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VMware vSphere Integration

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About this Manual

This manual describes the integration of VMware vSphere with Open Service Catalog Manager (OSCM) .

This manual is structured as follows:

Chapter	Description
Introduction on page 7	Provides an overview of the OSCM vSphere integration, the components involved, and the supported usage scenarios.
Configuring the vSphere Integration Software on page 10	Describes how to configure the vSphere integration so that it matches your environment.
Creating and Publishing Services on page 11	Describes how to create and publish services for vSphere in OSCM.
Using vSphere Services in OSCM on page 13	Describes how to provision, modify, and deprovision virtual machines in vSphere through services in OSCM.
Administrating the vSphere Integration on page 15	Describes administration tasks related to the OSCM vSphere integration.
Controller Configuration Settings on page 19	Describes the configuration settings for the vSphere integration software.
vSphere Configuration on page 21	Describes the configuration settings for the vSphere server.
Service Parameters and Operations on page 25	Describes the technical service parameters and service operations which are supported by the vSphere service controller.

Readers of this Manual

This manual is intended for operators who want to offer virtual machines controlled by vSphere through services on a marketplace provided by OSCM. It assumes that you have access to an existing OSCM installation and to a vSphere virtualization platform. In addition, you should have basic knowledge of vSphere and you should be familiar with the concepts and administration of OSCM.

Notational Conventions

This manual uses the following notational conventions:

Add	Names of graphical user interface elements.
`init`	System names, for example command names and text that is entered from the keyboard.
`<variable>`	Variables for which values must be entered.

`[option]`	Optional items, for example optional command parameters.
`one | two`	Alternative entries.
`{one | two}`	Mandatory entries with alternatives.

Abbreviations

This manual uses the following abbreviations:

APP	Asynchronous Provisioning Platform
OSCM	Open Service Catalog Manager
DBMS	Database Management System
IaaS	Infrastructure as a Service
IdP	SAML Identity Provider
SAML	Security Assertion Markup Language
STS	Security Token Service
VM	Virtual Machine
WSDL	Web Services Description Language
WSIT	Web Services Interoperability Technologies

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.
- *OpenStack Integration:* A PDF manual for operators describing how to offer and use virtual systems controlled by OpenStack 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.

- *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.
- *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 Introduction

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.

VMware vSphere is a server and infrastructure virtualization platform that allows for running multiple operating systems and applications on a single server, the vSphere server. It gives you on-demand access to fully configured virtual machines (VMs) that are provisioned by cloning VM templates provided in vSphere. The provisioning of computing resources in the Cloud allows you to rapidly scale and flex your infrastructure to support new business initiatives or roll out services.

When integrating applications with OSCM, the instance provisioning can be done in two provisioning modes: synchronous or asynchronous mode.

Asynchronous provisioning is required if provisioning operations take a long time because long-running processes or manual steps are involved. This is the case, for example, when provisioning virtual machines on a virtual machine server. OSCM supports the integration of such applications with its asynchronous provisioning platform (APP). This is a framework which provides a provisioning service as well as functions, data persistence, and notification features which are always required for integrating applications in asynchronous mode.

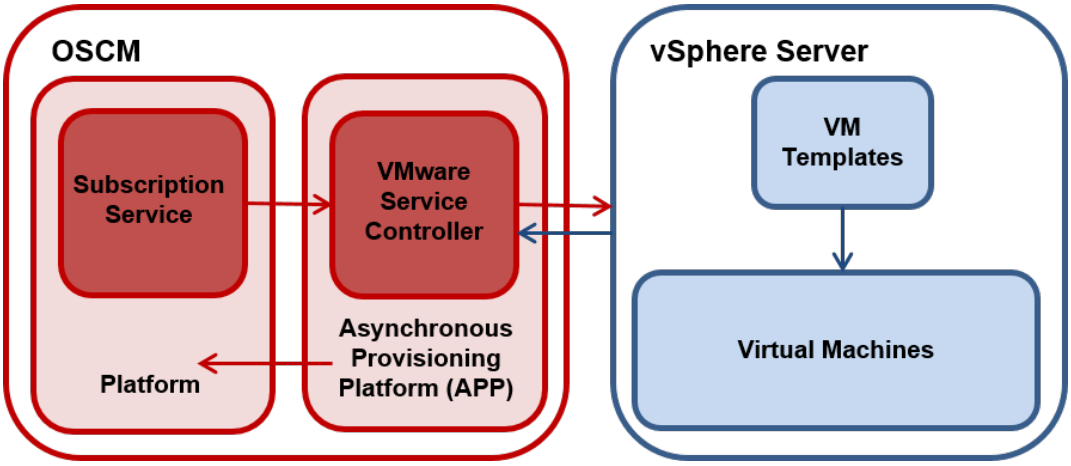
The integration of OSCM and vSphere provides for an Infrastructure as a Service (IaaS) solution that leverages the features of both products: Through services, which are published on a marketplace in OSCM, users can request and use VMs on a vSphere server. The usage costs can be calculated and charged by means of the OSCM billing and payment services.

When deploying the `oscm-app` container provided with OSCM, a VMware service controller is preconfigured and registered with the asynchronous provisioning platform (APP). This service controller can be used for integrating vSphere services with OSCM.

The VMware service controller includes all components required for connecting an existing OSCM installation with a vSphere server. This manual describes how to offer and use virtual machines provisioned on a VMware vSphere server through services on an OSCM marketplace.

1.1 Components Involved in the vSphere Integration

The following picture provides an overview of the main components involved in the integration of OSCM and vSphere:



In OSCM, customer subscriptions are managed by means of the **Subscription service**. When a customer creates, modifies, or terminates a subscription for a VM in vSphere, the Subscription service asynchronously triggers the corresponding actions in vSphere through the **Asynchronous Provisioning Platform (APP)** and the **VMware service controller**: VMs are created, modified, or deleted in vSphere.

APP is a framework which provides a provisioning service, an operation service, as well as functions, data persistence, and notification features which are required for integrating applications with OSCM in asynchronous mode. The actual communication with the applications is carried out by service controllers.

