The Modern Mainframe…
At the Heart of Your Business

Using SOA to Build Your Next Generation Solution

Service Oriented Finance's Business Problem

> **We want to increase revenue by selling our car loans through external Brokers**

**Service Oriented Finance
CEO**

Service Oriented Finance's Technical Challenges

How can Brokers access our existing car loan application?

**Service Oriented Finance
CIO**

Leverage Existing Investments

25% of the world's capital investment is in I/T*. The only way to innovate in a cost-effective manner is to leverage these investments
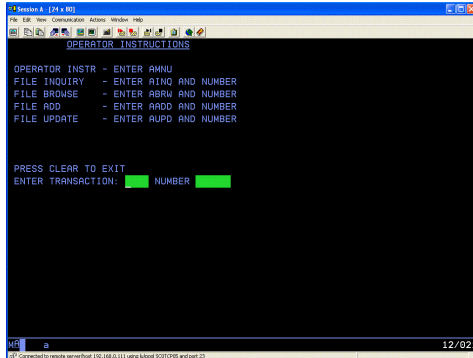
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"Many of the I/T assets required to enable an on-demand business already exist and have been supporting the business for years or even decades. Enabling these I/T assets to participate in integrated business processes is key to improving responsiveness".

DH Brown Associates, Inc.
Application Transformation: Leveraging Existing I/T Assets to Build Competitive Advantage (September 2004)

* Does not include real estate or government assets

Existing CICS Investment:
SOF Customer Management System
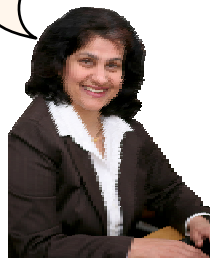
Existing application consists of
CICS programs accessed via
"green screen" terminals.

How do we make this available to
external Broker applications?

> We have invested millions
> of dollars in this asset

**Service Oriented Finance
CIO**

Use SOA to Unlock Your Assets

> We want to make
> portions of this
> application available
> to external Loan
> Brokers

> You can unlock your
> existing assets using
> a Service Oriented
> Architecture

**Service Oriented Finance
CIO**

IBM

The Basics: What is SOA?

… a service?

A **repeatable business task** – e.g., check customer credit; open new account

… service oriented architecture (SOA)?

An IT **architectural style** that supports integrating your business as linked services

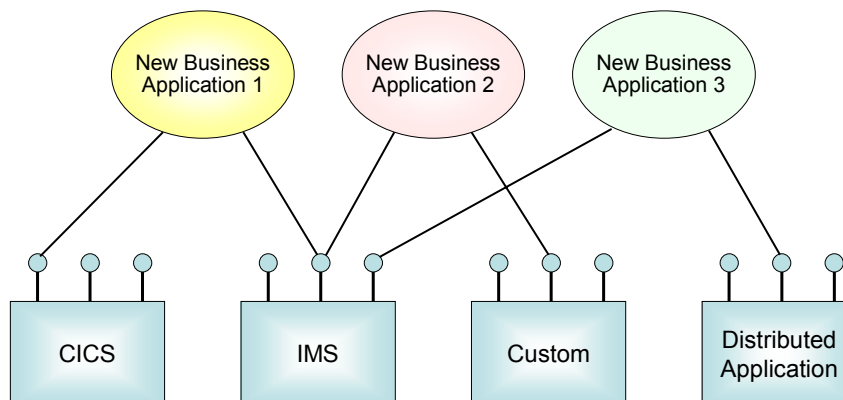"SOA impacts every aspect of IT and business."

Gartner

Steps to SOA
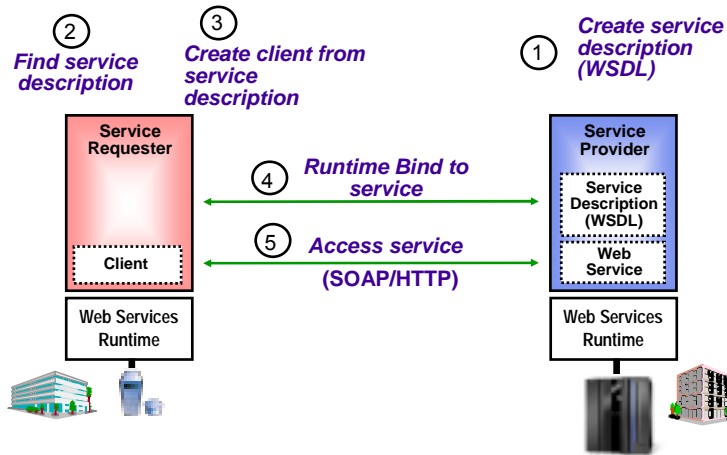
- Expose enterprise assets as services
- Create a rich environment for easy reuse
- Combine services to create new applications

New Business Application 1

New Business Application 2

New Business Application 3

CICS	IMS	Custom	Distributed Application

Introduction to SOA: Web Services

② **Find service description**

③ **Create client from service description**

① **Create service description (WSDL)**

Service Requester

④ **Runtime Bind to service**

Service Provider

Service Description (WSDL)

Client

⑤ **Access service (SOAP/HTTP)**

Web Service

Web Services Runtime

Web Services Runtime

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Exposing CICS Applications as Web Services

So Web Services give me reusability and interoperability.

But how do I get my CICS programs to talk Web Services?

