Docker

Container platform

What is Docker?

> Docker is a set of platform as a service (PaaS) products that use OS-level virtualization to deliver software in packages called **containers**.

- Docker is a tool that allows you to build, deploy, and manage **containers**.

What is a Container?

> A container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably from one computing environment to another.

- lightweight, portable, and isolated.

How does it work?

> Docker makes use of kernel ***namespaces*** to provide the isolated workspace called the container. When you run a container, Docker creates a set of ***namespaces*** for that container. These ***namespaces*** provide a layer of isolation. Each aspect of a container runs in a separate namespace and its access is limited to that namespace.

Namespaces

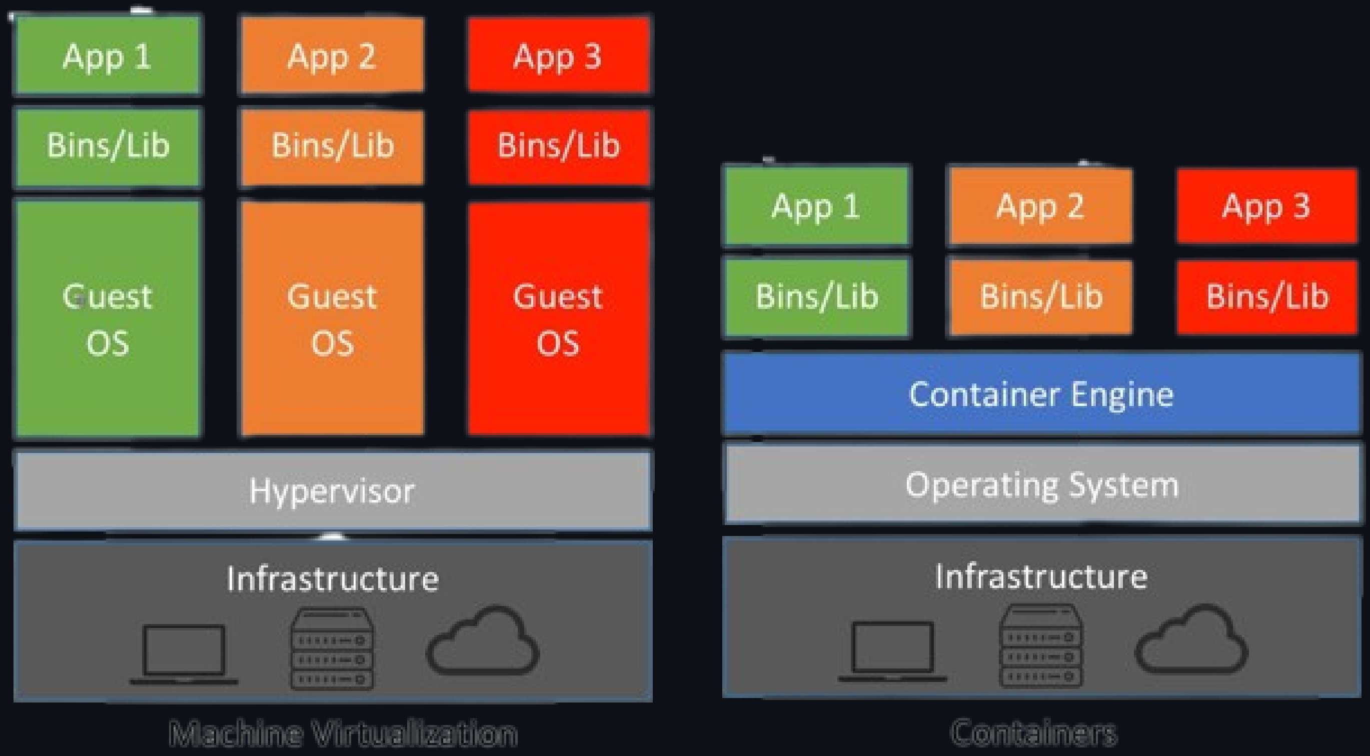
Docker Engine uses the following namespaces on Linux:

- `PID` - process isolation.
- `NET` - managing network interfaces.
- `IPC` - managing access to IPC resources.
- `MNT` - managing filesystem mount points.
- `UTS` - isolating kernel and version identifiers and hostnames.
- `USER` - user and group identity.
- `TIME` - virtualizing system clocks.
- `CGROUP` - managing cgroup hierarchies.

