SAS® Workflow Manager 2.1: Quick Start Tutorial

Overview

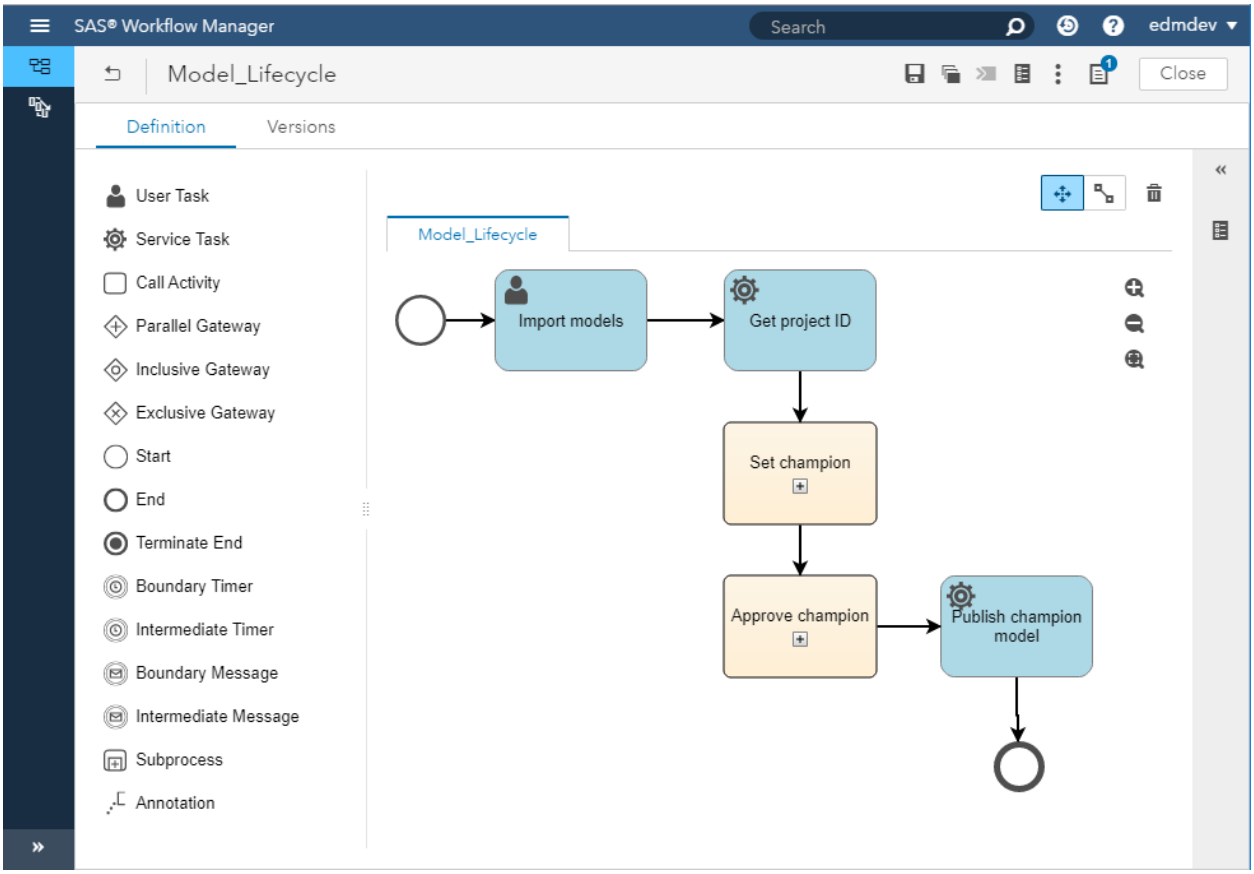
This Quick Start tutorial introduces the workflow design features of SAS Workflow Manager. It covers the most common tasks that you use to create and enable your own workflows.

In this tutorial, you create a workflow that can be used to manage the training and evaluation of models. This workflow is designed to work with models in SAS Model Manager. The workflow includes tasks for importing models, setting champion and challenger models, approving the champion model, and publishing the champion model for a project in SAS Model Manager. See *SAS Model Manager: User's Guide* for more information.

Note: In order to complete the tasks in this tutorial, your user ID must be a member of the SAS Workflow Editors group. For more information, see "Manage Permissions" in SAS Workflow Manager: Administrator's Guide.

The final workflow diagram is shown in Figure A.1 on page 2.

Figure A.1 *Workflow Diagram for the Model Life Cycle Workflow*



To create the model lifecycle workflow, complete the following steps:

1 Sign in to SAS Workflow Manager.

2 Create a new workflow definition.

3 Set the client identifier and define data objects that are needed by the workflow.

4 Add a prompt to the Start element.

5 Define the workflow activities:

   a Import models.

   b Get the project ID.

   c Specify the champion model.

   d Approve the champion model.

   e Publish the champion model.

6 Link the workflow elements with sequence flows.

7 Create a numbered version of the workflow and enable the workflow version.

Sign in to SAS Workflow Manager

Note: If you are already signed in to SAS Home, you can access SAS Workflow Manager by clicking **Manage Workflows**.

To sign in to SAS Workflow Manager:

1. In the address bar of your web browser, enter the URL for SAS Workflow Manager and press **Enter**. The Sign In page appears.

   Note: Contact your system administrator if you need the URL for SAS Workflow Manager. The default URL is http://*host_name*/SASWorkflowManager.

2. Enter a user ID and password.
3. Click **Sign In**.

Create a New Workflow Definition

1. In the Definitions category view, click **New Definition**. The New Definition window appears.
2. Enter `Model_Lifecycle` for the name.
3. For the description, enter `Sample workflow for performing actions in SAS Model Manager.`
4. Click **OK**. SAS Workflow Manager opens the new workflow.

   A workflow definition must always contain Start and End elements.

5. Drag the **Start** element from the list of objects onto the diagram.
6. Drag the **End** element from the list of objects onto the diagram.
7. Click to save the workflow definition.

