HENRY QUINN

INTRO TO DOCKER

ABOUT ME

- NewHaven.IO
  - Member Board of Directors
- U.S. District Court, District of Connecticut
  - Programmer, Analyst, Database Administrator
- Administrative Office of the US Courts
  - Software Developer - Temporary Duty Assignment

PLAN FOR TODAY

- What I Was Tasked With
- What Was Expected Of Me
  - VPS Overview (Virtual Private Server)
- What I Did Instead
  - Docker Overview

GET A COLDFUSION APP IN 16 COURTS IN UNDER A YEAR

- CONSTRAINTS
  - Finish The Application
  - Get It Cleared As Secure By IT Security Office
  - Requisition Servers
  - Install, Configure, And Test Applications

AO CONTROLLED VIRTUAL PRIVATE SERVERS

FROM NOTHING

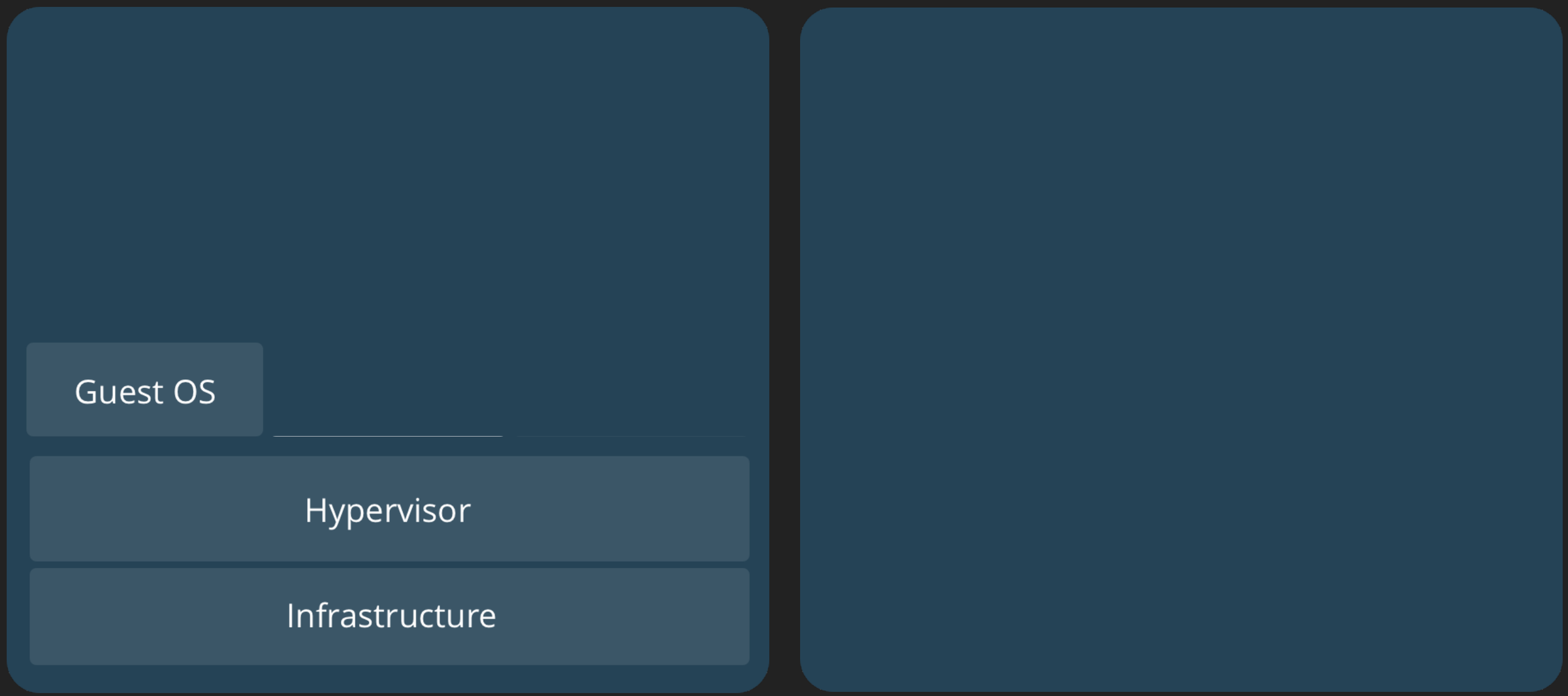
- Contact AO To Allocate Space And Install CentOS
- Log In With SSH
- Change Root Password
- Set Up Fail2Ban
- Configure Firewall
- Install And Configure Java, Apache Tomcat, ColdFusion, MySQL
- Take Periodic Snapshots
- Git Clone My Repo
- Configure Separate Directories For Each Specific Judge
- Set Up A Custom Domain
- Fly To District To Spot Check Data And Train Administrators
- Final Hand Off

PROBLEMS WITH THAT

- It takes a week.
- We don’t control other districts’ hardware.
- It takes even more work to set up failover solutions.
- Setting up directories of static code per judge doesn’t make sense.
- This all doesn’t leave very much time for future development efforts.

INFRASTRUCTURE AS CODE

INFRASTRUCTURE AS CODE



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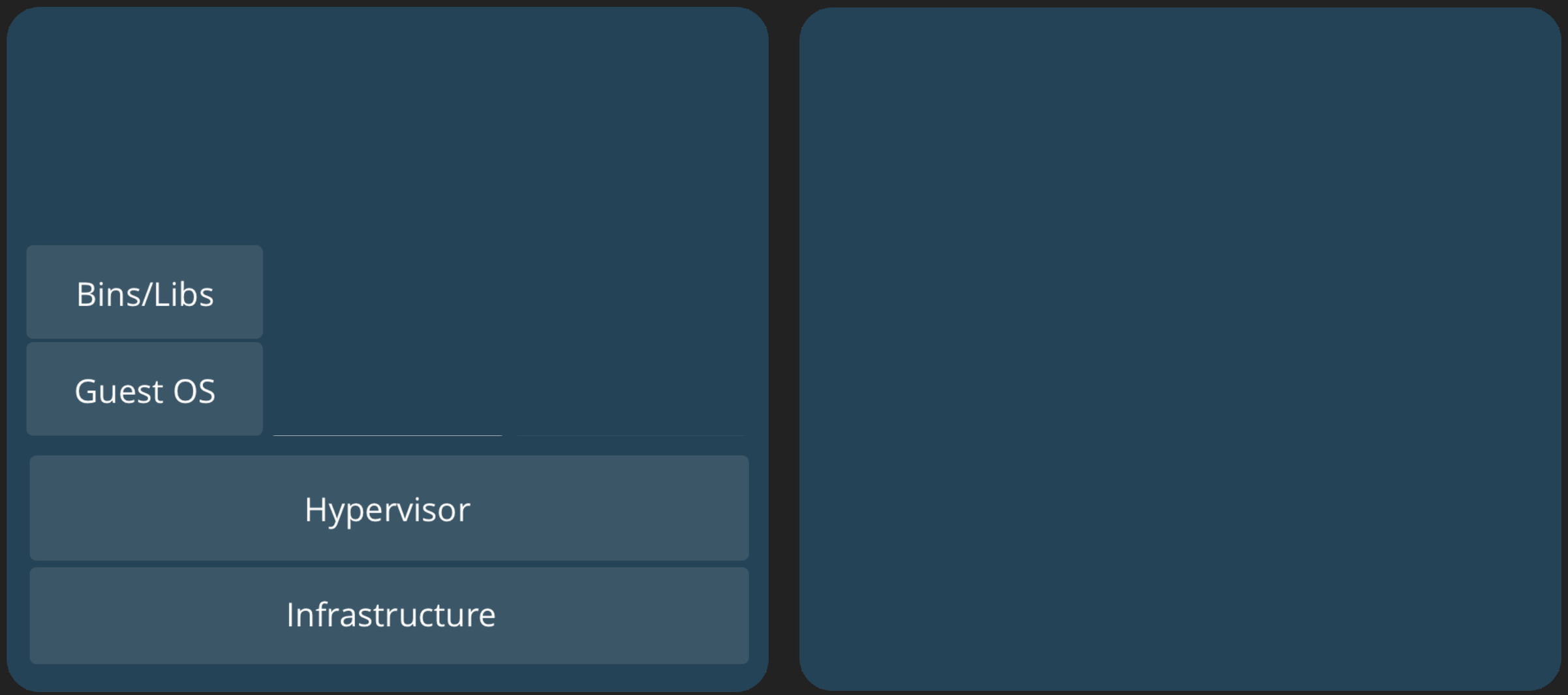

