IMS03 On Demand Integration Solutions Strategy and Directions

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IMS On Demand Integration Strategy

- **Protect our customers' investment by enabling access to IMS applications and data**
  - Designed to support open integration technologies
  - Support collaboration among IMS, IBM and non-IBM components

- **Enable tools development**

- **Encourage new application development by supporting standards - XML, SOAP, and Java, etc.**

Scalable
Reliable
High Performance

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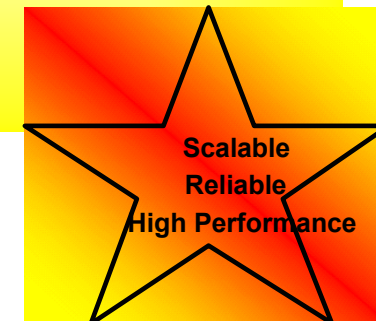
IMS On Demand Integration Directions

- **Provide robust and scalable IP based connectivity**
  - Support Sysplex Distributor
  - Support distributed access to IMS database

- **Enable IMS applications as clients**
  - Use IMS to pull information/data from a distributed system
  - Provide outbound support by enabling IMS applications as clients
    - To WebSphere
    - To IMS SOAP Gateway
    - To any server

- **Fully integrate with WebSphere and its tools to establish a common programming model for a service-oriented architecture (SOA) based on standards**
  - Support the new Service Component Architecture (SCA) programming model
  - Support WebSphere Autonomic Computing for Integrated Solutions Console

IMS On Demand Integration Directions …

- Support collaboration with non-IBM products & J2EE compliant applicant servers, e.g. WebLogic, NetWeaver, etc.

- Enhance the DLIModel Utility

  - Generate IMS database XMI metadata based on the new IMS Database metamodels

  - Facilitate generation of IMS database information from XML schemas

- Transformation of existing applications and IMS data

  - Develop runtime adapters to perform transformation between different formats by using XMI metadata stored in a repository

- Provide a standard, commonly supported interface to IMS data to minimize specific backend IMS DL/I knowledge

  - Continue to enhance JDBC/SQL access to IMS data (e.g. support recursive SQL/XQuery statements)

  - Support industry standard XQuery programming model for IMS XML database

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OTMA (Open Transaction Manager Access)

- High performance interface between MVS client applications and IMS transaction processing

  – Use MVS XCF facilities

MVS Sysplex

MVS Client Program — **XCF** — **OTMA** — **IMS**

Remote client
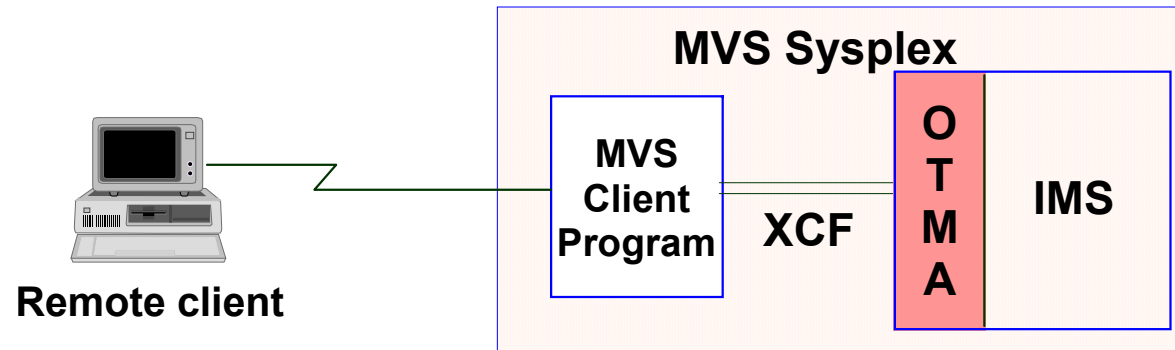
- Enables exploitation of existing IMS applications

  – MVS clients specify the nature of the flow and synchronization protocols, on a per-transaction basis

  – Includes user and transaction security

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OTMA Client Considerations

- OTMA Client interfaces and flows are documented, *__but__*
  - OTMA Client must be authorized
  - OTMA Client must be an XCF group member
  - Portions of OTMA Client must be written in Assembler
  - Portions of OTMA Client must run in SRB mode
    - e.g., Group Exit and Message Exit
  - MVS systems programming resources need to be involved in design and implementation of an OTMA Client

- **Skill set required to design and implement an OTMA Client is beyond the scope of a typical application programmer**
  - *That's why IBM provides an OTMA Callable Interface with IMS V6*

- **Several existing products are provided as OTMA Clients**
  - MQSeries IMS Bridge
  - IMS Connect

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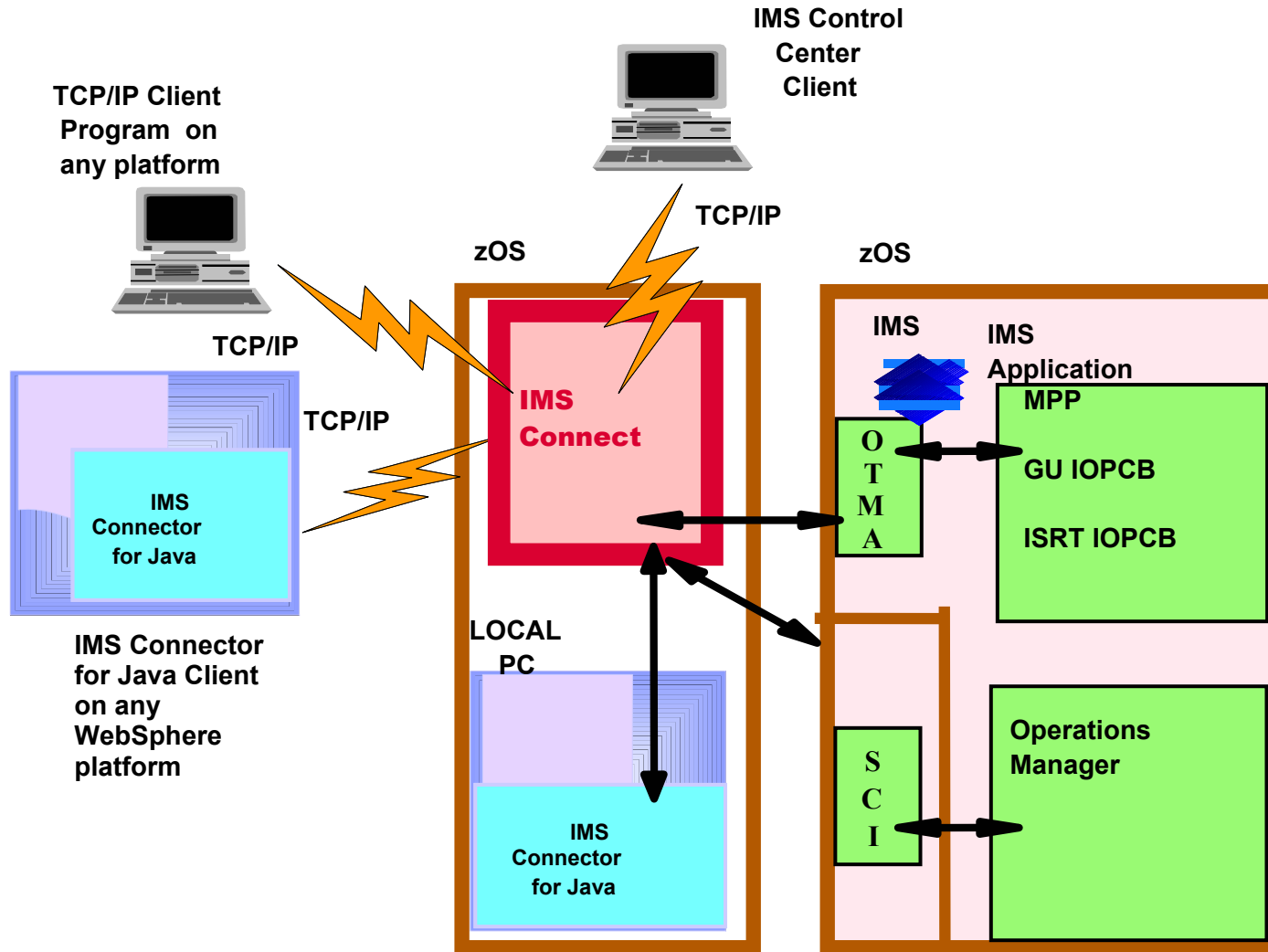
Network Access to IMS Transactions via MQSeries

