



IBM System *i*™

Getting Started with SOA on System i

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*i want stress-free IT.
i want control.
i want an *i*.*

Simplify IT

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AGENDA

- **What is SOA (Service Oriented Architecture)?**
- **Benefits of a SOA**
- **A practical approach for System i5**

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What's on the Minds of 450 of the World's Leading CEOs



CEO needs

- **Revenue growth** with cost containment
- Key competency: **responsiveness**
- Critical success factor: enable effectiveness of **people and processes**

Source: CEO Study of 456 WW CEOs IBM Corporation - 2004

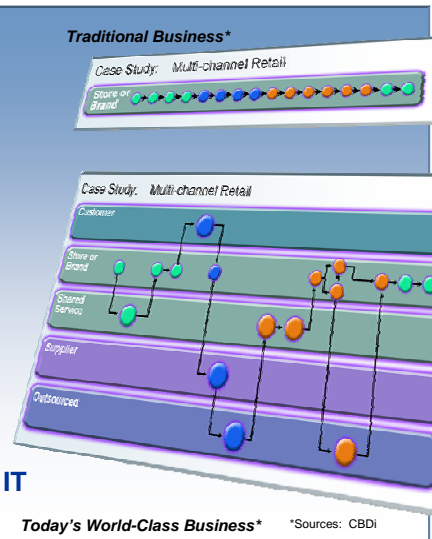
CIO challenges

- **Aligning IT and business goals to grow revenue and contain costs**
- **Building responsiveness and agility into the organization through IT**
- **How can IT help enable people and teams to be more effective**

Source: Operating Environment Market Drivers Study, IBM Corp. 2004

Why is business flexibility important?

- Economics: **global competition demands greater flexibility**
- Business processes: **changing more rapidly**
- Growth: **CEOs are saying that business flexibility is key to growth**
- Cost savings: **reusable assets can cut costs up to 20%**
- Outsourcing: **effective outsourcing of non-core functions demands flexible IT**



Of course you know what happens next...



Why SOA now?

<p>Standards</p> <ul style="list-style-type: none"> ▪ Broadly adopted Web services ensure well-defined interfaces. ▪ Before, proprietary standards limited interoperability 	<p>Organizational Commitment</p> <ul style="list-style-type: none"> ▪ Business and IT are united behind SOA (63% of projects today are driven by LOB)* ▪ Before, communication channels & 'vocabulary' not in place 	
<p>Degree of Focus</p> <ul style="list-style-type: none"> ▪ SOA services focus on business-level activities & interactions ▪ Before, focus was on narrow, technical sub-tasks 	<p>Connections</p> <ul style="list-style-type: none"> ▪ SOA services are linked dynamically and flexibly ▪ Before, service interactions were hard-coded and dependent on the application 	<p>Level of Reuse</p> <ul style="list-style-type: none"> ▪ SOA services can be extensively re-used to leverage existing IT assets ▪ Before, any reuse was within silo'ed applications

*Source: Cutter Benchmark Survey

AGENDA

- What is SOA (Service Oriented Architecture)?
- **Benefits of an SOA**
- A practical approach for System i5

On Demand Business Characteristics

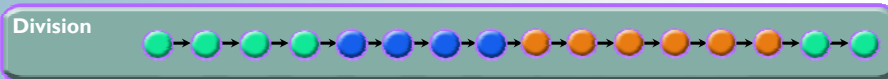
- **Business processes are automated**
 - Customers have online access
 - Suppliers and business partners are integrated into the business processes
 - Business processes are well-defined and execute end-to-end without interruption
- **Business processes are flexible**
 - Quickly created and modified
 - Responsive to changing customer demand
 - Replace inefficient existing business processes

Business flexibility is a key characteristic of an on demand business

Let's take a look at an example...

Traditional Business Process

Case Study: Order to Cash Process



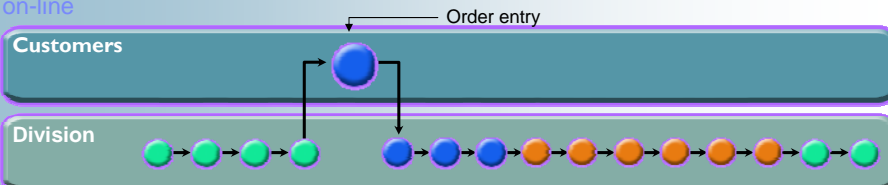
- Business process is embedded in three separate applications
- Business functions are tightly coupled within applications
- Business functions have unique and proprietary interfaces, restricting re-use
- Manual steps introduce functional gaps in the process
- Process cannot be easily measured and managed
- Changes to the process are difficult to implement
- New processes which are designed this way require long development cycles

Result: Business cannot operate on demand

On Demand Flexibility: Customer Self Service

Case Study: Order to Cash Process

Change: Allow customers and partners to order and manage accounts on-line



American Registry of Radiology Technologies

- World's largest credentialing organization that seeks to ensure high quality patient care in radiologic technology (257,000 Registrants)
- Needed inexpensive way to exchange certification information with other Radiology Organizations (American Society of Radiologic Technologists)
- Used web services wizard in WDSi



