Installing docker in a lab environment: Step by Step

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Disclaimer: There are multiple ways of installing docker on Windows, and certanitely the most popular is using boot2docker but my personal preference was to install a linux virtual machine that runs the docker software inside. If you would like to follow the official installation instructions for docker on windows, just follow the instructions on this link: http://docs.docker.com/windows/started/

Please be aware that either route will modify the network configuration on your computer (add virtual network adapters and such) and I am not responsible for any changes made to your system ☺

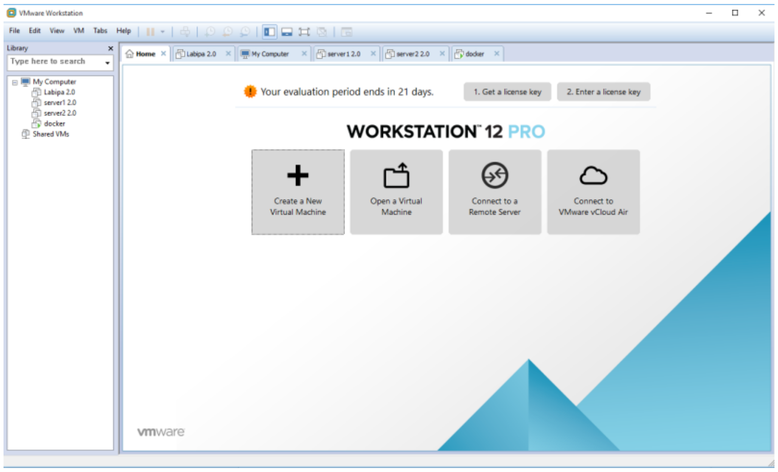
Pre-requisites:

1. Download and Install latest version of VMWare Workstation (version 12 as of this writing)
2. Download a copy of the Centos-7.x installation disk (ISO) (You can use Ubuntu or any other popular linux distro as well)
3. Putty for windows or another SSH client

Instructions:

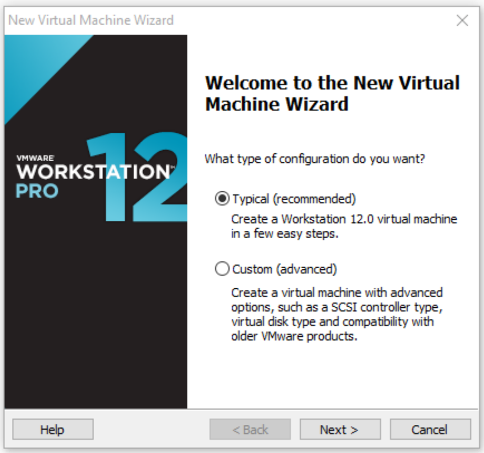
Note: For this tutorial, we will be using a 30 day evaluation license of VMWare workstation 12, but you can also use other free virtualization technologies like Virtual Box or Linux KVM. You can also dedicate a physical machine for docker and install something like RHEL atomic host, CoreOS or rancherOS which are Operating Systems specifically for docker containers.

1. Start the VMWare Workstation application by double clicking on your desktop icon. Once its launched you will see a screenshot similar to this one:



Your evaluation period ends in 21 days.

2. As soon as you click on the “+” icon labeled “Create New Virtual Machine” a wizard will pop-up. Select **Typical (recommended)** and click **Next**



New Virtual Machine Wizard

Welcome to the New Virtual Machine Wizard

What type of configuration do you want?

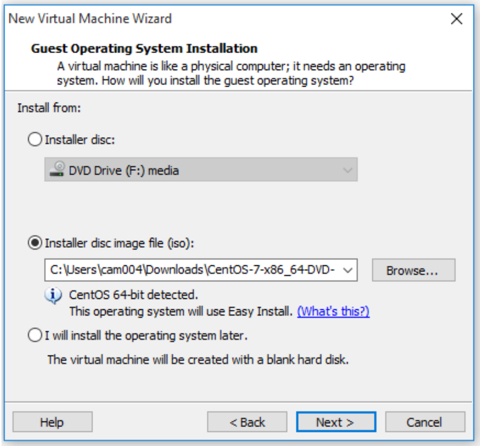
● Typical (recommended)

Create a Workstation 12.0 virtual machine in a few easy steps.

○ Custom (advanced)

Create a virtual machine with advanced options, such as a SCSI controller type, virtual disk type and compatibility with older VMware products.

