Oracle Database

NetApp Solutions

NetApp
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Oracle Database

Deploying Oracle Database

Solution Overview

Automated Deployment of Oracle19c for ONTAP on NFS

Organizations are automating their environments to gain efficiencies, accelerate deployments, and reduce manual effort. Configuration management tools like Ansible are being used to streamline enterprise database operations. In this solution, we demonstrate how you can use Ansible to automate the provisioning and configuration of Oracle 19c with NetApp ONTAP. By enabling storage administrators, systems administrators, and DBAs to consistently and rapidly deploy new storage, configure database servers, and install Oracle 19c software, you achieve the following benefits:

- Eliminate design complexities and human errors, and implement a repeatable consistent deployment and best practices
- Decrease time for provisioning of storage, configuration of DB hosts, and Oracle installation
- Increase database administrators, systems and storage administrators productivity
- Enable scaling of storage and databases with ease

NetApp provides customers with validated Ansible modules and roles to accelerate deployment, configuration, and lifecycle management of your Oracle database environment. This solution provides instruction and Ansible playbook code, to help you:

- Create and configure ONTAP NFS storage for Oracle Database
- Install Oracle 19c on RedHat Enterprise Linux 7/8 or Oracle Linux 7/8
- Configure Oracle 19c on ONTAP NFS storage

For more details or to begin, please see the overview videos below.

AWX/Tower Deployments

- Part 1: Getting Started, Requirements, Automation Details and Initial AWX/Tower Configuration

► https://docs.netapp.com/us-en/netapp-solutions/media/oracle_deployment_auto_v1.mp4 *(video)*

- Part 2: Variables and Running the Playbook

► https://docs.netapp.com/us-en/netapp-solutions/media/oracle_deployment_auto_v2.mp4 *(video)*

CLI Deployment

- Part 1: Getting Started, Requirements, Automation Details and Ansible Control Host Setup

► https://docs.netapp.com/us-en/netapp-solutions/media/oracle_deployment_auto_v4.mp4 *(video)*

- Part 2: Variables and Running the Playbook

► https://docs.netapp.com/us-en/netapp-solutions/media/oracle3.mp4 *(video)*

Getting started

This solution has been designed to be run in an AWX/Tower environment or by CLI on an Ansible control host.

AWX/Tower

For AWX/Tower environments, you are guided through creating an inventory of your ONTAP cluster management and Oracle server (IPs and hostnames), creating credentials, configuring a project that pulls the Ansible code from NetApp Automation Github, and the Job Template that launches the automation.

1. Fill out the variables specific to your environment, and copy and paste them into the Extra Vars fields in your job template.
2. After the extra vars have been added to your job template, you can launch the automation.
3. The job template is run in three phases by specifying tags for ontap_config, linux_config, and oracle_config.

CLI via the Ansible control host

1. To configure the Linux host so that is can be used as an Ansible control host
click here for RHEL 7/8 or CentOS 7/8, or
here for Ubuntu/Debian
2. After the Ansible control host is configured, you can git clone the Ansible Automation repository.
3. Edit the hosts file with the IPs and/or hostnames of your ONTAP cluster management and Oracle server's management IPs.
4. Fill out the variables specific to your environment, and copy and paste them into the `vars.yml` file.
5. Each Oracle host has a variable file identified by its hostname that contains host-specific variables.
6. After all variable files have been completed, you can run the playbook in three phases by specifying tags for `ontap_config`, `linux_config`, and `oracle_config`.

Requirements

Environment	Requirements
Ansible environment	AWX/Tower or Linux host to be the Ansible control host
	Ansible v.2.10 and higher
	Python 3
	Python libraries - netapp-lib - xmltodict - jmespath
ONTAP	ONTAP version 9.3 - 9.7
	Two data aggregates
	NFS vlan and ifgrp created

Environment	Requirements
Oracle server(s)	RHEL 7/8
	Oracle Linux 7/8
	Network interfaces for NFS, public, and optional mgmt
	Oracle installation files on Oracle servers

Automation Details

This automated deployment is designed with a single Ansible playbook that consists of three separate roles. The roles are for ONTAP, Linux, and Oracle configurations.
The following table describes which tasks are being automated.

Role	Tasks
ontap_config	Pre-check of the ONTAP environment
	Creation of NFS based SVM for Oracle
	Creation of export policy
	Creation of volumes for Oracle
	Creation of NFS LIFs
linux_config	Create mount points and mount NFS volumes
	Verify NFS mounts
	OS specific configuration
	Create Oracle directories
	Configure hugepages
	Disable SELinux and firewall daemon
	Enable and start chronyd service
	increase file descriptor hard limit
	Create pam.d session file
oracle_config	Oracle software installation
	Create Oracle listener
	Create Oracle databases
	Oracle environment configuration
	Save PDB state
	Enable instance archive mode
	Enable DNFS client
	Enable database auto startup and shutdown between OS reboots

Default parameters

To simplify automation, we have preset many required Oracle deployment parameters with default values. It is generally not necessary to change the default parameters for most deployments. A more advanced user can make changes to the default parameters with caution. The default parameters are located in each role folder under defaults directory.

Deployment instructions

Before starting, download the following Oracle installation and patch files and place them in the `/tmp/archive` directory with read, write, and execute access for all users on each DB server to be deployed. The automation tasks look for the named installation files in that particular directory for Oracle installation and configuration.

```
LINUX.X64_193000_db_home.zip -- 19.3 base installer
p31281355_190000_Linux-x86-64.zip -- 19.8 RU patch
p6880880_190000_Linux-x86-64.zip -- opatch version 12.2.0.1.23
```

License

You should read license information as stated in the Github repository. By accessing, downloading, installing, or using the content in this repository, you agree the terms of the license laid out here.

Note that there are certain restrictions around producing and/or sharing any derivative works with the content in this repository. Please make sure you read the terms of the License before using the content. If you do not agree to all of the terms, do not access, download, or use the content in this repository.

After you are ready, click here for detailed AWX/Tower deployment procedures or here for CLI deployment.

Step-by-step deployment procedure

AWX/Tower deployment Oracle 19c Database

1. Create the inventory, group, hosts, and credentials for your environment

This section describes the setup of inventory, groups, hosts, and access credentials in AWX/Ansible Tower that prepare the environment for consuming NetApp automated solutions.

1. Configure the inventory.
    a. Navigate to Resources → Inventories → Add, and click Add Inventory.
    b. Provide the name and organization details, and click Save.
    c. On the Inventories page, click the inventory created.
    d. If there are any inventory variables, paste them in the variables field.
    e. Navigate to the Groups sub-menu and click Add.
    f. Provide the name of the group for ONTAP, paste the group variables (if any) and click Save.
    g. Repeat the process for another group for Oracle.
    h. Select the ONTAP group created, go to the Hosts sub-menu and click Add New Host.
    i. Provide the IP address of the ONTAP cluster management IP, paste the host variables (if any), and click Save.

j. This process must be repeated for the Oracle group and Oracle host(s) management IP/hostname.

2. Create credential types. For solutions involving ONTAP, you must configure the credential type to match username and password entries.
   a. Navigate to Administration → Credential Types, and click Add.
   b. Provide the name and description.
   c. Paste the following content in Input Configuration:

```
fields:
  - id: username
    type: string
    label: Username
  - id: password
    type: string
    label: Password
    secret: true
  - id: vsadmin_password
    type: string
    label: vsadmin_password
    secret: true
```

   d. Paste the following content into Injector Configuration:

```
extra_vars:
  password: '{{ password }}'
  username: '{{ username }}'
  vsadmin_password: '{{ vsadmin_password }}'
```

3. Configure the credentials.
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for ONTAP.
   c. Select the custom Credential Type you created for ONTAP.
   d. Under Type Details, enter the username, password, and vsadmin_password.
   e. Click Back to Credential and click Add.
   f. Enter the name and organization details for Oracle.
   g. Select the Machine credential type.
   h. Under Type Details, enter the Username and Password for the Oracle hosts.
   i. Select the correct Privilege Escalation Method, and enter the username and password.

2. Create a project

1. Go to Resources → Projects, and click Add.
   a. Enter the name and organization details.

b. Select Git in the Source Control Credential Type field.

c. enter https://github.com/NetApp-Automation/na_oracle19c_deploy.git as the source control URL.

d. Click Save.

e. The project might need to sync occasionally when the source code changes.

3. Configure Oracle host_vars

The variables defined in this section are applied to each individual Oracle server and database.

1. Input your environment-specific parameters in the following embedded Oracle hosts variables or host_vars form.

The items in blue must be changed to match your environment.

Host VARS Config

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
button {
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_datastores_nfs {
  display: block;
}
#more_datastores_nfs_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button id="copy-
button1" onclick="CopyClassText1()">Copy</button></div><pre><code><div
class="CopyMeClass1" id="CopyMeID1">
#################################################################
```

```
###############      Host Variables Configuration        ###############
#####################################################################

# Add your Oracle Host
ansible_host: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>10.61.180.15</i></span>

# Oracle db log archive mode: true - ARCHIVELOG or false - NOARCHIVELOG
log_archive_mode: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>true</i></span>

# Number of pluggable databases per container instance identified by sid.
Pdb_name specifies the prefix for container database naming in this case
cdb2_pdb1, cdb2_pdb2, cdb2_pdb3
oracle_sid: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>cdb2</i></span>
pdb_num: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>3</i></span>
pdb_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>"{{ oracle_sid }}_pdb"</i></span>

# CDB listener port, use different listener port for additional CDB on
same host
listener_port: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>1523</i></span>

# CDB is created with SGA at 75% of memory_limit, MB. Consider how many
databases to be hosted on the node and how much ram to be allocated to
each DB. The grand total SGA should not exceed 75% available RAM on node.
memory_limit: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>5464</i></span>

# Set "em_configuration: DBEXPRESS" to install enterprise manager express
and choose a unique port from 5500 to 5599 for each sid on the host.
# Leave them black if em express is not installed.
em_configuration: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>DBEXPRESS</i></span>
em_express_port: <span <div contenteditable="true" style="color:#004EFF;
```