ARRT
Web Service

SS#, Birth Date, ARRT ID#

Registration Info

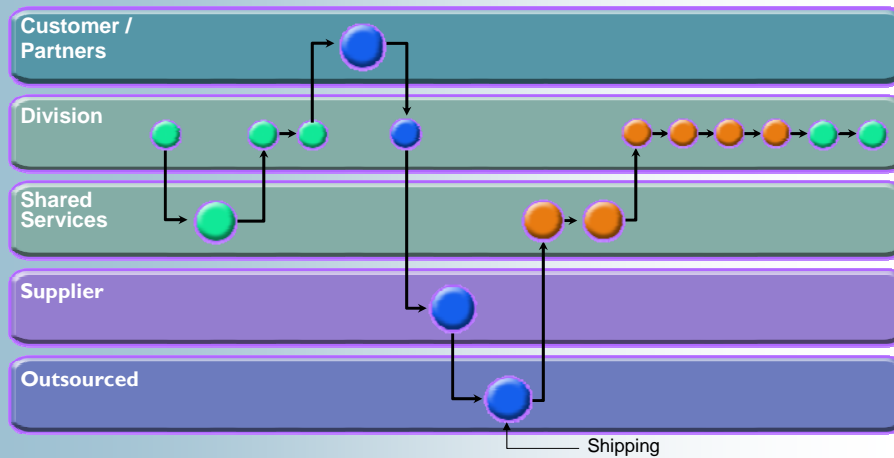


WWW.ASRT.ORG

On Demand Flexibility: Outsource

Case Study: Order to Cash Process

Change: Reduce shipping infrastructure and overhead costs

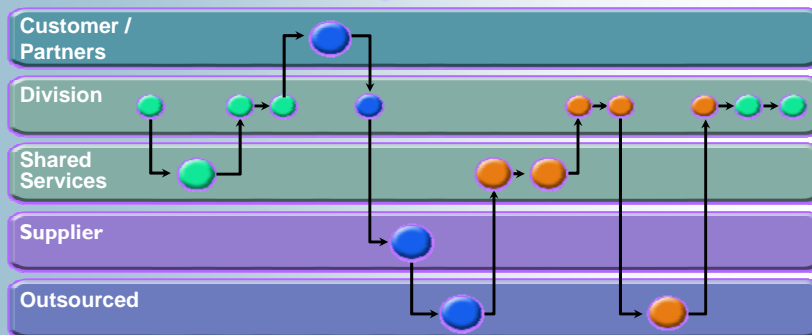


Implementing a Service Oriented Architecture?

So how do you go from this environment...



To this environment?



AGENDA

- What is SOA (Service Oriented Architecture)?
- Benefits of a SOA
- **A practical approach for System i5**

IBM System

Introducing the IBM SOA Foundation

Provides What You Need to Get Started with SOA

IBM SOA Foundation: Integrated, open set of software, best practice, and patterns

Supports complete lifecycle with a **modular** approach

Scalable; start small and grow as fast as the business requires

Extends value of your existing investments, regardless of vendor

Extensive business and IT standards support; facilitating greater **interoperability & portability**

Don't Panic!

IBM SOA Foundation

Software

Skills & Support

Leveraging existing IT Infrastructure

RPG Cobol Custom Apps.

ORACLE SAP iha CICS WebSphere IMS Microsoft

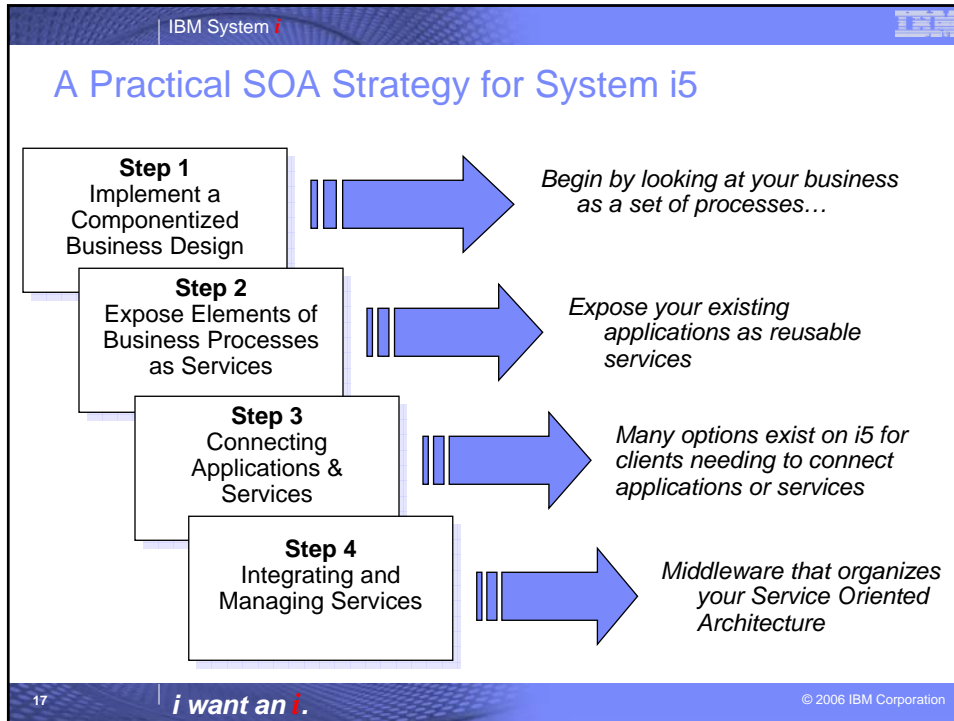
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Not this Scary!



