

IBM® Power Systems™ Virtual Servers

*Tutorial: Backing up and restoring
data in an AIX® VM*



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TABLE OF CONTENTS

OVERVIEW	1
Use cases	1
Saving full-system snapshots and restoring the data by using APIs	1
Backing up and restoring full-system or file-level data by using IBM Spectrum Protect	2
Backing up and restoring file-level data from the AIX VM to Cloud Object Storage	2
Required components	2
 SAVING FULL-SYSTEM SNAPSHOTS AND RESTORING THE DATA.....	4
General use information about IBM Power Systems Virtual Servers API use	4
Examples of snapshot, restore, clone APIs for a disk or volume.....	6
 BACKING UP AND RESTORING A FULL-SYSTEM NATIVE AIX VM IMAGE BY USING IBM SPECTRUM PROTECT .	11
Step 1: Creating a Linux VSI for staging	11
Step 2: Creating a Cloud Object Storage bucket.....	15
Step 3: Configuring s3fs-fuse in the Linux VSI	18

Step 4: Creating and exporting the staging file system	22
Step 5: Mounting the staging file system and backing up AIX VSI	25
Step 6: Restoring the mksysb backup image to a new VSI.....	29
Step 7: Cleaning up after a mksysb restore operation	32

BACKING UP AND RESTORING FILE-LEVEL DATA FROM THE AIX VM TO CLOUD OBJECT STORAGE..... 35

Step 1: Creating a Linux VSI and installing IBM Spectrum Protect	35
Step 2: Configuring the Linux VSI for IBM Spectrum Protect	43
Step 3: Configuring IBM Spectrum Protect server	46
Step 4: Configuring Cloud Object Storage	56
Step 5: Connecting Spectrum Protect to Cloud Object Storage	60
Step 6: Configuring Spectrum Protect server to back up an AIX client	70
Step 7: Configuring IBM Spectrum Protect client in AIX.....	73
Step 8: Backing up an AIX client and validating the backup operation	79

NOTICES..... 83

Privacy policy considerations.....	85
Trademarks	86

Overview

A key client expectation of [IBM® Power Systems™ Virtual Servers](#) is the ability to deploy a similar backup strategy as the one they use on-premise for their AIX® workloads. Most clients employ a strategy of weekly or monthly full-system backup operations, combined with more frequent filesystem or file-level backup operations.

Power Systems Virtual Servers provide AIX clients with similar capabilities. However, **the method and interfaces in Power Systems Virtual Server are somewhat different** from those on-premise.

This tutorial will provide step-by-step instructions for performing full-system or file-level backup operations in AIX virtual machines in three common scenarios.

Use cases

Depending upon your requirements to back up and restore the AIX VM data and depending on the components that you are working with, choose one of the following options:

Saving full-system snapshots and restoring the data by using APIs

In this case, we will provide examples of how to use the new snapshot and restore application programming interfaces (APIs) to perform full-system image backup operations.

Backing up and restoring full-system or file-level data by using IBM Spectrum Protect

Here, we will demonstrate how to perform full-system and file-level save and restore operations by using the IBM Spectrum Protect (formerly Tivoli Storage Manager) server and IBM Cloud Object Storage (COS).

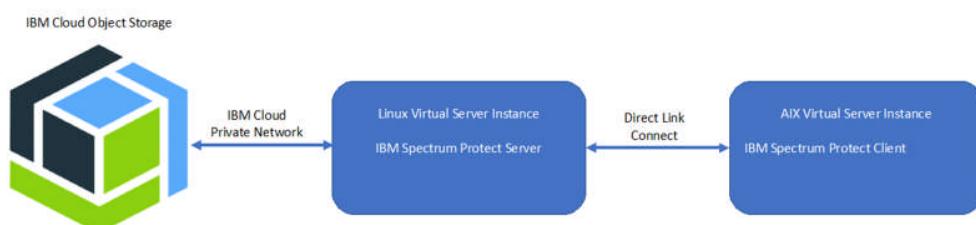
Backing up and restoring file-level data from the AIX VM to Cloud Object Storage

Lastly, we will show how to perform file-level save and restore operations from an AIX virtual server instance (VSI) directly to and from COS.

Required components

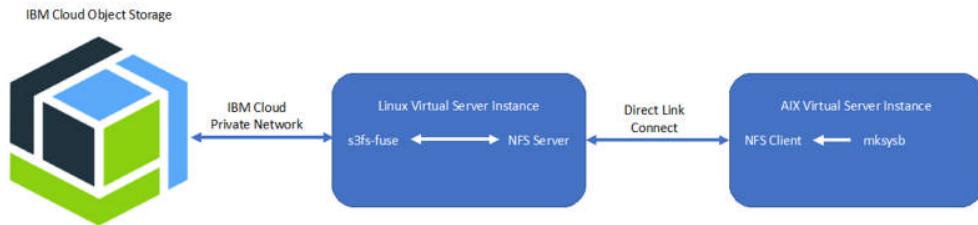
A **full-system native save and restore operation** requires the following components:

- *AIX virtual server instance*
- *IBM Cloud Direct Link Connect*
- *Linux virtual server instance*
- *IBM Cloud Object Storage service*
- *IBM Spectrum Protect server for Linux*
- *IBM Spectrum Protect client for AIX*



A **file-level save and restore operation** requires the following components:

- *AIX virtual server instance*
- *IBM Cloud Direct Link Connect*
- *Linux virtual server instance*
- *Cloud Object Storage service*
- *s3fs-fuse storage driver for Linux*
- *Network File System (NFS) server for Linux*
- *NFS client for AIX*
- *mksysb for AIX*

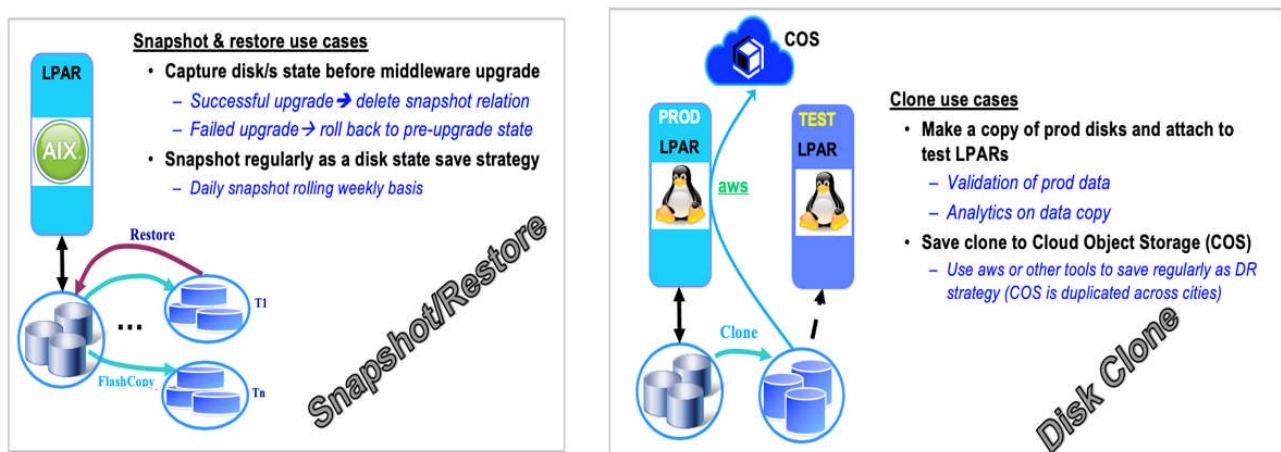


The full-system and file-level save and restore use cases require a Linux virtual server instance on IBM Cloud to facilitate private network access to Cloud Object Storage and a Direct Link Connect connection between the IBM Cloud services and the Power Systems Virtual Server service.

Saving full-system snapshots and restoring the data

The Power Systems Virtual Server offering can perform snapshot, restore, and clone operations of the Power Systems Virtual Server instances. Currently, the snapshot and restore capability is available only by using the API.

Power Systems Virtual Servers: snapshot, clone API use cases



General use information about IBM Power Systems Virtual Servers API use

Following example or sample code show how to use IBM Cloud API. Following sample focuses on use of VM shutdown and similar operations. This sample must be modified to perform any snapshot or restore operations.

```
#!/bin/bash
```

```
### START OF VARIABLES
API_KEY="ENTER YOUR API KEY HERE"
CLOUD_CRN="ENTER YOUR CLOUD CRN"
```

```

INSTANCE_NAME="ENTER YOUR INSTANCE NAME"
## Acceptable values are stop, start, hard-reboot, soft-reboot
OPERATION="stop"

#####
IFS=: read -ra ADDR <<< "${CLOUD_CRN}"
CLOUD_INSTANCE_ID=${ADDR[7]}
CLOUD_URL=(${ADDR[5]}.power-iaas.cloud.ibm.com)

## FIRST WE GET THE TOKEN FROM THE CLOUD IAM SERVICE USING THE API KEY

GET_TOKEN=$(curl -X POST -H "Content-Type: application/x-www-form-urlencoded" -H "Accept: application/json" -d "grant_type=urn%3Aibm%3Aparams%3Aoauth%3Agrant-type%3Aapikey&apikey=$API_KEY" https://iam.bluemix.net/oidc/token | jq -r '.access_token')

## THIS IS THE POST CALL TO INVOKE the OPERATION
curl -X POST https://\$CLOUD\_URL/pcloud/v1/cloud-instances/\$CLOUD\_INSTANCE\_ID/pvm-instances/\$INSTANCENAME/action -H "CRN: $CLOUD_CRN" -H "Authorization: Bearer $GET_TOKEN" -H 'Content-Type:application/json' -d '{ "action": "'$OPERATION'" }'

sleep 30

## THIS IS A GET CALL
curl -X GET https://\$CLOUD\_URL/pcloud/v1/cloud-instances/\$CLOUD\_INSTANCE\_ID/pvm-instances/\$INSTANCE\_NAME -H "CRN: $CLOUD_CRN" -H "Authorization: Bearer $GET_TOKEN" -H 'Content-Type:application/json'

```

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Examples of snapshot, restore, clone APIs for a disk or volume

Prerequisites:

- The body of the snapshot, restore, and clone (PVM and Volume) API must be modified with user defined values.
- Before running the restore API, the PVM instance must be shut off.

Creating a new snapshot:

```
curl -X POST https://< Cloud IP >/pcloud/v1/cloud-instances/<Cloud Instance ID>/pvm-instances/<PVM Instance ID>/snapshots \
-H "authorization: <AuthToken>" \
-H "content-type: application/json" \
-H "crn: <CRN>" \
-d "{\"name\": \"VM1-SS\", \"description\": \"Snapshotfor VM1\", \"volumeIDs\": [\"VM1-7397dc00-0000035b-boot-0\", \"vm1dv1\"]}"
```

Expected Response:

```
{"snapshotID":"65ea39fd-cab6-46b3-b88c-3c28479ab019"}
```

Getting snapshot details:

```
curl -X GET https://< Cloud IP >/pcloud/v1/cloud-instances/<Cloud  
Instance ID>/snapshots/<Snapshot ID>\  
-H "authorization: <AuthToken>" \  
-H "content-type: application/json" \  
-H "crn: <CRN>"
```

Expected Response:

```
{
```

```
    "action": "snapshot",  
    "creationDate": "2020-04-13T08:51:21.000Z",  
    "description": "Snapshotfor VM1",  
    "lastUpdateDate": "2020-04-13T08:51:54.000Z",  
    "name": "VM1-SS",  
    "percentComplete": 100,  
    "pvmInstanceID": "7397dc00-f328-4fbf-bef2-27200ca42cb9",  
    "snapshotID": "65ea39fd-cab6-46b3-b88c-3c28479ab019",  
    "status": "available",  
    "volumeSnapshots": {
```

```
        "398344bb-a64d-4fd5-b3cd-14ddfea6dd0e": "72f07383-ca5b-  
46a0-94a2-3d1e7a7faceb",  
  
        "7a7a5b6e-1177-400a-82a4-0784957bbe75": "33f91096-f204-  
4ed2-8110-c497a258c29c"  
  
    }  
  
}
```

Restoring the snapshot:

```
curl -X POST "https://< Cloud IP >/pcloud/v1/cloud-instances/<Cloud  
Instance ID>/pvm-instances/<PVM Instance  
ID>/snapshots/<Snapshot ID>/restore?restore_fail_action=" \  
-H "authorization: <AuthToken>" \  
-H "content-type: application/json" \  
-H "crn: <CRN>" \  
-d "{\"forceRestore\":\"false\"}"
```

Expected Response:

```
{  
  
    "action": "restore",  
  
    "creationDate": "2020-04-13T08:51:21.000Z",  
  
    "description": "Snapshotfor VM1",  
  
    "lastUpdateDate": "2020-04-13T08:55:28.000Z",  
  
    "name": "VM1-SS",  
  
    "pvmInstanceID": "7397dc00-f328-4fbf-bef2-27200ca42cb9",
```

```
"snapshotID": "65ea39fd-cab6-46b3-b88c-3c28479ab019",
  "status": "available",
  "volumeSnapshots": {
    "398344bb-a64d-4fd5-b3cd-14ddfea6dd0e": "72f07383-ca5b-
46a0-94a2-3d1e7a7faceb",
    "7a7a5b6e-1177-400a-82a4-0784957bbe75": "33f91096-f204-
4ed2-8110-c497a258c29c"
  }
}
```

Creating volume clone:

```
curl -X POST \  
  https://<Cloud IP>/pcloud/v1/cloud-instances/<Cloud Instance ID>/volumes/clone \  
   -H 'authorization: <Auth Token>' \  
   -H 'content-type: application/json' \  
   -H 'crn: <CRN>' \  
   -d '{  
     "displayName": "PerfClone",  
     "volumeIDs": ["VMT-1422dbc9-00000063-boot-0", "vmtdv1"]  
   }'
```

Expected Response:

```
{  
  "clonedVolumes": {  
    "6342e6a9-716d-4686-b644-7f089bceb332": "fd99a7ae-3e15-4f7e-af79-f5637e9a27f8",  
    "8461389f-e8fb-403f-8f48-81edcc9ef46f": "16ed7611-26cc-4b93-945d-760cd6a52c58"  
  }  
}
```

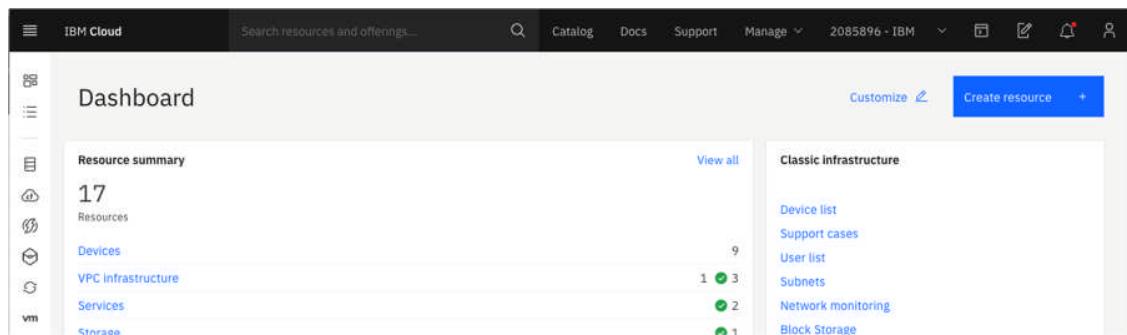
Backing up and restoring a full-system native AIX VM image by using IBM Spectrum Protect

There are several possible approaches to providing full-system save and restore functionality in the Power Systems Virtual Server environment that offer different compromises regarding security, capacity and cost. This solution uses the mksysb capability in AIX to perform full-system backups and a Linux virtual server instance (VSI) in IBM Cloud to provide a staging area for mksysb images and easy access to store those images in Cloud Object Storage.

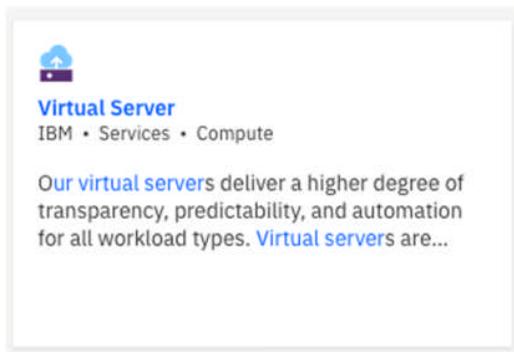
Note: Some issues were discovered using this approach for Power Systems Virtual Server instances that were deployed from the default AIX stock images. This process works correctly for backup and restore operations of a VSI built from a standard fresh AIX installation.

Step 1: Creating a Linux VSI for staging

1. Create your Linux VSI with appropriate resources. In the IBM Cloud dashboard, click the **Create resource** button in the upper right corner.



2. Search for "Virtual Server" and select the **Virtual Server** tile as shown in the figure.



3. Select the **Public** option. Specify a meaningful host name and select the same region as your Power Systems Virtual Server environment. Scroll down to select further options.

Catalog /

Virtual server instance

Delivers rapid scalability with pre-defined sizes that get you up and running quickly.

View docs

Type of virtual server

Public Multi-tenant	Dedicated Single-tenant	Transient Multi-tenant Ephemeral
-------------------------------	-----------------------------------	---

Reserved
Multi-tenant
Term commitment

Public instance

Quantity	Billing	Hostname	Domain
1	Hourly	labservices-osbackups-rhe	IBM.cloud

Placement group [What is a placement group?](#)

None [New group](#)

Location [\(i\)](#)

NA West SJC03 - San Jose	NA South DAL13 - Dallas	NA East TOR01 - Toronto
South America SAO01 - Sao Paulo	Europe FRA02 - Frankfurt	Asia-Pacific TOK02 - Tokyo

4. Click **All profiles**, and then click **Memory**. Select the **M1.2x16** profile. Depending on your actual usage, you may determine you need additional resources, but this is a good starting point.

The screenshot shows the AWS Lambda service configuration page. At the top, there are tabs for 'Popular profiles' and 'All profiles', with 'All profiles' being selected. Below the tabs, there are four categories: 'Balanced local storage', 'Balanced', 'Compute', and 'Memory'. The 'Memory' category is highlighted with a black background. A sub-header below the categories states: 'Best for memory caching and real-time analytics workloads.' A table follows, listing memory profiles with columns for Name, vCPU, RAM, and Price. The 'M1.2x16' profile is selected, indicated by a radio button next to it.

Name	vCPU	RAM	Price
M1.1x8	1	8 GB	\$0.053
M1.2x16	2	16 GB	\$0.105
M1.4x32	4	32 GB	\$0.210
M1.8x64	8	64 GB	\$0.407
M1.16x128	16	128 GB	\$0.842
M1.30x240	30	240 GB	\$1.456

5. Select an SSH key, if you have configured an SSH key, for more convenient console access, and choose the **Red Hat** operating system.

The screenshot shows the AWS Lambda service configuration page. At the top, there is a section for 'SSH keys (recommended)' with a dropdown containing '1 labservice-ab-key' and a 'Add key' button. Below this, there is a section for 'Image' with five options: 'CentOS 7.x Minimal (64 bit) - HVM', 'Debian 9.x Minimal Stable (64 bit) - HVM', 'Red Hat 7.x Minimal (64 bit) - HVM' (which is highlighted with a blue border), 'Microsoft 2019 Standard (64 bit) - HVM', and 'Ubuntu 18.04 Minimal LTS (64 bit) - HVM'.

