WAVV 2000 Conference

IBM

The CICS Transaction Gateway:
Web and Java access to CICS

Chris Smith
smithch@uk.ibm.com

Colorado Springs, 6 - 10 October 2000

Trademarks

- The following terms are trademarks of International Business Machines Corporation in the United States and/or other countries:

AIX	DB2	OS/390	VisualAge
CICS	MVS/ESA	VSE/ESA	
CICS/VSE	OS/2	VTAM	

- Java and Solaris are trademarks of Sun Microsystems, Inc

- Windows, Windows 95, Windows 98, and Windows NT are trademarks of Microsoft Corporation, Inc

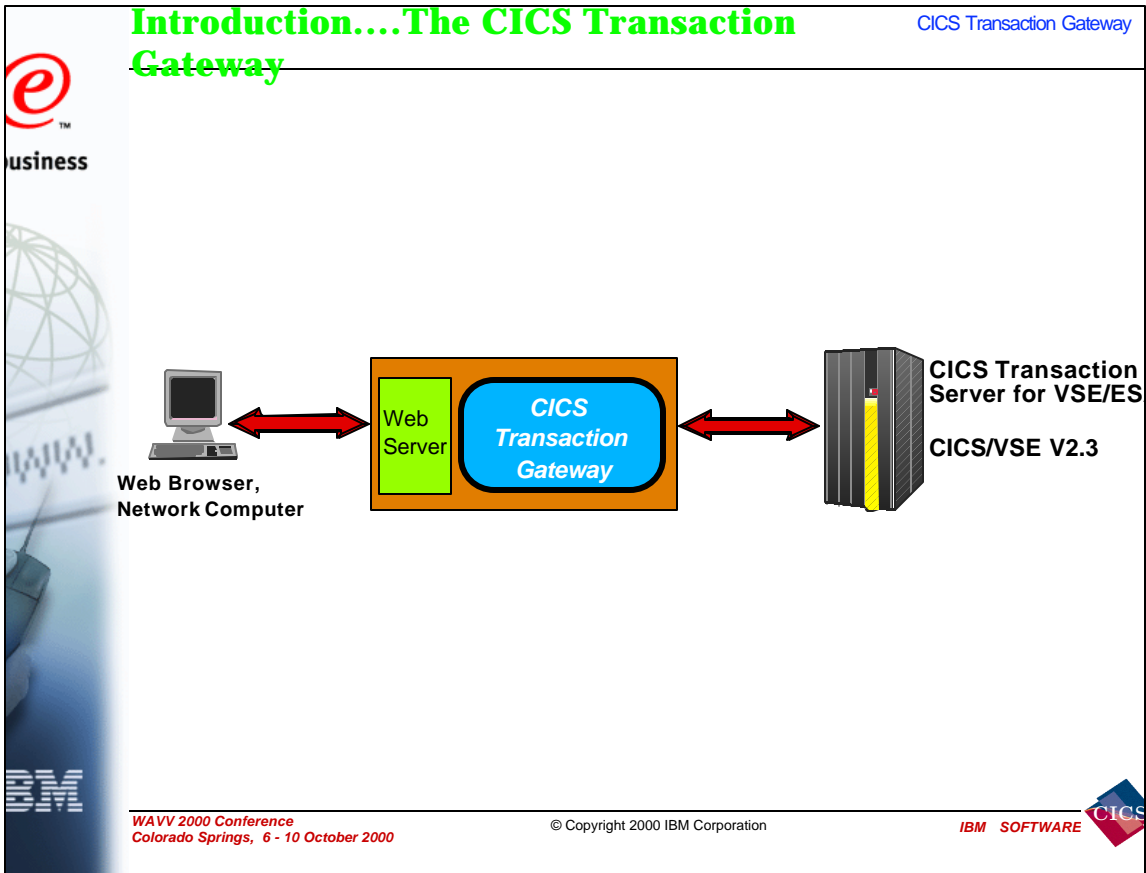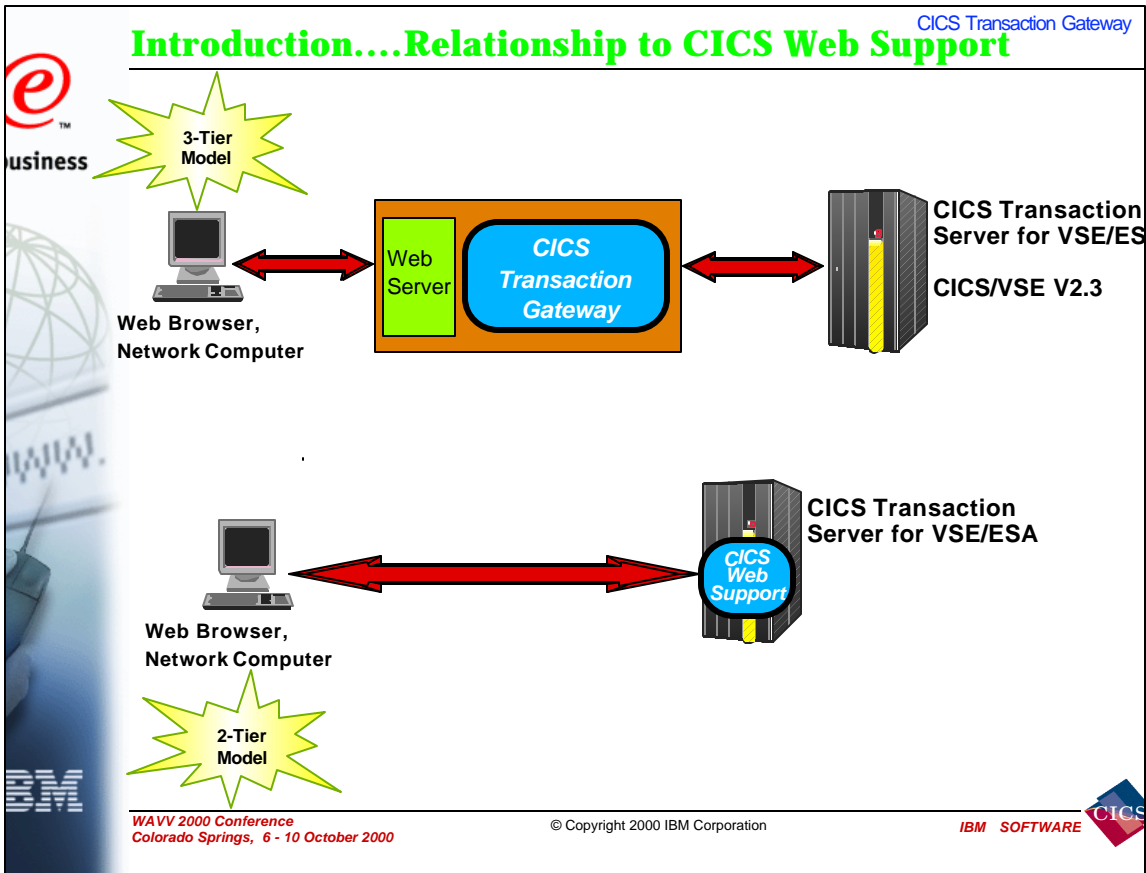- Other company, product, and service names may be trademarks or service marks of others

