WAVV 2004
Chattanooga, TN

XML and Web Services for

DUMMIES

A primer to the emerging trend in Internet computing

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Agenda

- Evolution of Web Services
- XML Basics
- Web Services Basics
- Mainframe resources
- Additional information and resources

XML
XSLT
UDDI

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illustro Education

- Members of the illustro team have a long history of educating the VSE community on emerging standards
  - BTAM to VTAM
  - TCP/IP education and implementation before Connectivity Systems had a product (Openconnect product)
  - HTTP, Web and Internet connectivity
  - CICS Transaction Server
  - …and now, a new technology: XML and Web Services

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Why Are We Here?

- Vendor race to define "the" standard that all will use
  - Database
  - Programming language
  - Interface
  - Operating System
- All solutions by definition are proprietary

The Problem with Proprietary

- The Evil Empire (whichever one) dictates all we do
- Decisions made in a vacuum, drunk on their own wine
- When dominance is achieved, there's no room for negotiation
- HOSTAGE!

Evolution of Web Services

- Evolved from distributed computing
- Computing models changed
  - Mainframe – all centralized
  - Advent of PCs and local networks
  - Early 1990s object frameworks emerged
    - Component Object Model (COM) – Microsoft
    - Common Object Request Broker Architecture (CORBA) from the OMG

Evolution of Web Services…

- Both COM and CORBA were models for encapsulating objects that can be called in a standard way from any application that supports <u>either one</u>
- COM and CORBA were not interoperable; one or the other
- Still islands of data

Islands of Data!

And finally, do you feel your client/server environment keeps you well connected to your department?

Evolution of Web Services…

- In the 1990s as LANS continued to multiply, new standards were developed for extending these frameworks across networks
  - OMG – Internet Inter-ORB Protocol (IIOP)
  - Microsoft – Distributed COM (DCOM)
  - Sun – Remote Method Invocation (RMI) for Java
- Using Remote Procedure Call (RPC), components call components across the network
  - But only within the component architecture—not interoperable

Evolution of Web Services...

- CORBA/IIOP and DCOM are both "Stateful" architectures
  - Server must hold state information, such as the callers address, longer than just a single request and reply
  - Connection oriented
- In "Stateless" architectures, server does not require connections longer than a single request/response
- 3270 Session – Stateful
- HTTP-Browser – Stateless

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Evolution of Web Services...

- These protocols also work synchronously
  - Other side must be available
  - Conversation must take place when initiated
- Asynchronous means one-way messages can be sent, acted upon when the service is available
  - IBM's MQSeries
  - Microsoft Message Queuing (MSMQ)

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Evolution of Web Services...

- Applications work well within similar networks, and same architectures
- Many cases they are tied to vendor definitions—DCOM Windows, CORBA/IIOP-Java
- Advent of Internet made the "network" extremely large and decentralized
- Synchronous, stateful interactions aren't feasible

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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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W3C WORLD WIDE WEB consortium

Benefits Offered by XML

- Open design standards
- Non-proprietary definition
- Part of the "computing democracy""
- Allows information reuse
- Improved lifecycle management
- Increased availability of enterprise information
- Locate and deliver information efficiently
- 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 Harmonizes Disparate Data Sources

- User can view and manipulate data coming from varying storage types
- XML acts as common interface between users and datastore content
  - eliminates need to maintain multiple tools
  - makes data interoperable on client side

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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:
  - Element: a section of a document defined by start and end tags (or an empty tag), including any associated content
    <Panel-Id>IESADMSL.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>
</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" standalone="yes" encoding="UTF-8"?>
<!-- Generated by z/XML-Host, Copyright 2004 illustro Systems
International, LLC -->
<Screen>
    <Panel-Id>IESADMSL.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 processor uses the Schemas to validate the document

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What are Web Services?

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

Web Services as "MiddleWare"
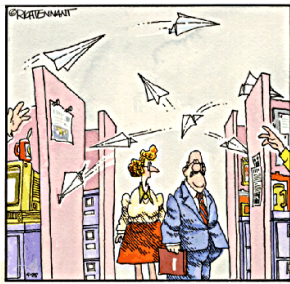
"CLEARLY, THE ISSUE OF MIDDLEWARE NEEDS TO BE ADDRESSED AS SOON AS POSSIBLE."

Three Key Standards

- SOAP – Simple Object Access Protocol
- WSDL – Web Services Description Language
- UDDI – Universal Description, Discovery and Integration Protocol

3 Key Standards - SOAP

- A protocol for accessing remote objects using XML
- 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.)

SOAP…

- SOAP 1.1 defined:
  - An XML envelope for XML messaging,
    - Headers + body
  - An HTTP binding for SOAP messaging
    - SOAP is "transport independent"
  - A convention for doing RPC
  - An XML serialization format for structured data
- SOAP Attachments adds
  - How to carry and reference data attachments using a MIME envelope and a SOAP envelope

SOAP…

3 Key Standards - WSDL

- A set of XML elements that describe the interface to a Web service
- 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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WSDL…

- Provides functional description of network services:
  - Protocol and deployment details
  - Platform independent description
  - Extensible language
- A short history:
  - WSDL v1.0, 9/2000
  - WSDL v1.1 submitted to W3C 3/2001.
  - A *de facto* industry standard.

