IMS e-business Application Development/Enablement Solutions

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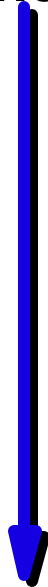
Application Integration

Native API's

Distributed Objects

Connection

Integration

Simplifying Access

Gateways / Connectors

(Simple, easy, not robust, minimal skills)

Messaging / Replication

(More function, higher value,

application to application, skills required)

Business Process Integration / Workflow

(More secure, robust, high performance, imbedded business logic, higher level skills)

Complex Transactions / Distributed Object Sharing

(Comprehensive, leverage existing investments, transaction integrity, highly secure, advanced skills)

Java

Enterprise JavaBeans

Connection Components

- IMS Connectors
  - eNetwork Host On-Demand
    - CICS Internet Gateway
      - CICS Gateway for Java
        - DCE Encina Lightweight Client
        - MQSeries Internet Gateway
        - MQSeries Client for Java
      - Net.Data
    - NotesPump
  - JDBC

- Universal Web access to all IT assets
- Increased productivity

Business Integration

MQSeries Family

MQSeries Workflow

- **Workflow, Process Flow**
- **Application Services**
- **Tools**

MQSeries Integrator

- **Xform, Rules, Routing**
- **API Framework**
- **Templates, Utilities**

MQSeries

- **Messaging Services**
- **Standard Formats**
- **Tools**

Family Traits

- **Modular Set of Offerings**
- **MQSeries Foundation**
- **Common Look and Feel**
- **Management/Monitoring**
- **Messaging Tools**

IBM

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Integration of e-business with IMS

- 🟩 **Application Integration**
  - ODBA
  - EJB
  - JDBC
  - Unicode
  - J2EE/JTA

- 🟩 **Product Integration**
  - OTMA
  - MQSeries
  - IMS Connect
  - IMS Java
  - WebSphere
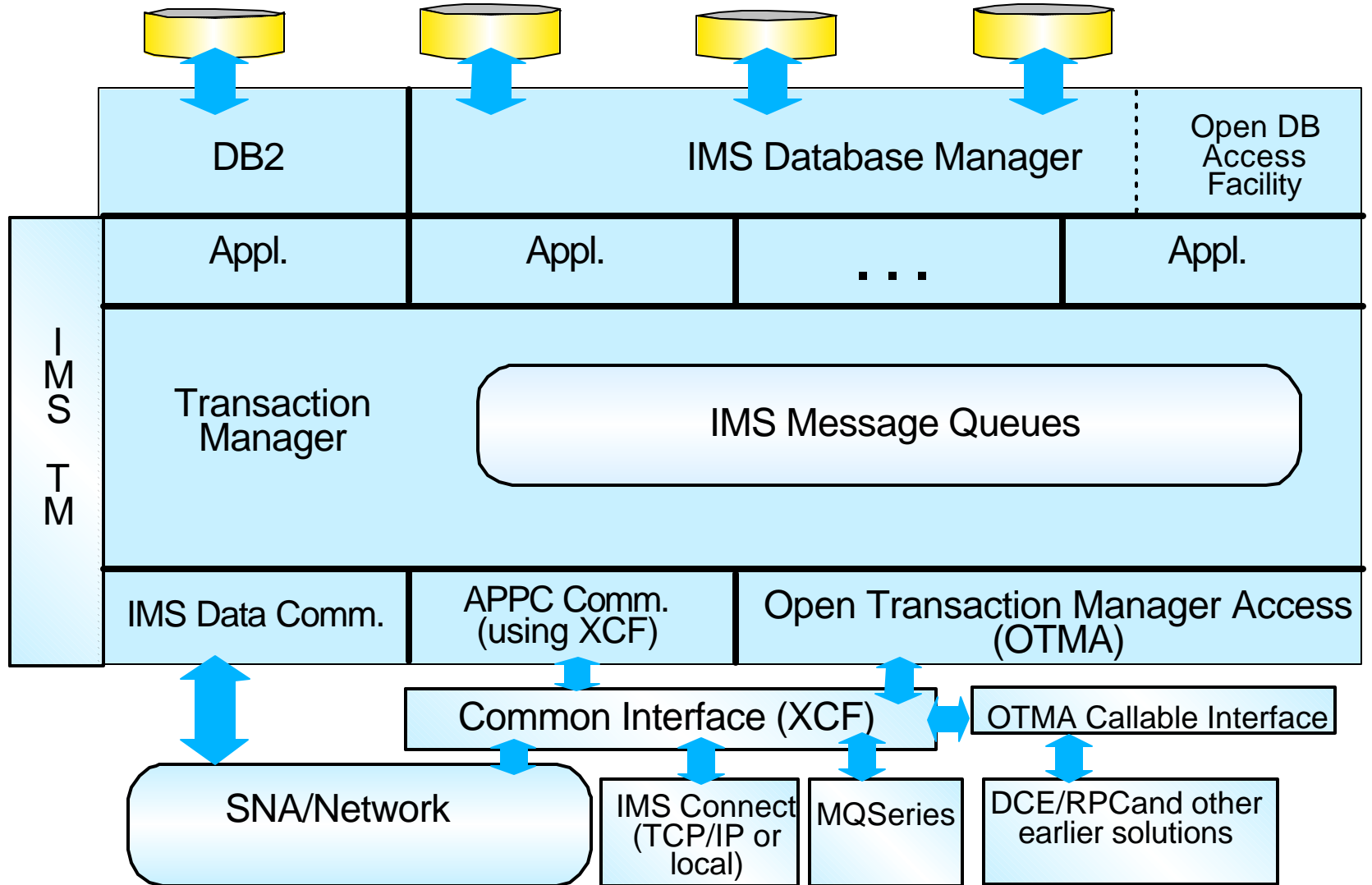 - Linux

- 🟩 **Operational integration**
  - Tivoli
  - XML

Middleware Subsystem Access

Provides enhanced access to IMS

DB2	IMS Database Manager	Open DB Access Facility

IMS TM

Appl.	Appl.	. . .	Appl.

Transaction Manager — IMS Message Queues

IMS Data Comm.	APPC Comm. (using XCF)	Open Transaction Manager Access (OTMA)

Common Interface (XCF) → OTMA Callable Interface

SNA/Network

IMS Connect (TCP/IP or local)

MQSeries

DCE/RPCand other earlier solutions

What is Open Database Access?

- **Open Database Access (ODBA) is a callable interface for accessing data managed by IMS DB**

  - Based on the DRA interface provided for CICS applications

  - Delivered in IMS Version 6

- **ODBA allows IMS DB and OS/390 application programs to be developed, installed, and maintained independently of each other**

- **ODBA provides for failure isolation and independent resource recoverability**

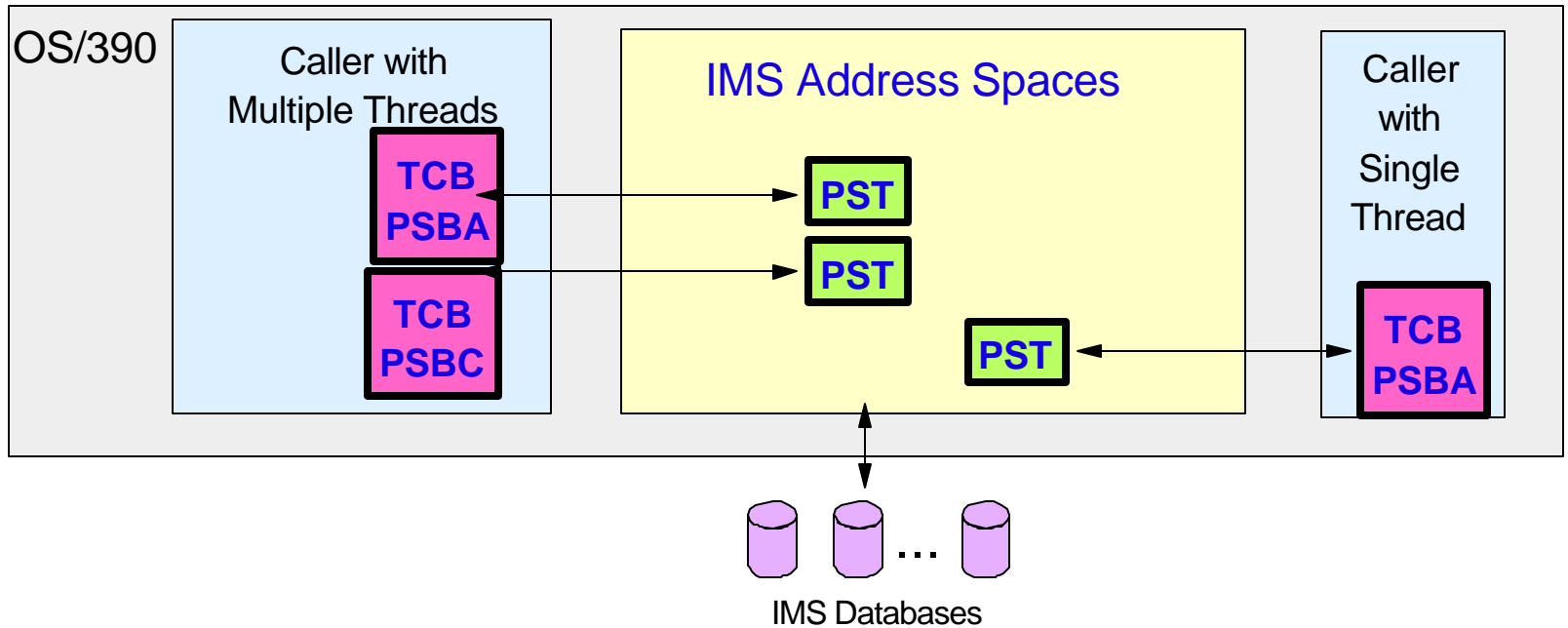 - Requires OS/390 Resource Recovery Services (RRS)

ODBA Connection to IMS

OS/390

Caller with Multiple Threads	IMS Address Spaces	Caller with Single Thread
TCB PSBA	PST	
	PST	
TCB PSBC	PST	TCB PSBA

IMS Databases

- **Multiple concurrent connections**

  - Connectors may have multiple threads

    - Each thread requires a TCB in caller environment
    - Each thread uses a PST in the control region

ODBA Calls

- **IMS Calls must use AIB interface with AERTDLI**
  - CIMS
    - Establishes and terminates ODBA
  - APSB
    - Allocates a PSB
  - DPSB
    - Deallocates a PSB
  - DLI calls
    - Usual access to databases (GU, GN, ISRT, ...)

- **Example: Call AERTDLI parmcount, xxxx, AIB, ...**
  - parmcount = set to n (optional)
  - xxxx = Call function (required)
  - AIB = Address of AIB (required-must be same as APSB AIB)
    - AIBRSNM1 = 8 character PCB name (required)

- **Synchronization done with SRRCMIT or ATRCMIT**

DB2 Stored Procedure Example

OS/390

DRDA Client		DB2	WLM Addr. Space	IMS
			CIMS INIT	
EXEC SQL CALL PGMA	→		PGMA APSB DL/I SQL DPSB PREP	
Commit		SRRCMIT	CIMS TALL	

DB2 Databases

IMS Databases
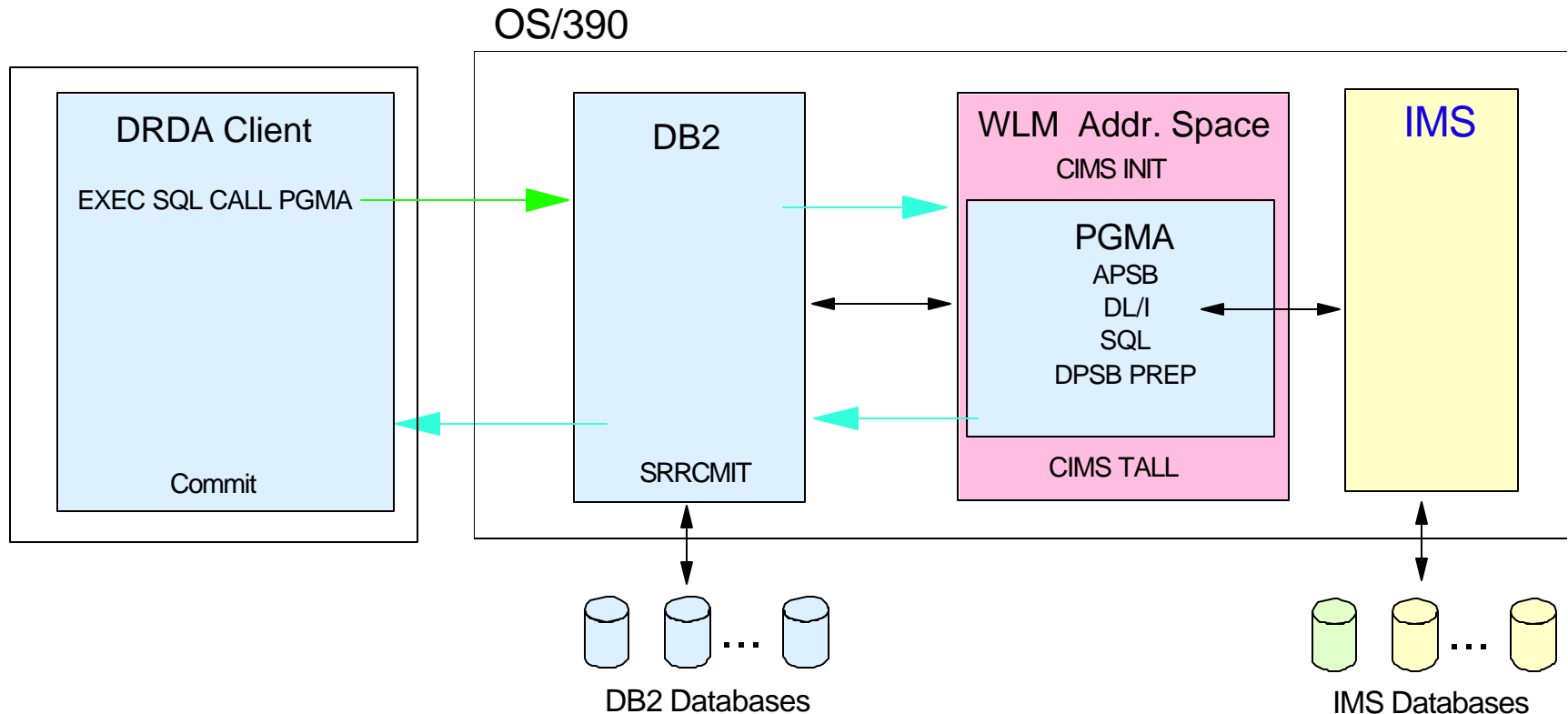
- **DB2 stored procedure example**
  - Client program does commit when stored procedure returns or DB2 can issue SRRCMIT

OTMA - What is it?

- **Component of IMS**

- **Available since IMS V5**

- **Provides standard access into IMS from any MVS client**

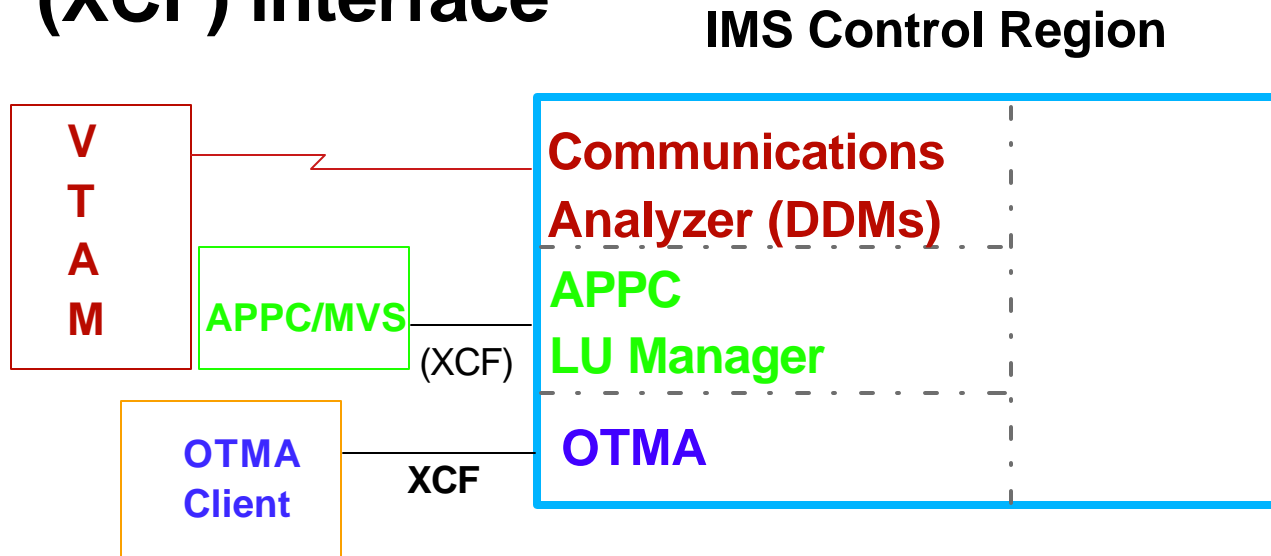- **Uses MVS Cross-System Coupling Facility (XCF) interface**

IMS Control Region

```
  ┌───────┐        ┌────────────────────────────────────┐
  │ V     │        │ Communications                     │
  │ T     │───────▶│ Analyzer (DDMs)       ┊            │
  │ A     │        │                       ┊            │
  │ M     │  ┌──────┤ APPC                               │
  │       │  │APPC/ │ LU Manager            ┊            │
  │       │  │MVS   │                       ┊            │
  └───────┘  └──────┘ (XCF)                               │
       ┌────────┐     │ OTMA                ┊            │
       │ OTMA   │─────┤                                  │
       │ Client │ XCF │                                  │
       └────────┘     └────────────────────────────────────┘
```
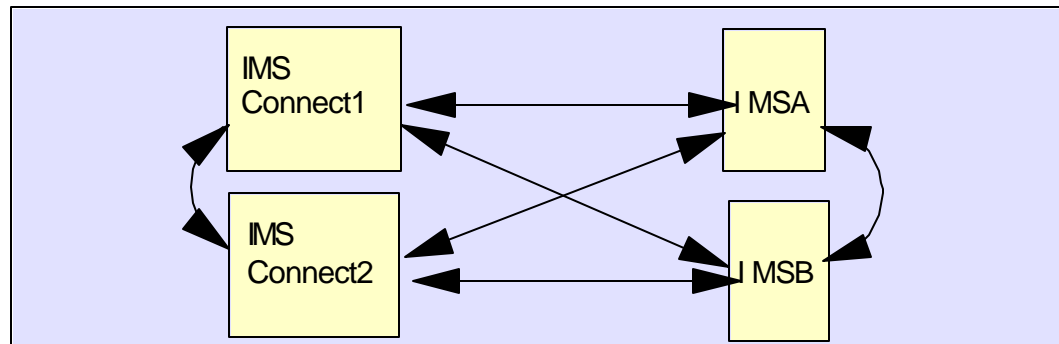
MVS Cross-System Coupling Facility (XCF)