- For a messaging and queuing model solution
  - Message delivery even when the connection is not available
  - MQ Adapter for IMS: Uses the External Subsystem (ESS) interface
    - The IMS application uses explicit MQ calls to get/put messages in MQ with syncpoint coordination in IMS
    - Calls to MQ, DB2 and IMS in the application are considered one UOW
  - MQ Bridge for IMS: Uses the OTMA interface
    - Coordinates message transfer between the MQ queue and the IMS message queue
    - Allows the application to use DL/I to access the messages

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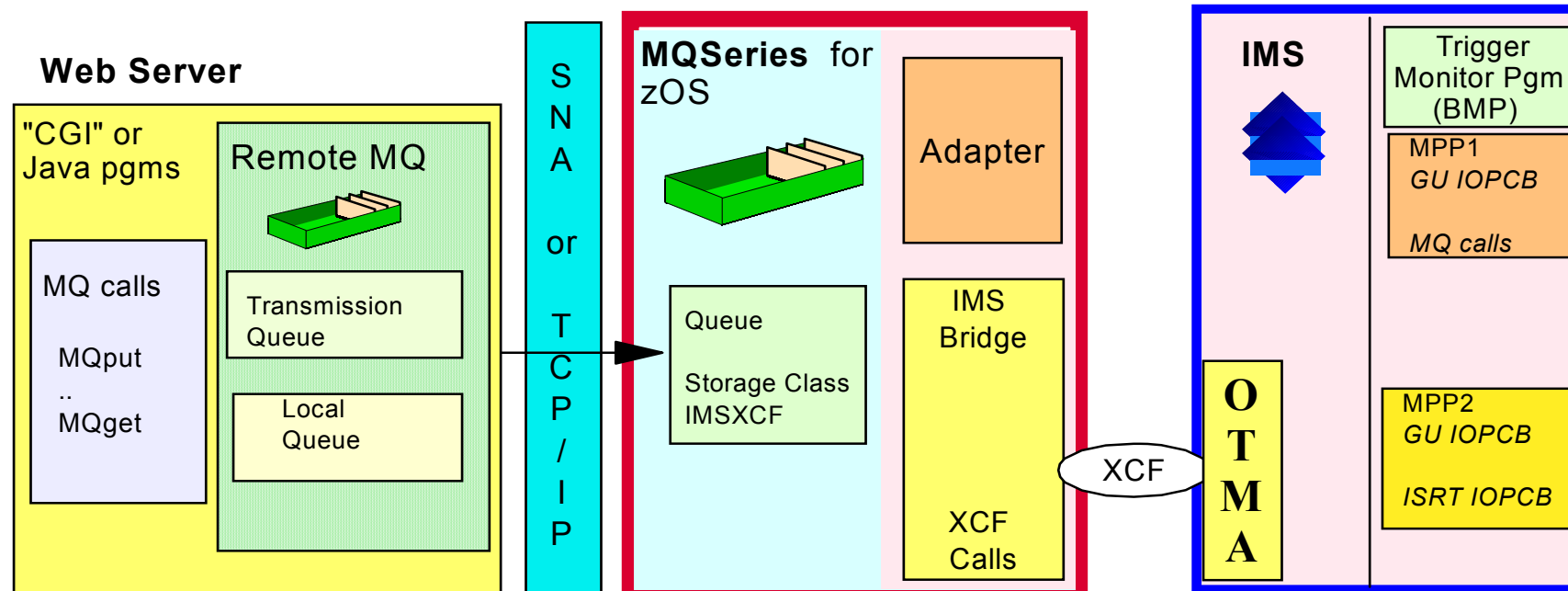
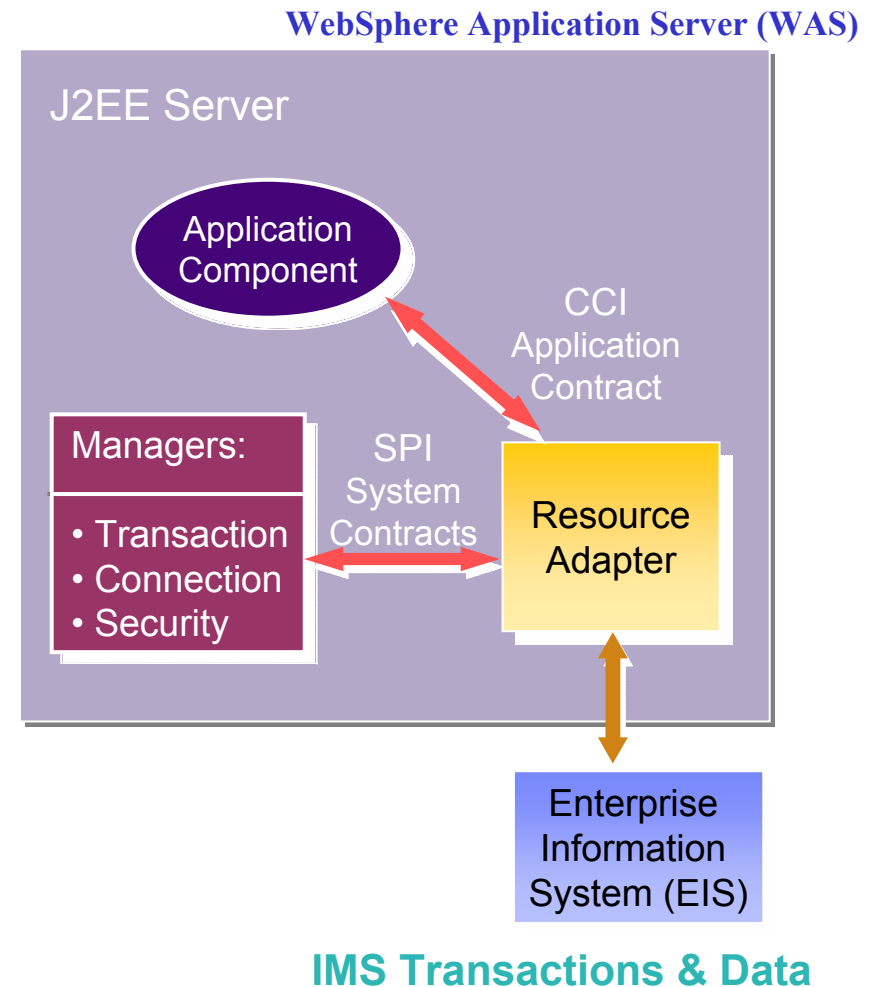# Network Access to IMS Transactions via TCP/IP *- IMS Connect*

- Direct connection model

- Provides flexible communications and workload balancing thru OTMA and exits

- Separately managed address space with command interface

- Provides *high performance* TCP/IP access to IMS applications
  – Supports TCP/IP sockets access to IMS transactions and commands
  – No requirement to modify existing IMS transactions
  – Provides a general purpose and structured interface
    • For the IMS Connector for Java
    • For user-written clients
  – Supports access to IMS by LINUX/390 applications

- Interface between IMS Control Center and IMS Operations Manager (IMS V8)

- XML Task Manager for XML translation of transaction input and replies (planned)

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IMS Connect – *TCP/IP Access to IMS*