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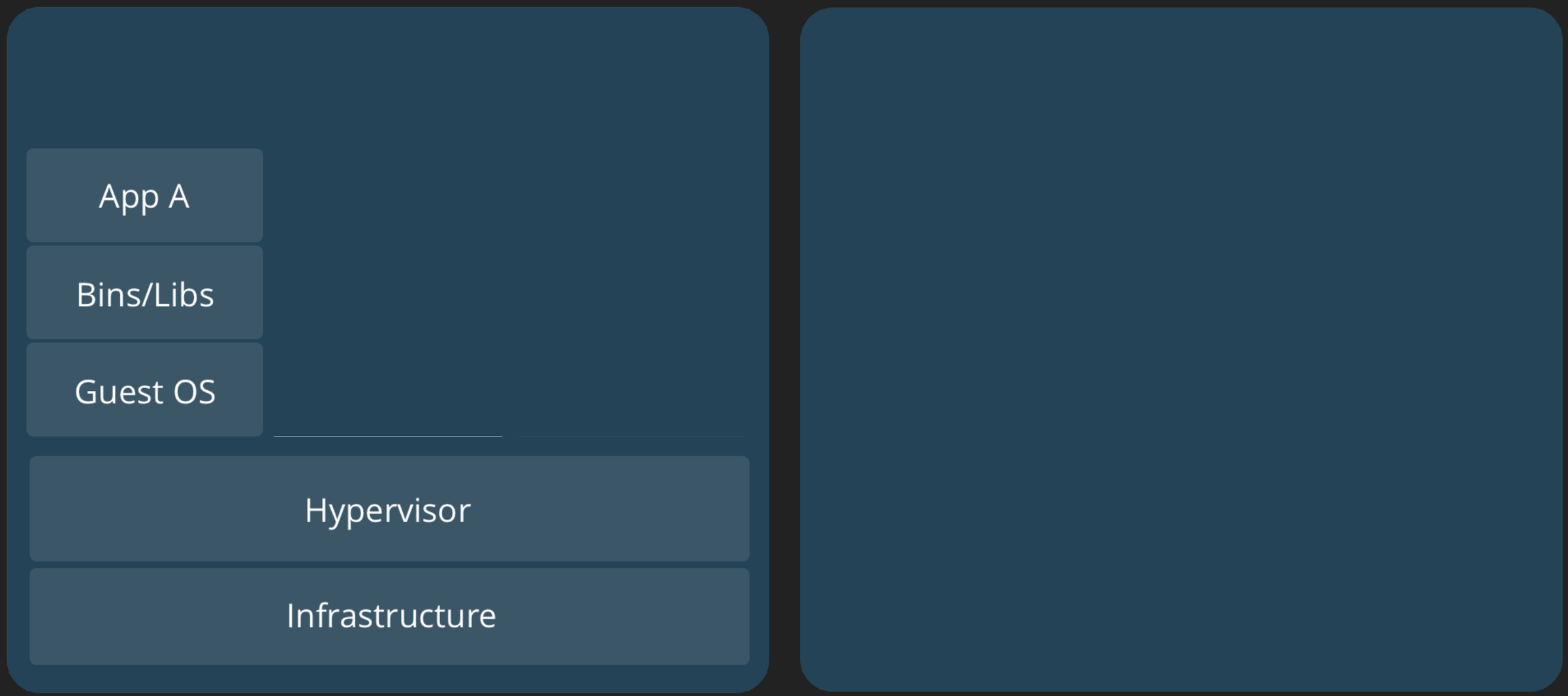

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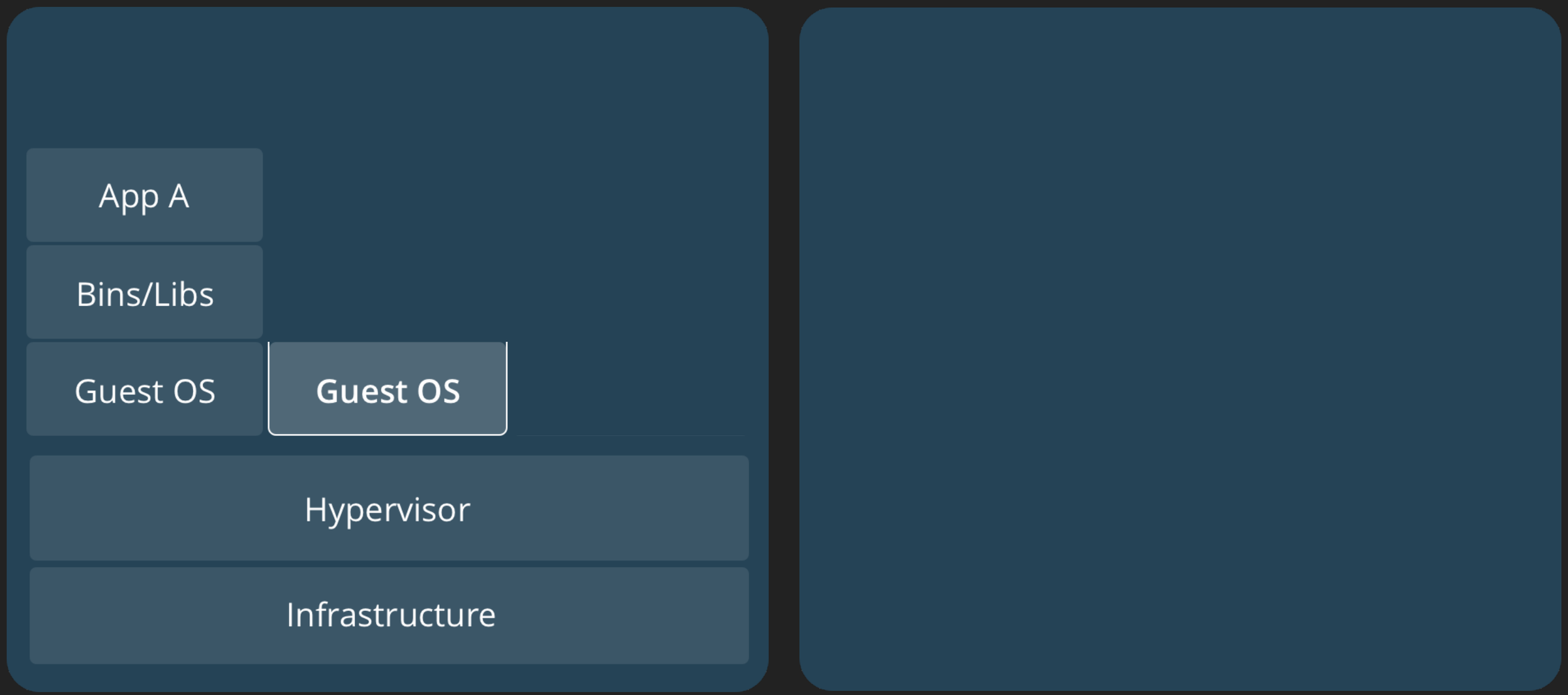

