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Digital Security
Secure Cloud Management Platform
Software User Manual (SUM)

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Lista delle Revisioni

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01.00	-	24/01/2022	Prima emissione	D. Leone
02.00	DCN222372	29/07/2022	Integrazione Rilascio SCMP 2.0.0	D. Leone
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06.00	DCN240480	28/07/2024	Integrazione Rilascio SCMP 6.0.0	D. Leone
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SCMP Documentazione (IT)

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Installation and Deploy

Getting Started

The Secure Cloud Management Platform solution, in line with Gartner's definition indicated in the Reference Documents, is an operational platform that enables the governance, lifecycle management, brokering, and automation of resources managed in a cloud environment.

Requirements

The SCMP solution is designed to run exclusively in Kubernetes environments compliant with the supported versions indicated in the section Supported Kubernetes Versions. Installation requires the availability of an existing Kubernetes cluster (upstream or managed service) or OpenShift Container Platform, equipped with the necessary resources to host the platform's core components.

In OpenShift environments, it is possible to leverage the benefits of Red Hat certified operators. Alternatively, it is possible to use upstream or managed Kubernetes clusters (EKS, AKS, GKE) with Helm v3.

Recommended Sizing

To ensure optimal performance, it is recommended that the Kubernetes cluster has nodes with the following minimum characteristics:

Type	Role	#qty	vCPU	Memory (GB)	Disk (GB)	Notes
Node	Control Plane	3	8	16	128	Respect native Kubernetes HA
Node	Infra	3	12	24	628	For ingress, logging, monitoring services
Node	Worker	4	8	32	128	For SCMP modules and user workloads

⚠ Note: Node quantities and sizes may vary based on environment size, number of SCMP modules installed, and workloads to be managed.

Other Requirements

- Helm v3 installed and configured.
- Access to Helm repositories and container registries indicated in the next section.
- Outbound network connectivity (port 443) to the Internet and APIs/consoles of supported cloud providers.
- Persistent Storage available via `StorageClass` compatible with Kubernetes PersistentVolumeClaim (NFS, Ceph, Portworx, EBS, Azure Disk, etc.).

The SCMP platform is supported on Kubernetes and OpenShift in the following versions:

Platform	Supported Version(s)	Notes
OpenShift Container Platform (OCP)	≥ 4.14	Recommended to use versions ≥ 4.14 to ensure compatibility with certified operators
Kubernetes Upstream	≥ 1.25	Supported with Helm v3; recommended to use versions ≥ 1.26
Amazon EKS (Elastic Kubernetes Service)	≥ 1.25	Validated support for managed EKS environments
Azure AKS (Azure Kubernetes Service)	≥ 1.25	Validated for managed AKS environments
Google GKE (Google Kubernetes Engine)	≥ 1.25	Validated for managed GKE environments

To perform the installation correctly, access to the following repositories is required:

- Repository Leonardo
- repository charts k8s

Furthermore, it is necessary to verify that the environment can make requests to the consoles and APIs provided by the providers that will be used.

Storage Considerations

Network Connectivity

Components

In this section, we define all the components necessary for the SCMP to function. The "required" elements must be installed before the various SCMP modules as explained in the "Installation" section.

PREREQUISITES

- Nginx Ingress Controller
- Cert Manager
- Minio Operator
- Strimzi Operator
- MongoDB Operator
- Vault AutoUnseal

MODULES

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Common Ports & Requirements

Communication Data

To update data, the SCMP uses a series of cron-jobs, divided by reference provider and relevant module. Specifically, we can identify:

Type	Launched every	Activity performed
Inventory	1 hour	Retrieves all inventory resources available on the provider
Costs	24 hours	Retrieves costs for the last 2 days for resources available on the provider (multiple days are retrieved to validate data)
Monitoring	24 hours	Retrieves monitoring information for the provider's resources
Catalog	24 hours	Retrieves catalog resources/SKUs from the provider, allowing their use in the SCMP
Security	24 hours	Retrieves compliance and security information for available providers

Supported Locales

Currently, the languages supported by SCMP are:

- Italian
- English

It is possible to change the language used by following these steps

Installation

In this section, you can find the order and the necessary steps to perform a complete and functional installation.

Installation Overview

1. Log in to the necessary Helm registries using this code: `helm registry login leonardocharts.azurecr.io --username leonardocharts --password $PASSWORD`
2. Install the prerequisites
3. Install a MongoDB instance (if not available, "MongoDB Operator" can be used)
4. Configure the necessary parameters for the Leonardo `vault-autounseal` chart as indicated in the code section.

```
global:
  OpenShift: true
  imagePullSecrets:
    - name: acr-secret-cs
  credentials: # specify the credentials for the image registry if you want to create the pull secret automatically
    - registry: $DOCKER_REGISTRY
      username: $DOCKER_REGISTRY_USERNAME
      password: $DOCKER_REGISTRY_PASSWORD
      email: ignorethis@email.it
  # The "namespace" key is needed by the official Vault chart in order to load the resources in the appropriate namespace
  # and it has to adhere to our naming scheme "<tenant>-<suffix>_namespace"
  namespace: scmp-vault
  tenant: scmp
  suffix_namespace: vault
```

5. Install the newly configured Leonardo `vault-Autounseal` chart using the code. `helm install vault-autounseal vault-autounseal`

6. **After the completion of the `vault-autounseal` installation (i.e., when `vault-prod` pods are already available in the cluster), configure the SCMP installation parameters as in the code.

```
global:
  tenant: scmp
  imagePullSecrets:
    - name: acr-secret-cs
  credentials: # specify the credentials for the image registry if you want to create the pull secret automatically
    - registry: $DOCKER_REGISTRY
      username: $DOCKER_REGISTRY_USERNAME
      password: $DOCKER_REGISTRY_PASSWORD
      email: ignorethis@email.it
  minio:
    accesskey: "minioadmin"
    password: "minioadmin123"
```

7. Launch the SCMP installation using the newly modified chart; to launch it, we can use: `helm install scmp scmp/`

Perform Configurations

After the installation, configuration steps are required, as described in the Appliance Setup section.

Upgrades & Maintenance

Additional Configuration Options

Load Balancer Configuration

Proxies

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SSL Certificates

Data Encryption

Initial Appliance Setup

Appliance Setup

Network Configuration

- Enable the ingress controller to expose services on the network.
- (optional) Create a DNS name to facilitate connection to the system.

Keycloak Setup

- Configure Realm theme on Keycloak
- Create client 'microfe' on Keycloak Realm:
- Enable 'Implicit Flow'
- Set 'Valid Redirect URIs' to:
 - http://localhost:3000/*
 - SCMP host domain

Content Management

- Upload micro frontends in singlespa bucket
- *Alternatively:* Use minio-uploader utility chart
- Upload micro frontends config in singlespa-config bucket
- *Alternatively:* Use minio-uploader utility chart

Access Control

- Set anonymous read-only access on Minio buckets:
 - singlespa
 - singlespa-config
 - config
- Configure IAM users and roles, as indicated in the IAM User Creation section.

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2 Authentication

The "Authentication" functionality allows interaction with the IAM to modify user profiling.

For preliminary configurations, refer to the specifications indicated in document DI-IPSC-81443, included in the reference documents table.

The menu is accessible from the button at the top right, as shown below.

Specifically, to access user profiling, the menu is "Authentication".



Figura 1 – Access to Authentication functionality

Dashboard view for user profiling:

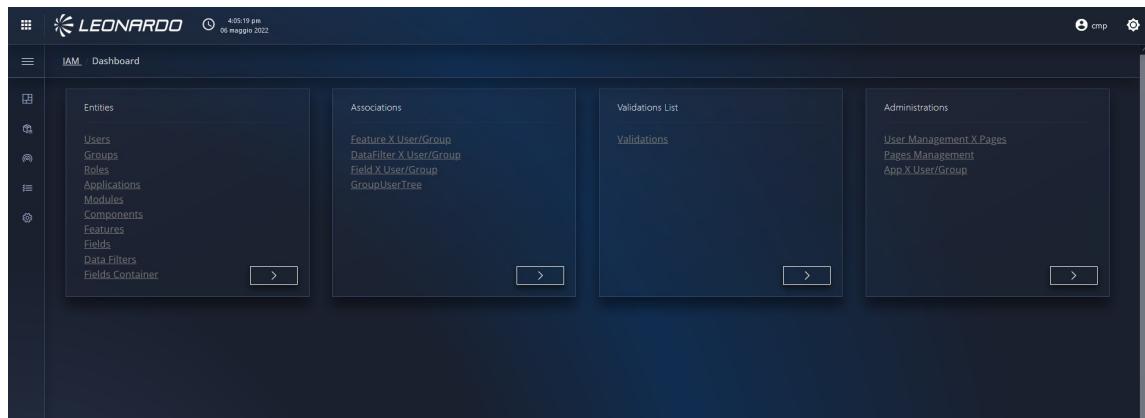


Figura 2 – IAM Dashboard

2.0.1 Groups

To simplify the assignment of menu attributes and authorizations, user groups can be used. Click the "Groups" menu in the "Entities" section of the IAM dashboard.

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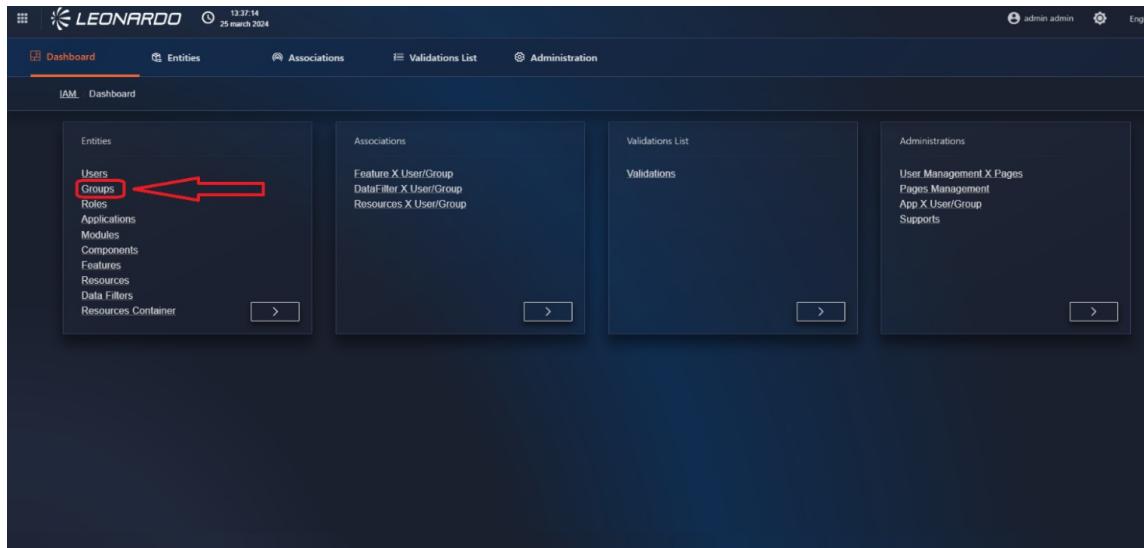


Figura 3 – Access to Group management

Once the link is clicked, the user will be shown the list of all available groups on the portal with their respective configuration buttons.

Groups	
EXPORT LIST TO CSV	Search Group
Group Name	Actions
iamAdministrators	
CmpTenantsAdmin	
CmpAdministrator	
CmpViewer	
iamUsers	
ETD-x2030	
CmpProvisioner	
ant_istante_handler	
QualifierAdmin	
iamUsersAdministrator	
10 <	

Figura 4 – List of configured groups

2.0.1.1 Group Creation

To create a new group within the system, click the "+" button in the top right. A group creation form will be displayed.

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The screenshot shows the 'Groups' section of the Leonardo platform. At the top, there are navigation links for Dashboard, Entities, Associations, Validations List, and Administration. Below these, a sub-navigation bar shows IAM, Entities, and Groups, with 'Entities' being the active tab. A red arrow points to the '+' button located in the top right corner of the main content area. The main area displays a table of existing groups, each with a set of actions (Search, Edit, Delete, etc.). A search bar labeled 'Search Group' is positioned above the table. At the bottom left, there is a '10 +' button.

Figura 5 – Adding a new Group

Enter the group name and click the "Add Group" button to add it to the system. Once pressed, the system will take us to the list of available groups where we can find the newly created group.

The screenshot shows the 'Add Group' form. The top navigation bar is identical to Figure 5. The main form has a 'Name' input field containing 'Insert Name'. Below the input field are two buttons: '< BACK' and '+ ADD GROUP'. A red arrow points to the '+ ADD GROUP' button.

Figura 6 – Group entry parameters

2.0.1.2 Management of Assigned Users and Attributes

To assign users to a group, from the list of available groups, click the "people" icon on the row corresponding to the group of interest. The user will be redirected to the "Members" page where it is possible to view all users assigned to the group and their basic information.

The screenshot shows the 'Groups' list again. A red arrow points to the 'people' icon in the 'Actions' column of the first group row. This icon represents the 'Members' link mentioned in the text above. The rest of the interface is consistent with Figure 5, showing the list of groups and their actions.

Figura 7 – Access to user assignment management

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We can add a user to the group by clicking the "+" button at the top right (1). Once pressed, a new row (2) will be created in the list of assigned users where a user can be selected from the list of available users (3).

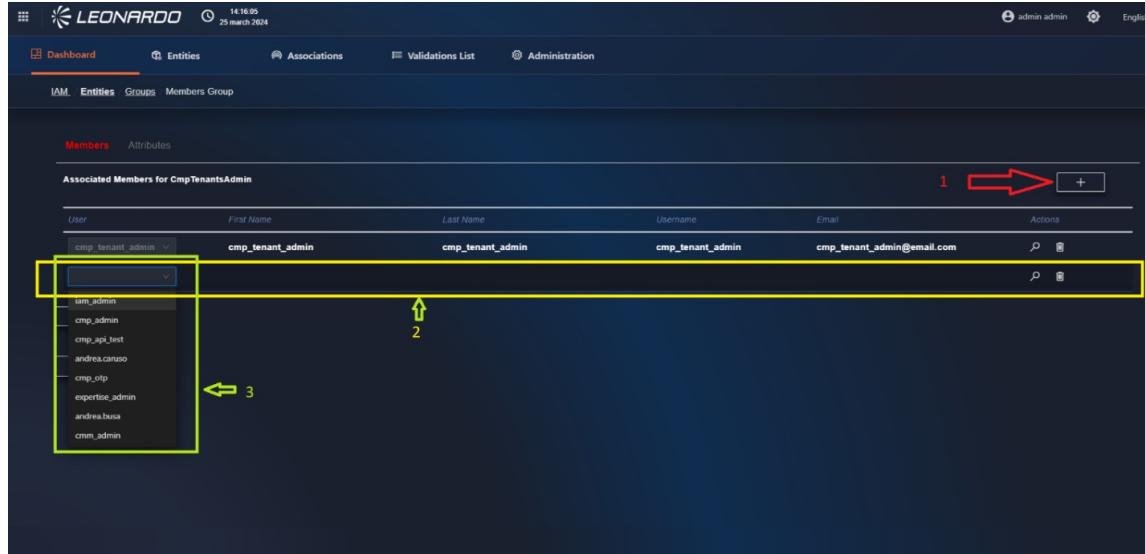


Figura 8 – Assign a user to the group

Similarly, it is possible to remove users from the group by clicking the "Trash" button corresponding to the user to be removed.

After adding all users to the group, click the "Save" button at the bottom left to save the changes. A save confirmation modal will be displayed.

We can assign attributes to the group that will be automatically used by the assigned users. To do this, select the "Attributes" tab at the top of the page (1), then using the "+" button at the top right (2), it is possible to add an attribute. In the left part, the key must be entered (3) and in the white part on the right, its value must be entered (4). During entry, we will see a dropdown below the field where clicking will allow saving the entered value (5).

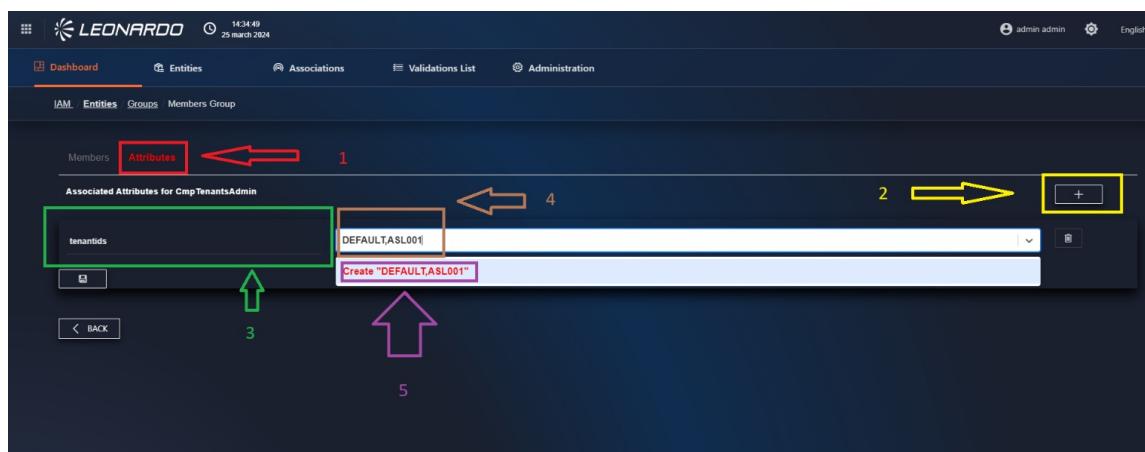


Figura 9 – Enter Attributes

Once all necessary attributes have been entered, changes can be saved using the "Save" button at the bottom.

To return to the list of available Groups, click the "Back" button present on each page.

2.0.1.3 Viewing, Modifying, and Deleting a Group

From the list of available Groups, a series of buttons are available for each group:

- "Magnifying glass": allows viewing group information (indicated by a red arrow in the image);
- "Pencil": allows modifying the group's basic information (indicated by a yellow arrow in the image);
- "Trash": allows deleting the group after clicking "confirm" in the displayed modal (indicated by a purple arrow in the image).

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The screenshot shows the 'Groups' section of the IAM Entities page. It lists several groups with their names and some descriptive text. Each group entry includes a set of icons for managing the group. A red arrow highlights the 'Search Group' input field at the top right of the list area. A purple arrow points to the first icon in the row for the 'iamAdministrators' group.

Figura 10 – Control buttons

2.0.2 Users

For an account to access and use the system, it must be appropriately configured. Below, we will see the process of creating and managing a user within the SCMP using IAM as an access control application.

To access User management, click the "Users" menu in the "Entities" section of the IAM dashboard.

The screenshot shows the main dashboard of the IAM module. It features four main cards: 'Entities' (with 'Users' highlighted), 'Associations', 'Validations List', and 'Administrations'. The 'Entities' card is expanded, showing sub-options like 'Users', 'Groups', 'Roles', etc. A red box surrounds the 'Users' link, and a red arrow points to it from the left. The other cards show various management links.

Figura 11 – Access to User management

Once the link is clicked, the user will be shown the list of all available groups on the portal with their respective configuration buttons.

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Username	Last Name	First Name	Email	Actions
iam_admin	admin	admin	iam_@com	
cmp_admin		cmp_admin		
cmp_api_test	testing	api e upath	giamr@y.com	
andrea caruso	Caruso	Andrea	anr@com	
cmp_otp	cmp	otp	giamr@com	
expertise_admin	Admin	Expertise	ex@com	
andrea busa	Andrea	Busà	and@by...com	
cmm_admin	admin	cmm	c@com	
cmp_administrator	admin	cmp	cmp@com	
cmpdemo	DEMO	Utente	cmpd@com	

Figura 12 – List of configured users

2.0.2.1 New User Creation

To create a new user within the system, click the "+" button at the top right. A user creation form will be displayed.

Figura 13 – New user creation

The new user creation form will be displayed. Fill in the mandatory fields in the list:

- E-mail: the user's valid e-mail address.
- Username: the username to be used as the account for portal access.
- First Name: User's first name.
- Last Name: User's last name.
- Password: Password of at least 8 characters to be used for access.
- Max concurrent connections: Maximum number of simultaneous connections enabled for the user.
- Default Language: the basic language to be displayed in the system.

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The screenshot shows a user creation form titled "User". It contains the following fields:

- Email: Insert Email
- Username: Insert Username
- First Name: Insert First Name
- Last Name: Insert Last Name
- Data access level: (dropdown menu)
- Organization: Insert Organization
- Assigned role: Insert Assigned role

Figura 14 – User creation form

Once all mandatory fields are entered, click the "+ Add user" button to complete the entry.

A confirmation message will be displayed, and the page will reset to allow the entry of a new user.

To view the newly created user, return to the page containing the list of users.

2.0.2.2 Role and Attribute Assignment

To manage users, you can click the "Groups" button corresponding to the row of the user to be modified.

The screenshot shows a list of users with their details and actions:

Username	Last Name	First Name	Email	Actions
iam_admin	admin	admin	iam_admin@gmail.com	
cmp_admin		cmp_admin		
cmp_ap_test	testing	api e upath	giammarco.piccoli.ext2@leonardocompany.com	
andrea.caruso	Caruso	Andrea	andrea.caruso@leonardo.com	
cmp_otp	cmp	otp	giammarco.piccoli.ext@leonardo.com	
expertise_admin	Admin	Expertise	expertiseadmin@leonardo.com	
andrea.busà	Andrea	Busà	andrea.busà@cybersecurity.leonardocompany...	
cmm_admin	admin	cmm	cmm@leonardo-cmm.com	
cmp_administrator	admin	cmp	cmp@leonardo.com	
cmpdemo	DEMO	Utente	cmpdemo@email.com	

Figura 15 – Access to user management

Once the button is pressed, the page refreshes to show the "Groups" page where one or more groups can be assigned to or removed from the user.

To add a new group to the user, you must select the group to be assigned to the user in the left section (1) and then, by clicking the "Associate" button in the center of the page (2), the group will automatically move to the right section and the changes will be saved automatically.

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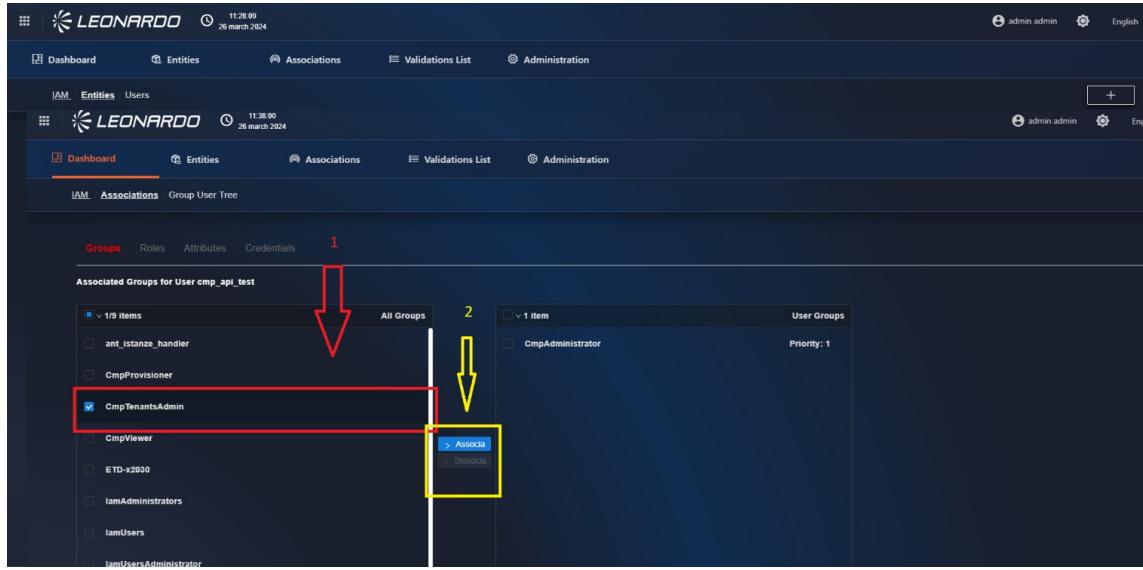


Figura 16 – Associate a user to the group

Similarly, it is possible to remove the user from the group by first clicking the group to be removed in the right section and then the "Disassociate" button in the center of the page. The changes will be saved automatically.

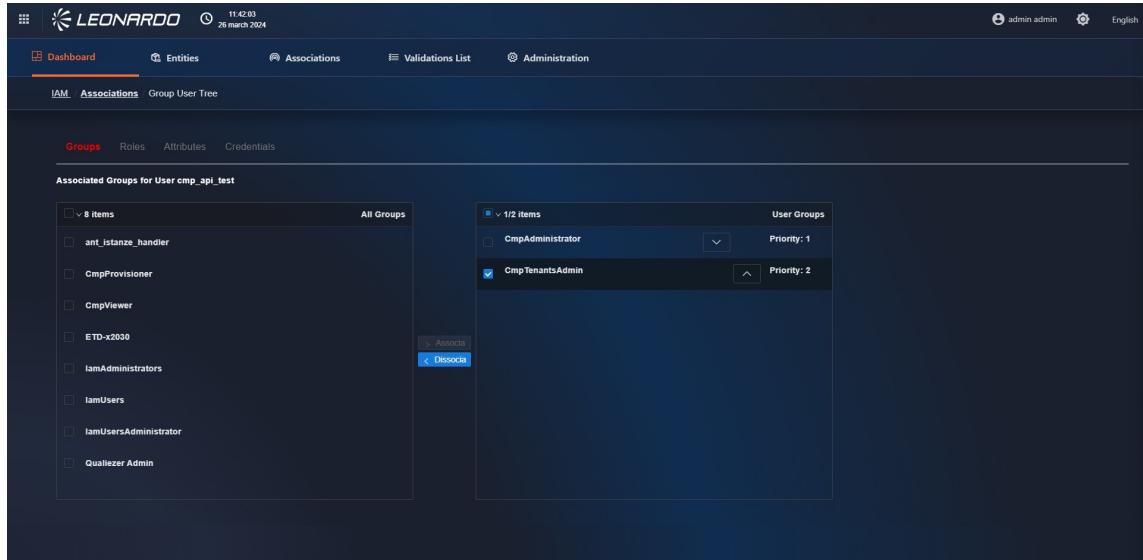


Figura 17 – Disassociate a user from the group

Furthermore, using the buttons in the right section, corresponding to each group, it is possible to modify the priority of the various groups.

For users, it is also possible to assign custom attributes. To do this, select the "Attributes" tab at the top of the page (1), then using the "+" button at the top right (2), it is possible to add an attribute. In the left part, the key must be entered (3) and in the white part on the right, its value must be entered (4). During entry, we will see a dropdown below the field where clicking will allow saving the entered value (5).

The list of available attributes is in the paragraph.

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Figura 18 – Enter Attributes

Once all necessary attributes have been entered, changes can be saved using the "Save" button at the bottom.

2.0.2.3 Credential Reset

As a user administrator, it is possible to reset passwords. To do this, click on the "Credentials" tab displayed at the top of the page. In this tab, you can enter a new password for the user and configure it as "Temporary". The temporary password must be changed by the user after the first login. A password validity period, expressed in days, can also be defined.

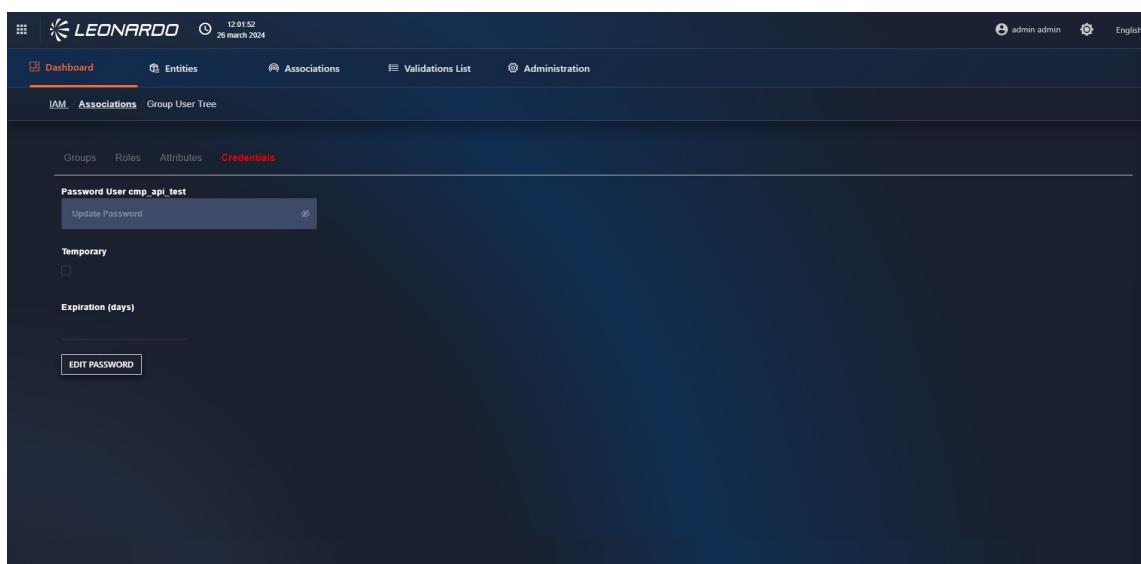


Figura 19 – Modifying the user's password

2.0.2.4 Viewing, Modifying, and Deleting a User

From the list of available users, a series of buttons are available for each group:

- "Magnifying glass": allows viewing user info (indicated by a red arrow in the image).
- "Pencil": allows modifying the user's basic information (indicated by a yellow arrow in the image).
- "Trash": allows deleting the user after clicking "confirm" in the displayed modal (indicated by a purple arrow in the image).

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The screenshot shows the 'Entities' section of the IAM dashboard. It displays a list of groups with the following columns: Group Name, Search Group, and a set of control buttons (Edit, Delete, etc.). A red arrow points to the 'Search Group' input field, and a purple arrow points to one of the edit icons.

Figura 20 – Control buttons

2.0.3 Management of Menus Enabled per User/Group

The IAM system integrated into the SCMP also allows the management of menu elements available to various users and groups. To access this functionality, simply click the "User management X Pages" link available in the "Administration" section of the IAM dashboard.

The screenshot shows the 'Dashboard' section of the IAM dashboard. It features four main cards: Entities, Associations, Validations List, and Administrations. The Administrations card contains a link labeled 'User Management X Pages', which is highlighted with a red box and a red arrow pointing to it.

Figura 21 – Access to menu management

At the top of the page, there are two dropdown menus: the left dropdown allows selecting a single user, and the right one allows selecting a group.

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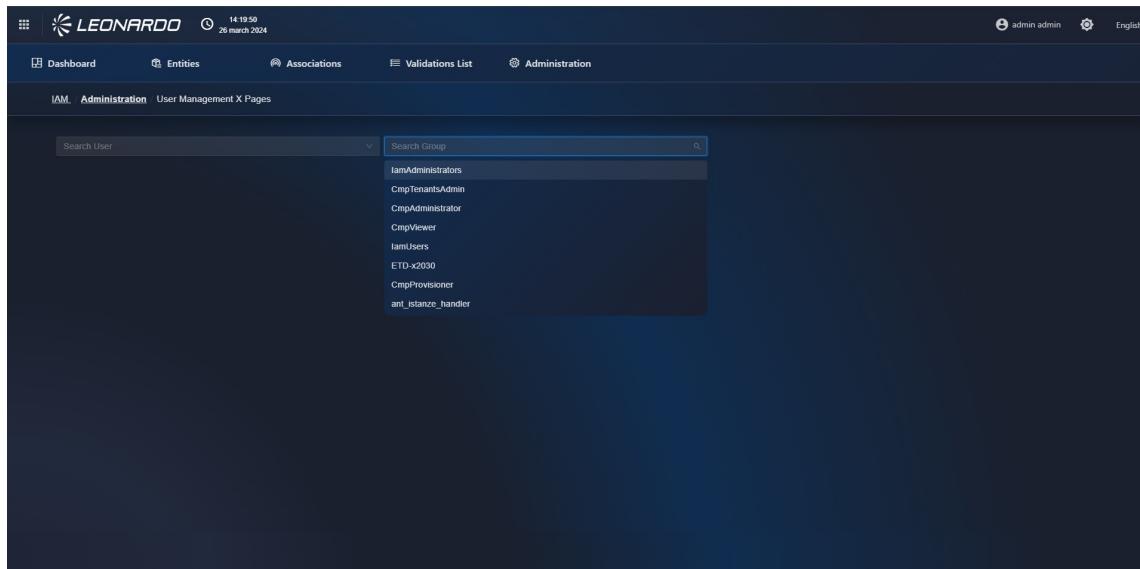


Figura 22 – Selection of user/group to modify

After selecting an account, the page will update to show all "STREAM" available on the application. It is possible to click the "+" button corresponding to each row to view the available "MODULES" and "COMPONENT".

The displayed component lists are automatically generated by the system using the configurations performed during installation.

For each component present, by clicking the dropdown menu on the corresponding row, it is possible to indicate its visibility (or lack thereof) to the user/group we previously selected.

The selectable values are:

- Enabled and default: only one default can be indicated per module. Selecting this option makes the selected page the main one; thus, upon clicking the menu, the user will be redirected to this page.
- Enabled: Indicates that the menu is visible and usable by the user/group.
- Disabled: Indicates that the menu will not be enabled and will not be visible to the user/group.
- N.D: not defined (the menu is disabled and will not be visible).

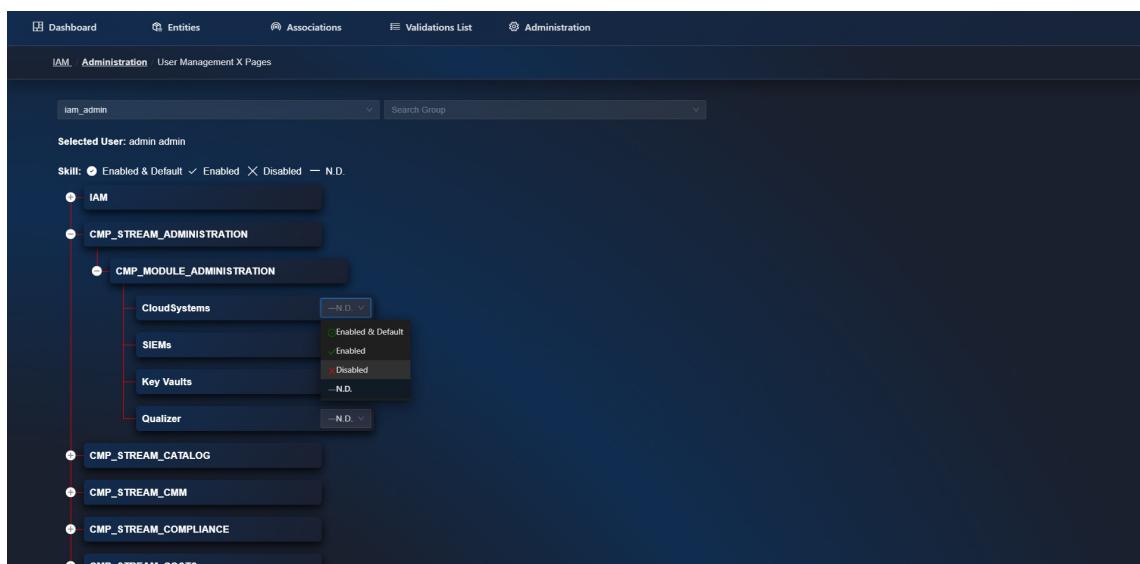


Figura 23 – Menu authorization management

2.0.4 User Profile Lists and Attributes

This section highlights the different types of users who can access and use the described product.

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For each of them, a list of functionalities the user has been enabled for and can interact with is provided.

All attributes that can be assigned to Users and Groups are also indicated here.

2.0.4.1 Attributes

Attribute	Acceptable Values	Type	Description
Monitoring	Default, AS01, mase	String array	Enter the list of enabled tenants for the user, separated by commas between each tenant name.
Costs	true / false	Boolean	By enabling the attribute, we specify that the user can perform searches by TAG instead of using the tenant as a discriminant.
Inventory	ADMIN / LIMITED	Enumeration	By entering ADMIN as the value, the user will be able to view both costs received from the provider and costs calculated by the SCMP. By entering LIMITED, only costs calculated by the SCMP will be viewable.
Inventory	Zona1	String	Mandatory parameter for tools used by IAM.

2.0.4.2 Administrator

Functionality	Create	Read	Undo	Delete
Monitoring	x	x	x	x
Costs	x	x	x	x
Inventory	x	x	x	x
Security	x	x	x	x
Dashboard	x	x	x	x
Catalog	x	x	x	x
Authentication	x	x	x	x
Administration	x	x	x	x
Cloud Maturity model	x	x	x	x
Provisioning	x	x	x	x
Tenant Management				
Service Detail Design				

2.0.4.3 Service Manager

Functionality	Create	Read	Undo	Delete
Monitoring				
Costs				
Inventory				
Security				
Dashboard				
Catalog				
Authentication	x	x	x	x
Administration				
Cloud Maturity model				
Provisioning				
Tenant Management	x	x	x	x
Service Detail Design	x	x	x	x

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2.0.4.4 Viewer

Functionality	Create	Read	Undo	Delete
Monitoring	x	x		
Costs	x	x		
Inventory	x	x		
Security		x		
Dashboard		x		
Catalog		x		
Authentication				
Administration				
Cloud Maturity model		x		
Provisioning				
Tenant Management				
Service Detail Design				

2.0.4.5 Authorized

Functionality	Create	Read	Undo	Delete
Monitoring	x	x	x	x
Costs	x	x	x	x
Inventory	x	x	x	x
Security				
Dashboard	x	x	x	x
Catalog	x	x	x	x
Authentication				
Administration	x	x	x	x
Cloud Maturity model				
Provisioning	x	x	x	x
Tenant Management				
Service Detail Design				

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Tenants

SCMP has been developed as a Multi-Tenant solution, which offers greater security, customization, flexibility, and scalability, with more efficient administration and reduced costs.

To allow the user to manage the tenants present in the infrastructure, the "Tenant" functionality has been made available, a feature not available to everyone but only to users enabled for Service Management.

To access the functionality, click on the bento button in the top left. Afterwards, click on "Tenant".

The screenshot shows the 'Service Detail Design' section of the SCMP interface. A red box highlights the 'Tenants' tab in the navigation bar. Below it, a red arrow points to the 'Tenants' section of the main content area. The content area displays a table of tenant information with columns: Customer, Service Type, Creation Date, Last Update, Status, Phase, and Actions. Three rows of data are visible, each corresponding to a service named 'Servizi PSN' created on March 5, 2024, at 15:09:27, 15:09:46, and 15:10:15 respectively. The status for all is 'New' and the phase is 'Deploy Service'. Action buttons for each row include a play icon and a checkmark icon.

Figura 24 – Access to Tenant management

Creation of a new tenant

At this point, the user is inside the "Tenant" tab page, which contains the list of tenants configured on the system. To add a new tenant, click the "menu" available in the top right and select the "+ Add" item.

The screenshot shows the 'Tenants List' page under the 'Tenants' section. A red arrow points to the '+ Add' button in the top right corner of the table header. The table lists four tenants: 'Tenant1', 'UnPathTenant', 'test', and 'test'. Each entry includes columns for Tenant ID, Name, and Description. The 'test' entries have 'edited' in the Description column.

Figura 25 – Add new tenant

Once pressed, the new tenant configuration page is displayed, divided into three sections:

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Figura 26 – New tenant creation form

1. General parameters:

Name	Description	Required
Tenant ID	Unique ID of the new tenant	x
Tenant Name	Name of the tenant that will be displayed to the user	x
Description	A description of the tenant	x
MarketPlace Subscription ID	the ID received from the Azure marketplace upon service subscription	

1. Data persistence:

Name	Description	Required
Inventory	Indicates the number of days for which inventory data will be retained in the collections present in the DB	x
Cost	Indicates the number of days for which cost data will be retained in the collections present in the DB	x
Monitoring	Indicates the number of days for which monitoring data will be retained in the collections present in the DB	x
Security	Indicates the number of days for which security data will be retained in the collections present in the DB	x

1. Init Catalog

In this section, you can select the catalog items that will be automatically copied to the new tenant.

The initial section (1) allows choosing only one option from:

- Empty Catalog: leave the catalog empty without copying any information.
- Copy Catalog from Default Tenant: indicates that the tenant from which to retrieve information to copy is the Default tenant.
- Copy Catalog from other Tenant: if selected, a new field containing the list of available tenants will be displayed in the section below, allowing the selection of the tenant from which to retrieve information to copy.

Subsequently, you can fill in the next section (2) by entering the non-mandatory fields:

- **Providers:** list of providers configured in the source tenant; selecting one or more providers will copy their catalog items to the new tenant.
- **Copy SCMP Catalog:** if activated, all elements present in the SCMP catalog will be added to the new tenant.
- **Copy Services:** if activated, all elements present in the SCMP catalog will be added to the new tenant.
- **Copy Custom Services:** if activated, custom services available on the tenant will be added to the new tenant.
- **Copy Blueprints:** if activated, all available Blueprints will be added to the new tenant.
- Association Catalog

In this section, you can select the flag to enable the tenant to use the "Common" price lists analyzed later. By selecting this field, it will no longer be necessary to define a specific catalog for the tenant; it will inherit the common price lists.

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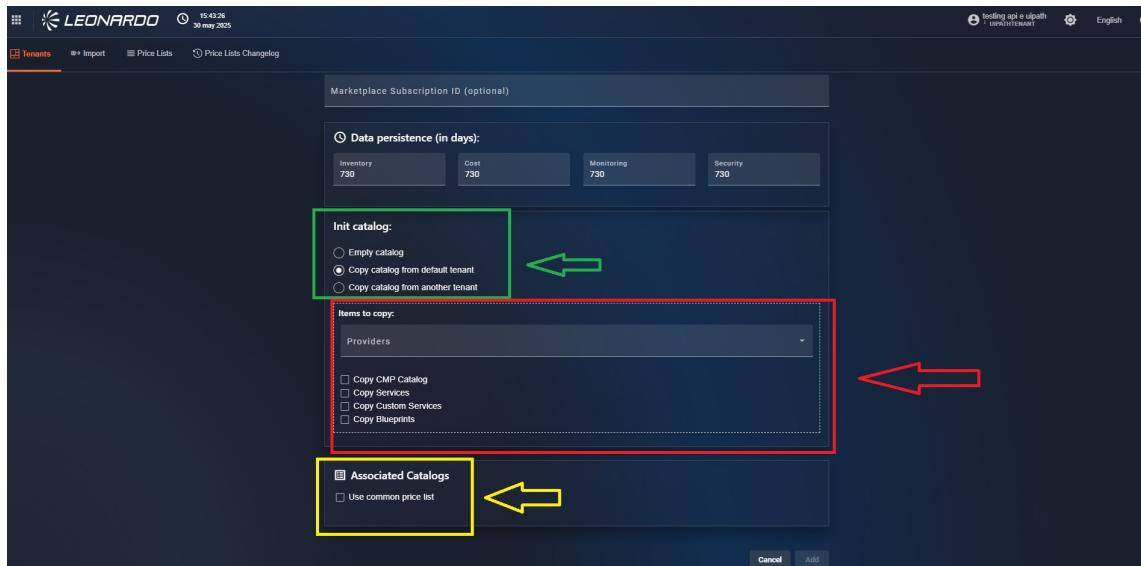


Figura 27 – Catalog initialization section

To confirm the creation of the new tenant, click the "Save" button in the bottom right. After waiting for loading, a creation confirmation message will be displayed, and the user will be returned to the tenant list where the newly created tenant will be present.

Viewing, Modifying, and Deleting a tenant

In the tenant list, next to each result, there is a "menu" with three buttons:

- "Show": allows viewing tenant information (indicated with a red arrow in the image).
- "Edit": allows modifying basic tenant information (indicated with a yellow arrow in the image).
- "Delete": allows deleting the user after clicking "confirm" in the displayed modal (indicated with a purple arrow in the image).

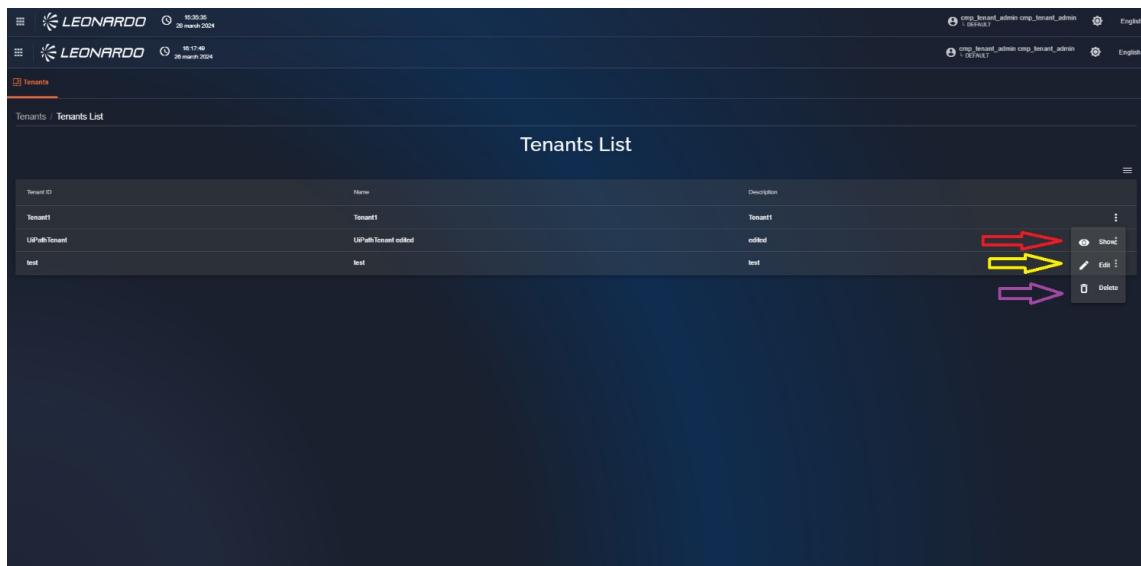


Figura 28 – Control buttons

Automated tenant and subsystem creation

The user is given the possibility to automate the import of tenants and subsystems to speed up "onboarding" operations. To access the functionality, click the "import" tab available at the top of the "Tenants" functionality.

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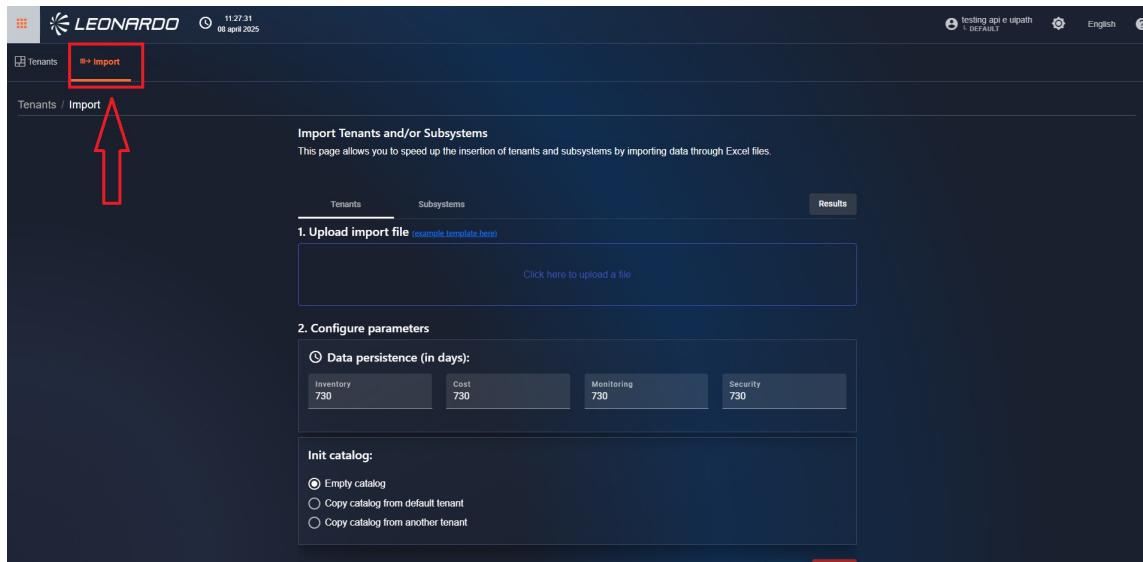


Figura 29 – Tenant import functionality

In the center of the page, there is a contextual menu that allows selecting the import type (Tenant or subsystems).

Let's analyze the 2 pages in detail.

Tenant Import

The functionality consists of 2 sections:

1. The "upload file" section where you can insert a file in .xlsx format (of which an example can be downloaded using the dedicated button) {in red in the figure}
2. The "configuration" section where it is possible to select the parameters shared between tenants (in yellow in the figure), as described in the section (Creation of a new tenant).

Once all information has been entered, you can click the "import" button (in green in the figure) to validate the uploaded file and start the import process.

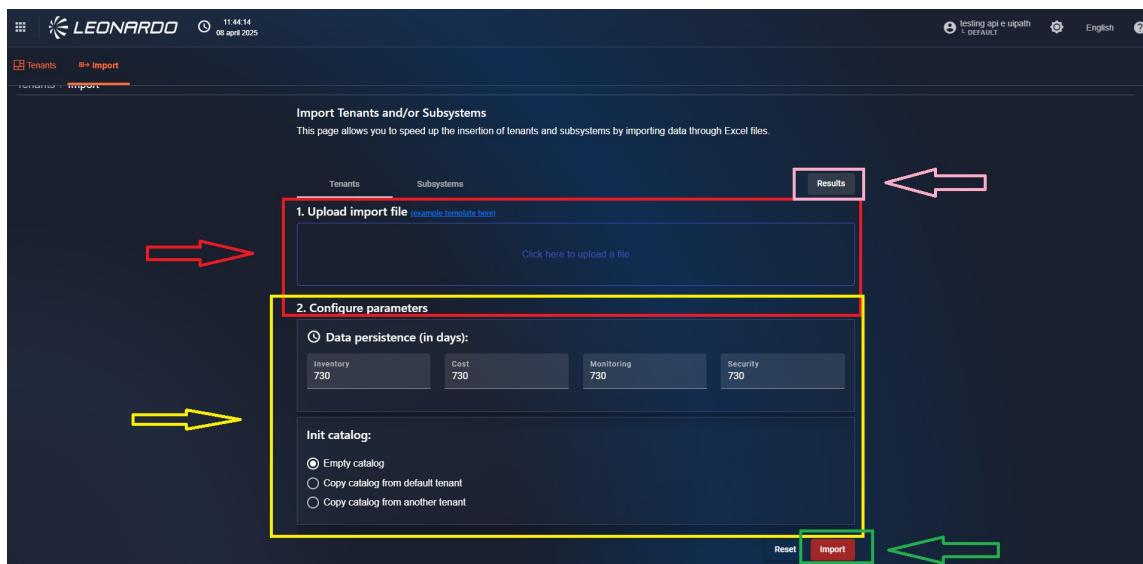


Figura 30 – Tenant configuration parameters

After a few minutes, you can use the "Results" button (in pink in the image) to view the details of the operations performed by the SCMP.

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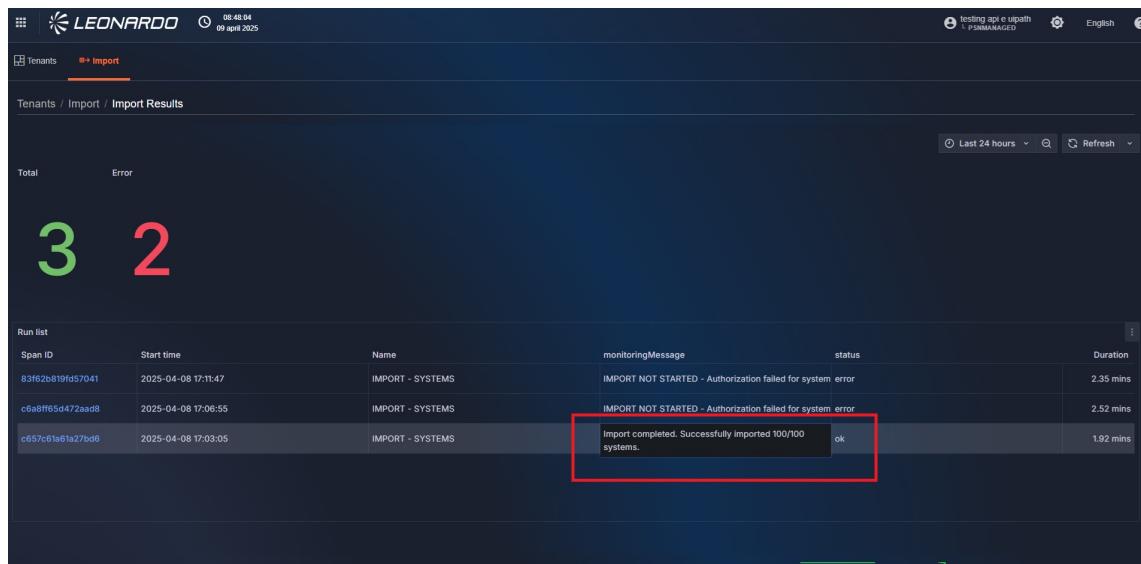


Figura 31 – Results of performed imports

Subsystem Import

To access the subsystem import functionality, you need to click on the "subsystems" tab available on the "import" page.

Figura 32 – Subsystem import functionality

The functionality consists of 2 sections:

1. The "upload file" section where you can insert a file in .xlsx format (of which an example can be downloaded using the dedicated button).
2. The selection of the provider type to import.

Once files are inserted and it's verified that the provider is compatible, you can click the "import" button (in green in the figure) to validate the uploaded file and start the import process.

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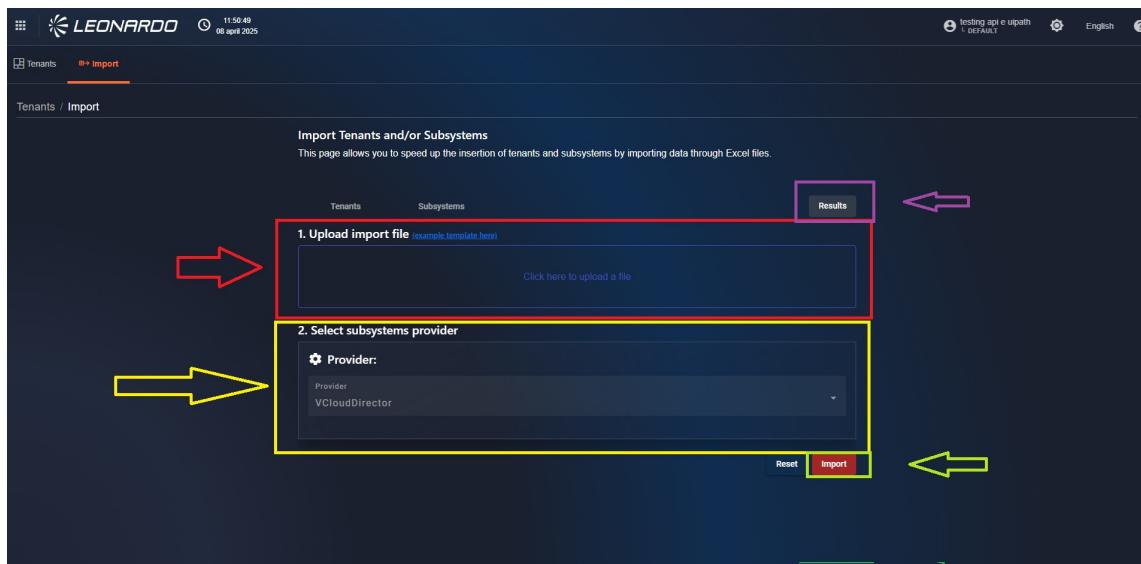


Figura 33 – Tenant and subsystem import functionality

After a few minutes, you can use the "Results" button (in pink in the image) to view the details of the operations performed by the SCMP.

Span ID	Start time	Name	monitoringMessage	status	Duration
83f62b819fd57041	2025-04-08 17:11:47	IMPORT - SYSTEMS	IMPORT NOT STARTED - Authorization failed for system error		2.35 mins
c6a8ff65d472aad8	2025-04-08 17:06:55	IMPORT - SYSTEMS	IMPORT NOT STARTED - Authorization failed for system error		2.52 mins
c657c61a61a27bd8	2025-04-08 17:03:05	IMPORT - SYSTEMS	Import completed. Successfully imported 100/100 systems.	ok	1.92 mins

Figura 34 – Results of performed imports

"Common" Catalogs

The user is given the possibility to import a series of catalogs for SKUs or resources, which will then be used by all tenants that have the enabled flag.

To proceed with price list entry, you can access the "Price list" page available on the tenant administration module.

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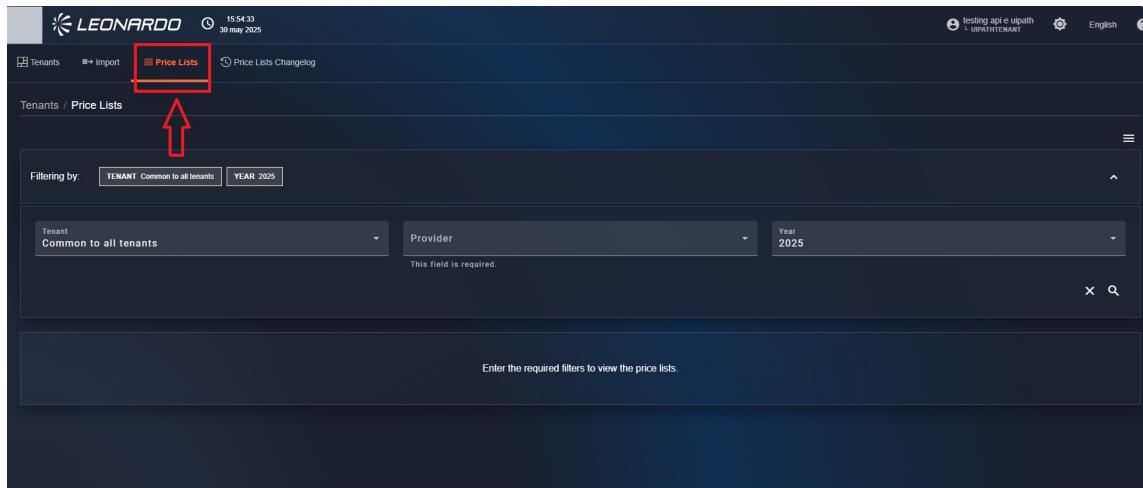


Figura 35 – Access to catalog import

Once inside the page, to view the data, we can use the "Provider" filter to select the type of provider for which to check the status of price lists.

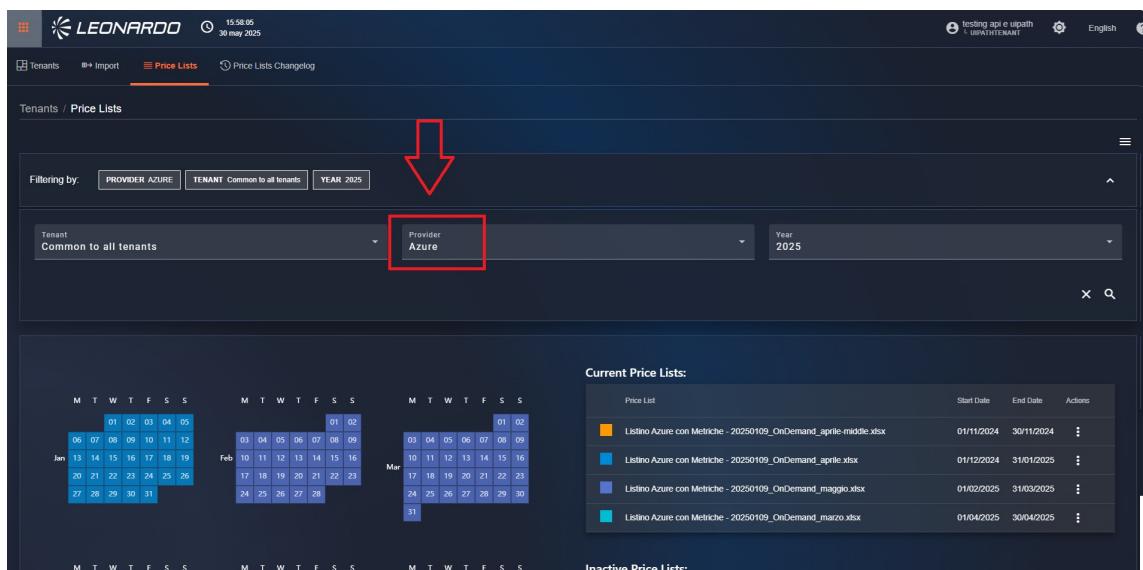


Figura 36 – Filter by provider

We can use the other filters on the page to:

- View data for a specific year ("Date" filter)
- View specific catalogs for the selected tenant ("tenant" filter)

To view the data, it is necessary to select only one type of provider, in order to display the calendar and the list of price lists applied for a given year to the specified tenant and/or common.

Inside the page, you will find the list of imported price lists with their validity period. For each row, a color is also indicated; this color helps identify the price list in the graphic section on the left. This calendar facilitates the identification of periods not covered by the price list.

The list of "inactive" price lists that have been previously replaced is also displayed.

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Current Price Lists:

Price List	Start Date	End Date	Actions
Listino Azure con Metriche - 20250109_OnDemand_aprile-middle.xlsx	01/11/2024	30/11/2024	⋮
Listino Azure con Metriche - 20250109_OnDemand_aprile.xlsx	01/12/2024	31/01/2025	⋮
Listino Azure con Metriche - 20250109_OnDemand_maggio.xlsx	01/02/2025	31/03/2025	⋮
Listino Azure con Metriche - 20250109_OnDemand_marzo.xlsx	01/04/2025	15/07/2025	⋮
Listino Azure con Metriche - 20250408_complessivo_tot (1).xlsx	01/08/2025	31/08/2025	⋮

Inactive Price Lists:

Price List	Actions
az edit 1.xlsx	⋮

Figura 37 – Inactive price lists

New price list entry

To enter a new price list, you need to click the "hamburger menu" available in the top right of the catalog resources page and select "Import Catalogue".

Current Price Lists:

Price List	Start Date	End Date	Actions
Listino Azure con Metriche - 20250109_OnDemand_aprile-middle.xlsx	01/11/2024	30/11/2024	⋮
Listino Azure con Metriche - 20250109_OnDemand_aprile.xlsx	01/12/2024	31/01/2025	⋮
Listino Azure con Metriche - 20250109_OnDemand_maggio.xlsx	01/02/2025	31/03/2025	⋮
Listino Azure con Metriche - 20250109_OnDemand_marzo.xlsx	01/04/2025	15/07/2025	⋮
Listino Azure con Metriche - 20250408_complessivo_tot (1).xlsx	01/08/2025	31/08/2025	⋮

Figura 38 – Access to "Scheduled Catalog Import"

Three parameters are present in the modal:

- Tenant: select the tenant on which to perform the upload.
- Provider: Select the provider related to the price list to be entered.
- Valid From: it is possible to indicate a start date for the price list's validity. On the day indicated in this variable, the system will automatically update the catalog resources to match the new price list.

If necessary, the user can enter a "common to all tenants" price list which will be used by all configured tenants containing systems from the reference provider.

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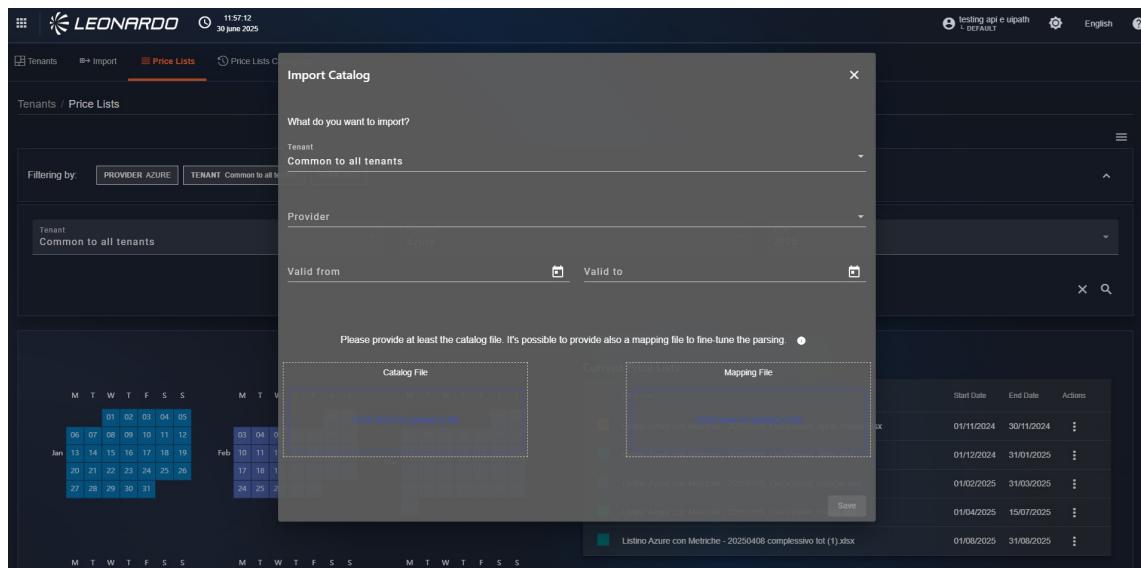


Figura 39 – Required fields for import

Additionally, below the parameters, there are two sections for file upload. By clicking on the first square on the left, you can select an "XLS" file containing all resources to be mapped. By clicking on the second square, you can insert a mapping file, following the information shown in the "Help" section indicated by a "Question Mark" icon. Clicking on it will open a box below the upload sections that contains all information related to the mapping file to be inserted.

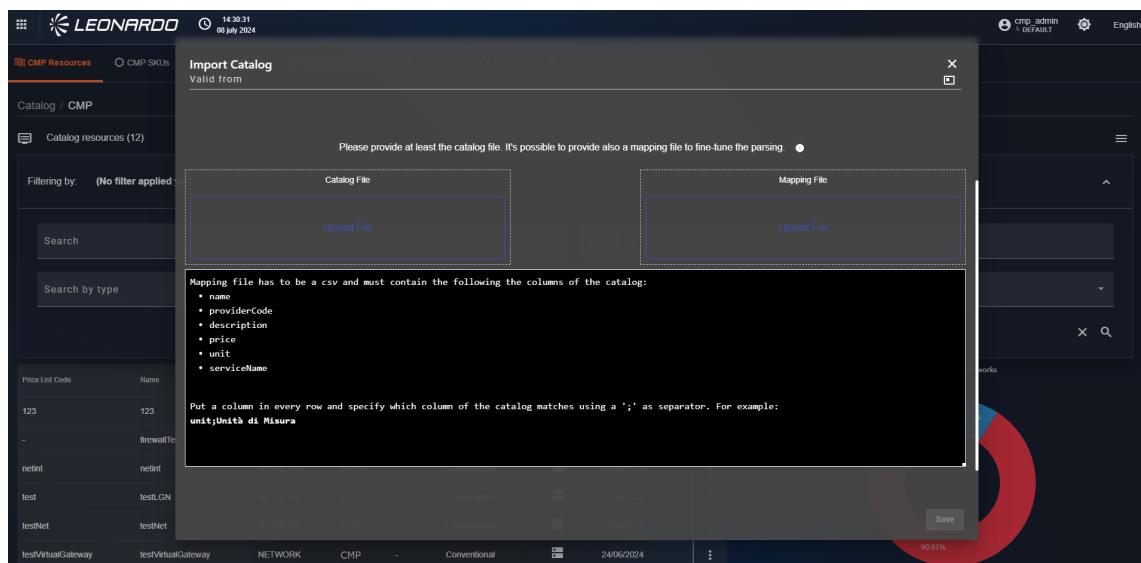


Figura 40 – Help message for Mapping file

After entering all parameters, you can click the save button at the bottom, and you will be returned to the previous page which, after the import, will display the new price list.

Modifying validity and deleting price lists

To modify a price list, it is necessary to click the menu corresponding to the table row containing the price list, as indicated in the figure. Subsequently, select the edit item to display the modification mask.

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Figura 41 – Edit a price list

Within the window, it is possible to modify the validity date of the price list, either to reduce or extend its duration. If the "Indefinite time" option is selected, the price list will remain valid until a new price list is entered. At that point, the price list with indefinite validity will be automatically deactivated and considered valid until the day the new price list is activated.

After the update, it is necessary to refresh the costs on the involved tenants, in order to correctly calculate the customer price based on the updated price lists.

Figura 42 – Edit the validity of a price list

The user is also given the option to delete a price list. In this case, the period previously covered by that price list will remain uncovered, i.e., without an associated rate.

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The screenshot shows the Leonardo platform's tenant administration interface. The 'Price Lists' tab is active. A modal window is open, prompting the user to confirm the deletion of a price list. The background displays a grid of monthly calendars and a list of current and inactive price lists.

Current Price Lists:	Actions
Listino Azure con Metriche - 20250109_OnDemand_aprile.xlsx	01/12/2024 31/01/2025
az edit 1.xlsx	01/04/2025 15/07/2025
Listino Azure con Metriche - 20250109_OnDemand_marzo.xlsx (1).xlsx	01/09/2025 31/06/2025

Inactive Price Lists:	Actions
az edit 1.xlsx	
Listino Azure con Metriche - 20250109_OnDemand_aprile-middle.xlsx	

Figura 43 – Price list deletion

Price list changes changelog

Using the "Price list changelog" tab available at the top of the "tenant administration" section, it is possible to view a list of operations performed on the price lists, with an indication of the dates used for import and the reference user who made the changes.

The screenshot shows the 'Price Lists Changelog' section. A filter bar at the top allows selecting a tenant. The main table lists changes for various providers (AZURE, GOOGLE) with details like file name, date, user, and success status.

Provider	File name	Date from ↑	Date To	User	Success
AZURE	Listino Azure con Metriche - 20250109_OnDemand_aprile-middle.xlsx	01/11/2024	30/05/2025	cmp_tenant_admin	✓
AZURE	Listino Azure con Metriche - 20250109_OnDemand_aprile.xlsx	01/12/2024	30/05/2025	cmp_tenant_admin	✓
AZURE	az edit 1.xlsx	01/01/2025	28/05/2025	cmp_api_test	✓
GOOGLE	gg edit1.xlsx	01/01/2025	28/05/2025	cmp_api_test	✓
GOOGLE	gg edit1.xlsx	01/01/2025	17/06/2025	cmp_tenant_admin	✓
AZURE	Listino Azure con Metriche - 20250109_OnDemand_maggio.xlsx	01/02/2025	30/05/2025	cmp_tenant_admin	✓
AZURE	Listino Azure con Metriche - 20250109_OnDemand_marzo.xlsx	01/04/2025	30/05/2025	cmp_tenant_admin	✓
AZURE	Listino Azure con Metriche - 20250109_OnDemand_marzo.xlsx	01/04/2025	17/06/2025	cmp_tenant_admin	✓

Figura 44 – Error details

Using the filter available on the page, we can view data for only one selected tenant.

Reporting tools

The reporting functionality, specific to features, allows generating global reports of the information available for the various providers. Within the pages, the possibility will also be given to create files to facilitate information sharing.

To access the functionality, above the breadcrumb path, click on the "Reports" tab.

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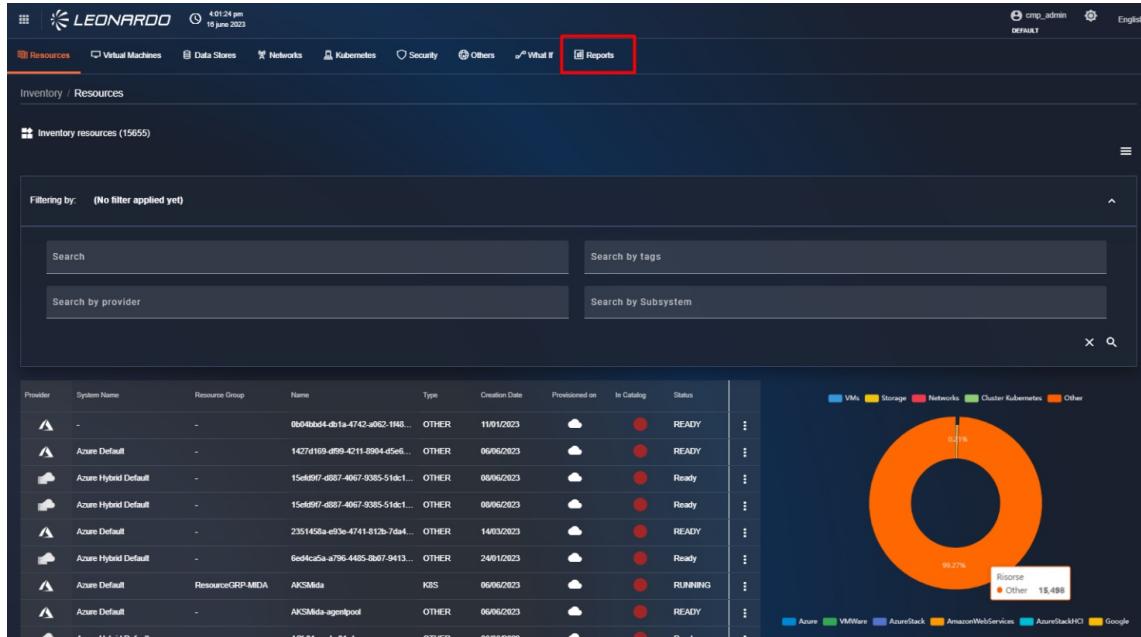


Figura 45 – Access to Catalog report

Available report types

- SKUs not in Price List – List of SKUs that have generated costs (retrieved through the cost functionality for each provider) that are not present in the price list entered in the "price lists" section.

Report creation

In the top right of the page, we can click on the "New Report" button to start creating a report. Specifically, a modal is displayed containing the list of available report types.

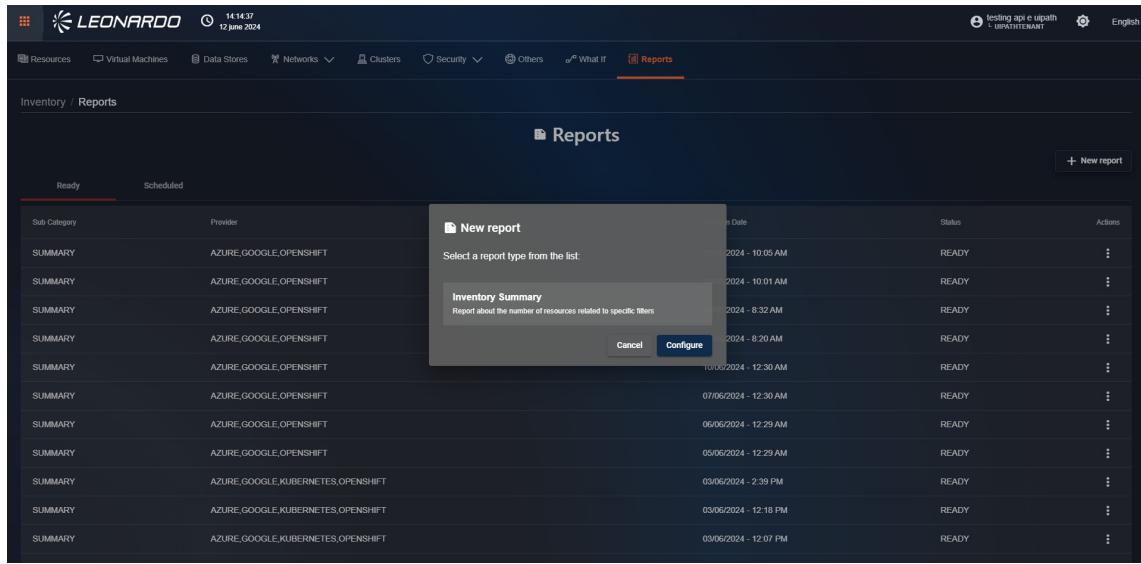


Figura 46 – New report creation

Once the report type is selected, click on the "Configure" button to select the providers to include in the report. In the newly opened window, you will find the "Provider" field that allows selecting one or more pre-existing providers in the system. Subsequently, you can select one or more subsystems to include in the report; if no providers are selected, no subsystems can be selected. Finally, there is a "tag" section to include only resources that have the entered tag.

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The screenshot shows the Leonardo platform's Reports section. A modal window titled "Inventory" is open, allowing configuration of a report for "Azure, Google". The modal includes fields for "Provider" (set to Azure, Google), "Subsystem" (set to MAE LAB, CMPPROJECT-374610), and "Tags". The "Report Type" field is set to "One-Shot". A "Submit" button is visible at the bottom of the modal. The main interface shows a table of existing reports, all of which are currently "READY".

Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	03/06/2024 - 2:39 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, KUBERNETES, OPENSHIFT	03/06/2024 - 2:39 PM	READY	⋮

Figura 47 – Report configuration

To confirm the creation of a static report, verify that "One-Shot" has been selected for the "Report type" field and click the "Submit" button at the bottom.

After a loading period, the newly generated report will be visible in the list.

The screenshot shows the Leonardo platform's Reports section after generating new reports. The table now lists 12 entries, each representing a report. The columns are "Sub Category", "Provider", "Creation Date", "Status", and "Actions". All 12 reports are marked as "READY".

Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE, GOOGLE	12/06/2024 - 1:21 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮

Figura 48 – List of generated reports

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4 Administration

The Administration functionality is the starting point for using the SCMP.

The providers configured within this functionality will be used by the system to retrieve all necessary information.

Within this functionality, it will be possible to:

- Configure cloud providers that can be used in the reference Tenant.
- Configure folders for various providers.
- Configure cloud SIEMs for various providers.
- Configure KeyVaults for various providers.
- Configure CommVaults for Backup and Disaster & Recovery for various providers.
- Configure Confidential Computing for various providers.

4.0.1 providers/subsystems

4.0.1.1 List of subsystems

To access the Administration functionality, click the bento button in the top left corner. Then, click "Administration".



Figura 49 – Access to Administration

At this point, the user is on the "Cloud Systems" tab page, where general information about the subsystems can be viewed, such as the reference provider and the subsystem's creation date. It also indicates with a red checkmark if the system is On-Premise.

We can notice that the list contains "folders," which are containers for subsystems. Clicking on the "arrow" corresponding to the folder row displays the subsystems within it and their information.

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Name	Type	Creation Date	On-Premises	State
CMP Managed Folder	GOOGLE	16/12/2024 10:47:16	□	●
CMP Managed Azure Folder	AZURE	16/12/2024 10:48:00	□	●
MAE Digital Transformation	AZURE	16/12/2024 10:48:01	□	●
MAE CMP	AZURE	16/12/2024 10:48:02	□	●
MAE OSP 2030	AZURE	16/12/2024 10:48:02	□	●
MAE LAB	AZURE	16/12/2024 10:48:03	□	●
CMP-DEVS CLUSTER	KUBERNETES	16/12/2024 11:03:34	□	●
Cluster 02	OPENSHIFT	16/12/2024 11:10:56	□	●
VMware	VMWARE	16/12/2024 11:11:39	■	●
SA CMP	REDHATEDGE	16/12/2024 13:00:37	■	●

Figura 50 – List of subsystems and folders

Additionally, each subsystem has a status, represented by a colored "LED":

- Green: the subsystem functions correctly in the SCMP "status: ok".
- Red: the subsystem is no longer usable by the SCMP "status: failed".

The SCMP periodically performs connection tests on all configured subsystems. When a subsystem fails this check, its status is updated, and all information retrieval processes (costs, inventory, monitoring, security) are disabled.

This might happen, for example, when the secret or passwords used for connection expire and need to be renewed. By modifying the subsystem, it is possible to insert new connection parameters to re-establish its correct functioning, which will be confirmed by an "OK" status.

4.0.1.1.1 INFORMATION ON SUBSYSTEM CRON-JOBS

Each tenant performs various information retrieval operations for all configured subsystems throughout the day, allowing the user to view all necessary data using only the SCMP.

To view the outcome of these operations, click on the subsystem row and, within the modal, select the "Show discovery info" button.

In addition to the number of operations and their outcome, scrolling down reveals the list and relevant details by clicking the "arrow" next to the operation of interest.

Name	Type	State	Creation Date
Google Default	GOOGLE (v1)	●	24/01/2023 11:49:55

Figura 51 – Information on cron-job

4.0.1.1.2 VIEWING, MODIFYING, AND DELETING A SUBSYSTEM

To view the data of a Cloud Provider, within the list, click on the kebab menu corresponding to the Cloud Provider of interest and click "Show".

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Name	Type	UUID	Creation Date
azure CMP	Azure	0a08e549-dd39-4249-88e1-f2b216c25def	14/06/2022 10:00:00
Azure Default	Azure	42b246e2-779c-400e-bcf1-e4a23f4380a	14/06/2022 10:00:00
Azure X2030	Azure	cc07be63-9b09-4343-a511-1d55d3fd0068	14/06/2022 10:00:00
Google Basic	Google	4dd02191-043c-41f6-b681-dca631d289e	14/06/2022 10:00:00
VMWare Default	VMWare	314ec832-7894-4690-975d-b13db99d3c7d	14/06/2022 10:00:00
Azure Stack Basic	AzureStack	877fe922-f484-48d7-b7d3-4fa83de97926	22/06/2022 15:37:04
Azure Stack HCI Default	AzureStackHCI	ec8edad9-c817-405d-9401-d7ebfd3b610	08/07/2022 12:33:19

Figura 52 – Access to the Cloud Provider in viewing mode

On this page, you can view the Provider's configuration.

Configuration data

Cloud Provider's Name * VMware Default

Type * VMWare

Version * 7.0.0

Cloud Provider's ID
630589e8f29c7a45f459bc01

Cloud Provider's UUID
57c6c237-d17d-4653-8852-e0b85e701a3e

Connection Parameters

Username * Admin@sphere.local
Type here your username

Password *
Type here your password

Figura 53 – Subsystem in display mode

If the provider is "ON-PREMISE", a table showing the usable capacities on the system and the list of resources already present in the subsystem will be visible below the configuration.

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The screenshot shows the 'On-Premise System Info' section of a management interface. It displays the following information:

- Total Virtual CPU of the sub-system: 64000
- Total RAM Capacity *: 1000
- Total storage size Capacity *: 1000
- Total storage size of the sub-system: 999 GB
- On-Premise System Info summary:

Available vCPUs	4	Available RAM	43484 MB	Available Storage	999 GB
-----------------	---	---------------	----------	-------------------	--------
- VM resource details:

Resource Type	Resource UUID	Property	Capacity
VM	422c052a-d80c-86f4-5885-6db39eed0ecc	vCPUs	2
VM	422c052a-d80c-86f4-5885-6db39eed0ecc	RAM	4 MB
VM	422c2a46-740b-e700-09e0-da161763b063	vCPUs	2
VM	422c2a46-740b-e700-09e0-da161763b063	RAM	4 MB
VM	422cd039-440b-658a-cdf4-f868820f404	vCPUs	2

Figura 54 – On-Premise machines

To return to the Cloud Provider page, click the "Close" button in the bottom left.

To modify the data of a Cloud Provider, within the list, click on the kebab menu corresponding to a Cloud Provider, and click "Edit".

The screenshot shows the 'Cloud Providers' list page. A context menu is open for the 'Azure Stack HCI Default' provider, with the 'Edit' option highlighted by a red arrow. The menu options are:

- Show
- Edit (highlighted)
- Delete

Name	Type	UUID	Creation Date
azure CMP	Azure	0a08e549-dd39-4249-88e1-f2b216c25def	14/06/2022 10:00:00
Azure Default	Azure	42b246e2-770c-400e-bcf-b-e4a23438f0a	14/06/2022 10:00:00
Azure X2030	Azure	c07be63-9b09-4343-a511-1d55d3d00068	14/06/2022 10:00:00
Google Basic	Google	4dd02191-043c-416f-b681-dca631d28d9e	14/06/2022 10:00:00
VMWare Default	VMWare	314ec832-7894-4690-976d-b13db99d3c7d	14/06/2022 10:00:00
Azure Stack Basic	AzureStack	677fe922-f484-48d7-b7d3-4fa83de97926	22/06/2022 15:37:04
Azure Stack HCI Default	AzureStackHCI	ec8edad9-c817-405d-9491-d7eebld3b610	08/07/2022 12:33:19

Figura 55 – Access to the Cloud Provider in edit mode

After doing so, the user will be on the Cloud Provider page in "edit" mode, which allows data modification.

To return to the Cloud Provider page, click the "Save" button in the bottom left. At this point, the user will be on the Cloud Provider page.

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The screenshot shows a list of cloud providers in a table format. A context menu is open over the last row, with a red arrow pointing to the 'Delete' option.

Name	Type	UUID	Creation Date	Actions
azure CMP	Azure	0a08e549-dd59-4249-88e1-f2b216c25def	14/06/2022 10:00:00	⋮
Azure Default	Azure	42b246e2-779c-400e-bcf1-ea23f4380a	14/06/2022 10:00:00	⋮
Azure X2030	Azure	cc07be63-9b09-4343-a511-1d55d3fd0068	14/06/2022 10:00:00	⋮
Google Basic	Google	4dd02191-043c-41f6-b681-dca631d289e	14/06/2022 10:00:00	⋮
VMWare Default	VMWare	314ec832-7894-4690-975d-b13db99d3c7d	14/06/2022 10:00:00	⋮
Azure Stack Basic	AzureStack	877fe922-f484-48d7-b7d3-4fa83de97926	22/06/2022 15:37:04	⋮
Azure Stack HCI Default	AzureStackHCI	ec8edad9-c817-405d-9401-d7eebf43b610	08/07/2022 12:33:19	⋮

Figura 56 – Starting for the Elimination of a Cloud Provider

To delete a Cloud Provider, within the list, click on the kebab menu corresponding to a Cloud Provider, and click "Delete".

The screenshot shows the same list of providers. A modal dialog is open over the 'Azure Stack HCI Default' row, asking for confirmation to delete the system. It has 'Cancel' and 'Remove' buttons.

Figura 57 – Confirm deletion of the Cloud Provider

After doing so, a modal will appear where you need to click the "Remove" button.

At this point, the Cloud Provider will no longer be present in the list, and the asset removal flow will be launched on the resource-manager.

4.0.1.1.3 COST MODEL FOR "ON-PREMISE" PROVIDERS

To manage resource usage costs for "On-Premise" providers, the ability to define a specific cost model per subsystem is provided.

The cost model allows configuring both "provider" costs (i.e., those actually incurred) and subsequently applying a discount or markup percentage to be applied to the customer.

Providers that use this functionality are:

- VMWare
- VCloud Director
- RedHat Edge
- OpenShift

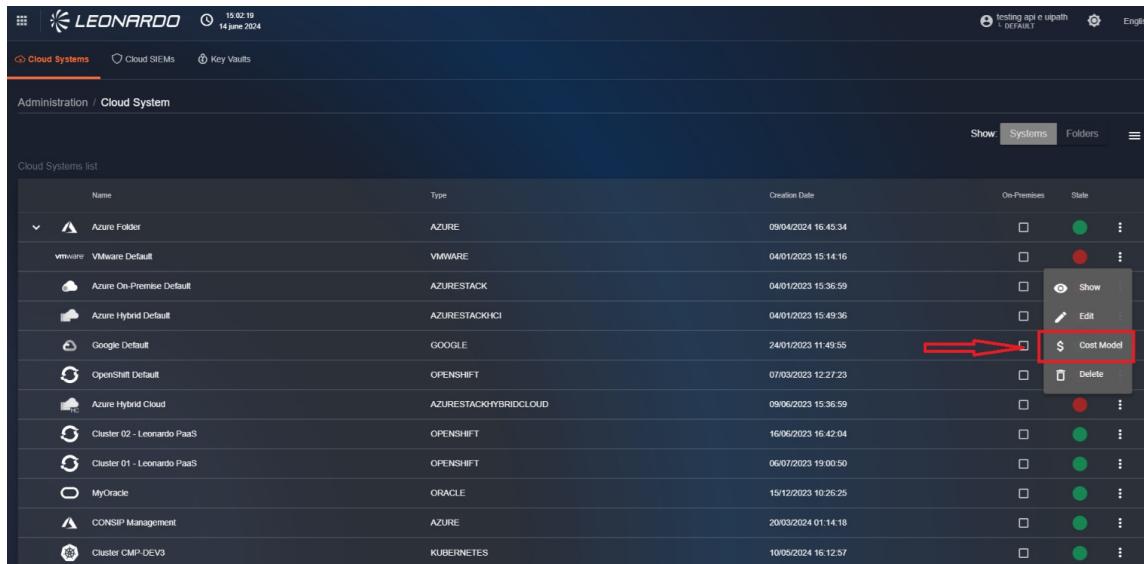
To modify the model, click the "three dots" button next to a subsystem and select "Cost model".

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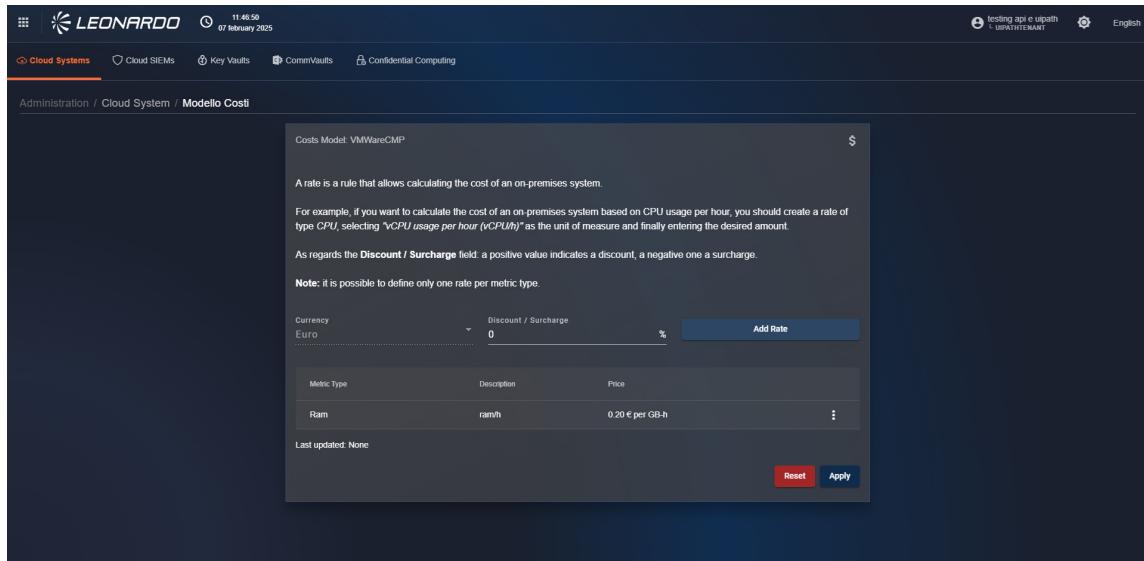


Name	Type	Creation Date	On-Premises	State
Azure Folder	AZURE	09/04/2024 16:45:34	<input type="checkbox"/>	Green ...
vmware VMware Default	VMWARE	04/01/2023 15:14:16	<input type="checkbox"/>	Red ...
Azure On-Premise Default	AZURESTACK	04/01/2023 15:36:59	<input type="checkbox"/>	Green ...
Azure Hybrid Default	AZURESTACKHCI	04/01/2023 15:49:36	<input type="checkbox"/>	Green ...
Google Default	GOOGLE	24/01/2023 11:49:55	<input type="checkbox"/>	Green ...
OpenShift Default	OPENSHIFT	07/03/2023 12:27:23	<input type="checkbox"/>	Green ...
Azure Hybrid Cloud	AZURESTACKHYBRIDCLOUD	09/06/2023 15:36:59	<input type="checkbox"/>	Red ...
Cluster 02 - Leonardo PaaS	OPENSHIFT	16/06/2023 16:42:04	<input type="checkbox"/>	Green ...
Cluster 01 - Leonardo PaaS	OPENSHIFT	06/07/2023 19:00:50	<input type="checkbox"/>	Green ...
MyOracle	ORACLE	15/12/2023 10:26:25	<input type="checkbox"/>	Green ...
CONSIP Management	AZURE	20/03/2024 01:14:18	<input type="checkbox"/>	Green ...
Cluster CMP-DEV3	KUBERNETES	10/05/2024 16:12:57	<input type="checkbox"/>	Green ...