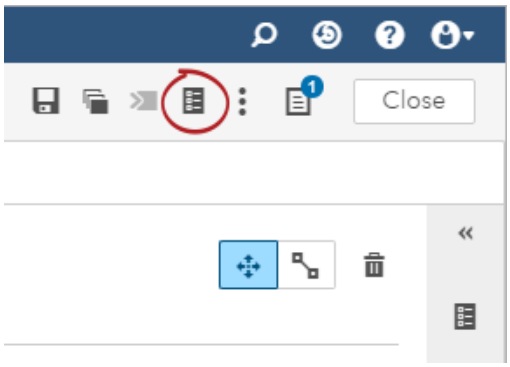
Set the Client Identifier and Define Data Objects

Set the Client Identifier

The client identifier denotes the application that starts the workflow. You must specify a client identifier for a workflow definition before it can be enabled.

1. Click in the upper right of the window.

4



The Definition Properties window appears.

2 Select **SAS Model Manager** for the client identifier.

Define the Data Objects Needed by the Workflow

You can define data objects at the same time that you define the workflow activities, or you can define data objects in the Definition Properties window. In this tutorial, you define the data objects needed by all of the activities in the workflow in the Definition Properties window.

For each data object listed in Table A.1:

3 Click . The New Data Object window appears.

4 Enter the name of the data object.

5 Select the data type for the data object.

6 Enter the value of the data object if a value is shown in the table. For the `Approver_List` enter your user ID.

> **TIP** Data objects do not require an initial value. Values can be assigned to data objects as the workflow activities execute.

7 Click **Save** to close the New Data Object window.

Table A.1 *Data Objects for the Model_Lifecycle Workflow*

Name	Type	Value	Description
Approved	Boolean	False	Whether a champion model has been approved.
Approval_Count	Decimal	1.0	The number of models that have been approved.
Approver_List	Character	*your user ID*	The list of users who have permission to approve a champion model.
Champion_ID	Character		The ID of the champion model.
Model_List	Character		The list of models in the project.
Model_Name	Character		The name of the model that is being published.
Project_ID	Character		The ID of the project.
Project_Name	Character		The name of the project.

Name	Type	Value	Description
Publishing_Destination	Character		The destination to which the champion model is published. The destinations that are available are determined by your system administrator.

8 Click **OK** to close the Definition Properties window.

9 Click to save the workflow definition.

Add a Prompt to the Start Node

In order for the workflow to prompt the user for information, you must define a prompt at the point where you want the workflow to request the information. For the Model_Lifecycle workflow, the workflow needs to prompt the user to enter the name of the project for which they want to set the champion model.

1 Select the Start node, and click « to open the **Properties** pane.

> **TIP** Click « and » to show and hide the properties panes. To display the **General Properties** pane for a task, click . To display the **Participants** pane for user tasks, click . To display the **Action** pane for service tasks, click .

2 Click to display the **Prompts** properties pane.

3 Click . The New Prompt window appears.

4 Enter `Project name` for the display text.

5 Select **Project_Name** for the data object.

When a new instance of the Model_Lifecycle workflow starts, it prompts the user to enter a project name and stores the user's answer in the **Project_Name** data object.

6 Click **OK** to close the New Prompt window.

Displa...	Data O...	Values
Project name	Project_ Name	[]

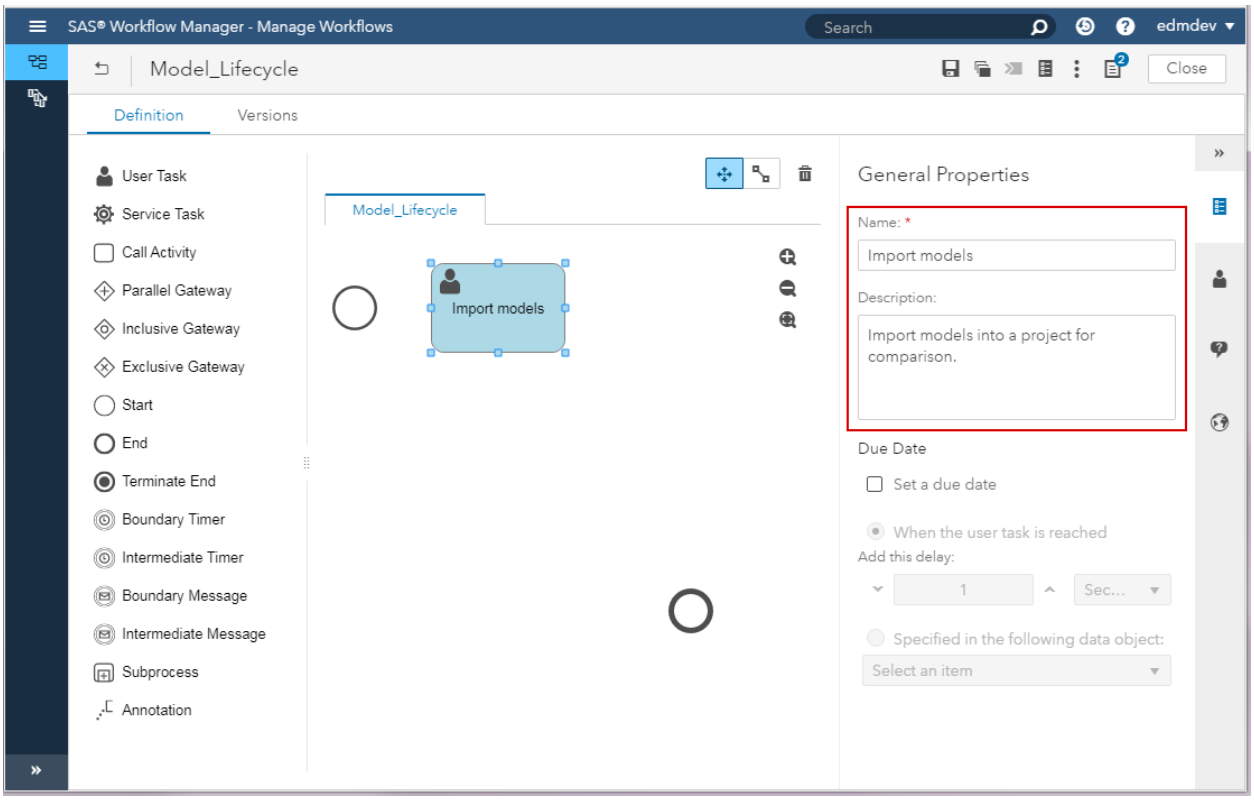
7 Click to save the workflow definition.