WAVV 2000 Conference
Colorado Springs, 6 - 10 October 2000

© Copyright 2000 IBM Corporation

IBM SOFTWARE

1-2

Agenda

- The CICS Transaction Gateway
  - Introduction
  - Structure
  - Terminal Servlet
  - Network protocols
  - Connectivity to CICS
  - Security
  - Application Programming Interfaces
  - Common Connector Framework

- Summary

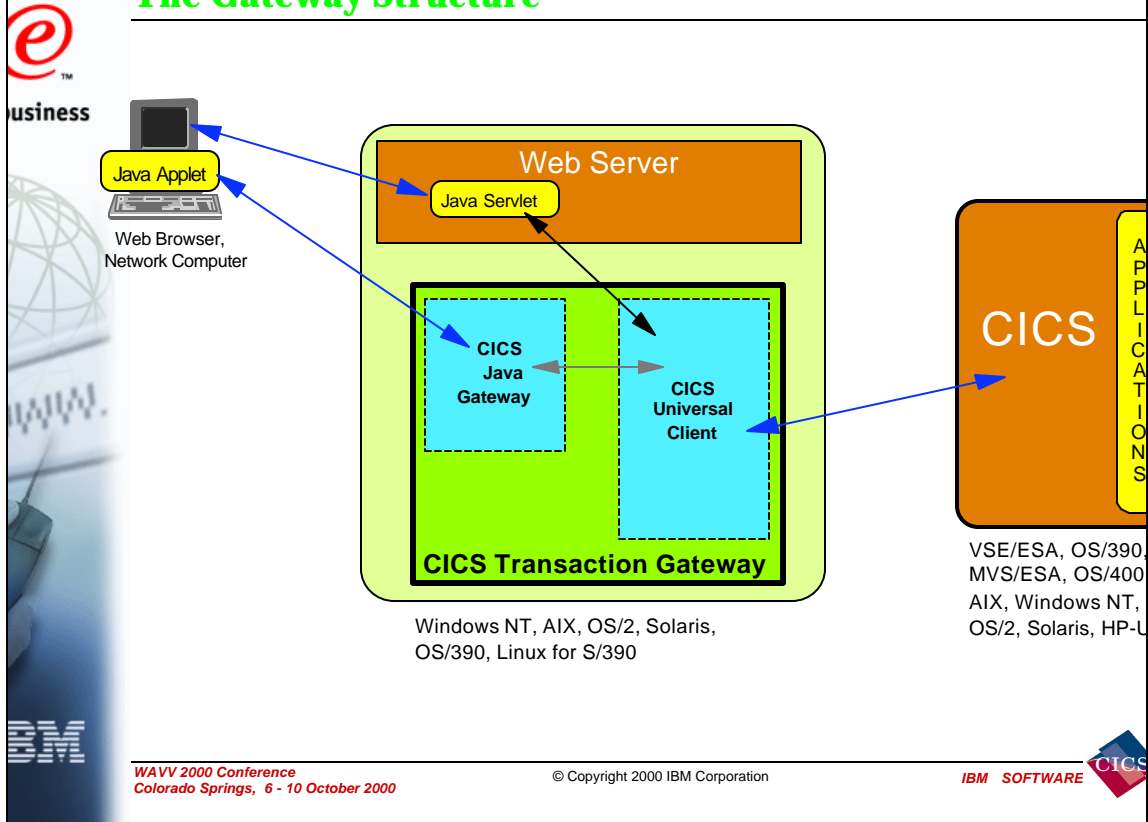© Copyright 2000 IBM Corporation

IBM   SOFTWARE

CICS

Introduction....The CICS Transaction Gateway

- Provides an interface to CICS from Java and the Web....
  - from a Web Browser or Network Computer
  - from any Java execution environment

- Is an IBM e-business Connector

- Replaces CICS Gateway for Java, CICS Internet Gateway

- Runs on Windows NT, AIX, Solaris, OS/2, OS/390
  - Linux for S/390 (GA 12/00), HP-UX (Future)

- Supports multiple concurrent users and CICS conections

- Is delivered and licensed with CICS Transaction Servers
  - Also delivered with WebSphere Enterprise Edition and with VisualAge for Java Enterprise Edition
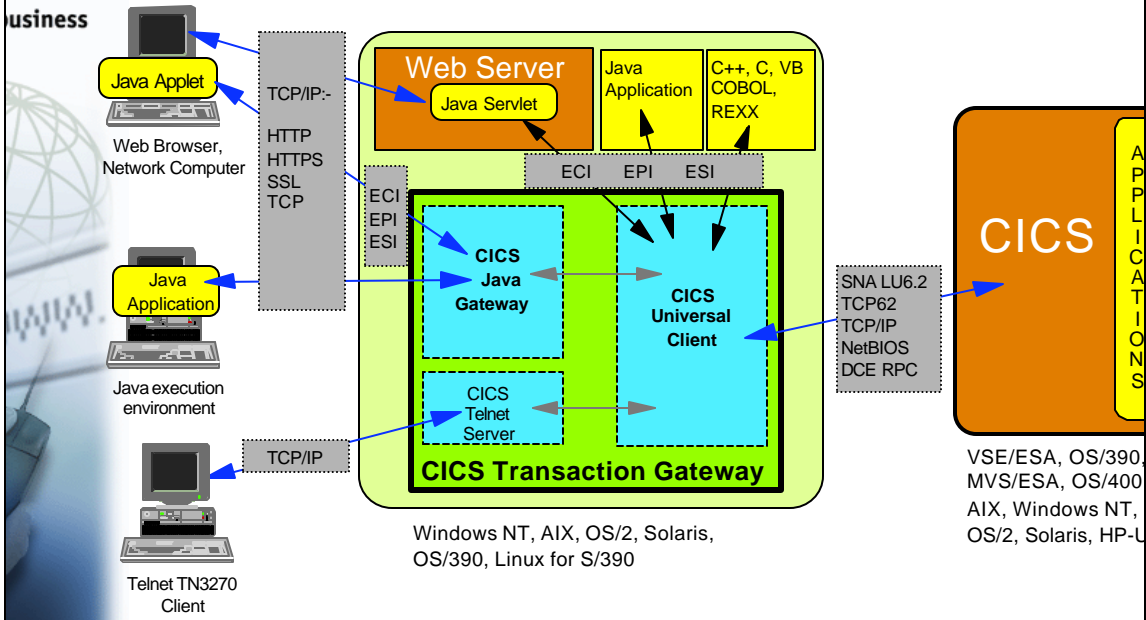 - Also downloadable from the CICS Web site

