

J2EE and .NET: Competition or Cooperation Integration using SOAP

Jeff Swisher

jeffs@dunnsolutions.com

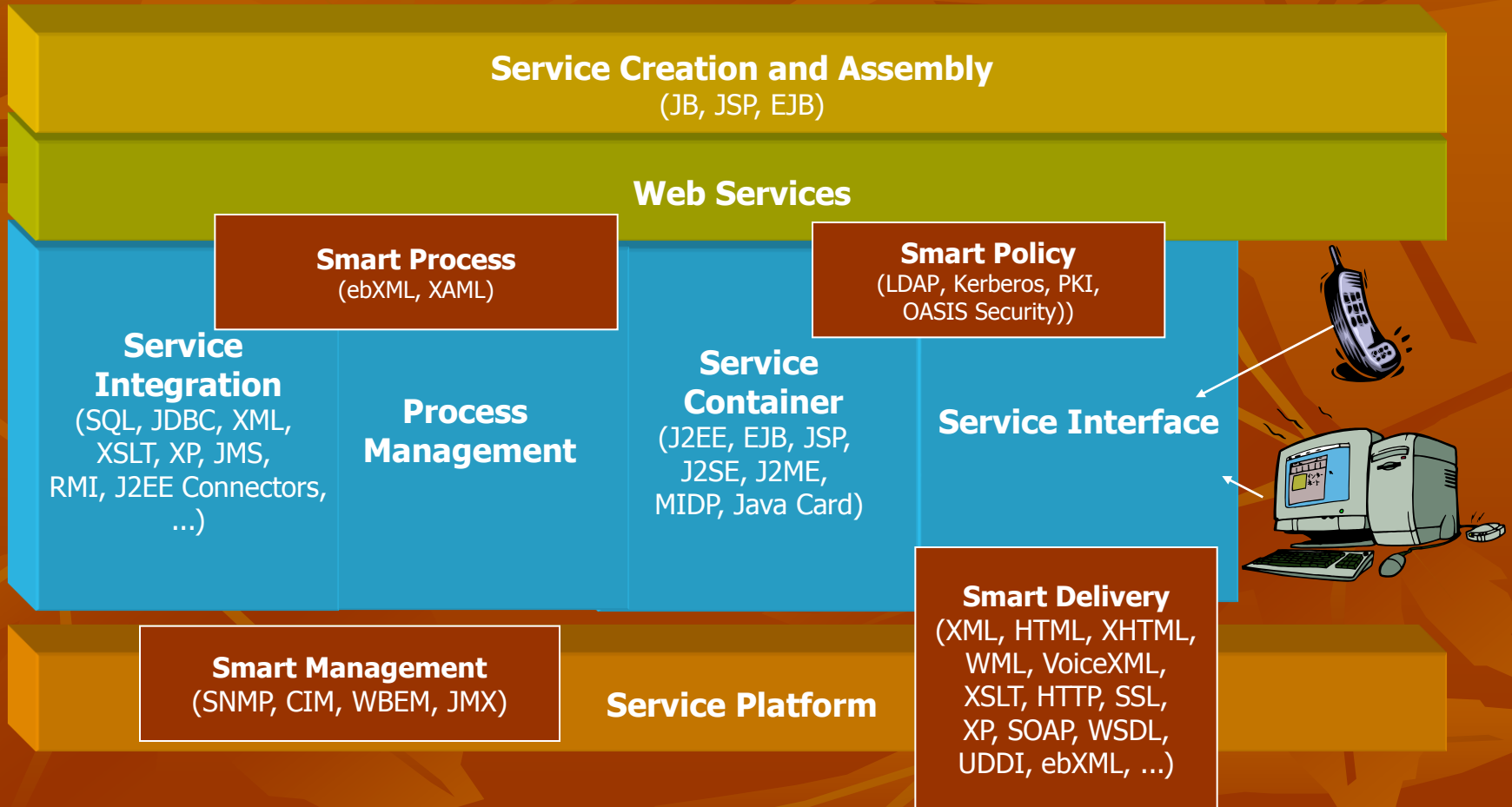
Objectives

- History of J2EE and .NET
- Understand how J2EE and .NET implement web services
- Understand the key issues with integrating the two web services platforms
- Understand how the two platforms can be integrated

Introduction

- Both J2EE and .NET web services exist and need to interoperate
- How do I demonstrate that they can interoperate?
 - test that a .NET client can call a J2EE web service
 - test that a J2EE client can call a .NET web service

J2EE Way of Life



.NET Way of Life

.NET Foundation Services (Hailstorm)

Passport, Calendar, Directory & Search, Notification & Messaging, Personalization, Web-Store/XML, Dynamic Delivery of Software and Services

.NET Framework & Tools

ASP.NET

(Web Services, Web Forms, ASP.NET Application Services)

Windows Forms

(Controls, Drawing, Windows Application Services)

Base Classes

(ADO.NET, XML, Threading, IO, ...)

Common Language Runtime

(Memory Management, Common Type System, Lifecycle Monitor)

.NET Servers

SQL Server, Biztalk, Commerce, Exchange, Mobile Information, Host Integration, Application Center

.NET Devices

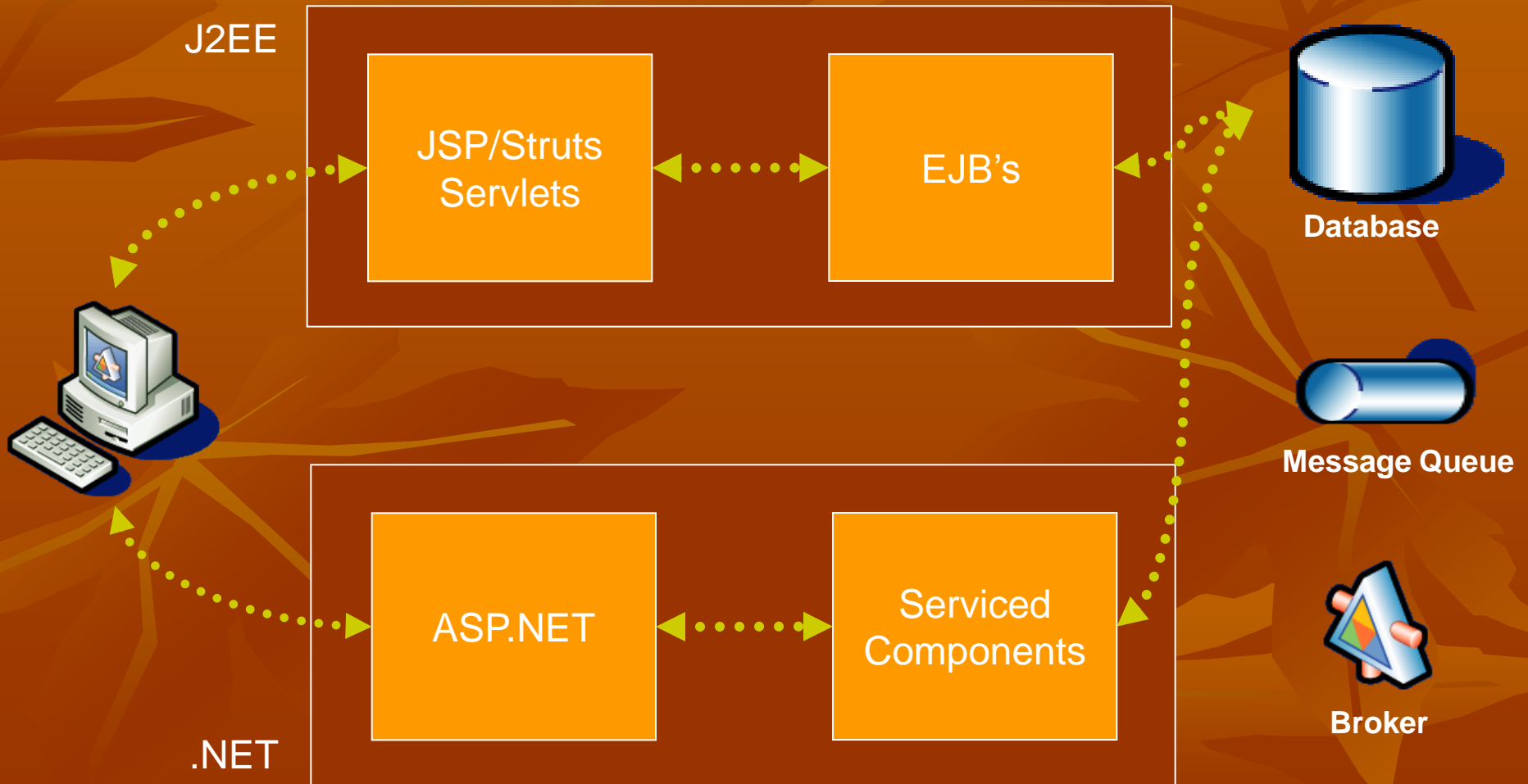
TabletPC, PocketPC,

Battle for the Enterprise Begins

- Keeping track of the ongoing rivalry between Microsoft and Sun Microsystems as they seek to control the enterprise application development market can puzzle even the most dedicated developer. For the software architect, the competing "standards" can be bewildering.

