Install Docker on Linux (Redhat or Centos)

To install Docker on an Amazon Linux instance

1. Launch an instance with the Amazon Linux AMI. For more information, see Launching an Instance in the*Amazon EC2 User Guide for Linux Instances*.
2. Connect to your instance. For more information, see Connect to Your Linux Instance in the *Amazon EC2 User Guide for Linux Instances*.
3. Update the installed packages and package cache on your instance.

```
[ec2-user ~]$ sudo yum update -y
```

4. Install Docker.

```
[ec2-user ~]$ sudo yum install -y docker
```

5. Start the Docker service.

```
[ec2-user ~]$ sudo service docker start
        Starting cgconfig service:                              [  OK  ]
Starting docker:                                        [  OK  ]
```

6. Add the `ec2-user` to the `docker` group so you can execute Docker commands without using `sudo`.

```
[ec2-user ~]$ sudo usermod -a -G docker ec2-user
```

7. Log out and log back in again to pick up the new `docker` group permissions.
8. Verify that the `ec2-user` can run Docker commands without `sudo`.

```
[ec2-user ~]$ docker info
Containers: 2
Images: 24
Storage Driver: devicemapper
 Pool Name: docker-202:1-263460-pool
 Pool Blocksize: 65.54 kB
 Data file: /var/lib/docker/devicemapper/devicemapper/data
 Metadata file: /var/lib/docker/devicemapper/devicemapper/metadata
 Data Space Used: 702.3 MB
 Data Space Total: 107.4 GB
 Metadata Space Used: 1.864 MB
 Metadata Space Total: 2.147 GB
 Library Version: 1.02.89-RHEL6 (2014-09-01)
Execution Driver: native-0.2
Kernel Version: 3.14.27-25.47.amzn1.x86_64
```

```
Operating System: Amazon Linux AMI 2014.09
```

Sign up for a Docker Hub Account

go to https://hub.docker.com and sign up

Docker Command Line

- Docker Command is used to manage the docker
- Docker command can be used to manage the local host or remote host by “docker –H host
- By default, the Docker command line stores its configuration files in a directory called .docker within your HOME directory. However, you can specify a different location via the DOCKER_CONFIG environment variable or the--config command line option.
- If both are specified, then the --config option overrides the DOCKER_CONFIG environment variable.

Run a Docker Container

- Run a container using Command “docker run”

docker run ubuntu /bin/**echo** 'Hello world‘

Hello world

- The docker run combination *runs* containers.
- Next we specified an image: ubuntu.
- This is the source of the container we ran.
- Docker calls this an image.
- In this case we used the Ubuntu operating system image.
- When you specify an image, Docker looks first for the image on your Docker host.
- If it can’t find it then it downloads the image from the public image registry: Docker Hub.
- Next we told Docker what command to run inside our new container:/bin/**echo** 'Hello world'

An interactive container

- You can get the console of the container by running a shell

```
docker run -t -i ubuntu /bin/bash

root@af8bae53bdd3:/#
```

-t flag assigns a pseudo-tty or terminal inside our new container and

the -i flag allows us to make an interactive connection by grabbing the standard in (STDIN) of the container.

```
root@af8bae53bdd3:/#

root@af8bae53bdd3:/# pwd /

root@af8bae53bdd3:/# ls

bin boot dev etc home lib lib64 media mnt opt proc root run sbin srv sys tmp
usr var

root@af8bae53bdd3:/# exit
```

A daemonized Hello world

```
$docker run -d ubuntu /bin/sh -c "while true; do echo hello world; sleep 1;
done“
```

- -d flag tells Docker to run the container and put it in the background, to daemonize it.
- The docker ps command queries the Docker daemon for information about all the containers it knows about.

```
$ docker ps

CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
1e5535038e28 ubuntu /bin/sh -c 'while tr 2 minutes ago Up 1 minute
insane_babbage

$ docker ps -a
```

To List all container including stopped one

Container Logs

The docker logs command looks inside the container and returns its standard output: in this case the output of our command hello world.

- $ docker logs insane_babbage

```
hello world

hello world

hello world

. . .
```

Stop a Docker Contianer

- The docker stop command tells Docker to politely stop the running container. If it succeeds it will return the name of the container it has just stopped.

