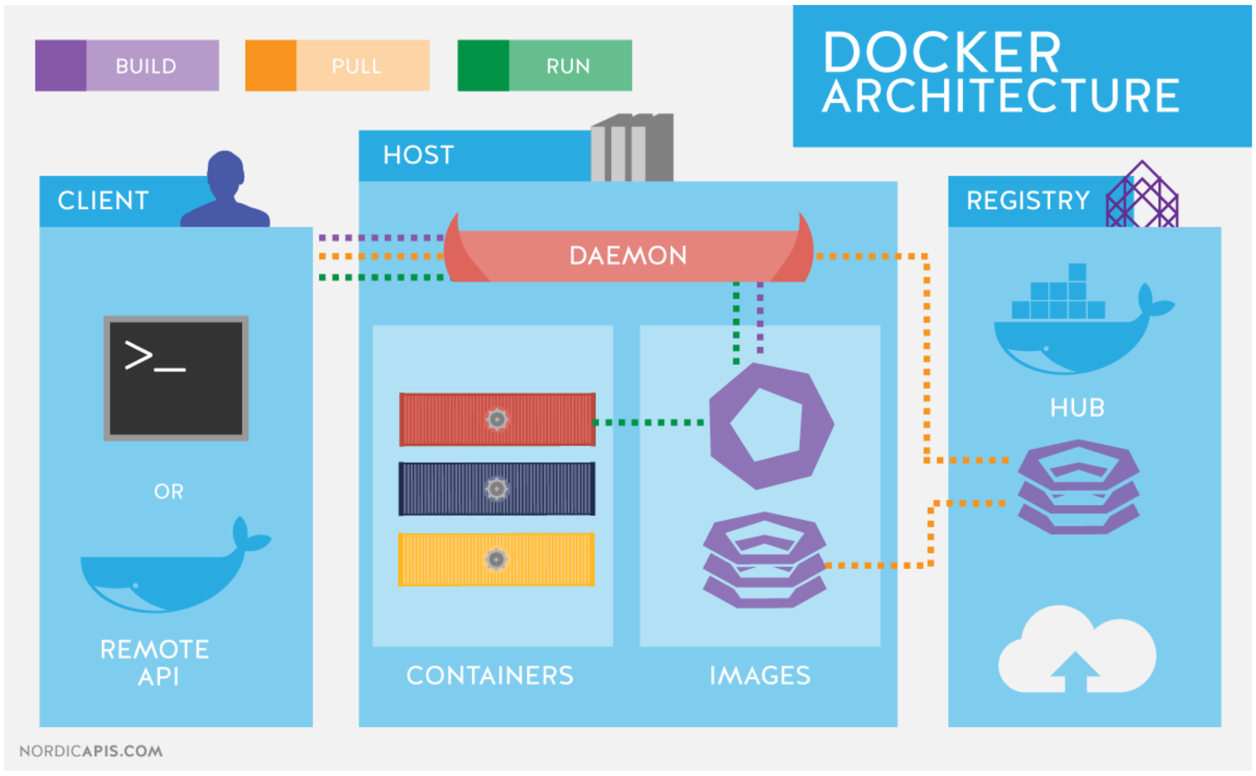
Docker Cheat Sheet

Introduction

Containers allow the packaging of your application (and everything that you need to run it) in a "container image". Inside a container you can include a base operational-system, libraries, files and folders, environment variables, volumes mount-points, and the application binaries.

A "container image" is a template for the execution of a container --- It means that you can have multiple containers running from the same image, all sharing the same behavior, which promotes the scaling and distribution of the application. These images can be stored in a remote registry to ease the distribution.

Once a container is created, the execution is managed by the "Docker Engine" aka "Docker Daemon". You can interact with the the Docker Engine through the "docker" command. These three primary components of Docker (client, engine and registry) are diagramed below:



Docker Engine

Container related commands

docker [CMD] [OPTS] CONTAINER

Examples:

All examples provided here work in RHEL

1. Run a container in interactive mode:

```
$ docker run -it rhel7/rhel bash                # Run a bash shell inside an image
[root@... /]#cat /etc/redhat-release            # Check the release inside container
```

2. Run a container in detached mode:

```
$ docker run --name mywildfly -d -p 8080:8080 jboss/wildfly
```

3. Run a detached container in a previously created docker network:

```
$ docker network create mynetwork
$ docker run --name mywildfly-net  -d --net mynetwork -p 8080:8080 jboss/wildfly
```

