

IBM Cloud Pak for Business Automation Demos and Labs 2023

IBM Automation Decision Services
Manage Decisions and infuse Machine Learning

V 1.0

Decisions

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1 Introduction

In this Lab, you build business operational decisions to implement services evaluation and client risk assessment for a Client Onboarding solution. You capture and automate these decisions using IBM Automation Decision Services.

It includes three exercises. Each exercise can be done separately.

Duration: About 3 hours (each exercise is about 1 hour).

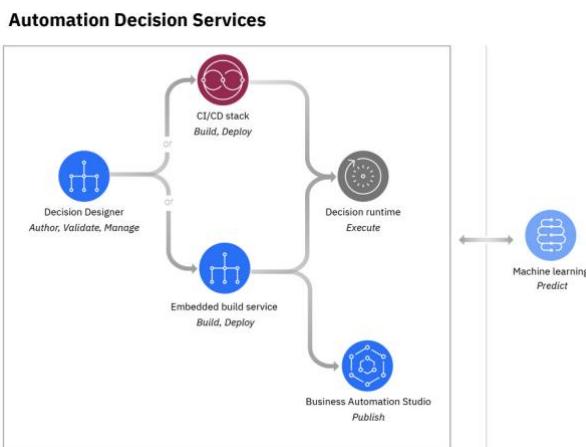
Audience: Anyone who wants to learn how to use Automation Decision Services.

1.1 IBM Automation Decision Services

IBM Automation Decision Services provides a comprehensive environment for authoring, managing, and running decision services. Operational decisions apply business policies, which are often influenced by numerous factors that can be both internal and external to an organization.

Part of the IBM Cloud Pak® for Business Automation platform, Automation Decision Services delivers advanced decision automation capabilities. Using Decision Designer in Business Automation Studio, business experts can model, author, and validate decisions in a low-code development environment. They can also infuse intelligence into business decisions by combining decision models and predictive models into unified decision services. They can collaborate with others in their organization by easily sharing and collaborating with projects in Business Automation Studio, backed by a central Git repository.

Automation Decision Services integrates with a continuous integration and delivery (CI/CD) stack. You can build and deploy decision services directly from Decision Designer. Deployed decision services can then either be published as automation services in Business Automation Studio, or invoked through the decision runtime.



For more information, see the IBM Documentation:

[IBM Automation Decision Services](#)

[What is Automation Decision Services](#)

1.2 Lab Overview

The end-to-end Client Onboarding solution explores a generic use case for onboarding new services to an existing client. Automation Decisions Services provides two decisions services that are integrated in the solution.

The first decision is to define the fees for the services the client is being onboarded to, and to suggest additional services that the client could be interested in, based on the information gathered. It is consumed in the end-to-end solution via an automation service from a Business Automation Application in the front office intake app.

The second decision provides input to determine the onboarding approval, the scoreboard. It implements a client risk evaluation based on multiple information sources such as the client profile, industry, and a client classification based on the client revenue. This decision combines descriptive and predictive models and is consumed in the end-to-end solution as an automated service in Workflow, during the approval step.

In this Lab you learn how to:

- Manage business decisions based on multiple data sources.
- Infuse intelligence into business decisions by adding a predictive model into the scorecard decision model to deliver the scoreboard of the client.
- Collaborate by sharing projects through a Git repository, build and deploy decision services from Decision Designer. Learn how to publish automation services in Business Automation Studio.

Integrating the automated services in other applications is not covered in this Lab. Look at the Workflow and Business Automation Application labs for this topic.

1.3 Lab Setup Instructions

1.3.1 Prerequisites

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 need to access:
 - **IBM Business Automation Studio** to access Decision Designer.
2. Download the file **ClientOnboardingLab.zip** from the **Lab Data** folder onto your computer.
3. Download the file **clientDefaultPaymentRS.xml** from the **Lab Data** folder onto your computer.
4. A GitHub account is needed for Exercise 3. You use a GitHub account to create a repository. If you do not have an account, create one in [GitHub](#). Your work will be saved in your repository.

1.3.2 Log in to the environment

1. Launch **Business Automation Studio** (URL listed in the Lab access document, see prerequisites).
2. Select your authentication type: **Enterprise LDAP**
3. Enter your *Username* and *Password* then click on **Log in**

The screenshot shows the 'Log in to IBM Cloud Pak' interface. At the top, it says 'Log in with'. Below that is a dropdown menu set to 'Enterprise LDAP'. The next two fields are 'Username' and 'Password', both filled in. The 'Username' field contains 'usr012' and the 'Password' field contains a series of six asterisks. At the bottom is a blue 'Log in' button with a white arrow icon.

2 Exercise 1: Modeling Decisions

2.1 Introduction

This exercise is an introduction to the authoring environment of Automation Decision Services. You navigate in Decision Designer, which is the development environment for creating decision services. You discover the main concepts of Automation Decision Services by exploring and modifying a given decision service. The scenario of this decision service is to define the fees for services that the client is being onboarded to and to suggest additional services the client could be interested in, based on the information gathered.

2.2 Exercise Instructions

In this exercise you import a decision service and explore it:

- Create a **project** and import a **decision service**
- Explore the **data model** and the **decision model**
- Add a business rule and edit a decision table to update the **logic** used in the model
- Validate the decision service

Prerequisites: you need to download the provided file **ClientOnboardingLab.zip** from the Lab data folder.

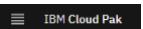
2.2.1 Creating a project and importing a decision service

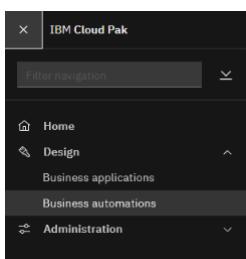
In this step, you create a project in Business Automation Studio. You import a decision service from the zip prepared for this exercise.

A project is a set of artifacts that share the same lifecycle and are grouped to solve a particular business problem. In this Lab you work with a decision automation project. It provides decision capabilities to help business experts to model and automate repeatable decisions.

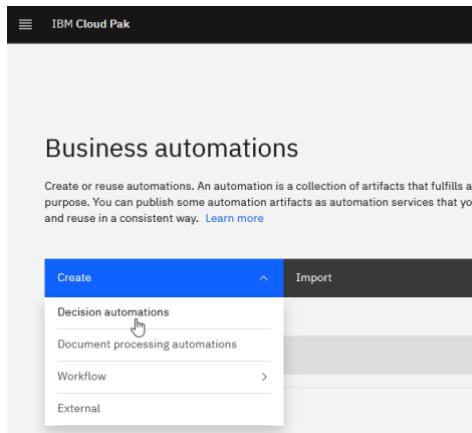
If you are already connected to Automation Decision Services and have your project opened following a previous exercise, you can skip this section and continue in section [Exploring the decision service: data model and decision model](#).

If you are starting the Lab with this exercise, do the following steps:

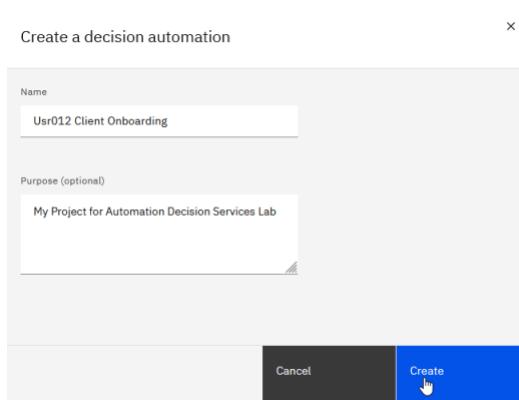
1. Log in to Business Automation Studio.
2. Click on the Navigation Menu on the top left corner  .
3. Expand **Design**, and then click on **Business automations**.



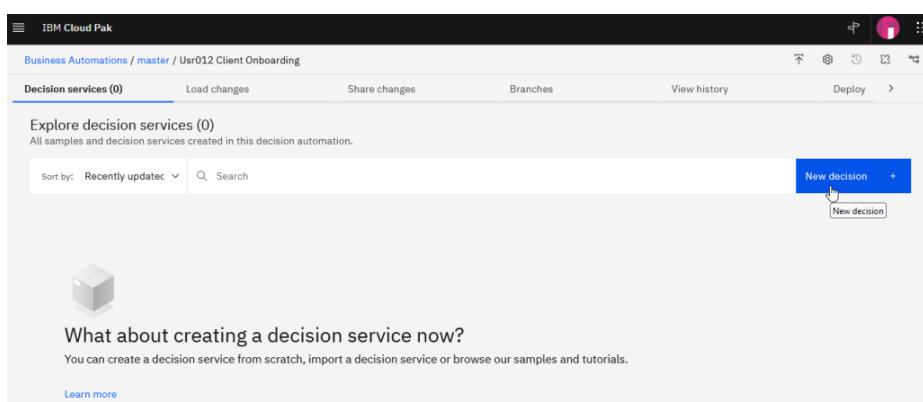
- Click Create and select Decision automations.



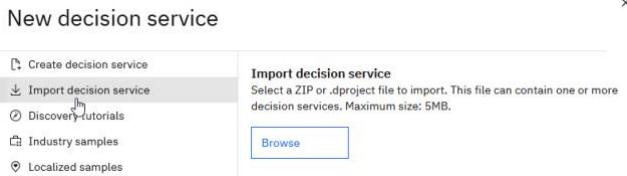
- Enter a name for your project. Enter **UsrNNN Client Onboarding Decision** where *UsrNNN* is your assigned username (this avoids conflicts with other projects if you are sharing the cluster).
- Click Create



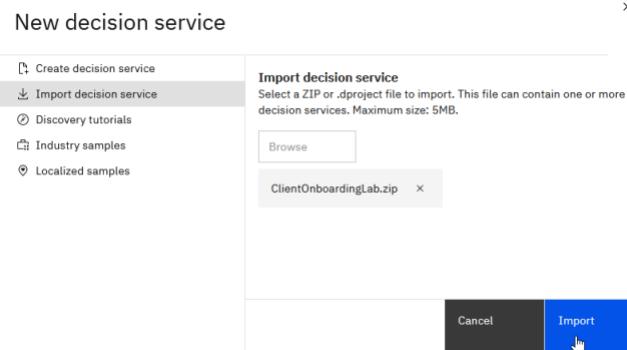
- Your new project opens in Decision Designer. You can optionally follow the guided popup if it shows or you can click **Maybe Later** to continue.
- Click New decision +.



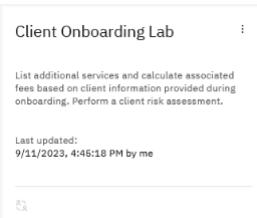
- Select Import decision service on the left to import the decision service provided by the Lab team.



10. Browse to select the project prepared for the Lab **ClientOnboardingLab.zip** and click **Import**.



11. A tile of a decision service named **Client Onboarding Lab** appears on the project page.



A decision project can be composed of several decision services. You create them or import them from the samples or from a zip file. A project can also be shared with other users and connected to a Git repository. These features will be covered in Exercise 3.

2.2.2 Exploring the decision service: data model and decision model

In this step, you explore the decision service that you imported. A decision service uses decision artifacts to define the business decision.

- **Decision models:** Represent a diagram that expresses the business logic. You can reuse the output of a decision model in another decision model.
- **Predictive models:** Apply data from a machine learning model to make a prediction.
- **Data model:** Represents the data structure used by the business logic. You can use the data model vocabulary in your decision models and predictive models.
- **External libraries and data sources:** Extend the data models using Java code or contain data models and functions that you can use in decision models.
- **Decision operations:** Define entry points for decision service execution.
- **Task models:** Allows business experts to define the decision logic outside model diagram (Note: task models are not covered in this lab, but you can see them in the samples proposed in [Additional information](#)).

For more information, see IBM Documentation [Building decision models](#).

1. Click on **Client Onboarding Lab** to open your decision service.
2. Your decision service is displayed.

Name	Last updated by	Last updated at
Fee and services Determines the fees of the services requested and a...	Me	9/11/2023, 4:45:18 ...
Scoreboard Determines if a client is risky using a predictive model an...	Me	9/11/2023, 4:45:17 ...
Services subset Builds a list of services that contains the Services count...	Me	9/11/2023, 4:45:17 ...

2.2.2.1 Exploring the data model

A data model defines the data that is needed to make your decisions. In a data model, you use predefined and custom data types to create a vocabulary that you can use to populate decisions. Basic data types, including string and integer, are predefined by default in Automation Decision Services. You create a data model to define custom data types to match specific needs for your service. These types are defined in a data model and can be used in one or more decision models in a service.

1. Open the **Data** tab and click on **Data**.

The data model is a collection of Data types that represents the data needed to make the decision. This collection is used by all the decision models defined in the decision service.

The model for Client Onboarding contains 6 Data types: Client Information, Industry, Scoreboard, Service, Service Information, and Service Request.

- Client Information
- Industry
- Scoreboard
- Service
- Service Information
- Service Request

In the decision model for this exercise, 5 of these data types are used: Client Information, Industry, Service, Service Information, and Service Request.

Two categories of data types can be defined:

- The **enumeration type**, such as Industry and Service, which contain a list of possible values.
- The **composite type**, such as Client Information, Service Information, and Service Request, which contain a set of attributes with a name and a type. The type can be a basic type predefined in Automation Decision Services such as string or integer or a custom data type.

The types defined as input of the model for this exercise (Fee and services) are:

- The enumeration **Industry**: lists the available industries.
- The enumeration **Service**: lists the available services.
- The composite type **Service request**: describes in which industry the client is and what are the services requested.
- The composite type **Client Information**: describes the characteristics of the client including annual revenue, number of employees, company age, defaulted payment.

The type defined as output of the model for this exercise (Fee and services) is:

- **Service Information**: a list of additional services suggested to the client and the fee for the services requested.

Automation Decision Services allows you to import sets of values extracted from an Excel file to populate enumeration data types. This is not covered in this Lab. For more information, see IBM Documentation [Extracting values from an external data source](#).

2. Click on **Client Information** to explore the data types. It is a Composite type composed of 4 attributes. Attributes and values allow you to define the characteristics of a data type.

