



# Introduction to the Enterprise Service Bus (ESB), Graphic User Interface (GUI)

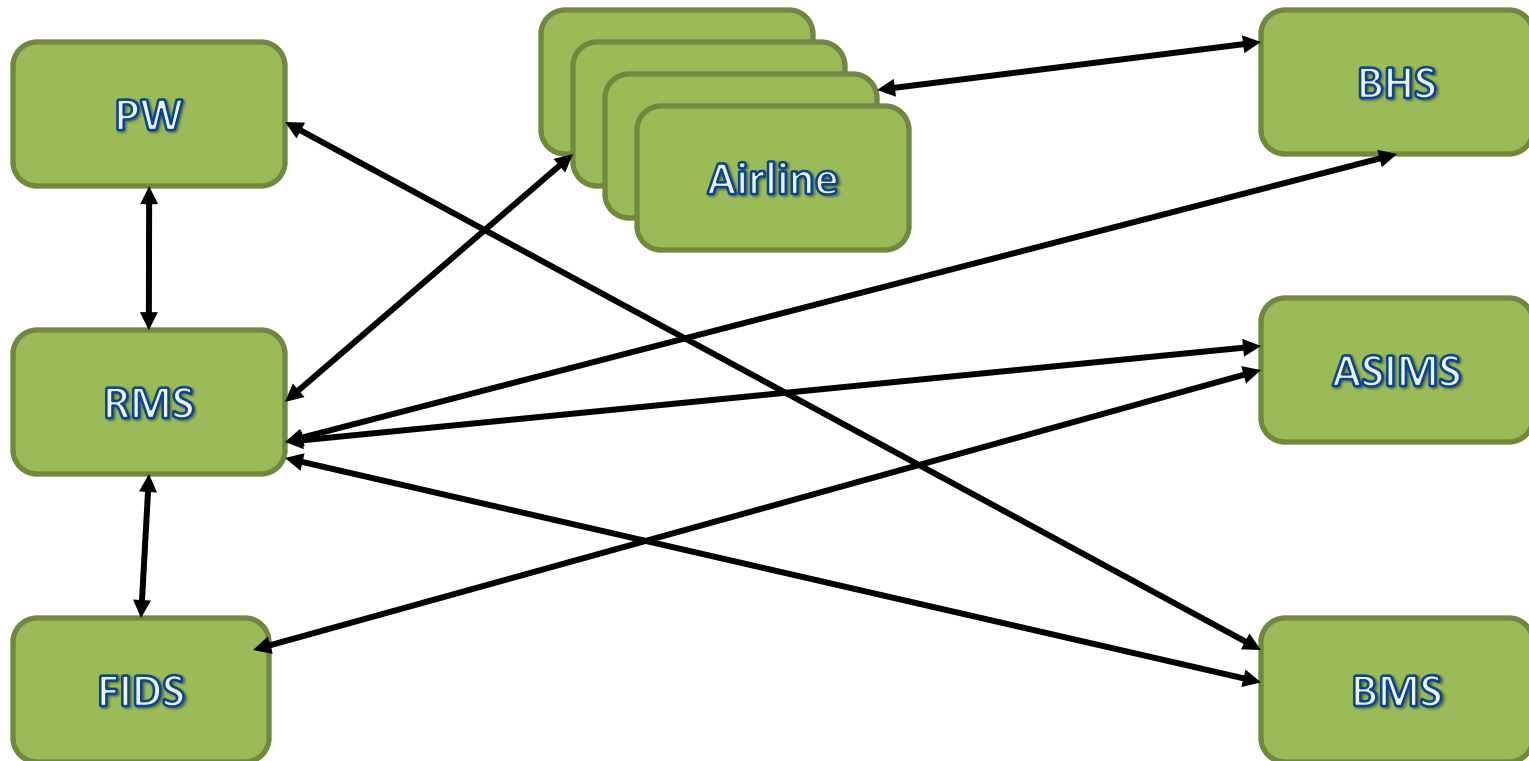
