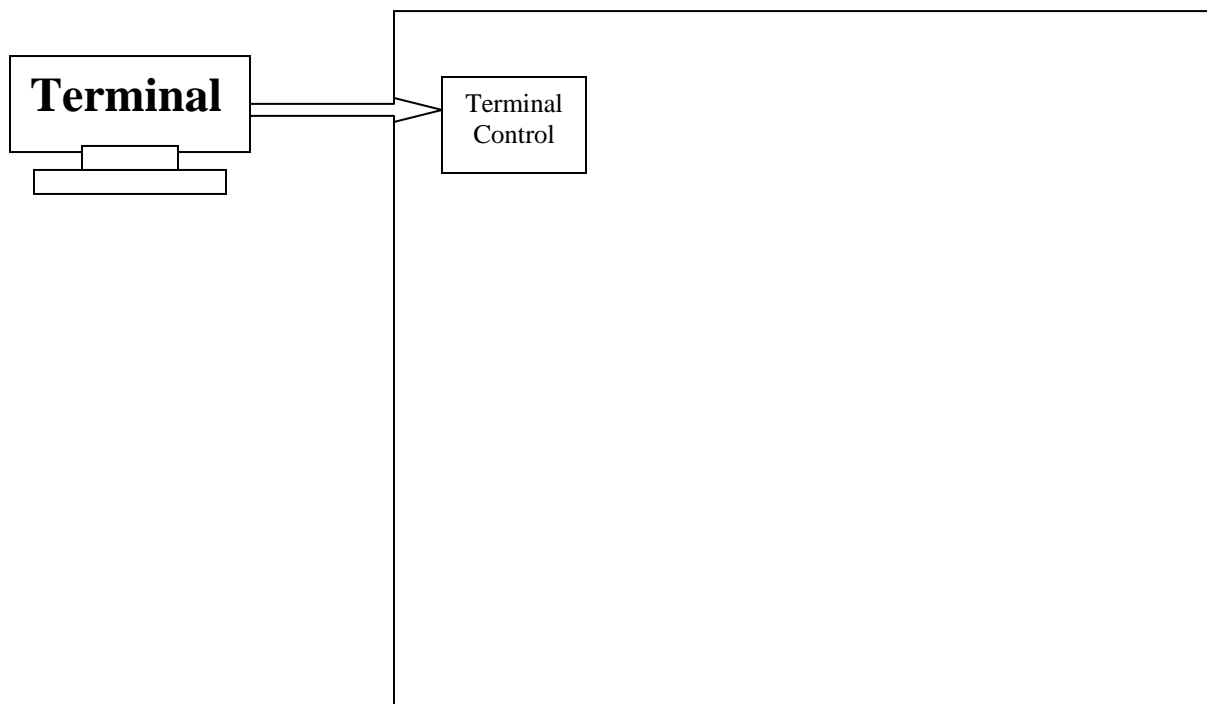


Figure: 1-18. Terminal Control

Notes :

When a end user enters a transaction code and an account number at the terminal and pressed enter key, then VTAM receives the message and passes it to CICS.

Terminal control accepts this input message from VTAM into a terminal input/output area (TIOA).

The Terminal Control Table (TCT) will have an entry for each terminal (TCTTE), which contains definition of the terminal. It also stores operational data such as an indication that terminal is out of service.

Task Control

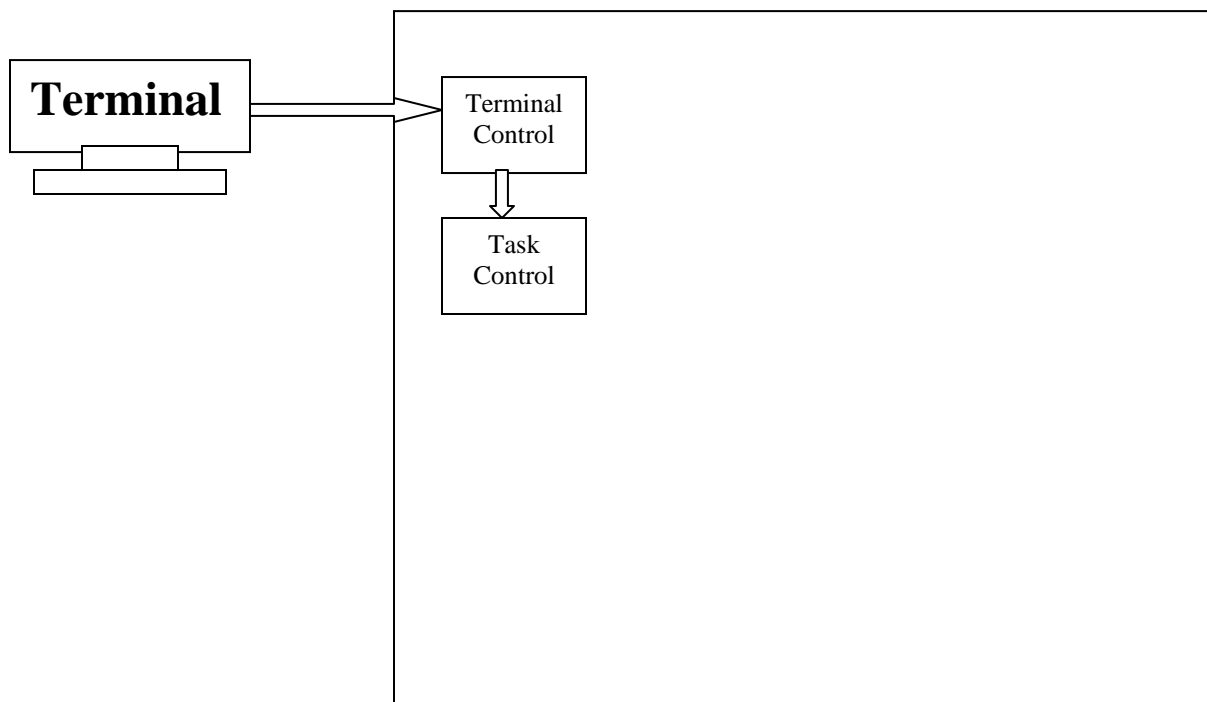


Figure: 1-19. Task Control.

Notes:

All transactions are defined in the Program Control Table (PCT). Task Control validates transactions by checking the program control table, which lists all valid transaction ids and the associated programs, so that control may be transferred to the correct program. If an operator enters a valid transaction code, task control would not find it in the Program Control Table and an error message would be sent to the terminal.

