



NC VSE User Group
Greensboro, NC

Introduction to XML and Web Services

North Carolina
VSE User Group

Greensboro, NC
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Agenda

■ Introduction to XML

■ Introduction to Web Services

■ z/XML-Host

- Features
- Demonstration



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What is XML?

- A World-Wide Web Consortium (W3C) standard for structured text
- A language tool that provides a way to give more intelligence to data
- A technology which provides significant benefits for adopting organizations




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eXtensible Markup Language

- Derivative of SGML
- Created by a working group of the W3C
- Version 1.0 released in February 1998





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Benefits Offered by XML

- Open design standards
- Non-proprietary definition
- Part of the "computing democracy"
- Allows information reuse
- Increased availability of enterprise information
- Configurable information appearance



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How Does XML Do This?

- XML is platform-independent
- Data structure can be designed to support any organizational goals or requirements
- XML does not care what tools or processes you apply to your information
- XML abstracts content and structure and makes them visible to automated processes
- XML provides structured markup for documents and other information



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What is Structured Markup?

- Technique for encoding documents according to structure and content
- Strategy to make document content available to sophisticated processes
- Mechanism for labeling document components and organizing them hierarchically




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Structure, Format and Content

- Documents contain two kinds of information
 - Format and content
- Format provides clues to structure
 - Helps end users understand the document
 - Provides a framework for the content





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Structure Without Style

- XML documents do not carry formatting information inside them
- To specify how to render an XML document, you need to specify style information
- Two competing approaches
 - XSLT: eXtensible Stylesheet Language
 - CSS: Cascading Style Sheets
- Both are W3C standards





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XML Basics

- Some terms and concepts
 - Tag: the markup used to enclose an element's content. A non-empty tag has an opening and closing tag: `<xxxxx> </xxxxx>`
 - Element: a section of a document defined by start and end tags (or an empty tag), including any associated content
`<Panel-Id>IESADM.SL.IESEADM</Panel-Id>`
 - Attribute: a property associated with an XML element that's also a named characteristic of the element `<Option num="1">Installation</Option>`





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XML Basics...

- Some terms and concepts
 - Nesting: ordering of elements whereby a child element is opened and closed before the parent is closed
`<Options>`
`<Option num="1">Installation</Option>`
`<Option num="2">Resource Definition</Option>`
`</Options>`
 - Well-formed: the XML document adheres to the syntax rules
 - Parser: program or service that validates the structure of the XML document



