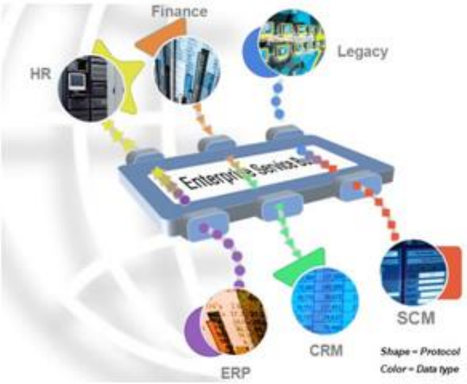
Enterprise Systems & Architecture

Enterprise Service Bus

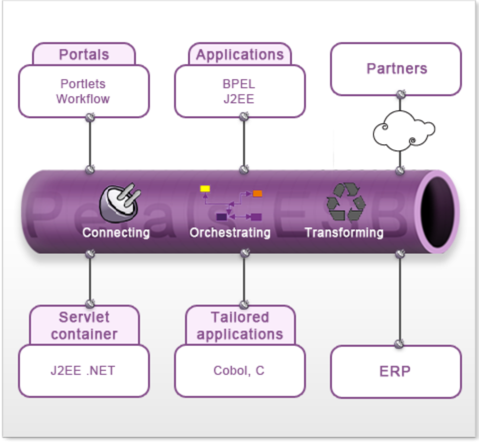
Enterprise Service Bus (ESB)



Enterprise Service Bus

- An Architecture
- Integrate various applications over a bus-like infrastructure
- Decouple applications from each other by *providing middleware to handle communication paths and workflows*