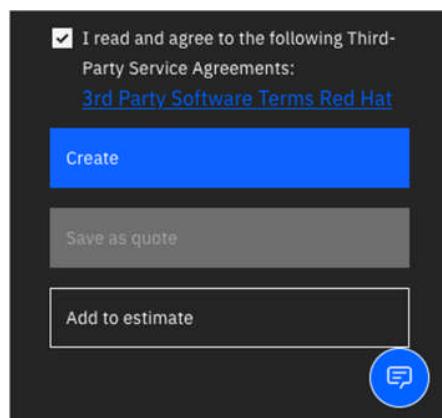
6. Add an additional disk to allow space to stage mksysb images. Click the **Add New** button to the right of **Attached Storage Disks**, and add a 100 GB disk.

Attached storage disks		
Disk	Type	Size
Boot disk	SAN	25 GB (SAN) [\$0.000]
Disk 1	SAN	100 GB (SAN) [\$0.013]

7. Change the **Uplink port speeds** to **1 Gbps non rate-limited private network uplinks** option.

Network interface	
Uplink port speeds	Public Egress - Bandwidth
1 Gbps non rate-limited private network uplinks [\$0.015]	0 GB [\$0.000]

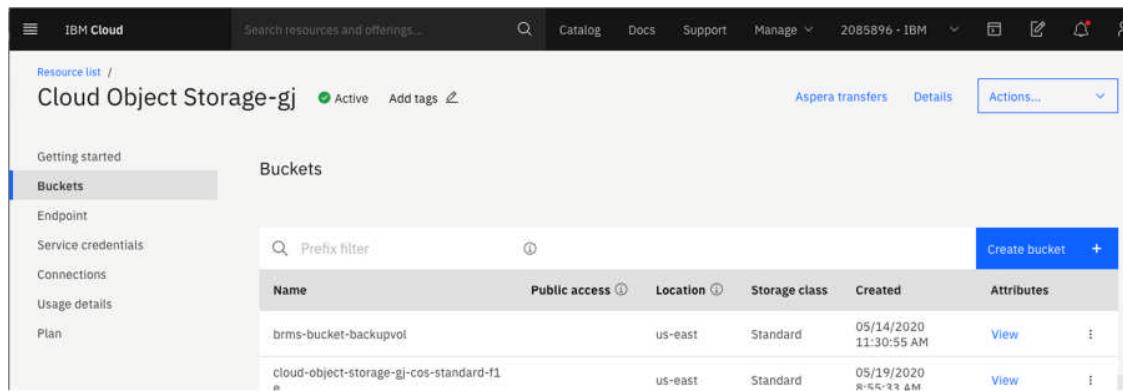
8. In the right column, select the check box to accept the Red Hat service agreement, and click the **Create** button. Your new VSI might take a few minutes to be created.



Step 2: Creating a Cloud Object Storage bucket

You must have a Cloud Object Storage bucket to store your mksysb files.

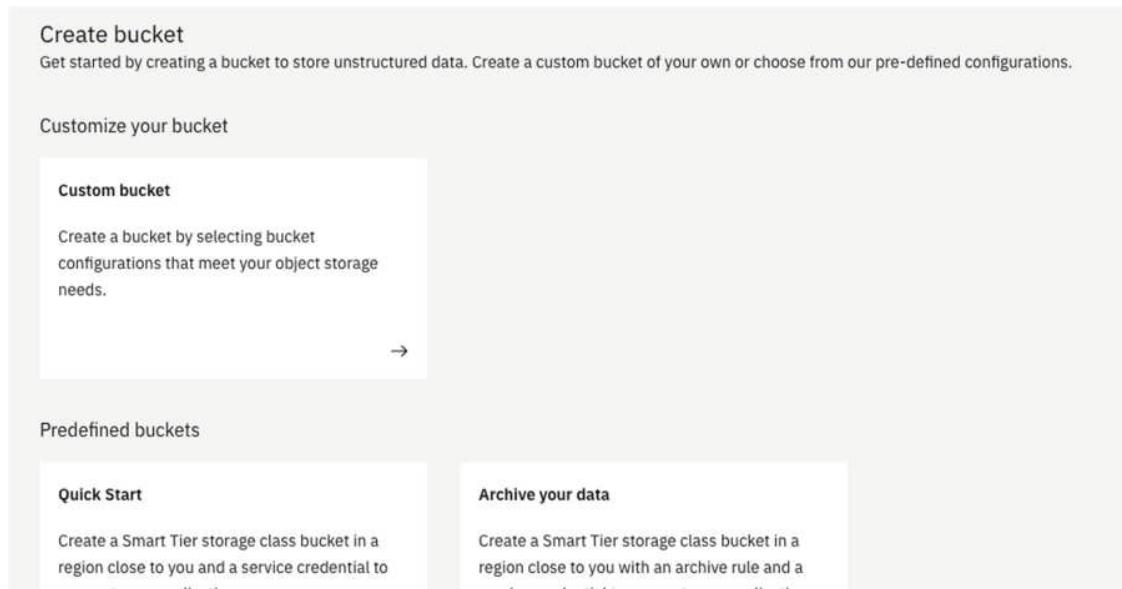
1. Navigate to the Cloud Object Storage resource in the IBM Cloud GUI. Click the **Create Bucket** button on the right side of the **Buckets** screen.



The screenshot shows the IBM Cloud Buckets screen. The left sidebar has links for Getting started, Buckets (which is selected), Endpoint, Service credentials, Connections, Usage details, and Plan. The main area is titled 'Buckets' and shows a table with columns: Name, Public access, Location, Storage class, Created, and Attributes. There is a 'Create bucket' button with a '+' icon at the top right of the table. Two buckets are listed:

Name	Public access	Location	Storage class	Created	Attributes
brms-bucket-backupvol	Private	us-east	Standard	05/14/2020 11:30:55 AM	View
cloud-object-storage-gj-cos-standard-f1	Private	us-east	Standard	05/19/2020 8:46:42 AM	View

2. Select the **Custom Bucket** option.



The screenshot shows the 'Create bucket' dialog. It starts with a 'Create bucket' section with a sub-section 'Custom bucket'. Below it are 'Predefined buckets' sections for 'Quick Start' and 'Archive your data'.

Create bucket
Get started by creating a bucket to store unstructured data. Create a custom bucket of your own or choose from our pre-defined configurations.

Customize your bucket

Custom bucket
Create a bucket by selecting bucket configurations that meet your object storage needs.

Predefined buckets

Quick Start
Create a Smart Tier storage class bucket in a region close to you and a service credential to support your application.

Archive your data
Create a Smart Tier storage class bucket in a region close to you with an archive rule and a service credential to support your application.

3. Specify a meaningful name for your bucket and ensure the **Resiliency**, **Location**, and **Storage Class** options are appropriately set. Scroll to the bottom of the page, and click **Create Bucket**.

The screenshot shows the 'Create Bucket' page for Cloud Object Storage. At the top, it displays the bucket name 'Cloud Object Storage-gj' as active and with tags. Below this, the 'Custom bucket' section shows the unique bucket name 'cloud-object-storage-osbackups-ab4'. A tooltip for 'Bucket naming rules' provides guidelines: must be unique across the whole IBM Cloud Object Storage system, do not use personal information, must start and end in alphanumeric characters (3 to 63), and allowed characters include lowercase, numbers, and non-consecutive dots and hyphens. The 'Resiliency' section offers three options: 'Cross Region' (highest availability), 'Regional' (selected, best performance), and 'Single Site' (data sovereignty). The 'Location' dropdown is set to 'us-east'. Under 'Storage class', 'Smart Tier' (New!) is selected, described as automatically giving the lowest storage rate based on monthly activity. Other options shown are 'Standard' (for active workloads) and 'Vault' and 'Cold Vault'.

- Click the **Service Credentials** item in the left column to create a key to access the bucket.

The screenshot shows the IBM Cloud interface for managing service credentials. The top navigation bar includes 'IBM Cloud', a search bar, and links for Catalog, Docs, Support, Manage, and user profile. Below the navigation is a resource list for 'Cloud Object Storage-gj'. The 'Service credentials' tab is selected in the left sidebar, which also contains 'Getting started', 'Buckets', 'Endpoint', 'Connections', 'Usage details', and 'Plan'. The main content area displays a table of existing service credentials. One row is shown in detail: 'Key name' is 'cloud-object-storage-gj-cos-standard-xiv-aixos7225', and it was 'Date created' on 'JUN 30, 2020 - 02:00:09 AM'. A 'New credential' button is visible at the top right of the table.

- Specify a meaningful name to your service credential. Click **Advanced Options** and turn on the **Include HMAC Credential** option. Then, click **Add**.

The screenshot shows the 'Create credential' dialog box. It has fields for 'Name' (set to 'cloud-object-storage-osbackups-ab4'), 'Role' (set to 'Writer'), and 'Advanced options'. Under 'Advanced options', there is a section for 'Select Service ID (Optional)' (set to 'Auto Generate') and a toggle switch for 'Include HMAC Credential' (set to 'On'). Below these are sections for 'Provide service-specific configuration parameters in a valid JSON object (Optional)' (with a 'Choose file' button) and 'Add inline configuration parameters (Optional)' (with the value '{"HMAC":true}'). At the bottom are 'Cancel' and 'Add' buttons.

Step 3: Configuring s3fs-fuse in the Linux VSI

After you've completed the IBM Cloud Object Storage configuration, you can install s3fs-fuse filesystem that allows you to attach your Cloud Object Storage bucket as a filesystem.

1. Log in to the Linux VSI that you created.
2. Use yum to update packages in the VSI to current levels.

```
[root@labservices-osbackups-rhel-ab4 ~]# yum -y update
Loaded plugins: product-id, search-disabled-repos, subscription-manager
rhel-7-server-optimal-rpms                                         | 2.0 kB  00:00:00
rhel-7-server-rpms                                              | 2.0 kB  00:00:00
rhel-7-server-supplementary-rpms                                | 2.0 kB  00:00:00
Resolving Dependencies
--> Running transaction check
---> Package NetworkManager.x86_64 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager.x86_64 1:1.18.4-3.el7 will be an update
---> Package NetworkManager-config-server.noarch 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager-config-server.noarch 1:1.18.4-3.el7 will be an update
---> Package NetworkManager-libnm.x86_64 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager-libnm.x86_64 1:1.18.4-3.el7 will be an update
---> Package NetworkManager-ppp.x86_64 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager-ppp.x86_64 1:1.18.4-3.el7 will be an update
---> Package NetworkManager-team.x86_64 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager-team.x86_64 1:1.18.4-3.el7 will be an update
---> Package NetworkManager-tui.x86_64 1:1.18.0-5.el7_7.1 will be updated
---> Package NetworkManager-tui.x86_64 1:1.18.4-3.el7 will be an update
---> Package acl.x86_64 0:2.2.51-14.el7 will be updated
---> Package acl.x86_64 0:2.2.51-15.el7 will be an update
---> Package avahi-autoipd.x86_64 0:0.6.31-19.el7 will be updated
---> Package avahi-autoipd.x86_64 0:0.6.31-20.el7 will be an update
---> Package avahi-libs.x86_64 0:0.6.31-19.el7 will be updated
---> Package avahi-libs.x86_64 0:0.6.31-20.el7 will be an update

... Many lines skipped ...

sudo.x86_64 0:1.8.23-9.el7
systemd.x86_64 0:219-73.el7_8.8
systemd-libs.i686 0:219-73.el7_8.8
systemd-libs.x86_64 0:219-73.el7_8.8
systemd-sysv.x86_64 0:219-73.el7_8.8
teamd.x86_64 0:1.29-1.el7
tuned.noarch 0:2.11.0-8.el7
tzdata.noarch 0:2020a-1.el7
util-linux.x86_64 0:2.23.2-63.el7
yum.noarch 0:3.4.3-167.el7

Complete!
[root@labservices-osbackups-rhel-ab4 ~]#
```

3. Use yum to install the necessary tools to build the s3fs-fuse package.

```
[root@labservices-osbackups-rhel-ab4 ~]# yum -y install automake fuse fuse-devel gcc-c++ git libcurl-devel libxml2-devel make openssl-devel unzip
Loaded plugins: product-id, search-disabled-repos, subscription-manager
rhel-7-server-optimal-rpms                                         | 2.0 kB  00:00:00
rhel-7-server-rpms                                              | 2.0 kB  00:00:00
rhel-7-server-supplementary-rpms                                | 2.0 kB  00:00:00
Package 1:make-3.82-24.el7.x86_64 already installed and latest version
Resolving Dependencies
--> Running transaction check
--> Package automake.noarch 0:1.13.4-3.el7 will be installed
--> Processing Dependency: perl >= 5.006 for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: autoconf >= 2.65 for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(warnings) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(vars) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(threads) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(strict) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(constant) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(Thread::Queue) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(TAP::Parser) for package: automake-1.13.4-3.el7.noarch
--> Processing Dependency: perl(POSIX) for package: automake-1.13.4-3.el7.noarch
... Many lines skipped ...
perl-macros.x86_64 4:5.16.3-295.el7
perl-parent.noarch 1:0.225-244.el7
perl-podlators.noarch 0:2.5.1-3.el7
perl-threads.x86_64 0:1.87-4.el7
perl-threads-shared.x86_64 0:1.43-6.el7
rsync.x86_64 0:3.1.2-10.el7
xz-devel.x86_64 0:5.2.2-1.el7
zlib-devel.x86_64 0:1.2.7-18.el7

Complete!
[root@labservices-osbackups-rhel-ab4 ~]#
```

4. Visit <https://github.com/s3fs-fuse/s3fs-fuse> and download the code for s3fs-fuse as a zip. Transfer that zip to your VSI and decompress it.

```
[root@labservices-osbackups-rhel-ab8 s3fs]# unzip s3fs-fuse-master.zip
Archive:  s3fs-fuse-master.zip
e0a38adaf6cec3f413bfe0bc45869bcf33301f19
  creating: s3fs-fuse-master/
  inflating: s3fs-fuse-master/.clang-tidy
  inflating: s3fs-fuse-master/.gitattributes
... Several lines skipped ...
  inflating: s3fs-fuse-master/test/sample_ahbe.conf
  inflating: s3fs-fuse-master/test/sample_delcache.sh
  inflating: s3fs-fuse-master/test/small-integration-test.sh
  inflating: s3fs-fuse-master/test/test-utils.sh
  inflating: s3fs-fuse-master/test/ut_test.py
  inflating: s3fs-fuse-master/test/write_multiple_offsets.py
[root@labservices-osbackups-rhel-ab8 s3fs]# ls
s3fs-fuse-master  s3fs-fuse-master.zip
[root@labservices-osbackups-rhel-ab8 s3fs]#
```

5. Navigate to the s3fs-fuse-master directory. Run autogen.sh, configure, make, and make install programs to build and install s3fs-fuse.

```
[root@labservices-osbackups-rhel-ab4 ~]# cd s3fs-fuse-master/
[root@labservices-osbackups-rhel-ab4 s3fs-fuse]# ./autogen.sh
--- Make commit hash file -----
--- Finished commit hash file ---
--- Start autotools -----
configure.ac:26: installing './config.guess'
configure.ac:26: installing './config.sub'
configure.ac:27: installing './install-sh'
configure.ac:27: installing './missing'
src/Makefile.am: installing './depcomp'
parallel-tests: installing './test-driver'
--- Finished autotools -----
[root@labservices-osbackups-rhel-ab4 s3fs-fuse]# ./configure
checking build system type... x86_64-unknown-linux-gnu
checking host system type... x86_64-unknown-linux-gnu
checking target system type... x86_64-unknown-linux-gnu
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... yes
... Many lines skipped ...

checking github short commit hash... 62c8be8
checking that generated files are newer than configure... done
configure: creating ./config.status
config.status: creating Makefile
config.status: creating src/Makefile
config.status: creating test/Makefile
config.status: creating doc/Makefile
config.status: creating config.h
config.status: executing depfiles commands
[root@labservices-osbackups-rhel-ab4 s3fs-fuse]# make
make all-recursive
make[1]: Entering directory `/root/s3fs-fuse'
Making all in src
make[2]: Entering directory `/root/s3fs-fuse/src'
g++ -DHAVE_CONFIG_H -I. -I.. -D_FILE_OFFSET_BITS=64 -I/usr/include/fuse -
I/usr/include/libxml2      -g -O2 -Wall -D_FILE_OFFSET_BITS=64 -D_FORTIFY_SOURCE=2 -MT
... Many lines skipped ...

make[2]: Entering directory `/root/s3fs-fuse'
make[2]: Leaving directory `/root/s3fs-fuse'
make[1]: Leaving directory `/root/s3fs-fuse'
[root@labservices-osbackups-rhel-ab4 s3fs-fuse]# make install
Making install in src
make[1]: Entering directory `/root/s3fs-fuse/src'
make[2]: Entering directory `/root/s3fs-fuse/src'
/usr/bin/mkdir -p '/usr/local/bin'
... Several lines skipped ...

make[2]: Nothing to be done for `install-exec-am'.
make[2]: Nothing to be done for `install-data-am'.
make[2]: Leaving directory `/root/s3fs-fuse'
make[1]: Leaving directory `/root/s3fs-fuse'
[root@labservices-osbackups-rhel-ab4 s3fs-fuse]#
```

6. Configure access to your bucket. In the Cloud Object Storage section of the IBM Cloud console, locate the Service Credential you created earlier.



```
{  
  "apikey": "6ee_458GISoUqC3K1xK01Swvx6ncu4xUi0W1XCK7aaHD",  
  "cos_hmac_keys": {  
    "access_key_id": "9eec0f82e7dd4a72a6fa19f0bd67d657",  
    "secret_access_key": "c22701d0d39517b860699ba0d8cab1ec23a7a04d71ed1d05"  
  },  
  "endpoints": "https://control.cloud-object-storage.cloud.ibm.com/v2/endpoints",  
  "iam_apikey_description": "Auto-generated for key 9eec0f82-e7dd-4a72-a6fa-19f0bd67d657",  
  "iam_apikey_name": "cloud-object-storage-osbackups-ab4",  
  "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",  
  "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity:a/06d2a1ecba244622a0fb88efb4843fb4::serviceid:  
ServiceId-42e92280-255e-420d-a7d9-4e1d2d98a3d6",  
  "resource_instance_id": "crn:v1:bluemix:public:cloud-object-storage:global:a/06d2a1ecba244622a0fb88efb4843fb4:  
43fb4:3513c7a1-690e-4fdf-9ec5-fa679037e8db::"  
}
```

7. Create a file `/etc/passwd-s3fs` containing your `access_key_id` and `secret_access_key` separated by a colon.

```
9eec0f82e7dd4a72a6fa19f0bd67d657:c22701d0d39517b860699ba0d8cab1ec23a7a04d71ed1d05  
~  
~
```

8. Set the permissions on that file.

```
[root@labservices-osbackups-rhel-ab4 ~]# chmod 600 /etc/passwd-s3fs  
[root@labservices-osbackups-rhel-ab4 ~]#
```

9. Create a mount point to attach your bucket and use the `s3fs` command to attach the storage. You'll need the name of the bucket and the URL of the private Cloud Object Storage endpoint for the appropriate region. Use the `df` command to confirm that the mount operation succeeded.

```
[root@labservices-osbackups-rhel-ab4 ~]# mkdir /cosbucket  
[root@labservices-osbackups-rhel-ab4 ~]# s3fs cloud-object-storage-osbackups-ab4  
/cosbucket -o passwd_file=/etc/passwd-s3fs -o url=https://s3.private.us-east.cloud-  
object-storage.appdomain.cloud -o use_path_request_style -o dbglevel=info -o  
allow_other  
[root@labservices-osbackups-rhel-ab4 ~]# df -h | grep s3fs  
s3fs          256T      0   256T  0% /cosbucket  
[root@labservices-osbackups-rhel-ab4 ~]#
```

Step 4: Creating and exporting the staging file system

Next, you must format and mount your staging disk.

