Automated deployments with SaltStack & Docker

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@baremetalio

How many of us have:

Spent too much time deploying new software?

Spent too much time

deploying new rolling back software?

Or have answered the question:

“Can we get an install of _____ **Cassandra** _____ ?”

“Can we get an install of ____**Memcached**____ ?”

“Can we get an install of ____**RabbitMQ**____ ?”

“Can we get an install of ______**Redis**______ ?”

“Can we get an install of ________…________ ?”

With:

“maybe next week.”

–Your friendly devops / sysadmin

The answer *should* be:

“on it!”

–*Your friendly devops / sysadmin*

“you can do it yourself!”

–Your friendly devops / sysadmin

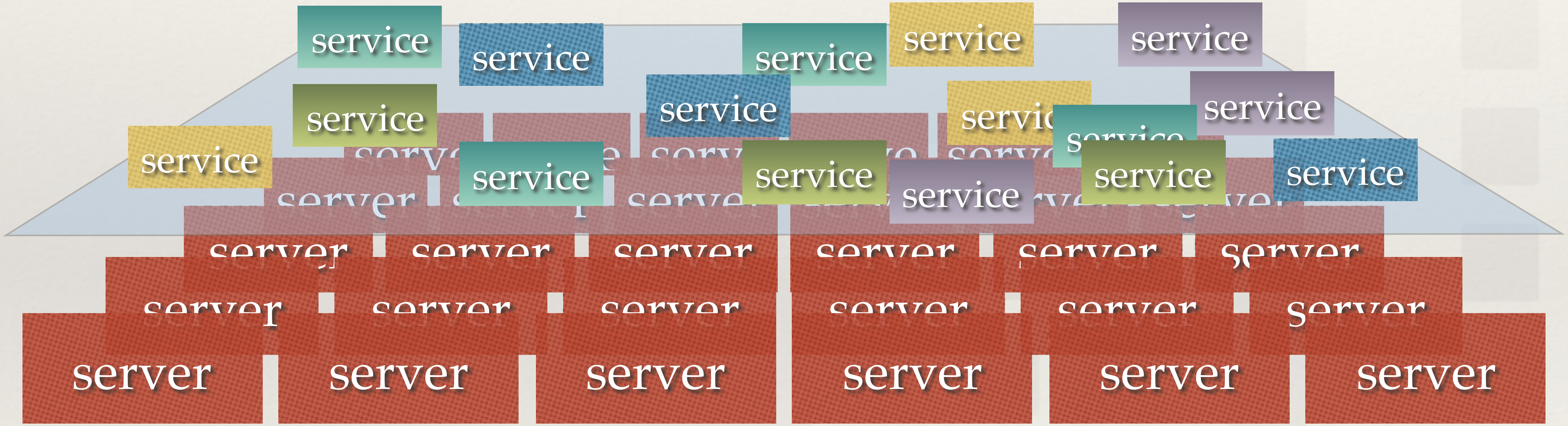
How do we get there?

“How to build a dynamic compute environment?”

Dynamic Compute Environment

- Easily start and stop services
- Experimentation with a low barrier to entry
- Scale processes as needed
- Unique, isolated application environments
- Self-service

Separation of concerns



Separation of concerns

- Host systems are identical
- Host systems are application/service -unaware
- Services are self-contained

The Application Layer

The Twelve-Factor App

http://12factor.net

I. Codebase
&
II. Dependencies

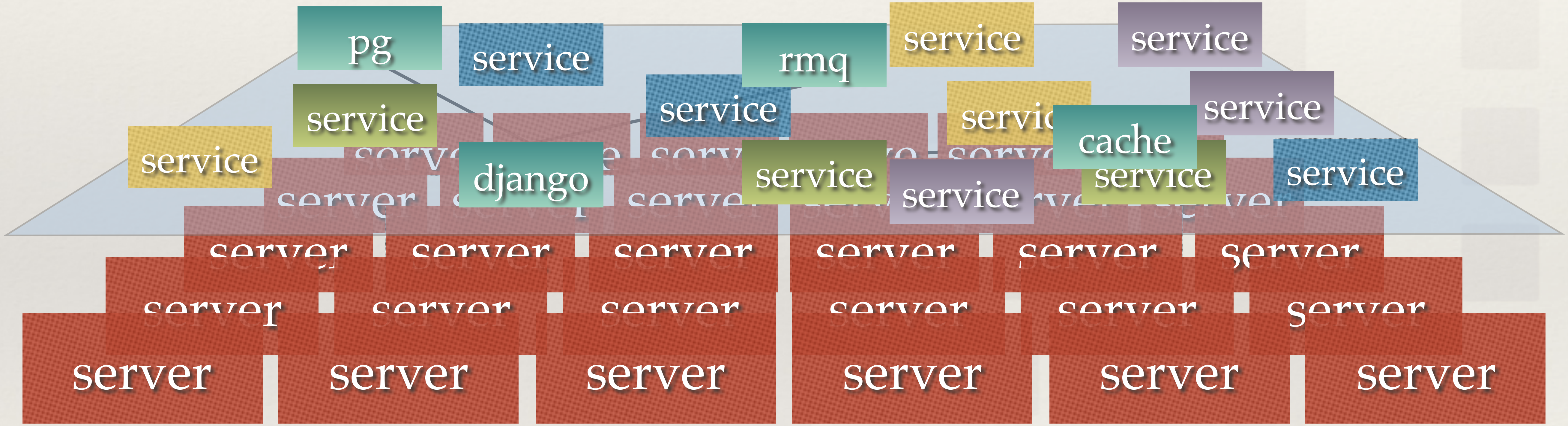
V. Build, Release & Run

IV. [Backing] Services

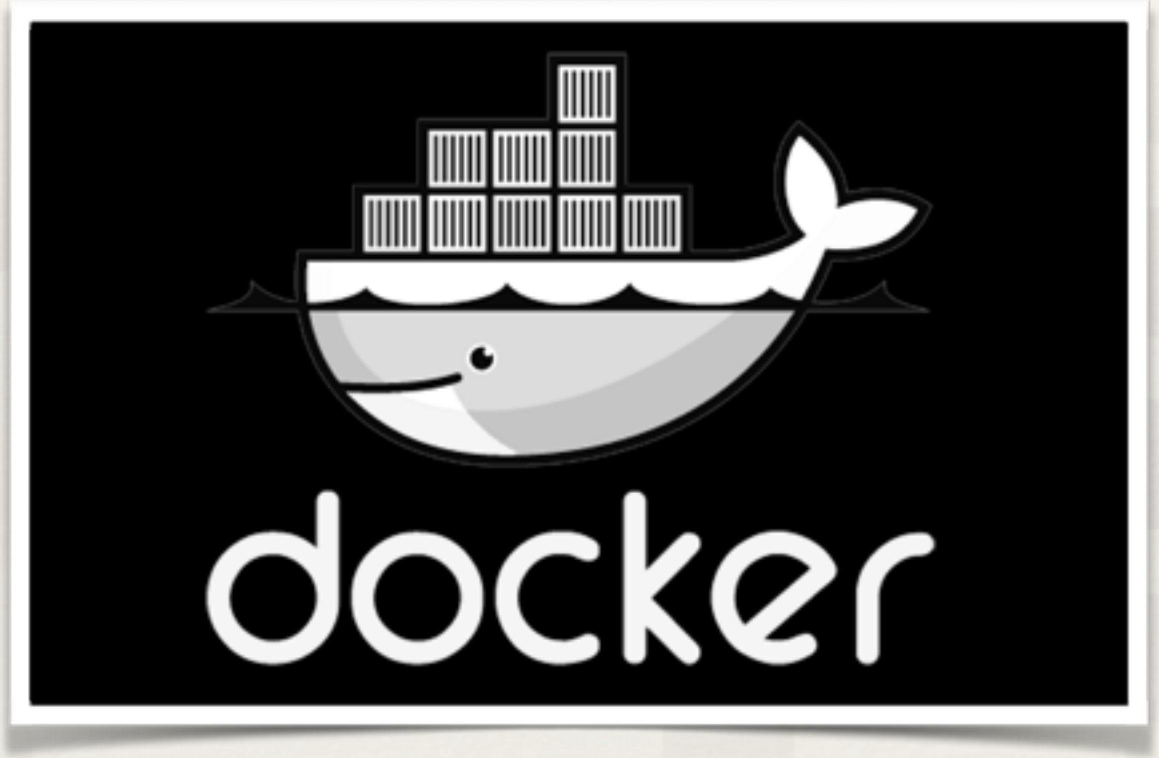
VII. Port-binding

III. Environment-based Config

Application Layer



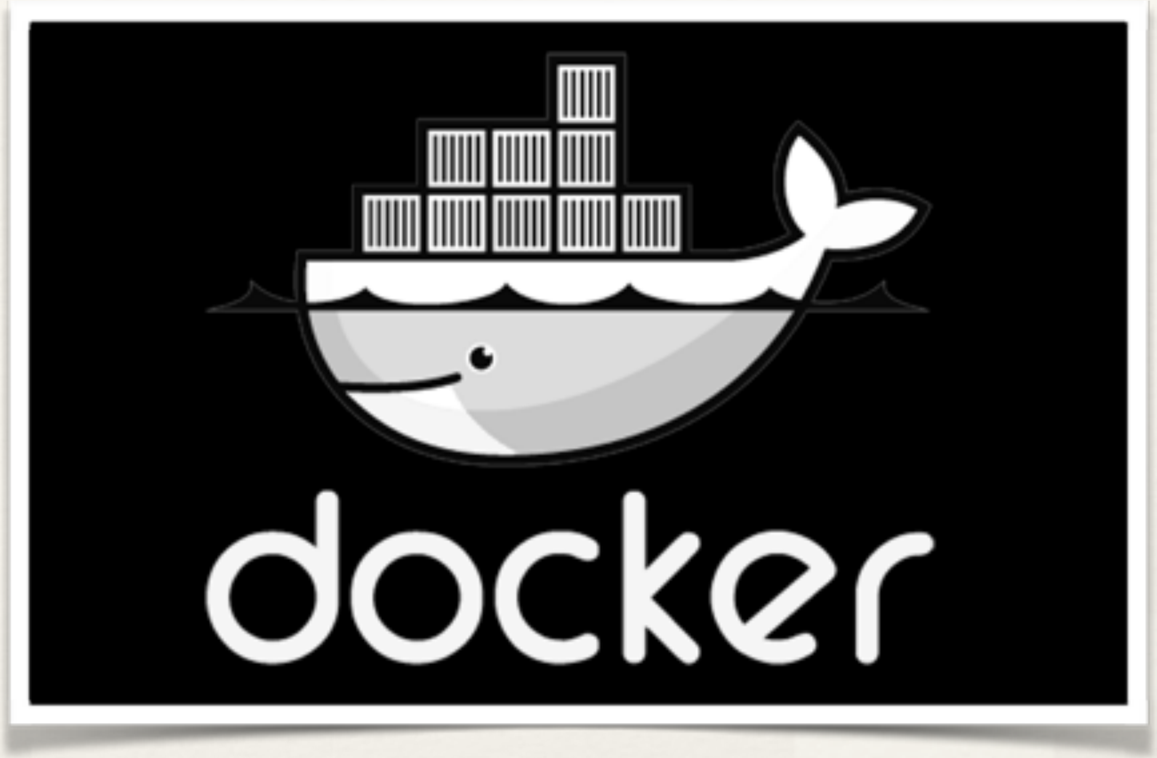
The nuts and bolts



Compute Environment

- The way to interact with systems
- Server provisioning
- Base software stack
- System configuration
  - logging (syslog config)
  - networking (/etc/hosts, floating IPs, etc.)
  - metrics collection

