

IBM Cloud Pak for Business Automation Demos and Labs 2025

Consume & Publish Automation Services in IBM Business Automation Workflow

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1 Introduction

1.1 IBM Business Automation Workflow

IBM Business Automation Workflow is software that combines business process management and case management capabilities in a single integrated workflow solution. It unites information, process, and users to provide a 360-degree view of work to help drive more successful business outcomes.

Additional information about IBM Business Automation Workflow can be found [here](#).

1.2 Lab Overview

In this lab, you will learn how to work with automation services and external services.

[Automation services](#) provide a unified way to leverage services in the IBM Cloud Pak for Business Automation platform. Capabilities such as Decisions & Workflow can expose automation services to be consumed throughout the platform.

[External services](#) are used to call an application or a service that is external to IBM Business Automation Workflow. For example, you can create an external service to call a Java application that sends out emails.

As a part of this lab, you will consume an automation service published by the Decision capability to scoreboard (perform risk assessment and classification) a client. You will then create an external service that invokes a Java application that sends out emails. Finally, you will see how to publish the external service as an automation service so that the email capability can be leveraged by others in the platform.

Approximate Duration: 2 hours

1.3 Lab Setup Instructions

1. If you are performing this lab as a part of an IBM event, access the document that lists the available systems and URLs along with login instructions. For this lab, you will need to access **IBM Business Automation Studio**.
2. Download the **mailIntegration.jar** from the **Lab Data** folder onto your computer. This file contains the Java implementation to send an email.

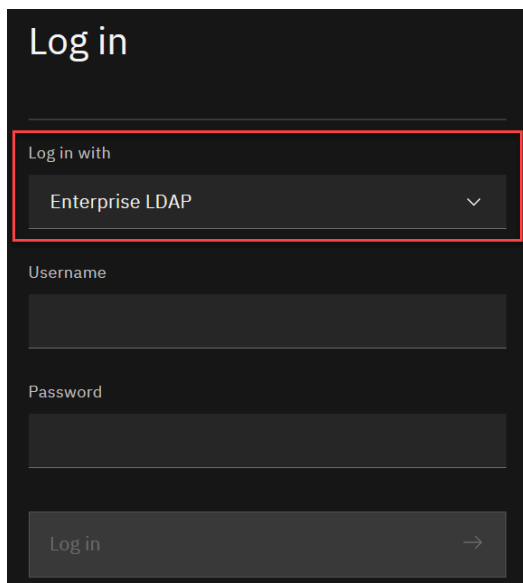
2 Exercise: Consume an Automation Service

2.1 Introduction

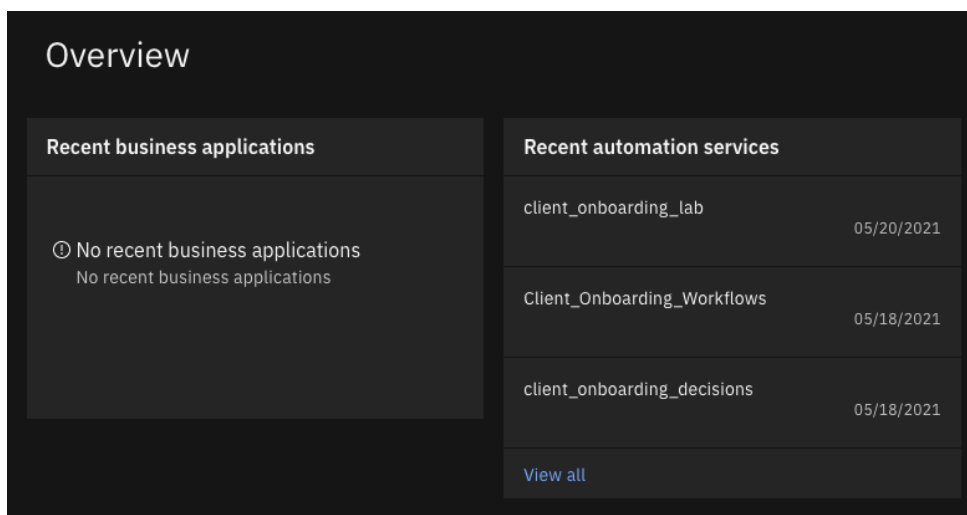
In this exercise, we will consume an automation service that is published using the IBM Automation Decision Service capability. This automation service invokes a decision that scoreboards a client i.e., gives an artificial intelligence backed risk assessment and classifies the client as Segment 1 or 2.


2.2 Exercise Instructions

In your browser, login to IBM Business Automation Studio using the Enterprise LDAP option.

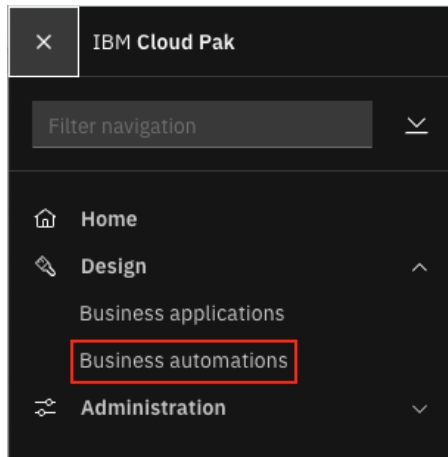


The homepage contains cards that showcase recent artifacts across all installed Cloud Paks in the system. For IBM Cloud Pak for Business Automation, the recent [business applications](#) and [automation services](#) are shown.

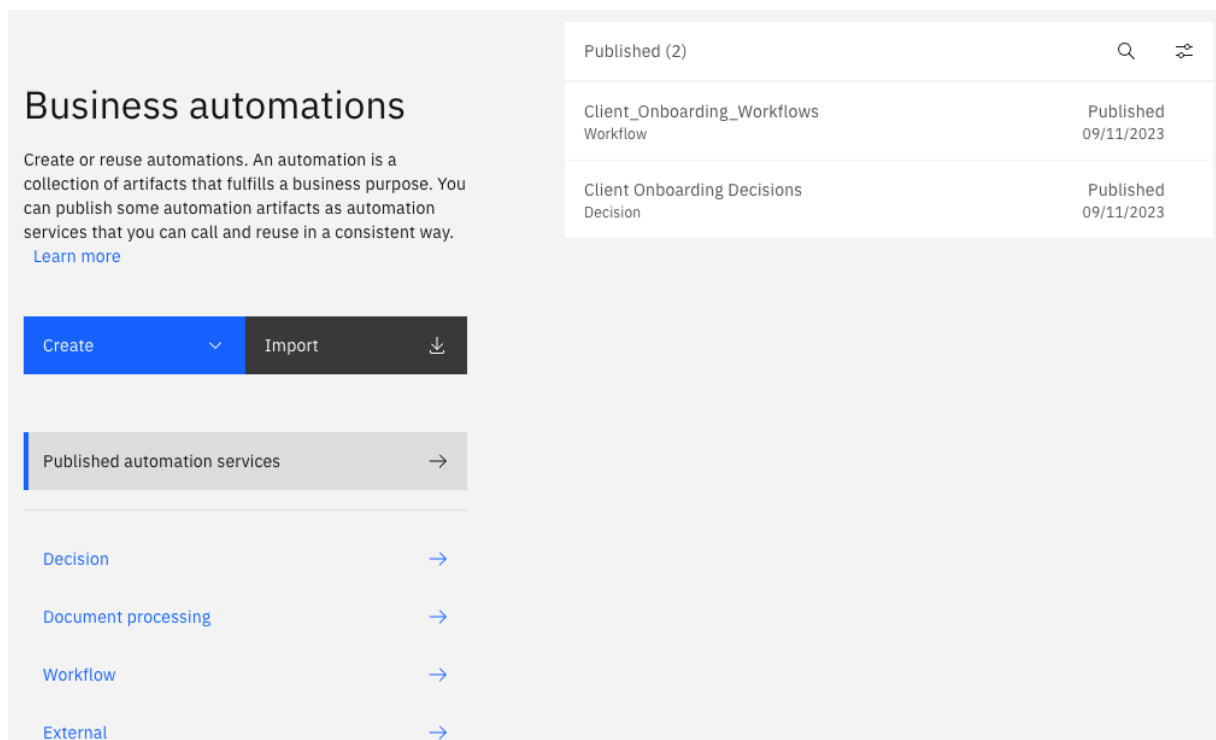


Recent business applications		Recent automation services	
 No recent business applications No recent business applications		client_onboarding_lab	05/20/2021
		Client_Onboarding_Workflows	05/18/2021
		client_onboarding_decisions	05/18/2021
		View all	

1. In the top-left corner, click on the menu icon and select **Design** → **Business automations** to access the automation repository.



This brings up the Business automations page where you can create or reuse automations from different capabilities of IBM Cloud Pak for Business Automation. If a capability is not installed on the system, it will be greyed out.