1. Use the **fdisk** command to determine the name of the intended disk. Look for the disk that is around 100 GB, in this case `/dev/xvcd`.

```
[root@labservices-osbackups-rhel-ab8 ~]# fdisk -l

Disk /dev/xvda: 26.8 GB, 26843545600 bytes, 52428800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0000cece

      Device Boot      Start        End      Blocks   Id  System
/dev/xvda1  *        2048    2099199     1048576   83  Linux
/dev/xvda2        2099200    52428799    25164800   83  Linux

Disk /dev/xvdc: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/xvdb: 2147 MB, 2147483648 bytes, 4194304 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x00025cdb

      Device Boot      Start        End      Blocks   Id  System
/dev/xvdb1            63    4192964     2096451   82  Linux swap / Solaris
[root@labservices-osbackups-rhel-ab8 ~]#
```

2. Format that disk by using the **mkfs.xfs** command.

```
[root@labservices-osbackups-rhel-ab8 ~]# mkfs.xfs /dev/xvdc
meta-data=/dev/xvdc              isize=512    agcount=4, agsize=6553600 blks
                                =           sectsz=512  attr=2, projid32bit=1
                                =           crc=1    finobt=0, sparse=0
data     =           bsize=4096   blocks=26214400, imaxpct=25
        =           sunit=0    swidth=0 blks
naming   =version 2             bsize=4096   ascii-ci=0 ftype=1
log      =internal log          bsize=4096   blocks=12800, version=2
        =           sectsz=512  sunit=0 blks, lazy-count=1
realtime =none                  extsz=4096   blocks=0, rtextents=0
[root@labservices-osbackups-rhel-ab8 ~]#
```

3. Create a mount point to attach the new disk.

```
[root@labservices-osbackups-rhel-ab8 ~]# mkdir /stage
```

4. Edit the /etc/fstab file and add a line to mount that disk on the mount point.

```
#  
# /etc/fstab  
# Created by anaconda on Thu Oct  3 14:41:18 2019  
#  
# Accessible filesystems, by reference, are maintained under '/dev/disk'  
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info  
#  
UUID=b894c135-27a1-4f7c-8cb1-8b3a69a05491 / ext3  
defaults,noatime 1 1  
UUID=1205ee90-24ba-4bed-af8d-7f9bf36008ed /boot ext3  
defaults,noatime 1 2  
LABEL=SWAP-xvdb1 swap swap defaults 0 0  
  
# Filesystem for mksysb staging  
/dev/xvdc /tsm xfs defaults 1 2
```

5. Use the **mount -a** command to mount the new file system, and then use the **df -h** command to check that the new file system is available.

```
[root@labservices-osbackups-rhel-ab8 ~]# mount -a  
[root@labservices-osbackups-rhel-ab8 ~]# df -h  
Filesystem      Size  Used Avail Use% Mounted on  
devtmpfs        7.8G   0    7.8G  0% /dev  
tmpfs          7.8G   0    7.8G  0% /dev/shm  
tmpfs          7.8G  17M  7.8G  1% /run  
tmpfs          7.8G   0    7.8G  0% /sys/fs/cgroup  
/dev/xvda2       24G  3.5G  19G  16% /  
/dev/xvda1     976M 155M 770M 17% /boot  
tmpfs          1.6G   0    1.6G  0% /run/user/0  
s3fs           256T   0   256T  0% /cosbucket  
/dev/xvdc      100G  33M  100G  1% /stage  
[root@labservices-osbackups-rhel-ab8 ~]#
```

6. Configure NFS to share your staging file system with your AIX VSIs. Use the yum command to install the NFS utilities.

```
[root@labservices-osbackups-rhel-ab4 ~]# yum install nfs-utils
Loaded plugins: product-id, search-disabled-repos, subscription-manager
rhel-7-server-optional-rpms                                         | 2.0 kB  00:00:00
rhel-7-server-rpms                                              | 2.0 kB  00:00:00
rhel-7-server-supplementary-rpms                                | 2.0 kB  00:00:00
Resolving Dependencies
--> Running transaction check
--> Package nfs-utils.x86_64 1:1.3.0-0.66.el7 will be installed
--> Processing Dependency: libtirpc >= 0.2.4-0.7 for package: 1:nfs-utils-1.3.0-0.66.el7.x86_64
--> Processing Dependency: gssproxy >= 0.7.0-3 for package: 1:nfs-utils-1.3.0-0.66.el7.x86_64

... Many lines skipped ...

Installed:
  nfs-utils.x86_64 1:1.3.0-0.66.el7

Dependency Installed:
  gssproxy.x86_64 0:0.7.0-28.el7                                     keyutils.x86_64 0:1.5.8-3.el7
  libbasicobjects.x86_64 0:0.1.1-32.el7                                libcollection.x86_64 0:0.7.0-32.el7
  libevent.x86_64 0:2.0.21-4.el7                                       libini_config.x86_64 0:1.3.1-32.el7
  libnfsidmap.x86_64 0:0.25-19.el7                                    libpath_utils.x86_64 0:0.2.1-32.el7
  libref_array.x86_64 0:0.1.5-32.el7                                   libtirpc.x86_64 0:0.2.4-0.16.el7
  libverto-libevent.x86_64 0:0.2.5-4.el7                                 quota.x86_64 1:4.01-19.el7
  quota-nls.noarch 1:4.01-19.el7                                      rpcbind.x86_64 0:0.2.0-49.el7
  tcp_wrappers.x86_64 0:7.6-77.el7

Complete!
[root@labservices-osbackups-rhel-ab4 ~]#
```

7. Edit the /etc/exports file to share the file system where your Cloud Object Storage bucket is mounted. Ensure you specify the correct subnet information for your Power Systems Virtual Servers environment.

```
/stage 192.168.50.0/24(rw,no_root_squash,insecure)
~
```

8. Start the nfs-server service.

```
[root@labservices-osbackups-rhel-ab4 ~]# systemctl start nfs-server
[root@labservices-osbackups-rhel-ab4 ~]#
```

Step 5: Mounting the staging file system and backing up AIX VSI

1. Open a terminal connection to the AIX VSI that you plan to back up.
2. Create a convenient mount point for the remote storage and then mount the exported file system from your NFS server.

```
# mkdir /stage  
# mount 10.72.253.136:/stage /stage  
#
```

3. Enter **smit mksysb** in the AIX VM to perform the backup operation. Enter a meaningful file name in the mount you made earlier in the **Backup Device or File** field. Ensure that the **Expand /tmp if needed** option is set to **yes**. Press **Enter** to begin the backup operation.

Back Up This System to Tape/File or UDFS capable media

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[Entry Fields]

WARNING: Execution of the mksysb command will
result in the loss of all material
previously stored on the selected
output medium. This command backs
up only rootvg volume group.

* Backup DEVICE or FILE	[/stage/aix72backup1.mksysb]	+ /
Create MAP files?	no	+
Create backup using snapshots?	no	+
EXCLUDE files?	no	+
Exclude WPAR file systems?	no	+
Location of File System Exclusion List	[]	/
List files as they are backed up?	no	+
Verify readability if tape device?	no	+
Generate new /image.data file?	yes	+
EXPAND /tmp if needed?	yes	+
Disable software packing of backup?	no	+
Backup extended attributes?	yes	+
Number of BLOCKS to write in a single output (Leave blank to use a system default)	[]	#
Location of existing mksysb image	[]	/
File system to use for temporary work space (If blank, /tmp will be used.)	[]	/
Backup encrypted files?	yes	+
Back up DMAP API filesystem files?	yes	+
Build new alt_disk_install boot_image?	no	+

F1=Help
F5=Reset
F9=Shell

F2=Refresh
F6=Command
F10=Exit

F3=Cancel
F7>Edit
Enter=Do

F4=List
F8=Image

4. After the backup operation completes, exit SMIT.

COMMAND STATUS

Command: OK stdout: yes stderr: no

Before command completion, additional instructions may appear below.

Creating information file (/image.data) for rootvg.

Creating list of files to back up

Backing up 56586 files.....
4542 of 56586 files backed up (8%).....
5139 of 56586 files backed up (9%).....
5861 of 56586 files backed up (10%).....

56586 of 56586 files backed up (100%)
0512-038 mksysb: Backup Completed Successfully.

F1=Help
F8=Image
n=Find Next

F2=Refresh
F9=Shell

F3=Cancel
F10=Exit

F6=Command
/=Find

5. Return to your Linux VSI. Your mksysb image must be located in the staging directory that you made.

```
[root@labservices-osbackups-rhel-ab8 ~]# ls -l /stage
total 8882152
-rw-r--r--. 1 root root 9095321600 Jul 16 14:32 aix72backup1.mksysb
[root@labservices-osbackups-rhel-ab8 ~]#
```

6. Place your mksysb image in your Cloud Object Storage bucket by copying it to the directory where your bucket is attached.

```
[root@labservices-osbackups-rhel-ab8 ~]# ls -l /stage
total 8882152
-rw-r--r--. 1 root root 9095321600 Jul 16 14:32 aix72backup1.mksysb
[root@labservices-osbackups-rhel-ab8 ~]#
```

7. Check the Cloud Object Storage GUI to confirm that the file is in the bucket.

The screenshot shows the IBM Cloud Cloud Object Storage interface. The left sidebar has a 'Objects' tab selected. The main area displays a table of objects with one item: 'aix72backup1.mksysb' (Size: 8.5 GB, Last modified: 07/16/2020 2:47:02 PM). Below the table is a 'Drag and drop files or folders to upload' area.

8. Remove the file from the staging file system to free up space for additional backup operations.

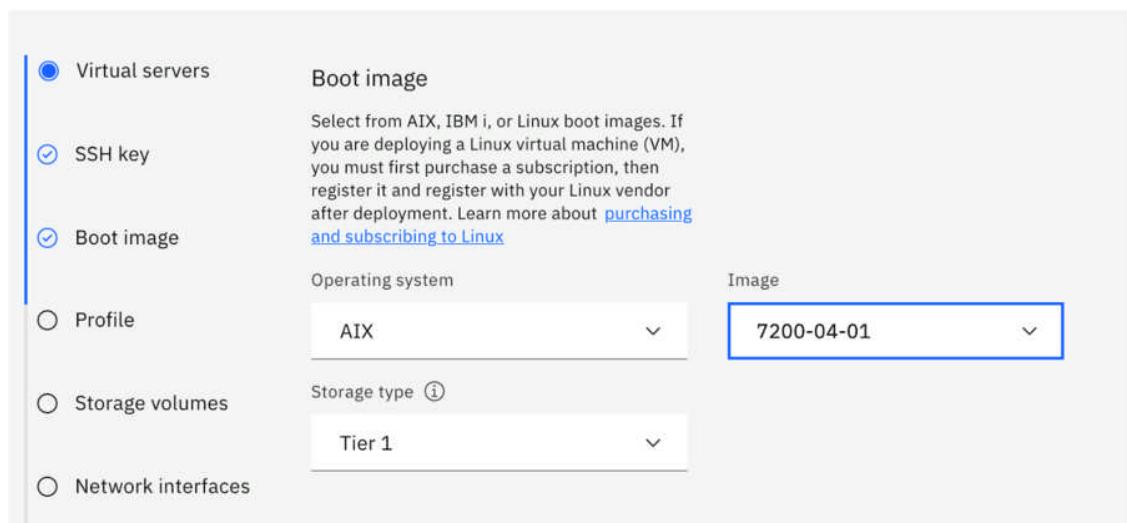
Step 6: Restoring the mksysb backup image to a new VSI

To restore an mksysb backup image into a new Power Systems Virtual Server instance, first connect to your Linux staging VSI.

1. List the available images in your Cloud Object Storage bucket and copy the desired image to the staging file system.

```
[root@labservices-osbackups-rhel-ab8 ~]# ls -l /cosbucket/
total 8882151
-rw-r--r--. 1 root root 9095321600 Jul 16 14:43 aix72backup1.mksysb
[root@labservices-osbackups-rhel-ab8 ~]# cp /cosbucket/aix72backup1.mksysb /stage/
[root@labservices-osbackups-rhel-ab8 ~]#
```

2. Create a Power Systems Virtual Server instance that is the target for your mksysb restore operation. Choose one of the standard AIX boot images. This image is used as a helper to perform the mksysb restore operation.



3. After the new VSI is provisioned, log in and create a mount point. Mount the staging file system from your Linux VSI that contains the mksysb that you are planning to restore. Use the **ls** command to confirm that the mksysb image is available.

```

# mkdir /stage
# mount 10.72.253.136:/stage /stage
# ls -l /stage/aix72backup1.mksysb
-rw-r--r--    1 root      system   9095321600 Jul 16 14:32 /stage/aix72backup1.mksysb
#

```

4. Return to the IBM Cloud GUI and add a new storage volume to your AIX VSI to use as a target for the mksysb restore operation.

New storage volume

Create and attach new storage volumes. Volumes can be shareable or bootable but not both.

Name	Shareable
mksysbrestore	<input type="checkbox"/> Off
Size (10GB-2TB)	Quantity
20	1
Storage volume Tier 1 20 GB	\$4.20/month
<input checked="" type="checkbox"/> I have read the service agreement and agree to the terms.	
Cancel	Create and attach

5. After the new storage volume is attached, make sure the **Bootable** parameter is set to **On**. You might have to refresh your browser several times to see the status change.

Attached volumes				
			Manage existing	Add new
Name	Size	Disk type	Shareable	Bootable
mksysbrestore	20 GB	Tier 1	<input type="radio"/> Off	<input checked="" type="radio"/> On
labservices-s-0a936efa-0000157a-boot-0	20 GB	Tier 1	<input type="radio"/> Off	<input checked="" type="radio"/> On

- Run the cfgmgr command, and then run the lspv command to confirm that the new disk is available.

```
# cfgmgr
# lspv
hdisk0      00f6db0af58e9775      rootvg      active
hdisk1      none                   None
#
```

- Run the alt_disk_mksysb command to restore your mksysb image on to the new disk.

```
# alt_disk_mksysb -c /dev/vty0 -d hdisk1 -m /stage/aix72backup1.mksysb
Restoring /image.data from mksysb image.
Checking disk sizes.
Creating cloned rootvg volume group and associated logical volumes.
Creating logical volume alt_hd5.
Creating logical volume alt_hd6.
Creating logical volume alt_hd8.
Creating logical volume alt_hd4.
Creating logical volume alt_hd2.
Creating logical volume alt_hd9var.
Creating logical volume alt_hd3.
Creating logical volume alt_hd1.
Creating logical volume alt_hd10opt.
Creating logical volume alt_hd11admin.
Creating logical volume alt_lg_dumplv.
Creating logical volume alt_livedump.
Creating logical volume alt_repo00.
Creating /alt_inst/ file system.
Creating /alt_inst/admin file system.
Creating /alt_inst/home file system.
Creating /alt_inst/opt file system.
Creating /alt_inst/tmp file system.
Creating /alt_inst/usr file system.
Creating /alt_inst/usr/sys/inst.images file system.
Creating /alt_inst/var file system.
Creating /alt_inst/var/adm/ras/livedump file system.
Restoring mksysb image to alternate disk(s).
Linking to 64bit kernel.
Changing logical volume names in volume group descriptor area.
Fixing LV control blocks...
forced unmount of /alt_inst/var/adm/ras/livedump
forced unmount of /alt_inst/var/adm/ras/livedump
forced unmount of /alt_inst/var
forced unmount of /alt_inst/var
forced unmount of /alt_inst/usr/sys/inst.images
forced unmount of /alt_inst/usr/sys/inst.images
forced unmount of /alt_inst/usr
forced unmount of /alt_inst/usr
forced unmount of /alt_inst/tmp
forced unmount of /alt_inst/tmp
forced unmount of /alt_inst/opt
forced unmount of /alt_inst/opt
forced unmount of /alt_inst/home
forced unmount of /alt_inst/home
forced unmount of /alt_inst/admin
forced unmount of /alt_inst/admin
forced unmount of /alt_inst
forced unmount of /alt_inst
Fixing file system superblocks...
Bootlist is set to the boot disk: hdisk0 blv=hd5
#
```

The bootlist is automatically modified to boot from the newly restored disk.

8. Reboot the AIX VSI to begin using your restored image. This first boot might take some extra time while the AIX OS is reconfigured to run in the new VSI.

Step 7: Cleaning up after a mksysb restore operation

When your new AIX VSI is running and after you log in, you can remove the original boot volume from the configuration.