Figura 58 – Access to the subsystem cost model

On the model page, we find a first generic section where it will be possible to configure the following fields:

- Currency: the reference currency to be used for the subsystem.
- Discount/Surcharge: a discount or markup percentage to be applied to customer costs.



Metric Type	Description	Price
Ram	ram/h	0.20 € per GB-h

Figura 59 – Price model

Subsequently, clicking the "Add rate" button will open a modal where, after choosing a metric (specific to the provider) and its relative unit of measurement, the price to be applied to all elements of the subsystem will be entered. Finally, click the "Save" button to confirm the entry.

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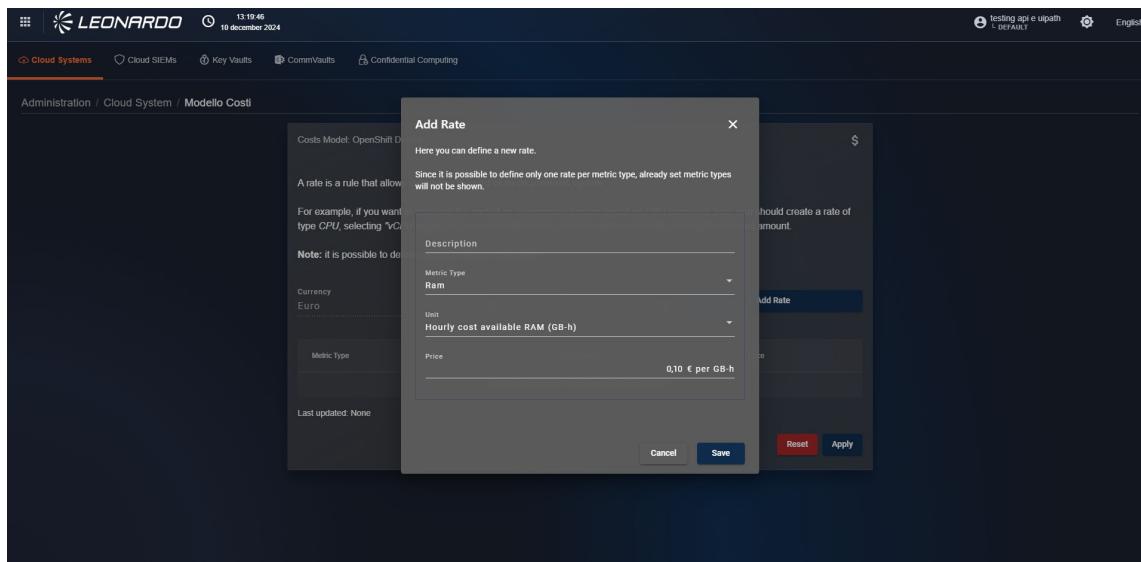


Figura 60 – Selection of the metric to be prepared

To confirm the changes to the model after entering all costs for each available component type, click the "Apply" button at the bottom.

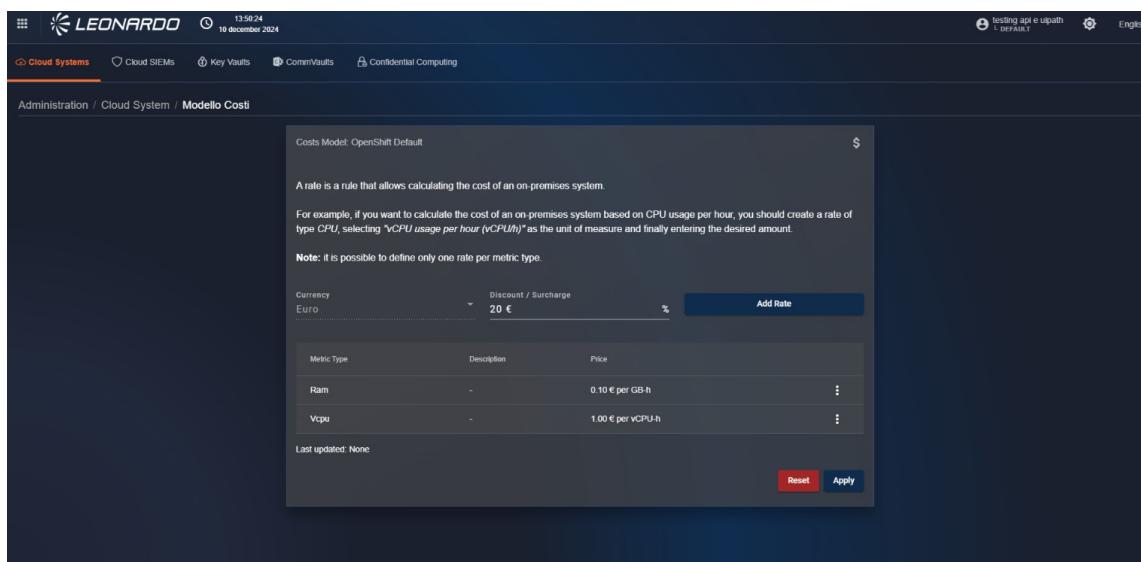


Figura 61 – Full cost model

4.0.1.1.4 MANUAL COST UPDATE

The user is given the possibility to perform a manual cost update if needed. This asynchronous operation can be requested individually per subsystem or globally for the entire tenant, which is automatically propagated to all available subsystems.

To request an update for a single subsystem, click the "three dots" button on the subsystem row and select "Refresh Cost".

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The screenshot shows the 'Cloud Systems' section of the Leonardo platform. The table lists various cloud systems with columns for Name, Type, Creation Date, On-Premises status, and State. The 'Azure Hybrid Default' system is selected, and a context menu is displayed, with the 'Refresh Costs' option being highlighted.

Name	Type	Creation Date	On-Premises	State
CMP Managed Azure Folder	AZURE	04/10/2024 10:12:37	<input type="checkbox"/>	Green
VMware VMware Default	VMWARE	04/01/2023 15:14:16	<input checked="" type="checkbox"/>	Red
Azure Hybrid Default	AZURESTACKHCI	04/01/2023 15:49:36	<input checked="" type="checkbox"/>	Red
Google Google Default	GOOGLE	24/01/2023 11:49:55	<input type="checkbox"/>	Green
OpenShift Default	OPENSHIFT	07/03/2023 12:27:23	<input type="checkbox"/>	Green
Azure Hybrid Cloud	AZURESTACKHYBRIDCLOUD	09/06/2023 15:36:59	<input type="checkbox"/>	Green
Cluster 02 - Leonardo PaaS	OPENSHIFT	16/06/2023 16:42:04	<input type="checkbox"/>	Green
Cluster 01 - Leonardo PaaS	OPENSHIFT	06/07/2023 19:00:50	<input type="checkbox"/>	Green
MyOracle	ORACLE	15/12/2023 10:26:25	<input type="checkbox"/>	Green
CONSIP Management	AZURE	20/03/2024 01:14:18	<input type="checkbox"/>	Green
Cluster CMP-DEV3	KUBERNETES	10/05/2024 16:12:57	<input type="checkbox"/>	Red
aws PSN Test	AMAZONWEBSERVICES	19/06/2024 15:32:52	<input type="checkbox"/>	Green

Figura 62 – Manual cost update

Within the modal, we can specify for how many days, starting from today's date, the costs of the selected subsystem should be re-downloaded and re-confirmed. After confirmation, we can go to the "cron-job Info" section to confirm the operations.

Additionally, it is possible to request a cost update for the entire tenant: by first clicking the "hamburger menu" button available in the top left and selecting "refresh cost", the activity will be distributed across all available subsystems on the page.

The screenshot shows the 'Cloud Systems' section of the Leonardo platform. The table lists various cloud systems. A context menu is open over the 'Cloud Systems' header, with the 'Refresh Costs' option highlighted by a green arrow.

Name	Type	Creation Date	On-Premises	State
CMP Managed Azure Folder	AZURE	04/10/2024 10:12:37	<input type="checkbox"/>	Green
VMware VMware Default	VMWARE	04/01/2023 15:14:16	<input checked="" type="checkbox"/>	Red
Azure Hybrid Default	AZURESTACKHCI	04/01/2023 15:49:36	<input checked="" type="checkbox"/>	Red
Google Google Default	GOOGLE	24/01/2023 11:49:55	<input type="checkbox"/>	Green
OpenShift Default	OPENSHIFT	07/03/2023 12:27:23	<input type="checkbox"/>	Green
Azure Hybrid Cloud	AZURESTACKHYBRIDCLOUD	09/06/2023 15:36:59	<input type="checkbox"/>	Green
Cluster 02 - Leonardo PaaS	OPENSHIFT	16/06/2023 16:42:04	<input type="checkbox"/>	Green
Cluster 01 - Leonardo PaaS	OPENSHIFT	06/07/2023 19:00:50	<input type="checkbox"/>	Green
MyOracle	ORACLE	15/12/2023 10:26:25	<input type="checkbox"/>	Green
CONSIP Management	AZURE	20/03/2024 01:14:18	<input type="checkbox"/>	Green
Cluster CMP-DEV3	KUBERNETES	10/05/2024 16:12:57	<input type="checkbox"/>	Red
aws PSN Test	AMAZONWEBSERVICES	19/06/2024 15:32:52	<input type="checkbox"/>	Green

Figura 63 – Updating costs on all tenant

Once a cost recovery is selected, it is possible to indicate the number of days to recover, and by selecting the "Reset the cost" box, the SCMP will first perform a data cleanup (for the selected range) and then perform the refresh.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. On the left, there's a sidebar with 'Cloud Systems' selected. The main area displays a list of cloud systems with columns for Name, Time, Creation Date, On-Premises, and State. A modal dialog titled 'Refresh Costs' is open in the center, asking for the number of days to refresh costs (set to 1) and a checkbox to reset costs. Below the dialog is a table of cost data.

Name	Time	Creation Date	On-Premises	State
CMP Managed Azure Folder	14:58:18 04 June 2025	16/05/2023 16:12:37	<input type="checkbox"/>	●
VMware Default	14:58:18 04 June 2025	16/05/2023 16:14:16	<input checked="" type="checkbox"/>	●
Azure Hybrid Default	14:58:18 04 June 2025	16/05/2023 16:49:36	<input checked="" type="checkbox"/>	●
Google Default	14:58:18 04 June 2025	16/05/2023 16:49:55	<input type="checkbox"/>	●
OpenShift Default	14:58:18 04 June 2025	16/05/2023 17:22:23	<input type="checkbox"/>	●
Azure Hybrid Cloud	14:58:18 04 June 2025	16/05/2023 17:36:59	<input checked="" type="checkbox"/>	●
Cluster 02 - Leonardo PaaS	14:58:18 04 June 2025	16/05/2023 16:42:04	<input type="checkbox"/>	●
Cluster 01 - Leonardo PaaS	14:58:18 04 June 2025	06/07/2023 19:00:50	<input type="checkbox"/>	●
MyOracle	14:58:18 04 June 2025	15/12/2023 10:26:25	<input type="checkbox"/>	●
CONSIP Management	14:58:18 04 June 2025	20/03/2024 01:14:18	<input type="checkbox"/>	●
Cluster CMP-DEV3	14:58:18 04 June 2025	10/05/2024 16:12:57	<input type="checkbox"/>	●
PSN Test	14:58:18 04 June 2025	19/05/2024 15:32:52	<input type="checkbox"/>	●

Figura 64 – Configuration of refresh costs

4.0.1.1.5 COST RECOVERY AND CALCULATION PROCESS

4.0.1.1.5.1 Cost recovery structure

The cost recovery process is performed by the "Abstraction Layer" module, which consists of:

- A sub-module of ABS called "layer" for each provider type (e.g., "CMP-ABS-VMWare-layer").
- ABS Gateway: this sub-module manages the communication and standardization of information retrieved from the various Layers of different providers and makes it available to other modules of the SCMP system.

The cost recovery process is performed by a cron-job, which is launched once per provider, automatically during nighttime hours.

For ON-Premise providers, usage values are automatically generated by the SCMP based on the quantity of resources available in inventory, using the same "ABS" modules. Subsequently, as with other providers, the usage values will be used to calculate costs via the cost model described in the Administration section.

In case of failure, the process is automatically scheduled up to 3 attempts. If the system fails to resolve automatically, manual intervention is required. Additionally, a manual cost update can be requested using the buttons available in the Administration section.

Below are the specific details by subsystem type.

4.0.1.1.5.2 Customer cost recovery and calculation for the Azure provider

Recovery methods:

- "Standard" model: The ABS module requests costs for the last 2 days via Azure's REST APIs, which are then saved in the SCMP database.
- "Storage Account" model: The ABS module retrieves a file containing cost extractions, divided by subsystem, which are then saved in the SCMP database.
- "Billing storage" model: The ABS module retrieves a file containing extractions of all subscriptions available in the "billing account"; the results are divided by subsystem and saved in the database.

Cost calculation per single resource:

1. The ABS module sends cost information and information about the resource that generated them to the cost module.
2. The cost module verifies the subsystem configuration to identify the "aggregation type". This parameter indicates which catalog to use (RESOURCES or SKUs) to correctly calculate the price.
3. The cost module checks if the resource identifier (UUID) is present in the SCMP catalog. If present, the system multiplies the usage by the catalog cost.
4. If the resource is not present in the catalog (and therefore does not fall into the previous step), the SCMP will apply the discount/markup percentage configured in the subsystem.

4.0.1.1.5.3 Customer cost recovery and calculation for the AWS provider

- "Standard" model: The ABS module queries AWS Cost Explorer APIs to get costs for the last 2 days, saving the data into the SCMP database.
- "ARN ROLE" model: The ABS module assumes a specific IAM role (ARN ROLE) to access AWS billing data. Costs are extracted and divided by subsystem, then saved into the SCMP database.

Cost calculation per single resource:

1. The ABS module sends cost information and information about the resource that generated them to the cost module.
2. The cost module verifies the subsystem configuration to identify the "aggregation type". This parameter indicates which catalog to use (RESOURCES or SKUs) to correctly calculate the price.
3. The cost module checks if the resource identifier (UUID) is present in the SCMP catalog. If present, the system multiplies the usage by the catalog cost.
4. If the resource is not present in the catalog (and therefore does not fall into the previous step), the SCMP will apply the discount/markup percentage configured in the subsystem.

4.0.1.1.5.4 Customer cost recovery and calculation for the Google provider

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- "Standard" model: The ABS module queries Google Cloud Billing APIs to get costs for the last 2 days, saving the data into the SCMP database.
- "Dataset Export" model: The ABS module accesses billing data exported from **BigQuery**. Costs are extracted, divided by subsystem, and saved into the SCMP database.

Cost calculation per single resource:

1. The ABS module sends cost information and information about the resource that generated them to the cost module.
2. The cost module verifies the subsystem configuration to identify the "aggregation type". This parameter indicates which catalog to use (RESOURCES or SKUs) to correctly calculate the price.
3. If the "Cost from USD" field has been selected, the system will use the price in USD (returned by the provider) for the calculation, to which a discount/markup percentage defined in the administration section is applied. Otherwise, the price already converted to EUR is used.
4. The cost module checks if the resource identifier (UUID) is present in the SCMP catalog. If present, the system multiplies the usage by the catalog cost.
5. If the resource is not present in the catalog (and therefore does not fall into the previous step), the SCMP will apply the discount/markup percentage configured in the subsystem.

4.0.1.1.5.5 Customer cost recovery and calculation for Oracle, OracleExAcc providers

- "Standard" model: The ABS module queries ORACLE APIs to get costs for the last 2 days, saving the data into the SCMP database.

Cost calculation per single resource:

1. The ABS module sends cost information and information about the resource that generated them to the cost module.
2. The cost module verifies the subsystem configuration to identify the "aggregation type". This parameter indicates which catalog to use (RESOURCES or SKUs) to correctly calculate the price.
3. If the "Cost from USD" field has been selected, the system will use the price in USD (returned by the provider) for the calculation, to which a discount/markup percentage defined in the administration section is applied. Otherwise, the price already converted to EUR is used.
4. The cost module checks if the resource identifier (UUID) is present in the SCMP catalog. If present, the system multiplies the usage by the catalog cost.
5. If the resource is not present in the catalog (and therefore does not fall into the previous step), the SCMP will apply the discount/markup percentage configured in the subsystem.

4.0.1.1.5.6 Customer cost recovery and calculation for Kubernetes, OpenShift, vcloudDirector, VMWare, Red Hat Edge providers

- Standard model: The ABS module generates Usage data on a 24-hour basis for all resources available in the inventory, as the providers are On-premise and all resources are allocated to the customer.

Cost calculation per single resource:

1. The ABS module sends cost information and information about the resource that generated them to the cost module.
2. The SCMP will apply the discount/markup percentage configured in the cost model.

4.0.1.2 New subsystem creation

To add a new subsystem to the portal, click on the "menu" available in the top right and select "+ Add new cloud provider".

Name	Type	Creation Date	On-Premises
Azure Default	Azure	04/01/2023 14:57:48	<input type="checkbox"/>
VMWare Default	VMWare	04/01/2023 15:14:16	<input checked="" type="checkbox"/>
OpenShift Default	OpenShift	07/03/2023 12:27:23	<input type="checkbox"/>
Azure Hybrid Default	AzureStack ICI	04/01/2023 15:49:36	<input checked="" type="checkbox"/>
AWS Default	AmazonWebServices	13/04/2023 11:05:32	<input type="checkbox"/>
google phs owner	Google	18/05/2023 14:52:32	<input type="checkbox"/>
Google Default	Google	24/01/2023 11:49:55	<input type="checkbox"/>
Azure On-Premise Default	AzureStack	04/01/2023 15:36:59	<input checked="" type="checkbox"/>
Azure Hybrid Cloud	AzureStackHybridCloud	09/06/2023 15:36:59	<input checked="" type="checkbox"/>
Cluster 02 - Leonardo PaaS	OpenShift	16/06/2023 16:42:04	<input type="checkbox"/>
azure CMP	Azure	30/06/2023 17:14:32	<input type="checkbox"/>

Figura 65 – Add a new Cloud Provider

The user views the basic data of the subsystem to be entered, explained below.

4.0.1.2.1 PARAMETERS SHARED AMONG PROVIDERS

On the creation page, we can note 3 fields:

- Name: indicates the name that will be displayed to identify the subsystem.
- Type: indicates the type of cloud provider to which the subsystem belongs.
- Version: the version relative to the provider of the subsystem to be installed.

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The screenshot shows a configuration interface for a new cloud provider. At the top, there are tabs for 'Cloud Systems', 'Cloud SIEMs', and 'Key Vaults'. Below the tabs, the path 'Administration / Cloud System / New' is displayed. The main title is 'New Cloud Provider/Folder'. Under the title, there is a section labeled 'Configuration data' containing three input fields: 'Cloud Provider's Name *', 'Type *', and 'Version *'. At the bottom right of the form, there are three buttons: 'Close', 'Test Connection', and 'Save'.

Figura 66 – General parameters of a subsystem

After selecting the type and version of the system, the form updates to display specific parameters based on the selected provider, as each of them manages authentication and resources differently.

All providers require authentication, which may vary by system, for asset retrieval.

This sensitive information, such as passwords or certificates, is securely saved on an infrastructural element that handles data security <https://www.vaultproject.io/>.

4.0.1.2.2 CONNECTION VERIFICATION AND SAVING, SHARED AMONG PROVIDERS

For all subsystems, 3 buttons are available at the bottom of the page:

The "Close" button allows cancelling the addition of a new subsystem.

The "Test Connection" button is used to perform a connection test using the entered parameters. In case of errors, the system returns an error message indicating "Error: Unauthorized system" and the button turns red. Otherwise, the button will turn green, and it will be possible to save the subsystem using the "Save" button.

The screenshot shows a configuration interface for connection plates. At the top, there are tabs for 'Cloud Systems', 'Cloud SIEMs', and 'Key Vaults'. Below the tabs, the path 'Administration / Cloud System / New' is displayed. The main title is 'New Cloud Provider/Folder'. Under the title, there are several input fields: a checkbox for 'Usage Aggregation' with a note 'If usage aggregation by resource (true) or by sku (false)', a field for 'Catalog Price Discount(-)/Surcharge(+) %' with a note 'Type here a custom discount/surcharge percentage', and a field for 'ODL ID Reference' with a note 'Type here the work order reference id'. At the bottom right, there are three arrows pointing down to the 'Save' button, which is highlighted in blue.

Figura 67 – Connection plates

Upon saving, the SCMP will communicate to the module managing that provider type to load all inventory items, metrics, costs, and security elements into our bus (Kafka).

The same module will subsequently schedule jobs for the periodic update of all existing assets.

After saving, a modal will appear informing the user that a cloud provider cannot be deleted before 24 hours. From the modal, click "OK". After doing so, the user is redirected to the Cloud Provider page.

4.0.1.2.3 AMAZON WEB SERVICES PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the Amazon Web Services subsystem to be entered are shown in the table:

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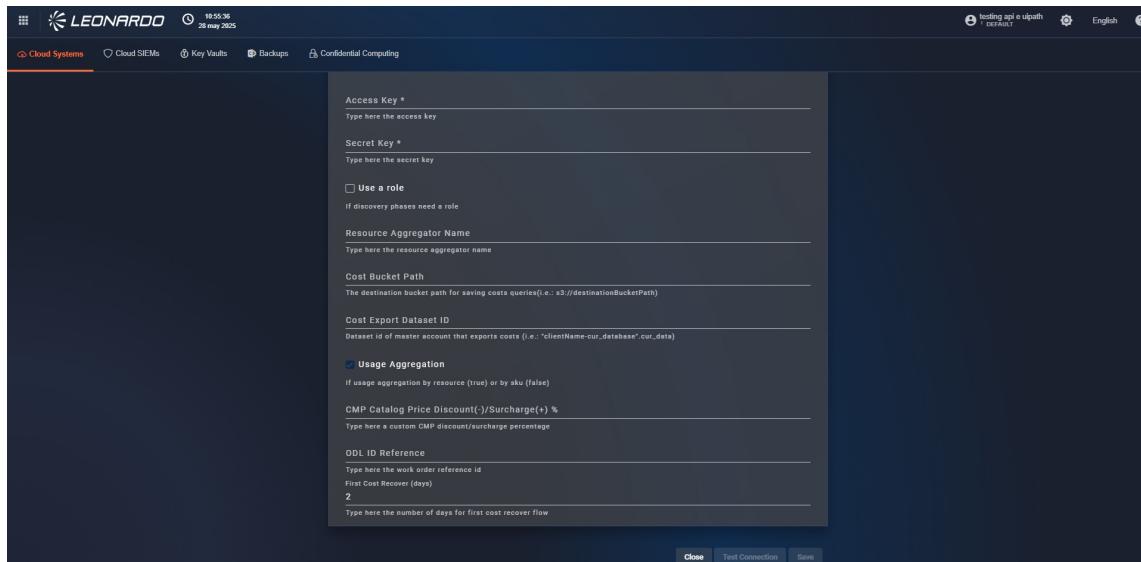


Figura 68 – Mask of configuration Amazon Web Services

Parameters indicated with * are mandatory.

Name	Type	Description	Example
AccessKey *	string	The AWS access key is an alphanumeric string that identifies the AWS user.	ZYKZGVAKIS4YK5IXCAXB
SecretKey *	password	The AWS secret access key is an alphanumeric string used to authenticate the AWS user.	np6Kc_xwsvhR8Q~rP05fcqYNXmbqfMGQLOEzfMt
use A role	Boolean	Specifies the use of one or more administration roles for authentication on one or more specific accounts within the provider's organization.	true
Arn Role (only if useArole is active)	string	Enter here the Arn ID of the role associated with a specific account for performing the monitoring discovery phase and for provisioning.	arn:aws:iam:{accountID}:role/{roleName}
Audit Arn Role (only if useArole is active)	string	Enter here the Audit Arn ID of the role associated with a specific account for performing the inventory discovery phase.	arn:aws:iam:{accountID}:role/{roleName}
Aggregator Name	string	Enter here the name of the aggregator on resources for using the AWS Config service to support the inventory discovery phase.	aws-{aggregatorName}
Cost Bucket Path	string	Enter here the path of the storage bucket for cost queries.	s3://{bucketPath}
Cost Export Dataset ID	string	Enter here the ID of the cost dataset on which to execute queries.	{databaseName}.{tableName}
usageAggregation	Boolean	Indicates the type of aggregation used for cost calculation (true for resources, false for SKUs).	True
Rate Code Aggregation (only if useAggregation is false)	Boolean	Indicates whether SKU aggregation occurs by SKU ID or by rate code.	true
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

Provider Configurations

1. S3 Configuration
 - Access [Amazon S3](#).
 - Create or use a bucket for CUR data.
 - Enable [Bucket Versioning](#).
2. CUR Definition

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- Access **Billing and cost management**.
 - Go to the Data Exports section.
 - Configure a new CUR report as follows:
 - Export details:
 - **Standard data export**: standard export format
 - **Export name**: name of the report
 - Data table content settings:
 - Select **CUR 2.0**.
 - Select **Hourly** as granularity.
 - Data export delivery options:
 - file format: **Parquet**
 - file versioning: **Overwrite existing data export file**.
 - Data export storage settings:
 - Configure the S3 bucket pointer with the one initially created.
 - Configure the bucket path prefix with **data**.
 - 3. IAM Role Creation for Glue
 - Access **IAM**.
 - Create a custom role for Amazon Glue management.
 - Assign the following policies:
 - **AWSGlueServiceRole** (standard AWS policy)
 - Custom policy for S3 bucket access:


```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObject",
                "s3:PutObject"
            ],
            "Resource": [
                "arn:aws:s3:::{bucketPath}/*"
            ]
        }
    ]
}
```
 - 4. Glue Database Creation
 - Access **AWS Glue**.
 - Create the database.
 - 5. Crawler Configuration
 - Create a **crawler** in Glue:
 - Select the custom role previously created.
 - Define the S3 path as **s3://{{bucketPath}}/data/**.
 - Set a **scheduling** (e.g., hourly: **0 * * * ***).
 - 6. Usage in Athena
 - After the first execution of the crawler, data will be available in **Athena** for queries.
 - **⚠ For past historical data, contact AWS support.**
-
1. AWS Configuration and Aggregators
 - a. Initial Configuration
 - Access **AWS Config** and click **Get started**.
 - Create an S3 bucket for aggregated data.
 - Enable override for **IAM** resource types and leave the remaining default options; AWS will automatically create the necessary role.
 - b. Config Aggregator
 - Create a **resource aggregator** in the **Aggregators** section.
 - Include all regions.
 1. IAM User Creation
 - Access **IAM** and go to the **Users** section.
 - Create a new user or select an existing one.
 - Optional: enable console access for the created user.
 2. Policies to Assign to the User
 - **AmazonAthenaFullAccess**
 - **AmazonS3FullAccess**
 - **AWS_ConfigRole**
 - **AWSConfigUserAccess**
 - **AmazonEC2ReadOnlyAccess**

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- CloudWatchReadOnlyAccess
- Add the following custom policy for managing the CUR bucket:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "VisualEditor0",
      "Effect": "Allow",
      "Action": [ "s3:*" ],
      "Resource": [
        "arn:aws:s3:::(bucketPath)",
        "arn:aws:s3:::(bucketPath)*"
      ]
    }
  ]
}
```

3. Access Key

- Generate **Secret Credential**.
- Save the **Access Key** and **Secret Key** (cannot be retrieved later). To enable **role assumption** via STS for cross-account services (e.g., AWS Config), associate the following policy with the created user:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "sts:AssumeRole",
      "Resource": [
        "arn:aws:iam::(accountamID):role/(roleName)"
      ]
    }
  ]
}
```

4.0.1.2.4 AZURE PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the Azure subsystem to be entered are shown in the table:

The screenshot shows a configuration interface for the Azure subsystem. At the top, there are navigation links for Cloud Systems, Cloud SIEMs, and Key Vaults. The main area is titled 'Cloud Provider's Name *' and contains the value 'Azure'. Below this is a 'Version *' field with the value '2020-08-01'. The 'Connection Parameters' section contains four fields: 'Client ID *' (Type here the client id), 'Client Secret *' (Type here the client secret), 'Tenant ID *' (Type here the tenant id), and 'Subscription ID *' (Type here the subscription id). There is also a checkbox for 'Usage Aggregation' with the note 'If usage aggregation by resource (true) or by sku (false)'. Below these are fields for 'Catalog Price Discount()/Surcharge() %' (Type here a custom discount/surcharge percentage) and 'ODL ID Reference' (Type here the work order reference id). At the bottom right are buttons for 'Close', 'Test Connection', and 'Save'.

Figura 69 – Azure configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example

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Name	Type	Description	Example
clientId *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a59e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q-rP05fCqYNXmbqfMGQLOEzfMt
tenantId *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
subscriptionId *	string	The ID of the Azure subscription used to access the Azure Cloud subsystem. A subscription is a contract for using Azure services.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
Storage account ID**	String	Enter the path where cost exports are performed.	/subscriptions/{{subscription}}/resourceGroups/{{resourcegroup}}/providers/Microsoft.Storage/storageAccounts/{{storage account}}
Cost from Billing storage**	boolean	Select this checkbox to retrieve costs in "Billing Account" format.	true
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

Variables for cost calculation

Variables indicated with ** are exclusive, so only one can be selected at a time. Each variable activates a different system for cost calculation, and if more than one is set, subsystem saving will be prevented. Specifically, we can:

- Use the "Storage account ID" field to retrieve costs via automatic extractions performed individually per subsystem (only if the storage belongs to the same tenant).
- Use the "Cost from Billing storage" field to retrieve costs at the billing account level, thus using a single file for all available subscriptions (Contributor and Blob Contributor permissions are required).
- By leaving "Cost from Billing storage" and "Cost from storage" empty, the SCMP will retrieve costs using the Azure APIs prepared for daily costs.

This distinction is necessary to prevent Azure APIs from responding with a 429 error due to a large number of requests. Additionally, to use the methods described previously, the Azure system must be correctly configured and the entered credentials must have all necessary permissions.

4.0.1.2.5 AZURESTACK PARAMETERS

Enabled functionalities:

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- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the AzureStack subsystem to be entered are shown in the table:

Figura 70 – AzureStack configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientId *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q~rP05fCqYNXmbqfMGQLOEfMt
tenantId *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
subscriptionId *	string	The ID of the Azure subscription used to access the Azure Cloud subsystem. A subscription is a contract for using Azure services.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

For On-Premise providers, in particular, data on infrastructure capacity is requested so that the SCMP can perform preliminary calculations in multiple scenarios.

For example, during provisioning, to ensure that the maximum allowed capacity of the provider is not exceeded.

4.0.1.2.6 AZURESTACK HCI PARAMETERS

Enabled functionalities:

- Catalog item retrieval

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Company internal

- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the AzureStack HCI subsystem to be entered are shown in the table:

The screenshot shows a configuration interface for the AzureStack HCI subsystem. It includes fields for Bridge Machine Username, Password, IP Address, Client ID, Client Secret, Tenant ID, Subscription ID, Location, Total CPU Capacity, Total RAM Capacity (MB), Total Storage Size Capacity (GB), Catalog Price Discount(%)/Surcharge(+)%, and ODL ID Reference.

Figura 71 – Configuration mask AzureStack HCI

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientid *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q-rP05fCqYNXmbqfMGQLOEfMt
tenantid *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
subscriptionId *	string	The ID of the Azure subscription used to access the Azure Cloud subsystem. A subscription is a contract for using Azure services.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

For On-Premise providers, in particular, data on infrastructure capacity is requested so that the SCMP can perform preliminary calculations in multiple scenarios.

For example, during provisioning, to ensure that the maximum allowed capacity of the provider is not exceeded.

4.0.1.2.7 AZURESTACK HYBRID CLOUD PARAMETERS

Enabled functionalities:

- Catalog item retrieval

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Company internal

- Inventory item retrieval
- Usage metrics retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the AzureStack Hybrid cloud subsystem to be entered are shown in the table:

Figura 72 – Configuration mask AzureStack Hybrid Cloud

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientId *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q-rP05fcqYNXmbqfMGQLOEfMt
tenantId *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
subscriptionId *	string	The ID of the Azure subscription used to access the Azure Cloud subsystem. A subscription is a contract for using Azure services.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

For On-Premise providers, in particular, data on infrastructure capacity is requested so that the SCMP can perform preliminary calculations in multiple scenarios.

For example, during provisioning, to ensure that the maximum allowed capacity of the provider is not exceeded.

4.0.1.2.8 REDHAT EDGE DEVICE PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval

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Company internal

- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the Google Cloud subsystem to be entered are shown in the table.

Figura 73 – Edge configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
client_id *	string		104822473261100667392
clientSecret *	string	Client secret used for connection	82hg7ds1h0sds7392
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	10
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

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PROVIDER side configuration

To be able to add the system to the SCMP, some configurations need to be performed on the provider's portal.

Specifically:

- Create a service account
 - a. Access <https://console.redhat.com>
 - b. In the top right, click on the Settings icon → Service Accounts → Create service account.
 - c. Enter Name and Description → Create.
 - d. Immediately copy the Client ID and Client Secret (the secret will not be shown again).
- Assign permissions
 - a. Go to Settings → User Access → Groups
 - b. Create a group that contains the following permissions/roles:

Service	Recommended role
Edge Management (fleet, update)	Edge Management Administrator or User
Image Builder	Image Builder Administrator or User
Insights Inventory (host read)	Insights Inventory Viewer

- In the Service accounts tab of the group → Add service account → select the newly created account.
- Rotate and revoke permissions
 - a. Portal → Service Accounts → menu (⋮)
 - b. Select **Reset credentials** to regenerate only the Client Secret.
 - c. Select **Delete service account** to permanently decommission the automation.

With this configuration, you can securely orchestrate the entire edge lifecycle – from image generation to update rollout – without ever using personal credentials.

4.0.1.2.9 GOOGLE CLOUD PARAMETERS

Enabled functionalities:

Catalog item retrieval

- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the Google Cloud subsystem to be entered are shown in the table. The "Service account" field can be entered either automatically or manually as described in the paragraph.

The screenshot shows the configuration interface for the Google subsystem. It includes fields for Service account, Authentication Type (SA Private Key ID), Client ID, Client Secret, Authorization URL, Token URL, and various checkboxes for OAuth 2.0 parameters like Client ID, Client Secret, and OAuth 2.0 Refresh token.

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Figura 74 – Google configuration mask

Parameters indicated with * are mandatory (available below the service account section).

Name	Type	Description	Example
serviceAccount *	object	Connection file generated from the Google console	service_account.json
discoveryProjectId *	string	Identifier of the project for which discovery will be performed	Theproject-547280
costExportProjectId	string	Dataset ID of the cost export service account if the dataset is different from the ProjectID	test-customer.test_customer.gcp_billing_export_resource_v1_01527DF_51B683_EB2A9
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
Cost from USD Currency	boolean	Indicates whether the final cost is calculated from the price in USD or EUR.	true
providerPriceDiscount ** (only if costFromUSDCurrency is true)	integer	Enter here a discount/markup to apply to provider prices in USD for all resources.	30
catalogPriceDiscount **	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	-5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

Variables for cost calculation

The variables indicated with ** are used differently for "customer" cost calculation depending on the presence of the "Cost from USD Currency" field. Specifically:

- If the field is deactivated, the value entered in "catalogPriceDiscount" is used as a percentage added to the price retrieved from the provider (or discounted if the value is negative), as for other providers.
- If the field is activated, the value entered in "catalogPriceDiscount" and the "providerPriceDiscount" value are used as a coefficient multiplied by the cost in USD retrieved from the provider.

This distinction is necessary to prevent Azure APIs from responding with a 429 error due to a large number of requests. Additionally, to use the methods described previously, the Azure system must be correctly configured and the entered credentials must have all necessary permissions.

The screenshot shows the configuration interface for a new cloud provider. At the top, it says 'New Cloud Provider/Folder'. Below that, there's a section for 'Cloud Provider's Name' with a dropdown set to 'Google'. Under 'Connection Parameters', there's a note: 'It's possible to upload service_account.json file to speed up AWS API calling.' Below this, a red arrow points to a link: 'Click here to import from service_account.json'. The entire configuration area is enclosed in a yellow box.

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Figura 75 – Configuration file loading

By uploading the file, the form is automatically completed with the necessary parameters, but it is also possible to enter them manually (yellow box in the image), following the table. All fields are mandatory:

Name	Type	Description	Example
Type	string	Enter the name of the configured authentication type.	service_account
project_id *	string	Enter here the unique ID of the project associated with the service account.	Theproject-367810
private_key_id *	string	Enter here the unique ID of the service account's private key.	55cb5cf903ee93ea1e9c294a07e46e0af0633e6
private_key *	password	Contains the service account's private key in PEM format. It is essential for authenticating the service account to Google Cloud APIs.	-----BEGIN PRIVATE KEY-----MIIJQgIBADANB...
client_e-mail *	string	The unique email address of the service account. It is used to identify the service account when authenticating to Google Cloud APIs.	user@dominio.com
client_id *	string	The client ID of the service account. It is a unique identifier used to identify the service account in Google Cloud.	104822473261100667392
auth_uri *	string	The URI used for authenticating the service account to Google Cloud APIs.	https://accounts.google.com/o/oauth2/auth
token_uri *	string	The URI used to obtain an access token for the service account.	https://oauth2.googleapis.com/token
auth_provider_x509_cert_url*	string	The URL of the X.509 certificate used for authenticating the service account.	https://www.googleapis.com/oauth2/v1/certs
client_x509_cert_url *	string	The URL of the X.509 certificate in the client.	https://www.googleapis.com/robot/v1/metadata/f543/myServiceAccount%40myProjectName.gserviceaccount.com

Provider Configuration

- Access GCP Console
 - Go to <https://console.cloud.google.com/>
 - Log in with your Google Cloud account.
- Create or Identify the Service Account (SA) From the console, select the project at the top where you want to add (or where it is already present) the service account. From the console, to create the service account, go to IAM and admin > Service accounts. Click on Create service account. Assign an ID (e.g., my-service-account), name, and description, then Create. On the service account page, go to the Keys section. Click on Add key and select Create new key. Choose JSON format and click Create. Download and keep the JSON file in a safe place.
- Associate Permissions with the Service Account

On the same service accounts page, find the newly created account and click on its name. Go to the Permissions section and in the table below, next to the service account, in the Inheritance column, click on Edit principal. In the pop-up menu, select the appropriate roles for the service account. Below is the minimal list of roles for the SCMP: - App Engine Admin - BigQuery Data Transfer Service Agent - Cloud OS Config Service Agent - Compute Admin - Kubernetes Engine Service Agent - OS Inventory Viewer - Security Center Service Agent Click Save and add the permissions to the service account.
- Enable Service APIs

Go back to the console home. Select the project at the top where the service account is present. Go to APIs and services. At the top, click on + Enable APIs and services. Search for the API services to enable in the search bar and click on their name. Once inside the API service, select Enable to activate it; below are the API services for the SCMP: - Cloud Monitoring API - Compute Engine API - Cloud Asset API - BigQuery API - Cloud Resource Manager API - OS Config API - Security Command Center API - Cloud Billing API - Service Usage API - Cloud Dataplex API
- Cost Dataset

If the cost dataset is located in a different service account than the one you want to integrate, specify the complete connection string to the relevant dataset in the Cost Export Dataset ID text box (in the subsystem creation module present in SCMP administration) (e.g., projectId.datasetName.tableName).

4.0.1.2.10 KUBERNETES PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval

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- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the Kubernetes subsystem to be entered are shown in the table.

Figura 76 – Configuration mask Kubernetes

Parameters indicated with * are mandatory.

Name	Type	Description	Example
Certificate authority data *	string	Enter the data related to the certificate used by the user for connection.	Sgeijesf90434n7u3h97ef
Kubernetes API server URI *	string	Enter the URL of the server to connect to.	https://www.google.com/infos
User certificate Data *	String	Enter the certificate related to the user used for connection.	--begin private key-- fnbsujffsfoije ...
User key Data *	String	Enter the key related to the user used for connection.	Sf8j9jts4ewht7h3wfwj908w
User token *	String	Secret token related to the user used for connection to the provider.	Sf8eufce9sfber4543jh8ddsfh89r43
User name *	String	Enter the username used for authentication.	administrator
Label selector	string	Enter here a selector to filter resources retrieved by the SCMP.	Name=rossi
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	-10
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001

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Provider Configuration

The standard authentication method is via the parameters contained in the kubeconfig file. The kubeconfig defines: API server endpoint (server) Authentication method (client certificates, tokens, oidc, etc.) Default namespace Context Authentication: Via client certificates (client-certificate-data and client-key-data)

Or via token (token in the user context)

Minimal kubeconfig example:

```
apiVersion: v1
kind: Config
clusters:
- cluster:
  certificate-authority-data: server: https://name: my-cluster
contexts:
- context:
  cluster: my-cluster
  user: my-user
  name: my-context
current-context: my-context
users:
- name: my-user
  user:
    token:
```

4.0.1.2.11 OPENShift PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the OpenShift subsystem to be entered are shown in the table:

Figura 77 – OpenShift configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
Username *	string	The username of the OpenShift user that will be used for connection to the provider.	name.surname@mail.com
Password *	password	The client's password, used to authenticate the client with the subsystem. The secret key must be kept confidential and not shared with anyone.	np6KcXmbqfMGQLOEzIMt
API server port *	integer	The port on which the OpenShift APIs are listening.	8090
API url *	string	The OpenShift URL on which to make requests.	www.google.com
discover all Namespaces	boolean	If the user has administrator permissions on all OpenShift "projects," all namespaces will be retrieved.	false
Namespace selector (only visible if "discover all namespaces" is active)	selection	If the user has visibility of a limited number of namespaces, it is necessary to enter the list of enabled namespaces here.	demo,infos,production

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Name	Type	Description	Example
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

User authorizations

If the "Discover all namespaces" field is selected, it is necessary that the user has administration permissions on **ALL** namespaces, otherwise, the system cannot be added.

This distinction is necessary because the OpenShift system automatically blocks incorrectly authorized requests.

Provider Configuration

To connect an OpenShift cluster system, it is sufficient to have a named or impersonal user with adequate privileges (e.g., cluster-admin or otherwise sufficient for the intended use) on the cluster.

Authentication:

Username and Password

Notes:

In OpenShift, it is very common to use specially created ServiceAccounts, with corresponding RoleBindings or ClusterRoleBindings.

Users can be both human (named) and technical (impersonal).

4.0.1.2.12 ORACLE PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Resource cost retrieval
- Security information retrieval

The specific parameters of the Oracle subsystem to be entered are shown in the table:

The screenshot shows the Oracle configuration interface. At the top, there are tabs for Cloud Systems, Cloud SIEMs, and Key Vaults, with 'Cloud Systems' being the active tab. Below the tabs, the 'Configuration data' section is visible. Under 'Cloud Provider's Name', the value 'Oracle' is selected from a dropdown. The 'Version' field contains 'v1'. The 'Connection Parameters' section contains several input fields: 'User Ocid' (mandatory), 'Fingerprint' (mandatory), 'Tenancy Ocid' (mandatory), 'Region' (mandatory), 'Realm' (mandatory), and 'Private Key' (mandatory). Below these, there is a 'Catalog Price Discount(-)/Surcharge(+) %' field and an 'ODL ID Reference' field. At the bottom right of the form are buttons for 'Close', 'Test Connection', and 'Save'.

Figura 78 – Oracle configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
username *	string	The username used for authentication with OCI.	ocid5:user.oc77.aaabnbthaj6pnvsb2gqnaaaaait3mqzekefmhkwige2wxna6hfaj3f6njma
fingerprint *	string	Is a unique value that identifies the device, used for authentication with OCI.	6a:f4:6e:9a:73:95:27:d5:64:8d11:a3:f5:0e:fb:f4;

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Name	Type	Description	Example
tenantId *	string	The ID of the OCI tenant to connect to.	ocid1.tenancy.oc1..aaaaabnbthaj6prvstb2gqnaaaaat3mqzekefmihwkige2wxna6hfaj3f6njna
region *	string	The region is the specific geographic location where OCI resources are located.	eu-dcc-rome-1
Realm	string	The name of the logical container that groups OCI resources and their associated costs.	personal-realm.it
keyFile *	password	A PEM file containing the public and private key used for authentication.	"-----BEGIN PRIVATE KEY-----MIJQgIBADANB..."
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	-10
odID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

Provider Configuration

Procedure for creating parameters for external integration in Oracle Cloud Infrastructure (OCI): 1. Access OCI Console

Go to <https://cloud.oracle.com/>
Log in with your Oracle Cloud account.

- Create or Identify the IAM User
In the main console menu, go to Identity & Security > Users. Select an existing user or create a new user for the integration: Click on Create User if you need to create one. Assign a name and an email. Save.
- Associate the user with a group with adequate permissions
After creating the user, you must associate it with a group that has permissions for the resources you want to manage via API. Go to Identity > Groups. Select a group (e.g., Administrators or create a custom group). Click on Add User to Group and add the newly created user.
- Generate the API key (Key File)
Go back to the user page (Identity > Users > select user). Go to the API Keys tab. Click on Add API Key. You have two options: Upload an existing public key (RSA public). Or generate a new public and private key from the console (download the private key). Select "Generate API Key Pair" to locally generate the key: Download the private key (.pem) and save it securely (it is your Key File). The public key will be automatically associated with the user.
- Obtain the required parameters
User OCID (User OCID): Go to Identity > Users > select user. You will find the user OCID on the user page (format ocid1.user.oc1..aaaaaaaa...). Fingerprint: It is the fingerprint of the public API key you added (displayed in the API Keys section). Tenant OCID (Tenant OCID / Main Compartment OCID): Go to Identity > Tenancy (click on the tenancy name in the top left). You will find the tenancy OCID (it is the main tenant, e.g., ocid1.tenancy.oc1..aaaaaaaa...). Region: Choose your OCI region (e.g., eu-frankfurt-1, us-ashburn-1, etc.). You can find it in the top right of the console or in Governance & Administration > Regions. Realm: It is usually oc1 for most public OCI tenants. You can verify this in the documentation or via CLI if necessary.

Summary of parameters and where to find them

Parameter Where to find it / how to obtain it User OCID Identity > Users > select user > OCID Fingerprint Identity > Users > API Keys > fingerprint Tenant OCID Identity > Tenancy > OCID Region Top right of the console (e.g., eu-frankfurt-1) Realm Generally oc1 (standard OCI realm) Key File Private .pem key generated at the time of API Key creation

4.0.1.2.13 ORACLEEXACC PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Resource cost retrieval
- Security information retrieval

The specific parameters of the OracleExAcc subsystem to be entered are shown in the table:

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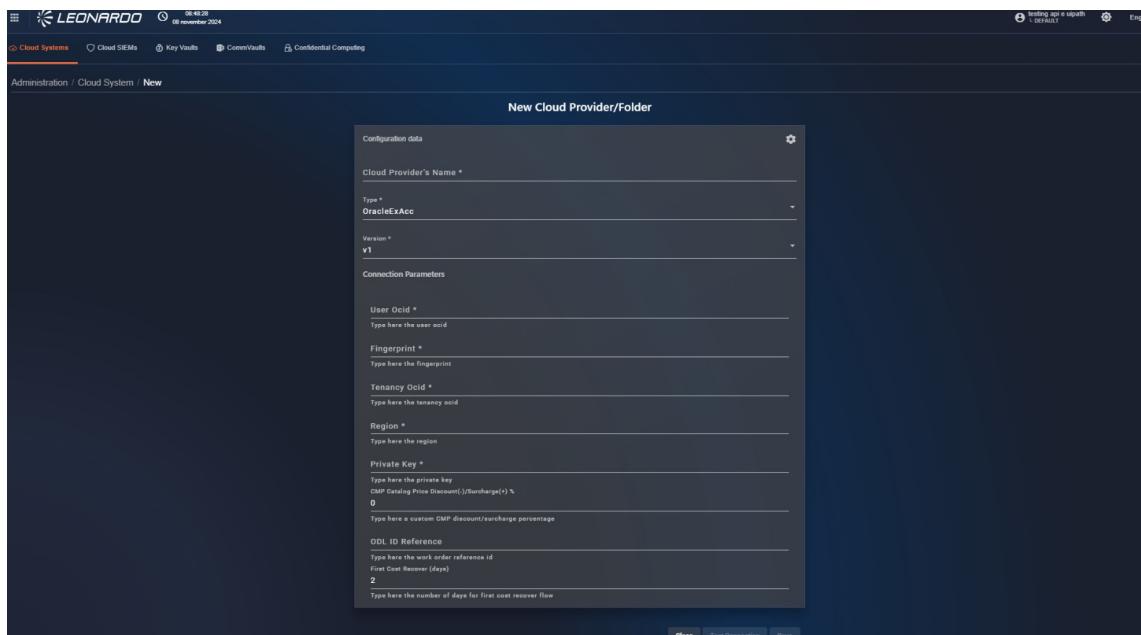


Figura 79 – Configuration mask OracleExAcc

Parameters indicated with * are mandatory.

Name	Type	Description	Example
username *	string	The username used for authentication with OCI.	ocid5.user.oc77.aaabnbthaj6pnvsb2gqnaaaaait3mqzekefmhwkige2wxna6hfaj3f6njma
fingerprint *	string	Is a unique value that identifies the device, used for authentication with OCI.	6a:f4:6e:9a:73:95:27:d5:64:8d11:a3:f5:0e:fb:f4:
tenantid *	string	The ID of the OCI tenant to connect to.	ocid5.tenancy.oc77...aaabnbthaj6pnvsb2gqnaaaaait3mqzekefmhwkige2wxna6hfaj3f6njma
region *	string	The region is the specific geographic location where OCI resources are located.	eu-dcc-rome-1
Private key *	password	A PEM file containing the public and private key used for authentication.	"-----BEGIN PRIVATE KEY-----MIIJQgIBADANB..."
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	-10
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
dataFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

4.0.1.2.14 VCLOUD PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval

The specific parameters of the VCloudDirector subsystem to be entered are shown in the table.

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Figura 80 – VCloudDirector configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
url *	string	The address of the VCloudDirector server to connect to.	https://url.westeurope.com/tenant/org-zzg-435832
tenantid *	string	The VCloudDirector tenant ID is the unique identifier of the tenant to connect to.	org-zzg-435832
Use providerPermission	boolean	To be activated if the user has all provider-level authorizations; if not activated, not all information is retrieved, only that of the enabled organizations.	true
token *	password	The authentication token for the VCloudDirector is a secret string used to authenticate the user with the VCloudDirector.	aesZo6LexKTQx92VoRpyzaesZo6LexKT
Location	String	Enter the region to which the VCloudDirector resources belong.	Eu west
Location	string	Enter the geographical location of the system.	OnPremise
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001

4.0.1.2.15 VMWARE PARAMETERS

Enabled functionalities:

- Catalog item retrieval
- Inventory item retrieval
- Usage metrics retrieval
- Resource cost retrieval
- Security information retrieval
- Resource provisioning
- Service provisioning
- Complex blueprint provisioning

The specific parameters of the VMWare subsystem to be entered are shown in the table:

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The screenshot shows a configuration interface for a VMWare subsystem. The 'Type' field is set to 'VMWare' and the 'Version' to '7.0.0'. The 'Connection Parameters' section requires 'Username', 'Password', and 'URL'. The 'Location' section allows selecting a sub-system location. Below these are fields for 'Total VCPU Capacity', 'Total RAM Capacity (MB)', and 'Total Storage Size Capacity (GB)'. A 'Catalog Price Discount(-)/Surcharge(+) %' field is also present. At the bottom, there's a 'ODL ID Reference' field and buttons for 'Close', 'Test Connection', and 'Save'.

Figura 81 – Configuration mask VMWare

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientId *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q-rP05fCqYNXmbqfMGQLOEfMt
tenantId *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
subscriptionId *	string	The ID of the Azure subscription used to access the Azure Cloud subsystem. A subscription is a contract for using Azure services.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odlID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
daysFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

For On-Premise providers, in particular, data on infrastructure capacity is requested so that the SCMP can perform preliminary calculations in multiple scenarios.

For example, during provisioning, to ensure that the maximum allowed capacity of the provider is not exceeded.

4.0.1.3 Folders

4.0.1.3.1 AZURE FOLDER

To allow the SCMP to leverage all the potential offered by the "Azure" provider, the ability to configure "Folders" has been introduced.

During the creation of a provider, by selecting the "Azure" type, we can observe the presence of an exclusive field for the provider:

- A confirmation box to indicate to the SCMP if the provider being added is a "Folder".

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The screenshot shows the 'Cloud Systems' section of the Leonardo platform. A specific configuration for 'Azure' is displayed. The 'Is a Folder of projects' checkbox is checked and highlighted with a red box. A red arrow points from the left towards this highlighted area.

Figura 82 – Option folder Azure

The specific parameters of the Azure subsystem to be entered are shown in the following table:

The screenshot shows the configuration mask for the Azure Folder. It includes fields for Client ID, Client Secret, Tenant ID, Usage Aggregation (unchecked), Catalog Price Discount, ODL ID Reference, and Days first cost recover. The 'Usage Aggregation' field is unchecked.

Figura 83 – Configuration mask Azure Folder

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientid *	string	The unique ID of the client connecting to the Azure Cloud subsystem. This ID is used to identify the client and authorize access to the subsystem's resources.	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
clientSecret *	password	The client's secret key, used to authenticate the client with the Azure Cloud subsystem. The secret key must be kept confidential and not shared with anyone.	np6Kc_xwsvhR8Q-rP05fcqYNXmbqfMGQLOEzIMt
tenantid *	string	The ID of the Azure tenant to which the Azure Cloud subsystem belongs. A tenant is an organizational entity in Azure representing a company or organization.	884147733-ff13-4783-a765-834183773083
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false

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Name	Type	Description	Example
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	5
odID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
daysFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

4.0.1.3.2 GOOGLE CLOUD FOLDERS

To allow the SCMP to leverage all the potential offered by the "Google Cloud" provider, the ability to configure "Folders" has been introduced, along with the option to import the file generated from the provider's console to simplify its insertion.

During the creation of a provider, by selecting the "Google Cloud" type, we can observe the presence of 2 exclusive fields for the provider:

1. A confirmation box to indicate to the SCMP if the provider being added is a "Folder".
2. A box where, by clicking inside, it will be possible, through the Windows file selection window, to insert the "JSON" file exported directly from the Google console.

Figura 84 – Specific parameters of Google Cloud

The specific parameters for the Google Folder to be entered are shown in the table:

Name	Type	Description	Example
serviceAccount	object	Connection file generated from the Google console	service_account.json
costExportDatasetID	string	Enter the ID of the dataset to be used for information retrieval.	Projectid.dataset.table
usageAggregation	boolean	Indicates whether "usage" aggregation is enabled for the subscription. When this option is enabled, subsystem costs will be grouped by Resource Type.	false
Cost from USD Currency	Boolean	Indicates whether the final cost is calculated from the price in USD or EUR.	true
providerPriceDiscount (only if costFromUSDCurrency is true)	integer	Enter here a discount/markup to apply to provider prices in USD for all resources.	30
Cost cross project	Boolean	Indicates whether to retrieve costs for all projects in the billing account or only for the current project.	true
catalogPriceDiscount	integer	Enter here a discount/markup to apply to catalog prices for all resources that do not have an SCMP relationship.	-20
odID	string	Enter here the ID of the work order that will be associated with the subsystem and will be inserted as a tag on all subsystem resources.	ODL001
daysFirstCostRecover	int	Enter the number of days prior to the creation date for which costs should be recovered at the first startup of the subsystem.	15

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Mandatory Enabled Services

The following services must be enabled on the service account used:

- bigquery.googleapis.com
- cloudresourcemanager.googleapis.com
- clouddataset.googleapis.com
- cloudbilling.googleapis.com
- compute.googleapis.com
- container.googleapis.com
- monitoring.googleapis.com

The "ServiceAccount" field can be automatically entered by uploading the file or manually by entering the fields available in the form.

After configuring a "Folder" type system, it will be displayed in both the cloud provider list and the folders page.

Name	Type	Creation Date	On-Premises	Status	Actions
CMP Managed Folder	GOOGLE	20/05/2024 15:53:40	<input type="checkbox"/>	●	⋮
CMP-Managed Azure Folder	AZURE	20/05/2024 15:54:47	<input type="checkbox"/>	●	⋮
MAE: Digital Transformation	AZURE	20/05/2024 15:54:48	<input type="checkbox"/>	●	⋮
MAE CMP	AZURE	20/05/2024 15:54:49	<input type="checkbox"/>	●	⋮
MAE OSP 2030	AZURE	20/05/2024 15:54:49	<input type="checkbox"/>	●	⋮
MAE LAB	AZURE	20/05/2024 15:54:49	<input type="checkbox"/>	●	⋮
Container Management	AKS	20/05/2024 15:51:19	<input type="checkbox"/>	●	⋮
Cluster 02	OPENSHIFT	20/05/2024 16:48:48	<input type="checkbox"/>	●	⋮
CMP-DEV3 CLUSTER	KUBERNETES	10/06/2024 13:47:59	<input type="checkbox"/>	●	⋮

Figura 85 – See folders

From the "Cloud System" page of the "Administration" module, click the "Folders" tab in the top right, which will display the list of folders configured in the tenant.

Within the page, the same view, modify, and delete operations can be performed on folders as those performed on the "Cloud Provider" page.

Name	Type	Creation Date	On-Premises	Actions
ASL02 Folder	Google	30/06/2023 16:21:22	<input type="checkbox"/>	⋮

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Figura 86 – Access to Folders

When accessing a "Folder" in "View" mode, scrolling down the page reveals a list of subsystems present in the provider and their status information:

- In green, we can see a subsystem correctly configured in the provider that the SCMP automatically adds to the system and will be visible in the "Cloud Providers" section and in all SCMP functionalities.
- In red, we can see an incorrectly configured subsystem which, after appropriate modifications from the "Google Cloud" console, can be accepted by the SCMP.

The screenshot shows a configuration interface for a folder. At the top, there are fields for token, auth provider, client, catalog price discount, and ODL ID reference. Below these, a section titled 'Contained Subsystems:' lists several subsystems. One subsystem, 'ASL02-E-MANAGEMENT', is highlighted with a green border. Another subsystem, 'ASL02-B-PRJ-SEC-SHARED', is highlighted with a red border and has a small warning box to its right stating 'Warning: Subsystem not added (perhaps insufficient permissions?)'. The bottom right corner of the interface has a 'Close' button.

Figura 87 – See subsystems of Folder

4.0.2 SIEM

The user can create a SIEM provider by clicking on the tab depicting a shield, located in the top bar, after accessing the "Cloud SIEMs" page, in the top right, click on the hamburger menu and then click on "Attach a SIEM".

The screenshot shows the 'Cloud SIEMs' page. At the top, there are tabs for 'Cloud Systems', 'Cloud SIEMs' (which is highlighted with a red circle), and 'Secrets Managers'. The main area is titled 'Security Information & Event Manager'. On the left, there is a 'SIEMs list' table with one entry: 'SIEM Pro Edition' (Type: SENTINEL, UUID: 3bb0471-3165-46fd-b937-e1c9bb8994ef, Creation Date: 30/01/2023 11:04:39). To the right of the table, there is a button labeled '+ Attach a SIEM' with a red arrow pointing to it. The top right corner of the interface has a 'cmp_admin' user icon and an 'English' language selection.

Figura 88 – Creation of a SIEM cloud provider

On the "Add SIEM" page, fill in all fields in the "General properties" section. After doing this, fill in all fields in the "SIEM's properties" section according to the table:

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Administration / Cloud SIEMs / Add SIEM

Attach new SIEM

General properties

Name *
SIEM- Business Edition

Type *
SENTINEL

SIEM's properties

clientId *
clientSecret *
resourceGroup *
subscriptionId *
tenantId *

Figura 89 – Compilation of the form to create a SIEM provider

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientId *	string	Unique ID of the SIEM to connect to, provided by the SIEM during application registration.	1b16698f-2df5-ed44-86b9ed-4b42c 1fe7ad9
clientSecret *	password	The secret to use for the connection, provided by the SIEM during application registration.	1b16698f-2df5-ed44-86b9ed-4b42c 1fe7ad9
resourceGroup *	string	The Azure resource group where the SIEM is hosted.	myGroup
subscriptionId *	string	The Azure subscription ID associated with the SIEM.	1b16698f-2df5-ed44-86b9ed-4b42c 1fe7ad9
tenantId *	string	The Azure tenant ID associated with the SIEM.	1b16698f-2df5-ed44-86b9ed-4b42c 1fe7ad9
workspaceID*	string	The Log Analytics workspace ID associated with the SIEM.	1b16698f-2df5-ed44-86b9ed-4b42c 1fe7ad9
workspaceName*	string	The name of the Log Analytics workspace associated with the SIEM.	theWorkspaceName

Finally, in the bottom right, click the "Save" button. Afterward, a popup will appear confirming the SIEM's creation, and the user will be redirected to the list of SIEMs.

4.0.2.1 Viewing, modifying, and deleting

To view a SIEM, next to it, click on the kebab menu and then click "Show". At this point, the user is on the "Show SIEM" page where data can be viewed but not modified. After viewing the data, in the bottom right, click the "Close" button. After this, the user is back on the list of SIEMs.

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The screenshot shows the 'Cloud SIEMs' section of the Leonardo platform. It displays a table with one row: 'Azure Sentinel CMP' (Type: SENTINEL, UUID: b8e937d1-9b23-4d90-963c-48cccd2f03828, Creation Date: 02/12/2022 17:16:44). To the right of the table is a kebab menu with three options: 'Show', 'Edit', and 'Delete'. Two red arrows point to the 'Edit' and 'Delete' buttons.

Figura 90 – Access to SIEM in display mode

The screenshot shows the 'Show SIEM' page for the entry 'Azure Sentinel CMP'. It includes sections for 'General properties' (Name: Azure Sentinel CMP, Type: SENTINEL, UUID: b8e937d1-9b23-4d90-963c-48cccd2f03828, Creation Date: 2022-12-02T17:16:44.02) and 'SIEM's properties' (clientId and clientSecret).

Figura 91 – SIEM in visual mode

To modify a SIEM, next to it, click on the kebab menu and then click "Edit". At this point, you are on the "Edit SIEM" page where fields can be modified.

After modifying the fields of interest, in the bottom right, click the "Update" button. After this, a popup will appear confirming the SIEM's modification, and the user will be back on the list of SIEMs.

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The screenshot shows the 'Administration / Cloud SIEMs' section of the LEONARDO platform. The main title is 'Security Informations & Events Managers'. Below it is a table titled 'SIEMs list' with columns: Name, Type, UUID, and Creation Date. One row is visible: 'Azure Sentinel CMP' (Type: SENTINEL, UUID: b8e937d1-9b23-4d90-963c-48cccd2f03828, Creation Date: 02/12/2022 17:16:44). To the right of the table is a vertical kebab menu with three items: 'Show', 'Edit', and 'Delete'. Two red arrows point to the 'Edit' and 'Delete' buttons.

Figura 92 – Access to SIEM in edit mode

The screenshot shows the 'Edit SIEM' page for the entry 'Azure Sentinel CMP'. The page title is 'Edit SIEM b8e937d1-9b23-4d90-963c-48cccd2f03828'. It contains two main sections: 'General properties' and 'SIEM's properties'. In 'General properties', fields include 'Name' (Azure Sentinel CMP), 'Type' (SENTINEL), 'UUID' (b8e937d1-9b23-4d90-963c-48cccd2f03828), and 'Creation Date' (2022-12-02T17:16:44.02). In 'SIEM's properties', fields include 'clientId', 'clientSecret', and 'resourceGroup' (sentineltest). At the bottom, there are fields for 'subscriptionId' (09f837d5-2dd0-4623-9b82-5a510f0983d2), 'tenantId', 'workspaceId' (6a07ef19-6586-45df-8aae-e59335bba3d7), and 'workspaceName' (workspacedev). A red 'Update' button is located at the bottom right.

Figura 93 – SIEM in edit mode

To delete a SIEM, next to it, click on the kebab menu and then click "Delete". At this point, a modal will appear where you need to click the "Remove" button. After this, the SIEM is no longer present in the list.

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The screenshot shows the 'Administration / Cloud SIEMs' section of the LEONARDO platform. The title 'Security Informations & Events Managers' is displayed. Below it is a table titled 'SIEMs list' with columns: Name, Type, UUID, and Creation Date. A single row is present: 'Azure Sentinel CMP' (Type: SENTINEL, UUID: b8e937d1-9b23-4d90-963c-48cccd2f03828, Creation Date: 02/12/2022 17:16:44). To the right of the table is a context menu with three options: 'Show', 'Edit', and 'Delete'. A red arrow points to the 'Delete' option.

Figura 94 – Option to delete a SIEM "Delete"

The screenshot shows the same 'Administration / Cloud SIEMs' section. A modal dialog box titled 'Confirm SIEM deletion' is displayed. It contains the message 'Are you sure you want to delete the SIEM b8e937d1-9b23-4d90-963c-48cccd2f03828?'. At the bottom of the dialog are two buttons: 'Cancel' and a red 'Remove' button. A red arrow points to the 'Remove' button.

Figura 95 – Confirm to delete a SIEM

4.0.3 Secrets Managers

The user can create a secret manager by clicking on the tab depicting a padlock, located in the top bar, as shown in the figure.

After accessing the "Secret Manager" page, at the top right, click on the burger menu and then click on "Add a secret manager"

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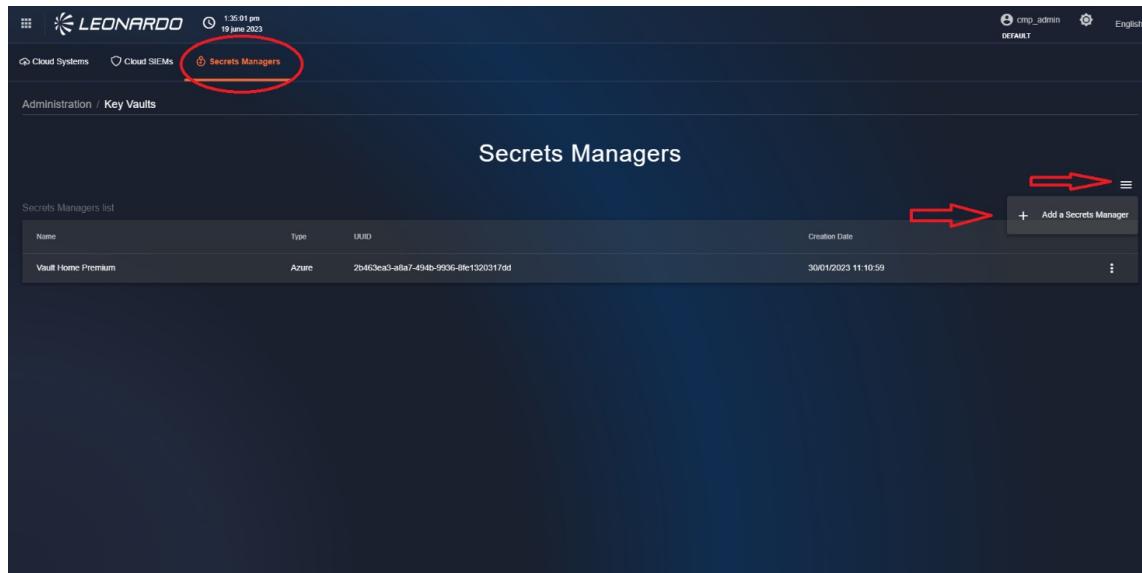


Figura 96 – Add a new Secret Manager

Here is an example form for adding a Secret manager from an Azure type provider (selectable from the "Type" dropdown at the top of the page).

After entering all the required parameters, click the "Save" button at the bottom to complete the entry, and the user will be redirected to the "Secret manager" list where the newly created component can be viewed.

4.0.3.1 Azure Key Vault

The specific parameters for an Azure Key Vault to be entered are shown in the table:

Name	Type	Description	Example
clientId *	string	Unique identifier of the key vault.	09f8985-9f89d0-4623-98982-5a510fd3d2
clientSecret *	password	A secret key used to authenticate the application with the Key Vault.	np6Kc_xwsvhR8Q-rP05fCqYNXmbqfMGQLOEzfMt
resourceGroup *	string	The Azure resource group where the Key Vault is hosted.	resourceGroupName

Figura 97 – Configuration mask Azure key vault

Parameters indicated with * are mandatory.

Name	Type	Description	Example
clientId *	string	Unique identifier of the key vault.	09f8985-9f89d0-4623-98982-5a510fd3d2
clientSecret *	password	A secret key used to authenticate the application with the Key Vault.	np6Kc_xwsvhR8Q-rP05fCqYNXmbqfMGQLOEzfMt
resourceGroup *	string	The Azure resource group where the Key Vault is hosted.	resourceGroupName

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Name	Type	Description	Example
subscriptionId *	string	The Azure subscription ID associated with the Key Vault.	09f8985-9f89d0-4623-98982-5a510fd3d2
tenantId	string	The Azure tenant ID associated with the Key Vault.	09f8985-9f89d0-4623-98982-5a510fd3d2
privateUrl	string	Private access URL to the Key Vault.	https://vault.azure.net/vault

Table 25 – Azure Key Vault specific fields

4.0.3.2 Google Secret Manager

The specific parameters for the Google Secret Manager to be entered are shown in the following table:

The screenshot shows the 'Add new Secrets Manager' page in the Google Cloud Platform. It has two main sections: 'General properties' and 'Secrets Manager's properties'. In the 'General properties' section, the 'Name' field is set to 'Google Cloud Secret Manager'. In the 'Secrets Manager's properties' section, the 'KmsProjectId' field is populated with 'kms-project-1'. Below these sections is a large dashed rectangular area covering several input fields: 'serviceAccount', 'project_id', 'private_key_id', 'private_key', 'client_email', 'client_id', 'auth_uri', 'token_uri', 'auth_provider_x509_cert_url', and 'client_x509_cert_url'. There are also three small buttons at the top right of this area: 'Click here to upload service_account.json', 'Click here to upload pem file', and 'Click here to import from service_account.json'.

Figura 98 – Google Secret Manager configuration mask

Parameters indicated with * are mandatory.

Name	Type	Description	Example
kmsProjectId *	string	The Google Cloud Platform (GCP) project ID associated with the Google Cloud Key Management Service (KMS).	5a85c16c6ad-49db-a58e-e209-ee11f53d6c6b
serviceAccount *	object	Connection file generated from the Google console.	service_account.json

It is possible to manually enter the parameters present in the "service_account.json" file into the displayed form if you do not want to upload it. All parameters are mandatory:

Name	Type	Description	Example
Type	string	Enter the name of the configured authentication type.	service_account
project_id *	string	Enter here the unique ID of the project associated with the service account.	Theproject-367810
private_key_id *	string	Enter here the unique ID of the service account's private key.	55cb5cf903ee93ea1e9c294a07e46e0af0633e6
private_key *	password	Contains the service account's private key in PEM format. It is essential for authenticating the service account to Google Cloud APIs.	-----BEGIN PRIVATE KEY-----MIIJQgIBADANB...

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Name	Type	Description	Example
client_e-mail *	string	The unique email address of the service account. It is used to identify the service account when authenticating to Google Cloud APIs.	user@dominio.com
client_id *	string	The client ID of the service account. It is a unique identifier used to identify the service account in Google Cloud.	104822473261100667392
auth_uri *	string	The URI used for authenticating the service account to Google Cloud APIs.	https://accounts.google.com/o/oauth2/auth
token_uri *	string	The URI used to obtain an access token for the service account.	https://oauth2.googleapis.com/token
auth_provider_x509_cert_url*	string	The URL of the X.509 certificate used for authenticating the service account.	https://www.googleapis.com/oauth2/v1/certs
client_x509_cert_url *	string	The URL of the X.509 certificate in the client.	https://www.googleapis.com/robot/v1/metadata/f543/myserviceaccount%40projectName.gserviceaccount.com

4.0.3.3 Viewing, modifying, and deleting a system

It is possible to view the data of a Secret Manager, within the list, by clicking on the kebab menu corresponding to a manager, and then on "Show".

The screenshot shows the 'Secrets Managers' section of the LEONARDO platform. At the top, there's a navigation bar with the LEONARDO logo, user info ('cmp_admin'), and language ('English'). Below the navigation, there are tabs for 'Cloud Systems', 'Cloud SIEMs', and 'Secrets Managers', with 'Secrets Managers' being the active tab. Underneath, a breadcrumb trail shows 'Administration / Key Vaults'. The main area is titled 'Secrets Managers' and contains a table titled 'Secrets Managers list'. The table has columns for 'Name', 'Type', 'UUID', and 'Creation Date'. A single row is visible, showing 'Vault Home Premium' as the name, 'Azure' as the type, '2b463ea3-a8a7-494b-9936-8fe1320317dd' as the UUID, and '30/01/2023 11:10:59' as the creation date. To the right of this row is a vertical kebab menu with options: 'Show' (highlighted with a red arrow), 'Edit', and 'Delete'.

Figura 99 – Access to the manager in display mode

On this page, you can view the Provider's configuration.

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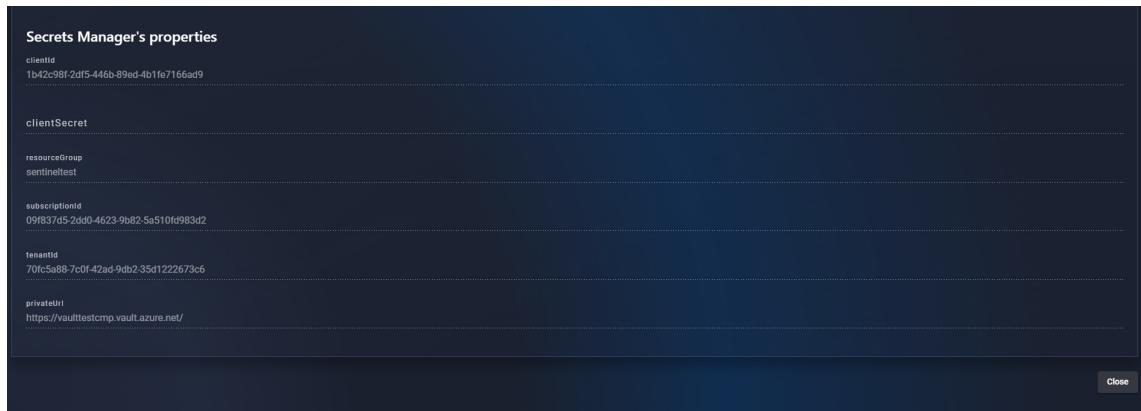


Figura 100 – manager in display mode

To return to the Secret manager page, click the "Close" button in the bottom left.

At this point, the user will be on the Secret manager page.

To modify the data of a Secret manager within the list, click on the kebab menu corresponding to a Cloud Provider, and click on "Edit".

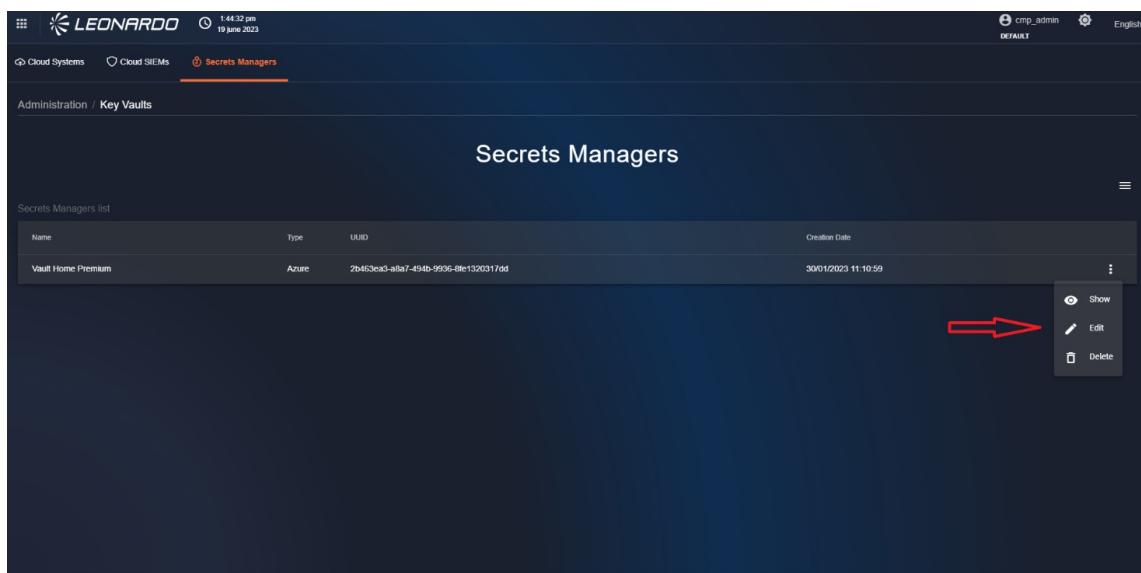


Figura 101 – Access to the manager in edit mode

After doing so, the user will be on the Cloud Provider page in edit mode where data can be modified. To return to the Cloud Provider page, click the "Save" button in the bottom left. At this point, the user will be on the Cloud Provider page.

To delete a "Secret manager", within the list, click on the kebab menu at a Secret Manager, and click on "Delete".

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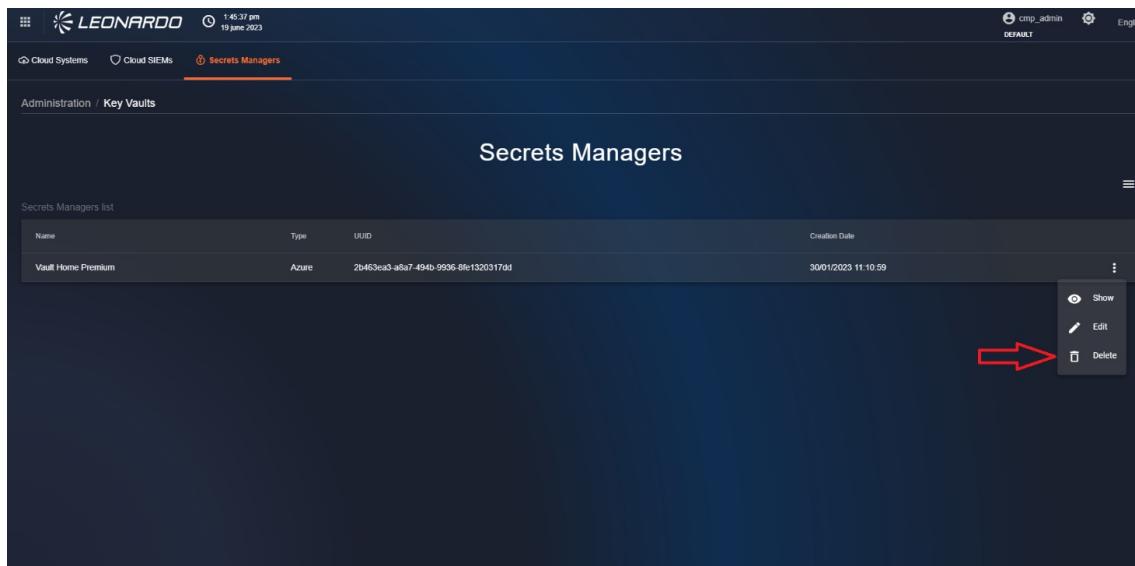


Figura 102 – Starting for the Elimination of a Secret Manager

Done that, a modal will appear where you need to click on the "Remove" button

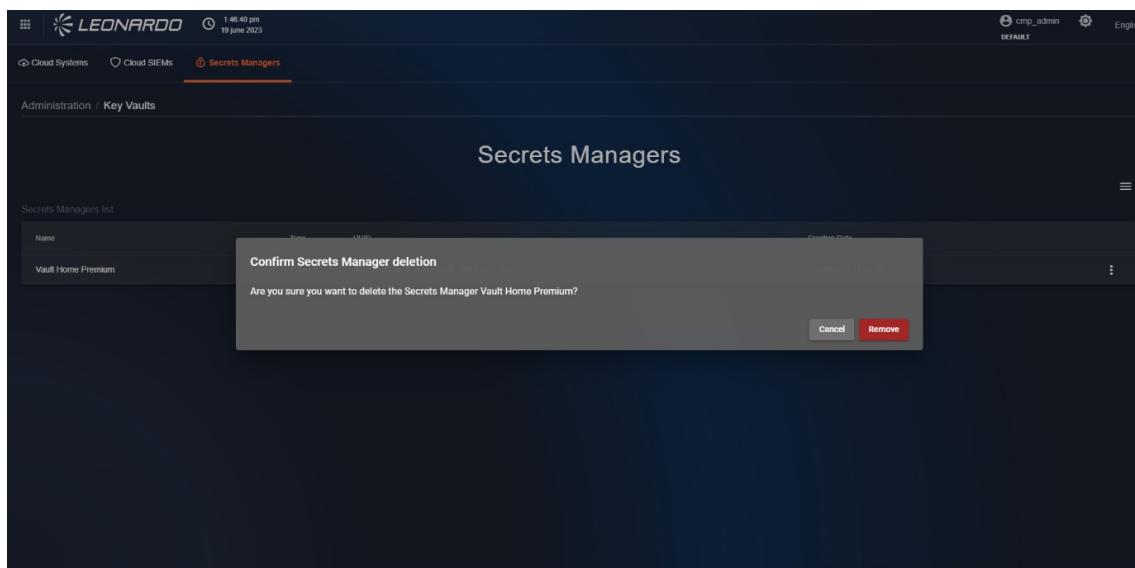


Figura 103 – Confirm deletion of the Secret Manager

At this point, the Secret manager will no longer be present in the list, and the asset removal flow will be launched on the resource-manager.

4.0.4 Backup

The user is given the ability to connect the SCMP to a CommVault to subsequently retrieve and display information related to backups and operations performed by the Vault.

To access this functionality, you need to select the "CommVault" tab available at the top of the "Administration" functionality.

We will be directed to the page containing the list of all configured "CommVaults", and by clicking on the menu on the right, it will be possible to add a new CommVault.

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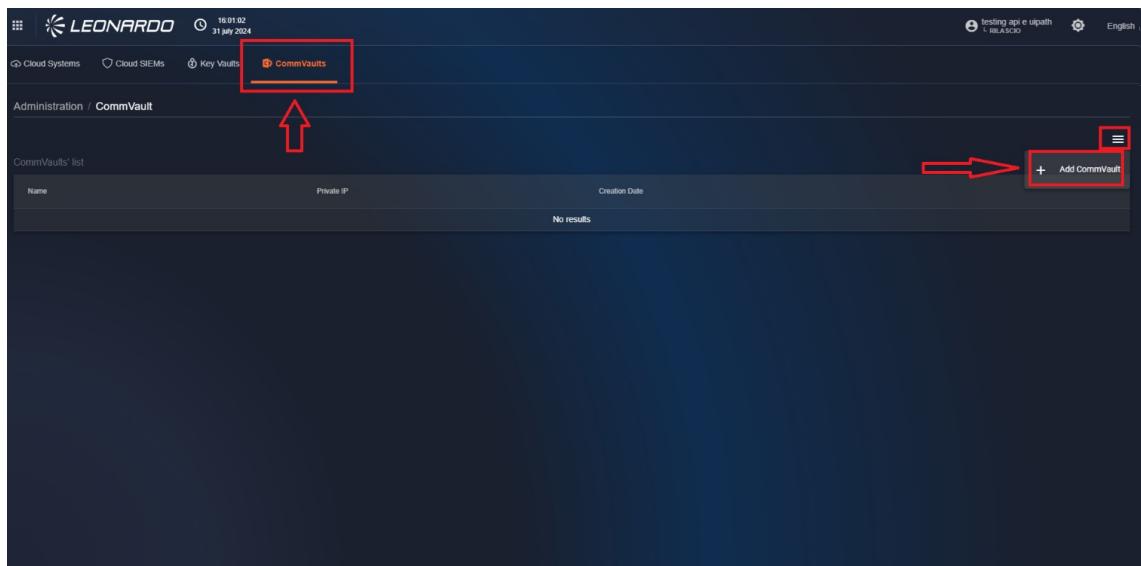


Figura 104 – Accesso a un CommVault

On this page, after entering the access credentials (IP address, username, and password), we can click the "Test connection" button to confirm the correct data entry and then confirm the entry via the "Save" button.

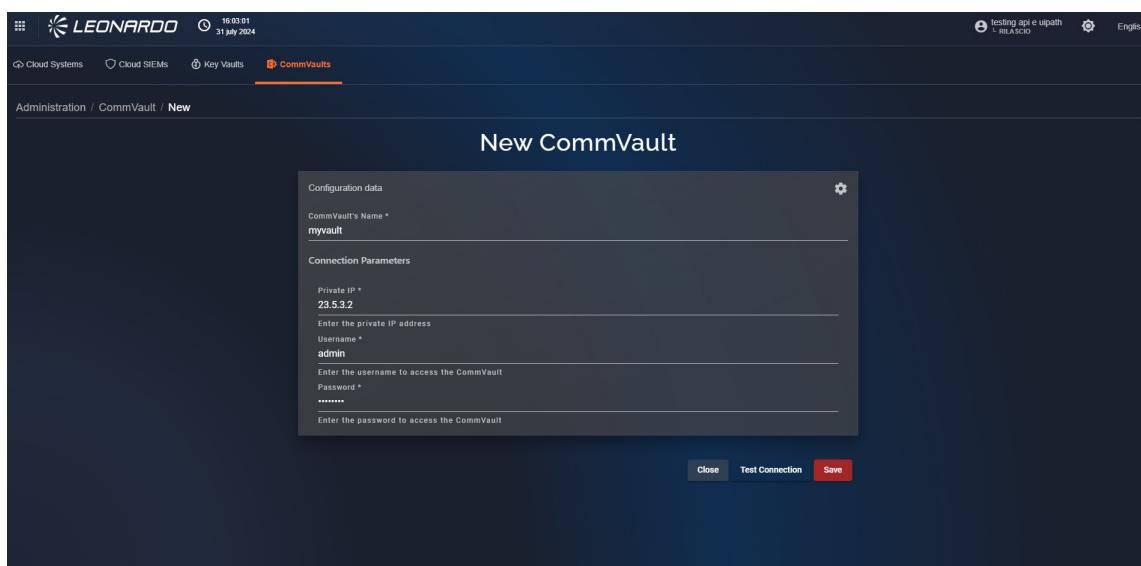


Figura 105 – Creazione di una connessione a un CommVault

4.0.5 Confidential computing

In the Confidential Computing section, the user is given the ability to add a connection to a "Remote Attestation" service within the SCMP to control and view information regarding the confidentiality status of machines managed by the service.

To access this functionality, you need to select the "Confidential computing" tab available at the top in the "Administration" functionality.

We will be directed to the page containing the list of all configured "Remote attestation" services, and by clicking on the menu on the right, it will be possible to add a new connection.

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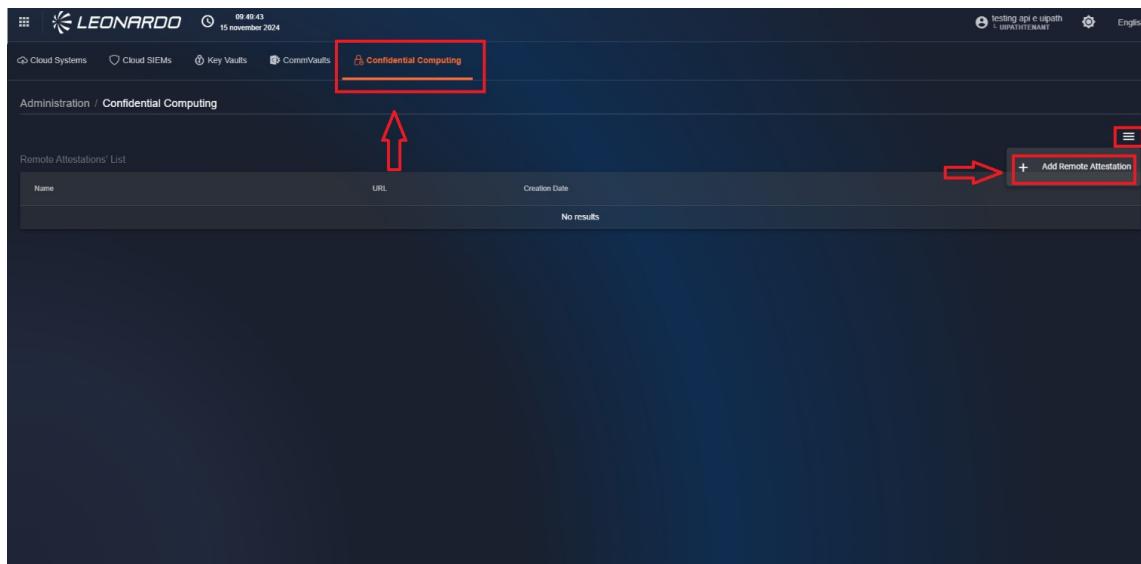


Figura 106 – Accesso a Confidential Computing

On this page, after entering the access credentials (IP address, username, and password), we can click the "Test connection" button to confirm the correct data entry and then confirm the entry via the "Save" button.

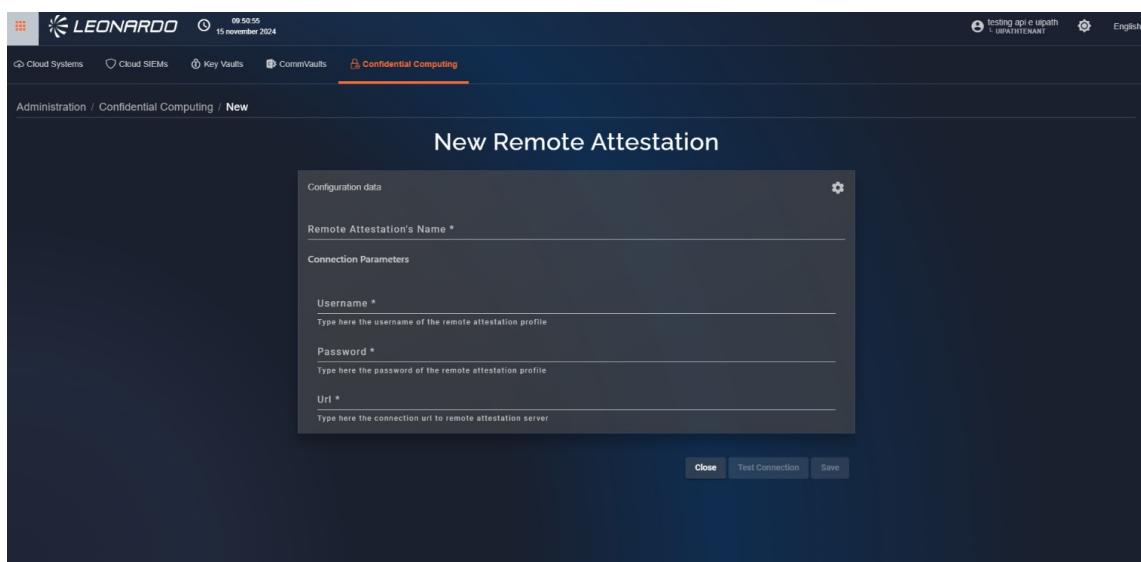


Figura 107 – Creation of connection to a service "Remote Attestation"

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5 Dashboard

Accessing the SCMP, the homepage presents a summary of four sections: inventory, monitoring, costs, and security.

In particular:

- The Inventory section shows:
 - A pie chart regarding SCMP resources (for each resource of a single provider, an SCMP type instance is created, so the data can be considered as the sum of all resources present across all providers).
 - A pie chart for each provider type.
- The monitoring section shows the most populated metrics with their relative usage.
- The costs section shows a summary of costs for the last 30 days.
- The security section shows the most severe vulnerabilities.

The title of each section is clickable and leads to the specific dashboard.



