GlassFish ESB v2.1 Intelligent Event Processor in Healthcare "Excessive Length of Stay" Example

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Introduction

As a healthcare enterprise looks after patients, information is gathered about various events that take place. Information about notable events, Admissions and Discharges, for example, is recorded in Hospital Information Systems or Patient Administration Systems. These systems typically broadcast event information in a form of HL7 messages for use by other enterprise systems, for example laboratory or diagnostic imaging. A stream of HL7 messages can be intercepted and processed to derive all sorts of interesting information.

The solution developed in this walkthrough deals with Excessive Length of Stay. Length of stay is defined as the period between patient's admission to and discharge from the hospital. Statistical average expected length of stay is typically available for different kinds of patients presenting with different kinds of conditions. A significant variation from the average length of stay for specific patients may indicate complications, treatment errors, infections and other kinds of issues that the hospital needs to investigate. Notification of such incidents may help the hospital in addressing these issues and prevent future occurrences.

In this solution the Intelligent Event Processor is used to calculate the continuously updated average length of stay over a period of time and use it to compare against each event's length of stay. It passes, to the downstream component, all events where the length of stay exceeds the average by $1 \frac{1}{2}$ times and ignores all others.

In the initial iteration, the solution reads a stream of discharge messages, containing admission date, discharge date, length of stay, and a bunch of other fields from a file and passes them to the IEP process. The IEP process keeps the window on the last 10 seconds worth of records and continuously calculates the average length of stay over all records in that window. As records are added to and removed from the window the average is recalculated. As each record is seen its length of stay is compared to the average length of stay of all records in the window at the time. If the length of stay in the current record is less then or equal to $1\frac{1}{2}$ times the average at the same time the record is discarded. If the average is greater the record is ejected to the output and ultimately written to a file of exception records.

In a subsequent iteration the solution is modified to accept messages from a JMS Queue. This modification allows the solution to use the stream of discharge messages produced by the HL7 Processor solution, discussed in "HL7 Processor Demonstration - GlassFish ESB v2.1", <u>http://blogs.sun.com/javacapsfieldtech/entry/hl7_processor_d</u> emonstration_glassfish_esb.

In a further modification the solution is configured to send notification messages to another JMS Queue. Notification messages are processed by a different solution and sent to an email recipient.

The final solution is shown in a schematic below. Neither the HL7 Processor solution, nor the Notification solutions are shown in the diagram. The former is discussed elsewhere. The later is developed in this walkthrough.



Building the Solution

Preliminaries

The key to untroubled start with IEP is to make sure the initial startup of components is performed correctly. So, once off, just after installing a new version of GlassFish ESB, do the following:

- 1. start NetBeans IDE
- 2. start the Java DB from the Services Tab in the IDE
- 3. start the GlassFish app server from the services tab in the IDE

4. start the sun-iep-engine form the JBI Service Engines node tree in the IDE

Once these steps are performed in the correct order an initial iepseDB database is created. Thereafter one can start components form command scripts and suchlike. I typically start the Java DB using a script, then the App Server using a script, then the NetBeans IDE using a script.

Make sure that the IEP DB is available. In NetBeans IDE switch to the Services Tab, right-click Databases node and choose "New Connection".



Complete details (localhost, 1527, iepseDB, iepseDB, iepseDB)

🗊 New Database Conn	ection X
Basic setting Advanced	
Data <u>I</u> nput Mode:	④ Eield Entry
<u>N</u> ame:	Java DB (Network)
Hos <u>t</u> :	localhost
Port:	1527
<u>D</u> atabase:	iebseDB
<u>U</u> ser Name:	iepseDB
Pass <u>w</u> ord:	******
	Remember password (see help for information on security risks)
Additional Props:	
Show JDBC URL	jdbc:derby://localhost:1527/iebseDB
	OK Cancel Help

Right-click the new connection and choose Connect ...

Projects - IEPGroup Fi	iles	Services	≪		
🖃 🗐 Databases					
Java DB					
🕀 🧰 Drivers					
🕂 🔣 jdbc:derby://loc	alhost: 1527/iepseDB [iepseDB on IEPSED)B]		(
🗄 🔣 jdbc:derby://loc	alhost: 1527/sample [a	pp on APP]	Cor	nnect	
🗄 🔣 jdbc:derby://loc	alhost: 1527/travel [tra	avel on TRAVEL]	15 bise	connect	
🗄 🔀 jdbc:derby://loc	alhost: 1527/vir [vir on	VIR]	Eve	cute Command	
🕀 🔬 Web Services				cute command	·
Enterprise Beans (2.	.x)		Ref	resh	
E Servers				-1-	Dalata
			Del	ete	Delete
			Pro	perties	

If configuration is correct, the database server is running and the iepseDB has been created, the connection will succeed. If not, troubleshoot and fix what issues there may be until this activity is successful.

Confirm the presence of IEP basic tables.



Before using the iepseDB make a backup copy of it (the directory containing the iepseDB files). This should be done when the database server is not running. Sometimes iepseDB gets corrupted and needs to be restored.

Prerequisites

The XML Schema, IEPCustomDischarge.xsd, see directory Combined/prerequisites, is the schema to which records in the input files conform.

```
<xsd:sequence>
                <xsd:element name="MSH_3_SENDING_APPLICATION"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1" />
                 <xsd:element name="MSH_4_SENDING_FACILITY"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1" />
                 <xsd:element name="MSH_7_DATE_TIM_OF_MESSAGE"</pre>
                    type="xsd:string" minOccurs="0" maxOccurs="1" />
            </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <xsd:element name="PID">
            <xsd:complexType>
            <xsd:sequence>
                 <xsd:element name="PID_3X_1_ID"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PID_3X_6_ASSIGNING_FACILITY'</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PID_5_1_PATIENT_NAME_FAMILY"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PID_5_2_PATIENT_NAME_GIVEN"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PID_7_DATE_TIME_OF_BIRTH"</pre>
                    type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PID_8_ADMINISTRATIVE_SEX"</pre>
                    type="xsd:string" minOccurs="0" maxOccurs="1"/>
            </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <re><xsd:element name="PV1">
            <xsd:complexType>
            <xsd:sequence>
                 <xsd:element name="PV1_19_1_VISIT_NUMBER"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PV1_44_ADMIT_DATE_TIME"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="PV1_45_DISCHARGE_DATE_TIME"</pre>
                     type="xsd:string" minOccurs="0" maxOccurs="1"/>
                 <xsd:element name="LOS"</pre>
                    type="xsd:int"/>
            </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        </xsd:sequence>
    </xsd:complexType>
    </xsd:element>
</xsd:schema>
```

Create a Project Group

Right-click on the blank space in the Project Explorer, choose "Project Group" -> "New Group ...", named CombinedPG, based in a folder named Combined. If the project group already exists switch to it instead, to add new projects



All our projects will be created in this project group and will appear under the specified folder in the file system.

Building IEP Project

Right-click in the empty space in the Project Explorer and create "New Project" -> "SOA" -> "Intelligent Event Processing Module".



