

# A VMsources Whitepaper

## Hardened / Immutable Backup Repository

A Virtual Appliance in OVA format designed for mounting iSCSI LUN  
as Veeam Hardened / Immutable Backup Repository

JOHN BORHEK

## Contents

Introduction.....	2
Creating a LUN on Your iSCSI SAN .....	3
Import the OVA .....	3
Powering on and Configuring the Immutable Repository VM .....	4
Configuring Your Immutable Repository in Veeam Backup and Replication 11 .....	12
Additional Measures .....	22
References .....	22

## Introduction

Veeam Backup and Replication 11 is a true game-changer with its Immutable Backup feature. Moving forward, Veeam Immutable Backups will free organizations from the hassle of physical tape libraries as well as eliminating the need for expensive “virtual tape libraries,” all while providing easily manageable backup chains.

Veeam Immutable Backups are the equivalent of “air gapped,” tape, or WORM backups! Immutable Backups are accomplished through the use of a Linux repository server, the XFS filesystem (to support Fast Clone), one-time-use credentials, and the immutability flag which is a property of just about any Linux filesystem.

What about validation? Does it actually work, you ask? Yes! And it is tested and proven by [Cohasset Associates](#) meeting the requirements for non-rewritable, non-erasable storage as specified by SEC 17a-4(f), FINRA 4511(c) and CFTC 1.31(c)-(d).

What an Immutable Repository is designed to do:

- Protect your backups from unintentional encryption by Ransomware
- Prevent backup file deletion by unauthorized administrators.

What an Immutable Repository cannot do:

- Prevent deletion of the SAN LUN by users who have SAN administrator credentials
- Prevent formatting of the volume by users who have login credentials for the Immutable Repository VM.

As a Best Practice, Veeam recommends that Immutable Repositories be deployed on a physical server with lots of disk space, such as an HPE Apollo. While that’s an admirable goal, there are lots of us with Virtualized and Cloud Infrastructures, and we rely on SAN systems to provide block storage.

VMSources’ goal has been to create a Virtual Appliance in OVA format, following Veeam Best Practices, making it easy for anybody to mount an iSCSI LUN as a Veeam Immutable Repository. Not everybody is fond of Linux or the CLI, so we have created an Ubuntu 20.04LTS server with all of the requirements baked-in as an OVA Virtual Appliance, and then documented the step-by-step instructions to mounting a SAN LUN, formatting it as XFS, and then creating your Veeam Immutable Repository.

PLEASE NOTE: **This Virtual Appliance is provided without warranty of any kind.** You must change the passwords to very strong, disable SSH, and the VM must run on secure, firewalled networks in order for any of this to amount to a hill of beans.

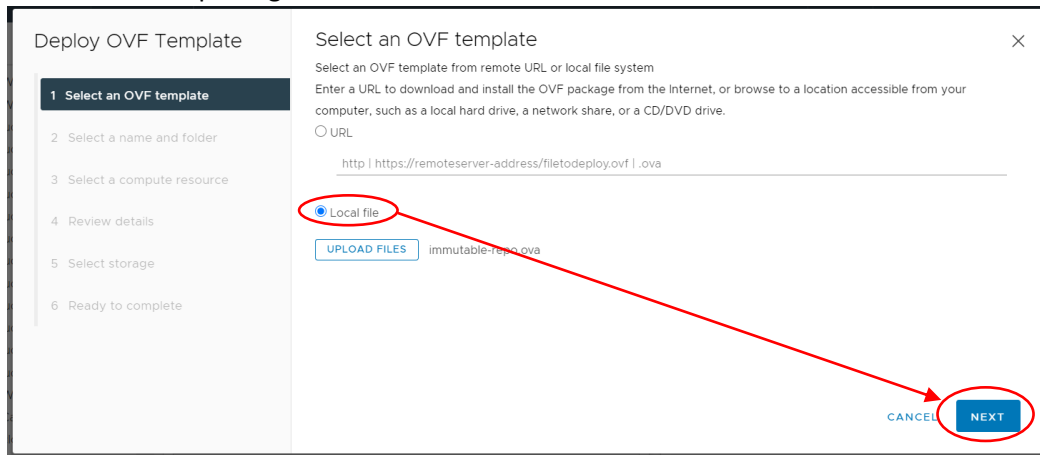
Download the appliance: <https://www.johnborhek.com/download/immutable-repository-for-veeam-backup-and-replication-11/>

## Creating a LUN on Your iSCSI SAN

1. Create a LUN on your iSCSI SAN
  - a. Most likely, your iSCSI SAN will require you to map the IQN of the initiator (the Immutable Repository) to the LUN which you have carved out. The Immutable Repository IQN is: iqn.2008-05.com.vmsources.immutable-repo:01
  - b. The IQN can be configured by editing: `/etc/iscsi/initiatorname.iscsi`

## Import the OVA

1. Import the Immutable Repository OVA to your VMware vSphere environment.
  - a. Locate the OVA package and click Next.



**Deploy OVF Template**

1 Select an OVF template

2 Select a name and folder

3 Select a compute resource

4 Review details

5 Select storage

6 Ready to complete

Select an OVF template

Select an OVF template from remote URL or local file system

Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

☐ URL

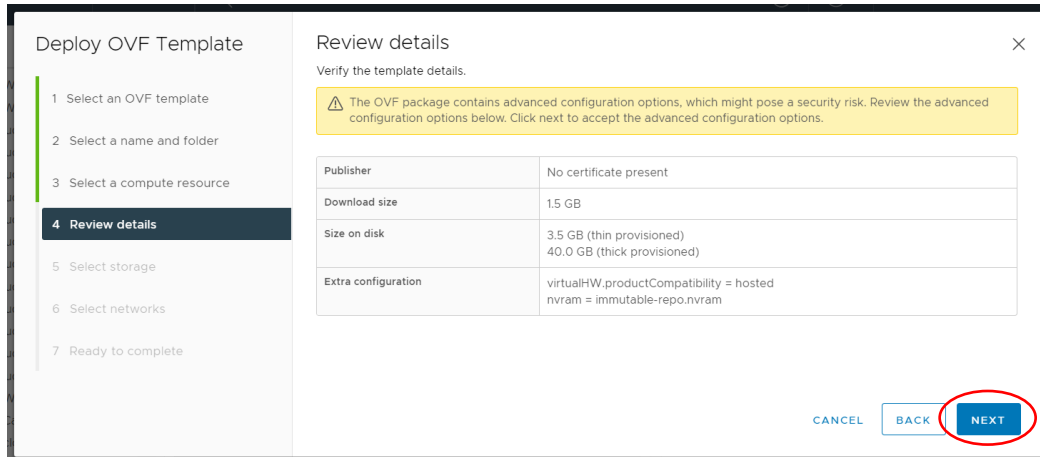
☒ Local file

http | https://remoteserver-address/filetoinstall.ovf | .ova

UPLOAD FILES immutable-repo.ova

CANCEL NEXT

- b. This is expected when importing an OVA. Click Next.



**Deploy OVF Template**

1 Select an OVF template

2 Select a name and folder

3 Select a compute resource

4 Review details

5 Select storage

6 Select networks

7 Ready to complete

**Review details**

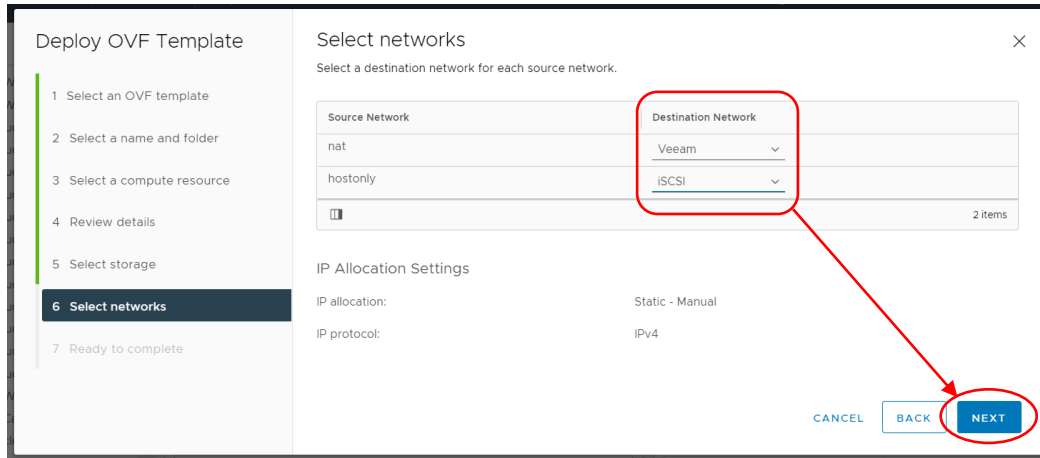
Verify the template details.

