IBM WebSphere Infrastructure for SOA & ESB

University of Toronto

Enterprise Service Bus (ESB), Adapters & Appliances

Glen McDougall,

IBM Canada Ltd.

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Introduction

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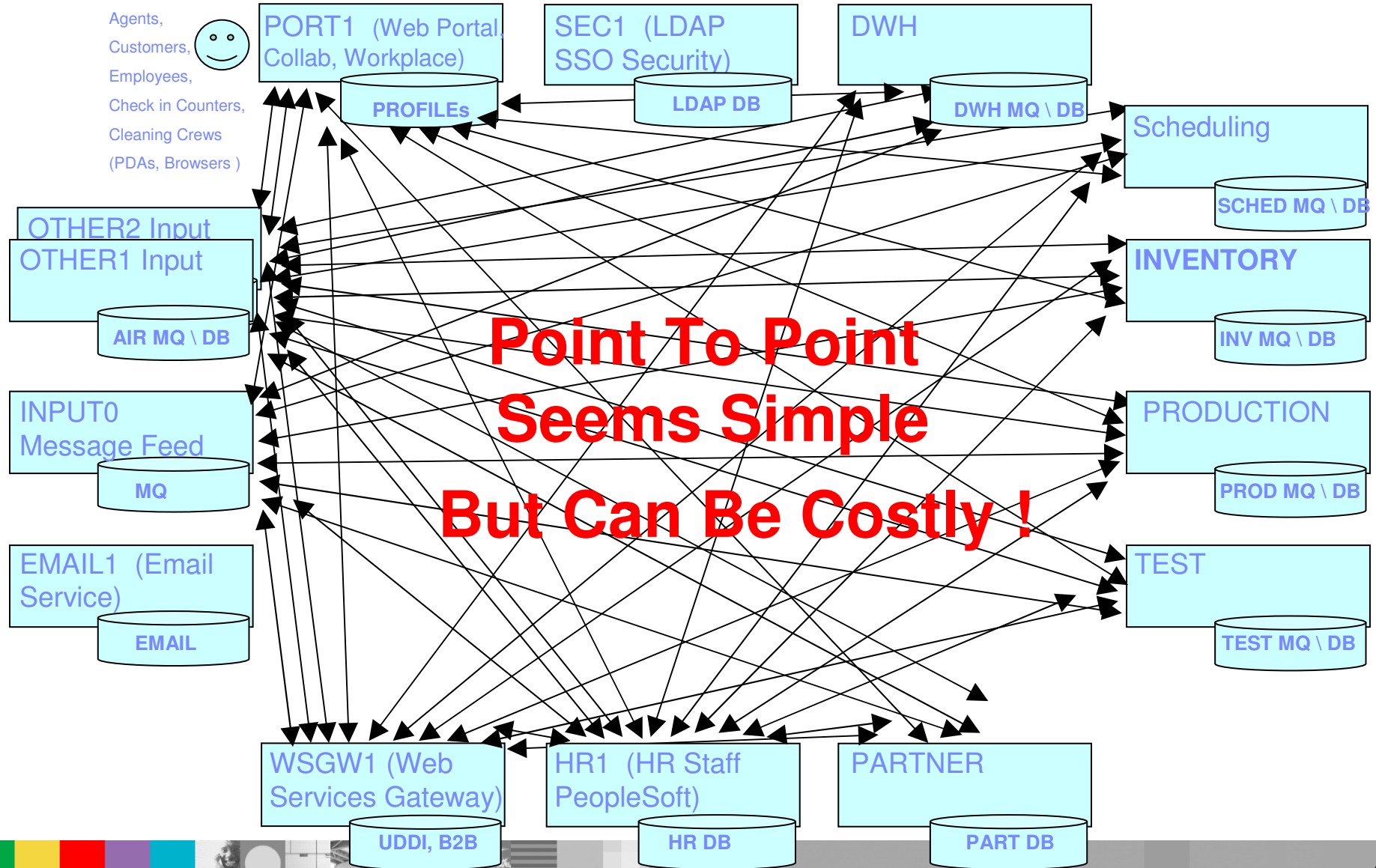
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U of T Agenda - Enterprise Service Bus (ESB), Adapters & Appliances

- Introduction

- ESB Concepts

- ESB Adapter Concepts

- Lightweight ESB (WESB) & Registry Concepts

- Advanced ESB Concepts (WMB)

- High Availability Concepts

- ESB Appliance Concepts

- ESB Patterns

- Summary

- [Optional Demo]

- Appendix

The cost of Point To Point changes

NON-ESB => "Complex, Inflexible, Brittle integration infrastructure"

Agents,
Customers,
Employees,
Check in Counters,
Cleaning Crews
(PDAs, Browsers)

PORT1 (Web Portal, Collab, Workplace)
PROFILEs

SEC1 (LDAP SSO Security)
LDAP DB

DWH
DWH MQ \ DB

Scheduling
SCHED MQ \ DB

OTHER2 Input
OTHER1 Input
AIR MQ \ DB

INVENTORY
INV MQ \ DB

INPUT0
Message Feed
MQ

PRODUCTION
PROD MQ \ DB

EMAIL1 (Email Service)
EMAIL

TEST
TEST MQ \ DB

Point To Point Seems Simple

But Can Be Costly !

WSGW1 (Web Services Gateway)
UDDI, B2B

HR1 (HR Staff PeopleSoft)
HR DB
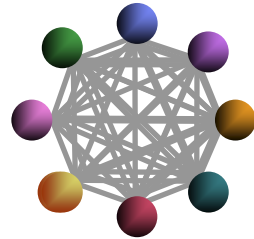
PARTNER
PART DB