In vSphere, the basic configuration of VMs for typical usage scenarios is defined by the vSphere administrators in so-called **VM templates**. A template defines, for example, the operating system used by the VM to be provisioned. For every template, any number of technical services can be created in OSCM. On the other hand, a technical service can reference several templates, and a user may choose a template when subscribing to a corresponding service. The technology provider organization is responsible for knowing and providing the correct VM template names.

The vSphere API is contacted by the VMware service controller for triggering actions in vSphere.

When APP is deployed, a VMware service controller is also deployed, registered, and initialized.

1.2 Usage Scenarios

The OSCM vSphere integration supports the following usage scenarios:

- **Provisioning of a VM**: When a customer subscribes to a corresponding service on an OSCM marketplace, vSphere is triggered to create a VM based on a specific VM template.
- **Vertical scale-up and scale-down**: By changing the corresponding parameters at an existing subscription, customers can trigger vSphere to add resources (disks, CPU, RAM, etc.) to a provisioned VM. In the same way, they can request vSphere to remove resources from a VM.
- **Starting and stopping a VM**: A customer can explicitly start and stop a VM on vSphere by executing a service operation at the corresponding subscription.

- **Creating a snapshot and restoring a VM**: A customer can explicitly create a snapshot of a VM on vSphere and restore it by executing a service operation at the corresponding subscription.
- **Deletion of a VM**: When a customer terminates a subscription for a VM, vSphere is triggered to delete it. The subscription is terminated independent of whether the deletion is successful.

In vSphere, the VMs created for OSCM subscriptions are managed in the same way as other VMs. They can be viewed and monitored with the standard vSphere management tools.

For more details on the usage scenarios, refer to *Using vSphere Services in OSCM* on page 13.

2 Configuring the vSphere Integration Software

The vSphere integration software requires and stores its data in the `bssapp` relational database. Another relational database, `vmware`, is used to store the vSphere configuration. The initial setup used when deploying the `oscm-app` container configures at least the following:

- `VCENTER_NAME`: The name of the vCenter running on the vSphere server.
- `DATACENTER_NAME`: The name of data center managed by the vCenter specified above.
- `CLUSTER_NAME`: The name of the cluster where VMs are to be provisioned.
- `LOADBALANCER_NAME`: The name of the load balancer used by vSphere. Usually, you can use the name of the VM Network in vSphere: `VM Network`.

In addition, you can upload `.csv` files containing an entire vSphere configuration matching your environment, for example, if you want to use several databases or clusters for the provisioning of VMs, into the `vmware` database. Usually, you do not need to change these settings once they have been imported into the database.

There are the following types of `.csv` files:

- `vCenter`: Defines the URL and user credentials for accessing the vSphere server. For security reasons, it is recommended to delete the file as soon as you have successfully installed and configured the vSphere integration software.
- `DataCenter`: Defines one or several data centers of the vSphere installation.
- `Cluster`: Defines one or several clusters managed by a data center.
- `VLAN`: Defines one or more VLANs for a cluster.
- `IPPool`: Defines the list of IP addresses associated with a VLAN.

You find samples of the above files *here*. Refer to *vSphere Configuration* on page 21 for details on the content of the files.

To import the vSphere configuration settings into the `vmware` database:

1. Prepare the `.csv` files so that the configuration matches your environment.
2. Invoke the instance status interface of APP for the VMware service controller by opening its URL in a Web browser.

   The access URL has the following format:

   `https://<hostname.fqdn>:<port>/oscm-app-vmware`

   `<hostname.fqdn>` is the name and the fully qualified domain name of the machine where the `oscm-app` container has been deployed, `<port>` is the port to address the machine (default: `8881`), `oscm-app-vmware` is the default context root of the service controller and cannot be changed.
3. Log in with the ID and password of the user specified in the configuration settings for the VMware service controller by the platform operator in the `BSS_USER_ID` and `BSS_USER_PWD` configuration settings, or as another technology manager registered for the same organization.
4. Set the following vSphere-specific settings:
   - **Connection URL**: The URL for accessing the vSphere API.
   - **User ID**: The ID of the technical user in vSphere for accessing the vSphere API.
   - **Password**: The password of the technical user in vSphere for accessing the vSphere API.
5. Upload the prepared `.csv` files into the database.
6. Save the settings.

3 Creating and Publishing Services

The following sections describe how to create and publish services in OSCM by means of which customers can request and use VMs on a vSphere server.

3.1 Prerequisites and Preparation

The following prerequisites must be fulfilled before you can create and publish services in OSCM:

- To create technical services for the vSphere integration in OSCM, you must have access to OSCM as a technology manager. You must be a member of the technology provider organization responsible for the VMware service controller as specified in the configuration settings for the installation.
- In vSphere, appropriate templates for the provisioning of VMs must exist, to which the technical services in OSCM can be mapped. The vSphere user specified in the configuration settings for the installation must have the necessary permissions to create and configure VMs based on these templates.
- To create marketable services for the vSphere integration in OSCM, you must have access to OSCM as a service manager of an organization with the supplier role. This may be the same organization as the technology provider organization or a different one.
- To publish your marketable services, you must have access to an appropriate marketplace in OSCM in your service manager role.

3.2 Creating Technical Services

The first step in providing OSCM services for vSphere is to create one or more technical services.

Proceed as follows:

1. Define one or more technical services in an XML file.

   As a basis, you can use the technical services samples provided on *https://github.com/servicecatalog/oscm/tree/master/oscm-app-vmware/resources*.

   In the technical service definition, be sure to specify:

   - The asynchronous provisioning type
   - The direct access type
   - Service parameters which represent the VM templates defined in vSphere as well as the naming, location, and sizing parameters for the VMs to be provisioned. Service parameters also define the network setup in vSphere and the configuration of the VMs. For details on the supported service parameters, refer to *Service Parameters and Operations* on page 25.
2. Log in to the OSCM administration portal with your technology manager account.
3. Import the technical services you created and appoint one or more supplier organizations for them.