- **Allows high performance cross-address space communications**

- **Monitoring capabilities provided**

  - When members join, fail or terminate
    - Other members in the group are notified
    - Members can take action
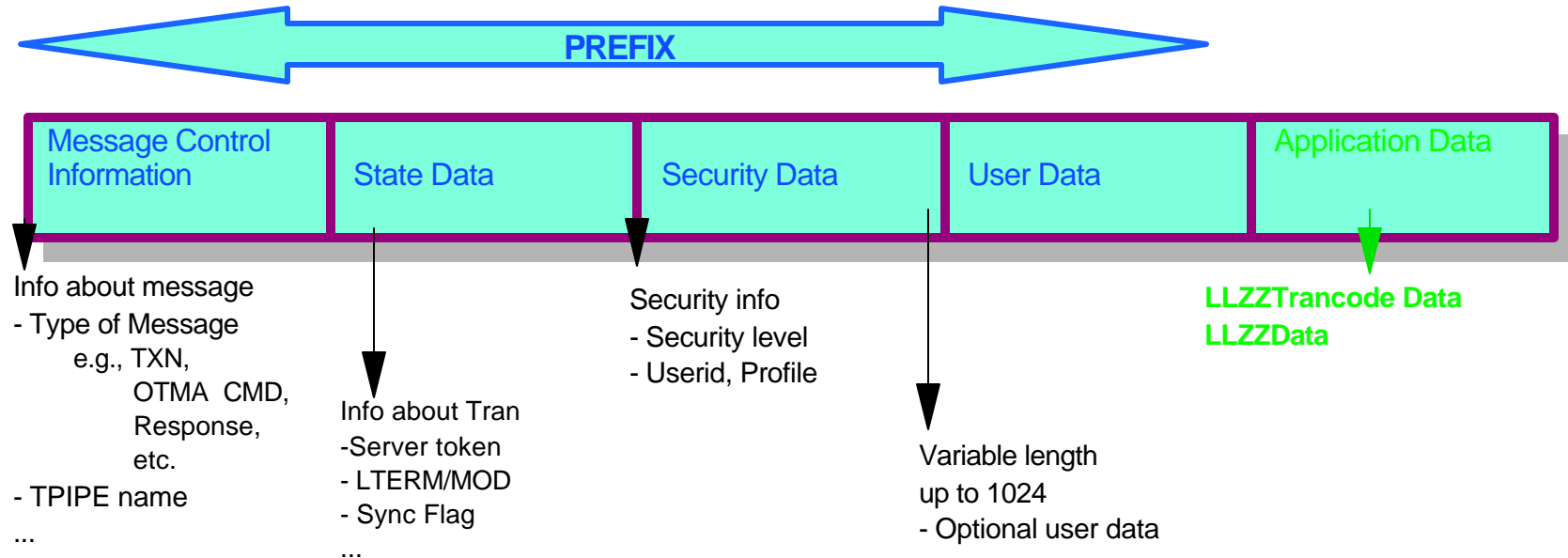
OTMA Message Protocol

- **All messages sent between IMS and the OTMA Client**

  - IXCMSGO Macro - MSGCNTL Parameter
  - Have a pre-defined OTMA Message Prefix
    - Allows a protocol for IMS and the OTMA client to interpret the data

PREFIX ⟷

Message Control Information	State Data	Security Data	User Data	Application Data

Info about message
- Type of Message
  e.g., TXN,
       OTMA CMD,
       Response,
       etc.
- TPIPE name
...

Info about Tran
-Server token
- LTERM/MOD
- Sync Flag
...

Security info
- Security level
- Userid, Profile

Variable length
up to 1024
- Optional user data

LLZZTrancode Data
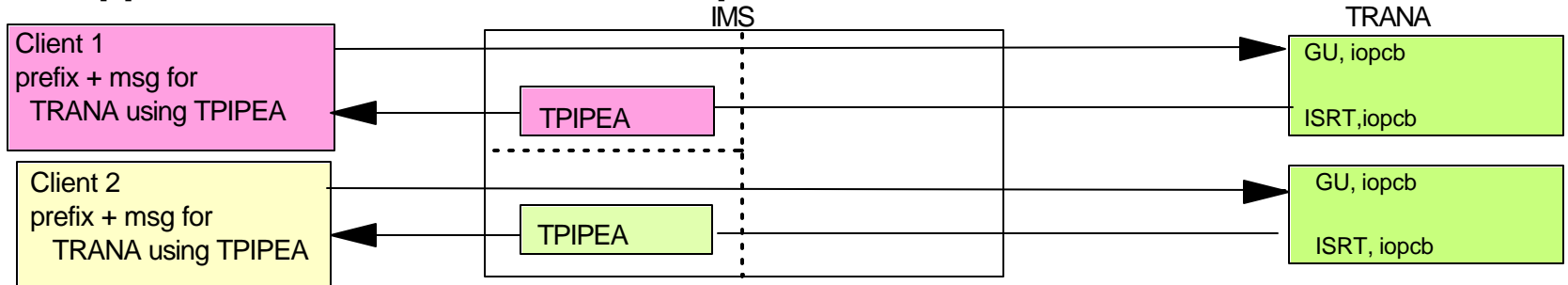**LLZZData**

Transaction Pipes (TPIPEs)

- **OTMA TPIPE**
  - IMS construct (control block)
  - Allows IMS to associate messages with a specific client

- **OTMA TPIPEs are not predefined**
  - Different clients could use same TPIPE name (treated as unique instances)
  - TPIPE structure is created dynamically
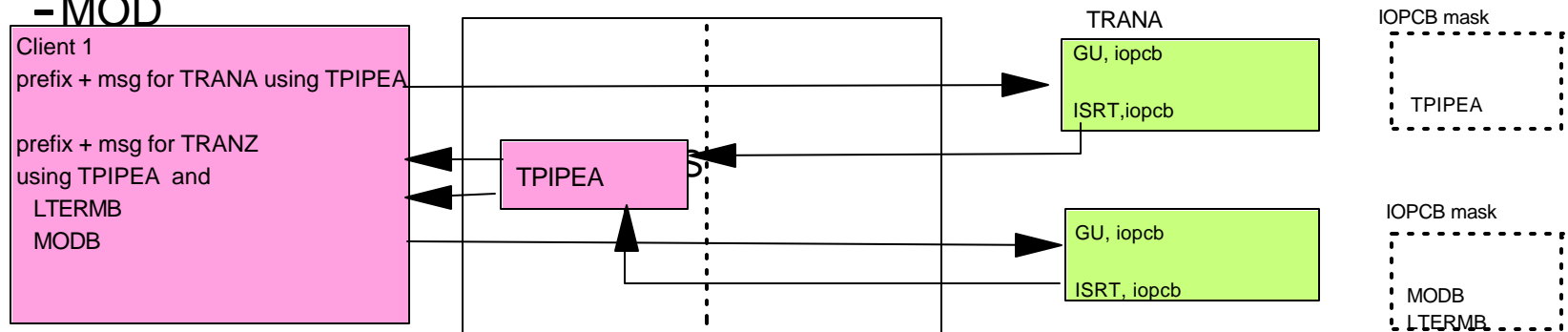
- **IMS Application cannot see the OTMA prefix**

IMS   TRANA

Client 1
prefix + msg for
  TRANA using TPIPEA

TPIPEA

GU, iopcb

ISRT, iopcb

Client 2
prefix + msg for
  TRANA using TPIPEA

TPIPEA

GU, iopcb

ISRT, iopcb

- **For IMS Applications, TPIPE ≅ LTERM**
  - IOPCB mask

- **State Data section of the MSG Prefix may provide overrides**
  - LTERM
  - MOD

TRANA   IOPCB mask

Client 1
prefix + msg for TRANA using TPIPEA

prefix + msg for TRANZ
using TPIPEA and
  LTERMB
  MODB

TPIPEA

GU, iopcb

ISRT, iopcb

TPIPEA

GU, iopcb

ISRT, iopcb

IOPCB mask

MODB
LTERMB

OTMA Callable Interface

OS/390 Environment

Client Program

OTMA_CREATE
OTMA_OPEN
OTMA_ALLOC
OTMA_SEND_RE
OTMA_FREE
OTMA_CLOSE
} **API Calls**

DFSYCRET

SVC Service Routine

XCF

IMS

O T M A
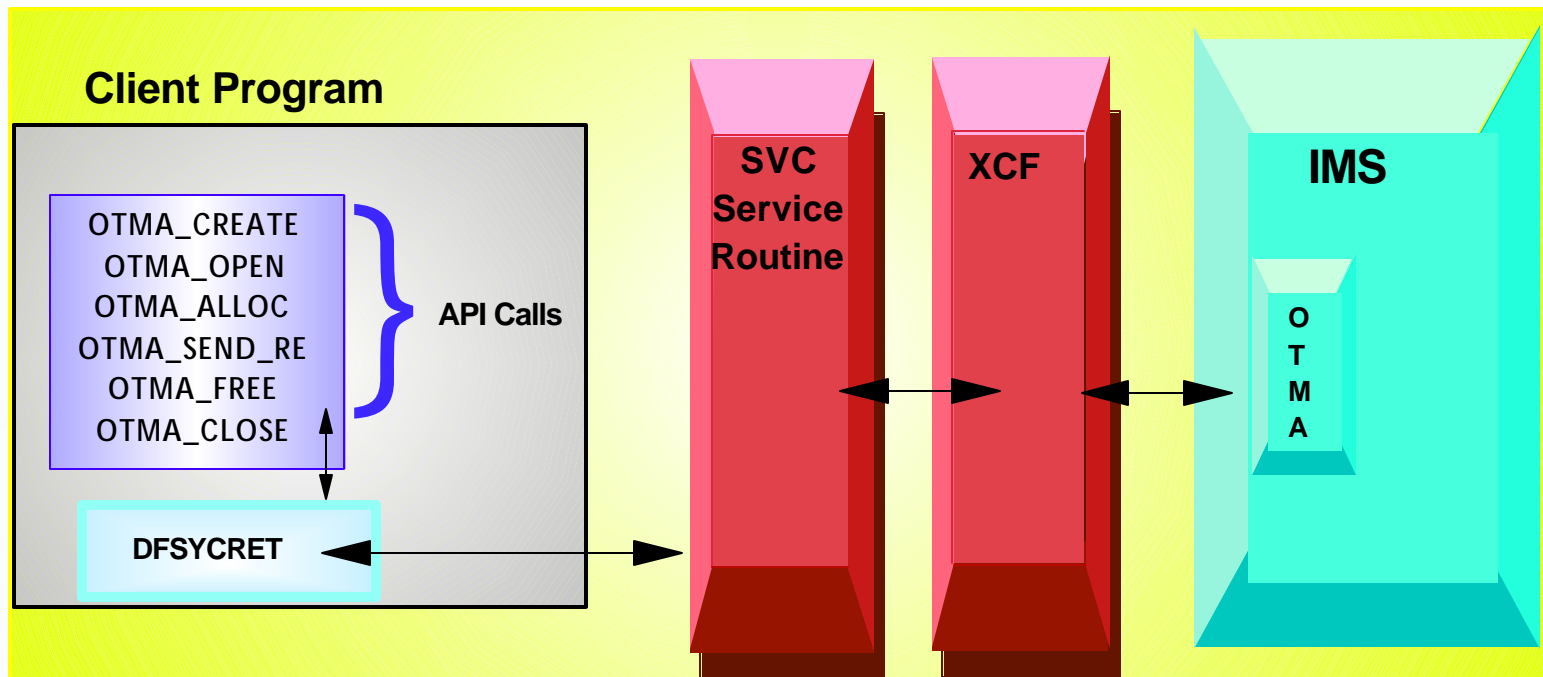
Available in IMS V6

What is IMS Connect

- **Provides communications and workload balancing between one or more TCP/IP clients and one or more IMS systems.**

- **Provides commands for managing the environment (e.g. start/stop TCP/IP clients or DATASTORE)**

- **Provides e-business access to IMS Applications, allowing fast deployment**
  - **Without modifying the IMS transaction**
  - **Without heavy workstation development effort when used with the IMS Connector for Java**
  - **Can be used in any TCP/IP environment**
  - **Allows the customer to write their own TCP/IP client applications**

IMS Connect

- **Provides enhanced IMS TCP/IP support**
  - Improved Performance with Persistent Sockets
  - Enhanced Usability with user exit, command improvement, and asynchronous output support
  - Ease Serviceability with Dump formatting enhancements
  - Enhance Manageability with SMP/E Install/Maintenance
  - Local webserving support without TCP/IP
  - Unicode
  - J2EE runtime support

- **Separately priced, orderable facility for IMS**
  - Much of the function runs with IMS V6 TM
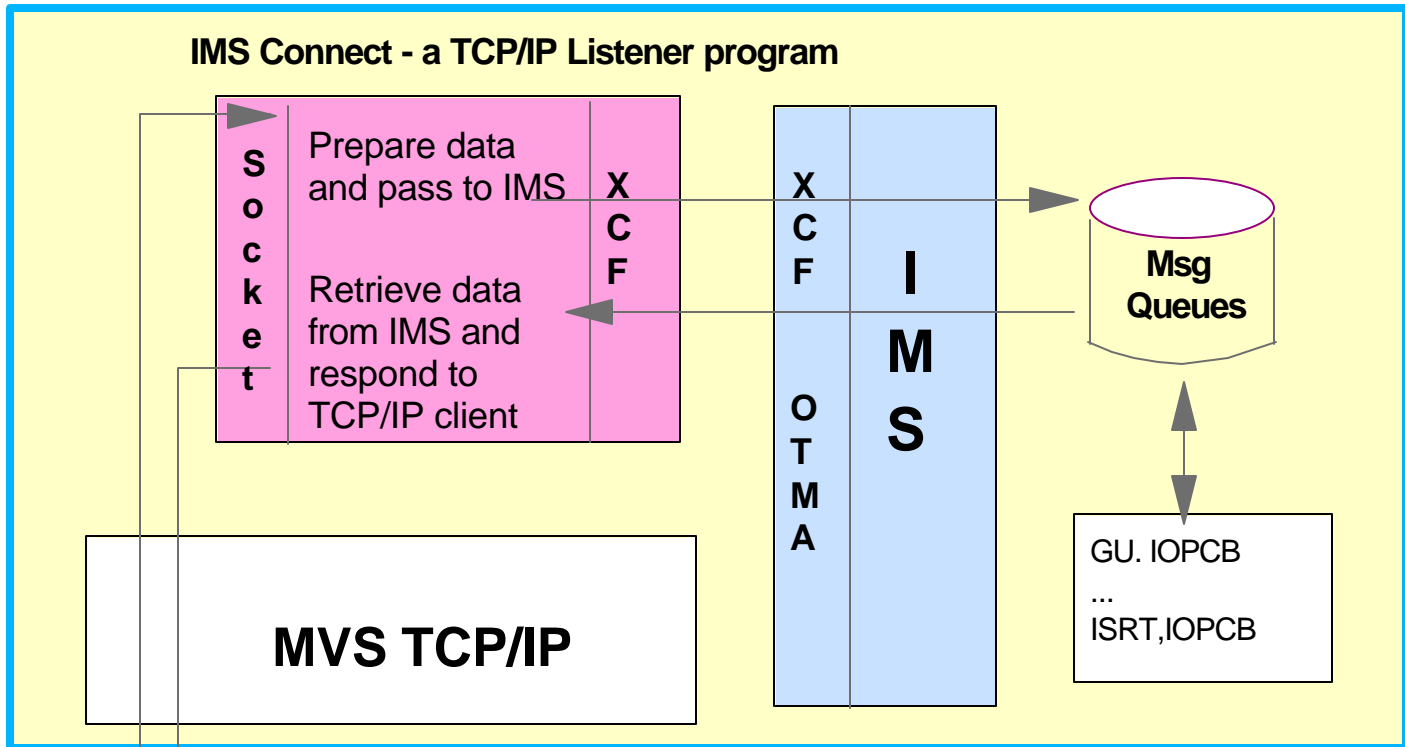 - Asynch output, Local, Unicode, J2EE and future function for IMS V7

IMS Connect

IMS Connect - a TCP/IP Listener program

Socket

Prepare data and pass to IMS

Retrieve data from IMS and respond to TCP/IP client

XCF

XCF OTMA

IMS

Msg Queues

MVS TCP/IP

GU. IOPCB
...
ISRT,IOPCB

IMS Connector for Java

Connect
Write (...*HWSJAV*...)
...

Java Sample using Sockets
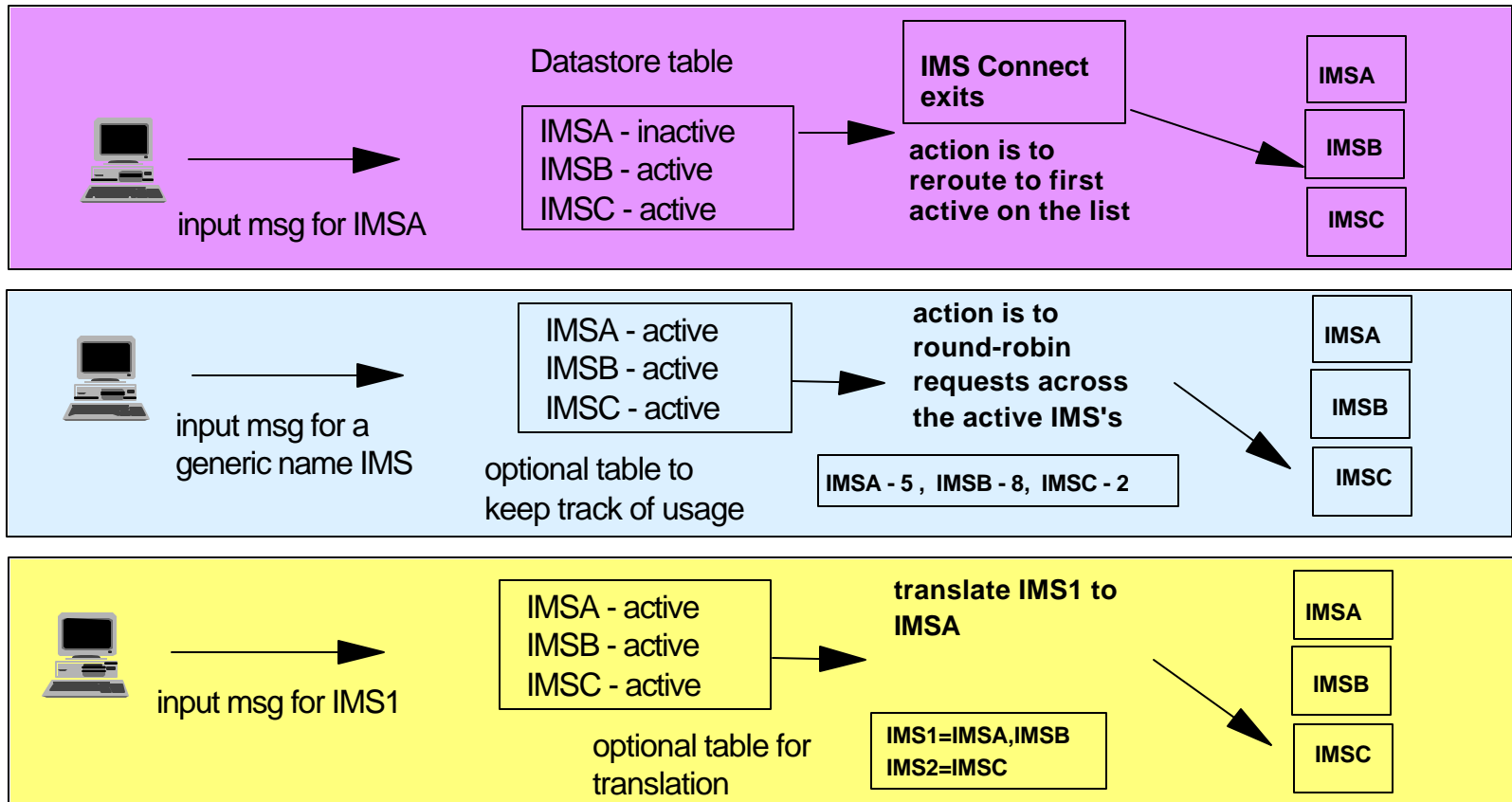
Connect
Write (...*SAMPLE*...)
...

