

# CICS Introduction and Overview

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Circle Software Incorporated

August 13th, 2013 (Tue)

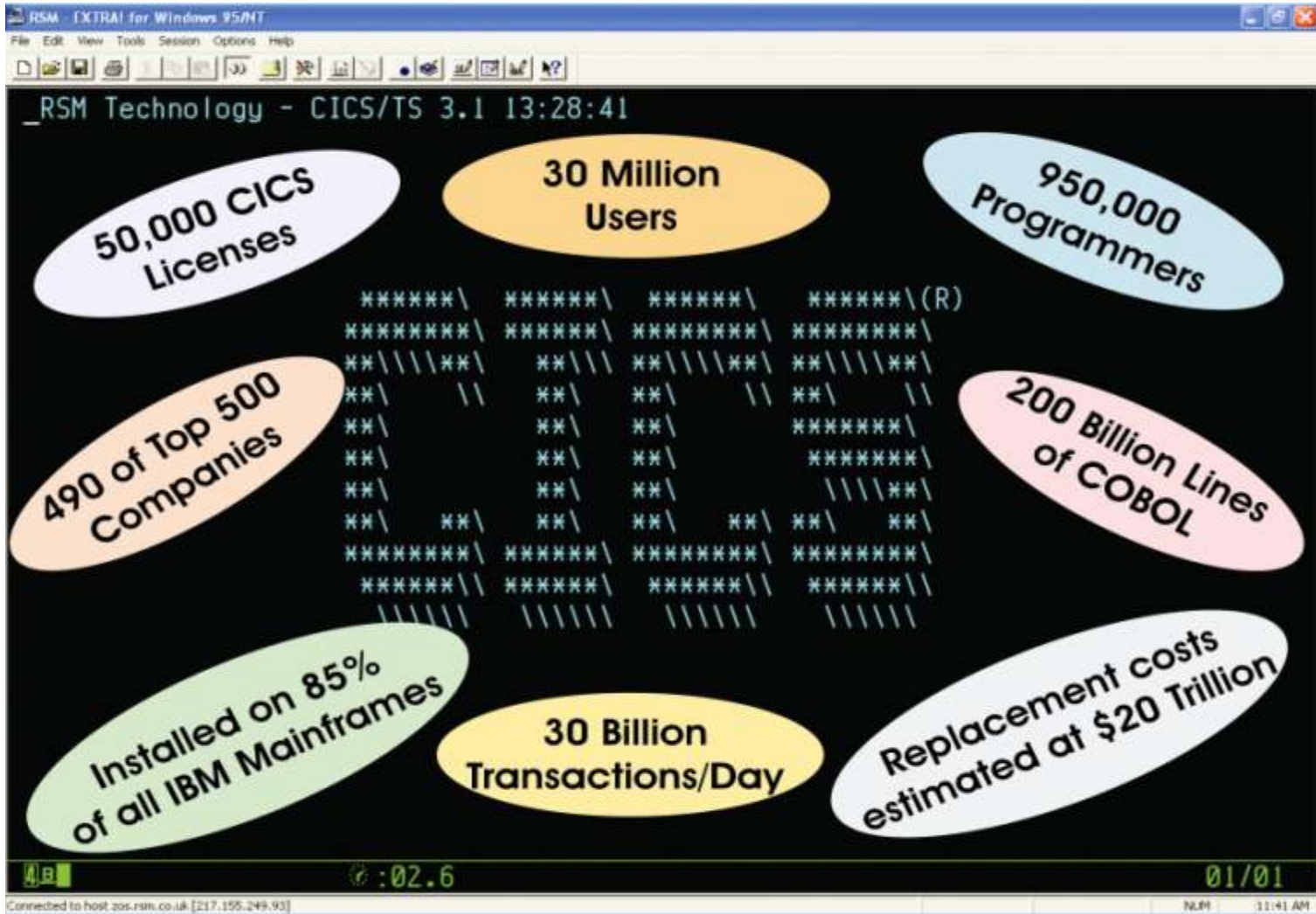
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**Session 13347**

# 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

# CICS The Product



**50,000 CICS Licenses**

**30 Million Users**

**950,000 Programmers**

**490 of Top 500 Companies**

**200 Billion Lines of COBOL**

**Installed on 85% of all IBM Mainframes**

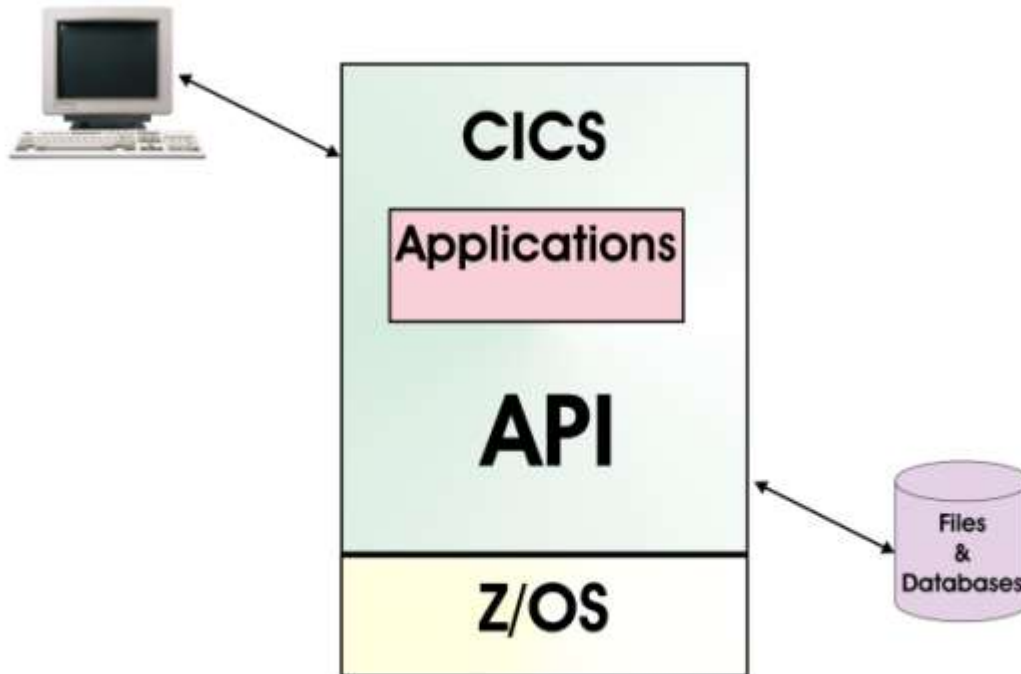
**30 Billion Transactions/Day**

**Replacement costs estimated at \$20 Trillion**

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# 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 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.