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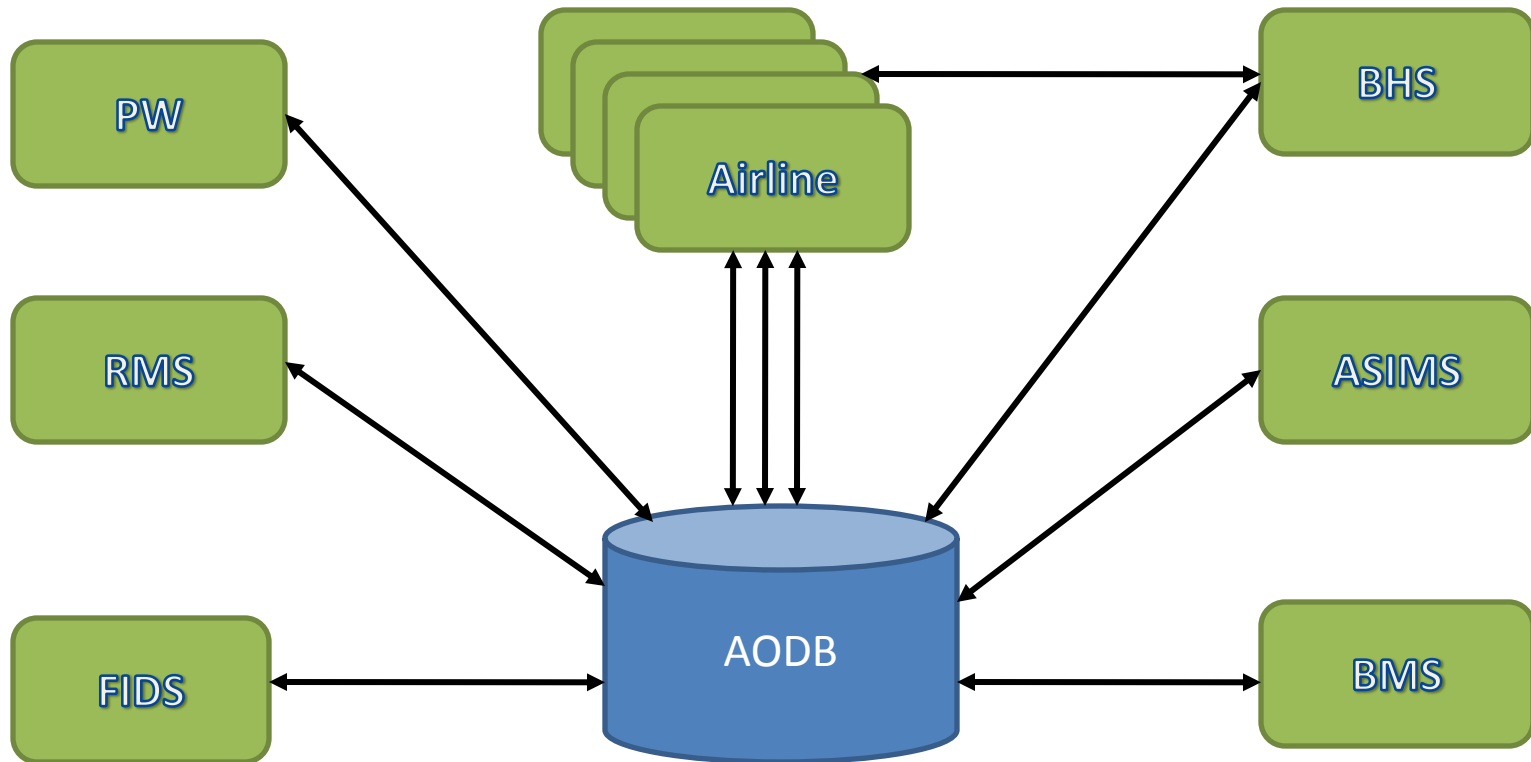
## What is ESB?

