How to Model Multi-Party Service in SoaML?

Written Date : September 4, 2013

What is this Tutorial About?

This tutorial explains what a multi-party service is in terms of SoaML and how to specify such a service with various SoaML diagrams in Visual Paradigm.

The example used in this tutorial is about paying tax through an online bank account. You will draw different SoaML diagrams to specify the tax payment service.

Preparation

To complete this tutorial, make sure you have Visual Paradigm downloaded and installed. Click here to download Visual Paradigm if you do not have it.

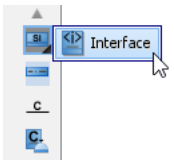
You are expected to have a basic understanding of SOA and SoaML, and how to develop an SOA with SoaML using Visual Paradigm. If you are unclear about any of these topics, please read the How to Draw SoaML Diagrams? tutorial first.

Part I - Define Interfaces in a Service Interface Diagram

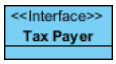
In a multi-party service contract, all participants provide their own interface and use the interfaces of each party they call. Let's draw a service interface diagram for the three interfaces: Tax Payer, Tax Receiver, and Bank.

1. In a new project, create a service interface diagram by selecting **Diagram > New** from the toolbar. In the **New Diagram** window, enter *Service Interface Diagram* in the search field and click **Next**. Then, fill in the **Diagram Name** and **Description** (if any), and click **OK** to confirm diagram creation.

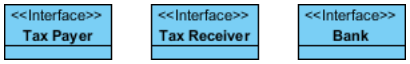
2. We are going to draw the three interfaces. Expand the **Service Interface** tool in the diagram toolbar and select **Interface**.



3. Let's create an interface for the tax payer. Click on the diagram to create an interface and name it `Tax Payer`.



4. Create two more interfaces: *Tax Receiver* and *Bank*.



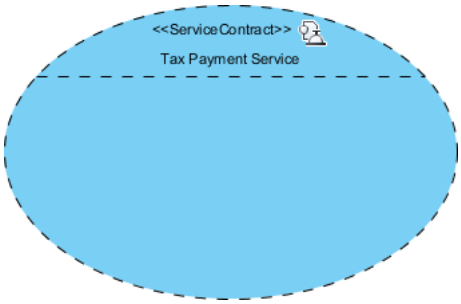
That's all for now. In each interface, there should be operations (or signals) to be invoked by others, but we are not going to specify them yet. When we define the choreography of the service in a sequence diagram, those operations will be generated automatically. This will be done in the coming sections.

Part II - Drawing a Service Contract Diagram

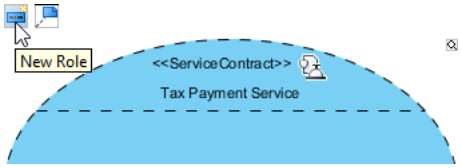
Multi-party service contracts are those that involve two or more participants. Let's draw a service contract diagram for the tax payment (multi-party) service.

1. To create a service contract diagram, select **Diagram > New** from the toolbar. In the **New Diagram** window, enter **Service Contract Diagram** in the search field and click **Next**. Then, fill in the **Diagram Name** and **Description** (if any), and click **OK** to confirm.

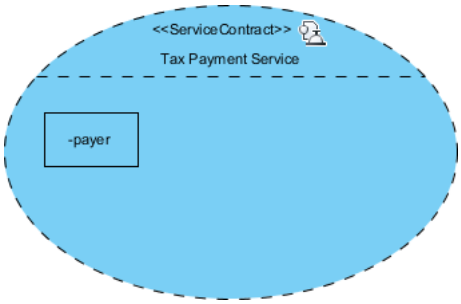
2. Select **Service Contract** from the diagram toolbar and click on the diagram to create a service contract. Name it *Tax Payment Service*.



3. Visualize the roles of participants in the tax payment service. Click on the **New Role** resource to create a role in the *Tax Payment Service* contract.