3. In the next screen, please select **Installer dick image file (iso)** and click on the **Browse…** button and select the location for the Centos*.ISO image you downloaded., then click **Next >**



New Virtual Machine Wizard

Guest Operating System Installation

A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

○ Installer disc:

DVD Drive (F:) media

● Installer disc image file (iso):

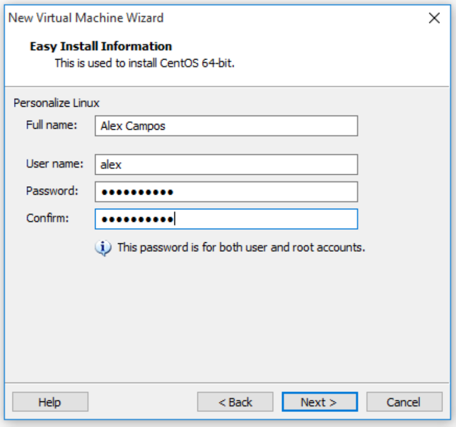
C:\Users\cam004\Downloads\CentOS-7-x86_64-DVD-

CentOS 64-bit detected.
This operating system will use Easy Install. (What's this?)

○ I will install the operating system later.

The virtual machine will be created with a blank hard disk.

4. You should now provide a default user account and credentials for both this account and the root administrator account (same password will be used for both accounts). Make sure you click **Next >** once you are done with this step.



New Virtual Machine Wizard

Easy Install Information

This is used to install CentOS 64-bit.

Personalize Linux

Full name: Alex Campos

User name: alex

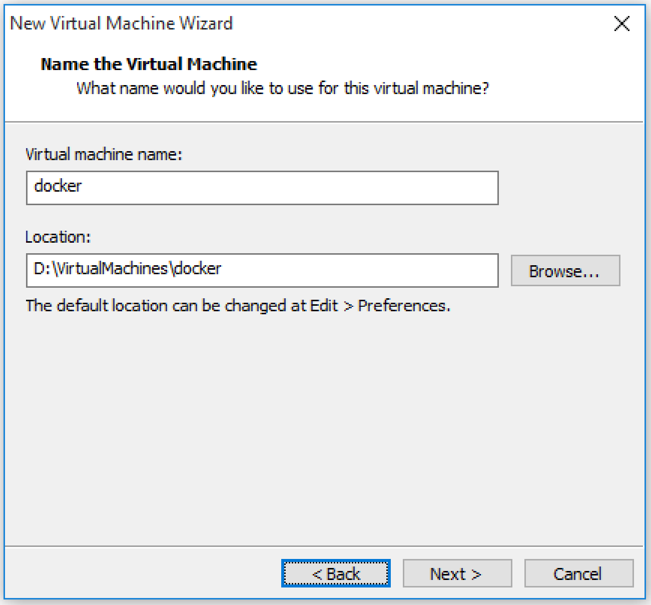
Password: ••••••••••

Confirm: ••••••••••

This password is for both user and root accounts.

5. On the next screen you are going to give the virtual machine a name. For this lab, I chosed docker but you can use whatever you want here. Pay attention to the **Location** of the Virtual

machine and make sure you choose a location that has enough available capacity (even though you are not going to use all of it right away, I still recommend you have at least 10-15GB of available disk storage per VM you decide to run)



New Virtual Machine Wizard

Name the Virtual Machine

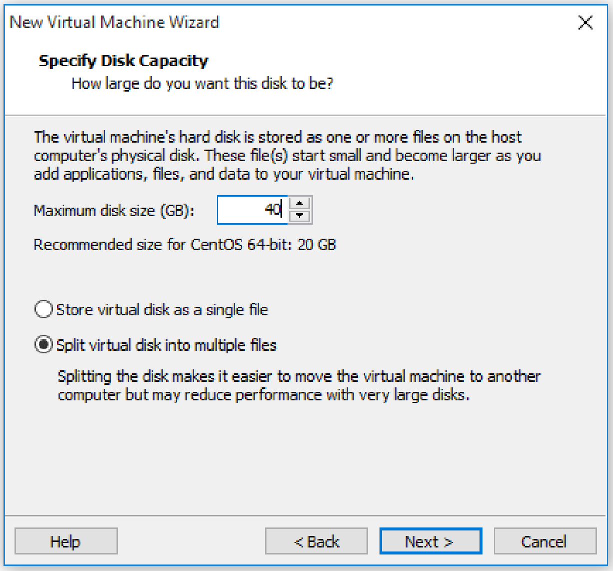
What name would you like to use for this virtual machine?

Virtual machine name: docker

Location: D:\VirtualMachines\docker

The default location can be changed at Edit > Preferences.

6. In the next screen, you are prompted for how storage you want to reserve for your Virtual Machine. If you are planning on moving your VM is easier to store the vhdk into multiple smaller files.



New Virtual Machine Wizard

Specify Disk Capacity

How large do you want this disk to be?

The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.

