



redhat.[®]

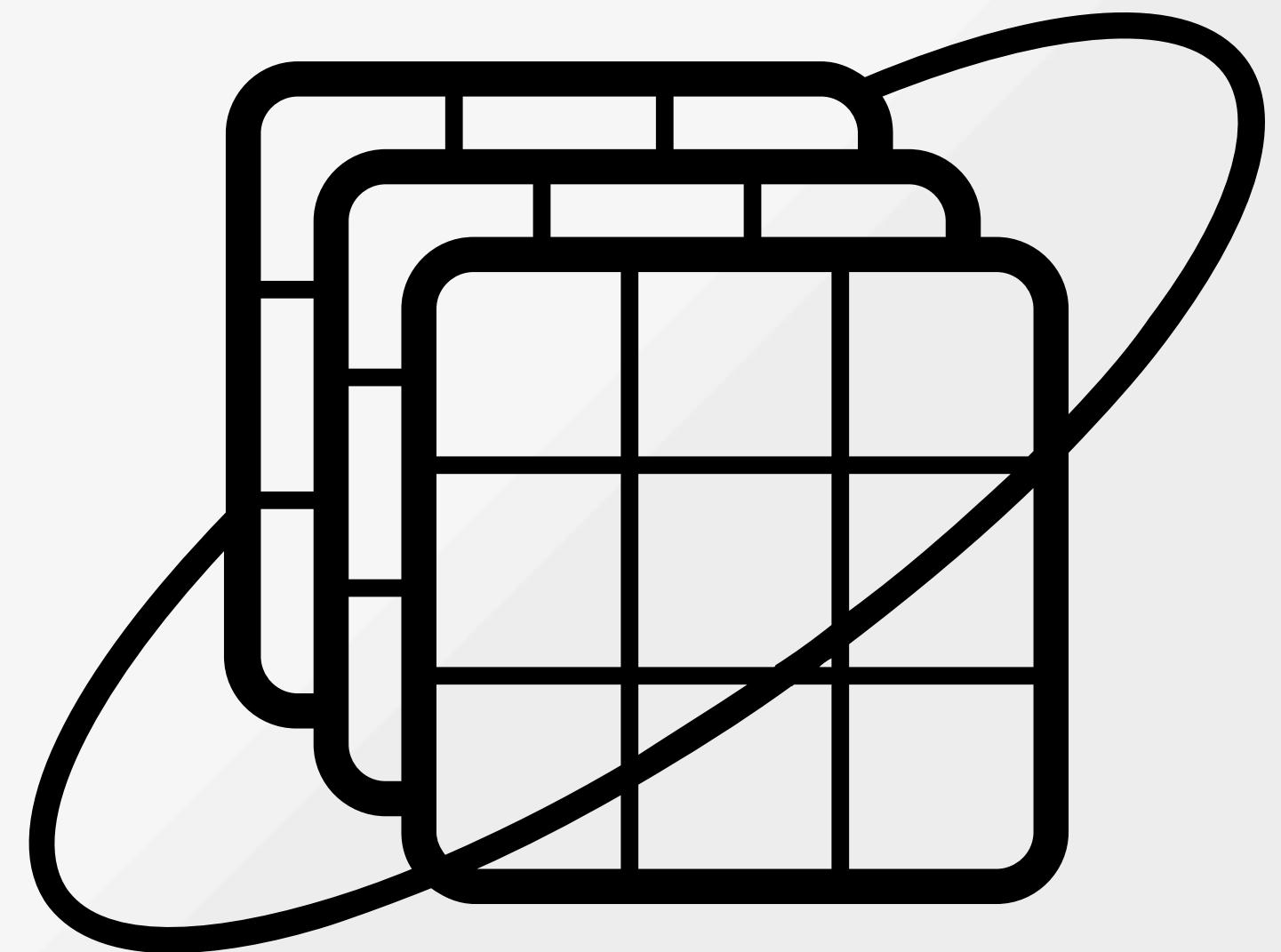
