# BlueXP SaaS for Oracle - Azure

## NetApp Solutions

NetApp
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# TR-4977: Oracle Database backup, restore and clone with SnapCenter Services - Azure

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## Purpose

SnapCenter Services is the SaaS version of the classic SnapCenter database management UI tool that is available through the NetApp BlueXP cloud management console. It is an integral part of the NetApp cloud-backup, data-protection offering for databases such as Oracle and HANA running on Azure NetApp Files. This SaaS-based service simplifies traditional SnapCenter standalone server deployment that generally requires a Windows server operating in a Windows domain environment.

In this documentation, we demonstrate how you can set up SnapCenter Services to backup, restore, and clone Oracle databases deployed on Azure NetApp Files volumes and Azure compute instances. It is very easy to setup data protection for Oracle database deployed on Azure NetApp Files with web based BlueXP user interface.

This solution addresses the following use cases:

- Database backup with snapshots for Oracle databases hosted in Azure NetApp Files and Azure VMs
- Oracle database recovery in the case of a failure
- Fast cloning of primary databases for dev, test environments or other use cases

## Audience

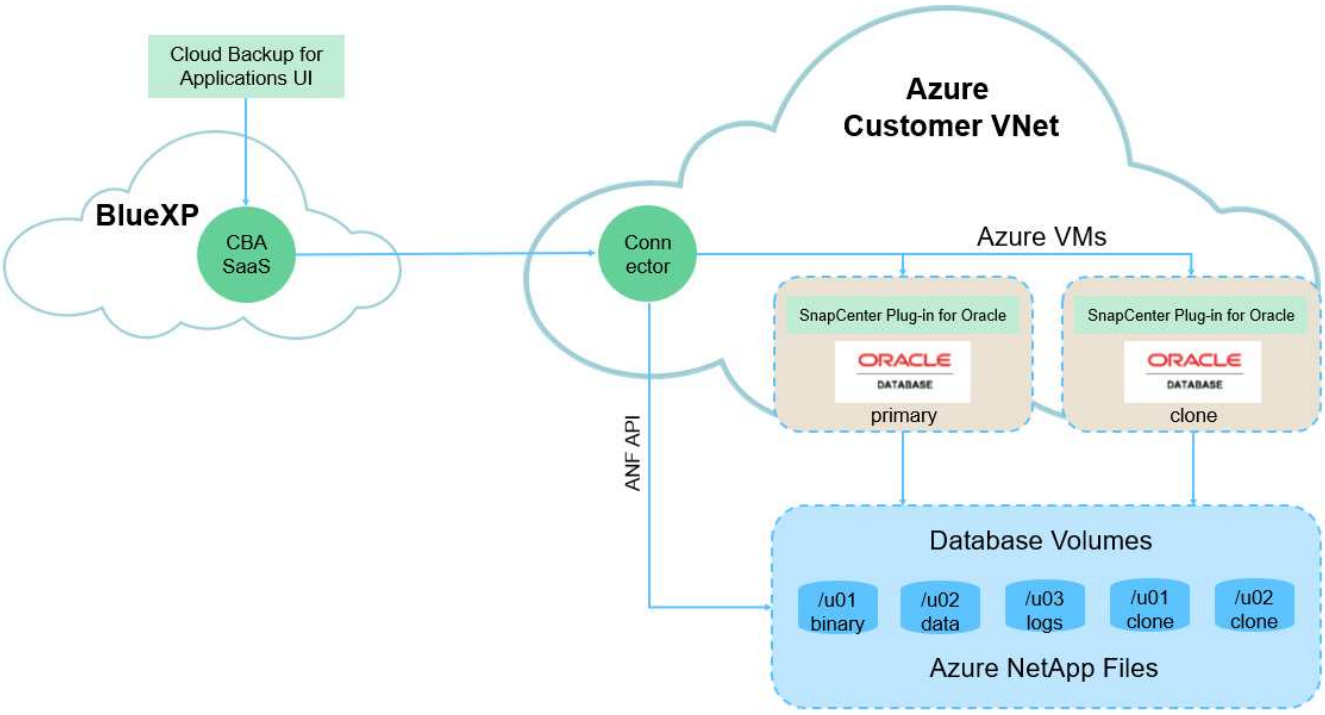
This solution is intended for the following audiences:

- The DBA who manages Oracle databases running on Azure NetApp Files storage
- The solution architect who is interested in testing Oracle database backup, restore, and clone in Azure
- The storage administrator who supports and manages the Azure NetApp Files storage
- The application owner who owns applications that are deployed to Azure NetApp Files storage and Azure VMs

## Solution test and validation environment

The testing and validation of this solution was performed in a lab environment that might not match the final deployment environment. For more information, see the section [Key Factors for Deployment Consideration].

### Architecture




This image provides a detailed picture of BlueXP backup and recovery for applications within the BlueXP console, including the UI, the connector, and the resources it manages.

## Hardware and software components

### Hardware

| | | |
|---|---|---|
| Azure NetApp Files storage | Premium Service level | Auto QoS type, and 4TB in storage capacity in testing |
| Azure instance for compute | Standard B4ms (4 vcpus, 16 GiB memory) | Two instances deployed, one as primary DB server and the other as clone DB server |

### Software

| | | |
|---|---|---|
| RedHat Linux | Red Hat Enterprise Linux 8.7 (LVM) - x64 Gen2 | Deployed RedHat subscription for testing |
| Oracle Database | Version 19.18 | Applied RU patch p34765931_190000_Linux-x86-64.zip |
| Oracle OPatch | Version 12.2.0.1.36 | Latest patch p6880880_190000_Linux-x86-64.zip |
| SnapCenter Service | Version v2.5.0-2822 | Agent Version v2.5.0-2822 |

## Key factors for deployment consideration

- **Connector to be deployed in the same virtual network / subnet as databases and Azure NetApp Files.** When possible, the connector should be deployed in the same Azure virtual networks and resource groups, which enables connectivity to the Azure NetApp Files storage and the Azure compute instances.

- **An Azure user account or Active Directory service principle created at Azure portal for SnapCenter connector.** Deploying a BlueXP Connector requires specific permissions to create and configure a virtual machine and other compute resources, to configure networking, and to get access to the Azure subscription. It also requires permissions to later create roles and permissions for the Connector to operate. Create a custom role in Azure with permissions and assign to the user account or service principle. Review the following link for details:Set up Azure permissions.
- **A ssh key pair created in the Azure resource group.** The ssh key pair is assigned to the Azure VM user for logging into the connector host and also the database VM host for deploying and executing a plug-in. BlueXP console UI uses the ssh key to deploy SnapCenter service plugin to database host for one-step plugin installation and application host database discovery.
- **A credential added to the BlueXP console setting.** To add Azure NetApp Files storage to the BlueXP working environment, a credential that grants permissions to access Azure NetApp Files from the BlueXP console needs to be set up in the BlueXP console setting.
- **java-11-openjdk installed on the Azure VM database instance host.** SnapCenter service installation requires java version 11. It needs to be installed on application host before plugin deployment attempt.

# Solution deployment

There is extensive NetApp documentation with a broader scope to help you protect your cloud-native application data. The goal of this documentation is to provide step-by-step procedures that cover SnapCenter Service deployment with the BlueXP console to protect your Oracle database deployed on an Azure NetApp Files storage and an Azure compute instance.

To get started, complete the following steps:

- Read the general instructions Protect your cloud native applications data and the sections related to Oracle and Azure NetApp Files.
- Watch the following video walkthrough

  Video of deployment of Oracle and ANF

## Prerequisites for SnapCenter service deployment

Deployment requires the following prerequisites.

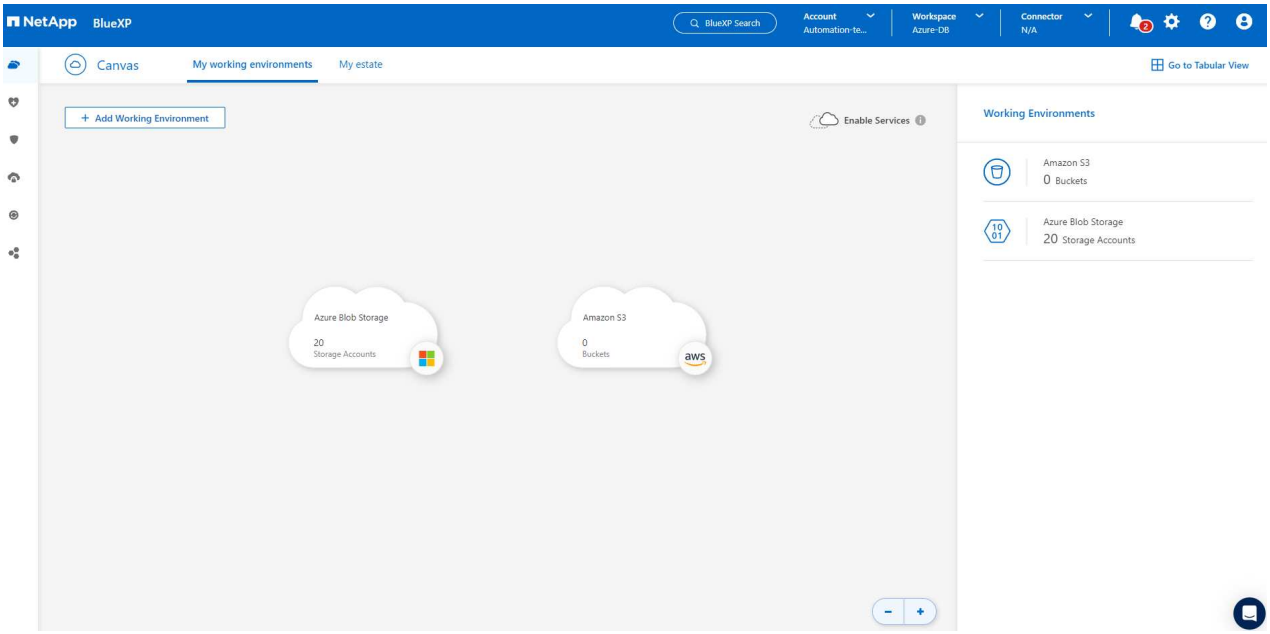
1. A primary Oracle database server on an Azure VM instance with an Oracle database fully deployed and running.
2. An Azure NetApp Files storage service capacity pool deployed in Azure that has capacity to meet the database storage needs listed in hardware component section.
3. A secondary database server on an Azure VM instance that can be used for testing the cloning of an Oracle database to an alternate host for the purpose of supporting a dev/test workload or any use cases that requires a full data set of production Oracle database.
4. For additional information for Oracle database deployment on Azure NetApp Files and Azure compute instance, see Oracle Database Deployment and Protection on Azure NetApp Files.

## Onboarding to BlueXP preparation

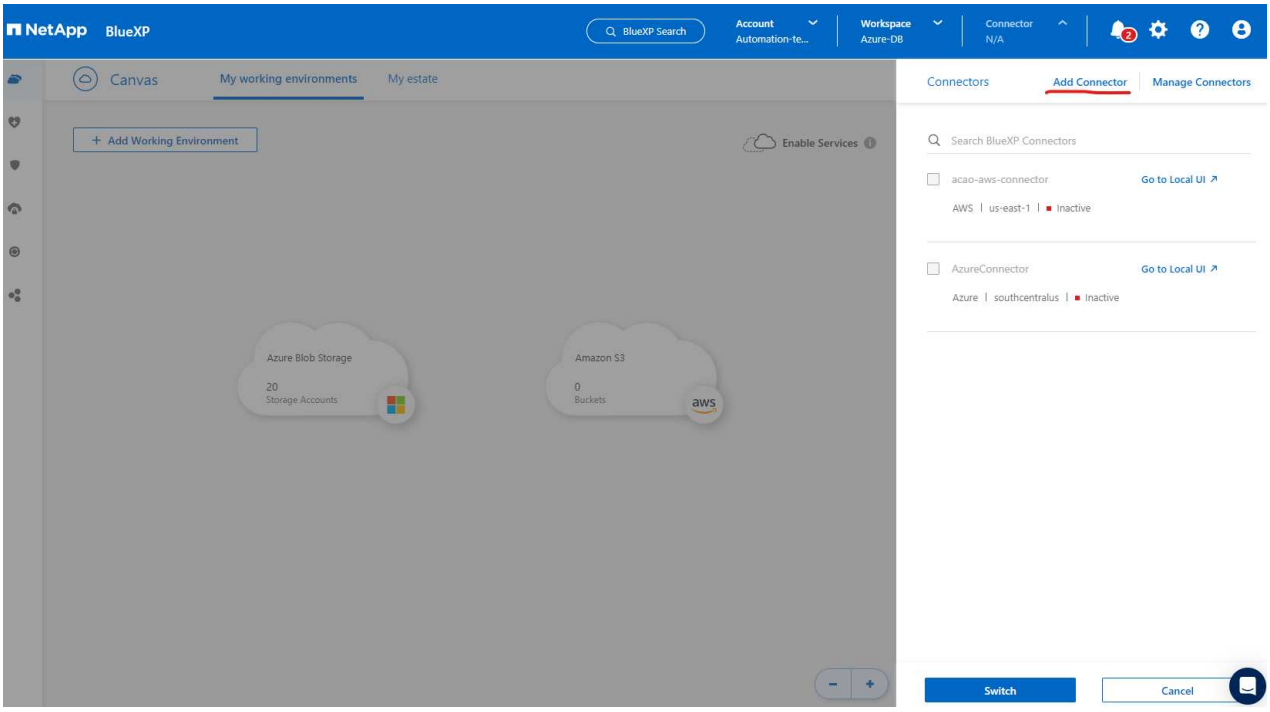
1. Use the link NetApp BlueXP to sign up for BlueXP console access.
2. Create an Azure user account or an Active Directory service principle and grant permissions with role in Azure portal for Azure connector deployment.
3. To set up BlueXP to manage Azure resources, add a BlueXP credential with details of an Active Directory service principal that BlueXP can use to authenticate with Azure Active Directory (App client ID), a client secret for the service principal application (Client Secret), and the Active Directory ID for your organization (Tenant ID).
4. You also need the Azure virtual network, resources group, security group, an SSH key for VM access, etc. ready for connector provisioning and database plugin installation.

## Deploy a connector for SnapCenter services

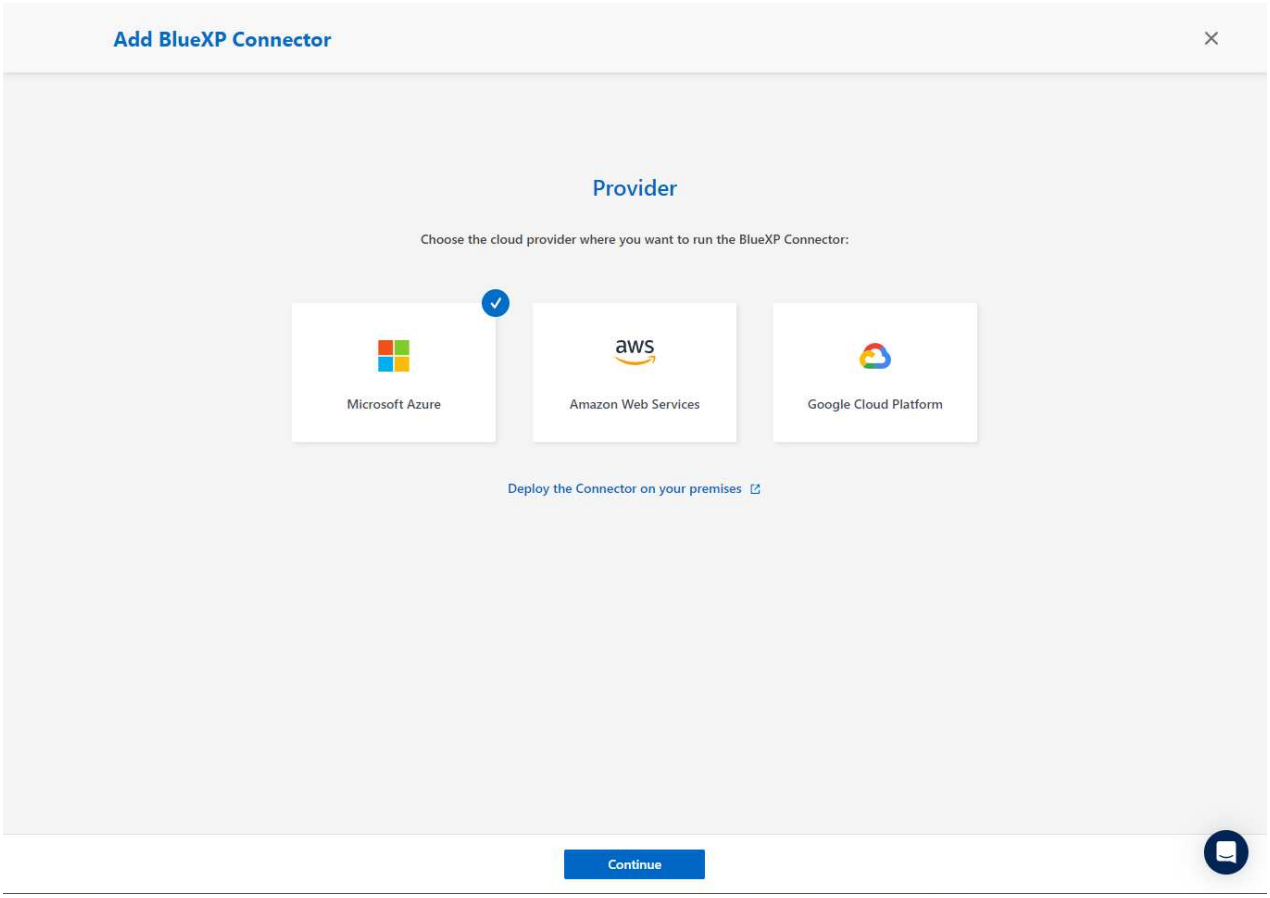
1. Login to the BlueXP console.