Figura 108 – Dashboard section "Inventory"

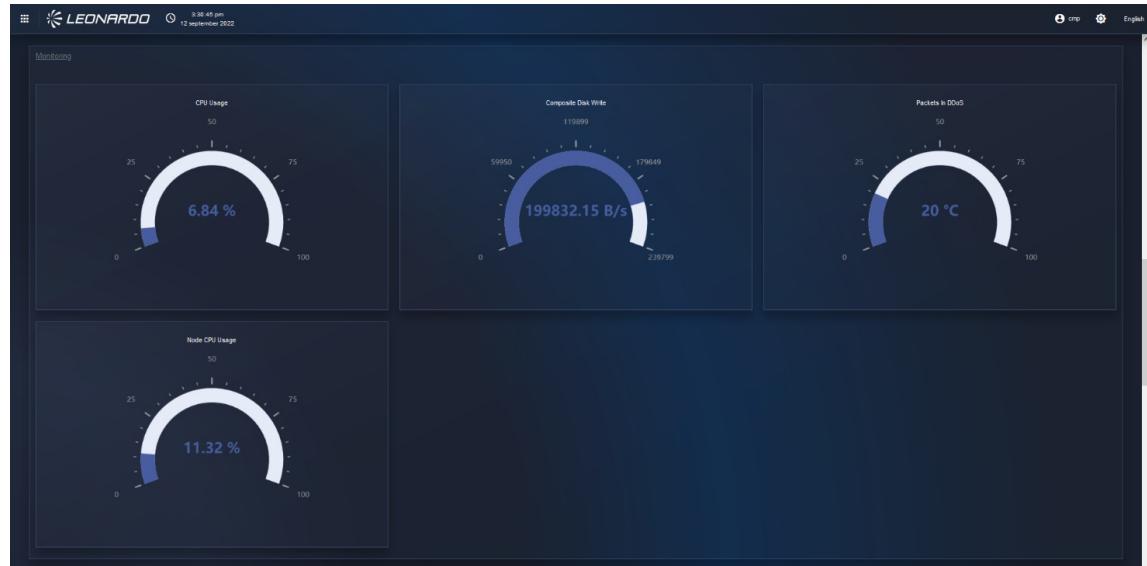


Figura 109 – Dashboard section "Monitoring"

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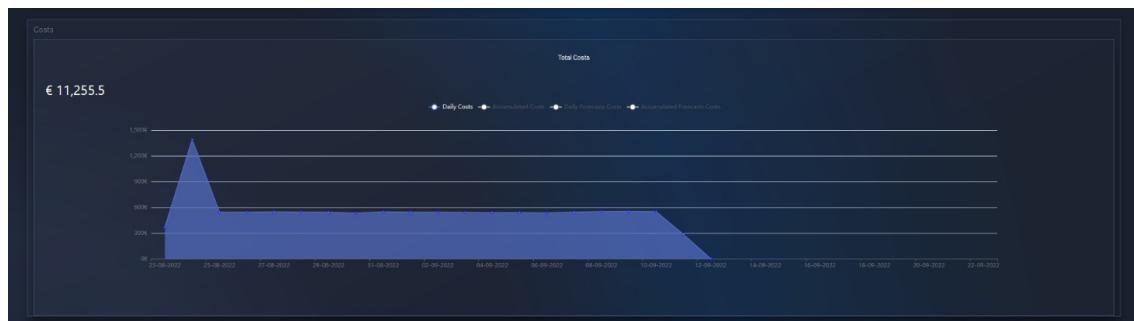


Figura 110 – Dashboard section "Costs"



Figura 111 – Dashboard section "Security"

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6 Inventory

The inventory functionality collects metadata of installed assets across all providers present on the SCMP.

The assets currently present are:

- Virtual Machine
- Data Stores
- Networks
- Clusters
- Edge
- Security
- Others

Heterogeneous metadata, coming from different sources, is then normalized by the SCMP to allow for standard visualization.

Inventory is accessible from the "Inventory" menu item.



Figura 112 – Accesso a Inventory

6.0.1 Inventory Dashboard

The Dashboard page provides a global and aggregated view of all resources, while the menus above the breadcrumb path allow filtering by resource type. The functionalities available on the various pages are identical.

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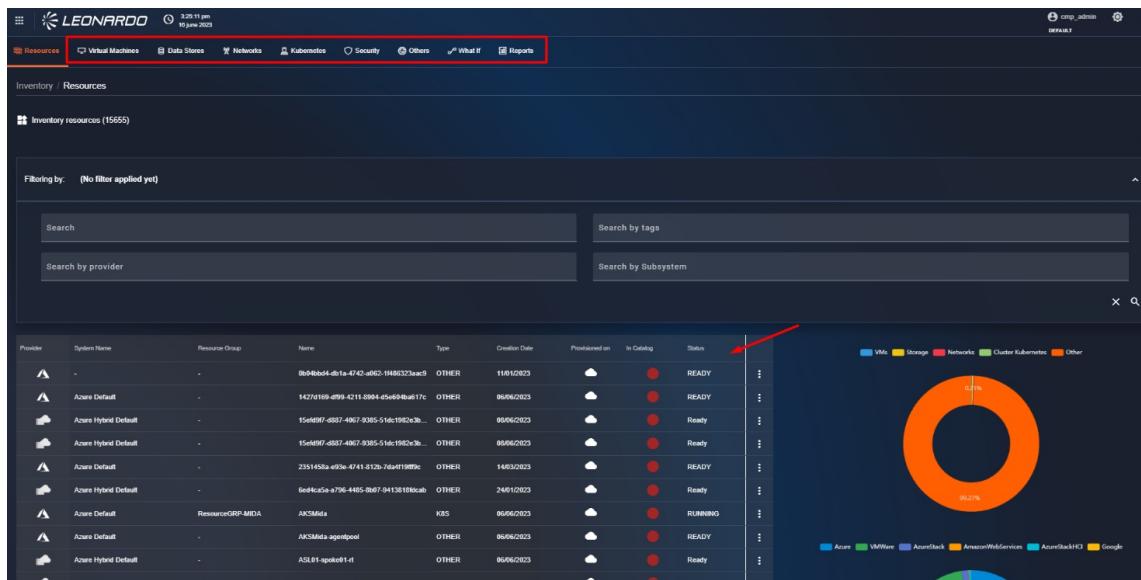


Figura 113 – dashboard di inventario

Within the "Resources" tab page, there are filters; in the first filter at the top, it is possible to search for resources by name, resource group, Provider, etc. It is also possible to filter resources by "Provider" and "Subsystem".

The last filter allows searching by tag. Click on it and select a tag, then by clicking the button depicting a magnifying glass, the page will refresh and display the list of filtered resources.

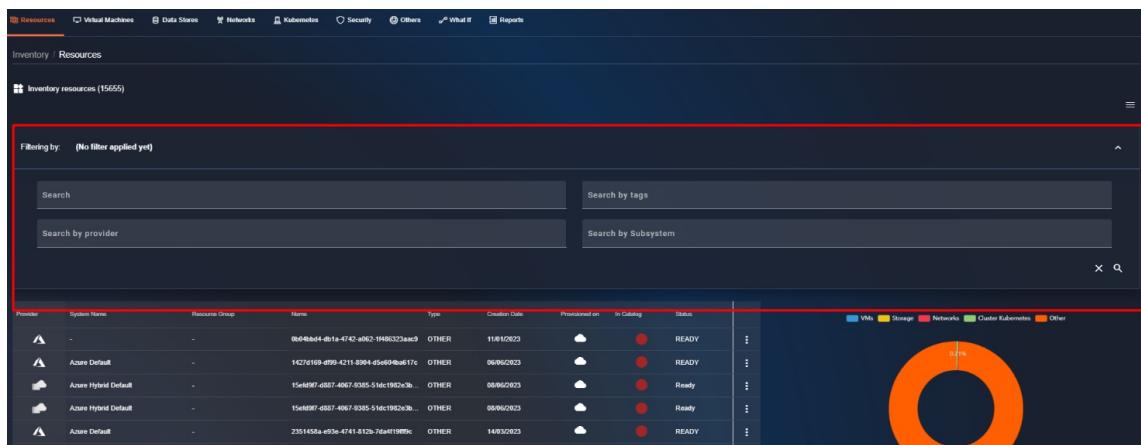


Figura 114 – Ricerca generica, per tag, per Provider e Subsystem

It is also possible to click on the graphs to automatically apply the relevant filters.

6.0.1.1 Resource detail view

To view the details of a resource, you can click as shown in the figure:

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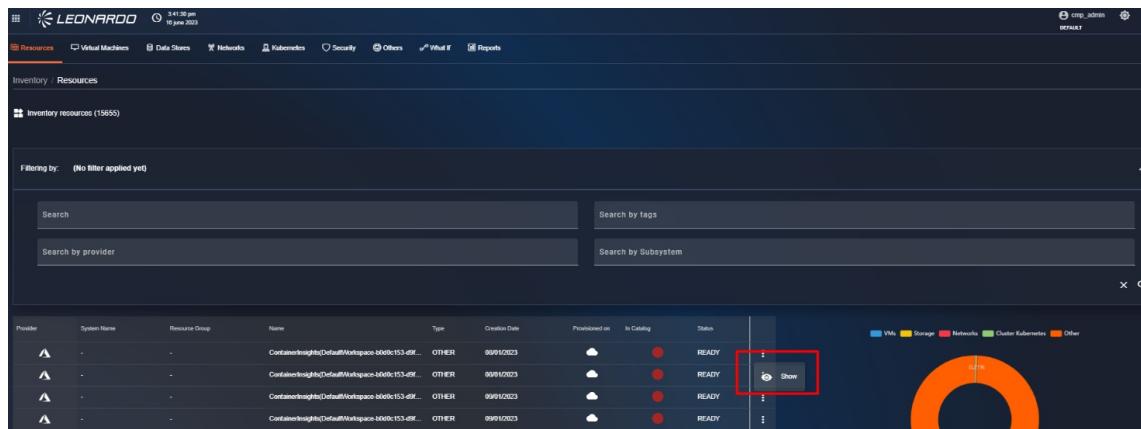


Figura 115 – Accesso alla risorsa in modalità lettura

The detail of an inventory asset shows the main characteristics at the top, such as monthly cost, machine size, and an external link to the resource pointing to the reference provider.

Below is the detailed view of a VM:

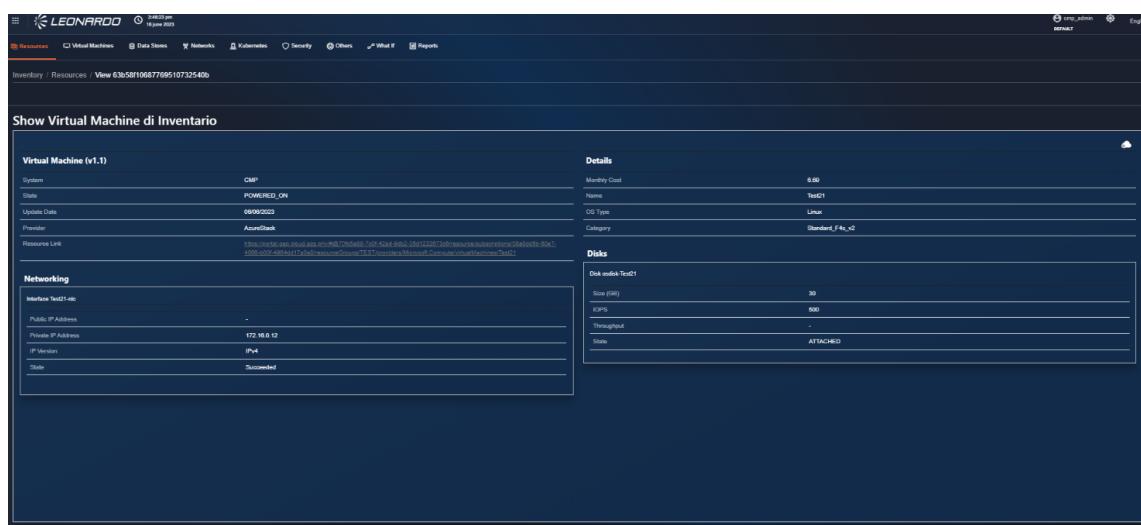


Figura 116 – Dettaglio risorsa

And at the bottom, the asset's relationships with other SCMP elements, as shown in the figure:

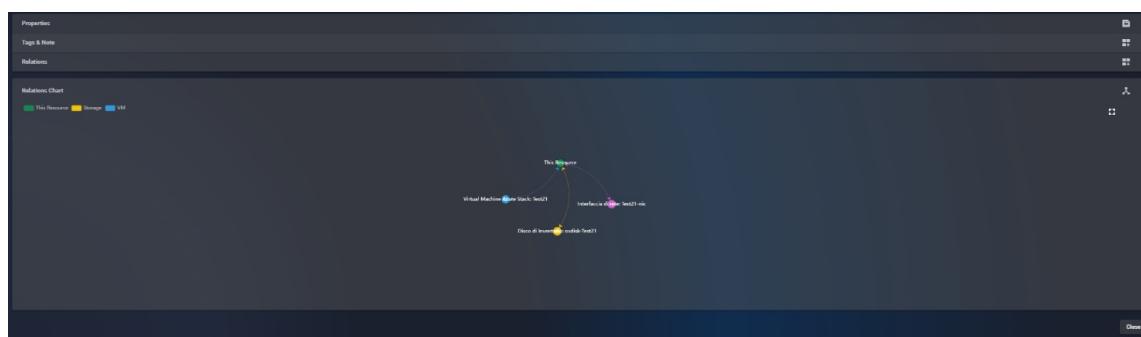


Figura 117 – Grafico delle relazioni

The relationship graph allows navigating between resources by directly clicking on the circle of the linked resource, in order to land on its details.

Furthermore, it is possible to edit some attributes, such as tags, as shown in the figure:

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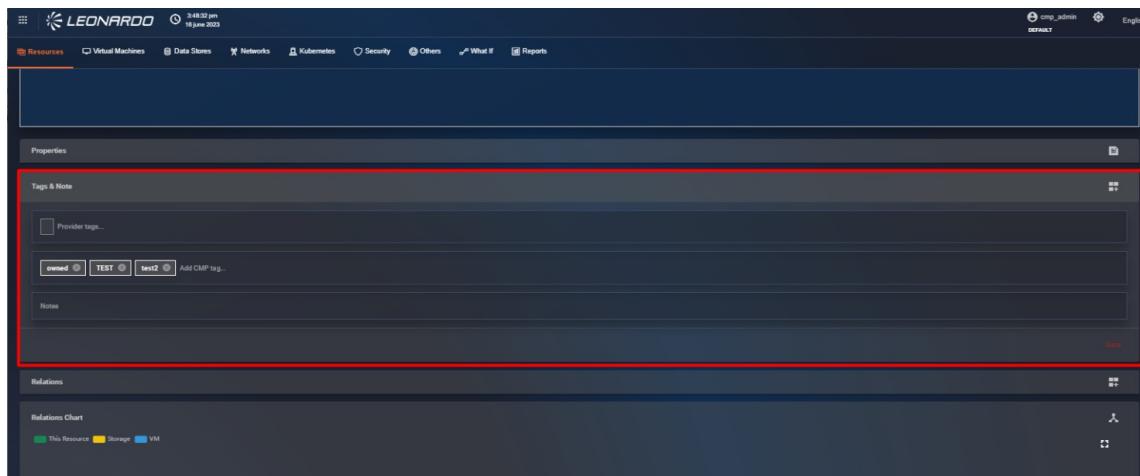


Figura 118 – Selezione del tag

For the "Provider Tags..." field, it is not possible to select a tag, as tags in this section are retrieved directly from the subsystem.

The "Add SCMP Tag..." field allows selecting from a list or manually entering one. Inside the tag, there is an "X" symbol to delete it.

It is possible to add multiple tags to the resource.

Subsequently, in the bottom right of the "Tags & Note" section, click on the "Save" button to save the change, and a banner will appear at the bottom indicating the tag has been saved.

Scroll the page to the bottom, and click on the "Close" button located on the right to return to the "Dashboard" tab page.

6.0.1.2 Actions on inventory machines

For inventory machines from supported providers, a new button available in the table context menu called "Manage" can be used to perform basic operations on the machines.

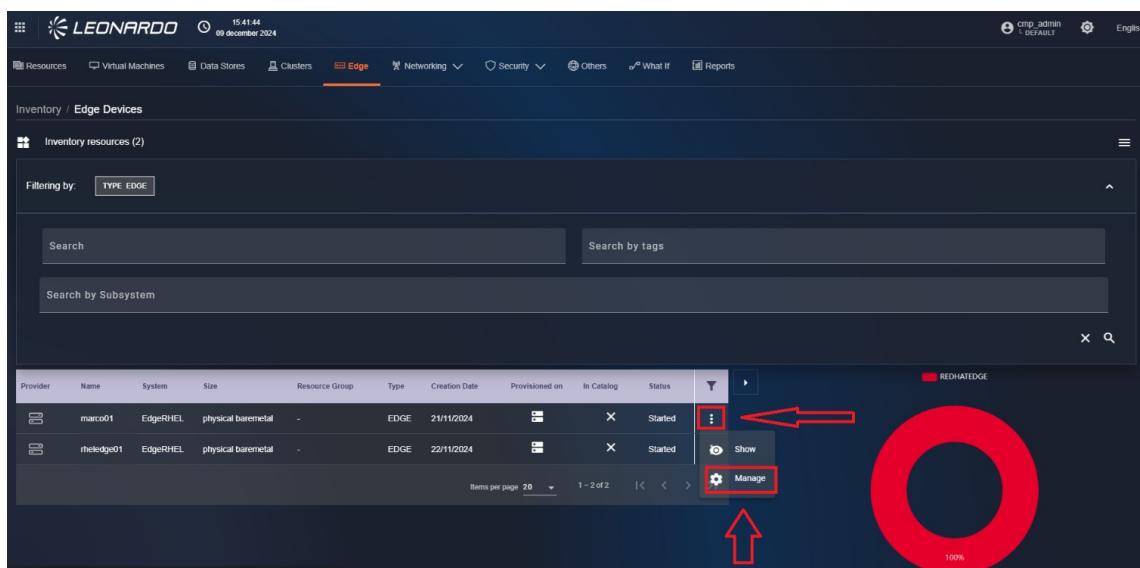


Figura 119 – Accesso alla funzionalità di "management"

From this resource detail page, the following operations can be performed using the menu at the top of the page; the operations available on the machines may vary depending on the provider:

Azure Stack HCI

- Start machine
- Stop machine
- Resize machine
- Add storage disks
- Add network interface
- Delete resource

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- Remove disk from resource
- Remove network interface

Red Hat Edge

- Update an EDGE device image

Operations are indicated in white when they can be executed and in gray when they are not supported or unavailable for the resource.

Figura 120 – Operazioni sulle macchine di inventario

6.0.1.3 “Cluster Explorer” functionality

Cluster Explorer is a powerful feature that allows users to view namespaces within a cluster in detail. This function provides a comprehensive overview of data and resource organization within the cluster, facilitating navigation and management of complex environments.

With Cluster Explorer, users can:

- View the complete list of namespaces in a cluster: Get a quick overview of all available namespaces in the cluster.
- Examine the details of each namespace: Access complete information about each namespace, including name, description, labels, and resource quotas.
- Filter and search namespaces: Quickly find specific namespaces using advanced filtering and search criteria.

To access the functionality, select the “Clusters” item from the horizontal menu of the Inventory module.

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Figura 121 – Accesso alla funzionalità di cluster explorer

Inside the page, a list of clusters present within the subsystems configured in the system will be displayed. Clicking on one of them will open a modal with the general details of the cluster.

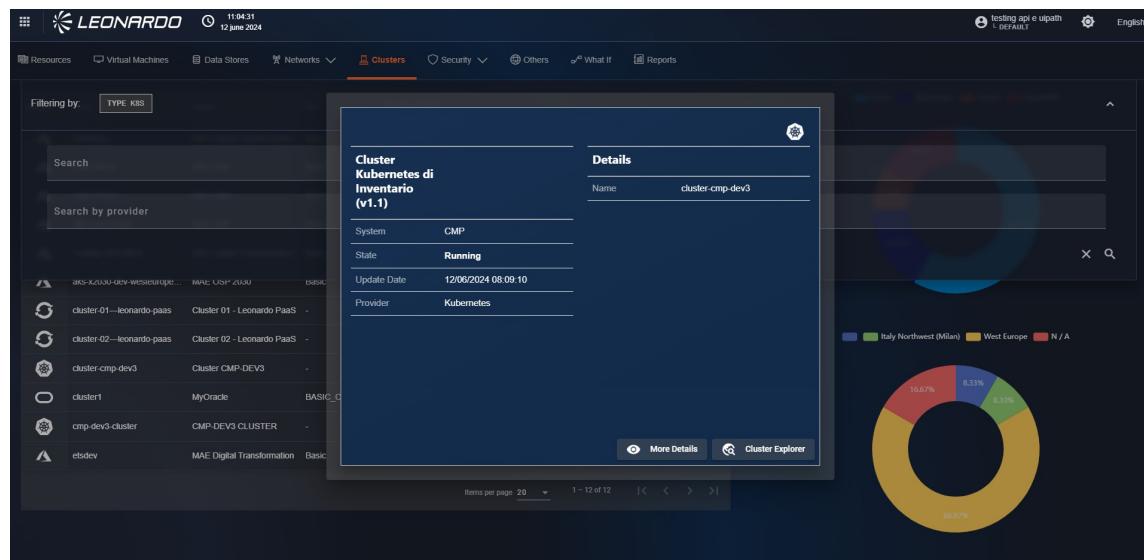


Figura 122 – Finestra di dettaglio del cluster

We can notice that at the bottom right there is a "cluster explorer" button; pressing it will redirect us to the cluster Dashboard. This page can also be accessed using the "cluster explorer" button available in the "three dots" context menu present for each cluster in the list of results.

Within this page, we can view a graph representing the distribution of namespaces within the cluster; on the right, the legend of namespaces with the number of active pods is displayed.

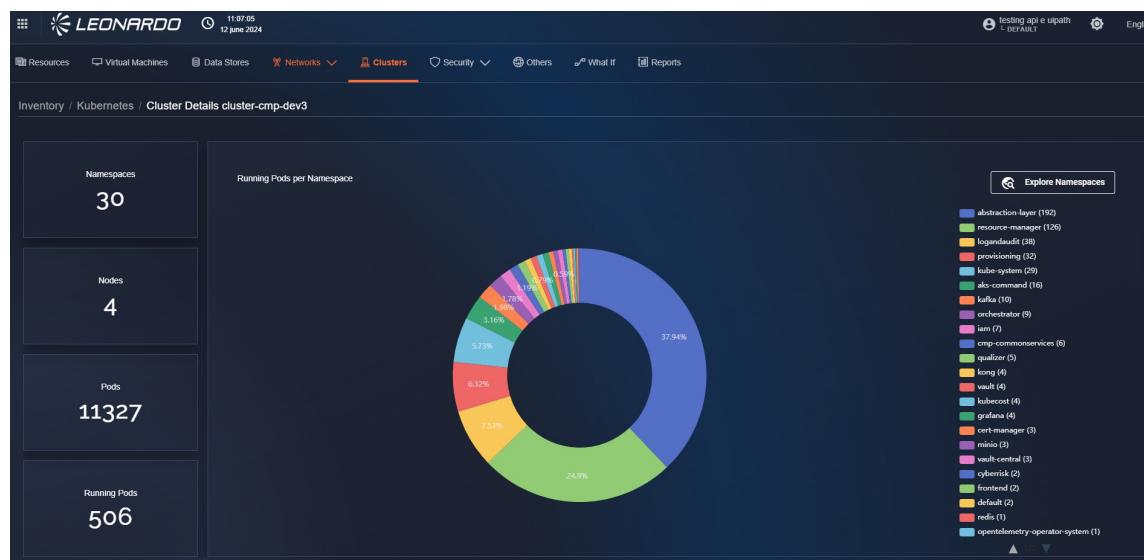


Figura 123 – Dashboard del "cluster explorer"

We can drill down into the details of namespaces using different components on the page:

it is possible to click on the "Explore namespaces" button at the top right or click on the number of namespaces displayed at the top left to view the namespace exploration page without filters. If we want to directly view the details of a namespace present in the graph, it is possible to click on the corresponding slice, and the detail page will be automatically filtered for the selected namespace.

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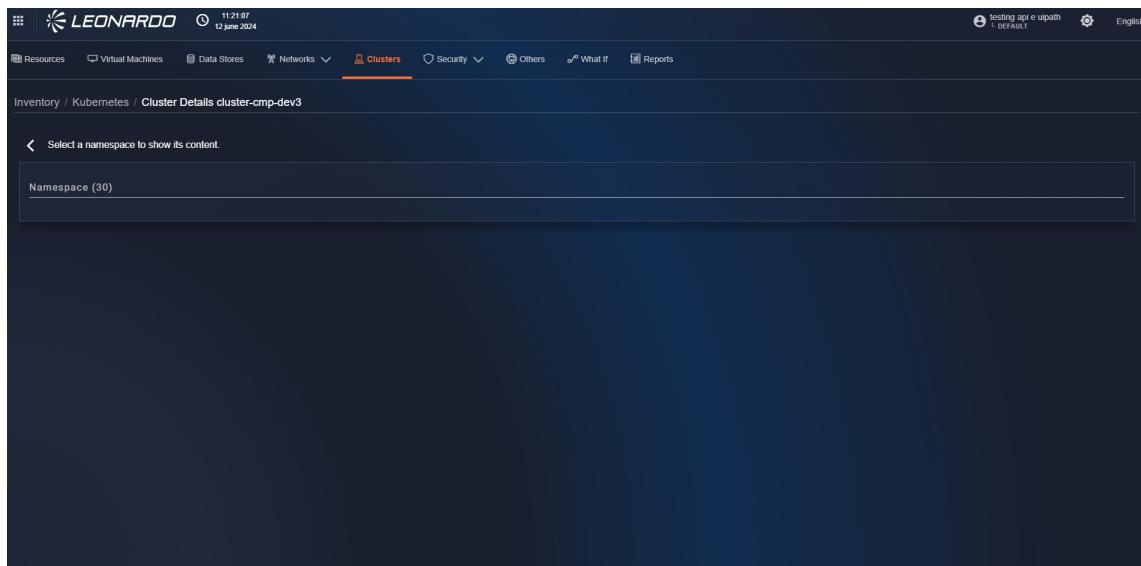


Figura 124 – Pagina "Namespace explorer"

The namespaces field at the top allows searching among available clusters by entering free text. If a match is found, you can select the namespace from the list to view its details.

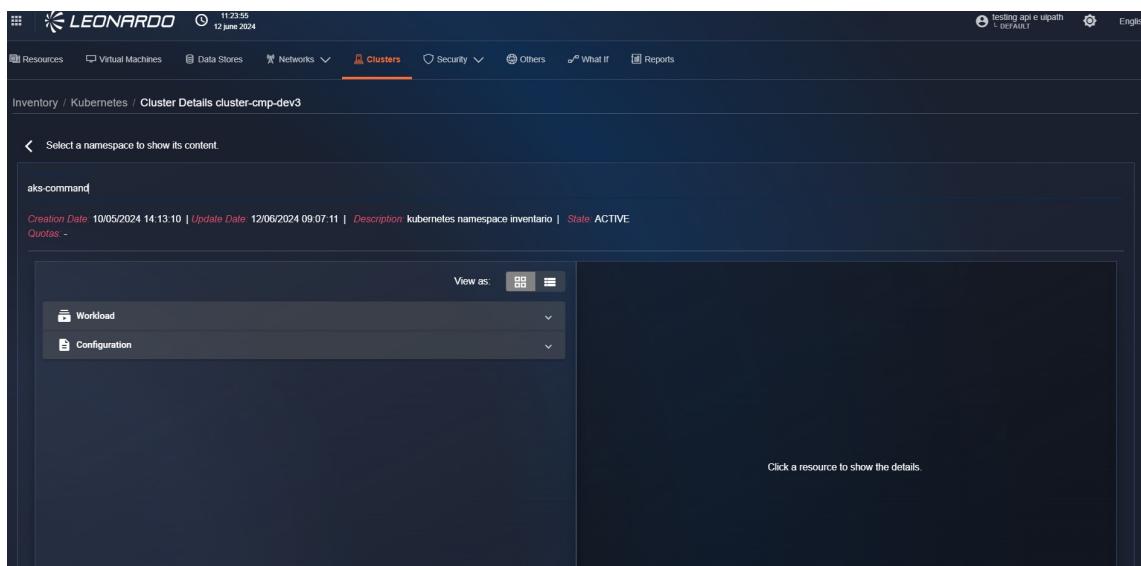


Figura 125 – Dettaglio dei namespace

Using the "Down Arrow" commands, it will be possible to navigate between available categories and sub-categories of elements. Finally, by selecting a result, its details will be displayed in the right section of the page, which will be automatically populated with the selected result from the left.

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The screenshot shows the Leonardo platform interface. At the top, there's a navigation bar with tabs like Resources, Virtual Machines, Data Stores, Networks, Clusters, Security, Others, What If, and Reports. The 'Clusters' tab is currently selected. Below the navigation is a breadcrumb path: Creation Date 10/05/2024 14:13:10 | Update Date 12/06/2024 09:07:11 | Description kubernetes namespace inventory | State ACTIVE. A 'Quotas' link is also present.

The main content area has a title 'Workload' under 'POD (229)'. It lists several pods: command-94..., command-5fd..., command-29..., command-16..., command-b1..., command-0a..., command-c3..., command-bf2..., command-aa..., command-a8..., command-42..., command-6d..., command-0f..., command-08..., command-07..., and command-0d... . To the right, a detailed view of a specific pod is shown:

- Creation Date:** 22/05/2024 05:05:30
- Name:** command-9492279db8094a4968e3cd0213f53f
- Description:** kubernetes pod inventory
- State:** FAILED
- ID:** 664d7d1a3c94de4c658f79ca
- UUID:** e2bbbd1b-4d84-41db-ae07-038d60e1aa3b
- Node Name:** aks-poolnew-6715053.vms5000000
- Pod IP Address:** 10.244.4.152
- Host IP Address:** 198.18.110.18
- State:** SUCCEEDED
- App Name:** undefined

A table below shows resource requirements:

Name	CPU Limit	CPU Request	Memory Limit	Memory Request
user-command	500 m	200 m	1.073.741.824 B	524.288.000 B

Figura 126 – Dettagli del contenuto del namespace

6.0.2 "WHAT IF" Functionality

This functionality allows performing simulations for asset migration from one provider to another, or within the same provider, in order to compare management and maintenance costs.

To run a simulation, click on the tab above the breadcrumb path that depicts a relationship connecting two entities, named 'What If'.

The screenshot shows the Leonardo platform interface with the 'What If' tab selected in the top navigation bar. The breadcrumb path is: Inventory / Resources. The main content area displays a table of resources, with the 'What If' tab highlighted in red.

The table columns include Provider, System Name, Resource Group, Name, Type, Created Date, Provisioned on, In Catalog, and Status. The table lists various resources across different providers (VMware Default, Azure Default, Azure Hybrid Default) and types (Storage, Network, Interface).

On the right side of the screen, there are two circular dashboards. The top one is labeled 'VMs' and the bottom one is labeled 'Storage'. Below the dashboards, there are legends for different cloud providers: Azure (blue), VMware (green), Amazon (orange), AWS Lambda (yellow), and Google (red).

Figura 127 – Accesso a "What If"

After doing so, you will find yourself on the "What If" tab page.

Above the list of simulations, on the right, we can notice two tabs that allow filtering the list by simulation type, specifically:

upon opening the page, all "Change Provider" type simulations will be displayed, while clicking on the "Capacity" tab will allow viewing the list of "Change size" type simulations.

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Name	Creation Date	Destination Providers	Status	Export	Options
Multiple Provider Migration	16/04/2024 10:05	Azure, Google, Oracle	●		
Multiple Provider Migration	16/04/2024 10:02	Azure, Oracle	●		
Multiple Provider Migration	15/04/2024 14:39	Google, Azure, Oracle	●		
Multiple Provider Migration	15/04/2024 12:59	Google, Oracle	●		
Multiple Provider Migration	11/03/2024 10:24	Google, Oracle	●		

Figura 128 – Pagina di "What If"

6.0.2.1 Scenario "What If": Provider Migration

To perform a "What If: Migrate Provider" simulation, click on the box on the left titled "Migrate to another provider".

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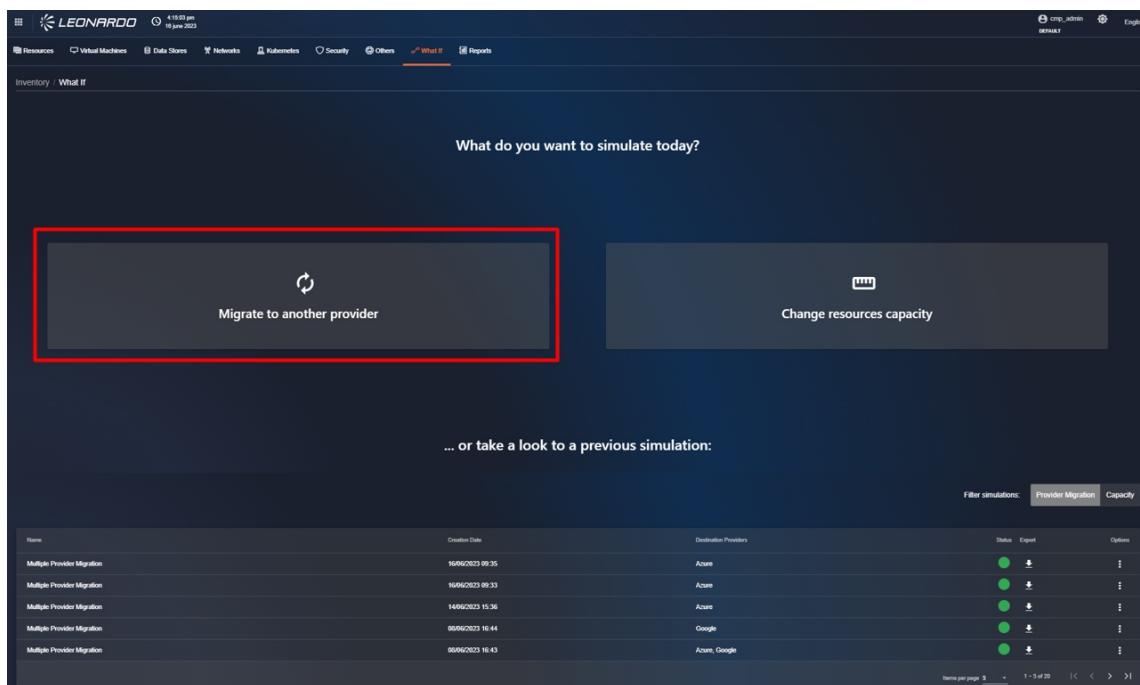


Figura 129 – Accesso alla funzionalità "What If: Migrate Provider"

After doing so, the user will find themselves on the "Start" page of step 1 for simulating resource migration from one cloud provider to another.

On the left, in the "Select Resources to migrate" box, the user can search for resources using three types of filters, including:

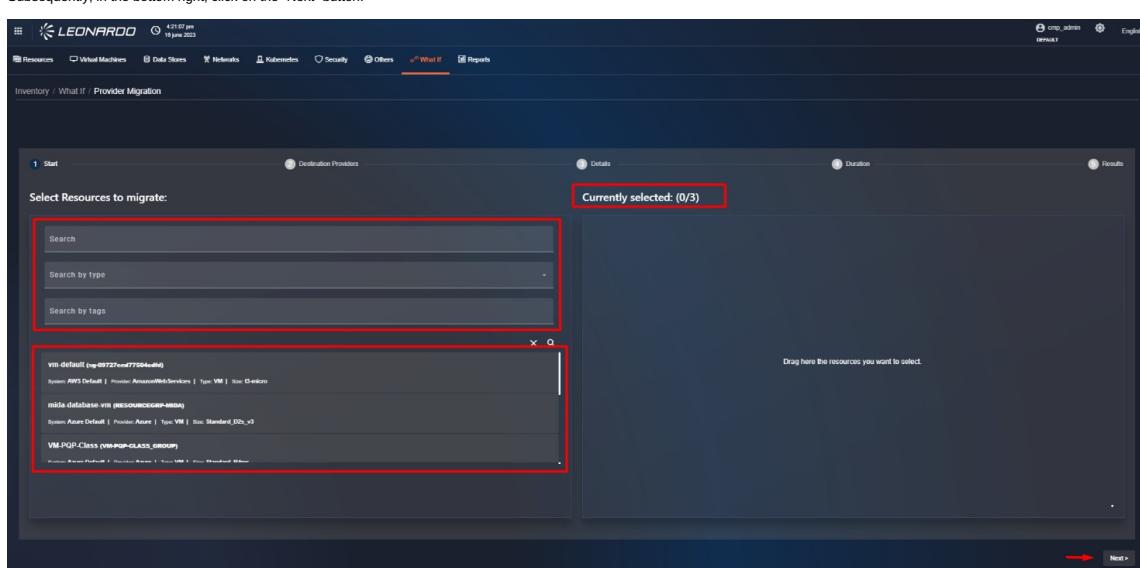
- "Search" which allows searching for a resource by name;
- "Search by Type" to obtain resources by selecting the resource type;
- "Search by tags" which allows searching for resources using one or more tags.

Within the resource table, only resources that have a relationship in the catalog will be displayed.

Within the resource table, click on one of them and, using the "drag and drop" technique, drag it to the right, into the box titled "Currently selected".

A maximum of three resources can be included per simulation.

Subsequently, in the bottom right, click on the "Next" button.



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Figura 130 – Scelta delle risorse in cui effettuare la migrazione del provider

After doing so, the user will find themselves on the "Destination Providers" page of step 2, where it is possible to click on the checkbox corresponding to one or more providers. Based on the selected provider type, the value in the 'Option selected' field at the bottom left will be automatically populated with the names of the selected providers.

Subsequently, in the bottom right, click on the "Next" button, while to return to the "Start" page of step 1, click on the "Back" button.

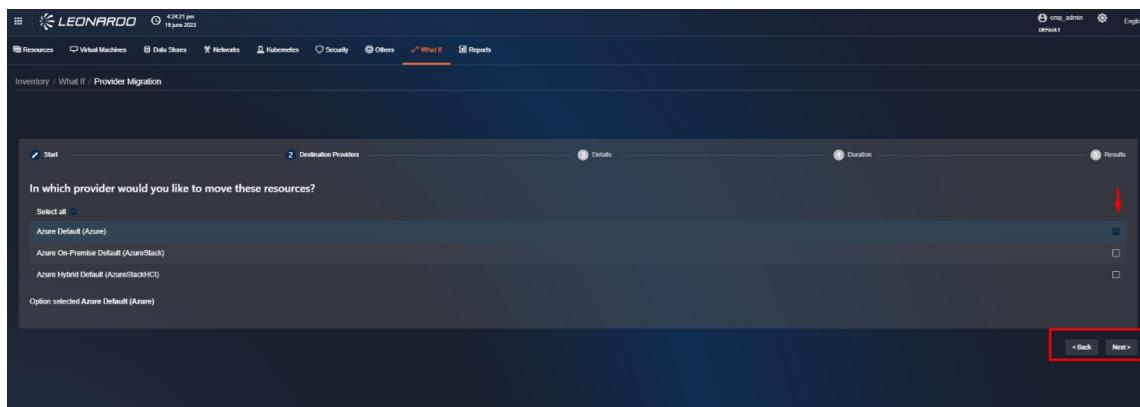


Figura 131 – Scelta del Cloud Provider in cui migrare le risorse

After clicking the "Next" button, the user will find themselves on the page of step 3 titled "Details".

On this page, cards will be displayed, one for each subsystem selected in step 2.

In each card, on the left, there is a list of regions available for the cloud provider, and on the right, an empty section is displayed.

Selecting one or more regions in the right section (in red in the figure) will display a menu in the right section that allows selecting the type of cost to apply (in yellow in the figure). Selecting the "Consumption" type requires no further parameters, while selecting the "Reservation" type, to the left of the field, it will be possible to choose the Reservation period (in yellow in the figure).

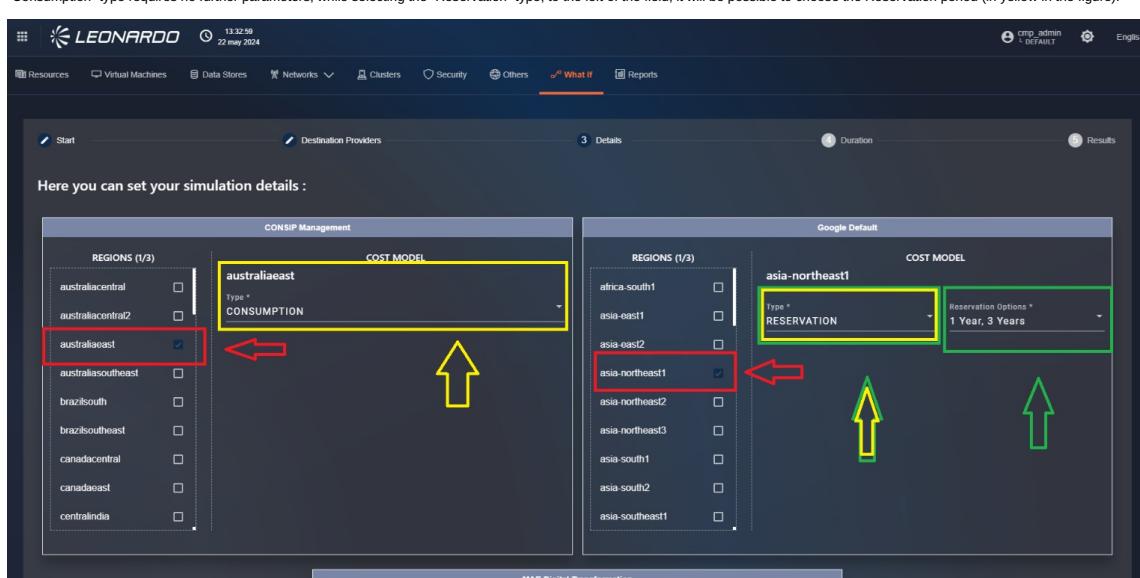


Figura 132 – Selezione della "Regione" e del "Cost Model"

After clicking the "Next" button, the user will find themselves in step 4 titled "Duration".

From the "Duration" page of step 4, select an interval for the simulation among:

- "One Month"
- "Six Months"
- "One Year"

To return to the "Details" page, in the bottom right, click on the "Back" button. Instead, to proceed with the simulation, click on the "Launch Simulation" button.

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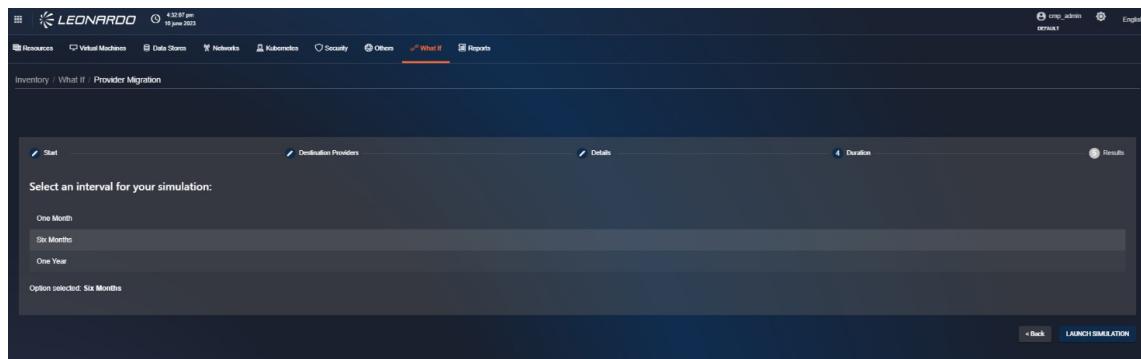


Figura 133 – Selezione dell'intervallo di tempo

After clicking the "Launch Simulation" button, the user will find themselves on the "Results" page of step 5.

Within the "Results" page, at the top, the "Simulation parameters" box can be viewed, which contains a summary of the parameters used. (in yellow in the figure)

Below the "Summary" box, there are different sections, one for each destination provider (in red in the figure), and inside, we can view the list of resources that can be migrated to the provider (in green in the figure). Clicking on one of them will display a histogram graph. In this graph we can note:

- A line parallel to the X-axis indicating the current cost of the resource.
- A series of bars (one for each region and selected cost type) that will be red when the destination price is higher than the starting price or green when the price is lower than the current cost of the resource; hovering over one of them will display its reference.
- A summary table of the selected cost types, which is used to generate the bar chart.

It is possible to view details for other simulations (in purple in the figure) using the procedure just described.

To exit the simulation without saving, in the bottom right, click on the "Close" button.

To save the simulation, click on the "Save" button next to the "Close" button, and then click on "Confirm".

After clicking a button, the user is redirected to the "What If" tab page.

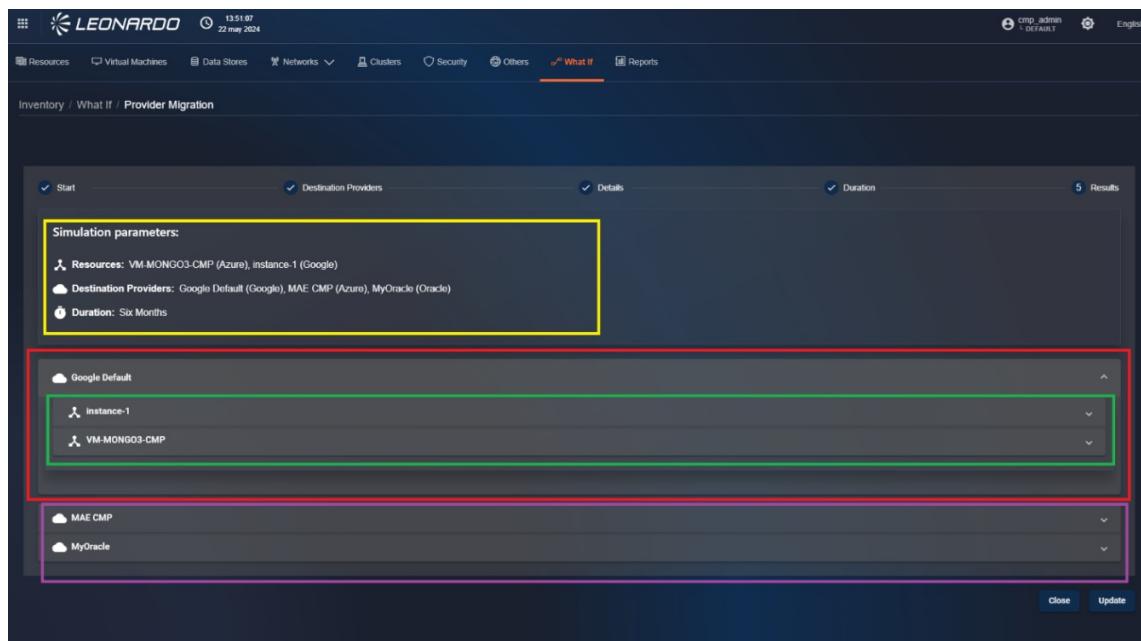


Figura 134 – Pagina dei risultati della simulazione WHAT IF

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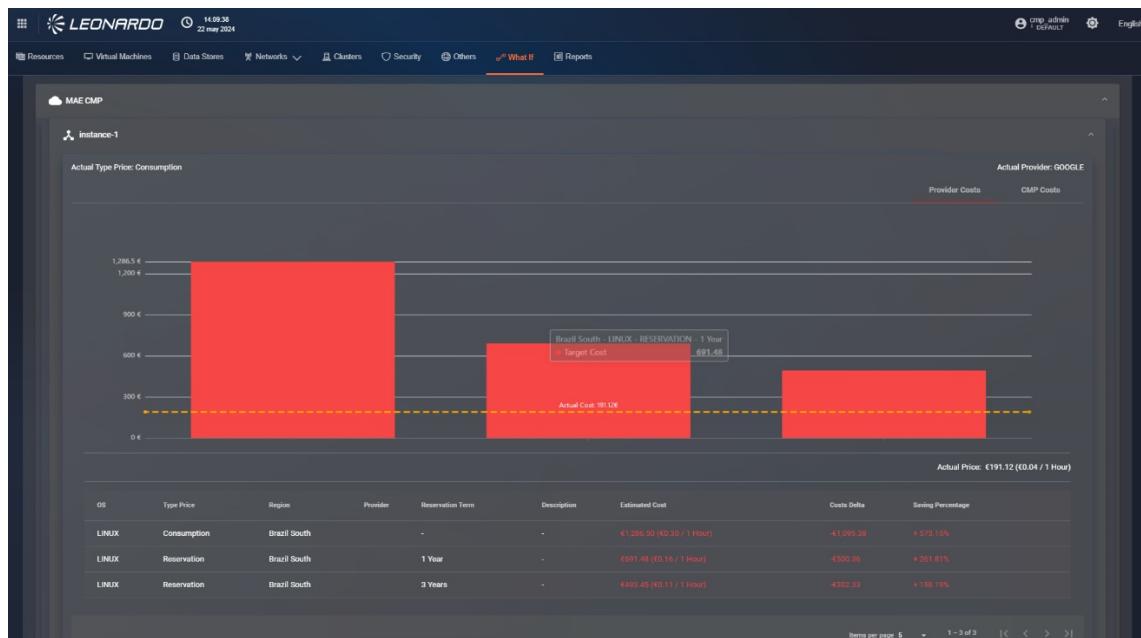


Figura 135 – Tabella riassuntiva della/e risorse

It is possible to update and re-run a simulation without re-entering all data.

To do this, click on the row to be modified. At this point, the user will be redirected to step 1 of the simulation, where all steps have been pre-filled using the saved parameters.

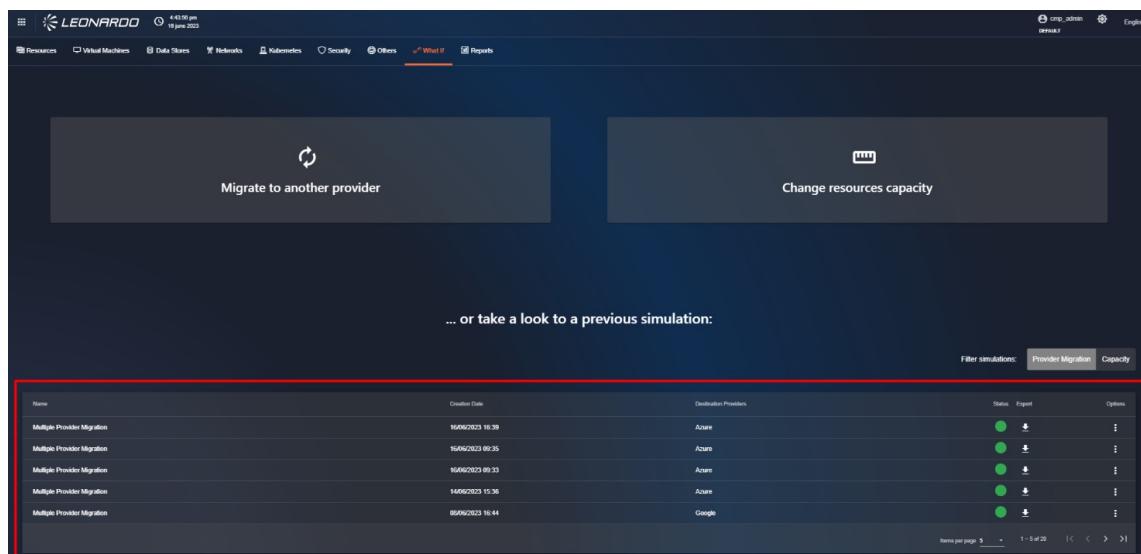


Figura 136 – Avvio per l'aggiornamento della simulazione di tipo "Migrate to another provider"

6.0.2.2 Scenario "What If": Change Resource Capacity

This functionality allows comparing the costs of a resource in case of modification of its technical characteristics.

Still from the "What If" tab page, in the top right, click on the "Change resources capacity" box.

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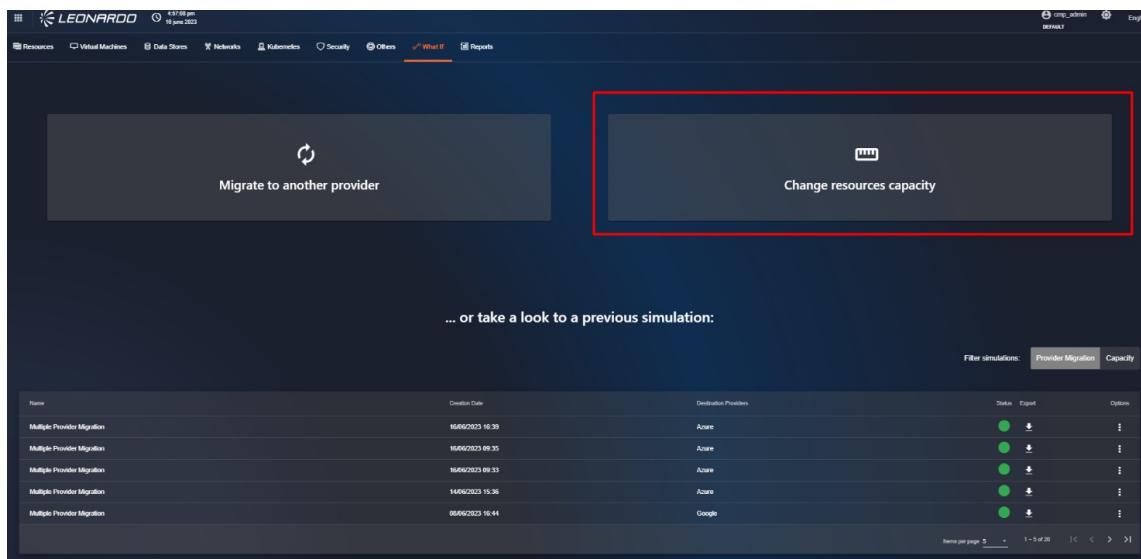


Figura 137 – Accesso alla funzionalità "What If: Change resources capacity"

After doing so, the user will find themselves on the "Start" page of step 1.

On the left, in the "Select Resources to change" box, the user can search for resources using three types of filters, including:

- "Search" which allows searching for a resource by name;
- "Search by Type" which allows obtaining resources by selecting the resource type;
- "Search by tags" which allows searching for resources using one or more tags associated with them.

The resource table will only show resources that, within the SCMP catalog, have more than one "Relationship" with different sizes but belong to the same region, price type, and operating system.

In the bottom left, there is the resource table, which can be filtered based on the parameters entered in the filter(s). Within the resource table, click on one of them and, using the "drag and drop" technique, drag it to the right, into the box titled "Currently selected:".

A maximum of three resources can be included per simulation.

Subsequently, in the bottom right, click on the "Next" button.

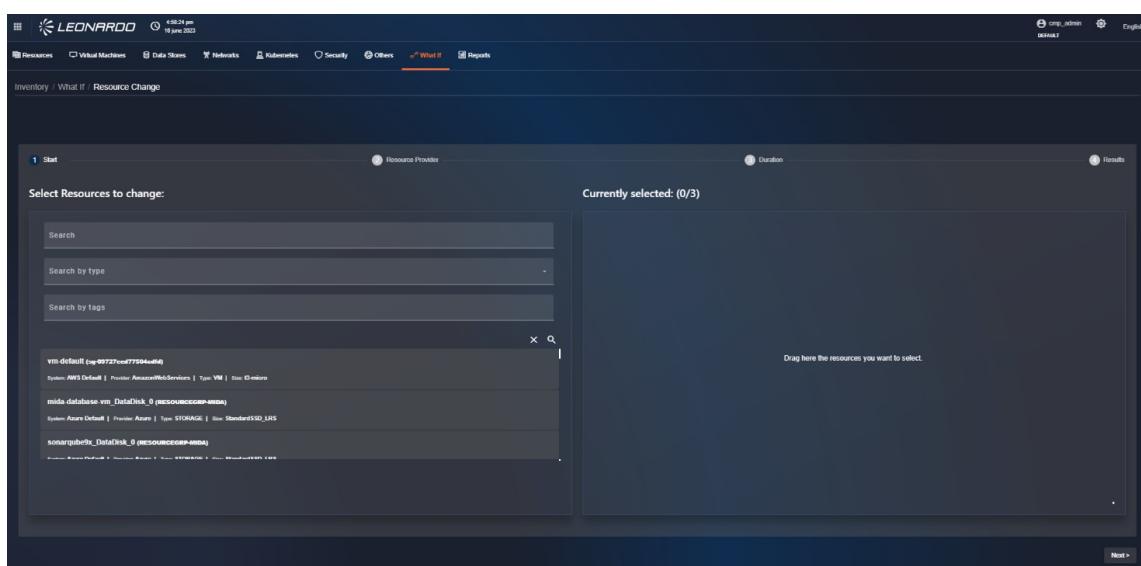


Figura 138 – Selezione delle risorse da cui modificare le capacità

After doing so, the user will find themselves on the "Resource Provider" page of step 2, where it is possible to modify the size of one or more resources.

Within the "Resource Provider" page of step 2, for a resource, click on the dropdown menu in the "Size" column and select a different size from the initial one.

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After that, in the bottom right, click on the "Next" button to continue the simulation.

To return to the "Start" page of step 1, click on the "Back" button.

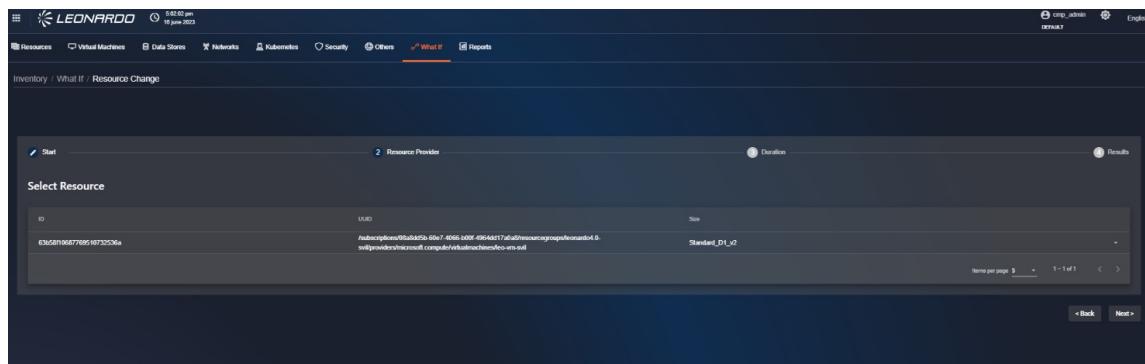


Figura 139 – Modifica della size di una risorsa

After clicking the "Next" button, the user will find themselves on the "Duration" page of step 3.

Within the aforementioned page, it is necessary to select an interval for the simulation.

After that, in the bottom right, click on the "Launch Simulation" button.

To go back, click on the "Back" button; in this way, the user will find themselves on the "Resource Provider" page of step 2.

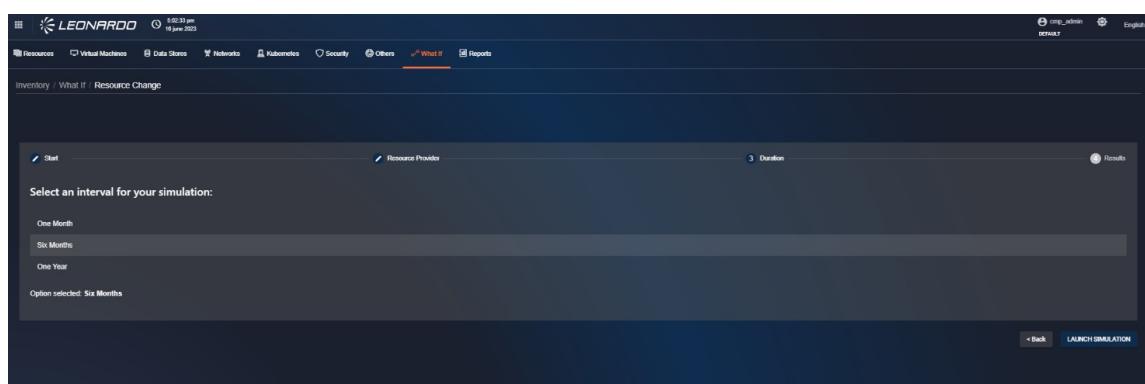


Figura 140 – Selezione dell'intervallo per la simulazione

After clicking the "Launch Simulation" button, the user will find themselves on the "Results" page of step 4.

Within the "Results" page, at the top, there is a "Summary" box that advises whether to modify the size of the resources. Below, there is an histogram graph, where the purple bar represents current costs, while the green bar represents target costs.

To save the simulation, click on the "Save" button next to the "Close" button, and then click on "Confirm". After doing so, the user is redirected to the "What If" page.

To exit the simulation without saving it, in the bottom right, click on the "Close" button. After doing so, the user will find themselves on the "What If" page.

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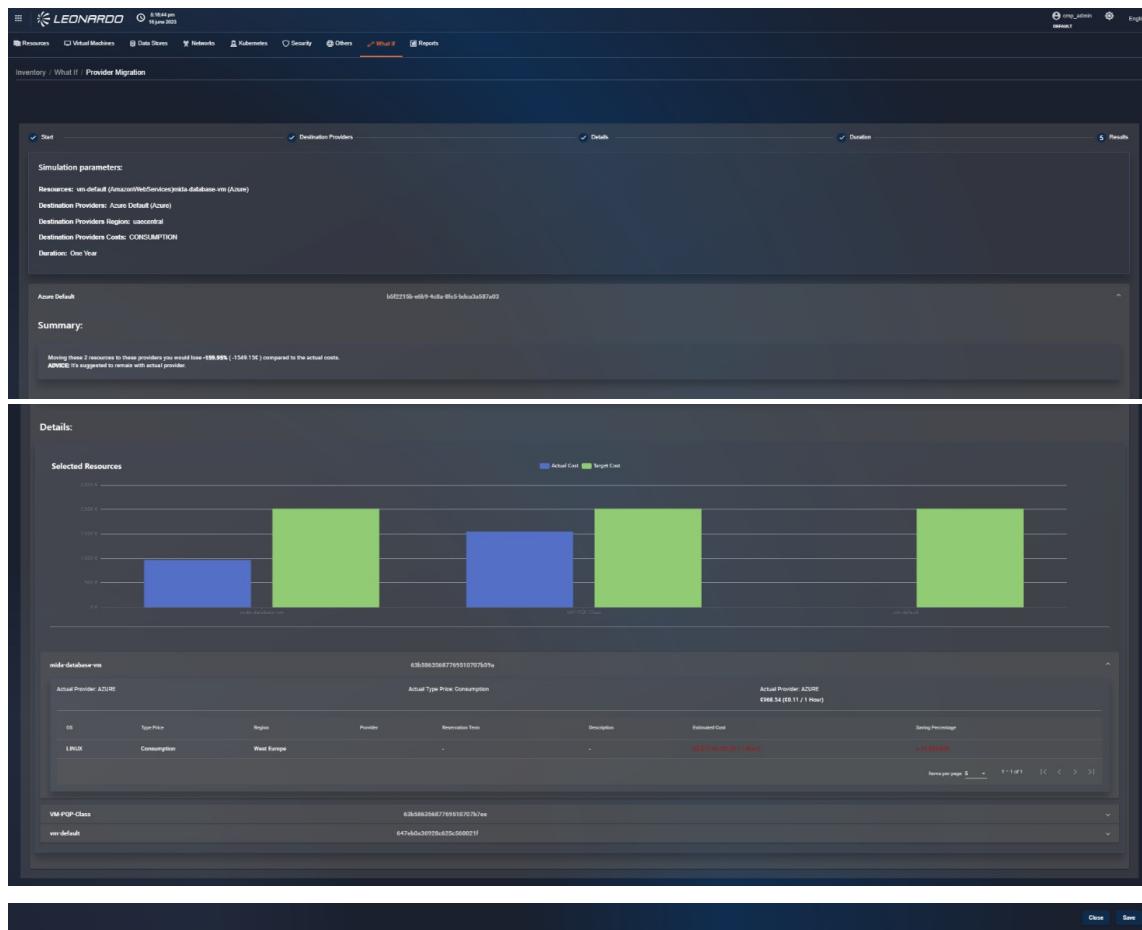


Figura 141 – Parametri di configurazione e consiglio sulla simulazione

6.0.2.3 What If scenario Export

For a simulation of a resource size modification, it is possible to export it in PDF, CSV, and JSON format.

Within the "What If" page, at the bottom, there is a table of simulations; click on the "Capacity" button located in the top right corner of the aforementioned table.

After doing so, the table shows simulations regarding resource size modification.

For a simulation, click on the button depicting an arrow.

At this point, a sub-menu will open where it is possible to export in the three previously described formats.

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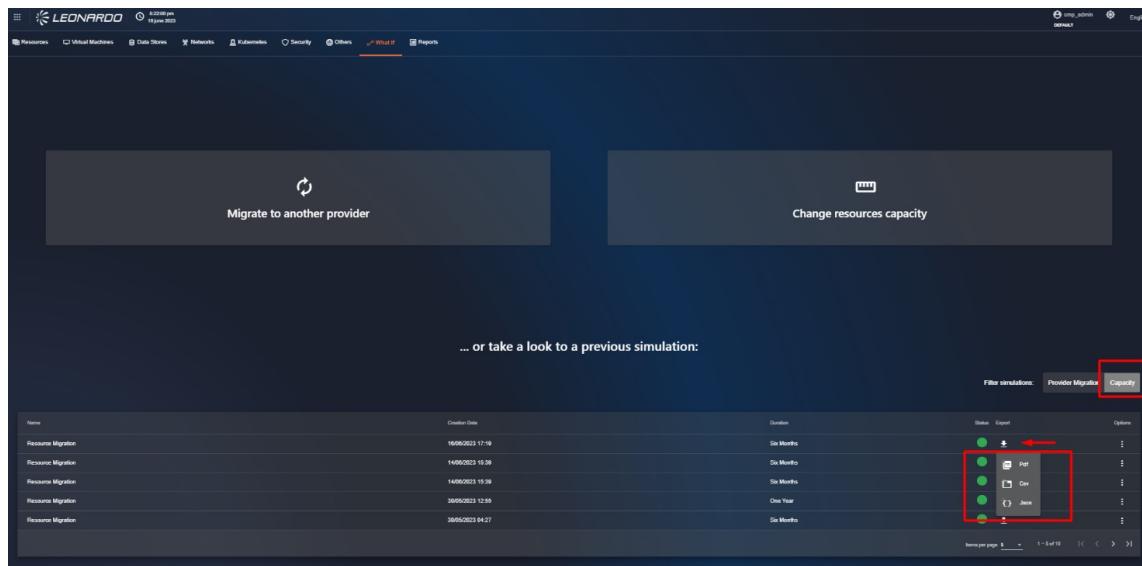


Figura 142 – Export della simulazione

Also for a simulation, it is possible to print it.

For a simulation, click on the kebab menu, and then click on the "Print" option.

At this point, a modal of the print preview will appear. Finally, click on the "Print" button to start printing the document.

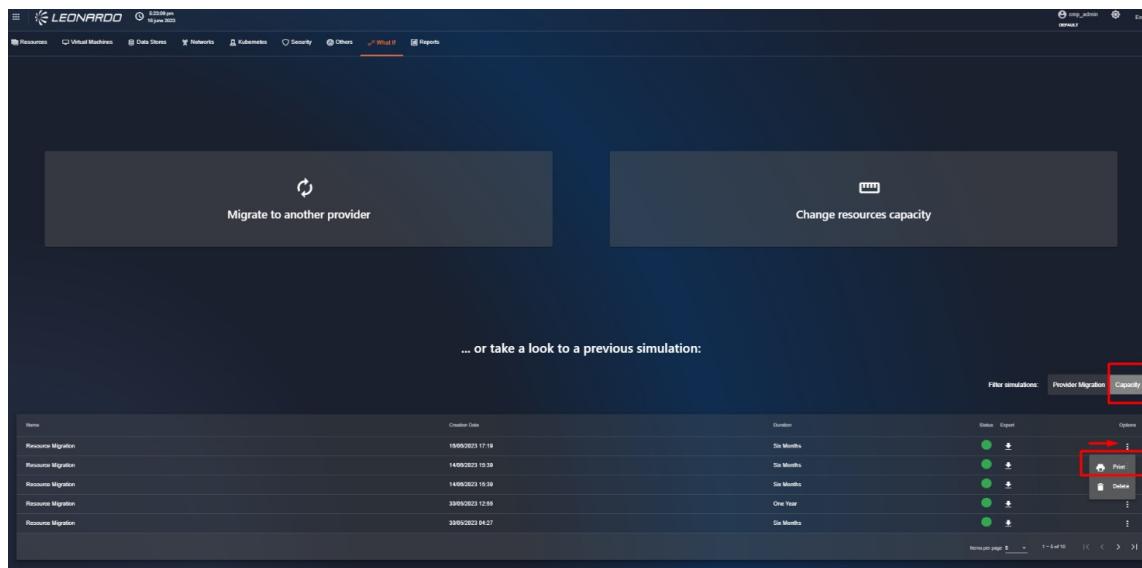


Figura 143 – Stampa della simulazione

For a simulation, click on the kebab menu.

From the list of options, click on "Delete".

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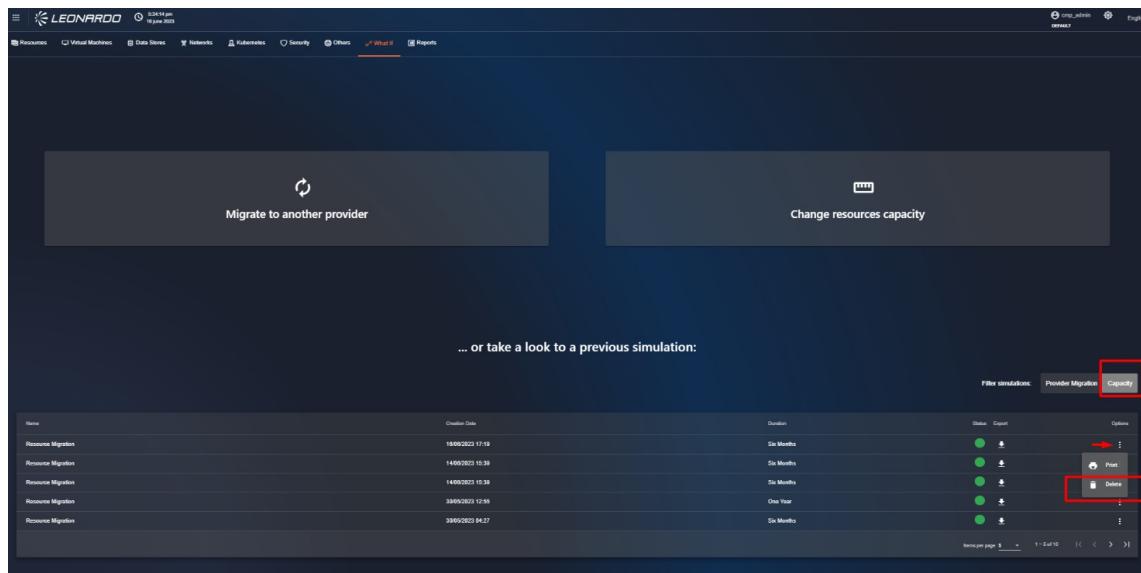


Figura 144 – Opzione per eliminare una simulazione

After clicking the "Delete" option, a modal will appear where it is necessary to confirm the deletion of the simulation by clicking on the "Confirm" button.

After doing so, the simulation is no longer present in the table.

If, however, you do not want to confirm the deletion of the simulation, click on the "Cancel" button.

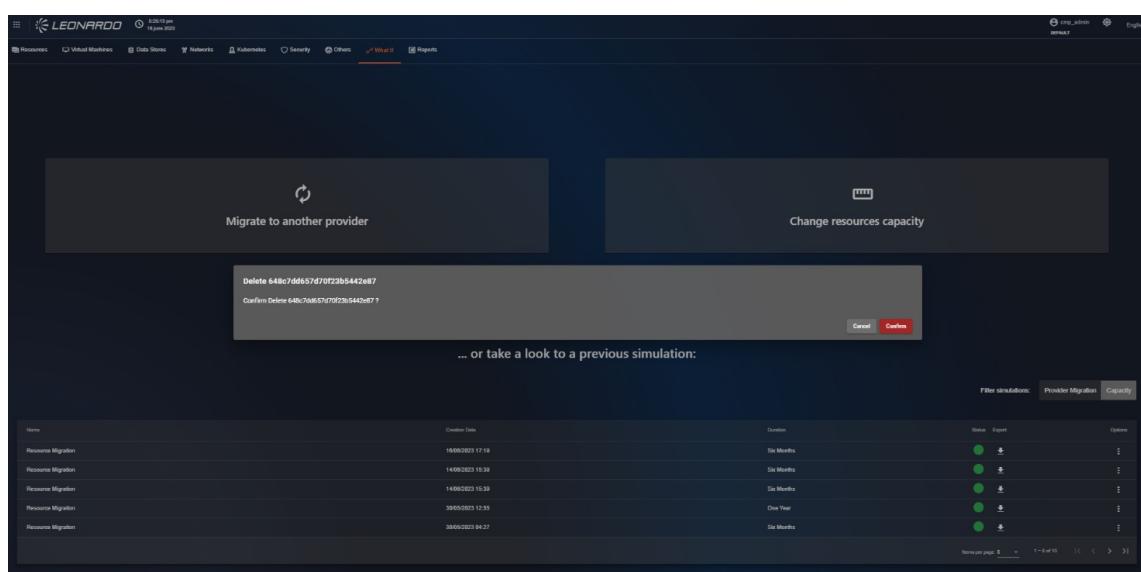


Figura 145 – Conferma dell'eliminazione della simulazione

6.0.3 Reporting Tools

The reporting functionality, specific to features, allows generating global reports of the information available for the various providers. Within the pages, there will also be the possibility to create files to facilitate information sharing.

To access the functionality, above the breadcrumb path, click on the "Reports" tab.

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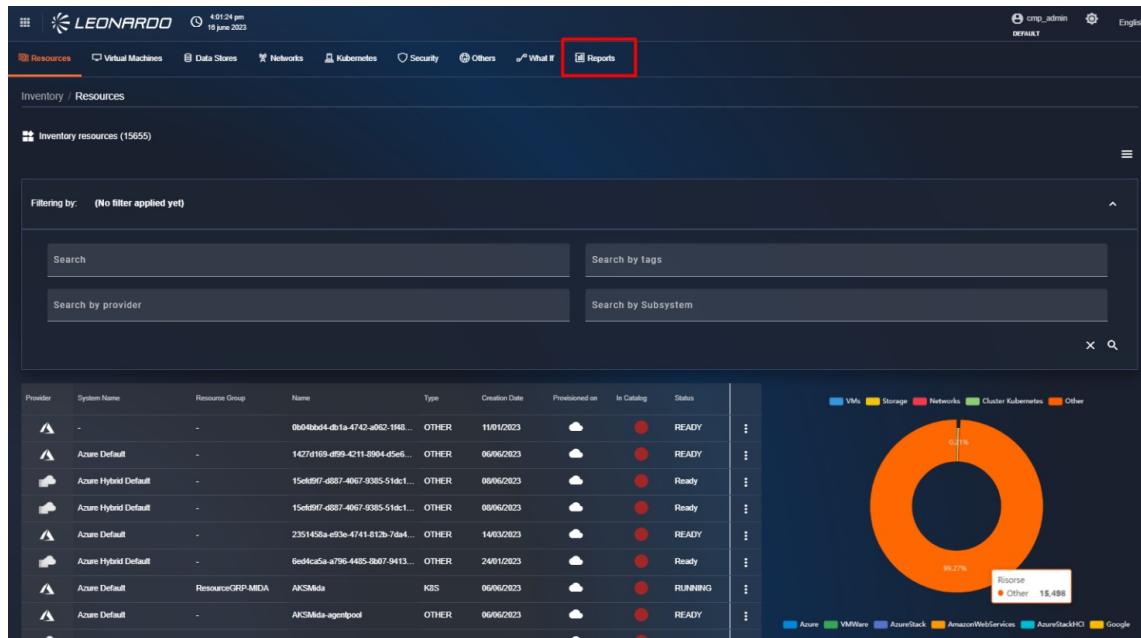


Figura 146 – Accesso al report di Catalogo

6.0.3.1 Available report types

- INVENTORY Summary – Summary on the quantity of main inventory resources based on the selected provider/subsystem combination.

6.0.3.2 Report Creation

At the top right of the page, we can click on the "New Report" button to start creating a report. Specifically, a modal is displayed containing the list of available report types.

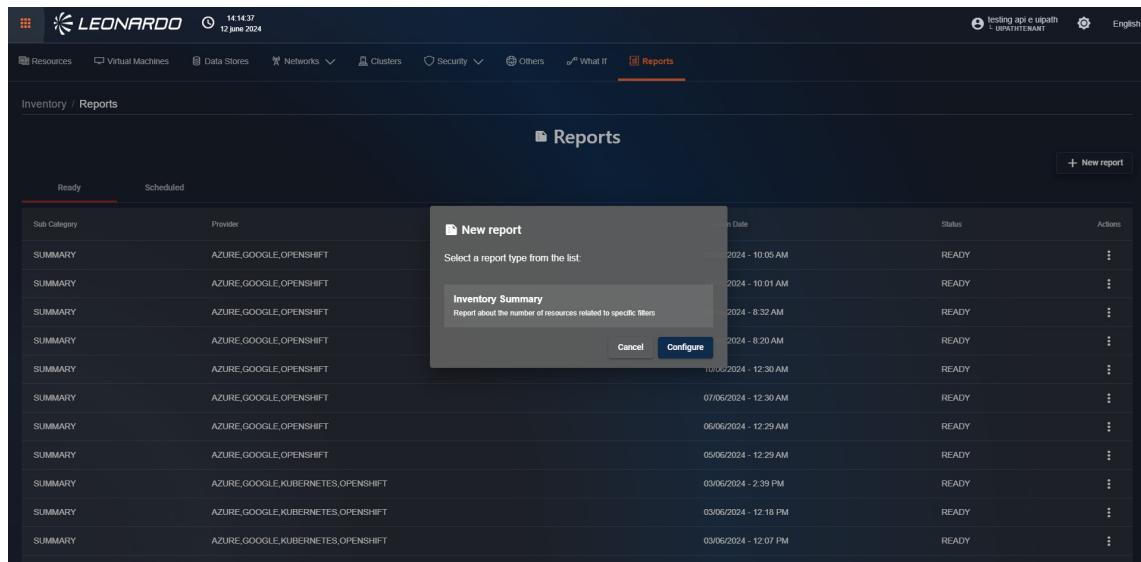


Figura 147 – Creazione nuovo report

Once the report type is selected, click on the "Configure" button to select the providers to include in the report. In the newly opened window, we find the "Provider" field which allows selecting one or more pre-existing providers in the system. Subsequently, it is possible to select one or more subsystems to include in the report; if no providers are selected, no subsystem can be selected. Finally, there is a "tag" section to include only resources that have the entered tag.

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The screenshot shows the Leonardo platform's reporting interface. A modal window titled "Inventory" is open, allowing users to configure a report for the "Azure, Google" provider. The subsystem is set to "MAE LAB, CMPPROJECT-374610". The report type is set to "One-Shot". A "Submit" button is visible at the bottom of the modal. The background shows a list of reports in the "Ready" tab, each with a creation date and status.

Figura 148 – Configurazione del report

At this point, the user can choose between two different actions:

- Create a static report that will be saved in the system.
- Schedule a task that generates the report periodically.

To confirm the creation of a static report, verify that "One-Shot" has been selected for the "Report type" field and click the "Submit" button at the bottom.

After a loading period, the newly generated report will be visible in the list.

The screenshot shows the list of generated reports. The table has columns for Sub Category, Provider, Creation Date, Status, and Actions. The "Actions" column contains three dots for each row. The list includes reports from various providers and subsystems, such as AZURE, GOOGLE, OPENSHIFT, and AZURE, GOOGLE.

Figura 149 – Lista dei report effettuati

6.0.3.2.1 REPORT SCHEDULING

If, instead, you want to schedule automatic report execution, it will be necessary to select "Recurring" for the "Report Type" field. In this case, the window refreshes to show additional parameters for configuring the periodic report.

The parameters to enter are:

- Period: allows selecting the report sending frequency (hourly, daily, ...).
- "Receive only if not empty" if selected, the file will not be sent when it contains no information.
- Report Language: allows selecting the language used in the report.
- File format: allows selecting one or more file types to include in the email.

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- User E-mails: allows entering an email address to send reports to. After entering an email, it is necessary to press "Enter" on the keyboard to confirm its insertion. Once pressed, the newly entered email will move to the box at the bottom, and the field will be cleared to allow the insertion of a new email, if necessary.

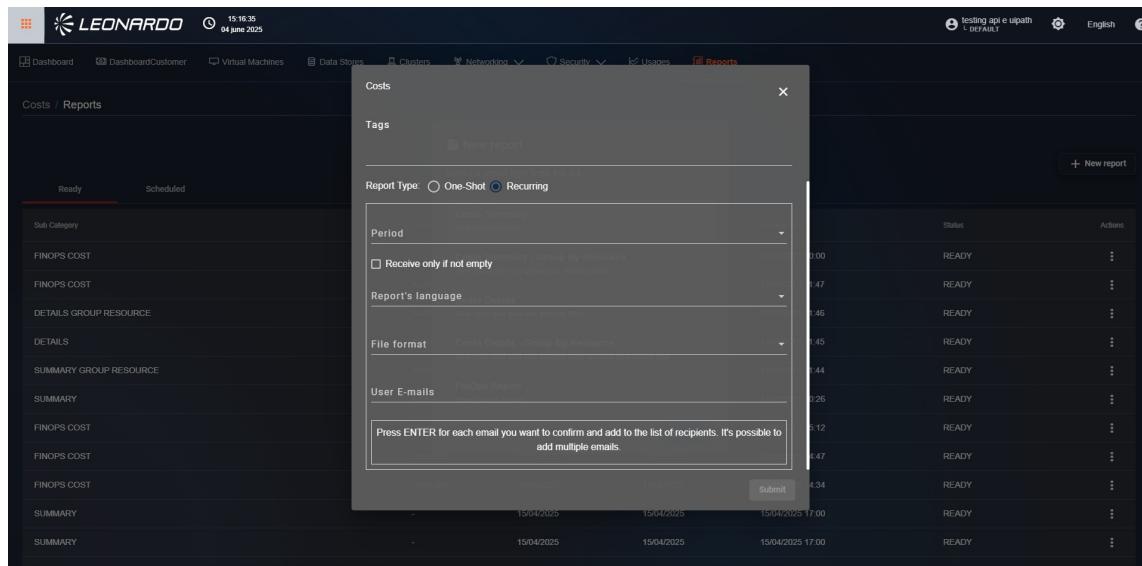


Figura 150 – Parametri dei report schedulati

Having configured all parameters, the "Submit" button will become clickable. Click it to confirm the insertion, and after a loading period, the newly generated report will be visible in the list.

Inventory / Reports					
Reports					
Ready	Scheduled	+ New report			
Sub Category	Provider	Creation Date	Status	Actions	
SUMMARY	AZURE, GOOGLE	12/06/2024 - 12:21 PM	READY	⋮	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮	⋮

Figura 151 – Lista dei report effettuati

6.0.3.2.2 LIST OF SCHEDULED REPORTS

To view the list of scheduled reports, select the "Scheduled" tab at the top left of the reports page.

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Figura 152 – Lista dei report programmati

On this page, you will find the list and related information of scheduled reports present in the system. For each result, by clicking the "Three dots" button on the right, three operations can be performed:

- View the last generated report.
- Edit the schedule settings; it will not be possible to modify the selected providers or subsystems.
- Delete the schedule to stop sending emails.

Figura 153 – Modifica di una schedule

6.0.3.2.3 USING REPORTS

By clicking on a static report row, or using the "Show report" button available for scheduled reports, it will be possible to view the detail page of the selected report.

Within the Inventory report summary, there is a "Stats" section showing the number of disks, interfaces, networks, and virtual machines belonging to the selected provider.

Below the "Stats" section, the filters used by the user to generate the report are present.

Below the filters, there is a summary table of resources belonging to the providers. On the right, there are two buttons: "PRINT" and "EXPORT".

Clicking on the "PRINT" button, a print preview modal appears. To print the report, click on the "Print" button in the bottom right; at this point, the printing of the report will start.

Clicking on the "EXPORT" button, it is possible to export the report in ".csv", ".json", or ".pdf" format.

To return to the "Results" tab, in the bottom right, click on the "CLOSE" button or in the top left, click on the left-pointing arrow, next to the report title.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there are navigation links: Resources, Virtual Machines, Data Stores, Networks, Clusters, Security, Others, What If, and Reports. The Reports link is highlighted. Below the navigation, the URL is shown as Inventory / Reports / Report 6669a0d3aae316468b3c8b34. The main content area is titled "Report Inventory Summary". It features a "Stats" section with five boxes: VMs (1), Disks (1), Networks (1), Interfaces (0), and K8Ss (0). Below this, a provider summary table shows data for Azure and Google. The table has columns for Type Provider, Subsystem Name, VMs, Disks, Networks, Interfaces, and K8Ss. For Azure, the values are 14, 16, 14, 0, and 0. For Google, the values are 1, 1, 1, 0, and 0. At the bottom right, there are buttons for PRINT and EXPORT.

Type Provider	Subsystem Name	VMs	Disks	Networks	Interfaces	K8Ss
Azure	MAE LAB	14	16	14	0	0
Google	CMPPROJECT-374610	1	1	1	0	0

Figura 154 – Dettagli dei report

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7 Monitoring

The SCMP collects metrics from all cloud providers and aggregates them by macro categories.

This aggregation allows comparison between metrics from different providers.

By accessing the dashboard, we can see how this aggregation mechanism provides an overview of resource utilization, divided by provider and organized by associated resource type.

Within the functionality, it is possible to filter by resource type using the tab bar at the top, while for a general view, the dashboard can be used.

The monitoring module can be accessed via the dedicated menu. As shown in the figure:



Figura 155 – Access to the Monitoring Module

7.0.1 Monitoring Dashboard

At this point, the user will be on the "Dashboard" monitoring tab page.

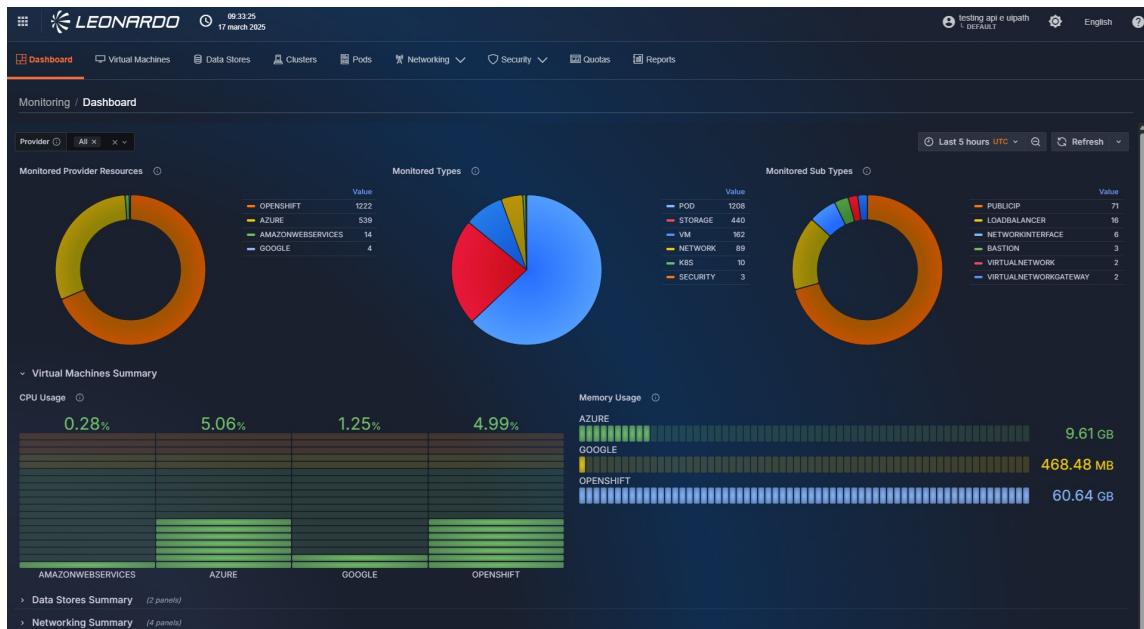


Figura 156 – Monitoring Dashboard

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7.0.1.1 Monitoring Section Filters

Within the page, a series of filters are available that can be selected simultaneously to filter the dashboard results.

The main filter is the display period, which can be found at the top right. Clicking on it will open a selection window (in yellow in the figure) where it will be possible to either enter a customized time range, using the "From" and "To" fields on the left, or select a "Smart" time range by directly clicking on the desired choice in the scrollable section on the right.

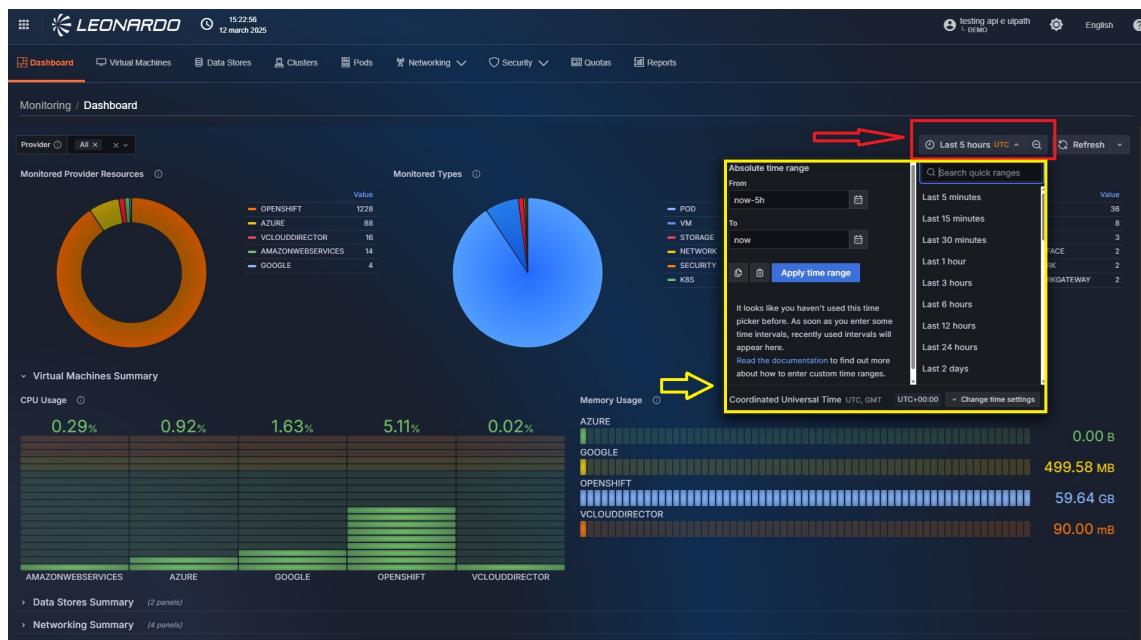


Figura 157 – Monitoring Time Filter

Additionally, a series of filters are available at the top left of the page, allowing users to filter the retrieved resources. Specifically, it is possible to filter by:

- Provider type
- Subsystem name.
- Resource name (only in detailed dashboards)

These filters allow for multiple values to be selected and can be combined to achieve the desired granularity.



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Figura 158 – Monitoring Functionality Filters

7.0.2 Quotas Dashboard

The Quotas dashboard, available in the "Quotas" tab, allows viewing the details of consumption and related limits applied to Vcloud type subsystems.

To access it, you need to click the button at the top of the tab bar.

