S-OPL: Service Ontology Pattern Language Specification

Version 1.6

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April, 2017

Summary

S-OPL: Service Ontology Pattern Language

*This document presents the Service Ontology Pattern Language (S-OPL).
In this version of S-OPL specification (1.6), S-OPL is represented by using OPL-ML (Ontology
Pattern Laguage Modeling Language). Thus, a structured model is used to represent the S-OPL
patterns and structural relationships between them, a general process model provides a general
view of the S-OPL process, and detailed process models expand the process general view.
Moreover, patterns related to claims present until the S-OPL previous version were excluded.*

1. Introduction

An **Ontology Pattern Language** (OPL) aims to provide holistic support for using
Domain-Related Ontology Patterns (DROPs) in the development of a domain ontology.
It provides explicit guidance on what modeling problems can arise in that domain,
informs the order to address these problems, and suggests one or more patterns to solve
each specific problem. Moreover, an OPL explicitly considers pattern combinations to
solve a given problem (as well as conflicting patterns), along with guidelines for
integrating them into a concrete ontology conceptual model (FALBO et al., 2013).

An OPL indicates explicitly which patterns must be considered as mandatory and
which ones as optional. To ensure a stable and sound pattern usage, the order in which
such patterns are combined is structured by means of a *pattern application flow* (the OPL
process). OPLs are structured to support and encourage the application of one pattern at
a time. Step by step, the patterns are chosen and combined in a systematic way. This
ensures that the main property of piecemeal growth is preserved: the 'whole' always
precedes its 'parts' (FALBO et al., 2013).

The **Service Ontology Pattern Language** (S-OPL) is an OPL that addresses the core
conceptualization about the service phenomena. S-OPL patterns were extracted from
UFO-S, a core commitment-based reference ontology for services (NARDI et al., 2015),
whose conceptualization is based on the establishment and fulfillment of commitments
and claims between service participants (used to refer to both service providers and
service customers) along the service life-cycle. UFO-S focuses on the three main phases
of the service life-cycle, namely: service offer, service negotiation, and service delivery.
Thus, the patterns of S-OPL are organized in three groups: *Service Offering*, *Service
Negotiation and Agreement,* and *Service Delivery*.

In this version, S-OPL is represented by using **OPL-ML** (Ontology Pattern
Language Modeling Language). Thus, it is described by a *structural model*, which
provides a structural view of the OPL, showing its components (patterns and pattern
groups) and structural relations between them (e.g., dependency), and by a *process model*,
which provides a behavioral view of the OPL, showing the paths to be followed to apply
the patterns.

The patterns that compose S-OPL are briefly presented in Section 2. S-OPL structural model is presented in Section 3. S-OPL process model is described in Section 4. Finally, in the Section 5, each S-OPL pattern is fully described.

2. S-OPL Domain-Related Ontology Patterns

As aforementioned, the patterns that compose S-OPL are organized in three groups, namely: (i) *Service Offering*, (ii) *Service Negotiation and Agreement*, and (iii) *Service Delivery*.

According to UFO-S (NARDI et al., 2015), at the beginning of a service relation, there is a service offering. A service offering is established between a service provider and a target customer community, whose members are said target customers. Depending on the specific service being modeled, these roles (Service Provider and Target Customer) can be played by different types of agents, namely persons, organizations and organizational units. A service offering comprises a set of service offering commitments from the service provider towards the target customer community. Table 1 describes the intent of the patterns of the *Service Offering* group.

We should highlight that the choice of which patterns to use is driven by the scope of the ontology being developed. For instance, although a service offering always involves commitments from the service provider towards the target customer community, representing those aspects may be out of the scope of the ontology being developed. Thus, S-OPL allows reusing only the parts of UFO-S that are relevant to the ontology in hands.

Table 1- Patterns of the *Service Offering* group.

Id	Name	Intent
SOffering	Service Offering	Represents service offerings established from service providers towards target customer communities, and thus to the members of those communities.
SODescription	Service Offering Description	Allows describing service offerings by means of service offering descriptions.
SOCommitments	Service Offering Commitments	Represents the service offering commitments from a service provider towards the target customer community in the context of a service offering.
P-Provider	Person Provider	Represents persons as service providers.
O-Provider	Organization Provider	Represents organizations as service providers.
OU-Provider	Organizational Unit Provider	Represents organizational units as service providers.
O-OU-Provider	Organization / Organizational Unit Provider	Represents organizations and organizational units as service providers.
P-O-Provider	Person / Organization Provider	Represents persons and organizations as service providers.
P-OU-Provider	Person / Organizational Unit Provider	Represents persons and organizational units as service providers.
P-O-OU-Provider	Person/ Organization / Organizational Unit Provider	Represents persons, organizations and organizational units as service providers.
P-TCustomer	Person Target Customer	Represents persons as target customers.

O-TCustomer	Organization Target Customer	Represents organizations as target customers.
OU-TCustomer	Organizational Unit Target Customer	Represents organizational units as target customers.
O-OU-TCustomer	Organization / Organizational Unit Target Customer	Represents organizations and organizational units as target customers.
P-O-TCustomer	Person / Organization Target Customer	Represents persons and organizations as target customers.
P-OU-TCustomer	Person / Organizational Unit Target Customer	Represents persons and organizational units as target customers.
P-O-OU-TCustomer	Person / Organization / Organizational Units Target Customer	Represents persons, organizations and organizational units as target customers.

Once a service is offered, service negotiation may occur. In general, service negotiation is motivated by the interest of a target customer in the service offering, considering its contents (including the conditions to be satisfied by the service customer in case it hires the service). During service negotiation, service provider and target customer interact in order to establish an agreement regarding their commitments with respect to an eventual service delivery.

If service negotiation succeeds, a service agreement is established, and the service provider starts to play the role of hired service provider, while the target customer starts to play the role of service customer. Like a service offering, a service agreement is composed of commitments. However, in contrast to the service offering, in a service agreement, service customers may also establish commitments to service providers (e.g., the commitment to pay for the service). Service agreement involves not only commitments from the hired service provider towards the service customer, but may also involve commitments from the service customer towards the hired service provider. Thus, these two participants become co-responsible for the service delivery. A service agreement should conform to what was previously established in the corresponding service offering.

As in the case of a service offering, what is agreed between the parties (commitments of both hired provider and service customer) depends on the context of the service agreement, as well as on the particular service business model, and, therefore, can refer to several different elements. These elements may be described in service agreement descriptions (such as a service contract). Table 2 describes the intent of the patterns of the *Service Negotiation and Agreement* group.

Table 2 - Patterns of the *Service Negotiation and Agreement* group.

Id	Name	Intent
SAgreement	Service Agreement	Represents a service agreement, without addressing service negotiation and offering aspects.

SNegotiation	Service Negotiation	Represents a service negotiation and the service offering to which the negotiation regards, without addressing an agreement that possibly results from it.
SNegAgree	Service Negotiation and Agreement	Represents a service negotiation and the service agreement that possibly results from it, considering also the corresponding service offering.
SOfferAgree	Service Offering and Agreement	Represents a service agreement in conformance with a service offering, without addressing service negotiation aspects.
SADescription	Service Agreement Description	Allows describing service agreements by means of service agreement descriptions.
HPCommitments	Hired Provider Commitments	Represents the commitments from a hired service provider towards a service customer.
SCCommitments	Service Customer Commitments	Represents the commitments from service customer(s) towards a hired service provider.
P-HProvider	Person Hired Provider	Represents persons as hired service providers.
OU-HProvider	Organizational Unit Hired Provider	Represents organizational units as hired service providers.
O-OU-HProvider	Organization / Organizational Unit Hired Provider	Represents organizations and organizational units as hired service providers.
P-O-HProvider	Person / Organization Hired Provider	Represents persons and organizations as hired service providers.
P-OU-HProvider	Person/ Organizational Unit Hired Provider	Represents persons and organizational units as hired service providers.
P-O-OU-HProvider	Person/ Organization / Organizational Unit Hired Provider	Represents persons, organizations and organizational units as hired service providers.
P-Customer	Person Customer	Represents persons as service customers.
O-Customer	Organization Customer	Represents organizations as service customers.
OU-Customer	Organizational Unit Customer	Represents organizational units as service customers.
O-OU-Customer	Organization / Organizational Unit Customer	Represents organizations and organizational units as service customers.
P-O-Customer	Person / Organization Customer	Represents persons and organizations as service customers.
P-OU-Customer	Person / Organizational Unit Customer	Represents persons and organizational units as service customers.
P-O-OU-Customer	Person / Organization / Organizational Units Customer	Represents persons, organizations and organizational units as service customers.

Service delivery concerns the execution of actions aimed at fulfilling the commitments established in the service agreement. Service delivery is a complex action, which is composed by several actions, including actions performed only by the hired service provider (hired provider actions), actions performed only by the service customer (customer actions), and actions performed by both in an interaction (hired provider-customer interaction). These actions are motivated by the commitments established in the service agreement, between the hired provider and the service customer. Table 3 describes the intent of the patterns of the *Service Delivery* group.

Table 3 - Patterns of the *Service Delivery* group.

Id	Name	Intent
SDelivery	Service Delivery	Represents the process (complex action) carried out to fulfill commitments established in the service agreement.
HPActions	Hired Service Provider Actions	Represents the actions of the service delivery that are performed only by the hired service provider.
SCActions	Service Customer Actions	Represents the actions of the service delivery that are performed only by the service customers.
Interations	Interations	Represents the actions in a service delivery in which the hired service provider and the service customer(s) act in tandem.
HPActionMotivation	Hired Provider Action Motivation	Represents the relationships between the actions performed only by a hired service provider and the commitments that motivated them.
SCActionMotivation	Service Customer Action Motivation	Represents the relationships between the actions performed only by a service customer and the commitments that motivated them.
InteractionMotivation	Motivations for Interactions	Represents the relationships between the interactions of a hired service provider and the service customer(s) and the commitments that motivated them.

3. S-OPL Structural Model

Figure 1 presents the S-OPL structural model. In the model, *patterns* are represented by rectangles with underlined labels. *Pattern groups* are represented by regions delimited by blue straight lines. *Groups of variant patterns* are delimited by rectangles with red dotted edges. *Variant patterns* are patterns that solve the same problem, but in different ways. Thus, from a set of variant patterns, when developing an ontology, only one can be used to solve the problem. Pattern dependency relations are represented by directed arrows, meaning that the source pattern (or pattern group) requires the target pattern to be applied first. Finally, dotted arrows are used to indicate that a pattern requires one of the patterns of a variant group. In the structural model, different colors are used to identify application actions patterns from different groups.
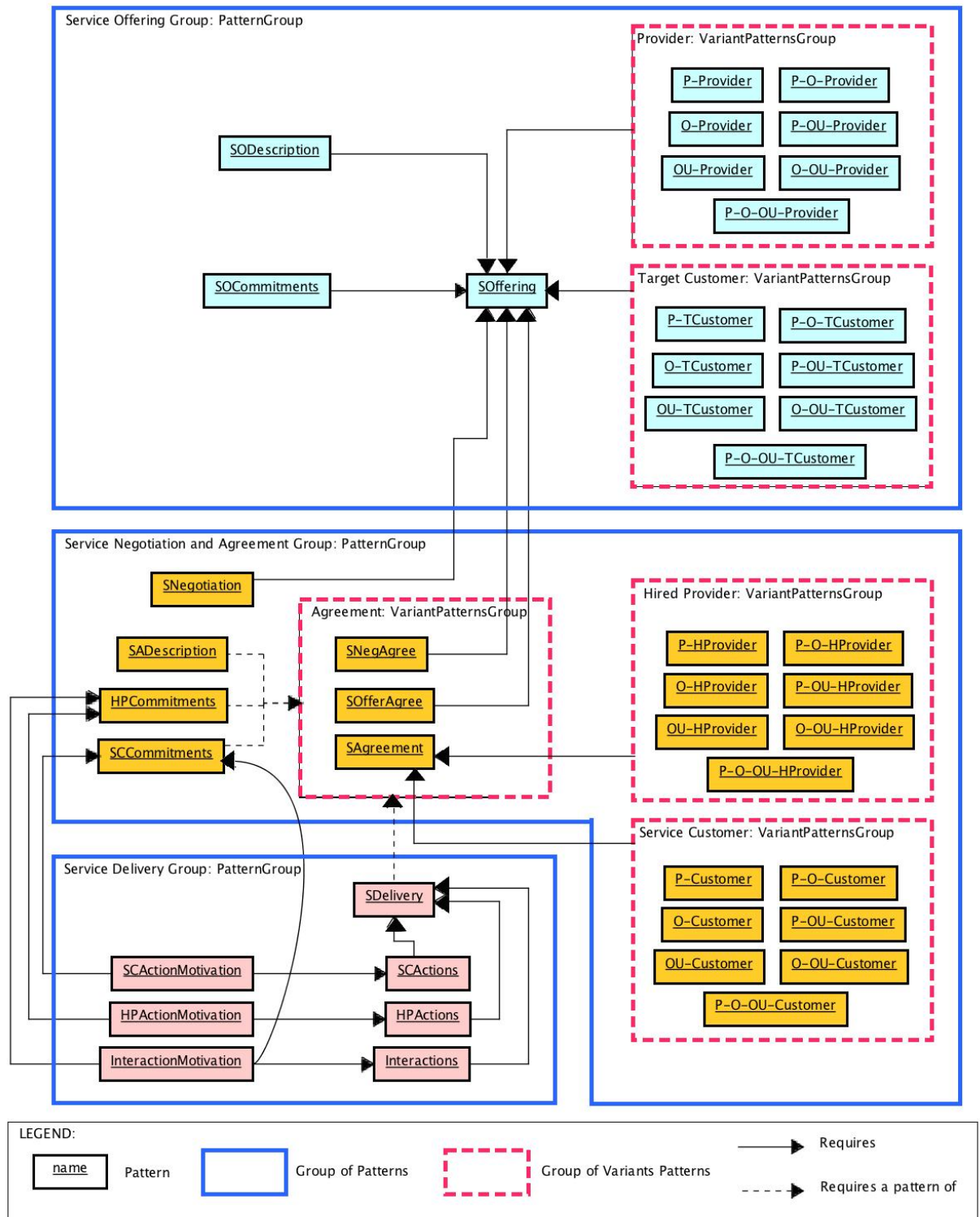
Figure 1 - S-OPL Structural Model.