IMS Sockets client

Connect
Write (LLLL LLZZ*IRMREQ*...)
Write (LLZZ trancode dat
Write (04ZZ)
Read
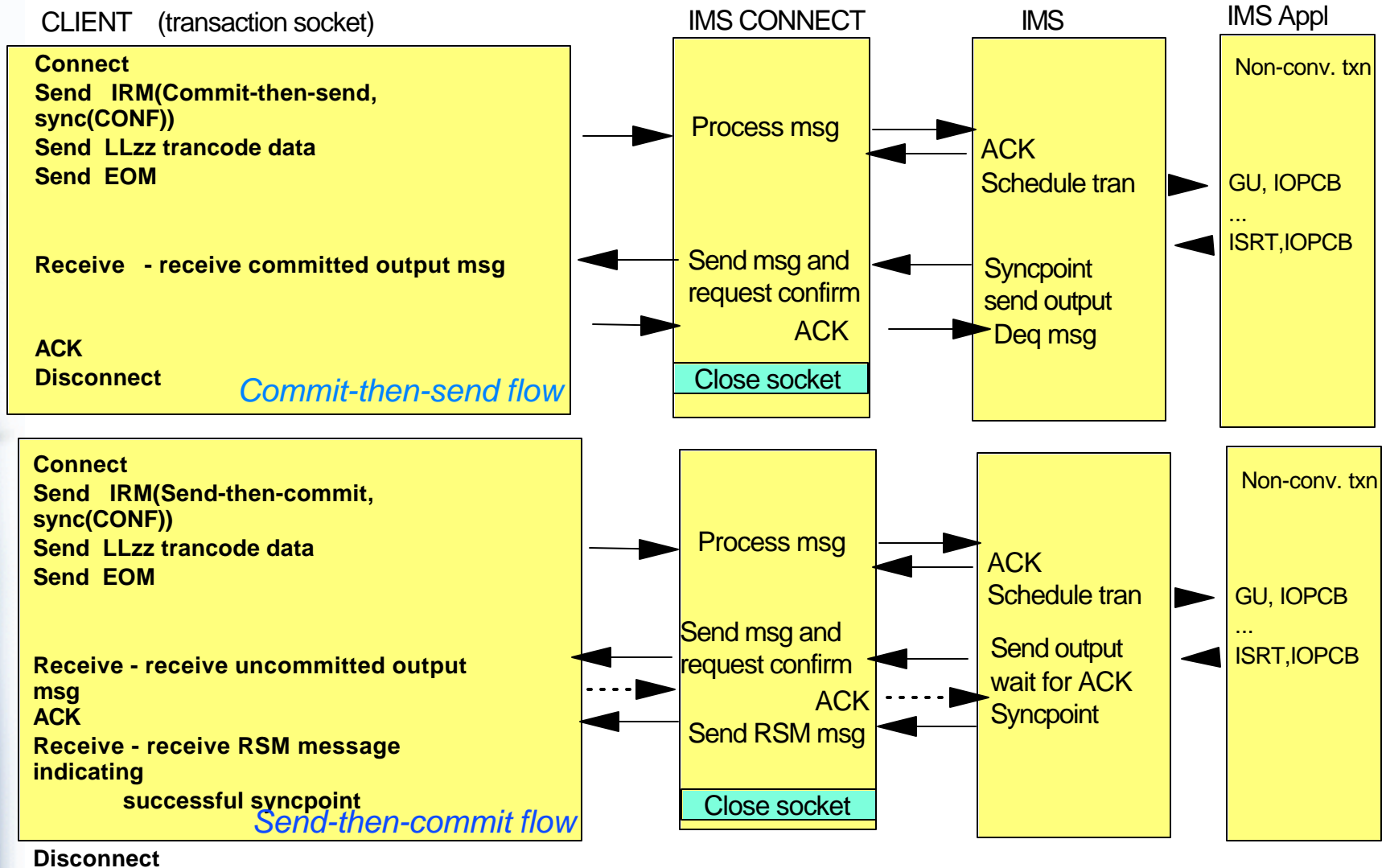Disconnect

IMS Connect Datastore Table

```
HWS (ID=ICONNA,RACF=Y)
TCPIP (HOSTNAME=TCPIP,RACFID=IDX,PORTID=(3333),EXIT=(HWSIMSO0,HWSSMPL0)
DATASTORE (ID=IMSA,GROUP=IMSXCF,MEMBER=ICONN1,TMEMBER=IMSA
DATASTORE (ID=IMSB,GROUP=IMSXCF,MEMBER=ICONN1,TMEMBER=IMSB
DATASTORE (ID=IMSC,GROUP=IMSXCF,MEMBER=ICONN1,TMEMBER=IMSC
```

Panel 1

Datastore table

input msg for IMSA

IMSA - inactive
IMSB - active
IMSC - active

IMS Connect exits

action is to reroute to first active on the list

IMSA
IMSB
IMSC

Panel 2

input msg for a generic name IMS

IMSA - active
IMSB - active
IMSC - active

optional table to keep track of usage

action is to round-robin requests across the active IMS's

IMSA - 5 , IMSB - 8, IMSC - 2

IMSA
IMSB
IMSC

Panel 3

input msg for IMS1

IMSA - active
IMSB - active
IMSC - active

optional table for translation

translate IMS1 to IMSA

IMS1=IMSA,IMSB
IMS2=IMSC

IMSA
IMSB
IMSC

IMS Connect
Sockets - Basic Flow

CLIENT   (transaction socket)   IMS CONNECT   IMS   IMS Appl

Connect
Send   IRM(Commit-then-send,
sync(CONF))
Send LLzz trancode data
Send EOM

Process msg

ACK
Schedule tran

Non-conv. txn

GU, IOPCB
...
ISRT,IOPCB

Receive   - receive committed output msg

Send msg and
request confirm
ACK

Syncpoint
send output
Deq msg

ACK
Disconnect

Commit-then-send flow

Close socket

Connect
Send   IRM(Send-then-commit,
sync(CONF))
Send LLzz trancode data
Send EOM

Process msg

ACK
Schedule tran

Non-conv. txn

GU, IOPCB
...
ISRT,IOPCB

Receive - receive uncommitted output
msg
ACK
Receive - receive RSM message
indicating
         successful syncpoint

Send msg and
request confirm
ACK
Send RSM msg

Send output
wait for ACK
Syncpoint

Send-then-commit flow

Close socket

Disconnect

IMS Connect Internal Structure Provides Connectivity Base for Future

BPE

IMS Connect

Environments

Command Component

TCP/IP Driver	Workstation Communication Component	Interface Call	Datastore Communication Component	OTMA Driver
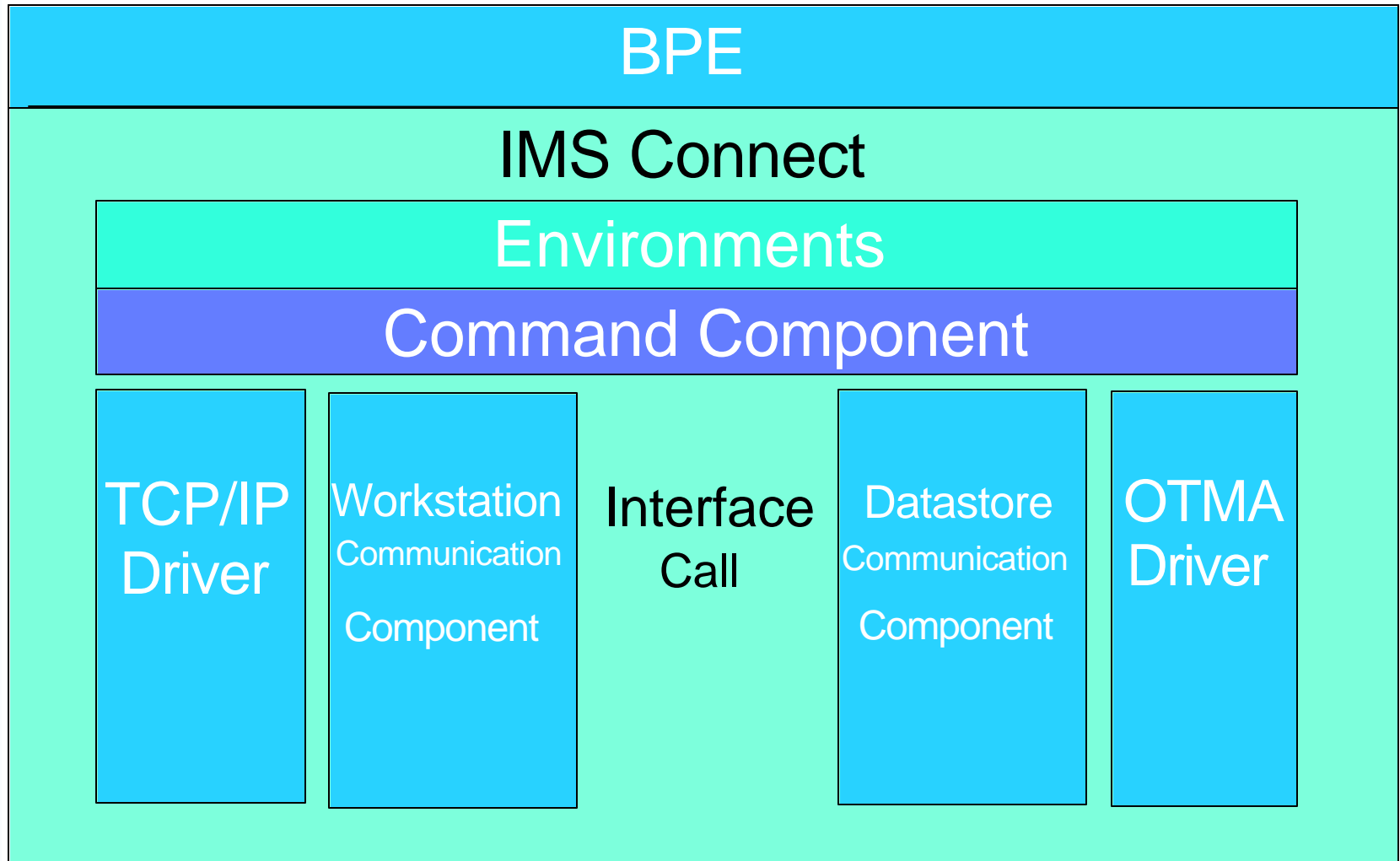
IMS Client

S/390 or z/OS

S/390, z/OS, Linux/390 or other non-390 environments

Client

IMS TM

IMS DB

DB2

OTMA

IMS CONNECT

IMS MPP or BMP Application

Internet

TCP/IP

Java or other application

1) **Converts IMS transaction input/output to HTML**
2) **Communicates with IMS**
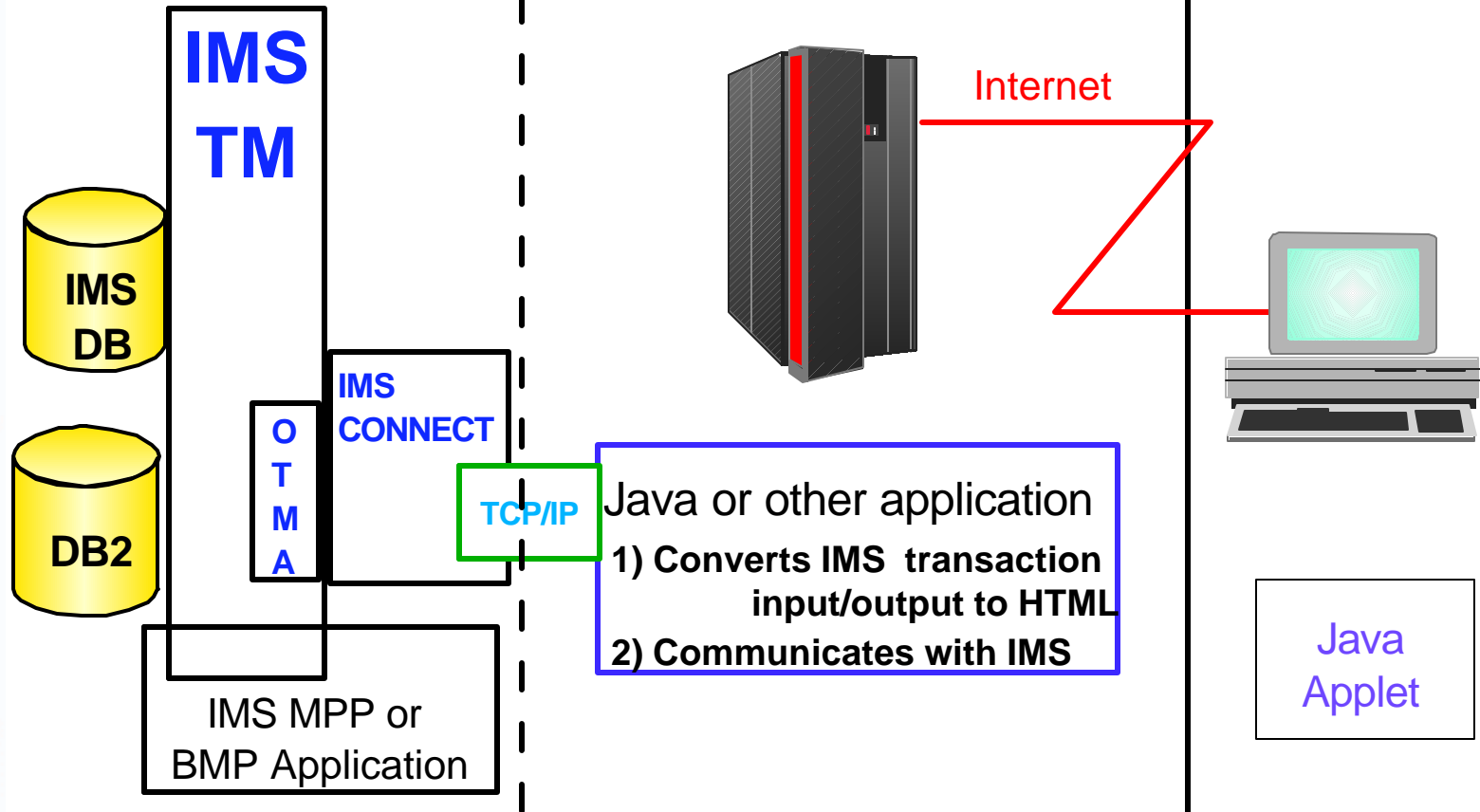
Java Applet

- Provides sample Java, Assembler, etc., application/applet access via TC/IP through IMS Connect to IMS
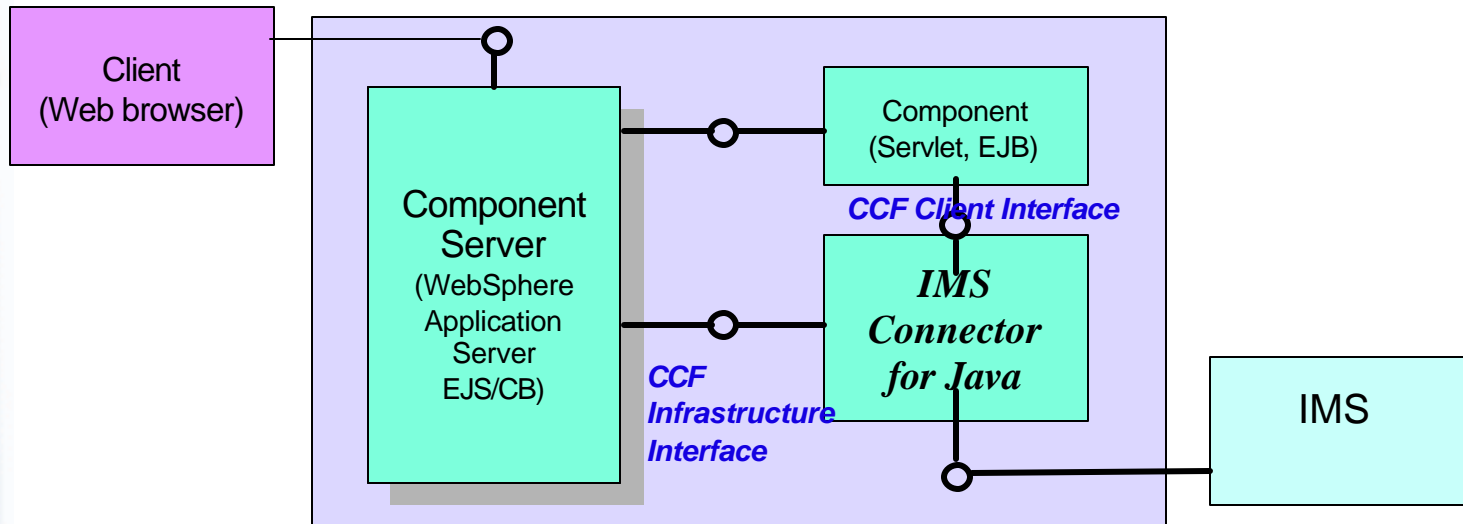- Available from **ibm.com**/ims

Accessing IMS from Java Applications or Servlets

HTML / Java Server Page

Web Browser

WebSphere Application Server

Servlet

IMS Connector for Java

TCP/ IP

OS/390

IMS Connect

IMS

IMS Application
(**Java**,COBOL)