Name	Type	List
Annual Revenue	integer	<input type="checkbox"/>
Company Age	integer	<input type="checkbox"/>
Defaulted Payment	boolean	<input type="checkbox"/>
Number of Employees	integer	<input type="checkbox"/>

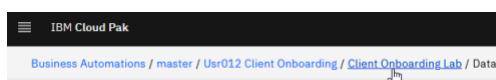
The **verbalization** defines how a data type is referenced in business rules. It depends on the type of element. Each attribute comes with a set of automatically generated expression and action phrases.

For more information, see IBM Documentation [Default verbalization](#).

3. Explore each **data type** and **attributes** to learn more about the data types.

For more information, see IBM Documentation [Creating a data model](#).

4. Click on **Client Onboarding Lab** in the breadcrumb to navigate back to your decision service.



Working with external libraries to enrich your data model is not covered in the Lab. For more information see IBM Documentation [Working with external libraries](#), or the [External library](#) tutorial available on GitHub.

2.2.2.2 Exploring the decision model

You define the structure of a decision in a model diagram. The primary part of the diagram are nodes:

- **Decision nodes:** represent the decision and contain logic that defines how each decision is made.
- **Input data nodes:** represent the data used to determine the decision output and are associated with a data type.
- **Function nodes:** represent values that are computed from other decision models.
- **Prediction nodes:** represent values that are computed in machine learning predictive models (prediction nodes are not used in this exercise, they are used in Exercise 2).
- **Links** represent the relationship between the decisions, input data, and the invocation of a function or prediction.

The rules define the logic of the decision and are expressed in business rules or decision tables. The rules determine the output of the model.

1. In the Models tab, click on **Fee and services**.

The screenshot shows the SAP Business Automation interface with the URL "Business Automations / master / Usr012 Client Onboarding / Client Onboarding Lab". The "Models" tab is selected. A search bar at the top right contains the text "Search". Below it, a table lists three decision models:

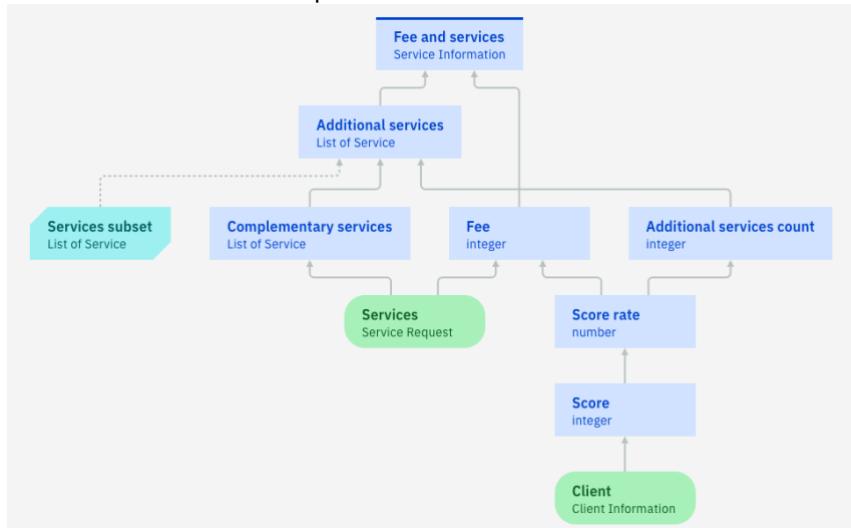
- Fee and services**: Describes the fees of the services requested and a suggestion for additional services to onboard. Last updated by "Me".
- Scoreboard**: Determines if a client is risky using a predictive model and classifies the client into a segment. Last updated by "Me".
- Services subset**: Builds a list of services that contains the Services count first elements of the Services list. It is used... Last updated by "Me".

It opens the decision model **Fee and services**.

In Automation Decision Services, you implement your decision by building a decision model diagram. The diagram shows how the decision depends on several sub-decisions.

The modeling diagram is inspired by the [Decision Model and Notation \(DMN\) standard](#).

The diagram below shows the decision model for **Fee and services**. As explained in [Exploring the decision mode introduction](#), the diagram is composed of nodes and links. The decision nodes are blue, input nodes are green, and function nodes cyan. The links represent the relationship between the nodes and show the input that is available in a node.



In this exercise, the top decision **Fee and services** is the final decision. It calculates the fees for the services requested by the client and suggests additional services to offer.

It is based on the **Client** information and the **Services** requested as input. To provide the outcome, it depends on intermediate steps, sub-decisions.

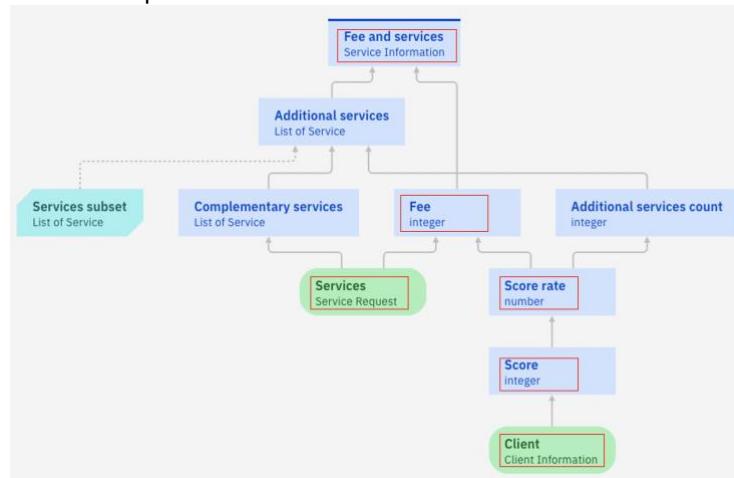
The final decision node **Fee and services** depends on two sub-decisions: **Fee** and **Additional services**.

Fee

The fee is computed by the **Fee** decision node, based on the service list represented by the input node **Services** and the **Score rate** decision node.

The **Score rate** decision node computes a rate to apply to the default fee for the client based on a score computed by the **Score** decision node.

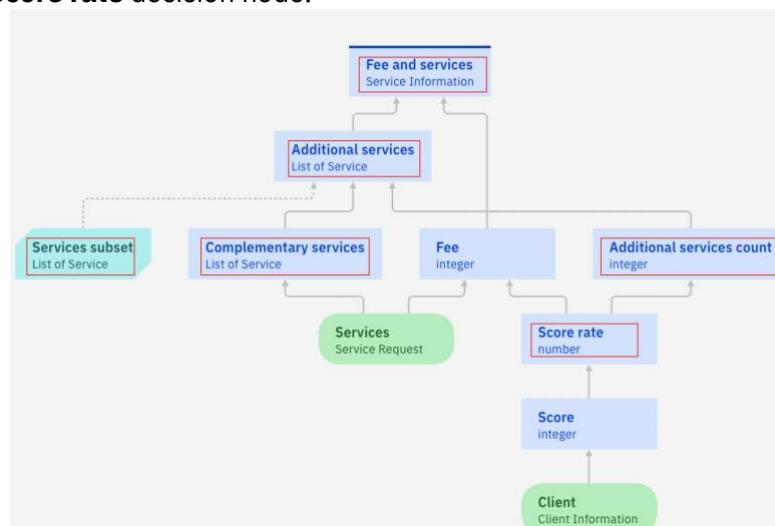
The **Score** decision node computes the client score from its different characteristics described by the **Client** input node.



Additional services

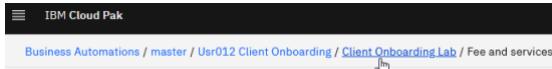
The additional services list is computed by the **Additional services** decision node. It takes a subset of the list computed by the **Complementary services** node.

To extract the subset of services it depends on the function node **Services subset** which is computed by taking the count of elements from the list. In the exercise, this computation is arbitrarily simplified. The count is computed by **Additional service count** decision node and the **Score rate** decision node.



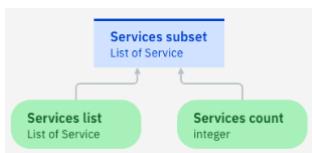
Note that the Services subset is a function node. It is computed from another decision model named Services subset.

2. Click on **Client Onboarding Lab** in the breadcrumb to navigate back to the **Models** tab.



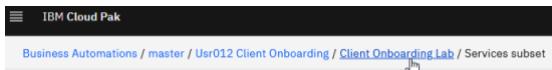
3. To see its diagram, click **Services subset** in the Models list:

Name	Last updated by
Fee and services	Me
Scoreboard	Me
Services subset	Me



For more information, see IBM Documentation [Creating a decision diagram](#)

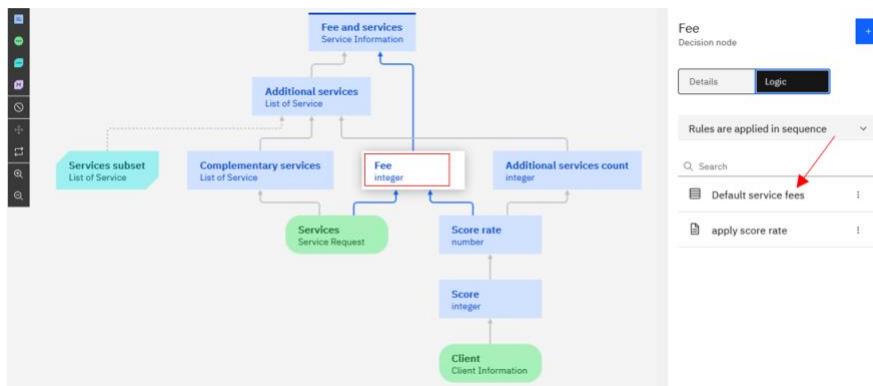
4. Return to the Decision model Fee and services by clicking **Client Onboarding Lab** in the breadcrumb to navigate back to the **Models** tab.



5. In the **Models** tab, click on **Fee and services**.

Name
Fee and services
Scoreboard
Services subset

6. Click on the **Fee** node, and then select the **Logic** tab to explore the decision logic. It displays the decision table **Default services fees** and the rule **apply score rate** that implement the business logic of the fee calculation. In Automation Decision Services, you express decision logic with a set of business rules and/or decision tables.



- Click on **Default services fees** in the **Logic** tab to open the decision table.

Default service fees ▾

	Services count	Fees
1	0	0
2	1	15,000
3	2	25,000
4	3	38,000
5	4	50,000
6		

Each row represents a single rule, where the **Services count** column represents a condition parameter and the **Fees** column the value of the action when the condition is met.

- Click on **apply score rate** in the **Logic** tab to open the business rule.

apply score rate ▾

Type your rule using the list below as reference

```

1
2 set decision to round ( decision * 'Score rate', 0 );

```

Inputs (2) Output (1)

▼ Services Service Request

▼ Score rate number

It is a simple text rule statement that determines a rate to apply to the fee calculation.

- Click on **Inputs** and then **Output** at the bottom of the screen.

The rule uses the vocabulary of the input data **Services** and **Score rate** and sets a value for the output of the decision **Fee**. In this decision logic, the rules are applied in sequence. A fee is assigned according to the number of services. Then, a rate is applied to calculate the final fee for the requested services.

To define how the rules interact with each other, you select a **rule interaction policy**.

10. On the Logic tab, expand the **Rules are applied in sequence** drop down.

The screenshot shows a user interface for managing logic. At the top, there are two tabs: 'Details' and 'Logic'. The 'Logic' tab is selected. Below the tabs, a dropdown menu is open, titled 'Rules are applied in sequence'. The menu contains five items, each with a brief description:

- First rule applies: When a rule is applicable, it makes a decision. The decision cannot be changed by other rules.
- Choose greatest value: When one or more rules are applicable, the decision is set to the greatest value.
- Choose smallest value: When one or more rules are applicable, the decision is set to the smallest value.
- Sum all values: When one or more rules are applicable, the decision is the sum of all values.
- Rules are applied in sequence: When a rule is applicable, it can modify the decision made by the previous rule. (This option is highlighted with a blue border.)

The interaction policy choices differ according to decision node type (number, list, integer...). In this exercise, the decision node Fee has an output type of integer, so the options above are displayed for the integer type.

For more information, see the IBM Documentation [Choosing an interaction policy](#).

2.2.3 Updating decision logic: adding a node, a rule, editing a decision table

You will now change the decision logic for the **Score** computation to take into account the number of services requested by the client. A higher number of services leads to a higher score. The change in the decision logic implies:

- Knowing the number of requested services from the **Score** node. This requires adding a link from the **Services** input and the **Score** node.
- Adding the computation for the number of services. This requires adding a rule to compute the new score.
- Adapting the score rate computation to the new score range.

Before modifying the decision logic, you will check the current behavior of the rule execution.

2.2.3.1 Test the decision logic

1. Click on **Back to the diagram** to return to the decision diagram.

The screenshot shows a navigation bar with several tabs: 'Business Automations / ... / Client Onboarding Lab / Fee and services'. Below the tabs, there are several status indicators: 'Modeling (10)', 'Error report (0)', 'Run (4)', and 'View history'. In the center, there is a large button labeled 'Back to the diagram →' with a hand cursor icon pointing at it.

2. Click on the **Run** tab.

The screenshot shows a navigation bar with tabs: 'Modeling (10)', 'Error report (0)', 'Run (4)', 'View history', and 'Dependencies (2)'. The 'Run (4)' tab is selected and highlighted in blue. Below the tabs, there is a decision diagram. It features a 'Fee and services Service Information' node at the top, which has a solid arrow pointing down to an 'Additional services List of Service' node. To the left of the diagram, there is a vertical toolbar with various icons, and below it, a pane labeled 'Test data' which is currently empty.

On the left, the **Test data** pane lets you select the set of data to submit to execute the rules. In this Lab, 4 sets of data are pre-defined: All Services, Federal 2, Federal 3, Telecom 1.

