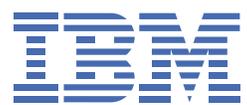


IBM Spectrum Protect Plus
Version 10.1.8

REST API Reference



First edition (April 2021)

This edition applies to version 10, release 1, modification 8 of IBM Spectrum Protect Plus (product number 5737-F11) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this publication

IBM Spectrum® Protect Plus is a data protection solution that provides recovery, replication, retention, and reuse for virtual machines, databases, and containers in hybrid multicloud environments. Data retention, data compliance, and disaster recovery are achieved by copying or archiving data to both on-premises and cloud-based object storage and to IBM Spectrum Protect, including support for physical and virtual tape storage.

IBM Spectrum Protect Plus offers an application programming interface (API) based on Hypertext Transfer Protocol (HTTP) and Representational State Transfer (REST) architecture. APIs using REST architecture and HTTP are often called REST APIs or RESTful APIs.

The REST API and related components comply with the industry standards for HTTP and REST architecture. Here is a list of documents with those standards, as published by the Internet Engineering Task Force (IETF) as Request for Comments (RFCs):

- Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content, IETF RFC 7231
- The JavaScript Object Notation (JSON) Data Interchange Format, IETF RFC 8259
- Common Format and MIME Type for Comma-Separated Values (CSV) Files, IETF RFC 4180

This publication provides information about the IBM Spectrum Protect Plus API based on the RESTful framework. Use the RESTful API to connect your applications to product components in order to query information about objects and to run basic operations by using HTTP protocols and the principles of RESTful API. This API uses RESTful architecture that is designed to interact with web-based applications in a simplified way, by using four basic HTTP methods: GET, POST, PUT, and DELETE.

Attention: The information in this publication was reviewed by subject matter experts, but the instructions have not been rigorously tested in a production environment. The use of this information and the implementation of any of these techniques is a user responsibility and depends upon the user's ability to evaluate and integrate techniques into the user's operational environment.

To keep the examples brief, some of the text related to error checking was omitted.

Overview of the IBM Spectrum Protect Plus REST API

You can invoke actions by using the IBM Spectrum Protect Plus REST API. In IBM Spectrum Protect Plus, you use a **session ID** that is associated with a specific user account to send an HTTP request. After you request a session ID for a user account by providing the user name and password for the account, you must ensure that every HTTP request includes a valid session ID.

Before you begin

Ensure that you have the required permissions for any actions that you are planning. Permission settings for user accounts are managed by role-based access control. For more information, see the IBM Spectrum Protect Plus Installation and User's Guide.

Methodology

Before you develop an application by using the IBM Spectrum Protect Plus REST API, consider using this methodology:

1. Run the procedure that you plan to develop by accessing IBM Spectrum Protect Plus through a web browser. Use several example instances and scenarios.
2. Generalize and design the procedure with the API.

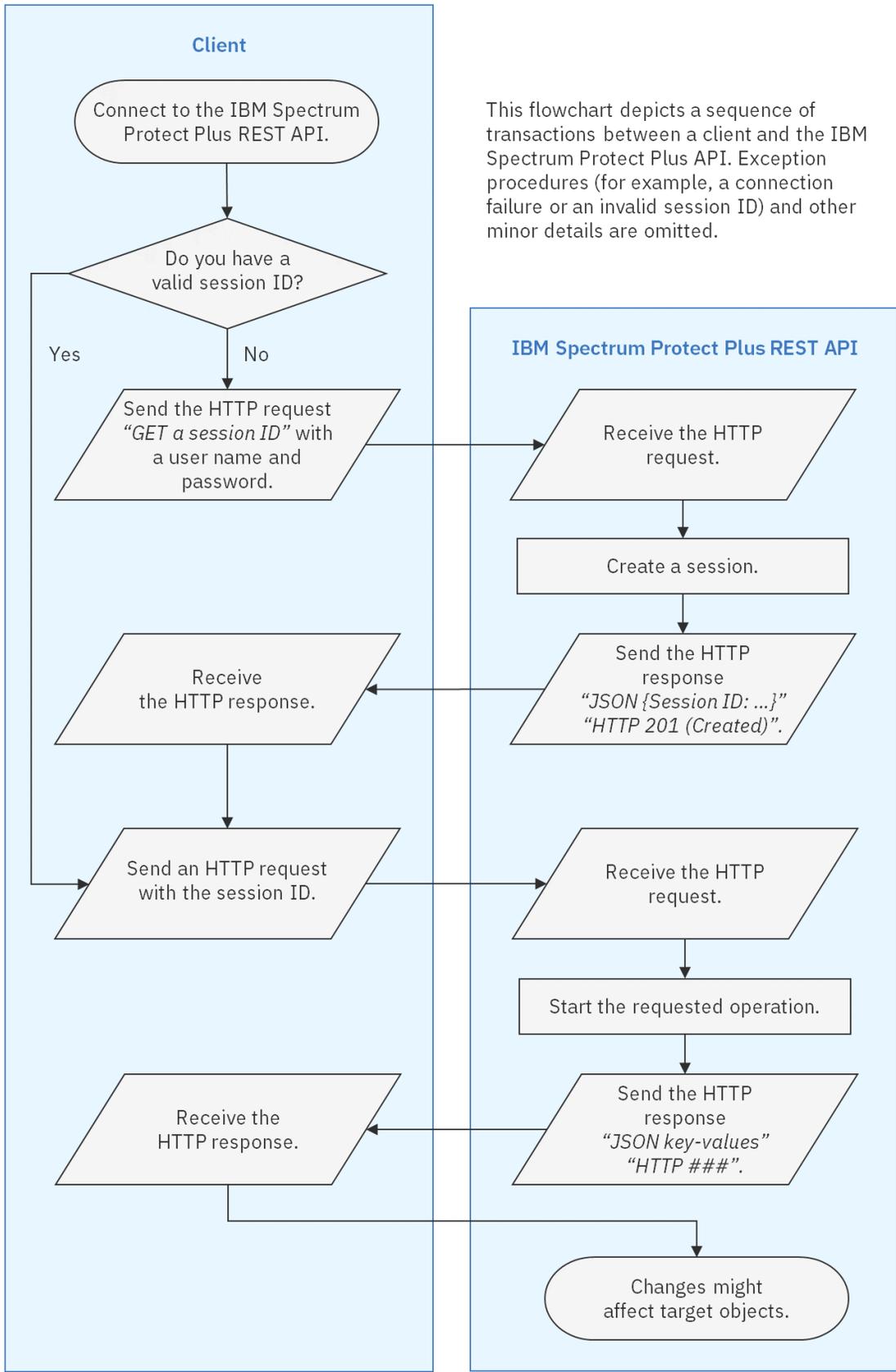
To use the suggested methodology, complete the following steps:

1. Open IBM Spectrum Protect Plus. Open the login page and enter the username and the password of a specific user.

If the credentials are valid, you access the Dashboard page as the user. In the back end, your browser receives 32 hexadecimal characters called session ID from IBM Spectrum Protect Plus and stores the information temporarily. Every session ID is associated with that user. The session ID is valid for 45 minutes. If you navigate to another page in IBM Spectrum Protect Plus, you do not have to enter the username and the password because the session ID in your browser is used automatically. Keep the page open and do nothing for 45 minutes and you will log out of the session automatically.

2. Access the IBM Spectrum Protect Plus REST API. If you have a valid session ID, use it; otherwise, request a new one by sending an HTTP request command with a username and a password, as described in [Creating a session ID](#) (page 19).

You will receive an HTTP response that contains a session ID associated with that user. Use this session ID in your HTTP requests to invoke other actions such as running inventory jobs for hypervisors.



This flowchart depicts a sequence of transactions between a client and the IBM Spectrum Protect Plus API. Exception procedures (for example, a connection failure or an invalid session ID) and other minor details are omitted.

Figure 1: A flowchart of transactions between a client and the IBM Spectrum Protect Plus REST API

Response and request format: JSON

The IBM Spectrum Protect Plus REST API uses JavaScript Object Notation (JSON) for HTTP requests and responses.

Structure of an HTTP response message

The REST API follows a consistent structure for response messages. For example, you might send the following request to IBM Spectrum Protect Plus by using an IP address of 10.0.0.100 to get site information.

```
GET https://10.0.0.100/api/site
```

You receive the following response with the HTTP status code of 200 (OK).

```
{
  "links": {
    "self": {
      "rel": "self",
      "href": "https://10.0.0.100/api/site",
      "hreflang": null,
      "media": null,
      "title": null,
      "type": null,
      "deprecation": null
    },
    "create": {
      "rel": "create",
      "href": "https://10.0.0.100/api/site",
      "hreflang": null,
      "media": null,
      "title": null,
      "type": null,
      "deprecation": null
    }
  },
  "total": 3,
  "sites": [
    {
      "links": {
        "self": {
          "rel": "self",
          "href": "https://10.0.0.100/api/site/1000",
          "hreflang": null,
          "media": null,
          "title": null,
          "type": null,
          "deprecation": null
        },
        "up": {
          "rel": "up",
          "href": "https://10.0.0.100/api/site",
          "hreflang": null,
          "media": null,
```

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```
        "title": null,
        "type": null,
        "deprecation": null
    },
    "edit": {
        "rel": "update",
        ...
    },
    "delete": {
        ...
    },
    "usedby": {
        "rel": "related",
        "href": "http://localhost:8082/api/endeavour/association/
↪resource/site/1000?action=listUsingResources",
        ...
    },
    "resourceprovider": {
        "rel": "related",
        "href": "https://10.0.0.100/api/site/1000/resourceprovider",
        ...
    }
},
"id": "1000",
"name": "Primary",
"description": "Primary Site",
"defaultSite": false,
"throttles": null,
"demo": false,
"rbacPath": "root:0/site:0/site:1000"
},
{...},
{...}
]
}
```

The structure above can be generalized as below:

```
{
  "links": <HATEOAS>,
  "total": <objectCount>,
  "<objectType>": [
    {
      "links": <HATEOAS>,
      "id": <objectId>,
      "name": <objectName>,
      "<requiredKey1>": <requiredValue1>,
      "<requiredKey2>": <requiredValue2>,
      ...,
      "<optionalKey1>": <optionalValue1>,
      "<optionalKey2>": <optionalValue2>,
      ...
    },
    {
      "links": <HATEOAS>,
      "id": <objectId>,
      "name": <objectName>,

```

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```
    "<requiredKey1>": <requiredValue1>,  
    "<requiredKey2>": <requiredValue2>,  
    ... ,  
    "<optionalKey1>": <optionalValue1>,  
    "<optionalKey2>": <optionalValue2>,  
    ...  
  },  
  <object3>,  
  <object4>  
  ...  
]  
}
```

HATEOAS and URI representation

Hypermedia as the Engine of Application State (HATEOAS) is a common methodology to provide users with interfaces of applications using REST architecture. Here is an example in IBM Spectrum Protect Plus. Recall the example response in the previous section and see what actions are represented as URIs based on HATEOAS.

The IBM Spectrum Protect Plus REST API has operation parameters that can transform a JSON object in a response. For details, follow the instructions in Operation parameters for JSON object output (page 363).

Getting started

You can develop an application that interacts with IBM Spectrum Protect Plus via the REST API by using various platforms, programming languages, scripting languages, and development tools.

Developing a client application by using the curl tool

curl is a cross-platform command-line data transfer tool that works well with REST transactions. Mozilla Firefox and Google Chrome can record the browser's HTTP requests and transform the requests into a curl command format. In a shell session, you can invoke the `curl` command and combine it with other text-processing commands such as `grep`. Although working with shell sessions is not suitable for processing large JSON records, it is a good approach to capture a browser's HTTP request in the curl format and modify it to generalize the structure before you actually code them in the production environment such as Python and Java.

This section describes how you can retrieve any actions on the IBM Spectrum Protect Plus web user interface on Mozilla Firefox or Google Chrome, capture their HTTP requests in the curl format, and then reuse them from your shell session. curl supports many platforms, for example:

- Bash on Linux® and Microsoft Windows Subsystems for Linux (WSL) 1
- Z Shell on Apple macOS series
- PowerShell Core and Microsoft Windows PowerShell and Command shell

For more information about curl, see the following documentation:

- `curl.1` the man page

- Everything curl, ISBN 978-91-639-6501-2

Capturing HTTP requests on a web browser

IBM Spectrum Protect Plus offers two user interfaces: the web user interface and the REST API. For scripting, you can take the following approach:

1. From a supported browser, take the action that you want to script and determine the simplest path.
2. Complete the action with multiple scenarios while capturing HTTP transactions.
3. Review the HTTP transactions that you captured.
4. Script the HTTP requests and handle the expected responses.

The supported browsers (Mozilla Firefox, Google Chrome, and Microsoft Edge) have a developer tool that can be used to capture HTTP transactions.

Before you begin

To review the web browsers that are supported for IBM Spectrum Protect Plus Version 10.1.8, see System requirements: IBM Spectrum Protect Plus.

In **Mozilla Firefox**, open **Firefox Developer Tools**. Click the **Network** tab. Click the **Pause/Resume recording network log** button to capture HTTP requests. Take the action that you want to script in the IBM Spectrum Protect Plus web user interface. Click the button again to stop capturing further HTTP requests. Find the relevant HTTP request in the list. Right-click the request, click **Copy > Copy as cURL (POSIX)**. Ensure that the curl command that you have copied works as you expect. Paste the command into a text editor and examine it.

In **Google Chrome**, you can capture HTTP requests in a similar way as in the example with Mozilla Firefox. Open **DevTools**. Click the **Network** tab. Click **Record network log**. In the IBM Spectrum Protect Plus web user interface, take the actions that you want to script. Click **Pause recording network log**. Find the relevant HTTP request in the list. Right-click the request, click **Copy > Copy as cURL (bash)**. Ensure that the curl command you copied works as you expect. Paste the command into a text editor and examine it.

Example: Start an inventory job for hypervisor instances

The following example shows how to capture an HTTP request to invoke an inventory job for hypervisors: VMware or Microsoft Hyper-V.

In your web browser, log in to IBM Spectrum Protect Plus (IPv4 address 10.0.0.100). In the navigation pane, click **Manage Protection > Hypervisors > VMware**. Turn on recording for a network log. Click **Run Inventory**. Turn off the recording mode.

In Mozilla Firefox 81 for Windows 10, for example, you will get the HTTP request and copy it into your system clipboard as a single curl command for POSIX:

```
curl 'https://10.0.0.100/api/endeavour/job/1004?action=start&actionname=start' \  
-H 'User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:81.0) \  
Gecko/20100101 Firefox/81.0' \  
-H 'Accept: application/json' \  
-H 'Accept-Language: en-US,en;q=0.5' \  
--compressed \  
-H 'Content-Type: application/json' \  
-H 'X-endeavour-auditrequest: true' \  

```

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```
-H 'X-Endeavour-Sessionid: 8b56b813936a4957be1db80ca8a8ea0c' \  
-H 'X-Endeavour-Locale: en-us' \  
-H 'Origin: https://10.0.0.100' \  
-H 'DNT: 1' \  
-H 'Connection: keep-alive' \  
-H 'Referer: https://10.0.0.100/' \  
-H 'Pragma: no-cache' \  
-H 'Cache-Control: no-cache' \  
--data ''
```

The curl command is equivalent to the following HTTP request:

Method: POST

URI: https://10.0.0.100/api/endeavour/job/1004

Parameters:

Key	Value
action	start
actionname	start

Tip: URIs are typically encoded with ASCII characters and can include parameters. For information about the syntax of URIs, see the following document, including its errata: Uniform Resource Identifier (URI): Generic Syntax, IETF RFC 3986.

For instructions about decoding URIs, see the following topics:

- Decoding URIs with parameters by using Python (page 12)
- Decoding URIs with parameters by using PowerShell (page 17)

Data: None.

Header:

Key	Value
Accept	application/json
Content-Type	application/json
X-Endeavour-Sessionid	8b56b813936a4957be1db80ca8a8ea0c

Options:

- --compressed

See also:

For more information about the relevant REST API request command, follow the instructions in Running an inventory job for virtualized systems (page 94).

Developing a client application by using Postman

Postman is an API development tool that supports REST APIs. You can use Postman to design scripts that interact with the IBM Spectrum Protect Plus REST API. Postman is a desktop application that runs on the Microsoft Windows, Apple macOS, and Linux operating systems.

After you download Postman from the official site. As soon as you complete the setup and registration steps, you will see a workspace.

Example 1: Get an IBM Spectrum Protect Plus session ID

Assume that you want to get a session ID from the IBM Spectrum Protect Plus virtual appliance whose IPv4 address is 10.0.0.100. If you already have a valid session ID, reuse it and skip this step. For details, follow the instructions in [Creating a session ID](#) (page 19). Launch Postman and open a new workspace.

Set the HTTP method (left of the URL field) to **POST**. Enter the URL:

```
https://10.0.0.100/api/endeavour/session
```

Click **Params** to manage key-value pairs for the *params* field in your HTTP request. You will see the params values being appended to the URL automatically. At this time, leave these fields blank.

Click **Auth** and enter appropriate values:

- **TYPE:** Basic Auth
- **Username:** (A valid username for the target IBM Spectrum Protect Plus application)
- **Password:** (The password for this user)

Click **Send**.

The response body and the HTTP status appear in the response pane. JSON records in the response body are formatted in color and with indentations (pretty-print format). You can collapse and expand nested JSON objects.

In this case, the key-value pair of sessionid should appear in the second line. Copy the value.

Example 2: Get site information

Set the HTTP method to **GET**. Enter the URL:

```
https://10.0.0.100/api/site
```

Click **Auth** and enter appropriate values:

- **TYPE:** API Key
- **Key:** X-Endeavour-Sessionid
- **Value:** (Paste the session ID.)
- **Add to:** Header

Click **Send**.

Ensure that you get the HTTP status of 200 (OK). The response body shows the list of the sites in a JSON format.

Python REST API

By using the Python programming language, you can script a client application that interacts with the IBM Spectrum Protect Plus REST API. The examples in this section and throughout this guide use third-party library Requests for HTTP transactions.

Applicable Python releases: The provided examples are based on the following releases: Python series: Python 3.6, 3.7, 3.8, and 3.9.

Getting a session ID using Python

Assume that you want to work with an IBM Spectrum Protect Plus virtual appliance with the following configuration:

- **IPv4 address:** 10.0.0.100
- **Username:** Sarah
- **Password:** MyPassw0rd!
- **SSL verification:** False, ignore warnings.

The following Python libraries and values to access to the REST API.

```
import json
import requests

spp_ipv4 = '10.0.0.100'
spp_username = 'Sarah'
spp_password = 'MyPassw0rd!'
spp_verify = False           # Disable SSL.

# Suppress HTTPS warnings when spp_verify is set to False.
from requests.packages.urllib3.exceptions import InsecureRequestWarning
requests.packages.urllib3.disable_warnings(InsecureRequestWarning)
```

After the previous script runs, the following Python snippet is used to retrieve a session ID from the target IBM Spectrum Protect Plus application:

```
spp_session = requests.post('https://' + spp_ipv4 + '/api/endeavour/session',
    auth=(spp_username, spp_password),
    headers={
        'Accept': 'application/json',
        'Content-type': 'application/json'
    },
    verify=spp_verify
)

spp_session = json.loads(spp_session.text)    # Convert to JSON
spp_sessionid = spp_session['sessionid']

print(spp_sessionid)
```

```
ee88d182812f49c98bbf9c819d69af07
```

You can use the obtained session ID for subsequent operations. For more information about session IDs, follow the instructions in [Creating a session ID](#) (page 19).

Sending a request to the REST API by using Python

Assume that you append the following Python snippet to the previous script. The snippet sends an HTTP request to the REST API and starts an inventory job for virtualized systems, such as virtual machines hosted on vCenter Server. For more information about this operation, follow the instructions in [Running an inventory job for virtualized systems \(page 94\)](#).

```
_params = {
    "action": "start",
    "actionname": "start"
}

_data = ""

requests.post('https://' + spp_ipv4 + '/api/endeavour/job/1004,
    headers={
        'Accept': 'application/json',
        'Content-type': 'application/json',
        'X-Endeavour-Sessionid': spp_sessionid
    },
    params=_params, data=_data, verify=spp_verify
)
```

The structure of this POST command is similar to the command for getting a session ID except for the URI and the session ID in the header.

The IBM Spectrum Protect Plus REST API has a consistent structure. You can use Python scripts that are similar to this example to develop applications that send requests to the REST API. You can enhance those basic structures with many other methods and mechanisms that are available in Python and its third-party libraries.

Decoding URIs with parameters by using Python

You can decode URI strings with parameters by using Python snippets.

Assume that you captured the following HTTP request by using Mozilla Firefox:

```
curl 'https://10.0.0.100/api/hypervisor?from=hlo&pageSize=100&
↪sort=%5B%7B%22property%22:%22name%22,%22direction%22:%22ASC%22%7D%5D&
↪filter=%5B%7B%22property%22:%22type%22,%22value%22:%22vmware%22,
↪%22op%22:%22=%22%7D%5D'
-H 'User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:71.0) ...'
...
```

A Python snippet that is similar to the following example can be used to decode the URI string:

```
import urllib.parse

uri_original = "https://10.0.0.100/api/hypervisor?" \
    + "from=hlo&" \
    + "pageSize=100&" \
    + "sort=%5B%7B%22property%22:%22name%22,%22direction%22:%22ASC%22%7D%5D&" \
    + "filter=%5B%7B%22property%22:%22type%22,%22value%22:%22vmware%22," \
    + "%22op%22:%22=%22%7D%5D"

uri_decoded = urllib.parse.unquote(uri_original)

print(uri_decoded)
```

The request prompts a response that is structured as shown:

```
https://10.0.0.100/api/hypervisor?from=hlo&pageSize=100&
↵sort=[{"property":"name","direction":"ASC"}]&
↵filter=[{"property":"type","value":"vmware","op":"="}]
```

Developing a client application with the JupyterLab application

You can develop an API by using JupyterLab, a notetaking application for scripting languages that runs in a web browser. When you develop APIs, you typically work in a command-line shell interface at the beginning, and then switch between the shell session and the editor. By using JupyterLab, you can view all information that you require in a single window to streamline the development process.

Installing, starting, and using JupyterLab

Before you can use JupyterLab for API development, you must install and start the application.

To install JupyterLab, follow the instructions in the online product documentation.

To start JupyterLab, issue the following command:

```
$ jupyter lab &
```

The output is similar to the following example:

```
JupyterLab server extension not enabled, manually loading...
...
[C 15:12:05.230 LabApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
    http://localhost:8888/?token=92bd5725f58178bd226ae4303fa0dff0e4ee820815831669
```

Open the URL from a web browser on the workstation where JupyterLab is installed. Verify that you can view the JupyterLab web interface.

To start using JupyterLab, create a notebook with a Python 3 kernel. You can add more kernels such as PHP Hypertext Processor. In the notebook, you can write scripts, run the scripts by using the kernel, and view the result. You can also add texts in a Markdown format.

Using Python Virtual Environments for Jupyter Kernel

If you plan to use non-standard libraries such as Requests and Paramiko, set up a Python Virtual Environment where you can conveniently maintain those libraries. The starting point is to create a Python Virtual Environment. Then, in JupyterLab, you create a kernel that uses this virtual environment.

As an example, assume that you created a Python Virtual Environment and logged in to it:

```
$ python3 -m virtualenv py36_venv
$ source ./py36_venv/bin/activate
```

Continuing with this example, you can now add a kernel with the Python Virtual Environment to your JupyterLab application:

```
(py36_venv) $ ipython kernel install --user --name=py36_venv
```

To verify the configuration, you would return to your web browser and ensure that the kernel `py36_venv` is available in the kernel list. To see a list of kernels with paths, issue the following command:

```
$ jupyter kernelspec list
```

The output is similar to the following example:

```
jupyter kernelspec list
Available kernels:
  py36_venv      /home/sarah/.local/share/jupyter/kernels/py36_venv
  php            /home/sarah/.ipython/kernels/php
  ruby          /home/sarah/.ipython/kernels/ruby
```

Collaborating with multiple users in a JupyterLab workspace

You can run JupyterLab on a remote server and allow multiple users to access the same workspace. This approach is useful for sharing resources such as JupyterLab notebooks, Python scripts, and virtual environment.

Assume that you want to run JupyterLab on a CentOS Linux server: `sarah@10.0.0.110`. From your client workstation, establish a Secure Shell (SSH) connection to the server and let localhost use the port 8080 (HTTPS):

```
$ ssh -N -L 8080:localhost:8080 sarah@10.0.0.110
```

Then, establish another SSH connection to this server and run JupyterLab with the following commands:

```
$ ssh sarah@10.0.0.110
```

```
$ jupyter lab --no-browser --port 8080 &
```

From a web browser, open JupyterLab. Ensure that the host name `localhost` on port 8080 connects to the remote server.

Invite other users to connect to the remote server and share your resources with them.

PowerShell REST API

By using the PowerShell scripting language, you can develop a client application that interacts with the IBM Spectrum Protect Plus REST API.

Applicable PowerShell releases: The provided examples are based on PowerShell Core 7.0 and 7.1.

Getting a session ID by using PowerShell

Assume that you want to work with an IBM Spectrum Protect Plus virtual appliance with the following configuration:

- **IPv4 address:** 10.0.0.100
- **Username:** Sarah
- **Password:** MyPassw0rd!
- **SSL verification:** False, ignore warnings.

The following PowerShell script loads values to access the REST API.

```
$sppUrl      = "https://10.0.0.100"
$sppUsername = "Sarah"
$sppPassword = ConvertTo-SecureString -String "MyPassw0rd!" -AsPlainText -Force
$sppCred     = New-Object `
    -TypeName System.Management.Automation.PSCredential `
    -ArgumentList ($sppUsername, $sppPassword)

$sppResponse = Invoke-RestMethod `
    -Method Post `
    -Uri $($sppUrl + '/api/endeavour/session') `
    -Authentication Basic `
    -Credential $sppCred `
    -Headers @{
        'Accept'          = 'application/json'
        'Content-type'    = 'application/json'
    } `
    -SkipCertificateCheck

Write-Output $sppResponse
```

The request prompts a response that is structured as shown:

```
sessionid      : db13bc848462424d919afef01ec691cd
user           : @{links=; name=sppadmin; type=NATIVE_USER; ..., id=1000}
demo          : False
preferences    : @{inactivityTimeout=30; ...; minPasswordLength=8}
tenantAdmin    : True
userGroups     : {}
timeZone       : UTC
useServerTime  : False
passwordExpired : False
usernameExpired : False
accountDisabled : False
passwordAge    : 0
passwordExpiresAt : 0
```

After the previous script runs, the following PowerShell snippet is used to retrieve a session ID from the target IBM Spectrum Protect Plus application:

```
$sppSessionid = $sppResponse.sessionid

Write-Output $sppSessionid
```

```
db13bc848462424d919afef01ec691cd
```

You can use the obtained session ID for subsequent operations. For more information about session IDs, follow the instructions in [Creating a session ID \(page 19\)](#).

Sending a request to the REST API by using PowerShell

Assume that you append the following PowerShell snippet to the previous script. The snippet sends an HTTP request to the REST API to display a list of jobs:

```
$sppHeaders = @{
    'X-Endeavour-Sessionid' = $sppSessionid
    'Accept'                = 'application/json'
    'Content-type'          = 'application/json'
}

$sppResponse = Invoke-RestMethod `
    -Method Get `
    -Uri $($sppUrl + '/api/endeavour/job/') `
    -Headers $sppHeaders `
    -SkipCertificateCheck

Write-Output $sppResponse
```

The request prompts a response that is structured as shown:

```
links                total page jobs
-----
@{self=; up=; create=; stats=}      4    1  {@links=; name=Maintenance; ...}
```

The jobs object is formatted in JSON. Get this object and convert it to a system array:

```
$sppJobs = $sppResponse.jobs | ConvertTo-JSON | ConvertFrom-JSON

Write-Output $sppJobs
```

The request prompts a response that is structured as shown:

```
links                : @{self=@{rel=self; href=https://10.0.0.100/...
name                 : Maintenance
description           : Auto-generated job for maintenance
policyId             : 1001
...

links                : ...
name                 : Storage Server Inventory
description           : Auto-generated job for maintenance
policyId             : 1002
...

links                : ...
name                 : Hypervisor Inventory
description           :
policyId             : 1003
...

links                : ...
name                 : Application Server Inventory
description           :
```

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Dashboard and session management

With the REST API, you can complete operations to log in to the IBM Spectrum Protect Plus application and use some widgets in the Dashboard page.

Sessions

You must have a valid session ID for operations such as starting a backup job.

For operations, you also must ensure that users have appropriate permission settings. Permission settings for user accounts are managed by role-based access control. For instruction about managing user accounts, follow the instructions in Accounts (page 287).

Creating a session ID

You can use the REST API to create a session and obtain the session ID.

Method and URI

To create a session, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/endeavour/session
```

This is the only request type of the REST API that does not require a session ID, but does require a username and a password.

Parameters

None.

Example: Create a new session

Assume that you want to create a session for the following IBM Spectrum Protect Plus application and the following user:

- IBM Spectrum Protect Plus
 - **IPv4 address:** 10.0.0.100
 - **SSL authentication:** Disable
- User
 - **User name:** Sarah
 - **Password:** MyPassw0rd!

A Python snippet that is similar to the following example can be used to request a new session ID from IBM Spectrum Protect Plus. As you can see, the headers section does not include the X-Endeavour-Sessionid key-value pair. The script results in a lengthy JSON object with the new session ID.

```

import json
import requests

spp_ipv4 = '10.0.0.100'
spp_username = 'Sarah'
spp_password = 'MyPassw0rd!'
spp_verify = False    # Disable SSL.

# Ignore warning for SSL not being used
from requests.packages.urllib3.exceptions import InsecureRequestWarning
requests.packages.urllib3.disable_warnings(InsecureRequestWarning)

_requests = requests.post('https://' + spp_ipv4 + '/api/endeavour/session',
    auth=(spp_username, spp_password),
    headers={
        'Accept':          'application/json',
        'Content-type':    'application/json'
    },
    params="", data="", verify=spp_verify)

_response = json.loads(_requests.text)    # Convert to JSON

```

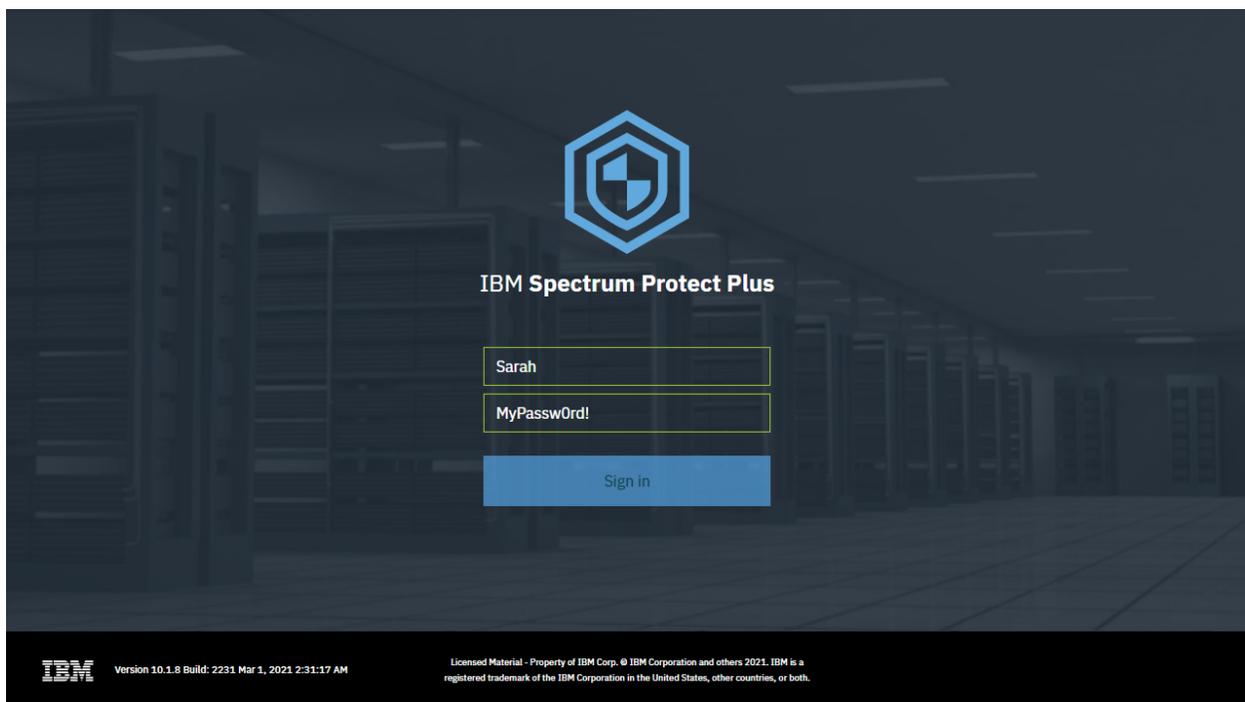


Figure 2: The same action can be taken in the IBM Spectrum Protect Plus web user interface: Open IBM Spectrum Protect Plus, enter the username and password, and click **Sign in**. If the authentication is successful, your browser receives a session ID that is associated with this user account.

You will get the session information associated with this user.

```

{
  "sessionid": "43b3b1b2cc434f4eb1b9df8c99e7866f",
  "user": {

```

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```
"links": {...},
"name": "Sarah",
"type": "NATIVE_USER",
"typeDisplayName": "Native User",
"tenantId": 1000,
"loginCount": 24,
"lastLogin": 1573480672249,
"failedLogin": 0,
"lastFailedLogin": 1572752667593,
"lastPasswordUpdate": 1564686262606,
"passwordAge": 0,
"passwordExpiresAt": 0,
"passwordExpired": false,
"accountDisabled": false,
"accountLocked": false,
"rbacPath": "user:0/user:1000",
"permissions": [
  {
    "resourcePool": {
      "links": {...},
      "name": "All Resources",
      "description": "Includes every resource in the system. ",
      "total": 0,
      "resources": [
        {
          "metadata": {},
          "include": true,
          "path": "root:0",
          "displayName": "Unknown"
        }
      ],
      "rbacPath": "resourcepool:0/resourcepool:1001",
      "id": "1001"
    },
    "roles": [
      {
        "links": {...},
        "name": "SUPERUSER",
        "type": "BUILTIN",
        "description": null,
        "displayName": "SUPERUSER",
        "rbacPath": "role:0/role:1000",
        "id": "1000",
        "virtualresources": []
      }
    ],
    "permissionIds": [],
    "roleIds": []
  }
],
"personas": [],
"metadata": {
  "quickStartAtLogin": true,
  "jobStatusPeriod": 12,
  "whatsNewBanner": "10.1.5",
  "jobLogTypes": [
    "INFO",
```

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```
        "WARN",
        "ERROR",
        "SUMMARY"
    ],
    "jobLogTypes_JobsOps": [
        "INFO",
        "WARN",
        "ERROR",
        "SUMMARY"
    ],
    "jobHistoryStatusPeriod": 12,
    "initialLogin": 1567668700334,
    "feedbackLastShown": 1570438820557
  },
  "id": "1000"
},
"demo": false,
"tenantAdmin": true,
"userGroups": [],
"timeZone": "UTC",
"useServerTime": false,
"passwordExpired": false,
"usernameExpired": false,
"accountDisabled": false,
"passwordAge": 0,
"passwordExpiresAt": 0
}
}
```

Normally, you want to get only the session ID, which is represented by the value of `sessionid`:

```
_session_id = _response['sessionid']
print(_session_id)
```

```
43b3b1b2cc434f4eb1b9df8c99e7866f
```

Use this session ID value in the header of future requests:

```
_header={
  'X-Endeavour-Sessionid': _session_id,
  'Accept': 'application/json',
  'Content-type': 'application/json'
}
```

Alerts

Alerts are warning and error messages in the IBM Spectrum Protect Plus environment.

For detailed documentation about messages, see the IBM Spectrum Protect Plus Installation and User's Guide.

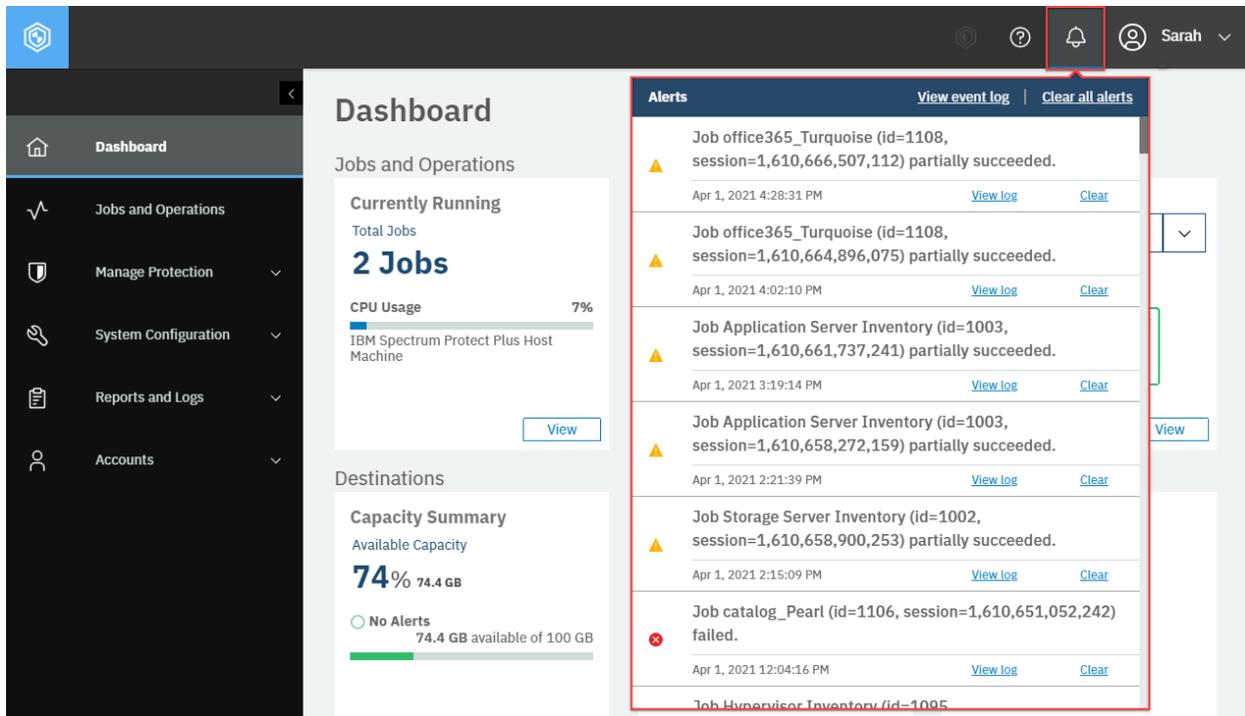


Figure 3: To view alerts in the IBM Spectrum Protect Plus web user interface, in the menu bar, click the Alerts icon.

In the web user interface, you can see the latest 99 alerts. In the REST API, you can view all alerts.

Getting alert information

You can get a list of alerts and information about each alert.

Tip: To get alert information in CSV format, follow the instructions in Getting alert information in CSV format (page 25).

Method and URI

To get information about all alerts in JSON format, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/alert/message
```

Parameters

You can use the operation parameters that are described in Operation parameters for JSON object output (page 363).

Data

None.

Example: Get alert information in JSON format

The following Python snippet requests a list of all alerts and information about each alert.

```
requests.get('https://' + spp_ipv4 + '/api/endeavour/alert/message',  
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 2584,  
  "unacknowledged": 467,  
  "page": 1,  
  "alerts": [  
    {  
      "links": {...},  
      "name": "JOB_PARTIAL",  
      "alertTime": 1564688662492,  
      "category": "JOB",  
      "categoryDisplayName": "JOB",  
      "type": "WARN",  
      "typeDisplayName": "WARN",  
      "initialMessage": "Job Application Server Inventory (id=1003, session=1,564,688,656,142) partially succeeded.",  
      "message": "Job Application Server Inventory (id=1003, session=1,564,688,656,142) partially succeeded.",  
      "messageName": "ALERT_JOB_PARTIALLY_SUCCEEDED",  
      "messageParams": [  
        "Application Server Inventory",  
        "1003",  
        1564688656142  
      ],  
      "initMessageParams": [  
        "Application Server Inventory",  
        "1003",  
        1564688656142  
      ],  
      "dataSource": "Application Server Inventory:1564688656142",  
      "status": "ACTIVE",  
      "statusDisplayName": "ACTIVE",  
      "storageId": null,  
      "serverId": null,  
      "jobId": "1003",  
      "jobSessionId": 1564688656142,  
      "retention": 180,  
    }  
  ]  
}
```

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```
        "first": 1564688662492,  
        "last": 1564688662492,  
        "expiresAt": 1580240662519,  
        "count": 1,  
        "acknowledged": true,  
        "expired": false,  
        "unique": true,  
        "id": "5d4341166dde3d12afd8b11f"  
    },  
    {...}, {...}, ..., {...}  
]  
}
```

Getting alert information in CSV format

You can get a list of alerts in CSV format. The CSV data will be shown in the response body.

Tip: This feature is not available in the web user interface.

Method and URI

To get information about all alerts, use a GET method and a URI:

```
GET      https://{hostname|IPv4}/api/endeavour/alert/message/download/csv
```

Parameters

None.

Data

None.

Example: Get alert information in CSV format

In this example, a Python snippet is used to get information about alerts in CSV format.

```
_response = requests.get('https://' + spp_ipv4  
    + '/api/endeavour/alert/message/download/csv',  
    headers={...}, verify=...)  
  
print(_response.text)
```

The request prompts a response as shown, with the HTTP status of 200 (OK). The columns Time and Last are in the UNIX time format followed by three digits, which represent milliseconds.

Tip: The response body can be extremely large.

```
Time,ReadableTime,Name,Category,Type,DataSource,First,ReadableFirst,Last,Readabl
↵elast,Level,Message
1564775266973,Fri 2 Aug 2019 19:47:46 UTC,JOB_FAILED,JOB,ERROR,onDemandRestore_1
↵564775110936:1564775111170,1564775266973,Fri 2 Aug 2019 19:47:46 UTC,1564775266
↵973,Fri 2 Aug 2019 19:47:46 UTC,0,Job onDemandRestore_1564775110936 (id=1007 se
↵ssion=1564775111170) failed.
...
```

You can load a CSV table into spreadsheet applications, such as Microsoft Excel. To learn how to load a CSV table into a spreadsheet, see the documentation for the spreadsheet application.

Jobs and Operations

Most actions in IBM Spectrum Protect Plus are defined as jobs.

For example, assume that you associate some VMware instances with an SLA Gold policy. IBM Spectrum Protect Plus creates a job, names it “vmware_Gold”, and starts this job at the scheduled day and time, as defined in the SLA policy. You can pause and resume this scheduled job, and you can start it manually as well. The job can run multiple times, and for each time, IBM Spectrum Protect Plus creates and manages a job session. Every job session has a job log that contains records of actions that were taken. If a job session fails, you can see the job log and identify the cause of the failure.

Running Jobs

You can get a list of active and ended jobs with brief information for each job. You can also cancel a running job.

Getting job session information

You can get information about job sessions. IBM Spectrum Protect Plus assigns a `{jobsessionId}` for every job and stores the information about the job. The information includes the type of job, the start time, the end time, and the job status: RUNNING, PARTIAL, COMPLETED, and so on.

Method and URI

To get information about job sessions, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/jobsession
```

To get information about a specific job session, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/jobsession/{jobsessionId}
```

You can get the `{jobsessionId}` of the specific job session from the list of all job sessions.

Parameters

Parameter 1: pageStartIndex

By default, the REST API splits the response body every 100 records. To see the next 100 records, use this parameter to see the other 100 records from the given index value. Index values are assigned to all records, starting with zero. Therefore, to see the 101st through the 200th records, use 100 for the pageStartIndex value.

- **Value Example:** 100
- **Type:** String. Available in the web user interface.

Parameter 2: filter

Filter the results by specifying criteria.

- **Example value:** Use the following value to get results that has the all status types:

```
[
  {
    "property": "status",
    "value": [
      "RUNNING", "PENDING", "HELD", "WAITING", "PAUSING", "PAUSED",
      "STOPPING", "STOPPED", "CANCELING", "CANCELED", "SUSPENDING",
      "SUSPENDED", "FAILED", "PARTIAL", "COMPLETED", "UNKNOWN"
    ],
    "op": "IN"
  }
]
```

- **Type:** List. Available in the web user interface.

Parameter 3: sort

By default, job session records are sorted by the start time, in ascending order, from the oldest record to the latest record. Use this parameter to sort the job session records in descending order.

- **Value:**

```
[
  {
    "property": "start",
    "direction": "DESC"
  }
]
```

- **Type:** Array. Available in the web user interface.

Data

None.

Example 1: Get information about all job sessions

Assume that you want to get a list of all job session records. Also assume that you want to sort job session records by the start time, in descending order, so that the latest jobs are at the top of the results.

The following Python snippet requests a list of all job session records and sorts them by start time in descending order:

```
_params = (
    ('sort', '[\
      {\
        "property": "start",\
        "direction": "DESC"\
      }\
    ]'),
)

requests.get('https://' + spp_ipv4 + '/api/endeavour/jobsession',
             headers={...}, params=_params, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```

{
  "links": {...},
  "total": 4877,
  "page": 1,
  "sessions": [
    {
      "links": {...},
      "jobName": "Application Server Inventory",
      "jobId": "1003",
      "type": "catalog",
      "typeDisplayName": "Catalog",
      "subType": "application",
      "subTypeDisplayName": "Application",
      "subPolicyType": null,
      "subPolicyTypeDisplayName": null,
      "serviceId": "serviceprovider.catalog.application",
      "displayName": null,
      "start": 1577881234,
      "end": 1577882234123,
      "duration": 1000000,
      "status": "PARTIAL",
      "statusDisplayName": "Partial",
      "indexStatus": "COMPLETED",
      "description": "Autorun - 10.4.4.1 only",
      "results": "Started",
      "properties": null,
      "numTasks": 2,
      "previousLastTask": 0,
      "lastUpdate": 1577882235123,
      "percent": 0,
      "expiresAt": null,
      "expirationTime": null,
      "retention": 0,
      "retentionUnit": null,
      "expired": false,
      "hasCatalog": false,
      "hasCondensed": false,
      "wormProtected": false,
      "rerunnable": false,
      "userUpdate": false,
      "actions": [],
      "statistics": null,
      "policySnapshot": {
        "id": "1003",
        "name": "Application Server Inventory",
        "type": "catalog",
        "subType": "application",
        "serviceId": "serviceprovider.catalog.application",
        "version": null,
        "spec": {
          "source": [
            {
              "href": "http://localhost:8082/api/appserver/1001",
              "resourceType": "appserver",
              "name": "10.4.4.1",
              "id": "1001",
              "include": true,

```

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```
        "metadata": {
            "path": ":",
            "name": "10.4.4.1"
        }
    },
    "option": {
        "retention": "3",
        "maxtasks": 50
    },
    "notification": [],
    "applicationtype": "oracle"
},
"description": "",
"script": null
},
"id": "1564688656142"
},
{...}, ..., {...}
]
}
```

The first job session record in the response body contains information that includes the following items:

- **Job name:** Application Server Inventory
- **Start time:** 1577881234123 (1 January 2020 at 6:20:34:123 AM US-CST)
- **End time:** 1577882234123 (1 January 2020 at 6:37:14:123 AM US-CST)
- **Duration:** 1,000,000 milliseconds (16 minutes and 40 seconds)
- **Status:** Partial
- `{jobsessionId}`: 1564688656142

The `total` value in the response indicates that there are 4,877 job session records. By default, the REST API splits the response body every 100 records. The response contains only the first 100 job session records. To see the next 100 records, use the following Python snippet:

```
_params = {
    "pageStartIndex": 100
}

requests.get('https://' + spp_ipv4 + '/api/endeavour/jobsession',
             headers={...}, params=_params, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200. As you see in the response body below, the page number increased to 2.

```
{
    "links": {...},
    "total": 4877,
    "page": 2,
    "sessions": [{...}, ..., {...}]
}
```

To see page 3 for the records of the 201st through the 300th, increase the `pageStartIndex` value to 200.

Example 2: Get information about a specific job session

Assume that you want to track one of the job sessions, and you have the {jobsessionId}: 1564688656142.

A Python snippet that is similar to the following example can be used to request the information about this job session:

```
jobsession_id = "1564688656142"

requests.get('https://' + spp_ipv4 + '/api/endeavour/jobsession/'
            + jobsession_id,
            headers={...}, verify=...)
```

You will get the job session record, with the HTTP status of 200 (OK).

Example 3: Get information about job sessions that are running

Assume that you want to get information about job sessions that are running or that will run shortly. In this case, you have to use the `filter` parameter to select only the job sessions that have the status value of RUNNING, PENDING, HELD, or CANCELING.

A Python snippet that is similar to the following example can be used to provide the filtered information:

```
_params = (
    ('sort', '[\
        {\
            "property": "start",\
            "direction": "DESC"\
        }\
    ]'),
    ('filter', '[\
        {\
            "property": "status",\
            "value": ["RUNNING", "PENDING", "HELD", "CANCELING"],\
            "op": "IN"\
        }\
    ]'),
)

requests.get('https://' + spp_ipv4 + '/api/endeavour/jobsession',
            headers={...}, params=_params, verify=...)
```

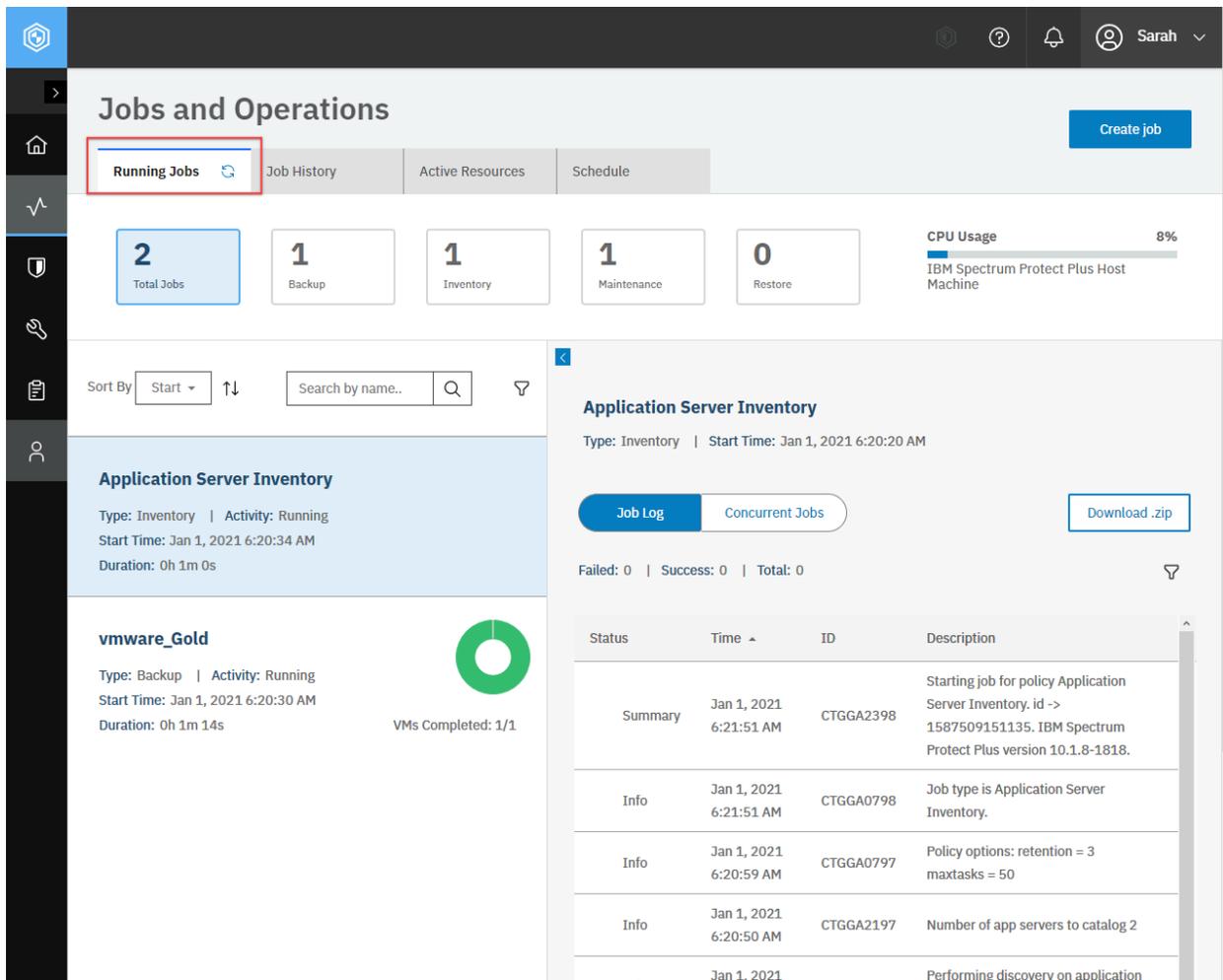


Figure 4: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Jobs and Operations** and ensure that the **Running Jobs** tab is displayed.

The request prompts a response that is similar to the response body in Example 1, with the HTTP status of 200 (OK). All of the job session records have the status value of RUNNING, PENDING, HELD, or CANCELING.

Canceling a job

You can cancel a job that has the status of running, pending, or paused schedule. If you cancel a running backup job, you can retain the partial data backup.

Method and URI

To cancel a job, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/endeavour/jobsession/{jobsessionId}
```

Tip: To get a {jobsessionId}, follow the instructions in Getting job session information (page 27).

Parameters

Parameter: action

You must specify the action parameter to cancel the job.

- **Value:** cancel
- **Type:** String. Required. Available in the web user interface.

Data

Data: catalogCompletedObjects

For backup jobs, enable this value to keep the data that was backed up.

- **Example value:** true
- **Type:** Boolean. Available in the web user interface.

Example: Cancel a job

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to cancel the backup job ({jobsession_id} 1577841955375).

```
jobsession_id = "1577841955375"
_params = {"action": "cancel"}
_data = f'''{{
    "catalogCompletedObjects": true
}}'''
requests.post('https://' + spp_ipv4 + '/api/endeavour/jobsession/'
              + jobsession_id,
              headers={...}, params=_params, data=_data, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 201 (Created). The job status must change from running to canceling.

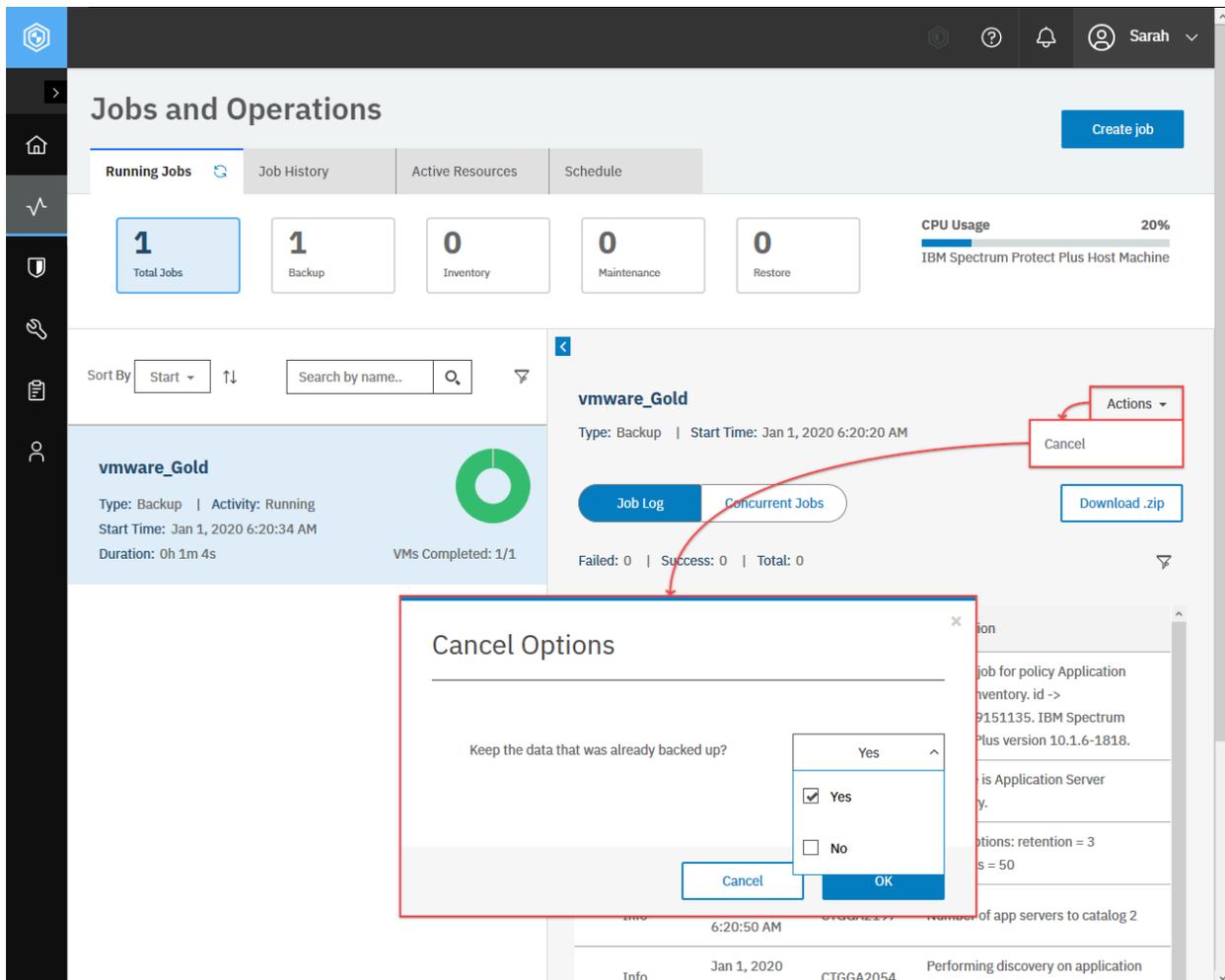


Figure 5: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Jobs and Operations** pane, ensure that the **Running Jobs** tab is displayed. Select the job to cancel, and click **Actions > Cancel**. Optionally, you can specify whether to keep data from backup jobs.

Job History

Each job is done by proceeding a series of actions. These actions are recorded in a job log which is created for each job. You can troubleshoot unsuccessful jobs by seeing their job logs and identify root causes.

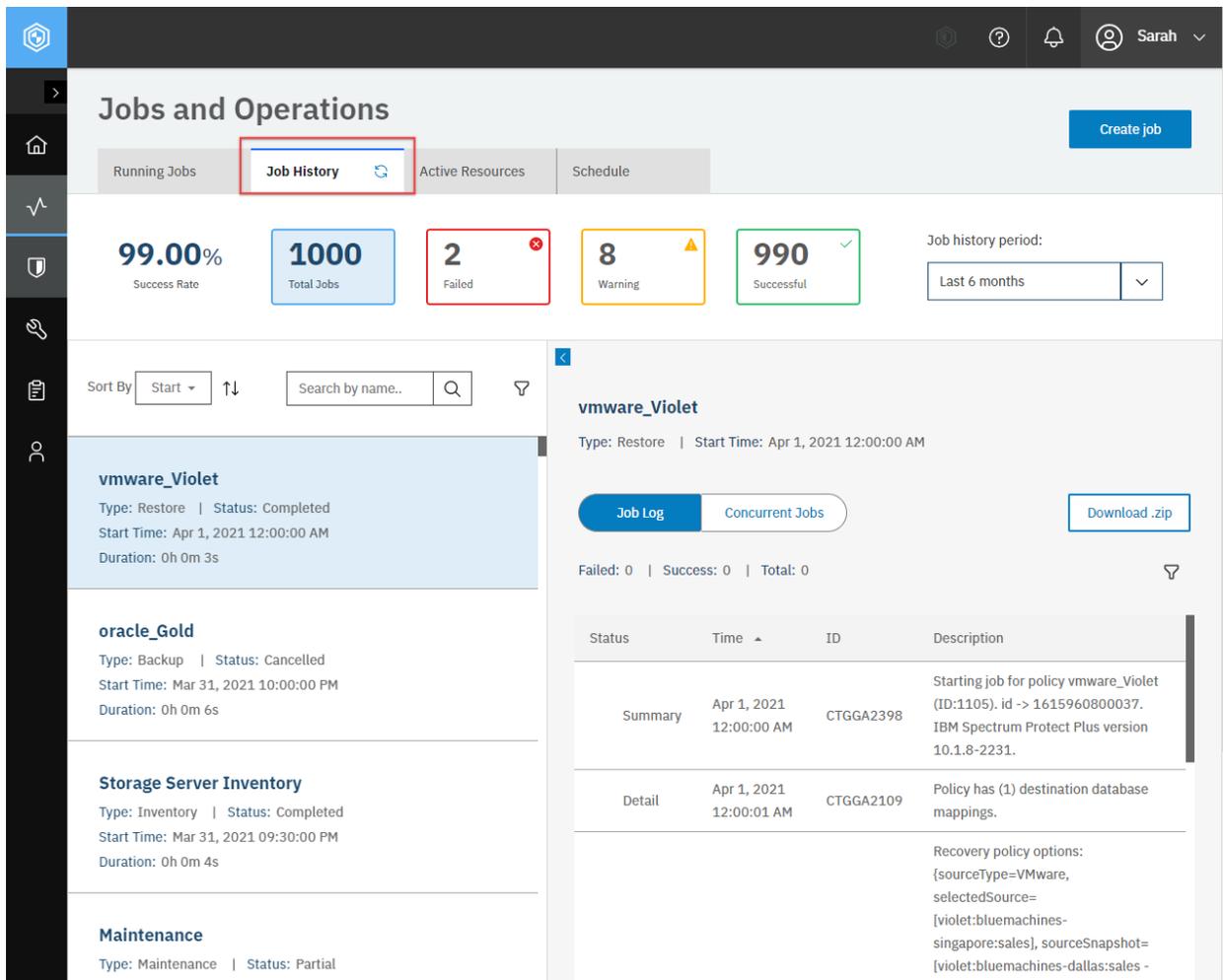


Figure 6: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Jobs and Operations** and click the **Job History** tab.

Getting a log for a job session

You can get a detailed log for a job session. You can get a log in JSON format or CSV format.

Method and URI

To get a log of job sessions in JSON format, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/log/job
```

To get a log of job sessions in CSV format, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/log/job/download/csv
```

Tip: To get a {jobsessionId}, follow the instructions in Getting job session information (page 27).

Parameters

Parameter: filter

Filter results by specifying criteria.

- **Example value:** Use the following value to get results for a job session with a `{jobsessionId}` of 1577841955375:

```
"filter": [  
  {  
    "property": "jobsessionId",  
    "value": "1577841955375",  
    "op": "="  
  }  
]
```

- **Type:** JSON object. Required.

Data

None.

Example: Get a log for a job session in CSV format

A Python snippet that is similar to the following example can be used to request a log for a job session (`{jobsessionId}` 1577841955375):

```
jobsessionId = "1577841955375"  
  
_params = {  
    "filter": f'''[  
        {{  
            "property": "jobsessionId",  
            "value": "{jobsessionId}",  
            "op": "="  
        }}  
    ]'''  
}  
  
_response = requests.get('https://' + spp_ipv4  
    + '/api/endeavour/log/job/download/csv',  
    headers={...}, params=_params, verify=...)  
  
print(_response.text)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
Type,Time,Server Time,Task ID,Message ID,Message  
SUMMARY,1577841955375,Wed 1 Jan 2020 01:25:55 UTC,,CTGGA2399,Starting job ...  
DETAIL,1577841957287,Wed 1 Jan 2020 01:25:57 UTC,2,CTGGA0171,Job options : ...  
...
```

Getting progress information about job sessions

You can get progress information about job sessions.

Method and URI

To get a list of jobs with progress information for each item, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/progress
```

Parameters

Parameter 1: pageSize

Specify the maximum number of objects for each page.

- **Example value:** 100
- **Type:** Integer.

Parameter 2: filter

Filter results by specifying criteria.

- **Example value:** Assume that you want to filter jobs by using the following criteria:
 - **Job status:** Failed, aborted, partial, or canceled
 - **Job types:** Virtualized systems
 - **{jobsessionId}:** 1610664896075

You can use the following JSON object:

```
"filter": [
  {
    "property": "summaryStatus",
    "value": "[\"complete\", \"partial\", \"failed\", \"skipped\"]",
    "op": "IN"
  },
  {
    "property": "type",
    "value": "HYPERVISORVM",
    "op": "="
  },
  {
    "property": "sessionId",
    "value": "1610664896075",
    "op": "="
  }
]
```

- **Type:** List.

See also:

For information about operations parameters for JSON object output, filtering, sorting, and pagination, follow the instructions in Operation parameters for JSON object output (page 363).

Parameter 2.1: filter > List > JSON object: summaryStatus

Filter previous jobs based on status. You can use the following values for the summaryStatus key:

summaryStatus value	Job status
complete	Completed
partial	Partial
skipped	Canceled
failed	Failed or aborted
running	Running
pending	Pending

- **Type:** JSON object.

Parameter 2.2: filter > List > JSON object: type

Filter jobs based on type. Use the following values for the type key:

type value	Job type
HYPERVISORVM	Virtualized systems (VMware vCenter, Hyper-V, and Amazon Elastic Compute Cloud, EC2)
INSTANCES	Cloud management (Microsoft 365)
DATABASE	(All other types)

- **Type:** JSON object.

Parameter 2.3: filter > List > JSON object: sessionId

Filter JSON objects based on {jobsessionId}.

- **Type:** JSON object.

Tip: To get a {jobsessionId}, follow the instructions in Getting job session information (page 27).

Parameter 3: sort > List > JSON object: id

Sort job items by IDs, which are based on the start time of the job.

- **Example value:** Use the following JSON object to sort the job items by their start time in descending order:

```
{
  "property": "id",
  "value":    "DESC"
}
```

- **Type:** JSON object. Available in the web user interface.

Data

None.

Example 1: Get progress information about incomplete jobs for virtualized systems

Assume that IBM Spectrum Protect Plus was used to run jobs, such as backup jobs for VMware vCenter objects, and you want to get progress information based on the following criteria:

- **Pagination:** 10 records per page, get the records between the 1st and 10th
- **Job status:** Failed, aborted, partial, or canceled
- **Job types:** Virtualized systems
- **Sorting order:** Sort the records by their start time in ascending order

Tip: The response body can be extremely large. Use filters and pagination.

A Python snippet that is similar to the following example can be used to request a list of jobs with progress information:

```
_params = {
    "pageSize": 10,
    "pageStartIndex": 0,
    "filter": {
        json.dumps([
            {
                "property": "summaryStatus",
                "value": ["failed", "partial", "skipped"],
                "op": "IN"
            },
            {
                "property": "type",
                "value": "HYPERVISORVM",
                "op": "="
            }
        ])
    },
    "sort": {
        json.dumps([
            {
                "property": "id",
                "direction": "ASC"
            }
        ])
    }
}

_response = requests.get('https://' + spp_ipv4
    + '/api/progress',
    headers={...}, params=_params, verify=...)

print(_response.text)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
    "links": {
        "self": {
            "rel": "self",
            "href": "https://10.0.0.100/api/progress",
```

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```

        "hreflang": null,
        "media": null,
        "title": null,
        "type": null,
        "deprecation": null
    }
},
"page": 1,
"total": 20,
"summaries": [
    {
        "links": {
            "up": {
                "rel": "self",
                "href": "https://10.0.0.100/api/progress",
                "hreflang": null,
                "media": null,
                "title": null,
                "type": null,
                "deprecation": null
            }
        },
        "name": "Service-Dallas",
        "type": "HYPERVISORVM",
        "association": null,
        "protectionInfo": null,
        "recoveryInfo": null,
        "recoveryPoint": null,
        "siteId": "10.0.1.1",
        "autoProvisionedsubPolicyName": null,
        "rbacPath": null,
        "rbacPathId": null,
        "extInfo": null,
        "location": "/vmware-dallas1.bluemachines.com.invalid/Production/Service-Dallas",
        "metadataPath": null,
        "inHLO": true,
        "jobPK": "1096_1610664896075",
        "resourceName": "Service-Dallas",
        "resourcePk": "221199d6aa263807e7387a0bfc15326",
        "proxyUsed": "10.0.1.1",
        "proxyUsedId": "2102",
        "isBase": true,
        "vmdkIds": null,
        "vmdkName": null,
        "transportMethod": "[hotadd]",
        "vmdkCount": 1,
        "protectedVmdkCount": 1,
        "totalDataTransferred": "37.59 GB",
        "total": 0,
        "throughput": "217081904",
        "queueTimeStart": 0,
        "queueTimeEnd": 0,
        "isSuccess": true,
        "summaryStatus": "partial",
        "vSnapUsed": "10.0.1.1",
        "vSnapUsedId": null,
    }
]

```

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```

    "percentageCompleted": 50,
    "vsnapVolumes": {
      "spp_1096_2207_176f26b6caf__group66c64994fb89402d922491630feba43
↵": "2102.volume.3"
    },
    "groupParentPk": null,
    "groupPercentageCompleted": 0,
    "resourcePhaseName": null,
    "resourcePhaseProgressPercentage": 0,
    "phaseNumber": 0,
    "totalPhases": 0,
    "Name": "Service-Dallas",
    "partitionId": null,
    "message": null,
    "backupStartTime": 1610384909,
    "backupEndTime": 1610385140,
    "errorCode": 0,
    "elapsedTime": 230,
    "base": true,
    "success": true,
    "protected": false,
    "failed": false,
    "systemHold": false,
    "id": "1610664896075.221199d6aa263807e7387a0bfcfb15326",
    "host": "10.250.250.13",
    "resourceType": "resourcesummary",
    "resourceSummary": {
      "name": "Service-Dallas",
      "type": "HYPERVISORVM",
      "association": null,
      "protectionInfo": null,
      "recoveryInfo": null,
      "recoveryPoint": null,
      "siteId": "10.0.1.1",
      "autoProvisionedsubPolicyName": null,
      "rbacPath": null,
      "rbacPathId": null,
      "extInfo": null,
      "location": "/vmware-dallas1.bluemachines.com.invalid/Production
↵/Service-Dallas",
      "metadataPath": null,
      "inHLO": true,
      "jobPK": "1096_1610664896075",
      "resourceName": "Service-Dallas",
      "resourcePK": "221199d6aa263807e7387a0bfcfb15326",
      "proxyUsed": "10.0.1.1",
      "proxyUsedId": "2102",
      "isBase": true,
      "vmdkIds": null,
      "vmdkName": null,
      "transportMethod": "[hotadd]",
      "vmdkCount": 1,
      "protectedVmdkCount": 1,
      "totalDataTransferred": "37.59 GB",
      "total": 0,
      "throughput": "217081904",
      "queueTimeStart": 0,

```

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```
        "queueTimeEnd": 0,
        "isSuccess": true,
        "summaryStatus": "complete",
        "vSnapUsed": "10.0.1.1",
        "vSnapUsedId": null,
        "percentageCompleted": 50,
        "vsnapVolumes": {
            "spp_1096_2207_176f26b6caf__group66c64994fb89402d922491630fe
↪ba43": "2102.volume.3"
        },
        "groupParentPk": null,
        "groupPercentageCompleted": 0,
        "resourcePhaseName": null,
        "resourcePhaseProgressPercentage": 0,
        "phaseNumber": 0,
        "totalPhases": 0,
        "Name": "Service-Dallas",
        "partitionId": null,
        "message": null,
        "backupStartTime": 1610384909,
        "backupEndTime": 1610385140,
        "errorCode": 0,
        "elapsedTime": 230,
        "base": true,
        "success": true,
        "protected": false,
        "failed": false,
        "systemHold": false,
        "id": "1610664896075.221199d6aa263807e7387a0bfcb15326",
        "host": "10.250.250.13"
    }
},
{...}, ..., {...}
]
}
```

Example 2: Get progress information about a job

Assume that you want to get progress information about a job with {sessionId} 1610664896075.

A Python snippet that is similar to the following example can be used to request progress information:

```
_params = {
    "filter": {
        json.dumps([
            {
                "property": "sessionId",
                "value": "1610664896075",
                "op": "="
            }
        ])
    }
}

_response = requests.get('https://' + spp_ipv4
```

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```
+ '/api/progress',
headers={...}, params=_params, verify=...)
```

The request prompts a response that is similar to the response body in the previous example.

Schedule

You can schedule jobs, or you can start jobs manually.

Getting information about scheduled jobs

You can get information about scheduled jobs.

Method and URI

To get information about all scheduled jobs, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/job
```

To get information about a specific scheduled job, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/job/{jobId}
```

Tip: To get a `{jobId}` value based on the name of the scheduled job, follow the instructions in Getting a `{jobId}` (page 352).

Parameters

None.

Data

None.

Example 1: Get information about all scheduled jobs

A Python snippet that is similar to the following example can be used to request a list of all scheduled jobs and their information.

