IBM WebSphere Application Server

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Agenda

- WebSphere Product Family - Overview

- WebSphere Components

- WebSphere Application Server

- Connectors

- VSE e-business Connectors

- Value of WebSphere Model

- More information

WebSphere Application Model

World Wide Web

Web Servers

Application Servers

Databases

Transactions
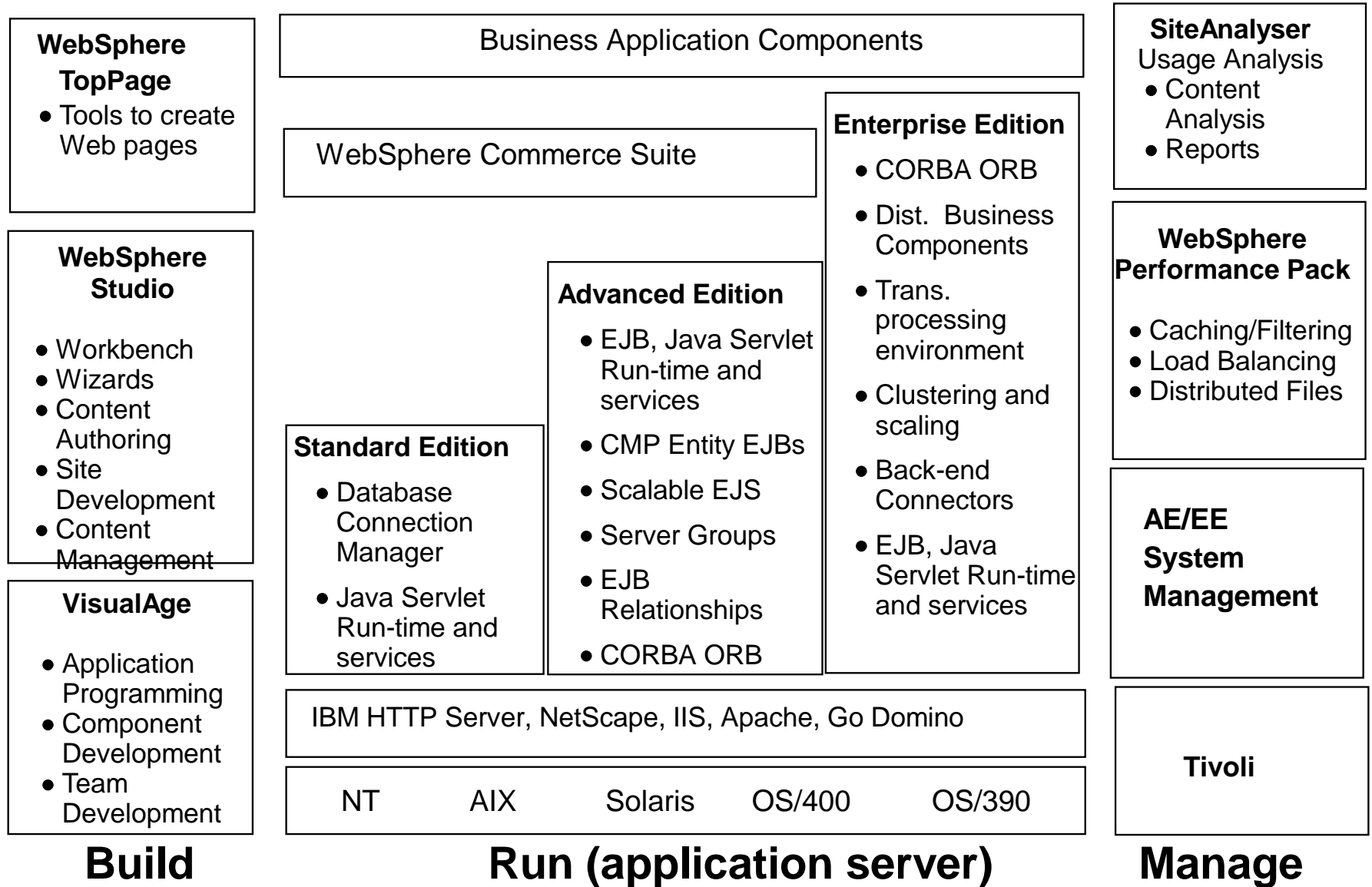
Business logic components

Clients
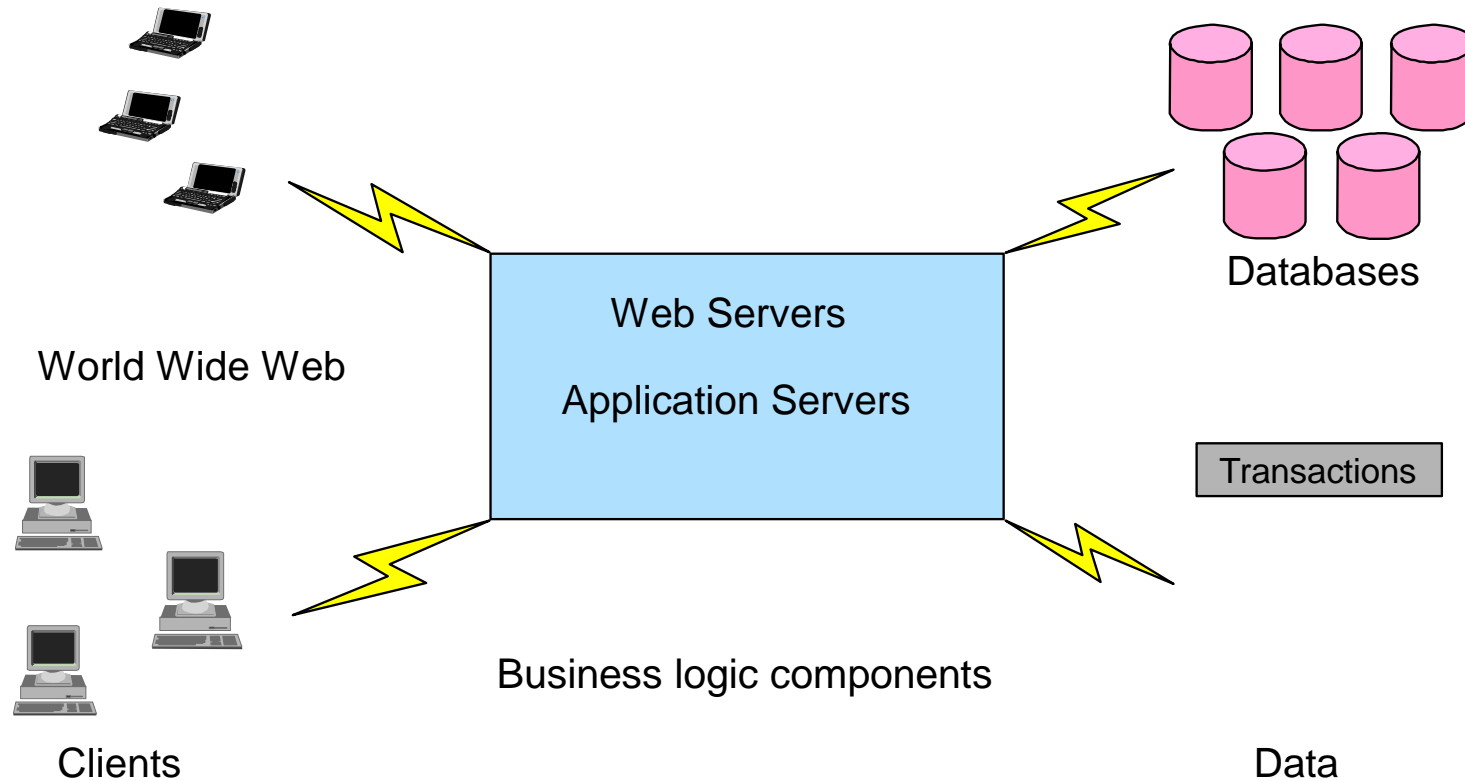
Data

- Web application server manages applications at 2nd tier of a 3-tier model
- Application deployment environment (Web standards)
- Tight enterprise integration and cooperation
  - ➤ Use data from back-end systems (databases, transaction systems)
  - ➤ Provides output to Web browsers on a client
- Infrastructure services (security, scalability, ...)