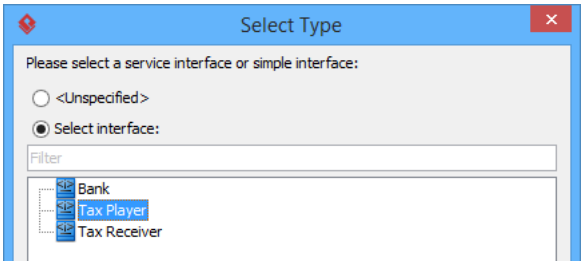


4. Name the role *payer*.

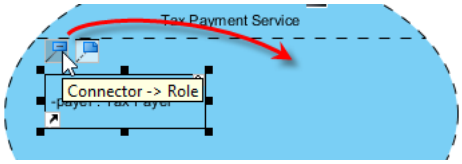


5. Let's set the type for the role. Right-click on the role and select **Select Type...** from the popup menu.

6. In the **Select Type** window, select *Tax Payer* and click **OK**.



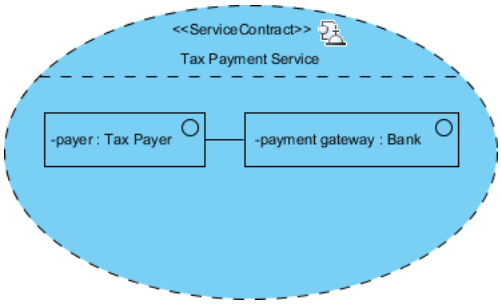
7. Visualize the role of the bank. Use the **Connector -> Role** resource to create a new role from the *payer* role.



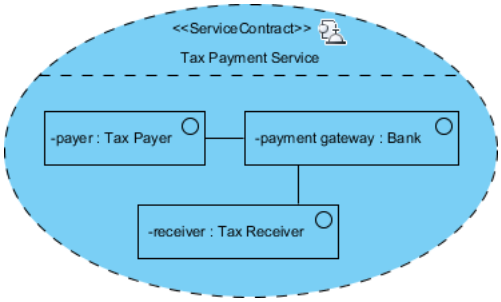
8. Name the role `payment gateway`.

9. Let's set the type for the role. Right-click on the role and select **Select Type...** from the popup menu.

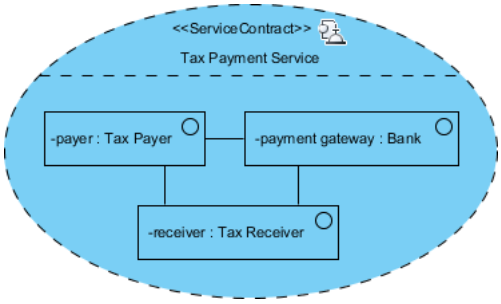
10. In the **Select Type** window, select *Bank* and click **OK**.



11. From the *payment gateway* role, create the role *receiver*. Select *Tax Receiver* as its type.



12. The tax receiver may interact with the tax payer to let them know about the payment status. So, connect the *payer* and *receiver* roles. Finally, your service contract diagram should look like this:

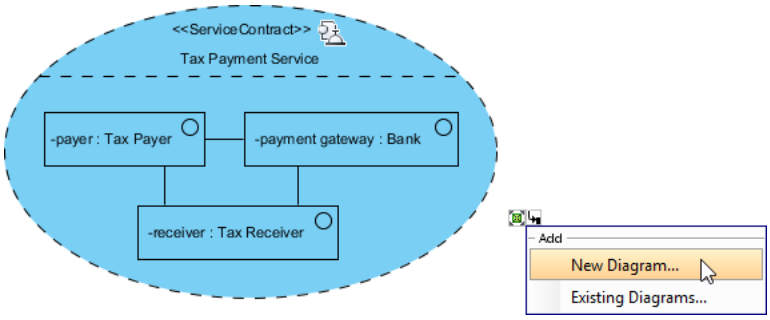


Part III - Specifying Multi-Party Choreography with a UML Sequence Diagram

In a multi-party service contract, the communication between parties and the choreography can be shown in an interaction diagram. An interaction diagram, like a UML sequence diagram, shows who calls whom and when the calls are made. Let's draw a sequence diagram to specify the choreography of the tax payment service.

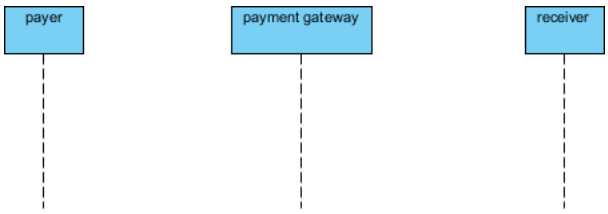
1. Click on the *Tax Payment Service* service contract.