4. Run a detached container mounting a local folder inside the container:

```
$ docker run --name mywildfly-volume  -d \
        -v myfolder/:/opt/jboss/wildfly/standalone/deployments/ \
        -p 8080:8080 jboss/wildfly
```

5. Follow the logs of a specific container

```
$ docker logs -f mywildfly
$ docker logs -f <container-name>
```

6. List containers

```
$ docker ps                 # List only active containers
$ docker ps -a              # List all containers
```

7. Stop a container

```
$ docker stop <container-name>          # Stop a container
$ docker stop -t 1 <container-name>     # Stop a container (timeout = 1 second)
```

8. Remove a container

```
$ docker rm <container-name>       # Remove a stopped container
$ docker rm -f <container-name>       # Remove a stopped container. Force stop if it is active
$ docker rm -f $(docker ps -aq)       # Remove all containers
$ docker rm $(docker ps -q -f "status=exited”) # Remove all stopped containers
```

9. Execute a new process in an existing container

```
$ docker exec -it mywildfly bash      # Executes and access bash inside a WildFly container
$ docker exec -it <container-name> <process>
```

daemon	Run the persistent process that manages containers
attach	Attach a running container to view its ongoing output or to control it interactively
commit	Create a new image from a container’s changes
cp	Copy files/folders between a container and the local filesystem
create	Create a new container
diff	Inspect changes on a container’s filesystem
exec	Run a command in a running container
export	Export the contents of a container’s filesystem as a ‘.tar’ archive
kill	Kill a running container using SIGKILL or a specified signal
logs	Fetch the logs of a container
pause	Pause all processes within a container
port	List port-mappings, or lookup the public-facing port that is NAT-ed to the PRIVATE_PORT
ps	List all containers
rename	Rename a container
restart	Restart a container
rm	Remove/delete one or more containers
run	Run a command in a new container
start	Start one or more containers
stop	Stop a container by sending SIGTERM then SIGKILL after a grace

	period.
top	Display the running processes of a container
unpause	Unpause all processes within a container
update	Update configuration of one or more containers
wait	Block until a container stops, then print its exit code

Image related commands

docker [CMD] [OPTS] IMAGE

Examples

1. Build an image using a Dockerfile

```
$ docker build -t [username/]<image-name>[:tag] <dockerfile-path>  # Build an image
$ docker build -t myimage:latest .                # Build an image called myimage using the Dockerfile in the same folder where the command was executed.
```

2. Check the history of an image

```
$ docker history jboss/wildfly                    #Check the history of the jboss/wildfly image
$ docker history [username/]<image-name>[:tag]             # Check the history of an image
```

3. List the images

```
$ docker images
```

4. Remove an image from the local registry

```
$ docker rmi [username/]<image-name>[:tag]
```

5. Tag an image

```
$ docker tag jboss/wildfly myimage:v1                       # Creates an image called "myimage" with the tag "v1" for the image jboss/wildfly:latest
$ docker tag <image-name> <new-image-name>                  # Creates a new image with the latest tag
```

$ docker tag <image-name>[:tag] [username/]<new-image-name>[:new-tag]   # Creates a new image specifying the "new tag" from an existing image and tag.

6. Exporting and Importing and image to an external file

$ docker save -o <filename>.tar [username/]<image-name>[:tag]   # Export the image to an external file

$ docker load -i <filename>.tar   # Import an image from an external file

7. Push an image to a registry.

$ docker push [registry/][username/]<image-name>[:tag]

build	Build Docker images from a Dockerfile
history	Show the history of an image
images	List images
import	Create an empty filesystem image and import the contents of the tarball into it
inspect	Return low-level information on a container or image
load	Load an image from a ‘.tar’ archive or STDIN
pull	Pull an image or a repository from the registry
push	Push an image or a repository to the registry
rmi	Remove one or more images
save	Save one or more images to a ‘.tar’ archive (streamed to STDOUT by default)
search	Search the Docker registry for images
tag	Tag an image into a repository

Network related commands

docker network [CMD] [OPTS]

connect	Connects a container to a network
create	Creates a new network with the specified name

disconnect	Disconnects a container from a network
inspect	Displays detailed information about on a network
ls	Lists all the networks created by the user
rm	Deletes one or more networks

Registry related commands

Default is https://index.docker.io/v1/

login	Log in to a Docker registry server. If no server is specified, then the default is used
logout	Log out from a Docker registry server. If no server is specified then the default is used.