**Warning:** The OVF package contains advanced configuration options, which might pose a security risk. Review the advanced configuration options below. Click next to accept the advanced configuration options.

Publisher	No certificate present
Download size	1.5 GB
Size on disk	3.5 GB (thin provisioned) 40.0 GB (thick provisioned)
Extra configuration	virtualHW.productCompatibility = hosted nvram = immutable-repo.nvram

CANCEL BACK NEXT

c. Map your networking and click Next.

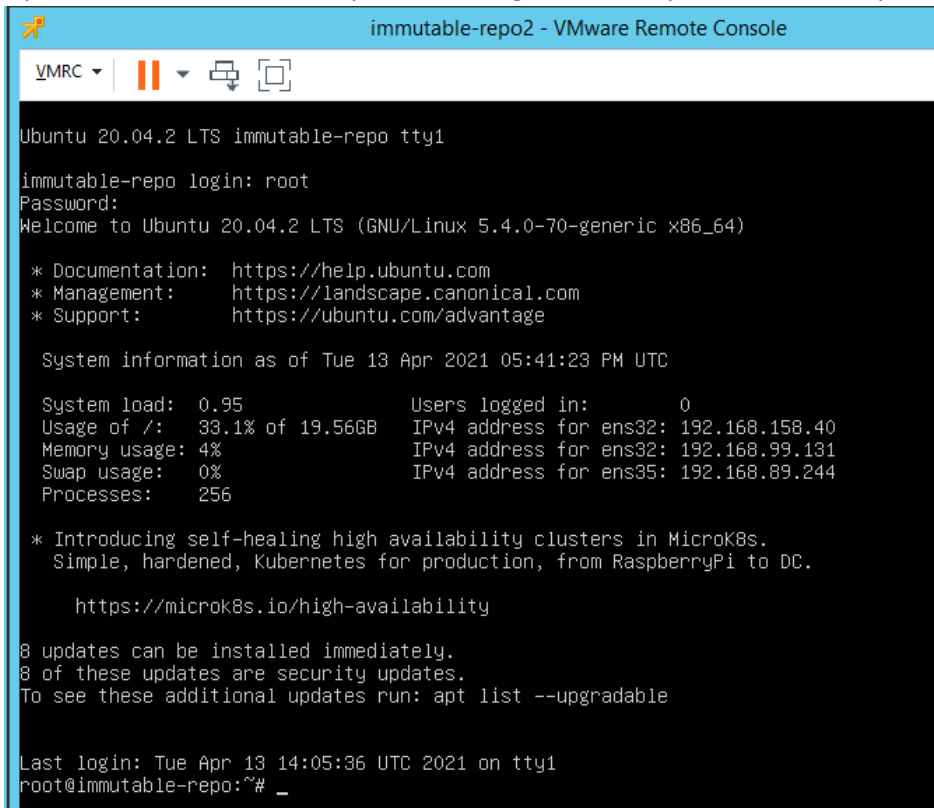


- i. Place the Source Network 'nat' on the same network as your Veeam Servers
- ii. Place the Source Network 'hostonly' on the same network as your iSCSI target ports

## Powering on and Configuring the Immutable Repository VM

**The initial password for both root and administrator is: P@ssw0rd (That's a zero in P@ssw0rd)**

1. Power on immutable-repo VM
2. Open VMRC to immutable-repo VM and log on as root (possible because you're using the console).



```

immutable-repo2 - VMware Remote Console
VMRC
Ubuntu 20.04.2 LTS immutable-repo tty1
immutable-repo login: root
Password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-70-generic x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:        https://ubuntu.com/advantage

System information as of Tue 13 Apr 2021 05:41:23 PM UTC

System load:  0.95           Users logged in:  0
Usage of /:   33.1% of 19.56GB IPv4 address for ens32: 192.168.158.40
Memory usage: 4%            IPv4 address for ens32: 192.168.99.131
Swap usage:   0%            IPv4 address for ens35: 192.168.89.244
Processes:    256

* Introducing self-healing high availability clusters in MicroK8s.
  Simple, hardened, Kubernetes for production, from RaspberryPi to DC.

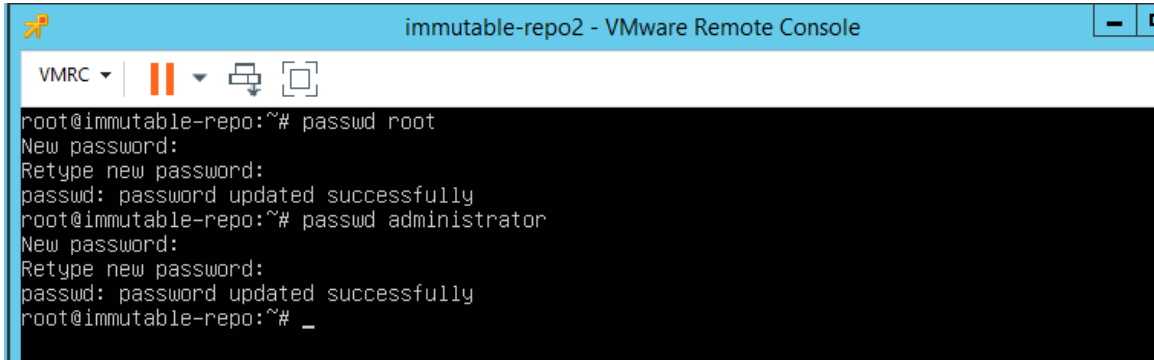
  https://microk8s.io/high-availability

8 updates can be installed immediately.
8 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Last login: Tue Apr 13 14:05:36 UTC 2021 on tty1
root@immutable-repo:~# _
  
```

3. Change root and vbruser password (HINT: use a randomized long password that is not used on any other system and store this password securely and offline). NOTE: the username "vbruser" is arbitrary and can be changed as needed. There is only a requirement for an un-privileged user that has ownership rights to the Immutable Repository folder (Later)

```
passwd root
passwd vbruser
```



```
root@immutable-repo:~# passwd root
New password:
Retype new password:
passwd: password updated successfully
root@immutable-repo:~# passwd administrator
New password:
Retype new password:
passwd: password updated successfully
root@immutable-repo:~# _
```

4. Change the Netplan network config to suit your environment. You can use the `/etc/netplan/50-immutable-init.yaml` as a template and modify the variables. **Be careful, indentation is important in this file**, follow the example.
  - i. `ens32` is your Veeam/Management Network. It is presently set for DHCP. To convert it to static, place a comment (#) in front of the `dhcp4` line and uncomment (remove the #) from the other lines following `ens32`. It will require an IP address, gateway and nameservers.
  - ii. `ens33` is your iSCSI network. **In most cases a gateway is not required or even desirable** on your iSCSI/SAN network. Modify the values in white.
  - iii. If Jumbo Frames are not wanted, comment (#) the MTU line

```
# This is the network config written by 'subiquity'
# To convert from DHCP to static, place a pound symbol after ens32, before the dhcp4 line and remove pound symbols after ens32
network:
  ethernets:
    ens32:
      dhcp4: true
      #addresses:
      #   - 192.168.158.40/24
      #   gateway4: 192.168.158.1
      #   nameservers:
      #     search: [mydomain.tld]
      #     addresses: [8.8.8.8, 8.8.4.4]
    ens33:
      addresses:
        - 192.168.89.100/24
      mtu: 9000
  version: 2
```