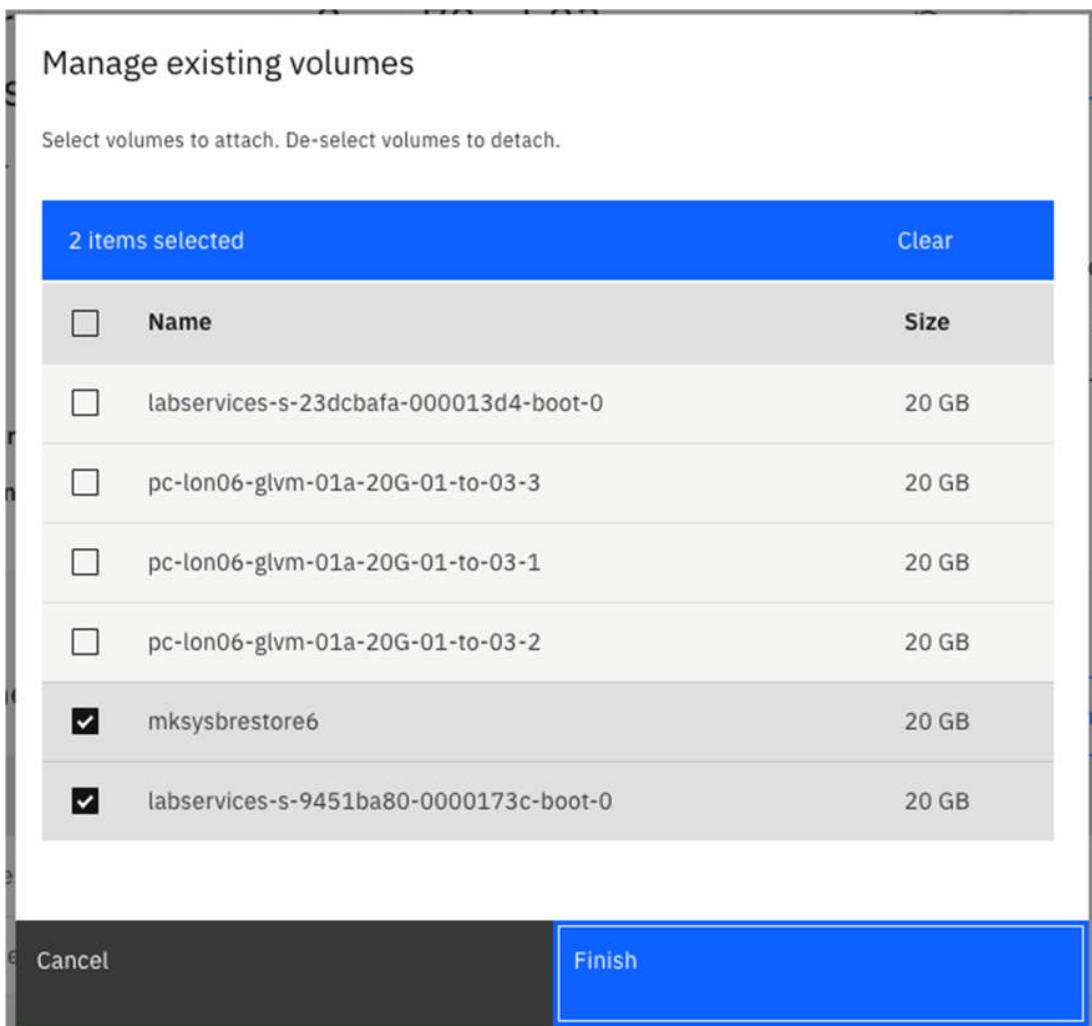
1. Run the **exportvg** command to remove the old rootvg. Then, run the **rmdev** command to remove the original rootvg disk.

```
# lsvg  
hdisk0      00f6db0af58e9775          old_rootvg  
hdisk1      00c8d1607c6bb0be          rootvg      active  
# exportvg old_rootvg  
# rmdev -Rdl hdisk0  
hdisk0 deleted  
#
```

2. Find the **Attached volumes** section in your IBM Cloud GUI for your AIX VSI. Click **Manage existing**.

Attached volumes				
Name	Size	Disk type	Shareable	Bootable
mksysbrestore6	20 GB	Tier 1	<input checked="" type="radio"/> Off	<input checked="" type="radio"/> On
labservices-s-9451ba80-0000173c-boot-0	20 GB	Tier 1	<input checked="" type="radio"/> Off	<input checked="" type="radio"/> On

3. Deselect the original boot volume, leaving your mksysb restore volume selected, and click **Finish**.

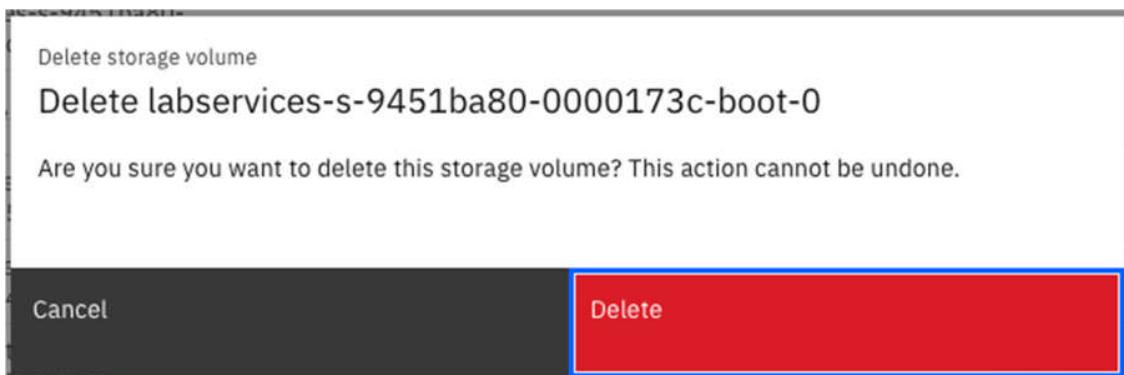


4. Navigate to **Storage volumes** in the left column. Locate your original boot volume and click the trash can icon on the right side of the listing to delete the volume.

The screenshot shows the IBM Cloud interface for managing storage volumes. The top navigation bar includes 'IBM Cloud', a search bar, and various links like Catalog, Docs, Support, Manage, and a user profile. Below the navigation is a breadcrumb path 'Resource list / Power Systems Virtual Server- LONDON06'. The main content area is titled 'Storage volumes' and displays a table of volumes. The table has columns: Name, Size, World Wide Name, Shareable, and Bootable. Each row represents a storage volume with its name, size (20 GB), WWN, and status for sharing and booting. A 'New volume +' button is at the top right of the table. At the bottom, there are pagination controls for items per page (10) and total items (1-10 of 28).

	Name	Size	World Wide Name	Shareable	Bootable	
mksysbrestore6	20 GB	600507681081818C2000000000000E84	<input type="checkbox"/> Off	<input checked="" type="checkbox"/> On		
labservices-s-9451ba80-0000173c-boot-0	20 GB	600507681081818C2000000000000E83	<input type="checkbox"/> Off	<input checked="" type="checkbox"/> On		
mksysbrestore5	20 GB	600507681081818C2000000000000E82	<input type="checkbox"/> Off	<input checked="" type="checkbox"/> On		
labservices-s-81734c41-00001675-boot-0	20 GB	600507681081818C2000000000000D01	<input type="checkbox"/> Off	<input checked="" type="checkbox"/> On		
labservices-s-23dcbafa-000013d4-boot-0	20 GB	600507681081818C2000000000000BAF	<input type="checkbox"/> Off	<input type="checkbox"/> Off		
route-test-lo-913c1d67-00001397-boot-0	20 GB	600507681081818C2000000000000BA4	<input type="checkbox"/> Off	<input checked="" type="checkbox"/> On		
pc-lon06-glvm-02a-20G-01-to-03b-3	20 GB	600507681081019918000000000000F98	<input checked="" type="checkbox"/> On	<input type="checkbox"/> Off		
pc-lon06-glvm-02a-20G-01-to-03b-1	20 GB	600507681081019918000000000000F96	<input checked="" type="checkbox"/> On	<input type="checkbox"/> Off		
pc-lon06-glvm-02a-20G-01-to-03b-2	20 GB	600507681081019918000000000000F97	<input checked="" type="checkbox"/> On	<input type="checkbox"/> Off		
pc-tor01-glvm-01-20G-01-to-03b-3	20 GB	600507681081019918000000000000F95	<input checked="" type="checkbox"/> On	<input type="checkbox"/> Off		

5. Click the **Delete** button on the pop-up message to confirm.



Backing up and restoring file-level data from the AIX VM to Cloud Object Storage

To facilitate file save and restore operations, you can use IBM Spectrum Protect on an x86 Linux VSI located in the Classic Infrastructure area of IBM Cloud. This VSI can be accessed from the Power Systems Virtual Servers environment by using IBM Cloud Direct Link Connect and can access Cloud Object Storage by using an internal endpoint.

Step 1: Creating a Linux VSI and installing IBM Spectrum Protect

1. Create a VSI with adequate resources to install and use IBM Spectrum Protect. You need at least 16 GB of RAM for standard operations. In addition to the 25 GB boot disk, a 100 GB disk is used for the Spectrum Protect database.

Instance details					
Name	lbservices-spectrumprotect-rhel-ab.IBM.cl...	Notes	N/A		
ID	104933162	Type	Public		
Location	Toronto 1	Suspended billing	Enabled on Power Off		
Created	6/29/2020, 2:40:15 PM	Boot mode	Unavailable		
Reloaded	N/A	Billing	Hourly		
Size	2 vCPU 16 GB Resize	Image	Red Hat Enterprise Linux 7.x - Minimal Install (64 ...)		
Transactions	Service Setup				

Network details					
Status	Interface	IP Address	Speed	VLAN	Security Groups
● Active	public (eth1)	169.48.5.242/28 ⓘ	1000 Mbps	tor01.fcr02a.1297	View
● Active	private (eth0)	10.166.112.144/26 ⓘ	1000 Mbps	tor01.bcr02a.1551	View

2. After the x86 Linux VSI is provisioned, upload the IBM Spectrum Protect installer into a convenient directory. Make it executable and then execute it to unpack it.

```
[root@labservices-spectrumprotect-rhel-ab SP]# chmod a+x  
SP_8.1.9_LIN86_SERSTG_AGT_ML.bin  
[root@labservices-spectrumprotect-rhel-ab SP]# ./SP_8.1.9_LIN86_SERSTG_AGT_ML.bin  
UnZipSFX 6.00 of 20 April 2009, by Info-ZIP (http://www.info-zip.org).  
  creating: im64/  
  creating: im64/Offerings/  
  creating: im64/configuration/  
  creating: im64/configuration/org.eclipse.update/  
  creating: im64/documentation/  
  creating: im64/documentation/de/  
  creating: im64/documentation/en/  
  creating: im64/documentation/es/  
... Many lines skipped ...  
  inflating: input/uninstall_response_sample.xml  
  inflating: input/update_response_sample.xml  
  inflating: im32/post-install.xml  
  inflating: im64/post-install.xml  
  inflating: README.htm  
[root@labservices-spectrumprotect-rhel-ab SP]#
```

3. Before the IBM Spectrum Protect install can begin, you must install the libaio and ksh packages. Use the **yum command to perform that installation.**

```
[root@labservices-spectrumprotect-rhel-ab SP]# yum install libaio ksh
Loaded plugins: product-id, search-disabled-repos, subscription-manager
rhel-7-server-optional-rpms                                         | 2.0 kB  00:00:00
rhel-7-server-rpms                                                 | 2.0 kB  00:00:00
rhel-7-server-supplementary-rpms                                    | 2.0 kB  00:00:00
Resolving Dependencies
--> Running transaction check
--> Package ksh.x86_64 0:20120801-142.el7 will be installed
--> Package libaio.x86_64 0:0.3.109-13.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package      Arch      Version       Repository      Size
=====
Installing:
ksh          x86_64    20120801-142.el7   rhel-7-server-rpms   884 k
libaio       x86_64    0.3.109-13.el7   rhel-7-server-rpms   24 k

Transaction Summary
=====
Install 2 Packages

Total download size: 909 k
Installed size: 3.2 M
Is this ok [y/d/N]: y
Downloading packages:
(1/2): ksh-20120801-142.el7.x86_64.rpm | 884 kB 00:00:00
(2/2): libaio-0.3.109-13.el7.x86_64.rpm | 24 kB 00:00:00
-----
Total                                         2.5 MB/s | 909 kB 00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : ksh-20120801-142.el7.x86_64           1/2
  Installing : libaio-0.3.109-13.el7.x86_64           2/2
Loaded plugins: product-id, subscription-manager
  Verifying  : libaio-0.3.109-13.el7.x86_64           1/2
  Verifying  : ksh-20120801-142.el7.x86_64           2/2

Installed:
  ksh.x86_64 0:20120801-142.el7                   libaio.x86_64 0:0.3.109-13.el7

Complete!
[root@labservices-spectrumprotect-rhel-ab SP]#
```

4. Run the installer. You can generally accept the default options and you'll need to agree to a number of licenses.

```
[root@labservices-spectrumprotect-rhel-ab SP]# ./install.sh -c
Preprocessing the input.
Loading repositories...
Preparing and resolving the selected packages...

=====> IBM Installation Manager> Install

Select packages to install:
  1. [X] IBM® Installation Manager 1.9.0
  2. [X] IBM Spectrum Protect server 8.1.9.20191011_1255
  3. [X] IBM Spectrum Protect languages 8.1.9.20191011_1251
  4. [X] IBM Spectrum Protect license 8.1.9.20191011_1250
  5. [X] IBM Spectrum Protect storage agent 8.1.9.20191011_1250
  6. [X] IBM Spectrum Protect device driver 8.1.9.20191011_1252
  7. [X] IBM Spectrum Protect Operations Center 8.1.9000.20191004_1254

  O. Check for Other Versions, Fixes, and Extensions

  N. Next,      C. Cancel
-----> [N]
Validating package prerequisites...
...

=====> IBM Installation Manager> Install> Licenses

Read the following license agreements carefully.
View a license agreement by entering the number:
  1. IBM Installation Manager - License Agreement

Options:
  A. [ ] I accept the terms in the license agreement
  D. [ ] I do not accept the terms in the license agreement

  B. Back,      C. Cancel
-----> [C] A

=====> IBM Installation Manager> Install> Licenses

Read the following license agreements carefully.
View a license agreement by entering the number:
  1. IBM Installation Manager - License Agreement

Options:
  A. [X] I accept the terms in the license agreement
  D. [ ] I do not accept the terms in the license agreement

  B. Back,      N. Next,      C. Cancel
-----> [N]
```

```

=====> IBM Installation Manager> Install> Licenses> Shared Directory

Installation Manager installation location:
    /opt/IBM/InstallationManager/eclipse

Shared Resources Directory:
    /opt/IBM/IBMIMShared

Options:
    L. Change Installation Manager Installation Location
    M. Change Shared Resources Directory

    B. Back,      N. Next,      C. Cancel
-----> [N]
Finding compatible package groups...

=====> IBM Installation Manager> Install> Licenses> Shared Directory> Location

New package group:
    1. [X] IBM Spectrum Protect

Selected group id: "IBM Spectrum Protect"
Selected location: "/opt/tivoli/tsm"
Selected architecture: 64-bit

Options:
    M. Change Location

    B. Back,      N. Next,      C. Cancel
-----> [N]

=====> IBM Installation Manager> Install> Licenses> Shared Directory>
    Location> Features

IBM® Installation Manager

IBM Spectrum Protect server

IBM Spectrum Protect languages
    1. [ ] Spanish
    2. [ ] Portuguese
    3. [ ] German
    4. [ ] French
    5. [ ] Italian
    6. [ ] Russian
    7. [ ] Japanese
    8. [ ] Korean
    9. [ ] Traditional Chinese
   10. [ ] Simplified Chinese

IBM Spectrum Protect license

IBM Spectrum Protect storage agent

IBM Spectrum Protect device driver

```

```
IBM Spectrum Protect Operations Center
11. [X] Operations Center

      B. Back,      N. Next,      C. Cancel
-----> [N]

=====> IBM Installation Manager> Install> Licenses> Shared Directory>
      Location> Features> Custom panels

---- Configuration for IBM Spectrum Protect Operations Center 8.1.9000.20191004_1254

Specify the secure communication settings - Secure (https) port
-----> [11090]

Specify the secure communication settings - SP800-131a Compliance Mode:

0. Off
1. Transition
2. Strict

-----> [2]

---- Create password

      Password length:
      - Minimum: 6 characters
      - Maximum: 64 characters

      The password must contain at least:
      - One uppercase letter (A - Z)
      - One lowercase letter (a - z)
      - One digit (0 - 9)
      - Two non-alphanumeric characters: ~ # $ % ^ @ * _ - + = | ( ) { } [ ] : ; <
> , . ? /
Create password
----->

Confirm password
----->

---- Configuration for IBM Spectrum Protect server 8.1.9.20191011_1255

Select the product that you purchased:
1. IBM Spectrum Protect
2. IBM Spectrum Protect Extended Edition
3. IBM Spectrum Protect for Data Retention

-----> 1
```

Read the following license agreements carefully.
View a license agreement by entering the number:
1. IBM Spectrum Protect - Software License Agreement
2. IBM Spectrum Protect - Non-IBM Terms
Options:
A. [] I accept the terms in the license agreements.
D. [] I do not accept the terms in the license agreements.

-----> A
Read the following license agreements carefully.
View a license agreement by entering the number:
1. IBM Spectrum Protect - Software License Agreement
2. IBM Spectrum Protect - Non-IBM Terms
Options:
A. [X] I accept the terms in the license agreements.
D. [] I do not accept the terms in the license agreements.

---- Configuration for IBM Spectrum Protect storage agent 8.1.9.20191011_1250

Read the following license agreements carefully.
View a license agreement by entering the number:
1. IBM Spectrum Protect for Storage Area Networks - Software License Agreement
2. IBM Spectrum Protect for Storage Area Networks - Non-IBM Terms
Options:
A. [] I accept the terms in the license agreements.
D. [] I do not accept the terms in the license agreements.

-----> A
Read the following license agreements carefully.
View a license agreement by entering the number:
1. IBM Spectrum Protect for Storage Area Networks - Software License Agreement
2. IBM Spectrum Protect for Storage Area Networks - Non-IBM Terms
Options:
A. [X] I accept the terms in the license agreements.
D. [] I do not accept the terms in the license agreements.

B. Back, N. Next, C. Cancel
-----> [N]

=====> IBM Installation Manager> Install> Licenses> Shared Directory>
Location> Features> Custom panels> Summary

Target Location:
Package Group Name : IBM Installation Manager
Installation Directory : /opt/IBM/InstallationManager/eclipse
Package Group Name : IBM Spectrum Protect
Installation Directory : /opt/tivoli/tsm
Shared Resources Directory : /opt/IBM/IBMIMShared

Translations:
English

Packages to be installed:

- IBM® Installation Manager 1.9.0
- IBM Spectrum Protect server 8.1.9.20191011_1255
- IBM Spectrum Protect languages 8.1.9.20191011_1251
- IBM Spectrum Protect license 8.1.9.20191011_1250
- IBM Spectrum Protect storage agent 8.1.9.20191011_1250
- IBM Spectrum Protect device driver 8.1.9.20191011_1252
- IBM Spectrum Protect Operations Center 8.1.9000.20191004_1254

Options:

- G. Generate an Installation Response File
- B. Back, I. Install, C. Cancel

----> [I] 25% 50% 75% 100%

=====> IBM Installation Manager> Install> Licenses> Shared Directory> Location> Features> Custom panels> Summary> Completion

The install completed successfully.

INFORMATION: Multiple informations are generated.

V. View Message Details

Options:

- F. Finish

----> [F]

```
[root@labservices-spectrumprotect-rhel-ab SP]#
```

Step 2: Configuring the Linux VSI for IBM Spectrum Protect

After the installation is complete, configure the Linux VSI to prepare for Spectrum Protect start up.

