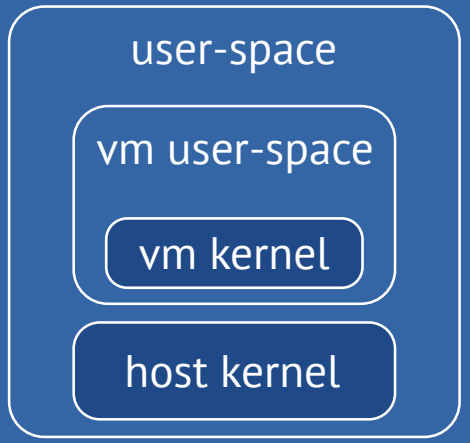
Introduction to Kubernetes

Containers

container vs virtual machine

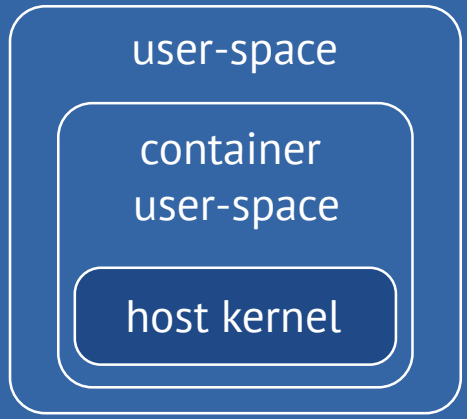
Virtual machine

runs its own kernel



Container

uses the host kernel



containers are not secure

It is possible to execute code on a host system from a container

containers are weird

Container operating system is a hybrid OS:
it pairs arbitrary host kernel
with arbitrary containerized user-space

takeaways

- Do not let unpriveleged users in
- Do not rely on kernel or even system features

But since you will anyway,
test containers with the production-like host kernel

Docker

layered images

```
FROM debian:jessie
RUN apt-get update \
    && apt-get install gradle \
    && apt-get clean
RUN apt-get update \
    && apt-get install \
    protobuf-compiler \
    && apt-get clean
```

Dockerfile reference

advanced topics

- Volumes

  You can mount directories from a host system into container

  Ownership and permissions on files are preserved

  => Problem with deleting files owned by root

- Networking

  You can connect port on the host system with the port exposed by container

  There is more, but “It’s complicated”

Continuous Integration with containers

containers for ci

At build

- Take base image
- Add build tools
- Add dependency cache
- Add git cache

Runtime

- Update git cache
- Run build task
- Publish artifact to storage
- Discard container