The default selection **Published automation services** shows all automation services available for consumption. The one we will be consuming as a part of this exercise is **Client Onboarding Decisions**.

2. Click on **Client Onboarding Decisions** to view its details.

Created by cp4badmin · 03/09/2024

Client Onboarding Decisions

Decision [Client-Onboarding](#)

List additional services and calculate associated fees based on client information provided during onboarding. Perform a client risk assessment.

1.0.0 (last published)

Operations Permissions

Operation	Description	Interaction Style
feeAndServices		Synchronous Request-response
scoreboard		Synchronous Request-response

An automation service can contain multiple operations. The table on the right shows the operations available along with a description for each operation. For this exercise, we will consume the **scoreboard** operation as the description matches our goal of scoreboarding the client.

3. Click on the **twisty** icon next to **scoreboard** to view more details about the operation.

scoreboard Synchronous Request-response

Input	Type	Description
client	ClientInformation	
industry	Industry	

Output	Type	Description
scoreboard	Scoreboard	

Here, we can see the inputs and outputs that are specified for this operation. This means that anyone consuming this automation service will need to provide an **industry** and **client information** and will receive the **scoreboard** in return. You can also see the interaction style of the operation, in the case of the **scoreboard** operation, synchronous request-response.

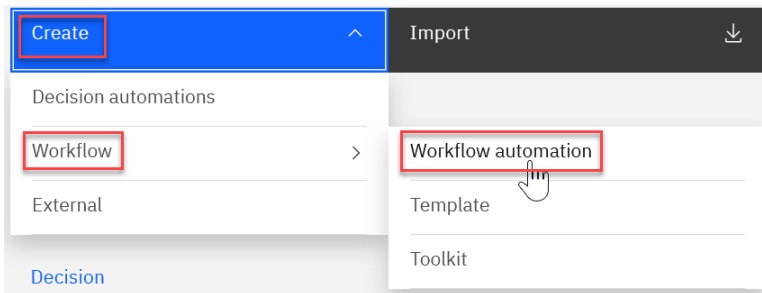
We will be consuming this automation service in a Workflow.

4. Click on the **Back** button in the upper-left corner.

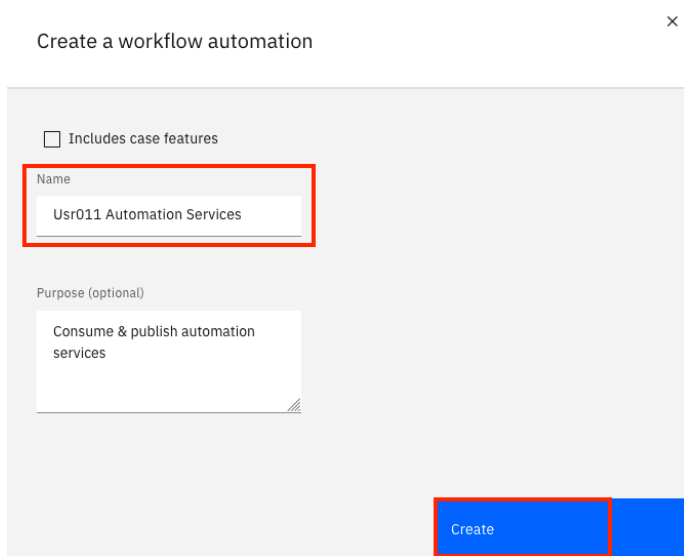
IBM Cloud Pak

Published (2)

- Click on **Create** → **Workflow** → **Workflow automation**.



- In the **Name** field, enter **UsrNNN Automation Services** where *UsrNNN* is your username.
- Provide an optional purpose.
- Click on **Create**.

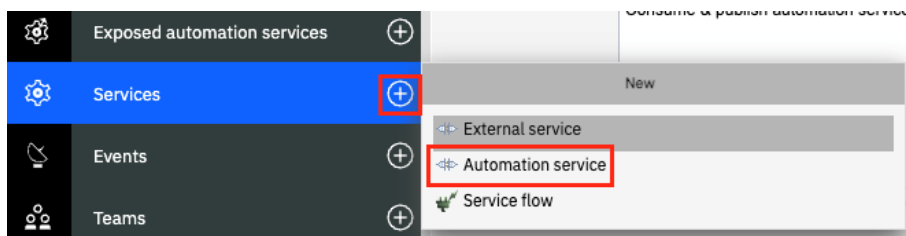


This opens the [IBM Process Designer](#) which is the primary modeling and designing tool in IBM Business Automation Workflow.

The left-hand side pane is the library panel where you can create and access different artifacts.

Note: If the IBM Process Designer window does not load the first time, click on the browser's address bar and press Enter to reload the page.

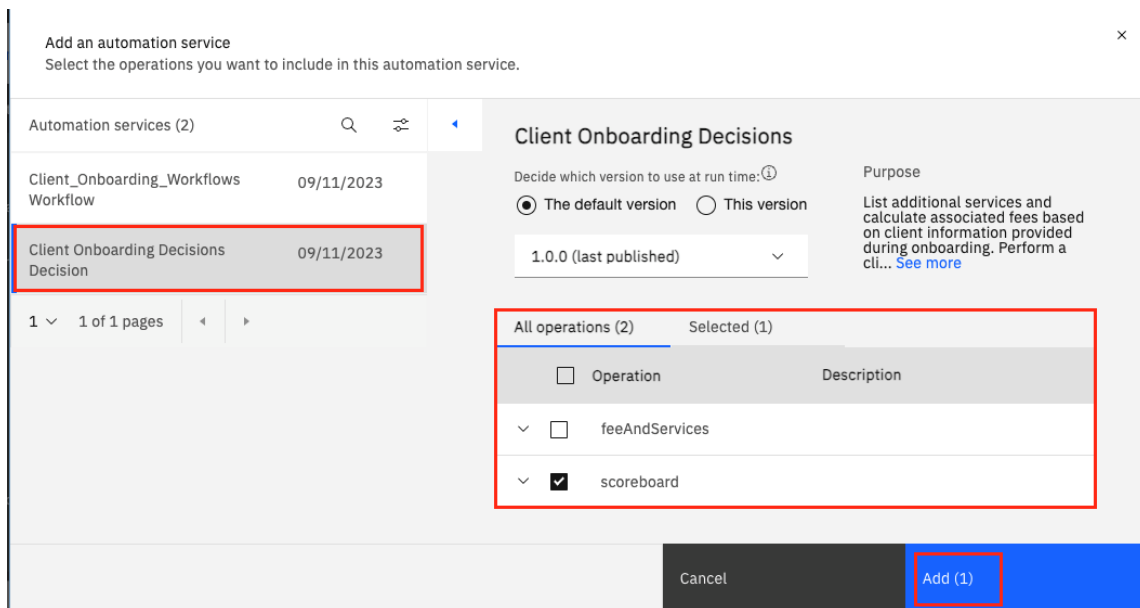
- In the library panel, hover over **Services**, click on the **+** button and select **Automation service**.



This brings up the list of published automation services where you can select which one you want to consume.

- Click on **Client Onboarding Decisions**.

11. Select only the **scoreboard** operation.

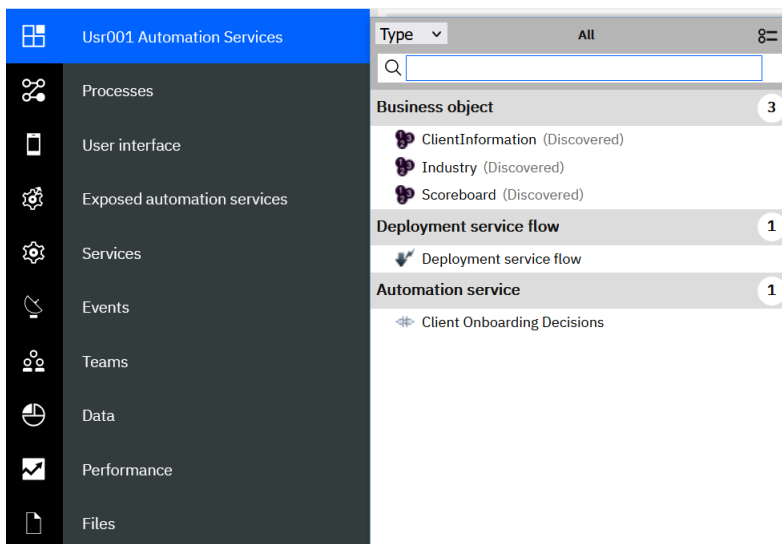


At the top, you can select which version of the automation service you want to consume. By default, the last published version is always chosen. We will leave that selection as is.

12. Click on **Add (1)**.

This creates the artifacts necessary to create the automation service in your workflow project and opens the Automation Service. This includes any [business objects](#) that are required to call the service. Let's look at the objects created.