Maximum disk size (GB): 40

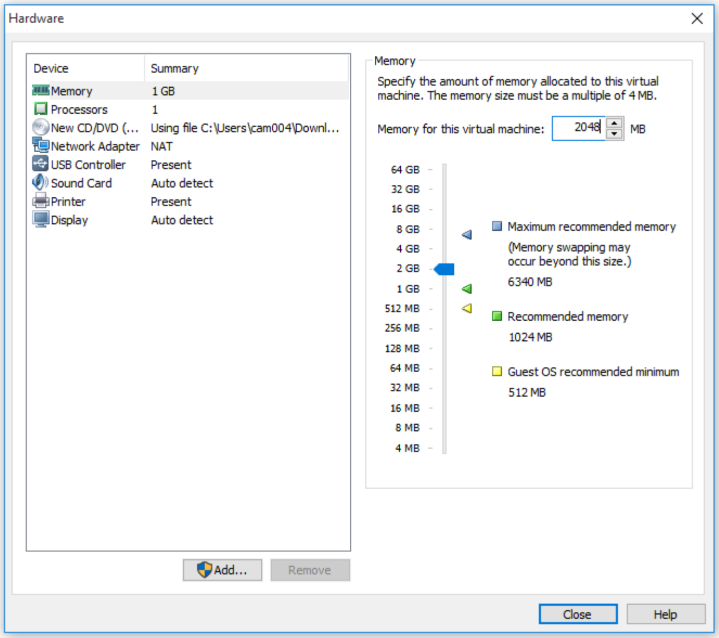
Recommended size for CentOS 64-bit: 20 GB

○ Store virtual disk as a single file

● Split virtual disk into multiple files

Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

7. Allocate as much memory as you think is necessary. I would recommend to at least give your VM 2 GB of ram.



Hardware

Device	Summary
Memory	1 GB
Processors	1
New CD/DVD (...	Using file C:\Users\cam004\Downl...
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Memory

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

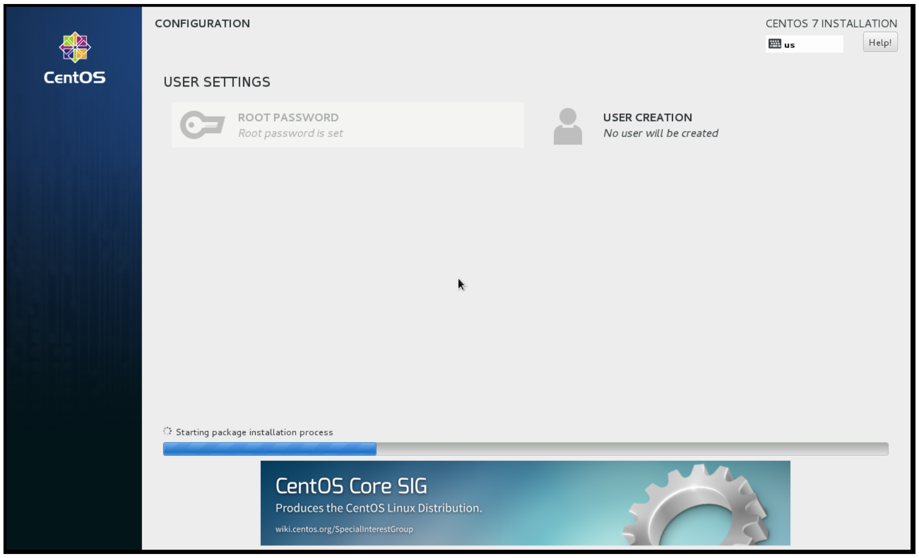
Memory for this virtual machine: 2048 MB

🟦 Maximum recommended memory
(Memory swapping may occur beyond this size.)
6340 MB

🟩 Recommended memory
1024 MB

🟨 Guest OS recommended minimum
512 MB

8. Wait for installation to finish



CONFIGURATION

CENTOS 7 INSTALLATION

us

Help!

