Integration in Action using JBoss Middleware

Ashokraj Natarajan - Cognizant
Agenda

- Open Source Enterprise Needs – Top Reasons
- Integration Trends
- HealthCare Trends – Use Cases Demo
- Cognizant Frameworks
- Cognizant Delivery Model
- Redhat SMAC Analysis
The objective is to demonstrate effective Open Source Enterprise Solutions using JBoss SOA Platform.
Open Source Survey

2009
- Lower costs
- Superior security
- Freedom from VENDOR lock-in

2010
- Lower costs
- Freedom from VENDOR lock-in
- Rapid pace of innovation

2011
- Freedom from VENDOR lock-in
- Lower costs
- Flexibility

2012
- Freedom from VENDOR lock-in
- Lower costs
- Quality
### Winning Themes – for Enterprises

<table>
<thead>
<tr>
<th>Top Reasons</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimized Cost and Time</td>
<td></td>
</tr>
<tr>
<td>Functionality, Performance and Reliability</td>
<td></td>
</tr>
<tr>
<td>The Broadest Connectivity</td>
<td></td>
</tr>
<tr>
<td>Enterprise Grade Support</td>
<td></td>
</tr>
<tr>
<td>Community Strength</td>
<td></td>
</tr>
<tr>
<td>Fast Learning curve</td>
<td></td>
</tr>
<tr>
<td>Adoption – No Barriers</td>
<td></td>
</tr>
<tr>
<td>Market Ready Products</td>
<td></td>
</tr>
</tbody>
</table>
Integration Trends

ESBs Are Hot

- ESBs are growing in importance.
- Many ESB vendors offer upgrades to a more Comprehensive Integration solution.

Holistic Approach To Integration

Many firms are now considering all their integration requirements (application, business-to-business [B2B], process, and data) to develop a holistic strategy that addresses them all with a minimum of technology overlap.

Lean Integration – On Rise

Many organizations are expected to move aggressively to implement Lean Integration to
- Speed up application delivery
- Automate repetitive integration tasks
- Make continuous improvements
Real-Time Integration – Increase in Demand

• Smart devices, web apps, and social media are driving the need to share and access information more quickly than ever before.
• More businesses are looking to collaborate using information in real time.

SaaS Apps Integration – Increase in Demand

• Increasing demand for integration coupled with integration capabilities fueling more integration and more SaaS adoption across the firms.
• Demand for SaaS applications continues to accelerate.

The ICC Has Become Mainstream

Having a well-staffed and well-trained ICC (Integration Competency Center) organization enables firms to handle complex integration projects more effectively.
Healthcare Industry Trends

1. Healthcare Reform, Compliance, & Regulations
2. Connecting the Healthcare Community
3. New & Changing Business Models
4. Pressures to Cut IT Costs
5. Massive Increase in Unstructured Data
6. Security of Data and IT Assets
Member Portal Solution
Member Portal – Functional Flow

This open source solution using JBoss middleware helps in Healthcare Eligibility Benefit enquiry process.

Participants: Patient, Clinic, Insurance Company

- Patient
- Clinic (Provider)
- Insurance Company (Payer)

Eligibility Benefit Inquiry
270 X12

Eligibility Benefit Response
271 X12
Member Portal – Use cases

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Time Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Eligibility Request &amp; Response</td>
<td>&lt; 1 second</td>
</tr>
<tr>
<td>Search Patient Request and Response</td>
<td>&lt; 1 second</td>
</tr>
</tbody>
</table>

- **Inputs**: Send Patient Identification Code
- **Outputs**: Retrieve Patient & Eligibility details
- **Transaction**: JBoss Enterprise SOA Platform
- **Use Case**: Search Patient

- **Transaction**: JBoss Enterprise SOA Platform
- **Use Case**: Check Eligibility

- **Transaction**: JBoss Enterprise SOA Platform
- **Use Case**: Search Patient

- **Transaction**: JBoss Enterprise SOA Platform
- **Use Case**: Check Eligibility
Products Overview

- Apache Tomcat 7.0
- JBoss SOA Platform version 5.3
- PostgreSQL version 9.0
- Smooks version 1.5
- Apache Hadoop version 0.20
- Twitter4J version 2.0.9
User Interface
Reference Architecture

Internal Consumers
- Portal Applications
  - Member Portal
  - Provider Portal
  - Broker Portal
- Customer Care Channels
  - Transformation and Routing