```
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>5501</i></span>

# "{{groups.oracle[0]}}" represents first Oracle DB server as defined in
Oracle hosts group [oracle]. For concurrent multiple Oracle DB servers
deployment, [0] will be incremented for each additional DB server. For
example,  "{{groups.oracle[1]}}" represents DB server 2,
"{{groups.oracle[2]}}" represents DB server 3 ... As a good practice and
the default, minimum three volumes is allocated to a DB server with
corresponding /u01, /u02, /u03 mount points, which store oracle binary,
oracle data, and oracle recovery files respectively. Additional volumes
can be added by click on "More NFS volumes" but the number of volumes
allocated to a DB server must match with what is defined in global vars
file by volumes_nfs parameter, which dictates how many volumes are to be
created for each DB server.
host_datastores_nfs:
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u01</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u02</i></span>&quot;,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u03</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
<a id="more_datastores_nfs" href="javascript:datastoredropdown();">More
NFS volumes</a><div id="select_more_datastores_nfs"></div><a
id="more_datastores_nfs_button"
```

```
href="javascript:adddatastorevolumes();">Enter NFS volumes'
details</a><div id="extra_datastores_nfs"></div>
</div></code></pre></div></div>
<script>
function CopyClassText1(){
    var textToCopy = document.getElementById("CopyMeID1");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_datastores_nfs").style.display = "none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button1").innerHTML = "Copied!";
          setTimeout(revert_copy, 3000);
      }
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
      document.getElementById("copy-button1").innerHTML = "Copy";
      document.getElementById("more_datastores_nfs").style.display =
"block";
}

function datastoredropdown() {
    document.getElementById("more_datastores_nfs").style.display = "none";
    document.getElementById("more_datastores_nfs_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_datastores_nfs");
```

```
    while (x < 100) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_datastores_nfs">How many extra NFS volumes do
you wish to add?</a><select name="number_of_extra_datastores_nfs"
id="number_of_extra_datastores_nfs">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function adddatastorevolumes() {
    var y =
document.getElementById("number_of_extra_datastores_nfs").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_datastores_nfs");
    while (j < y) {
        j++;
        myHTML += '  - {vol_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>"{{groups.oracle[0]}}_u01"</i></span>,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node02</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.201</i></span>,
size: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>25</i></span>}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_datastores_nfs").style.display =
"none";
    document.getElementById("more_datastores_nfs_button").style.display =
"none";
}

</script>
```

a. Fill in all variables in the blue fields.

b. After completing variables input, click the Copy button on the form to copy all variables to be transferred to AWX or Tower.

c. Navigate back to AWX or Tower and go to Resources → Hosts, and select and open the Oracle server configuration page.

d. Under the Details tab, click edit and paste the copied variables from step 1 to the Variables field under the YAML tab.

e. Click Save.

f. Repeat this process for any additional Oracle servers in the system.

4. Configure global variables

Variables defined in this section apply to all Oracle hosts, databases, and the ONTAP cluster.

1. Input your environment-specific parameters in following embedded global variables or vars form.

The items in blue must be changed to match your environment.

VARS

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
button {
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_storage_vlans {
  display: block;
}
#more_storage_vlans_button {
  display: none;
}
#more_nfs_volumes {
  display: block;
}
#more_nfs_volumes_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button id="copy-
```

```
button" onclick="CopyClassText()">Copy</button></div><pre><code><div
class="CopyMeClass" id="CopyMeID">
#####################################################################
###### Oracle 19c deployment global user configuration variables ######
######  Consolidate all variables from ontap, linux and oracle   ######
#####################################################################

###########################################
### Ontap env specific config variables ###
###########################################

#Inventory group name
#Default inventory group name - 'ontap'
#Change only if you are changing the group name either in inventory/hosts
file or in inventory groups in case of AWX/Tower
hosts_group: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>ontap</i></span>

#CA_signed_certificates (ONLY CHANGE to 'true' IF YOU ARE USING CA SIGNED
CERTIFICATES)
ca_signed_certs: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>false</i></span>

#Names of the Nodes in the ONTAP Cluster
nodes:
 - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
01</i></span>
 - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
02</i></span>


#Storage VLANs
#Add additional rows for vlans as necessary
storage_vlans:
   - {vlan_id: &amp;quot;<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>203</i></span>&amp;quot;, name: &amp;quot;<span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>infra_NFS</i></span>&amp;quot;,
protocol: &amp;quot;<span <div
contenteditable="true"/><i>NFS</i></span>&amp;quot;}
<a id="more_storage_vlans" href="javascript:storagevlandropdown();">More
```

```
Storage VLANs</a><div id="select_more_storage_vlans"></div><a
id="more_storage_vlans_button" href="javascript:addstoragevlans();">Enter
Storage VLANs details</a><div id="extra_storage_vlans"></div>

#Details of the Data Aggregates that need to be created
#If Aggregate creation takes longer, subsequent tasks of creating volumes
may fail.
#There should be enough disks already zeroed in the cluster, otherwise
aggregate create will zero the disks and will take long time
data_aggregates:
  - {aggr_name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>}
  - {aggr_name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node02</i></span>}

#SVM name
svm_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>ora_svm</i></span>


# SVM Management LIF Details
svm_mgmt_details:
  - {address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.91.100</i></span>, netmask: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>255.255.255.0</i></span>,
home_port: <span <div contenteditable="true"/><i>e0M</i></span>}

# NFS storage parameters when data_protocol set to NFS. Volume named after
Oracle hosts name identified by mount point as follow for oracle DB server
1. Each mount point dedicates to a particular Oracle files: u01 - Oracle
binary, u02 - Oracle data, u03 - Oracle redo. Add additional volumes by
click on "More NFS volumes" and also add the volumes list to corresponding
host_vars as host_datastores_nfs variable. For multiple DB server
deployment, additional volumes sets needs to be added for additional DB
server. Input variable "{{groups.oracle[1]}}_u01",
"{{groups.oracle[1]}}_u02", and "{{groups.oracle[1]}}_u03" as vol_name for
second DB server. Place volumes for multiple DB servers alternatingly
between controllers for balanced IO performance, e.g. DB server 1 on
controller node1, DB server 2 on controller node2 etc. Make sure match lif
address with controller node.
volumes_nfs:
```

```
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u01</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u02</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u03</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
<a id="more_nfs_volumes" href="javascript:nfsvolumesdropdown();">More NFS
volumes</a><div id="select_more_nfs_volumes"></div><a
id="more_nfs_volumes_button" href="javascript:addnfsvolumes();">Enter NFS
volumes' details</a><div id="extra_nfs_volumes"></div>

#NFS LIFs IP address and netmask
nfs_lifs_details:
  - address: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.200</i></span> #for node-1
    netmask: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>255.255.255.0</i></span>
  - address: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.201</i></span> #for node-2
    netmask: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>255.255.255.0</i></span>
```

```
#NFS client match
client_match: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.0/24</i></span>

###########################################
### Linux env specific config variables ###
###########################################

#NFS Mount points for Oracle DB volumes
mount_points:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03</i></span>

# Up to 75% of node memory size divided by 2mb. Consider how many
databases to be hosted on the node and how much ram to be allocated to
each DB.
# Leave it blank if hugepage is not configured on the host.
hugepages_nr: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>1234</i></span>

# RedHat subscription username and password
redhat_sub_username: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>
redhat_sub_password: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>

#####################################################
### DB env specific install and config variables ###
#####################################################

db_domain: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>your.domain.com</i></span>
```

```
# Set initial password for all required Oracle passwords. Change them
after installation.
initial_pwd_all: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>netapp123</i></span>

</div></code></pre></div></div>
<script>
function CopyClassText(){
    var textToCopy = document.getElementById("CopyMeID");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_storage_vlans").style.display = "none";
    document.getElementById("more_nfs_volumes").style.display = "none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button").innerHTML = "Copied!";
          setTimeout(revert_copy, 3000);
      }
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
      document.getElementById("copy-button").innerHTML = "Copy";
      document.getElementById("more_storage_vlans").style.display =
"block";
      document.getElementById("more_nfs_volumes").style.display = "block";
}
function storagevlandropdown() {
    document.getElementById("more_storage_vlans").style.display = "none";
    document.getElementById("more_storage_vlans_button").style.display =
```

```
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_storage_vlans");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_storage_vlans_info">How many extra VLANs do you
wish to add?</a><select name="number_of_extra_storage_vlans"
id="number_of_extra_storage_vlans">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addstoragevlans() {
    var y =
document.getElementById("number_of_extra_storage_vlans").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_storage_vlans");
    while (j < y) {
        j++;
        myHTML += '   - {vlan_id: &amp;quot;<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>203</i></span>&amp;quot;, name: &amp;quot;<span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>infra_NFS</i></span>&amp;quot;,
protocol: &amp;quot;<span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>NFS</i></span>&amp;quot;}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_storage_vlans").style.display =
"none";
    document.getElementById("more_storage_vlans_button").style.display =
"none";
}
function nfsvolumesdropdown() {
    document.getElementById("more_nfs_volumes").style.display = "none";
    document.getElementById("more_nfs_volumes_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_nfs_volumes");
    while (x < 100) {
```

```
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_nfs_volumes_info">How many extra NFS volumes do
you wish to add?</a><select name="number_of_extra_nfs_volumes"
id="number_of_extra_nfs_volumes">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addnfsvolumes() {
    var y = document.getElementById("number_of_extra_nfs_volumes").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_nfs_volumes");
    while (j < y) {
        j++;
        myHTML += '  - {vol_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>rtpora04_u01</i></span>, aggr_name: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>aggr01_node02</i></span>,
lif: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.201</i></span>, size: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>25</i></span>}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_nfs_volumes").style.display =
"none";
    document.getElementById("more_nfs_volumes_button").style.display =
"none";
}

</script>
```

1. Fill in all variables in blue fields.
2. After completing variables input, click the Copy button on the form to copy all variables to be transferred to AWX or Tower into the following job template.

5. Configure and launch the job template.

1. Create the job template.
   a. Navigate to Resources → Templates → Add and click Add Job Template.
   b. Enter the name and description
   c. Select the Job type; Run configures the system based on a playbook, and Check performs a dry run of a playbook without actually configuring the system.

d. Select the corresponding inventory, project, playbook, and credentials for the playbook.
e. Select the all_playbook.yml as the default playbook to be executed.
f. Paste global variables copied from step 4 into the Template Variables field under the YAML tab.
g. Check the box Prompt on Launch in the Job Tags field.
h. Click Save.