4. S-OPL Process

Figures 2-6 present the S-OPL process. Figure 2 provides a general view of the S-OPL process. Figures 3-5, in turn, show the detailed process related, respectively, to the Service Offering, Service Negotiation and Agreement, and Service Delivery groups. Finally, Figure 6 presents the S-OPL process in a complete and detailed view.

In figures 3-6, actions concerning a pattern application are represented by *pattern application action nodes* (the labeled rounded rectangles). A *pattern application action* refers to the application of a specific pattern. In these figures, *pattern application action groups* are delimited by rectangles with blue edges and are showed in an expanded way, being possible to see the grouped pattern application actions. Moreover, *variant pattern application actions* are grouped inside rectangles with red dotted edges. In Figure 2, *pattern application action groups* are represented as black boxes, providing a more general view of S-OPL. In this figure, *pattern application action groups* are represented by labeled rectangles with blue edges and with the symbol ⚓ in the corner.

Initial nodes (solid circles) are used to represent entry points in the OPL, i.e., pattern application actions in the language that can be performed first, without perfoming other pattern application actions. *Fork nodes* (line segments with multiple output flows) are used to represent parallel paths, i.e., if the ontology engineer decides to follow the fork node input path, then s/he must follow all paths leaving them. *Join nodes* (line segments with multiple input flows) are used to represent the junction of parallel paths and, to follow the join node output path, the ontology engineer must have already traveled all the join node input paths. *Decision nodes* (represented by diamonds) are used to represent alternative paths. Thus, if the ontology engineer decides to follow the decision node input path, then s/he must select one and only one of the decision node output paths. Control flows (arrowed lines) represent the sequences of paths that the ontology engineer can follow in the OPL. End points (solid circle doubly circled) are used to indicate where the patterns application process can be finished. Like in the structural model, in the process models, different colors are used to identify application actions patterns from different groups.
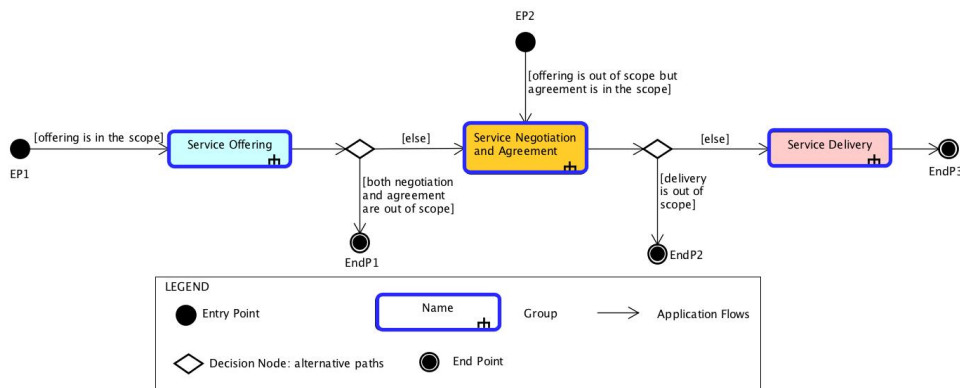

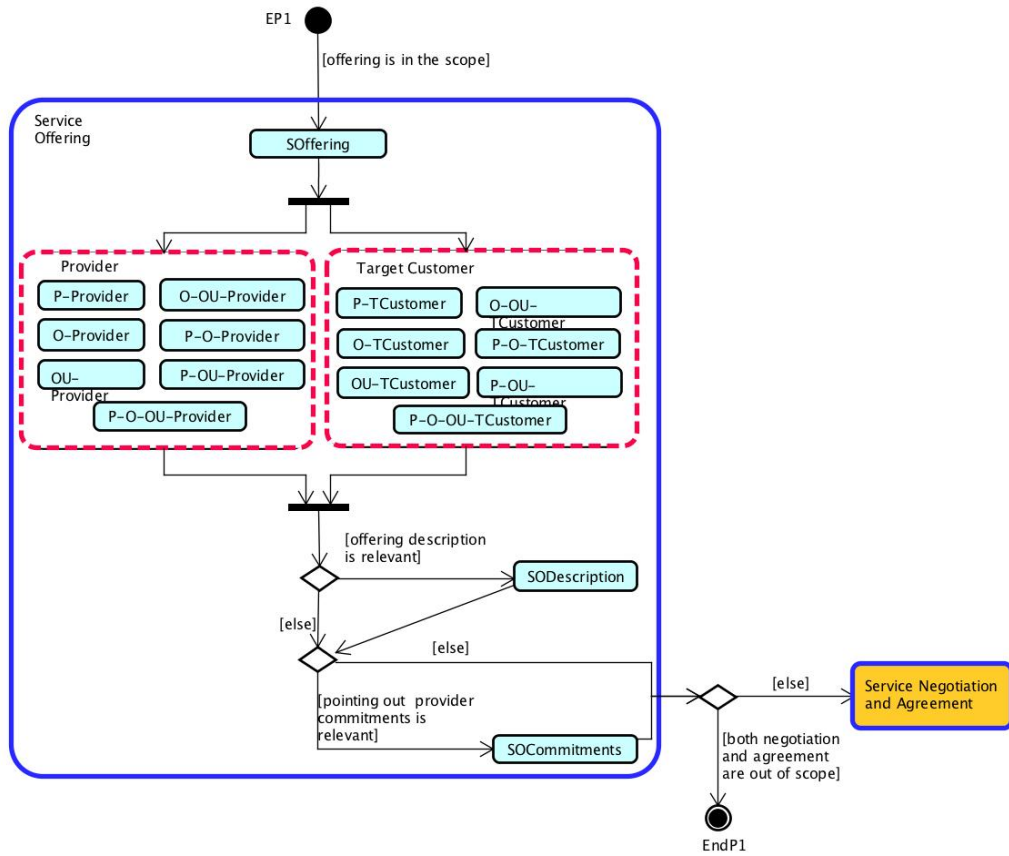Figure 2 - S-OPL Process (general view).

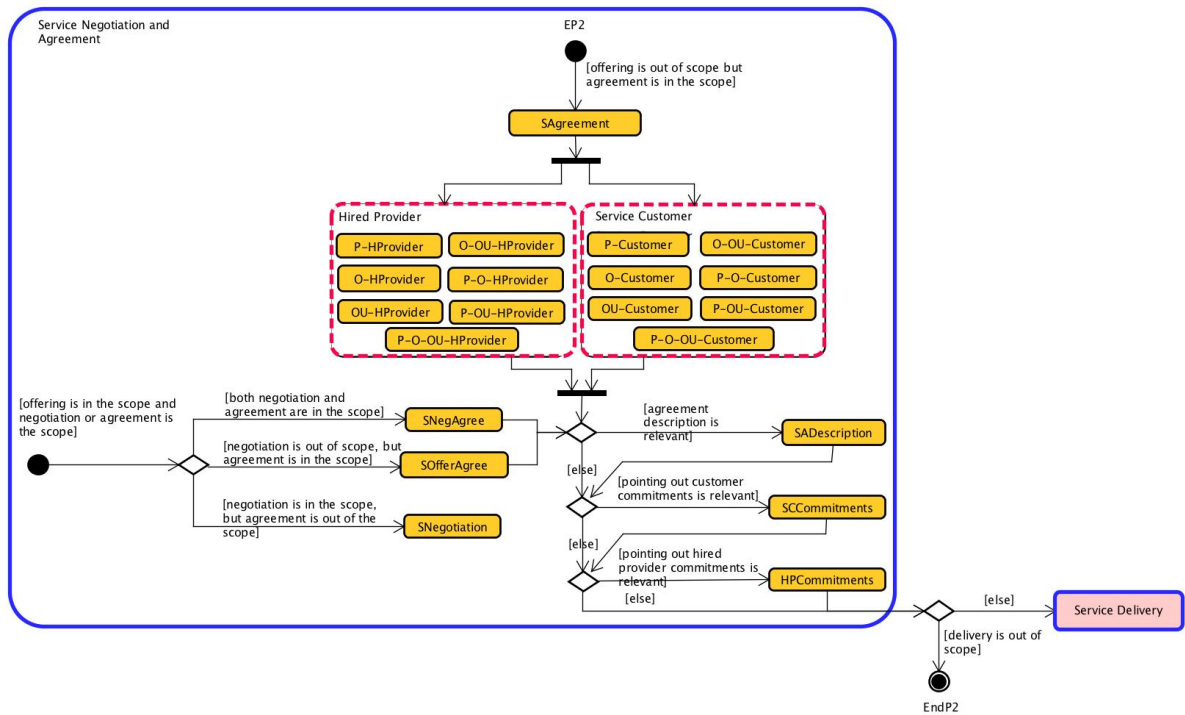Figure 3 - Detailed Process Model of the Service Offering Group.

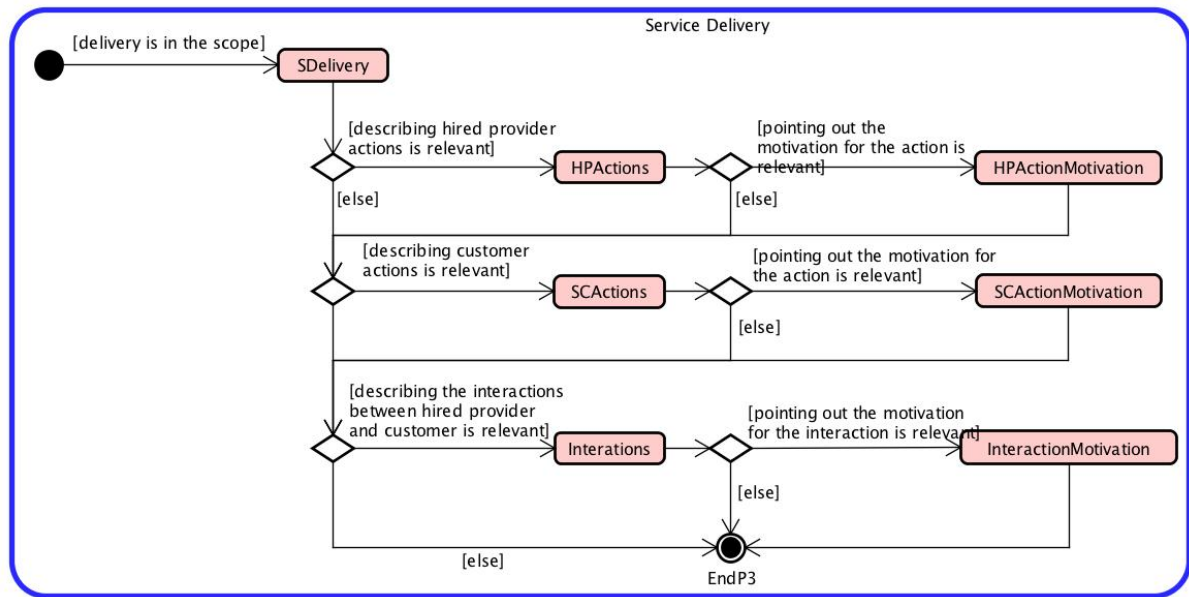Figure 4 - Detailed Process Model of the Service Negotiation and Agreement Group.