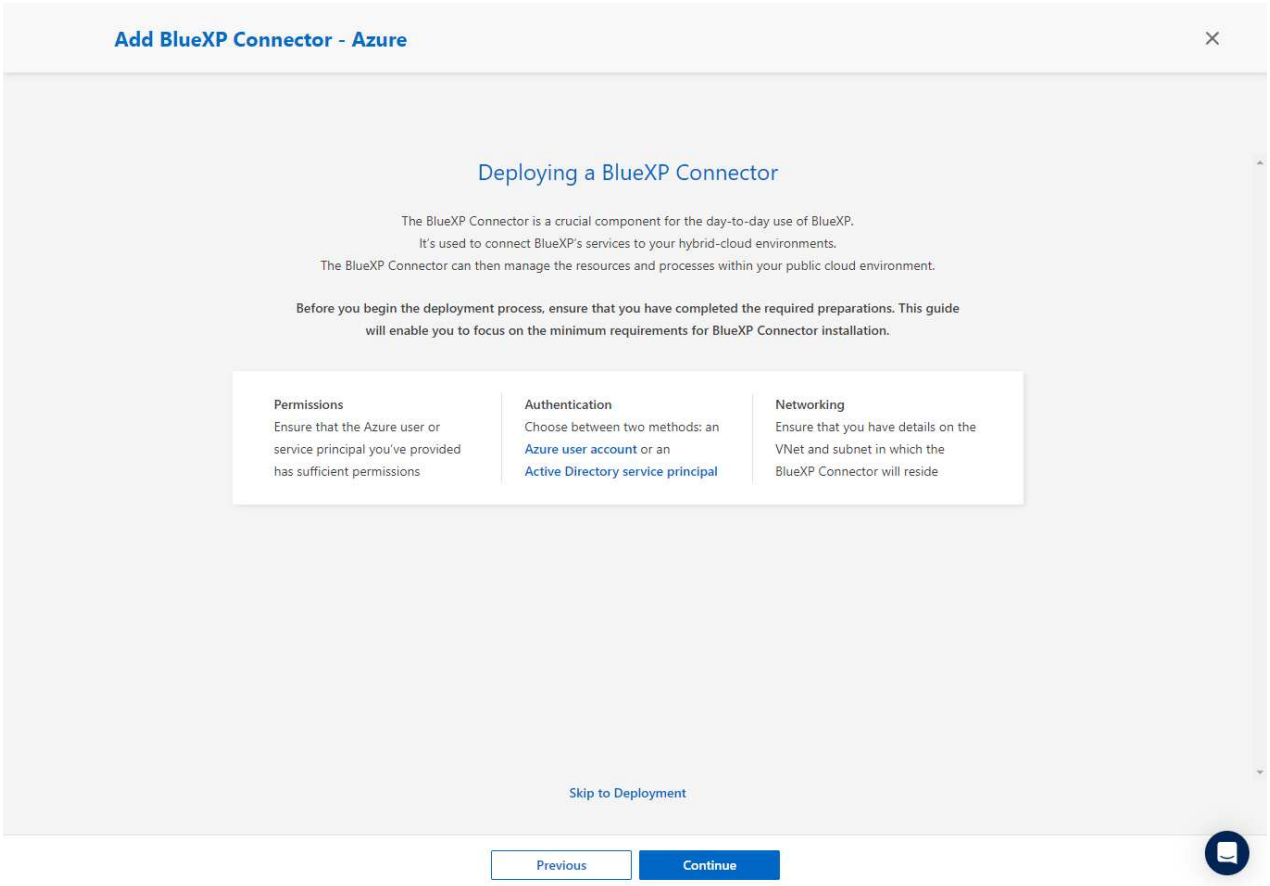

2. Click on **Connector** drop down arrow and **Add Connector** to launch the connector provisioning workflow.



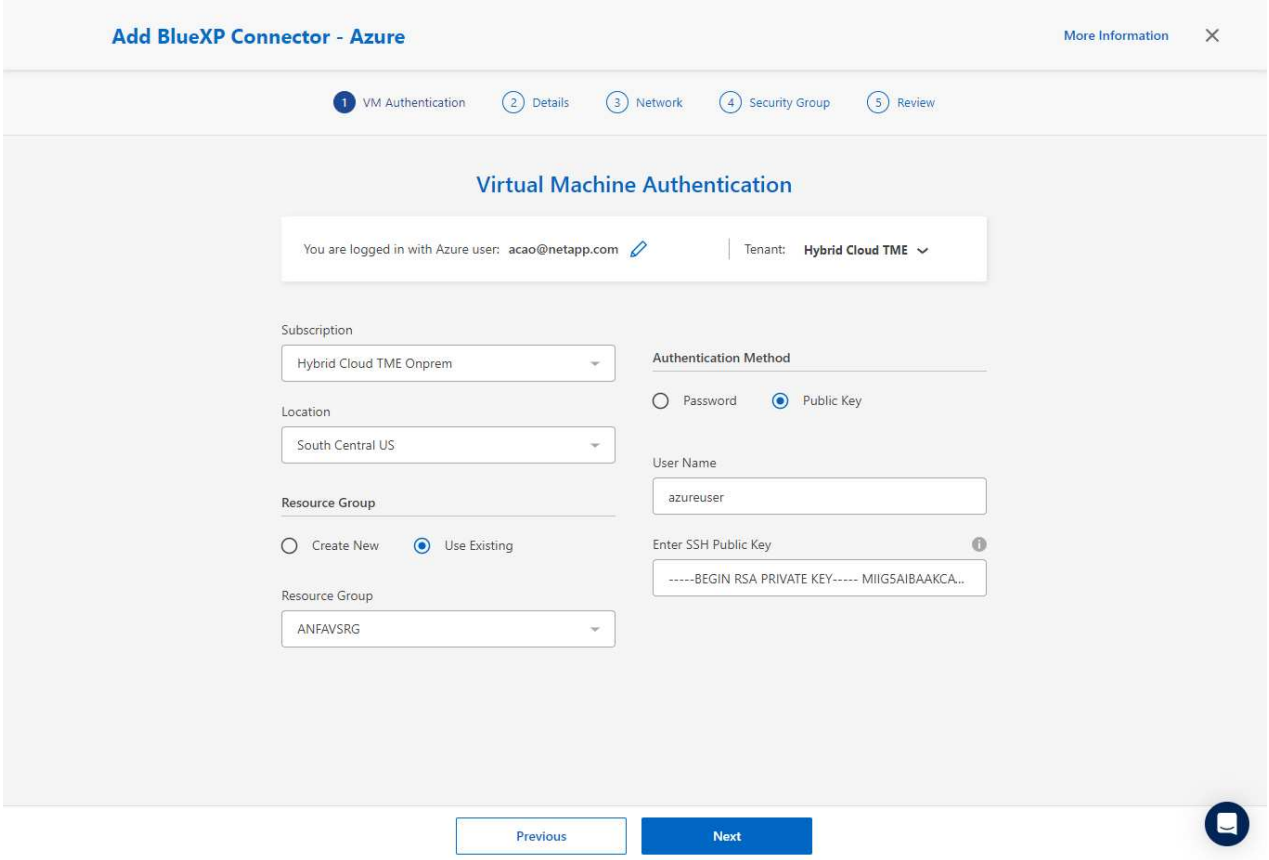

3. Choose your cloud provider (in this case, **Microsoft Azure**).



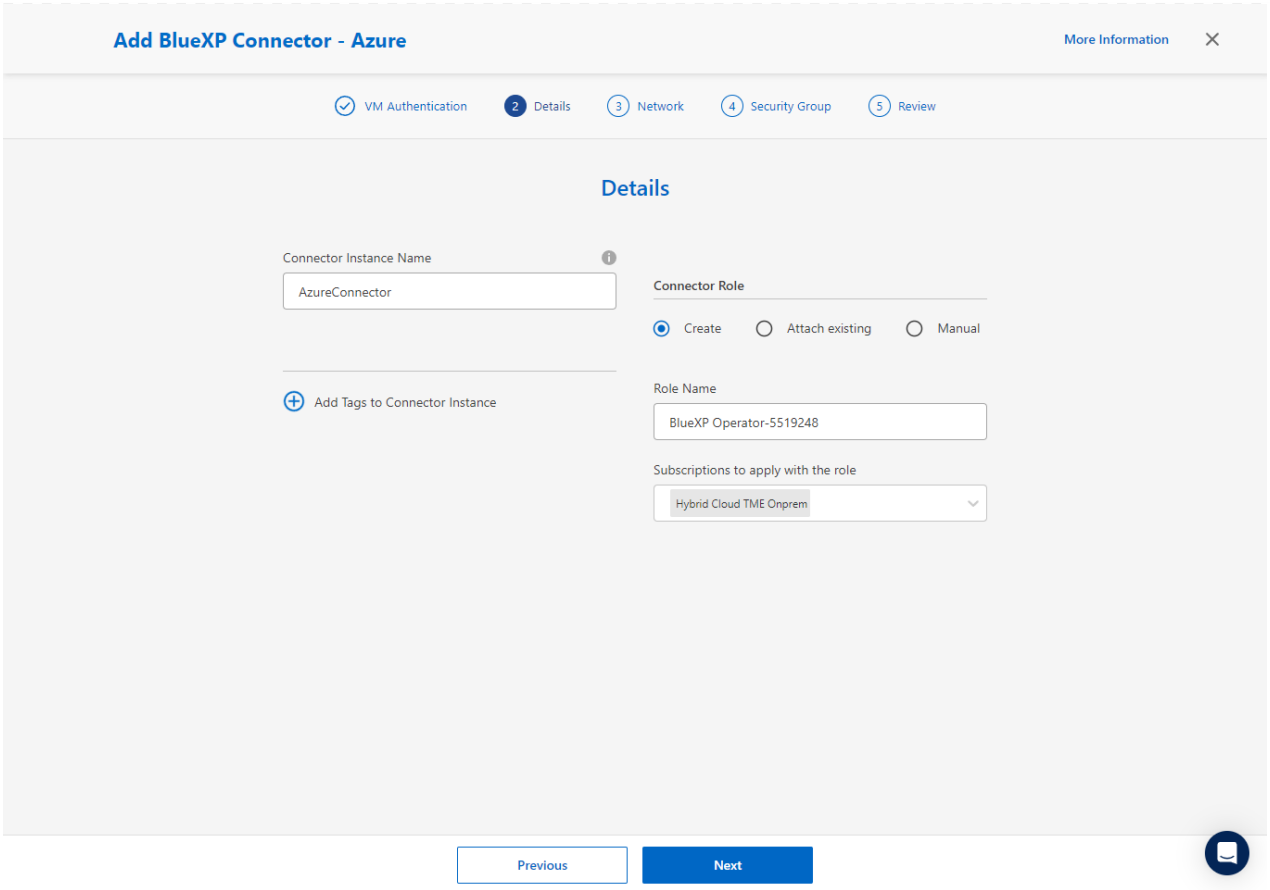

4. Skip the **Permission**, **Authentication**, and **Networking** steps if you already have them set up in your Azure account. If not, you must configure these before proceeding. From here, you could also retrieve the permissions for the Azure policy that is referenced in the previous section "Onboarding to BlueXP preparation."



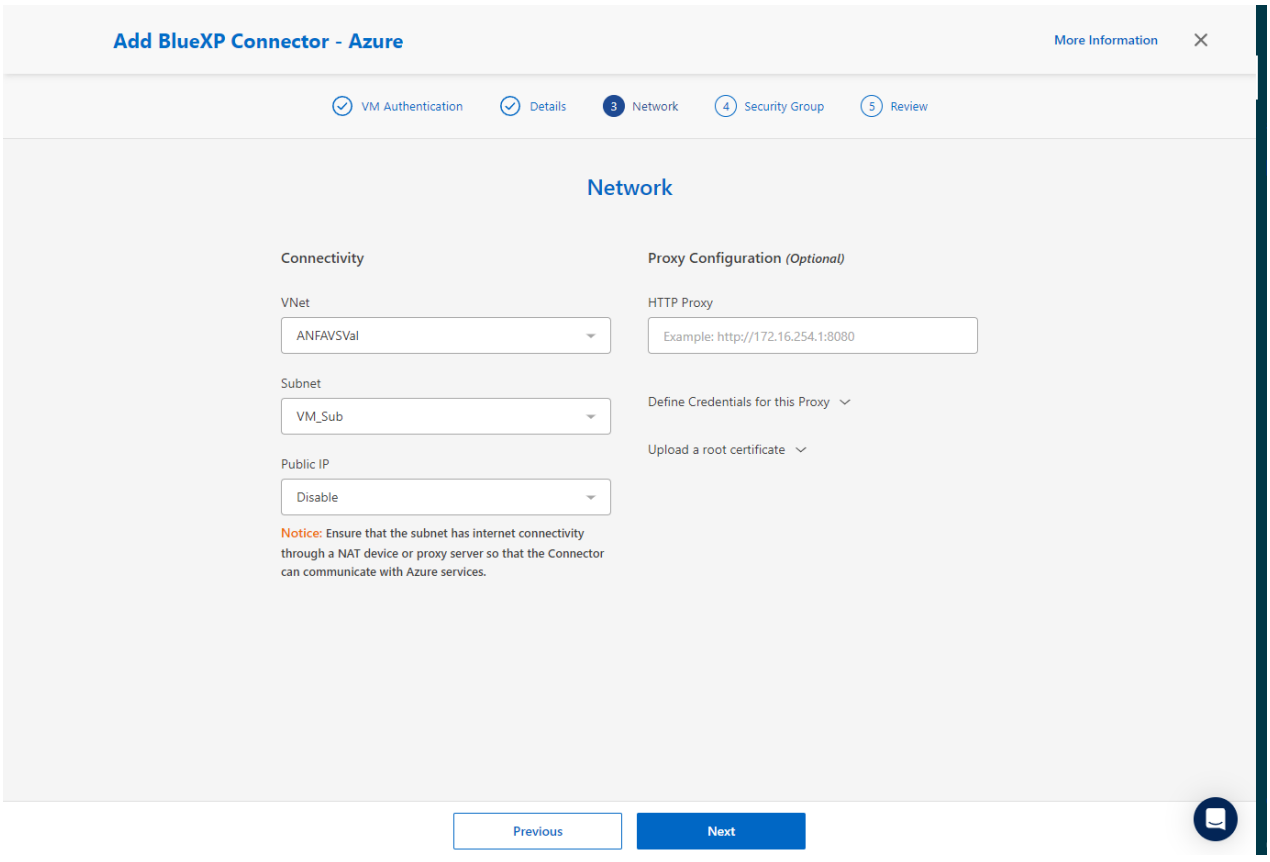

5. Click on **Skip to Deployment** to configure your connector **Virtual Machine Authentication**. Add the SSH key pair you have created in Azure resource group during onboarding to BlueXP preparation for connector OS authentication.



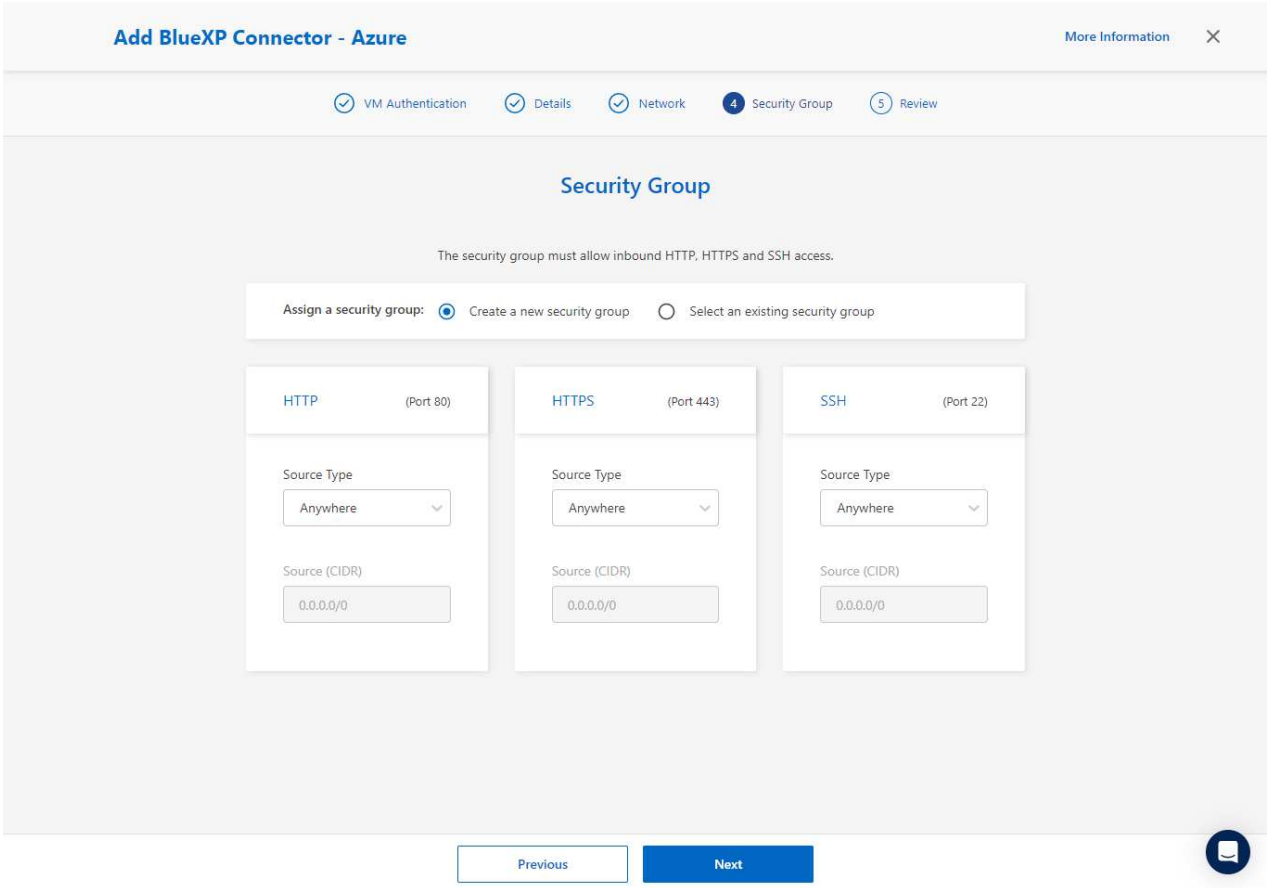

6. Provide a name for the connector instance, select **Create** and accept default **Role Name** under **Details**, and choose the subscription for the Azure account.