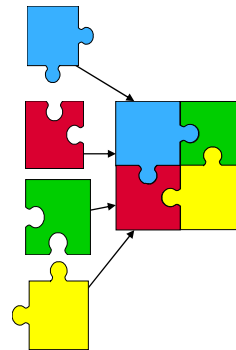
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- ## 1. Implement a Componentized Business Design
- Needs?
 - Must understand processes for training, collaboration, and documentation, i.e. requirements for compliance regulations (Sarbanes-Oxley and Basel II)
 - Required to document both the current state and future state business process and the comparison to validate enhancements and ROI before committing resources
 - Requires the ability to change the business process to respond to changes in market
 - Technology Solution?
 - Business Process Modeling and Application Modernization
 - Why?
 - You need to understand how SOA can improve your business
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This is Not a New Concept

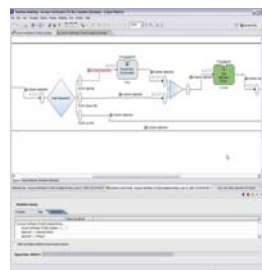
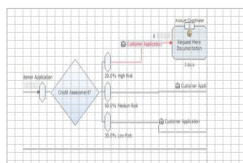
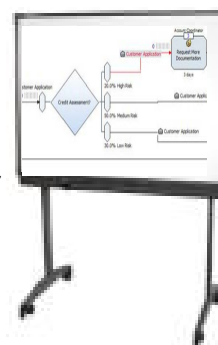
- Modularizing Applications
 - Main line
 - Subroutines
- ILE
 - Modules
 - Service Programs
 - Procedures
 - Database Functions



But, it is at a "higher level"

1. Implement a Componentized Business Design: Part A

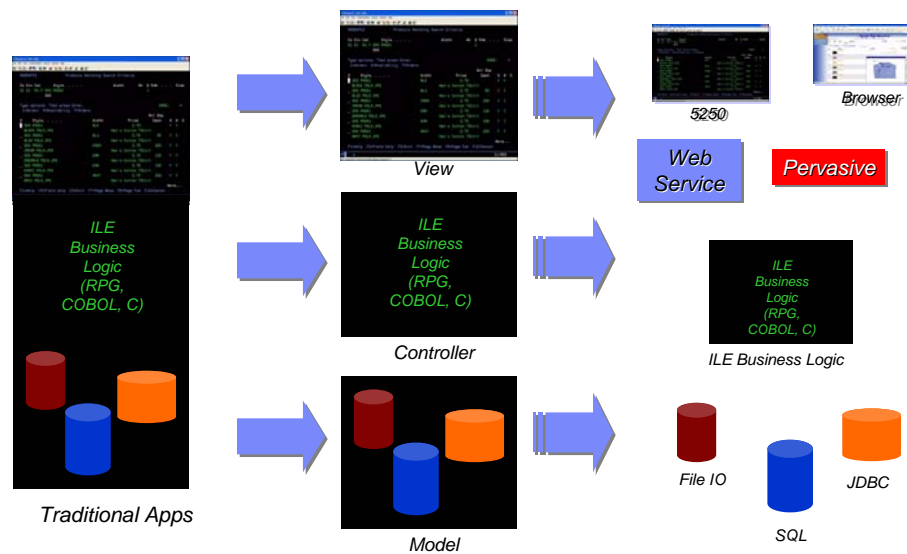
- Start thinking about your Business Processes
 - Begin by mapping out your existing processes
 - How:
 - Start With a White Board,
 - Graph Paper, or a
 - Tools like WebSphere Business Modeler



Why do Business Process Modeling?

- **Modeling For Documentation & Compliance**
 - Understand your business
 - Understand and capture complex behaviors and expertise in processes
 - Use output for training, collaboration, and documentation
- **Modeling For Redesign & Optimization**
 - Discover areas for process improvement and latent value in processes
 - Document current state and future state business process
 - Compare to validate enhancements and ROI before committing resources
 - Establish and track measurable process metrics for performance
 - Modeler for services decomposition
- **Modeling For Execution**
 - Change the business process to respond to changes in market
 - Future business process can be passed to application, workflow and business process development tools to be executed as a new running process
 - Linked to real-time monitoring
 - Feedback on process improvements and reporting for compliance on running processes

Part B... You may have to Modernize



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System i Developers Roadmap for SOA

Model — Assemble — Deploy — Monitor

Create

- RPG Modules
- HTML Forms
- Java beans

RPG COBOL
C/C++
4GL PHP

Tools

- Business Processes/ Services

•Services Available

•Application Created

Consumer Provider

- Start by migrating existing RPG applications to Model-View-Controller (MVC)
- Tools like Data Borough's x-Analysis in the Partner Innovation Program help
- Leverage WDS tools to work with your applications vs. PDM

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No Time to Re-Architect? Buy Time using Re-Facing

- Use WebSphere HATS or other Re-Facing tool
- Consume a Web Service

Traditional Apps

Web Service

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2. Expose Elements of Business Processes as Services

- Needs?
 - Allow selected Business Partners to access your existing internal application
 - Want a single, standards-based technology for integration to the application rather than supporting multiple integration techniques specific to each Business Partner
- Technology Solution?
 - Web services
- Why?
 - Industry Standard for Application to Application Integration
 - Acceptance by all major software vendors

Not a New Concept

Documentation or Repository


- Application Dictionary
- ILE Modules
 - Modules
 - Service Programs
 - Procedures
 - Database Functions
 - Triggers, stored procedures, etc
- Tracking of modules for reuse
- Change Management Systems
- Impact Analysis products

But, it is now enterprise-wide

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What is a Web Service?

