

# Getting started with containers

Managing containers and images

# Two important concepts

Image



Container

**Zutaten**

Hauptgericht  
Für 4 Personen

250 g	Brot, z. B. Weggli
2 dl	Bouillon
250 g	junger Spinat
2	Eier
5 EL	Paniermehl
50 g	Reibkäse, z.B. Greyzer
	Salz
1	Schalotte
2	Knoblauchzehen
400 g	gemischte Pilze, z. B. Eierschwämmchen und Steinpilze
½ Bund	Thymian
50 g	Butter
	rosa Pfeffer
20 g	Brunnenkresse

**So gehts**

**Zubereitung:** ca. 40 Minuten  
**Ruhen lassen:** ca. 30 Minuten  
**Gesamt:** 1 Std. 10 Min.

1  
Brot in Würfelchen schneiden und in Bouillon einweichen. Spinat waschen und tropfssass in eine Pfanne geben. Erhitzen, bis er zusammenfällt. Mit kaltem Wasser abschrecken. Spinat abgießen und gut ausdrücken. Spinat und Eier mit einem Stabmixer pürieren. Mit Paniermehl und Käse zur Brotmasse geben und gut verkneten. Mit Salz abschmecken. Masse ca. 30 Minuten ruhen lassen. Aus der Masse mit nassen Händen Knödel à ca. 50 g formen.

FAST FERTIG

2  
Inzwischen Schalotte und Knoblauch hacken. Pilze rüsten und nach Belieben klein schneiden. Kräuterblättchen abzupfen. Reichlich Wasser in einer weiten Pfanne aufkochen. Knödel portionenweise darin knapp unter dem Siedepunkt ca. 5 Minuten ziehen lassen, bis sie an der Oberfläche schwimmen und fest werden. Herausnehmen und abtropfen lassen. Butter in einer weiten, beschichteten Bratpfanne erhitzen. Schalotte, Knoblauch und Pilze darin bei mittlerer Hitze ca. 3 Minuten braten. Knödel dazugeben und kurz mitbraten. Mit Thymianblättchen und Pfeffer bestreuen. Mit Brunnenkresse servieren.

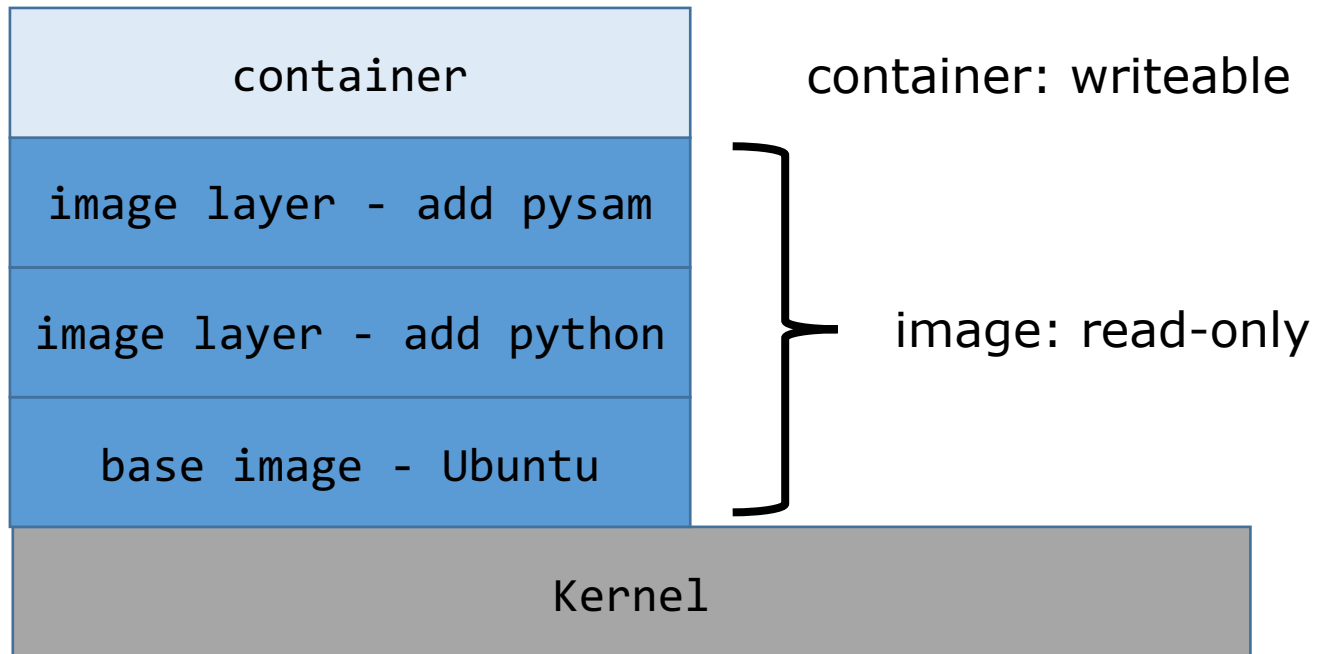
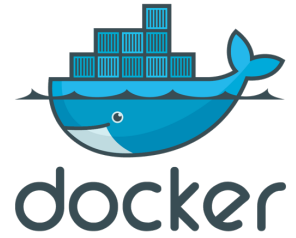
Rezept: Daniel Tinembart