Application Environment



- Image creation
- Image distribution
- Application runtime

Fill in the blanks

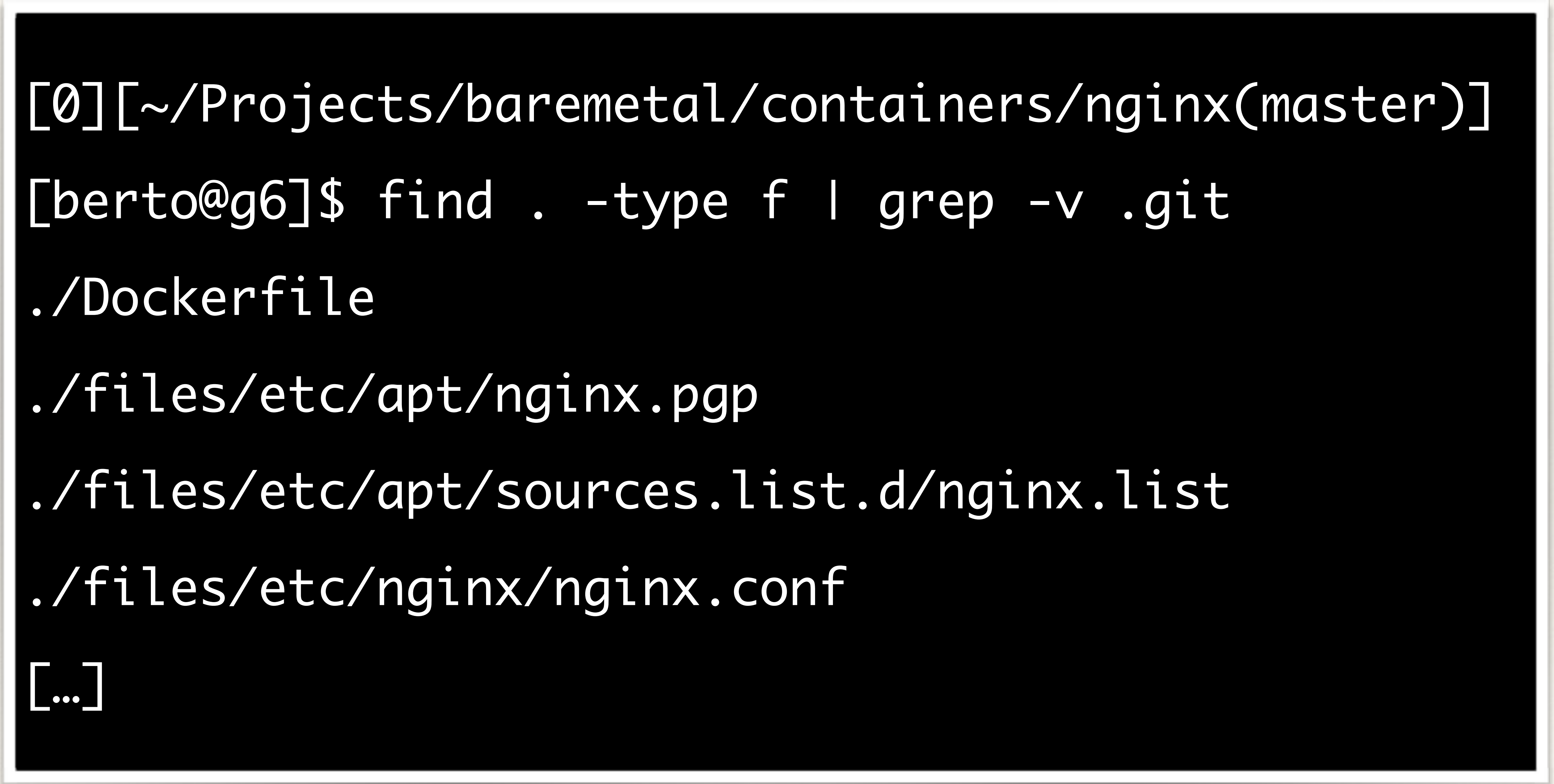
I. Codebase

&

II. Dependencies

I. Codebase

nginx service repo



```
[0][~/Projects/baremetal/containers/nginx(master)]
[berto@g6]$ find . -type f | grep -v .git
./Dockerfile
./files/etc/apt/nginx.pgp
./files/etc/apt/sources.list.d/nginx.list
./files/etc/nginx/nginx.conf
[…]
```

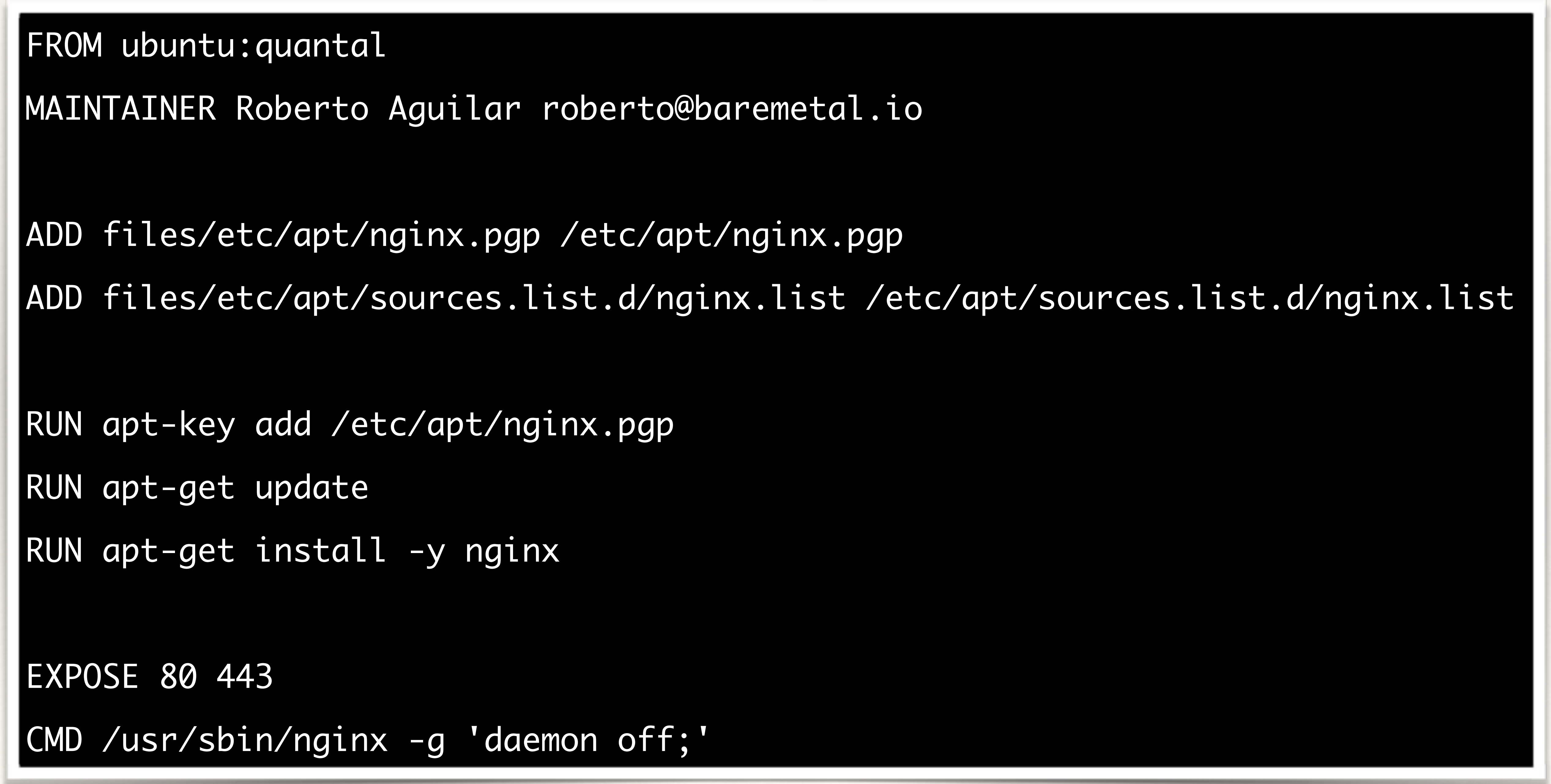
II. Dependencies

`Dockerfile (http://docs.docker.io/en/latest/use/builder/)`

- `FROM` - Defines the base image: OS, version, etc.
- `ADD` - Adds files to image
- `RUN` - Commands to configure image
- `EXPOSE` - Specifies exposed ports
- `ENV` - Defines environment variables
- `VOLUME` - Filesystem directories that are sharable
- `CMD` - Default command to run when launched

II. Dependencies

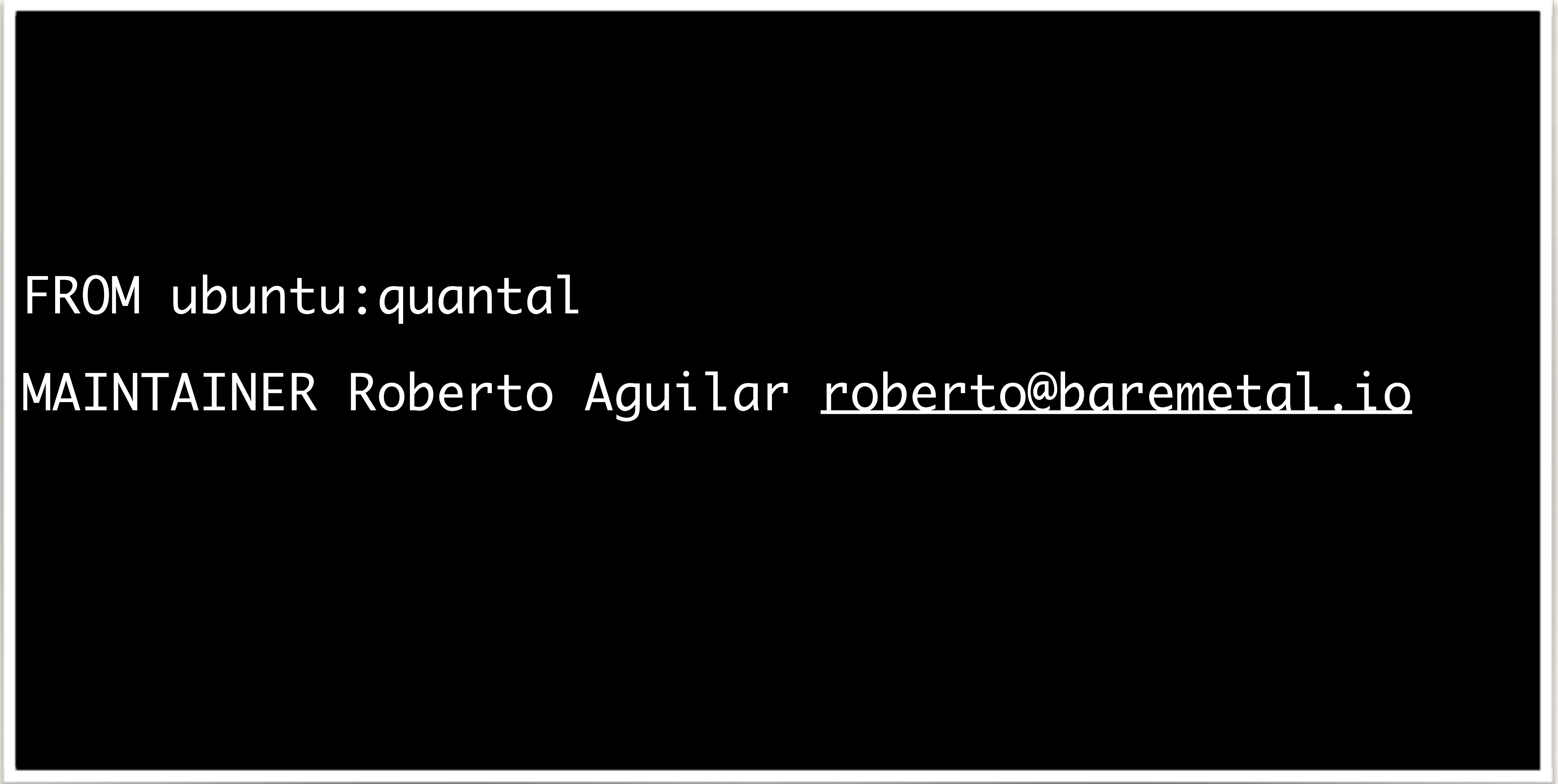
Dockerfile (http://docs.docker.io/en/latest/use/builder/)



```
FROM ubuntu:quantal
MAINTAINER Roberto Aguilar roberto@baremetal.io

ADD files/etc/apt/nginx.pgp /etc/apt/nginx.pgp
ADD files/etc/apt/sources.list.d/nginx.list /etc/apt/sources.list.d/nginx.list

RUN apt-key add /etc/apt/nginx.pgp
RUN apt-get update
RUN apt-get install -y nginx

EXPOSE 80 443
CMD /usr/sbin/nginx -g 'daemon off;'
```

II. Dependencies

Dockerfile (http://docs.docker.io/en/latest/use/builder/)



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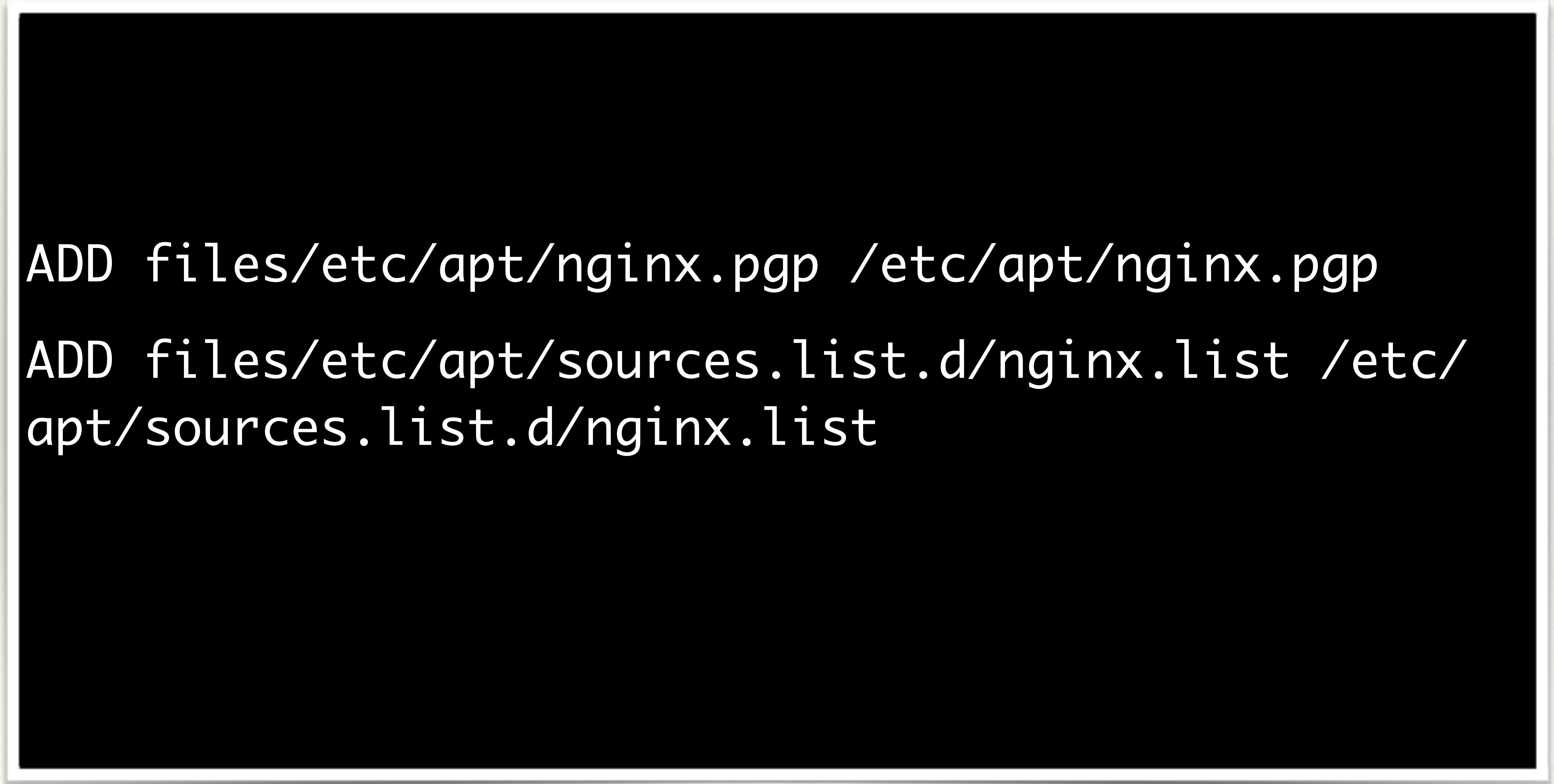

