



# Web Services NOW!

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# ***B2B Exchange with XML***

## **Flexible data formats**

- ▶ systems less likely to break as software evolves
- ▶ easier integration

## **Data representation is independent of:**

- ▶ hardware platform
- ▶ operating system
- ▶ programming language
- ▶ object model
- ▶ delivery device

**Besides B2B, XML is perfect  
for Enterprise Application Integration**

## ***XML: where the industry is now***

**Many important base technical standards are now W3C recommendations (<http://w3.org>)**

- ▶ XML Schema is a W3C Recommendation (May 2001)
- ▶ XSL Formatting Objects is now a W3C Recommendation
- ▶ XML Signature is a W3C Proposed Recommendation

**OASIS has established XML.ORG as the registry and repository for industry-specific vocabulary standards**

**xml.apache.org has robust, mature implementations of XML parser, XSL processor, and SOAP4J as open-source implementations, and much more countless products using XML from all vendors**

- ▶ IBM products: XML features in WebSphere (etc) are mature; XML Features available for 3+ releases

# *Is XML enough?*

## **The XML family of standards gives us**

- ▶ standard, portable business data description
- ▶ powerful and effective data integration
- ▶ standards for defining the expected data that enable comprehensive automatic validation
- ▶ standards for transforming data
- ▶ the beginnings of a security model

## **...but there is no standard way to exchange data between application systems!**

- ▶ and no way to support Business Process Integration

## **What's the solution?**

- ▶ Build a new layer of standards on top of the existing XML family of standards for this purpose.



# *The Expanding Internet Foundation*

Common Interoperability Standards for e-business are layered like rings of a tree



# Web Services: A Simple View

## “Web services” is how

- ▶ businesses describe functionality (services) they want to externalize
- ▶ businesses publish that information
- ▶ businesses discover services
- ▶ businesses connect to each other and invoke services with appropriate security, reliability, and confidentiality

## If XML defines a platform-independent way of representing data,

- ▶ making data integration easy and standard

## ...then Web services defines a platform-independent way of exchanging that data.

- ▶ process-level integration becomes easy

This is all moving very quickly because, basically, **it is a really good idea.**

# Why Web services?

## Not everyone will use the same

- ▶ Operating system
- ▶ Hardware or delivery device
- ▶ Programming language
- ▶ Distributed object system
- ▶ Database or other application

we need to  
integrate systems  
regardless of their  
implementation

## We want and need:

- ▶ to move from monolithic, custom-coded apps to choreographed, scripted components.
- ▶ agility and flexibility to reconfigure business functions to try new process models.
- ▶ to move from tightly coupled systems to loosely coupled ones to deal with inevitable change.
- ▶ a well-understood programming model for connecting businesses via the Internet.