IMS Control Center Client

TCP/IP Client Program on any platform

TCP/IP

zOS

TCP/IP

IMS Connector for Java

TCP/IP

IMS Connect

IMS Connector for Java Client on any WebSphere platform

LOCAL PC

IMS Connector for Java

zOS

IMS

IMS Application

O T M A

MPP

GU IOPCB

ISRT IOPCB

S C I

Operations Manager

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IMS Resource Adapters

WebSphere Application Server (WAS)
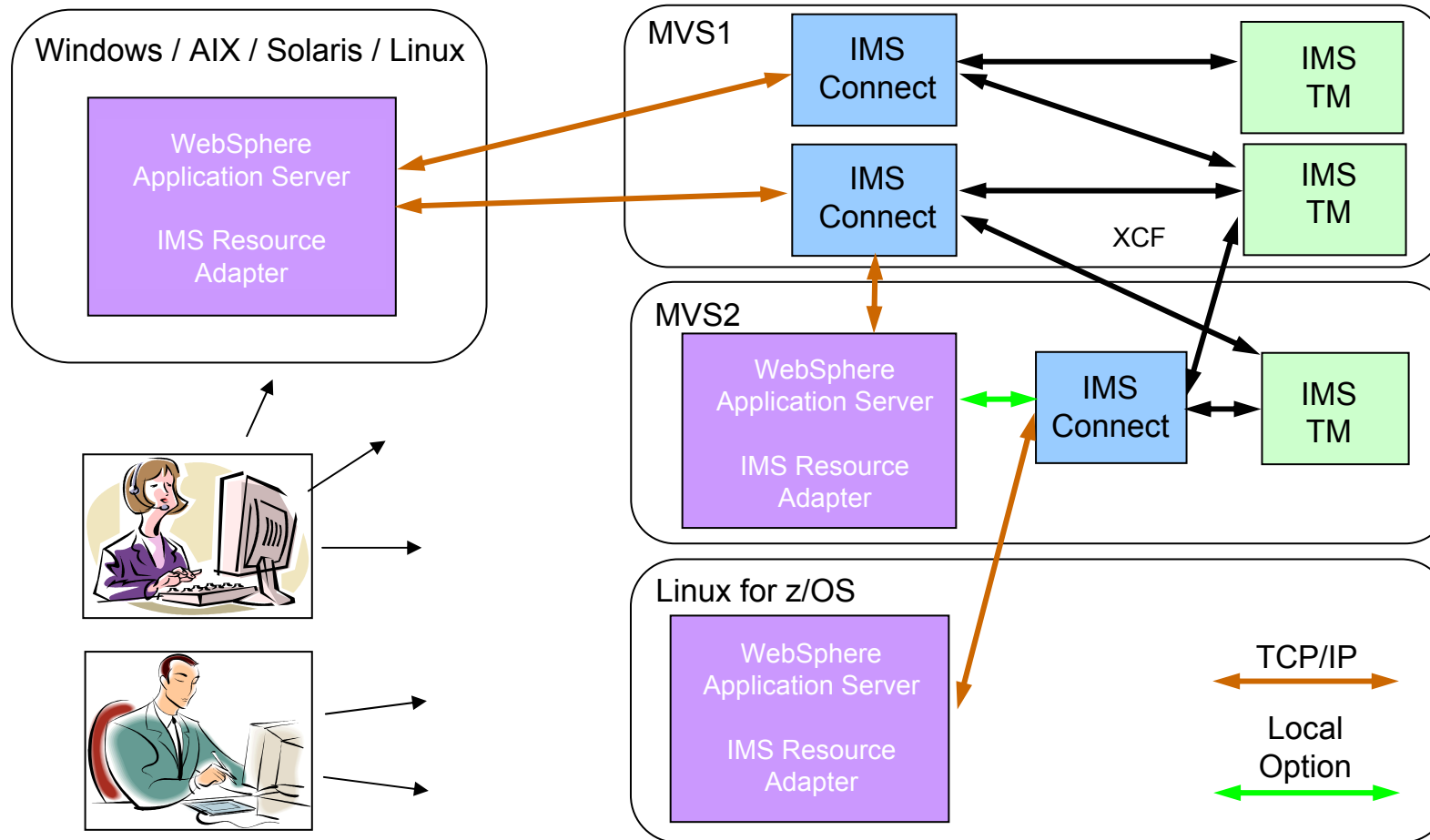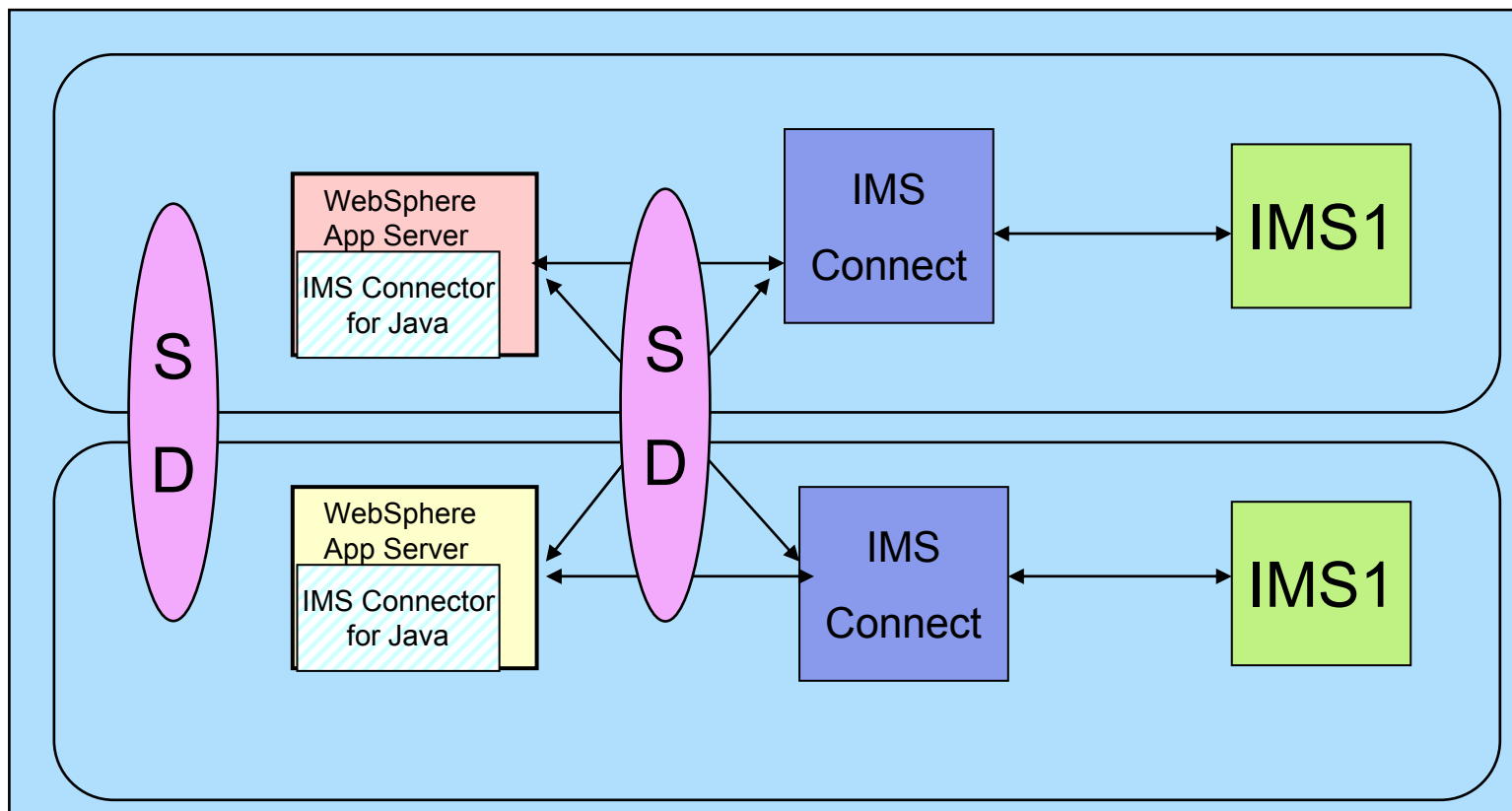
■ IMS Resource Adapters are IBM e-business Connectors (also called WebSphere Resource Adapters)

- ► IMS Connector for Java - IMS transactions
- ► IMS JDBC Connector - IMS data

■ Implement J2EE (Java 2 Enterprise Edition) Connector Architecture

■ Provide easy development of new solutions that can readily access IMS transactions and data

J2EE Server

Application Component

CCI Application Contract

Managers:
- Transaction
- Connection
- Security

SPI System Contracts

Resource Adapter

Enterprise Information System (EIS)

IMS Transactions & Data

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IMS Connector for Java and IMS Connect

Windows / AIX / Solaris / Linux

WebSphere Application Server

IMS Resource Adapter

MVS1

IMS Connect

IMS Connect

IMS TM

IMS TM

XCF

MVS2

WebSphere Application Server

IMS Resource Adapter

IMS Connect

IMS TM

Linux for z/OS

WebSphere Application Server

IMS Resource Adapter

TCP/IP

Local Option

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IMS & Sysplex Distributor (SD)