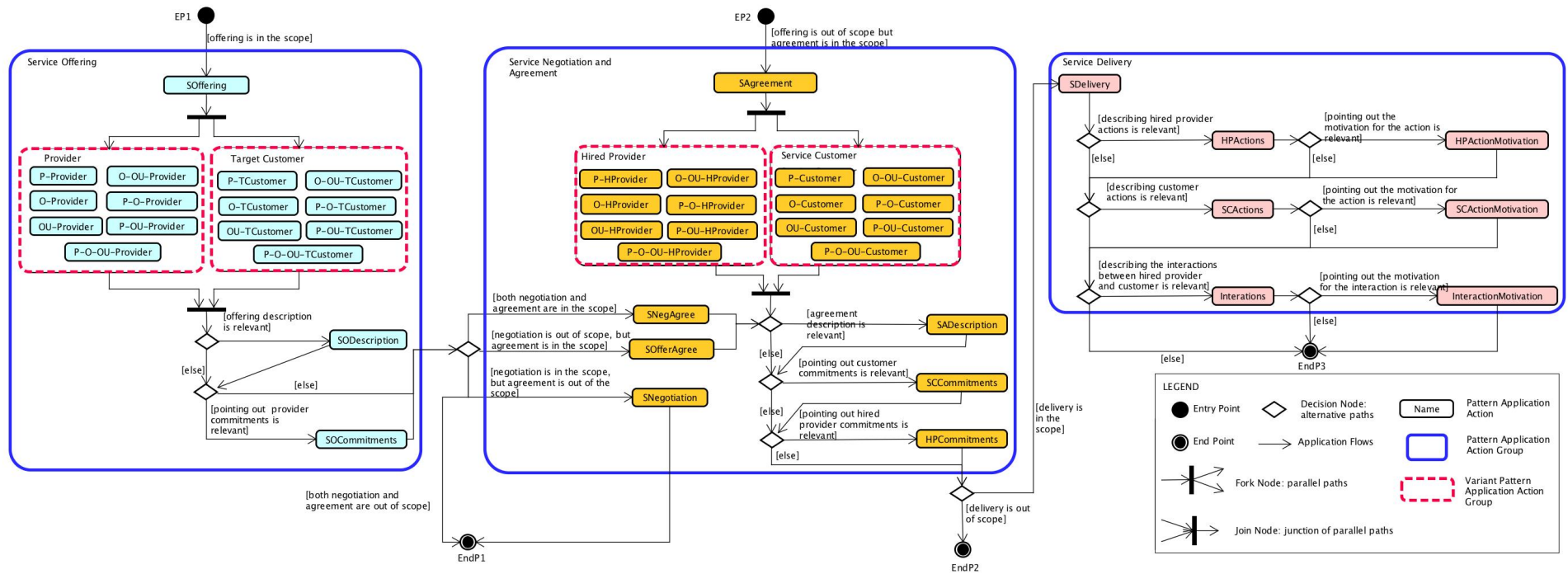Figure 5 - Detailed Process Model of the Service Delivery Group.

Figure 6 - S-OPL Process (detailed view).

As Figure 6 shows, S-OPL has two entry points: EP1 and EP2. The ontology engineer must choose one of them, depending on the scope of the specific service ontology being developed. When the requirements for the ontology being developed include describing the service offering, then the starting point is EP1. Otherwise, the starting point is EP2.

When EP1 is chosen, the ontology engineer must use first the *SOffering* pattern for modeling the service offering itself. Providers and target customers involed in service offerings can be people, organizations or organizational units. Therefore, for modeling which types of providers and target customers are involved in the offering being modeled, the ontology engineer has to select a pattern from the *Provider* group of variant patterns and a pattern from the *Target Customer* group of variant patterns. Then, if describe offering is relevant, the ontology engineer must use the *SODescription* pattern and, if the ontology engineer is interested in modeling offering commitments, s/he must select the *SOCommitments* pattern.

Once modeled the service offering, the ontology engineer can address problems related to service negotiation and agreement. However, if both service negotiation and agreement are out of the scope, s/he can stop the patterns application process at the end point EndP1. We should reinforce, however, that service offering may be out of the scope of the ontology and agreement may be in the scope. In this case, EP2 is the entry point.

If the ontology engineer has already modeled service offering, s/he must decide first if s/he needs to represent service negotiation and service agreement. If s/he is interested only in representing service negotiation (agreement is out of the scope of the ontology being developed), s/he has to use *SNegotiation*, a pattern that captures only the service negotiation and its relation to the service offering to which the negotiation regards. Once modeled negotiation, the ontology engineer can stop using the patterns at the end point EndP1. If s/he is interested in representing both the service negotiation and the agreement possibly resulting from it, s/he must use *SNegAgree*, a pattern that models the service negotiation, the service agreement, and their relations to the corresponding service offering. Finally, if s/he is interested in modeling only the service agreement and its conformance with a service offering (negotiation is out of the scope of the ontology being developed), then s/he must choose the *SOfferAgree* pattern, which represents an agreement in conformance with an offering.

If EP2 is the entry point (service offering, and thus service negotiation, are out of the scope of the ontology being developed), the first pattern to be used is *SAgreement*. Next, the ontology engineer must select one of the patterns of the *Hired Provider* group of variant patterns and one of the patterns of the *Service Customer* group of variant patterns, to model the possible types of hired provider and service customer. Note that this is necessary only if the entry point is EP2, since, when entry point is EP1, the types of providers and target customers were already modeled.

Once the agreement is modeled, if the ontology engineer is interested in describing the service agreement by means of a description, the *SADescription* pattern has to be used. Then, if modeling the hired provider commitments is relevant, *HPCommitments* pattern

must be used, and if it is relevant modeling service customer commitments, the *SCCommitments* pattern must be applied.

After modeling the agreement, the ontology engineer can stop the patterns application process at the end point EndP2 or, if service delivery is in the scope of the ontology being developed, s/he must apply the *SDelivery* pattern. Next, if model the actions performed by the hired provider is relevant, *HPActions* pattern must be used, and if point out the motivation for these actions is relevant, *HPActionMotivation* has to be applied. Then, if the ontology engineer wants to model the actions performed by the service customer, *SCActions* is to be used, and if point out the motivation for these actions is relevant, *HPActionMotivation* must be used. Finally, if model the interactions between hired provider and service customer is relevant, *Interactions* pattern has to be used, and if point out the motivation for the interactions is relevant, *InteractionMotivation* must be applied. Once the delivery is modeled, the pattern application process finishes at the end point EndP3.

5. S-OPL Patterns Descriptions

The description of S-OPL patterns includes the following items:

- **Name**: provides the name of the pattern.

- **Intent**: describes the pattern purpose.

- **Rationale**: describes the rationale underlying the pattern. A short statement answering the following question: What is the pattern rationale?

- **Competency Questions**: describes the competency questions that the pattern aims to answer.

- **Conceptual Model**: depicts the OntoUML diagram representing the pattern elements.

- **Axiomatization**: presents the axioms related to the pattern conceptual model.

- **Complementary Patterns:** lists other ontology patterns that are related to the pattern being presented, but that are not part of this pattern language.

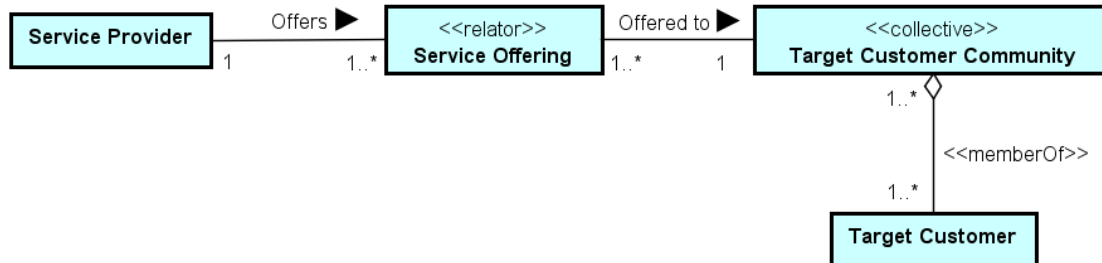## 5.1 Service Offering Group

Name: Service Offering

Intent: Represents *Service Offerings* established from *Service Providers* towards *Target Customer Communities*.

Rationale: A *Service Offering* mediates the relation between a *Service Provider* and a *Target Customer Community*. A *Service Offering* is offered by a <u>Service Provider</u> to a *Target Customer Community*. *Target Customer Community* is the group of agents that constitute the community to which the service is being offered. *Target Customer* is the role played by the agents when they become members of a *Target Customer Community*.

Competency Questions:
- What are the service offerings established between a service provider and a target customer community?
- What is the service provider of a service offering?
- What is the target customer community of a service offering?
- What are the members of a target customer community?

Conceptual Model:

Note: The stereotype of the *Service Provider* class is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Service Provider* is a <<rolemixin>>. Due to this fact, *Service Provider* class is not stereotyped in the current pattern. The stereotype of the *Target Customer* class is given by the pattern selected from the Target Customer sub-group. For instance, if P-Customer pattern is selected, than *Target Customer* is a <<role>>; if P-O-Customer pattern is selected, than *Target Customer* is a <<rolemixin>>. Due to this fact, the *Target Customer* class is not stereotyped in the current pattern.

Axiomatization:

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Term Definitions:

Service Provider	The role played by agents when these agents commit themselves to a *Target Customer Community* by means of a *Service Offering*.
Service Offering	A promise of the *Service Provider* to provide a service under certain conditions to a *Target Customer Community*.
Target Costumer Community	The group of agents that constitutes the community to which the service is being offered.
Target Costumer	The role played by agents that are members of the *Target Customer Community*.

SODescription - Service Offering Description

Name: Service Offering Description

Intent: Allows describing *Service Offerings* by means of *Service Offering Descriptions*.

Rationale: *Service Offerings* can be described by means of *Service Offering Descriptions*, such as folders, registration documents in a chamber of commerce, artifacts in a service registry, and so on.

Competency Questions:
- Which are the descriptions of a service offering?

Conceptual Model:

Axiomatization:

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Term Definitions:

Service Offering Description	A normative description that describes the different aspects of a particular *Service Offering*, such as terms and conditions, as well as aspects related to the service business model performed by the *Service Provider*.

SOCommitment - Service Offering Commitment

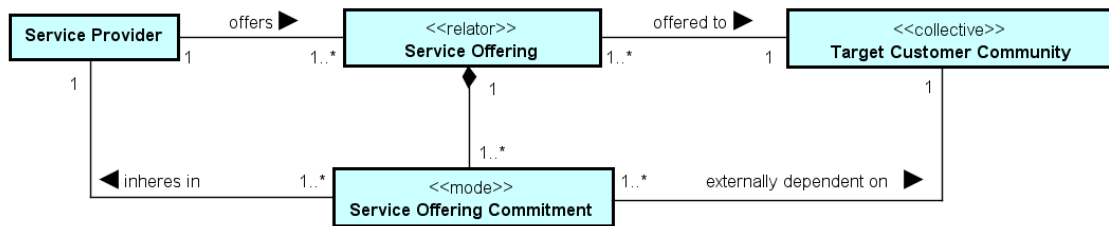**Name:** Service Offering Commitment

Intent: Represents the *Service Commitments* established from a *Service Provider* towards the *Target Customer Community*, in the context of a *Service Offering*.

