

# Linux Server

- [Filesystem](#)
  - [Expanding an existing filesystem using LVM](#)
- [Docker](#)
  - [Create a MAC VLAN network](#)
  - [Deploy Portainer on a MAC VLAN network](#)
- [Networking](#)
  - [Modifying the netplan to add interfaces and VLANs](#)
- [Certificates](#)
  - [Signing Public Certificates using OpenSSL](#)

# Filesystem

# Expanding an existing filesystem using LVM

## Description

This example below shows you how to expand an existing filesystem that is managed by Logical Volume Manager (LVM)

## Examine the existing filesystem

This command will tell the host to rescan the host adapters after a new disk has been added.

```
“ echo "- - -" | tee /sys/class/scsi_host/host*/scan
```

`/dev/mapper/ubuntu--vg-ubuntu--lv` is the filesystem I want to expand.

```
“ root@dock-host-2:/mnt# df -lh
Filesystem                Size  Used Avail Use% Mounted on
tmpfs                      1.6G  1.7M  1.6G   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 63G   17G  43G  28% /
tmpfs                      7.9G   0  7.9G   0% /dev/shm
tmpfs                      5.0M   0  5.0M   0% /run/lock
/dev/sda2                  974M  163M  745M  18% /boot
tmpfs                      1.6G  4.0K  1.6G   1% /run/user/1000
```

Use `lsblk` to take a look at all devices available. In my example I am going to use `/dev/sdb` as the disk to expand the existing filesystem in the LVM. `lsblk` shows that `/dev/sdb` is 128GB in size.

```
“ root@dock-host-2:~# lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
loop0               7:0    0  55.5M 1 loop /snap/core18/2344
loop1               7:1    0  55.5M 1 loop /snap/core18/2409
loop2               7:2    0 118.4M 1 loop /snap/docker/1779
loop3               7:3    0  61.9M 1 loop /snap/core20/1494
```

```

loop4          7:4   0 102.4M 1 loop /snap/lxd/23243
loop5          7:5   0  61.9M 1 loop /snap/core20/1518
loop6          7:6   0 117.2M 1 loop /snap/docker/1767
loop7          7:7   0   47M 1 loop /snap/snapd/16292
loop8          7:8   0   47M 1 loop /snap/snapd/16010
loop10         7:10  0 102.4M 1 loop /snap/lxd/23270
sda            8:0   0 128G 0 disk
├─sda1         8:1   0    1M 0 part
├─sda2         8:2   0    1G 0 part /boot
└─sda3         8:3   0 127G 0 part
   └─ubuntu--vg-ubuntu--lv 253:0  0 63.5G 0 lvm /
sdb            8:16  0 128G 0 disk
sr0           11:0   1 1024M 0 rom

```

The next step is to run a command to prep the new disk for the LVM format.

```

root@dock-host-2:~# pvcreate /dev/sdb
WARNING: dos signature detected on /dev/sdb at offset 510. Wipe it? [y/n]: y
Wiping dos signature on /dev/sdb.
Physical volume "/dev/sdb" successfully created.

```

Once the disk is ready we need to identify the the LVM name and use it to extend the volume with the new disk we set up.

```

root@dock-host-2:~# vgs
VG      #PV #LV #SN Attr  VSize  VFree
ubuntu-vg  1  1  0 wz--n- <127.00g 63.50g

```

Once we know the name of the Volume Group we can expand the Volume Group with the new disk.

```

root@dock-host-2:~# vgextend ubuntu-vg /dev/sdb
Volume group "ubuntu-vg" successfully extended

```

After the Volume Group has been extended we can run some commands to verify the new size. You can see in the example below that we have more space in our Volume Group.

```
root@dock-host-2:~# vgs
VG      #PV #LV #SN Attr   VSize  VFree
ubuntu-vg  2  1  0 wz--n- 254.99g <191.50g

root@dock-host-2:~# vgdisplay
--- Volume group ---
VG Name          ubuntu-vg
System ID
Format           lvm2
Metadata Areas   2
Metadata Sequence No 3
VG Access        read/write
VG Status        resizable
MAX LV           0
Cur LV          1
Open LV          1
Max PV           0
Cur PV          2
Act PV           2
VG Size          254.99 GiB
PE Size          4.00 MiB
Total PE         65278
Alloc PE / Size  16255 / <63.50 GiB
Free PE / Size   49023 / <191.50 GiB
VG UUID          CVE1jf-w4fj-FreW-Xn1p-i3gv-gzbh-GcpJdY
```

