CICS
Introduction and Overview

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Monday August 8, 2011  
9:30 am  
Orlando, FL   Session 9627
Abstract

This session provides an introduction to CICS and provides an overview of the product. CICS transaction processing and application server capabilities will be highlighted. It provides the attendee with information regarding important functionality such as Application Development, Storage Management, File Control, DB2 and MQ attach, Security, Two-phase commit, and Dispatching. The attendee also will see how resources are defined and will be introduced to the new face of CICS, the IBM CICS Explorer.
CICS: IBM's best kept secret

30 billion transactions/day, >$300B/week

40 years invested in applications
16,000 customers worldwide

30 million users
950,000 programmers earn their living from CICS

Over 900,000 concurrent users/system

5000 packages from 2000 ISVs
Used by 490 + of IBM's top 500 customers

50,000 CICS licenses
What is a transaction and what should software to manage transactions provide?

A transaction is the fundamental unit of work for which recovery, consistency and concurrency are managed in online processing environment.

For a transaction manager to pass the ACID test it should provide:

Atomicity, Consistency, Isolation and Durability
What else should transaction management software provide?

- Should support major programming languages
- Should provide tools to assist in development
- Should have an API to shield developers
- Should have tools to assist in operations
- Should support major platforms
- Should support major database systems
- Should support major network protocols

- And it should support Web-based applications
So **CICS** is a **Transaction Manager**?

**Customer Information Control System**

also known as ........

- a Transaction Server
- a Transaction Monitor
- an Application Server
So what does CICS actually do?

CICS provides a concurrent program execution environment for multiple end users, who have access to multiple data types.

CICS will manage the operating environment to provide performance, scalability, security and integrity.
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
CICS Provides .......

- Systems Services
  - Storage, Program, Task and Time Control
  - Security, Workload Management
- Communications Services
  - To other CICS's, end-users, the web and other non-CICS programs
  - SNA – TCP/IP
- Data Management Services
  - with Commit
  - with Logging
  - with Recovery
- Application Development Services
  - API
  - Language Tools
  - Debug Support
Does **CICS Run on a System z?**

- Well yes it does .......
  - and on the **UNIX** platforms,
    - AIX, HP-UX, Solaris,
  - and on **Windows**
  - and VSE
  - and **OS/400**
  - and **Linux** (PRPQ 7J0468 on System x)

- **TX Series** for Multi-platforms

- **CICS** also has Gateways, Clients, Connectors and Systems Management.......much much more
CICS - It's really Middleware!
CICS Systems Services - Security

- Strong security facilities are available in the CICS to implement identification, authentication and authorization.

- Uses SAF calls to access External Security Manager.

- Logon/Signon
  - Passwords (8 characters upper/lower/special char)
  - Passphrase (100 character)

- CICS implements techniques to protect
  - Transactions
  - Resources
  - Commands

- Encryption of communication flows
CICS Systems Services - Storage

- Effective use of memory is key to performance
- Supported Virtual Storage, Paging
- Redesigned to ..........
  - Utilize 31-bit addressing
  - Allow data to be put in memory
  - Provides storage protection within a region
  - Exploiting 64-bit addressing
- Storage has been a major evolution allowing for significant transactional growth
Other CICS Systems Services

- Abnormal termination and exception handling
- Interval Control for time initiated events
- Multitasking and subtasking
  - Different TCB's dispatched
  - Priority scheduling
  - Open Transaction Environment (OTE)
  - Threadsafe
  - JVM Server for threadsafe Java programs
  - Pooled JVM for non-threadsafe Java programs
(See CICS TS 4.2 Statement of Direction)
CICS Systems Management

- Operator commands to control the transaction processing environment (e.g. inquire/change trans, trace, purge trans ...)
- CICS Explorer – Web based definition, operation and monitoring
- Resource Definition Online (RDO) provides dynamic definitions
- Dynamic Program Library Management without CICS restart
- Exits and sample code allow for customization
  - TRUES – Task Related User Exits
  - GLUES – Global User Exits
  - URMS – User Replaceable Modules
- Monitoring tools are available to analyze performance and load
  - CICS Statistics Utilities
  - CICS Performance Monitor
  - CICS Performance Analyzer
- CICSPlex SM features provide operational and definitional tools
  - Web based interface (WUI) included with CICS Transaction Server
CICS Communications Services