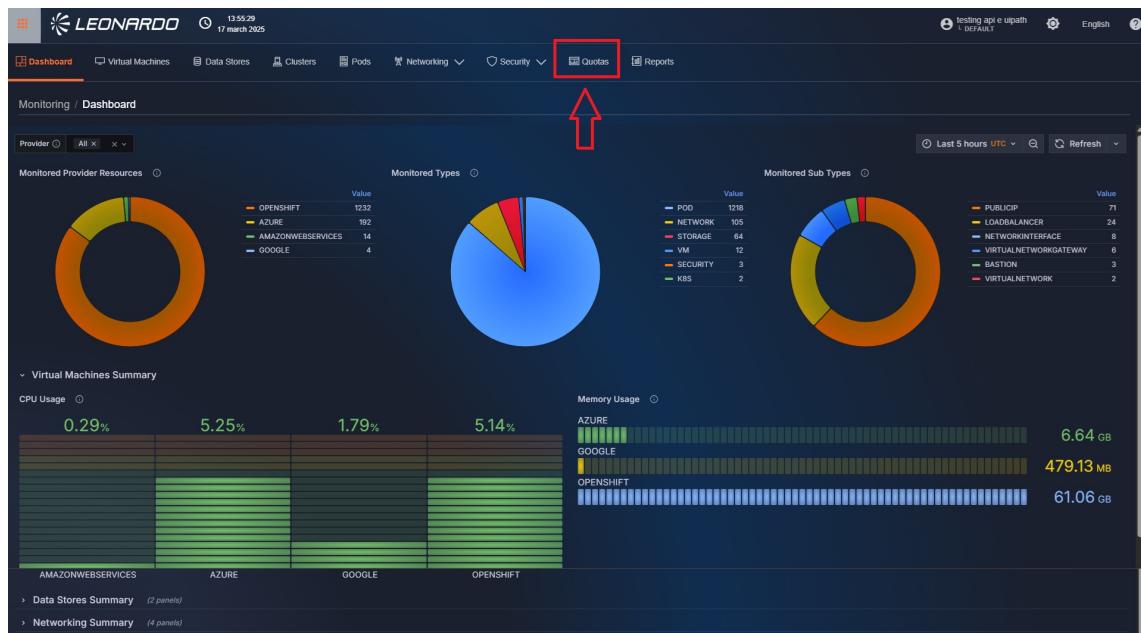


Figura 159 – Access to the Quotas section

At this point, the user will be on the "Quotas" monitoring tab page. At the top, we can see a filter bar, which allows filtering by provider or subsystem. Additionally, it is possible to view the filters for the chart using the "Show additional filters" button; these filters modify the chart's display. Below the filters, there is a table indicating the subsystem name and the quotas used, limits, and an average utilization divided by resource type. Finally, at the bottom, a time-based chart on the selected metric in the filters can be displayed.

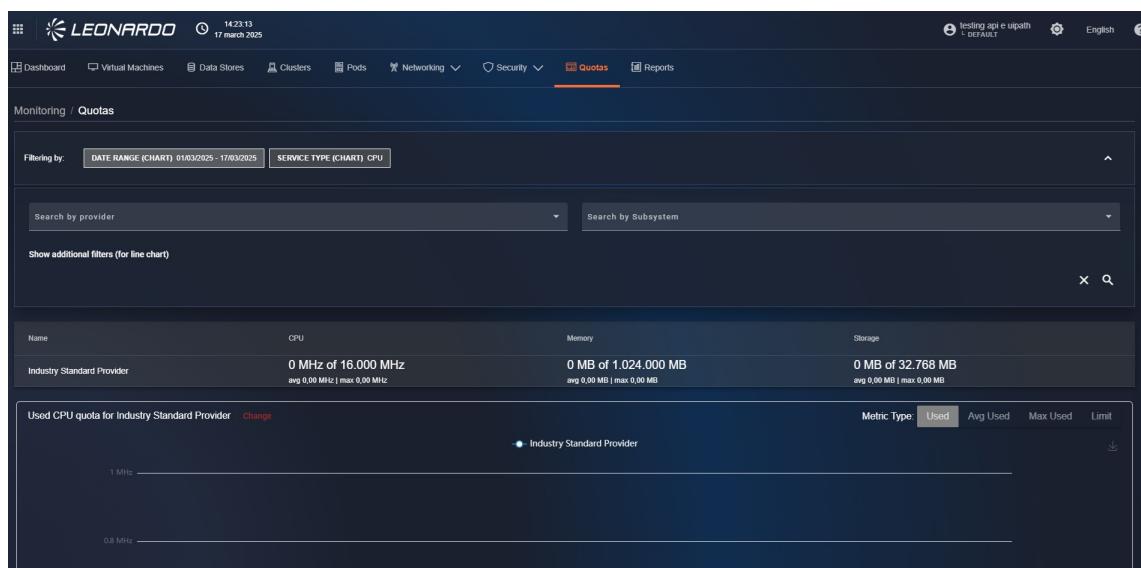


Figura 160 – Quotas Dashboard

7.0.3 Alarms on Quota Usage

To allow the user to receive notifications when quota usage thresholds are exceeded, an "Alerting" module has been included. To access it, you need to select the tab at the top of the Monitoring functionality.

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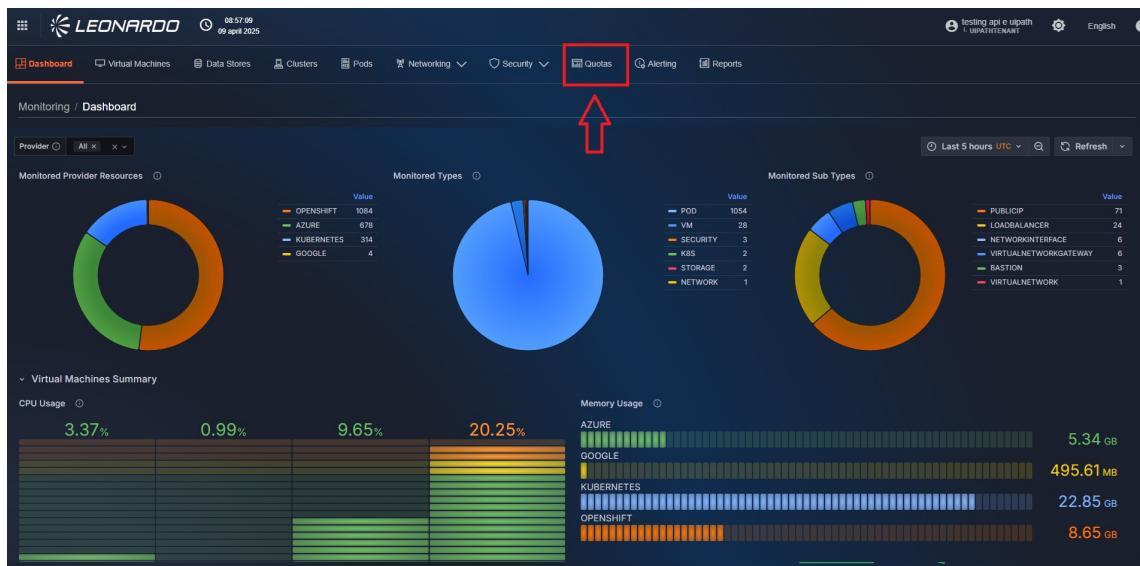


Figura 161 – Access to the Alerting system

Within the page, we find the list of "alerts" configured on the system, along with their respective configurations.

7.0.3.1 New Alert Creation

Using the menu available on the right, it is possible to add a new alert to the system. To do this, we select the displayed "New alert" option, and a configuration page will open.

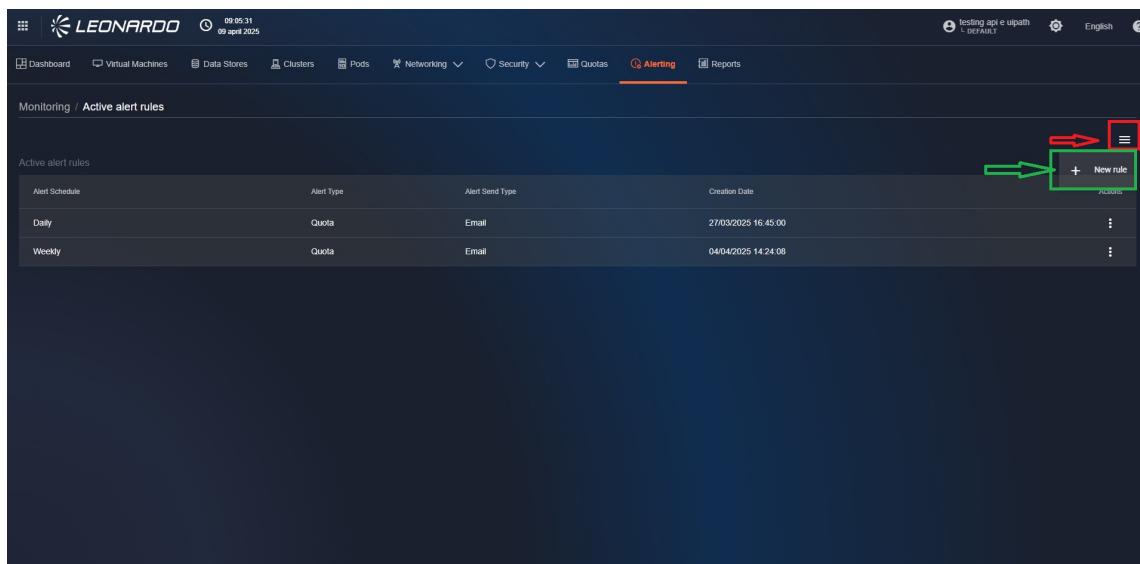


Figura 162 – New Alert Creation

On the configuration page, all fields must be filled in, specifically:

- **"Alert type":** Select the alert type
- **"Alert schedule":** Indicates the frequency of checks to be performed
- **"Quota type":** Select the quota type to monitor
- **"Threshold (%)":** Enter the percentage beyond which the alert will be sent.
- **"Subsystems":** Select one or more subsystems to monitor
- **"Alert send type":** Select the type of alert to receive, via e-Mail or Rabbit queue (for automatic integration with other systems)
- **"Alert format":** Select the format of the sent file that defines the alert details.
- **"Emails":** By selecting E-mail as the notification type, we can enter an email address to send reports to. After entering an email, it is necessary to press "Enter" on the keyboard to confirm its entry. Once pressed, the newly entered email will move to the box at the bottom, and the field will be cleared to allow for the entry of a new email, if necessary.

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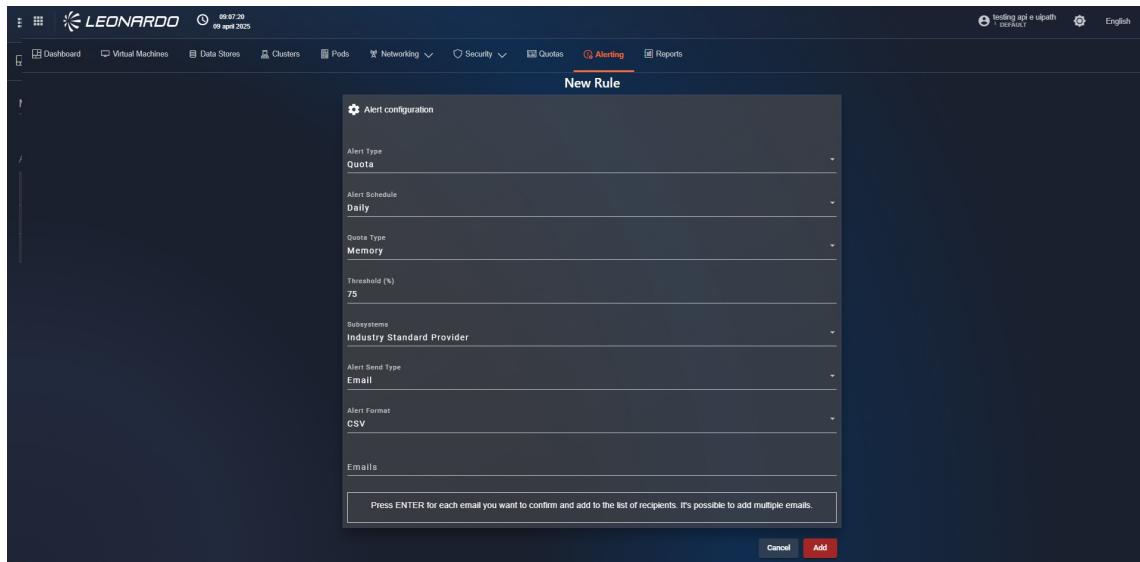


Figura 163 – Configuration Page

7.0.3.2 Viewing, Modifying, and Deleting an Alert

On this page, we find the list and related information of the alerts present in the system. For each result, by clicking the "Three dots" button on the right, it will be possible to perform three operations:

- View the "alert" configuration
- Edit the alert settings.
- Delete the schedule to stop sending emails.

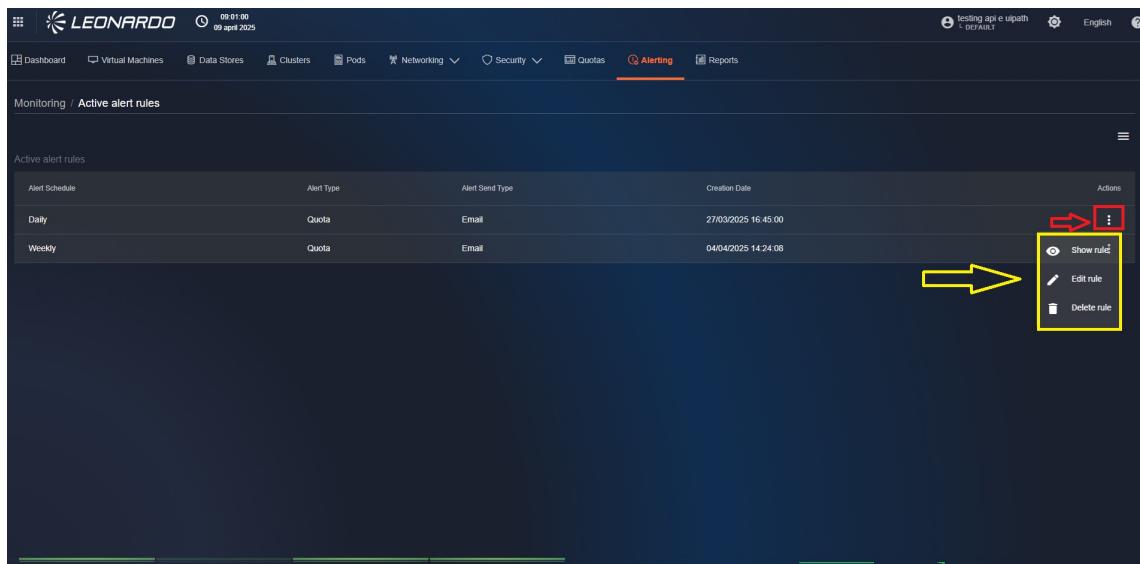


Figura 164 – Alert Operations

7.0.4 Reporting Tools

The reporting functionality, specific to each feature, allows generating global reports of the information available for the various providers. Within the pages, the possibility will also be given to create files to facilitate information sharing. To access the functionality, above the breadcrumb path, click on the "Reports" tab.

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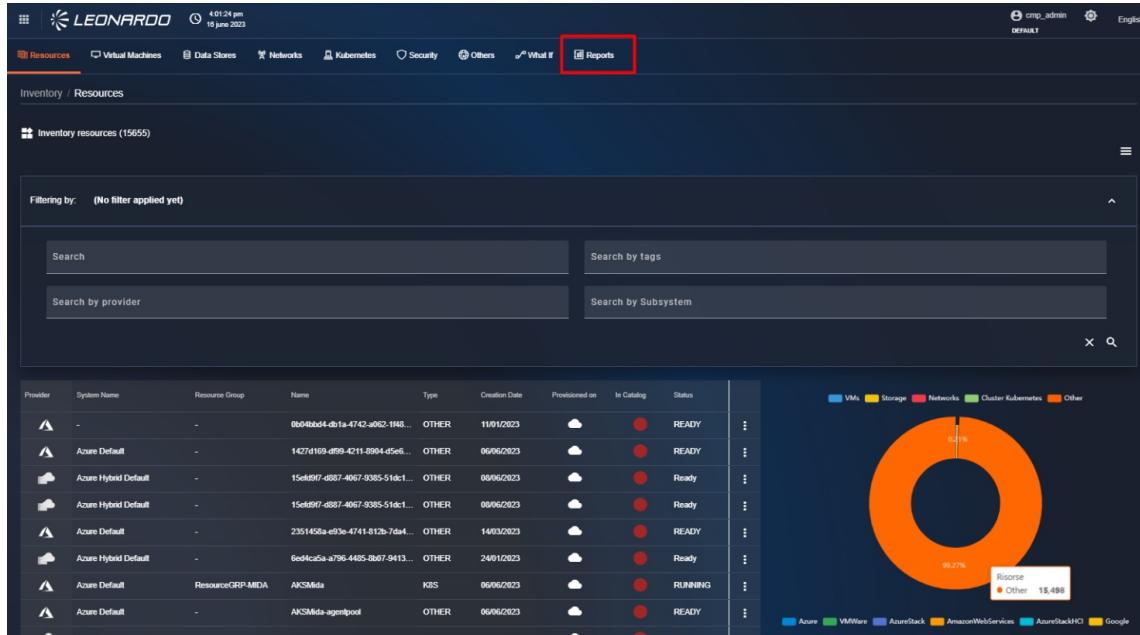


Figura 165 – Access to Catalog Report

7.0.4.1 Available Report Types

- Monitoring Threshold Quotas – List of VCloud and/or Backup subsystems, integrated into the SCMP, with details of utilization quotas (CPU, Memory, Storage, Backup). Based on the selected filter combination, it is possible to filter subsystems that exceed a certain utilization threshold.

7.0.4.2 Report Creation

At the top right of the page, we can click the "New Report" button to start creating a report. Specifically, a modal is displayed containing the list of available report types.

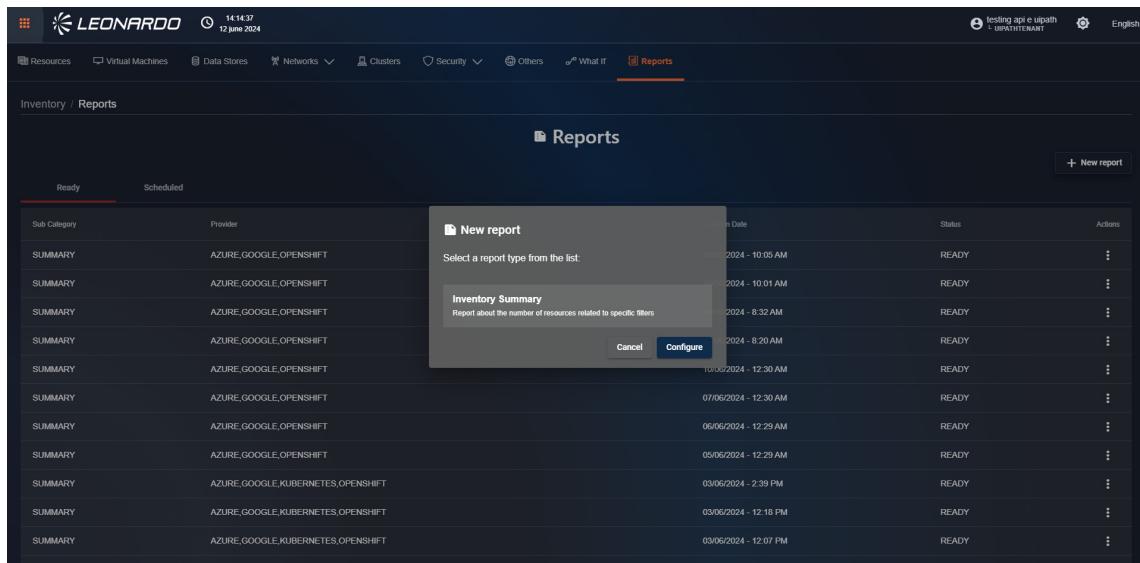


Figura 166 – New Report Creation

Once the report type is selected, click the "Configure" button to select the providers to include in the report. In the newly opened window, we find the "Provider" field which allows selecting one or more pre-existing providers in the system. Subsequently, it is possible to select one or more subsystems to include in the report; if no providers are selected, no subsystems can be selected. Finally, there is a "tag" section to include only resources that have the entered tag.

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Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	03/06/2024 - 2:39 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, KUBERNETES, OPENSHIFT			

Figura 167 – Report Configuration

At this point, the user can choose between two different actions:

- Create a static report that will be saved in the system.
- Schedule a job that generates the report periodically.

To confirm the creation of a static report, verify that "One-Shot" has been selected for the "Report type" field and click the "Submit" button at the bottom. After a loading period, the newly generated report will be visible in the list.

Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE, GOOGLE	10/06/2024 - 1:21 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮

Figura 168 – List of Generated Reports

7.0.4.2.1 REPORT SCHEDULING

If, on the other hand, automatic report execution is desired, it will be necessary to select "Recurring" for the "Report Type" field. In this case, the window updates to show additional parameters for configuring the periodic report. The parameters to enter are:

- Period: allows selecting the report sending frequency (hourly, daily, ...).
- "Receive only if not empty": if selected, the file will not be sent when it contains no information.
- Report Language: allows selecting the language used in the report.
- File format: allows selecting one or more file types to include in the email.
- User E-mails: allows entering an email address to send reports to. After entering an email, it is necessary to press "Enter" on the keyboard to confirm its entry. Once pressed, the newly entered email will move to the box at the bottom, and the field will be cleared to allow for the entry of a new email, if necessary.

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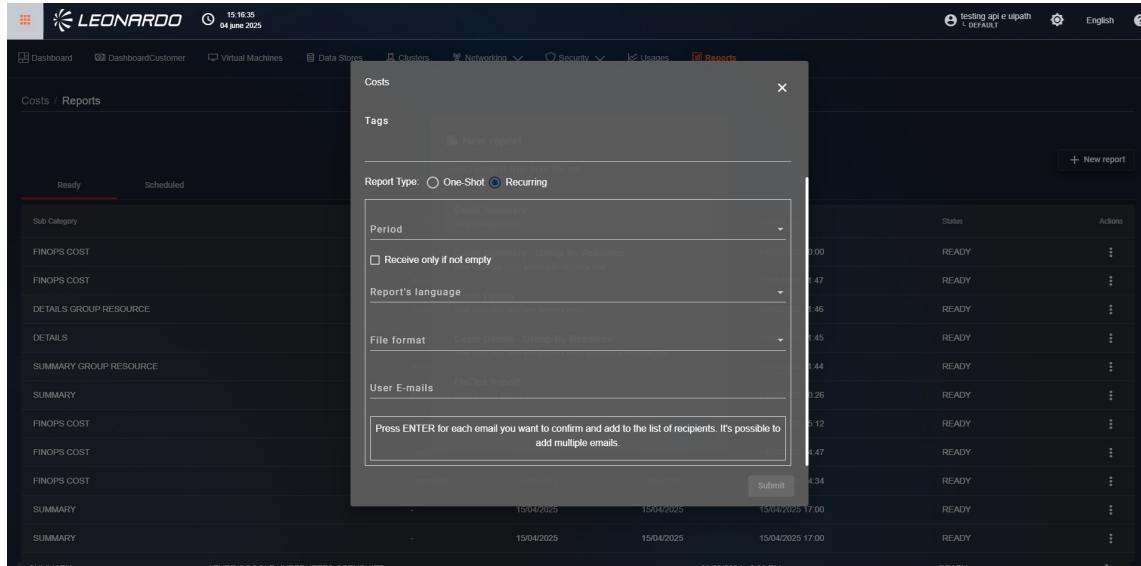


Figura 169 – Scheduled Report Parameters

Having configured all parameters, the "Submit" button will become clickable. Click it to confirm the entry, and after a loading period, the newly generated report will be visible in the list.

Inventory / Reports					
Reports					
Ready	Scheduled	Provider	Creation Date	Status	Actions
SUMMARY	AZURE, GOOGLE		12/06/2024 - 1:21 PM	READY	⋮
SUMMARY	AZURE		12/06/2024 - 12:29 PM	READY	⋮
SUMMARY	AZURE		12/06/2024 - 12:28 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		10/06/2024 - 10:05 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		10/06/2024 - 10:01 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		10/06/2024 - 8:32 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		10/06/2024 - 8:20 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT		05/06/2024 - 12:29 AM	READY	⋮

Figura 170 – List of Generated Reports

7.0.4.2.2 LIST OF SCHEDULED REPORTS

To view the list of scheduled reports, select the "Scheduled" tab located at the top left of the reports page.

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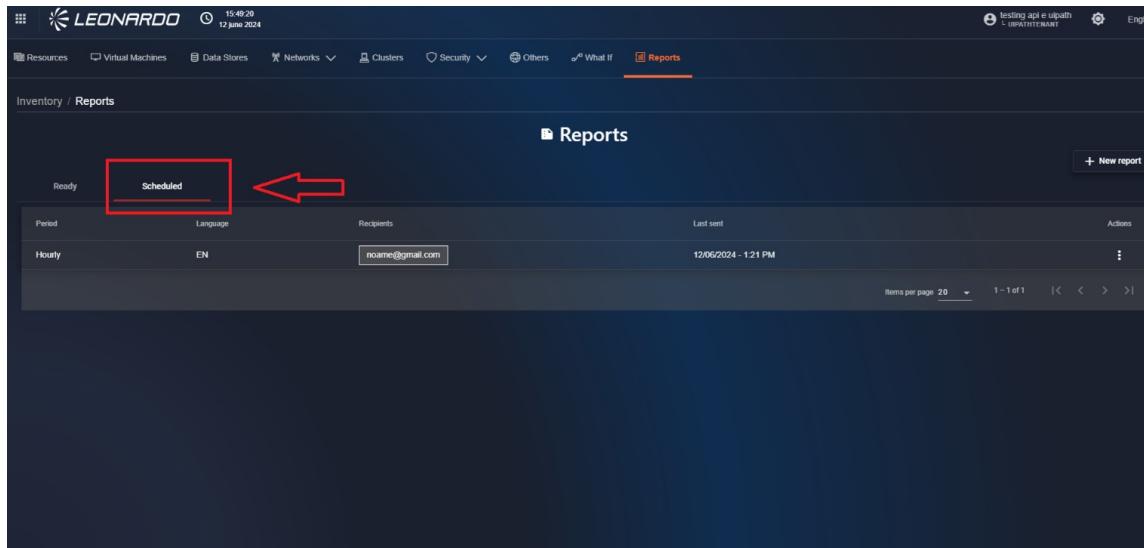


Figura 171 – List of Scheduled Reports

On this page, we find the list and related information of the scheduled reports present in the system. For each result, by clicking the "Three dots" button on the right, it will be possible to perform three operations:

- View the last generated report.
- Edit the schedule settings; it will not be possible to modify the selected providers or subsystems.
- Delete the schedule to stop sending emails.

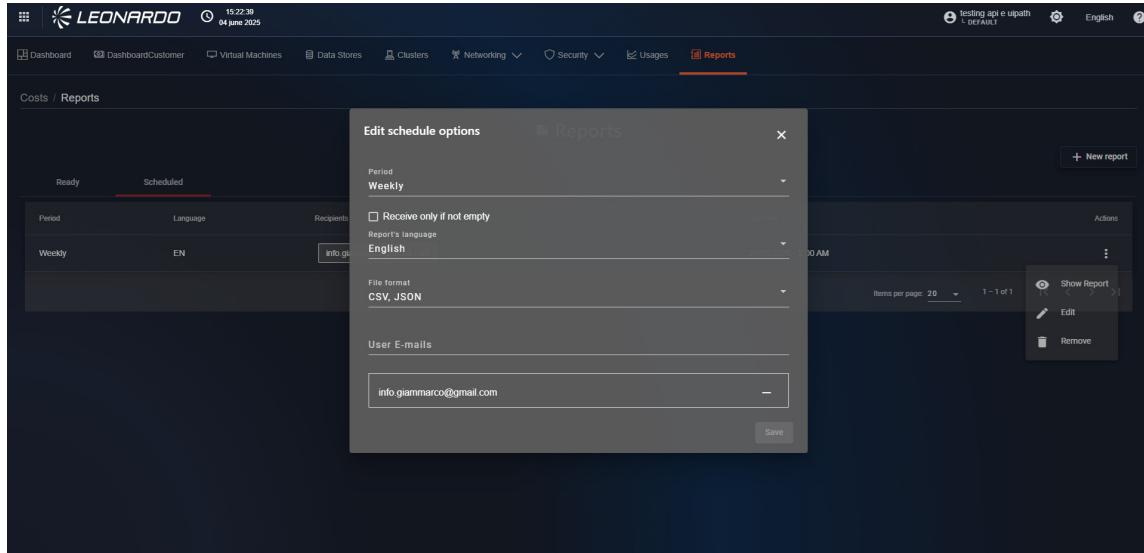


Figura 172 – Modify a schedule

7.0.4.2.3 REPORT USAGE

By clicking on a static report row, or by using the "Show report" button available for scheduled reports, it will be possible to view the detail page of the selected report. Within the inventory report summary, there is a "Stats" section which includes the number of disks, interfaces, networks, and virtual machines belonging to the selected provider. Below the "Stats" section, there are the filters used by the user to generate the report. Below the filters, there is a summary table of resources belonging to the providers. On the right, there are two buttons: "PRINT" and "EXPORT". Clicking the "PRINT" button will display a print preview modal. To print the report, click the "Print" button at the bottom right; at this point, the printing of the report will start. Clicking the "EXPORT" button allows exporting the report in ".csv", ".json", or ".pdf" format. To return to the "Results" tab, click the "CLOSE" button at the bottom right, or click the left-pointing arrow at the top left, next to the report title.

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Report Inventory Summary

Stats

1 VMs	1 Disks	1 Networks	0 Interfaces	0 K8Ss
-------	---------	------------	--------------	--------

PROVIDER: AZURE, GOOGLE | SUBSYSTEM: MAE LAB, CMPPROJECT-374610

Type Provider	Subsystem Name	VMs	Disks	Networks	Interfaces	K8Ss
Azure	MAE LAB	14	16	14	0	0
Google	CMPPROJECT-374610	1	1	1	0	0

Items per page: 20 | 1 - 2 of 2 | < >

Figura 173 – Report Details

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8 Security

The SCMP's security feature shows the vulnerabilities of inventory assets present on the SCMP.

To access the "Security" feature, click the bento button in the top left. After doing so, the menu bar will appear, where you need to click on "Security".



Figura 174 – Access to Security

8.0.1 General Dashboard

At this point, the user is on the "Dashboard" tab page where the security data of resources for all configured providers are shown in an aggregated manner.

At the top, there is a filter bar that allows filtering results by subsystem, status, and/or policy name.

After that, the user notices the presence of the bar chart indicating the compliance status of resources assigned to policies, subdivided by subsystem.

By hovering the mouse over a section of the chart, we can see that the values displayed on the page are updated to show a preview of the detail.

It is possible to click on a section of the chart to automatically apply the "subsystem" and "status" filters to the page.

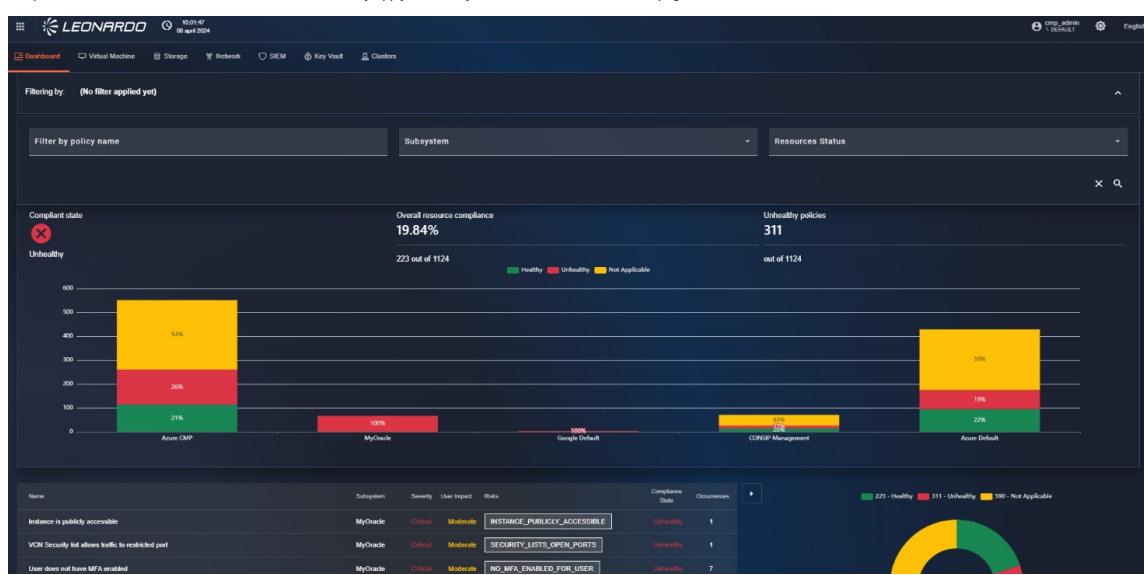


Figura 175 – Security Dashboard

Scrolling down the page, there is the policies table which will be automatically filtered based on the selected filters.

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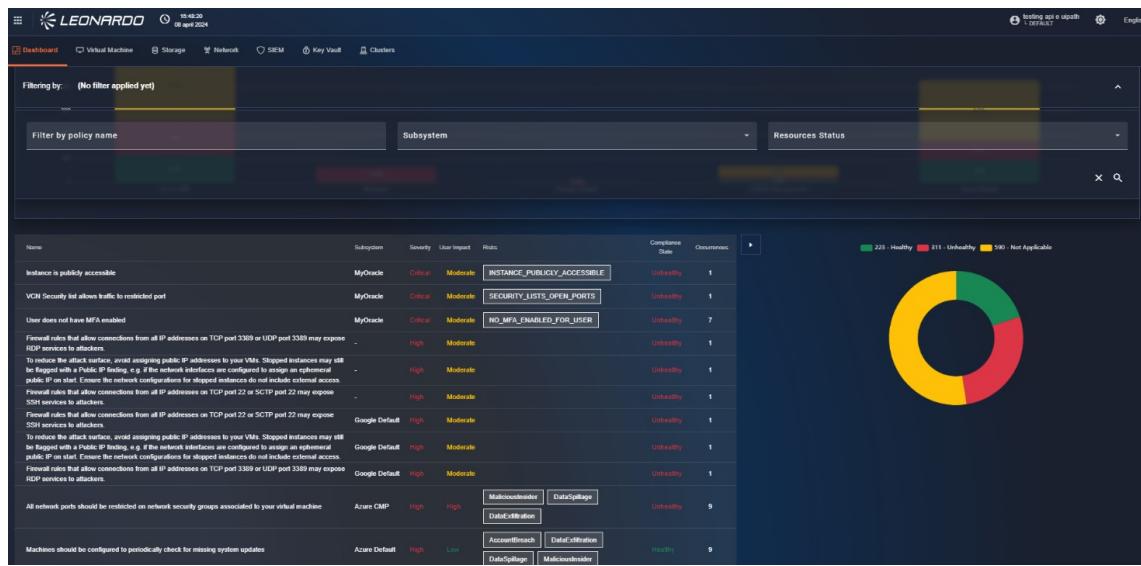


Figura 176 – Policies table

Clicking on a row in the table will open a detail window where you can find all information related to the selected policy, and the list of affected resources will also be available. It is possible to click on the name of a machine to view its details; in this case, the user will be redirected to the SCMP inventory resource in "view" mode.

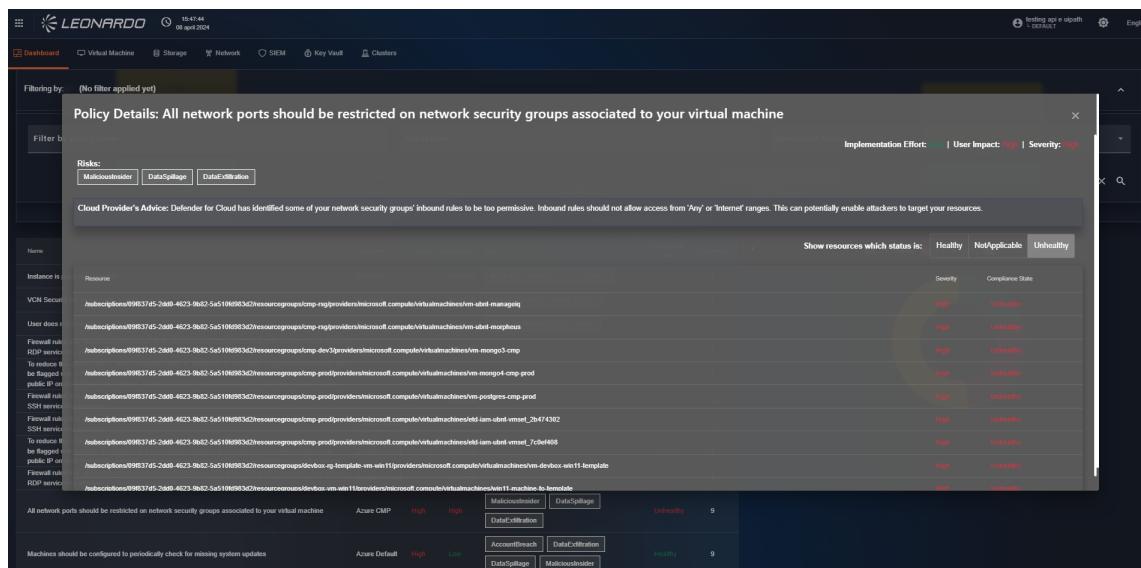


Figura 177 – Policy details

To exit the detail, you need to click outside the window, which will close automatically.

8.0.2 Dashboards specific to resource type

It is possible to further filter policies by resource type, using the tabs at the top of the page.

Once the resource type is selected, it is possible to navigate the pages following the methods described in the previous paragraph.

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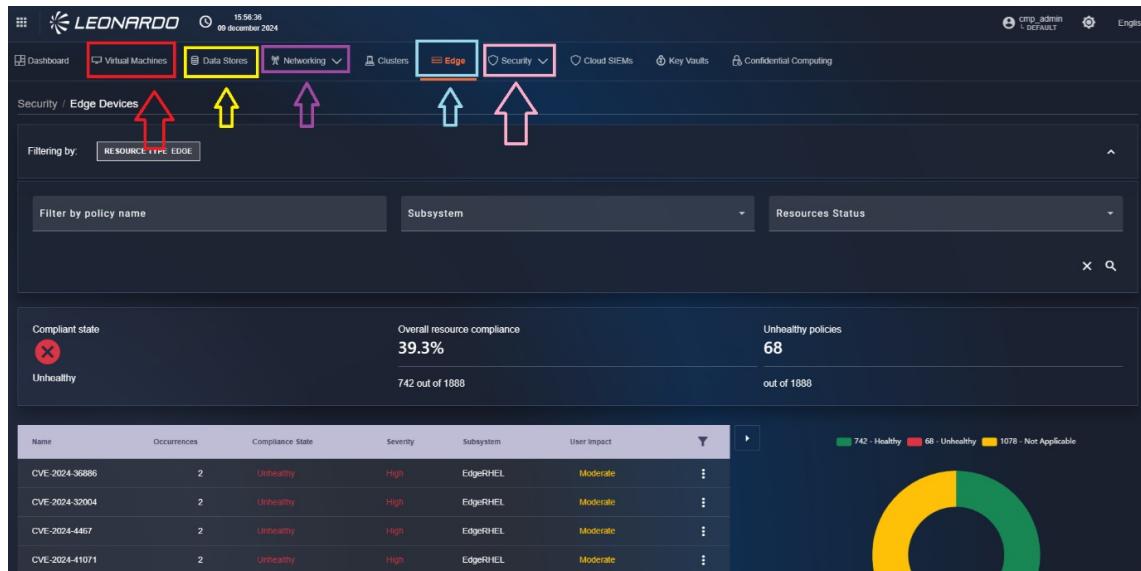


Figura 178 – Virtual Machines compliance Dashboard

8.0.3 SIEM Dashboard

To view the SIEM dashboard, click on the tab that depicts a shield. At the top, there is a dropdown menu where you can select the subscription of interest, while next to it is a dropdown menu where you can select a time range.

Below, there is the "Summary" section which contains information, including for example "Alerts" which indicates the number of alerts. Also within the "Summary" section is the "Incidents by status" chart which indicates incidents by status.

Below the "Summary" section, there is the "Hourly Events Grouped By Type" section which contains a histogram chart indicating hourly events by type.

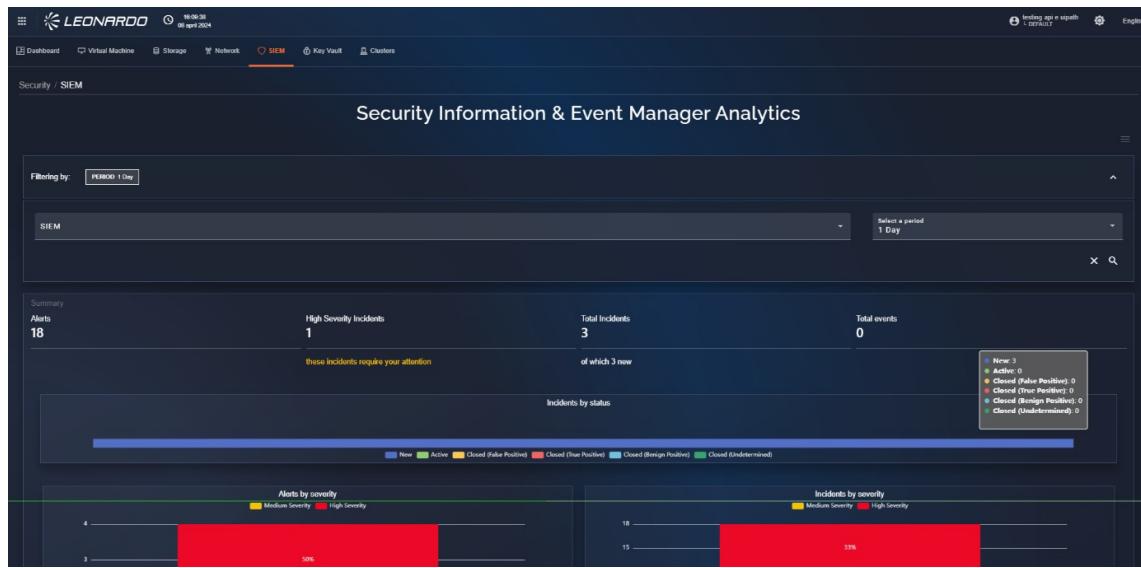


Figura 179 – SIEM Dashboard

Scrolling through the SIEM dashboard, there is the "Event types" chart which indicates all event types.

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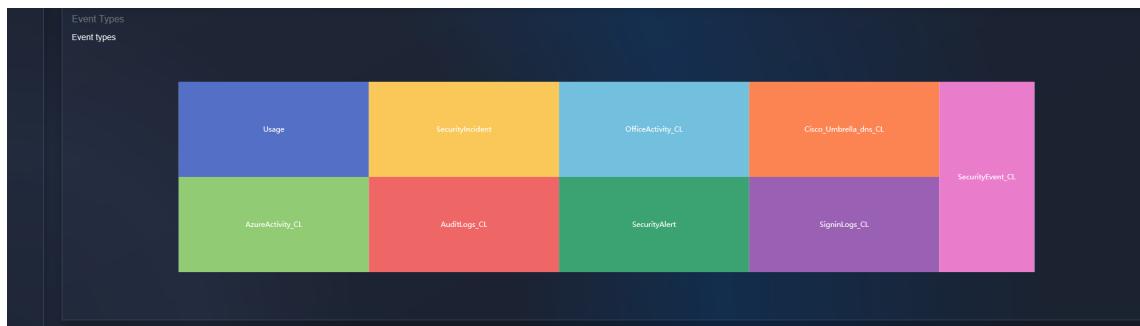


Figura 180 – “Event types” of the SIEM dashboard

Finally, at the bottom of the page, there are two tables: on the left, the “Alert rules” table which shows a set of alarm rules, while on the right, there is the “Incidents” table which shows incidents.

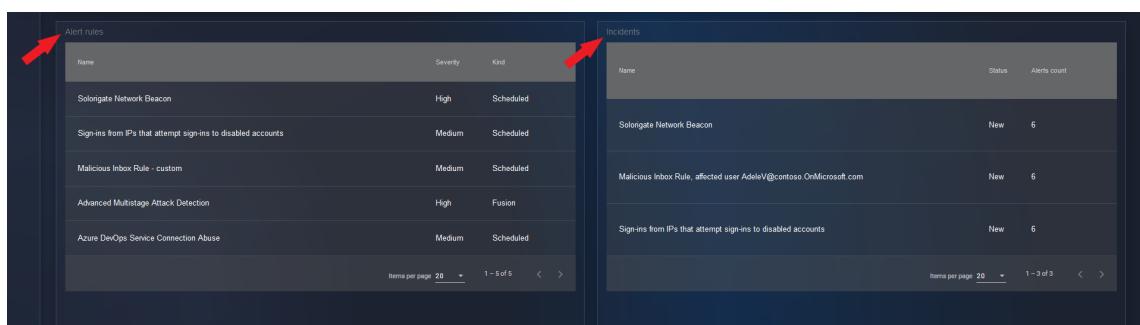


Figura 181 – “Alert rules” and “Incidents” tables

Clicking on a row in the table will open a detail window, where you can find all information related to the selected rule or incident.

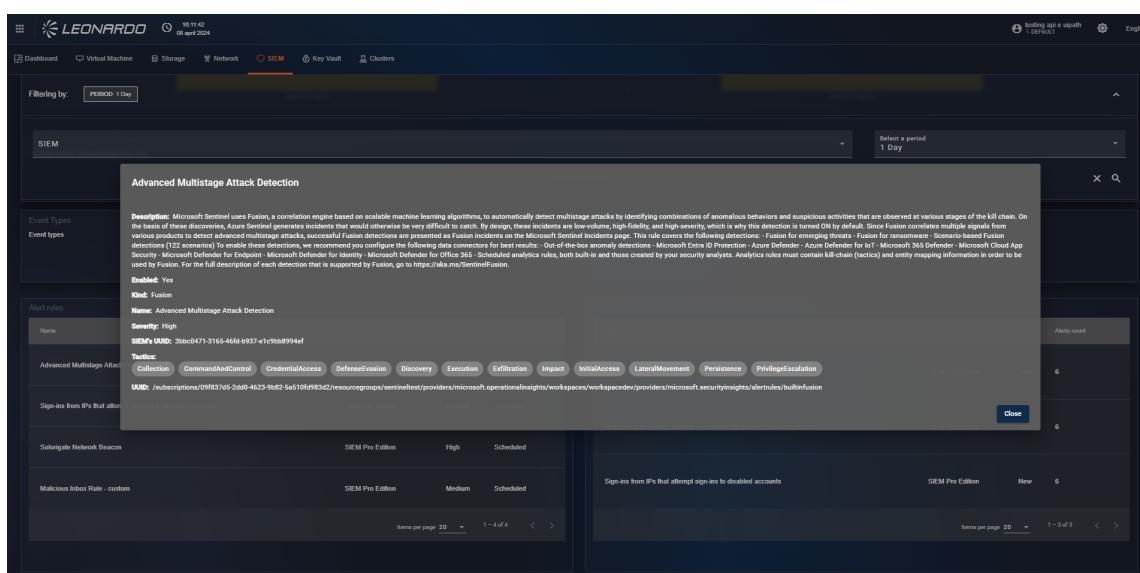


Figura 182 – “Incidents” details

8.0.4 Secret Manager Dashboard

To view the SIEM dashboard, click on the tab that depicts a key. At the top, there is a dropdown menu where you can select the subscription of interest.

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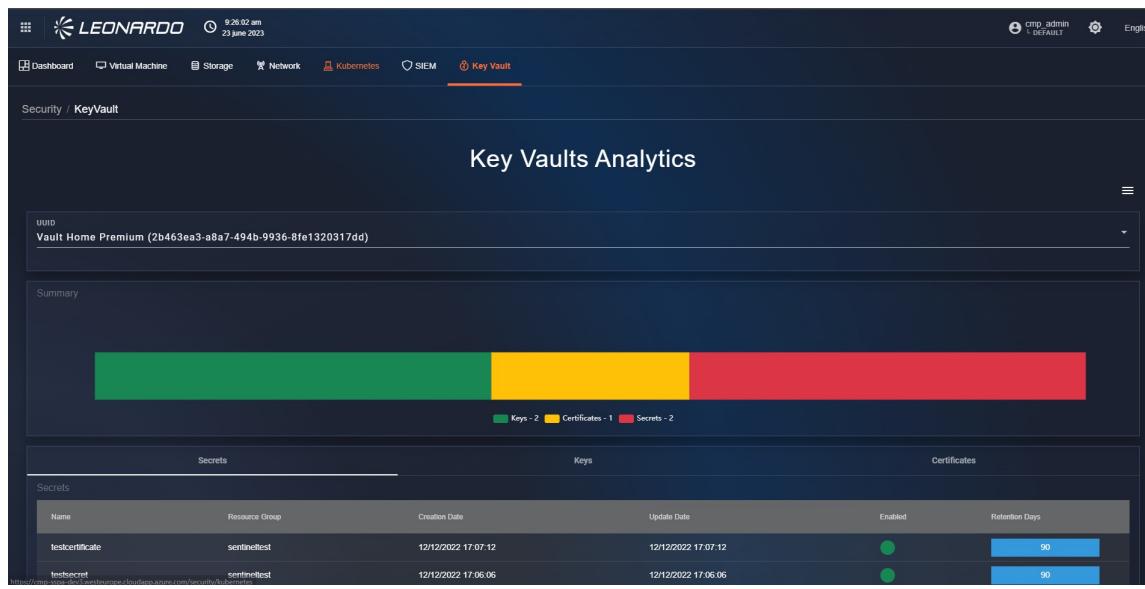


Figura 183 – Key Vault Dashboard

At the bottom of the page, you can see navigation buttons for the table and a table.

Depending on the selected page, the table will display respectively:

- Secret
- Keys
- Certificates

This screenshot is identical to Figura 183, but the "Secrets" tab is highlighted with a red box. The table below also has a red box around its header row.

Name	Resource Group	Creation Date	Update Date	Enabled	Retention Days
testcertificate	sentineltest	12/12/2022 17:07:12	12/12/2022 17:07:12	●	90
testsecret	sentineltest	12/12/2022 17:06:06	12/12/2022 17:06:06	●	90

Figura 184 – Viewable resources

Clicking on a row in the table allows you to view the detail of the selected resource.

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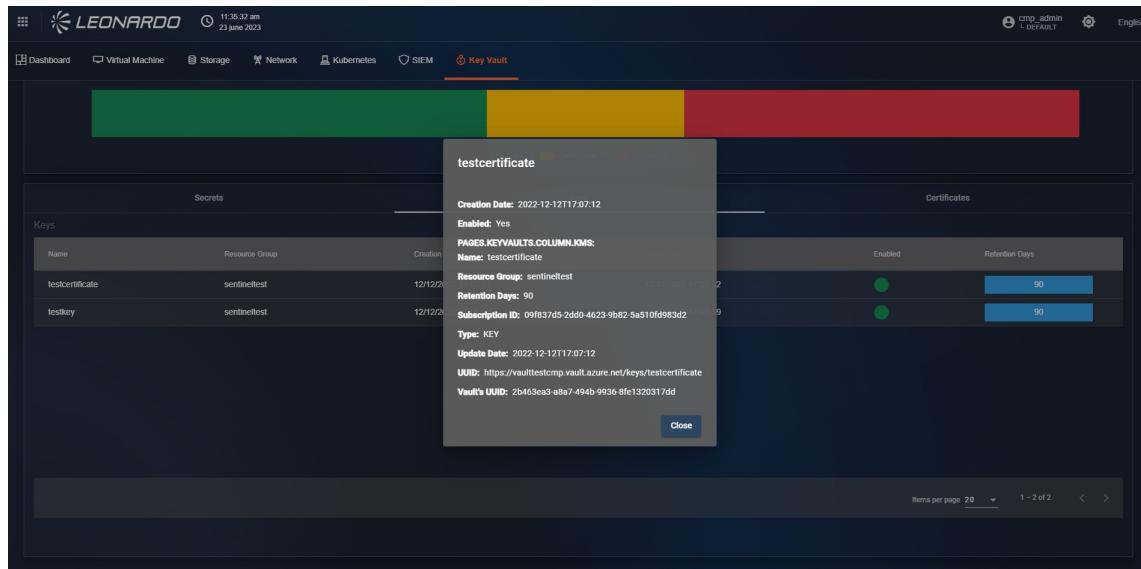


Figura 185 – Key details

8.0.5 Clusters Dashboard

At this point, the user is on the "Dashboard" tab page where all alerts generated by the configured "Cluster" type subsystems in SCMP are shown in an aggregated manner.

At the top, there is a filter bar that allows filtering results by namespace, subscription, and/or policy name.

After that, the user notices the presence of the bar chart indicating the total number of "alerts" received, subdivided by subsystem.

By hovering the mouse over a section of the chart, we can see that the values displayed on the page are updated to show a preview of the detail.

It is possible to click on a section of the chart to automatically apply the "subsystem" filter.

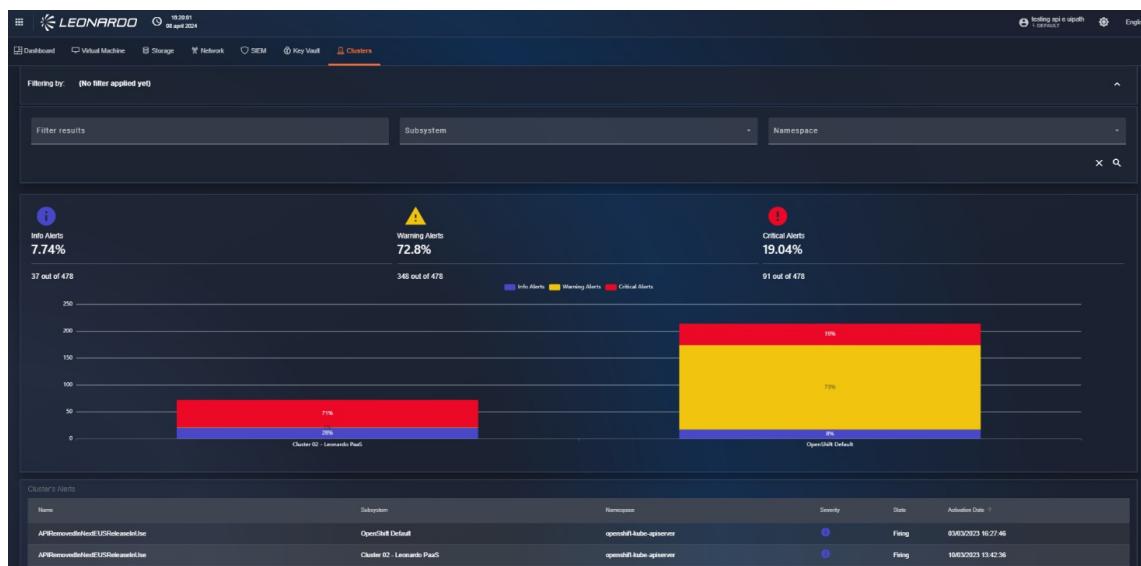


Figura 186 – "Cluster alerts" Dashboard

Scrolling down the page, there is the "alerts" table which will be automatically filtered based on the selected filters.

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Cluster's Alerts						
Name	Subsystem	Namespace	Severity	Status	Activation Date	
APIRemovedInNextReleaseAlert	OpenShift Default	openshift-kube-apiserver	Info	Firing	03/03/2023 16:27:46	
APIRemovedInNextReleaseAlert	Cluster 02 - Leonardo Paoli	openshift-kube-apiserver	Info	Firing	10/03/2023 13:42:36	
APIRemovedInNextReleaseAlert	OpenShift Default	openshift-kube-apiserver	Info	Firing	03/03/2023 16:27:46	
APIRemovedInNextReleaseAlert	Cluster 02 - Leonardo Paoli	openshift-kube-apiserver	Info	Firing	10/03/2023 13:42:36	
AggregatedLoggingSystemCPUHigh	Cluster 02 - Leonardo Paoli	openshift-logging	Info	Firing	22/03/2023 14:49:24	
AleManagerClusterDown	Cluster 02 - Leonardo Paoli	openshift-monitoring	Warning	Firing	10/03/2023 14:17:37	
AleManagerClusterDown	OpenShift Default	openshift-monitoring	Warning	Firing	03/03/2023 16:48:04	
AleManagerClusterWillToSendAlerts	OpenShift Default	openshift-monitoring	Warning	Firing	03/03/2023 16:48:04	
AleManagerClusterWillToSendAlerts	Cluster 02 - Leonardo Paoli	openshift-monitoring	Warning	Firing	10/03/2023 14:17:37	
AleManagerConfigInconsistent	Cluster 02 - Leonardo Paoli	openshift-monitoring	Warning	Firing	10/03/2023 14:17:37	
AleManagerConfigInconsistent	OpenShift Default	openshift-monitoring	Warning	Firing	03/03/2023 16:48:04	
AleManagerConfigInconsistent	Cluster 02 - Leonardo Paoli	openshift-monitoring	Info	Firing	10/03/2023 14:17:37	
AleManagerConfigInconsistent	OpenShift Default	openshift-monitoring	Info	Firing	03/03/2023 16:48:04	
AleManagerConfigInconsistent	Cluster 02 - Leonardo Paoli	openshift-monitoring	Info	Firing	10/03/2023 16:48:04	

Figura 187 – Alerts table

Clicking on a row in the table will open a detail window, where you can find all information related to the selected "alert".

Name	Severity	Compliance State
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-prod/providers/microsoft.compute/virtualmachines/vm-ubnt-manageq	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-prod/providers/microsoft.compute/virtualmachines/vm-ubnt-manageq	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-dev3/providers/microsoft.compute/virtualmachines/vm-mengot-cmp-prod	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-prod/providers/microsoft.compute/virtualmachines/vm-mengot4-cmp-prod	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-prod/providers/microsoft.compute/virtualmachines/vm-postgres-cmp-prod	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-ubnt/providers/microsoft.compute/virtualmachines/vm-ubnt-vmset_7b4f4308	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-ubnt/providers/microsoft.compute/virtualmachines/vm-ubnt-vmset_fcd4608	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-ubnt-tp-templates-vm-win11/providers/microsoft.compute/virtualmachines/vm-devices-win11-template	High	Unhealthy
Adscriptions/00R53745-2d49-4c23-9b82-5a5106983d2/resourcegroups/kmp-ubnt-tp-templates-vm-win11/providers/microsoft.compute/virtualmachines/vm11-machine-tp-templete	High	Unhealthy

Figura 188 – Alert details on clusters

To exit the detail, you need to click outside the window, which will close automatically.

8.0.6 Compliance Dashboard

To view the compliance dashboard, click on the tab that depicts a document in the security module.

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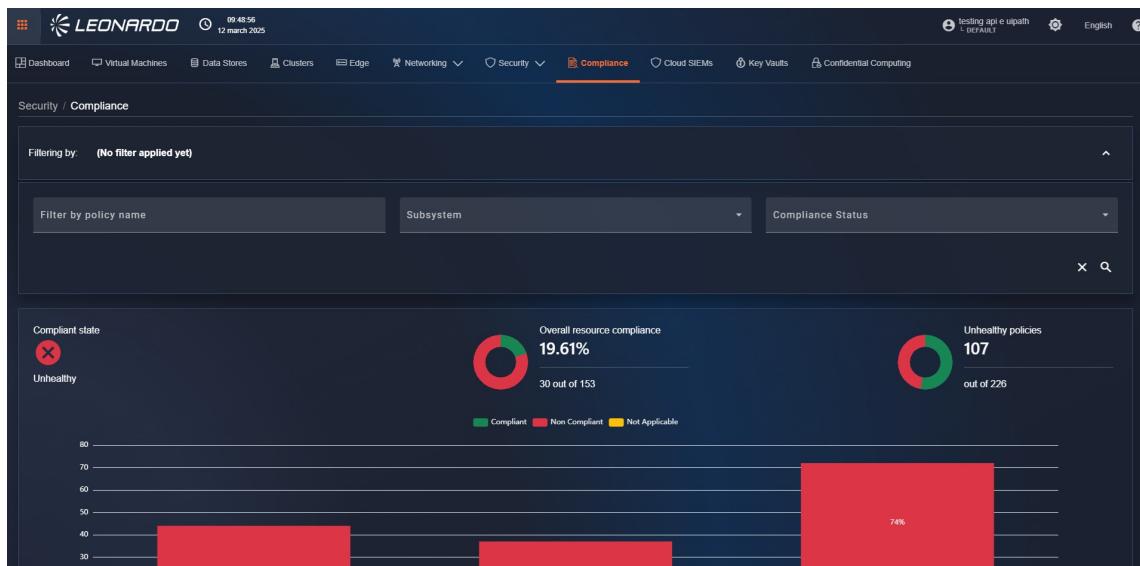


Figura 189 – Compliance dashboard

At this point, the user is on the "Compliance" tab page, composed of 4 sections. The first section contains filters that allow searching by policy name, subsystem, and/or compliance status. The second section, always active, contains pie charts that indicate the general status of the filtered resources.

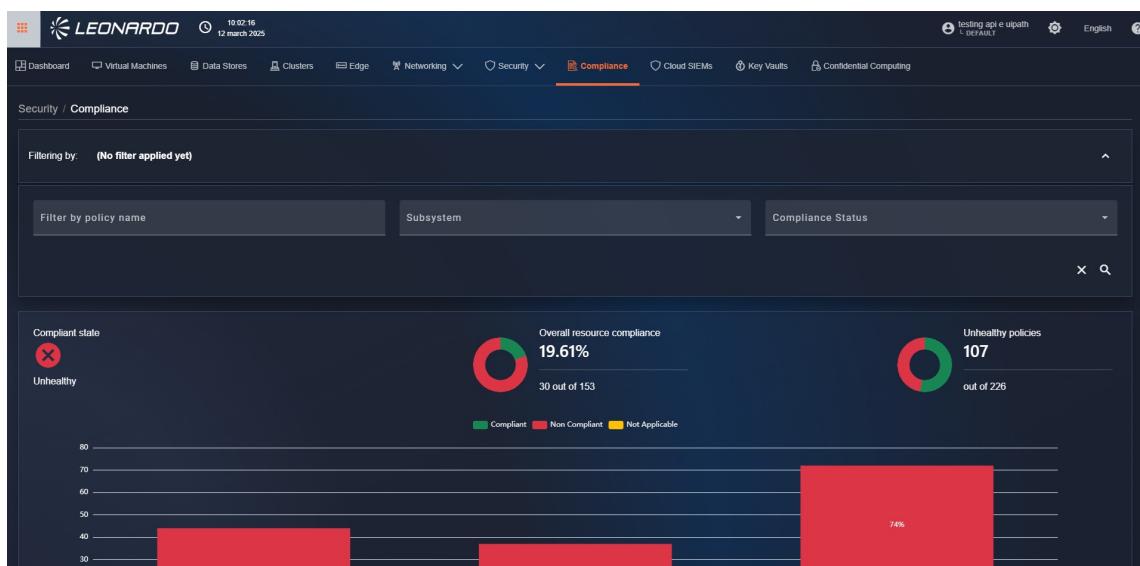


Figura 190 – "Filters" and "pie charts" sections

The third section, active only if multiple different subsystems are present in the results, shows a bar chart, subdivided by provider, of the compliance status of resources. The last section contains a table with general information on policy groups.

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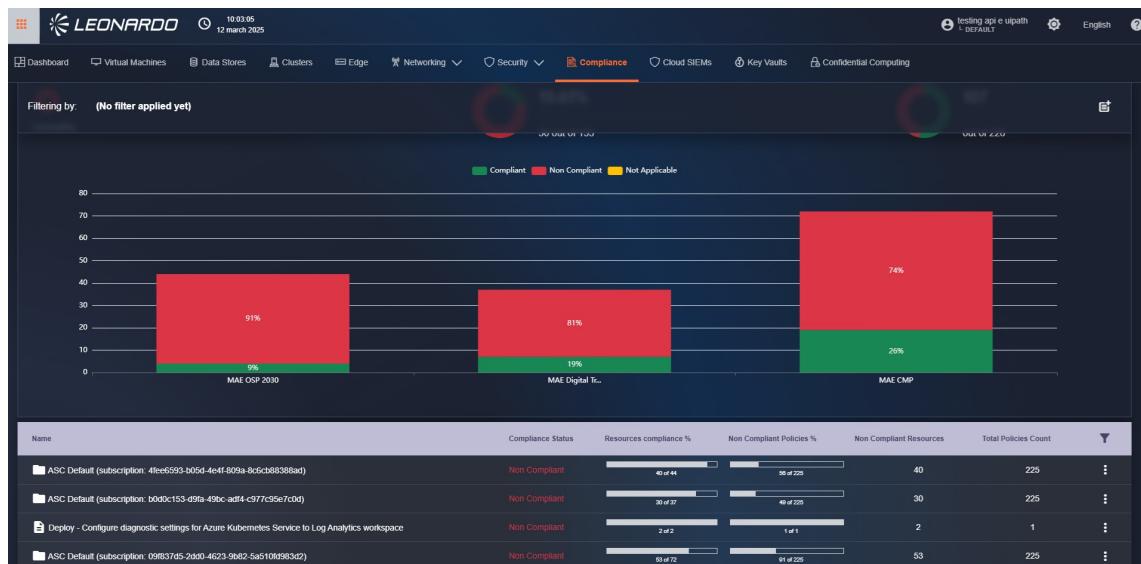


Figura 191 – “Bar charts” and “table” sections

Clicking on a row in the table opens a modal where it will be possible to view the list of all policies configured in the group, with the relative resource count. Still within the modal, we can click on one of the displayed policies; doing so will show at the bottom the list of all machines assigned to the policy and their respective status. Next to each resource, a “link” button is available; once clicked, the user will be redirected to the inventory page of the selected resource.

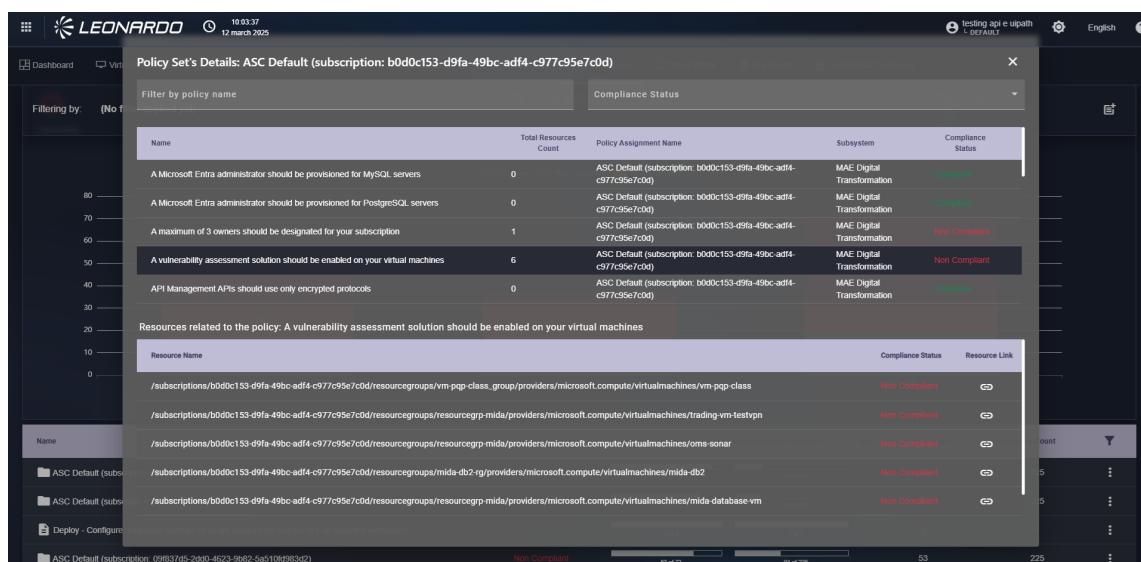


Figura 192 – Policy details

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9 Catalog

The Catalog section has three important features:

- Displaying the list of installable assets retrieved from providers, along with their associated prices and regions.
- Enabling the tenant administrator to define items that can be subsequently used for provisioning.
- Enabling the tenant administrator to define items that can be subsequently used within What If module simulations.

The retrieved prices, in addition to being visible within the asset's details, are used for What If scenarios and cost calculation.

To access the Catalog functionality, click on the bento button in the upper left corner.

Then, click on "Catalog".



At this point, the user is on the "Resources" tab page.

We can divide the functionality into 3 sections to specify its behavior:

- SCMP catalog items (yellow box in the image).
- Provider catalog items (green box in the image).
- SCMP catalog services and blueprints (red box in the image).

Below, we will analyze each group of functionalities separately.

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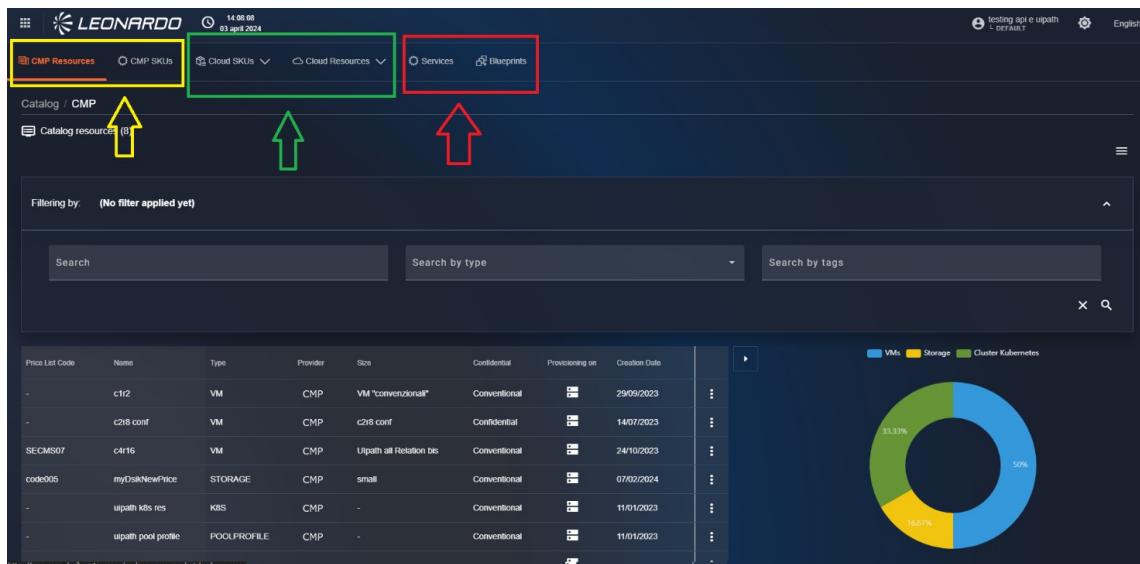


Figura 194 – Catalogo della SCMP

9.0.1 SCMP Catalog Item Management

On the page, there is a series of filters that, once selected and by clicking on the magnifying glass button, will be used to filter the list of results.

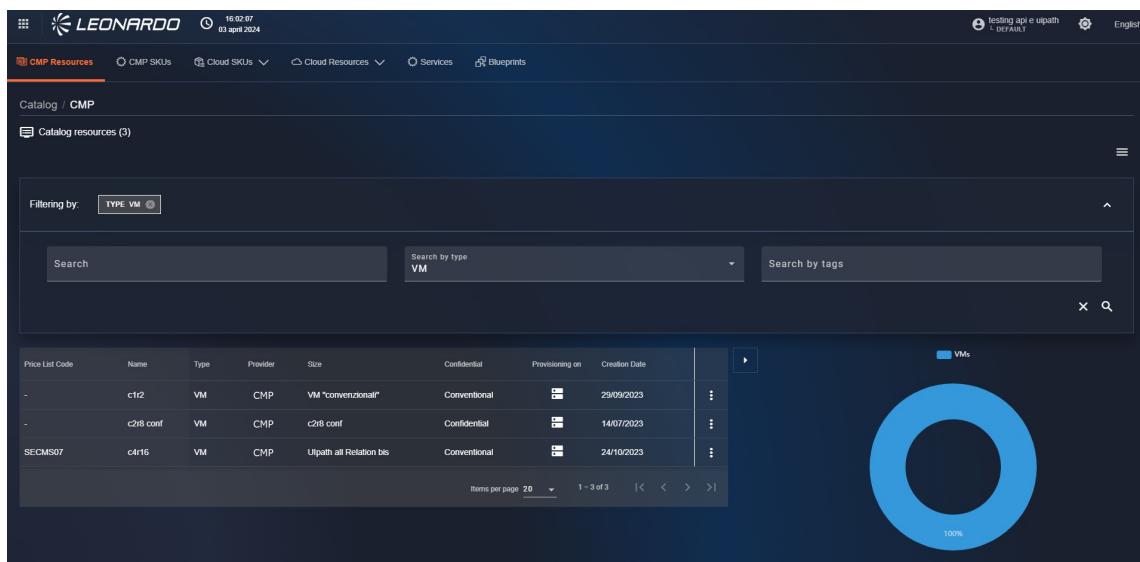


Figura 195 – Catalogo SCMP filtrato

 Association between SCMP catalog resource/SKU and Provider catalog resource/SKU

To allow the system to correctly calculate costs, it is necessary that the SCMP catalog resource or SKU contains a reference to the actual ID retrieved from the provider (as explained in this section) in order to correctly overwrite the cost of the resource / SKU.

Next to the magnifying glass button, there is an "X" button to reset the filters and the resource table.

Below the search filter, there is a search filter for tags.

Click on it and select a tag; at this point, the table returns the resources associated with the tag selected by the user.

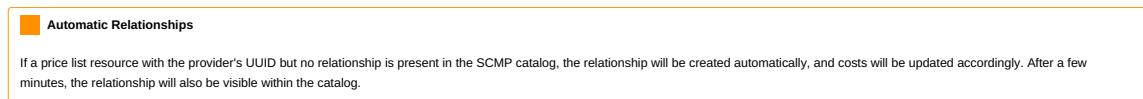
9.0.1.1 Resources and relationships between resources

Within the SCMP, it is possible to configure a "Relationship" type resource. This relationship allows mapping machines from various providers to modify their costs and enable their use in other functionalities (e.g., for cost calculation).

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To access the relationships page, click the "SCMP Resources" tab at the top of the Catalog functionality.

Price List Code	Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date	Actions
code005	myDiskNewPrice	STORAGE	CMP	small	Conventional	VMs	07/02/2024	⋮
-	res002	VM	CMP	cat0	Conventional	VMs	18/04/2024	⋮
-	upath kbs res	KBS	CMP	-	Conventional	VMs	11/01/2023	⋮
-	upath pool profile	POOLPROFILE	CMP	-	Conventional	VMs	11/01/2023	⋮
priceCode001	upathRelation1	VM	CMP	upathCat001	Conventional	VMs	15/04/2024	⋮
-	upathpool	POOLPROFILE	CMP	-	Conventional	VMs	12/01/2023	⋮
-	upathfile-stkds	KBS	CMP	-	Conventional	VMs	12/01/2023	⋮

Filtering by: (No filter applied yet)

Search Search by type Search by tags

VMs Storage Cluster Kubernetes

Risorse 2 VMs

Figura 196 – Accesso a "SCMP resources"

At the top, there is a filter section that allows searching by:

- "Search": allows entering free text for searching.
- "Search By tags": allows searching using tags associated with resources.
- "Search by Service name": allows searching by service name.

9.0.1.1.1 RESOURCE EXPORT

To export the list of Catalog resources present in the list, on the page, in the upper right corner, click on the hamburger menu, and then click on "Export".

The operator will have the option to export the list of results in .csv and/or .json format.

CSV JSON Export Force Sync

Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date	Actions
Audio Analytics	AIMODEL	CMP	-	Conventional	VMs	03/03/2023	⋮
BLUEPRINT DEMO	BLUEPRINT	CMP	-	Conventional	VMs	03/01/2023	⋮
Blueprint DEMO path	BLUEPRINT	CMP	-	Conventional	VMs	03/01/2023	⋮
Blueprint Retail	BLUEPRINT	CMP	-	Conventional	VMs	21/06/2023	⋮
MyApplication	BLUEPRINT	CMP	-	Conventional	VMs	24/01/2023	⋮
PaaS - AI Platform	PAAS	CMP	-	Conventional	VMs	14/06/2023	⋮
PaaS - IAM	PAAS	CMP	-	Conventional	VMs	14/06/2023	⋮
PaaS - Kafka	PAAS	CMP	-	Conventional	VMs	05/06/2023	⋮

VMs Cluster Kubernetes

Figura 197 – Scaricare la lista di risultati

9.0.1.1.2 FORCED CATALOG UPDATE FUNCTIONALITY

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Through the Force Sync functionality, it is possible to request a catalog update by clicking on the hamburger menu and then clicking on "Force Sync".

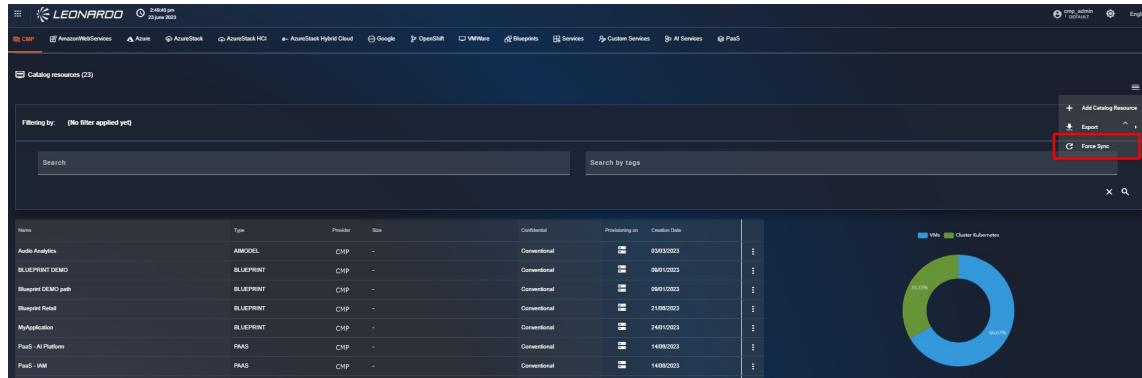


Figura 198 – Funzionalità Force Sync

9.0.1.1.3 CATALOG RELATIONSHIP CREATION

To create a resource in the Catalog, always on the page, in the upper right corner, click on the hamburger menu, and then click on "Add Catalog Resource".

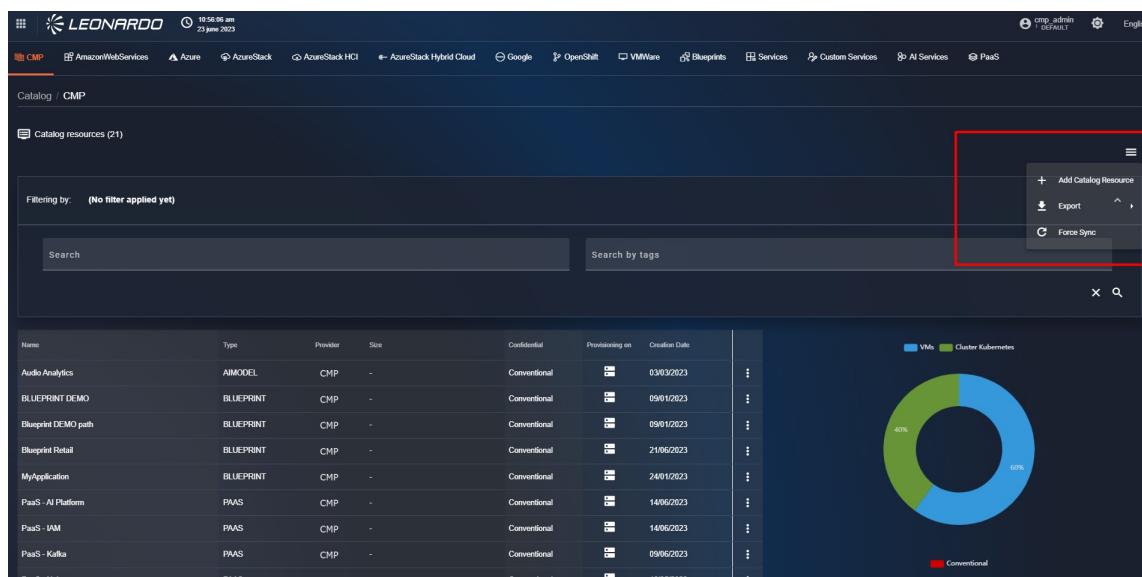


Figura 199 – Opzione per aggiungere una risorsa

At this point, the user is on the page where they can select the type of resource to create.

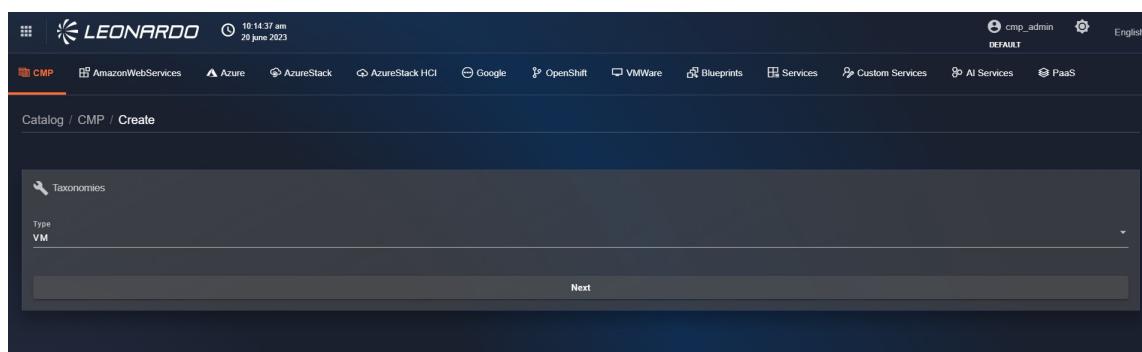


Figura 200 – Selezione del tipo di risorsa da creare

From the dropdown menu, select the type of resource to create. Then, click the "Next" button. You will be on the resource compilation page.

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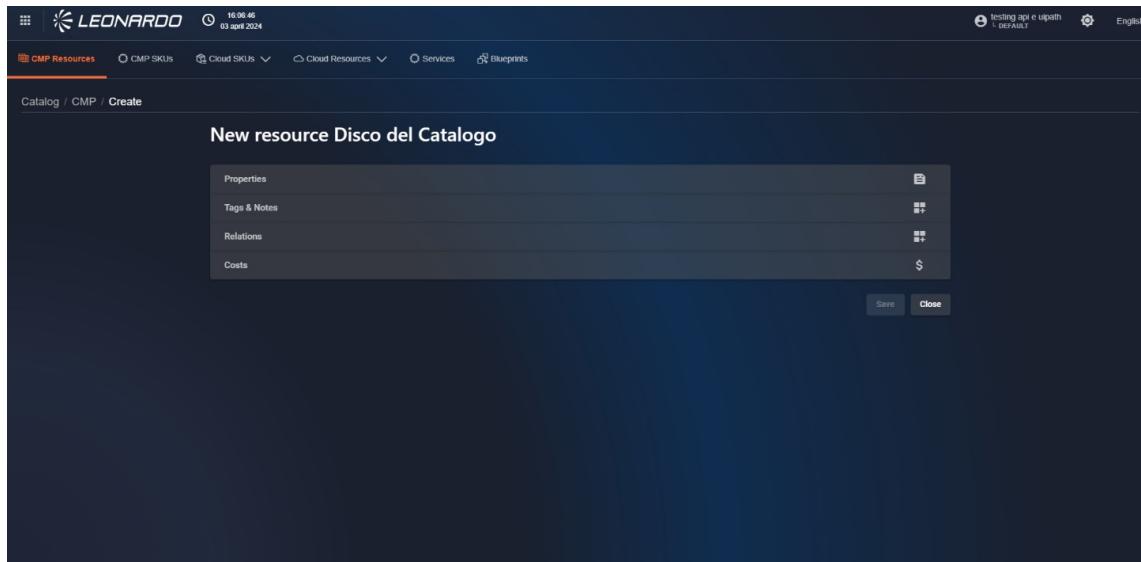


Figura 201 – Esempio di form per la creazione di una relazione

The individual parameters to be entered in the "Properties" section are specified in the table:

Mandatory parameters are indicated with *

Name	Type	Description	Example
category	string	Enter the resource's category	CAT0004BT
Price list code	string	Enter the price list identifier code from which associations are derived	PRC005DE
confidential	boolean	If enabled, indicates that the resource is confidential	false
description	string	Enter a free description of the resource	Low end machine
Name*	string	Enter the resource name	8Core16GB- small
RAM(GiB)*	integer	Enter here the quantity in GiB used by the machines included in the relationship	16
vCPU*	integer	Enter here the number of vCPUs used by the machines included in the relationship	8

On the resource creation page, fill in all fields in the "Properties" section. After doing this, select one or more tags for the "Add SCMP tag..." field and fill in notes in the "Tags & Note" section.

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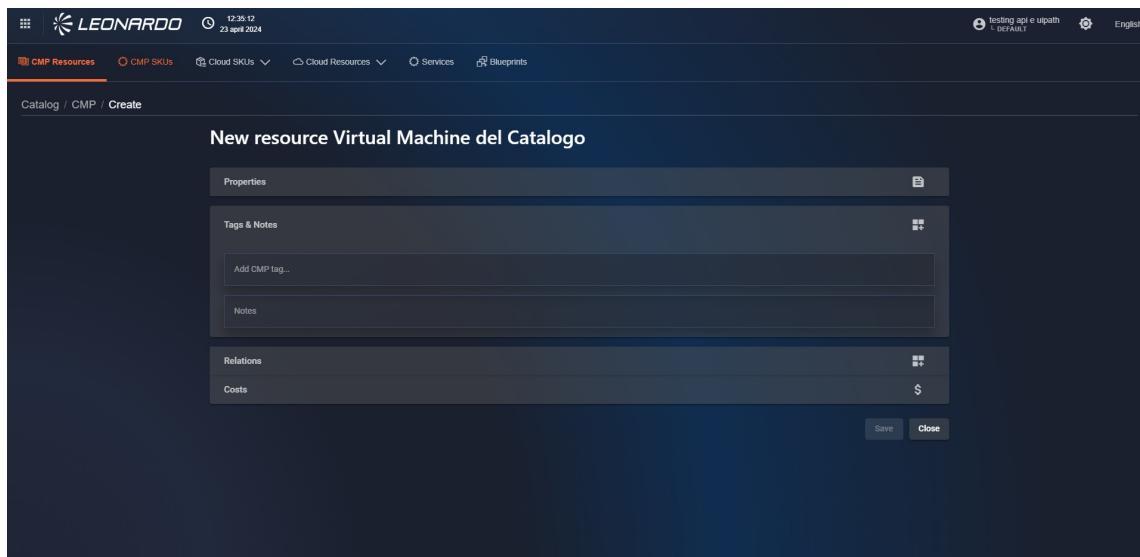


Figura 202 – Sezione tag e note

In the "Relations" section, open the left section. Subsequently, it is possible to use the "search" filters with free text or select a "System Type" from those available to filter the resource table.

Once the resource to be associated is identified, drag and drop it from the right side of the page to the left side.

It is possible to add only one resource per provider type. If the user tries to insert another resource from the same provider, a pop-up will appear inviting the user to add only one resource per provider.

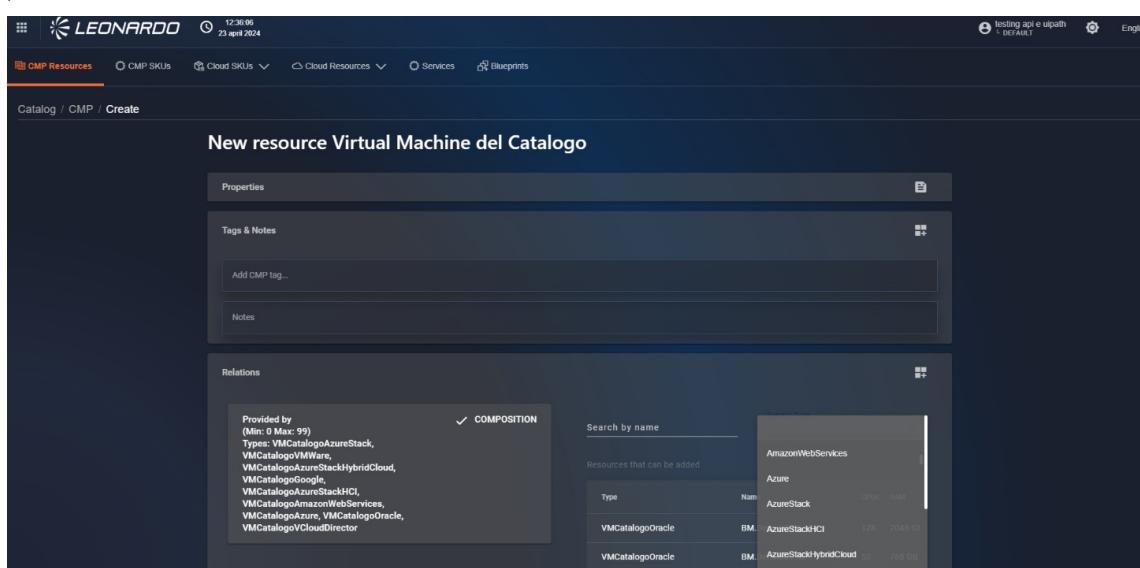


Figura 203 – Selezione del provider per associare le risorse

We can make a "single" association by entering only one machine in this section. In this way, the system allows us to manually select a customized price to associate with the resource in the "Cost" section below. To do this, select the billing interval (hourly, daily, weekly, monthly) and enter the cost relative to the selected period on the right.

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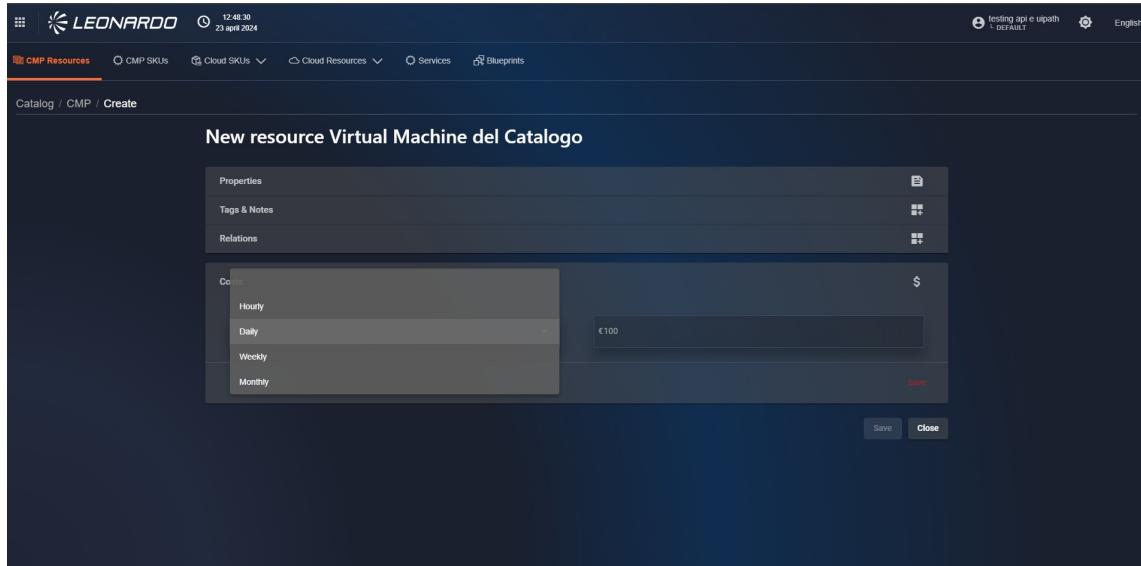


Figura 204 – Sezione costi delle relazioni

By selecting more than one machine per provider, the cost section is automatically hidden; the applied costs will be defined by the percentages configured in the subsystems.

Type	Name	CPU	RAM
VMCatalogoOracle	BM.DenseIO.E4.128	128	2048 Gi
VMCatalogoOracle	BM.DenseIO2.S2	52	768 GB
VMCatalogoOracle	BM.Optimized3.36	36	512 GB
VMCatalogoOracle	BM.Standard.A1.160	160	1024 Gi
VMCatalogoOracle	BM.Standard.E3.128	128	2048 Gi
VMCatalogoOracle	BM.Standard.E4.128	128	2048 Gi
VMCatalogoOracle	BM.Standard2.S2	52	768 GB
VMCatalogoOracle	BM.Standard3.64	64	1024 Gi
VMCatalogoAzure	Basic_A0	1	0 GB
VMCatalogoAzureStack	VM.Standard.F4s_Flex		

Figura 205 – Risorse associate alla risorsa SCMP

Once the resources are related, an illustrative diagram will automatically be created in the 'Relations Chart' section.