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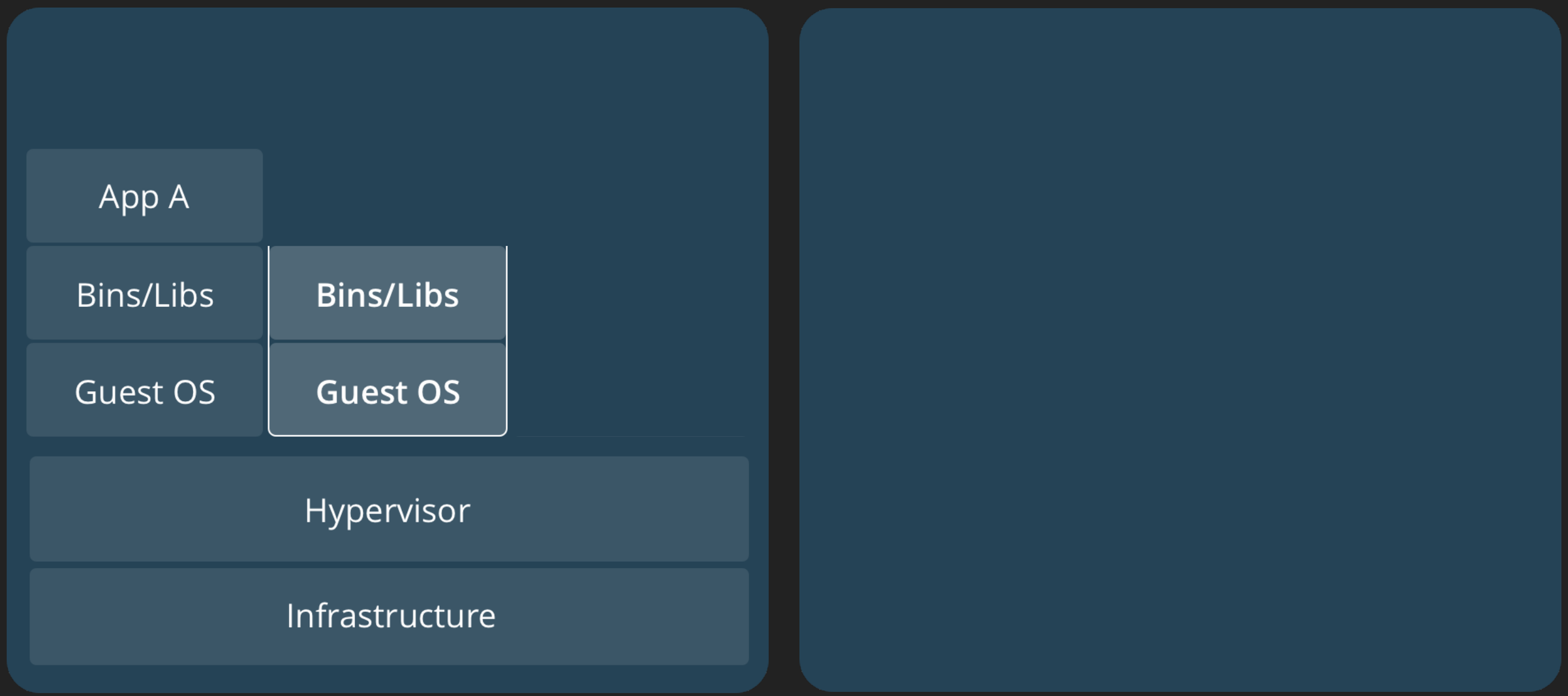

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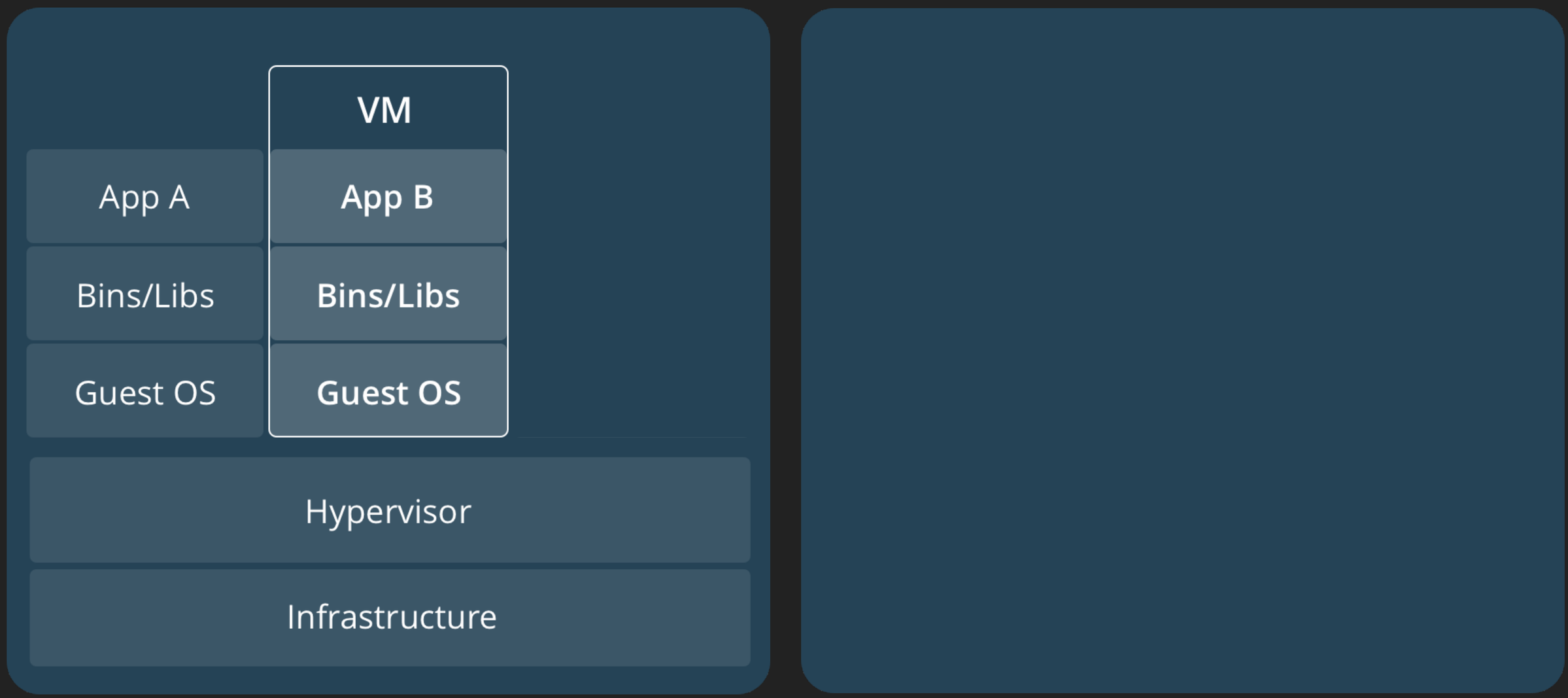

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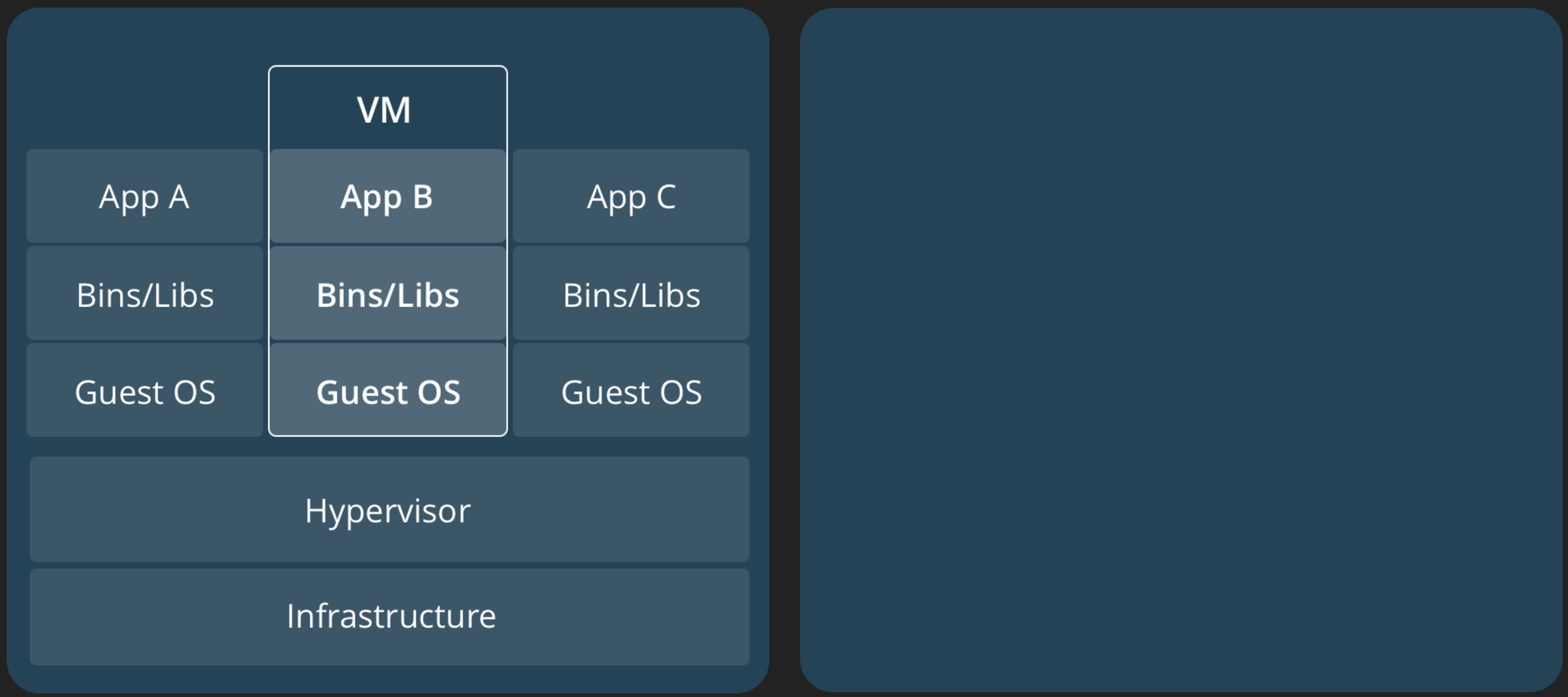

