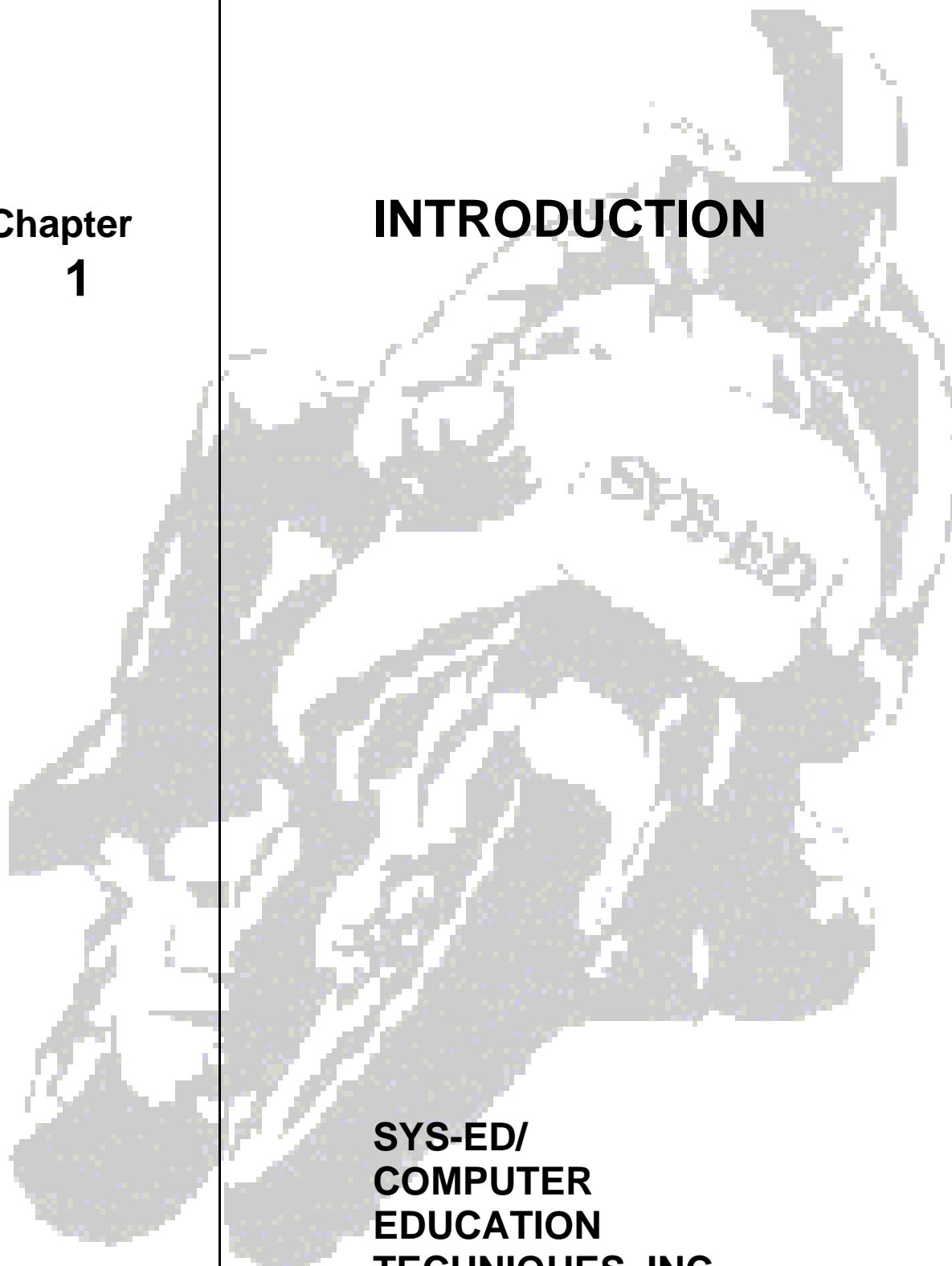


**Chapter
1**

INTRODUCTION



**SYS-ED/
COMPUTER
EDUCATION
TECHNIQUES, INC.**

Objectives

You will learn:

- C Multi tasking features of CICS.
- C The structure of the CICS system and how it relates to the application programmer.
- C CICS storage management.
- C The functions of the various CICS tables.
- C Advanced features of BMS.
- C Debugging aids including CEDF, CEBR, (InterTest or Xpediter).

1 On-line vs Batch Processing

ON-LINE

Random, unpredictable rate of input messages.

Multiple inputs processed concurrently.

Unpredictable demand on system resources.

Files usually accessed directly, although sequential processing possible and sometimes necessary.

Impossible to re-run an on-line transaction in the same environment in which it was originally run. Concept of re-run is inapplicable to on-line system as a whole.

Response time problems in the event of system failure.

Complex recovery problems in the event of system failure.

Performance problems frequently difficult to diagnose and correct.

BATCH

Rate of input under program control.

Inputs processed sequentially.

Predictable load on the system.

Files usually processed sequentially from first record to last.

Batch job can be re-run if inputs are saved.

Response time of minutes, hours, or days.

Recovery usually relatively simple.