3. Select **All Services** to the left and then click on **Run** to the right.

The screenshot shows the 'Run' tab selected in the top navigation bar. The 'All Services' node is expanded, revealing its internal structure. The 'annualRevenue' field is set to 27500000, 'companyAge' is 25, and 'defaultedPayment' has a checked checkbox. To the right, there's a message box with a cube icon and the text: 'Want to try out your decision? Run your decision model to ensure you have it set up correctly.' A 'Run' button is visible at the top right of the interface.

It generates a report and displays the input and output of each node in the decision model. The final decision is displayed in the top of the report: for Fee and services the result is "servicesFee": 50000.

The screenshot shows the 'Decision output' section. It lists the 'Node Name' and 'Result' for each node. The 'Fee and services' node has a result of: `{ "extendedServices": [], "servicesFee": 50000 }`. Other nodes listed include 'Fee', 'Additional services', 'Additional services count', 'Score rate', 'Complementary services', and 'Score'.

4. Expand **Run history**, and then expand **Score** node.

The screenshot shows the 'Run history' section expanded. It lists the 'Node', 'Rules', 'Rule Interaction', and 'Output' for each node. The 'Score' node is highlighted with a red border and has triggered three rules: 'revenue score', 'size score', and 'age score', resulting in a total output of 2. Below this, a table shows the triggered rules, number of runs, and output for each rule.

Triggered rules	Number of runs	Output
revenue score	1	1
size score	1	1
age score	1	2

The output displays the result for the decision node Score, which is a consolidated result. In this example, the Score decision node output is 2:

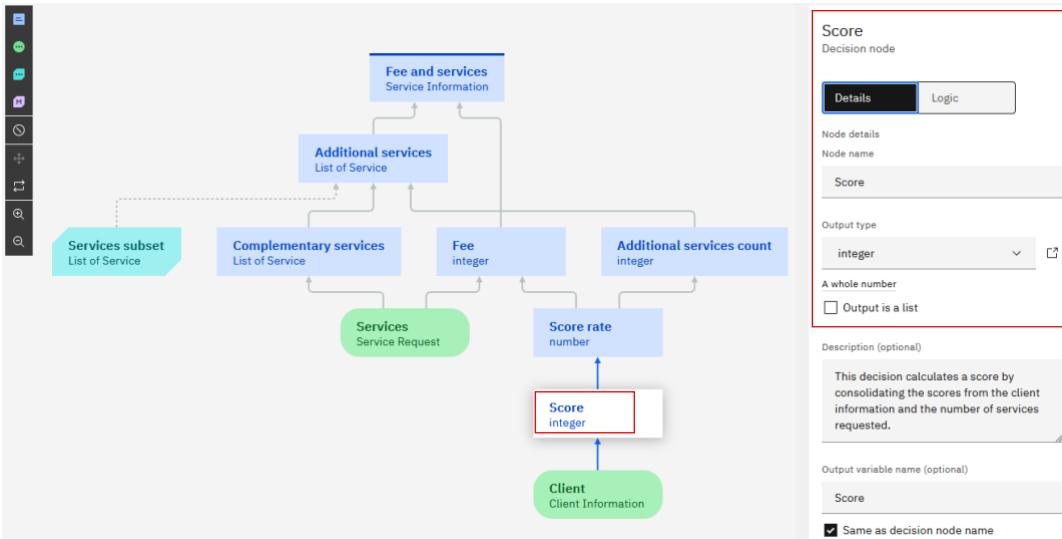
- Revenue score output is 1,
- Then added to size score (size score is 0) it remains 1,
- Then added to age score result is 2 (age score is 1).

- Click on the **Modeling** tab to return to your decision model.

2.2.3.2 Exploring the current logic

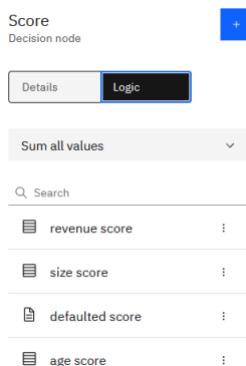
The Score node returns an integer that is used by the Score rate node to compute a rate from the score.

- Click on the **Score** node, and then the **Details** tab.



It returns an integer computed by adding all the values returned by its defined rules and decision tables.

- Click on the **Logic** tab to explore the logic of the business rules.



The logic contains one rule (defaulted score) and 3 decision tables (revenue score, size score, age score).

- Click on **defaulted score** to explore the logic.

The defaulted score rule adds -1 to the decision in case of a defaulted payment.

```
defaulted score
Type your rule using the list below as reference

1 if
2   Client is Defaulted Payment
3 then
4   add -1 to decision ;
```

- Click on the **revenue score** decision table.

The revenue score decision table computes a score from the annual revenue.

revenue score ▾

	Annual Revenue		Score	↑↓
	min	max		
1	0	1,000,000	0	
2	1,000,000	50,000,000	1	
3		≥ 50,000,000	2	
4				

5. Click on the **size score** decision table.

The size score decision table computes a score from the number of employees.

size score ▾

	Number of Employees		Score	↑↓
	min	max		
1	100	3,000	0	
2	3,000	8,000	1	
3		≥ 8,000	2	
4				

6. Click on the **age score** decision table.

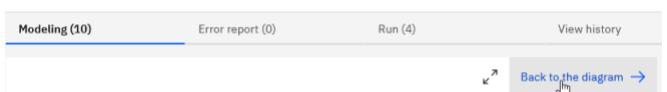
The age score decision table computes a score from the company age.

age score ▾

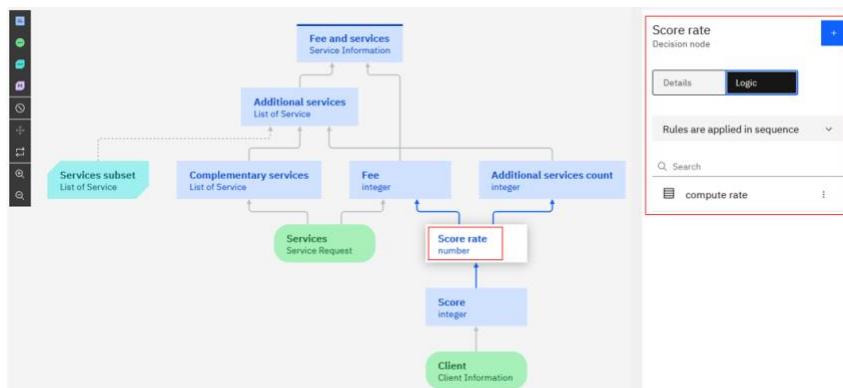
	Company Age		Score	↑↓
	min	max		
1	2	15	0	
2	15	30	1	
3		≥ 30	2	
4				

The Score output is used by the Score rate node to compute a rate from the score.

7. Click on **Back to the diagram** to return to the decision diagram.



8. Click on the **Score rate** node, and then on the **Logic** tab.



9. Open the **compute rate** decision table.

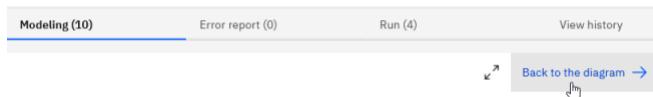
You see the score values.

compute rate ▾

	Score	↑↑	Score rate	↑↑
1	≤ -1		1.7	
2	0		1.4	
3	1		1.2	
4	2		1	
5	3		0.95	
6	4		0.9	
7	5		0.8	
8	≥ 6		0.7	
9				

In the next step, you change the decision logic.

10. Click on Back to the diagram.

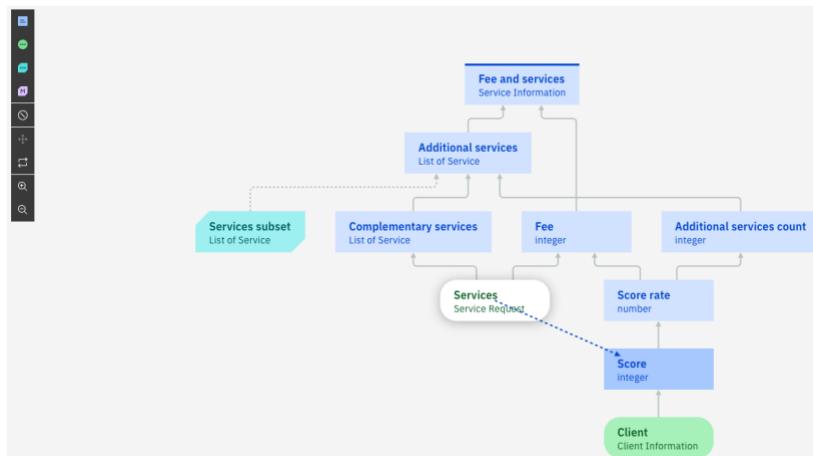


2.2.3.3 Adding a business rule

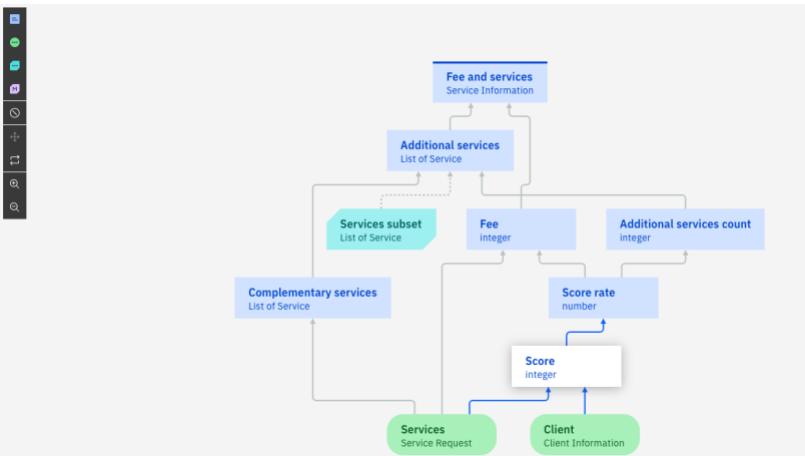
The score of the client is calculated based on 3 decision tables: revenue score, size score, and age score, and 1 rule: defaulted score. The score should also be evaluated based on the number of services that the customer requested to be onboarded. You modify the business rule that calculates the score to add the number of services to its logic. A higher number of services results in a higher score.

To add the number of services as an input to the score computation, you update the decision node **Score** to add **Services** as input and add a new rule to determine the score.

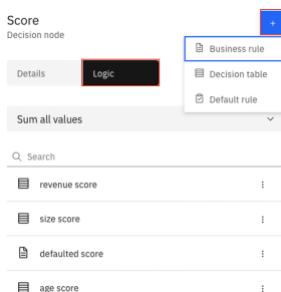
1. Click on the **Services** input node, then hover over the icon  , and then single click on **Connect to another node** (arrow) to add a link to connect to another node. Move your mouse to the **Score** decision node and click again.



This creates a link and the decision diagram is updated to reflect the new dependency:

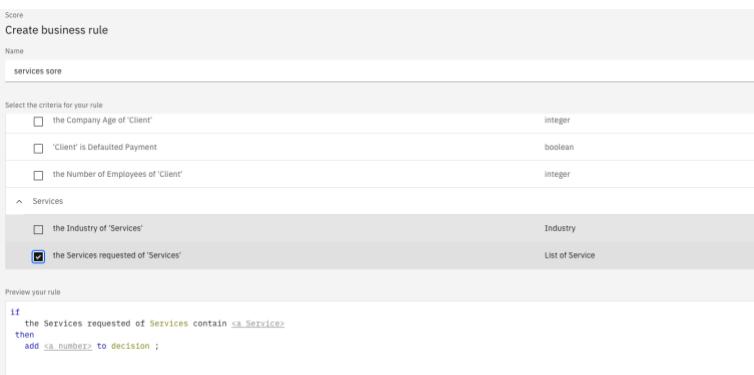


- Click on the **Score** decision node, then select the **Logic** tab in the right pane, and then click on the plus (+) and click **Business rule**.



This opens a wizard to help you select the criteria of your rule.

- Enter **services score** for the name for the rule, and then scroll down to select the criteria **the Services requested of 'Services'**.



- Click on **Create**. You see a red icon that indicates an error. Hover over the icon to see the details.



- In the rule editor, update the rule to contain the text shown below. You may wish to delete the text that is proposed first.

```
if
  the number of elements in the Services requested of Services is more than 3
then
  add 1 to decision ;
```

While you are typing, the auto-completion guides you through writing your rule. You can also trigger the auto-completion by typing Ctrl-Space in the editor.

Once finished the rule appears as follows:

The screenshot shows a code editor window titled "services score". It contains a single rule defined in a programming language:

```
1 if
2   the number of elements in the Services requested of Services is more than 3
3 then
4   add 1 to decision ;
```

Below the code editor, there are three small icons: a gear, a magnifying glass, and a circular arrow.

In the decision logic, the **Score** node is now the sum of 5 rules: revenue score, size score, defaulted score, age score, and services score.

The screenshot shows the configuration of a "Score" decision node. At the top, it says "Score" and "Decision node" with a plus sign icon. Below that, there are two tabs: "Details" and "Logic", with "Logic" being active. Under the "Logic" tab, there is a dropdown menu set to "Sum all values". A search bar labeled "Search" is present. A list of five rules is shown, each with a checkbox and a colon:

- revenue score :
- size score :
- defaulted score :
- age score :
- services score :

Click on Back to the diagram.

2.2.3.4 Updating a decision table

You update the decision table for the score rate because the values change following the update of the rule to compute the score.

1. Click on the **Score rate** node. Then, in the **Logic** tab, click on the **compute rate** decision table.

It displays the decision table that contains the decisions to determine the score rate.

compute rate

The screenshot shows a decision table with two columns: "Score" and "Score rate". The rows represent different score ranges and their corresponding rates:

	Score	Score rate
1	≤ -1	1.7
2	0	1.4
3	1	1.2
4	2	1
5	3	0.95
6	4	0.9
7	5	0.8
8	≥ 6	0.7
9		

In this table, each row represents a single rule. The Score represents a condition parameter and the Score rate the value for the action.