- Enterprise Service Bus (ESB) is an open intelligent message broker for data-exchange between heterogeneous (existing) systems.

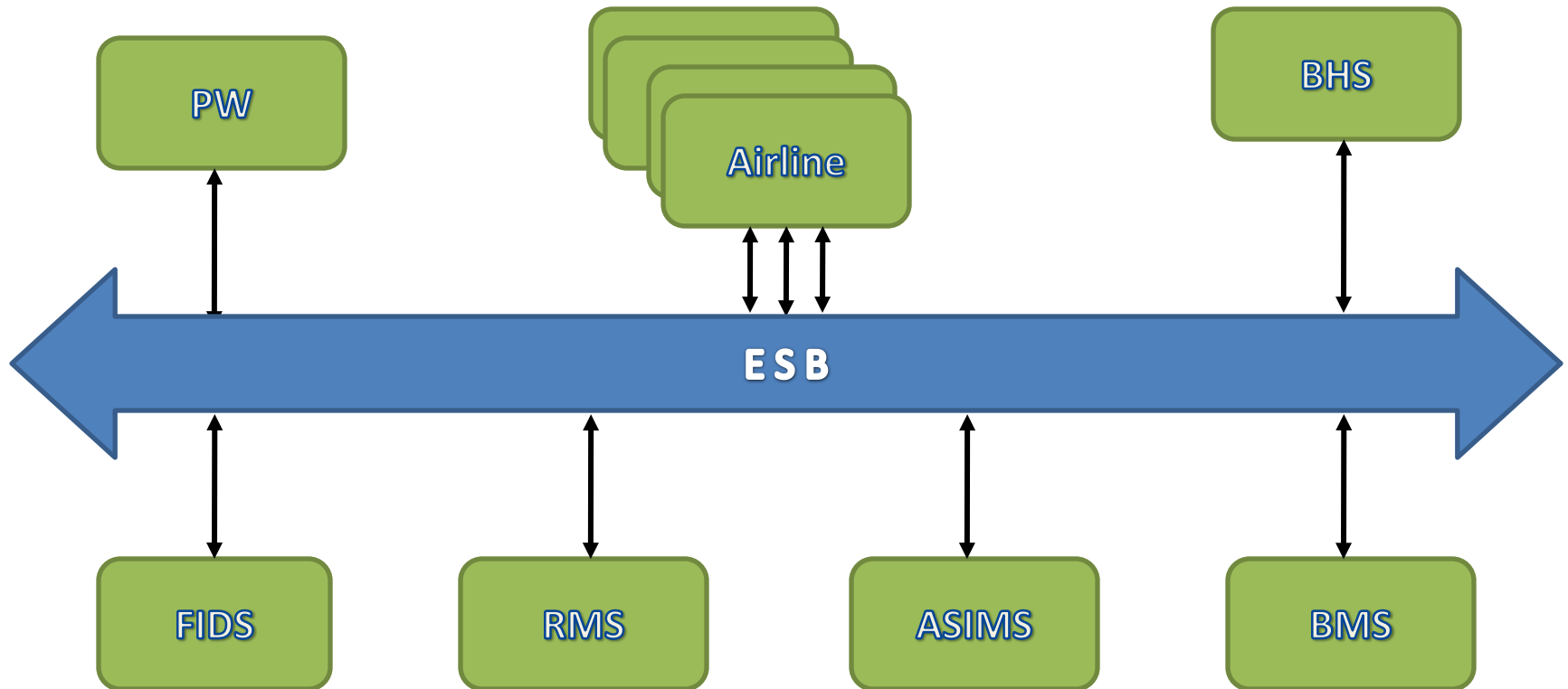
# Data Exchange (without a central data storage I)



# Data Exchange (with a central data storage)



# ESB Overview



# Interfaces - Differences



- Technologies, e.g. TCP/IP, file, email,...
- Formats, e.g. binary, CSV, XML, ...
- Services, e.g. Dataset, Updates
- Data : Incoming, Outgoing
- Data : Source, Subscriber
- Data : Access Level (Authorizations)
- Data : Quality (Priorities)