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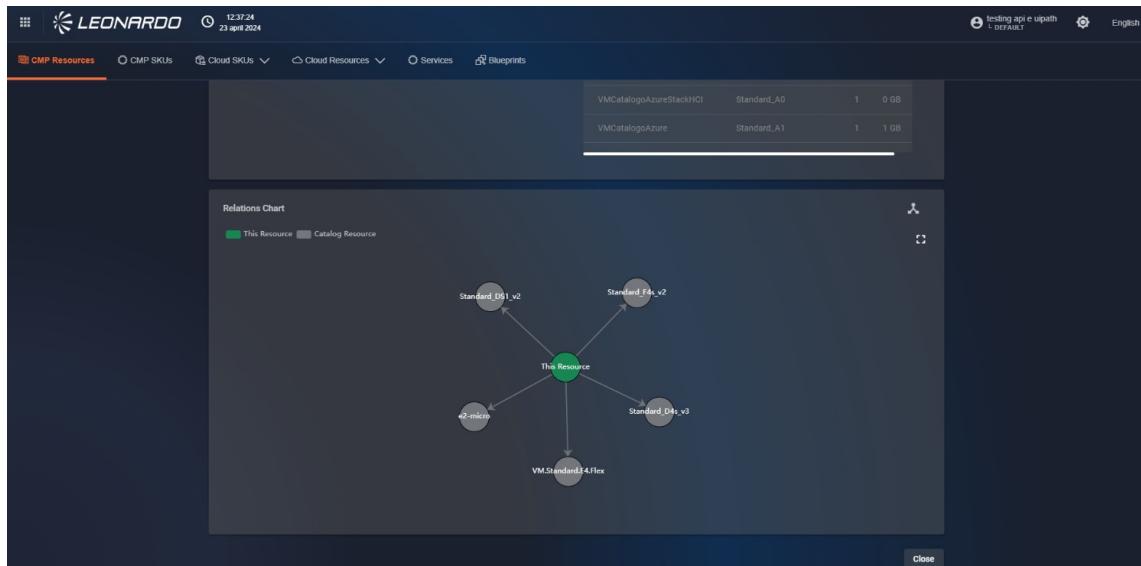


Figura 206 – Creazione automatica del Relation Chart

Finally, in the bottom right, click the "Save" button to save the changes. A banner will appear at the bottom, notifying the user of the successful resource creation, and the user will be redirected to the page containing the list of resources.

9.0.1.1.4 USING THE CATALOG TABLE

9.0.1.1.4.1 Resource Summary View

To view the data of an SCMP resource, on the "Resources" page of Catalog, in the list of resources, click on the record of interest for a resource. A window will appear showing brief information about the identified resource: System, Name, Size, Update Date, RAM, and CPU as shown in the following image.

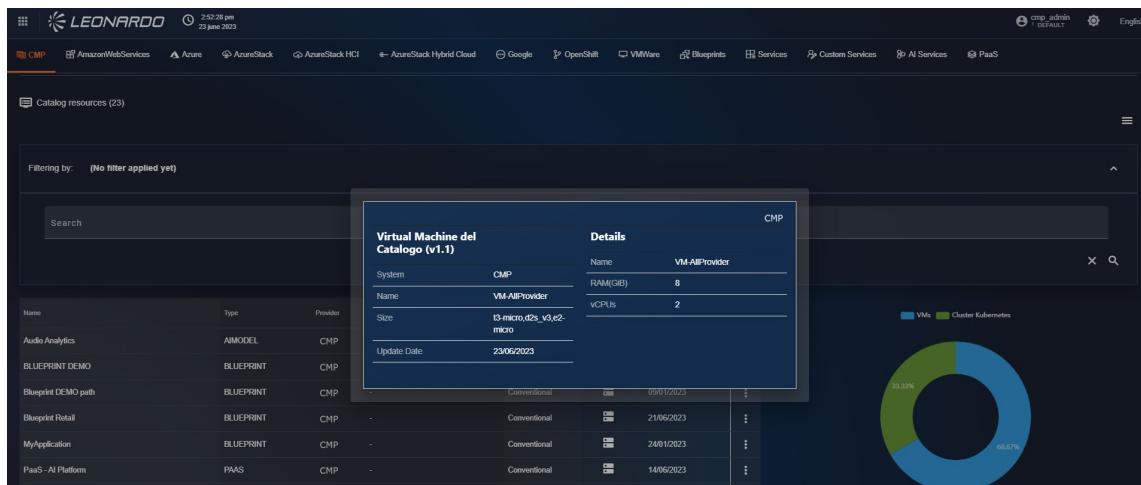


Figura 207 – Dettaglio rapido delle risorse di catalogo

9.0.1.1.4.2 Viewing Catalog Relationships

To view the data of an SCMP resource, on the "Resources" page of Catalog, in the list of resources, click on the kebab menu for a resource and then click on "Show".

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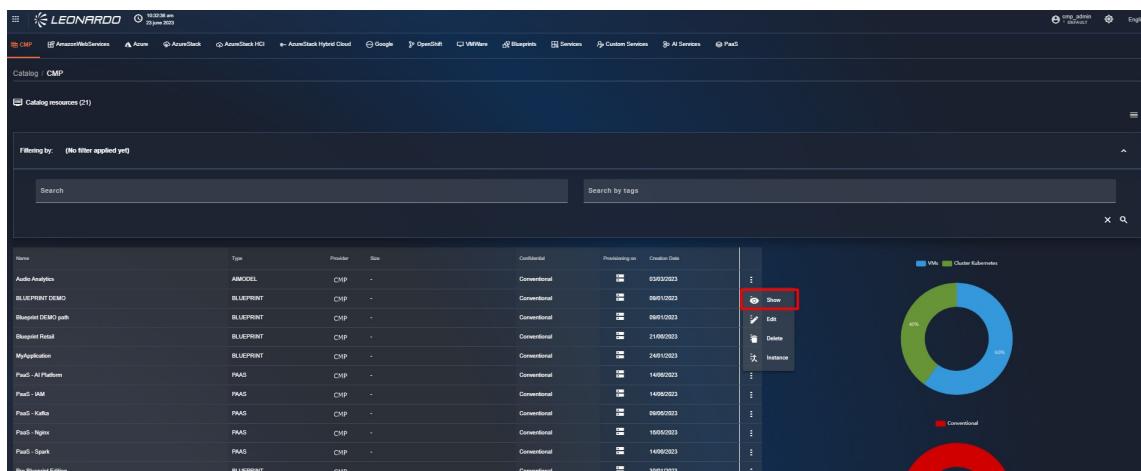


Figura 208 – Accesso alla risorsa in modalità view

After doing this, the user is on the resource page in view mode, where they can see the data but cannot modify it.

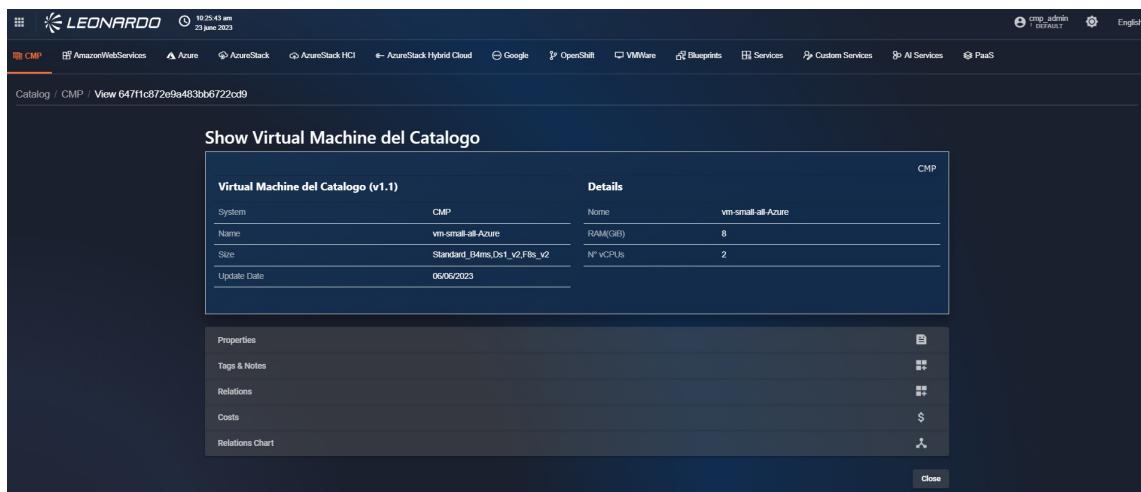


Figura 209 – Dettaglio completo delle risorse di catalogo

The detail of a resource is divided into various sections:

- Details.
- Properties.
- Tags & Notes.
- Relations.
- Cost, if present.
- Relations Chart.

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Catalog / CMP / View 647f1c872e9a483b6722c09

Show Virtual Machine del Catalogo

Virtual Machine del Catalogo (v1.1)

System	CMP	Details	
Name	vm-small-all-Azure	Name	vm-small-all-Azure
Size	Standard_B4ms_0x1_v2Fbx_x2	RAM(GB)	8
Update Date	06/06/2023	N° vCPUs	2

Properties

Category: Standard_B4ms_0x1_v2Fbx_x2
■ Confidential
Description:
description
Name: vm-small-all-Azure
RAM(GB): 8
vCPUs: 2

Tags & Notes

Relations

Costs

Relation Chart

Close

Figura 210 – Sezione proprietà degli elementi del catalogo

Catalog / CMP / View 647f1c872e9a483b6722c09

Show Virtual Machine del Catalogo

Virtual Machine del Catalogo (v1.1)

System	CMP	Details	
Name	vm-small-all-Azure	Name	vm-small-all-Azure
Size	Standard_B4ms_0x1_v2Fbx_x2	RAM(GB)	8
Update Date	06/06/2023	N° vCPUs	2

Properties

Tags & Notes

Provider tag...
Add CMP tag...
Notes

Relations

Costs

Relation Chart

Close

Figura 211 – Sezione Tags & Note degli elementi del catalogo

Relations

Provided by (0 items)
Type: VMCatalogAmazonWebServices, VMCatalogVMware, VMCatalogAzureStack, VMCatalogGoogle, VMCatalogAzureStack, VMCatalogAzure

Type: VMCatalogAzureStack

Name	Size	RAM	CPUs	Resource Group	Region
Standard_B4ms_x2	16	8	2		eu-west-2

Type: VMCatalogAzure

Name	Size	RAM	CPUs	Resource Group	
Standard_B4ms	16	4	2		eu-west-2

COMPOSITION

Search by name

Name	Type	Size	RAM	CPUs
VMCatalogAmazonWebServices	c7g-large	4	8192 GB	
VMCatalogAmazonWebServices	c1g-2large	16	32768 GB	
VMCatalogAmazonWebServices	g2-2large	4	11360 GB	
VMCatalogAmazonWebServices	rl3-metal	64	534384 GB	
VMCatalogAmazonWebServices	c1g-metal	64	113712 GB	
VMCatalogAmazonWebServices	c4-large	1	4096 GB	
VMCatalogAmazonWebServices	x2dce-32large	64	4194304 GB	
VMCatalogAmazonWebServices	c3-4large	8	30720 GB	
VMCatalogAmazonWebServices	m3d-large	16	113712 GB	
VMCatalogAmazonWebServices	c5d-large	3	32768 GB	
VMCatalogAmazonWebServices	g3-3large	32	499712 GB	
VMCatalogAmazonWebServices	c7g-metal	64	113712 GB	
VMCatalogAmazonWebServices	rfe-2large	4	6536 GB	
VMCatalogAmazonWebServices	mSe-16large	32	262144 GB	
VMCatalogAmazonWebServices	p2-3large	32	749568 GB	

Costs

Relations Chart

Close

09.00

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Figura 212 – Sezione delle relazioni del catalogo SCMP

The screenshot shows the SCMP interface with the 'Catalog / CMP' view. A specific resource, 'Virtual Machine del Catalogo (v1.1)', is selected. The 'Details' section shows the resource's name as 'vm-small-all-Azure', system as 'CMP', RAM as 8 GB, and 2 vCPUs. Below this, a 'Relations' section is expanded, displaying a 'Relations Chart'. This chart is highlighted with a red box and shows three nodes: 'Virtual Machine del Catalogo Azure Standard_1s_2', 'Virtual Machine del Catalogo Azure Standard_4s_2', and 'Virtual Machine del Catalogo del Catalogo Hybrid Cloud catalogo hybridCloud'. Arrows indicate relationships between these nodes. In the bottom right corner of the relations chart area, there is a 'Close' button.

Figura 213 – Sezione Relations Chart delle risorse

In the bottom right, click the "Close" button. The user will be redirected to the "Resources" page of Catalog.

9.0.1.1.4.3 Editing Catalog Relationships

To modify an SCMP resource, on the "Resources" page of Catalog, in the list of resources, click on the kebab menu for a resource and then click on "Edit".

The screenshot shows the 'Catalog / CMP' resources page. A context menu is open over a row for the 'BLUEPRINT DEMO' resource. The menu items are: 'Show' (disabled), 'Edit' (highlighted with a red box), 'Delete', and 'Instance'. To the right of the menu, there is a donut chart showing resource distribution: 40% VMs and 60% Cluster Kubernetes. The main table lists various resources with columns for Name, Type, Provider, Size, Confidential, Provisioning on, Creation Date, and a kebab menu icon. A search bar at the top is set to '(No filter applied yet)'.

Figura 214 – Accesso alla risorsa in modalità edit

After doing this, the user is on the resource page in edit mode. Unlike 'Show' mode, in 'Edit' mode, it is possible to modify the Properties section and the Cost section.

In the bottom right, click the "Save" button. At this point, a banner will appear at the bottom, notifying the user of the successful resource update.

In addition, the user will be redirected to the "Resources" page of Catalog.

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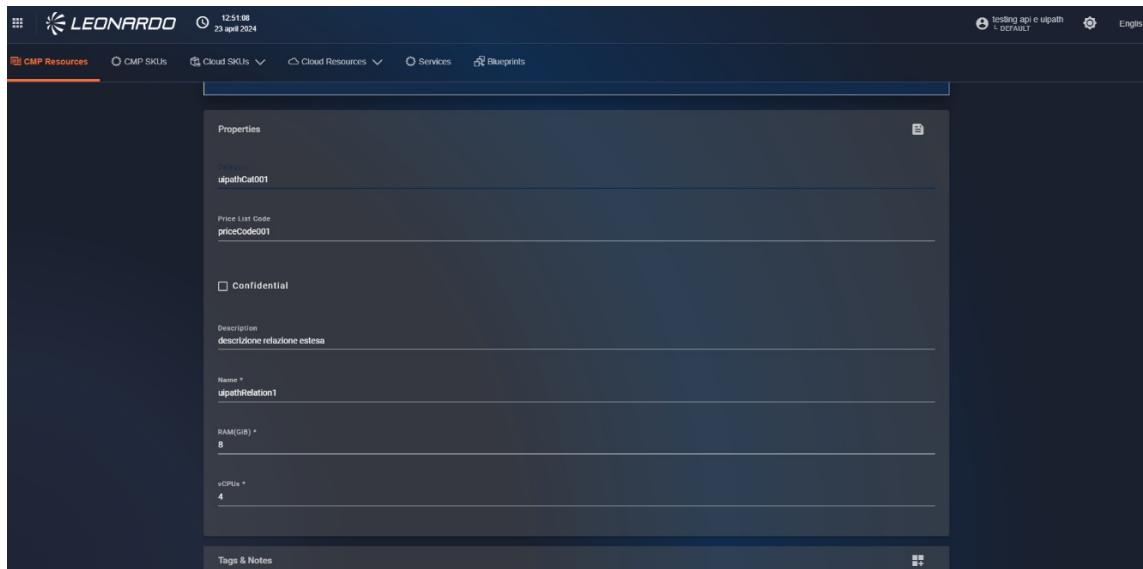


Figura 215 – Modifica della relazione

9.0.1.1.4.4 Deleting Catalog Relationships

To delete an SCMP resource, on the "Resources" page of Catalog, in the list of resources, click on the kebab menu for a resource and then click on "Delete".

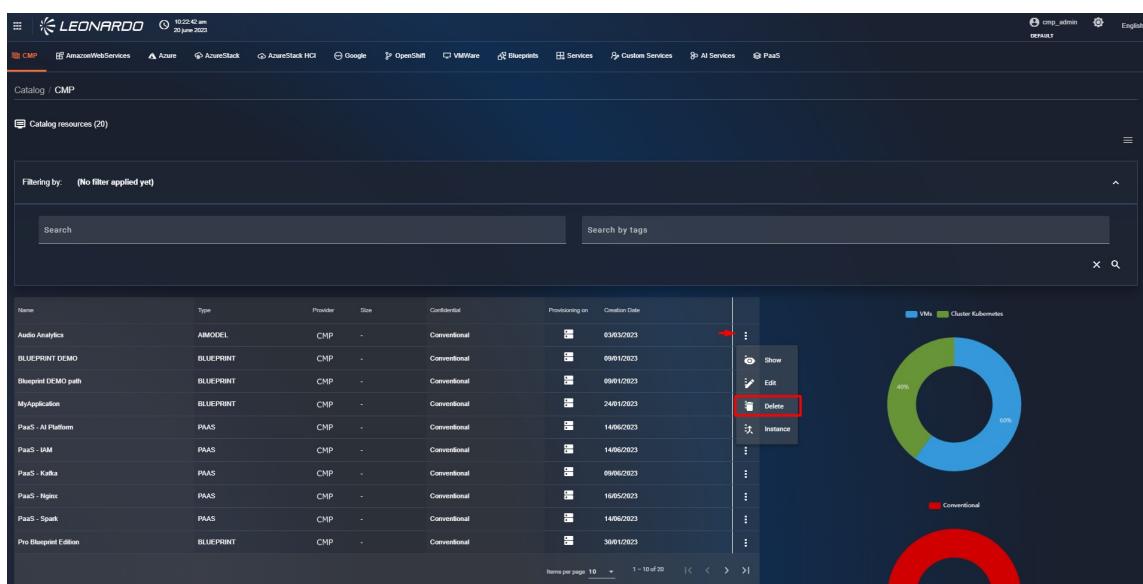


Figura 216 – Eliminazione di una risorsa

Once done, a modal appears where it is necessary to click the "Remove" button to confirm the resource deletion.

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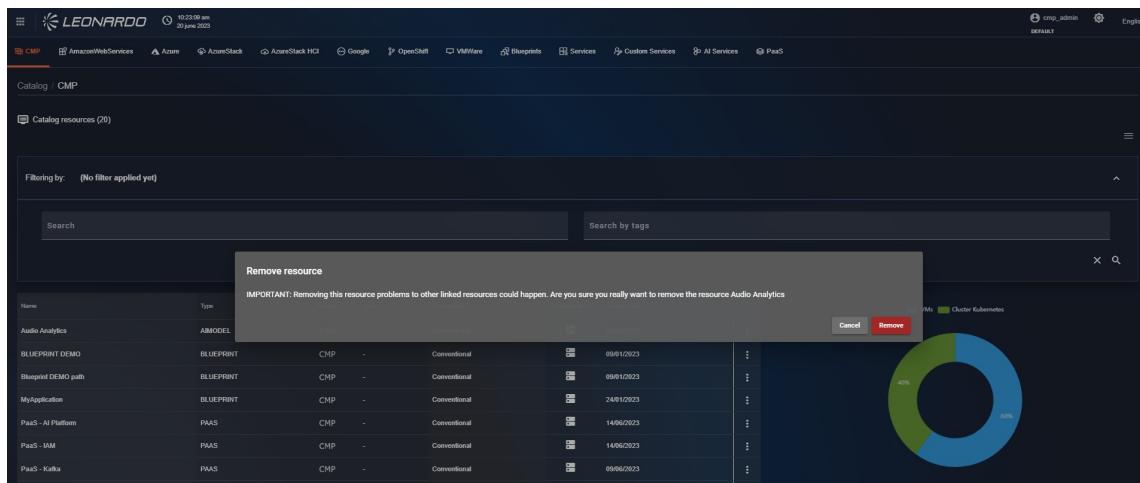


Figura 217 – Conferma eliminazione della risorsa

9.0.1.2 Resources and relationships between SKUs

Within the SCMP, it is possible to configure an "SCMP SKU" type resource. This relationship allows mapping SKUs received from providers to define their costs and the unit of measure displayed in the system.

To access the SKUs page, click the "SCMP SKU" tab at the top of the Catalog functionality.

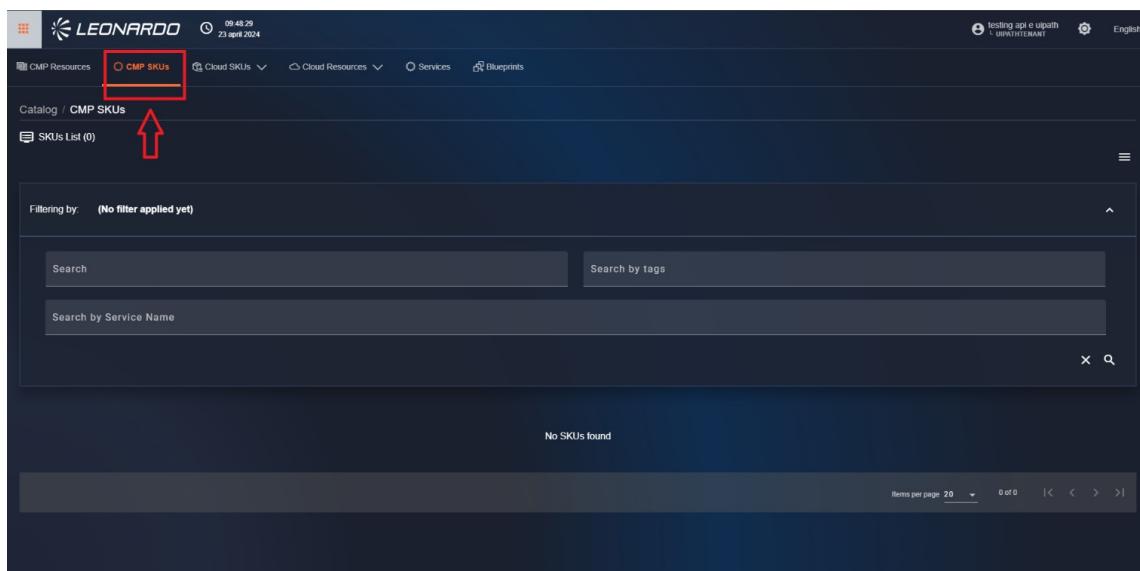


Figura 218 – Accesso a "SCMP SKU"

At the top, there is a filter section that allows searching by:

- "Search": allows entering free text for searching.
- "Search By tags": allows searching using tags associated with resources.
- "Search by Service name": allows searching by service name.

9.0.1.2.1 EXPORT OF CATALOG RESOURCES

To export the list of Catalog resources present in the list, always on the "SCMP" tab page, in the upper right corner, click on the hamburger menu, and then click on "Export".

The operator will have the option to export the list of results in .csv and/or .json format.

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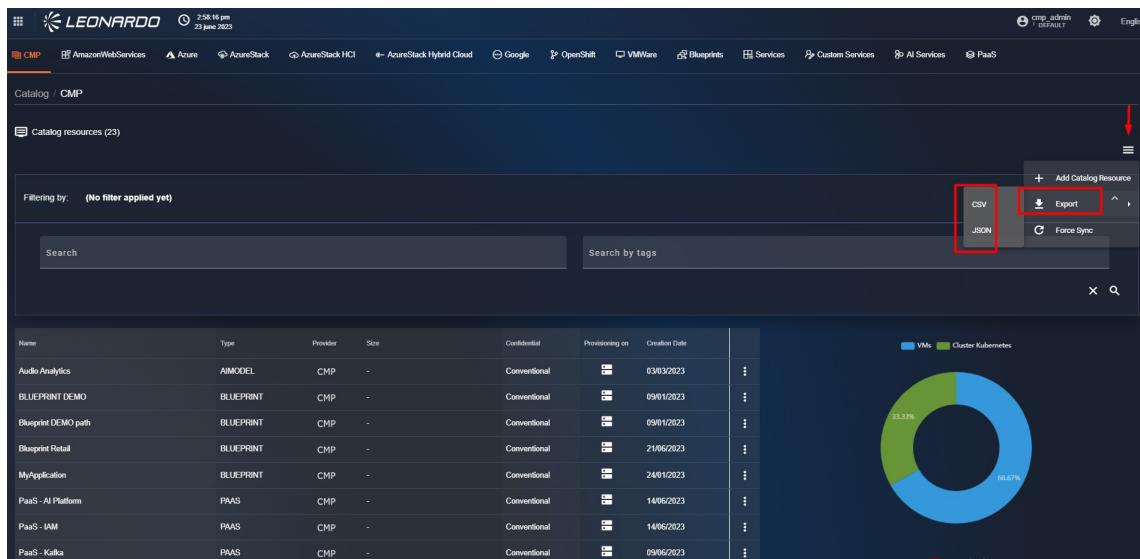


Figura 219 – Scaricare la lista di risultati

9.0.1.2.2 CREATING A CATALOG SKU RELATIONSHIP

To create a resource in the Catalog, always on the "SCMP" tab page, in the upper right corner, click on the hamburger menu, and then click on "Add Catalog Resource".

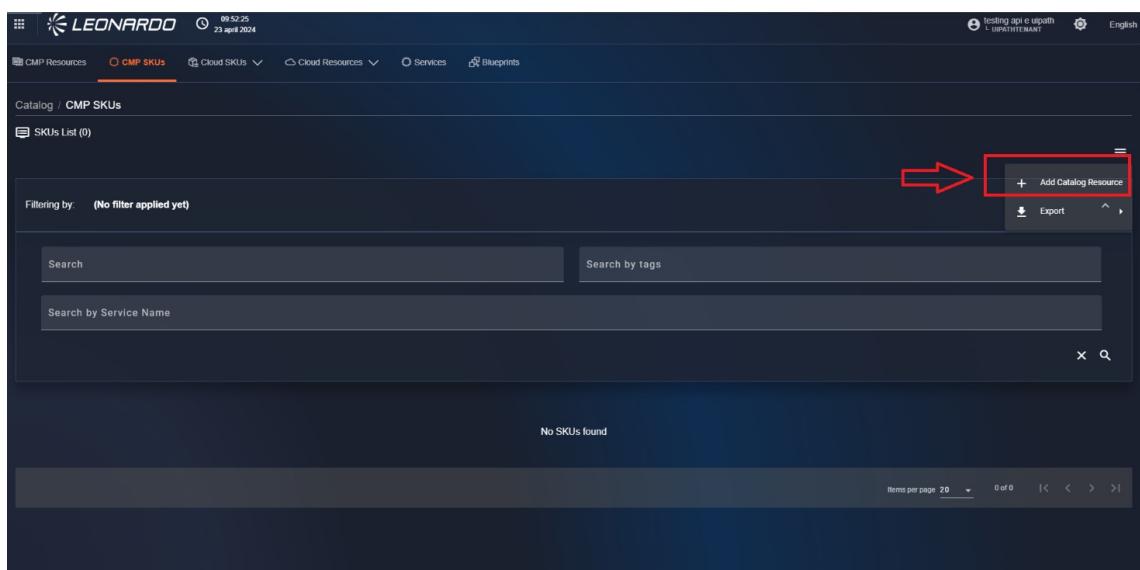


Figura 220 – Opzione per aggiungere una risorsa "SKU"

At this point, the user is on the "SKU" resource creation page. Click on the accordions on the page to view their details.

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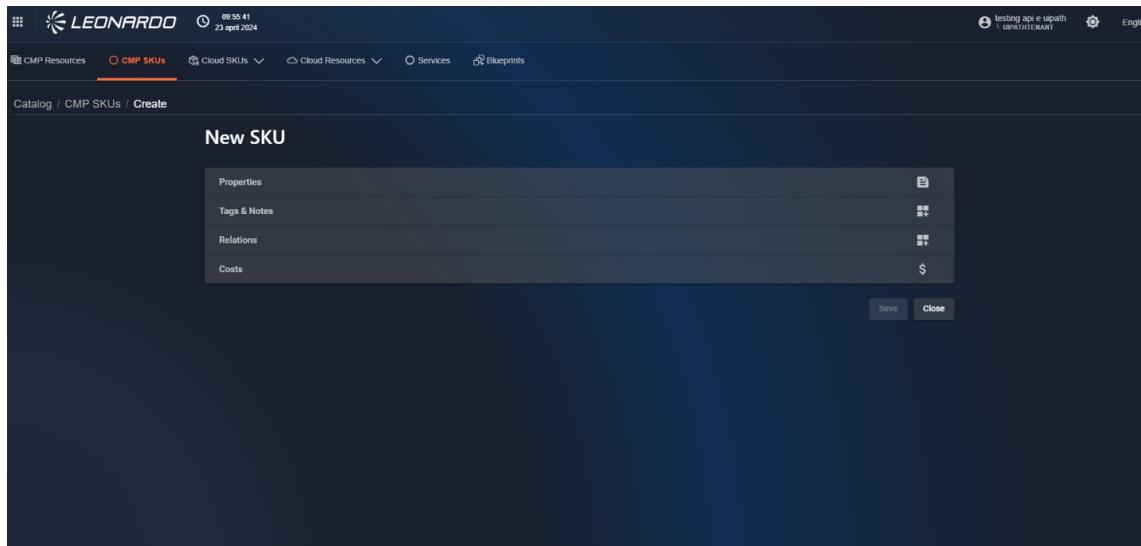


Figura 221 – IPagina di creazione "SKU"

In the "Properties" section, fill in all fields defined in the table.

Mandatory parameters are indicated with *

Name	Type	Description	Example
Price list code	string	Enter the price list identifier code from which associations are derived	PRI002FG
description	string	Enter a free description of the SKU	This sku is the basic vm on this provider
name *	string	Enter the SKU name	Simple vm sku
Service name	string	Enter the name of the service related to the SKU	enter the service name
unit	string	Enter text that will be used as the "unit of measure" displayed across all functionalities	MB/hour
Unit conversion Expression *	string	Enter the conversion formula between the value received from the provider and the value that will be used in the SCMP (conversion between the provider's unit of measure and the unit of measure indicated in the SKU relationship) "\$var" indicates the value received from the provider	\$var * 24 / 100

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The screenshot shows the 'New SKU' creation interface. The 'Properties' tab is active. The 'Unit Conversion Expression' field contains '\$var * 24'. The 'TEST EXPRESSION' button is highlighted in white.

Figura 222 – Compilazione dei campi, selezione Properties

After entering the conversion formula, it is necessary to click the "Test expression" button to verify its correctness.

If it has been entered correctly, the button will turn "Green" with "TEST OK" written on it; otherwise, it will turn "Red" with "KO". In this case, the possibility of saving the relationship is inhibited.

The screenshot shows the 'New SKU' creation interface. The 'Properties' tab is active. The 'Unit Conversion Expression' field contains '\$var * 24'. The 'TEST EXPRESSION' button is now green and labeled 'TEST OK'.

Figura 223 – Conferma della formula di conversione

Subsequently, select one or more tags for the "Add SCMP tag..." field and fill in notes in the "Tags & Note" section.

In the "Relation" section, it is possible to select one or more SKUs from the various provider catalogs to relate them and unify their costs. To do this, click on the "Composition" section on the left; a dark section will open where, using drag and drop, we can move the available SKUs to the right section.

In the right section, filters can be used to display only relevant results. The available filters are: the origin provider, the service name, and a free text field (in yellow in the image).

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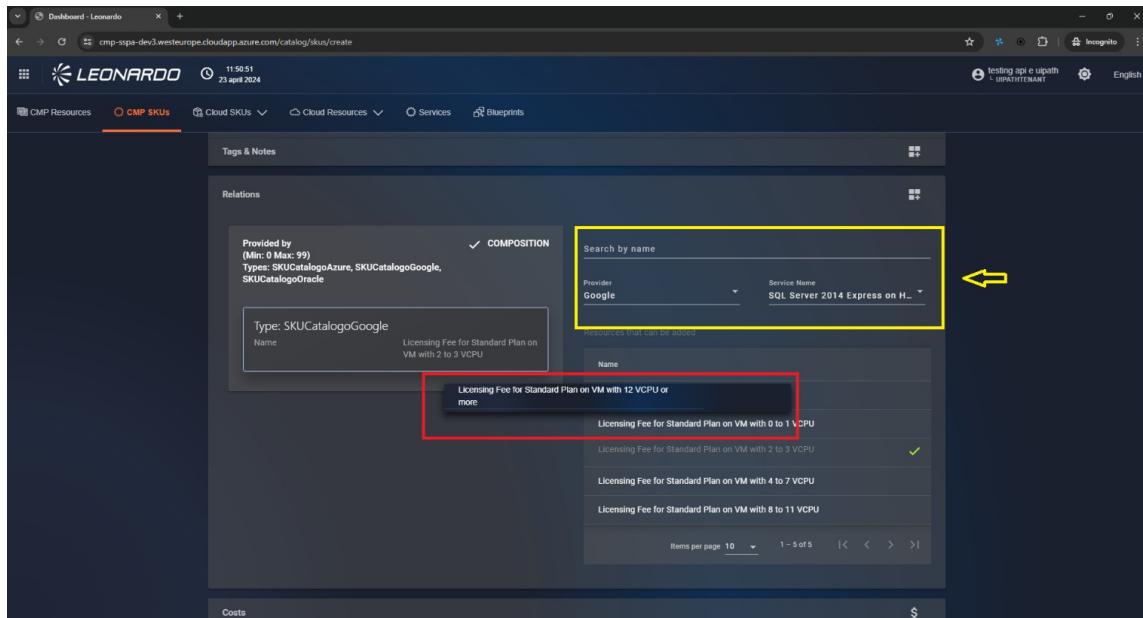


Figura 224 – Drag and drop Relazioni SKU

Once the resources are related, an illustrative diagram will automatically be created in the 'Relations Chart' section.

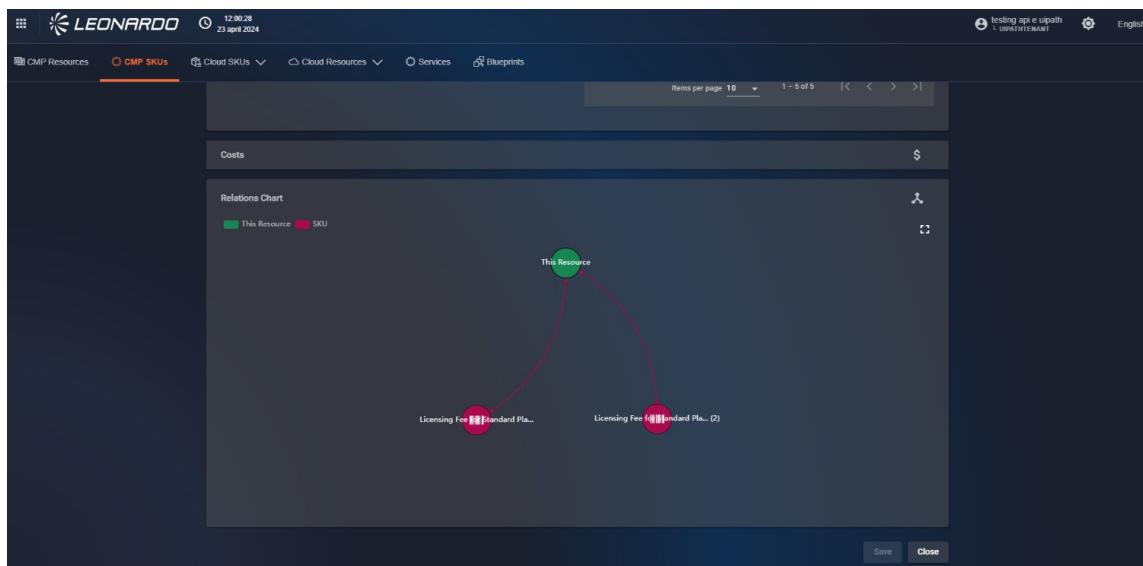


Figura 225 – Creazione automatica del Relation Chart

Finally, click the save button to confirm the creation of the SKU relationship. Upon completion, you will return to the page containing the list of SKU relationships, where you can find the new relationship in the list.

9.0.1.2.3 USING THE CATALOG TABLE

9.0.1.2.3.1 Catalog Resource Summary View

To view the data of an SKU resource, in the list of resources, click on the record of interest for a resource. A checkbox will appear showing brief information about the identified resource: System, Name, Size, Update Date, name, and service as shown in the following image.

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Name	Service Name	Creation Date
1 vCore - Free	SQL Database General Purpose - Serverless - Compute Gen5 - 1 vCore - Free - EU West	01/02/2024
100 RUls	Azure Cosmos DB - 100 RUls - US West	21/04/2024
100 RUls	Azure Cosmos DB - 100 RUls	21/04/2024
16 vCPU VM License	Red Hat Enterprise Linux - 5+ vCPU VM License	19/04/2024
4 vCPU VM License	Red Hat Enterprise Linux - 1.4 vCPU VM License	19/04/2024

Figura 226 – Dettaglio rapido delle risorse SKU

9.0.1.2.3.2 Viewing Relationships in the Catalog

To view the data of an SKU resource, in the list of resources, click on the kebab menu for a resource and then click on "Show".

Name	Service Name	Creation Date
1 vCore - Free	SQL Database General Purpose - Serverless - Compute Gen5 - 1 vCore - Free - EU West	01/02/2024
100 RUls	Azure Cosmos DB - 100 RUls - US West	21/04/2024
100 RUls	Azure Cosmos DB - 100 RUls	21/04/2024
16 vCPU VM License	Red Hat Enterprise Linux - 5+ vCPU VM License	19/04/2024
4 vCPU VM License	Red Hat Enterprise Linux - 1.4 vCPU VM License	19/04/2024

Figura 227 – Accesso alla risorsa in modalità view

After doing this, the user is on the resource page in view mode, where they can see the data but cannot modify it.

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Figura 228 – Dettaglio completo delle risorse di catalogo

The detail of a resource is divided into various sections:

- Details.
- Properties.
- Tags & Notes: where in the "Provider Tags..." field it is not possible to select a tag, as it is automatically obtained from the subsystem it belongs to; the "Add SCMP Tag..." field allows selecting tags from a list or entering one manually; in the Notes field, it is possible to enter a text note.
- Relations: where provider SKUs are present in relation.
- Cost.
- Relations Chart.

Figura 229 – Sezione proprietà degli elementi SKU di catalogo

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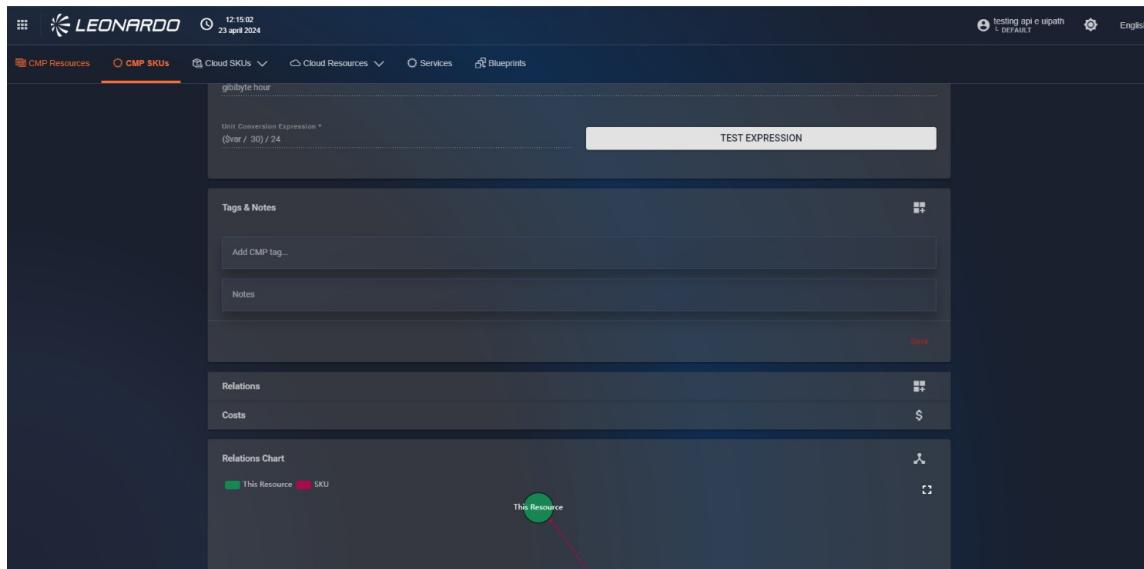


Figura 230 – Sezione Tags & Note degli elementi SKU di catalogo

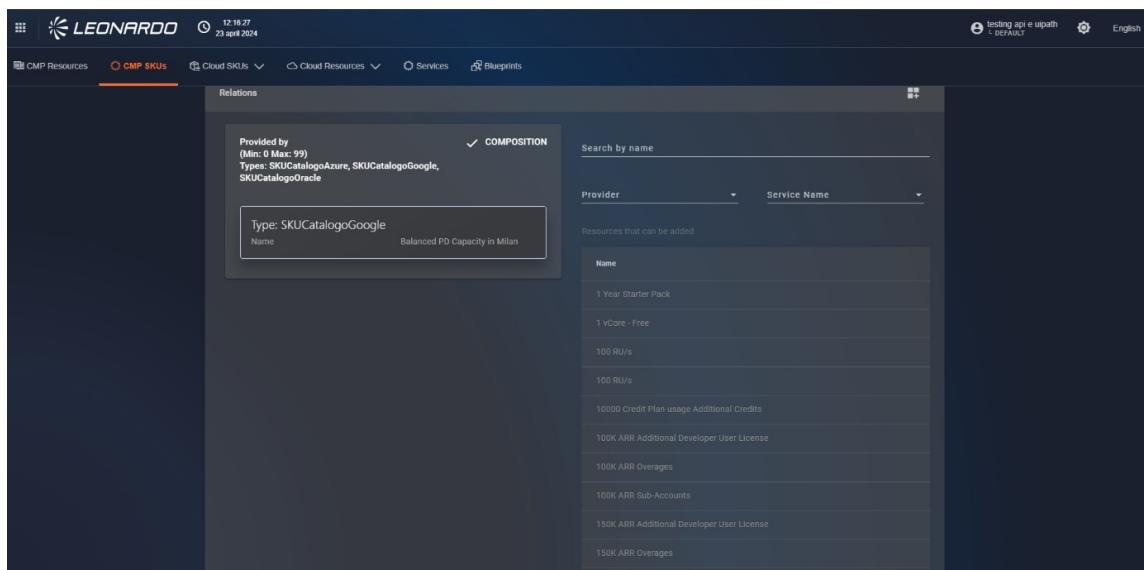


Figura 231 – Sezione delle relazioni degli SKU di catalogo

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The screenshot shows the Leonardo platform interface for managing resources. In the center, there is a 'Relations Chart' section with a red border. This chart displays a network of nodes representing various virtual machine configurations. One node is highlighted with a green circle and labeled 'This Resource'. Other nodes include 'Virtual Machine del Catalogo Azure Stack HCI Standard_1v2', 'Virtual Machine del Catalogo Azure Stack Hybrid Cloud Catalogo HybridCloud', 'Virtual Machine del Catalogo Azure Standard_1v2s', and 'Virtual Machine del Catalogo Azure Standard_1v2'. Lines connect these nodes to show their relationships.

Figura 232 – Sezione Relations Chart delle risorse

In the bottom right, click the "Close" button. The user will be redirected to the page containing the list of resources.

9.0.1.2.3.3 Editing Catalog Relationships

To modify an SCMP resource, on the "Resources" page of Catalog, in the list of resources, click on the kebab menu for a resource and then click on "Edit".

The screenshot shows the 'Catalog resources' page with a list of 20 items. Each item has a kebab menu with several options: 'Show', 'Edit' (highlighted with a red box), 'Delete', 'Instance', and others. To the right of the list is a circular chart showing resource distribution: 40% VMs and 20% Cluster Kubernetes. Below the list is a pie chart showing resource types: Conventional (red), VMs (blue), and Cluster Kubernetes (green).

Figura 233 – Accesso alla risorsa in modalità edit

After doing this, the user is on the resource page in edit mode. Unlike 'Show' mode, in 'Edit' mode, it is possible to modify the resource parameters.

9.0.1.2.3.4 Deleting Catalog SKU Relationships

To delete a catalog SKU resource, in the list of resources, click on the kebab menu for a resource and then click on "Delete".

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The screenshot shows the Leonardo Secure Cloud Management Platform's Catalog resources page. The table lists various resources with columns for Name, Type, Provider, Size, Confidential, Provisioning on, and Creation Date. A context menu is open over the row for 'Audio Analytics', with the 'Delete' option highlighted in red. The interface includes a search bar, a 'Search by tags' bar, and two donut charts on the right side.

Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date
Audio Analytics	AMODEL	CMP	-	Conventional		03/03/2023
BLUEPRINT DEMO	BLUEPRINT	CMP	-	Conventional		09/01/2023
Blueprint DEMO path	BLUEPRINT	CMP	-	Conventional		09/01/2023
MyApplication	BLUEPRINT	CMP	-	Conventional		24/01/2023
PaaS - AI Platform	PAAS	CMP	-	Conventional		14/06/2023
PaaS - IAM	PAAS	CMP	-	Conventional		14/06/2023
PaaS - Kafka	PAAS	CMP	-	Conventional		09/06/2023
PaaS - Njex	PAAS	CMP	-	Conventional		16/05/2023
PaaS - Spark	PAAS	CMP	-	Conventional		14/06/2023
Pro Blueprint Edition	BLUEPRINT	CMP	-	Conventional		30/01/2023

Figura 234 – Eliminazione di una risorsa SKU

Once done, a modal appears where it is necessary to click the "Remove" button to confirm the resource deletion.

The screenshot shows the Leonardo Secure Cloud Management Platform's Catalog resources page with a 'Remove resource' modal overlay. The modal contains the message: 'IMPORTANT: Removing this resource problems to other linked resources could happen. Are you sure you really want to remove the resource Audio Analytics?'. It has 'Cancel' and 'Remove' buttons. The background table shows the same list of resources as Figura 234.

Figura 235 – Conferma eliminazione della risorsa

9.0.1.3 Scheduled Import of Catalog Items

Manually entering catalog resources is a very long and costly operation. To simplify this, the user is given the possibility to insert an "Excel" file containing data that will then be automatically imported on the day indicated as "Start validity".

9.0.1.3.1 NEW IMPORT

To insert a new price list, it is necessary to click the "hamburger menu" available in the upper right corner of the catalog resources page and select "Import Catalogue".

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. In the top right corner, there is a sidebar with several options: 'Add Catalog Resource', 'Import Catalog' (which is highlighted with a yellow box), 'Imported Catalogues', 'Export', and 'Force Sync'. A red arrow points to the 'Import Catalog' option in the sidebar. A yellow arrow points to the same option in a modal window that has just been opened.

Figura 236 – Accesso all’ “Importazione pianificata del catalogo”

After clicking the button, a modal will open, containing two buttons:

- “Resources”: clicking this button indicates to the system that the inserted price list will contain resources.
- “SKUs”: clicking this button indicates to the system that the inserted price list will contain SKU items.

Once the resource type to be created is selected, the page updates to show all mandatory parameters.

The screenshot shows the Leonardo Secure Cloud Management Platform interface. A modal window titled 'Import Catalog' is open in the center of the screen. Inside the modal, there is a question 'What do you want to import?' and two tabs at the bottom: 'Resources' (which is selected) and 'SKUs'. The background of the main interface shows a list of catalog resources and a donut chart.

Figura 237 – Scelta della tipologia di catalogo

Two parameters are present in the modal:

- Provider: Select the provider related to the price list that will be inserted.
- Valid From: It is possible to indicate a start validity date for the price list. On the day indicated in this variable, the system will automatically update the catalog resources to conform to the new price list.

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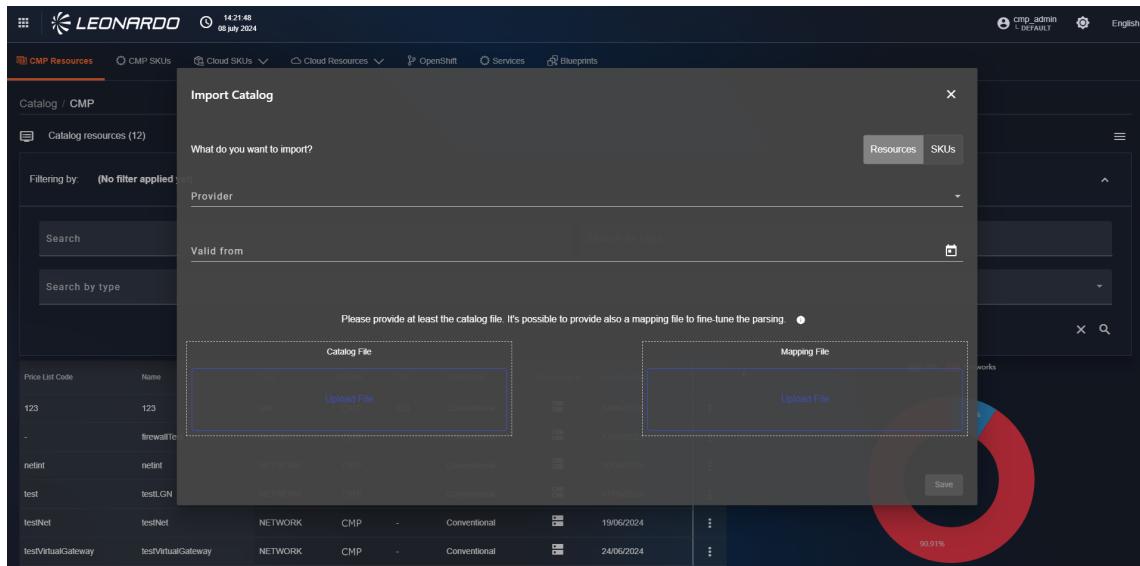


Figura 238 – Campi obbligatori per l'importazione

Furthermore, below the parameters, there are two sections for file upload. Clicking on the first square on the left will allow selecting an "XLS" file containing all the resources to be mapped. Clicking on the second square will allow inserting a mapping file, following the information shown in the "Help" section indicated with a "Question Mark" icon. Clicking on it will open a box, below the upload sections, containing all the information related to the mapping file to be inserted.

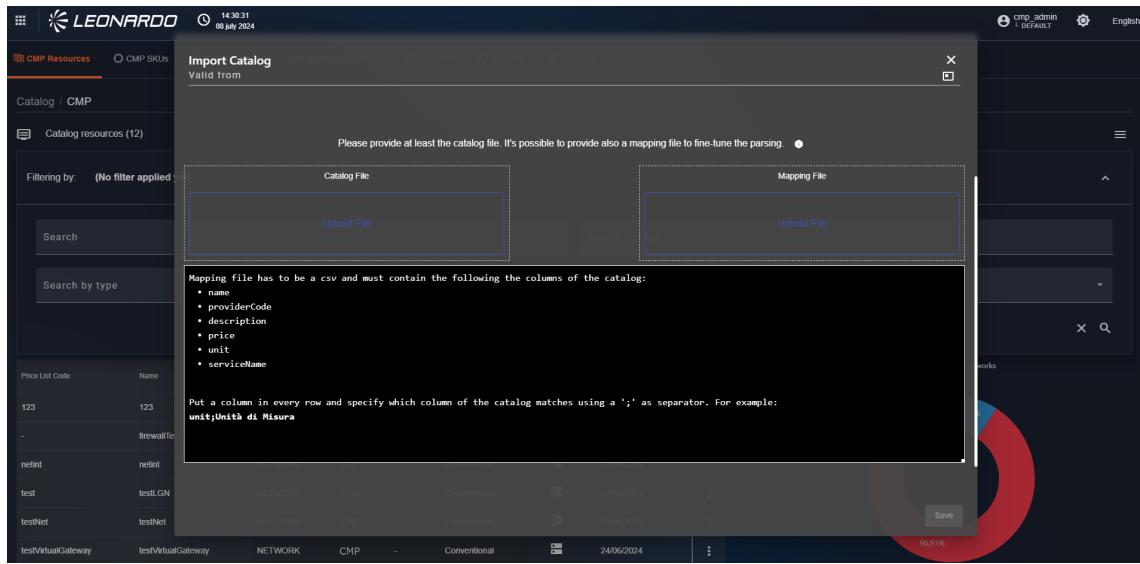


Figura 239 – Messaggio di aiuto per il file di Mapping

After entering all parameters, it will be possible to click the save button at the bottom, and we will be redirected to the imported catalogs management page, where it will be possible to monitor their insertion.

9.0.1.3.2 IMPORT MANAGEMENT

To insert a new price list, it is necessary to click the "hamburger menu" available in the upper right corner of the catalog resources page and select "Imported Catalogues".

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there's a header with the Leonardo logo, user information (cmp_admin, L DEFAULT), and language selection (English). Below the header, a navigation bar includes links for CMP Resources, CMP SKUs, Cloud SKUs, Cloud Resources, OpenShift, Services, and Blueprints. The main area is titled 'Catalog / CMP' and shows a table of 'Catalog resources (12)'. The table columns include Price List Code, Name, Type, Provider, Size, Confidential, Provisioning on, and Creation Date. To the right of the table is a donut chart with a blue segment (9.09%) and a red segment (90.91%). Below the table is a search bar and a 'Search by type' dropdown. On the far right, there's a toolbar with buttons for 'Add Catalog Resource', 'Import Catalog', 'Imported Catalogues' (which is highlighted with a yellow box and arrow), 'Export', and 'Force Sync'.

Figura 240 – Accesso ai cataloghi importati

The user will then be redirected to the page containing all previously imported catalogs. On this page, for each row, which corresponds to an Upload, it is possible to delete the file by clicking the "Three dots" button corresponding to the row and clicking "Delete" to remove it.

Catalogs can have 3 different states:

- Deleted: indicates that the file has been replaced with a subsequent version.
- Success: indicated with a green icon, indicates that the catalog is ready and will be used starting from the indicated day.
- In progress: indicated with a yellow icon, indicates that the system is checking the validity of the entered information.

On this page, we can also note that uploads made with the same file are saved using versions, so when an already existing catalog is inserted, it will be overwritten with a higher version, and previous versions will be deactivated.

The screenshot shows the 'Imported Catalogues' page. At the top, there's a header with the Leonardo logo, user information (cmp_admin, L DEFAULT), and language selection (English). Below the header, a navigation bar includes links for CMP Resources, CMP SKUs, Cloud SKUs, Cloud Resources, OpenShift, Services, and Blueprints. The main area is titled 'Catalog / CMP / Imported Catalogues' and shows a table of imported catalogues. The table columns include File Name, Provider, Valid from, Creation Date, Last update, Version, Status, and Validity. The table contains many rows, most of which are marked as 'Deleted' (red circle with a diagonal line). Other rows show 'Success' (green checkmark) or 'In progress' (yellow circle).

Figura 241 – Lista dei cataloghi importati

Clicking on a "Success" row in the table will open a modal. Inside, we can view a summary that contains, in addition to basic information, the number of elements, called "rows", that were found in the Excel file.

The rows available in the file can have 3 different states:

- Associated Rows: indicates that the system is able to both create the resource and associate it with a provider catalog size, allowing its use during provisioning.
- Success Rows: indicates that the system is able to create the resource but cannot establish a relationship with a provider resource.
- Failed Rows: indicates that the system cannot insert the resource.

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Catalog / CMP / Imported Catalogues

File Name	Provider	Valid from	Creation Date	Last update	Version	Status	Validity
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Oracle	17/06/2024	27/06/2024 16:56:15	27/06/2024 16:56:15	4	Success	Green
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Oracle	17/06/2024	27/06/2024 18:09:42	27/06/2024 18:09:42	0	Error	Red
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Oracle	26/06/2024	26/06/2024 17:30:56	26/06/2024 17:30:56	0	Deleted	Red
PSN - TIM - Expansione Managed ORACLE - v11b to PSN - Copia.xlsx	Oracle	26/06/2024	26/06/2024 17:39:05	26/06/2024 17:39:05	0	Deleted	Red
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsxb.xlsx	Oracle	27/06/2024	27/06/2024 08:08:31	27/06/2024 08:08:31	0	Deleted	Red
PSN_SPC_Azure_Listino_testsku.xlsx	Azure	27/06/2024	27/06/2024 11:05:46	27/06/2024 11:05:46	0	Deleted	Red
PSN_SPC_Azure_Listino_asof_20240327_v0.1 (1).xlsx	Azure	27/06/2024	27/06/2024 14:35:09	27/06/2024 14:35:10	0	Deleted	Red
PSN_SPC_Azure_Listino_asof_20240327_v0.1.xlsx	Azure	27/06/2024	27/06/2024 14:58:32	27/06/2024 14:58:32	0	Deleted	Red

Import Catalog Report

File Name	Status	Associated Rows
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Success	16
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Error	196
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Error	31
PSN - TIM - Expansione Managed ORACLE - v11b to PSN (version 1).xlsx	Error	227

No error found in the import process.

More details

Figura 242 – Dettagli dell' importazione

At the bottom, we can click the "More Details" button to view the details of the Excel file rows that were discarded by the system. Clicking on one of them allows us to view the row number, the name indicated in the file, and the error that prevented its insertion.

Catalog / CMP / Imported Catalogues

File Name	Provider	Valid from	Creation Date	Last update	Version	Status	Validity
PSN_SPC_Azure_Listino_testsku.xlsx	Azure		05/07/2024 15:12:14	05/07/2024 15:12:14	0	Success	Green

Import Catalog Report

File Name	Status	Associated Rows
PSN_SPC_Azure_Listino_testsku.xlsx	Success	141
PSN_SPC_Azure_Listino_testsku.xlsx	Error	5652
PSN_SPC_Azure_Listino_testsku.xlsx	Error	543
PSN_SPC_Azure_Listino_testsku.xlsx	Error	6195

No error found in the import process.

Service & Operation

cmp-rg-w process for filename PSN_SPC_Azure_Listino_testsku.xlsx (4670e)

Service & Operation	0ys	1m 27s	2m 55s	4m 22s	5m 49s
cmp-rg-w process for filename PSN_SPC_Azure_Listino_testsku.xlsx	0ys	1m 27s	2m 55s	4m 22s	5m 49s
cmp-rg-w: parsing excel...	4.3s				
cmp-rg-w: row number processed: 5643					2.74ms
cmp-rg-w: row number processed: 5644					1.07ms
cmp-rg-w: row number processed: 5645					703us
cmp-rg-w: row number processed: 5646					606us
cmp-rg-w: row number processed: 5647					641us
cmp-rg-w: row number processed: 5648					581us
cmp-rg-w: row number processed: 5649					562us
cmp-rg-w: row number processed: 5650					578us
cmp-rg-w: row number processed: 5651					712us
cmp-rg-w: row number processed: 5652					594us
cmp-rg-w: row number processed: 5653					583us
cmp-rg-w: row number processed: 5654					556us
cmp-rg-w: row number processed: 5655					

Less details

cmp-rg-w:row number processed: 5651 | 569us

Figura 243 – Dettagli delle righe dell' importazione

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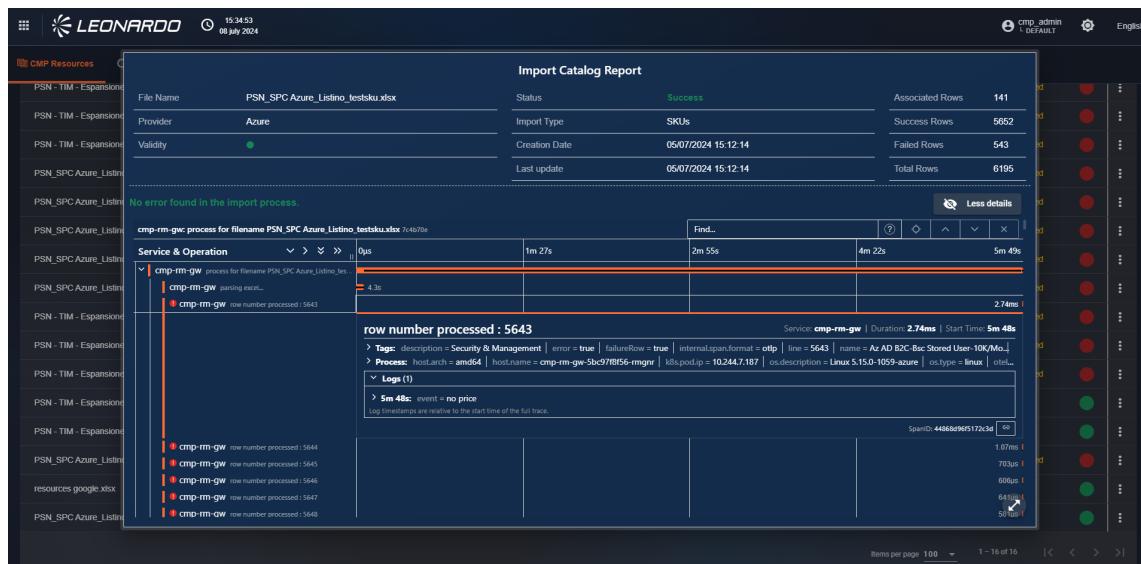


Figura 244 – Dettaglio dell' errore

9.0.2 Provider Catalog Item Management

Within the Catalog Module, it is possible to view the list and details of the "sizes" available on the various providers configured on the SCMP for both individual resources (VM, STORAGE, NETWORK, SECURITY) and resource groups "SKU".

9.0.2.1 Resources

To view the list of resources available for a provider, select the "Cloud resources" menu (in red in the image) at the top and select one of the available providers (in yellow in the image). The functionalities available on the pages of the different providers are identical.

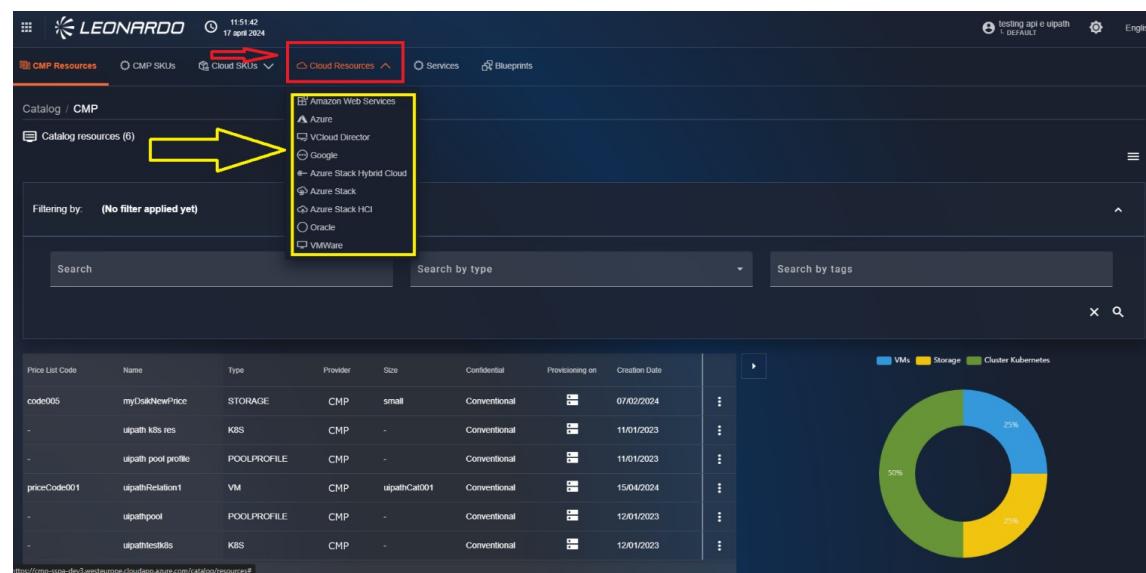


Figura 245 – Risorse del catalogo dei providers

9.0.2.1.1 EXPORT OF PROVIDER SIZES

To export the list of Catalog resources displayed on the page, in the upper right corner, click on the hamburger menu, and then click on "Export".

The operator will have the option to export the list of results in .csv and/or .json format.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there's a navigation bar with various service icons like CMP, AWS, Azure, etc. Below it, a sub-navigation bar shows 'Catalog / Amazon Web Services (AWS)'. The main area displays a table of 'Catalog resources (644)' with columns for Name, Type, Provider, Size, Confidential, Provisioning on, and Creation Date. Each row represents a different AWS instance type. To the right of the table is a circular progress bar indicating 100% completion. In the top right corner of the main content area, there are four buttons: 'CSV', 'JSON', 'Export', and 'Force Sync'. The 'Export' and 'Force Sync' buttons are highlighted with a red box.

Figura 246 – Esportazione dei risultati

9.0.2.1.2 FORCED CATALOG AND COST UPDATE FUNCTIONALITY

It is possible to force the system so that, after a few minutes, all "sizes" and their associated costs are automatically updated. To do this, click on the hamburger menu in the upper right corner, and then click on "Force Sync".

This screenshot is identical to Figure 246, showing the AWS Catalog resources page. The main difference is that the 'Force Sync' button in the top right corner is highlighted with a red box, indicating it has been selected or is the focus of the functionality being described.

Figura 247 – Funzionalità Force Sync

9.0.2.1.3 RESOURCE FILTERS

The user is given the possibility to filter the displayed resource lists. At the top of the page, there is a filter section. The available filters are:

- "search": allows searching for resources with free text.
- "search by type": allows searching for resources of a specific type only.
- "search by tags" allows searching for all resources containing a specific tag.

After entering one or more filters, click the "magnifying glass" button to perform the search.

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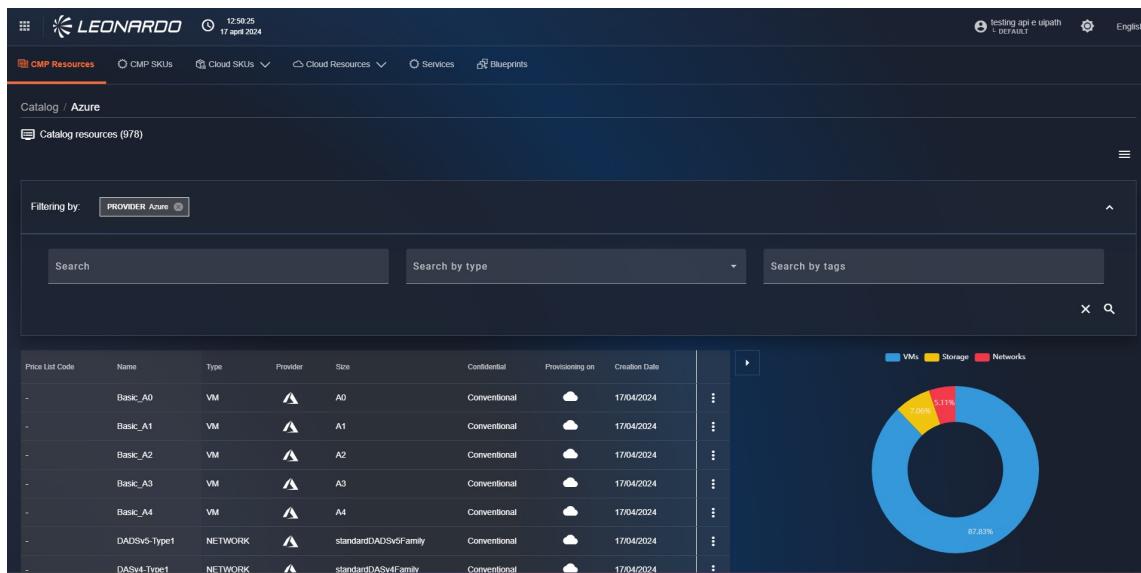


Figura 248 – Filtri del Catalogo

9.0.2.1.4 RESOURCE SUMMARY VIEW

To view a preview of a resource, click on the record of interest for a resource. A modal will appear showing the general information of the identified resource, including: System, Name, Size, Update Date, RAM, and CPU as shown in the following image.

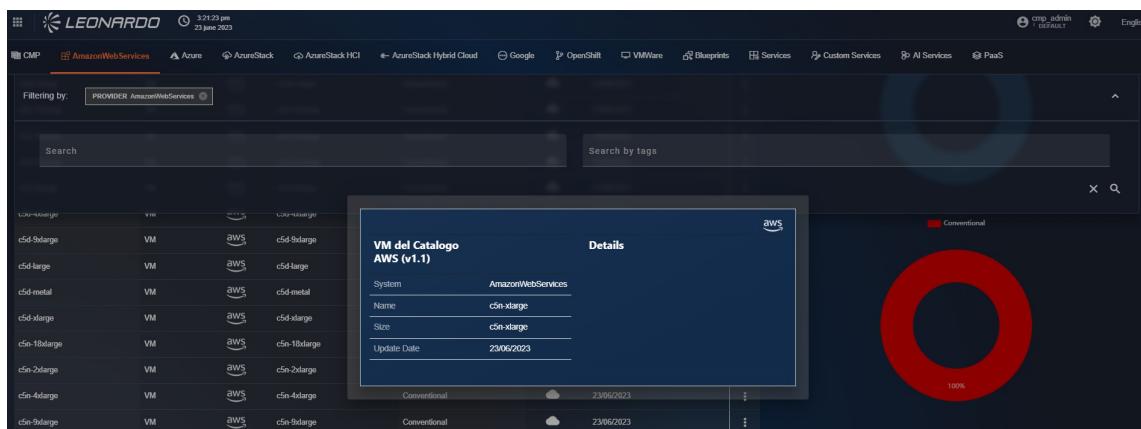


Figura 249 – Dettaglio rapido delle risorse di catalogo

9.0.2.1.5 VIEWING RESOURCE DETAILS

To view the data of a resource, click on the kebab menu for a resource and then click on "Show". After

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Figura 250 – Accesso alla risorsa in modalità view

doing this, the user is on the resource page in view mode, where they can see the data but cannot modify it.

Figura 251 – Dettaglio Risorsa dal Modulo Catalog

The detail of a resource is divided into various sections:

- Details
- Properties
- Tags & Notes
- Cost

In the Cost section, it is possible to sequentially select the Region, Zone, and Cost type to obtain a preview of the costs related to the selected resource.

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The screenshot shows a detailed view of a VM resource named "VM del Catalogo AWS (v1.1)". The "Details" tab is selected, displaying system information: Name (a1-2xlarge), Size (a1-2xlarge), and Update Date (23/06/2023). Below this, the "Costs" section is highlighted with a red box, showing a cost preview for "Reservation - Linux" at \$0.13 / 1 Hour. The "Cost Preview" panel includes dropdowns for Region (US East (N. Virginia)), Zone (Us-east-1b), and Price Type (Reservation - Linux - 1 Year).

Figura 252 – Sezione costi della risorsa

In the bottom right, click the "Close" button to return to the list.

9.0.2.2 "On-Premise" Resources

The management of resource catalogs in on-premise systems varies significantly, being specific to each system. In some cases, the catalog functionality is absent, while in others, it is available but does not allow automatic retrieval of resources.

The user is given the possibility to define a personalized "Cloud" catalog directly in the SCMP. In this way, it will then be possible to add the created resources to the relationships of "SCMP Catalog" resources.

To do this, it is first necessary to access the catalog resources tab of an on-premise provider. Specifically, we take "VMWare" as an example by selecting "VMWare" in the "Cloud resources" menu of the catalog module.

The screenshot shows the "Catalog resources (28)" list for the "Cloud Resources" tab. A search bar contains the term "VMWare", which is highlighted with a red box. The list includes items such as "r2-standard-4", "r2d-highcpu-8", "c2-standard-16", "c2-standard-8", and "c2-standard-2". To the right of the list is a donut chart showing the distribution of VMs and Networks, with 77.78% for VMs and 22.22% for Networks.

Figura 253 – Accesso al catalogo On-premise

On the page, in the upper right, above the filter bar, we find a contextual menu. Click on the "Three lines" icon and select "Add catalog resource". In this way, we will be redirected to the provider-specific page for creating the catalog resource.

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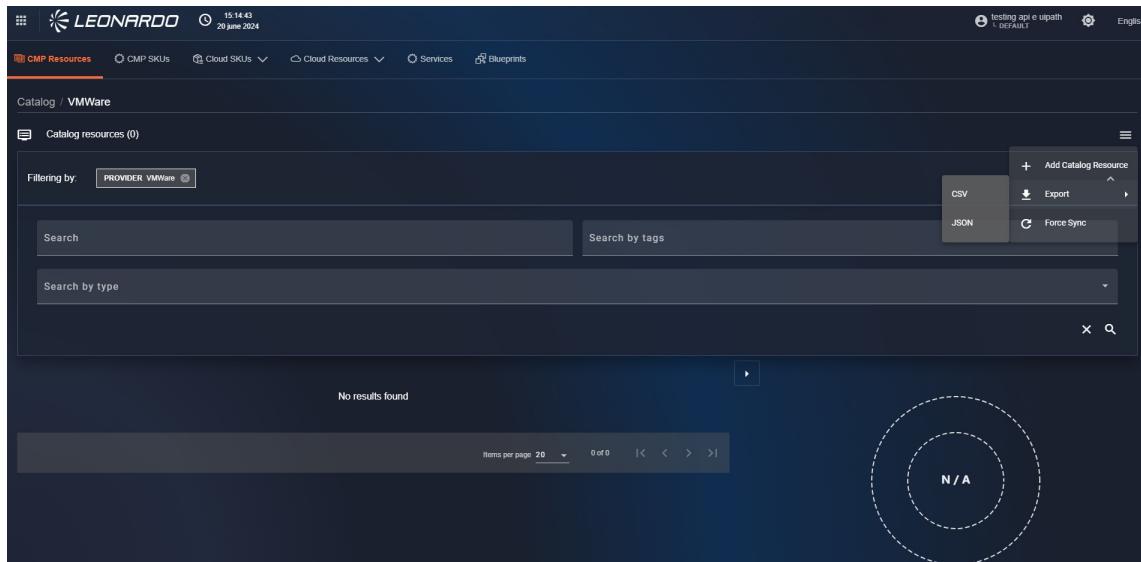


Figura 254 – Creazione nuova risorsa

At this point, the user is on the page where they can select the type of resource to create.

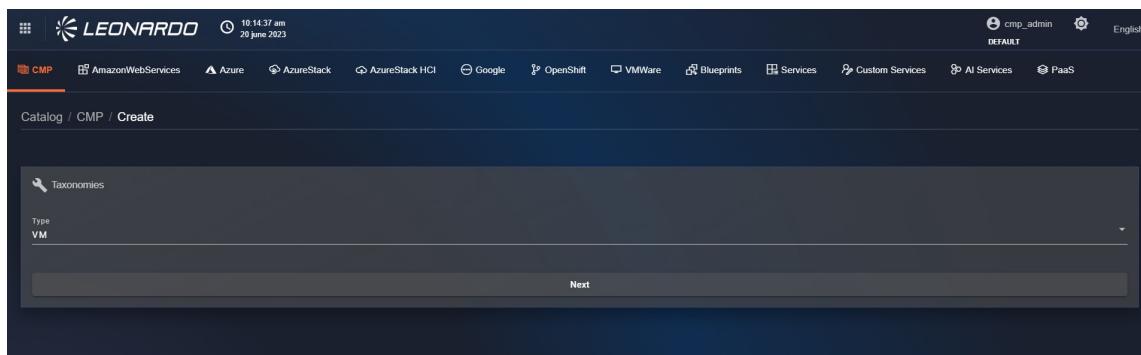


Figura 255 – Selezione del tipo di risorsa da creare

From the dropdown menu, select the type of resource to create. Then, click the "Next" button. You will be on the resource compilation page.

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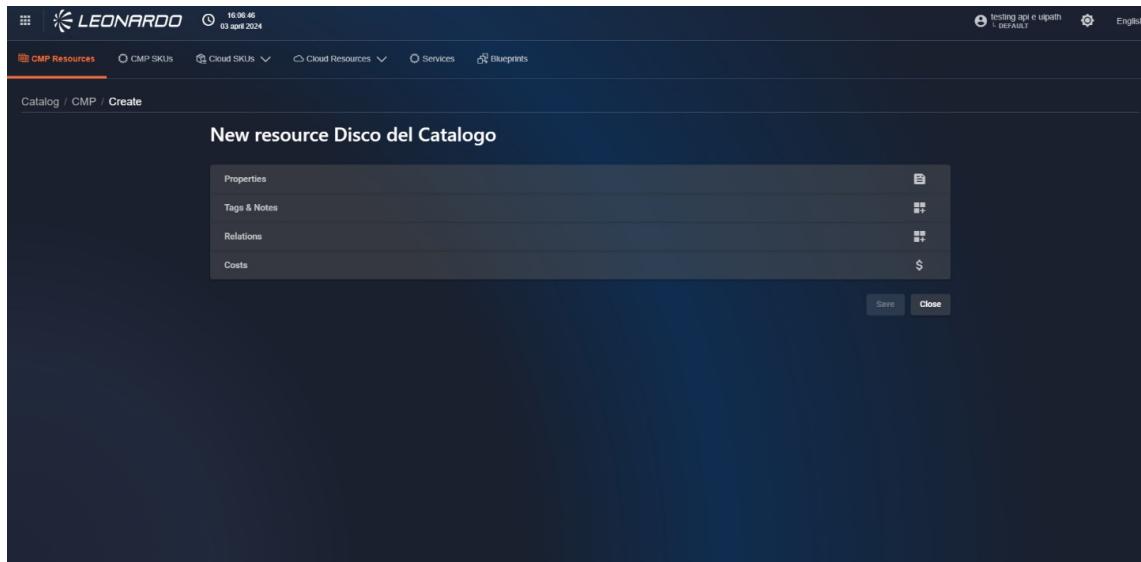


Figura 256 – Esempio di form per la creazione di una risorsa

On this page, after opening the available sections, enter all necessary parameters. In the "Cost" section at the bottom, it will be possible to add a customized price to associate with the resource. To do this, you need to select the billing interval (hourly, daily, weekly, monthly) and enter the cost related to the selected period on the right.

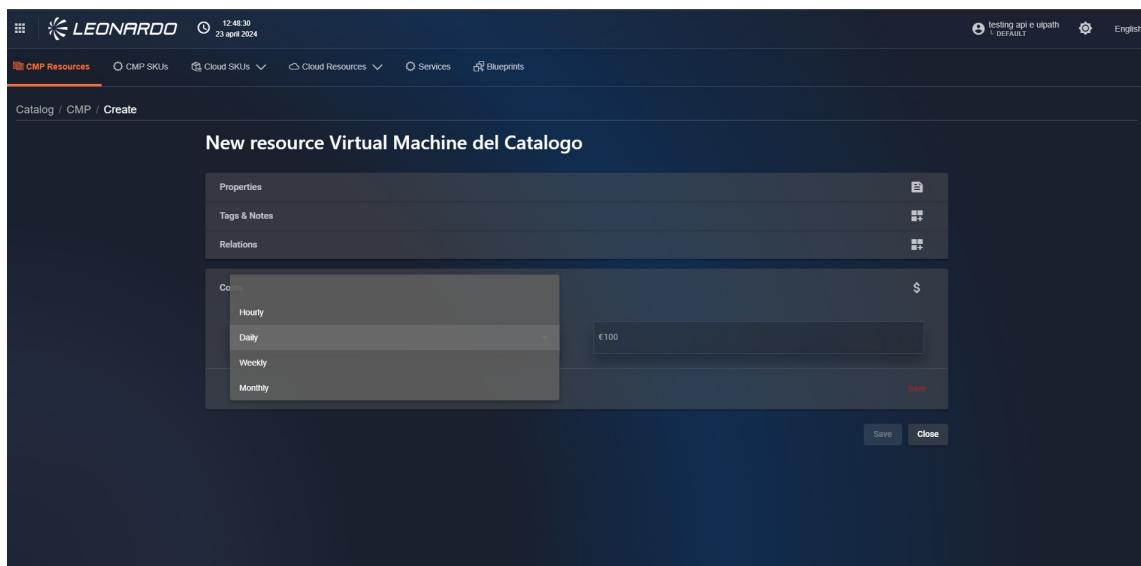


Figura 257 – Sezione costi delle risorse

9.0.2.3 Cloud SKU

To view the list of SKUs available for a provider, select the "Cloud SKU" menu (in red in the image) at the top and select one of the available providers (in yellow in the image). The functionalities available on the pages of the different providers are identical.

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Price List Code	Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date
priceCode001	upathRelation1	VM	CMP	upathCat001	Conventional		16/04/2024

Figura 258 – Risorse del catalogo dei providers

9.0.2.3.1 EXPORT OF AVAILABLE PROVIDER SIZES

To export the list of Catalog resources displayed on the page, in the upper right corner, click on the hamburger menu, and then click on "Export".

The operator will have the option to export the list of results in .csv and/or .json format.

Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date
a1-2large	VM	DWS	a1-2large	Conventional		23/09/2023
a1-4large	VM	DWS	a1-4large	Conventional		23/09/2023
a1-large	VM	DWS	a1-large	Conventional		23/09/2023
a1-medium	VM	DWS	a1-medium	Conventional		23/09/2023
a1-medal	VM	DWS	a1-medal	Conventional		23/09/2023
a1-large	VM	DWS	a1-large	Conventional		23/09/2023
c1-medium	VM	DWS	c1-medium	Conventional		23/09/2023
c1-large	VM	DWS	c1-large	Conventional		23/09/2023
c3-2large	VM	DWS	c3-2large	Conventional		23/09/2023

Figura 259 – Esportazione dei risultati

9.0.2.3.2 FORCED CATALOG UPDATE FUNCTIONALITY

It is possible to force the system so that, after a few minutes, all "sizes" and their associated costs are automatically updated. To do this, click on the hamburger menu in the upper right corner, and then click on "Force Sync".

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Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date
a1-2xlarge	VM	aws	a1-2xlarge	Conventional	Cloud	23/06/2023
a1-4xlarge	VM	aws	a1-4xlarge	Conventional	Cloud	23/06/2023
a1-large	VM	aws	a1-large	Conventional	Cloud	23/06/2023
a1-medium	VM	aws	a1-medium	Conventional	Cloud	23/06/2023
a1-metal	VM	aws	a1-metal	Conventional	Cloud	23/06/2023
a1-xlarge	VM	aws	a1-xlarge	Conventional	Cloud	23/06/2023
c1-medium	VM	aws	c1-medium	Conventional	Cloud	23/06/2023
c1-large	VM	aws	c1-large	Conventional	Cloud	23/06/2023
r3-2xlarge	VM	aws	r3-2xlarge	Conventional	Cloud	23/06/2023

Figura 260 – Funzionalità Force Sync

9.0.2.3.3 FILTERS FOR DISPLAYED RESOURCES

The user is given the possibility to filter the displayed resource lists. At the top of the page, there is a filter section. The available filters are:

- "search": allows searching for resources with free text.
- "search by Service name": allows searching for resources related to a specific service type only.
- "search by tags" allows searching for all resources containing a specific tag. After entering one or more filters, click the "magnifying glass" button to perform the search.

Name	Service Name	Creation Date
100 RU\$	Azure Cosmos DB - 100 RU\$	17/04/2024
100 RU\$	Azure Cosmos DB - 100 RU\$ - US West	17/04/2024
16 vCPU VM License	Red Hat Enterprise Linux - 5+ vCPU VM License	17/04/2024
4 vCPU VM License	Red Hat Enterprise Linux - 1-4 vCPU VM License	17/04/2024
8 vCPU VM License	Red Hat Enterprise Linux - 5+ vCPU VM License	17/04/2024

Figura 261 – Filtri del Catalogo

9.0.2.3.4 CATALOG RESOURCE SUMMARY VIEW

To view a preview of a resource, click on the record of interest for a resource. A modal will appear showing the general information of the identified resource, including: System, Name, Size, Update Date, service name.

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The screenshot shows the Leonardo platform interface. At the top, there's a navigation bar with links for CMP Resources, CMP SKUs, Cloud SKUs, Cloud Resources, Services, and Blueprints. The main area is titled 'Catalog / Azure SKUs' and shows a list of 'SKUs List (183)'. A specific item, 'Azure Cosmos DB - 100 RU/s', is highlighted in a modal window. The modal details the following:

Sku del Catalogo Azure (v1.1)		Details	
System	Azure	Name	100 RU/s
Name	100 RU/s	Service Name	Azure Cosmos DB - 100 RU/s - US West
Size	-		
Update Date	17/04/2024 12:29:42		

Below the modal, a table lists other Azure SKU options like '100 RU/s', '100 RU/s', '16 vCPU VM License', '4 vCPU VM License', and '8 vCPU VM License'. The table includes columns for Name, Service Name, and Creation Date.

Figura 262 – Dettaglio rapido delle risorse di catalogo

9.0.2.3.5 VIEWING RESOURCE DETAILS IN THE CATALOG

To view the data of a resource, click on the kebab menu for a resource and then click on "Show". After doing this, the user is on the resource page in view mode, where they can see the data but cannot modify it.

The screenshot shows the Leonardo platform interface. At the top, there's a navigation bar with links for CMP, AmazonWebServices, Azure, AzureStack, AzureStack HCI, AzureStack Hybrid Cloud, Google, OpenShift, VMware, Blueprints, Services, Custom Services, AI Services, and PaaS. The main area is titled 'Catalog / Amazon Web Services (AWS)' and shows a list of 'Catalog resources (544)'. A specific item, 'x1-2large', is highlighted in a modal window. The modal details the following:

Name	Type	Provider	Size	Confidential	Provisioning on	Creation Date
x1-2large	VM	IWS	x1-2large	Conventional	Cloud	23/06/2023
x1-4large	VM	IWS	x1-4large	Conventional	Cloud	23/06/2023
x1-large	VM	IWS	x1-large	Conventional	Cloud	23/06/2023
x1-medium	VM	IWS	x1-medium	Conventional	Cloud	23/06/2023
x1-medial	VM	IWS	x1-medial	Conventional	Cloud	23/06/2023
x1-large	VM	IWS	x1-large	Conventional	Cloud	23/06/2023
c1-medium	VM	IWS	c1-medium	Conventional	Cloud	23/06/2023
c1-large	VM	IWS	c1-large	Conventional	Cloud	23/06/2023
c2-2large	VM	IWS	c2-2large	Conventional	Cloud	23/06/2023
c3-4large	VM	IWS	c3-4large	Conventional	Cloud	23/06/2023

The modal also shows a 'Show' button, which is highlighted with a red box. To the right of the table, there's a circular chart with a blue segment labeled 'VMs' and a red segment labeled 'Conventional'.

Figura 263 – Accesso alla risorsa in modalità view

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Sku del Catalogo Google (v1.1)		Details	
System	Google	Name	1 Year Starter Pack
Name	1 Year Starter Pack	Service Name	MongoDB Atlas Starter
Size	-		
Update Date	17/04/2024 02:25:25		

Properties
Tags & Notes
Costs

Figura 264 – Dettaglio Risorsa dal Modulo Catalog

The detail of a resource is divided into various sections:

- Details
- Properties
- Tags & Notes
- Cost

In the Cost section, it is possible to sequentially select the Region, Zone, and Cost type to obtain a preview of the costs related to the selected resource.

VM del Catalogo AWS (v1.1)		Details	
System	AmazonWebServices	Name	a1-2xlarge
Name	a1-2xlarge	Size	a1-2xlarge
Size	-	Update Date	23/09/2023
Update Date	-		

Properties
Tags & Notes
Costs

Cost Preview

Region: US East (N. Virginia) Zone: Us-east-1b Cost Type: Reservation - Linux \$0.13 / 1 Hour

Figura 265 – Sezione costi della risorsa

In the bottom right, click the "Close" button to return to the list.

9.0.3 "Services and Blueprints" Item Management

9.0.3.1 Services

To access the "Services" functionality, click on the bento button in the upper left corner and then click on "Catalog".

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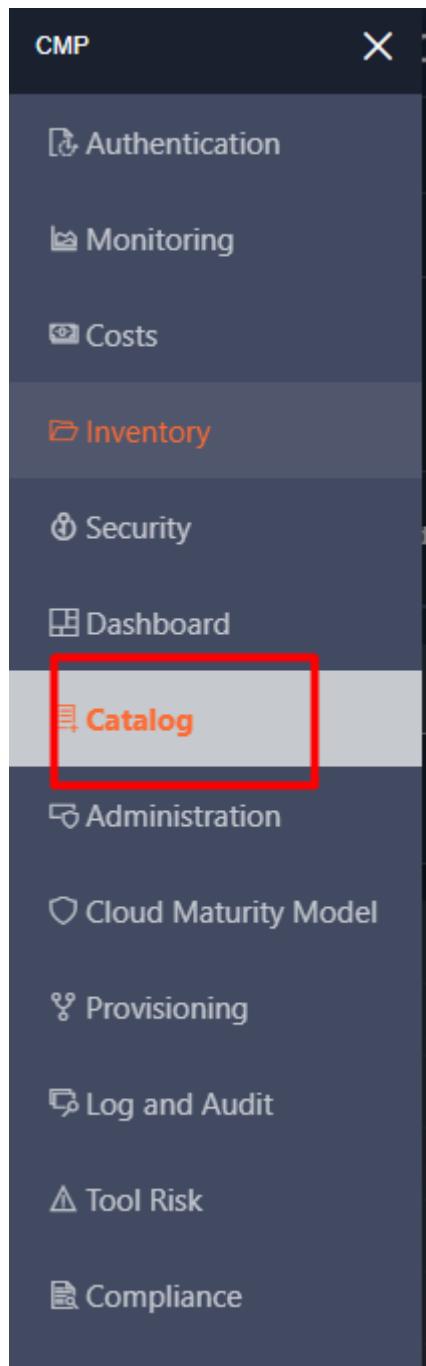


Figura 266 – Accesso ai "Services"

From the "SCMP" page, click on the tab that depicts three joined squares, 'Services', located above the breadcrumb path. After doing this, you will be on the 'Services' page, where a list of components called "Card" is displayed.

Each card refers to a specific type of service. Since there are many services, the system paginates them. At the bottom, we can use the "Item per page" field to display more results or use the arrows to navigate through the lists of services.

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Figura 267 – Pagina dei servizi

9.0.3.1.1 "SERVICES" PAGE FILTERS

To facilitate the user in searching for a specific service, a side filter section has been added to the page. Inside, we can find three combinable filters:

- "Filter by Text": by entering text in this field, the list of services will be updated to show services that include the entered text in their title or description (orange in the image).
- "Categories": it is possible to filter the list by one or more service categories. The category is manually entered during the service creation phase (green in the image).
- "Tags": it is possible to select one or more tags to display only services that have been configured with that tag (red in the image).

By using the filters in combination, it will be possible to display only the services that satisfy all specified conditions. In other words, the query will return only the services that match all set criteria.

Figura 268 – Filtri disponibili

9.0.3.1.2 CREATING SERVICES

From the "Services" page, the user can create a Service by accessing the appropriate section as shown in the figure.

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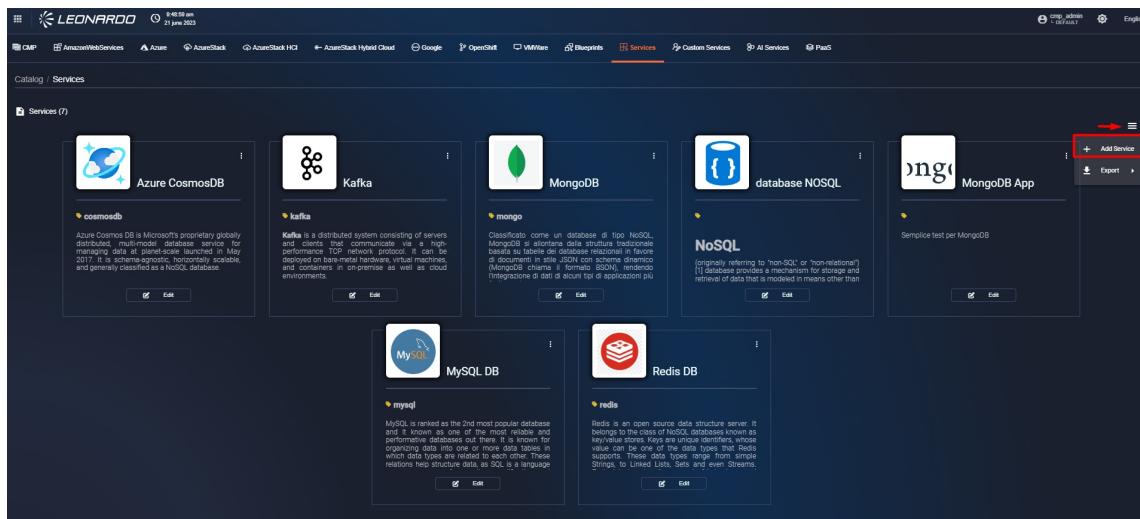


Figura 269 – Accesso al form di creazione del Service

On the creation page, it is necessary to select a service type using the "Service Type" field to display its mandatory parameters.