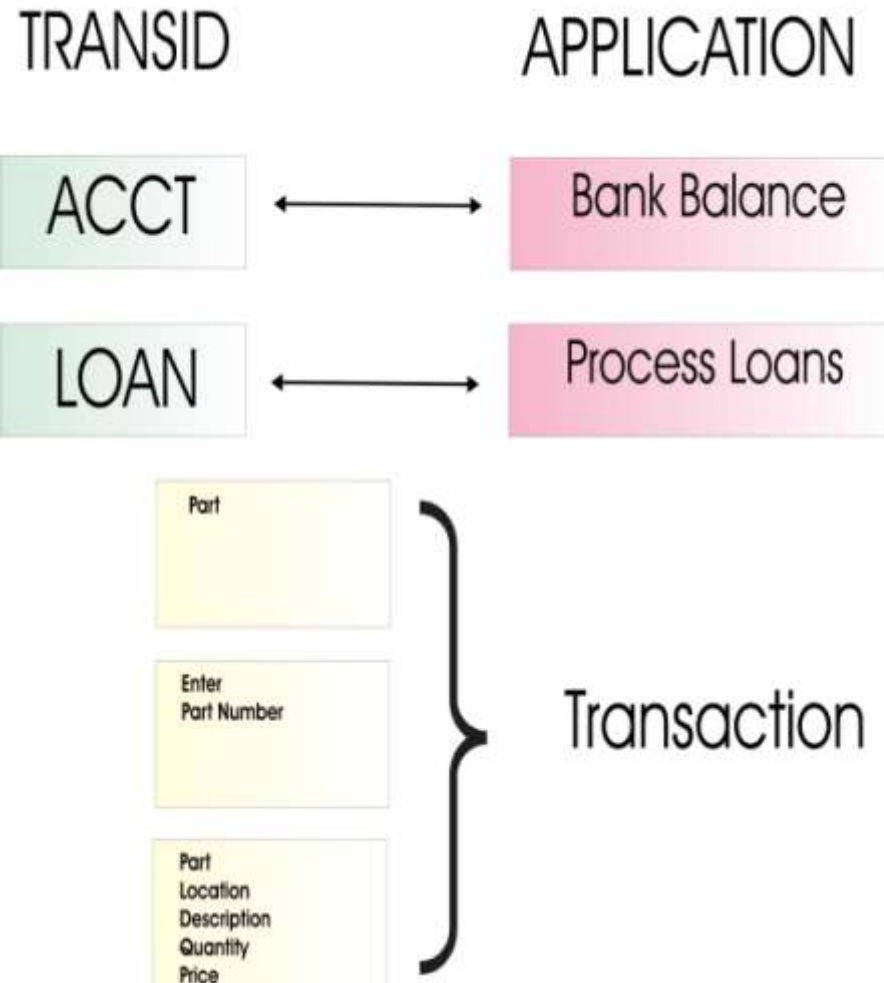
# Transaction Processing Requirements

- ❖ 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



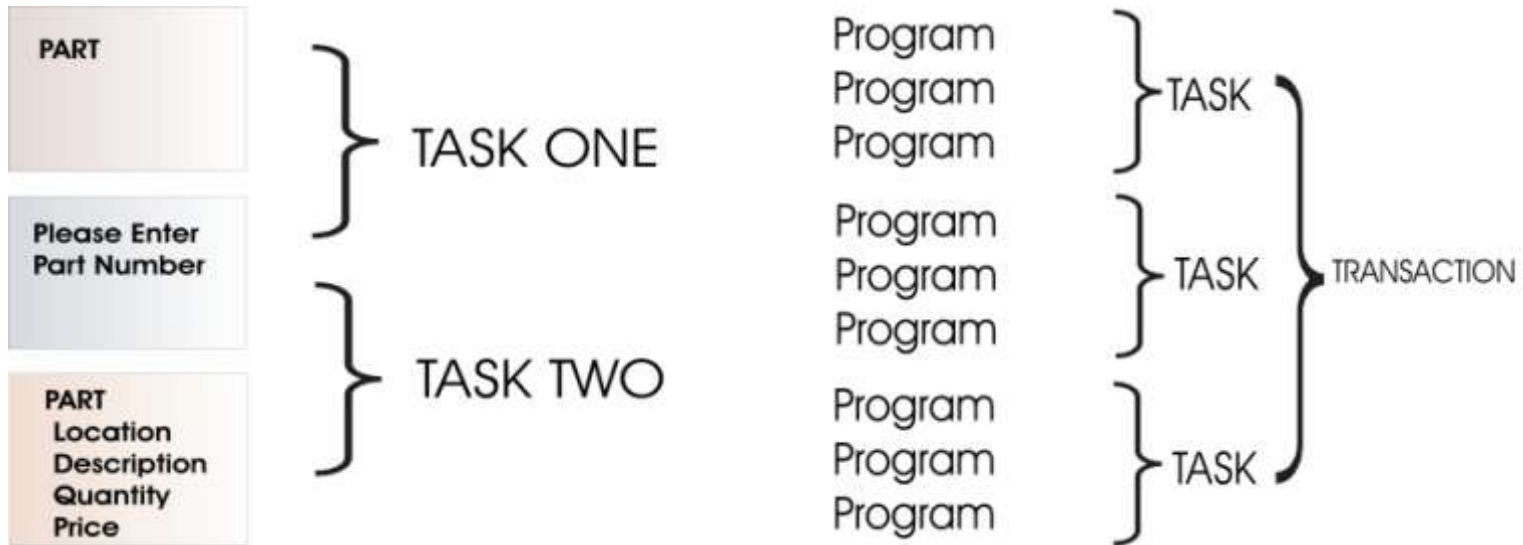
# A Business Transaction

- ❖ 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.



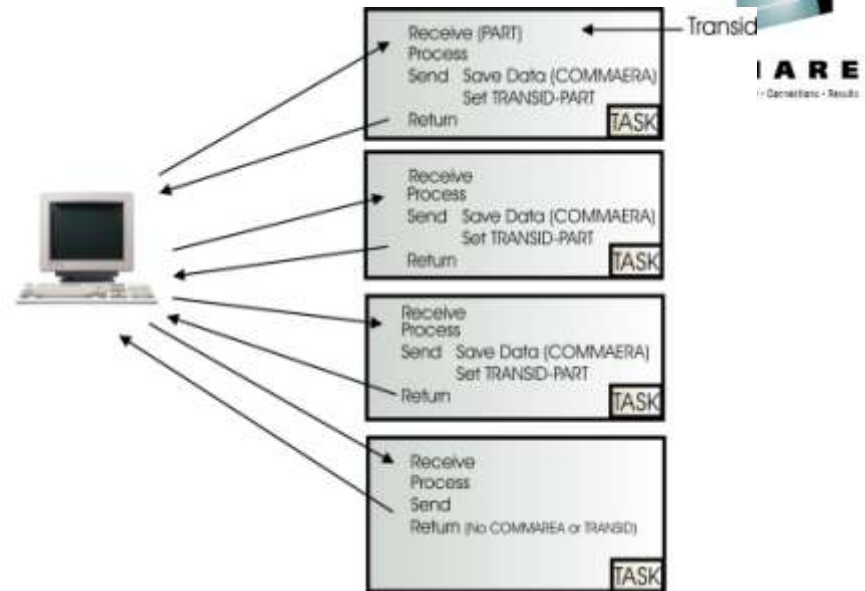
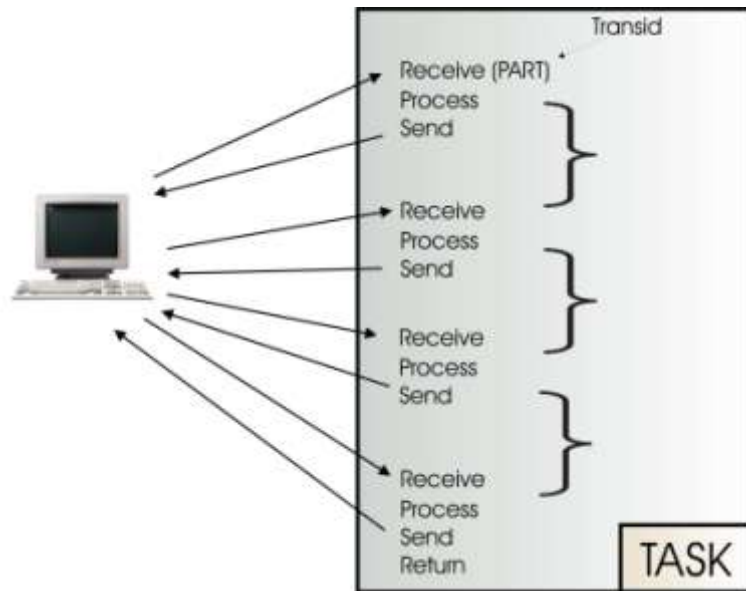