2. Hover over the **1** in the first row to display the following rule:

	if all of the following conditions are true : - ('Score' is at most -1), then set 'decision' to 1.7 ;	↑↓
2	1.7	
	1.4	
3	1	1.2
4	2	1
5	3	0.95
6	4	0.9
7	5	0.8
8	≥ 6	0.7

3. Select **row 8** and then right-click to open the contextual menu. Select **Insert row -> Above**. Enter 6 in Score column and 0.7 in Score rate column.

	Score	↑↓	Score rate	↑↓
1	≤ -1		1.7	
2	0		1.4	
3	1		1.2	
4	2		1	
5	3		0.95	
6	4		0.9	
7	5		0.8	
8	6		0.7	
9	≥ 6		0.7	
10				
11				

The warning icon  appears in lines 8 and 9 to automatically notify you of an issue. The warning indicates an overlap of rows 8 and 9 so you must change the values in row 9.

4. Change to 7 for Score column and 0.6 for Score rate column.

compute rate ▾

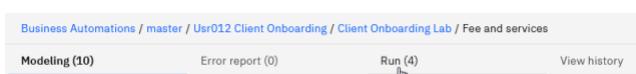
	Score	↑↓	Score rate	↑↓
1	≤ -1		1.7	
2	0		1.4	
3	1		1.2	
4	2		1	
5	3		0.95	
6	4		0.9	
7	5		0.8	
8	6		0.7	
9	≥ 7		0.6	

5. Click on Back to the diagram.

2.2.4 Validating the decision service

Now that you have modified the decision model and updated the decision logic, you want to test the decision service before deploying to production. Automation Decision Services integrates a test environment allowing you to fine tune your rules and verify their behavior.

1. Select the **Run** tab.



On the left side, the **Test data** pane lets you select the data to submit to execute the rules.

2. To see the behavior after the changes, select the same data set as you did before the changes: **All Services** and click on **Run**.

The decision output for servicesFee is now 47500.

The screenshot shows the IBM Decision Modeler interface. On the left, there's a sidebar with 'Test data' and a dropdown menu 'All Services'. Below it, a tree view shows 'All Services' expanded, with 'services', 'client' (expanded), 'annualRevenue' (set to 27500000), and 'companyAge'. On the right, a main panel shows a 'Decision output' section with a table. The table has two columns: 'Node Name' and 'Result'. There is one row for 'Fee and services', which has a result object: { "extendedServices": [], "servicesFee": 47500 }. A 'Run' button is at the top right of the main panel.

3. Expand **Run history**, and then expand **Score**.

It shows that the rule you added **services score** has been triggered. The result for the decision node **Score** is a consolidated result. It is the sum of the rules that triggered the result, applied in sequence.

Each displayed output is the sum, including the previous output.

Triggered rules	Number of runs	Output
revenue score	1	1
size score	1	1
age score	1	2
services score	1	3

In this example, the output of the **Score** decision is 3:

- Revenue score output is 1
- Then added to size score (size score is 0) it remains 1
- Then added to age score the result is 2 (age score is 1)
- Then added to services score it is 3 (services score is 1).

4. Click on **Client Onboarding Lab** in the breadcrumbs to navigate back to the Models tab.

The screenshot shows the breadcrumb navigation path: Business Automations / master / Usr012 Client Onboarding / Client Onboarding Lab / Fee and services. Below the breadcrumb, there are several buttons: Modeling (10), Error report (0), Run (4) (which is highlighted with a blue border), and View history.

For more information, see IBM Documentation

[Building decision models](#)

[Creating a decision diagram](#)

2.3 Summary

You have completed Exercise 1 - Modeling Decisions. You created a project and a decision service to define the fee and services for a client being onboarded to a set of services.

- You explored the decision model diagram and its elements.
- You updated the business logic.
- You created a rule.
- You added a link in the decision diagram.
- You edited a decision table.
- You tested and validated the decision service.

3 Exercise 2: Adding machine learning in the decision model

3.1 Introduction

In this exercise you leverage a machine learning model to improve the intelligence of the overall decision. This model evaluates risk based on information provided during the request. Adding a predictive model allows you to benefit from the experience of previous customers to estimate the risk level.

This model provides a prediction for the client risk based on the client information (annual revenue, company age, number of employees, and industry). If the client onboarding is risky, the prediction returns 1. If it is not, it returns a value of 0. It also provides the prediction confidence.

3.2 Exercise instructions

In this exercise, to use the machine learning model deployment into Automation Decision Services you:

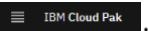
- Create a **predictive model** connected to the machine learning deployment.
- Add this **predictive model** into a **decision service**.
- Validate a decision service.

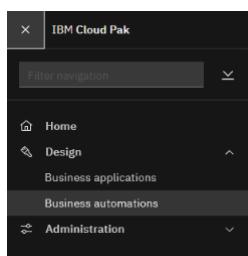
3.2.1 Log in to your project

If you are already connected to Automation Decision Services and have your project open you can skip this section and continue in the next section [Testing the model before changes](#).

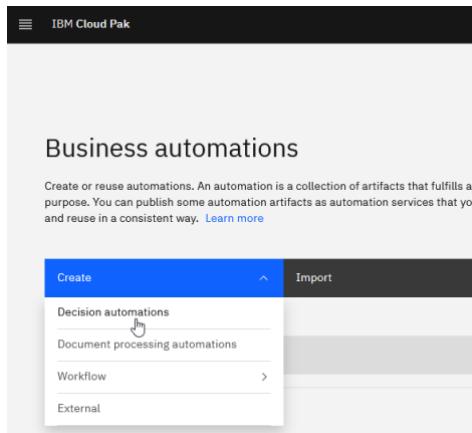
If you are starting the Lab from this exercise, follow the steps below.

3.2.2 Creating a project and importing a Decision service

1. Log in to Business Automation Studio.
2. Click on the Navigation Menu on the top left corner .
3. Expand **Design**, and then click on **Business automations**.

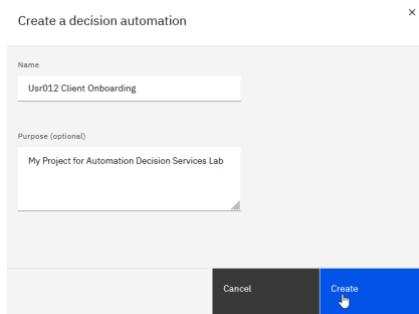


- Click Create and select Decision automations.



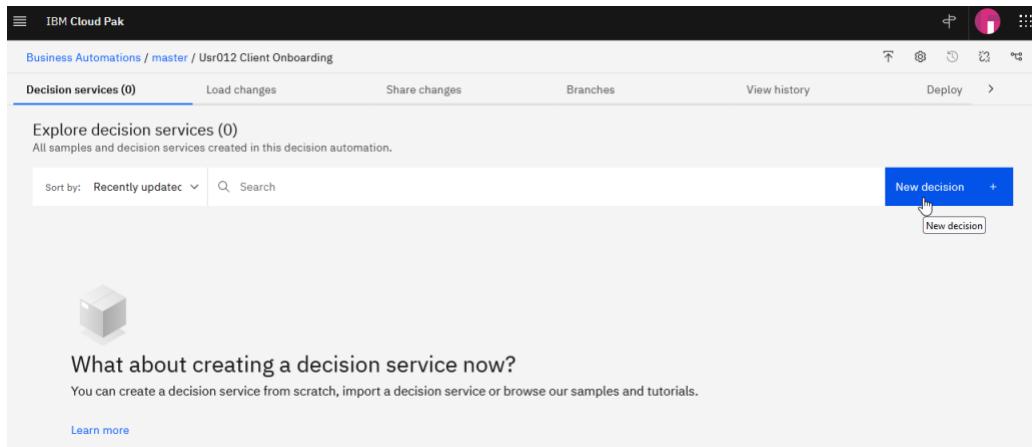
- Enter a name for your project. Enter **UsrNNN Client Onboarding Decision** where *UsrNNN* is your assigned username (this avoids conflicts with other projects if you are sharing the cluster).

- Click Create

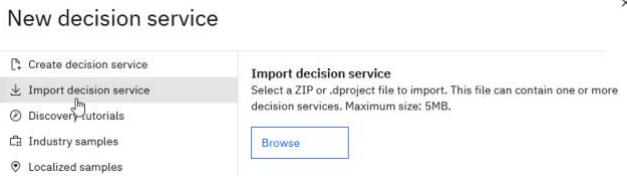


- Your new project opens in Decision Designer. You can optionally follow the guided popup if it shows or click **Maybe Later** to continue.

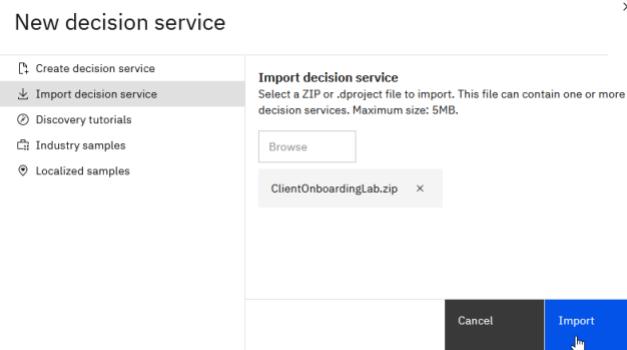
- Click New decision +.



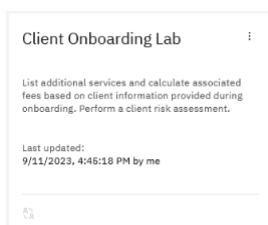
- Select Import decision service on the left to import the decision service provided by the Lab team.



10. Browse to select the project prepared for the Lab **ClientOnboardingLab.zip** and click **Import**.



11. A tile of a decision service named **Client Onboarding Lab** appears on the project page.



12. Click on **Client Onboarding Lab** to open your decision service.

3.2.3 Testing the model before changes

The Client Onboarding Lab decision service contains several decision models. In this exercise, you work on the Scoreboard decision model.

If you are not familiar with the data model, you can check [Exercise 1 Exploring the decision service: data model and decision model](#).

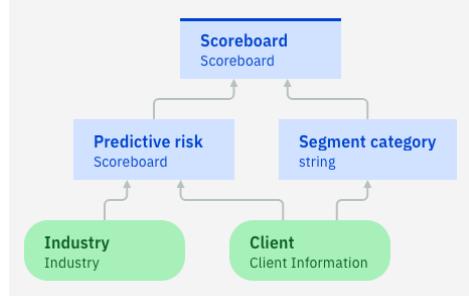
1. In the **Models** tab, click on **Scoreboard**.

Models		Data	Decision operations	
All models	Sort by: Name	Search	Create	+
			Last updated by	Last updated at
	Fee and services Determines the fees of the services requested and a...	Me	9/11/2023, 7:12:45 PM	⋮
	Scoreboard Determines if a client is risky using a predictive model and...	Me	9/11/2023, 4:45:17 PM	⋮
	Scoreboard Services subset Builds a list of services that contains the Services count first...	Me	9/11/2023, 4:45:17 PM	⋮

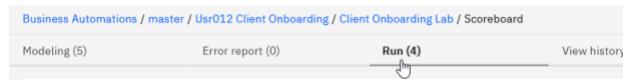
2. It opens the decision model **Scoreboard**.

The decision model diagram is a dependency diagram that shows the steps to make the final decision. The top decision **Scoreboard** is the final decision. It calculates a client risk and categorizes the client in a business segment. The segment is computed by the decision node **Segment category** from the input node **Client**. The risk is computed from the **Predictive risk** node

with the input nodes **Industry** and **Client**. This model is not complete because the Predictive risk node has no business logic defined. You will complete it in this exercise.



3. Select the **Run** tab to test the model.



On the left side, the **Test data** pane lets you select which set of data to submit to execute the rules. In this Lab, 4 sets of data are pre-defined: May be risky, Not so risky, Risky, Safe.

4. Select the **May be risky** data set and click on **Run** to test the model.

A screenshot of the 'Test data' pane. The dropdown menu shows 'May be risky'. The pane contains a table with columns for 'client' and 'industry'. Under 'client', there are rows for 'annualRevenue' (3000000), 'companyAge' (5), 'defaultedPayment' (checkbox checked), and 'numberofEmployees' (20). Under 'industry', there is a row for 'Telecom'. To the right of the table is a sidebar with a cube icon and the text: 'Want to try out your decision? Run your decision model to ensure you have it set up correctly.'

A report displays the input and output of each node in the decision model.

5. Expand **Decision output** and **Run history** sections if not already expanded.

Decision output		Result	
Node Name		Result	
Scoreboard		null	
Messages			
Message Node name Rule name			
Run history			
Node	Rules	Rule Interaction	Output
Scoreboard	0	Sequence	null
Predictive risk	0	Sequence	null
Segment category	1	Sequence	"Segment 2"
Industry	0	Not applicable	
Client	0	Not applicable	

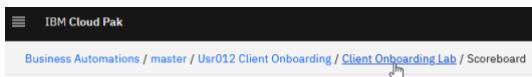
The final decision is displayed in the top of the report: for Scoreboard the result is "null". The decision result provides the segment 2 category based on the annual revenue specified in the data set. If the revenue is below 50000000, it categorizes the client in segment 2. If the revenue is greater, the client is set in segment 1. Here the risk is not yet computed. You need to add the logic in the decision node **Predictive risk**.

3.2.4 Creating a Predictive Model and Map Initial Data

You will now create a predictive model to encapsulate a machine learning model created elsewhere. You connect it by using the wizard to import a **local machine learning model**. You then define the input and the output of this predictive model.

Note: Automation Decision Services also supports connecting to a **remote machine learning model** deployment. A machine learning provider gives access to Machine learning deployment. Two types of providers are currently supported in Automation Decision Services: IBM Watson® Machine Learning and IBM Open Prediction Service. For more information about how to use machine learning models in Automation Decision Services see [Integrating machine learning](#) in the IBM Knowledge Center.

