FUJITSU

# FUJITSU Software Enterprise Service Catalog Manager V19.0

# Shell Integration

July 2020

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# About this Manual

This manual describes the integration of the Shell service with ) FUJITSU Software Enterprise Service Catalog Manager, hereafter referred to as ESCM.

This manual is structured as follows:

| Chapter | Description |
|---|---|
| *Introduction* on page 6 | Provides an overview of the ESCM Shell integration, the components involved, and the supported usage scenarios. |
| *Creating and Publishing Services* on page 8 | Describes how to prepare and provided Shell scripts, how to create and publish services for the Shell integration in ESCM, as well as how to configure a status information page for viewing details regarding script execution. |
| *Administrating the Shell Integration* on page 12 | Describes administration tasks related to the ESCM Shell integration. |
| *Service Parameters and Operations* on page 15 | Describes the technical service parameters and operations which are supported by the Shell service controller. |

## Readers of this Manual

This manual is intended for operators who want to use Shell scripts for offering services on a marketplace provided by ESCM. It assumes that you have access to an existing ESCM installation that supports Shell execution. In addition, you should have basic knowledge of Shell scripts and you should be familiar with the concepts and administration of ESCM.

## 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 |
| **ESCM** | Enterprise Service Catalog Manager |
| **DBMS** | Database Management System |
| **IaaS** | Infrastructure as a Service |
| **WSDL** | Web Services Description Language |
| **WSIT** | Web Services Interoperability Technologies |

# Available Documentation

The following documentation on ESCM is available:

- *Overview:* A PDF manual introducing ESCM. It is written for everybody interested in ESCM and does not require any special knowledge.
- *Operator's Guide:* A PDF manual for operators describing how to administrate and maintain ESCM.
- *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 ESCM.
- *Supplier's Guide:* A PDF manual for suppliers describing how to define and manage service offerings for applications that have been integrated with ESCM.
- *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 ESCM.
- *Microsoft Azure Integration:* A PDF manual for operators describing how to offer and use virtual systems controlled by Microsoft Azure through services in ESCM.
- *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 ESCM.
- *OpenStack Integration:* A PDF manual for operators describing how to offer and use virtual systems controlled by OpenStack through services in ESCM.
- *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 ESCM.
- *Shell Integration:* A PDF manual for operators describing how to use Shell scripts through services in ESCM.
- *Online Help:* Online help pages describing how to work with the administration portal of ESCM. The online help is intended for and available to everybody working with the administration portal.

# 1 Introduction

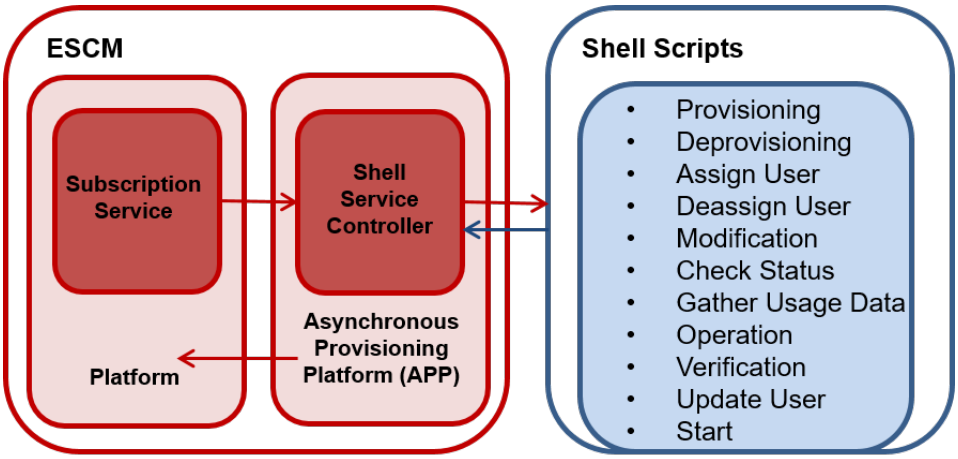
Enterprise Service Catalog Manager (ESCM) is a set of services which provide all business-related functions and features required for turning on-premise applications and tools into 'as a Service' (aaS) offerings and using them in the Cloud. This includes ready-to-use account and subscription management,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

The Shell integration with ESCM provides for an Infrastructure as a Service (IaaS) solution that allows users to install any software or execute any task in a UNIX environment by running Shell scripts from services, which are published on a marketplace. For example, users can request and use scripts for provisioning virtual systems in the cloud. The cloud usage costs are calculated and charged by means of the ESCM billing and payment services.