Name the project IEPA03_IEPM.

teps	Name and Locat	tion	
1. Choose Project 2. Name and Location	Project Name: IEPA03_IEPM		
	Project Location:	C:\GFESBv21_SH_Projects\Combined	Browse
	Project Fol <u>d</u> er:	C:\GFESBv21_SH_Projects\Combined\IEPA03_IEPM	1
. 10-	Set as Main Pr	oject	

Right-click on the "Processor Files" folder under the new module name, choose "New" -> "Other" -> "XML" -> "External XML Schema Documents(s)", click the "From File System" radio button, navigate to

 $\verb|Combined/prerequisites/IEPCustomDischarge.xsd and select it.||$

Projects - IE ◀0 × Files	Services	
IEPA03_IEPM		
🗊 New File		
Steps	Choose File Type	
1. Choose File Type	Project: Fig IEPA03_IEPM	<u>.</u>
	<u>C</u> ategories:	Eile Types:
	- C1 504	DTD Entity
		WSDL Document
	Other	 External XML Schema Document(s) External WSDL Document(s)
	Description:	
	This Wizard will retrieve Schen	na documents and their dependencies.
100		
		<back next=""> Enish Cancel Help</back>

~	1967					
1. Choose File Type 2. Specify Resource Location	Select the type of the source location and specify the target location for the resource.					
		http://				
		From Local File System				
		GFESBv21_SH_Projects/Combined/prerequisites/IEPCustomDischarge.xsd				
		Select the target location for the retrieved resource.				
		Save to Folder: C:\GFESBv21_SH_Projects\Combined\IEPA03_IEPM\src Browse				
a	XX	Over <u>w</u> rite files with same name.				

Right-click the name of the project, choose "New" -> "Intelligent Event Processor ...". Name the processor iepIEPA03.

eps	Name and L	ocation	
 Choose File Type Name and Location 	File <u>N</u> ame: Jie	pIEPA03	
	Project:	IEPA03_IEPM	1
	Folder:	src	Browse
	<u>Created File:</u>	C:\GFESBv21_SH_Projects\Combined\IEPA03_IEPM	\src\jepIEPA03.ie

Drag the "Input" -> "Stream Input" operator from the Palette onto the canvas

📴 iepIEPA03.iep 🗙	() V
Source Design 😽 🖇	- Aggregator
	Relation Aggregator
	Tuple Based Aggregator
	Correlation and Filter
100.000	Sta Relation Map
O	물급 Tuple Serial Correlation
	🖂 Input
	External Table Polling Stream
	🗟 Stream Input
	🖻 Output
	Batched Stream Output

Rename the operator to A03In.

1	a iepIEP/	A03.iep *	×					
	Source	Design	😽 🙎	5	1	8 🛃 🗄	- 🔆	.00% 💌
		_						
		Þ						
	A03In	<u></u>						

Double-click on the operator on the canvas to open its properties. Click the "select schema" button.

🗊 Stream Input Prop	erty Editor			×
Operator Configuration	Documentation			
Details				
Name:	StreamInput0	_		
Output Schema Name:	schema0	Select Sc	hema:	
Attributes				
Attribute Name	Data Type	Size	Scale	Comment
Add Attribute	Delete	. 1 .		Move Down
		<u>-</u>		
<u></u>				
			ОК	Cancel <u>H</u> elp

Expand past the root element of the schema and choose

pid_3x_1_id pid_3x_6_assigning_facility pv1_19_1_visit_number pv1_44_admit_date_time pv1_45_discharge_date_time los

Select schema elements or types	×
By File ■ UEPCustomDischarge.xsd ■ Elements ■ SellEPCustomDischarge ■ SellEPCustomDischarge	
OK Can	cel

🇊 Stream Input Prop	erty Editor					×
Operator Configuration	Documentation					
_Details						
<u>N</u> ame: Output Schema Name:	A03In schema0	hema:				
_Attributes						
Attribute Name	Data Type	Siz	e	Scale	Comment	
PID_3X_1_ID	VARCHAR	50				
PID_3X_6_ASSIGN	VARCHAR	50				
PV1_19_1_VISIT_N	VARCHAR	50				
PV1_44_ADMIT_D	VARCHAR	50				_
PV1_45_DISCHAR	VARCHAR	50				_
LOS	INTEGER	30				
<u>A</u> dd Attribute	Mo <u>v</u> e Down					
				ок	Cancel <u>H</u> elp	,

Close the dialogue box.

Drag "Stream Converter" -> "TimeBasedWindow" operator onto the canvas, rename it to TBW10Seconds, connect A03In to TBW10Seconds, edit properties of TBW10Seconds and configure "Size" to 10 seconds.

IBWI)Seconds			Stream Input
mentation				Balation Output
				Stream Output
100			- Inner II	- Relation Converter
IUSeconds			jsecona 🖭	Celete Stream
:ma0				Natification Chrose
				+ Sequence
Data Type	Size	Scale	Comment	Stream Converter
HAR 50				Attribute Based Window
HAR 50				
HAR 50				I'me Based Window
HAR 50				
HAR 50				
SER				
	perty Editor mentation 10Seconds ma0 Data Type HAR 50 HAR 50 HAR 50 HAR 50 HAR 50 HAR 50 HAR 50 SER	perty Editor mentation 10Seconds 10Seconds 10Seconds 10 10Seconds 10 10Seconds 10 10 10Seconds 10 10 10 10 10 10 10 10 10 10 10 10 10	perty Editor mentation 10Seconds Size 10 Data Type Size Scale HAR 50 HAR 50 HAR 50 HAR 50 HAR 50 HAR 50 SER 50	perty Editor × mentation 10Seconds Size: 10 second Ma0 Data Type Size Scale Comment HAR S0 HAR S0

Drag "Aggregator" -> "Relational Aggregator" operator to the canvas, rename it to RelAggAvgLoS and connect to TBW10Seconds.

Double-click RelAggAvgLoS to edit properties.

Drag LOS Input Attribute to the SELECT expression field and surround it by AVG() to form an expression: AVG(TBW10Seconds.LOS)

PM		E Aggregator
or Files		Relation Aggregator
ustomDischarge.xsd		Tuple Based Aggregator
PA03.iep		Correlation and Filter
PA03.wsdl		🛵 Relation Map
		Sa Tuple Serial Correlation
		🖃 Input
	A03In	External Table Polling Stream
		Stream Input
	TBW10 Seconds Rel AggAvgLoS	- Output
Relation Aggregator Pro	operty Editor X	Batched Stream Output
Operator Configuration Docu	mentation	Relation Output
Details	·	Character Calend
N		
Mame: IREIA	JggAvgLos	- Relation Converter
Output Schema Name: sche	mal	The stream
		🐹 Notification Stream
Attributes		Relation Operator
Input	ELECT	E Sequence
E C TBW 10Seconc	Everyopian Attribut Oata Tuna Siza Scala Commont	
• PID_3X_1	Avg(TBW10Seconds LOS) AvgLoS INTEGER	Attribute Based Window
PID_3X_6		Time Based Window
PV1_15_1	Add Attribute Delete Move In Move Down	
• PV1_45_D		
e Los		
<u>W</u> H	IERE	
1		
I I GR	OUP BY	
	OK Cancel <u>H</u> elp	
	ht	

Change attribute name to AvgLoS.

Drag "Correlation and Filter" -> "Stream Projection and Filter" onto the canvas. Rename it to ExcessiveLoS. Connect to RegAggAvgLoS and to A03In

Edit properties of the ExcessiveLoS operator. Add all input attributes to the SELECT table and add one more empty attribute.