2. Launch the job template.
   a. Navigate to Resources → Templates.
   b. Click the desired template and then click Launch.
   c. When prompted on launch for Job Tags, type in requirements_config. You might need to click the Create Job Tag line below requirements_config to enter the job tag.

      requirements_config ensures that you have the correct libraries to run the other roles.

   d. Click Next and then Launch to start the job.
   e. Click View → Jobs to monitor the job output and progress.
   f. When prompted on launch for Job Tags, type in ontap_config. You might need to click the Create "Job Tag" line right below ontap_config to enter the job tag.
   g. Click Next and then Launch to start the job.
   h. Click View → Jobs to monitor the job output and progress
   i. After the ontap_config role has completed, run the process again for linux_config.
   j. Navigate to Resources → Templates.
   k. Select the desired template and then click Launch.
   l. When prompted on launch for the Job Tags type in linux_config, you might need to select the Create "job tag" line right below linux_config to enter the job tag.
   m. Click Next and then Launch to start the job.
   n. Select View → Jobs to monitor the job output and progress.
   o. After the linux_config role has completed, run the process again for oracle_config.
   p. Go to Resources → Templates.
   q. Select the desired template and then click Launch.
   r. When prompted on launch for Job Tags, type oracle_config. You might need to select the Create "Job Tag" line right below oracle_config to enter the job tag.
   s. Click Next and then Launch to start the job.
   t. Select View → Jobs to monitor the job output and progress.

6. Deploy additional database on same Oracle host

The Oracle portion of the playbook creates a single Oracle container database on an Oracle server per execution. To create additional container databases on the same server, complete the following steps.

1. Revise host_vars variables.
   a. Go back to step 2 - Configure Oracle host_vars.
   b. Change the Oracle SID to a different naming string.

c. Change the listener port to different number.
d. Change the EM Express port to a different number if you are installing EM Express.
e. Copy and paste the revised host variables to the Oracle Host Variables field in the Host Configuration Detail tab.

2. Launch the deployment job template with only the oracle_config tag.

Validate Oracle installation

```
1. Log in to Oracle server as oracle user and execute the following
commands:
```

```
ps -ef | grep ora
```

This will list oracle processes if installation completed as expected and oracle DB started

```
2. Log in to the database to check the db configuration settings and the
PDBs created with the following command sets.
```

```
sqlplus / as sysdba
```

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu May 6 12:52:51 2021
Version 19.8.0.0.0

Copyright (c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.8.0.0.0

SQL>

```
select name, log_mode from v$database;
```

SQL> select name, log_mode from v$database;
NAME LOG_MODE
--------- ------------
CDB2 ARCHIVELOG

```
show pdbs;
```

SQL> show pdbs

```
    CON_ID CON_NAME                       OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       READ ONLY  NO
         3 CDB2_PDB1                      READ WRITE NO
         4 CDB2_PDB2                      READ WRITE NO
         5 CDB2_PDB3                      READ WRITE NO
```

```
col svrname form a30
col dirname form a30
select svrname, dirname, nfsversion from v$dnfs_servers;
```

SQL> col svrname form a30
SQL> col dirname form a30
SQL> select svrname, dirname, nfsversion from v$dnfs_servers;

SVRNAME DIRNAME NFSVERSION
---------- ---------- ----------
172.21.126.200 /rhelora03_u02 NFSv3.0
172.21.126.200 /rhelora03_u03 NFSv3.0
172.21.126.200 /rhelora03_u01 NFSv3.0

```
This confirms that dNFS is working properly.
```

```
3. Connect to database via listener to check hte Oracle listener
configuration with the following command. Change to the appropriate
listener port and database service name.
```

```
sqlplus system@//localhost:1523/cdb2_pdb1.cie.netapp.com
```

[oracle@localhost ~]$ sqlplus system@//localhost:1523/cdb2_pdb1.cie.netapp.com

SQL*Plus: Release 19.0.0.0.0 - Production on Thu May 6 13:19:57 2021
Version 19.8.0.0.0

Copyright (c) 1982, 2019, Oracle. All rights reserved.

Enter password:
Last Successful login time: Wed May 05 2021 17:11:11 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.8.0.0.0

SQL> show user
USER is "SYSTEM"
SQL> show con_name
CON_NAME
CDB2_PDB1

```
This confirms that Oracle listener is working properly.
```

Where to go for help?

If you need help with the toolkit, please join the NetApp Solution Automation community support slack channel and look for the solution-automation channel to post your questions or inquires.

Step-by-step deployment procedure

CLI deployment Oracle 19c Database

This section covers the steps required to prepare and deploy Oracle19c Database with the CLI. Make sure that you have reviewed the Getting Started and Requirements section and prepared your environment accordingly.

Download Oracle19c repo

```
1. From your ansible controller, run the following command:
```

```
git clone https://github.com/NetApp-Automation/na_oracle19c_deploy.git
```

```
2. After downloading the repository, change directories to
na_oracle19c_deploy <cd na_oracle19c_deploy>.
```

Edit the hosts file

Complete the following before deployment:

1. Edit your hosts file na_oracle19c_deploy directory.
2. Under [ontap], change the IP address to your cluster management IP.
3. Under the [oracle] group, add the oracle hosts names. The host name must be resolved to its IP address either through DNS or the hosts file, or it must be specified in the host.
4. After you have completed these steps, save any changes.

The following example depicts a host file:

```
#ONTAP Host<div>
[ontap]
<div>
<span <div contenteditable="false" style="color:#7EAF97
; font-weight:bold; font-style:italic; text-
decoration:;"/>10.61.184.183<i></i></span>
</div>
#Oracle hosts<div>
<div>
[oracle]<div>
<span <div contenteditable="false" style="color:#7EAF97
; font-weight:bold; font-style:italic; text-
decoration:;"/>rtpora01<i></i></span>
<div>
<span <div contenteditable="false" style="color:#7EAF97
; font-weight:bold; font-style:italic; text-
decoration:;"/>rtpora02<i></i></span>
</div>
```

This example executes the playbook and deploys oracle 19c on two oracle DB servers concurrently. You can also test with just one DB server. In that case, you only need to configure one host variable file.

> The playbook executes the same way regardless of how many Oracle hosts and databases you deploy.

Edit the host_name.yml file under host_vars

Each Oracle host has its host variable file identified by its host name that contains host-specific variables. You can specify any name for your host. Edit and copy the `host_vars` from the Host VARS Config section and paste it into your desired `host_name.yml` file.

> The items in blue must be changed to match your environment.

Host VARS Config

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
button {
```

```
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_datastores_nfs {
  display: block;
}
#more_datastores_nfs_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button id="copy-
button1" onclick="CopyClassText1()">Copy</button></div><pre><code><div
class="CopyMeClass1" id="CopyMeID1">
#################################################################
##############      Host Variables Configuration        ##############
#################################################################

# Add your Oracle Host
ansible_host: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>10.61.180.15</i></span>

# Oracle db log archive mode: true - ARCHIVELOG or false - NOARCHIVELOG
log_archive_mode: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>true</i></span>

# Number of pluggable databases per container instance identified by sid.
Pdb_name specifies the prefix for container database naming in this case
cdb2_pdb1, cdb2_pdb2, cdb2_pdb3
oracle_sid: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>cdb2</i></span>
pdb_num: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>3</i></span>
pdb_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>"{{ oracle_sid }}_pdb"</i></span>
```

```
# CDB listener port, use different listener port for additional CDB on
same host
listener_port: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>1523</i></span>

# CDB is created with SGA at 75% of memory_limit, MB. Consider how many
databases to be hosted on the node and how much ram to be allocated to
each DB. The grand total SGA should not exceed 75% available RAM on node.
memory_limit: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>5464</i></span>

# Set "em_configuration: DBEXPRESS" to install enterprise manager express
and choose a unique port from 5500 to 5599 for each sid on the host.
# Leave them black if em express is not installed.
em_configuration: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>DBEXPRESS</i></span>
em_express_port: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>5501</i></span>

# "{{groups.oracle[0]}}" represents first Oracle DB server as defined in
Oracle hosts group [oracle]. For concurrent multiple Oracle DB servers
deployment, [0] will be incremented for each additional DB server. For
example,  "{{groups.oracle[1]}}" represents DB server 2,
"{{groups.oracle[2]}}" represents DB server 3 ... As a good practice and
the default, minimum three volumes is allocated to a DB server with
corresponding /u01, /u02, /u03 mount points, which store oracle binary,
oracle data, and oracle recovery files respectively. Additional volumes
can be added by click on "More NFS volumes" but the number of volumes
allocated to a DB server must match with what is defined in global vars
file by volumes_nfs parameter, which dictates how many volumes are to be
created for each DB server.
host_datastores_nfs:
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u01</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
```

```
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u02</i></span>&amp;quot;,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &amp;quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u03</i></span>&amp;quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
<a id="more_datastores_nfs" href="javascript:datastoredropdown();">More
NFS volumes</a><div id="select_more_datastores_nfs"></div><a
id="more_datastores_nfs_button"
href="javascript:adddatastorevolumes();">Enter NFS volumes'
details</a><div id="extra_datastores_nfs"></div>
</div></code></pre></div></div>
<script>
function CopyClassText1(){
    var textToCopy = document.getElementById("CopyMeID1");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_datastores_nfs").style.display = "none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button1").innerHTML = "Copied!";
          setTimeout(revert_copy, 3000);
      }
```

```
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
      document.getElementById("copy-button1").innerHTML = "Copy";
      document.getElementById("more_datastores_nfs").style.display =
"block";
}

function datastoredropdown() {
    document.getElementById("more_datastores_nfs").style.display = "none";
    document.getElementById("more_datastores_nfs_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_datastores_nfs");
    while (x < 100) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_datastores_nfs">How many extra NFS volumes do
you wish to add?</a><select name="number_of_extra_datastores_nfs"
id="number_of_extra_datastores_nfs">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function adddatastorevolumes() {
    var y =
document.getElementById("number_of_extra_datastores_nfs").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_datastores_nfs");
    while (j < y) {
        j++;
        myHTML += '  - {vol_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>"{{groups.oracle[0]}}_u01"</i></span>,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node02</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.201</i></span>,
size: <span <div contenteditable="true" style="color:#004EFF; font-
```