# What are the *Barriers* to business Flexibility and Reuse?

- Architectural policy limited

- Infrastructure built without roadmap

- Business process standards missing

- Tactical quick-fixes for point applications
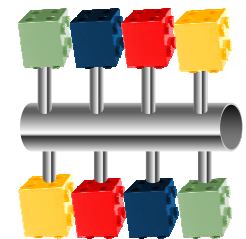
- Redundant LOB needs
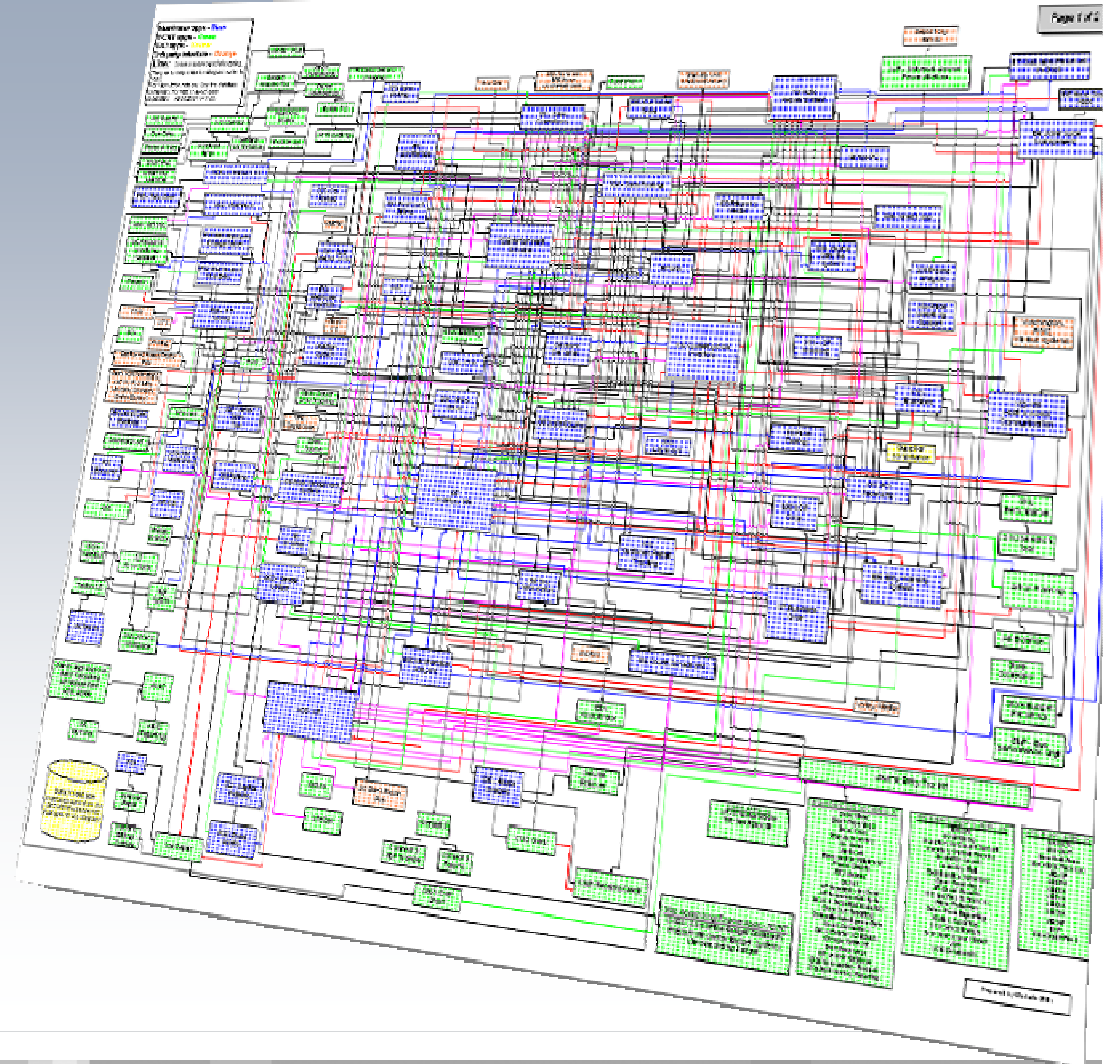
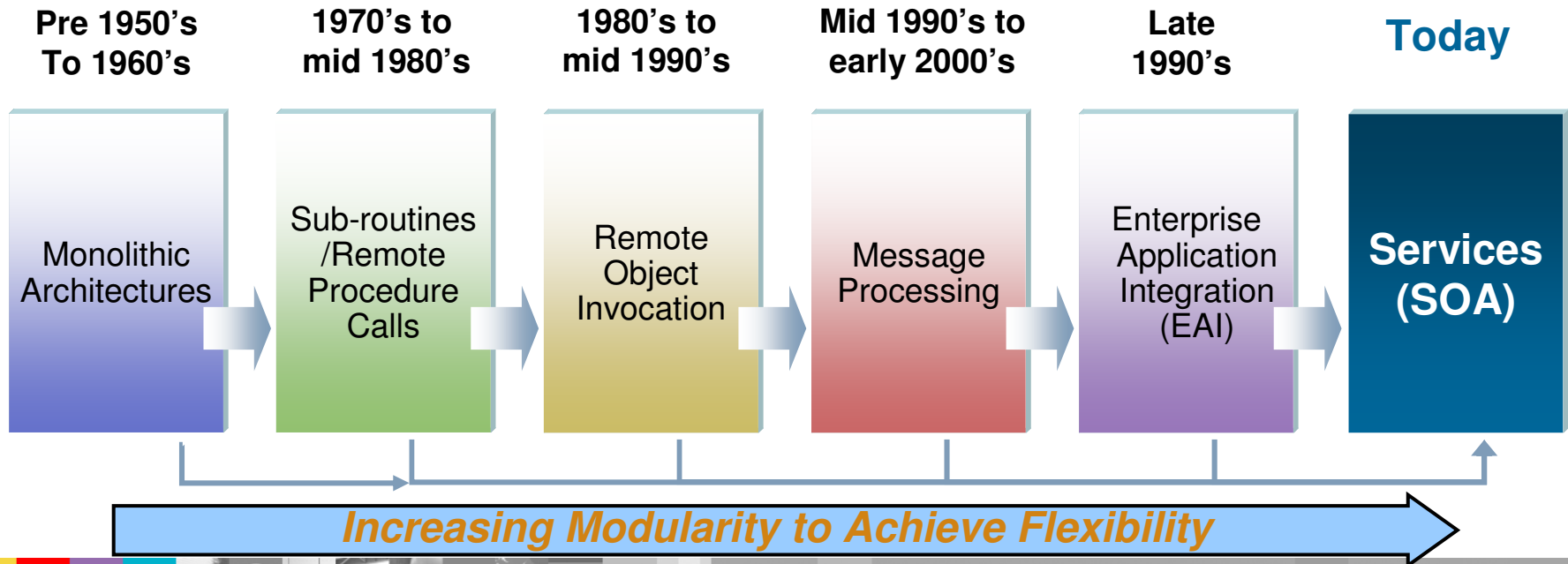# IT Architectural Evolution to SOA: Making IT More Responsive

- Point-to-Point connection between applications
- Simple, basic connectivity
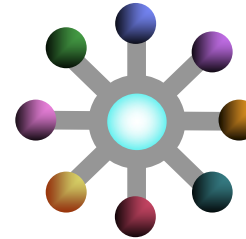
- EAI connects applications via a centralized hub
- Easier to manage larger number of connections

- Integration and choreography of services through an Enterprise Service Bus
- Flexible connections with well defined, standards-based interfaces

Pre 1950's To 1960's	1970's to mid 1980's	1980's to mid 1990's	Mid 1990's to early 2000's	Late 1990's	Today
Monolithic Architectures	Sub-routines /Remote Procedure Calls	Remote Object Invocation	Message Processing	Enterprise Application Integration (EAI)	Services (SOA)

