CLOUD COMPUTING APPLICATIONS

Containers: Union Filesystem

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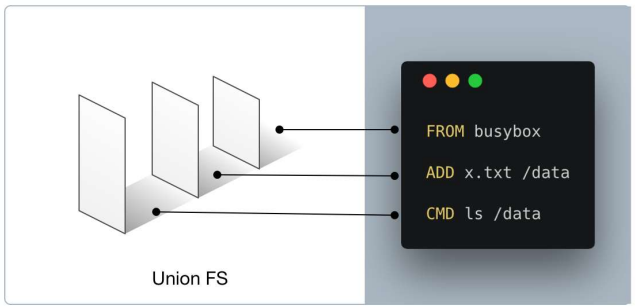
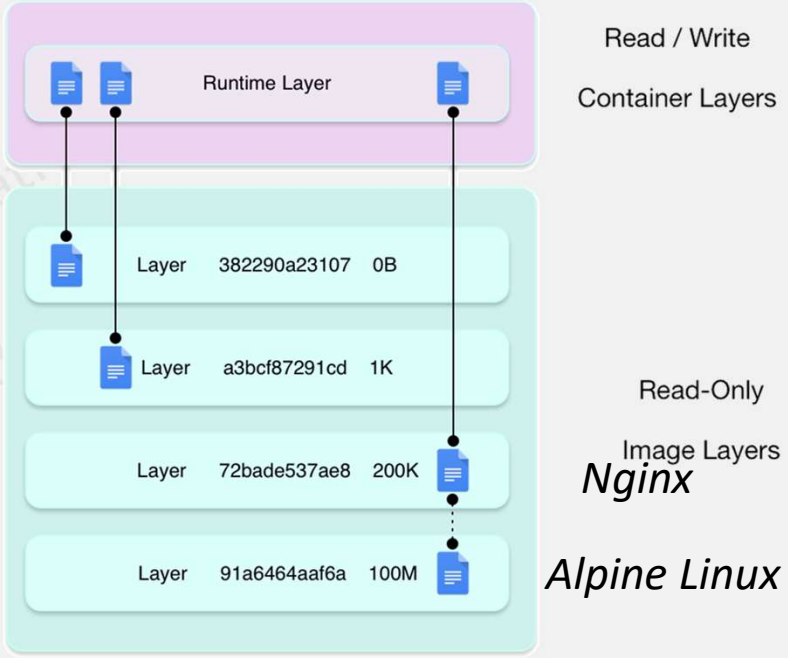
Union File System (Unionfs)

- Backbone of container images
- A stackable unification file system, which can appear to merge the contents of several directories (branches), while keeping their physical content separate
- overlays several directory into one single mount point
  - Contents of directories that have the same path within the merged branches will be seen together in a single merged directory, within the new virtual filesystem



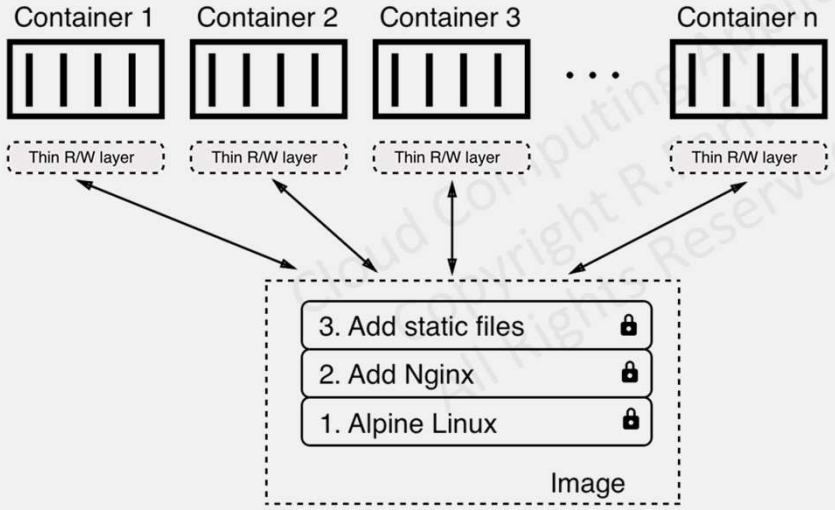
Union File System (Unionfs)

- With union mount, the directories in the file system from the underlying layer are getting merged with those from the upper layer file systems
- To access a file: first tries to access the file on the top branch and if the file does not exist there, it continues on lower level branches
- **copy-on-write (cow)**: If the user tries to ***modify*** a file on a lower level read-only branch the file is ***copied*** to to a higher level read-write branch
- the program running inside the container doesn't care which layer the files and directories comes from



Docker images

- A container image is made of a stack of immutable or read-only layers
- In run-time, the docker engine adds a R/W layer on top of the stack of immutable layers



Dockerfile

```
FROM node:12-alpine
WORKDIR /app COPY . .
RUN yarn install --production
CMD ["node", "src/index.js"]
```

Graph Driver

- A local instance of a Docker engine has a cache of Docker image layer
- This cache of layers is built up as explicit `docker pull` commands are executed, as well as `docker build`
- The driver to handle these layers is called a "graphdriver"

Graph Driver Options

- graphdriver options: vfs, aufs, overlay, overlay2, btrfs, zfs, devicemapper, and windows
- vfs: Naïve implementation, does **not** use a union filesystem or CoW technique
- Overlay, overlay2, aufs: unionfs on top of a real filesystems
  - ext4, xfs
- btrfs, zfs, devicemapper, windows: the underlying real filesystem performs the task of union

More details: https://integratedcode.us/2016/08/30/storage-drivers-in-docker-a-deep-dive/