# CICS Tasks and Programs



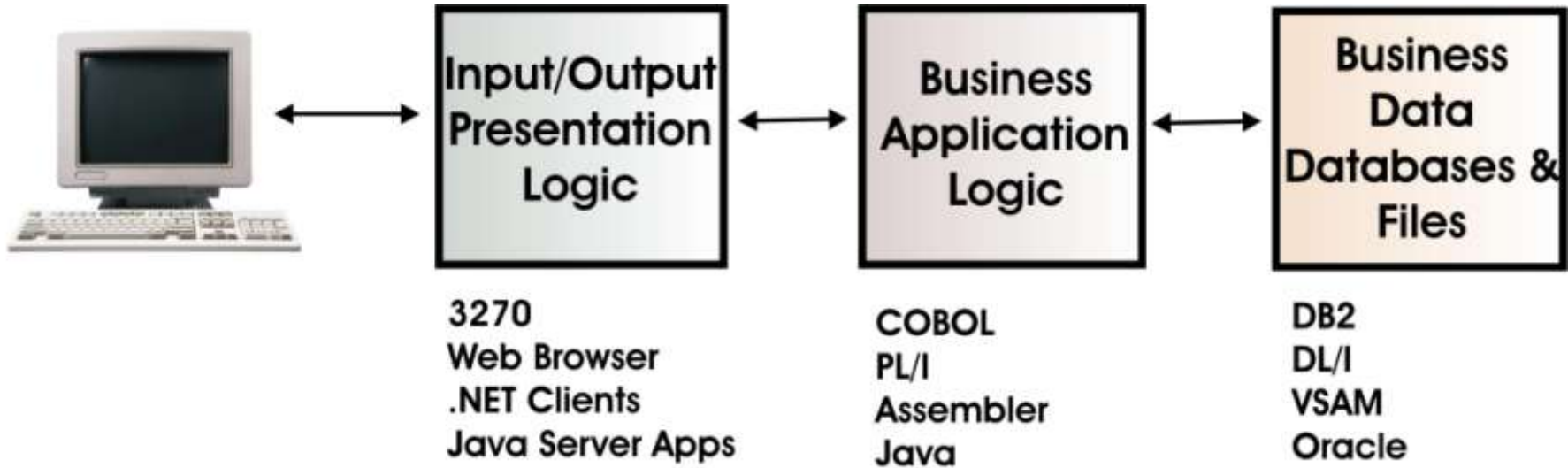
- ❖ A task is an instance of a transaction entered by a user.
- ❖ When a user types in data and presses the Enter or a Function key, CICS Begins a Task and loads the necessary programs.
- ❖ Tasks run concurrently. Therefore, a User can run the same transaction simultaneously.
- ❖ CICS multitasks giving 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.

# Conversational Versus Pseudo-Conversational



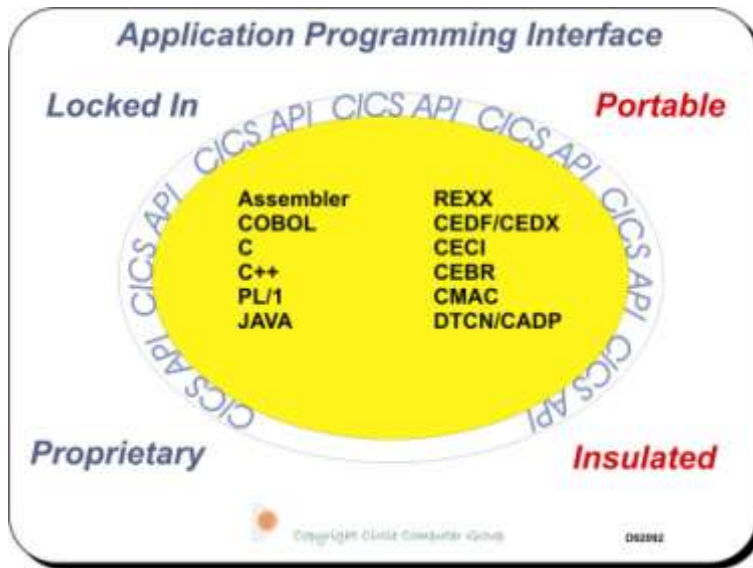
- ❖ Most applications are coded in a pseudo-conversational manner.
- ❖ Conversational programs run and stay in memory for the duration of the transaction.
- ❖ All resources are held /locked for this duration
  - ✓ If a user went to lunch in the middle of a conversational transaction, other users may 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).

# Application Development



- ❖ 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.

# EXEC Interface

*COBOL*  
EXEC CICS .....

*COBOL*  
EXEC CICS .....

*COBOL*  
EXEC CICS .....

*COBOL*

### CICS Command Format

*The general format of CICS commands for the COBOL language is:-*

```
EXEC CICS  
      FUNCTION  
      OPTION (Argument)  
END-EXEC
```

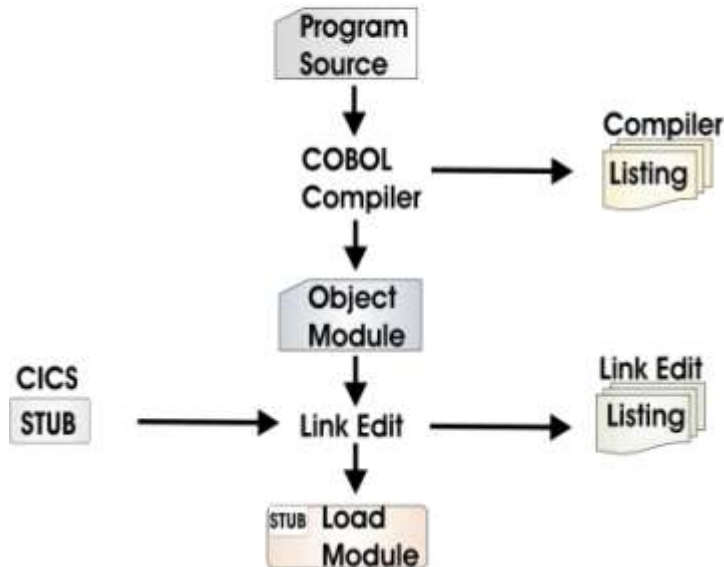
*FUNCTION* : describes the CICS operation  
*OPTION* : describes the options available with each function  
*ARGUMENT* : a data value used to qualify the option

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- ❖ 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.

# Integrated Translator

## Integrated Translator



## Program Preparation

### CICS Translator

#### Before Translation

```
EXEC CICS READ  
FILE ('STOCK')  
RIDFLD(KEY)  
INTO(INPUT-AREA)  
UPDATE  
RESP(WS-RESP)  
END-EXEC  
  
MOVE INPUT-AREA TO ....
```

#### After Translation

```
*EXEC CICS READ  
* FILE ('STOCK')  
* RIDFLD(KEY)  
* INTO(INPUT-AREA)  
* UPDATE  
* RESP(WS-RESP)  
*END-EXEC  
  
CALL DFHE11 USING ..  
  
MOVE INPUT-AREA TO ....
```