Now that the Volume Group is expanded we need to expand the Logical Volume and expand the Filesystem to use the new disk space. The commands below are used to check on the Logical Volume and then extend the Logical Volume.

```
root@dock-host-2:~# lvs
--- Logical volume ---
LV Path          /dev/ubuntu-vg/ubuntu-lv
LV Name          ubuntu-lv
VG Name          ubuntu-vg
LV UUID          K5CEft-q6tF-cjxB-wCFh-f970-CTy9-07KYYk
LV Write Access   read/write
LV Creation host, time ubuntu-server, 2021-12-19 20:48:29 +0000
LV Status        available
# open           1
LV Size          <63.50 GiB
Current LE       16255
```

```
Segments          1
Allocation        inherit
Read ahead sectors auto
- currently set to 256
Block device      253:0
```

```
root@dock-host-2:~# lvextend -l +100%FREE /dev/ubuntu-vg/ubuntu-lv
Size of logical volume ubuntu-vg/ubuntu-lv changed from <63.50 GiB (16255
extents) to 254.99 GiB (65278 extents).
Logical volume ubuntu-vg/ubuntu-lv successfully resized.
```

The last step is the expand the filesystem and verify that there is more free space.

```
root@dock-host-2:~# resize2fs /dev/mapper/ubuntu--vg-ubuntu--lv
resize2fs 1.46.3 (27-Jul-2021)
Filesystem at /dev/mapper/ubuntu--vg-ubuntu--lv is mounted on /; on-line
resizing required
old_desc_blocks = 8, new_desc_blocks = 32
The filesystem on /dev/mapper/ubuntu--vg-ubuntu--lv is now 66844672 (4k)
blocks long.
```

```
root@dock-host-2:~# df -lh
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           1.6G  1.7M  1.6G   1% /run
/dev/mapper/ubuntu--vg-ubuntu--lv 251G  17G 224G   7% /
tmpfs           7.9G   0 7.9G   0% /dev/shm
tmpfs           5.0M   0 5.0M   0% /run/lock
/dev/sda2       974M 163M 745M  18% /boot
tmpfs           1.6G  4.0K  1.6G   1% /run/user/1000
```

# Docker

# Create a MAC VLAN network

## Description

The command below is an example of creating a layer 2 macvlan network in docker. In the example below, the network I am using is 10.128.140.0/24 on interface ens160. You will have to replace the subnet and interface according to your install.

## Configuration

```
❗ docker network create -d macvlan --subnet=10.128.140.0/24 --gateway  
10.128.140.1 -o parent=ens160 L2-Connect
```

and this is how you add a VLAN network

```
❗ docker network create -d macvlan --subnet=172.16.8.0/22 --gateway 172.16.8.1  
-o parent=ens192.40 Data-40-L2-Connect
```

After creation of the network you can take a look to make sure it exists

```
❗ root@container:~# docker network ls
```

NETWORK ID	NAME	DRIVER	SCOPE
01734d37ed78	L2-Connect	macvlan	local
310563fabcd7	bridge	bridge	local
4bc024cbd7cc	host	host	local
d2879a267450	none	null	local

# Deploy Portainer on a MAC VLAN network

## Description

On the previous page I showed how to create a layer 2 macvlan network that allows you to deploy containers in the same network as the host itself. This example will show you how to deploy Portainer CE using the layer 2 macvlan network we created.

## Configuration

```
root@container:~# docker run -d --network L2-Connect --ip=10.128.140.31 --  
dns=1.1.1.1 --name=Portainer --restart=always -v  
/var/run/docker.sock:/var/run/docker.sock -v portainer_data:/data  
portainer/portainer-ce:latest
```

Once the container has been created you can run the docker container ls command to see the deployed container.

```
root@container:~# docker container ls
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS
PORTS	NAMES			
cd30907cabe6	portainer/portainer-ce:latest	"/portainer"	10 minutes ago	Up
10 minutes	Portainer			

# Networking

# Modifying the netplan to add interfaces and VLANs

Below is an example of the default netplan file to add an additional unnumbered interface.