13. In the library pane on the left click on the title of your project to show the list of artifacts.

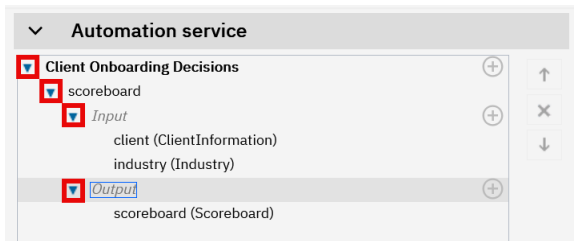


As you can see, the **ClientInformation**, **Industry** & **Scoreboard** business objects are automatically discovered as they are the inputs and output required to invoke the service.

Next, we will take a deeper look at the automation service.

14. Click on the **twisty** icon for the **scoreboard** operation to see its details.

15. Click on the **twisty** icons for the **Input** and **Output**.

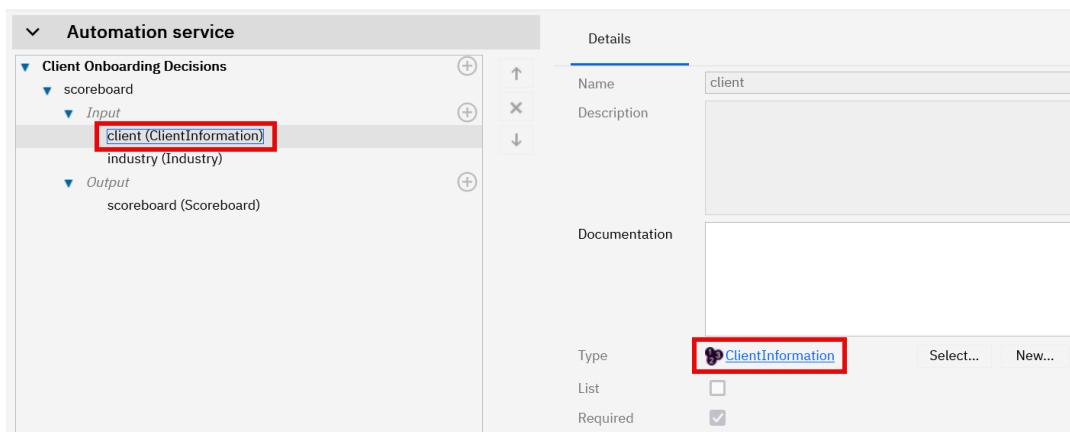


You can see the business objects used as input and output by the scoreboard operation.

16. Click on **client** under **Input**.

On the right, the details for the parameter are shown including its type: ClientInformation.

17. Click on **ClientInformation** to open the business object and see its parameters.

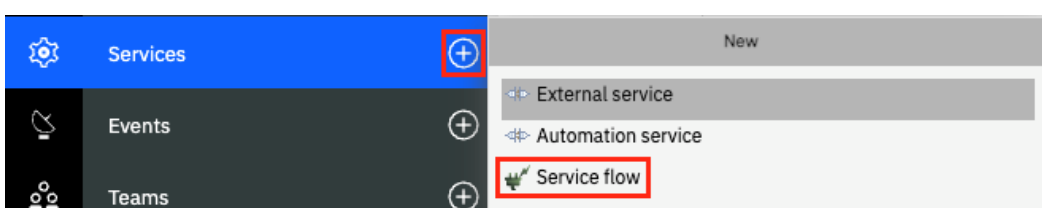


18. In the **Parameters** section, you can see the different parameters within this business object:



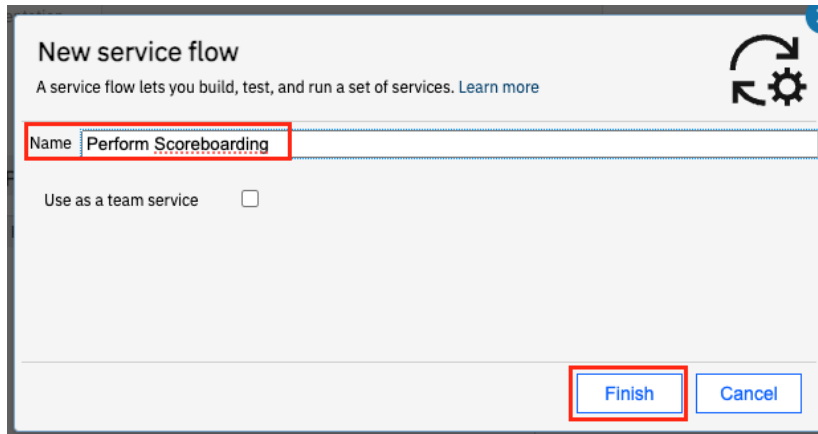
You can similarly explore the other input and output for the automation service. Next, we will create a [Service Flow](#) that can invoke this automation service.

19. In the library pane on the left, hover over **Services**, click on the **+** button and select **Service flow**.

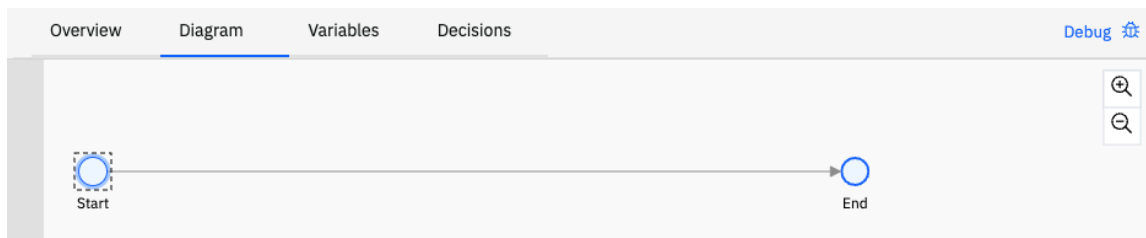


20. In the New Service Flow wizard, enter **Perform Scoreboarding** as the name.

21. Click on **Finish**.

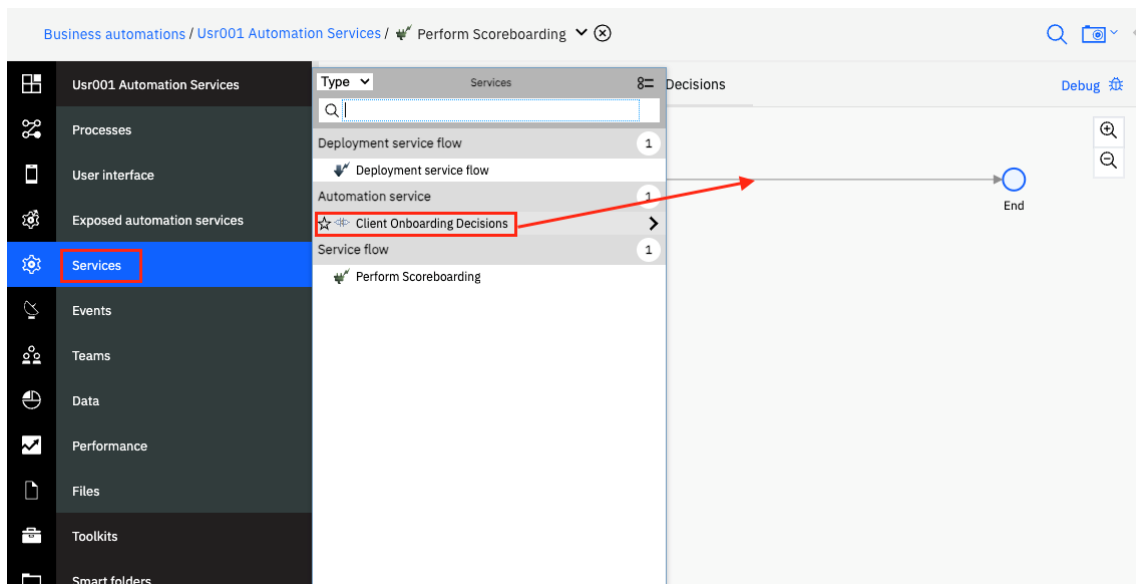


The service flow editor should now open with a default diagram:

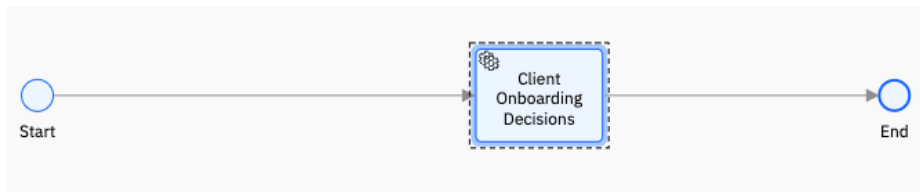


Now, we want to add a call to the automation service between the line connecting the **Start** and **End** nodes.

22. In the library pane on the left, click on **Services** and drag the **Client Onboarding Decisions** automation service on the line connecting the **Start** and **End** node.



Your diagram should then look as follows:



23. Click on the **Client Onboarding Decisions** service task between the **Start** and **End** nodes.
24. In the properties pane at the bottom, under **Implementation** select the **scoreboard** operation.