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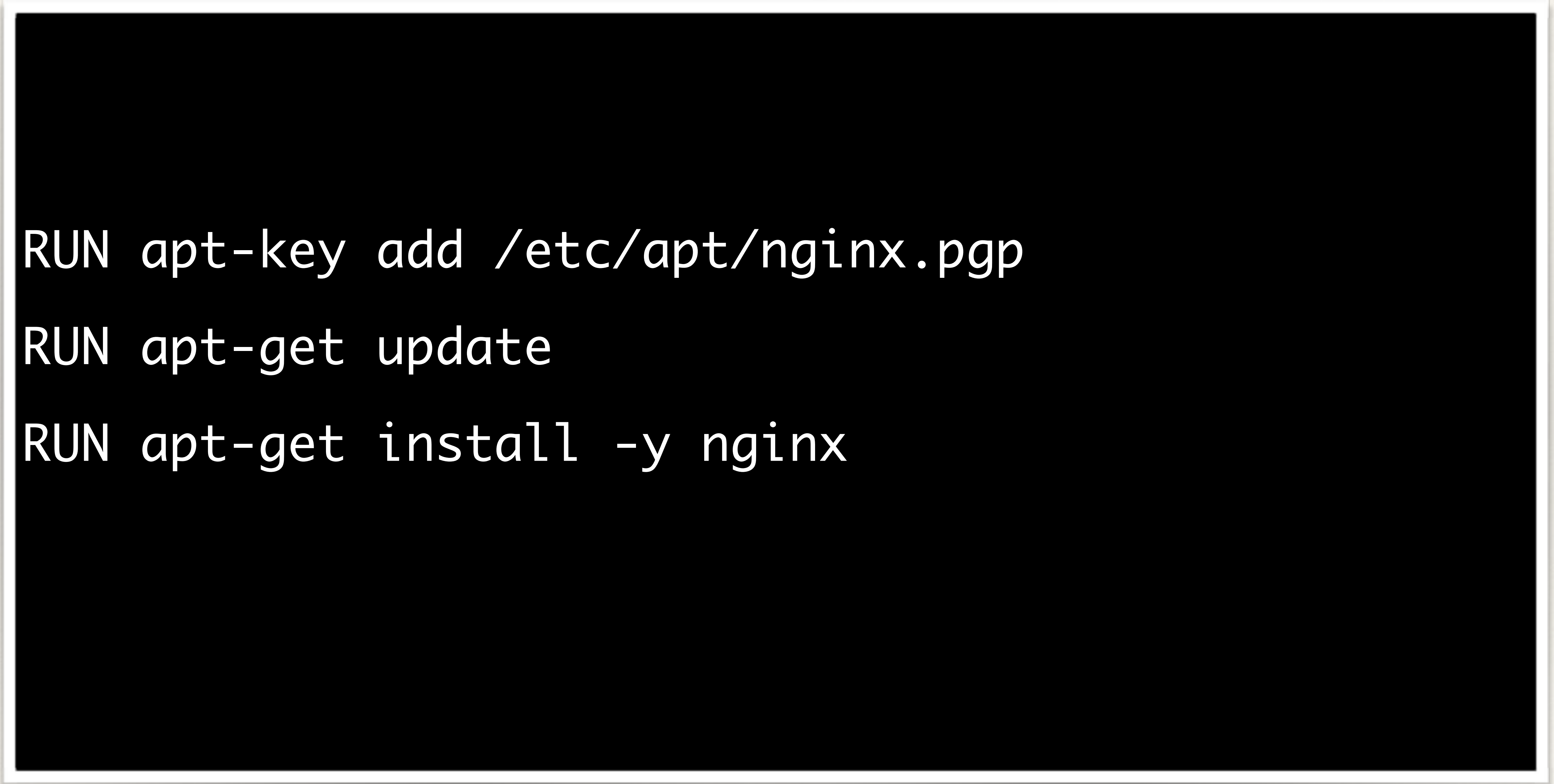

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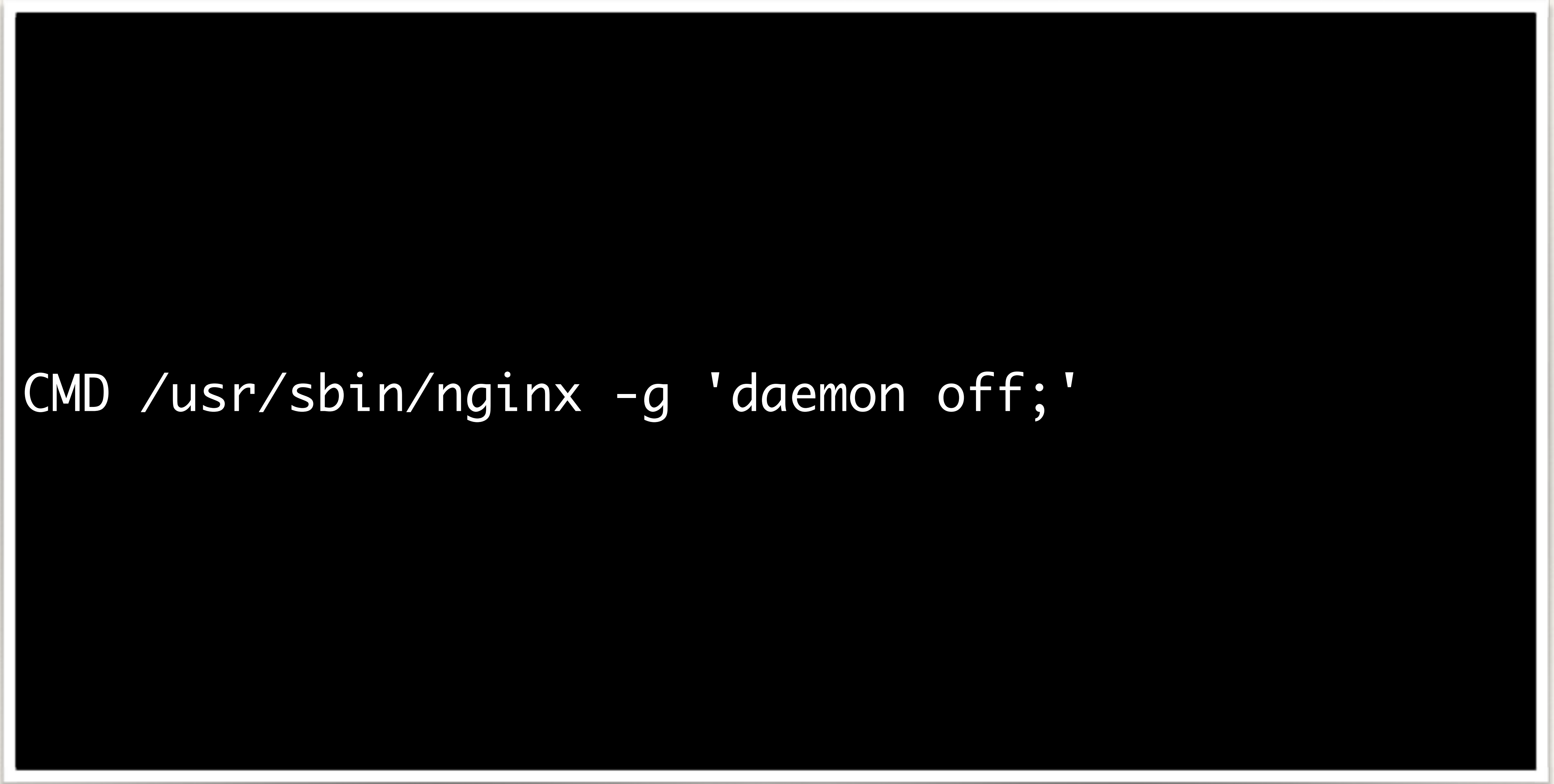
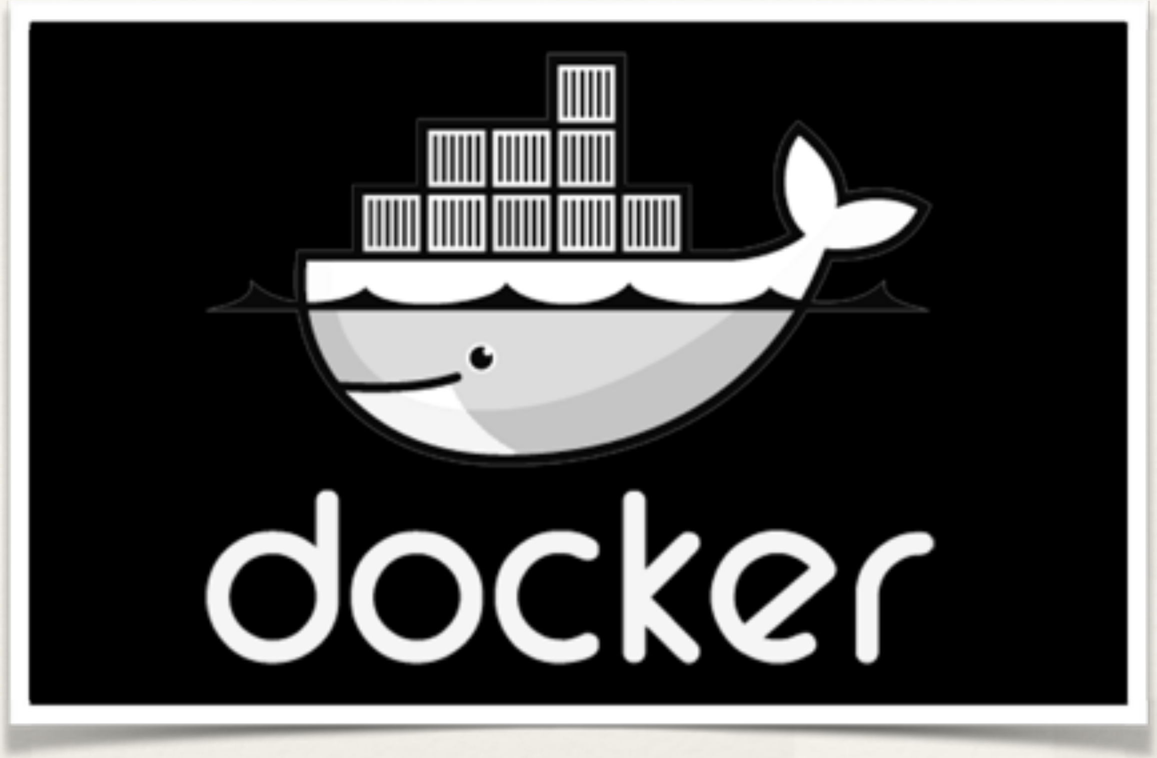


```
CMD /usr/sbin/nginx -g 'daemon off;'
```