```
requests.get('https://' + spp_ipv4 + '/api/endeavour/job',
headers={...}, verify=...)
```

```

{
  "links": {...},
  "total": 18,
  "page": 1,
  "jobs": [
    {
      "links": {...},
      "name": "Maintenance",
      "description": "Auto-generated job for maintenance",
      "policyId": "1001",
      "policyName": "Maintenance",
      "type": "maintenance",
      "typeDisplayName": "Maintenance",
      "subType": "maintenance",
      "subTypeDisplayName": "Maintenance",
      "serviceId": "com.syncsort.dp.xsb.serviceprovider.maintenance",
      "displayName": "Maintenance",
      "status": "IDLE",
      "statusDisplayName": "Idle",
      "lastSessionStatus": "COMPLETED",
      "lastSessionStatusDisplayName": "Completed",
      "triggerIds": [
        "1001"
      ],
      "triggerData": [
        {
          "triggerId": "1001",
          "triggerInfo": null
        }
      ],
      "lastRunTime": 1589151600156,
      "nextFireTime": 1589238000000,
      "lastSessionDuration": 5135140,
      "tenantId": 1000,
      "actions": null,
      "statistics": null,
      "lastrun": {
        "sessionId": "1589151600106",
        "jobName": "Maintenance",
        "type": "maintenance",
        "subType": "maintenance",
        "serviceId": "serviceprovider.maintenance",
        "start": 1589151600156,
        "end": 1589156735296,
        "duration": 5135140,
        "status": "COMPLETED",
        "results": "COMPLETED",
        "properties": null,
        "numTasks": 14,
        "previousLastTask": 0,
        "lastUpdate": 1589156735306,
        "percent": 100,
        "policySnapshot": null
      },
      "id": "1001"
    },
  ],
}

```

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```

    "links": {...},
    "name": "Storage Server Inventory",
    "description": "Auto-generated job for maintenance",
    "policyId": "1002",
    "policyName": "Storage Server Inventory",
    "type": "catalog",
    "typeDisplayName": "Catalog",
    "subType": "storage",
    "subTypeDisplayName": "Storage",
    "serviceId": "serviceprovider.catalog.storage",
    "displayName": "Storage Server Inventory",
    "status": "IDLE",
    "statusDisplayName": "Idle",
    "lastSessionStatus": "PARTIAL",
    "lastSessionStatusDisplayName": "Partial",
    "triggerIds": [
      "1002"
    ],
    "triggerData": [
      {
        "triggerId": "1002",
        "triggerInfo": null
      }
    ],
    "lastRunTime": 1589145300278,
    "nextFireTime": 1589231700000,
    "lastSessionDuration": 26231,
    "tenantId": 1000,
    "actions": null,
    "statistics": null,
    "lastrun": {...},
    "id": "1002"
  },
  {
    "links": {...},
    "name": "Application Server Inventory",
    "description": null,
    "policyId": "1003",
    "policyName": "Application Server Inventory",
    "type": "catalog",
    "typeDisplayName": "Catalog",
    "subType": "application",
    "subTypeDisplayName": "Application",
    "serviceId": "serviceprovider.catalog.application",
    "displayName": "Application Server Inventory",
    . . . ,
    "id": "1003"
  },
  {
    "links": {...},
    "name": "Hypervisor Inventory",
    "description": null,
    "policyId": "1004",
    "policyName": "Hypervisor Inventory",
    "type": "catalog",
    "typeDisplayName": "Catalog",
    "subType": "hypervisor",

```

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```

    "subTypeDisplayName": "Hypervisor",
    ...
    "id": "1004"
  },
  {
    "links": {...},
    "name": "oracle_Gold",
    "description": "",
    "policyId": "1005",
    "policyName": "oracle_Gold",
    "type": "protection",
    "typeDisplayName": "Protection",
    "subType": "oracle",
    "subTypeDisplayName": "Oracle",
    "serviceId": "serviceprovider.protection.application",
    "displayName": "Application / File System Protection",
    ...
    "id": "1005"
  },
  {
    "links": {...},
    "name": "oracle_Silver",
    ...
    "id": "1006"
  },
  {
    "links": {...},
    "name": "sql_Gold",
    "description": "",
    "policyId": "1011",
    "policyName": "sql_Gold",
    "type": "protection",
    "typeDisplayName": "Protection",
    "subType": "sql",
    "subTypeDisplayName": "SQL",
    "serviceId": "serviceprovider.protection.application",
    "displayName": "Application / File System Protection",
    ...
    "id": "1011"
  },
  {...},
  {
    "links": {...},
    "name": "hyperv_Gold",
    "description": "",
    "policyId": "1014",
    "policyName": "hyperv_Gold",
    "type": "protection",
    "typeDisplayName": "Protection",
    "subType": "hyperv",
    "subTypeDisplayName": "Hyper-V",
    "serviceId": "serviceprovider.protection.hypervisor",
    "displayName": "Hypervisor Backup",
    ...
    "id": "1014"
  },
  {

```

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```
        "links": {...},
        "name": "Report_vSnap Storage Utilization",
        "description": "Auto-generated job for Policy Report_vSnap Storage U
utilization",
        "policyId": "1023",
        "policyName": "Report_vSnap Storage Utilization",
        "type": "analyze",
        "typeDisplayName": "Analyze",
        "subType": "report",
        "subTypeDisplayName": "Report",
        "serviceId": "serviceprovider.report",
        "displayName": "Report",
        ...,
        "id": "1023"
    },
    {
        "links": {...},
        "name": "Report_vSnapStorageUtilization-Dallas1",
        "description": "Auto-generated job for Policy Report_vSnapStorageUtiliz
ation-Dallas1",
        "policyId": "1028",
        "policyName": "Report_vSnapStorageUtilization-Dallas1",
        ...,
        "id": "1024"
    },
    ...,
    {
        "links": {...},
        "name": "vmware_Diamond",
        ...,
        "id": "1043"
    },
    ...
]
}
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

Example 2: Get information about a specific scheduled job

Assume that you added an scheduled job, Diamond (`{slapolicyId} 2101`), to IBM Spectrum Protect Plus.

A Python snippet that is similar to the following example can be used to request information about this scheduled job:

```
sla_id = "2101"

requests.delete('https://' + spp_ip4 + '/ngp/slapolicy/' + sla_id,
               headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "name": "vmware_Diamond",
```

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```
"description": "",
"policyId": "1050",
"policyName": "vmware_Diamond",
"type": "protection",
"typeDisplayName": "Protection",
"subType": "vmware",
"subTypeDisplayName": "VMware",
"serviceId": "serviceprovider.protection.hypervisor",
"displayName": "Hypervisor Backup",
"status": "IDLE",
"statusDisplayName": "Idle",
"lastSessionStatus": "PARTIAL",
"lastSessionStatusDisplayName": "Partial",
"triggerIds": [
  "1049"
],
"triggerData": [
  {
    "triggerId": "1049",
    "triggerInfo": {
      "subpolicy_id": "VM Replication0(2113)"
    }
  }
],
"lastRunTime": 1589176802081,
"nextFireTime": 1589263200000,
"lastSessionDuration": 8154,
"tenantId": 1000,
"actions": null,
"statistics": null,
"lastrun": {
  "sessionId": "1589176800026",
  "jobName": "vmware_Diamond",
  "type": "protection",
  "subType": "vmware",
  "serviceId": "serviceprovider.protection.hypervisor",
  "start": 1589176802081,
  "end": 1589176810235,
  "duration": 8154,
  "status": "PARTIAL",
  "results": null,
  "properties": {
    "statistics": [
      {
        "resourceType": "vm",
        "total": 0,
        "success": 0,
        "failed": 0,
        "skipped": 0,
        "names": null,
        "jobSessionId": 0,
        "policyId": null,
        "startTime": 0
      },
      {
        "resourceType": "datastore",
        "total": 0,
```

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```

        "success": 0,
        "failed": 0,
        "skipped": null,
        "names": null,
        "jobSessionId": 0,
        "policyId": null,
        "startTime": 0
      }
    ]
  },
  "numTasks": 2,
  "previousLastTask": 0,
  "lastUpdate": 1589176810260,
  "percent": 0,
  "policySnapshot": null
},
"id": "1043"
}

```

Starting a job manually

IBM Spectrum Protect Plus can start backup jobs that are associated with service level agreement (SLA) policies in two ways:

1. An SLA policy for associated instances of hypervisors, application servers, and IBM Spectrum Protect Plus catalogs. Backup jobs are started automatically after the SLA policy is defined.
2. An SLA policy for associated instances of specific types of virtualized systems, application servers or IBM Spectrum Protect Plus. Backup jobs must be started manually regardless of how the SLA policy is defined.

For example, assume that you have a custom SLA policy, Diamond, which starts every day at midnight UTC. You associate the SLA policy with some instances of VMware, Oracle Database, and IBM Db2.

In this case, you do not have to create a script to start this SLA policy because backup jobs are started automatically by IBM Spectrum Protect Plus. But in some cases, you want to start the backup jobs *manually*. A manual start is supported for some types of virtualized systems, application servers, and IBM Spectrum Protect Plus. In that case, the SLA policy name has one of the following prefixes:

Prefix	Product
vmware	VMware vCenter
hyperv	Hyper-V
oracle	Oracle Database
sql	SQL Server
db2	Db2
exch	Exchange Server
mongo	MongoDB
office365	Microsoft 365
catalog	IBM Spectrum Protect Plus

Method and URI

To start a job manually, use a POST method and a URI:

```
POST https://{hostname|IP}/api/endeavour/job/{slapolicyId}
```

Tip: To get an `{slapolicyId}` value based on its name, follow the instructions in [Getting an {slapolicyId}](#) (page 360).

Parameters

Parameter 1: action

Specify the type of action.

- **Value:** inventory
- **Type:** System string. Required. Available in the web interface.

Parameter 2: actionname

Specify the step of the action.

- **Value:** start
- **Type:** System string. Required. Available in the web interface.

Data

None.

Example: Start a job manually

Assume that you want to start a job, `vmware_Gold` (`{slapolicyId}` 1021), manually.

A Python snippet that is similar to the following example can be used to start a job manually:

```
sla_id = "1021"      # vmware_Gold

_params = {
    "action":      "start",
    "actionname": "start"
}

requests.post('https://' + spp_ipv4 + '/api/endeavour/job/' + sla_id,
             headers={...}, params=_params, data="", verify=...)
```

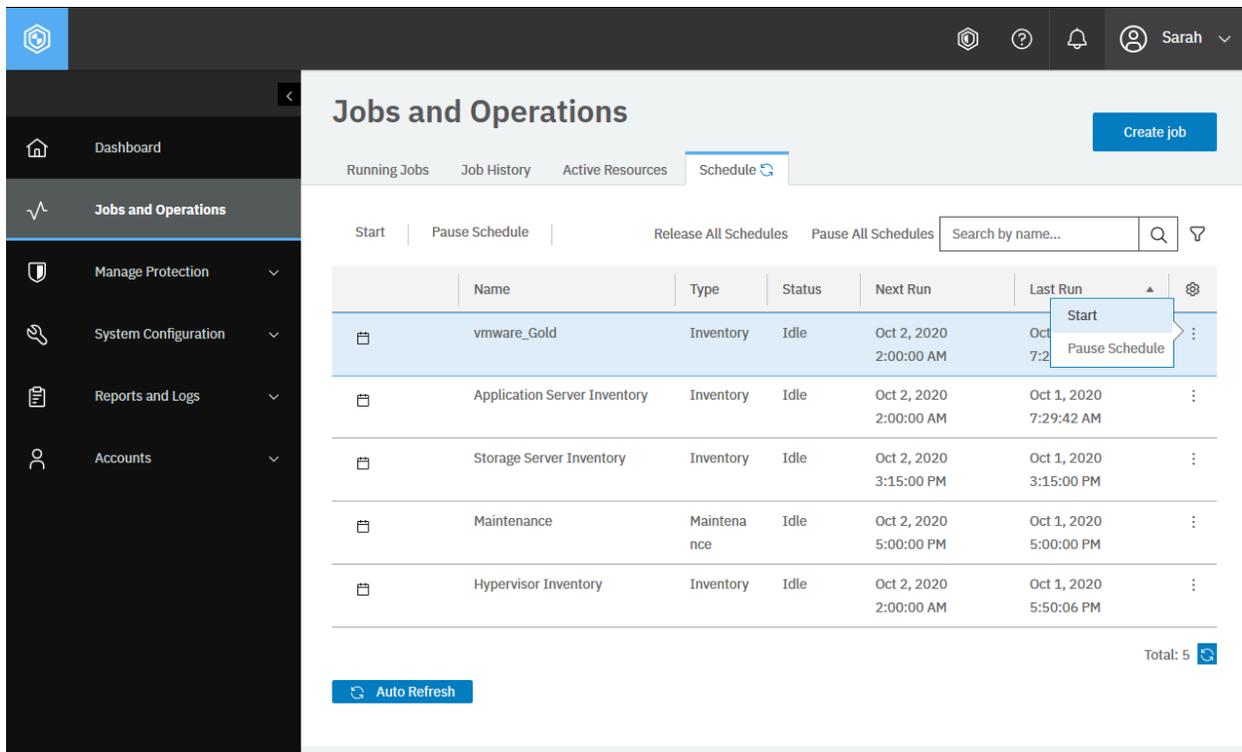


Figure 7: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Jobs and Operations** and click the **Schedule** tab. You will see a list of jobs. For the job that you want to start, click **Actions > Start**.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "name": "vmware_Gold",
  "description": "Auto-generated job for Policy vmware_Gold",
  "policyId": "1021",
  "policyName": "vmware_Gold",
  "type": "protection",
  "typeDisplayName": "Protection",
  "subType": "vmware",
  "subTypeDisplayName": "VMware",
  "serviceId": "serviceprovider.protection.hypervisor",
  "displayName": "Hypervisor Backup",
  "status": "RESOURCE ACTIVE",
  "statusDisplayName": "Resource active",
  "lastSessionStatus": "PARTIAL",
  "lastSessionStatusDisplayName": "Partial",
  "triggerIds": [
    "1015"
  ],
  "triggerData": [
    {
      "triggerId": "1015",
      "triggerInfo": {
        "subpolicy_id": "VADP Backup(2000)"
      }
    }
  ]
}
```

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```

    }
  },
  "lastRunTime": 1576153580805,
  "nextFireTime": 1576167979000,
  "lastSessionDuration": 3572,
  "tenantId": 1000,
  "actions": null,
  "statistics": null,
  "policy": {
    "links": {...},
    "name": "vmware_Gold",
    "type": "protection",
    "subType": "vmware",
    "serviceId": "serviceprovider.protection.hypervisor",
    "description": "",
    "version": "3.0",
    "rbacPath": "root:0/policy:0/policytype:serviceprovider.protection.hyper
visor/policy:1021",
    "tenantId": 1000,
    "creationTime": 1570192798811,
    "lastUpdated": 0,
    "spec": {
      "source": [],
      "storageworkflow": [
        {
          "id": "2000",
          "name": "Gold",
          "href": "http://localhost:8082/api/spec/storageprofile/2000"
        }
      ]
    },
    "option": {
      "maxtasks": 0,
      "vmsnapshot": {
        "takesnapshot": false,
        "concurrentsnapshots": 3,
        "includememory": false,
        "consistency": false,
        "consistencyvms": [],
        "scriptvms": [],
        "truncateapplicationlogs": false
      },
      "skipreadonlydatastores": true
    },
    "notification": []
  },
  "logicalDelete": false,
  "script": {
    "preScript": null,
    "postScript": null,
    "preSnap": null,
    "postSnap": null,
    "preGuest": null,
    "postGuest": null,
    "preGuestSnap": null,
    "postGuestSnap": null,
    "continueScriptsOnError": false
  }
}

```

(continues on next page)

Starting an ad hoc backup job

There are two scenarios to start a backup job for VMware and Microsoft Hyper-V instances:

1. Associate an SLA policy with virtualized system instances (for example, VMware virtual machines) so that the backup job can be started automatically or manually.
2. Start an ad hoc backup job.

The ad hoc backup does not have to include all instances that are associated with the SLA policies.

A single ad hoc backup job can process multiple virtual machines of the same type of virtualized system: VMware vCenter, Microsoft Hyper-V, or Amazon EC2. You cannot specify folders or datacenters even if they are associated with the specific SLA policy. You cannot specify virtual machines hosted on VMware *and* Microsoft Hyper-V at the same time.

The screenshot displays the IBM Spectrum Protect Plus web user interface. On the left is a dark navigation sidebar with various menu items. The main content area is titled 'VMware' and features a 'Manage vCenter' button and a 'Create job' button (highlighted with a red box). Below this is a 'VMware Backup' section with a search bar, a 'View' dropdown set to 'VMs and Templates', and a table listing vCenters. The table has columns for 'Name', 'Guest OS', and 'SLA Policy'. Two entries are visible: one with ID '10.0.0.10' and another with '10.0.0.20'. At the bottom right of the table area, it says 'Total: 2' and there are buttons for 'Run', 'Select SLA Policy', and 'Select options'. Below the table is an 'SLA Policy Status' section with a 'Filter Job Log' dropdown menu and a table with columns: Policy, Frequency, Total, Succeeded, Failed, Next Run, Status, Policy Options.

Figure 8: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **VMware** pane or the **Hyper-V** pane, click **Create job**.

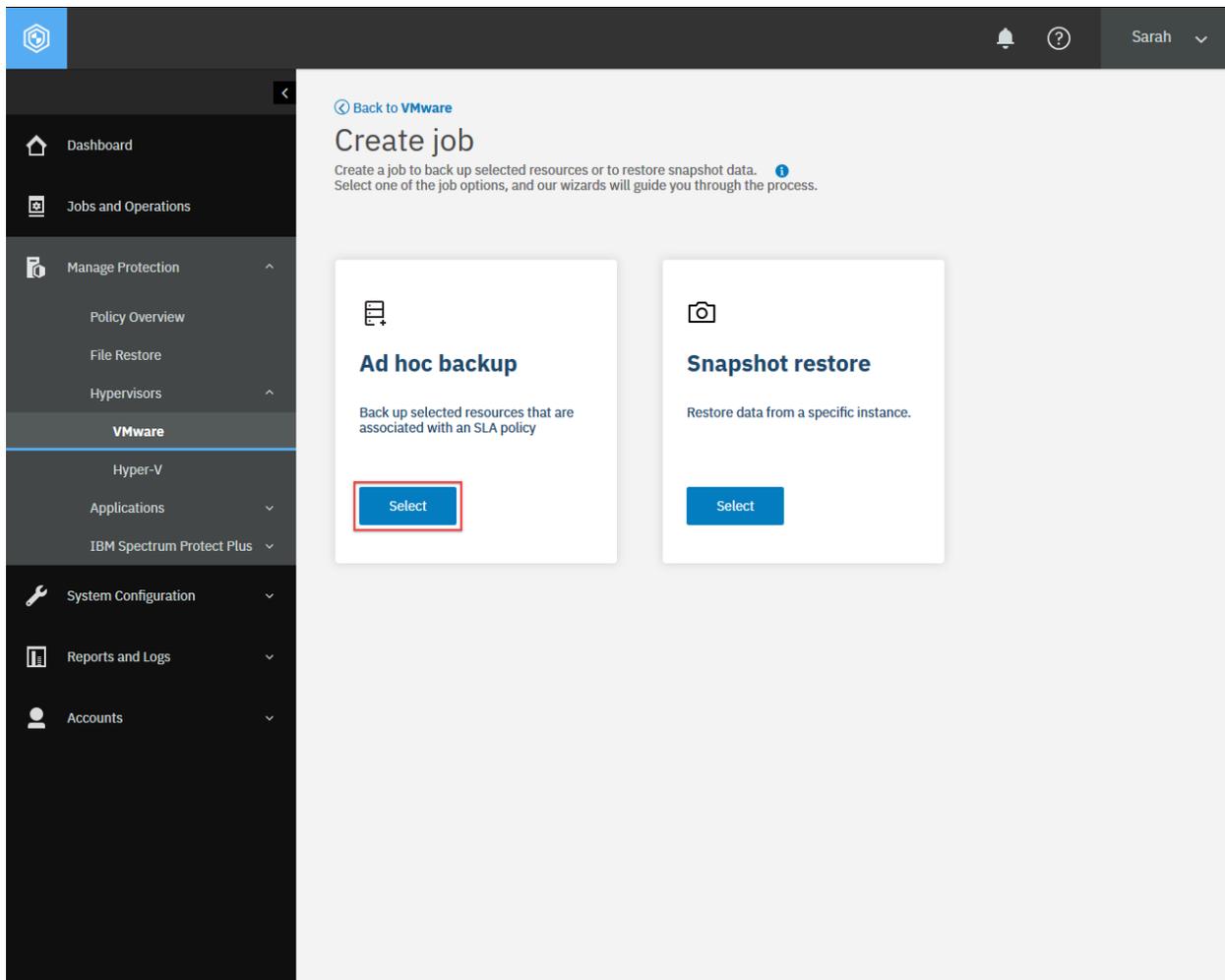


Figure 9: In the **Ad hoc backup** section, click **Select**.

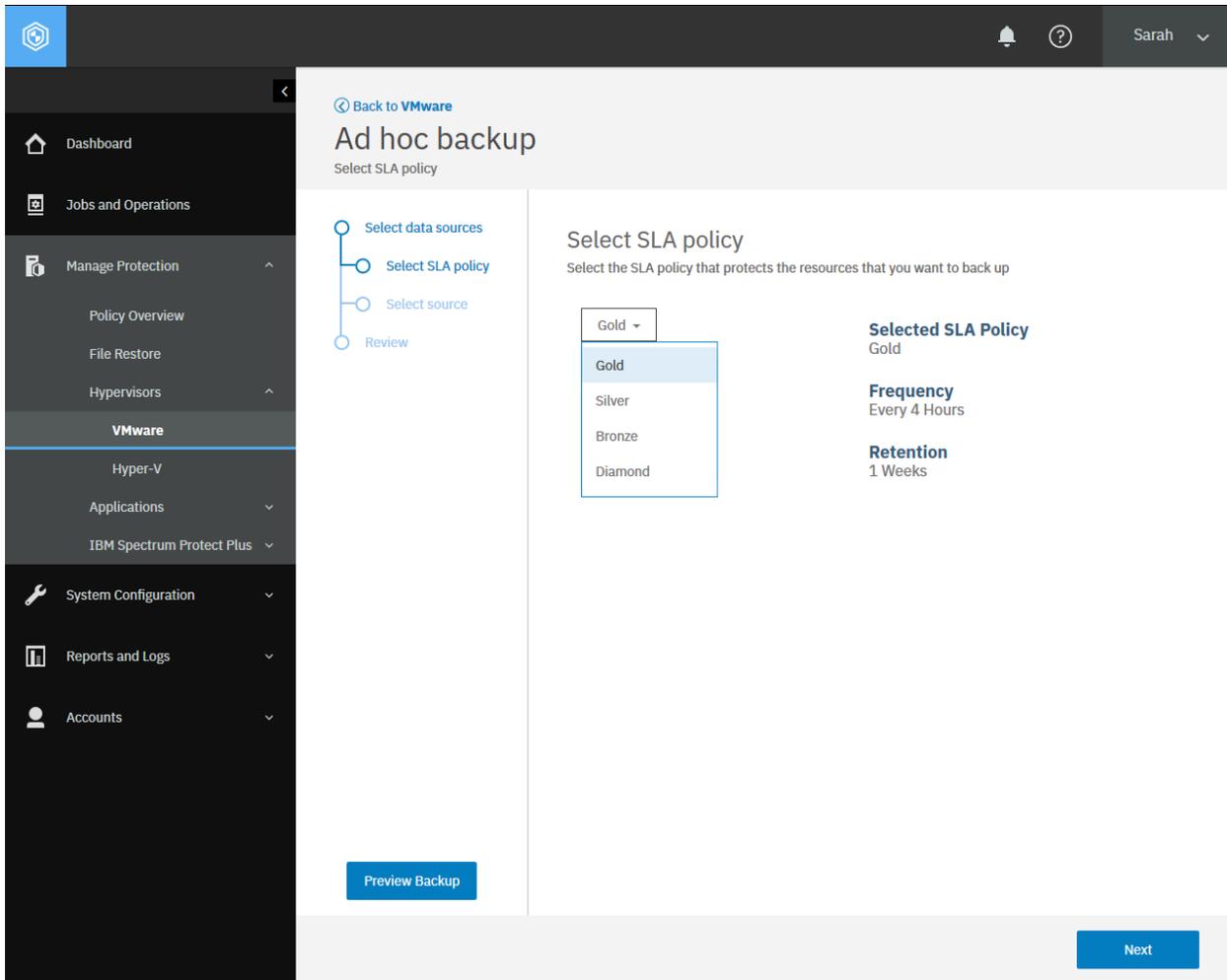


Figure 10: Select an SLA policy.

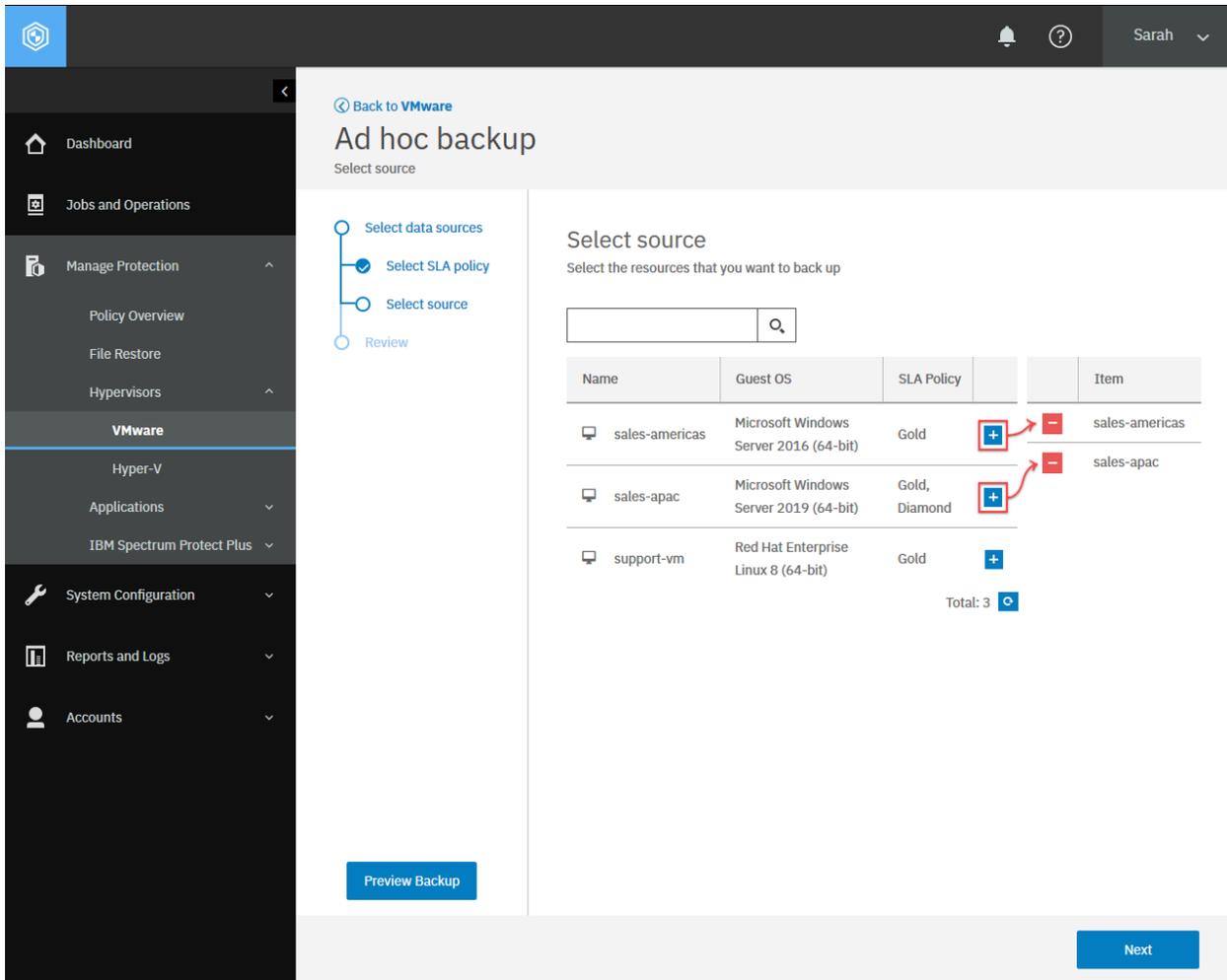


Figure 11: Select the virtual machines that you want to protect. You cannot select entire folders or datacenters.

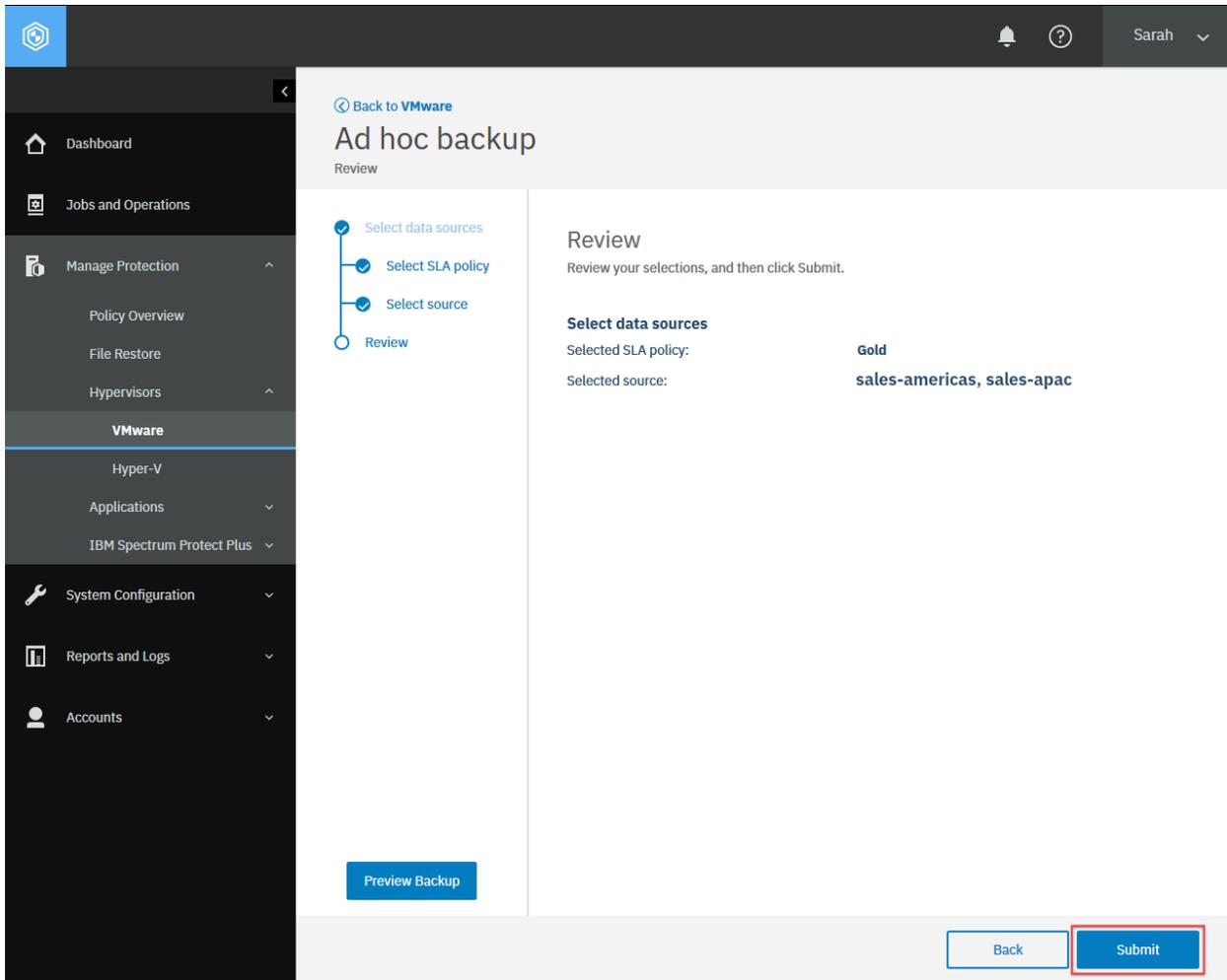


Figure 12: Review the configuration and click **Submit**.

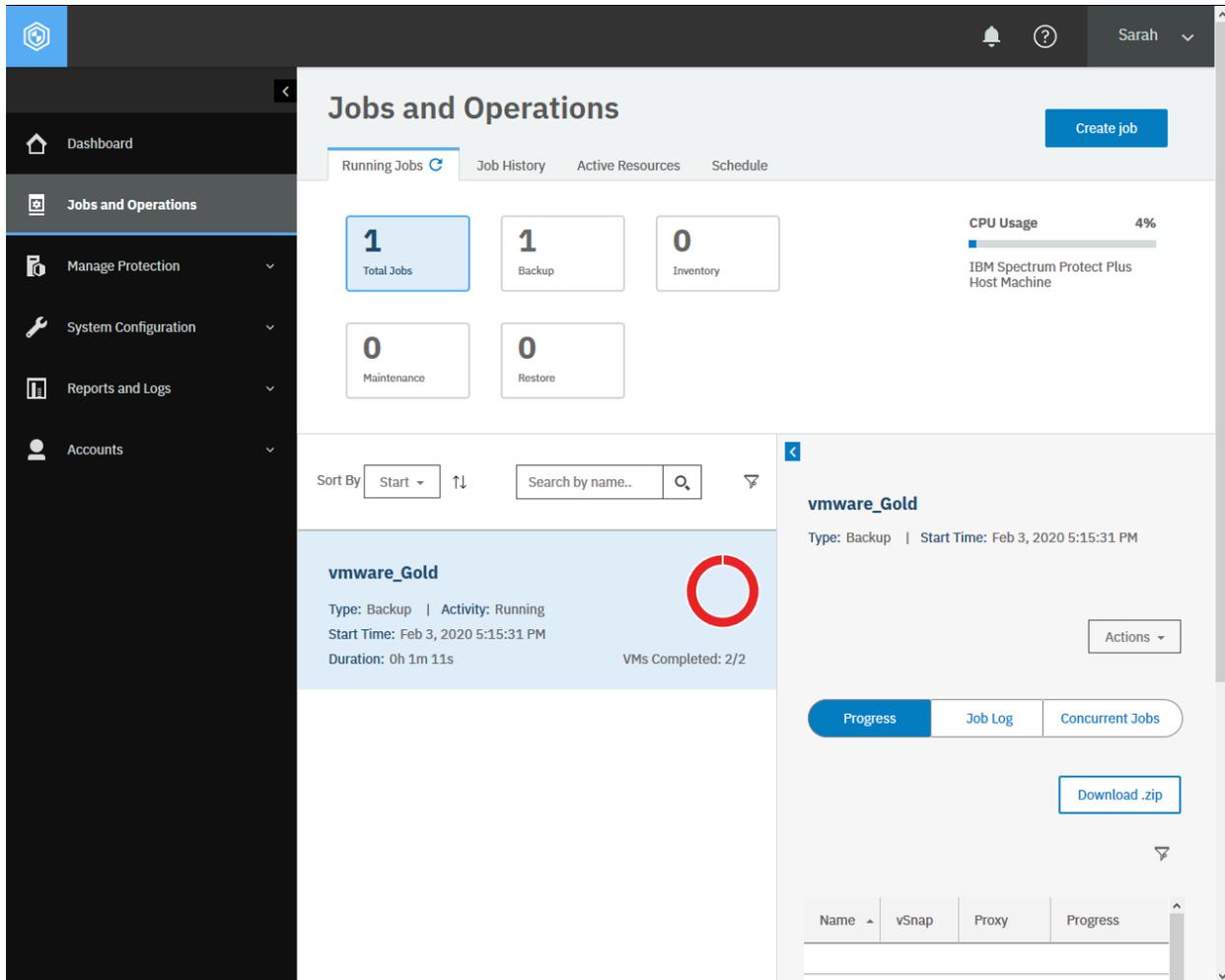


Figure 13: Go to the **Jobs and Operations** pane and you will see the ad hoc backup job running.

Method and URI

To start an ad hoc backup, use a POST method and a URI:

```
POST https://{hostname|IP}/ngp/hypervisor
```

Parameters

Parameter 1: action

Start an ad hoc job.

- **Value:** adhoc
- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: slaPolicyName

The name of the SLA policy.

- **Example value:** Gold
- **Type:** String. Required. Available in the web user interface.

Data 2: subtype

The type of the virtualized system, database, file system, cloud management, or containers.

- **Example value:** vmware
- **Type:** System string. Required. Available in the web user interface.

Tip: To get an {applicationName} value based on the name of the application name, follow the instructions in Getting an {applicationName} (page 340).

Data 3: resource:

The URLs of the instances to protect in the ad hoc backup job.

- **Value:**

A URL of a virtual machine uses the following syntax:

```
https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}  
↪/vm/{hypervisorVmId}
```

Tip: To get a {hypervisorVmId} by the virtual machine name, follow the instructions in Getting a {hypervisorVmId} (page 347).

A URL of a database uses the following syntax:

```
https://{hostname|IP}/api/application/{applicationName}  
↪/instance/{applicationServerId}/database/{applicationDatabaseId}?from=flo
```

Example: Start an ad hoc backup for virtual machines

Assume that you have the following virtual machines hosted on different VMware vCenter servers:

- sales-americas.
 - Virtualized system: VMware - Dallas. Gold.
 - SLA policy: Gold
 - {hypervisorHypervisorId}: 1001
 - {hypervisorVmId}: ec44616651cda8b66fec4f7fd0daf554
- sales-apac
 - Virtualized system: VMware - Singapore
 - SLA policies: Gold and Diamond
 - {hypervisorHypervisorId}: 1002
 - {hypervisorVmId}: 2648550a670c6d383cba0d369ae4f91c

A Python snippet that is similar to the following example can be used to start an ad hoc backup job for these two virtual machines:

```
hypervisor_hypervisor_id_vm1 = "1001"      # VMware - Dallas
hypervisor_vm_id1 = "ec44616651cda8b66fec4f7fd0daf554"      # sales-americas
uri_vm1 = 'https://' + spp_ipv4 + '/api' \
    + '/hypervisor/' + hypervisor_hypervisor_id1 \
    + '/vm/' + hypervisor_vm_id1 \
    + '?from=hlo'

hypervisor_hypervisor_id_vm2 = "1002"      # VMware - Singapore
hypervisor_vm_id2 = "2648550a670c6d383cba0d369ae4f91c"      # sales-apac
uri_vm2 = 'https://' + spp_ipv4 + '/api' \
    + '/hypervisor/' + hypervisor_hypervisor_id2 \
    + '/vm/' + hypervisor_vm_id2 \
    + '?from=hlo'

_params = {"action": "adhoc"}

_data = f'''{{
    "slaPolicyName": "Gold",
    "subtype":      "vmware",
    "resource":     [{"uri_vm1}", "{uri_vm2}"]
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/hypervisor/'
    headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK). Review the response to ensure that the backup job is running.

```
{
  "links": {...},
  "name": "vmware_Gold",
  "description": "Auto-generated job for Policy vmware_Gold",
  "policyId": "1045",
  "policyName": "vmware_Gold",
  "type": "protection",
  "typeDisplayName": "Protection",
  "subType": "vmware",
  "subTypeDisplayName": "VMware",
  "serviceId": "serviceprovider.protection.hypervisor",
  "displayName": "Hypervisor Backup",
  "status": "RESOURCE ACTIVE",
  "statusDisplayName": "Resource active",
  "lastSessionStatus": "FAILED",
  "lastSessionStatusDisplayName": "Failed",
  "triggerIds": [
    "1036"
  ],
  "triggerData": [
    {
      "triggerId": "1036",
      "triggerInfo": {
        "subpolicy_id": "VADP Backup(2000)"
      }
    }
  ],
}
```

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```

"lastRunTime": 1580775121325,
"nextFireTime": 1580775979000,
"lastSessionDuration": 74949,
"tenantId": 1000,
"actions": null,
"statistics": null,
"policy": {
  "links": {...},
  "name": "vmware_Gold",
  "type": "protection",
  "subType": "vmware",
  "serviceId": "serviceprovider.protection.hypervisor",
  "description": "",
  "version": "3.0",
  "rbacPath": "root:0/policy:0/policytype:serviceprovider.protection.hyper
visor/policy:1045",
  "tenantId": 1000,
  "creationTime": 1577725511302,
  "lastUpdated": 0,
  "spec": {
    "source": [],
    "storageworkflow": [
      {
        "id": "2000",
        "name": "Gold",
        "href": "http://localhost:8082/api/spec/storageprofile/2000"
      }
    ],
    "option": {
      "maxtasks": 0,
      "vmsnapshot": {
        "takesnapshot": false,
        "concurrentsnapshots": 3,
        "includememory": false,
        "consistency": false,
        "consistencyvms": [],
        "scriptvms": [],
        "truncateapplicationlogs": false
      },
      "skipreadonlydatastores": true
    },
    "notification": []
  },
  "logicalDelete": false,
  "script": {
    "preScript": null,
    "postScript": null,
    "preSnap": null,
    "postSnap": null,
    "preGuest": null,
    "postGuest": null,
    "preGuestSnap": null,
    "postGuestSnap": null,
    "continueScriptsOnError": false
  },
  "id": "1045"
},
},

```

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```
    },
    "numTasks": 2,
    "previousLastTask": 0,
    "lastUpdate": 1580775196299,
    "percent": 60,
    "policySnapshot": null
  },
  "id": "1038"
}
```

Manage Protection

You can complete operations to manage data protection. In the web user interface, most operations can be completed from the pages under **Manage Protection**.

Policy Overview

Service level agreement (SLA) policies, also known as backup policies, define parameters for backup jobs. These parameters include the frequency and retention period of backups and the option to replicate or copy backup data. You can use predefined SLA policies, or customize them to meet your needs.

You can complete operations with the REST API, as described in the following sections.

Getting information about SLA policies

You can get information about SLA policies.

Method and URI

To get information about all SLA policies, use a GET method and a URI:

```
GET https://{hostname|IPv4}/ngp/slapolicy
```

To get information about a specific SLA policy, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/spec/stroageprofile/{slapolicyId}
```

Tip: To get an `{slapolicyId}` value based on the name of the SLA policy, follow the instructions in Getting an `{slapolicyId}` (page 360).

Parameters

None.

Data

None.

Example 1: Get information about all SLA policies

A Python snippet that is similar to the following example can be used to request a list of all SLA policies and their information.

```
requests.get('https://' + spp_ipv4 + '/ngp/slapolicy',  
            headers={...}, verify=...)
```

	Name	Job type	Frequency	Retention
	Bronze	Backup	Every 1 Days at 2:26:19 PM	1 Weeks
	Container	Snapshot	Every 6 Hours	1 Days
		Backup	Every 1 Days at 11:10:00 PM	1 Months
	Demo	Backup	Every 1 Days at 2:26:26 PM	1 Months
	Diamond	Replication	Every 1 Days at 1:00:00 PM	1 Months
		Copy	Every 1 Weeks on Sunday at 12:00:00 AM	1 Weeks
		Archive	Every 1 Weeks on Sunday at 2:15:00 AM	5 Years
		Backup	Every 2 Hours	1 Weeks
	EC2	Snapshot	Every 1 Days at 11:10:00 PM	1 Weeks
	Emerald	Snapshot	Every 2 Weeks on Sunday at 12:00:00 AM	6 Months
	Gold	Backup	Every 4 Hours	1 Days
	Sapphire	Snapshot	Every 30 Minutes	1 Weeks
		Replication	Every 1 Days at 1:00:00 PM	1 Months
		Copy	Every 1 Days at 12:00:00 AM	1 Months
		Archive	Every 1 Months on the 20th at 2:15:00 AM	5 Years
		Backup	AM	1 Months
			Every 1 Days at 12:00:00 AM	
	Silver	Backup	Every 1 Days at 2:26:00 PM	1 Days

Figure 14: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Manage Protection** > **Policy Overview**, and see the **SLA Policies** section.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 7,  
  "slapolicies": [  
    {  
      "id": "2000",  
      "links": {...},  
      "description": "Gold SLA (hourly) to Primary site",  
      "name": "Gold",
```

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```

    "type": "backup",
    "version": "1.0",
    "spec": {
      "simple": true,
      "subpolicy": [
        {
          "type": "REPLICATION",
          "retention": {
            "age": 2
          },
          "useEncryption": false,
          "software": true,
          "trigger": {
            "frequency": 4,
            "type": "HOURLY",
            "activateDate": 1564604760000,
            "timezone": "America/Chicago"
          },
          "site": "Primary"
        }
      ]
    },
    "rbacPath": "root:0/storageprofile:0/storageprofiletype:backup/storag
↵eprofile:2000"
  },
  {
    "id": "2001",
    "links": {...},
    "description": "Silver SLA (daily) to Primary site",
    "name": "Silver",
    ...
  },
  {
    "id": "2002",
    "links": {...},
    "description": "Bronze SLA (weekly) to Primary site",
    "name": "Bronze",
    ...
  },
  {
    "id": "2004",
    "links": {...},
    "description": "Container SLA (daily) to Primary site",
    "name": "Container",
    "type": "snapshot_backup",
    ...
  },
  {
    "id": "2005",
    "links": {...},
    "description": "EC2 SLA",
    "name": "EC2",
    "type": "snapshot",
    ...
  },
  {
    "id": "2110",

```

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```
        "links": {...},
        "description": null,
        "name": "Diamond",
        "type": "backup",
        ...,
    },
    {
        "id": "2111",
        "links": {...},
        "description": null,
        "name": "Sapphire",
        "type": "snapshot_backup",
        ...,
    },
    {
        "id": "2112",
        "links": {...},
        "description": null,
        "name": "Emerald",
        "type": "snapshot",
        ...,
    }
]
}
```

Example 2: Get information about a specific SLA policy

Assume that you added an SLA policy, Sapphire (`{slapolicyId} 2111`) to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to request information about this SLA policy:

```
sla_id = "2111"

requests.get('https://' + spp_ipv4 + '/api/spec/storageprofile/' + sla_id,
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "id": "2111",
  "links": {...},
  "description": null,
  "name": "Sapphire",
  "type": "snapshot_backup",
  "version": "1.0",
  "spec": {
    "simple": true,
    "subpolicy": [
      {
        "type": "SNAPSHOT",
        "retention": {
          "age": 15
        },
        "trigger": {
```

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```
    "frequency": 1,
    "type": "DAILY",
    "activateDate": 1588982400000,
    "timezone": "America/Chicago"
  },
  "label": "Sales Kubernetes"
},
{
  "type": "REPLICATION",
  "software": false,
  "retention": {},
  "useEncryption": false,
  "trigger": {
    "frequency": 1,
    "type": "DAILY",
    "activateDate": 1588986000000,
    "timezone": "Asia/Singapore"
  },
  "site": "Primary"
},
{
  "type": "SPOFFLOAD",
  "retention": {},
  "target": {
    "href": "https://10.0.0.100/api/cloud/2",
    "resourceType": "cos",
    "id": "2",
    "wormProtected": false
  },
  "trigger": {
    "frequency": 1,
    "type": "DAILY",
    "activateDate": 1589014800000,
    "timezone": "America/Chicago"
  },
  "source": "backup"
},
{
  "type": "SPPARCHIVE",
  "retention": {
    "age": 90
  },
  "target": {
    "href": "https://10.0.0.100/api/cloud/4",
    "resourceType": "aws",
    "id": "4",
    "wormProtected": false
  },
  "trigger": {
    "frequency": 1,
    "type": "WEEKLY",
    "dowList": [
      false,
      true,
      false,
      false,
      false,
      false,
      false
    ]
  }
}
```

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```
        false,
        false,
        false
      ],
      "activateDate": 1589018400000,
      "timezone": "America/Chicago"
    },
    "source": "backup"
  },
  {
    "type": "REPLICATION",
    "retention": {
      "age": 15
    },
    "useEncryption": false,
    "software": true,
    "trigger": {
      "frequency": 1,
      "type": "DAILY",
      "activateDate": 1589007600000,
      "timezone": "America/Chicago"
    },
    "site": "Dallas"
  }
]
},
"rbacPath": "root:0/storageprofile:0/storageprofiletype:snapshot_backup/stor
ageprofile:2111"
}
```

Adding an SLA policy

You can add an SLA policy by using the REST API. There are three types of SLA policies. Use one of the following types based on the backup target objects:

Type 1 VMware, Hyper-V, Exchange, Microsoft 365, SQL, Oracle, Db2, MongoDB, IBM Spectrum Protect Plus Catalog, and Windows File Systems

Type 2 Kubernetes, OpenShift

Type 3 Amazon EC2

Method and URI

To add an SLA policy, use a POST method with a URI:

```
POST https://{hostname|IPv4}/ngp/slapolicy
```

Parameters

None.

Data

Data 1: name

The name of the SLA policy.

- **Example value:** Diamond
- **Type:** String. Required. Available in the web user interface.

Data 2: type

The type of the SLA policies.

- **Value:** Use one of the following values:

Backup targets	Value
VMware, Hyper-V, Exchange, Microsoft 365, SQL, Oracle, Db2, MongoDB, Catalog, and Windows File Systems (Type 1)	backup
Kubernetes, OpenShift (Type 2)	snapshot_backup
Amazon EC2 (Type 3)	snapshot

- **Type:** System string. Required. Available in the web user interface.

Data 2: spec

Configuration settings for the SLA policy.

- **Value:** {"subpolicy": ...}
- **Type:** JSON object. Required. Available in the web user interface.

Data 2.1: spec > subpolicy

Configuration settings for the SLA policy by topics: Snapshot protection, a backup policy, a replication policy, making incremental copies to standard object storage, and making full copies to archive object storage.

- **Example value 1:** Define configuration settings in a JSON object for each topic. Some topics are optional. For example, assume that you want to make an SLA policy for VMware instances and Db2 instances (Type 1); and make the SLA policy has only the backup policy topic. In this case, the subpolicy value has the following structure:

```
[
  {
    "type": "SNAPSHOT",
    ...
  }
]
```

- **Example value 2:** To create another SLA policy for Kubernetes or OpenShift instances (Type 2), and define configuration settings for all topics, the subpolicy value has the following structure:

```
[
  {
    "type": "SNAPSHOT",
    ...
  }
]
```

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```

    },
    {
      "type": "REPLICATION",
      "software": true,
      ...
    },
    {
      "type": "REPLICATION",
      "software": false,
      ...
    },
    {
      "type": "SPPOFFLOAD",
      ...
    },
    {
      "type": "SPPARCHIVE",
      ...
    }
  ]

```

- **Type:** Array. Required. Available in the web user interface.

Data 2.1.1: spec > subpolicy > type

The topics of the configuration settings. Available topics differ by the type of SLA policies.

- **Value:** Use one of the following values:

Topic	Value	Type 1	Type 2	Type 3
Snapshot protection	SNAPSHOT	Not available	Required	Required
Backup policy	REPLICATION with software	Required	Optional	Not available
Replication policy	REPLICATION without software	Optional	Optional	Not available
Incremental copy to standard object storage	SPPOFFLOAD	Optional	Optional	Not available
Full copy to archive object storage	SPPARCHIVE	Optional	Optional	Not available

When the value REPLICATION is used, you must define the Boolean value software which is described next.

- **Type:** System string. Required. Available in the browser user interface.

Data 2.1.2: spec > subpolicy > software

When the value REPLICATION is used for the Data key-value pair, spec > subpolicy > type, you must define the Boolean value software.

If software is true, the backup policy topic is used for the subpolicy JSON object. If the value of software is false, the replication policy topic is used.

- **Type:** Boolean. Available in the web user interface.

Data 2.1.3: spec > subpolicy > retention

The period to retain backup snapshots. Any backup snapshots that exceed the retention period will be purged.

Attention: Be careful about the retention period when you edit SLA policies. If you update an SLA policy with a shorter retention period, IBM Spectrum Protect Plus purges all backup snapshots that are older than that retention period.

For example, assume that you add an SLA policy with the retention period of 90 days to make a backup snapshot every day. Use this policy for 3 months. Update it with the new retention period of 3 days. Then, IBM Spectrum Protect Plus deletes 87 daily backup snapshots immediately and retains 3 snapshots that were created in the past 3 days.

- **Example value:** The following retention value can be used to retain backup snapshots for 365 days (1 year).

```
{
  "age": 365
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 2.1.3.1: spec > subpolicy > retention > age

The number of days to retain backup snapshots.

- **Type:** Integer. Required. Available in the web user interface.

Data 2.1.4: spec > subpolicy > useEncryption

An indication of whether using only encrypted disk storage on external vSnap servers. This key-value pair is available for the backup policy topic only.

- **Example value:** false to allow IBM Spectrum Protect Plus to store backup snapshots on vSnap servers with unencrypted disks.
- **Type:** Boolean. Required. Available in the web user interface.

Data 2.1.5: spec > subpolicy > trigger

Define the frequency, start date and time, and the timezone for the web user interface.

- **Example value 1:** The following trigger value can be used to make a backup snapshot every 15 minutes, start the SLA policy from 1590987600 UNIX time (June 1, 2020 at 0:00 AM CDT); and the timezone for the web user interface is set to CDT:

```
{
  "frequency": 15,
  "type": "SUBHOURLY",
  "activateDate": 1590987600000,
  "timezone": "America/Chicago"
}
```

- **Example value 2:** The following trigger value is the same as Example value 1, except the frequency being set to one time every two hours:

```
{
  "frequency": 2,
  "type": "HOURLY",
  "activateDate": 1590987600000,
  "timezone": "America/Chicago"
}
```

- **Example value 3:** The following trigger value is the same as Example value 1, except the frequency being set to one time every two days:

```
{
  "frequency": 2,
  "type": "DAILY",
  "activateDate": 1590987600000,
  "timezone": "America/Chicago"
}
```

- **Example value 4:** The following `trigger` value is the same as Example value 1, except the frequency being set to one time every Sunday and Friday:

```
{
  "frequency": 1,
  "type": "WEEKLY",
  "dowList": [ false,
               true, false, false, false, false, true, false
             ],
  "activateDate": 1590987600000,
  "timezone": "America/Chicago"
}
```

- **Example value 5:** The following `trigger` value is the same as Example value 1, except the frequency being set to one time on the 1st day and on the 15th day every other month:

```
{
  "frequency": 2,
  "type": "MONTHLY",
  "domList": [ false,
               true, false, false, false, false, false, false,
               false, false, false, false, false, false, false,
               true, false, false, false, false, false, false,
               false, false, false, false, false, false, false,
               false, false, false, false
             ],
  "activateDate": 1590987600000,
  "timezone": "America/Chicago"
}
```

- **Example value 6:** The following `trigger` value is the same as Example value 1, except the frequency being set to one time every three years, and the timezone for the web user interface being set to UTC:

```
{
  "frequency": 3,
  "type": "YEARLY",
  "activateDate": 1590987600000,
  "timezone": "UTC"
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 2.1.5.1: `spec > subpolicy > trigger > frequency`

A number of unit periods that are defined by the `type` value to run a job that are associated with the SLA policy. The range of the number varies by the `type` value:

type	Minimum frequency	Maximum frequency	Description
SUBHOURLY	5	60	Between 5 minutes and 60 minutes
HOURLY	1	24	Between 1 hour and 24 hours
DAILY	15	30	Between 1 day and 30 days
WEEKLY	1	4	Between 1 week and 4 weeks
MONTHLY	1	60	Between 1 month and 12 months
YEARLY	15	60	Between 1 year and 60 years

- **Type:** Integer. Required. Available in the web user interface.

Data 2.1.5.2: spec > subpolicy > trigger > type

The time unit.

- **Value:** Use one of the following values for the time unit you want to use:

Time unit	Value
Minute	SUBHOURLY
Hour	HOURLY
Day	DAILY
Week	WEEKLY
Month	MONTHLY
Year	YEARLY

- **Type:** System string. Required. Available in the web user interface.

Data 2.1.5.3: spec > subpolicy > trigger > dowList

The days in a week to trigger the SLA policy. Use this key-value pair when you use WEEKLY for type.

The dowList is a list that contains 8 Boolean objects. The item in index 0 is reserved for the system, and it must be false. The item in index 1 is Sunday, the item in index 2 is Monday, and so on.

- **Example:** You can make multiple days to trigger the SLA policy. For example, to trigger every Sunday and Saturday, use the following list:

```
[ false,
  true, false, false, false, false, false, true
]
```

- **Restriction:** In the web user interface, you can define only one day in a week.
- **Type:** System list (length 8, Boolean). Partially available in the web user interface.

Data 2.1.5.4: spec > subpolicy > trigger > domList

The days in a month to trigger the SLA policy. Use this key-value pair when you use MONTHLY for type.

The domList is a list that contains 33 Boolean objects. The item in index 0 is reserved for the system, and it must be false. The item in index 1 is the 1st day of a month, the item in index 2 is the 2nd day of a month, and so on. The item in index 33 is the last day of a month.

Tip: It is advised not to use the items between index 28 and 31 because some months do not have days between 28 and 31.

Example value: The following list can be used to select the last day of every month (for example, January 31, February 28, and so on):

```
[
  false,
  false, false, false, false, false, false, false,
  false, false, false, true
]
```

- **Restriction:** In the web user interface, you can define only one day in a month.
- **Type:** System list (length 33, Boolean). Partially available in the web user interface.

Data 2.1.5.5: spec > subpolicy > trigger > activateDate

The start time to activate the SLA policy. Use the UNIX timestamp format followed by three digits, which represent milliseconds.

- **Type:** Integer. Required. Available in the web user interface.

Data 2.1.5.6: spec > subpolicy > trigger > timezone

The Time Zone database name for the web user interface. This value does not affect the activateDate value in the UNIX time format for the start time. You can use UTC too.

Tip: Use UTC for UTC. To get a full list of TZ database names, see the web user interface or log in to IBM Spectrum Protect Plus via SSH and run the `timedatectl list-timezones` command.

- **Type:** System string. Required. Available in the web user interface.

Data 2.1.6: spec > subpolicy > source

The source for the incremental copy to standard object storage topic and the full copy to archive object storage topic. Use one of the following values:

Source	Value
Backup policy destination	backup
Replication policy destination	replication

- **Type:** System string. Required. Available in the web user interface.

Data 2.1.7: spec > subpolicy > site

The name of the site. This key-value pair is only available for the snapshot protection topic, the backup policy topic, and the replication policy topic.

- **Example value:** Primary
- **Type:** String. Required. Available in the web user interface.

Data 2.1.8: spec > subpolicy > target

Specify the object storage server or the repository server to store the backup snapshots. This key-value pair is only available for the incremental copy to standard object storage topic and the full copy to archive object storage topic.

- **Example value:**

```
{
  "href": "https://10.0.0.100/api/cloud/3",
  "resourceType": "cos",
  "id": "3"
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 2.1.8.1: spec > subpolicy > target > href

The {cloudProviderInfoHref} of the object storage server or the repository server.

Tip: To get a {cloudProviderInfoHref} by the name of the storage server or the repository server, follow the instructions in Getting a {cloudProviderInfoHref} (page 343).

- **Type:** String. Required.

Data 2.1.8.2: spec > subpolicy > target > resourceType

The type of the object storage server or the repository server.

- **Value:** Use one of the following values:

Provider	Value
Amazon Simple Storage Service (S3)	aws
IBM Cloud Object Storage	cos
Microsoft Azure Blob Storage	azure
S3 compatible object storage	generic
IBM Spectrum Protect	sp

- **Type:** System string. Required.

Data 2.1.8.3: spec > subpolicy > target > id

The {cloudProviderInfoId} of the object storage server or the repository server.

Tip: To get a {cloudProviderInfoId} by the name of the storage server or the repository server, follow the instructions in Getting a {cloudProviderInfoId} (page 343).

- **Type:** String. Required.

Data 2.1.9: spec > subpolicy > label

The prefix for snapshot names. This key-value pair is available in SLA policies for Kubernetes and OpenShift (Type 2), and Amazon EC2 (Type 3).

- **Restriction:** SLA policies for Kubernetes and OpenShift (Type 2) support only lowercase characters (a-z) or digits (0-9). SLA policies for Amazon EC2 does not have this restriction.
- **Example value:** daily
- **Type:** String. Available in the web user interface.

Example 1: Add an SLA policy for VMware instances (Type 1)

Assume that you want to add an SLA policy with the following properties:

- **Name:** Diamond
- **Type:** VMware, Hyper-V, Exchange, Microsoft 365, SQL Server, Oracle Database, Db2, MongoDB, IBM Spectrum Protect Plus Catalog, and Windows File Systems (Type 1)
- **Backup policy:** Required
 - **Retention:** 7 days
 - **Frequency:** every 2 hours

- **Start time:** 1 June 2020 at 0:00 US Central Time (1590987600 UNIX time)
- **Target Site:** Dallas
- **Only use encrypted disk storage:** No
- **Replication policy:** Enable
 - **Retention:** 30 days
 - **Frequency:** every 1 day
 - **Start time:** 1 July 2020 at 13:00 Singapore Time (1593579600 UNIX time)
 - **Target Site:** Singapore
 - **Only use encrypted disk storage:** No
- **Incremental copy to standard object storage:** Enable
 - **Retention:** 7 days
 - **Frequency:** every 1 week, every Sunday
 - **Start time:** June 10, 2020 at 0:00 US Central Time (1591765200 UNIX time)
 - **Source:** Backup policy destination
 - * **Destination and target:** Cloud services, BlueMachines IBM COS - Dallas (`{cloudProviderInfoId} 2`)
- **Full copy to archive object storage:** Enable
 - **Retention:** 5 years
 - **Frequency:** every 1 month, the 20th day of every month
 - **Start time:** 20 June 2020 at 2:15 US Central Time (1592637300 UNIX time)
 - **Source:** Backup policy destination
 - * **Destination and target:** Repository Server: BlueMachines Spectrum Protect - Dallas 1 (`{cloudProviderInfoId} 6`)

A Python snippet that is similar to the following example can be used to create an SLA policy:

```
_data = f'''{{
  "name": "Diamond",
  "type": "backup",
  "spec": {{
    "subpolicy": [
      {{
        "type": "REPLICATION",
        "software": true,
        "retention": {{
          "age": 7
        }}
      }}
    ],
    "useEncryption": false,
    "trigger": {{
      "frequency": 2,
      "type": "HOURLY",
      "activateDate": 1590987600000,
      "timezone": "America/Chicago"
    }}
  }}
  "site": "Dallas"
}}
'''
```

(continues on next page)

```
"type":      "REPLICATION",
"software":  false,
"retention":  {}
  "age": 30
},
"useEncryption": false,
"trigger":   {}
  "frequency": 1,
  "type":      "DAILY",
  "activateDate": 1593579600000,
  "timezone":   "Asia/Singapore"
},
"site": "Primary"
},
{}
"type":      "SPPOFFLOAD",
"retention": {}
  "age": 7
},
"trigger":   {}
  "frequency": 1,
  "type":      "WEEKLY",
  "dowList":   [ false,
                true, false, false, false, false, false
              ],
  "activateDate": 1591765200000,
  "timezone":   "America/Chicago"
},
"source":    "backup",
"target":    {}
  "href":     "https://10.0.0.100/api/cloud/2",
  "resourceType": "cos",
  "id":       "2"
},
{}
},
{}
"type":      "SPPARCHIVE",
"retention": {}
  "age": 1825
},
"trigger":   {}
  "frequency": 1,
  "type":      "WEEKLY",
  "dowList":   [ false,
                true, false, false, false, false, false
              ],
  "activateDate": 1592637300000,
  "timezone":   "America/Chicago"
},
"source":    "backup",
"target":    {}
  "href":     "https://10.0.0.100/api/cloud/6",
  "resourceType": "sp",
  "id":       "6"
},
{}
]
```

```
}  
}  
}}''  
  
requests.post('https://' + spp_ipv4 + '/ngp/slapolicy',  
             headers={...}, data=_data, verify=...)
```

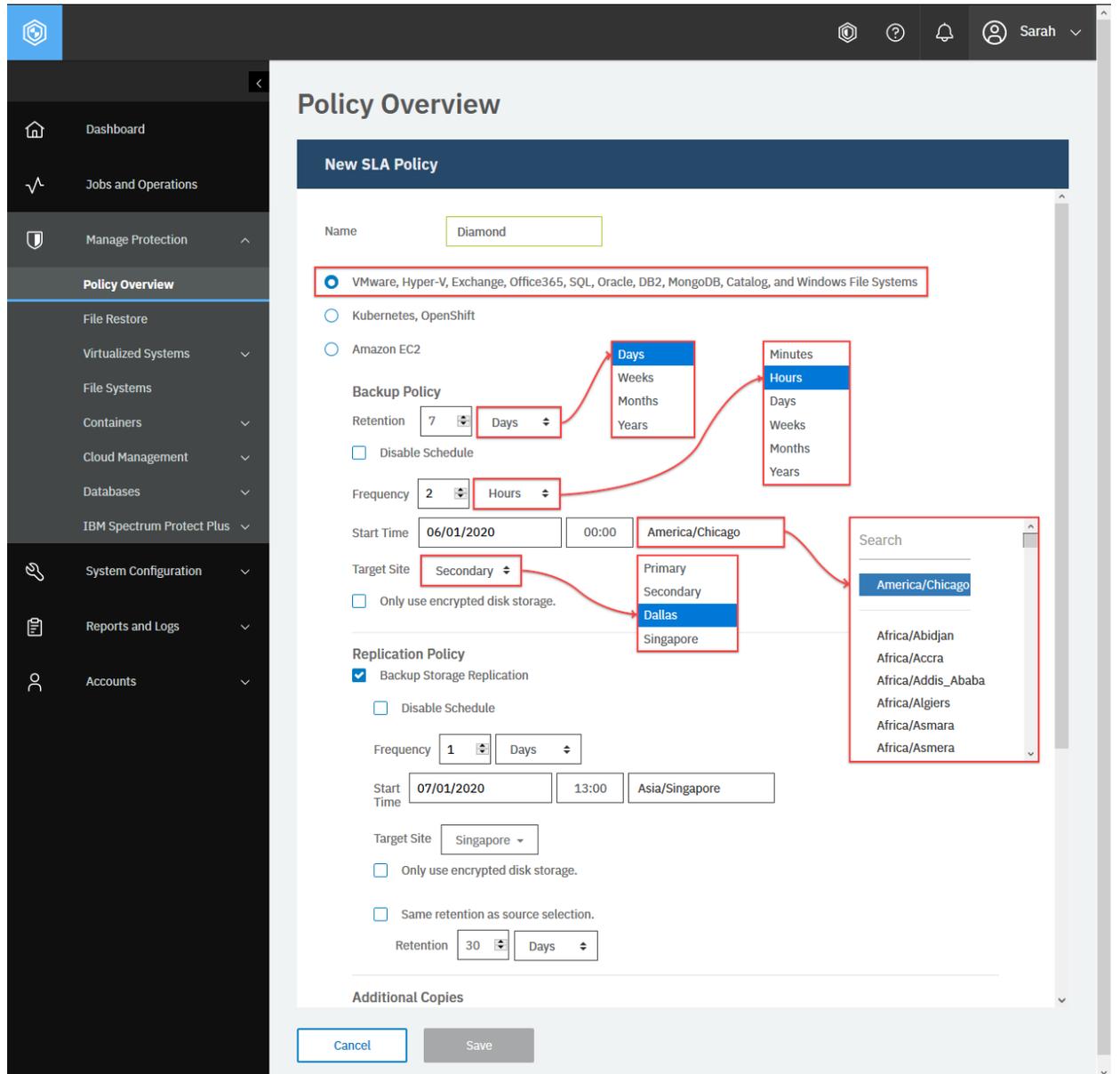


Figure 15: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Manage Protection > Policy Overview**, and see the **SLA Policies** section. Click **Add SLA Policy**. Enter the name. Click **VMware, Hyper-V, ...** to create an SLA policy Type 1. Fill in the required fields for a backup policy. Optionally, you can define a replication policy.

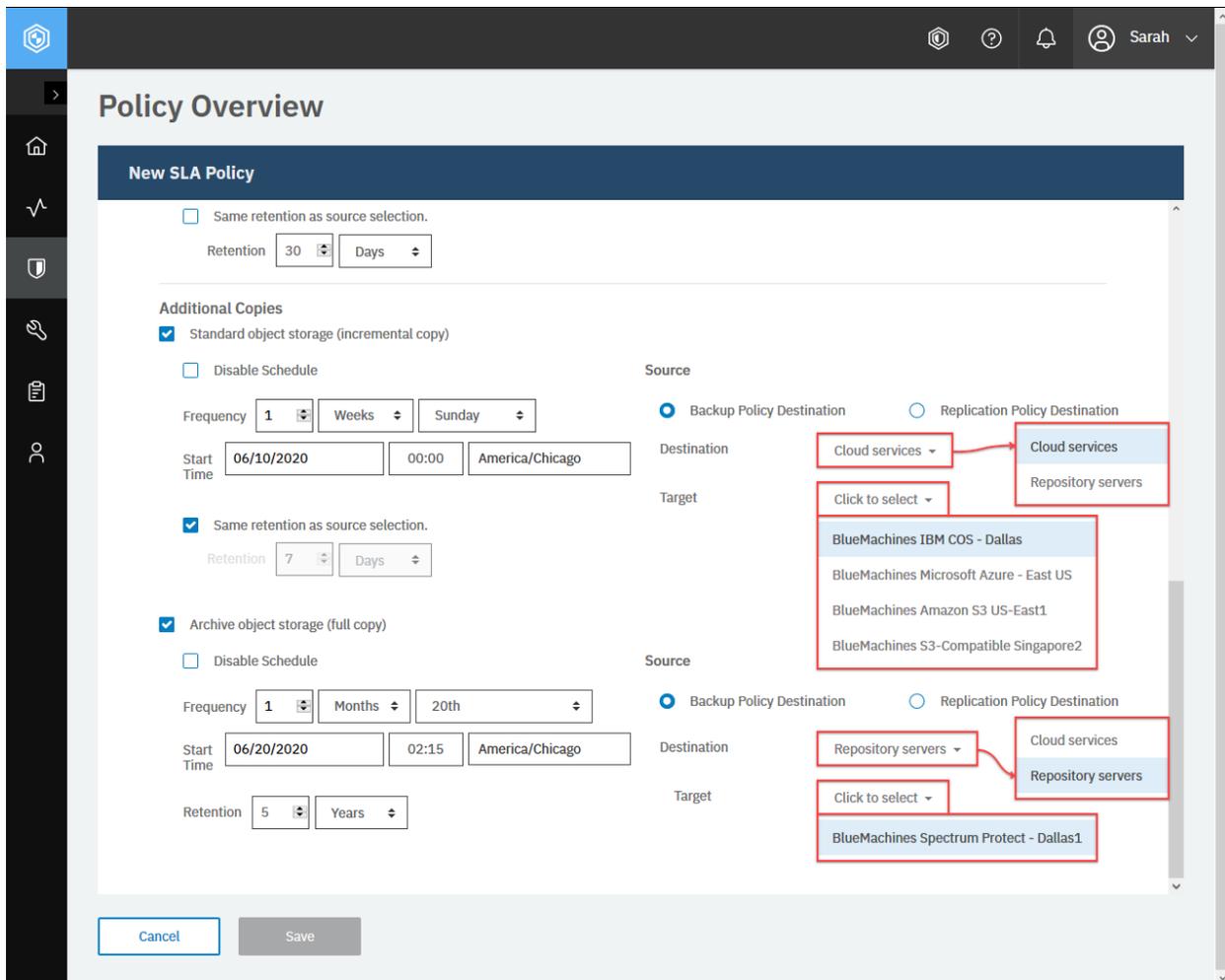


Figure 16: Scroll down the page. Optionally, you can define the incremental copy to standard object storage and full copy to archive object storage too. Click **Save**.

The request prompts a response with the HTTP status of 201 (Created). The response body is similar to the JSON object for the SLA policy, Diamond, as shown in Getting information about SLA policies (page 67). Review the response to ensure that the new SLA policy, Diamond, was created.

Example 2: Add an SLA policy for Kubernetes instances (Type 2)

Assume that you want to add an SLA policy with the following properties:

- **Name:** Sapphire
- **Type:** Kubernetes (Type 2)
- **Snapshot protection:** Required
 - **Retention:** 7 days
 - **Frequency:** every 30 minutes
 - **Start time:** 1 June 2020 at 0:00 US Central Time (1589778000 UNIX time)
 - **Snapshot prefix:** sapphire

- **Backup policy:** Enable
 - **Retention:** 1 month
 - **Frequency:** every 1 day
 - **Start time:** 1 June 2020 at 1:00 US Central Time (1589778000 UNIX time)
 - **Target Site:** Dallas
 - **Only use encrypted disk storage:** No
- **Replication policy:** Enable
 - **Retention:** 30 days
 - **Frequency:** every 1 day
 - **Start time:** 1 July 2020 at 13:00 Singapore Time (1593579600 UNIX time)
 - **Target Site:** Singapore
 - **Only use encrypted disk storage:** No
- **Incremental copy to standard object storage:** Yes
 - **Retention:** 1 month
 - **Frequency:** every 1 day
 - **Start time:** June 10, 2020 at 0:00 US Central Time (1591765200 UNIX time)
 - **Source:** Replication policy destination
 - * **Destination and target:** Cloud services, BlueMachines Amazon S3 US-East1 (`{cloudProviderInfoId}` 4)
- **Full copy to archive object storage:** Yes
 - **Retention:** 5 years
 - **Frequency:** every 1 month, the 20th day of every month
 - **Start time:** 20 June 2020 at 2:15 US Central Time (1592637300 UNIX time)
 - **Source:** Backup policy destination
 - * **Destination and target:** Cloud services: BlueMachines Azure US-East (`{cloudProviderInfoId}` 3)

A Python snippet that is similar to the following example can be used to create an SLA policy:

```
_data = f'''{{
  "name": "Sapphire",
  "type": "snapshot_backup",
  "spec": {{
    "subpolicy": [
      {{
        "name": "Storage Snapshot",
        "type": "SNAPSHOT",
        "retention": {{
          "age": 7
        }}
      }},
      "trigger": {{
        "frequency": 30,
        "type": "SUBHOURLY",
        "activateDate": 1589778000000,
        "timezone": "America/Chicago"
      }}
    ]
  }}
}}'''
```

(continues on next page)

```

    "label":      "sapphire"
  }},
  {{
    "type":      "REPLICATION",
    "software":  true,
    "retention": {{
      "age": 30
    }},
    "useEncryption": false,
    "trigger": {{
      "frequency": 1,
      "type":      "DAILY",
      "activateDate": 1589778000000,
      "timezone":   "America/Chicago"
    }},
    "site":      "Dallas"
  }},
  {{
    "type":      "REPLICATION",
    "retention": {{
      "age": 30
    }},
    "useEncryption": false,
    "software":    false,
    "trigger": {{
      "frequency": 1,
      "type":      "DAILY",
      "activateDate": 1593579600000,
      "timezone":   "Asia/Singapore"
    }},
    "site":      "Primary"
  }},
  {{
    "type":      "SPPOFFLOAD",
    "retention": {{
      "age": 30
    }},
    "trigger": {{
      "frequency": 1,
      "type":      "DAILY",
      "activateDate": 1591765200000,
      "timezone":   "America/Chicago"
    }},
    "source":    "replication",
    "target":    {{
      "href":     "https://10.0.0.100/api/cloud/4",
      "resourceType": "aws",
      "id":       "4"
    }}
  }},
  {{
    "type":      "SPPARCHIVE",
    "retention": {{
      "age": 1825
    }},
    "trigger": {{
      "frequency": 1,

```

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```
        "type": "MONTHLY",
        "domList": [ false,
                    false, false, false, false, true,
                    false, false, false, false, false,
                    false, false, false, false, false,
                    false, false
        ],
        "activateDate": 1592637300000,
        "timezone": "America/Chicago"
    }},
    "source": "replication",
    "target": {{
        "href": "https://10.0.0.100/api/cloud/3",
        "resourceType": "azure",
        "id": "3"
    }}
    }}
]
}}
}}''
requests.post('https://' + spp_ipv4 + '/ngp/slapolicy',
              headers={...}, data=_data, verify=...)
```

Policy Overview

New SLA Policy

Name:

VMware, Hyper-V, Exchange, Office365, SQL, Oracle, DB2, MongoDB, Catalog, and Windows File Systems
 Kubernetes, OpenShift
 Amazon EC2

Snapshot Protection

Retention: Days

Disable Schedule

Frequency: Minutes

Start Time:

Snapshot Prefix:

Backup Policy

Backup Storage

Retention: Months

Disable Schedule

Frequency: Days

Start Time:

Target Site:

Only use encrypted disk storage.

Replication Policy

Backup Storage Replication

Disable Schedule

Frequency: Days

Start Time:

Target Site:

Only use encrypted disk storage.

Same retention as source selection.

Retention: Days

Additional Copies

Figure 17: To create an SLA policy for Kubernetes (Type 2), click **Kubernetes** and fill in the required fields.

Policy Overview

New SLA Policy

Same retention as source selection.
Retention: 30 Days

Additional Copies

Standard object storage (incremental copy)

Disable Schedule

Frequency: 1 Days
Start Time: 06/10/2020 00:00 America/Chicago

Same retention as source selection.
Retention: 1 Months

Archive object storage (full copy)

Disable Schedule

Frequency: 1 Months 20th
Start Time: 06/20/2020 02:15 America/Chicago
Retention: 5 Years

Source

Backup Policy Destination Replication Policy Destination

Destination: Cloud services
Target: BlueMachines Amazon S3 US-East1

Cancel Save

Figure 18: Scroll down the page. Optionally, you can define the incremental copy to standard object storage and full copy to archive object storage too. Click **Save**.

The request prompts a response with the HTTP status of 201 (Created). The response body is similar to the JSON object for the SLA policy, Sapphire, as shown in Getting information about SLA policies (page 67). Review the response to ensure that the new SLA policy, Sapphire, was created.

Example 3: Add an SLA policy for Amazon EC2 instances (Type 3)

Assume that you want to add an SLA policy with the following properties:

- **Name:** Emerald
- **Type:** Amazon EC2 (Type 3)
- **Snapshot protection:** Required
 - **Retention:** 6 months
 - **Frequency:** every 2 weeks on Sunday
 - **Start time:** 25 June 2020 at 0:00 US Central Time
 - **Snapshot prefix:** Emerald:

A Python snippet that is similar to the following example can be used to create an SLA policy:

```
_data = f'''{{
  "name": "Emerald",
  "type": "snapshot",
  "spec": {{
    "subpolicy": [
      {{
        "type": "SNAPSHOT",
        "retention": {{
          "age": 180
        }}
      }},
      {{
        "trigger": {{
          "frequency": 2,
          "type": "WEEKLY",
          "dowList": [ false,
            true, false, false, false, false, false
          ],
          "activateDate": 1593061200000,
          "timezone": "America/Chicago"
        }}
      }},
      {{
        "label": "Emerald:"
      }}
    ]
  }}
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/slapolicy',
  headers={...}, data=_data, verify=...)
```

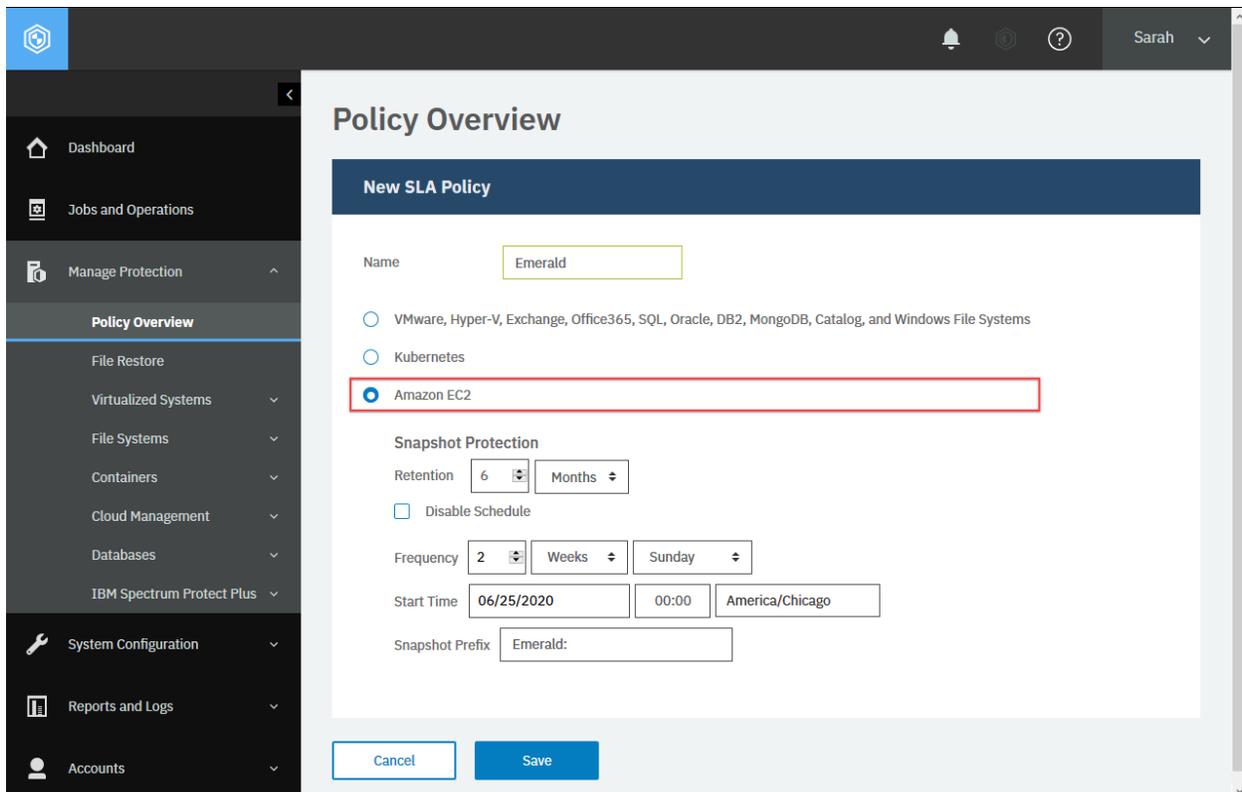


Figure 19: Create an SLA policy (Type 3) for Amazon EC2.

The request prompts a response with the HTTP status of 201 (Created). The response body is similar to the JSON object for the SLA policy, Emerald, as shown in Getting information about SLA policies (page 67). Review the response to ensure that the new SLA policy, Emerald, was created.

Editing the configuration of an SLA policy

You can edit settings for a site. You can change the site name and other options for the default Primary and Secondary sites.

Method and URI

To update the configuration of an SLA policy, use a POST method and a URI:

```
PUT https://{hostname|IPv4}/ngp/slapolicy/{slapolicyId}
```

Tip: To get an `{slapolicyId}` value based on the name of the site, follow the instructions in Getting an `{slapolicyId}` (page 360).

Parameters

None.

Data

The data key-value pairs are the same as for an SLA policy. For more information, follow the instructions in Adding an SLA policy (page 72).

If you use the same name value for the SLA policy name, the same SLA policy is updated. If you use a different name, the SLA policy will be updated and a copy of the original SLA policy will be created automatically.

Use the same or greater `spec > subpolicy > retention > age` value for the number of days to retain the backup snapshots. If you update an SLA policy with a smaller number of the retention days, IBM Spectrum Protect Plus purges all backup snapshots that exceed the retention days.

Example: Edit the configuration of an SLA policy

Assume that you added an SLA policy Diamond (`{slapolicyId}` 2121) as described in Example 1: Add an SLA policy for VMware instances (Type 1) (page 79). You want to update this SLA policy:

- **Name:** Moissanite
- **Type:** VMware, Hyper-V, Exchange, Microsoft 365, SQL Server, Oracle Database, Db2, MongoDB, IBM Spectrum Protect Plus Catalog, and Windows File Systems (Type 1)
- **Backup policy:** Required
 - **Retention:** 7 days
 - **Frequency:** every 2 hours
 - **Start time:** 1 June 2020 at 0:00 US Central Time
 - **Target Site:** Dallas
 - **Only use encrypted disk storage:** No
- **Replication policy:** Disable
- **Incremental copy to standard object storage:** Disable
- **Full copy to archive object storage:** Disable

A Python snippet that is similar to the following example can be used to update the configuration of an SLA policy:

```
slapolicy_id = "2121"      # Diamond

_data = f'''{{
    "name":          "Moissanite",
    "type":          "backup",
    "spec":          {{
        "subpolicy": [
            {{
                "type":          "REPLICATION",
                "software":     true,
                "retention":    {{
                    "age": 2
                }}
            }}
        ]
    }}
}}
```

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```
        "useEncryption": false,
        "trigger":      {{
            "frequency": 15,
            "type":      "SUBHOURLY",
            "activateDate": 1590901200000,
            "timezone":   "America/Chicago"
        }},
        "site":         "Dallas"
    }},
}]]
]]]
}}' '
requests.put('https://10.0.0.100/ngp/slapolicy/' + slapolicy_id,
             headers={...}, data=_data, verify=...)
```

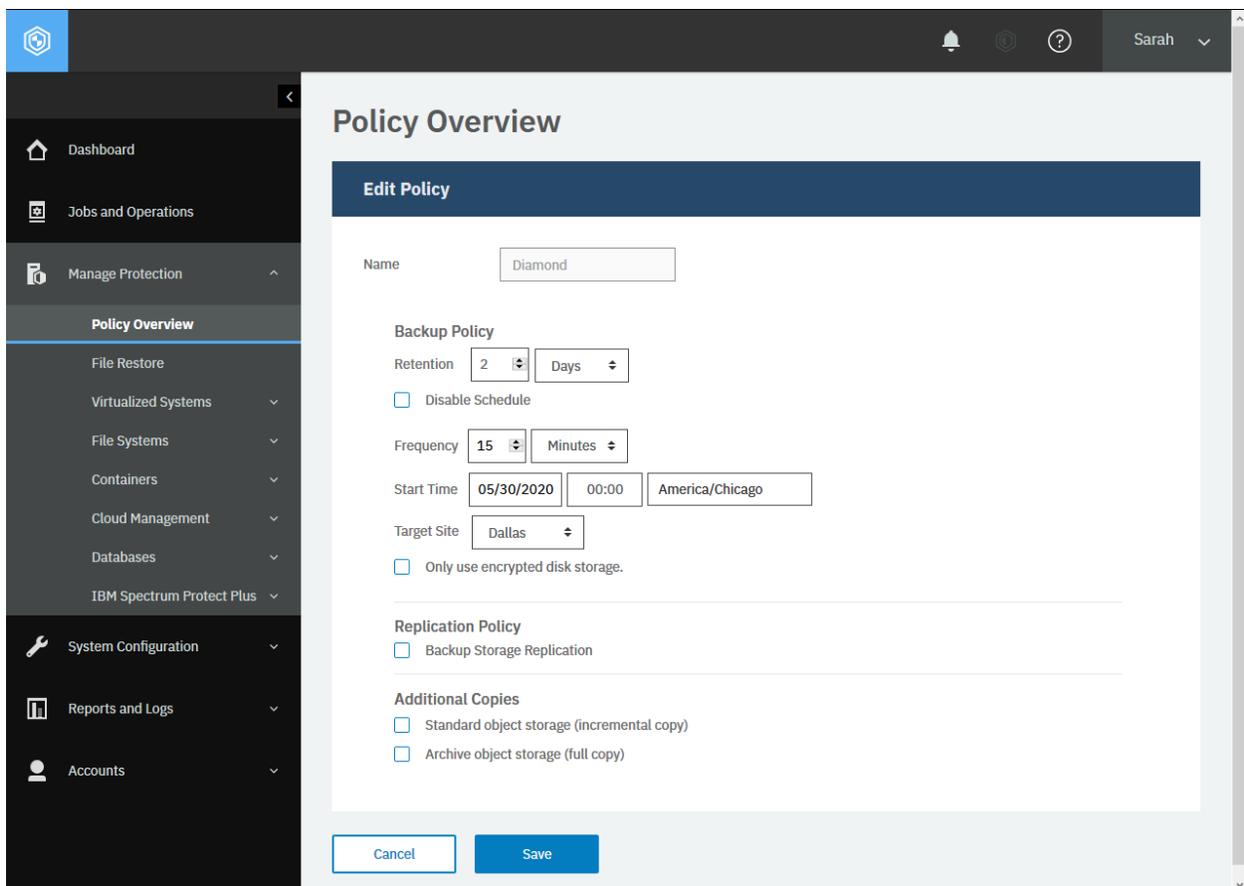


Figure 20: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Manage Protection > Policy Overview**, and see the **SLA Policies** section. Click the **Edit** icon for the SLA policy you want to edit its configuration.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the SLA policy is updated.

Deleting an SLA policy

You can delete a SLA policy.

Method and URI

To delete an SLA policy with {slapolicyId}, the request's method and URI are similar to the following example:

```
DELETE https://{hostname|IPv4}/ngp/slapolicy
```

Tip: To get an {slapolicyId} value based on its name, follow the instructions in Getting an {slapolicyId} (page 360).

Parameters

Parameter 1: name

Specify the name of the SLA policy to delete.

- **Example value** Diamond
- **Type:** System string. Required. Available in the web user interface.

None.

Data

None.

Example: Delete an SLA policy

Assume that you have an SLA policy, Diamond, and you want to delete it.

A Python snippet that is similar to the following example can be used to delete the SLA policy:

```
_params = {"name": "Diamond"}

requests.delete('https://' + spp_ipv4 + '/ngp/slapolicy/',
               headers={...}, params=_params, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the SLA policy Diamond.

Virtualized Systems (VMware, Hyper-V, Amazon EC2)

Some operations for virtualized systems share the same requests and response structure. For example, invoke an inventory job for virtualized systems and it takes place for all types of virtualized systems, namely, VMware, Microsoft Hyper-V, and Amazon Elastic Compute Cloud (EC2). This section describes operations that are commonly used by multiple virtualized systems.

Running an inventory job for virtualized systems

An inventory job for virtualized systems will rebuild a list of those and resources on it, such as virtual machines and virtual hard disks on it, that IBM Spectrum Protect Plus can protect. This section discusses how you can invoke an inventory job for hypervisors that applies to VMware vCenter, Microsoft Hyper-V, and Amazon EC2.

Every time you add a new hypervisor server or make any changes in their resources such as deploying new virtual machines on it, you have to run an inventory job at IBM Spectrum Protect Plus to update its list of hypervisor instances.

See also:

To run an inventory job for application servers (Oracle Database, SQL Server, Db2, MongoDB, Exchange Server, Microsoft 365, Kubernetes, and OpenShift), follow the instructions in [Running an inventory job for application server instances](#) (page 124).

Method and URI

To start an inventory job, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/endeavour/job/{jobId}
```

Tip: To get the `{jobId}` for the hypervisor inventory job, follow the instructions in [Getting a {jobId}](#) (page 352), where the object name is `Hypervisor Inventory`. This `{jobId}` may vary by the IBM Spectrum Protect Plus appliances.

Parameters

Parameter 1: action

Specify the type of action.

- **Value:** `inventory`
- **Type:** System string. Required. Available in the web interface.

Parameter 2: actionname

Specify the step of the action.

- **Value:** `start`
- **Type:** System string. Required. Available in the web interface.

Data

None.

Example: Start an inventory job for virtualized system instances

Assume that you want to run a hypervisor inventory job for virtualized systems.

Create a function that converts the policy name, Hypervisor Inventory, into the job ID:

```
job_id = converter_job("Hypervisor Inventory")
print(job_id)
```

1003

Assume that the job ID is 1003 in this IBM Spectrum Protect Plus appliance. A Python snippet that is similar to the following example can be used to start the hypervisor inventory job:

```
_params = {
    "action": "start",
    "actionname": "start"
}

_response = requests.post('https://' + spp_ipv4 + '/api/endeavour/job/' + job_id
    headers={...}, params=_params, verify=...)
```

The screenshot shows the IBM Spectrum Protect Plus web user interface. The left sidebar contains navigation options: Dashboard, Jobs and Operations, Manage Protection, Policy Overview, File Restore, Virtualized Systems, VMware, Hyper-V, Amazon EC2, File Systems, Containers, Cloud Management, Databases, IBM Spectrum Protect Plus, and System Configuration. The main content area is titled 'VMware' and includes a 'Manage vCenter' button and a 'Create job' button. Below this is the 'VMware Backup' section, which features a search bar, a 'View: VMs and Templates' dropdown, and a table of vCenters. The table has columns for Name, Guest OS, and SLA Policy. Two vCenters are listed: 10.0.0.10 and 10.0.0.20. The status 'Inventory In Progress' is highlighted in a red box. At the bottom of the VMware Backup section, there are buttons for 'Run', 'Select SLA Policy', and 'Select options'. Below this is the 'SLA Policy Status' section, which includes a 'Filter Job Log' dropdown menu.

Figure 21: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In any of hypervisor pages (for example, **VMware**), click **Run an inventory**. The blue **Run Inventory** button changes into **Inventory In Progress** in gray.

You will receive a response with no body and the HTTP status code of 204 (No Content).

Attention: Do not determine the status of inventory jobs by referring to the HTTP status code in a response. This request only starts an inventory job and receives a response with the HTTP status code of 204 (No Content) regardless of the status or the result. To see the status of the inventory jobs, follow the instructions in Getting the status of a hypervisor inventory job (page 96).

Getting the status of a hypervisor inventory job

You can get status information about a currently running inventory job and the previous one.

Method and URI

To get information about the present and previous hypervisor inventory jobs, use a GET method and a URI, where {jobId} is the ID for the hypervisor inventory job:

```
GET https://{hostname|IP}/endeavour/job/{jobId}
```

Parameters

None.

Example: Get status of a hypervisor inventory job

Assume that the {jobId} of the hypervisor inventory job is 1003.