External Consumers
- Portal Applications
  - NetworX Pricing
  - Claims Management
  - Accumulation Management
  - Benefits Management
- Trading Partners
  - Providers
  - Intermediaries
  - Blues Network

Enterprise Middleware
- Enterprise Service Bus
  - Security
  - Authentication
  - Authorization
  - Protocol Handler
- Business Process Management
  - Claims Submission
  - Eligibility Inquiry
  - Claims Status Inquiry
  - Enrollment
  - Quote to Submit
- Business Rules Management System
  - Eligibility Inquiry
  - Quote to Submit

Business / Domain Services
- List Member
- Find Member
- Search Patient
- Get Eligibility
- Get Accums
- Find Provider

Enterprise Business Applications
- Member
- Provider
- Claims
- Benefits
- Accumulations
- Underwriting
- Pricing
- COB
- Incentive Management
- Utilization Management
- Care

Enterprise Data Mart and Reporting
- Claims Repository
- ERA Repository
Apache Tomcat

Apache Tomcat is leveraged for deployment of user interfaces.

Portal interacts with JBoss SOA-P through webservices
Redhat JBoss SOA Components

Data Transformation - Smooks
Clinic submits the patient eligibility benefit request

Clinic receives the patient eligibility benefit details

Components View in JBoss SOA

JBoss Enterprise SOA Platform

- SOAP Client
- HTTP Router
- File Adapter
- Action Chain
  - Transformers (Smooks)
  - Logging
  - Custom Action

Retrieve Eligibility Benefit Response Details

Sends Eligibility Benefit details as response

Information System

X12 file format

Twitter

JSON

Log Analysis

Postgre SQL DB

Stores key patient details and transaction information
**Description**

HIPAA Framework helps in processing X12 transactions like data validation, data extraction. In the current solution, HIPAA framework is used to extract X125010270 HIPAA request.

HL7 Processing Framework is developed to validate and transform HL7 message formats from Health care systems. The framework is implemented on Red Hat JBoss SOA Platform. JBoss ESB receives the HL7 messages from external Health Care systems and invoke the webservices for HL7 processing.

**Benefits**

- This framework can be used to reduce the efforts and time by Health Insurance firms in their product offerings.
- Used to implement state Health Insurance Exchange (HIX) solutions for 2014 exchange readiness.
Smooks Configuration

<?xml version="1.0" encoding="UTF-8"?>
<smooks-resource-list xmlns="http://www.milyn.org/xsd/smooks-1.1.xsd"
xmlns:edi="http://www.milyn.org/xsd/smooks/edi-1.2.xsd">
<!-- Parse the EDI stream... -->
<edi:reader mappingModel="/smooks_config/Edi-To-Xml-Mapping.xml" />
</smooks-resource-list>>
Routing
Routing to HIS

JBoss SOA-P transforms the EDI X12 files to XML using Smooks action component and routes to HIS - DB component.

The Information System stub receives the 270 X12 request and sends 271 X12 response.
Back End Systems
The key information of the user like Patient Info and Insurance Eligibility Info will be stored in PostgreSQL database.
Social Connectors framework
Twitter Framework

- The processed eligibility benefit information are streamed in real time using the custom adapter developed for Twitter.
- The adapter is invoked from JBoss ESB services to publish the Patient Identification information to the twitter stream.
Logging & Error frameworks
The transactional information are logged intermittently in the server log files. JBoss ESB initiates the Job in Apache Hadoop through API calls. The log files are analyzed swiftly using Apache Hadoop. The vital information like transaction status are retrieved from the log statements.
PIEH Framework

Description
PIEH Framework provides solutions for run time exception coming from different coding environments.

Framework will work as a plug in and can be installed on a runtime environment. Framework stores solutions to the exceptions in a centralized error repository.

Benefits
• Can be leveraged to capture real time or batch exceptions from ESB Integrations.
• Can be installed on any runtime environment as a plug-in.
• Provides user interface making it easier for developers to add errors, get solutions and to insert new solutions.

Legend
- Channels
- Exception Handler
- Service Schema
- Business message
Big Data - Hadoop framework
Log Analyzer

- JBoss ESB initiates the Job in Apache Hadoop using Hadoop framework.
- The log files are analyzed swiftly using Apache Hadoop. The vital information like transaction status are retrieved from the log statements.