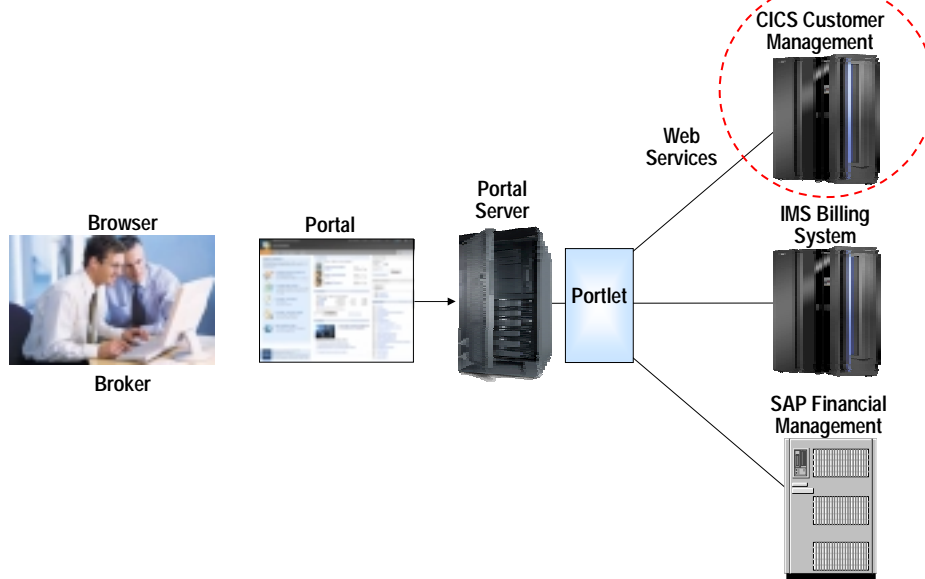**CICS TS Version 3.1 has built-in capabilities to expose programs as web services**

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Service Oriented Finance Solution Picture

CICS Customer Management

Web Services

Browser

Portal

Portal Server

Portlet

IMS Billing System

Broker

SAP Financial Management

DEMO: Broker Calls CICS Program Using Web Services

Loan Broker

SOF Extranet (B2B) Portal

SOAP / HTTP

CICS TS V3.1 Web Service
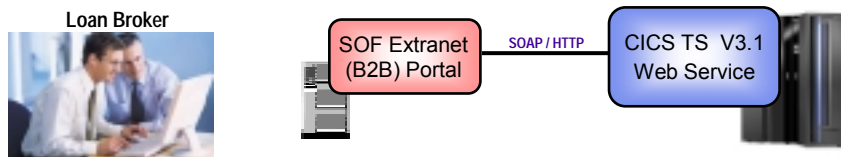
■ Loan Brokers use the SOF Portal. The Portal talks to SOF's Loan application using web services

Web Services expose CICS and IMS investments for a new generation of re-use.

How Did the CICS Web Service Work?

1. Receive SOAP request

2. CICS Web Services runtime handles the message

3. Handler chain processes SOAP headers

4. Data Mapping transforms XML into bytes, calls server app

Portal

Service Requester

Client

Web Services Runtime

CICS TS V3.1

Service Provider

CICS Application

COMMAREA

Web Services Runtime

Handler chain

SOAP Body

Data Mapping

Config

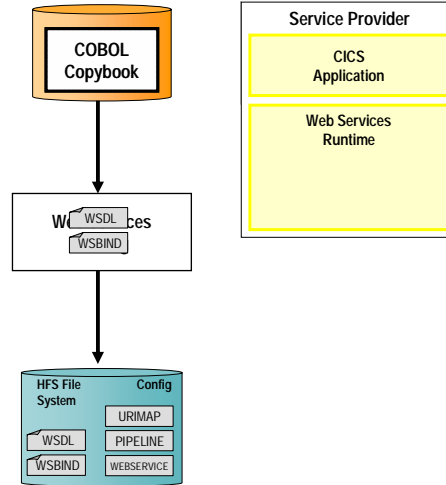Language structure 0101001
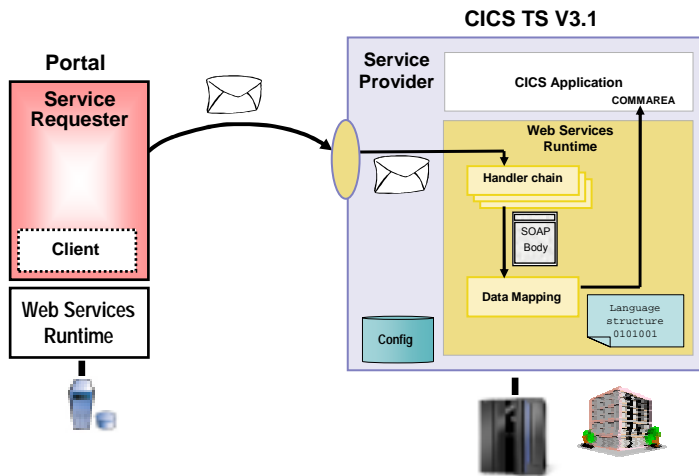
CICS Web Services

- Native Web Services capability offered by CICS
  - ▶ Extends CICS applications directly to a Service Oriented Architecture
  - ▶ A CICS application can now be a Web service provider and requester

- Highlights
  - ▶ Fully integrated into CICS
    - – Resource Definition using CICS admin screen, problem determination, monitoring & statistics
    - – New tooling support for easier application development
  - ▶ Simple configuration and system management