V. Build, Release & Run

Docker



Builds images

```
docker build -t <image_name> .
```

Container runtime

```
docker run -d <image_name> [command]
```

Docker Registry

github.com/dotcloud/docker-registry

Host images

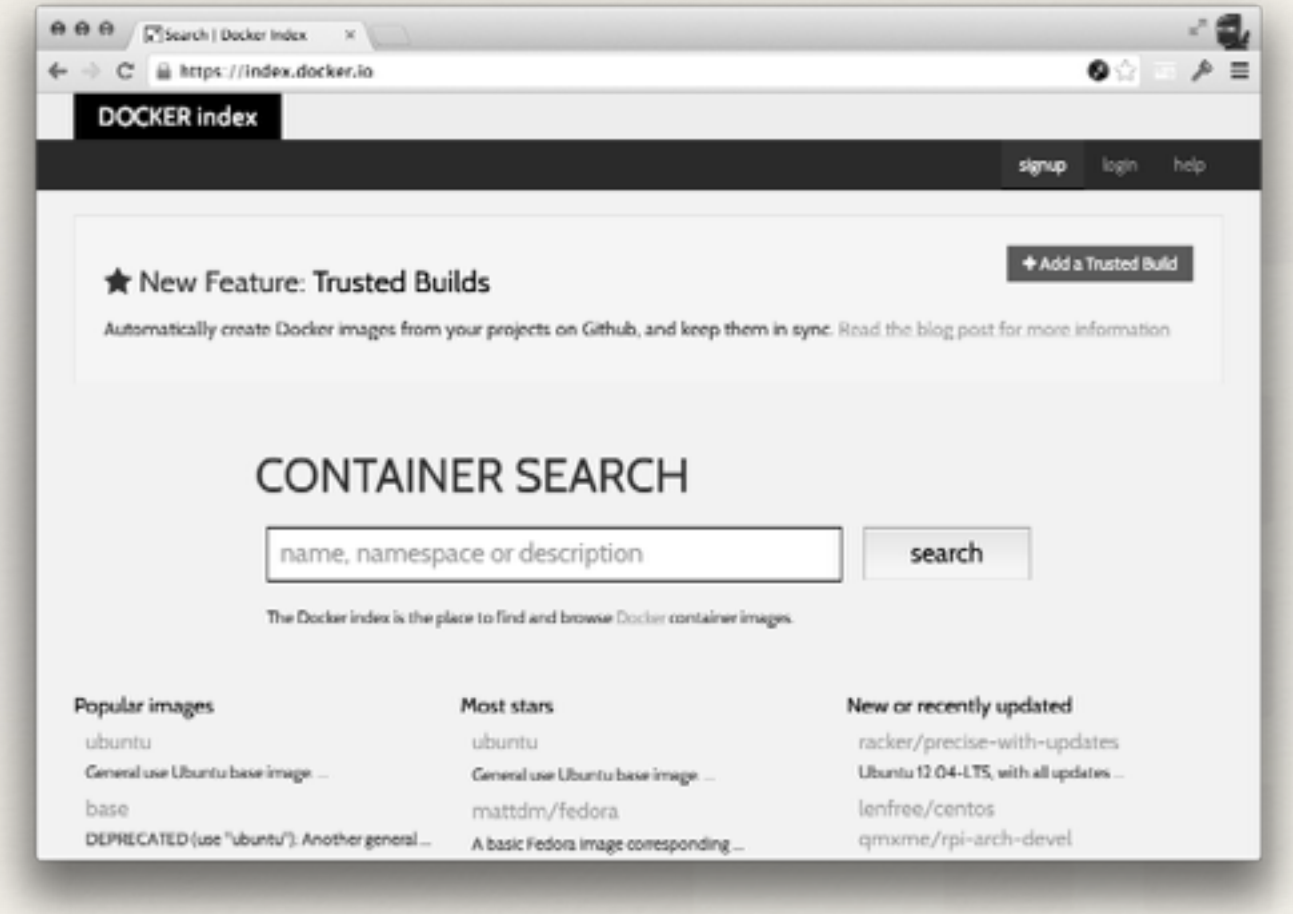
```
docker push <image_name>
```

Distribute images

```
docker pull <image_name>
```

Check out the Docker Index

Ready-made, downloadable images



New Feature: Trusted Builds

Automatically create Docker images from your projects on Github, and keep them in sync. Read the blog post for more information

CONTAINER SEARCH

The Docker index is the place to find and browse Docker container images.

Popular images

- ubuntu
  General use Ubuntu base image ...
- base
  DEPRECATED (use "ubuntu"). Another general ...

Most stars

- ubuntu
  General use Ubuntu base image ...
- mattdm/fedora
  A basic Fedora image corresponding ...

New or recently updated

- racker/precise-with-updates
  Ubuntu 12.04-LTS, with all updates ...
- lenfree/centos
- qmxme/rpi-arch-devel

http://index.docker.io

Anatomy of an image name

registry.local / baremetal / postgresql

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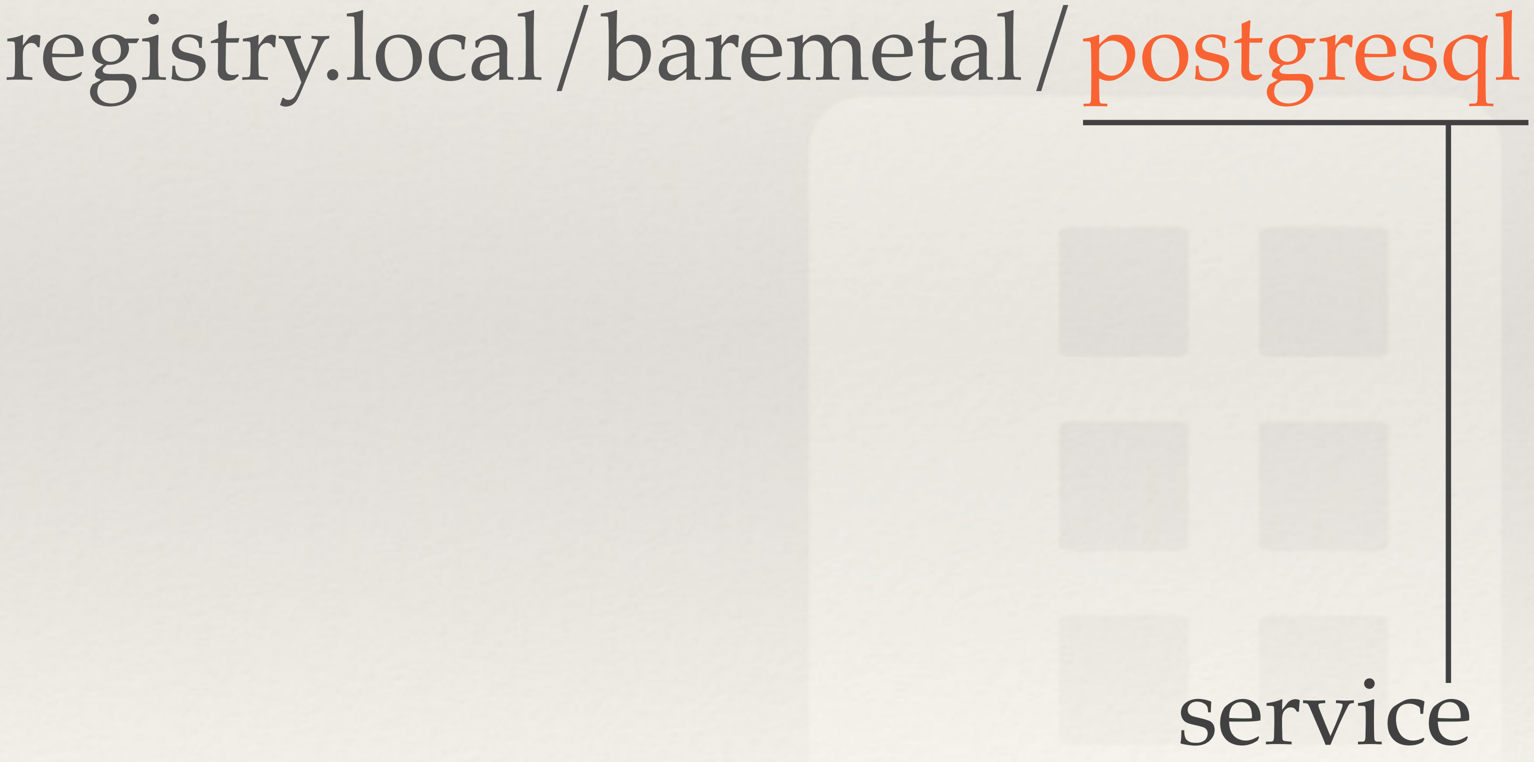
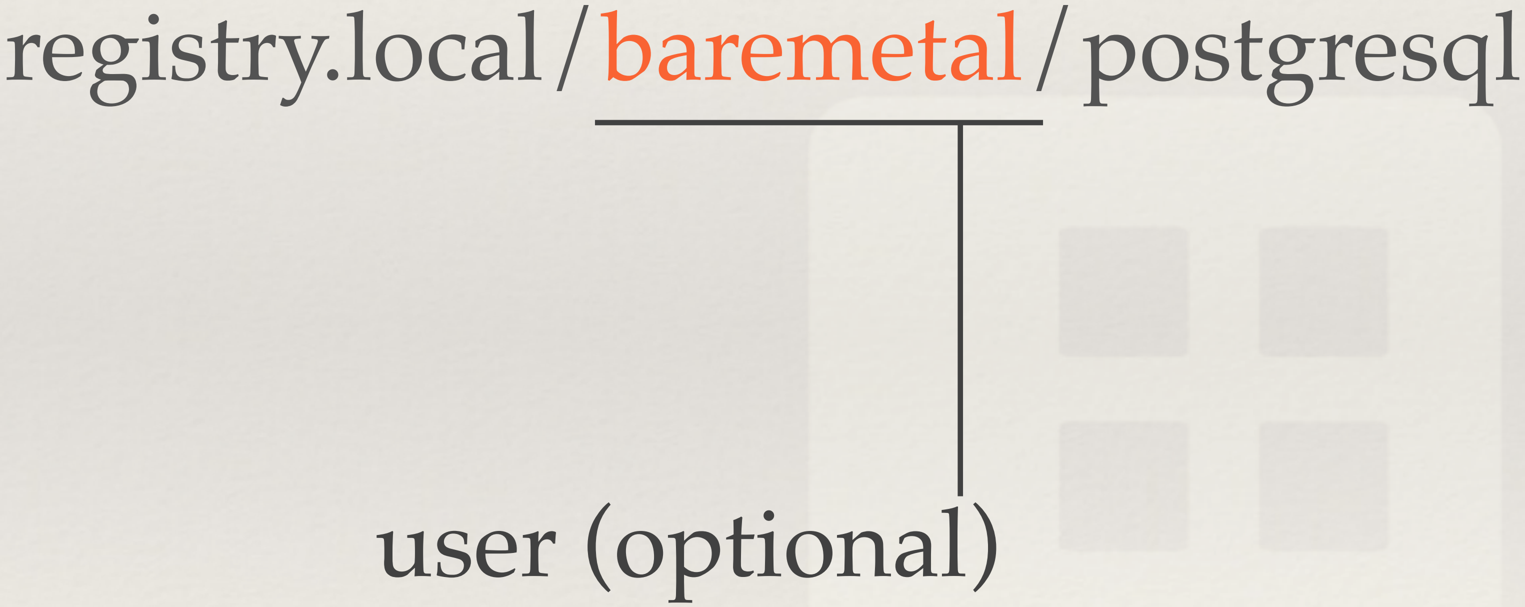


registry.local/baremetal/postgresql

service

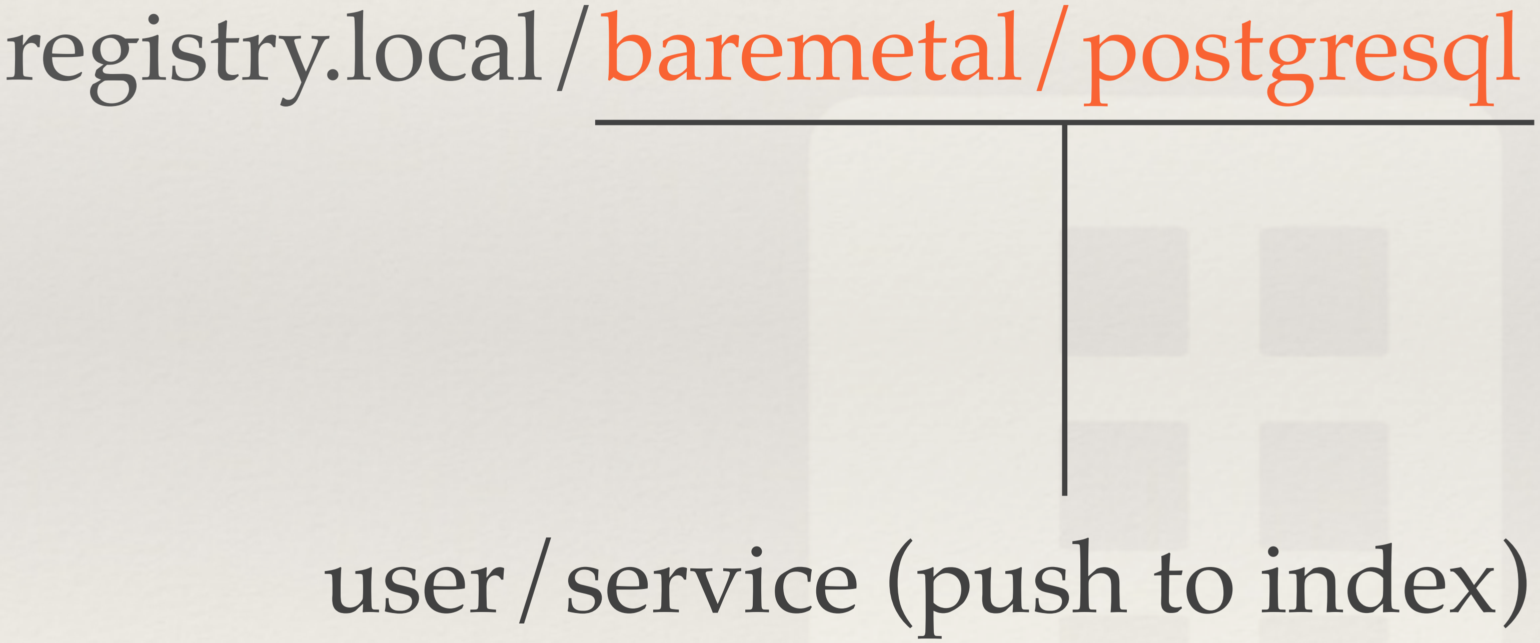
Anatomy of an image name



registry.local/baremetal/postgresql

user (optional)

