How to use Docker for the „Hausaufgabe

Tutorium: Effiziente Softwareentwicklung in UNIX/Linux

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STFS

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[1] https://docker-curriculum.com/

Docker FAQ

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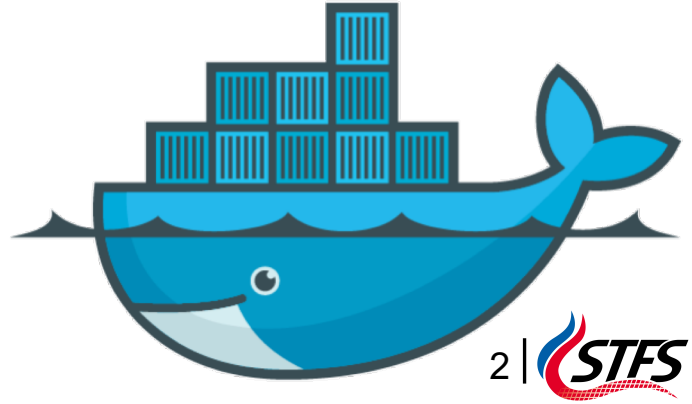
Frequently Asked Questions:

- What is Docker?
  - Docker is a utility to encapsulate applications and make them portable
- Is Docker a Virtual Machine?
  - Simple Answer: NO
    → some kernel functions are used on host machine
- On which operating systems can I run Docker?
  - Linux, MacOS and Windows
- Can I distribute Docker containers?
  - The answer is a clear:
    “YES and NO”



Docker: Is it a Virtual Machine (VM)?

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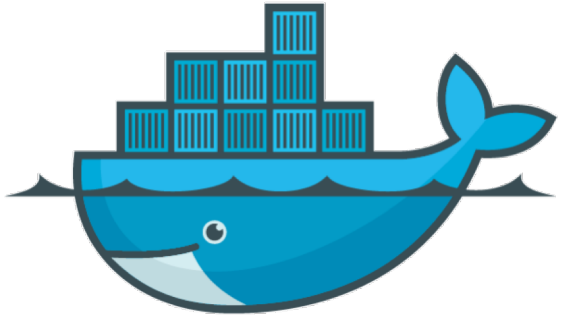
Docker:

- Is depending on host machine, e.g. chip architecture
- Uses kernel functionalities –> slimmer than VM
- “Multi-arch”(itecture) images are possible → automized build process is needed (Dockerfile)
- Orchestration of containers possible (Docker Swarm;Kubernetes)
- Code can (theoretically) be run in parallel over multiple nodes

Virtual Machine:

- Completely encapsulated system (emulated hardware and illusion of OS)
- Chip architecture of host machine is not important → emulation of hardware
- Images can be distributed, but are fairly large in size and have a slow start up process
- Parallelization is difficult (for multi node)



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[1] https://icons8.com/icons/set/oracle-vm-virtualbox

How can I build a Docker container?