- Rich set of Web services standards supported
  - ▶ SOAP 1.1 and 1.2   to send and receive Web services messages
  - ▶ WS-I Basic Profile 1.0a   for interoperability with between providers and requesters using SOAP
  - ▶ WS-Coordination   extensible coordination framework, and specific coordination of transactions
  - ▶ WS-AtomicTransaction   for transaction coordination
  - ▶ WS-Security   for authentication and encryption of all or part of a message

- SOAP requests can flow over HTTP or WebSphere MQ transports

Development Steps to Expose
CICS Application as a Web Service Provider

1. Start with COBOL copybook

2. Generate WSDL from copybook

3. Copy files to host file system.

   1. Use standard CICS supplied PIPELINE definition

4. CICS automatically installs other related definitions

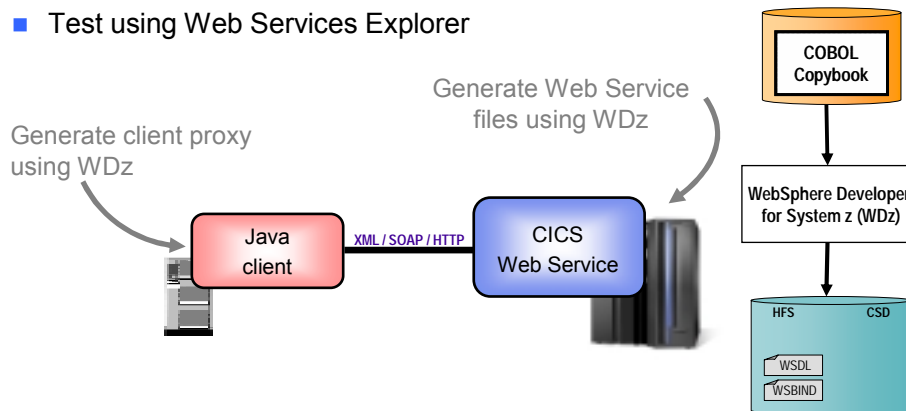5. CICS application is now web service enabled

COBOL Copybook

WSDL
WSBIND
W...ces

Service Provider

CICS Application

Web Services Runtime

HFS File System   **Config**

WSDL	URIMAP
	PIPELINE
WSBIND	WEBSERVICE

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DEMO: Use WebSphere Developer for System z
to Expose CICS Program as Web Service

- Generate WSDL and WSBIND files
- Deploy files to host file system
- Test using Web Services Explorer

COBOL Copybook

Generate Web Service files using WDz

Generate client proxy using WDz

Java client   **XML / SOAP / HTTP**   **CICS Web Service**

WebSphere Developer for System z (WDz)

HFS   **CSD**

WSDL
WSBIND

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Bank of Montreal: Reuse Existing Services

Challenge: Increase Efficiency and Customer Satisfaction

BMO Financial Group

Delivering Business Value:
- Re-used CICS assets with new Web services interfaces into new CRM business process
- New front-end application provided real-time view of improvements in cross-sell and up-sell opportunities
- Revitalize customer relationship management across multiple banking channels

Through greater IT flexibility:
- Reuse existing IT assets through service-enablement
- Modeled options for new system to support hundreds of transactions per second
- Build service-oriented applications more easily

How About a Sequence of CICS Screens? CICS Service Flow Feature

- Allows you to sequence fine-grained CICS program interactions into a higher level, coarse-grained unit.
  - ▶ This can then be exposed as a web service

- Consists of:
  - ▶ CICS Service Flow Runtime in CICS TS 3.1
    - − Runtime in CICS executes a sequence of terminal or commarea based interactions
  - ▶ Service Flow Modeler in WebSphere Developer for z
    - − Visually design flow
    - − Tool can record flow as user navigates through BMS screens
    - − Use Web Services wizards and test facilities in WDz

Service Flow Modeler

- Visual Designer in WDz
  - ▶ Wire CICS applications together into a reusable flow
  - ▶ Wire sequence of BMS screens into a reusable flow

- Expose flow as web service
  - ▶ Can be called from other larger business process flows

- CICS deployment
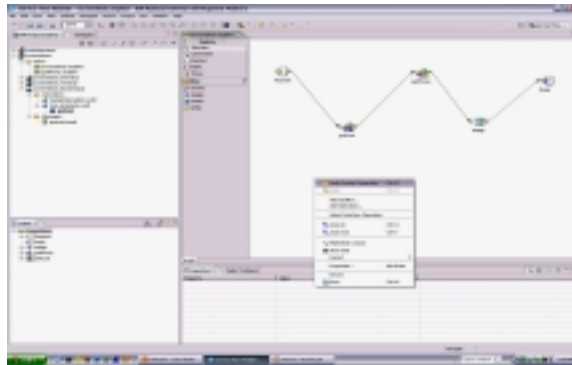 - ▶ Deploy to Service Flow Runtime in CICS TS 3.1

Service Flow Modeler

Deploy →

CICS TS 3.1

CICS Service Flow Runtime

Flow

Screen   API

EIS Applications
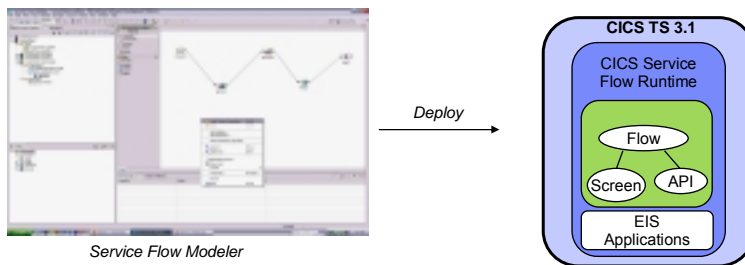
DEMO: Service Flow Modeler