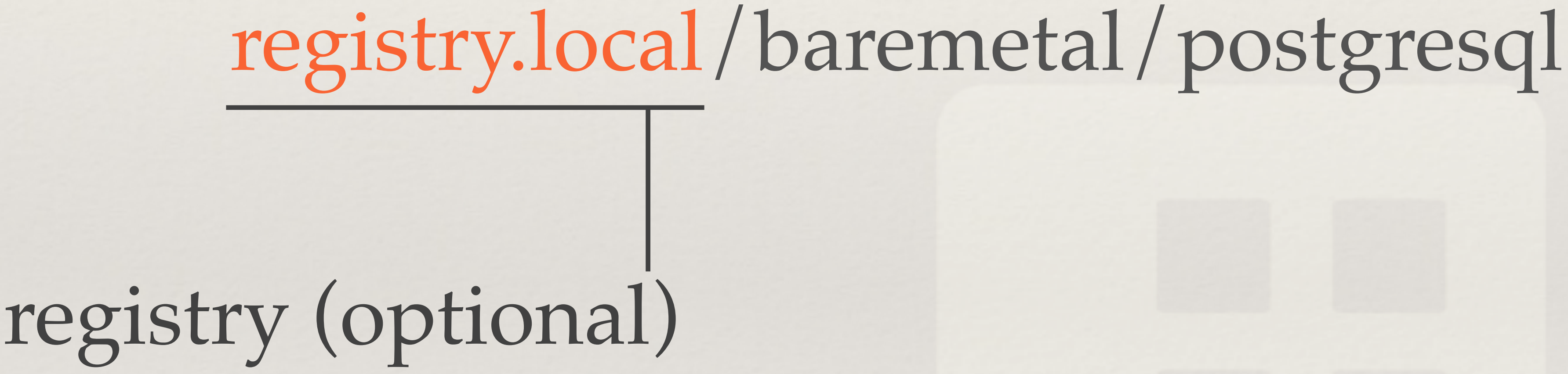
Anatomy of an image name



registry.local/baremetal/postgresql

user/service (push to index)

Anatomy of an image name



registry.local/baremetal/postgresql

registry (optional)

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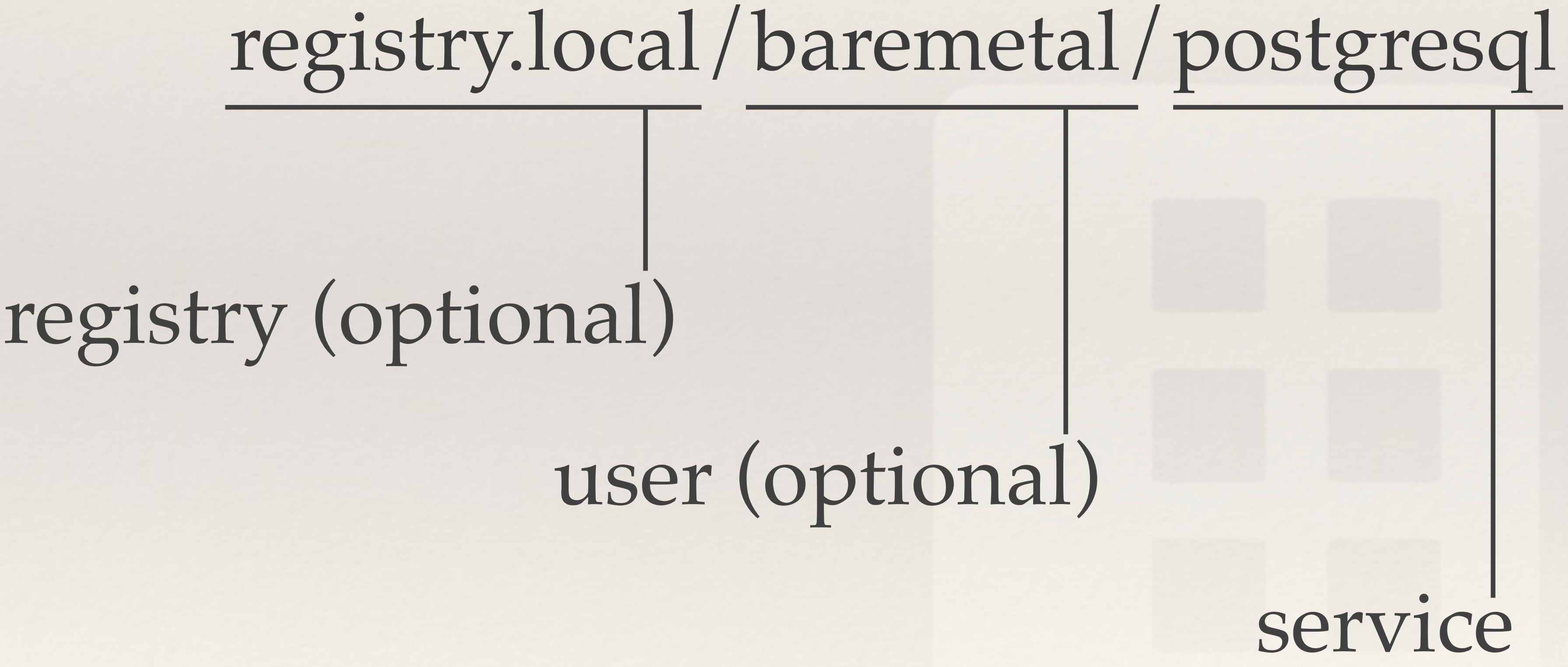

registry.local/baremetal/postgresql

registry (optional)

user (optional)

service

VII. Port-binding

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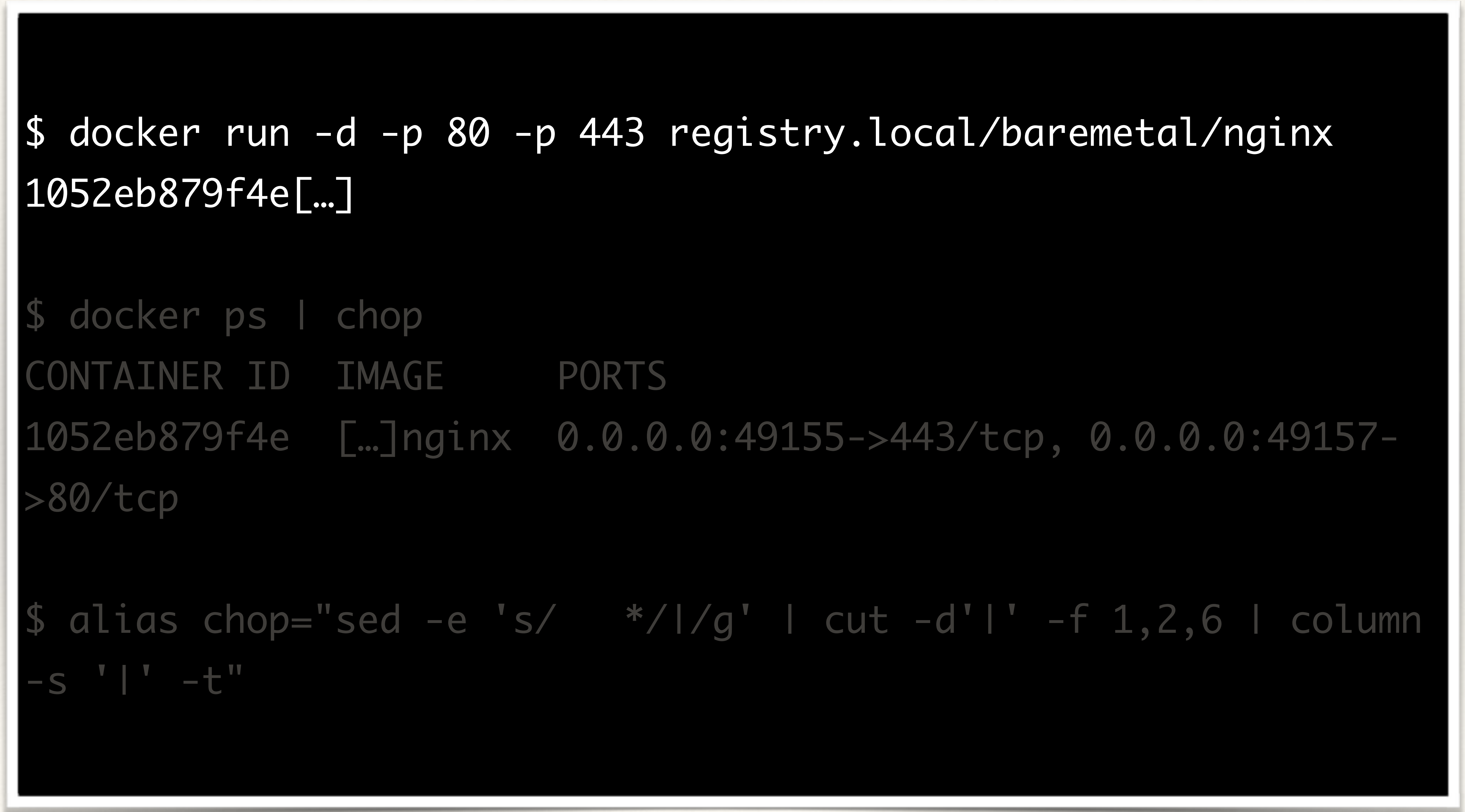
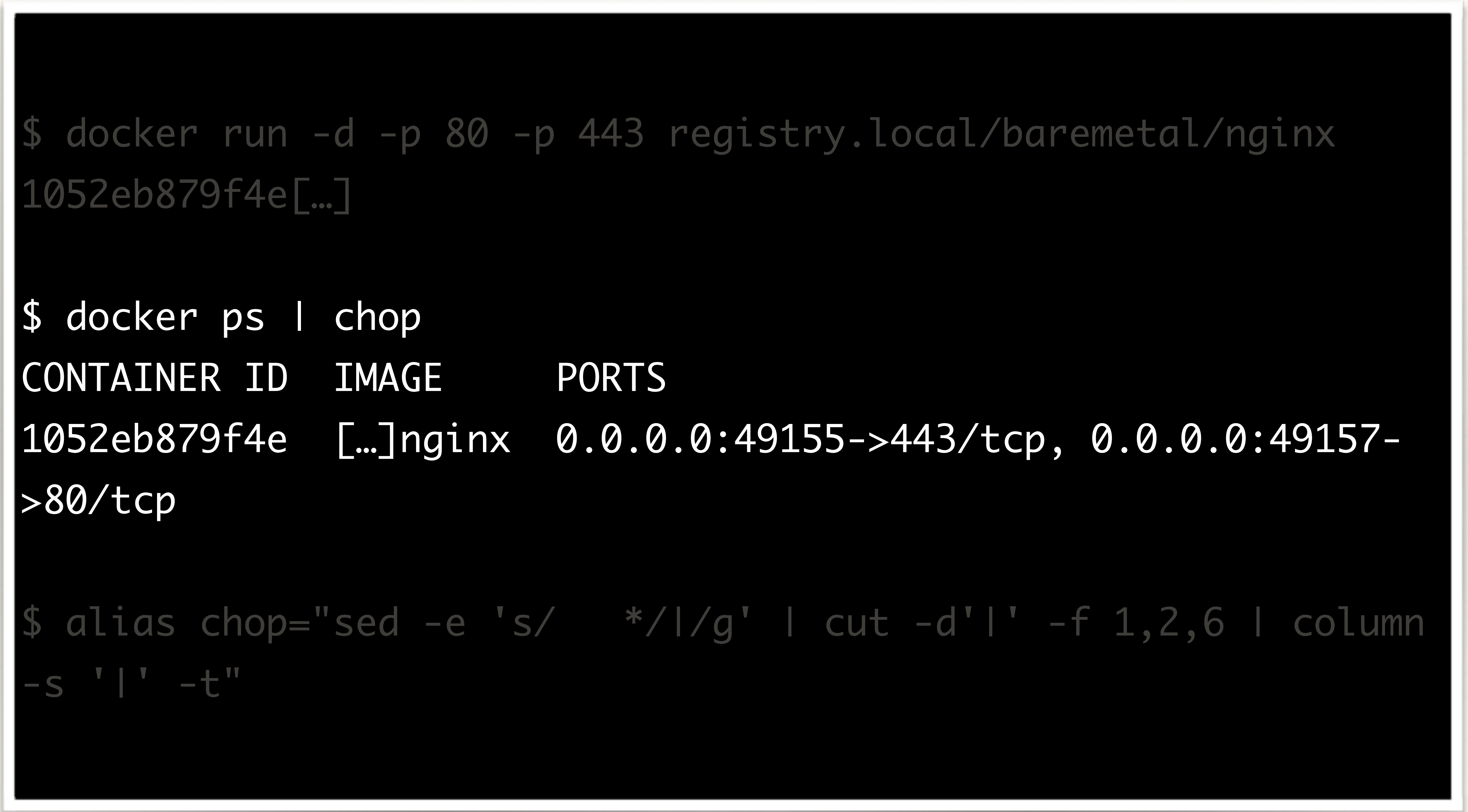


```
$ docker run -d -p 80 -p 443 registry.local/baremetal/nginx
1052eb879f4e[…]

$ docker ps | chop
CONTAINER ID  IMAGE     PORTS
1052eb879f4e  […]nginx  0.0.0.0:49155->443/tcp, 0.0.0.0:49157->80/tcp

$ alias chop="sed -e 's/   */|/g' | cut -d'|' -f 1,2,6 | column -s '|' -t"
```