- Web Services provide business function that can be described, published, located, invoked over a network
 - Built on established, ubiquitous Internet standards (SOAP/HTTP)
 - Supports other protocols providing higher QoS (SOAP/JMS, etc.)
 - Platform and implementation neutral providing true interoperability
 - Service Consumers need to know the Interfaces to web services but not the implementation details of services
- Web Services allow businesses to:
 - Describe application functionality (services) without regard to implementation details
 - Publish those services
 - Discover other services they wish to use
 - Connect and invoke those services



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Basic Web Services Standards

- XML - EXtensible Markup Language
 - Based on user-defined tags that identify the kind of data represented
 - Designed to easily represent data in a very portable manner
- WSDL - Web Services Description Language
 - XML-based interface definition language that separates the function from the implementation
 - Describes the Web Service contract
 - What a Web Service can do ?
 - Where it resides ?
 - How to invoke the Web Service (input and output)
- SOAP - Simple Object Access Protocol
 - An XML messaging protocol that works over any transport protocol

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You Already have the Tools - WDS*c*

WebSphere Development Studio for System i (5722-WDS)

Use Web Perspective to create System i Program call Bean

Provides checkbox to create Web Service

All your Compilers and PDM, SEU, etc.

One Step web service provider Wizards:

- 5250, Non-5250, and DB2

Generate Web services directly from HATS Studio and EGL

http://www.ibm.com/isource/cgi-bin/goto?it=usa_anred&on=206-015

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RPG as a Service Requester

Apache AXIS Web Services C++ Client APIs

- Web Services C/C++ Client
 - 5733-XT1 XML Toolkit for System i
 - GA 8/2005
 - Tech Preview – limited function (no array support)
 - Open Source
 - Apache.org AXIS
 - Ported to OS/400 ILE
 - WSDL -> C++ or C Stub Generator
- Direct invocation from ILE
- Runs in the ILE Job

Included with OS/400

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3. Connecting Applications & Services

- **Needs?**
 - Make Applications easier to communicate with another
 - Need ability to add, remove, and change applications without disrupting the entire business
 - Overcome the connectivity challenges of Multiple programming models, Multiple platforms, Multiple programming languages, Multiple message formats and varieties of standards?
- **Technology Solution?**
 - Enterprise Service Bus, Java Message Service, Message Queuing, SOA Appliances
- **Why?**
 - On average, it costs 40% of the original cost of development just to maintain applications.

This is Nothing New ..

- System i Shops do Connection today (transfer)
 - EDI
 - Data Queues
 - XML
 - RPC
 - Stored Procedures

But, SOA standards allow much more...

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Web Services are a good start...

Turn this ...

Application Application Application Application

Application Application Application Application

☐ = interface

...into this (web services).

Application Service Application Service Application Service Application Service

Interface Interface Interface

Interface Interface Interface Interface

Application Service Application Service Application Service Application Service

- ✓ Rich business abstractions describe the application interface
- ✓ Decouples the interfaces from the business applications
- ✓ The number and complexity of the interfaces is reduced
- ✓ Business applications and their interfaces become reusable

Separate connection points still leaving bloated interfaces...

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An Enterprise Service Bus shrinks those interfaces further

Turn this (web services)...

Application Service Application Service Application Service Application Service

Interface Interface Interface

Interface Interface Interface Interface

Application Service Application Service Application Service Application Service

...into this (SOA)

Application Service Application Service Application Service Application Service


Enterprise Service Bus

Application Service Application Service Application Service Application Service

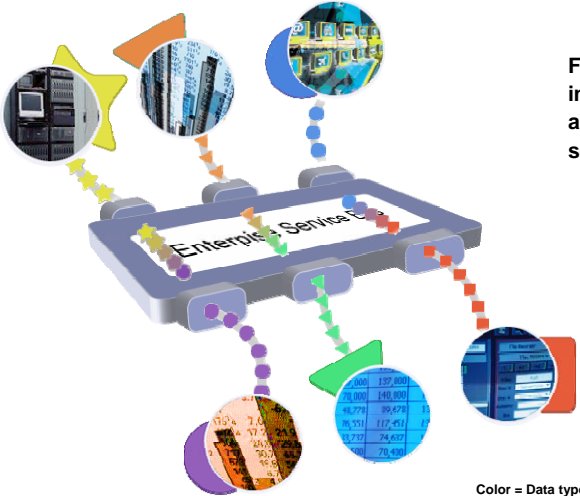
- ✓ Decouples the point-to-point connections from the interfaces
- ✓ Allows for dynamic selection, substitution, and matching
- ✓ Enables more flexible coupling and decoupling of the applications
- ✓ Enables you to find both the applications and the interfaces for re-use