What is a Container really?

Containers are essentially isolated processes

How is this different from a VM?



Virtual Machines

Pros

- High level of isolation
- Support most operating systems
- Work better with specialized hardware

Cons

- Require large amount of disk (>10GB)
- Performance penalty
- OS maintenance

Containers

Pros

- Easy to manage
- Resource efficient
- Very portable
- Fast startup times

Cons

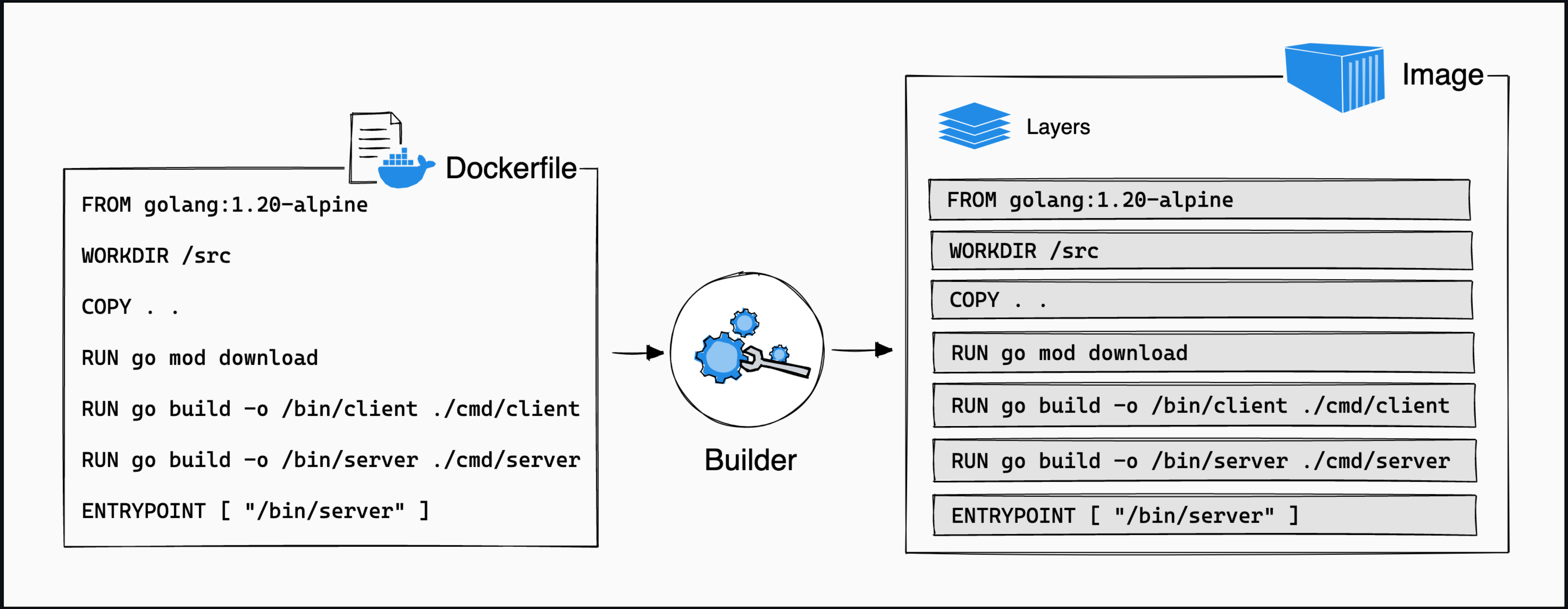
- Primarily linux only
- Lower level of isolation