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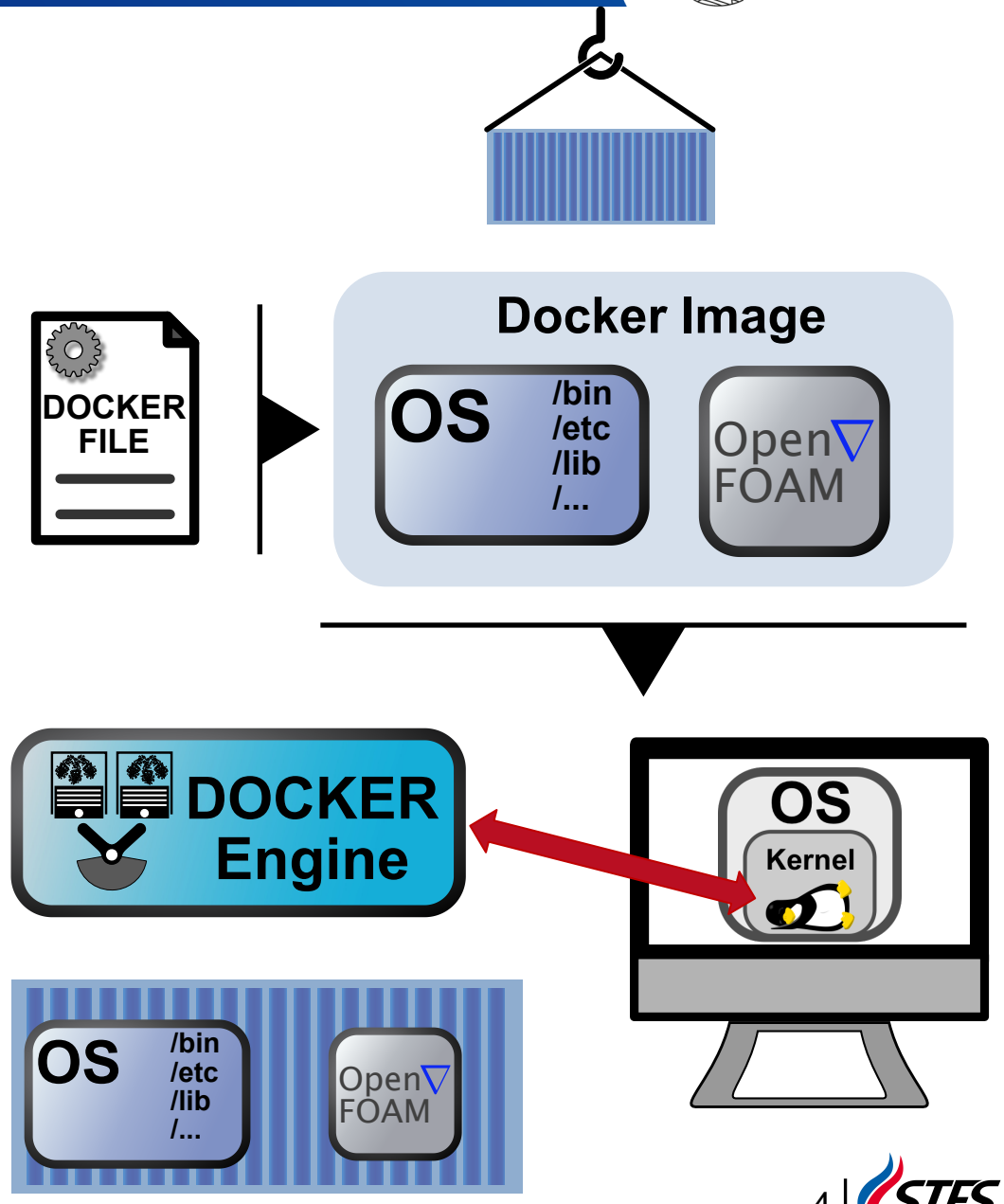
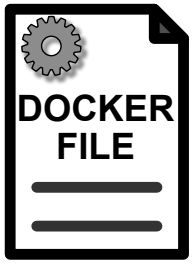
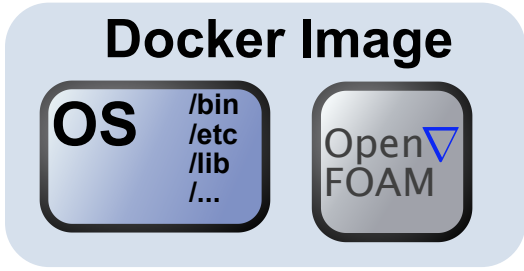
How to build a Docker container:

- Create “Dockerfile”
  - Pull OS-image
  - Set environment variables → e.g. ports, hostname, data/path…
  - Run system commands → e.g. apt-get install …
  - Build software inside docker
- Create image from Dockerfile
- Run container from image („running container is the instantiation of an image“)