A03In TBW/105econds RelAggAvg	ExcessiveLoS		E Corr Sig Rela Tup Stre Strong Tup Extre Rep	elation and ation Map am Projectior le Serial Corre It ernal Table Po Nay Stream	Filter and Filter elation Illing Stream	
Stream Projection and Filter Property Edite Operator Configuration Documentation Details)r 					×
Attributes	SELECT	Attribute	Data Type	Size	Scale	Comment
	A03In.PD_3X_6_ASSIGNING A03In.PU1_19_1_VISIT_NUM A03In.PV1_44_ADMIT_DATE A03In.PV1_45_DISCHARGE A03In.LOS Relandavid oS_Avid oS	PID_3X_6 PV1_19_1 PV1_44_A PV1_45_D LOS	VARCHAR VARCHAR VARCHAR VARCHAR INTEGER INTEGER	50 50 50 50 50		
	Add Attribute	Delete		Move Up	Mo	ve Down
	EKUM JAU3In,RelAggAvgLoS					

Configure the empty line to an expression (RelAggAvgLoS.AvgLoS \ast 1.5), name the attribute AvgLoS1 and a Half and set its Data Type to INTEGER

A03In.LOS	LOS	INTE	
RelAggAvgLoS.AvgLoS	AvgLoS	INTE	
(RelAggAvgLoS.AvgLoS * 1.5)	AvgLoS1andaHalf	INTE	
Add Attribute	Delete	Move Up M	o <u>v</u> e Down
FROM A03In, RelAggAvgLoS			
- , , , ,, ,, ,,			
WHERE			

Configure the WHERE to expression by entering A03In.LOS > (RelAggAvgLoS.AvgLoS * 1.5)

rator configuration Documentation							
tails							_
me: ExcessiveLoS							
utput Schema Name: schema2							
ributes							_
puts	SELECT						
	Expression	Attribute Name	Dat	Size	Scale	Com	Γ
PID_3X_1_ID	A03In.PID_3X_1_ID	PID_3X_1_ID	VAR	50		1	1
DV1 19 1 VISIT NUMBER	A03In.PID_3X_6_ASSIGNING	. PID_3X_6_ASSIGNING_FACILI	TY VAR	50	1	1	T
PV1 44 ADMIT DATE TIM	A03In.PV1_19_1_VISIT_NUMBER	R PV1_19_1_VISIT_NUMBER	VAR	50	1		
PV1 45 DISCHARGE DATE	A03In.PV1_44_ADMIT_DATE	PV1_44_ADMIT_DATE_TIME	VAR	50	1		
LOS	A03In.PV1_45_DISCHARGE_D	. PV1_45_DISCHARGE_DATE_T	ME VAR	50	Ĵ.		
RelAggAvgLoS	A03In.LOS	LOS	INTE		J.		
AvgLoS	RelAggAvgLoS.AvgLoS	AvgLoS	INTE	2 J	J.		
1.1016 CO-0000	(RelAggAvgLoS.AvgLoS * 1.5)	AvgLoS1andaHalf	INTE		1	1	L
	Add Attribute	Delete !	<u>1</u> ove Up		Mo <u>v</u> e [Down	
	FROM A03In RelAmAvol oS						-
	Troin prosiniticinggrigeou						
	LUN FOF						

Close the dialogue box.

Drag a "Output" -> "Stream Output" onto the canvas, name the stream ExcessiveLoSOut and connect ExcessiveLoS to ExcessiveLoSOut.

					🗆 🖸 Output	
					Batched Stream Output	1
	1	1.5	7-Dipo-		Relation Output	41.4
A03In	1	_ /	ExcessiveLoS	ExcessiveLoSOut	🗟 Stream Output	1
				the state	Relation Converter	
	TBW10 Seconds	Rel Agg AvgLoS		The second second	避 Delete Stream	10.00
					📜 Notification Stream	1.5
					Relation Operator	

Build the project.

Observe new WSDL artifact in the project explorer.



Edit the generated WSDL and modify OutputService_ExcessiveLoSOut and properties. Change file:address: to <project folder>/Combined/data.

Services DuputService Services DuputService_E DuputService	xcessiveLoSOut ExcessiveLoSOut Binding="OutputBinding_ExcessiveLoSOut" ess s	
🗄 🍿 file:address - Pr	operties	×
E Properties		
fileDirectory	C:\GFESBv21_SH_Projects\Combined\data	
relativePath		-

Change file:message: recordDelimiter to "\t\t\t".

🕀 🖂 A03InBatch_Msg		
⊕ ⊠ ExcessiveLoSOut_Msg		
🖻 😋 Port Types	🇊 file:message - Prop	erties
🕀 🧬 InputPt	Properties	
OutputPt_ExcessiveLoSOut	use	literal
🖻 😋 Bindings 🖌	encodingStyle	
🕀 🙀 InputBinding PortType="InputPt"	charset	
🖻 🙀 OutputBinding_ExcessiveLpSOut P	fileType	
	forwardAsAttachment	
ExcessiveLoSOut	deleteFileOnRead	
⊕	fileName	ExcessiveLoSOut.txt
🖻 🔛 ExcessiveLoSOu	fileNamelsPattern	false
file:message	fileNamelsRegex	
🛱 😋 Services	pollingInterval	
🕀 👰 InputService	part	
🖻 👮 OutputService_ExcessiveLoSOut	removeEOL	
. OutputPort_ExcessiveLoSOut	addEOL	false
🕀 🔚 file:address	multipleRecordsPerFile	true
Extensibility Elements	maxBytesPerRecord	
🖶 🗂 InputPlt	recordDelimiter	\t\t\t
OutputPlt_ExcessiveLoSOut	archive	

Build the project again.

The IEP project, first iteration, is ready

Building BPEL Project

Create a "New Project" -> "SOA" -> "BPEL Module" and name it IEPA03_BPELM.

Right-click the name of the BPEL module project and create "new" -> "WSDL Document".

- 1. name IEPA03_BPELM_FileIn
- 2. WSDL Type: concrete wsdl document
- 3. binding: file
- 4. type: poll

Steps	Name and Location	
 Choose File Type Name and Location Request Configuration 	File Name: IEPA03_BPELM_FileIn	
	Project: IEPA03_BPELM	
	Folder: src	Bro <u>w</u> se.
	Greated File: C:\GFESBv21_SH_Projects\03_IEP\IEPA03_BP	ELM\src\IEPA03_BPELM_FileIn.wsdl
	Greated File: C:\GFESBv21_SH_Projects\03_IEP\IEPA03_BP Iarget Namespace: http://j2ee.netbeans.org/wsdl/IEPA03_B WSDL Type: C Abstract WSDL Document I C Opcrete WSDL Document I C Opcrete WSDL Document	ELM\src\IEPA03_BPELM_FileIn.wsdl BPELM/IEPA03_BPELM_FileIn
	Greated File: C:\GFESBv21_SH_Projects\03_IEP\IEPA03_BP Jarget Namespace: [http://j2ee.netbeans.org/wsdl/IEPA03_WSDL Type: C Abstract WSDL Document If: Concrete WSDL Document Binding: FILE	ELM\src\IEPA03_BPELM_FileIn.wsdl BPELM/IEPA03_BPELM_FileIn

- 5. set file name pattern to IEP_output_%d.dat
- 6. set path to <project folder>/Combined/data

- set multiple record: true
 set Delimited by: \t\t\
 set Message Type: XML
- 10. For XSD Element Type choose XSD from the IEPA03_IEPM project: elIEPCustomDischarge

teps	Request Connguration		
Choose File Type Name and Location	File Polling		
Request Configuration	File <u>N</u> ame* (pattern):	IEP_output_%d.dat	☐ Is Rege <u>x</u>
		C:\GFESBv21_SH_Projects\Combined\data	Browse
		Polling Directory Relative To: Not Set>	•
	Polling Interval (ms):	1000	
	Enable Archive	Details	
	Record Processing		
	Multiple Record	Delimited By: /t/t/t	-
	Maximum (Bytes) Pe	r Record	
	Payload Processing	· ·	
	Me <u>s</u> sage Type:	xml	-
	XSD Element/Type:		
	Forward a Sele	ct Element Or Type	
		3y File	
		E IEPA03_BPELM	
	E	src/IEPCustomDischarge.xsd	
		Complex Types	
		elIEPCustomDischarge	
· lat			
	() Missing element	OK Canc	el Helo
	- Contraction and the second second	OK Conc	es Tech

Open IEPA03_BPELM.bpel process model.