# *Key Web Services Technologies*

## **SOAP: Simple Object Access Protocol**

- ▶ XML as a message protocol

## **WSDL: Web Services Description Language**

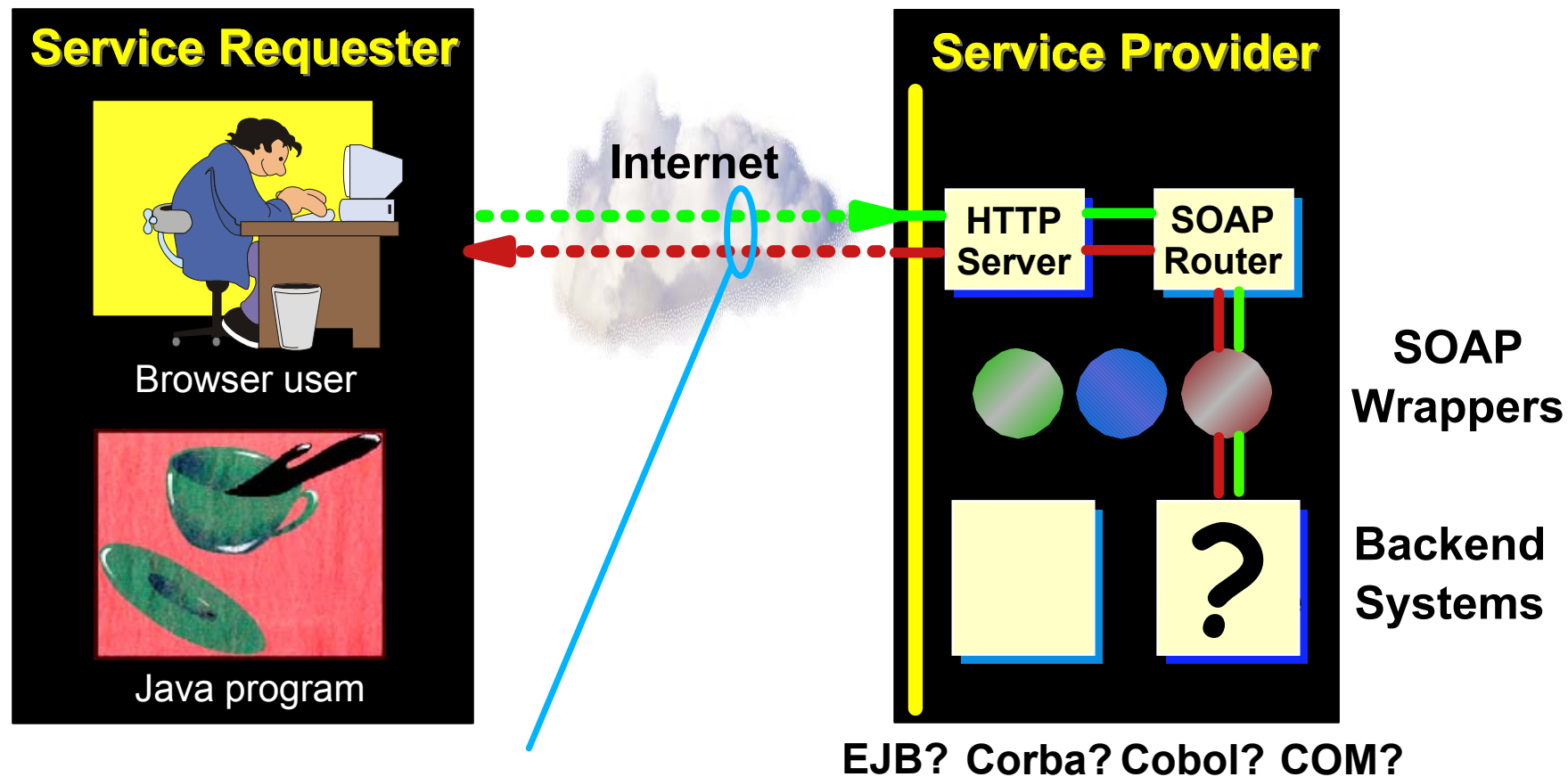
- ▶ describe integration requirements

## **UDDI: Universal Description, Discovery, Integration**

- ▶ publish and find available services



# SOAP hides the technology choices and implementation details from both parties



**Simple, standard XML messages**

- we only care about message format and content
- the less we know about the implementation details, the less work for us!

# *Why SOAP Will Succeed*

**Other distributed technologies failed on the Internet because they strongly coupled the endpoints and therefore could not become pervasive:**

- × **Unix RPC - requires binary-compatible Unix implementations at each endpoint**
- × **CORBA - requires compatible ORBs**
- × **RMI - requires Java at each endpoint**
- × **DCOM - requires Windows at each endpoint**
  
- ✓ **SOAP is the platform-neutral choice**
  - simply an XML wire format
  - places no restrictions on the endpoint implementation technology choices

# UDDI Roles and Operations

## Service Registry

- ▶ provides support for publishing and locating services
- ▶ like telephone yellow pages

## Service Provider

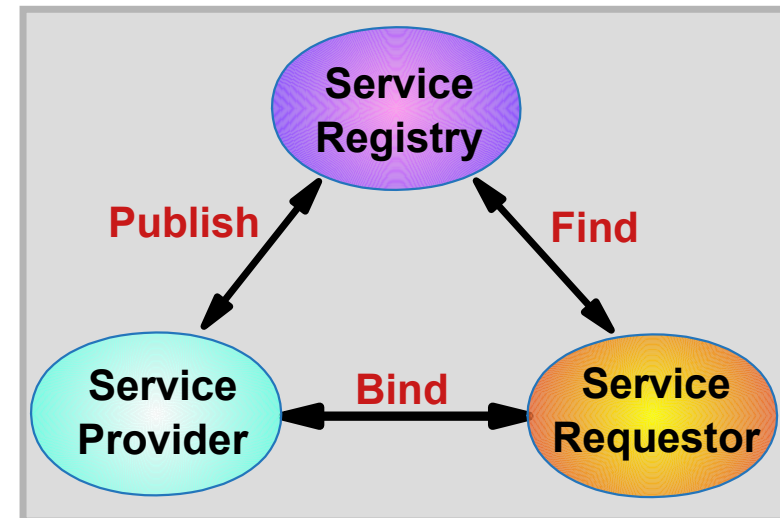
- ▶ provides e-business services
- ▶ **PUBLISH**es availability of these services through a registry

## Service Requestor

- ▶ **FIND**s required services in the Service Registry
- ▶ **BIND**s to services from Service Provider

## UDDI defines **publish** and **find** messages ("API")

- ▶ the service provider defines **bind** operations according to application-specific service requirements
- ▶ see <http://uddi.org> for complete specifications



# WSDL: Web Services Description Language

## an XML Vocabulary

- ▶ similar in purpose to IDL, but in XML form

## operational information about the service

- ▶ everything an IDE needs to know to help you integrate the service into your application

## WSDL is the convergence of IBM's NASSL and Microsoft's SDL

- ▶ Submitted to W3C by 25 companies

**We'll see the important role WSDL plays when we look at Web Services tooling later....**

Prolog

Types

Messages

Port Types

Operations

Bindings

# Security

**There is no such thing as security:**

**There are risks, and there are countermeasures.**

- ▶ Start with a risk assessment, then consider the countermeasures

**Some say HTTPS provides enough security for Web Services...**

- ▶ identification
- ▶ authentication
- ▶ integrity
- ▶ confidentiality

**...but there are reasons why security at the protocol level is not an adequate solution.**

# ***New Standards for Message-level Security***

## **Some works in progress:**

- ▶ XML Signature ("digital signatures") - w3c
- ▶ XML Encryption - w3C
- ▶ SAML - OASIS: authorization
- ▶ XACML - OASIS: access control
- ▶ XKMS - key management system

## **Want to learn more?**

- ▶ Papers
  - [ibm.com/developerworks/webservices](http://ibm.com/developerworks/webservices)
- ▶ SOAP: Security & Reliability, issues and solutions
  - status of public XML security specifications
  - PDF of my presentation
  - [ibm.com/developerworks/speakers/colan](http://ibm.com/developerworks/speakers/colan)

# Reliability

The delivery of messages over a reliable protocol is an essential component for middleware in e-business systems

**"Reliable" means:**

- ▶ The message is delivered exactly once, OR
- ▶ We reliably get an "undeliverable" report

**Fortunately, HTTP is a reliable protocol!**

- ▶ ...unless, of course, something goes wrong

**IBM's Proposal: HTTPR**

- ▶ reliability in the protocol layer
- ▶ don't want surface any work at app level
- ▶ minimal set of changes to achieve goal

**For more info:**

- ▶ "A Primer to HTTPR" on [ibm.com/developerworks](http://ibm.com/developerworks)

# *Where IBM is coming from*

## **Enterprise software**

- ▶ WebSphere (web app server), MQ Series (enterprise reliable messaging), DB2 (database), transactions, etc.