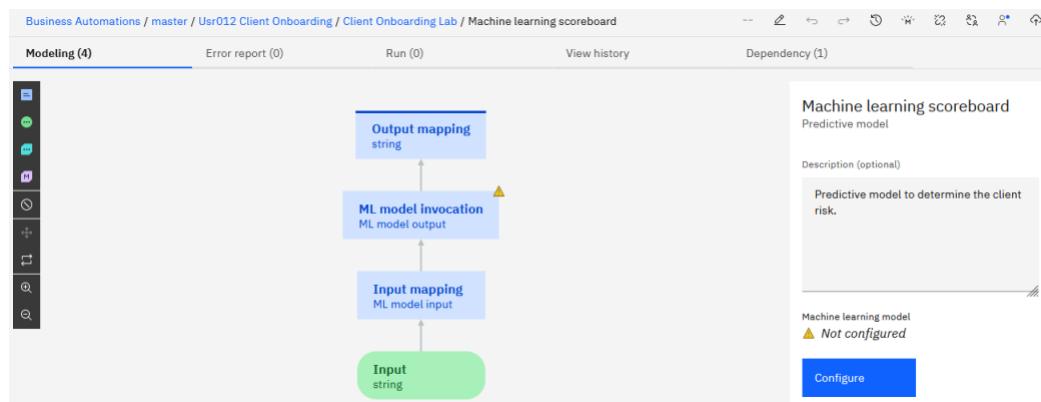
1. Click **Client Onboarding Lab** in the breadcrumbs to navigate back to the list of models.



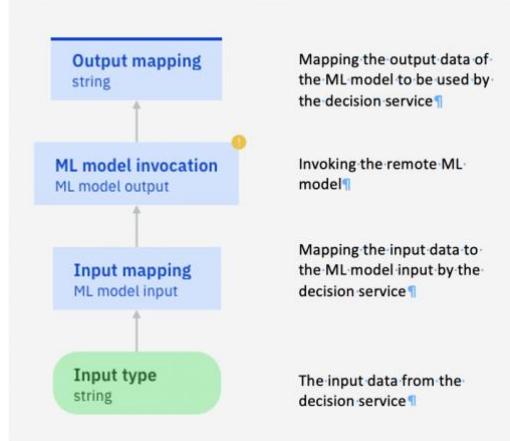
2. On the **Models** tab, click on **Create** and select **Predictive model**.
3. Enter the name **Machine learning scoreboard** and an optional description, and click on **Create**.

A screenshot of the 'Create model' dialog box. At the top left is the text 'Decision service 'Client Onboarding Lab''. Below it is 'Create model'. Under 'Select model type' are three options: 'Decision model' (Create a decision model to decompose your decision and define the data it depends on.), 'Task model' (Create a task model to chain together tasks and specify how, when, and under what condition they are run.), and 'Predictive model' (Create a predictive model to call a local or remote machine learning model.). The 'Predictive model' option is selected and highlighted with a blue border. Below the model type section are fields for 'Name' (containing 'Machine learning scoreboard') and 'Description (optional)' (containing 'Predictive model to determine the client risk.'). At the bottom left is a dropdown menu for 'Select the data model you want to use' with 'Data' selected. At the bottom right are two buttons: 'Cancel' and a large blue 'Create' button with a white cursor icon pointing at it.

4. The Predictive model **Machine learning scoreboard** is opened.



A predictive model is a simple Decision Model diagram. It has one or multiple input nodes, two mapping nodes, and one node that invokes the Machine Learning model.



5. In the right-hand pane click **Configure**.
6. Select Local machine learning model and click Next.

The screenshot shows the "Configure predictive model" screen. At the top, there are buttons for "Back to Machine learning scoreboard", "Back", and "Next". Below that, there are three tabs: "Choose configuration method", "Upload file", and "Map data". The "Choose configuration method" tab is active. It contains two options: "Remote machine learning model" (disabled) and "Local machine learning model" (selected and highlighted with a border). A note below says "Import a transparent machine learning model for local predictions." The "Next" button is visible at the top right of the form.

7. Upload the file clientDefaultPaymentRS.xml and click Next.

Back to Machine learning scoreboard
Configure predictive model

Back Next

Choose configuration method Upload file Map data

Upload file
Select a RuleSet or Scorecard model to upload.
The following file types are supported: .pmml, .xml

Add file using drag and drop
Drag and drop file here or click to select file

clientDefaultPaymentRS.xml

Select a decision logic generation method:
 Business rules
 Decision tables

8. Under Map data, expand the first input to the predictive model, **clientAnnualRevenue**, and select **integer** for the **Source type**.

Back to Machine learning scoreboard
Configure predictive model

Back

Choose configuration method Upload file Map data

Map data
Map data types from the RuleSet model to data types from your data model.

clientAnnualRevenue (integer)

Source type
Select a data type

Select a data type

System types
 integer
 No custom types

clientEmployeeNumber (integer)

9. Once the **Maps to** loads, select the corresponding data attribute from the Data model of the decision service, **the Annual Revenue of ClientInformation**. The resulting mapping should appear as follows.

clientAnnualRevenue (integer)

Mapping is complete. Cancel mapping

Source type
integer

Maps to
the Annual Revenue of ClientInformation

10. Repeat these steps for the **clientExistanceDuration** input to the predictive model. The result should appear as follows.

clientExistenceDuration (integer)

Mapping is complete. Cancel mapping

Source type: integer

Maps to: the Company Age of ClientInformation

11. Skip the clientIndustry input, which will be mapped later.

12. Repeat the steps again for the **clientEmployeeNumber** input to the predictive model. The result should appear as follows.

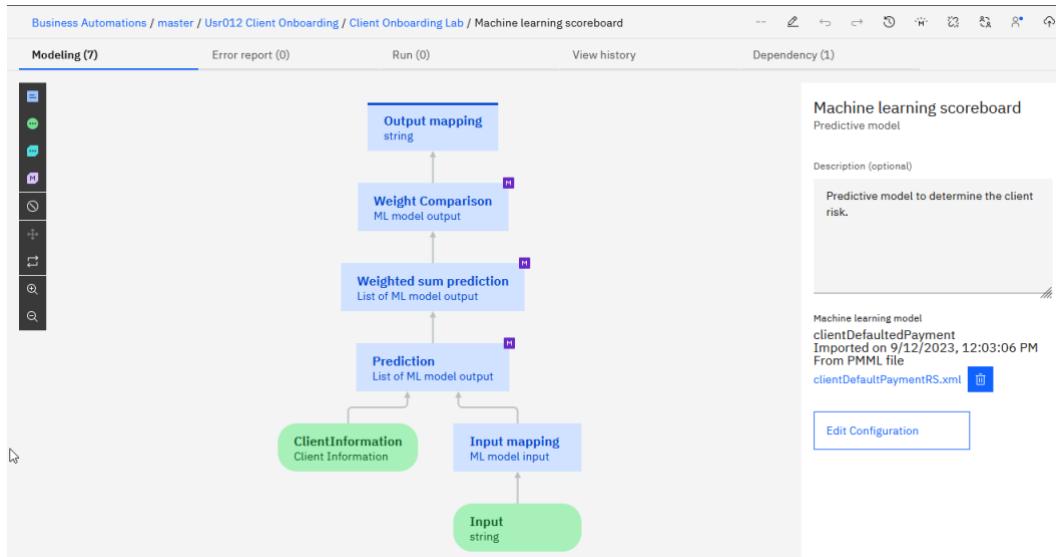
clientEmployeeNumber (integer)

Mapping is complete. Cancel mapping

Source type: integer

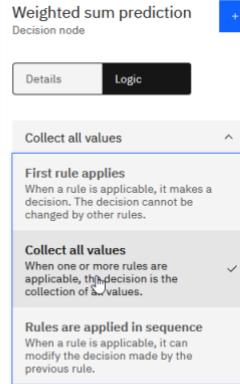
Maps to: the Number of Employees of ClientInformation

13. When three out of four mappings are complete, click **Apply** in the upper right. The predictive model appears as follows:



14. Select the **Weighted sum prediction** node, and then click the Logic tab. Make sure that the rule

interaction policy is **Collect all values**. Otherwise select it.



3.2.5 Add Additional Data Mapping

You mapped three of the input data variables from the machine learning model to the data types of the Decision Service data model using the import wizard. Now you will finish the mapping.

3.2.5.1 Defining the input mapping

In the previous section you saw the input mapping of the ML model, which requires:

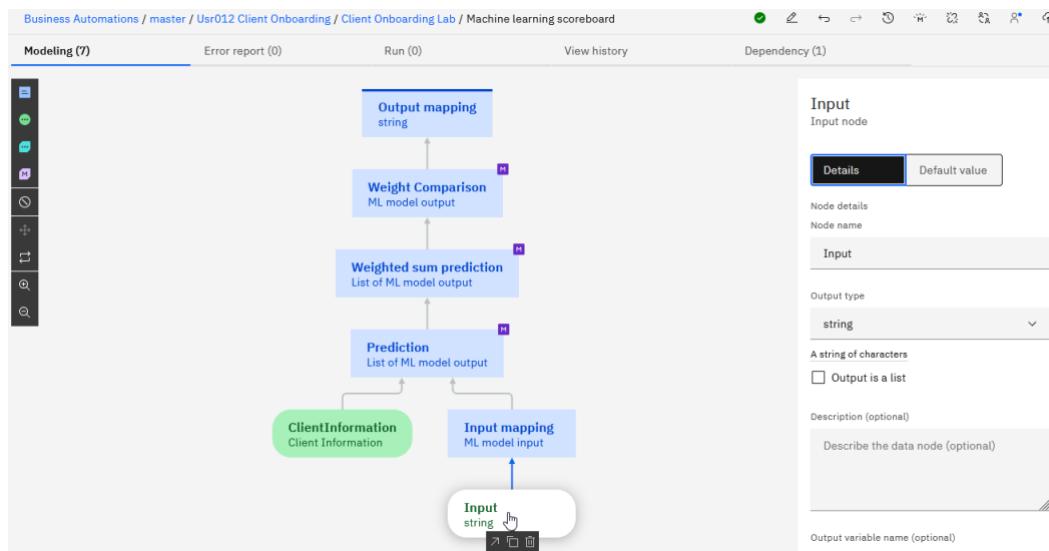
- clientAnnualRevenue as a number
- clientExistenceDuration as a number
- clientEmployeeNumber as a number
- clientIndustry as a number

Three of the values are mapped from the Client information type and the last value is from the Industry enumeration type. You must map each value to a number. Since Industry is not a number in the decision model, you must now:

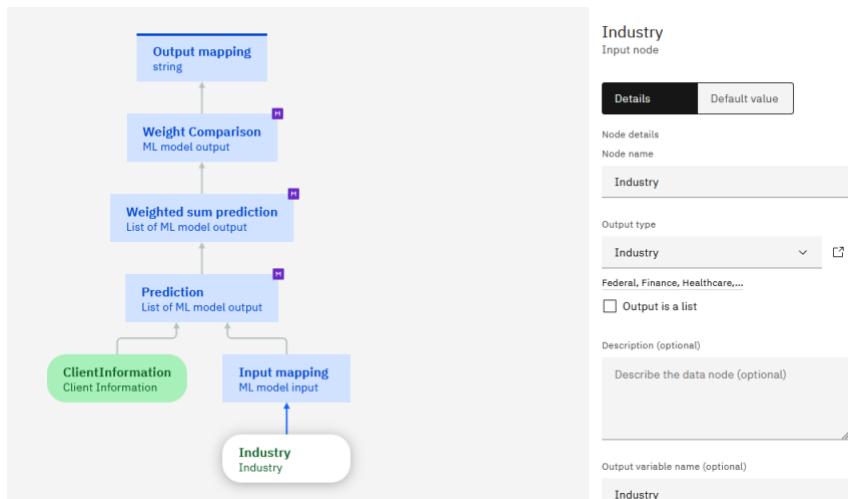
- Define an input node for **Industry**
- Map the Industry input node to the value expected by the ML model using a decision table to map the enumeration type to an integer.

You update the model to map your data to the required input:

1. Select the **Input** node in the diagram.



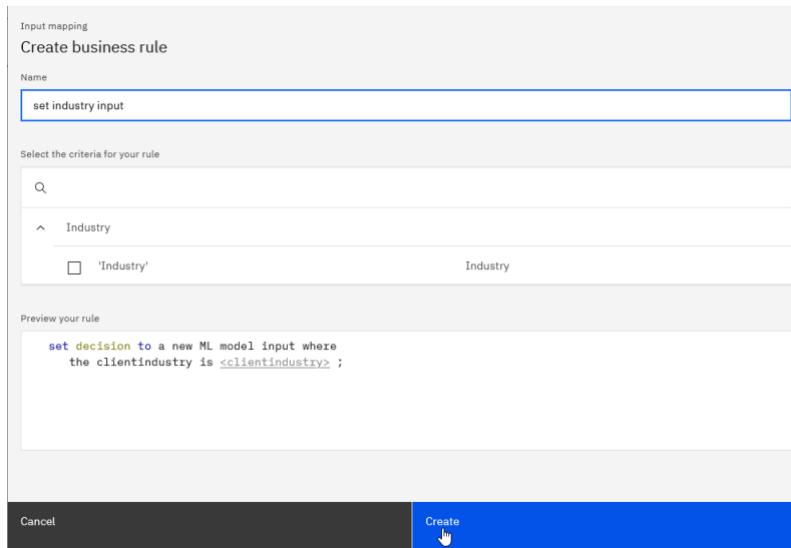
2. In the right **Details** pane, enter **Industry** as the **Node name** and expand **Output type** to select **Industry** as the type. The result should be as follows:



Now, you map the **Industry** input to the Decision Service data model.

3. In the Predictive model diagram, select the **Input mapping** node. Then, click on the **Logic** tab, select the plus (+) sign, and add a **Business rule**.
4. In the wizard, notice the preview of the generated rule. It matches the input of the Machine

Learning Service (Industry). Enter the rule name **set industry input** and click on **Create**.