Demo Time

- Docker Engine

`tinyurl.com/uug-killer`

Layers



Dockerfile

```
FROM golang:1.20-alpine

WORKDIR /src

COPY . .

RUN go mod download

RUN go build -o /bin/client ./cmd/client

RUN go build -o /bin/server ./cmd/server

ENTRYPOINT [ "/bin/server" ]
```

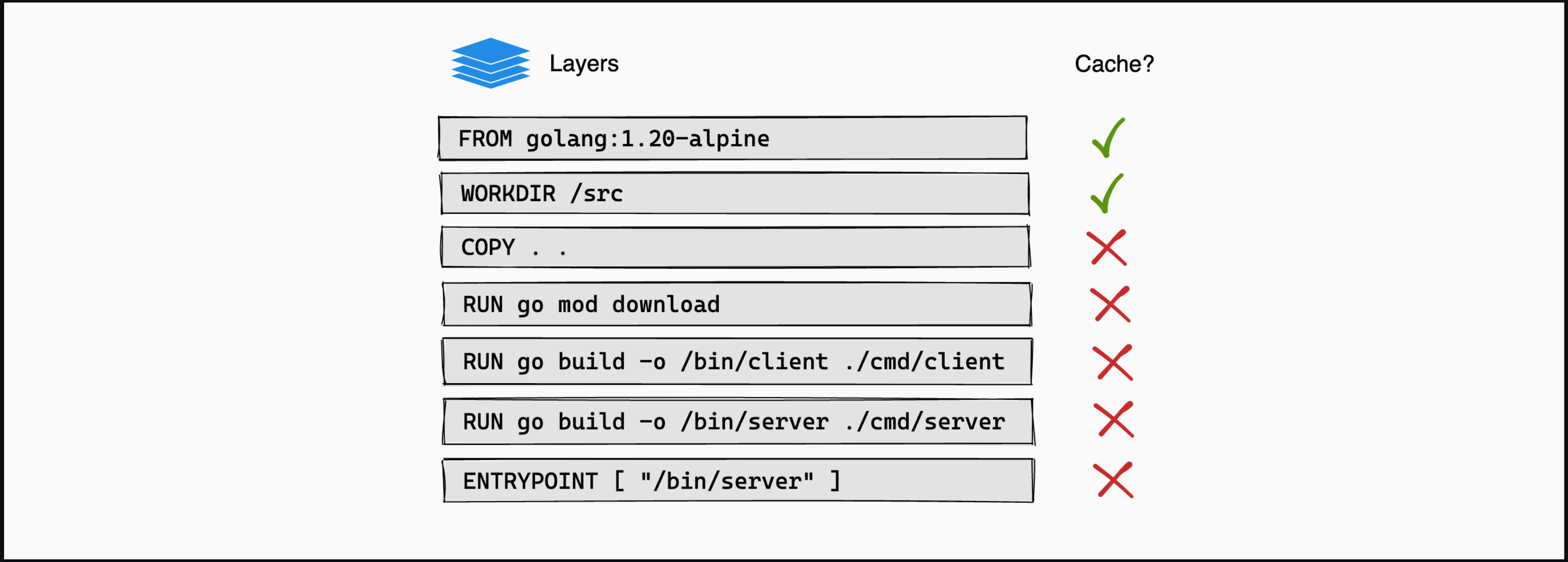
Builder

Image

Layers

```
FROM golang:1.20-alpine
WORKDIR /src
COPY . .
RUN go mod download
RUN go build -o /bin/client ./cmd/client
RUN go build -o /bin/server ./cmd/server
ENTRYPOINT [ "/bin/server" ]
```

Cached layers



Layers	Cache?
`FROM golang:1.20-alpine`	✓
`WORKDIR /src`	✓
`COPY . .`	✗
`RUN go mod download`	✗
`RUN go build -o /bin/client ./cmd/client`	✗
`RUN go build -o /bin/server ./cmd/server`	✗
`ENTRYPOINT [ "/bin/server" ]`	✗

Resources

- Killercoda demo
- Get Started with Docker
- Get Docker
- Docker playground
- Use the Docker command line