RESULT → Greater Business Responsiveness

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Enterprise Service Bus capabilities




Flexible connectivity infrastructure for integrating applications, data, and services to power your SOA

Color = Data type
Shape = Protocol

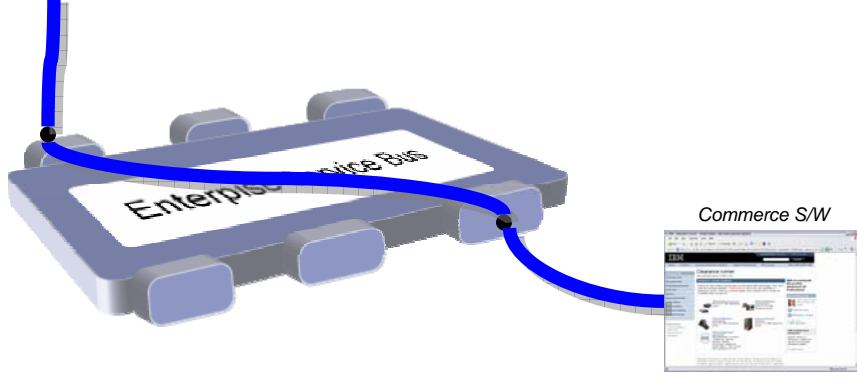
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ESB Capabilities: Routing

Shipping System 

► **ROUTES** messages between services




Commerce S/W 

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ESB Capabilities: Transformation

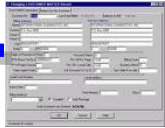
Shipping System



▶ **TRANSFORMS** message formats between requestor and service

Shipping Master	Customer Master
Lname (Char 15)	Lastname (Char 20)
Fname (Char 15)	Firstname (Char 20)
Zipcde (Char 5)	Address1 (Char 25)
Addr1 (Char 30)	City (Char 20)
City (Char 20)	State (Char 20)
State (Char 2)	Zipcode (char 5)
etc	etc

Customer Master

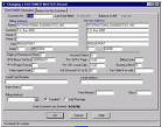


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ESB Capabilities: Conversion


Customer Master



CONVERTS transport protocols between requestor and service

JDBC	XML
UPDATE CUSTMAST RECORD=1 Name='John Smith', Address ='100 Main St.', etc...	<name>John Smith</name> <address>100 Main St.</address> Etc...

Customer Address Change

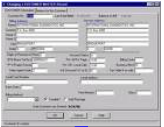


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ESB Capabilities: Publication/Subscription


Customer Master



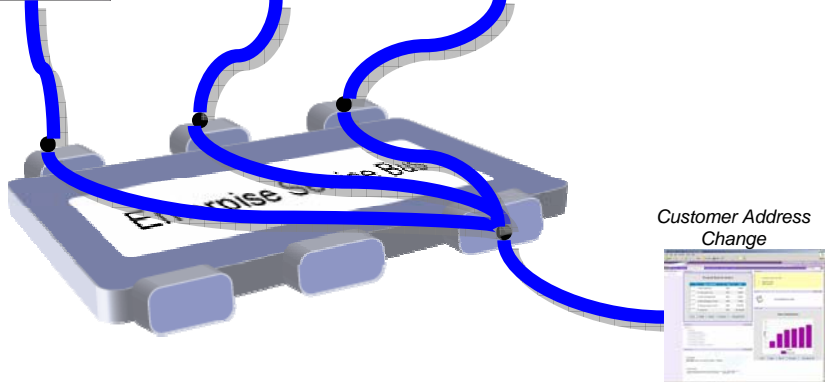
Shipping System



Warranty System



HANDLES business events between disparate sources



Customer Address Change

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What are the IBM ESB offerings

- 1

A Basic ESB:
WebSphere ESB V6*, a new product delivering an **Enterprise Service Bus**, built on top of and leveraging WebSphere Application Server. **Facilitates SOA for Web services. Uniquely able to connect to WebSphere MQ networks.**

New product



** SOD i5/OS, 2007*
- 2

An Advanced ESB:
WebSphere Message Broker V6, a new version of our **proven product**, built on top of and leveraging WebSphere MQ. **Delivers an advanced Enterprise Service Bus facilitating SOA for existing (non-Web Services) applications.** Available on System i5 LPAR Only.

New version



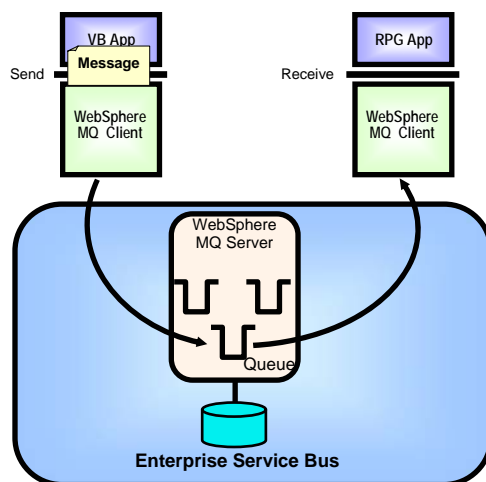
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Java Message Service (JMS)

- Application Programming Interface (API) for building message-based J2EE applications
- Implementation consists of JMS clients and JMS servers
 - Many clients can connect to each server
 - Servers can deliver messages to their own clients or other JMS servers
- Two messaging modes
 - Point-to-point
 - one sender, one receiver
 - queues are used
 - asynchronous messaging support, similar to WebSphere MQ
 - Publish/Subscribe
 - one sender, many receivers
 - receivers subscribe to topics
 - senders publish messages with associated topics

Got Java Skills?