1. Create a user account and group to own the IBM Spectrum Protect instance.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# groupadd tsmsrvrs -g 1111
[root@labservices-spectrumprotect-rhel-ab2 ~]# useradd -d /home/tsminst1 -u 2222 -g
1111 -s /bin/bash tsminst1
[root@labservices-spectrumprotect-rhel-ab2 ~]# passwd tsminst1
Changing password for user tsminst1.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[root@labservices-spectrumprotect-rhel-ab2 ~]#
```

2. Format and mount your database disk and create some directories for the database. You can use the **fdisk** command to determine the name of the intended disk. Look for the disk that is around 100 GB, in this case, /dev/xvcd.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# fdisk -l

Disk /dev/xvdb: 2147 MB, 2147483648 bytes, 4194304 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x00025cdb

      Device Boot      Start        End      Blocks   Id  System
/dev/xvdb1            63     4192964     2096451    82  Linux swap / Solaris

Disk /dev/xvdc: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/xvda: 26.8 GB, 26843545600 bytes, 52428800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0000cece

      Device Boot      Start        End      Blocks   Id  System
/dev/xvda1    *        2048     2099199     1048576    83  Linux
/dev/xvda2       2099200     52428799     25164800    83  Linux
[root@labservices-spectrumprotect-rhel-ab2 ~]#
```

3. Format that disk by using the **mkfs.xfs** command.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# mkfs.xfs /dev/xvdc
meta-data=/dev/xvdc              isize=512    agcount=4, agsize=6553600 blks
                                  sectsz=512  attr=2, projid32bit=1
                                  =          crc=1    finobt=0, sparse=0
data     =             bsize=4096   blocks=26214400, imaxpct=25
         =             sunit=0    swidth=0 blks
naming   =version 2             bsize=4096   ascii-ci=0 ftype=1
log      =internal log          bsize=4096   blocks=12800, version=2
         =             sectsz=512  sunit=0 blks, lazy-count=1
realtime =none                  extsz=4096   blocks=0, rtextents=0
```

4. Create a mount point to attach the new disk.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# mkdir /tsm
```

5. Edit the /etc/fstab file and add a line to mount that disk on the mount point.

```
#  
# /etc/fstab  
# Created by anaconda on Thu Oct  3 14:41:18 2019  
#  
# Accessible filesystems, by reference, are maintained under '/dev/disk'  
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info  
#  
UUID=b894c135-27a1-4f7c-8cb1-8b3a69a05491 / ext3  
defaults,noatime 1 1  
UUID=1205ee90-24ba-4bed-af8d-7f9bf36008ed /boot ext3  
defaults,noatime 1 2  
LABEL=SWAP-xvdbl swap swap defaults 0 0  
  
# Filesystem for Spectrum Protect Database  
/dev/xvdc /tsm xfs defaults 1 2
```

6. Use the **mount -a** command to mount the new file system and use the **df -h** command to check that the new file system is available.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# mount -a  
[root@labservices-spectrumprotect-rhel-ab2 ~]# df -h  
Filesystem      Size  Used Avail Use% Mounted on  
devtmpfs        7.8G   0    7.8G  0% /dev  
tmpfs          7.8G   0    7.8G  0% /dev/shm  
tmpfs          7.8G  8.6M  7.8G  1% /run  
tmpfs          7.8G   0    7.8G  0% /sys/fs/cgroup  
/dev/xvda2       24G  11G   13G  46% /  
/dev/xvdal     976M 129M  797M 14% /boot  
tmpfs          1.6G   0    1.6G  0% /run/user/0  
/dev/xvdc      100G  33M  100G  1% /tsm  
[root@labservices-spectrumprotect-rhel-ab2 ~]#
```

7. Change the ownership of the new file system to the ID that owns the server instance.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# chown tsminst1:tsmsrvrs /tsm
```

- Run the **su** command to change to the instance owner account and create the necessary directories inside the file system.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# su - tsminst1
Last login: Wed Jul  1 14:35:17 CDT 2020 from localhost.localdomain on pts/1
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/tsminst1
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/tsmdb001
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/tsmlog
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/tsmarchlog
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/dbback
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ mkdir /tsm/cosbucketsmp
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$
```

Step 3: Configuring IBM Spectrum Protect server

The next set of steps configure the server instance.

- Return to the root user account and use the **db2icrt** command to create the db2 instance.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# /opt/tivoli/tsm/db2/instance/db2icrt -a
server -u tsminst1 tsminst1
DBI1446I  The db2icrt command is running.

DB2 installation is being initialized.

Total number of tasks to be performed: 4
Total estimated time for all tasks to be performed: 309 second(s)

Task #1 start
Description: Setting default global profile registry variables
Estimated time 1 second(s)
Task #1 end

Task #2 start
Description: Initializing instance list
Estimated time 5 second(s)
Task #2 end

Task #3 start
Description: Configuring DB2 instances
Estimated time 300 second(s)
Task #3 end

Task #4 start
Description: Updating global profile registry
Estimated time 3 second(s)
Task #4 end

The execution completed successfully.

For more information see the DB2 installation log at "/tmp/db2icrt.log.31888".
DBI1070I  Program db2icrt completed successfully.

[root@labservices-spectrumprotect-rhel-ab2 ~]#
```

- Run the **su** command to change to the instance user account and proceed with setting the instance directory.

```
[root@labservices-spectrumprotect-rhel-ab2 ~]# su - tsminst1
Last login: Wed Jul  1 15:38:29 CDT 2020 on pts/0
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ db2 update dbm cfg using dftdbpath
/tsm/tsminst1/
DB20000I  The UPDATE DATABASE MANAGER CONFIGURATION command completed
successfully.
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$
```

- Edit the `/home/tsminst1/sqllib/userprofile` file to add the appropriate library path. This file is empty initially. You must add the following line.

```
export
LD_LIBRARY_PATH=/opt/tivoli/tsm/server/bin/dbbkapi:/usr/local/ibm/gsk8_64/lib64:/opt/i
bm/lib:/opt/ibm/lib64:$LD_LIBRARY_PATH
```

- Copy the sample server options file to the instance directory. Ensure you rename it as `dsmsserv.opt`. For this example, the default options configuration is sufficient.

```
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ cp
/opt/tivoli/tsm/server/bin/dsmsserv.opt.smp /tsm/tsminst1/dsmsserv.opt
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$
```

5. Initialize the database. Change to the instance directory and run the **dsmser** command to format the database by specifying the directories that you created earlier. This process takes about 10 minutes to complete.

```
[tsminst1@labservices-spectrumprotect-rhel-ab2 ~]$ cd /tsm/  
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$ dsmser format  
dbdir=/tsm/tsmdb001/ activelogsize=32768 activelogdirectory=/tsm/tsmlog/  
archlogdirectory=/tsm/tsmarchlog/  
ANR7800I DSMSERV generated at 11:33:37 on Oct 11 2019.  
  
IBM Spectrum Protect for Linux/x86_64  
Version 8, Release 1, Level 9.000  
  
Licensed Materials - Property of IBM  
  
(C) Copyright IBM Corporation 1990, 2019.  
All rights reserved.  
U.S. Government Users Restricted Rights - Use, duplication or disclosure  
restricted by GSA ADP Schedule Contract with IBM Corporation.  
  
ANR7801I Subsystem process ID is 10024.  
ANR0905W Options file /tsm/dsmser.opt not found.  
ANR7814I Using instance directory /tsm.  
ANR3339I Default Label in key data base is TSM Server SelfSigned SHA Key.  
ANR4726I The ICC support module has been loaded.  
ANR0152I Database manager successfully started.  
ANR2976I Offline DB backup for database TSMDB1 started.  
ANR2974I Offline DB backup for database TSMDB1 completed successfully.  
ANR0992I Server's database formatting complete.  
ANR0369I Stopping the database manager because of a server shutdown.  
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$
```

6. After the format operation is complete, start the db2 instance by using the **db2start** command. You can safely ignore the warning message.

```
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$ db2start  
07/02/2020 10:16:47      0  0  SQL5043N Support for one or more communications  
protocols specified in the DB2COMM environment variable failed to start successfully.  
However, core database manager functionality started successfully.  
SQL1063N DB2START processing was successful.  
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$
```

7. Use a macro to create an administrative user. Edit a new file called setup.mac and add the following lines.

```
register admin adminadmin adminadmin1  
grant auth adminadmin classes=system
```

8. Run the macro to add the user adminadmin with the password set to adminadmin1.

```
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$ dsmserv runfile setup.mac  
ANR7800I DSMSERV generated at 11:33:37 on Oct 11 2019.  
  
IBM Spectrum Protect for Linux/x86_64  
Version 8, Release 1, Level 9.000  
  
Licensed Materials - Property of IBM  
  
(C) Copyright IBM Corporation 1990, 2019.  
All rights reserved.  
U.S. Government Users Restricted Rights - Use, duplication or disclosure  
restricted by GSA ADP Schedule Contract with IBM Corporation.  
  
ANR7801I Subsystem process ID is 16715.  
ANR0900I Processing options file /tsm/dsmserv.opt.  
ANR7814I Using instance directory /tsm.  
ANR3339I Default Label in key data base is TSM Server SelfSigned SHA Key.  
ANR4726I The ICC support module has been loaded.  
ANR0990I Server restart-recovery in progress.  
ANR0152I Database manager successfully started.  
ANR1628I The database manager is using port 51500 for server connections.  
ANR2277W The server master encryption key was not found. A new master encryption key  
will be created.  
ANR1636W The server machine GUID changed: old value (), new value (e8.d7.a5.58.d0.bb-  
.ea.11.aa.67.06.4f.e6.e3.5c.bc).  
ANR2100I Activity log process has started.  
ANR4726I The NAS-NDMP support module has been loaded.  
ANR1794W IBM Spectrum Protect SAN discovery is disabled by options.  
ANR2200I Storage pool BACKUPPOOL defined (device class DISK).  
ANR2200I Storage pool ARCHIVEPOOL defined (device class DISK).  
ANR2200I Storage pool SPACEMGPOOL defined (device class DISK).  
ANR2560I Schedule manager started.  
ANR0993I Server initialization complete.  
ANR0916I IBM Spectrum Protect distributed by International Business Machines is now  
ready for use.  
ANR2068I Administrator ADMINADMIN registered.  
ANR2076I System privilege granted to administrator ADMINADMIN.  
ANR1912I Stopping the activity log because of a server shutdown.  
ANR0369I Stopping the database manager because of a server shutdown.  
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$
```

9. Prepare the database manager for database backup operation.
Edit the `/home/tsminst1/sqllib/userprofile` file and add the following lines.

```
DSMI_CONFIG=/tsm/tsminst1/tsmdbmgr.opt  
DSMI_DIR=/tsm/tsminst1/dbbkapi  
DSMI_LOG=/tsm/tsminst1/  
export DSMI_CONFIG DSMI_DIR DSMI_LOG
```

10. Log out and log back in to pick up the environment changes. Then, create a new file `/tsm/tsminst1/tsmdbmgr.opt` and enter the following line.

```
SERVERNAME TSMDBMGR_TSMINST1
```

11. Log in as the root user. Create a new file `/opt/tivoli/tsm/server/bin/dbbkapi/dsm.sys` and add the following lines.

```
servername TSMDBMGR_TSMINST1  
commmethod tcpip  
tcpserveraddr localhost  
tcpport 1500  
errorlogname /tsminst1/tsmdbmgr.log  
nodename $$_TSMDBMGR_$$
```

Additional DB2 or Spectrum Protect configuration might be desirable, but this minimum configuration is sufficient for this example.

IBM Spectrum Protect must now be able to start.

12. Log in as the `tsminst1` user and change to the `/tsminst1/tsm` directory. Run the **dsmserv** command to start the IBM Spectrum Protect.

```
[tsminst1@labservices-spectrumprotect-rhel-ab2 tsm]$ dsmserv
ANR7800I DSMSERV generated at 11:33:37 on Oct 11 2019.

IBM Spectrum Protect for Linux/x86_64
Version 8, Release 1, Level 9.000

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restricted by GSA ADP Schedule Contract with IBM Corporation.

ANR7801I Subsystem process ID is 18872.
ANR0900I Processing options file /tsm/dsmserv.opt.
ANR7814I Using instance directory /tsm.
ANR3339I Default Label in key data base is TSM Server SelfSigned SHA Key.
ANR4726I The ICC support module has been loaded.
ANR0990I Server restart-recovery in progress.
ANR0152I Database manager successfully started.
ANR1628I The database manager is using port 51500 for server connections.
ANR1635I The server machine GUID, e8.d7.a5.58.d0.bb.ea.11.aa.67.06.4f.e6.e3.5c.bc,
has initialized.
ANR2100I Activity log process has started.
ANR4726I The NAS-NDMP support module has been loaded.
ANR1794W IBM Spectrum Protect SAN discovery is disabled by options.
ANR2803I License manager started.
ANR0984I Process 1 for AUDIT LICENSE started in the BACKGROUND at 11:05:18 AM.
ANR2820I Automatic license audit started as process 1.
ANR8598I Outbound SSL Services were loaded.
ANR8230I TCP/IP Version 6 driver ready for connection with clients on port 1500.
ANR8200I TCP/IP Version 4 driver ready for connection with clients on port 1500.
ANR2560I Schedule manager started.
ANR2825I License audit process 1 completed successfully - 0 nodes audited.
ANR0985I Process 1 for AUDIT LICENSE running in the BACKGROUND completed with
completion state SUCCESS at 11:05:19 AM.
ANR0984I Process 2 for EXPIRE INVENTORY (Automatic) started in the BACKGROUND at
11:05:28 AM.
ANR0811I Inventory client file expiration started as process 2.
ANR0167I Inventory file expiration process 2 processed for 0 minutes.
ANR0812I Inventory file expiration process 2 is completed: processed 0 nodes,
examined 0 objects, retained 0 objects, deleted 0 backup objects, 0 archive objects,
0 database backup volumes, and 0 recovery plan files. 0 objects were retried 0 errors
were detected, and 0 objects were skipped.
ANR0985I Process 2 for EXPIRE INVENTORY (Automatic) running in the BACKGROUND
completed with completion state SUCCESS at 11:05:28 AM.
ANR0281I Servermon successfully started during initialization, using process 18903.
IBM Spectrum Protect:SERVER1>
ANR0993I Server initialization complete.
ANR0916I IBM Spectrum Protect distributed by International Business Machines is now
ready for use.
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: QUERY PROCESS
ANR0944E QUERY PROCESS: No active processes found.
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW LOCKS ONLYW=Y
```

```

ANR2017I Administrator SERVER_CONSOLE issued command: INSTRUMENTATION END
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2841W Server is NOT IN COMPLIANCE with license terms.
ANR1434W No files have been identified for automatically storing device configuration
information.
ANR4502W No files have been defined for automatically storing sequential volume
history information.
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW DBCONN
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW DEDUPTHREAD
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW BANNER
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW RESQ
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TXNT LOCKD=N
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2034E QUERY MOUNT: No match found using this criteria.
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2034E QUERY SESSION: No match found using this criteria.
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW SESS F=D
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW THREADS
ANR2017I Administrator SERVER_CONSOLE issued command: SHOW TIME

IBM Spectrum Protect Server for Linux/x86_64 - Version 8, Release 1, Level 9.000

IBM Spectrum Protect:SERVER1>

```

13. Define a device class for database backup and set dbrecovery to use that device.

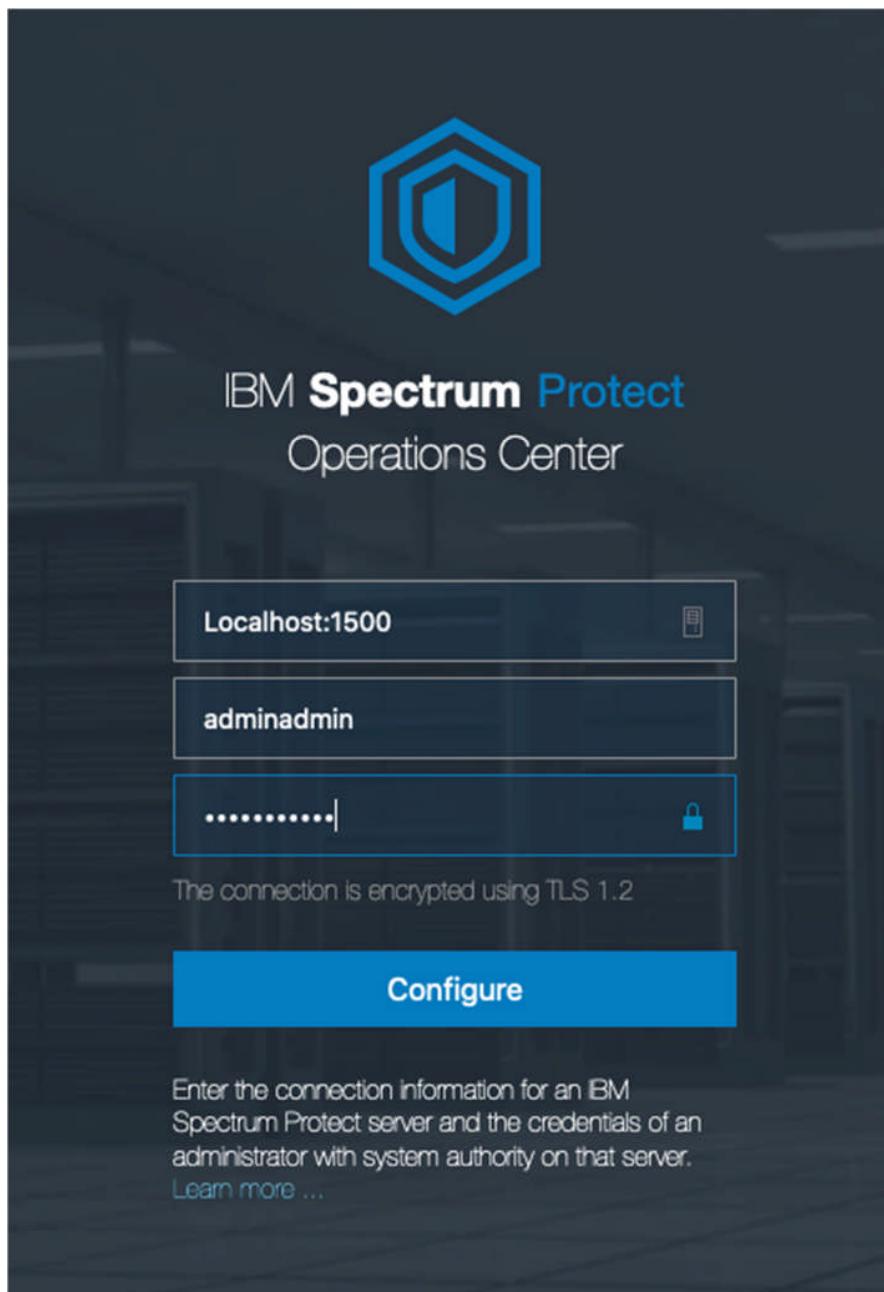
```

IBM Spectrum Protect Server for Linux/x86_64 - Version 8, Release 1, Level 9.000

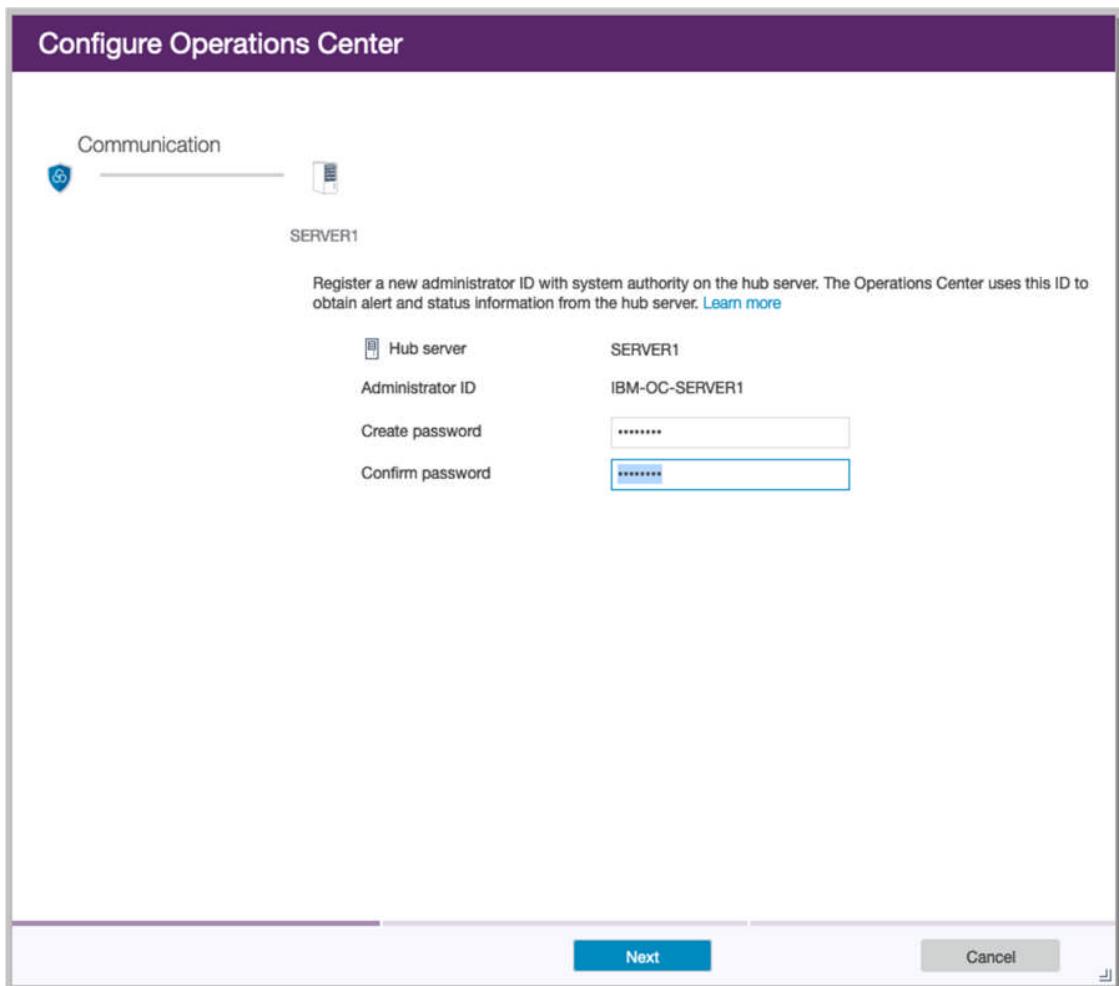
IBM Spectrum Protect:SERVER1>
define devclass dbback devtype=file directory=/tsm/dbback
ANR2017I Administrator SERVER_CONSOLE issued command: DEFINE DEVCLASS dbback
devtype=file directory=/tsm/dbback
ANR2203I Device class DBBACK defined.
ANR1434W No files have been identified for automatically storing device configuration
information.
IBM Spectrum Protect:SERVER1>
set dbrecovery dbback protectkeys=yes password=Passw0rd
ANR2017I Administrator SERVER_CONSOLE issued command: SET DBRECOVERY dbback
protectkeys=yes password=?****?
ANR2782I SET DBRECOVERY completed successfully and device class for automatic DB
backup is set to DBBACK.
IBM Spectrum Protect:SERVER1>

