e-business and Role of Middleware

WebSphere software

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Agenda

- **Big Picture**
  - Evolution of IT in a Business Environment
  - Emergence of e-business and On Demand business
    - Customer Pains

- **Middleware Technology Stack**
  - Integration Servers
  - Web Servers
    - HTTP Servers
    - Web Application Servers
  - Security
    - LDAP
    - Integrated Security Solutions
  - Service Oriented Architecture (SOA)
    - Web Services, Enterprise Service Bus (ESB)

- **Summary/Wrap Up**
  - Middleware Solutions from IBM
Big Picture

WebSphere software
Some of You May be Young Enough to Remember…

**Character Based Terminals**

3270, 5250, VT100

**Mainframe Based Computing**

COBOL, CICS, IMS, DB2…

Banks, Airlines, Telecommunication, Retail, Government, Science & Research, Military Establishments etc.
IT Department Evolution in the Last 20 Years

- **Focus was on building Departmental Systems**
- **Client/Server Era: Build a new app, get new db and deploy on a Server**

### 80s/90s

- **3GL Clients**: Cobol, C/C++, VB, PowerBuilder
- **4GL Clients**: PowerBuilder, Oracle Forms, Ingres W4GL
- **Domino Clients**: Lotus Notes, SameTime, QuickPlace

### 90s/2000+

- **DB**: Oracle, Ingres, DB2, SQLServer
- **Web Browser**: Internet
- **DB**

**New Business Models**
- Competition/Globalisation
- Amazon, .coms/e-Commerce
- e-business
Definition of e-business

- **Mid-90’s**
  - Phrases
    - “Network is the Computer”, “Network Centric Computing”,
    - “Information Superhighway”, “e-commerce”, “.com”
  - IBM Marketing
    - “e-business”, Lou Gerstner, Wall Street Briefing, Nov-96
    - “Transformation of business processes through the use of Internet technologies…”
    - “transacting business activities using Internet technologies”
      - e-commerce, Intranets, Extranets, Internet
      - Not just buying-selling online, conducting all activities online
      - Change drivers licenses, pay taxes, order goods and services
      - Interact with employees, customers, partners and suppliers
Phases of e-business Adoption

Access  |  Publish  |  Transact  |  Integrate Internally  |  Integrate Externally  |  Adapt Dynamically

"An on demand business is an enterprise whose business processes integrated end-to-end across the company and with key partners, suppliers and customers can respond with speed to any customer demand, market opportunity or external threat."
Challenges for Businesses - More Competitive, On Demand

Market Challenges

- Continuous Change
- Rigorous Competition
- Unrelenting Financial Pressures
- Unpredictable Threats

From

- Reactive
- Diffuse
- Fixed
- Vulnerable

To

- Responsive
- Focused
- Variable
- Resilient
Integration: Key Challenges for IT in a Business Environment

- Delivering more business value
  - **Constraints**
    - Increasingly complex heterogeneous environment
    - Maturing cycles of technology development
    - Access to up to date skills
  - **Provide a more seamless flow of information throughout the enterprise**
    - Responsive access to accurate information for Customers, Employees and Partners/Suppliers
    - Streamline business processes
      - Business processes via Web based platforms (e-business) has become prominent
      - e-business is helping organisations to become more responsive (on demand)

Integration/Simplification is key for IT to deliver business value!!
Open Standards Help Ease the Pain of Integration

- Customers require flexibility to rapidly address:
  - New business requirements
  - Changes in their business model and design
  - Changes in their relationship with suppliers, partners and customers

... While leveraging existing investment
What/Why is Middleware?