Many tasks can be processed concurrently (multi-tasking). Tasks are not usually processed through to completion in a single, uninterrupted operation. When the currently executing task has to wait e.g. for file i/o, a ready to run waiting task will receive control.

To control each task, task control acquires a task control area (TCA), which is released when the task terminates. This is a CICS control block and is transparent to the application program.

Program Control

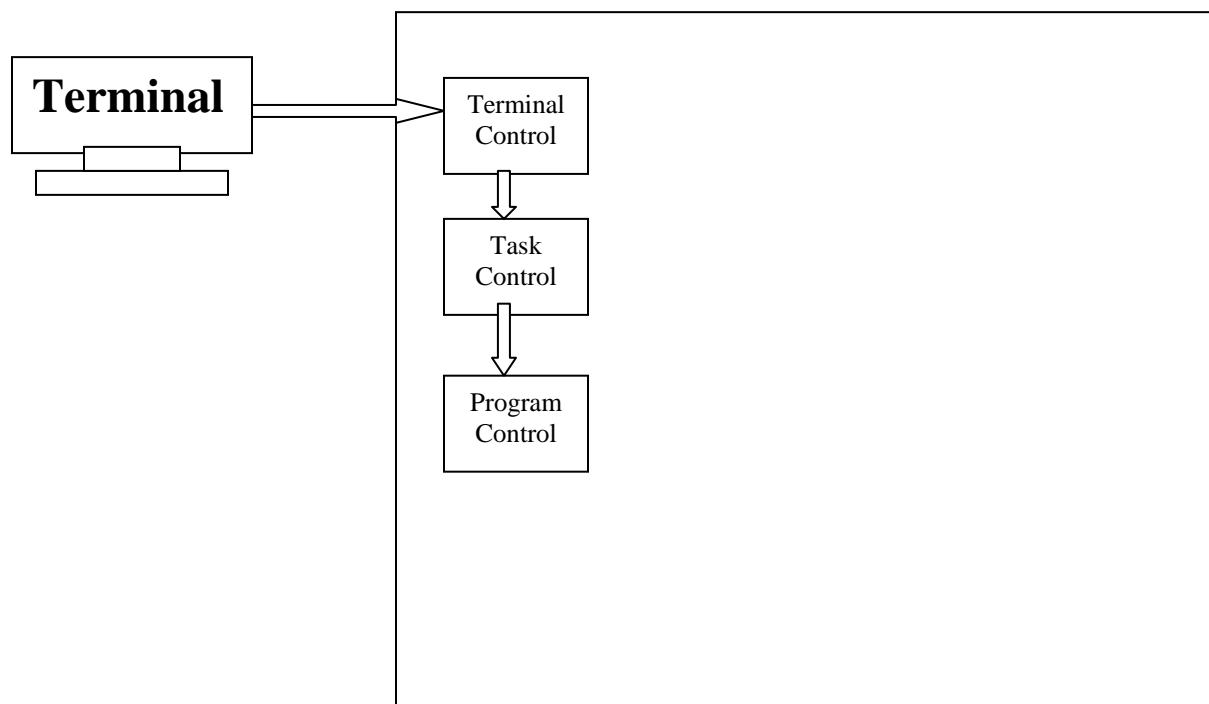


Figure: 1-20. Program Control

Notes:

Task control passes control to program control, which keeps track of the location of all of the application programs.

The Processing Program Table (PPT) contains the program size, program source language and other program information.

When an application program is first loaded its address in the program library is stored in the PPT. This is done so that subsequent loading of the program is faster.

The Processing Program Table also records a program's location in storage when loaded. Generally there is only one copy of a program in storage and many end users can be executing it simultaneously.

User Application Programs

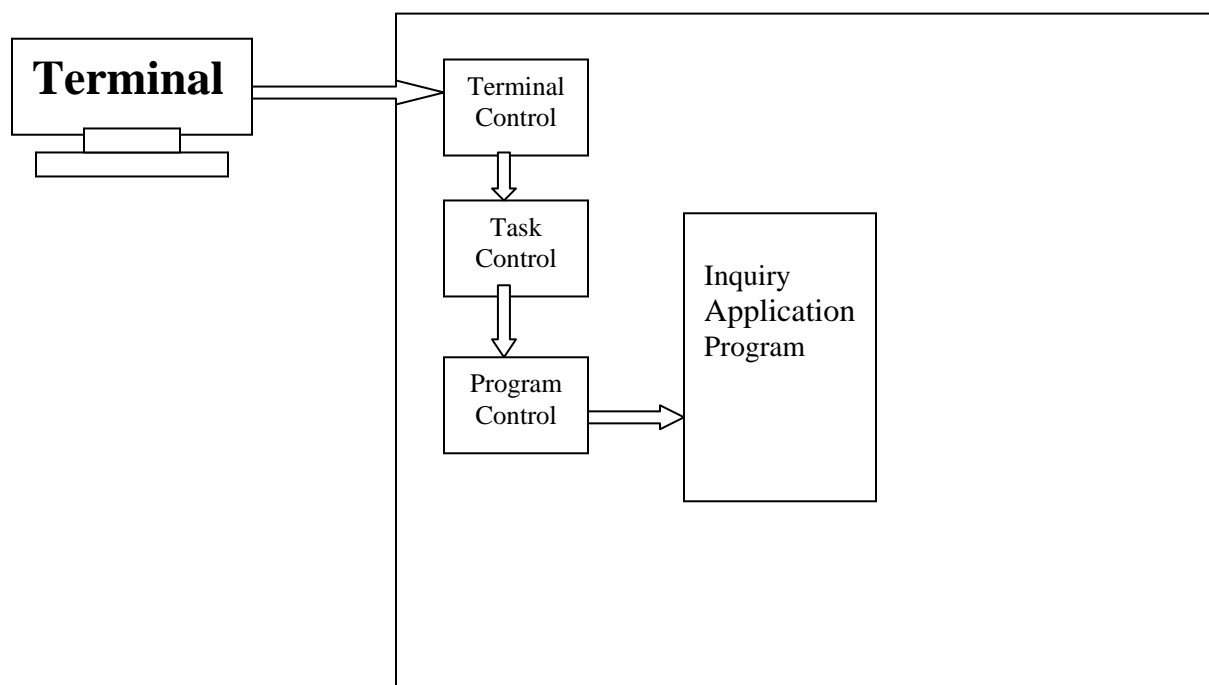


Figure: 1-21. User Application Programs

Notes :

Program control passes control to the application program, in this example to the program that handles the transaction code INQY.