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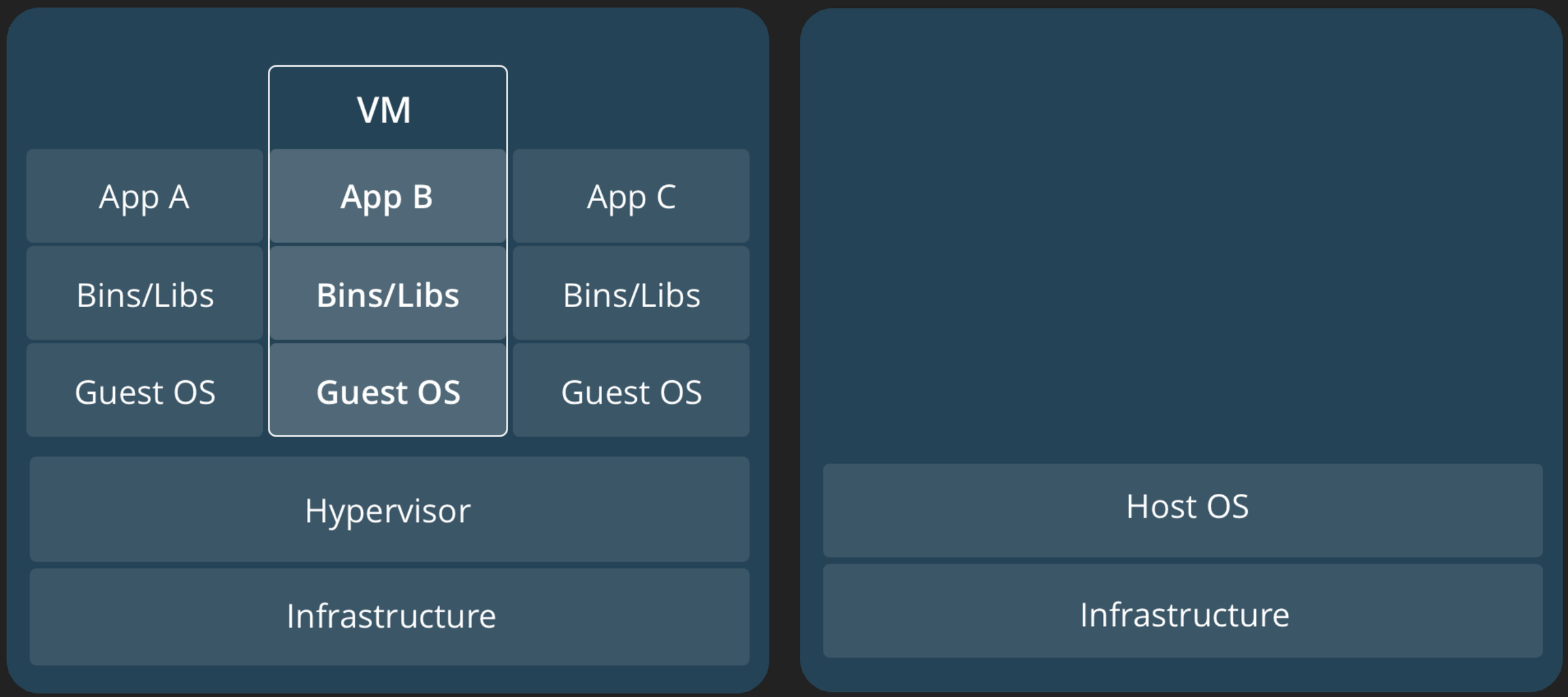

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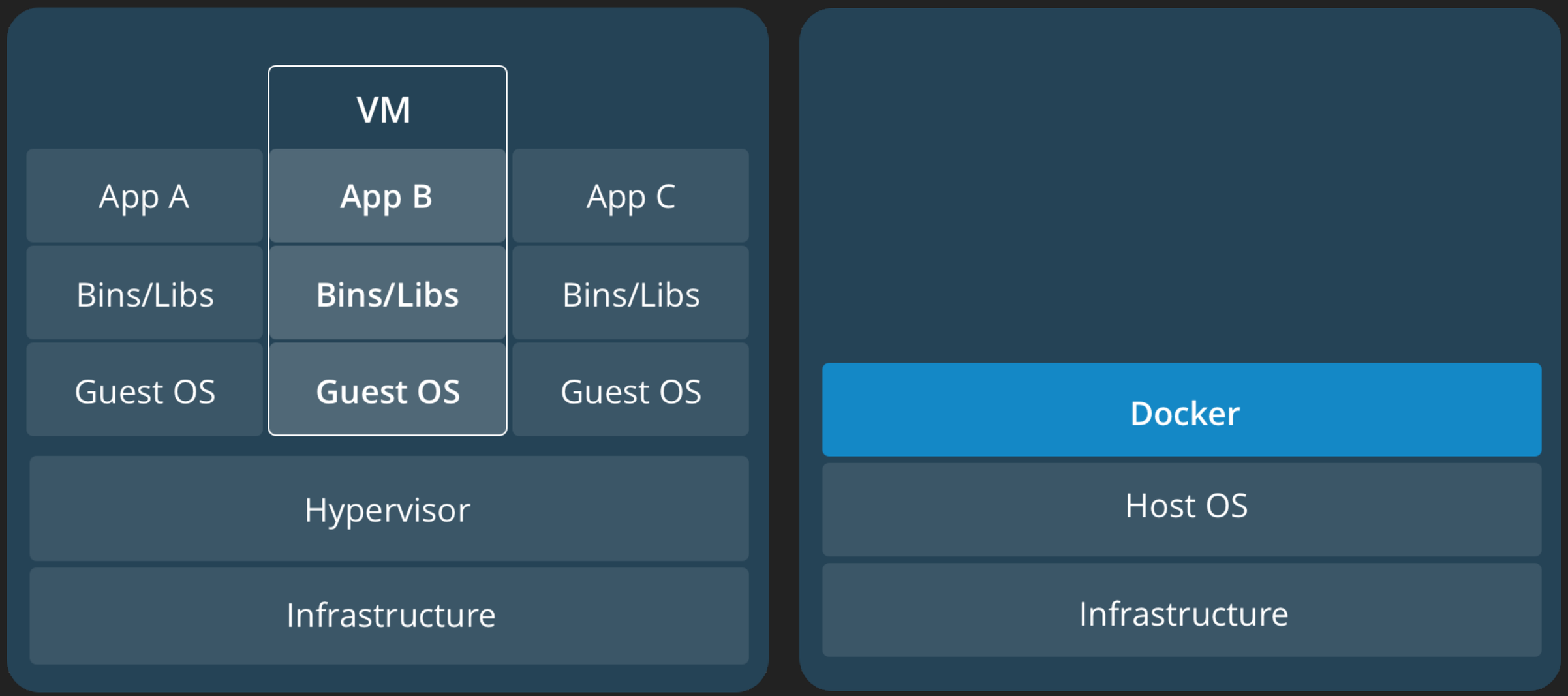