- "Glue", "Infrastructure Software", "Layer of software between the network and Applications" 

  - **Integration**
    - Businesses spend 40+% of their IT budget on integration.. mostly labour

  - **Scalability**
    - Required to meet today’s transactions/traffic rates

  - **Flexibility**
    - Componentisation
      - Layered Architecture enables easy adaptation to changing needs
Enterprise Environment - Evolution Towards Middleware

Processes
- Modelling
- Execution
- Management

Applications
- Business Process
- Business Efficiency

Business Process Integration Evolution
- Middleware Environment
  - Human Interaction & Collaboration
  - Transactions and Messaging
  - Information Management

Application Environment
- Systems Management & Security
- Software Development

Distributed OS Evolution
- Linux
- Unix
- Windows
- OS/400
- z/OS

System Environment
- Servers
- Storage
Role of Middleware in Enterprise Computing

- **Key Middleware Component for e-business platform**
  - Hosting environment for applications
  - Transactions & Security Management
  - Connectivity & Connection Pooling
  - User Session Management
  - Scalability, Availability & Failover
  - Integration with other systems
    - Web Services, JMS, Connectors & Adapters

- **Separation of Concerns**
  - Separates the middleware services from business logic
    - Comprehensive APIs to support middleware services
    - Consistent Programming Model (MVC) to support functional layers of applications
    - Role Based Skills Deployment
Middleware Technology Stack

WebSphere software
Middleware Technology Stack

- **Integration Servers**
  - Message Oriented Middleware (MOM)
  - Message Brokers
    - Publish/Subscribe
  - Process Integration

- **Web Servers**
  - HTTP Servers
    - Apache, Microsoft IIS, IBM HTTP Server, iPlanet
  - Web Application Servers
    - Java Application Servers, Web Services Runtime Engines, Web Portals

- **Security**
  - LDAP
  - Integrated Security Solutions
    - Authentication, Authorisation, Encryption, Delegation (Single Sign-On)

- **Service Oriented Architecture (SOA)**
  - Web Services, Enterprise Service Bus (ESB)
Messaging . . . What is it?

Communication among applications through the exchange of messages.

Event Notification
A one-way communication.

Request / Response
A two-way communication.

Some competing approaches . . .
Single System - Call / Return
Remote Procedure Call
Remote Method Invocation (Java)
Business Integration Technologies

1. Application to Application

2. Adapters for Speed & Simplification

3. Routing & Transformation via Broker

4. Business Process Management within An Enterprise

5. Business Process Management within And Across Enterprises

Company A

Company B
WebSphere MQ

Middleware that provides a flexible means to reliably exchange information between applications.

Applications
- Open / Close Queue
- Put / Get Messages

Queue Manager
- Takes care of the rest.

Benefits . . .
✓ Simplified application code!

A model based on “queues”.

Applications
- Application “A”
- Application “B”
- Application “C”
- Application “D”
WebSphere MQ - Message Delivery

**Benefits**
- Flexible application schedules !
- High valued transaction support !
- Lost, duplicate transactions eliminated !
- Highly responsive application behavior !

**Time Independent Delivery**
Messages are delivered when needed (for example, daytime entry, nighttime batch).

**Transactional Support**
Groups of messages delivered as “all or none” (for example, items in an order).

**Assured Delivery**
A message is delivered once and only once (even if a QM fails and is restarted).

**Asynchronous Delivery**
Once a message is “put”, application does not need to wait for a response.
Application View

Benefits . . .
✓ A single, consistent means for applications to exchange information!
✓ Flexible deployments - platforms!
✓ Flexible application designs!

Programming Interfaces
 Java Message Service (JMS)
 MQ Interface (MQI)
 C# language binding

Platform Support
All major platforms . . .
 Programming Interface
 Queue Manager

Message Access
 First In / First Out
 By Priority
 Direct
Point to Point connections - Potentially many interfaces over time...

But can reduce these using a broker

56 Interfaces
8 Computers

"The old way of writing point-to-point interfaces would have taken twice as long" - Eastman Chemical

16 Interfaces
Messaging . . . a Middleware Approach.

Addresses the more complex issues!

- Programming Interface
- Network Isolation
- Security
- Transmission Integrity
- Flexibility & Scalability

. . . . . . Provided by the middleware.