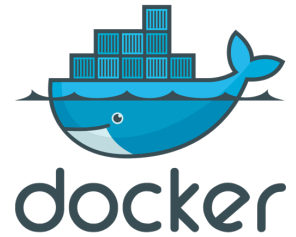
- read-only
- stored on longer term
- can be used as a base

- based on the image
- short-lived
- usually only minor adjustments

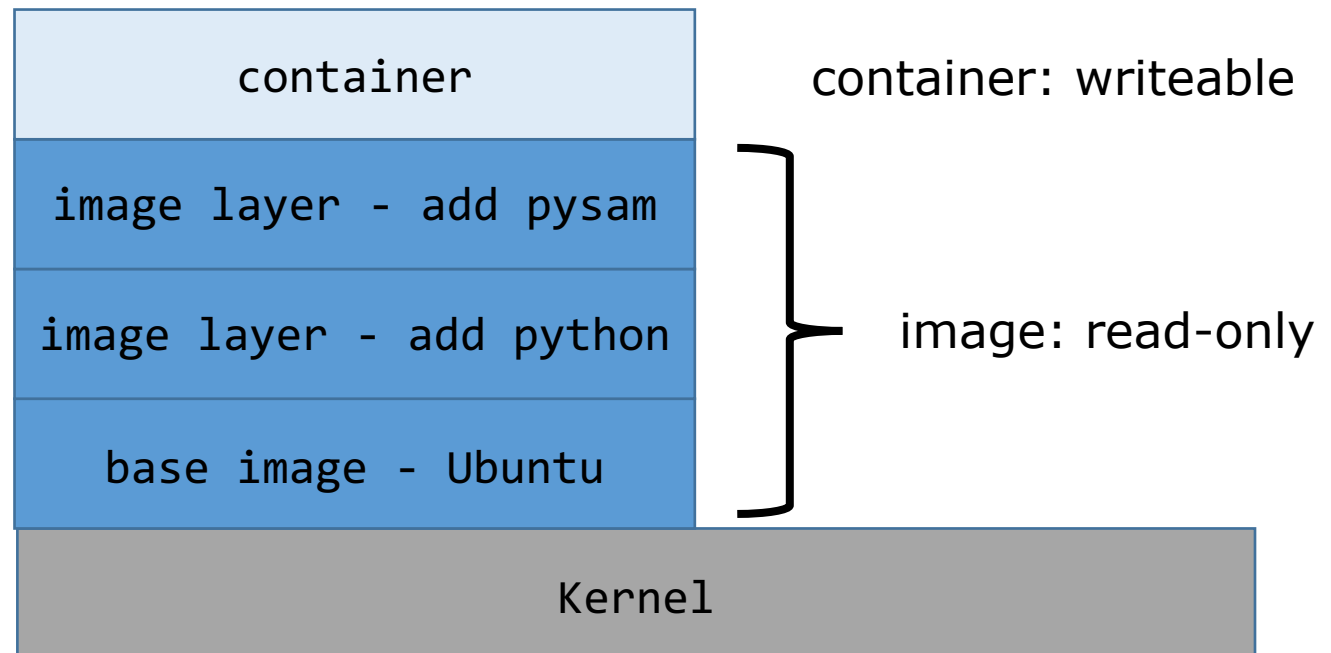
# The concept of layers



# Creating an image

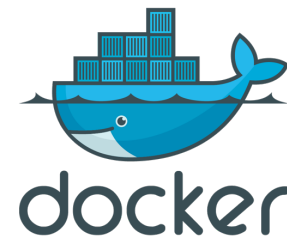


- From a Dockerfile
- From a container: `docker commit` (not reproducible)