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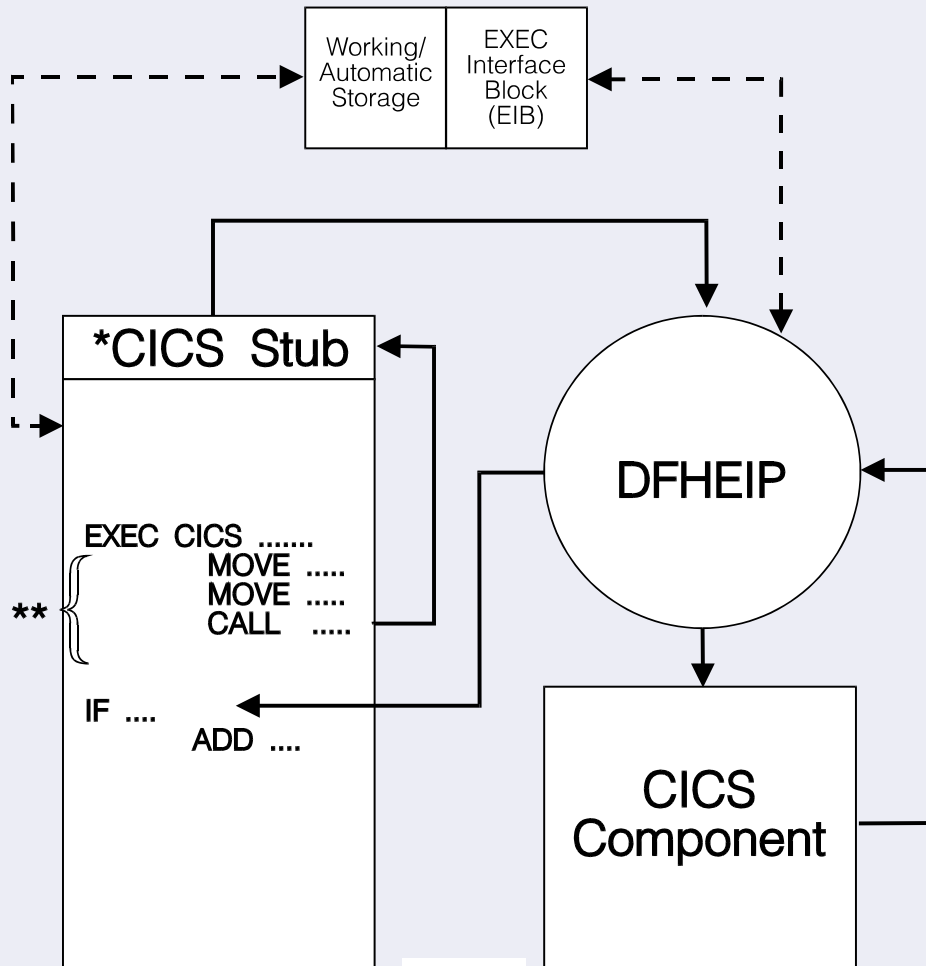
- ❖ Translation was a step before compile, now it's integrated into the compiler.
- ❖ The CICS Command is commented out and replaced with valid COBOL statements.
- ❖ The stub is link-edited with the load module and it is used to find the DFHEIP program.



# Execution Flow

\* Supplied by IBM.  
Must be linked in with  
Application code.

\*\* The EXEC CICS Command is commented  
out by the CICS Translator, and replaced  
by Language compatible Statements



❖ 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



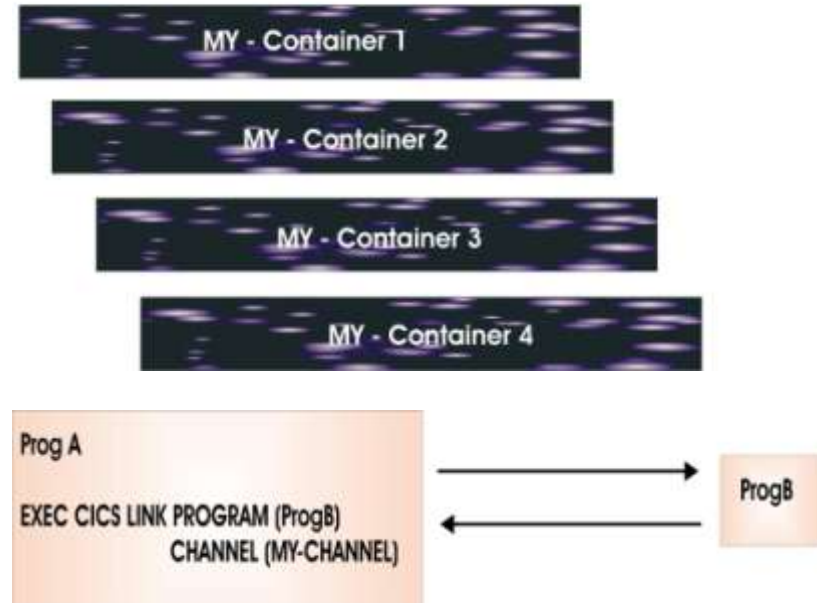
NAME	COBOL	PL/I	C	ASM	DESCRIPTION
EIBTIME	PIC S9(7)comp-3	FIX DEC(7,0)	char[4]	PL4	TIME IN OHHMMSS FORMAT
EIBDATE	PIC S9(7)comp-3	FIX DEC(7,0)	char[4]	PL4	DATE IN OCYYDDD FORMAT
EIBTRNID	PIC X(4)	CHAR(4)	char[4]	CL4	TRANSACTION IDENTIFIER
EIBTASKN	PIC S9(7)comp-3	FIX DEC(7,0)	char[4]	PL4	TASK NUMBER
EIBTRMID	PIC X(4)	CHAR(4)	char[4]	CL4	TERMINAL IDENTIFIER
EIBRSVDI	PIC XX	CHAR(2)	char[2]	CL2	RESERVED
EIBCPOSN	PIC S9(4)comp	FIX BIN(15)	signed short	H	CURSOR POSITION
EIBCALEN	PIC S9(4)comp	FIX BIN(15)	signed short	H	COMMAREA LENGTH
EIBAID	PIC X	CHAR(1)	char	CL1	ATTENTION IDENTIFIER
EIBFN	PIC XX	CHAR(2)	char[2]	CL2	FUNCTION CODE
EIBRCODE	PIC X(6)	CHAR(6)	char[6]	CL6	RESPONSE CODE
EIBDS	PIC X(8)	CHAR(8)	char[8]	CL8	DATASET NAME
EIBREQID	PIC X(8)	CHAR(8)	char[8]	CL8	REQUEST IDENTIFIER
EIBRSRCE	PIC X(8)	CHAR(8)	char[8]	CL8	RESOURCE NAME
EIBSYNC	PIC X	CHAR(1)	char	CL1	XFF' SYNCPOINT REQUESTED
EIBFREE	PIC X	CHAR(1)	char	CL1	XFF' FREE REQUESTED
EIBRECV	PIC X	CHAR(1)	char	CL1	XFF' RECEIVE REQUIRED
EIBSEND	PIC X	CHAR(1)	char	CL1	RESERVED
EIBATT	PIC X	CHAR(1)	char	CL1	XFF' ATTACH RECEIVED
EIBEOC	PIC X	CHAR(1)	char	CL1	XFF' EOC RECEIVED
EIBFMH	PIC X	CHAR(1)	char	CL1	XFF' FMHS RECEIVED
EIBCOMPL	PIC X	CHAR(1)	char	CL1	XFF' DATA COMPLETE
EIBSIG	PIC X	CHAR(1)	char	CL1	XFF' SIGNAL RECEIVED
EIBCONF	PIC X	CHAR(1)	char	CL1	XFF' CONFIRM REQUESTED
EIBERR	PIC X	CHAR(1)	char	CL1	XFF' ERROR RECEIVED
EIBERRCD	PIC X(4)	CHAR(4)	char[4]	CL4	ERROR CODE RECEIVED
EIBSYNRB	PIC X	CHAR(1)	char	CL1	XFF' SYNC ROLLBACK REQD
EIBNODAT	PIC X	CHAR(1)	char	CL1	XFF' NO APPL DATA RECEIVED
EIBRESP	PIC S9(8) comp	FIX BIN(31)	signed long	F	CONDITION NUMBER
EIBRESP2	PIC S9(8) comp	FIX BIN(31)	signed long	F	Additional details for some Responses
EIBRLDBK	PIC X	CHAR(1)	char	CL1	ROLLED BACK

# Passing Data Between Programs



```
EDIT CIRCS.CWI.CIRCS03(P03RECV2) - 01.09 Columns 00001 00072
Command ==> Scroll ==> CSR
000001 linkage section.
000002
000003 01 ls-commarea.
000004 02 ls-comm-key.
000005 03 ls-comm-dept pic 9.
000006 03 ls-comm-emp pic 9(5).
000007 03 filler PIC 9(2).
000008 02 ls-comm-count pic s9(8) comp.
000009 02 ls-comm-recs pic x(3000).
000010
000011
000012
000013 procedure division.
000014
000015 exec cics link
000016 program ("BROWSLNK")
000017 commarea(ls-commarea)
000018 length(length of ls-commarea)
000019 resp(ws-resp)
000020 end-exec.
r:00.1 04/15
```