```

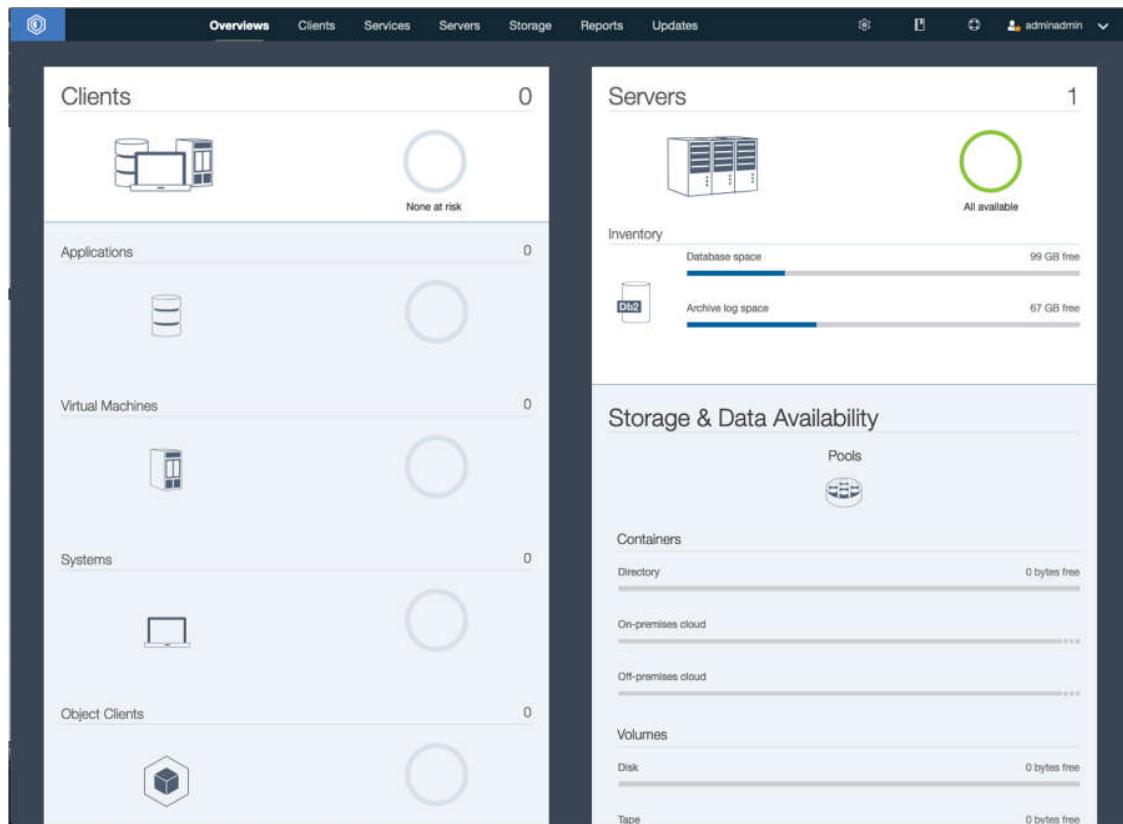
14. You can now log in to and configure the IBM Spectrum Protect Operations Center. Enter `https://<ip of your VSI>:11090/oc/` in a web browser. This URL takes you to the **Operations Center** login screen. Log in with the `adminadmin` user that you created earlier.



15. Set a new password for the new Operations Center administrator ID.



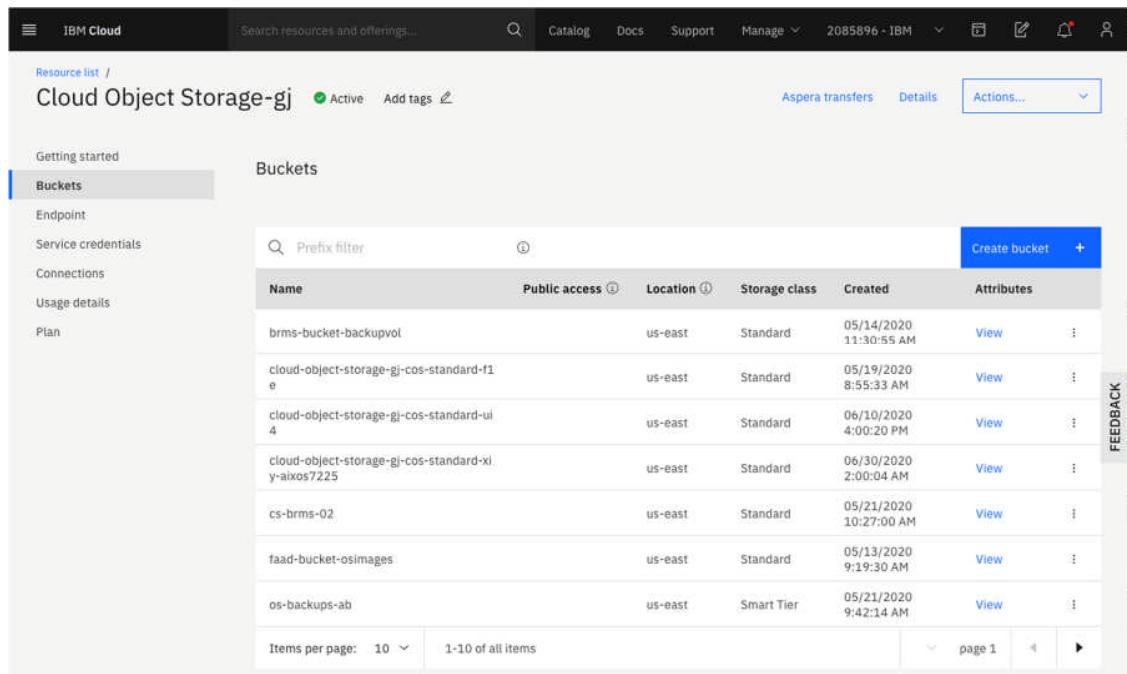
16. Make required adjustments in the configuration wizard and then click **Configure** and then **Close** when configuration is complete. After configuration, you will reach the **Overviews** screen.



Step 4: Configuring Cloud Object Storage

Before you can add Cloud Object Storage as a storage pool for IBM Spectrum Protect, you'll need to create a bucket and a service credential.

1. Navigate to your Cloud Object Storage resource in the IBM Cloud console. Click the **Create bucket** button.



The screenshot shows the IBM Cloud console interface for managing Cloud Object Storage buckets. The top navigation bar includes links for Catalog, Docs, Support, Manage, and a user profile. The main header displays the resource path "Cloud Object Storage-gi" and indicates it is "Active". A search bar and a "Create bucket" button are also present. On the left, a sidebar lists navigation options: Getting started, Buckets (which is selected and highlighted in blue), Endpoint, Service credentials, Connections, Usage details, and Plan. The main content area is titled "Buckets" and contains a table listing seven existing buckets. The columns in the table are Name, Public access, Location, Storage class, Created, and Attributes. The "Create bucket" button is located at the top right of the table. The table rows are as follows:

Name	Public access	Location	Storage class	Created	Attributes
brms-bucket-backupvol	Standard	us-east	Standard	05/14/2020 11:30:55 AM	View ⋮
cloud-object-storage-gi-cos-standard-f1e	Standard	us-east	Standard	05/19/2020 8:55:33 AM	View ⋮
cloud-object-storage-gi-cos-standard-u14	Standard	us-east	Standard	06/10/2020 4:00:20 PM	View ⋮
cloud-object-storage-gi-cos-standard-xiy-aixos7225	Standard	us-east	Standard	06/30/2020 2:00:04 AM	View ⋮
cs-brms-02	Standard	us-east	Standard	05/21/2020 10:27:00 AM	View ⋮
faad-bucket-osimages	Standard	us-east	Standard	05/13/2020 9:19:30 AM	View ⋮
os-backups-ab	Smart Tier	us-east	Smart Tier	05/21/2020 9:42:14 AM	View ⋮

At the bottom of the table, there are pagination controls: "Items per page: 10" (with a dropdown arrow), "1-10 of all items", "page 1", and navigation arrows.

- Choose the option for **Custom Bucket**. Specify a meaningful name to the bucket. Ensure that the appropriate **Location** and **Storage Class** options are selected. Scroll to the bottom and click the **Create Bucket** button.

Custom bucket

Unique bucket name

cloud-object-storage-spectrumprotect-ab3

Bucket naming rules:

- Must be unique across the **whole IBM Cloud Object Storage system**
- Do not use any personal information (any part of a name, address, financial or security accounts or SSN)
- Must start and end in alphanumeric characters (3 to 63)
- Characters allowed: lowercase, numbers and non-consecutive dots and hyphens

Resiliency

Cross Region Highest availability

Regional Best performance

Single Site Data sovereignty

Location

us-east

Storage class [View pricing](#)

Smart Tier New!

Smart Tier automatically gives you the lowest storage rate based on your monthly activity.

Standard

For active workloads that require higher performance and low latency and where data needs to be accessed frequently.

Your new bucket appears on the list of buckets in the Cloud Object Storage resource.

cloud-object-storage-spectrumprotect-ab3	us-east	Smart Tier	07/02/2020 1:12:05 PM	View	⋮
--	---------	------------	--------------------------	----------------------	-------------------

3. Navigate to **Service credentials** screen, and click the **New credential** button.

The screenshot shows the IBM Cloud service credentials page for a Cloud Object Storage resource named "Cloud Object Storage-gj". The "Service credentials" tab is selected in the left sidebar. A table lists existing credentials, each with a "Key name" (e.g., "cloud-object-storage-gj-cos-standard-f1e", "faad-bucket-osimages", etc.) and a "Date created" (e.g., MAY 19, 2020 - 08:55:34 AM). A blue "New credential" button is visible at the top right of the table area. The top navigation bar includes links for Catalog, Docs, Support, Manage, and a user profile.

Key name	Date created
cloud-object-storage-gj-cos-standard-f1e	MAY 19, 2020 - 08:55:34 AM
faad-bucket-osimages	MAY 13, 2020 - 09:19:31 AM
cloud-object-storage-gj-cos-standard-xiy-aixos7225	JUN 30, 2020 - 02:00:09 AM
BRMS-backup-service-credentials	MAY 20, 2020 - 03:01:30 PM
cloud-object-storage-gj-cos-standard-ui4	JUN 10, 2020 - 04:00:21 PM
cs-brms-02	MAY 21, 2020 - 10:27:02 AM
brms-bucket-backupvol	MAY 14, 2020 - 11:30:57 AM

4. Specify a meaningful name for the new credential. Also, click **Advanced Options** and select the **Include HMAC Credential** option. Then click **Add**.

Create credential X

Name:

Role: (i)

[Advanced options ^](#)

Select Service ID (Optional) (i)

Include HMAC Credential (i) On

Provide service-specific configuration parameters in a valid JSON object (Optional)

Add inline configuration parameters (Optional)
{"HMAC":true}

- Your new credential must be visible in the list of credentials.
- Click the down arrow to the left of its name to view the contents of the credential.



```

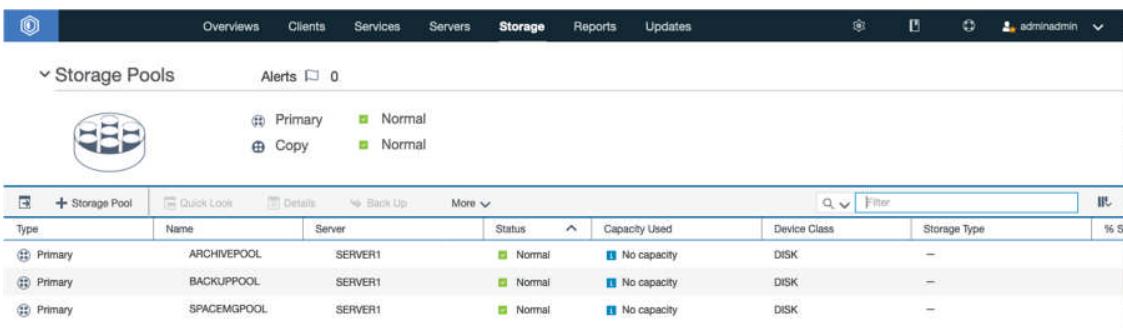
{
  "apikey": "dqe0_nhfS0Zat9Q1_YRhrb65jR0gb3UosXo8MICVN3l",
  "cos_hmac_keys": {
    "access_key_id": "a66096783ab74478905d02d02be08411",
    "secret_access_key": "cd64278cc5d88ce216d46d5908f25c232a378f7746aa02e"
  },
  "endpoints": "https://control.cloud-object-storage.cloud.ibm.com/v2/endpoints",
  "iam_apikey_description": "Auto-generated for key a6609678-3ab7-4478-905d-02d02be08411",
  "iam_apikey_name": "cloud-object-storage-spectrumprotect-ab3",
  "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
  "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity::a/06d2a1ecba244622a0fb88efb4843fb4::serviceid:492ef5db-d08a-4a54-8d72-bdf4176b40fc",
  "resource_instance_id": "crn:v1:bluemix:public:cloud-object-storage:global:a/06d2a1ecba244622a0fb88efb4843fb4:3513c7a1-690e-4fdf-9ec5-fa679037e8db::"
}

```

Step 5: Connecting Spectrum Protect to Cloud Object Storage

Now you can add the IBM Cloud Object Storage bucket as a storage pool.

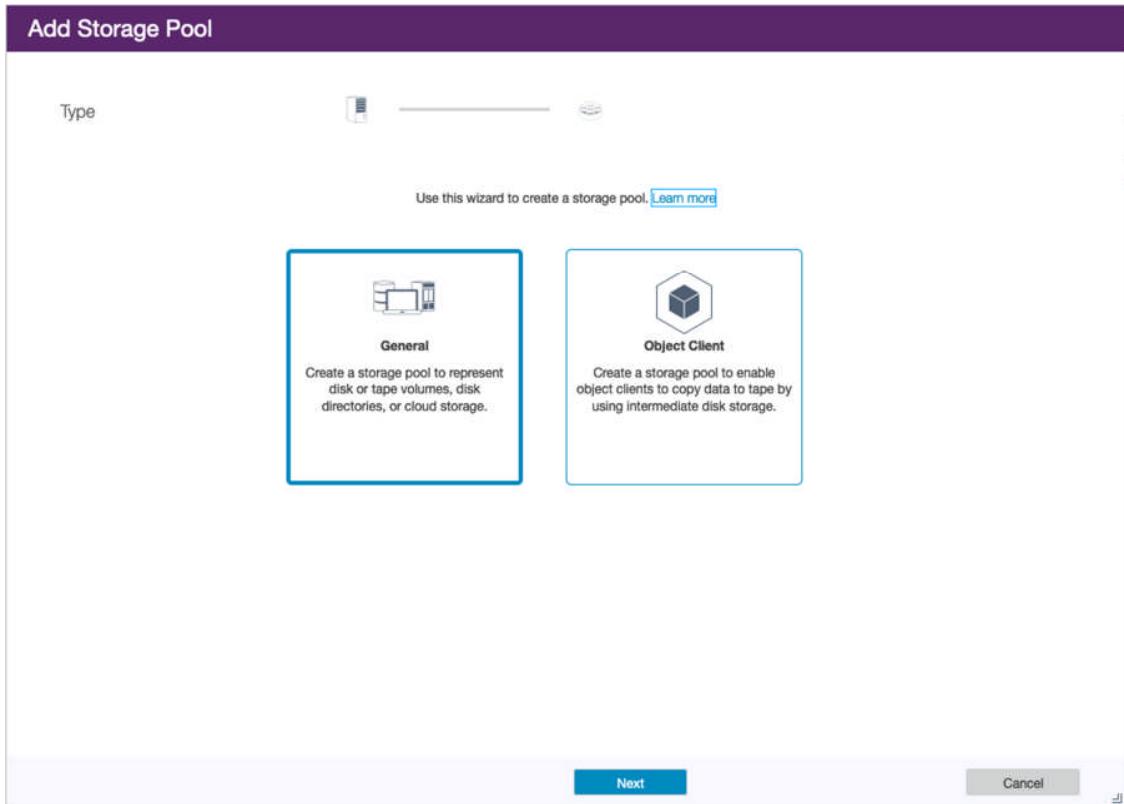
- Return to the Spectrum Protect Operations center. Click on **Storage** in the menu bar and select **Storage Pools**. This will take you to the **Storage Pools** screen.



The screenshot shows the 'Storage Pools' screen in the Spectrum Protect Operations center. At the top, there's a navigation bar with tabs like 'Overviews', 'Clients', 'Services', 'Servers', 'Storage', 'Reports', and 'Updates'. Below the navigation bar, there's a section for 'Storage Pools' with a summary table showing two primary pools: 'ARCHIVEPOOL' and 'BACKUPPOOL', both managed by 'SERVER1'. Both pools are listed as 'Normal' status with 'No capacity' used. A search bar and a filter button are also present at the top of the table.

Type	Name	Server	Status	Capacity Used	Device Class	Storage Type
Primary	ARCHIVEPOOL	SERVER1	Normal	No capacity	DISK	-
Primary	BACKUPPOOL	SERVER1	Normal	No capacity	DISK	-
Primary	SPACEMGPOOL	SERVER1	Normal	No capacity	DISK	-

2. Click the **+ Storage Pool** button to add the new storage pool.
Select the **General** option and click **Next**.



3. Specify a meaningful name and description for the new pool and then click **Next**.

Add Storage Pool

Identity SERVER1

Create a storage pool to store client data. [Learn more](#)

Name	COSBUCKET
Server	SERVER1
Description	Cloud Object storage bucket.

Back Next Cancel

4. Select the option for **Off-premises Cloud** and then click **Next**.

Add Storage Pool

Type

SERVER1 COSBUCKET

Choose the type of pool that best supports your business goals. [Learn more](#)

To copy data from an existing directory-container pool, cancel the wizard, select the pool, and click More > Add Container-copy Pool.