General | **Implementation** | Data mapping | Pre & post

Activity type: Service task

Implementation: Client Onboarding Decisions (Select... New...)

Operation: scoreboard

25. Switch to the **Data mapping** tab

The contents of this tab allow you to map constant values and/or variables to the input and output of the automation service.

26. Click on the **auto-map** icon for the **Input Mapping** section

General | Implementation | **Data mapping** | Pre & post

Input mapping: [auto-map icon] [warning icon] [input field] [client (ClientInf...)] [warning icon] [input field] [industry (Indust...)]

This brings up the variable creation wizard which allows us to automatically create the required variables. We want this service flow to be reusable so that it can be called by other artifacts (such as a human service). To do that, we can select the **client** and **industry** as inputs to this service flow. This means that anyone calling the **Perform Scoreboarding** service flow can provide these two variables as inputs.

27. Select the **Input** checkboxes for both **client** and **industry**.

Variable creation

Create variables where no matching variable exists. The new variables are automatically mapped. Existing mappings are not overwritten. Existing variables with the same name but different types are omitted.

Select the variables to be created and auto-mapped. By default, the variables are created as private variables. To create them as input, output, or input and output variables, select the check box beside the variable.

Variable name	Variable type	Input	Output
<input checked="" type="checkbox"/> client	ClientInformation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> industry	Industry	<input checked="" type="checkbox"/>	<input type="checkbox"/>

< Back Next > Finish Cancel

We would check the output checkboxes if we were modifying the input. This way any artifact calling the service flow would be able to get the updated values as the output to the flow.

28. Click on **Finish**.

29. Repeat the steps above to auto-map the output variable **scoreboard**. In this case however, select the Output checkbox

<input checked="" type="checkbox"/> Variable name	Variable type	Input	Output
<input checked="" type="checkbox"/> scoreboard	Scoreboard	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Your data mapping section should now look as follows:

General	Input mapping	Output mapping
Implementation	tw.local.client	scoreboard (Scoreboard)
Data mapping	tw.local.industry	tw.local.scoreboard
Pre & post		

30. Switch to the **General** tab.

31. Change the name of the task to **Perform Scoreboarding**.

General	Common
Implementation	Name Perform Scoreboarding
Data mapping	Color
Pre & post	Documentation

Now, to test this service flow, we will need to provide some default values.

32. Click on the **Variables** tab at the top.

33. Select the **client** input variable.

34. On the right-hand side, **check** the checkbox for the **Has default** field.

35. Updated the following values in the autogenerated script:

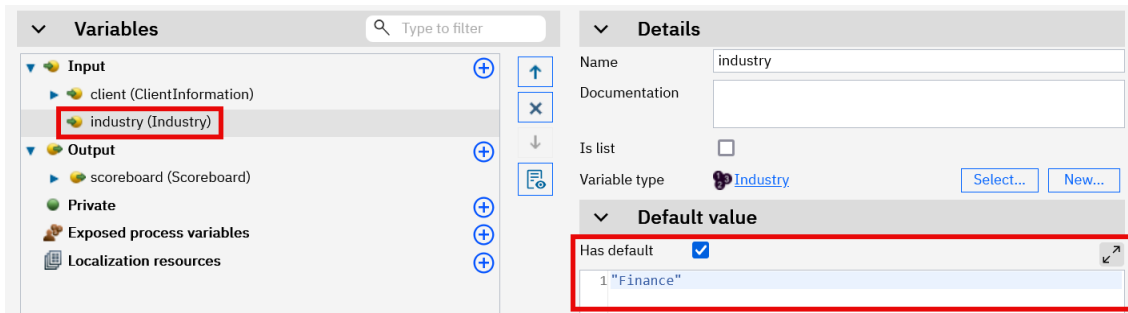
- annualRevenue:** 50000000
- companyAge:** 30
- numberOfEmployees:** 75

Overview	Diagram	Variables	Decisions	Debug	Run
Variables		Details			
Input		Name client			
client (ClientInformation)		Documentation			
industry (Industry)		Is list			
Output		Variable type ClientInformation			
scoreboard (Scoreboard)		Default value			
Private		Has default			
Exposed process variables		1 var autoObject = new tw.object.ClientInformation();			
Localization resources		2 autoObject.annualRevenue = 50000000;			
		3 autoObject.companyAge = 30;			
		4 autoObject.defaultedPayment = false;			
		5 autoObject.numberOfEmployees = 75;			
		6 autoObject			

36. Click on the **industry** input variable.

37. Check the **Has default** checkbox.

38. Update the industry in the autogenerated script to **Finance**.

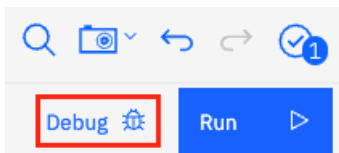


With the default values added, we are now ready to test the automation service.

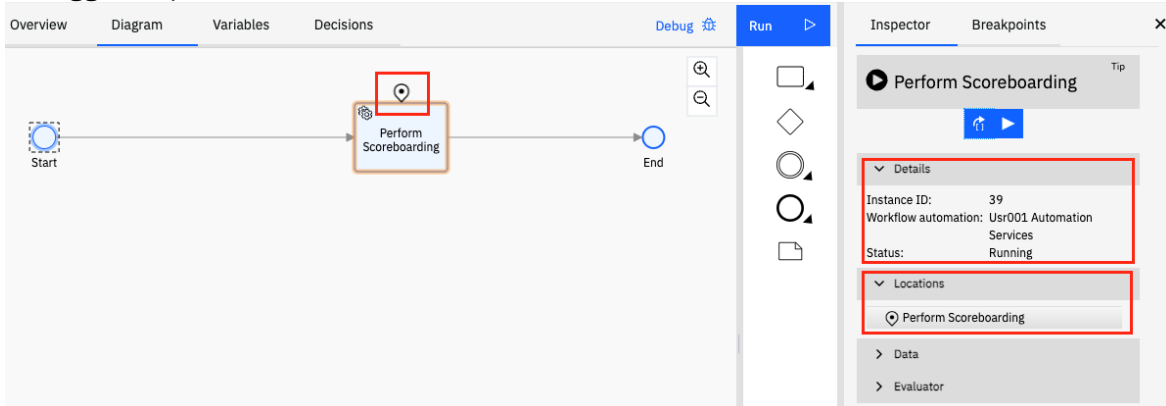
39. Click on the **Diagram** tab at the top.



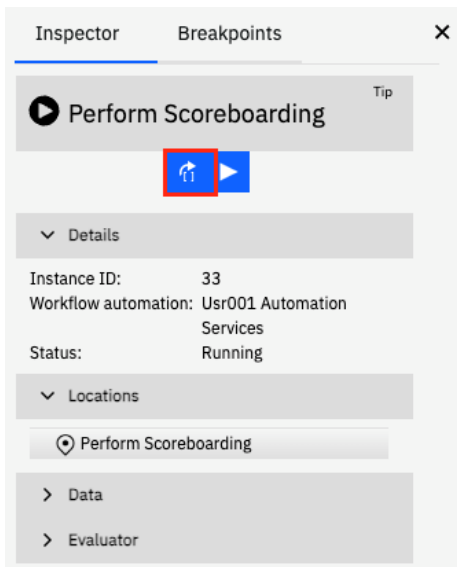
40. Click on the **Debug** icon in the upper-right corner.



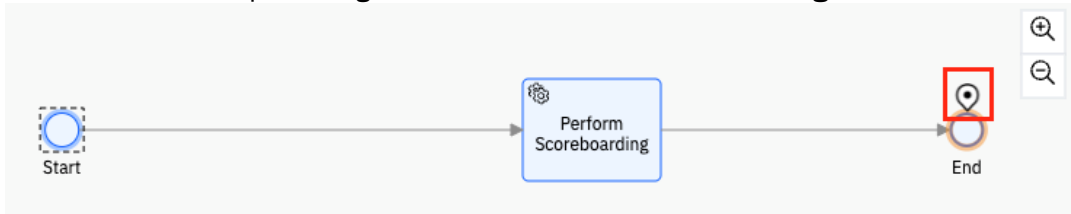
Notice how the **Inspector** panel is opened to the right containing the controls and information about your debugging session. The diagram now also shows a location pin indicating the current debugger step.