Volume related commands

docker volume [CMD] [OPTS]

create	Create a volume
inspect	Return low-level information on a volume
ls	List volumes
rm	Remove a volume

Related commands

docker events	Get real-time information from the server
docker info	Display system-wide information
docker version	Show the docker version information
systemctl status docker	Check if the docker service is running

Dockerfile

The Dockerfile provides the instructions to build a container image through the `` `docker build -t [username/]<image-name>[:tag] <dockerfile-path>` `` command. It starts from a previous existing Base image (through the FROM clause) followed by any other needed Dockerfile instructions.

This process is very similar to a compilation of a source code into a binary output, but in this case the output of the Dockerfile will be a container image.

Example Dockerfile

```
# Use the existing WildFly image
FROM jboss/wildfly

# Add an administrative user
RUN /opt/jboss/wildfly/bin/add-user.sh admin Admin#70365 --silent

#Expose the Administrative port
EXPOSE 8080 9990

# Bind the WildFly management to all IP addresses
CMD ["/opt/jboss/wildfly/bin/standalone.sh", "-b", "0.0.0.0", "-bmanagement", "0.0.0.0"]
```

Using the example Dockerfile

```
# Build the WildFly image
$ docker build -t mywildfly .

# Run a WidFly server
$ docker run -it -p 8080:8080 -p 9990:9990 mywildfly

# Access the WildFly administrative console and log in with the
credentials admin/Admin#70365
open http://<docker-daemon-ip>:9990 in a browser
```

Dockerfile INSTRUCTION arguments

FROM	Sets the Base image for subsequent instructions

MAINTAINER	Sets the author field of the the generated images
RUN	Executes commands in a new layer on top of the current image and commits the results
CMD	Allowed only once (if many, then only the last one takes effect)
LABEL	Adds metadata to an image
EXPOSE	Informs Docker that the container listens on the specified network ports at runtime.
ENV	Sets an environment variable
ADD	Copies new files, directories or remote file URLs into the filesystem of the container
COPY	Copies new files or directories into the filesystem of the container
ENTRYPOINT	Allows you to configure a container that will run as an executable
VOLUME	Creates a mount point and marks it as holding externally mounted volumes from native host or other containers
USER	Sets the user name or UID to use when running an image
WORKDIR	Sets the working directory for any RUN, CMD, ENTRYPOINT, COPY, and ADD commands
ARG	Defines a variable that users can pass at build-time to the builder using --build-arg
ONBUILD	Adds an instruction to be executed later, when the image is used as the base for another build
STOPSIGNAL	Sets the system call signal that will be sent to the container to initiate exit.

Example: Running a Web Server Container

`$ mkdir -p www/`	Create directory (if it doesn’t exist)
`$ echo “Server is up” > www/index.html`	Make a text file to serve later
`$ docker run -d \`	Run process in a container as a daemon
`  -p 8000:8000 \`	Map port 8000 in container to 8000 on host

`   --name=pythonweb \`	Name the container “pythonweb”
`   -v `pwd`/www:/var/www/html \`	Map container html to host www directory
`   -w /var/www/html \`	Set working directory to /var/www/html
`   rhel7/rhel \`	Choose the rhel7/rhel directory
`   /bin/python \`	Run the python command for
`   -m SimpleHTTPServer 8000`	A simple Web server listening to port 8000
`$ curl <docker-daemon-ip>:8000`	Check that server is working
`$ docker ps`	See that container is running
`$ docker inspect python_web | less`	Inspect the container
`$ docker exec -it python_web bash`	Open the running container and look in

Bachir Chihani, Ph.D.:

Bachir Chihani, Ph.D. holds an engineering degree from Ecole Superieure d'Informatique (Algeria) as well as a PhD degree in Computer Science from Telecom SudParis (France). Bachir has worked as a data engineer, software engineer, and research engineer for many years. Previously, he worked as a network engineer and got a CCNA Cisco-certification. Bachir has been programming for many years in Scala/Spark, Java EE, Android and Go. He has a keen interest in Open Source technologies particularly in the fields of Automation, Distributed Computing and Software/System Design and he likes sharing his experience through blogging.

Bachir authored many research papers in the field of Context-Awareness and reviewed many papers for International conferences. He also served as a technical reviewer for many books including Spring Boot in Action (Manning, 2016) and Unified Log Processing (Manning, 2016).

Rafael Benevides, Director of Developer Experience

Rafael Benevides is a Director of Developer Experience at Red Hat. In his current role he helps developers worldwide to be more effective in software development, and he also promotes tools and practices that help them to be more productive. He worked in several fields including application architecture and design. Besides that, he is a member of Apache DeltaSpike PMC - a Duke's Choice Award winner project. And a speaker in conferences like JUDCon, TDC, JavaOne and Devoxx. Twitter | LinkedIn | rafabene.com