IBM WebSphere Family

- Open, standards-based Java server runtime environment

- Web site development tools

- Commerce software

- Management software

► To build, manage and deploy powerful,
  portable e-business applications.

IBM WebSphere Product Family

WebSphere TopPage
- Tools to create Web pages

WebSphere Studio
- Workbench
- Wizards
- Content Authoring
- Site Development
- Content Management

VisualAge
- Application Programming
- Component Development
- Team Development

Business Application Components

WebSphere Commerce Suite

Standard Edition
- Database Connection Manager
- Java Servlet Run-time and services

Advanced Edition
- EJB, Java Servlet Run-time and services
- CMP Entity EJBs
- Scalable EJS
- Server Groups
- EJB Relationships
- CORBA ORB

Enterprise Edition
- CORBA ORB
- Dist. Business Components
- Trans. processing environment
- Clustering and scaling
- Back-end Connectors
- EJB, Java Servlet Run-time and services

IBM HTTP Server, NetScape, IIS, Apache, Go Domino

NT	AIX	Solaris	OS/400	OS/390

SiteAnalyser
Usage Analysis
- Content Analysis
- Reports

WebSphere Performance Pack
- Caching/Filtering
- Load Balancing
- Distributed Files

AE/EE System Management

Tivoli

Build

Run (application server)

Manage

Servlet

- A Servlet is a server-based Java program used to create <u>HTML on demand</u> for a Web server.

  - ► Small platform independent programs (Java classes) used to extend functionality of the Web server
  - ► Provide dynamic Web content to clients
  - ► Executed in a Servlet engine
    - − Engine places request to Servlet
    - − Servlet sends response in HTTP form to client

Receive request
info. via HTTP
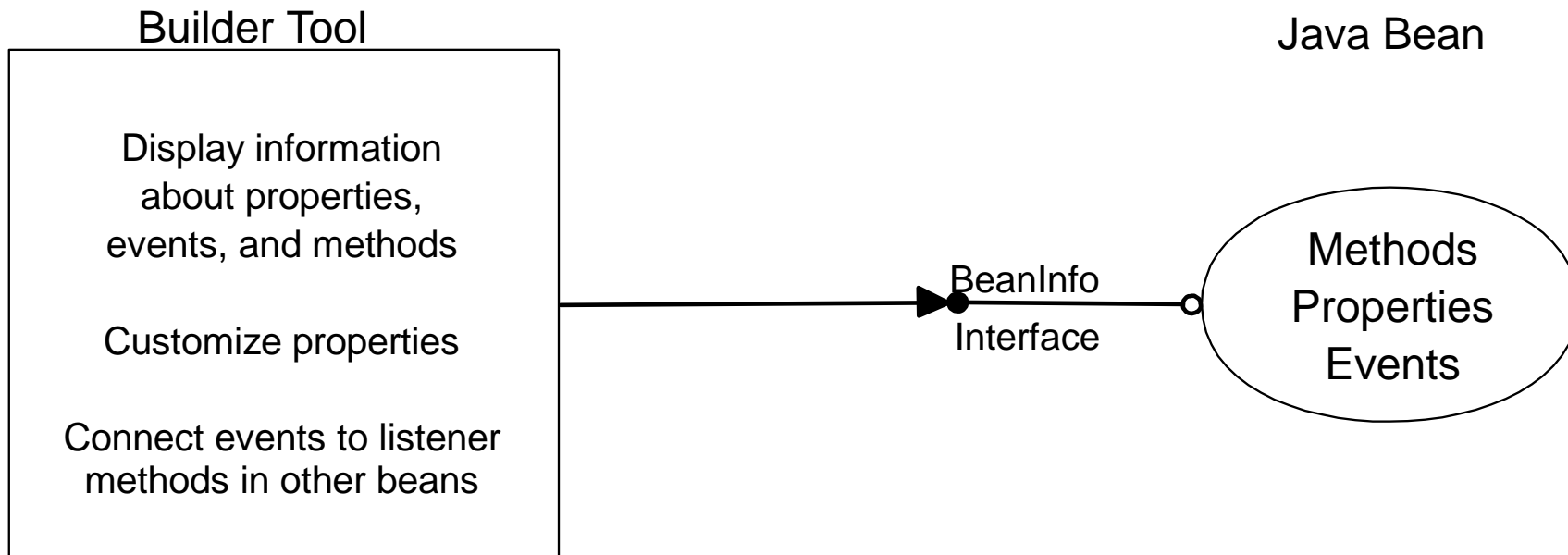Servlet request

Output HTML strings
to Web server via
HTTP Servlet response
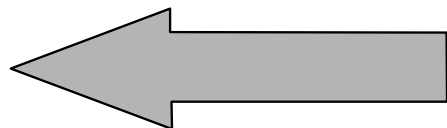
Java Servlet

Java program logic produces
HTML output

Java Server Pages

- Java Server Pages (JSP) are a new JavaSoft specification for dynamic page generation.

  - ► HTML source files that include Java extensions (<java> tag) for
    - − Dynamic content and increased functionality
  - ► Compiled into Servlet before deployment
    - − Recompiled only, if page changes
  - ► Code is fully functional Java
  - ► Code has access to Servlet and the Servlet object model
  - ► Embed results from Servlet and beans
  - ► Helps to separate HTML coding from business logic

Java Beans

- A Java Bean is a reusable software component that can be manipulated in a builder tool. Java Beans are usually used to represent items on a GUI, and are generally client-side only.

  - ▶ Java classes that conform to certain coding standards
  - ▶ Can be described in terms of properties, methods, and events
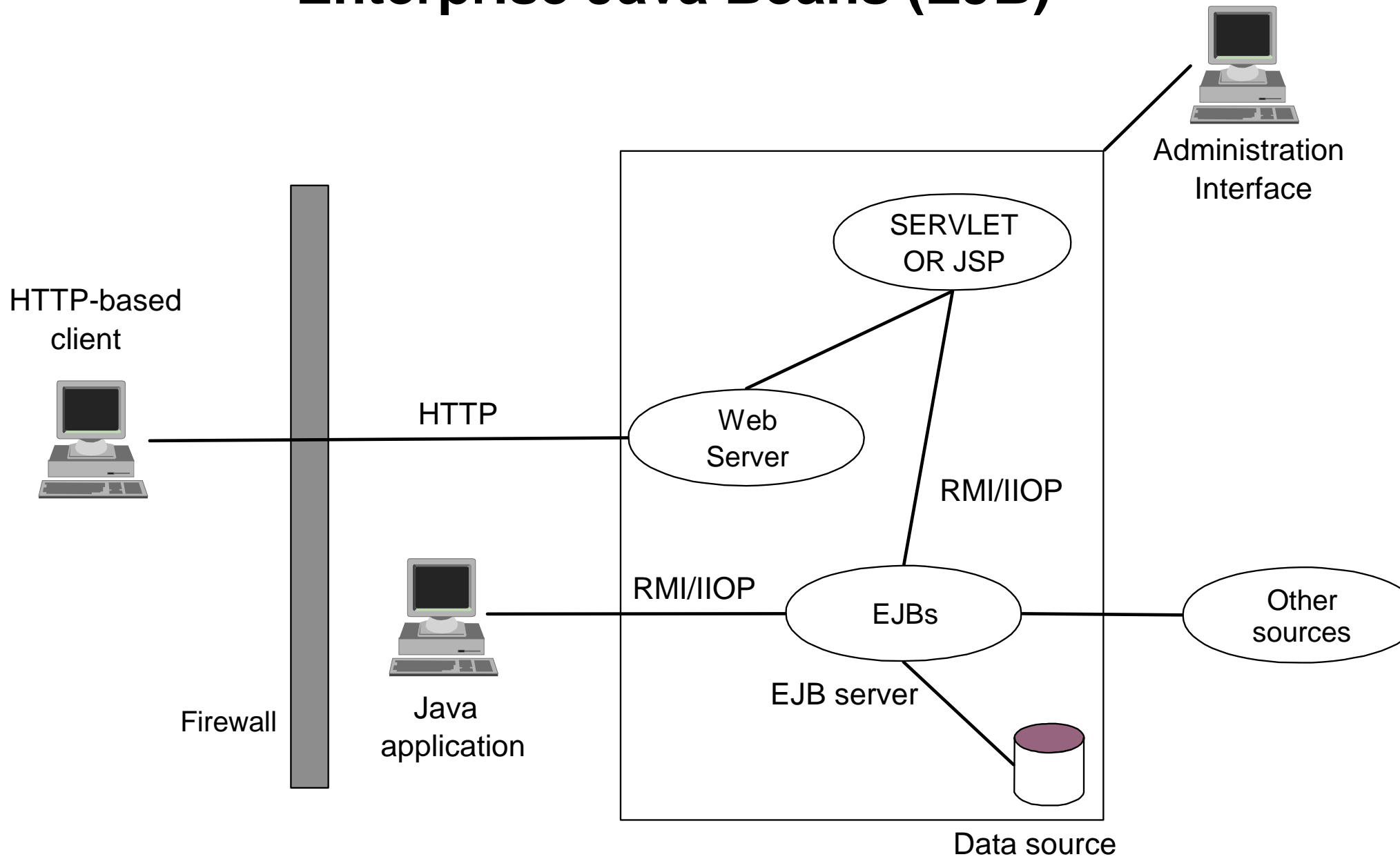 - ▶ May or may not be visual components (e.g. push buttons, sliders, ...)