A Python snippet that is similar to the following example can be used to get status information about the present and previous hypervisor inventory job:

```
job_id = "1003" # Hypervisor Inventory
requests.get('https://' + spp_ipv4 + '/api/endeavour/job/' + job_id,
            headers={...}, verify=...)
```

Assume that you ran an inventory job for virtualized systems and send the request to see the status of it. Normally, the inventory job takes a few minutes to complete and so you should see the running status. In your browser, the blue **Run Inventory** button has been grayed out and reading **Inventory In Progress**. Here is an example response with the HTTP status code of 200 (OK).

```
{
  "links": {...},
  "name": "Hypervisor Inventory",
  "description": null,
  "policyId": "1003",
  "policyName": "Hypervisor Inventory",
  "type": "catalog",
  "typeDisplayName": "Catalog",
  "subType": "hypervisor",
  "subTypeDisplayName": "Hypervisor",
  "serviceId": "serviceprovider.catalog.hypervisor",
```

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```
"displayName": "Hypervisor Inventory",
"status": "RUNNING",
"statusDisplayName": "Running",
"lastSessionStatus": "PARTIAL",
"lastSessionStatusDisplayName": "Partial",
"triggerIds": [
  "1003"
],
"triggerData": [
  {
    "triggerId": "1003",
    "triggerInfo": null
  }
],
"lastRunTime": 1578679221737,
"nextFireTime": 1578729600000,
"lastSessionDuration": 685498,
"tenantId": 1000,
"actions": null,
"statistics": null,
"lastrun": {
  "sessionId": "1578679221158",
  "jobName": "Hypervisor Inventory",
  "type": "catalog",
  "subType": "hypervisor",
  "serviceId": "serviceprovider.catalog.hypervisor",
  "start": 1578679221737,
  "end": 1578679907235,
  "duration": 685498,
  "status": "PARTIAL",
  "results": "Started",
  "properties": null,
  "numTasks": 4,
  "previousLastTask": 0,
  "lastUpdate": 1578679907240,
  "percent": 100,
  "policySnapshot": null
},
"id": "1003"
}
```

In the example response above, the status value reads RUNNING which means the hypervisor inventory job was running at the time you sent the request. You can also see the information about the previous hypervisor inventory job.

A few minutes later, you send the same request again to see the status. At this time, the button in the browser comes back to the original, blue **Run Inventory** button. Here is an example response with the HTTP status code 200 (OK). As you see, the status value reads IDLE.

```
{
  "links": {...},
  ...
  "status": "IDLE",
  "statusDisplayName": "Idle",
  "lastSessionStatus": "PARTIAL",
  "lastSessionStatusDisplayName": "Partial",
  "triggerIds": [
```

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```
    "1003"
  ],
  "triggerData": [
    {
      "triggerId": "1003",
      "triggerInfo": null
    }
  ],
  "lastRunTime": 1578681060744,
  "nextFireTime": 1578729600000,
  "lastSessionDuration": 529178,
  "tenantId": 1000,
  "actions": null,
  "statistics": null,
  "lastrun": {...},
  ...
}
```

Restriction: Do not determine the status of the hypervisor inventory jobs by referring to the HTTP status code in a response. This request will generate a response with the HTTP status code of 200 (OK) regardless of the status. Instead, refer to the relevant key-value pairs in the response to check the status.

Getting information about virtualized systems

You can get information about virtualized systems including vCenter Servers, Microsoft Hyper-V Servers, and Amazon EC2. The REST API can request a list of virtualized systems of all types, unlike the web user interface, which displays only one type.

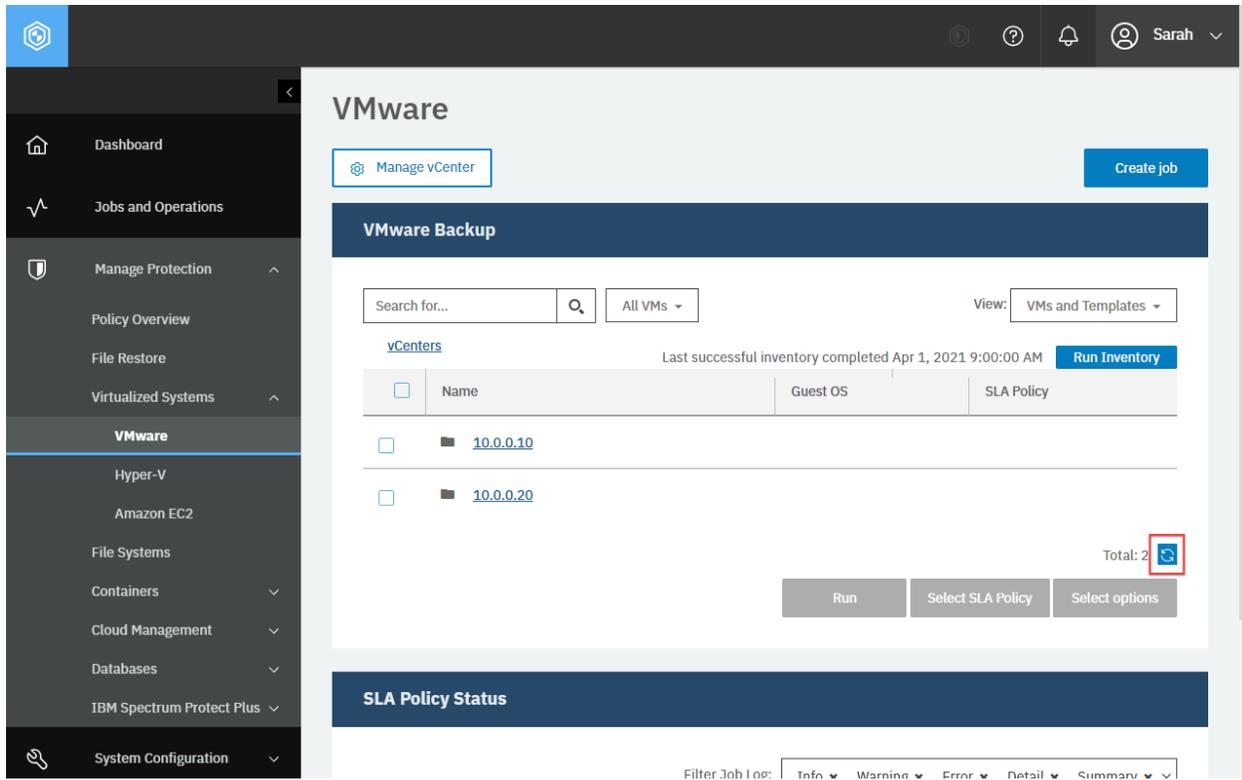


Figure 22: An equivalent action on a web browser for vCenter Servers.

Method and URI

To get information about all virtualized systems, use a GET method and a URI:

```
GET https://{hostname|IP}/api/hypervisor
```

To get information about all virtualized systems, use a GET method and a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
```

Tip: To get a `{hypervisorHypervisorId}` value based on its name, follow the instructions in Getting a `{hypervisorHypervisorId}` (page 344).

Parameters

Parameter 1: filter

Optionally, you may use the filter to specify a type of virtualized systems. You can use the `filter` operation parameters that are described in Filter (page 363). If you do not use this parameter, you will get all types of virtualized systems.

- **Example value:** Use the following value for the `filter` key to get objects that are managed by VMware vCenter:

```

{
  [
    {
      "property": "type",
      "value": "vmware",
      "op": "="
    }
  ]
}

```

- **Type:** JSON object. Available in the web user interface.

Data

None.

Example 1: Get information about all virtualized systems

A Python snippet that is similar to the following example can be used to get a list of all virtualized systems:

```

requests.get('https://' + spp_ipv4 + '/api/hypervisor',
             headers={...}, verify=...)

```

The response below with the HTTP status of 200 (OK) shows the list of all virtualized systems.

```

{
  "links": {...},
  "total": 5,
  "hypervisors": [
    {
      "links": {...},
      "name": "10.0.0.10",
      "hostAddress": "10.0.0.10",
      "user": {
        "href": "https://10.0.0.100:-1/api/identity/user/2102"
      },
      "sslConnection": true,
      "portNumber": 443,
      "type": "vmware",
      "id": "1001",
      "uniqueId": "fa8f1a0f-9d01-44e6-b281-6c577cd920ae",
      "version": null,
      "build": null,
      "apiVersion": null,
      "properties": {},
      "logicalDelete": false,
      "opProperties": {
        "snapshotConcurrency": 3,
        "veServerInfo": null
      },
      "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
or:1001",
      "resourceType": "hypervisor"
    },
  ],
}

```

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```

{
  "links": {...},
  "name": "hyperv.dallas.bluemachines.com.invalid",
  "hostAddress": "hyperv.dallas.bluemachines.com.invalid",
  "user": {
    "href": "https://10.0.0.100:-1/api/identity/user/2104"
  },
  "sslConnection": false,
  "portNumber": 5985,
  "type": "hyperv",
  "id": "1002",
  "uniqueId": "2d60ba76-9161-3492-ae5d-80f0b067760a",
  "version": null,
  "build": null,
  "apiVersion": null,
  "properties": {
    "sysinfoVersion": {
      "key": "version",
      "value": "10.0.17763"
    },
    "sysinfoModel": {
      "key": "model",
      "value": "PowerEdge R610"
    },
    "sysinfoManufacturer": {
      "key": "manufacturer",
      "value": "Dell Inc."
    },
    "sysinfoDomain": {
      "key": "domain",
      "value": "hyperv.dallas.bluemachines.com.invalid"
    },
    "sysinfoOs": {
      "key": "os",
      "value": "Microsoft Windows Server 2019 Datacenter"
    },
    "sysinfoName": {
      "key": "name",
      "value": "win2016enghv"
    }
  },
  "logicalDelete": false,
  "opProperties": {
    "snapshotConcurrency": 3,
    "veServerInfo": null
  },
  "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:hyperv/hypervis
or:1002",
  "resourceType": "hypervisor"
},
{
  "links": {...},
  "name": "us-east-1",
  "hostAddress": "10.0.0.100",
  "user": {
    "href": "https://10.0.0.100/api/identity/user/1002"
  },
}

```

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```
        "sslConnection": false,
        "portNumber": 11001,
        "type": "awsec2",
        "id": "1003",
        "uniqueId": "us-east-1",
        "version": null,
        "build": null,
        "apiVersion": null,
        "properties": {},
        "logicalDelete": false,
        "accountName": "testEc2",
        "displayName": "us-east-1",
        "opProperties": {
            "snapshotConcurrency": 0,
            "veServerInfo": null
        },
        "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:awsec2/hypervis
or:1005",
        "resourceType": "hypervisor"
    },
    {...}, {...}, ..., {...}
]
}
```

Example 2: Get information about a specific virtualized system

Assume that you want to get information about a specific virtualized system: 10.0.0.20. You get the hypervisorHypervisorId of it: 1005.

A Python snippet that is similar to the following example can be used to request information about this virtualized system:

```
hypervisor_hypervisor_id = "1005"

requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
            + hypervisor_hypervisor_id,
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "name": "10.0.0.20",
  "hostAddress": "10.0.0.20",
  ...,
  "id": "1005",
  ...
}
```

Example 3: Get information about a specific type of virtualized systems

Assume that you only want to get information for vCenter Servers. Add the following parameter to the request, as shown in Example 1.

```
_params = {"filter": json.dumps([
    {"property": "type",
     "value": "vmware",
     "op": "="}
])}

requests.get('https://' + spp_ipv4 + '/api/hypervisor',
             headers={...}, param=_param, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "total": 2,
  "hypervisors": [
    {
      "links": {...},
      "name": "10.0.0.10",
      "hostAddress": "10.0.0.10",
      ...
      "type": "vmware",
      "id": "1001",
      ...
    },
    {
      "links": {...},
      "name": "10.0.0.20",
      "hostAddress": "10.0.0.20",
      ...
      "id": "1005",
      ...
    }
  ]
}
```

Searching virtualized system instances

Search instances of virtualized systems.

Method and URI

To search VMware instances with a search string, use a GET method and a URI:

```
POST https://{hostname|IP}/api/hypervisor/search
```

Parameters

Parameter 1: resourceType

The resource type to search with. In the web user interface, you can select one from the **View:** drop-down list.

- **Value:** Use one of the following value:

Search target	Value
Virtual machines and templates	vm
Datastore	volume
Tags	tag
Tags and categories	tagcategory

- **Type:** System string. Required. Available in the web user interface.

Parameter 2: from

- **Value:** hlo
- **Type:** System string. Required.

Parameter 3: filter

Optionally, you may use a filter to specify the search target. If this parameter is not used, IBM Spectrum Protect Plus searches within all virtual machines. You can use the `filter` operation parameters that are described in Filter (page 363).

- **Example value:** To search within instances that are associated with none of SLA policies, use the following filter parameter:

```
[
  {
    "property": "unprotected",
    "value": "true",
    "op": "="
  }
]
```

- **Example value:** To search with instances that are associated with the SLA policy, Gold, use the following parameter:

```
[
  {
    "property": "storageProfileName",
    "value": "Gold",
    "op": "="
  }
]
```

- **Type:** Array. Available in the web user interface.

Data

Data 1: name

The search string. The name value can contain the following wildcard characters:

Wildcard character	Description
* (asterisk)	Matches zero or more characters.
? (question mark)	Matches any single character at the present position.

- **Example value:** sales-*
- **Type:** String. Required. Available in the web user interface.

Data 2: hypervisorType

The type of virtualized system servers.

- **Value:** Use one of the following value:

Virtualized system	Value
VMware vCenter	vmware
Hyper-V	hyperv
Amazon EC2	awsec2

- **Type:** String. Required. Available in the web user interface.

Example: Search VMware instances for virtual machines with a specific SLA policy

Assume that you have VMware assets in IBM Spectrum Protect Plus. You want to retrieve names of all virtual machines with the following properties:

- **Resource type:** Virtual machines and templates
- **Filter:**
 - **SLA policy:** Diamond
- **Hypervisor type:** VMware
- **Name:** *-dallas?

The string with the wildcard characters represents the name beginning with zero or more of any characters, followed by -dallas, and ending with any single character.

```
_params = {
  "resourceType": "vm",
  "from": "hlo",
  "filter": {
    json.dumps([
      {
        "property": "storageProfileName",
        "value": "Diamond",
        "op": "="
      }
    ])
  }
}

_data = f''{}
```

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```
"name": "*-dallas?",
"hypervisorType": "vmware"
}}''

requests.post('https://' + spp_ipv4 + '/api/hypervisor/search',
  headers={...}, params=_params, data=_data, verify=...)
```

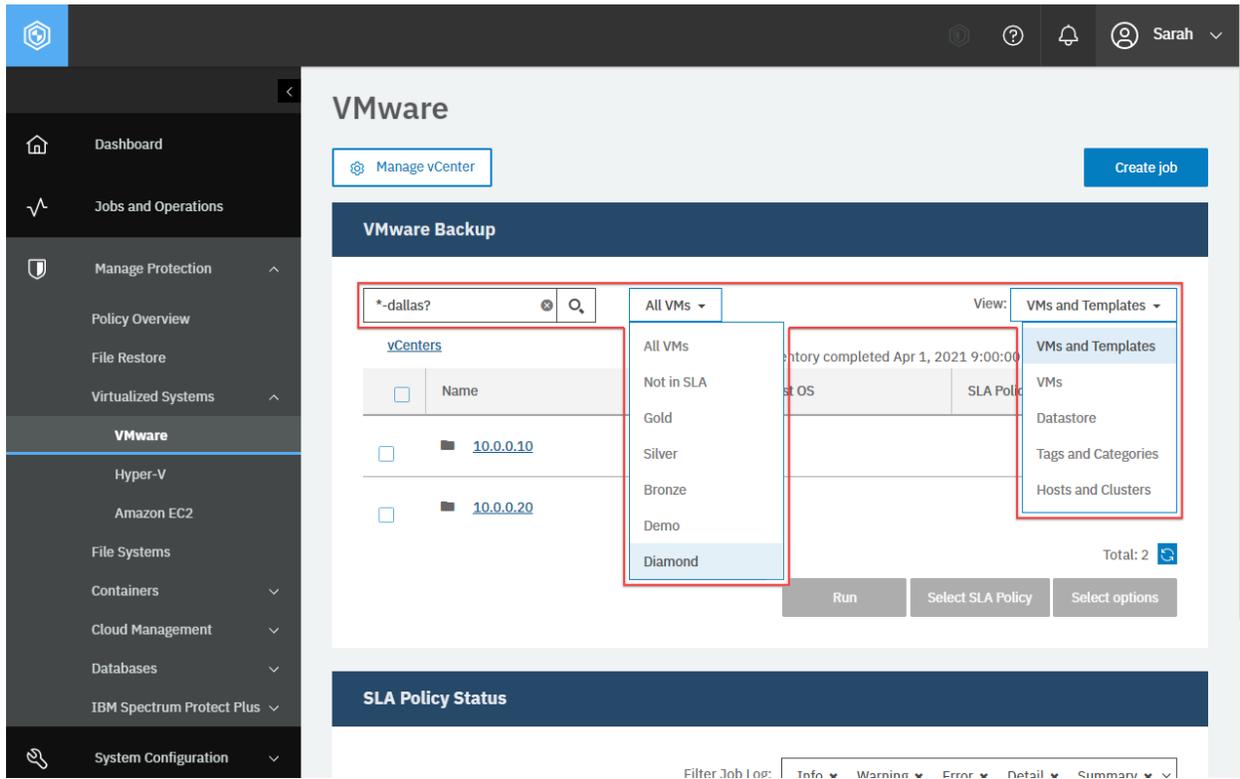


Figure 23: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **VMware** pane, fill the search string with the search field, set the filter if needed, and click **Search**.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "total": 2,
  "vms": [
    {
      "links": {...},
      "name": "vsnap-dallas1",
      "type": "vm",
      "association": null,
      "protectionInfo": null,
      "recoveryInfo": null,
      "recoveryPoint": null,
      "siteId": null,
      "autoProvisionedsubPolicyName": null,
      "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
or:1004/vdc:717dafb25bbbca30d8dc72ed3cbf81f0/vfld:716779e50daefc126bbaed0ef3c36
```

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```

↪22d/vm:8848ad8c1d38ef880cb892a5570d50f5",
    "rbacPathId": 4146,
    "extInfo": null,
    "location": "/vmware-dallas1.bluemachines.com.invalid/Dallas - DataC
↪enter1/Production folder",
    "metadataPath": "/MS:1004/DC:717dafb25bbbca30d8dc72ed3cbf81f0/FLDR:7
↪16779e50daefc126bbaed0ef3c3622d/VM:8848ad8c1d38ef880cb892a5570d50f5",
    "inHLO": true,
    "hypervisorType": "vmware",
    "hypervisorKey": "1004",
    "hypervisorManagementServerID": "1004",
    "nativeKey": "vm-104786",
    "cloudType": null,
    "tags": [],
    "tagCategories": [],
    "metadataPathVmHost": "/MS:1004/DC:717dafb25bbbca30d8dc72ed3cbf81f0/
↪CLUST:14100077601aaa13a1fdf555a065d58f/HOST:735cda83d7290ea7fa685ae7cdc3e95c/VM
↪:8848ad8c1d38ef880cb892a5570d50f5",
    "rbacPathVmHost": "root:0/hypervisor.all:0/hypervisor.type:vmware/hy
↪pervisor:1004/vdc:717dafb25bbbca30d8dc72ed3cbf81f0/vcluster:14100077601aaa13a1f
↪df555a065d58f/vhost:735cda83d7290ea7fa685ae7cdc3e95c/vm:8848ad8c1d38ef880cb892a
↪5570d50f5",
    "rbacPathIdVmHost": 4147,
    "alternatePaths": [
        {
            "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/
↪hypervisor:1004/vtagcategory:a6068ad43059b6b6fc3a0986ba7a0bed/vtag:a3269bb10cfb
↪e7a1588a5a3a5b3637de/vm:8848ad8c1d38ef880cb892a5570d50f5",
            "rbacPathId": 4148,
            "metadataPath": "/MS:1004/TAGCATEGORY:a6068ad43059b6b6fc3a09
↪86ba7a0bed/TAG:a3269bb10cfbe7a1588a5a3a5b3637de/VM:8848ad8c1d38ef880cb892a5570d
↪50f5"
        }
    ],
    "powerSummary": {
        "powerState": "ON",
        "lastPowerOnTime": null,
        "lastPowerOffTime": null,
        "lastSuspendTime": null,
        "uptime": 1574371737324
    },
    "storageSummary": {
        "committed": 80351072860,
        "uncommitted": 92048196830,
        "shared": 78085357568
    },
    "hypervisorHostKey": "735cda83d7290ea7fa685ae7cdc3e95c",
    "volumes": [
        {
            "name": "IBM_Flash_System-Dallas",
            "key": "00613cbaf57e385be9853046d07271f5",
            "configVolume": true
        },
        {
            "name": "isoImages",
            "key": "ece8716493cd0d5b7283552b67bf263c",
            "configVolume": false
        }
    ]

```

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```

    }
  ],
  "hypervisorFolderKey": "716779e50daefc126bbaed0ef3c3622d",
  "hypervisorFolderPath": "Production folder",
  "uniqueId": "4209f06b-f688-c4af-90d2-e93b6e40f270:5009d293-7abc-4b48
↵-4a29-818f3045445e",
  "profileId": null,
  "keyId": null,
  "keyProviderId": null,
  "configFilePath": "[SG_STORAGE] sales-apac/sales-apac.vmx",
  "fileDirPath": null,
  "datacenter": {
    "name": "BlueMachines_vCenter_Dallas1",
    "key": "717dafb25bbbca30d8dc72ed3cbf81f0"
  },
  "cluster": {
    "name": "PS_SEcluster",
    "key": "14100077601aaa13a1fdf555a065d58f"
  },
  "vmGroup": null,
  "resourcePool": {
    "name": "Resources",
    "key": "784eb71414bd617fdb01be7f5d7acd50"
  },
  "cpu": 1,
  "coresPerCpu": 1,
  "memory": 2147483648,
  "vmVersion": "vmx-13",
  "customAttributes": {},
  "vmStorageUtilization": null,
  "configInfo": {
    "name": null,
    "type": null,
    "association": null,
    "protectionInfo": null,
    "recoveryInfo": null,
    "recoveryPoint": null,
    "siteId": null,
    "autoProvisionedsubPolicyName": null,
    "rbacPath": null,
    "rbacPathId": null,
    "extInfo": null,
    "location": null,
    "metadataPath": null,
    "inHLO": true,
    "hypervisorType": null,
    "hypervisorKey": null,
    "hypervisorManagementServerID": null,
    "nativeKey": null,
    "cloudType": null,
    "tags": null,
    "tagCategories": null,
    "metadataPathVmHost": null,
    "rbacPathVmHost": null,
    "rbacPathIdVmHost": null,
    "alternatePaths": null,
    "vmId": null,

```

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```
"osName": null,
"osVersion": null,
"hostName": null,
"vmToolsStatus": "NOT_INSTALLED",
"guestNetworkInfo": [],
"windows": false,
"linux": false,
"nativeObject": {},
"hypervisorHostKey": null,
"volumeId": null,
"volumes": [],
"protected": false,
"systemHold": false,
"id": null
},
"attachments": [],
"vmMetadata": {},
"encrypted": false,
"hypervisorHostname": "vmware-singapore1.bluemachines.com.invalid",
"vmPoolDedupCompressionInfo": null,
"windows": false,
"template": false,
"linux": false,
"versionId": "vm.8848ad8c1d38ef880cb892a5570d50f5.1578038400234",
"nativeObject": {},
"volumeId": null,
"protected": false,
"systemHold": false,
"id": "8848ad8c1d38ef880cb892a5570d50f5",
"config": {
  "name": null,
  "type": null,
  "association": null,
  "protectionInfo": null,
  "recoveryInfo": null,
  "recoveryPoint": null,
  "siteId": null,
  "autoProvisionedsubPolicyName": null,
  "rbacPath": null,
  "rbacPathId": null,
  "extInfo": null,
  "location": null,
  "metadataPath": null,
  "inHLO": true,
  "hypervisorType": null,
  "hypervisorKey": null,
  "hypervisorManagementServerID": null,
  "nativeKey": null,
  "cloudType": null,
  "tags": null,
  "tagCategories": null,
  "metadataPathVmHost": null,
  "rbacPathVmHost": null,
  "rbacPathIdVmHost": null,
  "alternatePaths": null,
  "vmId": null,
  "osName": null,
```

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```

        "osVersion": null,
        "hostName": null,
        "vmToolsStatus": "NOT_INSTALLED",
        "guestNetworkInfo": [],
        "windows": false,
        "linux": false,
        "nativeObject": {},
        "hypervisorHostKey": null,
        "volumeId": null,
        "volumes": [],
        "protected": false,
        "systemHold": false,
        "id": null
    },
    "resourceType": "vm",
    "storageProfiles": [],
    "copies": null
},
{
    "links": {...},
    "name": "oracle-dallas2",
    "type": "vm",
    "association": null,
    "protectionInfo": null,
    "recoveryInfo": null,
    "recoveryPoint": null,
    "siteId": null,
    "autoProvisionedsubPolicyName": null,
    "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
↪or:1004/vdc:717dafb25bbbca30d8dc72ed3cbf81f0/vfld:716779e50daefc126bbaed0ef3c36
↪22d/vm:2648550a670c6d383cba0d369ae4f91c",
    "rbacPathId": 5310,
    "extInfo": null,
    "location": "/vmware-dallas1.bluemachines.com.invalid/Dallas - Datac
↪enter1/Production folder",
    "metadataPath": "/MS:1004/DC:717dafb25bbbca30d8dc72ed3cbf81f0/FLDR:7
↪16779e50daefc126bbaed0ef3c3622d/VM:2648550a670c6d383cba0d369ae4f91c",
    "inHLO": true,
    "hypervisorType": "vmware",
    "hypervisorKey": "1004",
    "hypervisorManagementServerID": "1004",
    "nativeKey": "vm-123790",
    "cloudType": null,
    "tags": [],
    "tagCategories": [],
    ...
}
]
}

```

Getting virtualized system instances with view filters

You can use view filters to filter the information about virtualized system instances. Use one of the following view filters:

View filter	{hypervisorView}	VMware	Hyper-V	Amazon EC2
Tags	tagcontent	x		x
Datastore	storagecontent	x	x	
Hosts and clusters	hostcontent	x		

Method and URI

To get information about all virtualized systems with one of the view filters, use a GET method and a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}/{hypervisorView}
```

Tip: To get a {hypervisorHypervisorId} based on the hostname or the IPv4 address, follow the instructions in Getting a {hypervisorHypervisorId} (page 344).

Parameters

Parameter 1: from

- **Value:** hlo
- **Type:** System string. Required.

Data

None.

Example 1: Get information about virtualize system instances with the tag view filter

Assume that you added VMware vCenter Server: VMware - Dallas 1 ({hypervisorHypervisorId} 1001). A Python snippet that is similar to the following example can be used to request information about virtualized system instances with the tag view filter:

```
hypervisor_hypervisor_id = "1001"    # VMware - Dallas

_params = {"from": "hlo"}

requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
            + hypervisor_hypervisor_id + '/tagcontent',
            headers={...}, params=_params, data="", verify=...)
```

The response below with the HTTP status of 200 (OK) shows the list of all virtualized systems.

```

{
  "links": {...},
  "total": 2,
  "contents": [
    {
      "links": {...},
      "name": "All",
      "type": "tagcategory",
      "association": null,
      "protectionInfo": null,
      "recoveryInfo": null,
      "recoveryPoint": null,
      "siteId": null,
      "autoProvisionedsubPolicyName": null,
      "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
or:1001/vtagcategory:512150d081814f93e4deb6055d66bcf4",
      "rbacPathId": 2,
      "extInfo": null,
      "location": "/DALLAS.BLUEMACHINES.com.invalid",
      "metadataPath": "/MS:1001/TAGCATEGORY:512150d081814f93e4deb6055d66bc
or:1001/vtagcategory:512150d081814f93e4deb6055d66bcf4",
      "inHLO": true,
      "hypervisorType": "vmware",
      "hypervisorKey": "1001",
      "hypervisorManagementServerID": "1001",
      "nativeKey": "urn:vmomi:InventoryServiceCategory:24b74365-f672-4aac-
8862-0f733c5cf9de:GLOBAL",
      "cloudType": null,
      "tags": null,
      "tagCategories": null,
      "metadataPathVmHost": null,
      "rbacPathVmHost": null,
      "rbacPathIdVmHost": null,
      "alternatePaths": null,
      "description": "",
      "cardinality": "MULTIPLE",
      "associableTypes": [],
      "nativeObject": {},
      "hypervisorHostKey": null,
      "windows": false,
      "volumeId": null,
      "linux": false,
      "volumes": [],
      "protected": false,
      "systemHold": false,
      "id": "512150d081814f93e4deb6055d66bcf4",
      "resourceType": "tagcategory",
      "storageProfiles": []
    }
  ]
}

```

Example 2: Get information about virtualize system instances with the storage view filter

Assume that you have a virtualized system VMware - Dallas1 which is vCenter Server. You get the {hypervisorHypervisorId} of it: 1001. The Python script snippet below will give you a list of instances:

```
hypervisor_hypervisor_id = "1001"    # VMware - Dallas

_params = {"from": "hlo"}

requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
            + hypervisor_hypervisor_id + '/storagecontent',
            headers={...}, params=_params, data="", verify=...)
```

The response below with the HTTP status of 200 (OK) shows the list of instances under the virtualized system "VMware - Dallas1", with the storage view filter.

```
{
  "links": {...},
  "total": 1,
  "contents": [
    {
      "links": {...},
      "name": "PS_SE-Datacenter",
      "type": "datacenter",
      "association": null,
      "protectionInfo": null,
      "recoveryInfo": null,
      "recoveryPoint": null,
      "siteId": null,
      "autoProvisionedsubPolicyName": null,
      "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
or:1001/vdc:717dafb25bbbca30d8dc72ed3cbf81f0",
      "rbacPathId": 3440,
      "extInfo": null,
      "location": "/dallas.bluemachines.com.invalid",
      "metadataPath": "/MS:1001/DC:717dafb25bbbca30d8dc72ed3cbf81f0",
      "inHLO": true,
      "hypervisorType": "vmware",
      "hypervisorKey": "1001",
      "hypervisorManagementServerID": "1001",
      "nativeKey": "datacenter-2",
      "cloudType": null,
      "tags": [
        {
          "name": "MGP Test2",
          "key": "a3269bb10cfbe7a1588a5a3a5b3637de"
        }
      ],
      "tagCategories": [
        {
          "name": "MGP-Test",
          "key": "a6068ad43059b6b6fc3a0986ba7a0bed"
        }
      ],
      "metadataPathVmHost": null,
      "rbacPathVmHost": null,
      "rbacPathIdVmHost": null,
    }
  ]
}
```

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```
    "alternatePaths": [
      {
        "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/
↳hypervisor:1001/vtagcategory:a6068ad43059b6b6fc3a0986ba7a0bed/vtag:a3269bb10cfb
↳e7a1588a5a3a5b3637de/vdc:717dafb25bbbca30d8dc72ed3cbf81f0",
        "rbacPathId": 3535,
        "metadataPath": "/MS:1001/TAGCATEGORY:a6068ad43059b6b6fc3a09
↳86ba7a0bed/TAG:a3269bb10cfbe7a1588a5a3a5b3637de/DC:717dafb25bbbca30d8dc72ed3cbf
↳81f0"
      }
    ],
    "accountName": null,
    "hypervisorHostKey": null,
    "nativeObject": {},
    "windows": false,
    "volumes": [],
    "linux": false,
    "volumeId": null,
    "protected": false,
    "systemHold": false,
    "id": "717dafb25bbbca30d8dc72ed3cbf81f0",
    "resourceType": "datacenter",
    "storageProfiles": []
  }
]
}
```

Example 3: Get information about virtualize system instances with the host view filter

Assume that you have a virtualized system VMware - Dallas1 which is vCenter Server. You get the {hypervisorHypervisorId} of it: 1001. The Python script snippet below will give you a list of instances:

```
hypervisor_hypervisor_id = "1001"    # VMware - Dallas

_params = {"from": "hlo"}

requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
            + hypervisor_hypervisor_id + '/hostcontent'
            headers={...}, params=_params, data="", verify=...)
```

The response below with the HTTP status of 200 (OK) shows the list of all virtualized systems. As you see there are vCenter Servers ("type": "vmware") and Microsoft Hyper-V Servers ("hyperv") in the same list.

```
{
  "links": {...},
  "total": 1,
  "contents": [
    {
      "links": {...},
      "name": "PS_SE-Datacenter",
      "type": "datacenter",
      "association": null,
      "protectionInfo": null,
    }
  ]
}
```

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```

    "recoveryInfo": null,
    "recoveryPoint": null,
    "siteId": null,
    "autoProvisionedsubPolicyName": null,
    "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervis
↵or:1001/vdc:717dafb25bbbca30d8dc72ed3cbf81f0",
    "rbacPathId": 3440,
    "extInfo": null,
    "location": "/vmware-dallas1.bluemachines.com.invalid",
    "metadataPath": "/MS:1001/DC:717dafb25bbbca30d8dc72ed3cbf81f0",
    "inHLO": true,
    "hypervisorType": "vmware",
    "hypervisorKey": "1001",
    "hypervisorManagementServerID": "1001",
    "nativeKey": "datacenter-2",
    "cloudType": null,
    "tags": [
      {
        "name": "MGP Test2",
        "key": "a3269bb10cfbe7a1588a5a3a5b3637de"
      }
    ],
    "tagCategories": [
      {
        "name": "MGP-Test",
        "key": "a6068ad43059b6b6fc3a0986ba7a0bed"
      }
    ],
    "metadataPathVmHost": null,
    "rbacPathVmHost": null,
    "rbacPathIdVmHost": null,
    "alternatePaths": [
      {
        "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/
↵hypervisor:1001/vtagcategory:a6068ad43059b6b6fc3a0986ba7a0bed/vtag:a3269bb10cfb
↵e7a1588a5a3a5b3637de/vdc:717dafb25bbbca30d8dc72ed3cbf81f0",
        "rbacPathId": 3535,
        "metadataPath": "/MS:1001/TAGCATEGORY:a6068ad43059b6b6fc3a09
↵86ba7a0bed/TAG:a3269bb10cfbe7a1588a5a3a5b3637de/DC:717dafb25bbbca30d8dc72ed3cbf
↵81f0"
      }
    ],
    "accountName": null,
    "hypervisorHostKey": null,
    "nativeObject": {},
    "windows": false,
    "volumes": [],
    "linux": false,
    "volumeId": null,
    "protected": false,
    "systemHold": false,
    "id": "717dafb25bbbca30d8dc72ed3cbf81f0",
    "resourceType": "datacenter",
    "storageProfiles": []
  }
]
}

```

Adding VMWare vCenter Server or Hyper-V server

Register VMware vCenter Server or Hyper-V server with IBM Spectrum Protect Plus. A hypervisor inventory job will start automatically after a new vCenter Server is registered successfully.

See also:

For more information about hypervisor inventory, follow the instructions in Running an inventory job for virtualized systems (page 94).

Method and URI

To register VMware vCenter Server or Hyper-V server with IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IP}/ngp/hypervisor
```

Parameters

None.

Data

Data 1: hostAddress

The hostname or the IPv4 address of VMware vCenter server or Hyper-V server.

- **Example value:** 10.0.0.10
- **Type:** String. Required. Available in the web user interface.

Data 2: portNumber

The port number to connect to the VMware vCenter Server or Hyper-V server.

When you connect to Hyper-V server, typically, you will use Microsoft Windows Remote Management (WinRM) over HTTPS or HTTP. To connect to Hyper-V server without using the SSL, you must enable WinRM on the Hyper-V host system. For more information, see the IBM Spectrum Protect Plus Installation and User's Guide.

- **Example value:** You can use the following typical values:

Virtualized system	SSL	Value
VMware vCenter	x	443
VMware vCenter		80
Hyper-V server	x	5986
Hyper-V server		5985

- **Type:** Integer. Required. Available in the web user interface.

Data 3: type

The type of the virtualized system.

- **Value:** Use one of the following values:

Virtualized system	Value
VMware vCenter	vmware
Hyper-V server	hyperv

- **Type:** System string. Required. Available in the web user interface.

Data 4: username

The {identityUserHref} of the existing user.

Tip: To get an {identityUserHref} value based on the username, follow the instructions in Getting an {identityUserHref} (page 350).

- **Example value:** https://10.0.0.100/api/identity/user/2139
- **Type:** String. Required. Available in the web user interface.

Data 5: sslConnection

Indication of whether SSL is used for the connection.

- **Example value:** true to enable SSL.
- **Type:** Boolean. Required. Available in the web user interface.

Data 6: opProperties

Optional properties.

- **Example value:**

```
{
  "snapshotConcurrency": 3
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 6: opProperties > snapshotConcurrency

The maximum number of virtual machines to process concurrently per ESX server or Hyper-V server.

- **Example value:** 3 (default)
- **Type:** Integer. Required. Available in the web user interface.

Example 1: Register VMware vCenter server with IBM Spectrum Protect Plus

Assume that you want to register the following VMware vCenter Server with IBM Spectrum Protect Plus:

- **Hostname/IP:** 10.0.0.10
- **Port:** 443 (HTTPS)
- **Username:** AD-BLUEMACHINESsarah.wiseman ({identityUserHref} https://10.0.0.100/api/identity/user/2138)
- **Use SSL:** Yes
- **Maximum number of VM's to process concurrently per ESX server:** 3

A Python snippet that is similar to the following example can be used to register VMware vCenter server with IBM Spectrum Protect Plus:

```

_data = f'''{{
  "hostAddress": "10.0.0.10",
  "portNumber": 443,
  "username": "https://10.0.0.100/api/identity/user/2137",
  "sslConnection": true,
  "type": "vmware",
  "opProperties": {{
    "snapshotConcurrency":3
  }}
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/hypervisor',
  headers={...}, params="", data=_data, verify=...)

```

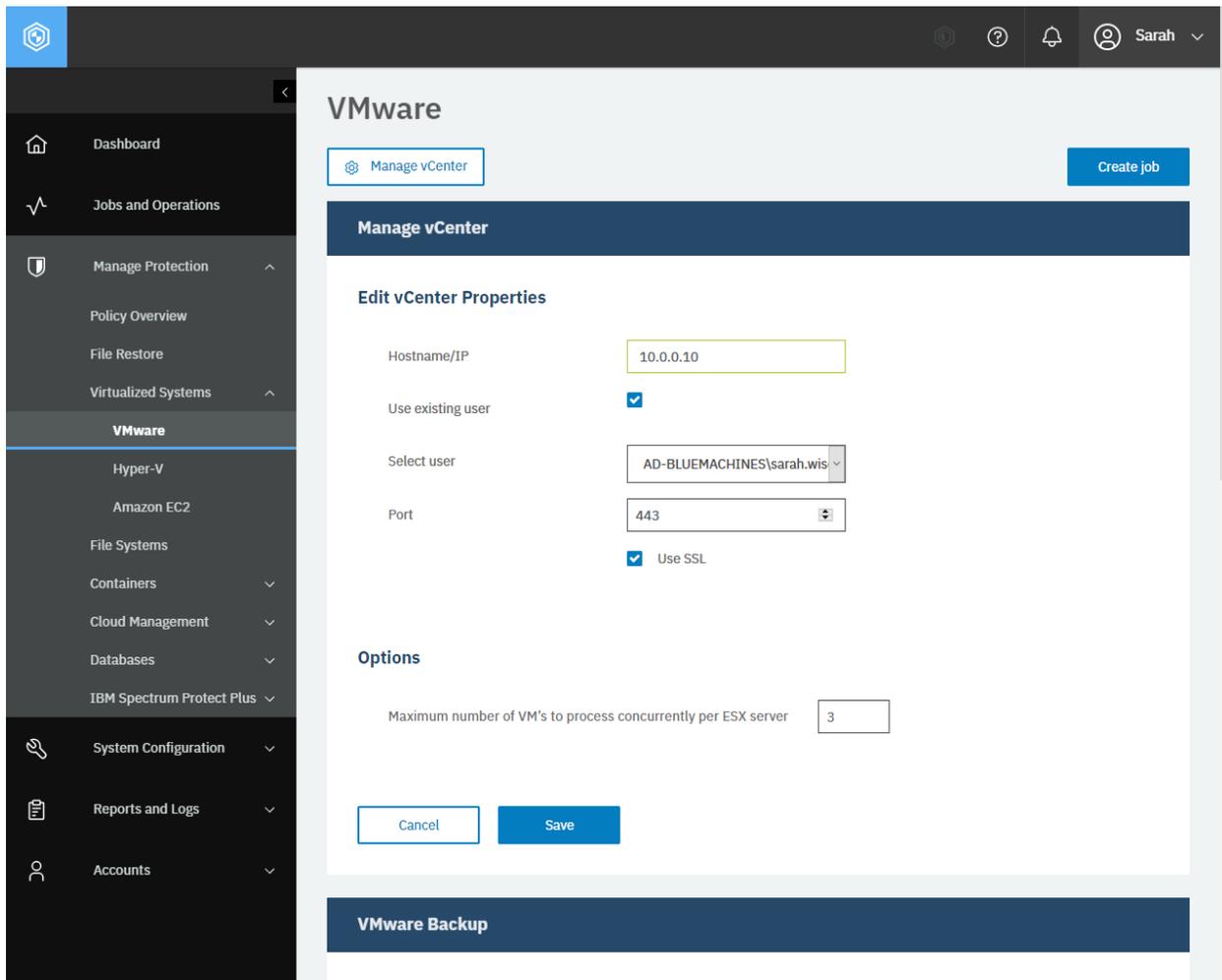


Figure 24: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **VMware** pane, click the **Manage vCenter**, fill in the required fields and click **Save**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created).

```

{
  "statusCode": 201,

```

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```
"response": {
  "links": {...},
  "name": "10.0.0.10",
  "hostAddress": "10.0.0.10",
  "user": {
    "href": "https://10.0.0.100:-1/api/identity/user/2137"
  },
  "sslConnection": true,
  "portNumber": 443,
  "type": "vmware",
  "id": "1001",
  "uniqueId": "fa8f1a0f-9d01-44e6-b281-6c577cd920ae",
  "version": null,
  "build": null,
  "apiVersion": null,
  "properties": {},
  "logicalDelete": false,
  "accountName": null,
  "opProperties": {
    "snapshotConcurrency": 2,
    "veServerInfo": null
  },
  "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:vmware/hypervisor:1
↵001",
  "resourceType": "hypervisor"
}
}
```

If the connection with IBM Spectrum Protect Plus has failed, for example, when an incorrect host address or an unavailable port number was given, the request prompts a response that is structured as shown, with the HTTP status of 400 (Bad Request).

```
{
  "statusCode": 400,
  "response": {
    "id": "HypervisorConnectionException",
    "description": "Could not connect to server 10.0.0.200: Exception caught
↵ trying to invoke method RetrieveServiceContent; nested exception is: \n\tjava.
↵net.ConnectException: Connection refused (Connection refused)",
    "title": "Error"
  }
}
```

If you enter an invalid username and password, the request prompts a response that is structured as shown, with the HTTP status of 401 (Unauthorized).

```
{
  "statusCode": 401,
  "response": {
    "id": "HypervisorConnectionAuthException",
    "description": "Authentication failed. Ensure the username and password
↵are correct. User must have all vCenter VMware User privileges as document
↵ed.",
    "title": "Error"
  }
}
```

Example 2: Register a Hyper-V Server

Assume that you want to register the following Microsoft Hyper-V Server in IBM Spectrum Protect Plus:

- **Hostname/IP:** hyperv.dallas.bluemachines.com.invalid
- **Port:** 5986 (WinRT over HTTPS)
- **Username:** AD-BLUEMACHINES\sarah.wiseman (`{identityUserHref}`
`https://10.0.0.100/api/identity/user/2138`)
- **Use SSL:** Yes
- **Maximum number of VM's to process concurrently per Hyper-V Server:** 3

A Python snippet that is similar to the following example can be used to register Hyper-V Server with IBM Spectrum Protect Plus:

```
_data = f'''{{
  "hostAddress":  "hyperv.dallas.bluemachines.com.invalid",
  "portNumber":   5986,
  "username":     "AD-BLUEMACHINES\\\\"sarah.wiseman",
  "sslConnection": false,
  "type":        "hyperv",
  "opProperties":  {{{"snapshotConcurrency":3}}
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/hypervisor',
              headers={...}, params="", data=_data, verify=...)
```

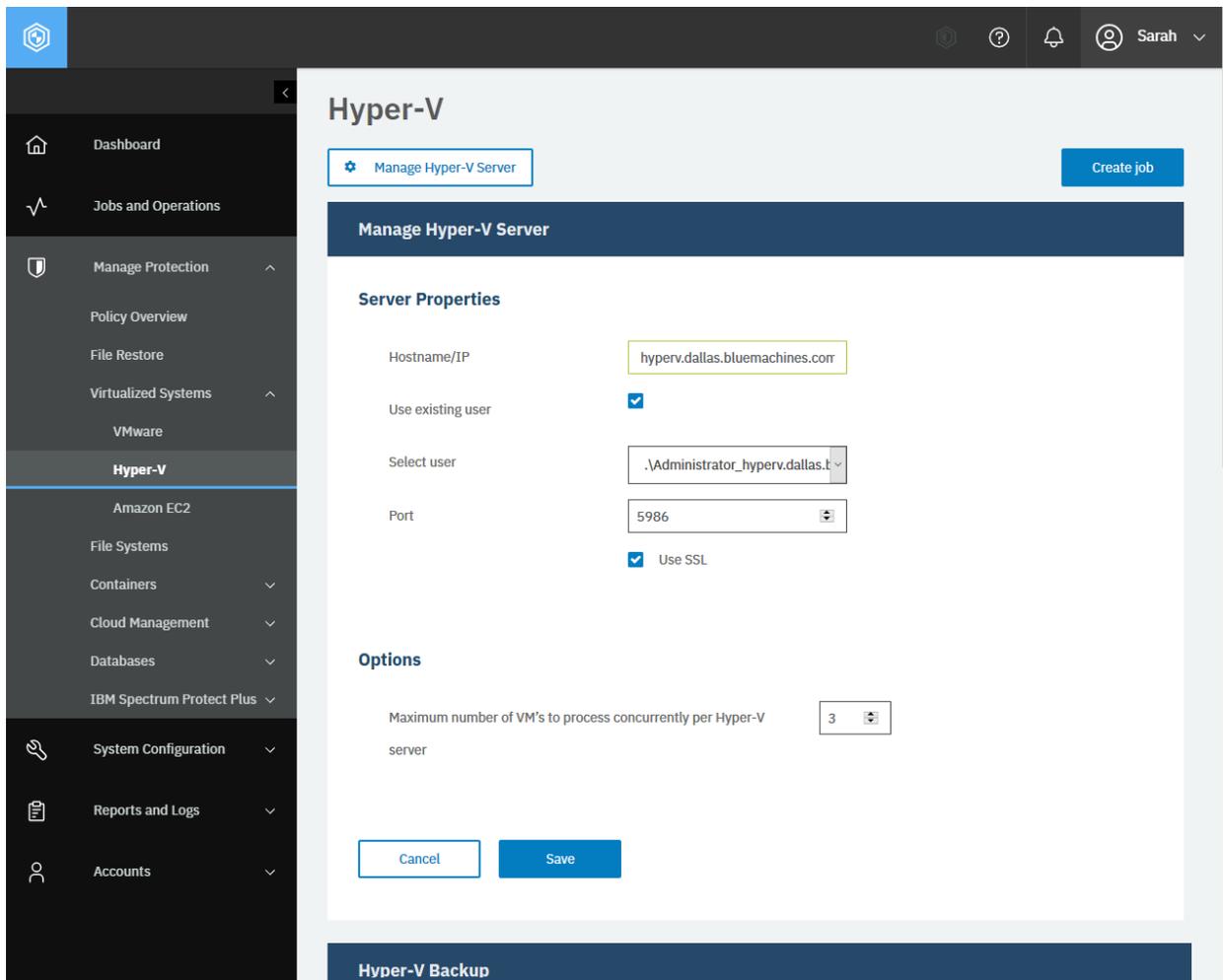


Figure 25: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Hyper-V** pane, click the **Manage Hyper-V Server**, fill in the required fields and click **Save**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created).

```
{
  "statusCode": 201,
  "response": {
    "links": {...}
  },
  "name": "hyperv.dallas.bluemachines.com.invalid",
  "hostAddress": "hyperv.dallas.bluemachines.com.invalid",
  "user": {
    "href": "https://10.2.1.10:-1/api/identity/user/2138"
  },
  "sslConnection": false,
  "portNumber": 5986,
  "type": "hyperv",
  "id": "1002",
  "uniqueId": "2d60ba76-9161-3492-ae5d-80f0b067760a",
  "version": null,
  "build": null,
}
```

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```
    "apiVersion": null,
    "properties": {},
    "logicalDelete": false,
    "accountName": null,
    "opProperties": {
      "snapshotConcurrency": 3,
      "veServerInfo": null
    },
    "rbacPath": "root:0/hypervisor.all:0/hypervisor.type:hyperv/hypervisor:1
002",
    "resourceType": "hypervisor"
  }
}
```

If the connection with IBM Spectrum Protect Plus has failed, for example, when an incorrect host address or an unavailable port number was given, the request prompts a response that is structured as shown, with the HTTP status of 400 (Bad Request).

```
{
  "statusCode": 400,
  "response": {
    "id": "HypervisorConnectionException",
    "description": "Could not connect to server hyperv.dallas.bluemachines.c
om.invalid: Connect to Hyper-V Server hyperv.dallas.bluemachines.com.invalid fa
iled. Cause: intel.management.wsman.WsmanException: Connect to hyperv.dallas.bl
uemachines.com.invalid:1 [hyperv.dallas.bluemachines.com.invalid/10.2.1.10] fai
led: Connection refused (Connection refused)",
    "title": "Error"
  }
}
```

If you enter an invalid username and password, the request prompts a response that is structured as shown, with the HTTP status of 401 (Unauthorized).

```
{
  "statusCode": 401,
  "response": {
    "id": "HypervisorAuthException",
    "description": "Authentication failed. Ensure the username and password
are correct. The username must be a member of the local administrators group. F
or non-SSL connections, set the \"AllowUnencrypted\" permission to true by ente
ring the following command in a Windows command prompt running with elevated pr
ivileges (start the command prompt with the \"Run as administrator\" option):\n
\nwinrm set winrm/config/service @{AllowUnencrypted=\"true\"}\n\nIn cluster env
ironments, ensure all nodes meet the above requirements. Ensure you understand
the security risks associated with configuring WinRM to allow unencrypted netwo
rk traffic.",
    "title": "Error"
  }
}
```

Unregistering a virtualized system

Unregister a virtualized system from IBM Spectrum Protect Plus.

Method and URI

To delete a hypervisor server with {hypervisorHypervisorId}, use a DELETE method and a URI:

```
DELETE https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
```

Tip: To get a {hypervisorHypervisorId} based on the hostname or the IPv4 address, follow the instructions in Getting a {hypervisorHypervisorId} (page 344).

Parameters

None.

Data

None.

Example: Unregister a vCenter Server

Assume that you have a virtualized system “10.0.0.10”, which is one of the vCenter Servers, and you want to delete it. You get the {hypervisorHypervisorId}: 1003. Run the following command:

```
hypervisor_hypervisor_id = "1003"

requests.delete('https://' + spp_ipv4 + '/api/hypervisor/'
               + hypervisor_hypervisor_id,
               headers={...}, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the VMwrae vCenter Server 10.0.010. The response body is empty.

Application Servers (File Systems, Containers, Cloud Management, Databases)

This chapter discusses common operations for all types of application servers and applications on them.

Running an inventory job for application server instances

IBM Spectrum Protect Plus supports application-level operations for the following solutions of application servers:

- File Systems
 - Microsoft Windows
- Containers
 - Kubernetes
 - OpenShift
- Cloud Management
 - Microsoft 365
- Databases
 - Db2
 - Exchange
 - MongoDB
 - Oracle
 - SQL

An inventory job for application servers will rebuild a list of application servers and application data on it such as databases that are registered in IBM Spectrum Protect Plus. An inventory job for application servers will start automatically as soon as you register a new application server on IBM Spectrum Protect Plus. In addition, every time you make any changes in an application such as deploying new databases on it, you have to run an inventory job at IBM Spectrum Protect Plus to update its list of application instances.

See also:

To run an inventory job for virtualized systems (VMware, Hyper-V, and Amazon EC2), follow the instructions in [Running an inventory job for virtualized systems](#) (page 94).

Method and URI

To start an inventory job for application server instances, use a POST method and a URI, where `{jobId}` is the ID for the application server inventory job:

```
POST https://{hostname|IPv4}/api/endeavour/job/{jobId}
```

Tip: To get the `{jobId}` for the application server inventory job, follow the instructions in [Getting a {jobId}](#) (page 352), where the object name is `Application Server Inventory`. This `{jobId}` may vary by the IBM Spectrum Protect Plus appliances.

Parameters

Parameter 1: action

Specify the type of action.

- **Value:** start
- **Type:** System string. Required. Available in the web interface.

Parameter 2: actionname

Specify the step of the action.

- **Value:** start
- **Type:** System string. Required. Available in the web interface.

Data

None.

Example: Start an inventory job for application server instances

Assume that you want to run an application server inventory job.

Create a function that converts the policy name, Application Server Inventory, into the job ID:

```
job_id = converter_job("Application Server Inventory")
print(job_id)
```

```
1004
```

A Python snippet that is similar to the following example can be used to start an inventory job for application server instances:

```
_params = {
    "action": "inventory",
    "actionname": "start"
}

_response = requests.post('https://' + spp_ipv4 + '/api/endeavour/job/' + job_id
    headers={...}, params=_params, verify=...)
```

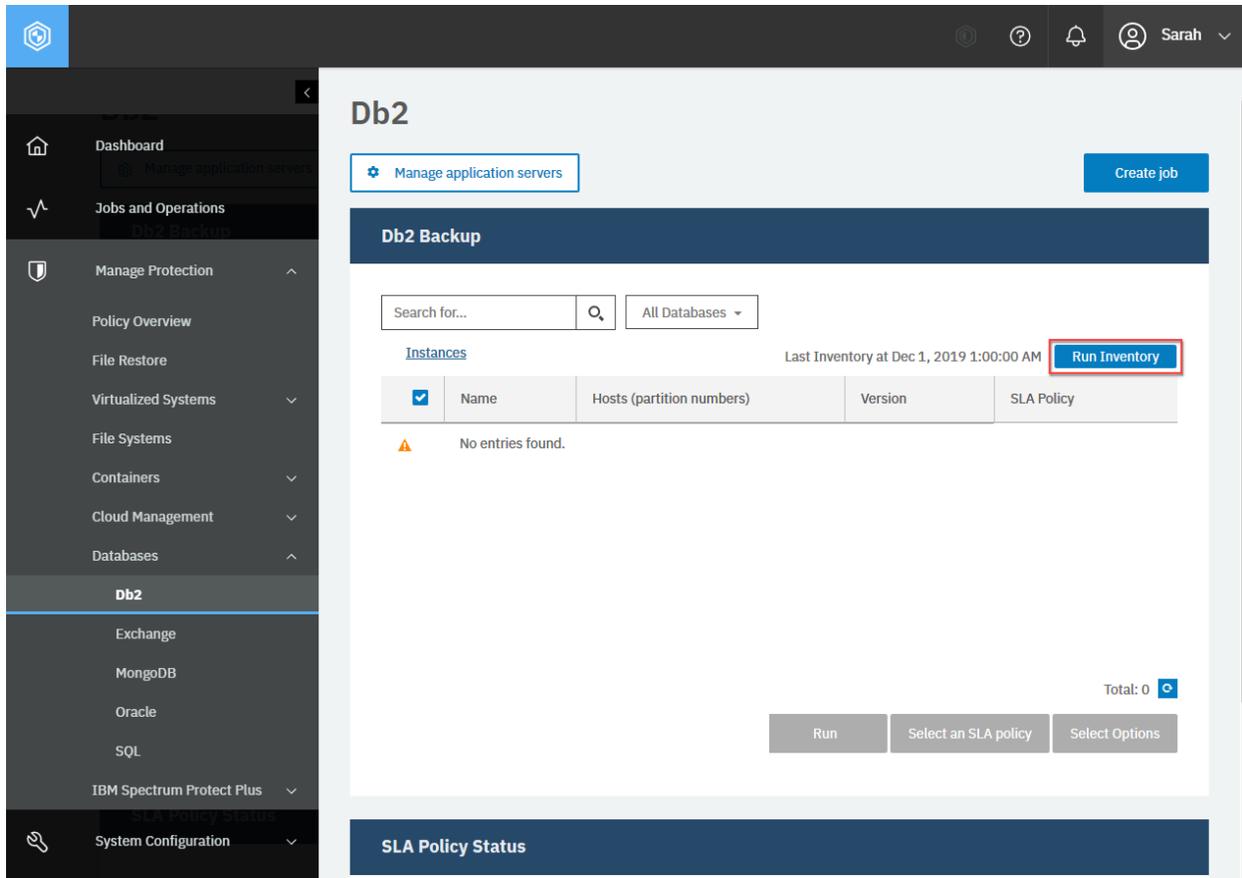


Figure 26: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In any of application server pages (for example, **Oracle**), click **Run an inventory**. The blue **Run Inventory** button changes into **Inventory In Progress** in gray.

You will receive a response with no body and the HTTP status code of 204 (No Content).

Restriction: Do not determine the status of the application inventory jobs by referring to the HTTP status code in a response. This request only starts an inventory job and receives a response with the HTTP status code of 204 (No Content) regardless of the status or the result. To see the status of the inventory jobs, follow the instructions in Getting the status of an inventory job for application servers (page 127).

Getting the status of an inventory job for application servers

You can get status information about a currently running inventory job and the previous inventory job for application servers.

Method and URI

To get information about current and previous application inventory jobs, use a GET method and a URI, where {jobId} is the ID for the application server inventory job:

```
GET https://{hostname|IP}/api/endeavour/job/{jobId}
```

Parameters

None.

Data

None.

Example: Get status of an inventory job for application servers

Assume that the {jobId} of the application server inventory job is 1004.

A Python snippet that is similar to the following example can be used to request information about the present and previous application server inventory jobs:

```
job_id = "1004" # Application Server Inventory  
  
requests.get('https://' + spp_ipv4 + '/api/endeavour/job/' + job_id,  
            headers={...}, verify=...)
```

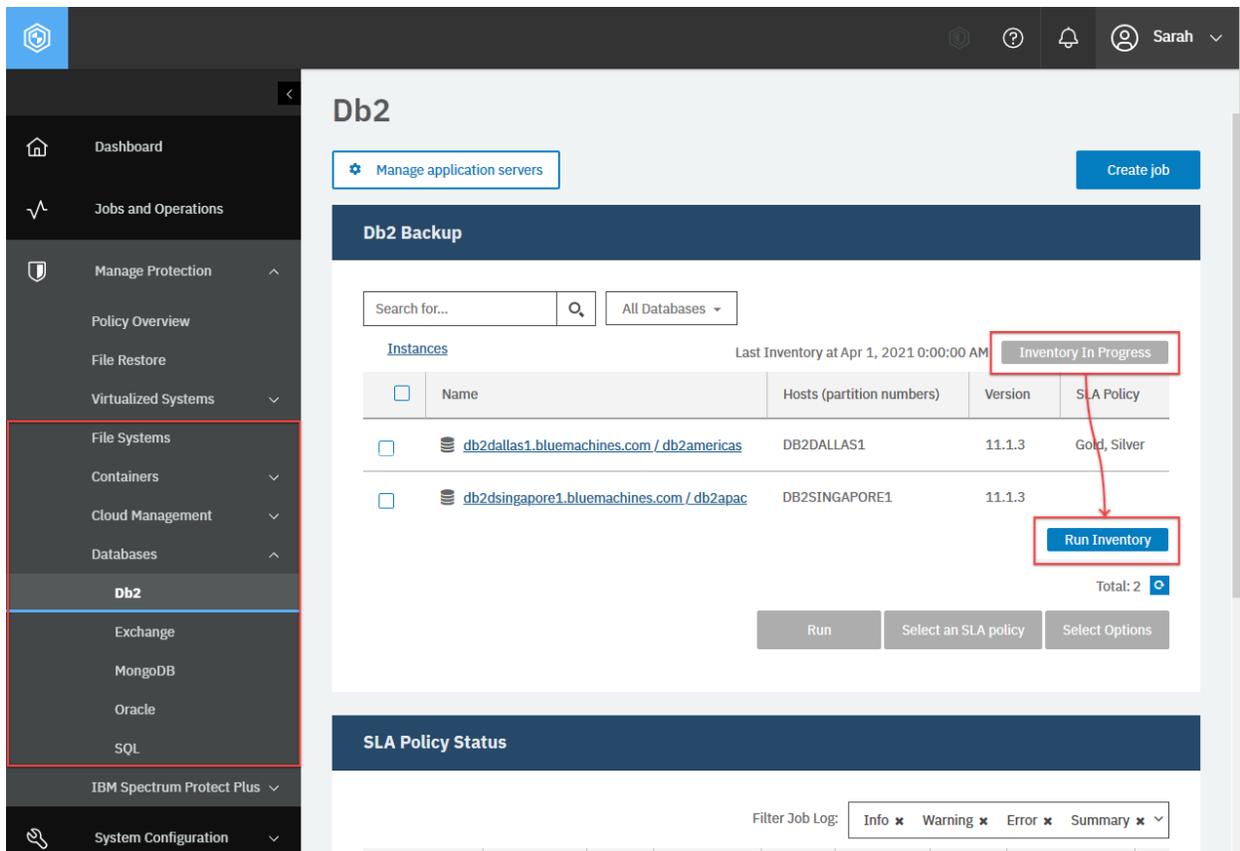


Figure 27: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Manage Protection** and any page under **File Systems, Containers, Cloud Management, or Databases**. In the **Backup** section, you will see either the **Inventory In Progress** button, which indicates the inventory job for application servers are in progress, or the **Run Inventory** button otherwise.

Assume that you ran an application inventory job and send the request to see the status of it. Normally, the inventory job takes a few minutes to complete and so you should see the running status. In your browser, the blue **Run Inventory** button has been grayed out and reading **Inventory In Progress**. Here is an example response with the HTTP status code of 200 (OK).

```
{
  "links": {...},
  "name": "Application Server Inventory",
  "description": null,
  "policyId": "1003",
  "policyName": "Application Server Inventory",
  "type": "catalog",
  "typeDisplayName": "Catalog",
  "subType": "application",
  "subTypeDisplayName": "Application",
  "serviceId": "serviceprovider.catalog.application",
  "displayName": "Application Server Inventory",
  "status": "RUNNING",
  "statusDisplayName": "Running",
  "lastSessionStatus": "PARTIAL",
  "lastSessionStatusDisplayName": "Partial",
}
```

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```
"triggerIds": [
  "1003"
],
"triggerData": [
  {
    "triggerId": "1003",
    "triggerInfo": null
  }
],
"lastRunTime": 1578684906215,
"nextFireTime": 1578729600000,
"lastSessionDuration": 20549,
"tenantId": 1000,
"actions": null,
"statistics": null,
"lastrun": {
  "sessionId": "1578684905188",
  "jobName": "Application Server Inventory",
  "type": "catalog",
  "subType": "application",
  "serviceId": "serviceprovider.catalog.application",
  "start": 1578684906215,
  "end": 1578684926764,
  "duration": 20549,
  "status": "PARTIAL",
  "results": "Started",
  "properties": null,
  "numTasks": 2,
  "previousLastTask": 0,
  "lastUpdate": 1578684926769,
  "percent": 0,
  "policySnapshot": null
},
"id": "1003"
}
```

In the example response above, the status value reads **RUNNING** which means the application inventory job was running at the time you sent the request. You can also see the information about the previous hypervisor inventory job.

A few minutes later, you send the same request again to see the status. At this time, the button in the browser comes back to the original, blue **Run Inventory** button. Here is an example response with the HTTP status code 200 (OK). As you see, the status value reads **IDLE**.

```
{
  "links": {...},
  ...
  "status": "IDLE",
  "statusDisplayName": "Idle",
  "lastSessionStatus": "PARTIAL",
  "lastSessionStatusDisplayName": "Partial",
  "triggerIds": [
    "1004"
  ],
  "triggerData": [
    {
      "triggerId": "1004",
```

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```

        "triggerInfo": null
      }
    ],
    "lastRunTime": 1578681060744,
    "nextFireTime": 1578729600000,
    "lastSessionDuration": 529178,
    "tenantId": 1000,
    "actions": null,
    "statistics": null,
    "lastrun": {...},
    ...
  }
}

```

Restriction: Do not determine the status of the application inventory jobs by referring to the HTTP status code in a response. This request will make a response with the HTTP status code of 200 (OK) regardless of the status. Instead, refer to the relevant key-value pairs in the response to check the status.

Databases (Db2, Exchange, MongoDB, Oracle, SQL)

IBM Spectrum Protect Plus supports backup and restore for five types of database solutions: IBM Db2, Microsoft Exchange Server, MongoDB, Oracle Database and Microsoft SQL Server.

Getting information for databases

You can get a list of application servers that host databases. Or, you can specify one application server and obtain information about the specified application server.

Method and URI

To get information about all application instances of a specific application, use a GET method and a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}
↪/instance
```

To get information about a specific application instance, use a GET method and a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}
↪/instance/{applicationInstanceId}
```

To get information about databases of a certain application instance, use a GET method and a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}
↪/instance/{applicationInstanceId}/applicationview
```

To get information about a specific database of a certain application instance, use a GET method and a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}
↪/instance/{applicationInstanceId}
↪/database/{applicationDatabaseId}
```

Tip: To get an {applicationName} value based on the type of the application, follow the instructions in Getting an {applicationName} (page 340). To get an {applicationInstanceId} value based on the name of the application instance, follow the instructions in Getting an {applicationInstanceId} (page 341).

Parameters

Parameter 1: from

- **Value:** hlo
- **Type:** System string. Required.

Example 1: Get information about application instances

Assume that you want to see a list of Db2 application servers that are registered with IBM Spectrum Protect Plus.

A Python snippet that is similar to the following example can be used to request information about all Db2 application instances:

```
application_name = "db2"

requests.get('https://' + spp_ipv4 + '/api/application/' + application_name
            + '/instance'
            headers={...}, verify=...)
```

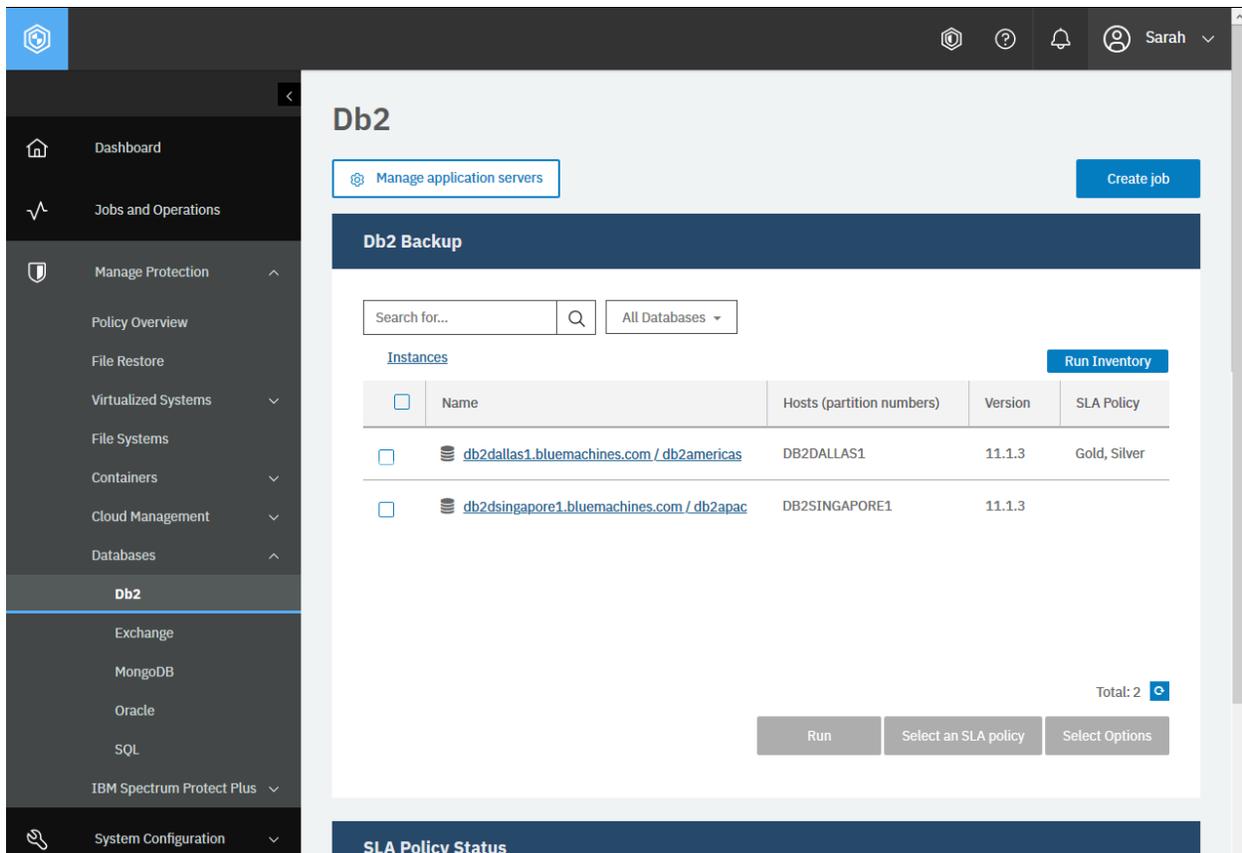


Figure 28: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Manage Protection** > **Databases** > **Db2**. You can get other types of applications in a similar way.

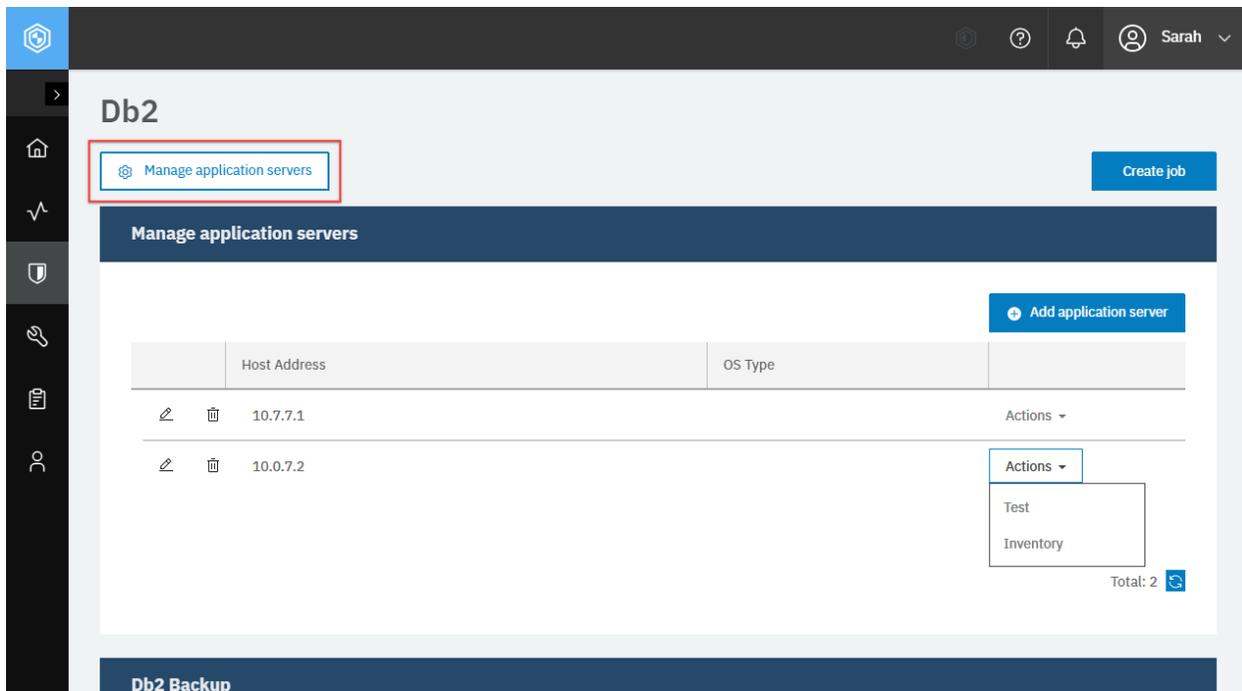


Figure 29: Click **Manage application servers** and you can see a list of application servers.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK). You can get information about application instances of other types of applications in a similar way.

```
{
  "links": {...},
  "total": 2,
  "instances": [
    {
      "links": {...},
      "id": "f794d5b0234ffa5271738a4bd9fbd905",
      "type": "db2",
      "osType": "linux",
      "isOwnerNode": false,
      "host": "10.7.7.1",
      "name": "db2dallas1.bluemachines.com / db2americas",
      "applicationFullName": "IBM Db2",
      "version": "11.1.3",
      "providerNodeId": "1001",
      "sessionId": 1571343979215,
      "jobId": "1005",
      "resourceType": "applicationinstance",
      "rbacPath": "root:0/app:0/app.type:db2/appinst:f794d5b0234ffa5271738a
↵4bd9fbd905",
      "appServerVmInfos": [
        {
          "appServerId": "1001",
          "appServerName": "10.7.7.1",
          "vmId": null,
          "vmName": null,
          "vmLocation": null,
          "hypervisorServerId": null,

```

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```

        "hypervisorServerName": null,
        "hypervisorHost": null
    }
],
"capabilities": {
    "resolveLogBackupLocations": false,
    "presnapshot": null,
    "snapshot": null,
    "postsnapshot": null,
    "enablelogbackup": null,
    "disablelogbackup": null,
    "logtruncate": null,
    "recordbackup": null,
    "masking": null,
    "prerestore": null,
    "restore": null,
    "postrestore": null,
    "restorecleanup": null
},
"location": "/db2dallas1.bluemachines.com / db2americas",
"metadataPath": "/DBINST:f794d5b0234ffa5271738a4bd9fbd905",
"storageProfiles": []
},
{
    "links": {...},
    "id": "26e734b8e0ac6e3afa52ba1cd2bd6e93",
    "type": "db2",
    "osType": "aix",
    "isOwnerNode": false,
    "host": "10.0.7.2",
    "name": "db2singapore1.bluemachines.com / db2apac",
    ...
}
]
}

```

Example 2: Get information about databases

Assume that you want to get information about all databases in the following Db2 application instance:

- **{applicationInstanceName}**: db2dallas1.bluemachines.com / db2americas.
- **{applicationInstanceId}**: f794d5b0234ffa5271738a4bd9fbd905

A Python snippet that is similar to the following example can be used to request information about all databases in the application instance:

```

application_name = "db2"
application_instance_id = "f794d5b0234ffa5271738a4bd9fbd905"

requests.get('https://' + spp_ipv4 + '/api/application/' + application_name
            + '/instance/' + application_instance_id + '/applicationview/'
            headers={...}, verify=...)

```

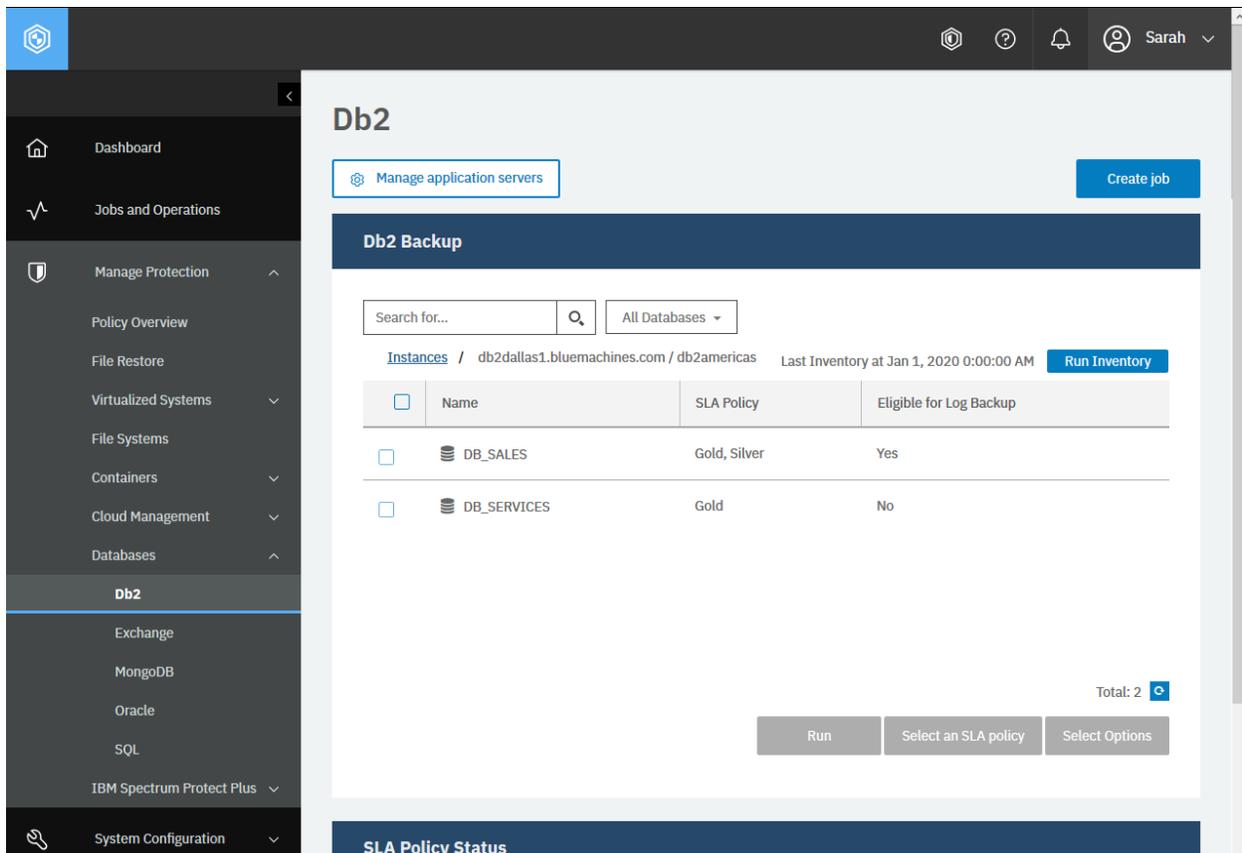


Figure 30: Click the application instance and you can see the databases in it.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK). You can get information about application instances of other types of applications in a similar way.

```
{
  "links": {...},
  "total": 2,
  "contents": [
    {
      "links": {...},
      "name": "DB_SALES",
      "type": "db2",
      "resourceType": "database",
      "id": "b91891e551ee0ac0765472ac0e3ba041",
      "host": "10.7.7.1",
      "providerNodeId": "1001",
      "sessionId": 1571343979215,
      "jobId": "1005",
      "rbacPath": "root:0/app:0/app.type:db2/appinst:f794d5b0234ffa5271738
↪a4bd9fbd905/appdb:b91891e551ee0ac0765472ac0e3ba041",
      "usedSize": 0,
      "totalSize": 0,
      "dataVolumeIds": [],
      "logVolumeIds": [],
      "eligibility": {
        "backup": {
```

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```
        "eligible": true,
        "reason": ""
    },
    "logbackup": {
        "eligible": true,
        "reason": ""
    }
},
"metadataPath": "/DBINST:f794d5b0234ffa5271738a4bd9fbd905/DB:b91891e
↪551ee0ac0765472ac0e3ba041",
"storageProfiles": [],
"paths": [],
"location": "/db2dallas1.bluemachines.com / db2americas/DB_SALES"
},
{
    "links": {...},
    "name": "DB_SERVICES",
    "type": "db2",
    "resourceType": "database",
    "id": "8c52d9437edfe68896ef9d1d91f77bfd",
    ...
}
]
}
```

Example 3: Get information about a specific database

Assume that you want to get information about the following database:

- **{applicationInstanceName}**: db2dallas1.bluemachines.com / db2americas.
- **{applicationInstanceId}**: f794d5b0234ffa5271738a4bd9fbd905
- **Database name**: DB_SALES

A Python snippet that is similar to the following example can be used to request information about all databases in the application instance:

```
application_name = "db2"
application_instance_id = "f794d5b0234ffa5271738a4bd9fbd905"

requests.get('https://' + spp_ipv4 + '/api/application/' + application_name
+ '/instance/' + application_instance_id + '/applicationview/'
headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK). You can get information about application instances of other types of applications in a similar way.

```
{
  "links": {...},
  "total": 2,
  "contents": [
    {
      "links": {...},
      "name": "DB_SALES",
      "type": "db2",
      "resourceType": "database",
```

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```
"id": "b91891e551ee0ac0765472ac0e3ba041",
"host": "10.7.7.1",
"providerNodeId": "1001",
"sessionId": 1571343979215,
"jobId": "1005",
"rbacPath": "root:0/app:0/app.type:db2/appinst:f794d5b0234ffa5271738
↪a4bd9fbd905/appdb:b91891e551ee0ac0765472ac0e3ba041",
"usedSize": 0,
"totalSize": 0,
"dataVolumeIds": [],
"logVolumeIds": [],
"eligibility": {
  "backup": {
    "eligible": true,
    "reason": ""
  },
  "logbackup": {
    "eligible": true,
    "reason": ""
  }
},
"metadataPath": "/DBINST:f794d5b0234ffa5271738a4bd9fbd905/DB:b91891e
↪551ee0ac0765472ac0e3ba041",
"storageProfiles": [],
"paths": [],
"location": "/db2dallas1.bluemachines.com / db2americas/DB_SALES"
},
{
  "links": {...},
  "name": "DB_SERVICES",
  "type": "db2",
  "resourceType": "database",
  "id": "8c52d9437edfe68896ef9d1d91f77bfd",
  ...
}
]
}
```

Databases: SQL

You can complete operations that are specifically available for SQL Server instances with the REST API, as described in the following sections.

Getting information about log backups for SQL Servers

You can get information about log backups for SQL Servers. This action is available only in the REST API.

Method and URI

To get information about log backups for SQL Servers, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/application/sql/logbackupstatus
```

Parameters

None.

Data

None.

Example: Get information about log backups for SQL Servers

Assume that you registered SQL Servers with IBM Spectrum Protect Plus and ran log backup jobs.

A Python snippet that is similar to the following example can be used to request information about the log backup status for each database:

```
requests.get('https://' + spp_ipv4 + '/api/application/sql/logbackupstatus',  
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "total": 4,  
  "results": [{  
    "links": {...},  
    "databaseName": "Sales_Americas",  
    "databasePk": "28b50719ebbcf817b927ac42df35e334",  
    "instanceName": "SQL-DALLAS1",  
    "instancePk": "3bb74f48d",  
    "status": "completed",  
    "appType": "sql",  
    "pk": "9141b6b3ccbee029b5817eff7190b1b1",  
    "name": "SQL-DALLAS1Sales_Americas",  
    "time": 1563289224690,  
    "appMetadata": {  
      "startTransactionId": "32000000021200001",  
      "endTransactionId": "32000000025900001"  
    },  
  },  
  {  
    ...,  
    "databaseName": "Support_Americas",  
    ...,  
    "instanceName": "SQL-DALLAS1",  
    ...  
  }  
}]
```

(continues on next page)

```

    },
    {
      ...,
      "databaseName": "Sales_Apac",
      ...,
      "instanceName": "SQL-SINGAPORE1",
      ...
    },
    {...},
  ]
}

```

Starting an ad hoc log backup job for SQL Servers

You can start an ad hoc job for SQL Server's log backup:

Method and URI

To start an ad hoc log backup job for SQL Server objects, use a POST method and a URI for one of the following types of targets:

- All databases on an SQL Server instance that does not use the Always On availability groups (AG) feature:

```

POST https://{hostname|IPv4}/api/application/sql/
↪/instance/{applicationInstanceId}

```

- A specific database on a standalone instance or a failover cluster instance (FCI):

```

POST https://{hostname|IPv4}/api/application/sql/
↪/instance/{applicationInstanceId}
↪/database/{applicationDatabaseId}

```

- All databases in an AG:

```

POST https://{hostname|IPv4}/api/application/sql/
↪/databasegroup/{applicationDatabasegroupId}

```

- A specific database in an AG:

```

POST https://{hostname|IPv4}/api/application/sql/
↪/databasegroup/{applicationDatabasegroupId}
↪/database/{applicationDatabaseId}

```

Parameters

Parameter 1: action

Start an ad hoc log backup job.