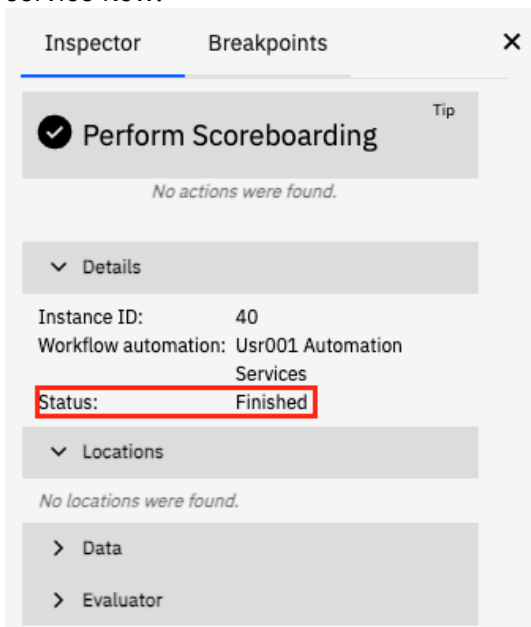
41. Click on the **Step over** button to invoke the automation service.



Notice the location pin changed from the **Perform Scoreboarding** to the **End** node.



42. Click the **Step over** button one more time to complete the execution of the Perform Scoreboarding service flow.

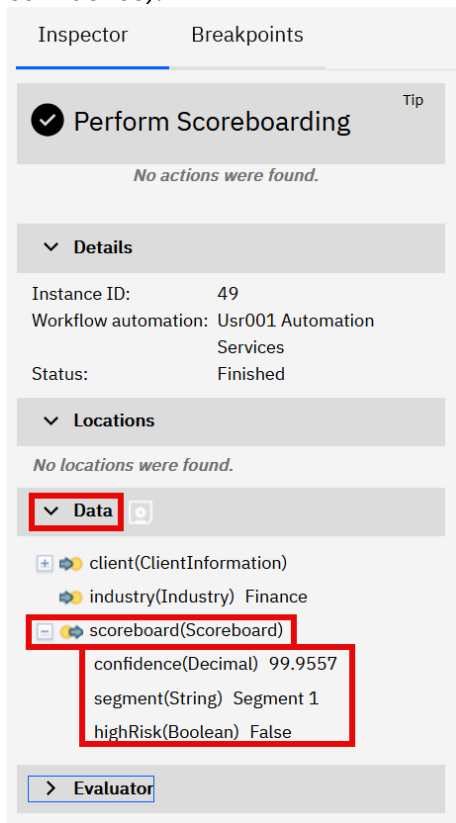


The Inspector status should now be updated to **Finished**.

43. Click on the **twisty** icon to expand the **Data** section.

44. Click on the **+ sign** in front of the **scoreboard** variable, which holds the result of invoking the external service.

45. Verify that the values shown match the screenshot below (there might be small variations in the confidence).

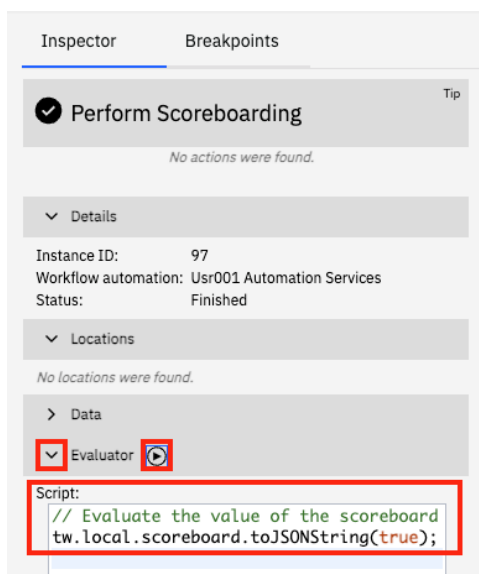


An alternative way to see the variable results and do much more, is using the Evaluator section.

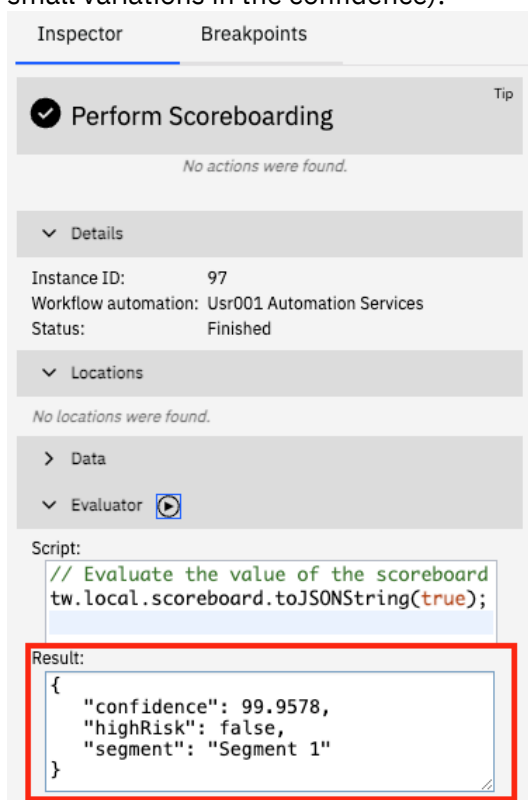
46. Click on the **twisty** icon to expand the **Evaluator** section.
47. Enter the following JavaScript expression in the **Script** field to inspect the scoreboard value returned by the **Perform Scoreboarding** service flow.

```
// Evaluate the value of the scoreboard output variable  
tw.local.scoreboard.toJSONString(true);
```

48. Click the **Run the script** button.



49. Verify that the values shown in the **Results** section match the screenshot below (there might be small variations in the confidence):



With that, you have successfully completed this exercise and learned how to consume an automation service and debug it from Process Designer. The service flow that encapsulates this automation service can now be reused throughout the project to call the decision service. If you want to learn more about this along with the basics of IBM Business Automation Workflow, look at the **Introduction to IBM Business Automation Workflow** lab.

In the next exercise, we will create an external service that calls out to a Java application to send emails.

3 Exercise: Create an External Service

3.1 Introduction

External services support various bindings like Java, REST API, Web Service, etc. In this exercise, we will create an external service that calls a Java application (.jar file) that sends an email.

Note: A single external service can only have one type of binding.

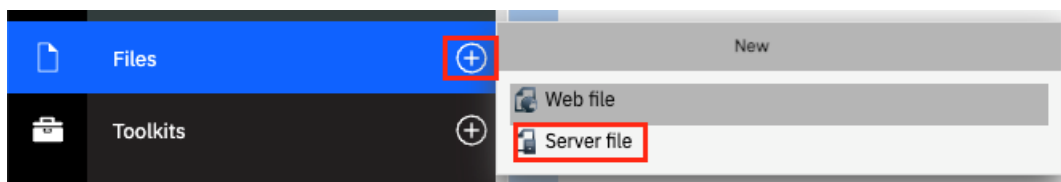
3.2 Exercise Instructions

1. Open the **UsrNNN Automation Services** workflow project if not already open.

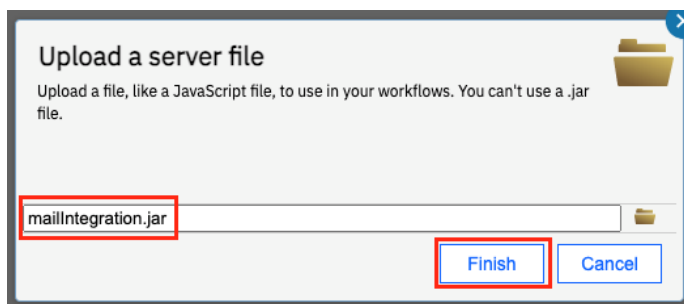
You can do this by going to the Business automation repository in **IBM Business Automation Studio**.

We first need to add a jar file to the project. This file contains the Java implementation to send an email. The [integration samples page](#) contains additional workflow project exports and the sample Java code that can be used to interact with emails.

2. In the library pane on the left, hover over **Files**, click on the **+** button and select the **Server file** option.

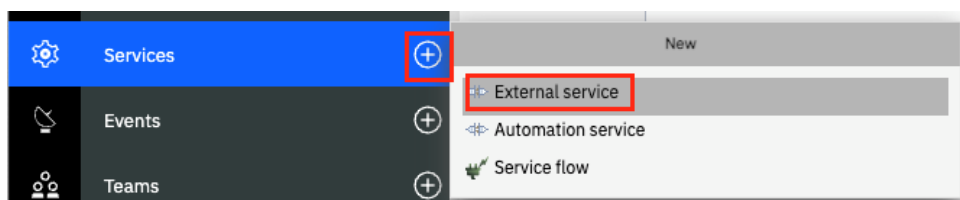


3. Select the **mailIntegration.jar** file downloaded as a part of the lab setup instructions.
4. Click on **Finish**.



Next, we will create the external service that uses this jar file.

5. In the library pane, hover over **Services**, click on the **+** button and select the **External service** option.



The **New external service** wizard pops up with two options. As we are integrating with a Java application, we will use the default selection.

6. Click on **Next**.

7. For the **Select a method to discover the service** field, select **Java service from server file** option.
8. In the **Managed file** field, click on **Select** and pick the **mailIntegration.jar** file.
9. For the **Java class** field, select the **Mail** class.

