Cloud Manager and Cloud Volumes ONTAP in the C2S environment

Similar to a standard AWS region, you can use Cloud Manager in the AWS Commercial Cloud Services (C2S) environment to deploy Cloud Volumes ONTAP, which provides enterprise-class features for your cloud storage. Most features that are available in a standard AWS region are also available in the Commercial Cloud Services environment.

The following limitations apply to the AWS Commercial Cloud Services environment:

- At the time of publication, the environment includes only two Availability Zones.
  If you deploy Cloud Volumes ONTAP HA in multiple Availability Zones, the mediator must be in the same Availability Zone as one of the Cloud Volumes ONTAP HA nodes.

- Data tiering to S3 is not supported.

- The sync to S3 feature using the NetApp Cloud Sync service is not supported.

- The Volume View in Cloud Manager is not supported.

- Because there is no internet access in the C2S environment, the following features are not supported:
  - Integration with NetApp Cloud Central
  - Automated software upgrades from Cloud Manager
  - NetApp AutoSupport
  - AWS cost information for Cloud Volumes ONTAP resources
Preparing your AWS environment

Your AWS environment must meet a few requirements so that Cloud Manager and Cloud Volumes ONTAP operate correctly in the AWS Commercial Cloud Services environment.

Steps

1. Choose the VPC and subnets in which you want to launch the Cloud Manager instance and Cloud Volumes ONTAP instances.
   
   If you plan to launch the Cloud Manager instance in a different location than Cloud Volumes ONTAP instances, then the Cloud Manager instance must have a network connection to that location.

2. Subscribe to Cloud Volumes ONTAP in AWS:
   
   a. Go to the AWS Intelligence Community Marketplace and search for Cloud Volumes ONTAP.
   b. Select the offering that you plan to deploy.
   c. Review the terms and click Accept.
   d. Repeat these steps for the other offerings, if you plan to deploy them.

   Important: You must use Cloud Manager to launch Cloud Volumes ONTAP instances. You must not launch Cloud Volumes ONTAP instances from the EC2 console.

3. Provide Cloud Manager and Cloud Volumes ONTAP with the permissions needed to perform actions in AWS by setting up IAM policies and roles for the instances:
   
   a. From the AWS IAM console, create your own policies by copying and pasting the required permissions.

      See IAM policy requirements on page 5.

      You should have one IAM policy for Cloud Manager, one for the Cloud Volumes ONTAP nodes, and one for the HA mediator (if you want to deploy HA pairs).

   b. Create IAM roles with the role type Amazon EC2 and attach the policies that you created in the previous step.

      Similar to the policies, you should have one IAM role for Cloud Manager, one for the Cloud Volumes ONTAP nodes, and one for the HA mediator (if you want to deploy HA pairs).

      The following example shows the review page for the Cloud Manager policy.
You must select the Cloud Manager IAM role when you launch the Cloud Manager instance. You can select the IAM roles for Cloud Volumes ONTAP and the HA mediator when you create a Cloud Volumes ONTAP working environment from Cloud Manager.

4. If you want to use Amazon encryption with Cloud Volumes ONTAP, ensure that requirements are met for the AWS Key Management Service:
   a. Ensure that an active Customer Master Key (CMK) exists in your account or in another AWS account. The CMK can be an AWS-managed CMK or a customer-managed CMK.
   b. If the CMK is in an AWS account separate from the account where you plan to deploy Cloud Volumes ONTAP, then you need to obtain the ARN of that key. You’ll need to provide the ARN to Cloud Manager when you create the Cloud Volumes ONTAP system.
   c. Add the IAM role for the Cloud Manager instance to the list of key users for a CMK. This gives Cloud Manager permissions to use the CMK with Cloud Volumes ONTAP.

**IAM policy requirements**

Set up IAM policies and roles that provide Cloud Manager and Cloud Volumes ONTAP with the permissions that they need to perform actions in the AWS Commercial Cloud Services environment. You need an IAM policy and IAM role for each of the following:

- The Cloud Manager instance
- Cloud Volumes ONTAP instances
- The Cloud Volumes ONTAP HA mediator instance (if you want to deploy HA pairs)