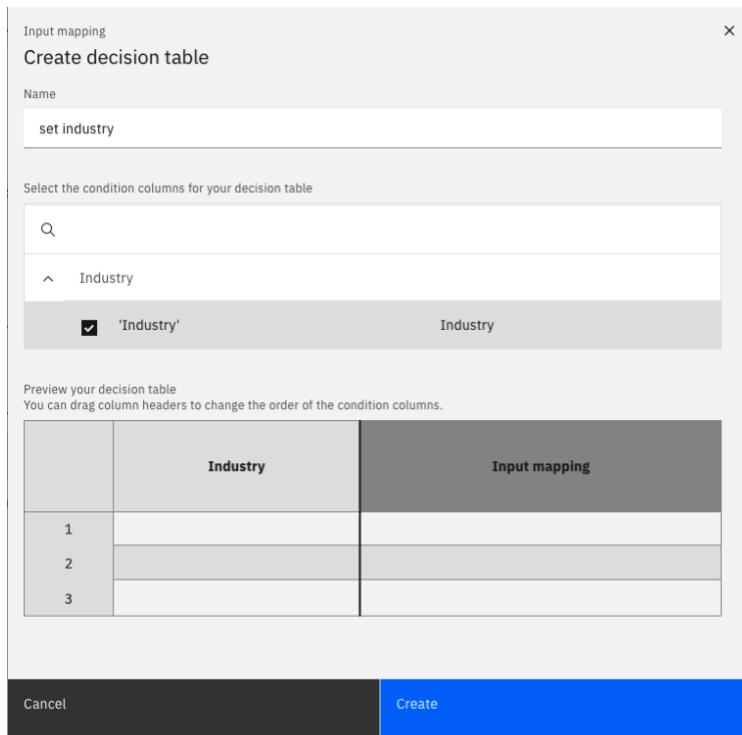
5. Edit the rule with the following statement:

```
set decision to a new ML model input where  
the clientindustry is 0 ;
```

This screenshot shows the 'set industry input' rule details page. The 'Logic' tab is selected. The rule code is 'set decision to a new ML model input where the clientindustry is 0 ;'. The 'Inputs' section shows an input named 'Industry' of type 'Industry'. The search bar at the top right contains 'set industry input'.

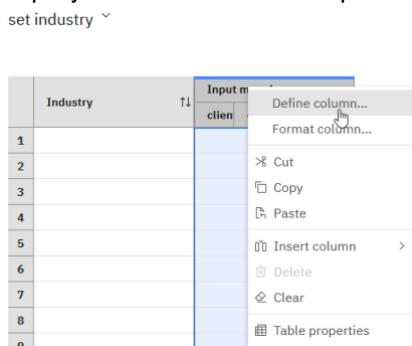
This rule always sets the client industry to 0. Now, you add a decision table to update the industry to the value in the industry provided as input.

- In the **Logic** tab, click the plus (+) sign and select **Decision table**.
- Enter **set industry** for the Name and select Industry in the **condition columns** list. Click on **Create**.



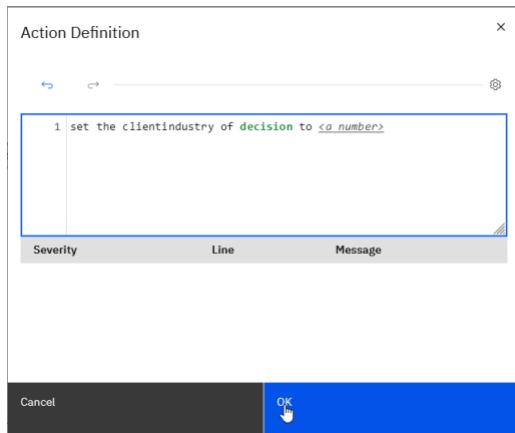
- Right-click on the **Input mapping** column and select **Define column**.

You need to update the column to set the industry only. The other attributes were set in an earlier step by the rule set client input.



- Update the rule in the editor with the following rule statement, then click **OK**.

```
set the clientindustry of decision to <a number>
```



10. Double click in the **Industry** column of **Row 1** and select **Federal** in the drop-down list. Add **0** for Input mapping.

11. Repeat for rows 2 to 5 as shown below:

set industry ▾

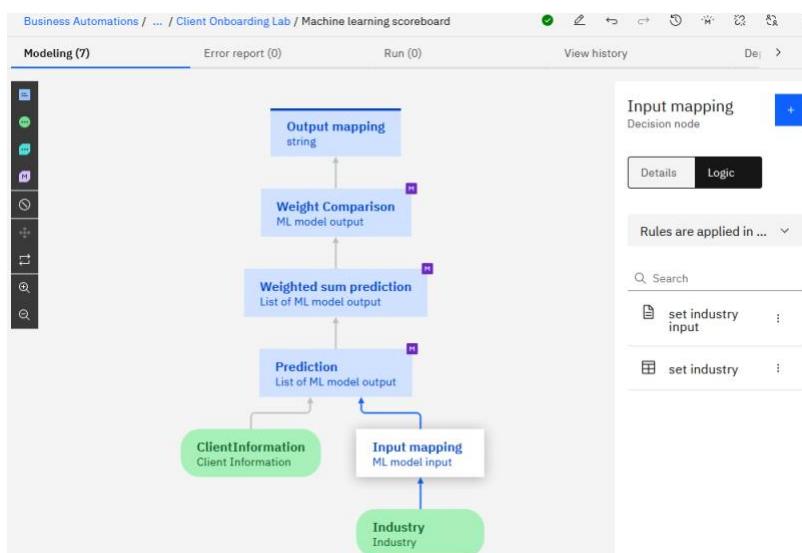
	Industry	Input mapping
1	Federal	0
2	Finance	1
3	Healthcare	2
4	Insurance	3
5	Telecom	4
6		

3.2.5.2 Defining the output mapping

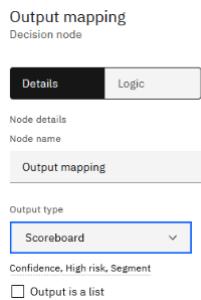
Now you must map the output of the machine learning model to the output of your predictive model. Your predictive model will return a scoreboard in which it predicts the score and gives the confidence. To do this you:

- Change the output type of the Output mapping node of the predictive model to scoreboard.
- Write a rule to map the output of the machine learning model to the scoreboard. The segment remains Unknown since it is not computed by the machine learning model.

1. Click **Back to the diagram** to return to the Predictive model diagram.

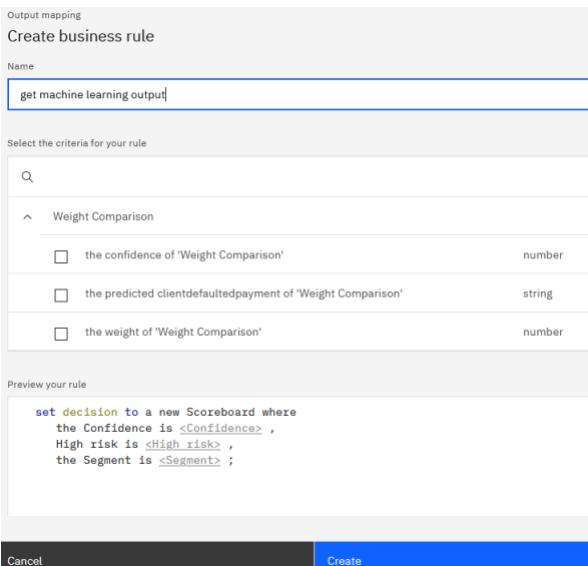


2. In the Predictive model diagram, select the **Output mapping** node. Then, in the **Details** tab, expand **Output type** and select **Scoreboard** in the list.



You define the business logic by adding a rule to map the machine learning model output (**get machine learning output**).

3. Select the **Logic** tab, then select the plus (+) sign, and add a **Business rule**.
4. Enter the name **get machine learning output**. Click on **Create** to edit your rule.



The rule is incomplete as you can see from the icon in line 1.

5. Edit the rule with the following statement:

```
if the predicted clientdefaultedpayment is "TRUE"
then
set decision to a new Scoreboard where
    High risk is true ,
    the Confidence is the confidence,
    the Segment is "Unknown";
else
set decision to a new Scoreboard where
    High risk is false ,
    the Confidence is the confidence,
    the Segment is "Unknown";
```

```

get machine learning output ▾
Type your rule using the list below as reference

1 if the predicted clientdefaultedpayment is "TRUE"
2 then
3 set decision to a new Scoreboard where
4   High risk is true ,
5   the Confidence is the confidence,
6   the Segment is "Unknown";
7 else
8 set decision to a new Scoreboard where
9   High risk is false ,
10  the Confidence is the confidence,
11  the Segment is "Unknown";

```

3.2.6 Validating the predictive model

Now that you have created your Predictive model and defined the predictive decision logic, you test it to verify. IBM Automation Decision Services integrates a test environment allowing you to fine-tune your rules and verify their behavior against the test data.

You add datasets to define the data that you want to test.

1. Select the **Run** tab.

2. In the Test data pane, click on Add test data set +.

Now you add four data sets: Risky, May be risky, Not so Risky, Safe.
To add test data, you enter a name and define the values.

3. Click on the **Rename test data set** (pencil) icon next to **dataset** and enter **Risky**. Expand **Industry** and **Client Information** to enter the test data

Name: **Risky**

Industry: Federal

Annual Revenue: 15708854

Company Age: 3

Defaulted Payment: true (checked)

Number of Employees: 12

The screenshot shows the SAP Fiori Test Data interface for a dataset named "Risky". The form contains the following fields:

- industry**: Federal
- clientInformation**:
 - annualRevenue**: 15708854
- companyAge**: 3
- defaultedPayment**:
- numberOfEmployees**: 12

- Click the Edit as JSON button (</>) to see the JSON content:

The screenshot shows the SAP Fiori Test Data interface for the "Risky" dataset. The "Edit as JSON" button is highlighted. The JSON content is displayed below:

```

1: {
2:   "industry": "Federal",
3:   "clientInformation": {
4:     "annualRevenue": 15708854,
5:     "companyAge": 3,
6:     "defaultedPayment": true,
7:     "numberOfEmployees": 12
8:   }
9: }

```

```

{
  "industry": "Federal",
  "clientInformation": {
    "annualRevenue": 15708854,
    "companyAge": 3,
    "defaultedPayment": true,
    "numberOfEmployees": 12
  }
}

```

You can edit datasets as FORM by entering the data in the form as you did in this step or as JSON. It can be easier to copy/paste using the JSON option.

5. (Optional) Repeat the steps to add 3 additional datasets. Copy/Paste the JSON content:

Name: **Not so risky**

```
{
  "industry": "Healthcare",
  "clientInformation": {
    "annualRevenue": 61399457,
    "companyAge": 4,
    "defaultedPayment": true,
    "numberOfEmployees": 10
  }
}
```

Name: **May be risky**

```
{
  "industry": "Telecom",
  "clientInformation": {
    "annualRevenue": 30000000,
    "companyAge": 5,
    "defaultedPayment": false,
    "numberOfEmployees": 20
  }
}
```

Name: **Safe**

```
{
  "industry": "Healthcare",
  "clientInformation": {
    "annualRevenue": 103314927,
    "companyAge": 26,
    "defaultedPayment": true,
    "numberOfEmployees": 67
  }
}
```

You now have 4 data sets available.

```
{
  "industry": "Federated",
  "clientInformation": {
    "annualRevenue": 15708854,
    "companyAge": 3,
    "defaultedPayment": true,
    "numberOfEmployees": 12
  }
}
```

6. Select a data set of your choice and click on **Run**.

7. See the Decision output for the data set **Risky** below.

Node Name	Result
Output mapping	<pre>{ "confidence": 0.929724477256148, "highRisk": true, "segment": "Unknown" }</pre>

8. You can explore the output in JSON format, by clicking on **Show JSON output**

Risky

9/12/2023, 2:15:35 PM

Show formatted output

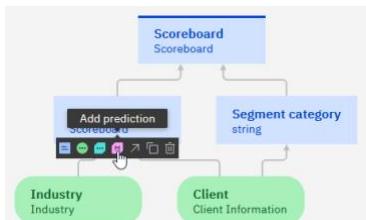
```
{
  "type": "Just",
  "value": {
    "a": "Risky",
    "b": {
      "tag": "Ok",
      "value": {
        "success": {
          "payload": "{\"confidence\":0.929724477256148,\"highRisk\":true,\"segment\":\"Unknown\"}",
          "trace": "",
          "infos": [
            {
              "nodeKind": "Decision",
              "result": "{\"confidence\":0.929724477256148,\"highRisk\":true,\"segment\":\"Unknown\"}",
              "executedRules": [
                {
                  "ruleName": "get machine learning output",
                  "result": "{\"confidence\":0.929724477256148,\"highRisk\":true,\"segment\":\"Unknown\"}",
                  "executionCount": 1,
                  "isDefault": false
                }
              ]
            }
          ]
        }
      }
    }
  }
}
```

3.2.7 Use the predictive model in the scoreboard decision model

You will start by adding a prediction node to the scoreboard decision model and connect it to this predictive model. You will also connect this prediction node to the predictive risk input node and create a rule to define the risk.