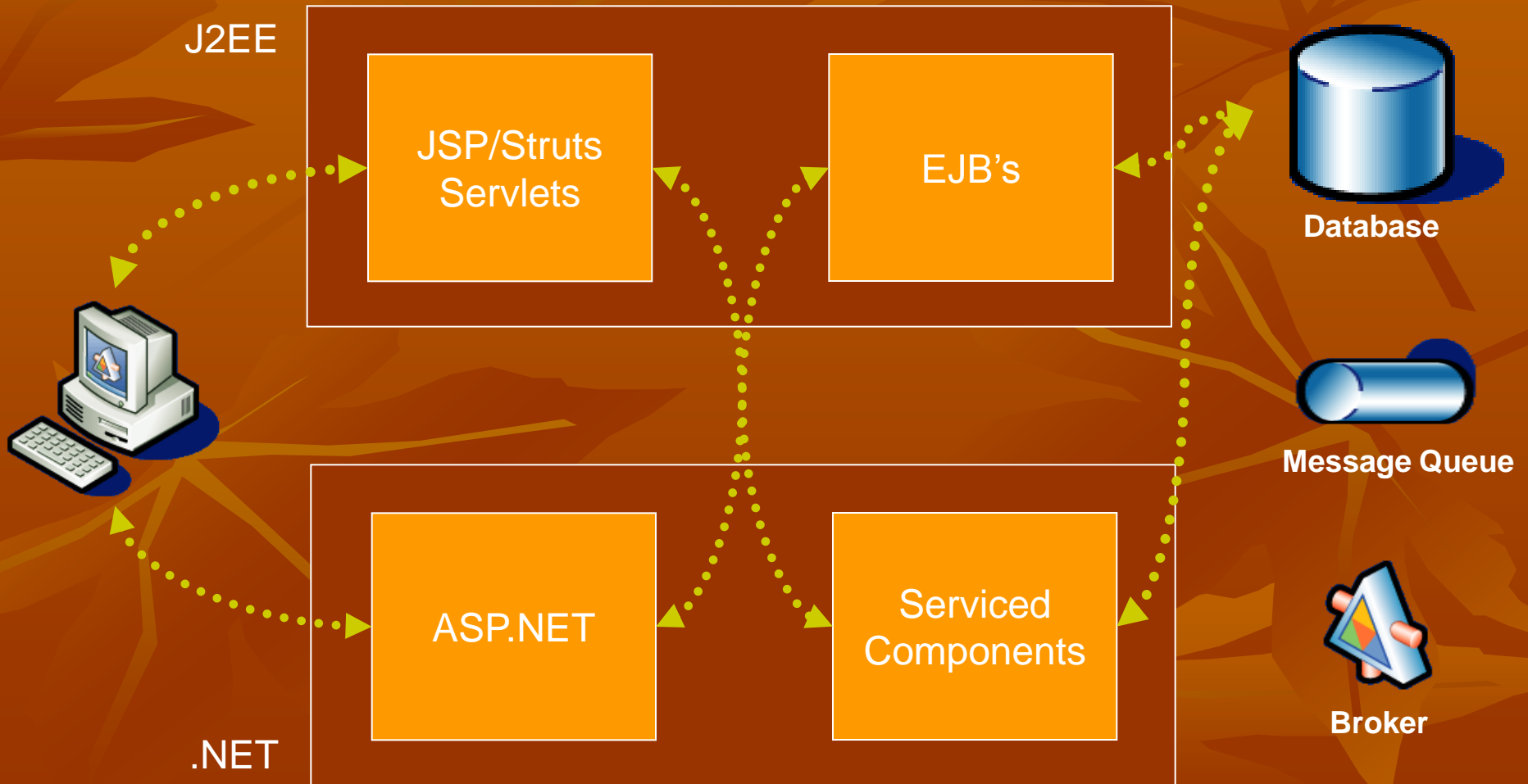
Interoperability Scenarios

Technology Map



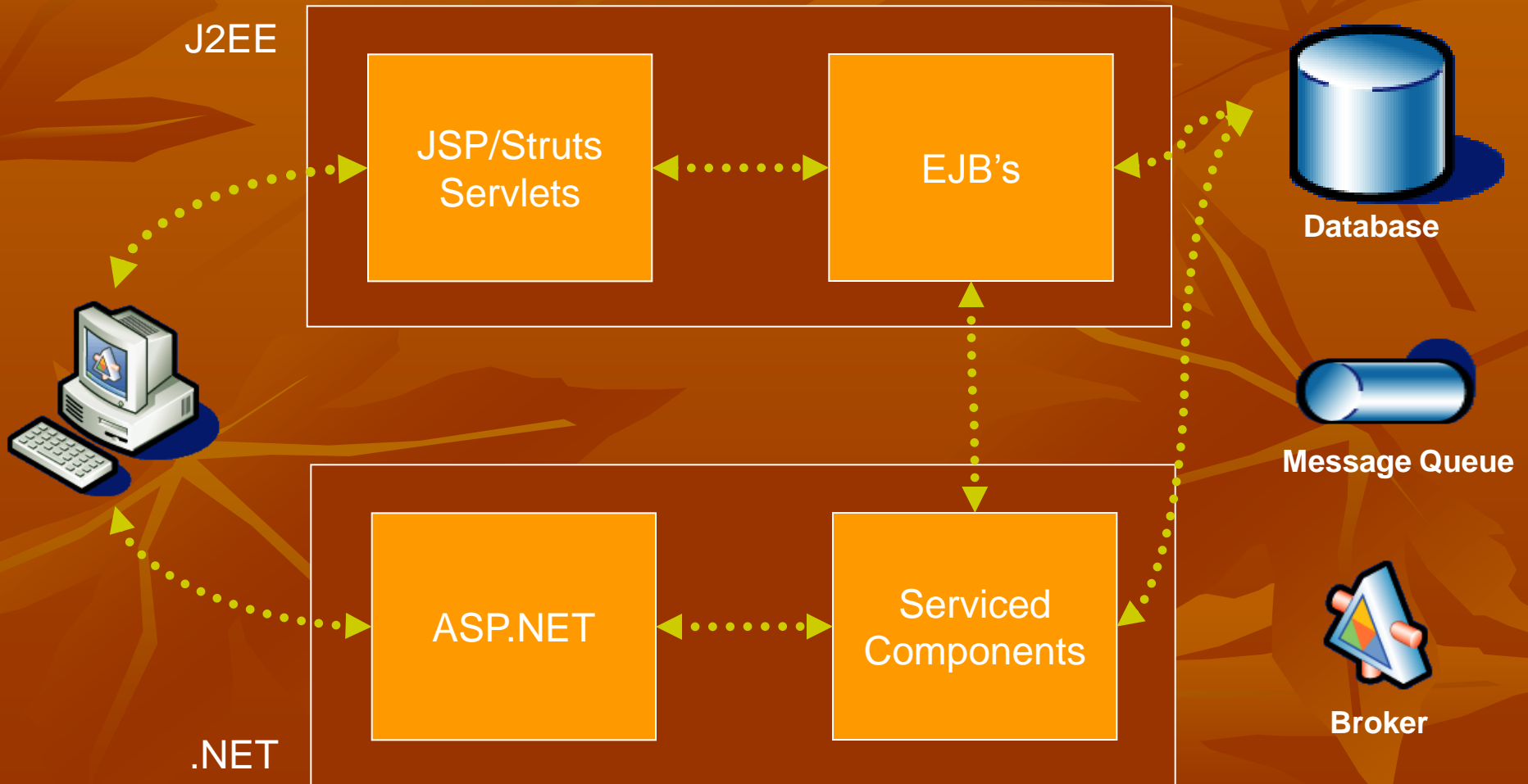
Interoperability Scenarios

Presentation Tier



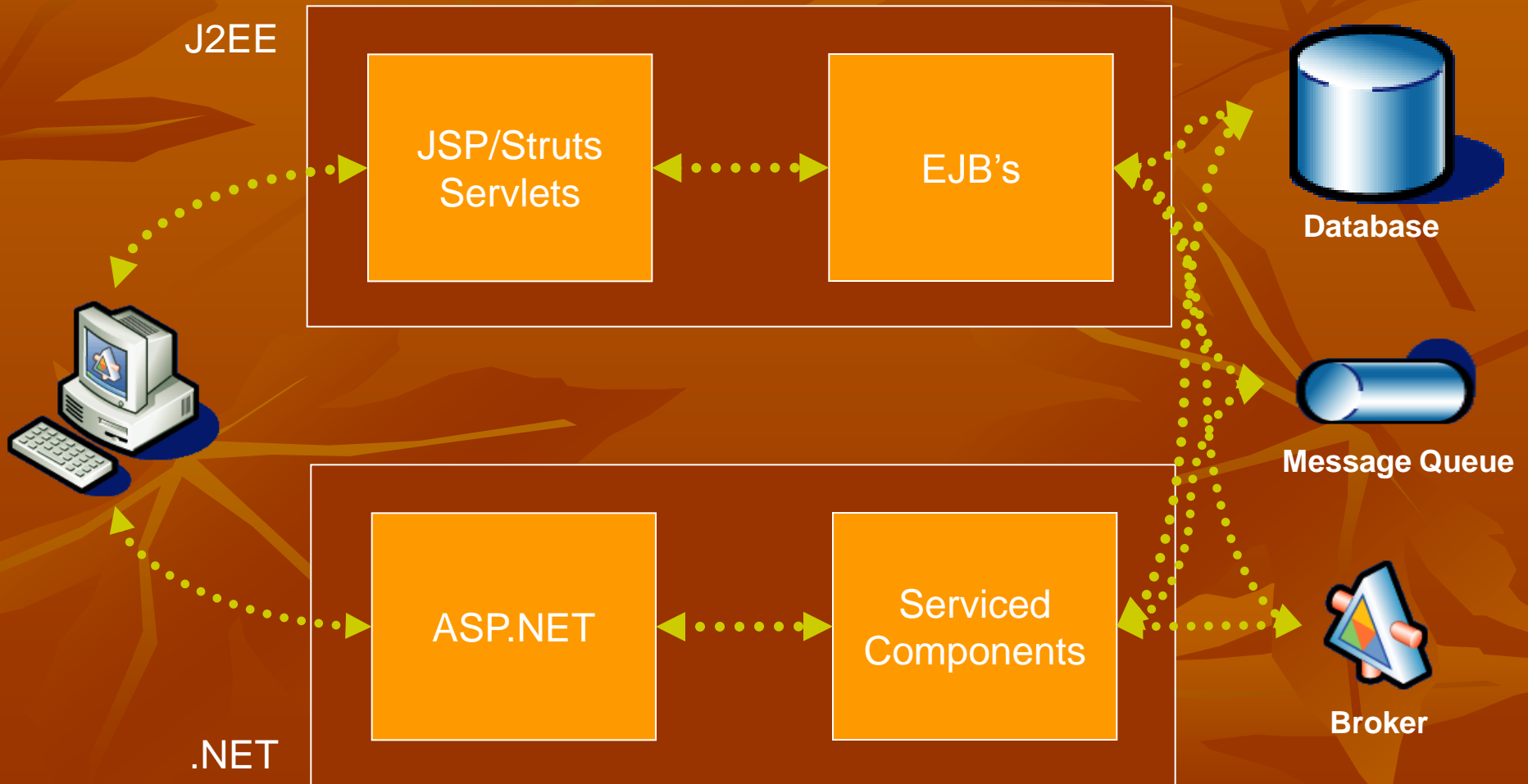
Interoperability Scenarios

Business Tier



Interoperability Scenarios

Shared Resources



Integration Technologies

- Wire Level
- Message Queues
- Web Services

Integration Technologies

Wire Level

- Products
 - Janeva(Borland), Ja.NET (Intrinsyc), JNBridge Pro (JNBridge)
- Advantages
 - Wire Level, Binary Performance
 - Keep Alive
- Disadvantages
 - Tightly Coupled Interface
 - Vendor Specific

Integration Technologies

Message Queues

- Products
 - MSMQ, IBM WebSphere MQ
 - Host Integration Server 2000, BizTalk Server 2002
- Advantages
 - Loosely Coupled, N to N Scenarios, SOA
 - Transactions, Security, RM
- Disadvantages
 - Synchronous Operation is Limited
 - Possible Port / Firewall Issues
 - Message Queue between Organizations?

Integration Technologies

Web Services

- Products
 - Standards-based SOAP stacks