Builder Tool   Java Bean

Display information
about properties,
events, and methods

                                    BeanInfo   Methods
Customize properties   Interface   Properties
                                                          Events
Connect events to listener
methods in other beans

Visual Age for Java
NetObjects Bean Builder

Enterprise Java Beans (EJB)

- Enterprise Java beans are server-side Java components that are designed for distributed environments.

- A business object
  - ► Either a long-lasting entity (like a bank account)
  - ► Or a short-lasting session (like a "visit" to the bank)

- It exits within an EJB container, running on an enterprise Java server
  - ► WebSphere is such an container, that provide services such as
    - − security, naming, directory services
    - − persistent storage

- It is accessible remotely or locally

Enterprise Java Beans (EJB)

Administration
Interface

SERVLET
OR JSP

HTTP-based
client

HTTP

Web
Server

RMI/IIOP

RMI/IIOP

EJBs

Other
sources

Firewall

Java
application

EJB server

Data source

WebSphere Studio

■ Delivers a complete set of Web deployment tools

■ Combines graphical development wizards with tools for Web site design and Java development (Servlet, Java Beans, ...), including

  ► Workbench environment to organize / manage Web development projects

  ► Integrated visual page designer for Web page development
    (based on NetObjects TopPage technology)

  ► Integrated Applet designer based on NetObjects Bean Builder technology

  ► Integrated remote debug facility of server side logic

  ► Tight integration with Visual Age for Java

  ► and more ...

Visual Age for Java -- Usage Concepts

- Develop business logic
- VAJava closely linked with WebSphere
  (tight integration with WebSphere Studio)
- Generation of middleware connectors. e.g.
  - ► Data access beans
  - ► Stored procedure builder
  - ► Simplified SQL coding
  - ► Enterprise Access Builder for connectors like MQSeries,
    Host-on-Demand, EJB support for SAP R/3, ...
- Roles based development
- "Build with Visual Age for Java, run with WebSphere"
  - ► Visually construct Servlet, build JSP's from Java Beans
  - ► Use powerful debugging functions
  - ► Debug target servers remotely

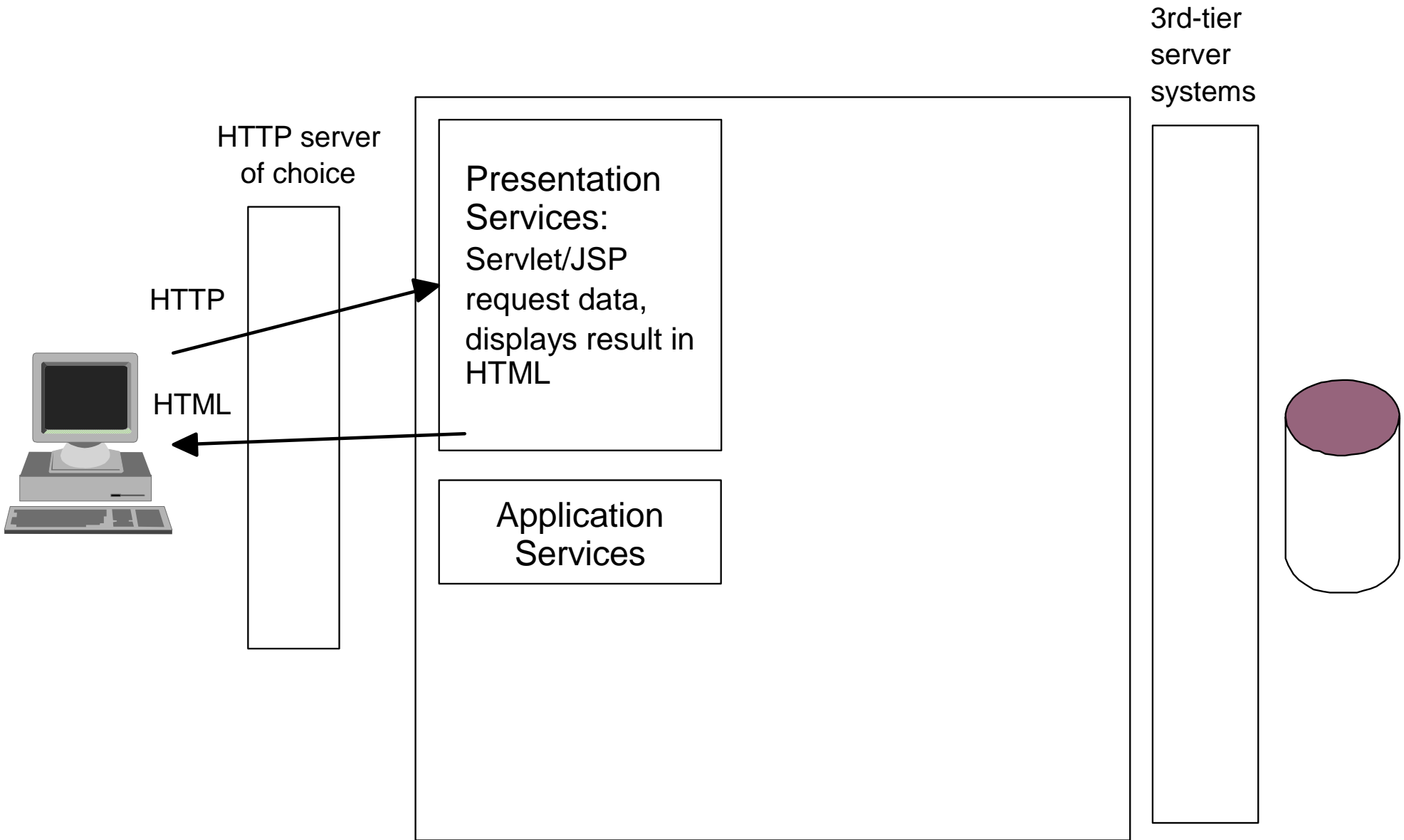# WebSphere Application Server (WAS) Product Editions

- Most current Version = Version 3.02

- WAS Standard Edition
  - ► Web Application Server
    - − HTTPd -- HTML pages, files, JSPs, Java Classes, Servlet
    - − Security plug-in

- WAS Advanced Edition adds
  - ► Web Application Server
    - − Plus IIOP plug-in
    - − EJB server

- WAS Enterprise Edition adds
  - ► Component Broker -- Workstation and 390
  - ► TXSeries (distributed CICS)
  - ► Encina