More than just a message broker…

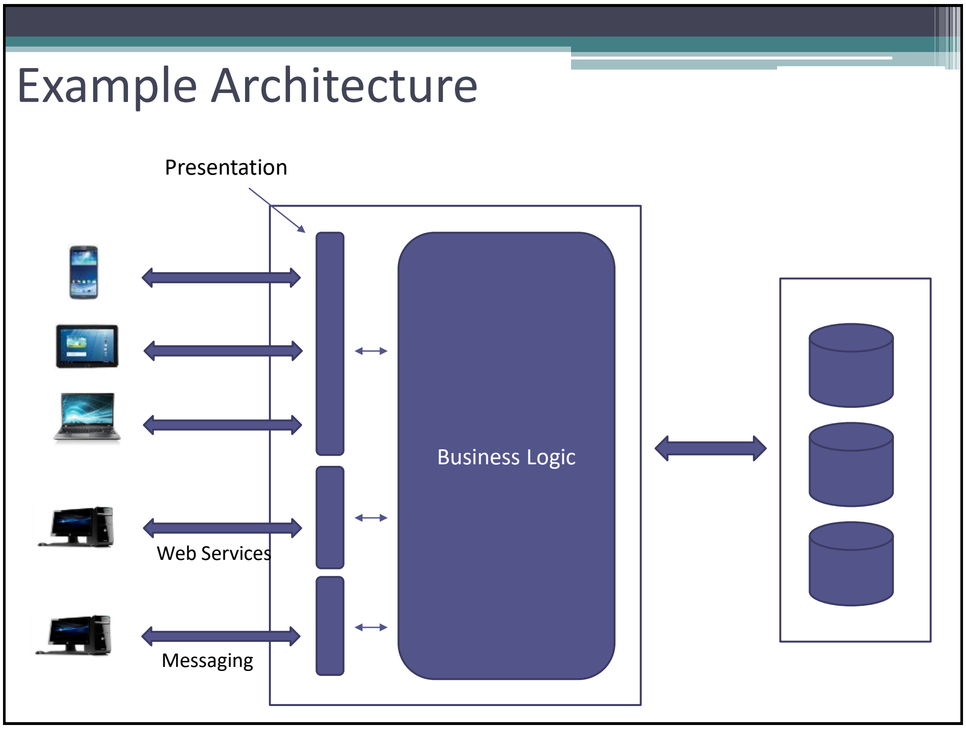


Integration Principles

- Orchestration
- Transformation
- Transportation
- Mediation

Integration Principles

Orchestration	Composing several existing fine-grained components into a single higher order composite service. This can be done to achieve appropriate "granularity" of services and promote reuse and manageability of the underlying components.
Transformation	Data transformation between canonical data formats and specific data formats required by each ESB connector. An example of this would be transforming between CSV, Cobol copybook or EDI formats to either SOAP/XML or JSON. Canonical data formats can greatly simplify the transformation requirements associated with a large ESB implementation where there are many consumers and providers, each with their own data formats and definitions.
Transportation	Transport protocol negotiation between multiple formats (such as HTTP, JMS, JDBC). Note: Mule treats databases like another "service" by making JDBC just another transport (or endpoint) where data can be accessed.
Mediation	Providing multiple interfaces for the purpose of a) supporting multiple versions of a service for backwards compatibility or alternatively, b) to allow for multiple channels to the same underlying component implementation. This second requirement may involve providing multiple interfaces to the same component, one legacy interface (flat file) and one standards compliant (SOAP/XML) interface.
Non-functional consistency	For a typical ESB initiative, this can include consistency around the way security and monitoring policies are applied and implemented. Additionally the goals of scalability and availability can be achieved by using multiple instances of an ESB to provide increased throughput (scalability) and eliminate single-points-of-failure (SPOFs), which is the key objective for highly available systems.



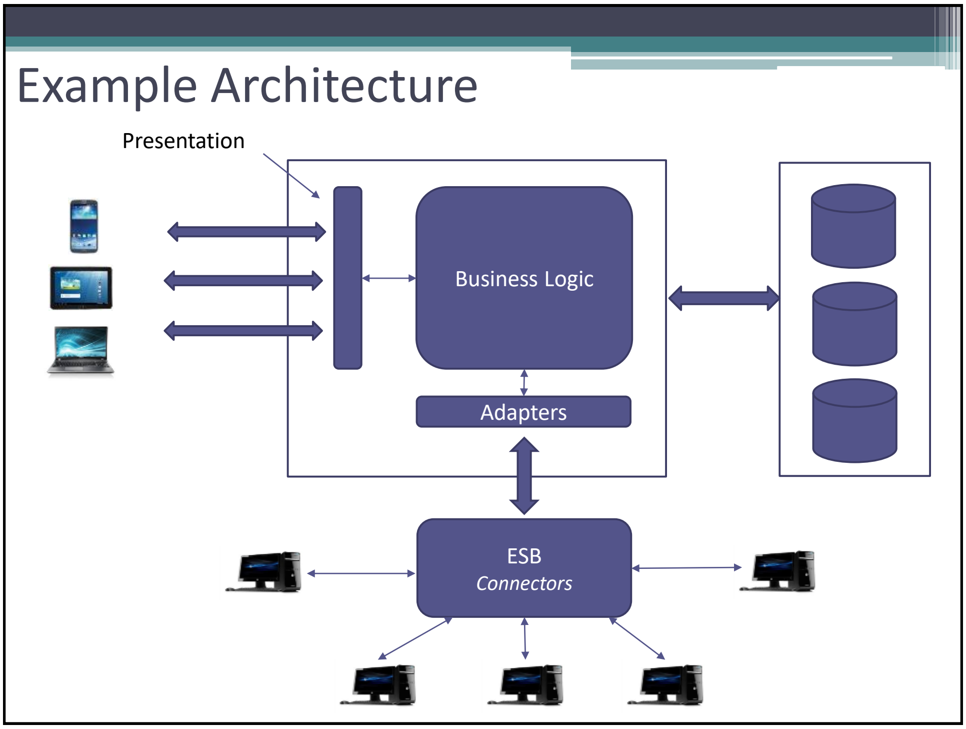
Example Architecture

Presentation

Business Logic

Web Services

Messaging



Example Architecture

Presentation

Business Logic

Adapters

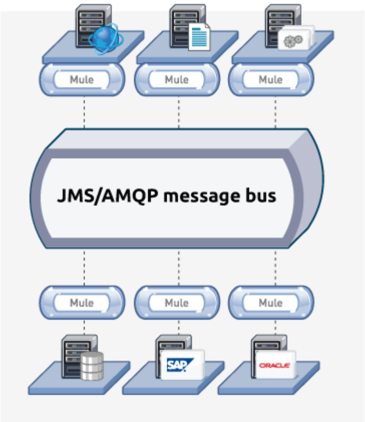
ESB

Connectors

Example ESB Products

- IBM WebSphere ESB
- Microsoft BizTalk Server
- Oracle Enterprise Service Bus
- Sonic ESB
- Red Hat - JBoss Fuse
- ***Mule ESB (Community / Enterprise Edition)***

