



# MODERNIZING HEALTHCARE WITH RED HAT JBOSS FUSE 6.0

May 24, 2013

Michelle Davis  
Senior Middleware Solutions Architect

Kenneth W. Peeples, CHFI, Security+  
JBoss Technology Evangelist

# Agenda

**Modernization of Healthcare via Integration**

Fuse History

What is JBoss Fuse?

Demo

Q and A

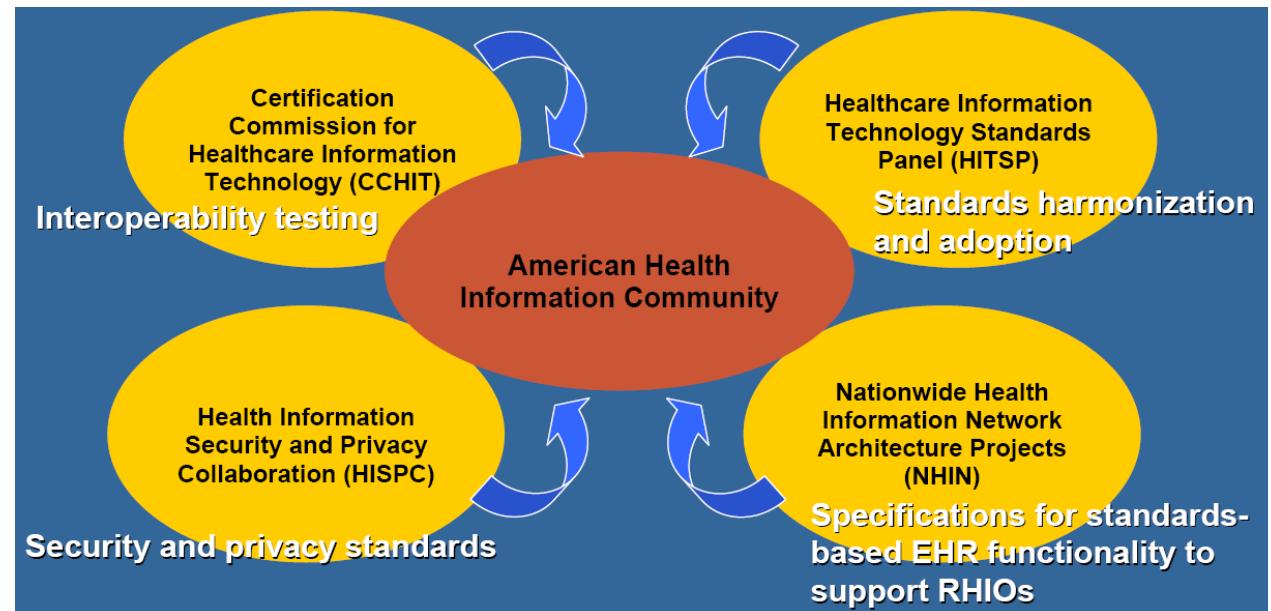
# Modernization of Healthcare via Integration

# Vertical Solutions – Healthcare

RedHat understands the Healthcare challenges

## Integration is Necessary

- Devices
- Systems
- Departmental
- Institutional
- Enterprise
- Regional
- National
- International