```
“ root@docker-app-1:~# cat /etc/netplan/00-installer-config.yaml
# This is the network config written by 'subiquity'
network:
  ethernets:
    ens160:
      addresses:
        - 10.128.50.10/24
      nameservers:
        addresses:
          - 1.1.1.1
          - 1.0.0.1
        search: []
      routes:
        - to: default
          via: 10.128.50.1
    ens192: {}
  version: 2
```

Below is an example of the default netplan file to add an additional unnumbered interface with an attached unnumbered VLAN.

```
“ network:
  ethernets:
    ens160:
      addresses:
        - 10.128.50.10/24
      nameservers:
        addresses:
          - 1.1.1.1
          - 1.0.0.1
        search: []
```

```
routes:
  - to: default
    via: 10.128.50.1
ens192: {}
version: 2
```

```
vlan40:
  id: 40
  link: ens192
```

# Certificates



```
+++++*...+...+++++
+++++
+
```

Enter PEM pass phrase: **<enter a secret password here>**

Verifying - Enter PEM pass phrase: **<re-type your secret password here>**

-----

You are about to be asked to enter information that will be incorporated into your certificate request.

What you are about to enter is what is called a Distinguished Name or a DN.

There are quite a few fields but you can leave some blank

For some fields there will be a default value,

If you enter '.', the field will be left blank.

-----

Country Name (2 letter code) [AU]:**US**

State or Province Name (full name) [Some-State]:**North Dakota**

Locality Name (eg, city) []:**West Fargo**

Organization Name (eg, company) [Internet Widgits Pty Ltd]:**HPN Lab**

Organizational Unit Name (eg, section) []:

Common Name (e.g. server FQDN or YOUR name) []:**login.hpnlab.net**

Email Address []:

Please enter the following 'extra' attributes to be sent with your certificate request

A challenge password []:

An optional company name []:

Once the command has finished running we'll be left with two files, the Private Key and the Certificate Signing Request

```
“ ~/certificates/login.hpnlab.net$ ls -lh
total 8.0K
-rw-rw-r-- 1 tyler tyler 1001 Sep 11 09:02 login-hpnlab-net.csr
-rw----- 1 tyler tyler 1.9K Sep 11 09:01 login-hpnlab-net.key
```

The next step is to copy the contents of the Certificate Signing Request and submit it to a public Certificate Authority for signing. The **highlighted** text is what gets submitted for signing.