This manual describes how to execute Shell scripts from services on an ESCM marketplace.

## 1.1 Components Involved in the Shell Integration

The following picture provides an overview of the main components involved in the integration of ESCM and Shell scripts:




In ESCM, customer subscriptions are managed by means of the **Subscription service**. When a customer creates or terminates a subscription, the Subscription service asynchronously triggers the corresponding actions in a Shell through the **Asynchronous Provisioning Platform (APP)** and the **Shell service controller**: Scripts are executed in a Shell.

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 ESCM in asynchronous mode. The actual communication with the applications is carried out by service controllers. For each application, a specific and dedicated service controller is required. When APP is deployed (`oscm-app` container), a Shell service controller is also deployed and initialized. It is preconfigured and registered with APP. This service controller can be used for integrating a Shell with ESCM. Refer to the *Technology Provider's Guide* for details on APP.

## 1.2 Usage Scenarios

The ESCM Shell integration supports the following usage scenarios:

- **Provisioning script**: When a customer subscribes to a corresponding service on an ESCM marketplace, the Shell service controller triggers the execution of a provisioning script.
- **Deprovisioning script**: When a customer terminates a subscription, the Shell service controller triggers the execution of a deprovisioning script. The subscription is terminated in ESCM independent of whether the Script execution is successful.
- **Assign user script**: When a customer assigns users to a subscription, the Shell service controller triggers the execution of an assign user script.
- **Deassign user script**: When a customer removes users from a subscription, the Shell service controller triggers the execution of a deassign users script.
- **Update user script**: When a customer updates the data of a user, the Shell service controller triggers the execution of an update user script.
- **Modification script**: When a customer reconfigures an existing subscription to a corresponding service, the Shell service controller triggers the execution of a modification script.
- **Status script**: When a customer opens the **Details** view of a subscription and then clicks the **Custom** tab (e.g. **Status** tab) that has been defined for the subscribed marketable service, the Shell service controller triggers the execution of a status script.
- **Operation script**: When a customer selects an operation for his subscription, the Shell service controller triggers the execution of an operation script.
- **Verification script**: When a customer subscribes to a corresponding service, the Shell service controller triggers the execution of a verification script, if defined and not empty. In case the verification script returns an error, the subscription process is aborted and the user is informed by a corresponding message. Note that the execution of a verification script is executed in synchronous mode; all other scripts are executed asynchronously.
- **Start script**: When starting the `oscm-app` container, the Shell service controller triggers the execution of a script (`start.sh`), for example, for installing additional software such as Python or PowerShell for executing remote commands.
- **Usage data script**: The Shell service controller triggers the execution of a script for collecting events that occurred due to the usage of cloud resources.

# 2 Creating and Publishing Services

The following sections describe how to create and publish services in ESCM by means of which customers can execute Shell scripts.

## 2.1 Prerequisites and Preparation

The following prerequisites must be fulfilled before you can create and publish services in ESCM.

- To create technical services for the Shell integration in ESCM, you must have access to ESCM as a technology manager. You must be a member of the technology provider organization responsible for the Shell service controller as specified in the configuration settings for the installation.
- To create marketable services for the Shell integration in ESCM, you must have access to ESCM 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 your service manager role.

### Preparing and Providing Shell Scripts

- Shell scripts must exist. They form the basis for the technical services in ESCM.
- The technology provider organization responsible for the Shell service controller prepares the scripts to be called by the Shell service controller. These scripts can be defined in marketable service parameters and then be referenced as scripts located either inside or outside (external URL) the Docker host.