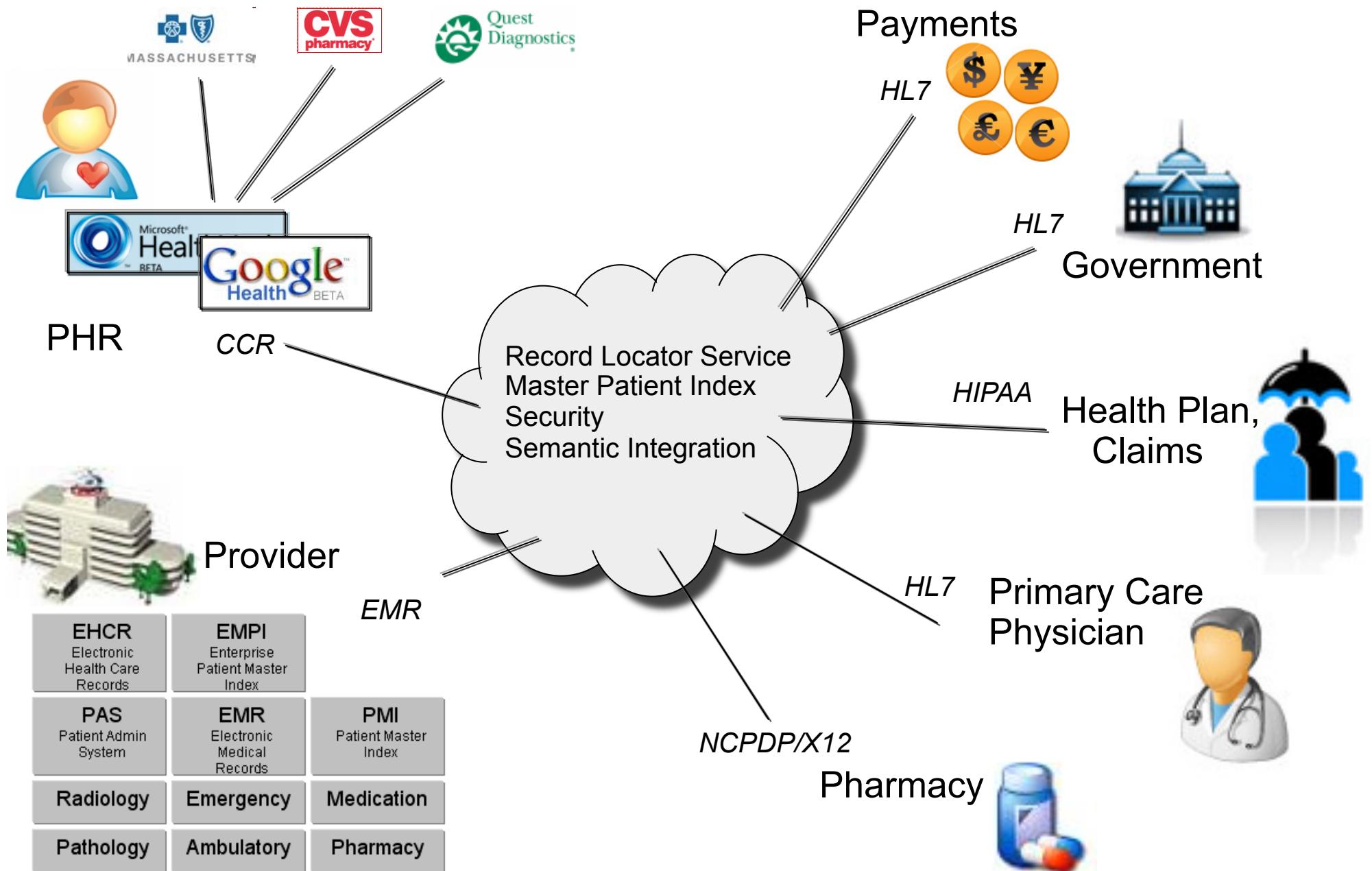


## Standards Development Organizations – HL7, DICOM, etc.

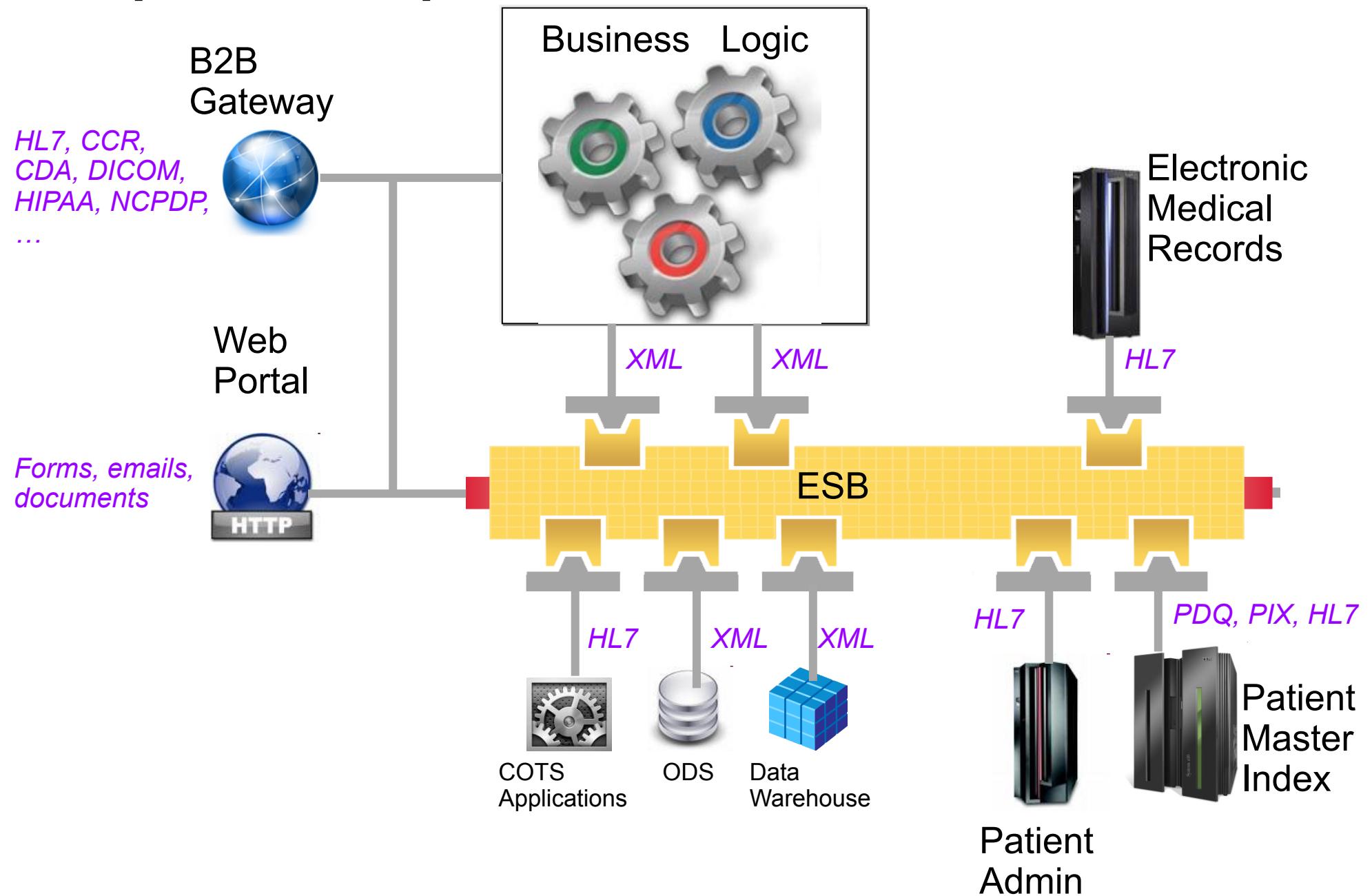
## Regulatory agencies

**Preserve existing investment without inhibiting the introduction of new solutions**

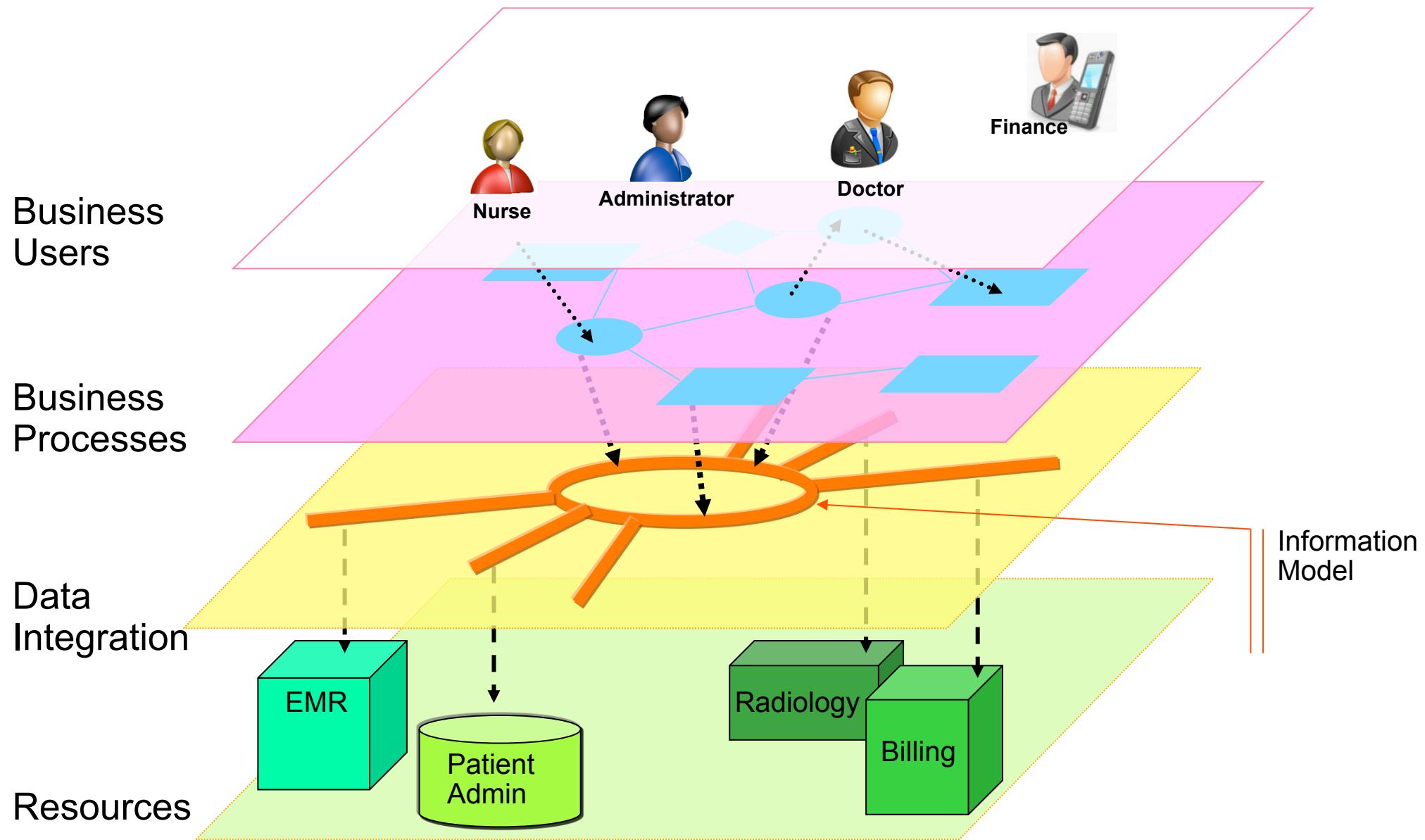
# Cross-enterprise Data Integration Concepts