In summary, before control to the application program, CICS has read the input (INQY and account number) into a terminal I/O area, validated the transaction identifier and initiated a task.

The application program may now process the input and issue commands to request services needed in performing the function of the application.

CICS contains some sample programs, transactions and file so that you can run an application immediately after CICS installation. These programs could also be used for demonstrations.

Basic Mapping Support - Input

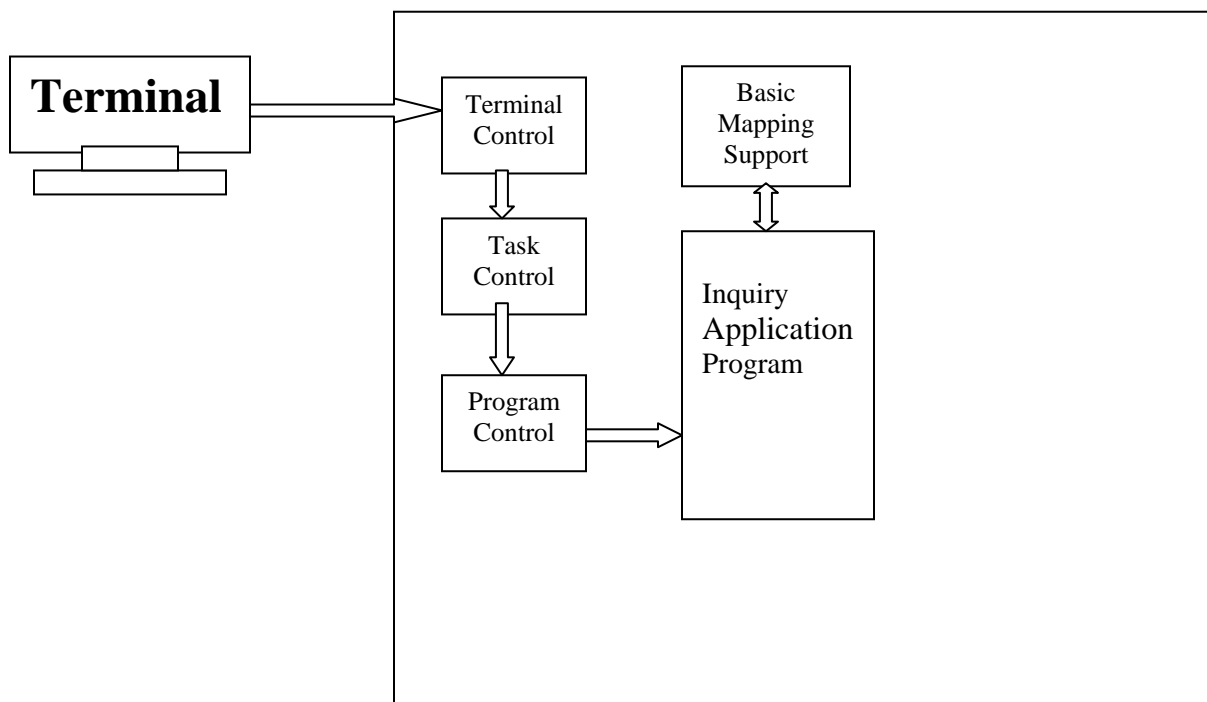


Figure: 1-22. Basic Mapping Support - Input

Notes:

Basic Mapping Support (BMS) simplifies programming for 3270 devices. It consists of supplied BMS modules and user defined screen maps. In the context of this transaction the next step is for the program to issue a BMS command to format and move the account number from the terminal i/o area to a map area in the working storage section of the application program.

BMS provides device independence, which allows an application programmer to communicate with

a terminal without having to understand its hardware control characteristics. BMS also provides format independence, which simplifies the positioning of data on the terminal.

File Control and Data Base Access

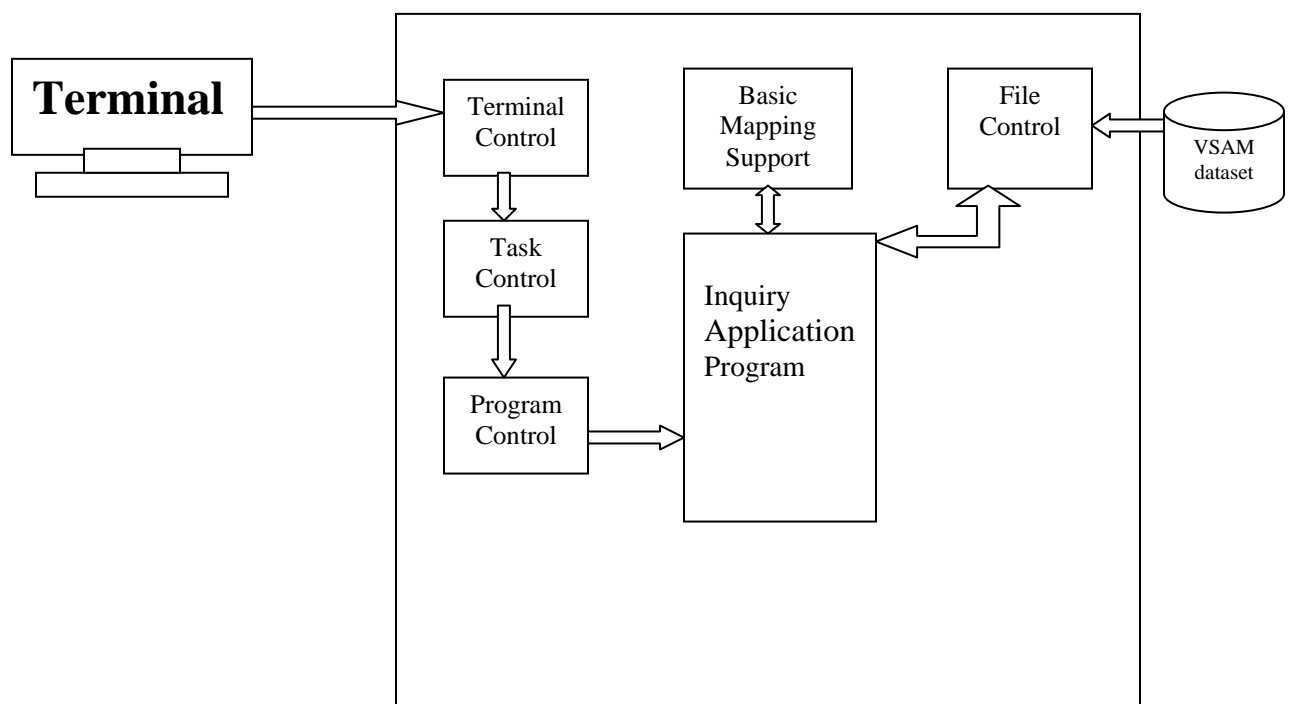


Figure: 1-23. File Control and Database Access

Notes:

The application program issues a command to retrieve a record from a VSAM file.