 - MS ASP.NET
 - Apache Axis, Glue etc.
- Advantages
 - Leverage component architectures & design patterns
 - Facilitate service-orientation
 - Loosely Coupled
- Disadvantages
 - Verbose

Integration Complications

- Wire
 - Creates proxies of data types
 - Proxies Not Platform Friendly (e.g. No Data Binding)
- Message Queues
 - Already exchange messages!
 - Need a common format
- Web Services
 - Should be exchanging messages!
 - WSDL differences
 - RPC vs. document style interfaces
 - Not Platform Friendly (e.g. No Data Binding)

WebServices Integration

Calling a J2EE Web Service from
a .NET Client

.NET Client for Orders

Order Master Order Home

Please Select One:

- View My Orders
- Add Order
- Select Orders By:

Customer: YourWay Paving Co.

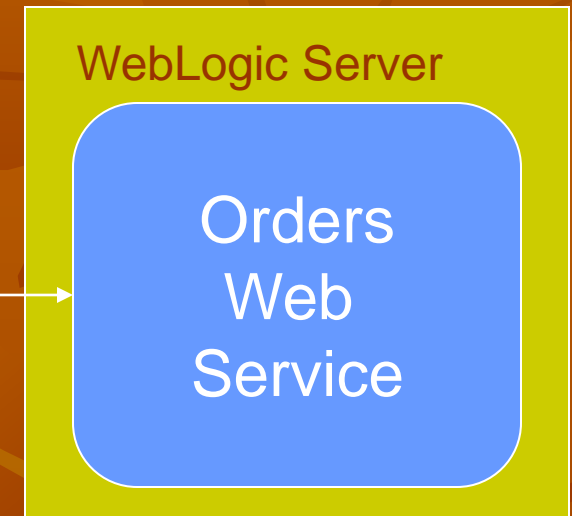
If you are not the user listed please enter the correct name below:

JANE Submit

Order Master Order List

Order Number	Customer Name	Expected Ship Date
1	Johns Lock Shop	2001-10-02
3	Johns Lock Shop	2001-10-02
4	Johns Lock Shop	2001-10-02