## **Services**

- ▶ 100K+ people in IBM Global Services dealing with solutions in heterogeneous customer environments

## **e-business**

- ▶ 5+ years of implementation experience in helping businesses combine IT and the web to their advantage





# ***IBM's Web Services Strategy***

**Support and help lead open standards efforts in the W3C, OASIS, ebXML, and elsewhere.**

**Get code to developers quickly via alphaWorks and support open source efforts in Apache and elsewhere.**

- ▶ [xml.apache.org](http://xml.apache.org)
- ▶ [ibm.com/alphaworks](http://ibm.com/alphaworks)
- ▶ [ibm.com/developerworks/oss](http://ibm.com/developerworks/oss)

**Add product support in WebSphere, MQ Series, DB2, Lotus Notes, Tivoli, etc.**

**Build customer solutions.**

# IBM and Web Services Standards

## IBM is leading the industry in developing the specifications needed to create Web Services standards

- ▶ worked with Microsoft to make SOAP vendor-neutral
- ▶ created first platform-neutral SOAP 1.1 implementation
  - then gave it away to Apache Software Foundation
- ▶ created WSDL in cooperation with Microsoft
- ▶ created UDDI.org (along with Microsoft and Ariba)
- ▶ created WSFL for composition and workflow coordination of web services
- ▶ HTTPR: proposed changes to HTTP to provide a reliable protocol as an underpinning to SOAP messaging
- ▶ called and led a meeting to propose new W3C working groups

**Note: there are not yet any finished standards...**

- ▶ SOAP and WSDL have been proposed to the W3C

# *IBM and Open Source*

## **IBM contributed key XML technologies to Apache**

- ▶ Xerces: XML parsers (Java and C++)
- ▶ Xalan: XSL processors (Java and C++)
- ▶ SOAP4J: platform-neutral SOAP 1.1 implementation
- ▶ we contribute the time of individuals or teams that continue to develop these tools
- ▶ <http://xml.apache.org>

## **IBM also has its own open-source repository**

- ▶ UDDI4J - Java classes whose methods map to the UDDI access API, do all the work
- ▶ WSDL4J - Java classes to build or manipulate WSDL documents in memory; implementation of JSR 110.
- ▶ <http://ibm.com/developerworks/oss>

# ***Web Services in WebSphere Application Server 4.0***

**WAS4 is the industry's premier production-ready Web app server for deploying Web Services solutions for dynamic e-business**

## **Integrated support for Web Services**

- ▶ SOAP - Simple Object Access Protocol
- ▶ UDDI - Universal Description, Discovery, Integration
- ▶ WSDL - Web Services Description Language
- ▶ enables powerful interoperability between Web Services and J2EE applications

## **Security:**

- ▶ HTTPS support
- ▶ Implementations of XML Signature and Encryption

# *WebSphere Studio Application Developer*

## **Terrific, extensible development environment for**

- ▶ XML development
- ▶ Web Services Development

## **Built on eclipse open-source tooling platform**

- ▶ add third-party tools, or write your own!

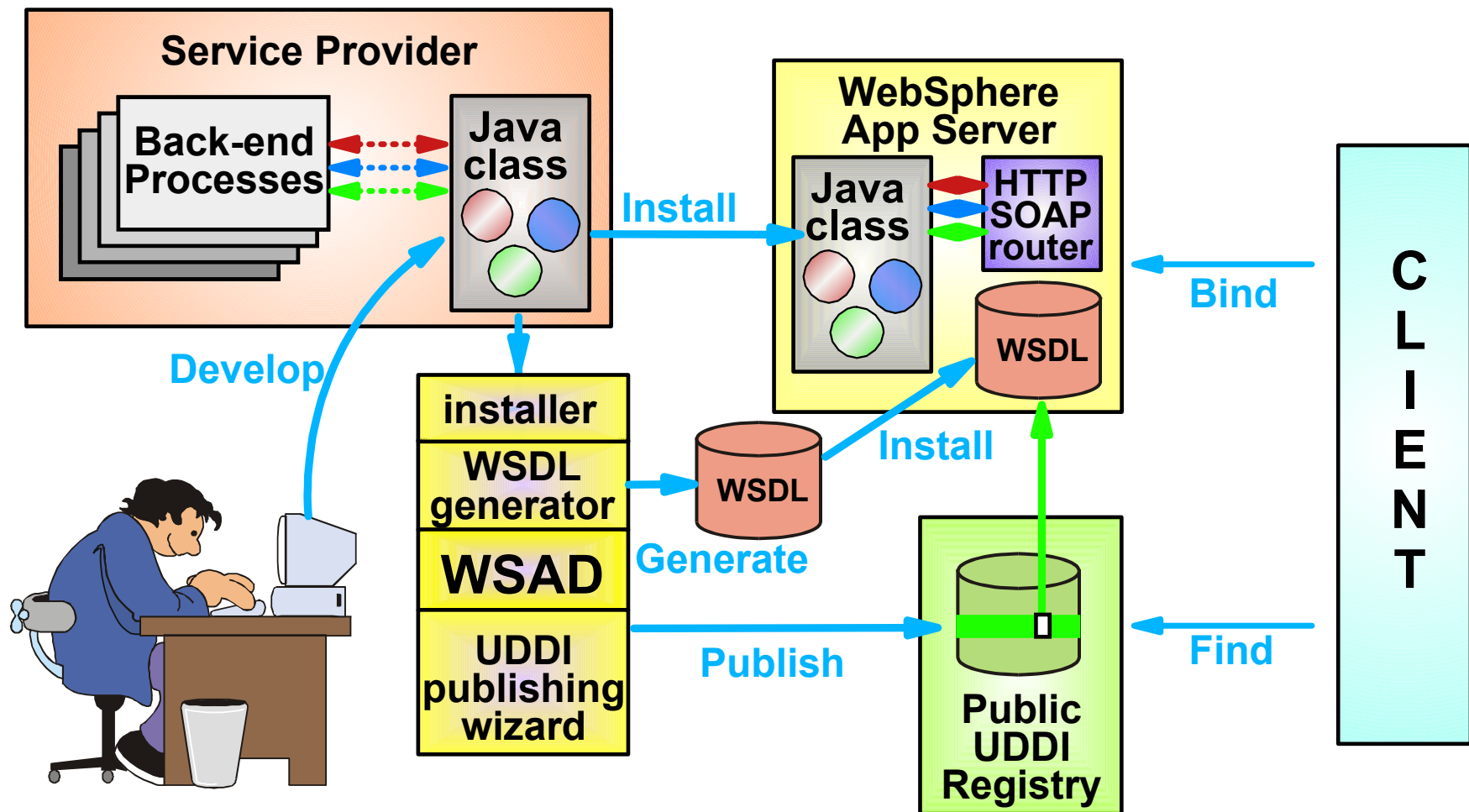
## **Tight integration with WebSphere App Server**