Rationale: A *Service Offering Commitment* is a social moment (in the sense of UFO-C) that inheres in the *Service Provider* (the committed agent), and is externally dependent on the *Target Customer Community*. The S*ervice Offering Commitments* from the S*ervice Provider* towards the *Target Customer Community* are part of the *Service Offering*.

Competency Questions:

- What are the service commitments from a service provider towards the target customer community established in the service offering?

Conceptual Model:

Axiomatization:

A1	$\forall$ so: ServiceOffering, sp: ServiceProvider, tcc: TargetCustomerCommunity, soco: ServiceOfferingCommitment (provides(sp, so) $\wedge$ offeredTo(so, tcc) $\wedge$ partOf(soco, so)) $\rightarrow$ (inheresIn(soco, sp) $\wedge$ externallyDependentOn(soco, tcc))

- Axiom A1: Each **Service Offering Commitment** that is part of a **Service Offering** inheres in the **Service Provider** that provides the **Service Offering**, and is externally-dependent on the **Target Customer Community** to which this offering is offered.

Term Definitions:

Service Offering Commitment	Commitments by the *Service Provider* towards the *Target Customer Community* that are part of a *Service Offering*.

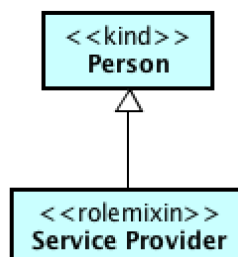## P-Provider - Person Provider

Name: Person Provider

Intent: Represents persons as *Service Providers*.

Rationale: *Persons* can act as (play the role of) *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Service Provider	The role played by a *Person* when she commits herself to a *Target Customer Community* by means of a *Service Offering*.

O-Provider - Organization Provider
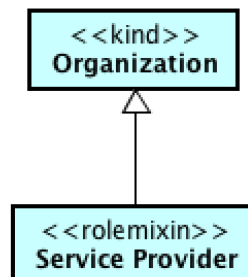
Name: Organization Provider

Intent: Represents organizations as *Service Providers*.

Rationale: *Organizations* can act as (play the role of) *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

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Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Service Provider	The role played by an *Organization* when it commits itself to a *Target Customer Community* by means of a *Service Offering*.

OU-Provider - Organizational Unit Provider
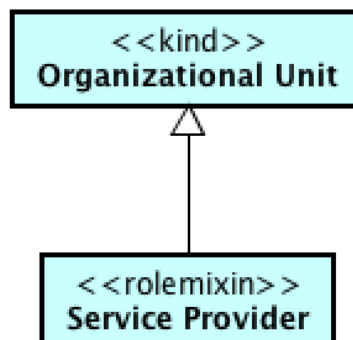
Name: Organizational Unit Provider

Intent: Represents *Organizational Units* as *Service Providers*.

Rationale: *Organizational Units* can act as (play the role of) *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

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Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Provider	The role played by an *Organizational Unit* when it commits itself to a *Target Customer Community* by means of a *Service Offering*.

O-OU-Provider - Organization / Organizational Unit Provider

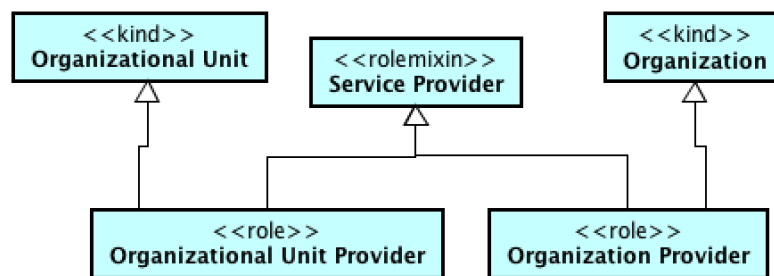**Name:** Organization / Organizational Unit Provider

Intent: Represents *Organizations* and *Organizational Units* as *Service Providers*.

Rationale: *Organizational Units* (playing the role of *Organizational Unit Provider)* and *Organizations* (playing the role of *Organization Provider)* can act as *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Provider	The role played by agents when these agents commit themselves to a *Target Customer Community* by means of a *Service Offering*.
Organizational Unit Provider	The role played by an *Organizational Unit* as a *Service Provider*.
Organization Provider	The role played by an *Organization* as a *Service Provider*.

P-O-Provider - Person/Organization Provider
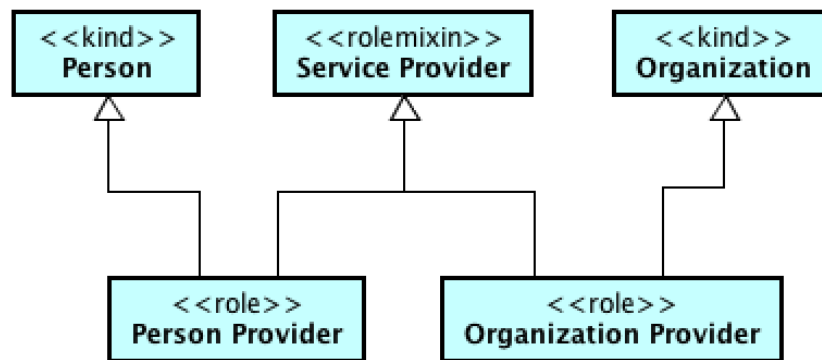
Name: Person/Organization Provider

Intent: Represents *Persons* and *Organizations* as *Service Providers*.

Rationale: *Persons* (playing the role of *Person Provider)* and *Organizations* (playing the role of *Organization Provider)* can act as *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Service Provider	The role played by agents when these agents commit themselves to a *Target Customer Community* by means of a *Service Offering*.
Person Provider	The role played by a *Person* as a *Service Provider*.
Organization Provider	The role played by an *Organization* as a *Service Provider*.

P-OU-Provider - Person/Organizational Unit Provider
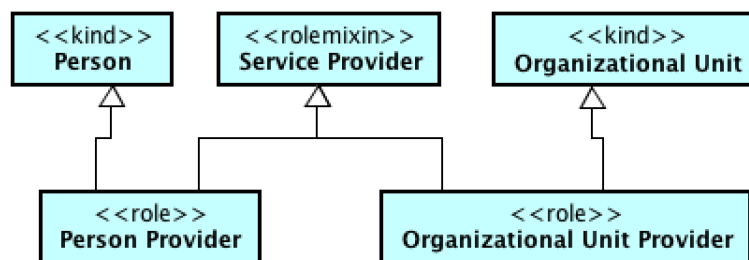
Name: Person/Organizational Unit Provider

Intent: Represents *Persons* and *Organizational Units* as *Service Providers*.

Rationale: *Persons* (playing the role of *Person Provider)* and *Organizational Units* (playing the role of *Organizational Unit Provider)* can act as *Service Providers*, i.e., the ones responsible for the service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Person	An individual human being.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Provider	The role played by agents when these agents commit themselves to a *Target Customer Community* by means of a *Service Offering*.
Person Provider	The role played by a *Person* as a *Service Provider*.
Organizational Unit Provider	The role played by an *Organizational Unit* as a *Service Provider*.

P-O-OU-Provider: Person/Organization/ Organizational Unit Provider

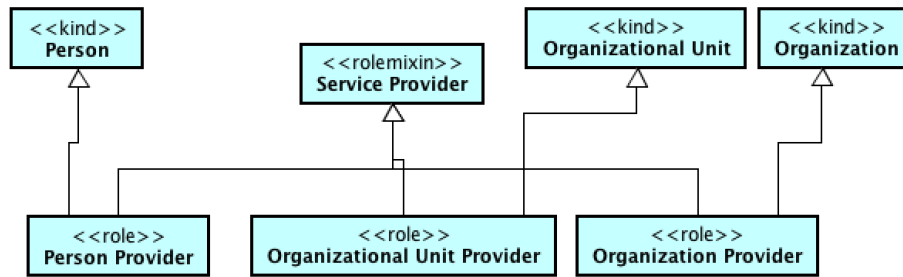**Name:** Person/Organization/Organizational Unit Provider

Intent: Represents *Persons*, *Organizations* and *Organizational Units* as *Service Providers*.

Rationale: *Persons* (playing the role of *Person Provider)*, *Organizational Units* (playing the role of *Organizational Unit Provider)*, and *Organizations* (playing the role of *Organization Provider)* can act as *Service Providers*, i.e., the ones responsible for service provision.

Competency Questions:
- Which are the types of service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Provider	The role played by agents when these agents commit themselves to a *Target Customer Community* by means of a *Service Offering*.

Organizational Unit Provider	The role played by an *Organizational Unit* as a *Service Provider.*
Person Provider	The role played by a *Person* as a *Service Provider.*
Organization Provider	The role played by an *Organization* as a *Service Provider.*
Organizational Unit Provider	The role played by an *Organizational Unit* as a *Service Provider.*

P-TCustomer – Person Target Customer
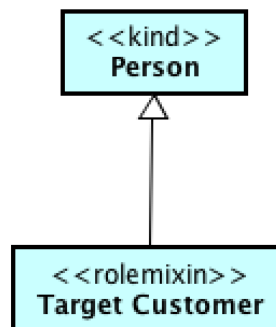
Name: Person Target Customer.

Intent: Represents *Persons* as *Target Customers*.

Rationale: *Persons* can act as (play the role of) *Target Customers* of a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Target Customer	The role played by agents that are members of the *Target Customer Community*.

O-TCustomer - Organization Target Customer
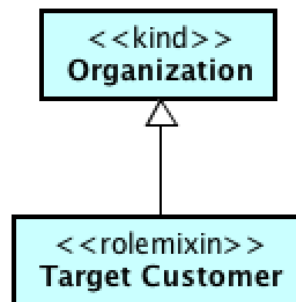
Name: Organization Target Customer

Intent: Represents *Organizations* as *Target Customers*.

Rationale: *Organization*s can act as (play the role of) *Target Customers* of a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Target Customer	The role played by agents that are members of the *Target Customer Community*.

OU-TCustomer - Organizational Unit Target Customer
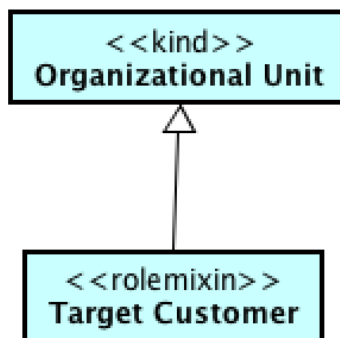
Name: Organizational Units Target Customer

Intent: Represents *Organizational Units* as *Target Customers*.

Rationale: *Organizational Units* can act as (play the role of) *Target Customers* of a service offering.

Competency Questions:
- Which is the type of target customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Target Customer	The role played by agents that are members of the *Target Customer Community*.

O-OU-TCustomer - Organization/Organizational Unit Target Customer

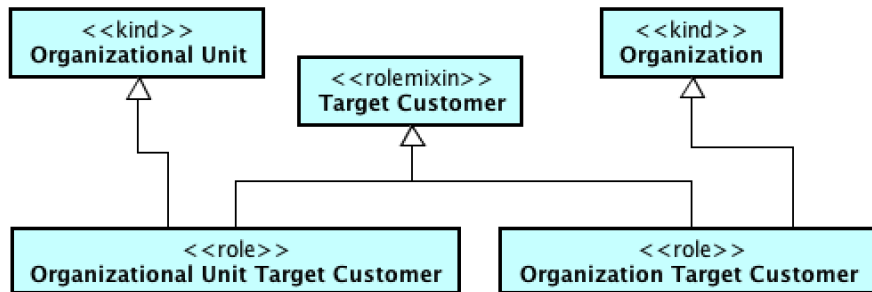**Name:** Organization/Organizational Unit Target Customer

Intent: Represents *Organizations* and *Organizational Units* as *Target Customers*.

