

## **IBM Integration Bus**

# Developing an application to demonstrate workload flexibility using Callable Flows

Featuring:

- Addition of new operation in HR\_Service REST API to access a callable application
- Using the CallableFlowInvoke node in a REST API
- Create a callable application using CallableInput and CallableReply nodes

September 2016 Hands-on lab built at product Version 10.0.0.6

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## 1. Introduction

IIB V10.0.0.4 introduced Callable Flows. This enables a message flow (or integration service, or REST API) to invoke a separate message flow in a call/return (blocked wait) programming model.

The calling and called message flows can operate on remote Integration Nodes, including IIB on Cloud and IIB On Premise.

## 1.1 Scenario Overview

This is the Development lab for Callable Flows in which you will create the applications and run a simple local test. The artefacts are then used for two of the following labs – IIB on Cloud Callable Flows (16L12) and Docker Callable Flows (16L11), which provide additional runtime opportunities for the same developed applications.

In this lab, you will use the HR\_Service REST API that was developed in 16L02 (Create a REST API with a swagger document) in this series of labs.

You will add a new operation. The implementation of this operation invokes a 'Callable' application. The callable application will access a database and retrieve employee details.



## 1.2 Outline of tasks

The tasks to complete in this lab are the following:

- 1. Import a REST API solution
- 2. Add an operation to the REST API to call a 'Callable' application
- 3. Import a map to access employees data
- 4. Create the Callable Application

## 1.3 Open the Windows Log Monitor for IIB

A useful tool for IIB development on Windows is the IIB Log Viewer. This tool continuously monitors the Windows Event Log, and all messages from the log are displayed immediately.

From the Start menu, click IIB Event Log Monitor. The Monitor will open; it is useful to have this always open in the background.

🔝 IIB Event Log Monitor
BIP31321: ( IB10NODE.server1 ) The HTTP Listener has started listening on port '
7800' for 'http' connections. [10/3/2014 3:17:23 PM]
BIP21541: ( IBI0NUDE.server1 ) Execution group finished with Configuration messa
ge. [10/3/2014 3:17:24 PM]
BIP21521: (IB10NODE.server1 ) Configuration message received from broker. [10/3
/2014 5:07:36 PM]
BIP2153I: ( IB10NODE.server1 ) About to ''Change'' an execution group. [10/3/201
4 5:07:36 PM]
BIP2155I: < IB10NODE.server1 > About to ''create '' the deployed resource ''Empl
oyeeService_JSONClient'' of type ''.APPZIP''. [10/3/2014 5:07:37 PM]
BIP2155I: < IB10NODE.server1 > About to ''create '' the deployed resource ''gen.
getEmployee_EmployeeService_EmpServClient_JSON1'' of type ''.SUBFLOW''. [10/3/20
14 5:07:37 PM1
BIP21551: ( IB10NODE.server1 ) About to ''create '' the deployed resource ''EmpS
eryClient JSON1'' of type ''.MSGFLOW''. [10/3/2014 5:07:37 PM]
BIP21541: ( IB10NODE server1 ) Execution group finished with Configuration messa
ge. [10/3/2014 5:07:43 PM]
BIP31321: ( IBI0NODE_HTTPListener ) The HTTP Listener has started listening on n
ort ''7080'' for ''http'' connections. [10/3/2014 5:07:47 PM]
RIP21521: ( IBIANODE sevice) Configuration message received from broker [10/3]
22014 5:50:41 PM1
<b>RIP21531:</b> (IRIANODE sequent ) about to $2^{\circ}$ (hange?) an execution group [10/3/201
A C-CG-41 PM
<b>DIPOLET</b> (IPIGNONE convert) (hout to $U$ delate $U$ the deployed recourse $U$ $Emm^{\circ}$
Entransite Childhood Serveri 7 About to defete the deptoyed resource Emps

This tool is not shipped as part of the IIB product; please contact us directly if you would like a copy.

#### Important note

The instructions in this lab guide are based on a Windows implementation, with a user named "iibuser".

The Windows VMWare image on which this lab is based is not available outside IBM, so you will need to provide your own software product installations where necessary.