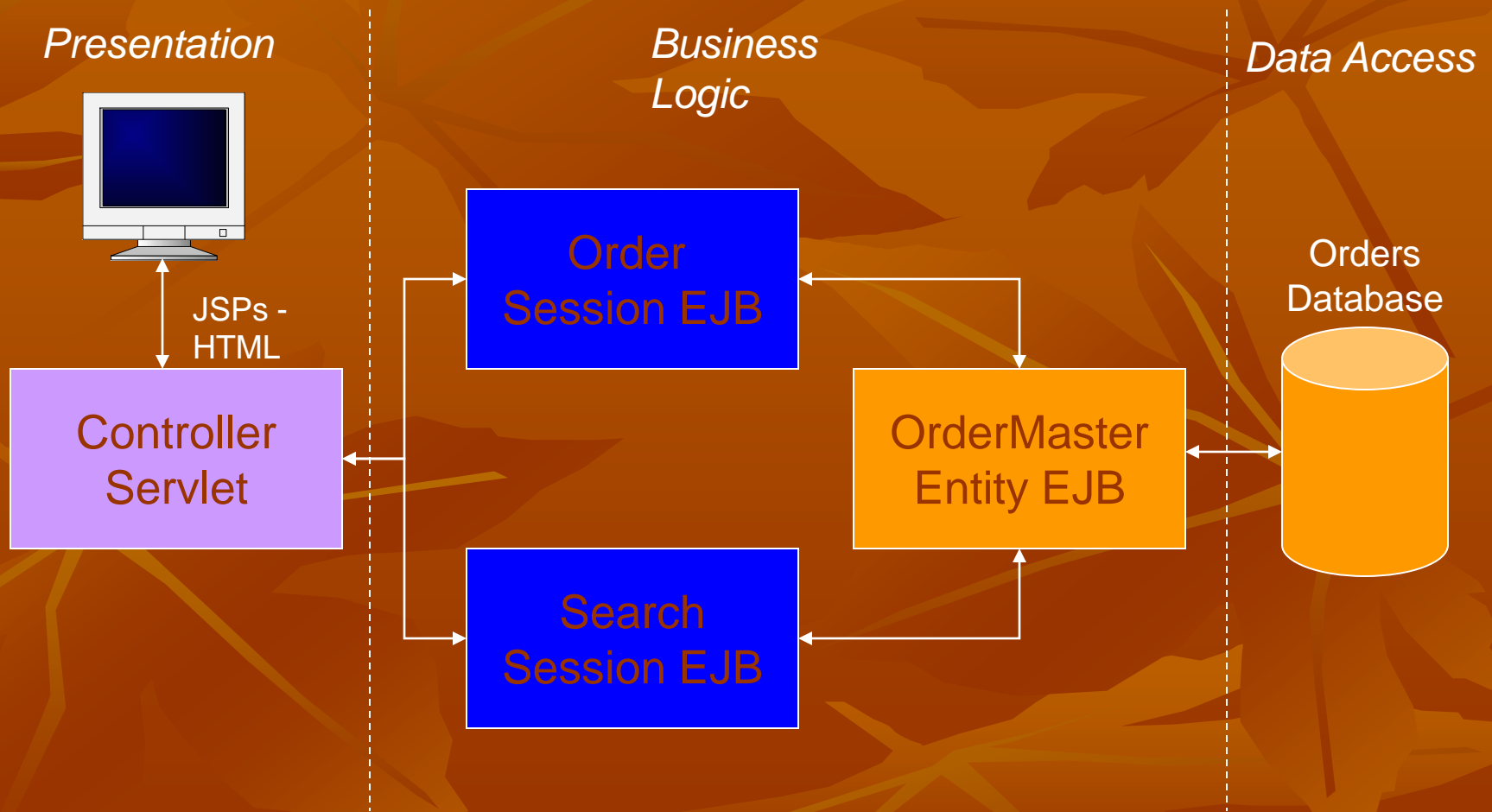
OrderHome



Call the Orders web service and get the user's Order information to display

Redirect to the Order list page

J2EE Orders Application



Making Orders a J2EE Web Service

- reuse the EJBs to process the web service requests – you want to make sure you have a stateless interface
- create a web service that will expose the methods your EJBs provide
- add the EJBs to the web service using controls
- check to see if you need to change any of the data types being returned from the web service
- generate a WSDL file for clients

Adding the EJBs to the web service

- add EJB controls
- creates an interface to the EJB so the web service can contact it



Calling the EJBs from Orders.jws

```
/**
 * @jws:operation
 */
public ordermasterfields[] getOrdersByID(String ID)
{
    ordermasterfields[] orderArray = null;
    try{
        LinkedList orderList = SearchEJB.getOrdersbyID(ID);
        orderArray = getArray(orderList)
    }
    catch(Exception e){
        System.out.println("*** In getOrdersByID method *** \n
            Exception is: " + e.getMessage());
    }
    return (orderArray);
}
```