```
weight:bold; font-style:italic; text-
decoration:underline;"/><i>25</i></span>}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_datastores_nfs").style.display =
"none";
    document.getElementById("more_datastores_nfs_button").style.display =
"none";
}

</script>
```

Edit the vars.yml file

The `vars.yml` file consolidates all environment-specific variables (ONTAP, Linux, or Oracle) for Oracle deployment.

- Edit and copy the variables from the VARS section and paste these variables into your `vars.yml` file.

VARS

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
button {
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_storage_vlans {
  display: block;
}
#more_storage_vlans_button {
  display: none;
}
```

```
#more_nfs_volumes {
  display: block;
}
#more_nfs_volumes_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button id="copy-
button" onclick="CopyClassText()">Copy</button></div><pre><code><div
class="CopyMeClass" id="CopyMeID">
#########################################################################
###### Oracle 19c deployment global user configuration variables ######
######  Consolidate all variables from ontap, linux and oracle   ######
#########################################################################

###########################################
### Ontap env specific config variables ###
###########################################

#Inventory group name
#Default inventory group name - 'ontap'
#Change only if you are changing the group name either in inventory/hosts
file or in inventory groups in case of AWX/Tower
hosts_group: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>ontap</i></span>

#CA_signed_certificates (ONLY CHANGE to 'true' IF YOU ARE USING CA SIGNED
CERTIFICATES)
ca_signed_certs: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>false</i></span>

#Names of the Nodes in the ONTAP Cluster
nodes:
 - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
01</i></span>
 - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
02</i></span>


#Storage VLANs
#Add additional rows for vlans as necessary
storage_vlans:
```

```
   - {vlan_id: &amp;quot;<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>203</i></span>&amp;quot;, name: &amp;quot;<span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>infra_NFS</i></span>&amp;quot;,
protocol: &amp;quot;<span <div
contenteditable="true"/><i>NFS</i></span>&amp;quot;}
<a id="more_storage_vlans" href="javascript:storagevlandropdown();">More
Storage VLANs</a><div id="select_more_storage_vlans"></div><a
id="more_storage_vlans_button" href="javascript:addstoragevlans();">Enter
Storage VLANs details</a><div id="extra_storage_vlans"></div>

#Details of the Data Aggregates that need to be created
#If Aggregate creation takes longer, subsequent tasks of creating volumes
may fail.
#There should be enough disks already zeroed in the cluster, otherwise
aggregate create will zero the disks and will take long time
data_aggregates:
  - {aggr_name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>}
  - {aggr_name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node02</i></span>}

#SVM name
svm_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>ora_svm</i></span>


# SVM Management LIF Details
svm_mgmt_details:
  - {address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.91.100</i></span>, netmask: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>255.255.255.0</i></span>,
home_port: <span <div contenteditable="true"/><i>e0M</i></span>}

# NFS storage parameters when data_protocol set to NFS. Volume named after
Oracle hosts name identified by mount point as follow for oracle DB server
1. Each mount point dedicates to a particular Oracle files: u01 - Oracle
binary, u02 - Oracle data, u03 - Oracle redo. Add additional volumes by
click on "More NFS volumes" and also add the volumes list to corresponding
host_vars as host_datastores_nfs variable. For multiple DB server
```

```
deployment, additional volumes sets needs to be added for additional DB
server. Input variable "{{groups.oracle[1]}}_u01",
"{{groups.oracle[1]}}_u02", and "{{groups.oracle[1]}}_u03" as vol_name for
second DB server. Place volumes for multiple DB servers alternatingly
between controllers for balanced IO performance, e.g. DB server 1 on
controller node1, DB server 2 on controller node2 etc. Make sure match lif
address with controller node.
volumes_nfs:
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u01</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u02</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
  - {vol_name: &quot<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>{{groups.oracle[0]}}_u03</i></span>&quot,
aggr_name: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>aggr01_node01</i></span>, lif: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>172.21.94.200</i></span>,
size: <span <div contenteditable="true"/><i>25</i></span>}
<a id="more_nfs_volumes" href="javascript:nfsvolumesdropdown();">More NFS
volumes</a><div id="select_more_nfs_volumes"></div><a
id="more_nfs_volumes_button" href="javascript:addnfsvolumes();">Enter NFS
volumes' details</a><div id="extra_nfs_volumes"></div>

#NFS LIFs IP address and netmask
nfs_lifs_details:
  - address: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.200</i></span> #for node-1
    netmask: <span <div contenteditable="true" style="color:#004EFF; font-
```

```
weight:bold; font-style:italic; text-
decoration:underline;"/><i>255.255.255.0</i></span>
  - address: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.201</i></span> #for node-2
    netmask: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>255.255.255.0</i></span>

#NFS client match
client_match: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.0/24</i></span>

##########################################
### Linux env specific config variables ###
##########################################

#NFS Mount points for Oracle DB volumes
mount_points:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03</i></span>

# Up to 75% of node memory size divided by 2mb. Consider how many
databases to be hosted on the node and how much ram to be allocated to
each DB.
# Leave it blank if hugepage is not configured on the host.
hugepages_nr: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>1234</i></span>

# RedHat subscription username and password
redhat_sub_username: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>
redhat_sub_password: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>
```

```
#####################################################
### DB env specific install and config variables ###
#####################################################

db_domain: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>your.domain.com</i></span>

# Set initial password for all required Oracle passwords. Change them
after installation.
initial_pwd_all: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>netapp123</i></span>

</div></code></pre></div></div>
<script>
function CopyClassText(){
    var textToCopy = document.getElementById("CopyMeID");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_storage_vlans").style.display = "none";
    document.getElementById("more_nfs_volumes").style.display = "none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button").innerHTML = "Copied!";
          setTimeout(revert_copy, 3000);
      }
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
```

```
      document.getElementById("copy-button").innerHTML = "Copy";
      document.getElementById("more_storage_vlans").style.display =
"block";
      document.getElementById("more_nfs_volumes").style.display = "block";
}
function storagevlandropdown() {
    document.getElementById("more_storage_vlans").style.display = "none";
    document.getElementById("more_storage_vlans_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_storage_vlans");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_storage_vlans_info">How many extra VLANs do you
wish to add?</a><select name="number_of_extra_storage_vlans"
id="number_of_extra_storage_vlans">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addstoragevlans() {
    var y =
document.getElementById("number_of_extra_storage_vlans").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_storage_vlans");
    while (j < y) {
        j++;
        myHTML += '   - {vlan_id: &amp;quot;<span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>203</i></span>&amp;quot;, name: &amp;quot;<span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>infra_NFS</i></span>&amp;quot;,
protocol: &amp;quot;<span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>NFS</i></span>&amp;quot;}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_storage_vlans").style.display =
"none";
    document.getElementById("more_storage_vlans_button").style.display =
"none";
}
function nfsvolumesdropdown() {
```

```
    document.getElementById("more_nfs_volumes").style.display = "none";
    document.getElementById("more_nfs_volumes_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_nfs_volumes");
    while (x < 100) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_nfs_volumes_info">How many extra NFS volumes do
you wish to add?</a><select name="number_of_extra_nfs_volumes"
id="number_of_extra_nfs_volumes">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addnfsvolumes() {
    var y = document.getElementById("number_of_extra_nfs_volumes").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_nfs_volumes");
    while (j < y) {
        j++;
        myHTML += '  - {vol_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>rtpora04_u01</i></span>, aggr_name: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>aggr01_node02</i></span>,
lif: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>172.21.94.201</i></span>, size: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline;"/><i>25</i></span>}<br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_nfs_volumes").style.display =
"none";
    document.getElementById("more_nfs_volumes_button").style.display =
"none";
}

</script>
```

Run the playbook

After completing the required environment prerequisites and copying the variables into `vars.yml` and

`your_host.yml`, you are now ready to deploy the playbooks.

<username> must be changed to match your environment.

```
1. Run the ONTAP playbook by passing the correct tags and ONTAP cluster
username. Fill the password for ONTAP cluster, and vsadmin when prompted.
```

```
ansible-playbook -i hosts all_playbook.yml -u username -k -K -t
ontap_config -e @vars/vars.yml
```

```
2. Run the Linux playbook to execute Linux portion of deployment. Input
for admin ssh password as well as sudo password.
```

```
ansible-playbook -i hosts all_playbook.yml -u username -k -K -t
linux_config -e @vars/vars.yml
```

```
3. Run the Oracle playbook to execute Oracle portion of deployment. Input
for admin ssh password as well as sudo password.
```

```
ansible-playbook -i hosts all_playbook.yml -u username -k -K -t
oracle_config -e @vars/vars.yml
```

Deploy Additional Database on Same Oracle Host

The Oracle portion of the playbook creates a single Oracle container database on an Oracle server per execution. To create additional container database on the same server, complete the following steps:

1. Revise the host_vars variables.
   a. Go back to step 3 - Edit the `host_name.yml` file under `host_vars`.
   b. Change the Oracle SID to a different naming string.
   c. Change the listener port to different number.
   d. Change the EM Express port to a different number if you have installed EM Express.
   e. Copy and paste the revised host variables to the Oracle host variable file under `host_vars`.
2. Execute the playbook with the `oracle_config` tag as shown above in Run the playbook.