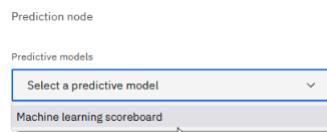
3.2.7.1 Add a prediction node

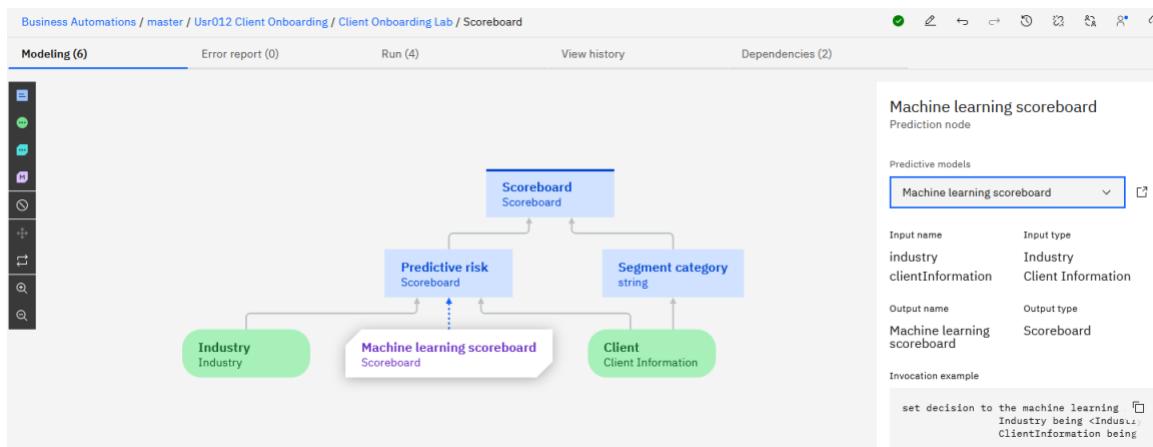
1. Go back to your Scoreboard decision model by clicking **Client Onboarding Lab** in the breadcrumbs and then on **Scoreboard**.
2. It shows the decision model **Scoreboard**. Hover over the **Predictive risk** node and click on the **Add prediction** icon.



The prediction node shows an error because it needs to be connected to a predictive model.

3. Click on your new **Prediction node** if not already selected, and in the right-side pane select the predictive model you created, **Machine learning scoreboard**.





3.2.7.2 Editing the logic definition of the predictive risk

You update the decision logic by adding a predictive rule. You add a rule calling the predictive model with the appropriate input, to define the risk and the confidence of the Scoreboard decision node.

1. Select the decision node **Predictive risk**. In the **Logic** tab, click the plus (+) sign and create a **Business rule**.
2. Enter a name for the rule: **predictive risk**.
3. Click on **Create**.
4. Edit the rule statement as follows:

```
set decision to the machine learning scoreboard computed from
  ClientInformation being Client ,
  Industry being Industry ;
```

3.2.8 Validating the final decision service

Now that you created the predictive model and updated the decision model Scoreboard to integrate the prediction to compute the risk for the client onboarding, you can validate the changes. You use the four datasets previously created to validate: Risky, May be risky, Not so Risky, Safe

1. Select the **Run** tab.

Node Name	Result
Scoreboard	<pre>{ "confidence": 92.9724, "highRisk": true, "segment": "Segment 2" }</pre>

The run history shows that the rule **Predictive risk** ran and computed the **confidence** level 92.97% and **high risk** value (true) for the **Scoreboard** decision node.

Node	Rules	Rule Interaction	Output
Scoreboard	1	Sequence	{ "confidence": 92.9724, "highRisk": true, "segment": "Segment 2" }
Predictive risk	1	Sequence	{ "confidence": 0.929724477256148, "highRisk": true, "segment": "Unknown" }
Segment category	1	Sequence	"Segment 2"
Industry	0	Not applicable	
Client	0	Not applicable	

- Click on **<user> Client Onboarding** in the breadcrumbs to move on to the next exercise.

3.3 Summary

You completed Exercise 2 - Adding machine learning in the decision model.

- You modified the scoreboard for the client onboarding by combining descriptive rules and predictive rules into a unified decision. By adding a predictive model to your project decision, you infused machine learning to evaluate the client risk based on a trained model.
- You added data sets to verify that your model is running correctly against the business rule policies defined for the Client Onboarding scenario.

4 Exercise 3: Sharing and publishing decision services

4.1 Introduction

In this exercise, you learn how to collaborate on your decision services and how to make them ready to execute by the other components of the platform. You connect your project to a Git repository to be able to build and deploy a decision service as an archive. You can easily collaborate by sharing your decision service and giving appropriate access. You then publish the decision service archive as an automation service in Business Automation Studio.

This exercise is dedicated to integrators and anyone who wants to understand how to execute a decision service.

Integrating the automation services in other applications is not covered in this Lab. Look at the Workflow and Business Automation Application Labs for this.

For this exercise, you can either work with the project you created or with the decision services prepared by the Lab team.

4.2 Exercise instructions

In this exercise you prepare a decision service for collaboration:

- **Connect** a decision service to a Git repository
- **Share changes** in a decision service to make them visible to collaborators
- **Deploy** the decision service as **an automation service**
- **Execute** the decision service

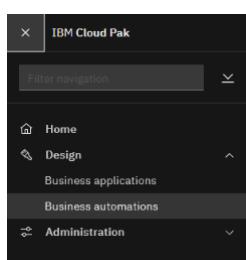
4.2.1 Log in to your project

If you did the previous exercises and have your decision service you can continue with your project. In Decision designer, open your project. Then move to the step [Exploring a decision operation](#).

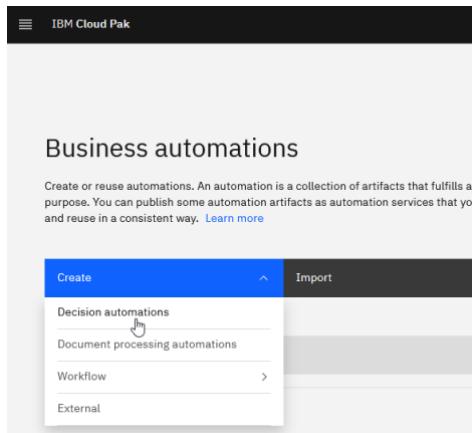
If you are starting the Lab with this exercise, follow the steps below.

4.2.2 Creating a project and importing a decision service

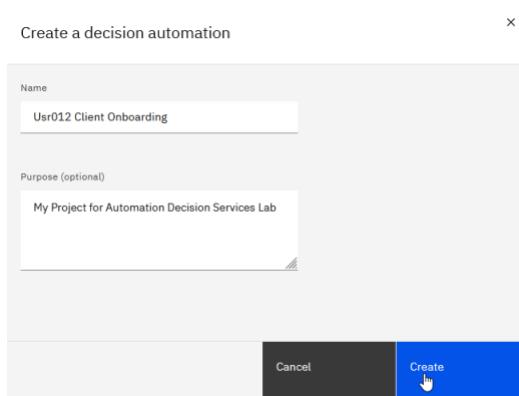
1. Log in to Business Automation Studio.
2. Click on the Navigation Menu on the top left corner  .
3. Expand **Design**, and then click on **Business automations**.



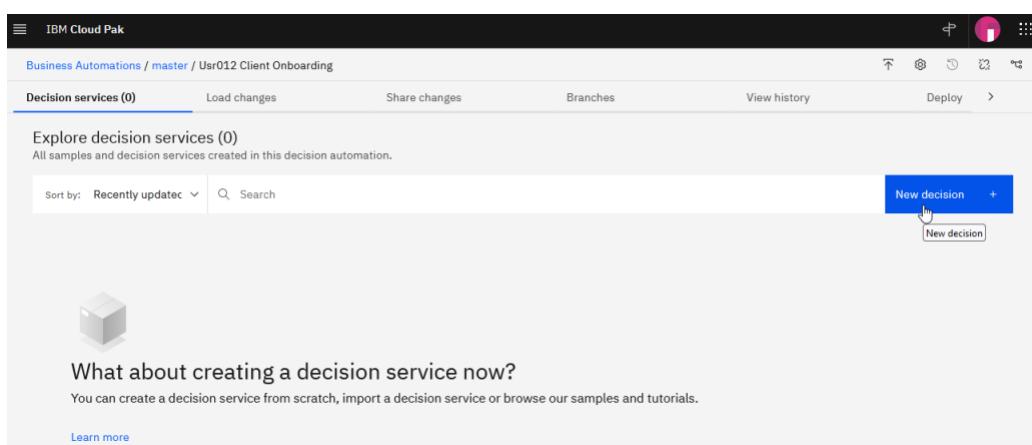
- Click Create and select Decision automations.



- Enter a name for your project. Enter **UsrNNN Client Onboarding Decision** where *UsrNNN* is your assigned username (this avoids conflicts with other projects if you are sharing the cluster).
- Click Create.

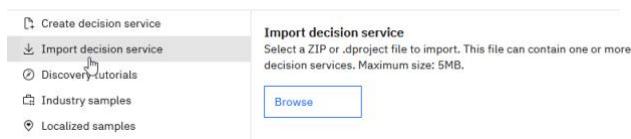


- Your new project opens in Decision Designer. You can optionally follow the guided popup if it shows or you can click **Maybe Later** to continue.
- Click New decision +.



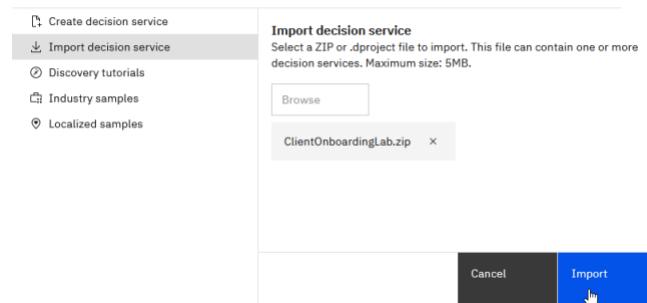
- Select Import decision service to import the decision service provided by the Lab team.

New decision service

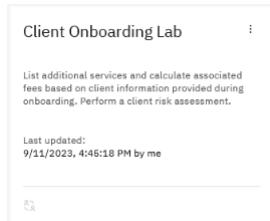


10. Browse to select the project prepared for the Lab **ClientOnboardingLab.zip** and click **Import**.

New decision service



11. A tile of a decision service named **Client Onboarding Lab** appears on the project page.



4.2.3 Exploring a decision operation

To deploy your decision service, you need to define an operation that is used to call the service. The operation includes the name and a reference to a decision model. A decision service must contain at least one decision operation to be deployed and executed. The decision service prepared for the Lab already contains two decision operations **feeAndServices** and **scoreboard**.

1. Click on the tile of the decision service Client Onboarding Lab.
2. Open the **Decision operations** tab to explore the Decision operations:

Business Automations / master / Usr012 Client Onboarding / Client Onboarding Lab					
Models	Data	Decision operations	Create		
Sort by: Name	Search		+ Create		
feeAndServices	feeAndServices	Fee and service...	Me	9/11/2023, 4:46:18 PM	
scoreboard	scoreboard	Scoreboard	Me	9/11/2023, 4:46:18 PM	

3. Click <user> Client Onboarding in the breadcrumbs to return to the project.

For more information, see the IBM Documentation [Creating decision operations](#).

4.2.4 Creating a Git repository

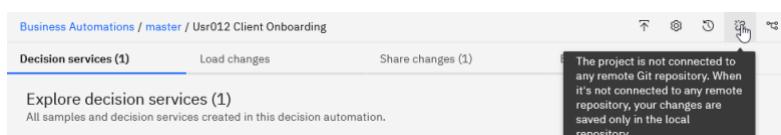
As a prerequisite you must have a GitHub account to do this step.

4. Open [GitHub](#) in your browser, and sign-in with your GitHub credentials.
5. Click the plus (+) button at the upper-right part of the page and select **New repository** to create an empty repository.
6. Give the repository a unique name, and add the following description:
Git repository for the Automation Decision Services Lab
7. Select Private and Click on **Create repository**. (The repository must **not** contain a readme, .gitignore, or license file.)
8. To the right side of the HTTPS URI field, click the copy button, then paste the value in a safe location for use in the next step. The URI has the following format:
<https://github.com/<yourAccountName>/<yourRepoName>.git>
9. Open the drop-down list for your GitHub account in the upper right corner of the page.
10. Click **Settings** and then **Developer settings > Personal access tokens**.
11. You can choose either **Fine-grained tokens** or **Tokens (classic)** based on your preference although **Tokens (classic)** is easier.
12. Enter a name, and make sure it has access to the **repo** scope permissions to give full control of the repository you just created to Automation Decision Services.
13. Click **Generate token** at the bottom of the page. Copy the generated access token before closing this page, then paste the value in a safe location for use in the next step.

4.2.5 Connecting your project to the Git repository

You now manage your project on a Git repository where you will get the history of all changes from Automation Decision Services. Connecting to a Git repository is required to be able to build and deploy archives.

1. Check the status of **Remote Git repository** in the upper right corner of Decision Designer. It shows that the project is not connected. If you do not see this icon, click **<user> Client Onboarding** in the breadcrumbs to return to the project.

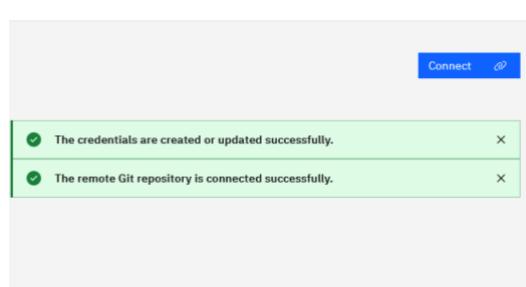


2. Click on this Git connection button to make a connection.
3. Enter the URI you previously saved, select **Username & password**, and enter your Github username and the personal access token you previously saved for the password. Then click on

Connect.

The screenshot shows the 'Connect to a remote Git repository' dialog. It includes fields for 'Repository URI' (https://github.com/XXX), 'Choose credentials type' (radio buttons for 'Use existing credentials' and 'Create or update credentials for the decision automation'), and 'Credentials type' (radio buttons for 'Username & password' and 'SSH key'). The 'Username & password' option is selected, showing fields for 'Username' (MyGitUsername) and 'Password' (redacted). A 'Connect' button is at the top right.

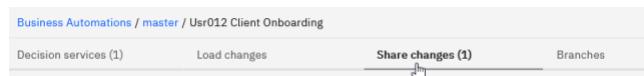
Upon successful connection, Decision Designer displays the following messages and updates the status of the Remote Git repository.



4.2.6 Sharing your decision service

The changes made on a decision service become visible when you share them. You give the access rights in Business Automation Studio to your collaborators.