Define the Import Models User Task

1 Drag the **User Task** element from the list of objects onto the diagram.

2 On the **General Properties** pane for the task, enter `Import models` for the task name.

3 For the task description, enter `Import models into a project for comparison.`



4 On the **Participants** pane for the task, select **Listed in this table**.

5 Click . The Add a Participant window appears.

6 Select **Potential Owner** for the workflow role.

7 Select **Group name** for the identity, and click . The Select Identity window appears.

8 In the search field, type `workflow` to display a list of matching names.

> **TIP** You can enter `*` (an asterisk) to display a list of all available identities.

9 Select **SAS Workflow Process Administrators** from the list, and click **OK** to close the Select Identity window.

10 Click **OK** to close the Add a Participant window.

11 Click to save the workflow definition.

Define the Get Project ID Service Task

The Get Project ID service task defines a REST web service. This web service retrieves the ID of the project that the user enters in answer to the prompt on the Start node.

1 Drag the **Service Task** element from the list of objects onto the diagram.

2 On the **General Properties** pane for the task, enter `Get project ID` for the task name.

3 Click to display the **Action** pane for the task. The default action is **Invoke REST web service**.

> **TIP** For this tutorial, you define a service task that invokes a REST web service. For other workflow definitions, if you select a different action, you must click **Choose** to display the correct fields for the selected action.

4 Enter `/modelRepository/projects?name=${Project_Name}` for the URL.

> **TIP** The URLs in service tasks are case sensitive.

5 Select **GET** for the method.

6 Click above the HTTP request headers table. The New Header window appears.

7 Enter `Accept` for the name of the header field.

8 Enter `application/json` for the value of the header field.

9 Click **OK** to close the New Header window.

10 Enter `200` for the expected result code.

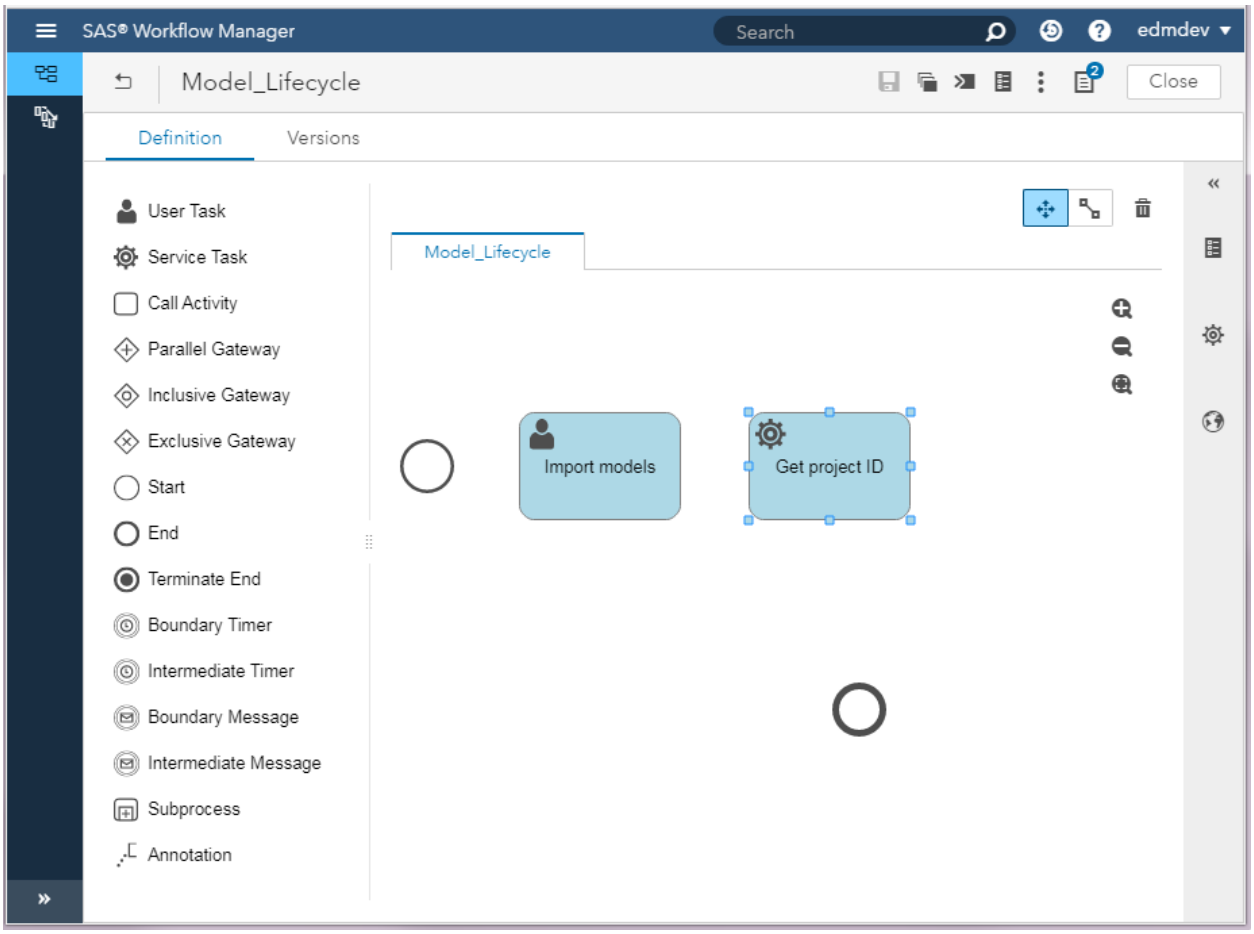
11 Select **JSON** for the output type.

12 For the output data objects, click above the output data objects table. The Add an Output Data Object window appears.

13 Select **Project_ID** for the name.

14 Enter `items[0].id` for the result field, and then click **OK** to close the Add an Output Data Object window.

15 Click to save the workflow definition.



Define the Set Champion Subprocess

To define the Set Champion subprocess, you complete the following steps:

1 Create a new subprocess.

2 Add a user task for selecting the champion and challenger models.

3 Add a service task that retrieves the ID of the champion model.

4 Add an exclusive gateway, and connect the subprocess elements with sequence flows.

5 Add a link condition on the link from the gateway back to the Set Champion and Challenger Models task.

6 Verify the order of the outgoing sequence flows for the gateway.

Create a New Subprocess

1 Drag the **Subprocess** element from the list of objects onto the diagram.

2 On the **General Properties** pane for the subprocess, enter `Set champion` for the name.

3 For the description, enter `Set a model as the project champion.`

4 Click ⊞ to open the subprocess in a new tab.

A subprocess must always contain Start and End elements.