© Copyright 2000 IBM Corporation

IBM   SOFTWARE

CICS

Introduction....Relationship to CICS Web Support

3-Tier Model

Web Browser, Network Computer

Web Server

CICS Transaction Gateway

CICS Transaction Server for VSE/ES

CICS/VSE V2.3

Web Browser, Network Computer

CICS Web Support

CICS Transaction Server for VSE/ESA

2-Tier Model

© Copyright 2000 IBM Corporation
IBM SOFTWARE
CICS

Introduction....The CICS Transaction Gateway

Web Browser, Network Computer

Web Server

CICS Transaction Gateway

CICS Transaction Server for VSE/ES

CICS/VSE V2.3

© Copyright 2000 IBM Corporation
IBM SOFTWARE
CICS

5-6

The Gateway Structure

Web Server

Java Servlet

Java Applet

Web Browser,
Network Computer

CICS Transaction Gateway

CICS
Java
Gateway

CICS
Universal
Client

CICS

A
P
P
L
I
C
A
T
I
O
N
S

VSE/ESA, OS/390,
MVS/ESA, OS/400
AIX, Windows NT,
OS/2, Solaris, HP-U

Windows NT, AIX, OS/2, Solaris,
OS/390, Linux for S/390

© Copyright 2000 IBM Corporation

IBM SOFTWARE

The Gateway Structure....CICS Universal Clients

- The CICS Universal Clients
  - Integrated within the CICS Transaction Gateway
  - Also available separately

- Provides access to CICS systems
  - Client API's
  - Connectivity

- Includes Telnet TN3270 support

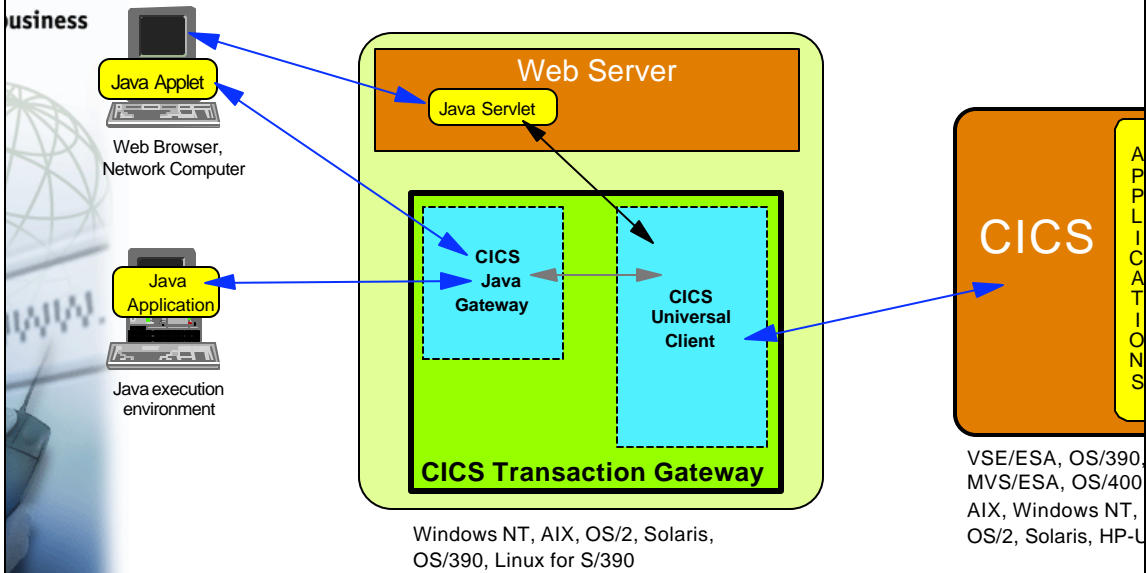- Runs on Windows 95/98, Windows NT, AIX, Solaris, OS/2

© Copyright 2000 IBM Corporation

IBM SOFTWARE

7-8

The Gateway Structure....

Web Browser,
Network Computer

Java execution
environment

Telnet TN3270
Client

Web Server

Java Servlet

Java Application

C++, C, VB COBOL, REXX

ECI EPI ESI

ECI EPI ESI

CICS Java Gateway

CICS Universal Client

CICS Telnet Server

CICS Transaction Gateway

Java Applet

Java Application

TCP/IP:-
HTTP
HTTPS
SSL
TCP

TCP/IP

SNA LU6.2
TCP62
TCP/IP
NetBIOS
DCE RPC

CICS

APPLICATIONS

VSE/ESA, OS/390,
MVS/ESA, OS/400
AIX, Windows NT,
OS/2, Solaris, HP-U

Windows NT, AIX, OS/2, Solaris,
OS/390, Linux for S/390

© Copyright 2000 IBM Corporation

IBM SOFTWARE

The Gateway Structure....

Web Browser,
Network Computer

Java execution
environment

Web Server

Java Servlet

CICS Java Gateway

CICS Universal Client

CICS Transaction Gateway

Java Applet

Java Application

CICS

APPLICATIONS

VSE/ESA, OS/390,
MVS/ESA, OS/400
AIX, Windows NT,
OS/2, Solaris, HP-U

Windows NT, AIX, OS/2, Solaris,
OS/390, Linux for S/390

© Copyright 2000 IBM Corporation

IBM SOFTWARE

9-10

The Gateway Structure….