For details on these steps, refer to the *Technology Provider's Guide* and to the online help of OSCM.

3.3 Creating and Publishing Marketable Services

As soon as the technical services for the vSphere integration exist in OSCM, you can define and publish marketable services based on them. Your cost calculation for the services should include any external costs for operating the VMs.

Proceed as follows:

1. Log in to the OSCM administration portal with your service manager account.
2. Define one or more marketable services based on the technical services you created for vSphere.
3. Define price models for your marketable services.
4. Publish the services to a marketplace.

For details on these steps, refer to the *Supplier's Guide* and to the online help of OSCM.

4 Using vSphere Services in OSCM

The following sections describe how users can subscribe to and work with the services you have created for vSphere in OSCM. You will find details of the supported usage scenarios outlined in *Usage Scenarios* on page 8.

4.1 Subscribing to Services

Users of customer organizations can subscribe to the services you have created for vSphere on the marketplace where you have published them. This results in the provisioning of a VM in vSphere, as defined in the underlying technical service.

Depending on the definition of the service, the name of the VM is either generated automatically, or the customer can enter a name for it. The technical service may specify a prefix which is prepended to this name, as well as a pattern against which the name is checked before the provisioning operation is started. The name is used as the host name of the provisioned VM.

Depending on the parameters defined for the technical service, the customer can select or enter the number of CPUs, amount of RAM, disk size, additional data disks, and network settings for the VM as well as the vCenter, data center, and cluster in which the VM is to be provisioned.

The provisioning operations are carried out in asynchronous mode. As long as the provisioning is not complete, the status of the subscription is **pending**. The status changes to **ready** as soon as the provisioning has been finished successfully.

As soon as the provisioning is complete, the users assigned to the subscription can access the VM provided by vSphere using the IP address and initial password indicated in the subscription details on the marketplace in OSCM. The initial user ID for accessing the VM is `Administrator` for Microsoft Windows systems, `root` for Linux systems. It is strongly recommended that the initial password is changed after the first login.

4.2 Modifying Subscription Parameters

By modifying the corresponding service parameters at their subscriptions, customers can change the VMs provisioned in vSphere.

The following scenario is supported by the vSphere integration software:

Vertical scale-up and scale-down. By changing the corresponding service parameters, customers can trigger vSphere to add resources (disks, RAM, CPUs) to a VM. In the same way, they can request vSphere to remove resources from the VM.

The modifications are carried out in asynchronous mode. As long as the update is not complete, the status of the corresponding subscription is **pending update**. The status changes to **ready** as soon as the modification has been finished successfully.

Note: If the subscription was **suspended** before starting the modification, its status changes to **suspended update** as long as the operation is not complete.

In the technical service definition, you can specify an address to which emails are to be sent that notify service users or administrators of customer organizations about a successful modification of a VM.

4.3 Executing Service Operations

Customers can explicitly start and stop a VM in vSphere from OSCM as well as create and restore snapshots. To do this, they execute the appropriate service operation from the subscription for the VM:

- **Start**: Starts the VM if it was stopped.
- **Stop**: Stops the VM if it was started.
- **Restart**: Shuts down the VM in vSphere and starts it again.
- **Snapshot**: Creates a snapshot of the VM. Be aware that no snapshot versions are stored. When a new snapshot is created, the previous one is overwritten.
- **Restore**: Resets the VM to a previously created snapshot.

4.4 Terminating Subscriptions

A customer can at any time terminate a subscription for a VM in vSphere.

vSphere is triggered to delete the VM. The subscription is terminated independent of whether the deletion is successful. Note, however, that the VM name cannot be re-used before the deletion has been completed in vSphere.

5 Administrating the vSphere Integration

The following sections describe administration tasks you may need to perform in your role as an operator of the vSphere integration software.

5.1 Controlling the Provisioning Process

The vSphere integration provides you with the following feature for controlling the provisioning, modification, and deprovisioning of VMs:

In the definition of the technical services for vSphere, you can specify the `MAIL_FOR_COMPLETION` parameter. This is an address to which emails are to be sent in case manual steps are required to complete an operation.

If you specify this parameter, the VMware service controller interrupts the processing of each operation before its completion and waits for a notification about the execution of a manual action. This notification consists in opening the link given in the email.

Omit the `MAIL_FOR_COMPLETION` parameter if you do not want to interrupt the processing.

5.2 Handling Problems in the Provisioning Process

If the provisioning of a VM fails on the vSphere side or if there are problems in the communication between the participating systems, the corresponding subscription in OSCM remains pending. The VMware service controller informs the technology managers of its responsible technology provider organization by email of any incomplete operation in vSphere.

You can then take the appropriate actions to solve the problem in vSphere or in the communication. For example, you could remove an incomplete VM, or you could restore a missing connection.

After solving the problem, the vSphere integration components and OSCM need to be synchronized accordingly. You do this by triggering a corresponding action in the APP component. Proceed as follows:

1. Work as a technology manager of the technology provider organization responsible for the VMware service controller.
2. Invoke the instance status interface of APP for the service controller of the application by opening it's URL in a Web browser.

   The access URL has the following format:

   `https://<hostname.fqdn>:<port>/oscm-app/controller/?controllerid=ess.vmware`

   `<hostname.fqdn>` is the name and the fully qualified domain name of the machine where the `oscm-app` container has been deployed, `<port>` is the port to address the machine (default: `8881`), `oscm-app/controller/?controllerid=ess.vmware` is the default context root of the service controller and cannot be changed.

   The Web page shows all subscriptions for the application, including detailed information such as the customer organization, the ID of the related application instance, and the provisioning status.
3. Find the subscription for which you solved the problem in the most recent provisioning, modification, or delete operation.