### **For Web Services:**

- ▶ a set of tools to speed the deployment of a Web service
- ▶ a set of tools to help you find and speed the integration of a Web service

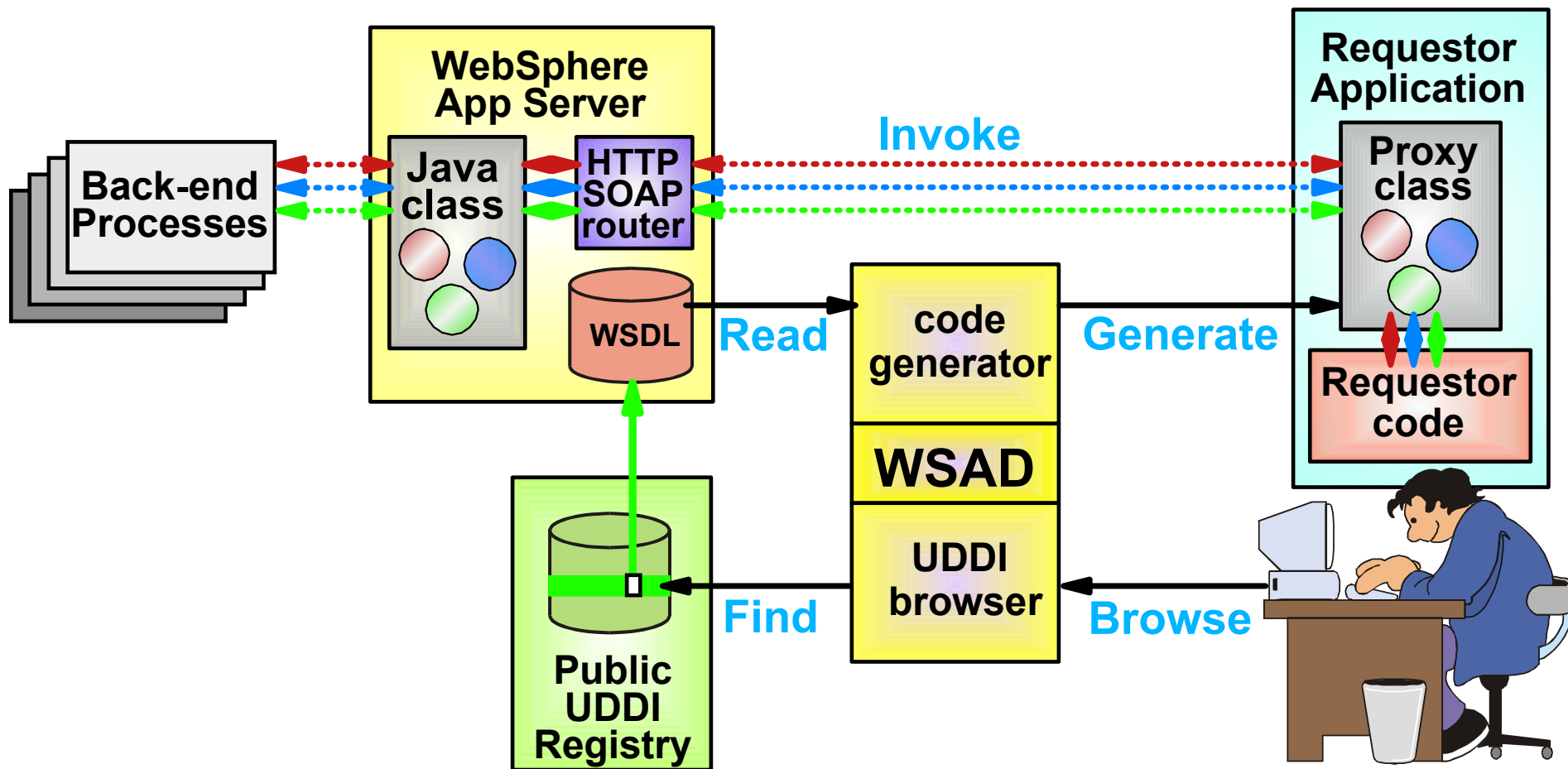
# WebSphere Studio App Developer: speeding *deployment* of Web Services

1. You **develop** a Java class for the service provider to be deployed
2. WSAD **generates** a service description by introspecting your class
3. WSAD **installs** code and WSDL description on the server
4. WSAD wizard **publishes** the availability of the service to UDDI
5. Client **finds** your service via UDDI then **binds** to your code



# WebSphere Studio App Developer: speeding *integration* of Web Services

1. You use UDDI browser in WSAD to **find** the service you want
2. WSAD **reads** the service description and sets up environment
3. WSAD **generates** a Web service proxy class for local use
4. You **call methods** on the service proxy class just like local code
5. Service proxy class **invokes** the service for you via SOAP messages