WAS Standard Edition

HTTP server
of choice

3rd-tier
server
systems

Presentation
Services:
Servlet/JSP
request data,
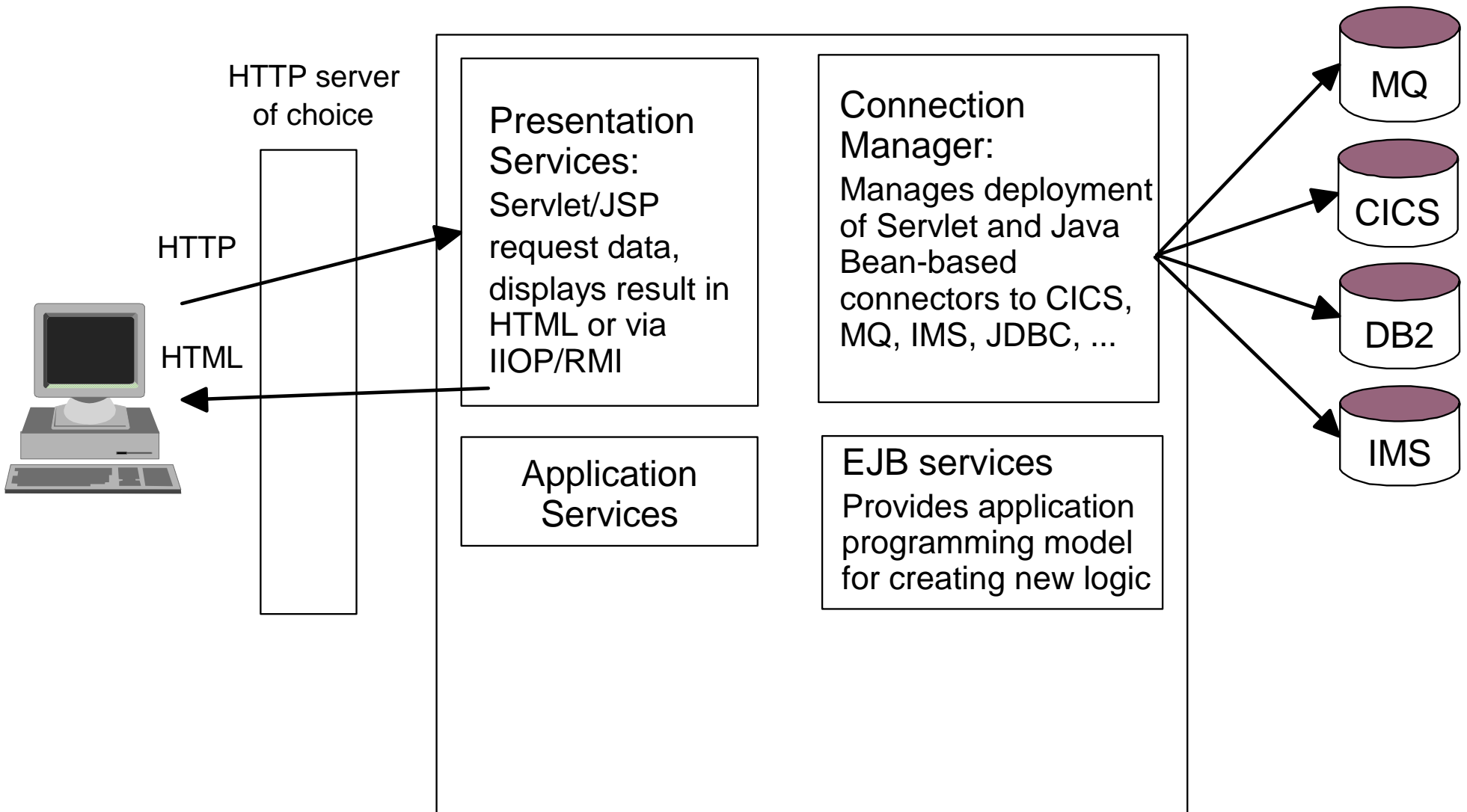displays result in
HTML

HTTP

HTML

Application
Services

Standard Edition V3

- Java-based application environment
- WAS to build, deploy and
  manage Internet / Intranet Web applications

- IBM HTTP server
  - New administration GUI
  - Support for LDAP connectivity
- Plugins for other web servers
- Administration and Monitoring
- Configuration and Management
- Improved integration with VAJava
- Full support of Java Servlet, JavaBeans, JSP, XML
- High speed pooled database access
  using JDBC for DB2 UDB and Oracle
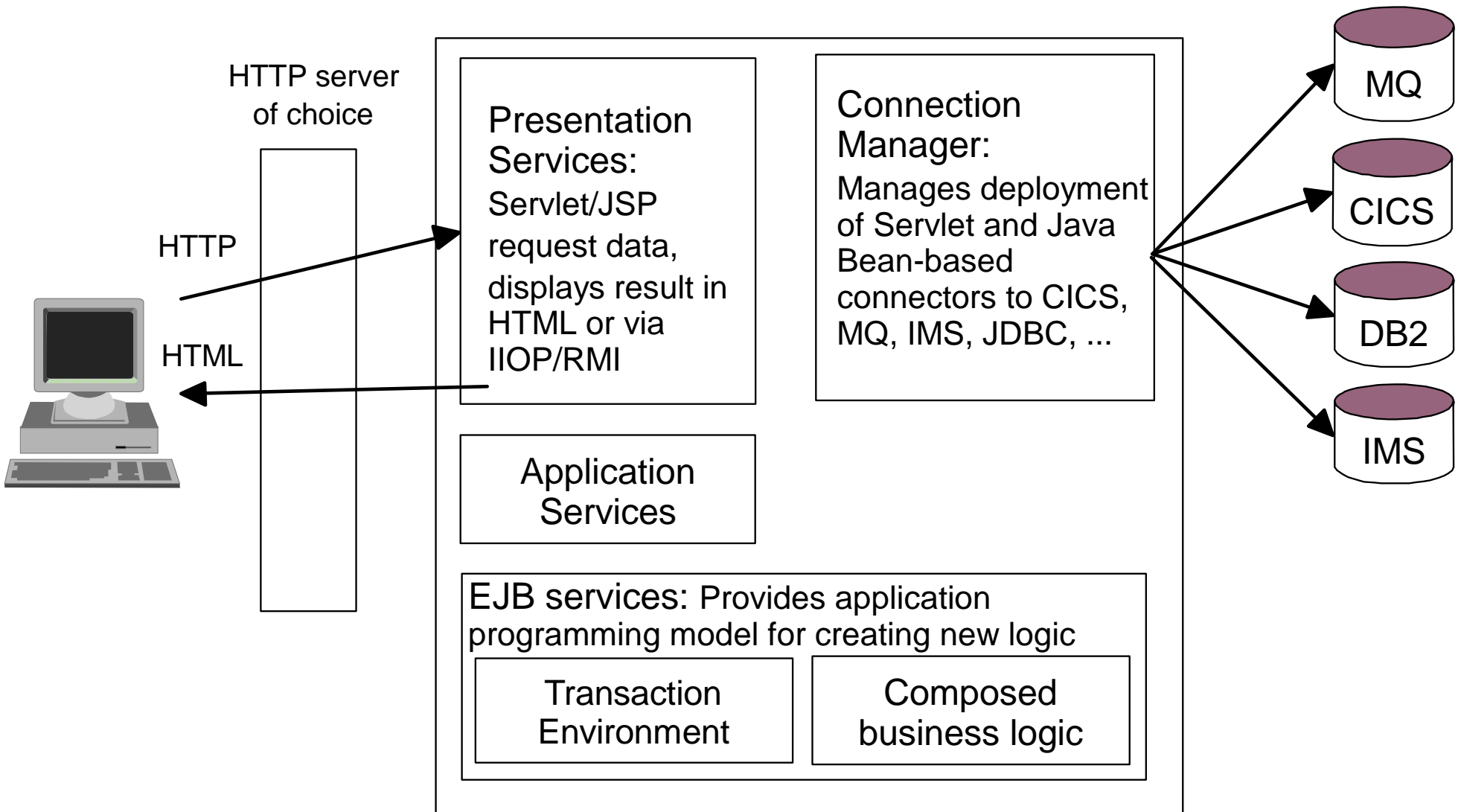- Servlet samples

WAS Advanced Edition

HTTP server
of choice

HTTP

HTML

Presentation Services:
Servlet/JSP request data, displays result in HTML or via IIOP/RMI

Connection Manager:
Manages deployment of Servlet and Java Bean-based connectors to CICS, MQ, IMS, JDBC, ...

