V19.1

Open Service Catalog Manager

Overview

February 2021

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About this Manual

This manual is an introduction to Open Service Catalog Manager (OSCM).

The manual is structured as follows:

Chapter	Description
What is OSCM? on page 7	Introduces OSCM, its basic usage scenario, users, and components.
OSCM for Technology Providers on page 12	Describes how software vendors can integrate their applications with OSCM.
OSCM for Suppliers, Brokers, and Resellers on page 15	Describes how suppliers can define and manage service offerings for applications and how brokers and resellers can support suppliers in selling the services.
OSCM for Customers on page 21	Describes how customers can subscribe to services in OSCM, manage their subscriptions, and work with the services they have subscribed to.
OSCM for Marketplace Owners on page 25	Describes how marketplace owners can administrate and customize their marketplaces in OSCM.
OSCM for Operators on page 28	Describes how OSCM supports its operators.
OSCM Across Organizations on page 29	Describes features of OSCM which are of relevance for all users.

Readers of this Manual

This manual is written for everybody interested in OSCM. It offers a basic introduction for readers who do not know OSCM and for those who have already started using the services. The manual does not require any special knowledge.

Abbreviations

This manual uses the following abbreviations:

API	Application programming interface
IaaS	Infrastructure as a Service
LDAP	Lightweight Directory Access Protocol
OIDC	OpenID Connect
OSCM	Open Service Catalog Manager
PaaS	Platform as a Service
REST	Representational State Transfer
SaaS	Software as a Service
SOAP	Simple Object Access Protocol

WSDL	Web Services Description Language

Available Documentation

The following documentation on OSCM is available:

- *Overview:* A PDF manual introducing OSCM. It is written for everybody interested in OSCM and does not require any special knowledge.
- *Operator's Guide:* A PDF manual for operators describing how to administrate and maintain OSCM.
- *Technology Provider's Guide:* A PDF manual for technology providers describing how to prepare applications for usage in a SaaS model and how to integrate them with OSCM.
- *Supplier's Guide:* A PDF manual for suppliers describing how to define and manage service offerings for applications that have been integrated with OSCM.
- *Reseller's Guide:* A PDF manual for resellers describing how to prepare, offer, and sell services defined by suppliers.
- *Broker's Guide:* A PDF manual for brokers describing how to support suppliers in establishing relationships to customers by offering their services on a marketplace.
- *Marketplace Owner's Guide:* A PDF manual for marketplace owners describing how to administrate and customize marketplaces in OSCM.
- *Microsoft Azure Integration:* A PDF manual for operators describing how to offer and use virtual systems controlled by Microsoft Azure through services in OSCM.
- *Amazon Web Services Integration:* A PDF manual for operators describing how to offer and use virtual servers controlled by the Amazon Elastic Compute Cloud Web service through services in OSCM.
- *OpenStack Integration:* A PDF manual for operators describing how to offer and use virtual systems controlled by OpenStack through services in OSCM.
- *VMware vSphere Integration:* A PDF manual for operators describing how to offer and use virtual machines provisioned on a VMware vSphere server through services in OSCM.
- *Shell Integration:* A PDF manual for operators describing how to use Shell scripts through services in OSCM.
- *Online Help:* Online help pages describing how to work with the administration portal of OSCM. The online help is intended for and available to everybody working with the administration portal.

1 What is OSCM?

Open Service Catalog Manager (OSCM) is a set of services which provide all business-related functions and features required for turning on-premise applications and tools into "as a Service" (aaS) offerings and using them in the Cloud. This includes ready-to-use account and subscription management, online service provisioning, billing and payment services, and reporting facilities.

With its components, OSCM supports software vendors as well as their customers in leveraging the advantages of Cloud Computing:

- Sharing: Through the Internet, many customers use applications which are installed centrally and share a common IT infrastructure. Each customer's security and privacy are not sacrificed, but even improved by the concentration of security means and expertise at data centers.
- Pay-per-use: Software vendors as well as their customers only pay for the services they actually use, without upfront investment or entry costs for both human and non-human resources. Customers simply subscribe to the services they like to use and pay for what they consume.
- Centralized management: Cloud application providers maintain and operate the applications centrally for all their customers. This substantially reduces installation and maintenance costs for all participants.

Integration with OSCM does not require software vendors to design or implement their applications in a specific way. Instead, OSCM offers open and standards-based interfaces, which enable software vendors to:

- Easily and rapidly provide new as well as existing applications with the required business services without the need of rewriting existing applications or changing their development environment.
- Leverage an open platform suitable for multiple sales channels such as online marketplaces, value-added resellers, system integrators, and direct sales.

While being open in its interfaces, OSCM provides all the required ways and means to ensure customer privacy and data security.

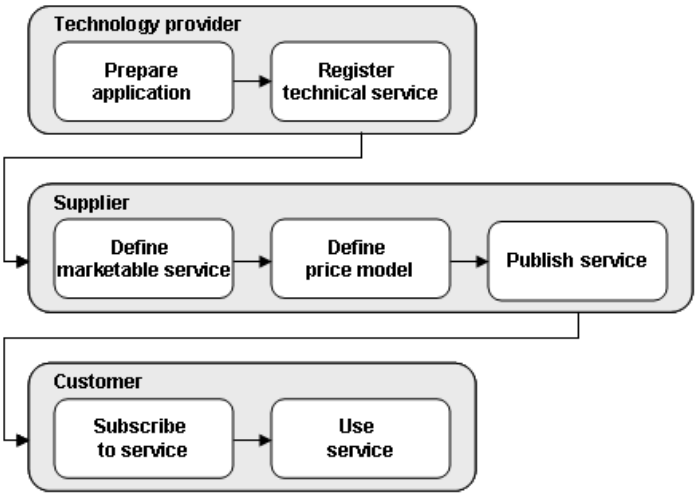
OSCM is typically operated and used in an IaaS environment such as OpenStack. It supports, however, all types of "as-a-Service" environments.

1.1 Usage Scenarios

OSCM supports a variety of usage scenarios. The following sections describe typical scenarios and provide an overview of the participating users and organizations.

Basic Usage Scenario

The basic scenario of deploying and using applications as services in the OSCM framework involves the following users and organizations:



1. **Technology providers** (e.g. independent software vendors) technically prepare their applications for usage in the Cloud and integrate them with OSCM. They register the applications as technical services in OSCM.

   For details, refer to *OSCM for Technology Providers* on page 12.

2. **Suppliers** (e.g. independent software vendors or sales organizations) define service offerings, so-called marketable services, for the technical services in OSCM. They publish the services to a marketplace.

   For details, refer to *OSCM for Suppliers, Brokers, and Resellers* on page 15.

3. **Customers** register themselves or are registered by an authorized organization in OSCM and subscribe to one or more services. Users appointed by the customers work with the underlying applications under the conditions of the corresponding subscriptions.