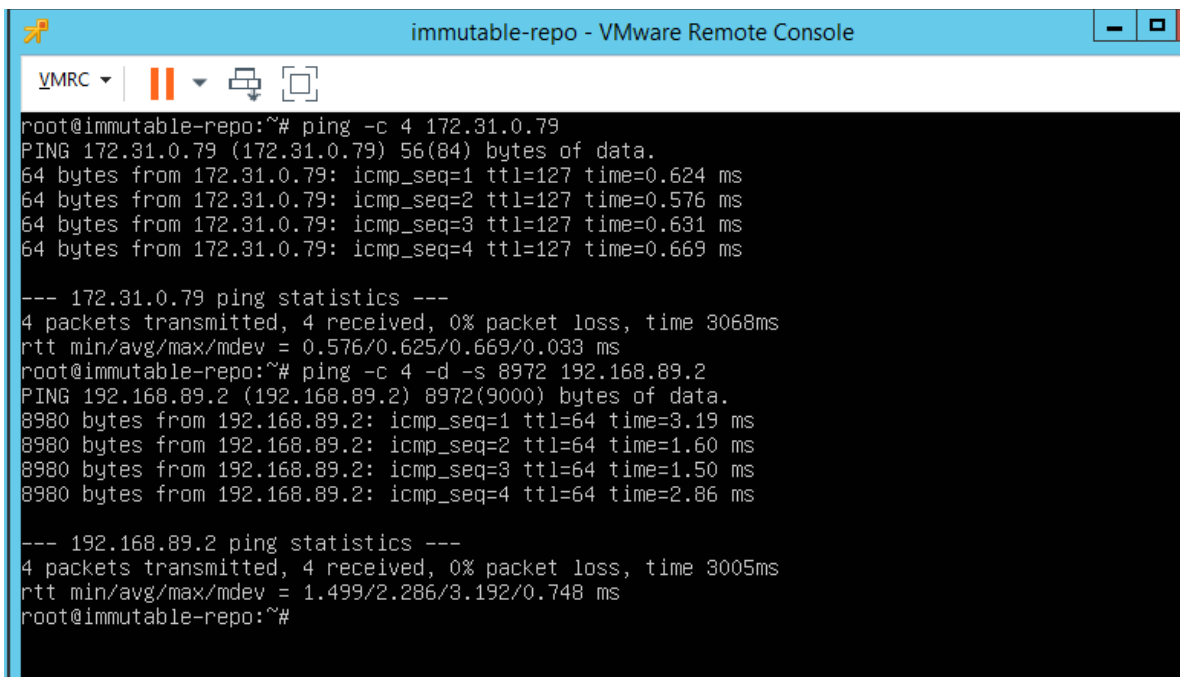
- b. Run the command:

```
netplan apply
```

- i. If it returns an error, most likely indentation is off. Go back and look for mistakes.

5. Now, let's ping our Veeam server and iSCSI Target to make sure networking is correct.

- a. Run the command: `ping -c 4 <IP of Veeam>`
- b. Run the command: `ping -c 4 -d -s 8972 <IP of iSCSI Target>`
- c. If all pings are returned, you are configured correctly.
- d. If the iSCSI ping does not return, remove: `mtu: 9000` from Netplan
- i. Run: `netplan apply` again.



```
root@immutable-repo:~# ping -c 4 172.31.0.79
PING 172.31.0.79 (172.31.0.79) 56(84) bytes of data.
64 bytes from 172.31.0.79: icmp_seq=1 ttl=127 time=0.624 ms
64 bytes from 172.31.0.79: icmp_seq=2 ttl=127 time=0.576 ms
64 bytes from 172.31.0.79: icmp_seq=3 ttl=127 time=0.631 ms
64 bytes from 172.31.0.79: icmp_seq=4 ttl=127 time=0.669 ms

--- 172.31.0.79 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3068ms
rtt min/avg/max/mdev = 0.576/0.625/0.669/0.033 ms
root@immutable-repo:~# ping -c 4 -d -s 8972 192.168.89.2
PING 192.168.89.2 (192.168.89.2) 8972(9000) bytes of data.
8980 bytes from 192.168.89.2: icmp_seq=1 ttl=64 time=3.19 ms
8980 bytes from 192.168.89.2: icmp_seq=2 ttl=64 time=1.60 ms
8980 bytes from 192.168.89.2: icmp_seq=3 ttl=64 time=1.50 ms
8980 bytes from 192.168.89.2: icmp_seq=4 ttl=64 time=2.86 ms

--- 192.168.89.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 1.499/2.286/3.192/0.748 ms
root@immutable-repo:~#
```

6. At this point, you can log on using ssh or continue to use the VMRC console. ssh is convenient as it will allow you to copy and paste the required commands to get started. To login with ssh:
- a. Start by logging on as the user: administrator
    - i. Use the password you just assigned to the administrator user
  - b. Then execute: `su -`
    - i. Use the password you assigned to root

7. Now, configure your iSCSI Target by running the commands, one line at a time:

```
iscsiadm -m discovery -t sendtargets -p <iSCSI Target IP>  
iscsiadm -m node -o show  
iscsiadm -m node --op=update -n node.conn[0].startup -v automatic  
iscsiadm -m node --op=update -n node.startup -v automatic  
iscsiadm -m node --loginall=automatic (requires time)  
systemctl restart iscsid.service  
iscsiadm -m session -o show
```



8. Find your volume by running the command:

```
fdisk -l
```

```
root@immutable-repo: ~  
  
Disk /dev/mapper/ubuntu--vg-ubuntu--lv: 20 GiB, 21474836480 bytes, 41943040 sectors  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
  
Disk /dev/sdb: 1.88 TiB, 2048000000000 bytes, 4000000000 sectors  
Disk model: DH3000  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 1048576 bytes  
  
Disk /dev/sdc: 1.88 TiB, 2048000000000 bytes, 4000000000 sectors  
Disk model: DH3000  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 1048576 bytes  
  
Disk /dev/sdd: 1.88 TiB, 2048000000000 bytes, 4000000000 sectors  
Disk model: DH3000  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 1048576 bytes  
  
Disk /dev/sde: 1.88 TiB, 2048000000000 bytes, 4000000000 sectors  
Disk model: DH3000  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 1048576 bytes  
  
Disk /dev/mapper/mpatha: 1.88 TiB, 2048000000000 bytes, 4000000000 sectors  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 1048576 bytes  
root@immutable-repo:~#
```

Your device will either be identified by: /dev/sdb (if there is only one target with one path, or by: /dev/mapper/mpatha (if it is a multipath iSCSI SAN). You will want to use multipath (mpath) if available.

- Once you have identified your volume, format it with this command using /dev/sdb or /dev/mapper/mpatha as appropriate (takes a bit):

```
mkfs.xfs -b size=4096 -m reflink=1,crc=1 /dev/mapper/mpatha
```

```
root@immutable-repo: ~
root@immutable-repo:~# mkfs.xfs -b size=4096 -m reflink=1,crc=1 /dev/mapper/mpatha
meta-data=/dev/mapper/mpatha      isize=512    agcount=4, agsize=125000000 blks
=                               sectsz=512   attr=2, projid32bit=1
=                               crc=1        finobt=1, sparse=1, rmapbt=0
=                               reflink=1
data            =               bsize=4096   blocks=500000000, imaxpct=5
=                               sunit=0      swidth=0 blks
naming          =version 2        bsize=4096   ascii-ci=0, ftype=1
log             =internal log     bsize=4096   blocks=244140, version=2
=                               sectsz=512   sunit=0 blks, lazy-count=1
realtime        =none            extsz=4096   blocks=0, rtextents=0
root@immutable-repo:~#
```

- Identify the UUID of the volume:

```
blkid
```

```
root@immutable-repo: ~
root@immutable-repo:~# blkid
/dev/sda2: UUID="168abb7c-082c-49b5-a158-2f4b38d2c934" TYPE="ext4" PARTUUID="7b4d2480-529b-4485-8270-3
/dev/sda3: UUID="p10Mh4-AJdQ-cGAe-pIvH-F7qU-N5N7-FXAo6b" TYPE="LVM2_member" PARTUUID="9c971828-783b-42
/dev/mapper/ubuntu--vg-ubuntu--lv: UUID="e1ced7da-7d08-428d-af55-1cc0f538d7b0" TYPE="ext4"
/dev/loop0: TYPE="squashfs"
/dev/loop1: TYPE="squashfs"
/dev/loop2: TYPE="squashfs"
/dev/loop3: TYPE="squashfs"
/dev/loop4: TYPE="squashfs"
/dev/loop5: TYPE="squashfs"
/dev/sda1: PARTUUID="176c3ced-7907-450d-8e4a-607172aa7463"
/dev/mapper/mpatha: UUID="8b28df99-a2fe-4012-b5f3-cefbe881e47d" TYPE="xfs"
root@immutable-repo:~#
```

- Copy the UUID of the xfs volume to a text file, but remove the quotations for use later:

```
UUID=8b28df99-a2fe-4012-b5f3-cefbe881e47d
```

- Your Immutable Repository mount point is pre-configured and ready-to-go with the correct ownership and user permissions pre-assigned as:

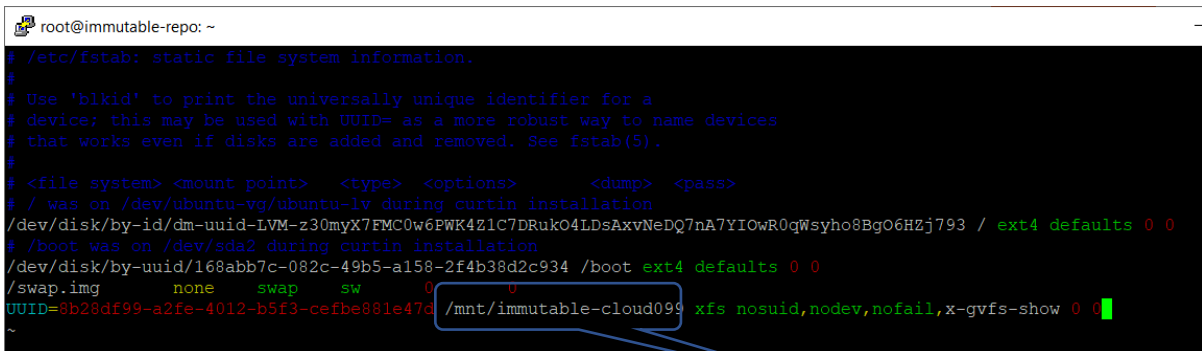
```
/mnt/immutable-repo-01
```

13. **OPTIONAL:** Step 13 is entirely optional as there is a pre-configured user and mount-point. If you wish to create additional users/repositories on this server, add additional users and mount points using these commands:

```
adduser newvbrusername
usermod -aG sudo newvbrusername
mkdir /mnt/newvbrreponame
chown -R newvbrusername: newvbrusername /mnt/newvbrreponame
chmod -R 700 /mnt/newvbrreponame
```

14. Edit /etc/fstab and substitute your UID and mount point (pre-configured mount point is /mnt/immutable-repo-01) for the values shown in the example:

```
vi /etc/fstab
```



```
root@immutable-repo: ~
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/ubuntu-vg/ubuntu-lv during curtin installation
/dev/disk/by-id/dm-uuid-LVM-z30myX7FMC0w6PWK4Z1C7DRukO4LDsAxvNeDQ7nA7YIOwR0qWsyho8BgO6H2j793 / ext4 defaults 0 0
# /boot was on /dev/sda2 during curtin installation
/dev/disk/by-uuid/168abb7c-082c-49b5-a158-2f4b38d2c934 /boot ext4 defaults 0 0
/swap.img none swap sw 0 0
UUID=8b28df99-a2fe-4012-b5f3-cefbe881e47d /mnt/immutable-cloud099 xfs nosuid,nodev,nofail,x-gvfs-show 0 0
```

/mnt/immutable-repo-01

- a. Add this line, substituting your UUID :

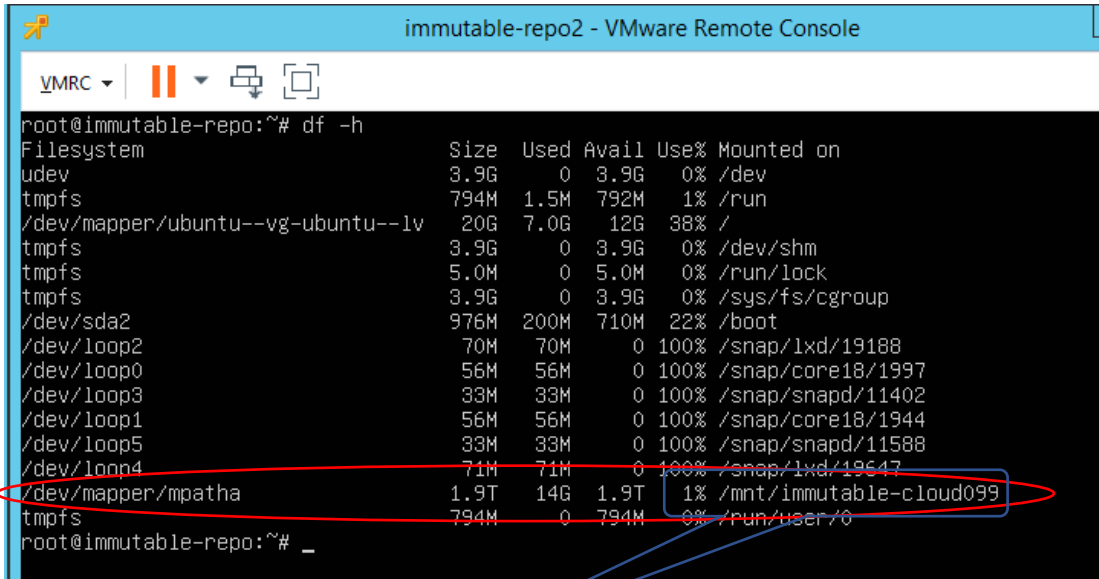
```
UUID=8b28df99-a2fe-4012-b5f3-cefbe881e47d /mnt/immutable-repo-01 xfs
nosuid,nodev,nofail,x-gvfs-show 0 0
```

15. Reboot!

16. Login as “root” using the VMRC.

17. Verify that your volume automounted to the correct path with the command

`df -h`



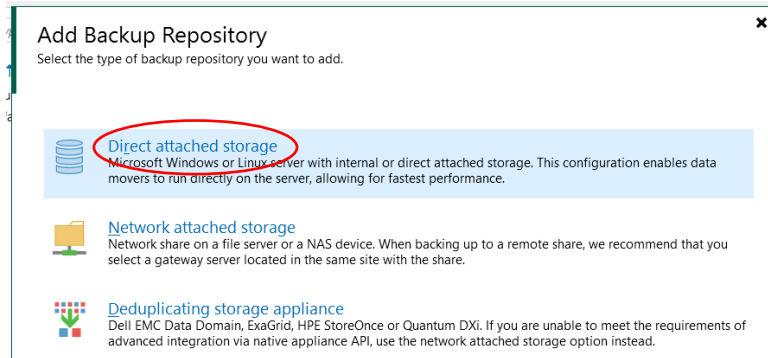
```

root@immutable-repo:~# df -h
Filesystem                Size      Used Avail Use% Mounted on
udev                     3.9G         0   3.9G   0% /dev
tmpfs                    794M       1.5M   792M   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 20G       7.0G    12G  38% /
tmpfs                    3.9G         0   3.9G   0% /dev/shm
tmpfs                    5.0M         0    5.0M   0% /run/lock
tmpfs                    3.9G         0   3.9G   0% /sys/fs/cgroup
/dev/sda2                 976M      200M    710M  22% /boot
/dev/loop2                70M       70M         0 100% /snap/lxd/19188
/dev/loop0                56M       56M         0 100% /snap/core18/1997
/dev/loop3                33M       33M         0 100% /snap/snapd/11402
/dev/loop1                56M       56M         0 100% /snap/core18/1944
/dev/loop5                33M       33M         0 100% /snap/snapd/11588
/dev/loop4                71M       71M         0 100% /snap/lxd/19647
/dev/mapper/mpatha        1.9T       14G    1.9T   1% /mnt/immutable-cloud099
tmpfs                    794M         0   794M   0% /run/user/0
root@immutable-repo:~# _
  