WebSphere MQ - Server Based Messaging



Features:

- Assured Delivery
- Sender & Receiver need not be running at the same time (asynchronous)
- Message flow control
- Clustering and failover
- Servers can be networked together

Version 6 Enhancements:

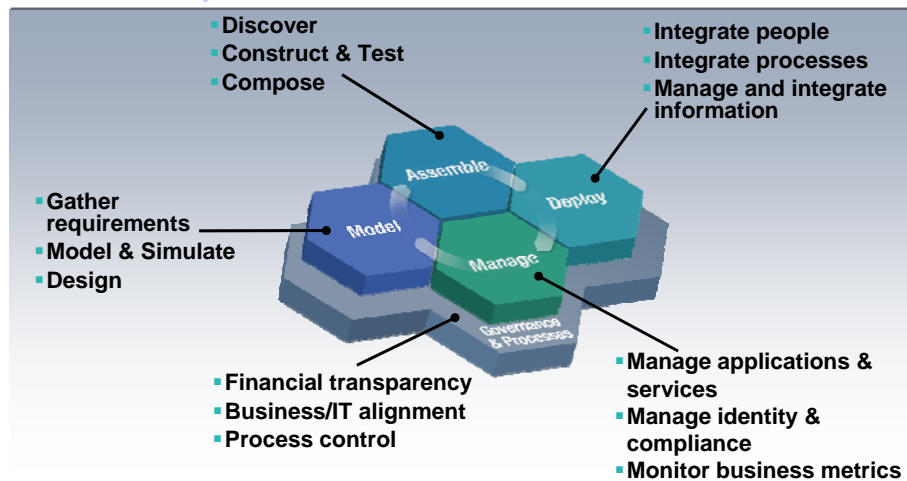
- Internet Protocol Version 6 (IPv6) support
- Integrated support for *Web Services* data over a reliable MQ transport
- Integrated publish/subscribe capability
- The product Quick Tour introduces the basic concepts of application connectivity and describes WebSphere MQ function and capabilities.
- Java Message Service (JMS) Support

4. Integrating and Managing Services

- **Needs?**
 - Improve operational and economic efficiency via an environment where services can be exchanged without rewriting applications
 - Reduce application development and maintenance costs by changing, adding or deleting business process rules rather than rewriting applications
- **Technology Solution?**
 - Business Objects, Service Component Architecture (SCA), Business Process Execution Language (BPEL)
- **Why?**
 - Provides Faster reaction to changing business situations

How are businesses thinking technically about flexible IT through SOA?


The SOA Lifecycle



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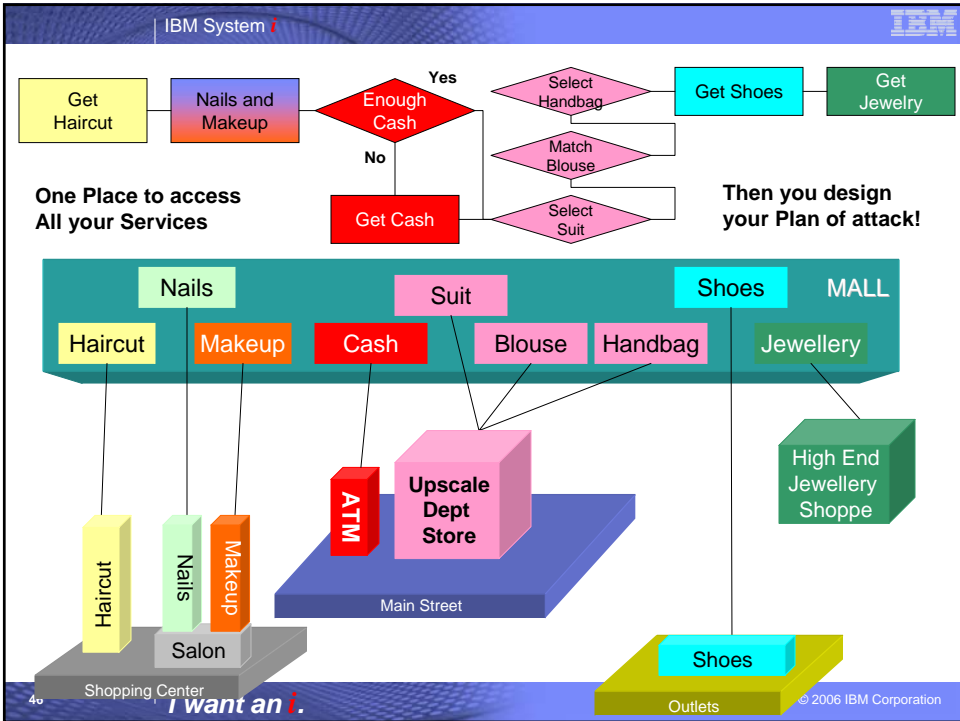
IBM Middleware for Integrating and Managing Services