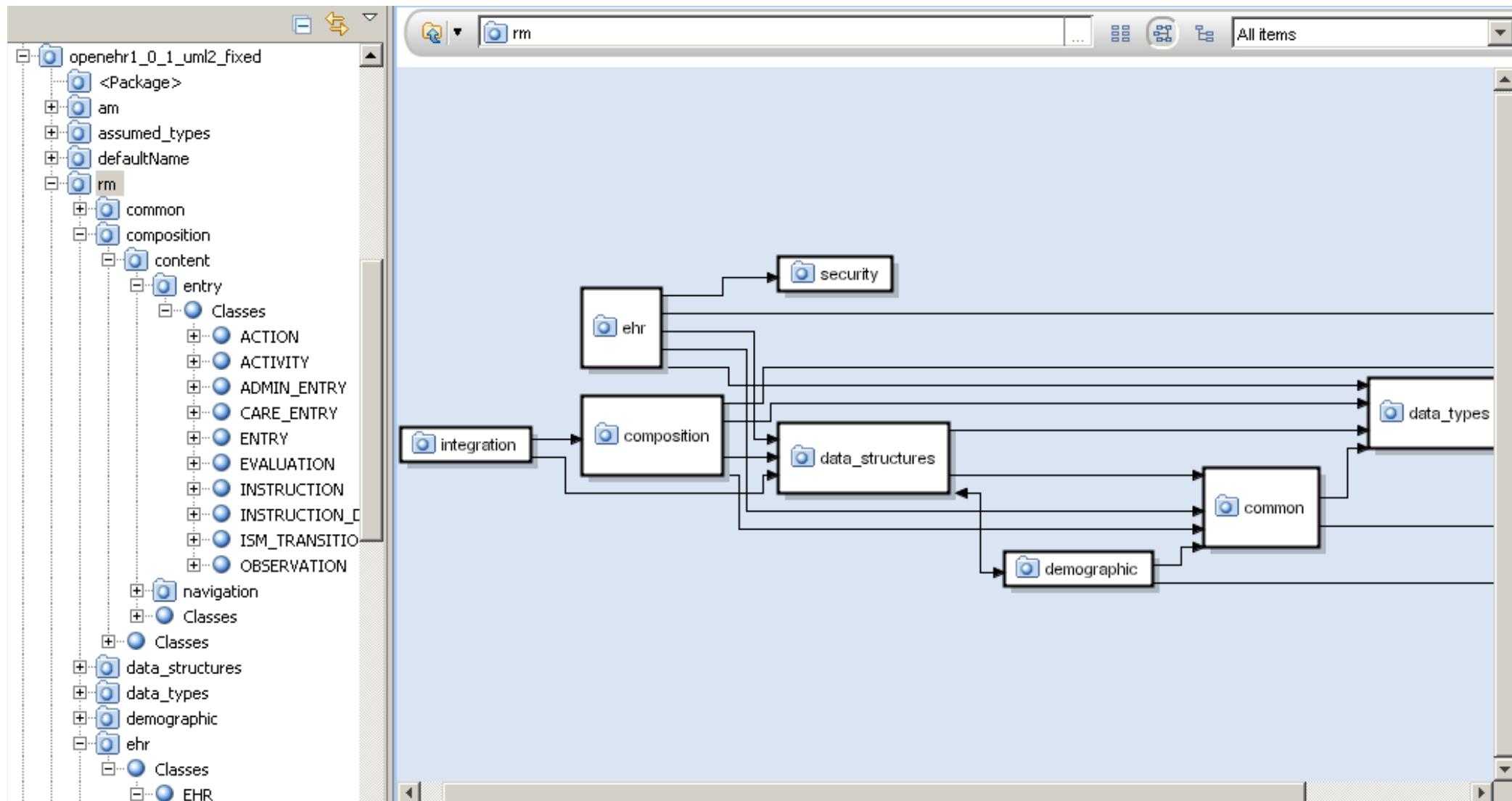
# Conceptual Enterprise Architecture in Healthcare