All VSAM and BDAM files are defined in the File Control Table (FCT).

DB2:

CICS supports access to IBM's relational database product via Structured Query Language (SQL) commands. It is available on numerous platforms.

Journal Control

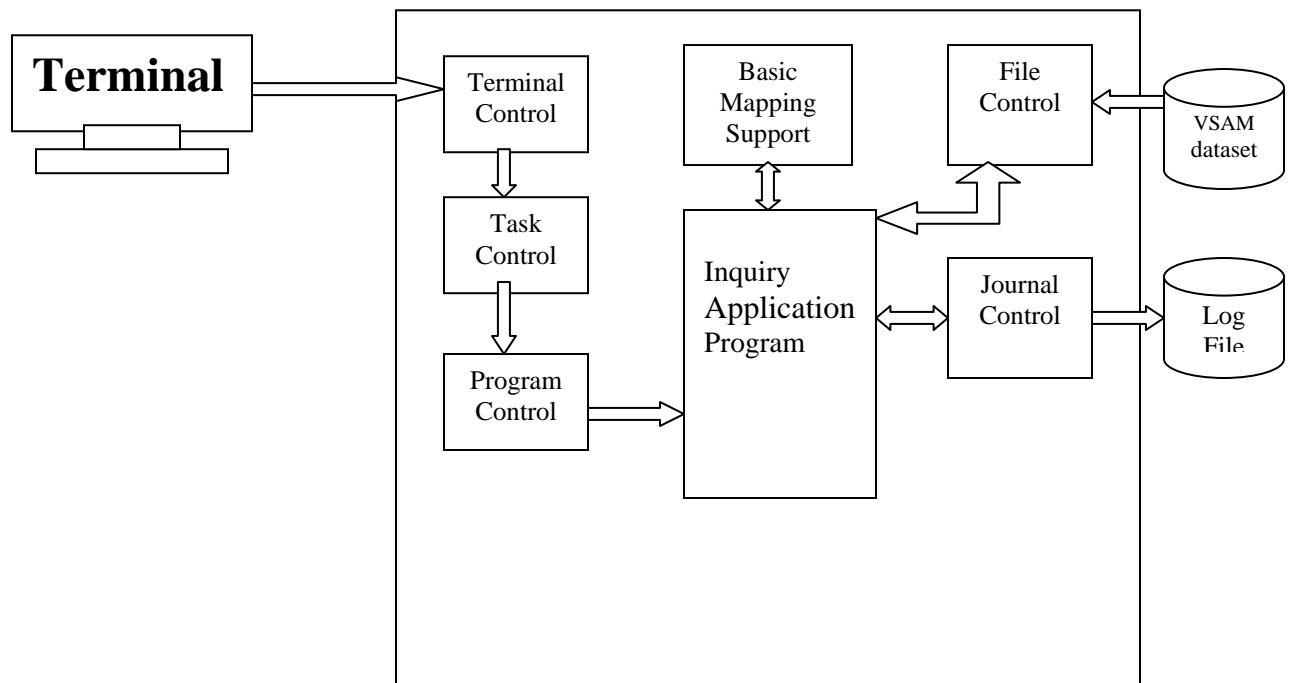


Figure: 1-24. Journal Control

Notes :

If a record in a database or a file is changed then information about this change is automatically logged on the system log through the journal control facility.

This logging will permit recovery in case of failure.

When appropriately defined, journal processing is performed automatically.

The system log is defined in the Journal Control Table (JCT).

In CICS Transaction Server for OS/390 the journal control is performed by the system logger.