Validate Oracle installation

```
1. Log in to Oracle server as oracle user and execute the following
commands:
```

```
ps -ef | grep ora
```

This will list oracle processes if installation completed as expected and oracle DB started

```
2. Log in to the database to check the db configuration settings and the
PDBs created with the following command sets.
```

```
sqlplus / as sysdba
```

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu May 6 12:52:51 2021
Version 19.8.0.0.0

Copyright (c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.8.0.0.0

SQL>

```
select name, log_mode from v$database;
```

SQL> select name, log_mode from v$database;
NAME LOG_MODE
--------- ------------
CDB2 ARCHIVELOG

```
show pdbs;
```

SQL> show pdbs

```
    CON_ID CON_NAME                        OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       READ ONLY  NO
         3 CDB2_PDB1                      READ WRITE NO
         4 CDB2_PDB2                      READ WRITE NO
         5 CDB2_PDB3                      READ WRITE NO
```

```
col svrname form a30
col dirname form a30
select svrname, dirname, nfsversion from v$dnfs_servers;
```

SQL> col svrname form a30
SQL> col dirname form a30
SQL> select svrname, dirname, nfsversion from v$dnfs_servers;

SVRNAME DIRNAME NFSVERSION
---------- ---------- ----------
172.21.126.200 /rhelora03_u02 NFSv3.0
172.21.126.200 /rhelora03_u03 NFSv3.0
172.21.126.200 /rhelora03_u01 NFSv3.0

```
This confirms that dNFS is working properly.
```

```
3. Connect to database via listener to check hte Oracle listener
configuration with the following command. Change to the appropriate
listener port and database service name.
```

```
sqlplus system@//localhost:1523/cdb2_pdb1.cie.netapp.com
```

[oracle@localhost ~]$ sqlplus system@//localhost:1523/cdb2_pdb1.cie.netapp.com

SQL*Plus: Release 19.0.0.0.0 - Production on Thu May 6 13:19:57 2021
Version 19.8.0.0.0

Copyright (c) 1982, 2019, Oracle. All rights reserved.

Enter password:
Last Successful login time: Wed May 05 2021 17:11:11 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.8.0.0.0

SQL> show user

USER is "SYSTEM"
SQL> show con_name
CON_NAME
CDB2_PDB1

```
This confirms that Oracle listener is working properly.
```

Where to go for help?

If you need help with the toolkit, please join the NetApp Solution Automation community support slack channel and look for the solution-automation channel to post your questions or inquires.

Oracle Database Data Protection

Solution Overview

Automated Data Protection for Oracle Databases

Organizations are automating their environments to gain efficiencies, accelerate deployments, and reduce manual effort. Configuration management tools like Ansible are being used to streamline enterprise database operations. In this solution, we demonstrate how you can use Ansible to automate the data protection of Oracle with NetApp ONTAP. By enabling storage administrators, systems administrators, and DBAs to consistently and rapidly setup data replication to an offsite data center or to public cloud, you achieve the following benefits:

- Eliminate design complexities and human errors, and implement a repeatable consistent deployment and best practices
- Decrease time for configuration of Intercluster replication, CVO instantiation, and recovery of Oracle databases
- Increase database administrators, systems and storage administrators productivity
- Provides database recovery workflow for ease of testing a DR scenario.

NetApp provides customers with validated Ansible modules and roles to accelerate deployment, configuration, and lifecycle management of your Oracle database environment. This solution provides instruction and Ansible playbook code, to help you:

On Prem to on prem replication

- Create intercluster lifs on source and destination
- Establish cluster and vserver peering
- Create and initialize SnapMirror of Oracle volumes
- Create a replication schedule through AWX/Tower for Oracle binaries, databases, and logs
- Restore Oracle DB on the destination, and bring database online

On Prem to CVO in AWS

- Create AWS connector
- Create CVO instance in AWS

- Add On-Prem cluster to Cloud Manager
- Create intercluster lifs on source
- Establish cluster and vserver peering
- Create and initialize SnapMirror of Oracle volumes
- Create a replication schedule through AWX/Tower for Oracle binaries, databases, and logs
- Restore Oracle DB on the destination, and bring database online

For more details or to begin, please see the overview videos below.

AWX/Tower Deployments

- Part 1: TBD

  video
- Part 2: TBD

  video

  After you are ready, click here for getting started with the solution.

Getting started

This solution has been designed to be run in an AWX/Tower environment.

AWX/Tower

For AWX/Tower environments, you are guided through creating an inventory of your ONTAP cluster management and Oracle server (IPs and hostnames), creating credentials, configuring a project that pulls the Ansible code from NetApp Automation Github, and the Job Template that launches the automation.

1. The solution has been designed to run in a private cloud scenario (on-premise to on-premise), and hybrid cloud (on-premise to public cloud Cloud Volumes ONTAP [CVO])
2. Fill out the variables specific to your environment, and copy and paste them into the Extra Vars fields in your job template.
3. After the extra vars have been added to your job template, you can launch the automation.
4. The automation is set to be ran three phases (Setup, Replication Schedule for Oracle Binaries, Database, Logs, and Replication Schedule just for Logs), and a forth phase to recovering the database at a DR site.
5. For detailed instructions for obtaining the keys and tokens necessary for the CVO Data Protection visit Gather Pre-requisites For CVO and Connector Deployments

Requirements

On-Prem |

Environment	Requirements
Ansible environment	AWX/Tower
	Ansible v.2.10 and higher
	Python 3
	Python libraries - netapp-lib - xmltodict - jmespath
ONTAP	ONTAP version 9.8 +
	Two data aggregates
	NFS vlan and ifgrp created
Oracle server(s)	RHEL 7/8
	Oracle Linux 7/8
	Network interfaces for NFS, public, and optional mgmt
	Existing Oracle environment on source, and the equivalent Linux operating system at the destination (DR Site or Public Cloud)

CVO

Environment	Requirements
Ansible environment	AWX/Tower
	Ansible v.2.10 and higher
	Python 3
	Python libraries - netapp-lib - xmltodict - jmespath
ONTAP	ONTAP version 9.8 +
	Two data aggregates
	NFS vlan and ifgrp created
Oracle server(s)	
	RHEL 7/8
	Oracle Linux 7/8
	Network interfaces for NFS, public, and optional mgmt
	Existing Oracle environment on source, and the equivalent Linux operating system at the destination (DR Site or Public Cloud)
	Set appropriate swap space on the Oracle EC2 instance, by default some EC2 instances are deployed with 0 swap

Environment	Requirements
Cloud Manager/AWS	AWS Access/Secret Key
	NetApp Cloud Manager Account
	NetApp Cloud Manager Refresh Token

Automation Details

On-Prem |

This automated deployment is designed with a single Ansible playbook that consists of three separate roles. The roles are for ONTAP, Linux, and Oracle configurations.
The following table describes which tasks are being automated.

Playbook	Tasks
ontap_setup	Pre-check of the ONTAP environment
	Creation of Intercluster LIFs on source cluster (OPTIONAL)
	Creation of Intercluster LIFs on destination cluster (OPTIONAL)
	Creation of Cluster and SVM Peering
	Creation of destination SnapMirror and Initialization of designated Oracle volumes
ora_replication_cg	Enable backup mode for each database in /etc/oratab
	Snapshot taken of Oracle Binary and Database volumes
	Snapmirror Updated
	Turn off backup mode for each database in /etc/oratab
ora_replication_log	Switch current log for each database in /etc/oratab
	Snapshot taken of Oracle Log volume
	Snapmirror Updated
ora_recovery	Break SnapMirror
	Enable NFS and create junction path for Oracle volumes on the destination
	Configure DR Oracle Host
	Mount and verify Oracle volumes
	Recover and start Oracle database

CVO

This automated deployment is designed with a single Ansible playbook that consists of three separate roles. The roles are for ONTAP, Linux, and Oracle configurations.
The following table describes which tasks are being automated.

Playbook	Tasks
cvo_setup	Pre-check of the environment
	AWS Configure/AWS Access Key ID/Secret Key/Default Region
	Creation of AWS Role
	Creation of NetApp Cloud Manager Connector instance in AWS
	Creation of Cloud Volumes ONTAP (CVO) instance in AWS
	Add On-Prem Source ONTAP Cluster to NetApp Cloud Manager
	Creation of destination SnapMirror and Initialization of designated Oracle volumes
ora_replication_cg	Enable backup mode for each database in /etc/oratab
	Snapshot taken of Oracle Binary and Database volumes
	Snapmirror Updated
	Turn off backup mode for each database in /etc/oratab
ora_replication_log	Switch current log for each database in /etc/oratab
	Snapshot taken of Oracle Log volume
	Snapmirror Updated
ora_recovery	Break SnapMirror
	Enable NFS and create junction path for Oracle volumes on the destination CVO
	Configure DR Oracle Host
	Mount and verify Oracle volumes
	Recover and start Oracle database

Default parameters

To simplify automation, we have preset many required Oracle parameters with default values. It is generally not necessary to change the default parameters for most deployments. A more advanced user can make changes to the default parameters with caution. The default parameters are located in each role folder under defaults directory.

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After you are ready, click here for detailed AWX/Tower procedures.

Step-by-step deployment procedure

AWX/Tower Oracle Data Protection

1. Create the inventory, group, hosts, and credentials for your environment

This section describes the setup of inventory, groups, hosts, and access credentials in AWX/Ansible Tower that prepare the environment for consuming NetApp automated solutions.

1. Configure the inventory.

    a. Navigate to Resources → Inventories → Add, and click Add Inventory.

    b. Provide the name and organization details, and click Save.

    c. On the Inventories page, click the inventory created.

    d. Navigate to the Groups sub-menu and click Add.

    e. Provide the name oracle for your first group and click Save.

    f. Repeat the process for a second group called dr_oracle.

    g. Select the oracle group created, go to the Hosts sub-menu and click Add New Host.

    h. Provide the IP address of the Source Oracle host's management IP, and click Save.

    i. This process must be repeated for the dr_oracle group and add the the DR/Destination Oracle host's management IP/hostname.

Below are instructions for creating the credential types and credentials for either On-Prem with ONTAP, or CVO on AWS.

On-Prem

1. Configure the credentials.
2. Create Credential Types. For solutions involving ONTAP, you must configure the credential type to match username and password entries.
   a. Navigate to Administration → Credential Types, and click Add.
   b. Provide the name and description.
   c. Paste the following content in Input Configuration:

```
fields:
  - id: dst_cluster_username
    type: string
    label: Destination Cluster Username
  - id: dst_cluster_password
    type: string
    label: Destination Cluster Password
    secret: true
  - id: src_cluster_username
    type: string
    label: Source Cluster Username
  - id: src_cluster_password
    type: string
    label: Source Cluster Password
    secret: true
```

   d. Paste the following content into Injector Configuration and then click Save:

```
extra_vars:
  dst_cluster_username: '{{ dst_cluster_username }}'
  dst_cluster_password: '{{ dst_cluster_password }}'
  src_cluster_username: '{{ src_cluster_username }}'
  src_cluster_password: '{{ src_cluster_password }}'
```

3. Create Credential for ONTAP
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for the ONTAP Credentials
   c. Select the credential type that was created in the previous step.
   d. Under Type Details, enter the Username and Password for your Source and Destination Clusters.
   e. Click Save
4. Create Credential for Oracle
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for Oracle

c. Select the Machine credential type.

d. Under Type Details, enter the Username and Password for the Oracle hosts.

e. Select the correct Privilege Escalation Method, and enter the username and password.

f. Click Save

g. Repeat process if needed for a different credential for the dr_oracle host.