# Enterprise Data Integration Concepts

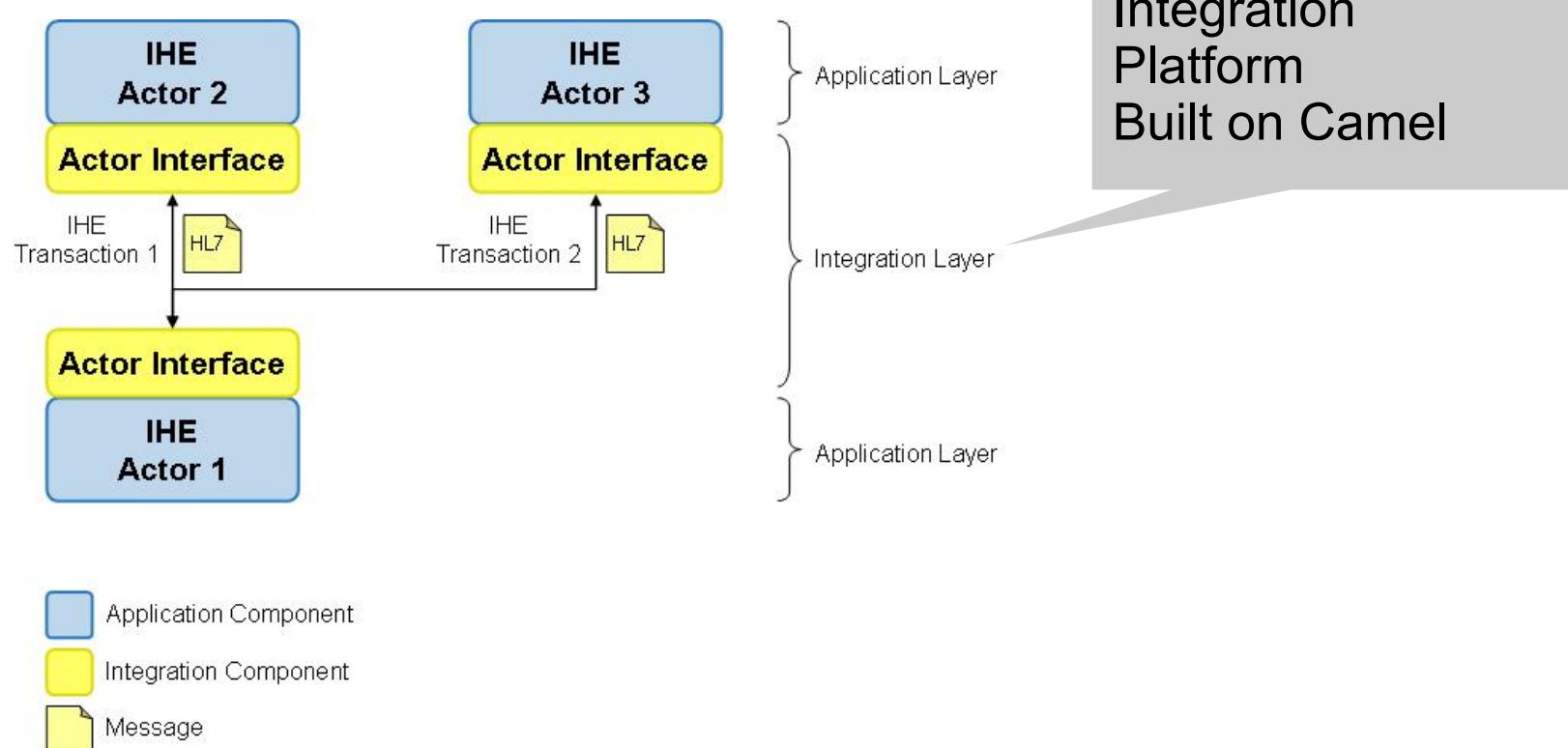


# Conformance to the openEHR Information Model (or Any)



# Open eHealth Integration Framework

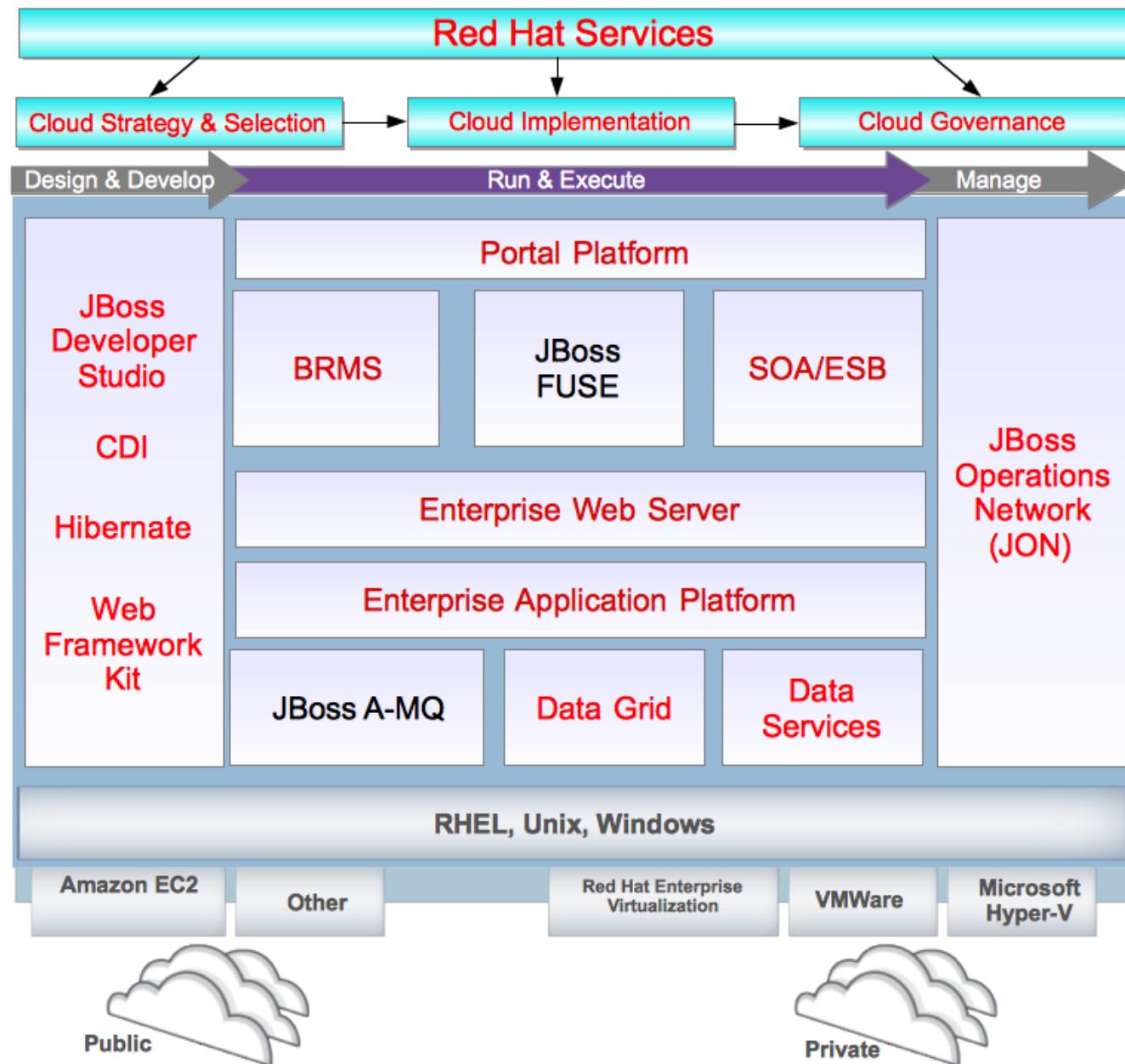
Open eHealth Framework is a development framework with special support for the implementation of IHE concepts (i.e. profiles).





# Red Hat JBoss Fuse 6.0

# JBoss Middleware Overview

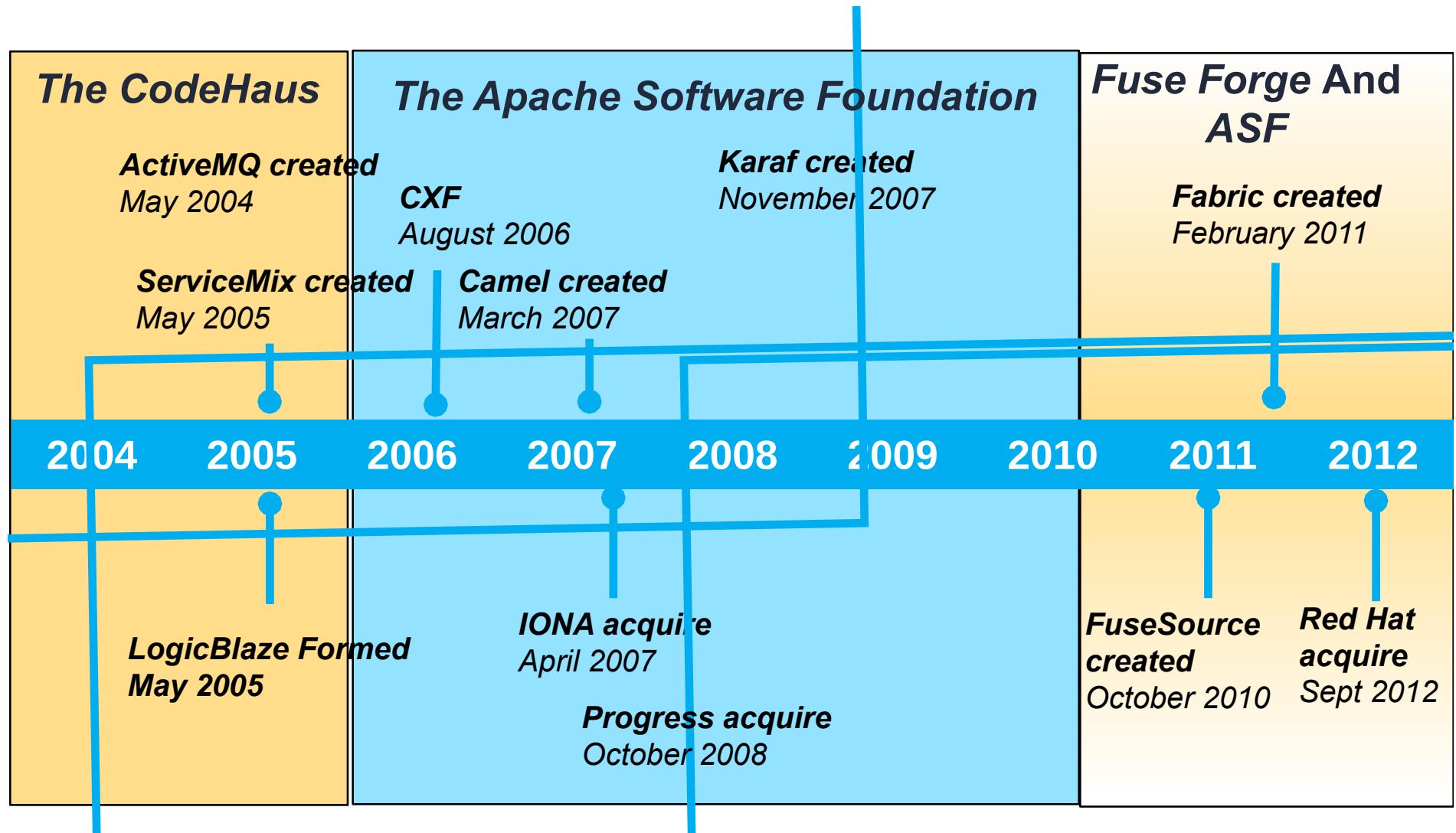


# JBoss FUSE

## *Integration Everywhere*

JBoss Fuse and JBoss A-MQ enable agencies and enterprises to build integration solutions more rapidly with small footprint, flexible application integration capabilities and a high-performance messaging platform.

# History of FuseSource

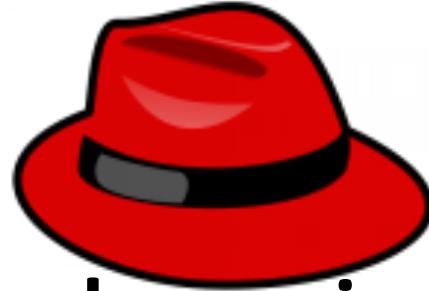


# The Leaders in Open Source Integration and Messaging

If you have an integration project...