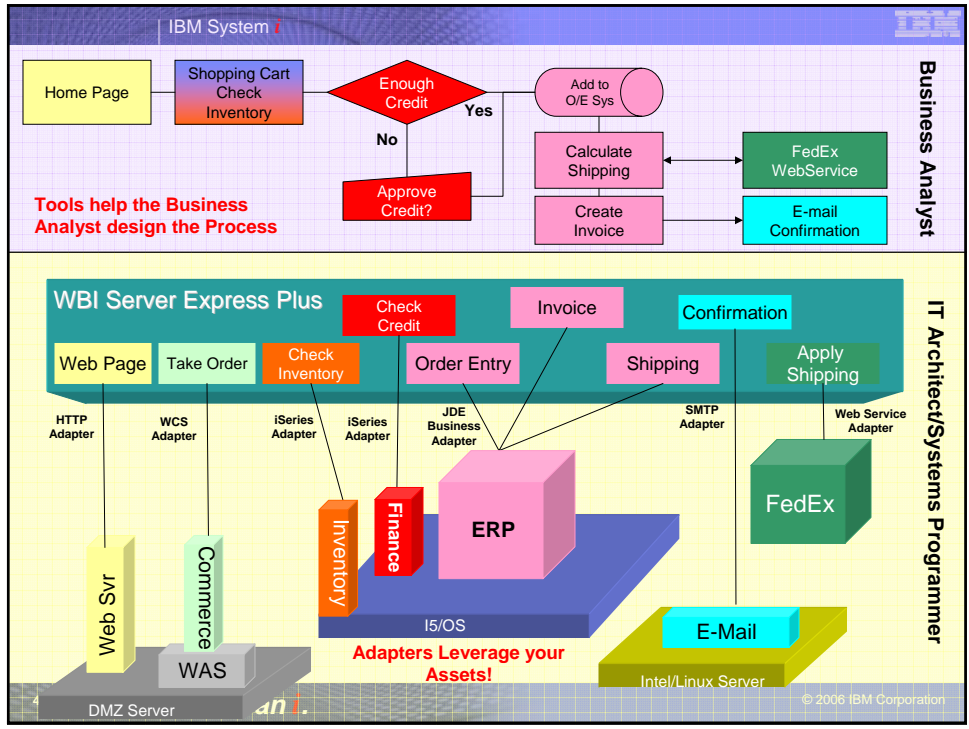
- **SMB clients can start with WBI Server Express Plus:**
 - Organize existing Services
 - Provides JCA Adapters to access existing applications
 - Choreograph Business Processes
- **For Enterprise clients, the IBM SOA Foundation Story:**
 - Sophisticated Tools and Middleware to address the entire SOA lifecycle:
 - Model – WebSphere Business Modeler
 - Assemble – WebSphere Integration Developer
 - Deploy – WESB*, WebSphere Process Server*
 - Manage – WebSphere Business Monitor



***Note: 2006 SOD for i5/OS**

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End-to-end process capabilities for your SOA

New! IBM SOA Foundation: <http://www.ibm.com/soa>

WebSphere Integration Developer
<http://www.ibm.com/software/integration/wid/>
 Easy-to-use integration to simplify and speed the assembly of composite applications

WebSphere Process Server*
<http://www.ibm.com/software/integration/wps/>
 Flexible deployment of business processes, making plug-and-play of components a reality