   For details, refer to *OSCM for Customers* on page 21.

Extended Usage Scenarios

The suppliers who define marketable services may involve additional users and organizations in offering and selling these services:

- **Brokers** support suppliers in establishing relationships to customers by offering the suppliers' services on a marketplace. A service subscription is a contract between the customer and the supplier.
- **Resellers** offer services defined by suppliers to customers applying their own terms and conditions. A service subscription establishes a contract between the customer and the reseller.

Brokers and resellers usually receive their share of a supplier's revenue. OSCM provides the means to define these revenue shares and calculate and retrieve the actual amounts from the service usage fees.

For details, refer to *OSCM for Suppliers, Brokers, and Resellers* on page 15.

OSCM Across Usage Scenarios

In addition to technology providers, suppliers, resellers, brokers, and customers, the following users are involved in the preparation and operation of OSCM and the applications integrated with it:

- **Marketplace owners** are responsible for administrating and customizing the marketplaces to which services are published. For details, refer to *OSCM for Marketplace Owners* on page 25.
- **Operators** are responsible for deploying and maintaining OSCM. For details, refer to *OSCM for Operators* on page 28.

  OSCM is provided in Docker containers and deployed in a container environment. The applications integrated with OSCM and their data may be hosted on the same system (Docker host) as OSCM or in different locations.

OSCM offers features and functions which are of relevance for all these participating parties. These include a state-of-the-art user interface, account and identity management, and external process control. Public Web services and application programming interfaces (APIs) are available by which developers can integrate applications and external systems with OSCM. For details, refer to *OSCM Across Organizations* on page 29.

1.2 Organizations and User Roles

Each user working in OSCM is a member of a specific organization. An organization typically represents a company, but it may also stand for a department of a company or a single person. Each organization in OSCM has a unique account and ID as well as one or more of the following roles: **operator**, **technology provider**, **supplier**, **reseller**, **broker**, **marketplace owner**, **customer**.

Customers can register themselves with OSCM or be registered by a supplier, reseller, broker, or operator. In any case, an organization with the customer role is created. Organizations with other roles can also act as customers, i.e. they are implicitly assigned the customer role. These organizations are created and assigned their roles as follows:

- When OSCM is installed, an organization with the operator role is created.
- Operators can assign the supplier, reseller, broker, and technology provider role to any existing organization or create new organizations with these roles.
- When operators create a marketplace, they specify an existing organization as its owner. In this way, the organization is assigned the marketplace owner role.

The roles of an organization determine which features are available to its users at the OSCM interfaces and which roles the users can be assigned. These user roles control the actions an individual user is allowed to carry out:

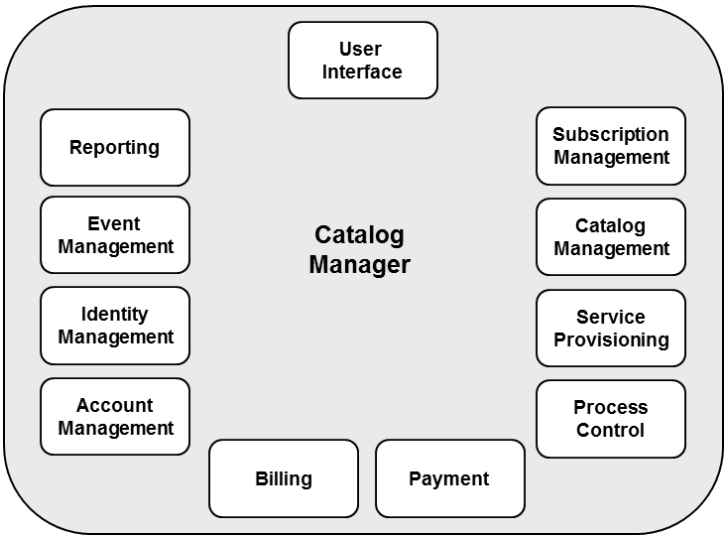
- **Standard user**: Users with this non-privileged role can work with services their organization has subscribed to. Every user registered in OSCM automatically is a standard user. Additional user roles must be assigned explicitly by an administrator.
- **Administrator**: Each organization must have at least one user with this role. An administrator can manage the organization's account and subscriptions as well as its users and their roles. The first administrator of an organization is defined when the organization is created.
- **OU administrator**: The users of an organization can be grouped in organizational units (OUs). The OU administrator role allows a user to manage the organizational units for which he has

been appointed as an administrator, to create, modify, and terminate subscriptions for these units, as well as generate reports for cost-controlling purposes.

- **Subscription manager**: This role allows a user to subscribe to services and manage his own subscriptions. Unlike administrators, subscription managers are not permitted to work on subscriptions belonging to others or on subscription data related to billing and payment.
- **Technology manager**: This role allows a user to define technical services. It can be assigned to users of technology provider organizations.
- **Service manager**: This role allows a user to define marketable services and price models as well as publish marketable services. It can be assigned to users of supplier organizations.
- **Reseller**: This role allows a user to publish a supplier's marketable services applying different terms and conditions. It can be assigned to users of reseller organizations.
- **Broker**: This role allows a user to publish a supplier's marketable services without changing the terms and conditions defined by the supplier. It can be assigned to users of broker organizations.
- **Marketplace manager**: This role allows a user to define the organizations who are permitted to access a marketplace and publish services to it as well as update and customize a marketplace. This role can be assigned to users of marketplace owner organizations. It is automatically assigned to all administrators of the marketplace owner organization when a marketplace is created.
- **Operator**: This role allows a user to carry out configuration and maintenance tasks, manage organizations, and create marketplaces. The first operator is created together with its operator organization when OSCM is installed.

1.3 OSCM Components

OSCM comprises the following technical components which provide the business framework for software applications in the Cloud:



Service Provisioning is the interface for making applications available in service offerings on a marketplace. Marketplaces are created and managed through the **Catalog Management**

component. Customers can subscribe to the available services and manage their subscriptions through **Subscription Management**.

Account Management provides for the registration of organizations and the management of the organization accounts. The individual users of OSCM, their accounts, roles, and logins are handled by the **Identity Management** component. As users work with the services and underlying applications, **Event Management** collects specific events, which serve as the basis for reporting and billing.

The **Billing** and **Payment** components are involved when it comes to calculating the charges for the customers depending on the services their users have consumed and to preparing the creation of invoices and payment collection. These components also serve to calculate the revenue shares of all participating parties.

Process Control allows for integrating organization-specific processes. Usually, such processes include approval processes and are modeled and automated with a process control system.

The **Reporting** facilities offer comprehensive reports for different purposes and at different levels of detail. Different types of report satisfy the needs of all participating parties.

OSCM provides a state-of-the-art **User Interface** for all participating parties. This includes the marketplaces, where customers work with services and subscriptions, as well as an administration portal, where technology providers, suppliers, resellers, brokers, marketplace owners, and operators perform their tasks.