IMS DB

DB2
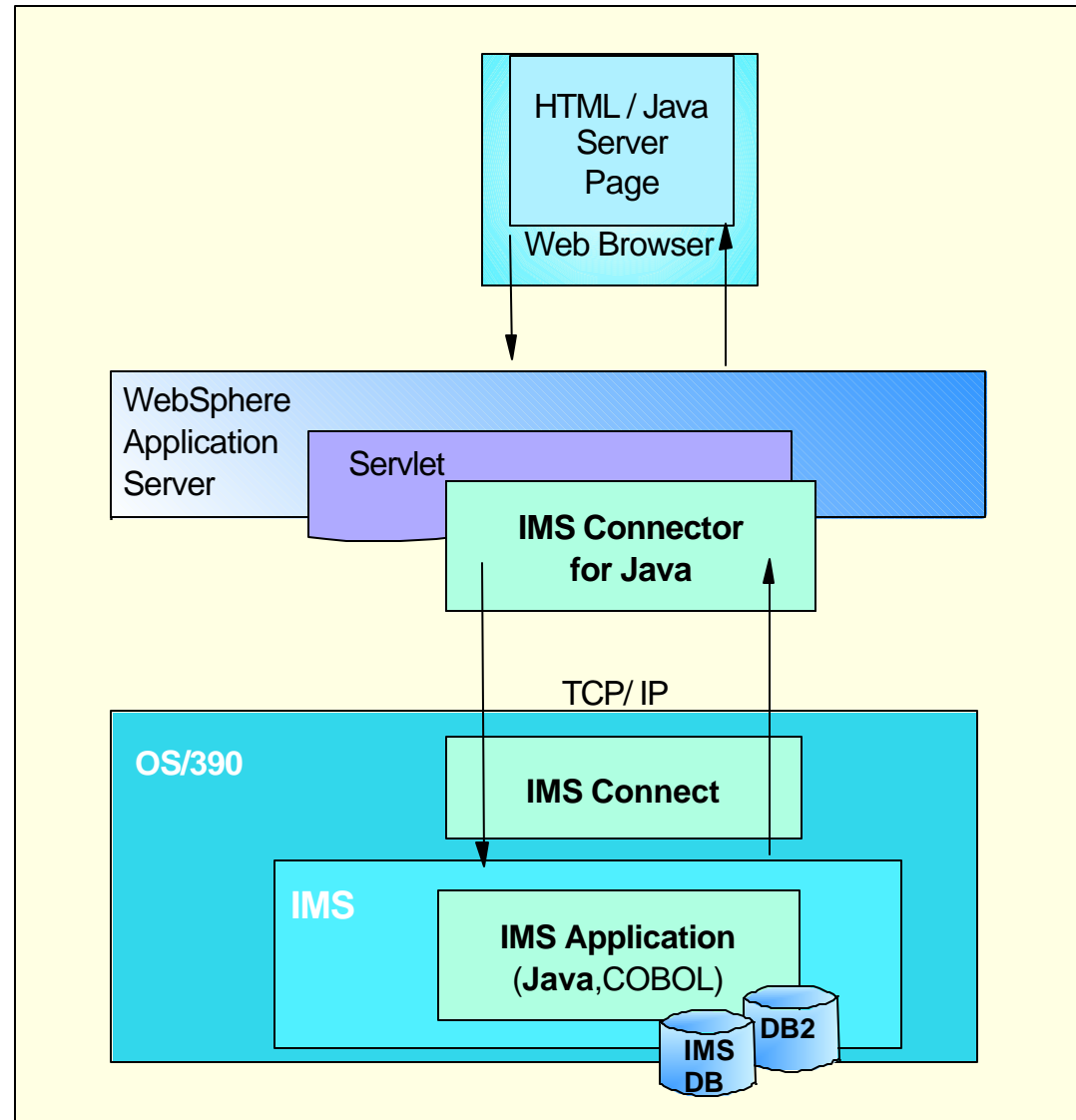
Connector Framework

- **Defines a common and consistent set of Java interfaces that all connectors implement**

- **Implements common functions like connections and interactions with back-end resources**

- **Programmer does not have to deal with many differences among different connectors when building applications**

- **Other connectors include CICS, MQ, Encina, SAP, HOD, etc.**

Client
(Web browser)

Component
Server
(WebSphere
Application
Server
EJS/CB)

Component
(Servlet, EJB)

CCF Client Interface

*IMS
Connector
for Java*

*CCF
Infrastructure
Interface*

IMS

IMS Connector for Java Overview

- **Helps customer make the transition to e-business by providing easy Java access to IMS**

- **Provides a way to create Java applications or servlets that can access existing IMS transactions**

- **Provides Connector Framework-compliant Java Class libraries which interact with IMS via IMS Connect on the host**

- **Provides Java bean classes to aid in visually composing applications. Applications can be easily and rapidly built by 'wiring' the Java beans and components together using the VisualAge for Java visual development tool.**

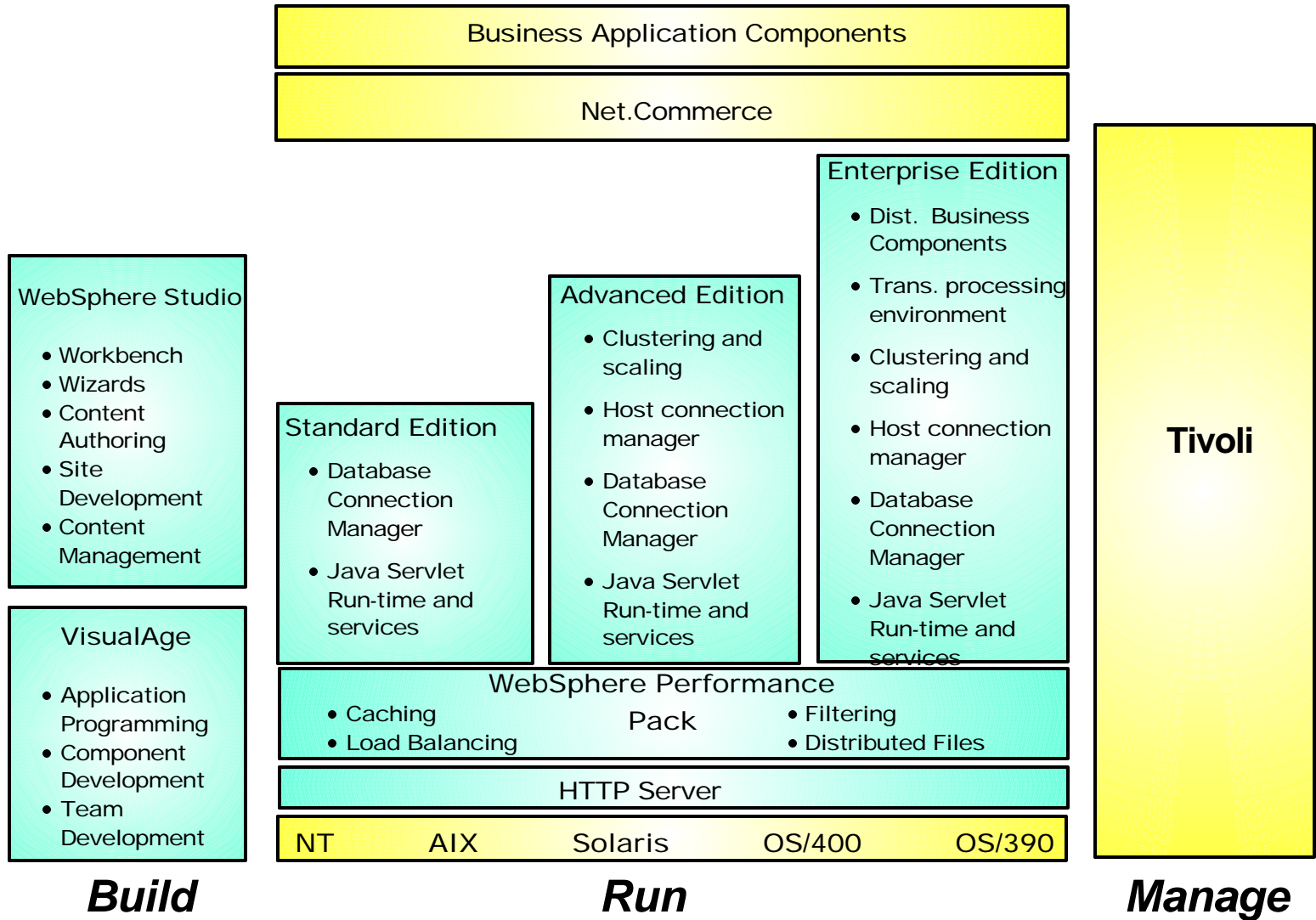- **Ships with Visual Age for Java Enterprise Edition as one of the IBM e-business Connectors**

VisualAge for Java Enterprise Edition

- *IMS Connector for Java*
- *IBM Connector Framework*
- *IBM Java Record Library*
- *IBM Enterprise Access Builder*

EAB Command Bean (uses IMS Connector for Java)

VisualAge for Java

VisualAge for Java EJB Tools

WebSphere Studio

VisualAge for Java

Java Applications

Java Servlets

EJB (Enterprise JavaBeans)

Java Applets
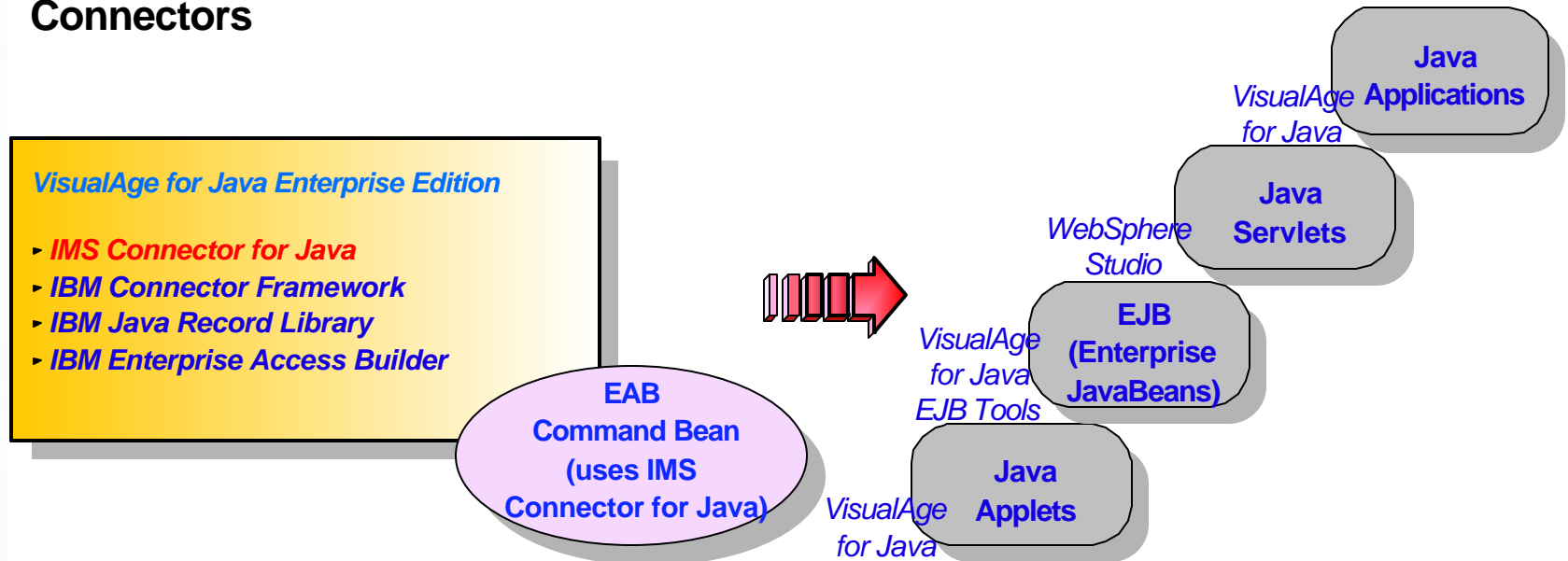
Java Servlet Development

e-business

Development Environment

Runtime Environment

COBOL Source

command.jar

COBOL Parser

VisualAge for Java

Enterprise Access Builder

create

EAB Command

WebSphere Studio

Servlet Generation Wizard

HTML and Servlet

create

publish

WebSphere Application Server

Servlet

Connect

IMS Connect

Connect

IMS

OTMA

= *IMS Connector for Java libraries*

IBM
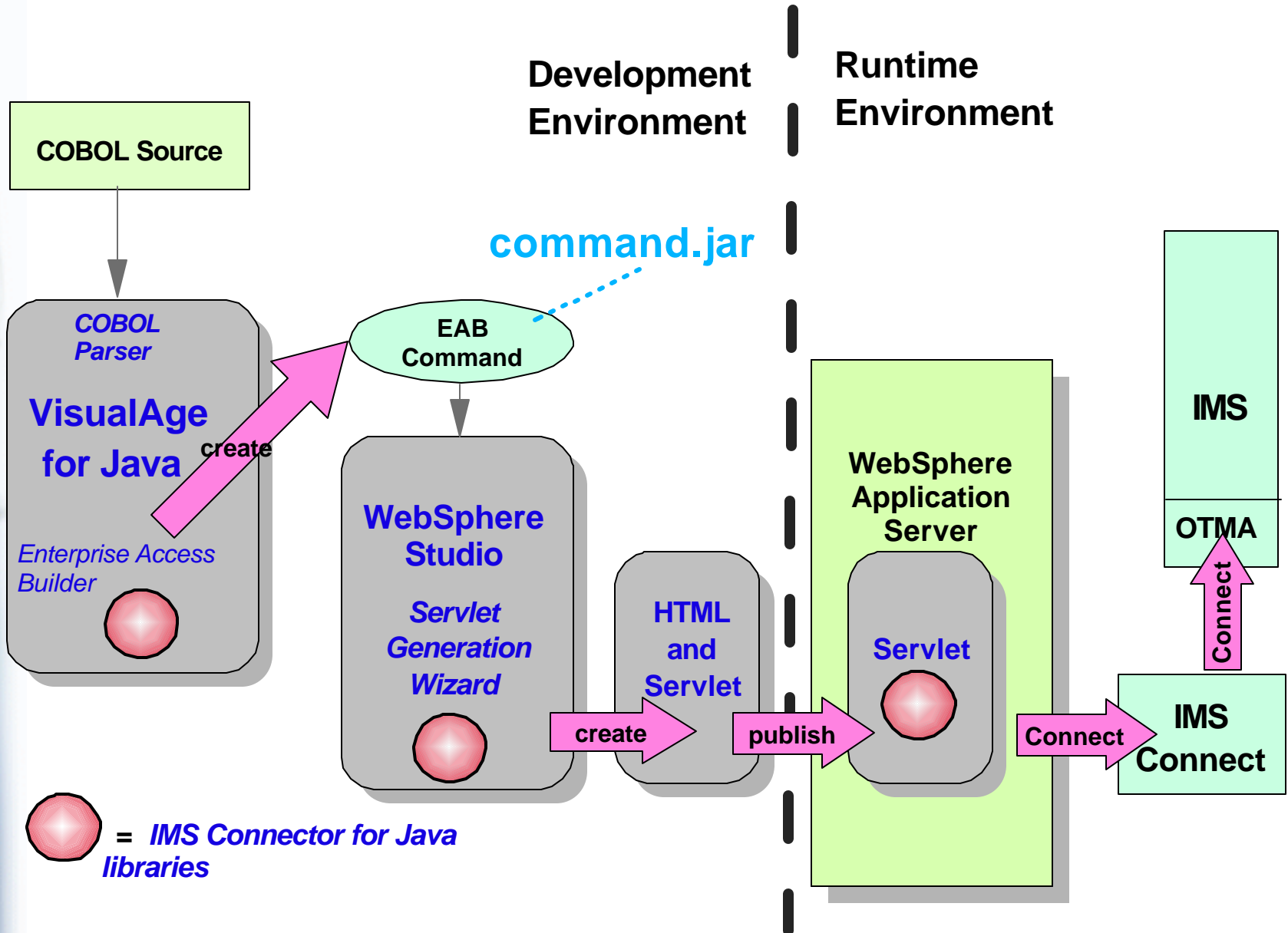
The Product Family

e-business ™

Business Application Components

Net.Commerce

Enterprise Edition

- Dist. Business Components
- Trans. processing environment
- Clustering and scaling
- Host connection manager
- Database Connection Manager
- Java Servlet Run-time and services

WebSphere Studio

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

Advanced Edition

- Clustering and scaling
- Host connection manager
- Database Connection Manager
- Java Servlet Run-time and services

Standard Edition

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

VisualAge

- Application Programming
- Component Development
- Team Development

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

HTTP Server

NT	AIX	Solaris	OS/400	OS/390

Tivoli

Build   *Run*   *Manage*

IBM

WebSphere Enterprise Edition

WebSphere EE enables new business processes from existing ones

Access Services

New Business Application

Direct Customer Access Appl.