Git repo is a source, application is an artifact,

contaner is a build tool

containers for prod

At build

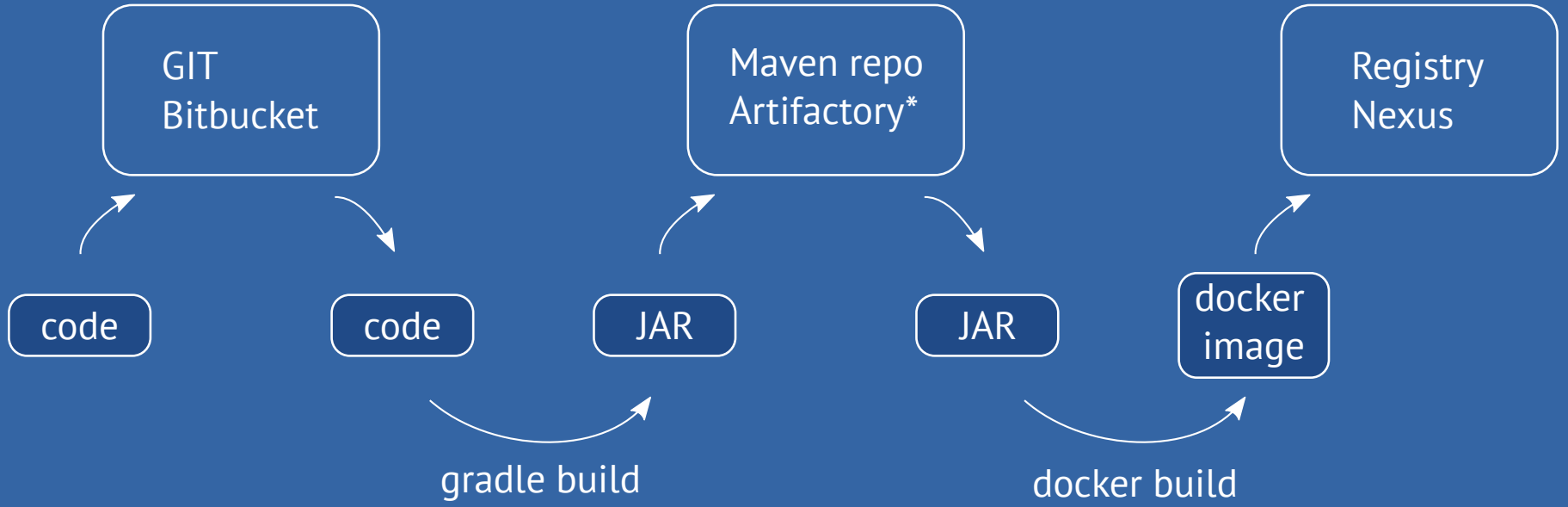
- Take base image
- Inject app artifact
- Define endpoint

Runtime

- Run container with exposed endpoint

Application is a source, container image is an artifact

lifecycle


GIT
Bitbucket
Maven repo
Artifactory*
Registry
Nexus
code
code
JAR
JAR
docker
image
gradle build
docker build

Kubernetes

There is a registry with Docker images

now what?

orchestration

Kubernetes is an open-source system for
automating deployment,
scaling,
and management
of containerized applications