Trace Control

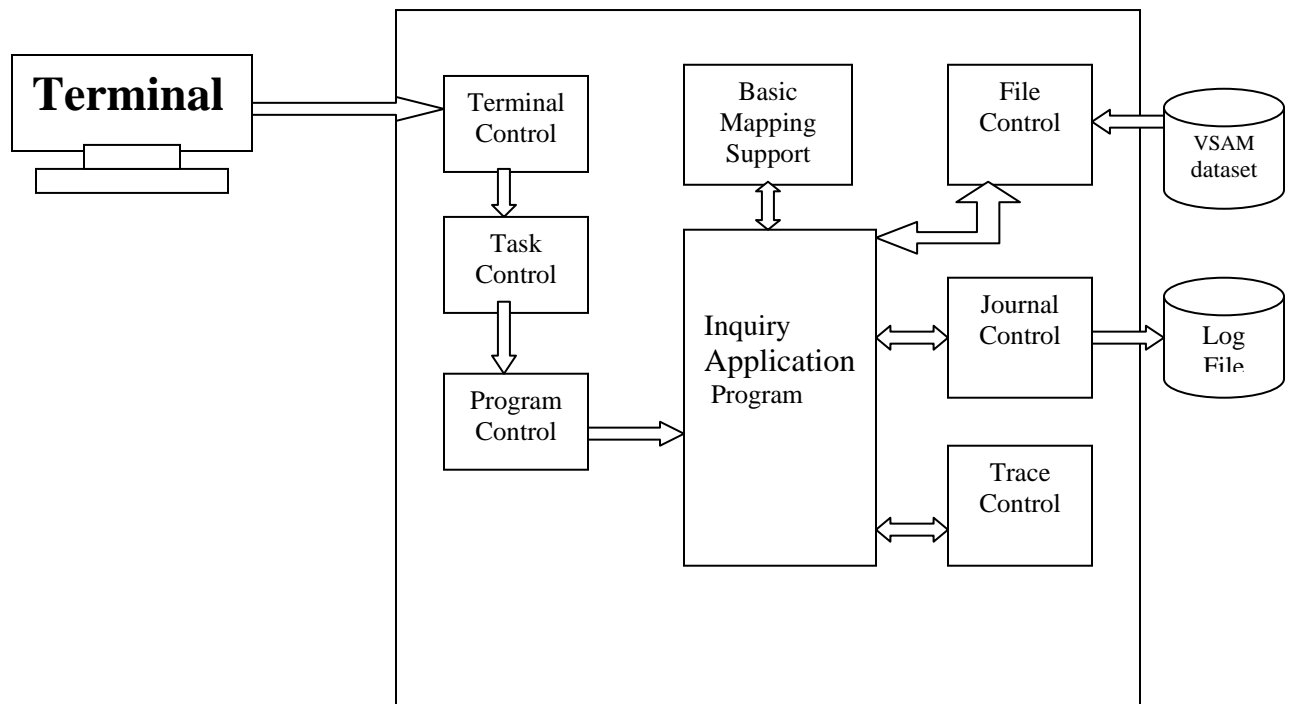


Figure: 1-25. Trace Control

Notes:

Tracing is a CICS debugging aid, which can be used to trace the processing path of an application program. It is invoked for each CICS command executed by the application program.

Trace entries are written to the Trace Table (TRT). Programmers can place trace commands in application programs to help find a well-hidden bug. The trace table resides in storage and appears in CICS dumps. There is an option, auxiliary trace, to have the trace table written out to disk and there is a utility program to selectively print it.

A further facility of CICS, known as the Executive Diagnostic Facility (EDF) enables a programmer to debug a program interactively at a terminal. In this case, the flow of the program can be stopped at a specified points, data areas examined and if necessary altered. Thus the program can be closely monitored and errors eliminated at the terminal.

Dump Control

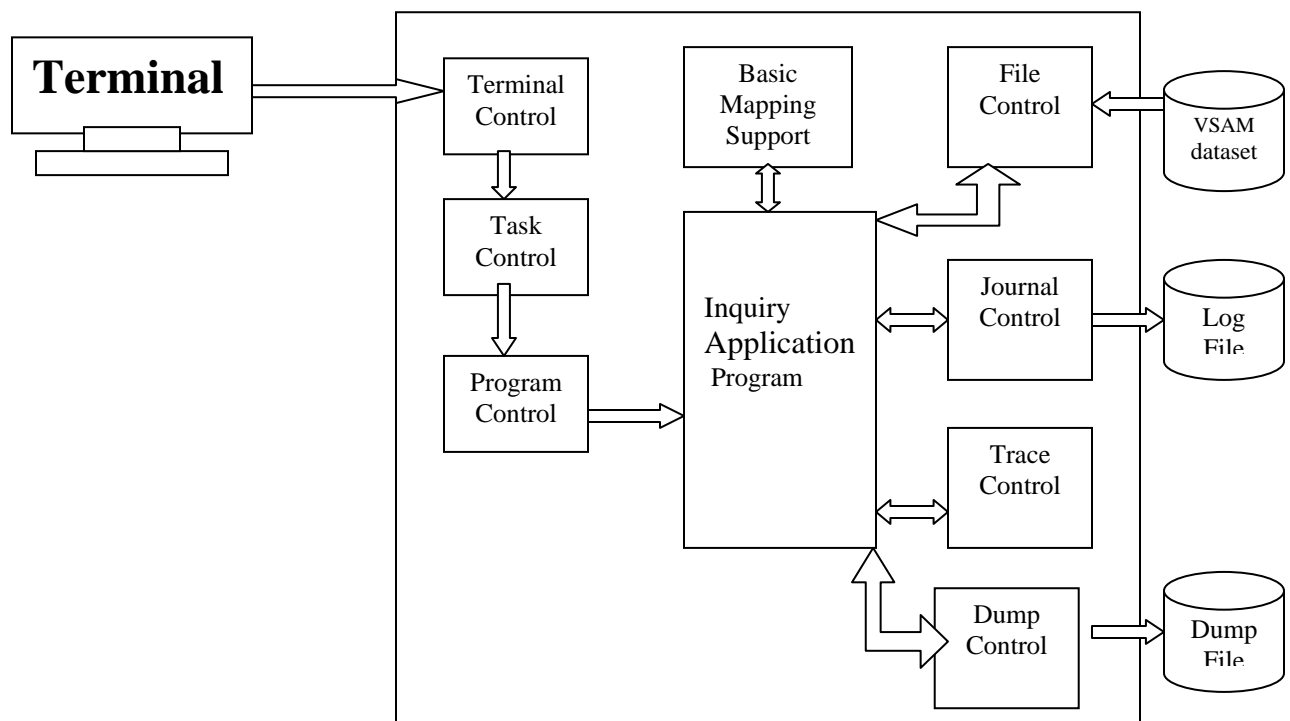


Figure: 1-26. Dump Control

Notes :

If a serious error condition occurs, such as a program check, CICS will abend the task with a task

dump.

This facility can also be invoked by a command in the application program. This causes all task-related storage areas to the dump file.

The dump utility program (DFHDUP) is a batch program that formats and prints the dump file.