Managed Object Framework

Composed Business Services

Composed Customer

Application Adaptors

Resource Services

CICS — Checking Account

IMS — Credit Card

DB2 — Personal Info

Oracle UNIX — Contact Mgmt

External Data Source Feed
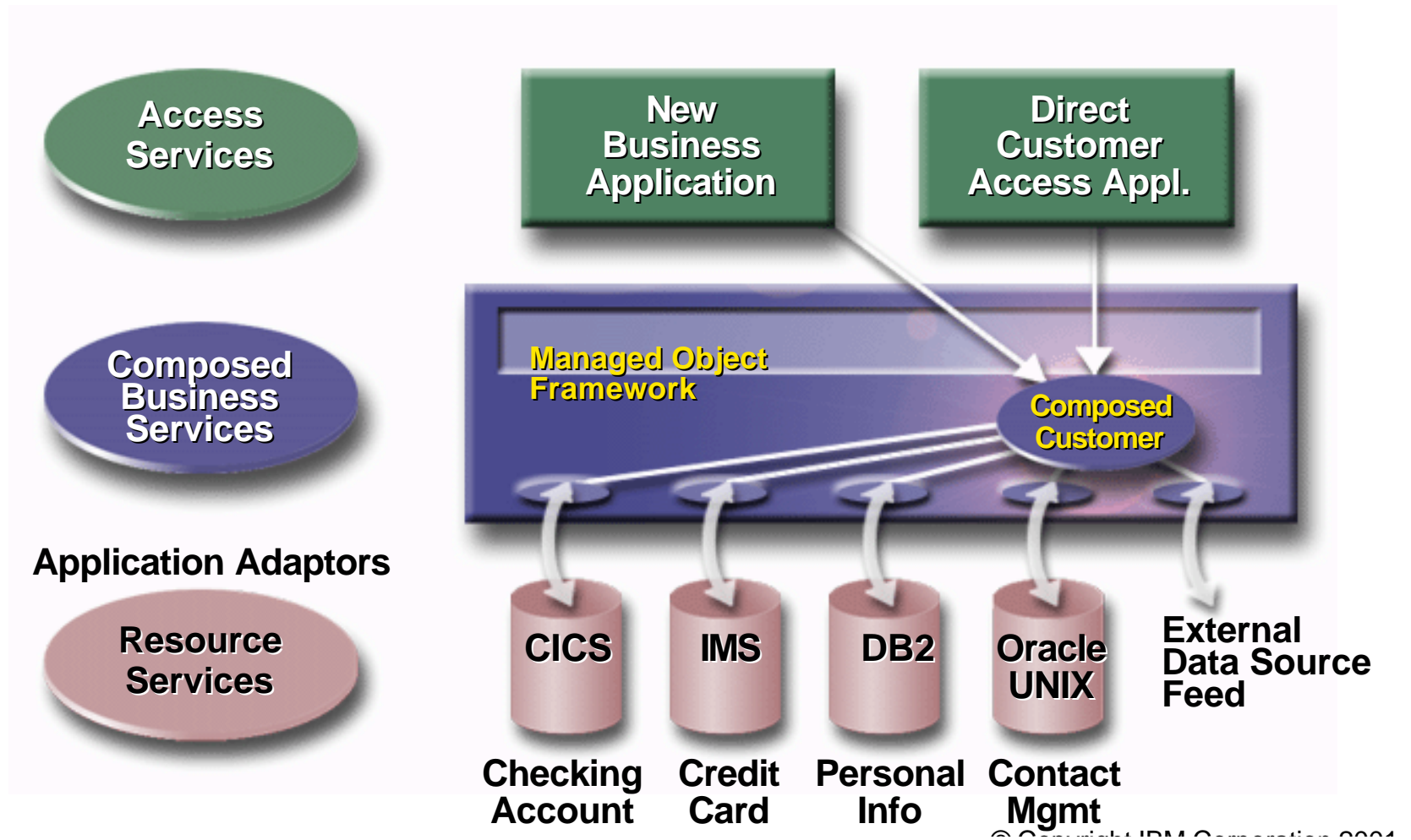
EJB Architecture

EJB Environment
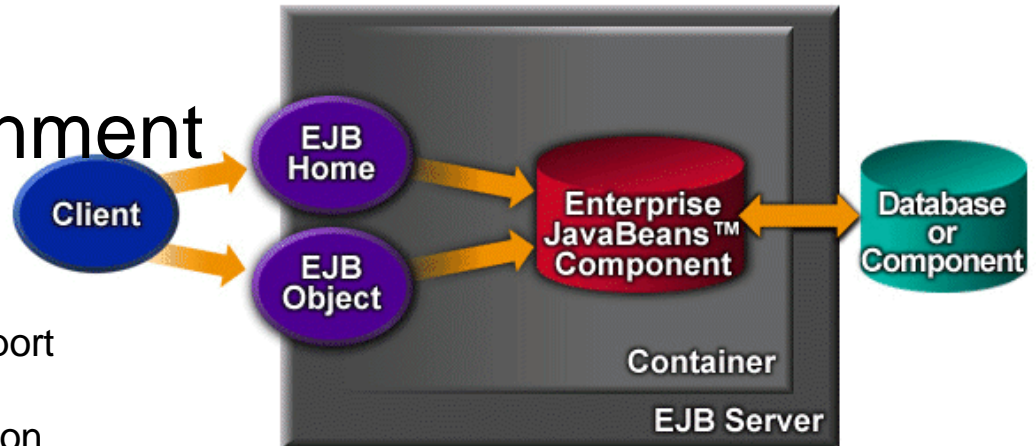
■ EJB Server
- Execution system
- Standard set of services to support enterprise bean components
- Access to a distributed transaction management service
- Activation/deactivation services
- Load balancing
- Fail-over support
- The home for all EJB objects

■ EJB Container
- Remote access/network interoperability
- Transaction management
- Authentication and authorization
- Resource pooling
- Concurrent service for multiple clients
- Thread and process management
- Clustering and high availability
- Runtime for all EJB's

■ EJB Object
- External representation of EJB
- Generated by the container at deployment
- Exposes all application-related interfaces for the object but not interfaces that allow container to manage and control the object

■ EJB Home
- Container implements for each bean deployed in the container
- Container makes available to a client via JNDI
- Client uses Home interface to create and remove EJB objects

IMS Strategy

S/390

Distributed Webserver

OS/390 Webserver

IMS

HTTP IIOP

intranet/ extranet/ internet
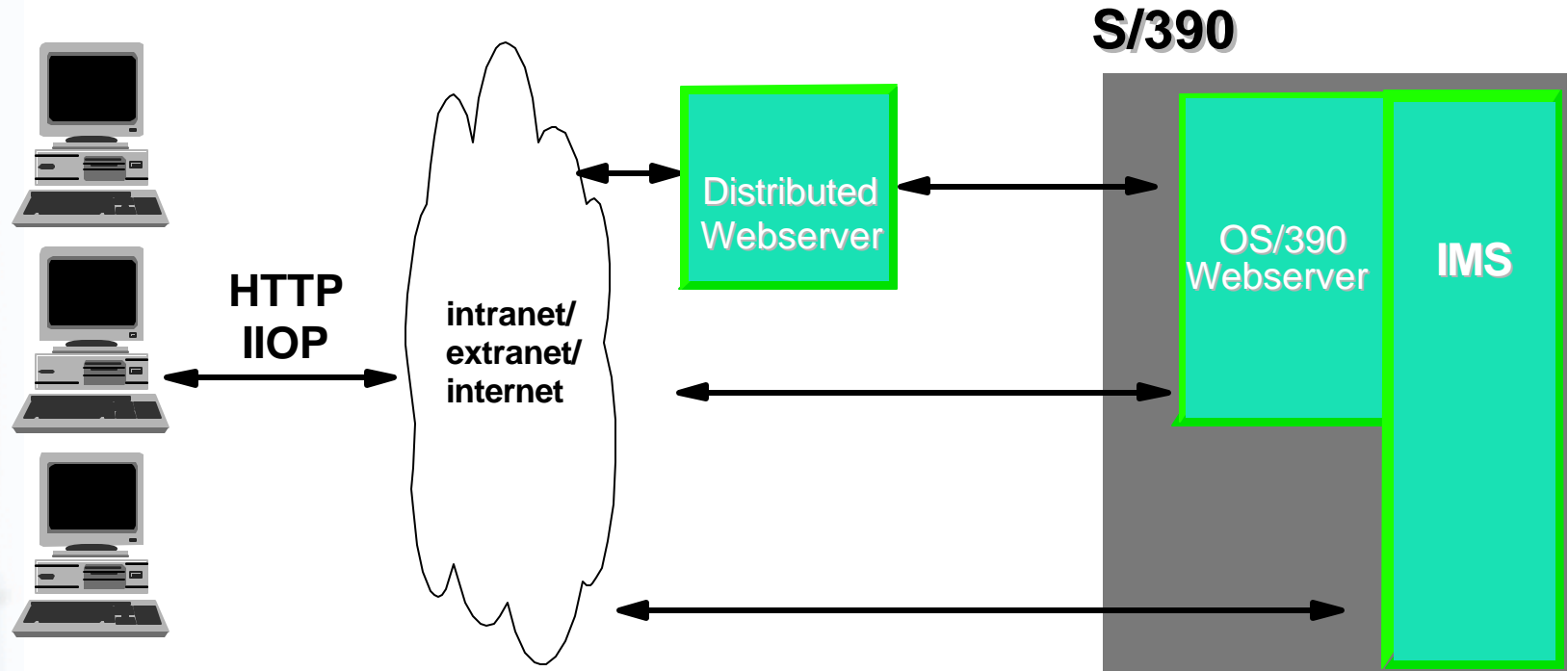
- Enable Web Browsers to invoke IMS applications
- Use standard HTTP and IIOP protocols
- Support both gateways and native access to IMS
- Enable Java as programming environment

Scalable High Performance

WebSphere Enterprise

Enterprise JavaBeans for IMS

- **Reusable components**
- **Server-side**
- **Extension to JavaBeans standard**
- **Focus on business logic**
- **Easy to develop and deploy**
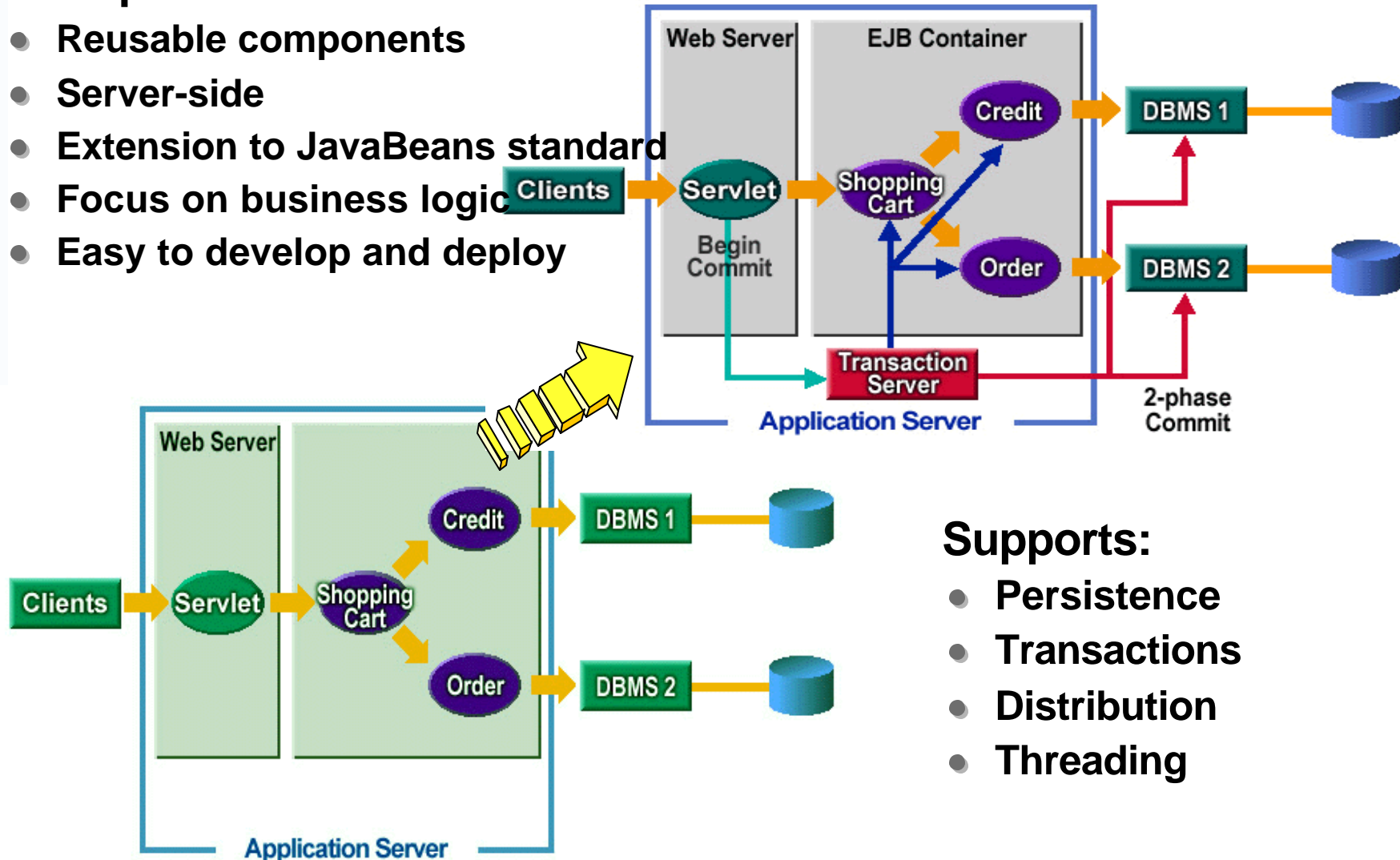
Supports:

- **Persistence**
- **Transactions**
- **Distribution**
- **Threading**

Enables new business processes from existing ones

WebSphere Enterprise Edition IMS Access

A multi-tiered Distributed Computing Infrastructure for the Enterprise

- **Comprehensive Distributed Object Infrastructure**
- **Integrated Solution providing for:**
  - Development Environment
  - Runtime Environment with Client enablement and server objects
  - Server management environment
- **Enables operational reuse of existing logic and data controlled by a resource manager**
- **Offers the ability to 'compose' new combinations of information and function across multiple backend systems**
- **Cross Platform; adherence to OMG's CORBA standards; and desktop interoperability with de facto standards (MS's COM/DCOM/ActiveX)**

Object Request Broker | Object Service Framework

Application Adapter Framework

Business Objects

IMS TM Data Objects

IMS

Client Environment

Server Environment
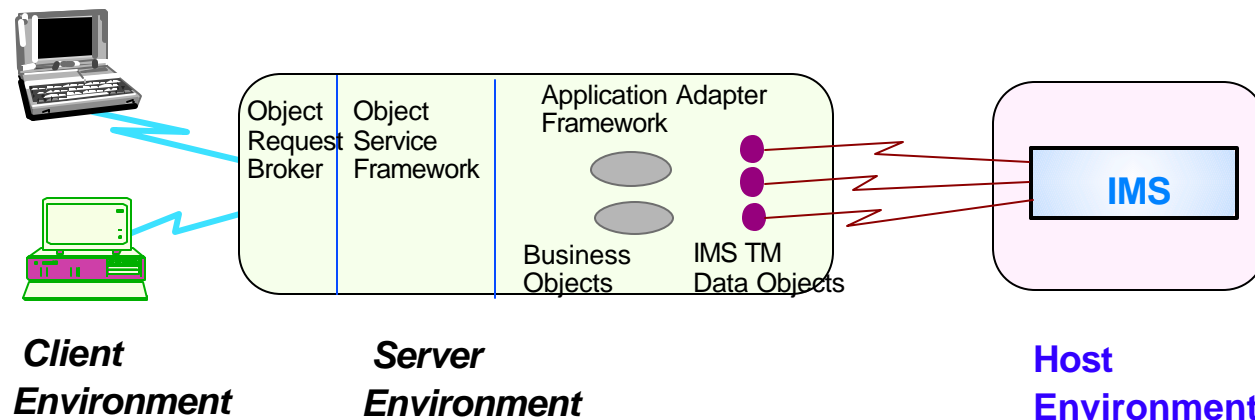
Host Environment

WebSphere Enterprise Edition IMS Access

OS/390 or z/OS WebSphere Environment

Object Request Broker	Object Service Framework	Application Adapter Framework	O T M A	IMS
		Business Objects IMS TM Data Objects		

Client Environment

WebSphere Enterprise Edition IMS Access

Object Request Broker

Object Service Framework

EJB Container

EJBs Session Beans

IMS TM EAB Beans

IMS

APPC

Client Environment

Remote Server Environment (e.g.. NT, AIX, Solaris)

Distributed Two-Phase Commit

Host Environment

WebSphere Enterprise Edition IMS Access

OS/390 Server Environment

Object Request Broker

Object Service Framework

EJB Container

EJB Session Beans

IMS TM EAB Beans

A P P C

IMS

Client Environment

Coordinated Two-Phase Commit

WebSphere Enterprise Edition Directions

Object Request Broker

Object Service Framework

EJB Container

EJB Session Beans

IMS TM EAB Beans

IMS Connect

IMS

Client Environment

OS/390 or other Server Enterprise Edition

Coordinated and Distributed Two-Phase Commit

OS/390 or z/OS IMS Environment
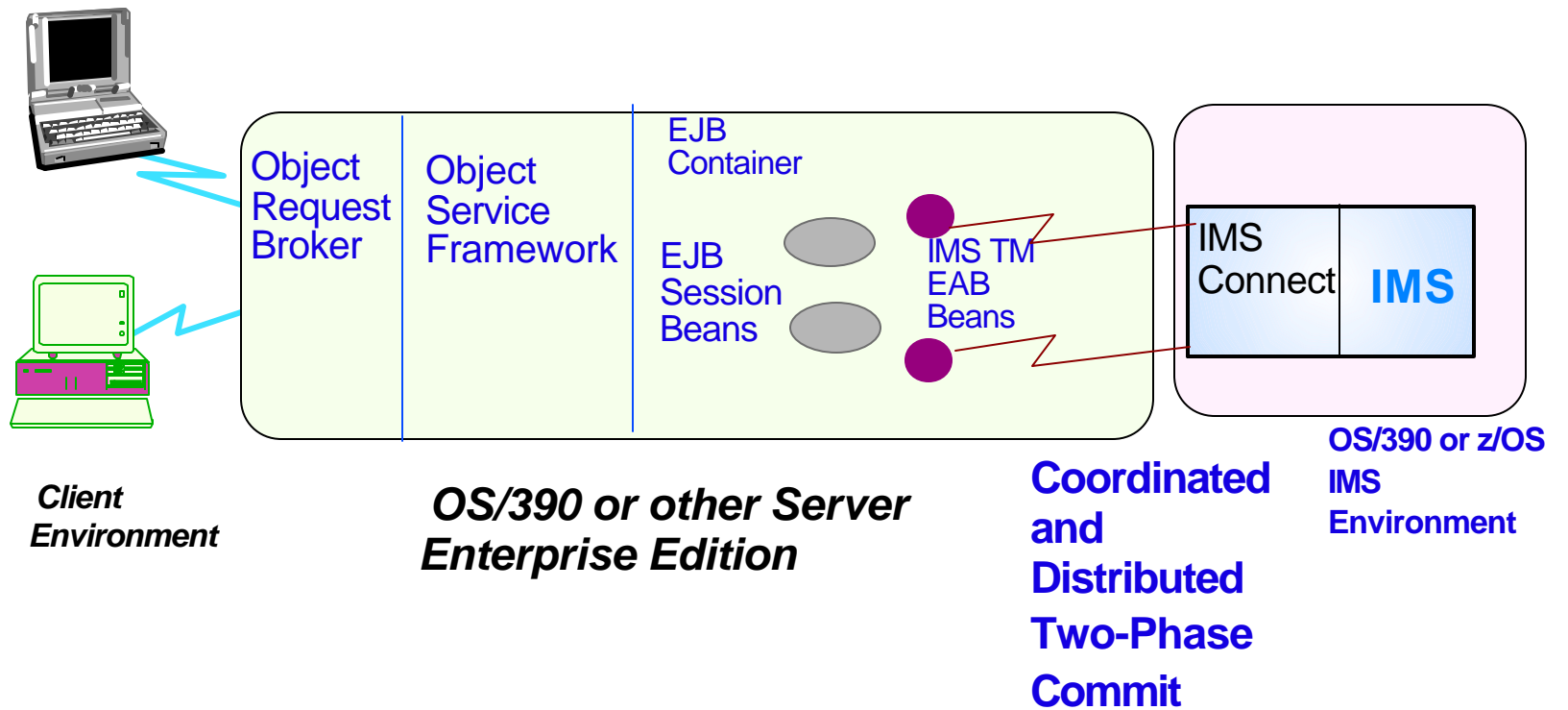
VisualAge Family