- Use Visual Designer in WDz
  - ▶ Record Screen interactions
  - ▶ Wire CICS programs together

Service Oriented Finance Solution Picture

CICS Customer Management

Web Services

IMS Billing System

Browser

Portal

Portal Server

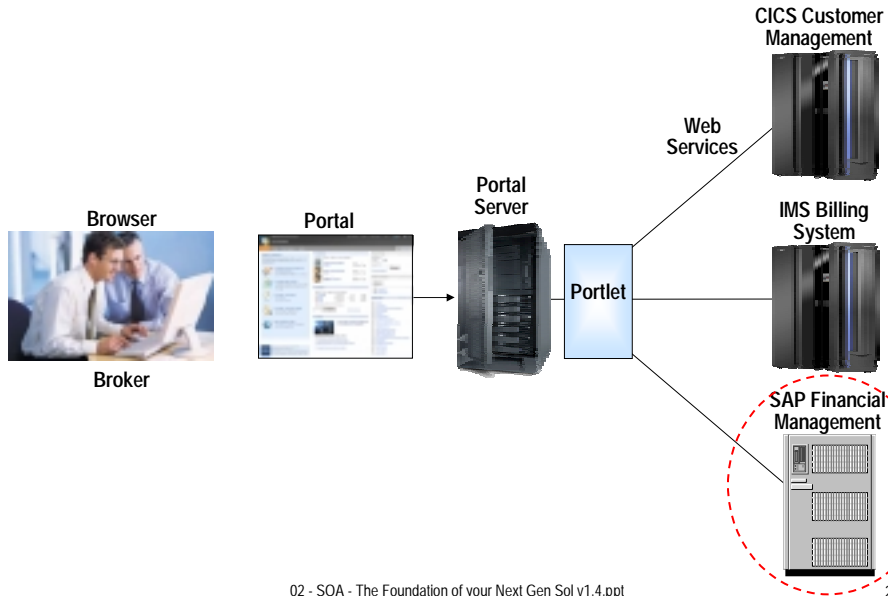Portlet

Broker

SAP Financial Management
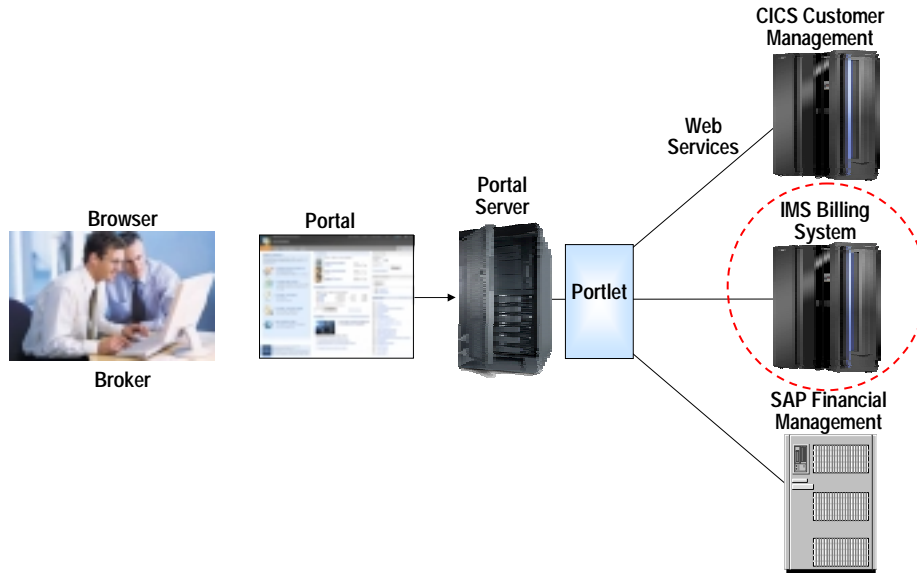
What About IMS Assets?
Use the IMS SOAP Gateway

- Integrates IMS assets into SOA by providing a standard Web Services interface
  - ▶ Expose your IMS application as a web service with easy deployment and configuration
    - − No programming needed

- Tooling support
  - ▶ IBM WebSphere Developer for System z generates Web Service artifacts like WSDL and XML converters
    - − From COBOL copybook of IMS application

- Transforms XML data without changing IMS application
  - ▶ IMS Connect XML Adapter transforms XML data
    - − No need to modify the IMS application code

Service Oriented Finance Solution Picture

CICS Customer Management

Web Services

IMS Billing System

Portal Server

Browser

Portal

Portlet

SAP Financial Management

Broker

What About Other Enterprise Assets without Native Web Services Capabilities?

How do we create services that connect to our other backend systems like SAP?

IBM provides a comprehensive set of adapters.

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What Do Adapters Provide?