USER SETTINGS

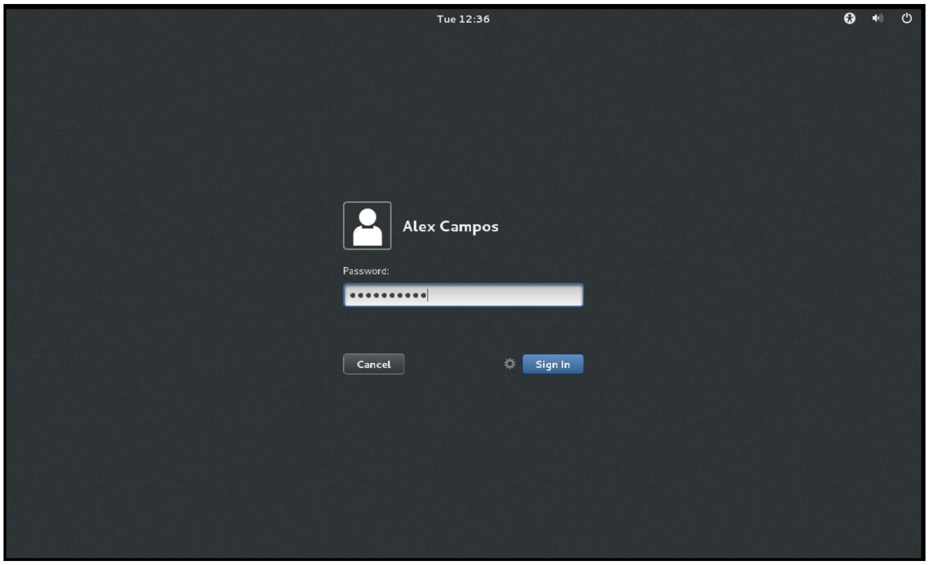
ROOT PASSWORD
Root password is set

USER CREATION
No user will be created

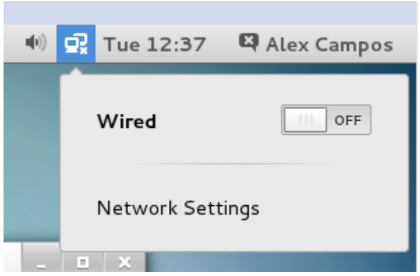
Starting package installation process

CentOS Core SIG
Produces the CentOS Linux Distribution.
wiki.centos.org/SpecialInterestGroup

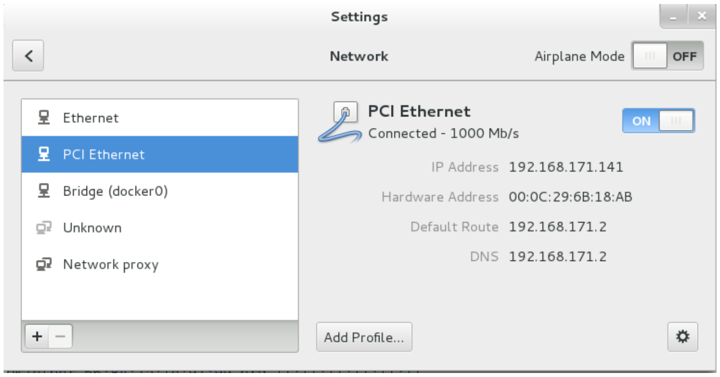
9. Once the OS is ready, login to the console and check the IP address, I recommend you download a tool such as putty to connect via SSH (we will be working command line anyway)



10. Click on the Network icon at the top menu bar and turn on the “**Wired**” connection and then click on “Network Settings” to find the IP address assigned to your system.



Wired OFF

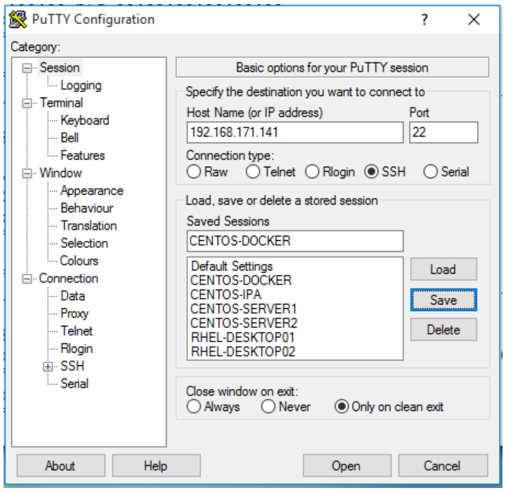


Airplane Mode OFF

PCI Ethernet
Connected - 1000 Mb/s
ON

IP Address 192.168.171.141
Hardware Address 00:0C:29:6B:18:AB
Default Route 192.168.171.2
DNS 192.168.171.2

11. Congratulations! Now you have a running Centos Virtual machine and are ready to connect via SSH using a client such as putty. In order to do this, just double click on the putty icon and enter the IP address of your new Virtual Machine:



Specify the destination you want to connect to

Host Name (or IP address): 192.168.171.141
Port: 22

Connection type:
○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

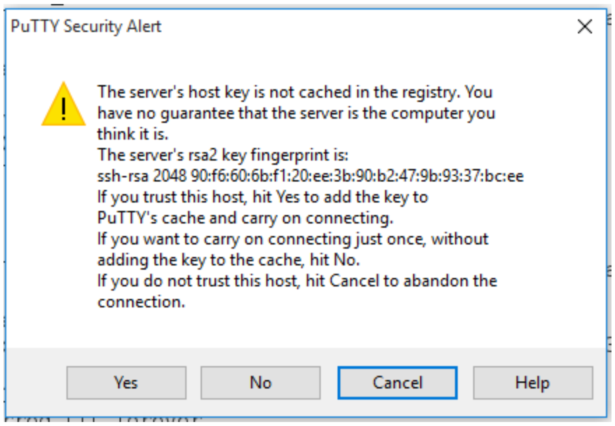
Load, save or delete a stored session

Saved Sessions: CENTOS-DOCKER

Default Settings
CENTOS-DOCKER
CENTOS-IPA
CENTOS-SERVER1
CENTOS-SERVER2
RHEL-DESKTOP01
RHEL-DESKTOP02

Close window on exit:
○ Always ○ Never ● Only on clean exit

12. If you get a security alert warning, is normal just click “Yes” to continue.

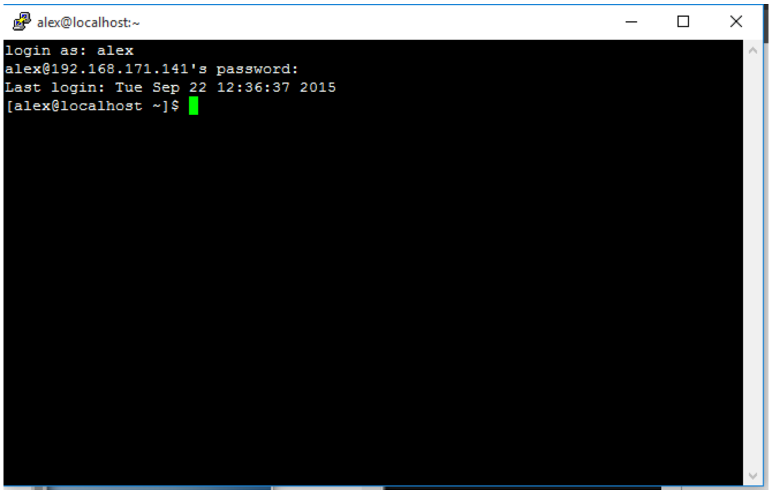


The server's host key is not cached in the registry. You have no guarantee that the server is the computer you think it is.
The server's rsa2 key fingerprint is:
ssh-rsa 2048 90:f6:60:6b:f1:20:ee:3b:90:b2:47:9b:93:37:bc:ee
If you trust this host, hit Yes to add the key to PuTTY's cache and carry on connecting.
If you want to carry on connecting just once, without adding the key to the cache, hit No.
If you do not trust this host, hit Cancel to abandon the connection.

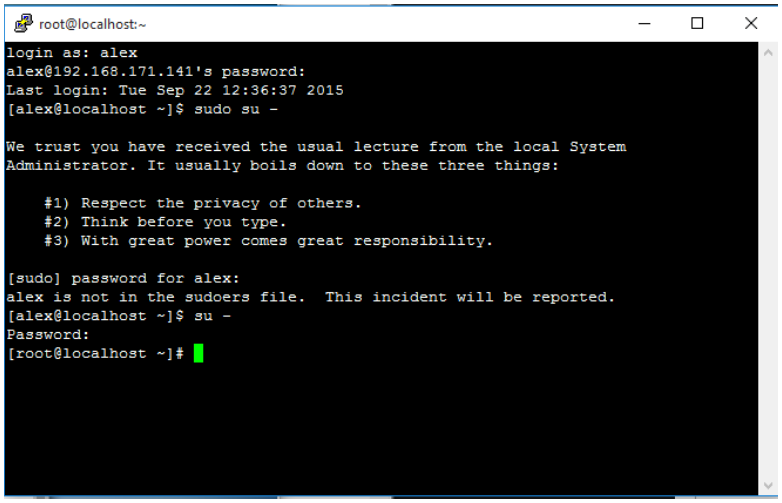
Post configuration and docker installation:

On the next few screens we proceed to configure the OS and install docker.