Dependency jar - hadoop-0.20.0-core
Calling Hadoop

// create a configuration
Configuration conf = new Configuration();
conf.set("fs.default.name", "hdfs://<localhost>:<Port>");
conf.set("mapred.job.tracker", "<localhost>:<Port>");
conf.set("mapred.jar", "LogAnalyzer.jar");

FileSystem fs = FileSystem.get(conf);
Path path = new Path("hdfs://<localhost>:<Port>/input/log");

//Job Configuration
Job job = new Job(conf, "Hadoop Log Analyzer job");
job.setJarByClass(LogAnalyzer.class);
job.setMapperClass(LogEntryMapper.class);
job.setReducerClass(LogEntryReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);

//Set Input and empty Output paths
FileInputFormat.addInputPath(job, new "/input/log");
FileOutputFormat.setOutputPath(job, new Path("/output"));

//Submit the job
job.submit();
boolean check = job.waitForCompletion(true);
End-to-End flow

The overall solution of the Eligibility Benefit Request e2e flow is depicted below
Demo
Open Source Frameworks
Framework - TPS

Description
TPS Framework (Transport Protocol Switching Framework) provide a framework for switching between different transport protocols like HTTP, FTP, JMS and Web Service.

Benefits
• To switch the listening transport protocol of the Core Service to a new transport protocol.
• To provide user interface for configuring the transport information for individual service.

*Protocols A and B – FTP, JMS, HTTP, WS
Framework – Integration Patterns

**Description**
Integration Patterns Framework is a collection of integration patterns pre-built using Apache Camel.

**Benefits**
- Drastically reduces development effort.
- Easily extended to use growing set of Camel components.
- This can be leveraged to integrate distributed applications.
Cognizant Delivery Model

Cognizant and Redhat Joint Case Study
Cognizant Delivery Model

Application Integration

Process Integration

Data Integration

Planning Process

Planning Process

Enterprise Integration Strategy

Integration Competency Center (ICC)

Improved Integration Results
Maximize value of Enterprise Data

Accessibility and Availability

Data Integration

Master Data Management

Data Quality Management

Maximize Enterprise Data Value

Transparency and Visibility

Reliability and Consistency
SMAC Solutions – Red Hat

- Social
- Mobile
- Cloud
- Analytics
Red Hat enables social collaboration through JBoss ESB (custom adapters) and jBPM (Domain Specific Processes) to collaborate—and capitalize—on events immediately as they happen.

Developed custom adapter for Twitter which are called in JBoss ESB services to publish the Patient Identification information to the twitter stream.
Mobile Solutions

With the ever increasing adoption of mobile devices, there is a need to serve applications to all devices like tablets and smart phones. Red Hat provides AeroGear, RichFaces, Errai to support latest mobile innovations.

JBoss Developer Studio 5’s BrowserSim can be used to preview and test your applications.
Red Hat JBoss Data Grid is a distributed in-memory data grid that provides:

- Schema less key value store – Red Hat JBoss Data Grid is a NoSQL database that provides the flexibility to store different objects without a fixed data model.
- Grid-based data storage – Red Hat JBoss Data Grid is designed to easily replicate data across multiple distributed nodes.
- Multiple access protocols – It is easy to access to the data grid using REST, memcached, Hot Rod, or simple map-like API.
Cloud Solutions

OpenShift is Red Hat's Cloud Computing Platform as a Service (PaaS) offering.

OpenShift is an application platform in the cloud where application developers and teams can build, test, deploy, and run their applications. OpenShift takes care of all the infrastructure, middleware, and management and allows the developer to focus on what they do best: designing and coding applications.
ManageIQ provides the scalable enterprise cloud management solution enabling organizations to manage their virtual infrastructures, transform IT and rapidly evolve to cloud computing.
Cognizant
Business Process Integration - BPI
Overview
Cognizant – Business Process Integration (BPI) practice

BPI is a technology services group providing end to end solutions in the Integration and BPM space

Unique value & Innovation

Global Delivery Capabilities

Industry Alliances

Proven record of success – with Fortune 1000 Clients
Clients’ needs are evolving...

1. Overall middleware needs comprise Core Solution spaces *(application, process, data & B2B)* together defined as comprehensive integration solutions
2. Clients are increasingly looking to buy from a single services provider with capabilities across comprehensive integration solutions
3. Comprehensive integration enabling Business Agility