This lab prepares the artefacts for deploying a REST API and a Callable Flow application, running on different Integration Nodes. It is assumed that one of the key scenarios is running the REST API on IIB on Cloud and hence the reference in this lab as 'Cloud Application'.

You should use the Windows user "iibuser". This user is a member of mqbrkrs and mqm, but is not a member of Administrators. The user "iibuser" can create new IIB nodes and do all required IIB development work. However, installation of the IIB product requires Administrator privileges (not required in this lab).

The lab uses DB2 HRDB database. HRDB contains two tables, EMPLOYEE and DEPARTMENT. These tables have been populated with data required for this lab. (The DDL for the HRDB is available in the student10 folder; The corresponding DDL for Microsoft SQL/Server is available in Integration service \_SQLServer, and we intend to provide the DDL for Oracle over time).

For the scenario, a single JSON Schema is used, which the built resources reference.

## 1.4 Configure Integration Bus node to work with DB2

Note 1

Login to Windows VM Image as the user "iibuser", password = "passw0rd".

Start the IIB Toolkit from the Start menu.

#### Note 2

If you have already done Lab 1 or Lab2 in this series (create a REST API), you can skip straight to Import the REST API.

The HRDB database, and the EMPLOYEE and DEPARTMENT tables have already been created on the supplied VMWare image. If you wish to recreate your own instance of this database, the commands

```
1_Create_HRDB_database.cmd and
2_Create_HRDB_Tables.cmd
```

are provided for this. If used in conjunction with the VM image, these commands must be run under the user "iibadmin". Appropriate database permissions are included in the scripts to GRANT access to the user iibuser.

To run this lab, the Integration Bus node must be enabled to allow a JDBC connection to the HRDB database.

1. Open an IIB Command Console (from the Start menu), and navigate to

#### c:\student10\Create HR database

2. Run the command

#### 3\_Create\_JDBC\_for\_HRDB

Accept the defaults presented in the script. This will create the required JDBC configurable service for the HRDB database.

3. Run the command

#### 4\_Create\_HRDB\_SecurityID

4. Stop and restart the node to enable the above definitions to be activated

mqsistop TESTNODE\_iibuser

#### mqsistart TESTNODE iibuser

This will create the necessary security credentials enabling TESTNODE\_iibuser to connect to the database.

## 1.5 Configure TESTNODE\_iibuser for REST APIs

The IIB support for the REST API requires some special configuration for the IIB node and server. Cross-Origin Resource Scripting (CORS) must be enabled for the IIB node to execute REST applications. This is also required when testing with the SwaggerUI test tool. See <u>http://www.w3.org/TR/cors/?cm\_mc\_uid=09173639950214518562833&cm\_mc\_sid\_5020000=1452</u> <u>177651</u> for further information.

- 1. Ensure that TESTNODE\_iibuser is started.
- 2. Check that CORS has been enabled on the IIB node by running the following command in an Integration Console:

```
mqsireportproperties TESTNODE_iibuser
   -e default
   -o HTTPConnector
   -r
```

3. If CORS is enabled, you will see the following lines (amongst others):

```
corsEnabled='true'
corsAllowOrigins='*'
corsAllowCredentials='false'
corsExposeHeaders='Content-Type'
corsMaxAge='-1'
corsAllowMethods='GET, HEAD, POST, PUT, PATCH, DELETE, OPTIONS'
corsAllowHeaders='Accept, Accept-Language, Content-Language, Content-
Type'
```

4. If CORS has not been enabled, run the following commands:

```
mqsichangeproperties TESTNODE_iibuser
  -e default
  -o HTTPConnector
  -n corsEnabled -v true
mqsistop TESTNODE_iibuser
```

mqsistart TESTNODE iibuser

## 2. Import IIB REST API and create new resource

In this section you will import a partially-built solution and add a new resource to the REST API to invoke a 'Callable' application. The scenario is based on the HR\_Service example that you may have used in other labs in this series.