Performance problems usually relatively tractable.

2 CICS as an On-Line System

CICS is a general purpose DB/DC system which runs as a single job under the operating system (DOS/VS, DOS/VSE, or MVS).

CICS acts as an interface between user application programs and the operating system and provides macros and commands to request services, such as transmitting data between application programs and terminals.

CICS controls the simultaneous processing of input from many terminals by many application programs and therefore has its own task dispatcher.

In a batch program, I/O and work areas are defined within the program, or are acquired directly from the operating system. In CICS from a dynamic storage area within the CICS partition.

A batch program issues I/O instructions directly to the operating system, whereas a CICS application program issues commands which are implemented by CICS, using operating system I/O macros.

When a batch program waits for an I/O completion, the entire batch partition waits. When a CICS task waits for an I/O completion, other CICS tasks may continue to execute.

3 Multi-Tasking

A task is the basic unit of system activity managed by CICS. The resources of the system, such as storage and CPU cycles, are allocated among all the tasks in the system, using various strategies to optimize throughput and response time.

A task is an invocation of a particular transaction. A given transaction may be executed many times during the course of a day; each execution is a different task.

In general, a task, when given control of the CPU by CICS, executes until it issues a command that requests an I/O operation. While that task is waiting for the I/O wait, CICS gives control of the CPU to another task.

At any point in time, in the CICS partition, there is one task using the CPU, and there may be one, several, or many tasks waiting for I/O completions. When the running task gives up control for an I/O wait, CICS selects one of the waiting tasks whose wait has ended, and gives it control of the CPU.

This process of sharing CPU utilization among all the tasks in the system, so that many tasks execute concurrently, is called multi-tasking.

4 Dynamic Storage Allocation

The CICS partition is divided into three basic components:

1. Operating System storage, the size of which is specified at CICS startup time. This storage is used by the access methods for buffers, I/O blocks, read exclusive lists, etc.
2. The CICS nucleus, CICS system programs and tables, and resident applications programs.
3. The CICS Dynamic Storage Area, used for CICS control blocks, I/O areas, work areas, and non-resident application programs.

This storage is recyclable; when a task frees the storage that it acquired during its lifetime, the storage is available for re-use by other tasks (or the same task) for other purposes (or the same purpose).

Most requests for storage are issued by CICS on behalf of application tasks, but an application task may issue an explicit request for storage. These storage requests are serviced by CICS from the Dynamic Storage Area.

5 CICS Structure and Components

A CICS system contains a number of system programs, or management programs.

These programs implement commands issued by application programs (and by CICS management programs). There is generally a one-to-one correspondence between a CICS function or facility, and a management program, although some functions involve several management programs.

For example, Transient Data Management is implemented by the Transient Data Program, Terminal Management by the Terminal Control Program, etc.

Some system programs do not interface with application programs via commands, but perform such system management functions as system initialization and system shutdown.

6 System Tables

Associated with some of the system or management programs are system tables.

These tables allow the user to define and change the system environment by changing table entries, and/or by executing CICS with a different version of one or more tables.

Some of the more important tables are:

- C Terminal Control Table (TCT), used by Terminal Management.
The TCT contains descriptions of terminals, terminal status, hardware features selected, etc.
- C Program Control Table (PCT), used by Task Management.
Transaction identifiers are defined in the PCT, along with the program which is to be invoked by each transaction identifier.
- C Processing Program Table (PPT), used by Program Management.
All application programs are described in the PPT.
- C The File Control Table (FCT), used by File Management.
All application datasets are described in the FCT as to access method, block size, record size, services supported (such as UPDATE, ADD, etc.), status (open or closed), etc.
- C Destination Control Table (DCT), used by Transient Data Management.
The DCT contains descriptions of all the Transient Data destinations, or queues, used in the system.
- C Journal Control Table (JCT), used by Journal Management.
All the journals used in the system are described in the JCT.

7 Application Programs

Application programs to run under CICS may be written in Assembler Language, COBOL, PL/I, or C.

The interface with CICS may be via commands (command level interface). Macros (macros level interface) are no longer supported.

Application programs must be quasi-reentrant, so that a single copy of the program may require it. In addition, application programs should be fully reentrant, to minimize virtual paging.

All application programs must be defined in the Processing Program Table.

8 Mapsets

A mapset is a part of the Basic Mapping Support facility which is created by the application programmer. It allows screen layouts to be described in symbolic, tabular form and relieves the programmer of many device-dependent considerations.

Mapsets are written using Assembler Language macros and must be described in the PPT.

9 Terminal Management

Terminal Management provides macros and commands which enable application programs to communicate with local and remote terminals, which are defined in the Terminal Control Table (TCT).

The system console may be defined as a terminal.

Terminal Management serves to:

- C Handle polling, code translation, and line/network management, using VTAM.
- C Initiate tasks in response to terminal input, and internal task initiation requests.
- C Handles line and terminal error detection and correction, and provides linkage to user-written Terminal Error Program (TEP) and Node Error Program (NEP).
- C Support terminal simulation, using card reader and line printer.