4. In the **Action** column, select the action for the vSphere integration components to execute next. Possible actions are the following:
   - `RESUME` - to resume the processing of a provisioning operation in APP which was suspended.
   - `SUSPEND` - to suspend the processing of a provisioning operation in APP, for example when vSphere does not respond.
   - `UNLOCK` - to remove the lock for a VM instance in APP.
   - `DELETE` - to terminate the subscription in OSCM and remove the instance in APP, but keep the VM in vSphere for later use. The service manager role is required for this action.
   - `DEPROVISION` - to terminate the subscription in OSCM, remove the instance in APP, and delete the VM in vSphere. The service manager role is required for this action.
   - `ABORT_PENDING` - to abort a pending provisioning or modification operation in OSCM. OSCM is notified to roll back the changes made for the subscription and return it to its previous state. In vSphere, no actions are carried out.
   - `COMPLETE_PENDING` - to complete a pending provisioning or modification operation in OSCM. OSCM is notified to complete the changes for the subscription and set the subscription status to **ready** (or **suspended** if it was suspended before). This is possible only if the operations of the service controller are already completed.
5. Click **Execute** to invoke the selected action.

The instance status interface provides the following additional functionality that is useful for problem-solving purposes:

- You can display service instance details for each subscription by clicking the corresponding entry in the table. This displays all subscription-related information that is stored in the `bssapp` database.

5.3 Updating Service Controller Settings in the Database

During deployment, several configuration settings are written to the `bssapp` and `vmware` databases. This configuration is used for the initial setup of the VMware service controller and its registration with APP. It is up to the platform operator for taking care that the initial settings are correct. Refer to the *Operator's Guide* for details on the initial configuration using a `var.env` file. In addition, you can to upload `.csv` files containing an entire vSphere configuration matching your environment, for example, if you want to use several databases or clusters for the provisioning of VMs, into the `vmware` database. Refer to *Configuring the vSphere Integration Software* on page 10 for details.

A technology provider can define service parameters in the technical service definition. If such a parameter has the same ID as a controller configuration setting stored in the database, it overrules the configuration setting in the database when the marketable service based on such a technical service is subscribed to. By default the values in the controller configuration settings are used. Refer to the *Technology Provider's Guide* for details on defining technical services.

In addition, a supplier can define custom attributes for subscriptions and for customers. If such an attribute has the same ID as a controller configuration setting stored in the APP database as well as a corresponding technical service parameter, it overrules the technical service parameter as well as the configuration setting in the database when the marketable service based on such a technical service is subscribed to.

The controller configuration settings are evaluated as follows:

1. Configuration setting as stored in the APP database.

2. Technical service parameter. If defined, it overrules 1.
3. Custom attribute for customer. If defined, it overrules 1. and 2.
4. Custom attribute for subscription. If defined, it overrules 1. and 2. and 3.

To update the controller settings in the APP database:

1. Invoke the instance status interface of APP for the VMware service controller of the application by opening it's URL in a Web browser.

   The access URL has the following format:

   `https://<hostname.fqdn>:<port>/oscm-app-vmware`

   `<hostname.fqdn>` is the name and the fully qualified domain name of the machine where the `oscm-app` container has been deployed, `<port>` is the port to address the machine (default: `8881`), `oscm-app-vmware` is the default context root of the service controller and cannot be changed.
2. Log in with the ID and password of the user specified in the configuration settings for the VMware service controller by the platform operator in the `BSS_USER_ID` and `BSS_USER_PWD` configuration settings, or as another technology manager registered for the same organization.
3. The following **general controller settings** can be changed:
   - **User ID**: The identifier of the user responsible for the VMware service controller.
   - **User Key**: The user key for accessing OSCM. You receive this key with the confirmation email for your user account. The user must have the technology manager role in OSCM and belong to the technology provider organization responsible for the service controller.

     It is recommended that the user account is used only for carrying out actions on behalf of the service controller in OSCM.
   - **Password**: The password of the user for accessing OSCM.
4. The following **VMware controller-specific settings** can be changed:
   - **Connection URL**: The URL for accessing the vSphere API.
   - **User ID**: The ID of the technical user in vSphere for accessing the vSphere API.
   - **Password**: The password of the technical user in vSphere for accessing the vSphere API.

   You can also change the vSphere configuration by updating the respective `.csv` files and uploading them again to the `vmware` database. Refer to *vSphere Configuration* on page 21 for details.
5. Save the settings.

5.4 Changing the Responsible Organization

You can change the technology provider organization responsible for the VMware service controller using the Web interface of APP:

1. In a Web browser, access the Web interface (base URL) of APP.

   The access URL has the following format:

   `https://<hostname.fqdn>:<port>/oscm-app`

   `<hostname.fqdn>` is the name and the fully qualified domain name of the machine where the `oscm-app` container has been deployed, `<port>` is the port to address the machine (default: `8881`), `oscm-app` is the default context root of APP and cannot be changed.
2. Log in with the ID and password of the user specified for `BSS_USER_KEY` in the configuration settings for APP or as another administrator of the same organization.

3. Specify the technology provider organization for the VMware service controller, `ess.vmware`.
4. Save the settings.

Appendix A: Controller Configuration Settings

This appendix describes the controller configuration settings as stored in the `bssapp` database. For details on how to update them, refer to *Updating Service Controller Settings in the Database* on page 16 and *Changing the Responsible Organization* on page 17.

CONTROLLER_ID

`CONTROLLER_ID=ess.vmware`

The identifier of the service controller.

BSS_ORGANIZATION_ID

`BSS_ORGANIZATION_ID=<organizationID>`

The ID of the organization in OSCM which is responsible for the service controller. The organization must have the technology provider role. It is created and initially assigned to the VMware service controller by the platform operator.

BSS_USER_ID

`BSS_USER_ID=<userId>`

The identifier of the user specified in `BSS_USER_KEY` for accessing OSCM.

BSS_USER_KEY

`BSS_USER_KEY=<userKey>`

The user key for accessing OSCM. You receive this key with the confirmation email for your user account. The user must have the technology manager role in OSCM and belong to the technology provider organization responsible for the service controller.

BSS_USER_PWD

`BSS_USER_PWD=_crypt:<password>`

The password of the user for accessing OSCM.

READY_TIMEOUT

`READY_TIMOUT=<organizationID>`

The time interval in milliseconds the VMware service controller waits for the VM instance to accept the next command in the provisioning process. When the specified timeout value is reached, the provisioning is aborted.