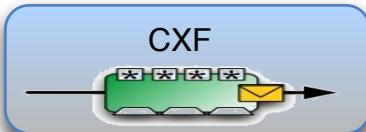
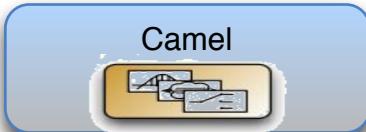
...you should be using Apache projects



If you are using Apache projects...

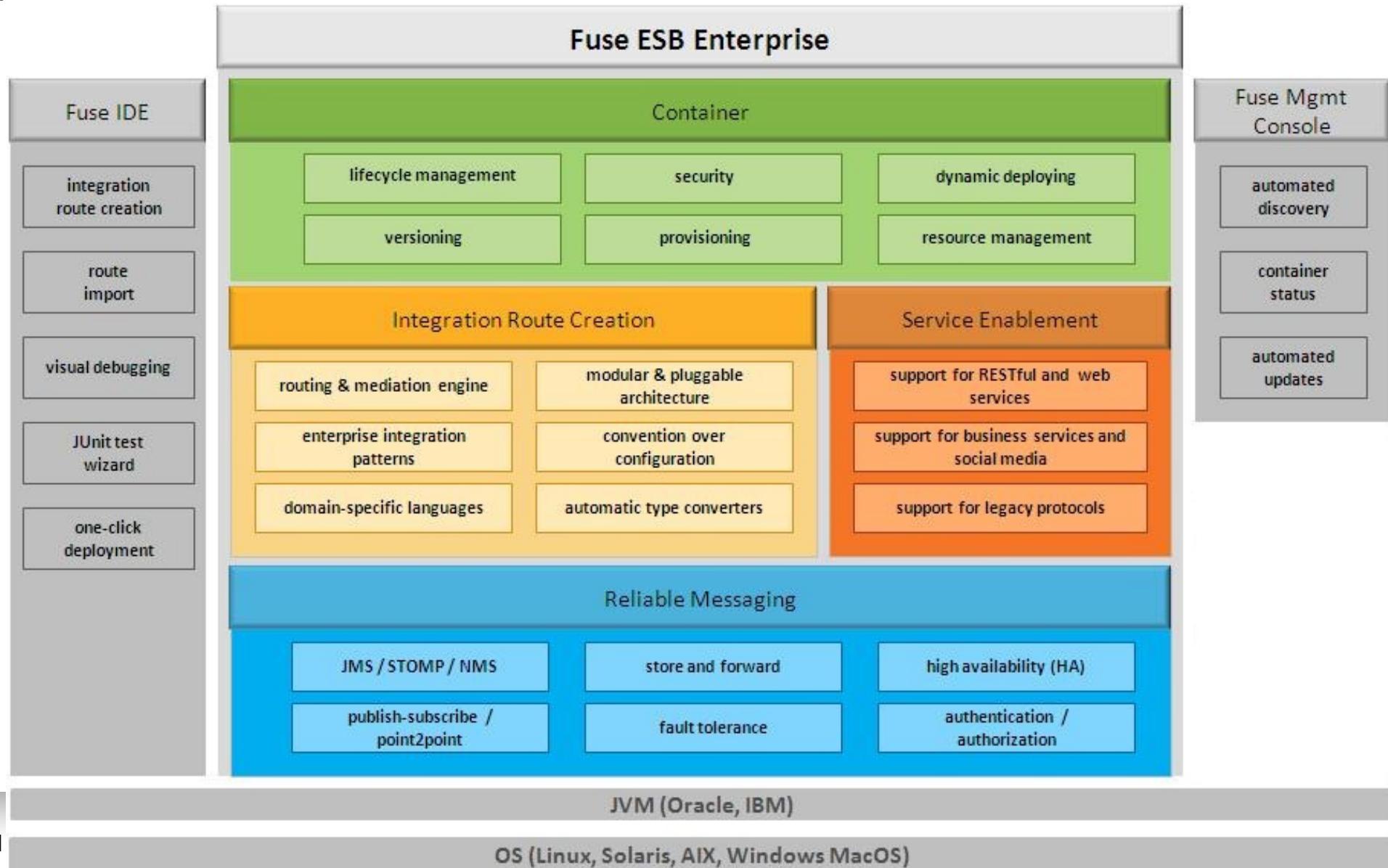
...you should be working with Red Hat

# Key Open Source Projects for JBoss Fuse

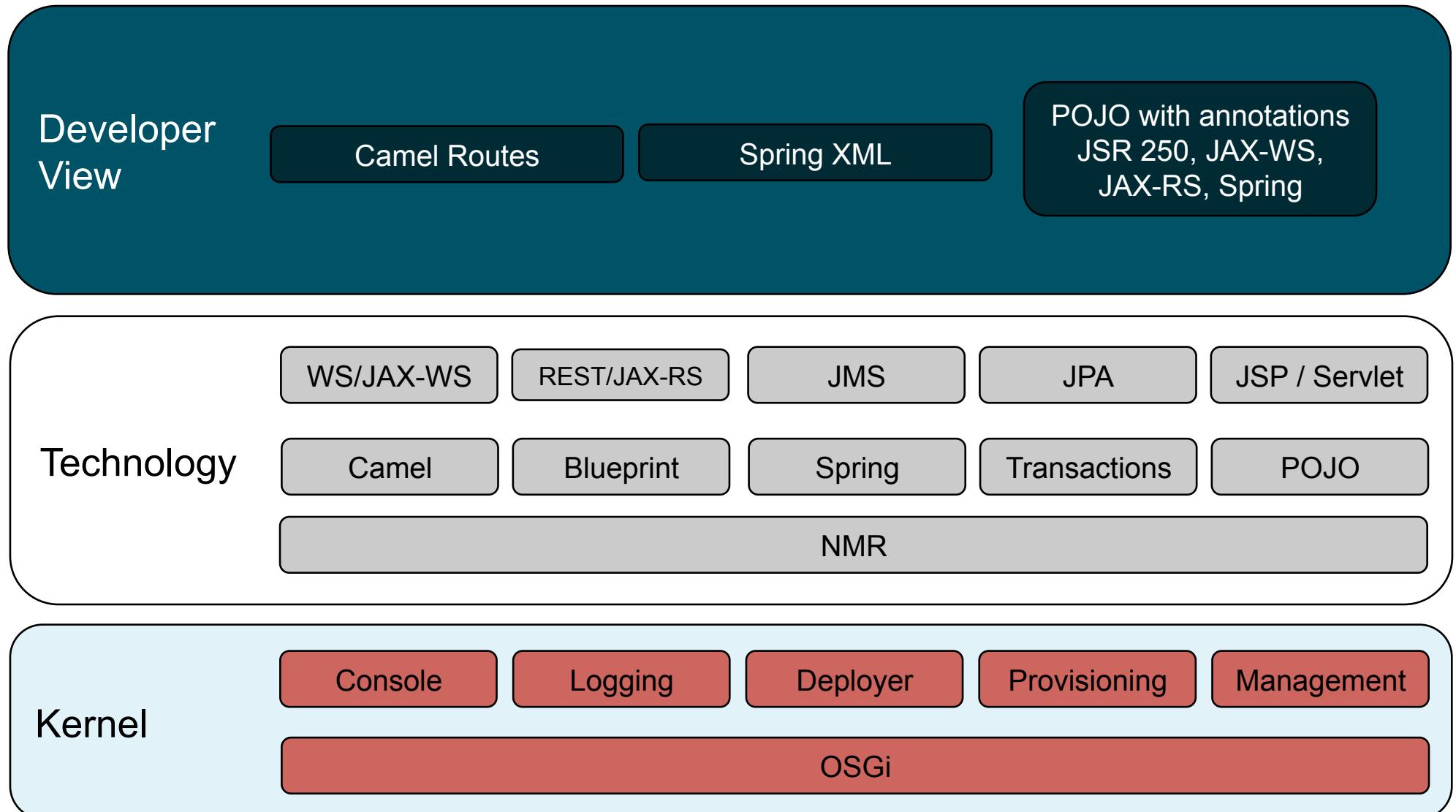
	JAX-WS, WS-*, REST for Web and Restful Integration
	Enterprise Messaging, multi platform and language support, JMS,STOMP,AMQP1.0, Highly available and fault tolerant
	Enterprise Integration Patterns framework
	Enterprise Service Bus, distributed,clustered, OSGi, JBI
	OSGi based container, supporting multiple archive types, remote management, dynamic configuration, extensible shell
	Centralized Configuration, Runtime Registry and remote Agent Architecture for deployment of containers and services on-premise or in the cloud