MQ

CICS

DB2

IMS

Application Services

EJB services
Provides application programming model for creating new logic

Advanced Edition V3

■ Standard Edition enhancements +

■ Enterprise Java Server
- ► Scalability features for EJBs, Servlet and JSPs
  - – EJB, Servlet, JSP code all executes in the same runtime
  - – Application-level load balancing
  - – Application-level partitioning
  - – Workload management for applications
- ► Java database connectivity
- ► Enhanced support for distributed transactions and transaction processing
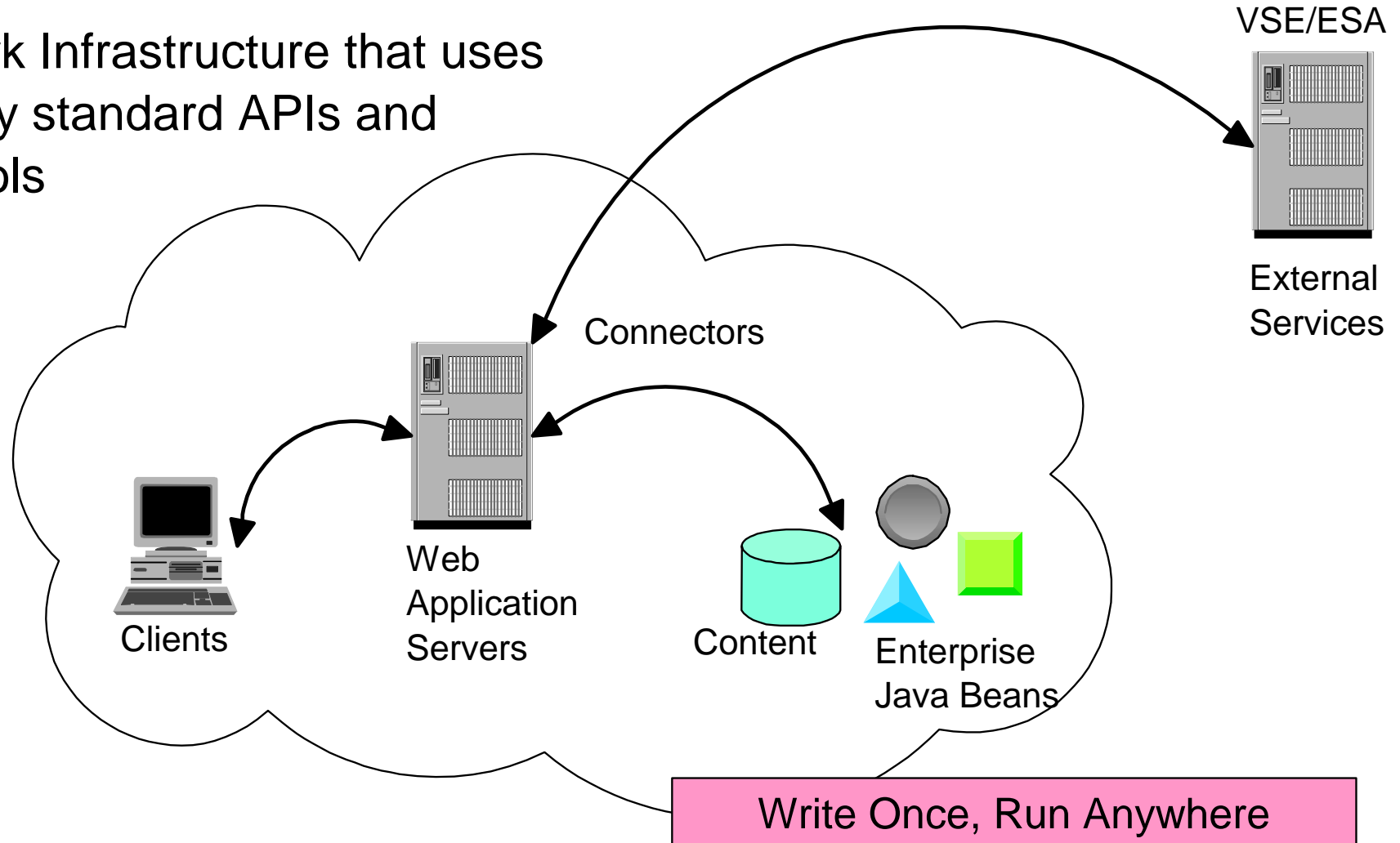- ► Improved security controls and management
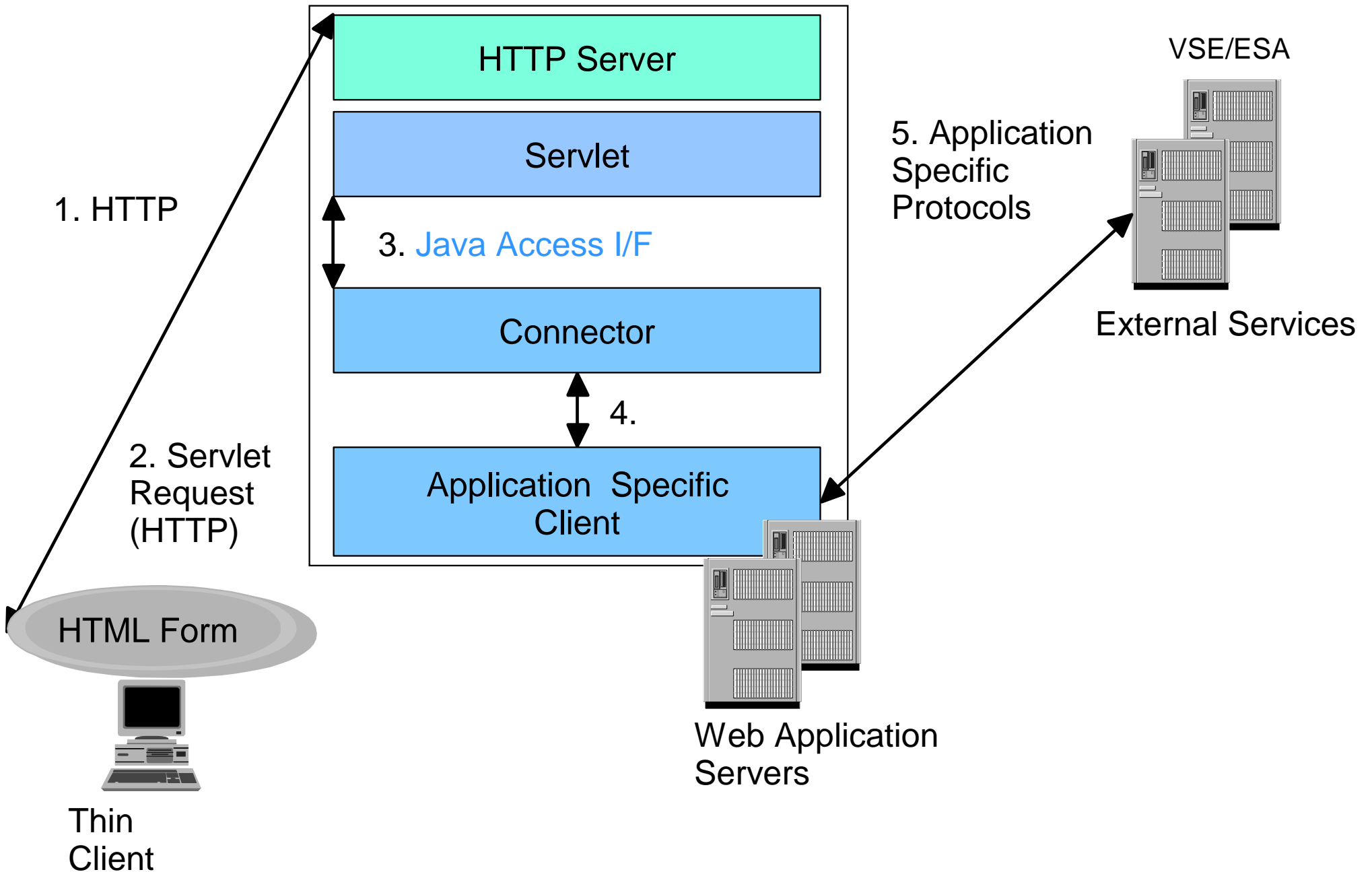
WAS Enterprise Edition

HTTP server of choice

HTTP

HTML

Presentation Services:
Servlet/JSP request data, displays result in HTML or via IIOP/RMI

Connection Manager:
Manages deployment of Servlet and Java Bean-based connectors to CICS, MQ, IMS, JDBC, ...