- ✓ **Choice of language - IBM has what you need**
- ✓ **Common technology - Visual development environment**
- ✓ **Best tools for IBM middleware**
- ✓ **Productivity**
- ✓ **Enterprise Scalability**

VisualAge	VisualAge	VisualAge	VisualAge	VisualAge	VisualAge	VisualAge	VisualAge
PL/I	RPG	C++	COBOL	Pacbase	Generator	Java	Smalltalk
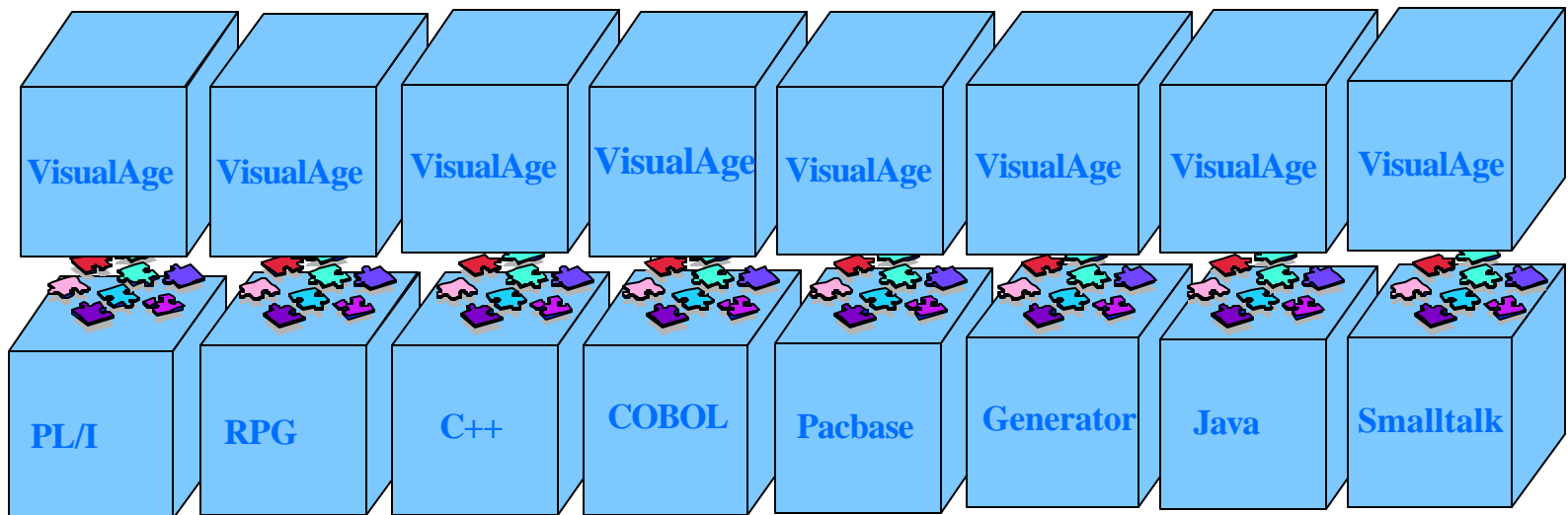
VisualAge brings your IMS business to the Web

✓ **VisualAge Generator Version 4 - fully integrated into VisualAge for Java Version 3**
- ► **Rapid Application Development**
- ► **Eases the skills transition to Java - your pace**

✓ **Access existing IMS transactions**
- ► **VisualAge for Java Enterprise Access Builders**

✓ **Create new n-tier Web applications with IMS transactions and access to DL/I data**
- ► **VisualAge Generator generates the code**

✓ **Bring your investment in IMS to the Web - easily!**

VisualAge Generator

End User

Web Application Server

Transaction Server

Servlet | **VisualAge Generator Java Gateway**

Web Browser

IMS, MVS/CICS, VSE/CICS, VM, OS/400, AIX/CICS, Native, NT/CICS, Native, OS/2/CICS, Native, HP-UX, SUN Solaris CICS, Native
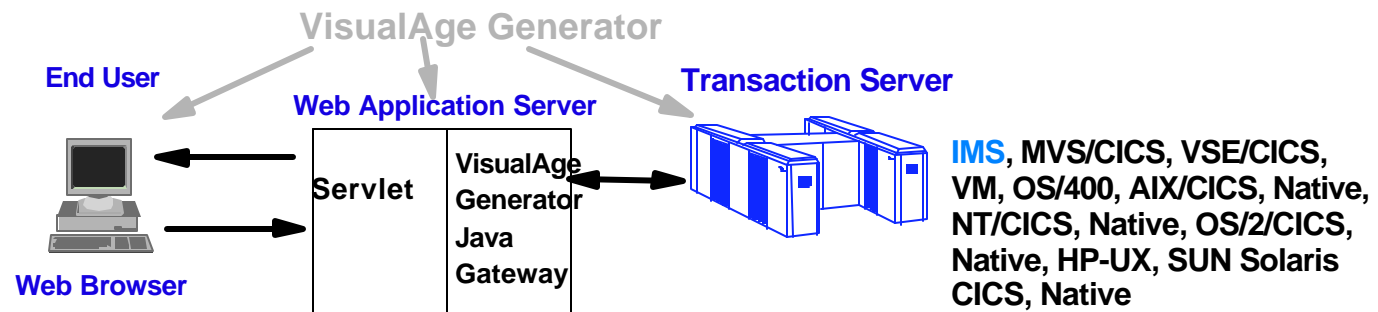
IMS Java Roadmap
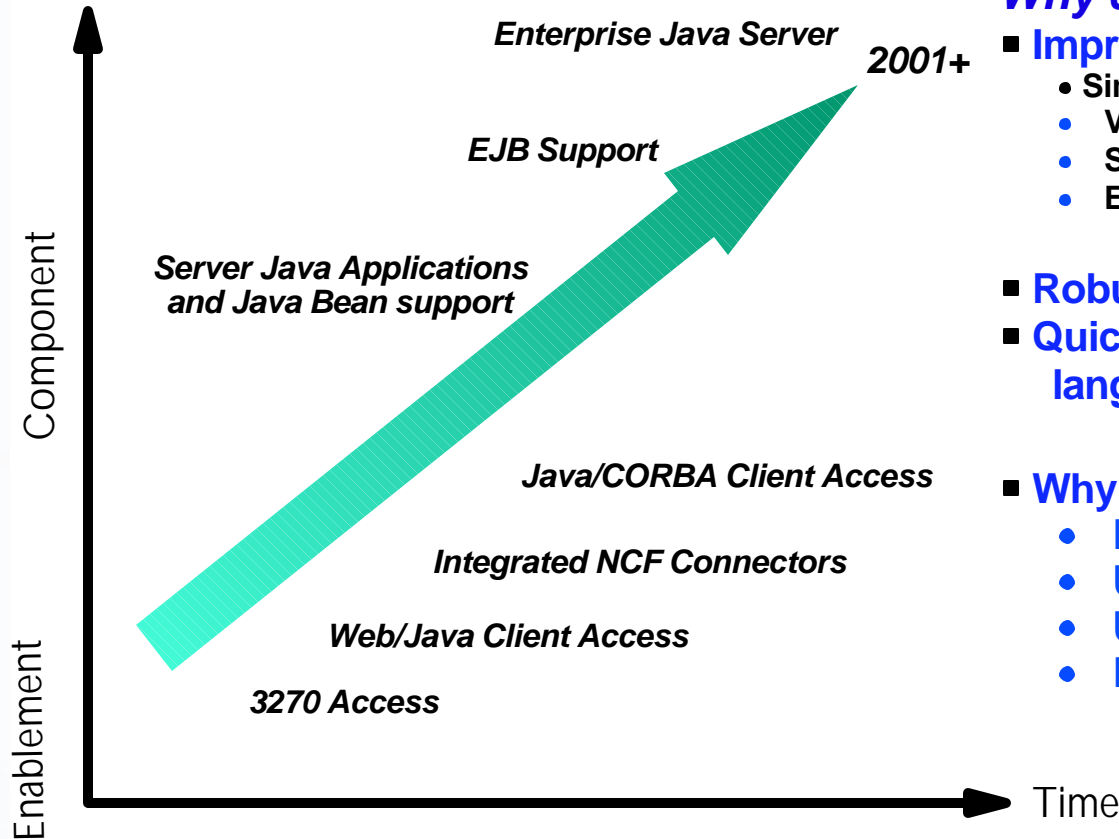
Why Java?
- **Improves AD Productivity**
  - Simpler and faster to program
  - Visual AD tools
  - Strong component model (OO)
  - Easier application deployment and manageability
- **Robust, Portable, Ubiquitous**
- **Quickly becoming the preferred language**

- **Why in IMS?**
  - Exploit existing infrastructure
  - Use new available skills
  - Use newer AD Tools
  - Improve application programmer productivity

Component / **Enablement** (vertical axis)

Time (horizontal axis)

Enterprise Java Server   **2001+**

EJB Support

Server Java Applications and Java Bean support

Java/CORBA Client Access

Integrated NCF Connectors

Web/Java Client Access

3270 Access

IMS V7 Java supports Integrated e-business Application Development

- **Providing the capability to write, compile and run IMS Java programs**
  - Provides a set of packages (groups of classes) for input-output message handling and access to IMS services, and support APIs familiar to Java programmers
  - Applications written in Java can run in IMS as MPPs, BMPs, IFPs

- **Using the APIs/Tools familiar to Java programmers**
  - JDBC for data access to IMS DB and/or DB2
  - Host and VisualAge tools for development
    - Initially compile using High Performance Java Compiler or Use the Serially Reusable Java Virtual Machine
      - ➤ Create VisualAge projects and do Remote Build
      - ➤ Edit using VisualAge editor
    - Remote debugging using VAJava Remote Debug tool
    - Performance Tracing

IMS V7 Java

- Supporting
  - ► Conversational and non-conversational transactions
  - ► Message Format Services (MFS) supported
  - ► Dependent regions, not Batch
  - ► JDBC 1.0 access to IMS DB
  - ► JDBC/SQLJ 1.0 access to DB2
  - ► HPJ compiled support (layered on LE/370 interface for C) provided initially
  - ► Serially Reusable Java provided for enhanced tooling
  - ► Usage from VisualAge for Java's ET/390

IMS V7 Java Class Library

- Objective: To provide a Java class library that:
  - ► is easy-to-use by experienced Java programmers, requiring only basic IMS knowledge
  - ► provides the infrastructure for automated tool support and integration with VisualAge Java and the Application Framework for e-business
  - ► robustly supports all major IMS capabilities
  - ► provides best-possible Java performance

Java in IMS packages

SSAQualificationStatement
SSAList   SSA
DLIConnection
DLISegment   DLISegmentInfo
DLIDatabaseView DLIRecord
    Implementation of java.sql

IMSTransaction   IMSMessageQueue
IMSApplication   IMSFieldMessage

AIB
AlternatePCB
DBPCB
DLIBaseSegment
DLITypeInfo
IOPCB
IMSException
IMSInfo
JavaToDLI

db Package	application Package
base Package	
CEETDLI Interface for C Language	

IMS DB	IMS System	IMS TM
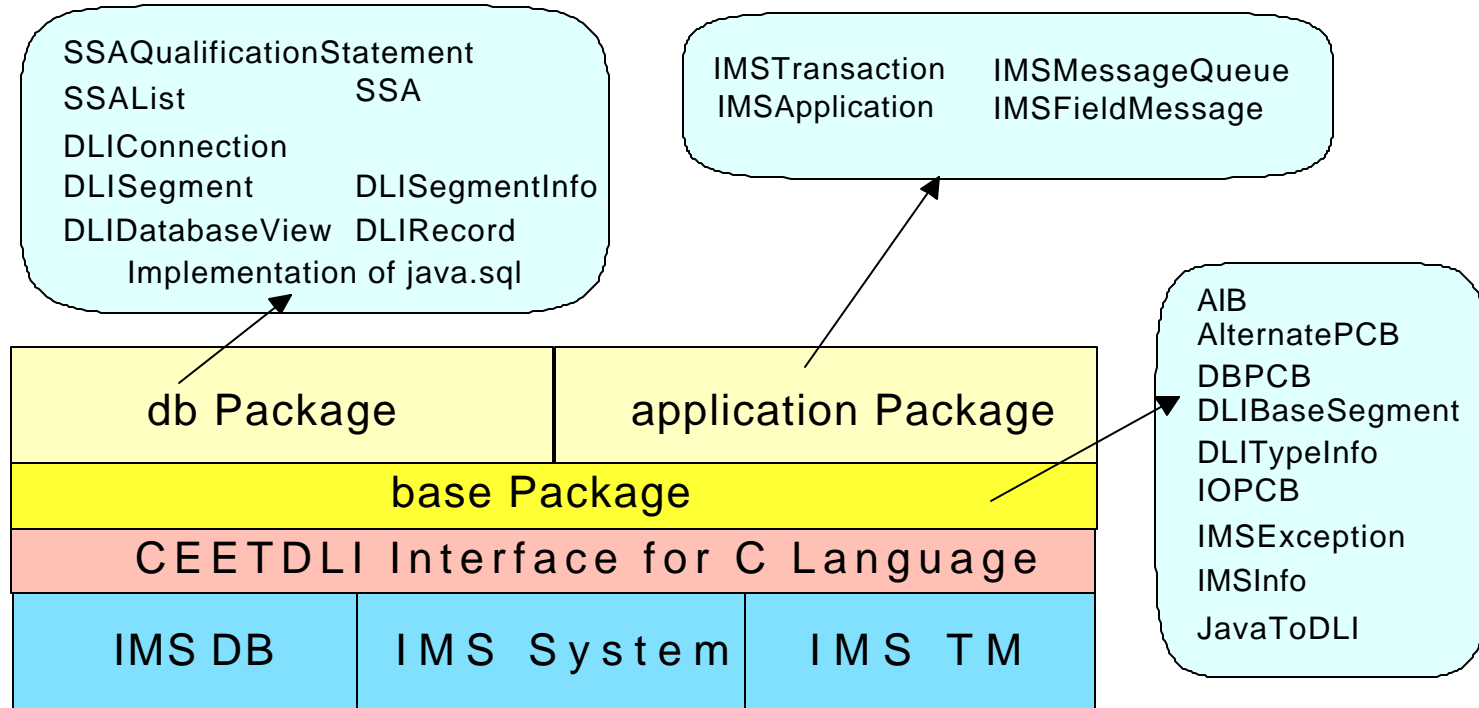
Java program uses the APIs that are provided
  Application package classes
      To initialize/begin the program
      To get/put the message from/to the message queue
      Commit
  JDBC interface or db Package classes to access IMS data

Building a Basic Java Application

- Define classes for input and output messages
- Subclass IMS Application and implement doBegin method
- Use IMSMessageQueue to receive and send messages
- Use IMSTransaction to commit or rollback resource
- Use JDBC to access DB2
- Define classes to access DL/I segments
- Use JDBC to access IMS DB

Adding DL/I Database Access

- DBA
  - ► Uses Java class generation tools to build "metadata" classes
  - ► DLISegment subclass for each segment in the database
  - ► DLIDatabaseView subclass to define segments used by an application and their hierarchical relationships
- Application Developer
  - ► Uses JDBC calls with a subset of SQL/92 to read insert, update, and delete IMS DB data

IMS V7 Java Tools Support

- ■ Java class generation for database support
  - ► necessary because DL/I databases do not provide metadata (definition of data in the database)
- ■ Java class generation for Connector Framework EAB Support
  - ► necessary because current Java parser in EAB only supports COBOL.

IMS Java Enhancements

- Enhance Performance/Tools support with a new JVM through new IMS region types
- Extend access to IMS DB in other environments (WebSphere EJBs, DB2 Stored Procedures, CICS)
- JDBC/SQL 2.0 standards support for IMS DB and DB2

Additional Requirements

- Support evolving Java Standards
  - ▶ Java Transaction API - UserTransaction
  - ▶ Java2 Message API
- Provide Client Object Request Broker - RMI over IIOP
- Enhance Tools support
  - ▶ Enhance Stored Procedure Builder to support visual development

The Big Picture:
JDBC Access to IMS Data

CICS
JCICS

DB2
Stored
Procedure

WAS
EJB

IMS-J
Tooling

DBDLIB
PSBLIB
COPYLIB

ODBA
DRA

IMS DB/DBCTL

CEETDLI Interface
JNI
Base
APP
JDBC / SQL
DLI Database View
IMS Java App

IMS TM

MPP BMP IFP JMP JBP
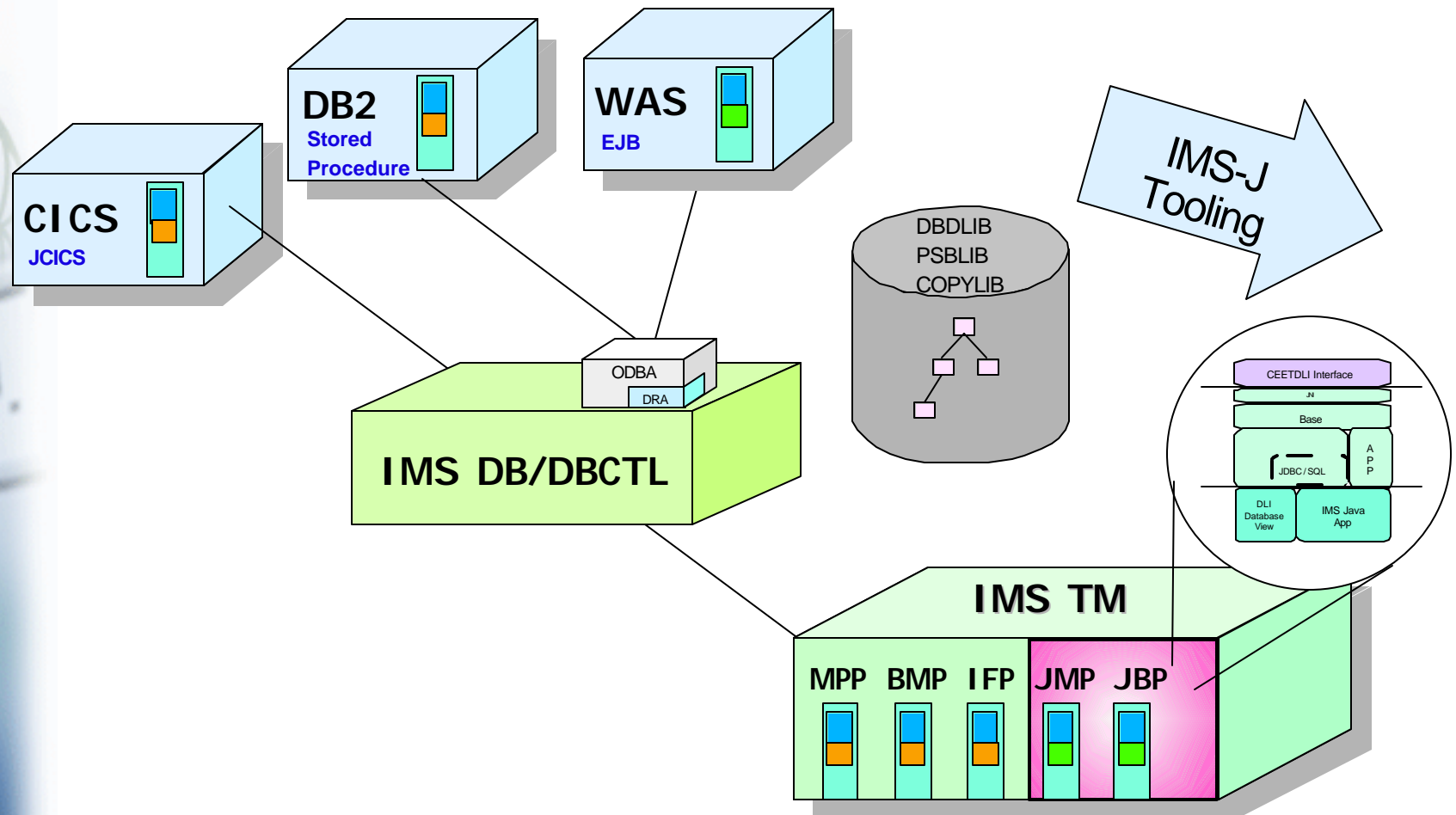
"**SELECT** CheckingAcct.Balance, SavingAcct.Balance,CheckingAcct.Name"
+