. . . . . . . . . . . . . Handled by the middleware, NOT the application!
Primitive node types:
✓ Receiving and routing messages
✓ Transforming a message to an alternative representation
✓ Selecting a message for further processing based upon the message’s content
✓ Interacting with an external repository to augment a message or store the whole or part of a message
✓ Responding to events and errors
Message Broker - Publish / Subscribe Routing

Pub/Sub Supports
✓ Topic and/or Content Based
✓ Automatic or On-Demand Delivery
Web Servers & Application Servers

Enterprise Security Infrastructure/LDAP

Presentation Browser

Basic Services - Application Infrastructure
Hosting, Connectivity, Connection Pooling, Application Access, Integration

Advance Services - Quality of Services (QoS)
Security, Workload Management, Failover

Synchronous/Asynchronous, Connectors/Adapters, Business Rules & Workflow

Firewall
DMZ
Firewall

Load Balancing & Caching proxy
HTTP Server Farm

Application Servers

App components

Database

Integration Brokers

Application

Business Critical Application
Java Programming Language

The Java programming language characterised by:

Simple, Portable, Object Oriented, Distributed, Interpreted, Robust, Secure, Architectural Neutral, High Performance, Multi-threaded and Dynamic

```java
/**
 * The myProgram class implements an application that
 * simply displays "Hello World!" to the standard output.
 */
class myProgram {
    public static void main(String[] args) {
        System.out.println("Hello World!");  //Display the string.
    }
}
```
The Java Platform

**Consumer & Embedded Devices**
- Set of tailored APIs for supporting a broad range of Consumer and Embedded devices
- User Interface, Security Model, Built-in Network protocols, Connected and Disconnected Devices
- Mobile Phones, PDAs, Set-top boxes, Telematics and Smartcards

**Core Java Platform**
- Tools: Compiler, Debugger, Utilities
- Runtime Environment: Java Virtual Machine (JVM), Just-In-Time (JIT) Compiler
- Programming APIs:
  - SWING, JDBC, Security, Java Beans, Networking, I/O, XML ….

**Server Side Java Platform**
- Programming Model
  - Servlets, Java Server Pages (JSP), Enterprise Java Beans (EJBs)
- Runtime Component Model
  - Containers, Components, Connectors
- Runtime Services (APIs)
  - Transactions, Naming, Security, Connectivity, Caching, Persistence

Current Version: 1.4/1.5

Current Version: 1.4
J2EE Architecture Overview

Functional Layers of a J2EE System

Deployment Scenario
J2EE Platform: Components, Containers, Connectors
Limitation of Platform Affinity

When applications are written to a platform-specific programming model, they become tightly coupled with the platform architecture.

The programming model dictates the deployment platform.
J2EE Eliminates Platform Affinity

Common J2EE programming model across platforms

When applications are written to a platform-neutral programming model, they are decoupled from the platform architecture.

Deployment platform decisions can be deferred (and changed)
What Should an Enterprise Portal Do?

Enable Users... ...from Any Device... ...to Use Portals as the Integration Point... ...to Work with Business Functions and Data

Employees

Customers

Suppliers

Partners

Commercial and External Feeds

Structured and Unstructured Data

People and Partners

Applications

Portal Server

A personal dashboard into the business!!
Java App Server Evolution

**Past**

- Web Applications
- J2EE Services Runtime
- Java App Server

**Now**

- J2EE/Web Services Runtime
- On Demand Platform ("Java Superplatform")
- External Info
- Apps
- Web Apps, ISV Apps, Portals
- Integration Services, Collaborations, Business Rules, Business Process Management, Content Management, Caching, Web Services

**Tools**

- Java Integration Server
- DB
- ERP, CRM, SCM, Etc.
- Web Apps, ISV Apps, Portals
Service Oriented Architecture (SOA)

- **Business**
  - SOA is a set of business, process, organisational, governance and technical methods to reduce or eliminate frustrations with IT, quantifiably measure IT’s business value and create an agile business environment for competitive advantage.

- **Technical**
  - SOA is a way for different computers, from different vendors, with different programs, from different functional areas of the business (or externally to customers, suppliers or vendors) to intelligently talk and exchange data with each other.