Web Server

Java Servlet

Web Browser

Java Applet
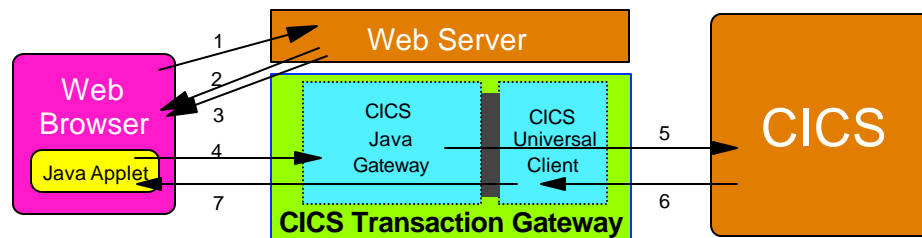
CICS Java Gateway

CICS Universal Client

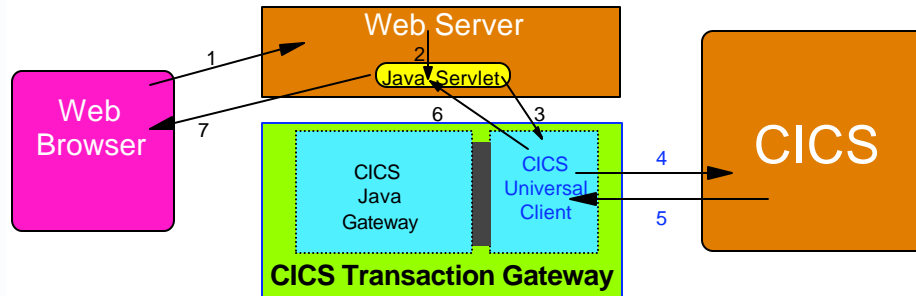**CICS Transaction Gateway**

CICS

- The CICS Java Gateway component is a Java application

- Applets are Java applications that execute on web browsers

- Servlets are Java applications that execute on web servers

© Copyright 2000 IBM Corporation

IBM SOFTWARE

CICS

The Gateway Structure….Applet Flows

Web Server

Web Browser

Java Applet

1
2
3
4
7

CICS Java Gateway

CICS Universal Client

CICS Transaction Gateway

5
6

CICS

1. Web browser requests HTML page from the Web-server
2. Web server returns HTML page which identifes applet
3. Web browser downloads applet
4. Applet creates a CICS request and passes it to the Gateway
5. Gateway calls CICS Universal Client to pass request to CICS
6. CICS processes the request and returns result to the Client
7. Gateway gets result from the Client and sends to applet

© Copyright 2000 IBM Corporation

IBM SOFTWARE

CICS

11-12

The Gateway Structure….Servlet flows

Web Server

Java Servlet

Web Browser

CICS

CICS Java Gateway

CICS Universal Client

CICS Transaction Gateway

1. Web browser requests an HTML page from the Web-server
2. Web server loads servlet identified in HTML page
3. Servlet creates a CICS request and passes to CICS Client
4. CICS Universal Client passes the request to CICS
5. CICS processes request and returns result to the Client
6. Servlet receives result from the Client
7. Servlet formats HTML page and web server sends to brows

IBM SOFTWARE

The Terminal Servlet

- Provides access to CICS *transactions* from Web Browsers

- Supplied as part of the CICS Transaction Gateway

- The Terminal Servlet can….
  - Behave like a simple terminal emulator
  - Substitute data from CICS into HTML template files
  - Display CICS screen data in server-side includes
  - Map specific CICS screens to HTML pages

- Can be invoked in three ways….
  - By URL
  - With an HTML FORM
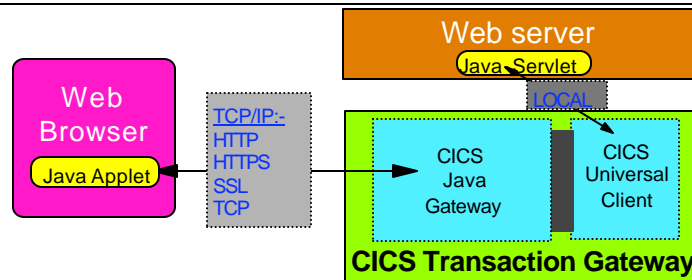 - With a server-side include

IBM SOFTWARE

13-14

The Terminal Servlet....