```

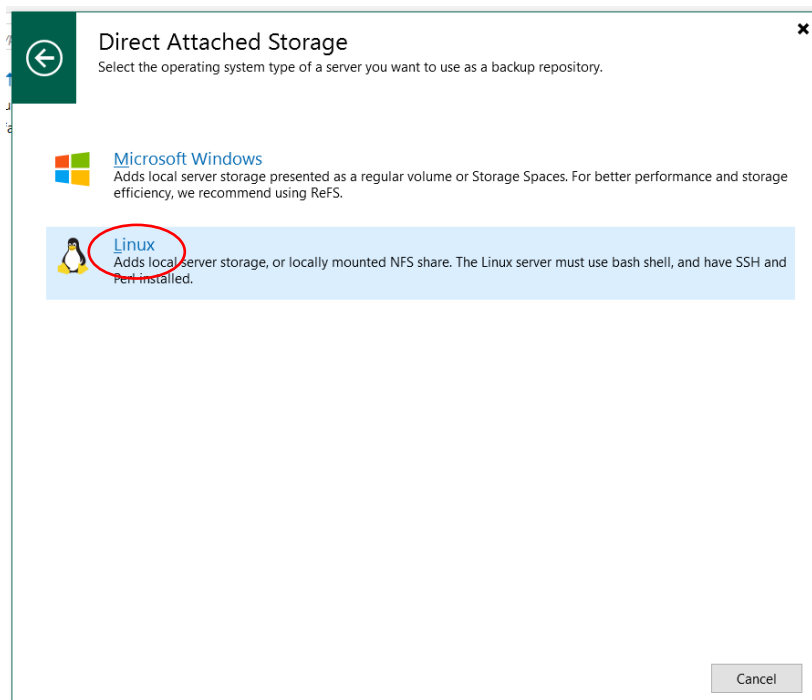
`/mnt/immutable-repo-01`

## Configuring Your Immutable Repository in Veeam Backup and Replication 11

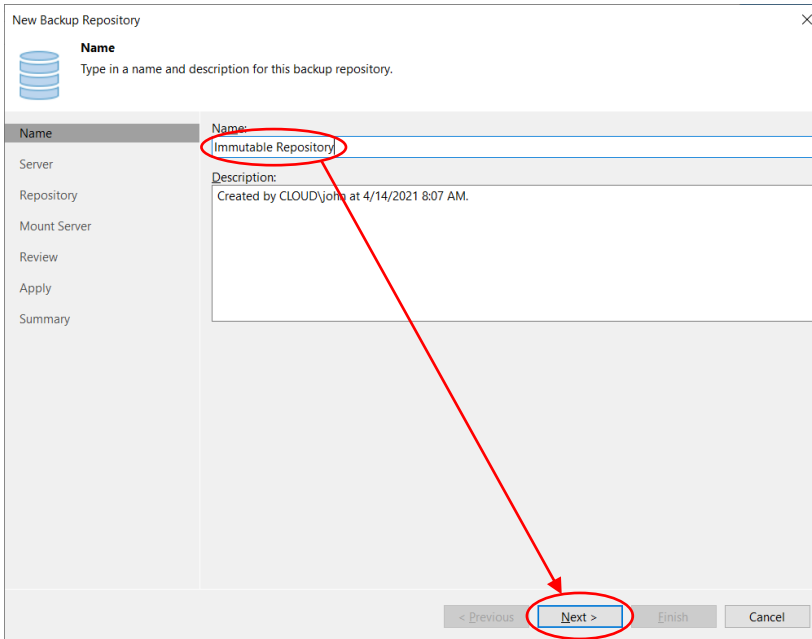
1. Now configure your Veeam Immutable Repository in Veeam Backup and Replication 11.



2. Now choose Linux.



3. Give your repository and name and click Next.



New Backup Repository

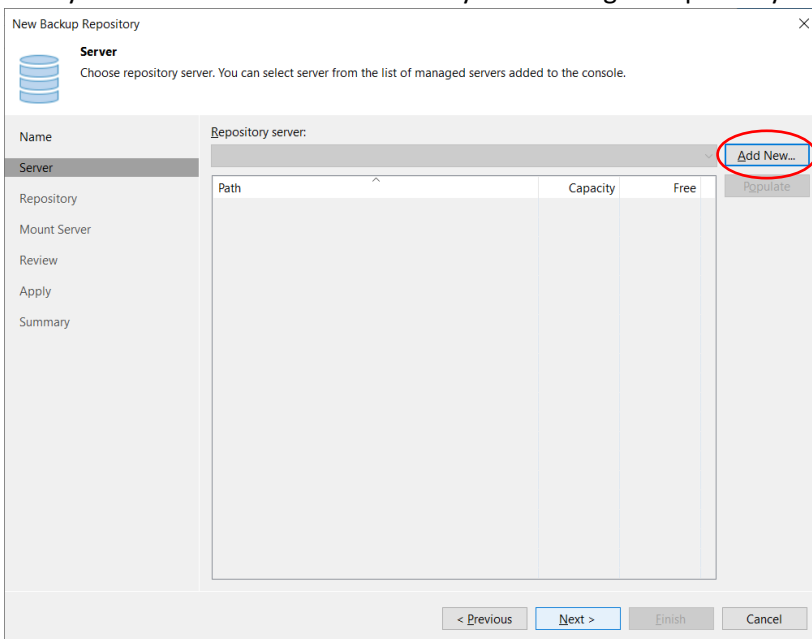
**Name**  
Type in a name and description for this backup repository.

Name: Immutable Repository

Description:  
Created by CLOUDJOHN at 4/14/2021 8:07 AM.

< Previous **Next >** Finish Cancel

4. Now you need to click on Add New so you can assign a repository.



New Backup Repository

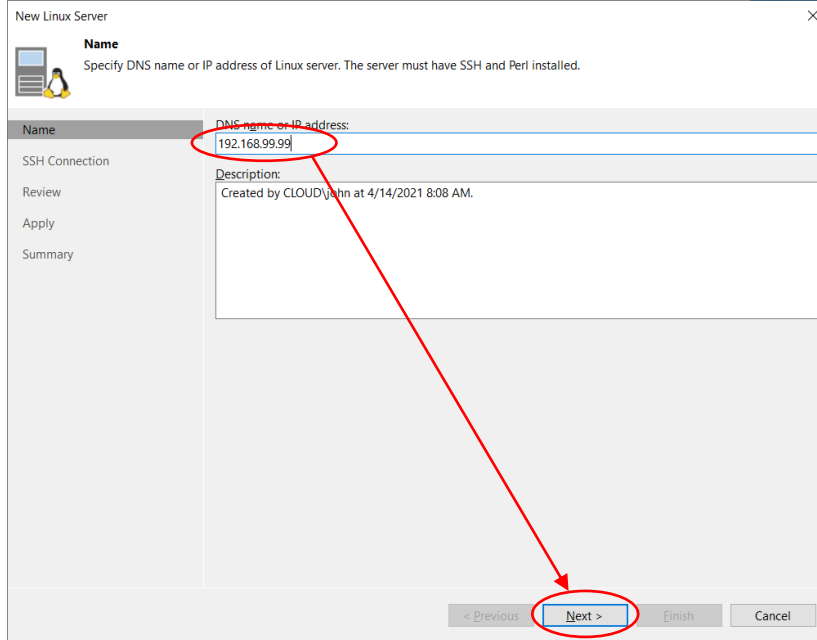
**Server**  
Choose repository server. You can select server from the list of managed servers added to the console.

Repository server: Add New...

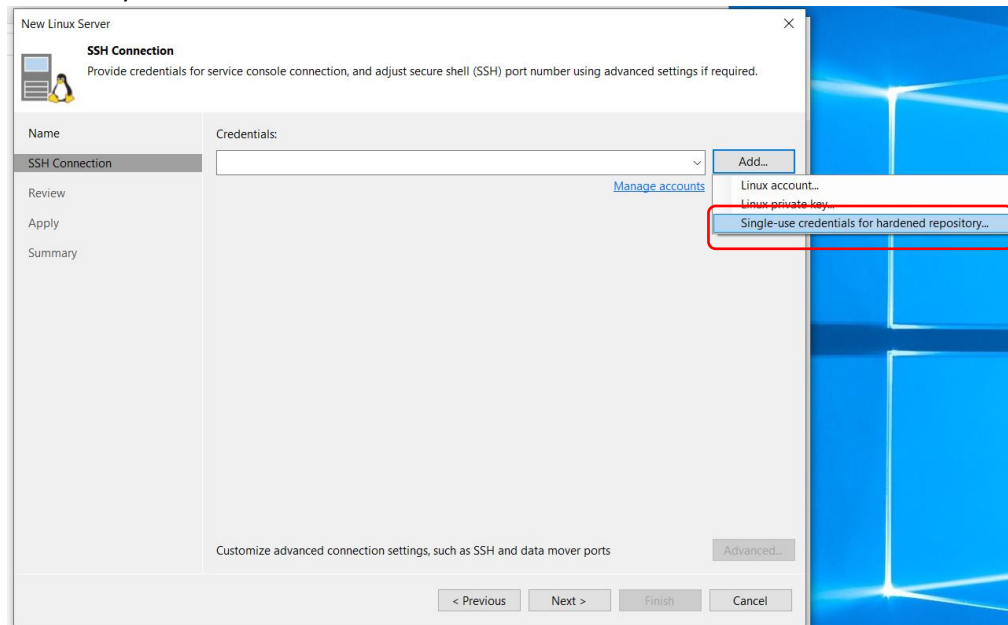
Path	Capacity	Free
------	----------	------

< Previous **Next >** Finish Cancel

- a. Enter the FQDN or IP of your Immutable Repository VM and click Next.

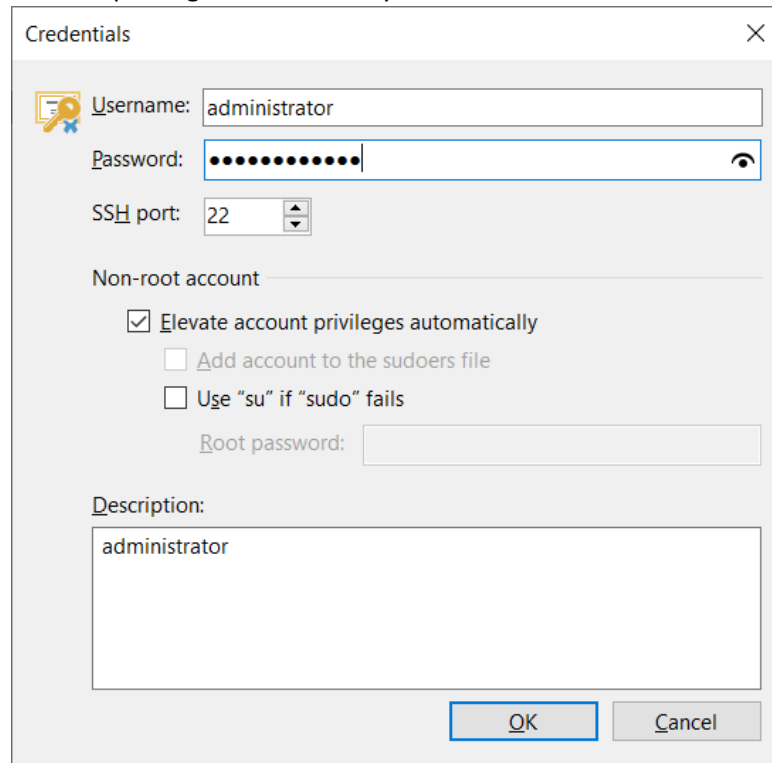


- b. Now add your SSH connection.