#### 2.1 Import REST API and Shared Library

1. Open the Integration Toolkit from the Start menu with a new Workspace, for example *C:\Users\iibuser\BM\IBT10\CallableFlows* 

If you have the Integration Toolkit already open, you can switch to a new Workspace by click on *File -> Switch Workspace -> Other* 

Workspace Launcher	×
Select a workspace	
IBM Integration Toolkit stores your projects in a folder called a workspace. Choose a workspace folder to use for this session.	
Workspace: C:\Users\ibuser\IBM\IBT10\CallableFlows	Browse
Copy Settings	
?	OK Cancel

2. When the Integration Toolkit restarts, right-click in the **Application Development** view and select Import. Click **Next**, navigate to the folder

#### C:\student10\CallableFlows\Resources

Select the file **HR\_Service\_CallableFlows.zip** and click Open. Confirm the import in the next window.

Similarly, click Import again, then Next and navigate to

#### C:\student10\CallableFlows\Solution

Select the file HR\_Service\_Executables.zip

Once the projects are imported, you should see the REST API in the **Application Development** view:

🔚 Application Development 🛛	💐 Patterns Explorer		
		<i>🔄</i> 🖻	♦
Application Development			New
HR_Service REST API Description Resources Flows GetDepartment GetEmployee_get getEmployeeNur GetEmploye	_getDepartment.map etEmployee.map mber.map s		

#### 2.3 Add new resource to the REST API

1. Double-Click on REST API Description.

You will see all the resources available.

The imported solution has an operation in the /employees/{employeeNumber} resource implemented.

For this lab you will add a new resource, which will be used for the Callable Flow implementation.

Click on the icon  $\oplus$  as shown.

■ HR_Service 🛛	$\bigcirc$	° Ø
• Header		<u> </u>
- Resources	( ) v v	- b
> //departments	0	

- 2. In the Create Resource dialog, do the following:
  - Highlight /{employeeNumber}
  - Give a new 'Resource path' /Employee\_CallableFlow
  - Select operation **GET**

Click OK.

Create Resource	×
Select a path segment in the existing resource structure to create a resource under it	
⊡-Base path	
- /departments	
⊡ /{departmentKey}	
··· /employees	
···· /manager	
MQEndpoint	
/cloudODBC	
⊡ · /{EDLEVEL}	
/predictSalary	
Resource path relative to the selection V / Employee_CallableFlow	
Select operations to add to the resource	
	DELETE
OPTIONS HEAD PATCH	
?	OK Apply Cancel

3. The new resource /employees/{employeeNumber}/Employee\_CallableFlow has been created.

Expand the resource to see its operations.

Click on the drop down menu for available 'Schema Types' and select 'EmployeeResponse'.

	ынрызус	co/~{civproylesswithing	هي. مد) /Employe				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	GET	getEmployee Cal	lableFlow	e_Callabler	low	(	Request Employ	ee using Ca	llableflow
	Name	Parameter ty	pData type	Format	Required	Description			
	employee	eNumberpath	string		v*				
	Respon	se stat Description				Array	Schema type	Allov	v nul
	200	The operatio	n was successf	ul.			oyeeRespons	e 💌 🔽	
• /	/employees/{employeeNumber}/MQEndpoint				DEPARTMENT DBRESP				
> /	employe	es/{employeeNumb	er}/cloudOD	BC			C EmployeeResp DepartmentRe	oonse esponse	
> /	/employees/{employeeNumber}/department     DetailedResponse     string								
- Mo	- Model Definitions				number boolean	-			
Nan	Name • <enter a="" create="" model="" name="" new="" to="" unique=""></enter>				Array	Туре	Allow		

You may have also noticed that you can provide your own comment for the operation. Add 'Retrieve Employee using CallableFlow'.

Save the updated HR\_Service.

4. Scroll to the right of /employees/{employeeNumber}/Employee\_CallableFlow.

You will be modifying the getEmployee\_CallableFlow operation so to implement it, click on the icon as shown

Retriev	e Employee using CallableFlow		
			(  i )
ray	Schema type	Allow null	\$
]	8 EmployeeResponse	-	Ī

5. This will open the subflow editor with a skeleton subflow.



6. In the Node Palette on the left, expand the 'Callable Flow' group. This contains three nodes, which were introduced in IIB V10.0.0.4.