Temporary Storage Control

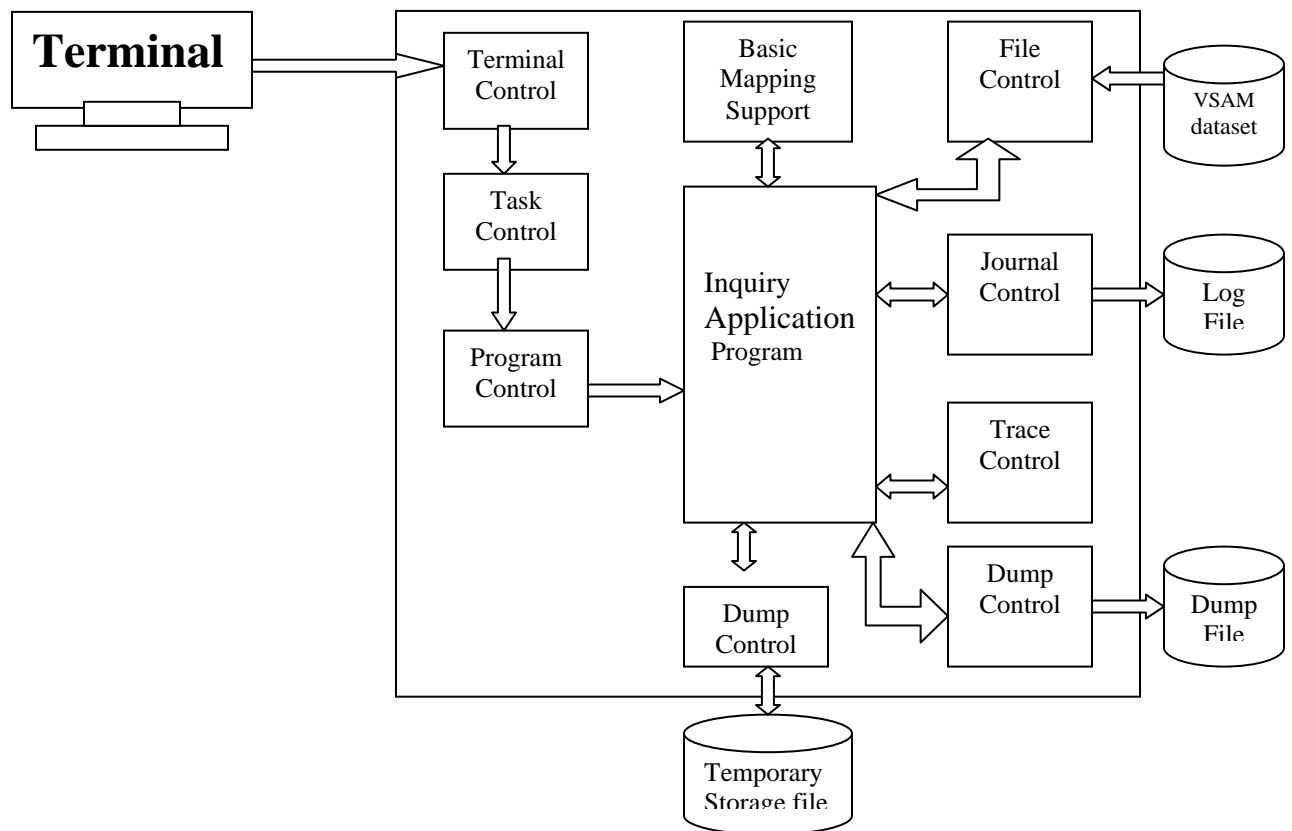


Figure: 1-27. Temporary Storage Control

Notes:

The application program can use CICS commands to write records to a temporary storage queue which can be retrieved later in the same sequence in which they were stored, or directly by entry number.

In a CICS run, all temporary storage records written to main storage are retained in CICS until purged by an application program or CICS is closed down.

If records are written to disk temporary storage then they can be passed from one run of CICS to the next by an appropriate shutdown and start-up of the system.

A temporary Storage Table(TST) is required for recovery purposes.

Transient Data Control

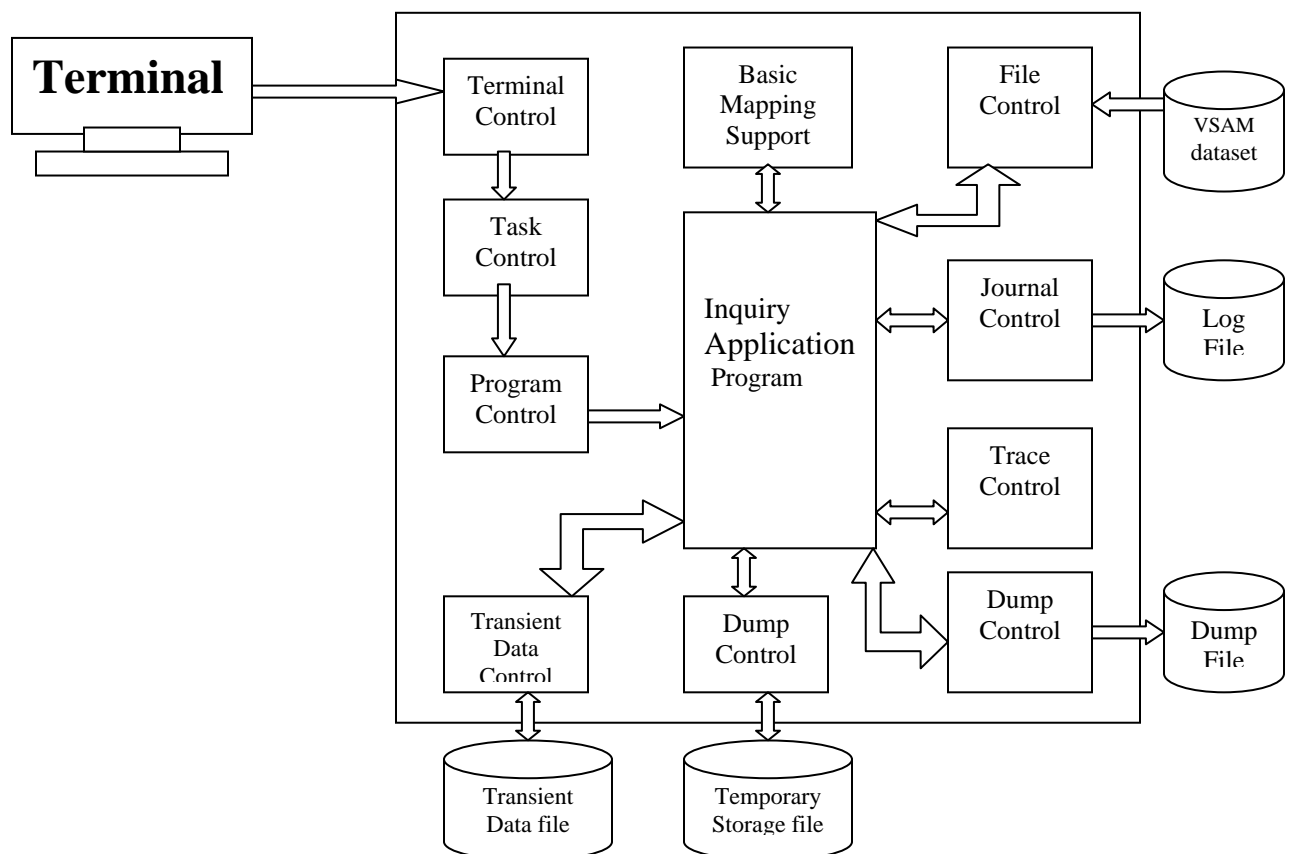


Figure: 1-28. Transient Data Control

Notes:

Transient Data is another CICS queuing facility.