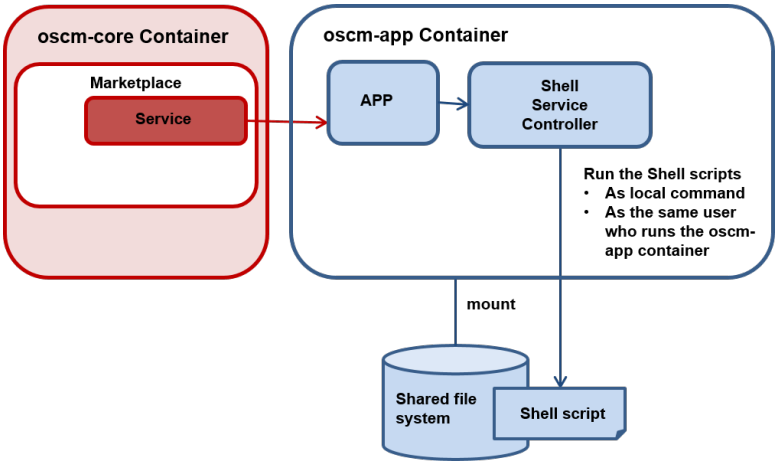
  To reference a script located inside the Docker host, you need to provide it in the following directory on your Docker host:

  `<docker>/config/oscm-app/scripts`

  `<docker>` is the ESCM data directory specified at installation time.

  As soon as you provide new scripts or change existing ones, you must restart the `oscm-app` container. The scripts are automatically copied into the container into the `/opt/scripts` folder.
- After deployment, the `oscm-app` container has the above shared file system mounted.

- The Shell service controller will run scripts stored on the shared file system as the same UNIX user who runs the `oscm-app` container:




## Shell Script Syntax and Rules

Shell scripts to be executed properly are subject to the following rules:

- Each script must return a valid JSON object followed by an `"END_OF_SCRIPT"` string value. In this way, the Shell service controller can determine that a script has finished successfully. Otherwise the script execution will run into a timeout.
- Each script must return exactly one JSON object.
- The JSON result may contain the following JSON keywords:
  - `status` (mandatory) - allowed values: `"ok"` or `"error"`
  - `message` (mandatory) - may contain information related to the script execution addressed to the user.
  - `usageData` (optional) - expected as a result of the execution of the usage data script. It contains the following JSON keywords:
    - `eventId` - ID of the billable event as defined in the technical service definition. You find a sample service definition with events on GitHub: *https://github.com/servicecatalog/oscm-app-shell/tree/master/src/main/resources*.
    - `multiplier` - specifies the number of occurrences of an event. Instead of recording the same event each time it occurs, you can record it only once and set the multiplier to the number of occurrences. The billing services consider the multiplier. For example, one event with a multiplier of 2 is handled in the same way as 2 events of the same type, if both events occur in the same billing period.
  - `data` (optional) - may contain any data which can be output in the **Status** tab after the script has been executed. You can include the following JSON keywords in the `data` field:
    - `output` - may contain any data to be presented, for example, HTML data for the status script.
    - `accessInfo` - may contain access information to be passed to the subscription details for display.
    - `name` - may contain any temporary data.

    - `id` - may contain any ID.
- Special characters used in scripts must be properly escaped.
- You find script samples on GitHub *here* and *here*.

## 2.2 Creating Technical Services

The first step in providing ESCM services for Shell script execution 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 service sample provided on *https://github.com/servicecatalog/oscm-app-shell/tree/master/src/main/resources*.

   A technical service specifies Shell scripts as parameter options. You need to make them available as described in *Prerequisites and Preparation* on page 8.

   In the technical service definition, be sure to specify:

   - The asynchronous provisioning type
   - The USER access type
   - Service parameters which correspond to the parameters specified in the Shell scripts. For details on the supported service parameters, refer to *Service Parameters and Operations* on page 15.
2. Log in to the ESCM 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 ESCM.

## 2.3 Creating and Publishing Marketable Services

As soon as the technical services for the Shell integration exist in ESCM, you can define and publish marketable services based on them. Your cost calculation for the services should include any external costs for operating any provisioned system, etc..

Proceed as follows:

1. Log in to the ESCM administration portal with your service manager account.
2. Define one or more marketable services based on the technical services you created for the Shell.
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 ESCM.

## 2.4 Configuring the Status Information Page

For checking the status of a script execution, you can add a custom tab to the **Details** view for subscriptions on a marketplace when defining a marketable service:

1. Make sure that a script for checking the status of provisioned instances is available. Refer to the sample script *`status.sh`* for details.