# Interfaces - Similarities



- Maintenance
- Monitoring
- Logging

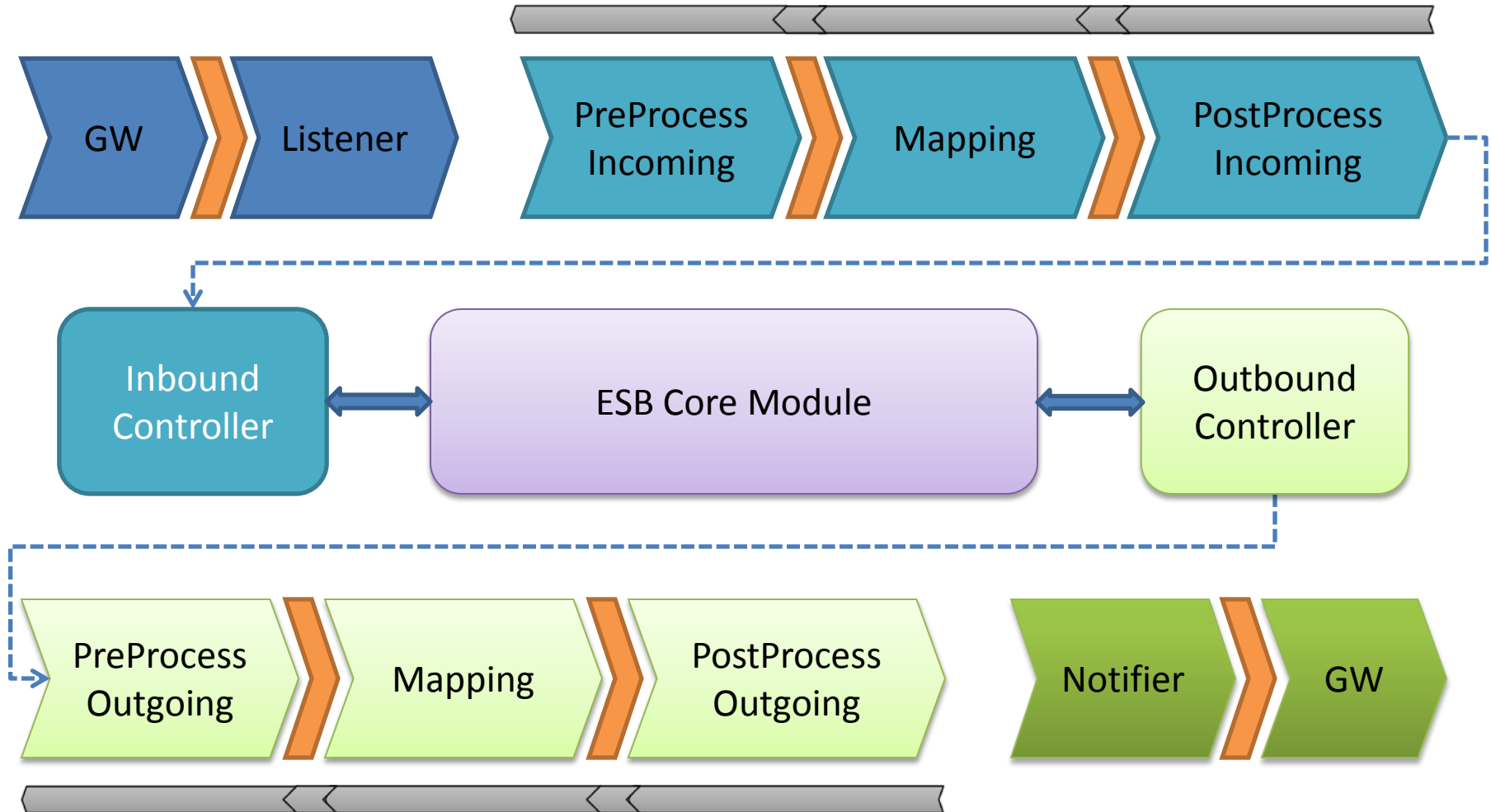
# ESB – Design Goals



- Heterogeneous System Landscape
  - Formats, Technologies, ..
- Low Modification and Maintenance Costs
  - New Interfaces, Configuration, Monitoring
- Multi-Base, Cloud-Ready Structure
- High Availability
  - Clustering
- Scalability
  - Data traffic, interfaces
- Sustainability
  - Standard (out-of-the-box) solution, J2EE, JBoss