Drag and drop a new CallableFlowInvoke node onto the flow editor as shown.

In the **Properties** of the CallableFlowInvoke node, set the following properties:

- Target Application:
  - HR\_Service\_CallableApplication this is the IIB application which will be deployed On-Premise and will retrieve the employee data from the database.
- Target Endpoint Name:
  - **CALLABLE\_Input** Callable Input node in the Callable Application.

HR_Service	*getEmployee_Callat	bleFlow.subflow ¤	
A Selette Palette	Flow Exe	erciser: 🖻 🖩 🗤 📙 🍭 🔍	~
Construction			
Callable Flow	∞ 22		
CallableInput	Input		Output
CallableReply			
CallableFlowI	nvoke		
Cloud Connec	tors		
🗟 LoopBack Cor	nnectors	CallableFlow	Invoke
Craph User Def	inad Draparties		
Graph Oser Der	med Properties		
■ Properties ¤	🕄 Problems 🗄 Outline	🖉 Tasks 🖽 Deployment Log	2 - 0
🕫 Callable	FlowInvoke Node	Properties - CallableFlow	[nvoke
Description			
Basic	Target Application*	HR_Service_CallableApplication	•
Monitoring	Target Endpoint Name*	CALLABLE_Input	•
	Request timeout (sec)	120	
	Call Preference	Prefer local calls	•

7. From the 'Transformation' group in the palette, drag and drop a Mapping node before the CallableFlowInvoke node and name it **getEmployeeNumber**.

Highlight the mapping node and click **Browse**.

Select getEmployeeNumber map and click OK.

HR_Service EgetEmployee_CallableFlow.subflow	x	
Generate Flow Exerciser: Generation Flow Exerciser:		
Q SCA		
WebSphere Adapters		
C Routing		
GetEmple	oyeeNumber) CallableFlowInvoke	
- Mapping	Data Transformation Man Selection	
Graph User Defined Properties		
	iter names (r = any character, * = any String):	
🔲 Properties 🕄 🔝 Problems 🗄 Outline 🧔 Tasks 😽	elect a Data Transformation Map	
👄 Mapping Node Properties - getEmployeeNu	Grault}:getDepartment_getDepartment	
Description		
Basic Mapping routine* {default}:getEmployee		Browse
Validation Transaction* Automatic	ocation:	
Monitoring	E HR_Service	

The map **getEmployeeNumber** retrieves the employeeNumber element from the Local Environment, passed on by the REST API call. The map was created as part of the starting solution for Lab 16L09 Endpoint connectors.

8. Connect the nodes as shown.

Save the flow with Ctrl-S.

HR_Service 🛛 🕮 *getE	imployee_CallableFlow.subflow 😒	
👌 🔮 Palette	Flow Exerciser: 💿 🚰 💋 🔍 🔍	
SCA 📥	33	
🖓 WebSphere Adapters		
GR Routing		
RET		
冯 Transformation 🛛 🗠	getEmployeeNumber	
.NETCompute	CallableFlowInvoke	
3 XSLTransform		
% Compute		
💸 JavaCompute		
Construction		
Graph User Defined Properties	3	

## 3. Create the Callable application

In this part of the lab you will create the Callable application which will be used in IIB on Cloud Callable Flows (16L12) and Docker Callable Flows (16L11) labs.

#### 3.1 Generate the new application and add artefacts

The Application that you will develop will use the EMPLOYEE table from the HRDB database. This requires the HRDB Database Definition project, which represents the tables' schemas. This is used by the Mapping nodes that access the EMPLOYEE table.

The HRDB project will not be developed in this lab - see Lab 16L02 for details of how to do this. In this lab the project is included in a shared library and is already in your Workspace from the import of the solution earlier.

In addition, the map getEmployeeJSON – in Shared Library "HR\_Service\_Executables" uses an existing JSON document (HR-Employee-and-Department-Services.json) which has defined schemas to represent the input and output messages. The map getEmployeeJSON retrieves rows from the EMPLOYEE table.