```
“ ~/certificates/login.hpnlab.net$ cat login-hpnlab-net.csr
-----BEGIN CERTIFICATE REQUEST-----
MIICqzCCAZMCAQAwZjELMAkGA1UEBhMCVVMxFTATBgNVBAgMDE5vcnRoIERha2
```

90

YTETMBEGA1UEBwwKV2VzdCBGYXJnbzEQMA4GA1UECgwHSFBOIEhYjEZMBcGA  
1UE

AwwQbG9naW4uaHBubGFilM5ldDCCASlwDQYJKoZIhvcNAQEBBQADggEPADCCA  
QoC

ggEBANLFOtCCMm+YFMUWu2NICNLqXKbotbnU0Xwj+NTXqw+9TxYU4tPIXPKXV  
WGQ

0tfZwYz+bOrfa2HhLUy3c9J9eX2ccyUoVBU7QBhVWSyvuShCkuZ2D4aqth/s0zxi  
nHgCP8wTC5x5W2sK3orrRfCPxohL62l66DXRxh9eX5hSiTZ5+SqOMQdhr7f4alFP  
KtjfiBehcH+KBE2BGbS61G0lj9B6TEZ8OB8oHXC6EA3AkScsbSaj0+yy5DBCV9mj  
mwflpYExVpTfbsos5MaT0QfQLcu0eysh2D1mg74Jyq0yfdZkR8q64kKDsQChGuAt  
0RfXFqeUv0xHienJlnTRDuhNM/cCAwEAAaAAMA0GCSqGS1b3DQEBCwUAA4IBAQA  
p

drJj4eclrfQz1WXofLfCCaRcpdhe/+SytpQmb77DRMTHQrXXCMCrHplgNusZr7rA  
z38A50mFlq/4jqT74R6kyZsXkKPCHMY1hXyKKdZWMT76tPLIFgKnI1e/b+IH45f3  
NnN7wN6AMQFaaTLyBKGUr5nnCU5kU5LsvmhHUkf4jJl5gcfI4d9QV7MYBHsZw7J  
XrOZ7bx3mwSz3w8Z5s1+tzqEzOfdTWFCGLQeHBEEHCnfflJM63wdJ/NnaBRfocC  
weawU/sh67uQoW0YKGRAGihNC24er9+8qQ/MPWBubogEt/z0KTsSE7sGRwZUQg  
Vs

G/t6rbRn6MDL7Zwu5Qzc

-----END CERTIFICATE REQUEST-----

## Submit a Certificate Signing Request to a public Certificate Authority for Signing

Once the Certificate has been purchased from a public signer, the next step is to sign the Certificate. The example below shows the Certificate Signing Request submission process using GoDaddy.

# Certificate Setup

1 Year Standard SSL Certificate

## Identify Primary Domain

Choose a Domain

Provide a domain and we'll create the CSR

Input a CSR

The CSR should contain the Primary Domain

-----BEGIN CERTIFICATE REQUEST-----

```
MIICqzCCAQMCAQAwZjElMAkGA1UEBhMCVVMxFTATBgNVBAGMDE5vcnRoIERha290
YTETMBEGA1UEBwwKV2VzdCBGYXJnbzEQMA4GA1UECgwHSFB0IEExYjEZMBcGA1UE
Aww0bG9naW4uaHBubGFiLm5ldDCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoC
ggEBANLF0tCCMm+YFMUWu2NICNLqXKbotbnU0XwJ+NTXqw+9TxYU4tPIXPKXVWQ
0tfZwYz+b0rfa2HhLUy3c9J9eX2ccyUoVBU70BhVWsyvuShCkuZ2D4aqth/s0zxi
nHgCP8wTC5x5W2sK3orrRfCPxohL62l66DXRxb9eX5hSiTZ5+SqOMQdhr7f4aLFP
KtJfiBehcH+KBE2BGbS61G0Ij9B6TEZ80B8oHXC6EA3AkScsbSaj0+yy5DBCv9mj
mwfIpYExVpTfbsos5MaT0fQLcu0eysh2D1mg74Jyq0yfdZkR8q64kKDsQChGuAt
0RfXFqeUv0xHienJlnTRDuhNM/cCAwEAAaAAMA0GCSqGSIb3D0EBCwUAA4IBAQA
pL334-1-CO-1UW-6L66-D-1L-6-1-0-173DM7U0-VYCMC-U-1-N-7-7-A
```

Based upon your CSR, you are requesting a certificate for: **login.hpnlab.net**

[CSR Help](#)

Cancel

Continue

If you're using GoDaddy, it's recommended to use the GoDaddy SHA-2 Issuing CA in the screenshot below.

## Additional Options

Please choose the following option(s) and accept the terms and conditions.

Certificate Issuer [Learn more](#)

GoDaddy SHA-2 ▾

I agree to the terms and conditions of the [Subscriber Agreement](#)

Cancel

Back

Continue

Once the Certificate Signing Request has been submitted to GoDaddy, there might be some verification steps to go through before the certificate is signed. After the certificate has been issued you should see a status page that looks similar to the below screenshot.

## Certificate Details

Type	Standard SSL Certificate
------	--------------------------

Status	Certificate issued <a href="#">(Revoke)</a>
--------	--

Domain name	login.hpnlab.net
-------------	------------------

Certificate Issuer	GoDaddy SHA-2
--------------------	---------------

Request Date	9/11/2024 9:53 AM
--------------	-------------------

Request Submission Type	New Request
-------------------------	-------------

Current Certificate Validity Period	9/11/2024 - 9/11/2025
-------------------------------------	-----------------------

Subscription Period	9/11/2024 - 9/11/2025
---------------------	-----------------------

Serial Number	68:29:ab:01:b5:d2:2b:8e
---------------	-------------------------

Next, download the certificate in a text (base64) format. In the example below I picked Apache knowing that the certificate will be encoded in text (base64) format. The zip file will contain the certificate and the Issuing Certificate Authority trust chain.


## Download Certificate

To secure your site that's hosted elsewhere, download the Zip file that matches your hosting server type. Then, install all of the certificates in the Zip file on your hosting server, including any intermediate certificates that might be needed for older browsers or servers.

First time installing a certificate?

[View Installation Instructions for the selected server.](#)

Server type

Download Zip File

## Extracting and Converting the certificates to different formats for different uses

Once the certificate Zip file has been downloaded, extract the Zip file contents to the same directory where you have your Private Key and Certificate Signing Request. In the example below I rename the signed certificate to be more in line with my filename convention.