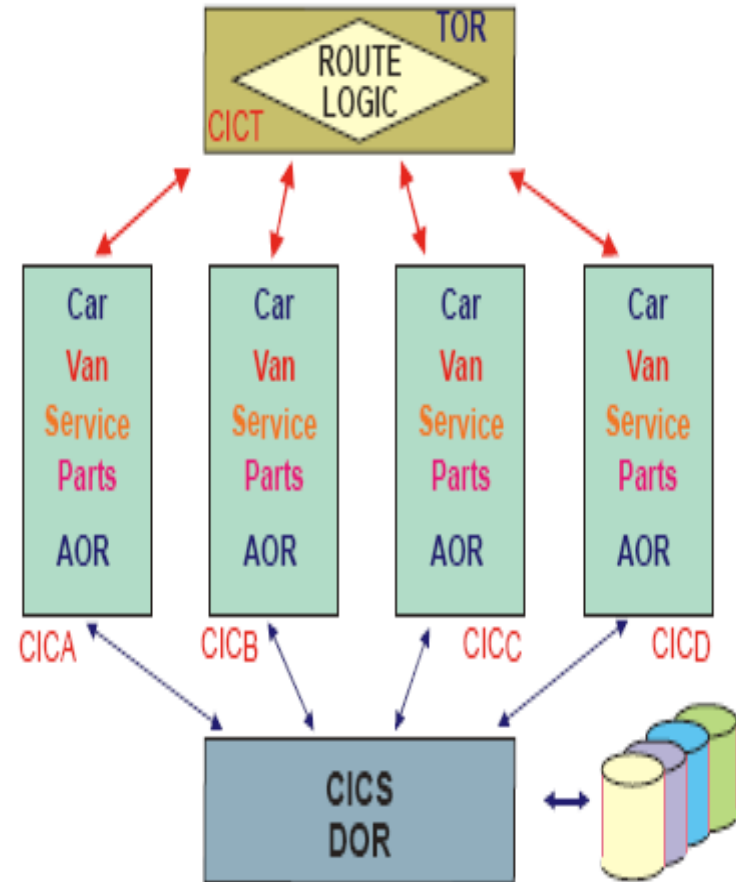
MY-CHANNEL



- ❖ 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)

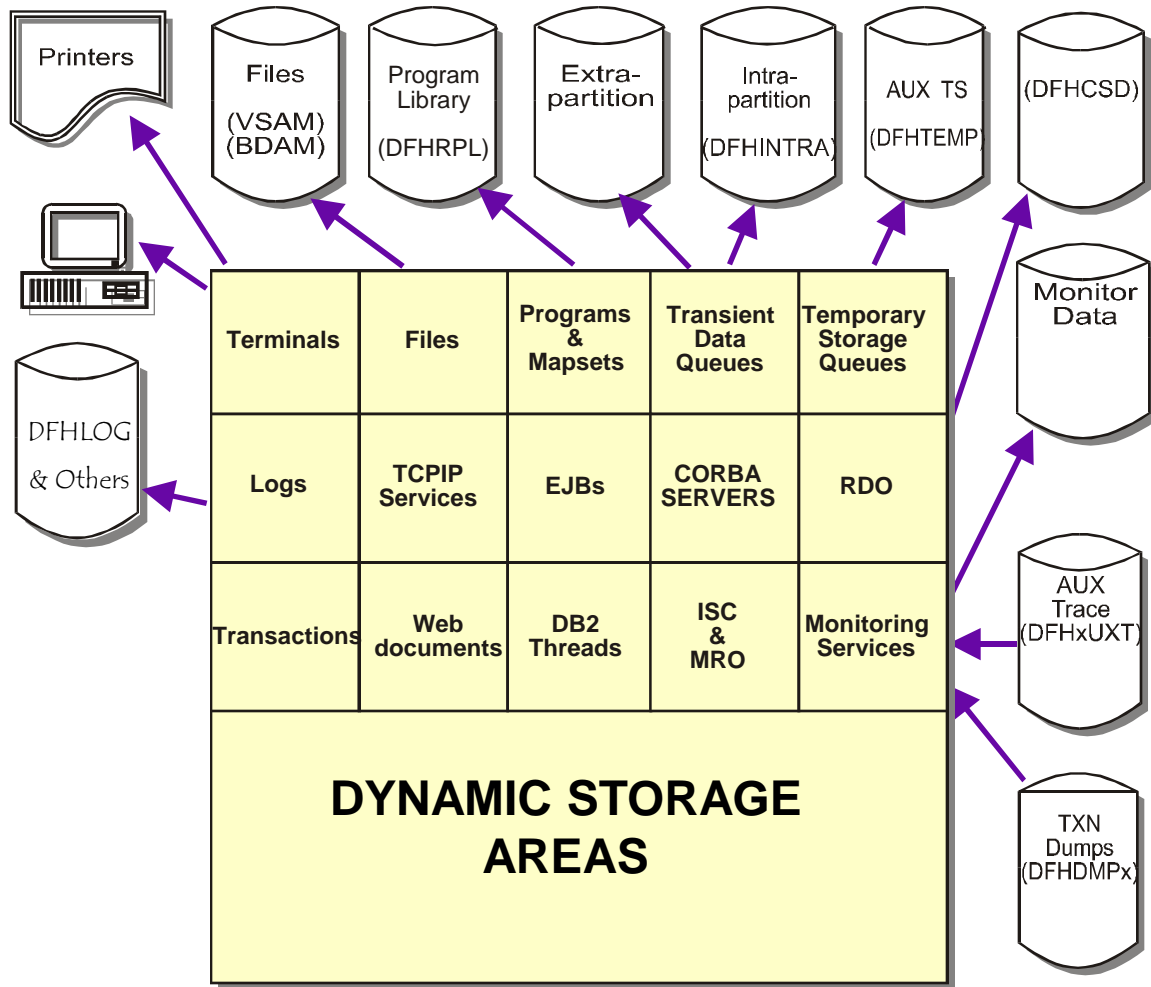


# Communications



- ❖ **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.