$ docker **stop** insane_babbage

```
$ docker ps

CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
```

Run a Web Server in a Container using Nginx

- Create a Website Directory to host

```
$mkdir -p ~/docker-nginx/html

$cd ~/docker-nginx/html

$echo “My Docker Website”> index.html
```

- Start the web server container

```
sudo docker run --name docker-nginx -p 80:80 -d -v ~/docker-
nginx/html:/usr/share/nginx/html nginx
```

- -v specifies that we're linking a volume
- -p denotes which port the host will listen and which port container will listen
- the part to the left of the : is the location of our file/directory on our virtual machine (~/docker-nginx/html)
- the part to the right of the : is the location that we are linking to in our container (/usr/share/nginx/html)
- Verify
- Open Browser in your machine and http://public IP or hostname

Working with Images

- Docker images will list the images you have locally on our host.

```
$ docker images

REPOSITORY TAG IMAGE ID CREATED SIZE

ubuntu 14.04 1d073211c498 3 days ago 187.9 MB

busybox latest 2c5ac3f849df 5 days ago 1.113 MB

training/webapp latest 54bb4e8718e8 5 months ago
```

- A repository potentially holds multiple variants of an image. In the case of ourubuntu image you can see multiple variants covering Ubuntu 10.04, 12.04, 12.10, 13.04, 13.10 and 14.04
- Tag is represt by name:tag (ubuntu:12:04)

$ docker **run** -t -i ubuntu:12.04 /bin/bash

- Docker pull pulls the image from Repository
- By default it pulls from docker hub
- You can specify your own registry as well

```
$ docker pull centos

Pulling repository centos

b7de3133ff98: Pulling dependent layers
```

```
5cc9e91966f7: Pulling fs layer

511136ea3c5a: Download complete

ef52fb1fe610: Download complete . . .

Status: Downloaded newer image for centos
```

- Docker Search to search in the repository
- In Docker hub

Searching images in registry

```
$docker login

$docker search sinatra

NAME DESCRIPTION STARS OFFICIAL AUTOMATED

training/sinatra Sinatra training image 0 [OK]

marceldegraaf/sinatra Sinatra test app 0
```

Pulling our image

- Docker pull to pull images
- In Docker hub

```
$docker pull training/sinatra
```

Building a sample app

To create a Docker image of a PHP web application

1. Install **git** and use it to clone the simple PHP application from your GitHub repository onto your system.
   a. Install git.

   ```
   [ec2-user ~]$ sudo yum install -y git
   ```

   b. Clone the simple PHP application onto your system.

   ```
   [ec2-user ~]$ git clone https://github.com/awslabs/ecs-demo-php-
   simple-app
   ```

2. Change directories to the `ecs-demo-php-simple-app` folder.

```
[ec2-user ~]$ cd ecs-demo-php-simple-app
```

3. Examine the Dockerfile in this folder. A Dockerfile is a manifest that describes the base image to use for your Docker image and what you want installed and running on it. For more information about Dockerfiles, go to theDockerfile Reference.

```
[ec2-user ecs-demo-php-simple-app]$ cat Dockerfile
FROM ubuntu:12.04

# Install dependencies
RUN apt-get update -y
RUN apt-get install -y git curl apache2 php5 libapache2-mod-php5 php5-
mcrypt php5-mysql

# Install app
RUN rm -rf /var/www/*
ADD src /var/www

# Configure apache
RUN a2enmod rewrite
RUN chown -R www-data:www-data /var/www
ENV APACHE_RUN_USER www-data
ENV APACHE_RUN_GROUP www-data
```

```
ENV APACHE_LOG_DIR /var/log/apache2

EXPOSE 80
CMD ["/usr/sbin/apache2", "-D",  "FOREGROUND"]
```

This Dockerfile uses the Ubuntu 12.04 image. The `RUN` instructions update the package caches, install some software packages for the web server and PHP support, and then add your PHP application to the web server's document root. The `EXPOSE` instruction exposes port 80 on the container, and the `CMD` instruction starts the web server.