The generation of these artefacts was done in earlier labs in this series and have been imported into the workspace. If you wish to see how they were created, please review Lab 16L09 Endpoint Connectors lab.

1. In the Application Development view click 'New...' and then 'Start by creating an application'.

🔚 Application Dev 🔀 👯 Patterns Explorer 🛛 🗖	HR_Service 🛛 🗐 getEmployee
Application Development	Prepare
HR_Service     REST API Description     HR_Service_Executables     HR_Service_Executables     HRDB     HRDB     BARs	New Artifact            Message Flow             Message Model             Message Map             Message Map             Mo Service             MO Service             Mo Service             Mo Service
	Quick Start

2. Name the application 'HR\_Service\_CallableApplication'.

Click 'Finish'.

New Application				
Create a new application An application is a deployable container that provide application.	es isolation at rur	ntime. Enter a nam	e for the new	A
Application name HR_Service_CallableApplication	>			
?	< Back	Next >	Finish	Cancel

3. Right-click the new application and then 'Manage Library references'

🔚 Application Development 🛛	🖏 Patterns Explorer 🛛 🗖 🗖
	🛎 🖻 🔄 🎽
Application Development	New
HR_Service	
HR_Service_CallableApplication	New 🕨
HR_Service_Executables	Manage Library references
🗄 📲 HRDB	Manage included projects

4. In the opened dialog, tick the box for HR\_Service\_Executables and HRDB, and then OK.

This will allow the HR\_Service\_CallableApplication to reference this shared library.

🔀 Manage Library References
Select the shared or static libraries to be referenced. Any other static libraries referenced from the selected static library will also be included.
Shared livesia:
Static libraries
The following static libraries will also be included because they are referenced by the selected static libraries.
OK Cancel

#### 3.2 Create the Callable Application's message flow

1. Right-Click HR\_Service\_CallableApplication then New -> Message Flow.



2. Name the new message flow 'CallableFlow' and click Finish.

🌐 New Messa	age Flow		<u>_     ×</u>
Create a new Select a conta	v message flow iner for the new message flow		E-E
Container: Message flow r Flow organizz I Use defai Schemar (d	HR_Service_CallableApplication ation ult broker schema efault broker schema)		New
?		Finish	Cancel

3. Expand the CallableFlow folder in the Palette and drop a CallableInput and CallableReply node onto the flow editor.

From the **Transformation** folder, drop a **Mapping** node onto the editor, and name it getEmployee\_Prem.

- -I HR\_Service □ getEmployee\_CallableFlow.subflow 📳 HR\_Service\_Cloud.bar 🖽 \*CallableFlow.msgflow 🔀 👌 😲 Palette Flow Exerciser: 🔟 🚰 况 ତ୍ରି SCA ۰ 🖓 WebSphere Adapters 🕞 Routing -:= Ret .NET CallableReply CallableInput •D 🕀 🖥 Transformation getEmployee Prem Construction Callable Flow 🔁 CallableInput Reply i CallableFlowInvoke Cloud Connectors • Graph User Defined Properties

Connect the nodes as shown below.

4. Highlight the CallableInput node and on the Basic Properties, set the Endpoint Name to CALLABLE\_Input.

This Endpoint name needs to match the Target Endpoint Name that was specified in the CallableFlowInvoke node in the implementation for

/employees/{employeeNumber}/Employee\_CallableFlow in HR\_Service (step 2.3.6).

📑 HR_Service 🛛 🗉 getE	mployee_CallableFlow.subflow
🔇 😳 Palette	Flow Exerciser: 💿 🚰 🍹
👰 SCA 📃	
🖓 WebSphere Adapters	
🕞 Routing	
💭 .NET	CallableTeneut
Transformation	CallableInpug
Construction	gi
😕 Callable Flow 🛛 🗠	
🗗 CallableInput	
. CallableReply	
Graph User Defined Propertie	s
	•
🔲 Properties 🔀 🔝 Probl	ems 🗄 Outline ⁄ Tasks 🗄
🗐 CallableInput Node	Properties - CallableInput
Description	
Basic Endpoint Nar	me* CALLABLE_Input
Monitoring	

5. Highlight the Mapping node getEmployee\_Prem.

In the properties of the map node, use the **Browse** button to set the name of the map file to **getEmployee\_JSON**. (This is a map in the HR\_Service\_Executables shared library that you imported and referenced earlier in this lab).