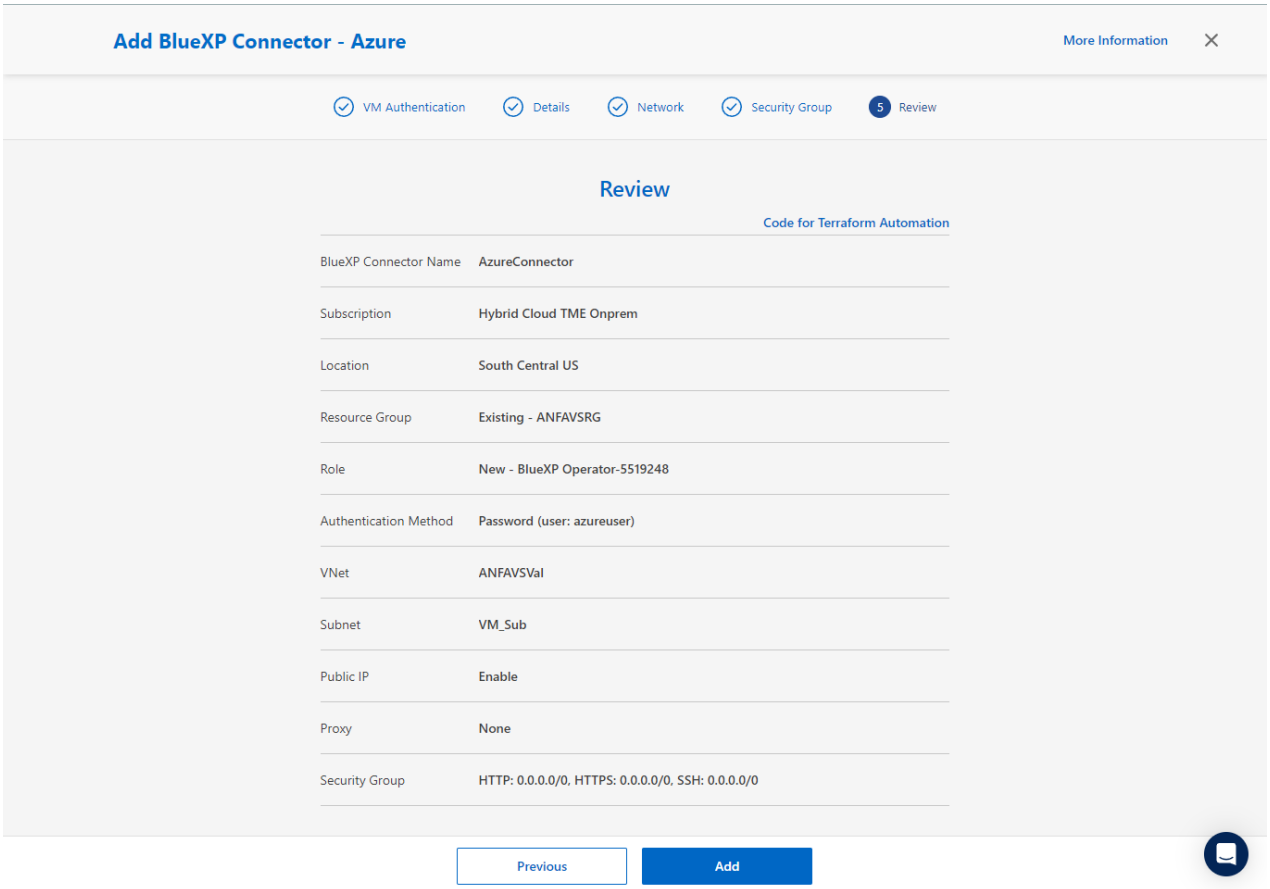

7. Configure networking with the proper **VNet**, **Subnet**, and disable **Public IP** but ensure that the connector has the internet access in your Azure environment.



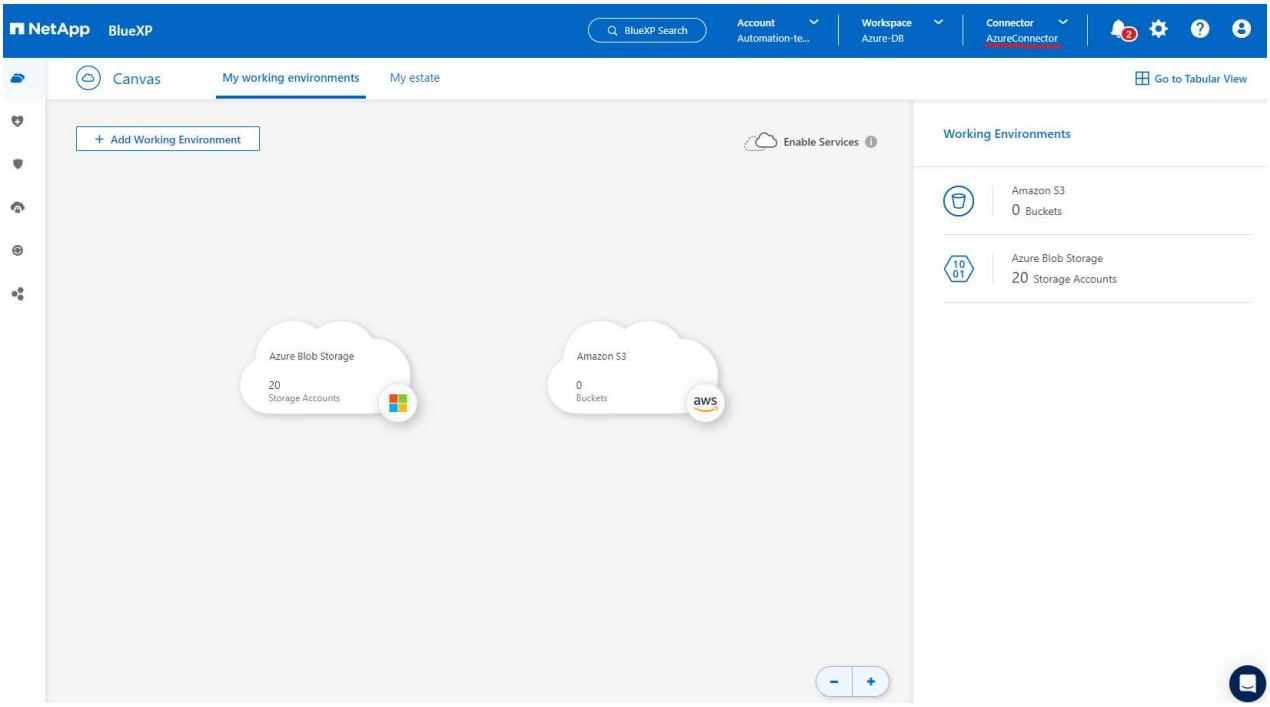
8. Configure the **Security Group** for the connector that allows HTTP, HTTPS, and SSH access.




9. Review the summary page and click **Add** to start connector creation. It generally takes about 10 mins to complete deployment. Once completed, the connector instance VM appears in the Azure portal.

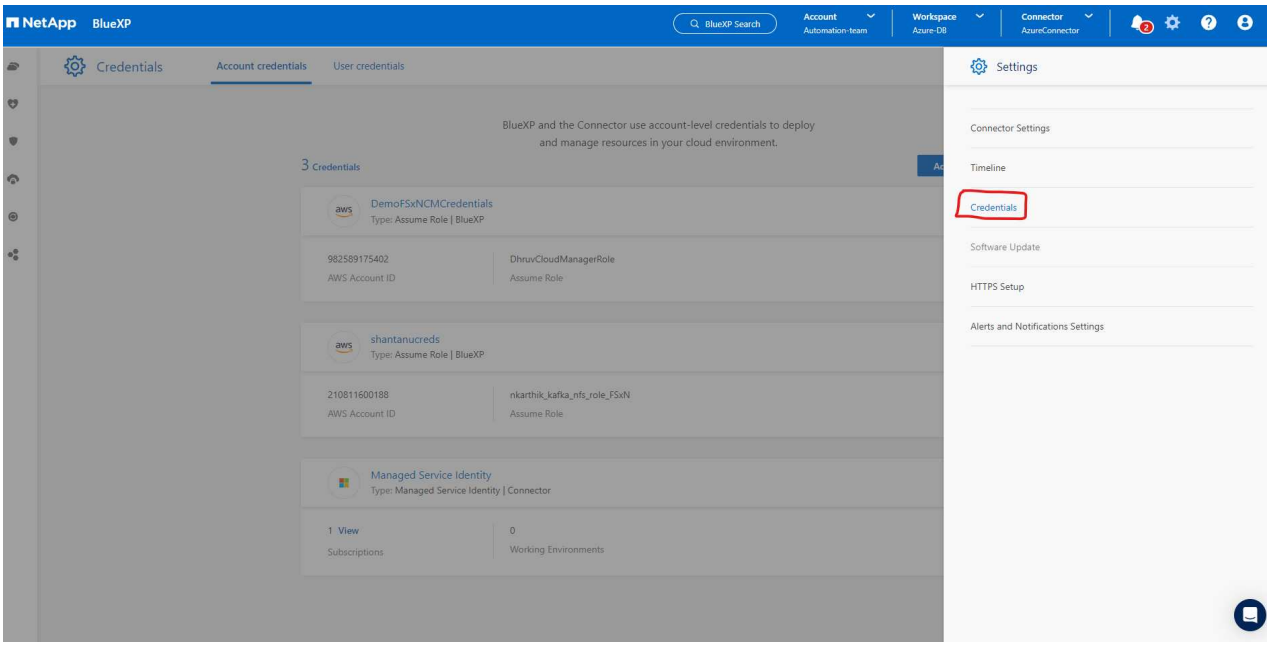



10. After the connector is deployed, the newly created connector appears under **Connector** drop-down.

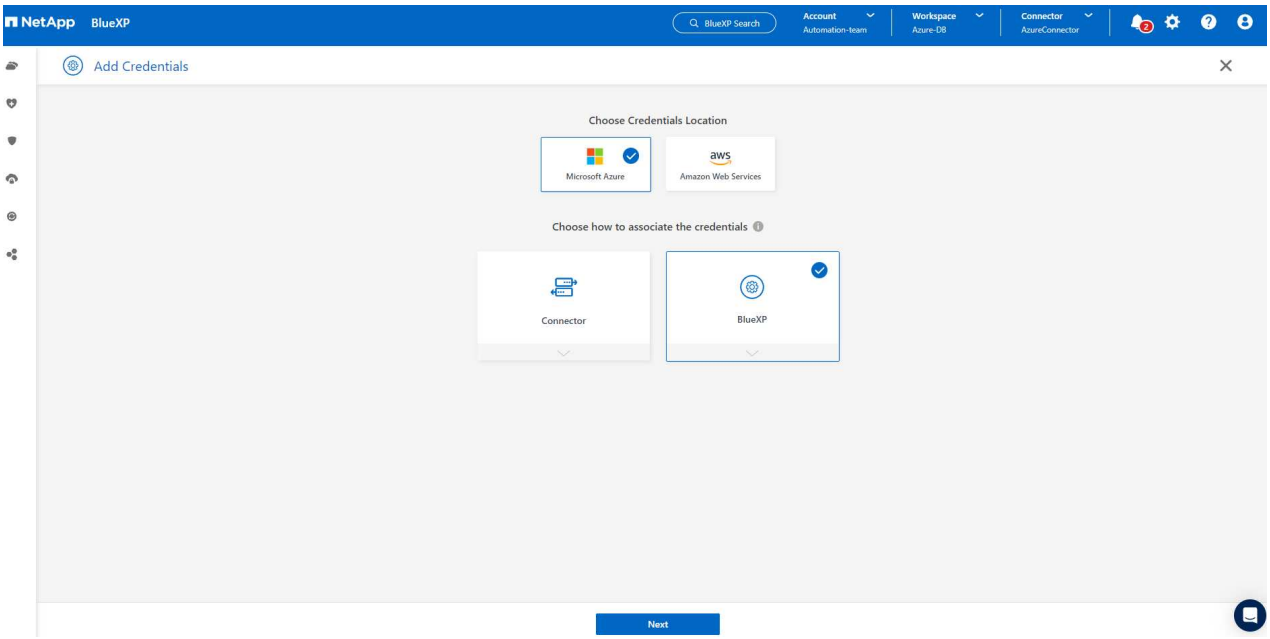


# Define a credential in BlueXP for Azure resources access

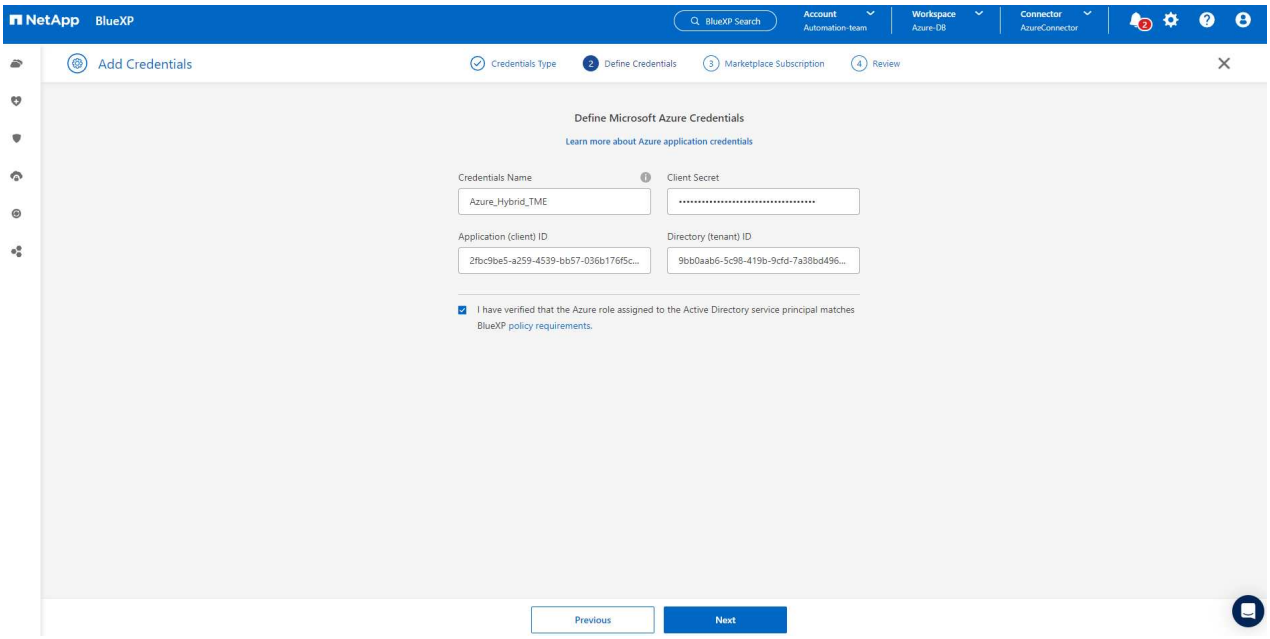
1. Click on setting icon on top right corner of BlueXP console to open **Account credentials** page, click **Add credentials** to start credential configuration workflow.



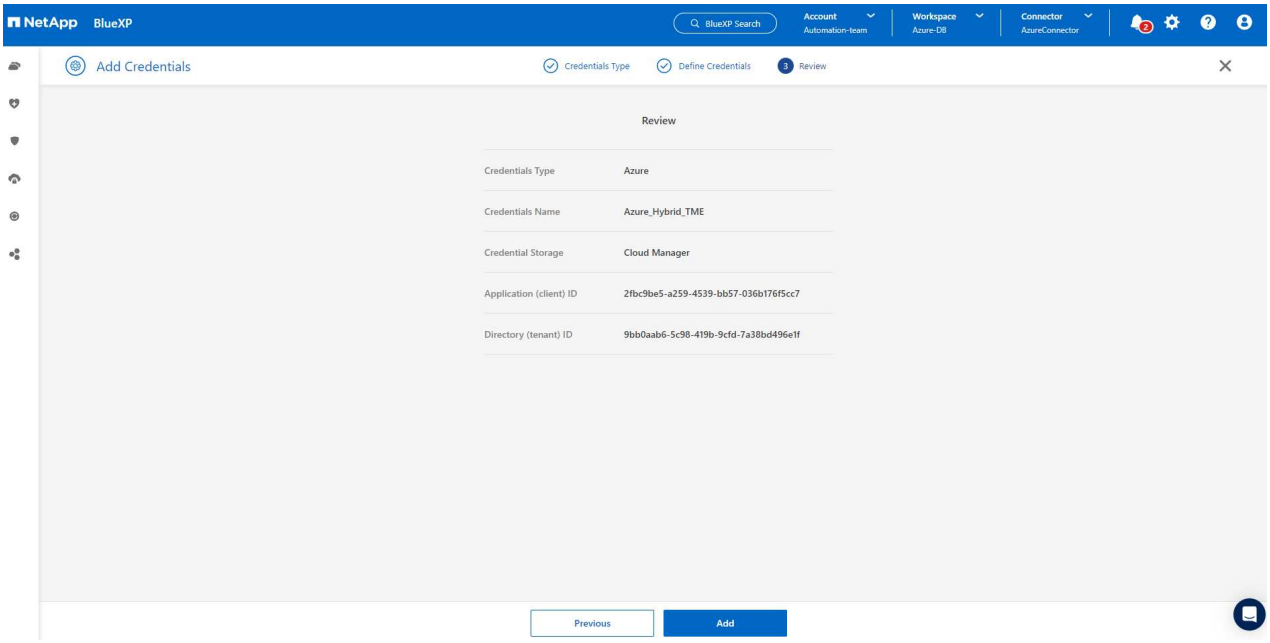

2. Choose credential location as - **Microsoft Azure - BlueXP**.



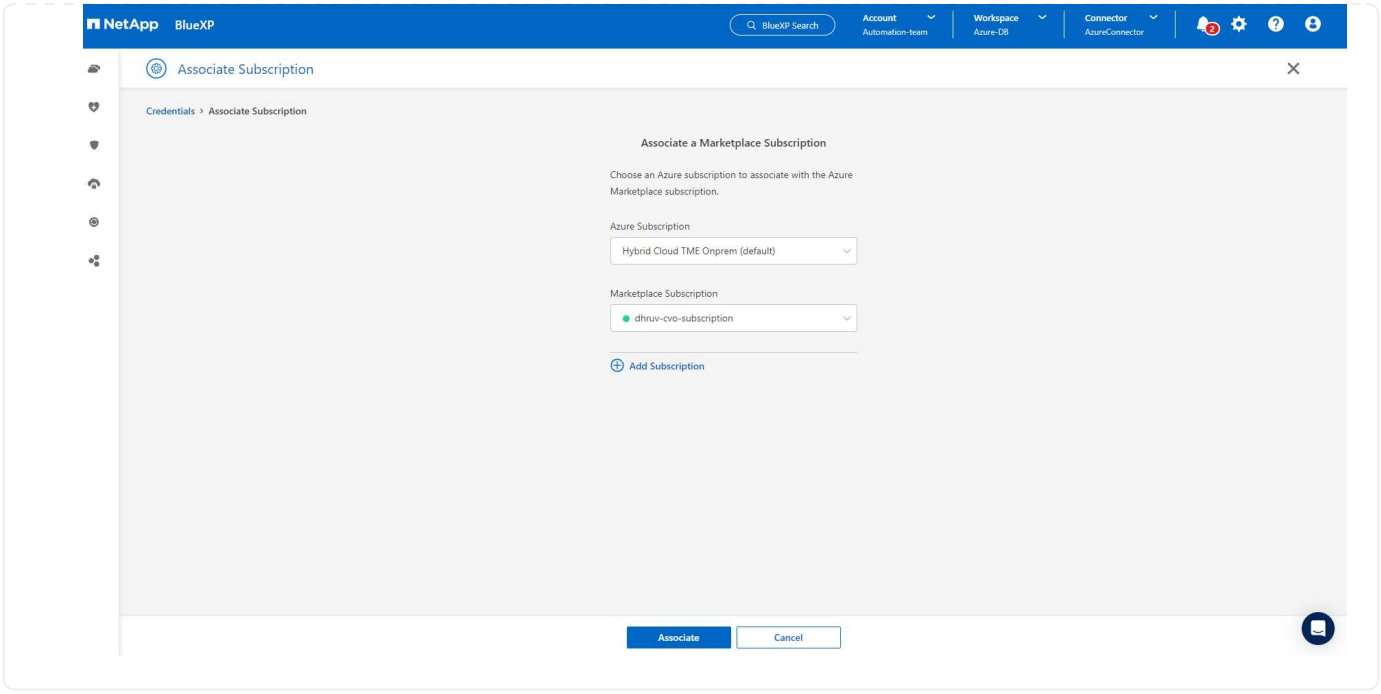

3. Define Azure credentials with proper **Client Secret**, **Client ID**, and **Tenant ID**, which should have been gathered during previous BlueXP onboarding process.