Rationale: *Organizations* (playing the role of *Organization Target Customer)* and *Organizational Units* (playing the role of *Organizational Unit Target Customer*) can be *Target Customers* of a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Target Customer	The role played by agents that are members of the *Target Customer Community*.
Organization Target Customer	The role played by an *Organization* as a *Target Customer*.
Organizational Unit Target Customer	The role played by an *Organizational Unit* as a *Target Customer*.

P-O-TCustomer - Person/Organization Target Customer
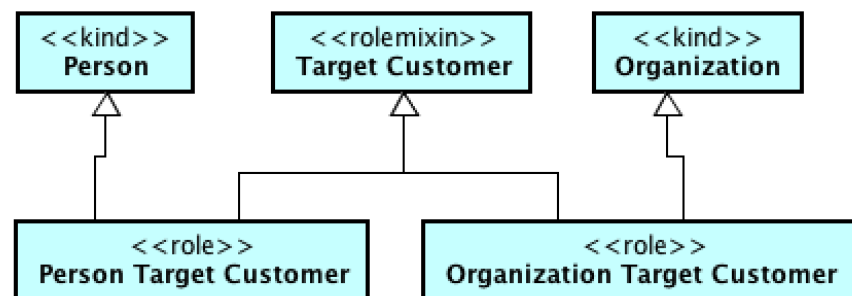
Name: Person/Organization Target Customer

Intent: Represent persons and organizations as *Target Customer*.

Rationale: *Persons* (playing the role of *Person Target Customer*) and *Organizations* (playing the role of *Organization Target Customer*) can act as *Target Customers* of a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Target Customer	The role played by agents that are members of the *Target Customer Community*.
Person Target Customer	*The role played by a *Person* as a *Target Customer*.
Organization Target Customer	*The role played by a *Organization* as a *Target Customer*.

P-OU-TCustomer - Person/Organizational Unit Target Customer

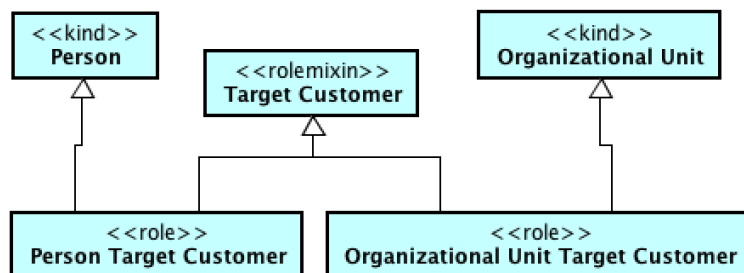**Name:** Person/Organizational Unit Target Customer

Intent: Represents *Persons* and *Organizational Units* as *Target Customers*.

Rationale: *Person*s (playing the role of *Person Target Customer*) and *Organizational Units* (playing the role of *Organizational Unit Target Customer*) can act as *Target Customers* of a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization*. In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Person	An individual human being.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Target Customer	The role played by agents that are members of the *Target Customer Community*.
Person Target Customer	The role played by a *Person* as a *Target Customer*.
Organizational Unit Target Customer	The role played by an *Organizational Unit* as a *Target Customer*.

P-O-OU-TCustomer - Person/Organization/Organizational Unit Target Customer

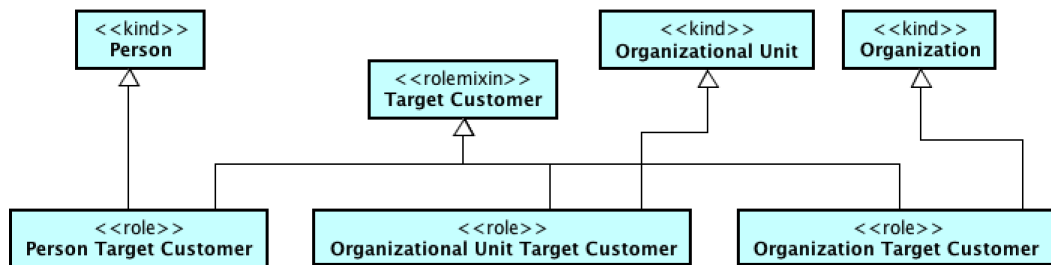**Name:** Person/Organization/Organizational Unit Target Customer

Intent: Represents *Persons*, *Organizations* and *Organizational Units* as *Target Customer*.

Rationale: *Persons* (playing the role of *Person Target Customer*), *Organizations* (playing the role of *Organization Target Customer*), and *Organizational Units* (playing the role of *Organizational Unit Target Customer*) can act as *Target Customers* in a service offering.

Competency Questions:
- Which are the types of target customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.

Target Customer	The role played by agents that are members of the *Target Customer Community*.
Person Target Customer	The role played by a *Person* as a *Target Customer*.
Organization Target Customer	The role played by an *Organization* as a *Target Customer*.
Organizational Unit Target Customer	The role played by an *Organizational Unit* as a *Target Customer*.

5.2 Service Negotiation and Agreement Group

SAgreement - Service Agreement

Name: Service Agreement

Intent: Represents a service agreement, without addressing service negotiation and offering aspects.

Rationale: A *Service Agreement* mediates a service relation established between a *Hired Service Provider* and *Service Customers*.

Competency Questions:
- Which are the parties involved in a service agreement?

Conceptual Model:

Note: The stereotype of the *Hired Service Provider* class is given by the pattern selected from the Hired Provider sub-group. For instance, if O-HProvider pattern is selected, than *Hired Service Provider* is a <<role>>; if P-O-HProvider pattern is selected, than *Hired Service Provider* is a <<rolemixin>>. Due to this fact *Hired Service Provider* class is not stereotyped in the current pattern. The same applies for *Service Customer*, considering, in this case, the pattern selected from the Service Customer sub-group.

Axiomatization:

A1	∀ hsp: HiredServiceProvider, sc:ServiceCustomer, sa: ServiceAgreement (isBoundTo(hsp, sa) ^ isBoundTo(sc, sa) → (hsp≠sc))

- Axiom A1: An agent cannot simultaneously play the roles of **Hired Service Provider** and **Service Customer** in the same **Service Agreement**.

Term Definitions:

Service Agreement	An agreement established between a *Hired Service Provider* and *Service Customers*, regarding a *Service Offering*.
Hired Service Provider	The role played by an agent that is hired to provide a service in the context of a *Service Agreement*.
Service Customer	The role played by an agent that hires a service in the context of a *Service Agreement*.

SNegociation - Service Negotiation
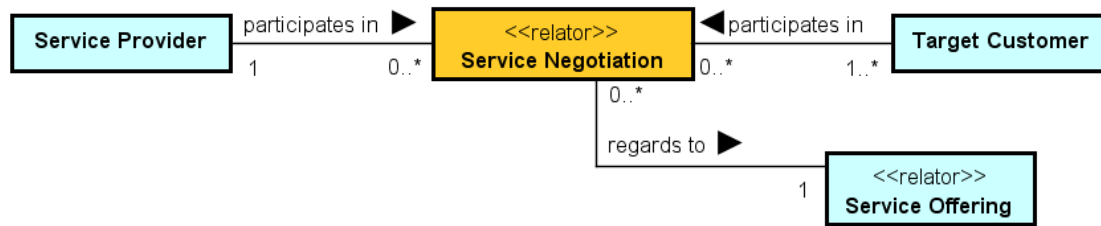
Name: Service Negotiation

Intent: Represents a *Service Negotiation* and the *Service Offering* to which the negotiation regards, without addressing an agreement that possibly results from it.

Rationale: In a *Service Negotiation*, the *Service Provider* and a specific *Target Customer* negotiates. The terms and conditions addressed in a *Service Negotiation* must regard to those of the corresponding *Service Offering*.

Competency Questions:
- Which are the parties involved in a service negotiation?

- To which terms and conditions must a service negotiation regard?

Conceptual Model:

Note: The stereotype of the *Service Provider* class is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Service Provider* is a <<rolemixin>>. Due to this fact, *Service Provider* class is not stereotyped in the current pattern. The same applies for *Target Customer*, considering, in this case, the pattern selected from the Target Customer sub-group.

Axiomatization:

A1	$\forall$ sp: ServiceProvider, tc:TargetCustomer, sn: ServiceNegotiation (participatesIn(sp, sn) $\wedge$ participatesIn(tc, sn) $\rightarrow$ (sp$\neq$tc))
A2	$\forall$ sp: ServiceProvider, sn: ServiceNegotiation participatesIn(sp, sn) $\rightarrow$ ($\exists$so: ServiceOffering (provides(sp, so) $\wedge$ regardsTo(sn, so))

- Axiom A1: An agent cannot simultaneously play the roles of **Service Provider** and **Target Customer** in the same **Service Negotiation**.
- Axiom A2: The **Service Provider** that participates in a **Service Negotiation** must provide the **Service Offering** to which the negotiation regards.

Term Definitions:

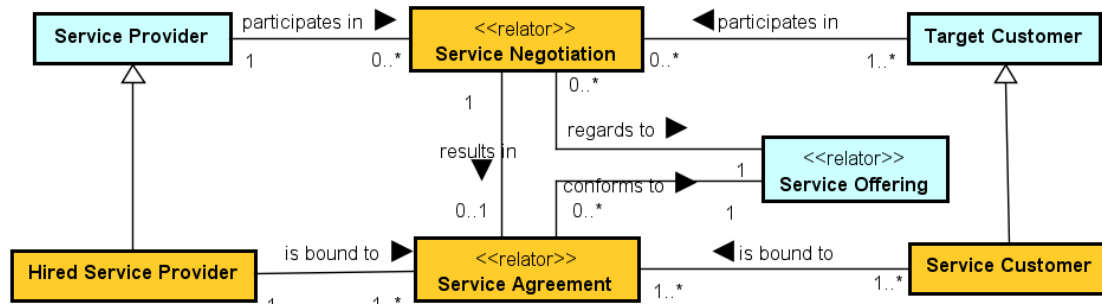|	
Service Negotiation	The interaction between the *Service provider* and a *Target Customer* aiming at establishing an agreement regarding a *Service Offering*.

Name: Service Negotiation and Agreement

Intent: Represents a *Service Negotiation* and the *Service Agreement* that possibly results from it, considering also the corresponding *Service Offering*.

Rationale: In a *Service Negotiation*, the *Service Provider* and a specific *Target Customer* participate aiming to establish a *Service Agreement*. In case of a successful *Service Negotiation*, a *Service Agreement* is established. The terms and conditions addressed in a *Service Negotiation* and that may take part of a *Service Agreement* must regard to/be in conformance with those of the corresponding *Service Offering*.

Competency Questions:

- Which are the parties involved in a service negotiation (and in the resulting agreement, if it is the case)?

- To which terms and conditions must a service negotiation regard?

- To which terms and conditions must a service agreement be in conformance?

- From which service negotiation did a service agreement result?

Conceptual Model:

Note: The stereotype of the *Service Provider* class is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Service Provider* is a <<rolemixin>>. Due to this fact, *Service Provider* class is not stereotyped in the current pattern. The same applies for *Target Customer*, considering, in this case, the pattern selected from the Target Customer sub-group.

Axiomatization:

A1	∀ so: ServiceOffering, sn: ServiceNegotiation, sa: ServiceAgreement (resultsIn(sn, sa) ^ regardsTo(sn, so) → conformsTo(sa, so))
A2	∀ sp: ServiceProvider, tc:TargetCustomer, sn: ServiceNegotiation (participatesIn(sp, sn) ^ participatesIn(tc, sn) → (sp≠tc))
A3	∀ sp: ServiceProvider, sn: ServiceNegotiation participatesIn(sp, sn) → (∃so: ServiceOffering (provides(sp, so) ^ regardsTo(sn, so))

- Axiom A1: When a **Service Negotiation** results in a **Service Agreement**, that agreement must conform to the offering to which the negotiation refers.
- Axiom A2: An agent cannot simultaneously play the roles of **Service Provider** and **Target Customer** in the same **Service Negotiation**.
- Axiom A3: The **Service Provider** that participates in a **Service Negotiation** provides the **Service Offering** to which the negotiation refers.