CVO

1. Configure the credentials.
2. Create credential types. For solutions involving ONTAP, you must configure the credential type to match username and password entries, we will also add entries for Cloud Central and AWS.
   a. Navigate to Administration → Credential Types, and click Add.
   b. Provide the name and description.
   c. Paste the following content in Input Configuration:

```
fields:
  - id: dst_cluster_username
    type: string
    label: CVO Username
  - id: dst_cluster_password
    type: string
    label: CVO Password
    secret: true
  - id: cvo_svm_password
    type: string
    label: CVO SVM Password
    secret: true
  - id: src_cluster_username
    type: string
    label: Source Cluster Username
  - id: src_cluster_password
    type: string
    label: Source Cluster Password
    secret: true
  - id: regular_id
    type: string
    label: Cloud Central ID
    secret: true
  - id: email_id
    type: string
    label: Cloud Manager Email
    secret: true
  - id: cm_password
    type: string
    label: Cloud Manager Password
    secret: true
  - id: access_key
    type: string
    label: AWS Access Key
    secret: true
  - id: secret_key
    type: string
    label: AWS Secret Key
    secret: true
  - id: token
    type: string
    label: Cloud Central Refresh Token
    secret: true
```

d. Paste the following content into Injector Configuration and click Save:

```
extra_vars:
  dst_cluster_username: '{{ dst_cluster_username }}'
  dst_cluster_password: '{{ dst_cluster_password }}'
  cvo_svm_password: '{{ cvo_svm_password }}'
  src_cluster_username: '{{ src_cluster_username }}'
  src_cluster_password: '{{ src_cluster_password }}'
  regular_id: '{{ regular_id }}'
  email_id: '{{ email_id }}'
  cm_password: '{{ cm_password }}'
  access_key: '{{ access_key }}'
  secret_key: '{{ secret_key }}'
  token: '{{ token }}'
```

3. Create Credential for ONTAP/CVO/AWS
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for the ONTAP Credentials
   c. Select the credential type that was created in the previous step.
   d. Under Type Details, enter the Username and Password for your Source and CVO Clusters, Cloud Central/Manager, AWS Access/Secret Key and Cloud Central Refresh Token.
   e. Click Save
4. Create Credential for Oracle (Source)
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for Oracle host
   c. Select the Machine credential type.
   d. Under Type Details, enter the Username and Password for the Oracle hosts.
   e. Select the correct Privilege Escalation Method, and enter the username and password.
   f. Click Save
5. Create Credential for Oracle Destination
   a. Navigate to Resources → Credentials, and click Add.
   b. Enter the name and organization details for the DR Oracle host
   c. Select the Machine credential type.
   d. Under Type Details, enter the Username (ec2-user or if you have changed it from default enter that), and the SSH Private Key
   e. Select the correct Privilege Escalation Method (sudo), and enter the username and password if needed.
   f. Click Save

2. Create a project

1. Go to Resources → Projects, and click Add.

a. Enter the name and organization details.
b. Select Git in the Source Control Credential Type field.
c. enter https://github.com/NetApp-Automation/na_oracle19c_data_protection.git as the source control URL.
d. Click Save.
e. The project might need to sync occasionally when the source code changes.

3. Configure global variables

Variables defined in this section apply to all Oracle hosts, databases, and the ONTAP cluster.

1. Input your environment-specific parameters in following embedded global variables or vars form.

The items in blue must be changed to match your environment.

On-Prem

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
button {
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_binary_vols {
  display: block;
}
#more_binary_vols_button {
  display: none;
}
#more_database_vols {
  display: block;
}
#more_database_vols_button {
  display: none;
}
#more_log_vols {
  display: block;
}
#more_log_vols_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button
id="copy-button-onprem"
onclick="CopyClassText()">Copy</button></div><pre><code><div
class="CopyMeClass" id="CopyOnPrem">
#####################################################################
###
```

```
###### Oracle Data Protection global user configuration variables
######
######  Consolidate all variables from ontap, aws, and oracle
######
#########################################################################
###

#############################################
### Ontap env specific config variables ###
#############################################

#Inventory group name
#Default inventory group name - 'ontap'
#Change only if you are changing the group name either in
inventory/hosts file or in inventory groups in case of AWX/Tower
hosts_group: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>ontap</i></span>

#CA_signed_certificates (ONLY CHANGE to 'true' IF YOU ARE USING CA
SIGNED CERTIFICATES)
ca_signed_certs: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>false</i></span>

#####################################################
# Inter-cluster LIF details
#####################################################
#Names of the Nodes in the Source ONTAP Cluster
src_nodes:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
02</i></span>

 #Names of the Nodes in the Destination ONTAP Cluster
dst_nodes:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>DR-
AFF-01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>DR-
AFF-02</i></span>
```

```
#Define whether or not to create intercluster lifs on source cluster
(ONLY CHANGE to 'No' IF YOU HAVE ALREADY CREATED THE INTERCLUSTER
LIFS)
create_source_intercluster_lifs:  <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>

source_intercluster_network_port_details:
  using_dedicated_ports: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_ifgrp: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_vlans: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  failover_for_shared_individual_ports: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline; text-
decoration:underline;"/><i>yes</i></span>
  ifgrp_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a</i></span>
  vlan_id: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10</i></span>
  ports:
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0b</i></span>
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0g</i></span>
  broadcast_domain: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>NFS</i></span>
  ipspace: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>Default</i></span>
  failover_group_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>iclifs</i></span>

source_intercluster_lif_details:
```

```
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_1</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.1</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
10</i></span>
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>AFF-01</i></span>
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_2</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.2</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
10</i></span>
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>AFF-02</i></span>

#Define whether or not to create intercluster lifs on destination
cluster (ONLY CHANGE to 'No' IF YOU HAVE ALREADY CREATED THE
INTERCLUSTER LIFS)
create_destination_intercluster_lifs:  <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline; text-
decoration:underline;"/><i>yes</i></span>

destination_intercluster_network_port_details:
  using_dedicated_ports: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_ifgrp: <span <div contenteditable="true"
```

```
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_vlans: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  failover_for_shared_individual_ports: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline; text-
decoration:underline;"/><i>yes</i></span>
  ifgrp_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a</i></span>
  vlan_id: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10</i></span>
  ports:
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0b</i></span>
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0g</i></span>
  broadcast_domain: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>NFS</i></span>
  ipspace: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>Default</i></span>
  failover_group_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>iclifs</i></span>

destination_intercluster_lif_details:
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_1</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.3</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
```

```
10</i></span>
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>DR-AFF-01</i></span>
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_2</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.4</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
10</i></span>
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>DR-AFF-02</i></span>

#####################################################################
################################
# Variables for SnapMirror Peering
#####################################################################
################################
#src_lif: #Will be retrieve through Ansible Task
#dst_lif: #Will be retrieve through Ansible Task
passphrase: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>your-passphrase</i></span>

#####################################################################
################################
# Source & Destination List
#####################################################################
################################
#Please Enter Destination Cluster Name
dst_cluster_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>dst-cluster-
name</i></span>

#Please Enter Destination Cluster
dst_cluster_ip: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
```

```
decoration:underline; text-decoration:underline;"/><i>dst-cluster-
ip</i></span>

#Please Enter Destination SVM to create mirror relationship
dst_vserver: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>dst-vserver</i></span>

#Please Enter NFS Lif for dst vserver
dst_nfs_lif: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>dst-nfs-lif</i></span>

#Please Enter Source Cluster Name
src_cluster_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>src-cluster-
name</i></span>

#Please Enter Source Cluster
src_cluster_ip: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>src-cluster-
ip</i></span>

#Please Enter Source SVM
src_vserver: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>src-vserver</i></span>

#####################################################################
################################
# Variable for Oracle Volumes and SnapMirror Details
#####################################################################
################################
#Please Enter Source Snapshot Prefix Name
cg_snapshot_name_prefix: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>oracle</i></span>

#Please Enter Source Oracle Binary Volume(s)
src_orabinary_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>binary_vol</i></span>
```

```
<a id="more_binary_vols"
href="javascript:binaryvolsdropdown();">More Binary Vols</a><div
id="select_more_binary_vols"></div><a id="more_binary_vols_button"
href="javascript:addbinaryvols();">Enter Volume details</a><div
id="extra_binary_vols"></div>
#Please Enter Source Database Volume(s)
src_db_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>db_vol</i></span>
<a id="more_database_vols"
href="javascript:databasevolsdropdown();">More Database Vols</a><div
id="select_more_database_vols"></div><a
id="more_database_vols_button"
href="javascript:adddatabasevols();">Enter Volume details</a><div
id="extra_database_vols"></div>
#Please Enter Source Archive Volume(s)
src_archivelog_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>log_vol</i></span>
<a id="more_log_vols" href="javascript:logvolsdropdown();">More Log
Vols</a><div id="select_more_log_vols"></div><a
id="more_log_vols_button" href="javascript:addlogvols();">Enter
Volume details</a><div id="extra_log_vols"></div>
#Please Enter Destination Snapmirror Policy
snapmirror_policy: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>async_policy_oracle</i></span>

###################################################################
################################
# Export Policy Details
###################################################################
################################
#Enter the destination export policy details
export_policy_details:
  name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>nfs_export_policy</i></span>
  client_match: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>0.0.0.0/0</i></span>
  ro_rule: sys
```

```
  rw_rule: sys


##########################################
### Linux env specific config variables ###
##########################################

#NFS Mount points for Oracle DB volumes
mount_points:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03</i></span>

# Up to 75% of node memory size divided by 2mb. Consider how many
databases to be hosted on the node and how much ram to be allocated
to each DB.
# Leave it blank if hugepage is not configured on the host.
hugepages_nr: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>1234</i></span>