Some of the components mentioned above are available as public Web services and provide APIs which applications can use to integrate with OSCM.

2 OSCM for Technology Providers

Technology providers are the companies, departments, or people who want to provide their applications in a SaaS model using OSCM to cover the business-related functionality.

To achieve this goal, the following tasks must be completed:

1. Prepare the applications for usage in a SaaS model.
2. Integrate applications with OSCM.
3. Provision the applications as technical services in OSCM.

Technology providers can use the OSCM reporting facilities, for example, for retrieving information on the number of subscriptions for their services or on the usage and load of the underlying applications.

The following sections provide an overview of the technology providers' tasks and briefly outline the planning considerations a technology provider has to take into account to make his application ready for SaaS. For details, refer to the *Technology Provider's Guide*.

2.1 Preparing Applications for Usage in a SaaS Model

An application that is to be offered in a SaaS model should take the following aspects into consideration:

- A remote interface by which users can access the application from anywhere in the Web (Internet/Intranet). This may be, for example, a Web user interface or a Web service.
- Multi-tenancy at least with respect to the management of data: The data of different customers or of different service subscriptions of a customer should be clearly separated from each other and only be accessible by the respective customer or subscription user.

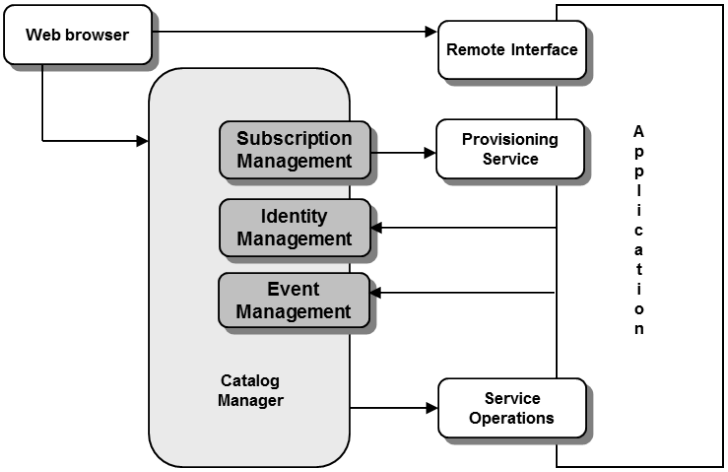
  In OSCM, the term "instance" refers to what is provisioned for a tenant (customer or subscription) on the application side. Possible solutions range from using different workspaces in one data container over maintaining different databases to instantiating different virtual servers in an Infrastructure as a Service (IaaS) environment.
- High scalability, because the number of users, performance, and space requirements may differ to a great extent for each customer.
- High availability, ideally 24x7. It is usually required to host an application in a professional data center that takes care of non-stop operation, backup, data security, and regular maintenance.
- Security aspects such as the following: Web service calls between OSCM and an application can be sent as plain text containing a user ID and password. For secure communication, the usage of certificates is recommended.

Technology providers may have to adapt their applications to fulfill these recommendations. They do this in their own development environments using their own tools and facilities.

2.2 Integrating Applications with OSCM

The technology provider is responsible for implementing the interfaces by which the application is integrated with OSCM.

An application can be integrated with OSCM components as shown in the following illustration. The OSCM components are colored in dark grey:



Depending on the requirements, the integration involves the following tasks:

1. Decide how users access the application.

   Users may access an application directly or through OSCM. When access occurs through OSCM, user management and authentication are under full control of the OSCM identity management, and price models on a per-user basis can be used.

2. Implement a provisioning service.

   If an application is to integrate with the subscription management of OSCM, it must provide a corresponding Web service (provisioning service). By the provisioning service, OSCM triggers the application to provision and manage whatever is required for a subscription.

3. Adapt the application's login/logout implementation.

   If an application is to be accessed through OSCM, its login/logout implementation must be adapted. Depending on the access type, specific methods defined by the provisioning service must be implemented.

4. Integrate with the OSCM event management.

   The application can send events to the event management of OSCM. Events can be used as a basis for price models, billing, and reporting. Integrating with the event management is optional, but recommended for fine-grained pay-per-use billing.

5. Implement service operations.

   The application can implement operations that can be executed from the OSCM user interface. Service operations can be used to access the resources of the application and perform administrative tasks.

2.3 Provisioning Applications as Services in OSCM

After the required preparations and adaptations of the applications are finished, technology providers register the applications as technical services in OSCM. By registering an application, the technology provider makes it available for suppliers.

An application can be registered in either of the following ways:

- If an application does not provide any parameters, options, user roles, events, or operations, the technology provider can register it using the OSCM user interface. Afterwards, the technology provider can update the service definition and add, for example, license information.
- If an application is complex and provides parameters, options, or events, the technology provider can create a technical service definition as an XML file and import this file into OSCM using the OSCM user interface.

After registering an application, a technology provider has to appoint one or more suppliers who are to be able to create service offerings based on the technical service. The suppliers must be known to OSCM, i.e. they must have been previously registered by the operator. A supplier can be an entirely independent organization, yet a technology provider can also act as his own supplier.

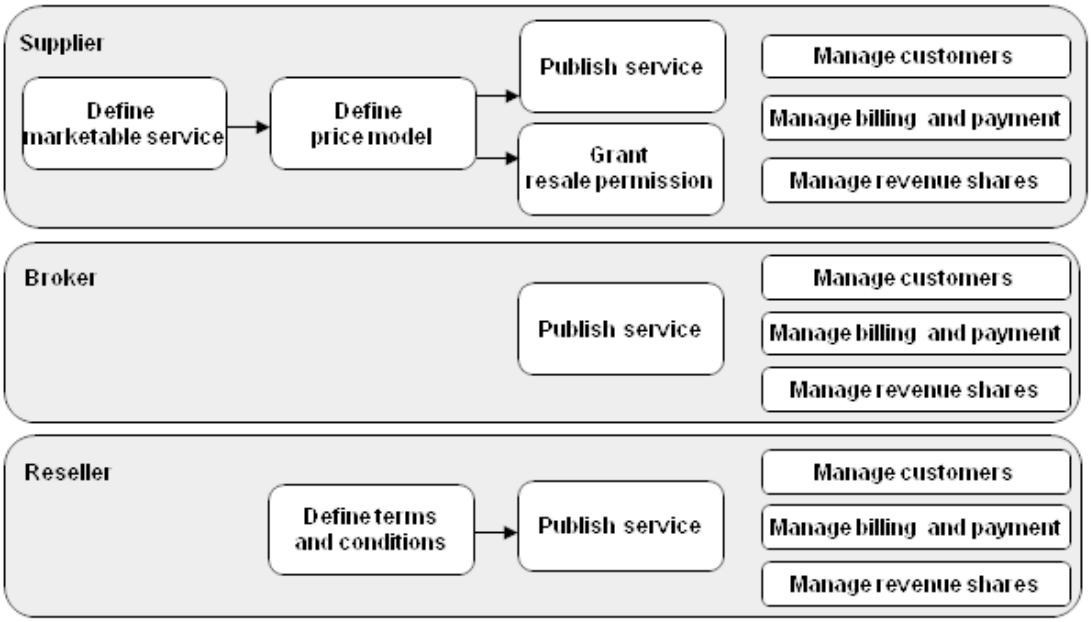
3 OSCM for Suppliers, Brokers, and Resellers

Suppliers, brokers, and resellers are the companies, departments, or people who offer and sell services in OSCM. In the following, the term "sellers" is used to denote all three organization roles.