J2EE Orders Web Service

Presentation



XML document
with an Array of
Orders

XML/SOAP/HTT
P

Orders.jws

- getOrdersByID
- getOrdersByCustomer
- getOrdersByStatus
- addOrder

*Business
Logic*

**Order
Session EJB**

- addOrder
- changeOrder
- removeOrder

**Search
Session EJB**

- getOrdersbyID
- getOrdersByCustomer
- getOrdersByStatus

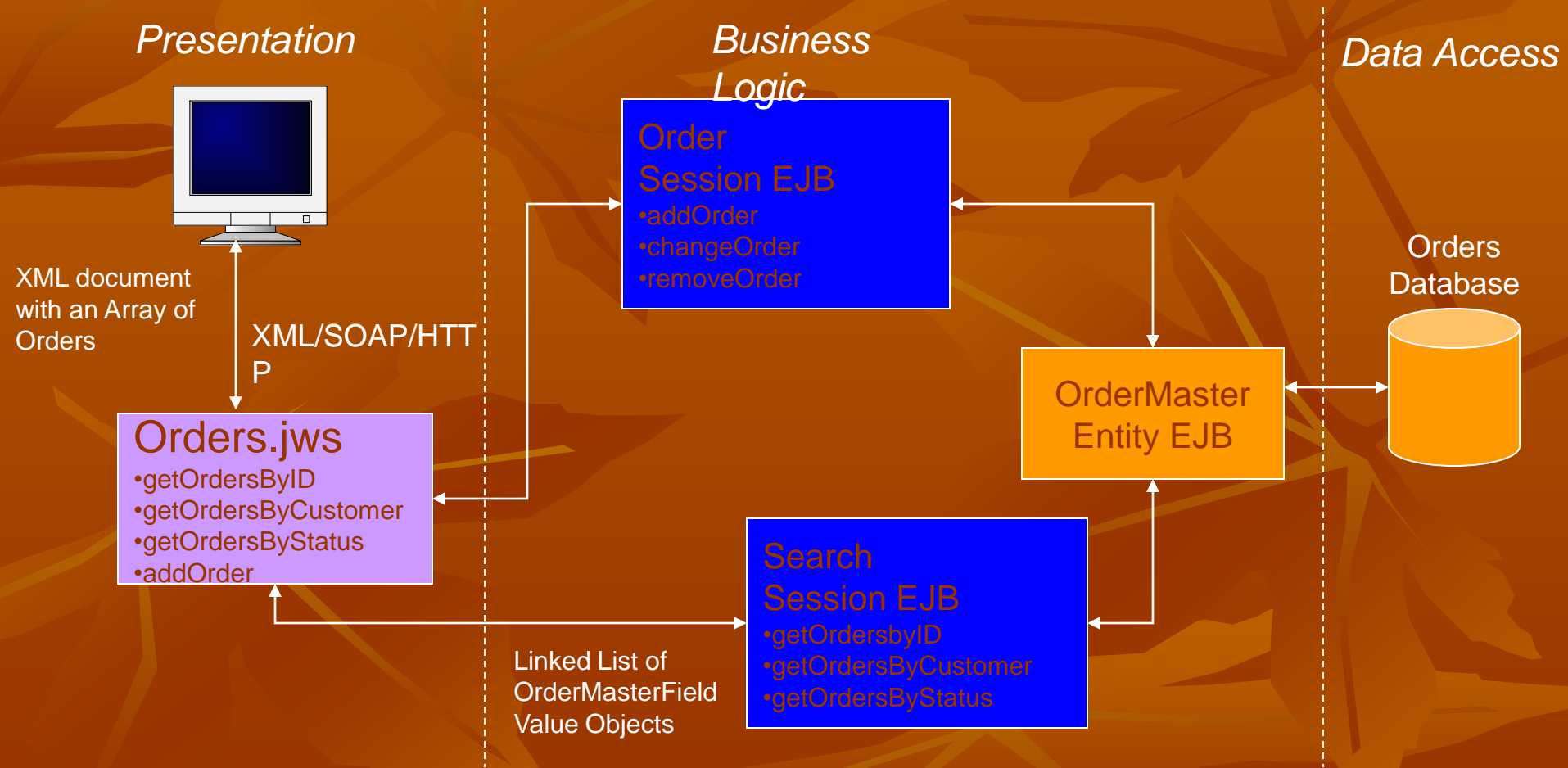
Data Access

Orders
Database



**OrderMaster
Entity EJB**

Linked List of
OrderMasterField
Value Objects



Request and Response Code

- the request

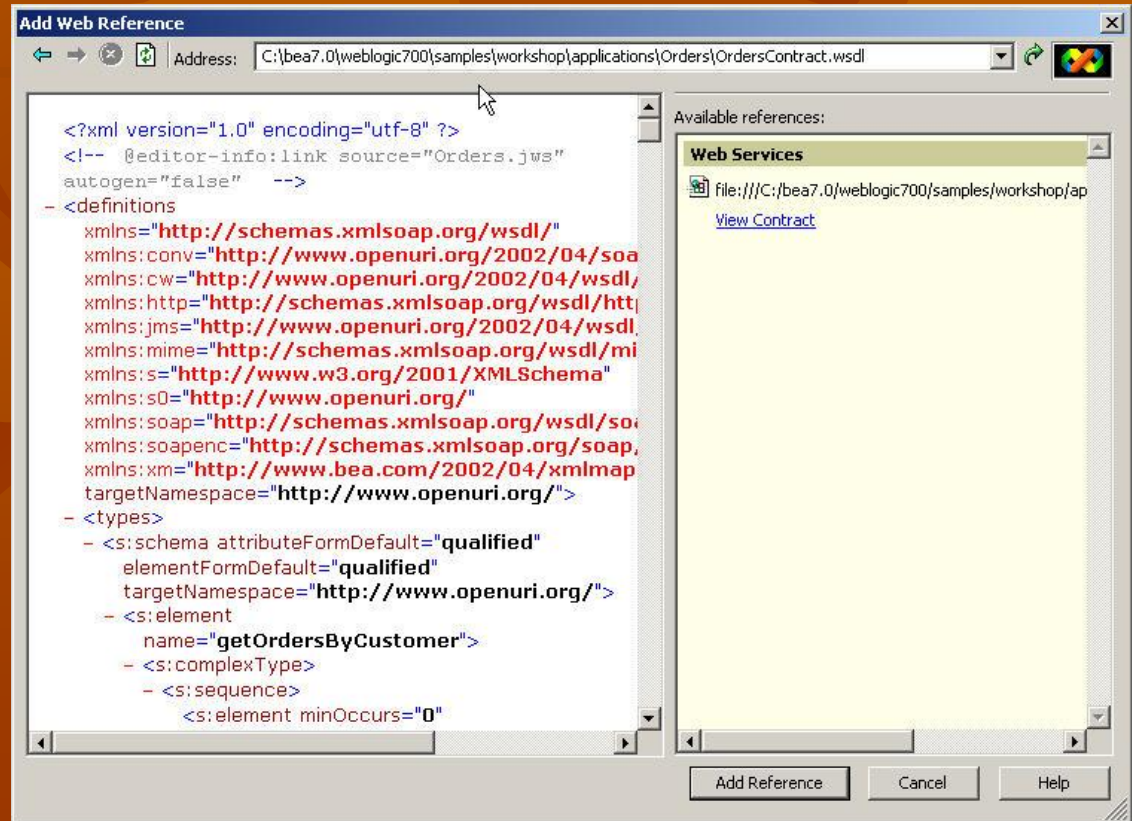
```
<getOrdersByID xmlns="http://www.openuri.org/">  
  <ID>JANE</ID>  
</getOrdersByID>
```

- the response

```
<ArrayOfordermasterfields xmlns="http://www.openuri.org/">  
  <ordermasterfields>  
    <orderNbr>1</orderNbr>  
    <customerNbr>100</customerNbr>  
    <employeeID>JANE</employeeID>  
    <customerName>Johns Lock Shop</customerName>  
    ... ..  
  </ordermasterfields>  
</ArrayOfordermasterfields>
```

Creating a .NET Client for Orders

- add a web reference to the client
- automatically generates proxy code



.NET Client Proxies

- defines all the methods and data types used to interact with the Orders web service

Reference.cs

```
public Orders() {  
    this.Url = "http://HOBSONEVELYN:7001/Orders/Orders.jws"; }  
  
public ordermasterfields[] getOrdersByID(string ID) {  
    object[] results =  
        this.Invoke("getOrdersByID", new object[] {ID});  
    return ((ordermasterfields[]) (results[0])); }  
}
```

Mapping Between the Client Proxy and the WSDL

Reference.cs

```
[System.Xml.Serialization.XmlTypeAttribute (Namespace="http://www.openuri.org/")]
public class ordermasterfields {
    public long orderNbr;
    public string orderDate;
    public System.Single partPrice;
    ... ..
}
```

Orders WSDL file

```
<s:complexType name="ordermasterfields">
  <s:sequence>
    <s:element minOccurs="1" maxOccurs="1" name="orderNbr" type="s:long" />
    <s:element minOccurs="0" maxOccurs="1" name="orderDate" type="s:string" />
    <s:element minOccurs="1" maxOccurs="1" name="partPrice" type="s:float" />
    ... ..
  </s:sequence>
</s:complexType>
```

Creating a .NET Client for Orders

- create an instance of orders

```
using OrderWebApplication.WebReferencel;
```

```
WebReferencel.Orders orders = new  
WebReferencel.Orders ();
```

- call the web service method

```
WebReferencel.ordermasterfields[] ordersResult =  
orders.getOrderByID (userName) ;
```

.NET Client for Orders

Order Master Order Home

Please Select One:

- View My Orders
- Add Order
- Select Orders By:

Customer: YourWay Paving Co.

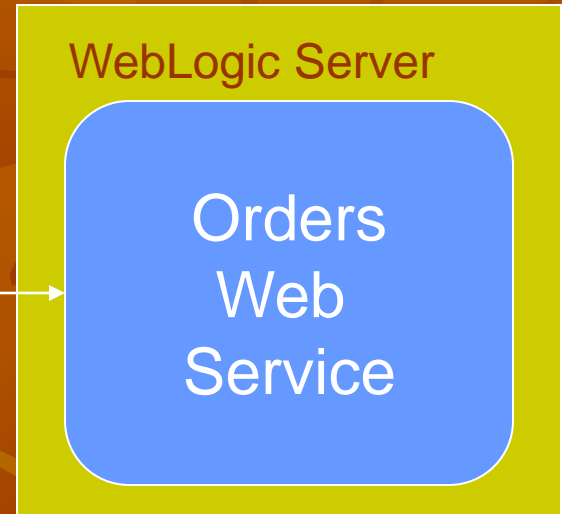
If you are not the user listed please enter the correct name below:

JANE Submit

Order Master Order List

Order Number	Customer Name	Expected Ship Date
1	Johns Lock Shop	2001-10-02
3	Johns Lock Shop	2001-10-02
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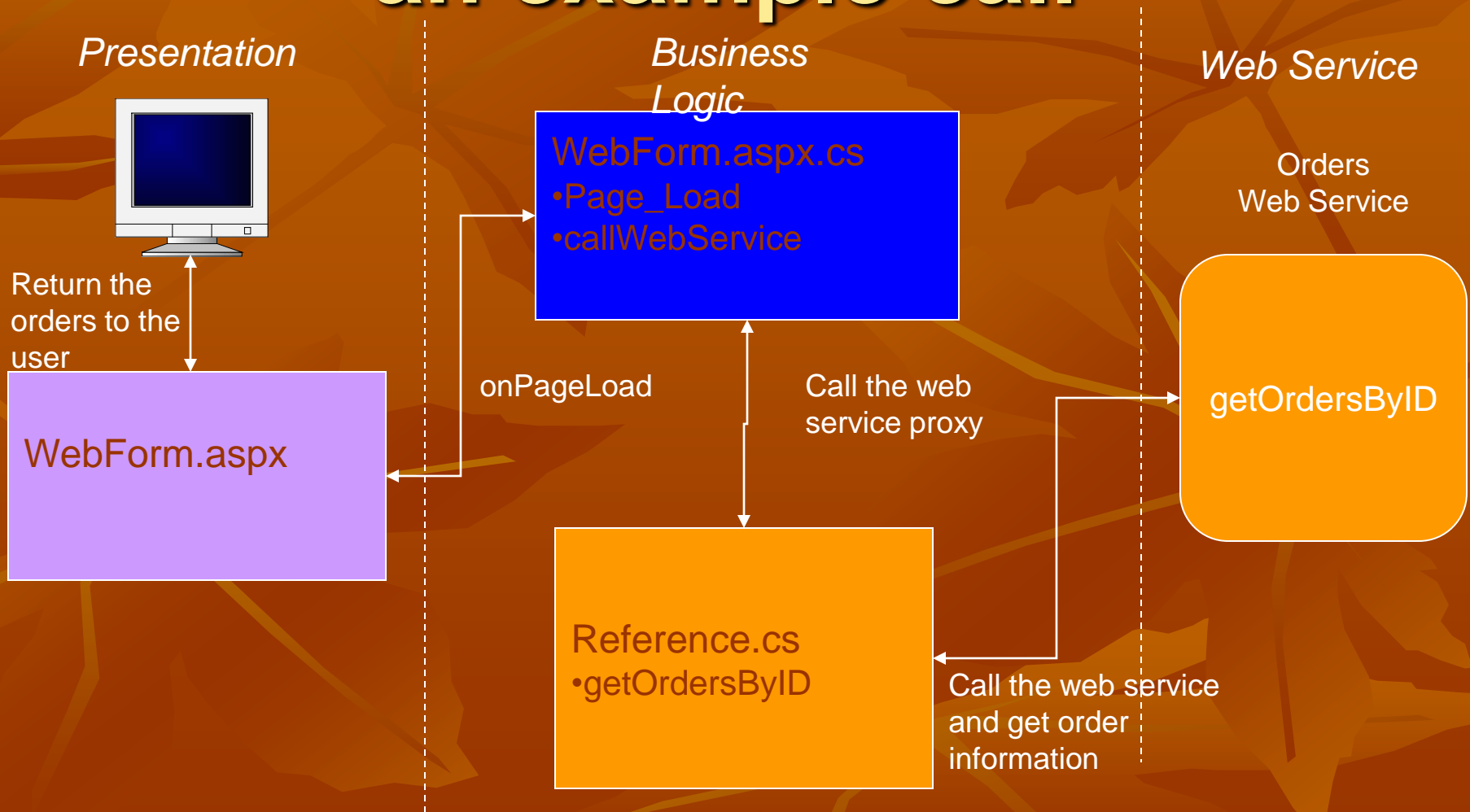
OrderHome



Redirect to the Order list page

Call the Orders web service and get the user's Order information to display

.NET Orders Client an example call



The background of the slide features a pattern of stylized, overlapping leaves in various shades of orange and yellow, creating a textured, autumnal effect.

Calling a .NET Web Service from a J2EE Client

J2EE Client for Orders

OrdersJ2EEClient.jws Web Service Created by BEA WebLogic Workshop

<http://HOBSONEVELYN:7001/MeasurementConversionsClient/OrdersJ2EEClient.jws>

Overview Console Test Form Test XML Warnings

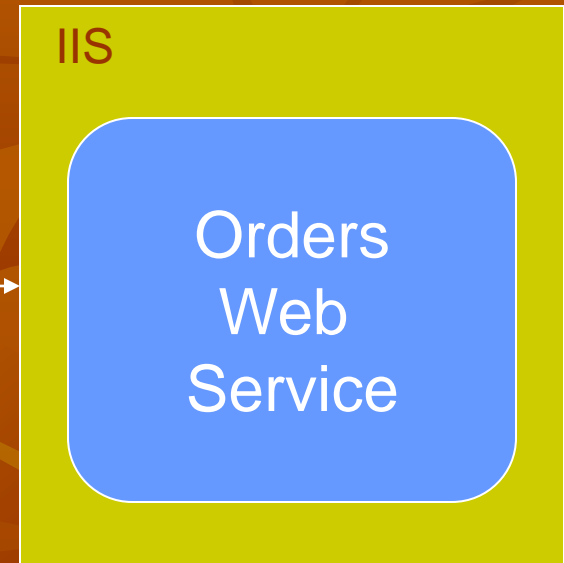
Test operations

Message Log Refresh
Log is empty

getOrdersByCustomer
integer customerNbr: 200
getOrdersByCustomer

getOrdersByEmployee

Call the
Orders web
service



MeasurementConversionsClient/OrdersJ2EEClient.jws

Overview Console Test Form Test XML Warnings

Test operations

Message Log Refresh
getOrdersByCustomer
OrdersNETClient.getOrdersByCustomer
Clear Log

External Service Request
Submitted at Wed Sep 11 17:08:59 MDT 2002

OrdersNETClient.getOrdersByCustomer

```
<SOAP-ENV:Envelope xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <SOAP-ENV:Body>
    <getOrdersByCustomer xmlns="http://tempuri.org">
      <customerNbr>200</customerNbr>
    </getOrdersByCustomer>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

External Service Response
Submitted at Wed Sep 11 17:08:59 MDT 2002

OrdersNETClient.getOrdersByCustomer

Return the user's
Order information
to display

.NET Orders Web Service

Presentation



Array of
OrderMasterField
Value Objects

HTML/HTTP

Orders.asmx

- getOrdersByEmployee
- getOrdersByCustomer
- getOrdersByStatus

*Business
Logic*

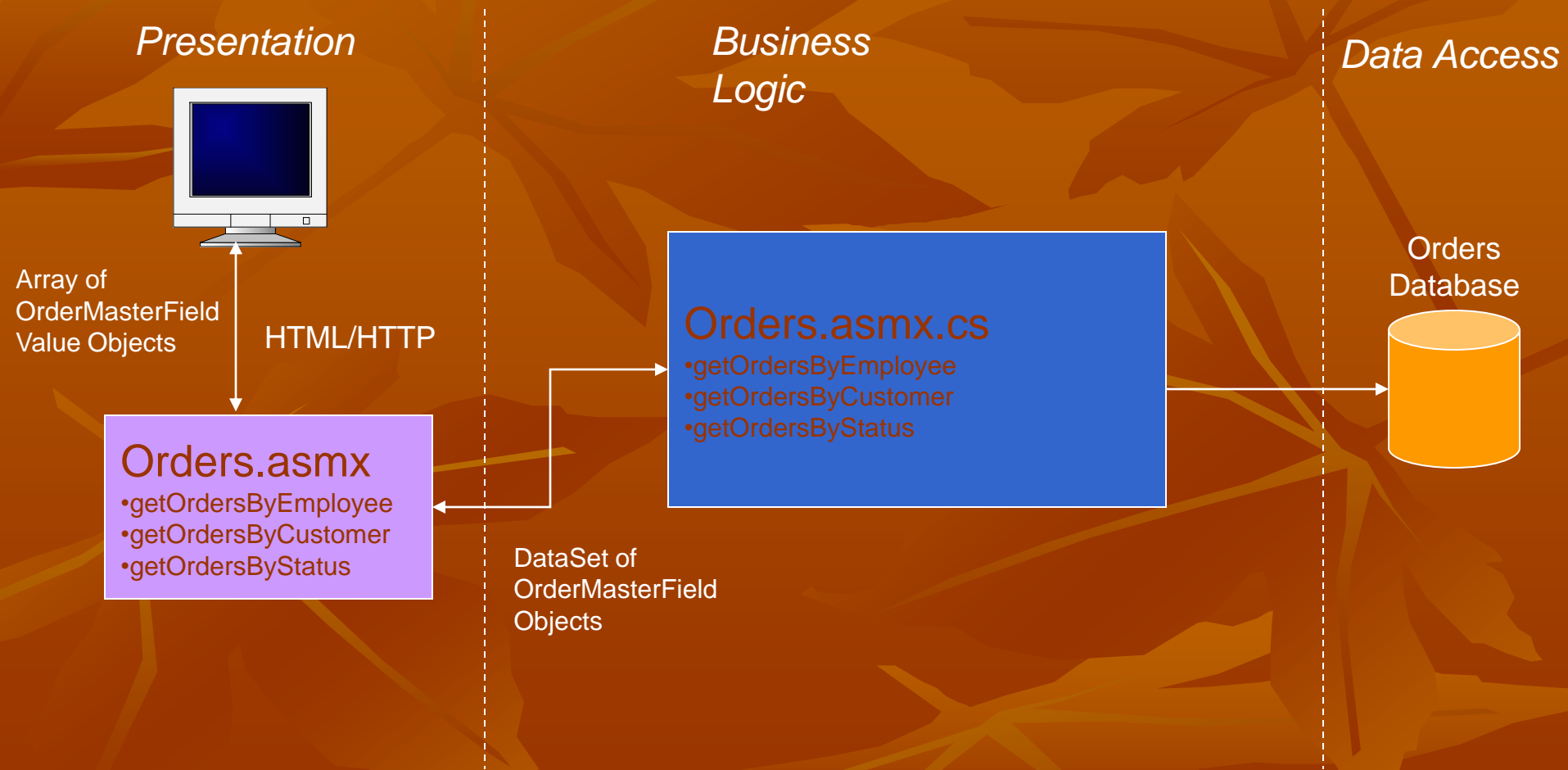
Orders.asmx.cs

- getOrdersByEmployee
- getOrdersByCustomer
- getOrdersByStatus

DataSet of
OrderMasterField
Objects

Data Access

Orders
Database



Orders in VisualStudio

The screenshot displays the Microsoft Development Environment (Visual Studio) interface. The main window shows the code for `Service1.asmx.cs` in Design mode. The code defines a `OrdersNET` class within the `OrderRetrieval` namespace. The code includes several using statements and a public class definition with a constructor and private fields.