VII. Port-binding



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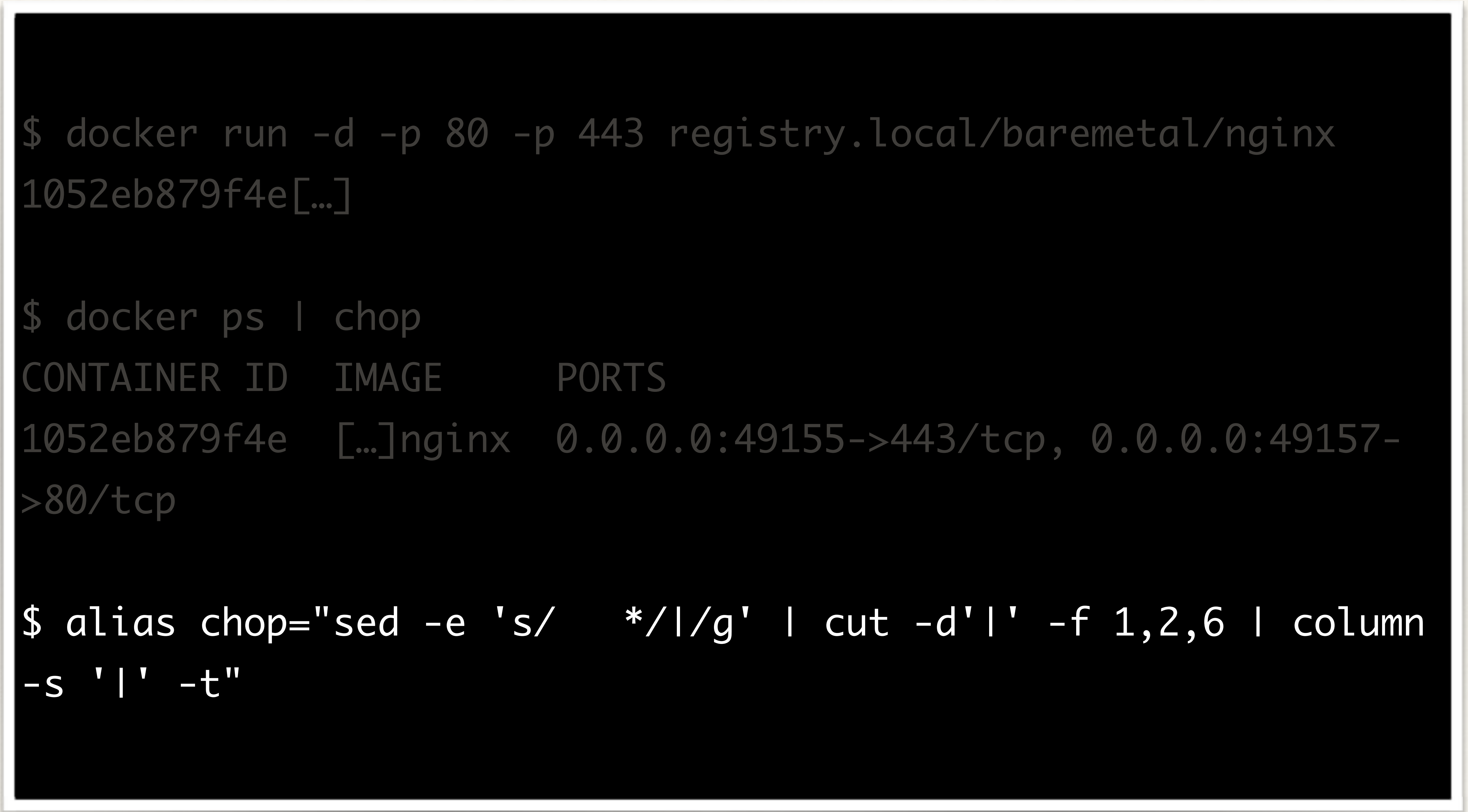

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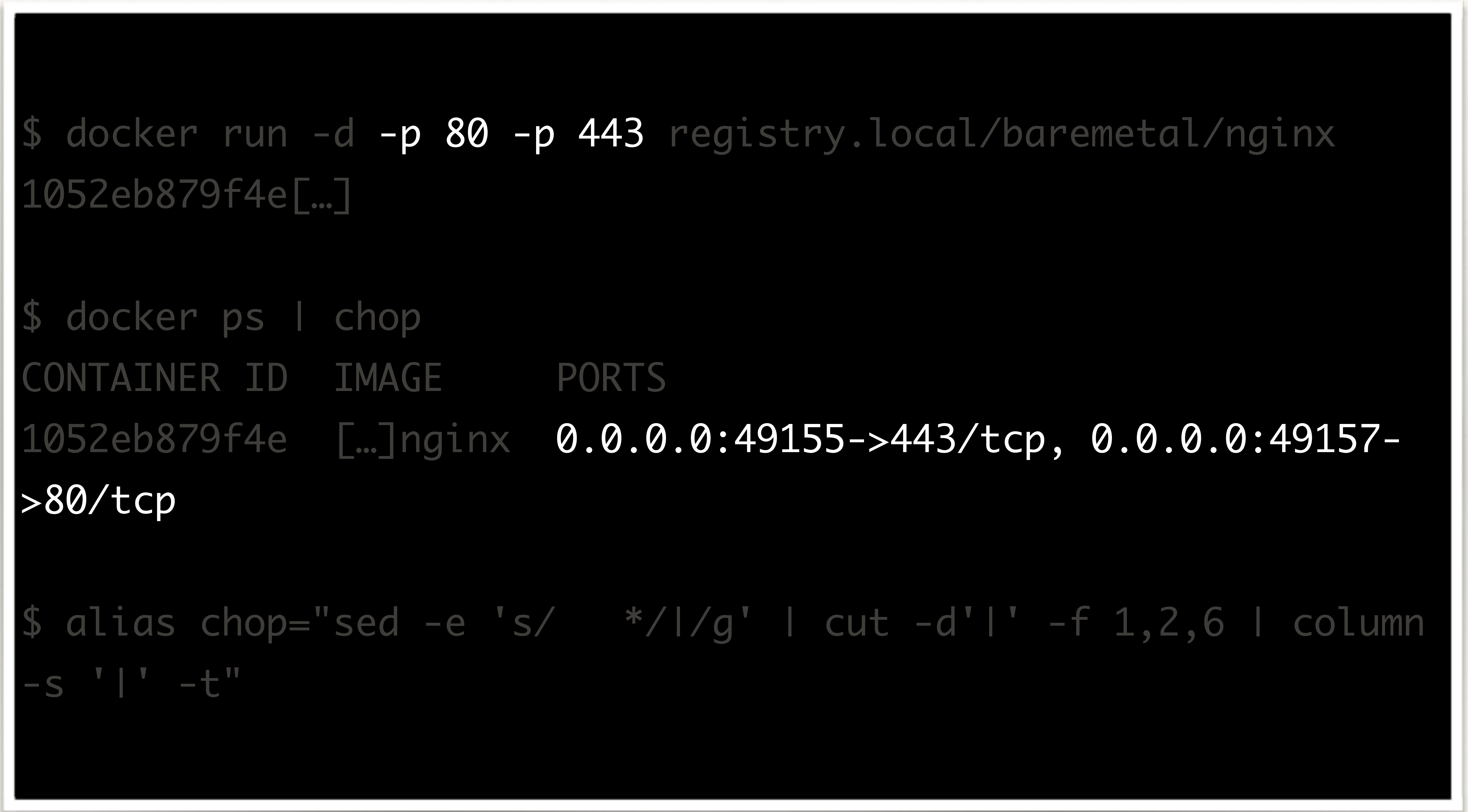

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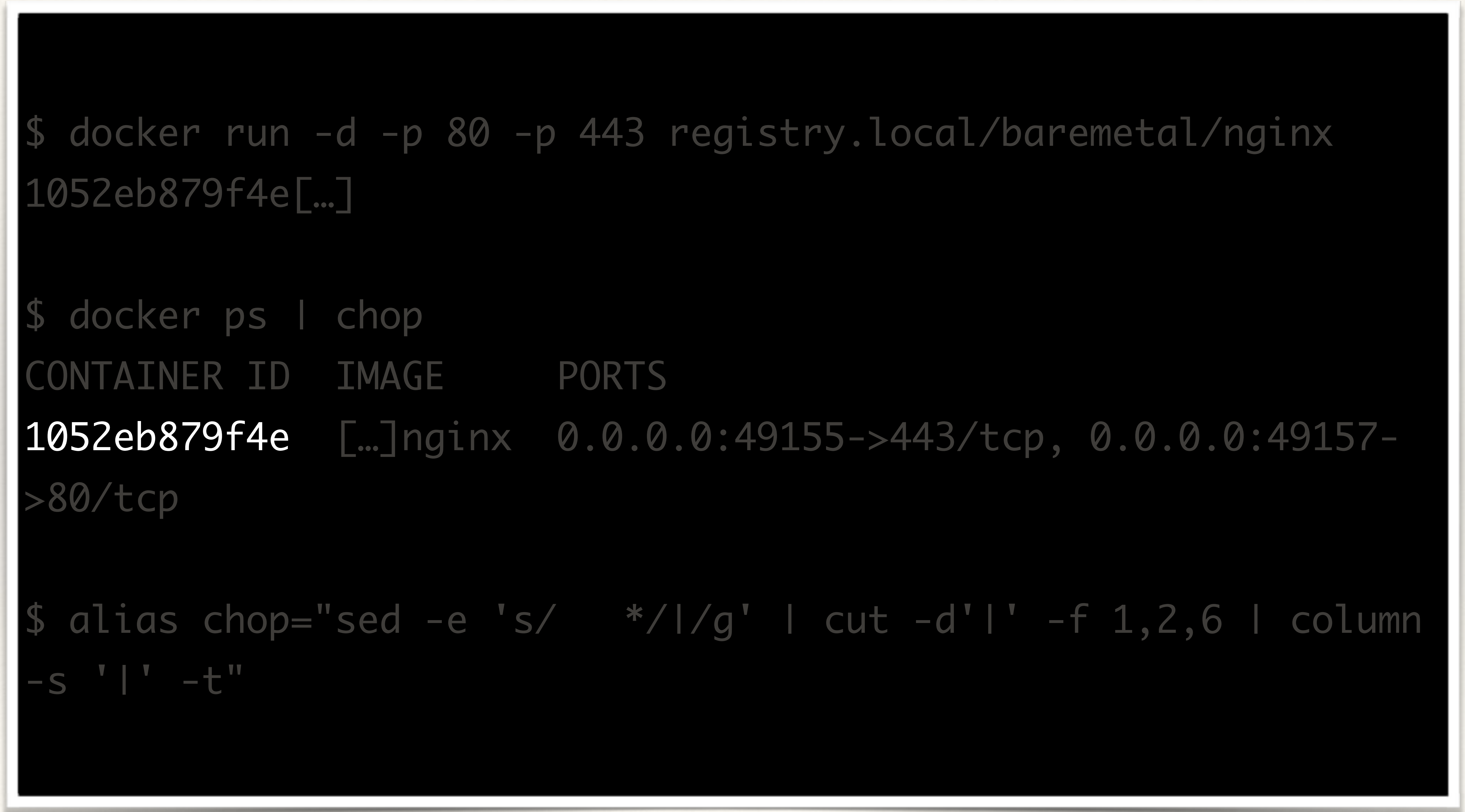
VII. Port-binding