Term Definitions:

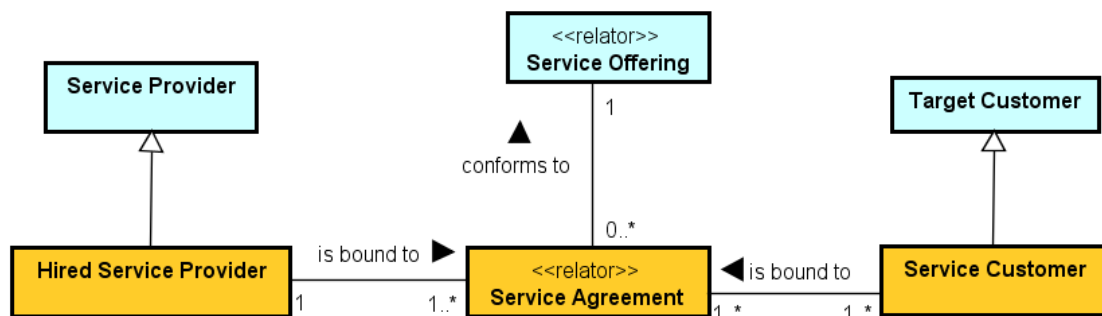|	
Service Negotiation	The interaction between the *Service provider* and a *Target Customer* regarding a *Service Offering*, aiming at achieving a *Service Agreement* between the parties.
Service Agreement	An agreement established between a *Hired Service Provider* and *Service Customers*, regarding a *Service Offering*.
Hired Service Provider	The role played by a *Service Provider*, when the *Service Provider* commits itself to a *Service Customer* to perform actions or to achieve the results determined in the *Service Agreement*.
Service Customer	The role played by a *Target Customer* that hires a service in the context of a *Service Agreement*.

Name: Service Offering and Agreement

Intent: Represents a *Service Agreement* in conformance with a *Service Offering*, without addressing service negotiation aspects.

Rationale: A *Service Agreement* is established between a *Hired Service Provider* and a *Service Customer*. The terms and conditions that may take part of a *Service Agreement* must be in conformance to those of the correspondent *Service Offering*.

Competency Questions:
- Which are the parties involved in a service agreement?

- To which terms and conditions must a service agreement be in conformance?

Conceptual Model:

Note: The stereotype of the *Service Provider* class (and also of the *Hired Service Provider* class) is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Service Provider* is a <<rolemixin>>. Due to this fact, *Service Provider* and *Hired Service Provider* classes are not stereotyped in the current pattern. The same applies for *Target Customer* and *Service Customer*, considering, in this case, the pattern selected from the Target Customer sub-group.

Axiomatization:

A1	∀ hsp: HiredServiceProvider, sc:ServiceCustomer, sa: ServiceAgreement (isBoundTo(hsp, sa) ^ isBoundTo(sc, sa) → (hsp≠sc))
A3	∀ hsp: HiredServiceProvider, sa: ServiceAgreement isBoundTo(hsp, sa) → (∃so: ServiceOffering (provides(hsp, so) ^ conformTo(sa, so))

- Axiom A1: An agent cannot simultaneously play the roles of **Hired Service Provider** and **Service Customer** in the same **Service Agreement**.
- Axiom A2: The **Service Provider** is bound to a **Service Agreement** provides the **Service Offering** to which the agreement is in conform.

Term Definitions:

Service Agreement	An agreement established between a *Hired Service Provider* and *Service Customers*, regarding a *Service Offering*.
Hired Service Provider	The role played by a *Service Provider*, when the *Service Provider* commits itself to a *Service Customer* to perform actions or to achieve the results determined in the *Service Agreement*.
Service Customer	The role played by a *Target Customer* that hires a service in the context of a *Service Agreement*.

SADescription - Service Agreement Description

Name: Service Agreement Description.

Intent: Allows describing *Service Agreements* by means of *Service Agreement Descriptions*.

Rationale: A *Service Agreement* can be described by means of *Service Agreement Descriptions*, which describe the agreement terms and conditions, such as payment conditions, service availability, etc.

Competency Questions:
- What are the descriptions of a service agreement?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Service Agreement Description	A normative description of different aspects of a *Service Agreement*, such as terms and conditions, as well as aspects related to the service business model performed by the *Service Provider*.

HPCommitments - Hired Provider Commitments
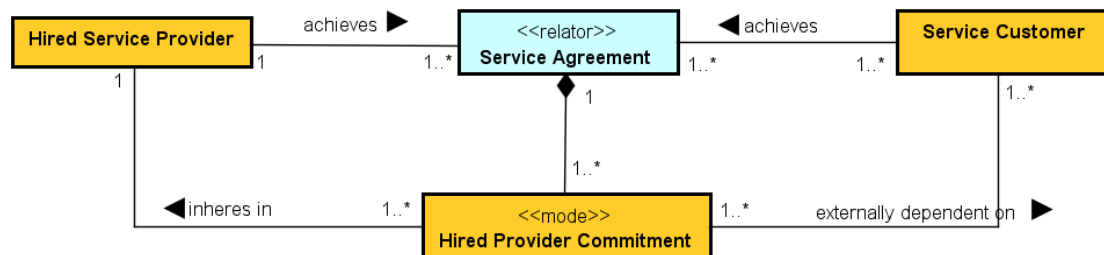
Name: Hired Provider Commitments

Intent: Represents the commitments from a *Hired Service Provider* towards a *Service Customer*.

Rationale: A *Hired Provider Commitment* is a social moment (in terms of UFO-C) that inheres in a *Hired Service Provider* and is externally dependent on the corresponding *Service Customer(s)*. The *Hired Provider Commitments* from the *Hired Service Provider* towards the *Service Customer(s)* are part of the *Service Agreement.*

Competency Questions:
- What are the service commitments from a hired service provider towards the service customer(s) established in a service agreement?

Conceptual Model:

Axiomatization:

A1	∀ sa: ServiceAgreement, hsp: HiredServiceProvider, sc: ServiceCustomer, hpco: HiredProviderCommitment (achieves(hsp, sa) ^ achieves(sc, sa) ^ partOf(hpco, sa)) → (inheresIn(hpco, hsp) ^ externallyDependentOn(hpco, sc))

- Axiom A1: Each **Hired Provider Commitment** that is part of a **Service Agreement** inheres in the **Hired Service Provider** that achieves the **Service Agreement**, and is externally dependent on the **Service Customer** that achieves the **Service Agreement**.

Term Definitions:

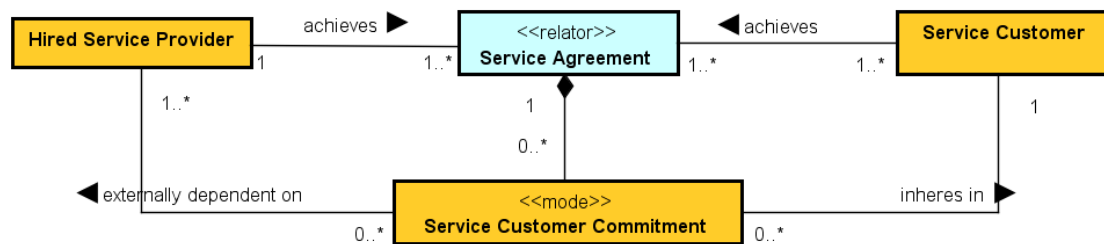| Hired Provider Commitment	Commitments by the *Hired Service Provider* towards the *Service Customer* that are part of the *Service Agreement.*

Name: Service Customer Commitments

Intent: Represents the commitments of Service Customer(s) towards a *Hired Service Provider*.

Rationale: A *Service Customer Commitment* is a social moment that inheres in a *Service Customer* and is externally dependent on a *Hired Service Provider*. Such commitments are established in the context of a *Service Agreement*. The *Service Customer Commitments* towards the *Hired Service Provider* are part of the *Service Agreement*.

Competency Questions:
- What are the commitments from the service customer(s) towards the hired service provider established in a service agreement?

Conceptual Model:

Axiomatization:

A1	∀ sa: ServiceAgreement, hsp: HiredServiceProvider, sc: ServiceCustomer, scco: ServiceCustomerCommitment (achieves(hsp, sa) ∧ achieves(sc, sa) ∧ partOf(scco, sa)) → (inheresIn(scco, sc) ∧ externallyDependentOn(scco, hsp))

- Axiom A1: Each **Service Customer Commitment** that is part of a **Service Agreement** inheres in the **Service Customer** to which the **Service Agreement** is achieves, and is externally dependent on the **Hired Service Provider** that achieves the **Service Agreement**.

Term Definitions:

Service Customer Commitment	Commitments by the *Service Customer* towards the *Hired Service Provider* that are part of the *Service Agreement*.

P-HProvider - Person Hired Provider
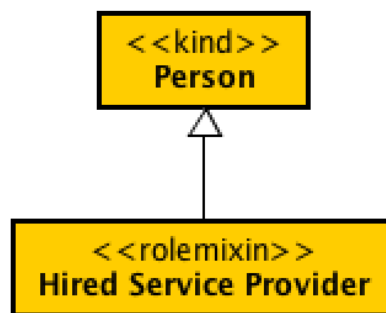
Name: Person Hired Provider

Intent: Represents persons as *Hired Service Providers*.

Rationale: *Persons* can act as (play the role of) *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Hired Service Provider	The role played by a *Person* who is hired to provide a service in the context of a *Service Agreement*.

O-HProvider - Organization Hired Provider
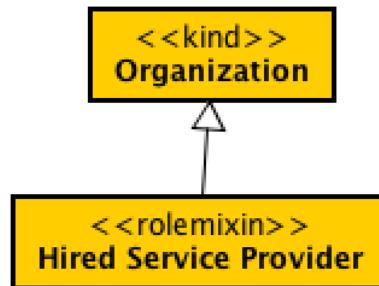
Name: Organization Hired Provider

Intent: Represents organizations as *Hired Service Providers*.

Rationale: *Organizations* can act as (play the role of) *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Hired Service Provider	The role played by an *Organization* that is hired to provide a service in the context of a *Service Agreement*.

OU-HProvider - Organizational Unit Hired Provider
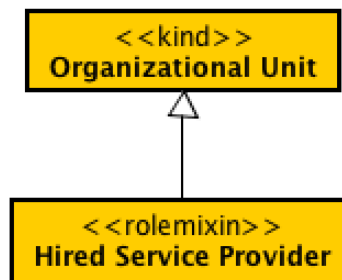
Name: Organizational Unit Hired Provider

Intent: Represents *Organizational Units* as *Hired Service Providers*.

Rationale: *Organizational Units* can act as (play the role of) *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Hired Service Provider	The role played by an *Organizational Unit* that is hired to provide a service in the context of a *Service Agreement*.

O-OU-HProvider - Organization / Organizational Unit Hired Provider

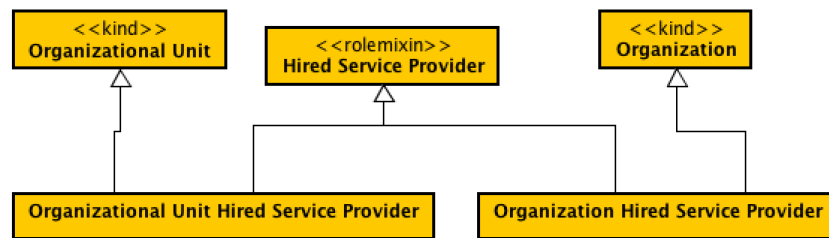**Name:** Organization / Organizational Unit Hired Provider

Intent: Represents *Organizations* and *Organizational Units* as *Hired Service Providers*.

Rationale: *Organizational Units* (playing the role of *Organizational Unit Hired Provider)* and *Organizations* (playing the role of *Organization Hired Provider)* can act as *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Hired Service Provider	The role played by an agent that is hired to provide a service in the context of a *Service Agreement*.
Organization Hired Provider	The role played by an *Organization* as a *Hired Service Provider*.
Organizational Unit Hired Provider	The role played by an *Organizational Unit* as a *Hired Service Provider*.