- **Benefits**
  - The combination of SOA & Web Services is close to being the “silver bullet” that companies have been looking for to:
    - Realise IT’s long-promised potential
    - Justify IT expenses and capital outlays
    - Provide non-technical people a clear understanding of what IT does, how they do it, and their intrinsic value.
Service Oriented Architecture (SOA): Basic Concepts

Service Directory

http://www.online_services.com

1 Publish

2 Discover

3 Invoke

Service Consumer

Application-A
- Travel Agent
- Retail Bank
- Publishing House

Service Provider

Application-B
- Airline /Car Rental/Hotel Chain
- Mortgage Specialist/Investment Banks
- Office Supplies Company

Flight Reservation
- Car Hire
- Hotel Booking
- Mortgage Lending
- Office Supplies
Implementing SOA with Web Services Standards

Service Directory

Service Consumer

Service Provider

<XML>
......
</XML>

SOAP: Simple Object Access Protocol
WSDL: Web Services Definition Language
UDDI: Universal Description, Discovery and Integration
WS*: Emerging Web Services Standards such Transactions, Security, System Management
Enterprise Service Bus
A Best Practice Design Pattern

Mediation Services
Routing
Transformation

Event Services
Publish and Subscribe

Transport Services
Synchronous/Asynchronous
Persistent/Non-persistent
Loosely-coupled/Tightly-coupled

... with unsurpassed technical characteristics ...
- Multiple standards - JAX-RPC, JMS, WebSphere MQ, Web Services ...
- Scale to match performance and throughput needs
- Security
Build Enterprise Service Bus with WebSphere

Web Services

WBI adapter

Event Broker

Message Broker

MQI application

JMS application

MQe SCADA

Web Service provider

Web Service requestor

JMS application

Web Service provider

Web Service requestor

JMS application

Mediation

Mediation

Platform Messaging

Service Integration Bus

Service Integration Bus

JCA adapter

JCA adapter
LDAP: Lightweight Directory Access Protocol

- Communication Protocol to access directories
  - Industry standard message format based on X.500 Directory Access Protocol
  - Runs over TCP/IP stack, less resource intensive

- Listing of information about objects arranged in order
  - Create and Search objects
  - Employee Directory, Telephone Directory
  - Hierarchical Namespace (tree like structure)
  - Entries arranged using Distinguished Name (DN) – unique id
    - DN=>cn=gurdeep rahi, ou=software group, o=ibm
    - DN=>cn=stuart chambers, ou=software group, o=ibm

Diagram:
- Client
- Directory Server
- Database
- LDAP
- Root
  - O=IBM
  - C=US
  - OU=Software
  - O=Hardware
  - CN=Gurdeep
  - ObjectClass=Person
  - ObjectClass=eMail=Gurdeep@ibm.com
    ....
Security Infrastructure

- Users
- LDAP
- Security Server
- Directory Server
- Application Server
- User Information
- Application Data

Authentication
Authorisation
Encryption
Delegation

Security Single Sign-On
Comparison: Traditional vs. SOA Approach to Building Apps

Traditional Monolithic Approach

- Get Credit Score Application

  - rigid, inflexible design
  - business process buried deep within the code
  - difficult to reuse code
  - limits ability to respond quickly to changes in business processes

Business Logic Flow Approach (Service-Oriented Architecture - SOA)

- Get Credit Score Flow

  - modular, flexible design
  - business process defined external to the code
  - easy to reuse code (reusable services)
  - facilitates ability to deliver e-business on demand
Scenario: Building SOA Applications with Web Services

**Application Involves Sequence of Steps Requiring Interaction with Other Systems**

1. **Get Customer Credit Score (internal)**

2. **Get Realtime Credit Score (external)**

3. **Combine Credit Scores**

4. **Record Combined Credit Score**

- **COBOL application running under CICS**
- **Business Partner Credit Score Service**
- **Java Program Logic**
- **'Credit Score' Database**
SOA Implementation using Web Services and Flow Language

- **Services** are easy-to-use code components
- Services are described using **WSDL**, including binding information
- Runtime invocation (binding) can be either SOAP or EJB RMI
- Services can be used as steps in a flow
Summary/Wrap Up