4. Build the Docker image from your Dockerfile. Substitute *`my-dockerhub-username`* with your Docker Hub user name.

   ```
   [ec2-user ecs-demo-php-simple-app]$ docker build -t my-dockerhub-
   username/amazon-ecs-sample .
   ```

5. Run **docker images** to verify that the image was created correctly and that the image name contains a repository that you can push to (in this example, your Docker Hub user name).

```
[ec2-user ecs-demo-php-simple-app]$ docker images
REPOSITORY                                  TAG                 IMAGE ID
CREATED             VIRTUAL SIZE
my-dockerhub-username/amazon-ecs-sample     latest              43c52559a0a1
12 minutes ago      258.1 MB
ubuntu                                      12.04               78cef618c77e
3 weeks ago         133.7 MB
```

6. Run the newly built image. The `-p 80:80` option maps the exposed port 80 on the container to port 80 on the host system. For more information about **docker run**, go to the Docker run reference.

```
7. [ec2-user ecs-demo-php-simple-app]$ docker run -p 80:80 my-dockerhub-
   username/amazon-ecs-sample
```

   ```
   apache2: Could not reliably determine the server's fully qualified
   domain name, using 172.17.0.2 for ServerName
   ```

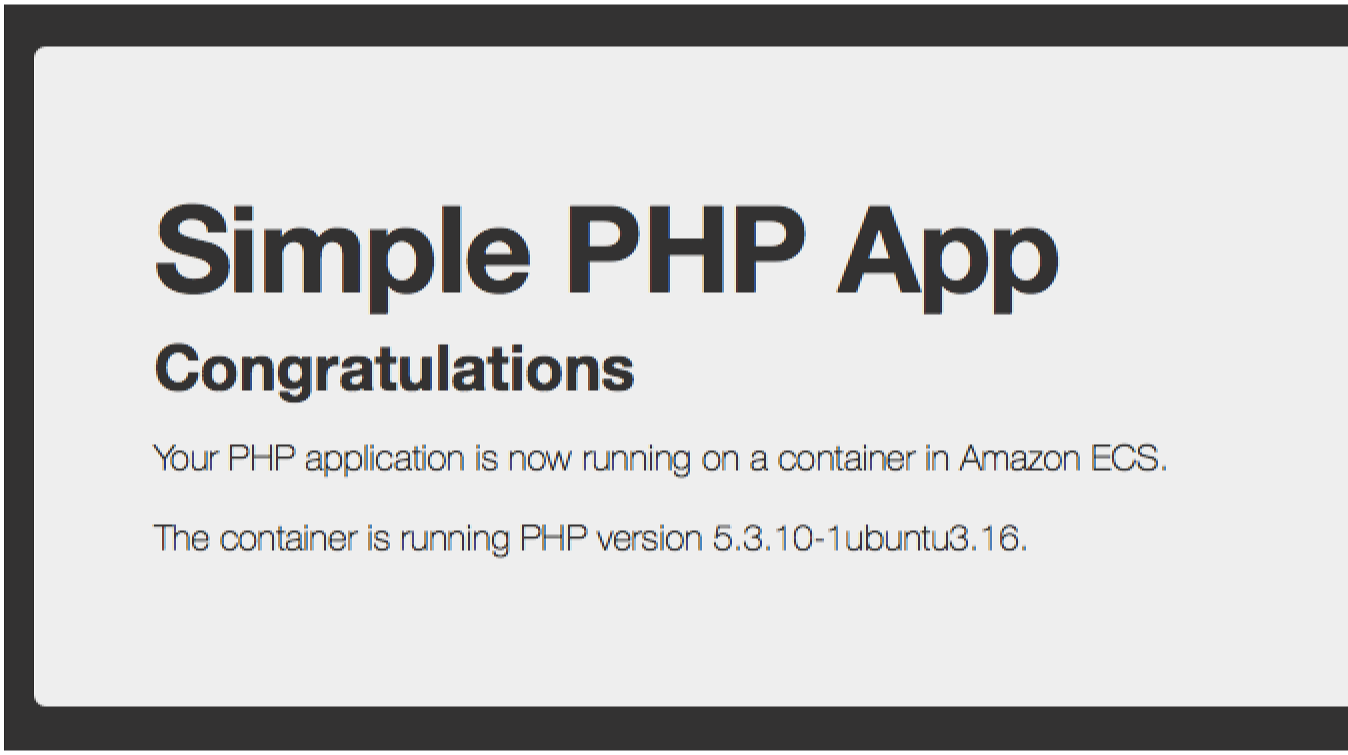
   Note

   Output from the Apache web server is displayed in the terminal window. You can ignore the "`Could not reliably determine the server's fully qualified domain name`" message.