Increasing Modularity to Achieve Flexibility

6

SOA: The Next Step on the Connectivity Evolution

Lines of code

SOA reduces business application Logic to basic Services

Direct Connectivity

Connectivity, Mediation & Process-Control logic

Business Application Logic

All connectivity, mediation and additional logic Is buried in the application

Message Queuing

Connectivity logic

Mediation & Process-Control logic

Business Application Logic

Abstracts out the connectivity logic from the application

Message Brokering

Connectivity and mediation logic

Process-Control logic

Business Application Logic

Abstracts out both the connectivity + mediation logic from the application

Service Orientation

Connectivity, mediation & process-control logic

Application Services

Reduces the application to its core business functions (eg Services)
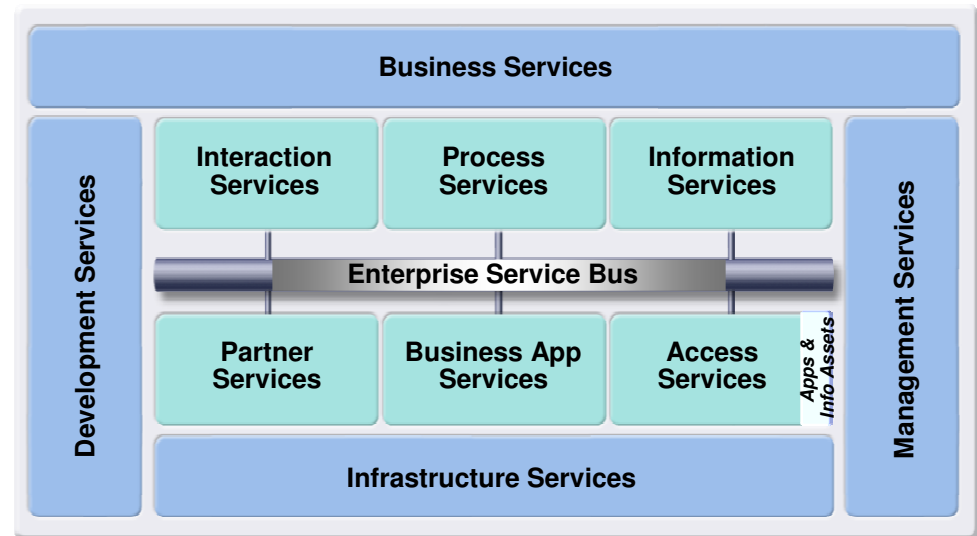
SOA Reference Architecture Provides the Blueprint
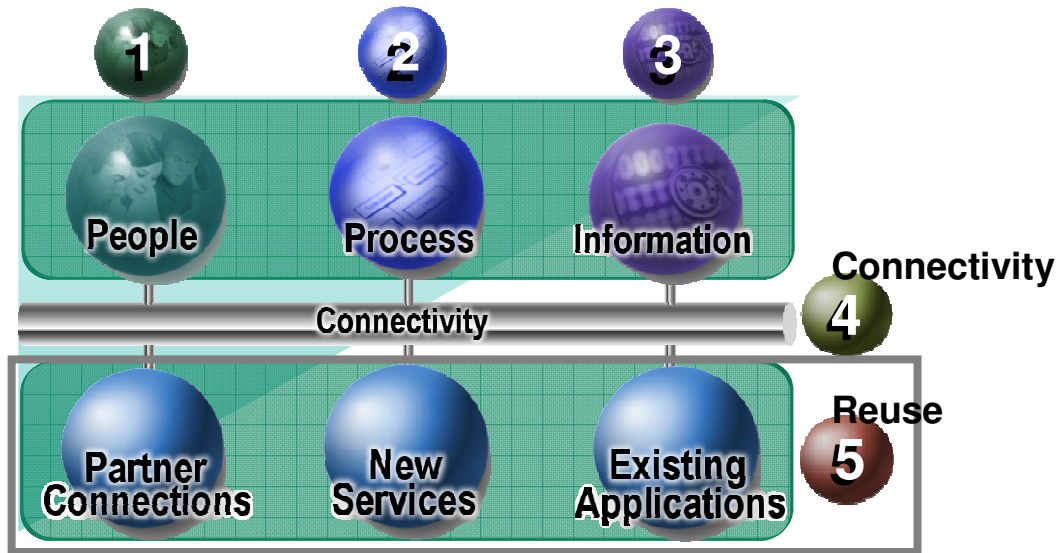
1 People: productivity though people collaboration

2 Process: business process management facilitating business innovation

3 Information: delivering information as a service

4 Connectivity: underlying connectivity to support business-centric SOA

5 Reuse: creating flexible, service-based business applications

The SOA Reference Architecture and its Key Principles
Providing IT Flexibility to Meet the Demands of Business