Allowed values: Any value between `0` and `4924967296`

Default: `300000`

USERID_<organizationId>

`USERID_<organizationId>=<userId>`

Optional. The identifier of a service manager of a supplier organization providing a service on an OSCM marketplace for provisioning VMs. This identifier must be specified in case a shell script with service parameter placeholders is to be executed during the provisioning process.

Replace `<organizationId>` and the `<userId>` with the corresponding IDs.

USERKEY_<organizationId>

`USERKEY_<organizationId>=<userKey>`

Optional. The user key of the service manager specified in `USERID_<organizationID>`. This key must be specified in case a shell script with service parameter placeholders is to be executed during the provisioning process.

Replace `<organizationId>` and the `<userKey>` with the organization ID and user key, respectively.

USERPWD_<organizationId>

`USERPWD_<organizationId>=_crypt:<userPwd>`

Optional. The password of the service manager specified in `USERID_<organizationID>`. This password must be specified in case a shell script with service parameter placeholders is to be executed during the provisioning process.

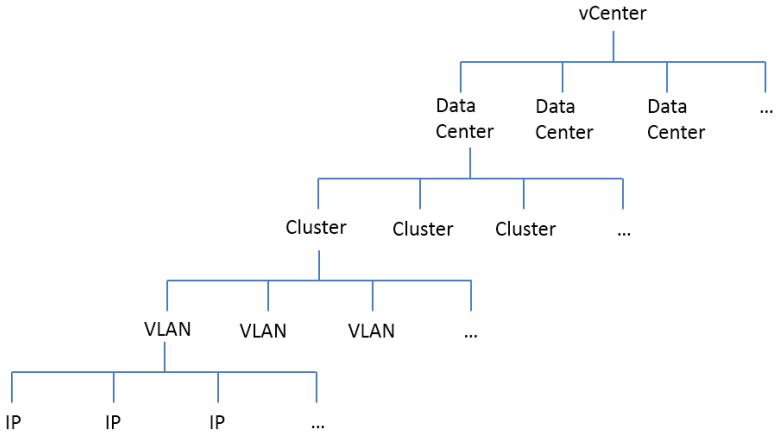
Replace `<organizationId>` and the `<userPwd>` with the organization ID and password, respectively. The `_crypt:` prefix ensures that the password will be encrypted before it is stored.

Appendix B: vSphere Configuration

The vSphere integration software requires and stores its data in the `bssapp` relational database. Another relational database, `vmware`, is used to store the vSphere configuration. The initial setup used when deploying the `oscm-app` container configures at least the following:

- `VCENTER_NAME`: The name of the vCenter running on the vSphere server.
- `DATACENTER_NAME`: The name of data center managed by the vCenter specified above.
- `CLUSTER_NAME`: The name of the cluster where VMs are to be provisioned.
- `LOADBALANCER_NAME`: The name of the load balancer used by vSphere. Usually, you can use the name of the VM Network in vSphere: `VM Network`.

In vSphere, several entities are distinguished. They form the following hierarchy:



One vCenter can manage many data centers. Each data center may contain any number of clusters. One cluster may use several VLANs (Virtual Local Area Networks), each having assigned several IP addresses.

You need to specify the vSphere configuration in the `.csv` files so that the correct entities are used for the provisioning of VMs in vSphere.

There are the following types of `.csv` files. They map the hierarchy depicted above:

- `vCenter`: Defines the URL and user credentials for accessing the vSphere server. For security reasons, it is recommended to delete the file as soon as you have successfully installed and configured the vSphere integration software.
- `DataCenter`: Defines one or several data centers of the vSphere installation.
- `Cluster`: Defines one or several clusters managed by a data center.
- `VLAN`: Defines one or more VLANs for a cluster.
- `IPPool`: Defines the list of IP addresses associated with a VLAN.

You find samples of the above files *here*.

You can upload the files to the `vmware` database using the instance status interface of APP for the VMware service controller:

`https://<hostname.fqdn>:<port>/oscm-app-vmware`

The files must be UTF-8 encoded.

Below you find a description of the headers in the individual files below which you need to enter the appropriate information. The individual entries must be separated by commas, and be placed into one line without line breaks. If the entries contain a comma or blanks, you need to enclose them in double quotes.

vCenter

vCenter represents the vSphere installation. The `vcenter.csv` file contains the following headers:

Header	Description
TKey	The technical identifier of the vCenter in the VMware service controller database. It is used internally for identifying the vCenter. The key must be unique and consist of integers only.
Name	The name of the vCenter running on the vSphere server.
Identifier	The unique identifier of the vCenter. If specified, this identifier can be used as a placeholder in the naming scheme of the VMs to be provisioned (`INSTANCENAME` service parameter).
URL	The URL for accessing the vSphere API.
UserId	The ID of the technical user in vSphere for accessing the vSphere API.
Password	The password of the technical user in vSphere for accessing the vSphere API.

Example:

```
TKey,Name,Identifier,URL,UserId,Password
1,myvc1,1,https://myvc1.com/sdk/vimService?wsdl,user,pw123
```

Data Center

Data centers are managed by a vCenter. For each vCenter, the `datacenter.csv` file may contain several entries for several data centers with the following headers:

Header	Description
VCenter	The name of the vCenter managing the data center.
Datacenter	The name of the data center.
DatacenterID	The unique identifier of the data center. The `${DC}` placeholder in the `INSTANCENAME` service parameter of a technical service definition is replaced by this ID when vSphere instance names are generated.

Example:

```
VCenter,Datacenter,DatacenterID
myvc1,datacenter1,1
```

```
myvc1,datacenter2,2
```

Clusters

One data center can contain many clusters. Each VM is provisioned in a cluster. For one vCenter and each data center managed by this vCenter, the `cluster.csv` may contain several entries for several clusters with the following headers:

Header	Description
VCenter	The name of the vCenter managing the data center where the cluster is located.
Datacenter	The name of the data center the cluster is associated with.
Clustername	The name of the cluster.