Suppliers define service offerings for the technology providers' applications. They can provide the services to customers by themselves as well as address customers through brokers and resellers.

Brokers and resellers support suppliers in selling their services by offering the services on a marketplace. Whereas brokers offer a service as defined by the supplier, resellers can apply their own terms and conditions. A subscription to a service offered by a reseller forms a contract between a customer and the reseller. A subscription to a service offered by a broker, however, establishes a contract between a customer and the supplier of the service.

Suppliers, brokers, and resellers perform the following basic tasks:



For all tasks, the sellers can use the OSCM user interface. They can also use the OSCM reporting facilities, for example, for retrieving billing data or information on their revenue shares depending on the usage of the services they offer.

3.1 Defining Marketable Services

A marketable service is a service offering to customers based on a technical service provided by a technology provider. It specifies parameters, conditions, and restrictions for using the underlying application. Suppliers are responsible for defining marketable services in OSCM. They must also specify a price model for each marketable service before the service can be published and provided to customers for subscription.

For each technical service, any number of marketable services can be defined, applying different price models, configurations, and upgrade and downgrade options. A supplier could, for example, define three marketable services based on one technical service, thus offering three different editions of an application to his customers.

The services could be defined as follows:

	Configuration	Price
Trial edition	Limited subscription for 4 weeks Limited set of features Number of users limited to 1	Free of charge
Standard edition	No limit of subscription lifetime Standard set of features Number of users limited to 25	Basic charge of 45 € per month
Enterprise edition	No limit of subscription lifetime Full set of features Unlimited number of users	Basic charge of 60 € per month 1 € per user login

If defined for the underlying application, specific parameters can take on different values which suppliers can make available to customers as different options. When a customer subscribes to the service, he can choose between these options. This makes service definitions flexible, since there is no need for defining separate services for every option suppliers want to offer.

OSCM supports suppliers in changing the definition of a marketable service at any time. The textual elements of the definition can be localized and made available to customers in all languages supported by OSCM.

Suppliers can copy a marketable service including its price model. This may be useful for offering an existing service with slightly different properties, for example, a higher service level with a higher price, or special discounts for a promotion campaign.

If suppliers do not want to offer a marketable service to customers any longer, they can delete it.

3.2 Defining Price Models

A price model specifies whether and how much customers subscribing to a service will be charged for:

- Using the subscription as such.
- Each user assigned to the subscription.
- Individual events. These include, for example, login and logout by users to the underlying application, the completion of specific transactions, or the creation or deletion of specific data.
- Parameters and their options.

It depends on the implementation of the underlying application and on its integration with OSCM whether fees for events or parameters can be defined.

Price Model Scope

Price models can have different scopes:

Service price models are the basic price models. A service price model must be defined for every marketable service.

In addition to service price models, OSCM allows for the definition of **customer price models**. A customer price model can be used, for example, to offer special discounts to a long-time customer, or to make a new service available to a pilot customer at no charge. A customer price model is

specific to one customer and to one service that is used by the customer. It is not available for any other services offered to the same or a different customer.

To support even greater flexibility, suppliers can define **subscription price models** in OSCM. A subscription price model is specific to one subscription of an individual customer. It is not available for any other subscriptions of the same or a different customer.

Price Model Elements

Each price model defined in OSCM - independent of its scope - consists of different elements that determine how the charges for a service are calculated. The following elements can be defined:

- One-time fee
- Recurring charge per subscription
- Recurring charge for users
- Prices for parameters and options
- Prices for events
- Role-based prices

Stepped prices are supported which allow the definition of ranges for which different price model elements apply. In addition, a free trial period can be defined and discounts can be granted to individual customers.

The actual charges for a service depend on the combination of the price model elements. The charges are either calculated pro rata (based on milliseconds) or per time unit (month, week, day, or hour). With pro rata calculation, customers are charged exactly for the time a service was used. With per time unit calculation, customers are charged for complete time units, for example, one week, even if the service was not used for the whole week.

3.3 Publishing Marketable Services

Publishing marketable services means making them available to customers for subscription on a marketplace. Suppliers can publish their services by themselves and authorize brokers and resellers to do so. Brokers and resellers can publish any service for which they have been granted resale permission. They can choose any marketplace for publishing the services.

Publishing a marketable service includes the following steps:

- Select the marketplace, and decide whether the service is to be available to any visitor or to registered customers only. A service can be published to any marketplace to which the seller has been granted access by the marketplace owner. Categories defined for the marketplace can be assigned to the service as required.
- Activate the marketable service to be published. Only activated services are available on a marketplace.
- Publish the URL of the marketplace to make the service known to customers. A seller can publish the URL, for example, by email or on his organization's website or portal.

Publishing Services through Brokers and Resellers

For each service, a supplier can grant resale permissions to any number of brokers or resellers:

- A broker provides a service as defined by the supplier. He is not allowed to change the name of the service, its definition, price model, parameters, options, terms, and conditions.

- A reseller is not allowed to change the name of the service, its definition, price model, parameters, and options. However, he can apply a different license agreement specifying his own terms and conditions.

The service details, which customers can display on a marketplace, include information on the broker or reseller who published the service and on the supplier who defined it.

A supplier can at any time revoke a resale permission for a broker or a reseller. The affected service is instantly withdrawn from the marketplace to which it was published. Existing subscriptions to the service are not affected.

3.4 Managing Customers

OSCM offers various features for managing the interaction of seller organizations with their customers. Customer management involves:

- Registering customers with OSCM.
- Defining custom attributes.
- Viewing the details of subscriptions.
- Terminating subscriptions.

Registering Customers

Sellers can register customers with OSCM so that they do not need to do this themselves. Registering a customer creates a new customer organization as well as an initial administrator account. This administrator is automatically sent an email with all the information required to access the given marketplace and subscribe to services.

Defining Custom Attributes

Suppliers can define custom attributes. They are a means to store specific data on customers or subscriptions, such as data needed for controlling the cost and activity accounting. For example, a supplier may want to define a unique identifier for each customer or specify the profit center to which a particular customer's revenue is to be accounted. Since there is no standard for such data, the supplier can define his own custom attributes for storing it.