Records are stored in the order that they are written, in a sequential queue for each defined queue, called a Transient Data destination.

The Destination Control Table (DCT) contains the queue definitions.

Basic Mapping Support - Output

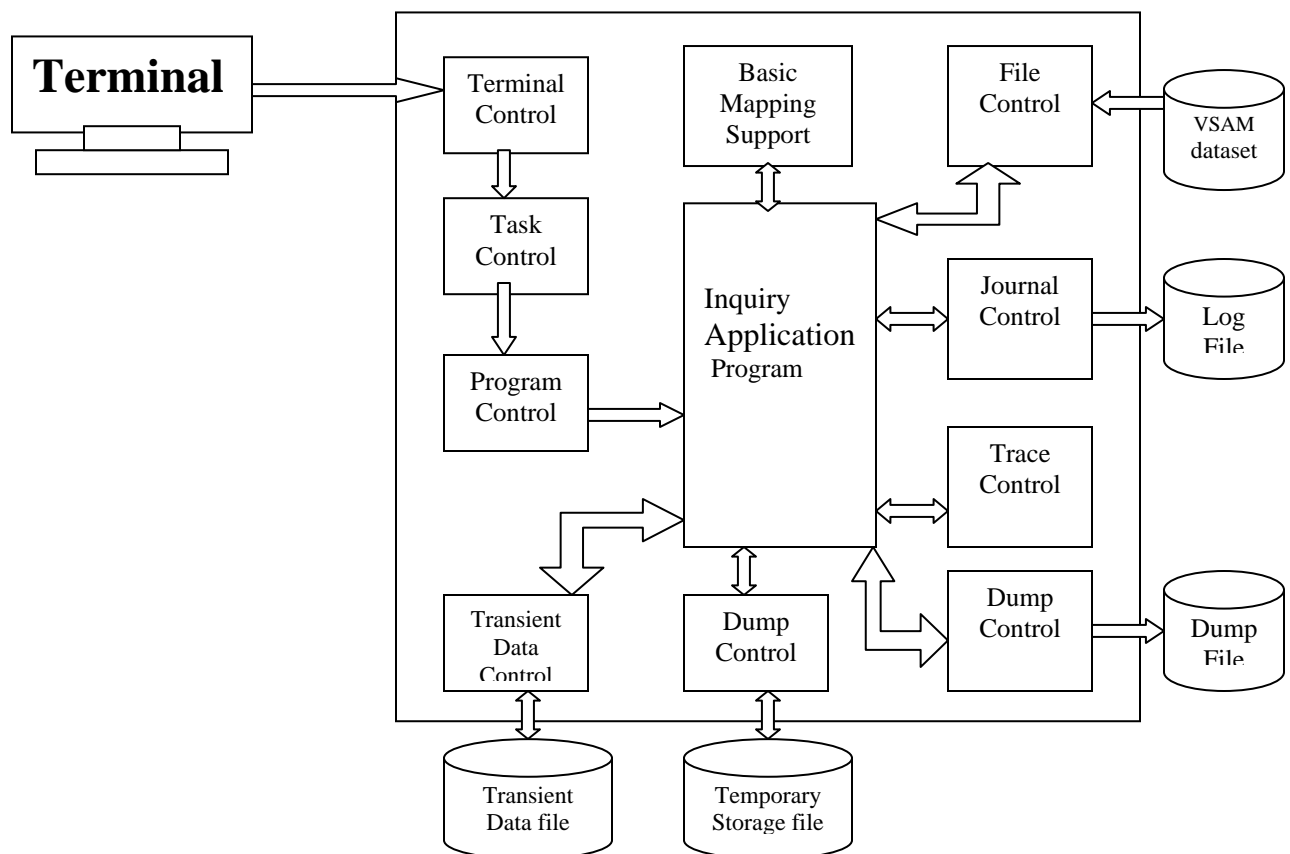


Figure: 1-29. Basic Mapping Support - output

Notes:

A BMS command formats the field for transmission to the terminal.

BMS moves the data from the map area to a terminal I/O area and terminal control will pass it to VTAM for transmission to the terminal.