Example:

```
VCenter,Datacenter,Clustername
myvc1,datacenter1,cluster1
myvc1,datacenter1,cluster2
myvc1,datacenter2,cluster3
```

VLAN

VLANs (Virtual Local Area Networks) enable a single physical LAN segment to be further subdivided so that groups of ports are isolated from one another as if they were on physically separated segments. VLANs are associated with clusters. The `vlan.csv` file contains the following headers for defining VLANs:

Header	Description
VCenter	The name of the vCenter managing the data center where the cluster is located.
Datacenter	The name of the data center the cluster is associated with.
Cluster	The name of the cluster this VLAN is assigned to.
Name	The name of this VLAN.
Gateway	The IP address of the gateway of this VLAN.
SubnetMask	The subnet mask.
DNSServer	The DNS server for the VLAN.
DNSSuffix	The DNS suffix for the VLAN. The suffix is used in DNS name registration and resolution.
Enabled	In order to associate a VLAN with a VM and to activate the VLAN, you need to set this parameter to `true`.

Example:

```
VCenter,Datacenter,Cluster,Name,Gateway,SubnetMask,
   DNSServer,DNSSuffix,Enabled
myvc1,datacenter1,cluster1,VLAN1,10.10.1.1,255.255.251.0,
   10.10.1.11,mycompany1.com,true
myvc1,datacenter1,cluster1,VLAN2,10.10.1.2,255.255.252.0,
   10.10.1.22,mycompany2.com,true
myvc1,datacenter1,cluster1,VM Network,10.10.1.3,255.255.253.0,
   10.10.1.33,mycompany3.com,true
```

The above example is not complete, and it contains line breaks due to text formatting reasons. You need to specify additional values for all clusters defined in the `cluster.csv` file.

IP Pool

An IP pool is a list of IP addresses associated with a VLAN. The `ippool.csv` file contains the following headers for defining IP addresses:

Header	Description
VCenter	The name of the vCenter managing the data center where the cluster is located.
Datacenter	The name of the data center the cluster is associated with.
Cluster	The name of the cluster to which this IP address is assigned.
VLAN	The name of the VLAN this IP address is assigned to.
IPAddress	The IP address.

Example:

```
VCenter,Datacenter,Cluster,VLAN,IPAddress
myvc1,datacenter1,cluster1,VLAN1,169.254.10.1
myvc1,datacenter1,cluster1,VLAN1,169.254.10.2
myvc1,datacenter1,cluster1,VLAN1,169.254.10.3
myvc1,datacenter1,cluster1,VLAN2,169.255.10.1
myvc1,datacenter1,cluster1,VLAN2,169.255.10.2
myvc1,datacenter1,cluster1,VLAN2,169.255.10.3
```

The above example is not complete. You need to specify additional values for all VLANs defined in the `vlan.csv` file.

Appendix C: Service Parameters and Operations

The following sections describe the technical service parameters and service operations which are supported by the VMware service controller.

You find a sample service on GitHub:
https://github.com/servicecatalog/oscm/tree/master/oscm-app-vmware/resources.

Note: All parameters defined in the technical service definition must be one-time parameters, since the modification of parameters is not supported. Be sure to set their `modificationType` to `ONE_TIME`.

General Parameters

The following parameters are required for provisioning a VM:

TEMPLATENAME

Mandatory. The name of the VM template to be used for the provisioning of a new VM instance. The template is a master copy of a VM that can be used to create many clones. When you provision a VM, you create a copy of the template, including its settings, configured virtual devices, installed software, and other contents of its disks.

Once specified, the template name can no longer be changed. Be aware that template names are case-sensitive.

Example: `centos52-template`

ACCESS_INFO

Optional. A pattern for the access information for a VM after it has been provisioned. The access information is sent by email to the subscribing user as well as all users assigned to the subscription. It is displayed in the details of the subscription.

The instance-specific values of this parameter contain the actual access information for the VM as soon as the subscription has been created.

The pattern may contain any textual expression. In addition, the following placeholders are supported:

- `${IP}`: IP address of the VM.
- `${HOST}`: Host name of the VM.
- `${CPU}`: CPU count.
- `${MEM}`: Main memory.
- `${DISK}`: System and data disk size(s).

Example: `${HOST}(IP:${IP})<br>${CPU} CPUs, ${MEM} RAM, ${DISK} HDD`

Default: `${HOST}, ${IP}`

MAIL_FOR_COMPLETION

Optional. The address to which emails are to be sent in case manual steps are required to complete an operation. If you specify this parameter, the service controller interrupts the provisioning of the VM and waits for a notification about the execution of a manual action. Omit this parameter if you do not want to interrupt the provisioning process.

Example: `info@company.com`

VM Naming Rule Parameters

The following parameters define the naming rules for the VMs to be provisioned:

INSTANCENAME

Mandatory. The name of the VM instance to be provisioned. This name is either generated automatically, or must be specified by customers when they subscribe to a corresponding service. The instance name is used as the host name of the VM in the network configuration. The permitted length of host names depends on the operating system.

The string given in `INSTANCENAME_PREFIX` is prepended to the name. The name including the prefix must match the pattern given in `INSTANCENAME_PATTERN`.

For the automatic generation of instance names, the following placeholders are supported. They are filled with the corresponding data from the VMware service controller database when the VM is provisioned. Refer to *vSphere Configuration* on page 21 for details.

- `${VC}`: Unique ID of the vCenter derived from the `vcenter` database table. Specifies the vSphere server on which the VM is provisioned.
- `${DC}`: Unique ID of the data center derived from the `vcenter` database table.
- `${ID3}`: Unique sequential number of 3 digits.
- `${ID6}`: Unique sequential number of 6 digits.
- `${ID8}`: Unique sequential number of 8 digits.
- `${ID10}`: Unique sequential number of 10 digits.
- `${ID12}`: Unique sequential number of 12 digits.
- `${IP3}`: The last octet (eight bit) of the VM's IP address, for example, `152` of the `192.16.20.152` IP address.