Custom attributes can be defined for customers and for subscriptions. For subscription attributes, suppliers can decide whether they themselves want to specify the value, or whether the customer must enter a value when he subscribes to a corresponding service. For customer attributes, suppliers can decide whether they themselves want to specify the value, or whether the customer administrator must enter a value by editing the customer organization's profile on a marketplace.

The custom attributes are included in the billing data that is generated by OSCM every month. The information can then be used, for example, as a reference for an external accounting, billing, or CRM system.

Handling Subscriptions

Sellers can view the details of each subscription to the services they offer. The entire subscription information is accessible, for example, the activation date and the number of users assigned to the subscription. Suppliers can also view the details of subscriptions to services offered by their authorized brokers.

Suppliers and resellers can explicitly terminate subscriptions. This may be required, for example, if a customer does not comply with the license agreement or does not pay for the subscription. A subscription to a service offered by a broker can be terminated by the respective supplier.

Providing Customer Support

As customers work with services, they may encounter problems or have questions or enhancement requests. OSCM provides the means by which customers can report issues directly to the relevant supplier or reseller by email. Suppliers and resellers can define a dedicated support email address to which the issues are sent. Issues related to services offered by brokers can directly be reported to the suppliers of the services.

3.5 Managing Billing and Payment

As users of customers work with services, OSCM automatically calculates the fees based on the related price models. It aggregates all the events, users, and configuration data associated with a subscription and rates them according to the applicable price model. At regular intervals OSCM generates billing data that can be used for creating invoices.

Suppliers and resellers are responsible for preparing the billing and payment for their customers, creating invoices, and collecting payments. This includes the following tasks:

- Specify the types of payment to be offered to customers.
- Define the VAT rates to be used for calculating the customer charges.
- Define the period for which billing data is generated.
- Export the generated billing data to make it available to external accounting systems.

Brokers are not involved in these tasks, because subscriptions to services they offer are contracts between the customers and the suppliers of the services. The suppliers are responsible for preparing the billing and payment as well as collecting the payments from the brokers' customers.

Managing Payment Types

Suppliers and resellers are responsible for defining how customers may pay for their subscriptions, for example, on receipt of invoice, with credit card, or by direct debit.

The payment types available to suppliers and resellers must be set up by the operator. Each supplier and reseller can then choose the payment types he wants to offer to his customers. A supplier can also select the payment types he wants to offer to the customers of his authorized brokers. Different payment types can be chosen for individual customers and individual services the customers have subscribed to.

In specific scenarios, the operator may deactivate any possibilities for customers to select payment types and specify billing addresses. If this is the case, the definition of payment types by suppliers and resellers is not possible.

Managing VAT Rates

In case suppliers want to invoice usage charges for subscriptions to their services as gross prices, they can enable VAT rate support for their organization.

Suppliers can specify a basic VAT rate, that applies by default to all prices for their own customers and the customers of their authorized brokers. In addition, country-specific or even customer-specific VAT rates can be defined.

Customers of resellers are not affected by the VAT rates defined by suppliers. Any cost calculation for resellers' customers results in net prices.

Defining Billing Periods

A billing period is the time interval for which billing data for customer subscriptions is generated. It is always one month.

By default, the start day of a billing period is the 1st day of a month. However, this is not always suitable in real business. For this reason, each supplier and reseller can define his desired start day for billing periods. This setting applies to new customer subscriptions to services provided by the supplier or reseller. Existing subscriptions keep their billing period as defined when the customer subscribed to the service.

Exporting Billing Data

OSCM allows suppliers and resellers to export the billing data for one or several customers for a specific time frame. The exported data can, for example, be forwarded to an accounting system which processes the data and generates the corresponding invoices. In this way, suppliers and resellers can use billing and payment processes that have been established in their organization.

3.6 Managing Revenue Shares

The revenue generated by services on a marketplace must be distributed to all participating parties. It is typically split between:

- The supplier who defines the services.
- The owners of the marketplaces where the services are published.
- The brokers and resellers who offer the services.
- The operator who provides the infrastructure for publishing the services.

Revenue shares are defined by the operator. They may be different for individual marketplaces, specific services, and individual supplier, broker and reseller organizations.

Suppliers, resellers, and brokers can at any time retrieve and export information on the revenue shares for the services they offer. They can use the data for charging or paying the other participating parties depending on the existing contracts.

4 OSCM for Customers

Customers are the companies, departments, or people who subscribe to one or more marketable services on a marketplace. After a customer has subscribed to a service in OSCM, his registered users who are assigned to the subscription can work with the underlying application in the Cloud.

Customers perform the following basic tasks which are described in more detail in the sections below:

- Access the services they want to subscribe to on a marketplace.
- Register in OSCM.
- Subscribe to services.
- Register service users and assign them to subscriptions.
- Use the services they subscribed to.
- Manage existing subscriptions.
- Pay for the services consumed.

Customers can use the reporting facilities provided by OSCM to get, for example, an overview on all users assigned to their subscriptions and on the billable events that occurred in using the services.

4.1 Accessing Services on a Marketplace

Customers can access any public marketplaces managed in OSCM as well as non-public marketplaces to which they have been granted access by the marketplace owners.

OSCM offers various features and functions that support customers in finding the services they want to use on a marketplace.

Customers can:

- Browse the service catalog and organize the services on different pages.
- Sort the services by different criteria.
- Search for services in the service catalog using a full-text search feature.
- Filter the services by terms from a tag cloud or by categories.
- Rate and comment on services.

Administrators of customer organizations can restrict the visibility of services on marketplaces to specific organizational units. A unit can, for example, represent a department in a company, an individual project, a cost center, or a single person. The OU administrators of each unit can further restrict the list of services visible to the other unit members.

4.2 Registering as a Customer

There are two ways how customers can register in OSCM in order to use the desired services:

- The customer registers himself on a registration Web page.

  The URL of the registration Web page may have been published by a supplier, broker, or reseller, or the customer may be forwarded to it automatically when subscribing to a service on a marketplace.

- A supplier, broker, reseller, or operator registers the customer so that he does not need to do this himself.

In any case, OSCM notifies a new customer by email of his registration.

4.3 Subscribing to Services

A customer can subscribe to any of the marketable services provided on a marketplace, accepting the applicable terms and conditions, and the privacy policy. OSCM even allows for making several subscriptions to the same service.

When subscribing to a service, the customer can choose between the options defined for the service and view the details on charging conditions and prices. Depending on the charging conditions and general settings, the customer can either immediately subscribe to the service or has to supply his payment information before. The payment information may consist, for example, of a credit card number or bank account data, depending on the facilities used for payment collection. OSCM even allows a customer to enter different payment information for different subscriptions as desired.

By means of organizational units, the administrators of a customer organization can define to which marketable services the administrators, OU administrators, and subscription managers of their organization can subscribe. Subscriptions can also be assigned to organizational units, for example, for cost-controlling purposes.

When a customer subscribes to a service, OSCM triggers the underlying application to provision all the required items, typically a specific set of data or configuration, for exclusive use by the customer in the scope of the subscription.