2. When creating or editing a marketable service for Shell script execution, specify the **URL of a custom tab**. This URL points to a Web page or Web application the content of which will be retrieved and shown on the custom tab. Using a custom tab, you can provide the information needed for accessing, for example, provisioned instances, such as IP addresses, network information, or user credentials.

   A predefined custom tab, `serverInformation.xhtml`, is available for viewing the output of a status script, e.g. `status.sh`.

   Set the URL for the custom tab in the following format:

   `https://<host_fqdn>:8881/<service controller name>/serverInformation.jsf`

   `<host_fqdn>` is the fully qualified name or IP address of the host used to access ESCM, `8881` is the port of APP. Omit the port if ESCM is operated with its proxy. `<service controller name>` is the default context root of the relevant service controller and cannot be changed.

   For example:

   `https://myhost:8881/oscm-app-shell/serverInformation.jsf`

3. Enter a **Name of the custom tab**, for example, `Status`. Do not enter `Details` because the first tab is named that way.
4. Enter the name of the status script in the **Retrieve status of provisioned instance. Absolute filesystem path or URL to script file** field of the service parameters. It is assumed that the script is located in the `/opt/scripts/` folder of your Docker host where the `oscm-app` container has been deployed.
5. Save the marketable service definition.
6. Activate the marketable service, log in to the marketplace, and create a subscription to the service.
7. Under **My Subscriptions**, you can now see the **Status** tab next to the **Details** tab.

For details on defining marketable services, refer to the *Supplier's Guide* and to the online help of ESCM.

# 3 Administrating the Shell Integration

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

## 3.1 Handling Problems in the Provisioning Process

If there are problems in the communication between the participating systems, the corresponding subscription in ESCM remains pending. The Shell service controller informs the technology managers of its responsible technology provider organization by email of any incomplete operation in the Shell script execution.

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

After solving the problem, the Shell integration components and ESCM 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 Shell service controller.
2. Invoke the instance status interface of APP for the service controller by opening its URL in a Web browser.

   The access URL has the following format:

   `https://<host_fqdn>:8881/oscm-app/controller/?controllerid=ess.shell`

   `<host_fqdn>` is the fully qualified name or IP address of the host used to access ESCM, `8881` is the port of APP. Omit the port if ESCM is operated with its proxy. `oscm-app/controller/?controllerid=ess.shell` 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 operation.
4. In the **Action** column, select the action for the Shell 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 a Shell script does not respond.
   - `UNLOCK` - to remove the lock for an instance in APP.
   - `DELETE` - to terminate the subscription in ESCM and remove the instance in APP, but keep a virtual system for later use. The service manager role is required for this action.
   - `DEPROVISION` - to terminate the subscription in ESCM, remove the instance in APP, and delete any virtual system. The service manager role is required for this action.
   - `ABORT_PENDING` - to abort a pending operation in ESCM. ESCM is notified to roll back the changes made for the subscription and return it to its previous state.
   - `COMPLETE_PENDING` - to complete a pending operation in ESCM. ESCM 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.

## 3.2 Updating Service Controller Settings in the Database

During the deployment of ESCM, several configuration settings are written to the `bssapp` database. This configuration is used for the initial setup of the Shell service controller and its registration with APP. The platform operator is responsible for taking care that the initial settings are correct. Refer to the *Operator's Guide* for details on the initial configuration in the `var.env` configuration file.

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 APP 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 change the user responsible for the Shell service controller, the operator needs to set corresponding environment variables. Refer to the *Operator's Guide* for details.

## 3.3 Changing the Responsible Organization

You can change the technology provider organization responsible for the Shell 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://<host_fqdn>:8881/oscm-app`

   `<host_fqdn>` is the fully qualified name or IP address of the host used to access ESCM, `8881` is the port of APP. Omit the port if ESCM is operated with its proxy. `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 Shell service controller, `ess.shell`.
4. Save the settings.
5. Make sure that the configuration settings for the Shell service controller are updated.

   Any technology manager registered for the technology provider organization you specified can log in to the graphical user interface for updating the controller configuration settings (see above). At least the ID and password of the user to be used for accessing ESCM must be changed in the controller configuration settings.

## 3.4 Logging

The Shell integration software records detailed information regarding script execution in the following log file inside the `oscm-app` container in the following folder:

`/opt/apache-tomee/logs/app-shell.log`

The logging is based on `log4j`.