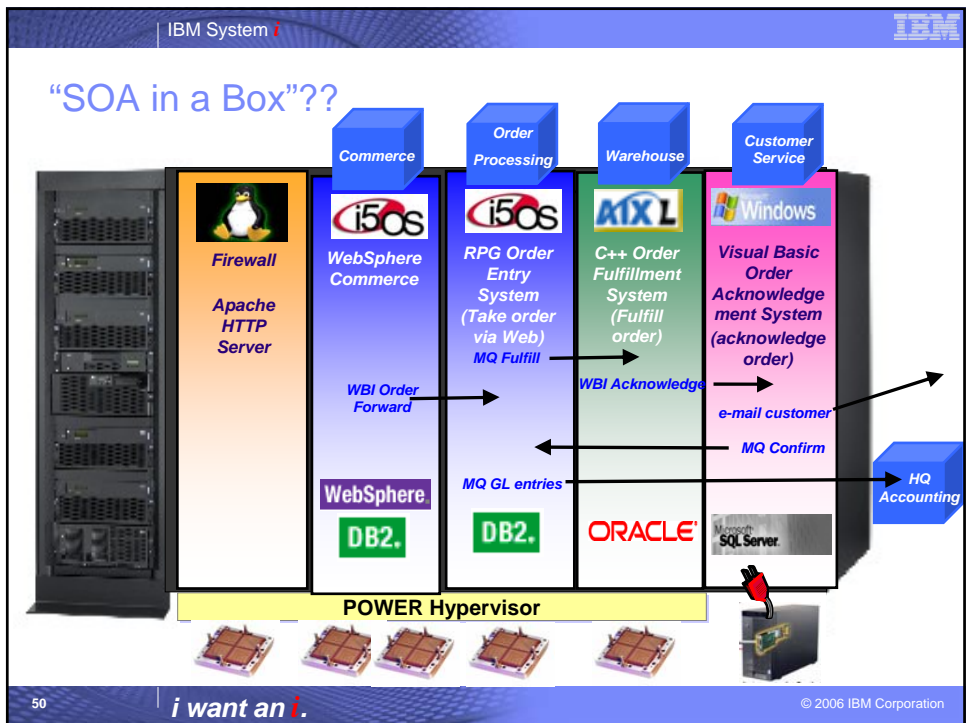
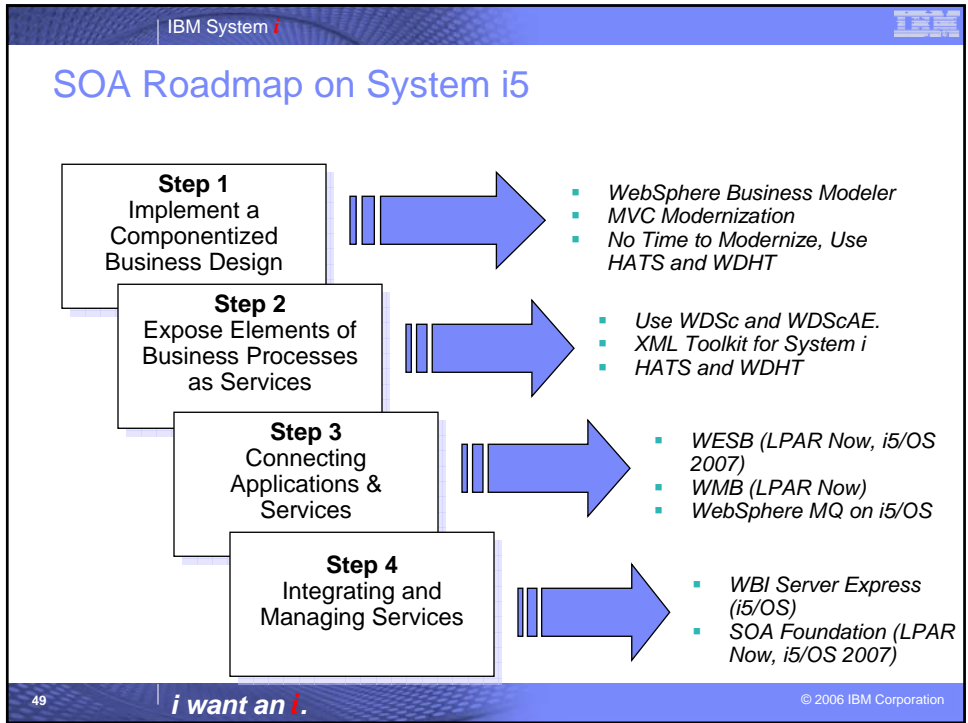
WebSphere Business Modeler
<http://www.ibm.com/software/integration/wbimodeler/>
 Simple to use process modeling for the business analyst to help maximize process and business resource re-use

WebSphere ESB*
 Connectivity infrastructure for integrating applications and services to power your SOA
<http://www.ibm.com/software/integration/wsesb/>

WebSphere Business Monitor
<http://www.ibm.com/software/integration/wbimonitor/>
 Real-time visibility into process performance enabling process intervention and continuous improvement

*SOD on i5/OS, 2007

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Why System i for SOA?

- You most likely have the tools you need to get started fast:
 - WebSphere Development Studio (5722-WDS) to provide web services from RPG (ILE) applications
 - XML Toolkit for System i (5733-XT1) to consume web services from RPG (ILE) applications
- On Demand: IBM System i5 Virtualization
 - Dynamic resource allocation
 - Multiple Operating Support in LPAR or onboard/outboard Intel Servers supports any solution in the marketplace
- Security
 - Virus Resistant
 - i5/OS has the lowest number [single digits] of O/S vulnerabilities than any other commercial operating system
- Scalability
 - System i has highest growth path in the industry ranging from the smallest uni-processors scaling beyond mainframes

More information...

- **WebSphere on System i5:**
 - <http://www.ibm.com/eserver/series/websphere>
- **System i Partner Innovation Program:**
 - http://www.developer.ibm.com/vic/hardware/portal/iii_pages/iii_tools_innov_roadmap#



<http://www.ibm.com/soa>



<http://www.soaflexibility.com/ibm/>

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Selecting a solution depends upon Your requirements

	WebSphere Application Server or MQ	WebSphere ESB*	WebSphere Message Broker	WebSphere Process Server*
	Messaging	ESB	Advanced ESB	Process Management
Web Services Support	*	*	*	*
Message Transport & Protocol Switching	*	*	*	*
Intelligent Routing & Message Logging		*	*	*
Event Driven Processing		*	*	*
Transformation of XML Data Formats		*	*	*
Transformation of non-XML Data Formats			*	
Complex Event Processing			*	
Sensor & Device Integration			*	
Native Integration with CICS & VSAM			*	
Third party JMS integration			*	
Process Modeling & Simulation				*
Process Choreography				*
Process Integration & Synchronization				*
Business Rules				*
Business State Machines				*
Human Workflow				*
Partner Management				*
Process Monitoring				*

*SOD on i5/OS, GA 2007

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