4.4 Registering Users for Subscriptions

Depending on the application underlying to a service a customer has subscribed to, the users may access the application under the control of OSCM, i.e. they log in to a marketplace and start their application sessions from there.

To be able to do so, the users must be registered in OSCM and assigned to the relevant subscriptions.

There are three ways how customers can register users:

- The administrator of a customer organization can register the users manually.
- The administrator of a customer organization can import multiple users in one operation from a user data file he created before.
- Customer organizations may be allowed to use their own identity management system or an external provider for user management and authentication. In this case, the users are imported from the external system and registered with OSCM. For details, refer to *OSCM Across Organizations* on page 29.

When a user is registered, OSCM creates a user account and notifies the user by email of his registration. The email includes all login information necessary for the user to access a marketplace.

Before a user can access a service, he needs to be assigned to the relevant subscription. This can be done by an organization administrator, an OU administrator of the organizational unit to which the subscription is assigned, or the subscription manager or OU administrator owning the subscription. Each registered user can be assigned to any number of his organization's subscriptions. Administrators or subscription owners can assign any users from their organization to their subscriptions, regardless of which organizational unit the users or subscriptions belong to or if the users are barred from seeing the underlying services otherwise.

When a user is assigned to a subscription, OSCM notifies the user as well as the underlying application. The application may take corresponding actions, for example, add the new user to its own user management system and create an appropriate workspace.

A user can be assigned a service role for each subscription in OSCM, provided that the underlying technical service defines such roles. The evaluation and handling of this information is at the discretion of the application. It may, for example, grant specific access rights to users with a certain service role.

4.5 Using Services

After a customer has subscribed to a service, his registered users who are assigned to the subscription can work with the underlying application.

OSCM supports two basic ways for a user to access an application:

- The user logs in to OSCM and works with the application.
- The user logs in directly to the application without involving OSCM.

The type of access available for each application depends on the application itself and on how it has been integrated with OSCM.

Accessing Applications Through OSCM

If a user accesses an application through OSCM, he logs in to OSCM on a Web page whose URL he has received from OSCM. Depending on this URL:

- The user is forwarded immediately to the remote interface of the application and can start his work, or
- The user is directed to a marketplace that presents the services the user is entitled to use. The user just selects the desired service. This forwards him to the remote interface of the underlying application where he can start his work.

An additional login to the application is not required. In the application, the user works in the context and on the data which are maintained for the applicable service subscription.

When the user has completed his work, the application usually offers a way to log out, including a route back to the marketplace if he has started his work from there.

Accessing Applications Outside of OSCM

Users can work directly with applications underlying to OSCM services, without a previous login to OSCM.

In this case, the application itself provides the user with the appropriate information and a URL for logging in and starting his work.

In the application, the user works in the context and on the data which are maintained for the applicable service subscription.

4.6 Managing Subscriptions

OSCM offers various means for customers to manage their existing subscriptions. Administrators of customer organizations can:

- Browse the subscriptions and search for specific ones using a full-text search feature.
- Change the user assignments for a subscription. If a subscription assignment is changed, the affected user is sent an email with the appropriate information.

- Upgrade or downgrade a subscription to a different usage or price model as offered by the supplier.
- Modify a subscription. This includes renaming the subscription, assigning and deassigning subscriptions to/from organizational units, or choosing different options that are available for the underlying service.
- Report issues. Questions, requests, or problems arising from the usage of a service can be reported directly to the supplier or reseller who offers the service. If the service is offered by a broker, the issues can be reported directly to the supplier of the service.
- Terminate a subscription. If a subscription is terminated, OSCM deactivates the related data but keeps it. The application underlying to the subscription is triggered to deprovision all the items related to the subscription. The assigned users are sent an email informing them about the termination.

OU administrators can carry out these tasks for the subscriptions assigned to their organizational units. Subscription managers and OU administrators can also execute these tasks for their own subscriptions. A subscription manager or OU administrator is assigned the ownership for a subscription either implicitly by creating it or explicitly by an administrator or OU administrator.

4.7 Paying for Services

Users have to pay for the services they have subscribed to that are not free of charge. The costs are calculated based on the applicable price models and charged to the customer by the respective supplier or reseller or an authorized payment service provider.

Typically, a customer has to supply his payment information before he can subscribe to a service for which he will be charged. The payment information includes the address that is printed on invoices and an email address to which invoices are sent. Depending on the facilities used for payment collection, the payment information may also consist, for example, of a credit card number or bank account data.

OSCM provides reporting facilities that keep customers informed about the costs they have to expect in their next invoice.

5 OSCM for Marketplace Owners

Marketplace owners are the companies, departments, or people who manage the marketplaces in OSCM. When operators create a marketplace, they specify an existing organization as the owner. An organization can own one or several marketplaces.

Marketplace owners perform the following basic tasks:

- Define who is allowed to access their marketplaces.
- Define who is allowed to publish services to their marketplaces.
- Administrate their marketplaces.
- Customize their marketplaces to adapt them to their organization's standards.
- Collect their revenue shares.

Marketplace owners can also use the OSCM reporting facilities for retrieving customer billing data and information on their revenue shares depending on the usage of the offered services.

The following sections briefly outline the basic tasks of marketplace owners. For details, refer to the *Marketplace Owner's Guide*.

5.1 Managing Marketplace Access

When a marketplace is created, it is public and accessible by any anonymous or registered users. The marketplace owner can restrict the access to it to the users of specific registered organizations. In this case, the users need to log in to be able to see, subscribe to, and use the services published on the marketplace. New customers cannot register themselves on the marketplace but need to be registered by a supplier, broker, reseller, or the platform operator.

A marketplace with restricted access can at any time be made public again and thus accessible by any users and organizations.

5.2 Managing Service Sellers

A marketplace owner is responsible for deciding who is allowed to publish services to his marketplace. OSCM distinguishes between two seller policies:

On an **open marketplace**, any seller organization with the supplier, broker, or reseller role can publish services immediately after the marketplace has been created. The marketplace owner can exclude specific sellers from the marketplace. This may be required, for example, if a seller does not adhere to the code of conduct or does not pay his fees for using the marketplace. After the problems with a seller have been sorted out, the marketplace owner can re-admit him so that he can again publish services to the marketplace.

By defining that a marketplace is open to any seller, the marketplace owner does not need to spend effort on managing and controlling the marketplace and the sellers. However, it also increases the risk that many sellers publish numerous services to the marketplace and customers are lost in the variety.

On a **marketplace for authorized sellers**, only suppliers, brokers, and resellers who are explicitly admitted by the marketplace owner can publish services. Any number of sellers can be admitted. The publishing approval for a seller can be revoked at any time, for example, if the seller is in arrears with his payments.