# FUSE ESB

Fuse ESB Enterprise is a comprehensive, standards-based integration platform that can be configured with any combination of components for a customizable IT footprint:



# The Complete Fuse ESB Architecture

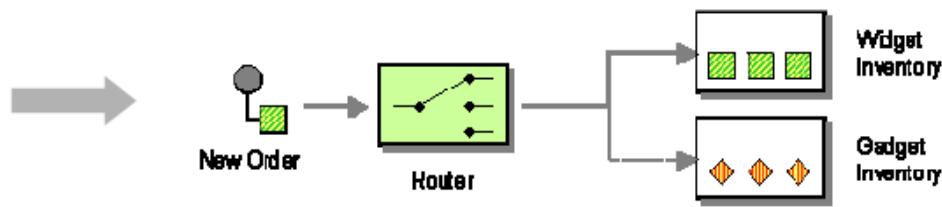


# Enterprise Integration Patterns

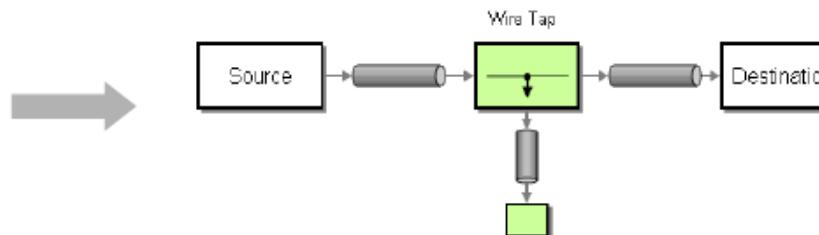
- ✚ Enterprise Integration Pattern (EIP)
  - Use routing patterns to handle Message Exchange

- ✚ Some patterns are

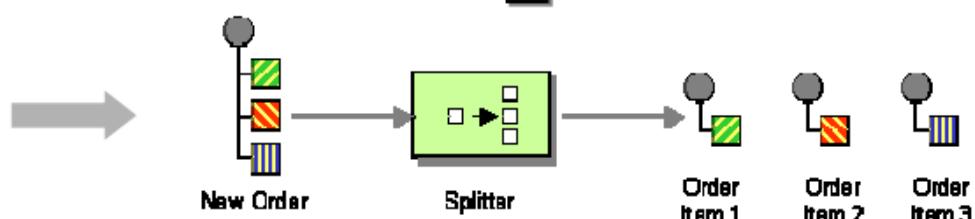
- Content-Based Router



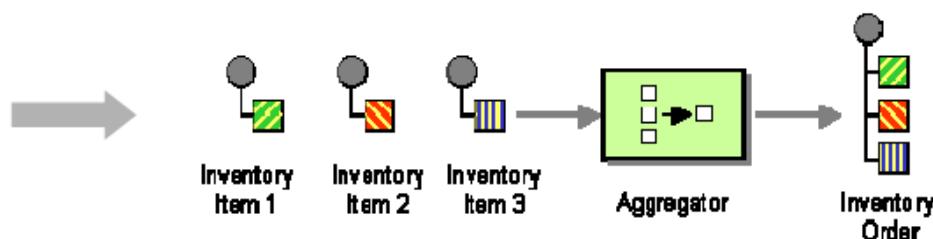
- Wire Trap



- XPath Splitter



- Split-Aggregator



# Apache Camel - Components

A *Component* is essentially a factory of Endpoint instances

+120 Components available

activemq	cxf	rss	sql
mail/imap/pop3	cxfrs	snmp	timer
amqp	dataset	ftp/ftps/sftp	amqp
atom	db4o	velocity	twitter
bean	direct	restlet	jdbc
ldap	ejb	hibernate	jetty
hadoop	xquery	hl7	jms
cache	quartz	http	jmx
mock	exec	ibatis	jpa
netty	file	irc	xslt

# Open Standards: OSGi Technology

## Dynamic

Install/uninstall, start/stop or update bundles dynamically at runtime

Add/remove function on demand without restarting

## Modular

Bundled to manage visibility and dependencies with built-in versioning

## Service-oriented

All bundles are services registered in a service registry

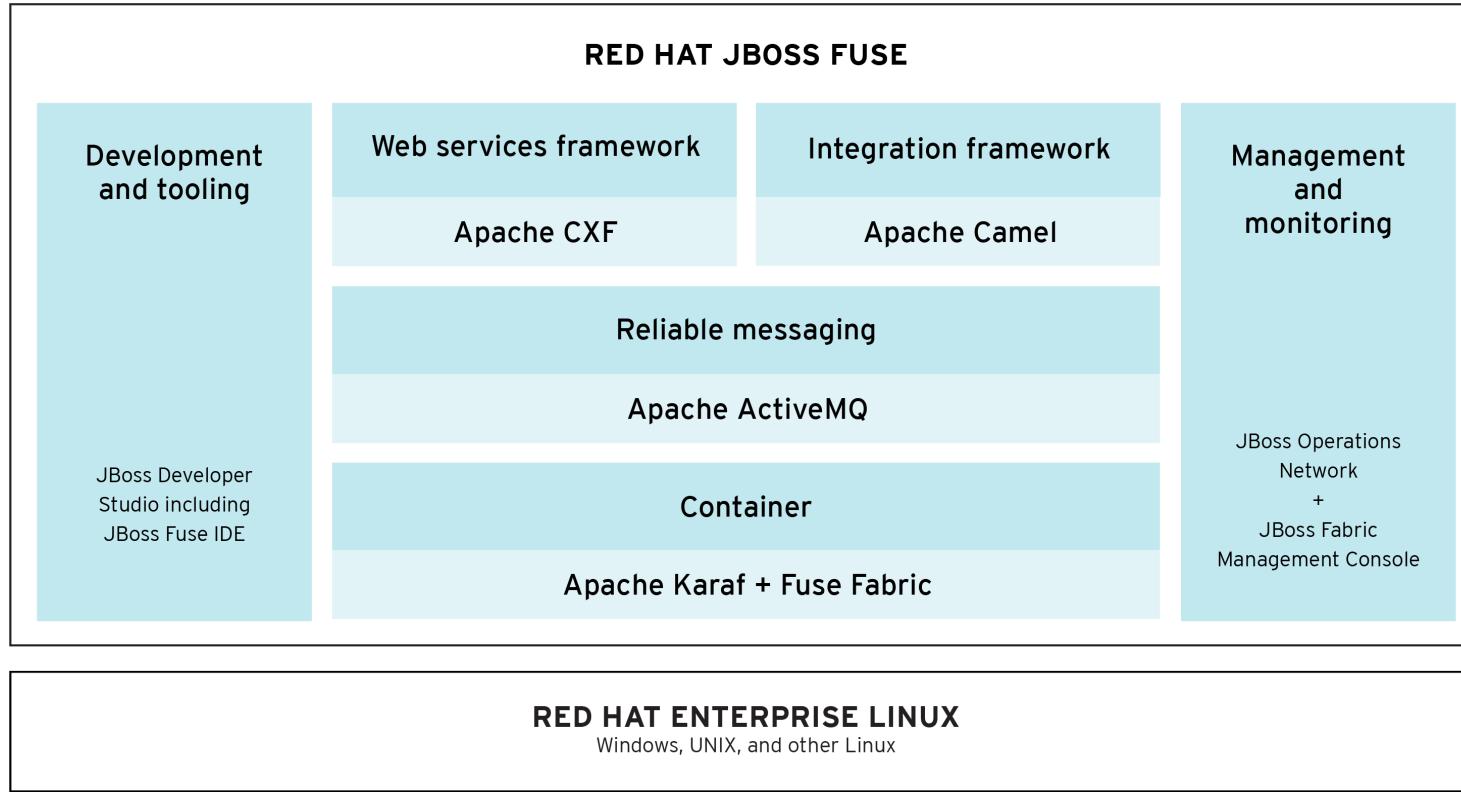
Publish, find and bind dynamically at runtime