- c. You will use the 'vbruser' user credentials in Veeam. At this point, you still have root access and could 'Use "su" if "sudo" fails', however you shouldn't have to choose this. Choose only: Elevate

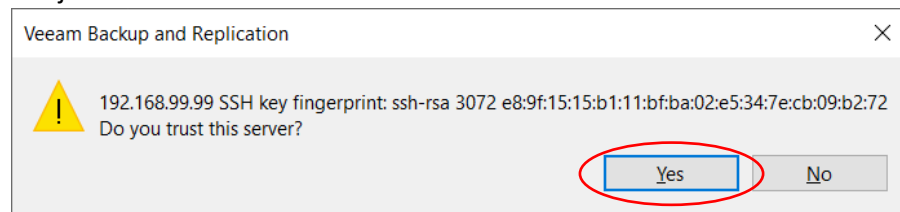
account privileges automatically.



A dialog box titled "Credentials" with a close button (X) in the top right corner. It contains the following fields and options:

- Username:** A text field containing "administrator".
- Password:** A password field with masked characters (dots) and a visibility toggle icon (an eye) on the right.
- SSH port:** A spinner box set to "22".
- Non-root account:** A section with three checkboxes:
  - ☒ **Elevate account privileges automatically**
  - ☐ **Add account to the sudoers file**
  - ☐ **Use "su" if "sudo" fails**
- Root password:** A text field.
- Description:** A text area containing "administrator".
- Buttons:** "OK" and "Cancel" buttons at the bottom right.

d. We just created it. Click Yes.

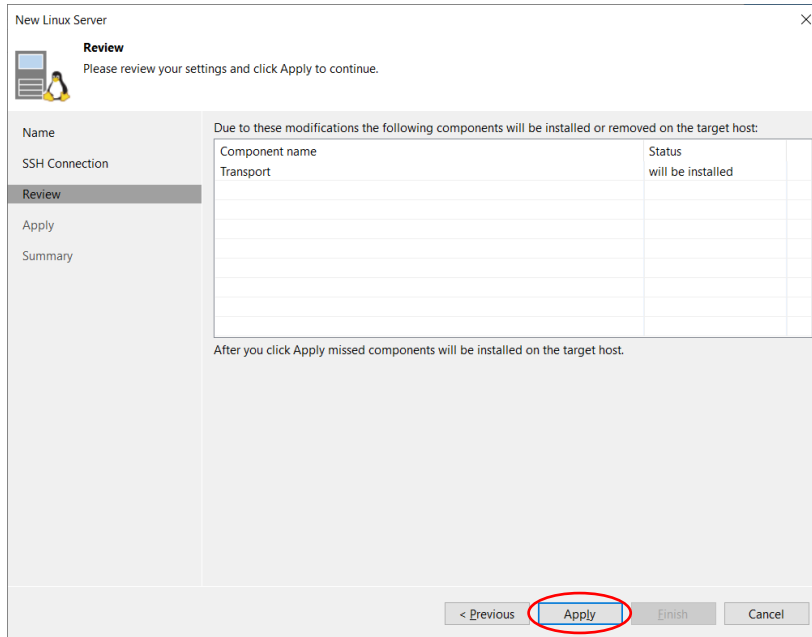


A warning dialog box titled "Veeam Backup and Replication" with a close button (X) in the top right corner. It contains the following information:

- Warning icon:** A yellow triangle with an exclamation mark.
- Text:** "192.168.99.99 SSH key fingerprint: ssh-rsa 3072 e8:9f:15:15:b1:11:bf:ba:02:e5:34:7e:cb:09:b2:72 Do you trust this server?"
- Buttons:** "Yes" and "No" buttons at the bottom right. The "Yes" button is circled in red.



e. Review your choices and click Apply.



**New Linux Server**

**Review**  
Please review your settings and click Apply to continue.

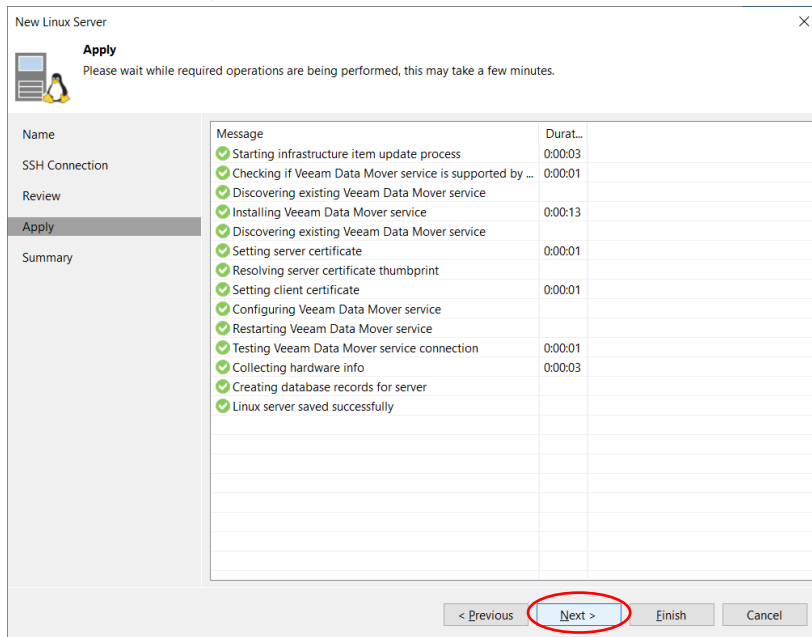
Due to these modifications the following components will be installed or removed on the target host:

Component name	Status
Transport	will be installed

After you click Apply missed components will be installed on the target host.

< Previous **Apply** Finish Cancel

f. After it's finished, click on Next.



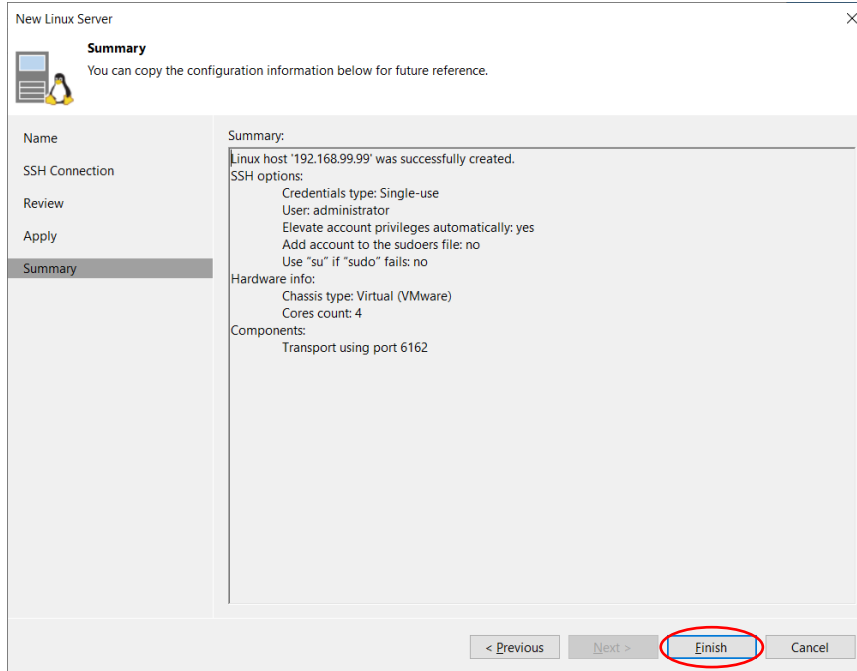
**New Linux Server**

**Apply**  
Please wait while required operations are being performed, this may take a few minutes.

Message	Durat...
✓ Starting infrastructure item update process	0:00:03
✓ Checking if Veeam Data Mover service is supported by ...	0:00:01
✓ Discovering existing Veeam Data Mover service	
✓ Installing Veeam Data Mover service	0:00:13
✓ Discovering existing Veeam Data Mover service	
✓ Setting server certificate	0:00:01
✓ Resolving server certificate thumbprint	
✓ Setting client certificate	0:00:01
✓ Configuring Veeam Data Mover service	
✓ Restarting Veeam Data Mover service	
✓ Testing Veeam Data Mover service connection	0:00:01
✓ Collecting hardware info	0:00:03
✓ Creating database records for server	
✓ Linux server saved successfully	

< Previous **Next >** Finish Cancel

g. Check out the summary and then click Finish.