MQ

CICS

DB2

IMS

Application Services

EJB services: Provides application programming model for creating new logic

Transaction Environment

Composed business logic

Enterprise Edition V3

- Advanced Edition enhancements +

- Enables full e-business transactions over the Web
- Provides high quality middleware runtime services for distributed applications
- Enables integration of new and existing business applications in heterogeneous systems
- Supports sophisticated business transactions
  - ▶ Integrated, mission-critical applications
- Provides high-end enterprise scalability, manageability, robustness, performance
  - ▶ CICS, TxSeries
  - ▶ IBM Component Broker (CORBA, EJB) technology

System Model (Connectors)

Network Infrastructure that uses industry standard APIs and protocols

VSE/ESA

External Services

Connectors

Web Application Servers

Clients

Content

Enterprise Java Beans

Write Once, Run Anywhere

Connectors - Server Integration

HTTP Server

Servlet

3. Java Access I/F

Connector

4.

Application Specific Client

1. HTTP

2. Servlet Request (HTTP)

HTML Form

Thin Client

Web Application Servers

5. Application Specific Protocols

VSE/ESA

External Services

VSE e-business Connectors

- Easy access to VSE/ESA resources from other systems

- VSE e-business connectors include

  - ► Server code running on VSE/ESA

  - ► JAVA beans, Servlet and samples on Java capable clients
    - − Such as IBM's WebSphere Application Server (3-tier approach)
      which may run on Windows NT, Linux, AIX, OS/390, ...
      - VSE e-business connectors
        best integrated with WAS advanced edition
    - − May also be used in 2-tier environments

- VSE/ESA 2.5 (as previewed in February 2000) will provide
  new VSE e-business connectors.

VSE e-business Connectors ...

- Advantages
  - ► Exploitation of non-VSE e-business infrastructure

  - ► Always newest e-business components
    - − Java, web server, security
    - − Platform independent

  - ► VSE/ESA resources can be easily integrated
    into new e-business applications
    - ► New VSE e-business connectors
    - ► e-business connectors available today
      (DB2 Connect, MQ Series client, CICS TS Gateway, ...)

  - ► E-business offerings can be exploited

  - ► Generalized interfaces

WebSphere - VSE Scenario

Web Browser / Client Applications
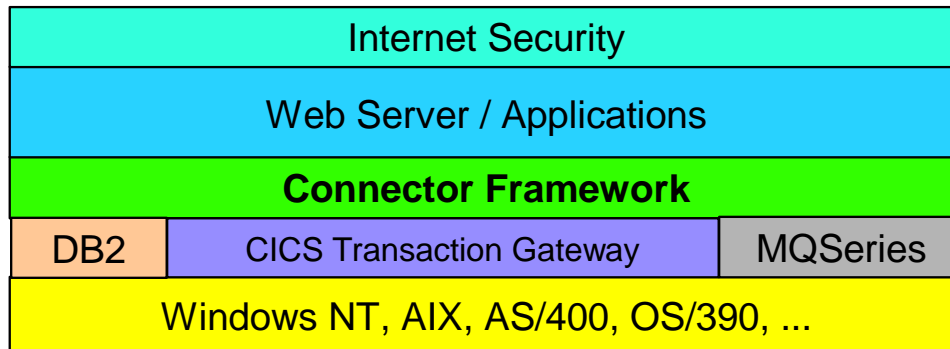
Internet   TCP/IP

Middle Tier

| Internet Security |
| Web Server / Applications |
| **Connector Framework** |

| DB2 | CICS Transaction Gateway | MQSeries |

| Windows NT, AIX, AS/400, OS/390, ... |

WebSphere
Application
Server

Intranet   SNA or TCP/IP

| DB2 | ←→ | CICS TS | MQSeries |

VSE/ESA 2.4

DB2

VSAM
DL/I

Other
Data
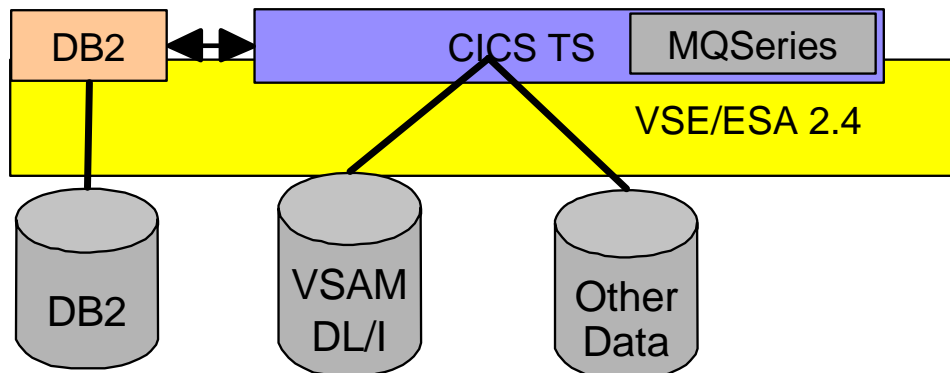
e-business Connectors Available Today

- DB2 Connect (JDBC)
  - ► TCP/IP based connection with DB2 V7 (previewed in April)

- CICS Transaction Gateway
  - ► SNA based connection

- MQSeries Connector
  - ► TCP/IP based connection

- And more ...