KUBERNETES FOR JAVA DEVELOPERS

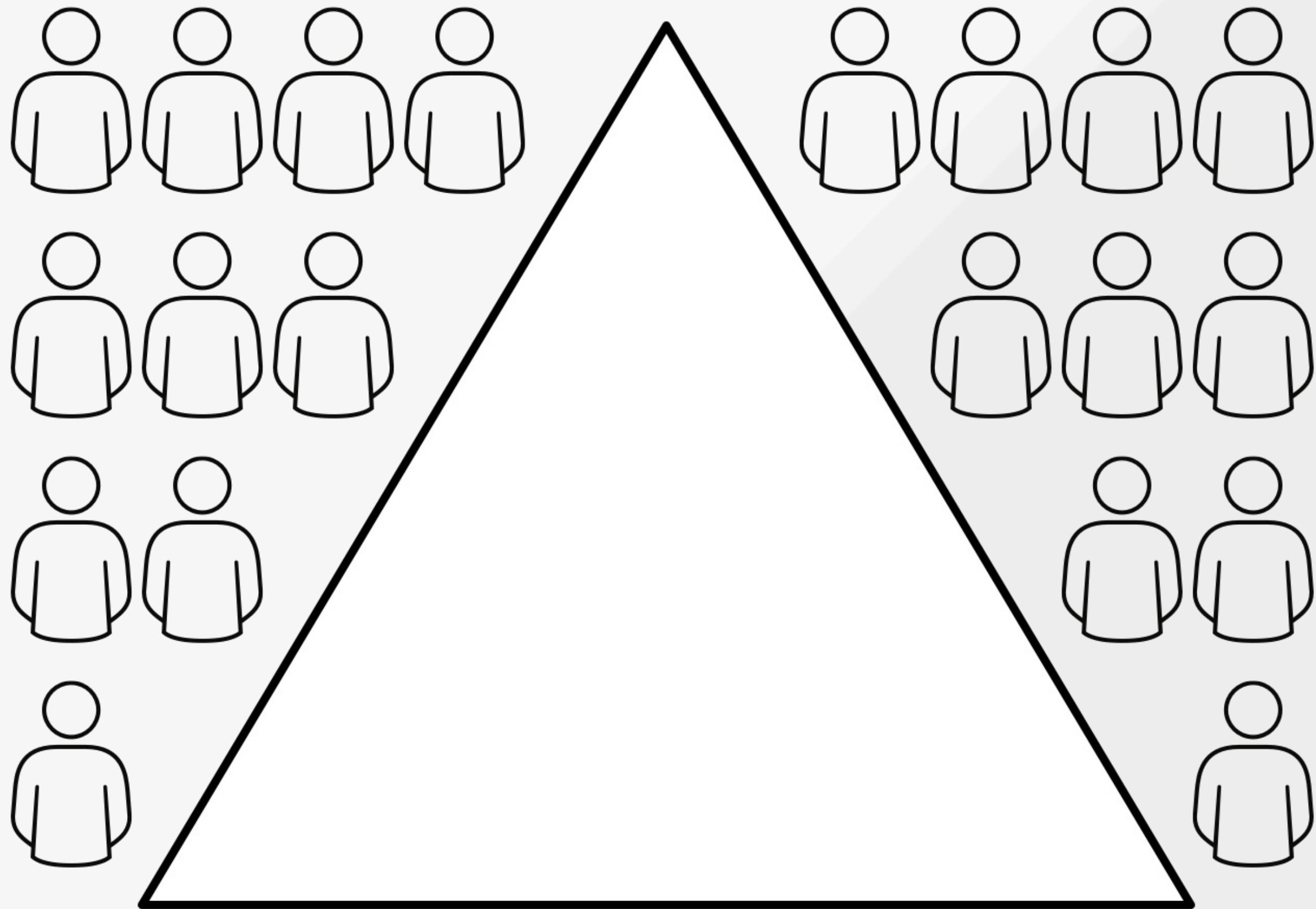
JAX 2017

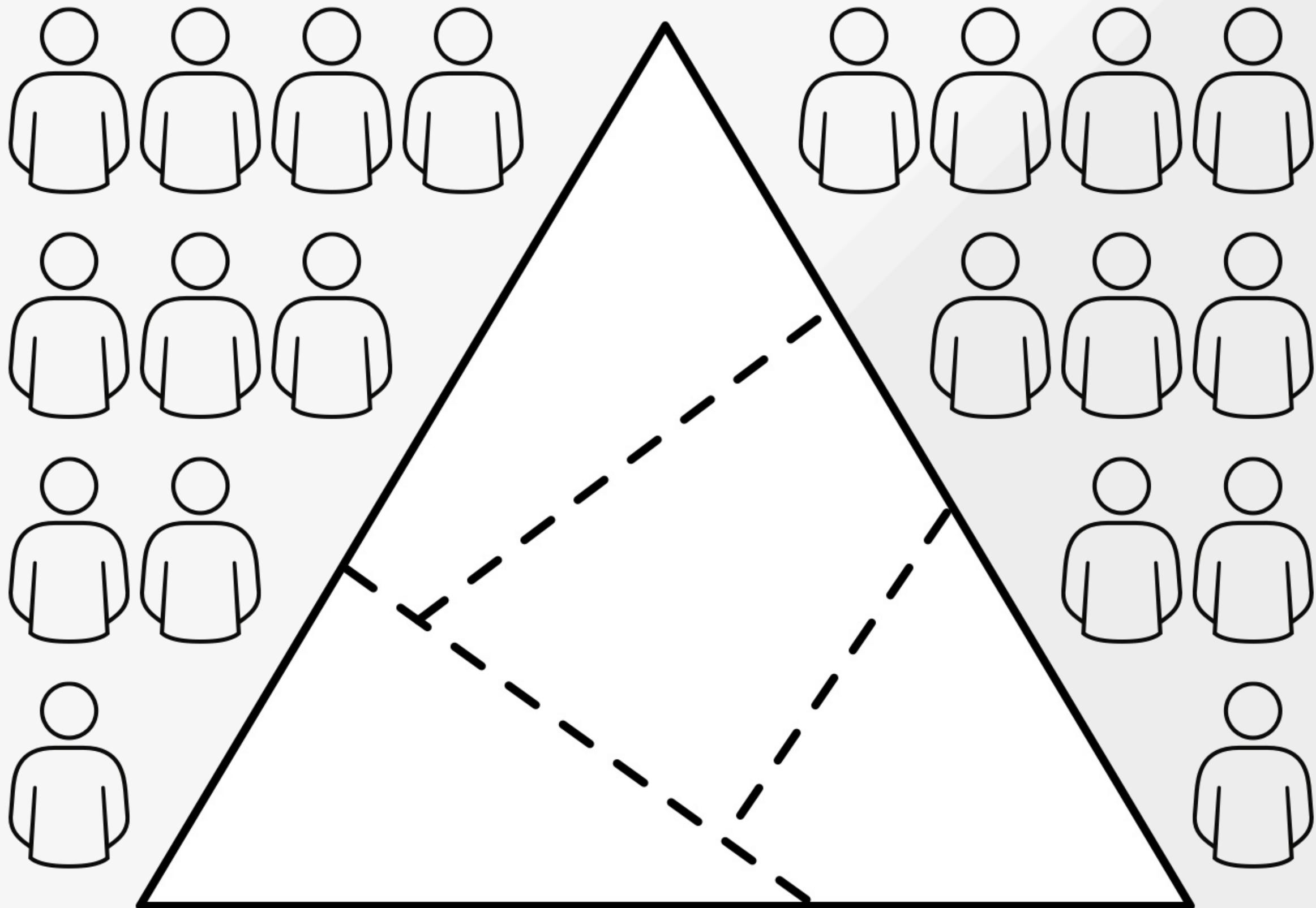
Dr. Roland