8. Open a browser and point to the server that is running Docker and hosting your container.
    - If you are using an EC2 instance, this is the **Public DNS** value for the server, which is the same address you use to connect to the instance with SSH. Make sure that the security group for your instance allows inbound traffic on port 80.
    - If you are running Docker locally on a Linux computer, point your browser to http://localhost/.
    - If you are using **boot2docker** on a Windows or Mac computer, find the IP address of the VirtualBox VM that is hosting Docker with the **boot2docker ip** command.

    -
      ```
      $ boot2docker ip
      ```
      ```
      192.168.59.103
      ```
    - If you are using **docker-machine** on a Windows or Mac computer, find the IP address of the VirtualBox VM that is hosting Docker with the **docker-machine ip** command, substituting `machine-name` with the name of the docker machine you are using.

    -
      ```
      $ docker-machine ip machine-name
      ```
      ```
      192.168.59.103
      ```
9. You should see a web page running the simple PHP app.



Simple PHP App

Congratulations

Your PHP application is now running on a container in Amazon ECS.

The container is running PHP version 5.3.10-1ubuntu3.16.

10. Stop the Docker container by typing **Ctrl**+**c**.

Java Hello World for Docker

In this example, we are going to run the typical Java Hello World example in docker. We shall use *Maven* to setup a new project for Hello word example. The contents of our maven project descriptor should be as follows:

pom.xml

```
<project xmlns="http://maven.apache.org/POM/4.0.0"xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

 xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">

<modelVersion>4.0.0</modelVersion>

<groupId>com.javacodegeeks</groupId>

<artifactId>helloworld</artifactId>

<version>1.0</version>

</project>
```

Now, add a Java class into the source folder (**src/main/java** directory) with the following code.

HelloWorld.java

```
public class HelloWorld {

  public static void main(String[] args) throws Exception{

    System.out.println("Hello World");

  }

}
```

After that, create a file called *Dockerfile* into the root directory of the project and copy the following contents.

Dockerfile

```
FROM ubuntu:14.04

MAINTAINER javacodegeeks
```

```
RUN apt-get update && apt-get install -y python-software-properties software-
properties-common

RUN add-apt-repository ppa:webupd8team/java



RUN echo "oracle-java8-installer shared/accepted-oracle-license-v1-1 boolean
true" | debconf-set-selections



RUN apt-get update && apt-get install -y oracle-java8-installer maven



ADD . /usr/local/helloworld

RUN cd /usr/local/helloworld && mvn install

CMD ["java", "-cp", "/usr/local/helloworld/target/helloworld-
1.0.jar", "HelloWorld"]
```

4. Running the example

Now, we are going to build the Docker image. Open a prompt and go to the directory where the Dockerfile is located. Now, you just need to execute the following command:

Docker build command

```
docker build -t javacodegeeks/helloworld:1.0 .
```

Once the command ends, the last line should be similar to this one:

Docker build output

```
Successfully built 29336bbbfa5c
```

At this moment, Docker has created an image called **javacodegeeks/helloworld:1.0**. Now, let’s create and start a container for this image with the `docker run` command.

Docker run command

```
docker run --name helloworldcontainer javacodegeeks/helloworld:1.0

HelloWorld
```

BUILDING A MULTI-NODE CLUSTER USING THE DEFAULT PORTS

The following TCP port are used by Galera:

- 3306-MySQL port
- 4567-Galera Cluster
- 4568-IST port
- 4444-SST port

Before we start, we need to stop enforcing AppArmor for Docker:

```
$ aa-complain /etc/apparmor.d/docker
```

Building a multi-node cluster using the default ports is not complicated. Besides mapping the ports 1:1, we also need to set `–wsrep-node-address` to the IP address of the host.

We assume following 3 nodes

- nodea 10.10.10.10
- nodeb 10.10.10.11
- nodec 10.10.10.12

A simple cluster setup would look like this:

```
nodea$ docker run -d -p 3306:3306 -p 4567:4567 -p 4444:4444 -p
4568:4568 --name nodea erkules/galera:basic  --wsrep-cluster-
address=gcomm:// --wsrep-node-address=10.10.10.10


nodeb$ docker run -d -p 3306:3306 -p 4567:4567 -p 4444:4444 -p
4568:4568 --name nodeb erkules/galera:basic --wsrep-cluster-
address=gcomm://10.10.10.10 --wsrep-node-address=10.10.10.11


nodec$ docker run -d -p 3306:3306 -p 4567:4567 -p 4444:4444 -p
4568:4568 --name nodec erkules/galera:basic --wsrep-cluster-
address=gcomm://10.10.10.10 --wsrep-node-address=10.10.10.12
```

```
nodea$ docker exec -t nodea mysql -e 'show status like
"wsrep_cluster_size"'

+--------------------+-------+

| Variable_name      | Value |

+--------------------+-------+

| wsrep_cluster_size |     3 |

+--------------------+-------+
```