Container-based storage

Directory
File-based storage on disk with optional copy pools

On-premises cloud
Object-based storage that is managed by internal IT staff in your data center. For example, IBM Cloud Object Storage and other certified S3 providers.

Off-premises cloud
Storage in vendor-managed repositories, using IBM Cloud, OpenStack Swift, Amazon S3, or Microsoft Azure

Traditional volume-based storage

Disk (primary)
Storage on disk or in a mountable deduplicating appliance

Tape (primary)
Storage on tape or in a deduplicating VTL

Tape (copy)
Copies of primary storage on tape or in a VTL

[Back](#) [Next](#) [Cancel](#)

5. Select **IBM Cloud Object Storage – S3 API** as the Cloud Type.
Then you'll need to gather and paste in the Access Key ID,
Secret Access Key, Existing Bucket Name, and URL from the IBM
Cloud Console.

Add Storage Pool

Credentials

SERVER1 COSBUCKET

Select the cloud type and enter connection information for accessing the cloud. [Learn more](#)

Pool type	Off-premises cloud
Encryption	<input checked="" type="checkbox"/> Enable
Cloud type	IBM Cloud Object Storage - S3 API (formerly SoftLayer) ▾
Access key ID	a66096783ab74478905d02d02be08411
Secret access key
Existing bucket name	cloud-object-storage-spectrumprotect-ab3
URL	https://s3.private.us-east.cloud-object-storage.appd +

Back Next Cancel

You can find the Access Key ID and Secret Access Key in the Service Credential that you created.

```
"cos_hmac_keys": {  
    "access_key_id": "a66096783ab74478905d02d02be08411",  
    "secret_access_key": "cd64278cc5d88ce216d46d5908f25c232a378f77469aa02e"  
},  
"endpoints": "https://control.cloud-object-storage.cloud.ibm.com/v2/endpoints"
```

And you can find the Existing Bucket Name and URL by looking at the Configuration of your bucket. To look at the configuration, click on the three dots icon to the right of the bucket name and choose **Configuration**.

y-aixos/220				2:00:04 AM
cloud-object-storage-spectrumprotect-ab3	us-east	Smart Tier	07/02/2020 1:12:05 PM	View
cs-brms-02	us-east	Standard	05/21/2020 10:27:00 AM	⋮
faad-bucket-osimages	us-east	Standard	05/13/2020 9:19:30 AM	Configuration
os-backups-ab	us-east	Smart Tier	05/21/2020 9:42:14 AM	Access Policies SQL URL Delete bucket

The Existing Bucket Name is just the name of the bucket. The URL is the Private Endpoint listed below.

Bucket configuration

Bucket details

Bucket name	cloud-object-storage-spectrumprotect-ab3	Total bytes	0 bytes
Service instance	cloud-object-storage	Resiliency	Regional
Total objects	0	Location	us-east
Storage class	Smart Tier ⓘ	Date created	07/02/2020 1:12:05 PM
Cloud Functions trigger	Disabled Learn more		

Bucket instance CRN
This value identifies the service instance when listing or creating buckets via the API. [Learn more](#)

```
crn:v1:bluemix:public:cloud-object-storage:global:a/06d2a1ecba244622a0fb88efb4843fb4:3513c7a1-690e-4fdf-9ec5-fa67903  
7e8db:bucket:cloud-object-storage-spectrumprotect-ab3
```

Endpoints

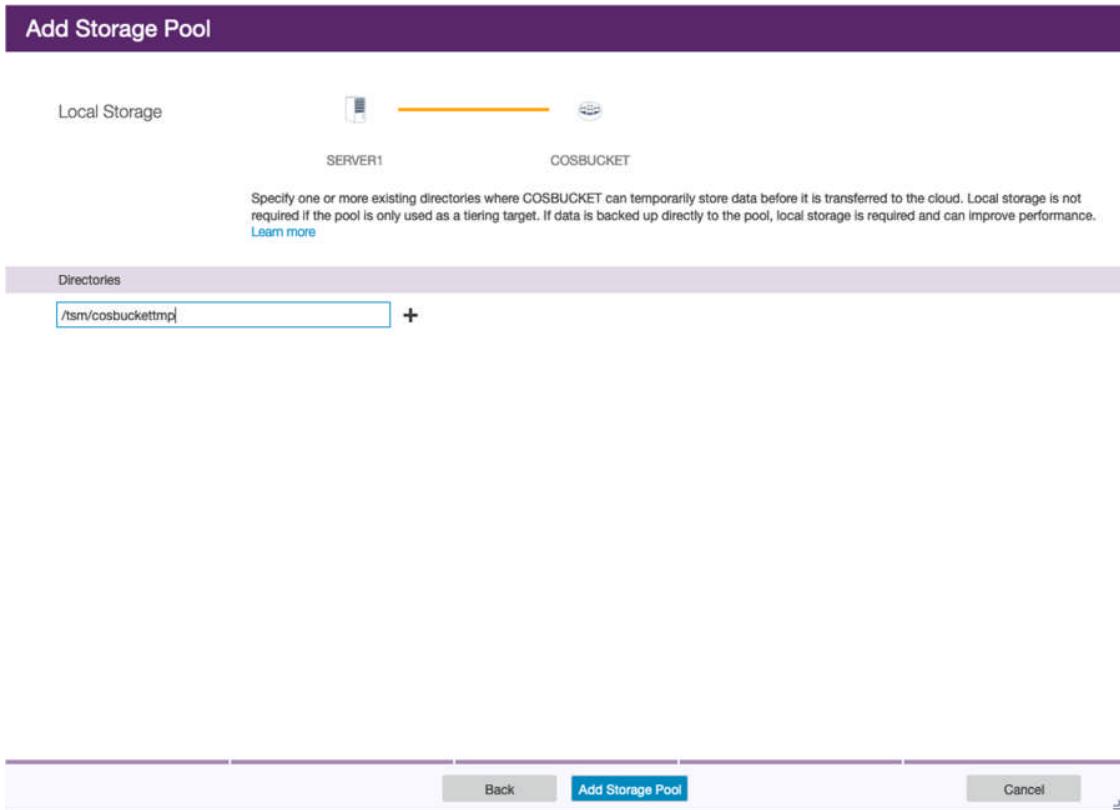
Endpoints are used hand in hand with your credentials (i.e. keys, CRN, bucket name) to tell your service where to look for this bucket. Depending on where your service or applications is located you will want to use one of the below endpoint types.

Private ⓘ
Use private endpoints to point applications or services that are hosted in the IBM cloud (excluding Cloud Foundry services).

```
s3.private.us-east.cloud-object-storage.appdomain.cloud
```

6. Click **Next** after you specify all the parameters.

7. Specify a temporary staging directory for data to be uploaded to Cloud Object Storage, and then click **Add Storage Pool**.



- After the storage pool is created, you can click the **Close & View Policies** button to view the **Policies** screen, or you can navigate to the **Policies** screen from the **Services** menu.

The screenshot shows the Policies screen with the following details:

- Backup & Restore**, **Archive & Retrieve**, and **Migrate & Recall** tabs are visible at the top.
- A toolbar below the tabs includes icons for Quick Look, Details, Filter, and a search bar.
- The main table displays one policy row:

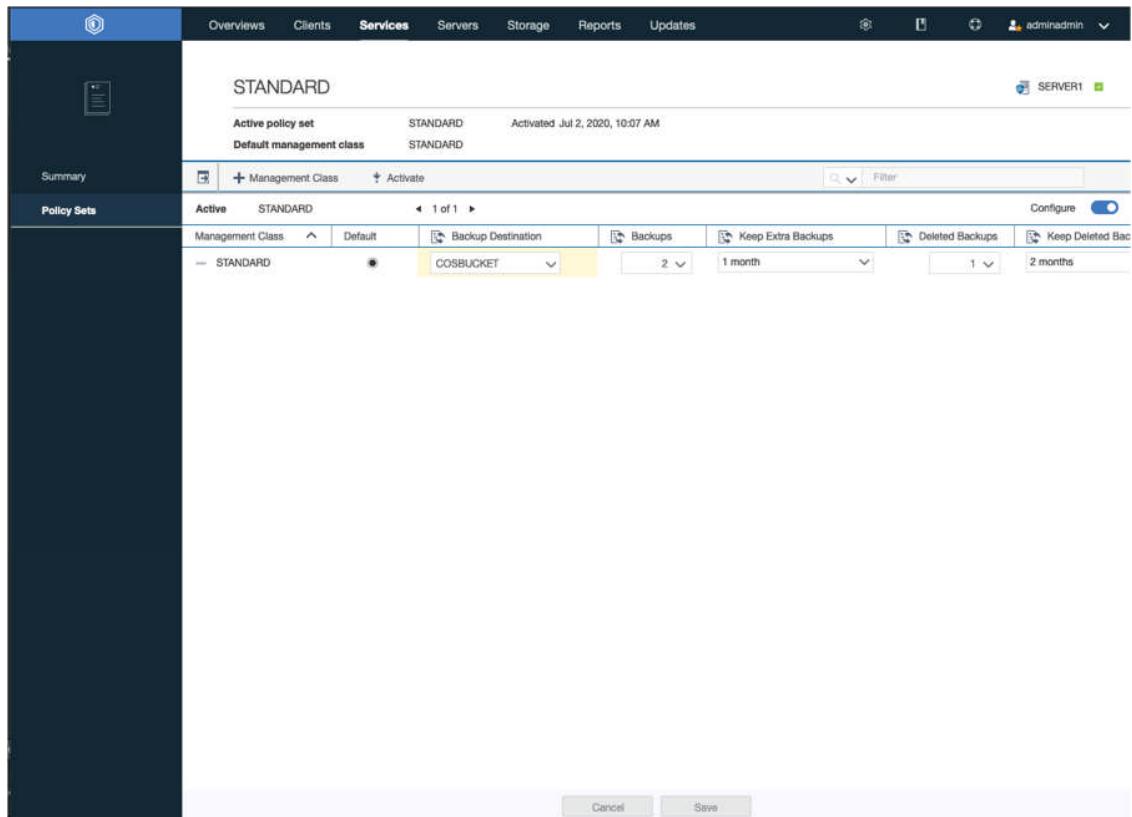
Policy Domain	Server	Clients	Mgmt Classes	Option Sets	Schedules	Default Mgmt Class	Backup Destination	Actions
STANDARD	SERVER1	0	1	0	0	STANDARD	BACKUPPOOL	

- Double click **STANDARD** to view the summary for the Standard policy.

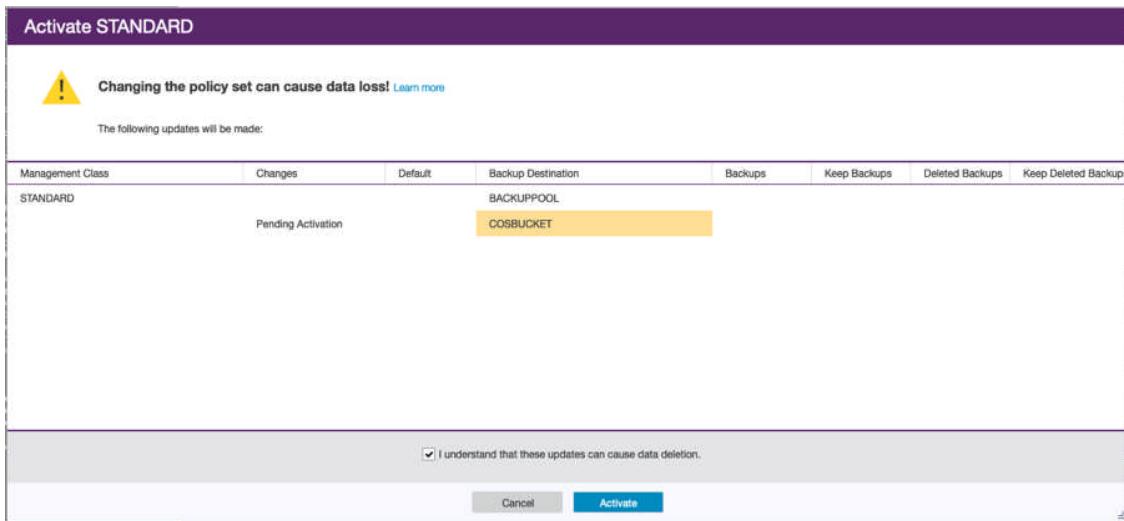
The screenshot shows the STANDARD policy summary screen with the following details:

- Active policy set**: STANDARD, **Default management class**: STANDARD, **Activated**: Jul 2, 2020, 10:07 AM.
- Summary** section:
 - Policy Sets**: SERVER1
 - General**: Expiration over 2 Weeks, 1 Objects, 0 Clients, 0 Schedules.
 - Retention Grace Periods**: Backup (30 days), Archive (365 days).
- Timeline**: A horizontal timeline showing the activation date (Jul 2, 2020) and a weekly cycle from Thursday to Wednesday.

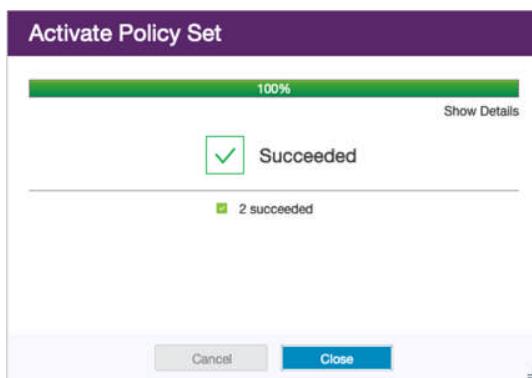
10. To change the target **Backup Destination** for the Standard Policy Set, click **Policy Sets** in the left column. Then, click the **Configure** toggle on the right side of the GUI. Finally, choose the Cloud Object Storage bucket on the pulldown menu under **Backup Destination**.



11. Click **Activate** in the middle button bar. This will open a warning that the change may cause data loss. Select the check box to confirm the change, and click **Activate** again.



You will receive a confirmation message for the change.



12. If needed, ensure to also click **Save** at the bottom of the **Policy Set** screen.

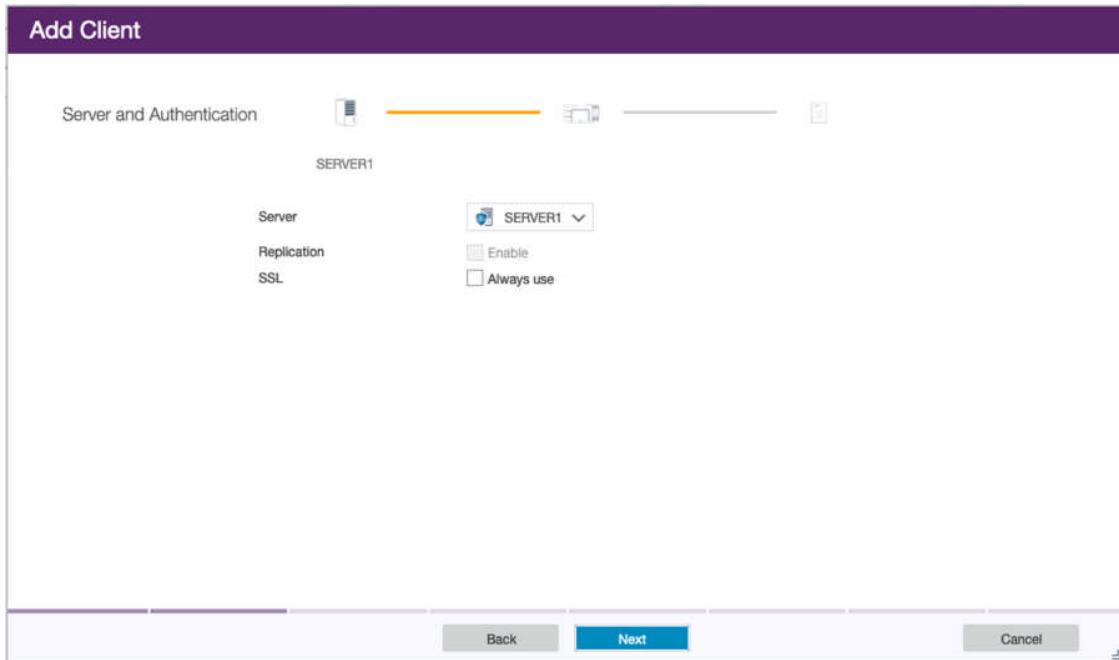
Step 6: Configuring Spectrum Protect server to back up an AIX client

Now you can proceed to set up a client definition.

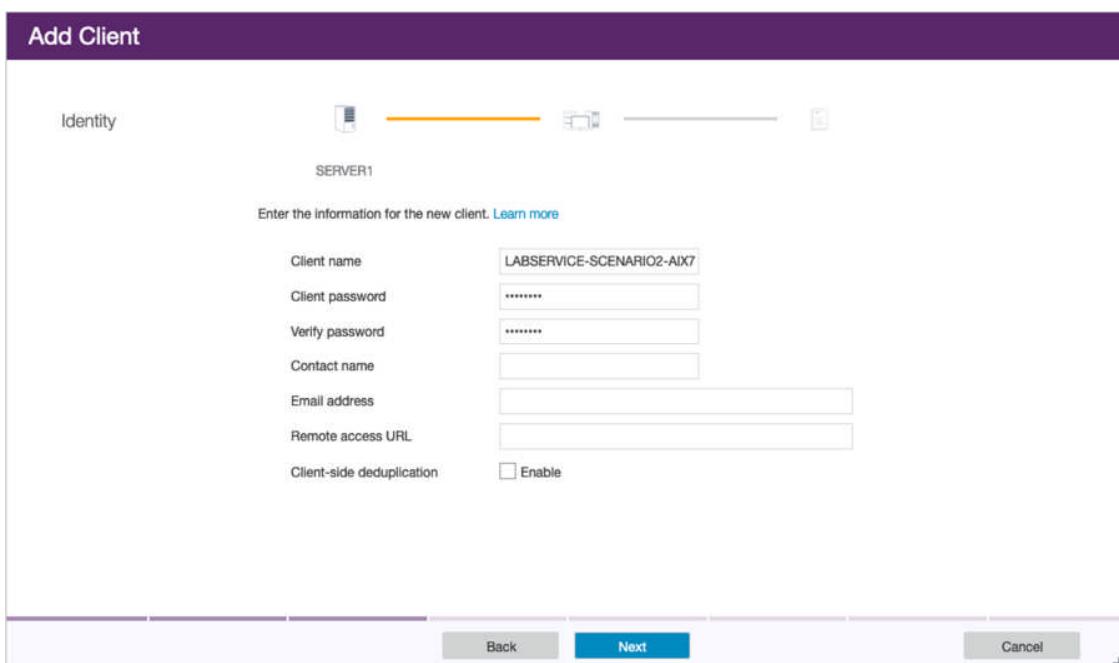
1. Choose **Clients** from the **Clients** menu in the top bar. Then click the **+ Client** button.