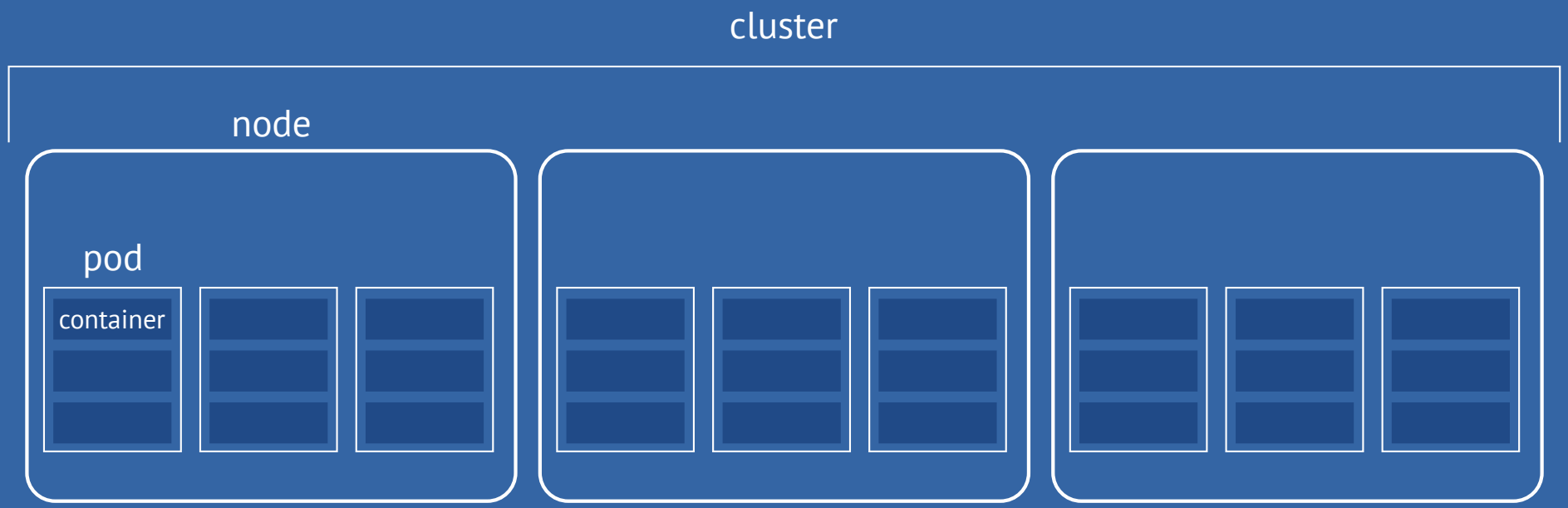
vocabulary

- Image
- Container
  runs image
- Pod
  group of containers
- Node
  host machine for pods
- Cluster
  set of nodes

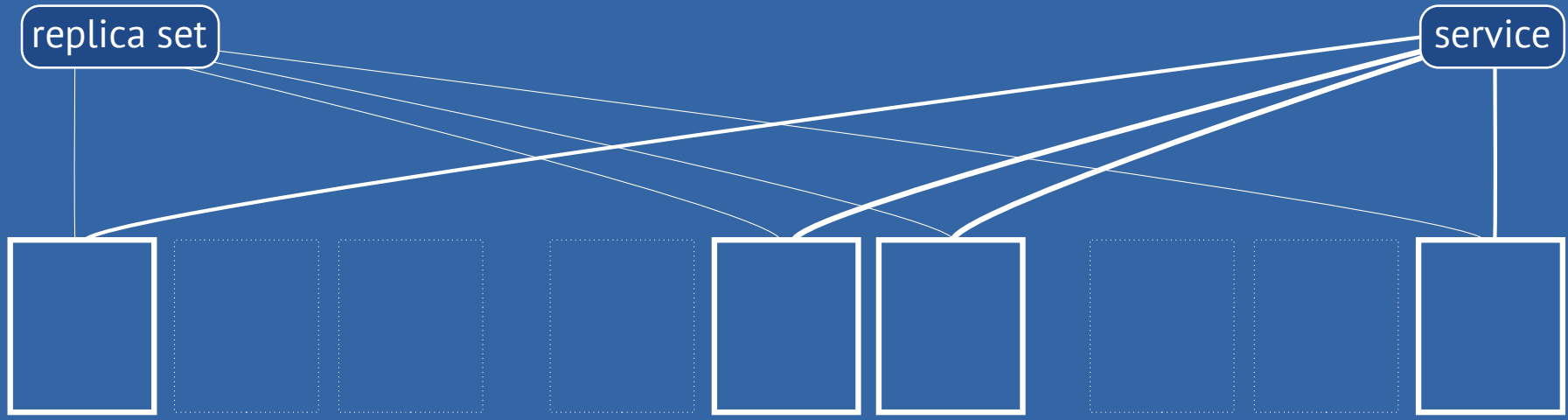
Applies to group of pods:

- Replica Set
  replica counter
- Deployment
  deployment strategy
- Service
  common interface

structure



deployment



kubernetes client tools

- Kubernetes provides full-featured REST API
- kubectl – command-line utility with full access to the API

  Very verbose with a lot of subcommands and options

  Resources can be created and managed directly by typing CLI commands

  Or can be stored in YAML files and applied in batches by running

  ```
  $ kubectl create -f <directory>
  ```