# Interfaces – General Structure



# Interface – Gateways (1)



- JMS (Topic/Queues)
- Oracle Native AQ
- MSMQ
- VFS/File
- FTP/SFTP/FTPS
- HTTP(s)
- Web Services (Client/Host)
- JDBC
- SMTP/POP3/IMAP
- TCP/UDP
- XMPP\*
- SMS\*
- Time Controlled Triggers\*\*

# Interface – Gateways (2)

Gateway Type	Description	Operation Mode	
JMS	Inbound BIC	In	BICG

Code	Description
JMS	JMS
MSMQ	MSMQ Inbound
OracleAQ	Oracle AQ
Schedule	Scheduled Gateway
TCP/IP	TCP/IP
VFS	VFS
WSClient	Webservice Client

# Interface – Formats

- XML
- CSV
- Fixed Length (column-based)
- Binary Stream (Fixed & Dynamic Structure)
- JSON
- IATA/AFTN\*\*
- Custom\*\*\*

# Interface – Data Types



Display Name	Internal Code	Master?	Subscribe Updates?
Arrivals	com.airit.fim.ejb.entity.OpArrivals	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Departures	com.airit.fim.ejb.entity.OpDepartures	<input type="checkbox"/>	<input type="checkbox"/>
AODB Request	com.airit.fim.request.DatasetRequest	<input type="checkbox"/>	<input type="checkbox"/>
RefServiceTypes	com.airit.fim.ejb.entity.RefServiceTypes	<input type="checkbox"/>	<input type="checkbox"/>
RefAirports	com.airit.fim.ejb.entity.RefAirports	<input type="checkbox"/>	<input type="checkbox"/>
RefAirlines	com.airit.fim.ejb.entity.RefAirlines	<input type="checkbox"/>	<input type="checkbox"/>
RefAircraftTypes	com.airit.fim.ejb.entity.RefAircraftTypes	<input type="checkbox"/>	<input type="checkbox"/>
RefAircraft	com.airit.fim.ejb.entity.RefAircraft	<input type="checkbox"/>	<input type="checkbox"/>
RefTerminals	com.airit.fim.ejb.entity.RefTerminals	<input type="checkbox"/>	<input type="checkbox"/>
RefConcourses	com.airit.fim.ejb.entity.RefConcourses	<input type="checkbox"/>	<input type="checkbox"/>
RefCater	com.airit.fim.ejb.entity.RefCater	<input type="checkbox"/>	<input type="checkbox"/>

# Interface – Mapping



- **Transformation**

- **Groovy**
- **JavaScript**
- **XSLT**
- **FreeMarker**

- **Custom Actions**

- **Groovy**
- **JavaScript**
- **Java**
- **Python\***
- **Ruby\***

# Interface – Mapping (Example 1)



```
<core:filterSettings type="SAX" readerPoolSize="1" defaultSerialization="false"/>

<jb:bean beanId="result" class="java.util.ArrayList" createOnElement="connect">
  <jb:wiring beanIdRef="arrivals" />
  <jb:wiring beanIdRef="departures" />
</jb:bean>

<g:groovy executeOnElement="connect">

  <g:imports>
    import java.util.Date;
    import java.util.ArrayList;
    import java.util.HashMap;
    import java.util.regex.Matcher;
    import java.util.regex.Pattern;
  </g:imports>

  <g:script>
    <!--
    use(DOMCategory) {

      def adIndicator = element.daily[0]. '@adi';
      def flightNumber = element.daily[0]. '@linecode' + element.daily[0]. '@number';
      def stt = Date.parse("dd/MM/yyyy HH:mm", element.daily[0]. '@schedule_date');

      def remarkList = element.daily.'field'.findAll{
        it.'@name' == "status"
      }
      def remark = "";
      if ( remarkList ) {
        remark = remarkList[0]. '@value';
      }
    }
  </g:script>
</g:groovy>
```