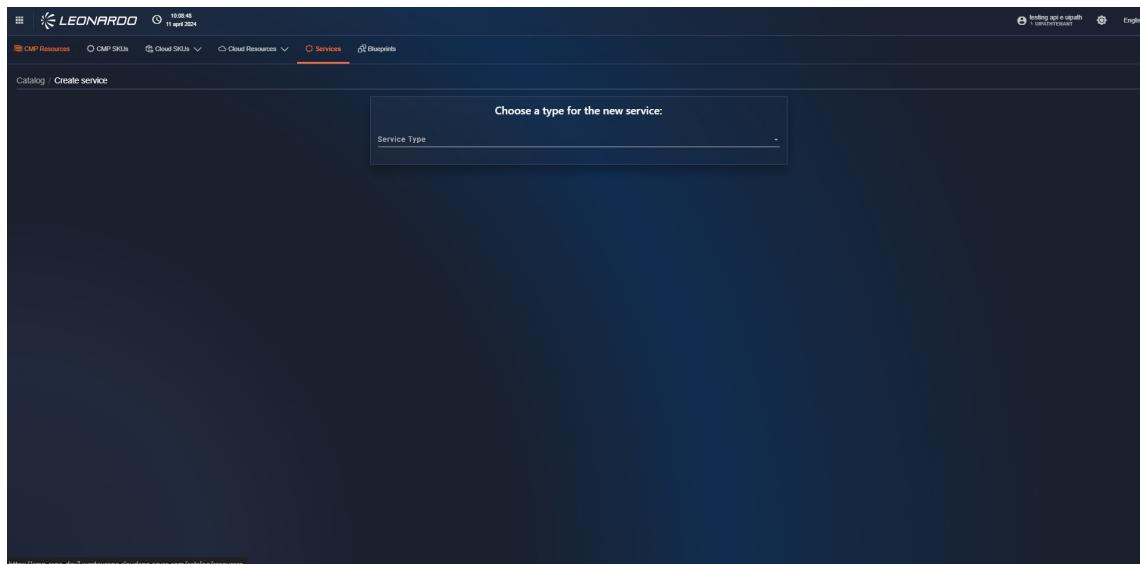


Figura 270 – Selezione della tipologia di servizio

In the following paragraphs, we will analyze the individual service types in detail.

9.0.3.1.2.1 "Standard" Services

The first type of services available for the SCMP are "Standard" services. These services are natively integrated into the system, and their operation cannot be modified by the user.

List of services offered:

- CosmosDb Cassandra SQL
- CosmosDb Core SQL
- CosmosDb Mongo
- Kafka 3.2.1 on Ubuntu 20.04 LTS
- Kafka 3.2.1 on Ubuntu 22.04 LTS
- Mongo DB 5.0 on Ubuntu 20.04 LTS
- Mongo DB 6.0 on Ubuntu 20.04 LTS
- Mongo DB 6.0 on Ubuntu 22.04 LTS
- MySQL DB 8.0 on Ubuntu 20.04 LTS
- MySQL DB 8.0 on Ubuntu 22.04 LTS

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- PostgreSQL 14 on Ubuntu 20.04 LTS
- PostgreSQL 14 on Ubuntu 22.04 LTS
- Redis DB 7.0 on Ubuntu 20.04 LTS
- Redis DB 7.0 on Ubuntu 22.04 LTS

To insert a new service, it is necessary to fill in all fields in the properties section, specifically:

- "Categories": enter free text in the field and select an already configured category from the dropdown, or it is possible to add a new category by clicking the "+" button in the dropdown (orange in the page).
- "Name": the name of the service that will be displayed on the corresponding card.
- "Description": the description of the service that will be shown on the relative card.
- "Upload File": by clicking this control, it will be possible to select an "image" type file from your PC that will be displayed on the service card.
- "Related Software": in this section, you can select one or more "Standard" software that will then be used during provisioning.

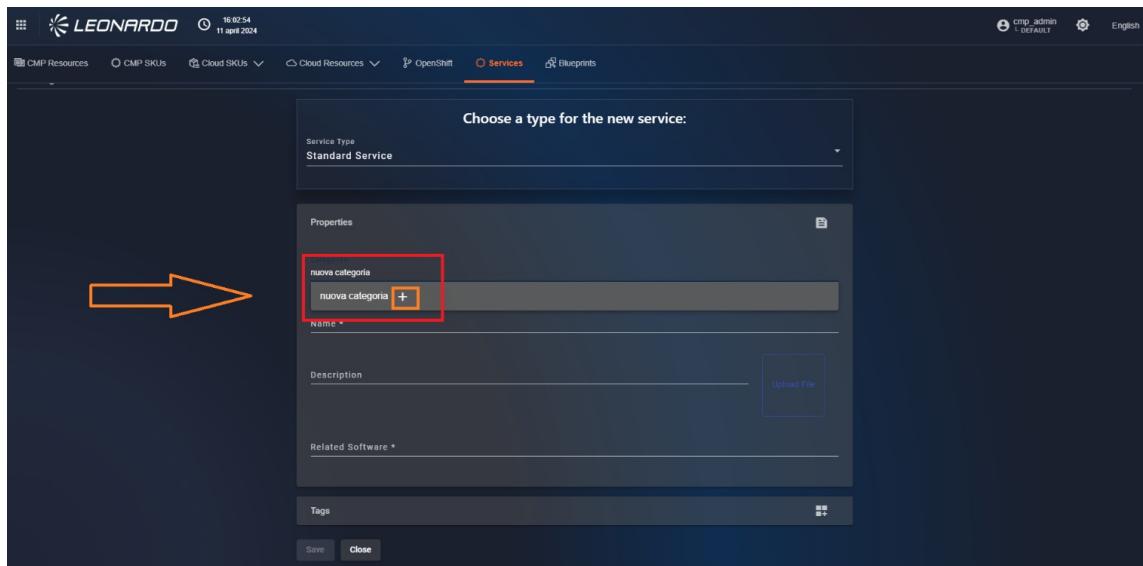


Figura 271 – Aggiunta nuova categoria

Once all data has been entered, the service can be saved using the "save" button in the bottom right. A confirmation modal will be displayed, and the user will be redirected to the list of available services.

9.0.3.1.2.2 "Custom" Services

The user is given the possibility to define "Custom" services by uploading a zip file containing all the necessary files for execution.

In this specific case, the SCMP system is only used to save the service and launch its execution, so it is not possible to check the correctness of the process, which will have to be managed by the user.

all are orchestrators, but with different functionalities and purposes:

1. Ansible:

- **Server and application orchestration:** Ansible automates the configuration and management of servers and applications across different platforms.
- **Executes YAML playbooks:** Ansible uses YAML playbooks to define instructions to be executed on servers.
- **Does not require an agent:** Ansible is agentless; it does not require software installation on the servers to be managed.

2. Bicep:

- **DSL language for Azure:** Bicep is an Azure-specific DSL that facilitates defining infrastructure as code.
- **Creates ARM templates:** Bicep translates files into ARM (Azure Resource Manager) templates that Azure uses to create resources.
- **Integrates with Azure DevOps:** Bicep integrates with Azure DevOps for lifecycle management.

3. Kubernetes:

- **Container orchestration:** Kubernetes is the leading platform for large-scale container orchestration.
- **Automates deployment and management:** Kubernetes automates the deployment, scaling, and management of containers in clusters.
- **Offers an ecosystem of tools:** Kubernetes offers a rich ecosystem of tools and libraries for container management.

4. Terraform:

- **Infrastructure as Code:** Terraform is an open-source tool for managing infrastructure as code.
- **Defines infrastructure in HCL files:** Terraform uses HCL configuration files to define the desired infrastructure.
- **Supports different providers:** Terraform supports a wide range of cloud and on-premise providers.

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In summary:

- **Ansible:** Ideal for automating server and application configuration.
- **Bicep:** Great for defining infrastructure on Azure in a readable way.
- **Kubernetes:** Powerful tool for large-scale container orchestration.
- **Terraform:** Flexible for managing infrastructure across multiple cloud providers or on-premise.

In the configuration of "Custom" services, we can identify a common section composed of the initial parameters:

- "Categories": enter free text in the field and select an already configured category from the dropdown, or it is possible to add a new category by clicking the "+" button in the dropdown.
- "Name": the name of the service that will be displayed on the corresponding card.
- "Description": the description of the service that will be shown on the relative card.

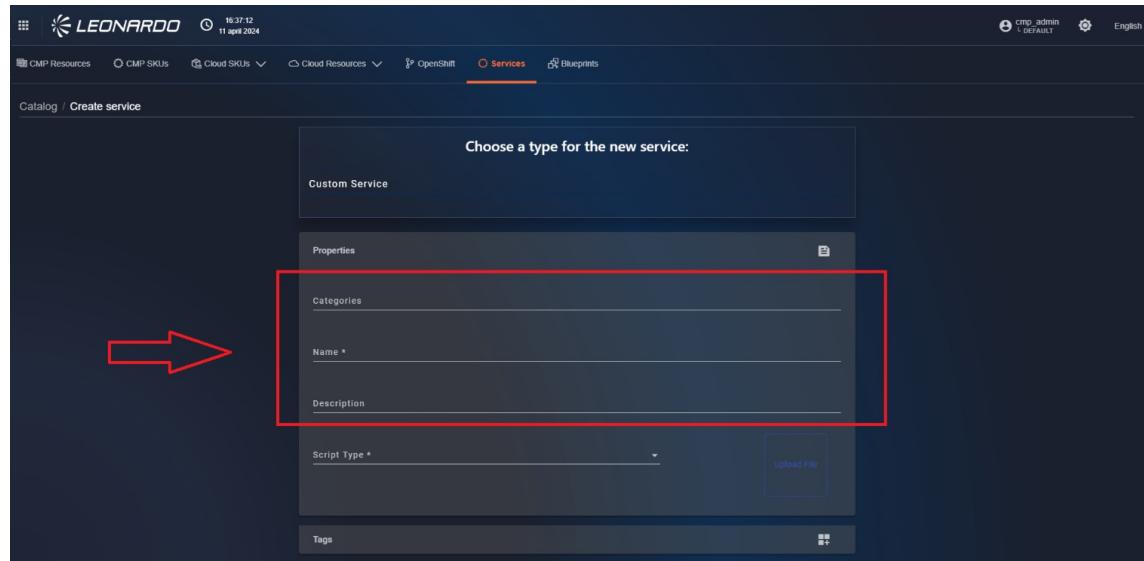


Figura 272 – Parametri generali dei "Custom Services"

Subsequently, it is necessary to choose the type of "orchestrator" to use and insert the corresponding ".zip" file in the "Upload File" section. The specifications for each type are indicated below:

Script type	Mandatory .zip file content
Ansible	Instance.yaml - Vars.yaml
Bicep	Main.bicep - Main.parameters.json
Kubernetes	Only .YAML files
Terraform	Main.tf - Variable.tf - Provider.tf

In addition to the files described in the table, it is possible to add a ".png / .jpg / .img" file to the zip that will then be used as the image for the corresponding Card.

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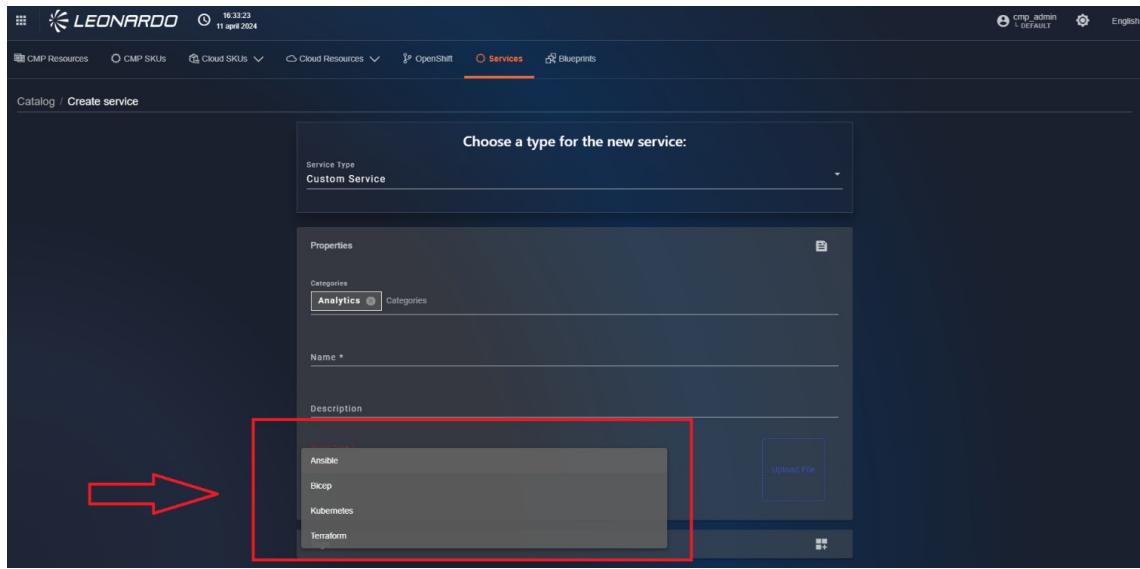


Figura 273 – Selezione della tipologia di Orchestratore

Once all data has been entered, the service can be saved using the "save" button in the bottom right. A confirmation modal will be displayed, and the user will be redirected to the list of available services.

9.0.3.1.2.3 "Azure Pipeline" Services

The user is given the possibility to define "Azure Pipeline" services. This type of service allows the SCMP to invoke the execution of a remote DEVOPS pipeline usable through the provisioning functionality.

In the configuration of "Azure Pipeline" services, we can identify a general section composed of the parameters:

- "Categories": enter free text in the field and select an already configured category from the dropdown, or it is possible to add a new category by clicking the "+" button in the dropdown.
- "Name": the name of the service that will be displayed on the corresponding card.
- "Description": the description of the service that will be shown on the relative card.

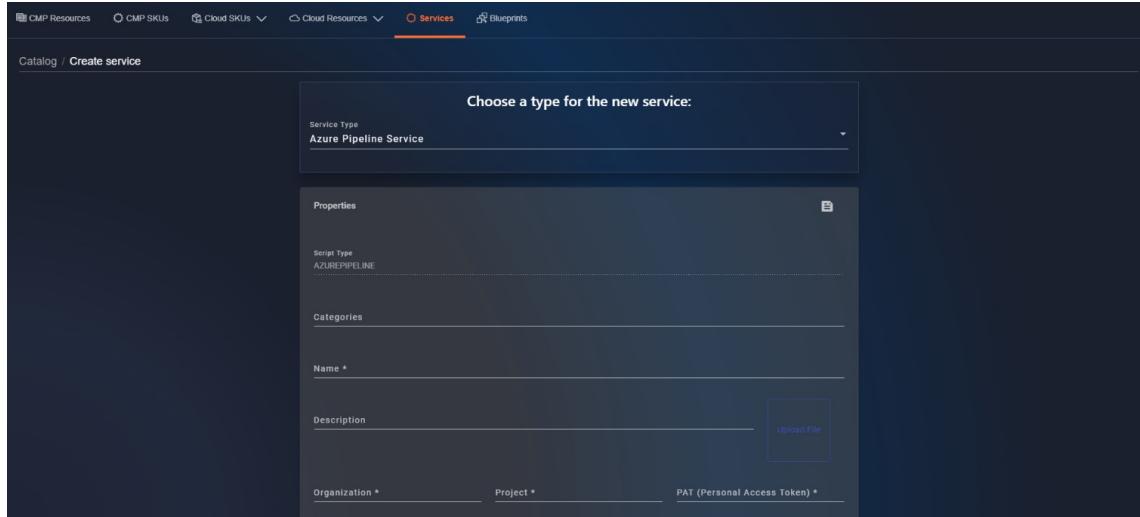


Figura 274 – Parametri generali "Azure pipeline service"

Also for this service, it will be possible, through the "Upload File" field, to insert a ".zip" file that contains a ".png / .jpg / .img" file within the zip, which will then be used as the image for the corresponding Card.

Subsequently, it will be necessary to fill in the specific parameters of the service, in particular, it will be necessary to insert:

- "Organization": the name of the DevOps organization where the pipeline resides.
- "Project": the name of the DevOps project where the pipeline resides.
- "PAT": the private personal access token generated from the "Azure DevOps" portal. Once these fields are filled, it is possible to click the "Test" button to verify the entered parameters.

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If the entered data is not valid, various error messages will be displayed indicating which parameter is incorrect (e.g., "Specified Organization is not valid.") and the button will turn red with "KO" written. When all parameters are correct, the button will turn green with "OK" written.

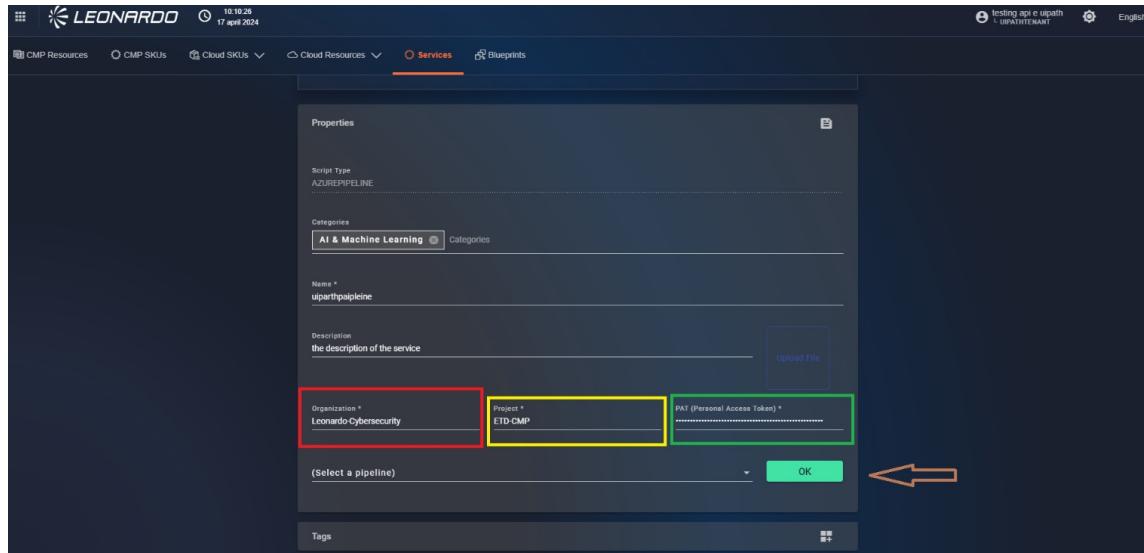


Figura 275 – Parametri specifici della Pipeline

After successfully performing the test, it will be possible to select the pipeline to execute using the "Select Pipeline" field and clicking on an available option.

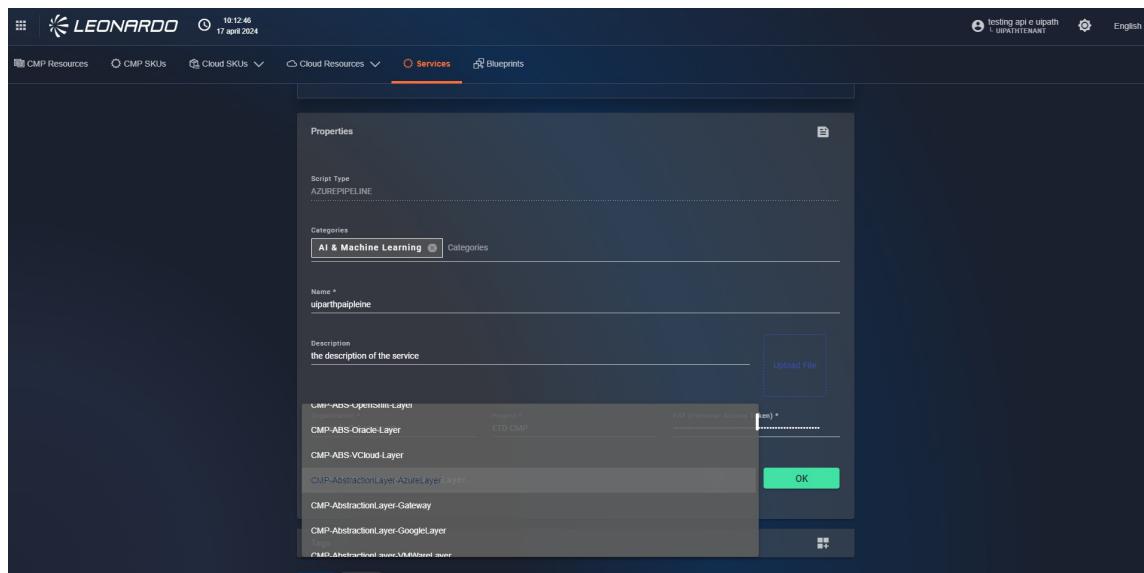


Figura 276 – Selezione della pipeline

Once all data has been entered, the service can be saved using the "save" button in the bottom right. A confirmation modal will be displayed, and the user will be redirected to the list of available services.

9.0.3.1.2.4 "HELM" Services

We can also configure "HELM" type services within the SCMP. For the configuration of these services, it is necessary to enter these parameters:

- "Categories": enter free text in the field and select an already configured category from the dropdown, or it is possible to add a new category by clicking the "+" button in the dropdown.
- "Chart name": the actual name of the HELM CHART that will be used.
- "Chart repository": the URL relative to the repository containing the HELM CHART to be used.
- "Repository username": if the repository indicated above is private, it will be necessary to provide a username to access the repository.
- "Repository password": if the repository indicated above is private, it will be necessary to provide the password for the user indicated above.
- "Chart version": indicates which version of the chart to use.
- "Cluster": indicates which cluster to install the application on.

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- "Description": the description of the service that will be shown on the corresponding card.
- "Image": in this section, it is possible to insert a .png file that will be used as the service image on the interface.
- "Immutable": Selecting this flag during provisioning will prevent modification of settings, and the service will be automatically configured based on.
- "Namespace": enter the name for the namespace where the deployment should occur.
- "Name": the name of the service that will be displayed on the corresponding card.
- "Configurations": in this section, it is possible to upload the values.yaml file that will be used for provisioning.

The screenshot shows the Leonardo platform's 'Create service' interface for a 'Helm Service'. At the top, a dropdown menu shows 'Service Type: Helm Service'. Below this, there are several input fields: 'Chart Name *' (empty), 'Chart Repository' (empty), 'Repository Password' (empty), 'Repository Username' (empty), and 'Chart Version *' (set to 'latest').

Figura 277 – Parametri generali dei "HELM Services"

For these services, it is also possible to prevent any kind of service modification by selecting the "immutable" option and entering a namespace and a cluster in which to deploy the applications.

The screenshot shows the 'Create service' interface again, but with the 'Immutable' checkbox selected. Other visible fields include 'Cluster' (dropdown), 'Description' (text input), 'Image' (file upload button), 'Namespace' (text input), 'Name *' (text input), 'Script Type *' (dropdown set to 'HELM'), and 'Configuration (values.yaml)' (file upload button).

Figura 278 – Parametro "immutable"

Once all data has been entered, the service can be saved using the "save" button in the bottom right. A confirmation modal will be displayed, and the user will be redirected to the list of available services.

9.0.3.1.3 EDITING AND DELETING SERVICES

In addition to creating a Service, it is possible to view, modify, and delete it.

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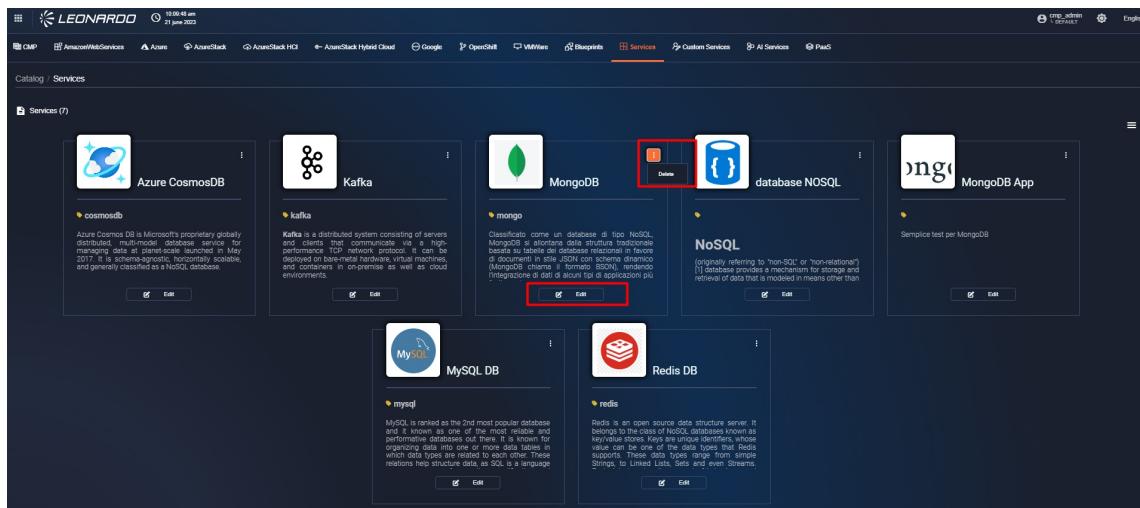


Figura 279 – Operazioni disponibili per i Services

- To modify the information of a "Service", click the "Edit" button within the card. Afterward, within the form, the user can modify the necessary data. After performing the edit operations, in the bottom right, click the "Submit" button. After doing this, the user is on the "Service" page.

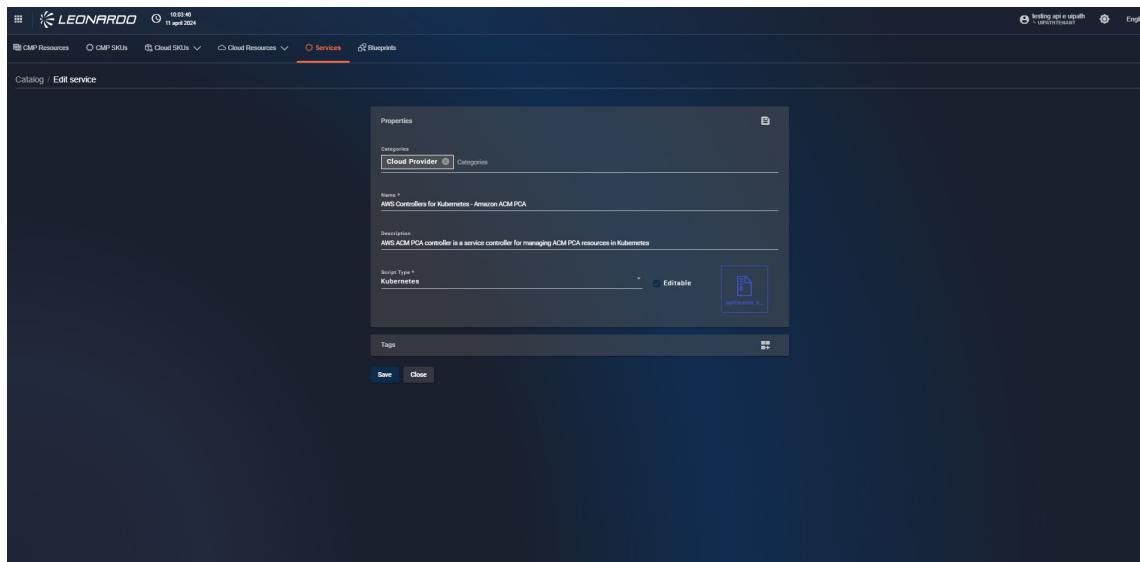


Figura 280 – Pagina di edit per un servizio

- To delete a "Service", click on the kebab menu of said service and then click on "Delete". After doing this, a confirmation modal for service deletion appears. At this point, it is necessary to click the "Remove" button.

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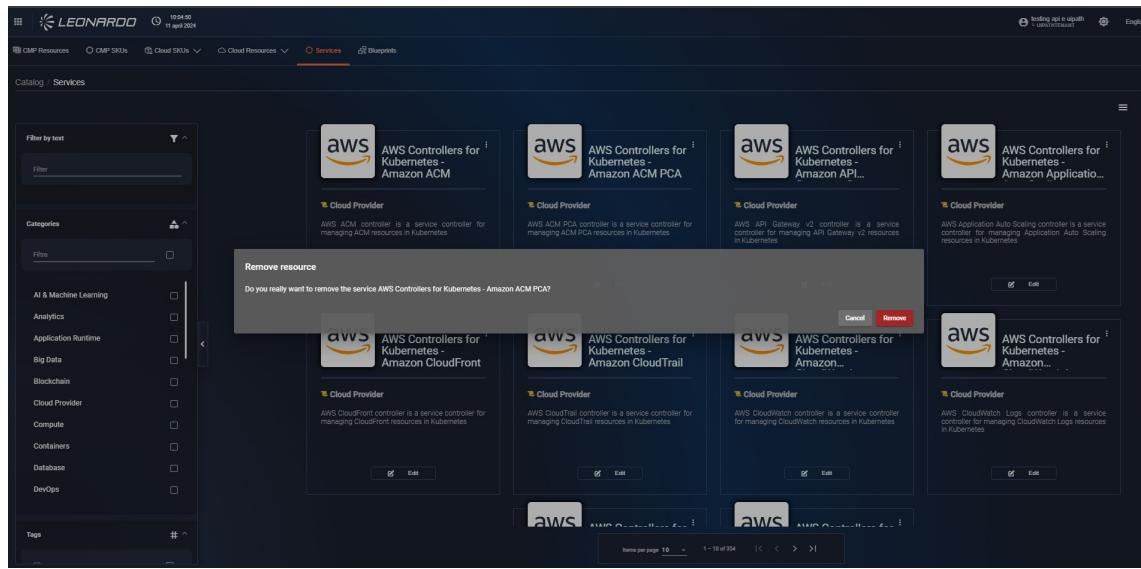


Figura 281 – Eliminazione di un servizio

9.0.3.2 Blueprint Management

To access the "Services" functionality, click on the bento button in the upper left corner and then click on "Catalog".

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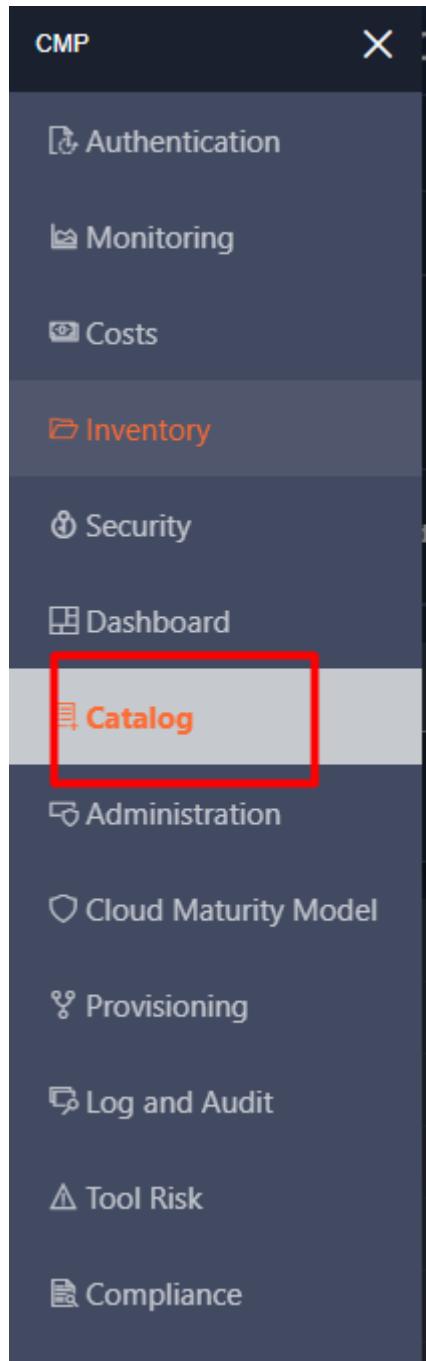


Figura 282 – Accesso alle "Blueprint"

From the "SCMP" page, click on the tab that depicts three joined squares, 'Blueprint', located above the breadcrumb path. After doing this, you will be on the 'Blueprint' page, where the list of blueprints configured in the system is displayed.

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Name	Description	Creation Date	Status
AKS Cluster & Helm Release	AKS Cluster & Helm Release	06/02/2024 09:11:51	✓
Blueprint with manual intervention	-	16/02/2024 14:11:14	✓
Docker development environment	Ubuntu VM setup for container development	22/02/2024 09:53:31	✓
Only manual	Blueprint with human tasks only	13/03/2024 09:39:32	✓
Onboarding Pubblica Amministrazione Secure Public Cloud GCP	Procedura di Onboarding nuova PA su Secure Public Cloud Google	14/03/2024 12:13:38	✓
Declarative blueprint	Blueprint with topology definition, but no provisioning plan	26/03/2024 14:13:35	✓

Figura 283 – Pagina delle Blueprint

9.0.3.2.1 ADDING A NEW BLUEPRINT

From the "Blueprint" page, the user can create a new blueprint by accessing the appropriate section as shown in the figure, by clicking the "hamburger menu" in the upper right corner and selecting "Add Blueprint".

Name	Description	Creation Date
manual	only manual	10/04/2024 08:09:07
name	dsdescr	10/04/2024 09:45:36
myBlueprintName	description	10/04/2024 09:46:13
isAnewName	descrizione32	10/04/2024 09:46:51

Figura 284 – Aggiunta nuova Blueprint

The user is redirected to step 1 of the "Blueprint" creation where all general information about the blueprint can be entered. After entering the data, click the "Save blueprint" button to save the blueprint draft. For details on the status, please refer to the next paragraph.

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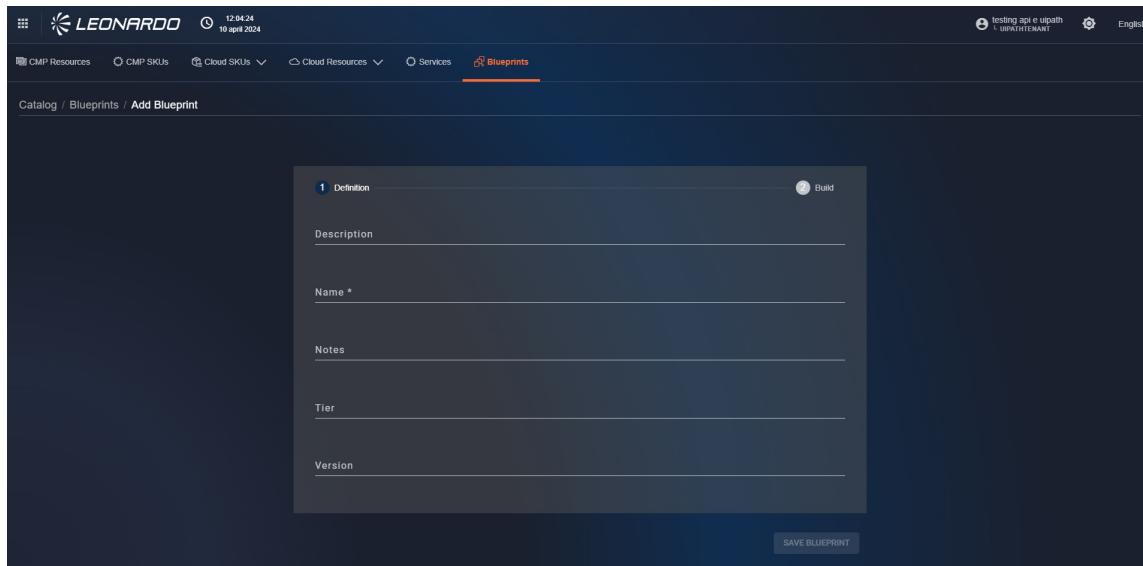


Figura 285 – Blueprint step 1

A confirmation modal for insertion will open. Once "yes" is clicked to continue, the user will see step 2 of blueprint creation.

Clicking "No" will cancel the draft insertion.

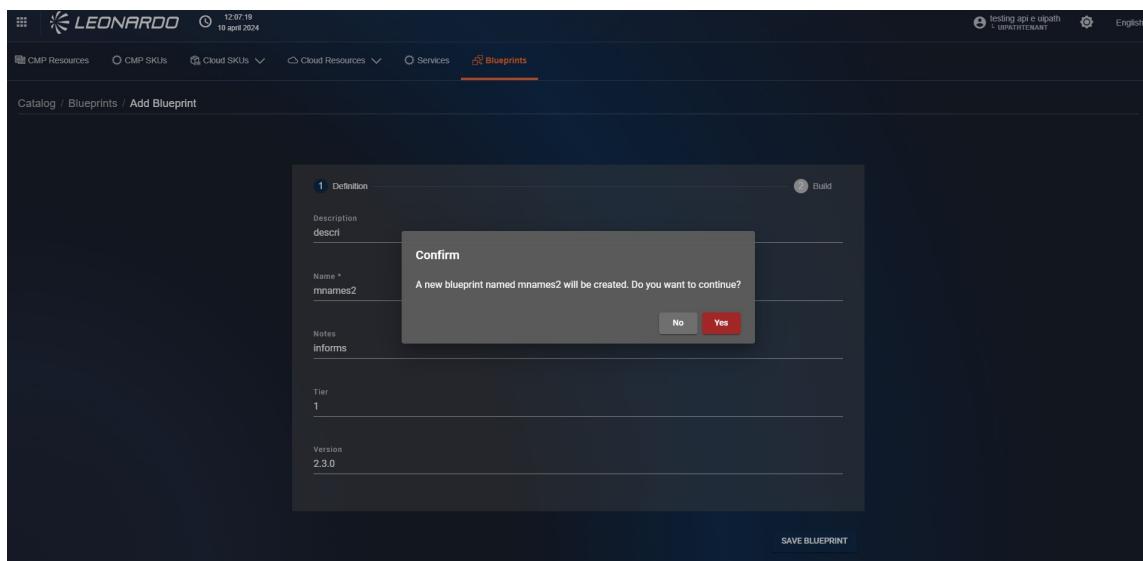


Figura 286 – Blueprint conferma della bozza

In step 2 of creating a Blueprint, it is necessary to click within the "Upload File" field and, using the Windows upload window, select the ".CSAR" file that contains the Blueprint.

After selecting a file, click the "Upload" button in the bottom right to start the file validation process, following the list of statuses in the paragraph below.

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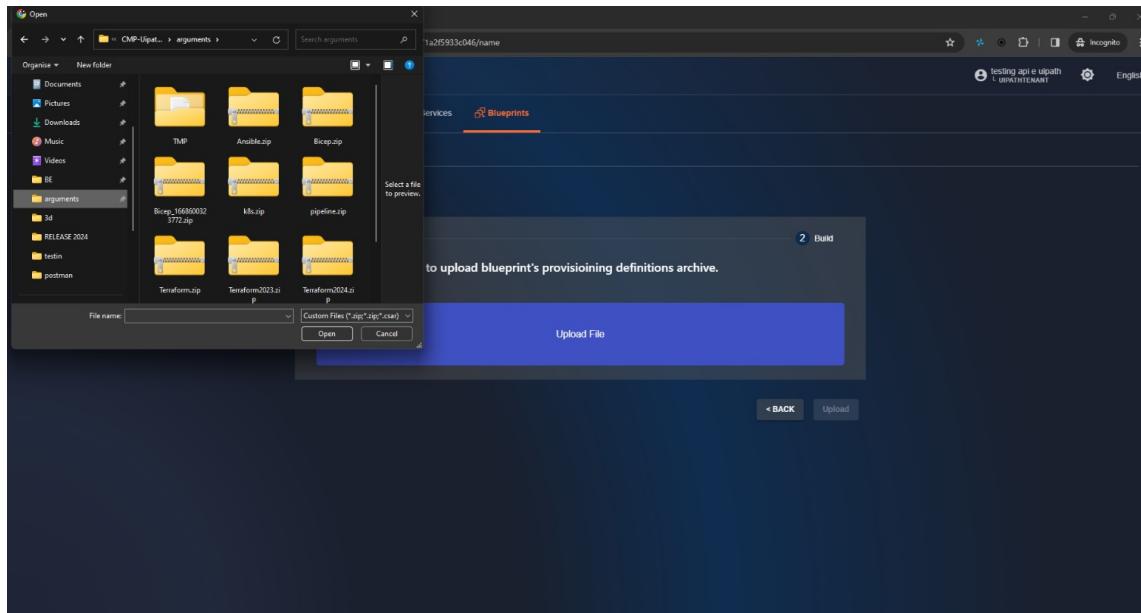


Figura 287 – Inserimento file

9.0.3.2.2 BLUEPRINT STATUS

Since "Blueprints" are complex objects that must be properly configured, a file validation system has been implemented to allow the use of only "Blueprint" services that are correctly configured.

Specifically, there are 4 possible "STATUSES":

1. READY TO USE (green checkmark): indicates that the blueprint is configured correctly and can be used during "Provisioning".
2. VERIFY (yellow circle): indicates that the SCMP is validating the content of the Blueprint.
3. FAILED (red "X"): indicates that the uploaded file is not valid and must be re-entered by the user after correction.
4. DRAFT (orange): indicates that the "blueprint" has been created as a draft but does not contain the necessary CSAR file. Once the file is inserted, the blueprint will change to VERIFY status.

Name	Description	Creation Date	Status
manual	only manual	10/04/2024 08:09:07	
name	dsdescr	10/04/2024 09:45:36	
myBlueprintName	description	10/04/2024 09:45:13	
isAnewName	descritzione32	10/04/2024 09:46:51	

Figura 288 – Status delle Blueprint

9.0.3.2.3 VIEWING, EDITING, AND DELETING BLUEPRINTS

In the table of available blueprints, for each row, on the right, there is a contextual menu. Once opened, it contains three functionalities:

The "View" functionality: allows viewing the details of the blueprint. Once clicked, the user will be redirected to the blueprint viewing page.

- Properties: in this section, it is possible to modify the basic information of the blueprint (Figure 241).

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- Provisioning plan: in this section, there is the bpmn graph which provides a graphical representation of the "steps" foreseen by the "Blueprint" (Figure 242). This section contains three buttons to modify the plan: the first, shaped like a "folder", allows uploading a new BPMN file to the edit page; the second, "download", allows downloading the currently displayed bpmn file; the third, on the right, "Upload", overwrites the current bpmn file available for the blueprint.
- Topology: The topology of a blueprint is the arrangement of components in a Kubernetes cluster. In this section, we can graphically visualize the system structure among different pods, services, and components (Figure 243).
- Update Model: in this section, it is possible to upload the CSAR file. By making this modification, the Blueprint will return to the "VERIFY" state to validate its content (Figure 244).

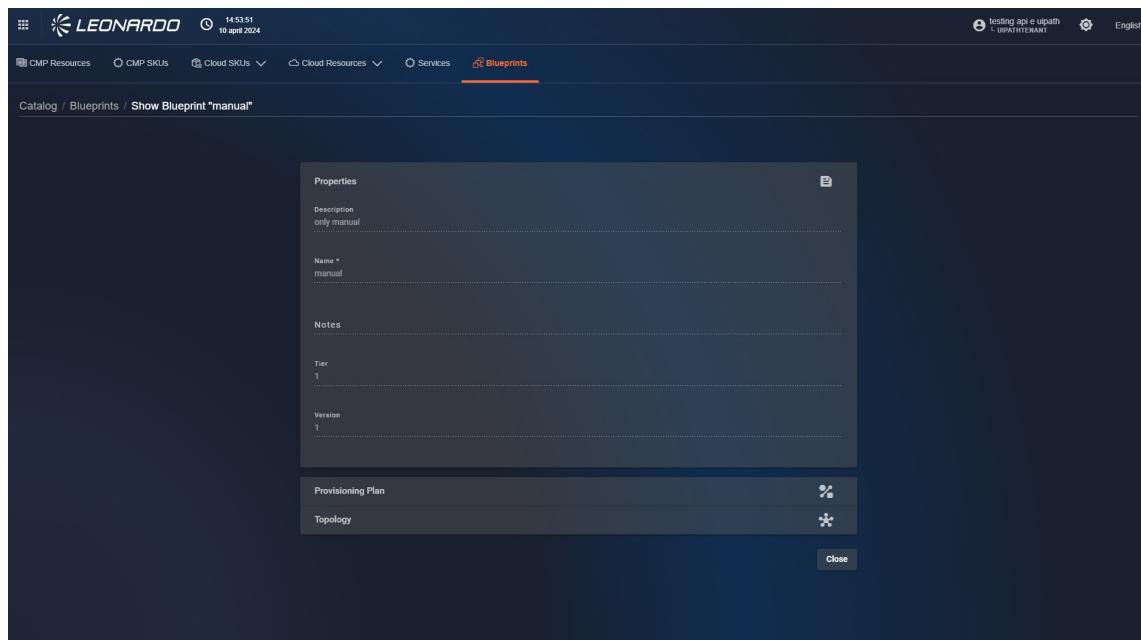
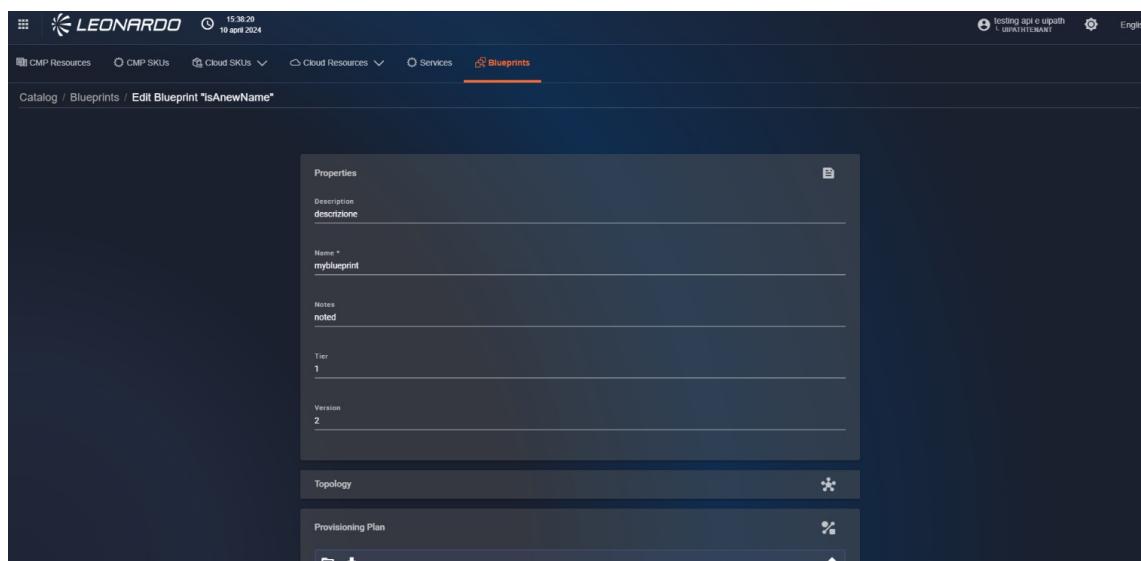


Figura 289 – Sezioni della pagina Blueprint "view"

The "Edit" functionality allows viewing and modifying all blueprint parameters, including the related CSAR file. It contains the following sections:

- Properties: in this section, it is possible to modify the basic information of the blueprint.
- Provisioning plan: in this section, there is the bpmn graph which provides a graphical representation of the "steps" foreseen by the "Blueprint". This section contains three buttons to modify the plan: the first, shaped like a "folder", allows uploading a new BPMN file to the edit page; the second, "download", allows downloading the currently displayed bpmn file; the third, on the right, "Upload", overwrites the current bpmn file available for the blueprint.
- Topology: The topology of a blueprint is the arrangement of components in a Kubernetes cluster. In this section, we can graphically visualize the system structure among different pods, services, and components.
- Update Model: in this section, it is possible to upload the CSAR file. By making this modification, the Blueprint will return to the "VERIFY" state to validate its content.



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Figura 290 – Sezioni della pagina Blueprint "edit"

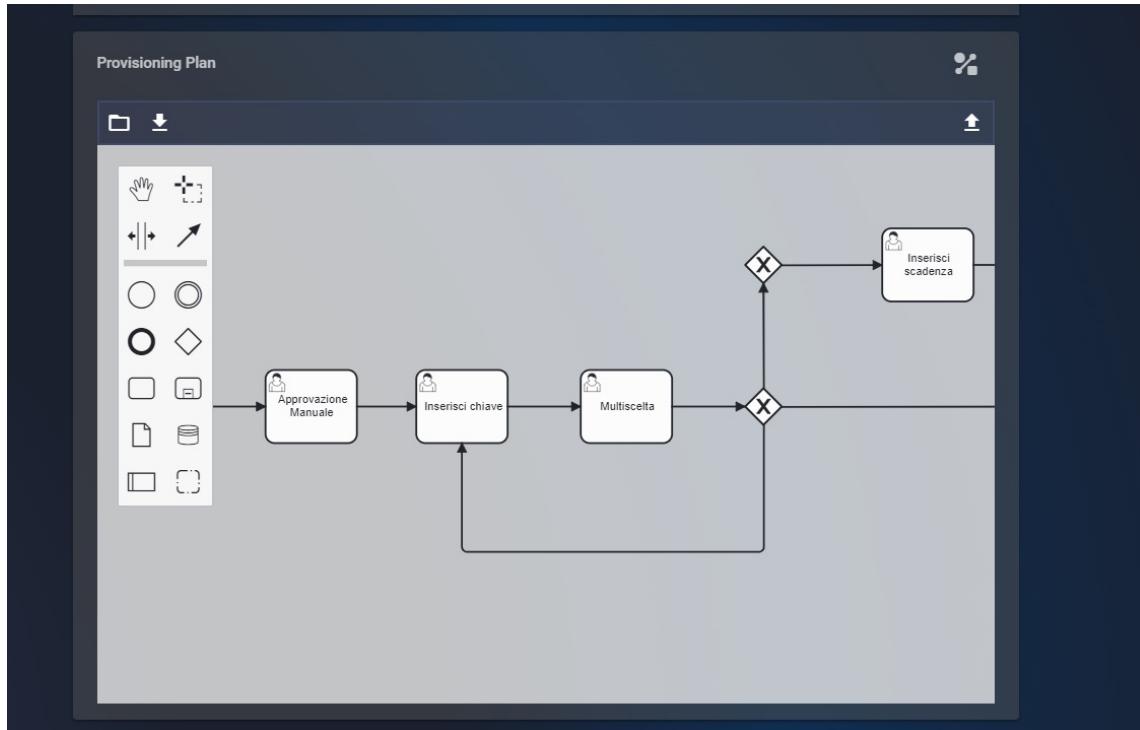


Figura 291 – Sezione Plan di una Blueprint

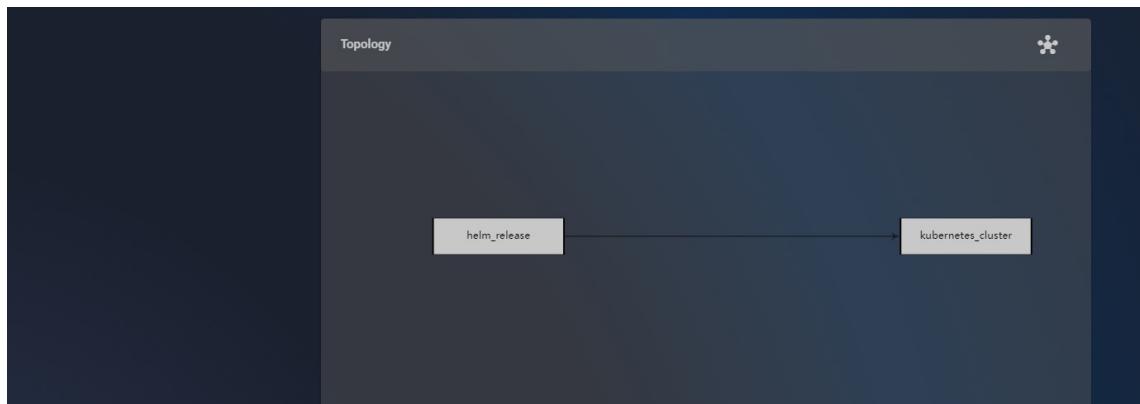


Figura 292 – Sezione Topology di una Blueprint

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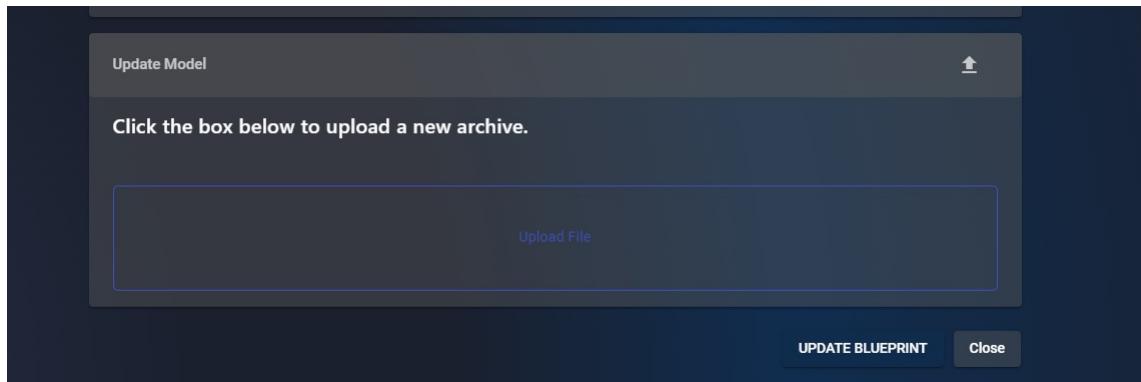


Figura 293 – Sezione Model di una Blueprint

The "Delete" functionality: allows permanently deleting the blueprint from the system. To do this, simply confirm the deletion by clicking the "Yes" button displayed in the deletion confirmation modal.

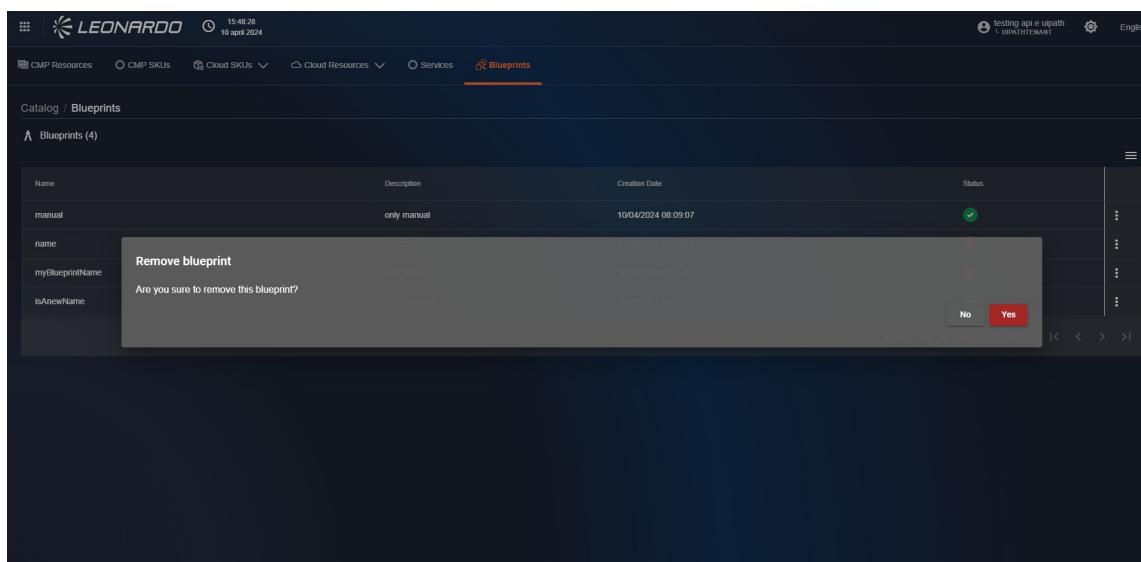


Figura 294 – Eliminazione di una Blueprint

9.0.4 Reporting Tools

The reporting functionality, specific to each feature, allows generating global reports of the information available for the various providers. Within the pages, the possibility will also be given to create files to facilitate information sharing.

To access the functionality, above the breadcrumb path, click on the "Reports" tab.

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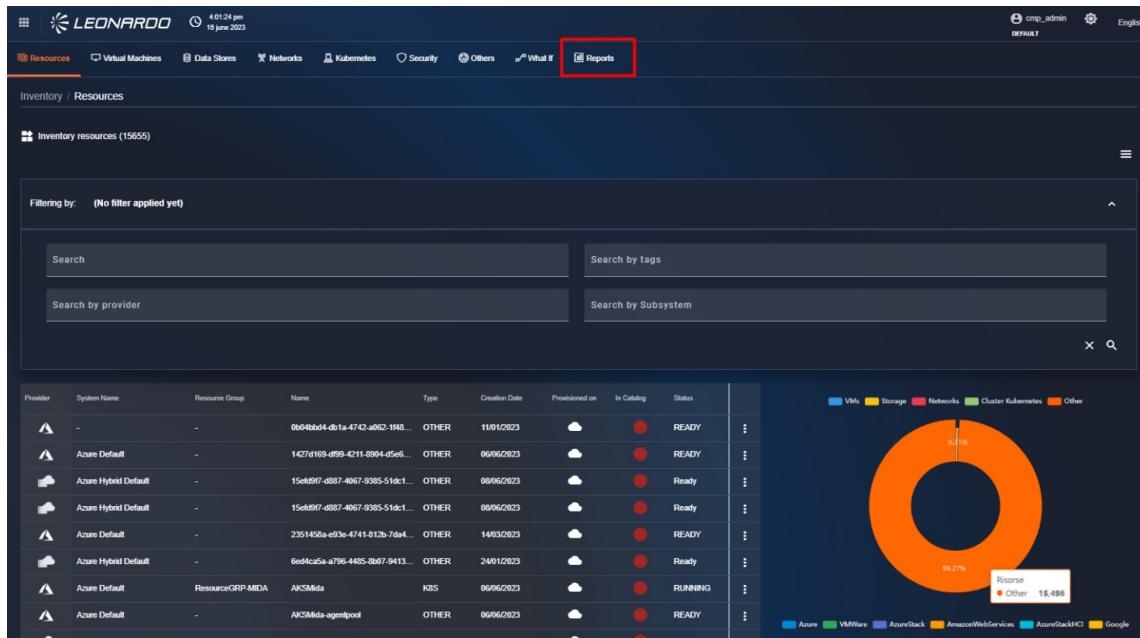


Figura 295 – Accesso al report di Catalogo

9.0.4.1 Available Report Types

CATALOG Missing SKU – List of provider SKUs not present in the SCMP catalog price list, if applicable. Consequently, the customer price for missing SKUs will be given by applying the discount/markup percentage configured in the Administration section.

9.0.4.2 Creating a Report

In the upper right of the page, we can click on the "New Report" button to start creating a report. Specifically, a modal will be displayed containing the list of available report types.

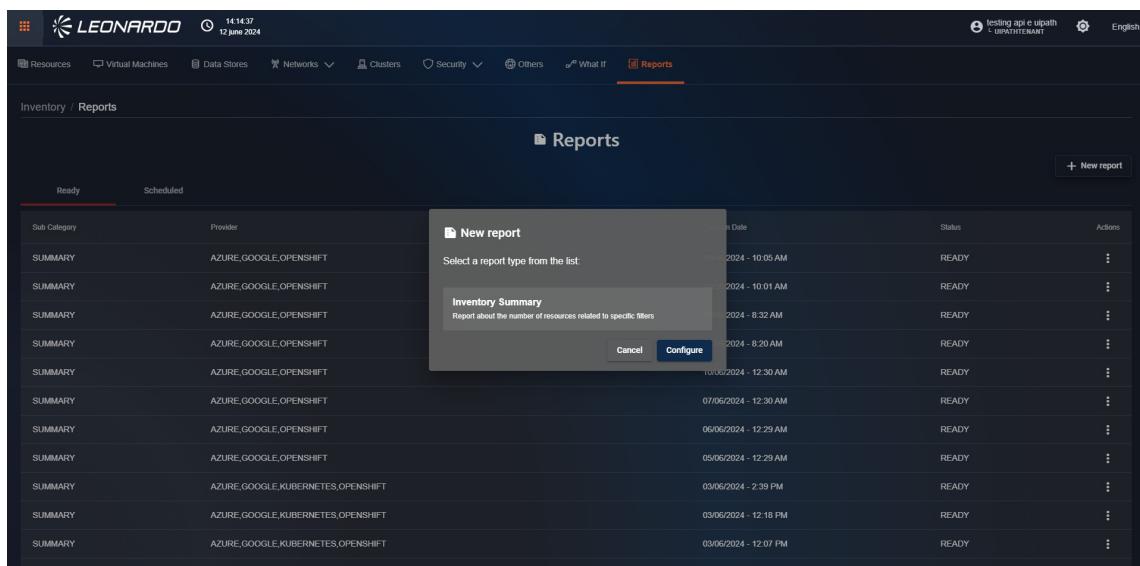


Figura 296 – Creazione nuovo report

Once the report type is selected, click the "Configure" button to select the providers to include in the report. In the newly opened window, we find the "Provider" field which allows selecting one or more existing providers in the system. Subsequently, it is possible to select one or more subsystems to include in the report. If no providers are selected, no subsystem can be selected. Finally, there is a "tag" section to include only resources that have the entered tag.

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Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	03/06/2024 - 2:39 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, OPENSHIFT			
SUMMARY	AZURE, GOOGLE, KUBERNETES, OPENSHIFT			

Figura 297 – Configurazione del report

At this point, the user can choose between two different actions:

- Create a static report that will be saved in the system.
- Schedule a recurring report generation.

To confirm the creation of a static report, verify that "One-Shot" has been selected for the "Report type" field and click the "Submit" button at the bottom.

After a loading period, the newly generated report will be visible in the list.

Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE, GOOGLE	12/06/2024 - 1:21 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮

Figura 298 – Lista dei report effettuati

9.0.4.2.1 REPORT SCHEDULING

If, on the other hand, you want to schedule automatic report execution, you will need to select "Recurring" for the "Report Type" field. In this case, the window will update to show additional parameters for configuring the periodic report.

The parameters to be entered are:

- Period: allows selecting the frequency of report delivery (hourly, daily, ...).
- "Receive only if not empty" if selected, the file will not be sent if it contains no information.
- Report Language: allows selecting the language used in the report.
- File format: allows selecting one or more file types to include in the email.

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- User E-mails: allows entering an email to which reports will be sent. After entering an email, it is necessary to press "Enter" on the keyboard to confirm its entry. Once pressed, the newly entered email will move to the bottom box, and the field will be cleared to allow the entry of a new email, if necessary.

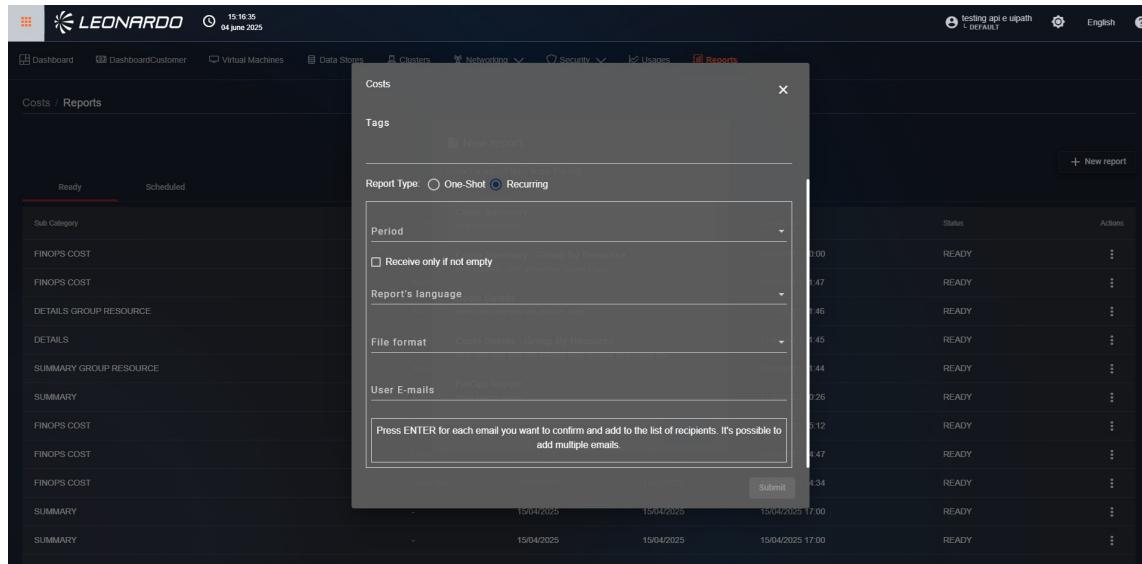


Figura 299 – Parametri dei report schedulati

Having configured all parameters, the "Submit" button will become clickable. Click it to confirm the entry, and after a loading period, the newly generated report will be visible in the list.

Inventory / Reports					
Reports					
Ready	Scheduled	Actions			
Sub Category	Provider	Creation Date	Status	Actions	
SUMMARY	AZURE, GOOGLE	12/06/2024 - 12:21 PM	READY	⋮	
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮	
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮	
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮	

Figura 300 – Lista dei report effettuati

9.0.4.2.2 LIST OF SCHEDULED REPORTS

To view the list of scheduled reports, select the "Scheduled" tab in the upper left of the reports page.

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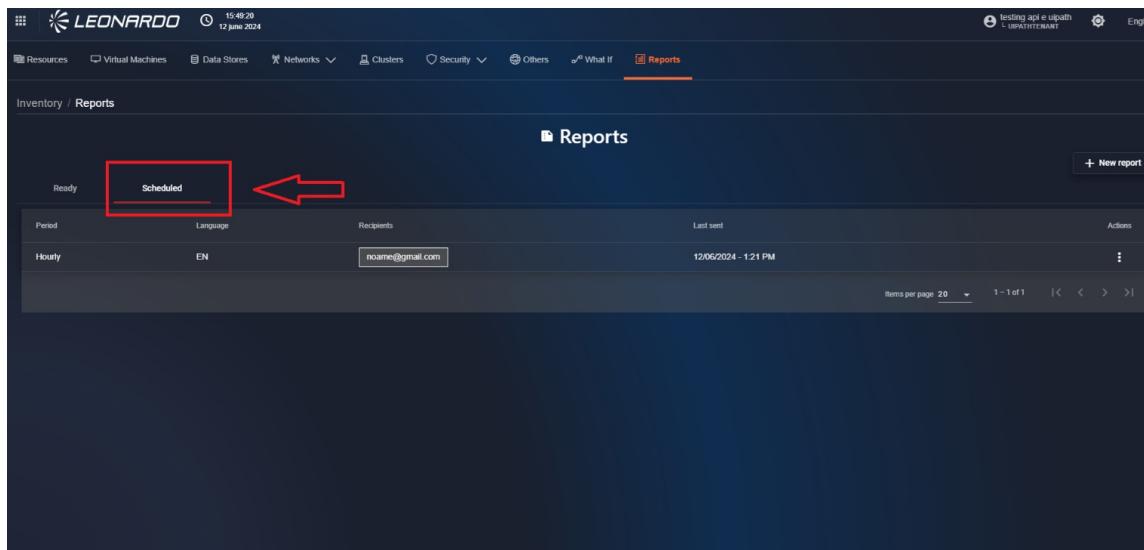


Figura 301 – Lista dei report programmati

On this page, you will find the list and related information of the scheduled reports present in the system. For each result, it is possible, by clicking the "Three dots" button on the right, to perform three operations:

- View the last generated report.
- Edit the schedule settings; it will not be possible to modify the selected providers or subsystems.
- Delete the schedule to stop sending emails.

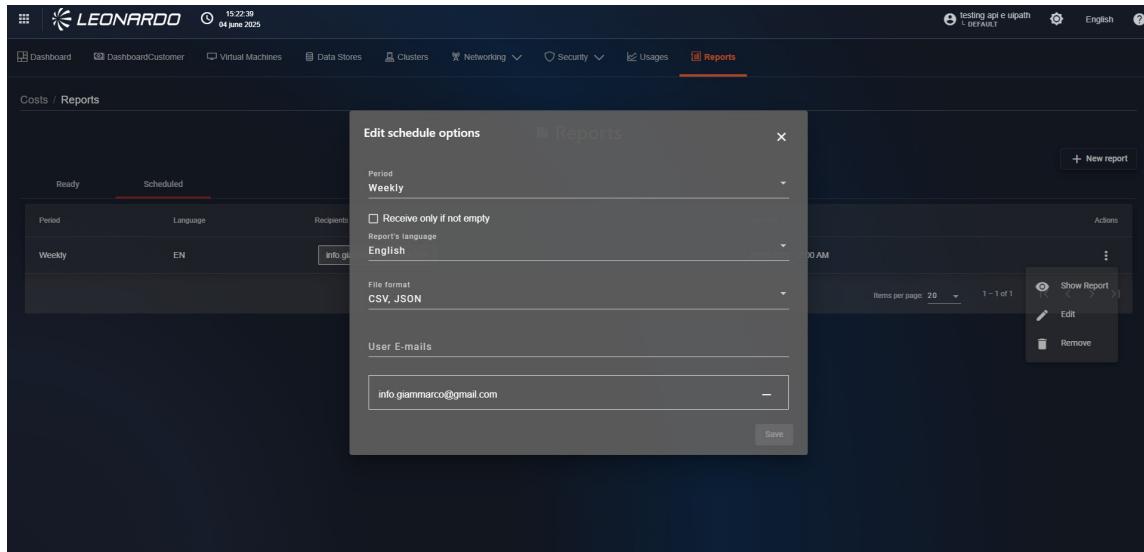


Figura 302 – Modifica di una schedula

9.0.4.2.3 USING REPORTS

Clicking on a row of a static report, or using the "Show report" button available for scheduled reports, will display the detail page of the selected report.

In the summary of the Inventory report, there is a "Stats" section which contains the number of disks, interfaces, networks, and virtual machines belonging to the selected provider.

Below the "Stats" section, there are the filters used by the user to generate the report.

Below the filters, there is a summary table of resources belonging to the providers. On the right, there are two buttons: "PRINT" and "EXPORT".

Clicking the "PRINT" button, a print preview modal appears. To print the report, click the "Print" button in the bottom right, at which point the printing of said report will begin.

Clicking the "EXPORT" button, it is possible to export the report in ".csv", ".json", or ".pdf" format.

To return to the "Results" tab, in the bottom right, click the "CLOSE" button or in the upper left, click the left-pointing arrow, next to the report title.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there is a navigation bar with links for Resources, Virtual Machines, Data Stores, Networks, Clusters, Security, Others, What If, and Reports. The Reports link is highlighted. Below the navigation bar, the URL is shown as Inventory / Reports / Report 6669a0d3aae316468b3c8b34. The main content area is titled "Report Inventory Summary". It features a "Stats" section with five boxes: VMs (1), Disks (1), Networks (1), Interfaces (0), and K8Ss (0). Below this, a message states "PROVIDER: AZURE,GOOGLE | SUBSYSTEM: MAE LAB,CMPPROJECT-374610". A table follows, showing resource counts by provider and subsystem. The table has columns for Type Provider, Subsystem Name, VMs, Disks, Networks, Interfaces, and K8Ss. Two entries are listed: Azure (MAE LAB) with 14 VMs, 16 Disks, 14 Networks, 0 Interfaces, and 0 K8Ss; and Google (CMPPROJECT-374610) with 1 VM, 1 Disk, 1 Network, 0 Interfaces, and 0 K8Ss. At the bottom right, there are buttons for PRINT and EXPORT, and pagination controls showing "Items per page: 20" and "1 - 2 of 2".

Type Provider	Subsystem Name	VMs	Disks	Networks	Interfaces	K8Ss
Azure	MAE LAB	14	16	14	0	0
Google	CMPPROJECT-374610	1	1	1	0	0

Figura 303 – Dettagli dei report

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Cost and Usages

SCMP collects, through the APIs made available by the providers, the cost details of inventory assets.

In the event that providers do not expose cost data, this data can be editorially entered into the catalog so that it can then be counted within this functionality.

Costs are collected with a breakdown by daily cost and by resource. Subsequently, as with the metrics section, the data is normalized and aggregated to allow for a uniform dashboard visualization.

Attention

As also indicated on the cost dashboards, data related to the last 48 hours has not yet been confirmed by the respective providers. We can use this table as a reference, but for details, it is necessary to check the specific provider's documentation.

For example:

Cloud Provider	Tool/Method	Update Times	Notes
Azure	Cost using export file	6/7 days	in the first 6 days of the following month, the costs of the previous month are consolidated
Azure	Cost Management	8-24 hours	Consolidated data updated within 24/48 hours; greater delay compared to others.
Google Cloud	Billing Dashboard	A few hours, maximum 24 hours	Near real-time updates; consolidation up to 24 hours.
Google Cloud	BigQuery Export	Every hour	Minimum delay for advanced analysis via BigQuery.
Oracle Cloud	Cost Analysis	4-6 hours, maximum 24 hours	some services may have greater delays.
AWS	Cost Explorer	8-24 hours	Aggregated data updated within 12-24 hours.
AWS	Cost and Usage Reports (CUR)	8-24 hours	Detailed reports with similar delay.
AWS	CloudWatch Metrics (Billing)	Every 6 hours	Near real-time monitoring.
AWS	Budget Alerts	3-5 hours	Rapid notifications when budget thresholds are exceeded.

Cost Dashboard

To access the cost section, use the menu as shown in the figure.



Figura 304 – Access to Costs

At this point, the user will find themselves within the "Dashboard" tab page of costs. On this screen, we can note in order:

- The "Cost trend" value, which indicates the total costs for the selected period.
- The "Cost difference" value, which indicates the markup applied in the selected period.
- A "Cloud provider Spend" bar chart, which indicates the cost billed to the client for each provider in the selected period.
- An "Effective Spend" bar chart, which indicates the effective cost of resources on the provider.

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At the bottom, there will be several resource aggregation charts, for example, by Region or Service Type, as indicated by the respective cloud providers, and as we will analyze later, it will be possible to customize the available charts and sections.

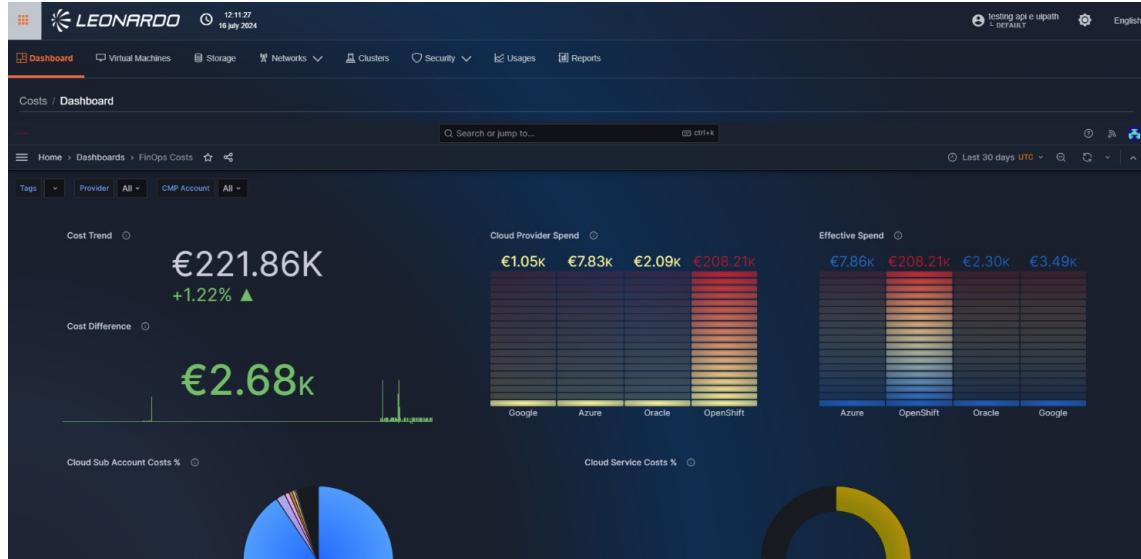


Figura 305 – Cost Dashboard

In the cost functionality, it is possible to filter by resource type using the tab bar at the top, while for a general view, the dashboard can be used.

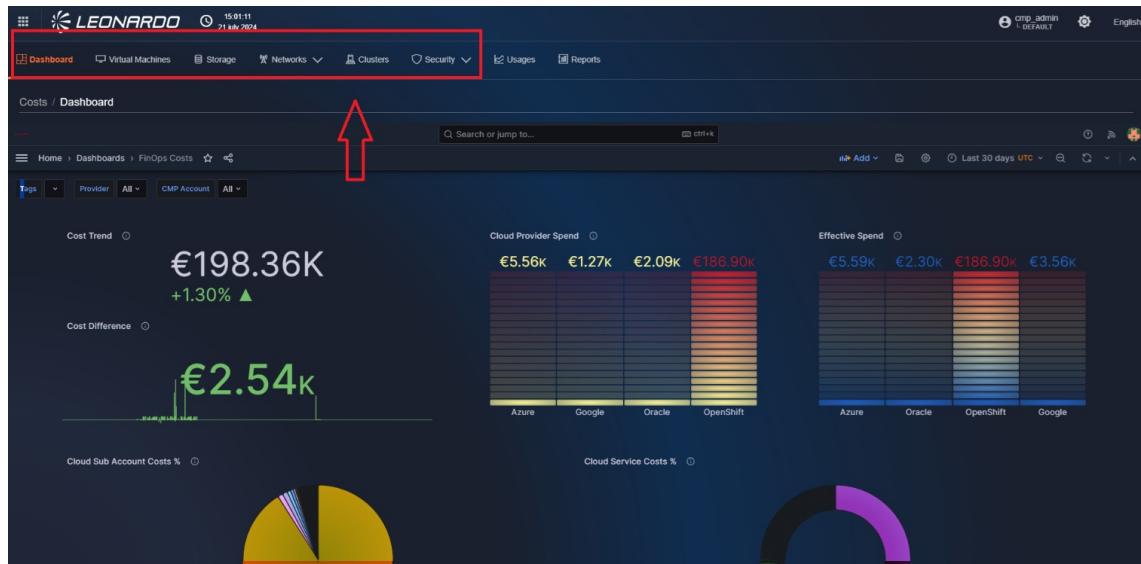


Figura 306 – Filter by resource type

Cost Section Filters

Within the page, a series of filters are available that can be selected simultaneously to filter the dashboard results.

The main filter is the display period, which can be found in the upper right. Clicking on it will open a selection window (in yellow in the figure) where it will be possible to either enter a custom time range, using the "From" and "To" fields on the left, or select a "smart" time range by clicking directly on the desired choice in the scrollable section on the right.

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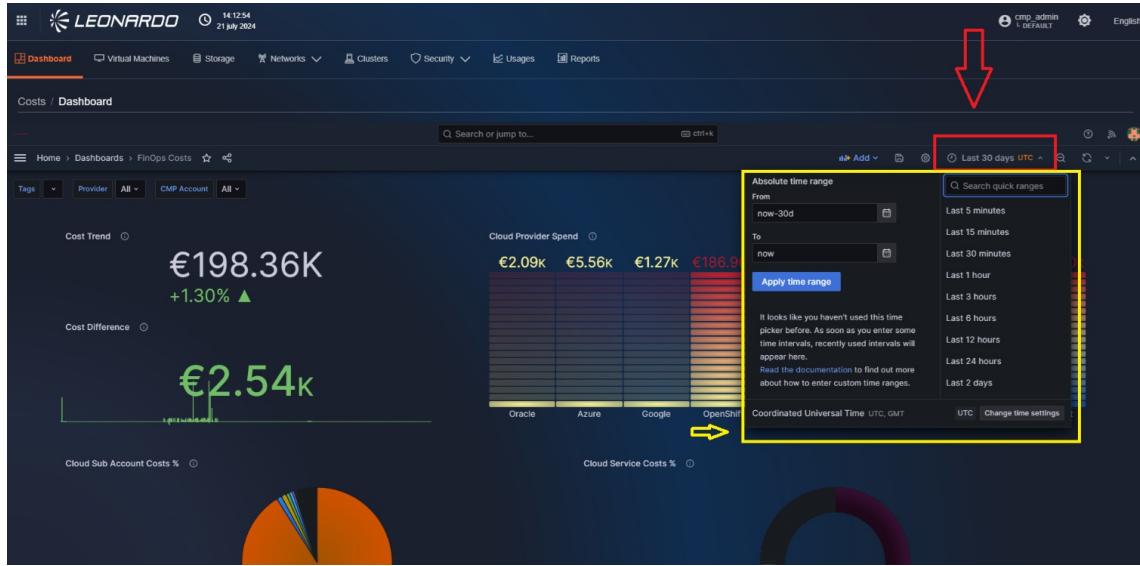


Figura 307 – Cost time filter

A series of filters are available in the upper left of the page, allowing you to filter the retrieved resources. Specifically, you can filter by:

- Tag
- Provider type
- Subsystem name.

These filters allow multiple values to be selected and can be combined to achieve the desired granularity

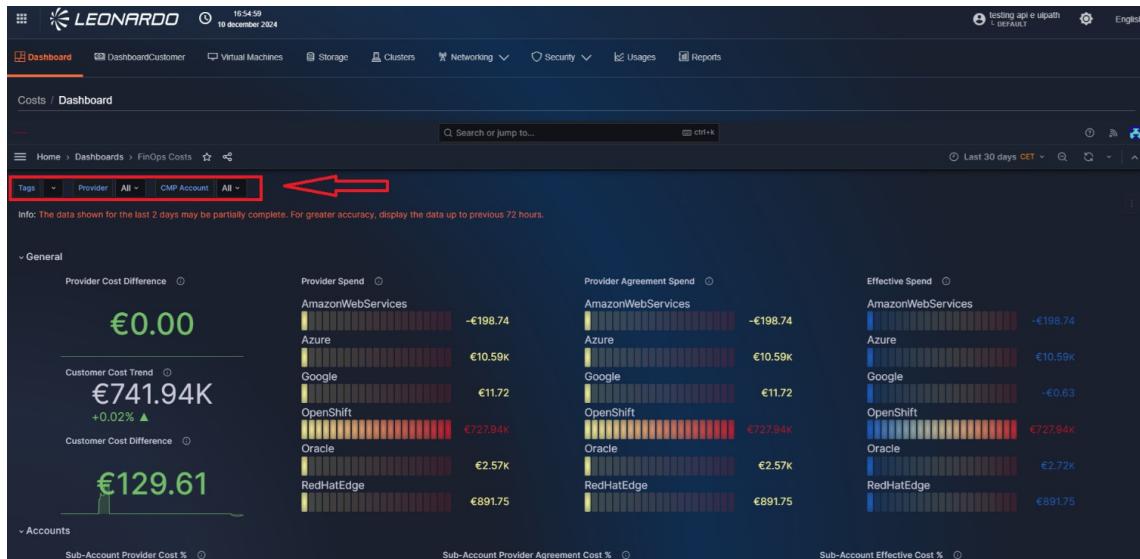


Figura 308 – Cost functionality filters

Overview of the data shown

"GENERAL" SECTION

In the first section, summary charts representing provider and SCMP costs are shown to the user based on the applied filters.

In detail:

- **Provider Cost Difference:** chart containing the cost difference between the sum of the original provider costs and the sum of the costs agreed upon with the provider.
Useful for identifying savings obtained through negotiation or resale compared to list prices.
- **Customer Cost Difference:** chart containing the cost difference between the sum of SCMP costs charged to the customer and the sum of the original provider costs.
Used to monitor profit margins and the competitiveness of prices offered to the customer.

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- **Customer Cost Trend:** chart containing the total SCMP costs charged to the customer, with the respective profit/loss percentage.
Allows observing economic trends over time and detecting cost peaks or anomalies.
- **Provider Spend:** chart containing the sum of original costs for each provider.
Allows identifying which providers the spending is concentrated on and the level of dependency.
- **Provider Agreement Spend:** chart containing the sum of agreed costs for each provider.
Useful for comparing the effectiveness of commercial agreements with each provider.
- **Effective Spend:** chart containing the sum of SCMP costs charged to the customer for each provider.
Helps evaluate the profitability obtained from each provider.



Figura 309 – General

"ACCOUNTS" SECTION

In the second section, charts focused on the costs generated by each subordinate account of each provider are shown to the user.

In detail:

- **Sub-Account Provider Cost %:** Percentage of the total provider cost, for each account.
Used to identify the most expensive accounts and analyze the distributed economic load.
- **Sub-Account Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each subordinate account.
Useful for checking which accounts benefit from more significant discounts.
- **Sub-Account Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each subordinate account.
Allows seeing which accounts generate more revenue.

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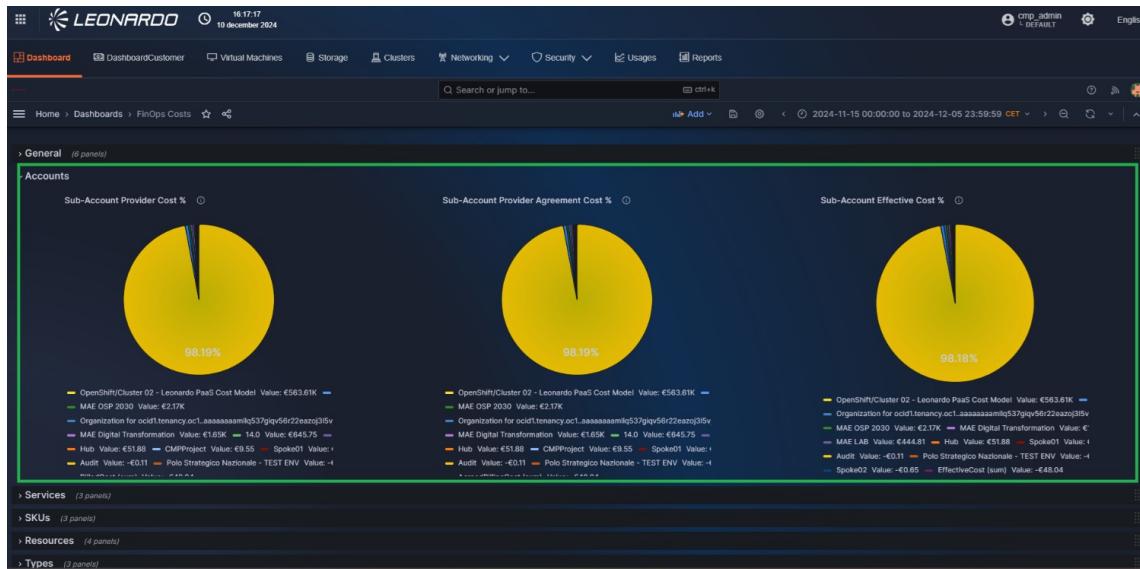


Figura 310 – Accounts

"SERVICES" SECTION

In the third section, charts focused on the costs generated by each cloud service of each provider are shown to the user.

In detail:

- **Service Provider Cost %:** Percentage of the total provider cost, for each service.
Allows understanding which services (e.g., compute, storage, network) have the most impact on costs.
- **Service Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each service.
Useful for analyzing the effectiveness of negotiations on various services.
- **Service Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each service.
Provides a clear view of the main revenue sources per service.

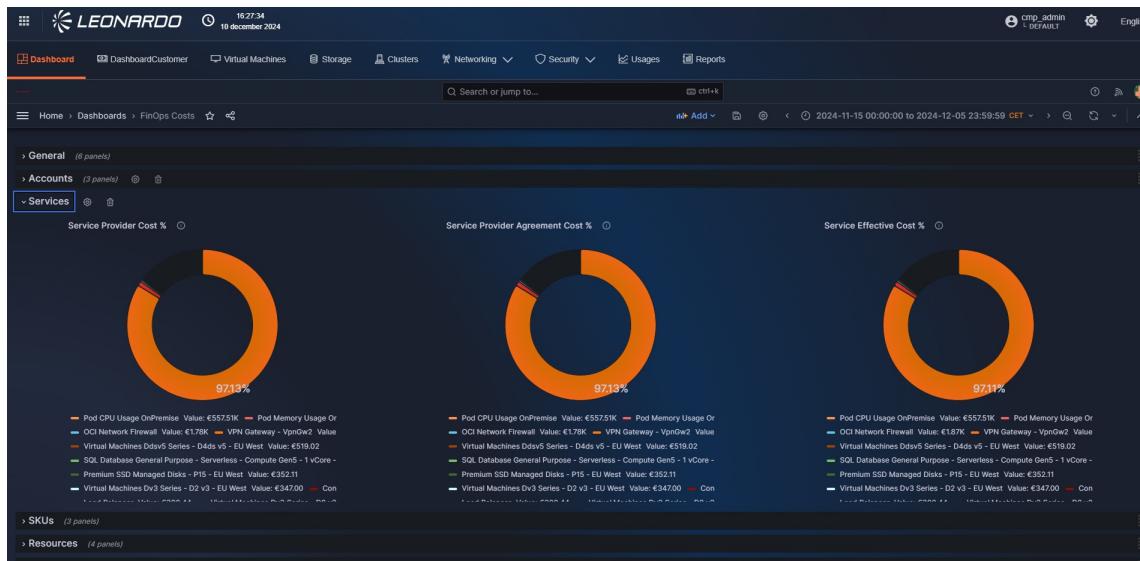


Figura 311 – Services

"SKUS" SECTION

In the fourth section, charts focused on the costs generated by each SKU of each provider are shown to the user.

In detail:

- **Sku Provider Cost %:** Percentage of the total provider cost, for each SKU.
Allows detailed cost analysis at the billing unit level.

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- Sku Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each SKU.
Useful for evaluating whether individual SKUs also benefit from discounts and optimizations.
- Sku Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each SKU.
Helps highlight any imbalances in margins at the SKU level.

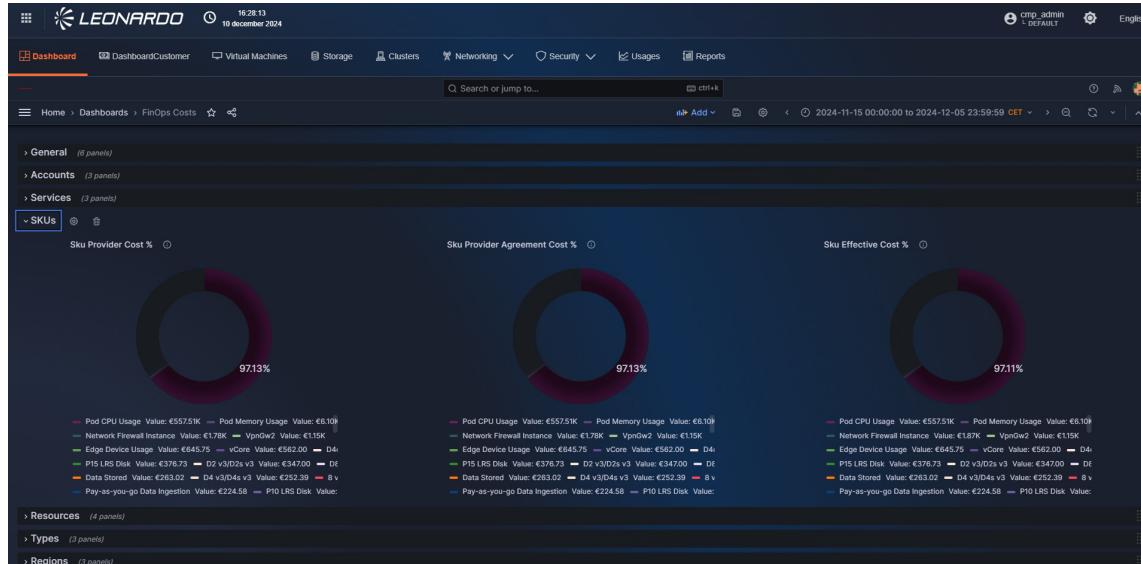


Figura 312 – Skus

"RESOURCES" SECTION

In the fifth section, charts focused on the costs generated by each resource of each provider are shown to the user.

In detail:

- Resource Provider Cost %:** Percentage of the total provider cost, for each resource.
Allows the identification of particularly expensive or underutilized resources.
- Resource Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each resource.
Allows seeing if discounts are distributed equally among resources.
- Resource Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each resource.
Provides visibility into the profitability of individual resources.