- **Value:** backuplogs
- **Type:** System string. Required.

Data

None.

Example: Start an ad hoc log backup job for SQL Servers

Assume that you registered SQL Servers with IBM Spectrum Protect Plus and you want to start an ad hoc job for log backup.

A Python snippet that is similar to the following example can be used to start an ad hoc job for log backup:

```
_params = {"action": "backuplogs"}
requests.post('https://' + spp_ipv4 + '/api/application/sql/logbackupstatus',
             headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "issuccess": true,
  "partial": false,
  "message": null,
  "instances": [
    {
      "name": "SQL-DALLAS1",
      "primaryKey": "3901715654",
      "databases": [
        {
          "name": "Sales_Americas",
          "primaryKey": "bdf61739552dc12302a4a15bb49a7bf0",
          "issuccess": true,
          "message": null,
          "recoveryTimestamp": null,
          "recoveryTransactionId": null,
          "appMetadata": null,
          "logMetadata": null,
          "transferDuration": 0,
          "transferSize": 0,
          "backupPaths": null
        },
        {
          "name": "Support_Americas",
          "primaryKey": "95e6eff67da3d3813c86675ba978b538",
          "issuccess": true,
          "message": null,
          "recoveryTimestamp": null,
```

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```

        "recoveryTransactionId": null,
        "appMetadata": null,
        "logMetadata": null,
        "transferDuration": 0,
        "transferSize": 0,
        "backupPaths": null
    }
]
},
{
    "name": "SQL-DALLAS1",
    "primaryKey": "3901715654",
    "databases": [
        {
            "name": "Sales_Americas",
            "primaryKey": "bdf61739552dc12302a4a15bb49a7bf0",
            "issuccess": true,
            "message": null,
            "recoveryTimestamp": null,
            "recoveryTransactionId": null,
            "appMetadata": null,
            "logMetadata": null,
            "transferDuration": 0,
            "transferSize": 0,
            "backupPaths": null
        },
        {
            "name": "Support_Americas",
            "primaryKey": "95e6eff67da3d3813c86675ba978b538",
            "issuccess": true,
            "message": null,
            "recoveryTimestamp": null,
            "recoveryTransactionId": null,
            "appMetadata": null,
            "logMetadata": null,
            "transferDuration": 0,
            "transferSize": 0,
            "backupPaths": null
        }
    ]
}
]
}

```

System Configuration

Backup Storage: Disk

IBM Spectrum Protect Plus supports one type of disk storage for backup: IBM vSnap servers.

Getting disk storage information about vSnap servers

You can get a list of all vSnap servers and information about each vSnap server. You can get vSnap server information from the cache data that is stored in the IBM Spectrum Protect Plus environment. Or, you can prompt IBM Spectrum Protect Plus to collect the latest information from a specific vSnap server.

Requirement: Beginning with Version 10.1.7, the IBM Spectrum Protect Plus virtual appliance does not have an onboard vSnap server. You might see “localhost” in a list of vSnap servers if you upgraded IBM Spectrum Protect Plus from Version 10.1.6 or earlier. In this case, migrate your data from the onboard vSnap server, which is designated as “localhost”, to external vSnap servers, object storage (Amazon S3, Microsoft Azure Blob Object Storage, IBM Cloud Object Storage, or S3-compatible storage), or replication servers (IBM Spectrum Protect) and delete the onboard vSnap server.

This action is required because an onboard vSnap server must not be used in a production environment.

Method and URI

To get information about all vSnap servers using cached records in IBM Spectrum Protect Plus, use a GET method and a URI:

```
GET https://{hostname|IP}/api/storage
```

To get information about a specific vSnap server using cached records in IBM Spectrum Protect Plus, use a GET method and a URI:

```
GET https://{hostname|IP}/api/storage/{storageId}
```

Tip: To get a {storageId} value based on its name, follow the instructions in Getting a {storageId} (page 362).

To request the latest information about a specific vSnap server, use a POST method and a URI:

```
POST https://{hostname|IP}/api/storage/{storageId}
```

Restriction: With this POST method request, you cannot retrieve information about all vSnap servers at once. Typically, the request takes longer than the GET requests that collect vSnap server information from IBM Spectrum Protect Plus.

Parameters

There is no parameters for the GET requests to retrieve vSnap information from IBM Spectrum Protect Plus.

For the POST request to retrieve information from a vSnap server, use the following parameter:

Parameter 1: action

Start an action to retrieve vSnap server information from the vSnap servers.

- **Value:** refresh
- **Type:** System string. Required. Available in the web user interface.

Data

None.

Example 1: Get information about all vSnap servers

The following Python snippet requests a list of all vSnap servers and their information: As mentioned, the information here might be old and inaccurate.

```
requests.get('https://' + spp_ipv4 + '/api/storage',  
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 2,  
  "storages": [  
    {  
      "links": {...},  
      "resourceType": "storage",  
      "type": "vsnap",  
      "typeDisplayName": "vSnap",  
      "site": "1000",  
      "name": "10.0.1.1",  
      "storageId": "2101",  
      "user": {  
        "href": "https://10.0.0.100:-1/api/identity/user/2120"  
      },  
      "rbacPath": "root:0/site:0/site:1000/site.all.storage:1000/storage:2  
↵101",  
      "hostAddress": "10.0.1.1",  
      "portNumber": 8900,  
      "sslConnection": true,  
      "initializeStatus": "Ready",  
      "initializeStatusDisplayName": "Ready",  
      "storageProfiles": null,  
      "version": "10.1.8-1900",  
      "capacity": {  
        "free": 0,  
        "total": 0,  
        "updateTime": 1576117254291
```

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```

    },
    "activeDirectoryInfo": null,
    "demo": false,
    "maxStreams": null,
    "isReady": true,
    "id": "2101"
  },
  {
    "links": {...},
    "resourceType": "storage",
    "type": "vsnap",
    "typeDisplayName": "vSnap",
    "site": "1001",
    "name": "10.0.1.2",
    "storageId": "2102",
    "user": {
      "href": "https://10.0.0.100:-1/api/identity/user/2120"
    },
    "rbacPath": "root:0/site:0/site:1001/site.all.storage:1000/storage:2
↵101",
    "hostAddress": "10.0.1.2",
    "portNumber": 8900,
    "sslConnection": true,
    "initializeStatus": "Ready",
    "initializeStatusDisplayName": "Ready",
    "storageProfiles": null,
    "version": "10.1.8-1900",
    "capacity": {
      "free": 0,
      "total": 0,
      "updateTime": 1576117254291
    },
    "activeDirectoryInfo": null,
    "demo": false,
    "maxStreams": null,
    "isReady": true,
    "id": "2102"
  }
]
}

```

Example 2: Get the latest information about a specific vSnap server

Assume that you added a vSnap server, vsnap-dallas1 ({storage_id} 2001) to IBM Spectrum Protect Plus. The following Python snippet requests information of the vSnap server. This POST method request retrieves the latest vSnap server information from the target vSnap server:

```

storage_id = "2101"
_params = {"action": "refresh"}

requests.post('https://' + spp_ipv4 + '/api/storage/' + storage_id,
             headers={...}, params=_params, verify=...)

```

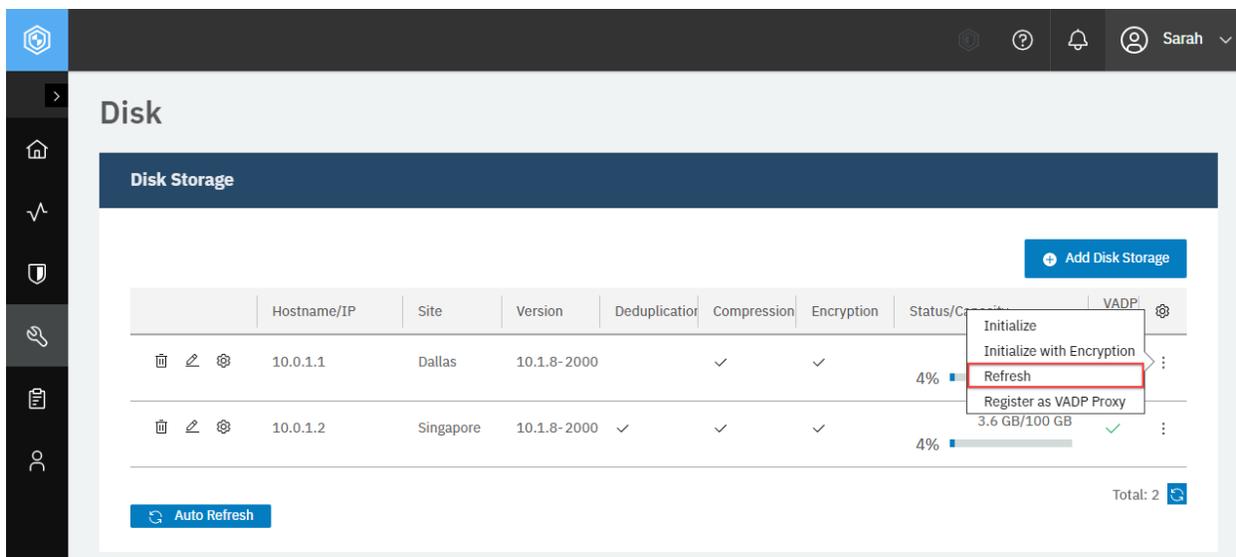


Figure 31: The same action can be taken in the IBM Spectrum Protect Plus web user interface: Click the three dots (⋮) > **Refresh** for the target vSnap server.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created).

```
{
  "links": {...},
  "resourceType": "storage",
  "type": "vsnap",
  "typeDisplayName": "vSnap",
  "site": "1000",
  "name": "10.0.1.1",
  "storageId": "2101",
  "...",
  "id": "2101",
}
```

Adding disk storage: vSnap server

Add a vSnap server to IBM Spectrum Protect Plus.

Method and URI

To add a vSnap server to IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IPv4}/ngp/storage
```

Parameters

None.

Data

Data 1: hostAddress

The hostname or the IPv4 address of the vSnap server.

- **Example value:** 10.0.1.1
- **Type:** String. Required. Available in the web user interface.

Data 2: siteId

The {siteId} of the site to associate with the vSnap server.

- **Example value:** 1000
- **Type:** String. Required. Available in the web user interface.

Tip: To get a {siteId} value based on its name, follow the instructions in Getting a {siteId} (page 360).

Data 3: type

The type of the disk storage. Use the vSnap server which is only available disk storage for IBM Spectrum Protect Plus.

- **Value:** vsnap
- **Type:** System string. Required.

Data 4: username

The username of the vSnap server.

- **Example value:** sarah-vsnap1
- **Type:** String. Required. Available in the web user interface.

Data 5: password

The password of the vSnap server.

- **Example value:** 6bxPYs6eQNa!V85R
- **Type:** String. Required. Available in the web user interface.

Data 6: portNumber

The port number to connect to the vSnap server.

- **Example value:** 8900
- **Type:** Integer. Required.

Data 7: sslConnection

Indication of whether SSL is used to connect with the vSnap server.

- **Example value:** true
- **Type:** Boolean. Required.

Example: Add a vSnap server

Assume that you want to add the following vSnap server to IBM Spectrum Protect Plus:

- **Hostname/IP:** 10.0.1.1
- **Site:** Primary ({siteId} 1000)
- **User name:** sarah-vsnap1
- **Password:** 6bxPYs6eQNa!V85R
- **Port:** 8900
- **SSL connection:** Enable

A Python snippet that is similar to the following example can be used to add the vSnap server to IBM Spectrum Protect Plus.

```
_data = f'''{{
  "hostAddress":    "10.0.1.1",
  "siteId":         "1000",
  "type":           "vsnap",
  "username":       "sarah-vsnap1",
  "password":       "6bxPYs6eQNa!V85R",
  "portNumber":     8900,
  "sslConnection": true
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/storage',
              headers={...}, data=_data, verify=...)
```

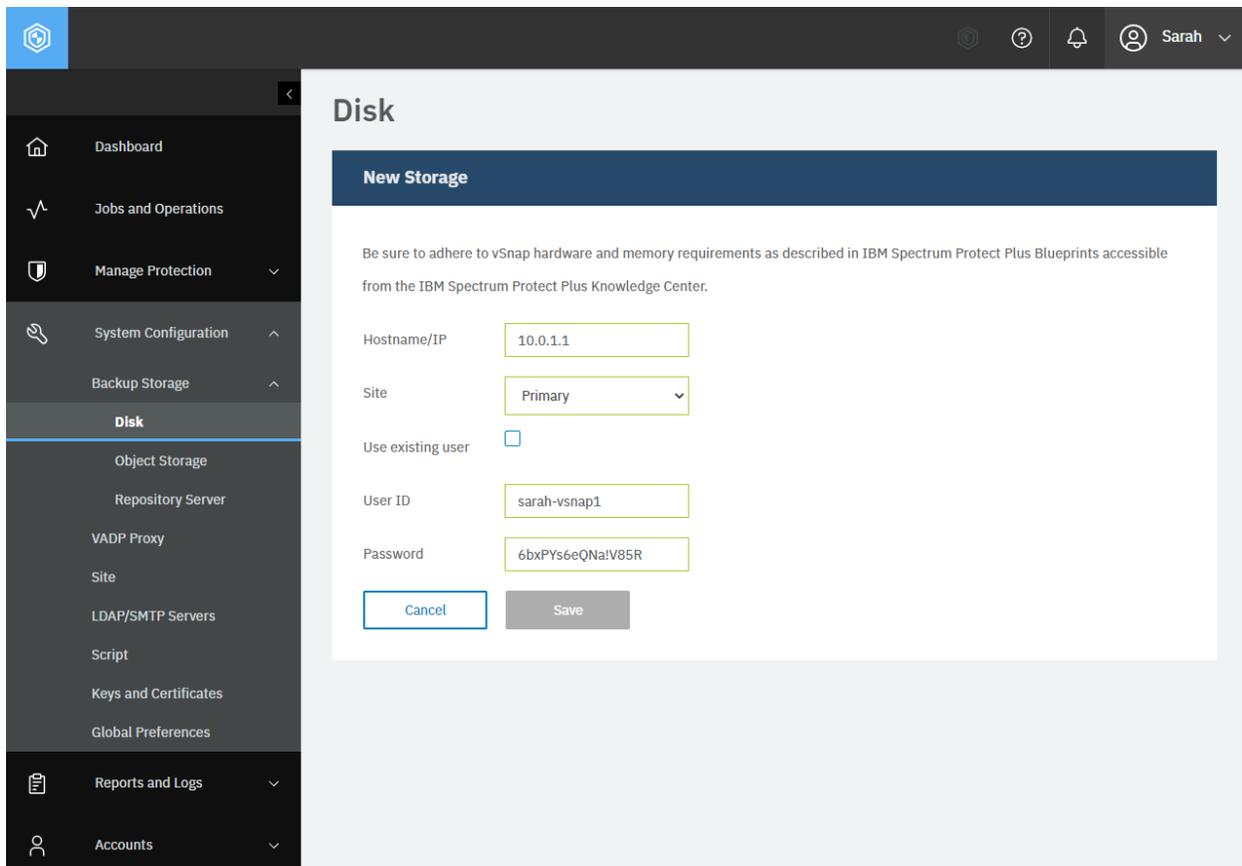


Figure 32: An equivalent action can be done from a web browser: In the navigation pane, click **System Configuration** > **Backup Storage** > **Disk** and click **Add Disk Storage**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the vSnap server was added.

```
{
  "statusCode": 201,
  "response": {
    "links": {...},
    "resourceType": "storage",
    "type": "vsnap",
    "typeDisplayName": "vSnap",
    "site": "1000",
    "name": "10.0.1.1",
    "storageId": "2101",
    "user": {
      "href": "https://10.0.1.1:-1/api/identity/user/2120"
    },
    "rbacPath": "root:0/site:0/site:1000/site.all.storage:1000/storage:2101"
  },
  "hostAddress": "10.0.1.1",
  "portNumber": 8900,
  "sslConnection": true,
  "initializeStatus": "Not Initialized",
  "initializeStatusDisplayName": "Not Initialized",
  "storageProfiles": null,

```

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```
"version": "10.1.8-1824",
"capacity": null,
"activeDirectoryInfo": null,
"demo": false,
"maxStreams": null,
"isReady": false
"statistics": {
  "storageId": "2101",
  "sizeTotal": 0,
  "sizeUsed": 0,
  "sizeFree": 0,
  "writable": true,
  "site": "1000",
  "description": null,
  "compressionRatio": "0.00",
  "deduplicationRatio": "0.00",
  "type": "vsnap",
  "errorDescription": null,
  "time": null,
  "lastUpdateTimestamp": null,
  "pools": []
}
}
```

Initializing a vSnap server

Initialize a new vSnap server you have added in three methods: (1) using the REST API, (2) using the browser interface, and (3) using the shell session on the vSnap server. This section describes the first method. For the second and the third methods, see the IBM Spectrum Protect Plus Installation and User's Guide. You can enable or disable encryption when you initialize the vSnap server.

Method and URI

To initialize the vSnap server with or without encryption, use a POST method and a URI:

```
POST https://{hostname|IP}/api/storage/{storageId}/management
```

Tip: To get a {storageId} value based on its name, follow the instructions in Getting a {storageId} (page 362).

Parameters

Parameter 1: action

Start an action to initialize the vSnap server with encryption.

- **Value:** Use an either one of the following values:

Value	Description
initwithencryption	Initialize the vSnap server with encryption
init	Initialize the vSnap server without encryption

- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: async

- **Value:** true
- **Type:** Boolean. Required.

Example: Initialize a vSnap server with encryption

Assume that you added a vSnap server, vsnap-dallas1 ({storage_id} 2001) to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to initialize the vSnap server with encryption:

```
storage_id = "2101"

_params = {"action": "initwithencryption"}

_data = f'''{{
    "async": true
}}'''

requests.post('https://' + spp_ipv4 + '/api/storage/' + storage_id
              + '/management',
              headers={...}, params=_params, data=_data, verify=...)
```

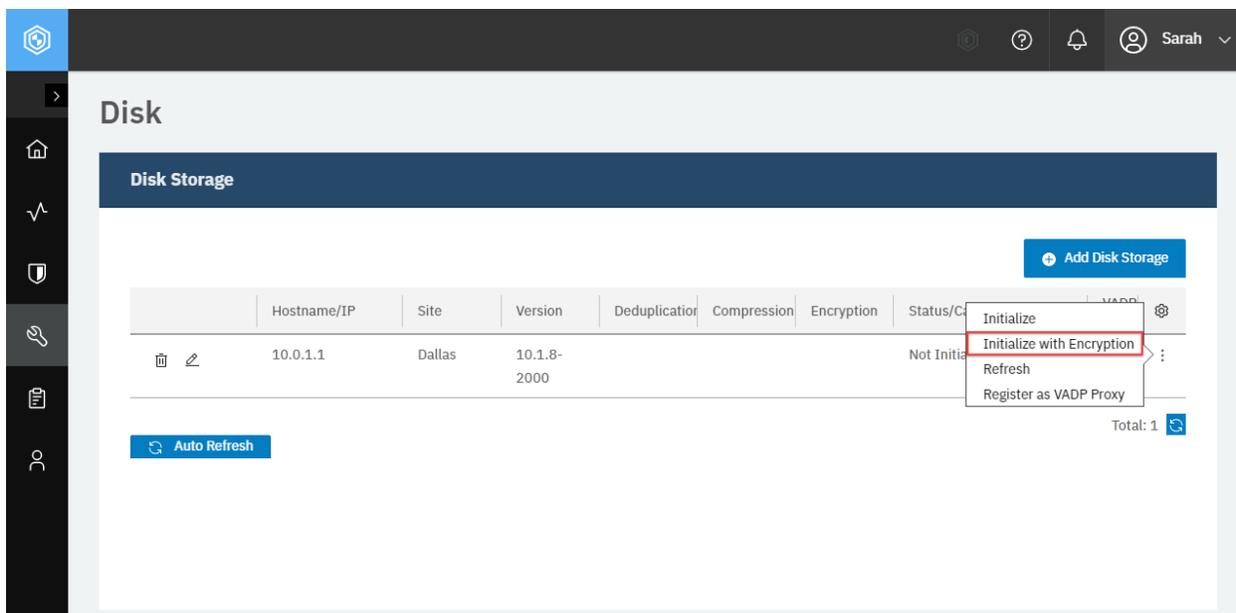


Figure 33: The same action can be taken in the IBM Spectrum Protect Plus web user interface: Click the three dots (⋮) > **Initialize with Encryption** for the target vSnap server.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "resourceType": "server",
  "fqdn": "vsnap-centos.dallas.bluemachines.com.invalid",
  "hostname": "vsnap-dallas1",
  "id": "2101",
  "init_status": "Initializing",
  "nfs_version": "1.3.0-0.61.e17",
  "nginx_version": "1.12.2-3.e17",
  "os_name": "CentOS Linux",
  "os_version": "7.8.2003",
  "samba_version": "4.10.4-11.e17_8",
  "uwsgi_version": "2.0.17.1-2.e17",
  "vsnap_version": "10.1.8-2000",
  "zfs_version": "Not Installed",
  "providerNodeId": "2101"
}
```

Rescanning disk storage: vSnap server

If IBM Spectrum Protect Plus reports that a vSnap server is reaching its storage capacity, the vSnap storage pool must be expanded. To expand a vSnap storage pool, you must first add virtual or physical disks on the vSnap server, either by adding virtual disks to the vSnap virtual machine or adding physical disks to the vSnap physical server. See the vSphere documentation for information about creating additional virtual disks.

Method and URI

To rescan a vSnap server with `{storageId}`, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/storage/{storageId}
```

To get information about vSnap server disks that are not registered with IBM Spectrum Protect Plus, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/storage/{storageId}/management/disk
```

Parameters

Parameter 1: action

Rescan the vSnap server.

- **Value:** rescan
- **Type:** System string. Required. Available in the web user interface.

Data

None.

Example 1: Rescan vSnap server

Assume that you have a vSnap server (`{storageId}` 2101).

A Python snippet that is similar to the following example can be used to rescan the vSnap server:

```
storage_id = "2101"

_params = {"action": "rescan"}

requests.post('https://' + spp_ipv4 + '/api/storage/' + storage_id,
              headers={...}, params=_params, verify=...)
```

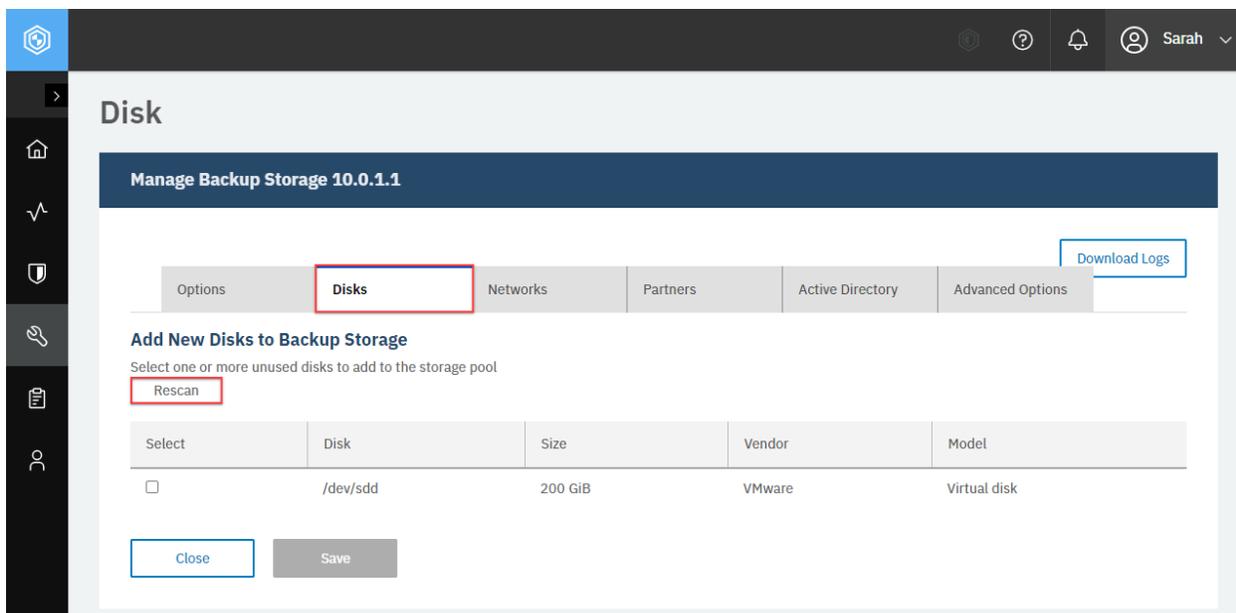


Figure 34: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration > Backup Storage > Disk** and click the **Edit** icon of the vSnap server to edit. In the Manage Backup Storage page, click the **Disks** tab, and click **Rescan**.

You will receive a response with the HTTP status of 200 (OK).

Example 2: Get information about unregistered disks in a vSnap server

Assume that you rescanned a vSnap server (`{storageId}` 2101) in the previous example, and this vSnap server has an unused, virtual hard disk drive with the capacity of 200 GB.

A Python snippet that is similar to the following example can be used to get information about

```
storage_id = "2101"

requests.get('https://' + spp_ipv4 + '/api/storage/' + storage_id
            + '/management/disk'
            headers={...}, params=_params, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "total": 1,
  "disks": [
    {
      "links":          {...},
      "resourceType":  "disk",
      "model":         "Virtual disk",
      "name":          "/dev/sdd",
      "size":          214748364800,
      "type":          "SCSI",
      "uuid":          "1234567890abcdef1234567890abcdef",
      "vendor":        "VMware",
```

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```
        "usedAs": "unused",
        "id": "1234567890abcdef1234567890abcdef",
        "storageId": "2101",
        "storageServerId": "2101",
        "originalPk": null,
        "protectionTime": null,
        "sessionId": null,
        "name": "/dev/sdd"
    }
]
}
```

Unregistering a vSnap server

Unregister a vSnap server from IBM Spectrum Protect Plus.

Warning: This operation permanently deletes all backup instances that are stored on the storage resources of the target vSnap server.

Method and URI

To unregister a vSnap server, use a DELETE method with a URI:

```
DELETE https://{hostname|IPv4}/api/storage/{storageId}
```

Tip: To get a {storageId} value based on its name, follow the instructions in Getting a {storageId} (page 362).

Parameters

None.

Data

None.

Example: Unregister a specific vSnap server

Assume that you have a vSnap server, 10.0.1.1 ({storageId 2001}), and you want to delete the vSnap server. Run the following command:

```
storage_id = "2101"

requests.delete('https://' + spp_ipv4 + '/api/storage/' + storage_id,
    headers={...}, verify=...)
```

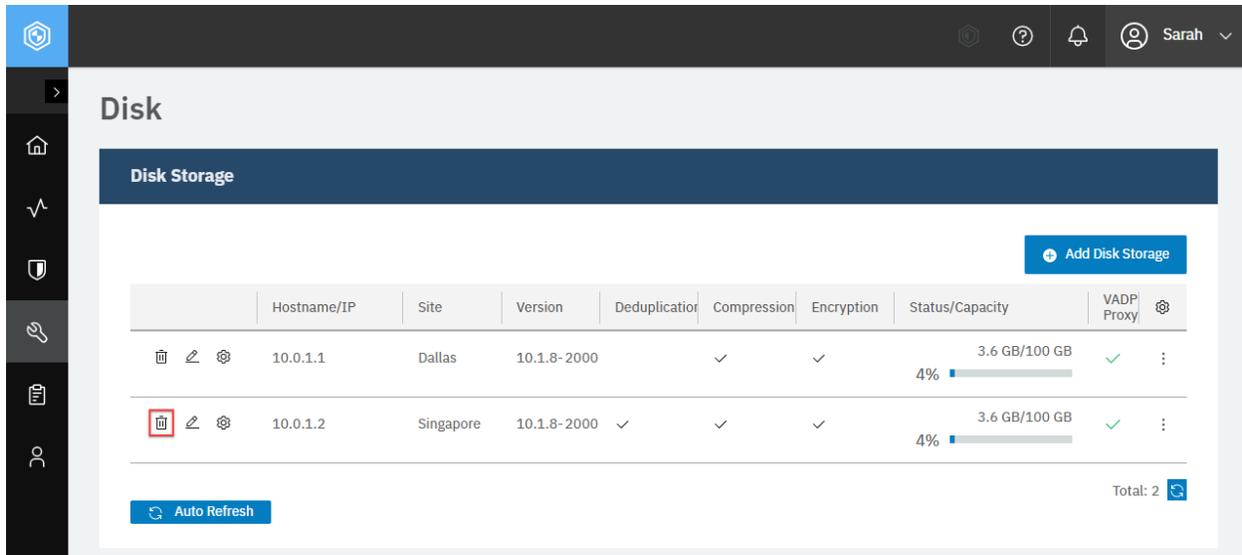


Figure 35: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **Backup Storage** > **Disk** and click the **Delete** icon for the target vSnap server.

You will receive a response with the HTTP status of 204 (No Content).

Backup Storage: Object Storage

IBM Spectrum Protect Plus supports four types of cloud object storage for backup snapshot data: Amazon Simple Storage Service (S3), IBM Cloud Object Storage, Microsoft Azure Blob Storage, and S3 compatible object storage.

Getting information about object storage accounts and repository servers

You can get a list of object storage servers and repository servers and obtain information about each account and server. Or, you can specify one object storage account or repository server and obtain information about the specified account or server.

Method and URI

To get information about all object storage servers and repository servers, use a GET method and a URI:

```
GET https://{hostname|IP}/api/cloud
```

To get information about a specific object storage server or repository server, use a GET method and a URI:

```
GET https://{hostname|IP}/api/cloud/{cloudProviderInfoId}
```

Tip: To get a {cloudProviderInfoId} value based on the name of the cloud provider, follow the instructions in Getting a {cloudProviderInfoId} (page 343).

Parameters

None.

Example: Get information about all object storage accounts and repository servers

A Python snippet that is similar to the following example can be used to request object storage and repository server information:

```
requests.get('https://' + spp_ipv4 + '/api/cloud',  
            headers={...}, verify=...)
```

	Name	Provider	
	Amazon S3-Compatible Storage - Dallas	generic	Actions
	BlueMachines IBM COS - Dallas	cos	Actions
	BlueMachines Microsoft Azure US-East	azure	Actions
	BlueMachines Amazon S3 US-East1	aws	Actions

Total: 4

Figure 36: To display object storage information in the IBM Spectrum Protect Plus web user interface, in the navigation pane, click **System Configuration** > **Backup Storage** > **Object Storage**.

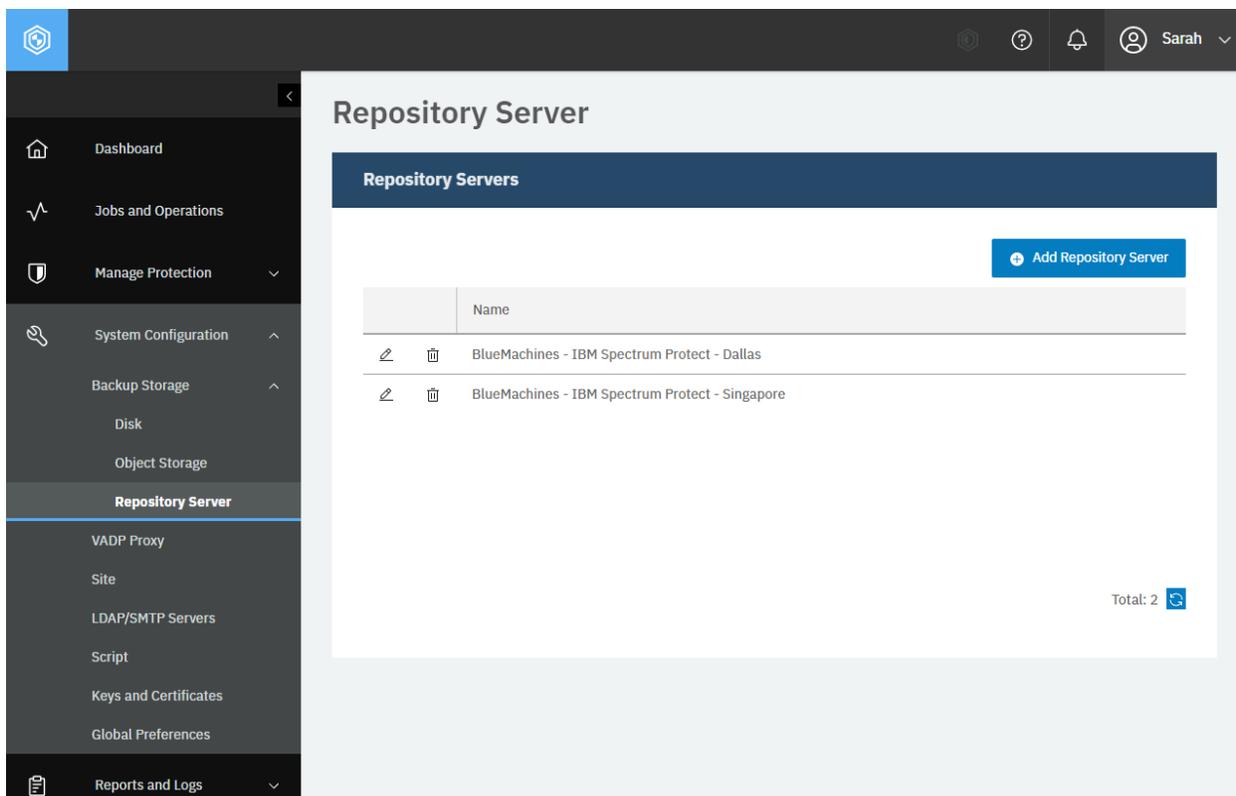


Figure 37: To see a list of repository servers, in the navigation pane, click **System Configuration > Backup Storage > Repository Server**.

The following example response from the Python snippet shows information about object storage and repository servers:

```
{
  "links": {...},
  "total": 6,
  "clouds": [
    {
      "links": {
        "self": {
          ...
          "href": "https://10.0.0.100/api/cloud/1",
          ...
        },
        ...
      },
      "id": "1",
      "name": "S3 Offload Repo",
      "type": "s3",
      "comment": null,
      "accesskey": {
        "href": "https://10.0.0.100/api/identity/key/1003"
      },
      "properties": {
        "type": "s3",

```

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```

        "certificate": {
            "href": "https://10.0.0.101/api/security/certificate/1005"
        },
        "endpoint": "https://demo.s3provider.com.invalid",
        "bucket": "bluemachines",
        "archiveBucket": "bluemachines-archive"
    },
    "provider": "generic",
    "wormProtected": false,
    "defaultRetention": 0,
    "offloadEnabled": true,
    "archiveEnabled": true,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:2",
    "cloudCapacity": null
},
{
    "links": {...},
    "id": "2",
    "name": "BlueMachines - IBM COS - Singapore",
    "type": "s3",
    "comment": null,
    "accesskey": {
        "href": "https://10.0.0.100/api/identity/key/1002"
    },
    "properties": {
        "type": "s3",
        "endpoint": "https://ibmcos.bluemachines.com.invalid",
        "bucket": "00000000-0000-0000-0000-000000000000",
        "protectionConfiguration": {
            "status": "COMPLIANCE",
            "minimumRetention": 0,
            "maximumRetention": 2,
            "defaultRetention": 1
        }
    },
    "provider": "IBM Cloud Object Storage",
    "wormProtected": true,
    "defaultRetention": 1,
    "offloadEnabled": true,
    "archiveEnabled": false,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",
    "cloudCapacity": null
},
{
    "links": {...},
    "id": "3",
    "name": "BlueMachines - Microsoft Azure - East US",
    "type": "s3",
    "comment": null,
    "accesskey": {
        "href": "https://10.0.0.100/api/identity/key/1003"
    },
    "properties": {

```

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```
        "type": "s3",
        "endpoint": "https://ibmcos.bluemachines.com.invalid",
        "bucket": "00000000-0000-0000-0000-000000000000",
        "protectionConfiguration": {
            "status": "COMPLIANCE",
            "minimumRetention": 0,
            "maximumRetention": 2,
            "defaultRetention": 1
        }
    },
    "provider": "Microsoft Azure Blob Storage",
    "wormProtected": true,
    "defaultRetention": 1,
    "offloadEnabled": true,
    "archiveEnabled": false,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",
    "cloudCapacity": null
},
{
    "links": {...},
    "id": "4",
    "name": "BlueMachines Amazon S3 US-East1",
    "type": "s3",
    "comment": null,
    "accesskey": {
        "href": "https://10.0.0.100/api/identity/key/1003"
    }
},
{
    "properties": {
        "type": "s3",
        "endpoint": "https://ibmcos.bluemachines.com.invalid",
        "bucket": "00000000-0000-0000-0000-000000000000",
        "protectionConfiguration": {
            "status": "COMPLIANCE",
            "minimumRetention": 0,
            "maximumRetention": 2,
            "defaultRetention": 1
        }
    }
},
{
    "provider": "Amazon S3",
    "wormProtected": true,
    "defaultRetention": 1,
    "offloadEnabled": true,
    "archiveEnabled": false,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",
    "cloudCapacity": null
},
{
    "links": {...},
    "id": "5",
    "name": "Amazon S3-Compatible Storage - Dallas",
    "type": "s3",
    "comment": null,
    "accesskey": {
```

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```

        "href": "https://10.0.0.100/api/identity/key/1003"
    },
    "properties": {
        "type": "s3",
        "endpoint": "https://ibmcos.bluemachines.com.invalid",
        "bucket": "00000000-0000-0000-0000-000000000000",
        "protectionConfiguration": {
            "status": "COMPLIANCE",
            "minimumRetention": 0,
            "maximumRetention": 2,
            "defaultRetention": 1
        }
    },
    "provider": "Generic",
    "wormProtected": true,
    "defaultRetention": 1,
    "offloadEnabled": true,
    "archiveEnabled": false,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",
    "cloudCapacity": null
},
{
    "links": {...},
    "id": "6",
    "name": "BlueMachines - IBM Spectrum Protect - Dallas",
    "type": "s3",
    "comment": null,
    "accesskey": {
        "href": "https://10.0.0.100/api/identity/key/1015"
    },
    "properties": {
        "type": "s3",
        "certificate": {
            "href": "https://10.0.0.100/api/security/certificate/1004"
        },
        "hostname": "DUMMY-SP01",
        "port": 9000.0,
        "bucket": "spp-spp10-10000000000000"
    },
    "provider": "sp",
    "wormProtected": false,
    "defaultRetention": 0,
    "offloadEnabled": true,
    "archiveEnabled": true,
    "ec2ServiceEnabled": null,
    "deepArchiveEnabled": false,
    "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",
    "cloudCapacity": null
}
]
}

```

Getting bucket information

You can get information about buckets that are associated with an object storage account. Bucket information is required to register an object storage account with IBM Spectrum Protect Plus.

Method and URI

To get bucket information, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/cloud
```

Parameters

Parameter 1: action

Request information about object storage buckets that are associated with cloud storage accounts.

- **Value:** getBuckets
- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: provider

The type of cloud storage provider. Use one of the following values:

Provider	Value
Amazon S3	aws
IBM Cloud Object Storage	cos
Microsoft Azure Blob Storage	azure
S3 compatible object storage	generic

- **Type:** System string. Required. Available in the web user interface.

Data 2: accesskey

An access key that was registered with IBM Spectrum Protect Plus. For details, follow the instructions in Keys and Certificates (page 213). To get the bucket information about a new object storage account, enter an empty JSON object (`{}`).

- **Example value:**

```
{
  "href": "https://10.0.0.100/api/identity/key/1003"
}
```

- **Type:** JSON object.

Data 2.1: accesskey > href

The URL of the access key. Typically, it has the following syntax:

```
https://{hostname|IPv4}/api/identity/key/{identityKeyId}
```

- **Type:** String.

Tip: To get an `{identityKeyId}` value based on the name of the identity key, follow the instructions in Getting an `{identityKeyId}` (page 350).

Data 3: properties

The properties of the object storage account.

- **Type:** Array. Required. Available in the web user interface.

Data 3.1: properties > region

The region of the Amazon S3 storage account. Use one of the following values:

Amazon S3 region	Value
US East (Virginia)	us-east-1
US East (Ohio)	us-east-2
US West (N. California)	us-west-1
US West (Oregon)	us-west-2
Asia Pacific (Tokyo)	ap-northeast-1
Asia Pacific (Seoul)	ap-northeast-2
Asia Pacific (Osaka-Local)	ap-northeast-3
Asia Pacific (Mumbai)	ap-south-1
Asia Pacific (Singapore)	ap-southeast-1
Asia Pacific (Sydney)	ap-southeast-2
Canada (Central)	ca-central-1
China (Beijing)	cn-north-1
China (Ningxia)	cn-northwest-1
EU (Frankfurt)	eu-central-1
EU (Ireland)	eu-west-1
EU (London)	eu-west-2
EU (Paris)	eu-west-3
EU (Stockholm)	eu-north-1
South America (São Paulo)	sa-east-1

- **Type:** System string.

Data 3.2: properties > endpoint

The endpoint URL of the account managed by IBM Cloud Object Storage, S3 compatible object storage, or Microsoft Azure Blob Storage. For Microsoft Azure Blob Storage accounts, use one of the following endpoint URLs:

Microsoft Azure endpoint	Value
Microsoft Azure Global	https://core.windows.net:443
Microsoft Azure Germany	https://core.cloudapi.de:443
Microsoft Azure China 21 Vianet	https://core.chinacloudapi.cn:443
Microsoft Azure USA Government	https://core.usgovcloudapi.net:443

- **Type:** String.

Data 3.3: properties > accessKey

The access key of the account managed by Amazon S3, IBM Cloud Object Storage, or S3 compatible object storage, or the storage account name of the Microsoft Azure Blob Storage account.

- **Example value:** QAH6fG85SkPmyEfqn4yy
- **Type:** String

Data 3.4: properties > secretKey

The secret access key for an Amazon S3 or S3 compatible object storage account; the secret key for an IBM Cloud Object Storage account, or the storage account shared key, account key, or access key for a Microsoft Azure Blob Storage account.

Example 1: Get bucket information for an Amazon S3 account

Assume that you want to get information about buckets that are associated with the following Amazon S3 account:

- **Region:** US West (N. California)
- **Access key:** Q3Z3MCDF7WJVG7KREFWFG
- **Secret access key:** rNzSHk2gBfjf9cECGp+cjrhEdhsZmxwHnRckk8BP

A Python snippet that is similar to the following example can be used to get information about the buckets that are associated with this Amazon S3 account:

```
_params = {"action": "getBuckets"}

_data = f'''{{
  "provider": "aws",
  "properties": {{
    "region": "us-west-1",
    "accessKey": "Q3Z3MCDF7WJVG7KREFWFG",
    "secretKey": "rNzSHk2gBfjf9cECGp+cjrhEdhsZmxwHnRckk8BP"
  }}
}}'''

requests.post('https://' + spp_ipv4 + '/api/cloud',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

Tip: Every bucket object has the name and ID that are the same string.

```
{
  "total": 3,
  "buckets": [
    {
      "links": {},
      "id": "bluemachines-sales",
      "name": "bluemachines-sales",
      "protectionConfiguration": null,
      "hasLifecycleRules": false,
      "hasBucketArchiveLifecycleRules": false,
      "resourceType": "bucket"
    },
    {...}, {...}
  ]
}
```

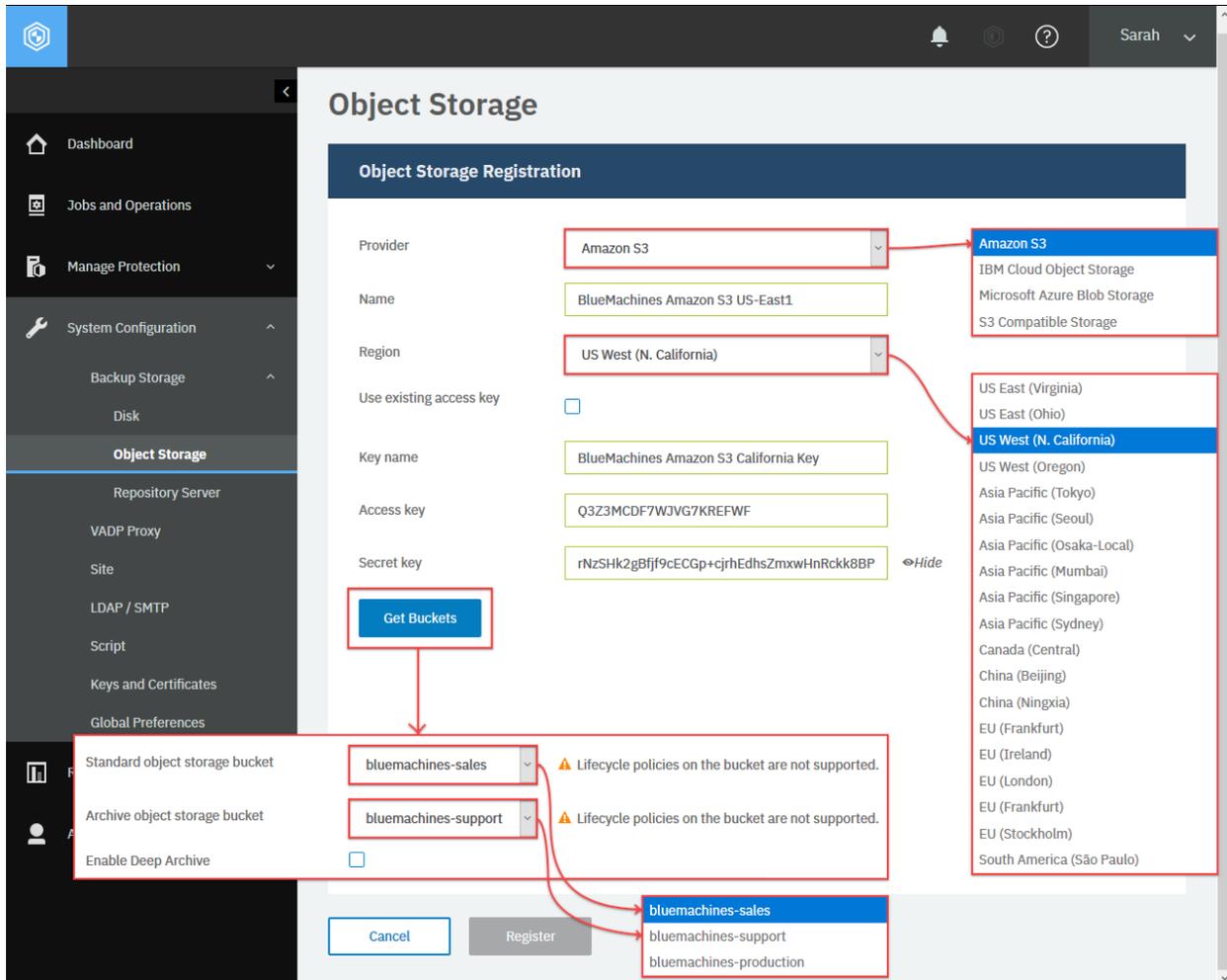


Figure 38: To get information about buckets that are associated with an Amazon S3 account, in the navigation pane, click **System Configuration** > **Backup Storage** > **Object Storage**. Then, in the **Object Storage** pane, click **Add Object Storage**. In the **Object Storage Registration** section, from the **Provider** list, select **Amazon S3**, configure the required settings, and click **Get Buckets**.

Example 2: Get bucket information by using an existing access key

As mentioned, you can also reuse an existing access key instead of entering the access key and the secret key of the object storage account. Assume that you want to get information about buckets that are associated with the following Amazon S3 account and the access key that was registered with IBM Spectrum Protect Plus:

- **Region:** US West (N. California)
- **Access key:** BlueMachines Amazon S3 California Key (`{identityKeyId} 1003`)

A Python snippet that is similar to the following example can be used to get information about the buckets that are associated with this Amazon S3 account:

```
_params = {"action": "getBuckets"}
_data = f'''{{
```

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```
"provider": "aws",
"accesskey": {
  "href": "https://10.0.0.100/api/identity/key/1003"
}
"properties": {
  "region": "us-west-1",
}
}''
requests.post('https://' + spp_ipv4 + '/api/cloud',
  headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response with the HTTP status of 200 (OK). The response body is similar to the JSON object, as shown in Example 1: Get bucket information for an Amazon S3 account (page 164).

```
{
  "total": 3,
  "buckets": [
    {
      "links": {},
      "id": "bluemachines-sales",
      "name": "bluemachines-sales",
      "protectionConfiguration": null,
      "hasLifecycleRules": false,
      "hasBucketArchiveLifecycleRules": false,
      "resourceType": "bucket"
    },
    {...}, {...}
  ]
}
```

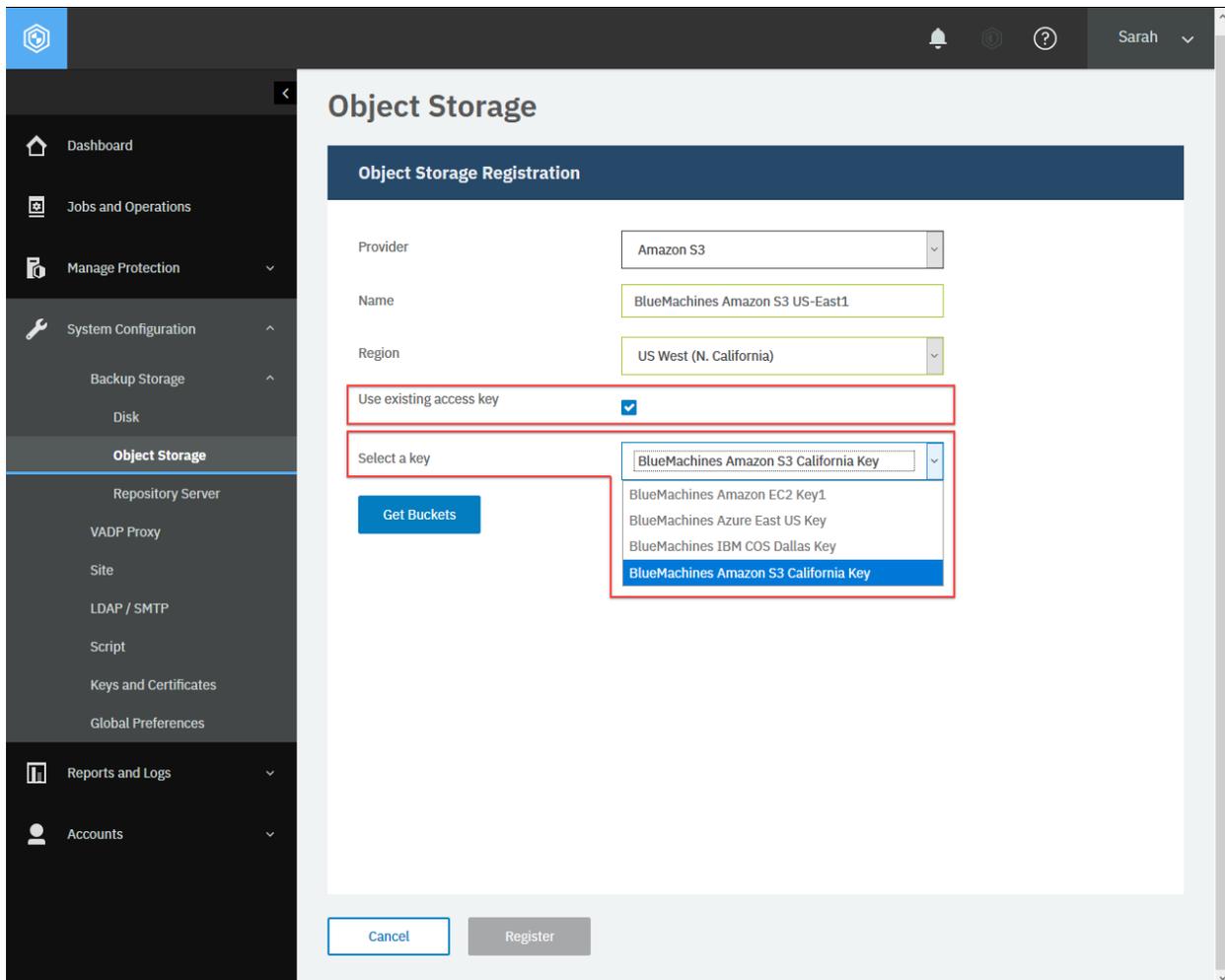


Figure 39: To obtain an existing access key from the IBM Spectrum Protect Plus user interface, in the navigation pane, click System Configuration > Backup Storage > Object Storage. Then, review the object storage registration information.

Example 3: Get bucket information for an IBM Cloud Object Storage account

Assume that you want to get information about buckets that are associated with the following IBM Cloud Object Storage account:

- **Endpoint:** `https://ibmcos.bluemachines.com.invalid`
- **Access key:** `QAH6fG85SkPmyEfqn4yy`
- **Secret access key:** `ddUTAun9DBHuehkC2TLwkfH7WyEzQ8PaCxJ4xNYn`

A Python snippet that is similar to the following example can be used to get information about the buckets that are associated with this IBM Cloud Object Storage account:

```
_params = {"action": "getBuckets"}

_data = f'''{{
  "provider":    "cos",
  "properties":  {{
```

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```
    "endpoint": "https://ibmcos.bluemachines.com.invalid",
    "accessKey": "QAH6fG85SkPmyEfqn4yy",
    "secretKey": "ddUTAun9DBHuehkC2TLwkfH7WyEzQ8PaCxJ4xNYn"
  }
}
requests.post('https://' + spp_ipv4 + '/api/cloud',
  headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response with the HTTP status of 200 (OK). The response body is similar to the JSON object, as shown in Example 1: Get bucket information for an Amazon S3 account (page 164).

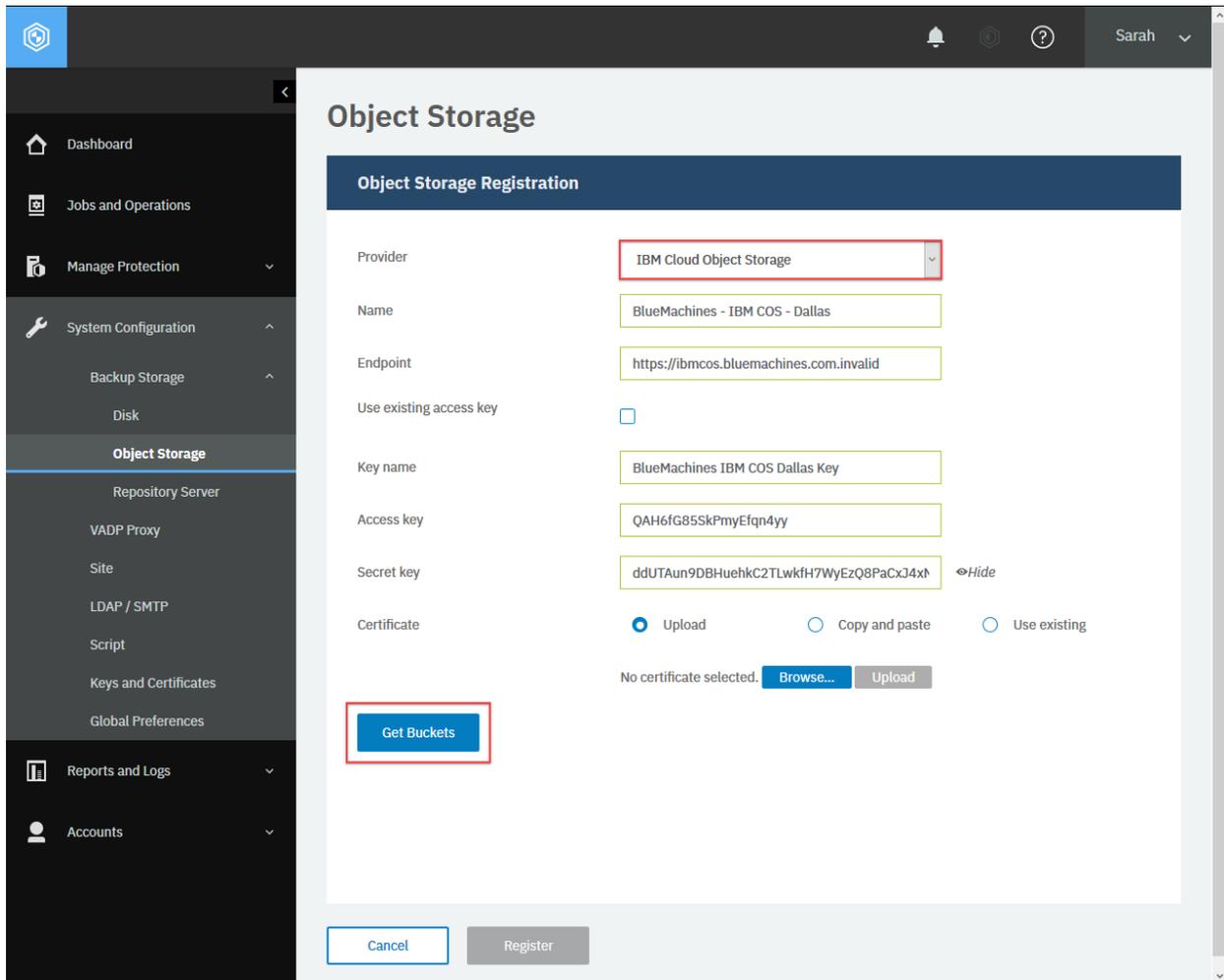


Figure 40: To obtain bucket information from the IBM Spectrum Protect Plus user interface, in the navigation pane, click **System Configuration > Backup Storage > Object Storage**. Then, in the **Object Storage Registration** section, from the **Provider** list, select **IBM Cloud Object Storage**, configure the required settings, and click **Get Buckets**.

Example 4: Get bucket information for a Microsoft Azure Blob Storage account

Assume that you want to get information about buckets that are associated with the following Microsoft Azure Blob Storage account:

- **Endpoint:** Microsoft Azure Global
- **Storage Account Name:** bluemachines-azure
- **Storage Account Shared Key:** VUAZ87JC6MKT7D5FXW+YZ24DDXXHWP3P9HZT+2J5V88LN8KWAZH4NW3R4PE495FHWKVZPTPSGR4QEUJ5TWH4DL==

A Python snippet that is similar to the following example can be used to get information about the buckets that are associated with this Microsoft Azure Blob Storage account:

```
_params = {"action": "getBuckets"}

_data = f'''{{
  "provider": "azure",
  "properties": {{
    "endpoint": "https://core.windows.net:443",
    "accessKey": "azure-bluemachines",
    "secretKey": "VUAZ87JC6MKT7D5FXW+YZ24DDXXHWP3P9HZT+2J5V88LN8KWAZH4NW3R4P
↵E495FHWKVZPTPSGR4QEUJ5TWH4DL=="
  }}
}}'''

requests.post('https://' + spp_ipv4 + '/api/cloud',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response with the HTTP status of 200 (OK). The response body is similar to the JSON object, as shown in Example 1: Get bucket information for an Amazon S3 account (page 164).

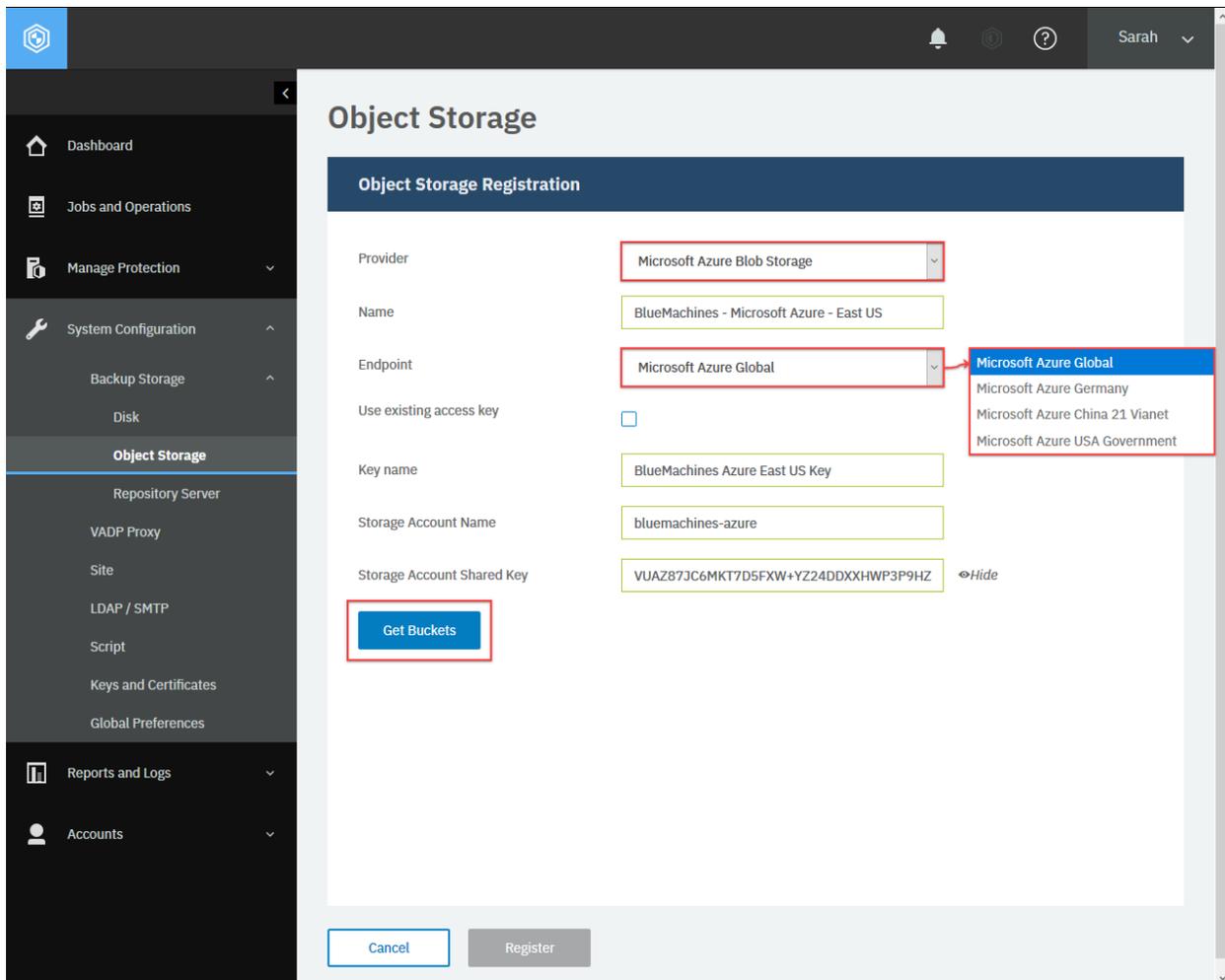


Figure 41: To obtain bucket information from the IBM Spectrum Protect Plus web user interface, in the navigation pane, click **System Configuration > Backup Storage > Object Storage**. Then, in the **Object Storage Registration** section, from the **Provider** list, select **Microsoft Azure Blob Storage**, configure the required settings, and click **Get Buckets**.

Example 5: Get bucket information about an S3 compatible object storage account

Assume that you want to get information about buckets that are associated with the following S3 compatible object storage account:

- **Endpoint:** `https://s3.volvox.com.invalid`
- **Access key:** `PJNG6J5FHENHWZ66K77X`
- **Secret access key:** `CFBF8QcKtMSMYTE++mX3pUWSwmchNBgg5a.fbnw5T`

A Python snippet that is similar to the following example can be used to get information about the buckets that are associated with this the S3 compatible object storage account:

```
_params = {"action": "getBuckets"}
_data = f'{{
    "provider": "generic",
```

(continues on next page)

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```
"properties": {{
  "endpoint": "https://s3.volvox.com.invalid",
  "accessKey": "PJNG6J5FHENHWZ66K77X",
  "secretKey": "CFBF8QcKtMSMYTE++mX3pUWSwchNBgg5afbnw5T"
}}' ' '
requests.post('https://' + spp_ipv4 + '/api/cloud',
  headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response with the HTTP status of 200 (OK). The response body is similar to the JSON object, as shown in Example 1: Get bucket information for an Amazon S3 account (page 164).

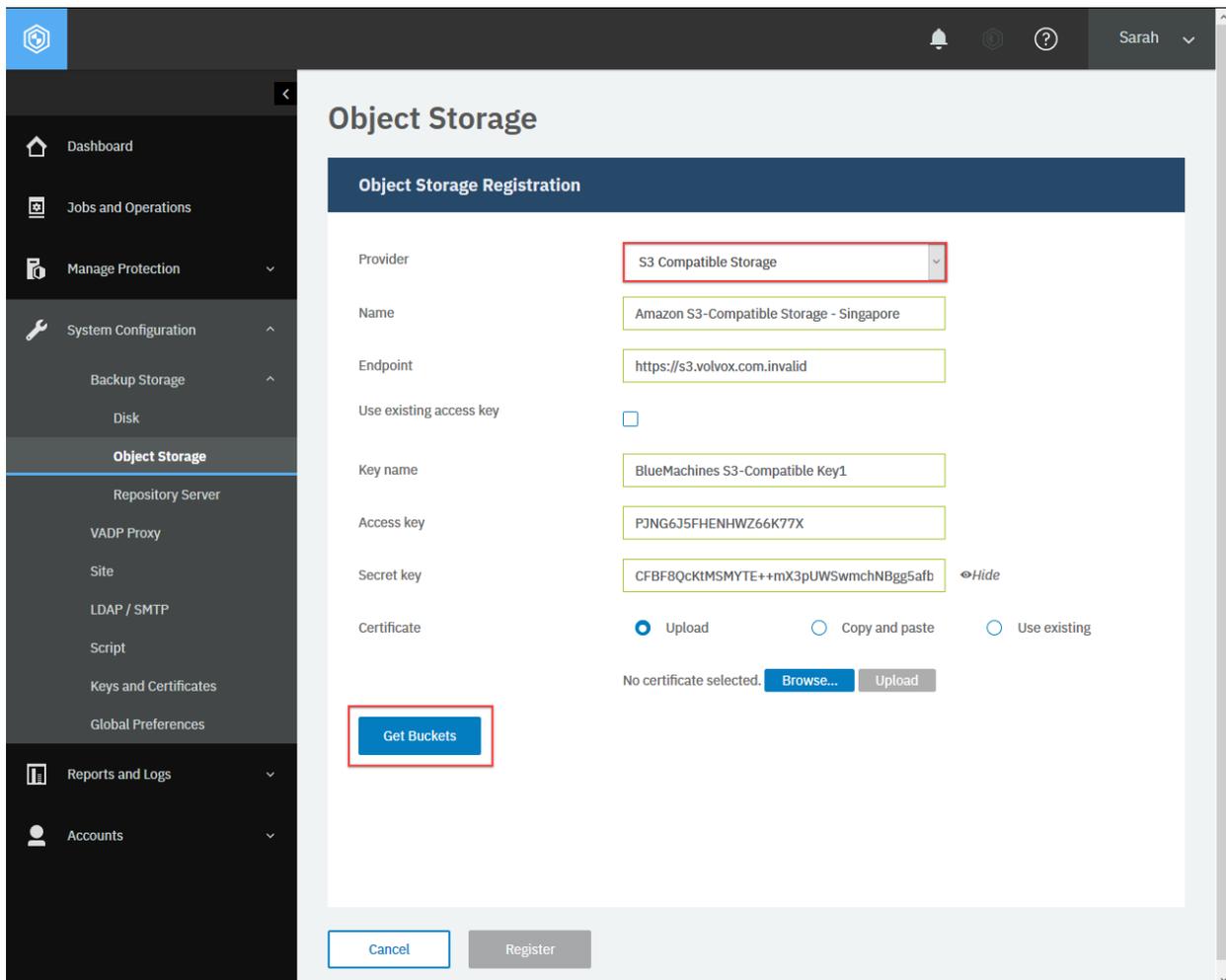


Figure 42: To obtain bucket information from the IBM Spectrum Protect Plus web user interface, in the navigation pane, click **System Configuration** > **Backup Storage** > **Object Storage**. Then, in the **Object Storage Registration** section, from the **Provider** list, select **S3 Compatible Storage**, configure the required settings, and click **Get Buckets**.

Adding an object storage server or a repository server

You can add an object storage server (Amazon S3, Azure Blob Object Storage, IBM Cloud Object Storage, or S3 compatible storage) or a repository server (IBM Spectrum Protect).

Method and URI

To add an object storage server, use a POST method with a URI:

```
POST https://{hostname|IPv4}/ngp/cloud
```

Parameters

None.

Data

Data 1: type

- **Value:** s3
- **Type:** System string. Required.

Data 2: provider

The type of cloud storage provider. For available key-value pairs, follow the instructions in Getting bucket information (page 162).

Provider	Value
Amazon S3	aws
IBM Cloud Object Storage	cos
Microsoft Azure Blob Storage	azure
S3 compatible object storage	generic
IBM Spectrum Protect	sp

- **Example value:** cos
- **Type:** System string. Required. Available in the web user interface.

Data 3: accesskey

The URL of the access key. The URL has the following format:

```
https://{hostname|IPv4}/api/identity/key/{identityKeyId}
```

Tip: To get an `{identityKeyId}` value based on the name of the identity key, follow the instructions in Getting an `{identityKeyId}` (page 350).

- **Example value:** https://10.0.0.100/api/identity/key/1010
- **Type:** String. Required. Available in the web user interface.

Data 4: properties

- **Example value:**

```
{
  "type": "s3",
  "certificate": "10.0.0.100/api/security/certificate/1287",
  "endpoint": "https://ibmcos.bluemachines.com.invalid",
  "bucket": "bluemachines-sales",
  "archiveBucket": "bluemachines-archive"
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 4.1: properties > type

- **Value:** s3
- **Type:** System string. Required.

Data 4.2: properties > certificate

The URL of the certificate for IBM Cloud Object Storage and S3 compatible object storage: {certificateHref}.

Tip: To get a {certificateId} value based on the certificate name, follow the instructions in Getting a {certificateHref} (page 359).

- **Type:** String. Available in the web user interface.

Data 4.3: properties > region

The region for Amazon S3. For available key-value pairs, follow the instructions in Getting bucket information (page 162).

- **Example value:** us-east-1
- **Type:** String. Available in the web user interface.

Data 4.4: properties > enableDeepArchive

Enable or disable the Amazon S3 Glacier Deep Archive storage class for Amazon S3.

- **Example value:** false
- **Type:** Boolean. Available in the web user interface.

Data 4.5: properties > endpoint

The URL of the endpoint of the object storage server.

- **Type:** String. Required. Available in the web user interface.

Data 4.6: properties > bucket

The name of the standard object storage bucket.

- **Type:** String. Required. Available in the web user interface.

Tip: To get the bucket name, follow the instructions in Getting bucket information (page 162).

Data 4.7: properties > archiveBucket

The name of the archive storage object bucket.

- **Type:** String. Available in the web user interface.

Data 4.8: properties > hostname

The hostname of IBM Spectrum Protect.

- **Example value:** sp-dallas1
- **Type:** String. Required. Available in the web user interface.

Data 4.9: properties > port

The port number to connect to IBM Spectrum Protect.

- **Example value:** 9000
- **Type:** Integer. Required. Available in the web user interface.

Data 5: name

The name of the object storage server or the repository server.

- **Example value:** BlueMachines - IBM COS - Singapore
- **Type:** String. Required. Available in the web user interface.

Example 1: Add an IBM Cloud Object Storage server

Assume that you want to add the following IBM Cloud Object Storage server:

- **Provider:** IBM Cloud Object Storage
- **Name:** BlueMachines - IBM COS - Dallas
- **Access key:** BlueMachines IBM COS Dallas Key ({identityKeyId} 1010)
- **Certificate (optional):** BlueMachines - Cert IBM Cloud Object Storage ({certificateId} 1287)
- **Standard object storage bucket:** bluemachines-sales
- **Archive object storage bucket:** bluemachines-archive

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to add the object storage server:

```
_data = f'''{{
  "type":      "s3",
  "provider":  "cos",
  "accesskey": "https://10.0.0.100/api/identity/key/1010",
  "properties": {{
    "type":      "s3",
    "certificate": "10.0.0.100/api/security/certificate/1287",
    "endpoint":   "https://ibmcos.bluemachines.com.invalid",
    "bucket":     "bluemachines-sales",
    "archiveBucket": "bluemachines-archive"
  }}
}}',
"name":      "BlueMachines - IBM COS - Dallas"
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/cloud',
              headers={...}, data=_data, verify=...)
```

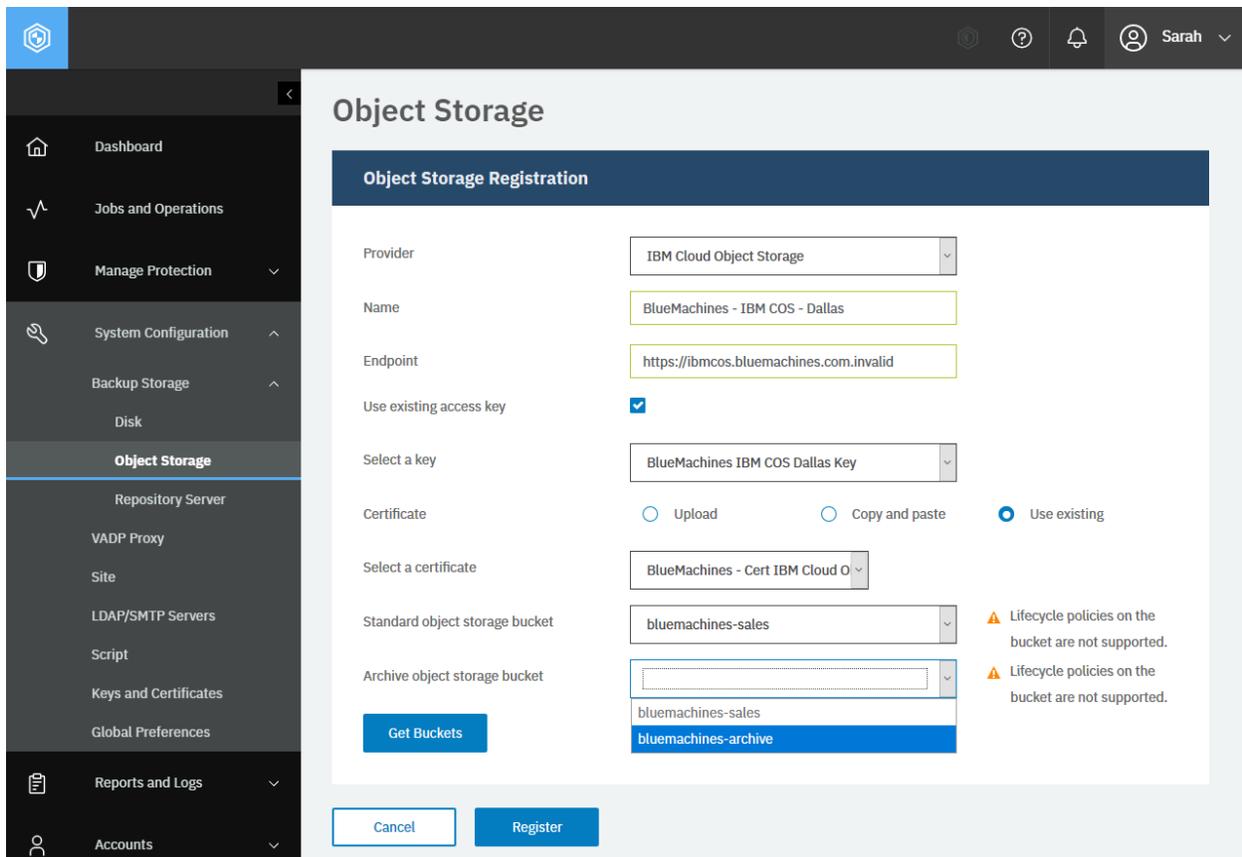


Figure 43: The same action can be taken in the IBM Spectrum Protect Plus web user interface: After getting the buckets, specify the standard object storage bucket and the archive object storage bucket. Optionally, you can specify the certificate for IBM Cloud Object Storage or S3 compatible object storage.

After you run the Python snippet, ensure that you get a response with the HTTP status of 201 (Created) and verify that the object storage server was added. The response body is similar to the JSON object for the object storage server, as shown in Getting information about object storage accounts and repository servers (page 156).

Example 2: Add IBM Spectrum Protect

Assume that you want to add the following IBM Spectrum Protect system:

- **Name:** BlueMachines Spectrum Protect - Dallas 1
- **Hostname:** sp-dallas1
- **Port:** 9000
- **Access key:** BlueMachines SP Dallas1 Key (`{identityKeyHref}`
`https://10.0.0.100/api/identity/key/1050`)
- **Certificate (optional):** BlueMachines - Cert IBM Spectrum Protect (`{certificateHref}`
`https://10.0.0.100/api/security/certificate/1287`)

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to add the IBM Spectrum Protect server:

```

access_key_href = "https://10.0.0.100/api/identity/key/1050"
certificate_key_href = "https://10.0.0.100/api/security/certificate/1287"

_data = f'''{{
  "type":      "s3",
  "provider":  "sp",
  "accesskey": {access_key_href},
  "properties": {{
    "type":      "s3",
    "certificate": {certificate_key_href}
    "hostname":  sp-dallas1
    "port":      9000
  }}
}}',
"name":      "BlueMachines - IBM COS - Dallas"
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/cloud',
  headers={...}, data=_data, verify=...)

```

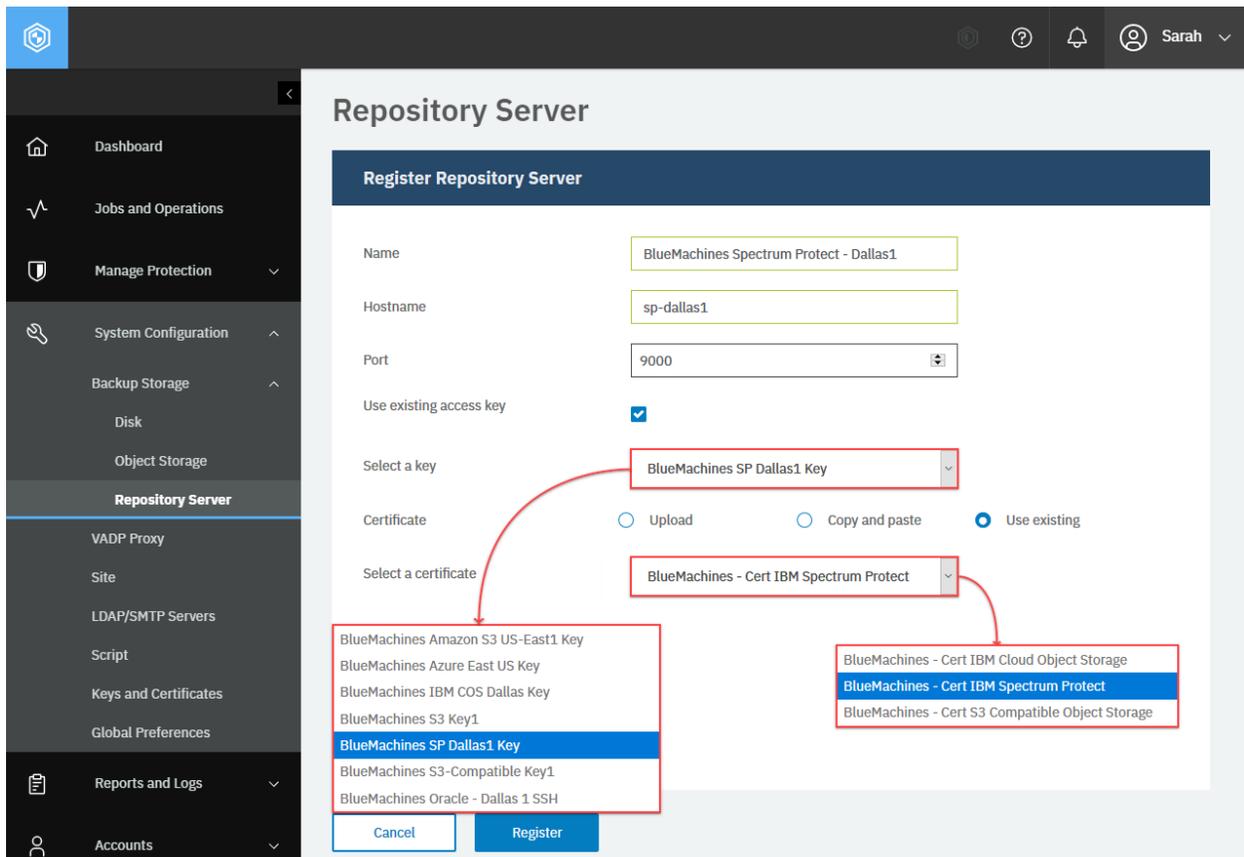


Figure 44: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigator pane, click **System Configuration > Backup Storage > Repository Server**, and click **Add Repository Server**. Enter the configuration values and click **Register**.

After you run the Python snippet, ensure that you get a response with the HTTP status of 201 (Created) and the IBM Spectrum Protect was added. The response body is similar to the JSON object for the IBM Spectrum Protect, as shown in Getting information about object storage accounts and repository servers

(page 156).

Unregistering an object storage server or a repository server

You can unregister an object storage server or a repository server from IBM Spectrum Protect Plus.

Method and URI

To unregister an object storage server or a repository server, use a DELETE method and a URI:

```
DELETE https://{hostname|IPv4}/api/api/cloud/{cloudProviderInfoId}
```

Tip: To get an `{cloudProviderInfoId}` value based on its name, follow the instructions in Getting a `{cloudProviderInfoId}` (page 343).

Parameters

None.

Data

None.

Example: Unregister an Amazon S3 object storage server

Assume that you want to unregister an Amazon S3 object storage server, BlueMachines Amazon S3 US-East1 (`{identityKeyId}` 4). Run the following command:

```
cloud_provider_info_id = "4"

requests.delete('https://' + spp_ipv4 + '/api/cloud/' + cloud_provider_info_id,
               headers={...}, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the cloud object storage server. You can unregister other types of object storage servers (Amazon S3, IBM Cloud Object Storage, and S3 compatible object storage) and repository servers (IBM Spectrum Protect) in a similar way.

Backup Storage: Repository Server

IBM Spectrum Protect Plus supports one type of repository servers for backup storage: IBM Spectrum Protect.

Getting repository server information

You can get a list of repository servers registered in IBM Spectrum Protect Plus and each of them.