- Invoking the Terminal Servlet with a URL:
  - ► http://webserver/servlet/TerminalServlet?request=send&transaction=CE

- Invoking the Terminal Servlet with an HTML FORM:
  - ► <FORM METHOD="GET" ACTION="/servlet/TerminalServlet">
    <INPUT TYPE="HIDDEN" NAME="REQUEST" VALUE="SEND">
    <INPUT TYPE="HIDDEN" NAME="TRANSACTION" VALUE="CECI"
    ....Text entry tags, buttons, etc...................
    </FORM>

- Invoking the Terminal Servlet with a server-side include:
  - ► <SERVLET NAME="TerminalServlet">
    <PARAM NAME="request" VALUE="send">
    <PARAM NAME="transaction" VALUE="CECI">

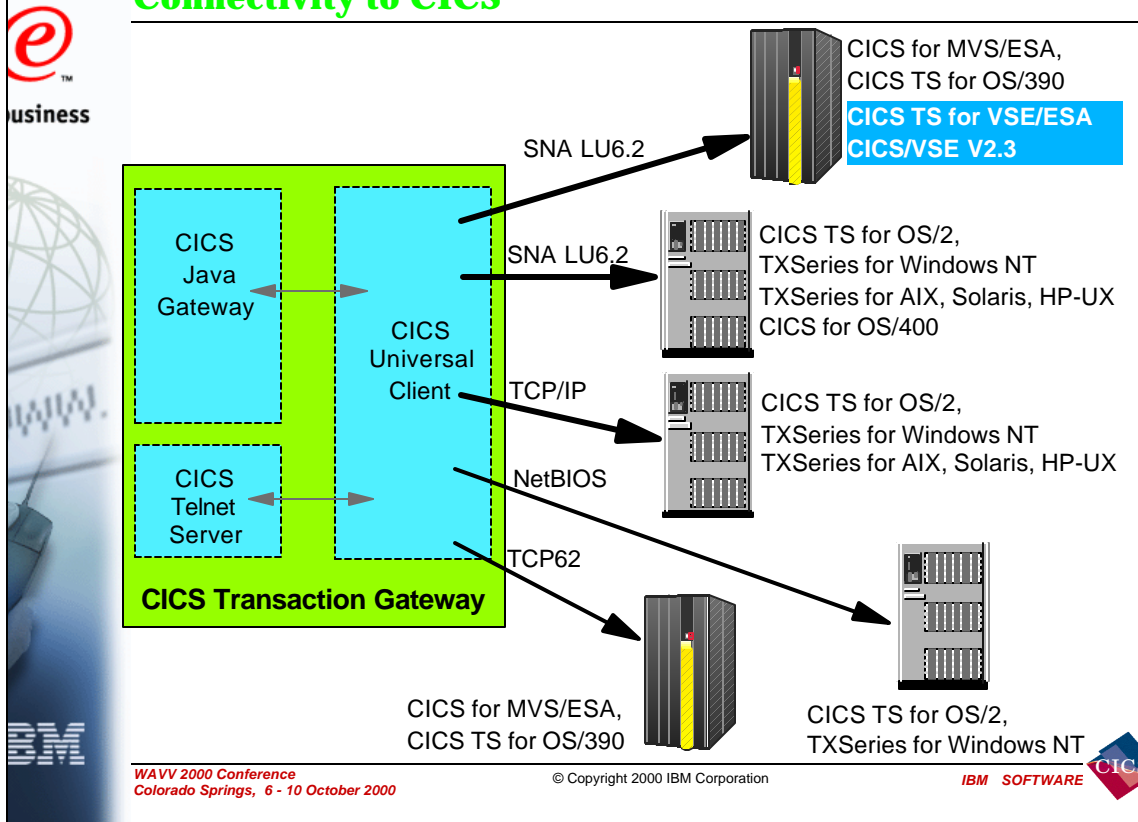© Copyright 2000 IBM Corporation   *IBM   SOFTWARE*   CICS

Network Protocols

- tcp
  - ► Private persistent connection protocol

- http
  - ► Standard protocol used for the Web

- ssl
  - ► Private persistent secure connection protocol

- https
  - ► Secure protocol used for the web

- local
  - ► Private protocol used on Gateway machine

© Copyright 2000 IBM Corporation   *IBM   SOFTWARE*   CICS

15-16

Connectivity to CICS

SNA LU6.2 → CICS for MVS/ESA, CICS TS for OS/390, **CICS TS for VSE/ESA CICS/VSE V2.3**

SNA LU6.2 → CICS TS for OS/2, TXSeries for Windows NT, TXSeries for AIX, Solaris, HP-UX, CICS for OS/400

TCP/IP → CICS TS for OS/2, TXSeries for Windows NT, TXSeries for AIX, Solaris, HP-UX

NetBIOS

TCP62

CICS Java Gateway

CICS Universal Client

CICS Telnet Server

CICS Transaction Gateway

CICS for MVS/ESA, CICS TS for OS/390

CICS TS for OS/2, TXSeries for Windows NT

Security

■ Between end-user or client application and the Gateway....
➤ Via Secure Sockets Layer
➡ User Exits provided

■ Between the Gateway and CICS on S/390....
➤ LU6.2 security
➡ Link
➡ Session (Bind-time)
➡ User (Conversation)

17-18

Application Programming Interfaces

- Three API's
  - External Call Interface
  - External Presentation Interface
  - External Security Interface