- Linkage between business and IT through support of the entire SOA Lifecycle

- Connectivity and Service Isolation through the Enterprise Service Bus

- Separation of Concerns/Modularity for incremental adoption

- Component-based Programming and Solution Development

- Business and IT Monitoring and Management
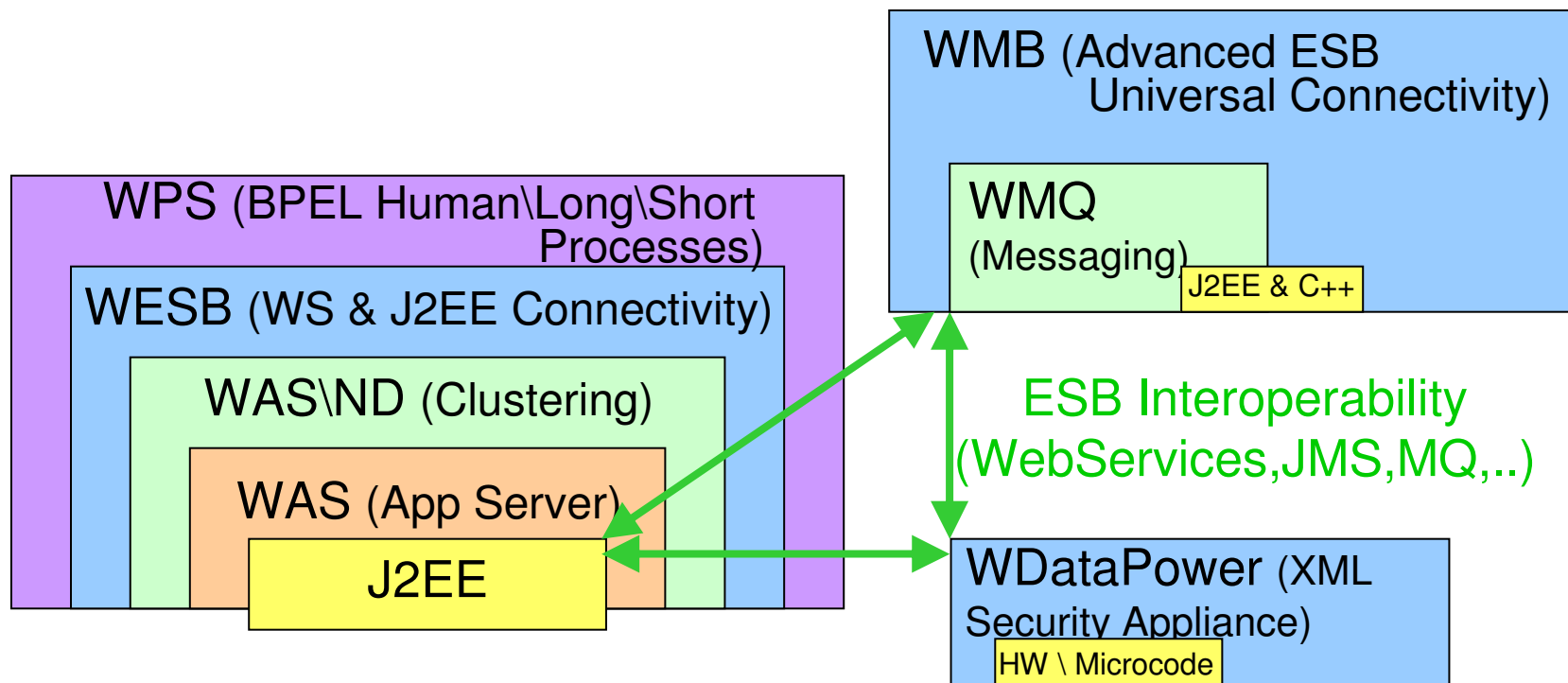
- Open Standards

Business Services

Development Services

Interaction Services

Process Services

Information Services

Enterprise Service Bus

Partner Services

Business App Services

Access Services

Apps & Info Assets

Infrastructure Services

Management Services

WebSphere current "Russian Doll" Packaging

Dev

Eclipse Tooling (RAD, WID, WMBTK,...) & Other Tooling ...

Run

WMB (Advanced ESB Universal Connectivity)

WMQ (Messaging) J2EE & C++

WPS (BPEL Human\Long\Short Processes)

WESB (WS & J2EE Connectivity)

WAS\ND (Clustering)

WAS (App Server)

J2EE

ESB Interoperability (WebServices,JMS,MQ,..)

WDataPower (XML Security Appliance) HW \ Microcode

■ =ESB Components

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An ESB enables "Loose Coupling" of Services

Turn this…

…into this.

Service	Service		Service		Service
Interface			Interface		Interface

Interface	Interface	Interface	Interface
Service	Service	Service	Service

Service	Service		Service		Service
Interface		Interface		Interface

Enterprise Service Bus

Interface	Interface	Interface	Interface
Service	Service	Service	Service
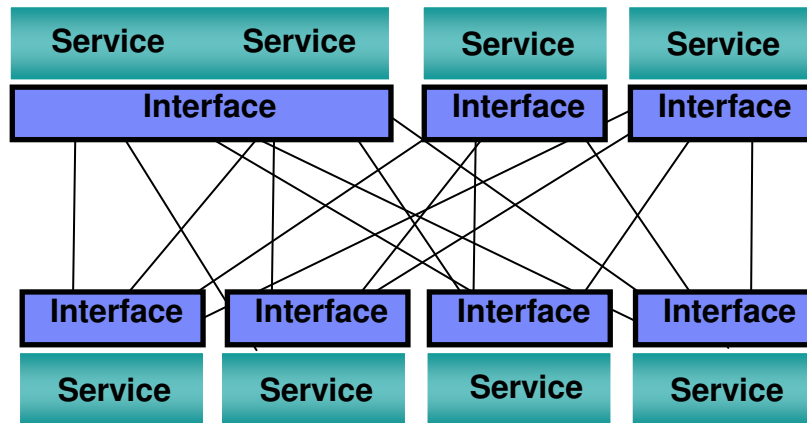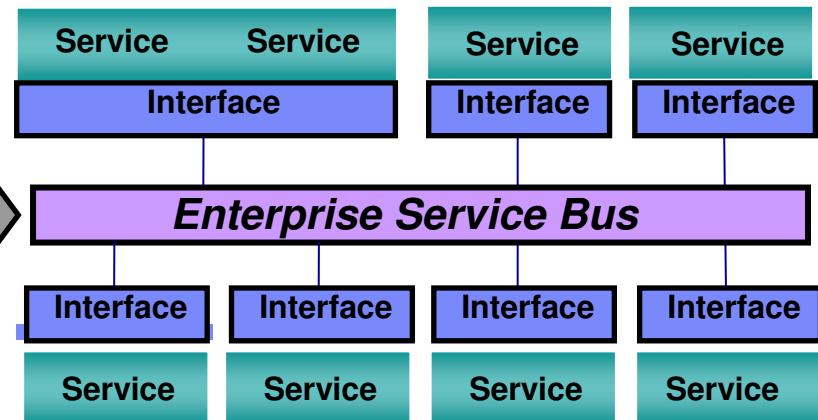
✓ Decouples the point-to-point connections from the interfaces