# Interface – Mapping (Example 2)



```
<?xml version="1.0" encoding="UTF-8"?>
<connect version="1.0" name="AirIT PRIZM Interface">
  <daily <#if departure.@action != "DELETE">action="replace"<#else>action="delete"</#if> adi="D" linecode="${departure.odFlightNumber
value?substring(3)?trim}" schedule_date="${assignMappedDate(departure.odStd)}">
  <@mapField name="schedule" value="${assignMappedDate(departure.odStd)}" instance="1"/>
  <@mapField name="actual" value="${assignMappedDate(departure.odEtd)}" instance="1"/>
  <@mapField name="gate" value="${extractValue(departure.odGates)}" instance="1"/>
  <@mapField name="aircraft" value="${extractValue(departure.odRactCode)}" instance="1"/>
  <@mapField name="status" value="${extractValue(departure.odRfsCode)}" instance="1"/>
  <#if departure.opDepartureRoutingsOdrOdIds?has_content>
    <#assign routingCounter = 1>
    <#list departure.opDepartureRoutingsOdrOdIds.OpDepartureRoutings?sort_by(["odrLegNumber","value"]) as opDepartureRouting>
      <#if opDepartureRouting.@action != "DELETE">
        <@mapField name="city" instance="${routingCounter}" value="${opDepartureRouting.odrRapCode[0].value}"/>
        <#assign routingCounter = routingCounter + 1>
      </#if>
    </#list>
  </#if>
  <#if departure.opDeparturesOdOdMainflights?has_content>
    <#assign codeShareCounter = 2>
    <#list departure.opDeparturesOdOdMainflights.OpDepartures as opDeparture>
      <#if opDeparture.@action != "DELETE">
        <@mapField name="line_code" value="${opDeparture.odFlightNumber[0].value?substring(0,3)?trim}" instance="${codeShareCounter}" />
        <@mapField name="number" value="${opDeparture.odFlightNumber[0].value?substring(3)?trim}" instance="${codeShareCounter}" />
        <#assign codeShareCounter = codeShareCounter + 1>
      </#if>
    </#list>
  </#if>
</daily>
</connect>
```



# Interfaces – Custom Actions



- Inbound
  - Gateway Service
    - Pre/Post Mapping
    - Pre/Post Mapping (Response)
  - Controller
    - Pre/Post Controller
  
- Outbound
  - Controller
    - Pre/Post Controller
  - Gateway Service
    - Pre/Post Mapping
    - Pre/Post Mapping (Response)

# ESB Core Module



IF source

```
FOR ALL subscriber
    apply_authorization()
    notify_outgoing_pipeline()
END
```

ELSE

```
    apply_authorization()
    FOR ALL sources
        notify_outgoing_pipeline()
    END
```

# Interface – Authorization (1)



BIC Arrival Authorizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Full Arrival Authorizations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attributes
  Detail Views
  Conditions
  Audit Trail

Include?	Internal Name	Display Name	Read Only	Quality
<input type="checkbox"/>	oaAcConfiguration	oaAcConfiguration	<input type="checkbox"/>	
<input type="checkbox"/>	oaAcOwner	oaAcOwner	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaAta	oaAta	<input type="checkbox"/>	
<input type="checkbox"/>	oaBaggageTotal	oaBaggageTotal	<input type="checkbox"/>	
<input type="checkbox"/>	oaBaggageWeight	oaBaggageWeight	<input type="checkbox"/>	
<input type="checkbox"/>	oaBaggagebeltArea	oaBaggagebeltArea	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaBaggagebeltBegin	oaBaggagebeltBegin	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaBaggagebeltEnd	oaBaggagebeltEnd	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaBaggagebeltLastbag	oaBaggagebeltLastbag	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaBaggagebelts	oaBaggagebelts	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaBta	oaBta	<input type="checkbox"/>	
<input type="checkbox"/>	oaCabinUsage	oaCabinUsage	<input type="checkbox"/>	

# Interface – Authorization (2)



Display Name	All Att.	Insert	Delete	Update
FlightView Arrival Authorizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
BIC Arrival Authorizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Full Arrival Authorizations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attributes | Detail Views | **Conditions** | Audit Trail

Read Conditions

Conditions
(oaRtrmCode is equal to T1) AND (oaFlightNumber like AA. *)