WebSphere software
WebSphere Software for On Demand Business
Integration and Infrastructure Software to Maximize Business Flexibility and Responsiveness

Innovative interactions
Maximize the use of your IT infrastructure to support new business models and reach users in new ways

Improved flexibility and speed
Increase your responsiveness by connecting the right people with the right information at the right time

Operational excellence
Improve your reliability and performance with a proven, secure IT platform
WebSphere Product Families: Best-of-Breed

- **Application & Transaction Infrastructure**
  - Build, Deploy and Run Applications

- **Application Transformation**
  - Leverage Legacy Applications in new Business Processes

- **Business Integration**
  - Improve Business Responsiveness with Integration across Enterprise

- **Portals**
  - Deliver Single Point of Personalised Interaction with Applications, Content, Processes and People

- **Commerce**
  - Automate and Integrate Marketing/Sales Processes across multiple channels

- **Mobile & Speed Middleware**
  - Extend access to Business Processes, Applications to Anyone Anywhere

- **Product Information Management**
  - Single, Integrated Source of Product Information
WebSphere Market Momentum

WebSphere software product line launched to build, deploy and manage Java-based Web applications (Application Server & Performance Pack)

Source: Gartner Application Integration, Middleware and Portals Market Worldwide, August 2002 and May 2004
eBay Establishes a Flexible Foundation

**Challenge**

- Scale for increased number of transactions
  - Digital camera sold every minute
  - 3.1 million listings per day
  - 7.6 million bids per day
  - 13+ million web services APIs called per day
  - 20+ million transactions per day
  - 625 million pages viewed per day
- Link operations across enterprises
- Integrate disparate systems
- Increase business flexibility

**Solution**

New highly scalable, resilient architecture and application development environment

- WebSphere Application Server
- WebSphere Studio Application Developer
- WebSphere MQ

**Business benefits**

- A solution that can grow with eBay
- Rapid deployment of new services
- Greater than 99.9% availability

**Technology benefits**

3 times/day, 6 days/week HTML rolls to the site

- Once a week significant feature releases go live-to-site
- Deployed internationally within 3 weeks
- Nearly 30K lines of code change weekly

With no down time
?? Questions ??

!! Comments !!

😊 Suggestions 😊

Thank You for Listening
Backup Slides

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Positioning: Web Services vs J2EE

- **Separation of Concern**
  - Separate “Interface” from “Implementation”
  - “Black box” approach
    - Hide implementation details from the interface

- **Web Services**
  - Handle management of “Interfaces”
  - Web Services Definition Language (WSDL) is used to describe an interface in a generic way
  - UDDI is used to publish an interface to a repository
  - SOAP is used for sending WSDL/messages

- **J2EE (Java 2 Enterprise Edition)**
  - Used for implementation business functions
  - Provides application partitioning, transaction management, connection pooling and system management

- “Well defined interface”
  - Interface Definition Language (IDL)
    - for RPC, CORBA, DCOM/ActiveX
  - XML/WSDL for Web Services

Mixing old and new apps

Legacy: COBOL, CICS, IMS
New: Java/EJBs, CORBA
3rd Party: SAP, Siebel, Peoplesoft etc.
IBM’s Proven Experience and Commitment to WebSphere

**Nobody invests more**
- $1 billion annual investment in engineering
- Over $5 billion investment in technology acquisitions
- Over 6,700 IBM developers
- Over 10,750 IGS technical practitioners trained on WebSphere

**Continued success**
- More than 87,000 WebSphere customers
- More than 4,000 partners certified on WebSphere software since 1999
- More than 3,150 active ISV solutions on WebSphere
- Over 1.1 million registered WebSphere developers worldwide

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**Award-winning WebSphere Software**

**Technology Innovator: IBM WebSphere Business Integration Server Express**  —VARBusiness Magazine’s 2004 Technology Innovator Awards (October 2004)


**Best Web Services Solution: IBM WebSphere Application Server**  —2004 Codie Awards (May 2004)