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A Well-formed XML Document

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Generated by z/XML-Host, Copyright 2005 illustro Systems
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<Screen>
  <Panel-Id>IESADM$SL.IESEADM</Panel-Id>
  <Title>
    VSE/ESA FUNCTION SELECTION
  </Title>
  <APPLID>DBDCCICS</APPLID>
  <Options>
    <Option num="1">Installation</Option>
    <Option num="2">Resource Definition</Option>
    <Option num="3">Operations</Option>
    <Option num="4">Problem Handling</Option>
    <Option num="5">Program Development</Option>
    <Option num="6">Command Mode</Option>
    <Option num="7">CICS-Supplied Transactions</Option>
  </Options>
  <Keys>
    <Key Desc="Help">PF1</Key>
    <Key Desc="SIGN OFF">PF3</Key>
    <Key Desc="Escape (U)">PF6</Key>
    <Key Desc="Escape (m)">PF9</Key>
  </Keys>
</Screen>
```

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XML Basics...

- Reason it works so well is all "partner" systems agree on the markup content
- A "map" is used to specify the particulars
 - Document Type Definitions (DTDs) and Schemas
 - Both specify how a documents elements work together to create a specific structure
 - Many different industry defined Schemas
 - You can create your own for intra-development
- XML Document parsers use the Schemas to validate the document

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XML Summary

- XML is:
 - Character based document containing data and information describing the data
 - Vendor neutral
 - Platform neutral
 - Language neutral
 - Protocol neutral

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Definitions of a Web Service

- A Web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-process able format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP-messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.


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Definitions of a Web Service

- Some kind of function you can use across some kind of network
 - Usually involve short interactions (connect, access code, disconnect)
 - Discoverable, maybe ...
 - Described with XML
- A Web Service is the exposure of a business process over a network

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Who Defines Web Services?

- Open System Standards Organizations
 - World Wide Web Consortium (W3C)
www.w3c.org
 - Web Services Interoperability Organization (WS-I)
www.ws-i.org


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Who Defines Web Services?


- Software Vendors
 - IBM Corp.
www.ibm.com/developerworks/webservices
 - Microsoft Corp.
www.microsoft.com/webservices
 - Hewlett-Packard Company
devresource.hp.com/drc/topics/web_services.jsp



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What are Web Services?


- A new component model
- Stateless and async or sync in design
- A way to leverage XML and the power of the Web
- The latest and greatest attempt at interoperability
- A new way to develop applications



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Components of a Web Service


- Service Provider
 - Delivers services across the network
 - Publishes their services to a broker
- Service Requestor
 - Asks the broker for a service
 - Binds to the provider once its found
- Service Broker
 - Matchmaker between providers and requestors



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Operations of a Web Service

- Publish
 - Service providers advertise (or not) their services with a service broker
- Find
 - Service requestors ask the broker for a service that meets certain criteria
- Bind
 - Service requestor bind to the service provider and transaction ensue



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Behind the Technology


- XML
 - EVERYTHING is in XML
- SOAP
 - Simple Object Access Protocol
 - Protocol to make requests and receive result
- WSDL
 - Web Services Description Language
 - Describes the available services, inputs and outputs



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Behind the Technology


- UDDI
 - Universal Description, Discovery and Integration
 - Data base of available services (gets you to the WSDL)
 - API to search and update the data base



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Data Transports

- Web Service protocols do not define the physical (wire) or logical (application layer) protocol used to transmit requests and results
- Typically the TCP/IP protocols used are
 - SMTP
 - HTTP




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Data Transports

- Simple Mail Transfer Protocol (SMTP)
 - Early TCP/IP protocol
 - Multipurpose Internet Mail Extensions (MIME) support allows non-textual data
- Problems with SMTP
 - Non-textual data must be encrypted
 - Security problems
 - Data size limitations




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Data Transports

- Hypertext Transfer Protocol (HTTP)
 - Most used protocol for Web Services
 - Newer protocol (1990s)
 - Supports binary data
 - Request headers more extensible
 - Request/response model
- Other protocols are possible
 - Internet Inter-ORB Protocol (IIOP)
 - IBM MQSeries




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SOAP Design


- Vendor neutral
- Language neutral
- Platform neutral
- Transport neutral



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SOAP Server


- Usually a Web Service lives behind a SOAP Server or Web Server that understands SOAP requests
 - Handles the transport protocol (HTTP)
 - Processes the SOAP request document
 - Calls processing program passing input data
 - Creates and returns result message



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SOAP Messages


- There are request and response messages
 - A request invokes a method on a remote object
 - A response returns the result of running the method
- Requests can use either Remote Procedure Call or Document style messages



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SOAP Messages

- Most Web Services use RPC style messages
 - SOAP specification defines how calls and returns are serialized in messages
- Document style messages can transport any XML document as long as the SOAP Server knows what to do with it




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SOAP Envelopes

- A SOAP envelope contains the message itself
- The message is in an application specific vocabulary; namespaces distinguish the parts
- The envelope can contain a header, and MUST contain a body



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SOAP Request

- ```
<SOAP-ENV:Envelope
 xmlns:SOAP-ENV="..."
 SOAP-ENV:encodingStyle="...">
 <SOAP-ENV:Body>
 <m:getLastTradePrice
 xmlns:m="my-ns">
 <symbol>IBM</symbol>
 </m:getLastTradePrice>
 </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```