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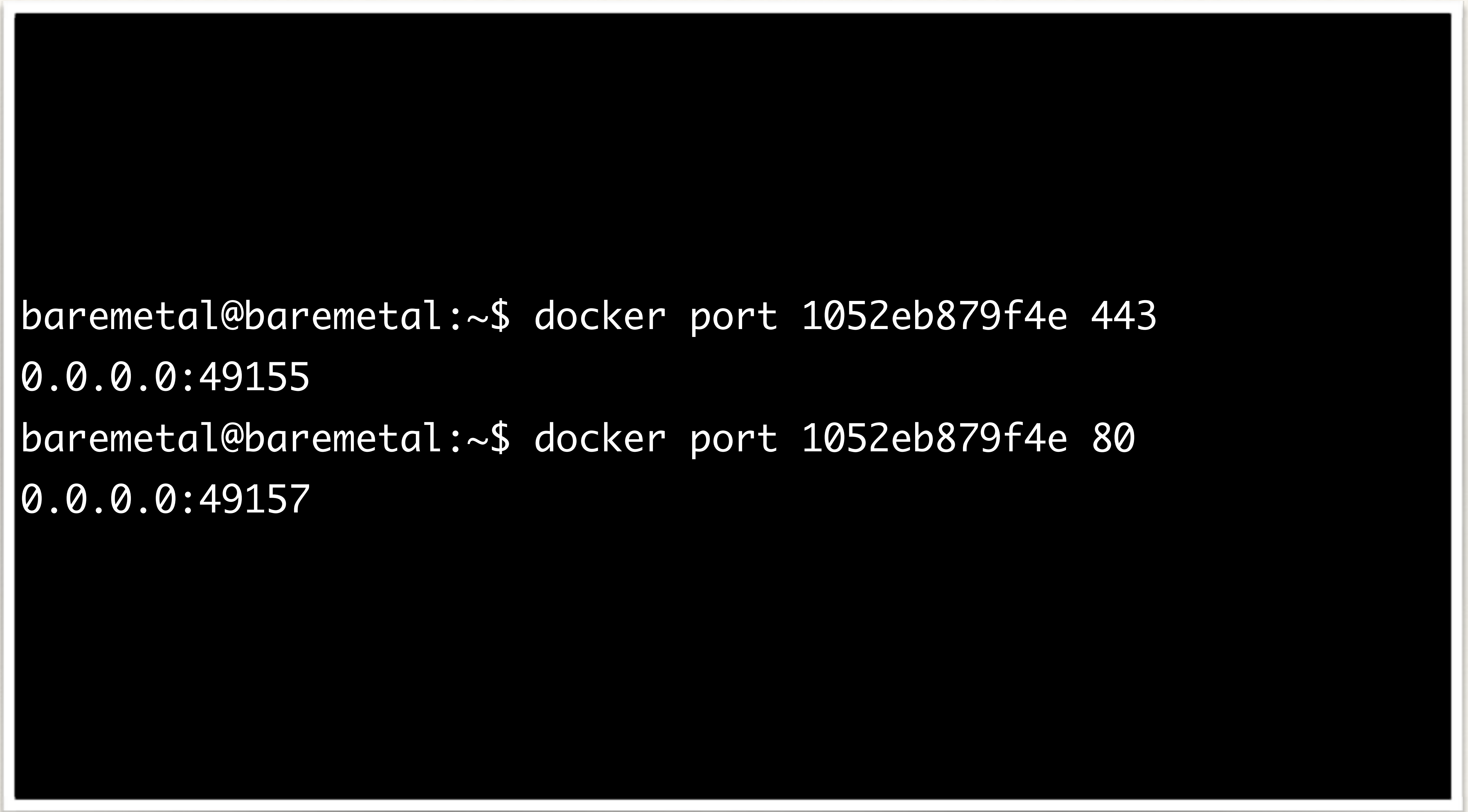
VII. Port-binding



```
baremetal@baremetal:~$ docker port 1052eb879f4e 443
0.0.0.0:49155
baremetal@baremetal:~$ docker port 1052eb879f4e 80
0.0.0.0:49157
```

VII. Port-binding

All interfaces, dynamic host port

```
-p 80
```

All interfaces, explicit host port

```
-p 80:80
```

Explicit interface, dynamic host port

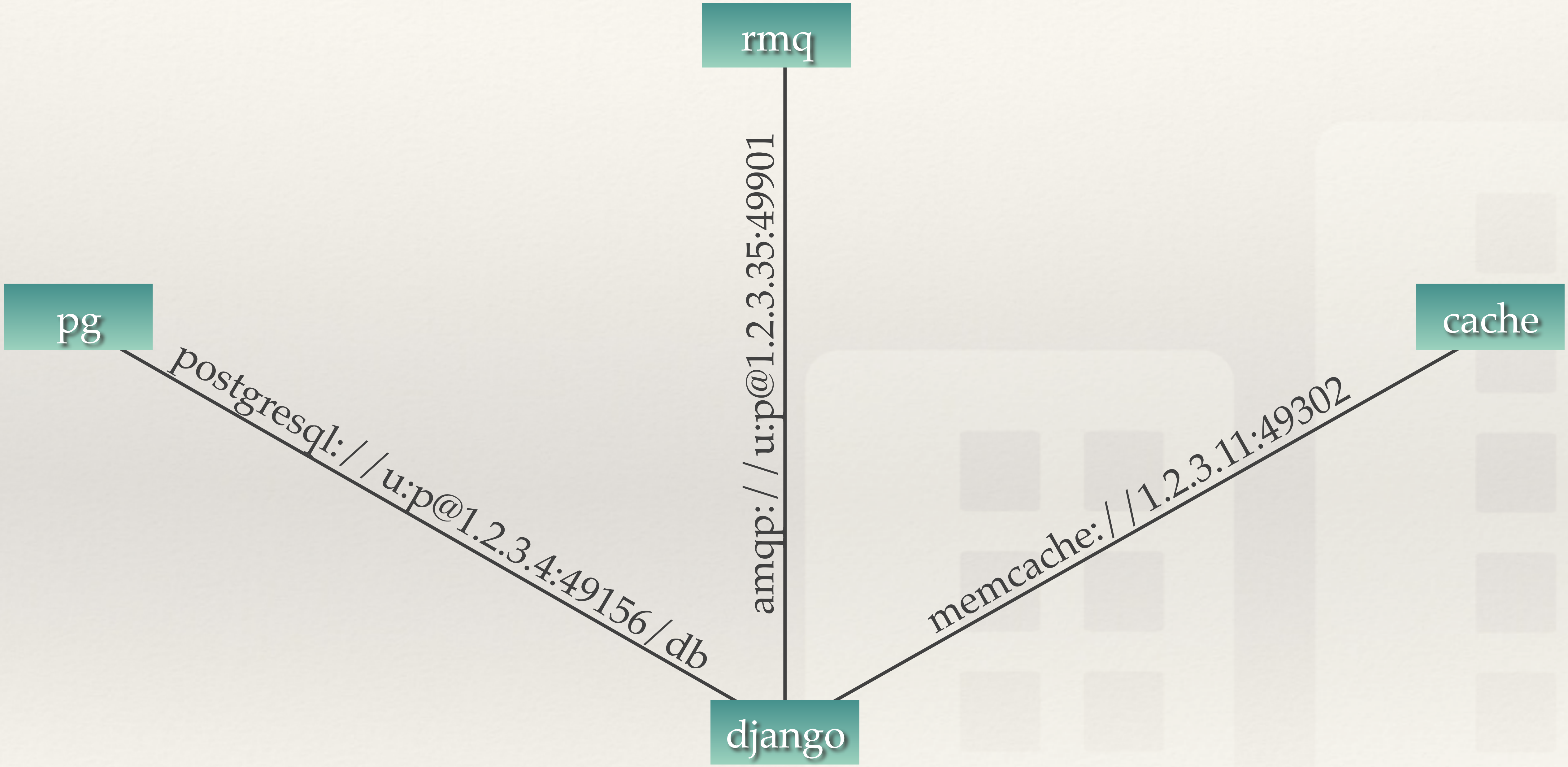
```
-p 192.168.42.147::80
```

Explicit interface, explicit host port

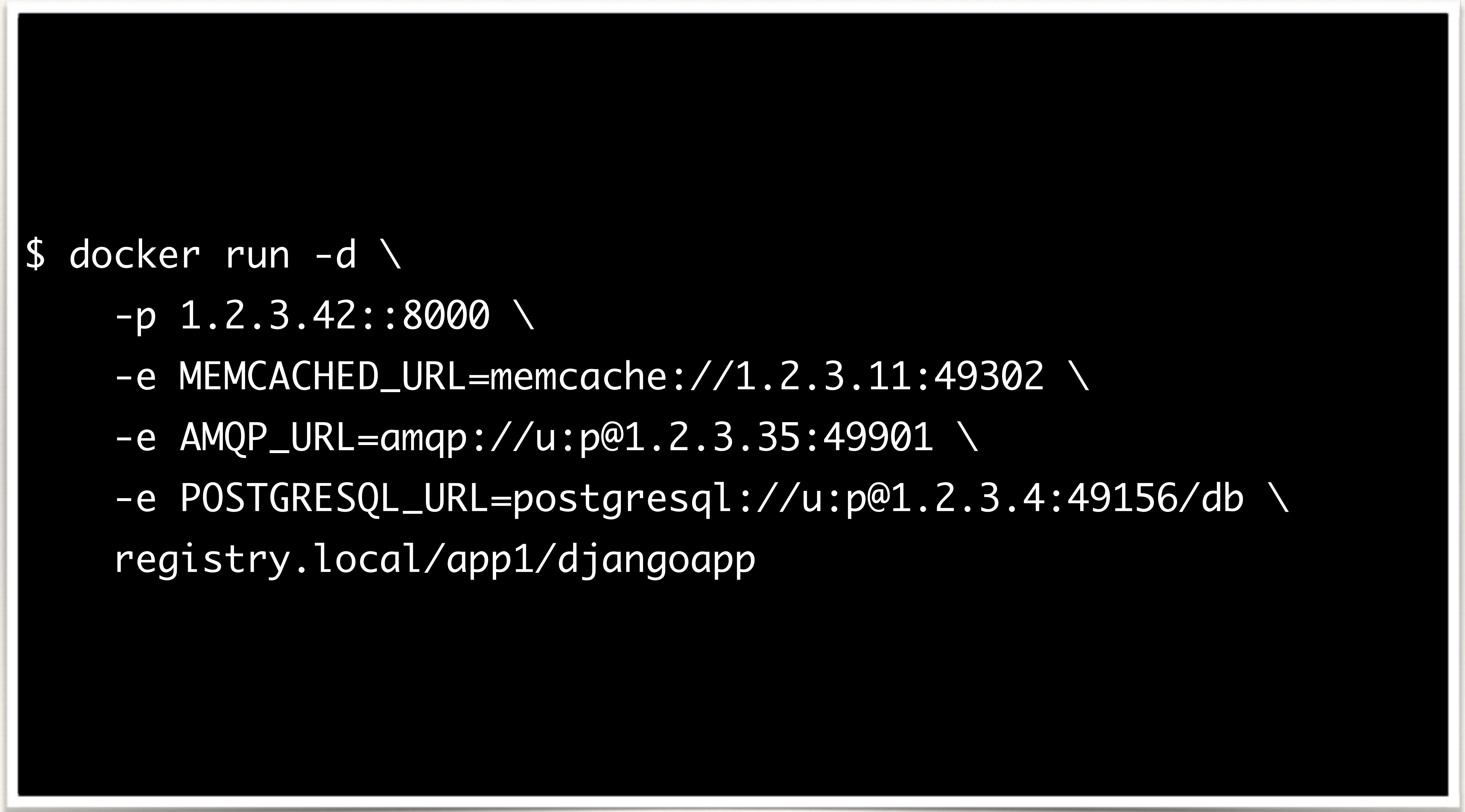
```
-p 192.168.42.147:80:80
```

III. Environment-based Config

III. Environment-based Config


rmq
pg
cache
django
postgresql://u:p@1.2.3.4:49156/db
amqp://u:p@1.2.3.35:49901
memcache://1.2.3.11:49302

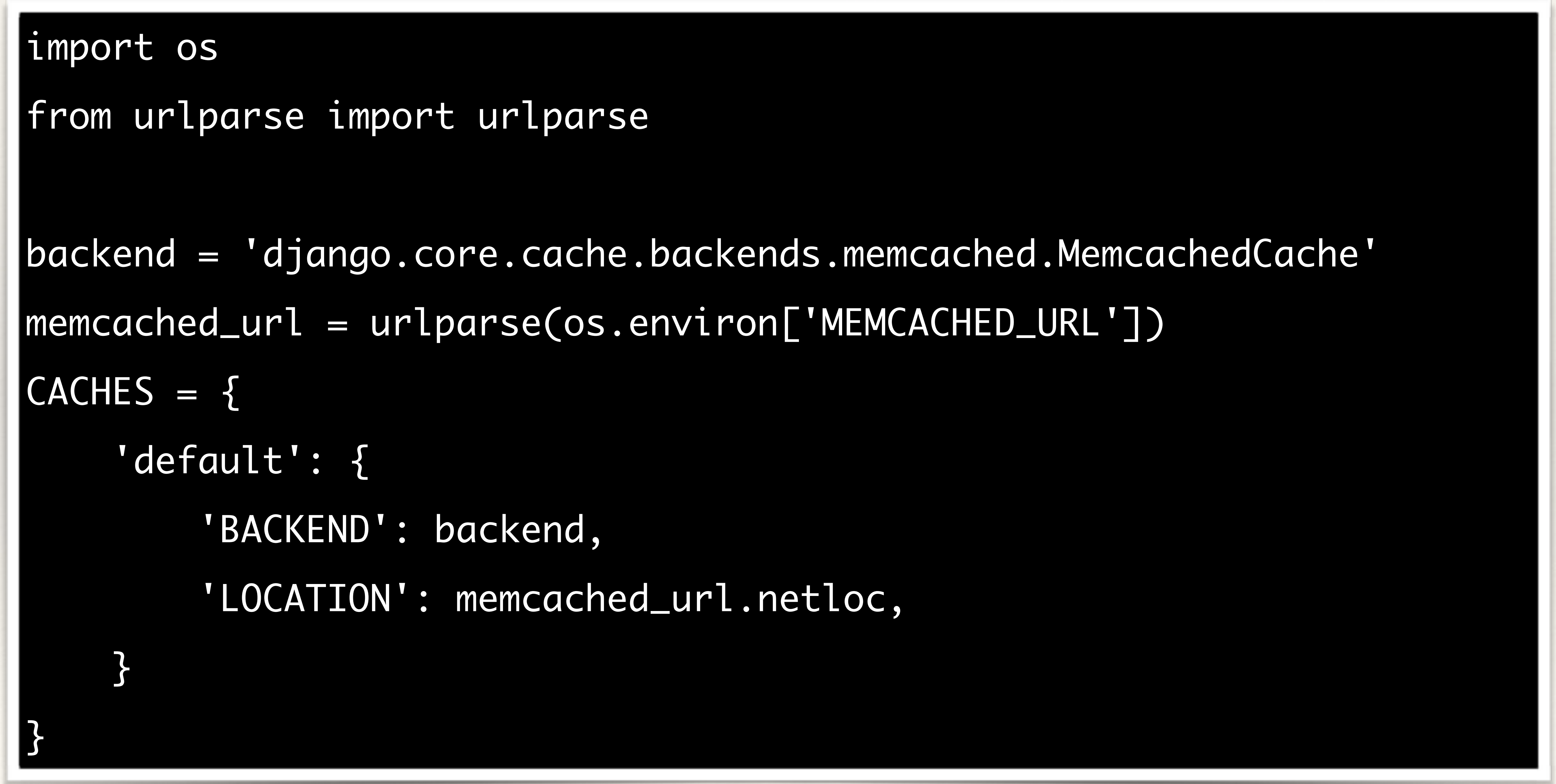
III. Environment-based Config



```
$ docker run -d \
    -p 1.2.3.42::8000 \
    -e MEMCACHED_URL=memcache://1.2.3.11:49302 \
    -e AMQP_URL=amqp://u:p@1.2.3.35:49901 \
    -e POSTGRESQL_URL=postgresql://u:p@1.2.3.4:49156/db \
    registry.local/app1/djangoapp
```