It is helpful to add some hint about the naming rules as default value.

Example: `Hostname ([a-z0-9]){6,8}`

INSTANCENAME_PATTERN

Optional. A regular expression specifying a pattern for the VM instance names entered by the users when they subscribe to a corresponding service. This parameter is useful if the `INSTANCENAME` parameter is configurable by the user subscribing to the service, i.e. the instance names are not generated automatically. If the names do not match the pattern, the subscription is rejected. Special characters must not be used.

Default: `^[a-zA-Z0-9][a-zA-Z0-9-]{0,61}[a-zA-Z0-9]$`

The pattern may contain any textual expression.

Example: `IT([a-z0-9]){6,8}`

INSTANCENAME_PREFIX

Optional. A string to be prepended to the VM instance names when they are generated or entered by the users when they subscribe to a corresponding service. The combination of prefix and instance name must match the `INSTANCENAME_PATTERN` parameter.

Example: `IT`

VM Location Parameters

The following parameters can be specified for defining where on the vSphere server the VMs are to be provisioned. The parameters can be used by suppliers for offering a list of options to the customers subscribing to a corresponding service.

TARGET_VCENTER_SERVER

Mandatory. The site where vSphere is installed. vCenter is the centralized management tool for the vSphere suite. Together with the `TARGET_DATACENTER` and `TARGET_CLUSTER` parameters, this parameter is used to specify the location of the provisioned VM instances. The vCenter must be contained in the `vmware` database.

TARGET_DATACENTER

Mandatory. The data center where the VM instances will be provisioned. Together with the `TARGET_VCENTER_SERVER` and `TARGET_CLUSTER` parameters, this parameter is used to determine the location of the provisioned VM instances. The data center must be contained in the `vmware` database.

TARGET_CLUSTER

Mandatory. The cluster where the VM instances will be provisioned. A cluster is a group of hosts. Together with the `TARGET_VCENTER_SERVER` and `TARGET_DATACENTER` parameters, this parameter is used to determine the location of the provisoned VM instances. The cluster must be contained in the `vmware` database.

TARGET_HOST

Optional. The name of the host on which the VM instances will be provisioned. If not specified, the default vSphere load balancing mechanism will determine the host machine to be used. In this case, the target host will be the one with the least VMs running on it.

TARGET_STORAGE

Optional. The name of the disk where the files of the VM instances are to be stored. If not specified, the vSphere load balancing mechanism will determine the target storage. In this case, the target storage will be the one with the highest amount of available disk space.

Example: `vmwdev1`

TARGET_FOLDER

Optional. The name of the virtual folder where the VM instances will be provisioned. If not specified, the VMs are placed into the folder where the VM template from which they were cloned is located.

Example: `folder_${ORGID}`

`${ORGID}` is a placeholder for the organization of the subscribing user.

The actual value will be, for example, `folder_83d79a`.

VM Sizing Parameters

The following parameters define the size of the VMs to be provisioned. Make sure that users can only specify numbers that are supported by the VM template and the configuration in vSphere. This can be done, for example, by presenting the supported numbers as different parameter options for selection.

NUMBER_OF_CPU

Mandatory. The number of virtual CPUs the VM instance to be provisioned will use. The number of licensed CPUs on the host, the number of CPUs that the guest operating system supports, and the VM hardware version determine the number of virtual CPUs that you can use.

Default: `1`

AMOUNT_OF_RAM

Mandatory. The amout of memory in MB allocated to each VM.

Default: `1024`

DISK_SIZE

Mandatory. The operating system disk size in GB. This parameter can be used to adjust the system disk size. If the parameter is not specified, the same disk size as specified in the VM template is used.

Currently, only one virtual device is supported. If multiple disks are defined in the VM template, the first one only will be configured.

Default: `40`

DATA_DISK_SIZE_#

Optional. Up to 4 additional data disks can be defined: Replace the hash sign (`#`) with a digit between 1 and 4. For each disk, this parameter is used for specifying the disk size in GB. Make sure that when a user modifies subscription parameters, the value for the disk size can only be increased.

When adding data disks, additional actions are required on the operating system where the VMs are provisioned: To enable disk usage, you need to format and mount them. To do so, you could use a script and provide the script's URL in the `SCRIPT_URL` service parameter.

Example: `DATA_DISK_SIZE_1="40"`

DATA_DISK_TARGET_#

Optional. The mount point of the data disk with the given number (Linux), or the disk drive (Microsoft Windows).

Example: `DATA_DISK_TARGET_1="D"`

DATA_DISK_TARGET_VALIDATION_#

Optional. A regular expression specifying a fixed part of the mount point or disk drive where the additional data disk is to be mounted. This parameter must not be configurable by the user subscribing to the service.

Example: `~/home/datadisk/`

VM Network Parameters

The following parameters define the network for the VM instances to be provisioned:

NUMBER_OF_NICS

Mandatory. The number of network interface cards (NICs) which are to be used for new VMs. The number must match the number defined in the VM template. You can configure up to 4 networks for a VM.

Default: `1`

NIC#_NETWORK_ADAPTER

Optional. The network adapter with the given number (`#`) which is to be used when a VM is provisioned. If specified, it replaces the network adapter defined in the VM template.

Example: `NIC1_NETWORK_ADAPTER="VLAN1"`

NIC#_NETWORK_SETTINGS

Optional. Determines how the IP address for the NIC with the given number (`#`) is set. The following options can be specified:

- `DHCP`: The DHCP protocol defines the IP address.
- `MANUAL`: The IP address is specified manually using the `NIC#_*` service parameters described below.
- `DATABASE`: The IP address is retrieved from the `vmware` database. The first free address is taken. The available IP addresses must have been defined in and imported from the `ippool.csv` configuration file.

Example: `NIC1_NETWORK_SETTINGS="DHCP"`

NIC#_IP_ADDRESS

Optional. The IP address for the NIC with the given number (`#`). Only useful when the `NIC#_NETWORK_SETTINGS` parameter is set to `MANUAL`.