4. Review and **Add**.



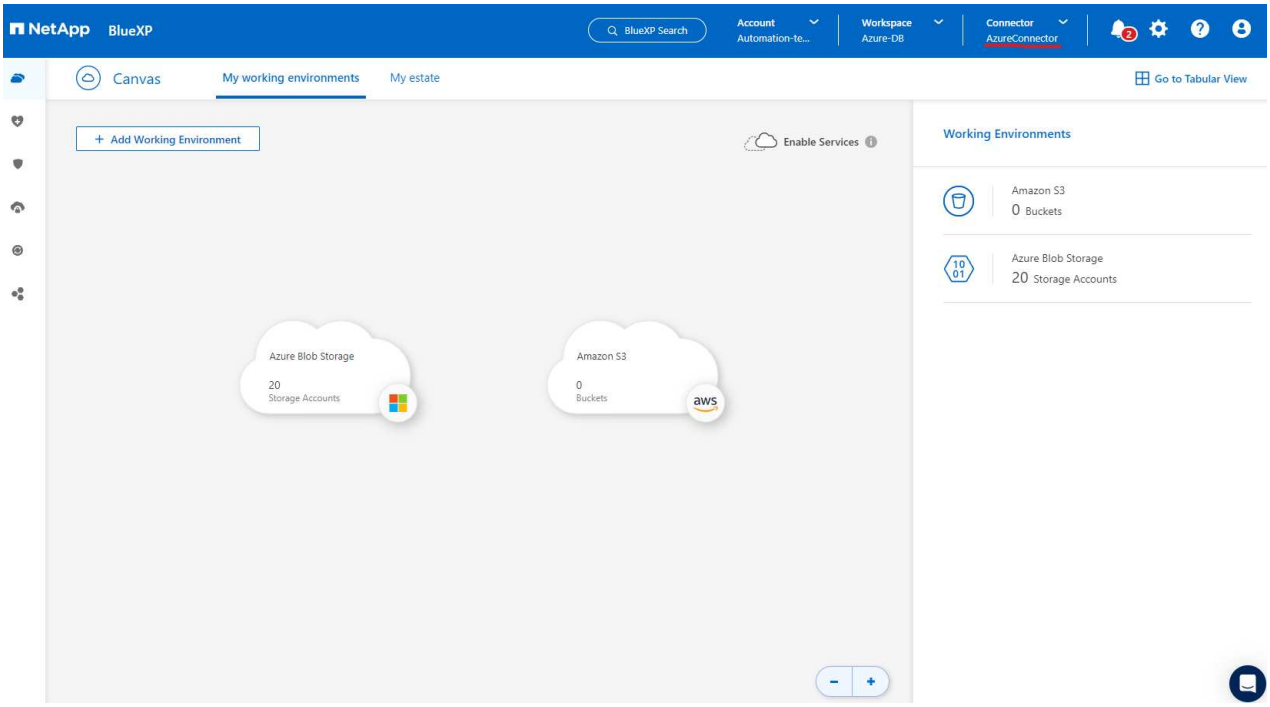

5. You may also need to associate a **Marketplace Subscription** with the credential.



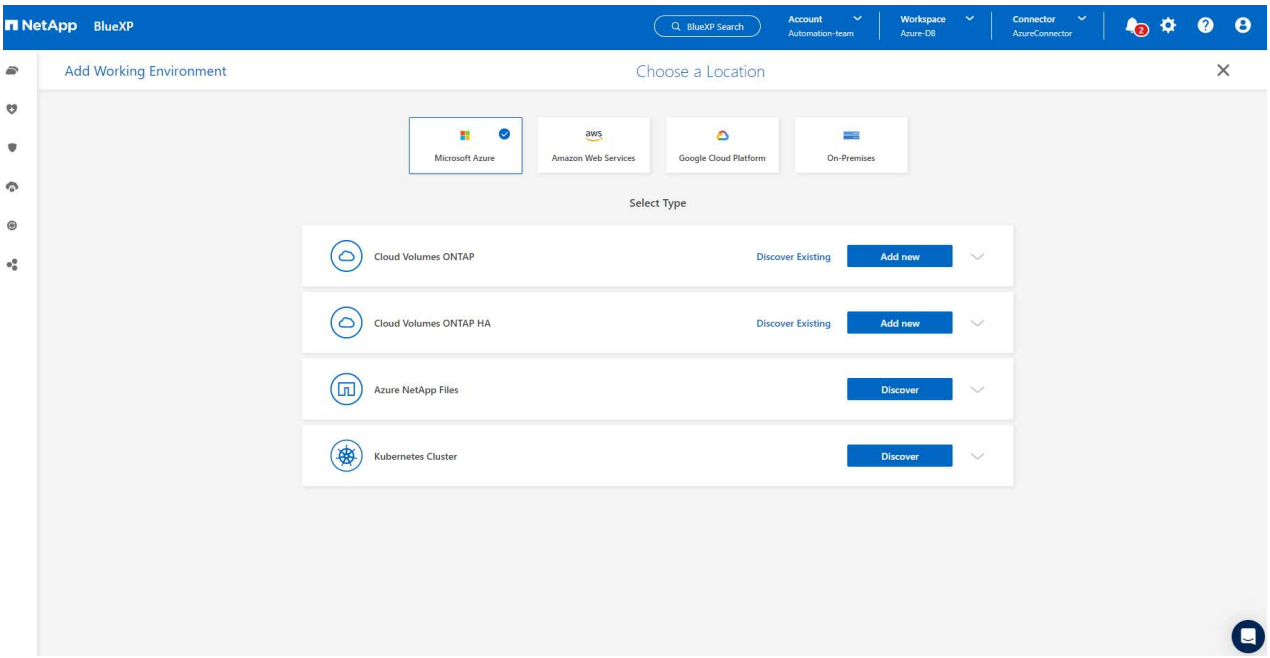

## SnapCenter services setup

With the Azure credential configured, SnapCenter services can now be set up with the following procedures:

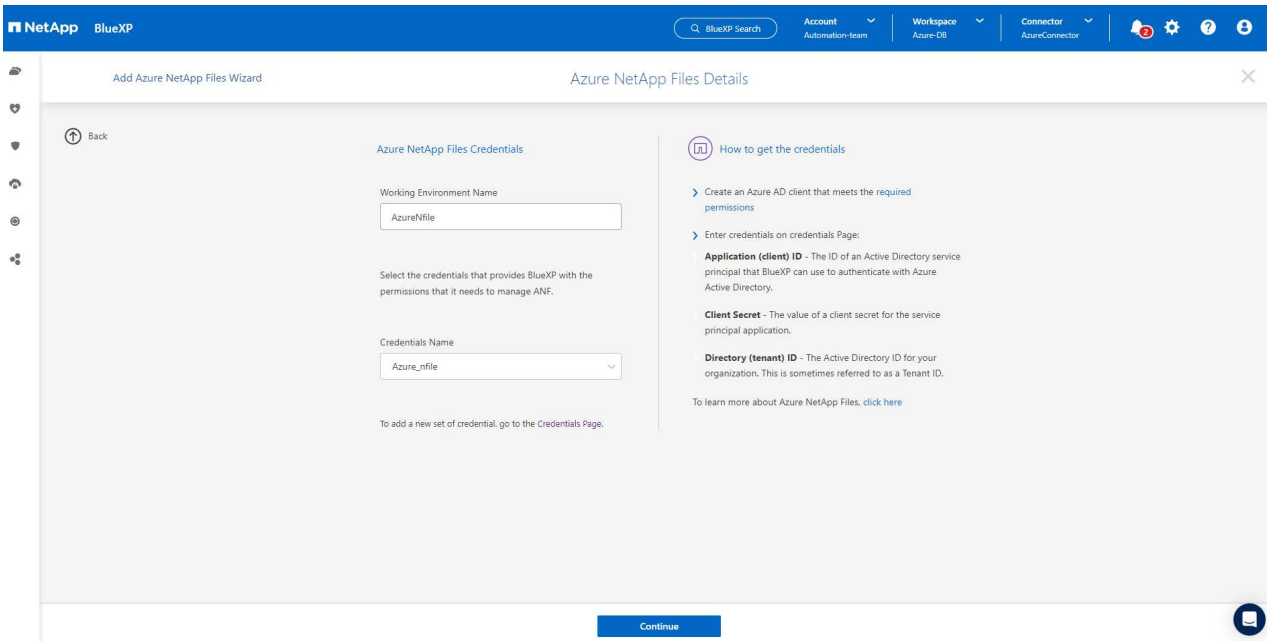
1. Back to Canvas page, from **My Working Environment** click **Add working Environment** to discover Azure NetApp Files deployed in Azure.



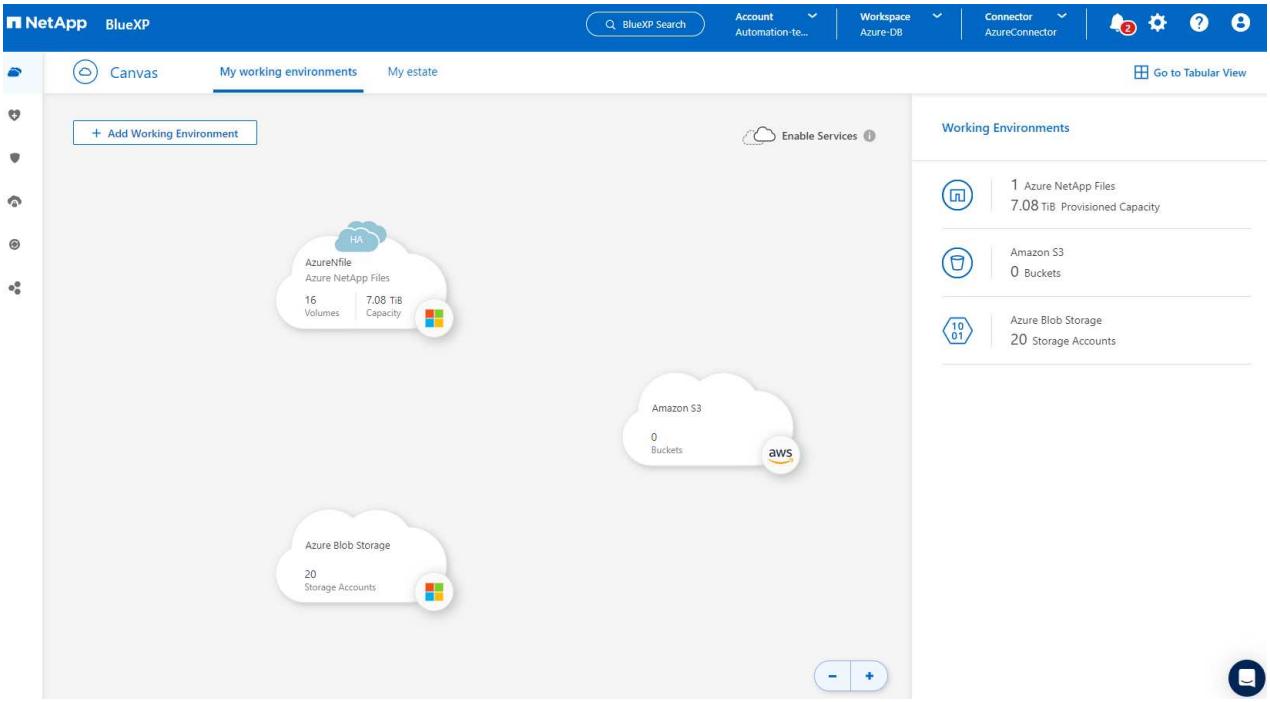

2. Choose **Microsoft Azure** as the location and click on **Discover**.



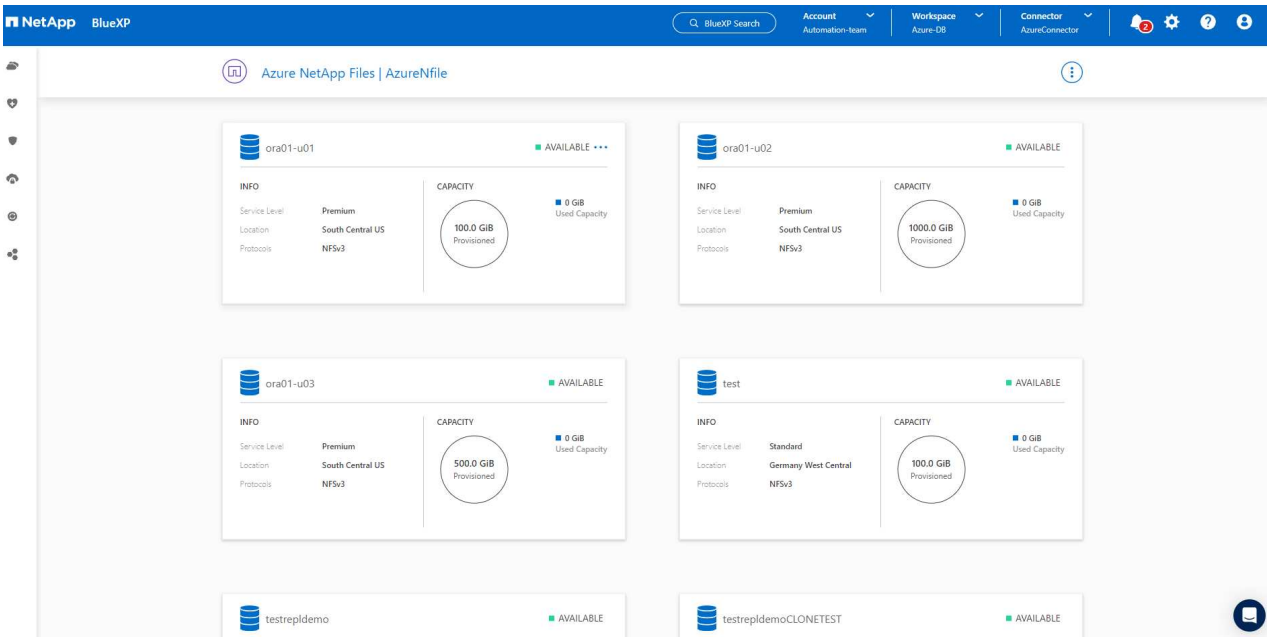

3. Name **Working Environment** and choose **Credential Name** created in previous section, and click **Continue**.



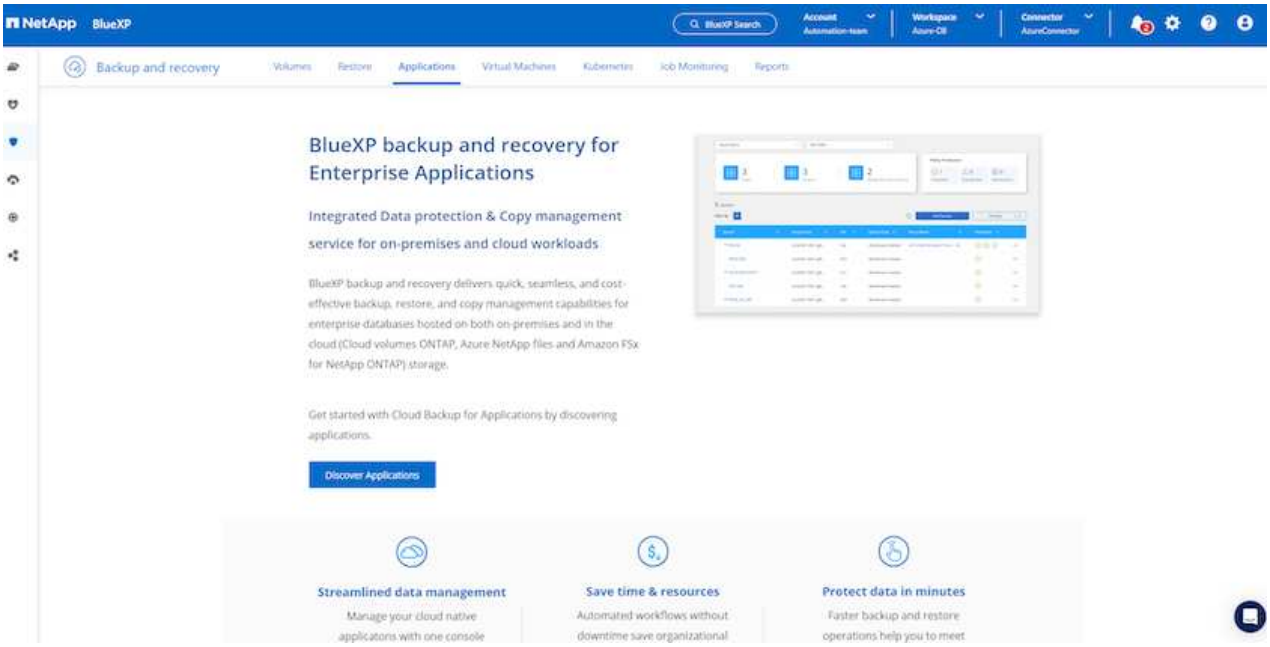

4. BlueXP console returns to **My working environments** and discovered Azure NetApp Files from Azure now appears on **Canvas**.