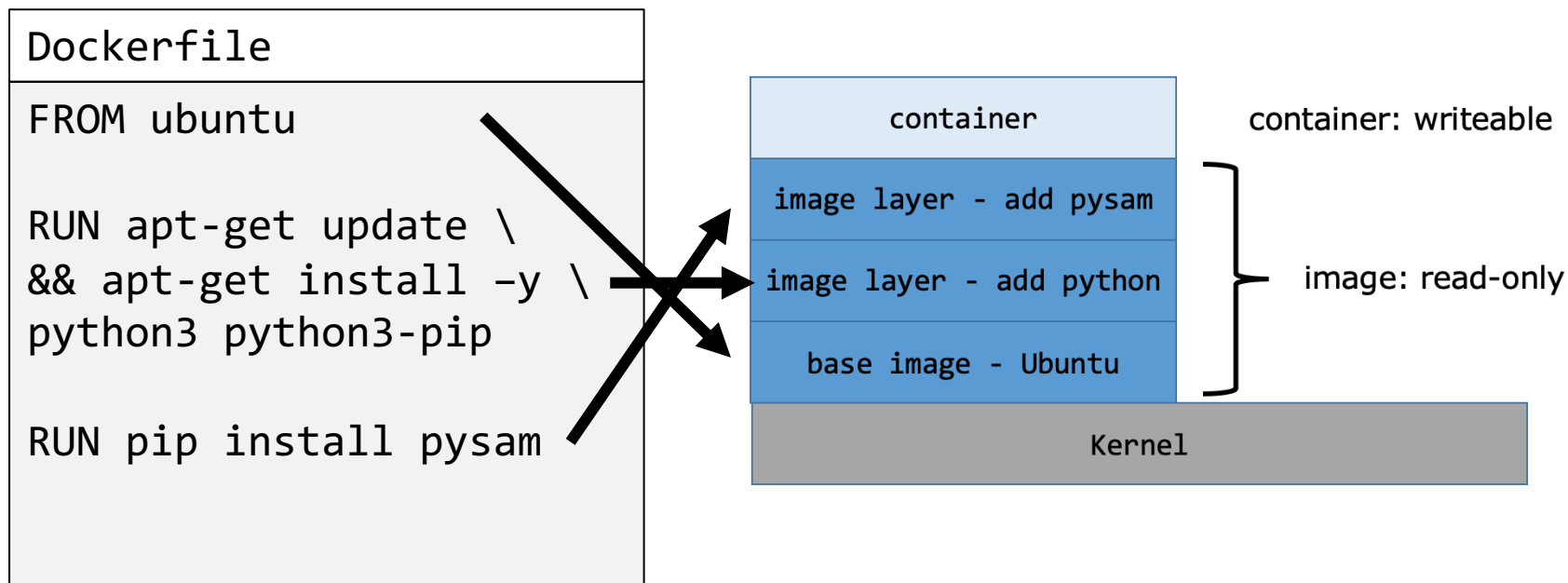


# Quiz question 6

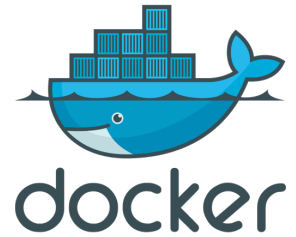
# Dockerfiles



- Set of instructions on how to add layers to an image
- Build with `docker build`



# The docker engine



- Manages in a daemon process:
  - images
  - containers
- Layers are efficiently handled:
  - caching
  - re-use
- User interaction **not** through files -> through the CLI

# The docker engine



Interaction through **command line interface**  
(or GUI), e.g:

**docker image ls**

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
lecture_basic	latest	44465faa1426	43 hours ago	515MB
geertvangeest/adv_singlecell_2022	latest	fc616eb35cf6	2 days ago	2.97GB
own_script	latest	35ee5b2f74c1	2 days ago	1.04GB
geertvangeest/ngs-variants-jupyter	2022.3	c3d451753035	2 weeks ago	3.54GB

**docker container ls**

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
6420ae80cc6c	ubuntu	bash	6 seconds ago	Up 5 seconds		blissful_tharp



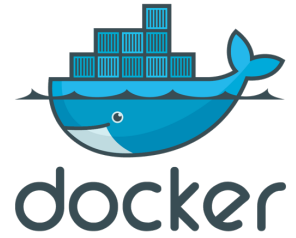
# Sharing an image



- docker hub (open to the world)
  - Command: `docker push`
  - Alternatives: quay.io, gitlab and github container repositories, AWS/Google cloud/Azure ...
- command `docker save`
- Dockerfile

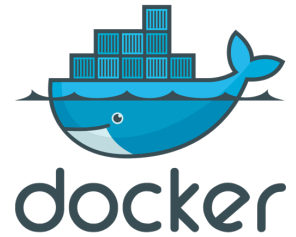
# Question 7

# 3 frequently used features

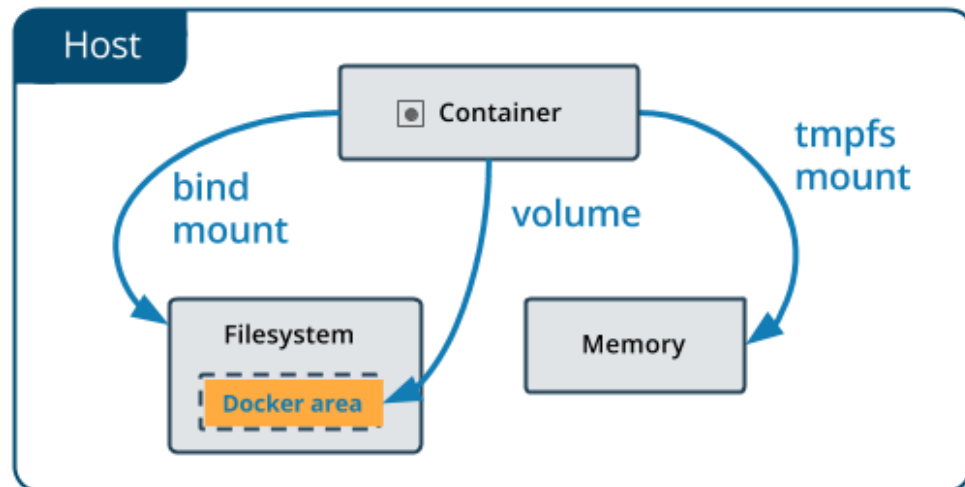


1. Mounting directories
2. Managing identities
3. Mapping ports

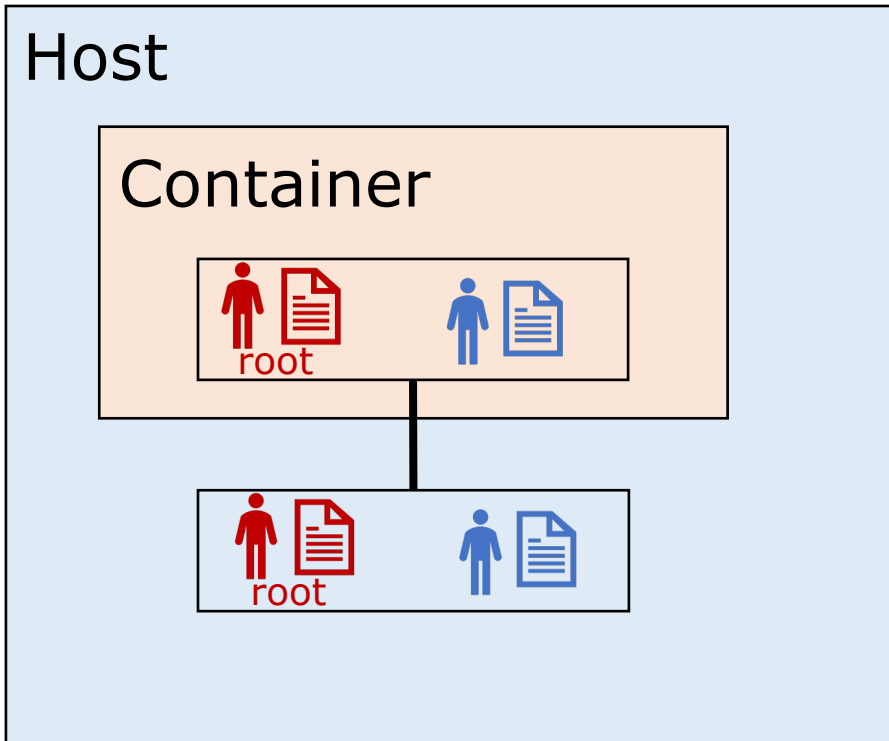
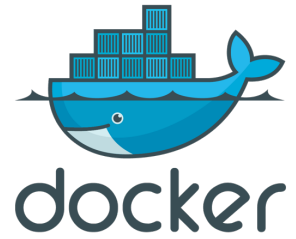
# Mounting