```
~/certificates/login.hpnlab.net$ unzip login.hpnlab.net.zip
Archive: login.hpnlab.net.zip
  inflating: gd_bundle-g2-g1.crt
  inflating: 6829ab01b5d22b8e.crt
  inflating: 6829ab01b5d22b8e.pem
~/certificates/login.hpnlab.net$ mv 6829ab01b5d22b8e.crt login-hpnlab-net.crt
~/certificates/login.hpnlab.net$ ls -lh
total 32K
-rw-rw-r-- 1 tyler tyler 2.3K Sep 11 07:57 6829ab01b5d22b8e.pem
-rw-rw-r-- 1 tyler tyler 4.7K Sep 11 07:57 gd_bundle-g2-g1.crt
```

```
-rw-rw-r-- 1 tyler tyler 2.3K Sep 11 07:57 login-hpnlab-net.crt
-rw-rw-r-- 1 tyler tyler 1001 Sep 11 09:02 login-hpnlab-net.csr
-rw----- 1 tyler tyler 1.9K Sep 11 09:01 login-hpnlab-net.key
-rw-rw-r-- 1 tyler tyler 6.6K Sep 11 10:41 login.hpnlab.net.zip
```

## Create a PFX (PKCS12) secure keychain

Use the OpenSSL command below to read the certificate files and encode them into a PFX file.

```
“ ~/certificates/login.hpnlab.net$ openssl pkcs12 -export -out login-hpnlab-net.pfx
-inkey login-hpnlab-net.key -in login-hpnlab-net.crt -certfile gd_bundle-g2-g1.crt
```

Let's break down what this command is doing

- The **green** text options tell OpenSSL we want to create a PFX (PKCS12) file.
- The **yellow** text options tell OpenSSL to read and import the Private Key into the PFX file.
- The **red** text options tell OpenSSL to read and import the signed certificate.
- The **orange** text options tell OpenSSL to read and import the Certificate Authority trust chain.

Once the command is executed you'll need to enter the password for the Private Key that we created earlier and you'll need to provide a new password to protect the PFX file. You can see that we now have a PFX file.

```
“
Enter pass phrase for login-hpnlab-net.key: <password for private key>
Enter Export Password: <new password for pfx file>
Verifying - Enter Export Password: <verify new password for pfx file>
tyler@dock-host-1:~/certificates/login.hpnlab.net$ ls -lh
total 40K
-rw-rw-r-- 1 tyler tyler 2.3K Sep 11 07:57 6829ab01b5d22b8e.pem
-rw-rw-r-- 1 tyler tyler 4.7K Sep 11 07:57 gd_bundle-g2-g1.crt
-rw-rw-r-- 1 tyler tyler 2.3K Sep 11 07:57 login-hpnlab-net.crt
-rw-rw-r-- 1 tyler tyler 1001 Sep 11 09:02 login-hpnlab-net.csr
-rw----- 1 tyler tyler 1.9K Sep 11 09:01 login-hpnlab-net.key
-rw----- 1 tyler tyler 6.9K Sep 11 11:06 login-hpnlab-net.pfx
-rw-rw-r-- 1 tyler tyler 6.6K Sep 11 10:41 login.hpnlab.net.zip
```