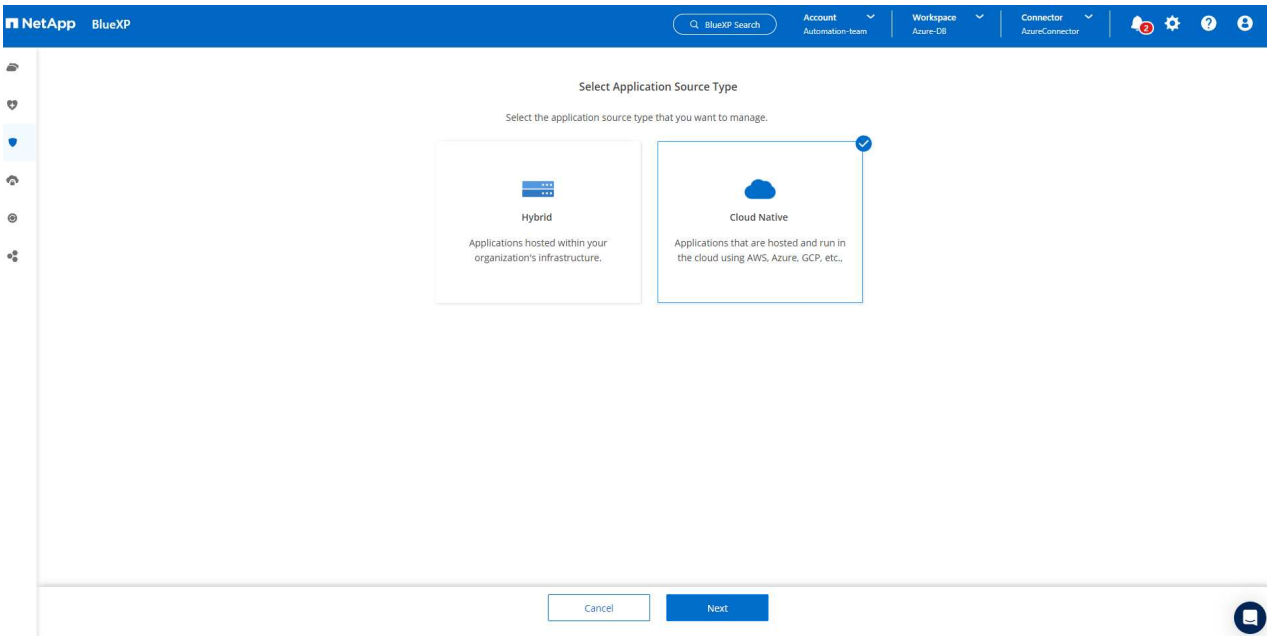

5. Click on **Azure NetApp Files** icon, then **Enter Working Environment** to view Oracle database volumes deployed in Azure NetApp Files storage.



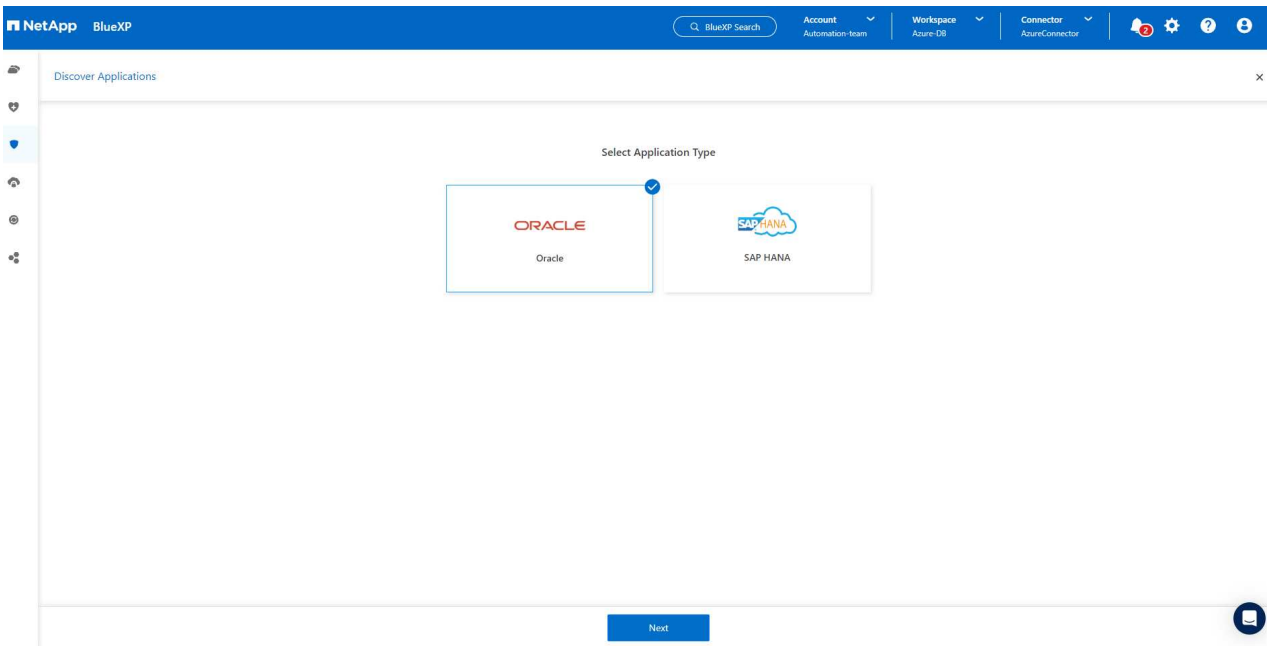

6. From the left-hand sidebar of the console, hover your mouse over the protection icon, and then click **Protection** > **Applications** to open the Applications launch page. Click **Discover Applications**.



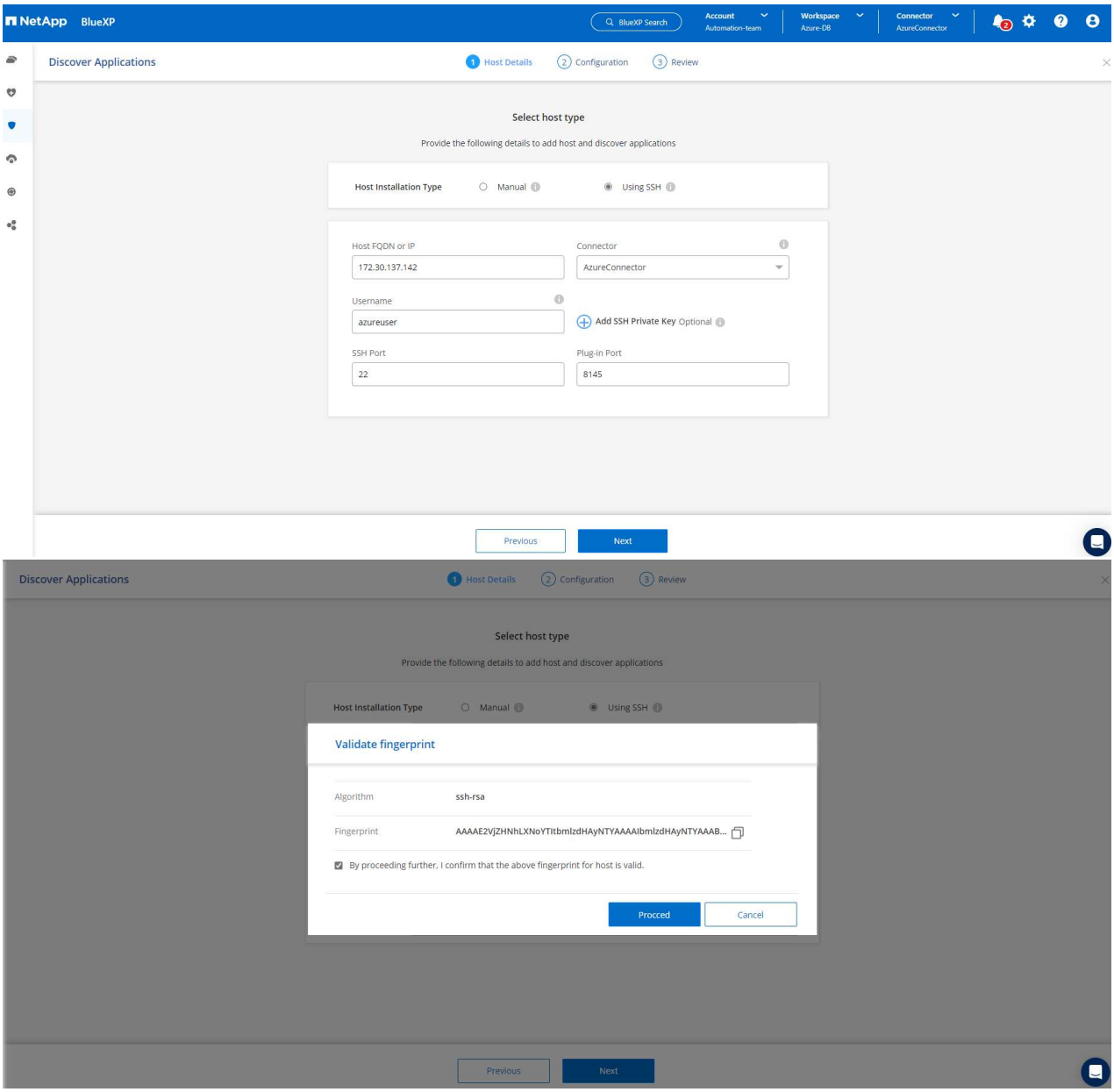

7. Select **Cloud Native** as the application source type.



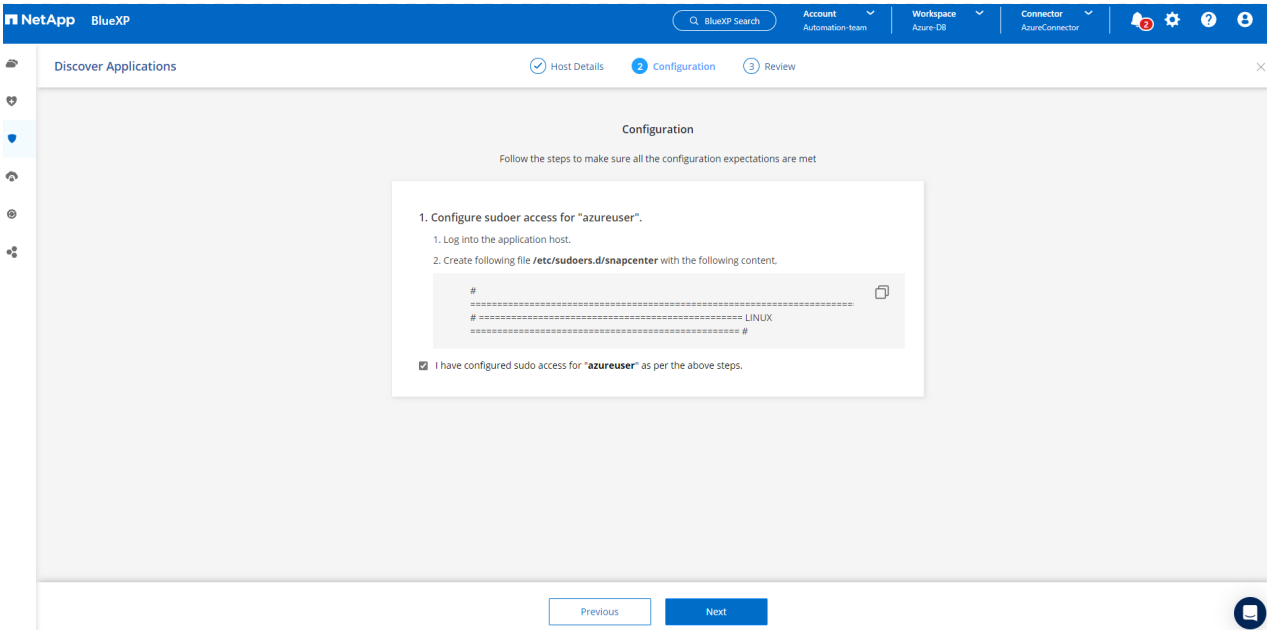

8. Choose **Oracle** for the application type, click on **Next** to open host details page.



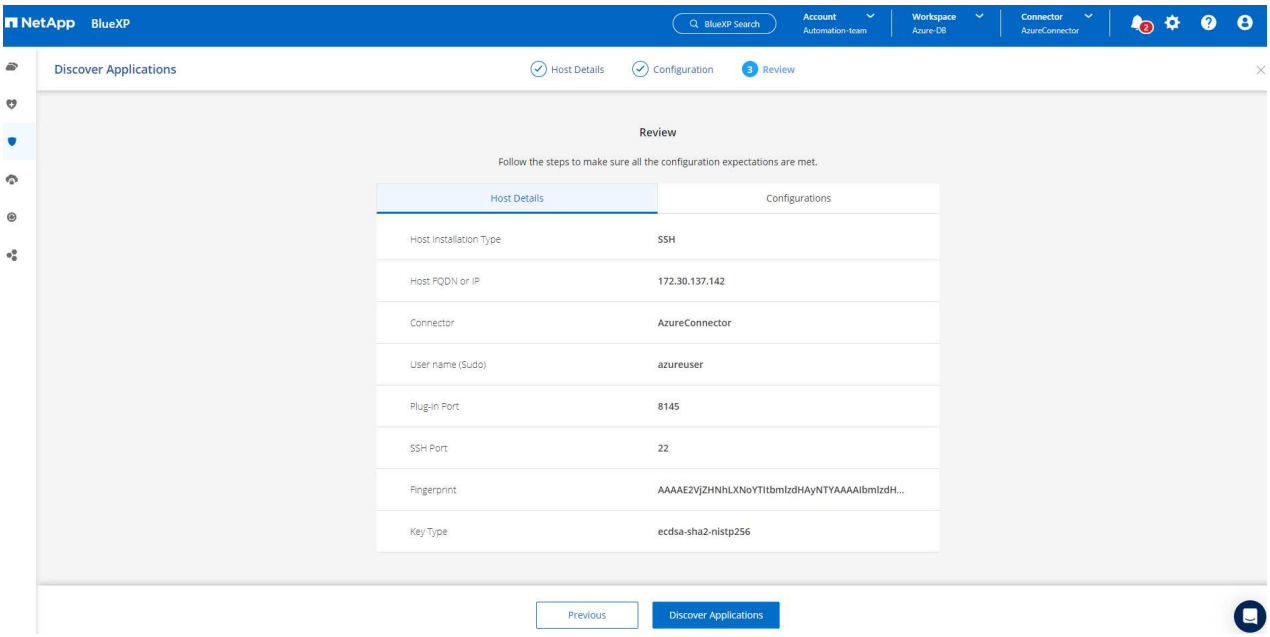

9. Select **Using SSH** and provide the Oracle Azure VM details such as **IP address**, **Connector**, Azure VM management **Username** such as azureuser. Click on **Add SSH Private Key** to paste in the SSH key pair that you used to deploy the Oracle Azure VM. You will also be prompted to confirm the fingerprint.



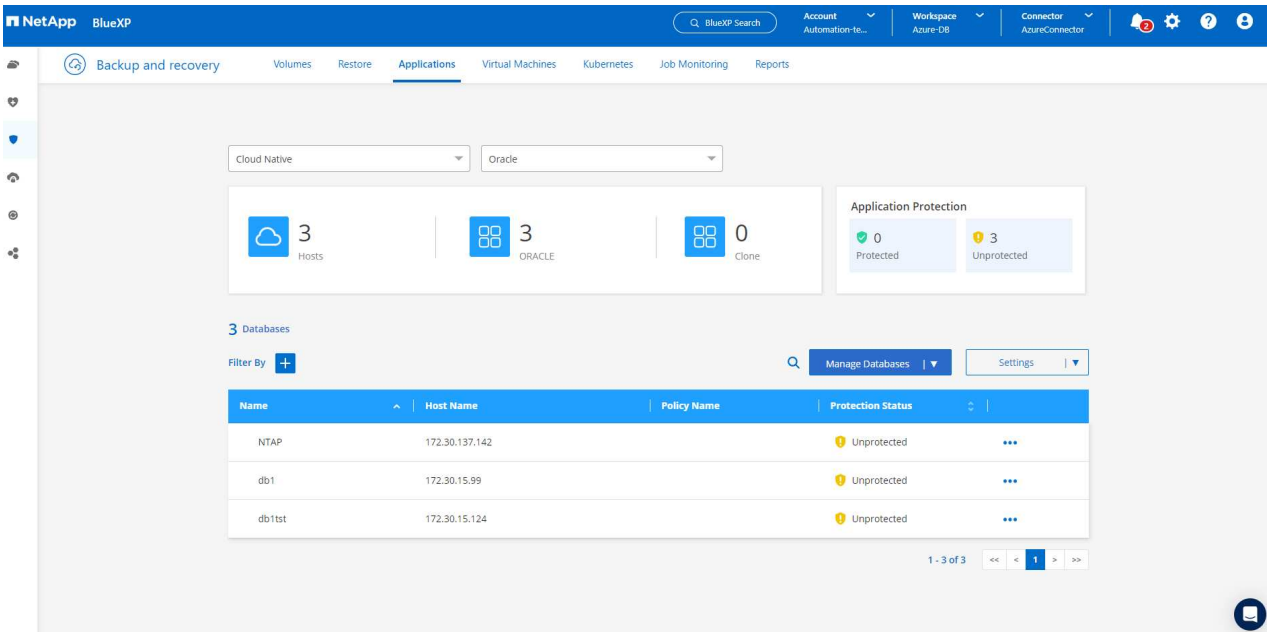

10. Move on to next **Configuration** page to setup sudoer access on Oracle Azure VM.




11. Review and click on **Discover Applications** to install a plugin on the Oracle Azure VM and discover Oracle database on the VM in one step.




12. Discovered Oracle databases on Azure VM are added to **Applications**, and the **Applications** page lists the number of hosts and Oracle databases within the environment. The database **Protection Status** initially shows as **Unprotected**.



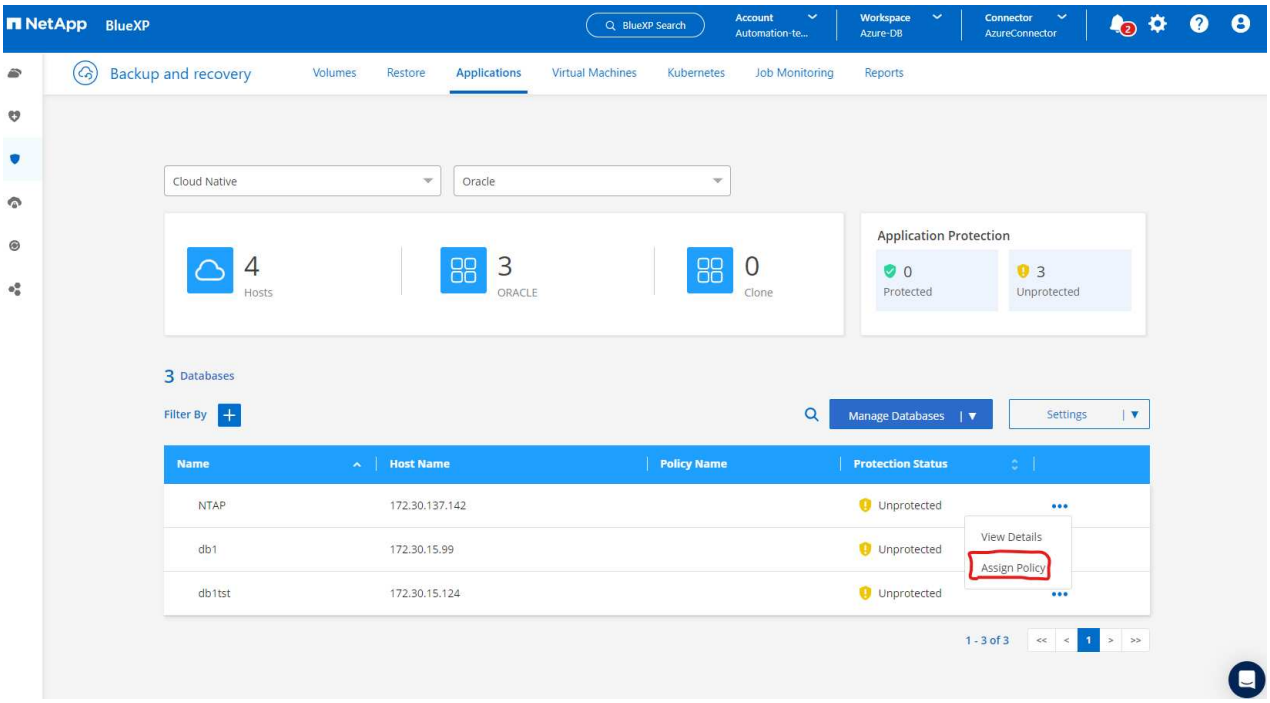

This completes the initial setup of SnapCenter services for Oracle. The next three sections of this document describe Oracle database backup, restore, and clone operations.