- Java is the primary language
  - Applets
  - Servlets
  - Applications

NB: The CICS Universal Clients interfaces are also available on the system on which the Gateway is running
  - C++, C, Visual Basic, COBOL, REXX

© Copyright 2000 IBM Corporation
IBM SOFTWARE
CICS

The External Call Interface

- Usually referred to as the *ECI*

- Allows invocation of COMMAREA-based *applications*

- CICS application invoked via
  - Program name
  - Userid and password
  - COMMAREA

- Like a CICS Distributed Program Link

- Calls may be extended to create one logical transaction

- Calls may be synchronous or asynchronous

© Copyright 2000 IBM Corporation
IBM SOFTWARE
CICS

The External Presentation Interface

- Usually referred to as the *EPI*

- Provides access to CICS 3270 *transactions*

- Acts as a logical terminal

- Used to control existing CICS 3270 applications

- No change to CICS application

© Copyright 2000 IBM Corporation
IBM SOFTWARE

The External Security Interface

- Usually referred to as the *ESI*

- Enables use of APPC *Password Expiry Management (PEM)*

- Passwords can be verified or changed

- Provides audit trail information

- Requires an External Security Manager on S/390

© Copyright 2000 IBM Corporation
IBM SOFTWARE

21-22

The Java API....basic concepts

- A *Class* is a collection of methods, data and interfaces common to all objects of a certain type

- A *Method* is the object-oriented term for a function

- An *Object* is created by instantiating the relevant class
  - ➤ Behaviour implemented with methods
  - ➤ State maintained in variables

- *JavaBeans* are self-contained re-usable Java components
  - ➤ Require no programming
  - ➤ Use any JavaBean enabled visual application builder
    - ➡ e.g. IBM VisualAge for Java, Sun BDK BeanBox

© Copyright 2000 IBM Corporation

IBM SOFTWARE

CICS

The Java API....the class library

- Class library
  - ➤ Contains all the Java source code which implements the CICS Transaction Gateway API

- Class library contains
  - ➤ All classes
  - ➤ JavaBeans

- JavaBeans supplied:
  - ➤ EPI Beans
  - ➤ Common Connector Framework (CCF) Beans

© Copyright 2000 IBM Corporation

IBM SOFTWARE

CICS

23-24

The Java API....

■ Several layers of Java API supported
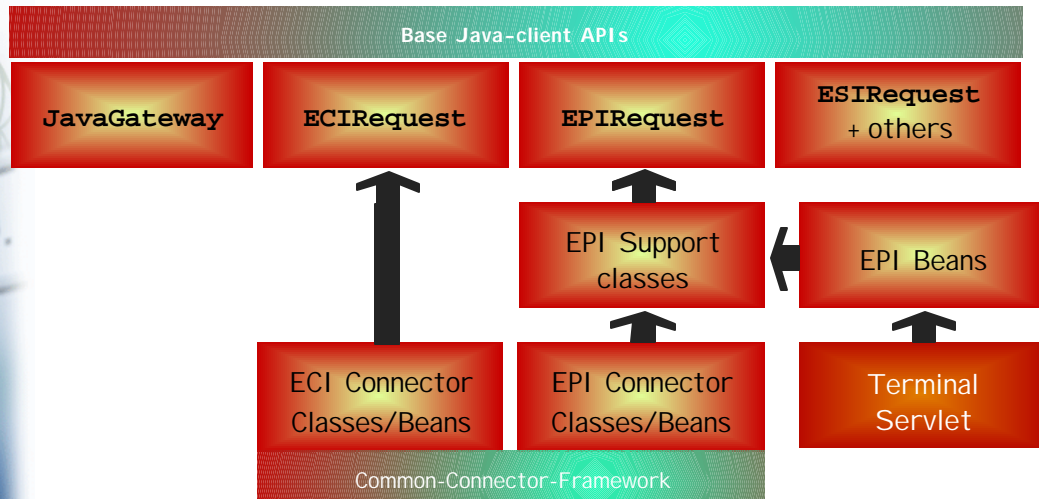
Base Java-client APIs			
JavaGateway	ECIRequest	EPIRequest	ESIRequest + others

EPI Support classes ← EPI Beans

ECI Connector Classes/Beans → ECIRequest

EPI Connector Classes/Beans → EPI Support classes

Terminal Servlet → EPI Beans

Common-Connector-Framework

Base Java API's

■ *JavaGateway* object
  ➤ Represents connection to the CICS Transaction Gateway
  ➤ Has various properties....
    ➡ URL
    ➡ Network address
    ➡ Security classes to be used
  ➤ Core method is *flow*
    ➡ Sends requests to the Gateway
    ➡ Synchronous or asynchronous

25-26

Base Java API's....