✓ Allows for dynamic selection, substitution, and matching

✓ Enables more flexible coupling and decoupling of the applications

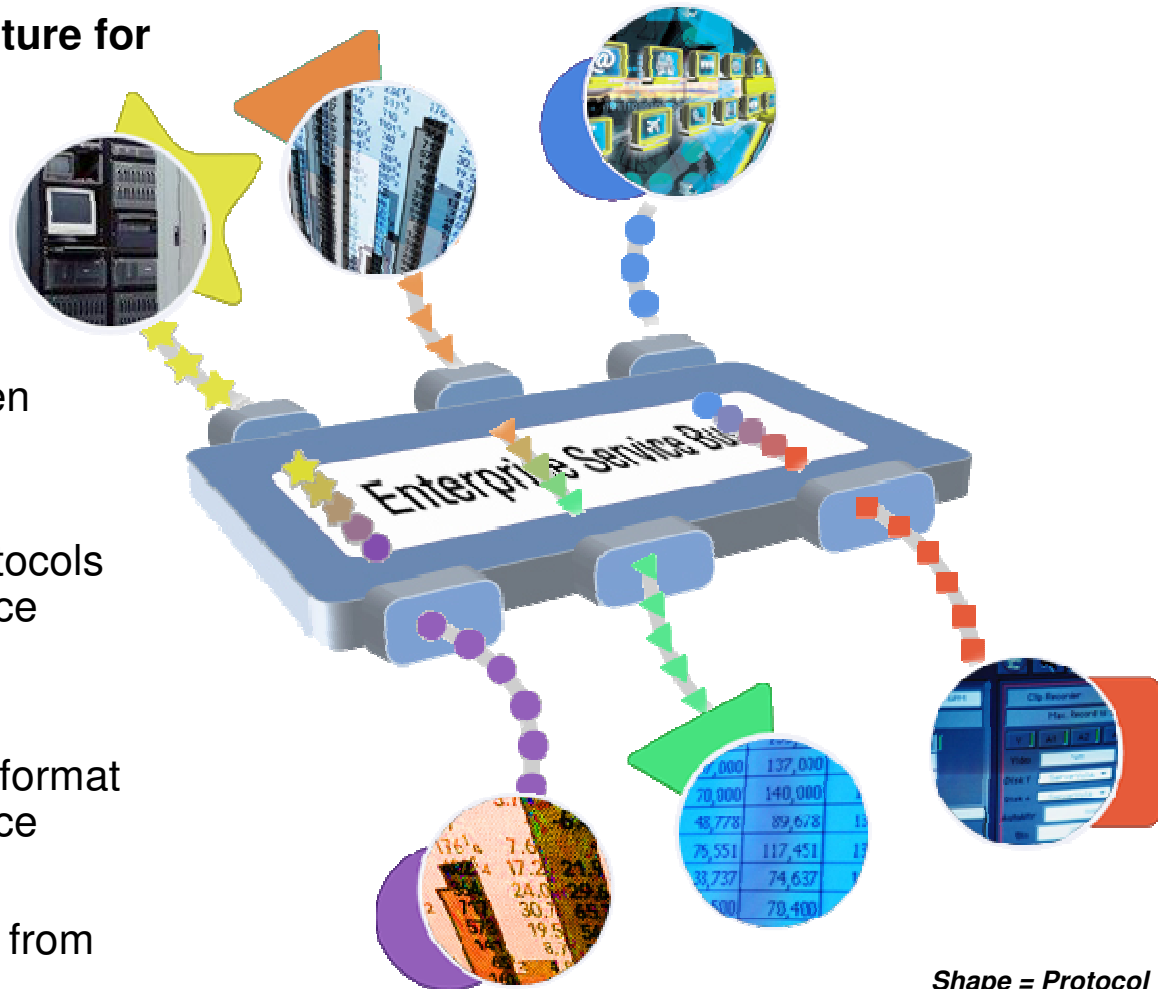✓ Enables you to find both the applications and the interfaces for re-use

RESULT → Greater Business Responsiveness

What is an Enterprise Service Bus (ESB)?

Flexible connectivity infrastructure for integrating applications and services to power your SOA

▶ Built on **MESSAGING**

▶ **ROUTING** messages between services

▶ **CONVERTING** transport protocols between requestor and service

▶ **TRANSFORMING** message format between requestor and service

▶ **HANDLING** business events from disparate sources

Shape = Protocol

Color = Data type

SOA Critical Success Factors

1 Interaction Services
Enables collaboration between people, process & information

2 Process Services
Orchestrate and automate business processes

3 Information Services
Manages diverse data and content in a unified manner

4 Facilitates communication **ESB** between services

5 Partner Services
Connect with trading partners

Business App Services
Build on a robust, scaleable, and secure services environment

Access Services
Facilitates interactions with existing information and application assets

Apps & Info Assets

Connectivity

- **Ability to connect all assets**
- **Universal transformation**
- **Scalability and performance**
- **Transactions**
- **24 x 7 operations**
- **Complex event processing**

IBM Delivers a World Class ESB Portfolio

ESB:

WebSphere ESB

provides Web Services connectivity and data transformation

Advanced ESB:

WebSphere Message Broker [+WDSTX]

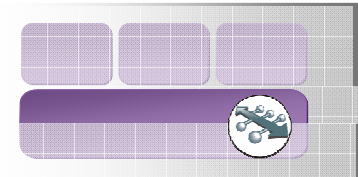provides universal connectivity and data transformation

SOA\ESB Connectivity

ESB

Advanced ESB
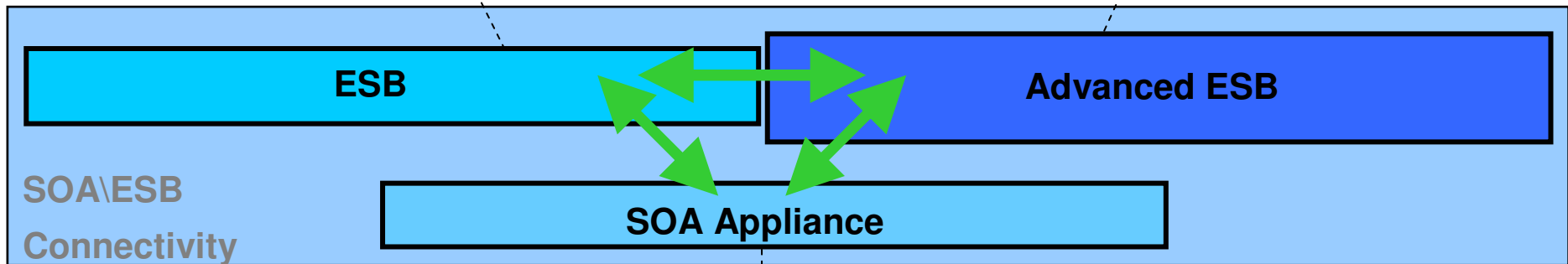
SOA Appliance

SOA Appliances:

WebSphere DataPower XS40\XI50

enhances security, simplifies and accelerates processing for the ESB

Application Integration

| Customer Challenges	Customer Benefits
▪ Applications are not integrated in a flexible and reliable method across the enterprise, reducing business responsiveness ▪ Differences between many internal and partner applications must be managed ▪ Maintaining point to point or custom written integration interfaces is cost and time prohibitive	▪ Reliably and seamlessly exchange data between multiple applications ▪ Manage differences between multiple applications and business partners ▪ Adopt an enterprise wide, flexible, service oriented approach to integration

Application Connectivity
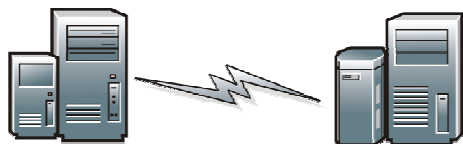
Application and Partner Mediation

Suppliers   Customers
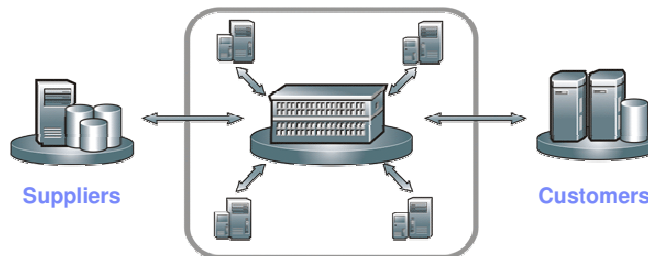
Enterprise Integration Backbone