Installation in Windows

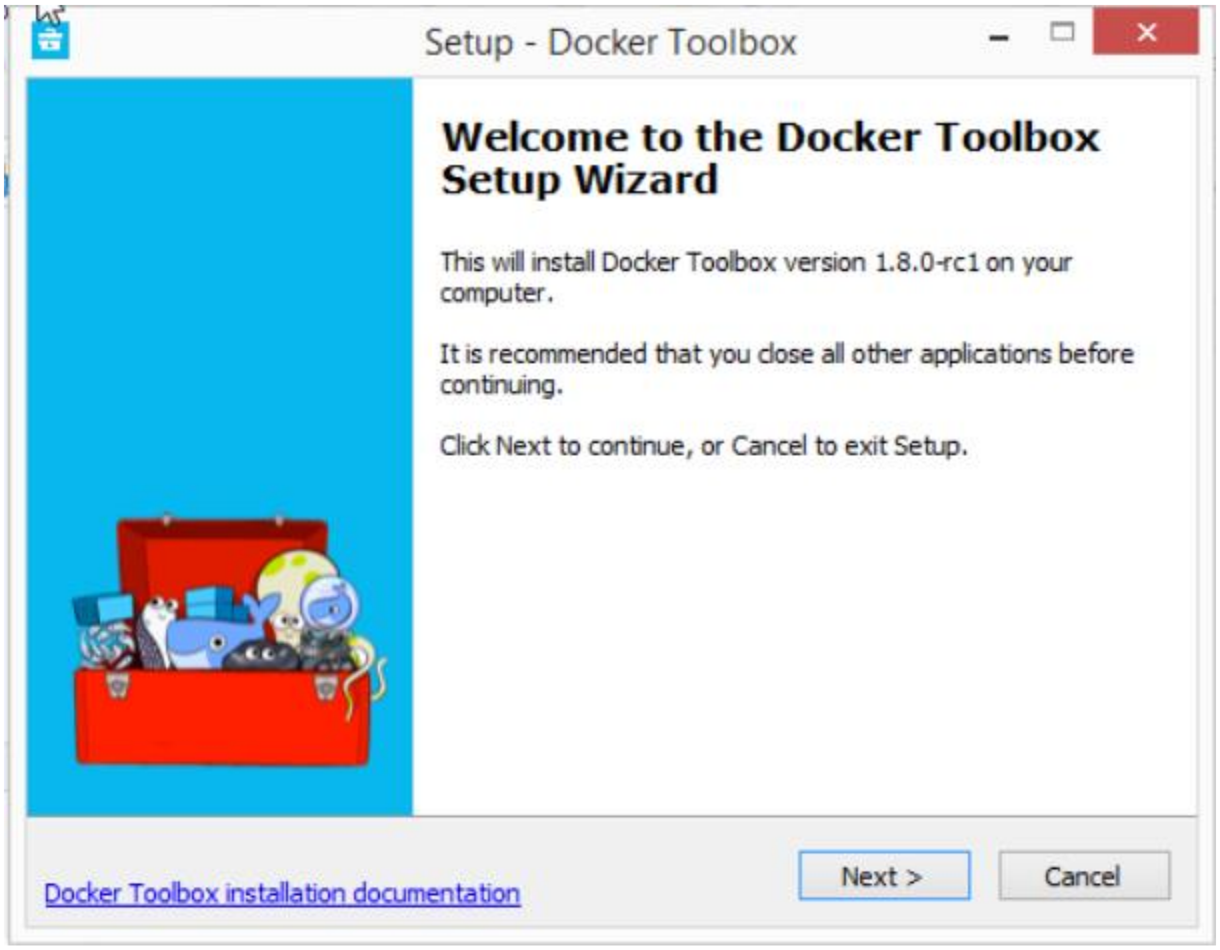
If you have VirtualBox running, you must shut it down before running the installer.