10 Program Management

Program Management provides commands to enable application programs to:

- C Pass control to each other.
- C Terminate a task normally.
- C Abend a task.
- C Load programs, tables, etc. from the core image/load library.
- C Trap task abends and invoke user-written abend exits.

Program Management provides for:

- C Keeping track of which application programs are in use and where they are located.
- C A high-level language interface so that programs written in COBOL, PL/1, C, and RPG may execute under CICS.
- C Intercepting programs checks so that CICS is not abended by the operating system.
- C Linkage to user-written Program Error Program (PEP) for handling task abends.
- C Invokes Dynamic Transaction Backout (DTB) during task abend.

11 File Management

File Management provides commands to enable application programs to process records on VSAM datasets using standard record and file formats. Files are described in the File Control Table, relieving the programmer of being concerned with the details of file organization and access method.

File Management provides a means for:

- C supporting updates, additions, deletions, direct retrieval, and sequential retrieval.
- C the Indirect Access Facility, which allows one dataset to be an index to another dataset.
- C an interface to DL/1 and DB2.
- C setting up exclusive control of records during update operations, to prevent concurrent updates of the same record.
- C automatic journalizing of before images for backward recovery and after images for forward recovery.

12 Basic Mapping Support

Basic Mapping Support allows screen formats to be described in symbolic form in maps, which are grouped into mapsets.

Basic Mapping Support provides:

- C Commands to enable application programs to send data to and receive data from terminals, referring to symbolic screen formats by map name and mapset name.
- C Device independence and format independence to application program.
- C Commands which the terminal operator may use to retrieve pages in any order.
- C Routing facility which application programs may use to send messages to other terminals, immediately or at some specified time.

13 Temporary Storage Management

Temporary Storage Management provides a work file or scratch pad facility, temporarily storing data for later processing.

Application programs use commands to store or retrieve data under a dynamically created name.

Temporary storage provides automatic journaling of before images of updates, for backward recovery.

A system table entry is not required for a TS Queue Name.

Data can be:

- C Stored or retrieved under a given name by any task.
- C Retrieved directly or sequentially, and can be updated.
- C Stored in main storage or on the temporary storage dataset (VSAM ESDS).

14 Transient Data Management

Transient Data Management provides a generalized queuing, or spooling facility for storage of data for later processing within CICS, or by batch programs.

Data is written to, and read from, destinations, or queues, pre-defined in the Destination Control Table.

Data may only be processed sequentially, and cannot be updated.

Intrapartition Transient Data

Queues may be written to, and read from, within CICS, by any task.

Automatic journaling for recovery.

Automatic task initiation by trigger level.

Extrapartition Transient Data

Each queue defines a separate sequential disk or tape dataset.

A given queue is either input or output, but not both.

Transient Data Management uses the standard sequential access method, so datasets may be created off-line and read into CICS and processed off-line.

15 Time Management

Time Management provides macros and commands to enable application programs to request time-dependent functions, such as:

- C Delays processing for a specified interval, or until a specified time.
- C Signal when a specified interval has elapsed, or a specified time has arrived.
- C Cause a specified task to be initiated after a specified interval, or at a specified time.

Time Management also:

- C Handles system stall detection and runaway task detection.
- C Provides application programs with the current time-of-day.

16 Journal Management

Journal Management provides facilities for the creation and management of special-purpose sequential datasets, on tape or disk, which are defined in the Journal Control Table. Journal Management also provides macros and commands for writing data to specified journals.

Journals are used to collect data for:

- C backward recovery.
- C forward recovery.
- C audit trail.
- C input to batch system.

CICS automatically collects data for backward and forward recovery on Journal 01 (System Log).

An application program may journal additional data to the same or any other journal.

17 Task Management

Task Management creates CICS control blocks which define a task. Task Management controls the allocation of CPU time between contending tasks, according to dispatching priority.

Dispatching priority = Transaction priority + Terminal priority + Operator priority.

Task Management serves to:

- C Initiate tasks on request from terminal management, transient data management, and time management.
- C Implement time-out values specified in the PCT to limit the time a task requires.
- C Wait for a terminal operator to send an input message.
- C Remains in a deadlock condition with one or more tasks.

Task management also provides macros and commands to enable application programs to:

- C Single-thread sections of code.
- C Voluntarily give up control to higher-priority tasks.

18 Storage Management

Storage Management allocates storage on demand by management programs for file I/O areas, terminal I/O areas, CICS control blocks, etc.

Storage Management serves to:

- C Allocate storage on demand by application programs.
- C Free storage re-use when no longer needed.
- C Detect and attempts recovery from damaged storage areas and storage chains.
- C Detect and attempts recovery from the short-on-storage condition.
- C Provide some memory protection.

19 Debugging Aids

The Execution Diagnostic Facility (EDF)

Enables programmers to test command level programs interactively, at the source level, using a 3270 terminal.

Trace Management

Allows an application program to make entries in the Trace Table to record, in chronological sequence, events occurring during execution of the program.

CICS management programs also make trace entries that record the execution of commands by application programs.

Dump Management

Allows an application program to request that selected areas of storage (including program storage) be written to a Dump Dataset for printing as a dump.