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### SOAP Response

- ```
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="..."
  SOAP-ENV:encodingStyle="...">
  <SOAP-ENV:Body>
    <m:getLastTradePriceResponse
      xmlns:m="my-ns">
      <price>91.77</price>
    </m:getLastTradePriceResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```



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Web Services Description Language

- If we're going to find and use web services automatically, we have to have a way to describe them
 - WSDL is used to describe a web service when it is published
 - When a service is located, WSDL is used to invoke it




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Web Services Description Language

- The WSDL file contains everything needed to make a SOAP request
 - The address of the machine that hosts the service
 - The name of the service
 - The name of the method
 - The name and types of the arguments to the method



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SOAP and WSDL

- In reality, we will write our client code to a known programming interface
 - We will know the method name and number and type of arguments ahead of time
- But, this information in the WSDL will be used by our tools to automatically handle many of the details for us



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Universal Description, Discovery and Integration

- A set of XML elements that describe how to query, insert, update, or delete elements in a Web services registry
- Does NOT define:
 - Which operating system to use
 - Which programming language to use
 - Which object model to use
 - Which wire protocol to use (HTTP, FTP, SMTP etc.)



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Using UDDI

- UDDI defines the operation of a service registry:
 - Data structures for registering
 - Businesses
 - Technical specifications
 - Service and service endpoints
 - SOAP Access API
 - Rules for the operation of a global registry
 - "private" UDDI nodes are likely to appear, though
 - Everything that goes into or comes out of a registry is in XML
 - All communication with a UDDI registry is done through SOAP calls



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Web Services Discovery



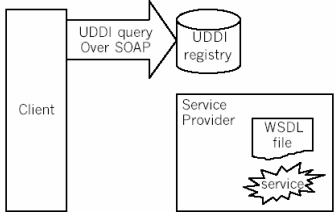
- One of the most powerful concepts of Web Services is services discovery
- All of the key pieces of information to be given to the SOAP client can be given at runtime
- Quick example of how SOAP, UDDI and WSDL work together




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Web Services Discovery...



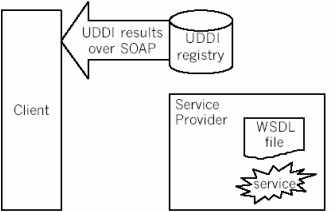
Step 1. The client queries the UDDI registry for a service




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Web Services Discovery...

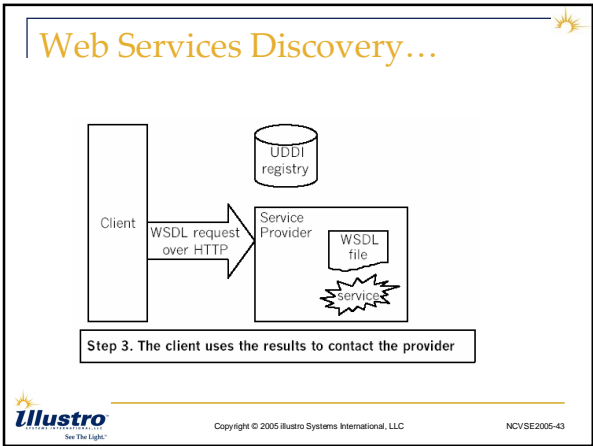


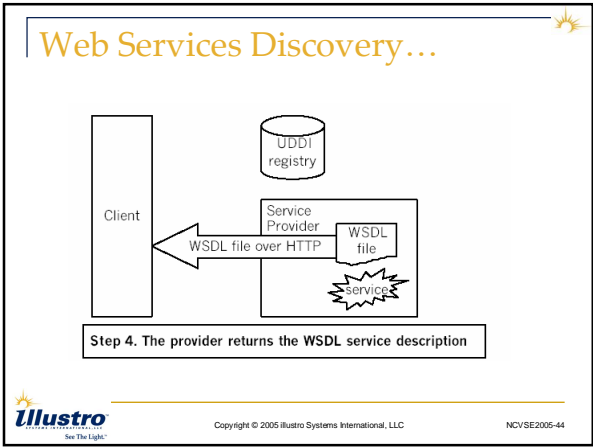
Step 2. The UDDI registry sends the query results back

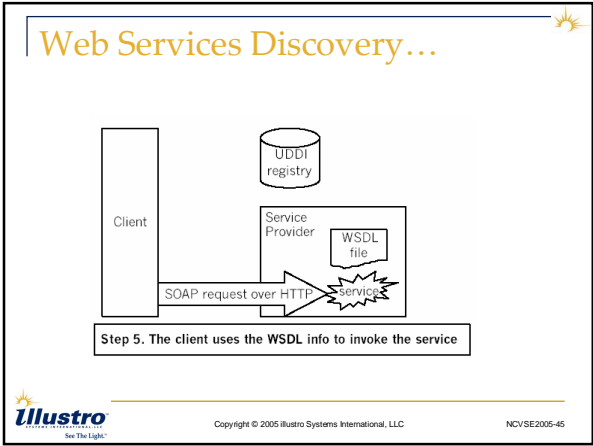


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Web Services Discovery...

The diagram illustrates the Web Services Discovery process. A 'Client' box on the left sends a request to a 'Service Provider' box on the right. The 'Service Provider' box contains a 'WSDL file' and is connected to a 'UDDI registry' box above it. An arrow labeled 'Service results over HTTP' points from the 'Service Provider' back to the 'Client'. A starburst graphic is next to the arrow. Below the diagram, a box contains the text 'Step 6. The service delivers the requested data'.

Step 6. The service delivers the requested data

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Web Services Are Different

- You can:
 - Use any Operating System
 - Use any programming language
 - Use XML to represent data universally
 - Dynamically discover and invoke components at runtime

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Mainframe Resources


- VSE/ESA 2.7 and z/VSE
 - SOAP Server/Client
 - SOAP Server allows CICS programs to be called as a Web Service from any SOAP-enabled platform
 - SOAP Client can be used by a CICS program to invoke a Web Service on another SOAP-enabled platform
 - Implemented as a CICS program using CWS
 - XMLAPI
 - Callable by CICS or batch programs
 - Provides creation or parsing of XML documents

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Summary – Web Services

- Companies may start on their Intranet
 - Discover the benefits of platform/database/language independence, they may start sharing with customers, vendors, suppliers and partners
- Incredible chance for success
 - Open standard
 - Non-proprietary
 - Same type of revolution that TCP/IP brought
- It's up to you—at this point in time you are way ahead of the game just with this much knowledge
- Chart the course! The future is yet to be defined!




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Summary – Web Services...

- For z/VSE and z/OS