New external service

An external service lets you call a service or application that is external to a workflow automation. [Learn more](#)

Select a method to discover the service.

Java service from server file

Managed file mailIntegration.jar [Select...](#)

Java class Mail (integration.mail)

External service name Mail

< Back Next > Finish Cancel

The external service name is automatically updated to match the name of the Java class.

10. Click on **Finish**.

This opens the external service editor with a similar look and feel to the automation service editor from the previous exercise.

11. Expand the **sendMessage** operation and the **Input** section to view its details.

External service

Mail

- getIMAPMessages
- getPOPMessages
- sendMessage

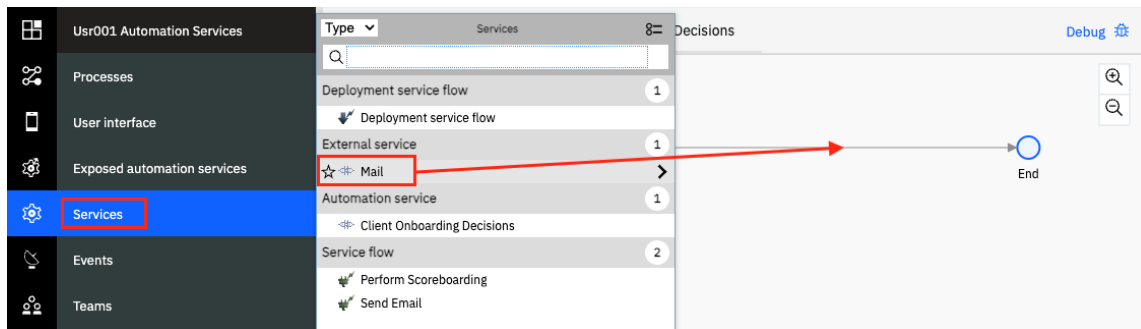
Input

- smtpHost (String)
- to (String)
- from (String)
- replyTo (String)
- cc (String)
- bcc (String)
- subject (String)
- contentType (String)
- body (String)
- importance (String)
- attachmentFileNames (String)

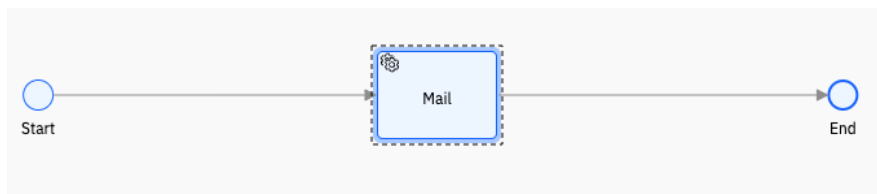
Output

Here you can see the inputs that can be used to send an email. Next, we will create a service flow just like the previous exercise to test this external service and make it reusable. In the next exercise, we will see how to publish an automation service that calls this service flow.

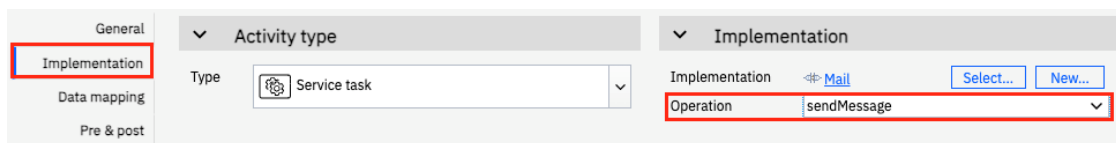
12. In the library pane on the left, hover over **Services**, click on the **+** button and select **Service Flow**.
13. In the New Service Flow wizard, enter **Send Email** as the name.
14. Click on **Finish** to open the service flow editor.
15. In the library pane on the left, click on **Services** and drag the **Mail** external service on the line connecting the **Start** and **End** node.



Your diagram should now look as follows:

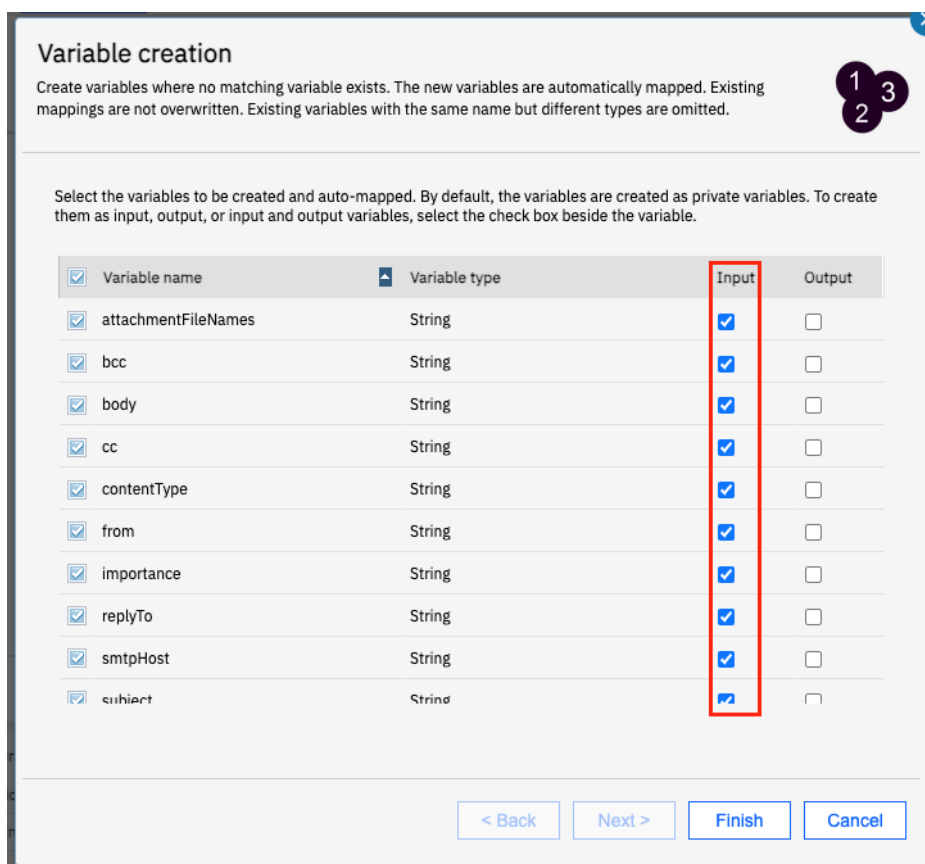


16. In the properties pane, under the **Implementation** section, select the **sendMessage** operation.



17. Switch the **Data Mapping** tab.
18. Click on the **auto-map** icon for the **Input Mapping** section.

19. In the variable creation wizard, select the **Input** checkboxes for **all** variables.



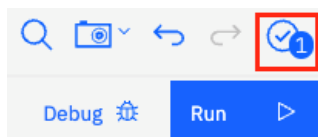
The screenshot shows the 'Variable creation' wizard. It has a title bar with a close button and three numbered steps (1, 2, 3). Step 1 is the current screen. The instructions state: 'Create variables where no matching variable exists. The new variables are automatically mapped. Existing mappings are not overwritten. Existing variables with the same name but different types are omitted.' Below this, it says: 'Select the variables to be created and auto-mapped. By default, the variables are created as private variables. To create them as input, output, or input and output variables, select the check box beside the variable.'

<input checked="" type="checkbox"/> Variable name	<input checked="" type="checkbox"/> Variable type	Input	Output
<input checked="" type="checkbox"/> attachmentFileNames	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> bcc	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> body	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> cc	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> contentType	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> from	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> importance	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> replyTo	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> smtpHost	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> subject	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>

At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'. The 'Finish' button is highlighted with a red box.

20. Click on **Finish**.

21. Click on the **Finish editing** button in the upper-right corner.



This completes the exercise.

You can optionally choose to test this service flow by providing default values to the input variables like you did when testing the automation service. For that you will need access to an email account with an SMTP server.

4 Exercise: Create and Publish an External Service

4.1 Introduction

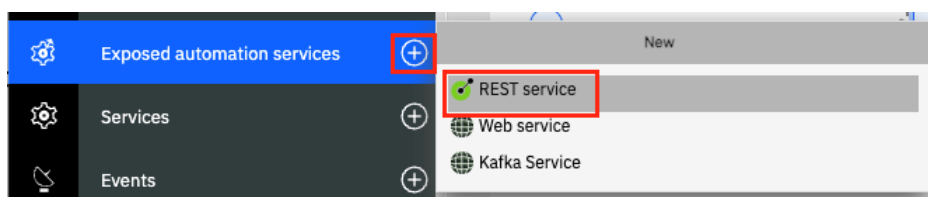
In this exercise, we will create an automation service containing an operation that invokes this service flow. We will then see how to publish this automation service.