**Policy for the Cloud Manager instance**

```json
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
      "ec2:DescribeInstances",
      "ec2:DescribeInstanceStatus",
      "ec2:RunInstances",
      "ec2:ModifyInstanceAttribute",
      "ec2:DescribeRouteTables",
      "ec2:DescribeImages",
      "ec2:CreateTags",
    ],
  },
```
"ec2:CreateVolume",
"ec2:DescribeVolumes",
"ec2:ModifyVolumeAttribute",
"ec2:DeleteVolume",
"ec2:CreateSecurityGroup",
"ec2:DeleteSecurityGroup",
"ec2:DescribeSecurityGroups",
"ec2:RevokeSecurityGroupEgress",
"ec2:RevokeSecurityGroupIngress",
"ec2:AuthorizeSecurityGroupEgress",
"ec2:AuthorizeSecurityGroupIngress",
"ec2:CreateNetworkInterface",
"ec2:DescribeNetworkInterface",
"ec2:DeleteNetworkInterface",
"ec2:ModifyNetworkInterfaceAttribute",
"ec2:DescribeSubnets",
"ec2:DescribeVpcs",
"ec2:CreateDhcpOptions",
"ec2:CreateSnapshot",
"ec2:DeleteSnapshot",
"ec2:DescribeSnapshots",
"ec2:GetConsoleOutput",
"ec2:DescribeKeyPairs",
"ec2:DescribeRegions",
"ec2:DeleteTags",
"ec2:DescribeTags",
"cloudformation:CreateStack",
"cloudformation:DeleteStack",
"cloudformation:DescribeStacks",
"cloudformation:DescribeStackEvents",
"cloudformation:ValidateTemplate",
"iam:PassRole",
"iam:CreateRole",
"iam:DeleteRole",
"iam:PutRolePolicy",
"iam:CreateInstanceProfile",
"iam:DeleteRolePolicy",
"iam:AddRoleToInstanceProfile",
"iam:RemoveRoleFromInstanceProfile",
"iam:DeleteInstanceProfile",
"iam:ListInstanceProfiles",
"s3:GetObject",
"s3:ListBucket",
"s3:GetBucketTagging",
"s3:GetBucketLocation",
"s3:ListAllMyBuckets",
"kms:List*",
"kms:Describe*",
"ec2:AssociateIamInstanceProfile",
"ec2:DescribeIamInstanceProfileAssociations",
"ec2:DisassociateIamInstanceProfile",
"ec2:DescribeInstanceAttribute",

"ec2:CreatePlacementGroup",
"ec2:DeletePlacementGroup"

"Resource": "*",

{"Sid": "fabricPoolPolicy",
"Effect": "Allow",
"Action": [
"s3:DeleteBucket",
"s3:GetLifecycleConfiguration",
"s3:PutLifecycleConfiguration",
"s3:PutBucketTagging",
"s3:ListBucketVersions"
],
"Resource": ["arn:aws-iso:s3:::fabric-pool*"}
Policy for Cloud Volumes ONTAP instances

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Action": "s3:ListAllMyBuckets",
         "Resource": "arn:aws-iso:s3:::*",
         "Effect": "Allow"
      },
      {
         "Action": ["s3:ListBucket", "s3:GetBucketLocation"],
         "Resource": "arn:aws-iso:s3:::fabric-pool-*",
         "Effect": "Allow"
      },
      {
         "Action": ["s3:GetObject", "s3:PutObject", "s3:DeleteObject"],
         "Resource": "arn:aws-iso:s3:::fabric-pool-*",
         "Effect": "Allow"
      }
   ]
}
```

Policy for the Cloud Volumes ONTAP HA mediator instance

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": ["ec2:AssignPrivateIpAddresses",
         "ec2:StartInstances",
         "ec2:StopInstances",
         "ec2:TerminateInstances",
         "ec2:AttachVolume",
         "ec2:DetachVolume"
      },
      {
         "Action": ["ec2:AttachVolume", "ec2:DetachVolume"],
         "Resource": ["arn:aws-iso:ec2:::*:instance/*"]
      },
      {
         "Action": ["ec2:AttachVolume", "ec2:DetachVolume"],
         "Resource": ["arn:aws-iso:ec2:::*:volume/*"]
      }
   ]
}
```
"ec2:CreateRoute",
"ec2:DeleteRoute",
"ec2:DescribeNetworkInterfaces",
"ec2:DescribeRouteTables",
"ec2:DescribeVpcs",
"ec2:ReplaceRoute",
"ec2:UnassignPrivateIpAddresses"
],
"Resource": "*"}
Installing and setting up Cloud Manager

Before you can launch Cloud Volumes ONTAP systems in AWS, you must first launch the Cloud Manager instance from the AWS Marketplace and then log in and set up Cloud Manager.