Gain improved efficiency and reduce costs

# JBoss Fuse 6.0

A small-footprint, flexible, open source **ESB**



## New in 6.0:

JBDS + Fuse IDE

JON + Fabric Management Console

Rebranding, repackaging

Enables **integration everywhere** for a real-time enterprise

JB0011



# Jboss Fuse - Roadmap

Integration Everywhere

## JBoss branding

Taking Fuse products and rebranding under Red Hat JBoss

## Cloud/On-premise

## IPaaS



### Cloud enablement JBoss interop

OpenShift, OpenStack, CloudStack, EC2

Fabric supports DMC  
Common Class loader support

### Cloud enablement

OpenShift, OpenStack, CloudStack, EC2

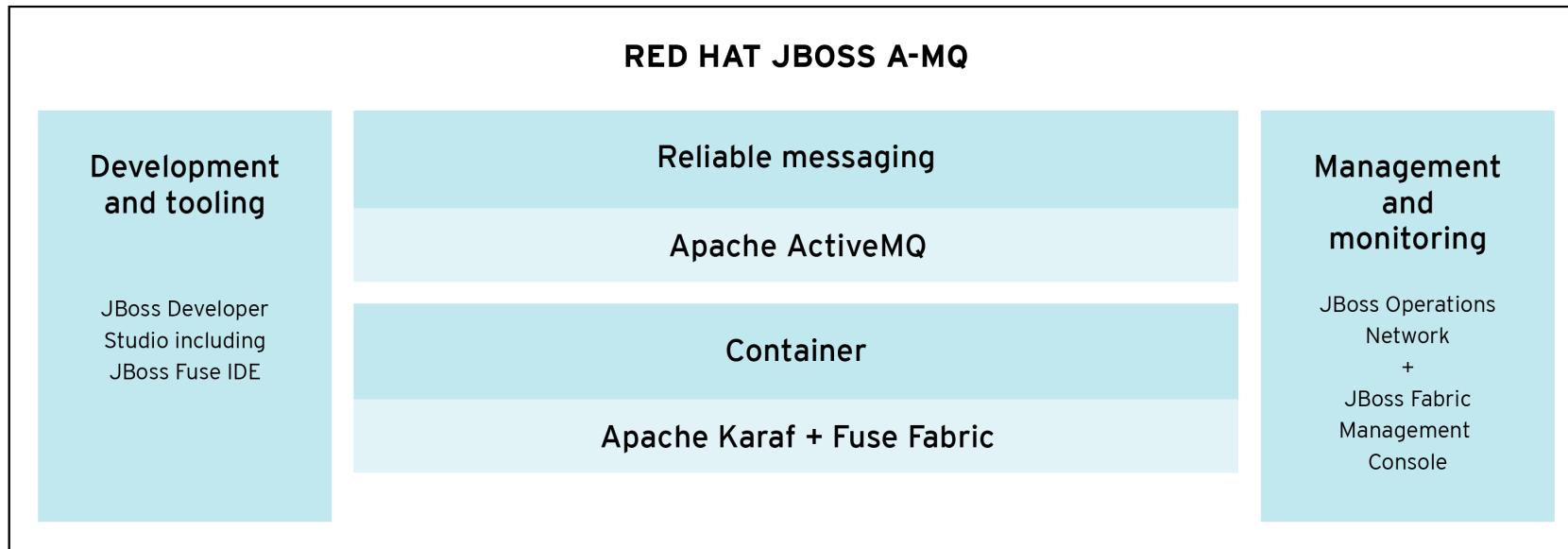
### Web Provisioning

Web based palette for defining integration routes



# JBoss A-MQ

A small-footprint, high-performance, open source **messaging platform**



JB0009

## New in 6.0:

AMQP 1.0 support (Tech Preview)

JBDS + Fuse IDE

JON + Fabric Management Console

Enables real-time **integration everywhere**





# Demo



# What is HL7?

Founded in 1987, Health Level Seven International (HL7) is a not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.

More information: <http://www.hl7.org>



# Example HL7 Message

MSH|^~\&|NES|NINTENDO|TESTSYSTEM|TESTFACILITY|20010101000000||  
ADT^A04|Q123456789T123456789X123456|P|2.3  
EVN|A04|20010101000000|||^KOOPA^BOWSER^^^^^^^CURRENT  
PID|1||123456789|0123456789^AA^^JP|BROS^MARIO^^^^||19850101000000|M|||123  
FAKE STREET^MARIO \T\ LUIGI BROS PLACE^TOADSTOOL  
KINGDOM^NES^A1B2C3^JP^HOME^^1234|1234|(555)555-0123^HOME^JP:1234567|||  
S|MSH|12345678||||||0||||N  
NK1|1|PEACH^PRINCESS^^^^|SO|ANOTHER CASTLE^^TOADSTOOL  
KINGDOM^NES^^JP|(123)555-1234|(123)555-2345|NOK|||||||||||  
NK1|2|TOADSTOOL^PRINCESS^^^^|SO|YET ANOTHER CASTLE^^TOADSTOOL  
KINGDOM^NES^^JP|(123)555-3456|(123)555-4567|EMC|||||||||||  
PV1|1|O|ABCD^EFGH^||||^|  
123456^DINO^YOSHI^^^^^^MSRM^CURRENT^^^NEIGHBOURHOOD DR **NBR**^|  
^DOG^DUCKHUNT^^^^^^^CURRENT||CRD|||||||  
123456^DINO^YOSHI^^^^^^MSRM^CURRENT^^^NEIGHBOURHOOD DR **NBR**^|AO|  
0123456789|1|||||||||||MSH||A|||20010101000000  
IN1|1|PAR^PARENT|||LUIGI  
IN1|2|FRI^FRIEND|||PRINCESS



# Example HL7 Message (Continued)

## Register a Patient (Event A04)

An A04 event signals that the patient has arrived or checked in as a one-time, or recurring outpatient, and is not assigned to a bed. One example might be its use to signal the beginning of a visit to the Emergency Room (= Casualty, etc.). Note that some systems refer to these events as outpatient registrations or emergency admissions.