4.2 Exercise Instructions

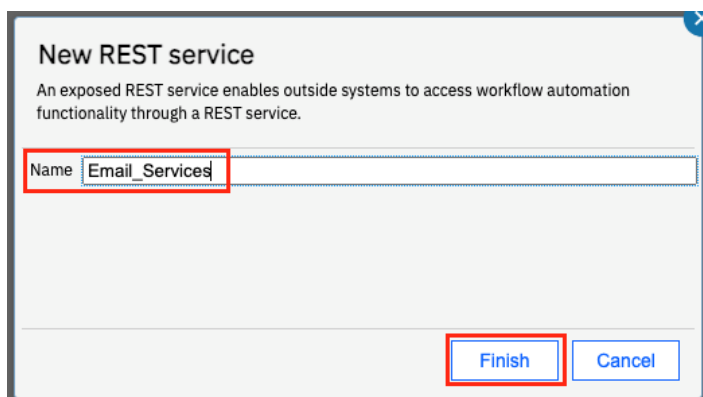
1. Open the **UsrNNN Automation Services** workflow project if not already open.

You can do this by going to the Business automation repository in **IBM Business Automation Studio**.

2. In the library pane on the left, hover over **Exposed automation services**, click on the **+** button and select the **REST service** option.

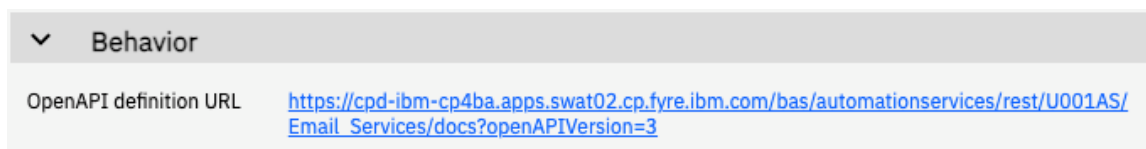


3. In the **Name** field, enter **Email_Services**.
4. Click on **Finish**.



This opens the **REST service** editor where you can add multiple operations. In this exercise, we will only add one operation to send emails.

REST Services also provide an OpenAPI definition URL. The OpenAPI spec defines a standard, language-agnostic interface for REST APIs.

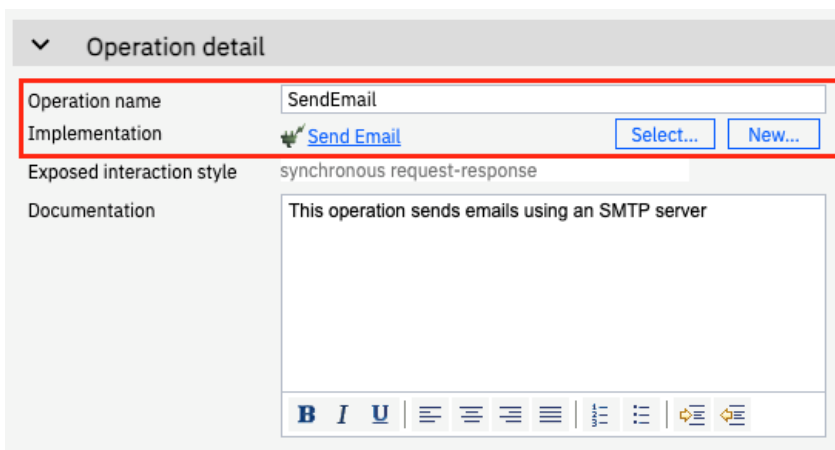


Note: The URL you see will be different compared to what's in the screenshot based on your lab environment.

5. In the **Operations** section, click on **+** to add a new operation.

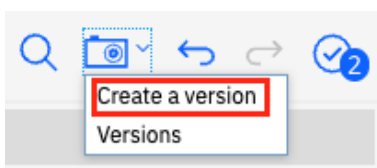


6. In the **Operation detail** section on the right, enter **SendEmail** in the **Operation name** field.
7. For the **Implementation** field, click on the **Select** button and select the **Send Email** service flow created in the previous exercise.



Next, we will need to create a version of this workflow project so that the REST service can be published as an automation service.

8. Click on the **Version** button in the upper right corner and select **Create a version**.



9. In the **Create a version** wizard, enter **v1.0** in the **Version name** field and an optional description.

10. Click on **Create Version**

The screenshot shows the 'Create a version' wizard. The left sidebar has two steps: 'Create Version' (active) and 'Confirmation & options'. The main area is titled 'Create a version' and contains a text input for 'Version name' with 'v1.0' entered, a larger text area for 'Description' with 'SendEmail initial version' entered, and a 'View previous versions' link. At the bottom right, there are 'Cancel' and 'Create Version' buttons. Red boxes highlight the 'Version name' input and the 'Create Version' button.

This will create the new version of your service and will take you to the **Confirmation & options** panel of the **Create a version** wizard. You can control access, modify permissions, and publish the automation service from this panel. However, for this lab we will publish the automation service from Business Automation Studio.

11. Click the **Done** button to exit the **Create a version** wizard

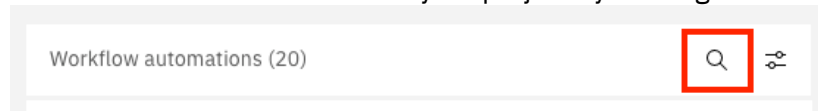
The screenshot shows the 'Create a version' wizard at the 'Confirmation & options' step. A green success message states 'Version created! A new version titled "v1.0" was successfully created!'. Below this, under 'Additional options', are two toggle switches: 'Publish as an automation service' and 'Install to servers', both currently turned off. At the bottom right, there are 'Cancel', 'Back', and 'Done' buttons. A red box highlights the 'Done' button.

12. Click on **Business automations** in the upper-left corner to go back to **IBM Business Automation Studio**.

[Business automations](#) / [Usr001 Automation Services](#) /  Email_Services ▼ ⊗

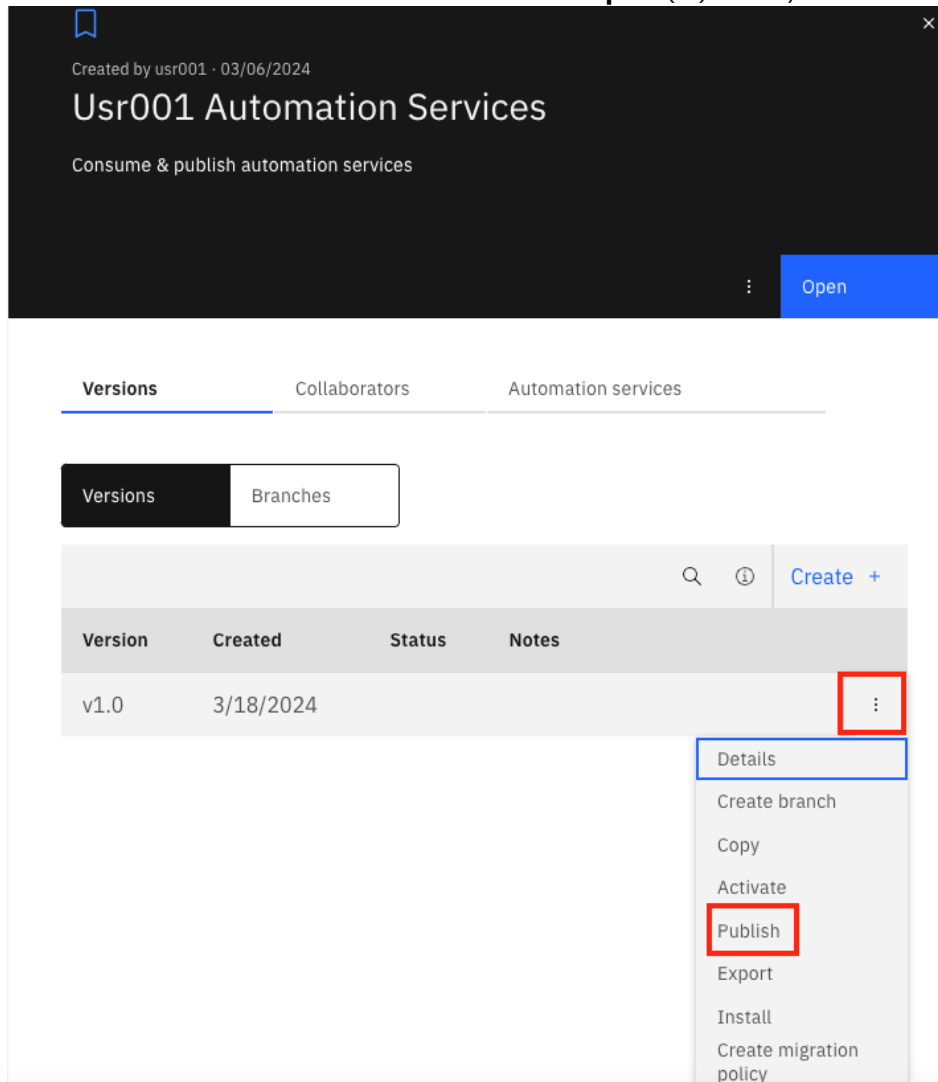
13. Click on your Workflow project **UsrNNN Automation Services**. Do **NOT** click on **Open** but on the tile itself.