# RedHat subscription username and password
redhat_sub_username: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>
redhat_sub_password: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>

##################################################
### DB env specific install and config variables ###
##################################################
#Recovery Type (leave as scn)
recovery_type: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>scn</i></span>

#Oracle Control Files
control_files:
  - <span <div contenteditable="true" style="color:#004EFF; font-
```

```
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02/oradata/CDB2/control01.ctl</i></span
>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03/orareco/CDB2/control02.ctl</i></span
>

</div></code></pre></div></div>
<script>
function CopyClassText(){
    var textToCopy = document.getElementById("CopyOnPrem");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_binary_vols").style.display =
"none";
    document.getElementById("more_database_vols").style.display =
"none";
    document.getElementById("more_log_vols").style.display = "none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button-onprem").innerHTML =
"Copied!";
          setTimeout(revert_copy, 3000);
      }
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
      document.getElementById("copy-button-onprem").innerHTML =
"Copy";
```

```
      document.getElementById("more_binary_vols").style.display =
"block";
      document.getElementById("more_database_vols").style.display =
"block";
      document.getElementById("more_log_vols").style.display =
"block";
}
function binaryvolsdropdown() {
    document.getElementById("more_binary_vols").style.display =
"none";
    document.getElementById("more_binary_vols_button").style.display
= "block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper =
document.getElementById("select_more_binary_vols");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_binary_vols_info">How many extra volumes
do you wish to add?</a><select name="number_of_extra_binary_vols"
id="number_of_extra_binary_vols">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addbinaryvols() {
    var y =
document.getElementById("number_of_extra_binary_vols").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_binary_vols");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>binary_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_binary_vols").style.display
= "none";
    document.getElementById("more_binary_vols_button").style.display
= "none";
}
function databasevolsdropdown() {
```

```
    document.getElementById("more_database_vols").style.display =
"none";

document.getElementById("more_database_vols_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper =
document.getElementById("select_more_database_vols");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_database_vols_info">How many extra
volumes do you wish to add?</a><select
name="number_of_extra_database_vols"
id="number_of_extra_database_vols">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function adddatabasevols() {
    var y =
document.getElementById("number_of_extra_database_vols").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_database_vols");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>db_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;

document.getElementById("select_more_database_vols").style.display =
"none";

document.getElementById("more_database_vols_button").style.display =
"none";
}
function logvolsdropdown() {
    document.getElementById("more_log_vols").style.display = "none";
    document.getElementById("more_log_vols_button").style.display =
"block";
    var x=1;
```

```
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_log_vols");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_database_vols_info">How many extra
volumes do you wish to add?</a><select
name="number_of_extra_log_vols" id="number_of_extra_log_vols">' +
buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addlogvols() {
    var y =
document.getElementById("number_of_extra_log_vols").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_log_vols");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>log_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_log_vols").style.display =
"none";
    document.getElementById("more_log_vols_button").style.display =
"none";
}

</script>
```

CVO

```
<style>
div {
position: relative;
}
div button {
position: absolute;
top: 0;
right: 0;
}
```

```
button {
  transition-duration: 0.4s;
  background-color: white;
  color: #1563a3;
  border: 2px solid #1563a3;
}
button:hover {
  background-color: #1563a3;
  color: white;
}
#more_binary_vols1 {
  display: block;
}
#more_binary_vols1_button {
  display: none;
}
#more_database_vols1 {
  display: block;
}
#more_database_vols1_button {
  display: none;
}
#more_log_vols1 {
  display: block;
}
#more_log_vols1_button {
  display: none;
}
</style>
<div class="listingblock"><div class="content"><div><button
id="copy-button-cvo"
onclick="CopyClassTextCVO()">Copy</button></div><pre><code><div
class="CopyMeClassCVO" id="CopyCVO">
#####################################################################
###
###### Oracle Data Protection global user configuration variables
######
######  Consolidate all variables from ontap, aws, CVO and oracle
######
#####################################################################
###

##########################################
### Ontap env specific config variables ###
##########################################
```

```
#Inventory group name
#Default inventory group name - 'ontap'
#Change only if you are changing the group name either in
inventory/hosts file or in inventory groups in case of AWX/Tower
hosts_group: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>ontap</i></span>

#CA_signed_certificates (ONLY CHANGE to 'true' IF YOU ARE USING CA
SIGNED CERTIFICATES)
ca_signed_certs: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>false</i></span>

#Names of the Nodes in the Source ONTAP Cluster
src_nodes:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>AFF-
02</i></span>

 #Names of the Nodes in the Destination CVO Cluster
dst_nodes:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>DR-
AFF-01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>DR-
AFF-02</i></span>

#Define whether or not to create intercluster lifs on source cluster
(ONLY CHANGE to 'No' IF YOU HAVE ALREADY CREATED THE INTERCLUSTER
LIFS)
create_source_intercluster_lifs:  <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>

source_intercluster_network_port_details:
  using_dedicated_ports: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_ifgrp: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
```

```
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  using_vlans: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>yes</i></span>
  failover_for_shared_individual_ports: <span <div
contenteditable="true" style="color:#004EFF; font-weight:bold; font-
style:italic; text-decoration:underline; text-
decoration:underline;"/><i>yes</i></span>
  ifgrp_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a</i></span>
  vlan_id: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10</i></span>
  ports:
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0b</i></span>
    - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>e0g</i></span>
  broadcast_domain: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>NFS</i></span>
  ipspace: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>Default</i></span>
  failover_group_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>iclifs</i></span>

source_intercluster_lif_details:
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_1</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.1</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
10</i></span>
```

```
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>AFF-01</i></span>
  - name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>icl_2</i></span>
    address: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>10.0.0.2</i></span>
    netmask: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>255.255.255.0</i></span>
    home_port: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>a0a-
10</i></span>
    node: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>AFF-02</i></span>

###########################################
### CVO Deployment Variables ###
###########################################

####### Access Keys Variables ######

# Region where your CVO will be deployed.
region_deploy: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>us-east-1</i></span>

########### CVO and Connector Vars ########

# AWS Managed Policy required to give permission for IAM role
creation.
aws_policy: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>arn:aws:iam::1234567:policy/OCCM</i></spa
n>

# Specify your aws role name, a new role is created if one already
does not exist.
aws_role_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>arn:aws:iam::1234567:policy/OCCM</i></spa
n>
```

```
# Name your connector.
connector_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>awx_connector</i></span>

# Name of the key pair generated in AWS.
key_pair: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>key_pair</i></span>

# Name of the Subnet that has the range of IP addresses in your VPC.
subnet: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>subnet-12345</i></span>

# ID of your AWS secuirty group that allows access to on-prem
resources.
security_group: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>sg-123123123</i></span>

# You Cloud Manager Account ID.
account: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>account-A23123A</i></span>

# Name of the your CVO instance
cvo_name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>test_cvo</i></span>

# ID of the VPC in AWS.
vpc: <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline;"/><i>vpc-
123123123</i></span>

##################################################################
################################
# Variables for - Add on-prem ONTAP to Connector in Cloud Manager
##################################################################
################################

# For Federated users, Client ID from API Authentication Section of
Cloud Central to generate access token.
sso_id: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-
```

```
decoration:underline;"/><i>123123123123123123123</i></span>

# For regular access with username and password, please specify
"pass" as the connector_access. For SSO users, use "refresh_token"
as the variable.
connector_access: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>pass</i></span>

#################################################################
################################
# Variables for SnapMirror Peering
#################################################################
################################
passphrase: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>your-passphrase</i></span>

#################################################################
################################
# Source & Destination List
#################################################################
################################
#Please Enter Destination Cluster Name
dst_cluster_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>dst-cluster-
name</i></span>

#Please Enter Destination Cluster (Once CVO is Created Add this
Variable to all templates)
dst_cluster_ip: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>dst-cluster-
ip</i></span>

#Please Enter Destination SVM to create mirror relationship
dst_vserver: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>dst-vserver</i></span>

#Please Enter NFS Lif for dst vserver (Once CVO is Created Add this
Variable to all templates)
dst_nfs_lif: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
```

```
text-decoration:underline;"/><i>dst-nfs-lif</i></span>

#Please Enter Source Cluster Name
src_cluster_name: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>src-cluster-
name</i></span>

#Please Enter Source Cluster
src_cluster_ip: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-decoration:underline;"/><i>src-cluster-
ip</i></span>

#Please Enter Source SVM
src_vserver: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>src-vserver</i></span>

#####################################################################
##################################
# Variable for Oracle Volumes and SnapMirror Details
#####################################################################
##################################
#Please Enter Source Snapshot Prefix Name
cg_snapshot_name_prefix: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>oracle</i></span>

#Please Enter Source Oracle Binary Volume(s)
src_orabinary_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>binary_vol</i></span>
<a id="more_binary_vols1"
href="javascript:binaryvols1dropdown();">More Binary Vols</a><div
id="select_more_binary_vols1"></div><a id="more_binary_vols1_button"
href="javascript:addbinaryvols1();">Enter Volume details</a><div
id="extra_binary_vols1"></div>
#Please Enter Source Database Volume(s)
src_db_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>db_vol</i></span>
<a id="more_database_vols1"
```

```
href="javascript:databasevols1dropdown();">More Database
Vols</a><div id="select_more_database_vols1"></div><a
id="more_database_vols1_button"
href="javascript:adddatabasevols1();">Enter Volume details</a><div
id="extra_database_vols1"></div>
#Please Enter Source Archive Volume(s)
src_archivelog_vols:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-decoration:underline; text-
decoration:underline;"/><i>log_vol</i></span>
<a id="more_log_vols1" href="javascript:logvols1dropdown();">More
Log Vols</a><div id="select_more_log_vols1"></div><a
id="more_log_vols1_button" href="javascript:addlogvols1();">Enter
Volume details</a><div id="extra_log_vols1"></div>
#Please Enter Destination Snapmirror Policy
snapmirror_policy: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>async_policy_oracle</i></span>

