Open Source Lab - CI/CD

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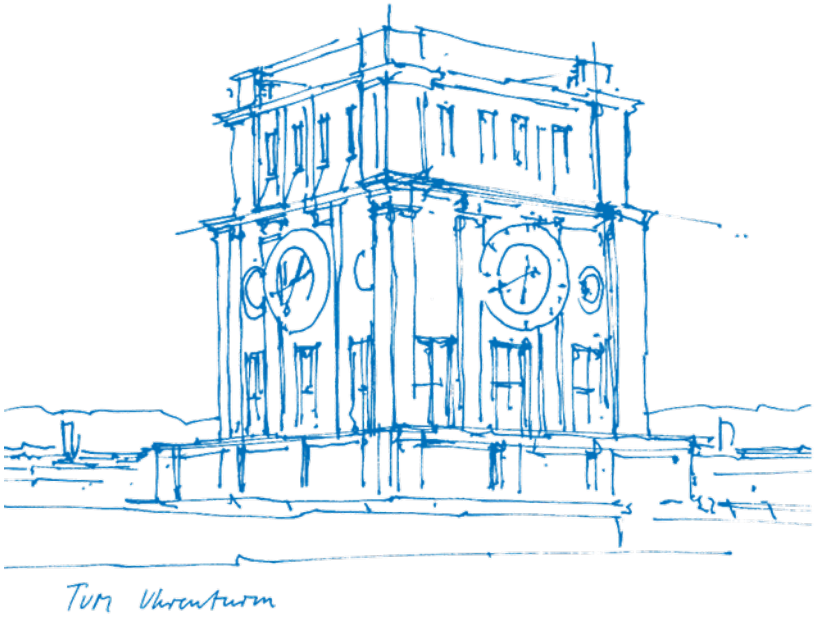
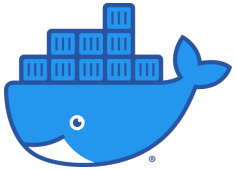
Garching, 04.11.2021



Motivation

- Reduce time consumption for recurring tasks
- Unified procedure for all project contributions
  Avoid: "But it works on my machine"

Docker



Images have a layered architecture. This allows Docker to avoid rebuilding the whole image by caching layers. Thus, order the layers from stable to frequently changing.

Logo: `https://www.docker.com/sites/default/files/d8/2019-07/Moby-logo.png`

Dockerfile

Most important commands:

FROM	baseimage
RUN	creates new layer
ENV	set environment variables
USER	set user
ENTRYPOINT	specify entrypoint into container

Important: The default user of a Docker image is root. Use the `USER` command to use a less privileged user.

Dockerfile - Example

```
FROM alpine:latest

RUN apk add --no-cache htop

ENTRYPOINT ["htop"]
```

Selection of base image is crucial for the image size (alpine $\Rightarrow$ small, Ubuntu/Debian $\Rightarrow$ big)

Cleanup installation artifacts to reduce image size

Build & Run Image

Build image:

```
docker build -t <tagname> <path to dir with Dockerfile>
```

Run image (not useful for development, mostly used for deployment):

```
docker run <tagname>
```

Run image in interactive mode (`-it`) and mount `<host dir>` to `<container dir>` (`--rm` cleans up the container file system on shutdown (not required)):

```
docker run --rm -it -v <host dir>:<container dir> <tagname>
```

Example: Run image `libfuse` and mount current directory (`$(pwd)`) to `/libfuse`:

```
docker run --rm -it -v $(pwd):/libfuse libfuse
```

Remarks

For production use, Docker is mostly not sufficient. Consider using Kubernetes `https://kubernetes.io/`.

If you want to learn more about containerized environments, check ”Skalierbare Container-Infrastrukturen” by Oliver Liebel (in German, 3., aktualisierte Auflage 2020, gebunden Rheinwerk Computing, ISBN 978-3-8362-7772-3, available in the library). 1260 pages.

Future of Docker unknown. Although it is in widespread use, it has significant drawbacks such as potentially huge image sizes, a universal kernel and a big attack surface. Maybe Library OSs will be the future of containerized execution.

CI/CD

- ALWAYS perform changes to CI/CD scripts in a separate branch, because very often multiple attempts are needed to get it running.
- NEVER hardcode secrets or passwords into your scripts. Inject them using the surrounding system.
- For any problem which should last longer, set it up probably. This will safe you a lot of time later.
- Carefully chose a system, since they are barely interchangeable

Dependabot

Example configuration file for Rust, `/.github/dependabot.yml`:

```yaml
version: 2
updates:
       - package-ecosystem: "cargo"  # Enable crate version updates for the main crate
         directory: "/"   # Look ‘Cargo.toml‘ in the repository root
         schedule:    # Check for updates every day (weekdays)
              interval: "daily"
       - package-ecosystem: "github-actions"   # Enable version updates for Github Actions
         directory: "/"   # Set to ‘/‘ to check the Actions used in ‘.github/workflows‘
         schedule:    # Check for updates every day (weekdays)
              interval: "daily"
```

See `https://docs.github.com/en/free-pro-team@latest/github/administering-a-repository/enabling-and-disabling-version-updates` for details

Bump actions/checkout from 2.3.4 to 2.3.5 #3

Open **dependabot** wants to merge 1 commit into `main` from `dependabot/github_actions/actions/checkout-2.3.5`

Conversation 0 | Commits 1 | Checks 2 | Files changed 1

dependabot bot commented on behalf of **github** yesterday — Contributor

Bumps actions/checkout from 2.3.4 to 2.3.5.

▸ Release notes

▸ Commits

compatibility 95%

Dependabot will resolve any conflicts with this PR as long as you don't alter it yourself. You can also trigger a rebase manually by commenting `@dependabot rebase`.

▸ Dependabot commands and options

Bump actions/checkout from 2.3.4 to 2.3.5 — Verified — 8b0c521

dependabot bot added dependencies github_actions labels yesterday

Source:
https://github.com/Garfield96/pack/pull/3

Github CI

Workflow file `*.yml`:

always located in:
`/.github/workflows/`

```yaml
name: CI

on: [push, pull_request]

jobs:
  build:
    runs-on: ubuntu-latest
    container: texlive/texlive:latest

    steps:
    - uses: actions/checkout@v2

    - name: Build pdf
      run: make pdf

    - name: Upload pdf
      uses: actions/upload-artifact@v2
      with:
        name: thesis
        path: build/main.pdf
        retention-days: 14
```

Source: `https://github.com/TUM-Dev/tum-thesis-latex/blob/master/.github/workflows/github-actions-demo.yml`

GitLab CI

.gitlab-ci.yml:

always located in:
/ (project root)

```yaml
default:
  image:
    name: texlive/texlive:latest
  tags:
  - Docker

stages:
- build

pdf:
  stage: build
  script:
  - make all
  artifacts:
    paths:
    - main.pdf
    expire_in: 1 week
```

Source: `https://gitlab.lrz.de/gbs-cm/skript/-/blob/master/.gitlab-ci.yml`

Jenkins

- Automation server
- Jobs are defined using a DSL inside a `Jenkinsfile`
- MIT License
- `www.jenkins.io`
- Repository: `https://github.com/jenkinsci/jenkins`

Logo: `https://www.jenkins.io/images/logo.png`