CLOUD COMPUTING APPLICATIONS

Docker Containers

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Dockerfile

- ***Imperative*** method to create an image
- Example

```
FROM ubuntu:18.04
RUN \
  apt-get update && \
  apt-get install -y --no-install-recommends zip unzip openjdk-8-jdk expect && \
  apt-get autoremove -qq -y --purge && \
  apt-get clean && \
  rm -rf /var/cache/apt /var/lib/apt/lists

COPY myExecutableFile.sh /exec/myExecutableFile.sh

RUN chmod a+rwx -R /exec/

ENTRYPOINT ["./exec/myExecutableFile.sh"]
```

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Running Docker Containers

- `docker container run alpine echo "Hello World"`

- First execution:
  - Will load the alpine image from Dockerhub

```
[→  ~ docker container run alpine echo "hello world"
Unable to find image 'alpine:latest' locally
latest: Pulling from library/alpine
ba3557a56b15: Pull complete
Digest: sha256:a75afd8b57e7f34e4dad8d65e2c7ba2e1975c795ce1ee22fa34f8cf46f96a3be
Status: Downloaded newer image for alpine:latest
hello world
```

- 2nd and afterwards:
  - Just runs

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Daemon mode, Exec

- `docker container run alpine ping 127.0.0.1`
  - `64 bytes from 127.0.0.1: seq=0 ttl=64 time=0.697 ms`
  - `64 bytes from 127.0.0.1: seq=1 ttl=64 time=0.091 ms`
  - `64 bytes from 127.0.0.1: seq=2 ttl=64 time=0.090 ms`
  - `^C`
- `docker container run -d alpine ping 127.0.0.1`
  - `F64d6c10ec3f42646c254e8a935a472d7bc771dfcb2c6311c39616ac57e5f002`
- `docker container ls`
  - `CONTAINER ID  IMAGE  COMMAND  CREATED  STATUS  PORTS  NAMES`
  - `f64d6c10ec3f  alpine  "ping 127.0.0.1"  19 seconds ago  Up 18 seconds  zen_noyce`
- `➜  ~ docker container exec -it f64d6c10ec3f /bin/sh`
- `/ # ps`
  - `PID  USER  TIME  COMMAND`
  - `1 root 0:00 ping 127.0.0.1`
  - `8 root 0:00 /bin/sh`
  - `14 root 0:00 ps`

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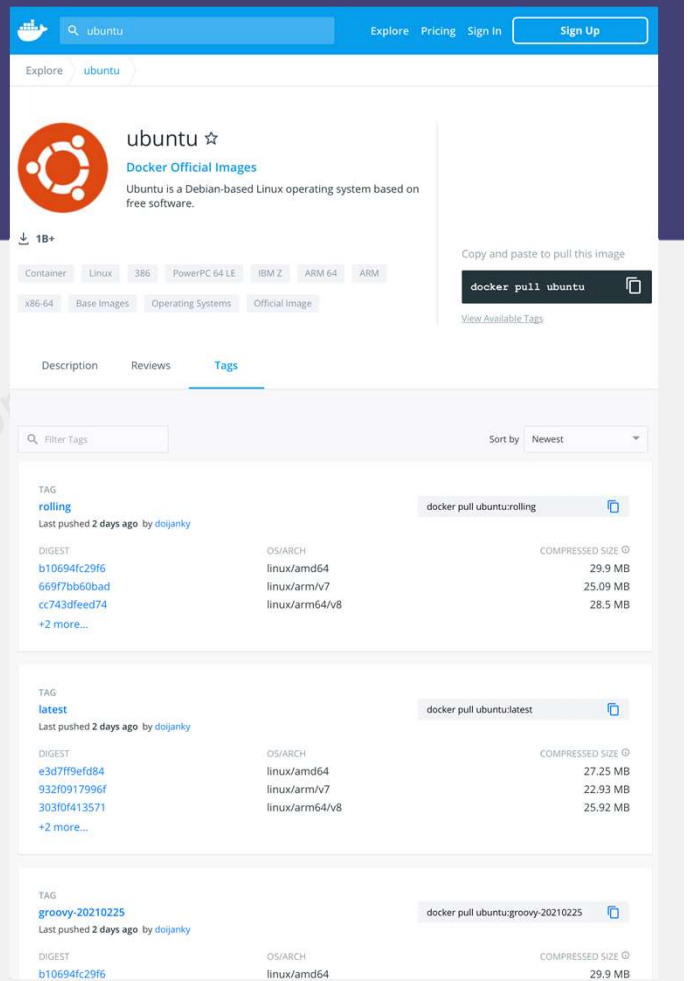
Ubuntu in Docker