```
using System;
using System.Collections;
using System.ComponentModel;
using System.Data;
using System.Diagnostics;
using System.Web;
using System.Web.Services;

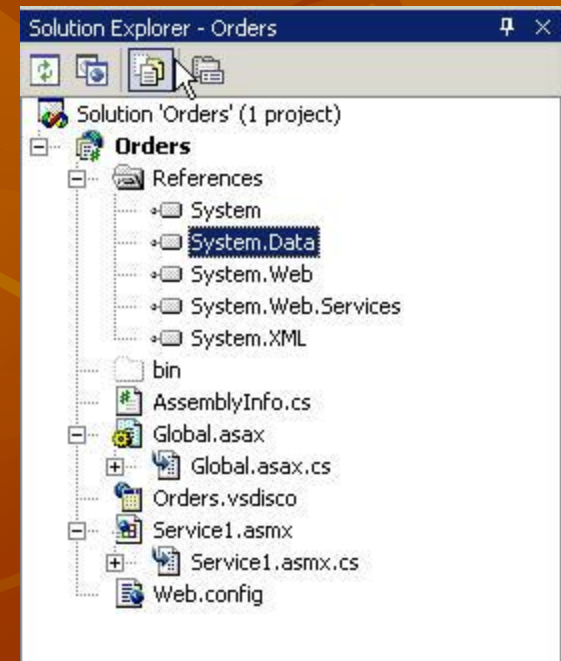
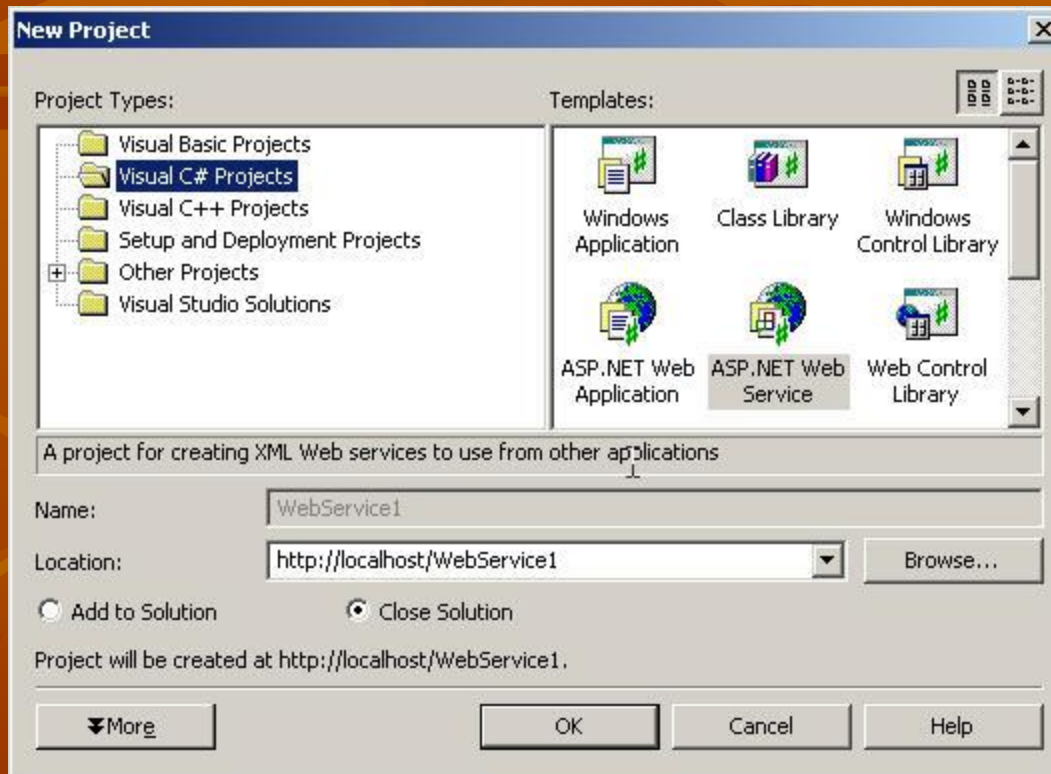
namespace OrderRetrieval
{
    /// <summary>
    /// Summary description for Service1.
    /// </summary>
    public class OrdersNET : System.Web.Services.WebService
    {
        public OrdersNET()
        {
            //CODEGEN: This call is required by the ASP.NET compiler.
            InitializeComponent();
        }

        private System.Data.OleDb.OleDbCommand oleDbCommand1;
        private System.Data.OleDb.OleDbCommand oleDbCommand2;
        private System.Data.OleDb.OleDbCommand oleDbCommand3;
    }
}
```

The Class View on the right shows the class hierarchy for `OrderRetrieval`, including `Global`, `OrdersNET`, and various methods like `Dispose(bool)`, `getOrdersByCustomer(int)`, `getOrdersByEmployee(string)`, `getOrdersByStatus(string)`, `InitializeComponent()`, and `OrdersNET()`.

The Solution Explorer at the bottom right shows the project structure for `OrderRetrieval`, including `References`, `AssemblyInfo.cs`, `Global.asax`, `OrderRetrieval.vsdisco`, `Service1.asmx`, and `Web.config`.

Create a ASP.NET Web Service



Create Web Methods for the Web Service

[**WebMethod**]

```
public DataSet getOrdersByCustomer(int customerNbr)
{
    DataSet ds = new DataSet("OrderSet");
    OleDbDataAdapter1.SelectCommand.CommandText = "SELECT
    OrderNumber, CustomerName, ExpectedShipDate FROM OrderMaster WHERE
    CustomerNbr=" + customerNbr + " ORDER BY OrderNumber";
    OleDbDataAdapter1.Fill(ds, "Orders");
    return ds;
}
```

Creating a J2EE Client for Orders

- Add the WSDL to the directory tree
- Create a service control for the .NET web service

Add a Service Control

STEP 1 Variable name for this control:

STEP 2 I would like to :

Use a Service control already defined by a CTRL file

CTRL file:

Create a service control from a WSDL

File or URL:

Make this a control factory that can create multiple instances at runtime

Creating a J2EE Client for Orders

- create an instance of the service control
- create methods that map to the web service methods
- call the web service method

```
private OrdersNETControl OrdersNETClient;  
  
public Node getOrdersByCustomer(int customerNbr)  
{  
    return (Node)  
        OrdersNETClient.getOrdersByCustomer(customerNbr);  
}
```

J2EE Client Proxies

OrdersNETControl.control

```
/** @editor-info:link source="OrdersNET.wsdl" autogen="true" */
import weblogic.jws.control.ServiceControl;

/**
 * @jws:location http-
 *   url="http://localhost/OrderRetrieval/Service1.asmx"
 * @jws:wsdl file="#OrdersNETWsd1"
 */
public interface OrdersNETControl extends ServiceControl
{
    public org.w3c.dom.Node getOrdersByEmployee
        (java.lang.String EmployeeID);
    ...
}
```

Mapping Between the Client Proxy and the WSDL

OrdersNETControl.ctrl