#####################################################################
##################################
# Export Policy Details
#####################################################################
##################################
#Enter the destination export policy details (Once CVO is Created
Add this Variable to all templates)
export_policy_details:
  name: <span <div contenteditable="true" style="color:#004EFF;
font-weight:bold; font-style:italic; text-decoration:underline;
text-decoration:underline;"/><i>nfs_export_policy</i></span>
  client_match: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>0.0.0.0/0</i></span>
  ro_rule: sys
  rw_rule: sys

#####################################################################
##################################
### Linux env specific config variables ###
#####################################################################
##################################

#NFS Mount points for Oracle DB volumes
mount_points:
```

```
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u01</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02</i></span>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03</i></span>

# Up to 75% of node memory size divided by 2mb. Consider how many
databases to be hosted on the node and how much ram to be allocated
to each DB.
# Leave it blank if hugepage is not configured on the host.
hugepages_nr: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>1234</i></span>

# RedHat subscription username and password
redhat_sub_username: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>
redhat_sub_password: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>xxx</i></span>

#####################################################
### DB env specific install and config variables ###
#####################################################
#Recovery Type (leave as scn)
recovery_type: <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline;"/><i>scn</i></span>

#Oracle Control Files
control_files:
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u02/oradata/CDB2/control01.ctl</i></span
>
  - <span <div contenteditable="true" style="color:#004EFF; font-
weight:bold; font-style:italic; text-
decoration:underline;"/><i>/u03/orareco/CDB2/control02.ctl</i></span
>
```

```
</div></code></pre></div></div>
<script>
function CopyClassTextCVO(){
    var textToCopy = document.getElementById("CopyCVO");
    var currentRange;
    if(document.getSelection().rangeCount > 0)
    {
        currentRange = document.getSelection().getRangeAt(0);
        window.getSelection().removeRange(currentRange);
    }
    else
    {
        currentRange = false;
    }
    var CopyRange = document.createRange();
    CopyRange.selectNode(textToCopy);
    window.getSelection().addRange(CopyRange);
    document.getElementById("more_binary_vols1").style.display =
"none";
    document.getElementById("more_database_vols1").style.display =
"none";
    document.getElementById("more_log_vols1").style.display =
"none";
    var command = document.execCommand("copy");
      if (command)
      {
          document.getElementById("copy-button-cvo").innerHTML =
"Copied!";
          setTimeout(revert_copy, 3000);
      }
    window.getSelection().removeRange(CopyRange);
    if(currentRange)
    {
        window.getSelection().addRange(currentRange);
    }
}
function revert_copy() {
      document.getElementById("copy-button-cvo").innerHTML = "Copy";
      document.getElementById("more_binary_vols1").style.display =
"block";
      document.getElementById("more_database_vols1").style.display =
"block";
      document.getElementById("more_log_vols1").style.display =
"block";
}
function binaryvols1dropdown() {
```

```
    document.getElementById("more_binary_vols1").style.display =
"none";

document.getElementById("more_binary_vols1_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper =
document.getElementById("select_more_binary_vols1");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_binary_vols1_info">How many extra volumes
do you wish to add?</a><select name="number_of_extra_binary_vols1"
id="number_of_extra_binary_vols1">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addbinaryvols1() {
    var y =
document.getElementById("number_of_extra_binary_vols1").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_binary_vols1");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>binary_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;

document.getElementById("select_more_binary_vols1").style.display =
"none";

document.getElementById("more_binary_vols1_button").style.display =
"none";
}
function databasevols1dropdown() {
    document.getElementById("more_database_vols1").style.display =
"none";

document.getElementById("more_database_vols1_button").style.display
= "block";
```

```
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper =
document.getElementById("select_more_database_vols1");
    while (x < 10) {
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_database_vols1_info">How many extra
volumes do you wish to add?</a><select
name="number_of_extra_database_vols1"
id="number_of_extra_database_vols1">' + buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function adddatabasevols1() {
    var y =
document.getElementById("number_of_extra_database_vols1").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_database_vols1");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>db_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;

document.getElementById("select_more_database_vols1").style.display
= "none";
```

```
document.getElementById("more_database_vols1_button").style.display
= "none";
}
function logvols1dropdown() {
    document.getElementById("more_log_vols1").style.display =
"none";
    document.getElementById("more_log_vols1_button").style.display =
"block";
    var x=1;
    var myHTML = '';
    var buildup = '';
    var wrapper = document.getElementById("select_more_log_vols1");
    while (x < 10) {
```

```
      buildup += '<option value="' + x + '">' + x + '</option>';
      x++;
    }
    myHTML += '<a id="more_database_vols_info">How many extra
volumes do you wish to add?</a><select
name="number_of_extra_log_vols1" id="number_of_extra_log_vols1">' +
buildup + '</select>';
    wrapper.innerHTML = myHTML;
}
function addlogvols1() {
    var y =
document.getElementById("number_of_extra_log_vols1").value;
    var j=0;
    var myHTML = '';
    var wrapper = document.getElementById("extra_log_vols1");
    while (j < y) {
        j++;
        myHTML += '  - <span <div contenteditable="true"
style="color:#004EFF; font-weight:bold; font-style:italic; text-
decoration:underline; text-
decoration:underline;"/><i>log_vol</i></span><br>';
    }
    wrapper.innerHTML = myHTML;
    document.getElementById("select_more_log_vols1").style.display =
"none";
    document.getElementById("more_log_vols1_button").style.display =
"none";
}

</script>
```

4. Automation Playbooks

There are four separate playbooks that need to be ran.

1. Playbook for Setting up your environment, On-Prem or CVO.
2. Playbook for replicating Oracle Binaries and Databases on a schedule
3. Playbook for replicating Oracle Logs on a schedule
4. Playbook for Recovering your database on a destination host

ONTAP/CVO Setup

ONTAP and CVO Setup

1. Configure and launch the job template.
    1. Create the job template.
        a. Navigate to Resources → Templates → Add and click Add Job Template.
        b. Enter the name ONTAP/CVO Setup
        c. Select the Job type; Run configures the system based on a playbook.
        d. Select the corresponding inventory, project, playbook, and credentials for the playbook.
        e. Select the ontap_setup.yml playbook for an On-Prem environment or select the cvo_setup.yml for replicating to a CVO instance.
        f. Paste global variables copied from step 4 into the Template Variables field under the YAML tab.
        g. Click Save.
    2. Launch the job template.
        a. Navigate to Resources → Templates.
        b. Click the desired template and then click Launch.

        ⓘ We will use this template and copy it out for the other playbooks.

Replication For Binary and Database Volumes

Scheduling the Binary and Database Replication Playbook

1. Configure and launch the job template.
    1. Copy the previously created job template.
        a. Navigate to Resources → Templates.
        b. Find the ONTAP/CVO Setup Template, and on the far right click on Copy Template
        c. Click Edit Template on the copied template, and change the name to Binary and Database Replication Playbook.
        d. Keep the same inventory, project, credentials for the template.
        e. Select the ora_replication_cg.yml as the playbook to be executed.
        f. The variables will remain the same, but the CVO cluster IP will need to be set in the variable dst_cluster_ip.
        g. Click Save.
    2. Schedule the job template.
        a. Navigate to Resources → Templates.
        b. Click the Binary and Database Replication Playbook template and then click Schedules at the top set of options.
        c. Click Add, add Name Schedule for Binary and Database Replication, choose the Start date/time at the beginning of the hour, choose your Local time zone, and Run frequency. Run frequency will be often the SnapMirror replication will be updated.

A separate schedule will be created for the Log volume replication, so that it can be replicated on a more frequent cadence.

Replication for Log Volumes

Unresolved directive in databases/db_protection_awx_automation.adoc - include::../_iinclude/db_protection_log_replication.adoc[]

Restore and Recover Database

Scheduling the Log Replication Playbook

1. Configure and launch the job template.
    1. Copy the previously created job template.
        a. Navigate to Resources → Templates.
        b. Find the ONTAP/CVO Setup Template, and on the far right click on Copy Template
        c. Click Edit Template on the copied template, and change the name to Restore and Recovery Playbook.
        d. Keep the same inventory, project, credentials for the template.
        e. Select the ora_recovery.yml as the playbook to be executed.
        f. The variables will remain the same, but the CVO cluster IP will need to be set in the variable dst_cluster_ip.
        g. Click Save.

This playbook will not be ran until you are ready to restore your database at the remote site.

5. Recovering Oracle Database

1. On-premises production Oracle databases data volumes are protected via NetApp SnapMirror replication to either a redundant ONTAP cluster in secondary data center or Cloud Volume ONTAP in public cloud. In a fully configured disaster recovery environment, recovery compute instances in secondary data center or public cloud are standby and ready to recover the production database in the case of a disaster. The standby compute instances are kept in sync with on-prem instances by running paraellel updates on OS kernel patch or upgrade in a lockstep.
2. In this solution demonstrated, Oracle binary volume is replicated to target and mounted at target instance to bring up Oracle software stack. This approach to recover Oracle has advantage over a fresh installation of Oracle at last minute when a disaster occurred. It guarantees Oracle installation is fully in sync with current on-prem production software installation and patch levels etc. However, this may or may not have additional sofware licensing implication for the replicated Oracle binary volume at recovery site depending on how the software licensing is structured with Oracle. User is recommended to check with its software licensing personnel to assess the potential Oracle licensing requirement before deciding to use the same approach.
3. The standby Oracle host at the destination is configured with the Oracle prerequisite configurations.
4. The SnapMirrors are broken and the volumes are made writable and mounted to the standby Oracle host.
5. The Oracle recovery module performs following tasks to recovery and startup Oracle at recovery site after all DB volumes are mounted at standby compute instance.

a. Sync the control file: We deployed duplicate Oracle control files on different database volume to protect critical database control file. One is on the data volume and another is on log volume. Since data and log volumes are replicated at different frequency, they will be out of sync at the time of recovery.

b. Relink Oracle binary: Since the Oracle binary is relocated to a new host, it needs a relink.

c. Recover Oracle database: The recovery mechanism retrieves last System Change Number in last available archived log in Oracle log volume from control file and recovers Oracle database to recoup all business transactions that was able to be replicated to DR site at the time of failure. The database is then started up in a new incarnation to carry on user connections and business transaction at recovery site.

> Before running the Recovering playbook make sure you have the following:
> Make sure it copy over the /etc/oratab and /etc/oraInst.loc from the source Oracle host to the destination host