Service Oriented Architecture (SOA): Transform Application Architecture

Integration Specialist

Application Developer

Web Application Platform

Direct Connection

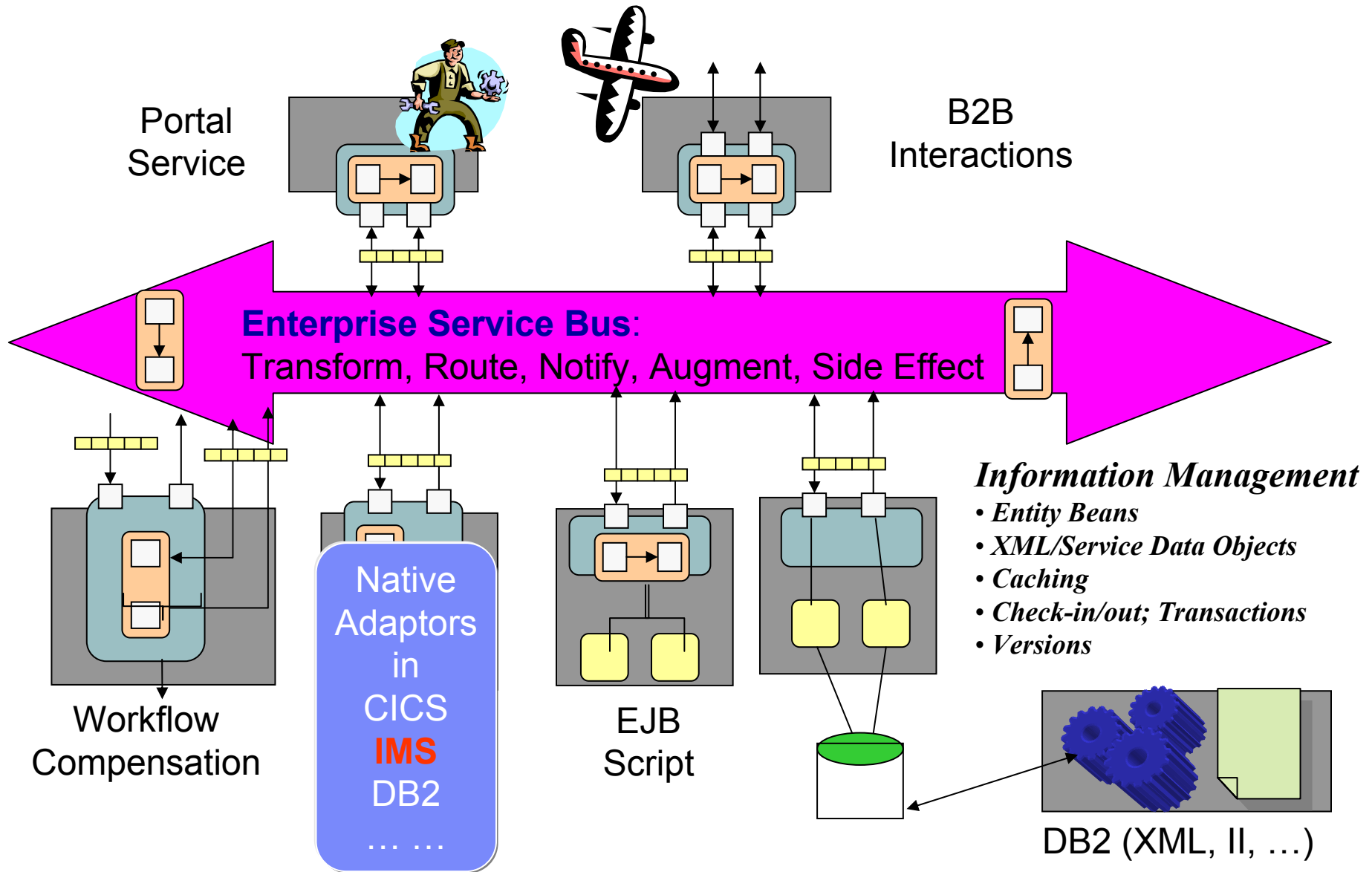**Web Service**

Application Developer

Native Application Platform
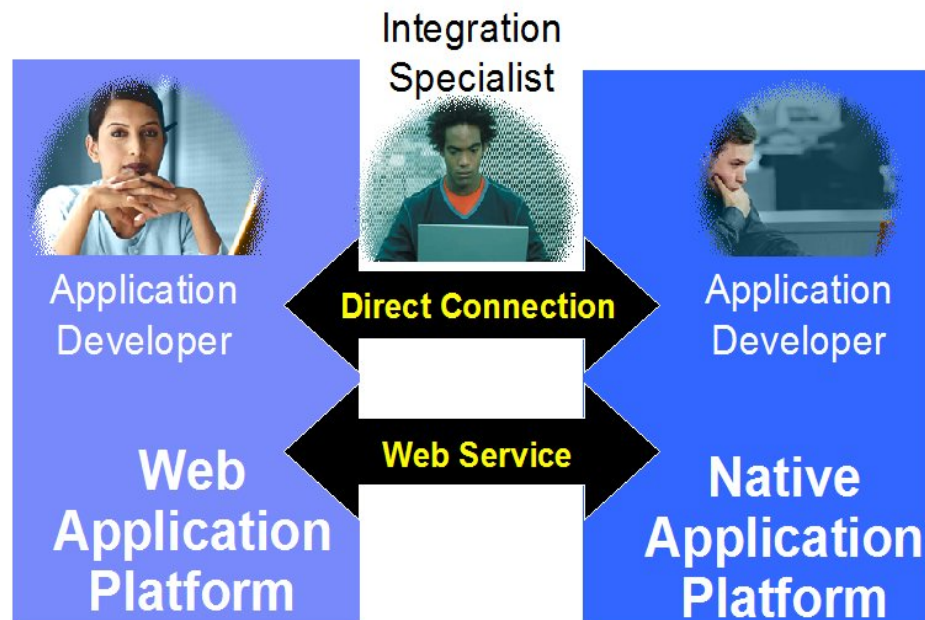
- Update and extend mission-critical applications as services, leveraging their core value in new ways

- Adapt business processes to new marketplace imperatives faster and with lower cost

- Improve development processes and productivity

- Reuse existing assets in a service-oriented architecture (SOA)

- Increase flexibility and efficiency with tools to discover existing business value and develop and deploy mixed-workload applications

Web Services and SOA

- SOAP is the industry standard protocol built in response to XML demands

- Web Services extend the basic SOAP capabilities with additional QoS, and enable SOAP to be the foundation of Service Oriented Architecture (SOA) implementations

- IBM's overall SOA solution will be in the form of an Enterprise Service Bus (ESB), a combination of WAS runtime support for message transport and transformation with ESB 'endpoint' support provided in existing server environments

  - Applications hosted in existing server environments will supply the bulk of the initial services accessed via the ESB
  - IMS ESB endpoint support is a very important part of the overall ESB deliverables.

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Enterprise Service Bus – End-to-End Solutions

Portal
Service

B2B
Interactions

Enterprise Service Bus:
Transform, Route, Notify, Augment, Side Effect

Workflow
Compensation

Native
Adaptors
in
CICS
IMS
DB2
… …

EJB
Script

Information Management
- *Entity Beans*
- *XML/Service Data Objects*
- *Caching*
- *Check-in/out; Transactions*
- *Versions*

DB2 (XML, II, …)

IMS Transactions, Web Services and SOA

- IMS Transactions can be enabled as Web services via WebSphere Application Servers (WAS) and Studio Tooling

  - Transform IMS applications into Web Services using WebSphere Studio Application Developer Integration Edition (WSAD-IE) and WebSphere Application Server (WAS)

    - IMS COBOL and C applications
      - WSAD-IE 4.1 +
      - WAS 4.1 + & WAS zOS 4.0.4 +
    - IMS MFS-based applications
      - WSAD-IE 5.0.1 +
      - WAS 5.0 + & WAS zOS 5.0 +
    - IMS PL/I applications (direction)

- Requirement: Support IMS transactions as Web services via IMS SOAP Gateway

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IMS SOAP Gateway – requirements & values

- ## **What IMS SOAP Gateway will initially provide**
  - SOAP 1.1 support enabling IMS applications to provide and request WSDL described services within an SOA environment
    - Interoperate with Miscrosoft .Net Visual Studio
  - HTTP transport
  - IBM WSED/WD4Z tooling to:
    - Generate & publish IMS applications as WSDL described SOAP services
    - Generate conversions to/from IMS transaction copybooks
  - Support IMS as SOAP/Web Services server
    - Interoperability with Microsoft & SAP SOAP clients

- ## **Dependencies**

  - Require IMS Connect Task manager & XML Adapters

- ## **Future requirements**
  - Support IMS as SOAP/Web Services consumer
  - Support WS-* standards
  - Support MQ transport

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IMS Java *for Integrated e-business Application Development/Connectivity*

- **A new feature since IMS V7**

  - Offers Java support to access IMS Databases from various environments (IMS, CICS, DB2, z/OS WebSphere, and distributed WebSphere)

  - Enables SQL access through the JDBC interface
  - IMS DLIModel Utility for metadata generation

- **Java Virtual Machine (JVM) support in dependent regions (JMP, JBP)**

  - JDK 1.4 support
  - JDBC 2.1 support
  - Just-In-Time (JIT) compilation
  - Resetable JVM