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Using WSDL

- Allows industries to define standardized service interfaces
- Allows advertisement of service descriptions, enables dynamic discovery and binding of compatible services
  - Used in conjunction with UDDI registry
- Provides a normalized description of heterogeneous applications

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3 Key Standards – UDDI

- 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
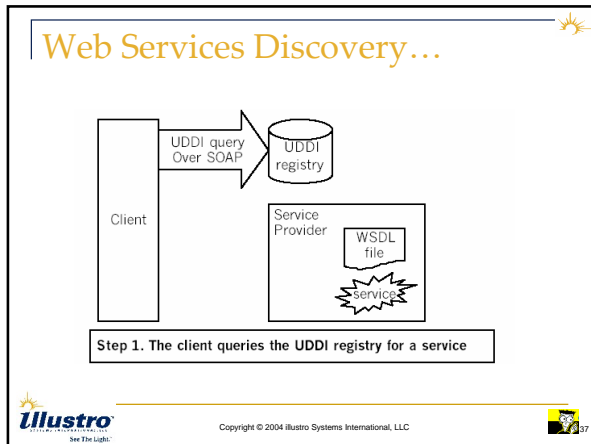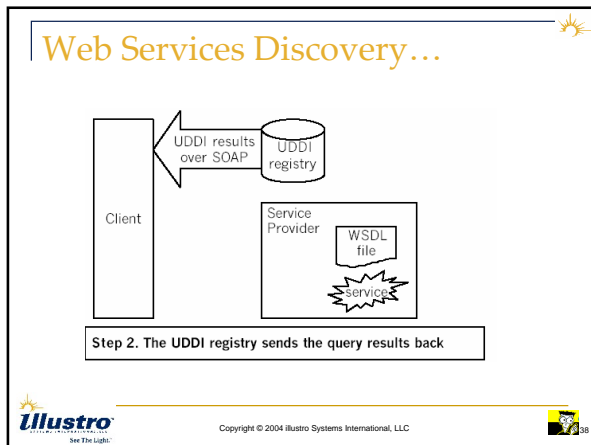
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Web Services Discovery

- 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…
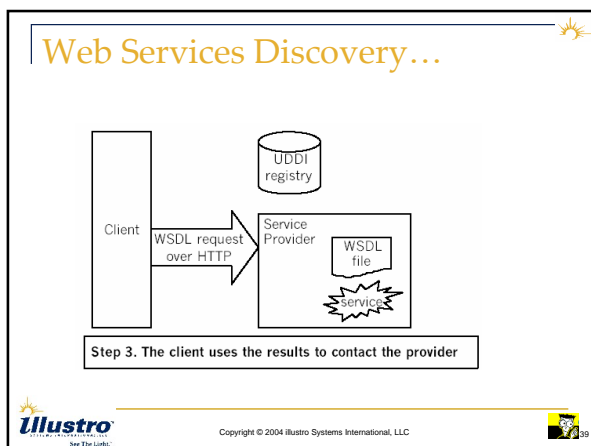

Step 2. The UDDI registry sends the query results back

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Web Services Discovery…

Step 3. The client uses the results to contact the provider

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Web Services Discovery…

UDDI
registry

Client

Service
Provider

WSDL
file

WSDL file over HTTP

service

Step 4. The provider returns the WSDL service description

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Web Services Discovery…

UDDI
registry

Client

Service
Provider

WSDL
file

SOAP request over HTTP

service

Step 5. The client uses the WSDL info to invoke the service

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Web Services Discovery…

UDDI
registry

Client

Service
Provider

WSDL
file

Service results over HTTP

service

Step 6. The service delivers the requested data

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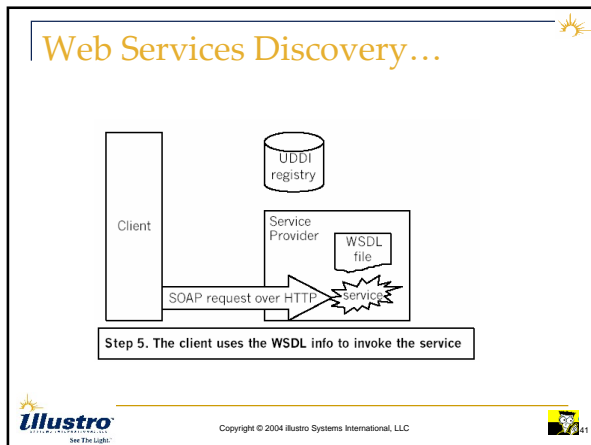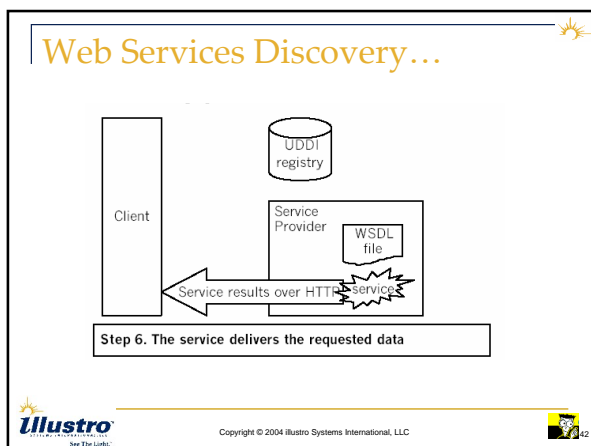## Web Services Are Different

- 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
  - 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
- For VSE/ESA and OS/390

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

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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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More Reading and Resources

- XML
  - www.w3c.org/XML
  - www.xml.com
- SOAP
  - www.w3c.org/TR/soap
- WSDL
  - www.w3c.org/TR/wsdl
- UDDI
  - www.uddi.org
- illustro's z/XML-Host
  - www.illustro.com/zxmlhost.htm