2. Click on the tiny resource icon at the bottom-right of the shape and select **New Diagram...** from the popup menu.

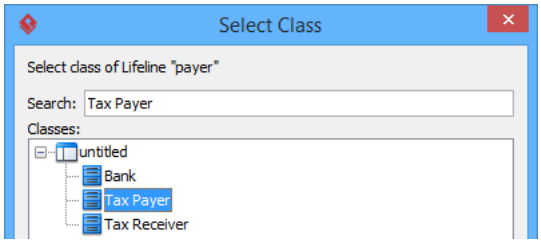


3. The **New Diagram** window will open. In the **New Diagram** window, enter *sequence diagram* in the search field and click **Next**. Then, fill in the **Diagram Name** and **Description** (if any), and click **OK** to confirm.

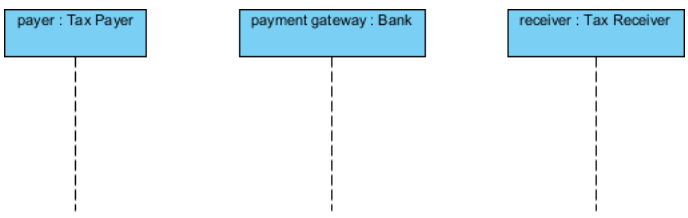
4. Create three lifelines in the diagram. Name them *payer*, *payment gateway*, and *receiver*.



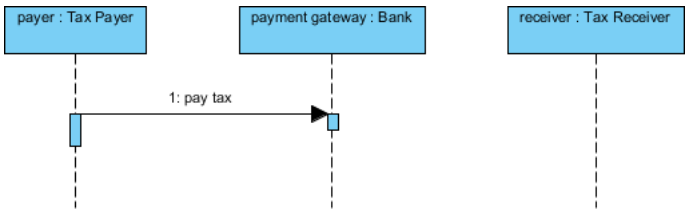
5. Set the classifier for the lifelines. Right-click on the *payer* lifeline and select **Select Class > Select Class...** from the popup menu. In the **Select Class** window, select **Tax Payer** and click **OK**.



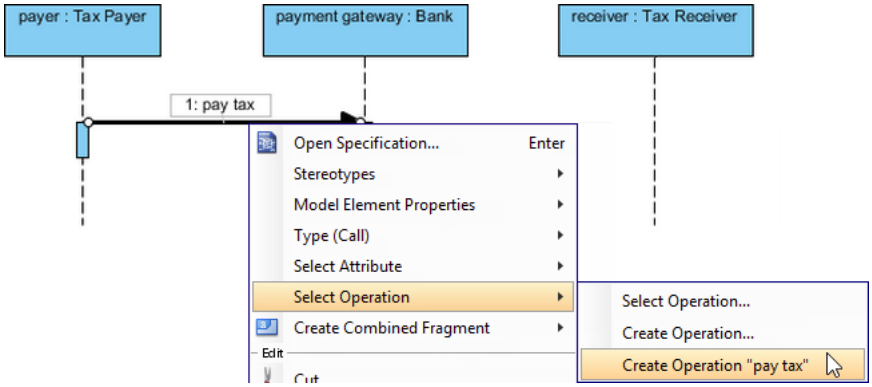
6. Set *Bank* and *Tax Receiver* to be the classifiers of the *payment gateway* and *receiver* lifelines, respectively.



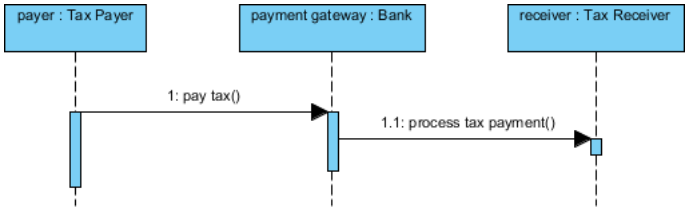
7. It's time to model the interaction between the lifelines. The interaction starts with a payment request made by the payer on a bank account. So, create a message named `pay tax` between the *payer* and *payment gateway* lifelines.