Connector Interfaces

Java Program	VSE Java Beans	VSE Connector Server
JDBC, ODBC, CLI	DB2 Connect	DB2 for VSE
MQSeries Client for Java	MQSeries Server for NT, Unix, etc.	MQSeries Server for VSE
Web Browser, Servlet	CICS Transaction Gateway	CICS Transaction Server for VSE
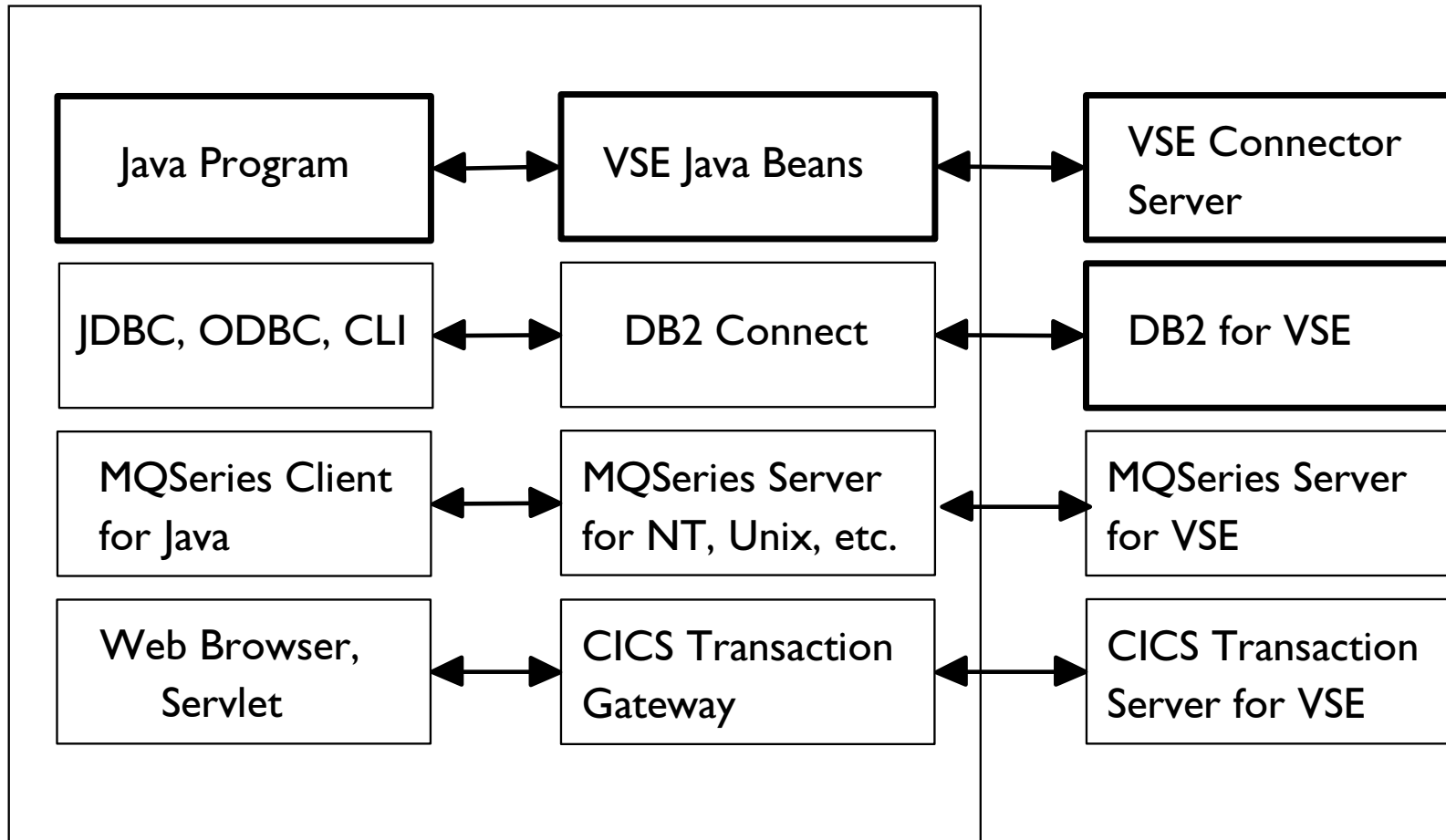
non-VSE platforms

WebSphere - Connection with VSE/ESA

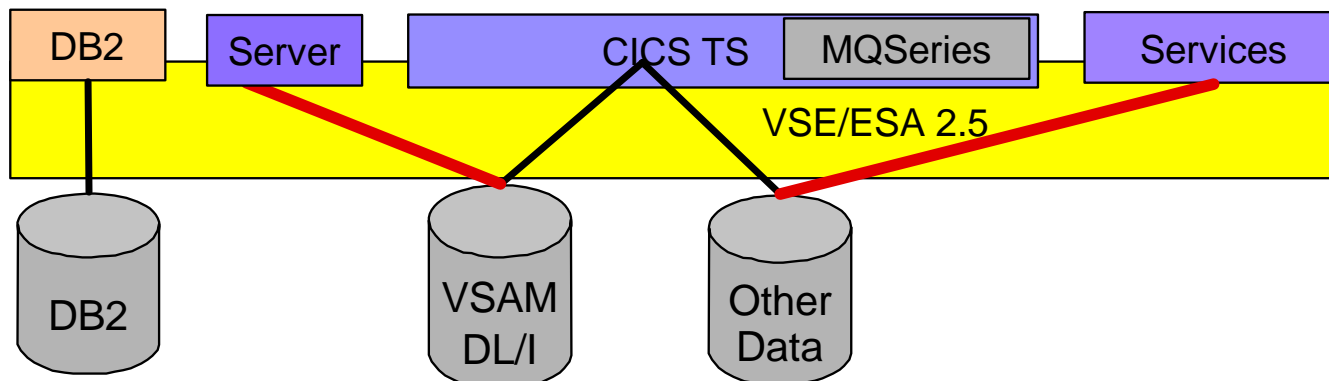Web Browser / Client Applications

Internet   TCP/IP

RS/6000
Netfinity

| Internet Security |
| Web Server / Applications |
| **Connector Framework** |

| DB2 | CICS Transaction Gateway | MQSeries | Connector |

| Windows NT, AIX, AS/400, OS/390, ... |

WebSphere
Application
Server

Intranet   SNA or **TCP/IP**

| DB2 | Server | CICS TS | MQSeries | | Services |

VSE/ESA 2.5

DB2

VSAM
DL/I

Other
Data
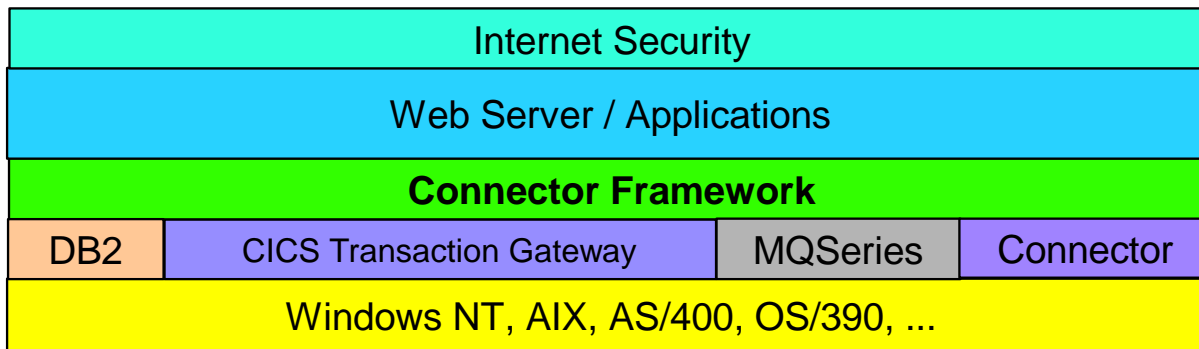
VSE e-business Connectors ...

- DB2 based connectors for VSAM and DL/I

  - ► Exploitation of DB2 infrastructure
    (JDBC/ODBC, DB2 Connect, DB2 server,
    DB2 stored procedures)

  - ► Mapping of SQL requests to VSAM and DL/I data

  - ► VSE/ESA provides APIs to
    - – Access VSAM and DL/I data
    - – Do the mapping to VSAM and DL/I data

  - ► Sample mappings and applications provided

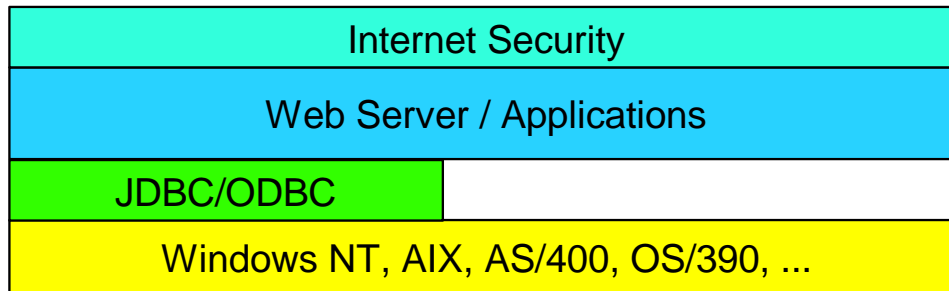 - ► Communication via DRDA (SNA or TCP/IP based with DB2 V7)

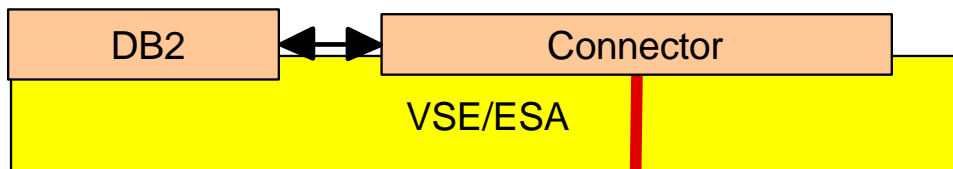# DB2-based Connectors

Web Browser / Client Applications

Internet   TCP/IP

RS/6000
Netfinity

| Internet Security |
| Web Server / Applications |
| JDBC/ODBC |
| Windows NT, AIX, AS/400, OS/390, ... |

WebSphere Application
Server

Intranet   **TCP/IP**

| DB2 | ←→ | Connector |
| VSE/ESA |

VSAM
DL/I

VSE e-business Connectors ...