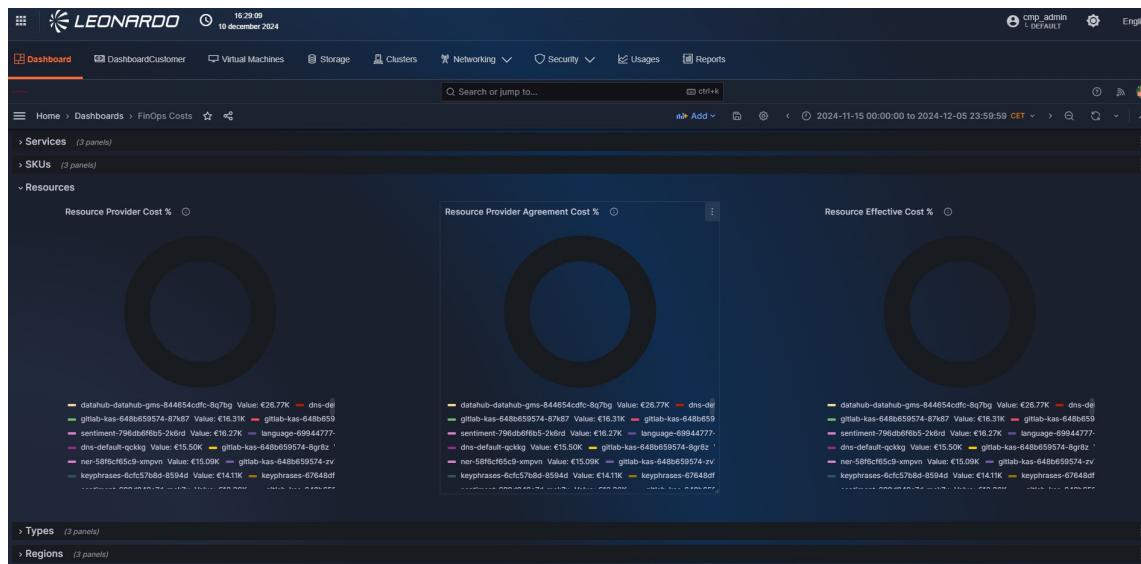


Figura 313 – Resources

"TYPES" SECTION

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In the sixth section, charts focused on the costs generated by each inventory resource type of each provider are shown to the user.

In detail:

- **Resource Type Provider Cost %:** Percentage of the total provider cost, for each resource type.
Offers an aggregated view useful for cost planning.
- **Resource Type Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each resource type.
Helps understand which types are most optimized through agreements.
- **Resource Type Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each resource type.
Allows measuring the commercial weight of each category.

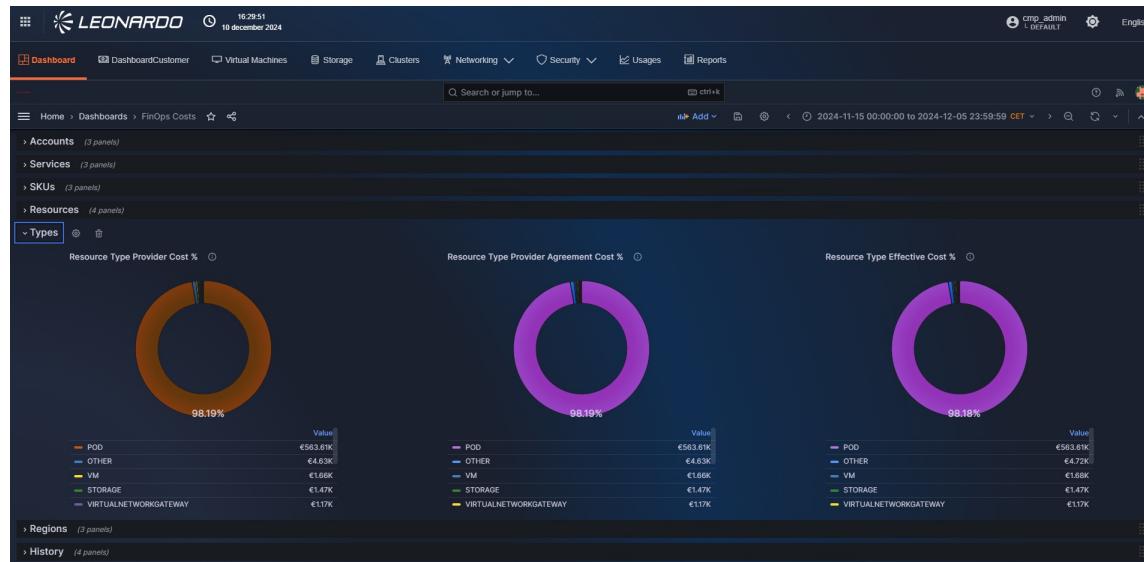


Figura 314 – Types

"REGIONS" SECTION

In the seventh section, charts focused on the costs generated in each region of each provider are shown to the user.

In detail:

- **Regional Provider Cost %:** Percentage of the total provider cost, for each region.
Indicates where resources are geographically located and their associated expenses.
- **Regional Provider Agreement Cost %:** Percentage of the total agreed provider cost, for each region.
Allows evaluating the convenience of chosen regions based on discounts.
- **Regional Effective Cost %:** Percentage of the total SCMP cost charged to the customer, for each region.
Useful for analyzing the distribution of revenue by geographical area.

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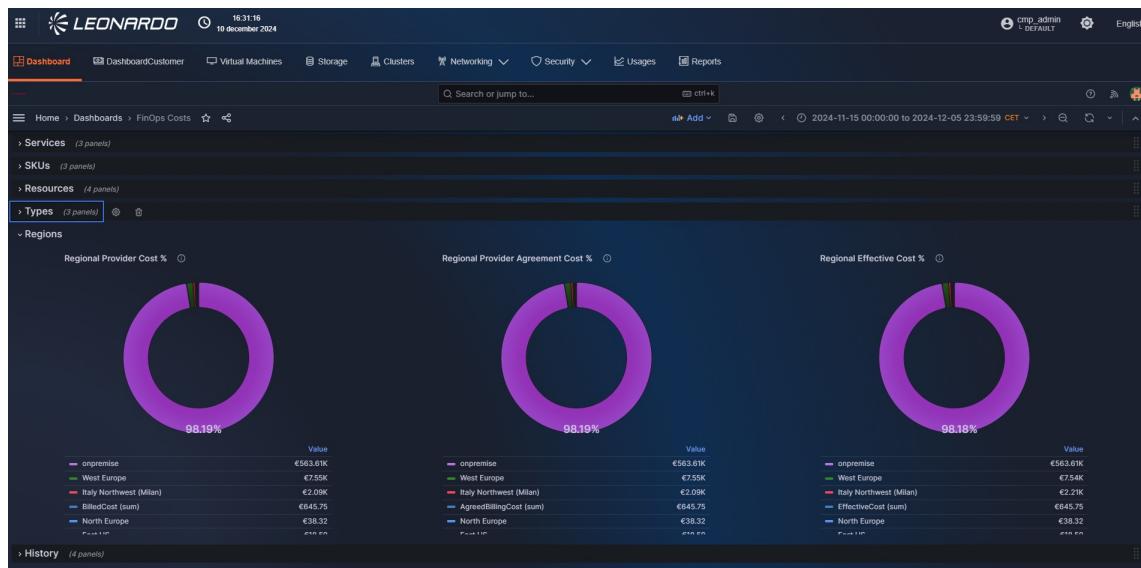


Figura 315 – Regions

"HISTORY" SECTION

Finally, in the eighth section, charts focused on the historical costs of each billing account, generated by each subsystem integrated into the SCMP, are shown to the user.

In detail:

- System Costs Details:** Comparison between the total provider cost, the total agreed provider cost, and the total customer cost, for all subsystems integrated into the SCMP.
Fundamental for retrospective analysis and for evaluating the economic sustainability of the system.
- Historical Provider Billing Costs:** History of the trend of total costs for each cloud billing account.
Helps predict future trends and anticipate spending or budget issues.



Figura 316 – History

Limited view for the customer

If a user configured with the "LIMITED" parameter is used to access the cost dashboard, the charts available on the dashboard will only relate to the recalculated SCMP costs, while the actual costs received from the providers will not be visible as they are superfluous, as can be seen in the image.

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Figura 317 – Limited cost dashboard

"Usage" Dashboard

In addition to the main cost dashboard and its related detailed dashboards by resource type, in the SCMP Costs module, the user can view an additional dashboard, focused on the consumption of inventory resources integrated into the platform.

By navigating to the Usages section of the module, generic and detailed information on the consumption of individual integrated services/SKUs and their respective resources will be shown.

To access the functionality, above the breadcrumb path, click on the "Usages" tab.

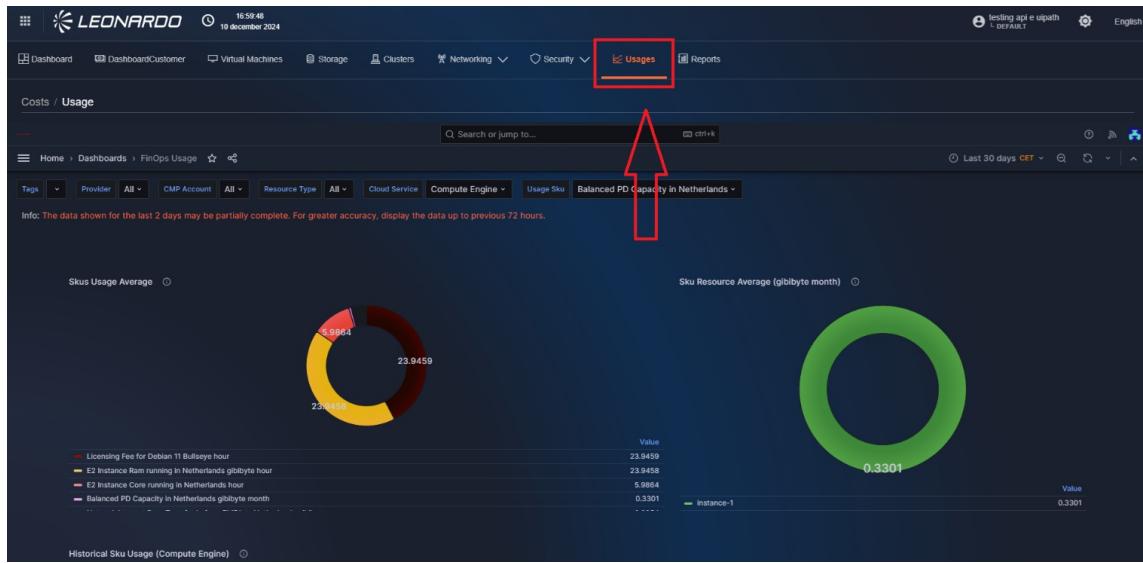


Figura 318 – Access to "Usages"

Usage section filters

Within the page, a series of filters are available that can be selected simultaneously to filter the dashboard results.

The main filter is the display period, which can be found in the upper right. Clicking on it will open a selection window (in yellow in the figure) where it will be possible to either enter a custom time range, using the "From" and "To" fields on the left, or select a "smart" time range by clicking directly on the desired choice in the scrollable section on the right.

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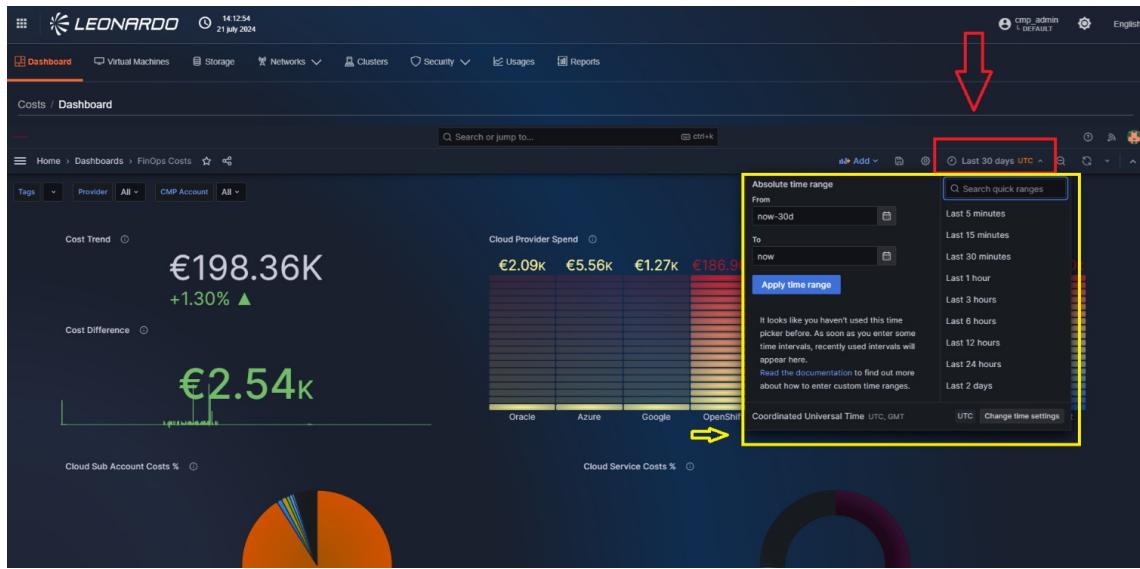


Figura 319 – Usage time filter

A series of filters are available in the upper left of the page, allowing you to filter the retrieved resources. Specifically, you can filter by:

- Tag
- Provider type
- Subsystem name.
- Resource type
- Cloud service name
- Cloud SKU name

These filters allow multiple values to be selected and can be combined to achieve the desired granularity.

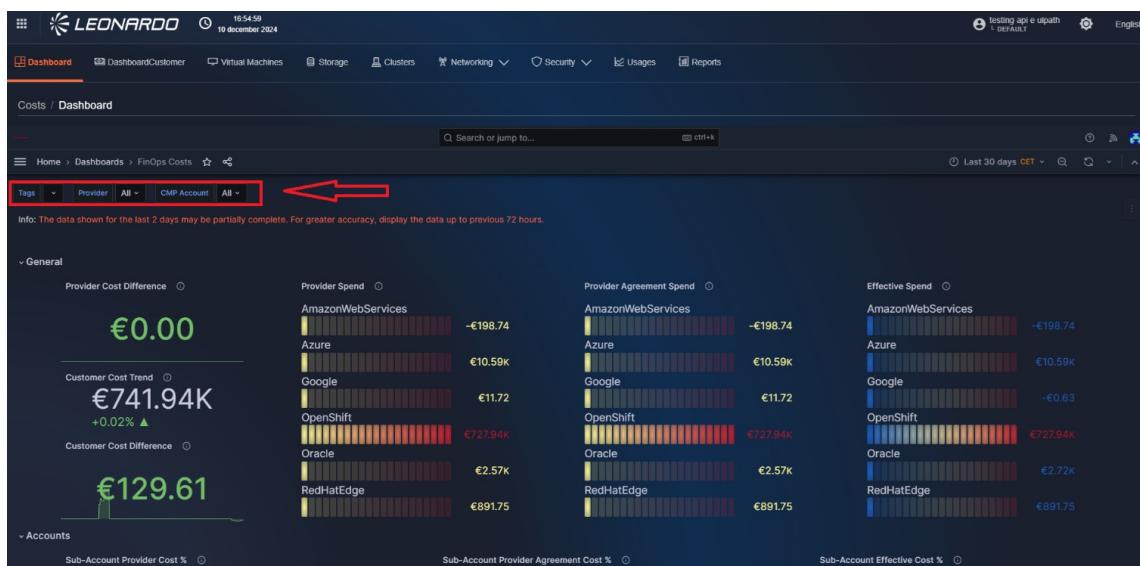


Figura 320 – Cost functionality filters

Overview of the data shown in the costs section

"SKUS USAGE AVERAGE" SECTION

The first chart represents the daily average consumed by each SKU. It is a summary chart that shows the user the general trend of consumption.

For each SKU, in fact, the average consumption and the unit of measure are indicated, within the specified time range, to briefly show which of them are, on average, most used and consequently which of them could generate higher costs for the user.

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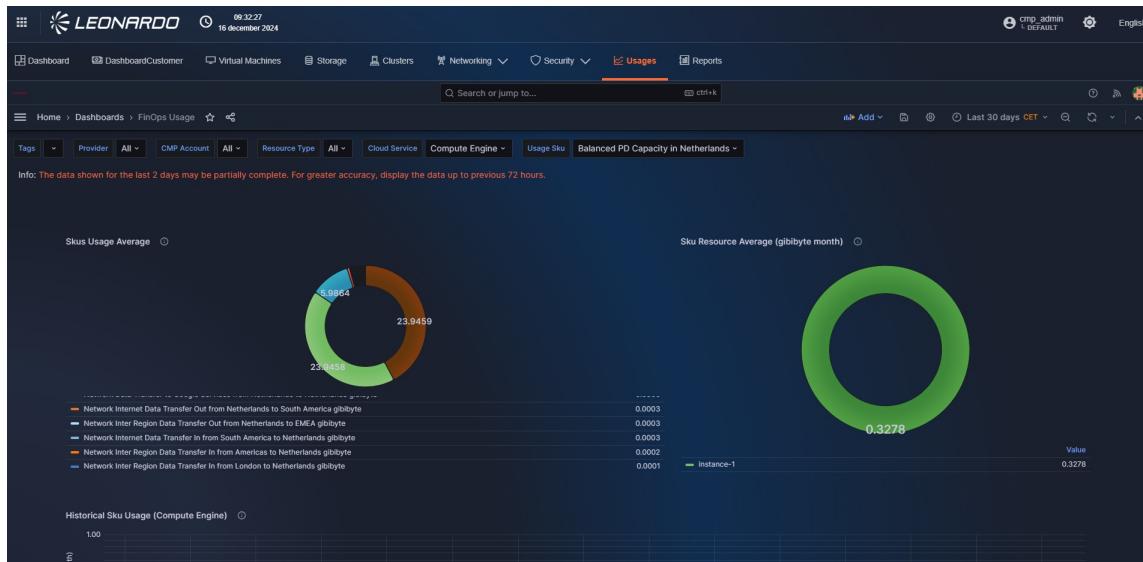


Figura 321 – "SKUs Usage" Section

"SKU RESOURCE AVERAGE" SECTION

The second chart, on the other hand, is focused on the SKU selected as a filter by the user and shows the daily average consumed by each resource, correlated to the specific SKU.

It too can be classified as a summary chart that provides the user with which resources for a given SKU are, on average, most used and consequently which of them could generate higher costs for the user.

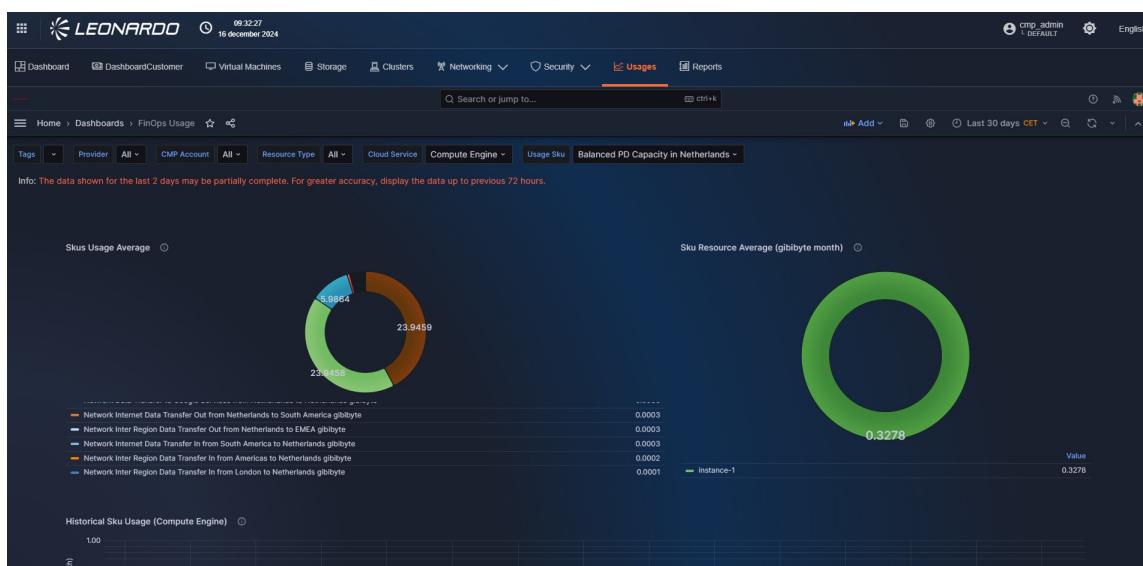


Figura 322 – "SKU resource" Section

"HISTORICAL SKU USAGE" SECTION

The first temporal chart shows the daily consumption trend of the specific SKU, selected as a filter in the dashboard.

In the case shown, a constant consumption (in hours) over time is highlighted, useful for the user for subsequent analysis phases.

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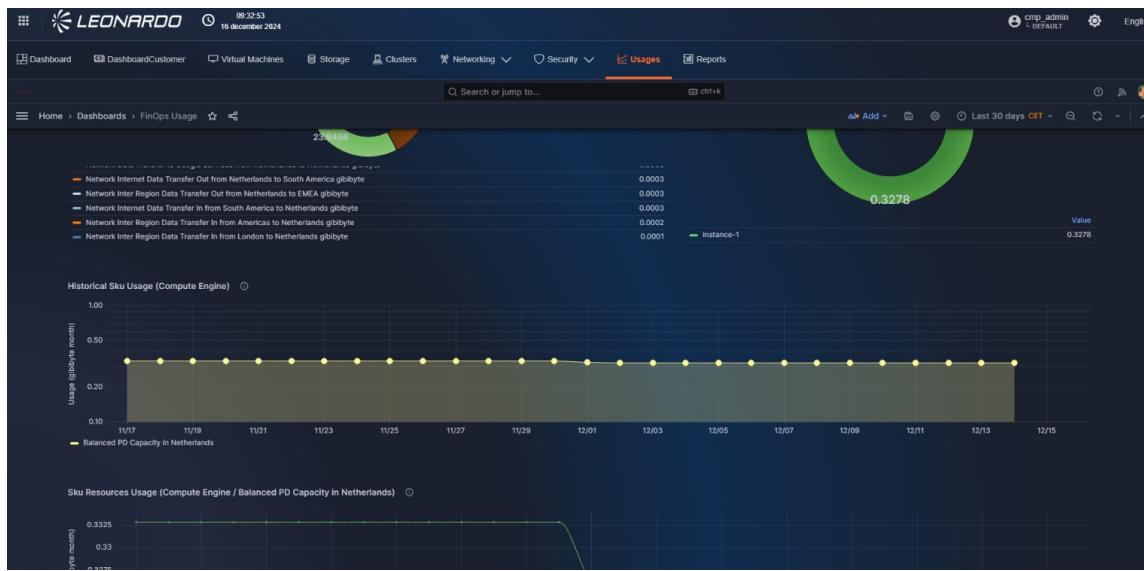


Figura 323 – "Historical SKU" Section

"SKU RESOURCES USAGE" SECTION

The second temporal chart, on the other hand, shows the daily consumption trend of the specific SKU, for each resource related to it.

This chart, therefore, shows the user the historical detail of the previous chart, highlighting which resources are involved in the consumption of the specific SKU and to what extent.

This last chart is particularly useful to the user because it highlights which resources are actually used within a specific SKU and, consequently, which of them could lead to higher costs for the user or be paid for without even being used.



Figura 324 – "SKU Resources" Section

Cost and Usage dashboard customization

For dashboard customization, please consult the official guide

Reporting Tools

The reporting functionality, specific per feature, allows generating global reports of the information available for the various providers. Within the pages, the possibility to create files to facilitate information sharing will also be provided.

To access the functionality, above the breadcrumb path, click on the "Reports" tab

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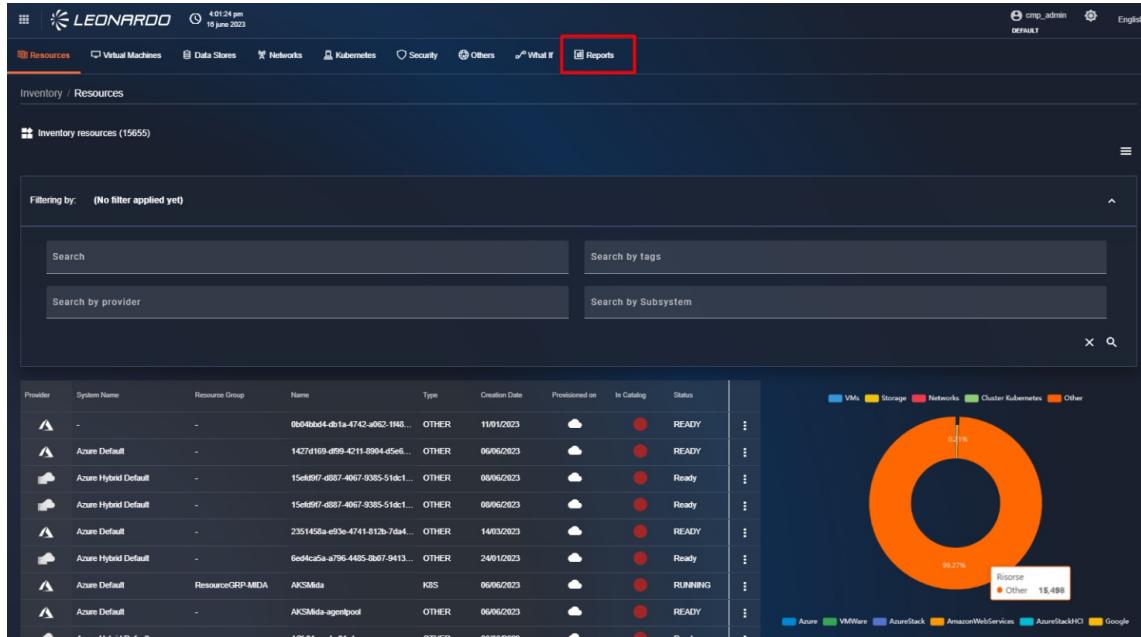


Figura 325 – Access to Catalog report

Available report types

- **Cost Summary** – Summary of total cost per service, based on the selected filter combination.
- **Cost Summary – Group by Resource Type** – Summary of total cost per service, with an indication of the number of resources involved, based on the selected filter combination.
- **Cost Details** – Detail of daily regional cost per resource, based on the selected filter combination.
- **Cost Details – Group by Resource Type** – Detail of total daily cost per service, with an indication of the number of resources involved, based on the selected filter combination.
- **FinOps Report** – Summary of total costs and total resource usage according to the FinOps FOCUS standard, for financial optimization of cloud services, based on the selected filter combination.

Creating a report

In the upper right of the page, we can click on the "New Report" button to start creating a report. Specifically, a modal window appears containing the list of available report types.

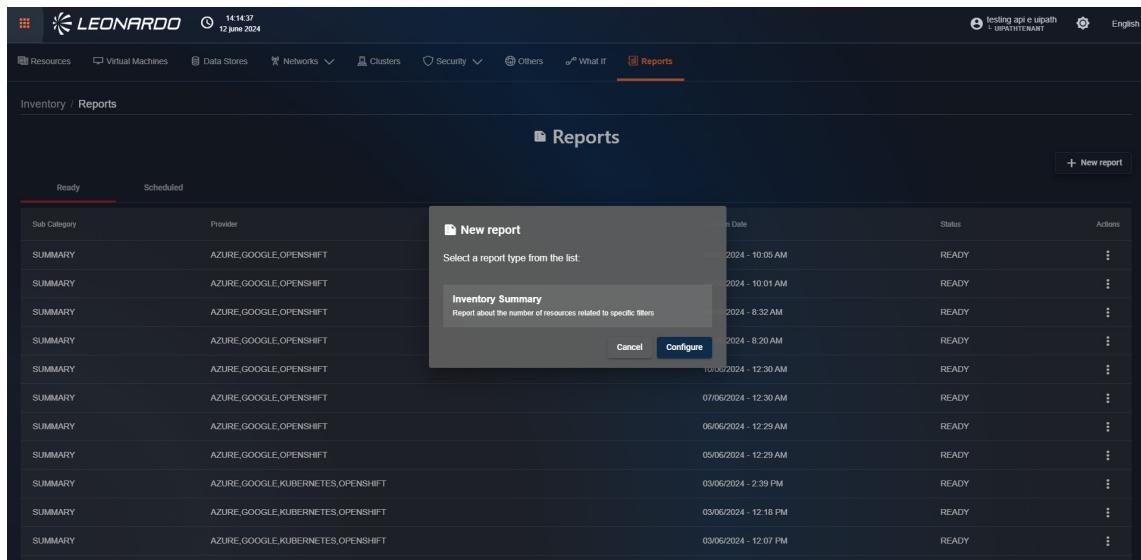


Figura 326 – New report creation

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Once the report type is selected, click on the "Configure" button to select the providers to include in the report. In the newly opened window, you will find the "Provider" field, which allows you to select one or more pre-existing providers in the system. Subsequently, it is possible to select one or more subsystems to include in the report; if no providers are selected, no subsystem can be selected. Finally, there is a "tag" section to include only resources that have the entered tag.

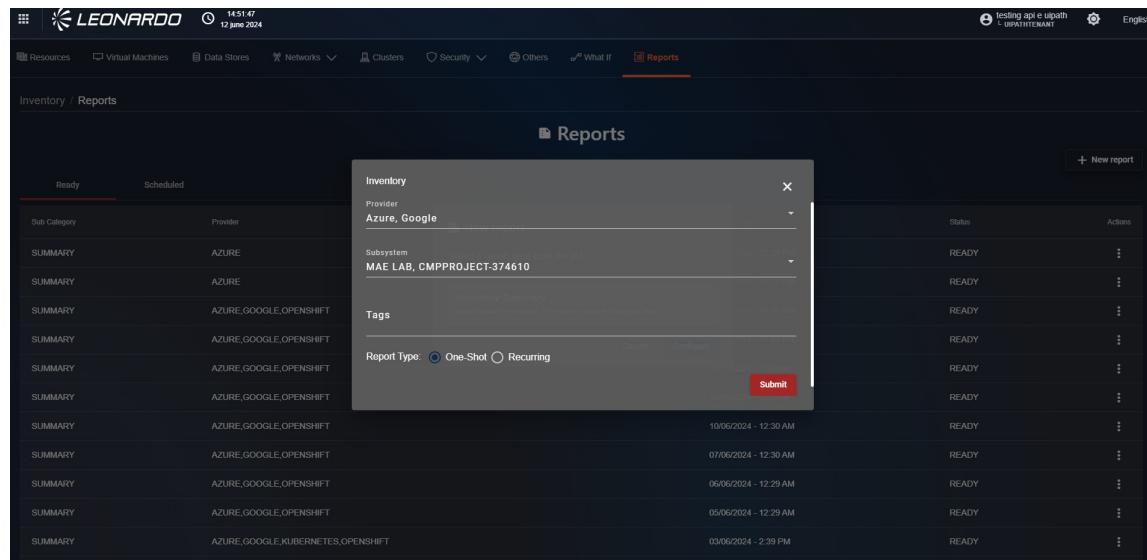


Figura 327 – Report configuration

At this point, the user can choose between two different actions:

- Create a static report that will be saved in the system.
- Schedule a job that generates the report periodically.

To confirm the creation of a static report, verify that "One-Shot" has been selected for the "Report type" field and click the "Submit" button at the bottom.

After a loading period, the newly generated report will be visible in the list.

Sub Category	Provider	Creation Date	Status	Actions
SUMMARY	AZURE, GOOGLE	12/06/2024 - 12:21 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮

Figura 328 – List of generated reports

REPORT SCHEDULING

If, instead, you want to schedule automatic report execution, you will need to select "Recurring" for the "Report Type" field. In this case, the window updates to show additional parameters for configuring the periodic report.

The parameters to enter are:

- Period: allows selecting the report sending frequency (hourly, daily, ...).

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- "Receive only if not empty" if selected, the file will not be sent when no information is present inside.
- Report Language: allows selecting the language used in the report.
- File format: allows selecting one or more file types to include in the email.
- User E-mails: allows entering an email address to send reports to. After entering an email, it is necessary to press "Enter" on the keyboard to confirm its insertion. Once pressed, the newly entered email will move to the bottom box, and the field will be cleared to allow the insertion, if necessary, of a new email.

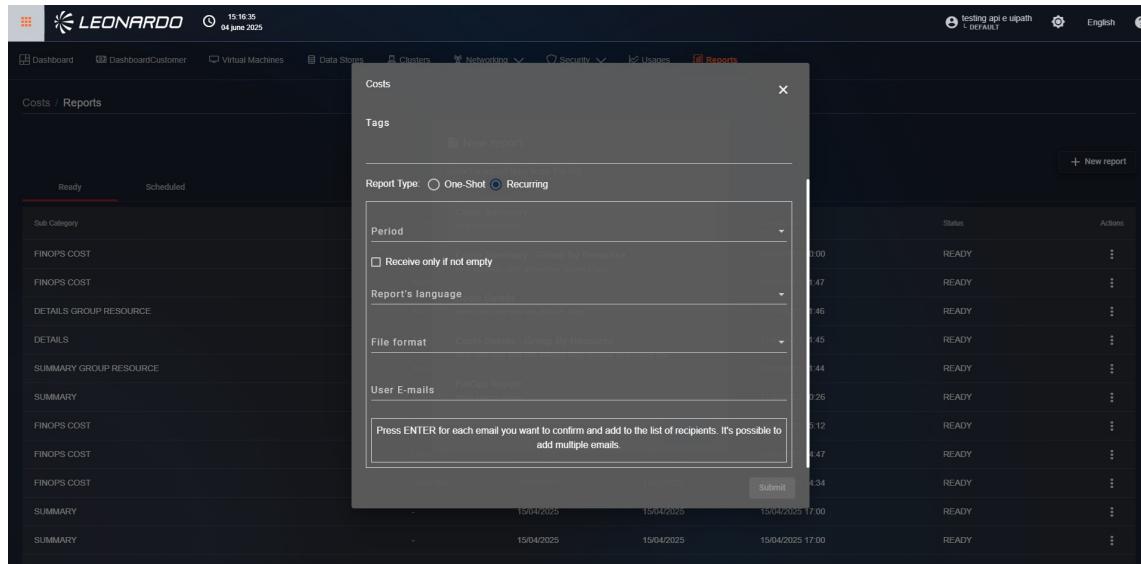


Figura 329 – Scheduled report parameters

Having configured all parameters, the "Submit" button will become clickable. Click it to confirm the insertion, and after a loading period, the newly generated report will be visible in the list.

Inventory / Reports					
Reports					
Ready	Scheduled				
Sub Category	Provider	Creation Date	Status	Actions	
SUMMARY	AZURE, GOOGLE	12/06/2024 - 12:21 PM	READY	⋮	⋮
SUMMARY	AZURE	12/06/2024 - 12:29 PM	READY	⋮	⋮
SUMMARY	AZURE	12/06/2024 - 12:28 PM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:05 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 10:01 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:32 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 8:20 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	10/06/2024 - 12:30 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	07/06/2024 - 12:30 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	06/06/2024 - 12:29 AM	READY	⋮	⋮
SUMMARY	AZURE, GOOGLE, OPENSHIFT	05/06/2024 - 12:29 AM	READY	⋮	⋮

Figura 330 – List of generated reports

LIST OF SCHEDULED REPORTS

To view the list of scheduled reports, select the "Scheduled" tab located at the top left of the reports page.

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Figura 331 – List of scheduled reports

On this page, you will find the list and related information of the scheduled reports present in the system. For each result, by clicking the "Three dots" button on the right, three operations can be performed:

- View the last generated report.
- Edit the schedule settings; it will not be possible to modify the selected providers or subsystems.
- Delete the schedule to stop sending emails.

Figura 332 – Editing a schedule

REPORT USAGE

By clicking on the row of a static report, or using the "Show report" button available for scheduled reports, you will be able to view the detail page of the selected report.

Within the Inventory report summary, there is a "Stats" section which includes the number of disks, interfaces, networks, and virtual machines belonging to the selected provider.

Below the "Stats" section, there are the filters used by the user to generate the report.

Below the filters, there is a summary table of resources belonging to the providers. On the right, there are two buttons: "PRINT" and "EXPORT".

Clicking the "PRINT" button brings up a print preview modal. To print the report, click the "Stampa" (Print) button in the lower right; at this point, the printing of the aforementioned will start.

Clicking the "EXPORT" button allows exporting the report in ".csv", ".json" or ".pdf" format.

To return to the "Results" tab, click the "CLOSE" button in the lower right, or click the left-pointing arrow in the upper left, next to the report title.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there are navigation links: Resources, Virtual Machines, Data Stores, Networks, Clusters, Security, Others, What If, and Reports. The Reports link is highlighted. The title bar shows the date as 12 June 2024 and the time as 15:58:09. On the right side, there are links for testing api e upath, L'OPPORTUNITÀ, and English.

The main content area is titled "Report Inventory Summary". It features a "Stats" section with five boxes: VMs (1), Disks (1), Networks (1), Interfaces (0), and K8Ss (0). Below this, a message states "PROVIDER: AZURE,GOOGLE | SUBSYSTEM: MAE LAB,CMPPROJECT-374610". There are "PRINT" and "EXPORT" buttons. A table follows, showing inventory details by provider and subsystem:

Type Provider	Subsystem Name	VMs	Disks	Networks	Interfaces	K8Ss
Azure	MAE LAB	14	16	14	0	0
Google	CMPPROJECT-374610	1	1	1	0	0

At the bottom, there are pagination controls: "Items per page: 20", "1 - 2 of 2", and navigation arrows.

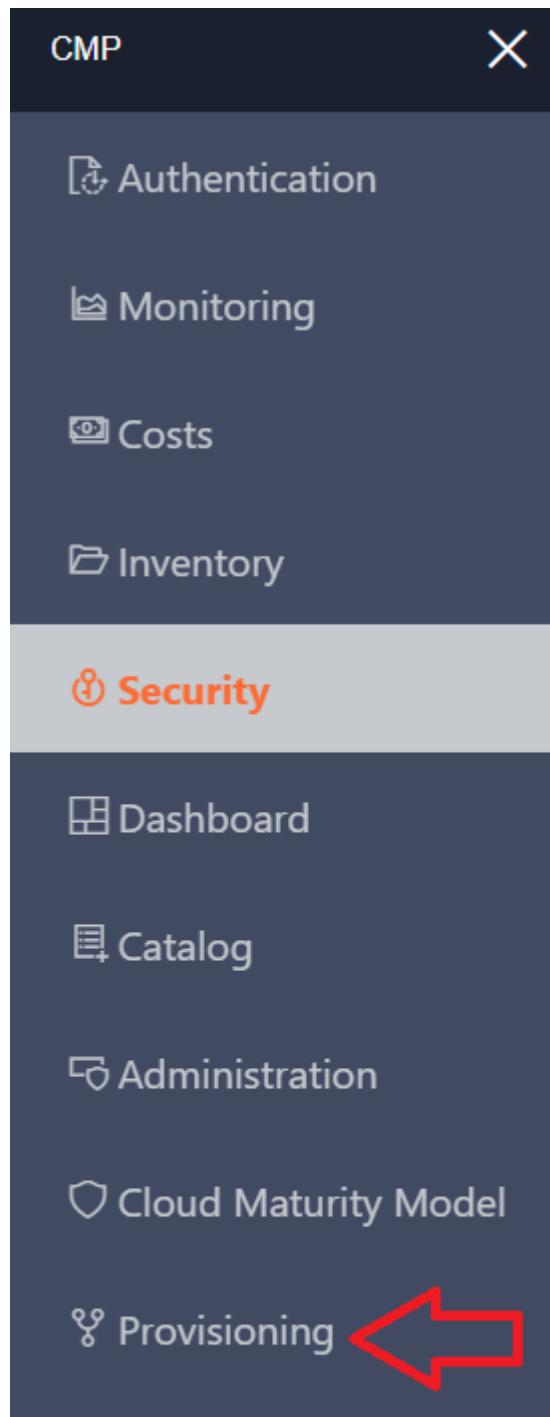
Figura 333 – Report details

11 Provisioning

Provisioning is one of the most important functionalities of SCMP. Through these modules, it is possible to allocate runtime assets within the providers managed by SCMP.

To use this functionality, relations must be defined within the SCMP.

This constraint was made available to bind certain characteristics to provisioning; for example, the VM size is not selectable during provisioning but is among the predefined characteristics by administrators within the catalog.



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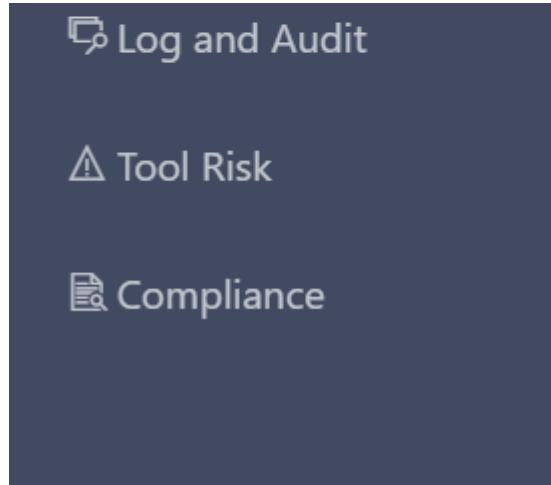


Figura 334 – Access to "Provisioning"

11.0.1 Dashboard

Accessing the functionality, the first available page is the Dashboard of provisionings carried out within the system.

The page presents a series of graphs, filters, and the list of provisionings performed.

The graphs allow visualizing the information present in the table, grouped by:

- The total of all provisionings carried out, divided by type.
- The status of provisionings carried out, divided by outcome and category of the provisioned asset.

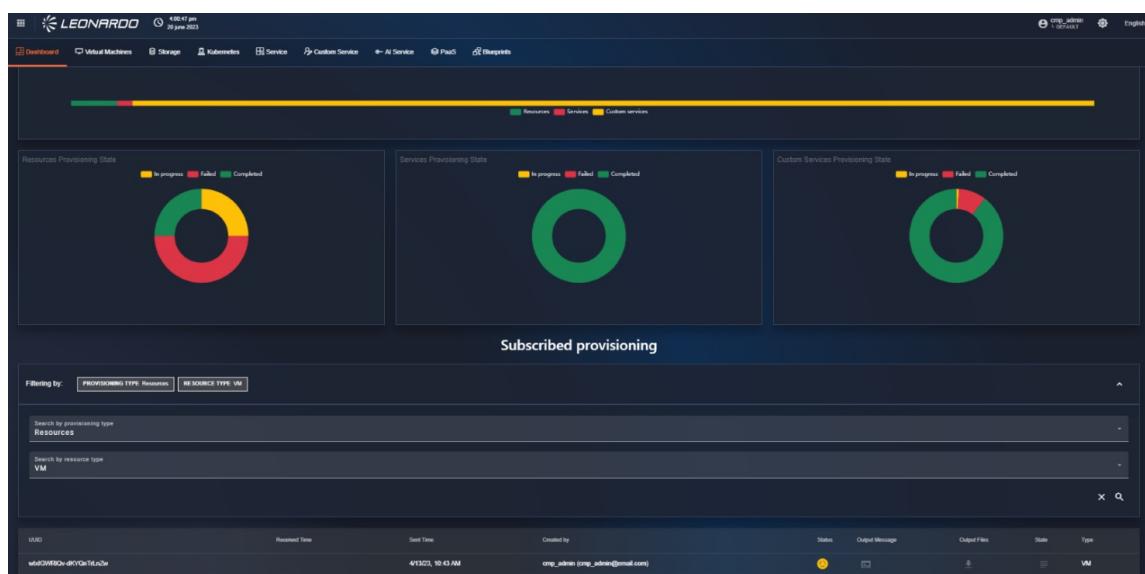


Figura 335 – Provisioning page graphs

At the bottom of the page, we can use the filters section to modify the results present in the table. The "Provisioning Type" filter is the main filter that allows selecting the type of asset to display, specifically:

- Selecting "Resources" adds a filter that allows selecting the type of resource for which you want to display the provisioning status. By default, the system shows the list of provisioned VMs.
- Selecting "Services" and "Custom services" has no additional filters, and the list is updated with only provisionings related to Services.
- Selecting "Blueprint" adds a filter that allows changing the flow (i.e., the type of blueprint to display), and the table is modified to show only flows not yet completed. Above the table, there is a control that allows changing tabs, to switch from "in progress" flows to "Completed" flows.

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Name	Received Time	Sent Time	Created by	Status	Type	Action
Standard_D4s_v3	13/02/2024 15:40:54	13/02/2024 16:37:07	cmp_admin	✓	VM	[Actions]
Standard_D4s_v3	13/02/2024 13:59:13	13/02/2024 14:58:59	cmp_admin	✗	VM	[Actions]
Standard_D4s_v3	13/02/2024 11:28:11	13/02/2024 12:27:54	cmp_admin	✗	VM	[Actions]
Standard_D4s_v3	25/01/2024 14:24:25	25/01/2024 15:24:06	cmp_admin (cmp_admin@email.com)	✗	VM	[Actions]
Standard_D4s_v3	25/01/2024 13:50:04	25/01/2024 14:49:42	cmp_admin (cmp_admin@email.com)	✗	VM	[Actions]
Standard_D4s_v3	25/01/2024 13:46:57	25/01/2024 14:45:27	cmp_admin (cmp_admin@email.com)	✓	VM	[Actions]
Standard_D4s_v3	25/01/2024 13:43:20	25/01/2024 14:43:03	cmp_admin (cmp_admin@email.com)	✗	VM	[Actions]

Figura 336 – Filter by asset type

11.0.2 Provisioning Table Specifications

11.0.2.1 "Resources", "Services", "Custom Services"

The list has the following attributes when "Resources", "Services", "Custom Services" is selected as a filter:

- Uuid, Provisioning identifier;
- Provisioning completion date;
- Provisioning request date;
- User who created the instance;
- Status;
- Output of provisioning systems;
- Detailed provisioning Json;
- Status information;
- Resource type.

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
w1xjGWRQy-dCYQnTlLzW	4/12/23, 10:43 AM		cmp_admin (cmp_admin@email.com)	🟡	[Message]	[File]	[State]	VM
PbxjPXNN50m8tKq3h7ip-A	3/10/23, 11:13 AM	3/10/23, 11:13 AM	cmp_admin (cmp_admin@email.com)	✓	[Message]	[File]	[State]	VM
5zcarv6HTBSMTk9ox67BEg	1/30/23, 12:03 PM	1/30/23, 12:03 PM	cmp_admin (cmp_admin@email.com)	✗	[Message]	[File]	[State]	VM
G_MjJbOOrYgyN5L02P2Ycg	1/30/23, 12:01 PM	1/30/23, 12:00 PM	cmp_admin (cmp_admin@email.com)	✗	[Message]	[File]	[State]	VM
pc_l-NFDQmu26WwQpnbXA	1/30/23, 11:33 AM	1/30/23, 11:33 AM	cmp_admin (cmp_admin@email.com)	✗	[Message]	[File]	[State]	VM
T8Fgj46Grzy5snb6A9maw	1/1/23, 9:30 AM	1/1/23, 9:29 AM	cmp_admin (cmp_admin@email.com)	✗	[Message]	[File]	[State]	VM
pQqrnCqE8acW61pYh7Q			cmp_admin (cmp_admin@email.com)	🟡	[Message]	[File]	[State]	VM

Figura 337 – "Resources" Table

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When in this view, the following operations can be performed:

- By clicking on the row of a failed provisioning, it is possible to modify and re-execute it.
- By clicking on the "Output Message" icon corresponding to a provisioning, it is possible to view the response received from the "Terraform" module.
- By clicking the "Download" button, it is possible to download the files returned by the functionality.
- By clicking the "State" button, it is possible to view the graph and the list of provisioned resources.

The screenshot shows the Leonardo platform's provisioning interface. At the top, there are tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, and Blueprints. The main title is 'Subscribed provisioning'. Below the title is a filtering bar with 'PROVISIONING TYPE Resources' and 'RESOURCE TYPE VM'. The table lists two provisioning entries:

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
wtxlGWRtQv-dkYQnTrLnzW	4/13/23, 10:43 AM		cmp_admin (cmp_admin@email.com)	!	[]	[]	[]	VM
PbxhPXNNS0m8nKq3H7ip-A	3/10/23, 11:13 AM	3/10/23, 11:13 AM	cmp_admin (cmp_admin@email.com)	✓	[]	[]	[]	VM

A modal window is open for the second entry, showing the Terraform execution plan:

```

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:
+ create

Terraform will perform the following actions:

# vsphere_virtual_machine.VMwarePro2023 will be created
resource "vsphere_virtual_machine" "VMwarePro2023" {
  + annotation = "(known after apply)"
  + boot_retry_delay = 10000
  + change_version = "(known after apply)"
  + cpu_limit = -1
  + cpu_share_count = "(known after apply)"
  + cpu_share_level = "normal"
  + datastore_id = "datastore-3011"
  + default_ip_address = "(known after apply)"
}
  
```

Figura 338 – Terraform message visualization

The screenshot shows the Leonardo platform's provisioning interface. At the top, there are tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, and Blueprints. The main title is 'Subscribed provisioning'. Below the title is a filtering bar with 'PROVISIONING TYPE Resources' and 'RESOURCE TYPE VM'. The table lists two provisioning entries:

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
wtxlGWRtQv-dkYQnTrLnzW	4/13/23, 10:43 AM		cmp_admin (cmp_admin@email.com)	!	[]	[]	[]	VM
PbxhPXNNS0m8nKq3H7ip-A	3/10/23, 11:13 AM	3/10/23, 11:13 AM	cmp_admin (cmp_admin@email.com)	✓	[]	[]	[]	VM

A modal window is open for the second entry, showing a resource graph visualization. The graph shows a central node labeled 'VMwarePro2023' connected to three other nodes: 'datastore' (yellow), 'network' (red), and 'datacenter' (orange). A legend at the bottom right indicates the colors for Provisioning (green), Other (orange), Storage (yellow), Network (red), and VM (blue).

Figura 339 – Resource graph visualization

11.0.2.2 Auto uninstall of HELM services

When we select "Custom services" as a filter type, we can notice a new "Uninstall" button displayed with a "Stop" icon.

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The screenshot shows the 'Subscribed provisioning' section of the Leonardo platform. The table lists the following data:

Name	Received Time	Sent Time	Created by	Status	Engine	Actions
Audio Analytics	04/06/2025 16:32:27	04/06/2025 16:32:22	cmp_api_test (giammarco.piccoli.ext2@leonardocompany.com)	✓		Uninstall (only Helm scripts)
Audio Analytics	30/05/2025 11:28:38	30/05/2025 11:23:46	cmp_admin	■		Uninstall (only Helm scripts)
Nginx Helm chart	30/05/2025 10:46:36	30/05/2025 10:43:41	cmp_api_test (giammarco.piccoli.ext2@leonardocompany.com)	■		Uninstall (only Helm scripts)
Audio Analytics	30/05/2025 10:00:28	30/05/2025 09:59:51	cmp_admin	■		Uninstall (only Helm scripts)
Audio Analytics	30/05/2025 09:56:43	30/05/2025 09:56:07	cmp_admin	■		Uninstall (only Helm scripts)
Audio Analytics	30/05/2025 09:55:39	30/05/2025 09:55:36	cmp_admin	✗		Uninstall (only Helm scripts)
Nginx Helm chart	30/05/2025 09:54:55	30/05/2025 09:54:40	cmp_admin	✗		Uninstall (only Helm scripts)
Audio Analytics	29/05/2025 14:37:01	29/05/2025 14:34:10	cmp_admin	■		Uninstall (only Helm scripts)

Figura 340 – Uninstall HELM service

Clicking the button will ask for confirmation of deletion. Upon confirmation, SCMP will delete all HELM resources deployed in the indicated namespace.

The screenshot shows the 'Subscribed provisioning' section of the Leonardo platform. A modal dialog is displayed in the center:

Uninstall Helm Chart

Are you sure you want to uninstall this Helm chart?

No Yes

The table lists the same data as Figura 340, including the red '✗' status for some entries.

Figura 341 – Uninstall confirmation

11.0.2.3 Blueprint

The list has the following attributes when "Blueprint" is selected as a filter:

- Blueprint Name
- Creation Date
- User who provisioned the blueprint

Above the table, we can notice two tabs. By clicking on them, the table is filtered respectively for Blueprints to be completed and Completed Blueprints (in red in the image).

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The screenshot shows the 'Blueprints' section of the Leonardo platform. At the top, there's a navigation bar with tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Services, Blueprints (which is currently selected), and Workflow. Below the navigation is a search bar with the placeholder 'Search by provisioning type' and a dropdown menu set to 'Blueprints'. Underneath is a table titled 'To be completed' with three rows. To the right of the table is a red arrow pointing to another table titled 'Completed/Failed', which is also highlighted with a red box.

Name	Creation date	Created by
Docker development environment	18/03/2024 09:46:30	cmp_admin
Docker development environment	14/03/2024 09:29:13	cmp_admin
Only manual	14/03/2024 09:12:56	cmp_admin

Figura 342 – "Provisioning blueprint" table tabs

In this view, it is possible to click on a table row to view the blueprint details.

When the selected blueprint is "to be completed," we will be redirected to the blueprint provisioning page where we can perform the necessary operations for completion.

The screenshot shows the 'Blueprint Provisioning Status' section. At the top, there's a navigation bar with tabs for Blueprint, Blueprint Provisioning Status (which is selected), and Blueprint Details. Below the navigation is a 'Process Diagram' section showing a flow from a start node to a 'CreateVM' task, which is highlighted with a red box, and then to an end node. Below the diagram are two tables: 'Variables' and 'Tasks'.

Variables	
address_space	10.0.0.0/16
admin_password	P@\$\$word123!
admin_username	admin
disk_managed_disk_type	Standard_LRS
disk_name	disk1403
image_sku	22_04-its
image_version	latest

Tasks

Figura 343 – "To be completed" flow visualization

If a completed blueprint is selected instead, we will be redirected to the blueprint provisioning details page where the prediction "flow" will not be displayed because it has already been completed.

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Variable	Value
address_space	10.0.0.0/16
admin_password	p@password123!
admin_username	deckerman
disk_managed_disk_type	Standard_LRS
disk_name	osdisk
image_sku	22_04-4s
image_version	latest
ip_configuration_name	ipconfig
location	West Europe
network_interface_name	nic
public_ip_name	pip
resource_group_name	my-rg-docker-28
subnet_address_prefixes	10.0.1.0/24
subnet_name	subnet
virtual_machine_name	docker-vm
virtual_network_name	vnet
vm_computer_name	docker-vm
vm_size	Standard_DS1_v2

Figura 344 – “Completed” flow visualization

11.0.3 Creation of Provisionings

11.0.3.1 Provisioning of “Physical Resources”

Using the tabs in the provisioning functionality, it is possible to view the lists of provisionable resources within the SCMP, such as Virtual Machines, Storage, and Kubernetes.

To view elements within the result lists, it is necessary that a relation exists in the SCMP catalog with the catalog resource of the provider to be provisioned.

The functionalities available for these elements are identical; only the parameters to be entered in the creation steps change.

UUID	Type	Provider	Size	Creation Date
catalog_1992ccb-b3c3-4109-a4a4-f47cf578db8	VM	CMP	I3-micro_D2s_v3_c2-micro	06/06/2023
catalog_0cb71ba0-d74a-4ccb-a326-587e393d34e2	VM	CMP	Standard_D4s_v3_D1_v2	06/06/2023
catalog_b7afefca-dfb4-41b5-98d8-96c090a4727a	VM	CMP	Standard_B4ms_Ds1_v2_F8s_v2	06/06/2023

Figura 345 – Tabs for resource creation

11.0.3.1.1 VIRTUAL MACHINES

To start provisioning a resource, click on the corresponding row to view the page containing step 1 of provisioning creation. In this step, it is necessary to select, using the dropdown on the left, the “target” subsystem where the resources are to be provisioned. Once selected, an information mirror will be displayed on the right indicating the characteristics of the resource that will be provisioned. To continue, click the “Next” button at the bottom right to go to step 2 “Config” page.

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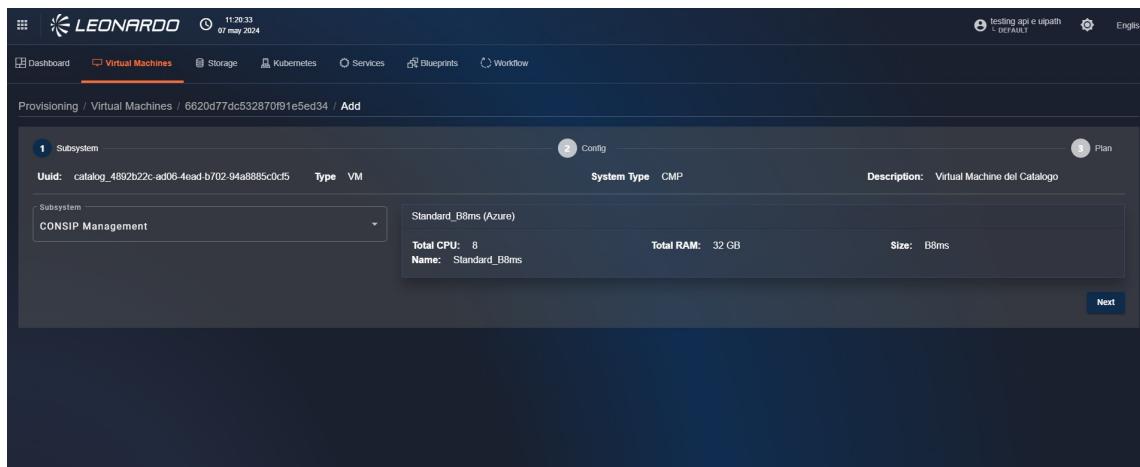


Figura 346 – Selection of the "target" subsystem, provisioning step 1

On the "Config" page of step 2, fill in all mandatory fields in all sections of the form. At the bottom left, click the "Reset" button to reset all fields on the page.

Instead, on the right, click the "Submit" button to go to step 3 "Plan".

The screenshot shows the 'Config' step of a provisioning process. The subsystem 'new virtual machine' is selected. Configuration Options include Virtual Machine Name, Resource Group, Storage Type (Disk for OS), Storage Size (Disk for OS) set to 10 GB, and Image. Network settings include Network and Subnet. User name for access and Tags are also present. A 'Submit' button is at the bottom right.

Figura 347 – Filling in the resource prediction form fields

After clicking the "Submit" button, the user is redirected to the "Plan" page of step 3 where we can view the provisioning plan sent by Terraform, which indicates all the parameters of the resources that will be configured, and at the bottom, there is a list with a cost perspective.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, it says "LEONARDO" with a timestamp "5:57:25 pm" and date "29 october 2022". On the right, there are user details "cmp_admin" and "DEFAULT", and language "English". The main area is titled "Subsystem" and "Config". A large text block shows a Terraform execution plan with actions like "create" for an "azurerm_linux_virtual_machine" resource named "vmtest". Below this, a table titled "Costs" lists consumption and reservation costs for Linux VMs over different time periods. At the bottom right, there are three buttons: "Back", "Reset", and "Apply".

Figura 348 – Forecast screen

Still from the "Plan" page of step 3, at the bottom right, there are three buttons: "Back", "Reset", and "Apply". If you click the "Back" button, the user returns to the "Config" page of step 2 where parameters can be modified.

If you click the "Reset" button, the user is redirected to the "Subscription" page of step 1 where it is necessary to select a subsystem, and then enter the parameters on the "Config" page of step 2.

Finally, if you click the "Apply" button, the forecast is saved, and the user is redirected to the "Dashboard" tab page where the user verifies the presence of the newly created forecast.

The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, it says "LEONARDO" with a timestamp "9:48:02 am" and date "21 june 2023". On the right, there are user details "cmp_admin" and "DEFAULT", and language "English". The top navigation bar includes tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, and Blueprints. The main area is titled "Subscribed provisioning" and shows three large circular progress indicators. Below this, a table titled "Filtering by" shows a single entry: "PROVISIONING TYPE Resources" and "RESOURCE TYPE VM". The table has columns for UUID, Received Time, Sent Time, Created by, Status, Output Message, Output Files, State, and Type. One row is visible with UUID "wtxGWRICQv-dkYQnTlnzW", Received Time "4/13/23, 10:43 AM", Created by "cmp_admin (cmp_admin@email.com)", and Type "VM".

Figura 349 – List of provisionings performed

11.0.3.2 Provisioning of "Services"

To access the services page, click on the tab that depicts a shelf located in the top menu. After doing this, you will find yourself on the "Service" page.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. At the top, there's a navigation bar with tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Services (which is currently selected), Blueprints, and Workflow. Below the navigation bar is a search bar labeled 'Filter by text' and a sidebar with a 'Categories' section containing items like AI & Machine Learning, Analytics, Application Runtime, Big Data, Blockchain, Cloud Provider, Compute, Containers, Database, and DevOps. The main area displays a grid of service cards. One card, 'Text Analytics / NLP', has a yellow box around its 'Subscribe' button. Other cards include PaaS - Nginx, Audio Analytics, Azure Resource Group, Redis DB, Subscription Alias Full Parameters PSN, Echo String, and Kafka. Each card includes a brief description and a 'Subscribe' button.

Figura 350 – List of cards

On the page, a list of components called "Card" is displayed. Each card refers to a specific type of service; in particular, the following information is displayed:

- Service name;
- Service icon;
- Type of script used for service provisioning;
- Service description;
- "Subscribe" button to proceed with service creation.

Depending on the type of service selected, the steps for provisioning change; these will be analyzed in detail below.

11.0.3.2.1 "STANDARD" SERVICES

Click the "Subscribe" button corresponding to a "standard" service. The user will be redirected to step 1 of the service creation page, and all instantiable versions of the service by SCMP will be displayed. In particular, various blocks will be shown, each with a list of configurations:

- Name and version of the service that will be instantiated.
- Name and version of the operating system that will be installed on the machine.
- Belonging provider on which the service will be provisioned.

The screenshot shows the 'Subscribe service' configuration page for Kafka. At the top, there's a navigation bar with tabs for Dashboard, Virtual Machines, Storage, Kubernetes, Service (selected), Custom Service, AI Service, PaaS, and Blueprints. Below the navigation bar is a breadcrumb trail: Provisioning / Service / Subscribe service. The main area is titled 'Subscribe a Kafka' and contains a sub-section 'Configuration'. It says 'Select the customization you prefer from list:' and shows two options under 'Available options': 'Redis DB 7.0' (redis) and 'Redis 7.0'. Both options mention 'OS: ubuntu-20_04-lts | Version: 3.2.1 | Available on: Azure'. Below this, it says 'Option selected: (None)' and has a 'Continue' button at the bottom right.

Figura 351 – Provisioning of a "standard" service

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Select a software version and press the "Continue" button; the user is redirected to step 2 of service provisioning.

In step 2, it will be necessary to select a subsystem and fill out the form with the details of the chosen subsystem.

The screenshot shows a configuration interface for a "standard" service. At the top, there's a navigation bar with links for Dashboard, Virtual Machines, Storage, Kubernetes, Service (which is highlighted), Custom Service, AI Service, PaaS, and Blueprints. Below the navigation is a section titled "Configuration Options". It contains several input fields: "Account Name *", "Resource Group *", "Location *", "Failover Location *", "Database Name *", and "Throughput (RU/s)" with a value of "400". There's also a "Tags" field and a "Reset" button. At the bottom right is a "Submit" button.

Figura 352 – Configuration of a "standard" service

After completing all the form fields, click "Submit".

A request will be sent to the Terraform service, which will validate the activation configuration of the indicated flow and return the result.

The screenshot shows a "Service configuration summary" page. At the top, there's a navigation bar with links for Dashboard, Virtual Machines, Storage, Kubernetes, Service (highlighted), Custom Service, AI Service, PaaS, and Blueprints. Below the navigation, the path "Provisioning / Service / Subscribe service" is shown. The main area has tabs for "Configuration" (selected), "Details", and "Summary". The "Configuration" tab displays a code block showing the Terraform execution plan. It includes comments like "Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:" followed by "+ create". It also lists actions such as "# azurerm_cosmosdb_account.account-name will be created" and "resource "azurerm_cosmosdb_account" "account-name" { ... }". At the bottom right are "Back" and "Apply" buttons.

Figura 353 – Service configuration summary

Click "Apply" to validate the flow and activate the service subscription.

The dashboard page will open with the list of all subscribed services and their relative statuses. Specifically, the newly provisioned service will have a "Running" status in yellow, and subsequently, depending on the result, the status will also be updated to "Completed" in green or "Error" in red.

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The screenshot shows the Leonardo Secure Cloud Management Platform dashboard. At the top, there is a header with the Leonardo logo, the time (4:23:56 pm, 23 June 2023), user information (cmp_admin, DEFAULT), and language settings (English). Below the header, there is a navigation bar with links for Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, and Blueprints. A filtering bar is present, set to 'PROVISIONING TYPE Services'. A search bar below it is set to 'Services'. The main area displays a table of subscribed services with columns: UUID, Received Time, Sent Time, Created by, Status, Output Message, Output Files, State, and Type. Three service entries are listed:

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
DSQblkPQuq0UVJDJRNQJQ	6/23/23, 12:23 PM	6/23/23, 12:22 PM	cmp_admin (cmp_admin@email.com)	X	☒	⬇	☰	SERVICE
VJwlNv74QF23OS0pr9FJyA	4/13/23, 10:32 AM	4/13/23, 10:25 AM	cmp_admin (cmp_admin@email.com)	✓	☒	⬇	☰	VM
YB6bDobKQxukQCP40VUa1g	1/30/23, 12:29 PM	1/30/23, 12:27 PM	cmp_admin (cmp_admin@email.com)	✓	☒	⬇	☰	VM

Figura 354 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.2.2 "CUSTOM" SERVICES

Click the "Subscribe" button corresponding to a "custom" service. The user will be redirected to step 1 of the service creation page where the subsystem can be selected, in which to perform the provisioning, from the dropdown in the center of the page.

The screenshot shows the 'Subscribe Custom Service' step of the service creation process. At the top, there is a header with the Leonardo logo, the time (14:12:01, 07 may 2024), user information (testing api e upath, DEFAULT), and language settings (English). Below the header, there is a navigation bar with links for Dashboard, Virtual Machines, Storage, Kubernetes, Services, Blueprints, and Workflow. The main area displays a configuration form titled 'Configuration'. It includes a section for selecting the subsystem, with a dropdown menu labeled 'Subsystem'.

Figura 355 – Provisioning of a "Custom" service

By selecting the subsystem, the page updates to proceed to step 2 of service provisioning.

In this step 2, it will be necessary to fill out the form with the specific configuration parameters of the selected service.

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Configuration Options

Account Name *

Resource Group *

Location *

Failover Location *

Database Name *

Throughput (RU/s)
400

Tags

Reset Submit

Figura 356 – Configuration of a "custom" service

After completing all the form fields, click "Launch".

A request will be sent to the Terraform service, which will validate the activation configuration of the indicated flow and return the result.

Provisioning / Service / **Subscribe service**

Configuration Details Summary

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:

- + create

Terraform will perform the following actions:

```
# azurerm_cosmosdb_account.account-name will be created
+ resource "azurerm_cosmosdb_account" "account-name" {
    + access_key_metadata_writes_enabled = true
    + analytical_storage_enabled = false
    + connection_strings = (sensitive value)
    + create_mode = (known after apply)
```

Back Apply

Figura 357 – Service configuration summary

Click "Apply" to validate the flow and start the automatic configuration operations.

The dashboard page will open with the list of all subscribed services and their relative statuses.

Specifically, the newly provisioned service will have a "Running" status in yellow, and subsequently, depending on the result, the status will also be updated to "Completed" in green or "Error" in red.

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The screenshot shows the Leonardo Secure Cloud Management Platform dashboard. At the top, there is a header with the Leonardo logo, the time (4:23:56 pm, 23 June 2023), and user information (cmp_admin, DEFAULT). Below the header is a navigation bar with links: Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, and Blueprints. A filtering bar is present, set to 'PROVISIONING TYPE Services'. A search bar below it is set to 'Services'. The main area displays a table of subscribed services with columns: UUID, Received Time, Sent Time, Created by, Status, Output Message, Output Files, State, and Type. Three service entries are listed:

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
DSQblkPQuq0UVJDJRNQJQ	6/23/23, 12:23 PM	6/23/23, 12:22 PM	cmp_admin (cmp_admin@email.com)	X	☒	Download	Running	SERVICE
VJwlNv74QF23OS0pr9FJyA	4/13/23, 10:32 AM	4/13/23, 10:25 AM	cmp_admin (cmp_admin@email.com)	✓	☒	Download	Running	VM
YB6bDobKQxukQCP40VUa1g	1/30/23, 12:29 PM	1/30/23, 12:27 PM	cmp_admin (cmp_admin@email.com)	✓	☒	Download	Running	VM

Figura 358 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.2.3 "AZURE PIPELINE" SERVICES

Click the "Subscribe" button corresponding to an "Azure Pipeline" service. The user will be redirected to step 1 of the service creation page. From the dropdown in the center of the page, select the "Branch" of the pipeline to execute.

The screenshot shows the 'Subscribe Custom Service' step of provisioning an Azure pipeline service. At the top, there is a header with the Leonardo logo, the time (14:24:10, 07 may 2024), and user information (testing api e upath, DEFAULT). Below the header is a navigation bar with links: Dashboard, Virtual Machines, Storage, Kubernetes, Services, Blueprints, and Workflow. The main area shows a configuration form for selecting a branch. It includes a 'Configuration' section with a 'Preview' button, a 'Please select a branch:' label, and a dropdown menu where 'develop' is selected. A note below the dropdown says 'Scegli il branch dal quale fare partire la pipeline'. A 'Confirm' button is at the bottom right.

Figura 359 – Provisioning of an "Azure pipeline" service

By selecting the branch, the page updates to proceed to step 2 of service creation.

In this step 2, it will be necessary to fill out the form with the configuration parameters retrieved directly from the Pipeline that will be executed.

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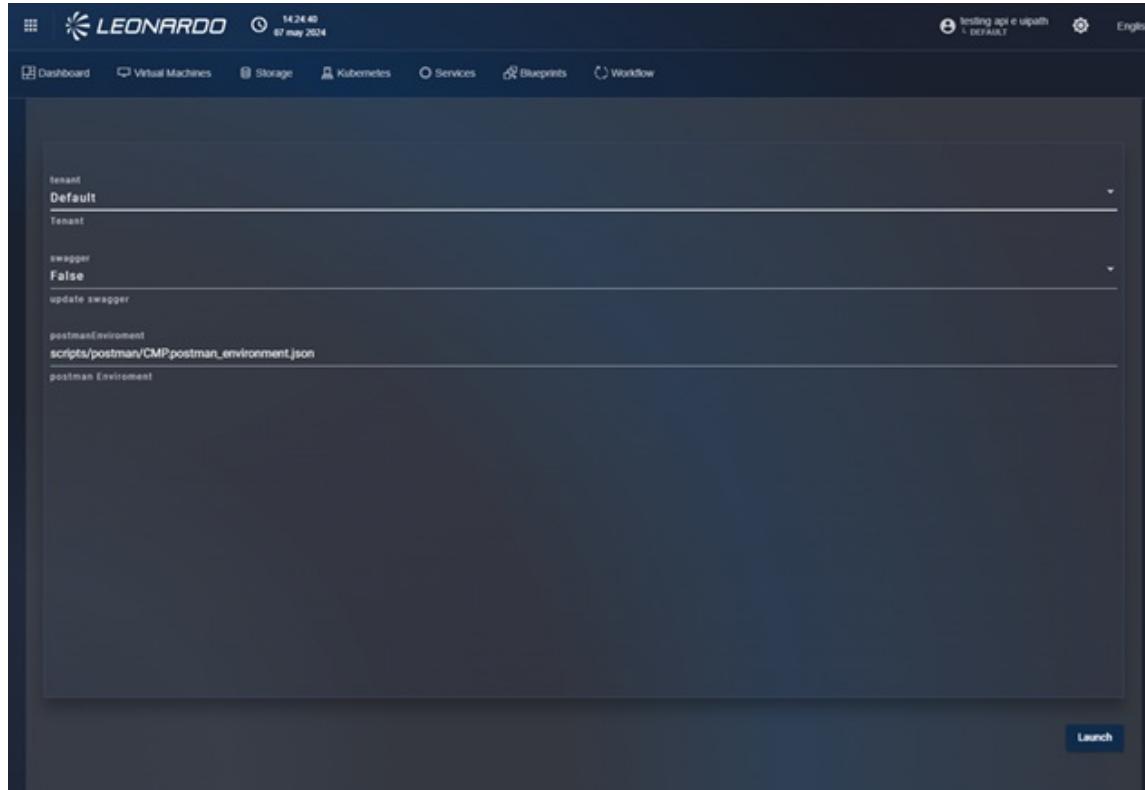


Figura 360 – Configuration of an "Azure pipeline" service

After completing all the form fields, click "Launch" to send the pipeline start request. The dashboard page will open with the list of all subscribed services and their relative statuses.

Specifically, the newly provisioned service will have a "Running" status in yellow, and subsequently, depending on the result, the status will also be updated to "Completed" in green or "Error" in red.

Dashboard							
Filtering by: PROVISIONING TYPE Services							
Search by provisioning type Services							
UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	Type
DSQblkPQuq0UVjDjRNQJQ	6/23/23, 12:23 PM	6/23/23, 12:22 PM	cmp_admin (cmp_admin@email.com)	X	X	X	SERVICE
VJwINv74QF23OS0pn9FJyA	4/13/23, 10:32 AM	4/13/23, 10:25 AM	cmp_admin (cmp_admin@email.com)	✓	X	X	VM
YB6bDobKQxukQCP40VUa1g	1/30/23, 12:29 PM	1/30/23, 12:27 PM	cmp_admin (cmp_admin@email.com)	✓	X	X	VM

Figura 361 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.2.4 "PAAS" AND "AI SERVICES"

Click the "Subscribe" button corresponding to a "PaaS" service. The user will be redirected to step 1 of the service creation page where it will be necessary to fill out the form with the specific configuration parameters of the selected service.

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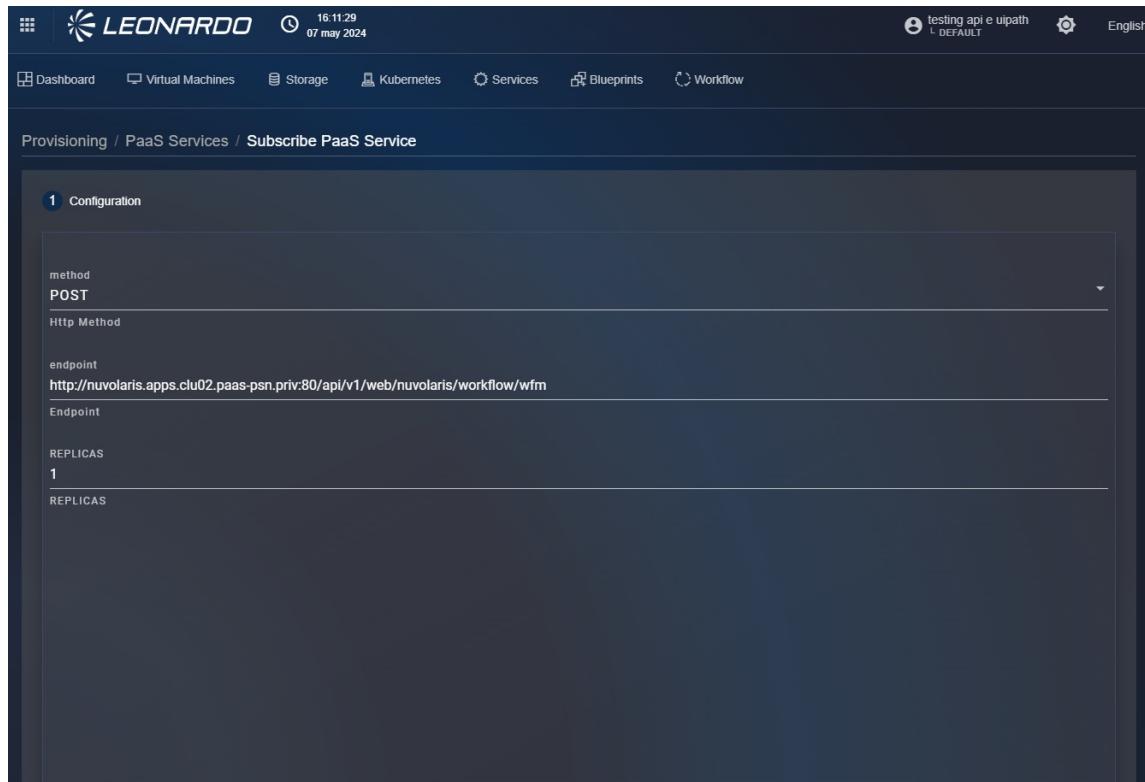


Figura 362 – Configuration of a "PaaS" service

After completing all the form fields, click "Launch".

The dashboard page will open with the list of all subscribed services and their relative statuses.

Specifically, the newly provisioned service will have a "Running" status in yellow, and subsequently, depending on the result, the status will also be updated to "Completed" in green or "Error" in red.

UUID	Received Time	Sent Time	Created by	Status	Output Message	Output Files	State	Type
DSQblklkPQuqUVJDJRNQJQ	6/23/23, 12:23 PM	6/23/23, 12:22 PM	cmp_admin (cmp_admin@email.com)	X	X	X	X	SERVICE
VJwINv74QF23OS0pn9FJyA	4/13/23, 10:32 AM	4/13/23, 10:25 AM	cmp_admin (cmp_admin@email.com)	✓	✓	✓	✓	VM
YB6bDobKQxukQCP40VUja1g	1/30/23, 12:29 PM	1/30/23, 12:27 PM	cmp_admin (cmp_admin@email.com)	✓	✓	✓	✓	VM

Figura 363 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.2.5 "HELM" SERVICES

Click the "Subscribe" button corresponding to a "HELM" service. The user will be redirected to step 1 of the service creation page where it will be necessary to select the cluster on which to perform the provisioning.

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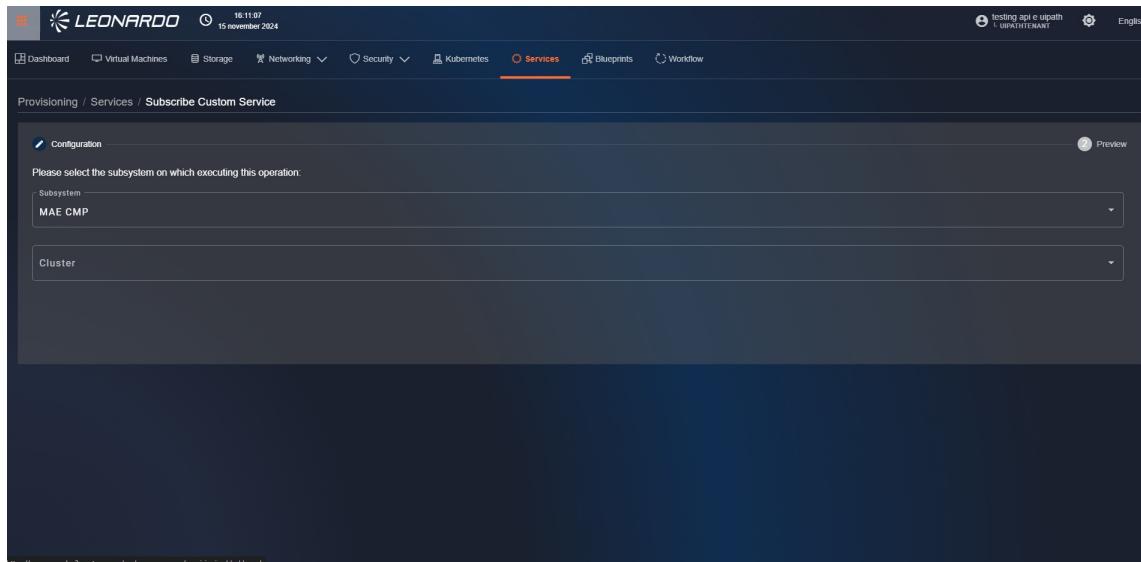


Figura 364 – Cluster selection

Fill out the form with the specific configuration parameters of the selected service. Also, add the "values.yaml" file at the bottom, which contains all the configuration parameters necessary for the service.

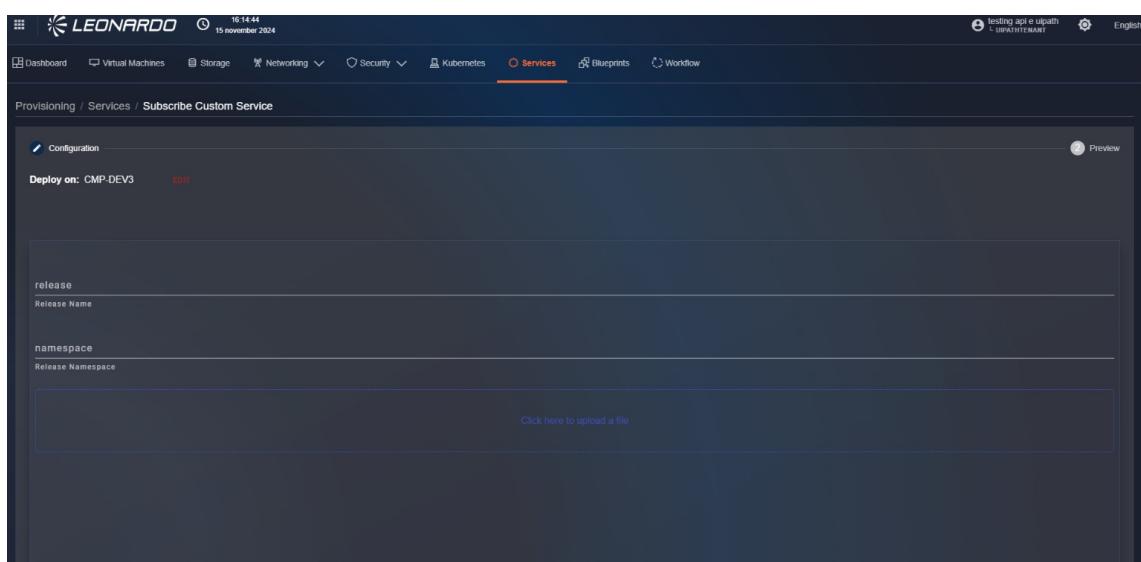


Figura 365 – Configuration of "HELM" parameters

After completing all the form fields, click "Launch".

The dashboard page will open with the list of all subscribed services and their relative statuses.

Specifically, the newly provisioned service will have a "Running" status in yellow, and subsequently, depending on the result, the status will also be updated to "Completed" in green or "Error" in red.

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The screenshot shows the Leonardo dashboard with the following details:

- Header:** LEONARDO, 4:23:56 pm, 23 June 2023, cmp_admin, DEFAULT, English.
- Top Navigation:** Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, Blueprints.
- Filtering:** PROVISIONING TYPE Services, Search by provisioning type Services.
- Table Headers:** UUID, Received Time, Sent Time, Created by, Status, Output Message, Output Files, State, Type.
- Data Rows:**
 - DSQblkPQuq0UVJDRNQJQ, 6/23/23, 12:23 PM, 6/23/23, 12:22 PM, cmp_admin (cmp_admin@email.com), X, ☒, ⬇, ☰, SERVICE
 - VJwlNv74QF23OS0pn9FJyA, 4/13/23, 10:32 AM, 4/13/23, 10:25 AM, cmp_admin (cmp_admin@email.com), ✓, ☒, ⬇, ☰, VM
 - YB6bDobKQxukQCP40VUa1g, 1/30/23, 12:29 PM, 1/30/23, 12:27 PM, cmp_admin (cmp_admin@email.com), ✓, ☒, ⬇, ☰, VM

Figura 366 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.2.6 "IMMUTABLE" HELM SERVICES

If the "immutable" flag was selected for the HELM service during creation, the user is not given the option to view and modify the service information, thus allowing for a "one-Click" installation. Once "subscribe" is selected, the system automatically begins provisioning and returns the user to the dashboard page to monitor the results.

The screenshot shows the Leonardo dashboard with the following details:

- Header:** LEONARDO, 4:23:56 pm, 23 June 2023, cmp_admin, DEFAULT, English.
- Top Navigation:** Dashboard, Virtual Machines, Storage, Kubernetes, Service, Custom Service, AI Service, PaaS, Blueprints.
- Filtering:** PROVISIONING TYPE Services, Search by provisioning type Services.
- Table Headers:** UUID, Received Time, Sent Time, Created by, Status, Output Message, Output Files, State, Type.
- Data Rows:**
 - DSQblkPQuq0UVJDRNQJQ, 6/23/23, 12:23 PM, 6/23/23, 12:22 PM, cmp_admin (cmp_admin@email.com), X, ☒, ⬇, ☰, SERVICE
 - VJwlNv74QF23OS0pn9FJyA, 4/13/23, 10:32 AM, 4/13/23, 10:25 AM, cmp_admin (cmp_admin@email.com), ✓, ☒, ⬇, ☰, VM
 - YB6bDobKQxukQCP40VUa1g, 1/30/23, 12:29 PM, 1/30/23, 12:27 PM, cmp_admin (cmp_admin@email.com), ✓, ☒, ⬇, ☰, VM

Figura 367 – Dashboard with the list of all subscribed services and their relative statuses

11.0.3.3 Provisioning of "Edge" device images

To access the "Edge" provisioning page, click on the tab of the same name in the top menu.

After doing this, we will be taken to the "Edge" page of the provisioning module.

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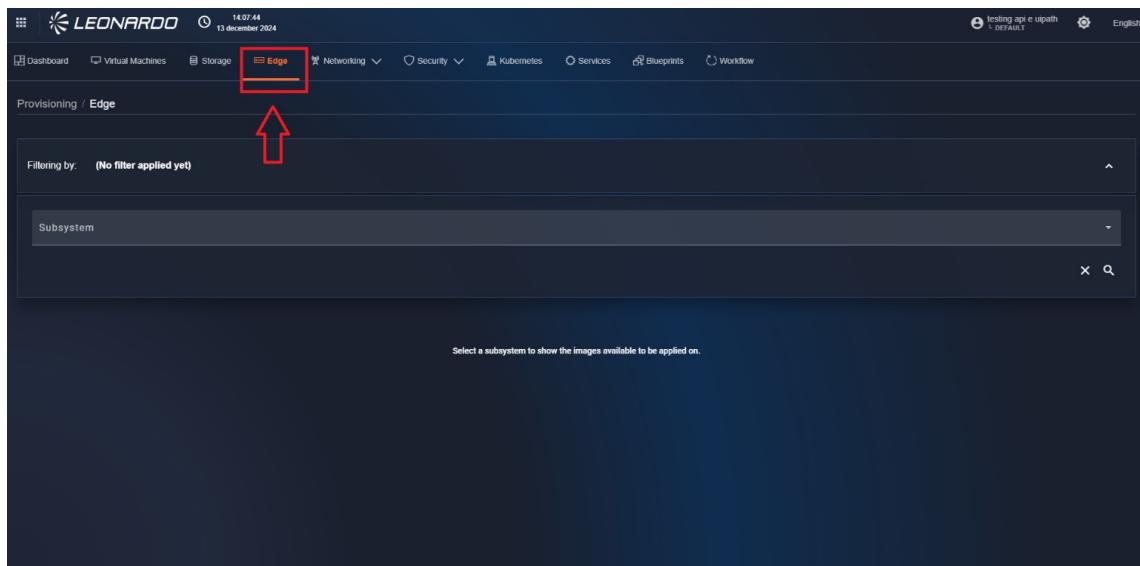


Figura 368 – Access to Edge provisioning

At first glance, the page may appear empty, but by selecting a configured EDGE subsystem from the "Subsystem" filter, all available images in the subsystem will be displayed below.

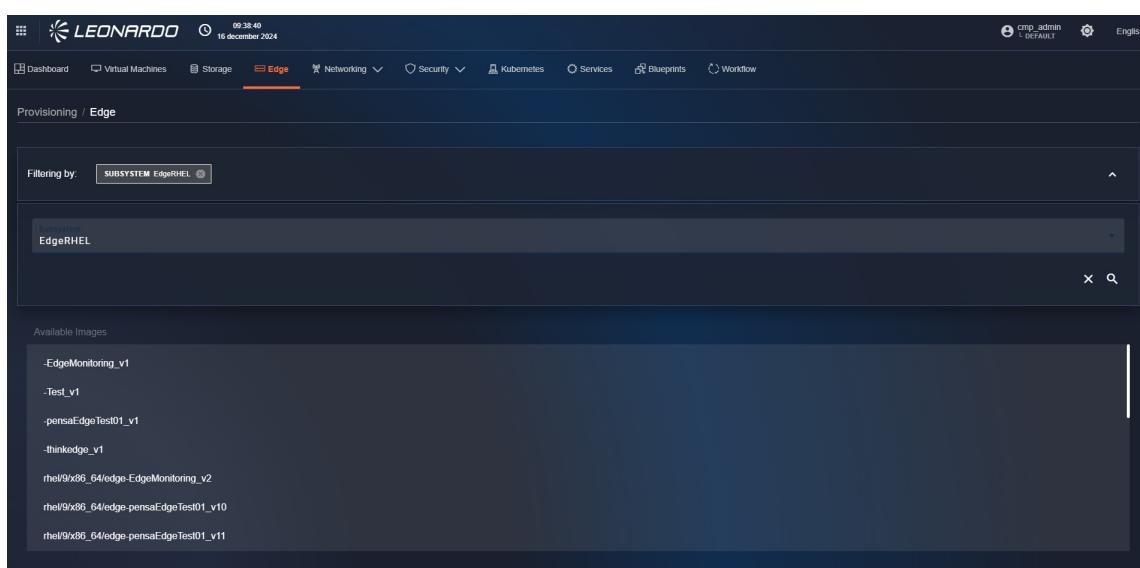


Figura 369 – Images available in the system

By selecting one of the available images, a section will open on the right that allows selecting a compatible inventory machine from the list.

After selecting a machine, we can confirm the operation using the "Apply" button.

We will be returned to the "dashboard" section of the "Provisioning" module where we can view the outcome of the operations.

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Figura 370 – Confirmation of "Edge" provisioning

11.0.3.4 Creation of a "Blueprint" provisioning request

To access the services page, click on the "blueprint" tab in the top menu. After doing this, you will find yourself on the "Blueprints" page.

On the page, a list of components called "Card" is displayed. Each card refers to a specific type of service; in particular, the following information is displayed:

- Service name.
- Service icon.
- Type of script used for service provisioning.
- Service description.
- "Subscribe" button to proceed with service creation.

Depending on the blueprint selected, the parameters for provisioning change, while the functionalities remain unchanged.

Figura 371 – List of blueprints

11.0.3.4.1 "BLUEPRINT" EXECUTION REQUEST

Click the "Subscribe" button corresponding to a "Blueprint". The user will be redirected to step 1 of the creation page. In this step, it is necessary to select the subsystem in which provisioning is to be performed from the dropdown.

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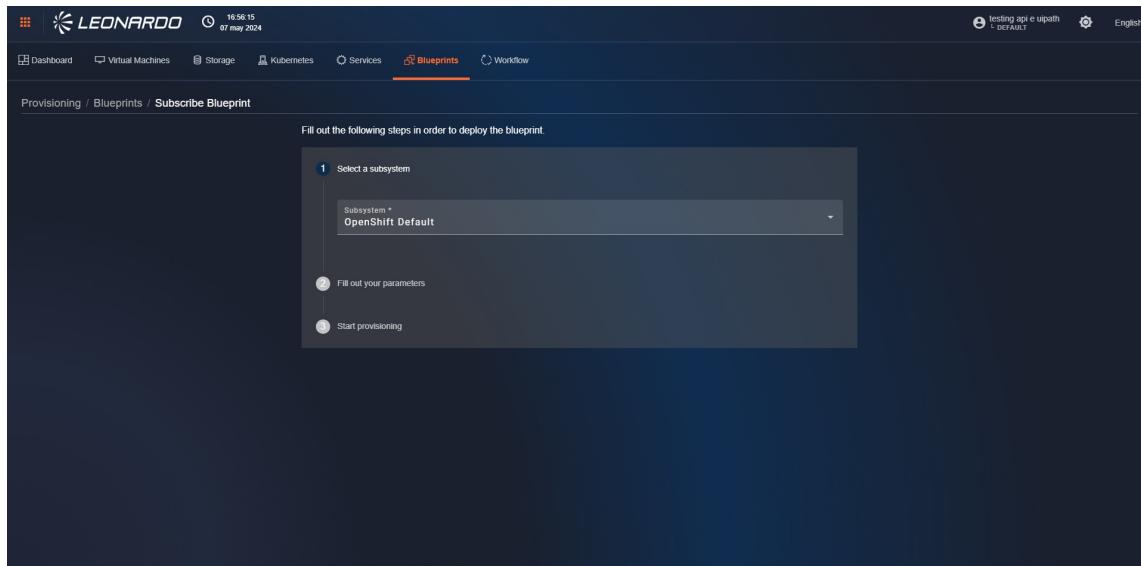


Figura 372 – Step 1 of Blueprint creation

By selecting a subsystem, the page will move to step 2 of creation where it will be necessary to fill out the form with the specific configuration parameters of the selected blueprint.