Drag IEPA03_BPELM_FileIn WSDL onto the left-hand swim line and name the partner link FileIn.

Drag iepIEPA03.wsdl from the IEP03_IEPM module onto the right-hand swim line and name the partner link IEPOut.



Drag receive, assign and invoke to the process scope.



Connect Receive1 to FileIn and out Invoke1 to IEPOut A03In operation.



Add variables vIn for Receive1 and vOut for Invoke1.

	IEPA03_BPELM	♦ If 🔮
FileIn Poll	Process Start	Pout Receive1 [Receive] -
(<u> </u>	Receive1 [Receive] - Property F Iype: ths:PolInputMessa Main Correlations Scope: IEPA03 BPELM	age
	Name: Receive1 Partner Link: FileIn	Ok Cancel
	Operation: poll Input Variable:	Create Browse
	Create Instance	
Output	Ok	Cancel <u>H</u> elp

			Pro	perty Editor
		IEPOUL	Nar	ne
			Doo	cumentation
Receive1			EN	lessage
		A03In	👝 Par	tner Link
1	1 2		Por	t Type
			One	eration
	🗊 New Inpu	t Variable		×
Invoke1				
Invokel [Invoke] -	Name: VOu	t		
Main La Luc 1	Type: tns:/	A03In_Msg		
Main Correlations		00. 000 M		
Name: Invoke	<u>Scope: JIEP</u>	AU3_BPELM		
Partner Link: IEPOu			Ok	Cancel
Operation: A03In			2	
				1
Input Variable:		/	Create	Browse
Output Variables		1	Cranta	Province 1

Switch to Mapper mode and map nodes of vIn to corresponding nodes of vOut.



Build the project.

The BPEL module, which sends records to the IEP processor, is ready

Building and Deploying Composite Application

Create "New Project" -> "SOA" -> "Composite Application", named IEPA03_CA.

Drag IEPA03_IEPM and IEPA03_BPELM modules onto the CASA map and build.

WSDL Ports	JBI Modules
OutputPort_ExcessiveLoSOut	(IEP) IEPA03_IEPM
~ /	🖓 ieplEPA03
2 QoS	► >>> InputRn
InputPort	
	(BPEL) IEPA03_BPELM
	E IEPA03_BPELM
	FileIn

Once the composite application is built, delete the superfluous SOAP BC.

Edit link properties of the link between the IEP Module and the BPEL Module. Configure Max Concurrency Limit to 1

a	WSDL Ports	JBI Modules
Dischar <u>c</u> wsdl	OutputPort_Excessive_c	oSOut (IEP) IEPA03_IEPM
🇊 Inp	utRn_partnerRole<->InputF	Rn - Properties 🔀
⊡ Consu	umer	
Service	Name	{http://enterprise.netbeans.org/bpel/IEPA0 veLoSOut >>-@oS
Endpoin	t Name	InputRn_partnerRole
EProvid	der	
Service	Name	{ieplEPA03_iep}nputPl
Endpoin	t Name	InputRn
ERedeli	ivery Extension	
Max Att	empts	
vVait Tim	ne	
On Failu	ire	
⊡ Thrott	ling Extension	BPELM
Max Cor	ncurrency Limit	1 OutPLK - OOS

Build and Deploy the composite application.

The runtime solution is now ready to process data

Exercising Solution

Submit IEP_output_1.dat by copying it from <project folder>/Combined/data/sources folder to <project folder>/Combined/data folder.

There will be nothing produced since the condition filters out the record.

Switch to NetBean -> Services -> Databases. Right-click the iepseDB connection and choose Connect.



Expand Tables node, right-click Q_0_o2 table name and choose "View Data".



Inspect data in table Q_0_O2.

EPA	IEPA03_CA.casa × i SQL Command 1 ×				
Connectio	Connection: jdbc:derby://localhost:1527/i 🔽 🛛 🚯 🐺 😰 🌆 🐨 📓 📲 🔍 🔩 🤯				
1 se	elect * i	from IEPSEDB.Q	0_02		
1:1	1:1 INS				
select *	select * from IEPSEDB.Q_0 ×				
		🖬 I 😂 K 🔨	>>> > ► Page Size: 20	Total Rows:	2 Page:1 of 1
#	AVGLOS	EMS_SEQID	EMS_TIMES	TAMP	EMS_TAG
1	4	1	2009-09-09 13:14:31.4370	006	+
2	4	1	2009-09-09 13:14:41.4370	006	-

Submit IEP_output_10.dat by copying it from <project folder>/Combined/data/sources folder to <project folder>/Combined/data folder.

Look for an output file, ExcessiveLoSOut.txt, in <project folder>/Combined/data.

Of the 10 transactions submitted to the solution 2 had excessive length of stay, bot of 4 days where the average length pf stay for the transactions in the window at the time was 2 days.



Submit IEP_output_1000.dat by copying it from <project

folder>/Combined/data/sources folder to <project folder>/Combined/data folder. 1000 transactions ought to take more then 10 seconds to process so there ought to be time to observe contents of tables Q_0 _oX at different time during process execution. In particular, table Q_0 _O1 (TBW10Seconds) shows transactions in the time window and Q_0 _O3 shows transactions with excessive length of stay (ExcessiveLoS).

Adding JMS Feeder to the Solution

What we are about to implement is called a "Service Activator" pattern - multiple methods of invoking the same service. We already have a File BC invoking the BPEL process. We will now add a JMS BC which will be used to send messages to the BPEL process as well.

Open the IEPA03_BPELM project. Right-click Process Files. Choose "New" -> "WSDL Document"/ Name the WSDL IEPA03_BPELM_JMSIn. Make it a Concrete WSDL, using JMS Binding, of Type Receive.

Step	35	Name and Locat	tion
 2. 1.	Choose File Type Name and Location Request Connection Configuration Request Consumer	File Name: TEPAO	3_BPELM_JMSIn
	Configuration Advanced Configuration	Folder: src	Browse
		Created File: C:V	Gresby21_SH_Projects/combined/tePAU3_bPELM/src/tePAU3_bPELM_JMS1n.wsdi
		<u>C</u> reated Hile: C: v <u>T</u> arget Namespace W <u>S</u> DL Type:	Http://j2ee.netbeans.org/wsdl/IEPA03_BPELM/IEPA03_BPELM_JMSIn Abstract WSDL Document Concrete WSDL Document
		<u>Greated Hie:</u> <u>C:v</u> <u>Target Namespace</u> W <u>S</u> DL Type: Binding:	SPESBV21_SH_Projects (Combined (JEPA03_BPELM (SFC (JEPA03_BPELM_JIMSIn, Wsd) MS Mttp://j2ee.netbeans.org/wsdl/IEPA03_BPELM/IEPA03_BPELM_JIMSIn C_Abstract WSDL Document MS

Click Next.

Set Connection URL: mq://<yourMQhost>:<yourMQport>, User Name: admin, Password: admin, Message Type: xml, XSD Element/Type: elIEPCustomDischarge from the IEPA03_IEPM project.

 Choose File Type Name and Location Request Connection Configuration Request Consumer Configuration Advanced Configuration Message Type: xml XSD Element/Type: Select Element Or Type EPA03_BPELM EPA03_IEPM Select Types EPA03_IEPM Select Types Elements Complex Types Elements 	Ste	ps	Request Configuration
Payload Processing Message Type: XSD Element/Type: XSD Element/Type: Select Element Or Type By File ElePA03_BPELM IEPA03_IEPM Src/IEPCustomDischarge.xsd Complex Types Elements Elements Elements Elements Elements Elements		Choose File Type Name and Location Request Connection Configuration Request Consumer Configuration Advanced Configuration	JHS Connection Image: Connection URL: Image: Manage: Market Image: Connection URL:
Select Element Or Type By File EPA03_BPELM File Fi			Payload Processing Message Type: xml XSD Element/Type:
Em Simple Types			Select Element Or Type By File EPA03_BPELM File Fi

Click Next.