"**FROM** MyBankPCB.Accounts " +
"**WHERE** CheckingAcct.Balance > 10000" +
"**AND** SavingAcct.Balance > 20000 "

DB2 Stored Procedure Example Using IMS V7 Java Classes JDBC interface

OS/390

DRDA Client	DB2	WLM Addr. Space	IMS
EXEC SQL CALL PGMA		CIMS INIT	
		ClassforName(DLIDriver) get.connection(IMS dbpcb) Select From Where	
Commit	SRRCMIT	CIMS TALL	

DB2 Databases

IMS Databases
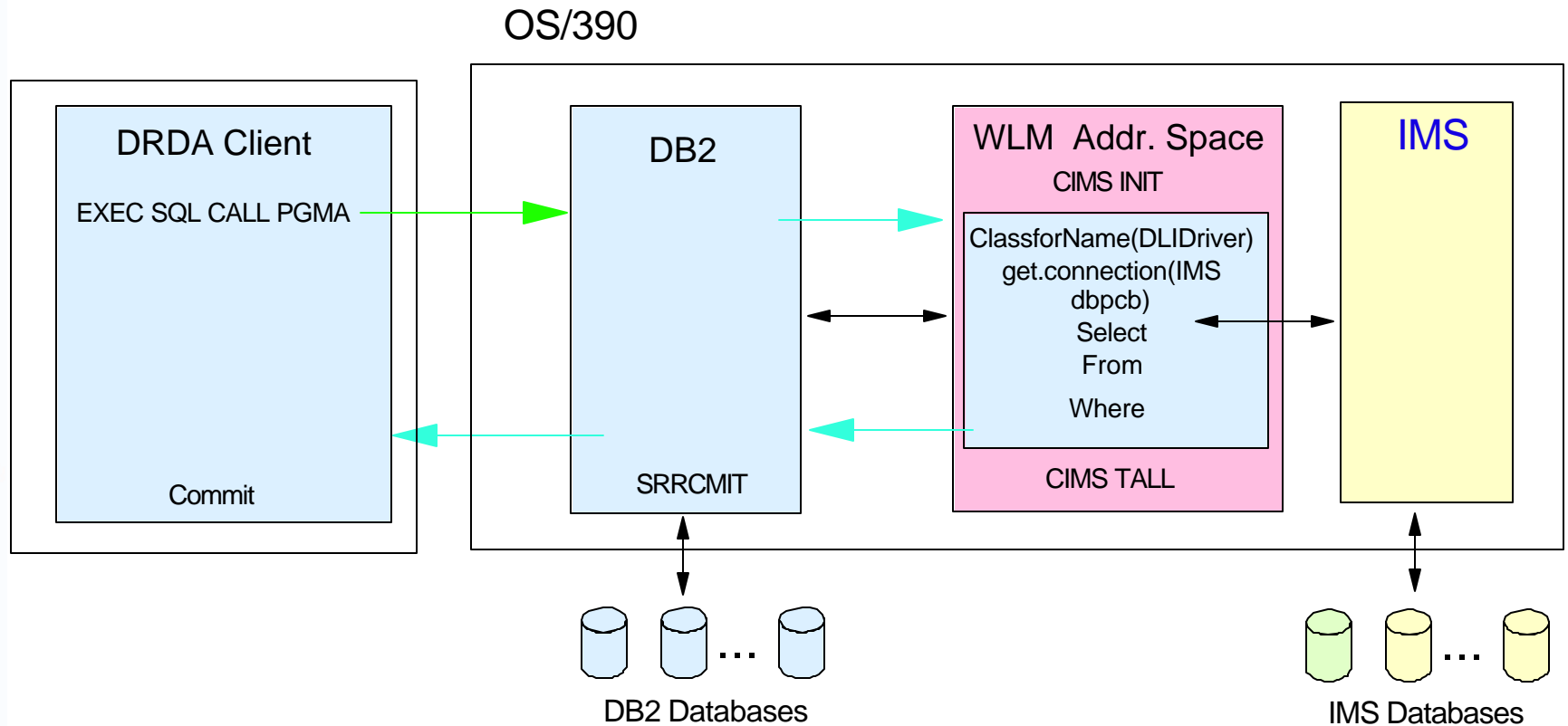
- **DB2 Java stored procedure example**
  - IMS Java Classes can be used to access IMS DB

CICS Example
Using IMS V7 Java Classes
JDBC interface

OS/390

Client

CICS

Java application

ClassforName(DLIDriver)
get.connection(IMS dbpcb)
Select
From
Where

IMS DB

IMS Databases
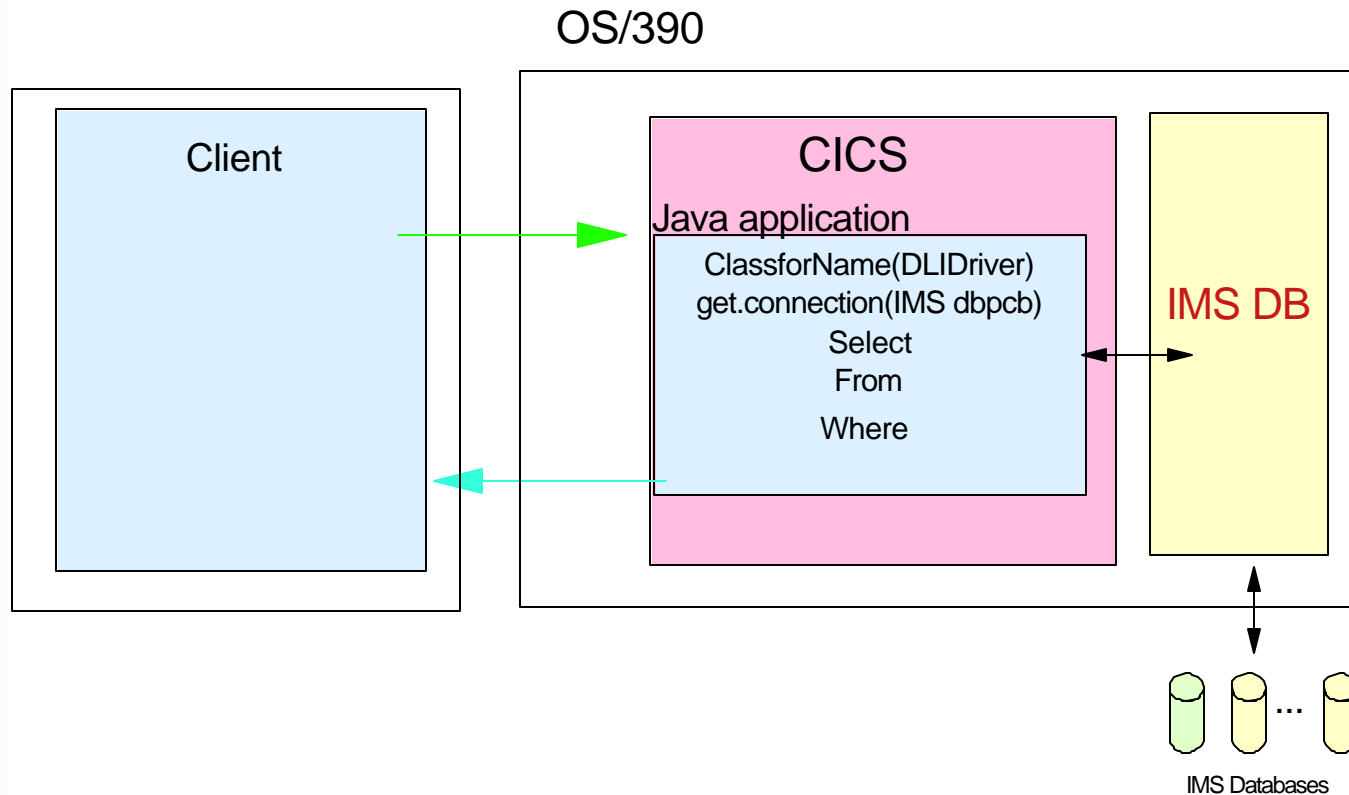
- **CICS Java Application example**
  - IMS Java Classes can be used to access IMS DB

OS/390 WebSphere Application Server Using IMS V7 Java Classes JDBC Interface

OS/390

```
Client
Browser
```

```
HTTP
Server
```

WAS Server

```
Servlet
ClassforName(DLIDriver)
get.connection(IMS
      dbpcb)
      Select
      From
      Where

      Close
```

O
D
B
A

IMS

IMS Databases
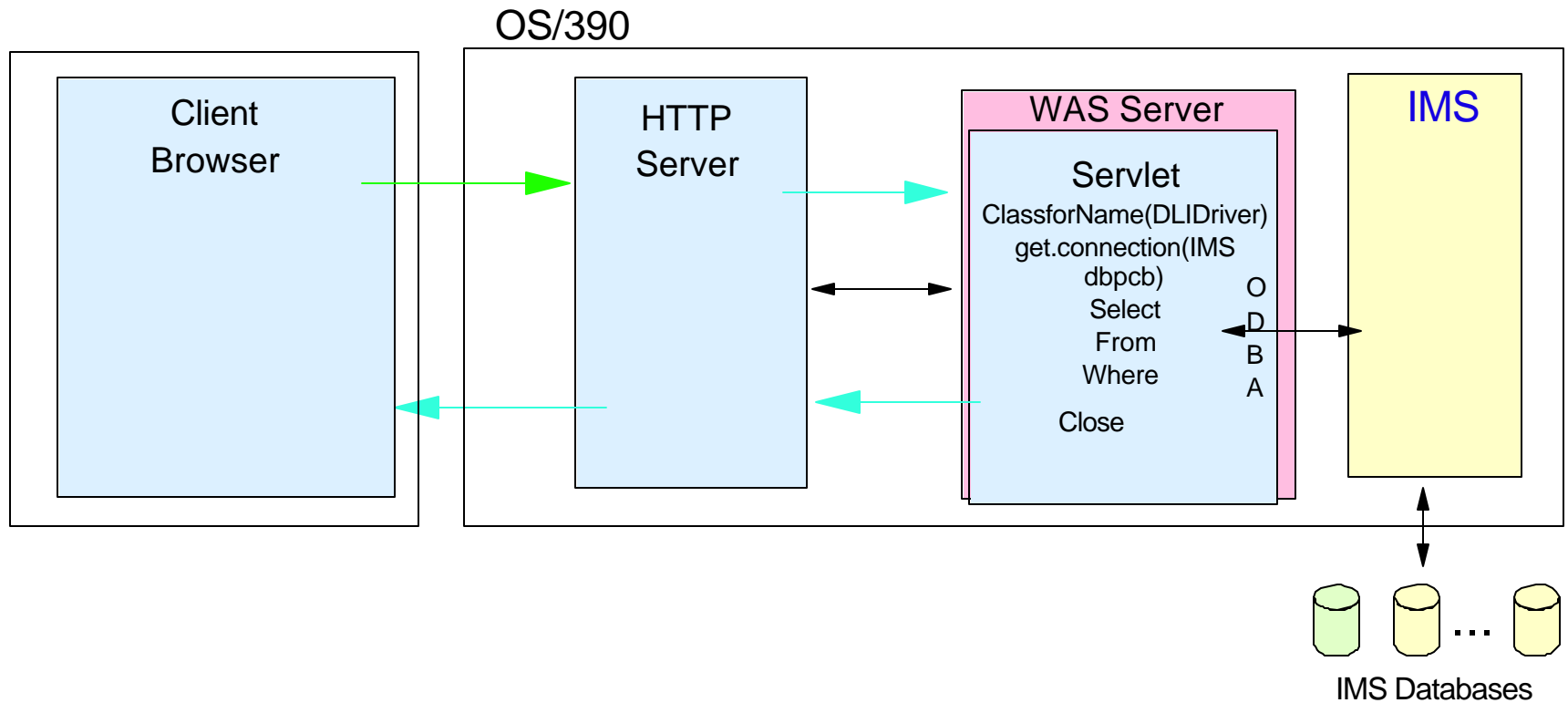
- **Websphere Java applications example**
  - IMS Java Classes can be used to access IMS DB

OS/390 WebSphere Application Server Using IMS V7 Java Classes EJB/JDBC Access to IMS DB

Object Request Broker

Object Service Framework

EJB Container

EJB Session Beans

IMS Java Classes

JDBC

EJB Entity Beans

O D B A

IMS

OS/390 Server Environment

Coordinated Two-Phase Commit

Host Environment
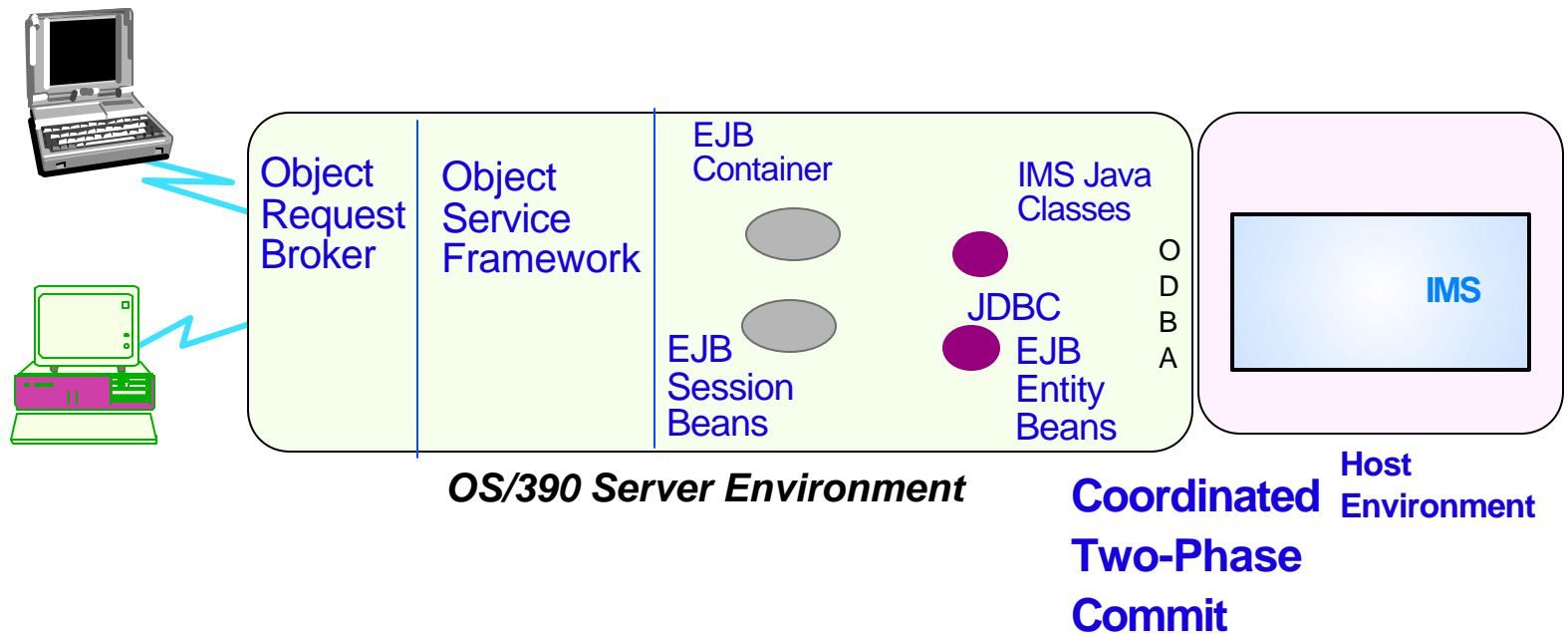
Requirement: To provide OS/390 WebSphere Application Server Entity Bean access to IMS DB data

XML - the missing piece of the puzzle

XML brings data to the web, adding the necessary component for 90% of e-business applications.

Web Communications (TCP/IP)

+   Web User Interface (HTML) for presentation and browsing

+   Web Programming (Java)

- business logic

- portable code

+   Web Data (XML) for structured information exchange

- business data

- portable data

=   **e-business**

What is XML?

- A text-based tag language, similar to HTML, but with user-definable tags
- Tags in text to markup meaning
- A simplified subset of SGML
- A World Wide Web Consortium (W3C) standard way of sharing structured data
- A metalanguage for defining other markup languages, interchange formats and message sets
  - ► Simple to use
  - ► Extensible
  - ► Mature
  - ► International
- Simplifies business-to-business transactions on the web

A key technology to enable e-business

IBM's XML Focus and Strategy

IBM Focus is on Business Integration

- ►Applications
  - ■ Transactional and Collaborative
- ►Business processes (intra-, inter-enterprise)
- ►People — universal access anywhere, anytime
- ►Data — personalized information
- ►Heterogeneous environments/platforms

IMS Strategy is

- ► To deliver XML-based solutions that will help our customers and business partners build, deploy, and manage e-business applications.