5 Drag the **Start** element from the list on the left onto the diagram.

6 Drag the **End** element from the list on the left onto the diagram.

7 Click to save the workflow definition.

Add the Select Champion and Challenger Models User Task

8 Drag the **User Task** element from the list of objects onto the diagram.

9 On the **General Properties** pane for the task, enter `Set champion and challenger models` for the task name.

10 For the task description, enter `Set the champion and challenger models for the project.`

11 Select **Set a due date** and **When the user task is reached**.

12 Under **Add this delay**, select **5 days**.

13 On the **Participants** pane for the task, select **Listed in this table**.

14 Click . The Add a Participant window appears.

15 Select **Potential Owner** for the workflow role.

16 Select **Group name** for the identity, and click . The Select Identity window appears.

17 In the search field, type `workflow` to display a list of matching names.

> **TIP** You can enter `*` (an asterisk) to display a list of all available identities.

18 Select **SAS Workflow Process Administrators** from the list, and click **OK** to close the Select Identity window.

19 Click **OK** to close the Add a Participant window.

Add the Get Champion Model Service Task

20 Drag the **Service Task** element from the list of objects onto the diagram.

21 On the **General Properties** pane for the task, enter `Get champion model` for the task name.

22 Click to display the **Action** pane for the task. The default action is **Invoke REST web service**.

> **TIP** For this tutorial, you define a service task that invokes a REST web service. For other workflow definitions, if you select a different action, you must click **Choose** to display the correct fields for the selected action.

23 Enter `/modelRepository/projects/${Project_ID}/champion` for the URL.

24 Select **GET** for the method.

25 Click above the HTTP request headers table. The New Header window appears.

26 Enter `Accept` for the name of the header field.

27 Enter `application/vnd.sas.models.model+json` for the value of the header field.

28 Click **OK** to close the New Header window.

29 Enter `200` for the expected result code.

30 Select **JSON** for the output type.

31 For the output data objects, click above the output data objects table. The Add an Output Data Object window appears.

32 Select **Champion_ID** for the name.

33 Enter `id` for the result field, and then click **OK** to close the Add an Output Data Object window.

34 Click to save the workflow definition.

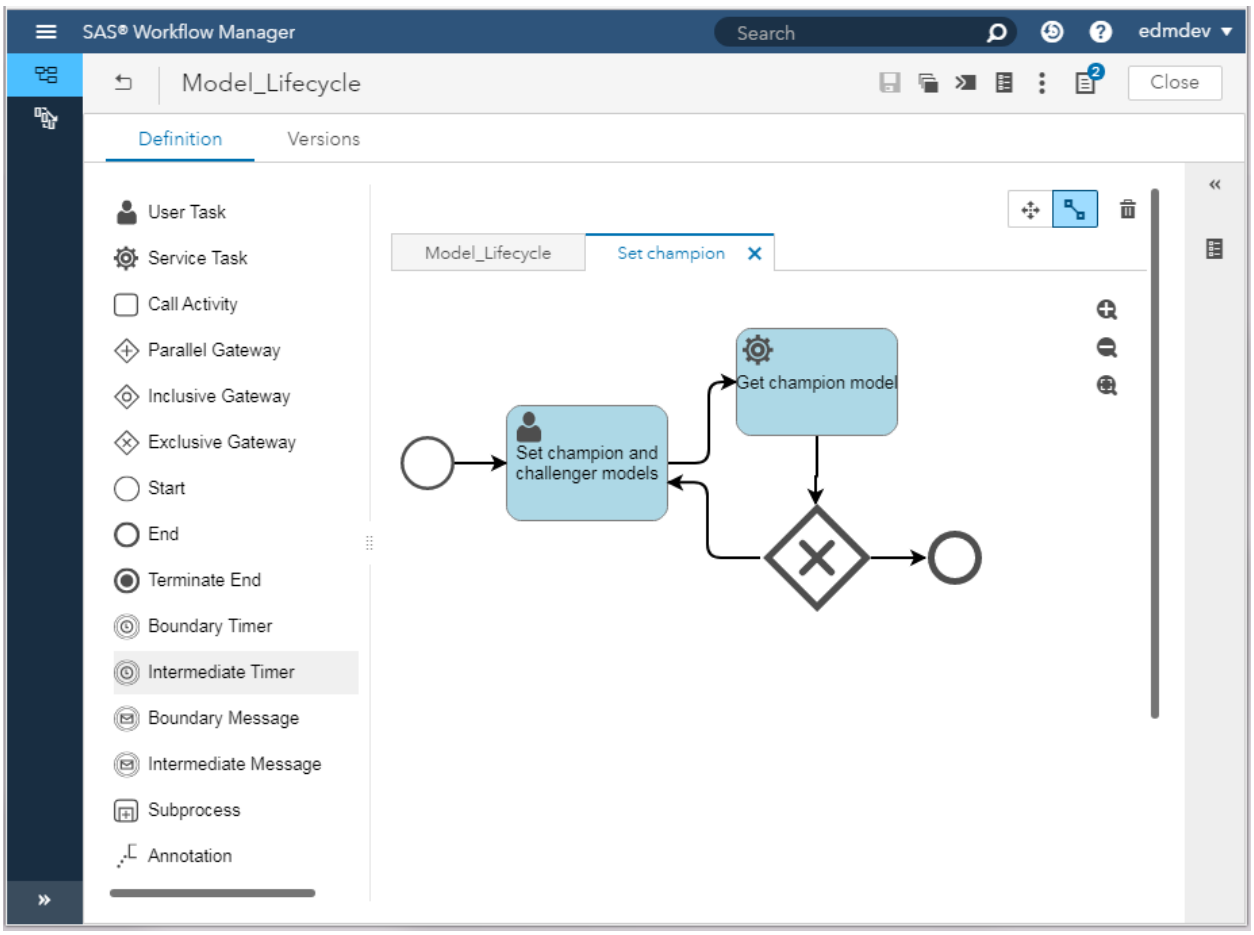
Add a Gateway and Connect the Elements with Sequence Flows

35 Drag the **Exclusive Gateway** element from the list of objects onto the diagram.

36 Click to enable link mode.

37 Connect the workflow elements as shown in Figure A.2 on page 10. To connect two elements, drag the cursor from the first element to the second element.