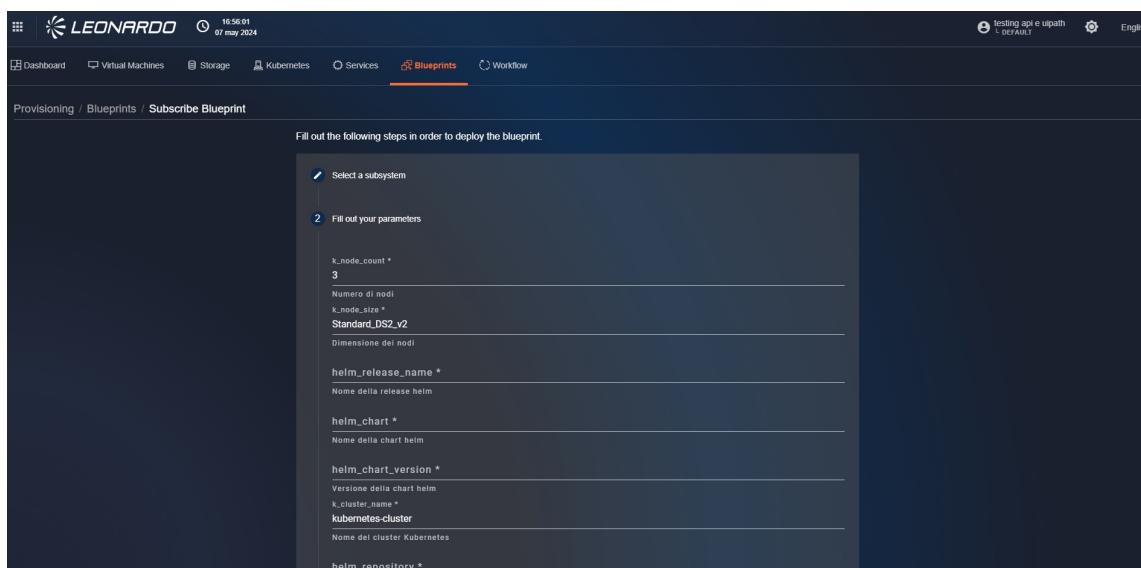


Figura 373 – Step 2 of "Blueprint" creation

Once the parameters have been entered, you can click the "Start" button at the bottom right to initiate provisioning. After a few seconds, you will be redirected to the "Dashboard" page, filtered for "Blueprints to be completed".

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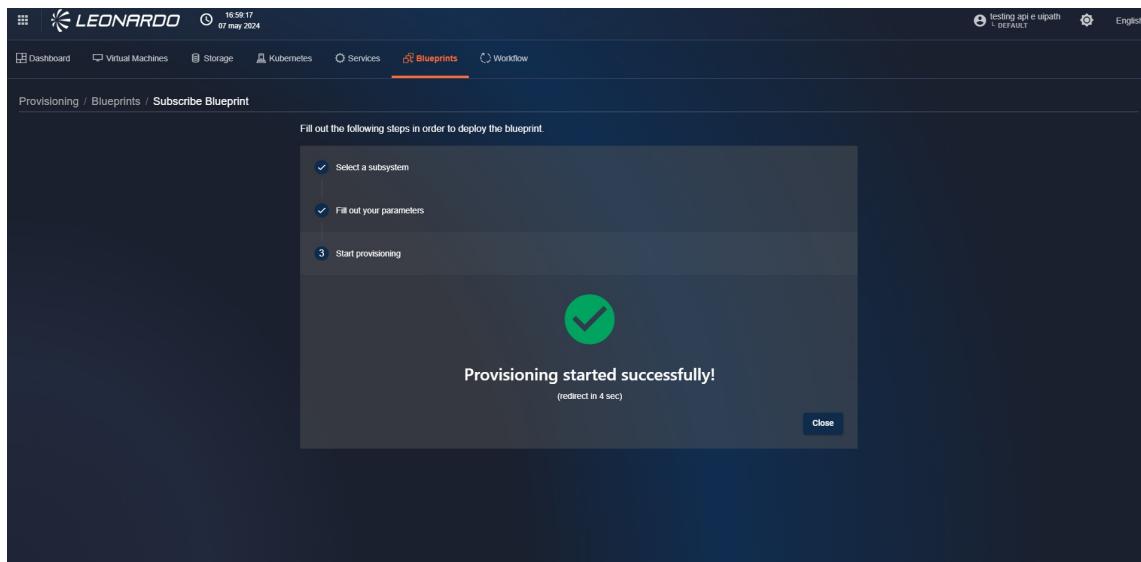


Figura 374 – Blueprint Request sent successfully

11.0.3.4.2 "TO BE COMPLETED" BLUEPRINT MANAGEMENT PAGE

To work on the blueprint, it is necessary to select a "to be completed" blueprint from the dashboard. Clicking on the corresponding row will display its management page.

This page is divided into sections, specifically:

- "Process Diagram": This section displays an image that graphically represents all the steps to be executed in the blueprint. Additionally, the step currently in execution is indicated in red.
- "Variables": In this section, we can view all parameters entered manually or automatically during the blueprint execution.
- "Task": In this section, it is possible to manage the blueprint steps that require manual intervention using the available controls.
- "Subprocess": In this section, we can view the status of all automatic operations performed during the blueprint execution.

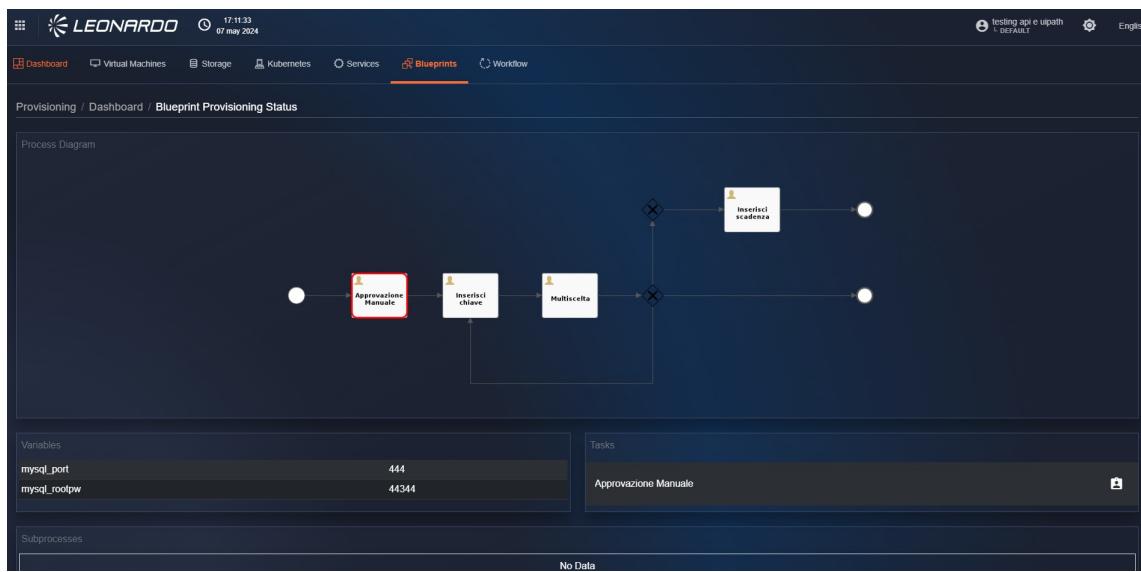


Figura 375 – Provisioning plan flow

The execution, and therefore the corresponding change, between the Blueprint steps can be carried out in two ways: automatically or manually, exactly as described within the Blueprint itself.

11.0.3.4.2.1 Automatic steps

The system automatically manages the creation, configuration of resources, and deployment of applications. The status and result of these steps are visible in the "Subprocess" section below.

For each row in the table, by clicking the buttons on the right, it is possible to verify the generated output message and download its content.

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Figura 376 – Blueprint subprocesses section

11.0.3.4.2.2 Manual steps

Manual tasks, when present and required in the blueprint, will appear in the relevant section. To work on it, it is first necessary to click the "Assign" button (red in the figure) to take charge of the task.

Figura 377 – Task assignment to the user

A confirmation modal for assignment will be displayed. By clicking "Yes", the task will be taken over by the user and cannot be worked on by a different user.

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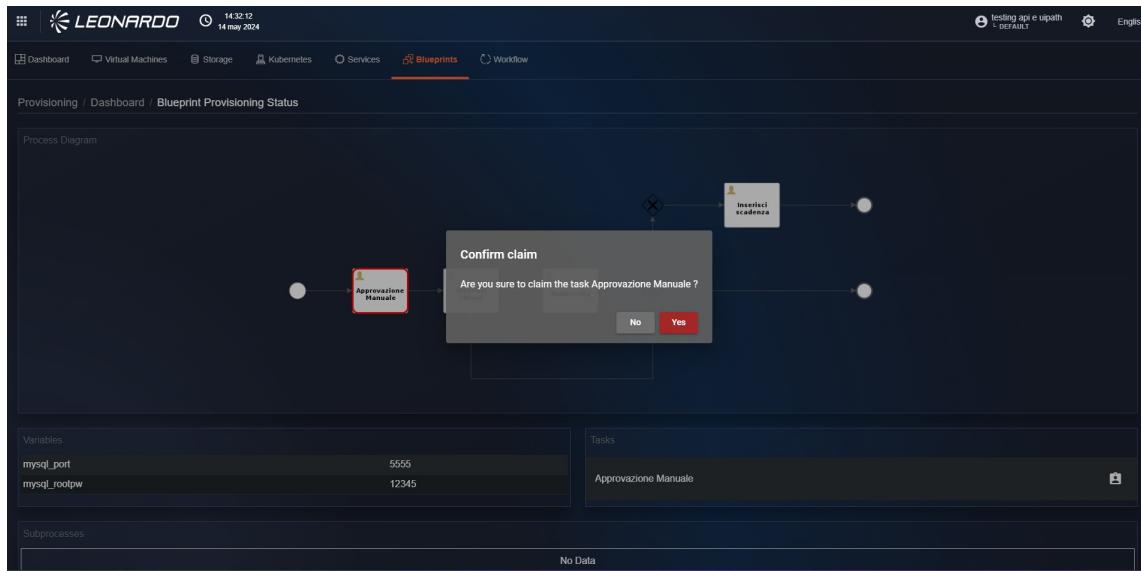


Figura 378 – Assignment confirmation

A confirmation message will appear at the bottom, and we can note that the "Task" section has been updated. On the left, below the task name, the relevant assignee is indicated, and on the right, there are 2 buttons:

- "Remove assignment" (red in the figure).
- "Complete manual task" (yellow in the figure).

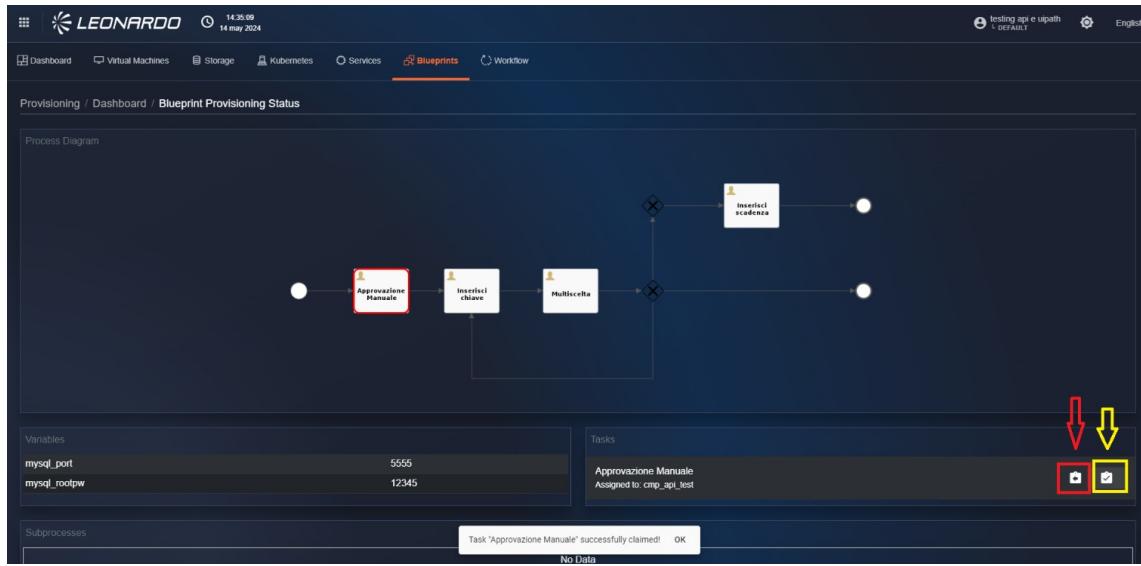


Figura 379 – Task management buttons

Clicking "Remove assignment" will open a confirmation modal. Clicking "Yes" will make the task available to other users who can take charge of it.

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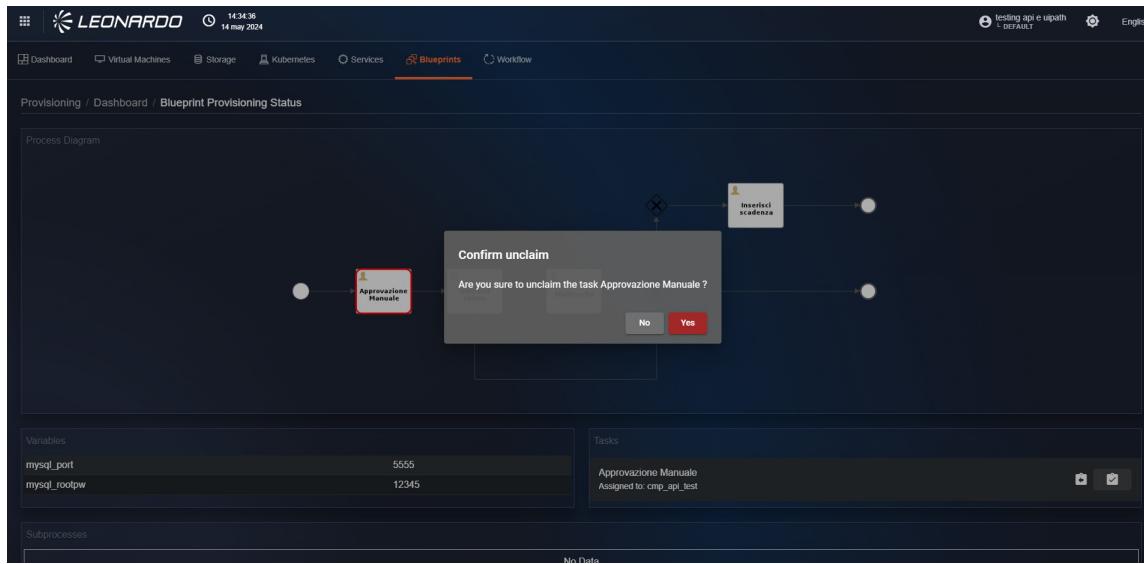


Figura 380 – Task release

Clicking the "Complete task" button will open a modal containing one or more customizable fields. The fields can be of different types.

We can enter numeric, boolean, and text fields. Once entered, it is possible to confirm by clicking the "Continue" button at the bottom right.

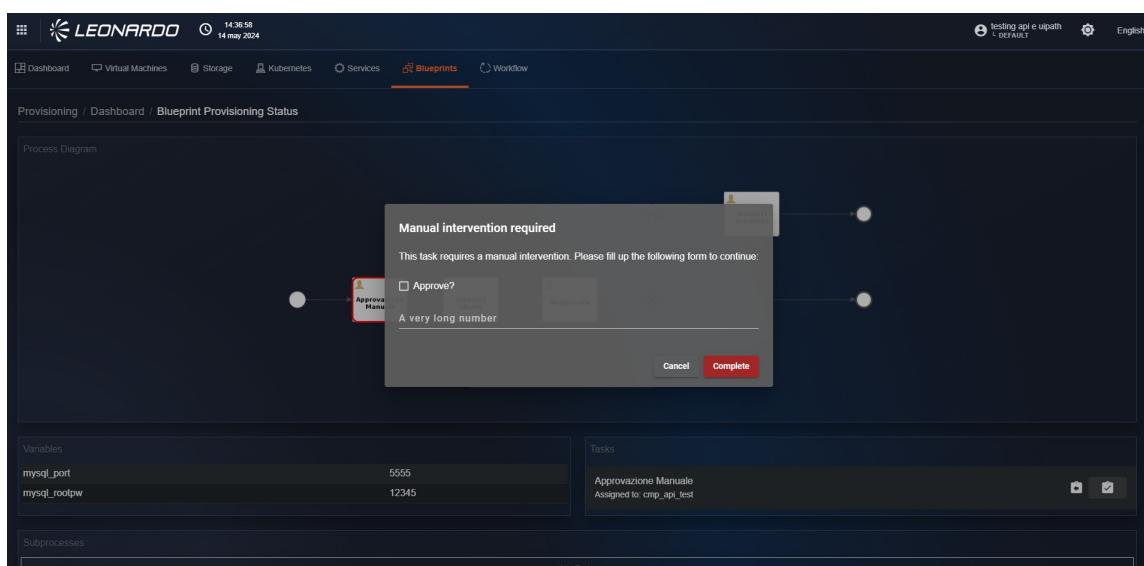


Figura 381 – Numeric fields of blueprints

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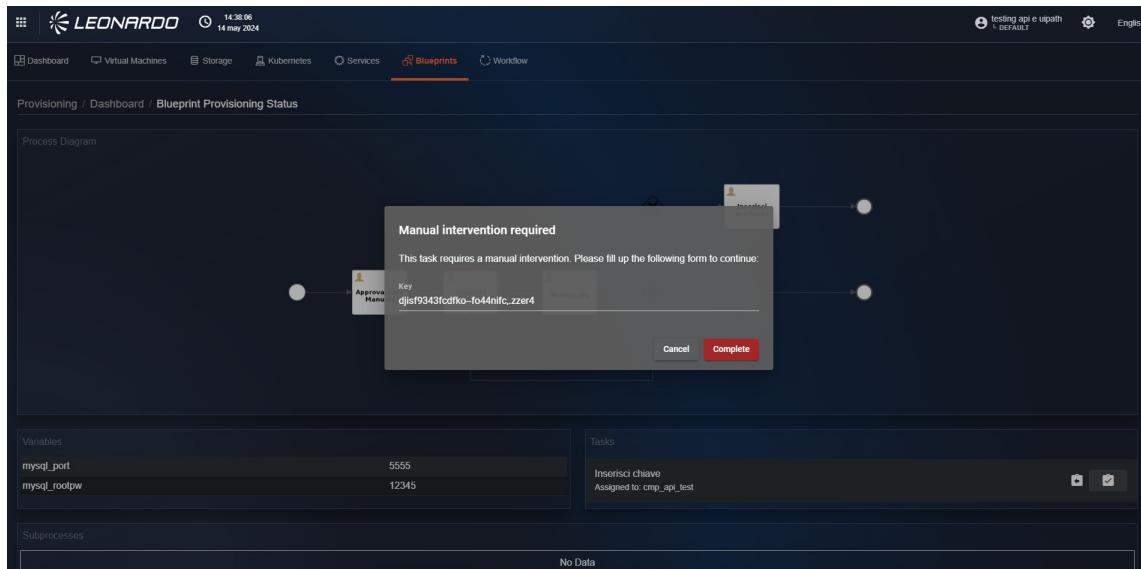


Figura 382 – Text fields in Blueprints

Once pressed, we can see that the BPMN graph on the page has been updated and that the next step of the blueprint is active and has a red outline.

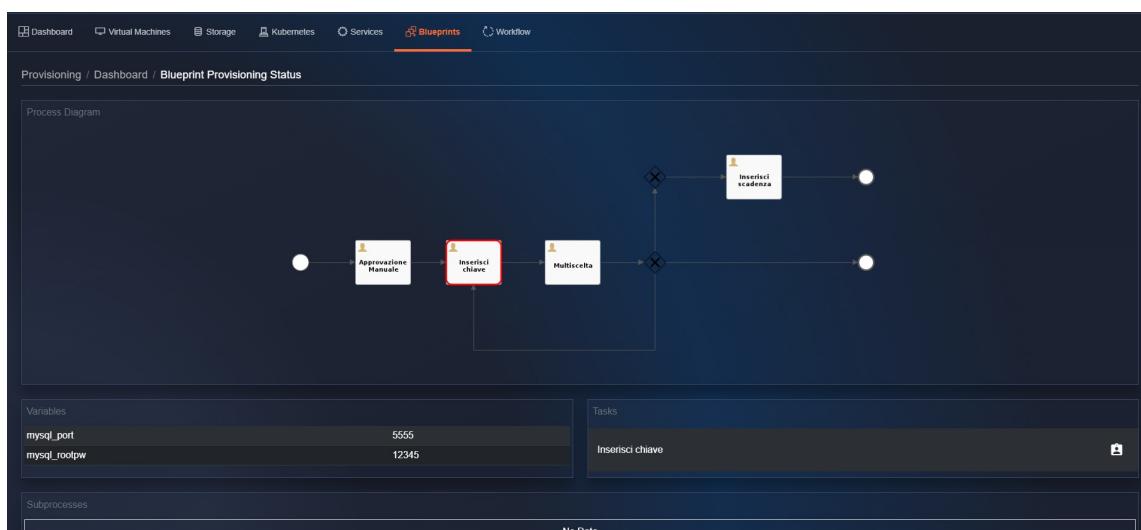


Figura 383 – Next step

All manual tasks present in the blueprint will follow the procedure described previously; therefore, regardless of the type of data to be entered, it is always necessary to assign the task to oneself.

It is possible to insert a temporal field within the manual steps of blueprints, using a calendar it will be possible to manually select the correct day and time.

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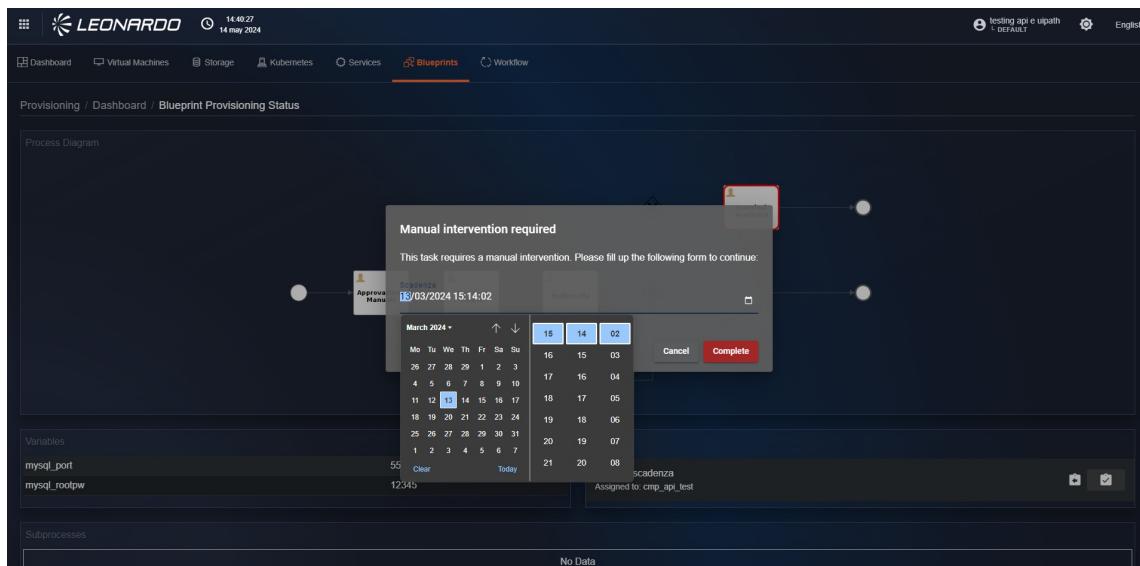


Figura 384 – Date field in tasks

The last type of step that we can find within the blueprints is the "Multi-choice" field. This field allows managing the blueprint's flow.

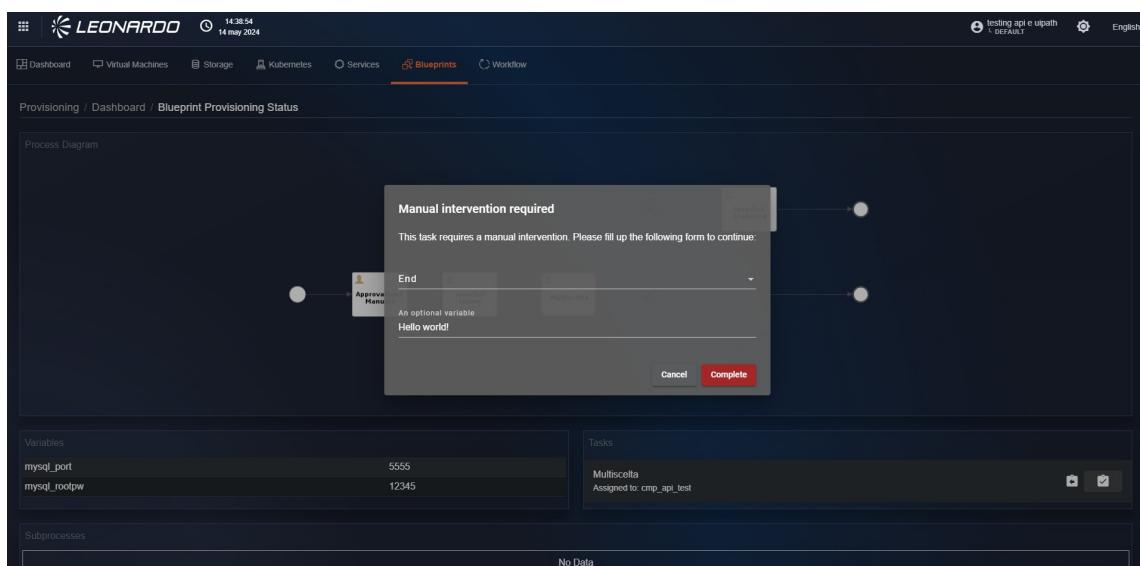


Figura 385 – Multi-choice field

This field is of "Selection" type, so it will not be possible to enter a custom value, but selectable options will be proposed. Specifically, we can find three choices:

- "Repeat": allows re-executing the previous steps as described in the blueprint (path in pink in the figure).
- "End": allows concluding the blueprint execution without performing further operations (path in yellow in the figure).
- "Insert date": allows moving to a subsequent step of the blueprint (path in green in the figure).

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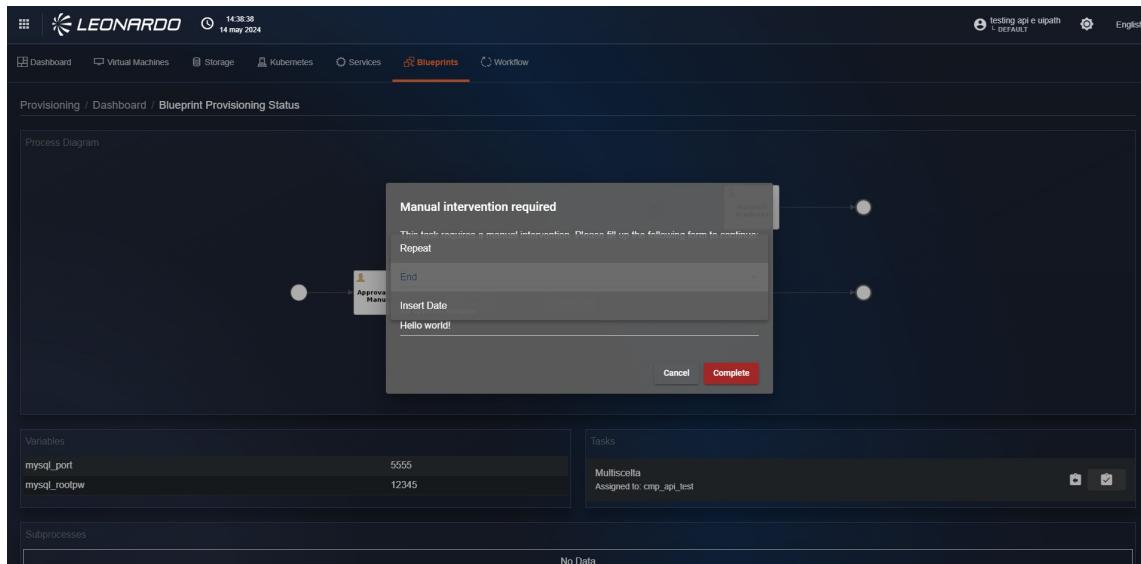


Figura 386 – Multi-choice field values

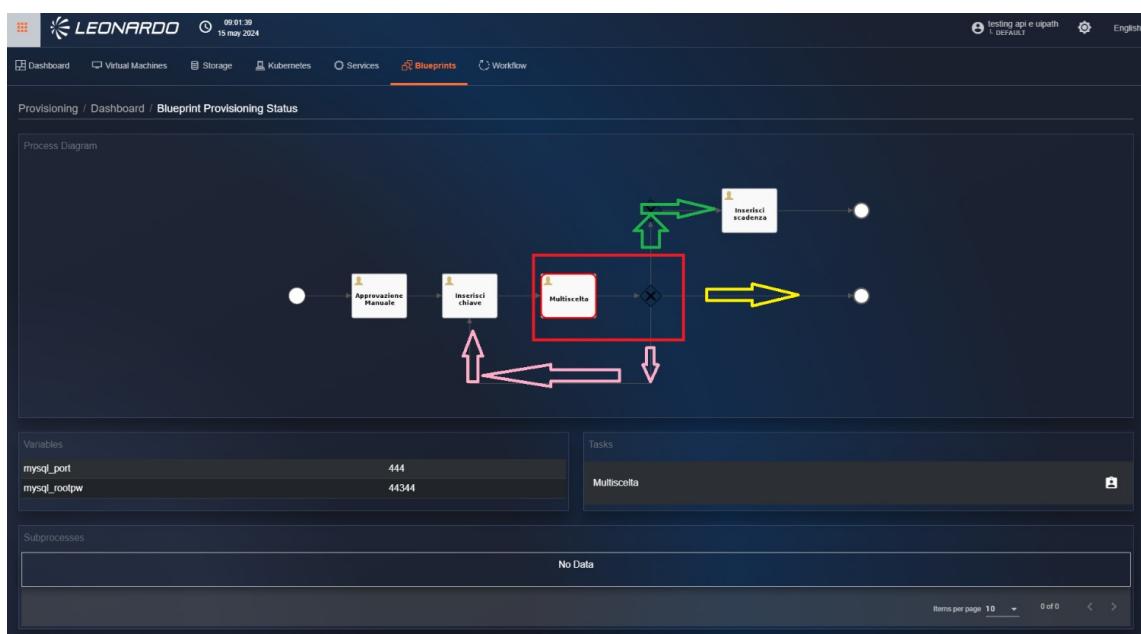


Figura 387 – Possible state changes for Multi-choice

Once all blueprint steps are completed, the graph will be automatically removed from the page, and in the step section, it will no longer be possible to take charge of an operation. Furthermore, in the "sub-processes" section, we will be able to view the result of all automated steps in the blueprint.

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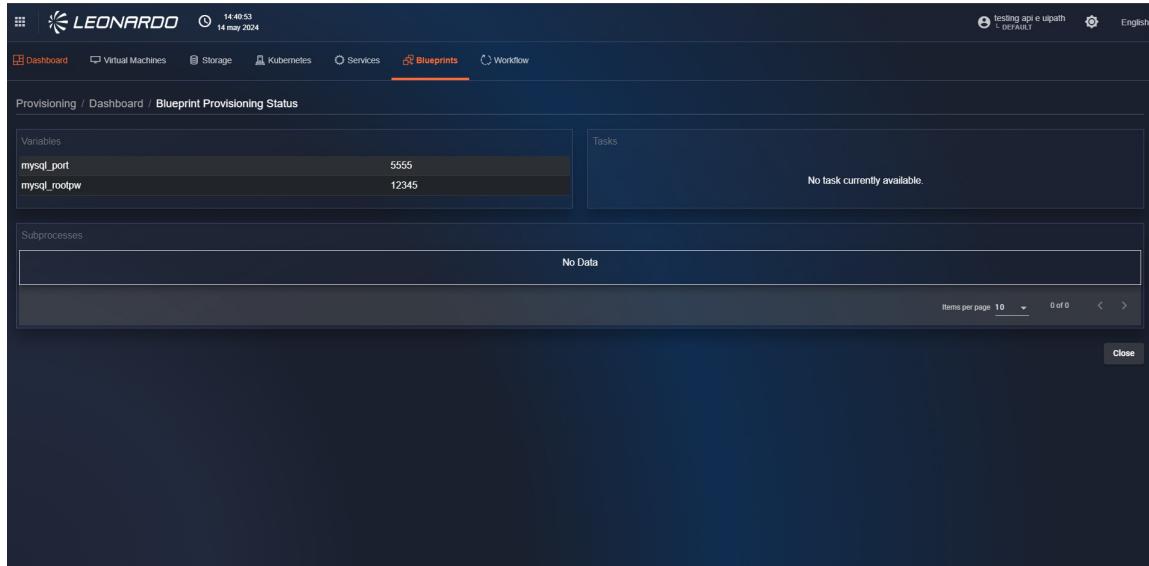


Figura 388 – Blueprint completion

11.0.3.5 Modification of a performed provisioning

For a provisioning that has been carried out and has failed, it is possible to modify it.

Provisioning modification is only available for resource types.

To start modifying a provisioning, click on a failed forecast.

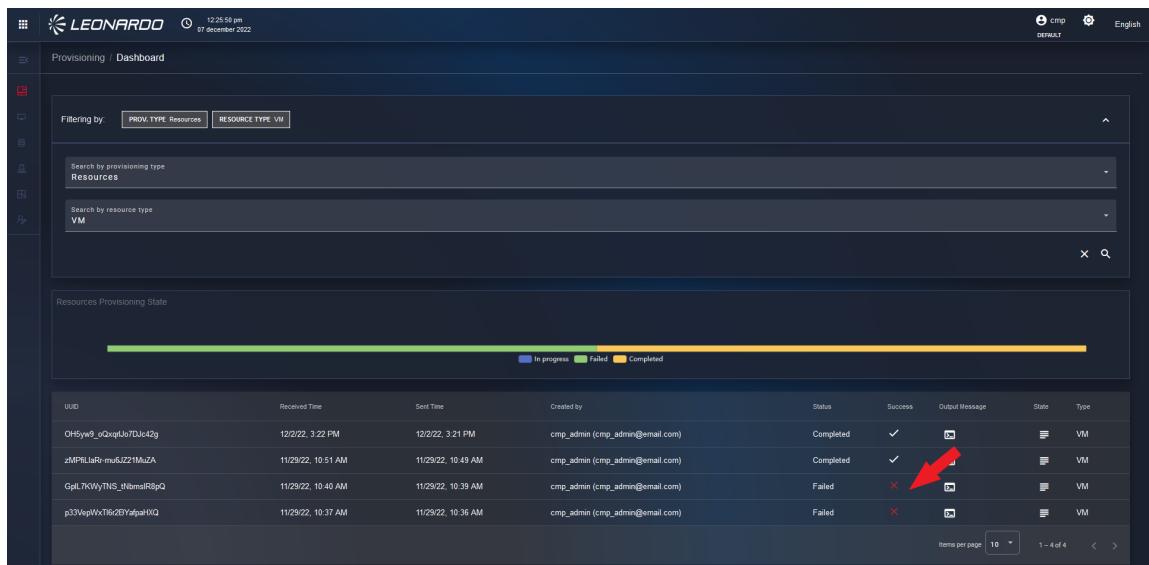


Figura 389 – Start modification of a Provisioning

After doing so, you will find yourself on the "Config" page of step 2 where you can modify the previously entered parameters.

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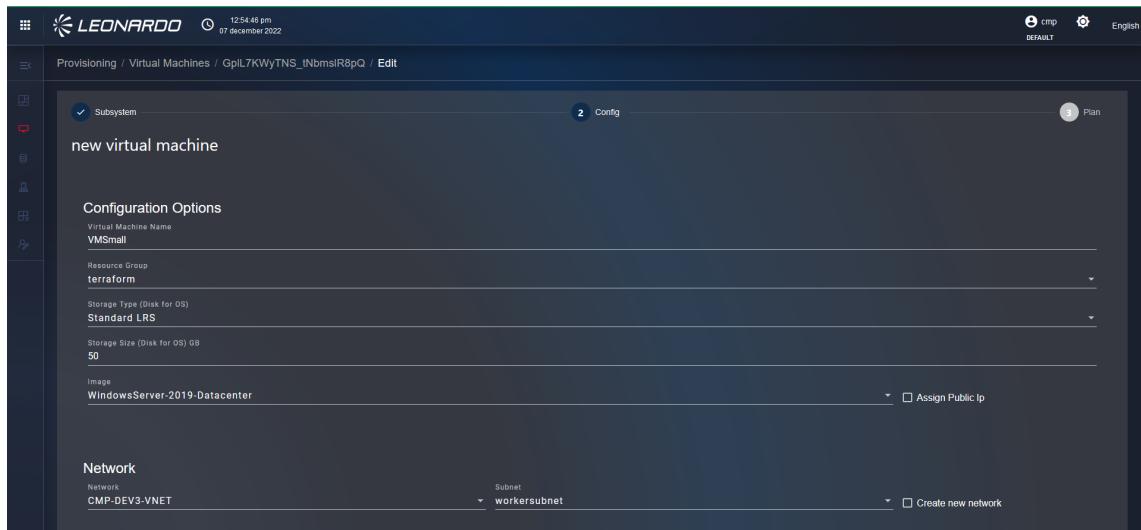


Figura 390 – Configuration parameters

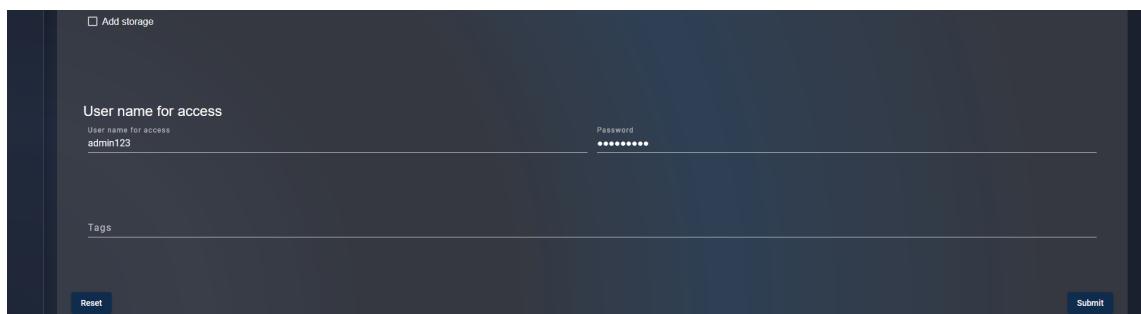


Figura 391 – Modification of parameters

After modifying the necessary parameters, at the bottom right, click the "Submit" button.

By doing so, you will find yourself on the "Plan" page of step 3, where the forecast is present, and below, the quote table.

At the bottom right, click the "Apply" button. After clicking the "Apply" button, you will find yourself on the "Dashboard" tab page.

Subsequently, from the "Dashboard" page, the user notes that the modification was successful.

It is also possible to modify a failed provisioning for other elements managed by SCMP.

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The screenshot shows a web-based interface for provisioning a virtual machine. At the top, there's a header with the Leonardo logo, a timestamp (08:54 am, 29 October 2022), and user information (cmp_admin, DEWAAT, English). Below the header, the URL is shown as Provisioning / Virtual Machines / 7LFHRSVDSVq0G9qcTjbEg / edit.

The main content area has a title "Subsystem" with a "Config" button. It displays a "Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:" section. Below this, it says "Terraform will perform the following actions:" followed by a detailed list of resource creation commands:

```
# azurerm_linux_virtual_machine.mongodb will be created
resource "azurerm_linux_virtual_machine" "mongodb" {
  + admin_password = (sensitive value)
  + admin_username = "admin123"
  + allow_extension_operations = true
  + computer_name = (known after apply)
  + disable_password_authentication = false
  + extensions_time_budget = "PT1H30M"
  + id = (known after apply)
  + location = "northeurope"
  + max_bld_price = "mongodb"
  + name = "mongodb"
  + network_interface_ids = (known after apply)
  + patch_mode = "ImageDefault"
}
```

Below the Terraform output, there's a "Costs" section with a table:

Type	Amount	Unit	OS	Zone	Reservation Term	Description	Meter ID	Tier Minimum Units
CONSUMPTION	€0.15	1 Hour	LINUX	-	-	-	-	-
RESERVATION	€0.06	3 Years	LINUX	-	3 Years	-	-	-
RESERVATION	€0.09	1 Year	LINUX	-	1 Year	-	-	-

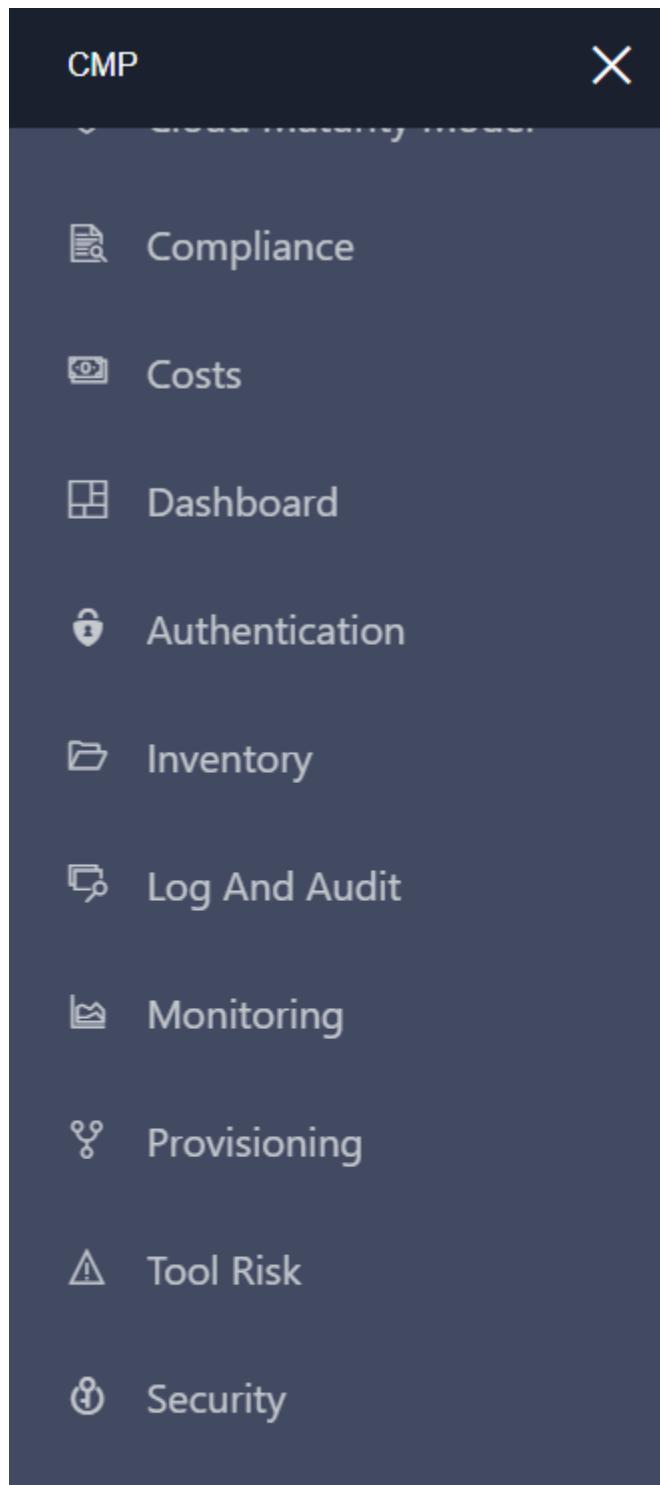
At the bottom right of the interface are "Back" and "Apply" buttons.

Figura 392 – Provisioning summary and quote table

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Backup and disaster recovery

The "Backup & Disaster Recovery" functionality allows the user to view an overview of the data available and configured in the CommVaults that have been correctly inserted into the "Administration" functionality. To access the functionality, it is necessary to click on the button available in the main menu. .



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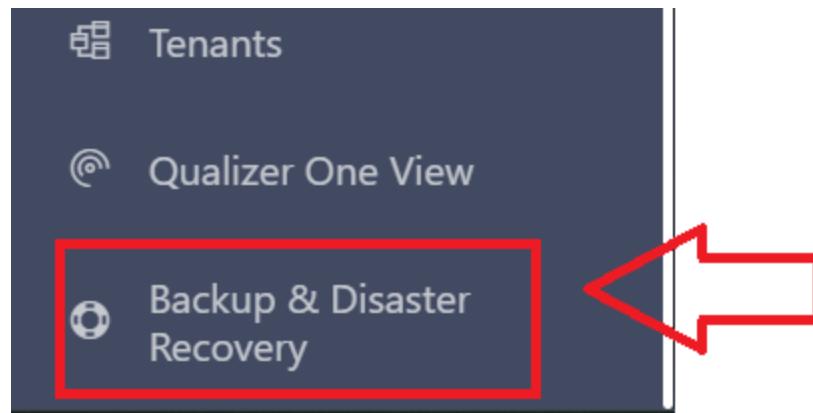


Figura 393 – Access to Backup & Disaster Recovery

Dashboard

The dashboard, divided into sections, offers a general overview of the content of the CommVaults; subsequently, to consult the details of each section, it is necessary to use the tabs at the top.

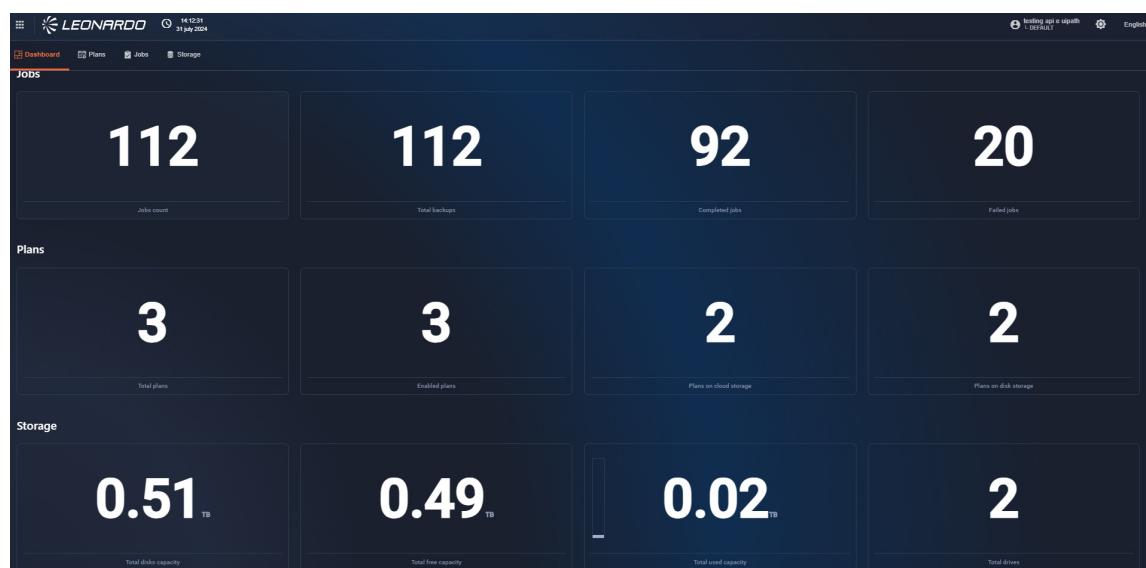


Figura 394 – D.R. functionality Dashboard

Plans

The "Plans" page contains, in addition to a filter that allows selecting the CommVault for which we want to view the details, the list of configured plans.

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Plan ID	Name	Type
1	1_settimana_disk	Server
2	1_settimana_cloud	Server

Figura 395 – List of plans

By clicking on an element of the table, which represents a "plan", a window with the details of the selected plan will be displayed; furthermore, by clicking on the name of the displayed storage, the user will be redirected to the storage details.

Figura 396 – Details of the Plans

Jobs

The "Jobs" page contains, in addition to a filter that allows selecting the CommVault for which we want to view the details, the list of results of the jobs performed by the CommVault.

Job ID	Start date	End date	Job type	Status
1	26/06/2024 10:00:08	26/06/2024 10:01:07	CS DR Backup	● Completed w/ one or more errors
10	28/06/2024 20:52:17	28/06/2024 20:54:38	Patch Download	● Completed

Figura 397 – List of Jobs performed

By clicking on an element of the table representing a "Job", a window with the details will be displayed.

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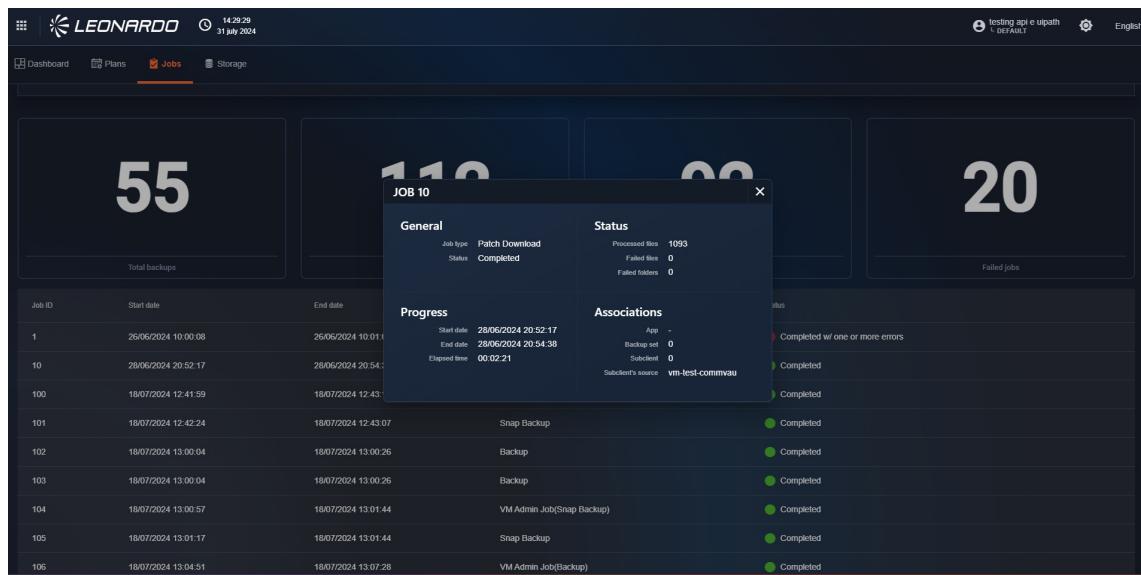


Figura 398 – Job Details

Storage

The "Storage" page contains, in addition to a filter that allows selecting the CommVault for which we want to view the details, the list and information on storage and their relative capacities.

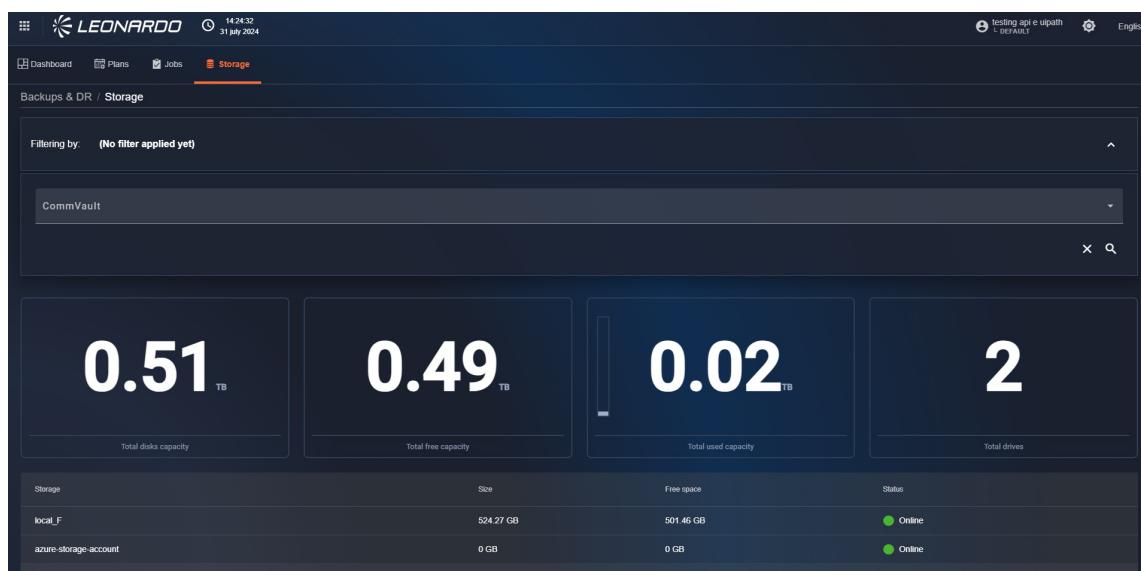


Figura 399 – List of available storage

By clicking on an element of the table, which represents a "storage", a window with the details will be displayed; furthermore, by clicking on the name of the displayed "plan", the user will be redirected to its details.

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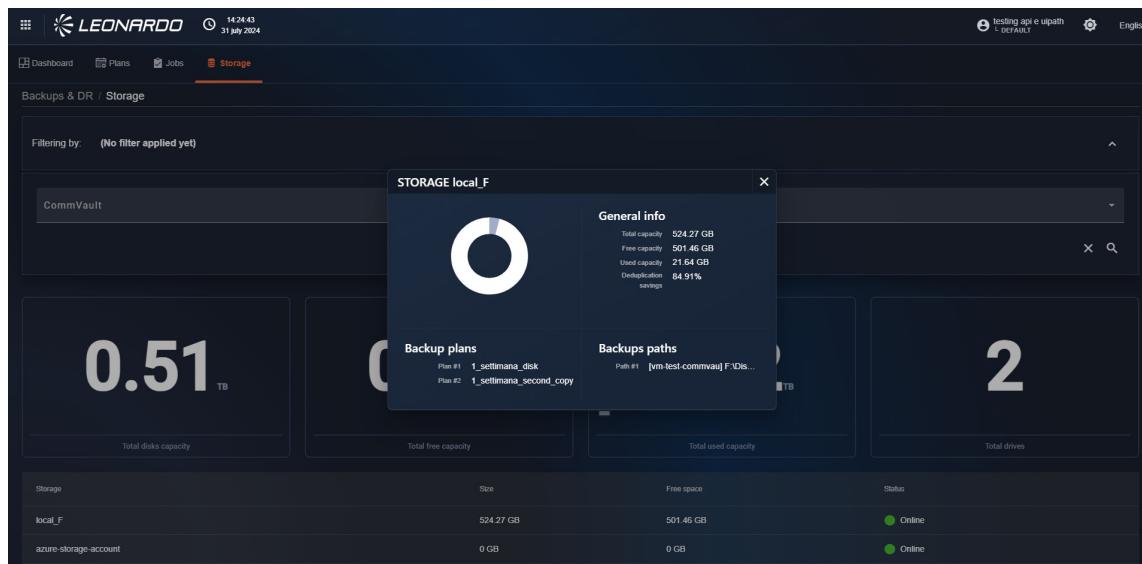


Figura 400 – Storage details

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Shared Features

This section outlines some general behaviors.

Multilingual Support

The operator interface is available in two languages (English – Italian) and the operator can choose the language simply by selecting the text in the top left of the screen.

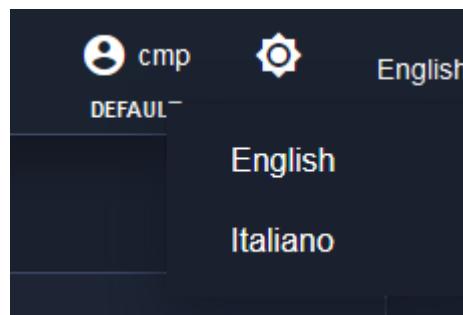


Figura 401 – Menu to change the language

Filter Reset

For the Monitoring, Costs, Inventory, Catalog, and Security functionalities, within the filters, it is possible to reset them and the lists by clicking on the button depicting an "X", located below the calendar filter.

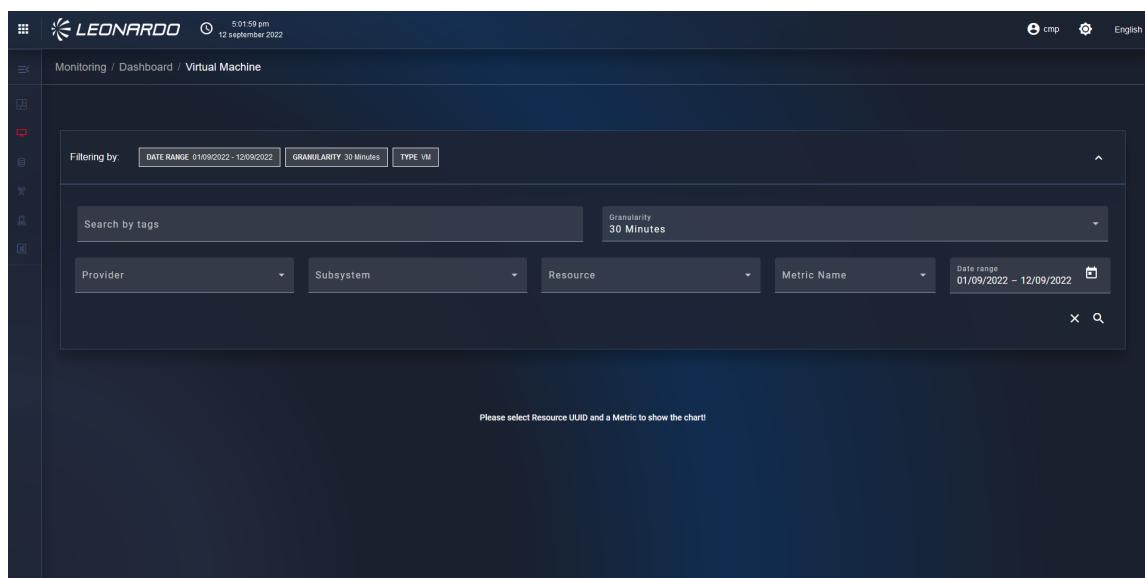


Figura 402 – Filter settings detail

Light mode

To activate light mode across the entire SCMP platform, in the top right of the menu bar, click on the button depicting the sun as shown below.

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Figura 403 – Activating light mode

To deactivate light mode, click on the button depicting the moon as shown in.

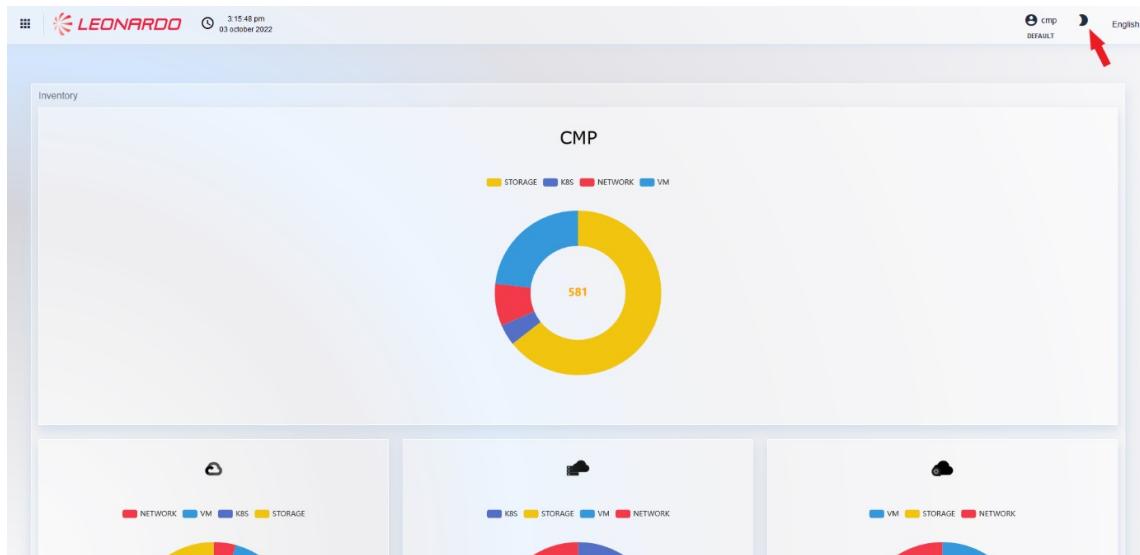


Figura 404 – Deactivating light mode

Switch Tenant

To switch from one Tenant to another, click on the button depicting a person icon. At this point, a dropdown menu appears where you need to click on "Switch Tenant".

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The screenshot shows a table of blueprints with columns for Name, Description, Creation Date, and Status. The 'Status' column includes icons for Draft (green checkmark), Error (red X), and Pending (yellow circle). A purple callout box highlights the 'Draft' status icon.

Name	Description	Creation Date	Status
manual	only manual	10/04/2024 08:09:07	
name	dsescr	10/04/2024 09:45:36	
myBlueprintName	description	10/04/2024 09:46:13	
isAnewName	descrizione32	10/04/2024 09:46:51	

Figura 405 – Menu for Tenant switch

After clicking on "Switch Tenant", a modal appears where you can select a Tenant to switch to. After selecting the desired Tenant, click on the "Confirm" button.

The system automatically verifies the tenant's enablement and existence before performing the switch.

After doing so, the page updates with the desired Tenant, where you can view all data belonging to it across all platform functionalities.

The screenshot shows a 'Select Tenant' modal with the message 'Please select the tenant that you would like to use.' It lists 'Default' and 'Tenant1'. Below it, it says 'Currently selected: Default'. A purple callout box highlights the 'Confirm' button.

Figura 406 – Tenant Switch

Managing Columns in Available Tables

For the tables available in SCMP, the user has the ability to customize the column display in two ways:

- Modify the order of the displayed columns.
- Change the number of columns shown.

These preferences are saved within the system, using the user identifier and the current page as references.

To customize the display, it is necessary to click on the "filter columns" button, shown with a "funnel" icon, available in the top right section of the respective table.

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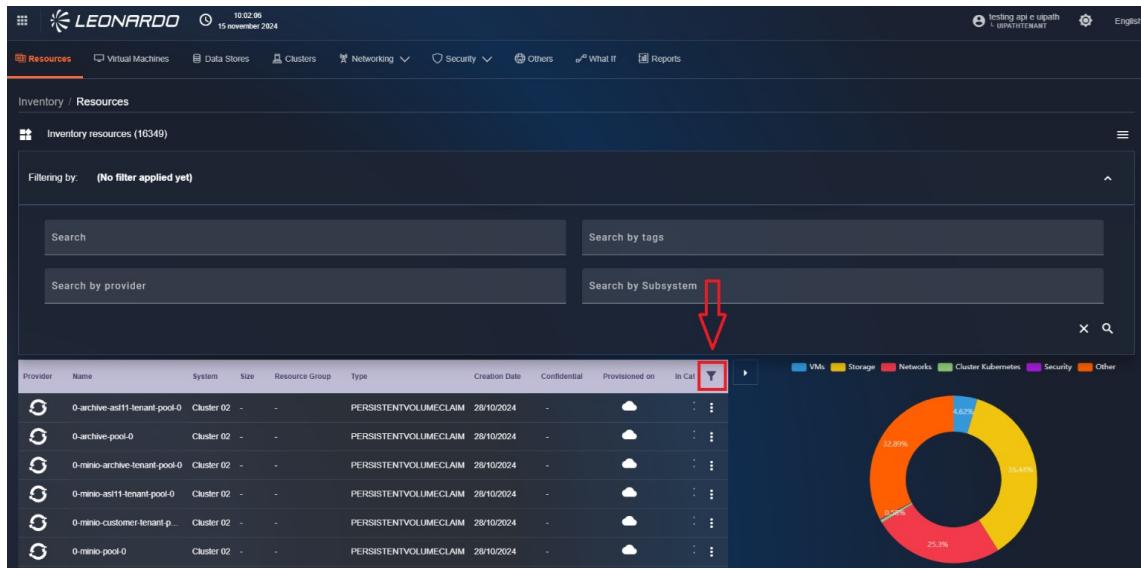


Figura 407 – Column Management

A configuration modal will open, containing the ordered list of all fields currently displayed on the interface.

We can use the "drag n' drop" technique by clicking on the "Vertical dots" button corresponding to the field we want to move, then we can release the component in the correct position.

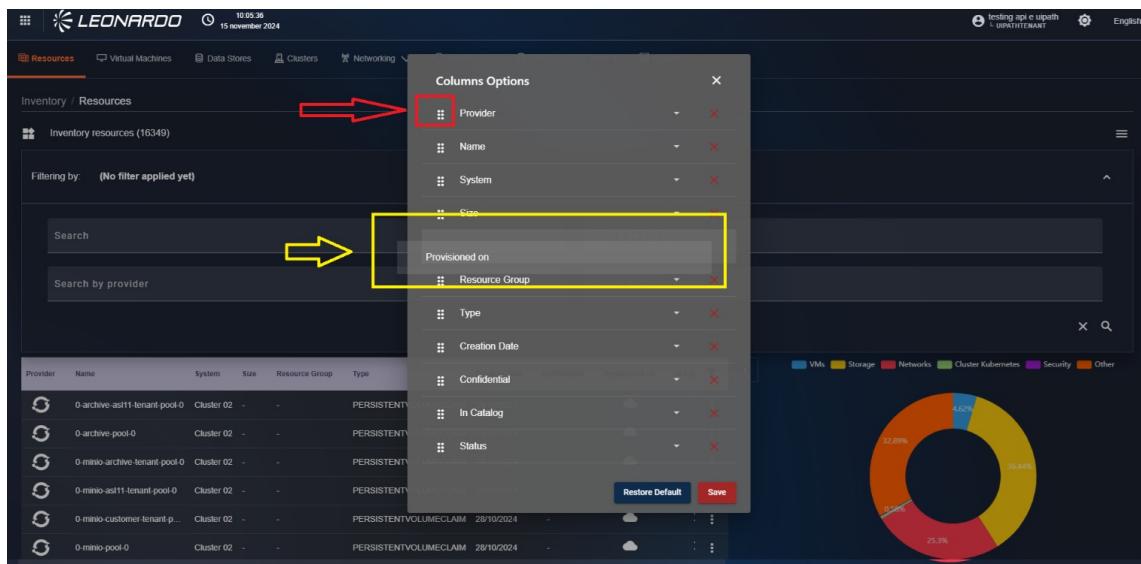


Figura 408 – Column Ordering

Additionally, it is possible to remove a field from the table by clicking on the red "X" corresponding to the field to be deleted; this will be removed from the list and, after saving, will also be removed from the table.

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The screenshot shows a table of inventory resources with columns for Provider, Name, System, Size, Resource Group, and Type. The 'Type' column is currently highlighted in yellow. A modal window titled 'Columns Options' is open, listing the same columns with their current order. The 'Provider' column has a red 'X' icon to its right, indicating it can be deleted. Other columns have red 'X' icons as well.

Figura 409 – Deleting Columns

If we want to add a field to the table, it will be necessary to click the "Add column" button; once pressed, it will be replaced by a "select" field which contains the list of all available fields not already present in the table.

The screenshot shows the same table and 'Columns Options' dialog as Figure 409. However, the 'Add Column' button at the bottom of the dialog is now highlighted with a red box, indicating it has been selected.

Figura 410 – Adding new column

Select the field to add to the table from the displayed list and complete the application by clicking the save button available in the bottom right.

The page will automatically refresh to display the new table; furthermore, the configuration will be saved automatically and automatically retrieved upon login.

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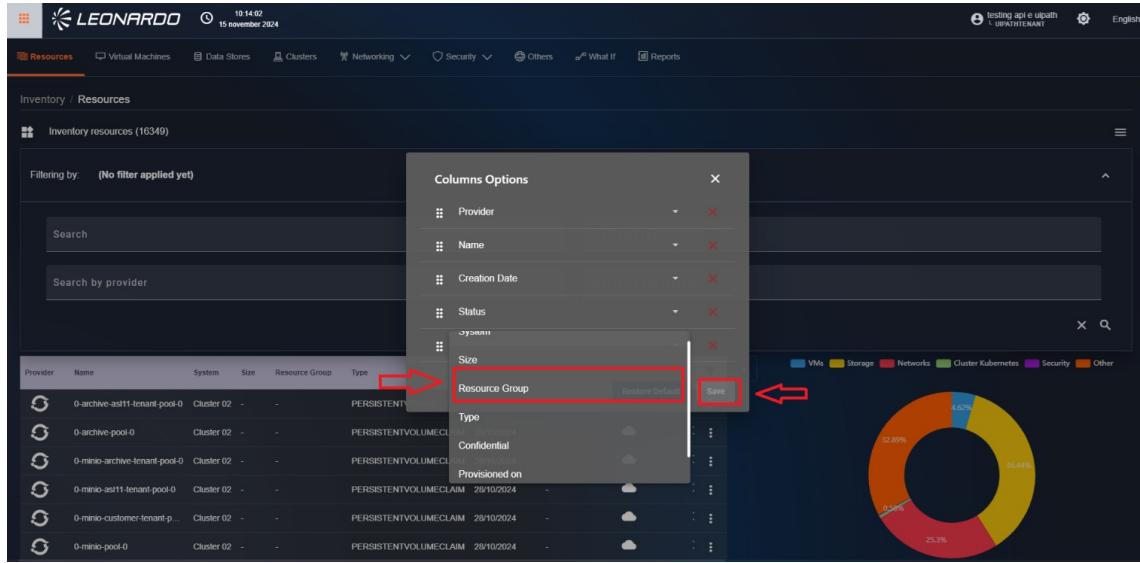


Figura 411 – Saving the view

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Service Detail Design

The Service Detail Design service is the solution implemented for managing requests, which must then be processed within our environment by an authorized user.

To access Service Detail Design, log in to SCMP with the Service Manager user.

After logging in, click the "Service Detail Design" module from the bento button.

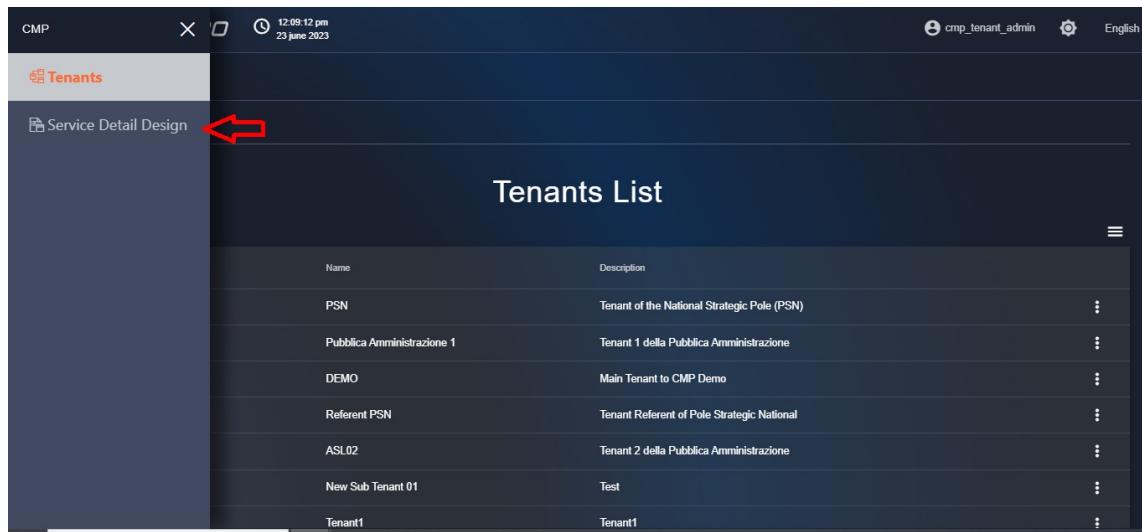


Figura 412 – Access to Service Detail Design module

The search page will be shown where it is possible to filter already created work orders based on:

- Status
- Customer
- Service Type
- Phase
- Creation Date

The table will show the general information of the Work Order.

This screenshot shows the 'Service Detail Design / Work Orders' page. At the top, there's a header with the Leonardo logo, the date '14 May 2024', and a timestamp '13:21:27'. On the right, there are user authentication details ('cmp_tenant_admin cmp_tenant_admin') and language selection ('English'). Below the header is a search bar with the text 'Work Orders'. Underneath the search bar, there's a breadcrumb navigation: 'Service Detail Design / Work Orders'. The main area features a filtering section with dropdown menus for 'Search by status' (New, In progress, Idle, Rejected, Completed), 'Search by customer', 'Search by service type', 'Select a phase', 'Select a date', and 'Select a date range'. Below the filtering section is a table of work orders. The table has columns: Order ID, Customer, Service Type, Creation Date, Last Update, Status, Phase, and Actions. There are six rows of work order data, each with a 'Actions' column containing a 'View' icon and a 'Details' icon.

Figura 413 – Service Detail Design functionality filters

Click the center of a work order row to view its content; a modal will open where we can expand the various sections by clicking on them.

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To exit the detail view, click outside the gray window.

The screenshot shows the 'Work Order Details' page. At the top, there are filtering options: 'Filtering by: DATE May 26, 2023'. Below this is a table with columns: Order ID, Order Title, Customer, Operator, Status, Created, Last Updated, and Service Type. The service type is listed as 'Servizi Cloud'. Under 'Technical Elements', there are sections for Client Data, Site Data, Documents, and Status History. The status history table shows three entries:

Order ID	Customer	Service Type	Created	Last Updated	Status
64995b4258ab7a35a1fb9449	IC_SPA_2021	Servizi Cloud	26/06/2023 16:22:38	26/06/2023 16:22:38	New
64995b4958ab7a35a1fb9448	IC_SPA_2021	Servizi Cloud	26/06/2023 16:31:47	26/06/2023 17:52:56	In progress
64995b4c58ab7a35a1fb9449	IC_SPA_2021	Servizi Cloud	26/06/2023 16:44:33	26/06/2023 17:53:05	Idle

Figura 414 – Work Order Details

Work Order Flow

To take charge of a work order, click the "Play" symbol next to an order in "New" status.

A status change notification will be displayed on the screen, and the current status of the Order becomes "In progress"; the buttons of the corresponding order are modified:

- by clicking the "Pause" button, the order will transition to "Idle" status;
- by clicking the "Mark as completed" button, it is possible to close the Work Order;
- by clicking the "Rejected" button, it is possible to report the cancellation of the Order;

The screenshot shows the 'Work Orders' page. At the top, there are filtering options: 'Filtering by: DATE May 26, 2023 - Jun 26, 2023' and 'STATUS New, In progress... + 3 others'. Below this is a table with columns: Order ID, Customer, Service Type, Creation Date, Last Update, Status, and Actions. The status column for the first row shows 'Completed' (highlighted with a red box). The actions column for the same row shows three buttons: a play icon, a checkmark, and a red circle (highlighted with a red box). A message box at the bottom center says 'Status updated successfully!' with an 'OK' button. The entire status column for the first row is also highlighted with a red box.

Figura 415 – Work order management page for Service Detail Design

When the "Mark as completed" button is clicked, a window is displayed on the screen where information to be attached to the order can be entered, specifically:

- the result of the processing;
- a description of the chosen result;
- a note for the operator.

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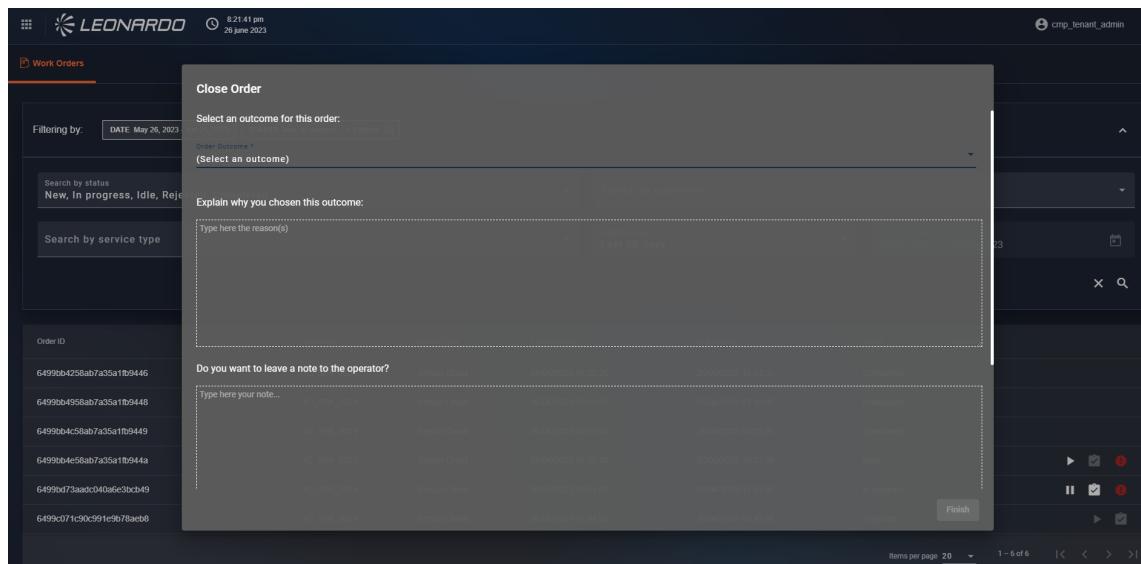


Figura 416 – Closing a Work order

By scrolling down the page, we can find the parameters section where it is possible to enter different key/value combinations for the parameters used during processing.

After entering the key and value, click the "Plus" button to confirm the entry; new empty fields are added where additional parameters can be entered. To delete a key/value pair, click the "Minus" button; once all parameters have been entered, click the "Finish" button.

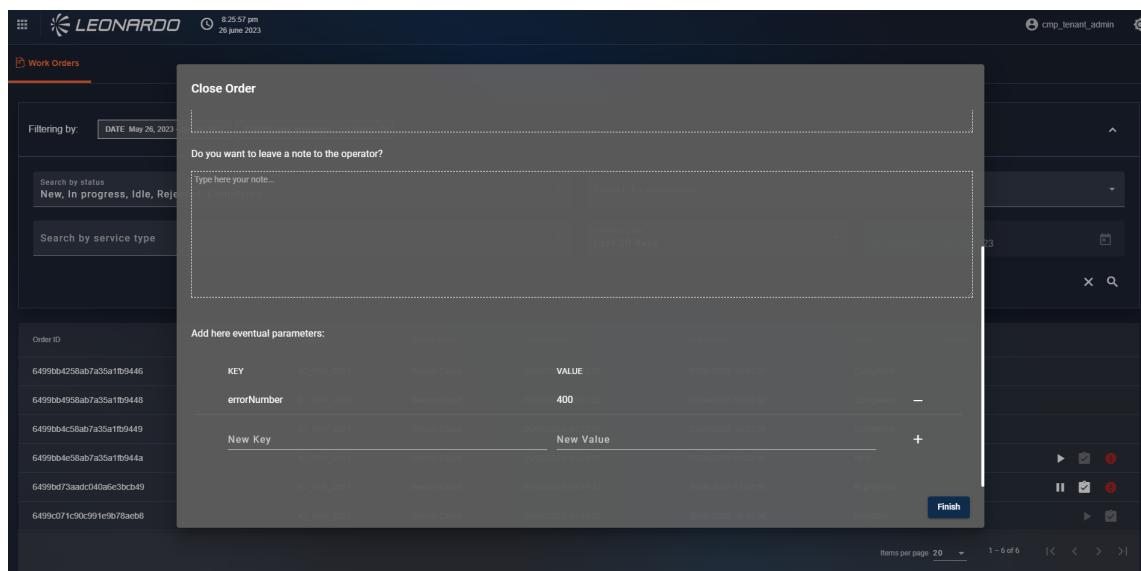


Figura 417 – Parameter entry

After completing the order, it is possible, by opening the respective menus, to view all the information entered during processing within the info section.

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The screenshot shows the Leonardo Secure Cloud Management Platform interface. On the left, there's a sidebar with filtering options like 'Filtering by:', 'DATE: May 20, 2023', 'Search by status: New, In progress, Idle, Rejected', and 'Search by service type'. Below this is a list of 'Order ID' entries. The main right panel is titled 'Work Order Details' for 'Gestione servizi cloud New' (IC_SPA_2021). It displays various details: Customer (cmp_admin), Operator (cmp_admin), Status (Completed), Created (26/06/2023 16:22:26), Last Updated (26/06/2023 16:44:36), and Service Type (Servizi Cloud). At the bottom, there are sections for 'Technical Elements' (Client Data, Site Data, Documents), 'Status History' (highlighted with a red box), and 'Additional Notes and Parameters'. The bottom right corner shows pagination information: 'Items per page: 20' and '1 - 6 of 6'.

Figura 418 – Information added during processing

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15 Leonardo Services

Leonardo provides several managed services which are represented in the following figure by type (called service families).

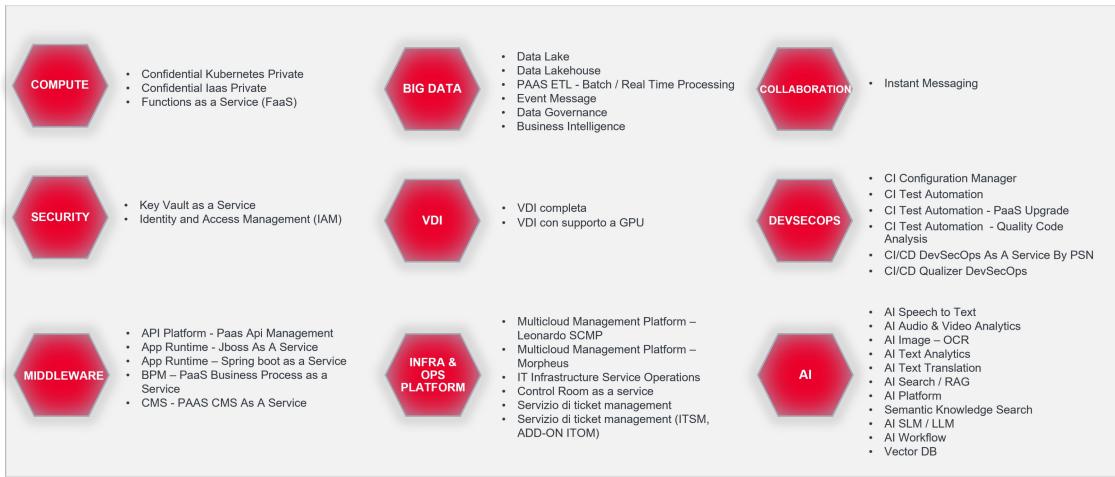


Figura 419 – Overview Leonardo Services

From a logical-functional point of view, the services can be divided into three macro-categories:

- Infrastructure as a Service (IaaS) Services
- Container as a Service (CaaS) Services
- Platform as a Service (PaaS) Services

The IaaS and CaaS categories include some services from the "Compute" family. The PaaS category includes services from all other families.

The aforementioned macro-categories will be described below.

15.1 Infrastructure as a Service (IaaS) Services

In the following table, you can consult the services pertaining to the Infrastructure as a Service (IaaS) category.

FAMILY	SUB-FAMILY	SERVICE NOMENCLATURE
Compute	Confidential - IaaS - Private	<ul style="list-style-type: none"> - Pool Small (Confidential) - Pool Medium (Confidential) - Pool Large (Confidential) - Pool X-Large (Confidential)

15.1.1 Compute

Below are the sub-families pertaining to the Compute family: - Confidential - IaaS - Private

15.1.1.1 Confidential - IaaS - Private

Below is the list of services pertaining to the Confidential - IaaS - Private sub-family:

- Pool Small (Confidential)
- Pool Medium (Confidential)
- Pool Large (Confidential)
- Pool X-Large (Confidential)

"Service Description"

The services allow for the provision of virtual computational environments (IaaS) of Private type, i.e., on a pool of physical resources, dedicated and isolated for each individual client, based on the use of "bare metal" compute instances. The data of the physical resources are encrypted and kept protected in all phases of their use (At-Rest, In-transit & In-use), leveraging the Confidential Computing paradigm. Depending on the pool of computational resources required for each individual Administration, it is possible to choose the most suitable service from the four available types.

"Service Features and Benefits"

Private Cloud resources are exclusively dedicated to each client. The services use secure Enclaves based on Trusted Execution Environment (TEE) leveraging HW Confidential, which offer an advanced level of security for data in use, protecting them during processing. They support advanced data encryption at Rest, in Transit & in Use. They use advanced Remote Attestation systems to verify the correctness of the TEE environment, isolating the memory of virtual machines from the host operating system and other malicious guests.

The advantages offered by the services are:

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- Security and confidentiality of data in dedicated environments;
- Workload isolation through advanced virtualization;
- Dedicated firewalls and network micro-segmentation;
- Automated provisioning and rapid resource management;
- Total control and centralized governance: centralized monitoring and auditing for traceability.

15.2 Container as a Service (CaaS) Services

In the following table, you can consult the services pertaining to the Container as a Service (CaaS) category.

FAMILY	SUB-FAMILY	SERVICE NOMENCLATURE
Compute	Confidential - Kubernetes - Private	Kubernetes Confidential Computing

15.2.1 Compute

Below are the sub-families pertaining to the Compute family: - Confidential - Kubernetes - Private

15.2.1.1 Confidential - Kubernetes - Private

Below is the list of services pertaining to the Confidential - IaaS - Private sub-family:

- Kubernetes Confidential Computing

"Service Description" Service that allows the provision of a platform for the orchestration of private and secure containers, designed to manage containerized applications in highly regulated environments or with confidentiality requirements. It offers a secure and controlled Kubernetes environment where the security component is one of the main aspects of the solution. The operating system on which the solution is based is hardened, to minimize the attack surface and potential vulnerabilities. Within the architectural components of the solution, mechanisms are used to ensure data security even during communication phases (through encryption mechanisms applied by default to communications between platform components) and for data stored within the platform itself. The platform can be customized to adapt to the specific needs of each Organization, ensuring integration with existing corporate systems and applications.

"Service Features and Benefits" Its implementation requires a combination of hardware certified for Confidential Computing, a security-hardened private Kubernetes infrastructure, and a set of observability and governance tools to maintain total control over the container lifecycle. Included functionalities:

- *Data protection* → the operating system is configured to ensure protection in all its phases: data in memory, through full disk encryption and key rotation; data in transit, using secure and encrypted communication protocols; data in use, adopting Confidential Computing practices and secure execution environments.
- *Secure Enclaves* → apply isolation and encryption, ensuring that only authorized parties can access the data.
- *Trusted Execution Environments (TEE)* → add a secure processing environment, protecting data from external threats.

Being a managed Kubernetes solution, the client will not have to deal with infrastructure management and its complexity, as the infrastructural layer is managed by Leonardo throughout the service lifecycle.

The advantages offered are:

- Security and confidentiality of containerized applications: end-to-end encryption, confidential computing for workloads, container isolation on dedicated nodes with hardware-based protection, integrated security policies, and advanced RBAC;
- Centralized control and governance of clusters;
- Scalability and flexibility;
- Integration with multicloud and legacy environments.

15.3 Platform as a Service (PaaS) Services

In the following table, you can consult the services pertaining to the Platform as a Service (PaaS) category.

FAMILY	SUB-FAMILY	SERVICE NOMENCLATURE
Compute	FaaS	Functions as a Service
Security	IAM	Identity & Access Management Service
Security	Key Management	Key Vault as a Service
Middleware	API Platform	PaaS API Management
Middleware	APP Runtime	Jboss as a Service
Middleware	APP Runtime	Spring boot as a Service
Middleware	BPM	PaaS Business Process as a Service
Middleware	CMS	PaaS CMS as a Service
Middleware	ETL	PaaS ETL - Batch / Real Time Processing - 1 worker
Infra & Ops Platform	Multicloud Management	Multicloud Management Platform-Leonardo SCMP

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FAMILY	SUB-FAMILY	SERVICE NOMENCLATURE
Infra & Ops Platform	Multicloud Management	Multicloud Management Platform-Morpheus
Infra & Ops Platform	Observability-Infra	Control Room as Service
Infra & Ops Platform	Observability-Infra	IT infrastructure Service Operations (Logging & Monitoring)
Infra & Ops Platform	TTM	PaaS Ticket Management Service
Infra & Ops Platform	TTM	PaaS Ticket Management Service (ITSM)
Infra & Ops Platform	TTM	PaaS Ticket Management Service (ADD-ON ITOM)
DevSecOps	CI	Configuration Manager
DevSecOps	CI	Test Automation
DevSecOps	CI/CD	DevSecOps As A Service By PSN
DevSecOps	CI/CD	Qualizer DevSecOps
Big Data	Data Lake	Data Lake - 1TB
Big Data	Data Lakehouse	Data Lakehouse
Big Data	Business Intelligence	Business Intelligence
Big Data	ETL	Batch/Real time Processing - 1 Worker
Big Data	Event Platform	Event Message
Big Data	Data Governance	Data Governance
AI	AI - Audio & Conversations	Speech to Text
AI	AI - Image	OCR
AI	AI - Text	AI Search - AI Search - RAG - 10 GB - 1 worker
AI	AI - Text	Text Analytics
AI	AI - Text	Translation
AI	AI - Generative	AI SLM/LLM
AI	AI - Tools	AI workflow
AI	AI - Tools	Vector DB
AI	AI - Tools	AI Platform
VDI	Virtual Desktop	VDI
VDI	Virtual Desktop	VDI with GPU Support
Collaboration	Communication	Instant Messaging

15.3.1 Compute

Below are the sub-families pertaining to the Compute family: - FAAS

15.3.1.1 FAAS

Below is the list of services pertaining to the FAAS sub-family:

- Functions as a Service

"Service Description"

FaaS (Function as a Service) is a system design model, event-driven, executed on stateless containers, where developers create, deploy, and run small, independent functions to perform specific tasks without worrying about the underlying infrastructure. The adoption of FaaS allows for the standardization of application development and execution, centralizing cross-functional capabilities such as orchestration, automatic provisioning, monitoring, integrated service management, and event-driven flow control. It offers tools for:

- centrally manage serverless functions;

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- automate component lifecycle management;
- enable multi-cloud and hybrid cloud portability;
- support innovation with GPU runtimes and dedicated AI tools. The FaaS platform provides and scales underlying resources based on demand. It is ideal for highly dynamic scenarios, with variable workloads, and integrates seamlessly with microservices and event-driven architectures.

"Service Features and Benefits" The service is not limited to providing an execution engine, but offers a complete ecosystem, composed of:

- *Serverless execution* → stateless functions and event-driven workflows, scalable and available in various programming languages.
- *Portability and independence* → executable on any Kubernetes cluster, multi-environment, without lock-in constraints.
- *Security and compliance* → data protection and centralized access management.
- The solution allows organizations to adopt a modern and flexible model, reducing operational complexity and benefiting from a standardized and easily accessible service.

The service is delivered via Apache OpenServerless, an open-source, cloud-agnostic serverless platform based on Apache OpenWhisk as a Function-as-a-Service (FaaS) engine.

The advantages offered are:

- *Reduction of operating costs* → you only pay for the actual use of the functions;
- *Flexibility and scalability* → resources adapt to demand;
- *Operational efficiency* → elimination of direct server management, patching, and updates;
- *High availability* → integrated redundancy and fault tolerance, ensuring high availability of functions even in the event of hardware failures or other interruptions;
- *Accelerated time-to-market* → rapid release of new functionalities without worrying about the infrastructure;
- *Development agility* → focus on code and business logic, not on server management;
- *Continuous innovation* → rapid experimentation with new low-cost services;
- *Competitive advantage* in cost and speed compared to traditional hosting models.

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16 ↗ REST API