By requiring that the publishing of services needs explicit approval, these marketplaces provide the marketplace owners with optimum control. Different marketplaces can be operated

independently. This is useful, for example, if a seller in one country is not to be allowed to offer services on a marketplace in another country.

The operator who creates a marketplace specifies the seller policy for it. The marketplace owner can at any time turn a marketplace which is open to any seller into a marketplace for authorized sellers only, and vice versa.

5.3 Administrating Marketplaces

Administrating a marketplace includes the following:

- Change the marketplace features and settings. This includes the access and seller policy for the marketplace as well as the availability of tags, reviews, and categories to visitors of the marketplace.
- Define categories that can be used for organizing and classifying the services on the marketplace. Categories may, for example, group different types of application software, such as word processing, desktop publishing, or spreadsheet software.
- Define featured services which are displayed on the marketplace home page. This allows the marketplace owner to control the initial service list seen by marketplace visitors and to promote specific services. The marketplace owner can individually select services for the marketplace home page, or choose to display services and subscriptions grouped by the categories that are defined for the marketplace.
- Remove customer ratings and comments on services which are not to be read by visitors. This enables the marketplace owner to moderate customer reviews.
- Deactivate a service published on the marketplace. This may be required under exceptional circumstances, for example, in the case of an infringement of the terms and conditions. When the problem is solved the service can be reactivated.
- Add tracking code for monitoring the traffic on the marketplace.
- Change the name of the marketplace.

5.4 Customizing Marketplaces

OSCM offers various features and functions that allow a marketplace owner to adapt a marketplace to his organization's standards.

A marketplace owner is responsible for providing legal information to visitors of his marketplace. This includes, for example, the terms and conditions and the privacy policy of the marketplace that must be read and accepted by customers when they register. A marketplace owner can enter and update these texts and provide them in all languages supported by OSCM.

To suit the standards of the marketplace owner organization, OSCM allows for customizing and localizing the texts presented at the user interface and used in automatically generated emails. In addition, a marketplace owner can customize the stage of the marketplace. The stage is the area on the marketplace where, for example, advertisements, eye catchers, or further information can be placed. OSCM allows marketplace owners to provide different stages for desktop and mobile devices for each of the supported languages.

To adapt the layout and branding of a marketplace to his organization's requirements, the marketplace owner can customize the colors, fonts, background images, and logos displayed to the marketplace visitors. The layout and branding is defined in a style sheet and in files and images referenced by it. OSCM provides a default style sheet that can be used as a basis and adapted as required. An archive containing the modified files needs to be created and provided to the platform operator who uploads the files and thus makes them available online to the

marketplace owner. The marketplace owner then can configure the marketplace to make the changes effective for the marketplace visitors.

5.5 Collecting Revenue Shares

Marketplace owners usually receive a share of the revenue for the services which are offered on their marketplaces by suppliers, brokers, and resellers. This revenue share is defined by the operator. It may differ for individual marketplaces, brokers or resellers, or even specific services.

A marketplace owner can at any time retrieve information on his revenue share depending on the usage of the offered services. This data can be used as the basis for charging the suppliers, resellers, and brokers. The data can also be used as the basis for paying the platform operators, depending on the existing contracts.

6 OSCM for Operators

Operators are the people who install, operate, and maintain OSCM in their environment.

The tasks of an operator comprise the following:

- Set up and maintain the OSCM runtime environment. This includes the installation and deployment of OSCM and the interfacing with a mail server.

  OSCM is provided in Docker images that can be deployed in a container environment.The applications integrated with OSCM and their data may be hosted on the same system (Docker host) as OSCM or in different locations.
- Monitor OSCM to track system usage and problems that occur at runtime. This includes configuring log levels and maintaining log files.
- Create regular backups of the OSCM databases, configuration settings, and log files.
- Create and manage organizations and users. This includes creating customer, technology provider, supplier, broker, and reseller organizations, importing users from data files provided by their organizations, locking and unlocking user accounts, and resetting the password of users.
- Create and maintain tenants for user management and authentication in external provider systems.
- Define revenue shares for marketplace owners, brokers, resellers, and the operator.
- Create and manage marketplaces. This includes configuring marketplaces, assigning organizations as marketplace owners, and uploading customizations to marketplaces.
- Add additional language support so that users can work in other languages than the default ones available after installation (English, German, Japanese). The operator can customize or translate the default user interface and email texts, platform objects such as event and parameter names, labels and texts used in reports, as well as the online help topics for the administration portal and the FAQs for the marketplaces.
- Execute billing tasks. This includes the explicit start of billing runs or the manual retry of payment processing when, for example, communication problems caused the automatic payment processing for an organization to fail.
- Create certificates for trusted communication, import and sign them. Certificates are required for OSCM to authenticate a calling client and to allow for trusted communication between OSCM and an application underlying a technical service, or an external process control system.

OSCM provides the following facilities to support the operators in performing their tasks:

- After an operator has successfully installed and configured OSCM, he can access and use the OSCM user interface.
- The OSCM reporting facilities provide operators with an overview of the revenue generated by the services which are published on their OSCM installation, and of the revenue shares for the operator, suppliers, brokers, resellers and marketplace owners. In addition, operators can retrieve an overview of the marketable services of a supplier with their subscriptions, a list of all customers of a supplier and his brokers and the services they have subscribed to, as well as a summary of all billing data for each customer of a supplier and his brokers, and the billing data of the current billing period for a selected subscription of a supplier's customer.

For a detailed description of all tasks involved in the operation and maintenance of OSCM, refer to the *Operator's Guide*.

7 OSCM Across Organizations

OSCM offers features and functions which are of relevance for all its users irrespective of their organization's role or their user role within the organization. These include:

- User interface
- Account and identity management
- External process control
- Public Web services and APIs

7.1 User Interface

The user interface of OSCM is a state-of-the-art Web interface accessible from any of the supported Web browsers. It includes the marketplaces, where customers work with services and subscriptions, as well as an administration portal, where technology providers, suppliers, resellers, brokers, marketplace owners, and operators perform their tasks.

OSCM ensures that each user can only see and access the options and services he is entitled to by his organization and his role within the organization.

The OSCM user interface supports multiple languages, each user being able to select his preferred one.

7.2 Account and Identity Management

Each registered user logs in and works in OSCM in the context of a specific organization.

For each organization, OSCM maintains a separate account. This **organization account** can be managed by the administrators of the organization. The user who registers a customer or requests the registration of his organization becomes the first administrator. He can add additional users and assign them administrator privileges for the organization.

In addition to organization accounts, OSCM maintains a separate account for each registered user. A **user account** serves to store user data such as the user's name, email address, preferred language, and password. Each user can change this data for his own account.

Instead of maintaining user accounts in OSCM, organizations can also connect to their own identity management systems based on LDAP or to external providers such as Microsoft Azure Active Directory for user management and authentication. In this case, the user data is maintained in the external system. Basic data are imported into OSCM so that the users can be assigned roles and subscriptions and receive notification emails sent by OSCM. If user data is changed in the external system, OSCM automatically synchronizes its information. OSCM only stores the user data and is not involved in user authentication.