- `docker container run -it --name cca ubuntu:groovy-20210225 /bin/sh`

- `root@11d34305e17c:/# uname -a`
  - `Linux 11d34305e17c 4.19.121-linuxkit #1 SMP Tue Dec 1 17:50:32 UTC 2020 x86_64 x86_64 x86_64 GNU/Linux`
- `root@11d34305e17c:/# cat /etc/os-release`
  - `NAME="Ubuntu"`
  - `VERSION="20.10 (Groovy Gorilla)"`
  - `ID=ubuntu`
  - `ID_LIKE=debian`
  - `PRETTY_NAME="Ubuntu 20.10"`
  - `VERSION_ID="20.10"`
  - `HOME_URL="https://www.ubuntu.com/"`
  - `SUPPORT_URL="https://help.ubuntu.com/"`
  - `BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"`
  - `PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/privacy-policy"`
  - `VERSION_CODENAME=groovy`
  - `UBUNTU_CODENAME=groovy`



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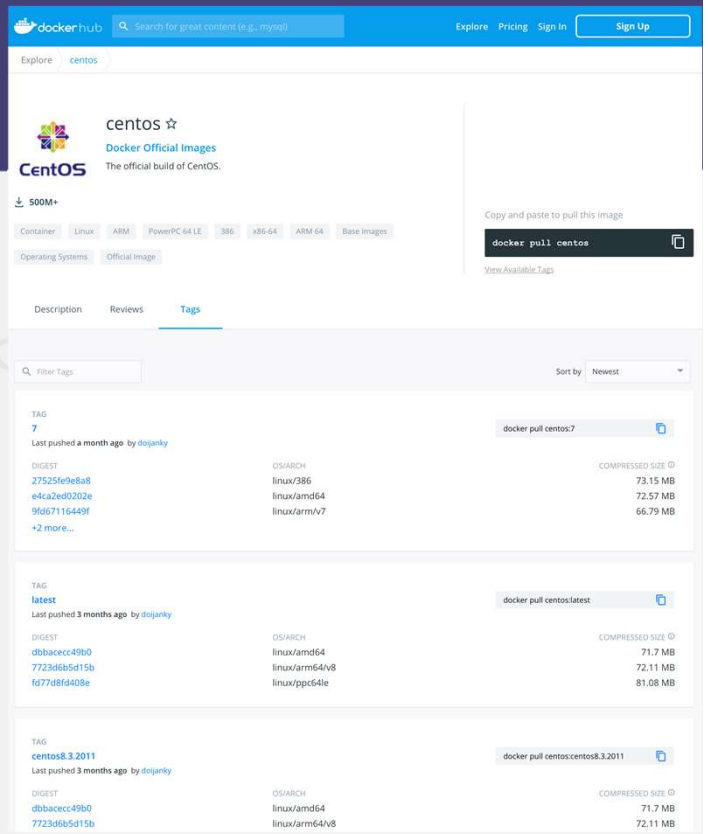
CENTOS in Docker

- `docker container run -it --name cca2 centos:latest /bin/sh`

- `[root@4a637cf86a9a /]# uname -a`
  - `Linux 4a637cf86a9a 4.19.121-linuxkit #1 SMP Thu Jan 21 15:36:34 UTC 2021 x86_64 x86_64 x86_64 GNU/Linux`
- `[root@4a637cf86a9a /]# cat /etc/os-release`
  - `NAME="CentOS Linux"`
  - `VERSION="8"`
  - `ID="centos"`
  - `ID_LIKE="rhel fedora"`
  - `VERSION_ID="8"`
  - `PLATFORM_ID="platform:el8"`
  - `PRETTY_NAME="CentOS Linux 8"`
  - `ANSI_COLOR="0;31"`
  - `CPE_NAME="cpe:/o:centos:centos:8"`
  - `HOME_URL="https://centos.org/"`
  - `BUG_REPORT_URL="https://bugs.centos.org/"`
  - `CENTOS_MANTISBT_PROJECT="CentOS-8"`
  - `CENTOS_MANTISBT_PROJECT_VERSION="8"`
- `[root@4a637cf86a9a /]# cat /etc/centos-release`
  - `CentOS Linux release 8.3.2011`



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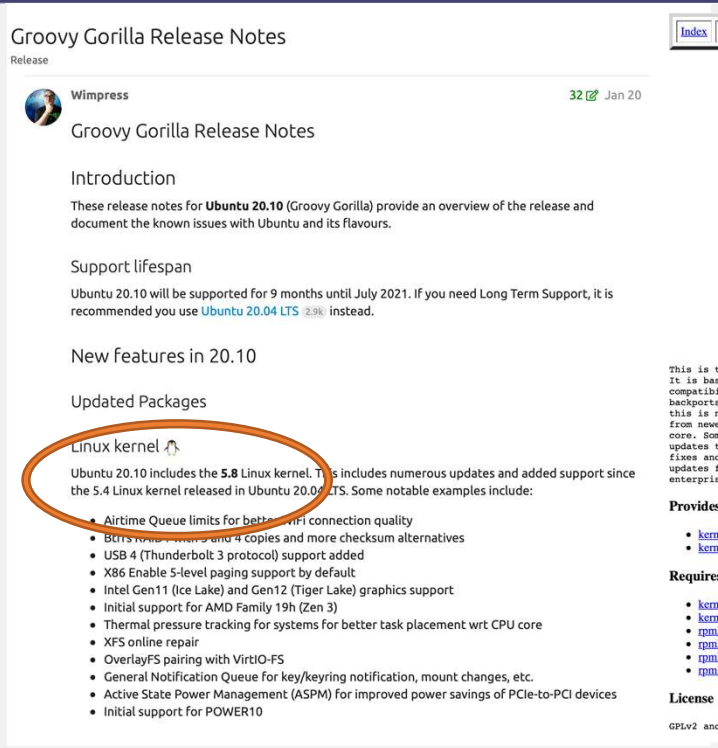
Kernel Versions