2. Select the **System or Application** option, and then click **Next**.

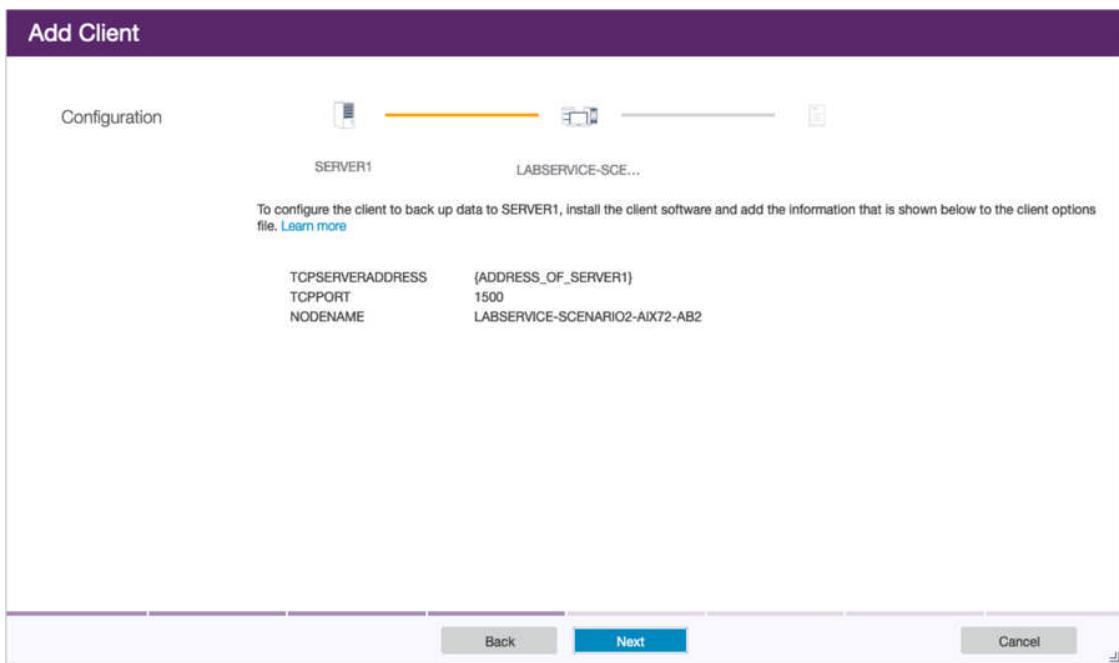
3. Select **Next** on the following screen to indicate that you will use the current Spectrum Protect server.



4. Fill in the client name, in this case the host name of the client, and choose a password for the VM to use to connect. Then click **Next**.

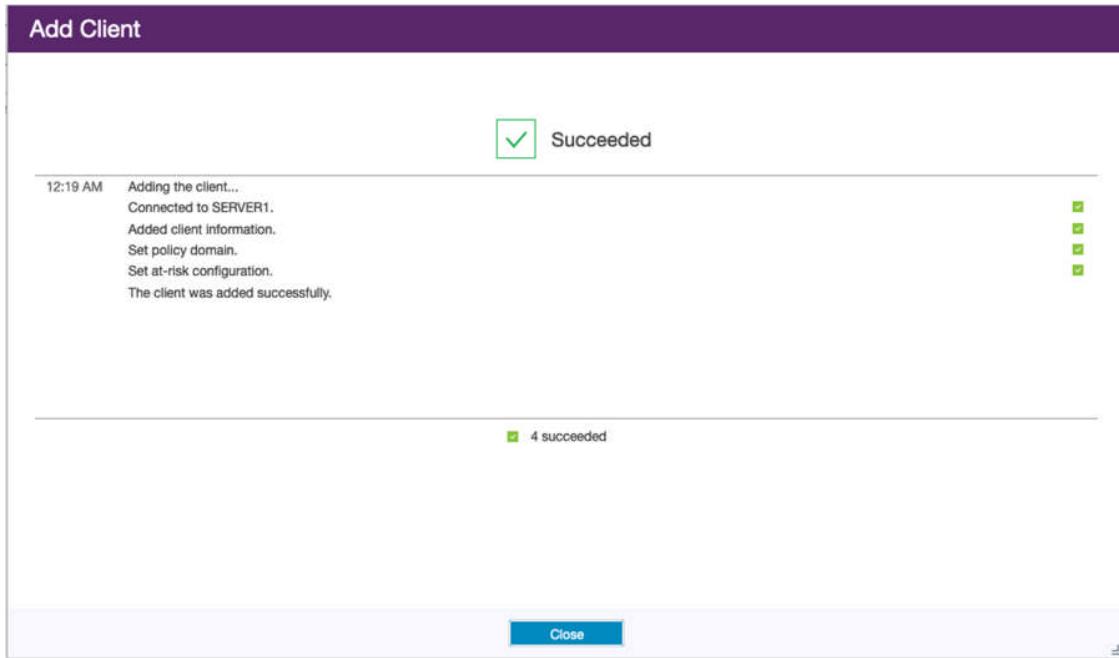


5. Take note of the information provided on the next screen. You need to put it into the options file when you set up the client VSI. Then click **Next**.



6. Click **Next** to accept the default Policy Domain for your client and **Next** again on the next few screens to take other default configuration choices. You can refer to the [IBM Spectrum Protect documentation](#) for more complex configuration options.

7. After all the configuration screens are complete, the client is added.



Step 7: Configuring IBM Spectrum Protect client in AIX

1. Copy the IBM Spectrum Protect client software to your AIX VSI in the Power Systems Virtual Servers environment. Since direct network access to the AIX environment may be limited, you can upload the software to a location within your Linux VSI and then run the **scp** command to copy it to your AIX VSI. Ensure you have enough space in the target filesystem.

```
# chfs -a size=2G /tmp
Filesystem size changed to 4194304
# mkdir /tmp/sp
# scp root@10.166.112.159:~/SP_CLIENT* /tmp/sp/
The authenticity of host '10.166.112.159 (10.166.112.159)' can't be established.
ECDSA key fingerprint is SHA256:14azUGCC1vXrluXVEBLvsgX1Tu2VIpevk0pvpU7AKmQ.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.166.112.159' (ECDSA) to the list of known hosts.
root@10.166.112.159's password:
SP_CLIENT_8.1.9_AIX_ML.tar.gz          100%  635MB  59.2MB/s  00:10
#
```

2. Change to the directory that contains the client software and decompress it.

```
# cd /tmp/sp
# gunzip SP*
# tar xvf SP*
x TSMCLI_AIX
x TSMCLI_AIX/usr
x TSMCLI_AIX/usr/sys
x TSMCLI_AIX/usr/sys/inst.images
x TSMCLI_AIX/usr/sys/inst.images/.toc, 34692 bytes, 68 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/GSKit8.gskcrypt64.ppc.rte, 4539392 bytes, 8866 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/GSKit8.gskssl164.ppc.rte, 38441984 bytes, 75082 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/README.htm, 22335 bytes, 44 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/README_api.htm, 21360 bytes, 42 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/tivoli.tsm.client.api.64bit, 184666624 bytes, 360677 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/tivoli.tsm.client.ba.64bit, 238700032 bytes, 466211 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/tivoli.tsm.client.jbb.64bit, 1138176 bytes, 2223 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/tivoli.tsm.client.webgui, 446763520 bytes, 872585 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/tivoli.tsm.filepath_aix, 2611200 bytes, 5100 tape blocks
x TSMCLI_AIX/usr/sys/inst.images/update.txt, 401 bytes, 1 tape blocks
#
```

3. Change to the directory where the installable files were decompressed.

```
# cd TSMCLI_AIX/usr/sys/inst.images
#
```

4. Run the `smit install` command and choose the **Install and Update Software option.**

```
Software Installation and Maintenance

Move cursor to desired item and press Enter.

Install and Update Software
List Software and Related Information
Software Maintenance and Utilities
Software Service Management
Relocatable Software Installation and Maintenance
Network Installation Management
EZ NIM (Easy NIM Tool)
System Workload Partition Software Maintenance
System Backup Manager
Alternate Disk Installation
EFIX Management
Thin Server Maintenance

F1=Help          F2=Refresh        F3=Cancel        F8=Image
F9=Shell         F10=Exit          Enter=Do
```

5. Choose the **Install Software option.**

```
Install and Update Software

Move cursor to desired item and press Enter.

Install Software
Update Installed Software to Latest Level (Update All)
Update Installed Software to Latest Level (Live Update)
Install Software Bundle
Update Software by Fix (APAR)
Install and Update from ALL Available Software

F1=Help          F2=Refresh        F3=Cancel        F8=Image
F9=Shell         F10=Exit          Enter=Do
```

6. Specify a period (.) to indicate the current directory as the Input device or directory, and press `Enter` to proceed.

Install Software

Type or select a value for the entry field.
Press Enter AFTER making all desired changes.

<p>* INPUT device / directory for software</p>	<p>[Entry Fields] [.]</p>
+	

F1=Help F2=Refresh F3=Cancel F4=List
F5=Reset F6=Command F7>Edit F8=Image
F9=Shell F10=Exit Enter=Do

7. On the next screen, change the option for **Accept new license agreements** to **yes** and press **Enter** to proceed. Press **Enter** again to confirm.

Install Software

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[TOP]		[Entry Fields]	
* INPUT device / directory for software	.		
* SOFTWARE to install	[_all_latest]	+	
PREVIEW only? (install operation will NOT occur)	no	+	
COMMIT software updates?	yes	+	
SAVE replaced files?	no	+	
AUTOMATICALLY install requisite software?	yes	+	
EXTEND file systems if space needed?	yes	+	
OVERWRITE same or newer versions?	no	+	
VERIFY install and check file sizes?	no	+	
Include corresponding LANGUAGE filesets?	yes	+	
DETAILED output?	no	+	
Process multiple volumes?	yes	+	
ACCEPT new license agreements?	yes	+	
PREVIEW new LICENSE agreements?	no	+	
INVOKE live update?	no	+	
[MORE...8]			
F1=Help	F2=Refresh	F3=Cancel	F4=List
F5=Reset	F6=Command	F7>Edit	F8=Image
F9=Shell	F10=Exit	Enter=Do	

8. After the installation is complete, press F10 or esc+0 to exit from SMIT.

```
COMMAND STATUS

Command: OK          stdout: yes          stderr: no

Before command completion, additional instructions may appear below.

[TOP]
geninstall -I "a -cgNQqwXY -J" -Z -d . -f File 2>&1

File:
I:GSKit8.gskcrypt64.ppc.rte    8.0.55.9
I:GSKit8.gskssl64.ppc.rte    8.0.55.9
I:tivoli.tsm.client.api.64bit  8.1.9.0
I:tivoli.tsm.client.ba.64bit.base 8.1.9.0
I:tivoli.tsm.client.ba.64bit.common 8.1.9.0
I:tivoli.tsm.client.ba.64bit.web 8.1.9.0
I:tivoli.tsm.client.ba.64bit.hdw 8.1.9.0
I:tivoli.tsm.client.ba.64bit.image 8.1.9.0
I:tivoli.tsm.client.ba.64bit.nas 8.1.9.0
I:tivoli.tsm.client.jbb.64bit   8.1.9.0
I:tivoli.tsm.client.webgui    8.1.9.0
I:tivoli.tsm.filepath.rte     2.2.0.58
[MORE...260]

F1=Help          F2=Refresh        F3=Cancel        F6=Command
F8=Image          F9=Shell          F10=Exit         /=Find
n=Find Next
```

9. Change the directory to /usr/tivoli/tsm/client/ba/bin64/ and edit a new file called dsm.sys.

```
# cd /usr/tivoli/tsm/client/ba/bin64
# vi dsm.sys
#
```

10. Put your server and connection information in that file.

Servername	labservices-spectrumprotect-rhel-ab2.IBM.cloud
COMMMethod	TCPip
TCPPort	1500
TCPServeraddress	10.166.112.159

11. Connect the client to the server. Run the **dsmc** command to start the client. Ensure the **Node Name** and **Password** match the characters that were used during the Client Configuration process in Spectrum Protect.

```
# dsmc
ANS0990W Options file '/usr/tivoli/tsm/client/ba/bin64/dsm.opt' could not be found.
Default option values will be used.
IBM Spectrum Protect
Command Line Backup-Archive Client Interface
  Client Version 8, Release 1, Level 9.0
  Client date/time: 07/10/20  10:58:44
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Node Name: LABSERVICE-SCENARIO2-AIX72-AB2
Please enter your user id <LABSERVICE-SCENARIO2-AIX72-AB2>:

Please enter password for user id "LABSERVICE-SCENARIO2-AIX72-AB2":

Session established with server SERVER1: Linux/x86_64
  Server Version 8, Release 1, Level 9.000
  Server date/time: 07/10/20  10:50:32  Last access: 07/10/20  00:19:10

Protect>
```

Step 8: Backing up an AIX client and validating the backup operation

1. Enter the incremental command to fully back up your client.

```
Protect> incremental

Incremental backup of volume '/'

Incremental backup of volume '/usr'

Incremental backup of volume '/var'

Incremental backup of volume '/home'

Incremental backup of volume '/admin'

Incremental backup of volume '/opt'

Incremental backup of volume '/var/adm/ras/livedump'

Incremental backup of volume '/usr/sys/inst.images'
Normal File-->          201,153 /usr/sys/inst.images/RPMS/linux/XML-LibXML-1.58-
1.i386.rpm [Sent]

... Many lines skipped ...

Normal File-->          2,191 /opt/triton/system-start [Sent]
Normal File-->          2,215 /opt/triton/system-stop [Sent]
Normal File-->          4,697 /opt/triton/vg-start [Sent]
Normal File-->          4,485 /opt/triton/vg-stop [Sent]
Successful incremental backup of '/opt'

Directory-->           256 /var/adm/ras/livedump/ [Sent]
Directory-->           256 /var/adm/ras/livedump/lost+found [Sent]
Successful incremental backup of '/var/adm/ras/livedump'

Total number of objects inspected:      62,118
Total number of objects backed up:     62,075
Total number of objects updated:        0
Total number of objects rebound:       0
Total number of objects deleted:       0
Total number of objects expired:       0
Total number of objects failed:        0
Total number of objects encrypted:    0
Total number of objects grew:         0
Total number of retries:              841
Total number of bytes inspected:      10.81 GB
Total number of bytes transferred:    10.83 GB
Data transfer time:                  315.36 sec
Network data transfer rate:          35,998.57 KB/sec
Aggregate data transfer rate:        27,633.44 KB/sec
Objects compressed by:               0%
Total data reduction ratio:          0.00%
Elapsed processing time:             00:06:50
Protect>
```

2. Identify the objects that Spectrum Protect uses to store the backup in your Cloud Object Storage bucket.

The screenshot shows a web-based interface for managing cloud object storage. The top navigation bar includes links for 'Resource list', 'Cloud Object Storage', 'cloud-object-storage-spectrumprotect-ab3', 'Aspera transfers', 'Details', and 'Actions...'. On the left, a sidebar menu lists various management options: Getting started, Buckets, Objects (which is selected and highlighted in grey), Configuration, Access policies, Endpoint, Service credentials, Connections, Usage details, and Plan. The main content area is titled 'Objects' and contains a reminder message about incomplete uploads. Below this is a table listing ten objects, each with a checkbox, object name, archival status, size, and last modified date. The table includes column headers: Object name, Archived, Size, and Last modified. A blue 'Upload' button is located at the top right of the table header.

	Object name	Archived	Size	Last modified
<input type="checkbox"/>	002-d6e092e17bbcea11a5a1064fe6e35cb...		15.8 MB	07/10/2020 11:07:20 AM
<input type="checkbox"/>	003-d6e092e17bbcea11a5a1064fe6e35cb...		15.9 MB	07/10/2020 11:07:29 AM
<input type="checkbox"/>	004-d6e092e17bbcea11a5a1064fe6e35cb...		16.0 MB	07/10/2020 11:07:22 AM
<input type="checkbox"/>	005-d6e092e17bbcea11a5a1064fe6e35cb...		15.9 MB	07/10/2020 11:08:39 AM
<input type="checkbox"/>	006-d6e092e17bbcea11a5a1064fe6e35cb...		15.9 MB	07/10/2020 11:07:15 AM
<input type="checkbox"/>	007-d6e092e17bbcea11a5a1064fe6e35cb...		15.9 MB	07/10/2020 11:07:14 AM
<input type="checkbox"/>	008-d6e092e17bbcea11a5a1064fe6e35cb...		15.6 MB	07/10/2020 11:07:16 AM
<input type="checkbox"/>	009-d6e092e17bbcea11a5a1064fe6e35cb...		15.8 MB	07/10/2020 11:07:03 AM
<input type="checkbox"/>	00a-d6e092e17bbcea11a5a1064fe6e35cb...		15.7 MB	07/10/2020 11:07:09 AM
<input type="checkbox"/>	00b-d6e092e17bbcea11a5a1064fe6e35cb...		15.3 MB	07/10/2020 11:07:31 AM

3. Validate file backup and restore operations by creating a new sample file, backing it up, deleting the file, and then restoring the file. Start by using the dd command to create an example file of 10 MB.

```
# dd if=/dev/zero of=/testfile bs=1m count=10
10+0 records in
10+0 records out
# ls -l /testfile
-rw-r--r--    1 root      system   10485760 Jul 10 14:27 /testfile
#
```

4. Perform incremental backup operation. This will capture your example file and any other files that have changed since your previous backup.

```
# dsmc incremental
ANS0990W Options file '/usr/tivoli/tsm/client/ba/bin64/dsm.opt' could not be found.
Default option values will be used.
IBM Spectrum Protect
Command Line Backup-Archive Client Interface
  Client Version 8, Release 1, Level 9.0
  Client date/time: 07/10/20 14:27:47
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Please enter your user id <LABSERVICE-SCENARIO2-AIX72-AB2>:

Please enter password for user id "LABSERVICE-SCENARIO2-AIX72-AB2":

Session established with server SERVER1: Linux/x86_64
  Server Version 8, Release 1, Level 9.000
  Server date/time: 07/10/20 14:19:13 Last access: 07/10/20 14:01:06

Incremental backup of volume '/'
Incremental backup of volume '/usr'
Incremental backup of volume '/var'
... several lines skipped ...

Normal File-->      10,485,760 /testfile [Sent]
... several lines skipped ...

Total number of bytes inspected:          10.81 GB
Total number of bytes transferred:        23.43 MB
Data transfer time:                      39.22 sec
Network data transfer rate:             611.93 KB/sec
Aggregate data transfer rate:           443.32 KB/sec
Objects compressed by:                  0%
Total data reduction ratio:            99.79%
Elapsed processing time:                00:00:54
#
```

5. Delete your example file and confirm that it is removed.

```
# ls -l /testfile
-rw-r--r-- 1 root      system    10485760 Jul 10 14:27 /testfile
# rm /testfile
# ls -l /testfile
/testfile not found
#
```

6. Restore your example file and confirm that it has been recovered.

```
# dsmc restore /testfile
ANS0990W Options file '/usr/tivoli/tsm/client/ba/bin64/dsm.opt' could not be found.
Default option values will be used.
IBM Spectrum Protect
Command Line Backup-Archive Client Interface
  Client Version 8, Release 1, Level 9.0
  Client date/time: 07/10/20  14:30:04
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Node Name: LABSERVICE-SCENARIO2-AIX72-AB2
Please enter your user id <LABSERVICE-SCENARIO2-AIX72-AB2>:

Please enter password for user id "LABSERVICE-SCENARIO2-AIX72-AB2":

Session established with server SERVER1: Linux/x86_64
  Server Version 8, Release 1, Level 9.000
  Server date/time: 07/10/20  14:21:30  Last access: 07/10/20  14:19:21

Restore function invoked.

Restoring      10,485,760 /testfile [Done]

Restore processing finished.

Total number of objects restored:          1
Total number of objects failed:            0
Total number of bytes transferred:        10.00 MB
Data transfer time:                      13.63 sec
Network data transfer rate:              751.26 KB/sec
Aggregate data transfer rate:            631.47 KB/sec
Elapsed processing time:                 00:00:16
# ls -l /testfile
-rw-r--r-- 1 root      system    10485760 Jul 10 14:27 /testfile
#
```

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