Figure A.2 *Diagram for the Specify Champion Subprocess*

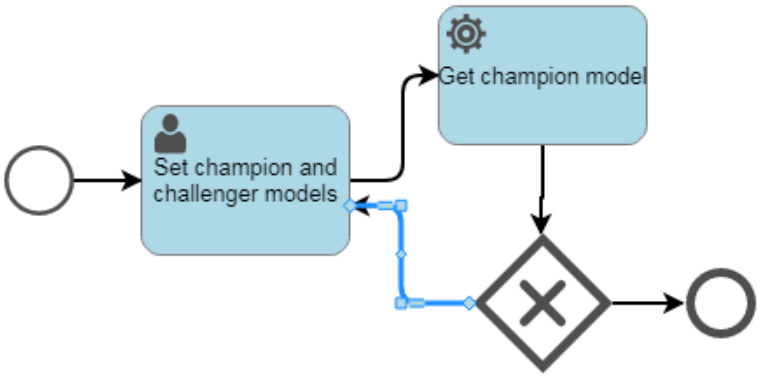


TIP To move a workflow element that is already in the diagram, click to enable move mode, and drag the workflow element as needed.

Specify the Link Condition and Verify the Link Order

If the Get Champion Code service task fails, the Champion_ID data object is null. In this case, workflow execution needs to return to the Set Champion and Challenger Models task. To enable this behavior, you add the condition expression `Champion_ID==""` on the link between the exclusive gateway and the Set Champion and Challenger Models task.

38 Select the link from the gateway to the **Set champion and challenger models** task.



39 Click ≡ to display the **Condition** property pane for the selected link.

40 Select **Champion_ID** for the data object, and click ⬇ to add the data object name to the **Condition** field.

41 Select **==** for the operator, and click ⬇ to add the operator to the **Condition** field.

42 Enter a null string (**""**) in the **Condition** field.

Verify the Gateway Link Order

With an exclusive gateway, only one outgoing sequence flow is executed. All outgoing sequence flows are evaluated in the order in which they are defined. Only the first sequence flow whose condition evaluates to True is taken.

If an outgoing sequence flow does not have a condition expression associated with it, it becomes the default sequence flow. This default sequence flow is executed if the condition expressions on all other outgoing sequence flows evaluate to False. A sequence flow that does not have any condition expressions associated with it must be the last sequence flow that is defined for the gateway.

The gateway in this subprocess has two outgoing sequence flows: one from the gateway back to the first task in the subprocess, and a default flow from the gateway to the End node. To verify that the order of sequence flows for the gateway is correct:

43 Select the gateway in the diagram.

44 Click to display the **Conditions** property pane. This property pane displays the list of condition expressions for the outgoing sequence flows of the gateway.

Conditions

Condition	Endpoint
Champion_ID=="""	Set champion and challenger models
	End

The default sequence flow is correctly listed last in the **Conditions** table.

> **TIP** If an exclusive gateway has additional conditions, you might need to reorder the conditions. To move a condition up or down in the list, select the conditions, and click one of the arrows beside the table.

45 Click to save the workflow definition.

46 Click × on the **Set champion** tab to close the tab for the subprocess.

Define the Approve Champion Subprocess

To define the Approve Champion subprocess, you complete the following steps:

1 Create a new subprocess.

2 Add a user task for reviewing the champion model.

3 Add a user task for approving the selection of the champion model.

4 Add a boundary timer to the Approve Champion Model task.

5 Connect the subprocess elements with sequence flows.

Create a New Subprocess

1 Drag the **Subprocess** element from the list of objects onto the diagram.

2 On the **General Properties** pane for the subprocess, enter `Approve champion` for the task name.

3 For the subprocess description, enter `After the champion has been set, request a review of the model to have it approved for publishing.`

4 Click to open the subprocess in a new tab.

5 Drag the **Start** element from the list of objects onto the diagram.

6 Drag the **End** element from the list of objects onto the diagram.

Add the Request Champion Approval User Task

7 Drag the **User Task** element from the list of objects onto the diagram.

8 On the **General Properties** pane for the task, enter `Request champion approval` for the task name.

9 For the task description, enter `After the champion has been set, request that the model be approved.`

10 On the **Participants** pane for the task, select **Listed in this table**.

11 Click . The Add a Participant window appears.

12 Select **Potential Owner** for the workflow role.

13 Select **Group name** for the identity, and click . The Select Identity window appears.

14 In the search field, type `workflow` to display a list of matching names.

> **TIP** You can enter `*` (an asterisk) to display a list of all available identities.

15 Select **SAS Workflow Process Administrators** from the list, and click **OK** to close the Select Identity window.

16 Click **OK** to close the Add a Participant window.

Add the Approve Champion Model User Task

17 Drag the **User Task** element from the list of objects onto the diagram.

18 On the **General Properties** pane for the task, enter `Approve champion model` for the task name.

19 For the task description, enter `Approve the model for publishing. A reminder will be sent if approval is not received within two days.`

20 Select both **Set a due date** and **When the user task is reached**.

21 Under **Add this delay**, select **2 Days**.

22 On the **Participants** pane for the task, select **Listed in this table**.

23 Click . The Add a Participant window appears.

24 Select **Potential Owner** for the workflow role.

25 Select **Group name** for the identity, and click . The Select Identity window appears.

26 In the search field, type `workflow` to display a list of matching names.

> **TIP** You can enter `*` (an asterisk) to display a list of all available identities.

27 Select **SAS Workflow Process Administrators** from the list, and click **OK** to close the Select Identity window.

28 Click **OK** to close the Add a Participant window.

29 Click to display the **Prompts** properties pane.

30 Click . The New Prompt window appears.

31 Enter `Model name` for the display text.

32 Select **This value is required**.

33 Select **Model_Name** for the data object.

34 Click **OK** to close the New Prompt window.

Displa...	Data O...	Values
Model name	Model_Name	[]

35 Click . The New Prompt window appears.

36 Enter `Publishing destination` for the display text.

37 Select **This value is required**.

38 Select **Publishing_Destination** for the data object.

39 Click **OK** to close the New Prompt window.

Displa...	Data O...	Values
Model name	Model_Name	[]
Publishing destination	Publishing_Destination	[]

When the Approve Champion Model task starts, it prompts the user to enter the model name and publishing destination. It stores the user's answers in the **Model_Name** and **Publishing_Destination**data objects.