Write Conditions

Conditions
(oaGaInd is not set )

# Interface – Data Quality



Display Name	All Att.	Insert	Delete
FlightView Arrival Authorizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BIC Arrival Authorizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Full Arrival Authorizations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attributes
  Detail Views
  Conditions
  Audit Trail

Include?	Internal Name	Display Name	Read Only	Quality
<input type="checkbox"/>	oaCabinCoggage	oaCabinCoggage	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaCallsign	oaCallsign	<input type="checkbox"/>	3
<input type="checkbox"/>	oaCancellationTime	oaCancellationTime	<input type="checkbox"/>	
<input type="checkbox"/>	oaCargoWeight	oaCargoWeight	<input type="checkbox"/>	
<input type="checkbox"/>	oaCodeshareNumber	oaCodeshareNumber	<input type="checkbox"/>	
<input type="checkbox"/>	oaConfirmedBy	oaConfirmedBy	<input type="checkbox"/>	
<input type="checkbox"/>	oaCreateTime	oaCreateTime	<input type="checkbox"/>	
<input type="checkbox"/>	oaCreateUser	oaCreateUser	<input type="checkbox"/>	
<input type="checkbox"/>	oaCreditStatus	oaCreditStatus	<input type="checkbox"/>	
<input type="checkbox"/>	oaCrewCockpit	oaCrewCockpit	<input type="checkbox"/>	
<input type="checkbox"/>	oaCrewnumber	oaCrewnumber	<input type="checkbox"/>	
<input type="checkbox"/>	oaDeboardingBegin	oaDeboardingBegin	<input type="checkbox"/>	
<input type="checkbox"/>	oaDeboardingEnd	oaDeboardingEnd	<input type="checkbox"/>	
<input type="checkbox"/>	oaEquipmentWeight	oaEquipmentWeight	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	oaEta	oaEta	<input type="checkbox"/>	6
<input checked="" type="checkbox"/>	oaEtaAirspaceMonitor	oaEtaAirspaceMonitor	<input type="checkbox"/>	6

# Interface – Monitoring (1)



- **Alarm Categories**

- Connectivity
- Session
- Data Exchange (Raw/Net)
- Error Ratio (dynamic time window)
- Maximal Response Time (dynamic time window)
- Average Response Time (dynamic time window)
- General Error Count \*

# Interface – Monitoring (2)



- **Alarm Handlers**
  - Database
  - Console/Logger
  - File
  - Email
  - HTTP\*
  - XMPP\*
  - Custom\*

# Interface – Monitoring (3)

Conditions

Conditions
(Data Error Ratio is greater than .02 / 2m) AND (Uptime is greater than 3m)

Outcomes

Handler
EmailHandler

Handler Property	Handler Value
Email Address : Addresses for Notification	recipient@company.com
Email Server : Server Address To Use	company.mail.server
Email Username : Email Server Username	
Email Password : Email Server Password	
Email From Address : Email From Address	PROD_ESB@airit.com



# Interface – Monitoring Overview



Active?	Code	Description	Status
<input checked="" type="checkbox"/>	AODB	AirIT AODB	Green
<input type="checkbox"/>	BhsPropworks	Propworks BHS Interface	Grey
<input checked="" type="checkbox"/>	BIC	BIC Interface	Orange
<input checked="" type="checkbox"/>	FlightView-Arrivals	Arrivals from FlightView	Red
<input checked="" type="checkbox"/>	FlightView-Departures	Departures from FlightView	Green
<input checked="" type="checkbox"/>	MSMQTest	Test	Green
<input checked="" type="checkbox"/>	PropWorks	AirIT PropWorks CAT Interface	Green