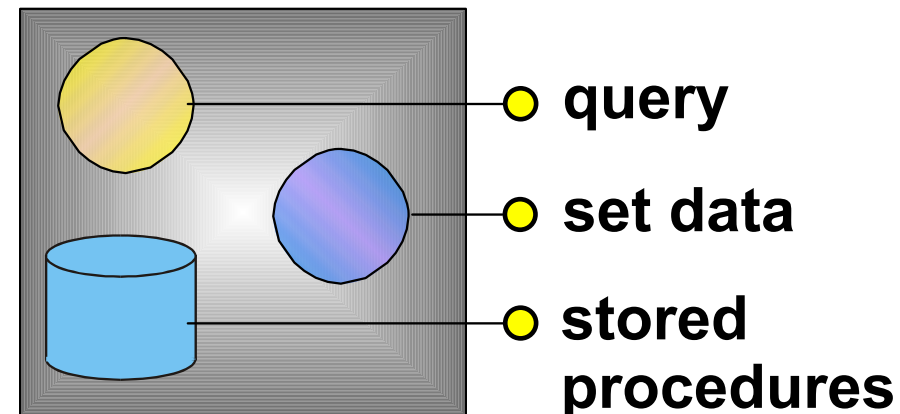
# DB2 Universal Database / XML Extender

## XML Extender current version:

- ▶ XML import and shred across tables
- ▶ XML export and recomposition
- ▶ XPath to SQL query transformation
- ▶ flexible configuration using XML-syntax Document Access Definition

## Web Services features coming in next version:

- ▶ query and set data functions available via web services
- ▶ database management functions via web services
- ▶ stored procedures accessible thru web services





# *Web Services in other IBM Products*

## **WebSphere MQ Series**

- ▶ technology preview of SOAP in WSTK 2.3
- ▶ integrated into next release of the product

## **Lotus:**

- ▶ enable Domino Services as Web Services
- ▶ incorporate SOAP interfaces, XML-based messaging
- ▶ other products will explore web services features for collaborative products like instant messaging

## **Tivoli:**

- ▶ management and security for Web Services deployment

# ***IBM alphaWorks***

***<http://ibm.com/alphaWorks>***

## **Hundreds of tools for Web Services, XML, Java**

- ▶ early versions of features that may be in products
- ▶ some are solid production-code (XML4J, LotusXSL)
- ▶ some are experimental, prototypes
- ▶ free download and use

## **Some recent Web Services downloads:**

- ▶ Web Services Toolkit 3.0 and demos
- ▶ Web Services Hosting Technology
- ▶ Web Services Process Management Toolkit
- ▶ Web Services Invocation Framework
- ▶ Web Services Gateway
- ▶ WSDL Toolkit

## Web services zone



## Web service invocation sans SOAP





Web Services Invocation Framework creates an interface that is independent of the transport mechanism used by a service. It allows the developer to [invoke Web services by using the Web Services Description Language directly](#), thus completely hiding the transport layer interactions. (Articles)

- [Using WSDL in a UDDI registry, Part 2](#): We continue this series with an introspective on the various programming scenarios of using WSDL in a UDDI registry environment. (Articles)
  - [Using WSDL in a UDDI registry, Part 1](#): This paper discusses the specifics of dealing with WSDL in UDDI registry environments to allow services to search for each other. It expands the guidelines given by UDDI.org on how WSDL can work with UDDI with more concrete detail. (Articles)
  - [SOAP security extensions: digital signature](#): Satoshi Hada explains how Digital Signatures, SSL, and SOAP can work together in a cohesive, complementary, and standards-based system. (Articles)
  - [Web services and short messaging](#): This is a case study on the development of a Web services-enabled implementation of the Short messaging service used in cellphones, 2-way pagers, and wireless PDAs. (Articles)
  - [Web services and XML technologies CD](#): This recently updated CD offers articles, tutorials and tools to keep you up to date with the latest XML and Web services developments from developerWorks and alphaWorks. (Articles)
- **dW theme:** [Code reuse](#): Be the master of your code.

## Discussion forums

- [Web services technical](#): Get answers to questions on designing, implementing, and managing vendor-independent Web services. (Forums)

## Columns

-  **Web services architect, Part 3** by Dan Gisolfi  
The Web services architect examines the structural differences between [Web services and CORBA](#).
-  **The Web services insider, Part 9** by James Snell and Maryann Hondo  
The Insider defines the questions we should be asking about [Web services security](#). **New!**
-  **The Web services (r)evolution, Part 4** by Graham Glass  
In this [installment](#), Graham explains WSDL, how to describe the core properties of a Web service, and introduces tools that leverage WSDL to accelerate your development process.
-  **The Python Web services developer, Part 4** by Uche Ogbuji and Mike Olson  
This conclusion to the series on [Web services software repository](#) explains how WSDL plays its part in describing the packages.

September 26, 2001

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## WebSphere

**NEW**  
solutions for  
**dynamic e-business**

## WEB SERVICES

briefing days

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News → [More news](#)

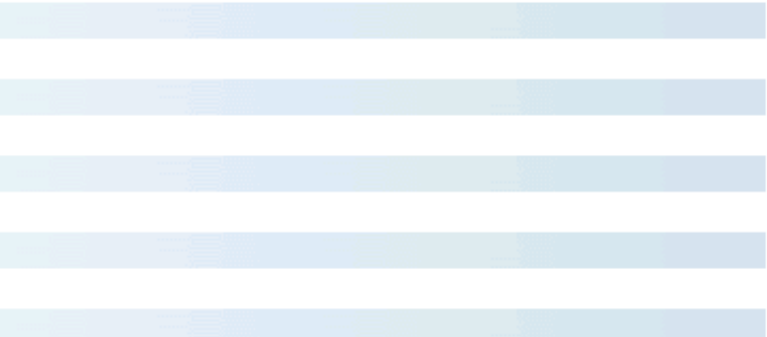
- [Firms wait for UDDI proof](#) (ZDNet UK)
- [IBM serves up Web services technology](#) (EarthWeb.com)
- [Flamenco Networks offers plug-and-play Web services](#) (InfoWorld)



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## Dynamic e-business

The next stage of e-business and Web services



### → About dynamic e-business

Learn about dynamic e-business and how IBM is providing the software and services you need to build Web services, how you can start simple and with what you have, getting benefits right away. And with IBM you can do this in a single, open, integrated platform.

### → Offerings

Be a part of the e-business evolution. Work with IBM to build and deploy Web services in your business. Read about current and future product offerings from our different brands.