## Oracle database backup

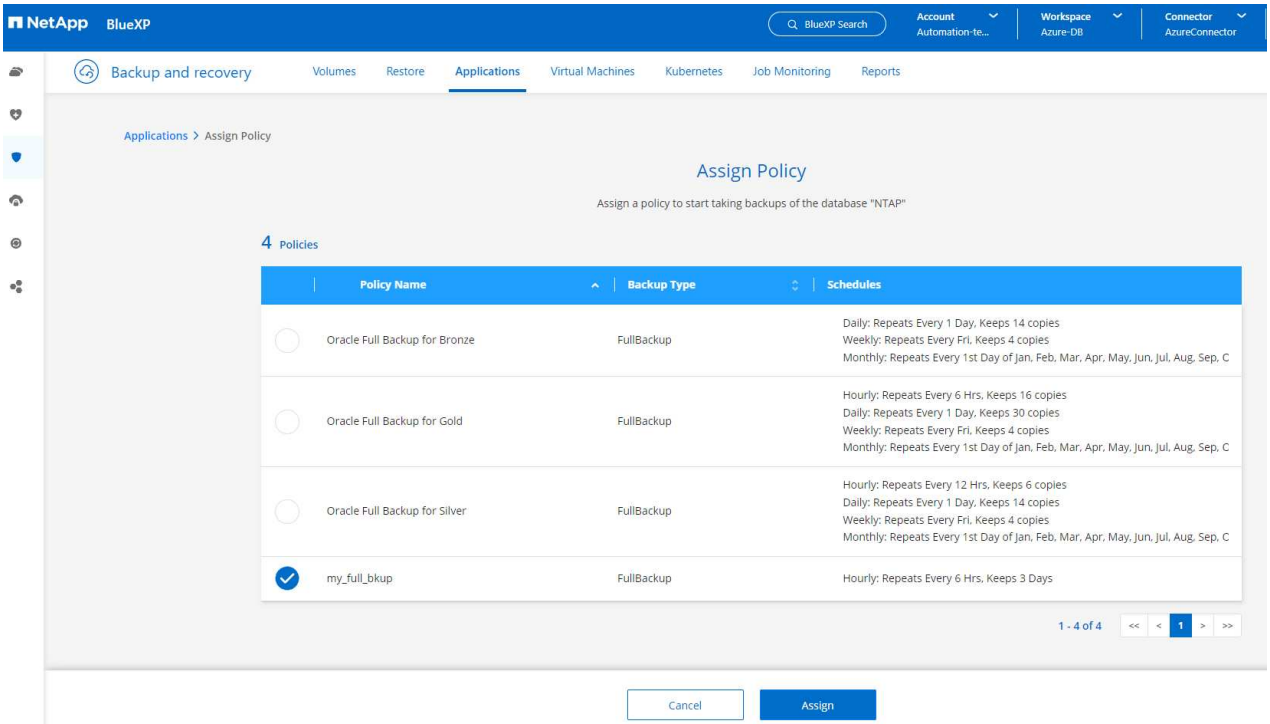
1. Our test Oracle database in Azure VM is configured with three volumes with an aggregate total storage about 1.6 TiB. This gives context about the timing for the snapshot backup, restore, and clone of a database of this size.

```
[oracle@acao-ora01 ~]$ df -h
Filesystem                 Size  Used Avail Use% Mounted on
devtmpfs                   7.9G     0  7.9G   0% /dev
tmpfs                      7.9G     0  7.9G   0% /dev/shm
tmpfs                      7.9G   17M  7.9G   1% /run
tmpfs                      7.9G     0  7.9G   0% /sys/fs/cgroup
/dev/mapper/rootvg-rootlv   40G   23G   15G  62% /
/dev/mapper/rootvg-usrlv   9.8G  1.6G  7.7G  18% /usr
/dev/sda2                  496M  115M  381M  24% /boot
/dev/mapper/rootvg-varlv   7.9G  787M  6.7G  11% /var
/dev/mapper/rootvg-homelv  976M  323M  586M  36% /home
/dev/mapper/rootvg-optlv   2.0G  9.6M  1.8G   1% /opt
/dev/mapper/rootvg-tmplv   2.0G   22M  1.8G   2% /tmp
/dev/sda1                  500M  6.8M  493M   2% /boot/efi
172.30.136.68:/ora01-u01   100G   23G   78G  23% /u01
172.30.136.68:/ora01-u03   500G  117G  384G  24% /u03
172.30.136.68:/ora01-u02  1000G  804G  197G  81% /u02
tmpfs                      1.6G     0  1.6G   0% /run/user/1000
[oracle@acao-ora01 ~]$
```

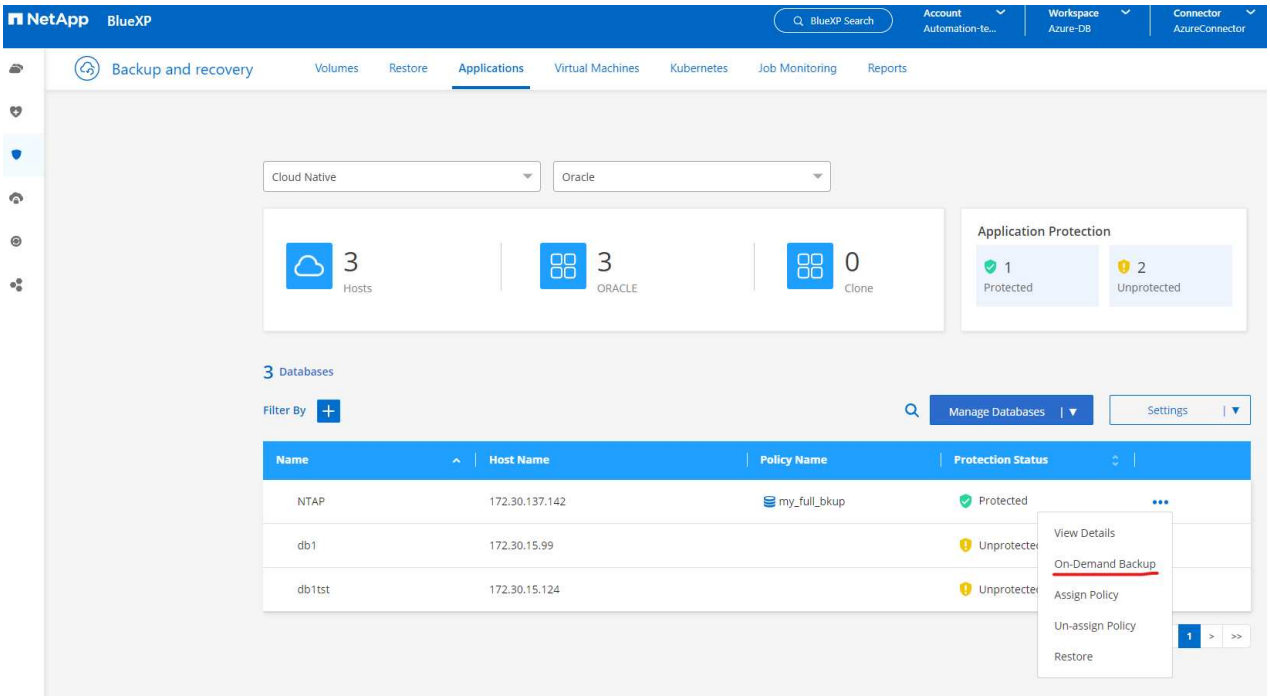
1. To protect database, click the three dots next to the database **Protection Status**, and then click **Assign Policy** to view the default preloaded or user defined database protection policies that can be applied to your Oracle databases. Under **Settings** - **Policies**, you have option to create your own policy with a customized backup frequency and backup data-retention window.



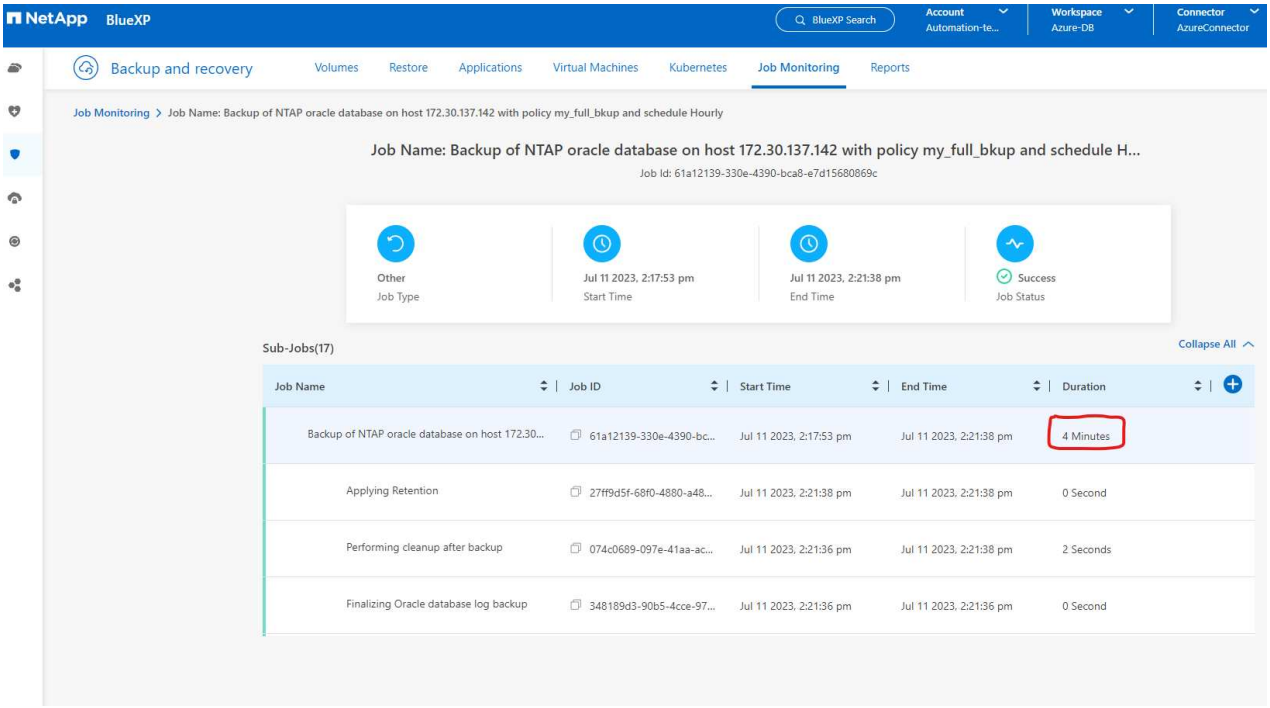

2. When you are happy with the policy configuration, you can then **Assign** your policy of choice to protect the database.



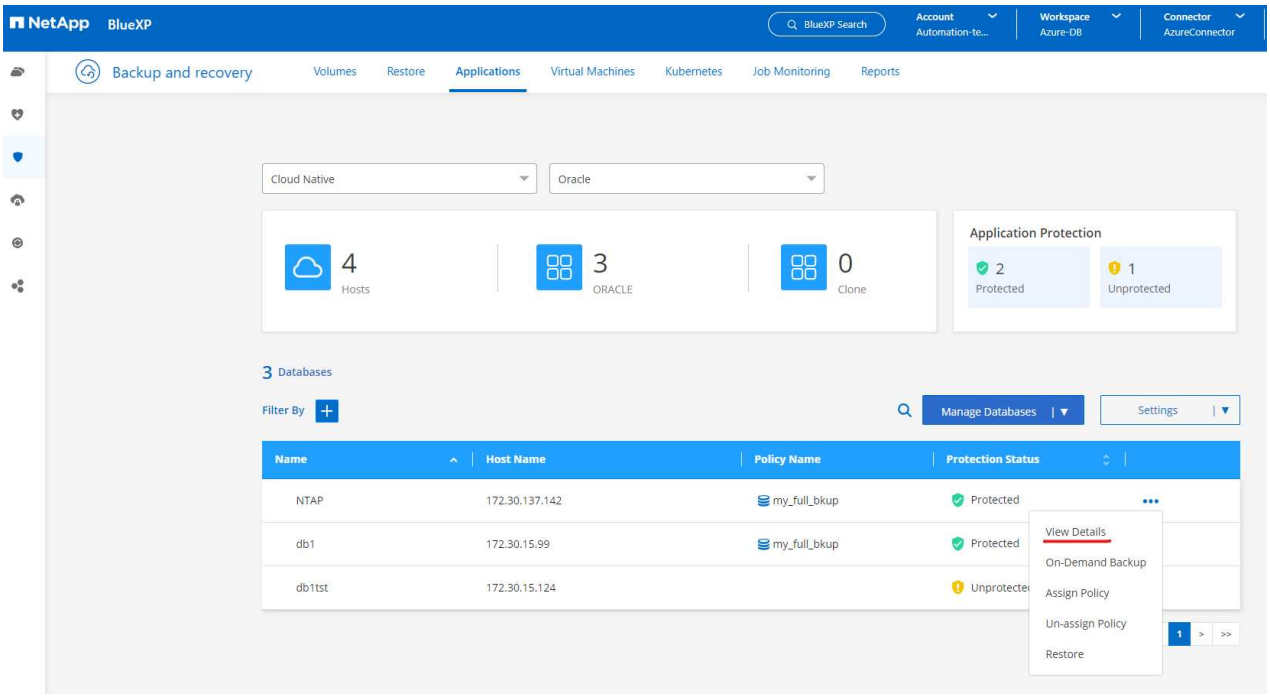

3. After the policy is applied, the database protection status changed to **Protected** with a green check mark. BlueXP executes the snapshot backup according to the schedule defined. In addition, **ON-Demand Backup** is available from the three-dot drop down menu as shown below.



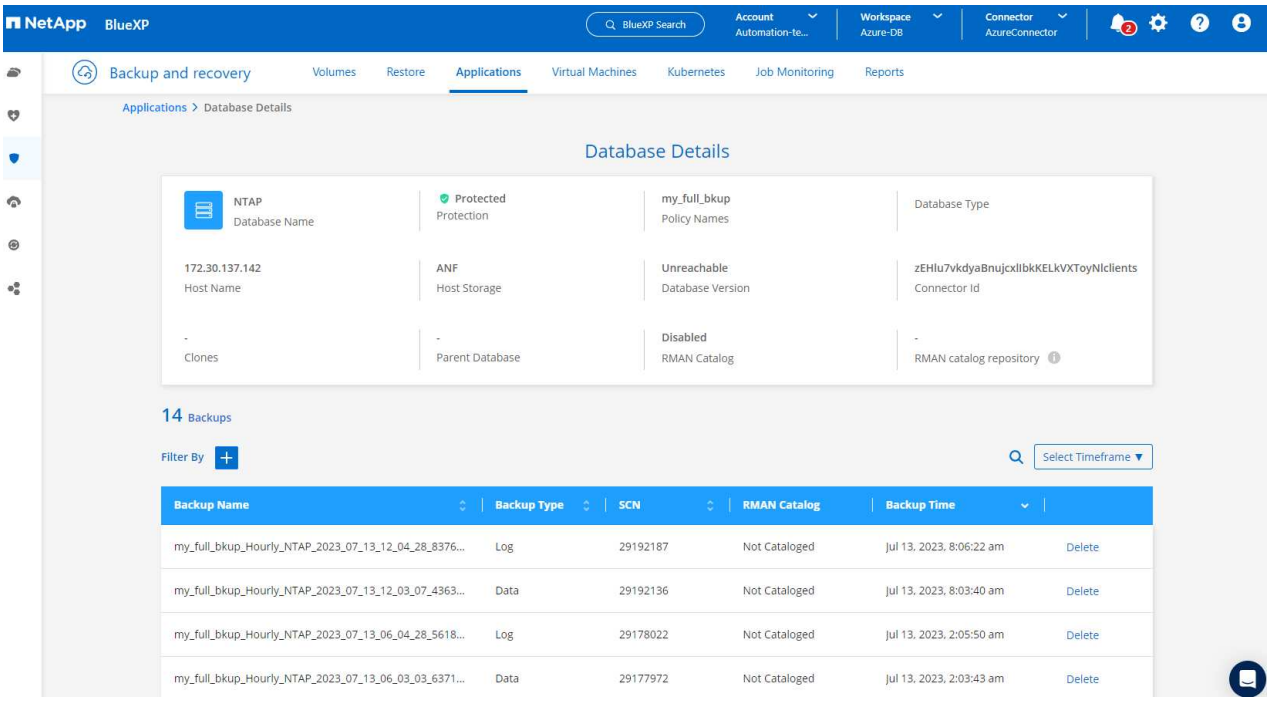

4. From **Job Monitoring** tab, backup job details can be viewed. Our test results showed that it took about 4 minutes to backup an Oracle database about 1.6 TiB.