- SNA - VTAM
  - 3270 Terminals
  - APPC / LU 6.2 sessions
  - CICS or IMS ISC (InterSystem Communication)
  - FEPI – Front End Programming Interface
- MRO – Multiple Region Operation
- XCF / MRO - Cross-system MRO (CTC or Coupling Facility)
- EXCI – External CICS Interface
- TCP/IP
  - TCP/IP Sockets
  - Region to Region IP Connectivity (IPIC)
  - Internet protocols (e.g. HTML, XML, SOAP)
  - Remote Procedure Calls (ONC RPC)
  - IIOP / EJB (Note Statement of Direction TS 4.2)
- WebSphere MQ
CICS Data Services

- Multiple types, multi-access within same transaction

- VSAM (KSDS, ESDS, RRDS)
  and VSAM transparency too….

- Data Base Management Systems (DBMS)
  - DB2
  - IMS DBCTL
  - And many other third party database products

- Transient Data queues (TD queues)
- Temporary Storage (TS)

- Data Tables (> 2GB)

- Data integrity, logging, recovery, backout, restart
CICS Application Development Services

- Command level Application Programming Interface
  XPI, SPI added for Systems Programmers

- Language Support
  (Assembler, COBOL, PL/I, C, C++, Java, REXX)

- Dynamic Scripting with PHP and Groovy support

- Execution Diagnostic Facility (EDF)

- Command Interpreter

- End to end debugger for client and server

- Support for BMS/3270 screens, Web Services, and Atom feeds
**But What Does a CICS Command Look Like?**

- **EXEC CICS LINK**
  - PROGRAM(‘MyProgram’)
  - COMMAREA(MyData)
  - LENGTH(LengthofMyData)

- **EXEC CICS RETURN**

- **EXEC CICS READNEXT**
  - DATASET(‘MENUFILE’)
  - INTO(MASTER-MENU-RECORD)
  - RIDFLD(MENU-KEY)
  - LENGTH(OPTION-LENGTH)
  - RESP(CICS-RESPONSE)

- **EXEC CICS WRITEQ TD**
  - QUEUE(‘CSSL’)
  - FROM(IDMSG)
  - LENGTH(IDMSGLN)
  - RESP(RESPVAL)

- **EXEC CICS DOCUMENT CREATE**
  - DOCTOKEN(Atoken)
  - TEXT(AppPgmCA)
  - LENGTH(Input_data_len)
  - NOHANDLE

- **EXEC CICS WEB SEND**
  - DOCTOKEN(Atoken)
  - STATUSCODE(StatusCode)
  - STATUSTEXT(StatusText)
  - LENGTH(StatusLen)
  - CLNTCODEPAGE(‘819’)
  - NOHANDLE

- **EXEC CICS GET**
  - CONTAINER(MsgInput)
  - INTOCCSID(UTF8-CCID)
  - SET(Msg-Ptr)
  - FLENGTH(Msg-Length)
**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
CICS – One or Many CICS Regions?

- CICS can run in one single region
- CICS can run as several independent regions on a single system or across multiple systems
- CICS can run as several interconnected regions on multiple images on a single system or across several systems
- Sysplex - z/OS
- CICSPlex – a group of CICS regions
- CICSPLEX SM – CICSPlex Systems Manager
CICS – What do a call a bunch of regions?

For manageability and recoverability CICS regions in a CICSp Plex are often segregated by function:

- TOR – Terminal Owning Region
- WOR – Web Owning Region
- ROR – Remote Owning Region
- AOR – Application Owning Region
- FOR – File Owning Region
- DOR – Data Owning Region
- QOR – Queue Owning Regions
CICS – How Does Your System Grow?