- Provide a consistent framework for access to back-end systems and technologies
  - ▶ Translates an abstracted interface into target-specific protocols, APIs or data formats
  - ▶ Abstracted interface encapsulates business functions and events in the form of business objects

- Consistent configuration, deployment, and administration

- A standardized framework enables WebSphere development tools to generate code that would otherwise be manual with third party adapters

IBM Adapter Portfolio

Adapter Category			
Application	• **Ariba Buyer** • Clarify CRM • **eMatrix** • **i2** • **JD Edwards OneWorld**	• **MetaSolv Applications** • **Oracle Applications** • **PeopleSoft Enterprise *** • **Portal Infranet**	• **SAP Exchange Infrastructure** • **SAP Software *** • **Siebel eBusiness Applications** *** • **SunGard FRONT ARENA**
Technology	• **COM** • **CORBA** • Complex Data • EDI • **Enterprise Java Bean** • DTS • E-mail • Exchange	• Fix Protocol • **Flat Files *** • Lotus Domino • Healthcare Protocols • HTTP • **i-Series** • **JDBC *** • JMS	• SWIFT • TCP/IP • **Web Services** • WebSphere MQ • WebSphere Message Broker • WebSphere MQ Workflow • **XML**

Adapter development kit available for developing custom adapters

Notes:

Adapters in **bold** can introspect target application/technology

* Both Java Connection Architecture (JCA) and Java Message Service (JMS) adapter versions provided

** Only available as a Java Connection Architecture (JCA) adapter

Business Problem Solved

We are getting hundreds of new customers through our external brokers

SOA allowed us to quickly unlock our core application assets for reuse

Service Oriented Finance CEO

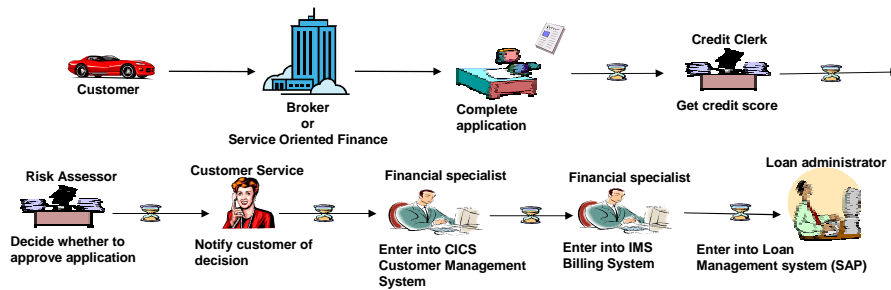**Service Oriented Finance CIO**

Service Oriented Finance's Technical Challenges

1. How can Brokers access our existing car loan application?

2. How do I optimize the existing process so we are ready to handle a large increase in the number of car loan requests?
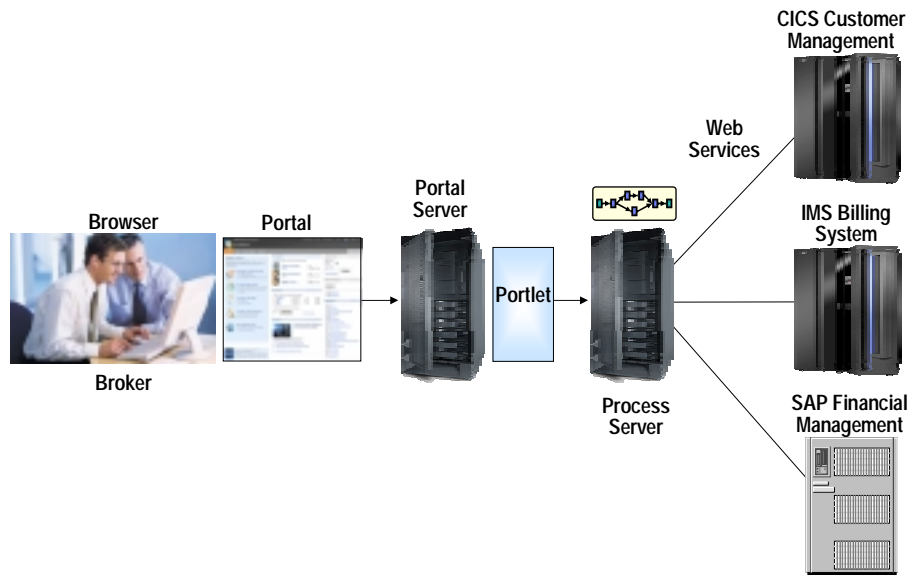
Service Oriented Finance CIO

Current Process for New Car Loans

Customer

**Broker
or
Service Oriented Finance**

**Complete
application**

Credit Clerk

Get credit score

Risk Assessor

**Decide whether to
approve application**

Customer Service

**Notify customer of
decision**

Financial specialist

**Enter into CICS
Customer Management
System**

Financial specialist

**Enter into IMS
Billing System**

Loan administrator

**Enter into Loan
Management system (SAP)**

Reasons current process isn't ready for increased amount of business:
- Manual process won't scale
- Manual data entry results in errors
- Multiple manual steps makes it difficult to determine status of any
  particular loan request

Service Oriented Finance Solution Picture

Browser

Portal

**Portal
Server**

Portlet

**Process
Server**

**Web
Services**

**CICS Customer
Management**

**IMS Billing
System**

**SAP Financial
Management**

Broker

Next Step to SOA

- Combine exposed services to innovate new cross-system business functions
- Use IBM Middleware to quickly achieve business process integration, portal integration, and data integration