- ***ECIRequest*** object
  - ➤ Encapsulates all types of ECI request

- ***EPIRequest*** object
  - ➤ Encapsulates all types of EPI request

- ***ESIRequest*** object
  - ➤ Encapsulates all types of ESI request

- ***CicsCpRequest*** object
  - ➤ Queries code page in use

- ***Callbackable*** interface
  - ➤ Used with asynchronous calls

IBM SOFTWARE CICS

Java EPI Support Classes

- Hides programmer from 3270 datastreams

- Based on C++ EPI classes in CICS Universal Client

- Terminal class handles all interactions with CICS

- Terminal has associated ***Screen*** instance....
  - ➤ Contains a number of ***Fields***
    - ➡ accessed by index or screen position

- for BMS screens a ***Map*** class can be generated from BMS source and then fields accessed by name

- BMS Map classes created using supplied utility

IBM SOFTWARE CICS

27-28

Simple Java EPI application

```java
import com.ibm.ctg.client.*;                      // Need the client-side classes
import com.ibm.ctg.epi.*;                          // And the enhanced EPI classes
public class EPIAndy
{
    public static void main (String [ ] astrArgs)   // Invoke program using :
    {                                               //   java EPIAndy <Gateway_URL> <CICS_Server>
        try {
            JavaGateway jgate = new JavaGateway();            //Create a default JavaGateway
            jgate.setURL(astrArgs[0]);                        // Set URL of remote Gateway
            jgate.open();                                     // Open the connection

            Terminal terminal = new Terminal(jgate, astrArgs[1], null, null); // Add a terminal
            terminal.send(null, "CESN", null);                // Start CESN on the terminal

            Screen screen = terminal.getScreen();             // Get the current screen
            for (int i = 1; i <= screen.fieldCount(); i++)    // Loop round all fields
            {
                if (screen.field(i).textLength() > 0) {       // Print non-empty fields
                    System.out.println("Field " + i + ": " + screen.field(i).getText());
                }
            }

            screen.setAID(AID.PF3);                           // Set the AID key to send
            terminal.send();                                  // Return the screen to CICS
            terminal.disconnect();                            // Disconnect the terminal
        }
        catch (Exception e) {                                 // Handle any problems
            System.out.println(e.getMessage());
        }
    }
}
```

EPI JavaBeans

- Use to quickly create front-ends that connect to CICS

- The EPI Beans are ....
  - Built on top of the EPI Support classes
  - Fully compliant with Sun's JavaBeans API

- Four EPI Beans supplied
  - The *EPITerminal* bean
  - The *EPIBasicScreenHandler* bean
    - Specific *ScreenHandler* beans can also be created
  - The *EPIScreenButtons* bean
  - The *EPIMonitor* bean

The Common Connector Framework

- The IBM *Common-Connector-Framework (CCF)* provides a consistent means of interacting with Enterprise resources from any Java execution environment
  - ► Consistent for User client applications
  - ► Consistent for the IBM Connectors

- Enterprise Access Builder (EAB), part of VisualAge for Java Enterprise Edition V3, provides CCF connectors....
  - ► CICS, MQSeries, IMS
  - ► Encina, Host-on-Demand, SAP R/3

- New CCF based connectors available with VSE/ESA V2.5
  - ► Access VSE resources such as VSAM, Librarian, POWER

IBM   SOFTWARE   CICS

The Common Connector Framework....

- The CCF Client API....
  1. **ConnectionSpec**
     ➡ Contains properties to access an Enterprise resource
  2. *InteractionSpec*
     ➡ Contains properties for a single interaction
  3. *Communication*
     ➡ The conduit used to execute interactions

- The CICS Connectors....
  - ► CICSConnectionSpec
  - ► ECIInteractionSpec
  - ► EPIInteractionSpec

IBM   SOFTWARE   CICS

Further Information

- CICS Website for general information and publications:
  - http://www.ibm.com/software/ts/cics/

- Red Books, downloadable from http://www.redbooks.ibm.com
  - Revealed! CICS Transaction Gateway with More CICS Clients Unmasked, SG24-5277
  - Revealed! Architecting Web Access to CICS, SG24-5466

- Samples provided with the Gateway....
  - Use of ECI, EPI, ESI
  - Use of EPI Beans with VisualAge for Java
  - Use of the Terminal Servlet

CICS Transaction Gateway Summary

- Enables access to CICS applications and transactions from:
  - Web Browsers or Network Computers
  - Java Applets, Servlets, Applications

- Is an IBM e-business Connector

- Provides the ECI, EPI and ESI programming interfaces

- Allows visual programming using supplied JavaBeans

- Terminal Servlet provides 3270 transaction access

- Supports the cross-product Common Connector Framework

- Provides network security via industry standard SSL

- Supports CICS/VSE V2.3 as well as CICS TS for VSE/ESA

- Provided as part of the CICS TS for VSE/ESA package