Add a Boundary Timer

A boundary timer enables you to put a time limit on an activity. When the time limit is reached, the timer fires, and the outgoing sequence flows are executed.

For this workflow, you define a boundary timer with a recurrence interval of two days. Each time the timer fires, it triggers a service task that sends a reminder email to the list of individuals who can approve the model. The timer continues to fire until the Approve Champion Model task is completed.

40 Drag the **Boundary Timer** element from the list of elements onto the **Approve champion model** task.

41 For the description, enter `When this timer triggers, send a reminder email to the list of approvers.`

42 Click to display the **Time** property pane.

> **TIP** When you first add a boundary timer, the property pane automatically displays the properties for the boundary timer. To display or edit the properties of a boundary timer later, right-click the boundary timer, and select **Set Properties**.

43 Clear the **Cancel the activity** check box.

44 Clear the **This event occurs only once** check box.

45 Set the **Recurrence interval** to `2 Days`.

Use the default values for the remaining boundary timer options.

Add the Send Reminder Service Task

The Send Reminder service task is triggered by the boundary timer. It sends the reminder email to the list of approvers.

46 Drag the **Service Task** element from the list of objects onto the diagram.

47 On the **General Properties** pane for the task, enter `Send reminder` for the task name.

48 For the task description, enter `Send an email reminder to the owner of the approval task.`

49 On the **Action** properties pane for the task, select **Send email** as the action, and click **Choose** to display the correct fields for the selected action.

50 To specify the list of recipients for the email, select **Listed in this data objects**, and select **Approver_List** for the data object.

51 Enter `Model requires approval` for the email subject.

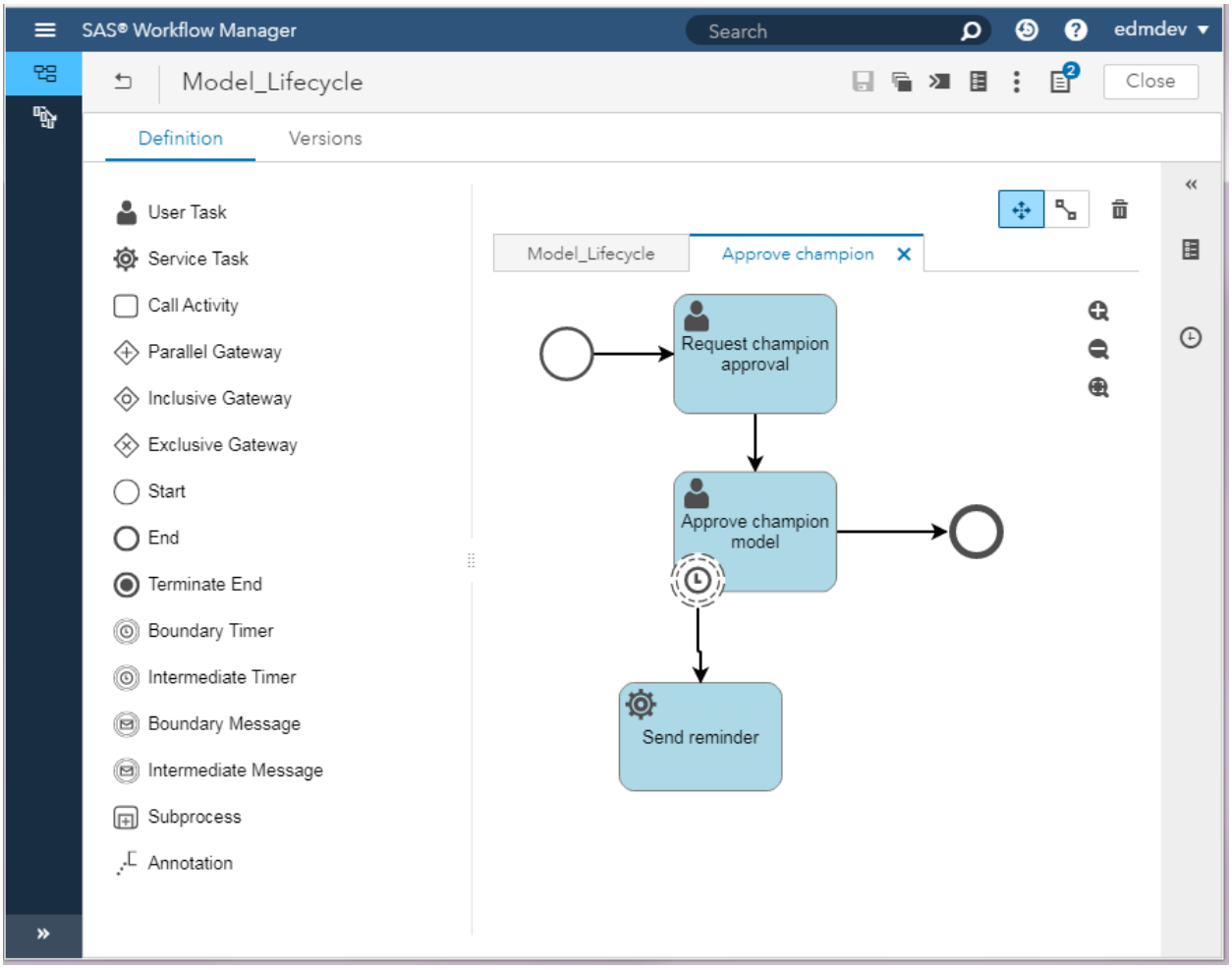
52 In the **Message** field, enter `A model is waiting for your approval.`

Connect the Elements with Sequence Flows

53 Click to enable link mode.

54 Connect the workflow elements as shown in Figure A.3 on page 16. To connect two elements, drag the cursor from the first element to the second element.