1. Download the Docker tool box from the below URL

   https://www.docker.com/products/docker-toolbox

2. Click the installer link to download.
3. Install Docker Toolbox by double-clicking the installer.

   The installer launches the “Setup - Docker Toolbox” dialog.



Welcome to the Docker Toolbox Setup Wizard

This will install Docker Toolbox version 1.8.0-rc1 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

4. Press “Next” to install the toolbox.

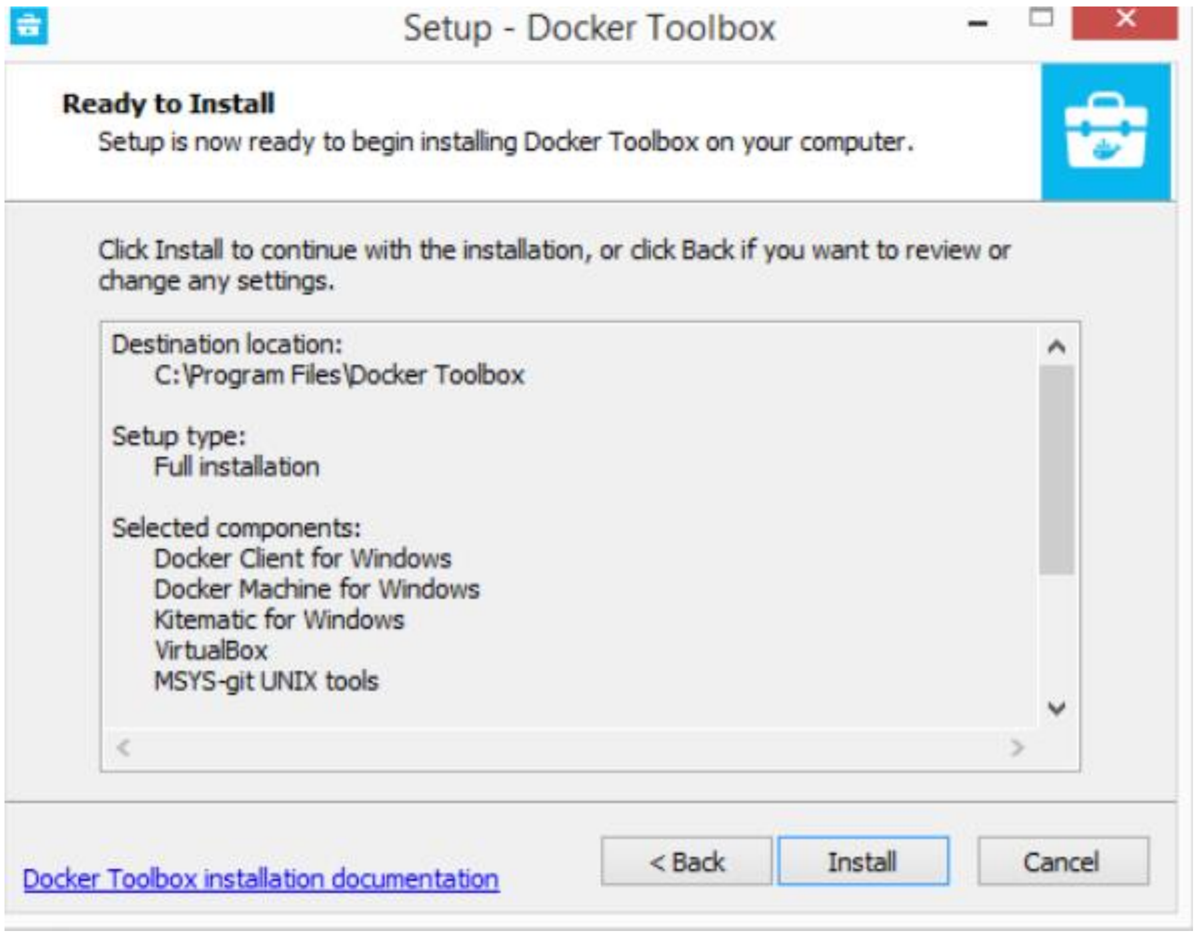
   The installer presents you with options to customize the standard installation. By default, the standard Docker Toolbox installation:

   - installs executables for the Docker tools in `C:\Program Files\Docker Toolbox`
   - install VirtualBox; or updates any existing installation
   - adds a Docker Inc. folder to your program shortcuts
   - updates your `PATH` environment variable
   - adds desktop icons for the Docker Quickstart Terminal and Kitematic

   This installation assumes the defaults are acceptable.