P-O-HProvider - Person/Organization Hired Provider
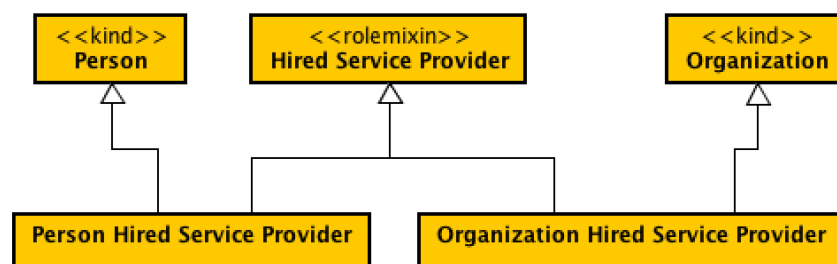
Name: Person/Organization Hired Provider

Intent: Represents *Persons* and *Organizations* as *Hired Service Providers*.

Rationale: *Persons* (playing the role of *Person Hired Service Provider)* and *Organizations* (playing the role of *Organization Hired Service Provider)* can act as *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Hired Service Provider	The role played by an agent that is hired to provide a service in the context of a *Service Agreement*.
Person Hired Provider	The role played by a *Person* as a *Hired Service Provider*.
Organization Hired Provider	The role played by an *Organization* as a *Hired Service Provider*.

P-OU-HProvider - Person/Organizational Unit Hired Provider

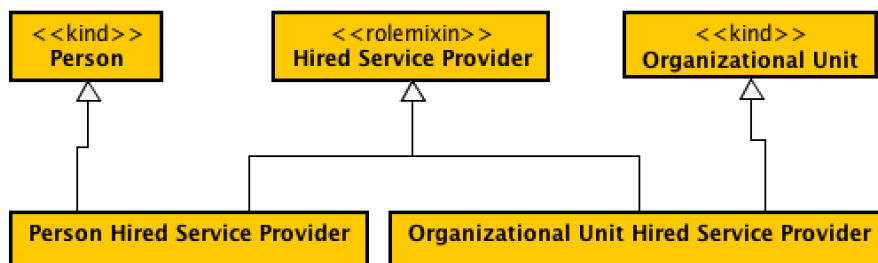**Name:** Person/Organizational Unit Hired Provider

Intent: Represents *Persons* and *Organizational Units* as *Hired Service Providers*.

Rationale: *Persons* (playing the role of *Person Hired Service Provider)* and *Organizational Units* (playing the role of *Organizational Unit Hired Service Provider)* can act as *Hired Service Providers*, i.e., the ones responsible for the hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Person	An individual human being.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Hired Service Provider	The role played by an agent that is hired to provide a service in the context of a *Service Agreement*.
Person Hired Provider	The role played by a *Person* as a *Hired Service Provider*.

Organizational Unit Hired Provider	The role played by an *Organizational Unit* as a *Hired Service Provider*.

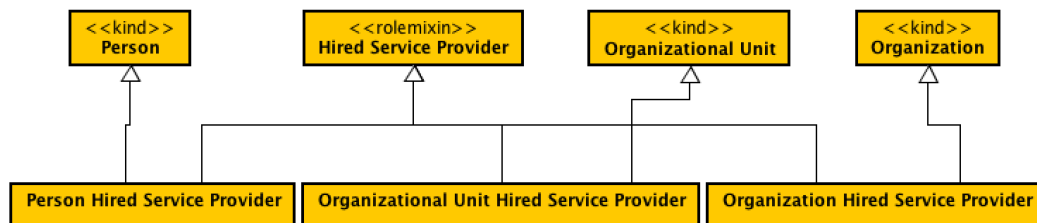**Name:** Person/Organization/Organizational Unit Hired Provider

Intent: Represents *Persons*, *Organizations* and *Organizational Units* as *Hired Service Providers*.

Rationale: *Persons* (playing the role of *Person Hired Service Provider)*, *Organizational Units* (playing the role of *Organizational Unit Hired Service Provider)*, and *Organizations* (playing the role of *Organization Hired Service Provider)* can act as *Hired Service Providers*, i.e., the ones responsible for hired service provision.

Competency Questions:
- Which are the types of hired service providers?

Conceptual Model:

Axiomatization:

  -

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Hired Service Provider	The role played by an agent that is hired to provide a service in the context of a *Service Agreement*.

Person Hired Provider	The role played by a *Person* as a *Hired Service Provider*.
Organization Hired Provider	The role played by an *Organization* as a *Hired Service Provider*.
Organizational Unit Hired Provider	The role played by an *Organizational Unit* as a *Hired Service Provider*.

P-Customer – Person Customer

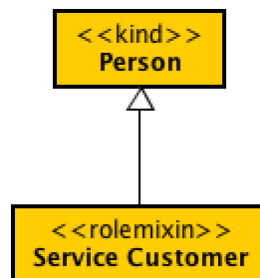**Name:** Person Customer.

Intent: Represents *Persons* as *Service Customers*.

Rationale: *Persons* can act as (play the role of) *Service Customers* in a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Service Customer	The role played by a *Person* that hires a service in the context of a *Service Agreement*.

O-Customer - Organization Customer
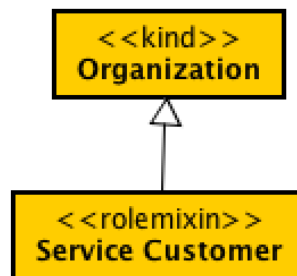
Name: Organization Customer

Intent: Represents *Organizations* as *Service Customers*.

Rationale: *Organization*s can act as (play the role of) *Service Customers* of a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Service Customer	The role played by an *Organization* that hires a service in the context of a *Service Agreement*.

OU-Customer - Organizational Unit Customer
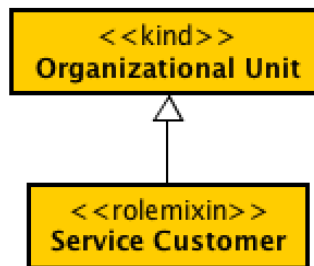
Name: Organizational Units Customer

Intent: Represents *Organizational Units* as *Service Customers*.

Rationale: *Organizational Units* can act as (play the role of) *Service Customers* of a service agreement.

Competency Questions:
- Which is the type of services customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Customer	The role played by an *Organizational Unit* that hires a service in the context of a *Service Agreement*.

O-OU-Customer - Organization/Organizational Unit Customer

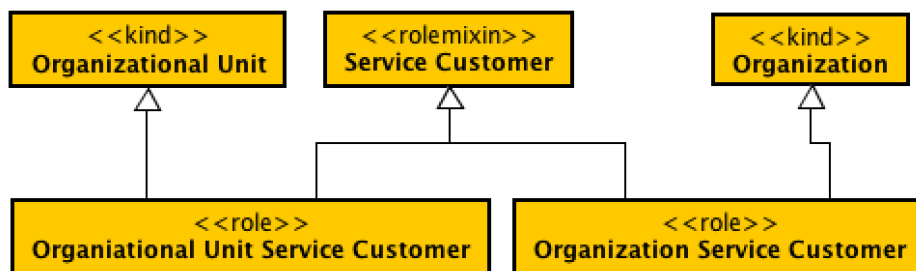**Name:** Organization/Organizational Unit Customer

Intent: Represents *Organizations* and *Organizational Units* as *Service Customers*.

Rationale: *Organizations* (playing the role of *Organization Service Customer)* and *Organizational Units* (playing the role of *Organizational Unit Service Customer*) can be *Service Customers* of a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Customer	The role played by an agent that hires a service in the context of a *Service Agreement*.
Organizational unit Service Customer	The role played by an *Organizational Unit* as a *Service Customer*.
Organization Service Customer	The role played by an *Organization* as a *Service Customer*.

P-O-Customer - Person/Organization Customer
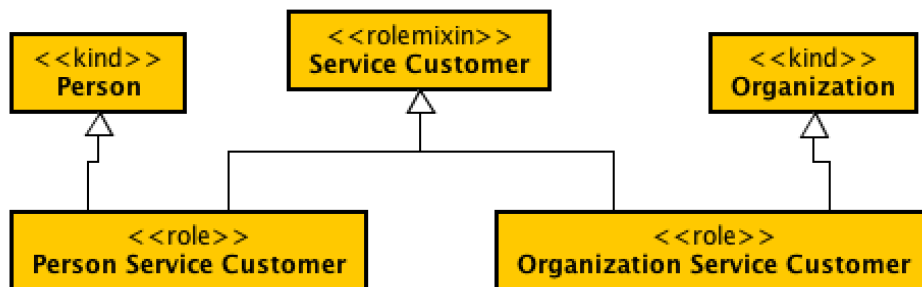
Name: Person/Organization Customer

Intent: Represent persons and organizations as *Service Customer*.

Rationale: *Persons* (playing the role of *Person Service Customer*) and *Organizations* (playing the role of *Organization Service Customer*) can act as *Service Customers* of a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Service Customer	The role played by an agent that hires a service in the context of a *Service Agreement*.
Person Service Customer	The role played by a *Person* as a *Service Customer*.
Organization Service Customer	The role played by an *Organization* as a *Service Customer*.

P-OU-Customer - Person/Organizational Unit Customer
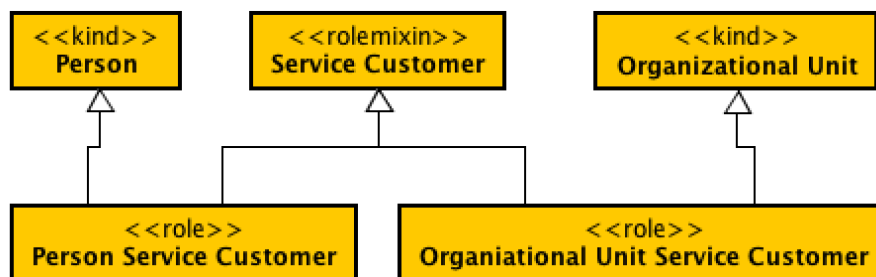
Name: Person/Organizational Unit Customer

Intent: Represents *Persons* and *Organizational Units* as *Service Customers*.

Rationale: *Person*s (playing the role of *Person Service Customer*) and *Organizational Units* (playing the role of *Organizational Unit Service Customer*) can act as *Service Customers* of a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR pattern from E-OPL.

Term Definitions:

Person	An individual human being.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Customer	The role played by an agent that hires a service in the context of a *Service Agreement*.
Person Service Customer	The role played by a *Person* as a *Service Customer*.
Organizational unit Service Customer	The role played by an *Organizational Unit* as a *Service Customer*.

P-O-OU-Customer - Person/Organization/Organizational Unit Customer

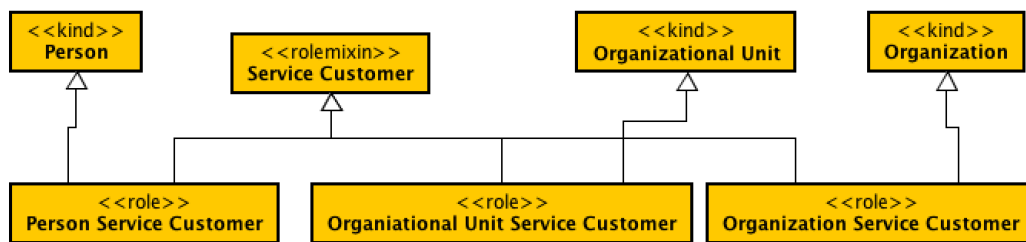**Name:** Person/Organization/Organizational Unit Customer

Intent: Represents *Persons*, *Organizations* and *Organizational Units* as *Service Customer*.

Rationale: *Persons* (playing the role of *Person Service Customer*), *Organizations* (playing the role of *Organization Service Customer*), and *Organizational Units* (playing the role of *Organizational Unit Service Customer*) can act as *Service Customers* in a service agreement.

Competency Questions:
- Which are the types of services customers?

Conceptual Model:

Axiomatization:

-

Complementary Patterns:

An *Organizational Unit* is part of a *Complex Organization.* In order to address this issue, consider applying the COAR and MOAR patterns from E-OPL.

Term Definitions:

Person	An individual human being.
Organization	A social agent that has as its main purpose the provision of services or products, and that is formally recognized by its external environment.
Organizational Unit	A working group of an *Organization* that is only recognized in the internal context of this *Organization*.
Service Customer	The role played by an agent that hires a service in the context of a *Service Agreement*.