| CICS | IMS | Custom | Distributed Application |
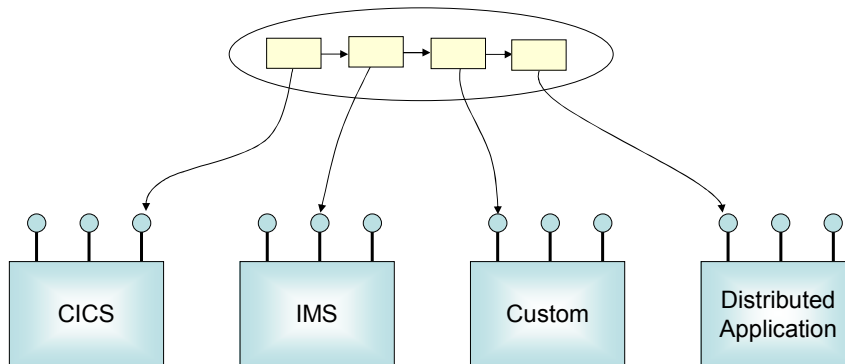
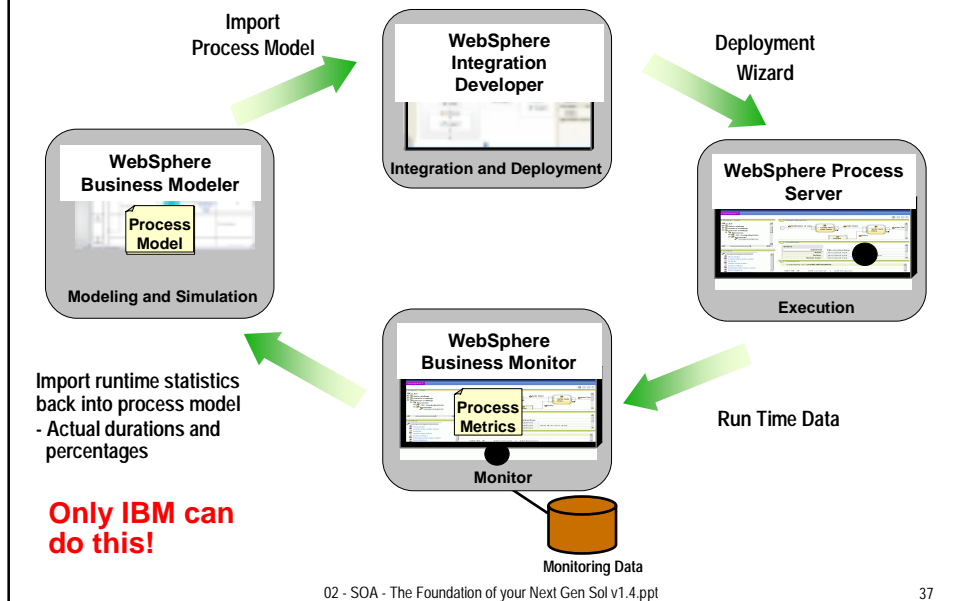# WebSphere Integrated Framework for Next Generation Process Management

1. **Model** the solution using **WebSphere Business Modeler**
   - Verify that proposed solution will meet the business objectives.
   - Gain agreement with executives, business owners, and development

2. **Develop** (assemble) the solution using **WebSphere Integration Developer**
   - Develop Loan Application solution
   - Implement Key Performance Indicators to measure business results

3. **Deploy** the solution onto **WebSphere Process Server**
   - Deploy to integration server that supports all aspects of integration
   - Execute on server that is reliable, scalable, secure, and based on open standards

4. **Manage** the deployed solution using **WebSphere Business Monitor**
   - Monitor processes to identify and fix problems, delays
   - Review Key Performance Indicators to ensure business objectives are met

Closed Loop For Continuous Improvement

Import Process Model

WebSphere Integration Developer

Integration and Deployment

Deployment Wizard

WebSphere Business Modeler

Process Model

Modeling and Simulation

WebSphere Process Server

Execution

Import runtime statistics back into process model
- Actual durations and percentages

WebSphere Business Monitor

Process Metrics

Monitor

Run Time Data

Only IBM can do this!

Monitoring Data

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Will the New Process Meet Business Objectives? Model the New Process

Solution: WebSphere Business Modeler
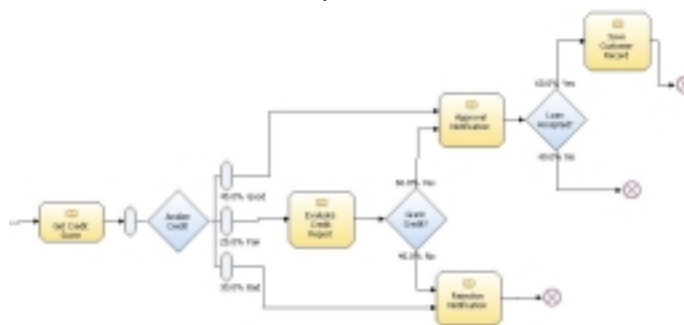
- Clearly define and document business requirements
- Graphically design the way processes will work
- Can include both human and automated steps

- Model the things that affect performance
  ► Tasks, costs, times, resources
- Model the things that measure performance
  ► Key Performance Indicators (KPIs)
- Simulate your model before it is developed
  ► Allows you to identify bottlenecks
- Assess achievement of business objectives

Model Flow Needs to be Completed with Programming Assets
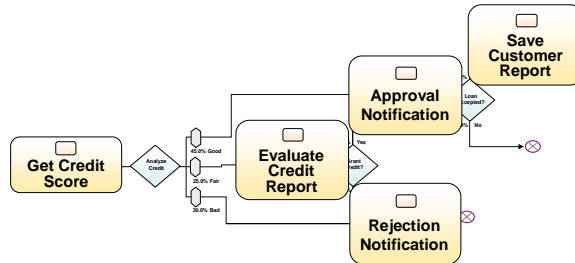
- Model is converted into a structured language (BPEL) flow
  - WebSphere Business Modeler generates BPEL