# Outlook (1)



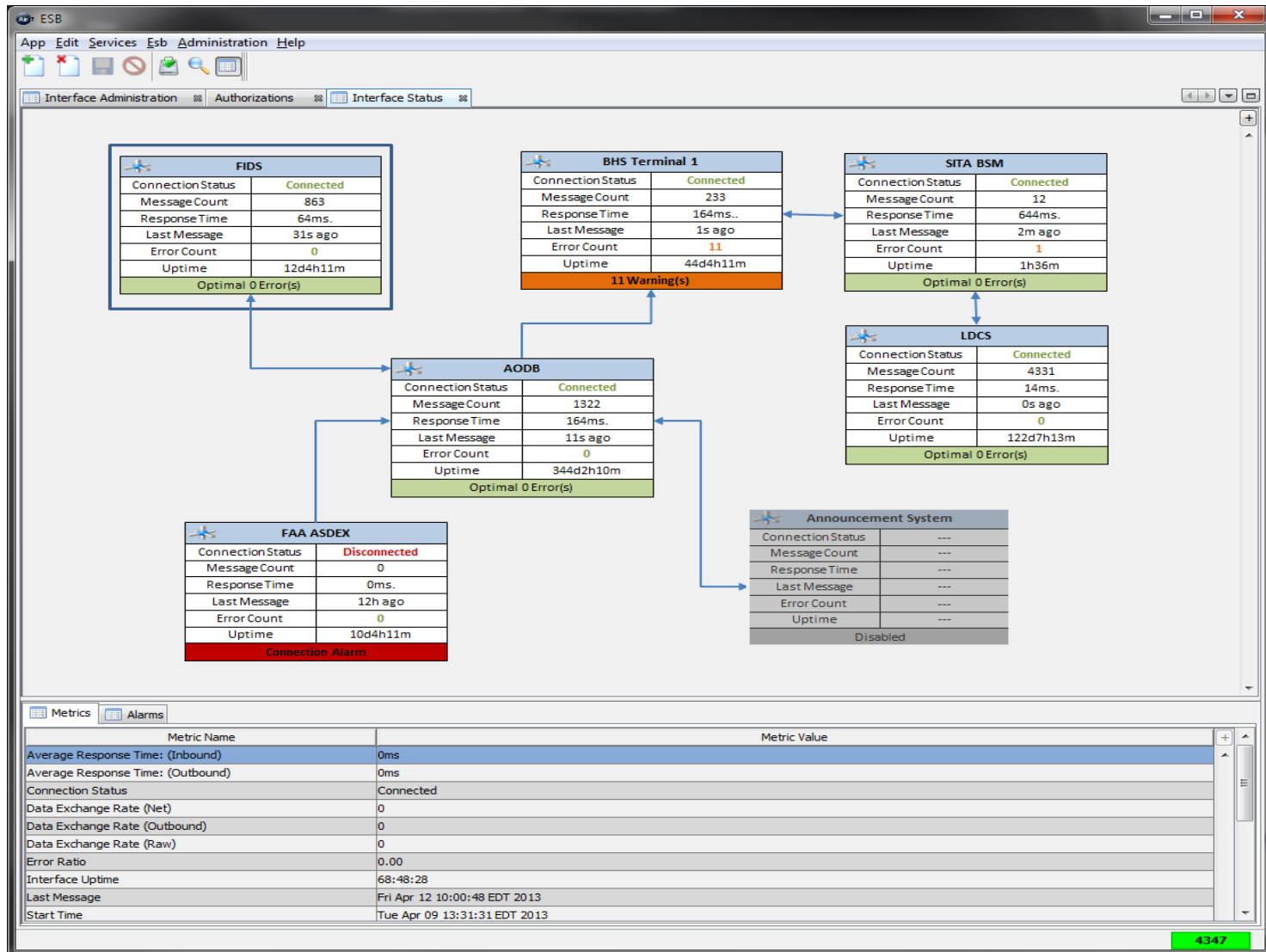
- Multi-Site Visualization/Monitoring (ESB Federation)
- Auto-generated Gateway Infrastructure
- Interface Export
- Interface Wizard
- Web-based GUI

# Outlook (2)



- Graphical Monitoring (SCADA-Like)
- Graphical Design of Interfaces (Topology and Configuration)
- Advanced Log Viewing
- Advanced Administrative Protocols (XMPP/SMS/Interactive Shell)
- Graphical Mapping Design

# Graphical Monitoring



**THANK YOU!**

**ANY  
QUESTIONS?**