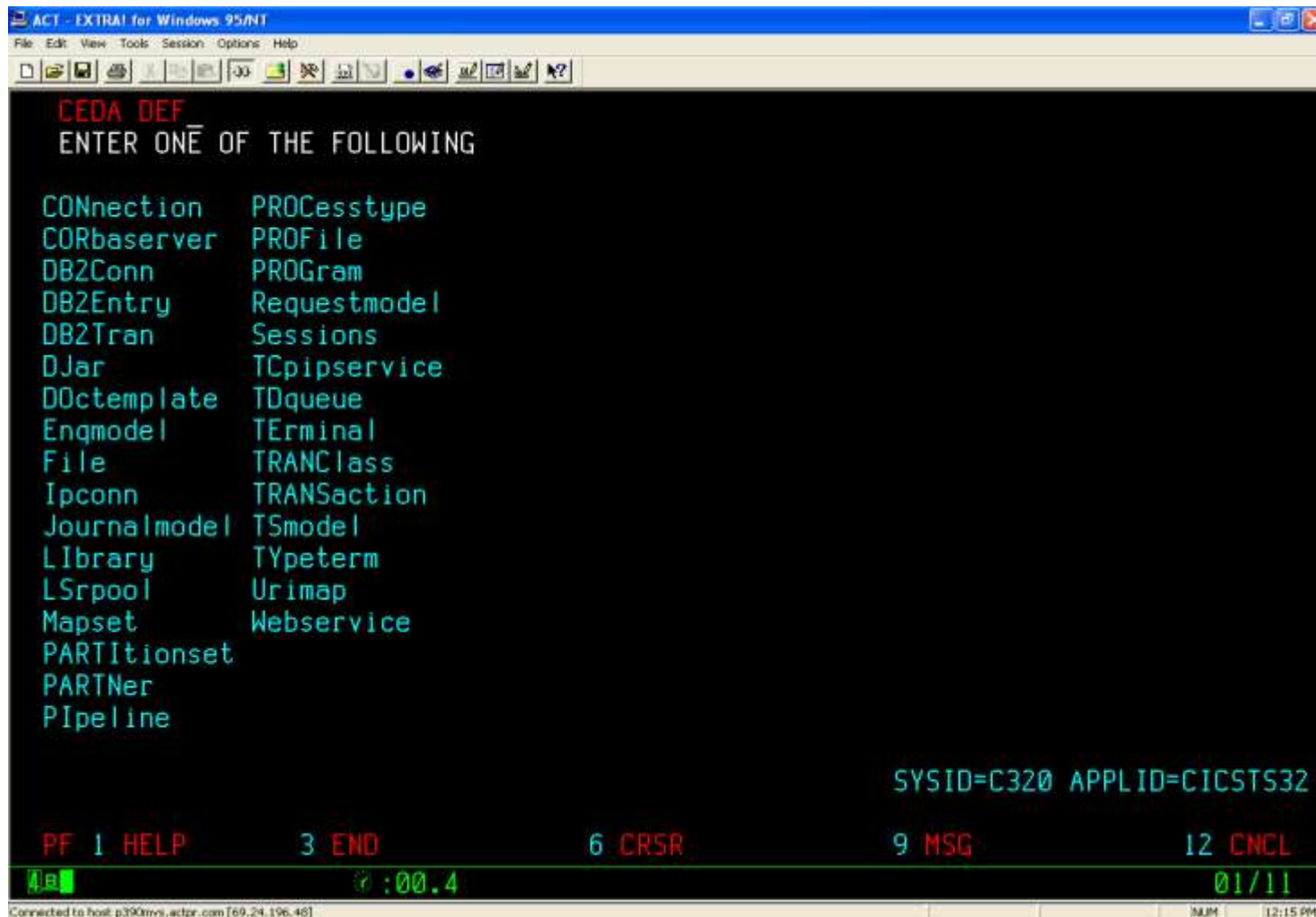
# Methods for Resource Definition



- ❖ **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)



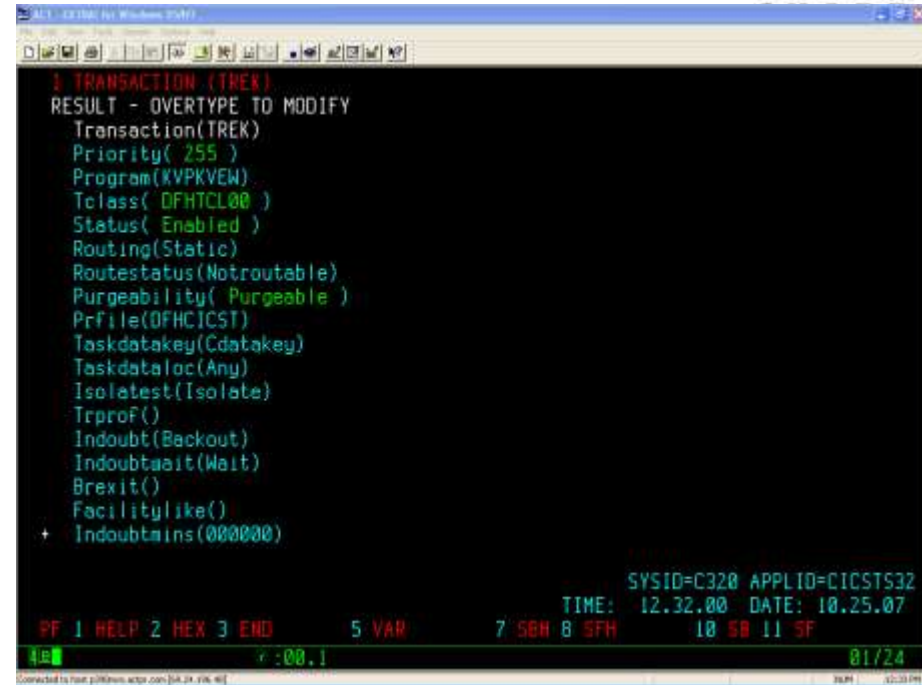
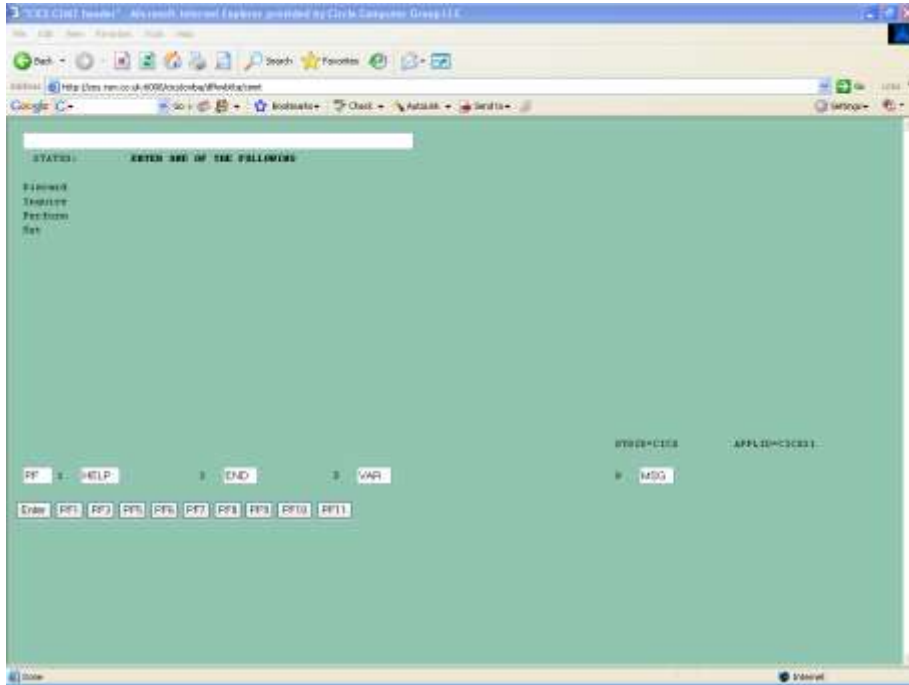
```
ACT - EXTRA! for Windows 95/NT
File Edit View Tools Session Options Help
[Icons]
CEDA DEF
ENTER ONE OF THE FOLLOWING

CONNECTION  PROCesstype
CORbaserver  PROFile
DB2Conn      PROGram
DB2Entry     Requestmodel
DB2Tran      Sessions
DJar         TCpipservice
DOctemplate  TDqueue
Engmodel     TERminal
File         TRANClass
Ipconn       TRANSaction
Journalmodel TSmodel
Library      TYpeterm
LSrpool      Urimap
Mapset       Webservice
PARTitionset
PARTner
Pipeline

                                SYSID=C320 APPLID=CICST532

PF 1 HELP      3 END      6 CRSR      9 MSG      12 CNCL
[Cursor] :00.4 01/11
Connected to host: p390trms.actpr.com [69.24.196.46]  MUM  12:15 PM
```

