CICS Introduction and Overview

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August 13th, 2013 (Tue)
4:30pm – 5:30pm
Session 13347
Agenda

- What is CICS and Who Uses It
- Pseudo Conversational Programming
- CICS Application Services
- CICS Connectivity
- CICS Resource Definitions
- CICS Supplied Transactions
- CICS Web Services
What is CICS?

- CICS is an online transaction processing system.
- Middleware between the operating system and business applications.
- Manages the user interface.
- Retrieves and modifies data.
- Handles the communication.

CICS
Applications
API
Z/OS

Files & Databases

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CICS Customers

- **Banks**
  - Mortgage
  - Account Reconciliations
  - Payroll

- **Brokerage Houses**
  - Stock Trading
  - Trade Clearing
  - Human Resources

- **Insurance Companies**
  - Policy Administration
  - Accounts Receivables
  - Claims Processing
Batch Versus Online Programs

The two ways to process input are batch and online.

- **Batch** requests are saved then processed sequentially.
- After all requests are processed the results are transmitted.
- Used for order entry processing such as warehouse applications.
- **Online** requests are received randomly and processed immediately.
- Results are transmitted as soon as they are available.
- Response time tends to be sub-second.
- Used for applications – such as: Credit Card Authorization.
Transaction Processing Requirements

- Large volume of business transactions to be rapidly and accurately processed
- Multiple users, single/sysplex or distributed
- With potentially:
  - A huge number of users
  - Simultaneous access to data
  - A large volume of data residing in multiple database types
  - Intense security and data integrity controls necessary
- The access to the data is such that:
  - Each user has the perception of being the sole user of the system
  - A set of changes is guaranteed to be logically consistent.
    If a failure occurs, any intermediate results are undone before the system becomes available again
  - A completed set of changes is immediately visible to other users
A Business Transaction

- A transaction has a 4-character id.

- It's a sequence of related operations that performs a function.

- It might perform a single action.
  - Account balance.

- It can also perform a set of operations.
  - Read credit limits.
  - Check if amount of purchase is greater than limit.
  - Subtract funds or deny purchases.
CICS Tasks and Programs

- A task is an instance of a transaction entered by a user.
- When a user types in data and presses the Enter or a Function key, CICS Begins a Task and loads the necessary programs.
- Tasks run concurrently. Therefore, a User can run the same transaction simultaneously.
- CICS multitasks giving fast response times.
- Programs can be loaded once and shared by transactions.
- CICS runs each task individually, briefly giving CPU to each one.
- If a user updates a file or database, the change is immediately available.
Most applications are coded in a pseudo-conversational manner.

Conversational programs run and stay in memory for the duration of the transaction.

All resources are held /locked for this duration

- If a user went to lunch in the middle of a conversational transaction, other users may have to wait.

Pseudo- conversational programs overcome this by terminating when the first response is produced.

- Usually when the 3270 screen is displayed.

This frees up the resource should the user go to lunch.

A transaction is re-started when the user presses the Enter or a Function key.

This involves more difficult program design (but is well worth it).
CICS Application Programs are generally divided into 3 categories.

This allows each component to be invoked/reused by other applications.

The separation will also allow for plug and play component changes when necessary.

A Business Transaction can mix & match program languages and data types.
Application Services

- The API allows programmers to request services using EXEC CICS commands.
- Many programming languages are supported in the CICS environment.
- CICS provides built-in transactions to assist the programmer with development.
  - CEDF / CEDX are the execution diagnostic facility transactions. They provide an interactive debugging facility.
  - CADP / DTCN provide access to the CICS Debug Tool, a Source Level Debugger supplied with LE370.
  - CECI is the command interpreter transaction which allows the prototyping EXEC CICS statements w/o coding a program.
  - CEBR allows a programmer to browse through CICS Temporary Storage or Transient Data Queues.
  - CMAC is the CICS Message and Codes online transaction.
CICS programs look like batch with the insertion of Execute CICS commands.

The CICS commands are used to request Services.

CICS commands must be translated into COBOL prior/during program compilation.
Translation was a step before compile, now it's integrated into the compiler.

The CICS Command is commented out and replaced with valid COBOL statements.

The stub is link-edited with the load module and it is used to find the DFHEIP program.
The program DFHEIP gives control to the management module that will satisfy the request.

The Exec Interface Block (EIB) Copybook contains fields to pass data and receive responses from CICS.