5. Press “Next” until you reach the “Ready to Install” page.

   The system prompts you for your password.



Ready to Install

Setup is now ready to begin installing Docker Toolbox on your computer.

Click Install to continue with the installation, or click Back if you want to review or change any settings.

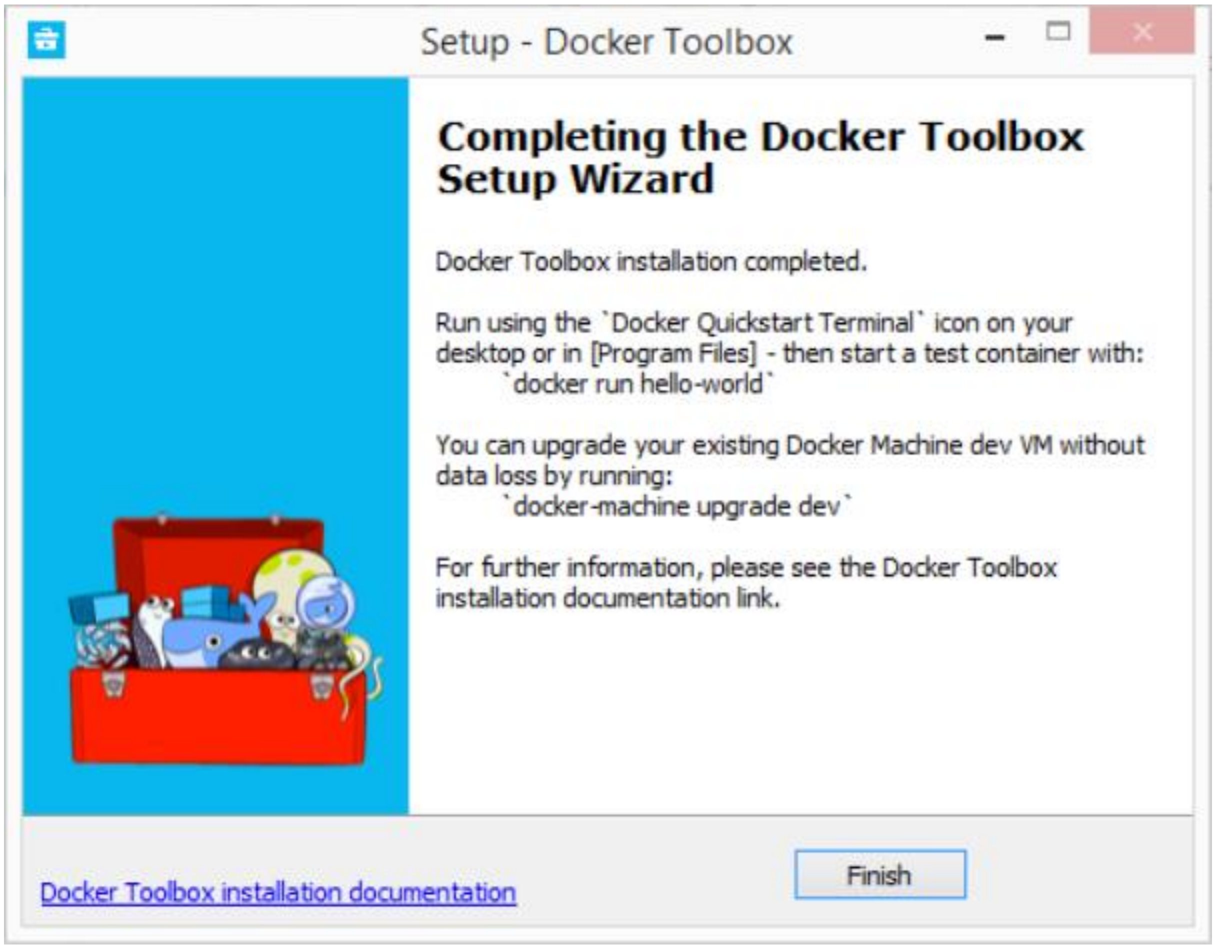
```
Destination location:
    C:\Program Files\Docker Toolbox

Setup type:
    Full installation

Selected components:
    Docker Client for Windows
    Docker Machine for Windows
    Kitematic for Windows
    VirtualBox
    MSYS-git UNIX tools
```

6. Press “Install” to continue with the installation.

   When it completes, the installer provides you with some information you can use to complete some common tasks.