- Note: The Groovy Gorilla version of ubuntu is supposed to come with Linux Kernel 5.8
- Centos 8.3 is supposed to run Kernel 4.18.240
- But we see it is running with 4.19.121 in Docker Desktop 3.2.3
  - Engine 20.10.5
  - This is the host Linux kernel, shared with all the containers
  - bzImage and initramfs



Groovy Gorilla Release Notes

Release

Wimpress 32 Jan 20

Groovy Gorilla Release Notes

Introduction

These release notes for **Ubuntu 20.10** (Groovy Gorilla) provide an overview of the release and document the known issues with Ubuntu and its flavours.

Support lifespan

Ubuntu 20.10 will be supported for 9 months until July 2021. If you need Long Term Support, it is recommended you use Ubuntu 20.04 LTS instead.

New features in 20.10

Updated Packages

Linux kernel

Ubuntu 20.10 includes the **5.8** Linux kernel. This includes numerous updates and added support since the 5.4 Linux kernel released in Ubuntu 20.04 LTS. Some notable examples include:

- Airtime Queue limits for better WiFi connection quality
- Btrfs RAID 1 with 3 and 4 copies and more checksum alternatives
- USB 4 (Thunderbolt 3 protocol) support added
- X86 Enable 5-level paging support by default
- Intel Gen11 (Ice Lake) and Gen12 (Tiger Lake) graphics support
- Initial support for AMD Family 19h (Zen 3)
- Thermal pressure tracking for systems for better task placement wrt CPU core
- XFS online repair
- OverlayFS pairing with VirtIO-FS
- General Notification Queue for key/keyring notification, mount changes, etc.
- Active State Power Management (ASPM) for improved power savings of PCIe-to-PCI devices
- Initial support for POWER10

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kernel-4.18.0-240.el8 RPM for x86_64

From CentOS 8.3.2011 BaseOS for x86_64 / Packages

Name: kernel	Distribution: Unknown
Version: 4.18.0	Vendor: CentOS
Release: 240.el8	Build date: Fri Sep 25 22:04:44 2020
Group: System Environment/Kernel	Build host: kbuilder.bsys.centos.org
Size: 0	Source RPM: kernel-4.18.0-240.el8.src.rpm
Packager: CentOS BuildSystem <http://bugs.centos.org>	
Url: http://www.kernel.org/	
Summary: The Linux kernel, based on version 4.18.0, heavily modified with backports	

This is the package which provides the Linux kernel for CentOS.
It is based on upstream Linux at version 4.18.0 and maintains kABI compatibility of a set of approved symbols, however it is heavily modified with backports and fixes pulled from newer upstream Linux kernel releases. This means this is not a 4.18.0 kernel anymore: it includes several components which come from newer upstream linux versions, while maintaining a well tested and stable core. Some of the components/backports that may be pulled in are: changes like updates to the core kernel (eg.: scheduler, cgroups, memory management, security fixes and features), updates to block layer, supported filesystems, major driver updates for supported hardware in CentOS, enhancements for enterprise customers, etc.

Provides

- kernel
- kernel(x86-64)

Requires

- kernel-core-uname-r = 4.18.0-240.el8.x86_64
- kernel-modules-uname-r = 4.18.0-240.el8.x86_64
- rpmlib(CompressedFileNames) <= 3.0.4-1
- rpmlib(FileDigests) <= 4.6.0-1
- rpmlib(PayloadFilesHavePrefix) <= 4.0-1
- rpmlib(PayloadIsXz) <= 5.2-1

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Multi Stage Dockerfile

- Multi stage allows us to not include unnecessary intermediate layers
  - ```
    FROM alpine:latest AS build
    RUN apk update && apk add --update alpine-sdk
    RUN mkdir /app
    WORKDIR /app
    COPY . /app
    RUN mkdir bin
    RUN gcc test.c -o bin/test

    FROM alpine:latest
    COPY --from=build /app/bin/test /app/test
    CMD /app/test
    ```
- The resulting image will be 4MB instead of ~200MB

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    ```

Image registries

- Docker Hub
- Google
  - https://cloud.google.com/container-registry
- Amazon AWS Amazon Elastic Container Registry (ECR)
  - https://aws.amazon.com/ecr/
- Microsoft Azure
  - https://azure.microsoft.com/en-us/services/container-registry/
- Red Hat
  - https://access.redhat.com/containers/
- Artifactory
  - https://jfrog.com/integration/artifactory-docker-registry/

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Full Namespace of Images

- <registry URL>/<User or Org>/<name>:<tag>
  - public.ecr.aws/nginx/nginx:latest
  - public.ecr.aws/datadog/agent:latest
  - myregistry.azurecr.io/marketing/campaign10-18/email-sender:v2

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