1. Return to <user> Client Onboarding and click on the Share changes tab.

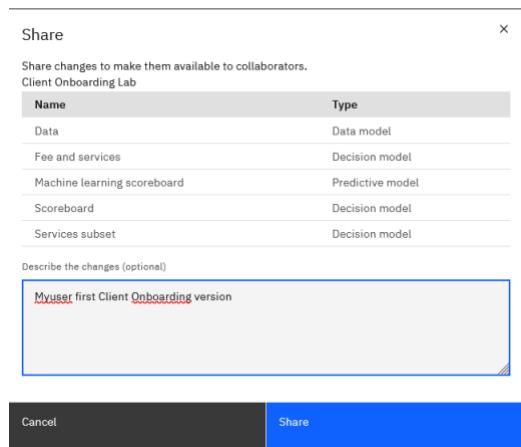


It displays the changes you made to the Decision service and shows the number of changes. You see the artifacts in your decision service and not for your project (the number of changes may be slightly different).

The screenshot shows the 'Share changes' tab with a table of changes. The columns are 'Decision service name', 'Updated artifacts', 'Details', and 'Last updated'. There are five rows of data:

Decision service name	Updated artifacts	Details	Last updated
Client Onboarding Lab	3	Decision service updated	9/12/2023, 2:21:01 PM
Name	Type		
Fee and services	Decision model	Artifact updated	View details
Machine learning scoreboard	Predictive model	Artifact updated	View details
Scoreboard	Decision model	Artifact updated	View details

2. Ensure **Client Onboarding Lab** is selected and click **Share**.
3. Enter a comment to describe the changes (<user> first Client Onboarding version) and then click **Share**.



4. After the changes are shared, there are no pending changes.

Decision services (1) Load changes Share changes Branches View history Deploy >

Share changes Share changes that you made locally with your collaborators.

No pending changes You don't have any changes waiting to be shared. The floor is yours!

Revert changes Share

Sharing changes means that updates done locally are published and visible to other users provided that you give them access.

In this Lab, adding other users is not required. However below is the procedure you would follow.

To share a project with other users, click **Business Automations** in the breadcrumbs or go to **Business automations** from the upper left menu, then select **Decision**.

1. In Business automations you select your project by clicking on your project name. Search if you cannot find it easily.

The screenshot shows the IBM Cloud Pak interface. The left sidebar has a 'Create' button highlighted in blue. Below it are links for 'Published automation services', 'Decision', 'Document processing', 'Workflow', and 'External'. The right panel is titled 'Decision automations (1)' and shows a single item: 'Usr012 Client Onboarding' last edited on 09/13/2023. There is an 'Open' button at the bottom right of the panel.

5. The right-side panel opens with your project details.

The screenshot shows the 'Usr012 Client Onboarding' project details. The right-side panel is open, showing the 'Versions' tab with one version listed: 'Version 1' created on 09/11/2023. There are tabs for 'Collaborators' and 'Automation services' at the top of the panel. A 'Create +' button is visible at the bottom right.

6. Select the **Collaborators** tab. You have Admin permissions on your project by default. To add collaborators, click **Edit**, enter the names of the users you want to add and select the permissions (Admin, Edit or Read).

The screenshot shows the 'Collaborators' tab. A table lists a single collaborator: 'usr012' with 'Admin' permissions. There is an 'Edit' button next to the permissions column.

7. Click **Cancel** (adding users is not covered in this lab).

The screenshot shows the 'Add collaborators' dialog. It includes fields for 'User or group' (with 'usr012' selected), 'Permissions' (set to 'Admin'), and a 'Find collaborators' search bar. At the bottom, there is a 'Cancel' button and an 'Add (0)' button.

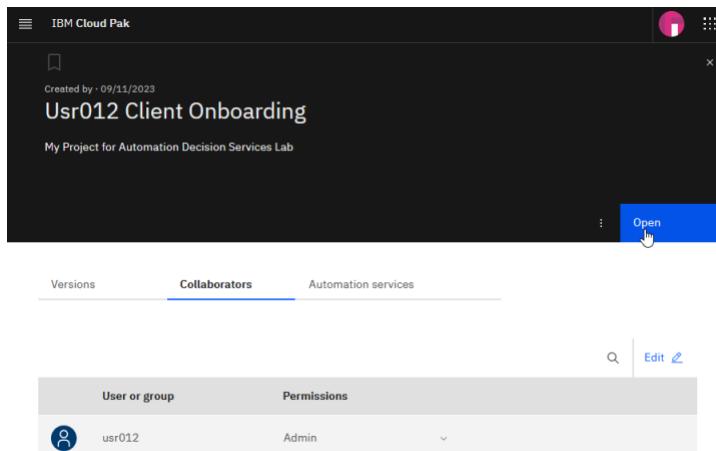
4.2.7 Creating a version

To deploy your decision service, you need to create a version of the current content. Versions correspond to tags in Git. A version is a snapshot of the project and records a point-in-time of the decision services within the project.

Creating versions requires one of the following permissions in the project:

- **Admin** - Administrative privileges
- **Edit** - Write permission

1. Return to your project by clicking on **Open** if you see the following screen. Otherwise navigate from the upper left menu.



2. Open the **View history** tab.

It shows all the changes made to the project. You may have a slightly different amount of history for your project.

The screenshot shows the 'View history' tab with three entries. The first entry is '9/13/2023, 10:20:19 AM' by 'usr012 first Client Onboarding versi...'. The second entry is '9/8/2023, 3:09:41 PM' by 'Myuser first Client Onboarding'. The third entry is '8/29/2023, 2:24:59 PM' by 'initial commit'. The second entry is highlighted with a blue border. To its right are 'Restore' and 'Version +' buttons. The 'View history' tab is selected at the top.

3. In the row for the most recent version, click the **Version +** button at the right.
4. Enter a name for this version, it is recommended to add your user number to the name such as v1.1usr012) and a description.

The screenshot shows a 'Create a version' dialog. It has fields for 'Name' (containing 'v1.1usr012') and 'Description (optional)' (containing 'My first version'). There are 'Cancel' and 'Create' buttons at the bottom, with a mouse cursor hovering over the 'Create' button.

5. Click **Create**.

A new version is created:

View history (3)			
Last shared	Shared by	Versions	
9/13/2023, 10:20:19 AM usr012 first Client Onboarding versi...	usr012	v1.1usr012 X	Restore ⏪ Version +
9/8/2023, 3:09:41 PM My user first Client Onboarding	usr011	v1.1usr011 X	Restore ⏪ Version +
8/29/2023, 2:24:59 PM initial commit	usr011	No version is created	Restore ⏪ Version +

You are now ready to deploy your version.

4.2.8 Deploying your project

You build and deploy your decision service directly in Automation Decision Services. A decision service archive is built from your decision service and is deployed to the decision runtime in the deployment space ID named ‘embedded’. It is then ready to be published as an automation service.

- Click the **Deploy** tab and expand the version you created in the previous section.

Note: in this example the name of the version is v1.1usr012 but in your exercise you added your user number as the name of the version.

Version	Shared on	Shared by
v1.1usr012 My first version	9/13/2023, 10:59:51 AM	usr012
Decision service	Deployment status	Decision ID
Client Onboarding Lab	Not deployed	-
		Undeploy
		Deploy

- Click **Deploy** and **Deploy** again in the confirmation window. This triggers a build and deployment through the embedded repository for runtime archives. Wait for the deployment to finish (it could take a few minutes).
- Once completed, you can check the logs by clicking the **View logs button** in the Deployment status.

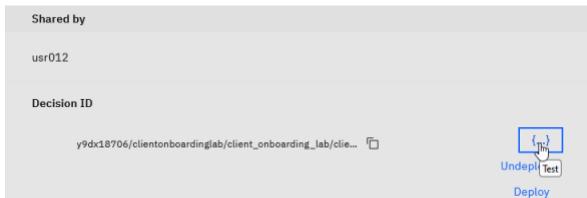
Version	Shared on	Shared by
v1.1usr012 My first version	9/13/2023, 10:59:51 AM	usr012
Decision service	Deployment status	Decision ID
Client Onboarding Lab	Deployed on 9/13/2023, 11:05:23 AM	y9dx18706/clientonboardinglab/client_onboarding_lab...

Note that a **Decision ID** was added. The decisionID parameter is required to call the decision service in the runtime service. It provides the decision path to the generated decision service archive.

4.2.9 Executing your decision through the ADS runtime

To directly execute your decision in the ADS runtime:

1. Click {...} next to the decision id. This opens the Swagger UI tool dedicated to the REST API generated for your decision service archive.



2. Expand POST /feeAndServices/execute, click **Try it out**, and enter the following JSON:

```
{  
  "client": {  
    "annualRevenue": 27500000,  
    "companyAge": 25,  
    "defaultedPayment": false,  
    "numberOfEmployees": 350  
  },  
  "services": {  
    "servicesRequested": [  
      "Employee Benefits Plan",  
      "Mental Health Care",  
      "Onsite Medical Testing",  
      "Virtual Medical Assistance"  
    ],  
    "Industry": "Healthcare"  
  }  
}
```

3. Click **Execute**.

4. Scroll down to **Server response** and see the **Code is 200** and the **Response body**:

```
{  
  "extendedServices": [],  
  "servicesFee": 47500  
}
```

Note: You may get a different result if you did not do Exercise 1.

4.2.10 Publishing your decision service through Business Automation Studio

To publish the deployed version of your decision service into the catalog of Automation Services, follow the below procedure.

1. Close the Swagger UI browser window.
2. Click on **Business Automation** in the breadcrumbs.



- Select the **Versions** tab, click the 3 dots menu, and then click **Publish**.

Version	Created	Status	Notes
v1.1usr012	9/13/2023	Published	My first version
v1.1usr011	9/8/2023	First version	

- The next dialog lets you set users or group permissions to use or administer the automation service once published. Set **Restrict access** to On to prevent exposing your service to all other users on the cluster, and then click **Publish**.

Publish automation services

Decide who can see these services.

Version name: v1.1usr012

Automation services: Client Onboarding Lab

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	Role
usr012	Admin

Cancel Publish

After a few moments, the **Status** is updated to Published.

Version	Created	Status	Notes
v1.1usr012	9/13/2023	Published	My first version

- Navigate using the left arrow in the upper left of the Business Automation Studio

IBM Cloud Pak

Decision automations (1)

Back Client Onboarding

- Expand the **Published automation services** list to see your published service.

The screenshot shows the IBM Cloud Pak interface for Business automations. At the top, there's a navigation bar with the IBM Cloud Pak logo. Below it, the title "Business automations" is displayed. A descriptive text explains that you can create or reuse automations for business purposes. There are buttons for "Create" and "Import". On the left, a sidebar says "Published automation services" and has a refresh icon. The main area shows a table titled "Published (5)" with the following data:

Client Onboarding Lab	Decision	Published 09/13/2023
Client Onboarding Lab	Decision	Published 09/08/2023
Client_Onboarding_Workflows	Workflow	Published 09/04/2023
Client_Onboarding_Workflows_External	External workflow	Published 08/28/2023
Client Onboarding Decisions	Decision	Published 08/22/2023

Once the archive is published as an automation service, you can execute it in other Cloud Pak for Business Automation capabilities. Look at the Workflow and Business Automation Application labs to learn how to work with published decisions.

4.3 Summary

You completed Exercise 3 - Sharing and publishing decision service.

- You made updates to your decision services visible for other collaborators by sharing the changes.
- You connected your decision project to a Git repository.
- You created a version and explored the procedure to deploy and publish a decision service.

Congratulations on completing the lab!

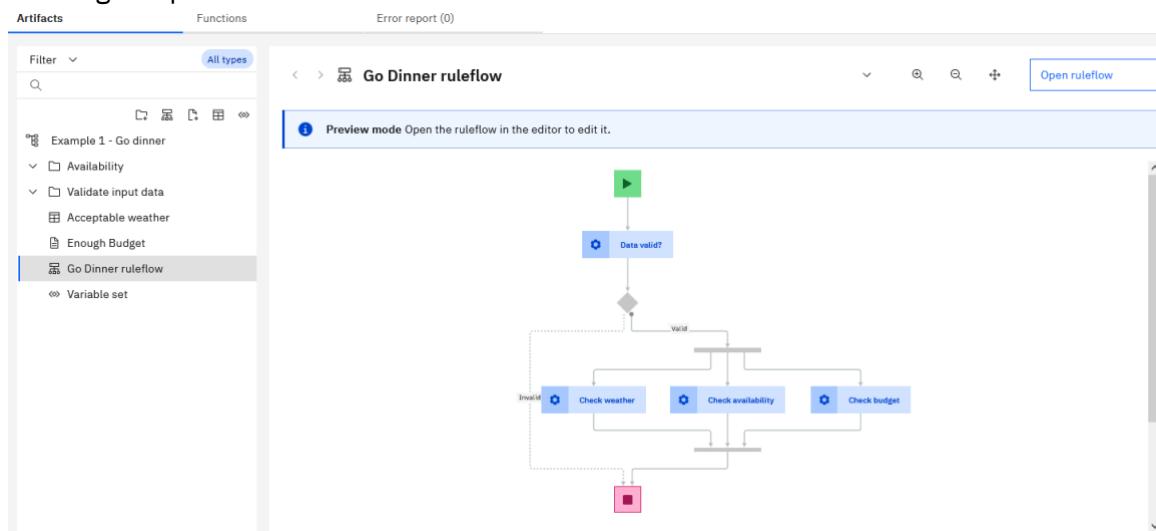
5 Additional information

5.1 Explore the Samples

Samples and tutorials for Automation Decision Services

[Samples and tutorials in GitHub](#)

The repository of decision services includes the Training sample, which has several decision services to introduce the main features in Automation Decision Services: diagrams, business rules, decision tables, rule policies, and data and task models. The sample includes a series of decision models that gradually increase in complexity in defining a decision service. The following image shows a task model from the Training sample:



5.2 Consult Documentation and Communities

IBM Documentation

[IBM Automation Decision Services](#)

[What is Automation Decision Services](#)

IBM Business Automation Community

[Decision Management](#)

DMN

[Decision Model and Notation](#)