HR_Service	E_ actEmploy	oo CallablaElow subflow	🔚 LID Convice Cloud har	CallableFlow.msgflow	×
👌 😲 Palette	Flo	w Exerciser: 💿 🚰 🕅			
📖 JMS			]		^
💭 HTTP					
🧔 REST					
👰 Web Service	s	CallableInput	/	P	
🔁 SCA		Callablethput		CallableReply	
🐻 WebSphere /	Adapters		netEmployee Prem		
Routing	<b>•</b>		<u></u> ,		
Graph User Def	fined Properties				
Properties 2	🗙 🖳 Problems	🗄 Outline 🧔 Tasks 🏢	Deployment Log		
🖶 Mapping	Node Properties	s - getEmployee_Prem			
Description					
Description					
Basic	Mapping routine*	{default}:CallableFlow_getF	mplovee Prem		Browse
Basic Validation	Mapping routine*	{default}:CallableFlow_getE	mployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction*	{default}:CallableFlow_getE Automatic	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction*	{default}:CallableFlow_getE Automatic rmation Map Selection	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfor Filter names (? = a	{default}:CallableFlow_getE Automatic mation Map Selection any character, * = any String)	imployee_Prem	_ <u> </u>	Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfo Filter names (? = a	{default}:CallableFlow_getE Automatic rmation Hap Selection any character, * = any String)	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction*  Data Transfo  Filter names (? = a  Select - Dota mat	{default}:CallableFlow_getE Automatic rmation Map Selection any character, * = any String)	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfo Filter names (? = a Select - Dote Tran Gefault):get	{default}:CallableFlow_getE Automatic mation Map Selection any character, * = any String) stormation Map EmployeeJSON in Shared Libra	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfor Filter names (? = a Select - Deta Tran Control (default):get Location:	{default}:CallableFlow_getE Automatic mation Map Selection any character, * = any String) istormation Map EmployeeJSON in Shared Libra	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfor Filter names (? = a Select - Determan Ceffedult):get Location:	{default}:CallableFlow_getE Automatic mation Map Selection any character, * = any String) istormation Map EmployeeJSON in Shared Libra	imployee_Prem		Browse
Basic Validation Monitoring	Mapping routine* Transaction* Data Transfor Filter names (? = a Select - Bota man Gefault):get Location: Data Transfor HR_Service	{default}:CallableFlow_getE Automatic mation Map Selection any character, * = any String) istormation Map EmployeeJSON in Shared Libra e_Executables	imployee_Prem : ary HR_Service_Executables		Browse
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Basic Validation Monitoring	Mapping routine* Transaction* Data Transfo Filter names (? = a Select - Dete Tran Contine (default):get Location: Default):get AR_Service (?)	{default}:CallableFlow_getE Automatic rmation Map Selection any character, * = any String) Istormation Map EmployeeJSON in Shared Libra e_Executables	imployee_Prem : ary HR_Service_Executables		Browse

6. The flow is now complete, so **Save** and close the flow.

🛒 HR_Service 🛛 🕮 getEmplo	yee_CallableFlow.subflow	ud.bar 🔠 *CallableFlow.msgflow 🔀	
	ow Exerciser: 🔍 🚰 况 🛛 🔍		•
🛄 JMS			
💭 НТТР			
🧔 REST 🦳			
👰 Web Services	CallableInput		
🔁 SCA		CallableReply	
G WebSphere Adapters	getEmployee Pre	m	
Routing 🗾	~		
Graph User Defined Properties			
Properties 💥 🖳 Problems	🗜 Outline 🧔 Tasks 🎹 Deployment Log		
Mapping Node Propertie	s - getempioyee_prem		
Description			
Basic Mapping routine*	{default}:getEmployeeJSON in Shared Library HR_Set	ervice_Executables	Browse
Validation Transaction*	Automatic		•
Monitoring	1		

# 4. Test the new REST API Resource and Callable Application

In this part of the lab a quick test will be done to make sure that your developed solution works. Please note that in this test you will be deploying all the resources to the same Integration server. In IIB on Cloud Callable Flows (16L12) and Docker Callable Flows (16L11) labs you will see how you can use Callable Flows between different Nodes/ environments.