- ISC and MRO
  - InterSystems Communication - system to system
  - Multi-Region Operation - region to region
  - XCF/MRO – Cross System Coupling Facility MRO
  - IPIC – IP InterCommunications

- Multi-platform

- Clients and Gateways

- No single points of failure

- Systems Management

- Workload Balancing
Communicating among CICSs can be using memory, SNA or TCP/IP
CICS e-business options

A pragmatic approach to implementing e-business solutions
CICS Transaction Gateway (TG) and the Universal Client (UC)

- Enables client applications to invoke services in CICS

- Gives users at Web browsers access to business critical applications running on CICS servers

- Supported on multiple platforms:
  - Windows (XP, Vista, Windows 7)
  - Linux
  - HP-UX
  - z/OS
  - AIX
  - Sun Solaris

- Client Interfaces
  - MQ client - WebSphere MQ queues
  - External Presentation Interface (EPI) – “3270 Screen Based”
  - External Call Interface (ECI) - “Call and Return with Data”
    “Remote Procedure Call”
CICS Transaction Gateway

Support for IBM JEE and JCA connectors

Any platform that can run WebSphere and CTG
CICS Client Interfaces

CICS Application

3270 Presentation Logic

Program Link

Business Logic

EPI
External PRESENTATION Interface

Intelligent Workstation or other CPU

ECI
External CALL Interface

Intelligent Workstation or other CPU
**CICS access with Java**

CICS Client and Gateway classes
- Used by Java program to run a CICS transaction
- ECI, EPI calls available

JCICS Classes
- Allow CICS function execution for Java programs

Connection to CICS can be by
- CTG, WebSphere AS, either or both
- Program calls can be created by program development workbenches
CICS 3270 Bridge

- Rapid enablement of 3270 Terminal Transactions
- Allows 3270 terminal based transactions to run with map recompile
- Utilities provided to recover old maps
- CICS interprets HTML/XML flows, formats as if it came from 3270
- Allows new web applications to be written using CICS skills
- Linkable bridge allows EXCI invocation of 3270 terminal based trans
- Can be sysplex enabled
CICS Web Support

- Gives CICS applications direct access to web browser
- CICS interprets HTTP flows and executes transactions
- Allows new web applications to be written using CICS skills
- Secure Socket Layer (SSL) support using up to 256 bit encryption
- Certificates mapped to MVS USERID
- Mixed case password and passphrase support
- Can be sysplex enabled
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)
High Volume and High Availability

CICS Configuration

WebSphere → TCP/IP → Port Sharing → CTG → EXCI → CICS → DB2

Port Sharing

MVS Work Load Manager

Work Load Agent

Share in Orlando 2011
**CICS Tools**

- 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 CICS Information

http://www.SHARE.org

SHARE Website – Volunteer Center > Projects/Programs
then select Data Program – CICS Project

You’ll find information on:
- CICS Announcements
- CICS Tools
- CICS User Groups
- CICS-L Discussion group (listserv)
- CICS Presentations made at Share
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
Introduction to CICS Dynamic Scripting  
Redbook, published March 28, 2011  

Threadsafe Considerations for CICS  
Redbook, published March 14, 2011  

Extend The CICS Explorer: A Better Way to Manage Your CICS  
Redbook, published February 23, 2010  

Java Application Development for CICS  
Redbook, published February 24, 2009  

Implementing CICS Web Services  
Redbook, published November 12, 2008  

Exploring Systems Monitoring for CICS Trans Gateway  
Redbook, published April 3, 2008  

CICS Web Services Workload Management and Availability  
Redbook published March 31, 2008  

CICS Systems Manager in the WUI as the Principle Management Interface  
Redbook, published November 16 2007  

CICS Redbooks  
www.redbooks.ibm.com  

SG24-7924-00  
SG24-6351-03  
SG24-7819-00  
SG24-5275-03  
SG24-7657-00  
SG24-7562-00  
SG24-7141-01  
SG24-6793-01
“I never said most of the things I said.”

“If you ask me anything I don't know, I'm not going to answer."  

-- Yogi Berra