### → News

Read what's being written about dynamic e-business.

### → Partners

Learn about our partners and the Web services we are building together.

### → Developer links

Tools, resources and information to help developers move forward with dynamic e-business.

### → Resources

White papers, product roadmaps, FAQs, thought leadership papers and more to help you take the next step.

### → Case studies

See how dynamic e-business is changing the marketplace. Read about real world examples of our solutions at work.

### → Get started

Take the next step in working with the jStart team to build, deploy and manage Web services in your business.

### What's new

[Lotus to offer Web services kit to developers](#)

[Web services battle at centerstage at JavaOne](#)

[Highlights from the dynamic e-business announcement](#)  
[Demo: Wrap an existing application with Web Services](#)

### Register

**Register**  
  
**now**

**"Resources" has several excellent whitepapers... including one by Mark Colan**

# *How our customers are using Web services today*

**We have several customers who are already realizing the cost-savings and flexibility offered by Web services**

- ▶ visit [ibm.com/software/jstart](http://ibm.com/software/jstart) for some case studies

**There are two basic categories:**

- ▶ EAI (Web services inside the firewall)
- ▶ Improving existing business partner integration

**UDDI is seen as a future growth**

- ▶ focus is on current business partnerships
- ▶ advertising on UDDI for new business comes later

# *Web Services: Inside the Enterprise*

## **Enterprise Application Integration**

- ▶ Easy to integrate applications from different vendors, different hardware, different programming languages
- ▶ End-to-end integration leverages your systems and people for better efficiency
- ▶ Especially helpful for companies that formed from mergers and acquisitions

"Gartner believes that more than 40 percent of enterprises' first experience with Web services will be an internal deployment of a Web services-enabled architecture.

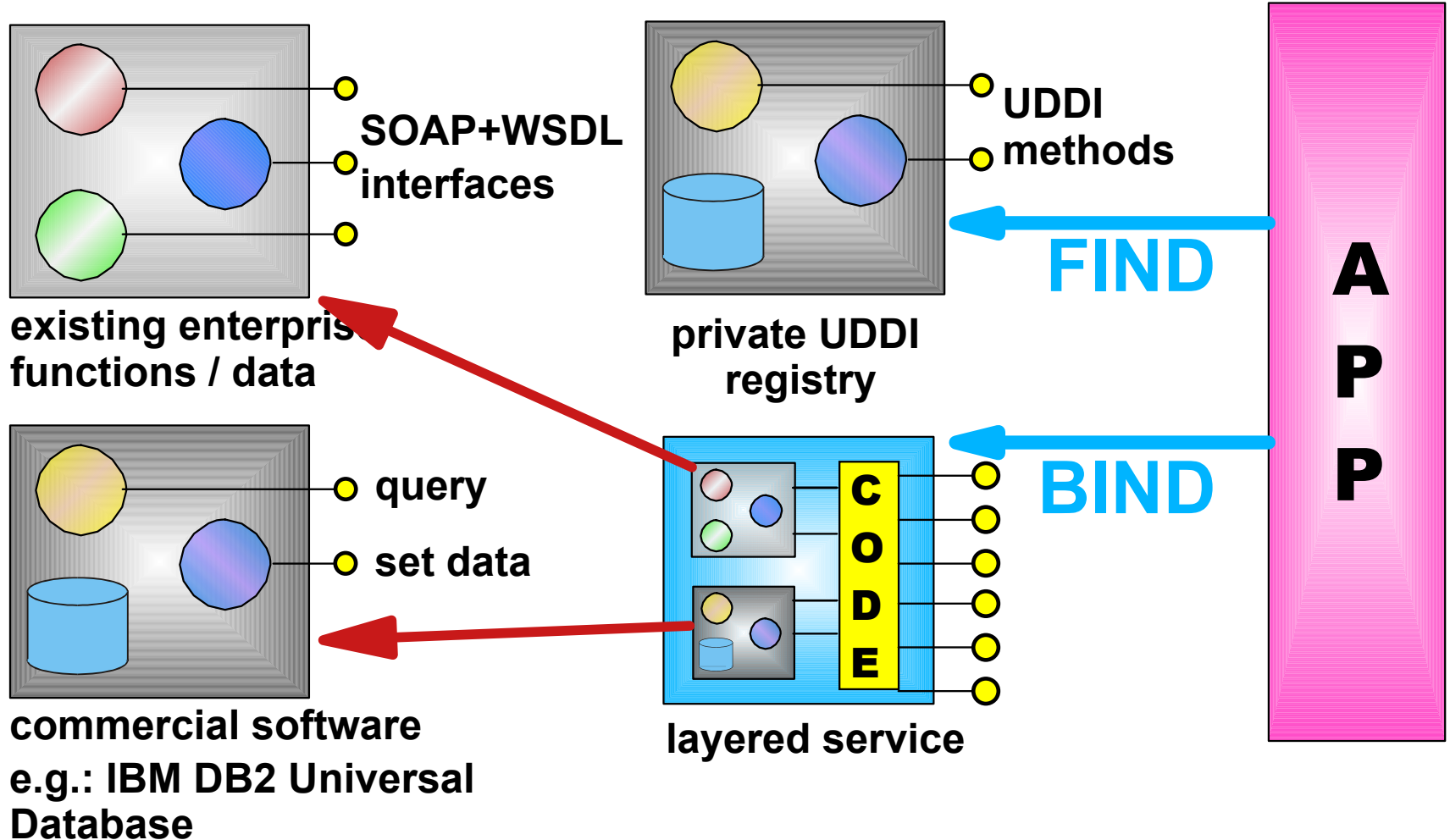
"In these implementations, enterprises will begin to realize immediate benefits even before the development of well-behaved [public] Web services."

Gartner Inc, "The Hype Is Right: Web Services Will Deliver Immediate Benefits", October 2001.