Steps

1. Obtain a root certificate signed by a certificate authority (CA) in the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format. Consult your organization's policies and procedures for obtaining the certificate.

   You'll need to upload the certificate to AWS in step 4 after you complete the Setup wizard. Cloud Manager uses the trusted certificate when sending requests to AWS over HTTPS.

2. Launch the Cloud Manager instance:
   a. Go to the AWS Intelligence Community Marketplace page for OnCommand Cloud Manager.
   b. On the Custom Launch tab, choose the option to launch the instance from the EC2 console.
   c. Follow the prompts to configure the instance.

      Note the following as you configure the instance:
      • The t2.medium instance type is supported.
      • You must choose the IAM role that you created when preparing your AWS environment.

      ![IAM role](image)

      ![Shutdown behavior](image)

      • You should keep the default storage options.
      • The required connection methods for the Cloud Manager instance are as follows: SSH, HTTP, and HTTPS.

3. Set up Cloud Manager from a host that has a connection to the Cloud Manager instance:
   a. Open a web browser and enter the following URL:

      `http://ipaddress:80`

   b. Complete the steps in the Setup wizard to set up a new Cloud Manager instance.

      Note the following as you set up Cloud Manager:
      • AutoSupport is not enabled by default in the Commercial Cloud Services environment.
      • The option to automatically update Cloud Manager to the newest version is not available in the Commercial Cloud Services environment because there is no internet connection.

4. After you finish the Setup wizard, Cloud Manager prompts you for the certificate that you obtained in step 1:
   a. Click Load File and select the certificate.
   b. Click Install and Restart to install the certificate and restart Cloud Manager.

5. After Cloud Manager restarts, log in using the administrator user account that you created in the Setup wizard.
6. Optional: If you don't want to use a self-signed certificate for HTTPS access to the Cloud Manager console, install a certificate signed by a CA:

   Note: This certificate is used when accessing the Cloud Manager console over HTTPS. The certificate that you provided in step 4 was required for communication with AWS services.

   a. In the upper right of the Cloud Manager console, click the task drop-down list, and then select **HTTPS Setup**.

   ![HTTPS Setup page](image)

   b. In the **HTTPS Setup** page, install a certificate by first generating a certificate signing request (CSR) or by installing your own CA-signed certificate.

   The certificate must use the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format.

   After you install the certificate, Cloud Manager uses the certificate when you can access the console using HTTPS (port 443).

7. If needed, click **Tenants** and create additional tenants.

8. If multiple people need to use Cloud Manager, click the user icon, select **Users**, and add additional user accounts.

   **Note:** A Cloud Manager Admin has access to all tenants and working environments, a Tenant Admin can administer the working environments in a single tenant, and a Working Environment Admin can administer one or more working environments in a tenant.

**Result**

Cloud Manager is now installed and set up so users can launch Cloud Volumes ONTAP instances.
Launching Cloud Volumes ONTAP instances

You can launch Cloud Volumes ONTAP instances in the AWS Commercial Cloud Services environment by creating new working environments in Cloud Manager.

Before you begin

If you purchased a license, you must have the license file that you received from NetApp. The license file is a .NLF file in JSON format.

Steps

1. On the Working Environments page, click Create.

2. Under Create, select Cloud Volumes ONTAP or Cloud Volumes ONTAP HA.

3. Complete the steps in the wizard to launch the Cloud Volumes ONTAP system.

   Note the following as you complete the wizard:

   • If you want to deploy Cloud Volumes ONTAP HA in multiple Availability Zones, deploy the configuration as follows because only two AZs were available in the AWS Commercial Cloud Services environment at the time of publication:
     - Node 1: Availability Zone A
     - Node 2: Availability Zone B
     - Mediator: Availability Zone A or B
   
   • You should leave the default option to use a generated security group. The predefined security group includes the rules that Cloud Volumes ONTAP needs to operate successfully. Security group rules on page 13

   • A key pair is required to enable key-based SSH authentication to Cloud Volumes ONTAP.

   • The underlying AWS disk type is for the initial Cloud Volumes ONTAP volume. You can choose a different disk type for subsequent volumes.

   • The performance of AWS disks is tied to disk size. You should choose the disk size that gives you the sustained performance that you need. Refer to AWS documentation for more details about EBS performance.