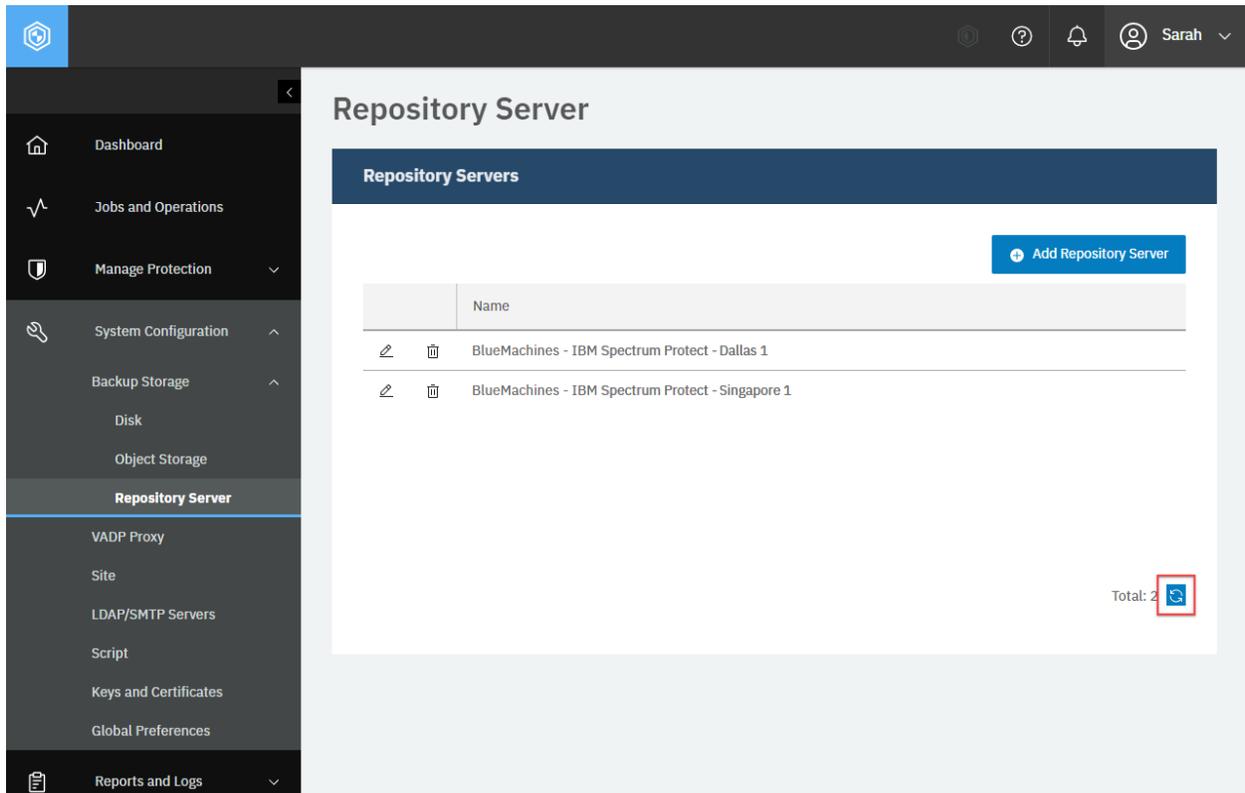


Figure 45: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Repository Server** pane, click **Refresh**.

Method and URI

To get information about all repository servers, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/cloud
```

To get information about a specific repository server, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/cloud/{cloudProviderInfoId}
```

Tip: To get a `{cloudProviderInfoId}` value based on its name, follow the instructions in Getting a `{cloudProviderInfoId}` (page 343).

Parameters

None.

Data

None.

Example 1: Get information about all repository servers

The following Python snippet requests a list of all repository servers and their information:

```
requests.get('https://' + spp_ipv4 + '/api/cloud',  
            headers={...}, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 2,  
  "clouds": [  
    {  
      "links": {...},  
      "id": "1",  
      "name": "BlueMachines - Spectrum Protect - Singapore 1",  
      "type": "s3",  
      "comment": null,  
      "accesskey": {  
        "href": "https://10.0.0.100/api/identity/key/1001"  
      },  
      "properties": {  
        "type": "s3",  
        "certificate": {  
          "href": "https://10.0.0.100/api/security/certificate/1001"  
        },  
        "hostname": "SP-SINGAPORE1",  
        "port": 9000,  
        "bucket": "spp-singapore1-1575895669224"  
      },  
      "provider": "sp",  
      "wormProtected": false,  
      "defaultRetention": 0,  
      "offloadEnabled": true,  
      "archiveEnabled": true,  
      "ec2ServiceEnabled": null,  
      "deepArchiveEnabled": false,  
      "rbacPath": "root:0/cloud:0/cloudType:s3/cloud:1",  
      "cloudCapacity": null,  
      "name": "BlueMachines - Spectrum Protect - Singapore 1",  
      "id": "1",  
      "type": "s3"  
    },  
    {  
      "id": "2",
```

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```
        "name": "BlueMachines - Spectrum Protect - Dallas 1",
        ...
    }
]
}
```

Example 2: Get information about a specific repository server

Assume that you want to get information about the specific repository server. You get the `cloudProviderInfoId` of it: 2. A Python snippet that is similar to the following example can be used to request the information about this repository server:

```
cloud_provider_info_id = "2"

requests.get('https://' + spp_ipv4 + '/api/cloud'
            + cloud_provider_info_id,
            headers={...}, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  ...
  "id": "2",
  "name": "BlueMachines - Spectrum Protect - Dallas 1",
  ...
}
```

Adding a repository server

To register a repository server, follow the instructions in [Adding an object storage server or a repository server](#) (page 172).

Unregistering a repository server

You can delete a repository server you have registered. *It must be unused by IBM Spectrum Protect Plus.*

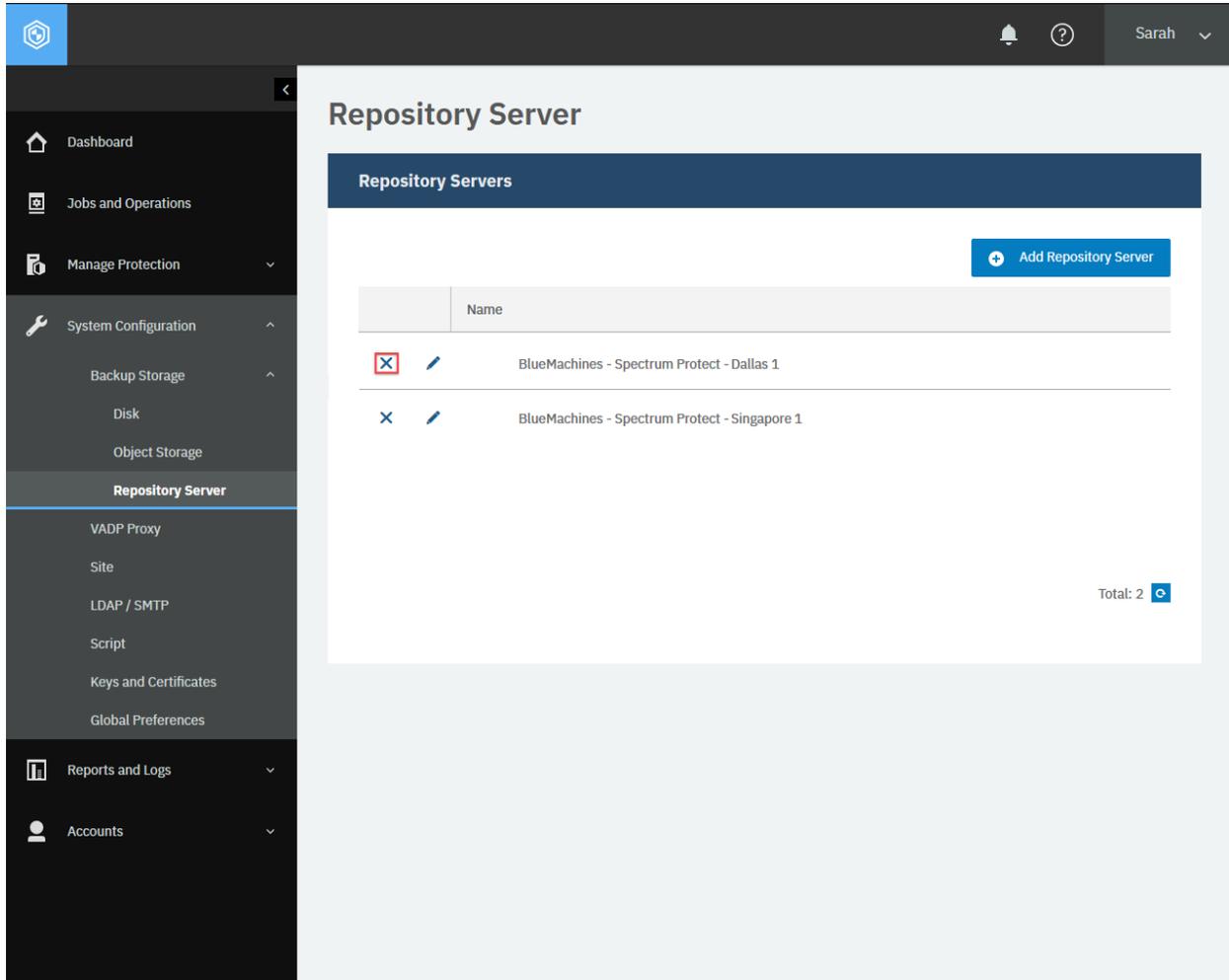


Figure 46: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Repository Server** pane, click the **Delete** icon next to the repository server you want to unregister.

Method and URI

To delete a repository server with `{cloudProviderInfoId}`, the request's method and URI are similar to the following example:

```
DELETE https://{hostname|IPv4}/api/cloud/{cloudProviderInfoId}
```

Tip: To get a `{cloudProviderInfoId}` value based on its name, follow the instructions in Getting a `{cloudProviderInfoId}` (page 343).

Parameters

None.

Data

None.

Example

Assume that you have a repository server BlueMachines - Spectrum Protect - Dallas 1 and you want to unregister it. You get the {cloudProviderInfoId} of it: 2. Run the command below.

```
cloud_provider_info_id = "2"

requests.delete('https://' + spp_ipv4 + '/api/cloud/'
               + cloud_provider_info_id,
               headers={...}, params="", data="", verify=...)
```

Ensure you get a response with the HTTP status of 204 (No Content) and that you no longer see the repository server BlueMachines - Spectrum Protect - Dallas 1.

VADP proxy

IBM Spectrum Protect Plus supports VMware vStorage API for Data Protection™ (VADP) to load-balance trafficts when it is operating on a VMware environment.

IBM Spectrum Protect Plus and vSnap virtual appliances have onboard VADP proxy servers and you can also install and use a VADP proxy server on a supported Linux virtual machine.

Getting VADP proxy information

You can get information about VADP proxies that are registered with IBM Spectrum Protect Plus.

Method and URI

To get information about all VADP proxy servers, use a GET method and a URI:

```
GET      https://{hostname|IPv4}/api/vadp
```

Parameters

None.

Data

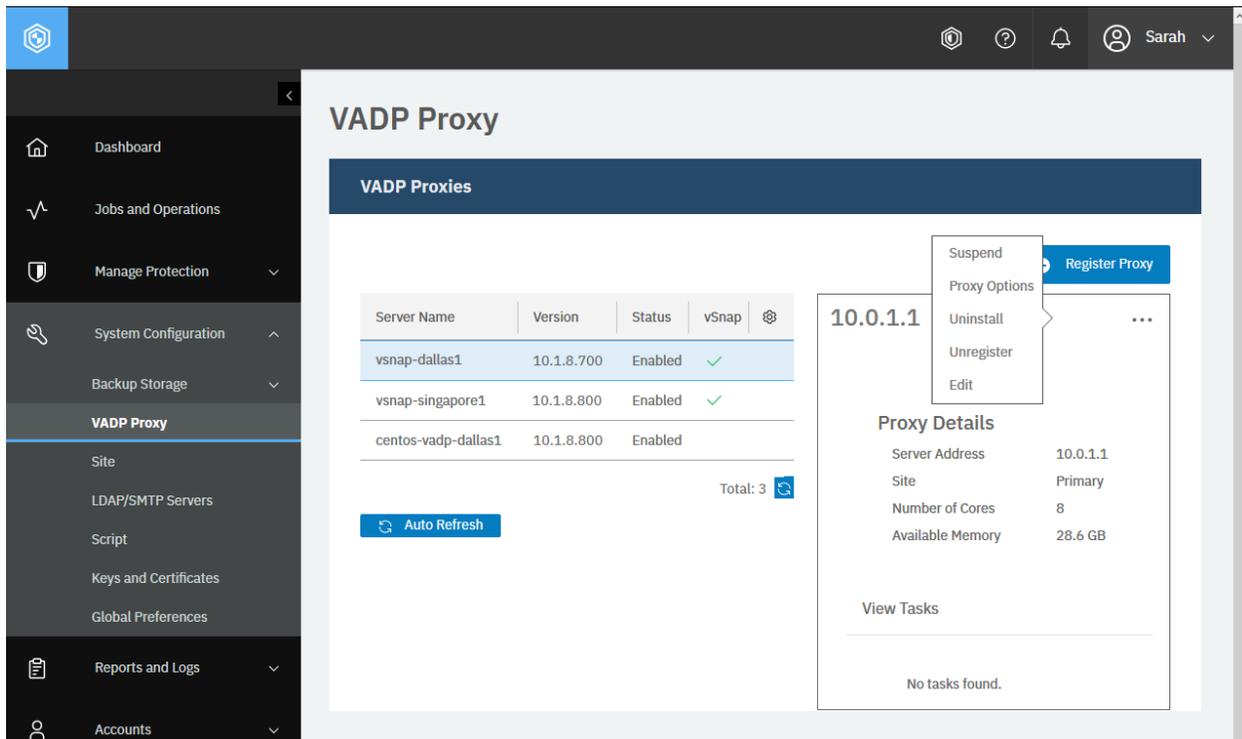
None.

Example: Get VADP proxy information

Assume that you registered a VADP proxy with IBM Spectrum Protect Plus, in addition to the onboard VADP proxy.

A Python snippet that is similar to the following example can be used to get information about the VADP proxies:

```
requests.get('https://' + spp_ipv4 + '/api/vadp',  
            headers={...}, verify=...)
```



The screenshot shows the IBM Spectrum Protect Plus web user interface. The navigation pane on the left includes options like Dashboard, Jobs and Operations, Manage Protection, System Configuration, Backup Storage, VADP Proxy, Site, LDAP/SMTP Servers, Script, Keys and Certificates, Global Preferences, Reports and Logs, and Accounts. The main content area is titled "VADP Proxy" and shows a table of VADP proxies. The table has columns for Server Name, Version, Status, and vSnap. The table lists three proxies: vsnap-dallas1, vsnap-singapore1, and centos-vadp-dallas1. A details panel for the proxy 10.0.1.1 is open, showing Proxy Details such as Server Address, Site, Number of Cores, and Available Memory. The details panel also includes a "View Tasks" section and a "No tasks found." message.

Server Name	Version	Status	vSnap
vsnap-dallas1	10.1.8.700	Enabled	✓
vsnap-singapore1	10.1.8.800	Enabled	✓
centos-vadp-dallas1	10.1.8.800	Enabled	

Total: 3

Auto Refresh

Proxy Details

Server Address	10.0.1.1
Site	Primary
Number of Cores	8
Available Memory	28.6 GB

View Tasks

No tasks found.

Figure 47: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration > VADP Proxy**.

The following response body displays information about VADP proxies. The HTTP status of this response is 200 ("OK").

```
{  
  "links": {...},  
  "vadps": [  
    {  
      "server": "vsnap-dallas1",  
      "version": "10.1.8.700",  
      "status": "Enabled",  
      "vsnap": "vsnap-dallas1",  
      "site": "Primary",  
      "cores": 8,  
      "memory": "28.6 GB"  
    },  
    {  
      "server": "vsnap-singapore1",  
      "version": "10.1.8.800",  
      "status": "Enabled",  
      "vsnap": "vsnap-singapore1",  
      "site": "Primary",  
      "cores": 8,  
      "memory": "28.6 GB"  
    },  
    {  
      "server": "centos-vadp-dallas1",  
      "version": "10.1.8.800",  
      "status": "Enabled",  
      "vsnap": "centos-vadp-dallas1",  
      "site": "Primary",  
      "cores": 8,  
      "memory": "28.6 GB"  
    }  
  ]  
}
```

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```
{
  "links": {...},
  "id": 2103,
  "siteId": 3101,
  "siteName": "Dallas",
  "displayName": "centos-vadp-dallas1",
  "hostName": "10.0.2.1",
  "ipAddr": "10.0.2.1",
  "securePort": 8098,
  "rbacPath": "root:0/proxy:0/proxy.type:VMDKBACKUP.VADPPROXY/proxy.type:
↪pe.VMDKBACKUP.VADPPROXY:2,103",
  "corecount": 0,
  "availablememory": 0,
  "version": "10.1.8.800",
  "state": "ENABLED",
  "stateDisplayName": "Enabled",
  "isLocal": false,
  "demo": false,
  "user": {
    "href": "https://10.0.0.100/api/identity/user/2154"
  }
},
{
  "links": {...},
  "id": 2000,
  "siteId": 1000,
  "siteName": "Dallas",
  "displayName": "localhost",
  "hostName": "localhost",
  "ipAddr": "127.0.0.1",
  "port": 8080,
  "rbacPath": "root:0/proxy:0/proxy.type:VMDKBACKUP.VADPPROXY/proxy.type:
↪pe.VMDKBACKUP.VADPPROXY:2,000",
  "corecount": 0,
  "availablememory": 0,
  "version": "10.1.8.800",
  "state": "SUSPENDED",
  "stateDisplayName": "Suspended",
  "isLocal": true,
  "demo": false,
  "user": {
    "href": "https://10.0.0.100/api/identity/user/-1"
  }
},
{...}, {...}
],
"enabled": [
  {
    "links": {...},
    "id": 2000,
    "siteId": 1000,
    "siteName": "Dallas",
    "displayName": "localhost",
    ...
  },
  {
    "links": {...},
```

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```
        "id": 2103,
        ...,
      },
      {...}
    ],
    "suspended": [
      {
        "links": {...},
        "id": 2105,
        "siteId": 1001,
        "siteName": "Singapore",
        "displayName": "vsnap-singapore1",
        ...,
        "version": "10.1.5.1008",
        "state": "SUSPENDED",
        "stateDisplayName": "Suspended",
        ...
      }
    ],
    "available": []
  }
}
```

Registering a VADP proxy

You can register a VADP proxy with the IBM Spectrum Protect Plus system environment.

Method and URI

To register a VADP proxy with the IBM Spectrum Protect Plus system environment, use a POST method and a URI:

```
POST https://{hostname|IPv4}/ngp/vadp
```

Parameters

None.

Data

Data 1: pushinstall

- **Example value:**

Install the VADP proxy application on the Linux system.

```
{
  "hostAddress": "10.0.2.1"
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 1.1: pushinstall > hostAddress

The IPv4 address or the hostname of the Linux system.

Data 2: identityId

The {identityId} of the identity to log in to the Linux system.

- **Example value:** 2110

Tip: To get a {siteId} value based on the name of the site, follow the instructions in Getting a {siteId} (page 360).

- **Type:** String. Required. Available in the web user interface.

Data 3: registration

- **Example value:**

```
{
  "siteId": "3102"
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 3.1: registration > siteId

The {siteId} of the site to associate with the VADP proxy.

Tip: To get a {siteId} value based on the name of the site, follow the instructions in Getting a {siteId} (page 360).

Type: String. Required. Available in the web user interface.

Example: Installing a VADP proxy

Assume that you want to install a VADP proxy on the following Linux system and add it to IBM Spectrum Protect Plus:

- **Name:** centos-vadp-dallas1
- **IPv4 address:** 10.0.2.1
- **Identity:** sarah-vadp1_10.0.2.1 ({identityId} 2110)
- **Site:** Dallas ({siteId} 3101)

A Python snippet that is similar to the following example can be used to install the VADP proxy on the Linux system and register the proxy with IBM Spectrum Protect Plus:

```
_data = f'''{{
  "pushinstall": {
    "hostAddress": "10.0.2.1"
  },
  "identityId": "2110",
  "registration": {
    "siteId": "3101"
  }
}}'''
```

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```
requests.post('https://' + spp_ipv4 + '/ngp/vadp',
             headers={...}, data=_data, verify=...)
```

Figure 48: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **VADP Proxy**. Click **Register Proxy**. Enter the required values in the fields and click **Install**.

The request prompts a response with the HTTP status of 201 (Created). Review the response to ensure that the new VADP proxy, centos-vadp-dallas1, was added. The response body is similar to the JSON object for centos-vadp-dallas1, as shown in Getting VADP proxy information (page 182).

Additional actions for a VADP proxy

You can take additional actions with a VADP proxy: suspending the VADP proxy temporarily, resuming the suspended VADP proxy, and uninstalling the VADP proxy application from the VADP proxy server. If you uninstall the VADP proxy will be unregistered from IBM Spectrum Protect Plus.

Method and URI

To take additional actions such as suspending, resuming, or uninstalling the VADP proxy, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/vadp/{vadpId}
```

Tip: To get a `{vadpId}` value based on the IPv4 address of the VADP proxy, follow the instructions in [Getting a {vadpId}](#) (page 362).

Parameters

Parameter 1: action

Specify the type of action.

- **Value:** Use one of the following values:

Action	Value
Suspend	suspend
Resume	resume
Uninstall	uninstall

Tip: To unregister a VADP proxy, follow the instructions in [Unregistering a VADP proxy](#) (page 189).

- **Type:** System string. Required. Available in the web user interface.

Data

None.

Example: Suspend a VADP proxy

Assume that you have a VADP proxy, `centos-vadp-dallas1` (`{vadp_id}` 2102), and you want to suspend the VADP proxy.

A Python snippet that is similar to the following example can be used to suspend the VADP proxy from IBM Spectrum Protect Plus:

```
_params = {"action": "suspend"}
requests.post('https://' + spp_ipv4 + '/api/vadp/' + vadp_id,
              headers={...}, params=_params, verify=...)
```

Ensure that you get a response with the HTTP status of 200 (OK) and the VADP proxy is suspended. You can take other actions (resuming and uninstalling) in a similar way.

Unregistering a VADP proxy

You can unregister a VADP proxy from the IBM Spectrum Protect Plus.

Method and URI

To unregister a VADP proxy with `{vadpId}`, use the DELETE method with a URI:

```
DELETE https://{hostname|IPv4}/api/vadp/{vadpId}
```

Tip: To get a `{vadpId}` value based on the IPv4 address of the VADP proxy, follow the instructions in Getting a `{vadpId}` (page 362).

Parameters

None.

Data

None.

Example: Unregister a VADP proxy

Assume that you have a VADP proxy, `centos-vadp-singapore1` (`{vadp_id}` 2103), and you want to unregister the VADP proxy.

A Python snippet that is similar to the following example can be used to unregister the VADP proxy from IBM Spectrum Protect Plus:

```
vadp_id = "2103"
requests.delete('https://' + spp_ipv4 + '/api/vadp/' + vadp_id,
               headers={...}, data=_data, verify=...)
```

Ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the VADP proxy `centos-vadp-singapore1`. The response body is empty.

Site

A *site* is used to group vSnap servers based on a physical or logical location to manage data placement in the environment. A site is assigned to a vSnap server when the server is added to IBM Spectrum Protect Plus.

Sites are not applicable to object storage (for example, IBM Cloud Object Storage or Amazon S3) or to repository servers (IBM Spectrum Protect).

Getting site information

You can get a list of sites and information for each, or get information about a specific site.

Method and URI

To get information about all sites, use a GET method and a URI:

```
GET https://{hostname|IP}/api/site
```

To get information about a specific site, use a GET method and a URI:

```
GET https://{hostname|IP}/api/site/{siteId}
```

Tip: To get a `{siteId}` value based on its name, follow the instructions in [Getting a {siteId}](#) (page 360).

Parameters

None.

Data

None.

Example 1: Get information about all sites

Assume that you have added a site, “Dallas”. A Python snippet that is similar to the following example can be used to request a list of all sites and their information:

```
requests.get('https://' + spp_ipv4 + '/api/site',  
            headers={...}, verify=...)
```

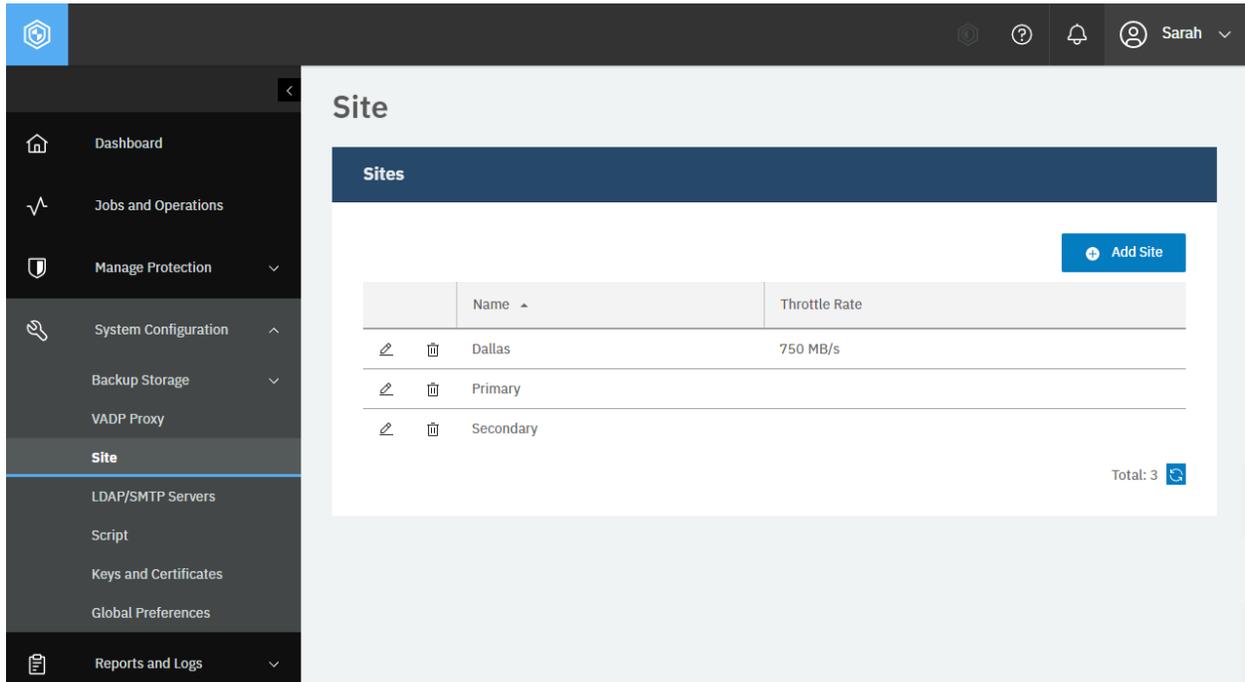


Figure 49: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration > Site**.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 4,  
  "sites": [  
    {  
      "links": {...},  
      "id": "2000",  
      "name": "Secondary",  
      "description": "secondary site",  
      "defaultSite": false,  
      "throttles": null,  
      "demo": false,  
      "rbacPath": "root:0/site:0/site:2000"  
    },  
    {  
      "links": {...},  
      "id": "1000",  
      "name": "Primary",  
      "description": "Primary Site",
```

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```
    "defaultSite": true,
    "throttles": null,
    "demo": false,
    "rbacPath": "root:0/site:0/site:1000"
  },
  {
    "links": {...},
    "id": "3110",
    "name": "Dallas",
    "description": null,
    "defaultSite": false,
    "throttles": [
      {
        "rate": "786432000",
        "schedules": [
          {
            "start": 133200,
            "end": 165599
          },
          {
            "start": 219600,
            "end": 251999
          },
          ...
          {
            "start": 565200,
            "end": 590399
          }
        ]
      }
    ],
    "demo": false,
    "rbacPath": "root:0/site:0/site:3110"
  }
]
```

For information about enabling throttling for sites to limit the bandwidth used by IBM Spectrum Protect Plus, follow the instructions in Adding a site (page 193).

Example 2: Get information about a specific site

Assume that you want to get information about the site with the following `{siteId}`: 2000. A Python snippet that is similar to the following example can be used to request the information about this site:

```
site_id = "2000"

requests.get('https://' + spp_ipv4 + '/api/site/' + site_id,
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "id": "2000",
```

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```

"name": "Secondary",
"description": "secondary site",
"defaultSite": false,
"throttles": null,
"demo": false,
"rbacPath": "root:0/site:0/site:2000"
}

```

Adding a site

You can add a new site.

Method and URI

To add a site, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/site
```

Parameters

None.

Data

Data 1: name

The name of the site.

- **Example value:** Dallas
- **Type:** String. Required. Available in the web user interface.

Data 2: description

The description of the site.

- **Example value:** BlueMachines Dallas data center
- **Type:** String.

Data 3: defaultSite

Indication of whether the site is set as the default.

Requirement: You must have at least one default site, which is usually Primary. If you set another site as a default site, the current one is unset.

- **Example value:** false
- **Type:** Boolean.

Data 4: throttles

The throttle settings.

Restriction: Throttle settings apply to outgoing traffic from vSnap servers in replication, archive, and copy operations, but not to restore operations.

Tip: If you associate a vSnap server with a site, the vSnap server uses the throttle settings of the site with the time zone setting of the vSnap server.

- **Example value:**

```
[
  {
    "rate": "786432000",
    "schedules": [
      {
        "start": 115200,
        "end": 147599
      },
      {
        "start": 201600,
        "end": 233999
      }
    ]
  }
]
```

- **Type:** List. Available in the web user interface.

Data 4.1: throttles > JSON object > rate

The throughput in bytes per second.

- **Type:** Integer. Available in the web user interface.

Data 4.2 throttles > JSON object > schedules

Schedule settings. The sample values, which start at 0 and end at 3600, specify a range between midnight and 1 AM on Sunday. By default, both values are set to 0. As a result, throttling is disabled.

- **Type:** Array. Available in the web user interface.

Data 4.2.1 throttles > JSON object > schedules > JSON object > start

The start time defined by the number of seconds after Sunday 00:00:00.

Type: Integer. Available in the web user interface.

Data 4.2.2 throttles > JSON object > schedules > JSON object > end

The end time defined by the number of seconds after Sunday 00:00:00.

Type: Integer. Available in the web user interface.

Data 5: loadBalanceRatio

VMware VM allocation.

Restriction: Do not enter a value other than 100 unless you are instructed to do so by IBM Software Support.

- **Value:** 100
- **Type:** Integer. Available in the web user interface.

Example: Add a new site with throttle settings

As you can see in the IBM Spectrum Protect Plus interface in your web browser, every site allows you to specify throttles to restrict the bandwidth that IBM Spectrum Protect Plus uses.

For example, assume that you have an SLA policy that takes a backup snapshot every hour. You do not want to consume too much bandwidth with this job during business hours, which are from 8 AM through 5 PM Monday through Friday and 8 AM through 3 PM on Saturdays. Your office is located in the US Central Daylight Time (CDT) zone.

Log in to one of the vSnap servers that are associated with the site, and see the time zone setting of the vSnap server:

```
[sarah@workstation ~ ] ssh sarah-vsnap1@10.0.1.1 # vsnap-dallas1
sarah-vsnap1@10.0.1.1's password: 6bxPYs6eQNa!V85R
Last login: Mon Jun 01 00:00:00 2020 from 10.0.0.1
-----
Be sure to adhere to vSnap hardware and memory requirements
as described in IBM Spectrum Protect Plus Blueprints
accessible from the IBM Spectrum Protect Plus Knowledge Center.
-----
```

```
[sarah-vsnap1@vsnap-dallas1 ~]$ timedatectl
Local time: Mon 2020-06-01 01:00:00 UTC
Universal time: Mon 2020-06-01 01:00:00 UTC
RTC time: Mon 2020-06-01 01:00:00
Time zone: UTC (UTC, +0000)
NTP enabled: yes
NTP synchronized: yes
RTC in local TZ: yes
DST active: n/a
...
```

This output indicates that the time zone of this vSnap server is set to UTC, which is 5 hours ahead of CDT.

You want to limit the bandwidth to a maximum of 750 MB per second during these business hours and allow unlimited bandwidth after hours.

The rate is 750 MB per second, which is 786,432,000 bytes per second. Monday at 8 AM CDT or 1 PM UTC is 133,200 seconds after 0:00 AM on Sunday. This value can be calculated by using the following formula: $60 \times 60 \times 24 + 60 \times 60 \times 13$. The other time ranges can be calculated in a similar way.

```
_data = f''{{
  "name": "Dallas",
  "description": "BlueMachines Dallas Data Center",
  "defaultSite": false,
  "throttles": [
    {{
      "rate": "786432000",
      "schedules": [
        {{"start": 133200, "end":165599}},
        {{"start": 219600, "end":251999}},
        {{"start": 306000, "end":338399}},
        {{"start": 392400, "end":424799}},
        {{"start": 478800, "end":511199}},
        {{"start": 565200, "end":590399}}
      ]
    }}
  ]
}}
```

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```
],  
  "loadBalanceRatio": 100  
}}''  
  
requests.post('https://' + spp_ipv4 + '/api/site',  
  headers={...}, data=_data, verify=...)
```

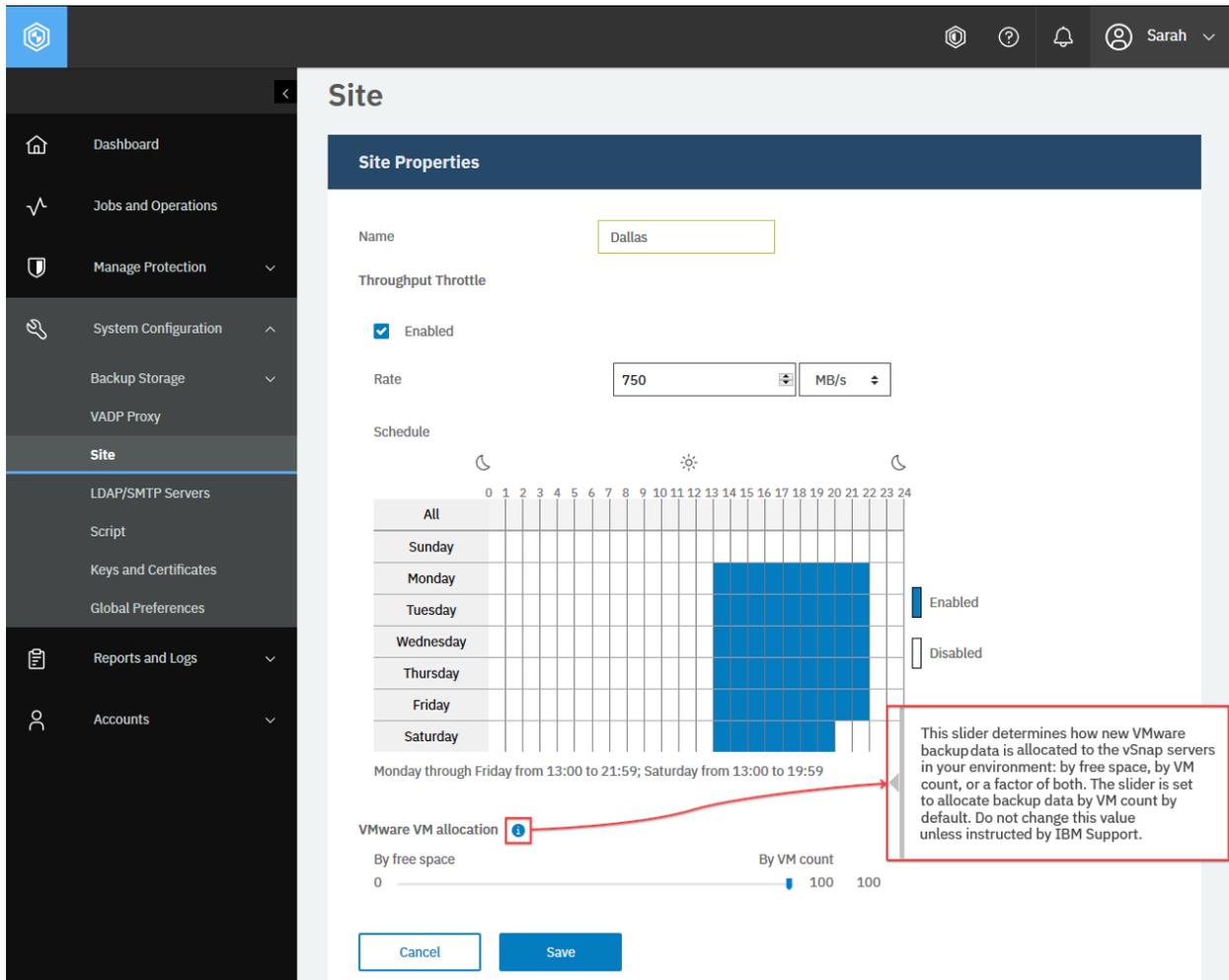


Figure 50: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **Site** and click **Add Site**. Optionally, you can specify properties by selecting the **Enable Throttle** checkbox. As mentioned, the vSnap servers that are associated with this site use their time zones.

The request prompts a response with the HTTP status of 201 (Created). The response body is similar to the JSON object for the Dallas site, as shown in Getting site information (page 190). Review the response to ensure that the new site, Dallas, was created.

Editing the configuration of a site

You can edit settings for a site. You can change the site name and other options for the default Primary and Secondary sites.

Method and URI

To update the site of `{siteId}`, use a PUT method and a URI:

```
PUT https://{hostname|IPv4}/api/site/{siteId}
```

Tip: To get a `{siteId}` value based on the name of the site, follow the instructions in Getting a `{siteId}` (page 360).

Parameters

None.

Data

The data key-value pairs are the same as for a site. For more information, follow the instructions in Adding a site (page 193).

Example: Edit the configuration of a site

As you can see in the IBM Spectrum Protect Plus interface in your web browser, every site allows you to specify throttles to restrict the bandwidth that IBM Spectrum Protect Plus uses.

For example, assume that you added a site that is named Dallas (`{siteId}` 3100). You want to assign the following values to this site:

- Rename it Singapore
- Remove all throttles
- Add the description BlueMachines Singapore Data Center.

A Python snippet that is similar to the following example can be used to update the configuration of a site:

```
site_id = "3100"      # Dallas

_data = f'''{{
    "name":          "Singapore",
    "description":  "BlueMachines Singapore Data Center",
    "defaultSite":  false,
    "throttles":    [],
    "loadBalanceRatio": 100
}}'''

requests.put('https://10.0.0.100/api/site/' + site_id,
            headers={...}, data=_data, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the site is updated. This request is similar to the one that you used to create the site; compare the HTTP request method, the URI, the data values, and the HTTP status code in the response.

Deleting a site

You can delete a site.

Method and URI

To delete a site with `{siteId}`, use the DELETE method with a URI:

```
DELETE https://{hostname|IPv4}/api/site/{siteId}
```

Tip: To get a `{siteId}` value based on its name, follow the instructions in [Getting a {siteId}](#) (page 360).

Parameters

None.

Data

None.

Example: Delete a site

Assume that you have a site, Singapore, and you want to delete it. You get the `{siteId}`: 3101.

A Python snippet that is similar to the following example can be used to delete the site:

```
site_id = "3101"    # Singapore
requests.delete('https://' + spp_ipv4 + '/api/site/' + site_id,
               headers={...}, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the site Singapore.

LDAP/SMTP Servers

With IBM Spectrum Protect Plus, you can add an individual user or add multiple users by specifying a Lightweight Directory Access Protocol (LDAP) server with LDAP groups and user accounts. You can add up to one LDAP server. The LDAP directory service on it must be either Microsoft Active Directory or OpenLDAP. For general information regarding LDAP, see the following standards document:

- Lightweight Directory Access Protocol (LDAP): The Protocol, IETF RFC 4511

For task instructions about using an LDAP server, see the following sections:

- Adding users that are based on an LDAP group (page 296)
- Modifying settings of users (page 300)

The Simple Mail Transfer Protocol (SMTP) is used for reporting features. When you add an SMTP server to IBM Spectrum Protect Plus, reports can be sent to specific addresses via email. For general information about SMTP, see the following standards document:

- Simple Mail Transfer Protocol, IETF RFC 5321

For task instructions about using an SMTP server, see the following section:

- Scheduling a report (page 239)

Getting LDAP server information

You can get information about a registered LDAP server. The LDAP server list will display a maximum of one item because IBM Spectrum Protect Plus supports the registration of only one LDAP server.

Method and URI

To get information about an LDAP server, use a GET method and a URI:

```
GET https://{hostname|IP}/api/ldap
```

Parameters

None.

Data

None.

Example: Get information about an LDAP server

Assume that you registered an LDAP server with IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to request information about the LDAP server:

```
requests.get('https://' + spp_ipv4 + '/api/ldap',  
            headers={...}, verify=...)
```

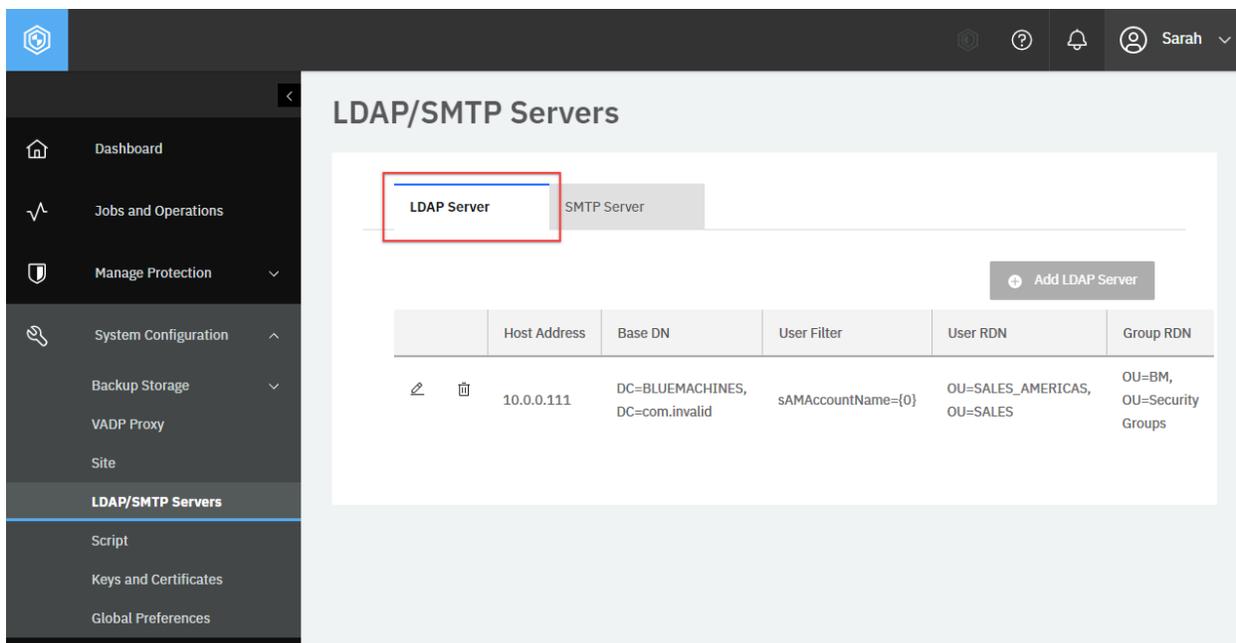


Figure 51: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **LDAP/SMTP Servers** and ensure that the **LDAP Server** tab is displayed.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "ldapServers": [
    {
      "links": {
        "self": {
          "rel": "self",
          "href": "https://10.0.0.111/api/ldap/1012",
          ...
        },
      },
      ...
    }
  ],
  "tenantId": 1000,
  "hostAddress": "10.0.0.111",
  "name": "10.0.0.111",
  "comment": null,
  "user": {
    "href": "https://10.0.0.100/api/identity/user/2148"
  },
  "sslConnection": false,
  "portNumber": 389,
  "baseDN": "DC=BLUEMACHINES,DC=com",
  "userRDN": "OU=SALES",
  "groupRDN": "OU=BM,OU=Security Groups",
  "userFilter": "sAMAccountName={0}",
  "rbacPath": "ldap:0/ldap:1012",
  "resourceType": "ldap",
  "id": "1012"
}
```

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```

    }
  ]
}

```

Adding an LDAP server

You can add an LDAP server.

Method and URI

To add an LDAP server, use a POST method with a URI:

```
POST https://{hostname|IPv4}/ngp/ldap
```

Parameters

None.

Data

Data 1: hostAddress

IPv4 address of the LDAP server.

- **Example value:** 10.0.0.111
- **Type:** String. Required. Available in the web user interface.

Data 2: portNumber

Port number to connect to the LDAP server. The typical default port is 389 for non-SSL connections or 636 for SSL connections.

- **Example value:** 389
- **Type:** Integer. Required. Available in the web user interface.

Data 3: sslConnection

Indication of whether SSL is used to connect with the LDAP server.

- **Example value:** false (default)
- **Type:** Boolean. Required. Available in the web user interface.

Data 4: useExistingUser

Indication of whether an existing identity is used.

- **Example value:** true
- **Type:** Boolean. Required. Available in the web user interface.

Data 5: existingUser

The `{identityUserHref}` of the identity.

Tip: To get an `{identityKeyHref}` value based on the name of the identity, follow the instructions in Getting an `{identityUserHref}` (page 350)

- **Example value:** `https://10.0.0.100/api/identity/user/2148`
- **Type:** String. Required. Available in the web user interface.

Data 6: `username`

The `{identityUserHref}` of the identity. This value should be the same as the `existingUser` value.

- **Example value:** `https://10.0.0.100/api/identity/user/2148`
- **Type:** String. Required. Available in the web user interface.

Data 7: `baseDN`

The base distinguished name (DN) of the LDAP object.

- **Example value:** `DC=BLUEMACHINES, DC=com`
- **Type:** String. Required. Available in the web user interface.

Data 8: `userFilter`

Filter value to select specific users in the base DN.

- **Example value:** `sAMAccountName={0}`
- **Type:** String. Required. Available in the web user interface.

Data 9: `userRDN`

Relative distinguished names of users, separated by commas.

- **Example value:** `cn=Users`
- **Type:** String. Required. Available in the web user interface.

Data 10: `groupRDN`

Relative distinguished names of groups, separated by commas.

- **Example value:** `OU=BM,OU=Security Groups`
- **Type:** String. Required. Available in the web user interface.

Example: Add an LDAP server

Assume that you want to add the following LDAP server with an Active Directory database to IBM Spectrum Protect Plus:

- **Host address:** `10.0.0.111`
- **Port:** `389`
- **SSL:** `Disable`
- **Credentials:** `BLUEMACHINESSALES ({identityUserHref} https://10.0.0.100/api/identity/user/2148)`
- **Base DN:**
 - **Domain component 1:** `BLUEMACHINES`
 - **Domain component 2:** `com`
- **User filter:** `sAMAccountName={0}`

- Active Directory authentication with the Windows user naming attribute, sAMAccountName.
- **User RDN:**
 - **Organization unit:** SALES
- **Group RDN:**
 - **Organization unit 1:** BM
 - **Organization unit 2:** Security Groups

A Python snippet that is similar to the following example can be used to add the LDAP server:

```
_data = f'''{{
  "hostAddress":    "10.0.0.111",
  "portNumber":    389,
  "sslConnection": false,
  "useExistingUser": true,
  "existingUser":   "https://10.0.0.100/api/identity/user/2148",
  "username":      "https://10.0.0.100/api/identity/user/2148",
  "baseDN":        "DC=BLUEMACHINES,DC=com",
  "userFilter":    "sAMAccountName={{0}}",
  "userRDN":       "OU=SALES",
  "groupRDN":      "OU=BM,OU=Security Groups"
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/ldap',
              headers={...}, data=_data, verify=...)
```

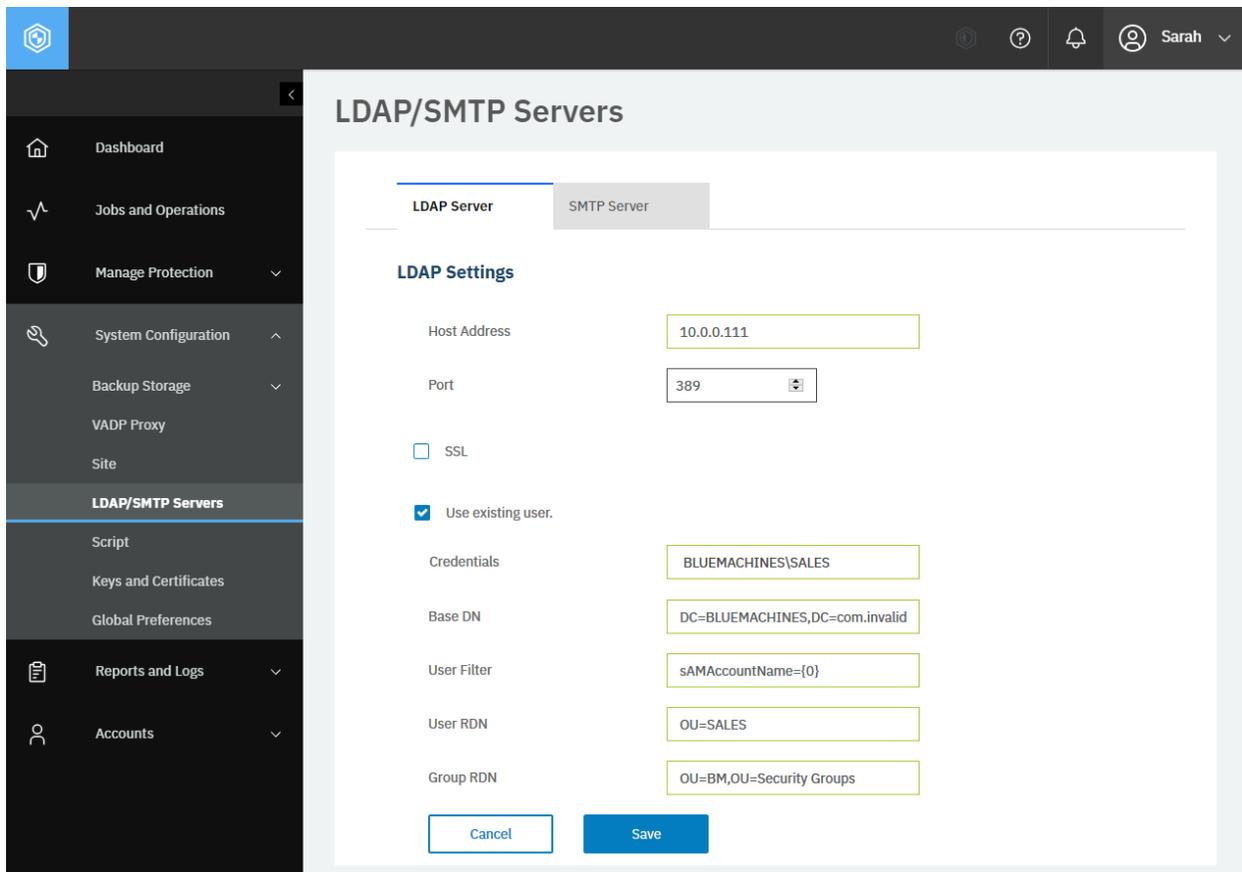


Figure 52: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration > LDAP/SMTP Servers** and ensure that the **LDAP Server** tab is displayed. Click **Add LDAP Server**. Enter the required values in the fields and click **Save**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the LDAP server was added.

```
{
  "statusCode": 201,
  "response": {
    "links": {...},
    "tenantId": 1000,
    "hostAddress": "10.0.0.111",
    "name": "10.0.0.111",
    "comment": null,
    "user": {
      "href": "https://10.0.0.100/api/identity/user/2148"
    },
    "sslConnection": false,
    "portNumber": 389,
    "baseDN": "DC=BLUEMACHINES,DC=com",
    "userRDN": "OU=SALES",
    "groupRDN": "OU=BM,OU=Security Groups",
    "userFilter": "sAMAccountName={0}",
    "rbacPath": "ldap://ldap:1012",
    "resourceType": "ldap",
  }
}
```

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```

    "id": "1012"
  }
}

```

Editing the configuration of an LDAP server

You can edit an LDAP server configuration.

Method and URI

An LDAP server must be specified by using an `{ldapId}`. To update the configuration of an LDAP server, use a PUT method and a URI:

```
PUT https://{hostname|IPv4}/ngp/ldap/{ldapId}
```

Tip: To get an `{ldapId}`, follow the instructions in [Getting an {ldapId}](#) (page 353).

Parameters

None.

Data

You can use the data key-value pairs that are described in [Adding an LDAP server](#) (page 201).

Example: Edit the configuration of an LDAP server

Assume that you want to edit the configuration of an LDAP server with the following `{ldapId}`: 1012. You want to assign the following values to this LDAP server:

- **Port:** 636 (LDAP over SSL)
- **SSL:** Enabled

A Python snippet that is similar to the following example can be used to update the configuration of the LDAP server:

```

ldap_id = "1012"

_data = f'''{{
    "portNumber":    636,
    "sslConnection": true
}}'''

requests.put('https://' + spp_ipv4 + '/ngp/ldap/' + ldap_id,
             headers={...}, data=_data, verify=...)

```

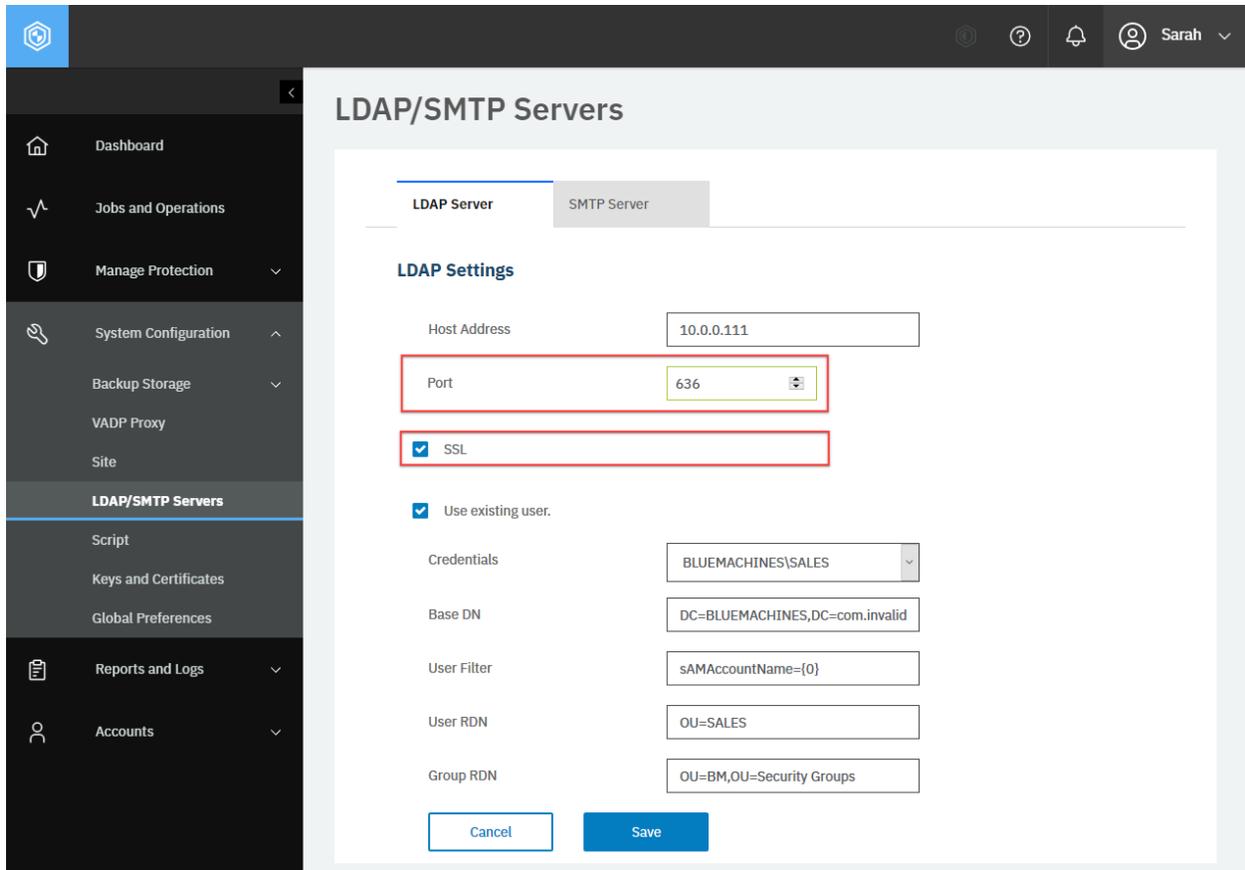


Figure 53: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **LDAP/SMTP Servers** and ensure that the **LDAP Server** tab is displayed. Click the **Edit** icon of the LDAP server you want to edit. Edit the configuration values and click **Save**.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the LDAP server settings are updated. The response body is similar to the JSON object for Sales_Americas, as shown in Getting LDAP server information (page 199).

Unregistering an LDAP server

You can unregister an LDAP server from IBM Spectrum Protect Plus.

Method and URI

To delete an LDAP server with `{ldapId}`, the request's method and URI are similar to the following example:

```
DELETE https://{hostname|IPv4}/api/ldap/{ldapId}
```

Tip: To get an `{ldapId}` value based on its name, follow the instructions in Getting an `{ldapId}` (page 353).

Parameters

None.

Data

None.

Example: Unregister an LDAP server

Assume that you have an LDAP server, 10.0.0.111, and you want to delete it. You get the {ldapId}: 1011.

A Python snippet that is similar to the following example can be used to unregister the LDAP server:

```
ldap_id = "1011"      # 10.0.0.111

requests.delete('https://' + spp_ipv4 + '/api/ldap/' + ldap_id,
                headers={...}, params="", data="", verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the LDAP server 10.0.0.111. The response body is empty.

Getting SMTP server information

You can get information about a registered SMTP server. For each IBM Spectrum Protect Plus server, you can register only one SMTP server.

Method and URI

To get information about an SMTP server, use a GET method and a URI:

```
GET      https://{hostname|IP}/api/smtp/{smtpId}
```

Tip: To get an {smtpId} value based on its name, follow the instructions in Getting an {smtpId} (page 361).

Parameters

None.

Data

None.

Example: Get information about an SMTP server

Assume that you registered an SMTP server with IBM Spectrum Protect Plus (`{smtpId}` 1002).

A Python snippet that is similar to the following example can be used to request information about this SMTP server:

```
smtp_id = "1002"

requests.get('https://' + spp_ipv4 + '/api/smtp/' + smtp_id,
             headers={...}, verify=...)
```

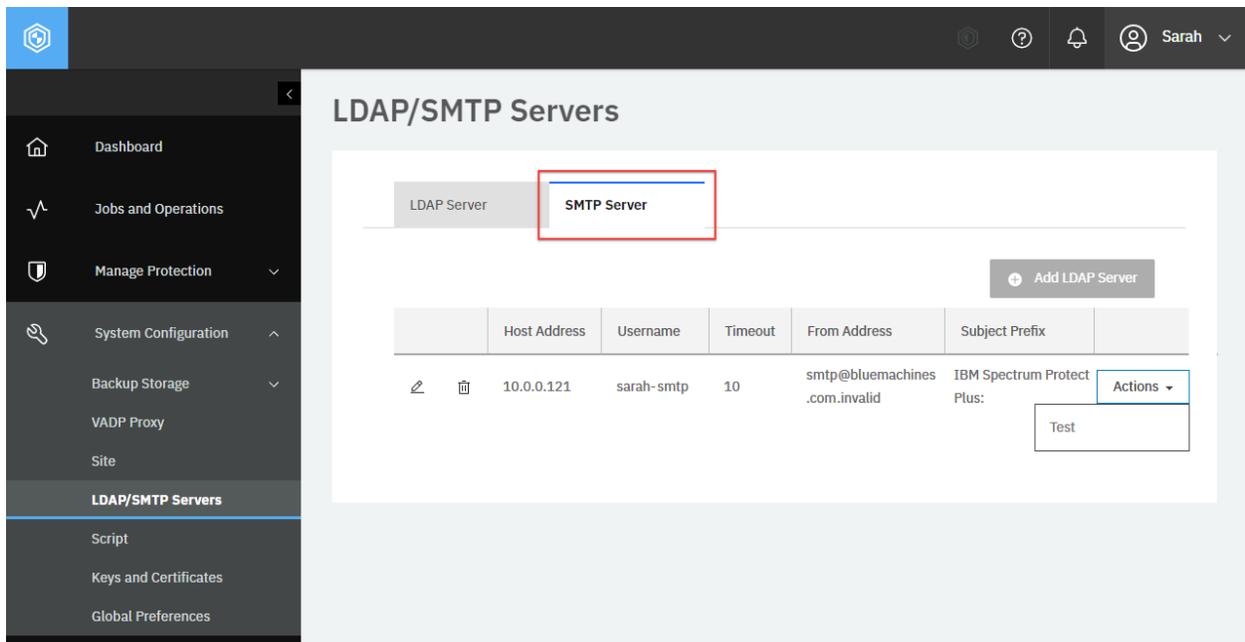


Figure 54: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **LDAP/SMTP Servers** and click the **SMTP Server** tab.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "name": "10.0.0.121",
  "hostAddress": "10.0.0.121",
  "rbacPath": "smtp:0/smtp:1002",
  "user": "sarah-smtp",
  "comment": "",
  "portNumber": 25,
  "timeout": 10000,
  "fromAddress": "smtp@bluemachines.com.invalid",
  "subjectPrefix": "IBM Spectrum Protect Plus:",
```

(continues on next page)

```
"id": "1002"
}
```

Adding an SMTP server

You can add an SMTP server to IBM Spectrum Protect Plus.

Method and URI

To add an SMTP server, use a POST method with a URI:

```
POST https://{hostname|IPv4}/ngp/smtp
```

Parameters

None.

Data

Data 1: hostAddress

The IP address of the host, or the path and hostname of the SMTP server.

- **Example value:** 10.0.0.121
- **Type:** String. Required. Available in the web user interface.

Data 2: portNumber

The communications port of the server that you are adding. The default port number is 25 for non-SSL connections or 443 for SSL connections.

- **Example value:** 25
- **Type:** Integer. Required. Available in the web user interface.

Data 3: username

The name that is used to access the SMTP server.

- **Example value:** sarah-smtp
- **Type:** String. Available in the web user interface.

Data 4: password

The name that is used to access the SMTP server.

- **Example value:** ?^y{+~k9R8S*S4FW
- **Type:** String. Required, if username has a value. Available in the web user interface.

The password that is associated with the username.

Data 5: timeout

The email timeout value in milliseconds.

- **Example value:** 10000

- **Type:** Integer. Available in the web user interface.

Data 6: fromAddress

The address that is associated with email communications from IBM Spectrum Protect Plus.

- **Example value:** smtp@bluemachines.com.invalid
- **Type:** String. Available in the web user interface.

Data 7: subjectPrefix

The prefix for email subject lines sent from IBM Spectrum Protect Plus.

- **Example value:** IBM Spectrum Protect Plus:
- **Type:** String. Available in the web user interface.

Example: Add an SMTP server to IBM Spectrum Protect Plus

Assume that you want to add the following SMTP server to IBM Spectrum Protect Plus:

- **Host address:** 10.0.0.121
- **Port:** 25 (SMTP without SSL encryption)
- **Username:** sarah-smtp
- **Password:** ?^y{+~k9R8S*S4FW
- **Timeout:** 10,000 milliseconds (10 seconds)
- **From address:** smtp@bluemachines.com.invalid
- **subjectPrefix:** IBM Spectrum Protect Plus:

A Python snippet that is similar to the following example can be used to add the SMTP server:

```
_data = f'''{{
  "hostAddress": "10.0.0.121",
  "portNumber": 25,
  "username": "sarah-smtp",
  "password": "?^y{+~k9R8S*S4FW",
  "timeout": 10000,
  "fromAddress": "smtp@bluemachines.com.invalid",
  "subjectPrefix": "IBM Spectrum Protect Plus : "
}}'''

requests.post('https://' + spp_ipv4 + '/ngp/smtp',
              headers={...}, data=_data, verify=...)
```

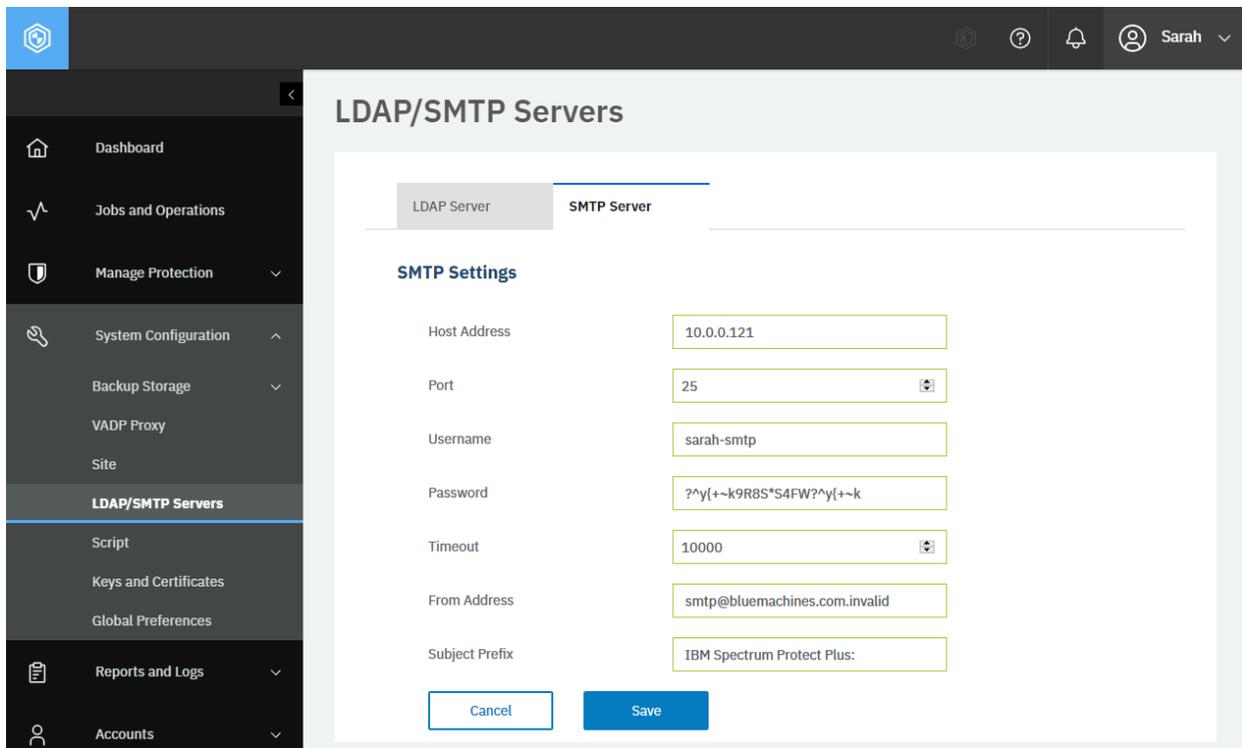


Figure 55: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **LDAP/SMTP Servers** and click the **SMTP Server** tab. Click **Add SMTP Server**. Enter the required values in the fields and click **Save**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the SMTP server 10.0.0.121 was added. The response body is similar to the JSON object that is shown in Getting SMTP server information (page 207).

Editing the configuration of an SMTP server

You can edit an SMTP server configuration.

Method and URI

To edit the configuration of the SMTP server, use a PUT method with a URI:

```
PUT https://{hostname|IPv4}/ngp/smtp/{smtpId}
```

Tip: To get an {smtpId}, follow the instructions in Getting an {smtpId} (page 361).

Parameters

None.

Data

You can use the data key-value pairs that are listed in Adding an SMTP server (page 209).

Example: Edit the configuration of an SMTP server

Assume that you want to edit the configuration of an SMTP server with the following `{smtpId}` value: 1002. You want to assign the following values to this SMTP server:

- **Port:** 443 (HTTP with SSL encryption)
- **From address** smtp.dallas@bluemachines.com.invalid

A Python snippet that is similar to the following example can be used to edit the configuration of the SMTP server:

```
smtp_id = "1002"

_data = f'''{{
    "hostAddress":    "10.0.0.121",
    "portNumber":    443,
    "username":      "sarah-smtp",
    "password":      "?^y{{+~k9R8S*S4FW",
    "timeout":       10000,
    "fromAddress":   "smtp.dallas@bluemachines.com.invalid",
    "subjectPrefix": "IBM Spectrum Protect Plus:"
}}'''

requests.put('https://' + spp_ipv4 + '/ngp/smtp/' + smtp_id,
             headers={...}, params="", data=_data, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the SMTP server settings are updated.

Deleting an SMTP server

To unregister an SMTP server from IBM Spectrum Protect Plus, you must delete the SMTP server.

Method and URI

To unregister an SMTP server, use a DELETE method and a URI:

```
DELETE https://{hostname|IPv4}/api/smtp/{smtpId}
```

Tip: To get an `{smtpId}` value based on the SMTP server name, follow the instructions in Getting an `{smtpId}` (page 361).

Parameters

None.

Data

None.

Example: Unregister an SMTP server

Assume that you have an SMTP server, 10.0.0.121, and you want to unregister it. You get the {smtpId}: 1002.

A Python snippet that is similar to the following example can be used to unregister the SMTP server:

```
smtp_id = "1002"

requests.delete('https://' + spp_ipv4 + '/api/smtp/' + smtp_id,
                headers={...}, params="", data="", verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the SMTP server 10.0.0.121. The response body is empty.

Keys and Certificates

In the Keys and Certificates section of the web user interface, you can manage access keys, SSH private keys, and certificates that are registered with IBM Spectrum Protect Plus. The following tables summarize where you can manage authentication methods for each type of product.

Virtualized systems:

Product	Access keys	SSH keys	Certificates	Identity	User menu
VMware vCenter				x	
Hyper-V				x	
Amazon EC2				x	
Linux		x		x	
Windows				x	

Application servers:

Product	Access keys	SSH keys	Certificates	Identity	User menu
Oracle Database		x		x	
SQL Server				x	
IBM Db2		x		x	
MongoDB		x		x	
Exchange Server				x	
Microsoft 365				x	

Object storage:

Product	Access keys	SSH keys	Certificates	Identity	User menu
Amazon S3	x				
IBM Cloud Object Storage	x		x		
Azure Blob Storage	x				
S3 compatible object storage	x		x		

Repository servers:

Product	Access keys	SSH keys	Certificates	Identity	User menu
IBM Spectrum Protect	x		x		

IBM Spectrum Protect Plus:

Product	Access keys	SSH keys	Certificates	Identity	User menu
IBM Spectrum Protect Plus					x
Individual users				x	
LDAP server				x	
SMTP server				x	

To manage usernames and passwords, follow the instructions in Identity (page 329). To establish a secure connection between IBM Spectrum Protect Plus and a client, for example, your workstation, you must upload an SSL certificate file by clicking the user menu and clicking **Manage SSL Certificates**. For details, see the IBM Spectrum Protect Plus Installation and User's Guide.

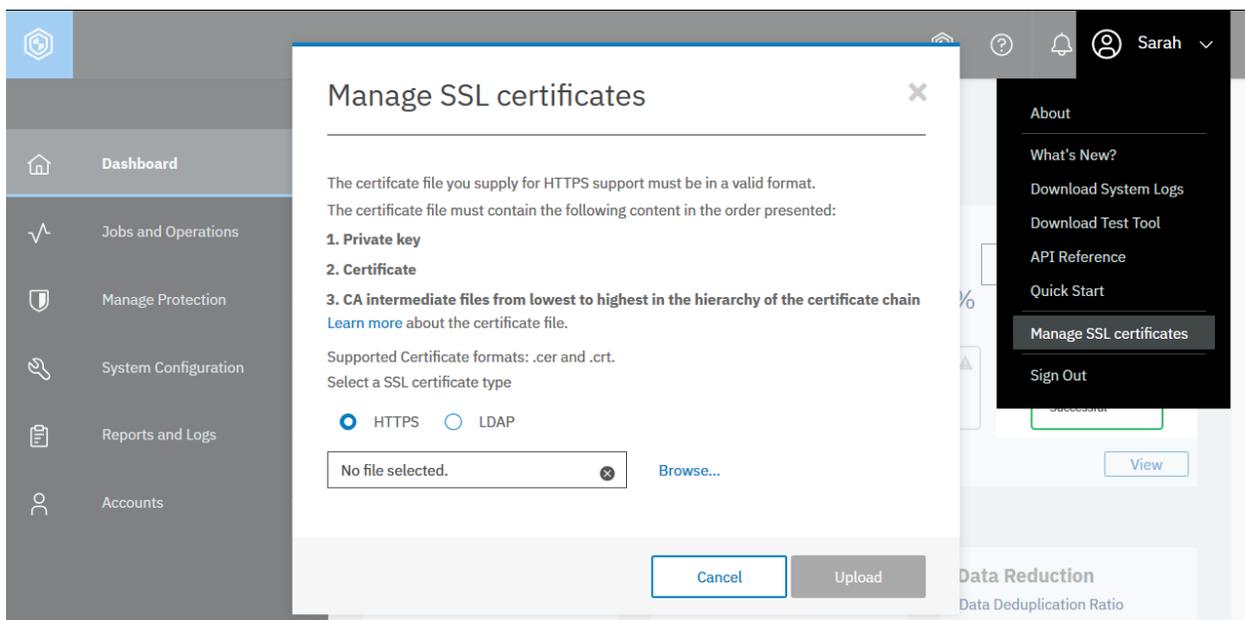


Figure 56: You can upload an SSL certificate file to establish a secure connection between clients and IBM Spectrum Protect Plus. This operation can be completed by clicking **Manage SSL certificates** in the user menu and follow the instructions.

Getting information about access keys and SSH keys

You can get a list of access keys and SSH keys with information about each key. Access keys and SSH keys share the same URI path. You can use the `filter` parameter to get the keys of either type.

Method and URI

To get information about all access keys and SSH keys, use a GET method and a URI:

```
GET https://{hostname|IP}/api/identity/key
```

To get information about a specific access key or an SSH key, use a GET method and a URI:

```
GET https://{hostname|IP}/api/identity/key/{identityKeyId}
```

Tip: To get an `{identityKeyId}` value based on its name, follow the instructions in [Getting an {identityKeyId}](#) (page 350).

Parameters

Parameter 1: `filter`

Specify criteria to get access keys or SSH keys.

- **Values:** To get only access keys, use the following value:

```
[
  {
    "property": "keytype",
    "value":    ["exch_key"],
    "op":      "NOT IN"
  }
]
```

To get only SSH keys, use the following value:

```
[
  {
    "property": "keytype",
    "value":    "ssh_private_key",
    "op":      "="
  }
]
```

- **Type:** List. Available in the web user interface.

Parameter 1.1: `filter > property`

Specify a property to apply to the filter.

- **Value:** `keytype`
- **Type:** List. Available in the web user interface.

Parameter 1.2: `filter > value`

Specify the property value that you want to apply to the filter.

- **Type:** List or system string. Available in the web user interface.

Data

None.

Example 1: Get information about all access keys

Assume that you added access keys to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to request information about the access keys:

```
_params = {
    "filter": str([
        "property": "keytype",
        "value": ["exch_key"],
        "op": "NOT IN"
    ])
}

requests.get('https://' + spp_ipv4 + '/api/identity/key',
             params=_params, headers={...}, verify=...)
```

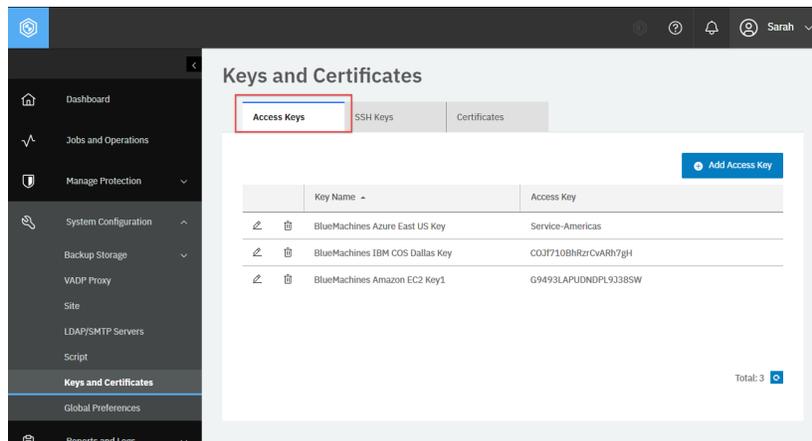


Figure 57: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration > Keys and Certificates**, and ensure that the **Access Key** tab is displayed.

The response body for the Python snippet displays a list of all access keys and all SSH keys. The HTTP status of this response is 200 (OK).

```
{
  "links": {...},
  "total": 3,
  "keys": [
    {
      "links": {...},
      "resourceType": "key",
      "id": "1002",
      "name": "BlueMachines Amazon EC2 Key1",
```

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```

        "keytype": "iam_key",
        "keyalgorithm": null,
        "length": 0,
        "user": null,
        "comment": null,
        "fingerprint": null,
        "publickey": null,
        "access": "G9493LAPUDNDPL9J38SW",
        "secret": null,
        "privatekey": "",
        "tenant": null,
        "tenantID": null,
        "clientID": null,
        "clientSecret": null,
        "adminUser": null,
        "adminUserPass": null,
        "rbacPath": "root:0/identity:0/identitytype:key/identitykey:1002"
    },
    {
        ...
        "id": "1003",
        "name": "BlueMachines IBM COS Dallas Key",
        ...
    },
    {...}
]
}

```

Example 2: Get information about all SSH keys

Assume that you added SSH keys to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to request information about the SSH keys:

```

_params = {
    "filter": str([
        {
            "property": "keytype",
            "value": "ssh_private_key",
            "op": "="
        }
    ])
}

requests.get('https://' + spp_ipv4 + '/api/identity/key',
             params=_params, headers={...}, verify=...)

```

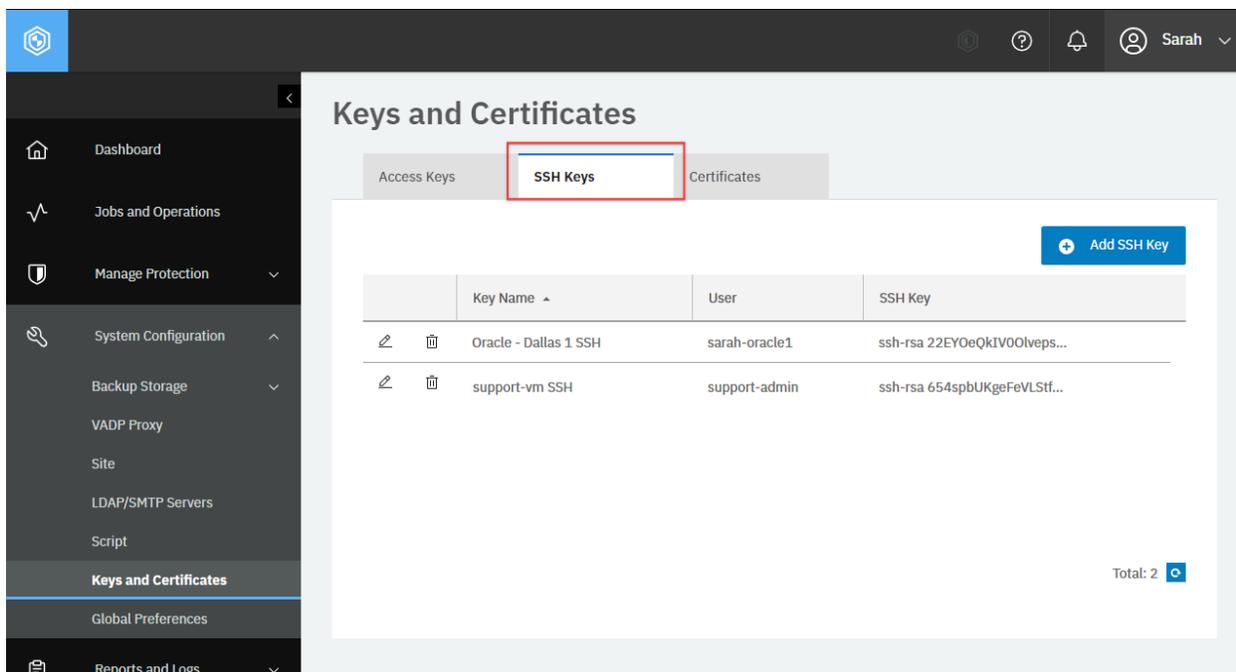


Figure 58: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Keys and Certificates** pane, click the **SSH Keys** tab.

The response body for the Python snippet displays a list of all access keys and all SSH keys. The HTTP status of this response is 200 (OK).

```
{
  "links": {...},
  "total": 2,
  "keys": [
    {
      "links": {...},
      "resourceType": "key",
      "id": "1006",
      "name": "Oracle - Dallas 1 SSH",
      "keytype": "ssh_private_key",
      "keyalgorithm": "RSA",
      "length": 1024,
      "user": "sarah-oracle1",
      "comment": null,
      "fingerprint": "5f:96:57:e2:43:52:16:25:c2:27:25:e7:39:9f:05:b7",
      "publickey": "ssh-rsa 22EY0eQkIV00lvepsVdy2NoktYdwZhfR9JFMNkUj3IXd3p
↳...
↳0pvuGdiXP1EV/XxE3yqRDGqwiVQYMS0Zd9wgfj0FMbq9DkTZypfivZXjzFWoJVKNYSx ",
      "access": null,
      "secret": "",
      "privatekey": null,
      "tenant": null,
      "tenantID": null,
      "clientID": null,
      "clientSecret": null,
      "adminUser": null,
      "adminUserPass": null,

```

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```
        "rbacPath": "root:0/identity:0/identitytype:key/identitykey:1006"
    },
    {
        ...
        "id": "1007",
        "name": "support-vm SSH",
        ...
    }
]
}
```

Example 3: Get information about a specific access key

In this example, a Python snippet is used to get information about a specific access key: BlueMachines IBM COS Dallas Key ({identityKeyId} 1003).

```
identity_key_id = "1003"

requests.get('https://' + spp_ipv4 + '/api/identity/key/' + identity_key_id,
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "resourceType": "key",
  "id": "1003",
  "name": "BlueMachines IBM COS Dallas Key",
  "keytype": "iam_key",
  "keyalgorithm": null,
  "length": 0,
  "user": null,
  "comment": null,
  "fingerprint": null,
  "publickey": null,
  "access": "COJf710BhRzrCvARh7gH",
  "secret": null,
  "privatekey": "",
  "tenant": null,
  "tenantID": null,
  "clientID": null,
  "clientSecret": null,
  "adminUser": null,
  "adminUserPass": null,
  "rbacPath": "root:0/identity:0/identitytype:key/identitykey:1003"
}
```

Adding an access key

You can add an access key.

Method and URI

To add an access key, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/identity/key
```

Parameters

None.

Data

Data 1: name

The name of the access key.

- **Example value:** BlueMachines Amazon S3 California Key
- **Type:** String. Required. Available in the web user interface.

Data 2: keytype

The type of the access key.

- **Value:** iam_key
- **Type:** System string. Required.

Data 3: access

An access key string.

- **Example value:** G9493LAPUDNDPL9J38SW
- **Type:** String. Available in the web user interface.

Data 4: secret

A secret key of the access key.

- **Example value:** rNzSHk2gBfjf9cECGp+cjrhEdhsZmxwHnRckk8BP
- **Type:** String. Available in the web user interface.

Example: Add an access key

Assume that you want to add an access key with the following properties:

- Name: BlueMachines S3 Compatible Object Storage Key
- Access key: PJNG6J5FHENHWZ66K77X
- Secret key: CFBF8QcKtMSMYTE++mX3pUWSwmchNBgg5afbW5T

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to add the access key:

```

_data = f'''{{
  "name": "BlueMachines S3 Compatible Object Storage Key",
  "keytype": "iam_key",
  "access": "PJNG6J5FHENHWZ66K77X",
  "secret": "CFBF8QcKtMSMYTE++mX3pUWSwchNBgg5afbnw5T"
}}'''

requests.post('https://' + spp_ipv4 + '/api/identity/key',
  headers={...}, data=_data, verify=...)