The EIB is Read / Only, the contents should not be modified.
## EIB Fields

<table>
<thead>
<tr>
<th>NAME</th>
<th>COBOL</th>
<th>PL/I</th>
<th>C</th>
<th>ASM</th>
<th>DESCRIPTION</th>
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<tr>
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<td>PIC 9(7) comp-3</td>
<td>FIX DEC(7,0)</td>
<td>char[4]</td>
<td>PL4</td>
<td>TIME IN OHHH.MMSSS FORMAT</td>
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<td>EIBDATE</td>
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<td>DATE IN OCYYDDD FORMAT</td>
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<td>PL4</td>
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<td>PIC X(4)</td>
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<tr>
<td>EIBRSVD1</td>
<td>PIC XX</td>
<td>FIX BIN(15)</td>
<td>signed short</td>
<td>H</td>
<td>RESERVED</td>
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<tr>
<td>EIBCPSON</td>
<td>PIC S9(4) comp</td>
<td>FIX BIN(15)</td>
<td>signed short</td>
<td>H</td>
<td>CURSOR POSITION</td>
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<td>PIC X(4)</td>
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<td>COMMAREA LENGTH</td>
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<td>EIBAUD</td>
<td>PIC X</td>
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<td>ATTENTION IDENTIFIER</td>
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<td>CL8</td>
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<tr>
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<td>EIBRECV</td>
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<td>XFF ATTACH RECEIVED</td>
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<tr>
<td>EIBEOC</td>
<td>PIC X</td>
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<td>char[1]</td>
<td>CL1</td>
<td>XFF EOC RECEIVED</td>
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<tr>
<td>EIBFMH</td>
<td>PIC X</td>
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<td>CL1</td>
<td>XFF FMHS RECEIVED</td>
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<tr>
<td>EIBCOMPL</td>
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<td>CL1</td>
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<td>PIC X</td>
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<td>char[1]</td>
<td>CL1</td>
<td>XFF SIGNAL RECEIVED</td>
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<td>EIBCONF</td>
<td>PIC X</td>
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<td>char[1]</td>
<td>CL1</td>
<td>XFF CONFIRM REQUESTED</td>
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<tr>
<td>EIBERR</td>
<td>PIC X</td>
<td>CHAR(1)</td>
<td>char[1]</td>
<td>CL1</td>
<td>XFF ERROR RECEIVED</td>
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<td>EIBERRCD</td>
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<td>CHAR(4)</td>
<td>char[4]</td>
<td>CL4</td>
<td>ERROR CODE RECEIVED</td>
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<td>PIC X</td>
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<td>char[4]</td>
<td>CL4</td>
<td>XFF SYNC ROLLBACK REQ'D</td>
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<td>CL4</td>
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<td>FIX BIN(31)</td>
<td>signed long</td>
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<td>Additional details for some Responses</td>
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<td>EIBRLDBK</td>
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<td>CHAR(1)</td>
<td>char[4]</td>
<td>CL4</td>
<td>ROLLED BACK</td>
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</tbody>
</table>
A commarea is the older way of passing data between programs.
The maximum size is 32K, if more was needed temporary storage was often used.
Channels and containers are a new way of passing data.
There can be an unlimited number of containers in a channel.
Each container can hold an unlimited amount of data.
CICS Connectivity

- Multi Region Operation (MRO)
- Inter System Communication (ISC)
- External CICS Interface (EXCI)
- External Call / Presentation Interface (ECI / EPI)
- Web Support / Services (TCP/IP)
Communications

- **Transaction Routing**
  - Allows Users from terminals connected in one CICS System to run transactions in another CICS system.

- **Function Shipping**
  - Allows a CICS Transaction in one system to access the resources owned by a connected CICS system.

- **Asynchronous Processing**
  - Allows distributed processing of an application asynchronously, and can be used cross system.

- **Distributed Program Link (DPL)**
  - Allows a program to link to another program in a remotely connected system.

- **External CICS Interface (EXCI)**
  - Enables an MVS Batch Program to call a program in a CICS region.
  - Same as External Call Interface (ECI), but with ECI the call is made from another platform.

- **External Presentation Interface (EPI)**
  - Allows a program running on another platform to emulate a 3270 terminal into CICS.

- **Web Support / Services**
  - Allows applications running on other platforms to communicate using a SOAP / XML message in an HTTP format over TCP/IP with CICS programs.
CICS Resources

- CICS is a table driven product.
- It requires the definition of resources prior to their use.
- These are some of the resources defined to CICS.
CICS System Definitions

- Resource Definitions are descriptions of resource types.
  - Example: The name of a transaction and the first program to execute.

- Resource Definitions provide CICS with the information to recognize and manipulate data appropriately.

- The information in the resource definitions may also contain the properties and interactions between resources.

- If a resource is not defined or defined incorrectly to CICS, it may not be recognized or cause errors and Transaction failures.