## 4.1 Deploy the Shared Library and the Callable Application

1. In the IIB Toolkit navigator, deploy **first** the HRDB and HR\_Service\_Executables shared libraries to the default server and then the HR\_Service\_CallableApplication.



## 4.2 Deploy the service

1. In the IIB Toolkit navigator, deploy HR\_Service REST API to the default server.



#### 4.3 Test the service

1. Open the IIB web UI by right-clicking TESTNODE\_iibuser and selecting Start Web User Interface.



2. You will be switched to the default browser. Fully expand TESTNODE\_iibuser, down to the HR\_Service REST API, as shown below.

Under HR\_Service, click "API", which will show you the available operations in the REST API, and whether they have been implemented. You will be able to see a few operations that had been implemented.

For this lab we will use **Employee\_CallableFlow** operation, so check that you see the operation has been implemented.

It will also show you the URLs for the REST API and the definitions (the json file).

IBM Integration	Welcome, default * ⑦ * IBM.
Filter Options	HR_Service - REST API
	API
√ Ze default     √	Expand all Collapse all
Services	EST API Base URL http://betaworks-esb10.7800/HR_Services/resources
▼ 🖪 REST APIs	EST API Definitions URL http://betaworks-esb10.7800/HR_Services/resources/HR_Employee_and_Department_Services.json
▼ 7 HR_Service ▼	
API	→ /departments
j Libraries	/departments/{departmentKey}
Message Flows	
Subflows	▹ /departments/{departmentKey}/employees
Resources	▹ /departments/{departmentKey}/manager
Applications	
📥 Libraries	→ /employees
Shared Libraries	/employees/{EDLEVEL}/predictSalary
😬 Message Flows	· /amalanaaa//amalanaaNumbaa)
Bubflows	/employees/{employeenumber}
🗁 Resources	/employees/{employeeNumber}/Employee_CallableFlow
Operational Policy	
🕨 📇 Data	GET getEmployee_CallableFlow Request Employee using Callableflow Implemented Implemented
Alignment     Alignmen	

3. On the "REST API Definitions URL", right-click and select "Copy Link Location".

HR_Service - REST API	СОРҮ	
API		
REST API Base URL http://betaworks-esb10:7800/HR_Services/resources		
	Open Link in New <u>T</u> ab Open Link in New <u>W</u> indow	
/departments	Open Link in New Private Window	v
/departments/{departmentKey}	Bookmark This Link Save Lin <u>k</u> As	
//departments/{departmentKey}/employees	Copy Link Location	
//departments//departmentKey/manager	Search Sector	Drk"

4. In Firefox, open a new tab, and open the SwaggerUI tool (using the bookmark in the REST folder).

If you are using your own environment, open Swagger UI.

By default, this will open the Petstore Swagger document.

TESTNODE_ibuser - IBM Inte × Swagger UI × +	
( file:///C:/tools/swagger-ui-master/dist/index.html	C Q Search
🔒 ODM 🔒 IIB 🔒 WAS 🔒 SD 🔒 REST 🔒 IOT 🔒 Healthcare 🔒 Registration	🔒 Cloud 🔒 Build 🎍 Feedback 🍶 Mobile
🕀 swagger	http://petstore.swagger.io/v2/swagger.json api_
Swagger Petstore	
This is a sample server Petstore ser sample, you can use the api key sp	ver. You can find out more about Swagger at <u>http://swagger.io</u> or o ecial-key to test the authorization filters.
Contact the developer Apache 2.0	

5. In the entry field (not the browser address field), paste the contents of the clipboard and click Explore.

The two high-level tags departments and employees, will be shown.