**New Linux Server**

**Summary**  
You can copy the configuration information below for future reference.

**Name**

**SSH Connection**

**Review**

**Apply**

**Summary**

**Summary:**

Linux host '192.168.99.99' was successfully created.

**SSH options:**

- Credentials type: Single-use
- User: administrator
- Elevate account privileges automatically: yes
- Add account to the sudoers file: no
- Use "su" if "sudo" fails: no

**Hardware info:**

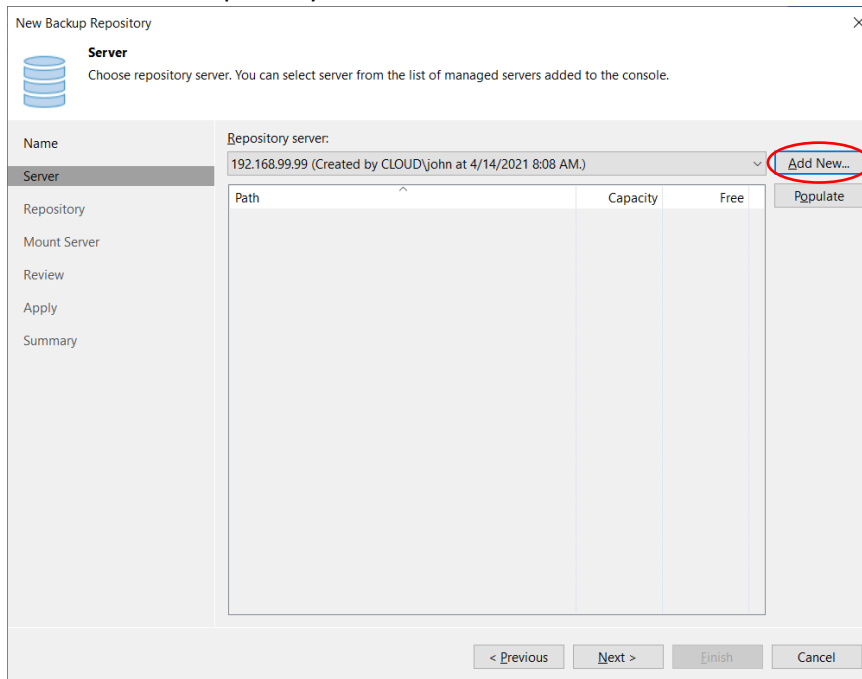
- Chassis type: Virtual (VMware)
- Cores count: 4

**Components:**

- Transport using port 6162

< Previous   Next >   **Finish**   Cancel

h. Now we need a repository server. Click on Add New.



**New Backup Repository**

**Server**  
Choose repository server. You can select server from the list of managed servers added to the console.

**Name**

**Server**

**Repository**

**Mount Server**

**Review**

**Apply**

**Summary**

**Repository server:**

192.168.99.99 (Created by CLOUD\john at 4/14/2021 8:08 AM.)

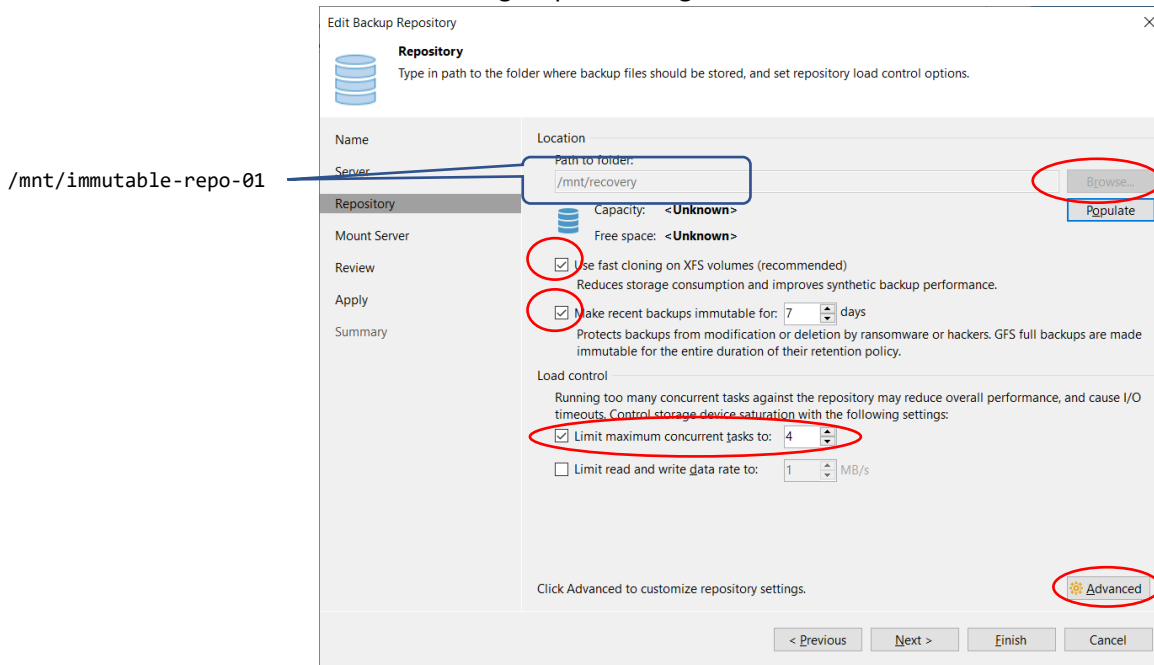
**Add New...**

Path	Capacity	Free

Populate

< Previous   Next >   Finish   Cancel

i. Do the following steps to configure:



Repository

Type in path to the folder where backup files should be stored, and set repository load control options.

Name: /mnt/immutable-repo-01

Location: Path to folder: Browse

Capacity: <Unknown>

Free space: <Unknown>

☒ Use fast cloning on XFS volumes (recommended)  
 Reduces storage consumption and improves synthetic backup performance.

☒ Make recent backups immutable for: 7 days  
 Protects backups from modification or deletion by ransomware or hackers. GFS full backups are made immutable for the entire duration of their retention policy.

Load control  
 Running too many concurrent tasks against the repository may reduce overall performance, and cause I/O timeouts. Control storage device saturation with the following settings:

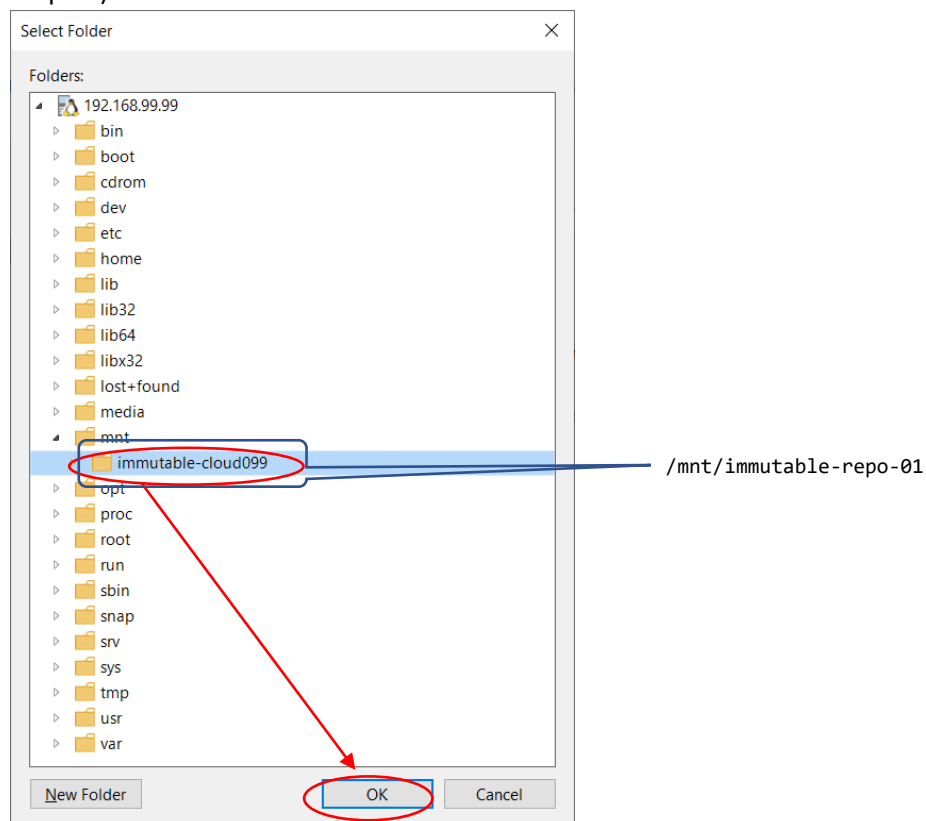
☒ Limit maximum concurrent tasks to: 4

☐ Limit read and write data rate to: 1 MB/s

Click Advanced to customize repository settings. Advanced

< Previous Next > Finish Cancel

i. Click Browse, and Locate the /mnt/immutable-repo-01 folder (or folder you created in Step 13) and click OK.