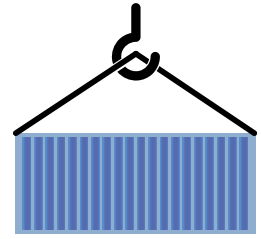


Detailed look on Docker

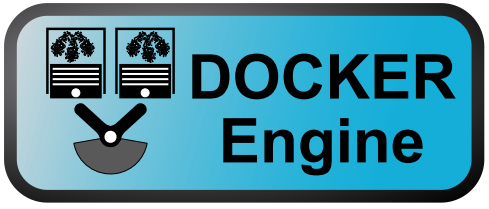


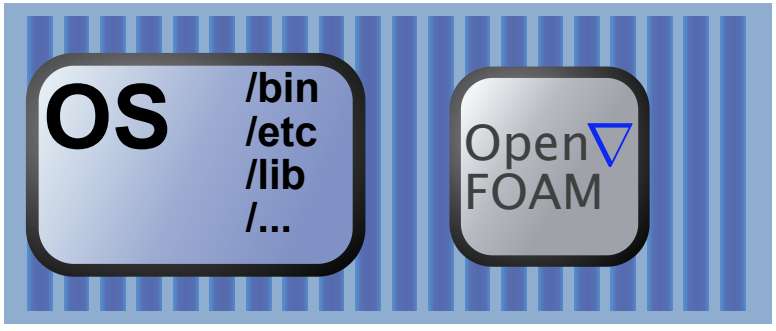


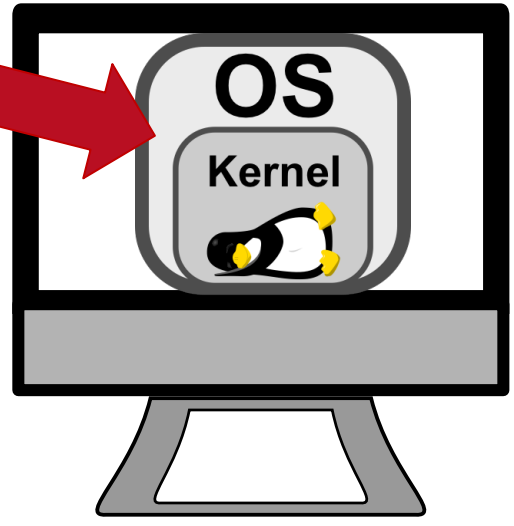
- Image is already related to chip architecture and OS
- Native “Manifest” utility



- Dockerfile is kind of like “Make”
- Complex software build is not trivial







- Docker uses kernel functionalities of host
  → faster than VM

How to get the container?

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Get the container

1. Create the image from the ”Dockerfile”
2. Start container from the image
3. If 2. was not interactive, attach to the container

Linux/UNIX:

1. Download the tar file from moodle and extract it
2. chmod 770 –R <on the extracted folder> && cd <extracted folder>
3. ./installTutoriumContainer.sh
4. If you have detached <Ctrl-D> you can use the script again to attach

Error management:

1. RTFM or cheat sheet: https://devhints.io/docker

```
#!/bin/bash
#/*
#
#     _______.___________. _______     _______.
#    /       |           ||   ____|   /       |
#   |   (----`---|  |----`|  |__      |   (----`
#    \   \       |  |     |   __|      \   \
#.----)   |      |  |     |  |    .----)   |
#|_______/       |__|     |__|    |_______/
#
#All rights reserved!
#Contact the authors for more information
#
#Date:Mo 25 Nov 2019 22:36:22 CET
#
#
#Author:Philip Haspel, M.Sc.
#
#
#Email:haspel@stfs.tu-darmstadt.de
#*/
if ! docker image ls | grep -irn imagetutorium; then
    docker build -t imagetutorium .
    docker run -it --name linuxtutorium imagetutorium /bin/bash
else
    if  ! docker ps -a  | grep -irn linuxtutorium; then
        echo "Image already there, just the container is run"
        docker run -it --name linuxtutorium imagetutorium /bin/bash
        exit 0;
    else
        if ! docker container ls | grep -irn linuxtutorium; then
            docker start -a linuxtutorium
            exit 0;
        else
            docker attach linuxtutorium
        fi
    fi
fi
```

How to use the container?

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- Usage for the “Hausaufgabe”
- Uniform ”development” environment
- Data management in Docker is challenging
  → use git to manage your data
- Git will be part of the lecture but rather late
  - Basic usage is straight forward and can be learned on your own
  - RTFM: https://docs.gitlab.com/ee/gitlab-basics/
- Create an account at: https://www.hrz.tu-darmstadt.de/forschungsdaten_management/tugitlab/index.de.jsp
- Create a project named: <yourNameLinuxTut201920>
- Push your solution there