Set Destination: qIEP, Destination Type: Queue, Redelivery: 1:move(same:\$_DLQ).

eps	Request Configuration
Choose File Type Name and Location	Destination Properties
Request Connection	Destination: QIEP
. Request Consumer	Destination Type: O Queue O Topic
Advanced Configuration	Subscription Durability: C Durable, Name:
	C Mon-durable
	Client ID;
	Concurrency: 1 Enable Batch, Size 0
	Redelivery: 1:move(same: \$_DLQ)
	Redelivery If defined, this attribute specifies what actions to take in the event that an error occurred in processing the JMS message received from the JMS destination (for example, putting the "poisoned" message in a dead letter queue).
i oit	

Click Finish to complete the configuration wizard.

Open the IEPA03_BPELM.bpel process in the editor. Drag the new IEPA03_BPELM_JMSIn WSDL onto the target market at the left hand swim line. Name the new partner link JMSIn.



Delete Receive1 activity. Drag the "Structured Activities" -> "Pick" activity from the Palette onto the target marker inside the process scope to replace the Receive1 activity you just deleted.



Select the Pick1 scope. Click the "Add on Message" icon.



Connect the first onMessage activity to the FileIn partner link and the second onMessage activity to the JMSIn partner link.



Double-click the first onMessage activity, click Browse and choose the existing vIn variable.

FileIn Poll JMSIn	OnMe Conversion Con	IEPOut A03In M Doc	essa perty tner l t Typ eratio ut Va lain cumei
IMSInOp Main Correla	Handler] - Property Editor	<u>×</u>	1
Partner Link: Operation:	FileIn poll		
<u>I</u> nput Variabl	e:	Create Browse	
	 Input Variable Chooser IEPA03_BPELM IEPA03_WIN IEPA03_BPELM IEPA04_BPELM IEPA04_BPELM	Ok Cancel	×
Output			-

Double-click the second onMessage activity, click Create and create a new vIn2 variable.

] [Message Handler] - P
FileIn			E Message
(TOURT)	OnMe		Property Editor
		(EPOut IEPOut	Partner Link
	Mestage 1	Message	Port Type
poli	(Q)	♥ / (♥)	Operation
JMSIn	🗊 [Message I	landler] - Property Editor	×
	Main Correlati	ons	1
	2.7. 24		
JMSInOp	Partner Link:	JMSIn	
	Operation:	JMSInOperation	*
	Input Variable:		Create Browse
		New Treput Versiable	
		wew input variable	
		Name: vIn2	
		Type: tos: IMSInnutMessage	
			elp
		Scope: IEPA03_BPELM	
		Ok	Cancel
			8

Drag the Assign1 activity onto the target marker below the first onMessage activity inside its scope.



Add Assign activity below the second onMessage.



Double-click the Assign2 activity and map nodes of vIn2 to corresponding nodes of vOut as shown.



Click the Pick1 activity and check the "Create Instance" checkbox.



Save and Build the project.

Open the IEPA03_CA -> "Service Assembly" and click Build.



Deploy the project.

Use a tool like QBorwser (<u>http://sourceforge.net/projects/qbrowserv2/</u>) to connect to the JMS implementation and submit one or more message from the <project root>/Combi

ned/data/sources/IEPOutput_10.dat to the JMS Queue qIEP. Observe server.log to make sure that solution still works.

🐼 QBrowser V2.5.1 - Nat connected
File New Message Edit Local Store Display Subscribe Inguiry command Des
「「「なな」のの日本四川」、「四日は国際」
Message Queue Management Tool
Connect to Broker
Input connect information. Or you can select it from Connection History.
Host : localhost
Port : 27676
User : admin
Password : ****
Connection History:
host = localhost port = 27676 user = admin
OK Cancel
QBrowser V2.5.1 - imqbroker(localhost:27676) user=admin
File New Message Edit Local Store Display Subscribe Inguiry command Dest
Message Queue Management Tool
DefaultQueue : Queue × 💊 qIEP : Queue ×
MessageID
Topic Purce all messages
Im TMPWORK Delete gueue from Broker
Display details of this destination
destination (qIEP) : Pause

🔄 create new message		
dest name qIEP		•
dest type:	QUEUE	•
JMS Header		+ -
JMS Header		Header Value
Message Properties:		+ -
Property KEY	Property Type	Property Value
input type: TextMessage Message body: A text file can be drag&droped.		repeat #: 1 Load from file
Delivery Mode: Persistent	Compress Mode: Ur	ncompress T Clear

Tinput a file path for TextMessage body	×
The contents of indicated file will be copied to editor screen of TextMessage body.	
ojects \Combined \data \sources \IEP_output_1.dat	
OK Cancel	

create new message		
dest name gIEP		
lest type:	QUEUE	•
JMS Header		+ -
JMS Header		Header Value
Message Properties:		+ -
Property KEY	Property Type	Property Value
input type: TextMessage		repeat #: 1
Message body:	+	
A text file can be drag&droped.		Load from file
<pre><ns1:pid_8_administrative_: <="" ns1:pid=""> <ns1:fv1></ns1:fv1></ns1:pid_8_administrative_:></pre>	SEX>M <td>ADMINISTRATIVE_SEX></td>	ADMINISTRATIVE_SEX>
<ns1:pv1_19_1_visit_number R></ns1:pv1_19_1_visit_number 	>V20080908111907<)	ns1:PV1_19_1_VISIT_NUMBE
<ns1:pv1_44_admit_date_tim ME></ns1:pv1_44_admit_date_tim 	E>20080908111907 </td <td>ns1:PV1_44_ADMIT_DATE_TI</td>	ns1:PV1_44_ADMIT_DATE_TI
<ns1:pv1_45_discharge_date _DATE_TIME></ns1:pv1_45_discharge_date 	_TIME>200809130330	021
<ns1:los>4</ns1:los>		
 <td>></td> <td>- N</td>	>	- N
Delivery Mode: Persistent	Compress Mode:	ncomptess 🔽 Clear
		Send Cancel

Confirm sending
<pre><ns1:pid_3x_6_assigning_facility>HosA<ns1:pid_5_1_patient_name_family>Kessel<ns1:pid_5_2_patient_name_given>Abigail<ns1:pid_7_date_time_of_birth>19460101123045<ns1:pid_8_administrative_sex>M <ns1:pv1> <ns1:pv1_19_1_visit_number>V20080908111907<ns1:pv1_44_admit_date_time>20080908111907<ns1:pv1_45_discharge_date_time>20080913033024< <ns1:los>4</ns1:los> </ns1:pv1_45_discharge_date_time></ns1:pv1_44_admit_date_time></ns1:pv1_19_1_visit_number></ns1:pv1></ns1:pid_8_administrative_sex></ns1:pid_7_date_time_of_birth></ns1:pid_5_2_patient_name_given></ns1:pid_5_1_patient_name_family></ns1:pid_3x_6_assigning_facility></pre>
of sending this message 1
Send Cancel



The project still works and can now receive messages from files and over JMS.

Adding JMS Notification Receiver to the Solution

Currently notification messages, these where the length of stay exceeds average by more then 1 ½ times, are written to a file. This is not particularly useful as there may be a significant delay between the time a notification is written and the time somebody gets informed. To give us the flexibility to add an automated notificaitn mechanism we will modify the IEP process to send notification messages to a JSM Queue instead of writing them to a file.