```

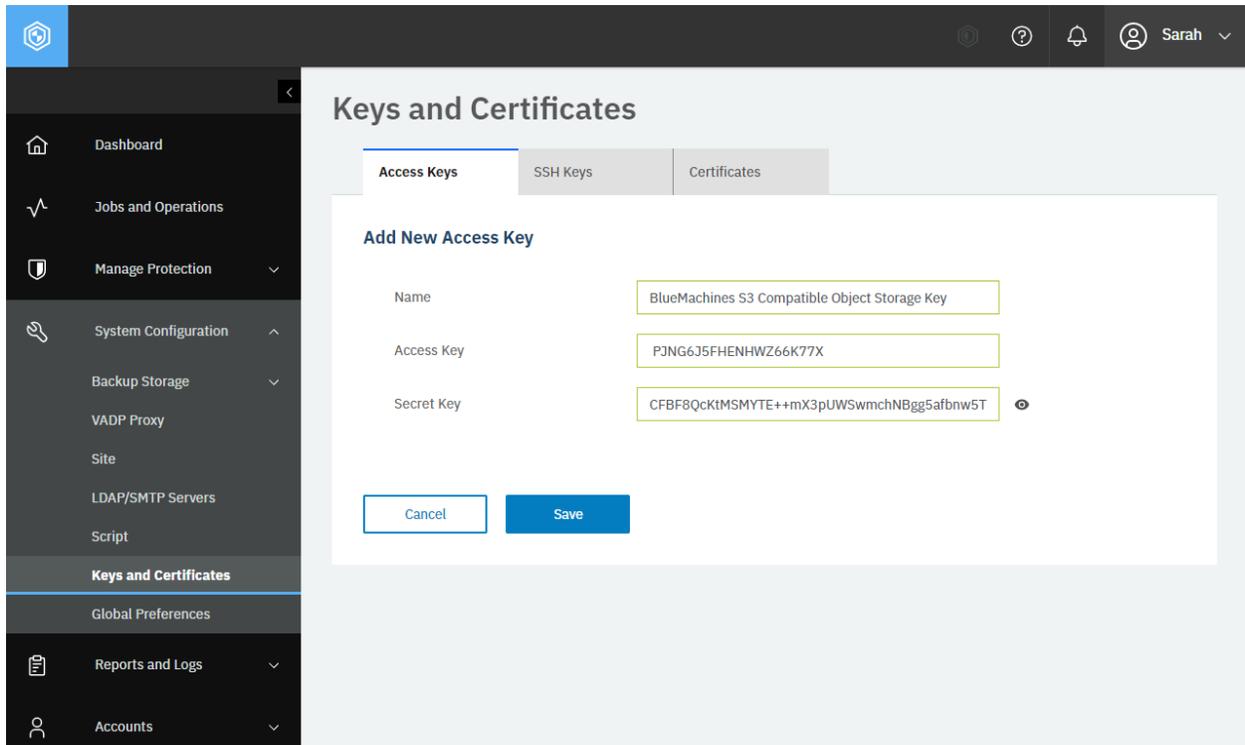


Figure 59: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **VMware** pane, ensure that the **Access Keys** tab is displayed. Click **Add Access Key**. In the **Add New Access Key** section, enter the name, access key, and secret key, and click **Save**.

After you run the Python snippet, ensure that you get a response with the HTTP status of 201 (Created) and that the access key was created. The response body is similar to the JSON object for an access key, as shown in Getting information about access keys and SSH keys (page 215).

Adding an SSH key

Add an SSH key.

Tip: To create an SSH key on the target Linux server, follow the instructions in the IBM Spectrum Protect Plus Installation and User's Guide.

Method and URI

To add an SSH key, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/identity/key
```

Parameters

None.

Data

Data 1: name

The name of the SSH key.

- **Example value:** BlueMachines Amazon S3 California Key
- **Type:** String. Required. Available in the web user interface.

Data 2: user

A user name of the target Linux server for which you want to establish an SSL connection.

- **Example value:** sarah-oracle1
- **Type:** String. Required. Available in the web user interface.

Data 3: keytype

The type of key.

- **Value:** ssh_private_key
- **Type:** System string. Required. Available in the web user interface.

Data 4: privatekey

The private SSH key of the target Linux server. Replace new lines with the escape sequence characters:

```
\n
```

- **Example value:**

```
-----BEGIN RSA PRIVATE KEY-----\nProc-Type: 4,ENCRYPTED\nDEK-Info: AES-1  
28-CBC,08295638... \n\nUbdH2oDSWTckWrxWsLaDvEvV7704vZhxDkcE6p1RYyp8d4aCQ  
...  
WS1Ff2nxnW/7A9i9yKRGvFIaotFIoa43ZLA8ivn\n-----END RSA PRIVATE KEY-----
```

- **Type:** String. Required. Available in the web user interface.

Data 5: passphrase

The optional passphrase for the SSH key of the target Linux server. It may be different from the user password of the Linux server.

- **Example value:** E^vBQ:9!Y)w<pNw~
- **Type:** String. Available in the web user interface.

Example: Create an SSH key

Assume that you want to establish a secure connection between IBM Spectrum Protect Plus and a Linux server that hosts an Oracle Database. You log in to the Linux server and generate an SSH public key and private key:

```
[sarah@workstation ~ ] ssh sarah-oracle1@10.4.4.1 # oracle-dallas1
sarah-oracle1@10.4.4.1's password: A'mK'"~RPtY=*k(h
...
```

```
$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/sarah-oracle1/.ssh/id_rsa):
Created directory '/home/sarah-oracle1/.ssh'.
Enter passphrase (empty for no passphrase): E^vBQ:9!Y)w<pNw~
...
Your identification has been saved in /home/sarah-oracle1/.ssh/id_rsa.
Your public key has been saved in /home/sarah-oracle1/.ssh/id_rsa.pub.
...
The key's randomart image is:
+---[RSA 2048]-----+
|    +.o=o  o    |
|                |
+---[SHA256]-----+
```

```
$ cat /home/sarah-oracle1/.ssh/id_rsa.pub
ssh-rsa 22EY0eQkIV00lveps...
```

```
$ cat /home/sarah-oracle1/.ssh/id_rsa.pub \
>> /home/sarah-oracle1/.ssh/authorized_keys
```

```
$ chmod 600 \
/home/sarah-oracle1/.ssh/authorized_keys
```

```
$ sudo cp /etc/ssh/sshd_config{,.bak}
```

```
$ sudo vi /etc/ssh/sshd_config # Enable: PubkeyAuthentication yes
```

```
$ systemctl restart sshd
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ====
Authentication is required to manage system services or units.
Multiple identities can be used for authentication:
 1. oracle
 2. grid
 3. sarah-oracle1
Choose identity to authenticate as (1-3): 3
Password: A'mK'"~RPtY=*k(h
==== AUTHENTICATION COMPLETE ====
```

```
$ cat /home/sarah-oracle1/.ssh/id_rsa
-----BEGIN RSA PRIVATE KEY-----
Proc-Type: 4,ENCRYPTED
DEK-Info: AES-128-CBC,4E9A0765C9067B52F06549D610C6591A
xbeIIcosQ5TsuqXirKJFlg0z1ryQus7RrapZcBgSuZ8PdVXvtvYDBA2qRo79G40Y
```

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```
...
Pnidu8/8iFy7uoNe9F5J6h40g6S1vI58Ub/e9fbgIzd2N05MhYkc5c0a8I1rhUq1
-----END RSA PRIVATE KEY-----
$
```

The SSH key that you have generated on the Linux server has the following properties:

- **Name:** Oracle - Dallas 1 SSH
- **User:** sarah-oracle1
- **Private key:** See the Python snippet.
- **Passphrase:** E^vBQ:9!Y)w<pNw~

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to add the new SSH key:

```
privatekey_original = f'''-----BEGIN RSA PRIVATE KEY-----
Proc-Type: 4,ENCRYPTED
DEK-Info: AES-128-CBC,4E9A0765C9067B52F06549D610C6591A

xbeIIcosQ5TsuqXirKJFlg0z1ryQus7RrapZcBgSuZ8PdVXvtvYDBA2qRo79G40Y
...
Pnidu8/8iFy7uoNe9F5J6h40g6S1vI58Ub/e9fbgIzd2N05MhYkc5c0a8I1rhUq1
-----END RSA PRIVATE KEY-----'''

privatekey = privatekey_original.replace('\n', '\\n') # Replace new lines with \n

_data = f'''{{
  "name":      "Oracle - Dallas 1 SSH",
  "user":      "sarah-oracle1",
  "keytype":   "ssh_private_key",
  "privatekey": "{privatekey}",
  "passphrase": "E^vBQ:9!Y)w<pNw~"
}}'''

requests.post('https://' + spp_ipv4 + '/api/identity/key',
              headers={...}, data=_data, verify=...)
```

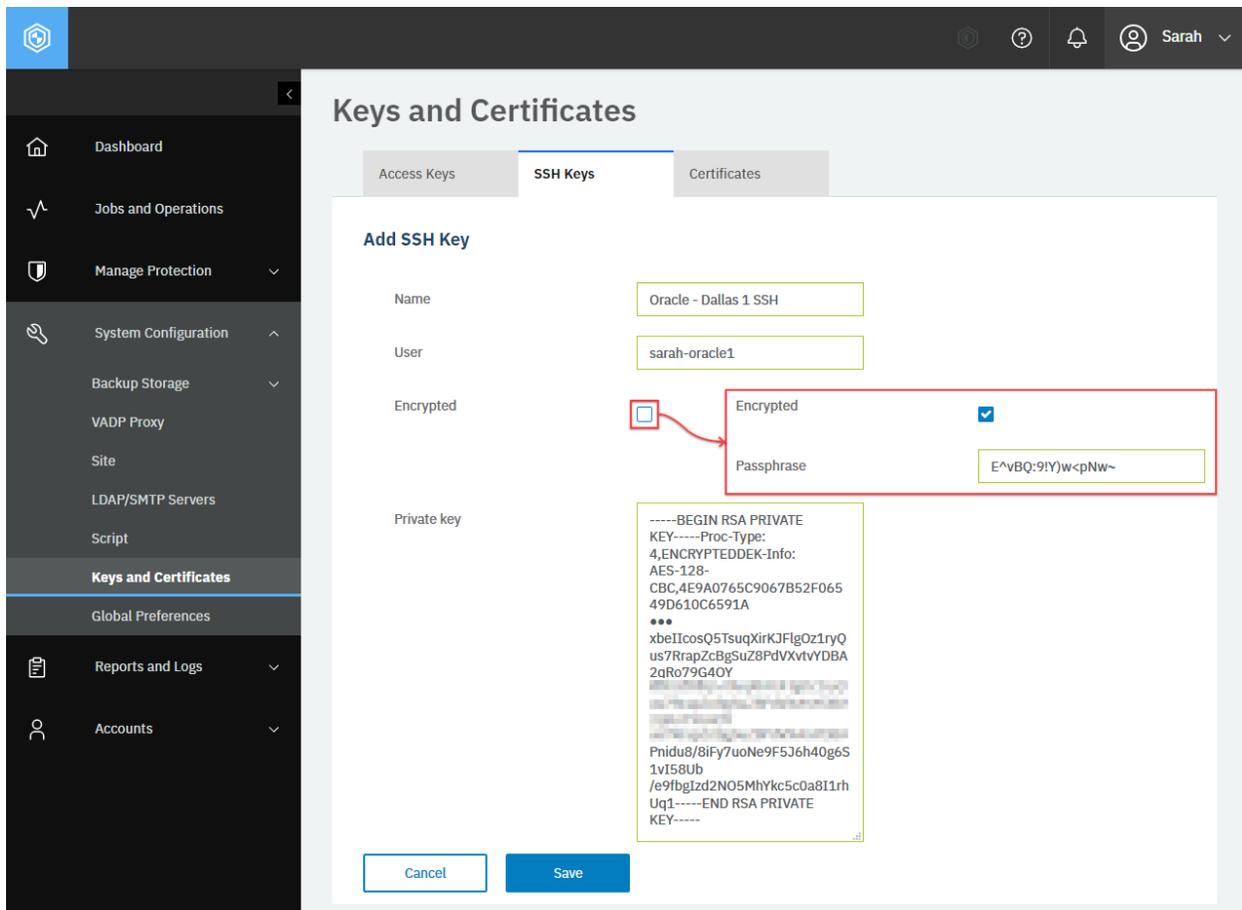


Figure 60: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Keys and Certificates** pane, click the **SSH Keys** tab. Click **Add SSH Key**. In the **Add SSH Key** section, enter the name, username, and private key, and click **Save**. You can select the **Encrypted** checkbox and enter the password to encrypt the SSH connection.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the SSH key settings are updated. This request is similar to the one that you used to create the SSH key; compare the HTTP request method, the URI, the data values, and the HTTP status code in the response. The response body is similar to the JSON object for the original SSH key, as shown in Getting information about access keys and SSH keys (page 215).

Editing the configuration of an access key or an SSH key

You can edit the configuration of an access key or an SSH key.

Method and URI

To edit the configuration of an access key, use the PUT method with a URI:

```
PUT https://{hostname|IPv4}/api/identity/{identityKeyId}
```

Tip: To get an `{identityKeyId}`, follow the instructions in [Getting an {identityKeyId}](#) (page 350).

Parameters

None.

Data

You can use the data key-value pairs that are described in [Adding an access key](#) (page 220) and [Adding an SSH key](#) (page 221).

Example: Edit the configuration of an access key

Assume that you want to edit the access key `BlueMachines IBM Amazon S3 US-East1 Key` (`{identityKeyId}` 1005). You want to assign the following values to this access key:

- Name: `BlueMachines IBM COS Singapore Key`
- Access key: `FD82Hf2w37tqq2sX9Uye`
- Secret key: `fVBvcjgJvbjuWBPU7uVzTJc47CNNJtQmnJNJted`

Run the following command:

```
identity_key_id = "1005"

_data = f'''{{
    "name": "BlueMachines IBM COS Singapore Key",
    "access": "FD82Hf2w37tqq2sX9Uye"
    "secret": "fVBvcjgJvbjuWBPU7uVzTJc47CNNJtQmnJNJted"
}}'''

requests.put('https://' + spp_ipv4 + '/api/identity/key/' + identity_key_id,
             headers={...}, params="", data=_data, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the access key settings are updated. This request is similar to the one that you used to create the access key; compare the HTTP request method, the URI, the data values, and the HTTP status code in the response. The response body is similar to the JSON object for the original access key, as shown in [Getting information about access keys and SSH keys](#) (page 215).

Deleting an access key or an SSH key

You can delete an access key or an SSH key.

Method and URI

To delete an access key or an SSH key with `{identityKeyId}`, use a DELETE method and a URI:

```
DELETE https://{hostname|IPv4}/api/identity/key/{identityKeyId}
```

Tip: To get an `{identityKeyId}` value based on its name, follow the instructions in Getting an `{identityKeyId}` (page 350).

Parameters

None.

Data

None.

Example: Delete an access key

Assume that you want to delete the access key, BlueMachines Amazon EC2 Key1 (`{identityKeyId}` 1002). A Python snippet that is similar to the following example can be used to delete the access key:

```
identity_key_id = "1002"    # BlueMachines Amazon EC2 Key1

requests.delete('https://' + spp_ipv4 + '/api/identity/key/' + identity_key_id,
               headers={...}, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the access key. You can delete an SSH key in a similar way.

Getting certificate information

You can get certificate information.

Method and URI

To get information about all certificates, use a GET method with a URI:

```
GET https://{hostname|IPv4}/api/security/certificate
```

To get information about a specific certificate, use a GET method with a URI:

```
GET https://{hostname|IPv4}/api/security/certificate/{certificateId}
```

Tip: To get a {certificateId} value based on its name, follow the instructions in Getting a {certificateId} (page 358).

Parameters

None.

Data

None.

Example 1: Get information about all certificates

Assume that you want to get information about all certificates.

A Python snippet that is similar to the following example can be used to get information about all certificates:

```
requests.get('https://' + spp_ipv4 + '/api/security/certificate',
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "total": 3,
  "certificates": [
    {
      "links": {...},
      "name": "BlueMachines - Cert IBM Spectrum Protect",
      "displayName": null,
      "id": 1286,
      "storeId": "1286",
      "type": "sp",
      "lastUpdated": 1580536800000,
      "comment": null,
      "rbacPath": "root:0/certificate:0/certificate.type:sp/certificate:1286"
    },
    {
      "links": {...},
      "name": "BlueMachines - Cert IBM Cloud Object Storage",
      "displayName": null,
      "id": 1287,
      "storeId": "1287",
      "type": "cos",
      "lastUpdated": 1577858400000,
      "comment": null,
      "rbacPath": "root:0/certificate:0/certificate.type:cos/certificate:1287"
    },
    {
      "links": {...},
      "name": "BlueMachines - Cert S3 Compatible Object Storage",
```

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```
    "displayName": null,  
    "id": 1288,  
    "storeId": "1288",  
    "type": "aws",  
    "lastUpdated": 1583042400000,  
    "comment": null,  
    "rbacPath": "root:0/certificate:0/certificate.type:aws/certificate:1288"  
  }  
]  
}
```

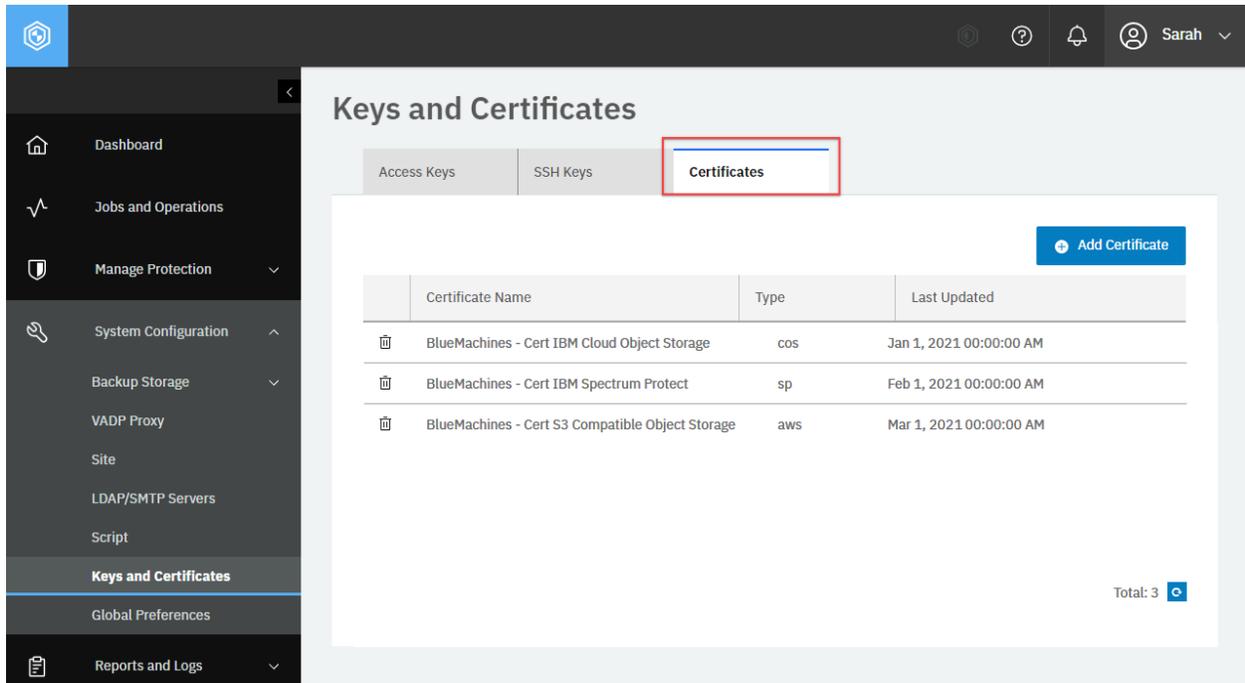


Figure 61: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **System Configuration** > **Keys and Certificates**, and click the **Certificates** tab.

Example 2: Get information about a specific certificate

Assume that you want to get information about the following certificate: BlueMachines - Cert IBM Spectrum Protect (`{certificateId}` 1286). A Python snippet that is similar to the following example can be used to request the information about this certificate:

```
certificate_id = "1286"  
  
requests.get('https://' + spp_ipv4 + '/api/security/certificate/'  
            + certificate_id,  
            headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},
```

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```
"name": "BlueMachines - Cert IBM Spectrum Protect",
"displayName": null,
"id": 1286,
"storeId": "1286",
"type": "sp",
"lastUpdated": 1587187415947,
"comment": null,
"rbacPath": "root:0/certificate:0/certificate.type:sp/certificate:1286"
}
```

Adding a certificate

In the REST API, you can add a new certificate by sending the certificate string in plain text format.

You cannot edit configurations of certificates that you added. To update a certificate, delete it and add a new certificate.

Method and URI

To add a certificate, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/security/certificate
```

Parameters

None.

Data

Data 1: crt

The certificate in a text format. Replace new lines with the escape sequence characters:

```
\n
```

- **Example value:** -----BEGIN CERTIFICATE-----\nj1w5eFM...+Vrr=\n-----END CERTIFICATE-----
- **Type:** String. Required. Available in the web user interface.

Data 2: name

A meaningful name for the certificate.

- **Example value:** BlueMachines Cert IBM Spectrum Protect
- **Type:** String. Required. Available in the web user interface.

Data 3: type

The type of certificate. Use one of the following system values:

Type	Value
S3 compatible object storage	aws
IBM Spectrum Protect	sp
IBM Cloud Object Storage	cos

- **Type:** System string. Required. Available in the web user interface.

Restriction: IBM Spectrum Protect Plus does not support certificate management for the original Amazon S3.

Example: Add a certificate

Assume that you want to add the following certificate text to IBM Spectrum Protect Plus:

- Certificate value: See the Python snippet.
- Name: BlueMachines - Cert IBM Spectrum Protect
- Type: IBM Spectrum Protect

A Python snippet that is similar to the following example can be used to add the certificate:

```
cert_original = f'''-----BEGIN CERTIFICATE-----
j1w5eFMwPNhJSf14zAau4Gz0UuPyZea20P5Arvsg00BKbr2dLwZ6Ey0N1Ux4ab0FM12PHvD5ERthstuH
XpTKcSb66fI2hmyegTbV3EQCPR+GJJcCbSpBngu2u4onyLlr4V7gkvmVPj9yvgS64Co4BS3kwHC0tVen
...
vfJdE2s4Zc31HvMSK0By37YTtNADXqEiIle+Vrr=
-----END CERTIFICATE-----'''

cert_string = cert_original.replace('\n', '\\n') # Replace new lines with \n

data = f'''{{
    "cert_value": {cert_string},
    "name": "BlueMachines - Cert IBM Spectrum Protect"
    "type": "sp"
}}'''

requests.post('https://' + spp_ipv4 + '/api/security/certificate',
              headers={...}, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). The response body is similar to the JSON object for the certificate, “BlueMachines - Cert IBM Spectrum Protect”, as shown in Getting certificate information (page 227).

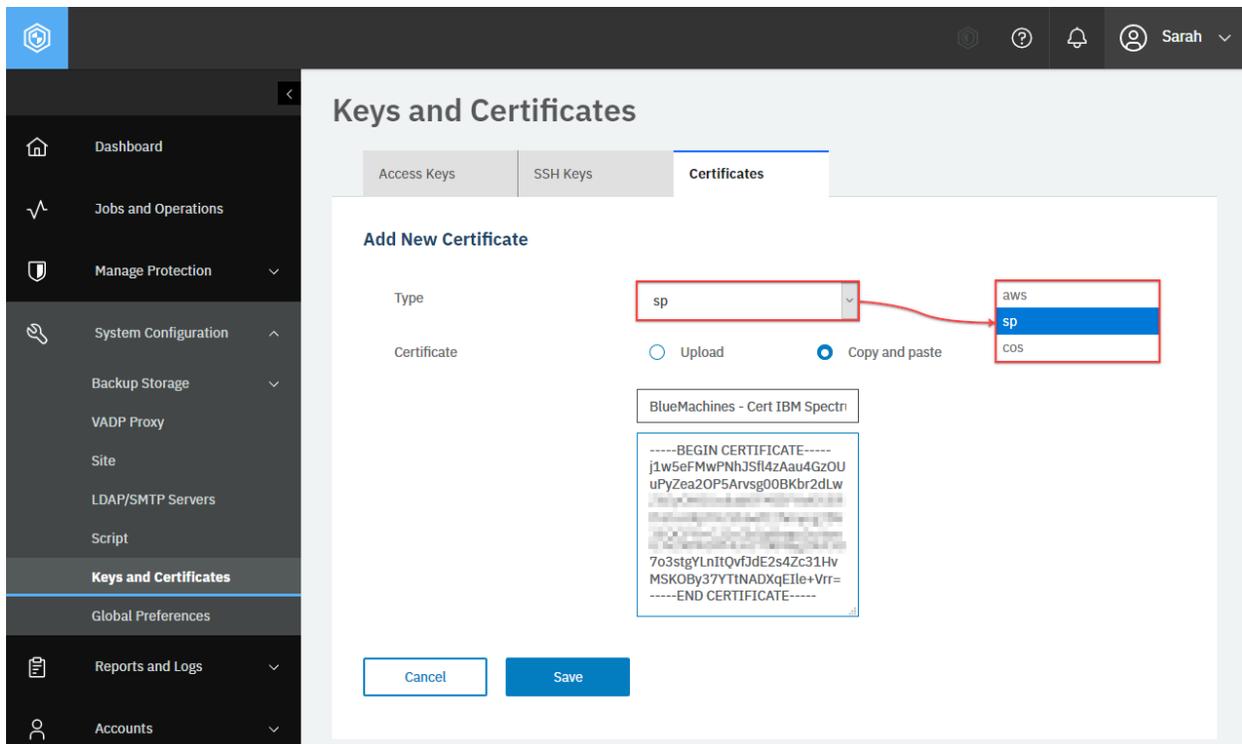


Figure 62: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Keys and Certificates** pane, click the **Certificates** tab, and click **Add Certificates**. In the **Add New Certificate** section, select **aws** for S3 compatible object storage, **sp** for IBM Spectrum Protect, or **cos** for IBM Cloud Object Storage. Select **Copy and paste**. Enter the certificate name. Paste the certificate string in plain text. You can also upload a certificate file.

Deleting a certificate

You can delete a certificate from IBM Spectrum Protect Plus.

Method and URI

To delete a certificate, use a DELETE method with a URI:

```
DELETE https://{hostname|IPv4}/api/security/certificate/{certificateId}
```

Tip: To get the `{certificateId}` based on the certificate name, follow the instructions in Getting a `{certificateId}` (page 358).

Parameters

None.

Data

None.

Example: Delete a certificate

Assume that you have a certificate, BlueMachines - Cert S3 Compatible, with a `{certificateId}` value of 1288, and you want to delete the certificate. Run the following command:

```
certificate_id = "1288"

requests.delete('https://' + spp_ipv4 + '/api/security/certificate/'
               + certificate_id,
               headers={...}, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see this certificate.

Reports and Analytics

You can use the REST API to obtain reports and analyze system status.

Reports

Reports in IBM Spectrum Protect Plus provide users with status information. You can use *predefined reports*. Each predefined report has different options.

For more information about predefined reports, see *Types of reports* in the IBM Spectrum Protect Plus Installation and User's Guide.

In addition, you can create *custom reports* based on predefined reports.

Getting report information

You can get a list of reports and information for each. In the user interface, you can access reports on the following tabs: **Reports** and **Custom Reports**.

The screenshot displays the IBM Spectrum Protect Plus web user interface. On the left is a dark navigation pane with the following menu items: Dashboard, Jobs and Operations, Manage Protection, System Configuration, Reports and Logs, Reports (highlighted), Audit Log, and Accounts. The main content area is titled 'Reports' and has two tabs: 'Reports' (active) and 'Custom Reports'. At the top right of the main area, there is a 'Filter by category:' dropdown menu currently set to 'All'. A red box highlights this dropdown, and a red arrow points to an expanded dropdown menu on the right side of the page. This expanded menu lists the following categories: All, Backup Storage Utilization, Protection, System, and VM Environment. Below the filter is a table of reports with the following columns: Name (job title), Category, and Schedule. The table contains 25 rows of predefined reports.

	Name (job title)	Category	Schedule
🔍 📄 +	Configuration	System	
🔍 📄 +	Container Persistent Volume Backup History	Protection	
🔍 📄 +	Container Persistent Volume Backup Utilization	Backup Storage Utilization	
🔍 📄 +	Container Persistent Volume SLA Policy RPO Compliance	Protection	
🔍 📄 +	Database Backup History	Protection	
🔍 📄 +	Database SLA Policy RPO Compliance	Protection	
🔍 📄 +	File System Backup History	Protection	
🔍 📄 +	File System SLA Policy RPO Compliance	Protection	
🔍 📄 +	Job	System	
🔍 📄 +	License	System	
🔍 📄 +	Microsoft 365 Backup History	Protection	
🔍 📄 +	Microsoft 365 SLA Policy RPO Compliance	Protection	
🔍 📄 +	Protected and Unprotected Databases	Protection	
🔍 📄 +	Protected and Unprotected File Systems	Protection	
🔍 📄 +	Protected and Unprotected Microsoft 365 Users	Protection	
🔍 📄 +	Protected and Unprotected VMs	Protection	
🔍 📄 +	VM Backup History	Protection	
🔍 📄 +	VM Backup Utilization	Backup Storage Utilization	
🔍 📄 +	VM Datastores	VM Environment	
🔍 📄 +	VM LUNs	VM Environment	
🔍 📄 +	VM SLA Policy RPO Compliance	Protection	
🔍 📄 +	VM Snapshot Sprawl	VM Environment	
🔍 📄 +	VM Sprawl	VM Environment	
🔍 📄 +	VM Storage	VM Environment	
🔍 📄 +	vSnap Storage Utilization	Backup Storage Utilization	

Figure 63: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Reports and Logs > Reports**. Click the **Reports** tab to see a list of predefined reports or click the **Custom Reports** tab to see a list of custom reports. You can filter the reports by specifying the category.

Method and URI

To get information about all reports, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/report
```

To get information about a specific report with `{reportIdStr}`, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/report/{reportIdStr}
```

Tip: To get a `{reportIdStr}` by the report name, follow the instructions in Getting a `{reportIdStr}` (page 355).

Parameters

None.

Data

None.

Example: Get information about all reports

A Python snippet that is similar to the following example can be used to request information about all reports:

```
requests.get('https://' + spp_ipv4 + '/api/endeavour/report',  
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "total": 18,  
  "page": 1,  
  "reports": [  
    {...}, {...}, ..., {...},  
    {  
      "links": {...},  
      "name": "vSnap",  
      "displayName": "vSnap Storage Utilization",  
      "description": "Review the storage utilization for your vSnap Storag  
↪e Array.",  
      "category": "Backup Storage Utilization",  
      "categoryDisplayName": "Backup Storage Utilization",  
      "custom": false,  
      "creationTime": 1564685718121,  
      "parentName": "vSnap",  
      "parentDisplayName": "vSnap Storage Utilization",  
      "rbacPath": "root:0/report:0/reportcategory:BackupStorageUtilization  
↪CategoryName/report:1013",  
      "hasChildren": true,  
    }  
  ]  
}
```

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```
    "id": "1013"
  },
  {...}, {...}, ..., {...},
  {
    "links": {...},
    "name": "vSnapStorageUtilization-Dallas1",
    "displayName": "vSnapStorageUtilization-Dallas1",
    "description": "A report of storage utilization for vSnap Dallas1",
    "category": "Backup Storage Utilization",
    "categoryDisplayName": "Backup Storage Utilization",
    "langType": "EN_US",
    "custom": true,
    "creationTime": 1575637231627,
    "parentId": "1013",
    "parentName": "vSnap",
    "parentDisplayName": "vSnap Storage Utilization",
    "rbacPath": "root:0/report:0/reportcategory:BackupStorageUtilization
↳CategoryName/report:1102",
    "id": "1102"
  }
]
}
```

Deleting a custom report

You can delete a custom report.

Method and URI

To delete a custom report, use a DELETE method with a URI:

```
DELETE https://{hostname|IPv4}/api/endeavour/report/{reportIdStr}
```

Tip: To get the `{reportIdStr}` based on the report name, follow the instructions in [Getting a {reportIdStr}](#) (page 355).

Parameters

None.

Data

None.

Example: Delete a custom report

Assume that you added a custom report, vSnapStorageUtilization-Dallas1 (`{reportIdStr}` 1013), and you want to delete the custom report. Run the following command:

```
report_id_str = "1013"

requests.delete('https://' + spp_ipv4 + '/api/endeavour/report' + report_id_str,
               headers={...}, verify=...)
```

Ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see this custom report.

Scheduling a report

Schedule a report to run at a specific time and send the result to email recipients.

Method and URI

To schedule a report, use a POST method and a URI:

```
POST https://{hostname|IPv4}/ngp/report
```

Parameters

Parameter 1: action

Start an action to schedule the report.

- **Value:** schedule
- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: userId

Use this value when you want to run a report on behalf of someone else. For example, the user Sarah (`{userId}: 1001`) creates a session ID and sends a request to run a report without the `userId` key-value pair and her name appears in the report. Add `_sppadmin_` (`{userId}: 1000`) in the key-value pair and this username appears in the report.

Tip: To get a `{userId}` value based on its name, follow the instructions in Getting a `{userId}` (page 357).

- **Example value:** 1000
- **Type:** String.

Data 2: resources

Specify the reports to use. Use the following syntax:

```
[
  {
    "name":      {reportName 1},
    "id":        {reportIdStr 1},
    "rbacPath": {reportRbacPath 1},
    "href":      {reportHref 1}
  },
  ...,
  {...}
]
```

- **Example value:** A list that is similar to the following example can be used to specify the Database Backup History report:

```
[
  {
    "name":      "Database Backup History",
    "id":        "1012",
    "rbacPath":  "root:0/report:0/reportcategory:ProtectionCategoryName/report
↵:1012",
    "href":      "https://10.0.0.100/api/endeavour/report/1012"
  },
  ...,
  {...}
]
```

- **Type:** List (JSON object). Required. Available in the web user interface.

Data 2.1: resources > name

The name of the report.

- **Type:** String. Required. Available in the web user interface.

Data 2.2: resources > id

The {reportIdStr} of the report.

Tip: To get a {reportIdStr} based on the report name, follow the instructions in Getting a {reportIdStr} (page 355).

- **Type:** String. Required.

Data 2.3: resources > rbacPath

The {reportRbacPath} of the report.

Tip: To get a {reportRbacPath} based on the report name, follow the instructions in Getting a {reportRbacpath} (page 356).

- **Type:** String. Required.

Data 2.3: resources > href

The {reportHref} of the report.

- **Type:** String. Required.

Tip: To get a `{reportHref}` based on the report name, follow the instructions in Getting a `{reportHref}` (page 355).

- **Type:** JSON object. Required. Available in the web user interface.

Data 3: `trigger`

Define the frequency, start date and time, and the time zone for the web user interface. The structure of the value is the same as the value of `spec > subpolicy > trigger` for an SLA policy. For details, follow the instructions in Adding an SLA policy (page 72).

- **Type:** JSON object. Required. Available in the web user interface.

Data 4: `notification`

The email addresses of the recipients.

- **Example value:**

```
[
  "sarah.wiseman@bluemachines.com.invalid",
  "arthur.roberts@bluemachines.com.invalid"
]
```

- **Type:** List (string). Required. Available in the web user interface.

Data 5: `option`

Specify the options.

- **Example value:** Use the following value to get the scheduled report in PDF:

```
{
  "renderPdf": true,
  "renderExcel": false,
  "renderWord": false,
  "export": false
}
```

- **Type:** JSON object. Available in the web user interface.

Data 5.1: `option > renderPDF`

Enable or disable to attach a copy of the report in PDF to the scheduled email.

- **Type:** Boolean. Available in the web user interface.

Data 5.2: `option > renderExcel`

Enable or disable to attach a copy of the report in Microsoft Excel format to the scheduled email.

- **Type:** Boolean. Available in the web user interface.

Data 5.3: `option > renderWord`

Enable or disable to attach a copy of the report in Microsoft Word format to the scheduled email.

- **Type:** Boolean. Available in the web user interface.

Example: Schedule a report

Sarah (`{userId: 1001}`) is based in Dallas where the time zone is US Central Time. First, she schedules one of the reports on a browser as below:

- **Report:** vSnap Storage Utilization (`{reportIdStr}: 1013`)
- **Frequency:** One time every day
- **Start Time:** 1 January 2020 at 0:00 AM US CST or 1577858400 in the UNIX timestamp format.
- **Recipients:**
 - sarah.wiseman@bluemachines.com.invalid
 - arthur.roberts@bluemachines.com.invalid
- **User:** sppadmin (`{userId}: 1000`)
- **Option:** Attach the PDF file to the scheduled report email.

A Python snippet that is similar to the following example can be used to schedule the report:

```
report_id = "1013"    # vSnap Storage Utilization

_params = {"action": "schedule"}

_data = f'''
    {{
      "userId":    "1000",
      "resources": [{{
                    "name":    "vSnap Storage Utilization",
                    "id":      "{report_id}",
                    }}],
      "trigger":   {{
                    "frequency": 1,
                    "type":      "DAILY",
                    "activateDate": 1577858400000,
                    "timezone":   "America/Chicago",
                    }}},
      "notification": [
                    "sarah.wiseman@bluemachines.com.invalid",
                    "arthur.roberts@bluemachines.com.invalid"
                    ],
      "option" {{
        "renderPdf":    true,
        "renderExcel": false,
        "renderWord":  false,
        "export":      false
      }}
    }}'''

requests.post('https://' + spp_ipv4 + '/ngp/report',
             headers={...}, params=_params, data=_data, verify=...)
```

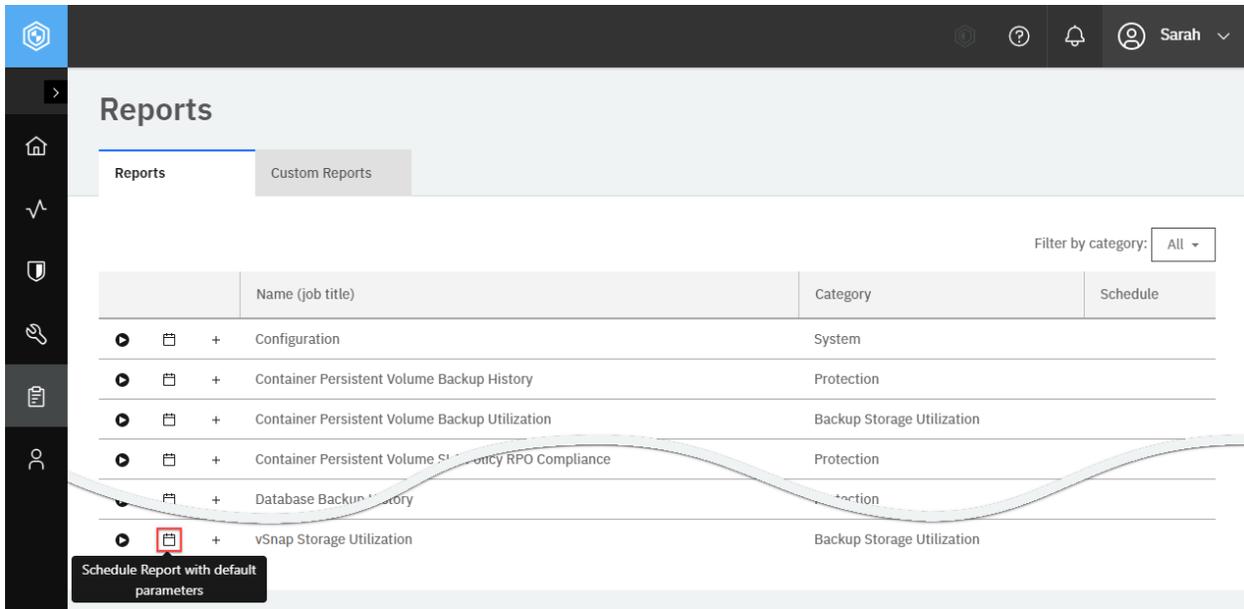


Figure 64: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Reports and Logs > Reports**, and click the **Schedule Report with default parameters** button for the report you want to use.

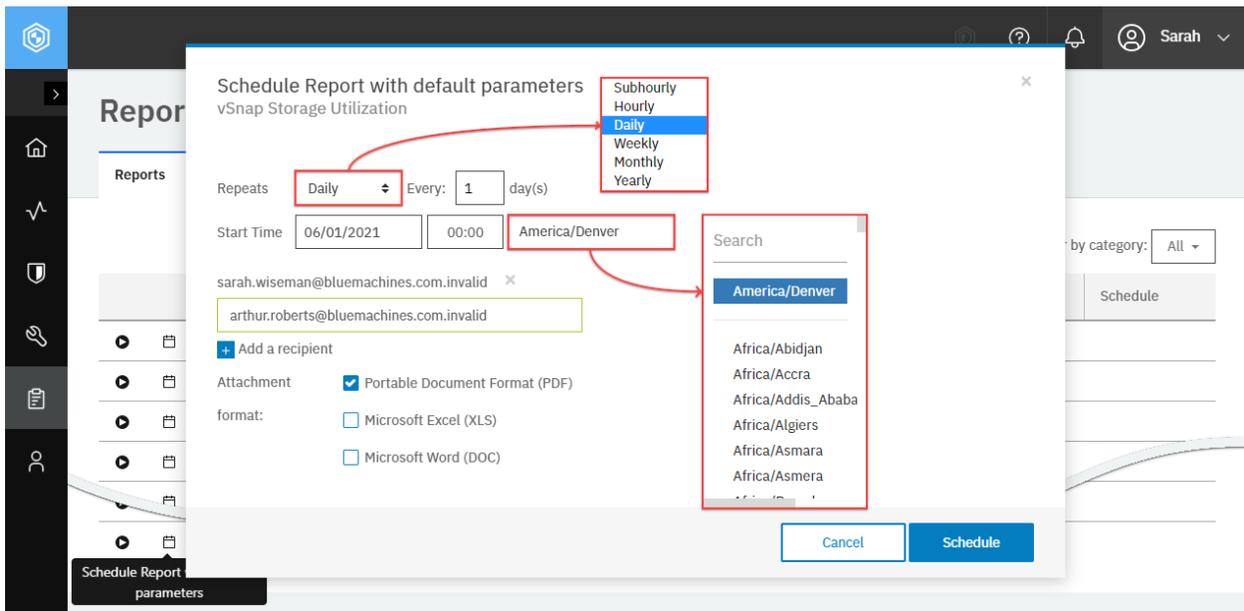


Figure 65: Enter the frequency, start time, and email addresses of recipients. Click **Schedule**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created).

```
{
  "statusCode": 201,
  "response": [
    {

```

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```
"links": {...},
"name": "Report_vSnap Storage Utilization",
"type": "Schedule",
"category": "SCHEDULE",
"properties": {
  "activateDate": 1577858400000,
  "deactivateDate": null,
  "frequency": 1,
  "type": "DAILY",
  "dowList": [
    false,
    ...
  ],
  "domList": [
    false,
    ...
  ]
},
"rbacPath": "trigger:0/trigger:1020",
"onHold": false,
"id": "1020"
},
{
  "links": {...},
  "name": "Report_vSnap Storage Utilization",
  "type": "analyze",
  "subType": "report",
  "serviceId": "serviceprovider.report",
  "description": "",
  "version": "3.1",
  "rbacPath": "root:0/policy:0/policytype:serviceprovider.report/polic
↵y:1023",
  "tenantId": 1000,
  "creationTime": 1576173685532,
  "lastUpdated": 1576177184653,
  "spec": {
    "source": [
      {
        "href": "https://10.0.0.100/api/endeavour/report/1013",
        "name": "vSnap Storage Utilization",
        "id": "1013",
        "parentId": "",
        "tags": {}
      }
    ],
    "option": {
      "renderPdf": true,
      "renderWord": false,
      "renderExcel": false,
      "export": false
    },
    "notification": [
      {
        "href": "https://10.0.0.100/api/smtp/1001",
        "type": "email",
        "recipients": [
          "sarah.wiseman@bluemachines.com.invalid",
```

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```
        "arthur.roberts@bluemachines.com.invalid"
      ]
    }
  ],
  "logicalDelete": false,
  "id": "1023"
}
]
```

Creating a custom report

You can modify predefined reports with custom parameters in IBM Spectrum Protect Plus and save the customized reports.

Method and URI

To create a custom report, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/endeavour/report
```

Parameters

None.

Data

Data 1: name

The name of the custom report.

- **Example value:** vSnapStorageUtilization-Dallas1
- **Restriction:** Report names can include alphanumeric characters and the following symbols:

```
$-_.+!*'()
```

Spaces are not permitted.

- **Type:** String. Required. Available in the web user interface.

Data 2: description

The description of the custom report.

- **Example value:** A report about storage utilization for vSnap Dallas1
- **Type:** String. Available in the web user interface.

Data 3: paramValues

The options of the custom report. The available options depend on the original predefined report. For details, follow the instructions in Report parameters (page 248).

- **Example value:** The following value defines example options that are available in the predefined report, vSnap Storage Utilization, and custom reports based on it:

```
{
  "vSnap":          ["(All)"],
  "IncludeReplicaVols": false,
  "VMsPerStorage":  false
}
```

- **Type:** JSON object. Required. Available in the web user interface.

Data 4: parentId

The {reportIdStr} of the original predefined report.

- **Example value:** 1013
- **Type:** String. Required. Available in the web user interface.

Tip: To get a {reportIdStr} by the report name, follow the instructions in Getting a {reportIdStr} (page 355).

Example: Create a custom report

Assume that you want to create the following custom report:

- **Name:** vSnapStorageUtilization-Dallas1
- **Description:** A report about storage utilization for vSnap Dallas1
- **Options:**
 - **Exclude Replica Destination Volume:** true
 - **Show Resources protected per vSnap Storage:** true
 - **vSnap server:** 10.0.1.1 ({vSnapId} 2000)
- **Original predefined report:** vSnap Storage Utilization ({reportIdStr} 1013)

A Python snippet that is similar to the following example can be used to create a custom report based on the vSnap Storage Utilization report:

```
_data = f'''{{
  "name":          "vSnapStorageUtilization-Dallas1",
  "description":  "A report of storage utilization for vSnap Dallas1",
  "paramValues": {{
    "vSnap":          ["2000"],
    "IncludeReplicaVols": true,
    "VMsPerStorage":  true
  }}
}}',
"parentId": "1013"
}}'''

requests.post(sppUrl + '/api/endeavour/report',
  headers=..., data=_data, verify=...)
```

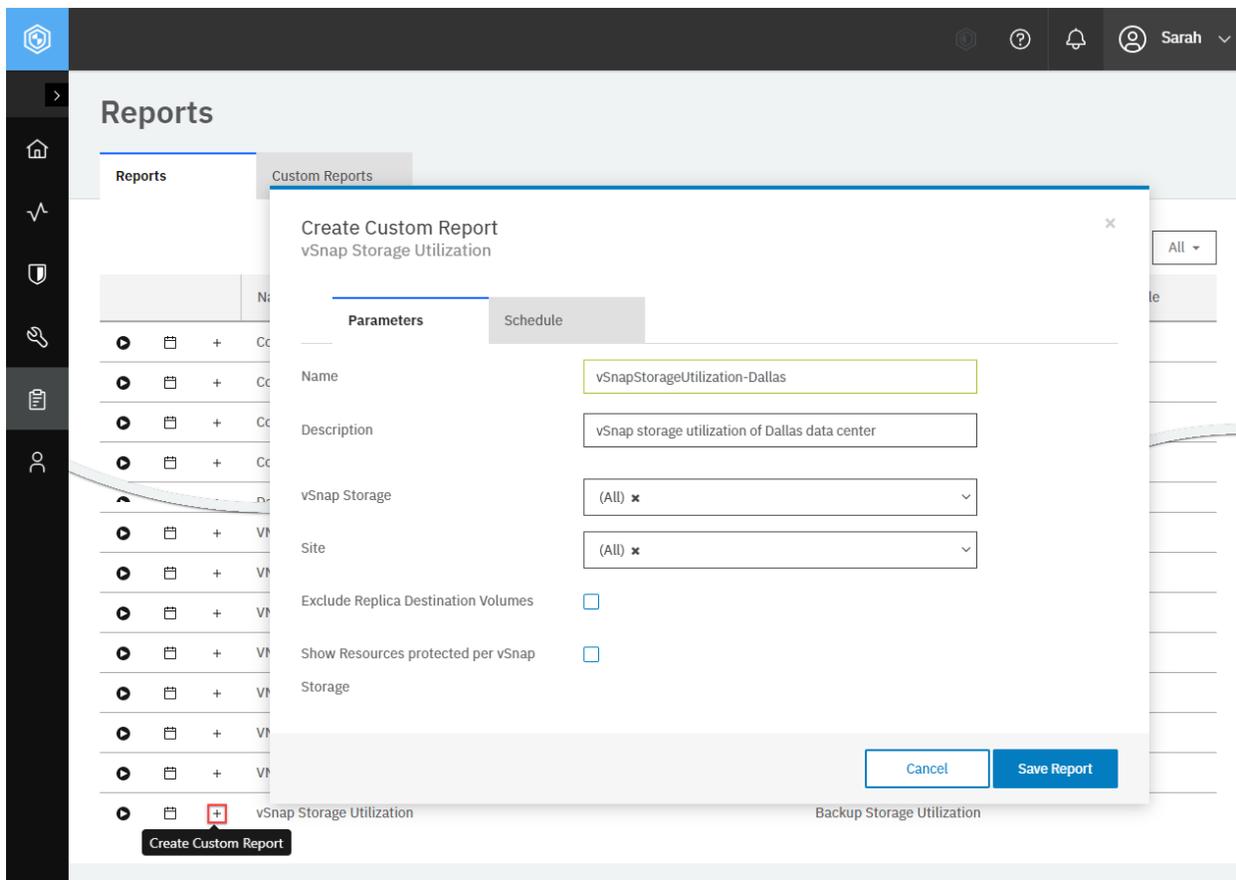


Figure 66: The same action can be taken in the IBM Spectrum Protect Plus web user interface: Click the **Reports** tab. Click **Create Custom Report** for the predefined report that you want to use to create a custom report. Configure the parameters.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the custom report was added.

```
{
  "links": {...},
  "name": "vSnapStorageUtilization-Dallas1",
  "displayName": "vSnapStorageUtilization-Dallas1",
  "description": "A report of storage utilization for vSnap Dallas1",
  "categoryDisplayName": "Backup Storage Utilization",
  "langType": "EN_US",
  "custom": true,
  "creationTime": 1577082702705,
  "paramValues": {
    "vSnap": [
      "2000"
    ],
    "IncludeReplicaVols": true,
    "VMsPerStorage": true
  },
  "parentId": "1013",
  "parentName": "vSnap",
  "rbacPath": "root:0/report:0/reportcategory:BackupStorageUtilizationCategory"
}
```

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```

↪Name/report:1101",
  "id": "1101"
}

```

Report parameters

As mentioned in [Creating a custom report](#) (page 245), you must specify options when you create a custom report that is based on a predefined report. Every predefined report has different options. Specify new options by using the `paramValues` key. For more information about predefined reports, see the [IBM Spectrum Protect Plus Installation and User's Guide](#).

vSnap Storage Utilization report

Review the storage utilization of your vSnap servers, including the availability status, free space, and used space. The vSnap Storage Utilization report displays both an overview of your vSnap servers and a detailed view of the individual virtual machines and databases that are protected on each vSnap server.

Category

Backup Storage Utilization

paramValues

Assume that you want to use the following options for the Protected and Unprotected VMs report:

- **vSnap storage:** All
- **Exclude replica Destination Volumes:** No
- **Show resources protected per vSnap storage:** No

To use the listed options, the `paramValues` key will have the following JSON object:

```

{
  "vSnap": ["2000"],
  "IncludeReplicaVols": false,
  "VMsPerStorage": false
}

```

paramValues 1: vSnap

To select all vSnap servers, use `["(All)"]`. To select specific vSnap servers, enter their `{storageId}`.

- **Example value:** `["2000", "2001"]`
- **Type:** Array. Required. Available in the web user interface.

Tip: To get a `{storageId}` value based on its name, follow the instructions in [Getting a {storageId}](#) (page 362).

paramValues 2: IncludeReplicaVols

Exclude replica destination volumes.

- **Type:** Boolean. Required. Available in the web user interface.

paramValues 3: VMsPerStorage

Show resources protected per vSnap server.

- **Type:** Boolean. Required. Available in the web user interface.

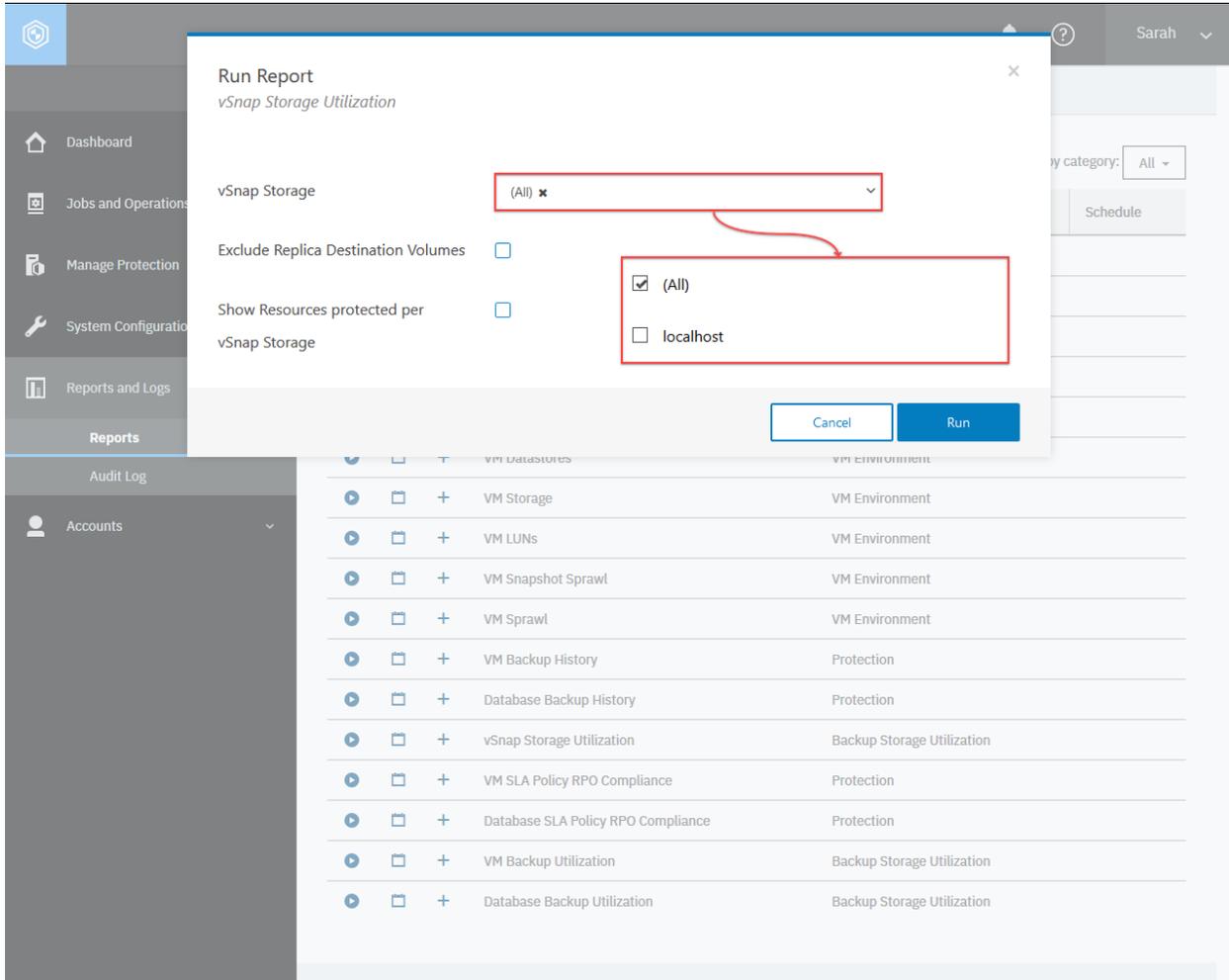


Figure 67: Report options for vSnap Storage Utilization in the web user interface

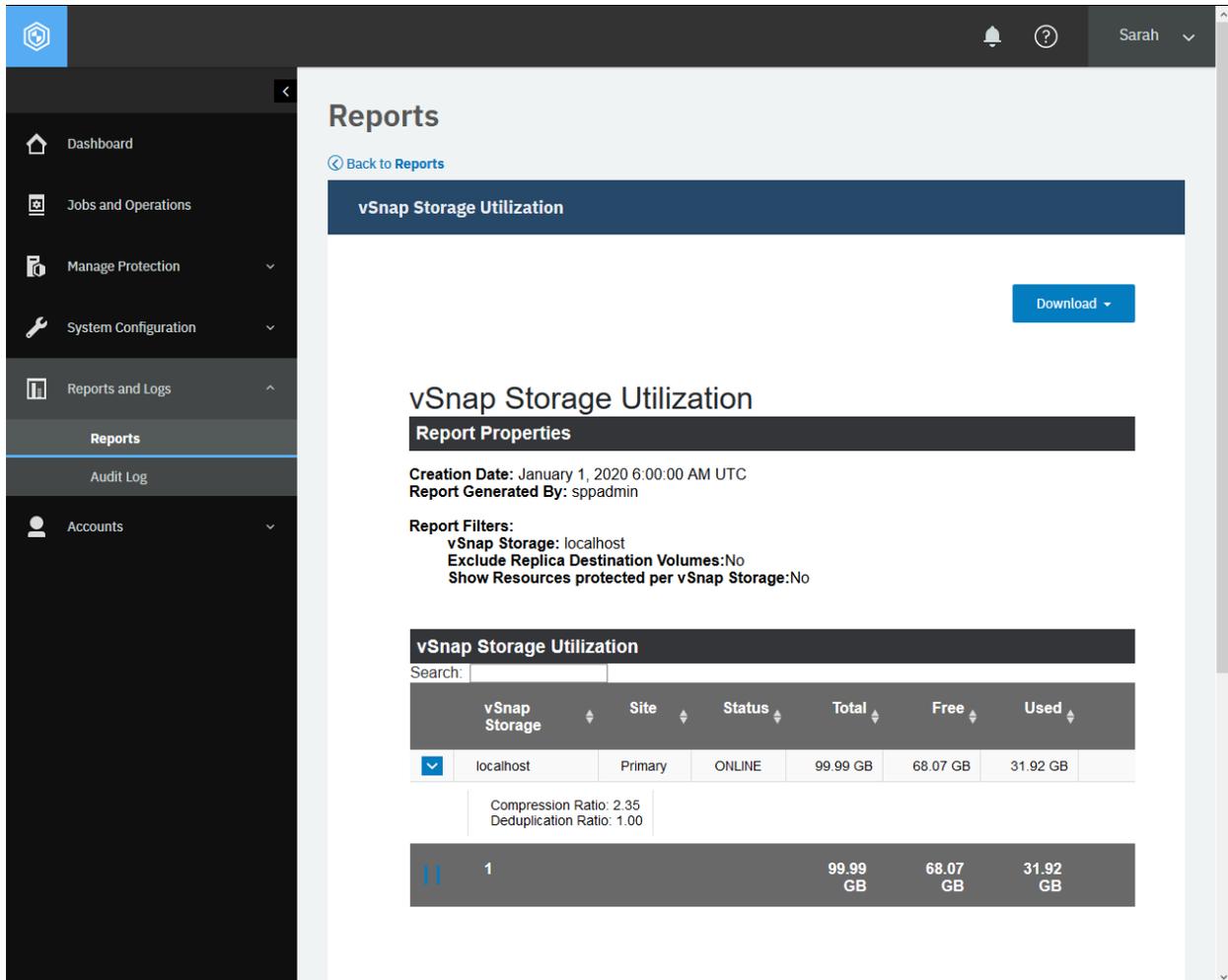


Figure 68: An example report of vSnap Storage Utilization

Protected and Unprotected VMs report

The Protected and Unprotected VMs report shows the protection status of your virtual machines. The report displays the total number of virtual machines added to the IBM Spectrum Protect Plus inventory before backup jobs are started.

Category

Protection

paramValues

Assume that you want to use the following options for the Protected and Unprotected VMs report:

- **Virtualized system type:** VMware
- **Hypervisors or Amazon EC2 accounts:** BlueMachines vCenter - Dallas (`{hypervisorHypervisorId}` 1001)
- **Hide unprotected virtual machines:** No
- **Show only the virtual machines with object storage copy backups:** No
- **Tags:** Sales

To use the listed options, the `paramValues` key will have the following JSON object:

```
{
  "NodeCascadingParameterGroup-HypervisorType": "vmware",
  "NodeCascadingParameterGroup-Hypervisor": ["1001"],
  "UnprotectedVMs": false,
  "OffloadedVMs": false,
  "tags": ["Dallas-Production"]
}
```

paramValues 1: NodeCascadingParameterGroup-HypervisorType

Specify a type of the virtualized systems:

- **Value:** Use one of the following values:

Virtualized system type	NodeCascadingParameterGroup-HypervisorType
All	(All)
VMware	vmware
Hyper-V	hyperv
Amazon EC2	awsec2

- **Type:** System string. Required. Available in the web user interface.

paramValues 2: NodeCascadingParameterGroup-Hypervisor

Specify the hypervisor or the Amazon EC2 account.

Tip: To get a `{hypervisorHypervisorId}` by hostname/IP, follow the instructions in Getting a `{hypervisorHypervisorId}` (page 344).

- **Type:** List (string). Required. Available in the web user interface.

paramValues 3: UnprotectedVMs

Indication of whether the result omits unprotected virtual machines.

- **Type:** Boolean. Required. Available in the web user interface.

paramValues 4: OffloadedVMs

Indication of whether the result shows only the virtual machines with object storage copy backups.

- **Type:** Boolean. Required. Available in the web user interface.

paramValues 5: tags

Tag names for VMware instances. Or, you can use (All) to select all tags.

- **Example:** ["Dallas-Production"]
- **Type:** List (string). Required. Available in the web user interface.

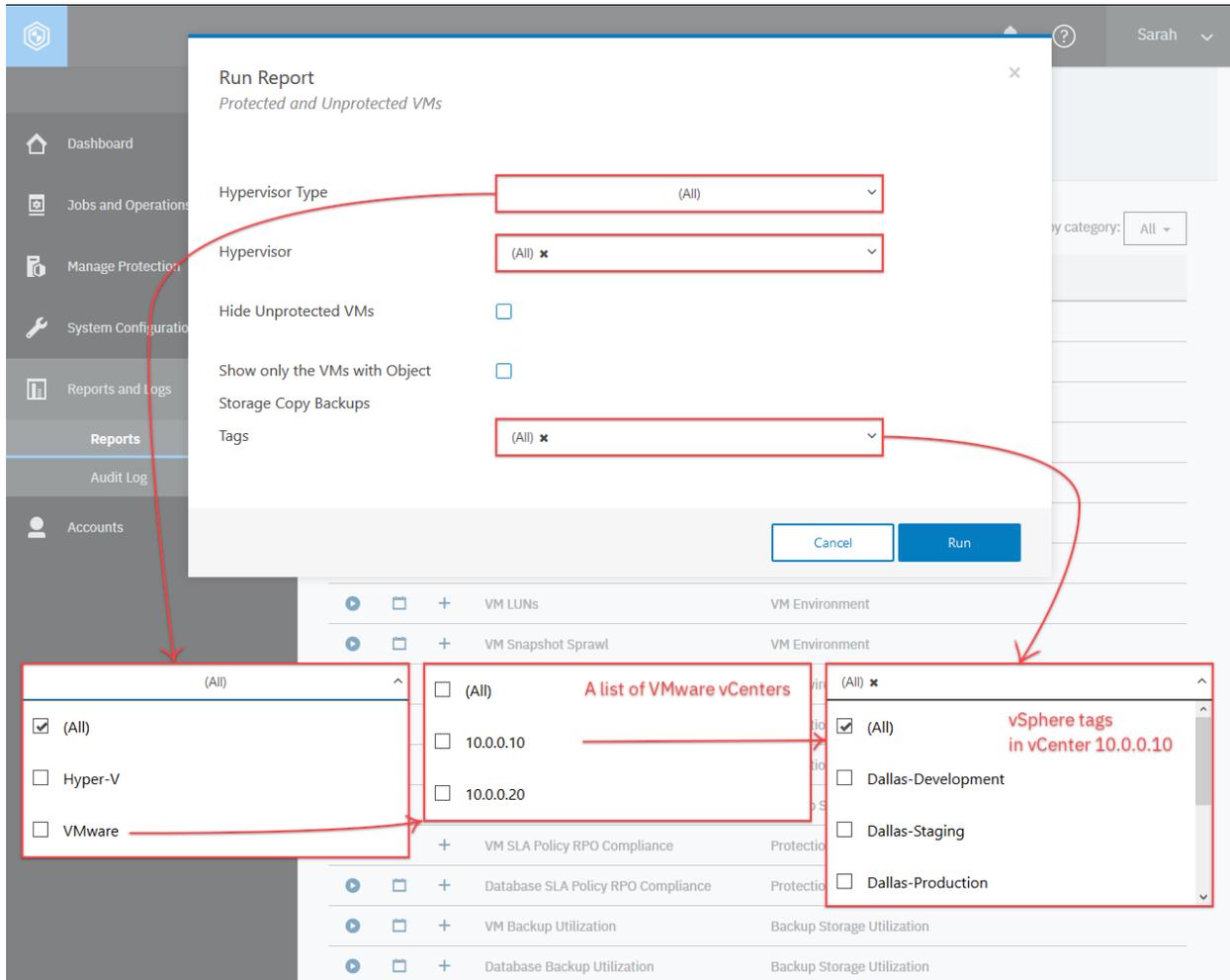


Figure 69: The option menus in the web browser interface

The screenshot shows a web interface for reports. The main title is 'Protected and Unprotected VMs'. Below the title, there is a 'Report Properties' section with the following details:

- Creation Date: June 1, 2020 2:00:00 AM UTC
- Report Generated By: Sarah
- Report Filters:
 - Type: VMware
 - Hypervisor/Account: 10.0.0.10
 - Hide Unprotected VMs: No
 - Show only the VMs with Object Storage Copy Backups: No
 - Tags: Sales

Below the properties, there are two sections: 'Protected VMs' and 'Unprotected VMs'. The 'Protected VMs' section states 'No Protected VMs found'. The 'Unprotected VMs' section contains a search bar and a table with the following data:

VM Name	Hypervisor/Account	Type	Location	Managed Capacity
Sales-Texas-VM	10.0.0.111	VMware	/vmware-dallas1.bluemachines.com.invalid /Dallas - DataCenter1/sales-americas	1.97 GB
Sales-California-VM	10.0.0.112	VMware	/vmware-dallas1.bluemachines.com.invalid /Dallas - DataCenter1/sales-americas	1.93 GB

Figure 70: An example report.

Configuration report

You can use the predefined report, Configuration, or any custom report based on it.

paramValues

paramValues 1 ConfigurationType

A list that includes the following system string values:

ConfigurationType	Description
(All)	All options
Application Servers	Application Servers
Backup Storage - Cloud	Backup Storage - Cloud
Backup Storage - Disk	Backup Storage - Disk
Backup Storage - Repository Server	Backup Storage - Repository Server
Hypervisors	Hypervisors
LDAP	LDAP
SMTP	SMTP
VADP Proxy	VADP Proxy

Example value: Use the following list to enable Application Servers, Backup Storage - Disk, and Hypervisors.

```
[  
  "Application Servers",  
  "Backups Storage - Disk",  
  "Hypervisors"  
]
```

Type: List (system string). Required. Available in the web user interface.

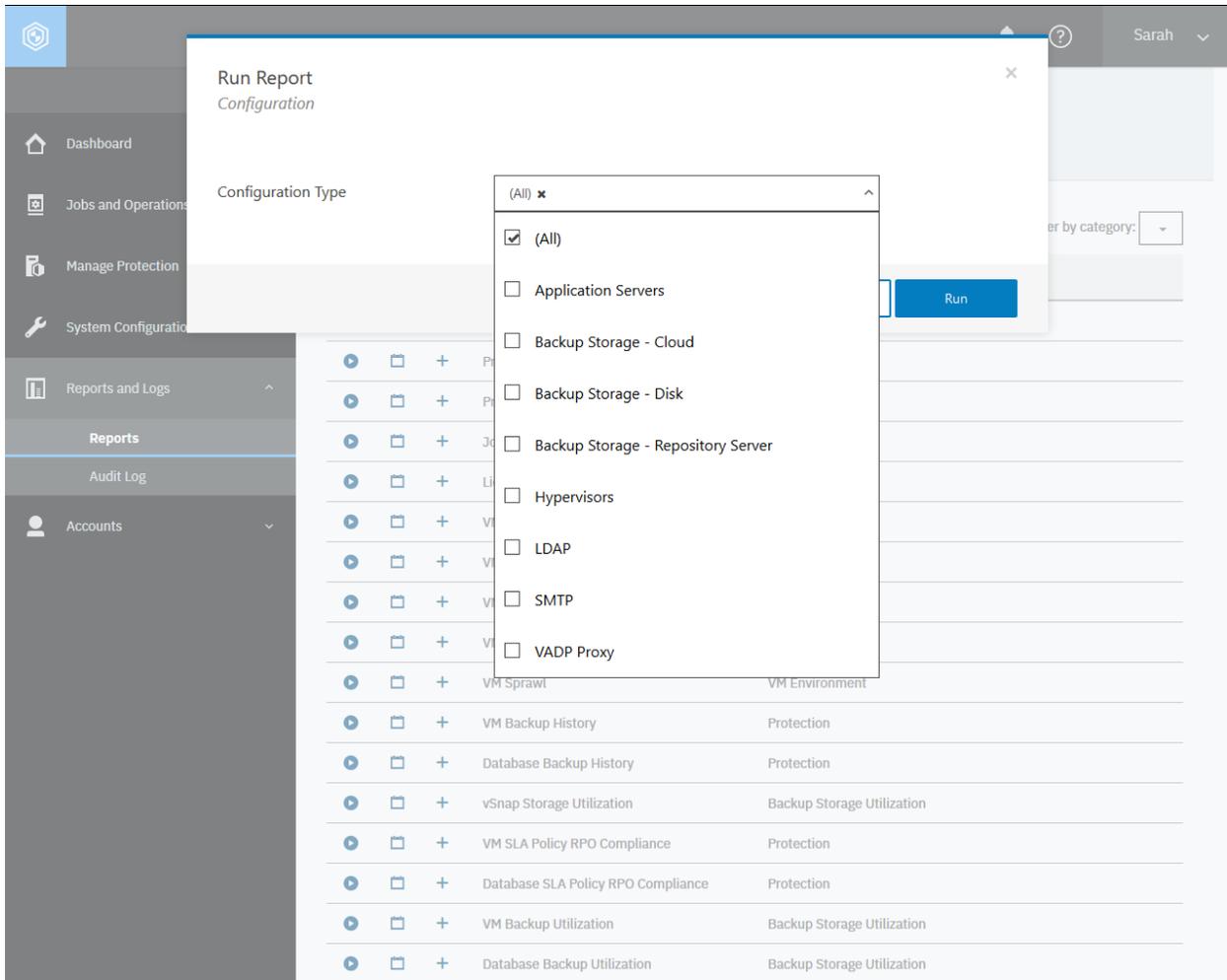


Figure 71: Preparing to run the Configuration report.

The screenshot shows the IBM Spectrum Protect Plus Reports interface. The left sidebar contains navigation options: Dashboard, Jobs and Operations, Manage Protection, System Configuration, Reports and Logs, Reports (selected), Audit Log, and Accounts. The main content area is titled 'Reports' and shows a 'Configuration' report. A 'Download' button is visible in the top right. The report details are as follows:

Configuration

Report Properties

Creation Date: January 1, 2020 6:00:00 AM UTC
 Report Generated By: sppadmin

Report Filters:
 Configuration Type: SMTP, VADP Proxy, Hypervisors, LDAP, Backup Storage - Repository Server, Backup Storage - Cloud, Backup Storage - Disk

Hypervisors

Search:

Name	Type	SSL Connection
10.0.0.10	VMware	True
10.0.0.20	VMware	True
10.0.2.10	Hyper-V	False

Total: 3

Backup Storage - Disk

Search:

Name	Type	Site
------	------	------

Figure 72: An example Configuration report

Additional topics for vSnap Storage Utilization

You can complete additional operations for the report vSnap Storage Utilization.

Protected virtual machines

You can get basic information about protected virtual machines.

Method and URI

To get information about all protected virtual machines, use a GET method and a URI:

```
GET https://{hostname|IPv4}/api/endeavour/catalog/recovery/hypervisorvm
```

Parameters

Parameter 1: embedded

Specify the type of action.

- **Value:** (children(properties))
- **Type:** System string. Required.

Data

None.

Example: Get information about protected virtual machines

Assume that you want to get information about protected virtual machines.

A Python snippet that is similar to the following example can be used to get a list of protected virtual machines and detailed information about each:

```
_params = {"embed": "(children(properties))"}  
  
requests.post('https://' + spp_ipv4  
             + '/api/endeavour/catalog/recovery/hyipervisorvm',  
             headers={...}, params=_params, verify=...)
```

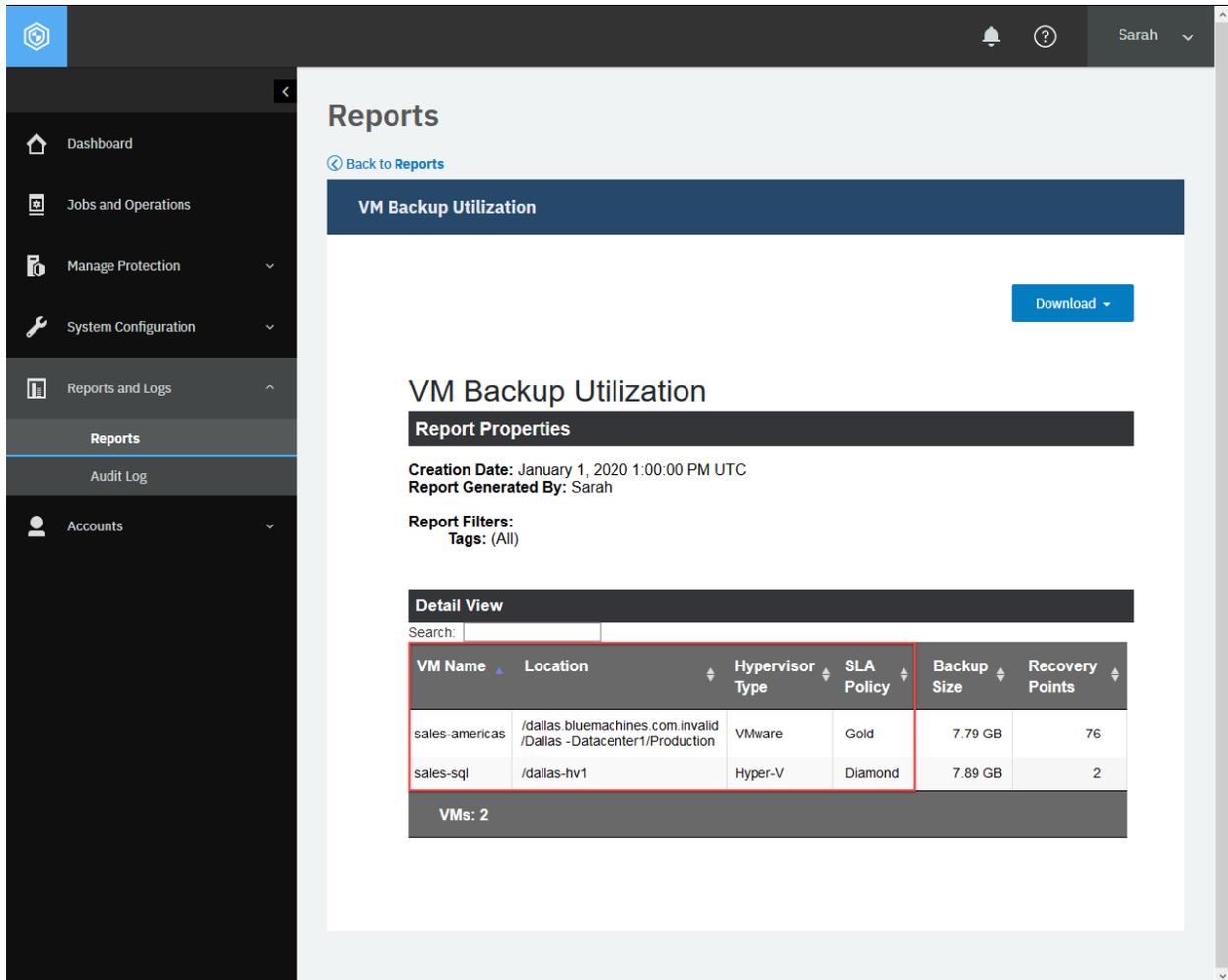


Figure 73: An example report of VM Backup Utilization. The REST API command described in this section will give you more detailed information including the primary key (pk) for each protected virtual machines. You will rely on those primary keys to retrieve additional data such as backup sizes and the number of backup snapshots (restore points).

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "queryElapsedTime": 11,
  "id": "hypervisorvm",
  "name": "hypervisorvm",
  "type": "folder",
  "catalogTime": null,
  "catalogProvider": "recovery",
  "comment": null,
  "tags": null,
  "documentType": null,
  "page": 1,
  "properties": {},
  "children": [
    {
```

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```

"links": {...},
"id": "5d551d2816186f1eaaa46718",
"name": "sales-sql",
"type": "document",
"catalogTime": 1565871979100,
"catalogProvider": "recovery",
"comment": null,
"tags": null,
"documentType": "vm",
"metadataPath": "/MS:1002/VM:8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",
"properties": {
  "name": "sales-sql",
  "comment": null,
  "creatorId": 0,
  "creationTime": null,
  "type": "vm",
  "flags": 0,
  "pk": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",
  "sessionId": 1565871979100,
  "objType": null,
  "jobId": "1014",
  "host": null,
  "protectionInfo": {
    "policyName": "hyperv_Gold",
    "subPolicyName": "VADP Backup(2000)",
    "subPolicyId": "2000",
    "storageProfileId": 2000,
    "storageProfileName": "Gold",
    "subPolicyLabel": null,
    "subPolicyType": "BACKUP",
    "subPolicySubType": "vsnap",
    "originalSubPolicyType": null,
    "protectionTime": 1565873191165,
    "lastErrorMessage": null,
    "recoveryPoint": "1365d24f-f8ca-4e29-9064-f487e8906701",
    "mirrorLabel": null,
    "snapLabels": null,
    "snapshotName": null,
    "protectedVolumePks": [],
    "flashCopyIds": null,
    "emcVnxSnapshotIds": null,
    "cloudSnapshotIds": null,
    "storageSnapshots": [
      {
        "storageType": "vsnap",
        "storageSnapshotId": "2000.snapshot.87",
        "snapshotReplicationId": null,
        "snapshotVersionId": "17374895456114910019",
        "storageId": "2000",
        "storageVolumeId": "2000.volume.20",
        "contentType": null
      },
      {
        "storageType": "vsnap",
        "storageSnapshotId": "2000.snapshot.87",
        "snapshotReplicationId": null,
        "snapshotVersionId": "17374895456114910019",

```

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```
        "storageId": "2000",
        "storageVolumeId": "2000.volume.20",
        "contentType": null
    }
],
"maskSnapshotIds": null,
"storageSiteIds": [
    "1000"
],
"primary": null,
"baseBackup": false,
"retentionInfo": {
    "type": "days",
    "count": 7,
    "expiration": 1566478113751
},
"skippedVolumePks": [],
"protectionMethod": "VMWARE_CBT",
"resourceType": null,
"destinationPk": null,
"destinationInfo": {
    "destinationFileName": null,
    "vmx": null,
    "vmxf": null,
    "vmxBackup": null,
    "vmxfBackup": null,
    "configFile": "Virtual Machines\\8989CFF1-6F16-4E2B-9FCC
↵-9F8C8CD719C9.VMCX",
    "extendedConfigFile": null,
    "configFileBackup": null,
    "extendedConfigFileBackup": null,
    "backupPath": "sales-sql_8ee9123",
    "destinationVolumeKey": "ae85b9df-5739-4de9-a287-b12ae2a
↵030b9"
},
"storageType": [
    "VSNAP"
],
"backupMetadata": null,
"backupDocumentKey": null,
"rmanTag": null,
"recoveryTransactionId": null,
"masked": false,
"forceBase": false,
"dbServerTime": null,
"incrementalSnapshot": false,
"isCGCreatedByEcx": false,
"transferDuration": 66668,
"transferSize": 9256960,
"storageInfo": "{\\"localhost\\": [\\"spp_1014_2000_16c946367fd_
↵_16c94639564_15_vsnap\\" ]}",
"sppoFromVSNap": false,
"excludedFromBackup": false,
"dummyObject": false,
"backupPathsInfos": [
    {
        "destStorageVolumePk": "2000.volume.20",
```

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```

        "backupPaths": [
            "sales-sql_8ee9123"
        ]
    },
    {
        "destStorageVolumePk": "2000.volume.20",
        "backupPaths": [
            "sales-sql_8ee9123"
        ]
    }
],
"baseBackupSize": 9295626240,
"combinedDelta": 0
},
"parentPk": "2d60ba76-9161-3492-ae5d-80f0b067760a",
"providerNodeId": "1002",
"providerUniqueId": null,
"siteId": null,
"autoProvisionedSubPolicyName": null,
"rbacPath": "root:0/hypervisor.all:0/hypervisor.type:hyperv/hype
↪rvisor:1002/vm:8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",
"rbacPathId": 186,
"location": "/dallas-hv1",
"metadataPath": "/MS:1002/VM:8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C
↪9",
    "isProtected": false,
    "inHLO": false,
    "hypervisorType": "hyperv",
    "hypervisorKey": "1002",
    "hypervisorManagementServerID": "1002",
    "nativeKey": null,
    "cloudType": null,
    "tags": [],
    "tagCategories": [],
    "metadataPathVmHost": "/MS:1002/VM:8989CFF1-6F16-4E2B-9FCC-9F8C8
↪CD719C9/CLUST:2d60ba76-9161-3492-ae5d-80f0b067760a/HOST:8a88cacf-80f5-308d-bdaf
↪-f2939920ee87/VM:8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",
    "rbacPathVmHost": "root:0/hypervisor.all:0/hypervisor.type:hyper
↪v/hypervisor:1002/vm:8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9/vcluster:2d60ba76-916
↪1-3492-ae5d-80f0b067760a/vhost:8a88cacf-80f5-308d-bdaf-f2939920ee87/vm:8989CFF1
↪-6F16-4E2B-9FCC-9F8C8CD719C9",
    "rbacPathIdVmHost": 187,
    "alternatePaths": [],
    "isTemplate": false,
    "isEncrypted": false,
    "powerSummary": {
        "powerState": "ON",
        "lastPowerOnTime": 1564750421466,
        "lastPowerOffTime": 0,
        "lastSuspendTime": 0,
        "uptime": 0
    },
    "storageSummary": {
        "committed": 9295626240,
        "uncommitted": 45465206784,
        "shared": 0
    }
},

```

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```
"hypervisorHostKey": "8a88cacf-80f5-308d-bdaf-f2939920ee87",
"hypervisorHostName": "dallas-hv1",
"volumes": [
  {
    "name": "csvvol1",
    "key": "2b7532f9-7f2e-4457-ab79-160b631fc66f",
    "isConfigVolume": false
  },
  {
    "name": "csvvol2",
    "key": "9dab0f74-ace3-4d1a-bb5a-07e7ed10c185",
    "isConfigVolume": true
  }
],
"uniqueId": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",
"configFilePath": "Virtual Machines\\8989CFF1-6F16-4E2B-9FCC-9F8
C8CD719C9.VMCX",
"fileDirPath": "SSwin2k12",
"cluster": {
  "name": "dallas-hv1",
  "key": "2d60ba76-9161-3492-ae5d-80f0b067760a"
},
"cpu": 1,
"coresPerCpu": 1,
"memory": 1073741824,
"vmVersion": "8.0",
"vmStorageUtilization": 0,
"vmDestVolDedupCompressionInfo": [],
"configInfo": {
  "name": null,
  "comment": null,
  "creatorId": 0,
  "creationTime": null,
  "type": null,
  "flags": 0,
  "pk": null,
  "sessionId": null,
  "objType": null,
  "jobId": null,
  "host": null,
  "providerNodeId": null,
  "providerUniqueId": null,
  "siteId": null,
  "autoProvisionedsubPolicyName": null,
  "isProtected": false,
  "inHLO": true,
  "hypervisorType": null,
  "hypervisorKey": null,
  "hypervisorManagementServerID": null,
  "nativeKey": null,
  "cloudType": null,
  "tags": null,
  "tagCategories": null,
  "vmId": null,
  "osName": null,
  "osVersion": null,
  "hostName": null,
```

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```
        "vmToolsStatus": null,
        "guestNetworkInfo": []
      }
    }
  },
  {...}, ..., {...}
]
}
```

Base backup sizes

You can get a base backup size in bytes for each protected virtual machine by using the primary key (pk).