```
<Software>  
  <Self Promotion>  
    illustro's z/XML-Host  
  </Self Promotion>  
</Software>
```



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Resources

- World Wide Web Consortium
 - WWW.W3C.org
- Web Services Interoperability Organization
 - WWW.WS-I.org
- OASIS
 - www.oasis-open.org
 - www.uddi.org



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Resources


- IBM developerWorks
 - Ibm.com/developerworks/webservices
 - Ibm.com/developerworks/speakers/dtidwell
 - Ibm.com/developerworks/speakers/colan
- IBM Redbooks
 - redbooks.ibm.com
- IBM alphaWorks (WSTK)
 - www.alphaworks.Ibm.com/webservices



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Resources

- Apache Web Services Project
 - ws.apache.org
- LOTS of books are available
 - Professional XML Web Services
Wrox Press, ISBN 1-861005-09-1
 - Developing .NET Web Services with XML
Syngress Publishing, ISBN 1-928994-81-4



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Our Solution for 3270 Applications



- Available since WAVV 2002 (Ft. Mitchell KY)



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z/XML-Host Features

- Works just like z/Web-Host except XML documents are generated
- Provides information to other programs instead of humans
- Combine data from multiple 3270 screens into a single user designed XML document
- Can be used interactively from a client program



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z/XML-Host Features

- Can be used as a SOAP Server
 - Single request/response per session
- XMLScreen definitions use AAF statements
 - Automatically navigate applications
 - Gather data to be returned
 - Specify XML Template to generate returned document



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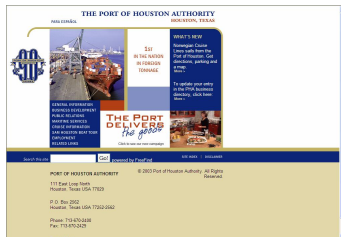
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Example VSE XML Application

Port of Houston Authority

Ranked first in the United States in foreign waterborne commerce, second in total tonnage, and sixth in the world.

About 190 million tons of cargo moved through the Port of Houston in 2003.




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Example VSE XML Application

- At PHA z/XML-Host is the interface between:
 - Container Information System (CONICS)
 - Internally developed
 - CICS, VSAM, COBOL application
 - JAVA based Shipping Container Management System from Navis LLC.
 - Commercial software package
 - JAVA, XML application




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Example VSE XML Application...

- According to Navis:
<http://www.navis.com/images/pr/PortOfHouston.042204.pdf>
PHA plans to enhance their customer service offering by providing terminal constituents with realtime access to key information through Navis WebAccess. Shipping lines, truckers and agents will also conduct transactions and business processes over the web.




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Example VSE XML Application...

- According to Navis...

Navis WebAccess will be integrated with PHA's current terminal operating system through the Navis Third Party Host Interface. The Third Party Host Interface allows terminals to utilize their current terminal operating system and preserve their investment while enhancing functionality.



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z/XML-Host Information

■ Product information

www.illustro.com/zxmlhost.htm

■ Download and install

www.illustro.com/downloads.htm

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