# CEMT – CICS Master Terminal



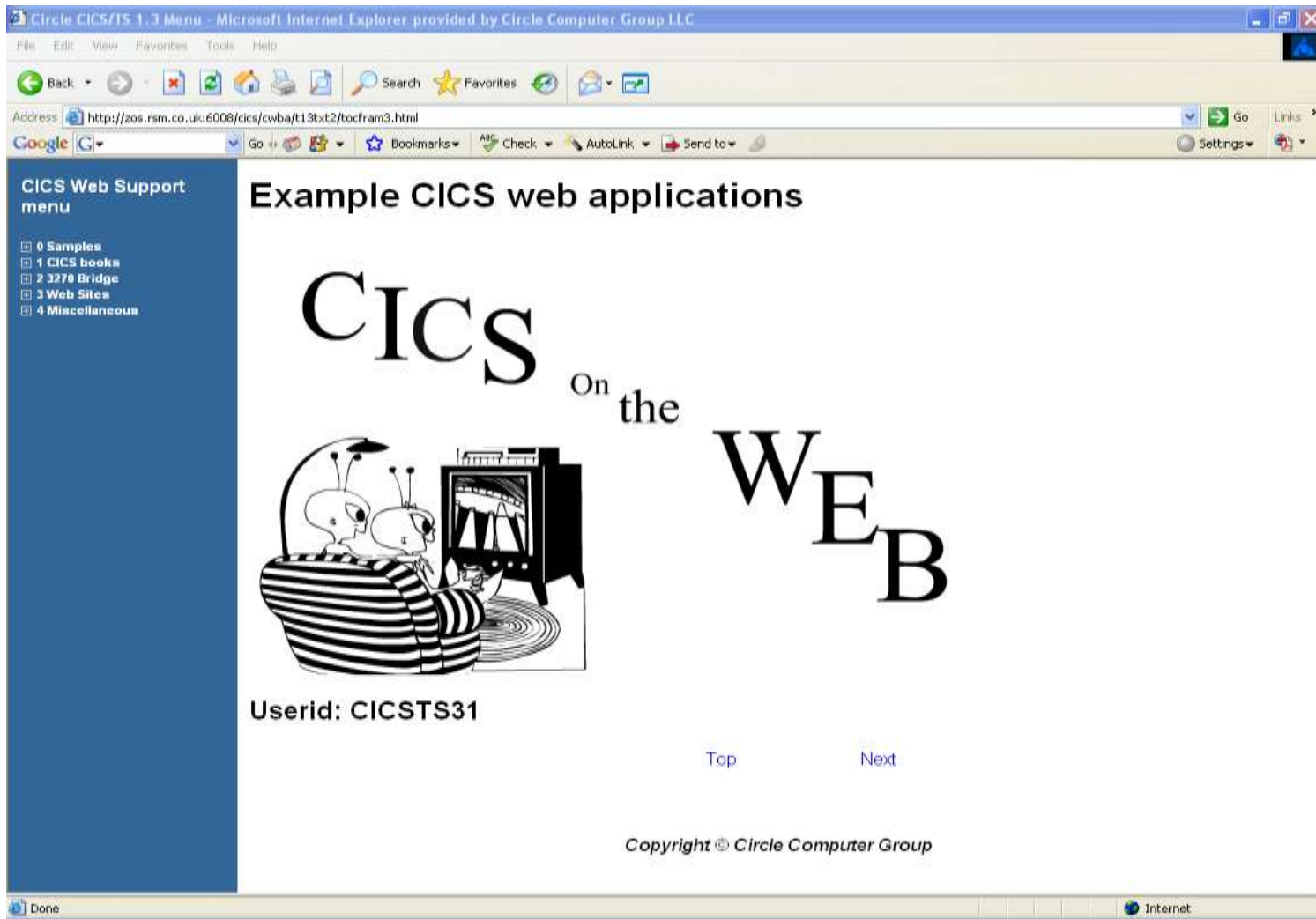
- ❖ The CICS Master Terminal (CEMT) transaction can be used to get information about resources and their definitions.
- ❖ CEMT has four commands and can be used to alter resource definitions that have already been installed in CICS.
- ❖ Only some attributes of a resource may be changed using CEMT, others 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



Circle CICS/TS 1.3 Menu - Microsoft Internet Explorer provided by Circle Computer Group LLC

File Edit View Favorites Tools Help

Back Forward Stop Home Refresh Print Search Favorites

Address <http://zos.rsm.co.uk:6008/cics/cwba/t13txt2/tocfram3.html> Go Links


Google Go Bookmarks Check AutoLink Send to Settings

### CICS Web Support menu

- 0 Samples
- 1 CICS books
- 2 3270 Bridge
- 3 Web Sites
- 4 Miscellaneous

## Example CICS web applications

# CICS On the WEB



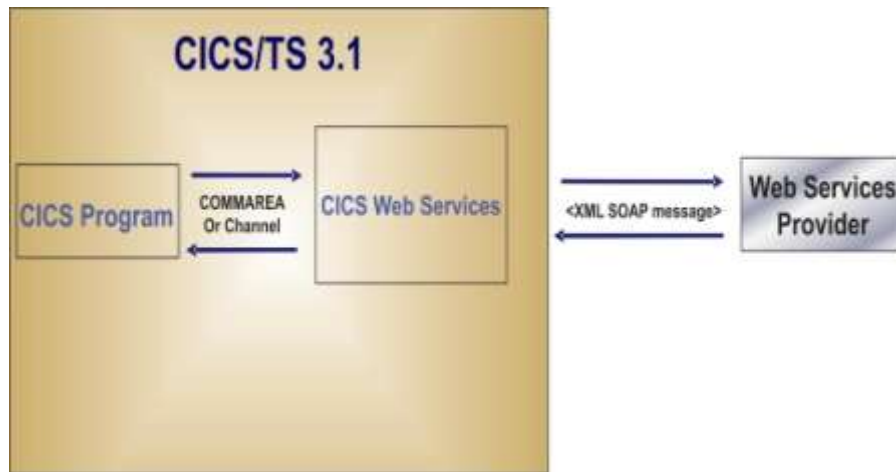
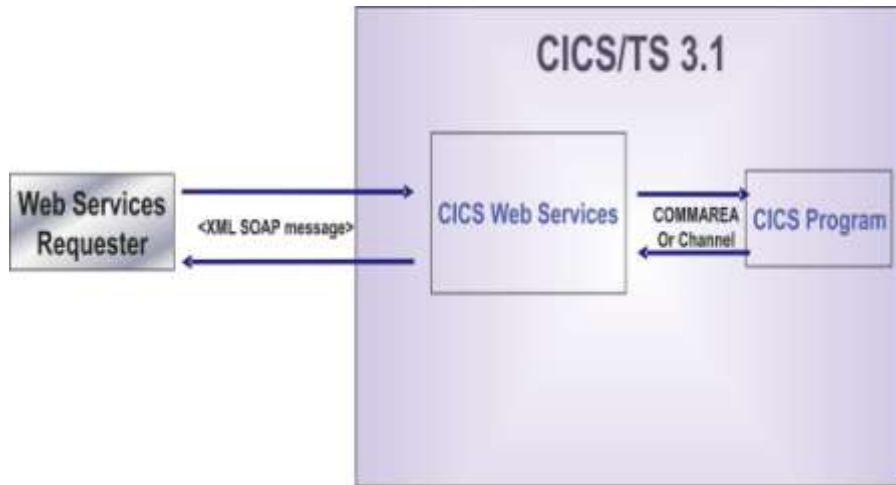
Userid: CICSTS31

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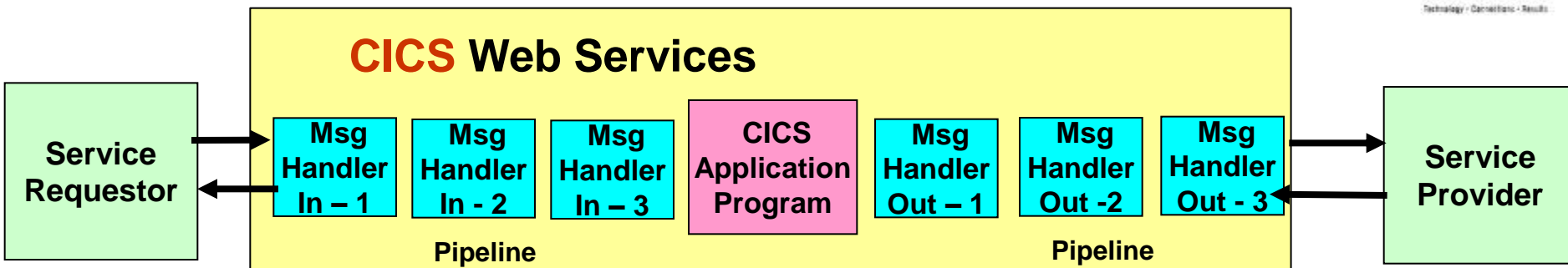
# CICS Web Services



- ❖ 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)