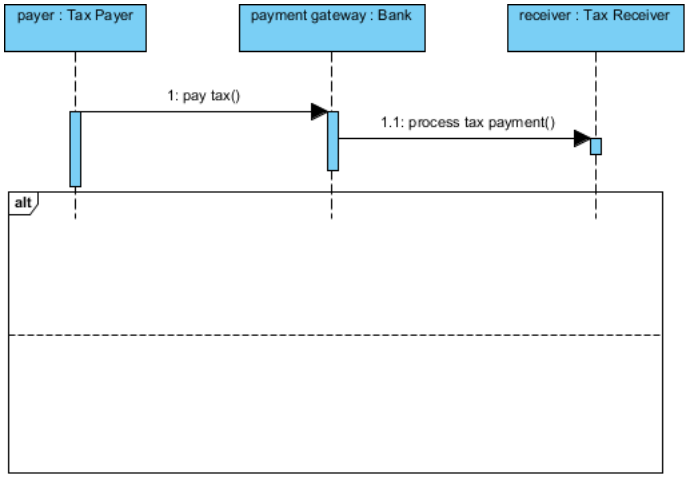
8. For 'pay tax' to be an operation in the *Bank* interface, we have to create an operation from the sequence message. Right-click on the message and select **Select Operation > Create Operation "pay tax"** from the popup menu.



9. Having received the payment request, the bank will request the tax receiver to process the payment. Create a message named `process tax payment` from *payment gateway* to *receiver*. Again, create an operation from the message.

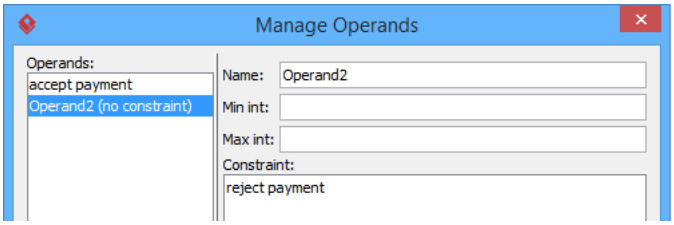


10. If the payment is made correctly, the tax receiver will send a confirmation message to both the bank and the tax payer. Otherwise, the tax receiver will send a reject message to the bank, and the bank will forward the message to the tax payer. To represent this conditional flow, draw an alternative combined fragment that covers the lifelines.

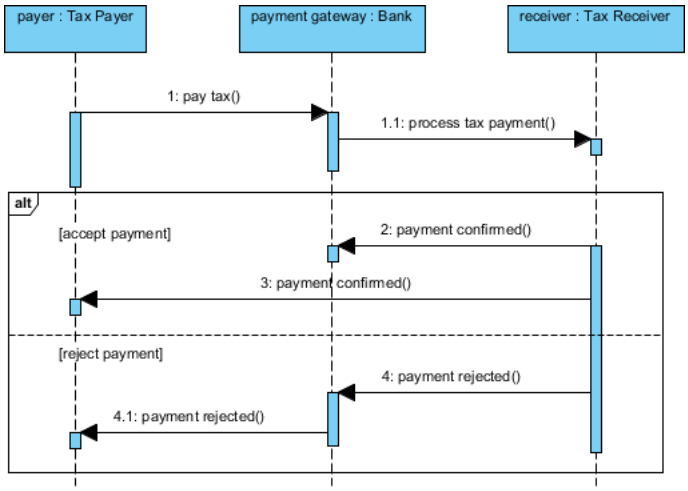


11. Right-click on the **alt** tag at the top-left of the combined fragment and select **Operand > Manage Operands...** from the popup menu.

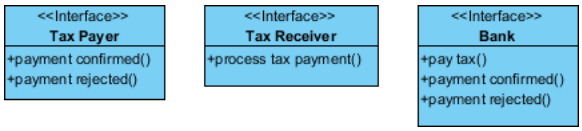
12. Enter the constraints for both operands in the **Manage Constraints** window. For the first operand, enter *accept payment* as the constraint. For the second, enter *reject payment*. Click **OK** to confirm the changes.



13. Create the messages between the lifelines. Remember to create operations for all the sequence messages you created. When finished, your sequence diagram should look like this:



14. When you drew the UML sequence diagram, you created operations for the three lifelines. If you check the service interface diagram now, you can see the interfaces have operations listed.



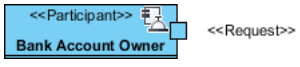
Part IV - Drawing a Service Participant Diagram

In a multi-party service, each participant provides its own interface and uses the interfaces of the other parties. This information can be represented with a service participant diagram. Let's draw a service participant diagram.

1. To create a service participant diagram, select **Diagram > New** from the toolbar. In the **New Diagram** window, enter *Service Participant Diagram* in the search field, click **Next**. Then, fill in the **Diagram Name** and **Description** (if any), and click **OK** to confirm.