- COBOL – Java Interoperability in Java dependent regions
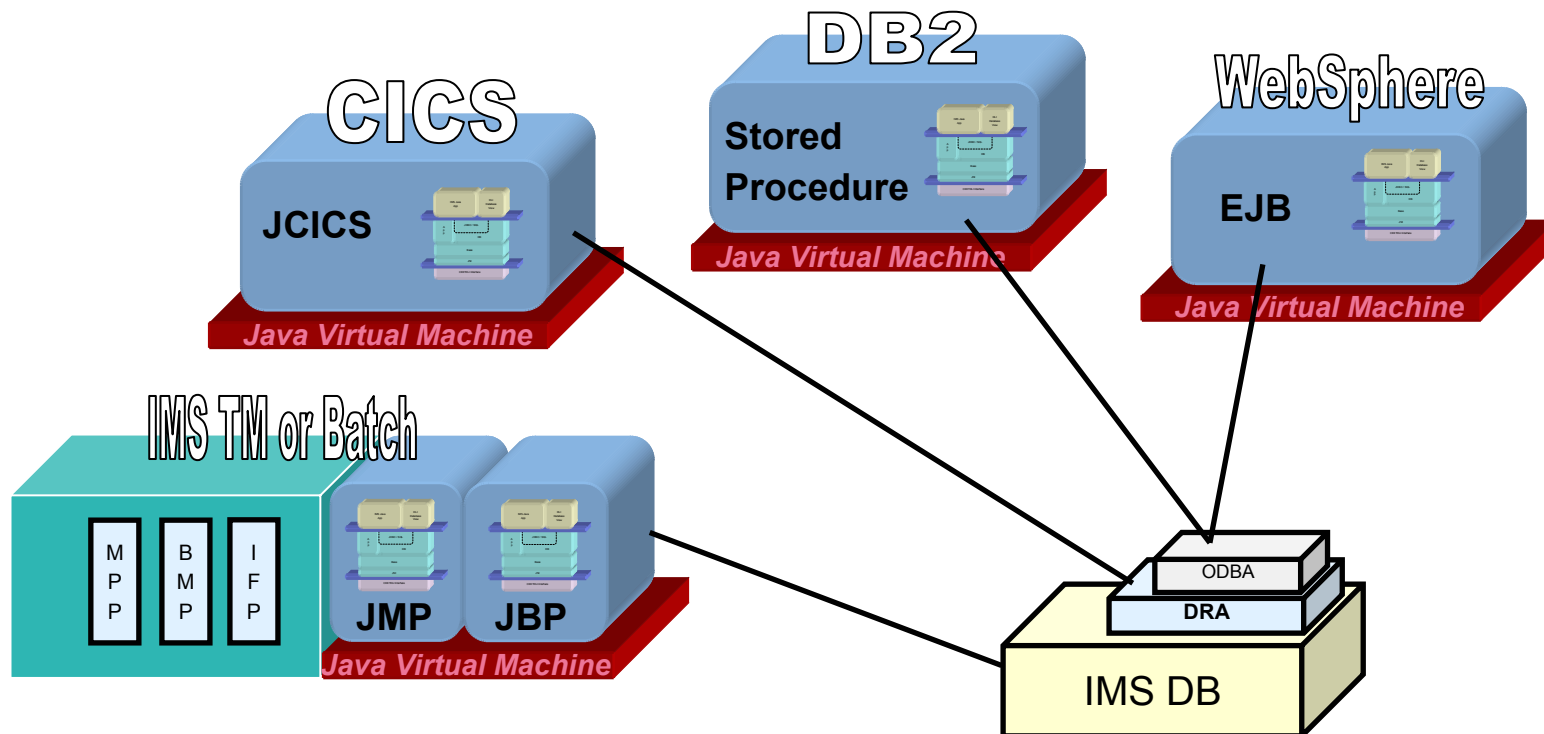- Access DB2 data from new IMS dependent regions

IMS Java Running Environments

● **Non-Managed Environments**

  –IMS TM V7, V8, V9 (Resetable JVM)

  –CICS 2.1, 2.2 (Resetable JVM)

  –DB2 V7, V8 (Resetable JVM)

● **Managed Environments**
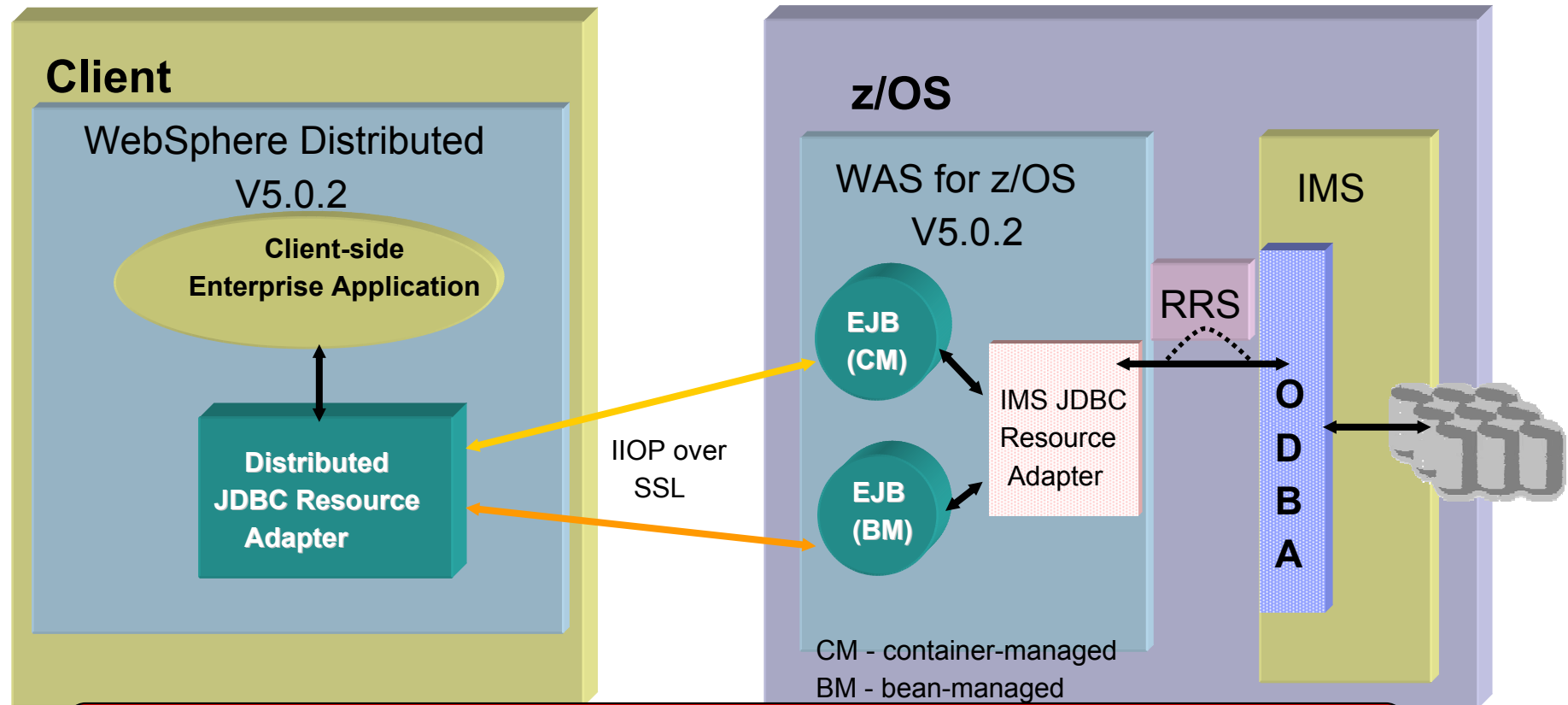
  –WebSphere 4.01, 5.0 (JVM)

Remote Database Services

- **Remote Database Services (RDS) available IMS Version 9**

- **Ability to access IMS DL/I data from a distributed J2EE server**
  - WebSphere Application Server 5.0.2 for distributed platforms

- **Complete client application deployed on distributed J2EE server**
  - Distributed functionality is transparent to client application

- **All client-server communication is handled by new IMS Java components**
  - IMS JDBC distributed Resource Adapter (client-side RAR)
  - Container Managed EJB (server-side EAR)
  - Bean Managed EJB (server-side EAR)

IMS Java RDS …

– IMS Java Remote Database Services

- From a client application deployed on a distributed WebSphere Application Server
- Client-server communication handled by IMS Java

Client

WebSphere Distributed

V5.0.2

Client-side
Enterprise Application

Distributed
JDBC Resource
Adapter

IIOP over
SSL

z/OS

WAS for z/OS
V5.0.2

EJB
(CM)