Completing the Docker Toolbox Setup Wizard

Docker Toolbox installation completed.

Run using the `Docker Quickstart Terminal` icon on your desktop or in [Program Files] - then start a test container with:
`docker run hello-world`

You can upgrade your existing Docker Machine dev VM without data loss by running:
`docker-machine upgrade dev`

For further information, please see the Docker Toolbox installation documentation link.

7. Press "Finish" to exit.

Running a Docker Container

To run a Docker container, you:

- create a new (or start an existing) Docker virtual machine
- switch your environment to your new VM
- use the `docker` client to create, load, and manage containers

Once you create a machine, you can reuse it as often as you like. Like any VirtualBox VM, it maintains its configuration between uses.

There are several ways to use the installed tools, from the Docker Quickstart Terminal or from your shell.

Using the Docker Quickstart Terminal

1. Find the Docker Quickstart Terminal icon on your Desktop and double-click to launch it.

   The application:

   - opens a terminal window
   - creates a `default` VM if it doesn't exist, and starts the VM after
   - points the terminal environment to this VM

   Once the launch completes, you can run `docker` commands.

2. Verify your setup succeeded by running the `hello-world` container.

```
$ docker run hello-world
Unable to find image 'hello-world:latest' locally
511136ea3c5a: Pull complete
31cbccb51277: Pull complete
e45a5af57b00: Pull complete
hello-world:latest: The image you are pulling has been verified.
Important: image verification is a tech preview feature and should not
be
relied on to provide security.
Status: Downloaded newer image for hello-world:latest
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.
```

```
   (Assuming it was not already locally available.)

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


For more examples and ideas, visit:

http://docs.docker.com/userguide/
```

Using Docker from Windows Command Prompt (cmd.exe)

Launch a Windows Command Prompt (cmd.exe).

> The `docker-machine` command requires `ssh.exe` in your `PATH`environment variable. This `.exe` is in the MsysGit `bin` folder.

Add this to the `%PATH%` environment variable by running:

```
set PATH=%PATH%;"c:\Program Files (x86)\Git\bin"
```

Create a new Docker VM.

```
docker-machine create --driver virtualbox my-default

Creating VirtualBox VM...

Creating SSH key...

Starting VirtualBox VM...

Starting VM...
```

```
To see how to connect Docker to this machine, run: docker-machine env

my-default
```

The command also creates a machine configuration in the`C:\USERS\USERNAME\.docker\machine\machines` directory. You only need to run the `create` command once. Then, you can use`docker-machine` to start, stop, query, and otherwise manage the VM from the command line.

- List your available machines.

```
C:\Users\mary> docker-machine ls

NAME                ACTIVE   DRIVER       STATE     URL

SWARM

my-default          *        virtualbox   Running

tcp://192.168.99.101:2376
```

If you have previously installed the deprecated Boot2Docker application or run the Docker Quickstart Terminal, you may have a `dev` VM as well.

- Get the environment commands for your new VM.

```
C:\Users\mary> docker-machine env --shell cmd my-default
```

- Connect your shell to the `my-default` machine.

```
C:\Users\mary> eval "$(docker-machine env my-default)"
```

- Run the `hello-world` container to verify your setup.

```
C:\Users\mary> docker run hello-world
```

Using Docker from PowerShell

1. Launch a Windows PowerShell window.
2. Add `ssh.exe` to your PATH:

```
PS C:\Users\mary> $Env:Path = "${Env:Path};c:\Program Files

(x86)\Git\bin"
```

3. Create a new Docker VM.

```
PS C:\Users\mary> docker-machine create --driver virtualbox my-default
```

4. List your available machines.

```
C:\Users\mary> docker-machine ls

NAME                    ACTIVE    DRIVER        STATE      URL

SWARM

my-default          *         virtualbox    Running

tcp://192.168.99.101:2376
```

5. Get the environment commands for your new VM.

```
C:\Users\mary> docker-machine env --shell powershell my-default
```

6. Connect your shell to the `my-default` machine.

```
C:\Users\mary> eval "$(docker-machine env my-default)"
```

7. Run the `hello-world` container to verify your setup.

```
C:\Users\mary> docker run hello-world
```