- Programmer uses WebSphere Integration Developer
  - Imports BPEL from modeler

- Model now needs to be completed by programmers to provide:
  - Web service for Get Credit Score
  - Service for updating CICS, IMS and SAP
  - Assign role for each human step
  - Data maps for each step
  - Automatically generate executables for Deployment to WebSphere Process Server (via EAR)

Use WebSphere Integration Developer to Build the Process

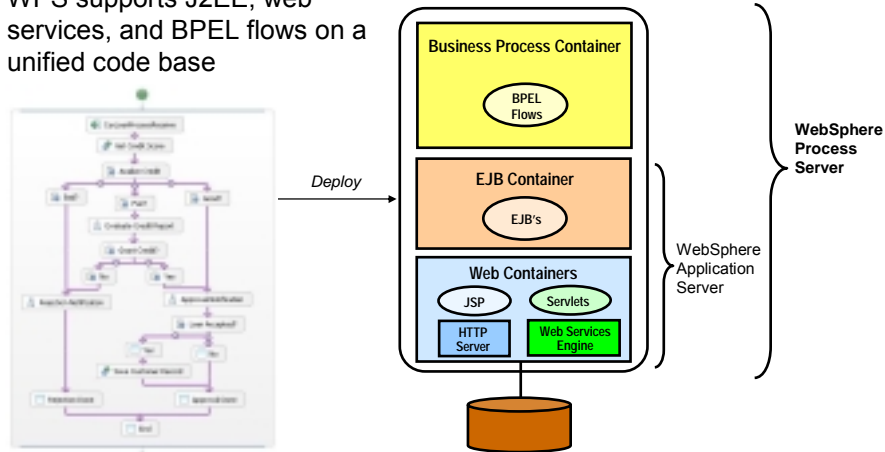- Graphically describe business process flow in Business Process Execution Language (BPEL)

- Drag and drop services into process flow (automatic binding)

- Automatic human workflow support

- Built-in Unit Test Environment

- Built-in Process Debugger

- Generate and deploy to runtime server

- Flow may be invoked as web service, EJB, or message driven bean

Process from Modeler (in BPEL)

The Completed Process Runs on WebSphere Process Server (WPS)

- The completed BPEL process can be deployed easily to WPS

- WPS supports J2EE, web services, and BPEL flows on a unified code base

Deploy

Business Process Container
BPEL Flows

EJB Container
EJB's

Web Containers
JSP   Servlets
HTTP Server   Web Services Engine

**WebSphere Process Server**

WebSphere Application Server

WebSphere Process Server - Highlights

- Service Oriented Architecture platform
  - ▶ A single integrated platform
  - ▶ A uniform invocation programming model
  - ▶ A uniform data representation model (Business Objects)
  - ▶ Powerful tools to build and reuse standard components

- WebSphere Application Server Foundation
  - ▶ Clustering, failover, high availability and robust platform
  - ▶ Single administration environment

- Business Processes
  - ▶ WS-BPEL standard

- Powerful Staff Components for Human Workflow
  - ▶ Participating / Originating / Ad-Hoc Tasks
  - ▶ Multi-level escalation
  - ▶ Client components out-of-the box

- Business State Machines, Business Rules & Transformations
  - ▶ Advanced services to build integration solutions

DEMO: Run the New Car Loan Process
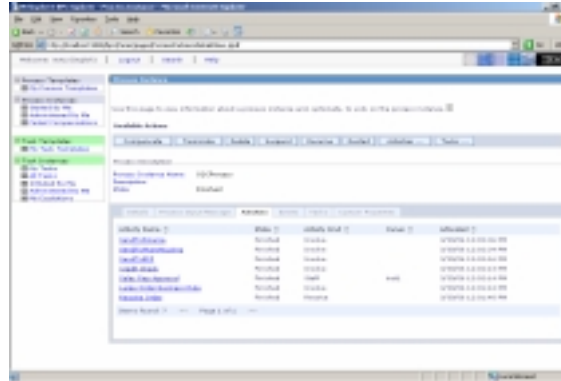
- Submit new loan application through Portal
- Process-level monitoring
- Human workflow – Work list gets populated with tasks

Run the Process on System z

What platform should I use to run my Next Generation processes?

System z is an ideal platform for your SOA infrastructure

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Why SOA on System z?
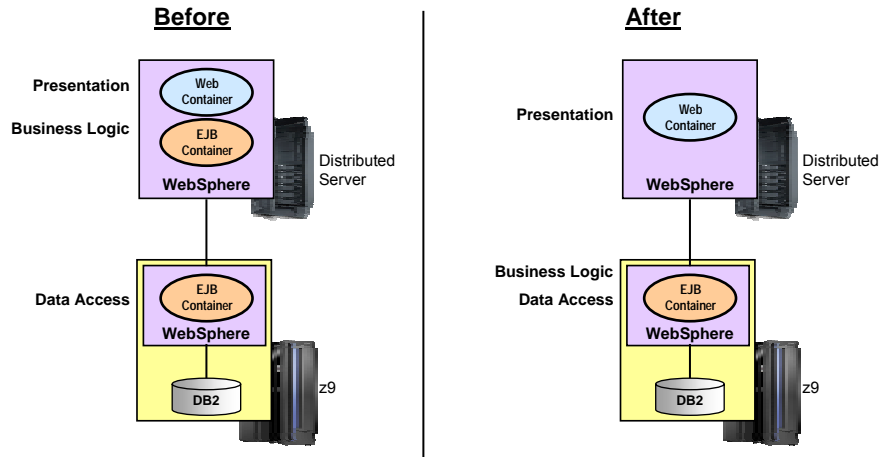## 1. Qualities of Service