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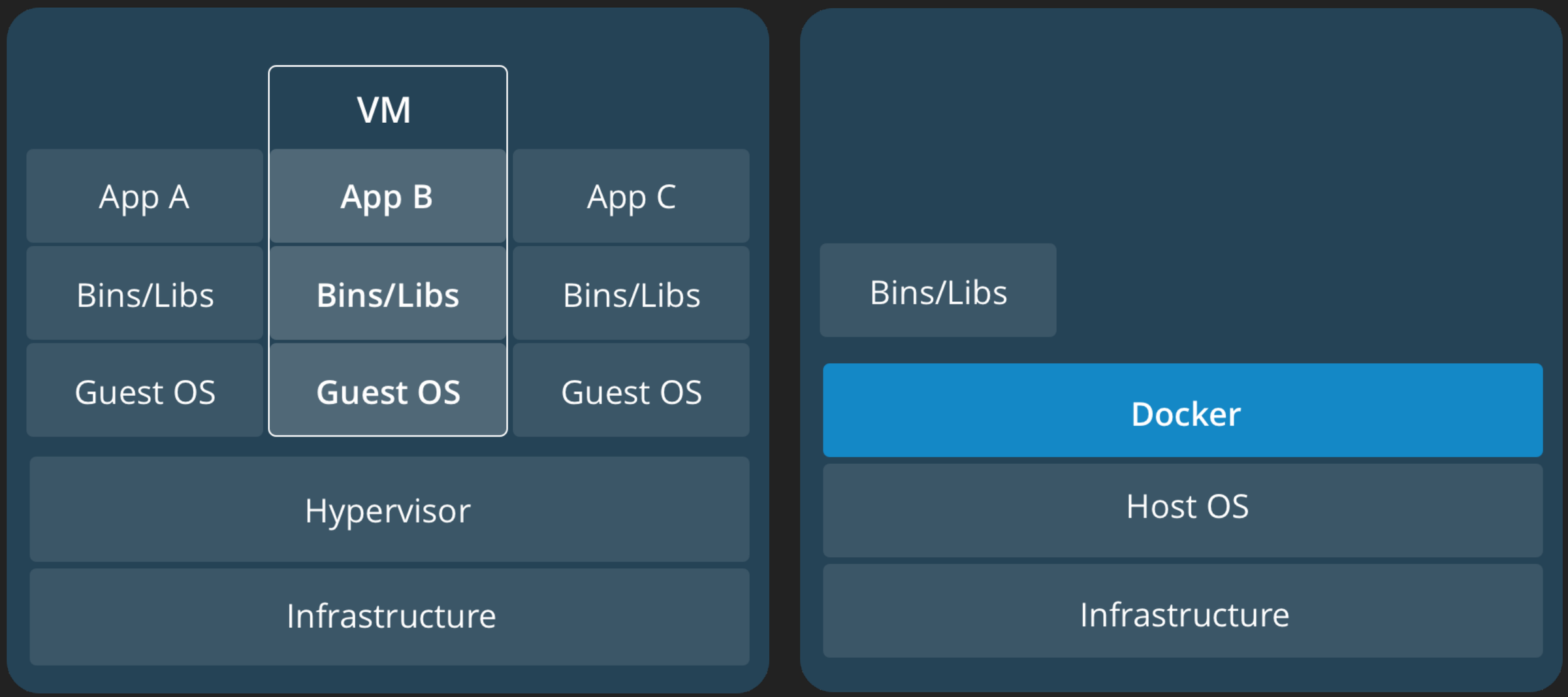

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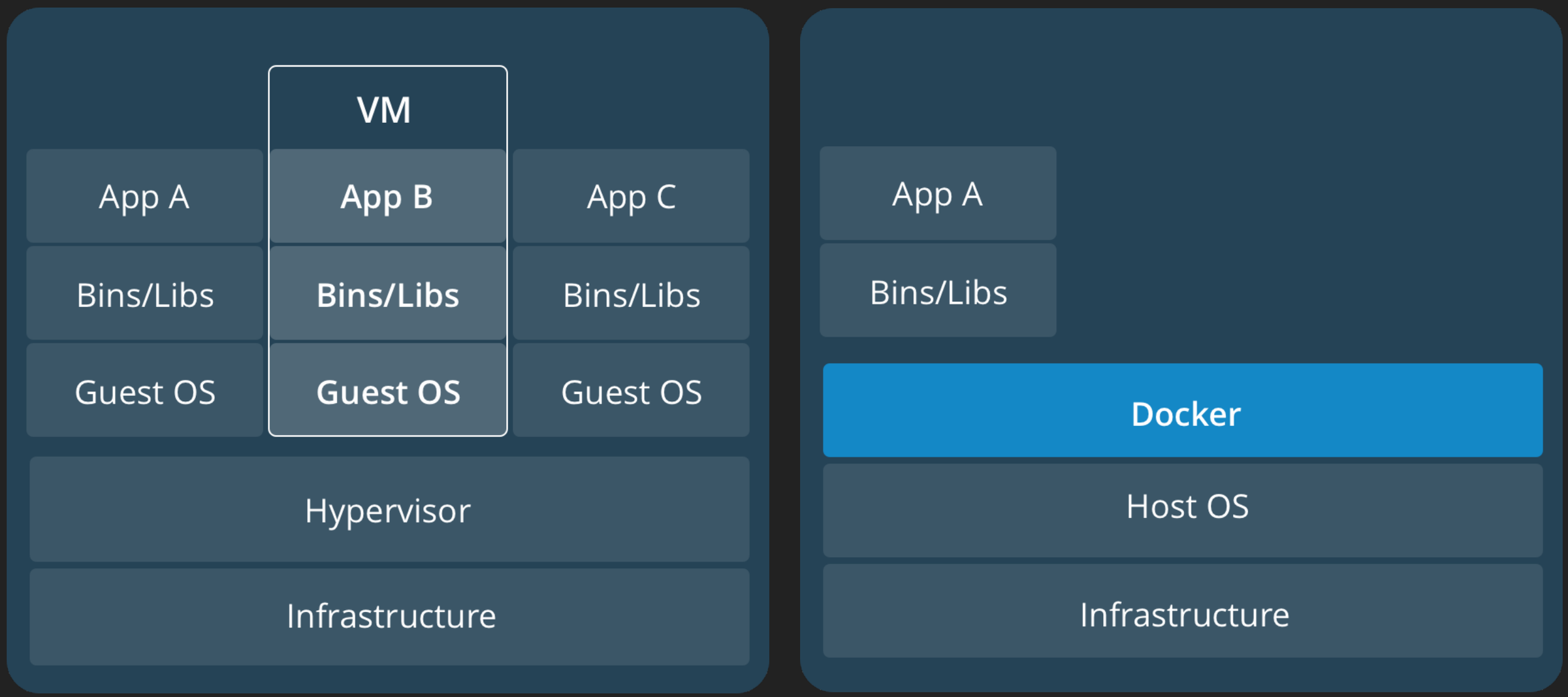

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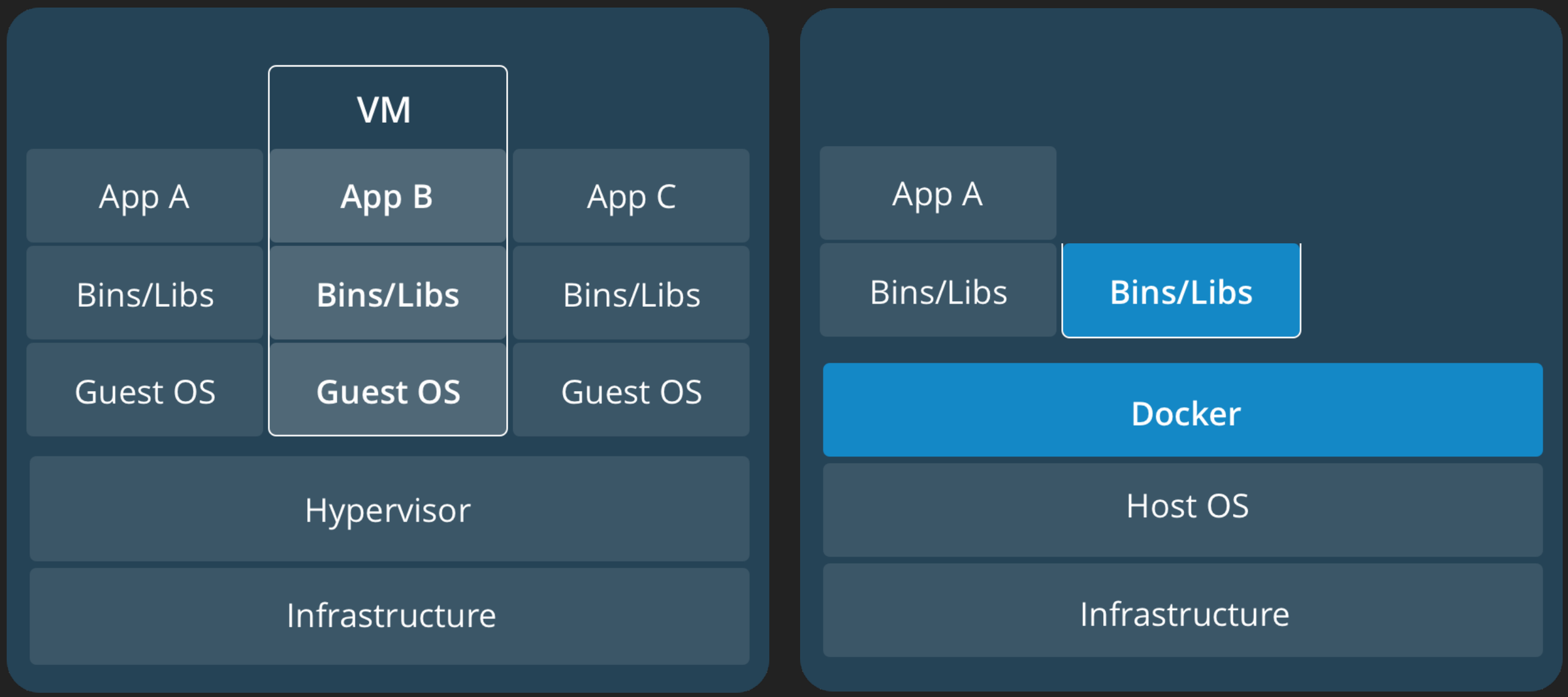