IBM is

- ►Ensuring strong, open standards
- ►Enabling our entire product line for XML
- ►Building e-business solutions

Exploit XML for Data/Metadata Interchange

- Transaction inputs and outputs
  - ► Enterprise Access Builder
  - ► MFS data model
- Database Definitions
  - ► Common Warehouse Model
  - ► XML Producers - Parsers for DBDs, PSBs, and copybooks
  - ► XML Consumers
    - – Java In IMS
    - – DB2 Stored Procedure Builder
- Adhoc DL/I Queries
  - ► Segment Search Argument Model to define queries
  - ► Query results as XML document

IMS/XML Requirements

Provide Integrated Tool support for IMS applications
- **No one tool is able to cover all IMS source definitions**
- **IMS provides domain knowledge to model and generate XML documents for each source definition and documen**

Provide Interchangeability of IMS applications/data
- **Leverage XMI standard**

Activity: Model IMS source documents in metadata model
- **IMS DB data**
  - **DBD files, PSBs/PCBs, copybooks, etc. (describe data)**
- **IMS Transaction definitions**
  - **Represent IMS proprietary transaction definitions in XML documents**
- **IMS Transactional messages and MFS**
  - **Represent IMS transactional input and output messages in XML documents**

Metadata eases the building of connector tools for existing applications

XML and IMS

- **Processing XML Documents in New IMS Applications Today**
  - **Customers can write IMS C++ or IMS Java applications using the XML Toolkit for OS/390**
    - Tran code still must be EBCDIC, rest of data can be XML
    - Java/C++ program can invoke XML parser to convert to non-tagged data

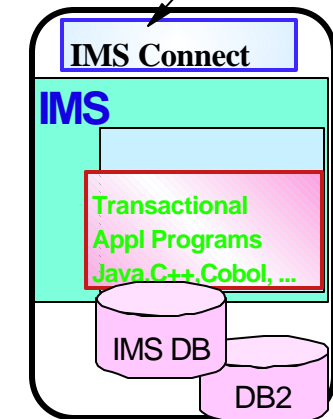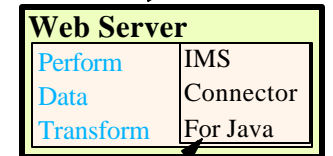- **Bridging XML and Existing IMS Applications Today**
  - **Using MQSeries Integrator**
    - Dictionary support for messages
    - Routing and processing based on message content
    - US Utility built cost-effective e-business infrastructure to IMS

- **XML and IMS Requirements**
  - **Processing XML Documents in new/changed IMS Cobol applications using the XML Toolkit for OS/390**
  - Supporting SOAP(Simple Object Access Protocol)-compliant XML documents for Industry tooling and evolution to Web Services
  - Transforming XML for existing IMS applications using Web Server and/or IMS Connect
  - Using XML as an IMS Data Definition language

SOAP-compliant XML documents

XML Repository

Web Server
| Perform Data Transform | IMS Connector For Java |

IMS Connect

IMS

Transactional Appl Programs Java,C++,Cobol, ...

IMS DB

DB2

US Utility company

Building a cost-effective e-business Infrastructure with Java and XML

Challenge: Utility industry deregulation required differentiation by providing proliferating information to energy traders, providers, producers, consumers (e.g.. viewing account history online for reconciliation)

Solution: Establish generic e-business infrastructure based on thin-client architecture using XML and transaction processing between Internet client and existing IMS system through EJB, a Web Application Server Java Servlet, and MQSeries

Benefits: Enable device independence with respect to the client and to leverage its existing investment in legacy IMS transaction systems

Web Services - The Next Step In The Evolution of the Web

- Allow programmable elements to be placed on web sites where others can access distributed behaviors
  - ► Web Services are emerging as building blocks for constructing B2B applications that integrate business processes over the Internet
- Applications can use XML to expose their features while remaining neutral with respect to any operating system, programming language or backend server
- Typically transactional, requiring integration with existing systems
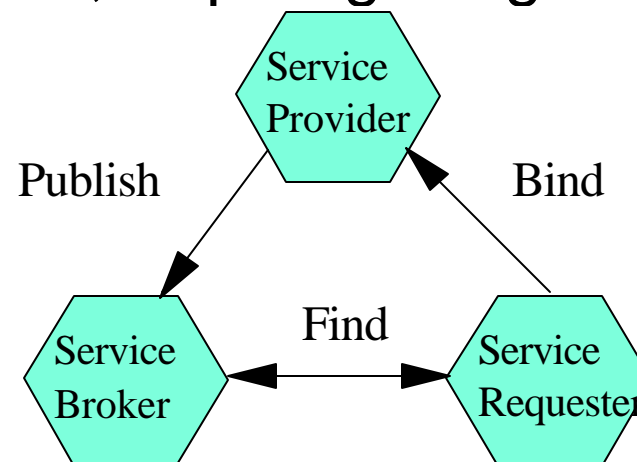
```
                    Service
                    Provider

      Publish                       Bind

                      Find
   Service                       Service
   Broker                        Requester
```

IMS Initiatives for e-business

- Complete industry-strength access to IMS via Standards-based connectors
- Support Java applications on OS/390 and z/OS
  - Java transaction programs in IMS regions
  - Other OS/390, z/OS and non-390 Java applications accessing IMS DB data more directly
- Leverage OS/390 and z/OS ORB/EJB server to provide distributed object capability
- Exploit XML as a means of data/metadata interchange

Complete Industry Strength Access to IMS Transactions

- Provide a common client programming model to access IMS transactions via many server environments: WebSphere, DB2 Stored Procedures, CICS, MQSeries
  - ► Connector Architecture (CCF and J2EE)
- Support different protocols or transports for Standards-based connectors with proper security, authority, and integrity
- Expand XML exploitation for existing and new IMS applications and data with additional parsing/transformation
- Support non-Java environments
- Continually improving performance/functionality

IMS e-business Enablement

Connection to and new IMS applications

- **IMS Connect** for access to existing IMS trans through TCP/IP and Locally
- **IMS Connector for Java** providing Java beans for creation of Java applications/servlets with the VisualAge Enterprise Access Builder (EAB) and Connector Framework and J2EE to access existing IMS trans via IMS Connect
- **MQSeries** for additional tools for e-business through OTMA
  - ► With VA Interspace to bridge Visual Basic program (e.g.. COM/DCOM) to IMS
  - ► With Lotus Notes/Domino to bridge Notes/Collaboration with IMS
- **WebSphere Application Server** for Enterprise Java server access to IMS via APPC, IMS Connect, or OTMA Callable Interface

New IMS Application Development for e-business

- **IMS Java** providing e-business applic development/tools integration in IMS
  - ► Provide an API
    - ► Usable by experienced Java programmers
    - ► Layered on LE/370 interface for C
    - ► Provides infrastructure for tool support
  - ► HPJ compiled initially
  - ► Persistent reusable Java for expanded tooling
  - ► Supports JDBC/SQLJ
  - ► Usable from VAJava ET/390
  - ► Support user written Java stored procedures using DL/I Java classes

IMS e-business Enablement Requirements

Connection to existing/new IMS applications

- **IMS Connect**
  - ► Continually enhanced Performance
  - ► Systems Management, Usability, Serviceability enhancements
  - ► Availability, Recovery, Security enhancements
  - ► EJB Distributed Commit support

- **IMS Connector for Java**
  - ► Conversational support
  - ► Performance enhancements
  - ► EJS Distributed Commit support
  - ► Additional environment support

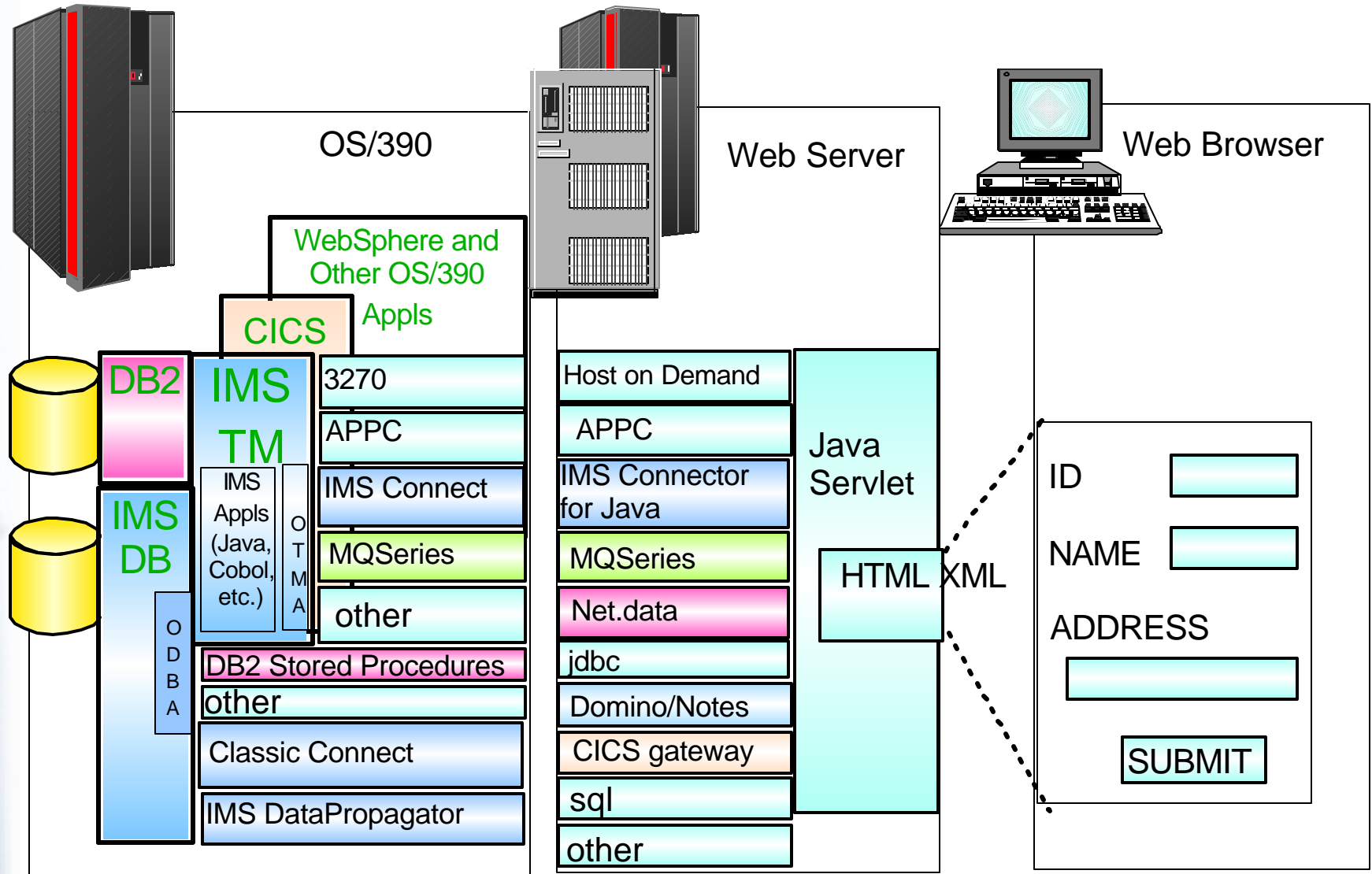## Enabling New IMS Application Development

- **IMS Java**
  - ► Enhanced Application Development and Execution environment support
  - ► Performance enhancements
  - ► Non-390 access to DL/I (ODBA)
  - ► Java2 w/JDBC 2.0 and Java transaction API
  - ► Additional Tooling with Class Generation (Class Definition Tool) and Stored Procedure Builder enhanced to support visual development

Leveraging IMS Applications and Data

OS/390

Web Server

Web Browser

WebSphere and Other OS/390 Appls

DB2

IMS TM

IMS DB

CICS

IMS Appls (Java, Cobol, etc.)

OTMA

ODBA

- 3270
- APPC
- IMS Connect
- MQSeries
- other
- DB2 Stored Procedures
- other
- Classic Connect
- IMS DataPropagator

- Host on Demand
- APPC
- IMS Connector for Java
- MQSeries
- Net.data
- jdbc
- Domino/Notes
- CICS gateway
- sql
- other

Java Servlet

HTML XML

ID

NAME

ADDRESS

SUBMIT

Internet Solutions Directions
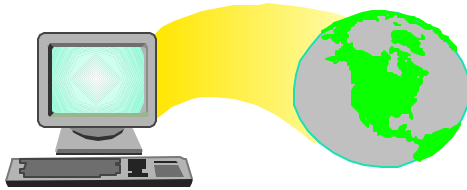
Improve Levels of Performance and Functionality

Exploit XML

IMS Connect
  Improve Delivery/Service
  Improve Performance

2001
Provide IMS Java applications

IMS Connector for Java
  Provide Connector Integration
  Improve AD Tools
  Improve Portability
  Simplify Access

WAS providing IMS EJB Container and Java Transaction Services

IMS Object and Web early mapping tools

IMS TCP/IP Support

IMS WWW and Java Samples/Templates

End-to-End Performance

*Transactions
access per
second*

IMS Serving mission-critical
applications and data access across
the enterprise and over the internet

■ **Measurement Goals**
- **Test the highest throughput that IMS Connect can handle**
- **Evaluate key performance enhancements added to IMS Connect V1**
  - **Persistent Sockets**
  - **Unix System Services latch elimination**
  - **OTMA latch contention reduction**

■ **Measurement Environment**
- **IMS Fast Path workload (TPC-C like) with TPNS as a transaction driver**
- **OS/390 2.7; TCP/IP 3.7; IMS Connect V1**
- **Ran on 9672-ZZ7 CMOS 12-way**

■ **Results**
- **5955 transactions/second steady throughput with one IMS and one IMS Connect**
  - **CPU 52.3% busy**

Achieved thru enhancements
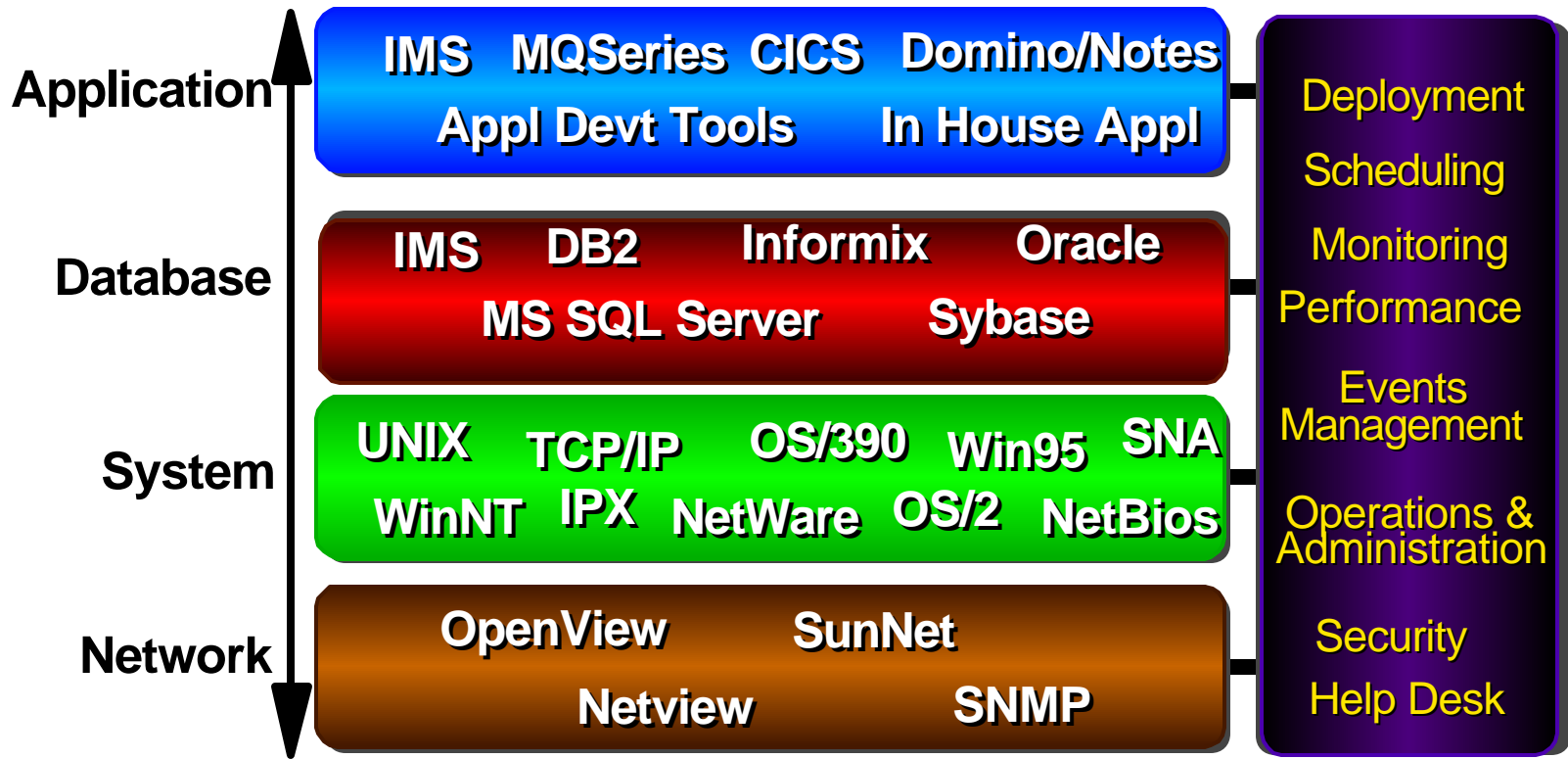across the IBM product line

Systems Management

Tivoli

A Complete Solution to Manage "the Stack"

Application

| IMS MQSeries CICS Domino/Notes |
| Appl Devt Tools   In House Appl |

Database

| IMS   DB2   Informix   Oracle |
| MS SQL Server   Sybase |

System

| UNIX TCP/IP OS/390 Win95 SNA |
| WinNT IPX NetWare OS/2 NetBios |

Network

| OpenView   SunNet |
| Netview   SNMP |

Deployment

Scheduling

Monitoring

Performance

Events
Management

Operations &
Administration

Security

Help Desk

Tivoli *ready*

A Program to Increase Tivoli Product Technical Synergy

IBM

IMS Connector Information

- **IMS Information available at http://www.ibm.com/ims**

- **IMS Redbooks available at http://www.redbook.ibm.com**
  - SG24-6123-00 IMS Version 7 and Java Application Programming
  - SG24-6514 IMS e-business Connectors
  - SG24-6285 Application Integration using XML on z/OS and OS/390

- **IMS Education available at http://ww.ibm.com/services/learning/us**

- **IMS Consulting Services for migration and skills transfer, and Customized Offerings available at dmservices@us.ibm.com**

Summary

IMS provides the tools for integrated e-business solutions for the Internet and Java with

- Consistency
- Flexibility
- High performance

What IBM is trying to do is

- Deliver the capability that our customer *want and need*
- Make it *simpler and more integrated*
- Continue the focus on software that *lasts forever*
- **Help our cust**omers *put it all together*

IMS Serving the World Wide Web