Select Folder

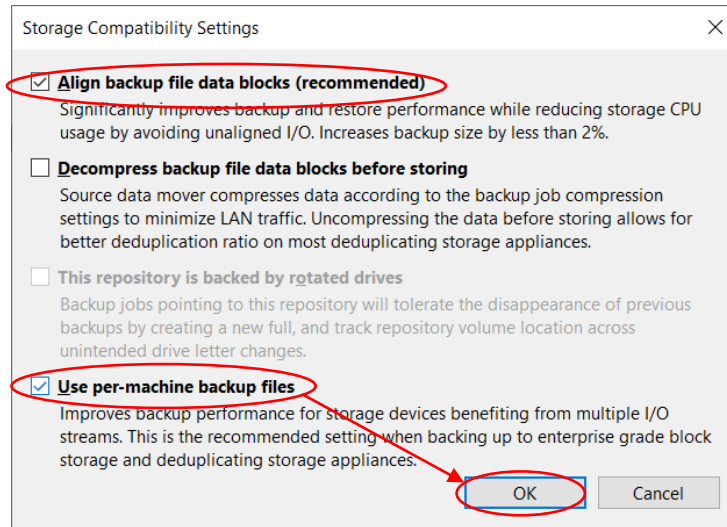
Folders:

- 192.168.99.99
  - bin
  - boot
  - cdrom
  - dev
  - etc
  - home
  - lib
  - lib32
  - lib64
  - libx32
  - lost+found
  - media
  - mnt
    - immutable-cloud099
  - opt
  - proc
  - root
  - run
  - sbin
  - snap
  - srv
  - sys
  - tmp
  - usr
  - var

/mnt/immutable-repo-01

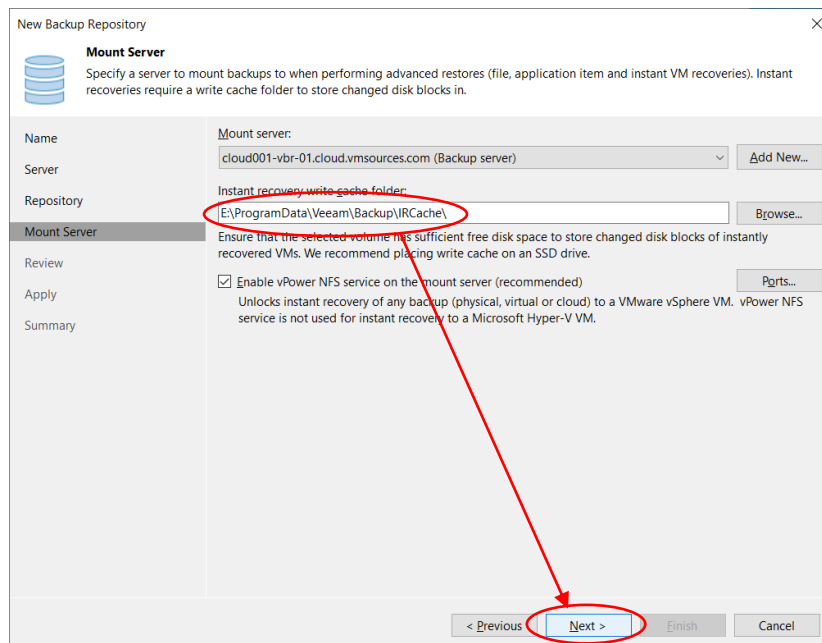
New Folder OK Cancel

- ii. Click on Advanced:
  1. Align backup file data blocks
  2. Use per-machine backup files



- iii. Use Fast cloning on XFS....
- iv. Make recent backups immutable for.... (set your desired number)
- v. Set "Limit maximum concurrent tasks to" equal to the number of vCPUs which you assigned the repository VM

- j. Choose a write cache folder and click Next.



k. Review your choices and click Apply.

New Backup Repository

**Review**  
Please review the settings, and click Apply to continue.

The following components will be processed on server cloud001-vbr-01.cloud.vmsources.com:

Component name	Status
Transport	already exists
vPower NFS	already exists
Mount Server	already exists

☐ Search the repository for existing backups and import them automatically  
☐ Import guest file system index data to the catalog

< Previous **Apply** Finish Cancel

l. After it's finished doing its thing, click Next.

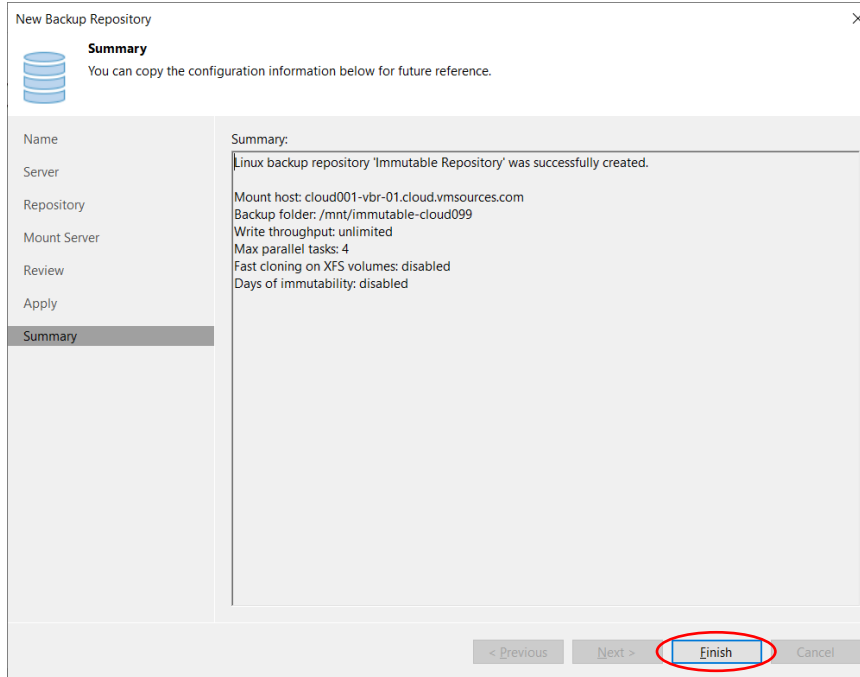
New Backup Repository

**Apply**  
Please wait while backup repository is created and saved in configuration, this may take a few minutes.

Message	Durat...
✓ Starting infrastructure item update process	0:00:03
✓ [cloud001-vbr-01] Discovering installed packages	0:00:04
✓ [cloud001-vbr-01] Registering client CLOUD001-VBR-0...	
✓ [cloud001-vbr-01] Registering client CLOUD001-VBR-0...	
✓ [cloud001-vbr-01] Registering client CLOUD001-VBR-0...	
✓ [cloud001-vbr-01] Discovering installed packages	
✓ All required packages have been successfully installed	
✓ Detecting server configuration	
✓ Reconfiguring vPower NFS service	
✓ Creating configuration database records for installed p...	
✓ Collecting backup repository info	
✓ Creating database records for repository	0:00:09
✓ Backup repository has been added successfully	

< Previous **Next >** Finish Cancel

m. Nothing left to do but click Finish!



New Backup Repository

**Summary**  
You can copy the configuration information below for future reference.

**Summary:**

Linux backup repository 'Immutable Repository' was successfully created.

Mount host: cloud001-vbr-01.cloud.vmsources.com  
Backup folder: /mnt/immutable-cloud099  
Write throughput: unlimited  
Max parallel tasks: 4  
Fast cloning on XFS volumes: disabled  
Days of immutability: disabled

< Previous   Next >   **Finish**   Cancel

## Additional Measures

[Configure SSH to use two-factor authentication](#)

<https://ubuntu.com/tutorials/configure-ssh-2fa#1-overview>

## References

<https://ubuntu.com/server/docs/service-iscsi>

<https://netplan.io/examples/>

<https://www.veeam.com/blog/v11-immutable-backup-storage.html>