Tip: To get the primary key (pk) as well as other detailed information about each protected virtual machine, follow the instructions in this section. To get the sum of data sizes of all backup snapshots for each protected virtual machine, follow the instructions in [Incremental backup sizes \(page 267\)](#).

Method and URI

To get a base backup size for each protected virtual machine, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/endeavour/catalog/recovery/hypervisorvm
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in [Aggregate functions \(page 366\)](#).

- **Value:** aggregate
- **Type:** Array. Required. Available in the web user interface.

Parameter 2: filter

- **Value:**

```
[
  {
    "property": "sessionId",
    "op": ">",
    "value": "0"
  },
  {
    "property": "protectionInfo.baseBackup",
    "op": "=",
    "value": "true"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data

Data 1: op

Use the MAX() function for the protectionInfo.transferSize values. For more information about the MAX() function, follow the instructions in MAX() (page 368).

- **Value:**

```
[
  {
    "operation": "max",
    "fieldname": "protectionInfo.transferSize",
    "outputname": "baseBackupSize"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data 2: group

Use the GROUP clause with the primary key values. For more information about the GROUP clause, follow the instructions in GROUP clause (page 368).

- **Value:** ["pk"]
- **Type:** Array. Required. Available in the web user interface.

Data 3: copytype

- **Value:** versiononly
- **Type:** System string. Required.

Example: Get information about the base backup size for virtualized system protection

Assume that you have two protected virtual machines:

- sales-americas
 - **Primary key:** 92647504afd9005226aef77bc0b98abb
 - **Base backup size:** 100 GB (107,374,182,400 bytes)
 - **Incremental backup snapshot sizes:** 10 GB (10,737,418,240 bytes, 1 GB x 10 backup snapshots)
 - **Total backup size:** 110 GB
- sales-sql
 - **Primary key:** 8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9
 - **Base backup size:** 1 TB (1,073,741,824,000 bytes)
 - **The sum of all incremental backup snapshots:** 1 TB x 1 backup snapshot
 - **Total backup size:** 2 TB

A Python snippet that is similar to the following example can be used to get a list of protected virtual machines and a base backup size for each. In this example, the value will be shown with the output key name baseBackupSize.

```

_params = {
  "action": "aggregate",
  "filter": str([
    {
      "property": "sessionId",
      "op": ">",
      "value": "0"
    },
    {
      "property": "protectionInfo.baseBackup",
      "op": "=",
      "value": "true"
    }
  ])
}

_data = f'''{{
  "op": [
    {{
      "operation": "max",
      "fieldname": "protectionInfo.transferSize",
      "outputname": "baseBackupSize"
    }}
  ],
  "group": [
    "pk"
  ],
  "copytype": "versiononly"
}}'''

requests.post('https://' + spp_ipv4
+ '/api/endeavour/catalog/recovery/hypervisorvm',
headers={...}, params=_params, data=_data, verify=...)

```

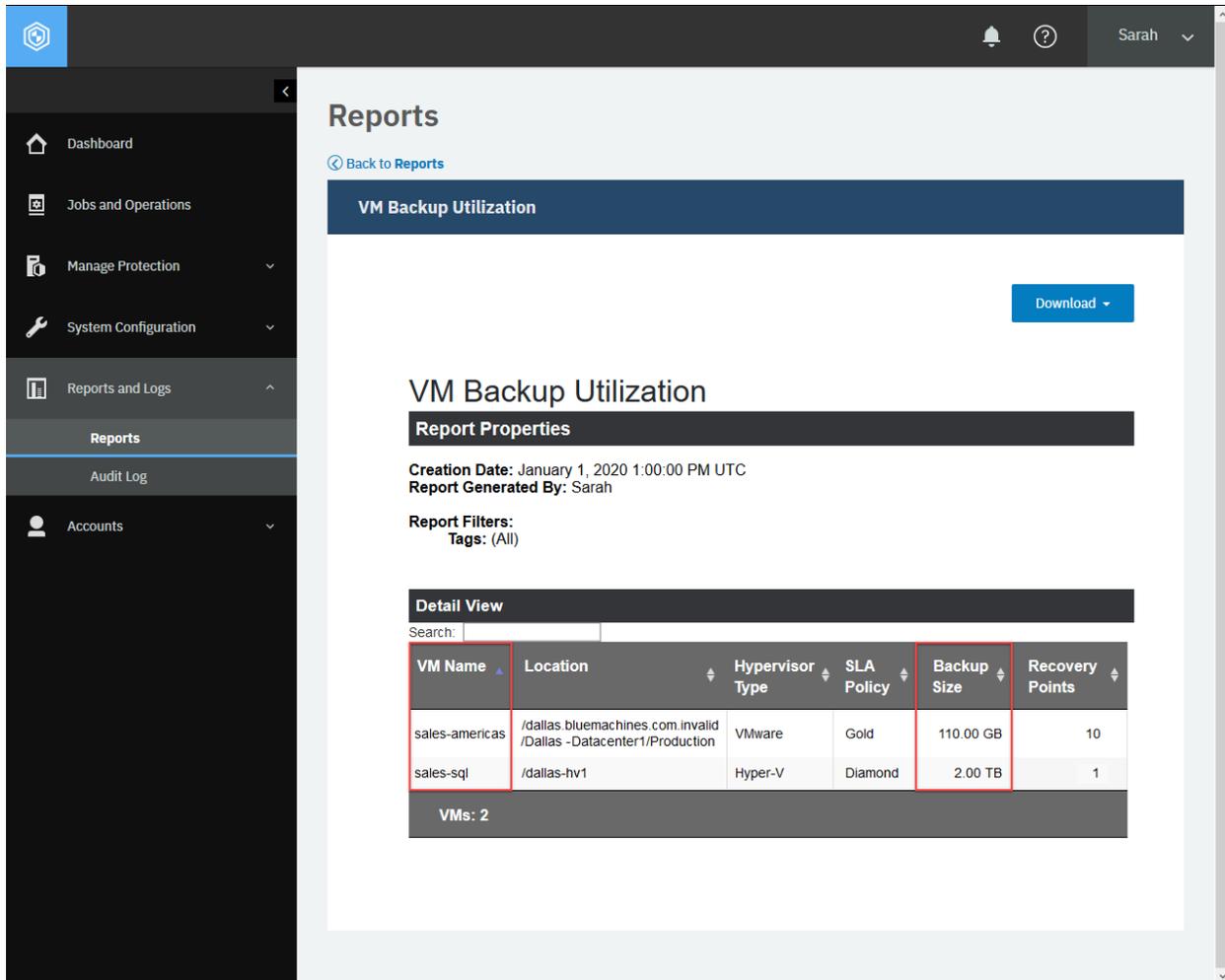


Figure 74: In this report, the backup size for each virtual machine is a sum of the base backup size and the incremental backup sizes.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
      "_id": {
        "pk": "2cc67ed7057bf949ce068f477a1ee6f5"
      },
      "baseBackupSize": 107374182400
    },
    {
      "_id": {
        "pk": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9"
      },
      "baseBackupSize": 1073741824000
    },
    {...}, ..., {...}
  ]
}
```

Incremental backup sizes

You can get an incremental backup size for each protected virtual machine by using its primary key (pk).

Tip: To get the primary key (pk) as well as other detailed information about each protected virtual machine, follow the instructions in Protected virtual machines (page 257). To get the data size of the base backup for each protected virtual machine, follow the instructions in Base backup sizes (page 263).

Method and URI

To get an incremental backup size for each protected virtual machine, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/endeavour/catalog/recovery/hypervisorvm
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in Aggregate functions (page 366).

- **Value:** aggregate
- **Type:** System string. Required. Available in the web user interface.

Parameter 2: filter

Optionally, you may use a filter to specify the type of virtualized systems. If this parameter is not used, the request counts all protected virtual machines regardless of the type of virtualized systems. You can use the filter operation parameters that are described in Filter (page 363).

- **Value:**

```
[
  {
    "property": "sessionId",
    "op": ">",
    "value": "0"
  },
  {
    "property": "protectionInfo.baseBackup",
    "op": "=",
    "value": "false"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data

Data 1: op

Use the SUM() function for the `protectionInfo.transferSize` values. For more information about the SUM() function, follow the instructions in SUM() (page 368).

- **Value:**

```
[
  {
    "operation": "sum",
    "fieldname": "protectionInfo.transferSize",
    "outputname": "incrBackupSize"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data 2: group

Use the GROUP clause with the primary key values. For more information about the GROUP clause, follow the instructions in GROUP clause (page 368).

- **Value:** ["pk"]
- **Type:** Array. Required. Available in the web user interface.

Data 3: copytype

- **Value:** versiononly
- **Type:** System string. Required.

Example: Get information about incremental backup sizes

Assume that you have two protected virtual machines:

- sales-americas
 - **Primary key:** 92647504afd9005226aef77bc0b98abb
 - **Base backup size:** 100 GB (107,374,182,400 bytes)
 - **Incremental backup snapshot sizes:** 10 GB (10,737,418,240 bytes, 1 GB x 10 backup snapshots)
 - **Total backup size:** 110 GB (115,343,360 bytes)
- sales-sql
 - **Primary key:** 8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9
 - **Base backup size:** 1 TB (1,073,741,824,000 bytes)
 - **The sum of all incremental backup snapshots:** 1 TB x 1 backup snapshot
 - **Total backup size:** 2 TB

The Python code snippet below will return a list of protected virtual machines and their primary key and incremental backup size. In this example, the value will be shown with the key name `baseBackupSize`.

```

_params = {
  "action": "aggregate",
  "filter": str([
    {
      "property": "sessionId",
      "op": ">",
      "value": "0"
    },
    {
      "property": "protectionInfo.baseBackup",
      "op": "=",
      "value": "false"
    }
  ])
}

_data = f''''{{
  "op": [
    {{
      "operation": "sum",
      "fieldname": "protectionInfo.transferSize",
      "outputname": "incrBackupSize"
    }}
  ],
  "group": [
    "pk"
  ],
  "copytype": "versiononly"
}}''''

requests.post('https://' + spp_ipv4
+ '/api/endeavour/catalog/recovery/hypervisorvm',
headers={...}, params=_params, data=_data, verify=...)

```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```

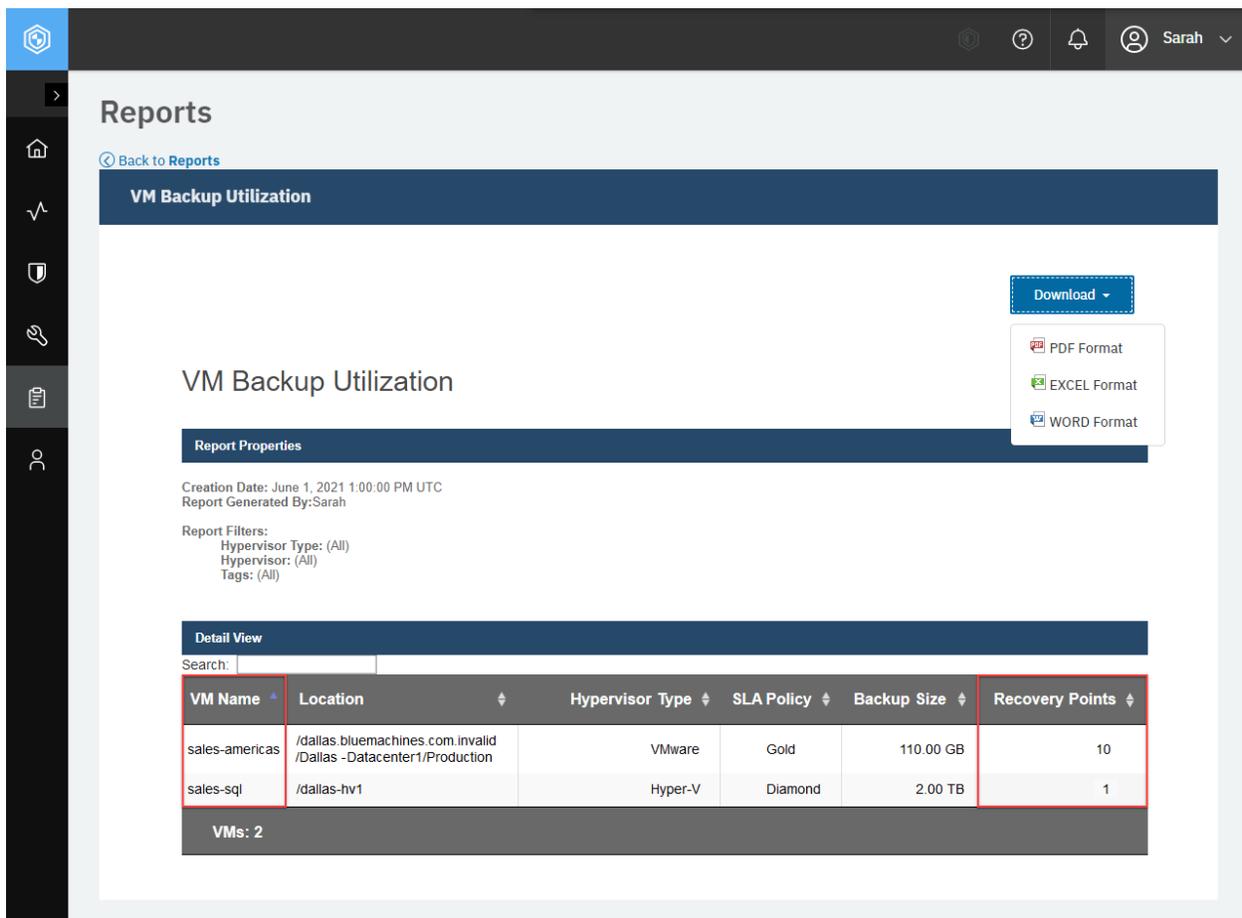
{
  "links": {...},
  "results": [
    {
      "_id": {
        "pk": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9"
      },
      "incrBackupSize": 1073741824000
    },
    {
      "_id": {
        "pk": "92647504afd9005226aef77bc0b98abb"
      },
      "incrBackupSize": 10737418240
    },
    {...}, ..., {...}
  ]
}

```

Recovery points

You can get the number of restore points that are available (a recovery point) for each protected virtual machine with its primary key (pk).

Tip: To get the primary key (pk) as well as other detailed information about each protected virtual machine, follow the instructions in Protected virtual machines (page 257).



The screenshot shows the 'Reports' section of the IBM Spectrum Protect Plus interface. The main heading is 'VM Backup Utilization'. Below this, there is a 'Report Properties' section with the following details:

- Creation Date: June 1, 2021 1:00:00 PM UTC
- Report Generated By: Sarah
- Report Filters:
 - Hypervisor Type: (All)
 - Hypervisor: (All)
 - Tags: (All)

Below the report properties is a 'Detail View' section containing a table of VMs. The table has the following columns: VM Name, Location, Hypervisor Type, SLA Policy, Backup Size, and Recovery Points. The data is as follows:

VM Name	Location	Hypervisor Type	SLA Policy	Backup Size	Recovery Points
sales-americas	/dallas.bluemachines.com.invalid /Dallas -Datacenter1/Production	VMware	Gold	110.00 GB	10
sales-sql	/dallas-hv1	Hyper-V	Diamond	2.00 TB	1

At the bottom of the table, it indicates 'VMs: 2'. A 'Download' button is visible in the top right corner of the report area, with options for PDF Format, EXCEL Format, and WORD Format.

Figure 75: For each virtual machine, the number of recovery points is displayed. This is the number of backup snapshots that you can restore.

Method and URI

To get a recovery point for each protected virtual machine, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/endeavour/catalog/recovery/hypervisorvm
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in [Aggregate functions \(page 366\)](#).

- **Value:** aggregate
- **Type:** Array. Required. Available in the web user interface.

Parameter 2: filter

- **Value:**

```
[
  {
    "property": "sessionId",
    "op": ">",
    "value": "0"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data

Data 1: op

Use the `COUNT()` function for the pk values. For more information about the `COUNT()` function, follow the instructions in [COUNT\(\) \(page 367\)](#).

- **Value:**

```
[
  {
    "operation": "count",
    "fieldname": "pk",
    "outputname": "count"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Data 2: group

Use the `GROUP` clause with the primary key values. For more information about the `GROUP` clause, follow the instructions in [GROUP clause \(page 368\)](#).

- **Value:** ["pk"]
- **Type:** Array. Required. Available in the web user interface.

Data 3: copytype

- **Value:** versiononly
- **Type:** System string. Required.

Example: Get information about recovery points

Assume that you have two protected virtual machines:

- **sales-americas:**
 - **Primary key:** 92647504afd9005226aef77bc0b98abb
 - **Base backup size:** 100 GB (107,374,182,400 bytes)
 - **Incremental backup snapshot sizes:** 10 GB (10,737,418,240 bytes, 1 GB x 10 backup snapshots)
 - **Total backup size:** 110 GB
- **sales-sql:**
 - **Primary key:** 8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9
 - **Base backup size:** 1 TB (1,073,741,824,000 bytes)
 - **The sum of all incremental backup snapshots:** 1 TB x 1 backup snapshot
 - **Total backup size:** 2 TB

A Python snippet that is similar to the following example can be used to get a list of protected virtual machines and their primary keys and recovery points. In this example, the value will be shown with the key name count.

```
_params = {
    "action": "aggregate",
    "filter": str([
        {
            "property": "sessionId",
            "op": ">",
            "value": "0"
        }
    ])
}

data = f'''{{
    "op": [
        {{
            "operation": "count",
            "fieldname": "pk",
            "outputname": "count"
        }}
    ],
    "group": [
        "pk"
    ],
    "copytype": "versiononly"
}}'''

requests.post('https://' + spp_ipv4
              + '/api/endeavour/catalog/recovery/hypervisorvm',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK). As you can see, the protected virtual machine sales-americas has ten backup snapshots (recovery points) and sales-sql has one snapshot.

```

{
  "links": {...},
  "results": [
    {
      "_id": {
        "pk": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9"
      },
      "count": 1
    },
    {
      "_id": {
        "pk": "92647504afd9005226aef77bc0b98abb"
      },
      "count": 10
    },
    {...}, ..., {...}
  ]
}

```

Analytics

You can analyze the system operations of IBM Spectrum Protect Plus by viewing the dashboard in the user interface and by viewing reports. However, some types of analytical information are available only by using the REST API.

Getting backup history for a virtual machine

You can get virtual machine backup history. This action is available only in the REST API.

URI and Method

To get information about virtual machine backup history, use a GET method and a URI:

```
GET https://{hostname|IP}/ngp/analytics/vmbackuphistory
```

Parameters

None.

Data

None.

Example: Get virtual machine backup history

A Python snippet that is similar to the following example can be used to request information about virtual machine backup history.

```
requests.get('https://' + spp_ipv4 + '/ngp/analytics/vmbackuphistory',  
            headers={...}, verify=spp_verify)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "instances": [  
    {  
      "pk": "8989CFF1-6F16-4E2B-9FCC-9F8C8CD719C9",  
      "VM": "Sales-Win2016-001",  
      "tags": [],  
      "SLAPolicy": "Gold",  
      "ProtectionTime": 1617235200111,  
      "hypervisor": "dallas-hv1.bluemachines.com.invalid",  
      "hypervisorType": "Hyper-V",  
      "Status": "Success",  
      "BackupStorage": "localhost",  
      "BackupDetails": {  
        "BackupData": 416746424,  
        "BackupDuration": 237536  
      },  
      "TotalRuns": 2  
    },  
    {...}, ..., {...}  
  ]  
}
```

In the previous response, the `ProtectionTime` value represents the date and time when this backup job was completed. This timestamp uses the UNIX format followed by three digits that represent milliseconds. For example, the value `1617235200111` represents 1 April 2021 at 0:00.111 AM UTC.

The `BackupDetails > BackupData` value represents the total size of the backup snapshot in bytes. For example, the value `416746424` represents approximately 397 MB.

The `BackupDuration` value represents the time in milliseconds to complete the backup job. For example, the value `237536` represents 3 minutes and 57.536 seconds.

Getting database backup history

You can get database backup history. This action is available only in the REST API.

Method and URI

To get database backup history, use a GET method and a URI:

```
GET https://{hostname|IP}/ngp/analytics/dbbackuphistory
```

Parameters

None.

Data

None.

Example: Get database backup history

A Python snippet that is similar to the following example can be used to request information about database backup history.

```
requests.get('https://' + spp_ipv4 + '/ngp/analytics/dbbackuphistory',  
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "links": {...},  
  "instances": [  
    {  
      "pk": "7540bc5013b15e4940ebbb908c4aaf87",  
      "parentPk": "34ea1797e3fd1d00d33b349517057d1d",  
      "DB": "SALES-AMERICAS1",  
      "SLAPolicy": "Gold",  
      "ProtectionTime": 1570380381334,  
      "Status": "Failed",  
      "BackupStorage": "",  
      "BackupDetails": {  
        "FailureReason": "[Backup failed: Backup failed, Backup of all d  
atabases failed :All databases failed]"  
      },  
      "TotalRuns": 392  
    },  
    {...}, ..., {...}  
  ]  
}
```

Getting virtual machine backup compliance

You can get information about virtual machine backup compliance. This action is available only in the REST API.

URI and Method

To get information about virtual machine backup compliance, use a GET method and a URI:

```
GET https://{hostname|IP}/ngp/analytics/vmbackups1acom
```

Parameters

None.

Data

None.

Example: Get information about virtual machine backup compliance

A Python snippet that is similar to the following example can be used to request information about virtual machine backup compliance.

```
requests.get('https://' + spp_ipv4 + '/ngp/analytics/vmbackups1acom',  
            headers={...}, verify=spp_verify)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{  
  "backup2vsnap": {  
    "compliance": [],  
    "ucompliance": [  
      {  
        "VM": "Sales-Windows2016-005",  
        "SLAPolicy": "Gold",  
        "Hypervisor": "win2016enghv.bluemachines.com.invalid",  
        "HypervisorType": "hyperv",  
        "ProtectionTime": 1565873191165,  
        "Location": "/win2016enghv",  
        "Frequency": 4,  
        "Schedule": "HOURLY",  
        "FailureReason": "Defined RPO for SLA Policy Gold to run Every 4  
↪ hour(s) not meet."  
      }  
    ],  
    {  
      "VM": "Sales-RedHatLinux-004",  
      "SLAPolicy": "Gold",  
      "Hypervisor": "10.0.0.10",  
      "HypervisorType": "vmware",  
      "ProtectionTime": 1573345610009,  
      "Location": "/vmware-dallas1.bluemachines.com.invalid/Dallas -
```

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```
↪DataCenter1/Lab folder",
    "Frequency": 4,
    "Schedule": "HOURLY",
    "FailureReason": "Defined RPO for SLA Policy Gold to run Every 4
↪ hour(s) not meet."
    }
  ]
},
"replication": {
  "compliance": [],
  "ucompliance": []
},
"offload": {
  "compliance": [],
  "ucompliance": []
}
}
```

Getting database backup compliance

You can get information about database backup compliance. This action is available only in the REST API.

Method and URI

To get information about database backup compliance, use a GET method and a URI:

```
GET https://{hostname|IP}/ngp/analytics/dbbackups/acom
```

Parameters

None.

Data

None.

Example: Get database backup compliance

A Python snippet that is similar to the following example can be used to request information about database backup compliance.

```
requests.get('https://' + spp_ipv4 + '/ngp/analytics/dbbackups/acom',
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```

{
  "backup2vsnap": {
    "compliance": [],
    "ucompliance": [
      {
        "DB": "Bluemachines-Oracle-SalesDB",
        "SLAPolicy": "Gold",
        "ProtectionTime": 1567168142000,
        "Frequency": 4,
        "Schedule": "HOURLY",
        "FailureReason": "[Backup failed: Backup failed, Backup of all d
atabases failed :All databases failed]"
      },
      ..., {...}
    ]
  },
  "replication": {
    "compliance": [],
    "ucompliance": []
  },
  "offload": {
    "compliance": [],
    "ucompliance": []
  }
}

```

Counting virtual machines

Method and URI

To count all protected and unprotected virtual machines registered by IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IP}/api/endeavour/catalog/hypervisor/vm
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in [Aggregate functions \(page 366\)](#).

- **Value:** aggregate
- **Type:** Array. Required. Available in the web user interface.

Parameter 2: filter

Optionally, you may use a filter to specify the virtualized system type: VMware vCenter, Hyper-V, or Amazon EC2. If this parameter is not used, IBM Spectrum Protect Plus counts all virtual machines. You can use the `filter` operation parameters that are described in [Filter \(page 363\)](#).

- **Example value:** To search within instances that are associated with no SLA policies, use the following filter parameter:

```
[
  {
    "op": "=",
    "property": "hypervisorType",
    "value": "vmware"
  }
]
```

Choose one of the following virtualized systems and use the value in the filter.

Virtualized system	Value
VMware vCenter	vmware
Hyper-V	hyper-v
Amazon EC2	aws-ec2

- **Type:** JSON object. Available in the web user interface.

Data

Data 1: op

Use the COUNT() function to count the pk objects. For more information about the COUNT() function, follow the instructions in COUNT() (page 367). Name the output variable count.

- **Value:**

```
[
  {
    "operation": "count",
    "fieldname": "pk",
    "outputname": "count"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Example: Count virtual machines that are managed on VMware vCenter

A Python snippet that is similar to the following example can be used to count the virtual machines that are managed by VMware vCenter Server, and registered with IBM Spectrum Protect Plus. The number includes both protected virtual machines and unprotected virtual machines.

```
hypervisor_type = "vmware" # VMware vCenter
# hypervisor_type = "hyper-v" # Hyper-V
# hypervisor_type = "aws-ec2" # Amazon EC2

_params = {
  "action": "aggregate",
  "filter": f'''[
    {{
      "op": "=",
      "property": "hypervisorType",
      "value": {hypervisor_type}
    }}
  ]'''
}
```

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```
}
_data = f'''{{
  "op": [
    {{
      "operation": "count",
      "fieldname": "pk",
      "outputname": "count"
    }}
  ],
}}'''
requests.post('https://' + spp_ipv4
              + '/api/endeavour/catalog/hypervisor/vm',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
      "_id": null,
      "count": 600
    }
  ]
}
```

Counting databases

Method and URI

To count all protected and unprotected databases registered by IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IP}/api/endeavour/catalog/application/database
```

Parameters

Parameter 1: action

Invoke the aggregate functions.

- **Value:** aggregate
- **Type:** System string. Required.

Data

Data 1: op

Use the `COUNT()` function to count the pk objects. For more information about the `COUNT()` function, follow the instructions in `COUNT()` (page 367). Name the output variable `count`.

- **Value:**

```
[
  {
    "operation": "count",
    "fieldname": "pk",
    "outputname": "count"
  }
]
```

- **Type:** Array. Required.

Example: Count databases

A Python snippet that is similar to the following example can be used to invoke an aggregate function that counts the total number of databases registered by IBM Spectrum Protect Plus. The number includes protected and unprotected databases.

```
_params = {"action": "aggregate"}

_data = f'''{{
  "op": [
    {{
      "operation": "count",
      "fieldname": "pk",
      "outputname": "count"
    }}
  ]
}}'''

requests.post('https://' + spp_ipv4
              + '/api/endeavour/catalog/application/database',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
      "_id": null,
      "count": 100
    }
  ]
}
```

Counting protected virtual machines

You can count the virtual machines that are protected by IBM Spectrum Protect Plus.

Method and URI

To count protected virtual machines that are registered with IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IP}/api/endeavour/catalog/recovery/hypervisorvm
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in [Aggregate functions](#) (page 366).

- **Value:** aggregate
- **Type:** System string. Required. Available in the web user interface.

Parameter 2: filter

Optionally, you may use a filter to specify the type of virtualized systems. If this parameter is not used, the request counts all protected virtual machines regardless of type. You can use the `filter` operation parameters that are described in [Filter](#) (page 363).

- **Example value:** To search protected virtual machines for only VMware instances, use the following filter parameter:

```
[
  {
    "property": "hypervisorType",
    "value":    "vmware",
    "op":      "="
  }
]
```

Use one of the following values to specify the virtualized system:

Virtualized system	Value
VMware vCenter	vmware
Hyper-V	hyperv
Amazon EC2	awsec2

- **Type:** Array. Available in the web user interface.

Data

Data 1: op

Use the COUNT() function for the pk values. For more information about the COUNT() function, follow the instructions in COUNT() (page 367).

- **Value:**

```
[
  {
    "operation": "count",
    "fieldname": "pk",
    "outputname": "count"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Example 1: Count protected virtual machines

A Python snippet that is similar to the following example can be used to invoke an aggregate function that counts virtual machines that are protected by IBM Spectrum Protect Plus.

```
_params = {"action": "aggregate"}

_data = f'''{{
  "op": [
    {{
      "operation": "count",
      "fieldname": "pk",
      "outputname": "count"
    }}
  ]
}}'''

requests.post('https://' + spp_ipv4
              + '/api/endeavour/recovery/hypervisorvm',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
      "_id": null,
      "count": 890
    }
  ]
}
```

Example 2: Count only VMware virtual machines

Add a filter to count only virtual machines that are hosted on VMware vCenter servers.

```
_params = {"action": "aggregate"}

_data = f'''{{
  "op": [
    {{
      "operation": "count",
      "fieldname": "pk",
      "outputname": "count"
    }}
  ],
  "filter": [
    {{
      "op": "=",
      "property": "hypervisorType",
      "value": "vmware"
    }}
  ]
}}'''

requests.post('https://' + spp_ipv4
              + '/api/endeavour/recovery/hypervisorvm',
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
      "_id": null,
      "count": 700
    }
  ]
}
```

Counting protected databases

You can count the databases that are protected by IBM Spectrum Protect Plus.

Method and URI

To count protected databases that are registered with IBM Spectrum Protect Plus, use a POST method and a URI:

```
POST https://{hostname|IP}/api/endeavour/catalog/recovery/applicationdatabase
```

Parameters

Parameter 1: action

Invoke aggregate functions. For more information about aggregate functions, follow the instructions in [Aggregate functions \(page 366\)](#).

- **Value:** aggregate
- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: op

Use the `COUNT()` function for the pk values. For more information about the `COUNT()` function, follow the instructions in [COUNT\(\) \(page 367\)](#).

- **Value:**

```
[
  {
    "operation": "count",
    "fieldname": "pk",
    "outputname": "count"
  }
]
```

- **Type:** Array. Required. Available in the web user interface.

Example: Count protected databases

A Python snippet that is similar to the following example can be used to invoke an aggregate function, `COUNT()`, which counts protected databases registered by IBM Spectrum Protect Plus.

```
_params = {"action": "aggregate"}

_data = f'''{{
  "op": [
    {{
      "operation": "count",
      "fieldname": "pk",
      "outputname": "count"
    }}
  ]
}}'''

requests.post('https://' + spp_ipv4
              + '/api/endeavour/catalog/recovery/applicationdatabase'
              headers={...}, params=_params, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "results": [
    {
```

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```
    "_id": null,  
    "count": 100  
  }  
]  
}
```

Accounts

You can manage users, roles, resource groups, and identities.

User

You can add users, get user information, and delete users.

Getting user information

You can get a list of users and information about each.

Method and URI

To get information about all users, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/user
```

To get information about a specific user, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/user/{userId}
```

Tip: To get a `{userId}` value based on the user name, follow the instructions in Getting a `{userId}` (page 357).

Parameters

None.

Data

None.

Example 1: Get information about all users

In this example, a Python snippet is used to get information about all users:

```
requests.get('https://' + spp_ipv4 + '/api/security/user',  
            headers={...}, data="", verify=...)
```

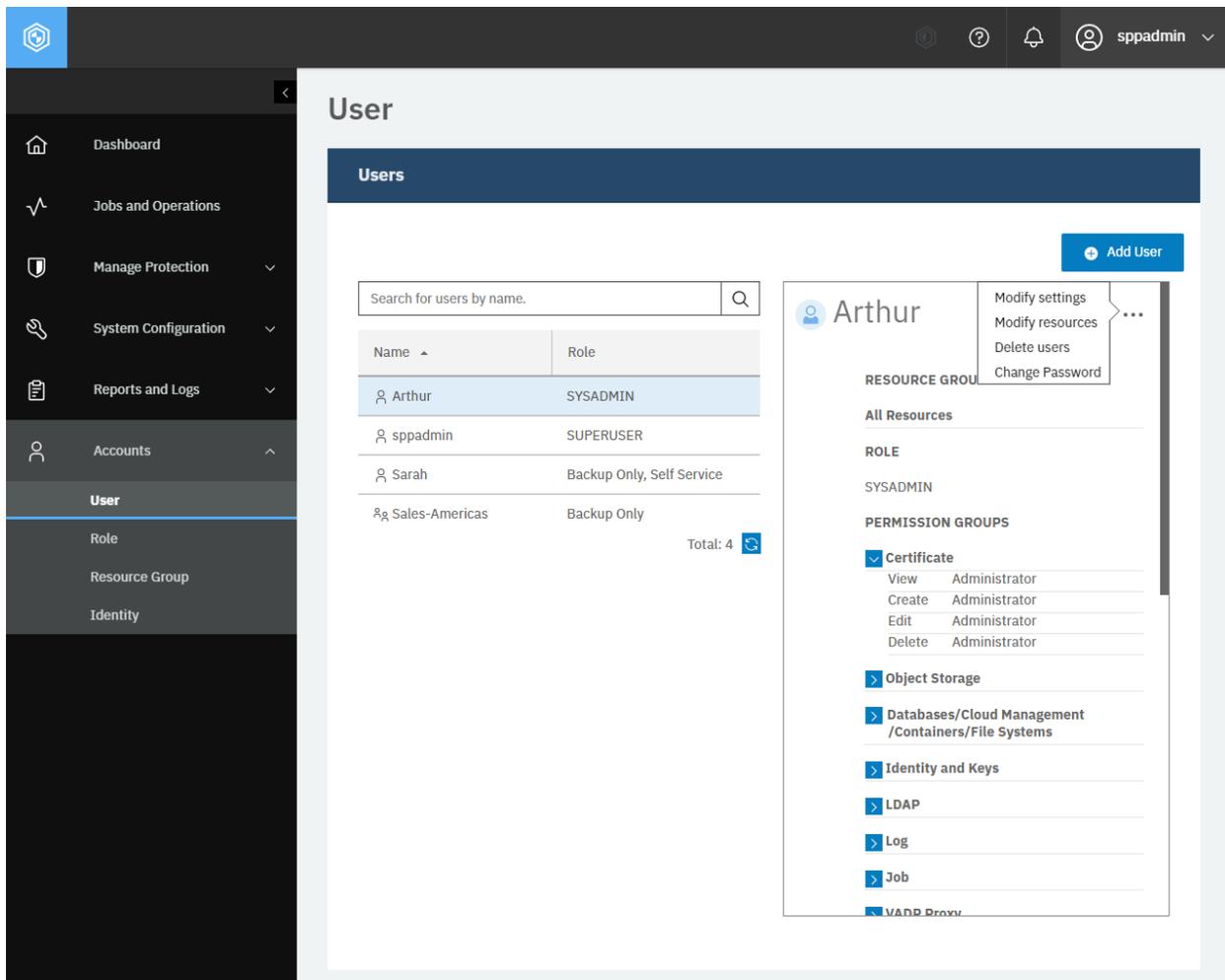


Figure 76: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts** > **User**. In the list, click a user to view details.

This example shows a list of all users. The HTTP status of the response is 200 (OK). The response body below suggests that there are three users: Sarah (userId: 1005), sppadmin (userId: 1000) and Sales_Americas (userId: 1006), which is an LDAP group.

```
{
  "links": {...},
  "total": 3,
  "users": [
    {
      "links": {...},
      "name": "Sarah",
      "type": "NATIVE_USER",
      "typeDisplayName": "Native User",
      "tenantId": 1000,
      "loginCount": 0,
      "lastLogin": null,
      "failedLogin": 0,
      "lastFailedLogin": null,
      "lastPasswordUpdate": 1585007826754,
```

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```
"passwordAge": 0,
"passwordExpiresAt": 0,
"passwordExpired": false,
"accountDisabled": false,
"accountLocked": false,
"rbacPath": "user:0/user:1005",
"permissions": [
  {
    "resourcePool": {
      "links": {...},
      "name": "BlueMachines - Dallas",
      "description": "",
      "total": 0,
      "resources": [
        {
          "metadata": {
            "href_host": "",
            "href_path": "",
            "id": "1001",
            "name": "10.0.0.10",
            "typeTitle": "Hypervisor",
            "path": "Hypervisor:hypervisor/VMware:vmware
↪/vCenters:vcenters/10.0.0.10:1001"
          },
          "include": true,
          "path": "root:0/hypervisor.all:0/hypervisor.type
↪:vmware/hypervisor:1001",
          "displayName": "10.0.0.10"
        },
        {
          "metadata": {
            "href_host": "",
            "href_path": "",
            "id": "all",
            "name": "All",
            "typeTitle": "All",
            "path": "Screen:screen/All:all"
          },
          "include": true,
          "path": "root:0/screen:0",
          "displayName": "All"
        }
      ],
      "rbacPath": "resourcepool:0/resourcepool:1002",
      "id": "1002"
    },
    "roles": [
      {
        "links": {...},
        "name": "Self Service",
        "type": "BUILTIN",
        "description": null,
        "displayName": "Self service",
        "rbacPath": "role:0/role:992",
        "id": "992",
        "virtualresources": [
          {
```

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```
        "links": {...},
        "name": "Policy",
        "permissions": [
          {
            "name": "policy.view",
            "virtualResource": "Policy",
            "displayName": "View",
            "id": "policy.view"
          }
        ],
        "id": "Policy"
      },
      {
        "links": {...},
        "name": "Site",
        "permissions": [...],
        "id": "Site"
      },
      {...}, ..., {...}
    ]
  },
  {
    "links": {...},
    "name": "Backup Only",
    "type": "BUILTIN",
    "description": null,
    "displayName": "Backup only",
    "rbacPath": "role:0/role:994",
    "id": "994",
    "virtualresources": [...]
  }
],
"permissionIds": [],
"roleIds": []
}
],
"id": "1005"
},
{
  "links": {...},
  "name": "sppadmin",
  "type": "NATIVE_USER",
  "typeDisplayName": "Native User",
  "tenantId": 1000,
  "loginCount": 1,
  "lastLogin": 1584468081598,
  "failedLogin": 0,
  "lastFailedLogin": 1584468072009,
  "lastPasswordUpdate": 1574191518133,
  "passwordAge": 0,
  "passwordExpiresAt": 0,
  "passwordExpired": false,
  "accountDisabled": false,
  "accountLocked": false,
  "rbacPath": "user:0/user:1000",
  "permissions": [
    {
```

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```

    "resourcePool": {
      "links": {...},
      "name": "All Resources",
      "description": "Includes every resource in the system. ",
      "total": 0,
      "resources": [
        {
          "metadata": {},
          "include": true,
          "path": "root:0",
          "displayName": "Unknown"
        }
      ],
      "rbacPath": "resourcepool:0/resourcepool:1001",
      "id": "1001"
    },
    "roles": [
      {
        "links": {...},
        "name": "SUPERUSER",
        "type": "BUILTIN",
        "description": null,
        "displayName": "SUPERUSER",
        "rbacPath": "role:0/role:1000",
        "id": "1000",
        "virtualresources": []
      }
    ],
    "permissionIds": [],
    "roleIds": []
  }
},
{
  "links": {...},
  "name": "Sales_Americas",
  "type": "LDAP_GROUP",
  "typeDisplayName": "LDAP Group",
  "tenantId": 1000,
  "loginCount": 0,
  "lastLogin": null,
  "failedLogin": 0,
  "lastFailedLogin": null,
  "lastPasswordUpdate": 1585045976570,
  "passwordAge": 0,
  "passwordExpiresAt": 0,
  "passwordExpired": false,
  "accountDisabled": false,
  "accountLocked": false,
  "rbacPath": "user:0/user:1006",
  "permissions": [...],
  "id": "1006"
},
{...}
]
}

```

Example 2: Get information about a specific user

The following Python snippet can be used to get information about a specific user: Sarah (`{userId}`: 1005).

```
user_id = "1005"

requests.get('https://' + spp_ipv4 + '/api/security/user/' + user_id,
             headers={...}, data="", verify=...)
```

```
{
  links": {...},
  "name": "Sarah",
  "type": "NATIVE_USER",
  "typeDisplayName": "Native User",
  "tenantId": 1000,
  "loginCount": 0,
  "lastLogin": null,
  "failedLogin": 0,
  "lastFailedLogin": null,
  "lastPasswordUpdate": 1585007826754,
  "passwordAge": 0,
  "passwordExpiresAt": 0,
  "passwordExpired": false,
  "accountDisabled": false,
  "accountLocked": false,
  "rbacPath": "user:0/user:1005",
  "permissions": [...],
  "personas": [],
  "id": "1007"
}
```

You can get a similar record if you use a `{userId}` for an LDAP group.

Adding an individual user

You can create an individual user. To register an LDAP group, follow the instructions in [Adding an LDAP server](#) (page 201). To create users that are based on an LDAP group, follow the instructions in [Adding users that are based on an LDAP group](#) (page 296).

Method and URI

To add a user, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/security/user
```

Parameters

None.

Data

Data 1: name

The username of the new user. Do not use root, admin, or test.

- **Example value:** Sarah
- **Type:** String. Required. Available in the web user interface.

Data 2: password

The password of the new user. Use at least 8 characters.

- **Example value:** MyPassw0rd!
- **Type:** String. Required. Available in the web user interface.

Data 3: type

The type of user.

- **Value:** NATIVE_USER
- **Type:** System string. Available in the web user interface.

Data 4: permissions

Define permissions for the new user. Roles define what actions users can take and resource groups define what resources they can access.

- **Example value:** Use the following syntax to specify the roles and the resource groups for the user. You must specify the same roles for all resource groups.

```
[
  {
    "resourcePoolId": {resourcePoolId 1},
    "roleIds": [
      {roleId 1},
      {roleId 2},
      ...
    ]
  }
  {
    "resourcePoolId": {resourcePoolId 2},
    "roleIds": [
      {roleId 1},
      {roleId 2},
      ...
    ]
  },
  ...
]
```

Tip: To get a {roleId} value based on its name, follow the instructions in Getting a {roleId} (page 357). To get the {resourcepoolId} value based on its name, follow the instructions in Getting a {resourcepoolId} (page 358).

- **Type:** Array. Required. Available in the web user interface.

Example: Add a new individual user

Assume that you are an administrator of IBM Spectrum Protect Plus. A new member Sarah has joined your team. You want to create a new individual user for her.

Sarah must have permissions to view all hypervisor objects and some additional resources that are available in the appliance, such as the VMware instances. Sarah must have permissions to start backup jobs manually. But she must not start any other operations.

You can add the following user:

- **Username:** Sarah
- **Password:** MyPassw0rd!
- **Type:** An individual new user
- **Roles to assign:**
 - Backup Only ({roleId} 992)
 - Self Service ({roleId} 994)
- **Resource groups to access:**
 - BlueMachines - Dallas ({resourcepoolId} 1002)
 - Virtualized System All Resource Group ({resourcepoolId} 1000)

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to add the new individual user:

```
_data = f'''{{
  "name":          "Sarah",
  "password":      "MyPassw0rd!",
  "type":          "NATIVE_USER",
  "sourceProvider": null,
  "sourceUser":    null,
  "sourceUserDN": "",
  "permissions":  [
    {{
      "resourcePoolId": "1002",
      "roleIds":        ["992", "994"]
    }},
    {{
      "resourcePoolId": "1000",
      "roleIds":        ["992", "994"]
    }}
  ]
}}'''

requests.post('https://' + spp_ipv4 + '/api/security/user',
             headers={...}, data=_data, verify=...)
```

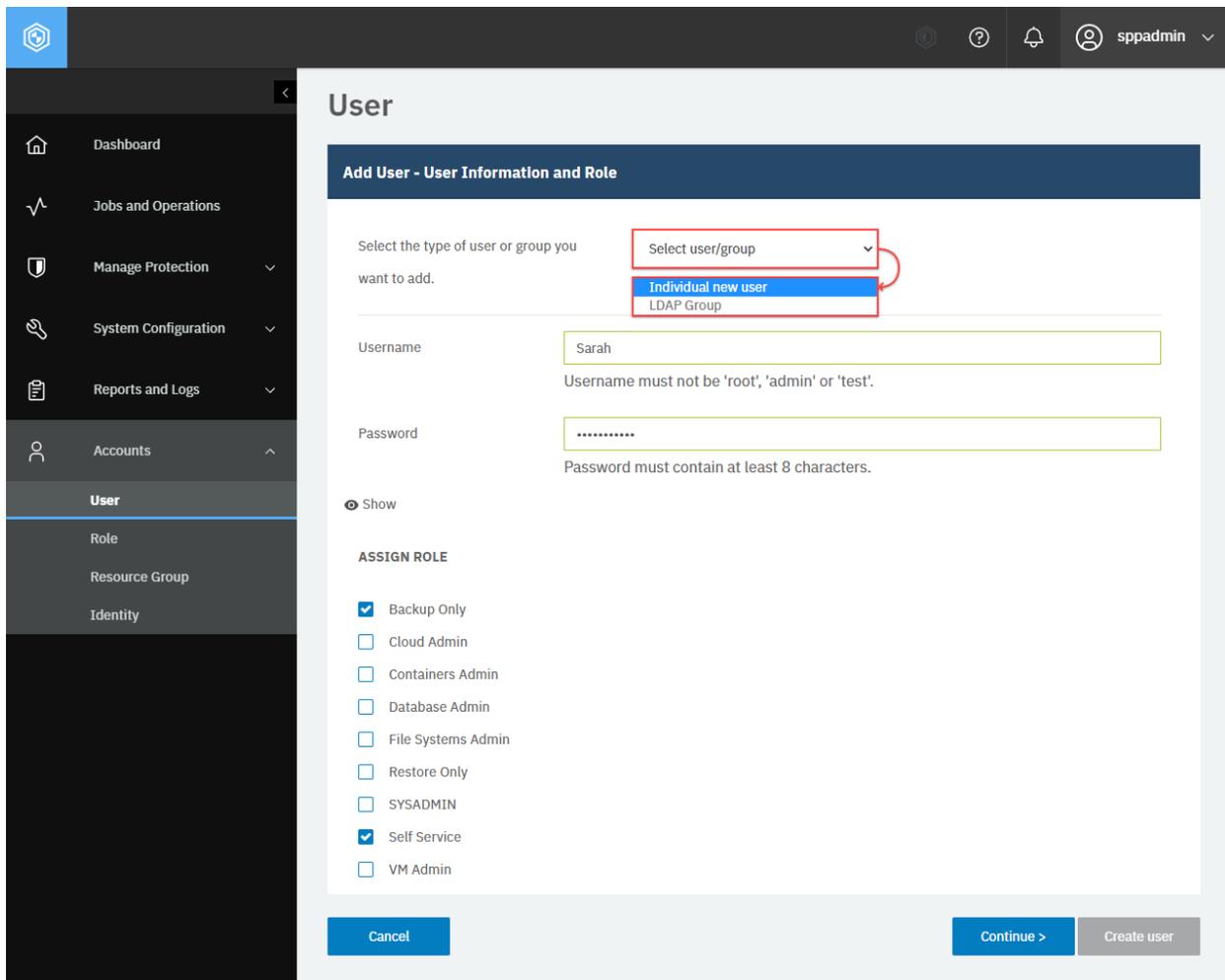


Figure 77: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts > User** and click **Add User**. You proceed to the **Add User - User Information and Role** section. To add an individual user, from the **Select the type of user or group you want to add** list, select **Individual new user**. Enter the username and the password. Select roles for the new user. Click **Continue**.

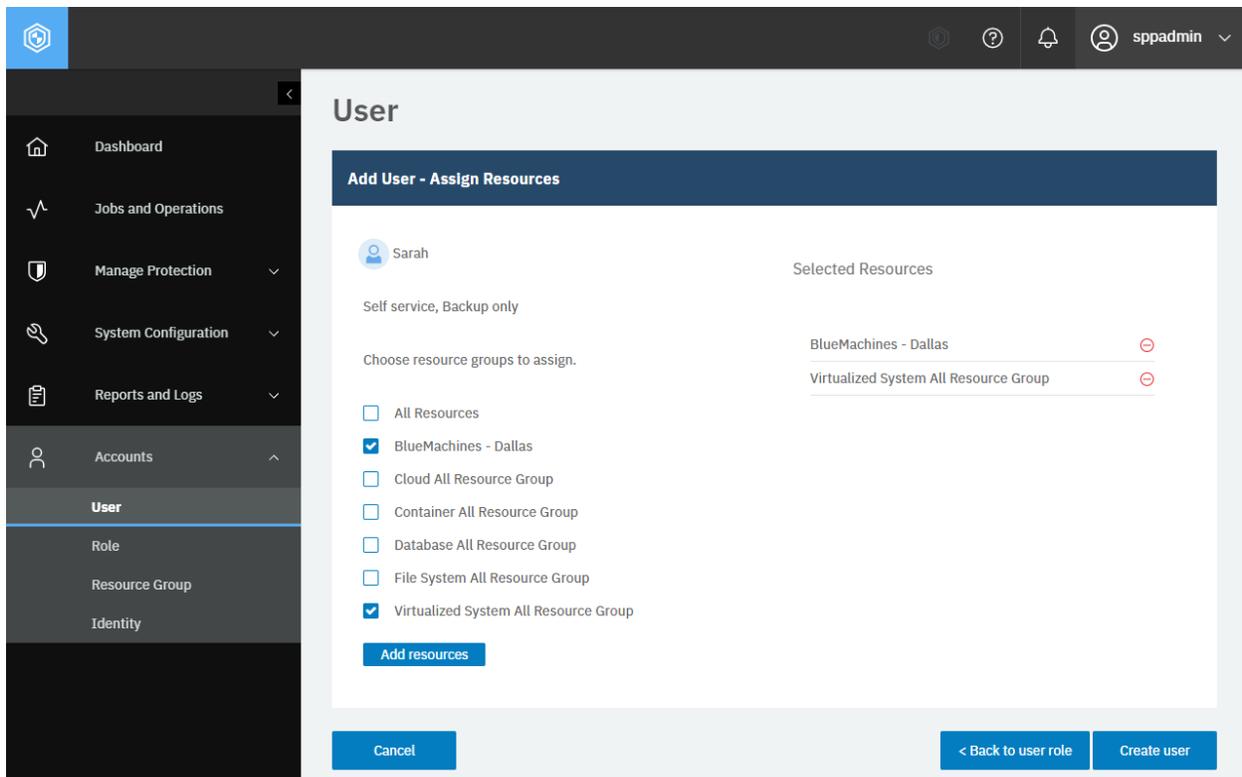


Figure 78: In the **Add User - Assign Resources** section, select resource groups that you want to assign to the new user. Click **Add resources** and click **Create user**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the new user, Sarah, was added. The response body is similar to the JSON object for Sarah, as shown in Getting user information (page 287).

Adding users that are based on an LDAP group

You can create a group of users that are loaded from an LDAP group.

To register an LDAP group, follow the instructions in Adding an LDAP server (page 201). To create an individual user, follow the instructions in Adding an individual user (page 292).

Method and URI

To add a user, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/security/user
```

Parameters

None.

Data

Data 1: name

The CN of the LDAP group.

- **Example value:** Sarah
- **Type:** String. Required. Available in the web user interface.

Data 2: type

The type of user to add.

- **Value:** LDAP_GROUP
- **Type:** System string. Required. Available in the web user interface.

Data 3: sourceProvider

The `{ldapHref}` value of the LDAP server.

Tip: To get an `{ldapHref}` value based on the hostname or the IPv4 address of the LDAP server, follow the instructions in Getting an `{ldapHref}` (page 353).

- **Example value:** `https://10.0.0.111/api/ldap/1012`
- **Type:** System string. Required. Available in the web user interface.

Data 4: sourceUser

The `{ldapUserHref}` value of the LDAP server.

Tip: To get an `{identityUserHref}` value based on the identity name, follow the instructions in Getting an `{identityUserHref}` (page 350).

- **Example value:** `https://10.0.0.111/api/ldap/1011/group/Sales_Americas`
- **Type:** System string. Required. Available in the web user interface.

Data 5: sourceUserDn

The DN of the LDAP user. Use the syntax:

```
CN={CN},{groupRDN},{groupDN}
```

- **Example value:**

```
CN=Sales_Americas,OU=BM,OU=Security Groups,DC=BLUEMACHINES,DC=com.invalid
```

- **Type:** String. Required. Available in the web user interface.

Data 6: permissions

Define permissions for the new user. Roles define what actions users can take and resource groups define what resources they can access.

- **Example value:** Use the following syntax to specify the roles and the resource groups for the user. You must specify the same roles for all resource groups.

```
[
  {
    "resourcePoolId": {resourcePoolId 1},
    "roleIds": [
      {roleId 1},
      {roleId 2},
      ...
    ]
  }
  {
    "resourcePoolId": {resourcePoolId 2},
    "roleIds": [
      {roleId 1},
      {roleId 2},
      ...
    ]
  },
  ...
]
```

Tip: To get a {roleId} value based on its name, follow the instructions in Getting a {roleId} (page 357). To get the {resourcepoolId} value based on its name, follow the instructions in Getting a {resourcepoolId} (page 358).

- **Type:** Array. Required. Available in the web user interface.

Example: Add users based on an LDAP group

Assume that you want to create users based on the following LDAP group in IBM Spectrum Protect Plus:

- **CN:** Sales_Americas
- **Type:** An LDAP group
- **{ldapHref}:** https://10.0.0.111/api/ldap/1011
- **{ldapUserHref}:** https://10.0.0.111/api/ldap/1011/group/Sales_Americas
- **LDAP group search criteria:** CN=Sales_Americas,OU=BM,OU=Security Groups
 - **CN:** Sales_Americas
 - **Group RDN:** OU=BM, OU=Security Groups
 - **Base DN:** DC=BLUEMACHINES,DC=com.invalid
- **Roles to assign:** Backup Only ({roleId} 992)
- **Resource groups to access:** Virtualized System All Resource Group ({resourcepoolId}: 1000)

```
ldap_href = "https://10.0.0.111/api/ldap/1011"
ldap_user_href = "https://10.0.0.111/api/ldap/1011/group/Sales_Americas"

_data = f''''{{
  "name":          "Sales-Americas",
  "type":          "LDAP_GROUP",
  "sourceProvider": "{ldap_href}",
  "sourceUser":    "{ldap_user_href}",
  "sourceUserDN":  "CN=Sales_Americas,OU=BM,OU=Security Groups,"
```

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```
+ "DC=BLUEMACHINES,DC=com.invalid",
"permissions": [
  {
    "resourcePoolId": "1000",
    "roleIds": ["992"]
  }
]
}]'
requests.post('https://' + spp_ipv4 + '/api/security/user',
  headers={...}, data=_data, verify=...)
```

The screenshot shows the IBM Spectrum Protect Plus web user interface. The navigation pane on the left includes 'Dashboard', 'Jobs and Operations', 'Manage Protection', 'System Configuration', 'Reports and Logs', and 'Accounts'. Under 'Accounts', the 'User' section is expanded, showing 'Role', 'Resource Group', and 'Identity'. The main content area is titled 'User' and contains the 'Add User - User Information and Role' form. The form has a dropdown menu for 'LDAP Group' with 'LDAP Group' selected. Below this is a 'SELECT LDAP GROUP' section with a 'Search LDAP' field and a 'View All' link. The 'Group RDN (optional)' field contains 'OU=BM,OU=Security Groups' and the 'Group Name' field contains 'Sales'. A list of 'LDAP Groups' is shown below, with 'Sales_Americas' selected. The 'ASSIGN ROLE' section has checkboxes for 'Backup Only' (checked), 'Cloud Admin', 'Containers Admin', 'Database Admin', and 'File Systems Admin'. At the bottom, there are 'Cancel', 'Continue >', and 'Create user' buttons.

Figure 79: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts** > **User** and click **Add User**. Select **LDAP Group** from the drop-down list. To see a list of all LDAP groups that are registered in IBM Spectrum Protect Plus, click **View All**. To search the LDAP groups, enter search criteria in the **Group RDN (optional)** field or the **Group Name** field, and click the search icon. From the **LDAP groups** list, select an LDAP group to add. In the **ASSIGN ROLE** section, assign roles to the user, and click **Continue**. In the **Add User - Assign Resources** section, assign resource groups to the user, and click **Create user**.

The request prompts a response with the HTTP status of 201 (Created). Review the response to ensure that the LDAP group, Sales_Americas, was added to the list of the users. The response body is similar to the JSON object for Sales_Americas, as shown in Getting user information (page 287).

Modifying settings of users

You can modify user settings, including the user name, roles, and assigned resource groups. Changing the password requires a different type of request. See Changing a user password (page 305).

Method and URI

To update the user {userId}, use a PUT method and a URI:

```
PUT https://{hostname|IP}/api/security/user/{userId}
```

Tip: To get a {userId} value based on the user name, follow the instructions in Getting a {userId} (page 357).

Parameters

None.

Data

You can use the data key-value pairs that are described in Adding an individual user (page 292) or Adding users that are based on an LDAP group (page 296). To update the password of an individual user, follow the instructions in Changing a user password (page 305).

Example 1: Modify settings for an individual user

Assume that you have the following individual user:

- **Username:** Sarah (userId: 1005)
- **Roles:**
 - Backup Only
 - Self Service.
- **Resource groups:**
 - Virtualized System All Resource Group
 - BlueMachines - Dallas

You want to modify these user settings as shown:

- **Name:** Sarah Wiseman
- **Role:** SYSADMIN
- **Resource group:** All Resources

A Python snippet that is similar to the following example can be used to update the individual user settings:

```
user_id = "1005"    # Sarah (an individual user)

_data = f'''{{
  "name":          "Sarah Wiseman",
  "permissions": [
    {{
      "resourcePoolId": "1002",
      "roleIds":        ["1001"]
    }},
    {{
      "resourcePoolId": "1000",
      "roleIds":        ["1001"]
    }}
  ]
}}'''

requests.put('https://' + spp_ipv4 + '/api/security/user/' + user_id,
             headers={...}, data=_data, verify=...)
```

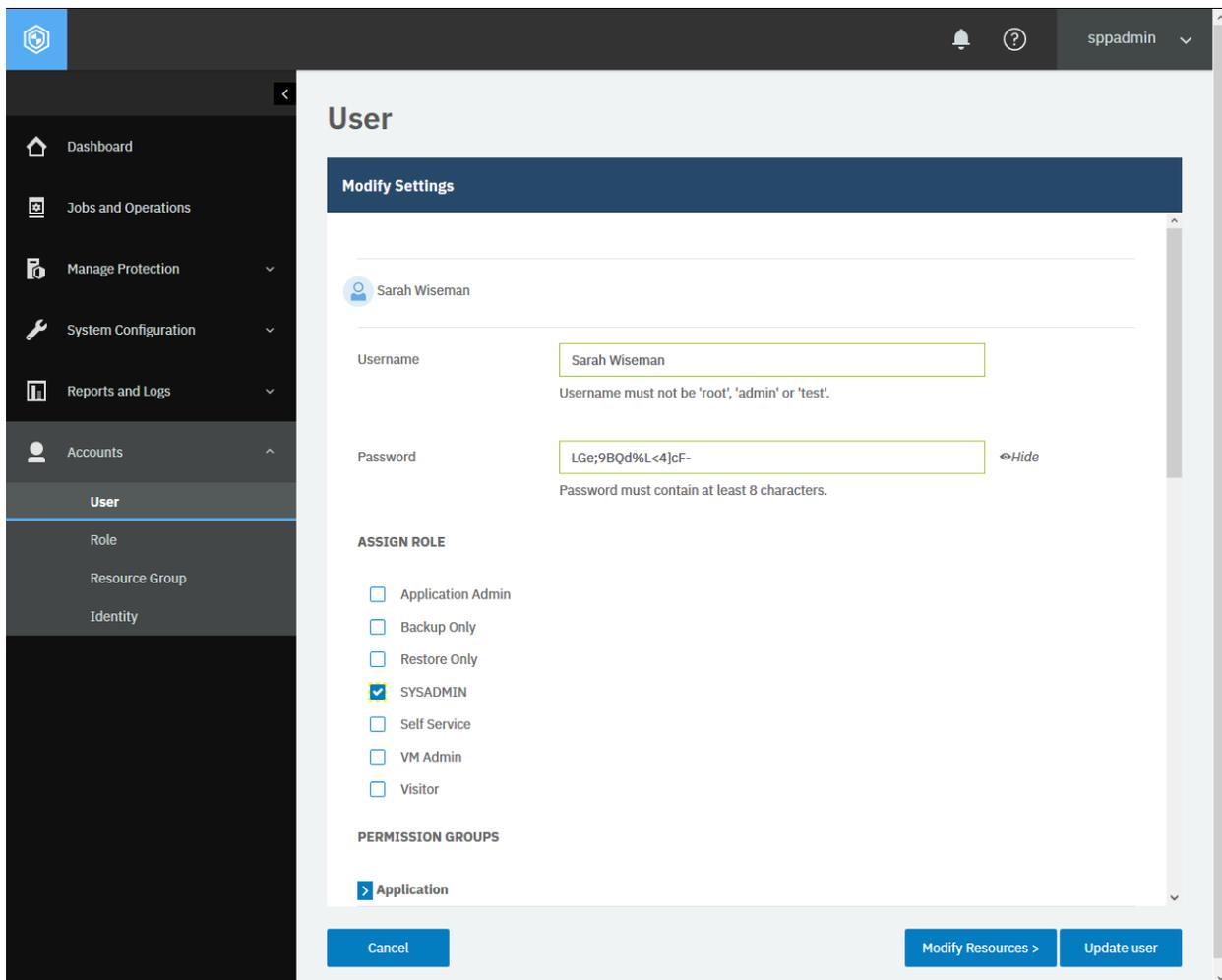


Figure 80: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts > User**, click the user to update from the list, click the ellipsis (...) > **Modify settings**. To update only the resource group of this user, click **Modify resources**.

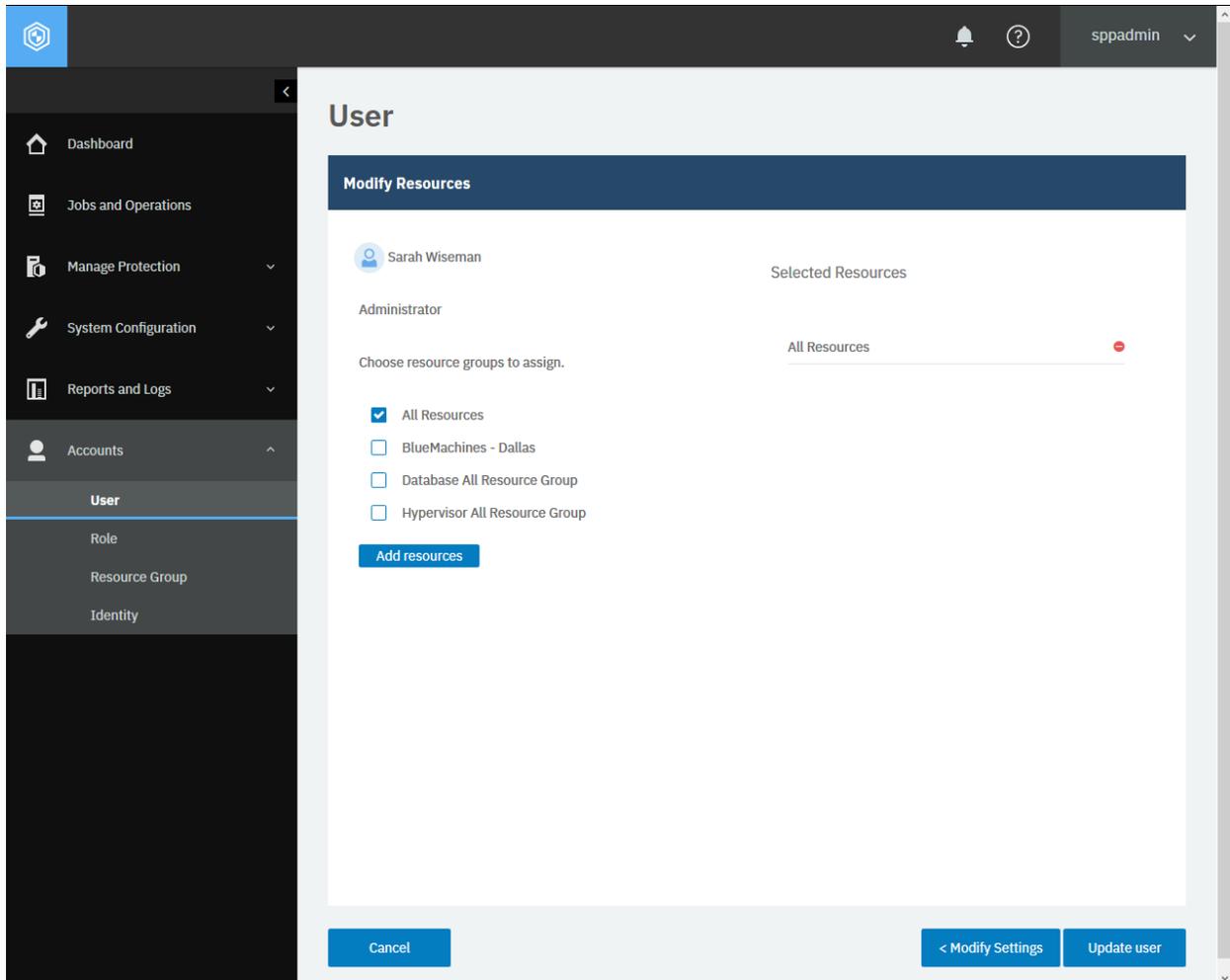


Figure 81: Modifying the resource group settings.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the user is updated.

Example 2: Modify settings of a user that is based on an LDAP group

Assume that you added the user, Sales-Americas (`{userId} 1006`), to IBM Spectrum Protect Plus. The user is based on an LDAP group. You want to modify the settings as below:

- **Role:** SYSADMIN (`{roleId} 1001`)
- **Resource group:** All Resources (`{resourcePoolId} 1001`)

A Python snippet that is similar to the following example can be used to modify the settings of the LDAP group user:

```
user_id = "1006"      # Sales-Americas (an LDAP group)

_data = f'''{{
  "permissions": [
    {{
```

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```
        "resourcePoolId": "1001",  
        "roleIds":      ["1001"]  
    }  
]  
}}''  
  
requests.put('https://' + spp_ipv4 + '/api/security/user/' + user_id,  
            headers={...}, data=_data, verify=...)
```

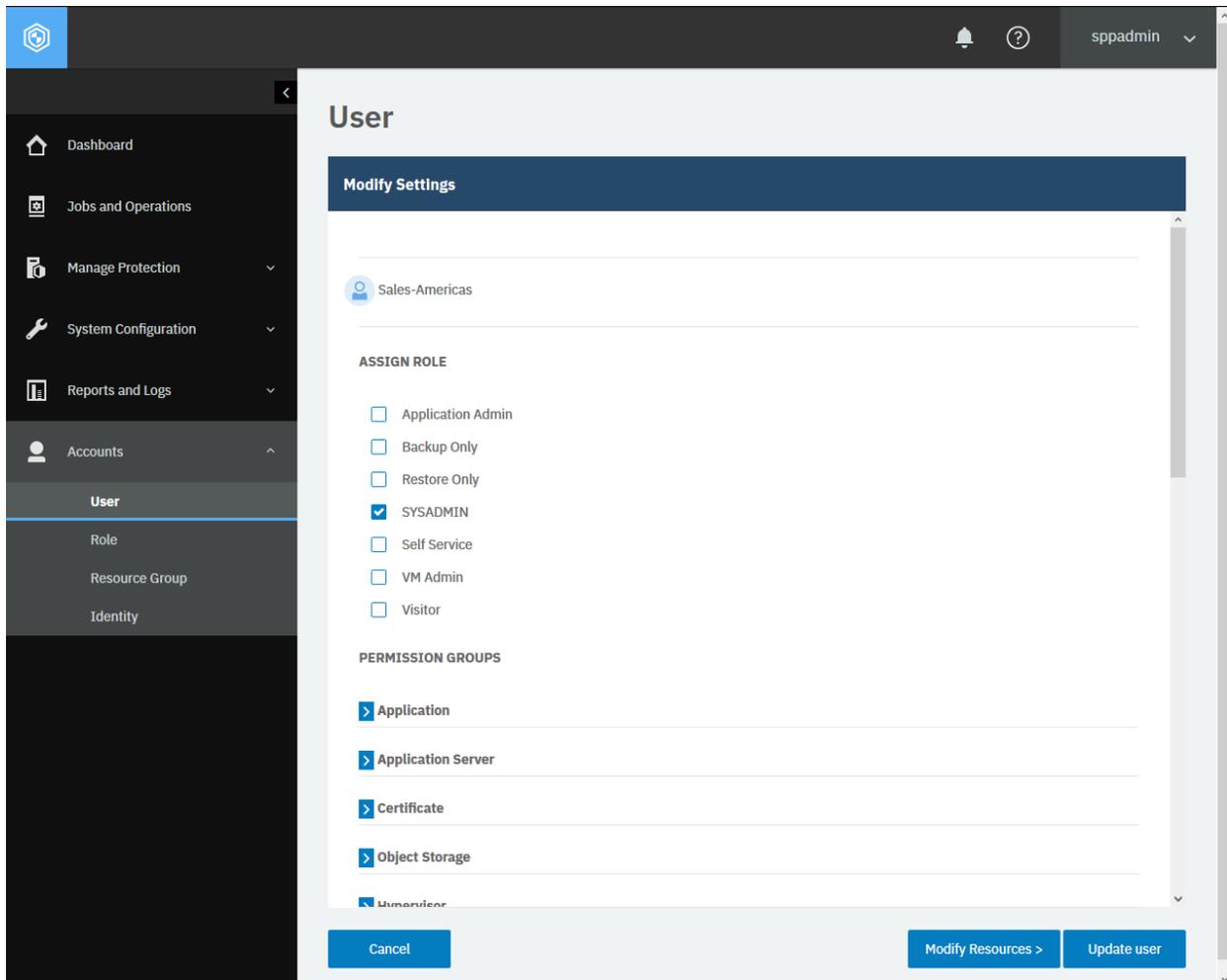


Figure 82: For an LDAP group user, you can modify roles and resource groups.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the user is updated.

Changing a user password

You can change the password of an individual user. To modify other settings of users, follow the instructions in [Modifying settings of users \(page 300\)](#).

Tip: Passwords of users in an LDAP group are usually managed by the LDAP server.

Method and URI

To change the password, use a POST method and a URI:

```
POST https://{hostname|IP}/api/security/user/{userId}
```

This POST request is idempotent.

Tip: To get a `{userId}` value based on the user name, follow the instructions in [Getting a {userId} \(page 357\)](#).

Parameters

Parameter 1: action

Start an action to change the user password.

- **Value:** `changePassword`
- **Type:** System string. Required. Available in the web user interface.

Data

Data 1: newPassword

A new password.

- **Example value:** `LGe;9BQd%L<4]cF-`
- String. Required. Available in the web user interface.

Example: Update the password of an individual user

Assume that you want to change the password of the user Sarah (userId: 1005) from `MyPassw0rd!` to `LGe;9BQd%L<4]cF-`. A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to update the password:

```
user_id = "1005"

_params = {"action": "changePassword"}

_data = f'''{{
    "newPassword": "LGe;9BQd%L<4]cF-"
}}'''
```

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```
requests.put('https://' + spp_ipv4 + '/api/security/user/' + user_id,  
            headers={...}, params=_params, data=_data, verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that the user password is updated. There is no response body. Because this request is idempotent, you may send the same request and receive the same response without making any changes.

Deleting users

You can delete an individual user or remove an LDAP group from the list of users.

If you delete an LDAP server, the LDAP group will be automatically removed from the list of users. For details, follow the instructions in Unregistering an LDAP server (page 206).

Method and URI

To delete a user with a {userId}, the request's method and URI are similar to the following example:

```
DELETE https://{hostname|IPv4}/api/security/user/{userId}
```

Tip: To get a {userId} value based on the user name, follow the instructions in Getting a {userId} (page 357).

Parameters

None.

Data

None.

Example

Assume that you want to delete user Sarah ({userId} 1005). Run the following command:

```
user_id = "1005"  
  
requests.delete('https://' + spp_ipv4 + '/api/security/user/' + user_id,  
               headers={...}, params="", data="", verify=...)
```

After you run the Python snippet, ensure that you get a response with the HTTP status of 204 (No Content) and that you no longer see the user Sarah.

To delete an LDAP group, send a similar request with the {userId} of the LDAP group.

Role

You can get information about roles. You can also add, edit, and delete roles.

Getting role information

You can get a list of roles and information about each.

Method and URI

To get information about all roles, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/role
```

To get information about a specific role, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/role/{roleId}
```

Tip: To get a `{roleId}` value based on its name, follow the instructions in [Getting a {roleId}](#) (page 357).

Parameters

None.

Data

None.

Example 1: Get information about all roles

In this example, a Python snippet is used to get information about all roles:

```
requests.get('https://' + spp_ipv4 + '/api/security/role',  
            headers={...}, data="", verify=...)
```

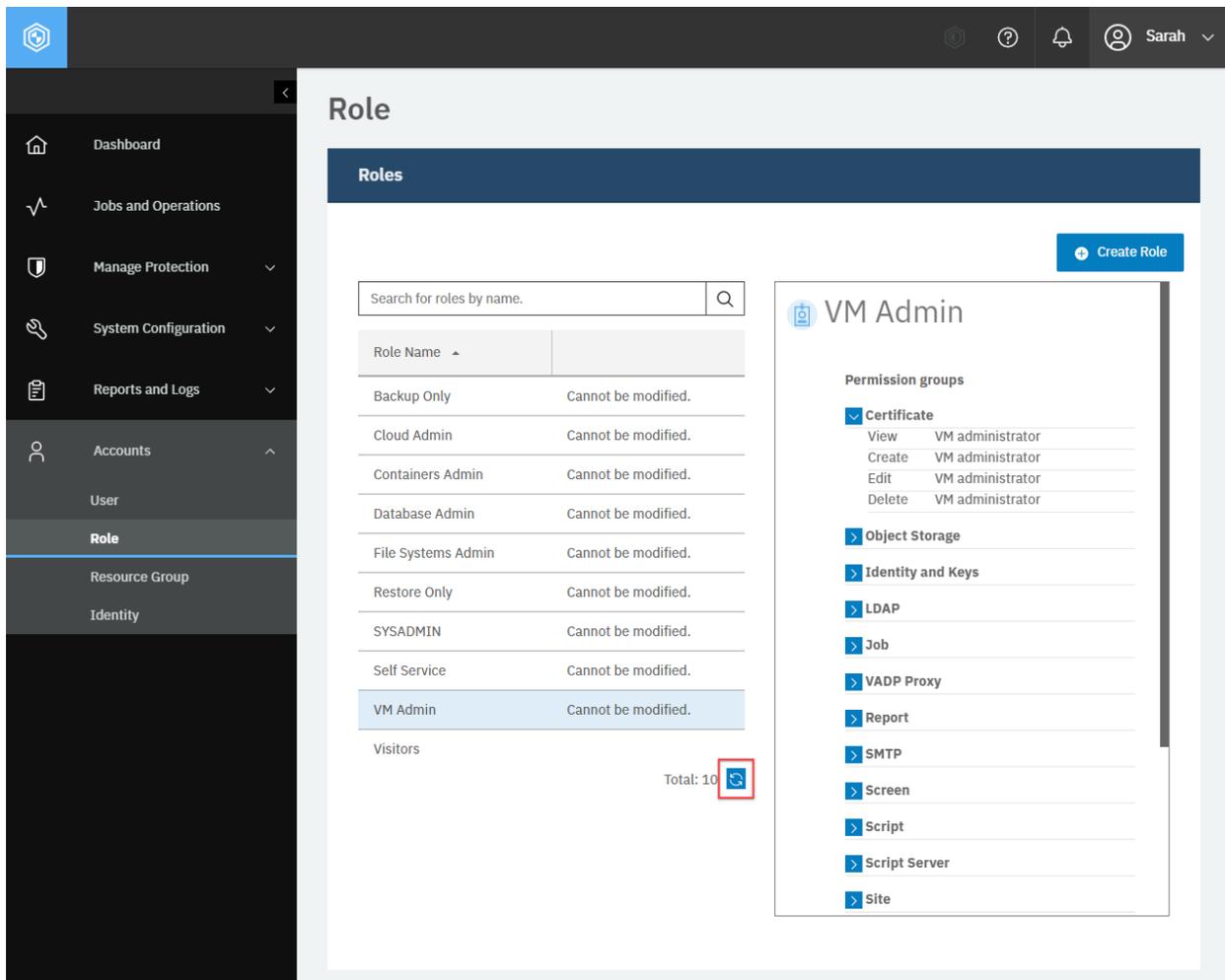


Figure 83: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts > Role**. Then, click the refresh icon.

This example shows a list of roles. The HTTP status of the response is 200 (OK).

```
{
  "links": {...},
  "total": 10,
  "roles": [
    {
      "links": {...},
      "name": "VM Admin",
      "type": "BUILTIN",
      "description": null,
      "displayName": "VM administrator",
      "rbacPath": "role:0/role:997",
      "id": "997",
      "virtualresources": [
        {
          "links": {...},
          "name": "Policy",
          "permissions": [
```

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```
{
  {
    "name": "policy.create",
    "virtualResource": "Policy",
    "displayName": "Create",
    "id": "policy.create"
  },
  {
    "name": "policy.view",
    "virtualResource": "Policy",
    "displayName": "View",
    "id": "policy.view"
  },
  {
    "name": "policy.edit",
    "virtualResource": "Policy",
    "displayName": "Edit",
    "id": "policy.edit"
  },
  {
    "name": "policy.run",
    "virtualResource": "Policy",
    "displayName": "Run",
    "id": "policy.run"
  },
  {
    "name": "policy.delete",
    "virtualResource": "Policy",
    "displayName": "Delete",
    "id": "policy.delete"
  }
],
  "id": "Policy"
},
{
  "links": {...},
  "name": "Site",
  "permissions": [
    {
      "name": "site.view",
      "virtualResource": "Site",
      "displayName": "View",
      "id": "site.view"
    }
  ],
  "id": "Site"
},
{...}, {...}, ..., {...}
]
},
{...}, {...}, ..., {...}
]
}
```

Example 2: Get information about a specific role

In this example, a Python snippet is used to get information about a specific role: VM Admin ({roleId} 1001).

```
role_id = "1001"

requests.get('https://' + spp_ipv4 + '/api/security/role/' + role_id,
            headers={...}, data="", verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "name": "VM Admin",
  "type": "BUILTIN",
  "description": null,
  "displayName": "VM administrator",
  "rbacPath": "role:0/role:997",
  "id": "997",
  "virtualresources": [
    {
      "links": {...},
      "name": "Policy",
      "permissions": [
        {
          "name": "policy.create",
          "virtualResource": "Policy",
          "displayName": "Create",
          "id": "policy.create"
        },
        {...}, {...}, ..., {...}
      ],
      "id": "Policy"
    },
    {
      "links": {...},
      "name": "Site",
      "permissions": [
        {
          "name": "site.view",
          "virtualResource": "Site",
          "displayName": "View",
          "id": "site.view"
        },
        {...}, {...}, ..., {...}
      ],
      "id": "Site"
    },
    {...}, {...}, ..., {...}
  ]
}
```

Creating a role

You can create a new role.

Method and URI

To create a new role, use a POST method and a URI:

```
POST https://{hostname|IPv4}/api/security/role
```

Parameters

None.

Data

Data 1: name

The name of the role.

- **Example value:** Visitor
- **Type:** String. Required. Available in the web user interface.

Data 2: description

The description of the role.

- **Example value:** (None)
- **Type:** String.

Data 3: permissionIds

Specify pairs of a permission group and a permission item to enable. For example, to enable Application Server-View and Job-View, the `permissionIds` key should have the value `["appserver.view", "policy.view"]`. These permission items apply to both the web user interface and the REST API.

Permission group	Key	Available values
Databases / Cloud Management / Containers / File Systems	application	view
Application Server	appserver	register, view, edit, deregister
Certificate	certificate	create, view, edit, delete
Object Storage	cloudprovider	register, view, edit, deregister
Hypervisor	hypervisor	register, view, edit, deregister, options
Identity and Keys	identity	create, view, edit, delete
LDAP	ldap	register, view, edit, deregister
Log	log	view
Job	policy	create, view, edit, run, delete
VADP Proxy	proxy	register, view, edit, deregister
Report	report	create, view, edit, delete
Resource Group	resourcepool	create, view, edit, delete
Role	role	create, view, edit, delete
Script	script	upload, view, edit, delete
Script Server	scriptserver	register, view, edit, deregister
Site	site	create, view, edit, delete
SMTP	smtp	register, view, edit, deregister
Backup Storage	storage	register, view, edit, deregister
SLA Policy	storageprofile	create, view, edit, delete
User	user	create, view, edit, delete

In the REST API, you can toggle the permission to view and use the web user interface. This setting is not available in the **Role** pane of the web user interface.

Permission group	Key	Available values
Web User Interface	screen	view

Tip: Every user may have multiple roles. For example, assume that the user Sarah was associated with two system roles: VM Admin and Application Admin. In this case, she has all permission items for both virtualized systems and application servers.

- **Example value:**

```
[
  "report.create",
  "report.view",
  "report.edit",
  "screen.view"
]
```

- **Type:** Array. Required. Available in the web user interface.

Example 1: Create a role that can view everything

Assume that you want to create a new role Visitor. You want to allow users that are associated with this role to view all permission groups, including Web User Interface. A Python snippet that is similar to the following example can be used to create the role:

```
_data = f'''{{
  "name":      "Visitor",
  "description": "",
  "permissionIds": [
    "application.view",
    "appserver.view",
    "certificate.view",
    "cloudprovider.view",
    "hypervisor.view",
    "identity.view",
    "ldap.view",
    "log.view",
    "policy.view",
    "proxy.view",
    "report.view",
    "resourcepool.view",
    "role.view",
    "screen.view",
    "script.view",
    "scriptserver.view",
    "site.view",
    "smtp.view",
    "storage.view",
    "storageprofile.view",
    "user.view"
  ]
}}'''

requests.post('https://' + spp_ipv4 + '/api/security/role',
             headers={...}, data=_data, verify=...)
```

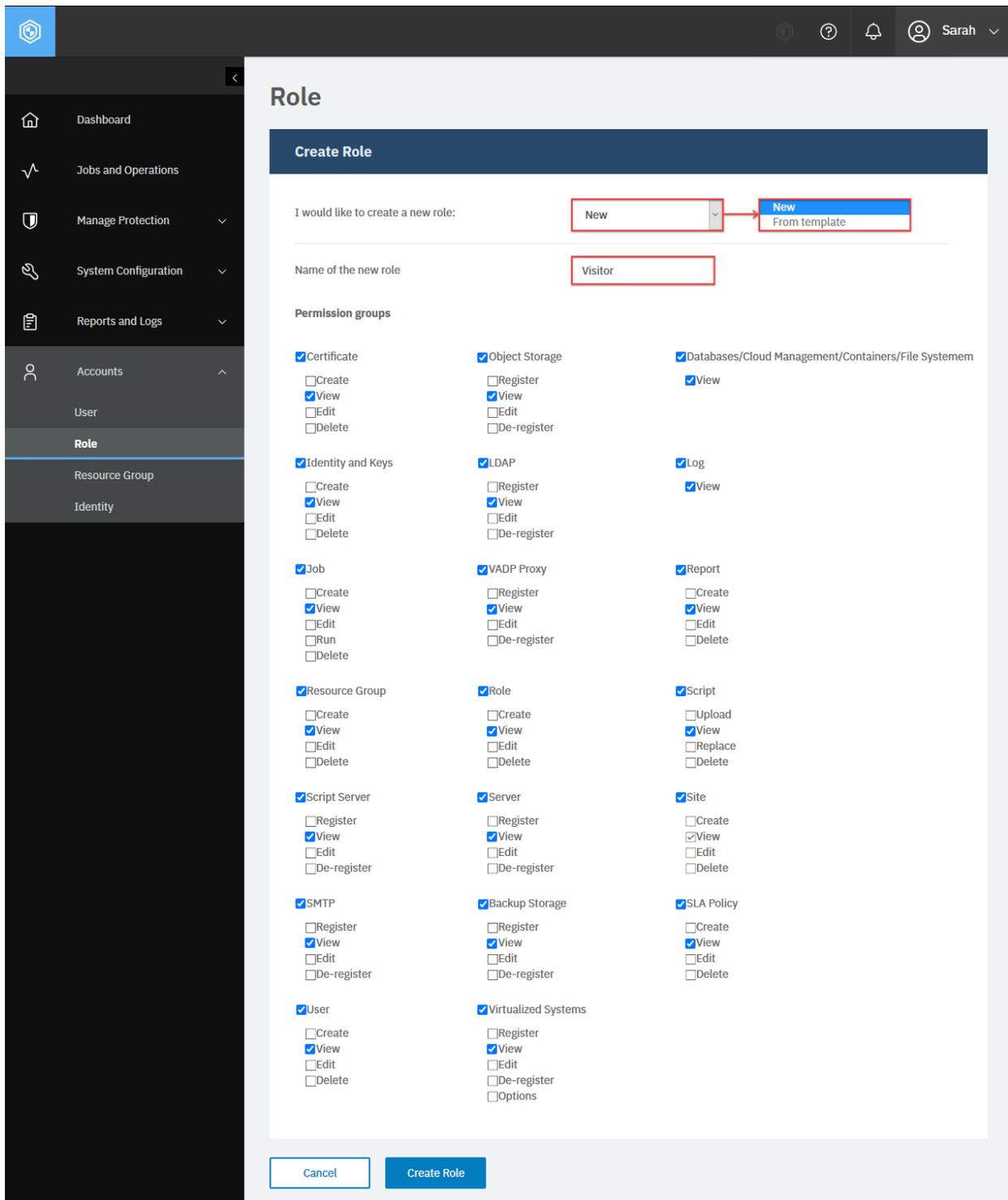


Figure 84: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Role** pane, click **Add Role**. Enter the required fields, specify permission groups, and click **Create Role**.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the role Visitor was added. The response body is similar to the JSON object, as shown in Example 2: Get information about a specific role (page 310).

Example 2: Create a role that is permitted to only use the REST API

Assume that you want to create a role that has all permission items for Site, but the role must not use the web user interface.

As mentioned, revoking the permission to use the web user interface can be done from the REST API only. A Python snippet that is similar to the following example can be used to create such a role:

```
_data = f'''{{
  "name":      "Screen Only",
  "description": "",
  "permissionIds": [
    "site.create",
    "site.view",
    "site.edit",
    "site.delete"
  ]
}}'''

requests.post('https://' + spp_ipv4 + '/api/security/role',
              headers={...}, data=_data, verify=...)
```

If the user Sarah is only associated with this role, she can view, create, edit, and delete sites through the REST API, but she cannot see anything in the web user interface, including the **Site** page.