	PAST	ſE
\varTheta swagger	ervices/resources/HR_Employee_and_Department_Services.json	api_key Explore

#### **HR Employee and Department Services**

This is the HR Swagger document for the Employee and Department Services used by the IIB BetaWorks REST labs. It contains resource definitions and JSON model definitions.

departments : Lists all of the departments at ACME	Show/Hide   List Operations   Expand Operations
employees : Lists all of the employees at ACME	Show/Hide   List Operations   Expand Operations
default	Show/Hide   List Operations   Expand Operations

6. We are concerned with the getEmployee\_CallableFlow, which is in the 'default' section because the IIB Toolkit does not offer the option to provide a "tags" parameter on the new definition.

Click "List Operations" to show the operations related to employees.

Note that SwaggerUI does not have any knowledge at this point of whether the operation has been implemented.

💮 swagger	iervices/resources/HR_Employee_and_Departmen	_Services.json api_key	xplore
HR Employee ar	nd Department Services		
This is the HR Swagger docu definitions and JSON model	ment for the Employee and Department Services used definitions.	by the IIB BetaWorks REST labs. It contains resour	ce
departments : Lists a	all of the departments at ACME	Show/Hide   List Operations   Expand Op	erations
employees : Lists all	of the employees at ACME	Show/Hide   List Operations   Expand Op	erations
default		Show/Hide List Operations Expand Op	erations
GET /employees/{emp	oloyeeNumber}/MQEndpoint		
GET /employees/{emp	ployeeNumber}/cloudODBC		
GET /employees/{emp	oloyeeNumber}/Employee_CallableFlow		

7. Expand the GET employees/{employeeNumber}/Employee\_CallableFlow operation by clicking it.

The input parameter is employeeNumber. Provide a suitable value, say 000010.

default		Show/Hide L	ist Operations Expa	nd Operations
GET /employees/{employeeNumber}/Employee_Callable	eFlow			
Implementation Notes Retrieve Employee using CallableFlow				
Response Class (Status 200)				
Model Schema				
<pre>{     "DBResp": {         "UserReturnCode": 0,         "RowsRetrieved": 0,         "RowsAdded": 0,         "RowsDubdated": 0,         "RowsDubted": 0,         "SQLCODE_Errorcode": 0,         "SQLSTATE_SQLState": "string",         "SQL_Error_Message": "string"     } } </pre>				×
Response Content Type application/json 💌				
Parameters Parameter Value	Description	Paramotor Type	Data Turoo	
employeeNutber 000010	Description	path	string	

8. When you have provided an employeeNumber, click Try it out!

If successful, the returned data will look something like this. Note the database response information (user return code, number of rows returned), as well as the user data.

Note that you can copy the Request URL below, and paste directly into a browser.

Try it outi Hide Response	
Request URL	
http://betaworks-esb10:7800/HR_Services/resources/employees/000010/Employee_CallableFlow	
Response Body	
<pre>{     "DBResp": {         "UserReturnCode": 0,         "RowsRetrieved": 1     },     "Employee": [         {             "EMPNO": "000010",             "FIRSTNME": "CHRISTINE",             "MIDINIT": "I",             "LASTNAME": "HASS",             "WORKDEPT": "A00",             "WORKDEPT": "A00",             "MORNDENT": "A00",             "MORNDENT": "A00",             "MORNDENT": "A00",             "MORNDENT": "A00",             "UserReturnCode": "A00",             "MonneturnCode": "A00",             "MonneturnCode: "MonneturnCode": "A00",             "MonneturnCode: "MonneturnCod</pre>	
"PHONENO": "3978", "HIREDATE": "1995-01-01T00:00:00Z", "JOB": "PRES ", "EDLEVEL": 18, "SEX": "F", "BIRTHDATE": "1963-08-24T00:00:00+01:00", "SALARY": 152750, "DONNET": 1000	
Response Code	
200	
Response Headers	
<pre>{   "content-type": "application/json; charset=utf-8" }</pre>	

Now that you have completed this lab for developing Callable Flows artefacts you can proceed to IIB on Cloud Callable Flows (16L12) and Docker Callable Flows (16L11) labs. In these labs you will see the value of using Callable Flows in distributed environments such as IIB on Cloud or Docker.

#### END OF LAB GUIDE