MSH - Message Header

[{ SFT }] - Software Segment

[ UAC ] - User Authentication Credential

EVN - Event Type

PID - Patient Identification

[ PD1 ] - Additional Demographics

..... (segments continued)



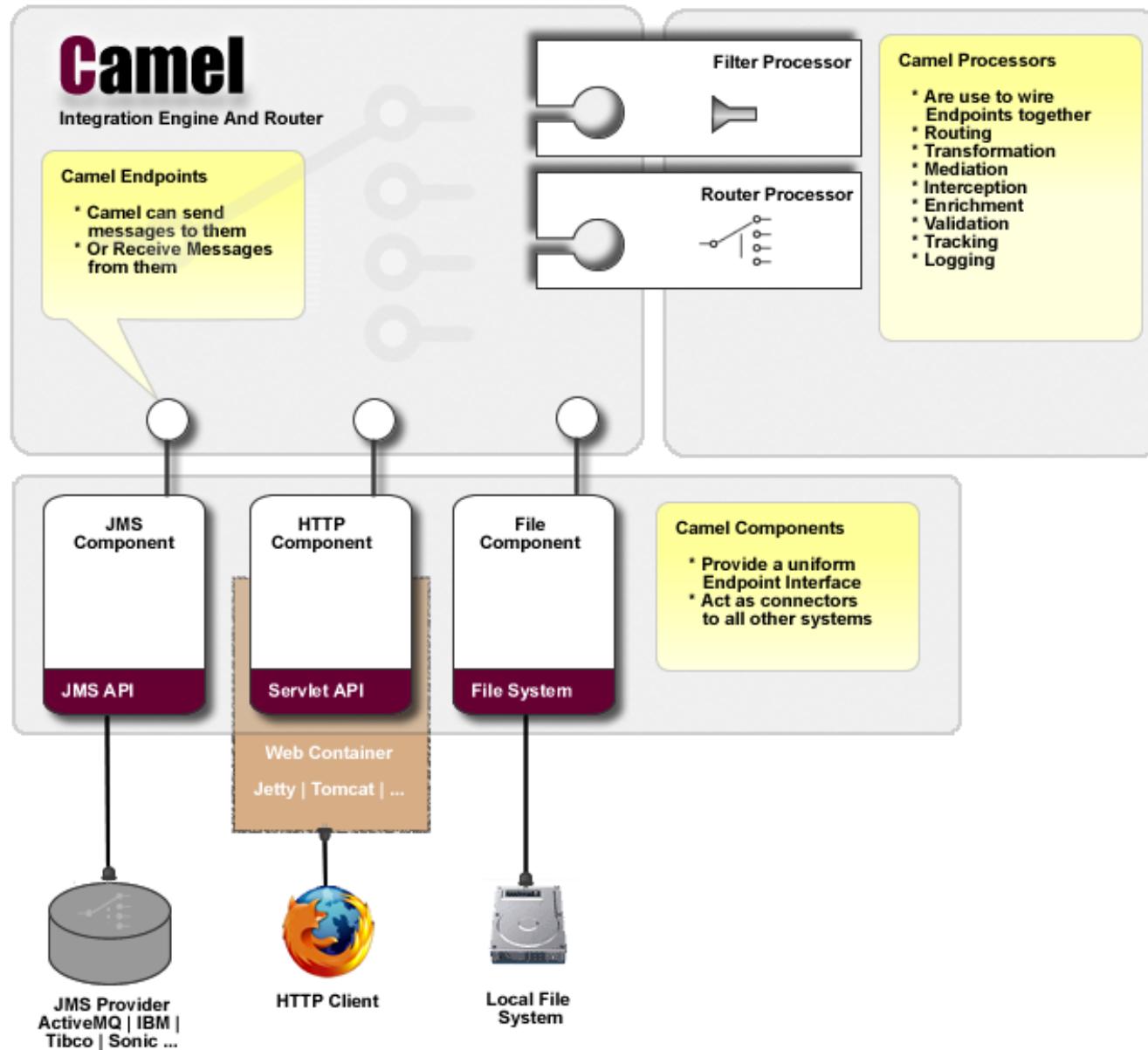
# What is HAPI?

HAPI (HL7 application programming interface; pronounced "happy") is an open-source, object-oriented HL7 2.x parser for Java. HL7 (<http://hl7.org>) is a messaging specification for healthcare information systems. This project is not affiliated with the HL7 organization; we are just writing some software that conforms to their specification.

More information: <http://hl7api.sourceforge.net/>



# Camel Architecture



# What is Camel DSL?

Camel uses a Java Domain Specific Language or DSL for creating Enterprise Integration Patterns or Routes in a variety of domain-specific languages (DSL) as listed below.

- Java DSL - A Java based DSL using the fluent builder style.
- Spring XML - A XML based DSL in Spring XML files
- Blueprint XML - A XML based DSL in OSGi Blueprint XML files
- Groovy DSL - A Groovy based DSL using Groovy programming language
- Scala DSL - A Scala based DSL using Scala programming language
- Annotation DSL - Use annotations in Java beans.

More Information: <http://camel.apache.org/dsl.html>



# What are Camel URI Components and Endpoints?

Camel makes extensive use of URIs to allow you to refer to endpoints which are created by a Component if you refer to them within Routes.

An Endpoint acts rather like a URI or URL in a web application or a Destination in a JMS system; you can communicate with an endpoint; either sending messages to it or consuming messages from it. You can then create a Producer or Consumer on an Endpoint to exchange messages with it.

More information:

<http://camel.apache.org/components.html>



# What is the Camel HL7 Component?

<http://camel.apache.org/hl7.html> - The **hl7** component is used for working with the HL7 MLLP protocol and HL7 v2 messages using the HAPI library.

This component supports the following:

- HL7 MLLP codec for Mina
- Agnostic data format using either plain String objects or HAPI HL7 model objects.
- Type Converter from/to HAPI and String
- HL7 DataFormat using HAPI library
- Even more ease-of-use as it's integrated well with the camel-mina (**Camel 2.11**: [camel-mina2] ) component.



# What is Apache MINA?

Apache MINA is a network application framework which helps users develop high performance and high scalability network applications easily.

Apache MINA is often called:

- NIO framework library,
- client server framework library, or
- a networking socket library

More information: <http://mina.apache.org/>



# Prerequisites

- Maven 3.0.3 or higher
- JDK 1.7
- JBoss Fuse 6
- JBoss Developer Studio 6

# Source

<https://github.com/kpeeples/jboss-fuse-hl7.git>



# Demonstration Steps

**Code Location:** <https://github.com/kpeeples/jboss-fuse-hl7.git>

**Step 1** – View the README in 'installs' directory

**Step 2** – Install HAPI TestPanel

**Step 3** – Add the JBoss Fuse product from the JBoss.org (or Red Hat Customer Support Portal)

<https://www.jboss.org/products/fuse.html>

**Step 4** - Update the zip filename in init.sh in the FUSE\_BIN variable

**Step 5** - Run 'init.sh' & read output

**Step 6** - Install and/or Setup JBDS for project import

<https://www.jboss.org/products/fuse.html>

**Step 7** - Add the JBoss Fuse server

admin=redhat,admin update users.properties in /etc first

**Step 8** - Import the maven project to review the files



# Demonstration Steps (Continued)

## Step 9 - Start JBoss Fuse

```
[kpeeples@localhost bin]$ ./fuse Please wait while JBoss Fuse is loading... 100%
[=====]
```

JBoss Fuse (6.0.0.redhat-024) <http://www.redhat.com/products/jbosserverprisemiddleware/fuse/>

Hit " for a list of available commands and '[cmd] --help' for help on a specific command. Hit " or 'osgi:shutdown' to shutdown JBoss Fuse.

```
JBossFuse:karaf@root>
```

## Step 10 - When the JBoss Fuse console appears, install the Fuse Application Bundle (FAB)

```
JBossFuse:karaf@root>osgi:install -s fab:mvn:hl7test/eip/6.0.0.redhat-024
```

```
show .m2 repo
```

view the OSGi list to make sure the FAB has been created and active

```
osgi:list -l
```

```
[ 234] [Active     ] [Created     ] [      ] [  60] fab:mvn:hl7test/eip/6.0.0.redh
at-024
```



# Demonstration Steps (Continued)

**Step 11** - Create a HL7 Listener to act as the Interface Engine or Processor.

**Step 12** - Send Messages from testpanel to be directed to another listener or to a service

**Step 13** - Use `log:display` on the ESB shell to check out the business logging.





**Questions?**



**CamelOne 2013**  
The Open Source Integration Conference

JUNE 10th-11th • BOSTON, MA

[▶ Register](#)