- Resource definitions are mostly stored on the CICS System Definition (CSD) File.
Methods for Resource Definition

- **Resource Definition Online (RDO)** – Uses CICS supplied transactions (CEDA, CEDB and CEDC) while a CICS region is running, to make definitions that are stored in the CICS System Definition (CSD) file.

- **DFHCSDUP Offline Utility** – Operates like RDO, but offline through a batch job.

- **Automatic Installation (Autoinstall)** – Works only with user modifications through a definition model. The utility then dynamically creates new definitions based on the model which can prevent the manual creation of large numbers of definitions.

- **System programming** – using the EXEC CICS CREATE command, creates resources that are independent of the CSD.

- **Macro Definition** – using assembler macros, creates definitions and stores them in assembled tables in a program library. The definitions are installed during CICS initialization.
Resource Definition Online (RDO)
The CICS Master Terminal (CEMT) transaction can be used to get information about resources and their definitions. CEMT has four commands and can be used to alter resource definitions that have already been installed in CICS. Only some attributes of a resource may be changed using CEMT, others require complete re-installation.
Access to CICS

- CICS provides access to applications from a variety of sources.
- Client applications can be developed on any platform and in any language.
- CICS can also be used as a client to other applications running on different platforms.
CICS Web Application

Example CICS web applications

CICS on the WEB

Userid: CICSTS31

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CICS Web Services

- Available in the most current releases.
- Described by a WSDL.
- CICS can be a service requester or provider in a SOA environment.
- CICS provides utilities to assist in converting applications into Web Services and accessing Web Services from external providers.
- CICS Supports the current standards for Web Services.
CICS Service Oriented Architecture (SOA)

- Integrated into most current release
- Defined by Web Service Description Language (WSDL)
- CICS role in SOA can be service requestor, service provider or both
- CICS Web Services utility programs
  - Assist in converting existing application into a Web Service
  - Use a Web Service provided by an external provider
- Support for web services standards and technologies
  - WSDL 2.0
  - WS-I Basic Profile 1.1
  - WS-Security
  - WS-Trust
  - WS-Addressing
  - Message Transmission Optimization Mechanism / XML – Binary Optimized Packaging (MTOM/XOP)
**CICS Events Processing**

- An event is anything of significance to an enterprise

- CICS allows users to capture, format and emit business events from CICS

- Events can be sent via HTTP, MQ queue, TS Queue or Start Transaction for further processing

- Events are bound to a CICS system using an event binding editor built into CICS Explorer and Rational Developer for System z with Java (RDz)

- The bindings are enabled using a BUNDLE resource
  - CICS Explorer or Web User Interface (WUI)
  - RDO or CEMT

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CICS Explorer – the new face of CICS
If CICS does not provide the needed functionality there are many tools available from IBM and other vendors to assist in creating and managing an online transaction processing system.

For example IBM provides the following:
- CICS Batch Application Control
- CICS Configuration Manager for z/OS
- CICS Interdependency Analyzer
- CICS Online Transmission Time Optimizer for z/OS
- CICS VSAM Recovery for z/OS
- CICS Performance Analyzer
- CICS Business Events Publisher
- CICS VSAM Transparency
- CICS Deployment Assistant for z/OS
- CICS Service Flow Runtime
- IBM Tivoli OMEGAMON XE for CICS on z/OS
- REXX for CICS Transaction Server for VSE/ESA
- Extensions to the CICS Information Center
CICS - Summary

- CICS is ideal for existing transactional environments and your new ones too..... It provides:
  - Availability, Maintainability, and Scalability
  - Tools for Development, Support and Operation
  - Continues exploitation of new hardware and software technology
  - Plenty of education is available
Some useful IBM Websites

http://www.ibm.com/software/htp/cics/
CICS Product Information

http://publib.boulder.ibm.com/infocenter/cicsts/v4r2/index.jsp
CICS Information Center for CICS Transaction Server

http://www.redbooks.ibm.com/
Download Redbooks

http://www.ibm.com/cics/soap/
SOAP for CICS Information

Lists available training courses and certifications

CICS SupportPacs
<table>
<thead>
<tr>
<th>Title</th>
<th>Redbook Code</th>
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<tbody>
<tr>
<td>Introduction to CICS Dynamic Scripting</td>
<td>SG24-7924-00</td>
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<td>Threadsafe Considerations for CICS</td>
<td>SG24-6351-03</td>
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<td>Extend The CICS Explorer: A Better Way to Manage Your CICS</td>
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<td>Exploring Systems Monitoring for CICS Trans Gateway</td>
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<td>CICS Systems Manager in the WUI as the Principle Management Interface</td>
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</table>
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CA: CICS Concepts & Facilities