5. From three-dot drop down menu **View Details**, you can view the backup sets created from snapshot backup.

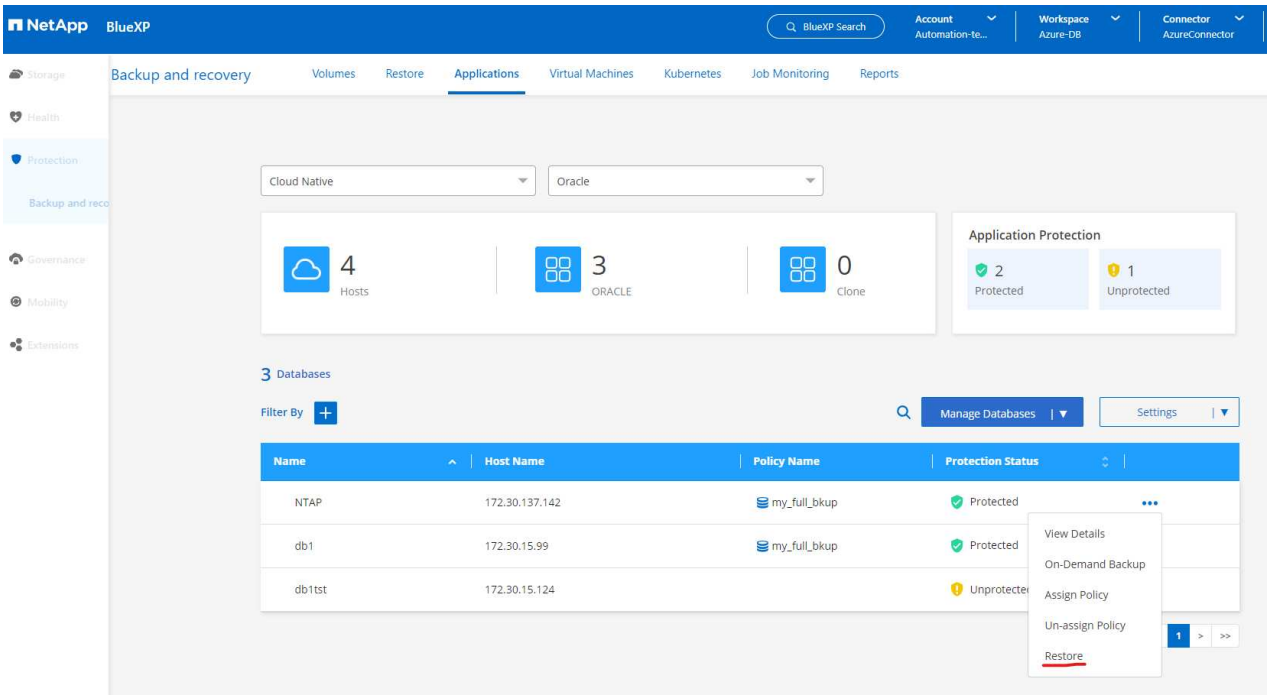



6. Database backup details include the **Backup Name**, **Backup Type**, **SCN**, **RMAN Catalog**, and **Backup Time**. A backup set contains application-consistent snapshots for data volume and log volume respectively. A log volume snapshot takes place right after a database data volume snapshot. You could apply a filter if you are looking for a particular backup in the backup list.

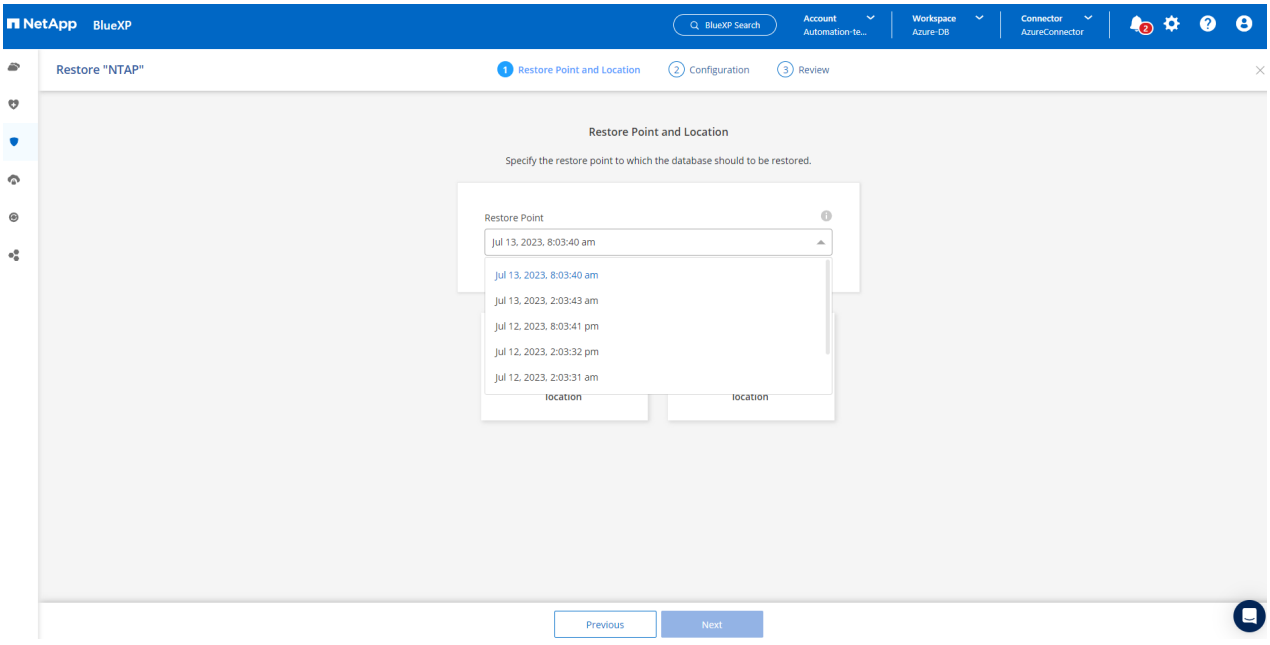



## Oracle database restore and recovery

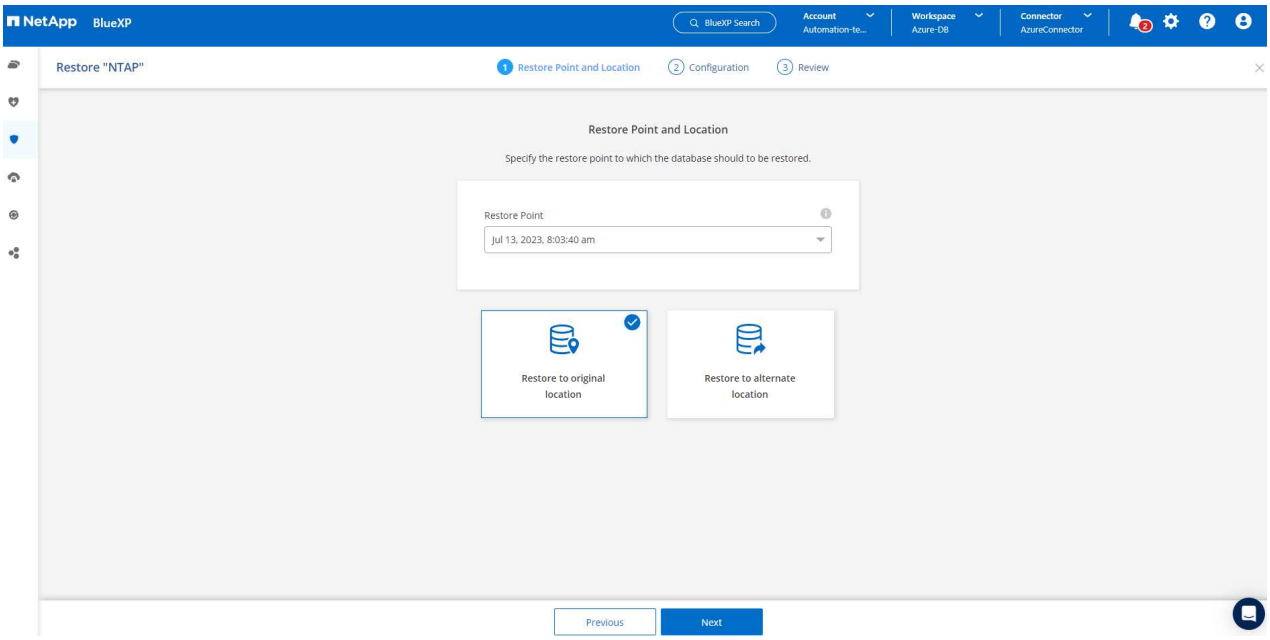
1. For a database restore, click the three-dot drop down menu for the particular database to be restored in **Applications**, then click **Restore** to initiate database restore and recovery workflow.



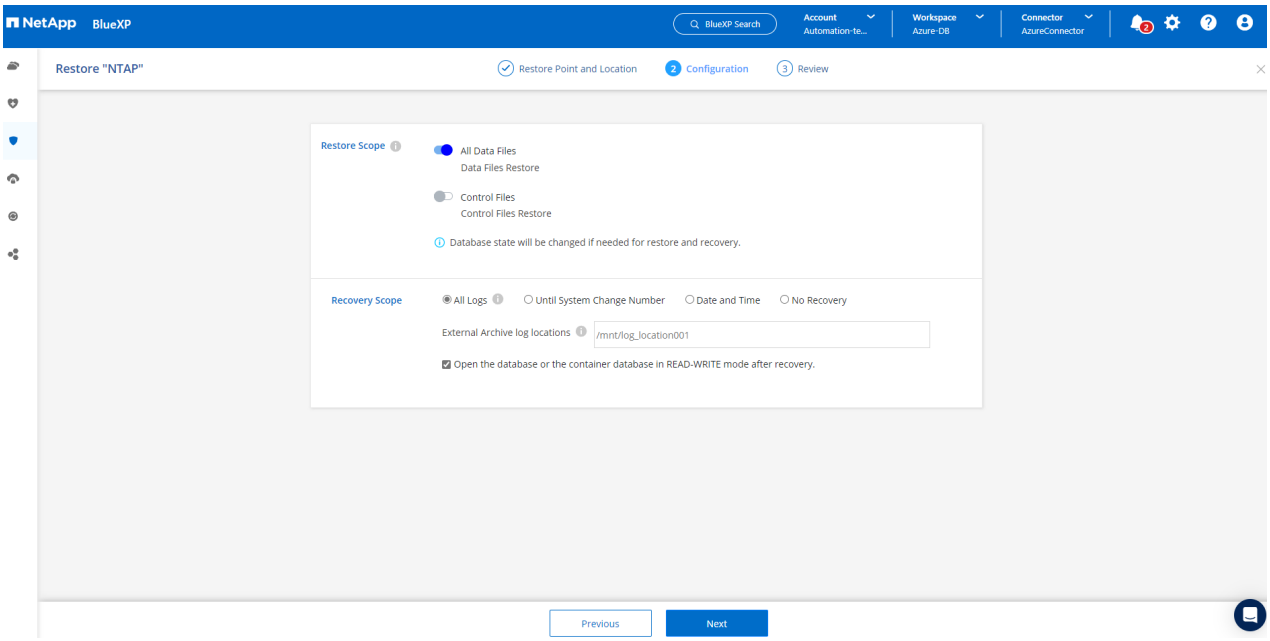

2. Choose your **Restore Point** by time stamp. Each time stamp in the list represents an available database backup set.



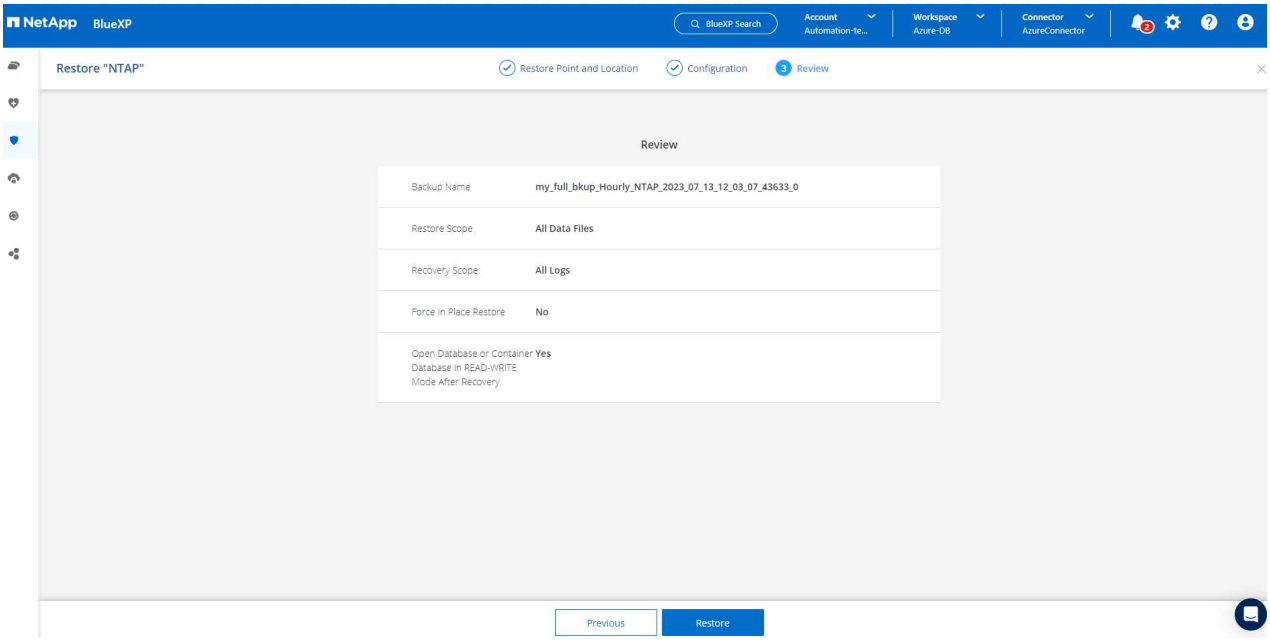

3. Choose your **Restore Location** to **original location** for an Oracle database in place restore and recovery.



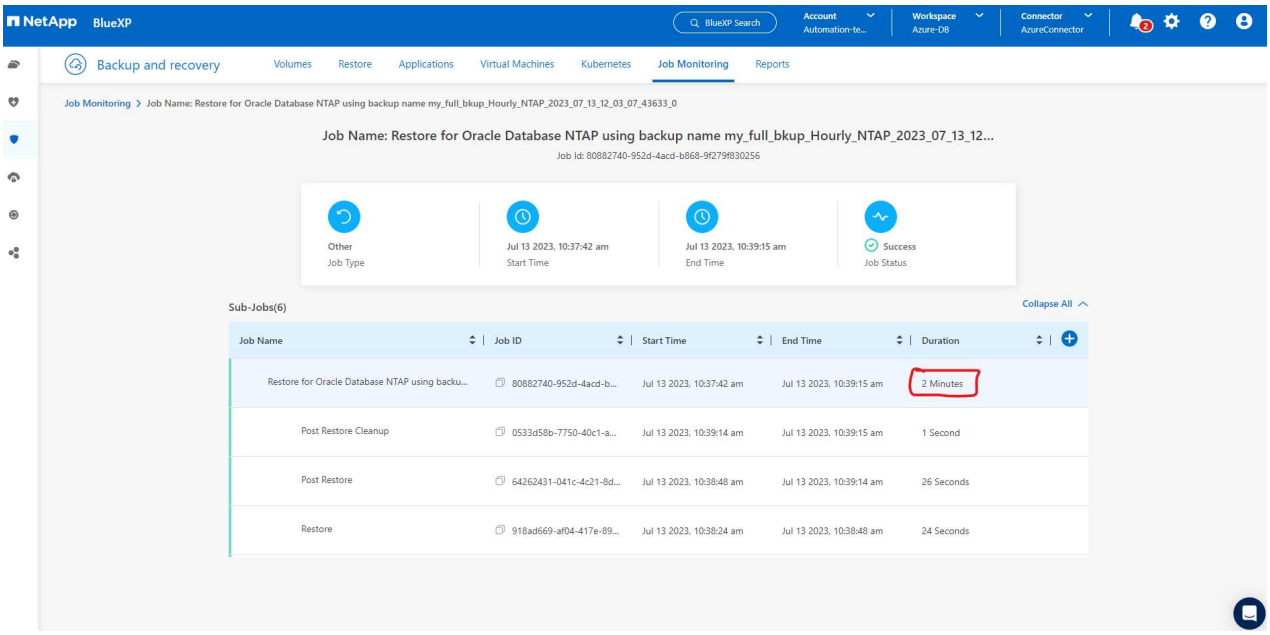

4. Define your **Restore Scope**, and **Recovery Scope**. All Logs mean a full recovery up to date including current logs.




5. Review and **Restore** to start database restore and recovery.




6. From the **Job Monitoring** tab, we observed that it took 2 minutes to run a full database restore and recovery up to date.

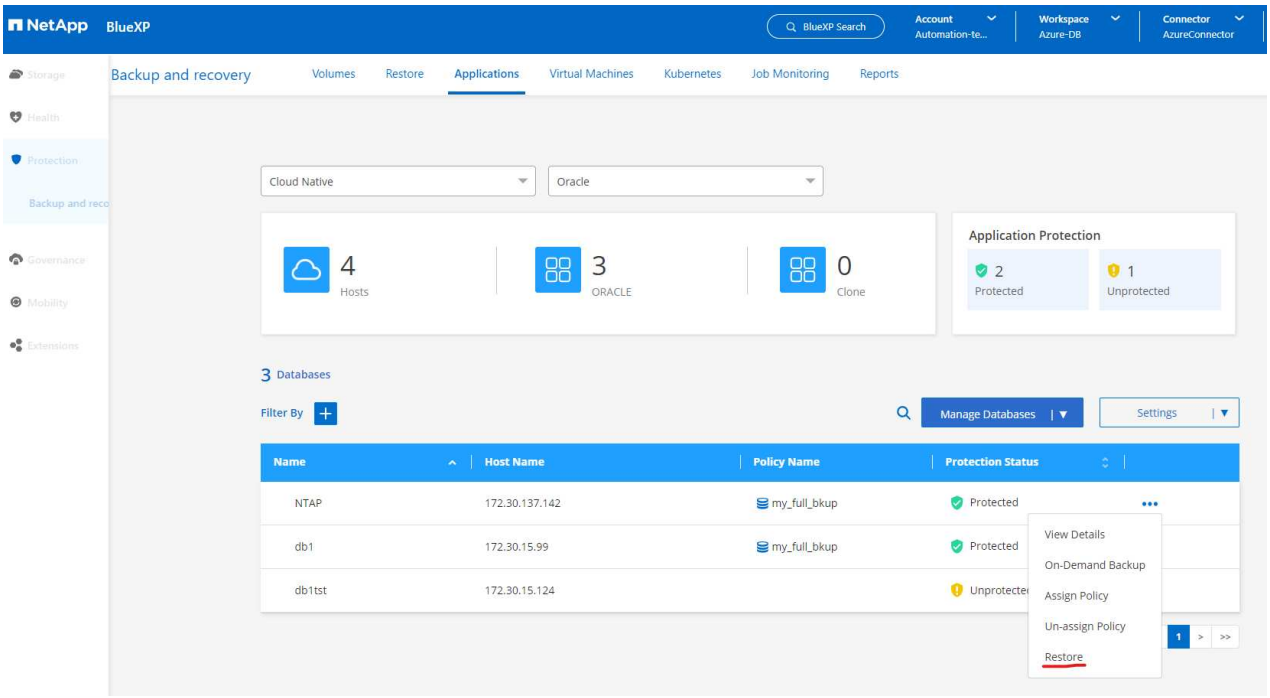



## Oracle database clone

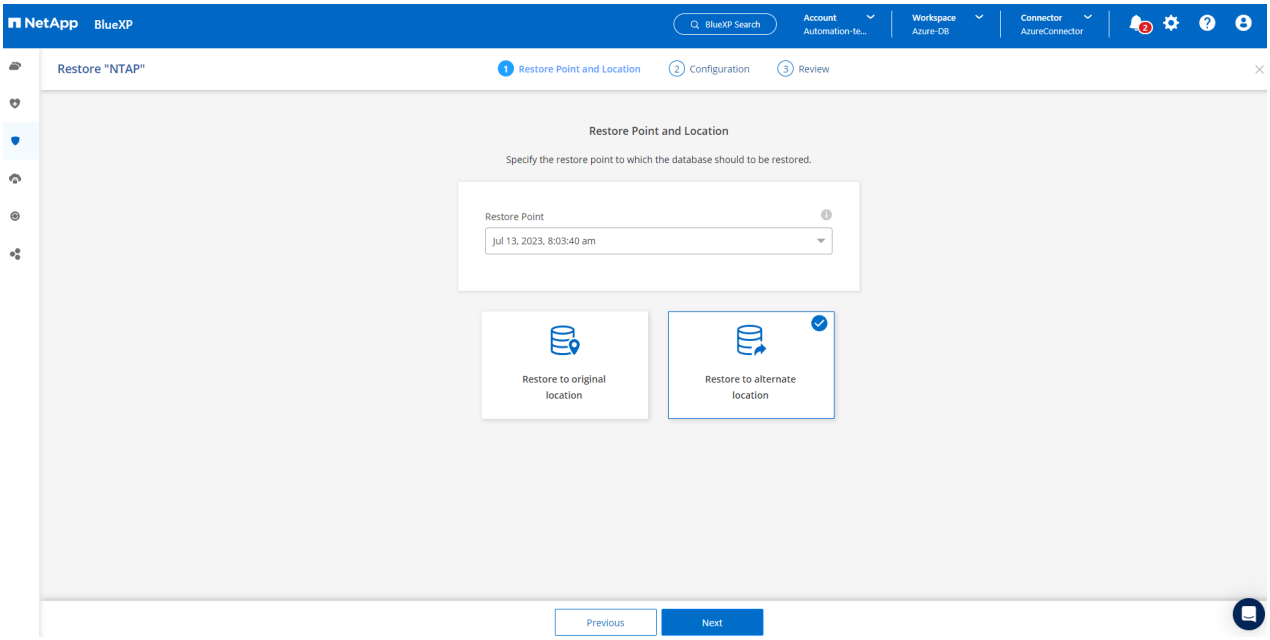
Database clone procedures are similar to restore but to an alternate Azure VM with identical Oracle software stack pre-installed and configured.