- An effective SOA implementation requires very high Quality of Services (QoS) from the underlying environment
  - ▶ Continuous Availability/Disaster Recovery
  - ▶ Scalability and Clustering
  - ▶ Rock solid Security
  - ▶ Workload Management to handle peak demand

- *These are fundamental characteristics of System z, making it an ideal platform to deploy an SOA solution*

- IBM's core SOA framework runs on z/OS
  - ▶ WebSphere Application Server
  - ▶ WebSphere Process Server
  - ▶ WebSphere Portal Server
  - ▶ WebSphere Enterprise Service Bus

Why SOA on System z?
2. Co-location

- Typically the mainframe already houses the core applications and data that provide a competitive advantage to the business
  - ▶ Quickly expose them as services, and continue the QoS the business depends on

- Having the Process Server and Enterprise Service Bus in close proximity to the assets they access provides better performance and throughput

- HiperSockets technology means less network overhead
  - ▶ Memory to memory communication

Proximity to Data
Large Transportation Company Benchmark

Before

Presentation

Business Logic

| Web Container |
| EJB Container |
WebSphere

Distributed Server

Data Access

| EJB Container |
WebSphere

DB2   z9

After

Presentation

| Web Container |
WebSphere

Distributed Server

Business Logic
Data Access

| EJB Container |
WebSphere

DB2   z9

- **Advantages of refactoring business logic to be co-resident with z/OS data**
  - ▶ Average CPU time per EJB transaction was reduced by over 77%
  - ▶ Number of bytes of data transferred per EJB transaction was reduced by 99%
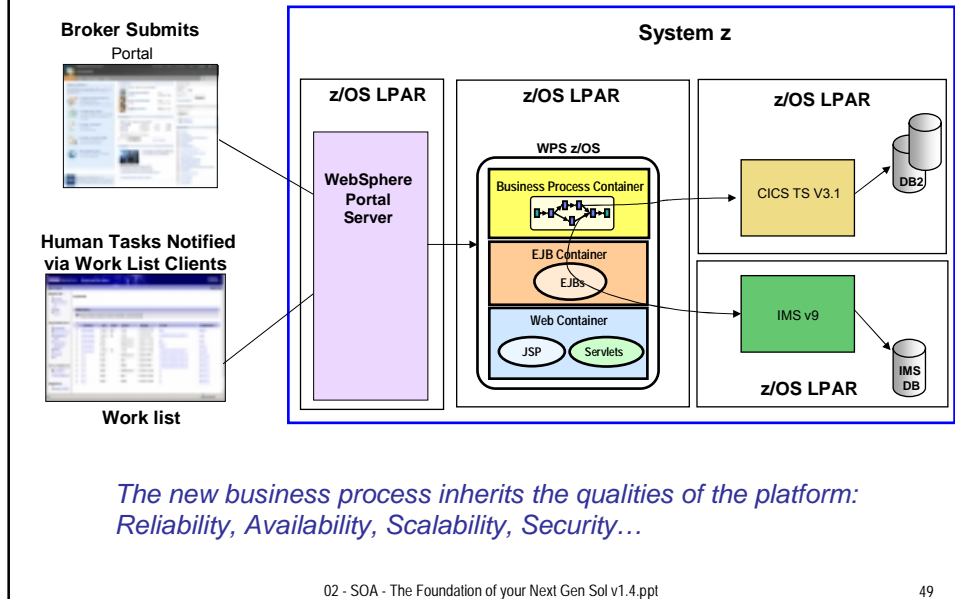

Why SOA on System z?
3. Core System Transaction Capabilities for SOA

- ■ System z provides a mature, robust transaction processing platform

- ■ Many subsystems on z/OS are transactional resource managers working in collaboration with z/OS Recoverable Resource Services
  - ▶ CICS Transaction Server, IMS, WebSphere Application Server for z/OS, WebSphere Process Server for z/OS, WebSphere Enterprise Service Bus for z/OS, DB2 etc.
  - ▶ Supports transaction coordination between participating subsystems

Service Oriented Finance Runs its Next Generation SOA Solutions on System z

Broker Submits
Portal

Human Tasks Notified via Work List Clients

Work list

System z

z/OS LPAR

WebSphere Portal Server

z/OS LPAR

WPS z/OS

Business Process Container

EJB Container

EJBs

Web Container

JSP   Servlets

z/OS LPAR

CICS TS V3.1

DB2

IMS v9

IMS DB

z/OS LPAR

The new business process inherits the qualities of the platform: Reliability, Availability, Scalability, Security…

IBM Provides Extensive Support for SOA Next Generation Solutions

- Tools to create and use services quickly

- Service combining frameworks to integrate services into applications
  - ▶ Assemble services into business processes
    - – WebSphere Process Server
  - ▶ Deliver services to user desktops
    - – WebSphere Portal Server
  - ▶ Combine multiple data services into a single data service
    - – WebSphere Information Integrator

- Management tools for your SOA environment

Option to Run Natively on System z

Summary

Unlock the value of your System z assets using a Service Oriented Architecture.

System z is an ideal platform for implementing Next Generation SOA Solutions.

IBM