   • The disk size is the default size for all disks on the system.

   Note: If you need a different size later, you can use the Advanced allocation option to create an aggregate that uses disks of a specific size.

   • Storage efficiency features can improve storage utilization and reduce the total amount of storage that you need.

The following image shows the Review & Approve page for a new system:
**Result**

Cloud Manager launches the Cloud Volumes ONTAP instance. You can track the progress in the timeline.
Security group rules

Cloud Manager creates security groups that include the inbound and outbound rules that Cloud Manager and Cloud Volumes ONTAP need to operate successfully in the cloud. You might want to refer to the ports for testing purposes or if you prefer to use your own security groups.

Security group rules for Cloud Manager

Inbound rules

Note: The source for inbound rules is 0.0.0.0/0.

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSH</td>
<td>22</td>
<td>SSH connections to Cloud Manager</td>
</tr>
<tr>
<td>HTTP</td>
<td>80</td>
<td>Accessing the Cloud Manager console</td>
</tr>
<tr>
<td>HTTPS</td>
<td>443</td>
<td>Accessing the Cloud Manager console</td>
</tr>
</tbody>
</table>

Outbound rules

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All TCP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
<tr>
<td>All UDP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
</tbody>
</table>

Security group rules for Cloud Volumes ONTAP

Inbound rules

Note: The source for inbound rules is 0.0.0.0/0.

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ICMP</td>
<td>All</td>
<td>Pinging the instance</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>111</td>
<td>Portmapper</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>139</td>
<td>NetBIOS</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>161-162</td>
<td>SNMP</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>445</td>
<td>Microsoft SMB</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>635</td>
<td>NFS mount</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>749</td>
<td>Kerberos</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>2049</td>
<td>NFS</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>3260</td>
<td>iSCSI</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>4045-4046</td>
<td>NFS mountd</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>10000</td>
<td>NDMP</td>
</tr>
<tr>
<td>Custom TCP Rule</td>
<td>11104-11105</td>
<td>Intercluster management and data</td>
</tr>
<tr>
<td>Type</td>
<td>Port range</td>
<td>Used for</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>111</td>
<td>Portmapper</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>161-162</td>
<td>SNMP</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>635</td>
<td>NFS mount</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>2049</td>
<td>NFS</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>4045-4046</td>
<td>NFS mountd</td>
</tr>
<tr>
<td>Custom UDP Rule</td>
<td>4049</td>
<td>NFS rquotad protocol</td>
</tr>
<tr>
<td>HTTP</td>
<td>80</td>
<td>ONTAP System Manager access</td>
</tr>
<tr>
<td>HTTPS</td>
<td>443</td>
<td>ONTAP System Manager access</td>
</tr>
<tr>
<td>SSH</td>
<td>22</td>
<td>SSH to the CLI</td>
</tr>
</tbody>
</table>

**Outbound rules**

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ICMP</td>
<td>All</td>
<td>All outbound traffic (SnapMirror and SnapVault)</td>
</tr>
<tr>
<td>All TCP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
<tr>
<td>All UDP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
</tbody>
</table>

**External security group rules for the HA mediator**

**Inbound rules**

*Note:* The source for inbound rules is 0.0.0.0/0.

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSH</td>
<td>22</td>
<td>SSH connections to the HA mediator</td>
</tr>
<tr>
<td>TCP</td>
<td>3000</td>
<td>RESTful API access from Cloud Manager</td>
</tr>
</tbody>
</table>

**Outbound rules**

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All TCP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
<tr>
<td>All UDP</td>
<td>All</td>
<td>All outbound traffic</td>
</tr>
</tbody>
</table>

**Internal security group rules for the HA mediator**

*Note:* Cloud Manager always creates this security group. You do not have the option to use your own security group.

**Inbound rules**

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All traffic</td>
<td>All</td>
<td>Communication between the HA mediator and Cloud Volumes ONTAP HA nodes only</td>
</tr>
</tbody>
</table>
Outbound rules

<table>
<thead>
<tr>
<th>Type</th>
<th>Port range</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>All traffic</td>
<td>All</td>
<td>Communication between the HA mediator and Cloud Volumes ONTAP HA nodes only</td>
</tr>
</tbody>
</table>
Where to get help and find more information

You can get help and find more information about Cloud Manager and Cloud Volumes ONTAP by going to https://docs.netapp.com/us-en/oocm from a system that has internet access.
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