1. SSH to your new system and switch your account to root. Follow the screenshots as needed:



```
login as: alex
alex@192.168.171.141's password:
Last login: Tue Sep 22 12:36:37 2015
[alex@localhost ~]$
```



```
login as: alex
alex@192.168.171.141's password:
Last login: Tue Sep 22 12:36:37 2015
[alex@localhost ~]$ sudo su -

We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

    #1) Respect the privacy of others.
    #2) Think before you type.
    #3) With great power comes great responsibility.

[sudo] password for alex:
alex is not in the sudoers file.  This incident will be reported.
[alex@localhost ~]$ su -
Password:
[root@localhost ~]#
```

Note: If sudo doesn't work, try just su – root and then execute the following command:

```
#usermod –a –G wheel username_from_installation
#systemctl reboot
```

2. Configure a hostname using the following command:

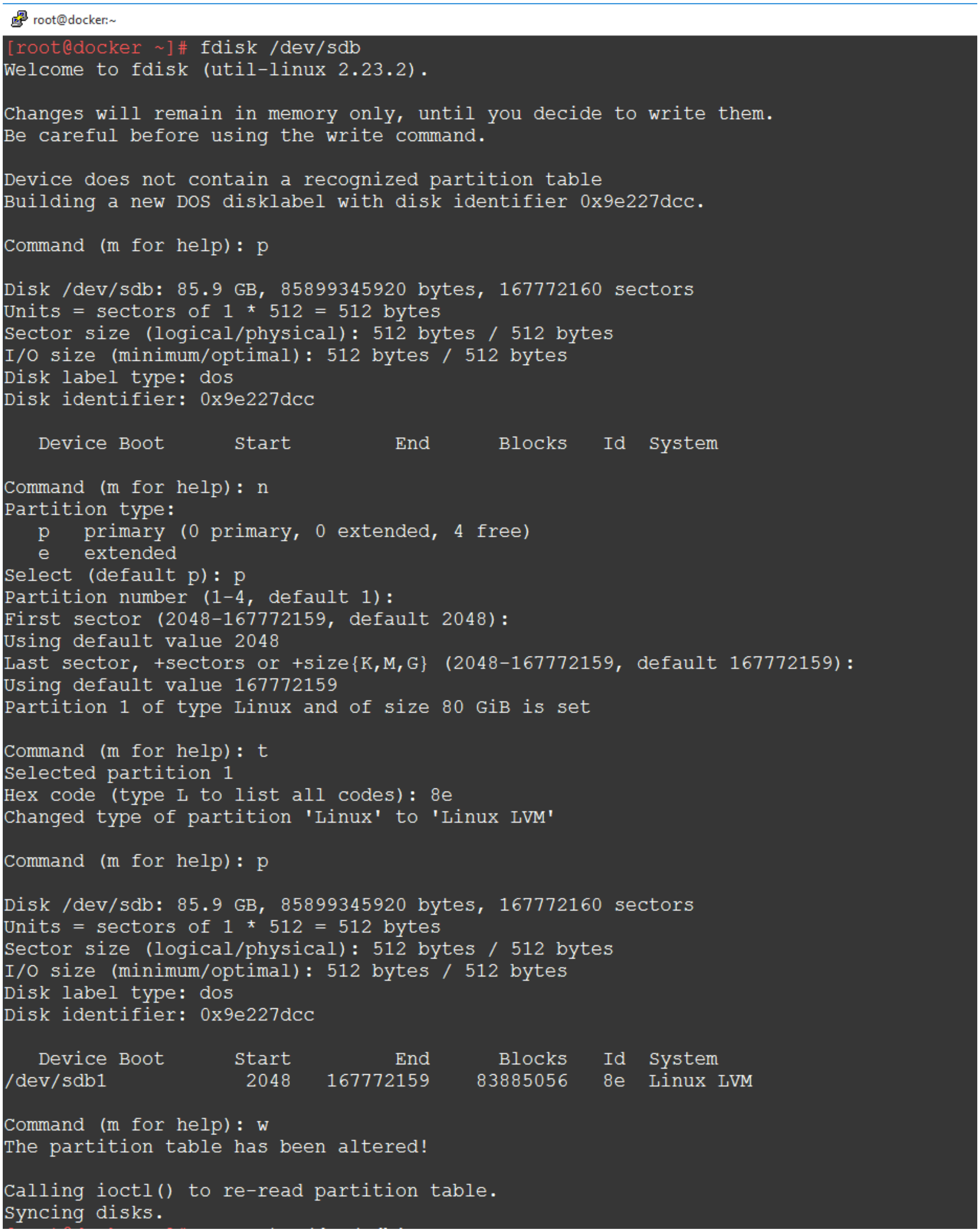
```
#hostnamectl set-hostname docker.example.com
```

3. Install security updates

```
#yum update -y
```

Optional: Setup a second disk for docker (Attach another drive to your VM and then from the terminal window execute the following command(s) – please follow the screenshot for reference:

[root@docker ~]# fdisk /dev/sdb

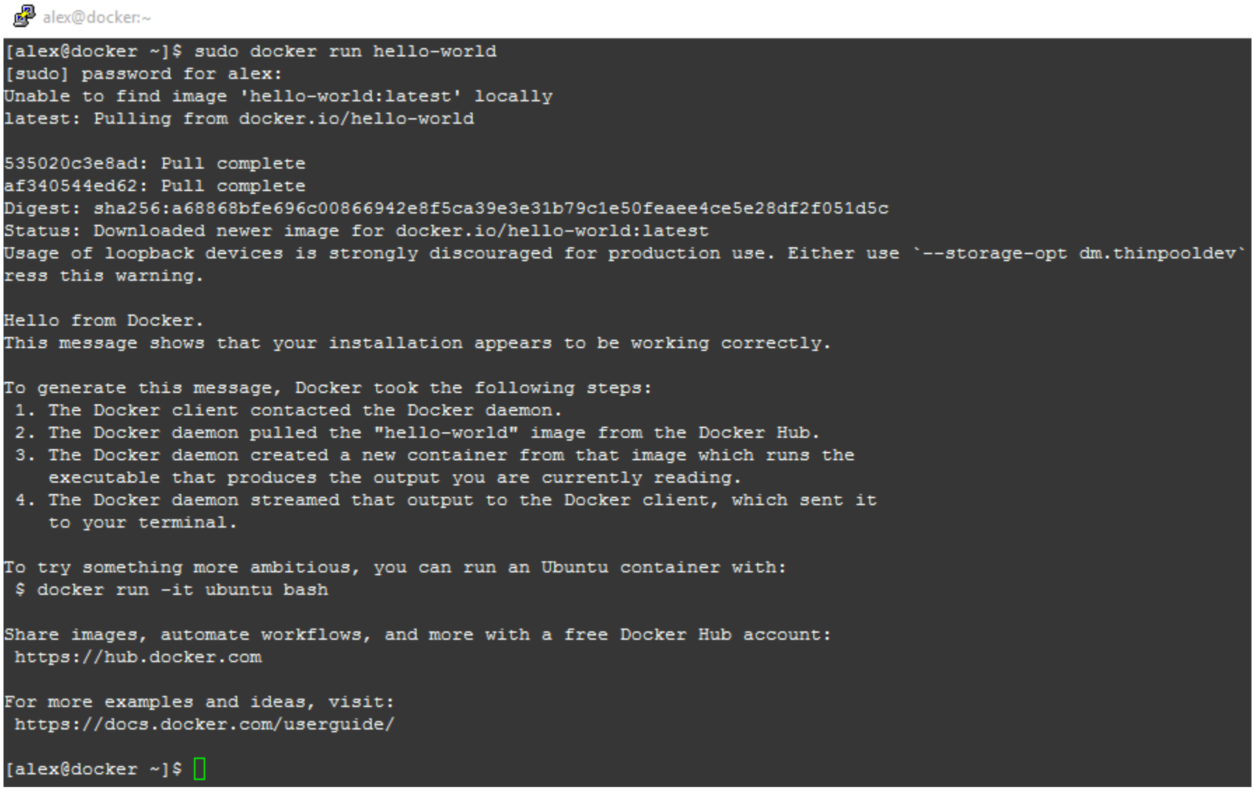


```
[root@docker ~]# fdisk /dev/sdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x9e227dcc.

Command (m for help): p

Disk /dev/sdb: 85.9 GB, 85899345920 bytes, 167772160 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 label type: dos
Disk identifier: 0x9e227dcc

   Device Boot      Start         End      Blocks   Id  System

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1):
First sector (2048-167772159, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-167772159, default 167772159):
Using default value 167772159
Partition 1 of type Linux and of size 80 GiB is set

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): 8e
Changed type of partition 'Linux' to 'Linux LVM'

Command (m for help): p

Disk /dev/sdb: 85.9 GB, 85899345920 bytes, 167772160 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 label type: dos
Disk identifier: 0x9e227dcc

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048   167772159    83885056   8e  Linux LVM

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

Commands to Install Docker, execute one at a time as root:

yum install docker –y
systemctl enable docker.service
groupadd docker
usermod –a –G docker username_created_during_install
systemctl start docker.service
docker run hello-world

If this works, that means that docker is working. You should reboot your system to make sure you are using the latest kernel (if updated on step 3) and that everything works. From now on, we don't need to use the root account unless there is a need for it.



```
[alex@docker ~]$ sudo docker run hello-world
[sudo] password for alex:
Unable to find image 'hello-world:latest' locally
latest: Pulling from docker.io/hello-world

535020c3e8ad: Pull complete
af340544ed62: Pull complete
Digest: sha256:a68868bfe696c00866942e8f5ca39e3e31b79c1e50feaee4ce5e28df2f051d5c
Status: Downloaded newer image for docker.io/hello-world:latest
Usage of loopback devices is strongly discouraged for production use. Either use `--storage-opt dm.thinpooldev`
ress this warning.