The platform operator can specify the maximum number of users that can be registered for each organization. If this number is exceeded, the operator is notified accordingly.

The administrators of an organization are allowed to change most of the information for the user accounts in their organization. They are also allowed to delete user accounts, if required. Administrators cannot change another user's password stored in OSCM, but they can reset it to a new password generated by OSCM.

Administrators can also organize their users in **organizational units**. A unit can, for example, represent a department in a company, an individual project, a cost center, or a single person. A user can belong to any number of organizational units, and can be removed from them when necessary. Each organization has a default unit to which all users are added automatically.

Administrators can define which services are visible to the members of each organizational unit on a marketplace. When a user logs in to OSCM, he can only access the services that his administrator made visible to the organizational units to which he belongs. Administrators can assign, reassign and deassign organizational units to/from subscriptions, for example, for cost controlling purposes.

To facilitate the management of multiple organizational units, administrators can appoint one or more OU administrators for each unit. For his units, an OU administrator can change the description and members, define the visible services, create, modify, and terminate subscriptions, as well as generate reports for cost-controlling purposes.

7.3 External Process Control

Organizations often have specific processes for registering users, subscribing to services, or defining prices. Usually, such processes include approval processes and are modeled and automated with a process control system.

For certain actions, OSCM provides a way to interact with such process control systems: Triggers can be configured to be invoked when specific actions are carried out at the user interface. The triggers start the corresponding process in the process control system. If approval for the action is required, it is suspended until it is approved or rejected in the process control system. If no approval is required, the action is instantly executed.

Users can see all pending actions at the OSCM user interface, cancel them, or delete aborted ones.

7.4 Public Web Services and APIs

OSCM exposes its basic functionality as public Web services and provides APIs that enable developers to make applications ready for SaaS and use the OSCM features.

The so-called **platform services** can be invoked by any application that implements Web services. In addition, the following utilities for developers are available:

- **Provisioning API**: Resources for implementing a provisioning service which is necessary for integrating an application with the subscription management of OSCM.
- **Notification API and Trigger API**: Resources for implementing and using a notification service which must be provided to enable OSCM to interact with an external process control system.
- **Operation API**: Resources for implementing the interface for calling operations for a technical service, such as backup and restore.
- **Integration Helpers**: A Web application package that supports application developers in adapting the login/logout implementation of a Java-based Web application.
- **Asynchronous Provisioning Platform (APP)**: A framework for integrating applications with OSCM using provisioning services that work in asynchronous mode.

While the platform services and most of the APIs are based on SOAP (Simple Object Access Protocol) and WSDL (Web Services Description Language), several components provide a REST (Representational State Transfer) API in addition or a pure Java API. The REST API and its documentation are accessible and useable by means of the Swagger toolkit.

Glossary

Administrator

A privileged user role within an organization with the permission to manage the organization's account and subscriptions as well as its users and their roles. Each organization has at least one administrator.

Application

A software, including procedures and documentation, which performs productive tasks for users.

Billing System

A system responsible for calculating the charges for using a service.

Broker

An organization which supports suppliers in establishing relationships to customers by offering the suppliers' services on a marketplace, as well as a privileged user role within such an organization.

Cloud

A metaphor for the Internet and an abstraction of the underlying infrastructure it conceals.

Cloud Computing

The provisioning of dynamically scalable and often virtualized resources as a service over the Internet on a utility basis.

Customer

An organization which subscribes to one or more marketable services in OSCM in order to use the underlying applications in the Cloud.

Infrastructure as a Service (IaaS)

The delivery of computer infrastructure (typically a platform virtualization environment) as a service.

Marketable Service

A service offering to customers in OSCM, based on a technical service. A marketable service defines prices, conditions, and restrictions for using the underlying application.

Marketplace

A virtual platform for suppliers, brokers, and resellers in OSCM to provide their services to customers.

Marketplace Owner

An organization which holds a marketplace in OSCM, where one or more suppliers, brokers, or resellers can offer their marketable services.

Marketplace Manager

A privileged user role within a marketplace owner organization.

OIDC

An authentication mode of OSCM where users are managed and authenticated by means of OpenID Connect in an external system such as Microsoft Azure Active Directory, the so-called OIDC provider.

OIDC Tenant

An entity in OSCM representing a configuration of settings and parameters required to connect to a specific tenant at an OIDC provider, for example, a specific domain and directory in Microsoft Azure Active Directory.

Operator

An organization or person responsible for maintaining and operating OSCM.

Organization

An organization typically represents a company, but it may also stand for a department of a company or a single person. An organization has a unique account and ID, and is assigned one or more of the following roles: technology provider, supplier, customer, broker, reseller, marketplace owner, operator.

Organizational Unit

A set of one or more users within an organization representing, for example, a department in a company, an individual project, a cost center, or a single person. A user may be assigned to one or more organizational units.

OU Administrator

A privileged user role within an organization allowing a user to manage the organizational units for which he has been appointed as an administrator, and to create, modify, and terminate subscriptions for these units.

Payment Type

A specification of how a customer may pay for the usage of his subscriptions. The operator defines the payment types available in OSCM; the supplier or reseller determines which payment types are offered to his customers, for example payment on receipt of invoice, direct debit, or credit card.

Platform as a Service (PaaS)

The delivery of a computing platform and solution stack as a service.

Price Model

A specification for a marketable service defining whether and how much customers subscribing to the service will be charged for the subscription as such, each user assigned to the subscription, specific events, or parameters and their options.

Reseller

An organization which offers services defined by suppliers to customers applying its own terms and conditions, as well as a privileged user role within such an organization.

Role

A collection of authorities that control which actions can be carried out by an organization or user to whom the role is assigned.

Seller

Collective term for supplier, broker, and reseller organizations.

Service

Generally, a discretely defined set of contiguous or autonomous business or technical functionality, for example an infrastructure or Web service. OSCM distinguishes between technical services and marketable services, and uses the term "service" as a synonym for "marketable service".

Service Manager

A privileged user role within a supplier organization.

Standard User

A non-privileged user role within an organization.

Software as a Service (SaaS)

A model of software deployment where a provider licenses an application to customers for use as a service on demand.

Subscription

An agreement registered by a customer for a marketable service in OSCM. By subscribing to a service, the customer is given access to the underlying application under the conditions defined in the marketable service.

Subscription Manager

A privileged user role within an organization with the permission to create and manage his own subscriptions.

Supplier

An organization which defines marketable services in OSCM for offering applications provisioned by technology providers to customers.

Technical Service

The representation of an application in OSCM. A technical service describes parameters and interfaces of the underlying application and is the basis for one or more marketable services.

Technology Manager

A privileged user role within a technology provider organization.

Technology Provider

An organization which provisions applications as technical services in OSCM.