# Web Services: Inside the Enterprise

## SOAP+WSDL useful for application or data integration strategy with loose coupling

- ▶ Especially helpful for companies that formed from mergers and acquisitions



# ***Web Services: improving business partner integration***

## **Common XML data formats allow different companies to integrate quickly for e-business**

- ▶ Solves more difficult BP integration problem
- ▶ New model: find business partners dynamically, and begin doing business immediately
- ▶ Business directories, marketplaces, auctions

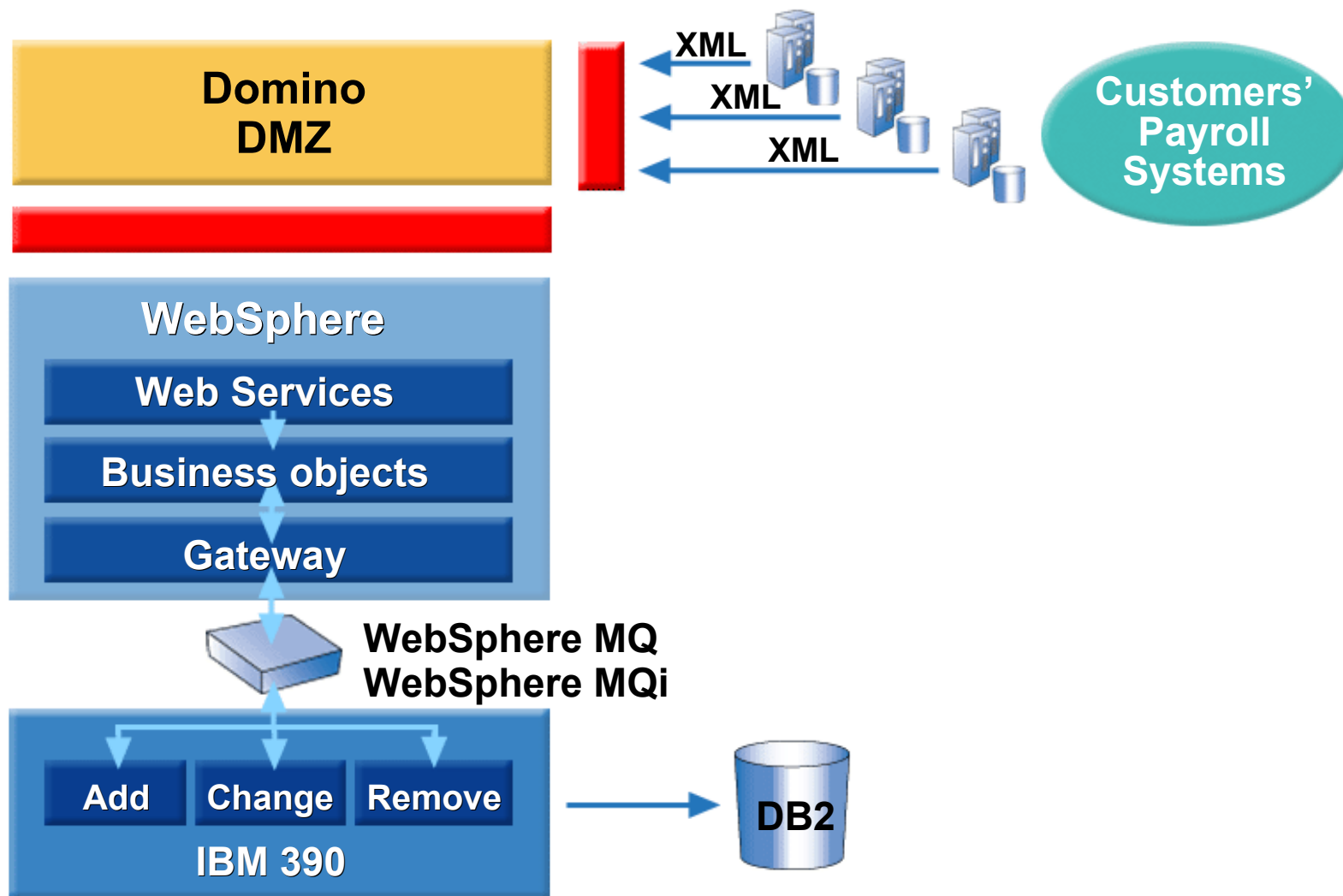
"Web services will offer some business-to-business benefits early on as well...by transforming the process through which enterprises make connections with one another.

"Established trading partners will seek to drive down the costs of interconnection by reducing the energy devoted to maintaining contacts."

Gartner Inc, "The Hype Is Right: Web Services Will Deliver Immediate Benefits", October 2001.



# Storebrand ASA



Read all about it!

[ibm.com/developerworks/webservices/library/ws-asa](http://ibm.com/developerworks/webservices/library/ws-asa)

# ***Cost savings, Flexibility, Agility***

## **Web services reduces costs**

- ▶ "By 2005, the aggressive use of Web services will drive a 30% increase in the efficiency of IT development projects"

## **Flexibility and agility in EAI**

- ▶ "more than 40 percent of enterprises' first experience with Web services will be an internal deployment...enterprises will begin to realize immediate benefits"