Enterprise Service Bus
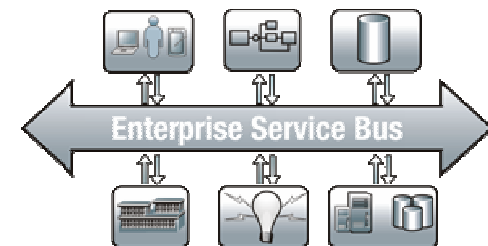
Assure reliable and flexible information flow between diverse applications and organizations

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Asynchronous Messaging Fundamentals

A single solution, with multi-platform APIs (JMS and MQI)

- Easy to use message centric interface
- Network independent
- Faster application development

Assured message delivery

- Exactly Once, Transactional

Loosely-coupled applications

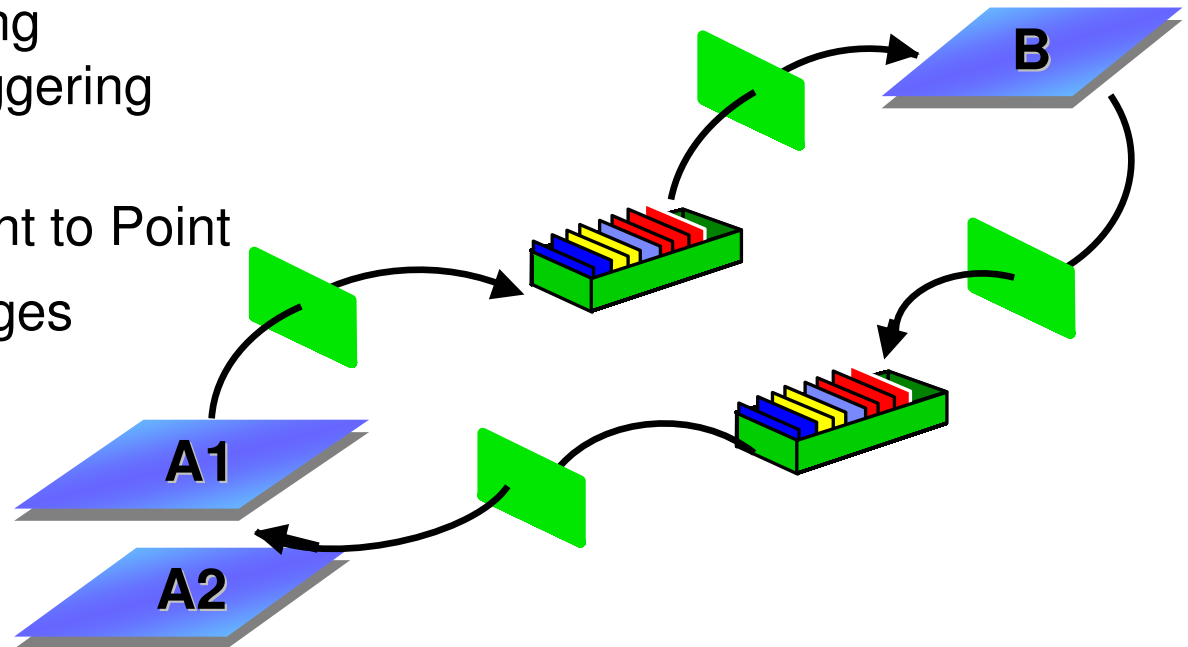- Asynchronous messaging
- Pacing, Parallelism, Triggering

Scalable & Robust

- Publish\Subscribe or Point to Point
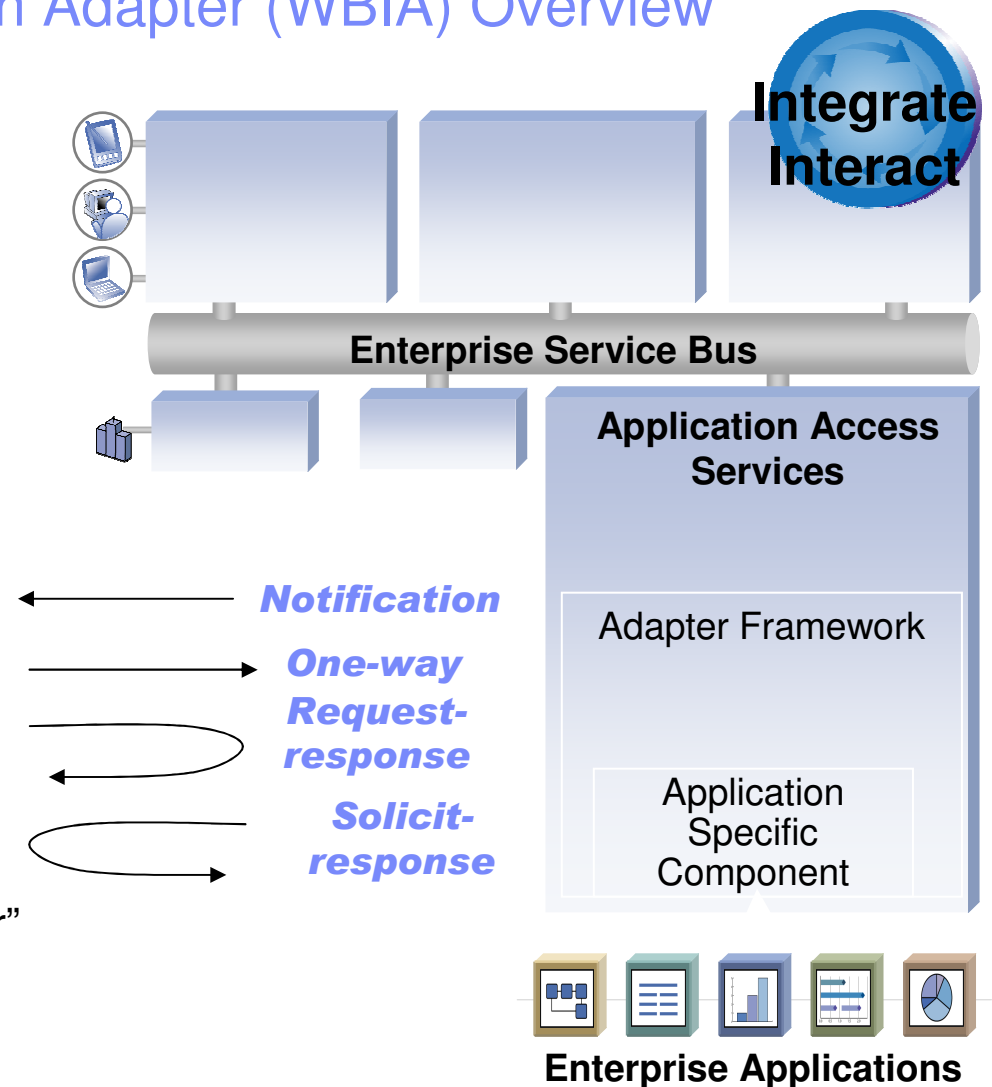- Clustering, Large Messages