Figure A.3 Diagram for the Approve Champion Subprocess



55 Click 🖫 to save the workflow definition.

56 Click × on the **Approve champion** tab to close the tab for the subprocess.

Define the Publish Champion Model Service Task

This task defines a REST web service that publishes the champion model to the destination specified by the Publishing_Destination data object.

1 Drag the **Service Task** element from the list of objects onto the diagram.

2 On the **General Properties** pane for the task, enter `Publish champion model` for the task name.

3 Click ⚙ to display the **Action** pane for the task. The default action is **Invoke REST web service**.

> **TIP** For this tutorial, you define a service task that invokes a REST web service. For other workflow definitions, if you select a different action, you must click **Choose** to display the correct fields for the selected action.

4 Enter `/modelManagement/publish?force=true` for the URL.

5 Select **POST** for the method.

6 Add the HTTP request header fields. For each field listed in Table A.2:

   a Click above the HTTP request headers table. The New Header window appears.

   b Enter the name and value of the header as shown in the table.

   c Click **OK** to close the New Header window.

Table A.2 HTTP Request Header Keys

Name	Value
Accept	*/*
Content-type	application/vnd.sas.models.publishing.request+json

7 Enter `201` for the expected result code.

8 Select **JSON** as the input type.

9 Click above the **Input body** field. The Input Body window appears.

10 Copy and paste the following text into the Input Body window:

```
{
"name":"Published model ${Model_Name}",
"notes":"Publish models",
"modelContents": [{
"modelName": "${Model_Name}",
"sourceUri": "/modelRepository/models/${Champion_ID}"
}],
"destinationName": "${Publishing_Destination}"
}
```

11 Click **OK** to close the Input Body window.

12 Select **JSON** for the output type.

13 Click to save the workflow definition.

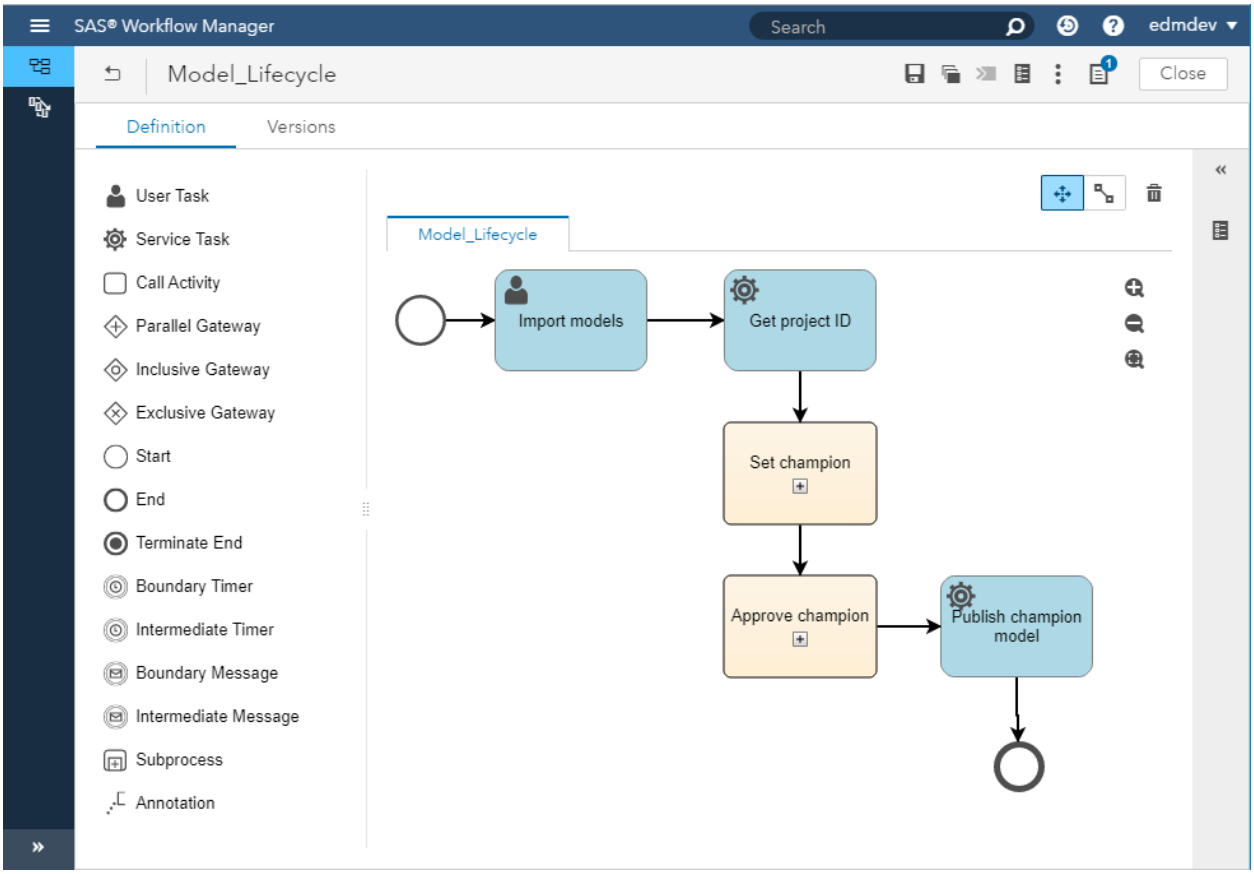
Link the Model_Lifecycle Elements

The final step in defining the Model_Lifecycle workflow is to link all of its elements together with sequence flows.

1 Click to enable link mode.

2 Connect the workflow elements as shown in Figure A.4 on page 18. To connect two elements, drag the cursor from the first element to the second element.

Figure A.4 *Final Model_Lifecycle Workflow Diagram*



3 Click to save the workflow definition.

Create a Version and Enable the Workflow Version

To enable a workflow, you must create a static read-only version of the workflow definition. After a workflow is enabled, other SAS applications can start new instances of the workflow definition.