EJB
(BM)

IMS JDBC
Resource
Adapter

RRS

IMS

O
D
B
A

CM - container-managed
BM - bean-managed

IVPs can be used to test container & bean managed EJBs on WAS on a
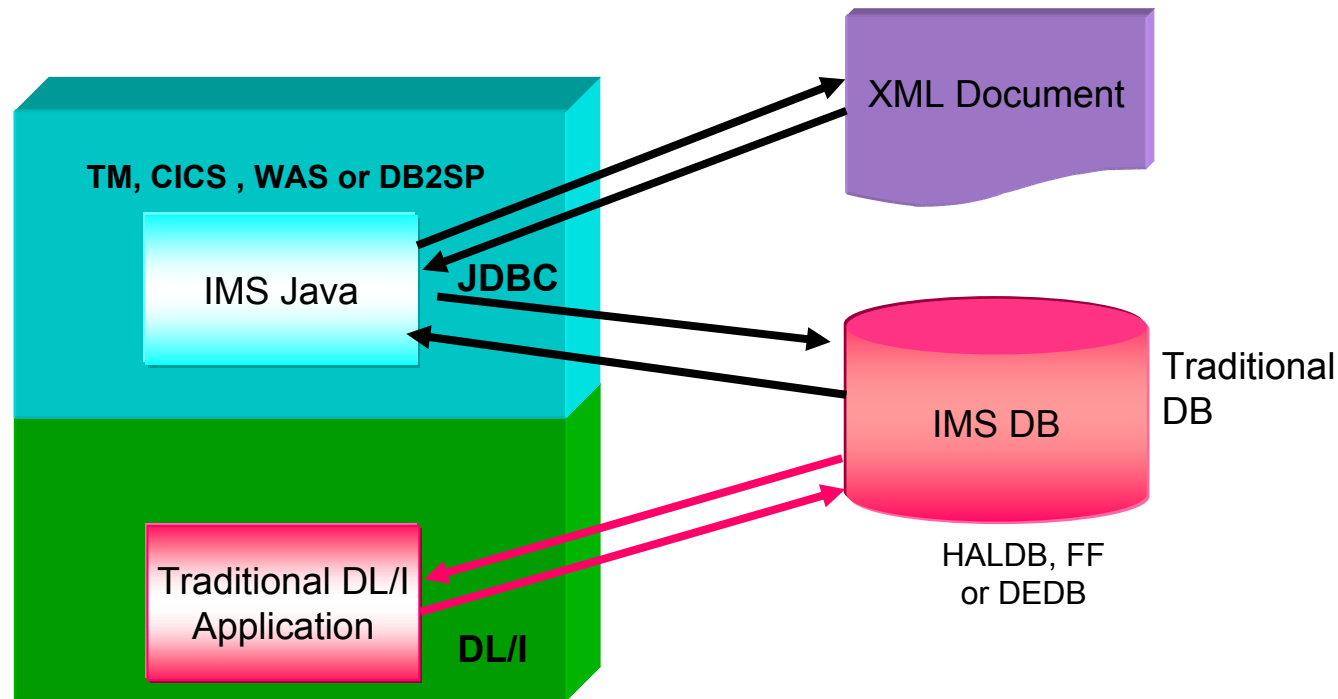*non-z/OS platform (see IMS Java Guide and Reference for details)*

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IMS XML Database

- Natural mapping between hierarchical XML data and hierarchical IMS database definitions

- Basic IMS DBD/PCB ←→ XML Schema mapping rules

  - Default XML Schema generation

- Insert and Retrieval Routines

  - Intact and Decomposed support
  - XPath indexing

- Works on full XML documents

  - Analogous to DB2 XML Extender
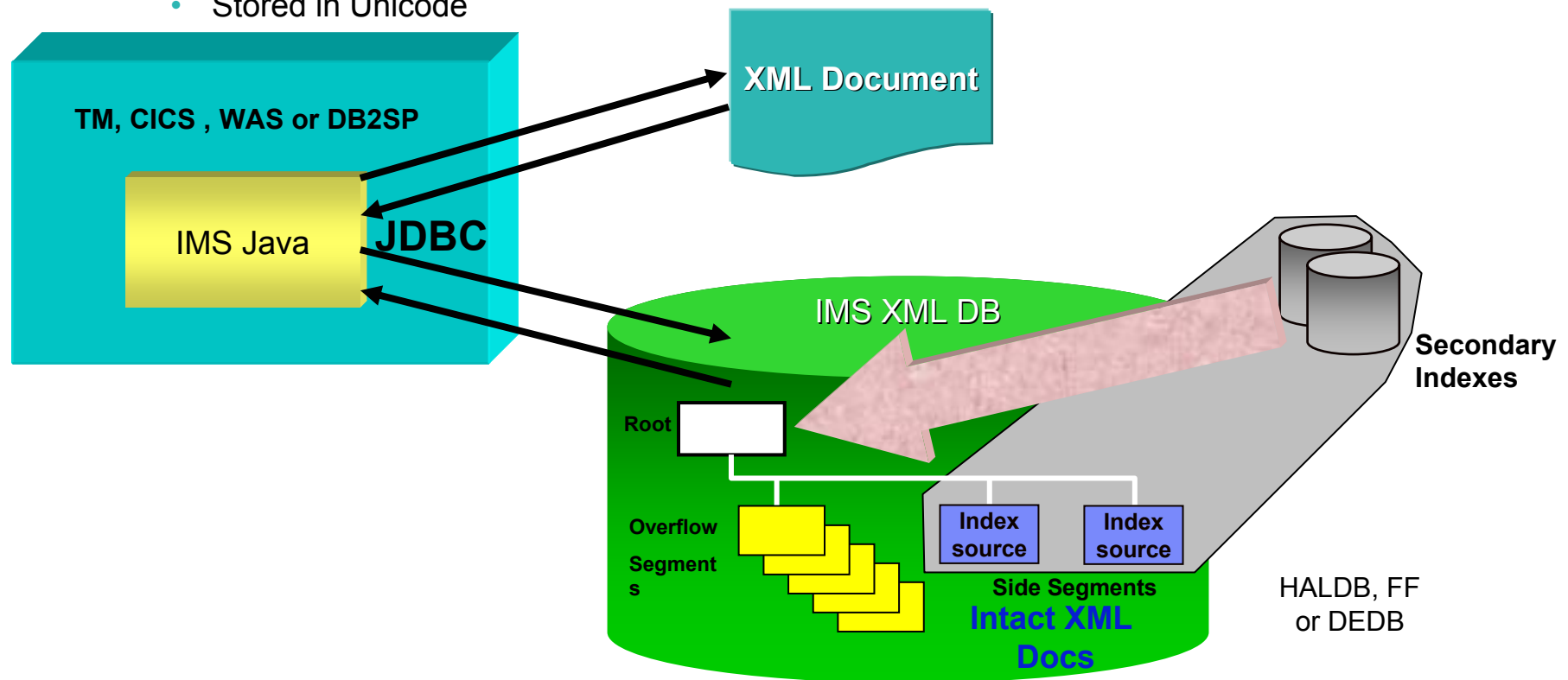
XML DB Highlights - Decomposed data

- Retrieve - Compose XML document from **any** existing traditional database

- Insert - Decompose XML docs back into same DB

- Same data can be read by existing IMS applications

TM, CICS , WAS or DB2SP

IMS Java

JDBC

XML Document

Traditional DB

IMS DB

HALDB, FF or DEDB

Traditional DL/I Application

DL/I

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XML DB Highlights - Intact Data

- Insert/Retrieve/Delete new XML documents **INTACT** in new IMS databases

- **Intact data** is not expected to be understood by other IMS applications
  - XML Documents span IMS segments
  - Stored in Unicode

XML Document

TM, CICS , WAS or DB2SP

IMS Java   **JDBC**

IMS XML DB

Secondary Indexes

Root

Overflow Segments

Index source   Index source

Side Segments
Intact XML Docs

HALDB, FF or DEDB

DLIModel Utility – IMS Database AD Tool

❖*Parse DBD and PSB source files*

❖*Generates XML Schemas to validate XML documents being stored into or retrieved from IMS*