Pervasive

- Mobile, PDAs

WebSphere Business Integration Adapter (WBIA) Overview

- WBIA Adapters are JMS-based

- WBIA works with WMB, WPS, WAS, and new \ existing Application Packages (eg PeopleSoft) and APIs (eg JDBC)

- Based on a standard framework

- Fast and flexible configuration

- Adapt almost any appl. or database

- Communicates with multiple transports (JMS, MQ, IIOP)

- Process multiple interactions in parallel

- Senses and reacts to application events

- Object Discovery Agent to "Auto-discover" your endpoint interfaces and business objects

- (Also see JCA-based WA Adapters)

Integrate Interact

Enterprise Service Bus

Application Access Services

Adapter Framework

Application Specific Component

Notification

One-way

Request-response

Solicit-response

Enterprise Applications

IBM Software Group

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Lightweight ESB Concepts (WESB)
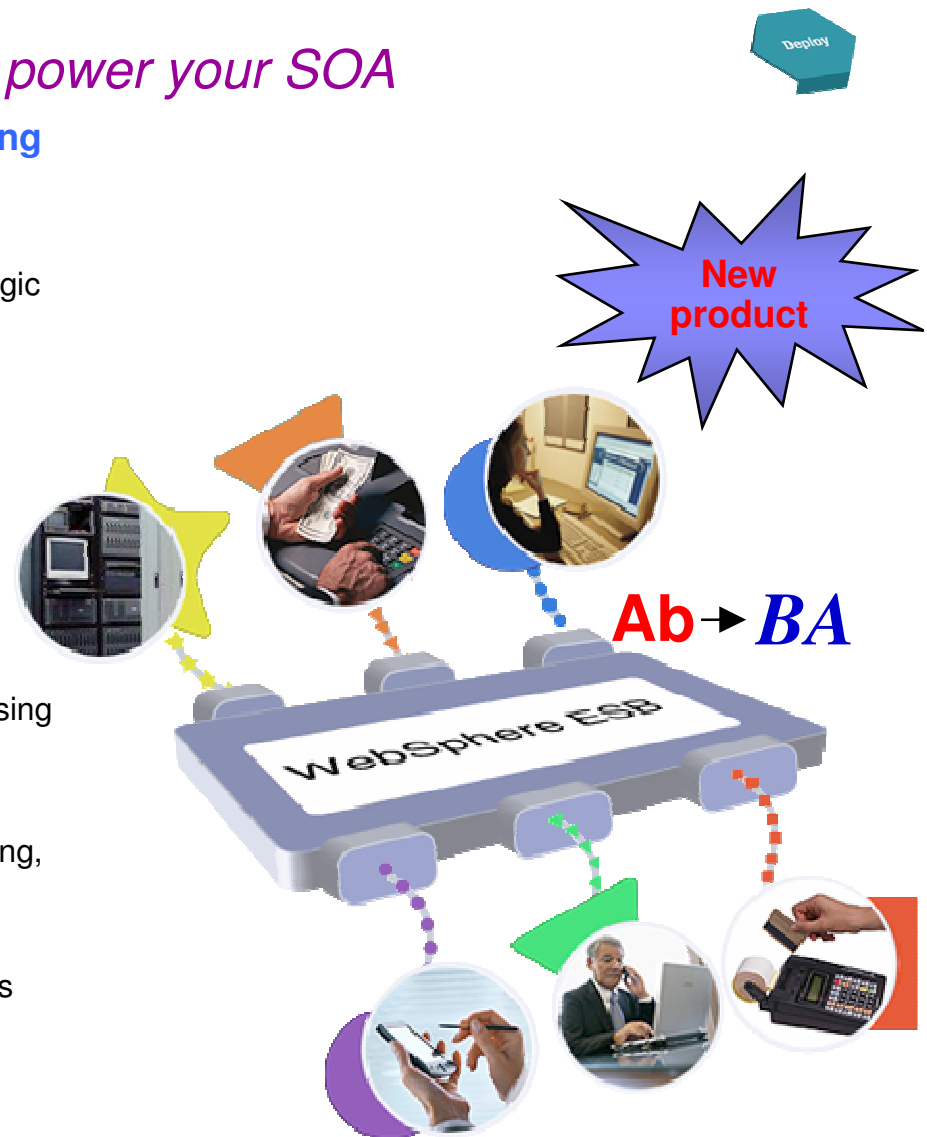
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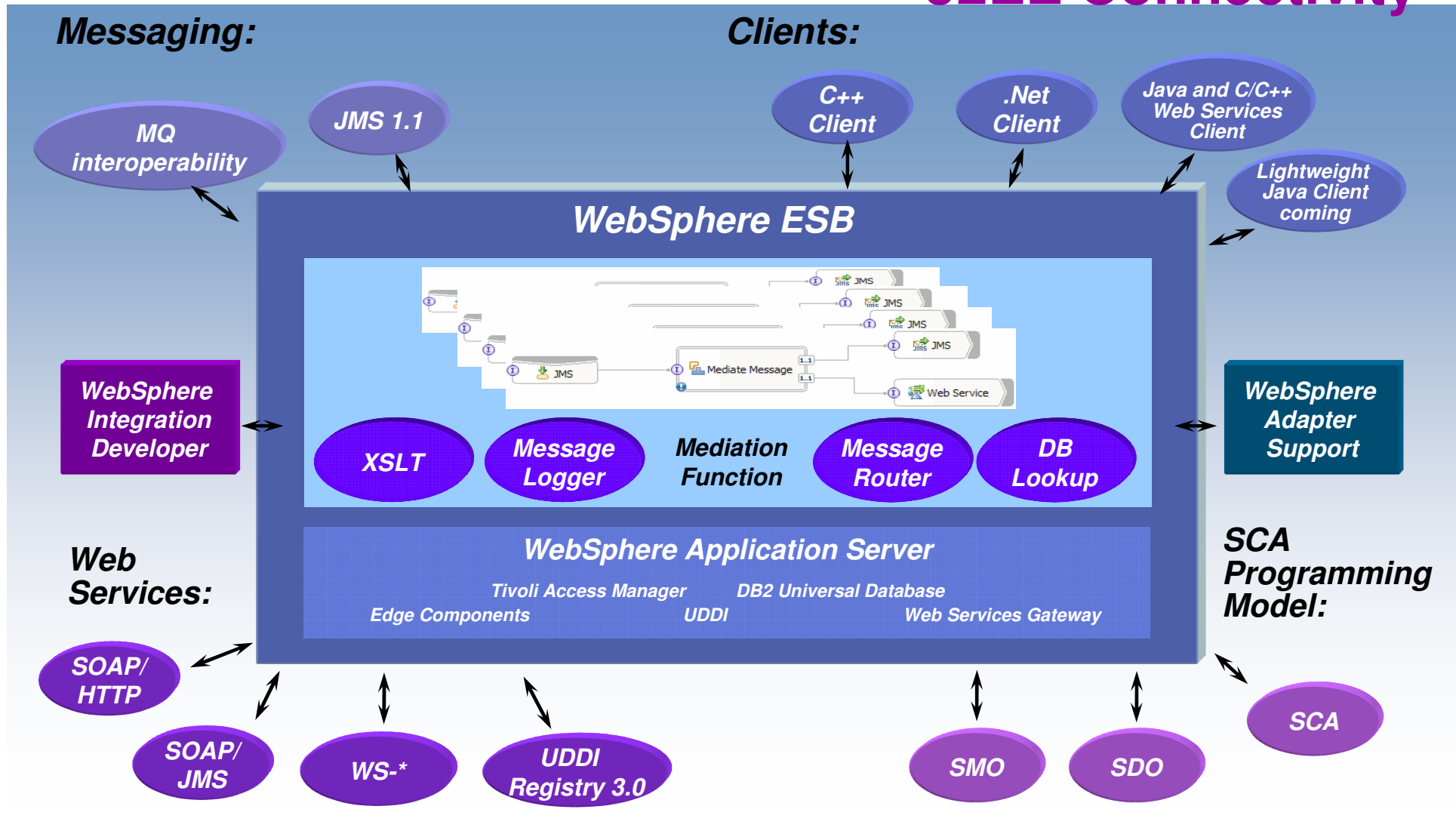Version=