Example ESB from MuleSoft^{TM}

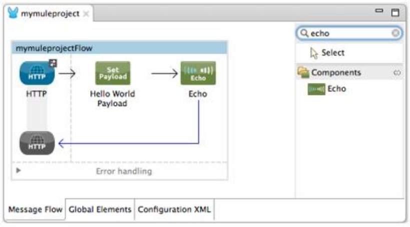


Anypoint Studio IDE

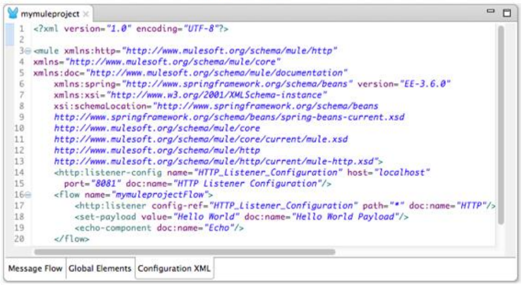
- Eclipse based development tool from *Mulesoft*
- Embedded Mule Server
- Visual & XML application editor

Anypoint Visual & XML Editor

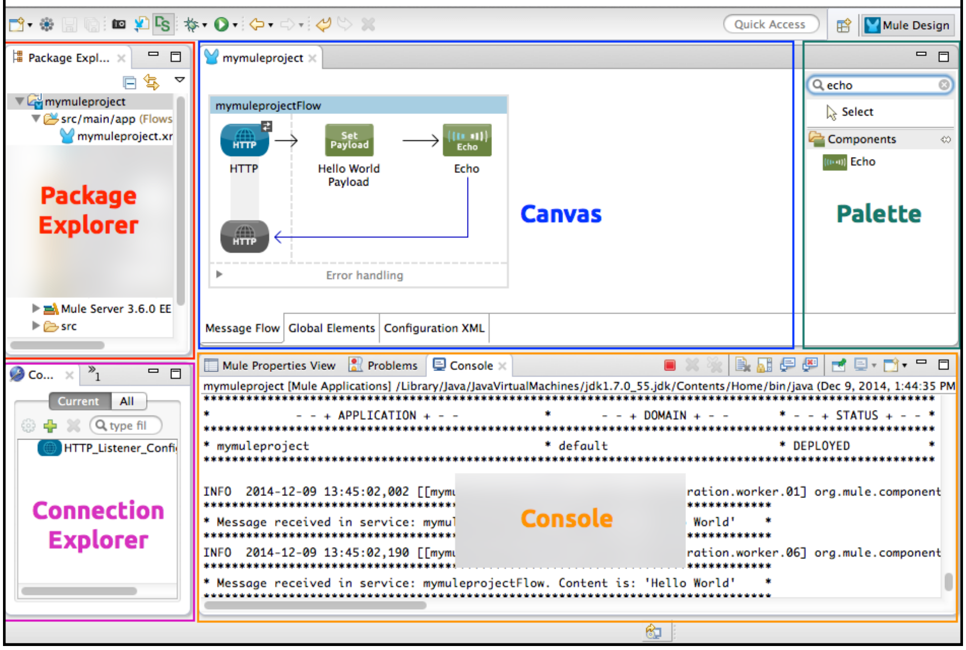
Visual Editor



XML Editor

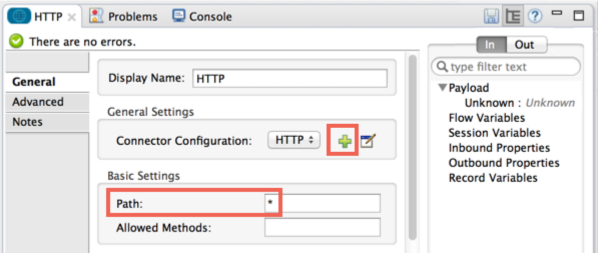


```
<?xml version="1.0" encoding="UTF-8"?>

<mule xmlns:http="http://www.mulesoft.org/schema/mule/http"
xmlns="http://www.mulesoft.org/schema/mule/core"
xmlns:doc="http://www.mulesoft.org/schema/mule/documentation"
    xmlns:spring="http://www.springframework.org/schema/beans" version="EE-3.6.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
    http://www.springframework.org/schema/beans/spring-beans-current.xsd
    http://www.mulesoft.org/schema/mule/core
    http://www.mulesoft.org/schema/mule/core/current/mule.xsd
    http://www.mulesoft.org/schema/mule/http
    http://www.mulesoft.org/schema/mule/http/current/mule-http.xsd">
    <http:listener-config name="HTTP_Listener_Configuration" host="localhost"
      port="8081" doc:name="HTTP Listener Configuration"/>
    <flow name="mymuleprojectFlow">
        <http:listener config-ref="HTTP_Listener_Configuration" path="*" doc:name="HTTP"/>
        <set-payload value="Hello World" doc:name="Hello World Payload"/>
        <echo-component doc:name="Echo"/>
    </flow>
```



```
mymuleproject [Mule Applications] /Library/Java/JavaVirtualMachines/jdk1.7.0_55.jdk/Contents/Home/bin/java (Dec 9, 2014, 1:44:35 PM