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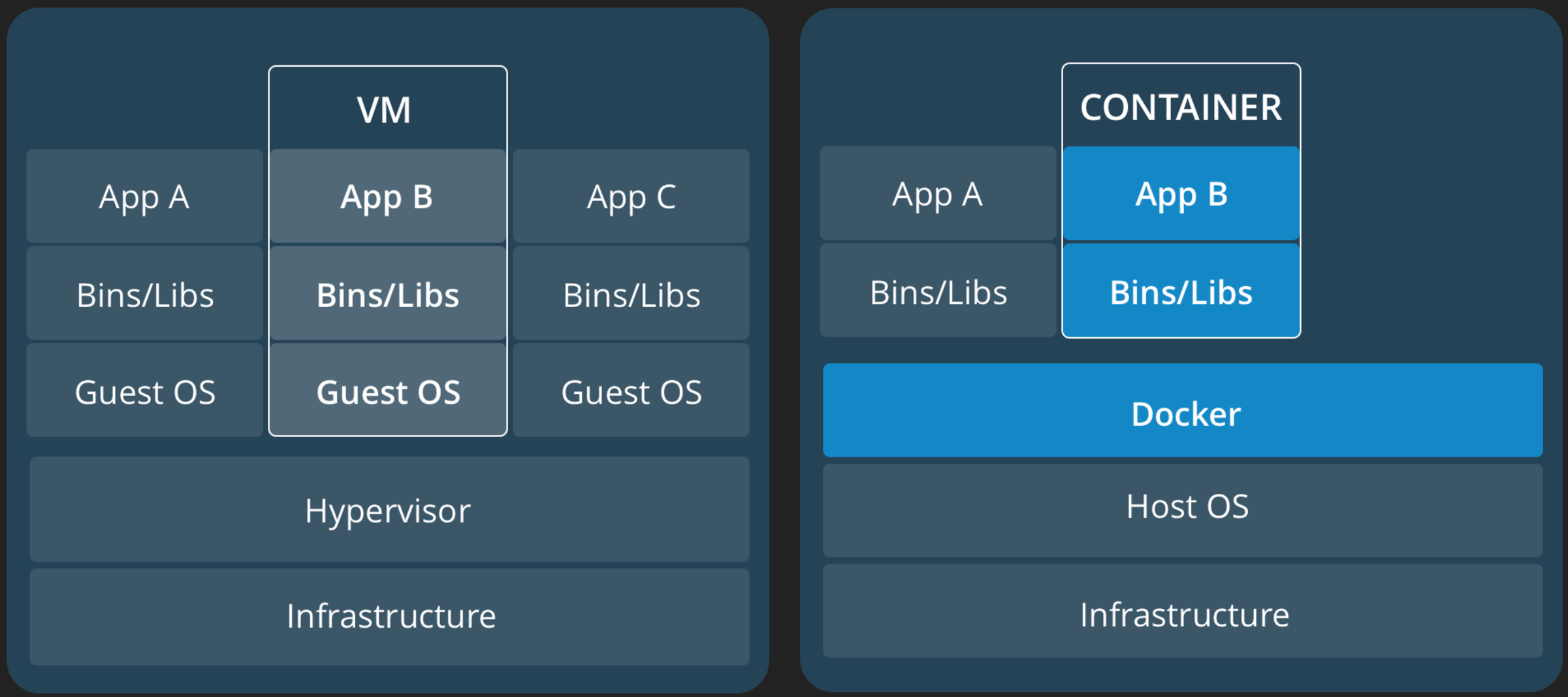

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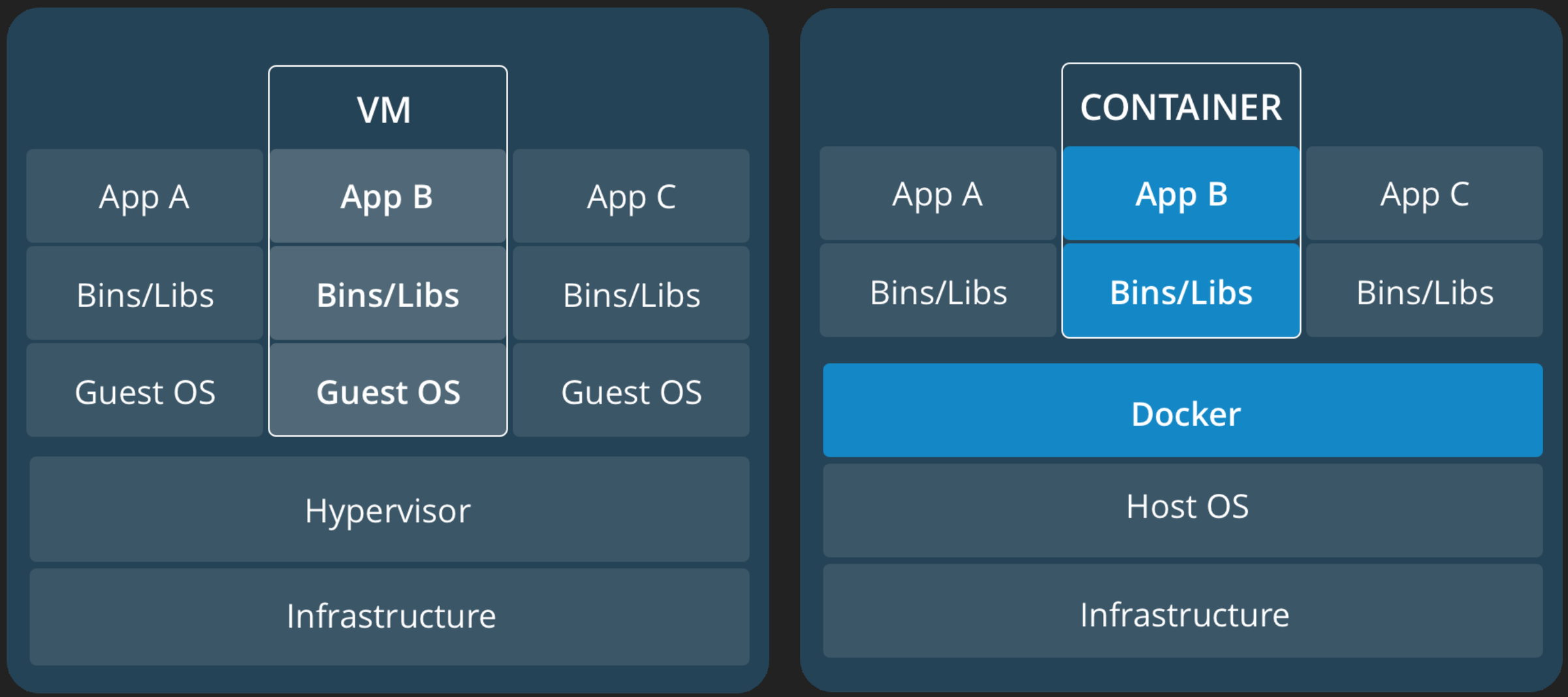


BROAD OVERVIEW

- Docker is a container management engine.
- Containers are builds that run the same on every platform.
- Containers are built from images, kind of like an .ISO file.
- Images are built using Dockerfiles.
- Dockerfiles are just text files with lists of instructions on how to build, configure, and run your environments.