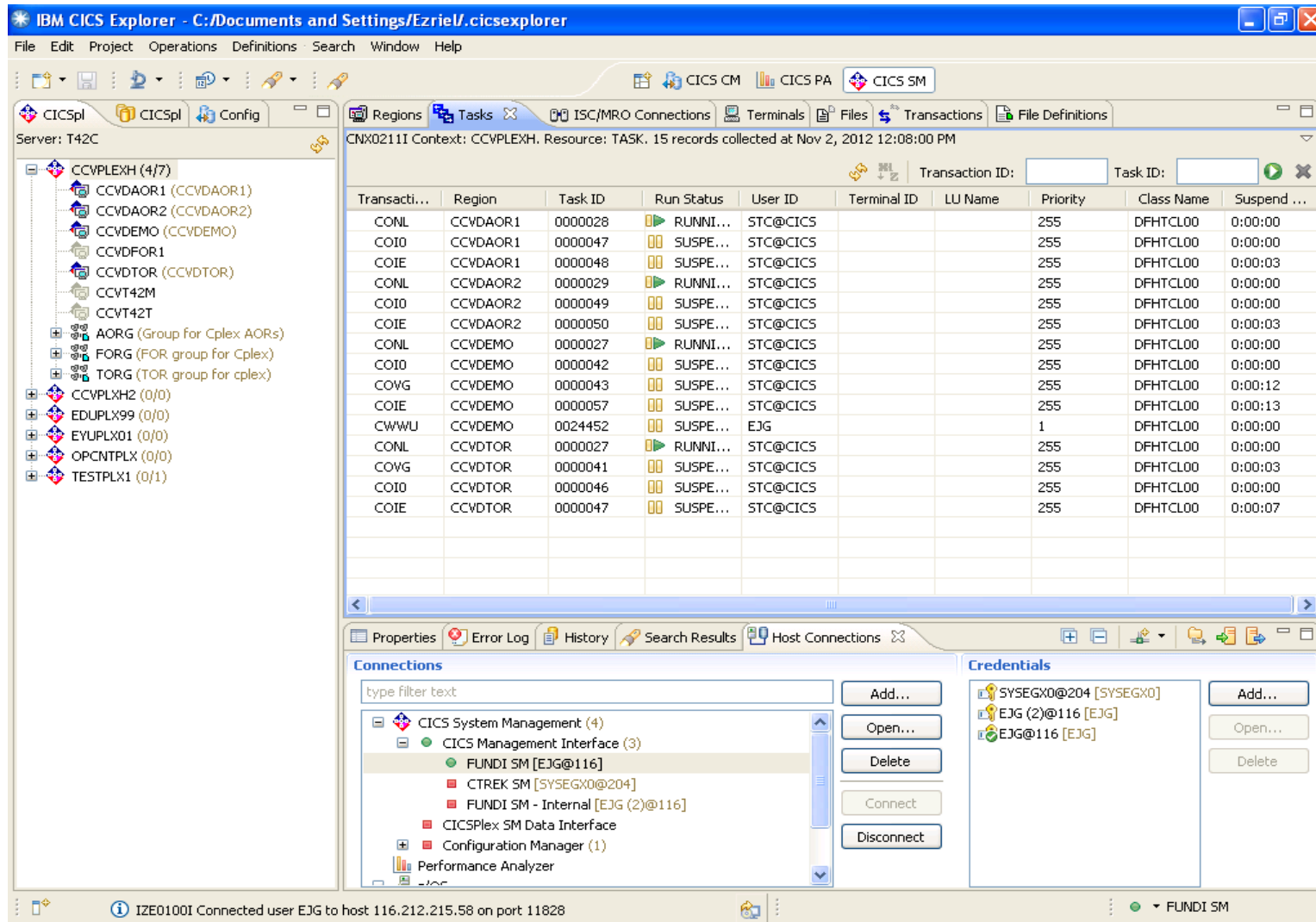
- ❖ Integrated into most current release
- ❖ Defined by Web Service Description Language (WSDL)
- ❖ CICS role in SOA can be service requestor, service provider or both
- ❖ CICS Web Services utility programs
  - ❖ Assist in converting existing application into a Web Service
  - ❖ Use a Web Service provided 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



# CICS Explorer – the new face of CICS



IBM CICS Explorer - C:/Documents and Settings/Ezriel/cicsexplorer

File Edit Project Operations Definitions Search Window Help

Regions Tasks ISC/MRO Connections Terminals Files Transactions File Definitions

Server: T42C

CCVPLEXH (4/7)

- CCVDAOR1 (CCVDAOR1)
- CCVDAOR2 (CCVDAOR2)
- CCVDEMO (CCVDEMO)
- CCVDFOR1
- CCVDTOR (CCVDTOR)
- CCVT42M
- CCVT42T
- AORG (Group for Cplex AORs)
- FORG (FOR group for Cplex)
- TORG (TOR group for cplex)
- CCVPLXH2 (0/0)
- EDUPLX99 (0/0)
- EYUPLX01 (0/0)
- OPCNTPLX (0/0)
- TESTPLX1 (0/1)

CNX0211I Context: CCVPLEXH. Resource: TASK. 15 records collected at Nov 2, 2012 12:08:00 PM

Transacti...	Region	Task ID	Run Status	User ID	Terminal ID	LU Name	Priority	Class Name	Suspend ...
CONL	CCVDAOR1	0000028	▶ RUNNI...	STC@CICS			255	DFHTCL00	0:00:00
COIO	CCVDAOR1	0000047	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:00
COIE	CCVDAOR1	0000048	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:03
CONL	CCVDAOR2	0000029	▶ RUNNI...	STC@CICS			255	DFHTCL00	0:00:00
COIO	CCVDAOR2	0000049	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:00
COIE	CCVDAOR2	0000050	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:03
CONL	CCVDEMO	0000027	▶ RUNNI...	STC@CICS			255	DFHTCL00	0:00:00
COIO	CCVDEMO	0000042	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:00
COVG	CCVDEMO	0000043	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:12
COIE	CCVDEMO	0000057	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:13
CWWU	CCVDEMO	0024452	◻ SUSPE...	EJG			1	DFHTCL00	0:00:00
CONL	CCVDTOR	0000027	▶ RUNNI...	STC@CICS			255	DFHTCL00	0:00:00
COVG	CCVDTOR	0000041	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:03
COIO	CCVDTOR	0000046	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:00
COIE	CCVDTOR	0000047	◻ SUSPE...	STC@CICS			255	DFHTCL00	0:00:07

Transaction ID:  Task ID:

Properties Error Log History Search Results Host Connections

**Connections**

type filter text

- CICS System Management (4)
  - CICS Management Interface (3)
    - FUNDI SM [EJG@116]
    - CTREK SM [SYSEGX0@204]
    - FUNDI SM - Internal [EJG (2)@116]
  - CICSplex SM Data Interface
  - Configuration Manager (1)
  - Performance Analyzer

**Credentials**

- SYSEGX0@204 [SYSEGX0]
- EJG (2)@116 [EJG]
- EJG@116 [EJG]

IZE0100I Connected user EJG to host 116.212.215.58 on port 11828

FUNDI SM

# 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 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

<http://www.ibm.com/software/ts/cics/education/>  
Lists available training courses and certifications

<http://www.ibm.com/support/docview.wss?uid=swg27007241>  
CICS SupportPacs

Introduction to CICS Dynamic Scripting <i>Redbook, published March 28, 2011</i>	SG24-7924-00
Threadsafe Considerations for CICS <i>Redbook, published March 14, 2011</i>	SG24-6351-03
Extend The CICS Explorer: A Better Way to Manage Your CICS <i>Redbook, published February 23, 2010</i>	SG24-7819-00
Java Application Development for CICS <i>Redbook, published February 24, 2009</i>	SG24-5275-03
Implementing CICS Web Services <i>Redbook, published November 12, 2008</i>	SG24-7657-00
Exploring Systems Monitoring for CICS Trans Gateway <i>Redbook, published April 3, 2008</i>	SG24-7562-00
CICS Web Services Workload Management and Availability <i>Redbook published March 31, 2008</i>	SG24-7141-01
CICS Systems Manager in the WUI as the Principle Management Interface <i>Redbook, published November 16 2007</i>	SG24-6793-01

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CICS Concepts & Facilities