- Other VSE connectors
  - ► Access to VSE/ESA resources, such as
    VSE/VSAM files, VSE/POWER, VSE/ICCF,
    VSE Librarian, VSE consoles, job submission

  - ► Access provided via
    - external services running on VSE/ESA
    - Java-based services running on
      e.g. web application server environments
    - Plug-in capabilities for subsystems and vendors
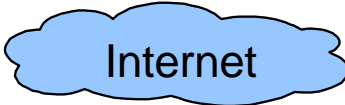   on VSE/ESA and middle tier

  - ► Java samples (Applets / Servlet) are provide

  - ► Communication TCP/IP based
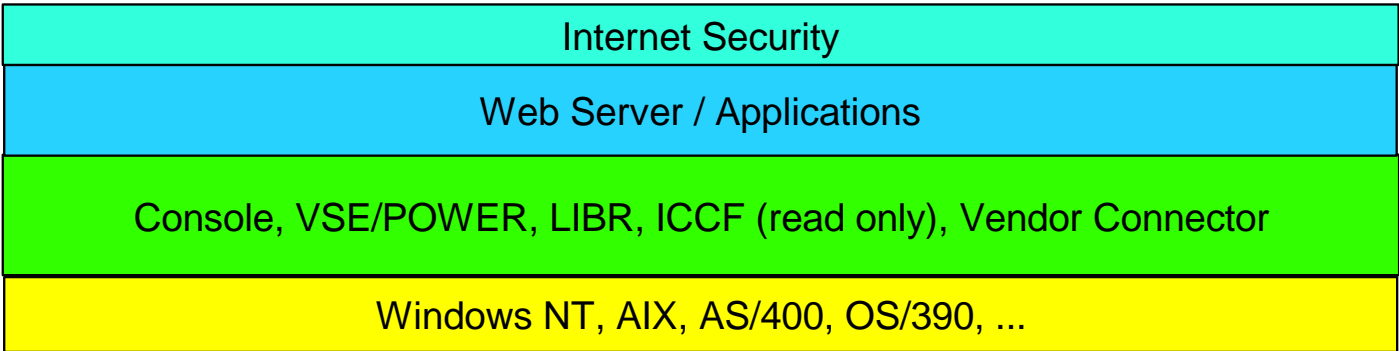
Connectors based on External Services

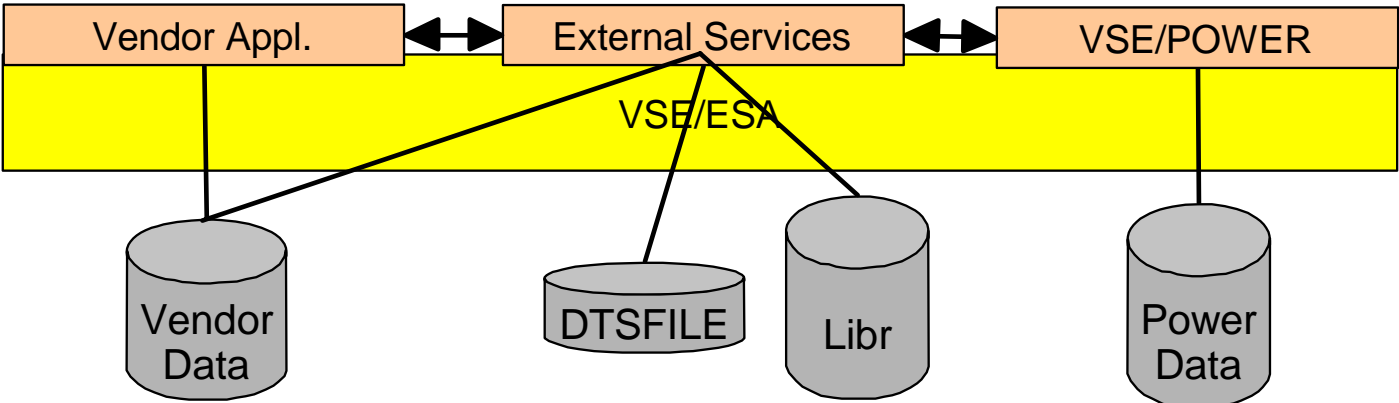Web Browser / Client Applications

Internet   TCP/IP

| Internet Security |
| Web Server / Applications |
| Console, VSE/POWER, LIBR, ICCF (read only), Vendor Connector |
| Windows NT, AIX, AS/400, OS/390, ... |

WebSphere
Application
Server

Intranet   **TCP/IP**

| Vendor Appl. | ↔ | External Services | ↔ | VSE/POWER |

VSE/ESA

Vendor Data

DTSFILE   Libr

Power Data

Samples

- VSE connector client

- Java applications
  - Access to VSE/POWER queues, VSE Libraries, ICCF, VSE console, job submission
  - Display and change of VSAM data
  - Monitoring of VSAM space usage

- Java applets
  - Mapping of VSAM data into a relational structure
  - Display of VSAM used and free space

- Java Servlet
  - Search utility for VSE databases
  - More ...

Value of WebSphere Model

- Select best platform for e-business applications

- Extend core business applications into fully functioning Web applications
  - ► Extend reach and usefulness to end-users without increasing risk to existing applications.
  - ► Turns stateless HTTP into stateful, "conversational" model

- Implementation of internet standards (Servlet, Java Beans, JSP, HTTP)
  - ► Increased productivity (reuse)
  - ► Isolation from server APIs
  - ► Portability of applications

- Exploit development tools
  - ► Heterogeneous team support (let the right expert do the work)
  - ► Source control via visual tools (VAJava, NetObject Fusion)
  - ► Open to any tool or editor

- Provide an environment that grows
  - ► Caching and filtering for improved response times
  - ► Load balancing for high performance and scalability
  - ► File replication and security

More Information

- IBM e-business connectors
  - ► http://www.software.ibm.com/webservers/connectors
- Application Framework for e-business
  - ► http://www.software.ibm.com/ebusiness
- WebSphere
  - ► http://www.software.ibm.com/webservers
- CICS Gateways
  - ► http://www.ibm.com/software/ts/cics/products/
- DB2 related connectors (net.data, DB2 Connect, ...)
  - ► http://www.software.ibm.com/data

- ► VSE/ESA home page
  (includes links to VSE/ESA and e-business, TCP/IP for VSE/ESA, Turbo Dispatcher, ...)
  - ► http://www.s390.ibm.com/vse/

Related Redbooks

- TCP/IP in General
  - ▶ TCP/IP Tutorial and Technical Overview - GG24-3376

- TCP/IP for VSE/ESA
  - ▶ The native TCP/IP Solution for VSE - SG24-2041
  - ▶ VSE as a Webserver - SG24-2040

- CICS Gateways
  - ▶ Running CICS Transactions Through the Web:
    The CICS Internet Gateway for VSE/ESA - SG24-4799
  - ▶ External Presentation Interface (EPI):
    New VSE/ESA Support for CICS - SG24-2038
  - ▶ Revealed ! CICS Transaction Gateway
    with more CICS Clients unmasked - SG24-5277

- WebSphere Application Servers:
  Standard and Advanced Editions - SG24-5460

- WebSphere V3 Performance Tuning Guide - SG24-5657