Ending the Transaction

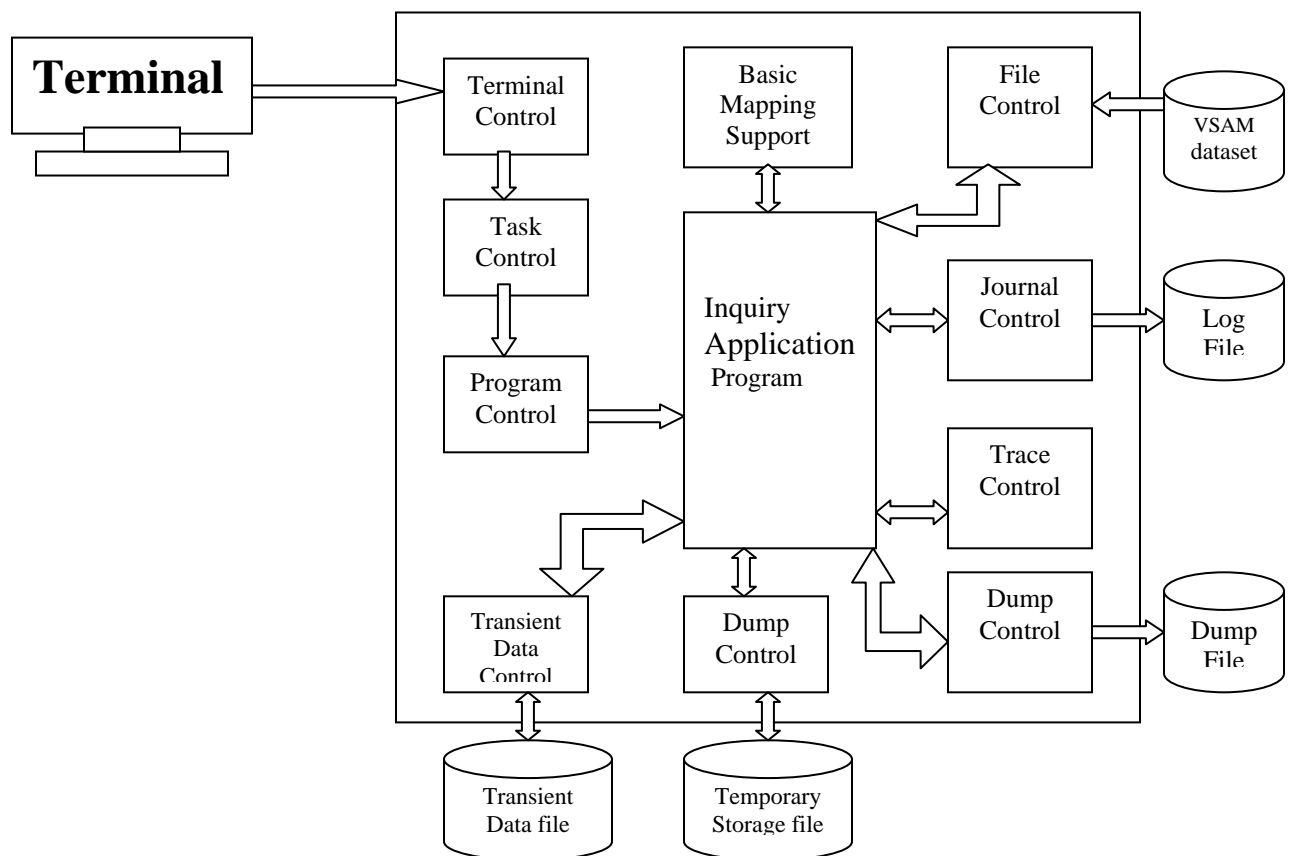


Figure: 1-30. Ending the Transaction

Notes:

The transaction is terminated by issuing the RETURN command.

All storage allocated to this task is released and made available for use by other tasks.

INITIALISATION

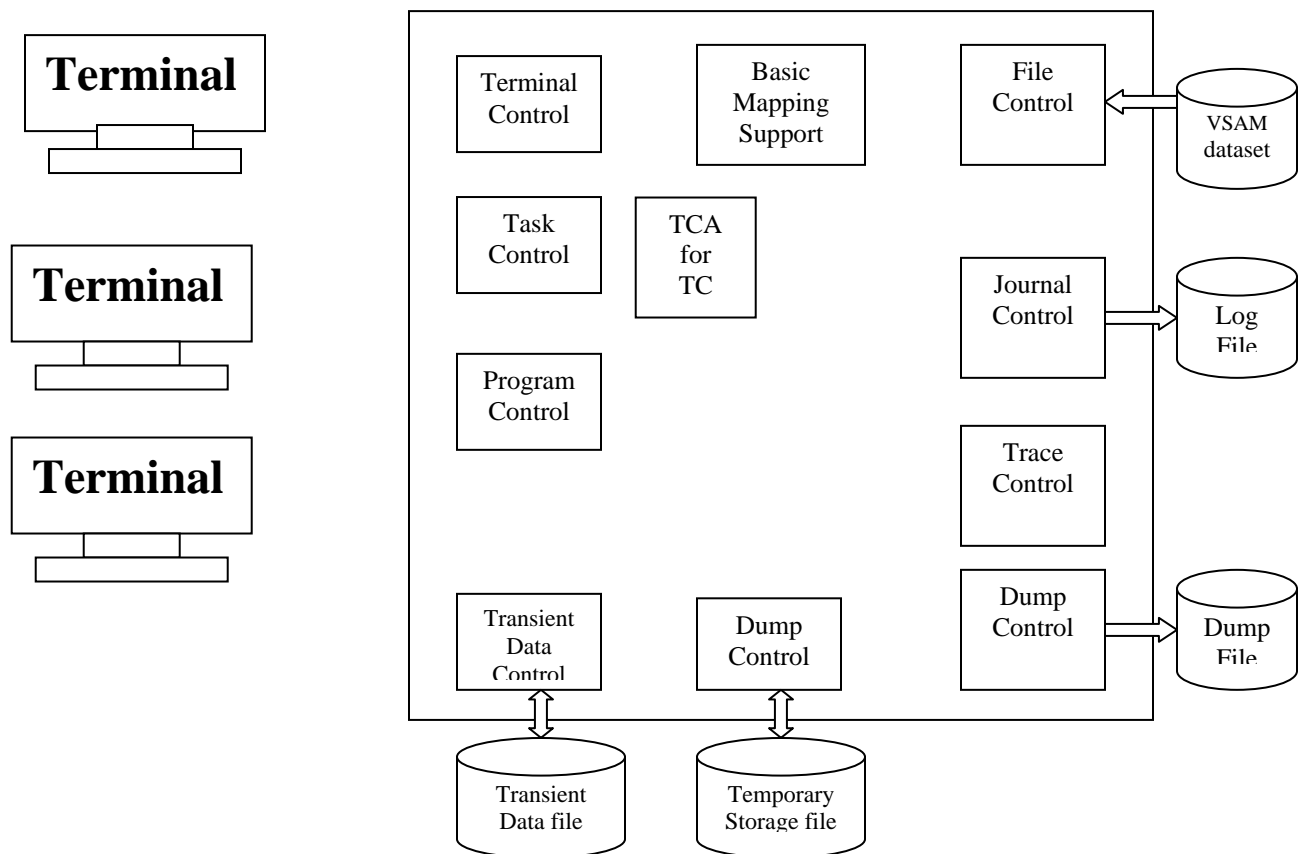


Figure: 1-31. Initialisation
Unit 1. Introduction

Notes:

Most MVS sites run many CICS regions, some for production work and some for testing. The contents of each CICS system is controlled by the **System Initialisation Table**.

During Initialisation – the CICS code is loaded and the CICS tables are loaded.

On completing Initialisation Terminal Control starts to execute as a CICS task.

Initiating CICS Transactions

The different ways of initiating a CICS transaction is :

- **By a transaction identifier entered at the terminal with ENTER key.**
- **By a transaction identifier associated with a terminal for pseudo-conversation.**
- **By a START command which initiates the transaction specified in the parameter.**
- **By Automatic Task Initiation (ATI).**
- **By a 3270-attention identifier, any PF or PA keys could be defined in PCT to initiate a transaction.**

Notes: