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Applications Deployment

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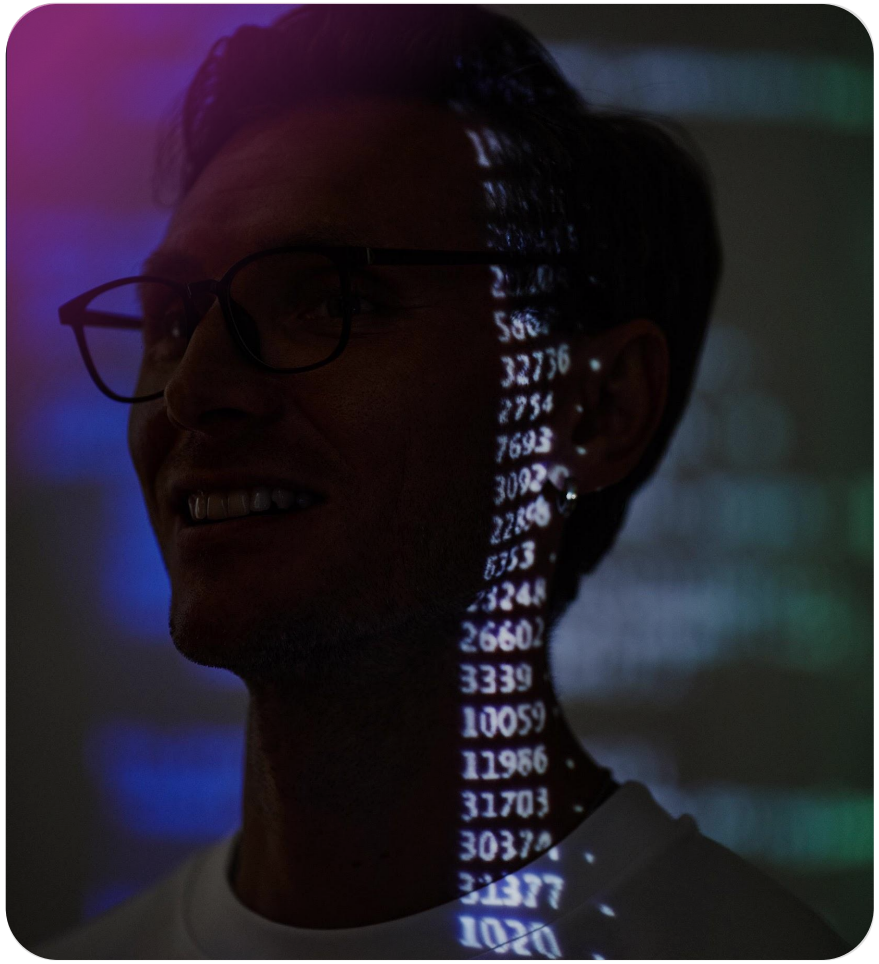
https://mimuw.rtbhouse.com

Applications Deployment

run ...

apply ...



Plan

1. Motivation
2. Containers internals
3. Deployment strategies
4. Versioning
5. Automation & orchestration
6. Toolings

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Expectations

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Downtime

mBank Polska
18 hrs ·

⚠️W najbliższy weekend - z 19 na 20 marca będziemy modernizować nasze systemy.
W związku z tym przez kilka godzin nie będziecie mieć dostępu do banku:

- między 2:00 a 8:30 nie zapłacicie kartą💳 w sklepach i nie skorzystacie z bankomatów,
- od 2:00 do 10:00 nie zrobicie zakupów online🌐 i nie zalogujecie się na swoje konto w serwisie transakcyjnym💻 ani w aplikacji mobilnej📱,
- w godzinach 1:30-11:00 nie będziecie mogli składać wniosków.

W czasie przerwy nie będzie możliwości logowania się na konto, a mLinia 📞 będzie działać w trybie informacyjnym.

Żeby przerwa nie pokrzyżowała Wam weekendowych planów, warto na ten czas zaopatrzyć się w gotówkę💰 i zlecić z wyprzedzeniem ważne przelewy.

Sprawdźcie szczegóły na ➡️ www.mbank.pl/przerwa

Preparations

Environment

Application part

- dependencies
- configurations
- containers

Strategy of deployment

Automation


Machine
a piece of hardware or a VM

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Server

software that provides a service

- nginx
- postgres
- redis
- envoy
- memcached
- kafka

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Devs

Containerization

SysAdm

Image

Dockerfile

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Image

Container

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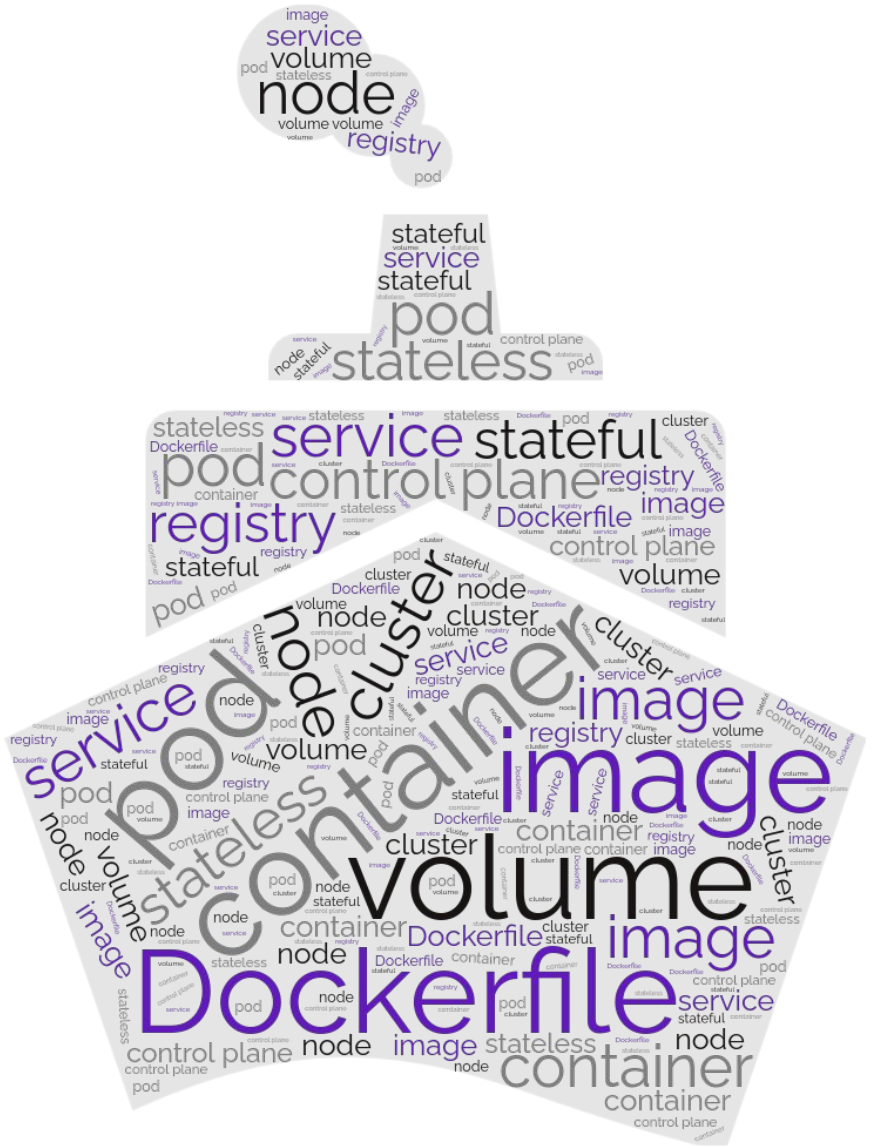
… more containers vocabulary



It works for me

Containers to build, to test
and to deploy

Dockerfiles for build, test, deploy

```
FROM node
USER app_builder
WORKDIR /usr/src/app
COPY . /usr/src/app
RUN npm install
RUN npm run bundle
```

```
FROM nginx
RUN rm /etc/nginx/conf.d/default.conf
COPY content /usr/share/nginx/html
COPY conf /etc/nginx
```

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Multistage Dockerfile

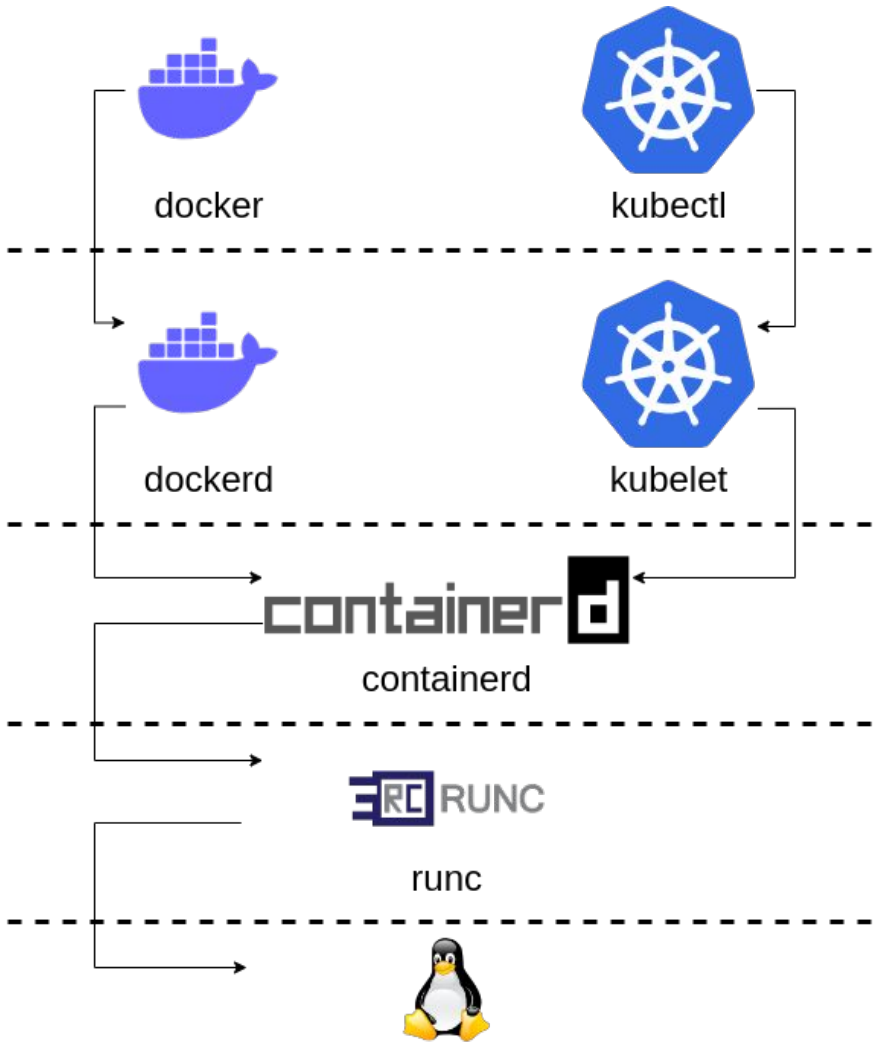
```
FROM node as build
USER app_builder
WORKDIR /usr/src/app
COPY . /usr/src/app
RUN npm install
RUN npm run bundle
...
```

```
...
FROM nginx
RUN rm /etc/nginx/conf.d/default.conf
COPY --from=build content
/usr/share/nginx/html
COPY conf /etc/nginx
```

Layers

```
FROM python:3.10-alpine
COPY src /code
WORKDIR /code
RUN apk add bash
RUN pip install -r /code/requirements.txt
RUN python3 py_compile *.py
CMD python3 app.py
```

Single container spawn



Linux stuff behind containers

```
1   systemd  (prev: init)
523 vim

823 VBoxSVC
833 \ VirtualBoxVM

715 containerd-shim-runc-v2
719 \_ postgres
720     \_ postgres
721     \_ postgres
723     \_ postgres

351 containerd-shim-runc-v2
352 \_ redis-server
```

```
user@host:~$
user@host:~$
user@host:~$
user@host:~$
user@host:~$ docker pull mcr.microsoft.com/\
> windows/server:ltsc2022-amd64
```

```
user@host:~$
user@host:~$
user@host:~$
user@host:~$
user@host:~$ docker pull mcr.microsoft.com/\
> windows/server:ltsc2022-amd64
ltsc2022-amd64: Pulling from windows/server
6d889b139513: Pulling fs layer
60fff5ce9fed: Downloading  538.4kB/1.995GB
image operating system "windows" cannot be
used on this platform
user@host:~$
```

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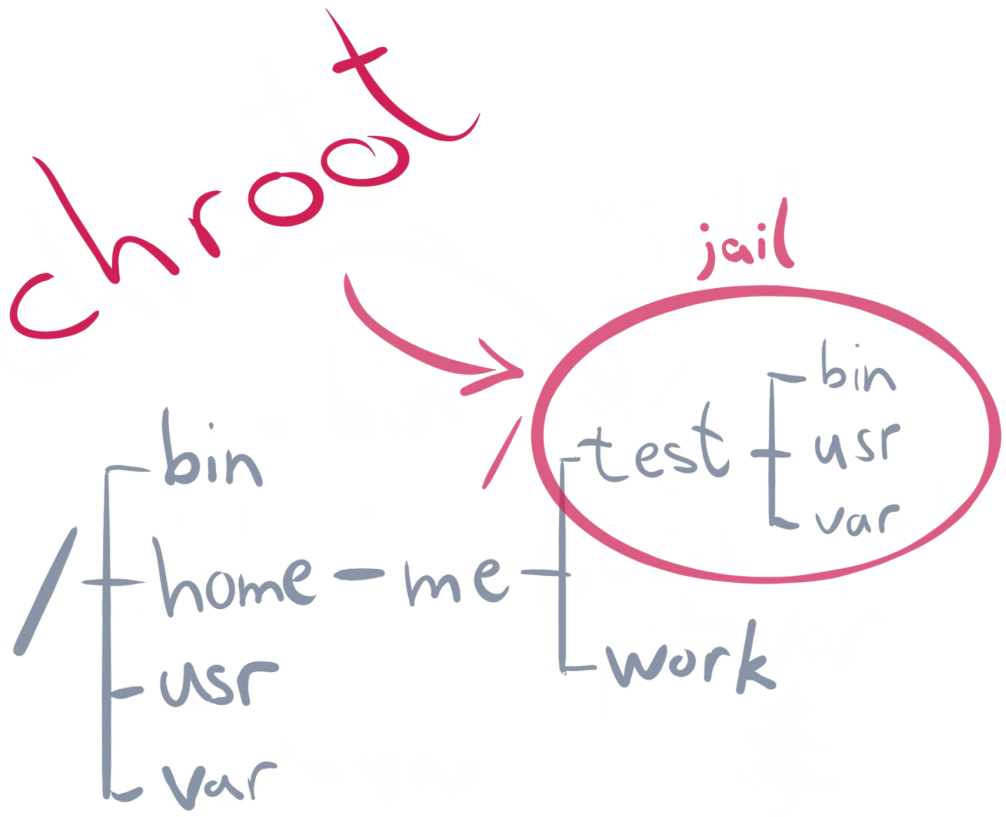
Containers

- namespaces
- cgroups
- (capabilities)

chroot



Namespaces

```
1    systemd  (prev: init)
523  vim

823  VBoxSVC
833  \ VirtualBoxVM

715  containerd-shim-runc-v2
719  \_ postgres
720       \_ postgres
721       \_ postgres
723       \_ postgres

351  containerd-shim-runc-v2
352  \_ redis-server
```

```
1    postgres
49   \_ postgres
50   \_ postgres
51   \_ postgres
```

```
1    redis-server
```

Namespaces

- mount [the first one introduced in 2002]
- cgroup
- ipc
- network
- pid
- uts (hostname)
- user [2013, allowed to make kernelspace-containers]
- time [most recent one, delivered in 2020]

unshare --help

```
-m, --mount[=<file>]      unshare mounts namespace
-u, --uts[=<file>]        unshare UTS namespace (hostname etc)
-i, --ipc[=<file>]        unshare System V IPC namespace
-n, --net[=<file>]        unshare network namespace
-p, --pid[=<file>]        unshare pid namespace
-U, --user[=<file>]       unshare user namespace
-C, --cgroup[=<file>]     unshare cgroup namespace
-T, --time[=<file>]       unshare time namespace

-f, --fork                fork before launching <program>
--map-user=<uid>|<name>   map current user to uid (implies --user)
--map-group=<gid>|<name>  map current group to gid (implies --user)
-r, --map-root-user       map current user to root (implies --user)
-c, --map-current-user    map current user to itself (implies --user)
```

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Cgroups

monitor

limit

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Resources

```
$ docker stats --no-stream
```

CONTAINER ID	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8146f077d595	0.08%	1.502GiB / 31.09GiB	4.83%	145kB / 8.43MB	39.3MB / 132MB	96
7e9ba2b3294f	0.04%	986.7MiB / 31.09GiB	3.10%	1.5MB / 1.71MB	40.5MB / 277MB	10
fbcc1b97a31e	4.28%	377.7MiB / 31.09GiB	1.19%	188kB / 1.46MB	25MB / 169MB	5
c96a75487a8d	10.05%	2.183GiB / 31.09GiB	7.02%	106kB / 10.7MB	47.8MB / 623kB	34
2e21a1888ae0	0.00%	2.012MiB / 31.09GiB	0.01%	29.8kB / 0B	0B / 0B	6
5e7719e3faf6	0.13%	2.684MiB / 31.09GiB	0.01%	1.65MB / 1.12MB	3.86MB / 16.4kB	4
0c0efa52440e	0.00%	77.78MiB / 31.09GiB	0.24%	6.65MB / 6.82MB	528kB / 350MB	20
649ba7510e1b	0.05%	11.34MiB / 31.09GiB	0.04%	175kB / 126B	0B / 0B	13

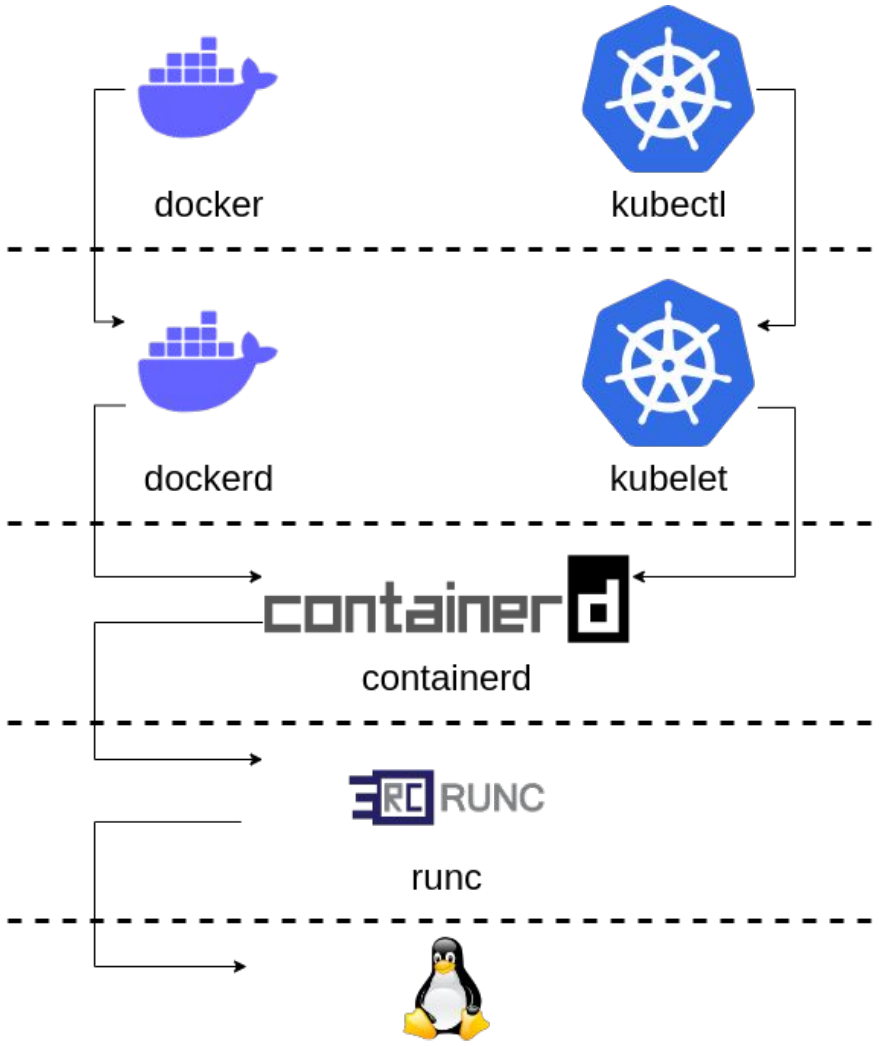
Single container spawn

Top-level API (docker, kubectl)

Rich on-host daemon (dockerd, kubelet)

Containers runtime daemon (containerd)

Low-level containers runtime (runc)



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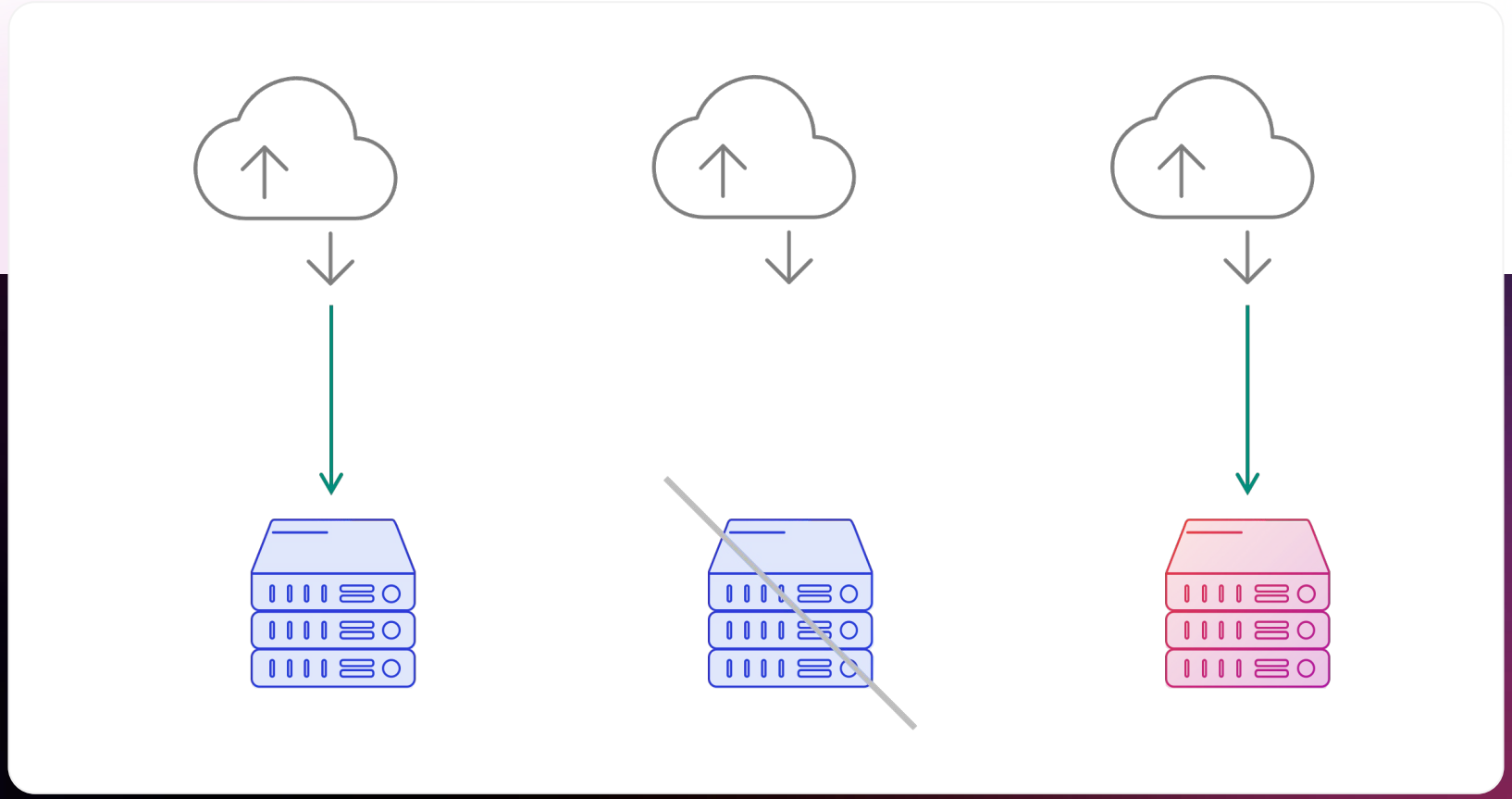
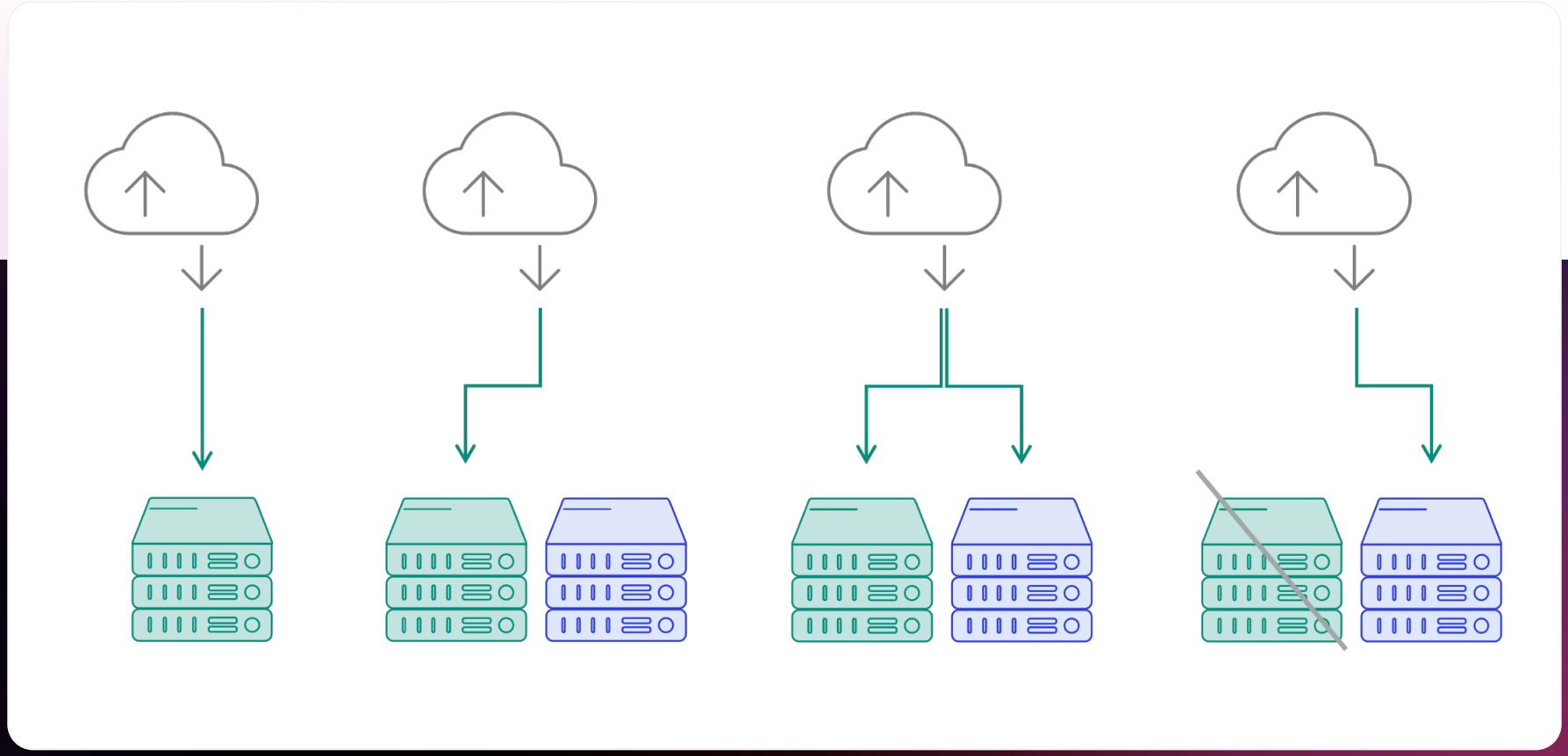
Deployment strategies

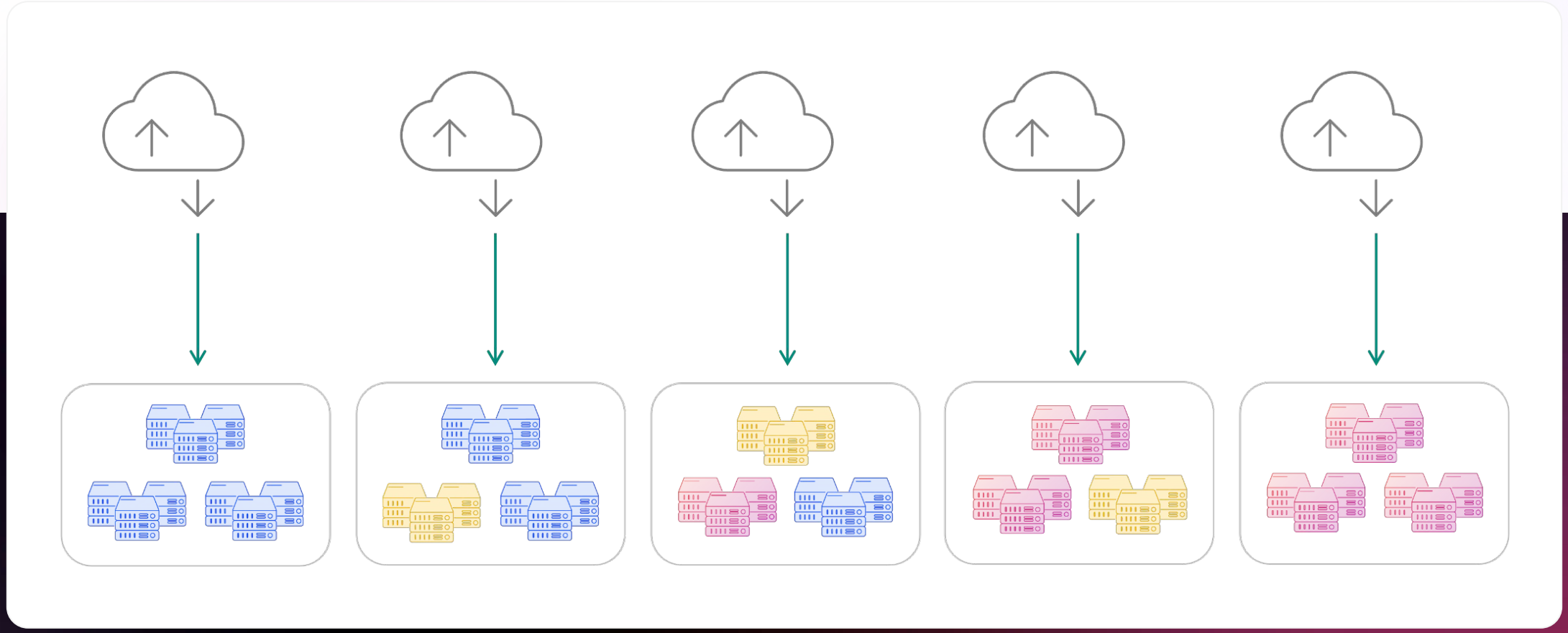
Take-down



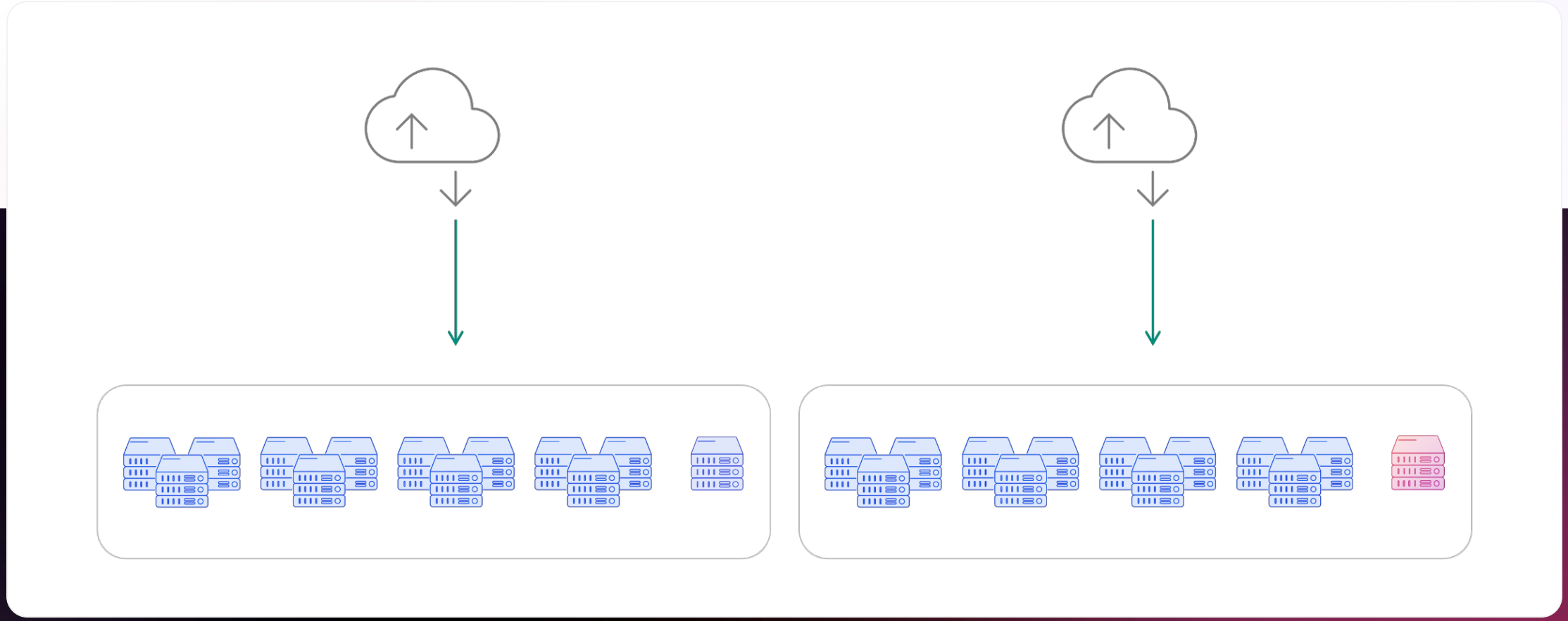
Blue/green



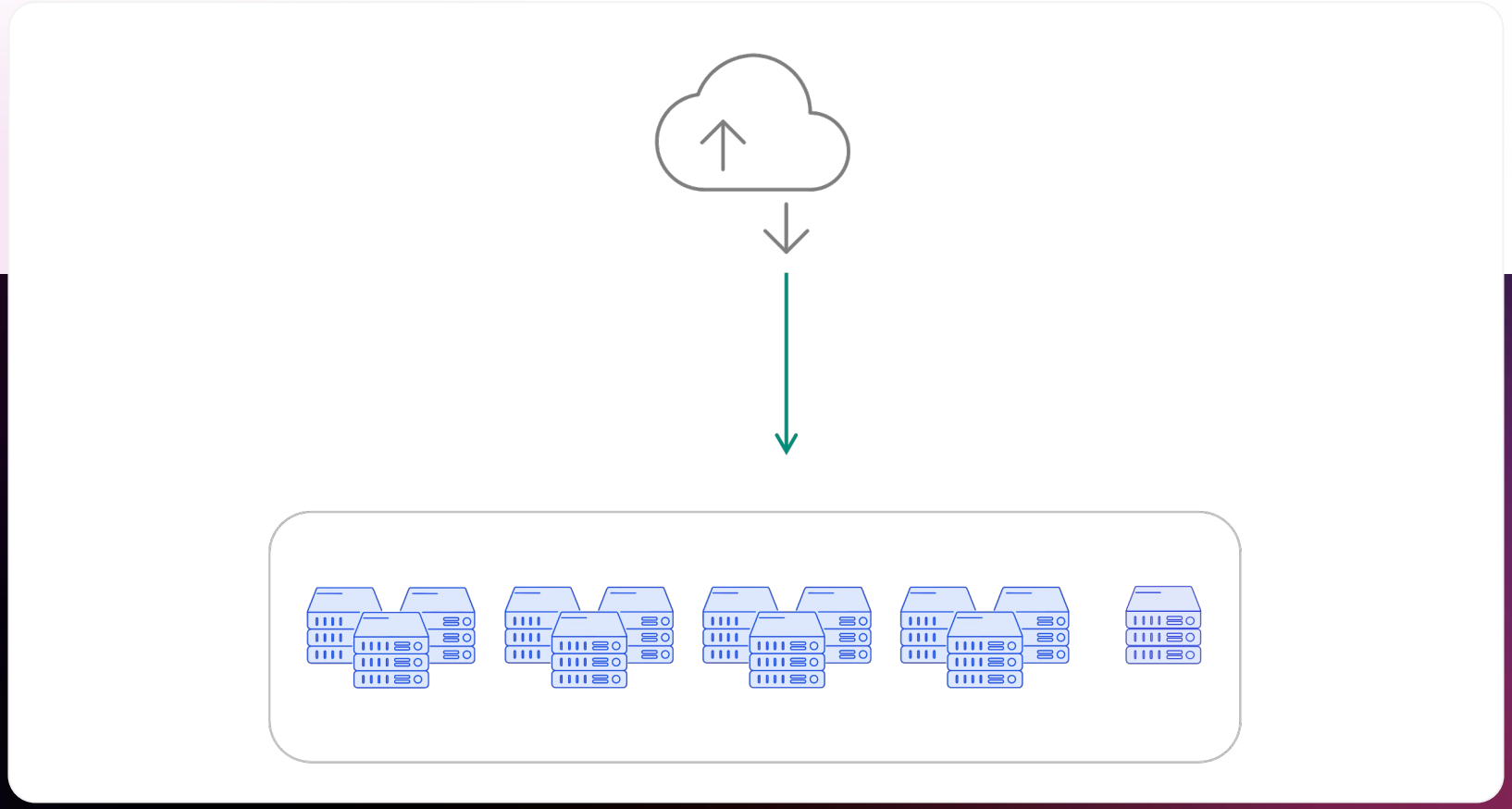
Rolling



Canary



Microservices deployment



Versioning

4.26.53

1.734.34-ef23c9

2021.11.351

Versioning

- (obviously) sources
- network configurations
- database schemas
- credentials

- OS configuration
- filesystem content
- ... something else?

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Automation & orchestration

Infrastructure as code

Approach

- declarative
- imperative

Method

- push
- pull

Infrastructure as code

Terraform

- validate
- plan
- apply

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*Ops

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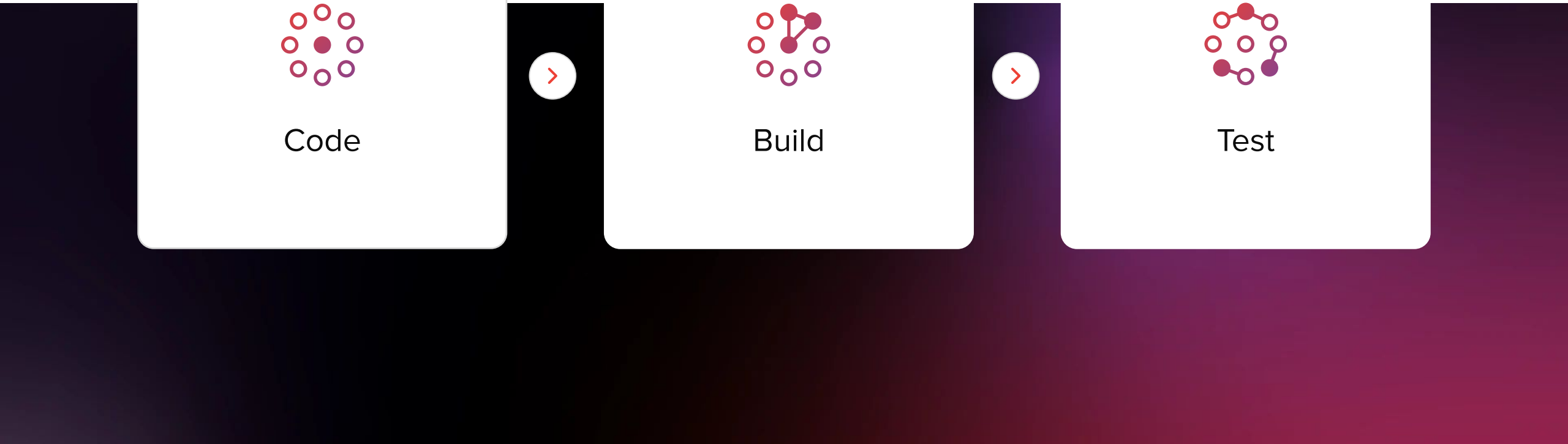
Continuous

- Integration
- Delivery
- Deployment
- Configuration Automation

Continuous Integration



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CD /Continuous Delivery /Continuous Deployment

Build

Release

Run

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Continuous Configuration Automation

Settings Change

Apply

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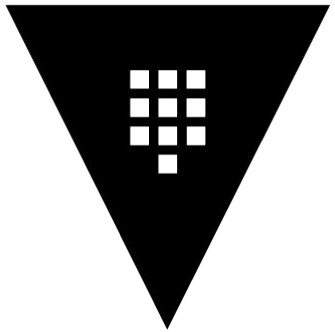
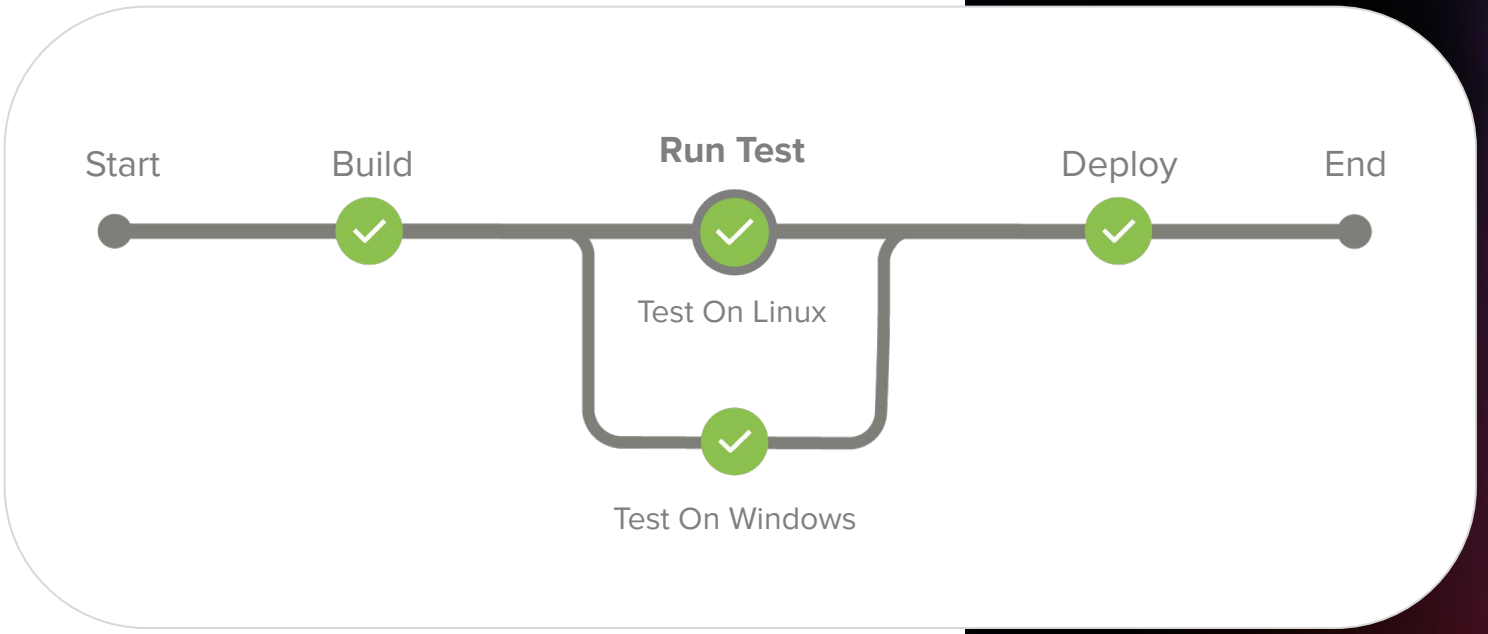
Secrets management



HashiCorp
Vault



https://www.jenkins.io/blog/2017/09/25/declarative-1/

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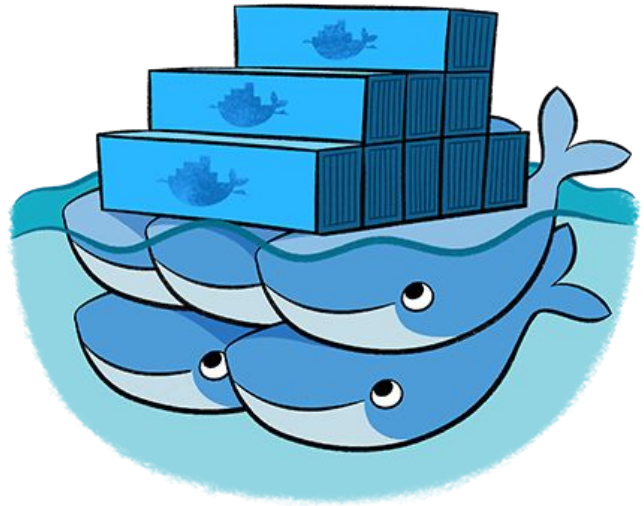
Docker Swarm



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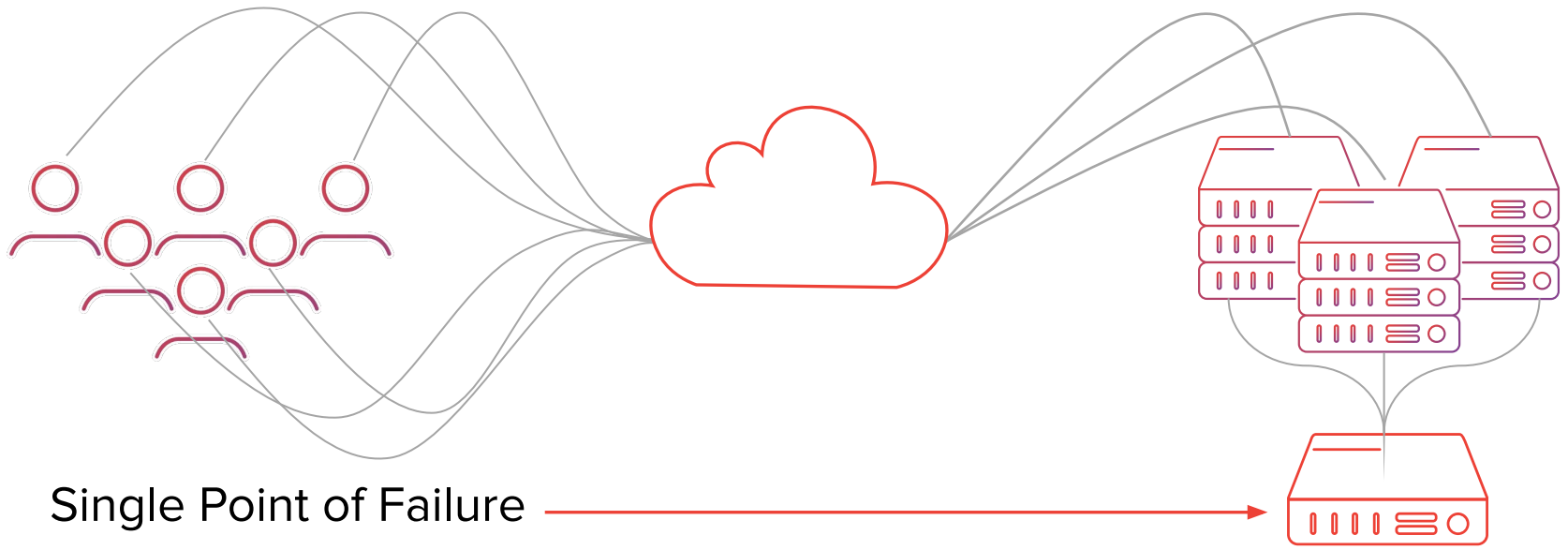
Kubernetes

SPOF



Intro to laboratory

```
@app.route('/run/<string:task_name>',
methods=['POST'])
def run_attendee_program(task_name: str):
    assert request.content_type == 'text/plain'
    code = request.data
    validate_attendee_code(task_name, code)
    return {
        'exit_code': 0,
        'results': [0] * 10
    }
```

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Thank you.

Damian Bodnar