III. Environment-based Config

settings.py - memcached setup

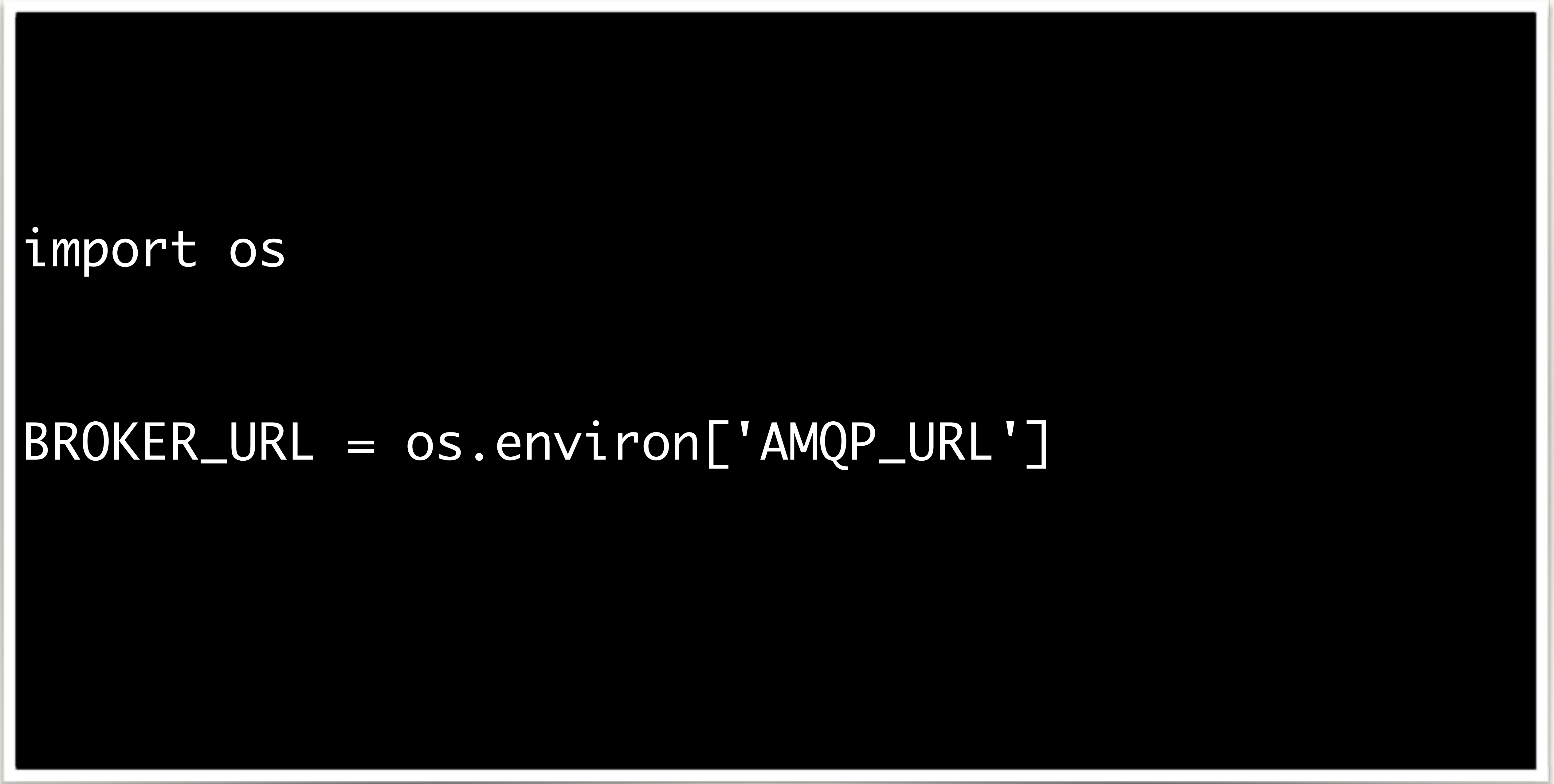


```
import os
from urlparse import urlparse


backend = 'django.core.cache.backends.memcached.MemcachedCache'
memcached_url = urlparse(os.environ['MEMCACHED_URL'])
CACHES = {
    'default': {
        'BACKEND': backend,
        'LOCATION': memcached_url.netloc,
    }
}
```

III. Environment-based Config

settings.py - RabbitMQ setup

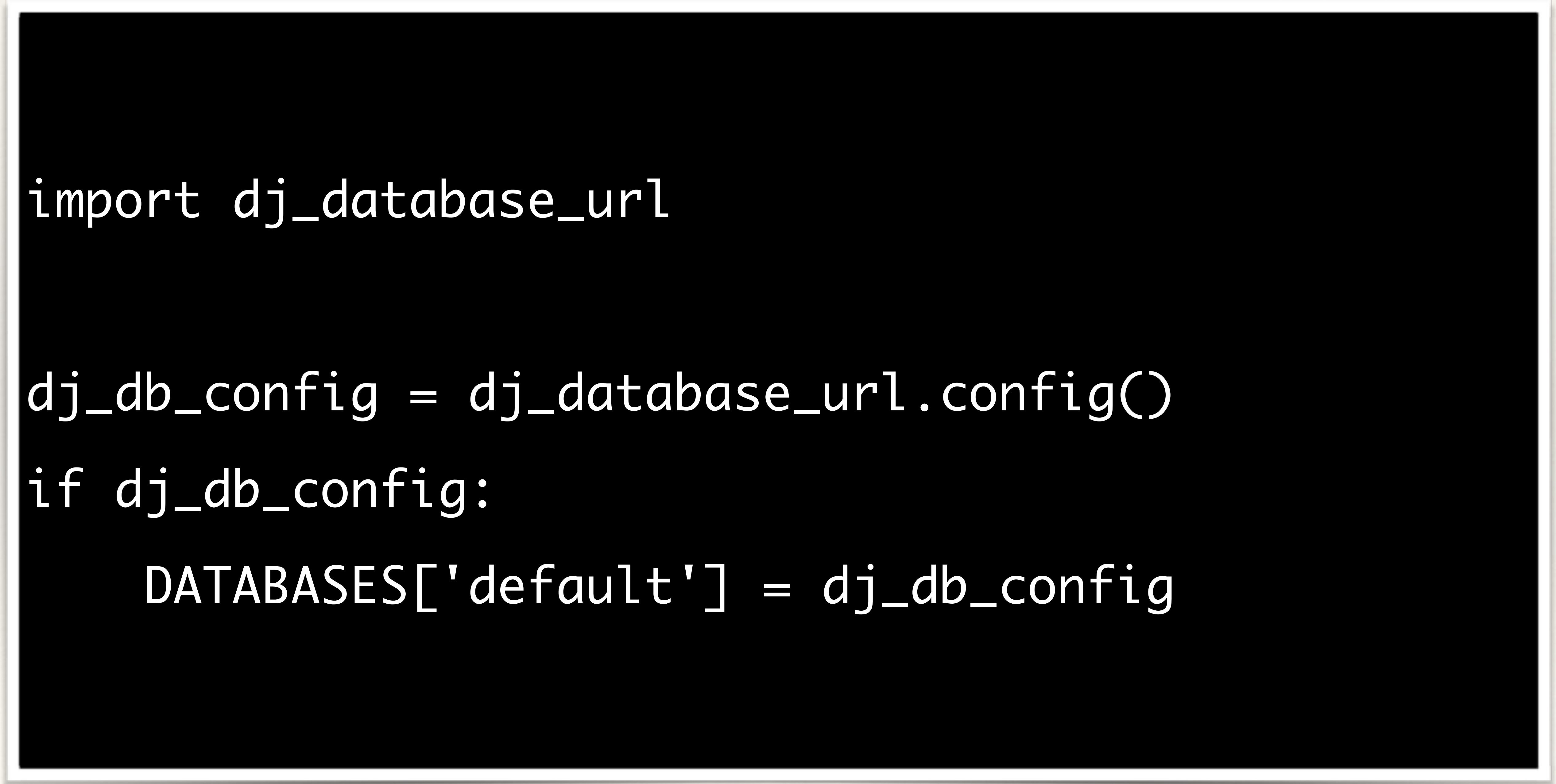


```
import os

BROKER_URL = os.environ['AMQP_URL']
```

III. Environment-based Config

settings.py - postgresql setup



```
import dj_database_url


dj_db_config = dj_database_url.config()
if dj_db_config:
    DATABASES['default'] = dj_db_config
```

Baremetal Platform

Baremetal Platform

- Thin as possible
- Run the platform on the platform
    - Run as many services as possible in containers

Baremetal Platform

- Two main components
  - container manager
  - orchestration
- Two major goals
  - minimize downtime
  - eliminate single point of failure

Container Manager

- Starts containers assigned to the host
- Stops containers no longer assigned
- Restarts containers that should be running and die
- Restarts containers when service config changes

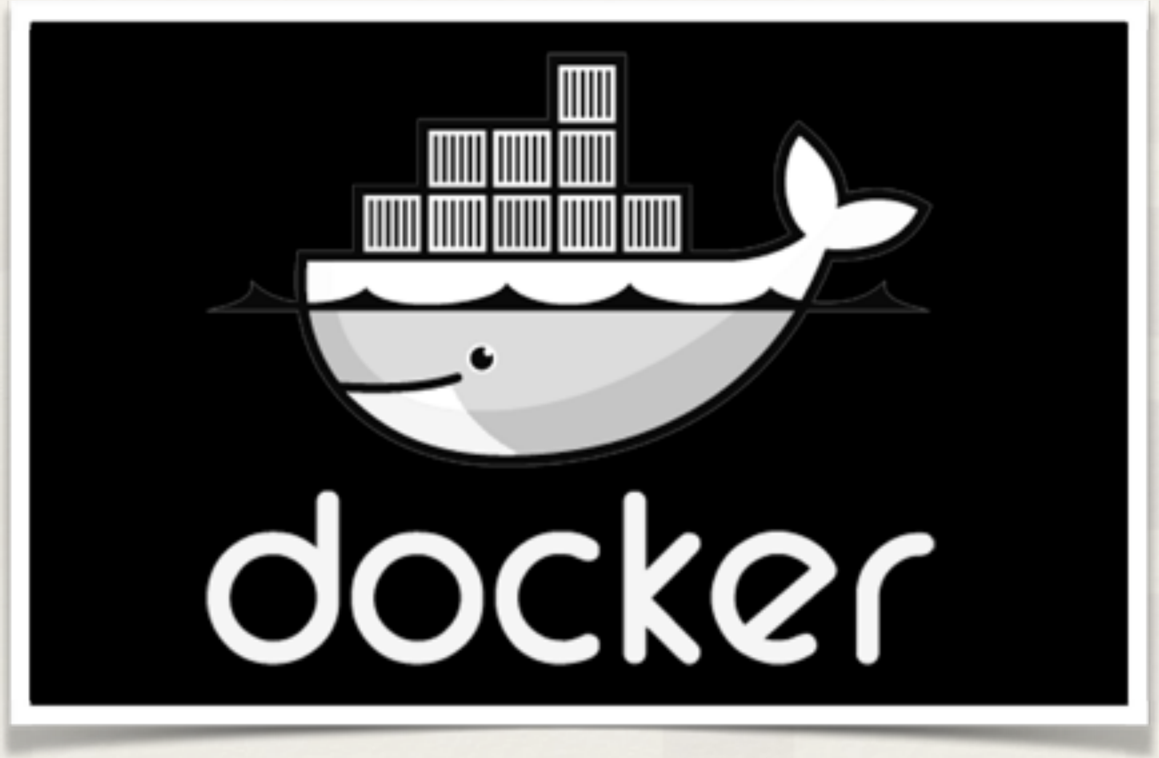
Orchestration

- Aware of all hosts in cluster
- Reacts to hosts joining and leaving cluster
- Reacts to configuration changes
- Assigns containers to hosts

Orchestration Configuration

- Repositories
  - tracks Docker image, git repo and branch
- Services
  - repo, dependencies, failover
- Applications
  - services, # instances, configuration, memory allocation

The nuts and bolts



Additional Services

- etcd - fault-tolerant configuration store
- serf - host discovery and message passing
- zfs - next-gen copy-on-write filesystem

Containerize as much as possible

Containerize as much as possible

- Run the platform on the platform
- Services remain self-contained
- Portable - simple to relocate to another system
- Easily deploy new versions and rollback if needed

Thanks!

Baremetal
Industries

Let us know what you think:

http://baremetal.io/scale