**Note:** Be aware that this log file is available only if you set the `TOMEE_DEBUG` configuration setting in the `var.env` configuration file to `true`.

To view the log file, log in to the `oscm-app` container as follows:

```
docker exec -it oscm-app /bin/bash
```

The default log level is `INFO`.

# Appendix A: Service Parameters and Operations

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

## Service Parameters

The Shell service controller supports the parameters below.

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

The Shell service controller supports the parameters below.

**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`.

**APP_CONTROLLER_ID**

Mandatory. The ID of the service controller as defined in its implementation. The ID is set during the installation of the Shell integration software.

Default (must not be changed): `ess.shell`

**PROVISIONING_SCRIPT**

Mandatory. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when a user subscribes to a service on the marketplace.

Example: `/provisioning.sh`

**DEPROVISIONING_SCRIPT**

Mandatory. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when a user terminates the subscription.

Example: `/deprovisioning.sh`

**UPDATE_SCRIPT**

Mandatory. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when the configuration of an existing subscription is changed.

Example: `/update.sh`

**ASSIGN_USER_SCRIPT**

Mandatory. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when a user is assigned to a subscription.

Example: `/assign_user.sh`

**DEASSIGN_USER_SCRIPT**

Mandatory. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when a user is removed from a subscription.

Example: `/deassign_user.sh`

**CHECK_STATUS_SCRIPT**

Optional. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when a user opens the **Details** view under **My Subscriptions** and selects the **Status** tab. It retrieves the status of a provisioned instance.

Example: `/status.sh`

**SCRIPT_TIMEOUT_SECONDS**

Optional. The number of seconds until the execution of a running script will be canceled.

Default: `600`

**USAGE_DATA_SCRIPT**

Optional. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script is automatically executed, by default, on a daily basis if the `APP_TIMER_REFRESH_USAGEDATA` parameter is set accordingly for APP. The script gathers the number of billable events defined in the technical service definition for calculating cloud usage costs.

Example: `/usage_data.sh`

**TECHNICAL_SERVICE_ID**

Optional. The technical service identifier as defined in the current technical service definition in the `tns:TechnicalService` element. This ID is used for generating events for usage data collection.

Default: `Shell`

**<freely definable service parameter>**

Optional. Any number of parameters that are mapped from the parameters defined in the Shell script files. For each parameter in the script file, a corresponding parameter must be specified in the technical service definition.

All service parameters are patched into the script file at the top of the file. For example, a service parameter called `MY_PARAM` can be used as `$MY_PARAM` in the script file.

Parameters are used for passing data for script execution, for example, number of allowed transactions, number of bookable CPUs, etc.

**OPERATIONS_SCRIPT**

Optional. The absolute file system path or URL to a Shell script file defining operations that can be executed for a subscription, for example, starting or stopping a provisioned VM. The base folder is `/opt/scripts`. This script will be executed when a user selects an operation for his subscription.

Example: `/operation.sh`

**UPDATE_USER_SCRIPT**

Optional. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. This script will be executed when the data of a user is changed.

Example: `/update.sh`

**VERIFICATION_SCRIPT**

Optional. The absolute file system path or URL to a Shell script file. The base folder is `/opt/scripts`. If specified, this script will be executed BEFORE any other script. This is useful, for example, for checking whether a specific instance already exists, whether parameters are passed correctely, etc.

Example: `/verification.sh`

## Service Operations for Instances Provisioned by a Shell Script

The Shell service controller supports the definition and execution of service operations for instances provisioned using a Shell script. The operations are defined in the script referenced by the `OPERATIONS_SCRIPT` service parameter.

The `actionURL` for each operation is:

```
http://oscm-app:8880/oscm-app/webservices/oscm-app/oscm-app
         /org.oscm.app.v2_0.service.AsynchronousOperationProxy?wsdl
```

`<oscm-app>` and `<8880>` are the server and port of the container where the Shell service controller is deployed.

# 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 ESCM 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 ESCM, 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 ESCM to provide their services to customers.

### Marketplace Owner

An organization which holds a marketplace in ESCM, 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 ESCM 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 ESCM 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 ESCM.

### 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 ESCM; 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. ESCM 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 ESCM. 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 ESCM for offering applications provisioned by technology providers to customers.

### Technical Service

The representation of an application in ESCM. 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 ESCM.