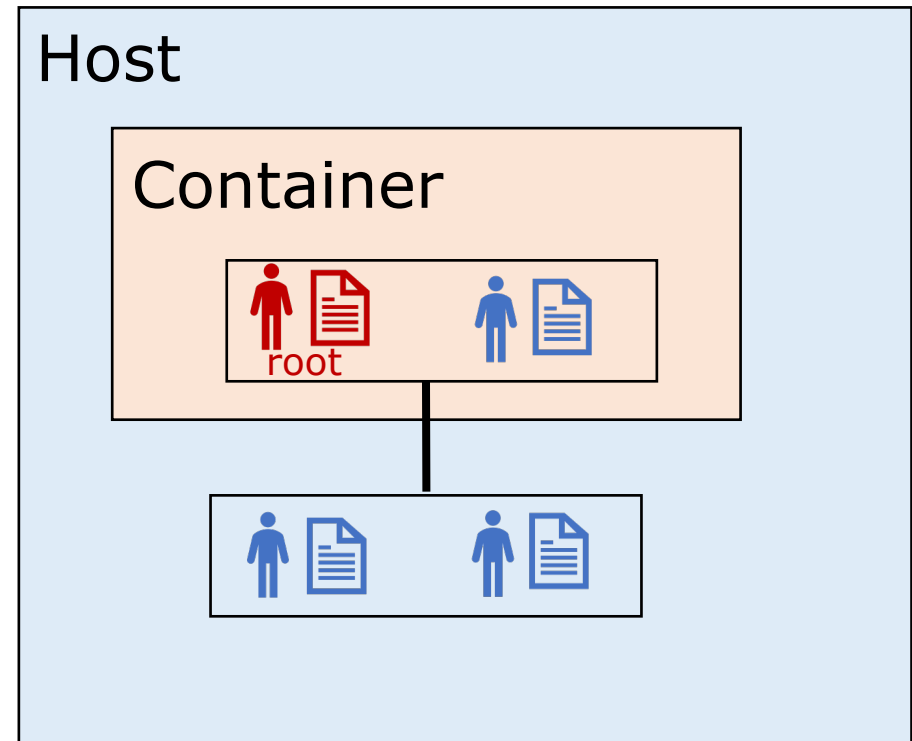
- **Bind-mount:** Make a directory on the host available to the container
- **Volume:** Disk space reserved and managed by docker (isolated)



# Identity



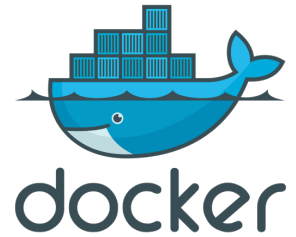
Linux



Other systems

```
docker run -u "$(id -u):$(id -g)"
```

# Mapping ports



- Processes that display browser content:
  - Jupyter
  - Rstudio server
  - Any other web server
- These are published at [IP]:[PORT], so e.g: 127.0.0.1:8000
- Forward the port from the container to port on the host: `docker run -p 80:8000`
- Meaning: publish port 8000 in the container at port 80 on the host

# Exercises

- Re-attaching to an exited container
- Creating an image with `docker commit`
- Non-interactive run
- Removing a container
- Pushing to docker hub
- Mounting a directory
- Managing permissions