## **Improving efficiency in existing B2B partnerships**

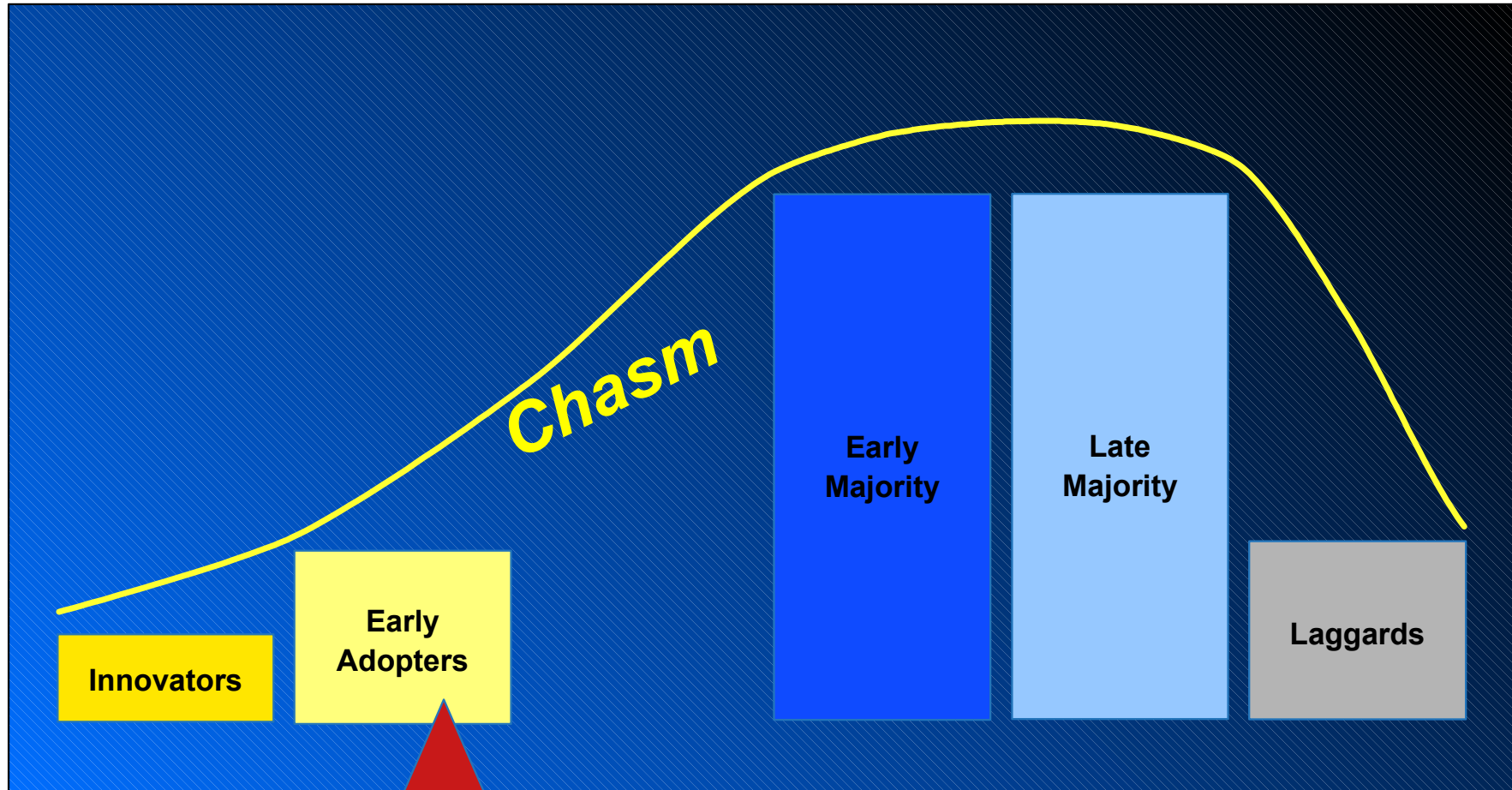
- ▶ "Web services will offer some B2B benefits early on as well...established trading partners will seek to drive down the costs of interconnection"
- ▶ we have customers doing this now

## **These cost savings are not speculative investments!**

- ▶ in a weak economy, you can still make more money by reducing your costs

All quotes on this page: Gartner Inc, "The Hype Is Right: Web Services Will Deliver Immediate Benefits", 9 Oct 2001

# Technology Adoption Life Cycle



Web Services  
today

Many pilots, prototypes, studies, and first-time solutions are in progress now

# Web Services NOW!

## Now is the time to get started with Web services

- ▶ flexibility, agility, speed of integration, cost savings

## Experimental technologies, technical resources

- ▶ [ibm.com/alphaworks](http://ibm.com/alphaworks) - Web Services Tool Kit and more
- ▶ [ibm.com/developerworks/webservices](http://ibm.com/developerworks/webservices)

## Product support for SOAP, WSDL, UDDI, Security

- ▶ WebSphere Application Server Adv. Edition v4.0
  - ➔ free trial: [ibm.com/websphere](http://ibm.com/websphere), click "Downloads"
- ▶ WebSphere Studio Application Developer
  - ➔ beta: [ibm.com/software/webservers/studio/preregister.html](http://ibm.com/software/webservers/studio/preregister.html)
- ▶ many other products: over the next few months

## Case Studies

- ▶ [ibm.com/developerworks/speakers/colan](http://ibm.com/developerworks/speakers/colan), see "Web Services NOW!" presentation (PDF)

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# Web Services: Summary

## Software evolution, Business revolution

- ▶ leverage existing software as highly-integratable objects
- ▶ no need to learn a new programming language!
- ▶ integrate systems internally, or with business partners
- ▶ new business opportunities abound

## Open standards is a requirement

- ▶ Web Services build on existing standards
- ▶ IBM leads the industry in development of new standards

## Get started now with IBM

- ▶ WebSphere 4.0 fully supports Web Services applications
- ▶ WebSphere Studio Application Developer beta available now
- ▶ SOAP4J, UDDI4J, Web Services Toolkit on [ibm.com/alphaworks](http://ibm.com/alphaworks)
- ▶ jStart Web Services team helps get your dev team up to speed quickly with a limited-scope project

# Resources

## **[ibm.com/developerWorks](http://ibm.com/developerWorks)**

- ▶ Many great tutorials and in-depth technical articles

## **[ibm.com/alphaworks](http://ibm.com/alphaworks)**

- ▶ download early technologies for free

## **Whitepapers (introductory and architectural):**

- ▶ [ibm.com/webservices](http://ibm.com/webservices)
- ▶ click Documentation link

## **[ibm.com/developerworks/speakers/colan](http://ibm.com/developerworks/speakers/colan)**

- ▶ Web Services NOW! (includes case studies)
- ▶ Technical Overview of Web Services
- ▶ All About UDDI (including Private UDDI uses)
- ▶ SOAP: Security and Reliability, Issues and Solutions

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