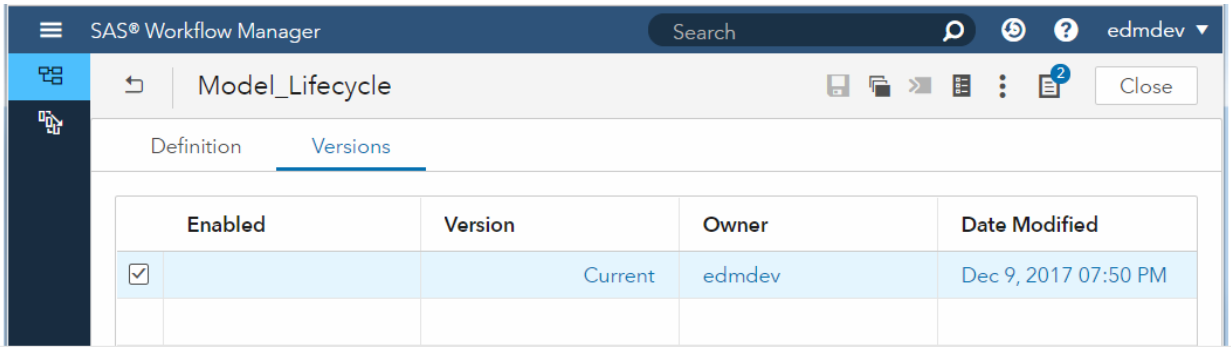
When you save changes to a workflow definition, SAS Workflow Manager saves your changes to a draft that is labeled **Current** on the **Versions** tab. The only version of a workflow definition that you can edit is the current version. When you create a new version, the current version is assigned a version number and becomes a static read-only version. The next time you edit the definition and save your changes, SAS Workflow Manager creates a new **Current** version.

Only a static read-only version of a workflow definition can be enabled, and only one version of a workflow definition can be enabled at a time. If a version of a workflow is already enabled, and you enable a different version, the previously enabled version is disabled and cannot be used by other applications.

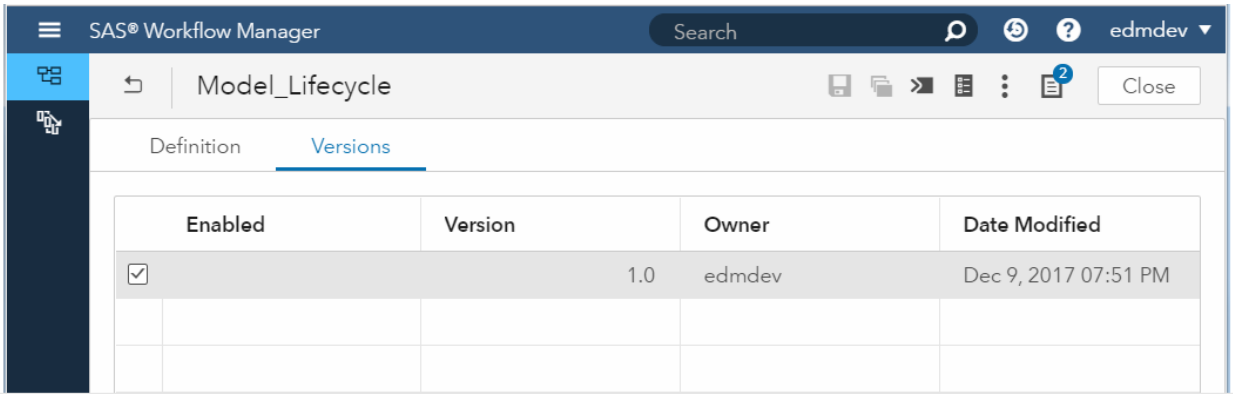
To enable the Model_Lifeycle workflow:

1 Click the **Versions** tab.

   SAS Workflow Manager has saved your workflow definition as the **Current** version.

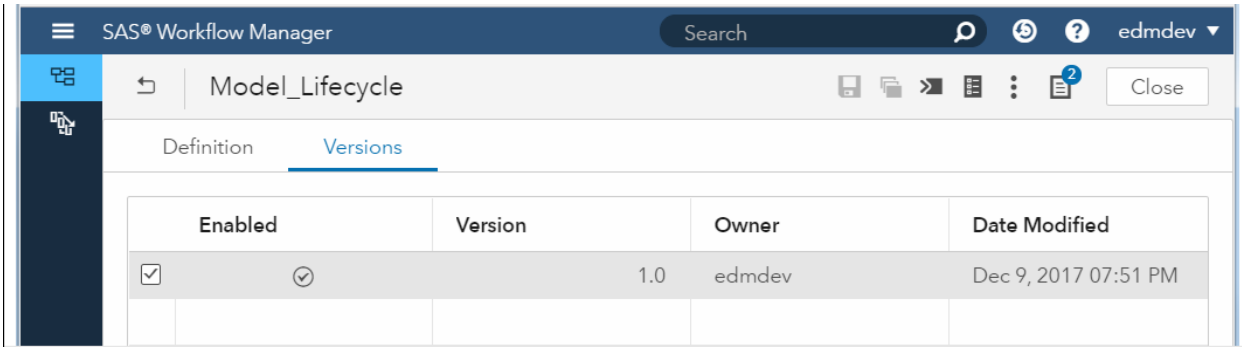


2 Click to create a static numbered version of the workflow definition. SAS Workflow Manager assigns the number 1.0 to the version.



3 Click to enable version 1.0 of the workflow definition.

The check mark in the **Enabled** column indicates the version that is enabled.



TIP If your workflow has multiple versions, you can view different versions by selecting the version on the **Versions** page, and then clicking the **Definitions** tab. The selected check box indicates the version that is displayed on the **Definitions** tab.

4 Click **Close** to close the workflow definition.

Running the Model_Lifecycle Workflow

The Model_Lifecycle workflow in this tutorial is designed to work with SAS Model Manager.

- The Model_Lifecycle workflow can be started only from SAS Model Manager.
- In order to complete the tasks in this workflow in SAS Model Manager, your user ID must be a member of the SAS Workflow Process Administrators group. For more information, see "Manage Permissions" in SAS Workflow Manager: Administrator's Guide.
- Your system administrator must define the publishing destination that is specified in the Publishing_Destination data object in order for the Publish Champion Model service task to run successfully. For more information, see "Configuring Publish Destinations" in SAS Model Manager: Administrator's Guide.
- When you run this workflow in SAS Model Manager, the models that are imported with the Import Models user task must have a score code type that is compatible with the publishing destination. For more information, see "Set Model General Properties" in SAS Model Manager: User's Guide.

For additional information, see "Using SAS Workflow with SAS Model Manager" in SAS Model Manager: User's Guide.

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