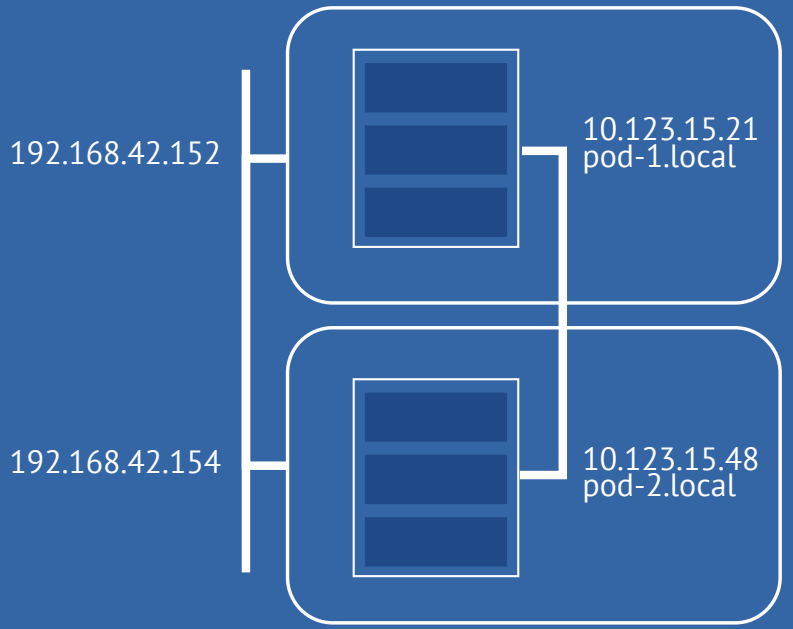
- kubernetes-dashboard – an optional plugin which provides graphical web-interface with limited functionality

networking

- Every node has external IP address

- Every pod has internal IP address and domain name
- Every service has internal IP address and domain name

=> Pods can talk to pods and services by name or IP



But how do I reach the pod from the outside?

debugging pod

Pod with one container, based on “busybox” container image

When started, runs shell and waits for input

Works as a gate to internal network

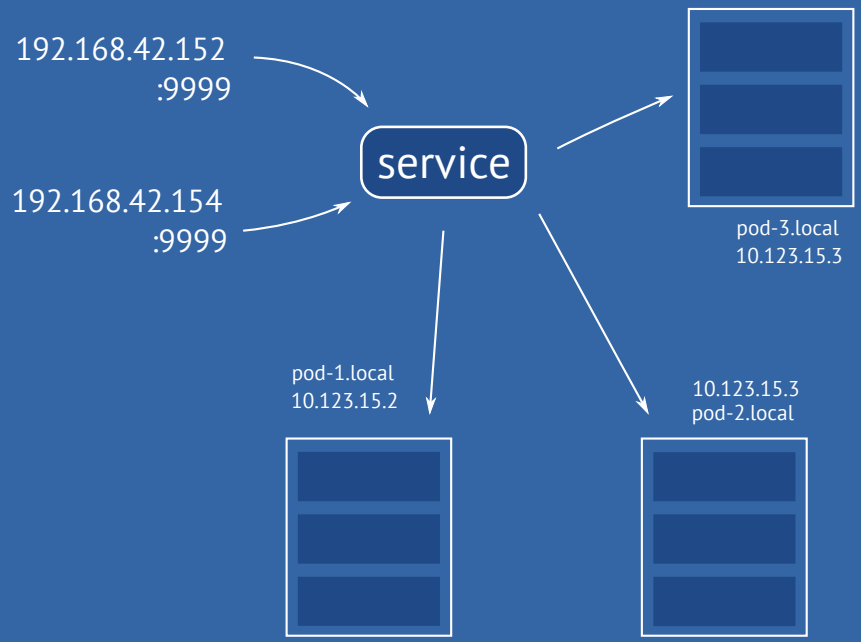
```
(laptop)$ kubectl run -i --tty busybox --image=busybox --rm --restart=Never
Waiting for pod default/busybox-kz38w to be running, status is Pending, pod ready: false
Waiting for pod default/busybox-kz38w to be running, status is Pending, pod ready: false

Hit enter for command prompt
/ # telnet pod-1.local 8080
```

exposed service

NodePort – the same port on every node

- Assigned to the service
- Open for external network
- Traffic is redirected to one of the pods behind the service



Demo

q&a

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