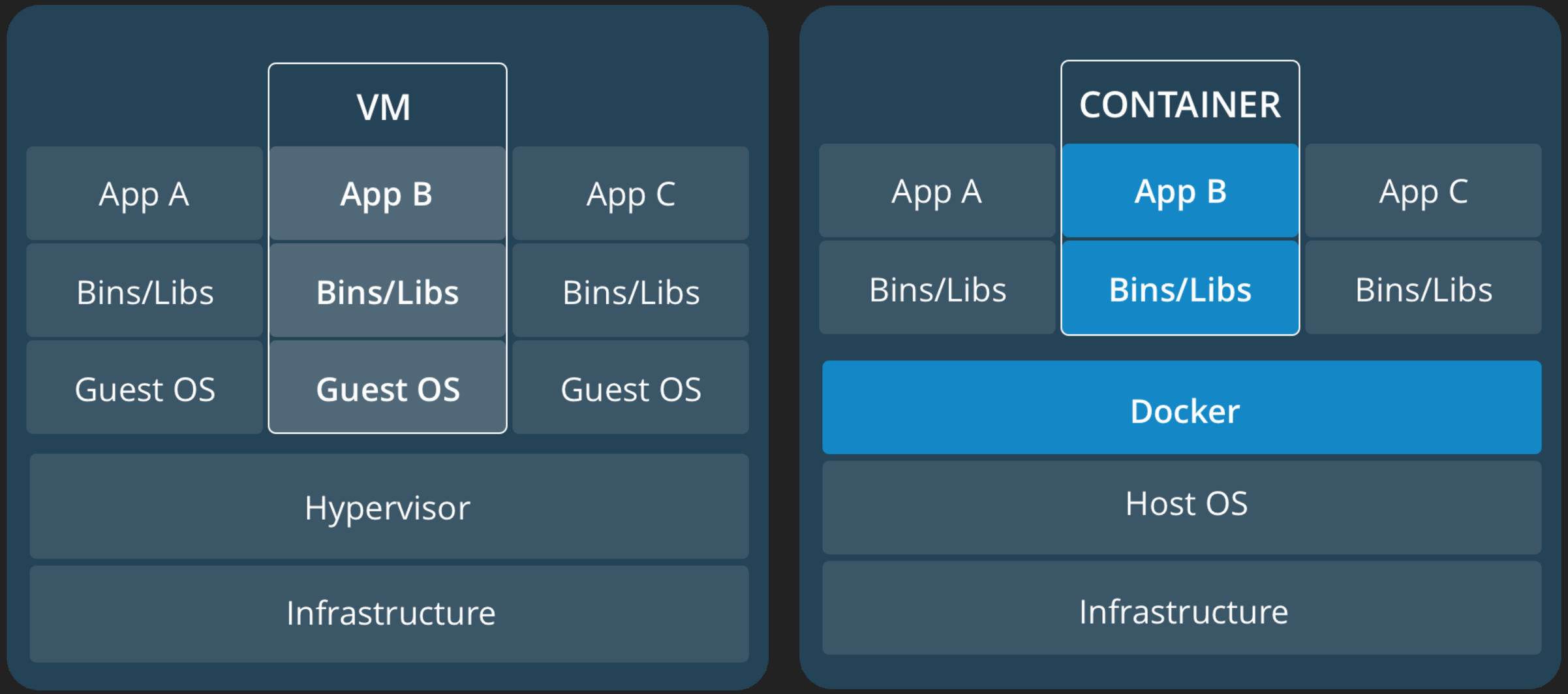
DOCKERFILES (PSEUDOCODE)

```
FROM lucee/lucee5:5.0.1.85

COPY config/lucee/setenv.sh /usr/local/tomcat/bin/

COPY config/lucee/lucee-web.xml.cfm /opt/lucee/web/

COPY config/lucee/lucee-server.xml /opt/lucee/server/
lucee-server/context/

ENV ELI_DSN_DRIVER=MySQL \
  ELI_DSN_CLASS=org.gjt.mm.mysql.Driver \
  ...

COPY code/ /var/www/
```

IMAGES

- An image is an inert, immutable file that's essentially a snapshot of a container.
- Images are created from Dockerfiles, which are made of instructions that build layers on top of a metaphorical system.
- Running "build" on a Dockerfile creates an image, while running "run" on an image spawns an instance of that image.
- A running instance of an image is called a container, of which you can have multiple based on the same image.

CONTAINERS


VM
App A
App B
App C
Bins/Libs
Bins/Libs
Bins/Libs
Guest OS
Guest OS
Guest OS
Hypervisor
Infrastructure
CONTAINER
App A
App B
App C
Bins/Libs
Bins/Libs
Bins/Libs
Docker
Host OS
Infrastructure

BUILDING AN IMAGE

- $ docker build –rm -t quinncuatro/eli-lucee .
- Boring Nerd Stuff ———–>

```
Status: Downloaded newer image for lucee/lucee5:5.0.1.85
# Executing 1 build trigger
 ---> Running in 505fd46acd64
Removing intermediate container 505fd46acd64
 ---> a37b7ca2c64f
Step 2/7 : LABEL author="Henry Quinn <henryquinniv@gmail.com>"
 ---> Running in 2034564b3357
Removing intermediate container 2034564b3357
 ---> d434d44acbd1
Step 3/7 : COPY config/lucee/setenv.sh /usr/local/tomcat/bin/
 ---> f6c501786550
Step 4/7 : COPY config/lucee/lucee-web.xml.cfm /opt/lucee/web/
 ---> c6d02a7998ab
Step 5/7 : COPY config/lucee/lucee-server.xml /opt/lucee/server/lucee-server/
context/
 ---> 7e042dc479c0
Step 6/7 : ENV ELI_DSN_DRIVER=MySQL   ELI_DSN_CLASS=org.gjt.mm.mysql.Driver
 ELI_DSN_CONNECTIONSTRING=jdbc:mysql://eli-db:3306/eli?useUnicode=true&charac
terEncoding=UTF-8&useLegacyDatetimeCode=true   ELI_DSN_DATABASENAME=eli   ELI
_DSN_USERNAME=root   ELI_DSN_PASSWORD=123456   LUCEE_TIMEZONE=America/New_Yor
k
 ---> Running in 5a20bb537337
Removing intermediate container 5a20bb537337
 ---> 677c2f84fce5
Step 7/7 : COPY code/ /var/www/
 ---> d0643da52e54
Successfully built d0643da52e54
Successfully tagged quinncuatro/eli-lucee:latest
```

USING AN IMAGE TO MAKE A CONTAINER

- $ docker images | grep eli-lucee

```
Henrys-MacBook-Pro:lucee quinncuatro$ docker images | grep eli-lucee
quinncuatro/eli-lucee   latest              d0643da52e54        2 minutes ago       643MB
```

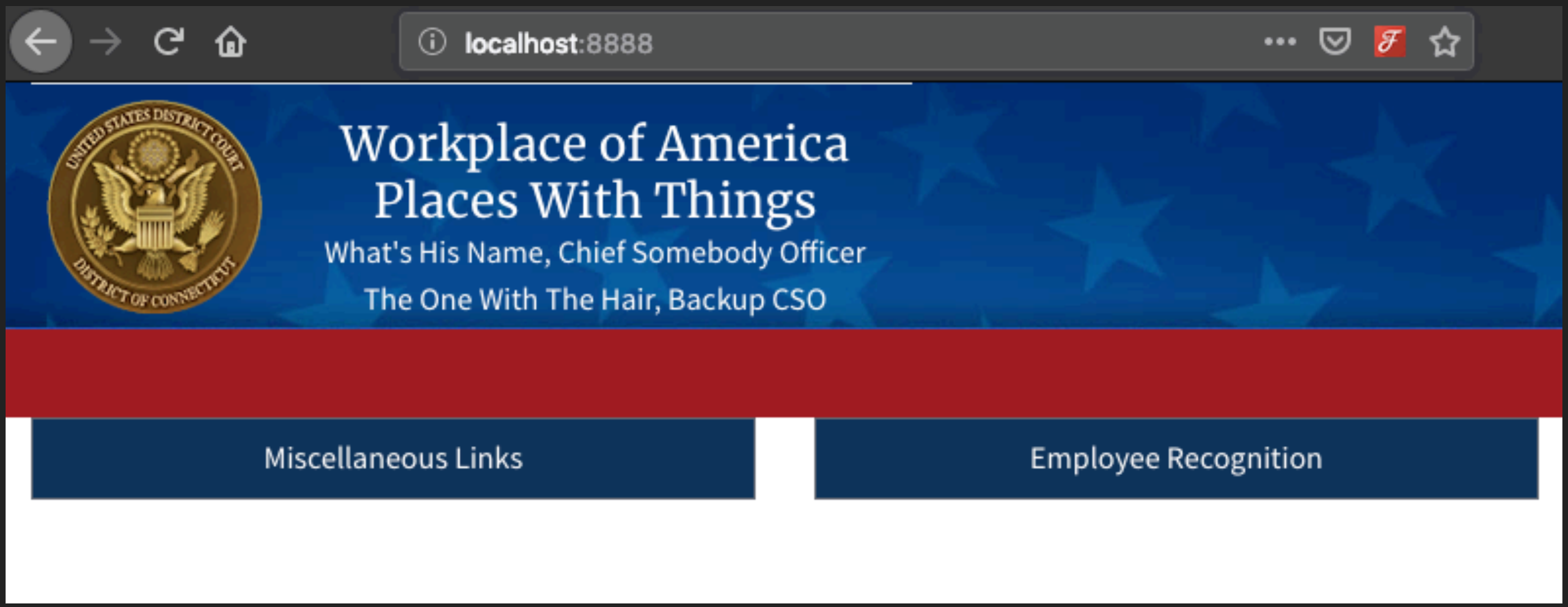
- $ docker run -d -p 127.0.0.1:8888:8888 --restart always --name eli-lucee --mount type=bind,source=$(pwd)/code,target=/var/www quinncuatro/eli-lucee:latest

```
Henrys-MacBook-Pro:lucee quinncuatro$ docker run -d -p 127.0.0.1:8888:8888 --restart always --name eli-lucee --mount type=bind,source=$(pwd)/code,target=/var/www quinncuatro/eli-lucee:latest
d306882d378cf30c1c72d4a007ae7da8d2174b449453339aff766f91355c339c
```

VERIFYING THAT THE CONTAINER IS RUNNING

- $ docker ps -a | grep eli-lucee

```
Henrys-MacBook-Pro:lucee quinncuatro$ docker ps -a | grep eli-lucee
d306882d378c        quinncuatro/eli-lucee:latest   "catalina.sh run"   2 minutes ago
    Up 2 minutes        8080/tcp, 127.0.0.1:8888->8888/tcp   eli-lucee
```



PROBLEMS WITH THAT

- It’s only one container.
- It’s not connected to a database.
- How would we even persist the database container’s data?
- If we set a database container up, how do we make the containers talk?