Ensure that your Azure NetApp File storage has sufficient capacity for a cloned database the same size as the primary database to be cloned. The alternate Azure VM has been added to **Applications**.

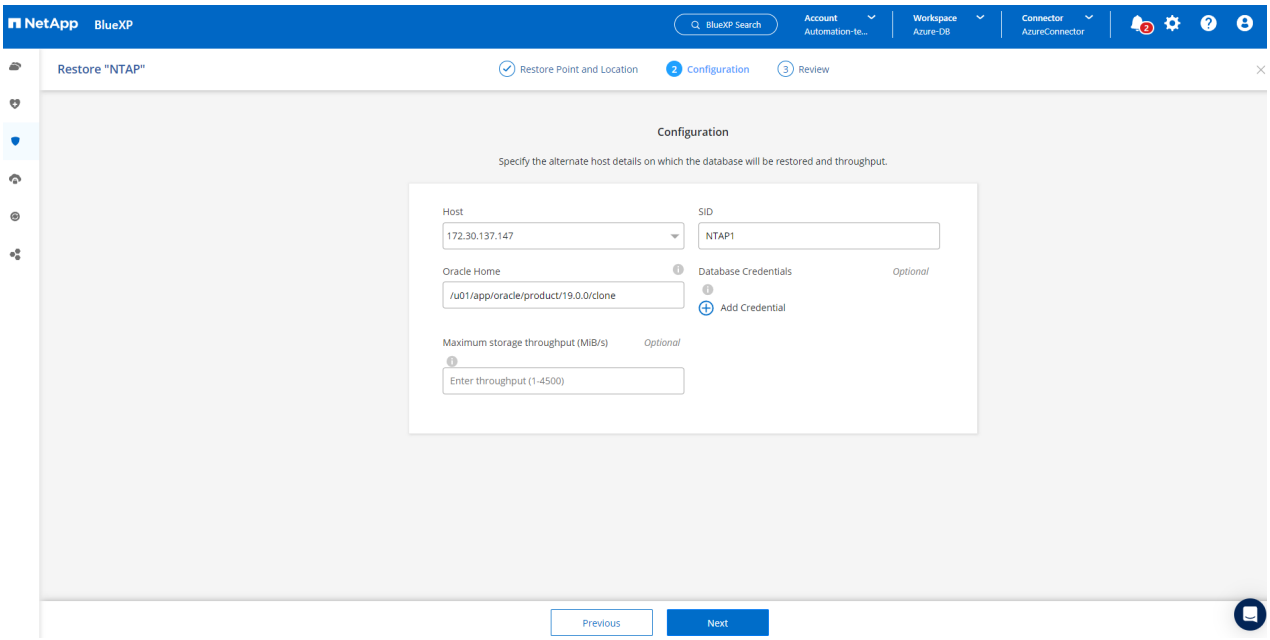
1. Click the three-dot drop down menu for the particular database to be cloned in **Applications**, then click **Restore** to initiate clone workflow.



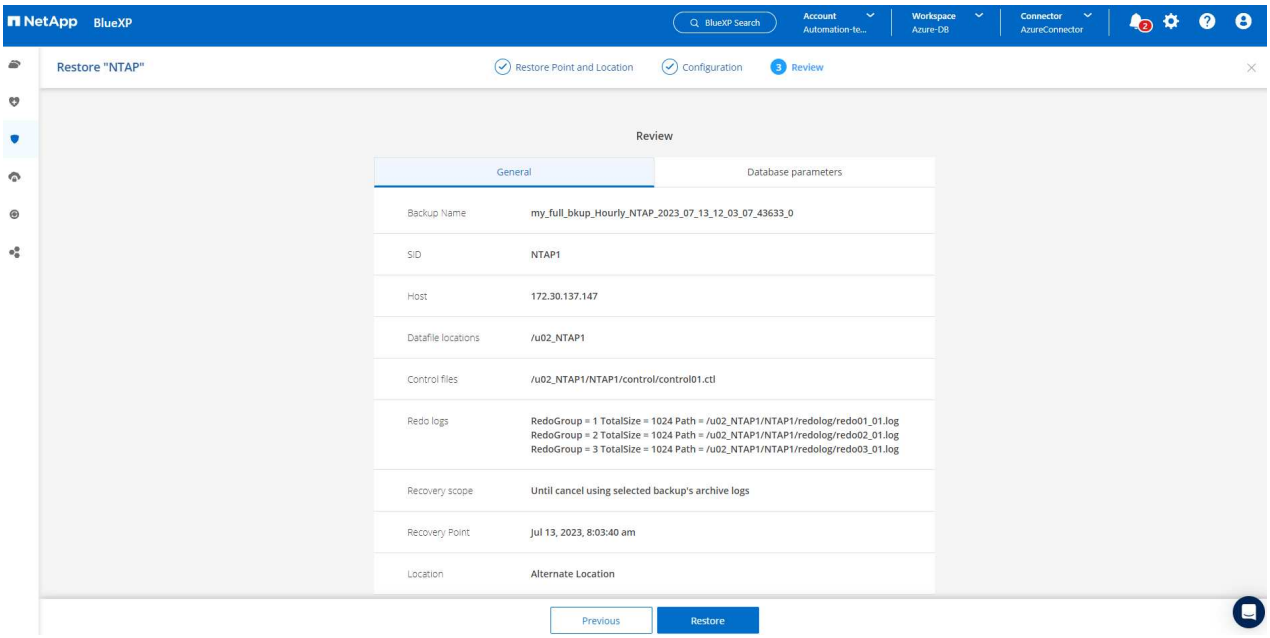

2. Select the **Restore Point** and check the **Restore to alternate location**.



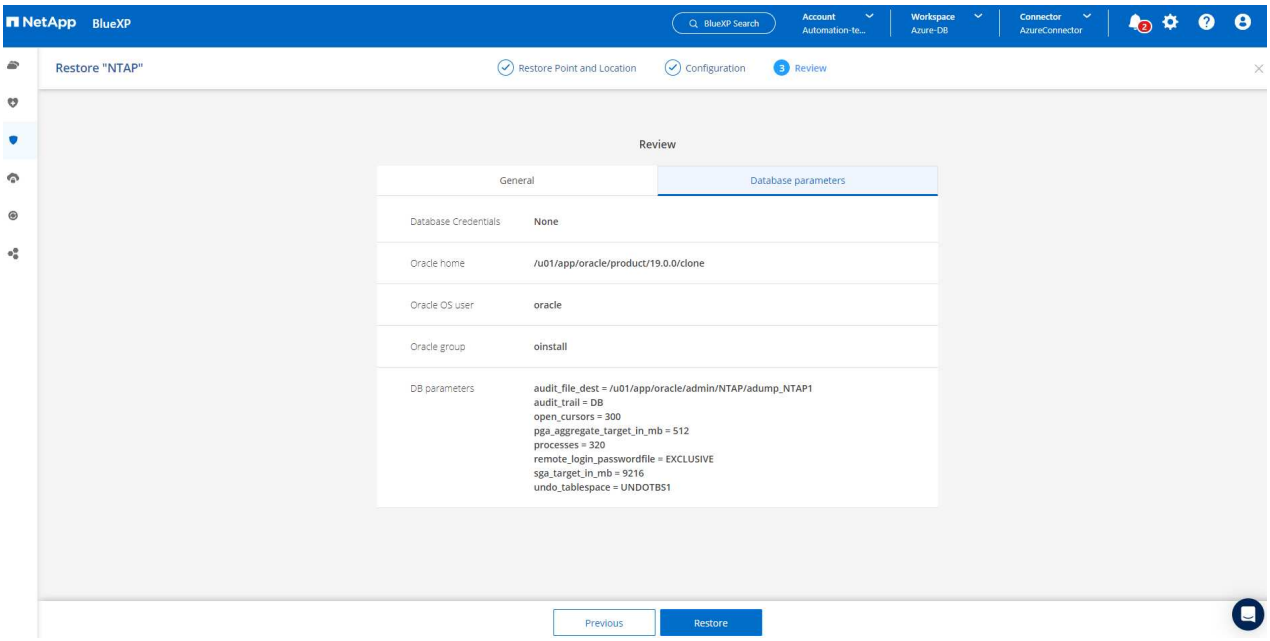
3. In the next **Configuration** page, set alternate **Host**, new database **SID**, and **Oracle Home** as configured at alternate Azure VM.



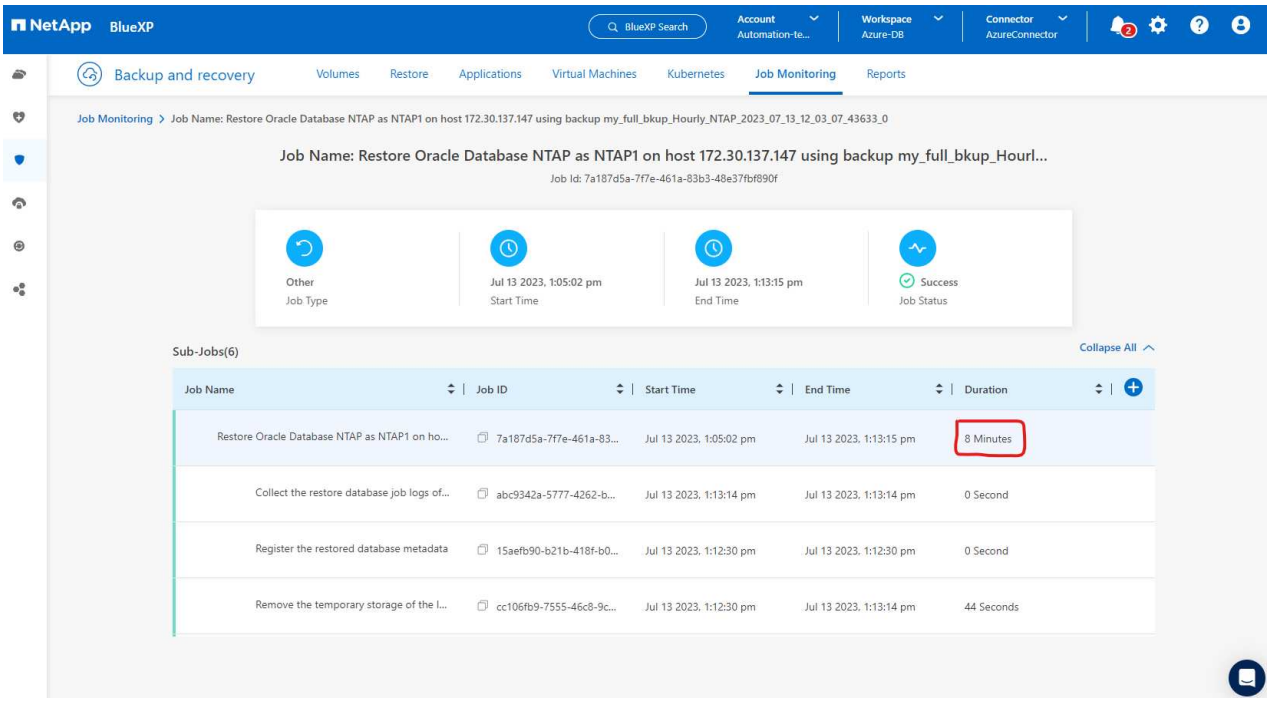

4. Review **General** page shows the details of cloned database such as SID, alternate host, data file locations, recovery scope etc.



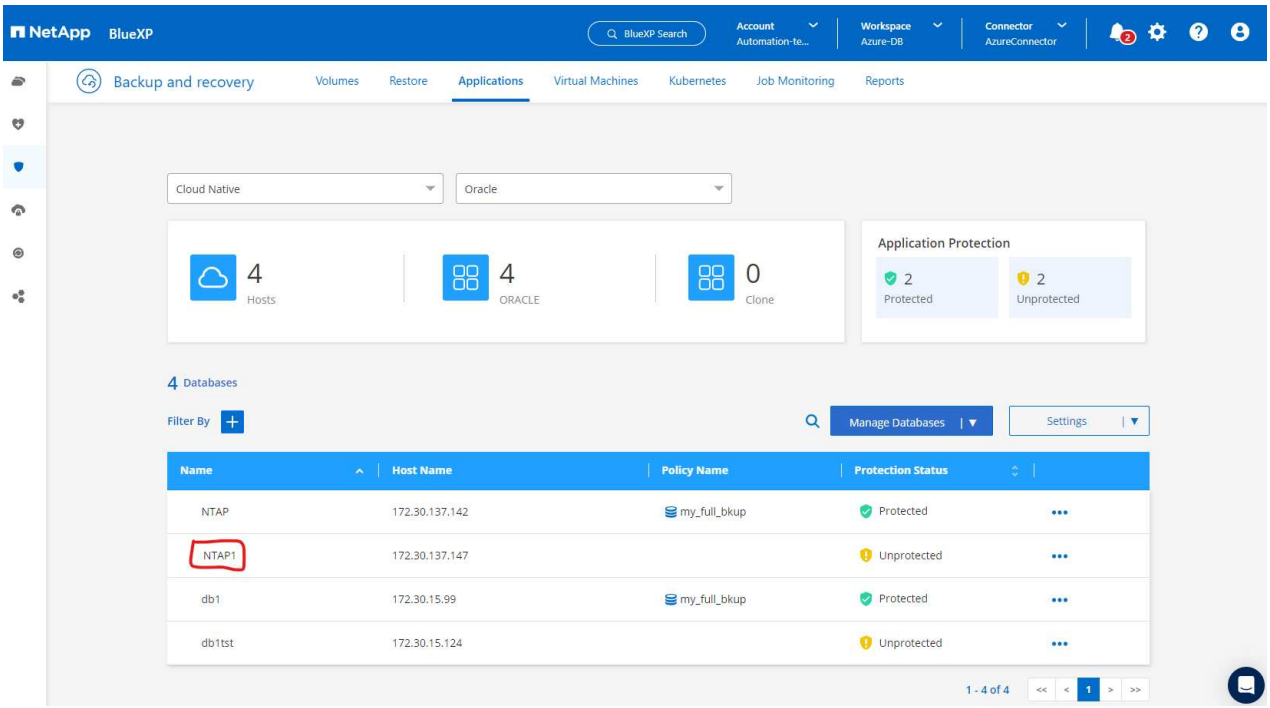

5. Review **Database parameters** page shows the details of cloned database configuration as well as some database parameters setting.




6. Monitor the cloning job status from the **Job Monitoring** tab, we observed that it took 8 minutes to clone a 1.6 TiB Oracle database.




7. Validate the cloned database in BlueXP **Applications** page that showed the cloned database was immediately registered with BlueXP.




8. Validate the cloned database on the Oracle Azure VM that showed the cloned database was running as expected.

```
[oracle@acao-ora02 admin]$ cat /etc/oratab
#



# This file is used by ORACLE utilities.  It is created by root.sh
# and updated by either Database Configuration Assistant while creating
# a database or ASM Configuration Assistant while creating ASM instance.

# A colon, ':', is used as the field terminator.  A new line terminates
# the entry.  Lines beginning with a pound sign, '#', are comments.
#
# Entries are of the form:
#   $ORACLE_SID:$ORACLE_HOME:<N|Y>:
#
# The first and second fields are the system identifier and home
# directory of the database respectively.  The third field indicates
# to the dbstart utility that the database should , "Y", or should not,
# "N", be brought up at system boot time.
#
# Multiple entries with the same $ORACLE_SID are not allowed.
#
#
# SnapCenter Plug-in for Oracle Database generated entry (DO NOT REMOVE THIS LINE)
NTAP1:/u01/app/oracle/product/19.0.0/clone:N
[oracle@acao-ora02 admin]$ export ORACLE_SID=NTAP1
[oracle@acao-ora02 admin]$ export ORACLE_HOME=/u01/app/oracle/product/19.0.0/clone
[oracle@acao-ora02 admin]$ export PATH=$PATH:$ORACLE_HOME/bin
[oracle@acao-ora02 admin]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jul 13 17:16:31 2023
Version 19.18.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.18.0.0.0

SQL> select name, open_mode, log_mode from v$database;

NAME      OPEN_MODE            LOG_MODE
--------- -------------------- ------------
NTAP1     READ WRITE           NOARCHIVELOG
```

This completes the demonstration of an Oracle database backup, restore, and clone in Azure with NetApp BlueXP console using SnapCenter Service.

# Additional information

To learn more about the information that is described in this document, review the following documents and/or websites:

- Set up and administer BlueXP

  https://docs.netapp.com/us-en/cloud-manager-setup-admin/index.html

- BlueXP backup and recovery documentation

  https://docs.netapp.com/us-en/cloud-manager-backup-restore/index.html

- Azure NetApp Files

https://azure.microsoft.com/en-us/products/netapp

- Get started with Azure

  https://azure.microsoft.com/en-us/get-started/

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