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WebSphere ESB (WESB)

Delivering an Enterprise Service Bus to power your SOA

- **Provides Web Services connectivity, JMS messaging and service oriented integration**
  - ▶ Improve flexibility through the adoption of service oriented interfaces, and XSLT\XML Mediations
  - ▶ Minimize disruption by using an ESB to handle integration logic

- **Ease of use**
  - ▶ Easy to use tools that require minimal programming skills
  - ▶ Simple to install, configure, build and manage

- **Improve time to value**
  - ▶ Cost effective solution for services integration
  - ▶ Support for over hundreds of ISV solutions
  - ▶ Save time and development costs by utilizing pre-built mediations
  - ▶ Dynamically re-configure to meet changing business processing loads

- **Seamless integration with the WebSphere platform**
  - ▶ Built on and inherits WebSphere qualities of service: clustering, fail-over, systems management, security
  - ▶ Upgradeable from WAS\ND v6
  - ▶ Embedded in and easily upgradeable to WebSphere Process Server to leverage full SOA process choreography
  - ▶ Integrates tightly with IBM Tivoli security and systems management offerings

- **Lower to Moderate volumes**

New product

Ab → *BA*

WebSphere ESB

WebSphere ESB v6 is a lightweight ESB

J2EE Connectivity

Messaging:

Clients:

MQ interoperability

JMS 1.1

C++ Client

.Net Client

Java and C/C++ Web Services Client

Lightweight Java Client coming

WebSphere ESB

JMS
JMS
JMS
JMS

I JMS
Mediate Message
1..1
1..1
Web Service

WebSphere Integration Developer

XSLT

Message Logger

Mediation Function

Message Router

DB Lookup

WebSphere Adapter Support

WebSphere Application Server

Tivoli Access Manager   DB2 Universal Database
Edge Components   UDDI   Web Services Gateway

Web Services:

SCA Programming Model:

SOAP/ HTTP

SOAP/ JMS

WS-*

UDDI Registry 3.0

SMO

SDO

SCA

Service Management Repository (WSRR) Concepts

Service Production

Service Consumption

**Development-time
Asset Management**

Analyst

Specify Service

Architect/
Developer

Create Service

Tester

Review Service

Development-
time Repository

Business process
models
Design models
Test scripts, data,
cases

Usage and cost
metrics
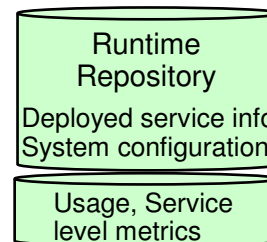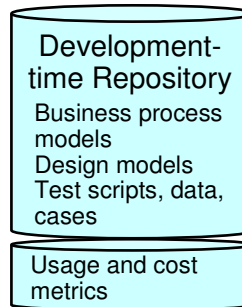
Search Service

Report On
Service

Feedback Service

Manager

Manager

Approve Service

Report On Service

Search Service

Browse Service

Use Service

Project Team

Administrator

Deploy Service

Runtime
Repository

Deployed service info
System configuration

Usage, Service
level metrics

**Run-time
Asset Management**
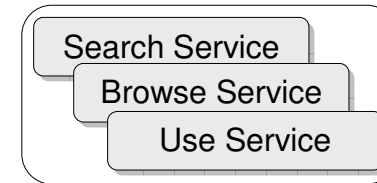
Search Service

Project Team

WebSphere ESB v6 – Competitive Differentiators (1)

Feature	Function	Benefit
1. Combines JMS messaging and XML-based mediation in one system	Complete standards-based ESB solution in one runtime product	Ease of implementation
2. Built on WebSphere Application Server v6	Inherits all the qualities of service of WAS; host and mediate services in one place	Superior and proven reliability, manageability, transactionality, scalability; ease of implementation
3. Included in and upgradeable to WebSphere Process Server v6	Most comprehensive SOA platform on the market	Single SOA solution –WPS includes: app server, messaging, mediation, BPEL process automation, human workflow, state machine, business rules
4. Built in transactional connectivity to WebSphere MQ	Transactional context and publish/subscribe topics are preserved across networks	No need for separate bridges; No loss of transactions; Easier management

WebSphere ESB v6 – Competitive Differentiators (2)

Feature	Function	Benefit
5. Service Component Architecture (SCA & SDO) Programming model	Common model for invoking components and simplifying data access	Separates business logic & data from implementation details enabling much greater reuse
6. Pre-built management and mediation environments	Intelligent message routing, logging, and XSLT transformation services	No need to write mediations in Java
7. Integrated UDDI Service Registry and Web Services Gateway	Locate and store Web Services, with proxy capability	More secure Web Services with greater reuse
8. Eclipse-based tooling with WID for artifact development	Widely adopted tooling environment with WID also used with WebSphere Process Server	Increases return on programming skills and better integration with WPS