Open IEPA03_IEPM -> Processor Files -> iepIEPA03.wsdl in the WSDL editor. Expand Bindings node. Right-click on the OutputBinding_ExcessiveLoSOut. Choose Add -> JMS Binding.



Right-click the ExcessiveLoSOut operation node. Choose Add -> JMS Operation.

🖻 😋 Bindings			
🗄 🕀 InputBinding PortTyp	e="InputPt"		
🗄 🙀 OutputBinding_Exces	siveLoSOut PortTy	/pe="OutputP	t_ExcessiveLoSOut"
jms:binding			
file:binding			
ExcessiveLoSOut			
⊕ • file:operation	Cu <u>t</u>	Ctrl+X	
🕀 🔛 ExcessiveLoS	Сору	Ctrl+C	
🛱 🖓 🔁 Services	<u>P</u> aste	Ctrl+V	
🕀 👰 InputService			
🕀 👰 OutputService Exces	<u>A</u> dd	<u> </u>	Documentation
Extensibility Elements	<u>D</u> elete	Delete	JMS Operation
🕂 🗂 InputPlt	Change Order	·	L

Right-click the new jms:operation node and choose Porperties.

Configure key properties:

- destination: qIEPOut
- destinationType: Queue
- maxConcurrentConsumers: 1
- concurrencyMode: cc
- redeliveryHandling: 1:move(same:\$_DLQ)
- deliveryMode: NON_PERSISTENT
- priority: 4
- timeout: 30000

🖻 🔂 Messages		
🗄 🖂 A03In_Msg		
🕀 🖂 A03InBatch_Msg	🇊 jms:operation - Prop	erties
ExcessiveLoSOut_Msg	- Common	
🖻 🔄 Port Types	verb	
🕀 💮 InputPt	destination	qIEPOut
OutputPt_ExcessiveLoS	destinationType	Queue
	transaction	
🕀 💀 InputBinding PortType=	Consumer	
🖻 🎝 OutputBinding_Excessiv	clientID	
jms:binding	messageSelector	
file:binding	validateMessageSelector	
ExcessiveLoSOut	subscriptionDurability	
jms:operation	subscriptionName	
🕀 🔍 file:operation	maxConcurrentConsumers	1
🗄 🐨 🚮 ExcessiveLoSOu	concurrencyMode	cc
E Services	batchSize	
🕀 👷 InputService	redeliveryHandling	1:move(same:\$_DLQ)
🗄 😥 OutputService_Excessiv	Provider	
Extensibility Elements	deliveryMode	NON_PERSISTENT
InputPlt	timeToLive	
OutputPlt_ExcessiveLoS	priority	4
	disableMessageID	
	disableMessageTimeStamp	
	timeout	30000





Right-click the new jms:message. Choose Proeprties. Configure properties: messageType: TextMessage, textPart: output.



Expand Services node all the way to OutputService_ExcessiveLoSOut. Right-click OutputPort_ExcessiveLoSOut node. Choose Add -> JMS Address.

jms:message			
Q InputService			
OutputPort_ExcessiveLoSOut Bir	ndina="OutputBind	lina Excessive	LoSOut"
file:address	Cu <u>t</u>	Ctrl+X	
Extensibility Elements	Сору	Ctrl+C	
🕂 🖑 InputPlt	Paste	Ctrl+V	
OutputPlt_ExcessiveLoSOut	Add		Degumentation
	Auu		Documentation
	<u>D</u> elete	Delete	JMS Address
	Change Order	·	

Right-click the new jms:address node. Choose Porperties. Configure properties as appropriate for your environment.



Right-click file:address and choose Delete.



Right-click file:message and choose Delete.



Right-click file:operation and choose Delete.



Right-click file:binding and choose Delete.



Save the WSDL and Build the IEP project.

Open the IEPA03_CA -> Service Assembly and Build.

Note that the IEP output binding changed from File BC to JMS BC.



Set the maxConcurrencyLimit property of the connection between the BPEL Process and the IEP Processor to 1 again.

Build and Deploy the project.

Submit the 10-record file, IEP_output_10.dat, and observe the appearance of the qIEPOut and the appearance of messages in that Queue. There may be a delay of a few seconds as the IEP batches output stream to optimize performance.

🚱 QBrowser V2.5.1 - imqbroker((localhost:27676) user=admin						
File New Message Edit Local :	Store Display Subscribe Inquiry command Des	t command(U) Transactions(X)	Command input Look a	nd Feel(J) ClientVersio	n(B)		
) » 🔊 🕹 🧶 👰 🛱 🖓 🧐	🖱 🎯 😁 😔 🖓 🍐					
Message Queue Ma	inagement Tool	Dest Name: qIEPC	Dut ; Queue			Browse	Search
() impleation (lacally ast, 276.76)	💊 mq.sys.dmq : Queue 🗙 💊 qIEPOut : Queue	×					
Cueue	# MessageID 1 ID:4595-192.168.60.4(c5:e9:ce:b3:c5:8d)	4336-1253057237531	Timestamp 2009/09/16 09:27:17 EST	Type TextMessage	Size 468 byte	Mode Non-Persis	Priority 4
qIEP	2 ID:4596-192.168.60.4(c5:e3:cc:b3:c5:8d) - 3 ID:4603-192.168.60.4(ef:ca:4c:e7:90:f2) 4 4 ID:4604-192.168.60.4(81:dc:86:32:d8:a2) - 5 ID:4605-192.168.60.4(81:dc:86:32:d8:a2) -	4336-1253057237531 1337-1253057237531 4335-1253057237531 1352057237531	2009/09/16 09:27:17 EST 2009/09/16 09:27:17 EST 2009/09/16 09:27:17 EST 2009/09/16 09:27:17 EST	TextMessage TextMessage TextMessage	468 byte 468 byte 465 byte	Non-Persis Non-Persis	4
LocalStore	5 ID:4606-192.168.60.4(er:ca:4c:e7:90:72)-4	1337-1253057237546	2009/09/16 09:27:17 EST	Textmessage	467 Dyte	Non-Persis	4
GIEPOut Topic LocalStore Topuc	3 ID:4603-192.168.60.4(efrcz 4 ID:4604-192.168.60.4(81:d 5 ID:4606-192.168.60.4(efrcz	a:4c:e7:90:f2)-4337-125 c:86:32:d8:a2)-4335-12 a:4c:e7:90:f2)-4337-125	3057237531 53057237531 3057237546	2009/09/16 09: 2009/09/16 09: 2009/09/16 09:	27:17 EST 27:17 EST 27:17 EST		
WIMPWORK	🔍 Message Details						
	JMS header	,					
	JMS Header		Head	er Value			
	JMSMessageID	ID:4606-192.168.60.4	(ef:ca:4c:e7:90:f2)-4	337-12530572375	46	_	
	JMSDestination	qIEPOut : Queue				_	
	JMSReplyTo					_	
	JMSCorrelationID					_	
	JMSDeliverMode	1				_	
	JMSPriority	4				_	
	JMSExpiration	0				_	
	JMSType					_	
	JMSRedelivered	false				_	
	JMSTimestamp	1253057237546				_	
	<pre><msgns:excessivelosout_ms <pid_3x_1_id="">A000090V2 <pv1_44_admit_date_time>2 <pv1_45_discharge_date_tii <los="">3 <avglos>1</avglos> <avglos1adahalf>1</avglos1adahalf></pv1_45_discharge_date_tii></pv1_44_admit_date_time></msgns:excessivelosout_ms></pre>	<pre>gObj xmlns:msgns= _3X_1_ID> ITY>HosA00809080457320080908045732ME>2008091110055</pre>	"iepIEPA03_iep" 6_ASSIGNING_FAC 1_19_1_VISIT_NU 1_44_ADMIT_DATH 7PV1_45_DISCHAR	/> //ILITY> //MBER> //IME> XGE_DATE_TIME	>		

The IEP messages are now queueud to a JMS Queue instead of being written to a file.