Example: `NIC1_IP_ADDRESS="172.16.254.1"`

NIC#_SUBNET_MASK

Optional. The subnet mask for the NIC with the given number (`#`). Only useful when the `NIC#_NETWORK_SETTINGS` parameter is set to `MANUAL`.

Example: `NIC1_SUBNET_MASK="255.255.252.0"`

NIC#_GATEWAY

Optional. The gateway for the NIC with the given number (`#`). Only useful when the `NIC#_NETWORK_SETTINGS` parameter is set to `MANUAL`.

Example: `NIC1_GATEWAY="192.0.2.254"`

NIC#_DNS_SERVER

Optional. The DNS server for the NIC with the given number (`#`). Only useful when the `NIC#_NETWORK_SETTINGS` parameter is set to `MANUAL`.

Example: `NIC1_DNS_SERVER="208.67.222.222"`

NIC#_DNS_SUFFIX

Optional. The DNS suffix for the NIC with the given number (`#`). The suffix is used in DNS name registration and resolution. This policy lets you specify a suffix for a group of VMs, and prevents users from changing it.

Example: `NIC1_DNS_SUFFIX="example.com"`

VM Configuration Parameters

The following parameters define the configuration of the VMs to be provisioned:

SCRIPT_URL

Optional. The URL points to a shell script (Linux) or batch file (Microsoft Windows) that is downloaded from the given location, and uploaded and executed on a VM after the VM has been created and configured. You can use such a script or batch file, for example, for formatting and mounting additional data disks, or changing the root password. For security reasons, the `SCRIPT_URL` parameter must not be configurable by the user subscribing to the service.

Apart from the `SCRIPT_URL` parameter, the following service parameters must be specified:

- `SCRIPT_USERID`
- `SCRIPT_PWD`

Scripts or batch files can be provided, for example, in the `docroot` directory of the `app-domain` domain.

A script or batch file can contain commands or placeholders for the following service parameters:

- `LINUX_ROOT_PWD`
- `NIC#_DNS_SERVER` (`#` being a digit between 1 and 4)
- `NIC#_DNS_SUFFIX` (`#` being a digit between 1 and 4)
- `NIC#_GATEWAY` (`#` being a digit between 1 and 4)
- `NIC#_IP_ADDRESS` (`#` being a digit between 1 and 4)
- `NIC#_SUBNET_MASK` (`#` being a digit between 1 and 4)
- `INSTANCENAME`
- `SCRIPT_URL`
- `SCRIPT_USERID`
- `SCRIPT_PWD`
- `DOMAIN_NAME`
- `DATA_DISK_TARGET_#` (`#` being a digit between 1 and 4)
- `DATA_DISK_SIZE_#` (`#` being a digit between 1 and 4)
- `DATA_DISK_TARGET_VALIDATION_#` (`#` being a digit between 1 and 4)

If the script or batch file contains a placeholder for a service parameter, you must insert the user credentials of a service manager of a supplier organization as VMware service controller settings:

- `USERID_<organizationID>`
- `USERKEY_<organizationID>`
- `USERPWD_<organizationID>`

For details, refer to *Controller Configuration Settings*on page 19.

A sample script for changing the Linux root password is available in the `<install_pack_dir>/samples` directory: `changeRootPassword.sh`.

Example: `http://localhost:8080/changeNetworkSettings.sh`

SCRIPT_USERID

Optional. The user ID for executing the shell script (Linux) or batch file (Microsoft Windows) in the VM.

SCRIPT_PWD

Optional. The password for executing the shell script (Linux) or batch file (Microsoft Windows) in the VM.

DOMAIN_NAME

Optional. The domain part of the fully qualified domain name (FQDN) for Linux environments, or the Microsoft Windows domain that the VM will join if it is a Microsoft Windows system.

LINUX_ROOT_PWD

Optional. The root account password for Linux environments. Initially, a VM is provisioned with the user credentials derived from the VM template.

The root password can be changed only by executing a script using the `SCRIPT_URL` parameter. A sample of such a script is provided in the `<install_pack_dir>/samples` directory: `changeRootPassword.sh`.

In the sample script, the `LINUX_ROOT_PWD` parameter contains the new Linux root password which is set when the script is executed. The sample script can be provided, for example, in the `docroot` directory of the `app-domain` domain.

WINDOWS_DOMAIN_JOIN

Optional. If set to `true`, the VM will join a Microsoft Windows domain, if set to `false`, the VM will be part of a Microsoft Windows Workgroup.

Default: `false`

WINDOWS_DOMAIN_ADMIN

Optional. The name of a Microsoft Windows domain administrator.

WINDOWS_DOMAIN_ADMIN_PWD

Optional. The password of the Microsoft Windows domain administrator.

WINDOWS_WORKGROUP

Optional. The Microsoft Windows Workgroup the VM will join, if specified by the `WINDOWS_DOMAIN_JOIN` parameter.

WINDOWS_LOCAL_ADMIN_PWD

Optional. The local administrator password of the VM.

WINDOWS_LICENSEKEY

Optional. The license key of the Microsoft Windows system.

SYSPREP_RUNONCE_COMMAND

Optional. The Microsoft Windows batch file that is executed by the Microsoft Windows system preparation script (`sysprep`) after the first boot.

Example: `cmd /c CALL \\server\share\file.bat`

Service Operations for VMs

The VMware service controller supports the service operations below for VMs.

The `actionURL` for each operation is:

```
https://oscm-app:8881/oscm-app/webservices/oscm-app/oscm-app
         /org.oscm.app.v2_0.service.AsynchronousOperationProxy?wsdl
```

`<oscm-app>` and `<8881>` are the server and port of the container where the VMware service controller is deployed.

START_VM

Starts a VM in vSphere if it was stopped.

STOP_VM

Stops a VM in vSphere if it was started.

RESTART_VM

Shuts down a VM in vSphere and starts it again.

SNAPSHOT_VM

Creates a snapshot of the VM. Be aware that no snapshot versions are stored. When a new snapshot is created, the previous one is overwritten.

RESTORE_VM

Restores a previously created snapshot of the VM.

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.

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.