********************************************************************************************************
*            - - + APPLICATION + - -            *       - - + DOMAIN + - -       *   - - + STATUS + - - *
********************************************************************************************************
* mymuleproject                                 * default                        * DEPLOYED             *
********************************************************************************************************

INFO  2014-12-09 13:45:02,002 [[mymu                                 ration.worker.01] org.mule.component
************************************                                 ************
* Message received in service: mymul                                  World'    *
************************************                                 ************
INFO  2014-12-09 13:45:02,190 [[mymu                                 ration.worker.06] org.mule.component
************************************                                 ************
* Message received in service: mymuleprojectFlow. Content is: 'Hello World'    *
********************************************************************************
```

Anypoint *Connectors*



There are no errors.

Display Name: HTTP

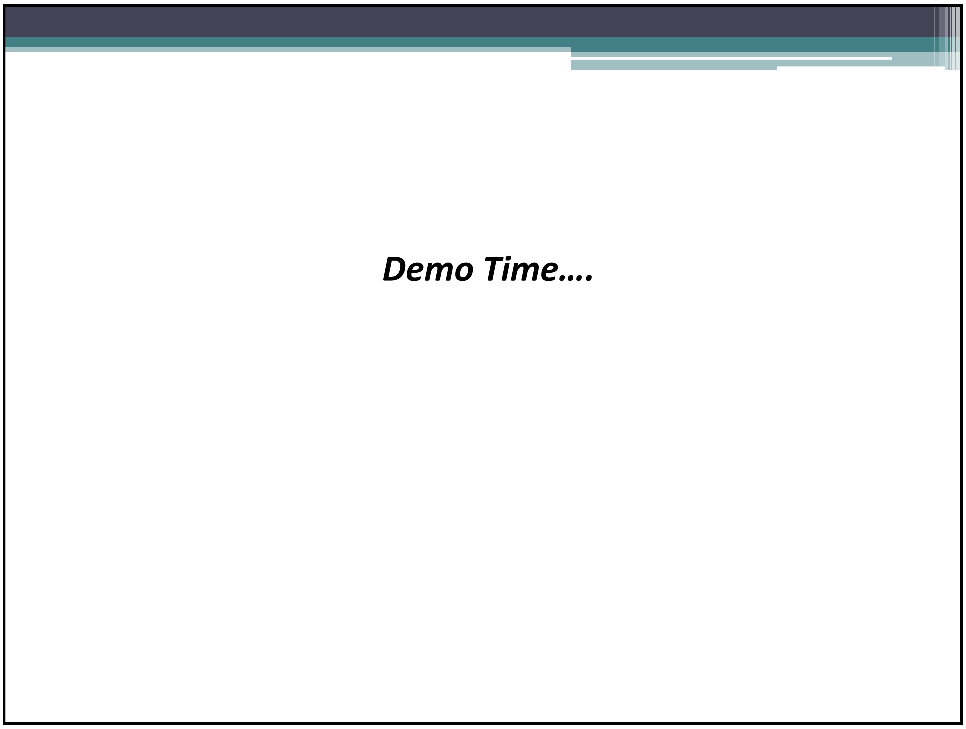
General Settings

Connector Configuration: HTTP

Basic Settings

Path: *

Allowed Methods:



Demo Time….