Adding Notification Sender

Now that we have the notifications messages in a JMS Queue we can develop a solution which will process these notifications. In this case we will take each message and send it, using electronic mail, to a pre-configured recipient.

Right-click anywhere in the empty area of the project explorer and choose New Project -> SOA -> BPEL Module. Name this BPEL Module EMailNotifier_BPELM.

Create a "New" -> "XML Schema", named A03In_MsgObj. When the XSD opens in the editor switch to the Source view.

Open the "IEPA03_IEPM" -> "Processor Files" -> "iepIEPA03.wsdl" WSDL. Switch to the Source view, select the element named A03In_MsgObj and copy to the clipboard.



Switch to the A03In_MsgObj.xsd and paste inside the <schema ...>...</schema> tags. Right-click inside the source and choose Format.



Switch back to the iepIEPA03.wsdl, select the value of the targetNamespace property and copy it to the clipboard.

Switch back to the A03In_MsgObj.xsd and replace all occurrences of the targetNamespace and xmlns:tns attribute values with the copied text.

mlns:tns="http://xml.netbeans.org/s	schema/A03I	_MsgObj"		
<pre>lementFormDefault="qualified"></pre>				
xsd:element name="A03In_MsgObj">	I Replace			
<pre><xsd:complextype> <xsd:sequence></xsd:sequence></xsd:complextype></pre>	Eind What:	http://xml.netbeans.org/	schema/A03In_MsgObj 💌	Find
<pre><xsd:element name="PID_3 <xsd:element name=" pid_3<="" pre=""></xsd:element></pre>	Replace With:	iepIEPA03_iep	•	<u>R</u> eplace
<pre><xsd:element <="" name="PV1 description" pre=""></xsd:element></pre>		Match Case	Wrap Around	Replace Al
<pre><xsd:element los"<="" name="PV1 4</pre></td><td></td><td>Whole Words</td><td>Search Selection</td><td>Close</td></tr><tr><td><re><xsd:element name=" p=""></xsd:element></pre>			Search Backwards	Help
		Highlight Results	Incremental Search	-

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"</pre>
      targetNamespace="iepIEPA03 iep"
  xmlns:tns="iepIEPA03 iep"
    elementFormDefault="qualified">
<xsd:element name="A03In MsgObj">
         <xsd:complexType>
             <xsd:sequence>
                 <xsd:element name="PID_3X_1_ID" type="xsd:string"/>
                  <xsd:element name="PID 3X 6 ASSIGNING FACILITY" type="xsd:string"/>
                  <xsd:element name="PV1 19 1 VISIT NUMBER" type="xsd:string"/>
                  <xsd:element name="PV1 44 ADMIT DATE TIME" type="xsd:string"/>
                  <xsd:element name="PV1_45_DISCHARGE_DATE_TIME" type="xsd:string"/>
                  <xsd:element name="LOS" type="xsd:int"/>
              </xsd:sequence>
          </xsd:complexType>
      </xsd:element>
  </xsd:schema>
```

Save the XSD.

In the new project right-click the Process Files node and choose New WSDL Document. Name this WSDL EMailNotifier_BPELM_EMailOut. Make this WSDL a Concrete WSDL, EMAIL Binding of type "Send Email (using SMTP)".

Steps	Name and Locati	ion
 Choose File Type Name and Location SMTP Settings 	File <u>N</u> ame: EMailNo	btfier_BPELM_EMailOut
	Project: EMail	INotifier_BPELM
	Folder: src	Browse
	Created File: v21_	_SH_Projects\Combined\EMailNotifier_BPELM\src\EMailNotifier_BPELM_EMailOut.v
	<u>T</u> arget Namespace: W <u>S</u> DL Type:	p://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_EMailOu <u>Abstract WSDL Document</u> <u>Concrete WSDL Document</u>
	Target Namespace: WSDL Type: Binding:	p://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_EMailOL

Click Next.

Configure outgoing email properties:

- SMTP Server: localhost (you would use a server of your own)
- Port: 25 (default for non-secure SMTP server)
- Username: msender (use your own)
- Password: ****** (use your own)
- Message Type: xml
- XSD Element/Type: A03In_MsgObj

Click the Test button to verify that your connection settings are correct.

Leave other properties at defaults and click Finish to complete the wizard.

teps	SMTP Settings	
Choose File Type Name and Location	Email Connection —	
. SMTP Settings	Location:	
	SMTP Server:	localhost
	Port:	25
	User Name:	msender
	Password:	*******
	Use SSL	Use SSL
		Test Connection
	Payload Processing	
	Message Type:	xml
	XSD Element/Type:	
	Send Option:	lect Element Or Type
	Image Handling:	By File
	Normalized Messa	E src/A03In_MsgObj.xsd
		Complex Types
		A03In_MsgObj
		🗈 📴 Simple Types
	P.C	Ruilt-In Schema Tynes
XX	(3) XSD Element/Ty	OK Cancel Help
		<i>v</i> ,

Alas, this does not correctly set the message type for the Email BC. Open the new WSDL in the editor.

Expand the Messages node. Right-click the "message" node and choose Properties. Change the Element or Type property to A03In_MsgObj. Save the WSDL.

	🗊 message []	Part] - Properties	X.
to xsd:string	Properties		
times subject xsd:string	Name	message	
message xsd:string	Element or Type	xsd:string	
Port Types			and a second
EmailNotifier_BPELM_EMailOu	ItF Tessage [Pa	art] - Element or Type	×
🗄 🙆 SendEmail	🕀 🔄 By File		<u> </u>
input1 Message = "EM	lail 🖻 😤 EMail	lotifier_BPELM	
Bindings	🖻 🐻 sr	c/A03In_MsgObj.xsd	
EMailNotifier_BPELM_EMailOu	JEE 🕀 🕞	Complex Types	
email:SMTPbinding		Elements	
	÷.	A03In MsgObj	
email:SMTPoperation	- L	Cimple Turse	<u> </u>
Cinding in Operation			

Create a "New" -> "WSDL Document", named EMailNotifier_BPELM_JMSIn.

Make is a Concrete WSDL, JMS Binding, of type Receive.

teps	Name and Lo	ocation
Choose File Type • Name and Location Request Connection	File <u>N</u> ame: EN	MailNotifier_BPELM_JMSIn
Configuration Request Consumer	Project:	EMailNotifier_BPELM
Configuration Advanced Configuration	Folder:	src Browse
	Created File:	SBv21_SH_Projects\Combined\EMailNotifier_BPELM\src\EMailNotifier_BPELM_JMSIn.w
	Target Names WSDL Type:	pace: http://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_JMSIr
	Target Namesı WSDL Type: Binding:	pace: http://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_JMSIr
	Target Namesı WSDL Type: Binding: Type:	pace: http://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_IMSIn C Abstract WSDL Document C Concrete WSDL Document IMS Receive

Click Next.

Configure properties:

- Connection URL: mq://localhost:27676 (change host and port for your environment)
- User Name: admin
- Password: admin
- Message Type: xml
- XSD Element/Type: A03In_MsgObj

Steps	Request Configuration		
 Choose File Type Name and Location Request Connection Configuration Request Consumer Configuration Advanced Configuration 	JMS Connection Connection URL: User Name: Password:	mq://localhost:27676 admin *****	
	Payload Processing		
	Message Type: XSD Element/Type:	xml	
	Forward a P-Sel	ect Element Or Type By File 중을 EMailNotifier_BPELM 白-感 src/A03In_MsgObj.xsd	×
	Message Type	Elements	
	Defines what dat	A03In_MsgObj	
- tay	'text' = payload i	OK Cana	al Help
- A - A	O Missing elemer		
			6

Click Next.

Configure Destination and Redeliver properties, and click Finish.

eps	Request Configuration
Choose File Type Name and Location	Destination Properties
Request Connection Configuration	Destination: IgIEPOut
Request Consumer Configuration	Destination Type: O Queue C Topic
dvanced Configuration	Subscription Durability: C Durable, Name:
	C Non-durable
	Client ID:
	☐ XA Transaction
	IMC Concurrent Deparation
	Delivery Mode: Concurrent Coustom (sync)
	Message Selector:
	Redelivery: [1:move(same:s_DLQ)]
	Redelivery
	If defined, this attribute energifies what actions to take

Open the BPEL process. Drag the EMailNotifier_BPELM_JMSIn onto the canvas and drop it onto the target marker in the left hand swim line. Name the partner link JMSIn. Drag the EMailNotifier_BPELM_EMailOut WSDL and drop it onto the target marker in the right hand swim line. Name the partner link EMailOut.



Drag Receive, Assign and Invoke activities onto the canvas and drop onto the target markers inside the process scope. Connect the Receive1 to JMSInOperation operation of the inbound partner and the Invoke1 to the SendEmail operation of the outbound partner link.



Add a variable to the Receive1 activity to hold the incoming message.

JMSIn JMSInOp,	Receivel [R	equive]	- Property Editor	EMailOut		Flow
	Name: Partner Link: Ogeration:	ns Receive 1 JMSIn JMSInOp	eration		ļ	-
	Input Variable:	🗊 New	Input Variable		C <u>r</u> eate	Browse
Jutput	6	Name:	vIn			
XML check × build.: init-esb-ide: init-esb-cli:	<	<u>I</u> ype: <u>S</u> cope:	tns:JMSInputMessa	nge M		

Add a variable to the Invoke1 activity to contain the outgoing message.

	JMSIn MSInOp		Receive1	EMailOut • D SendEmail	-
		Main Correlatio	voke] - Property Editor		×
		Name:	Invoke1		- 1
		Partner <u>L</u> ink:	EMailOut	1	_
Out	put	Operation:	SendEmail	ļ	
₩.	XML check ×	Input Variable:		Create Brog	<u>w</u> se
-	init-esb-ide init-esb-cli check-catd-c	Output Var	New Input Variable		<u> </u>
	init-catd: pre-init: init-private	Iv	vpe: ths:EMailNotifier_BPELM	1_EMailOutInputMessag	je
	init-userdi:	Sc	cope: [EMailNotifier_BPELM		

Double-click the Assign1 activity and configure mappings as shown, varying from email address and subject as you see fit.



Build the project.

Create a "New Project" -> "SOA" -> "Composite Application", named EMailNotifier_CA.

5teps	Name and Location	
L. Choose Project 2. Name and Location	Project Name: EMailNotifier_CA	
	Project Location: C:\GFESBv21_SH_Projects\Combined Project Folder: C:\GFESBv21_SH_Projects\Combined\EMailNotifier_CA	Browse
X	Set as Main Project	

Drag the EMailNotifier_BPELM project onto the CASA canvas.

Build and Deploy the project.

Source Design	
WSDL Ports	JBI Modules
EMailNotifier_BPELM_JMSIn_InPort	(BPEL) EMailNotifier_BPELM
	EMailNotifier_BPELM
EMAIL	EMailOut Des
EMailNotifier_BPELM_EMailOutPort	

Submit the 10-record file, IEP_output_10.dat, as before. Again, wait for the IEP output stream to release the batch of records. Use you electronic mail client to receive and review notification messages.

🕼 Inbox - Outlook Express		
<u>Eile Edit View Iools Message H</u> elp		
Create Mail Reply All Forward Print Delete Send/Recv	Addresses Find	
🕸 Inbox		
Folders X ! 0 V Size From To	Subject	Received
Gutbook Express Mr 1KB msender@aus.sun n	receiver@aus.sun.com Excessive LoS Alert	16-Sep-2009 11:36 AM
E- Colars IKB msender@aus.sun n	receiver@aus.sun.com Excessive LoS Alert	16-Sep-2009 11:36 AM
Sent Items		
🗊 Deleted Items (19)		
Drafts		
Excessive LoS Alert		
<u>File E</u> dit <u>Vi</u> ew <u>T</u> ools <u>M</u> essage <u>H</u> elp		
Backy Backy All Forward Brief Delate Bravious	Next Addresses	
Kepiy Kepiy Ali Tolward Philt Delete Previous	Next Addresses	
From: msender@aus.sun.com		
Date: Wednesday, 16 September 2009 11:36 AM		
To: mreceiver@aus.sun.com		
Subject: Excessive LoS Alert		
4,000080		
HosA		
V20080908044851		
20080908044851		
20080913121138		
4		
3		

This message corresponds to the following A03In_MsgObj XML message:

```
0,...,10,...,20,...,30,...,40,...,50,...,60,...,70,...,80,...,90,
1 <A03In_MsgObj
2 xmlns:msgns="iepIEPA03_iep"
xmlns:ns0="http://j2ee.netbeans.org/wsdl/EMailNotifier_BPELM/EMailNotifier_BPELM_EMailOut"
xmlns="iepIEPA03_iep">
     <PID_3X_1_ID xmlns="">A000080</PID_3X_1_ID>
     <PID 3X 6 ASSIGNING FACILITY xmlns="">HosA</PID 3X 6 ASSIGNING FACILITY>
     <PV1_19_1_VISIT_NUMBER xmlns="">V20080908044851</PV1_19_1_VISIT_NUMBER>
     <PV1_44_ADMIT_DATE_TIME xmlns="">20080908044851</PV1_44_ADMIT_DATE_TIME>
8
     <PV1_45_DISCHARGE_DATE_TIME xmlns="">20080913121138</PV1_45_DISCHARGE_DATE_TIME>
9
     <LOS xmlns="">4</LOS>
10
     <AvgLoS xmlns="">2</AvgLoS>
11
     <AvgLoS1andaHalf xmlns="">3</AvgLoS1andaHalf>
12
13 </A03In MsgObj>
```

The Email BC stripped XML markup and gave us just the date content.

Exercising the solution through the HL7 Processor

The HL7 Processor solution is discussed in "HL7 Processor Demonstration - GlassFish ESB v2.1", <u>http://blogs.sun.com/javacapsfieldtech/entry/hl7_processor_d</u> <u>emonstration_glassfish_esb</u>. Build and deploy this solution. Submit to it the 50 record file, ADT_A0x_output50.dat, and observe the outcome produced by the IEP solution.

By sharing a common JMS Queue, qIEP, to which the HL7 Processor wrote custom discharge messages, and from which the IEP Processor read custom discharge messages, the three separate solutions were able to work together to accomplish a goal neither of the solutions would be able to accomplish by itself.

Summary

So, what have we seen and accomplished?

We constructed an Intelligent Event Processor solution to process discharge events, calculating an average of the last 10 seconds worth of events each time a new even was processed, comparing that event's length of stay to the average at the time and isolating these events whose length of stay was more the 1 ½ times the average at the time. These events were written to the output stream, for some other solution to use for notification and alerting, for example.

We modified this basic solution to receive a stream of events over JMS and to emit the notification events to a JMS destination.

We then created a notification processor solution which used these events to send notifications by electronic mail.

Finally, we submitted a set of HL7 v2 delimited messages to the HL7 Processor solution, which broke them up into admissions and discharges, converted discharge messages to the custom discharge message format used by the IEP solution which we developed here, and delivered them to this IEP solution for processing.