DOCKER COMPOSE YAML

```yaml
version: "3.5"
services:
  lucee-eli:
    build:
      context: ./lucee
      dockerfile: Dockerfile
    container_name: eli-lucee
    ports:
      - “8888:8888"
    networks:
      - eli-net
  db-eli:
    build:
      context: ./mysql
      dockerfile: Dockerfile
    container_name: eli-db
    volumes:
      - eli_dbdata:/var/lib/mysql
    networks:
      - eli-net
volumes:
  eli_dbdata:
networks:
  eli-net:
    driver: bridge
```

CREATING MULTIPLE CONTAINERS WITH DOCKER-COMPOSE

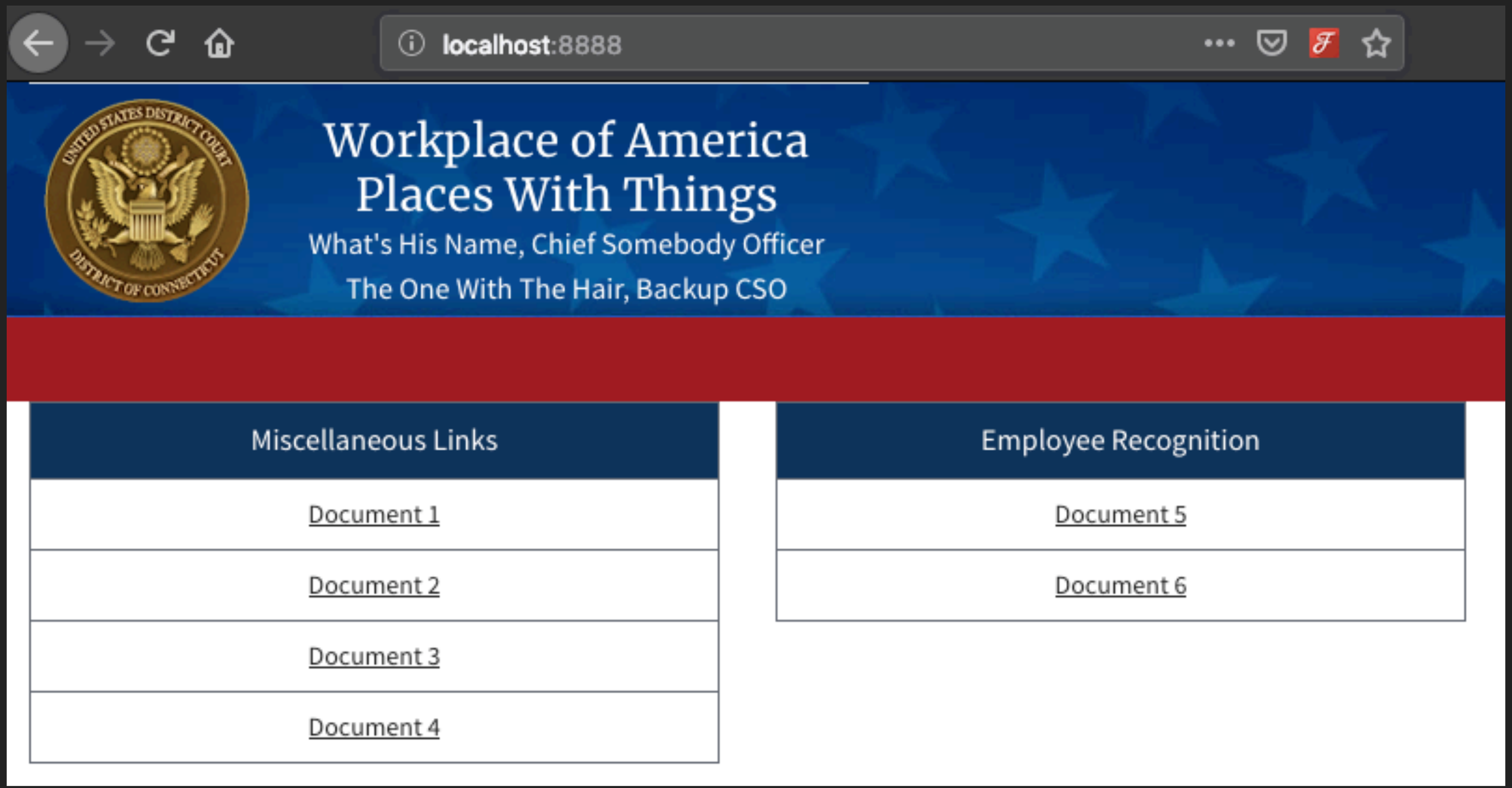
- $ docker-compose up -d

```
Henrys-MacBook-Pro:DEVC quinncuatro$ docker-compose up -d
Creating eli-db    ... done
Creating eli-lucee ... done
```

- $ docker ps -a

```
Henrys-MacBook-Pro:DEVC quinncuatro$ docker ps -a
CONTAINER ID        IMAGE                  COMMAND                  CREATED             ST
ATUS                PORTS                                NAMES
f01c4197e715        devc_lucee-eli         "catalina.sh run"        6 seconds ago       Up
 5 seconds          8080/tcp, 0.0.0.0:8888->8888/tcp     eli-lucee
f3551800c77a        devc_db-eli            "docker-entrypoint.s…"   6 seconds ago       Up
 5 seconds          3306/tcp                             eli-db
```

VERIFYING THAT THE CONTAINERS ARE RUNNING



NOW LETS ITERATE EVEN FASTER

- In spinup.sh (a bash script that executes different sets of Docker commands for me) there's a line:
- $ docker run -d -p 127.0.0.1:8888:8888 –restart always –name eli-lucee –mount type=bind,source=$(pwd)/lucee/code,target=/var/www –network eli-net devc_lucee-eli:latest
- –mount type=bind,source=$(pwd)/lucee/code,target=/var/www

PLATFORM AGNOSTIC

- Docker can generate containers that run the same no matter where they are, whether it be:
  - Windows 10/Server
  - OS X >= 10.11 (El Cap)
  - CentOS, Debian, Fedora, RHEL, SUSE, Ubuntu
  - AWS
  - Azure
  - GCE

PLATFORM AGNOSTIC

- Now, why is that a benefit?
  - You can spin your apps and data layers up REALLY fast.
  - No hand configs when trying out new tools, just “$ docker run ${whatever}” and go.
  - Develop and deploy with the exact same point releases of operating systems and dependencies.
  - Ensures that your applications are isolated and segregated.
  - Use the same image through the entire CI process.

PLAN FOR TODAY

- What I Was Tasked With
- What Was Expected Of Me
  - VPS Overview (Virtual Private Server)
- What I Did Instead
  - Docker Overview

HELPFUL LINKS (DIGITAL OCEAN)

- Digital Ocean Referral Code (Free $10 Credit)
  - https://m.do.co/c/c4539d6703fe
- Digital Ocean CentOS Guides
  - https://www.digitalocean.com/community/tutorials/initial-server-setup-with-centos-7
  - https://www.digitalocean.com/community/tutorials/how-to-install-linux-apache-mysql-php-lamp-stack-on-centos-7

HELPFUL LINKS (DOCKER)

- Install Docker CE (Community Edition)
  - https://docs.docker.com/engine/installation/
- Getting Started
  - Mac - https://docs.docker.com/docker-for-mac/
  - PC - https://docs.docker.com/docker-for-windows/
- Docker Labs - https://github.com/docker/labs