Person Service Customer	The role played by a *Person* as a *Service Customer*.
Organization Service Customer	The role played by an *Organization* as a *Service Customer*.
Organizational unit Service Customer	The role played by an *Organizational Unit* as a *Service Customer*.

5.3 Service Delivery Group

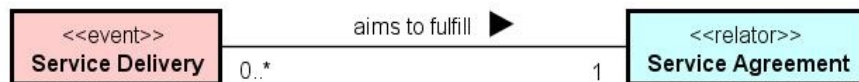**SDelivery - Service Delivery**

Name: Service Delivery

Intent: Represents the process (complex action) carried out to fulfill commitments established in the *Service Agreement*.

Rationale: Some commitments established in a *Service Agreement* are only fulfilled by performing actions. The *Service Delivery*, as a complex action, represents the actions performed as a whole, aiming at fulfilling the *Service Agreement*.

Competency Questions:
- Which are the processes performed to fulfill a service agreement?

Conceptual Model:

Axiomatization:

-

Term Definitions:

Service Delivery	A process (complex action) performed aiming at fulfilling a *Service Agreement*.

HPActions - Hired Service Provider Actions
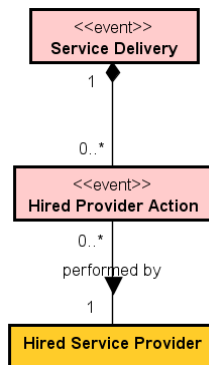
Name: Hired Service Provider Actions

Intent: Represents the actions of the *Service Delivery* that are performed only by the *Hired Service Provider*.

Rationale: A *Hired Provider Action* is a kind of action performed only by the *Hired Service Provider*. *Hired Provider Actions* are part of the *Service Delivery* process.

Competency Questions:

- What are the actions of the service delivery process that are performed only by the hired service provider?

Conceptual Model:

Note: The stereotype of the *Hired Service Provider* class (in fact, defined by the *Service Provider* class) is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Hired Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Hired Service Provider* is a <<rolemixin>>. Due to this fact, *Hired Service Provider* class is not stereotyped in the current pattern.

Axiomatization:

-

Term Definitions:

Hired Provider Action	An action performed by the *Hired Service Provider* as part of the *Service Delivery*

SCActions - Service Customers Actions
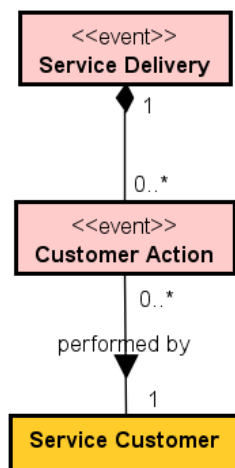
Name: Service Customers Actions

Intent: Represents the actions of the *Service Delivery* process that are performed only by the *Service Customers*.

Rationale: A *Customer Action* is a kind of action that is performed only by the *Service Customer*. *Customer Actions* are part of the *Service Delivery* process.

Competency Questions:

- What are the actions of the service delivery process that are performed only by the service customer(s)?

Conceptual Model:

Note: The stereotype of the *Service Customer* class (in fact, defined by the *Target Customer* class) is given by the pattern selected from the Target Customer sub-group. For instance, if P-Customer pattern is selected, than *Service Customer* is a <<role>>; if P-O-Customer pattern is selected, than *Service Customer* is a <<rolemixin>>. Due to this fact, *Service Customer* class is not stereotyped in the current pattern.

Axiomatization:

-

Term Definitions:

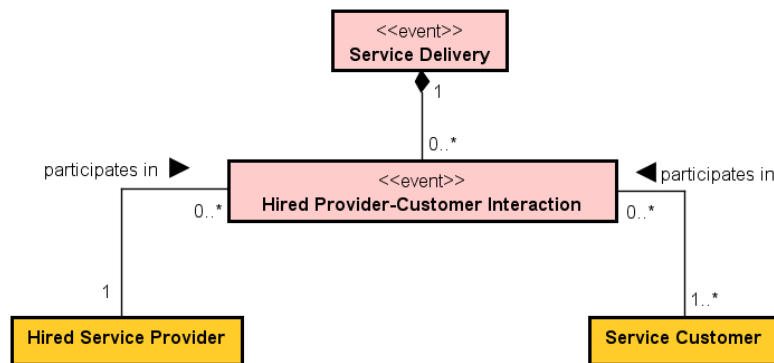|	
Customer Action	An action performed by the *Service Customer* as part of the *Service Delivery*.

Name: Interactions

Intent: Represents the actions in a *Service Delivery* in which the *Hired Service Provider* and the *Service Customer(s)* act in tandem.

Rationale: A *Hired Provider-Customer Interaction* is an event in which *Hired Service Provider* and *Service Customer(s)* participate. *Hired Provider-Customer Interactions* are part of a *Service Delivery.*

Competency Questions:

- What are the actions of the service delivery process that are performed by both the hired service provider and the service customer(s)?

Conceptual Model:

Note: The stereotype of the *Hired Service Provider* class (in fact, defined by the *Service Provider* class) is given by the pattern selected from the Provider sub-group. For instance, if O-Provider pattern is selected, than *Hired Service Provider* is a <<role>>; if P-O-Provider pattern is selected, than *Hired Service Provider* is a <<rolemixin>>. Due to this fact, *Hired Service Provider* class is not stereotyped in the current pattern. The same applies for *Service Customer*, considering, in this case, the pattern selected from the Target Customer sub-group.

Axiomatization:

-

Term Definitions:

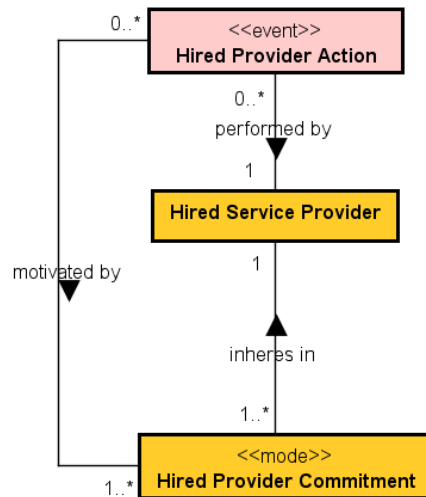| Hired Provider - Customer Interaction	An *Interaction* between the *Hired Service Provider* and the *Service Customer(s)* performed as part of the *Service Delivery*.

Name: Hired Provider Action Motivation

Intent: Represents the relationships between the actions performed only by a *Hired Service Provider* and the commitments that motivated them.

Rationale: *Hired Provider Actions* are performed by a *Hired Service Provider* and are motivated by some of its commitments (the *Hired Provider Commitments*).

Competency Questions:

- What did motivate the actions performed only by a hired service provider?

Conceptual Model:

Axiomatization:

A1	∀ hpac: HiredProviderAction, hpco: HiredProviderCommitment, hsp: HiredServiceProvider (motivatedBy(hpac, hpco) ^ performedBy(hpac, hsp) → inheresIn (hpco, hsp))

- Axiom A1: The **Hired Provider Commitments** that motivate a **Hired Provider Action** should inhere in the **Hired Service Provider** that performs the action

SCAMotivations - Service Customer Action Motivation
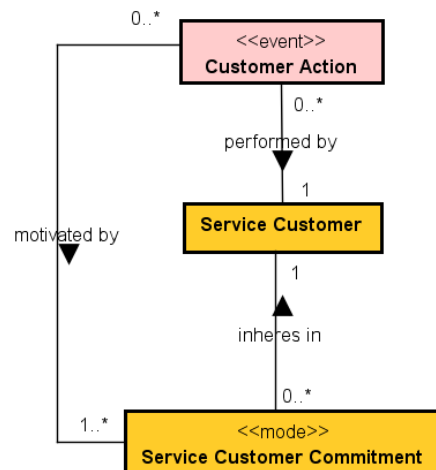
Name: Service Customer Action Motivation

Intent: Represents the relationships between the actions performed only by a *Service Customer* and the commitments that motivated them.

Rationale: *Customer Actions* are performed only by a *Service Customer* and are motivated by some of its commitments (the *Service Customer Commitments*).

Competency Questions:

- What did motivate the actions performed only by the service customer?

Conceptual Model:

Axiomatization:

A1	∀ cac: CustomerAction, scco: ServiceCustomerCommitment, sc: ServiceCustomer (motivatedBy(cac, scco) ^ performedBy(cac, sc) → inheresIn (scco, sc))

- Axiom A1: The **Service Customer Commitments** that motivate a **Customer Action** should inhere in the **ServiceCustomer** that performs the action.

InteractionMotivation - Motivations for Interactions

Name: Motivations for Interactions

Intent: Represents the relationships between the interactions of a hired service provider and the service customer(s) and the commitments that motivated them.
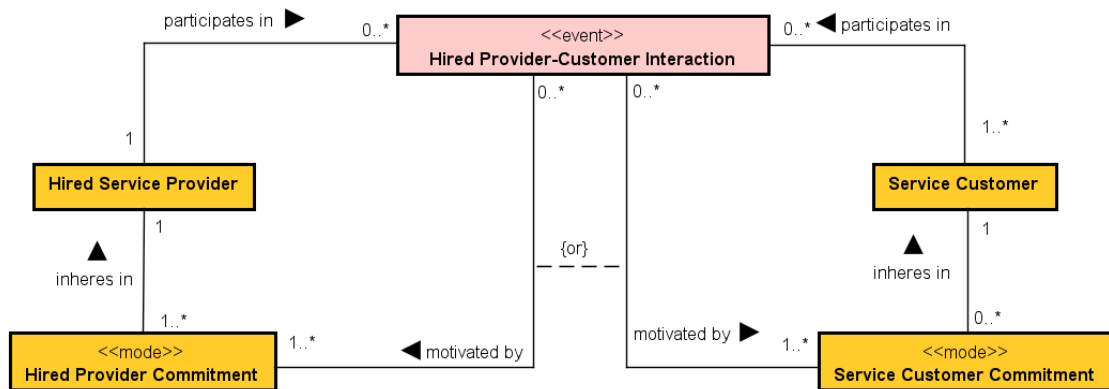
Rationale: *Hired Provider-Customer Interactions* are motivated by either the commitments established by the *Hired Service Provider* (*Hired Provider Commitment*)

or by the commitments established by *Service Customer(s)* (*Service Customer Commitment*). Motivated by these commitments, *Hired Service Provider* and *Service Customer(s)* participate in interactions (*Hired Provider-Customer Interaction*).

Competency Questions:

- What did motivate the interactions between hired service provider and service customer(s)?

Conceptual Model:

Axiomatization:

A1	∀ hpi: HiredProviderCustomerInteraction (∃co ((HiredProviderCommitment(co) ∨ ServiceCustomerCommitment(co)) ^ motivatedBy(hpi, co))
A2	∀ hpi: HiredProviderCustomerInteraction, hpco: HiredProviderCommitment, hsp: HiredServiceProvider (motivatedBy(hpi, hpco) ^ participatesIn(hsp, hpi)) → inheresIn (hpco, hsp)
A3	∀ hpi: HiredProviderCustomerInteraction, scco: ServiceCustomerCommitment, sc: ServiceCustomer (motivatedBy(hpi, scco) ^ participatesIn(sc, hpi)) → inheresIn (scco, sc)

- Axiom A1: Each **Hired Provider-Customer Interaction** is motivated by at least one commitment (a **Hired Provider Commitment** or a **Service Customer Commitment**).

- Axiom A2: The **Hired Provider Commitments** that motivate a **Hired Provider-Customer Interaction** should inhere in the **Hired Service Provider** that participates in the **Interaction**.

- Axiom A3: The **Service Customer Commitments** that motivate a **Hired Provider-Customer Interaction** should inhere in a **Service Customer** that participates in the **Interaction**.

6. References

1. Falbo, R. A., Barcellos, M.P., Nardi, J.C., and Guizzardi, G., *Organizing Ontology Design Patterns as Ontology Pattern Languages*. Proceedings of the 10th Extended Semantic Web Conference - ESWC 2013, 2013

2. Nardi, J.C., Falbo, R.A., Almeida, J.P.A., Guizzardi, G., Pires, L.F., van Sinderen, M.J., Guarino, N., Fonseca, C.M., *A Commitment-based Reference Ontology for Services*, Information Systems, 54, 2015, pp. 262–287