❖*Determines the structural layout of the XML in the database*
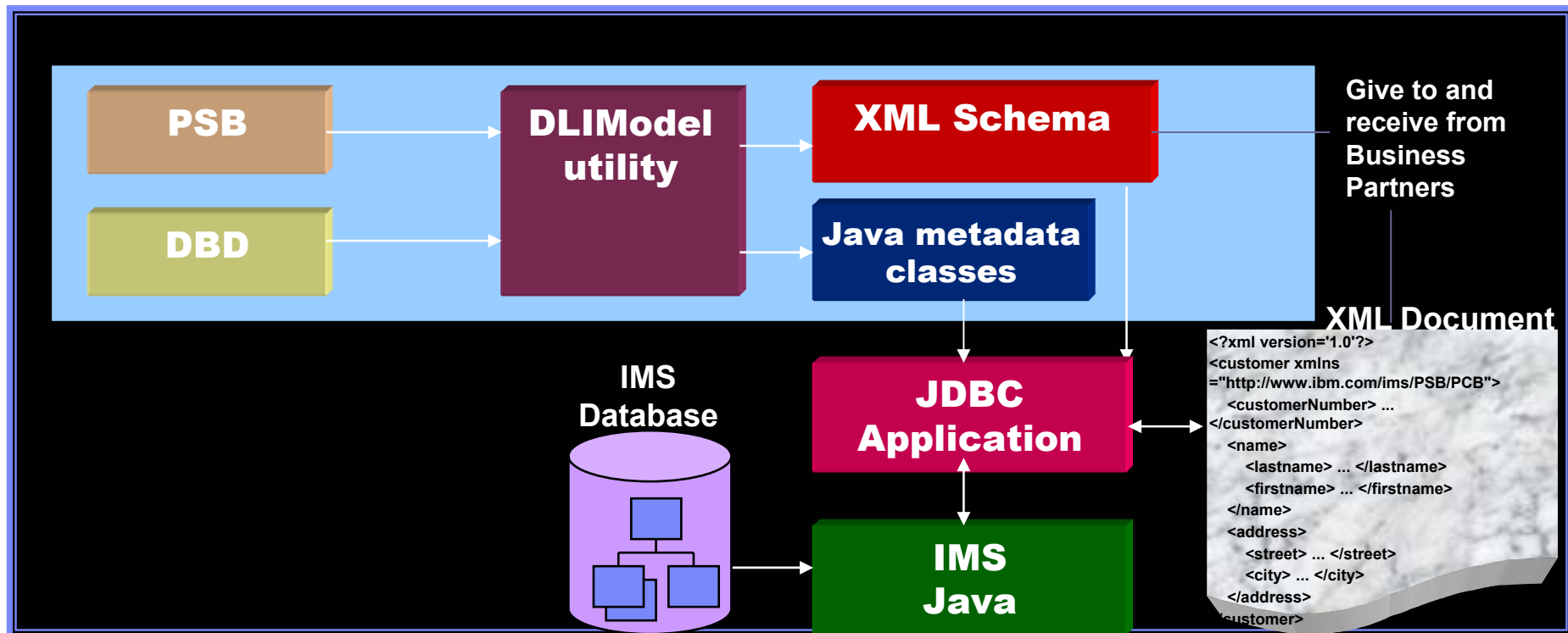
IMS Callout (IMS as Clients) Requirements

- Provide outbound support from IMS applications

- Use IMS to pull information/data from a distributed system

  - IMS COBOL/PLI program initiates the request to outbound to WAS or some other applications, and then gets response back

- The JCA (J2EE Connector Architecture) 1.5 architecture (optional) supports an EIS (Enterprise Information System, e.g. IMS) to initiate communications towards the J2EE application server, e.g. WebSphere Application Server (WAS)

  - IMS clients to WAS/WBI V7 (1Q06)

- Provide outbound Web services support to an external SOAP server

  - IMS SOAP clients/IMS Web Services clients (1Q06)

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IMS Open Database Manager (ODBM)

- IMS ODBM provides the backend infrastructure and the callable interface that enable a connection from any z/OS application within the sysplex to an IMS DB support system (DBCTL & DB/TM).

- A z/OS application like IMS Connect can communicate with IMS ODBM to access the IMS Database. And a distributed application can talk to IMS Connect via TCP/IP to provide distributed access to the IMS Database.

Requirements: Connectivity to IMS Transactions and Data
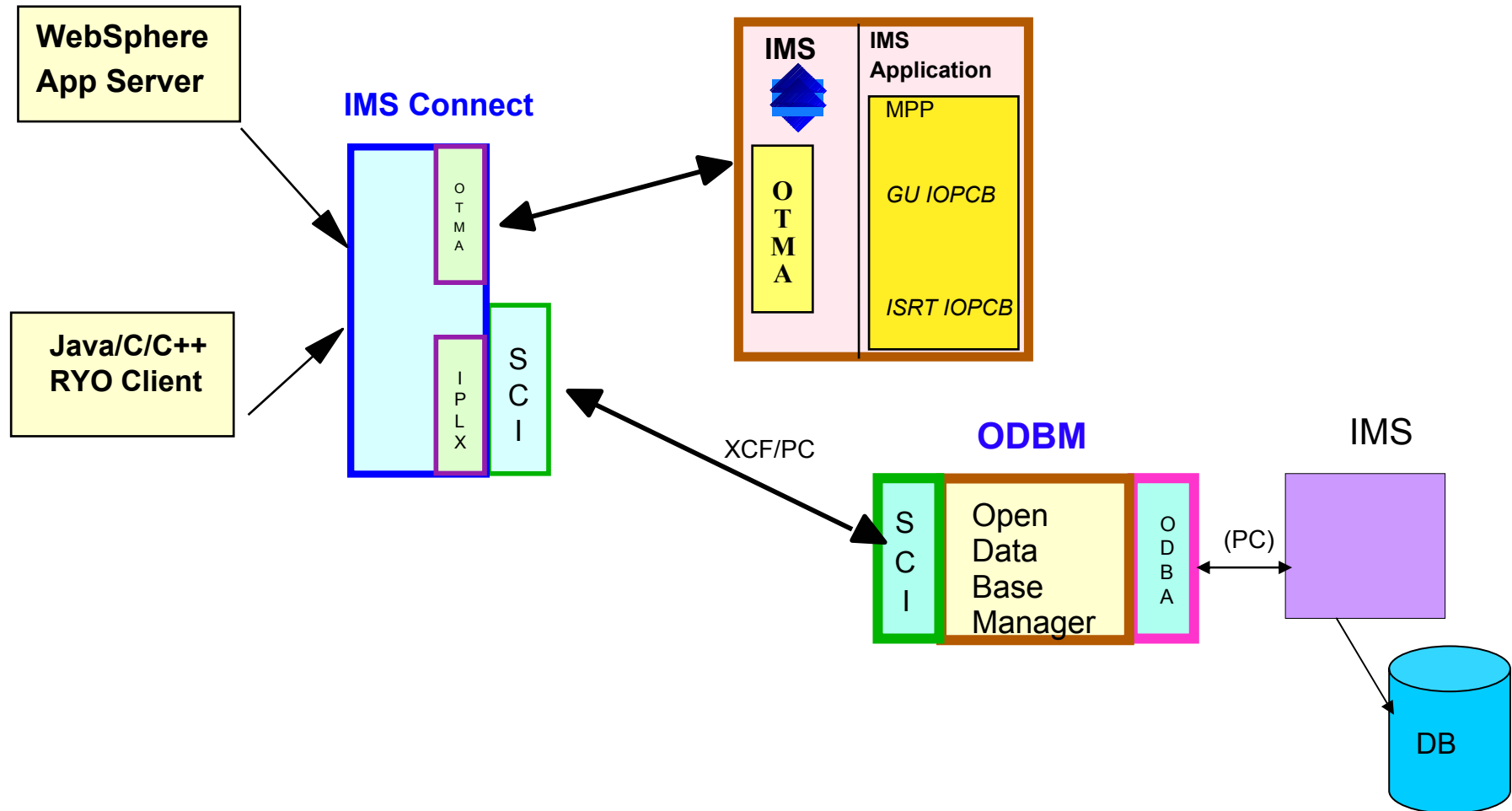
Modernize MFS based IMS transactions