```

Python Interactive Shell
[1]: import json
import requests

spp_ipv4 = '10.0.0.100' # IBM Spectrum Protect Plus - Dallas
spp_username = 'Sarah'
spp_password = 'MyPassw0rd!'
spp_verify = False # Disable SSL.

from requests.packages.urllib3.exceptions import
InsecureRequestWarning
requests.packages.urllib3.disable_warnings(InsecureRequestWarning)

_response = requests.post('https://' + spp_ipv4
+ '/api/endeavour/session',
auth=(spp_username, spp_password),
headers={
'Accept': 'application/json',
'Content-type': 'application/json'
},
params="", data="", verify=spp_verify)

_response = json.loads(_response.text) # Convert to JSON
_session_id = _response['sessionid']
print(_session_id)

_header={
'X-Endeavour-Sessionid': _session_id,
'Accept': 'application/json',
'Content-type': 'application/json'
}

200
(OK)
afcf8386a93604a999f6d85a0e23cdddf

[2]: _response = requests.get('https://' + spp_ipv4 + '/api/site',
headers=_header, verify=spp_verify)

_response = json.loads(_response.text) # Convert to JSON
print(json.dumps(_response, indent=4))

200
(OK)
{
  "links": {
    "self": {
      "rel": "self",
      "href": "https://10.0.0.100/api/site",
      "hreflang": null,

```

Figure 85: Sarah cannot see anything in the web user interface. However, she can take permitted actions through the REST API.

Editing the configuration of a role

You can edit the configuration of a role.

Method and URI

To edit the configuration of a role, use a PUT method with a URI:

```
PUT https://{hostname|IPv4}/api/security/role/{roleId}
```

Tip: To get a `{roleId}` value based on the role name, follow the instructions in Getting a `{roleId}` (page 357).

Parameters

None.

Data

For information about the available data key-value pairs, follow the instructions in [Creating a role](#) (page 311).

The update request will overwrite key-value pairs in data. Add the permission items that you want to keep in the `permissionIds` list. Any permission item that is not present in the list will be unselected and revoked.

Example: Edit the configuration of a role

Assume that you have a role with View permissions for all permission groups. The `{roleid}` is 1010. You want to modify the following values for this role:

- Rename it `VisitorMod`
- Keep the View permission for all permission groups
- Add the Run permission to Job
 - In the `permissionIds` list, this permission item is represented by `policy.run`.

A Python snippet that is similar to the following example can be used to update the role:

```
role_id = "1010"

_data = f'''{{
    "name":          "VisitorMod",
    "description":   "",
    "permissionIds": [
        "application.view",
        "appserver.view",
        ...,
        "policy.view",
        "policy.run",
        ...
    ]
}}'''

requests.put('https://' + spp_ipv4 + '/api/security/role/' + role_id,
             headers={...}, data=_data, verify=...)
```

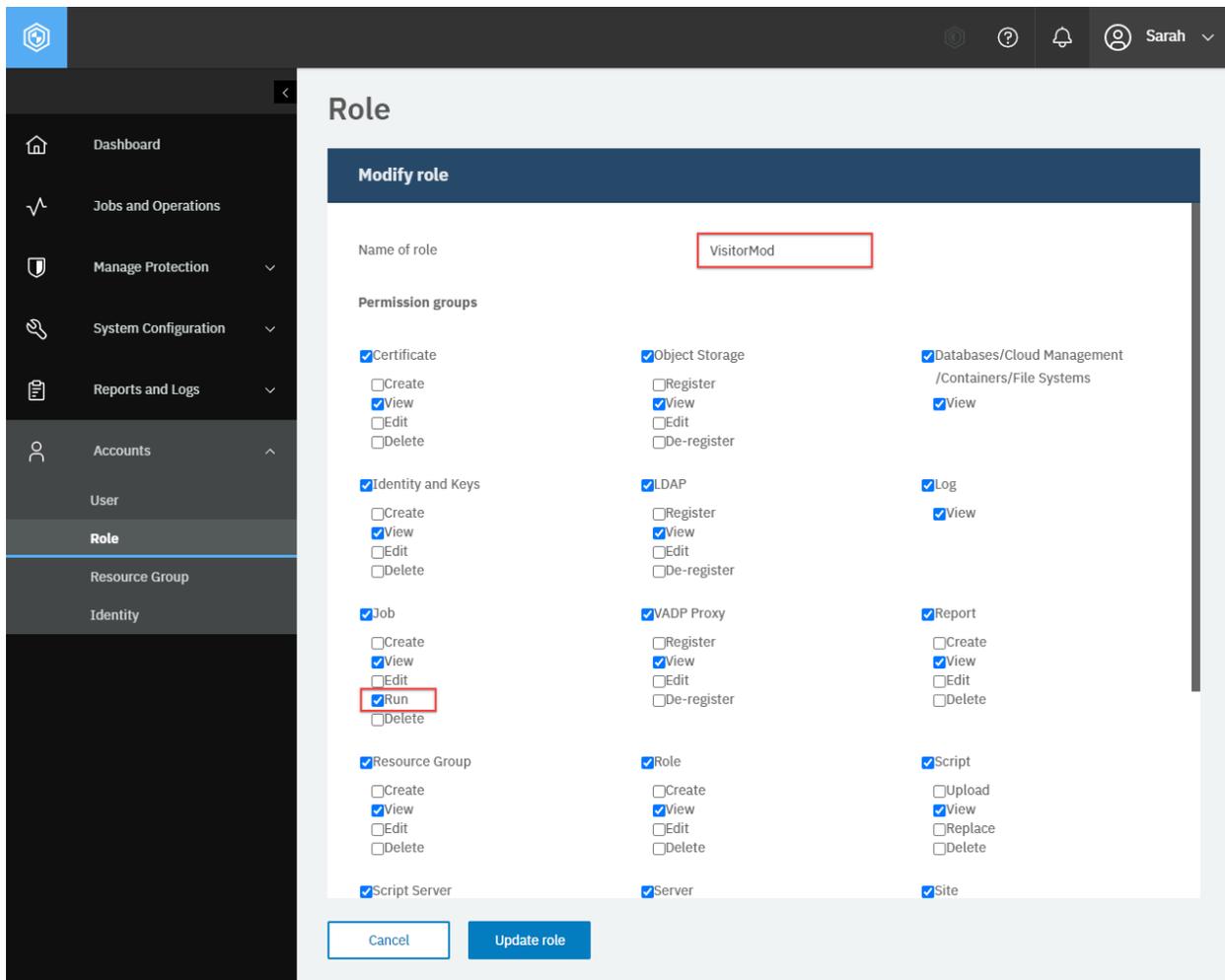


Figure 86: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts** > **Role**, click the custom role that you want to edit, click the ellipsis (...) > **Modify role**. Specify options for a role.

After you run the Python snippet, ensure that you get a response with the HTTP status of 200 (OK) and that the role settings are updated. The response body is similar to the JSON object for Visitor, as shown in Example 2: Get information about a specific role (page 310).

Deleting a role

You can delete a custom role.

Method and URI

To delete a role with `{roleId}`, the request's method and URI are similar to the following example:

```
DELETE https://{hostname|IPv4}/api/security/role/{roleId}
```

Tip: To get a `{roleId}` value based on its name, follow the instructions in [Getting a {roleId}](#) (page 357).

Parameters

None.

Data

None.

Example: Delete a custom role

Assume that you have a role, Visitor (`{roleId}` 1002), and you want to delete it.

A Python snippet that is similar to the following example can be used to delete this role:

```
role_id = "1002"
requests.delete('https://' + spp_ipv4 + '/api/security/role/' + role_id,
                headers={...}, params="", data="", verify=...)
```

You will get a response with the HTTP status of 204 (No Content). Ensure you can no longer see the user Visitor.

Resource Group

You can complete operations for resource groups with the REST API, as described in the following section.

Getting resource group information

You can get a list of resource groups and information about each resource group.

Method and URI

To get information about all resource groups, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/resourcepool
```

To get information about a specific resource group, use a GET method and a URI:

```
GET https://{hostname|IP}/api/security/resourcepool/{resourcepoolId}
```

Tip: To get a `{resourcepoolId}` value based on its name, follow the instructions in [Getting a {resourcepoolId}](#) (page 358).

Parameters

None.

Data

None.

Example 1: Get information about all resource groups

In this example, a Python snippet is used to get information about all resource groups:

```
requests.get('https://' + spp_ipv4 + '/api/security/resourcepool',  
            headers={...}, data="", verify=...)
```

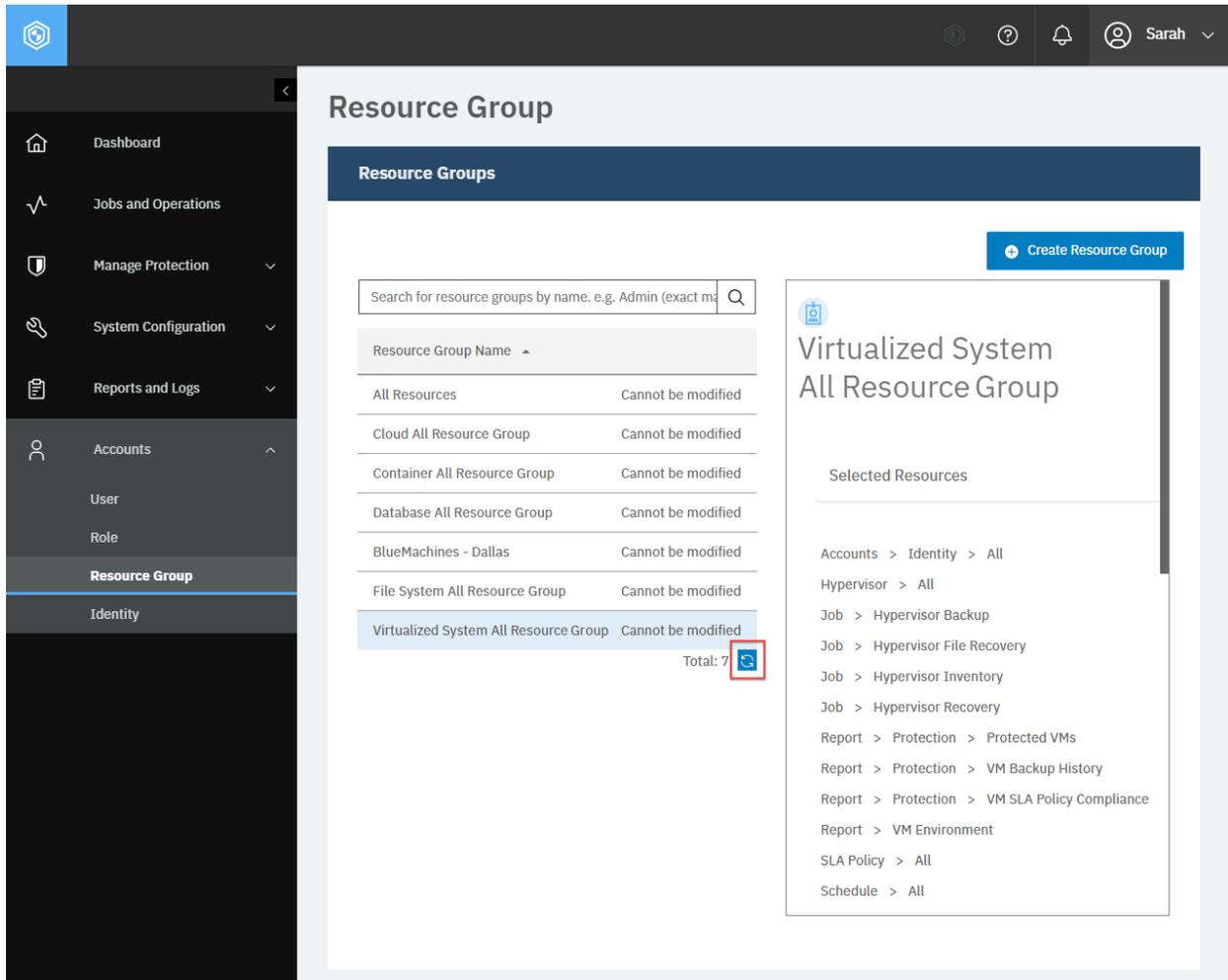


Figure 87: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts > Resource Group** and click **Refresh**.

The response body for the Python snippet displays a list of all resource groups. The HTTP status of the response is 200 (OK). There are four resource groups in the list.

```
{  
  "links": {...},  
  "total": 7,  
  "resourcePools": [  
    {  
      "links": {...},  
      "name": "Virtualized System All Resource Group",  
      "description": "Includes all Hypervisor resources on the system",  
      "total": 0,  
    }  
  ]  
}
```

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```

"resources": [
  {
    "metadata": {
      "path": "Hypervisor/All:0",
      "name": "Hypervisor All",
      "href_host": "http://localhost:8082"
    },
    "include": true,
    "path": "root:0/hypervisor.all:0",
    "displayName": "Hypervisor all"
  },
  {
    "metadata": {
      "path": "System Configuration/VADP Proxy/All:0",
      "name": "VADP proxy All",
      "href_host": "http://localhost:8082"
    },
    "include": true,
    "path": "root:0/proxy:0/proxy.type:vmdkbackup.vadpproxy",
    "displayName": "VADP proxy all"
  },
  {
    "metadata": null,
    "include": true,
    "path": "root:0/policy:0/policytype:serviceprovider.recovery
↪.file",
    "displayName": "Unknown"
  },
  {
    "metadata": {
      "id": "1030",
      "path": "Job/Hypervisor Recovery:1030",
      "name": "Hypervisor Recovery",
      "typeTitle": "Hypervisor Recovery",
      "href_host": "http://localhost:8082",
      "href_path": "/api/endeavour/policy/types/1030"
    },
    "include": true,
    "path": "root:0/policy:0/policytype:serviceprovider.recovery
↪.hypervisor",
    "displayName": "Hypervisor recovery"
  },
  {
    "metadata": {
      "id": "1027",
      "path": "Job/Hypervisor Inventory:1027",
      "name": "Hypervisor Inventory",
      "typeTitle": "Hypervisor Inventory",
      "href_host": "http://localhost:8082",
      "href_path": "/api/endeavour/policy/types/1027"
    },
    "include": true,
    "path": "root:0/policy:0/policytype:serviceprovider.catalog.
↪hypervisor",
    "displayName": "Hypervisor inventory"
  },
  {

```

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```

        "metadata": {
            "id": "1028",
            "path": "Job/Hypervisor Backup:1028",
            "name": "Hypervisor Backup",
            "typeTitle": "Hypervisor Backup",
            "href_host": "http://localhost:8082",
            "href_path": "/api/endeavour/policy/types/1028"
        },
        "include": true,
        "path": "root:0/policy:0/policytype:serviceprovider.protecti
on.hypervisor",
        "displayName": "Hypervisor backup"
    },
    {
        "metadata": {
            "id": "allstorageprofiles",
            "path": "SLA Policy/All:allstorageprofiles",
            "name": "All SLA Policies",
            "typeTitle": "All SLA Policies",
            "href_host": "",
            "href_path": "allstorageprofiles"
        },
        "include": true,
        "path": "root:0/storageprofile:0",
        "displayName": "All SLA policies"
    },
    {
        "metadata": {
            "id": "allscripts",
            "path": "System Configuration/Scripts/All:allscripts",
            "name": "All Scripts",
            "typeTitle": "All Scripts",
            "href_host": "",
            "href_path": "allscripts"
        },
        "include": true,
        "path": "root:0/script:0",
        "displayName": "All scripts"
    },
    {
        "metadata": {
            "id": "allschedules",
            "path": "Schedule/All:allschedules",
            "name": "All Schedules",
            "typeTitle": "All Schedules",
            "href_host": "",
            "href_path": "allschedules"
        },
        "include": true,
        "path": "root:0/trigger:0",
        "displayName": "All schedules"
    },
    {
        "metadata": {
            "id": null,
            "path": "Report/VM Environment",
            "name": "VM Environment",

```

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```
        "category": "",
        "href_host": "http://localhost:8082",
        "href_path": "/api/endeavour/report/categories/VM%20Envi
environment"
      },
      "include": true,
      "path": "root:0/report:0/reportcategory:VMEnvironmentCategor
yName",
      "displayName": "VM environment"
    },
    {
      "metadata": {
        "id": "1014",
        "path": "Report/Protection/VM SLA Policy Compliance",
        "name": "VM SLA Policy Compliance",
        "parentId": "",
        "category": "Protection",
        "href_host": "http://localhost:8082",
        "href_path": "/api/endeavour/report/1014"
      },
      "include": true,
      "path": "root:0/report:0/reportcategory:ProtectionCategoryNa
me/report:1014",
      "displayName": "VM SLA policy compliance"
    },
    {
      "metadata": {
        "id": "1011",
        "path": "Report/Protection/VM Backup History",
        "name": "VM Backup History",
        "parentId": "",
        "category": "Protection",
        "href_host": "http://localhost:8082",
        "href_path": "/api/endeavour/report/1011"
      },
      "include": true,
      "path": "root:0/report:0/reportcategory:ProtectionCategoryNa
me/report:1011",
      "displayName": "VM backup history"
    },
    {
      "metadata": {
        "id": "1002",
        "path": "Report/Protection/Protected VMs",
        "name": "Protected VMs",
        "parentId": "",
        "category": "Protection",
        "href_host": "http://localhost:8082",
        "href_path": "/api/endeavour/report/1002"
      },
      "include": true,
      "path": "root:0/report:0/reportcategory:ProtectionCategoryNa
me/report:1002",
      "displayName": "Protected VMs"
    },
    {
      "metadata": {
```

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```

        "id": "allkeys",
        "path": "System Configuration/Keys/All:allkeys",
        "name": "All Keys",
        "href_host": "",
        "href_path": "allkeys"
    },
    "include": true,
    "path": "root:0/identity:0/identitytype:key:0",
    "displayName": "All keys"
},
{
    "metadata": {
        "id": "allcertificates",
        "path": "System Configuration/Certificates//All:allcertific
ates",
        "name": "All Certificates",
        "href_host": "",
        "href_path": "allcertificates"
    },
    "include": true,
    "path": "root:0/certificate:0",
    "displayName": "All certificates"
},
{
    "metadata": {
        "id": "allcloud",
        "path": "System Configuration/Cloud//All:allcloud",
        "name": "All Cloud",
        "href_host": "",
        "href_path": "allcloud"
    },
    "include": true,
    "path": "root:0/cloud:0",
    "displayName": "All cloud"
},
{
    "metadata": {
        "id": "allcredentials",
        "path": "Accounts/Identity/All:allcredentials",
        "name": "All Identities",
        "href_host": "",
        "href_path": "allcredentials"
    },
    "include": true,
    "path": "root:0/identity:0/identitytype:credential:0",
    "displayName": "All identities"
},
{
    "metadata": {
        "id": "9",
        "name": "Dashboard",
        "path": "Screen/Dashboard:1",
        "href_host": "http://localhost:8082",
        "href_path": "/api/screen/9"
    },
    "include": true,
    "path": "root:0/screen:0/screen:9",

```

```

    "displayName": "Dashboard"
  },
  {
    "metadata": {
      "id": "10",
      "name": "File Restore",
      "path": "Screen/FileRestore:1",
      "href_host": "http://localhost:8082",
      "href_path": "/api/screen/10"
    },
    "include": true,
    "path": "root:0/screen:0/screen:10",
    "displayName": "File restore"
  },
  {
    "metadata": {
      "id": "100",
      "name": "VMware Backup",
      "path": "Screen/VMware Backup:100",
      "href_host": "http://localhost:8082",
      "href_path": "/api/screen/100"
    },
    "include": true,
    "path": "root:0/screen:0/screen:100",
    "displayName": "VMware Backup"
  },
  {
    "metadata": {
      "id": "101",
      "name": "VMware Restore",
      "path": "Screen/VMware Restore:101",
      "href_host": "http://localhost:8082",
      "href_path": "/api/screen/101"
    },
    "include": true,
    "path": "root:0/screen:0/screen:101",
    "displayName": "VMware Restore"
  },
  {
    "metadata": {
      "id": "110",
      "name": "HyperV Backup",
      "path": "Screen/HyperV Backup:110",
      "href_host": "http://localhost:8082",
      "href_path": "/api/screen/110"
    },
    "include": true,
    "path": "root:0/screen:0/screen:110",
    "displayName": "HyperV Backup"
  },
  {
    "metadata": {
      "id": "111",
      "name": "HyperV Restore",
      "path": "Screen/HyperV Restore:111",
      "href_host": "http://localhost:8082",
      "href_path": "/api/screen/111"
    }
  }

```

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```
    },  
    "include": true,  
    "path": "root:0/screen:0/screen:111",  
    "displayName": "HyperV Restore"  
  },  
  },  
  {  
    "metadata": {  
      "id": "13",  
      "name": "SLA Policy",  
      "path": "Screen/Policy Overview:1",  
      "href_host": "http://localhost:8082",  
      "href_path": "/api/screen/13"  
    },  
    "include": true,  
    "path": "root:0/screen:0/screen:13",  
    "displayName": "SLA policy"  
  },  
  },  
  {  
    "metadata": {  
      "id": "14",  
      "name": "Backup Storage",  
      "path": "Screen/BackupStorage:14",  
      "href_host": "http://localhost:8082",  
      "href_path": "/api/screen/14"  
    },  
    "include": true,  
    "path": "root:0/screen:0/screen:14",  
    "displayName": "Backup storage"  
  },  
  },  
  {  
    "metadata": {  
      "id": "5",  
      "name": "Report",  
      "path": "Screen/Reports:5",  
      "href_host": "http://localhost:8082",  
      "href_path": "/api/screen/5"  
    },  
    "include": true,  
    "path": "root:0/screen:0/screen:5",  
    "displayName": "Report"  
  },  
  },  
  {  
    "metadata": {  
      "id": "30",  
      "name": "Identity",  
      "path": "Screen/Identity:30",  
      "href_host": "http://localhost:8082",  
      "href_path": "/api/screen/30"  
    },  
    "include": true,  
    "path": "root:0/screen:0/screen:30",  
    "displayName": "Identity"  
  },  
  },  
  {  
    "metadata": {  
      "id": "31",  
      "name": "Keys and Certificates",
```

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```
        "path": "Screen/Keys and Certificates:30",
        "href_host": "http://localhost:8082",
        "href_path": "/api/screen/31"
    },
    "include": true,
    "path": "root:0/screen:0/screen:31",
    "displayName": "Keys and certificates"
},
{
    "metadata": {
        "id": "site",
        "name": "Site",
        "path": "System Configuration/Site/All:site",
        "href_host": "http://localhost:8082",
        "href_path": ""
    },
    "include": true,
    "path": "root:0/site:0",
    "displayName": "Site"
}
],
"rbacPath": "resourcepool:0/resourcepool:1000",
"id": "1000"
},
{
    "links": {...}
},
"name": "Database All Resource Group",
...,
"rbacPath": "resourcepool:0/resourcepool:999",
"id": "999"
},
{
    "links": {...},
    "name": "All Resources",
    "description": "Includes every resource in the system. ",
    ...,
    "rbacPath": "resourcepool:0/resourcepool:1001",
    "id": "1001"
},
{
    "links": {...},
    "name": "BlueMachines - Dallas",
    "description": "",
    "total": 0,
    "resources": [
        {
            "metadata": {
                "href_host": "",
                "href_path": "",
                "id": "1001",
                "name": "10.0.0.10",
                "typeTitle": "Hypervisor",
                "path": "Hypervisor:hypervisor/VMware:vmware/vCenters:vc
Centers/10.0.0.10:1001"
            },
            "include": true,

```

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```
    "path": "root:0/hypervisor.all:0/hypervisor.type:vmware/hype
    ↵rvisor:1001",
      "displayName": "10.0.0.10"
    },
    {
      "metadata": {
        "href_host": "",
        "href_path": "",
        "id": "all",
        "name": "All",
        "typeTitle": "All",
        "path": "Screen:screen/All:all"
      },
      "include": true,
      "path": "root:0/screen:0",
      "displayName": "All"
    }
  ],
  "rbacPath": "resourcepool:0/resourcepool:1002",
  "id": "1002"
}
]
```

Example 2: Get information about a specific resource group

In this example, a Python snippet is used to get information about a specific resource group: BlueMachines - Dallas (`{resourcepoolId} 1002`).

```
resourcepool_id = "1002"

requests.get('https://' + spp_ip_v4 + '/api/security/resourcepool/'
            + resourcepool_id,
            headers={...}, data="", verify=...)
```

The response will show information about the resource group. The HTTP status of the response is 200 (OK).

Identity

This section discusses how you can manage identities using the REST API. Some features in IBM Spectrum Protect Plus require credentials to access your resources. For example, assume that you want to protect a virtual machine that is hosted on VMware vCenter server. You will need the location and the credential of the vCenter server to grant IBM Spectrum Protect Plus access to the virtual machine. You can create an identity and associate it with the virtual machine. Similarly, you can create identities for Microsoft Windows Servers, IBM Db2 databases, an SMTP server, and so on.

Getting identity information

You can get a list of identities and information for each. Or get information about a specific identity.

Method and URI

To get information about all identities, use a GET method and a URI:

```
GET https://{hostname|IP}/api/identity/user
```

To get information about a specific identity, use a GET method and a URI:

```
GET https://{hostname|IP}/api/identity/user/{identityUserId}
```

Tip: To get an `{identityUserId}` value based on its name, follow the instructions in [Getting an {identityUserId}](#) (page 349).

Parameters

None.

Data

None.

Example 1: Get information about all identities

A Python snippet that is similar to the following example can be used to request a list of all identities and their information.

```
requests.get('https://' + spp_ipv4 + '/api/identity/user',  
            headers={...}, verify=...)
```

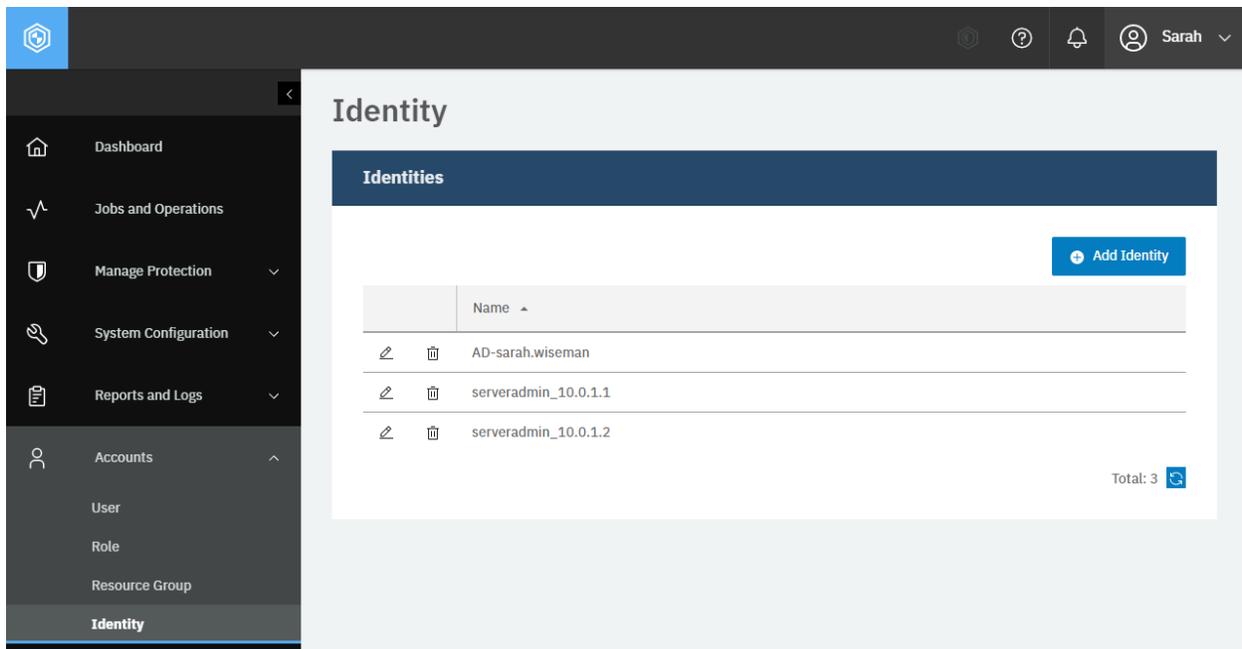


Figure 88: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the navigation pane, click **Accounts > Identity**.

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "total": 3,
  "users": [
    {
      "links": {...},
      "resourceType": "user",
      "id": "2101",
      "name": "sarah-oracle1_10.4.4.1",
      "username": "sarah-oracle1",
      "type": "system",
      "ostype": null,
      "comment": null,
      "keyid": null,
      "realm": null,
      "rbacPath": "root:0/identity:0/identitytype:credential/identitycreden
      tial:2101",
      "password": null
    },
    {
      ...
      "id": "2102",
      "name": "sarah.wiseman@bluemachines.com.invalid_10.0.0.10",
      "username": "sarah.wiseman@bluemachines.com.invalid",
      ...
      "realm": "@bluemachines.com.invalid",
      "rbacPath": "root:0/identity:0/identitytype:credential/identitycreden
      tial:2102",
      ...
    }
  ]
}
```

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```
    },
    {
      ...
      "id": "2104",
      "name": ".\\Administrator_hyperv.dallas.bluemachines.com.invalid",
      "username": ".\\Administrator",
      ...
      "realm": "\\ADMINISTRATOR",
      "rbacPath": "root:0/identity:0/identitytype:credential/identitycreden
↵tial:2104",
      ...
    },
    {
      ...
      "id": "2105",
      "name": "serveradmin_localhost",
      "username": "serveradmin",
      ...
      "realm": null,
      "rbacPath": "root:0/identity:0/identitytype:credential/identitycreden
↵tial:2105",
      ...
    },
    {...}, {...}, ..., {...}
  ]
}
```

Example 2: Get information about a specific identity

Assume that you added an identity, sarah-oracle1_10.4.4.1 ({identityUserId} 2101) to IBM Spectrum Protect Plus.

A Python snippet that is similar to the following example can be used to request information about this identity:

```
identity_user_id = "2101"

requests.get('https://' + spp_ipv4 + '/api/identity/user/' + identity_user_id,
            headers={...}, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 200 (OK).

```
{
  "links": {...},
  "resourceType": "user",
  "id": "2101",
  "name": "sarah-oracle1_10.4.4.1",
  "username": "sarah-oracle1",
  "type": "system",
  "ostype": null,
  "comment": null,
  "keyid": null,
  "realm": null,
  "rbacPath": "root:0/identity:0/identitytype:credential/identitycreden
01",
```

(continues on next page)

```
"password": null
},
```

Adding an identity

You can add a new identity.

Method and URI

To add an identity, use a POST method with a URI:

```
POST https://{hostname|IPv4}/api/identity
```

Parameters

None.

Data

Data 1: name

The name of the identity.

- **Example value:** AD-sarah.wiseman
- **Type:** String. Required. Available in the web user interface.

Data 2: username

The username of the identity.

- **Example value:** sarah.wiseman@bluemachines.com.invalid
- **Type:** String. Required. Available in the web user interface.

Data 3: password

The password of the identity.

- **Example value:** @sw!9*Q7C.V<y-h"
- **Type:** String. Required. Available in the web user interface.

Data 4: ostype

The operating system of the services in which the identity is used.

- **Value** Use LINUX for a credential to log in to a Linux system, or use null otherwise. For example, assume that you register an Oracle Database that is running on a Linux application server with IBM Spectrum Protect Plus. In this case, use LINUX for the application server, and use null for the Oracle Database.
- **Type:** System string or null. Required. Available in the web user interface.

Data 5: comment

An optional comment on the identity.

- **Example value:** Sarah's Active Directory credential.

- **Type:** String.

Example: Add an identity defined by Microsoft Active Directory

Assume that you want to register the following credential, which was created on Microsoft Active Directory:

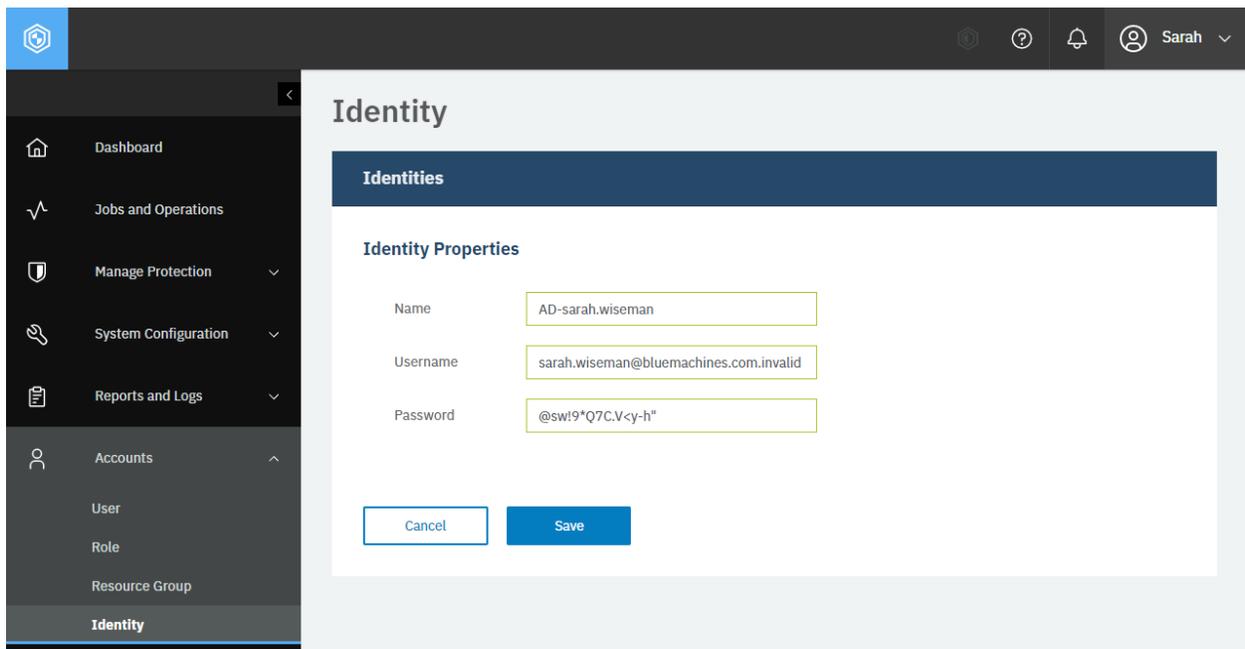
- **Name:** AD-sarah.wiseman
- **Username:** sarah.wiseman@bluemachines.com.invalid
- **Password:** @sw!9*Q7C.V<y-h"
- **Comment:** Sarah's Active Directory credential

A Python snippet that is similar to the following example can be used to register the credential:

```
_data = f'''{{
  "name": "AD-sarah.wiseman",
  "username": "sarah.wiseman@bluemachines.com.invalid",
  "password": "@sw!9*Q7C.V<y-h\\""",
  "ostype": null,
  "comment": "Sarah's Active Directory credential"
}}'''

requests.post('https://' + spp_ipv4 + '/api/identity/user',
  headers={...}, data=_data, verify=...)
```

Tip: To send a double quotation mark in the password value, type two backslashes in the Python f-string and the REST API receives a single backslash followed by the double quotation mark (|").



The screenshot shows the IBM Spectrum Protect Plus web user interface. On the left is a dark sidebar with navigation options: Dashboard, Jobs and Operations, Manage Protection, System Configuration, Reports and Logs, Accounts, User, Role, Resource Group, and Identity. The main content area is titled 'Identity' and contains a form for adding an identity. The form has a header 'Identities' and a section 'Identity Properties' with three input fields: 'Name' (AD-sarah.wiseman), 'Username' (sarah.wiseman@bluemachines.com.invalid), and 'Password' (@sw!9*Q7C.V<y-h"). At the bottom of the form are 'Cancel' and 'Save' buttons.

Figure 89: The same action can be taken in the IBM Spectrum Protect Plus web user interface: In the **Identity** pane, click **Add Identity**. Enter required values in the fields.

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Review the response to ensure that the new identity, AD-sarah.wiseman, was created. The password value is represented by null.

```
{
  "links": {...},
  "resourceType": "user",
  "id": "2101",
  "name": "AD-sarah.wiseman",
  "username": "sarah.wiseman@beluemachines.com.invalid",
  "type": "system",
  "ostype": null,
  "comment": "Sarah's Active Directory credential",
  "keyid": null,
  "realm": "@BELUEMACHINES.COM.INVALID",
  "rbacPath": "root:0/identity:0/identitytype:credential/identitycredential:21
↵33",
  "password": null
}
```

Editing an identity

You can edit an identity.

Method and URI

To update the identity with `{identityUserId}`, use a PUT method and a URI:

```
PUT https://{hostname|IPv4}/api/identity/{identityUserId}
```

Parameters

None.

Data

You can use the data key-value pairs that were described in Adding an identity (page 333).

Example: Update an identity defined by Microsoft Active Directory

Sarah has created an identity based on her own Microsoft Active Directory (AD) credential. Now she wants to use a shared account of the IT team instead:

- **Name:** BlueMachines-AD
- **Username:** AD-BlueMachines\Administrator
- **Password:** =q<gEbbN5G6\$6xAh
- **Comment:** An Active Directory shared credential

A Python snippet that is similar to the following example can be used to update the identity settings. As you see in the password value, `\\` represents the backslash in Python's f-string and `\\` represents a backslash.

```
identity_user_id = "2101"

_data = f'''{{
  "name": "BlueMachines-AD",
  "username": "AD-BlueMachines\\\\\\\\Administrator",
  "password": "=q<gEbbN5G6$6xAh",
  "comment": "An Active Directory shared credential"
}}'''

requests.put('https://' + spp_ipv4 + '/api/identity/user/' + identity_user_id,
             headers={...}, data=_data, verify=...)
```

The request prompts a response that is structured as shown, with the HTTP status of 201 (Created). Ensure the new identity AD-sarah.wiseman has been updated. The password value is represented by null.

```
{
  "links": {...},
  "resourceType": "user",
  "id": "2101",
  "name": "BlueMachines-AD",
  "username": "AD-BlueMachines\\\\Administrator",
  "type": "system",
  "ostype": null,
  "comment": "An Active Directory shared credential",
  "keyid": null,
  "realm": "\\ADMINISTRATOR",
  "rbacPath": "root:0/identity:0/identitytype:credential/identitycredential:21
↵34",
  "password": null
}
```

Deleting an identity

You can delete an identity.

Method and URI

To delete an identity, use a DELETE method and a URI:

```
DELETE https://{hostname|IPv4}/api/identity/user/{identityUserId}
```

Tip: To get an `{identityUserId}` value based on its name, follow the instructions in [Getting an {identityUserId}](#) (page 349).

Parameters

None.

Data

None.

Example: Delete an identity

Assume that you have an identity AD-sarah.wiseman (`{identityUserId} 2101`).

A Python snippet that is similar to the following example can be used to delete the identity:

```
identity_user_id = "2101"      # AD-sarah.wiseman

requests.delete('https://' + spp_ipv4 + '/api/identity/user/'
               + identity_user_id,
               headers={...}, verify=...)
```

Ensure you get a response with the HTTP status of 204 (No Content) and that you no longer see the identity item AD-sarah.wiseman.

Appendix: Additional topics for the REST API

Learn about additional operations that you can complete with the REST API.

Collection resources

For collection resources, you can convert an object name to an ID. This operation might be necessary because the REST API often specifies objects by using their IDs instead of names.

For example, the following POST request can be used to apply an SLA Gold policy to the IBM Spectrum Protect Plus server with object name 10.0.0.100:

```
POST https://10.0.0.100/api/endeavour/job/1000
```

In this POST request, you do not see the SLA policy name, Gold. Instead, you see its ID: 1000. Similarly, the SLA policy Silver usually has the ID of 1001 unless you delete and recreate the policy using the same name. Because you might not know the ID of an SLA policy, you need a function to convert object names into corresponding IDs.

The following Python snippet converts an SLA policy name into its ID. For more information about the `convert_sla()` function, follow the instructions in Getting an {slapolicyId} (page 360).

```
spp_url = "https://10.0.0.100"  
spp_sessionid = "43b3b1b2cc434f4eb1b9df8c99e7866f"  
  
sla_name = "Gold"  
  
sla_id = convert_sla(spp_url, spp_sessionid, sla_name)
```

As shown in the previous example, the following information was required to log in to IBM Spectrum Protect Plus and obtain the SLA policy ID: the IBM Spectrum Protect Plus URL, the session ID, and the target object name, Gold.

In this example, the `convert_sla()` function will return the following ID for the Gold policy:

```
print(sla_id)
```

```
3001
```

Read the available information to learn how the converter functions can be used to convert a wide variety of object names into IDs.

Restriction: Within an object type, use unique object names. For example, all SLA policies should have unique names. Some third-party products support the use of identical names for multiple objects of the same type. For example, Hyper-V Server you can create two virtual machines having the same name in the same path. Avoid using duplicate names in an IBM Spectrum Protect Plus environment.

Application

For the application collection resource, you can use an object value to return another value for the same object.

Getting an {applicationName}

To specify the application, use one of the following system values:

Application	{applicationName}
VMware vCenter	vmware
Hyper-V	hyperv
Amazon EC2	awsec2
Office 365	office365
Db2	db2
Exchange Server	exchange
MongoDB	mongo
Oracle Database	oracle
SQL Server	sql
IBM Spectrum Protect Plus	catalog

Getting an {applicationName}

IBM Spectrum Protect Plus assigns a name {applicationInstanceName} to each application instance on an application server.

The [applicationInstanceName] for instances of Db2, SQL Server, MongoDB, and Exchange Server has the following syntax:

```
{application server FQDN} / {application server name}
```

The [applicationInstanceName] for Oracle Database instances have the following syntax:

```
{application server host name} / {application server name}
```

Example 1: Assume that you installed a Db2 instance, db2americas, on a Linux server, whose FQDN is db2dallas1.bluemachines.com.invalid. The {applicationName} of this Db2 instance is structured as shown:

```
db2dallas1.bluemachines.com.invalid / db2americas
```

Example 2: Assume that you installed an Oracle Database instance, Oracle18cDBHome, on a Linux server, whose hostname is oracle-dallas1. The {applicationName} of this Oracle Database instance is structured as shown:

```
oracle-dallas1 / Oracle18cDBHome
```

Getting an {applicationInstanceId}

IBM Spectrum Protect Plus assigns an ID, {applicationInstanceId}, to each application instance on an application server.

Method and URI: To convert the value of an object for an application server, use a GET method with a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}/instance
```

Path: Response body (JSON) > instances > name & id

Example: Assume that you registered the following Db2 application instance with IBM Spectrum Protect Plus:

- **{applicationName}:** db2
- **{applicationInstanceName}:** db2dallas1.bluemachines.com.invalid / db2americas

A Python snippet that is similar to the following example can be used to return its ID, f794d5b0234ffa5271738a4bd9fbd905:

```
application_name = "db2"
object_name = "db2dallas1.bluemachines.com.invalid / db2americas"

_response = requests.get('https://' + spp_ipv4 + '/api/application/'
    + application_name + '/instance',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['instances']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
f794d5b0234ffa5271738a4bd9fbd905
```

Getting an {applicationDatabaseId}

IBM Spectrum Protect Plus assigns an ID, {applicationDatabaseId}, to each database on an application server.

Method and URI: To convert the value of an object for an application server, use a GET method with a URI:

```
GET https://{hostname|IP}/api/application/{applicationName}
↵/instance
```

Path: Response body (JSON) > instances > name & id

Example: Assume that you registered the following Db2 application instance with IBM Spectrum Protect Plus:

- **{applicationName}:** db2
- **{applicationInstanceId}:** f794d5b0234ffa5271738a4bd9fbd905

A Python snippet that is similar to the following example can be used to return its ID, b91891e551ee0ac0765472ac0e3ba041:

```
application_name = "db2"
application_instance_id = "f794d5b0234ffa5271738a4bd9fbd905"
    # db2dallas1.bluemachines.com.invalid / db2americas

object_name = "db2dallas1.bluemachines.com.invalid / db2americas"

_response = requests.get('https://' + spp_ipv4 + '/api/application/'
    + application_name + '/instance',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['instances']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['links']['self']

print(object_id)
```

```
b91891e551ee0ac0765472ac0e3ba041
```

Getting an {applicationDatabasegroupId} for SQL Server

IBM Spectrum Protect Plus assigns an ID, {applicationDatabasegroupId}, to each AG of SQL Servers.

Method and URI: To convert the value of an object for an application server, use a GET method with a URI:

```
GET    https://{hostname|IP}/api/application/sql/databasegroup
```

Path: Response body (JSON) > databasegroups > name & id

Example: Assume that you registered the following SQL Server instances with IBM Spectrum Protect Plus:

- **Availability group name:** “bluemachines-ag”

A Python snippet that is similar to the following example can be used to return its ID, 372C4D0A-9069-439A-B356-7501A908270B:

```
object_name = "bluemachines-ag"

_response = requests.get('https://' + spp_ipv4 + '/api/application/sql'
    + '/databasegroup',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['databasegroups']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['primaryKey']
```

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```
print(object_id)
```

```
372C4D0A-9069-439A-B356-7501A908270B
```

Cloud

For the cloud collection resource, you can use an object value to return another value for the same object.

Getting a {cloudProviderInfoId}

IBM Spectrum Protect Plus assigns an ID {cloudProviderInfoId} to each object storage server or repository server.

Method and URI: To convert the name of a cloud object storage provider, use a GET method with a URI:

```
GET https://{hostname|IP}/api/cloud
```

Path: Response body (JSON) > clouds > name & id

Example: Assume that you have an object storage server that is named BlueMachines - IBM COS - Singapore. A Python snippet that is similar to the following example can be used to request the {cloudProviderInfoId} of the object storage server, 3:

```
object_name = "BlueMachines - IBM COS - Singapore"

_response = requests.get('https://' + spp_ipv4 + '/api/cloud',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)           # Convert to JSON

_response_json_object = _response_json['clouds']     # Get the specific object

for keys in _response_json_object:
    if keys['name'] == object_name:
        object_id = int(keys['id'])

print(object_id)
```

```
3
```

Getting a {cloudProviderInfoHref}

IBM Spectrum Protect Plus assigns a URL, {cloudProviderInfoHref}, to each object storage server or repository server.

Method and URI: To convert the value of an object for an identity, use a GET method with a URI:

```
GET https://{hostname|IP}/api/cloud
```

Path: Response body (JSON) > clouds > name & href.

Example: Assume that you have an object storage server that is named BlueMachines - IBM COS - Singapore. A Python snippet that is similar to the following example can be used to request the {cloudProviderInfoHref} of the object storage server, https://10.0.0.100/api/cloud/3:

```
object_name = "BlueMachines - IBM COS - Singapore"

_response = requests.get('https://' + spp_ipv4 + '/api/cloud',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)      # Convert to JSON

_response_json_object = _response_json['clouds'] # Get the specific object

for keys in _response_json_object:
    if keys['name'] == object_name:
        object_href = keys['links']['self']['href']

print(object_href)
```

```
https://10.0.0.100/api/cloud/3
```

Hypervisor

For the hypervisor collection resource, you can use an object value to return another value for the same object.

Getting a {hypervisorHypervisorId}

IBM Spectrum Protect Plus assigns an ID, {hypervisorHypervisorId}, to each virtualized system server. The virtualized systems can be associated with vCenter Servers, Hyper-V servers, or Amazon EC2 accounts.

Method and URI: To convert the value of an object for a virtualized system, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/hypervisor/
```

Path: Response body (JSON) > hypervisors > name & id

Example: Assume that you added a vCenter Server instance, 10.0.0.10 (VMware-Dallas), to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {hypervisorHypervisorId} value, 1001:

```
object_name = "10.0.0.10"      # VMware-Dallas

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['hypervisors']

for keys in object_json:
```

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```
if keys['name'] == object_name
    object_id = keys['id']

print(object_id)
```

```
1001
```

Getting a {hypervisorDatacenterId}

In VMware vCenter, every vCenter Server has one or more datacenters. With IBM Spectrum Protect Plus, you can associate SLA policies with datacenters.

Method and URI: To convert the value of an object for a datacenter, use a GET method with a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
    /vmcontent
```

Path: Response body (JSON) > contents > name & id

Example: Assume that you added a vCenter Server, 10.0.0.10 (VMware-Dallas, {hypervisorHypervisorId} 1001), to IBM Spectrum Protect Plus. You have a datacenter, Dallas - Datacenter2. A Python snippet that is similar to the following example can be used to return the datacenter's {hypervisorDatacenterId} value, 76edd18b1d3ce7865bbab693881ab53:

```
hypervisor_hypervisor_id = "1001"      # 10.0.0.10 (VMware-Dallas)
object_name = "Dallas-DataCenter2"

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
    + hypervisor_hypervisor_id + '/vmcontent',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['contents']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
76edd18b1d3ce7865bbab693881ab53
```

Getting a {hypervisorFolderId} for a VMware environment

In an environment that is managed by VMware vCenter Server software, you can create multilevel folders in datacenters. IBM Spectrum Protect Plus assigns an ID, {hypervisorFolderId}, to each VMware folder and subfolder.

Method and URI: To get the ID of the folder in the datacenter folder (the root folder), use a GET method and a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
    /datacenter/{hypervisorDatacenterId}/vmcontent
```

To get the ID of the subfolder in the folder or another subfolder with {hypervisorFolderId}, use a GET method and URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
    /folder/{hypervisorFolderId}/vmcontent
```

Path: Response body (JSON) > contents > name & id

Example: Assume that you added a VMware vCenter Server to IBM Spectrum Protect Plus. The vCenter Server name is 10.0.0.10 (VMware-Dallas) and the {hypervisorHypervisorId} value is 1001. You also have a datacenter that is named Dallas - Datacenter2 with a {hypervisorDatacenterId} value of 76edd18b1d3ce7865bbab693881ab53. In this datacenter, you added a folder, Production. A Python snippet that is similar to the following example can be used to return the {hypervisorFolderId} value, 6c5c1265cb91ca615ec16221fc0befe8:

```
object_name = "Production"

hypervisor_hypervisor_id = "1001"      # 10.0.0.10 (VMware-Dallas)
hypervisor_datacenter_id = "76edd18b1d3ce7865bbab693881ab53"
    # Dallas-DataCenter2

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
    + hypervisor_hypervisor_id + '/datacenter/' + hypervisor_datacenter_id
    + '/vmcontent',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['contents']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
6c5c1265cb91ca615ec16221fc0befe8
```

Assume that you added a subfolder, online-services-subfolder, in the Production folder. A Python snippet that is similar to the following example can be used to return the {hypervisorFolderId} value of this subfolder, 51d0128ff2ece10133fc1e34acbbf86f:

```
object_name = "online-services-subfolder"

hypervisor_hypervisor_id = "1001"      # 10.0.0.10 (VMware-Dallas)
hypervisor_folder_id = "6c5c1265cb91ca615ec16221fc0befe8"    # Production

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
    + hypervisor_hypervisor_id + '/folder/' + hypervisor_folder_id
    + '/vmcontent',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['contents']

for keys in object_json:
    if keys['name'] == object_name:
```

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```
object_id = keys['id']  
  
print(object_id)
```

```
51d0128ff2ece10133fc1e34acbbf86f
```

In a VMware datacenter, you can create nested folders. Folders and subfolders within the hierarchy can have the same names, if the folders or subfolders with matching names have different folder paths. For example, assume that you have a VMware datacenter with folder `New_York`. You cannot create another folder using the same name, `New_York`, because these two folders share the same folder path. By contrast, you can create a subfolder, `New_York`, in the `New_York` folder because the two folders have different paths.



Figure 90: In a VMware datacenter, you can create multiple, nested folders. You can use the same name for multiple folders or subfolders, if the matching folders or subfolders do not share the same path.

Getting a `{hypervisorVmId}`

Every virtual machine on VMware and Microsoft Hyper-V will have an ID, `{hypervisorVmId}`.

Method and URI: To get the ID of the folder in the datacenter folder (the root folder), use a GET method and a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}  
/datacenter/{hypervisorDatacenterId}/vmcontent
```

If the target VMware virtual machine is in a folder or a subfolder, use the following URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}  
/folder/{hypervisorFolderId}/vmcontent
```

To get the ID of the virtual machine that is hosted by Hyper-V or Amazon EC2, use a GET method with a URI:

```
GET https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
```

Path: Response body (JSON) > contents > name & id

Example: Assume that you have a virtual machine, `Service-Dallas`, in a subfolder, `online-services-childfolder`. The value of the `{hypervisorFolderId}` is `7a2ab40929457c84ed9c0e276a19f9ea`. The server name is `10.0.0.10` (VMware - Dallas) and the `{hypervisorHypervisorId}` is `1001`. A Python snippet that is similar to the following example can be used to return the virtual machine's `{hypervisorVmId}` value, `ec44616651cda8b66fec4f7fd0daf554`:

```

object_name = "Service-Dallas"

hypervisor_hypervisor_id = "1001"      # 10.0.0.10 (VMware-Dallas)
hypervisor_folder_id = "7a2ab40929457c84ed9c0e276a19f9ea"
    # online-services-subfolder

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
    + hypervisor_hypervisor_id
    + '/folder' + hypervisor_folder_id
    + '/vmcontent',
    headers=..., data=..., params=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['contents']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)

```

```
ec44616651cda8b66fec4f7fd0daf554
```

Restriction: Do not use the same name for multiple virtual machines hosted on the same Hyper-V Server. With Microsoft Hyper-V, you can have multiple virtual machines sharing the same name in the same Hyper-V Server. Unlike VMware vCenter, Hyper-V does not support folders.

Getting a {hypervisorVdiskId} for a VMware environment

Every hard disk in a VMware virtual machine has an ID, {hypervisorVdiskId}.

Restriction: You can initiate operations for specific hard drives in a VMware vCenter environment, but not in a Microsoft Hyper-V environment or Amazon EC2 environment.

To get the ID of a virtual disk, use the GET method with a URI:

```
GET      https://{hostname|IP}/api/hypervisor/{hypervisorHypervisorId}
        /vm/{hypervisorVmId}/vmcontent
```

Path: Response body (JSON) > contents > name & id

Example: Assume that you want to get the {hypervisorVdiskId} of a hard disk, Hard disk 1, on a VMware virtual machine, Sales-Americas. The virtual machine has a {hypervisorVmId} of ec44616651cda8b66fec4f7fd0daf554. A Python snippet that is similar to the following example can be used to return the {hypervisorVdiskId} value, e738a8a316cc11e8f7f84fa903e3dddc:

```

object_name = "Hard disk 1"

hypervisor_hypervisor_id = "1001"      # 10.0.0.10 (VMware-Dallas)
hypervisor_vm_id = "ec44616651cda8b66fec4f7fd0daf554"    # Sales-Americas

_response = requests.get('https://' + spp_ipv4 + '/api/hypervisor/'
    + hypervisor_hypervisor_id
    + '/vm/' + hypervisor_vm_id
    + '/vmcontent',
    headers=..., data=..., params=..., verify=...)

```

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```
_response_json = json.loads(_response.text)    # Convert to JSON
object_json = _response_json['contents']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
e738a8a316cc11e8f7f84fa903e3dddc
```

Getting a {hypervisorView}

To specify the type of view filter, use one of the following system values:

View filter	{hypervisorView}	VMware	Hyper-V	Amazon EC2
Datastore	storageview	x	x	
Tags	tagview	x		x
Tags and categories	tagcategory	x		
Hosts and clusters	hostcontent	x		

Identity

For the identity collection resource, you can use an object value to return another value for the same object.

Getting an {identityUserId}

IBM Spectrum Protect Plus assigns an ID, {identityUserId}, to each identity.

Method and URI: To convert the value of an object for an identity, use a GET method with a URI:

```
GET    https://{hostname|IP}/api/identity/user
```

Path: Response body (JSON) > users > name & id

Example: Assume that you added an identity, AD-sarah.wiseman, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {identityUserId} value, 2133:

```
object_name = "AD-sarah.wiseman"

_response = requests.get('https://' + spp_ipv4 + '/api/identity/user',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['users']
```

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```
for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

2133

Getting an `{identityUserHref}`

IBM Spectrum Protect Plus assigns a URL, `{identityUserId}`, to each identity.

Method and URI: To convert the value of an object for an identity, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/identity/user
```

Path: Response body (JSON) > keys > name & href.

Example: Assume that you added an identity, AD-sarah.wiseman, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its `{identityKeyHref}` value, `https://10.0.0.100/api/identity/user/2133`:

```
object_name = "AD-sarah.wiseman"

_response = requests.get('https://' + spp_ipv4 + '/api/identity/user',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['users']

for keys in object_json:
    if keys['name'] == object_name:
        object_href = keys['links']['self']['href']

print(object_href)
```

`https://10.0.0.100/api/identity/user/2133`

Getting an `{identityKeyId}`

IBM Spectrum Protect Plus assigns an ID, `{identityKeyId}`, to each access key or SSH key.

Method and URI: To convert the value of an object for an access key or SSH key, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/identity/key
```

Path: Response body > keys > name & id

Example: Assume that you added an access key, BlueMachines IBM COS Dallas Key, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its `{identityKeyId}` value, 1003:

```

object_name = "BlueMachines IBM COS Dallas Key"

_response = requests.get('https://' + spp_ipv4 + '/api/identity/key',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['keys']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)

```

```
1003
```

You can convert an SSH key name into its ID in a similar way.

Getting an {identityKeyHref}

IBM Spectrum Protect Plus assigns a URL, {identityKeyHref}, to each access key or SSH key.

Method and URI: To convert the value of an object for an access key or SSH key, use a GET method with a URI:

```
GET    https://{hostname|IP}/api/identity/key
```

Path: Response body > keys > name & links > self > href.

Example: Assume that you added an access key, BlueMachines IBM COS Dallas Key, to IBM Spectrum Protect Plus. The Python code snippet that is similar to the following example can be used to return its {identityKeyHref} value, https://10.0.0.100/api/identity/key/1003:

```

object_name = "BlueMachines IBM COS Dallas Key"

_response = requests.get('https://' + spp_ipv4 + '/api/identity/key',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['keys']

for keys in object_json:
    if keys['name'] == object_name:
        object_href = keys['links']['self']['href']

print(object_href)

```

```
https://10.0.0.100/api/identity/key/1003
```

You can convert an SSH key name into its URL in a similar way.

Job

For the Job collection resource, you can use an object value to return another value for the same object.

Getting a {jobName}

IBM Spectrum Protect Plus assigns a name, {jobName}, to each scheduled job. Use one of the following policy names:

Scheduled job	Policy name
Maintenance	Maintenance
Storage server inventory	Storage Server Inventory
Application server inventory	Application Server Inventory
Hypervisor inventory	Hypervisor Inventory
Protection	{applicationName}_{slaPolicyName}

For more information about {applicationName}, follow the instructions in Getting an {applicationName} (page 340).

Getting a {jobId}

IBM Spectrum Protect Plus assigns an ID, {jobId}, to each scheduled job.

Method and URI: To convert the value of an object for a scheduled job, use a GET method with a URI:

```
GET https://{hostname|IP}/api/endeavour/job
```

Path: Response body (JSON) > jobs > policyName & id.

Example: Assume that you added an SLA policy, Gold, to IBM Spectrum Protect Plus. Then, you assigned the policy to SQL Server instances. In this case, you must add the prefix “sql_” to the SLA policy name. A Python snippet that is similar to the following example can be used to return its {jobId} value, 1011:

```
object_name = "sql_Gold"

_response = requests.get('https://' + spp_ipv4 + '/api/endeavour/job',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['jobs']

for keys in object_json:
    if keys['policyName'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
1011
```

LDAP

For the LDAP collection resource, you can use an object value to return another value for the same object.

Getting an `{ldapId}`

IBM Spectrum Protect Plus assigns an ID, `{ldapId}`, to each LDAP server.

Method and URI: To convert the value of an object for an LDAP server, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/ldap
```

Path: Response body (JSON) > `ldapServers` > `hostAddress` & `id`

Example: Assume that you added an LDAP server (IPv4 address 10.0.0.111) to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its ID, 1012:

```
object_name = "10.0.0.111"

_response = requests.get('https://' + spp_ipv4 + '/api/ldap',
                        headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['ldapServers']

for keys in object_json:
    if keys['hostAddress'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
1012
```

Getting an `{ldapHref}`

IBM Spectrum Protect Plus assigns a URL `{ldapHref}` to the LDAP server that was registered with IBM Spectrum Protect Plus.

Method and URI: To convert the value of an object for an identity, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/ldap
```

Path: Response body (JSON) > `ldapServers` > `hostAddress` & `links` > `self` > `href`

Example: Assume that you added an LDAP server (IPv4 address 10.0.0.111), to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its `{ldapHref}` value, `https://10.0.0.111/api/ldap/1012`:

```
object_hostAddress = "10.0.0.111"

_response = requests.get('https://' + spp_ipv4 + '/api/ldap',
                        headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON
```

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```
object_json = _response_json['ldapServers']

for keys in object_json:
    if keys['hostAddress'] == object_hostAddress:
        object_href = keys['links']['self']['href']

print(object_href)
```

```
https://10.0.0.111/api/ldap/1012/user/Sales-Americas
```

Getting an `{ldapUserHref}`

IBM Spectrum Protect Plus assigns a URL, `{ldapUserHref}`, to an LDAP server common name.

Method and URI: To convert the value of an object for an identity, use a GET method with a URI:

```
GET https://{hostname|IP}/api/ldap/{ldapId}/user
```

Path: Response body (JSON) > users > cn & links > self > href

Example: Assume that you added the LDAP server (`{ldapId}` 1012) and common name, Sales-Americas, to IBM Spectrum Protect Plus.

A Python snippet that is similar to the following example can be used to return its `{ldapUserHref}` value, `https://10.0.0.111/api/ldap/1012/user/Sales-Americas`:

```
ldapId = "1012"
ldapCn = "Sales-Americas"

_response = requests.get('https://' + spp_ipv4 + '/api/ldap',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['users']

for keys in object_json:
    if keys['cn'] == ldapCn:
        object_href = keys['links']['self']['href']

print(object_href)
```

```
https://10.0.0.111/api/ldap/1012/user/Sales-Americas
```

Report

For the report collection resource, you can use an object value to return another value for the same object.

Getting a `{reportIdStr}`

IBM Spectrum Protect Plus assigns an ID, `{reportIdStr}`, to each predefined report and custom report.

Method and URI: To convert the value of an object for a report, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/endeavour/report/
```

Path: Response body (JSON) > reports > name & id.

Example: Assume that you have a report, `vSnapStorageUtilization-Dallas1`. A Python snippet that is similar to the following example can be used to return its `{reportIdStr}`, 1013:

```
object_name = "vSnapStorageUtilization-Dallas1"

_response = requests.get('https://' + spp_ipv4 + '/api/report',
                        headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['reports']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
1013
```

Getting a `{reportHref}`

IBM Spectrum Protect Plus assigns a URL, `{reportHref}`, to each predefined report and custom report.

Method and URI: To convert the value of an object for a report, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/endeavour/report/
```

Path: Response body (JSON) > reports > name & links > self > href.

Example: Assume that you have a report, `vSnapStorageUtilization-Dallas1`. A Python snippet that is similar to the following example can be used to return its `{reportHref}` value, `https://10.0.0.100/api/endeavour/report/1102`:

```
object_name = "vSnapStorageUtilization-Dallas1"

_response = requests.get('https://' + spp_ipv4 + '/api/report',
                        headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON
```

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```
object_json = _response_json['reports']    # Get the specific object

for keys in object_json:
    if keys['name'] == object_name:
        object_href = keys['links']['self']['href']

print(object_href)
```

```
https://10.0.0.100/api/endeavour/report/1102
```

Getting a {reportRbacpath}

The {reportRbacpath} is the system path of the role-based access control (RBAC) permissions that are assigned to each predefined report and custom report.

Method and URI: To convert the value of an object for a report, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/endeavour/report/
```

Path: Response body (JSON) > reports > name & rbacPath

Example: Assume that you have a report, vSnapStorageUtilization-Dallas1. A Python snippet that is similar to the following example can be used to return its {reportRbacpath} value.

```
object_name = "vSnapStorageUtilization-Dallas1"

_response = requests.get('https://' + spp_ipv4 + '/api/report',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['reports']    # Get the specific object

for keys in object_json:
    if keys['name'] == object_name
        object_value = keys['rbacPath']

print(object_value)
```

```
root:0/report:0/reportcategory:BackupStorageUtilizationCategoryName/report:1102
```

Security

For the security collection resource, you can use an object value to return another value for the same object.

Getting a {userId}

IBM Spectrum Protect Plus assigns an ID, {userId}, to each user.

Method and URI: To convert the value of an object for a user, use a GET method with a URI:

```
GET https://{hostname|IP}/api/security/user
```

Path: Response body (JSON) > users > name & id.

Example: Assume that you added a user, Sarah, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return Sarah's {userId} value, 1001:

```
object_name = "Sarah"

_response = requests.get('https://' + spp_ipv4 + '/api/security/user',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['users']        # Get the specific object

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
1001
```

Getting a {roleId}

IBM Spectrum Protect Plus assigns an ID, {roleId}, to each role.

Method and URI: To convert the value of an object for a role, use a GET method with a URI:

```
GET https://{hostname|IP}/api/security/role
```

Path: Response body (JSON) > roles > name & id.

Example: Assume that you added a role, Visitor, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {roleId} value, 1002:

```
object_name = "Visitor"

_response = requests.get('https://' + spp_ipv4 + '/api/security/role',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

_response_json_object = _response_json['roles']    # Get the specific object

for keys in _response_json_object:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

Getting a {resourcepoolId}

IBM Spectrum Protect Plus assigns an ID, {resourcepoolId}, to each resource group.

Method and URI: To convert the value of an object for a resource group, use a GET method with a URI:

```
GET https://{hostname|IP}/api/security/resourcepool
```

Path: Response body (JSON) > resourcepools > name & id.

Example: Assume that you added a resource group, BlueMachines - Dallas, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {resourcepoolId} value, 1002:

```
object_name = "BlueMachines - Dallas"

_response = requests.get('https://' + spp_ipv4 + '/api/security/resourcepool',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['resourcepools']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

Getting a {certificateId}

IBM Spectrum Protect Plus assigns an ID, {certificateId}, to each certificate.

Method and URI: To convert the value of an object for a certificate, use a GET method with a URI:

```
GET https://{hostname|IP}/api/security/certificate
```

Path: Response body (JSON) > certificates > name & id.

Example: Assume that you added a certificate, BlueMachines - Cert IBM Spectrum Protect, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {certificateId} value, 1286:

```
object_name = "BlueMachines - Cert IBM Spectrum Protect"

_response = requests.get('https://' + spp_ipv4 + '/api/security/certificate',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['certificates']
```

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```
for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
1286
```

Getting a {certificateHref}

IBM Spectrum Protect Plus assigns a URL {certificateHref} to each certificate.

Method and URI: To convert the value of an object for a certificate, use a GET method with a URI:

```
GET https://{hostname|IP}/api/security/certificate
```

Path: Response body (JSON) > certificates > name & links > self > href.

Example: Assume that you added a certificate, “BlueMachines - Cert IBM Spectrum Protect”, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {certificateHref} value:

```
object_name = "BlueMachines - Cert IBM Spectrum Protect"

_response = requests.get('https://' + spp_ipv4 + '/api/security/certificate',
    headers={...}, verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['certificates']

for keys in object_json:
    if keys['name'] == object_name:
        object_href = keys['links']['self']['href']

print(object_href)
```

```
https://10.0.0.100/api/security/certificate/1286
```

Site

For the site collection resource, you can use an object value to return another value for the same object.

Getting a {siteId}

IBM Spectrum Protect Plus assigns an ID, {siteId}, to each site.

Method and URI: To convert the value of an object for a site, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/site
```

Path: Response body (JSON) > sites > name & id.

Example: Assume that you added a site, Singapore, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {siteId} value, 3101:

```
object_name = "Singapore"

_response = requests.get('https://' + spp_ipv4 + '/api/site',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['sites']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
3101
```

SLA policy

For the SLA policy collection resource, you can use an object value to return another value for the same object.

Getting an {slapolicyId}

IBM Spectrum Protect Plus assigns an ID, {slapolicyId}, to each SLA policy.

Method and URI: To convert the value of an object for an SLA policy, use a GET method with a URI:

```
GET      https://{hostname|IP}/ngp/slapolicy
```

Path: Response body (JSON) > slapolicies > name & id.

Example: Assume that you added an SLA policy, Gold, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {slapolicyId} value, 2113:

```
object_name = "Diamond"

_response = requests.get('https://' + spp_ipv4 + '/ngp/slapolicy',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['slapolicies']
```

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```
for keys in object_json:
    if keys['name'] == object_name
        object_id = keys['id']

print(object_id)
```

2113

SMTP

For the SMTP collection resource, you can use an object value to return another value for the same object.

Getting an {smtpId}

IBM Spectrum Protect Plus assigns an ID, {smtpId}, to each SMTP server.

Method and URI: To convert the value of an object for an SMTP server, use a GET method with a URI:

```
GET https://{hostname|IP}/api/smtp
```

Path: Response body (JSON) > smtps > hostAddress & id

Example: Assume that you added an SMTP server (IPv4 address 10.0.0.121) to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {smtpId} value, 1001:

```
object_name = "10.0.0.121"

_response = requests.get('https://' + spp_ipv4 + '/api/smtp',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['smtps']

for keys in object_json:
    if keys['hostAddress'] == object_name:
        object_id = keys['id']

print(object_id)
```

1001

Storage

For the storage collection resource, you can use an object value to return another value for the same object.

Getting a {storageId}

IBM Spectrum Protect Plus assigns an ID, {storageId}, to each storage server.

Method and URI: To convert the value of an object for a storage server, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/storage
```

Path: Response body (JSON) > storages > name & id.

Example: Assume that you added a vSnap server, 10.0.1.1, to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its {storageId} value, 2101:

```
object_name = "10.0.1.1"

_response = requests.get('https://' + spp_ipv4 + '/api/storage',
                        headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['storages']

for keys in object_json:
    if keys['name'] == object_name:
        object_id = keys['id']

print(object_id)
```

```
2101
```

VADP

For the VADP collection resource, you can use an object value to return another value for the same object.

Getting a {vadpId}

IBM Spectrum Protect Plus assigns an ID, {vadpId}, to each VADP proxy.

Method and URI: To convert the value of an object for a VADP proxy, use a GET method with a URI:

```
GET      https://{hostname|IP}/api/vadp
```

Path: Response body (JSON) > vadps > ipAddress & id

Example: Assume that you added a VADP proxy (IPv4 address 10.0.2.1) to IBM Spectrum Protect Plus. A Python snippet that is similar to the following example can be used to return its ID, 2102:

```

object_name = "10.0.2.1"

_response = requests.get('https://' + spp_ipv4 + '/api/vadp',
    headers=..., verify=...)

_response_json = json.loads(_response.text)    # Convert to JSON

object_json = _response_json['vadps']

for keys in object_json:
    if keys['ipAddr'] == object_name:
        object_id = keys['id']

print(object_id)

```

2102

Operation parameters for JSON object output

Most responses from the REST API are nested JSON objects that contain multiple records in the JSON object format. A response can contain hundreds of records.

The REST API has optional operation parameters that transform a JSON object in a response. These functions are similar to those seen in the American National Standards Institute (ANSI) Structured Query Language (SQL), which uses the WHERE clause, the ORDER BY clause, and so on. You can include REST API operation parameters in your HTTP request and receive a response in JSON object format.

Filter

The `filter` parameter filters the JSON objects in a response by retrieving only the JSON objects that satisfy given criteria.

Parameter 1: `filter`

Filters JSON objects. The value is an array, which can include multiple criteria. You will get only the records that meet at least one of the given criteria.

- **Example:** Assume that you want to get records that meet one of the criteria:
 - **Criterion 1:** The value `acknowledged` is equal to `false`.
 - **Criterion 2:** The value `jobId` is one of the items in the list: `["1005", "1014"]`.

```

"filter": [
  {
    "property": "acknowledged",
    "value":    false,
    "op":      "=",
  },
  {
    "property": "jobId",
    "value":    ["1005", "1014"],
    "op":      "IN",
  }
]

```

This operation is equivalent to the following ANSI SQL query:

```
SELECT * FROM table WHERE (acknowledged = 0) OR (value IN ("1005", "1014"))
```

Parameter 1.1: `filter` > List > JSON object > property

The key name of the values to evaluate.

- **Type:** String. Required.

Parameter 1.2: `filter` > List > JSON object > value

The value to compare. The data format must match the property value to evaluate.

- **Type:** Various. Required.

Parameter 1.3: `filter` > List > JSON object > op

The operator to evaluate the criteria.

- **Value:** Use one of the following values:

Value	Description
=	The property is equal to the value.
<	The property is smaller than the value.
>	The property is greater than the value.
IN	The property exists in the set of the value.

- **Type:** System string. Required.

A Python snippet that is similar to the following example can be used to send a request to IBM Spectrum Protect Plus to get alert records that meet the specified criteria:

```
_params = {
    "sort": f'''[
        {{
            "property": "jobId",
            "direction": "ASC"
        }},
        {{
            "property": "first",
            "direction": "DESC"
        }}
    ]'''
}

_response = requests.get('https://' + spp_ipv4
    + '/api/endeavour/alert/message/download/csv',
    headers={...}, params=_params, verify=...)

print(_response.text)
```

Sort

The `sort` parameter sorts records by given object values.

Parameter 1: `sort`

Sorts records. The value is an array, where you can include multiple sort operators.

- **Example:** Assume that you want to sort records by the `jobId` values in ascending order, and then sort records by the `start` values in descending order. You can use the following parameter:

```
"sort": [  
  {  
    "property": "jobId",  
    "direction": "ASC"  
  },  
  {  
    "property": "start",  
    "direction": "DESC"  
  }  
]
```

This operation is equivalent to the following ANSI SQL query:

```
SELECT * FROM table ORDER BY jobId ASC, start DESC
```

- **Type:** List.

Parameter 1.1: `sort > List > JSON object > property`

The value to sort.

- **Type:** String. Required.

Parameter 1.2: `sort > List > JSON object > direction`

The order (ascending or descending) in which to sort records.

- **Value:** Use one of the following values:

Value	Description
DESC	Sort values in descending order (default).
ASC	Sort values in ascending order.

- **Type:** System string.

Pagination

Records in a REST API response are sorted by the `id` values in ascending order, unless you specify the sorting order by using the `sort` function. By default, the REST API splits the response body into sets of 100 records. You can see the next 100 records by specifying the `pageStartIndex` value. Or, you can increase the number of records in each response by specifying the `pageSize` value.

Parameter 1: `pageStartIndex`

The initial record number in the ordered records. The records are numbered 0, 1, 2, and so on. You can specify 0 or any positive integer for the `pageStartIndex` value.

- **Example:** Assume that you want to get records, starting with the 201st record. Each page contains 100 records by default. You can use the following parameter to get the records between the 201st and the 300th:

```
"pageStartIndex": 200
```

This operation is equivalent to the following ANSI SQL query:

```
SELECT * FROM table WHERE id > 200 LIMIT 100
```

- **Type:** Integer.

Parameter 2: pageSize

The number of records on each page. The default value is 100.

- **Example:** Assume that you want to get 500 records in a response. You can use the following parameter:

```
"pageSize": 500
```

This operation is equivalent to the following ANSI SQL query:

```
SELECT * FROM table LIMIT 500
```

- **Type:** Integer.

Aggregate functions

The REST API has aggregate functions. Each aggregate function can receive a set of values for each argument and return a single-value result for a set of input values. These functions are similar to those seen in ANSI SQL queries, which use the COUNT() function, the MAX() function, and so on.

General structure

You can include REST API aggregate functions in your HTTP request and receive a response in JSON object format. The HTTP requests must use the POST method, although the operations are idempotent.

Use the following parameter:

Parameter 1: action

Invoke the aggregate functions.

- **Value:** aggregate
- **Type:** System string. Required.

Data 1: op

Specify the aggregate function, the input values, and the variable name for the output value in the data value. The data value is a JSON array in which you can invoke multiple aggregate functions in a single request.

- **Example value:** The following JSON array shows the typical structure of a data value for invoking multiple aggregate functions:

```
[  
  {  
    "operation": <aggregate function 1>,  
    "fieldname": <input values 1>,  
    "outputname": <output variable name 1>
```

(continues on next page)

```

    },
    {
      "operation": <aggregate function 2>,
      "fieldname": <input values 2>,
      "outputname": <output variable name 2>
    },
    ...
  ]

```

- **Type:** Array.

Data 1.1: op > operation

Specify the aggregate function.

- **Value:** The following values are available:

Aggregate function	operation
COUNT()	count
MAX()	max
SUM()	sum

For more information about the aggregate functions, follow the instructions in :ref:COUNT(), MAX(), and SUM().

- **Type:** System string. Required.

Data 1.2: op > fieldname

The names of the target objects that you want to use for arguments. You can specify one or more target objects.

- **Example value:** pk
- **Type:** String. Required.

Data 1.3: op > outputname

The key name for the output key-value pair.

- **Example value:** countPrimaryKeys
- **Type:** String. Required.

COUNT()

The COUNT() function returns the number of objects.

This operation is equivalent to the following ANSI SQL query:

```
SELECT COUNT(primary_key) FROM table
```

SUM()

The SUM() function returns the sum of a set of numbers.

This operation is equivalent to the following ANSI SQL query:

```
SELECT SUM(transfer_size) FROM table
```

MAX()

The MAX() function returns the maximum value in a set of values in a group.

This operation is equivalent to the following ANSI SQL query:

```
SELECT MAX(transfer_size) FROM table
```

GROUP clause

You can use the `group` clause to divide selected rows into groups such that the rows of each group have matching values in one or more columns or expressions. The `group` clause is equivalent to the `GROUP BY` clause in ANSI SQL.

Data 2: group

Specify a value to apply to the `group` clause.

- **Example value:** ["pk"]
- **Type:** Array.

This operation is equivalent to the following ANSI SQL query:

```
SELECT COUNT(primary_key) FROM table GROUP BY pk
```

Accessibility features for the IBM Spectrum Protect product family

Accessibility features assist users who have a disability, such as restricted mobility or limited vision, to use information technology content successfully.

Overview

The IBM Spectrum Protect family of products includes the following major accessibility features:

- Keyboard-only operation
- Operations that use a screen reader

The IBM Spectrum Protect family of products uses the latest W3C Standard, WAI-ARIA 1.0 (www.w3.org/TR/wai-aria/), to ensure compliance with US Section 508 (www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-section-508-standards/section-508-standards) and Web Content Accessibility Guidelines (WCAG) 2.0 (www.w3.org/TR/WCAG20/). To take advantage of accessibility features, use the latest release of your screen reader and the latest web browser that is supported by the product. The product documentation in IBM Knowledge Center is enabled for accessibility. The accessibility features of IBM Knowledge Center are described in the Accessibility section of the IBM Knowledge Center help (www.ibm.com/support/knowledgecenter/about/releasenotes.html?view=kc#accessibility).

Keyboard navigation

This product uses standard navigation keys.

Interface information

User interfaces do not have content that flashes 2 - 55 times per second.

Web user interfaces rely on cascading style sheets to render content properly and to provide a usable experience. The application provides an equivalent way for low-vision users to use system display settings, including high-contrast mode. You can control font size by using the device or web browser settings.

Web user interfaces include WAI-ARIA navigational landmarks that you can use to quickly navigate to functional areas in the application.

Vendor software

The IBM Spectrum Protect product family includes certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for accessibility information about its products.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service
800-IBM-3383 (800-426-3383)
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Glossary

A glossary is available with terms and definitions for the IBM Spectrum Protect family of products. See the IBM Spectrum Protect glossary.



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