Hello from Docker.
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker Hub account:
 https://hub.docker.com

For more examples and ideas, visit:
 https://docs.docker.com/userguide/

[alex@docker ~]$
```

Additional notes: https://docs.docker.com/installation/centos/

Docker commands quick reference

Since you are going to be using Docker from the command line, I recommend you install bash-completion which is a package that will let you do some “tab” completion and get a list of available options as you type.

```
#sudo yum install bash-completion -y
```

docker commands:

As usual, to get a detail explanation of all the commands and the options, consult the man pages in this case:

```
#man docker
```

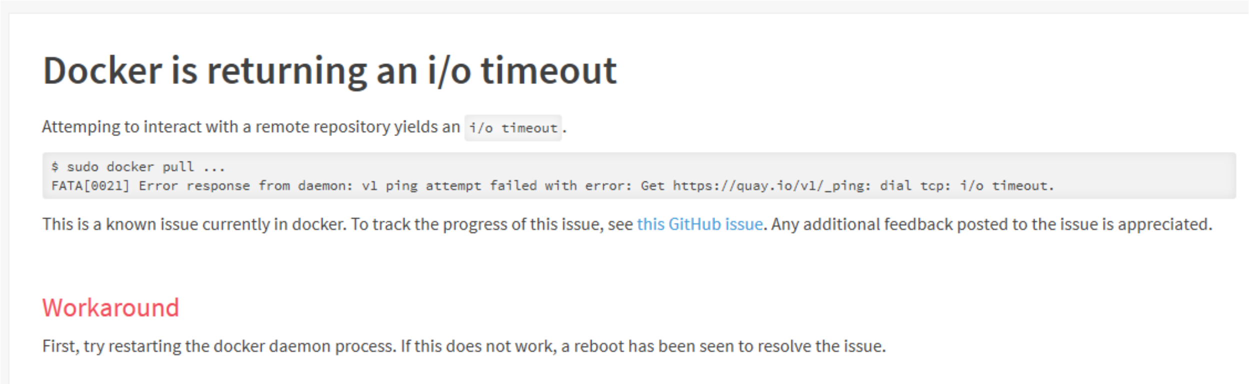
Command	Description
docker ps [OPTIONS]	Depending on the option chosen it can display all running containers and what process/CMD running inside that container or filter based on specific attributes (options)
docker images [OPTIONS] [REPOSITORY]	Show all images from default local repository or another specified repo. Remember an image contains everything you need to run an application inside an isolated process.

docker run [OPTIONS] IMAGE [COMMAND] [ARG...]	It will start a new process based on the specified image. This can be an interactive process (-it), a detached process which continues to run in the background (-d) and you can also use some options to do PNATing to the process (map a Host Port to a “docker local port”. Example(s)
	`#docker run -p 80 -d invisibleaxm/docker-example`
	`#docker run –it ubuntu /bin/bash`

docker build [OPTIONS] PATH | URL | -	Build a new image from the source code at PATH
docker login [OPTIONS] [SERVER]	Register or log in to a Docker registry server, if no server is specified "https://index.docker.io/v1/" is the default.
docker commit [OPTIONS] CONTAINER [REPOSITORY[:TAG]]	Create a new image from a container's changes
docker push [OPTIONS] NAME[:TAG]	Push an image or a repository to the registry
docker pull [OPTIONS] NAME[:TAG|@DIGEST]	Pull an image or a repository from the registry
docker tag [OPTIONS] IMAGE[:TAG] [REGISTRYHOST/][USERNAME/]NAME[:TAG]	Tag an image or list remote tags
docker rm [OPTIONS] CONTAINER [CONTAINER...]	Remove one or more containers
docker rmi [OPTIONS] IMAGE [IMAGE...]	Remove one or more images

Known bugs

- The first time I tried this at home on my windows 10 PC, I experienced some problems getting docker to work on it. I noticed that the official installation instructions only list versions of windows up to 8.1 so I decided to try setting it up in VMWare instead.
- When I tried to push my saved image into the docker hub, I got an error about i/o timeout. I found this work-around online (basically restart the docker daemon).



Docker is returning an i/o timeout

Attemping to interact with a remote repository yields an `i/o timeout`.

```
$ sudo docker pull ...
FATA[0021] Error response from daemon: v1 ping attempt failed with error: Get https://quay.io/v1/_ping: dial tcp: i/o timeout.
```

This is a known issue currently in docker. To track the progress of this issue, see this GitHub issue. Any additional feedback posted to the issue is appreciated.

Workaround

First, try restarting the docker daemon process. If this does not work, a reboot has been seen to resolve the issue.