- ## MFS Web Services
  - ❖ **Transform MFS based IMS transactions as web services via**
    - WSAD-IE
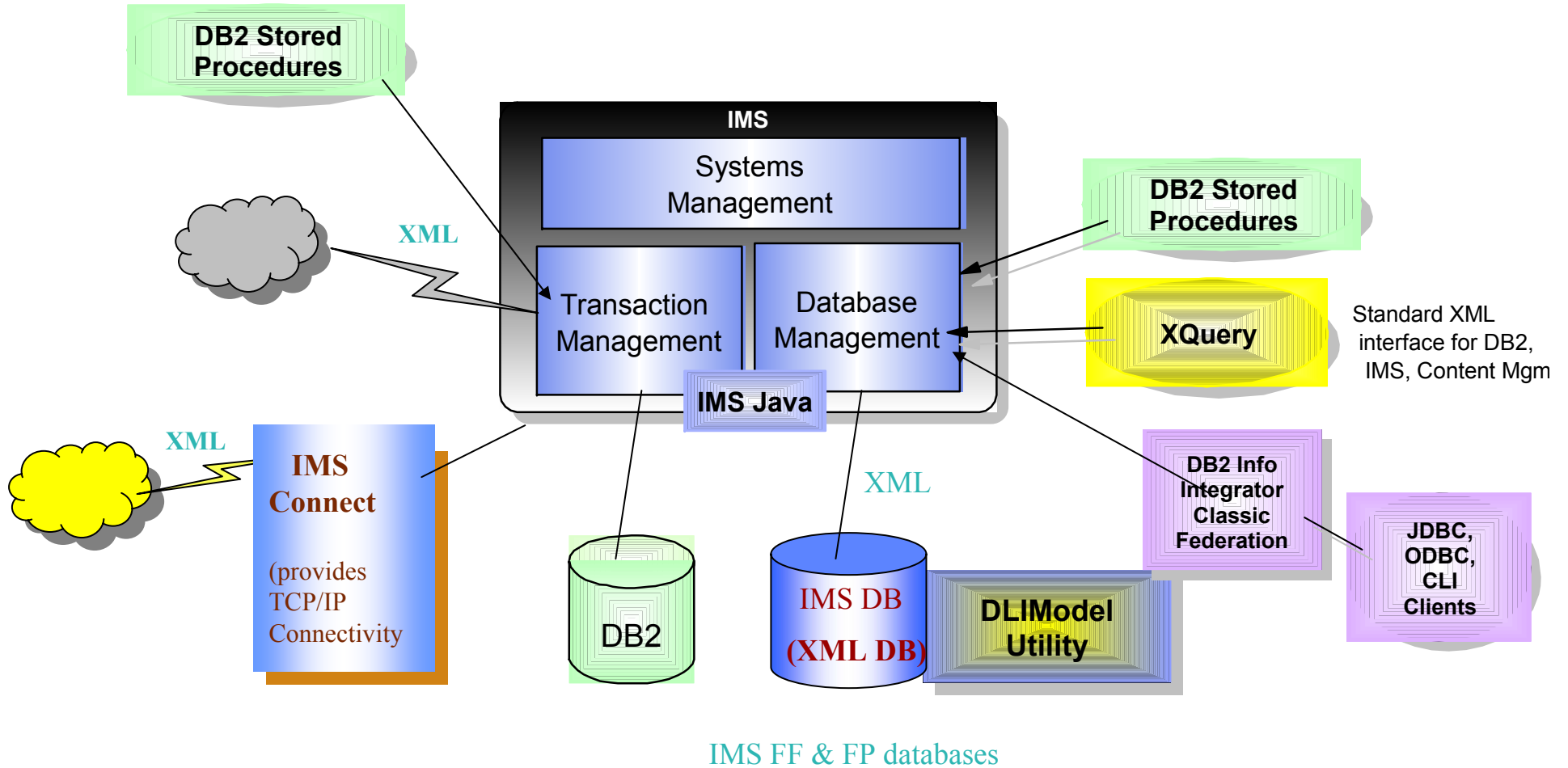   - WebSphere Application Server

- ## MFS Web Enablement (direction)
  - ❖ **Render displays on new modern devices, extending the use of MFS without modifying existing applications**
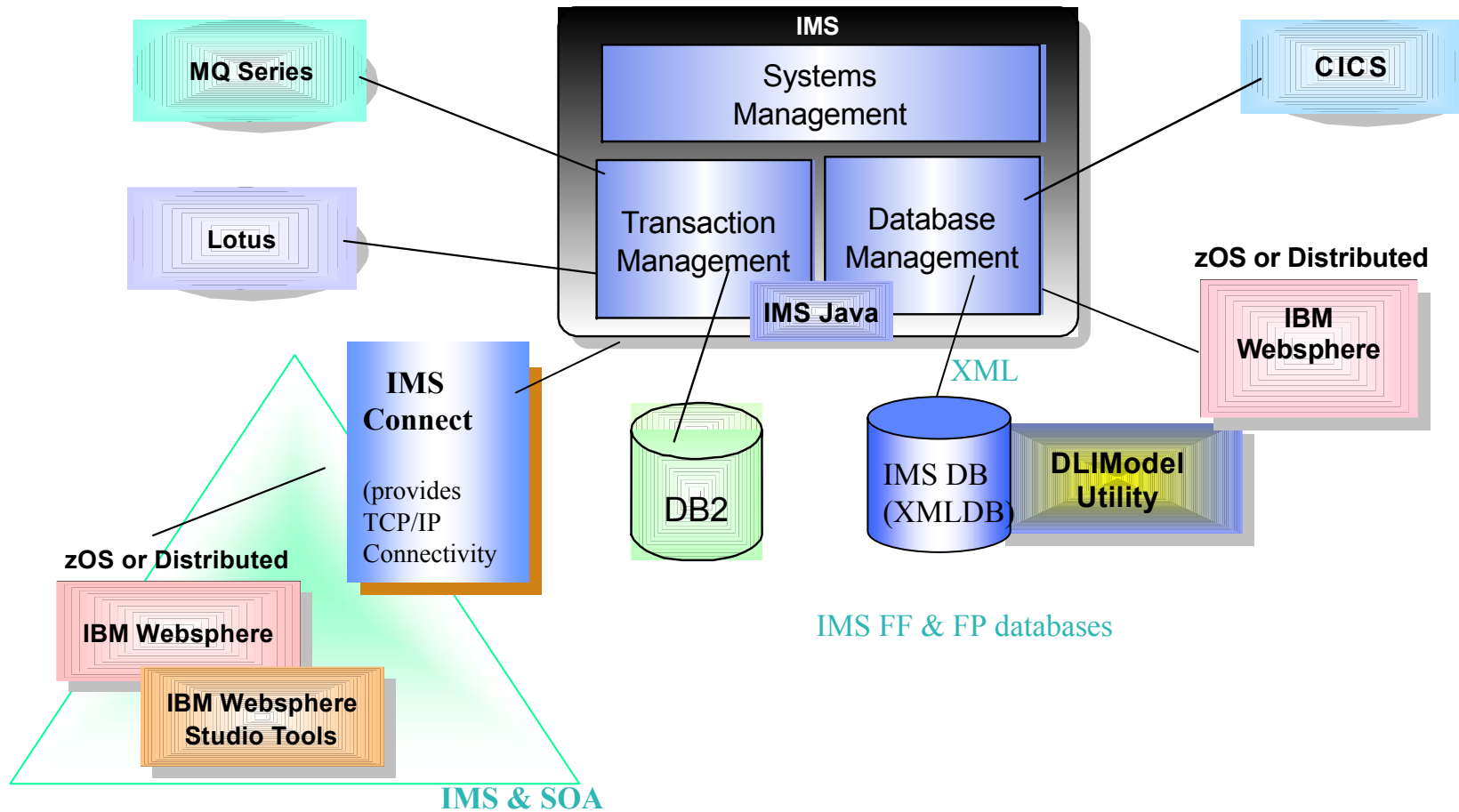   - Web browser
    - cell phones
    - PDAs

- ## MFS XML utility to provide command line interfaces for MFS (direction)

IMS Integration with IBM Products

IMS FF & FP databases

Yellow = future directions

IMS Integration with IBM Products ...

MQ Series

Lotus

IMS

Systems Management

Transaction Management

Database Management

IMS Java

CICS

zOS or Distributed

IBM Websphere

IMS Connect

(provides TCP/IP Connectivity)

zOS or Distributed

IBM Websphere

IBM Websphere Studio Tools

DB2

IMS DB (XMLDB)

XML

DLIModel Utility

IMS FF & FP databases

IMS & SOA

Yellow = future directions

IMS Integration with non-IBM Products

TCP/IP Clients

Write-Your-Own Client

Apache TomCat

Non IBM Webserver
e.g. WebLogic

Websphere Application Server

SOAP Gateway

(provides HTTP Connectivity)

IMS Connect

(provides TCP/IP Connectivity

SOAP HTTP Clients

SAP Server

Microsoft .NET

Apache

SOAP=Simple Object Access Protocol

IMS

Systems Management

Transaction Management

Database Management

Java

DB2

IMS DB (XMLDB)

IMS & SOA

IMS FF & FP databases

Yellow = customer requirements

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