```
public interface OrdersNETControl extends ServiceControl
{
    public org.w3c.dom.Node getOrdersByEmployee (java.lang.String EmployeeID);
    public org.w3c.dom.Node getOrdersByStatus (java.lang.String status);
    public org.w3c.dom.Node getOrdersByCustomer (int customerNbr);
}
```

OrdersNET WSDL file

```
<s:element name="DataSet" nillable="true">
  <s:complexType>
    <s:sequence>
      <s:element ref="s:schema" />
      <s:any />
    </s:sequence>
  </s:complexType>
</s:element>
```

Request and Response Code

- the request

```
<getOrdersByCustomer xmlns="http://tempuri.org/">  
  <customerNbr>200</customerNbr>  
</getOrdersByCustomer>
```

- the response

```
<OrderSet xmlns="">  
  <Orders diffgr:id="Orders1" msdata:rowOrder="0">  
    <OrderNumber>2</OrderNumber>  
    <CustomerName>Set in Place</CustomerName>  
    <ExpectedShipDate>2002-10-02</ExpectedShipDate>  
  </Orders>  
</OrderSet>
```


J2EE Client for Orders

OrdersJ2EEClient.jws Web Service Created by BEA WebLogic Workshop

<http://HOBSONEVELYN:7001/MeasurementConversionsClient/OrdersJ2EEClient.jws>

Overview Console Test Form Test XML Warnings

Test operations

Message Log Refresh
Log is empty

getOrdersByCustomer
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getOrdersByEmployee

Call the
Orders web
service



MeasurementConversionsClient/OrdersJ2EEClient.jws

Overview Console Test Form Test XML Warnings

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Clear Log

External Service Request
Submitted at Wed Sep 11 17:08:59 MDT 2002

OrdersNETClient.getOrdersByCustomer

```
<SOAP-ENV:Envelope xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <SOAP-ENV:Body>
    <getOrdersByCustomer xmlns="http://tempuri.org">
      <customerNbr>200</customerNbr>
    </getOrdersByCustomer>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

External Service Response
Submitted at Wed Sep 11 17:08:59 MDT 2002

OrdersNETClient.getOrdersByCustomer

Return the user's
Order information
to display

How Can .NET and J2EE Interoperate?

- simple web services interoperability - SOAP, WSDL
 - J2EE client can invoke a .NET web service
 - J2EE client can use a .NET WSDL document to create a stub
 - .NET client can invoke a J2EE web service
 - .NET client can use a J2EE WSDL document to create a stub
- adding support for all XML Schema types
 - XML Schema choice → Java type ?
- adding support for .NET types
 - ADO.NET DataSet → Java type ?
- adding support for .NET SOAP extensions



Enhancing Interoperability

- SOAP interoperability issues still exist
- WSDL is at the heart of service interoperability
 - a common WSDL interface can increase reusability
 - WSDL also enables interoperability with SOAP clients
 - tools can automatically generate client-side proxies
- other best practices
 - stick with well-accepted standards (e.g., SOAP 1.2)
 - keep your data types simple
 - provide XML schema definitions for all your data types

Integration Complications...

- .NET and Java Data Types do NOT map
 - .net DataSet = ????
 - Java Vector = ????
- We like to work with Native Objects
 - DataSets, Collections, etc.

Integration Complications...

- Thoughts:
 - We Should be Thinking Service
 - We Should be Thinking Multiplatform
 - We Should NOT be Thinking RPC's
 - i.e. Method Calls
- We are Exchanging Messages
- XML is our Data Format
- XSD Should Define Message Structure

Conclusions

- Web services can be written successfully in either .NET or J2EE
- Interoperability between J2EE and .NET web services is possible today and continued improvements are coming
- Interoperability has improved dramatically
- Use common data types that can be easily serialized
- Learning a new language or paradigm might be needed

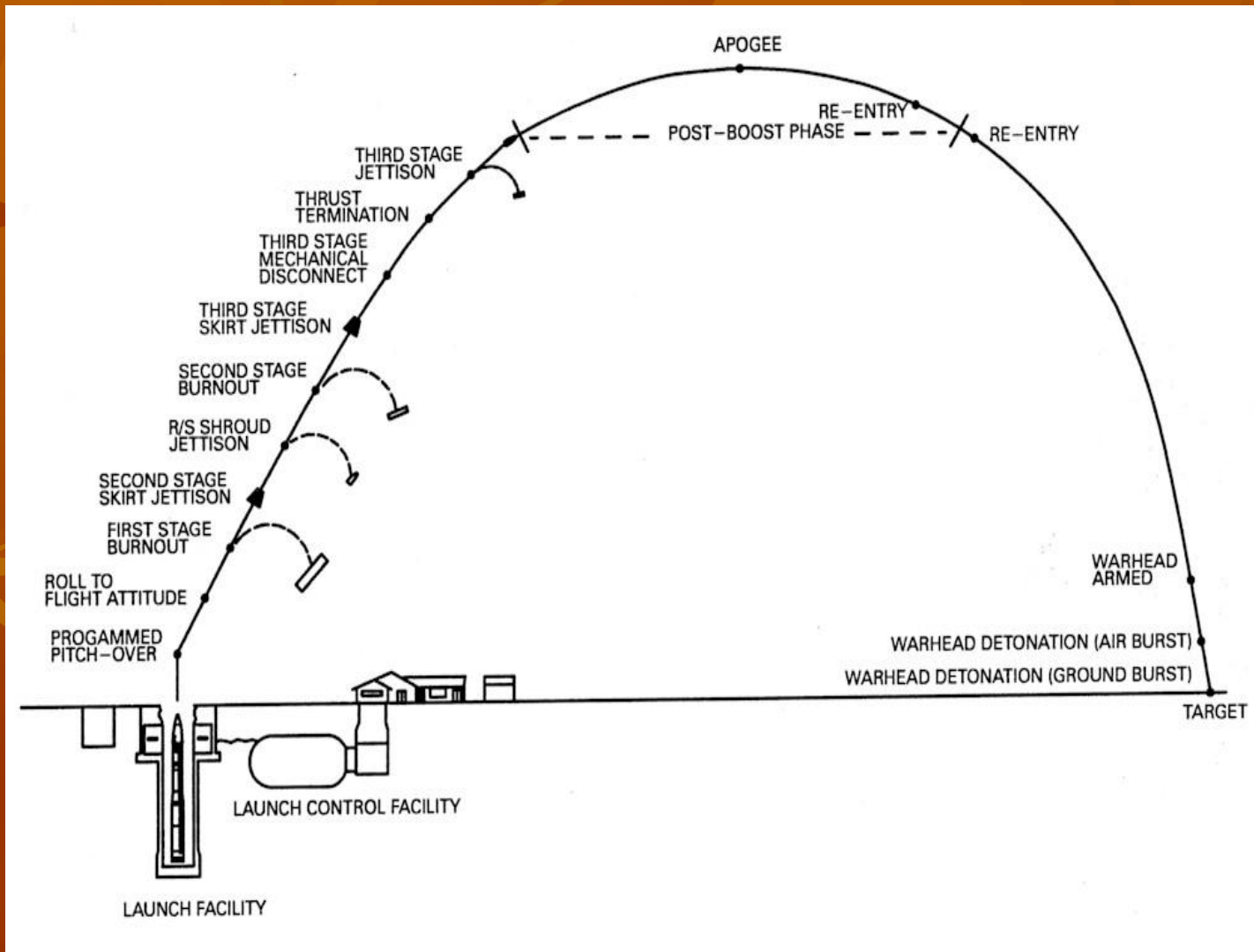
Why Borland?

- Borland is uniquely positioned to leverage both web services platforms with our hardware offerings and partnerships with Microsoft and J2EE vendors
- Borland will extend its industry-leading development software to provide an end-to-end web services management solution for both J2EE and .NET

Real Example

- United States Air force Space Command
 - Create a system to pull together (.NET, Fortran, Cobol) and other systems into one integration platform.

Air Force Space Command...



Questions

Jeff Swisher

Dunn Solutions Group

Email: jeffs@dunnsolutions.com

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