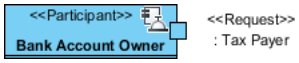
2. There are three participants in the tax payment service: the bank account owner, the online bank, and the tax department. Draw them in the diagram.

3. The bank account owner is a consumer of the tax payment service. Create a **<<Request>>** port in the *Bank Account Owner* participant. You can create a **<<Request>>** port via the resource-centric interface of a participant.

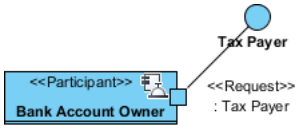


4. Let's set the type for the port. Right-click on the port and select **Select Type...** from the popup menu.

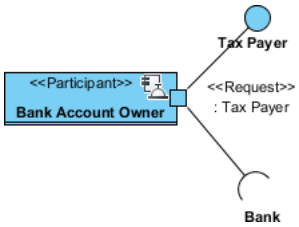
5. In the **Select Type** window, select *Tax Payer* and click **OK**.



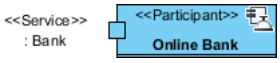
6. The bank account owner provides its interface, which is the *Tax Payer* interface, and according to the interaction modeled in the UML sequence diagram, we know that it uses the *Bank* interface. Draw the provided interface from the **<<Request>>** port first. Name the interface *Tax Payer*.



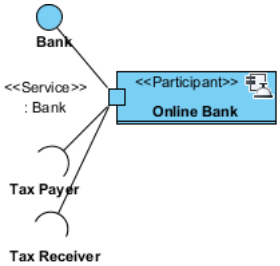
7. Draw the required interface from the **<<Request>>** port. Name it *Bank*.



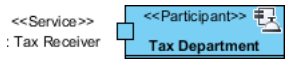
8. The *Online Bank* participant is a provider of the tax payment service. Create a **<<Service>>** port in it. Then, select *Bank* as the port type.



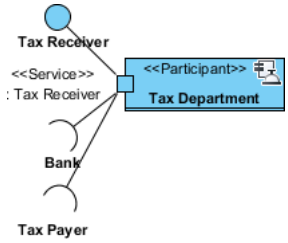
9. *Online Bank* provides the *Bank* interface and uses both the *Tax Payer* and *Tax Receiver* interfaces. Draw the provided and required interfaces. For this special case, you have to draw two required interfaces for the *Tax Payer* and *Tax Receiver* interfaces.



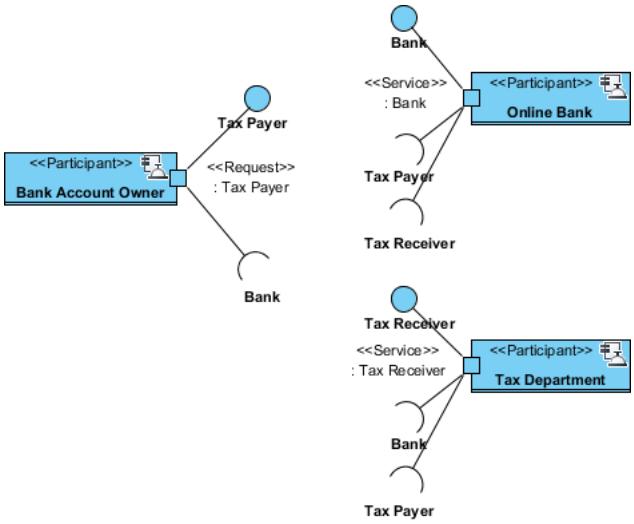
10. The *Tax Department* participant is also a provider of the tax payment service. Create a **<<Service>>** port in it. Then, select *Tax Receiver* as the port type.



11. *Tax Department* provides the *Tax Receiver* interface and uses both the *Bank* and *Tax Payer* interfaces. Draw the provided and required interfaces.



When finished, your diagram should look like this:



Resources

1. Complete SoaML Sample Project - Tax-Payment_SoaML.vpp

Related Links

- Visual Paradigm Feature - SoaML Modeling
- Tutorial - How to Draw SoaML Diagrams?

Attributions

- Object Management Group - Service oriented architecture Modeling Language (SoaML) Specification

Visual Paradigm home page
(https://www.visual-paradigm.com/)

Visual Paradigm tutorials
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