Hint: You can use the search for your project by clicking on the **search** icon the upper-right corner.



The project details view opens on the right. From this view you can fully manage the different versions of your project and publish or unpublish the capabilities provided by your service. Notice the version we previously created from the IBM Process Designer is listed.

14. Hover over the **v1.0** version and click on the **ellipsis (...)** menu, then select **Publish**.



Created by usr001 · 03/06/2024

Usr001 Automation Services

Consume & publish automation services

Open

Versions Collaborators Automation services

Versions Branches

Version	Created	Status	Notes
v1.0	3/18/2024		

Details
Create branch
Copy
Activate
Publish
Export
Install
Create migration policy

This brings up the **Publish automation services** dialog.

15. Click on the **Restrict access** toggle to turn on access control.

Keep the default settings, which helps to keep the environment clean for other participants, in case of a multi-user event.

19. Click on the **Next** button.

Create a version

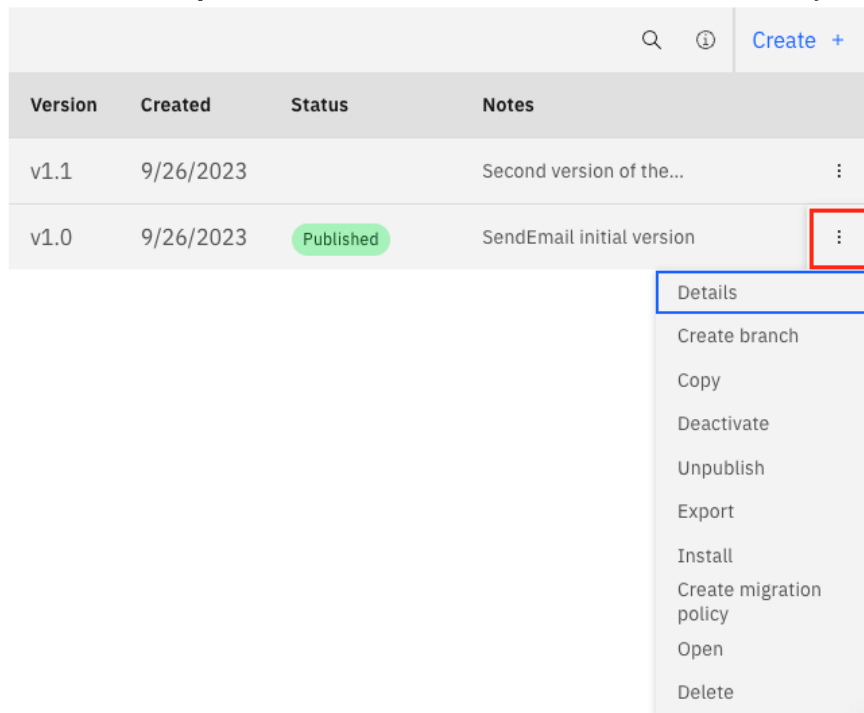
The screenshot shows the 'Create a version' wizard. On the left, a sidebar contains two steps: 'Create Version' (active) and 'Confirmation & options'. The main area is titled 'Create a version' and includes a sub-header: 'If available, you will have additional options for publishing and installing a version to servers after this new version is created.' Below this, there are two input fields: 'Version name' with the value 'v1.1' and 'Description' with the value 'Second version of the SendEmail service'. A 'View previous versions' link is visible below the description field. At the bottom right, there are two buttons: 'Cancel' and 'Next' (highlighted with a red box).

20. You should now see the Version created message in green. Click on the **Done** button to exit the **Create a version** wizard.

Create a version

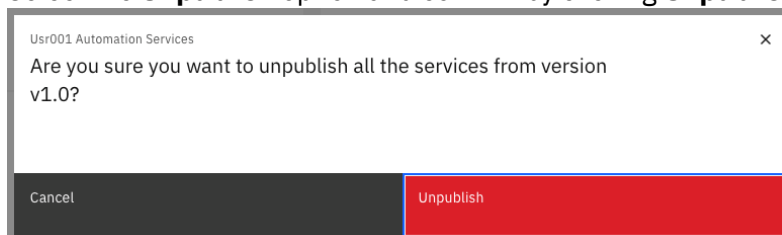
The screenshot shows the 'Create a version' wizard after successful creation. A green message box at the top states: 'Version created! A new version titled "v1.1" was successfully created!'. Below this, the 'Additional options' section is visible, containing two toggle switches: 'Publish as an automation service' and 'Install to servers', both of which are currently turned off. At the bottom right, there are three buttons: 'Cancel', 'Back', and 'Done' (highlighted with a red box).

21. Click on the **ellipsis (...)** menu next to the version that has already been published (**v1.0**).

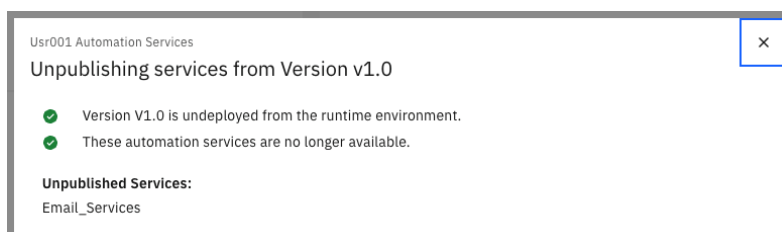


Explore the actions available for the version.

22. Select the **Unpublish** option and confirm by clicking **Unpublish** in the confirmation dialog.



Notice once the version is unpublished, the capabilities provided by your project will no longer be available for other components in the platform.



Close the confirmation dialog by clicking on the **X** icon in the top-right.

23. Finally publish the latest version of the project by clicking on the **ellipsis (...)** menu and selecting the **Publish** option for version **v1.1**.

24. Click the **Restrict access** toggle and click the **Publish** button

Publish automation services
Decide who can see these services.

Version name: V1.1
Add notes (optional): Second version of the SendEmail service

Permissions
Add users or groups to the list of the people who are allowed to use published automation services.

Restrict access ☒ On

Users & groups (1)
Name: usr001, Role: Admin

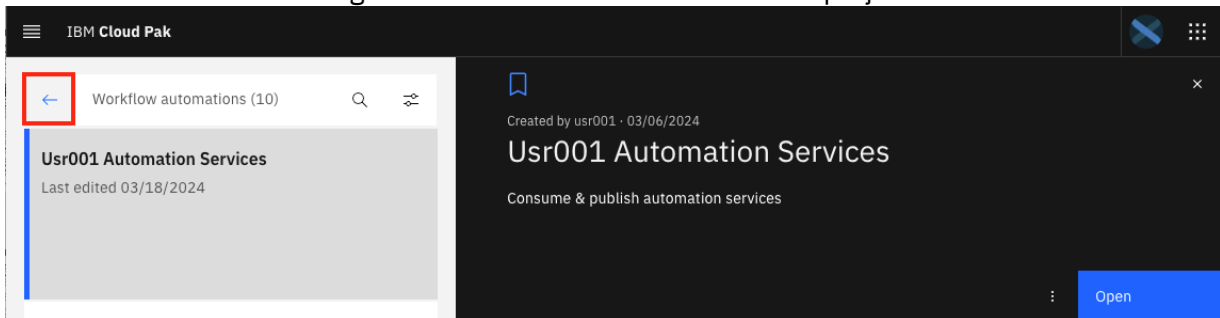
Buttons: Cancel, Publish

Once the new version is published, the status will show as **Published**.

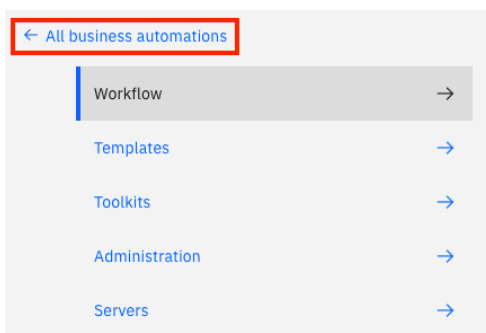
Version	Created	Status	Notes	
v1.1	9/26/2023	Published	Second version of the SendEmail service	⋮
v1.0	9/26/2023		SendEmail initial version	⋮

Now we will validate that the automation service is available.

25. Click on the Back button to go back to the Workflow automations projects.



26. Click on **All business automations**.



27. The list of published automation services now shows the **Email_Services** automation service.

Published (3) 🔍 ⚙️	
Email_Services Workflow	Published 09/26/2023
Client_Onboarding_Workflows Workflow	Published 09/11/2023
Client Onboarding Decisions Decision	Published 09/11/2023

This indicates that the **Email_Services** is ready to be used by other components in the platform.

This concludes the Create and publish an external service exercise.

Congratulations on completing the lab!