Huß, Red Hat, @ro14nd

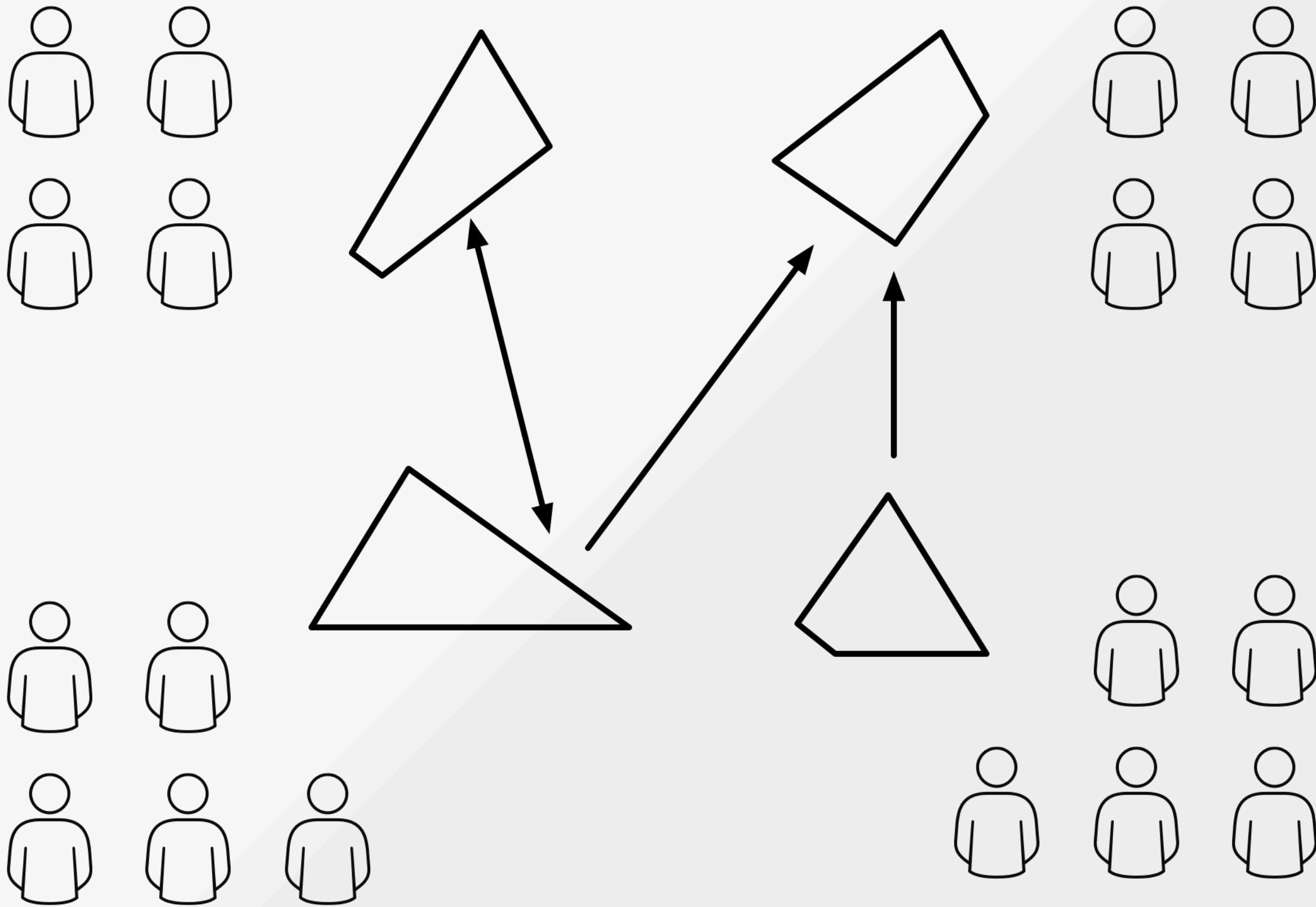


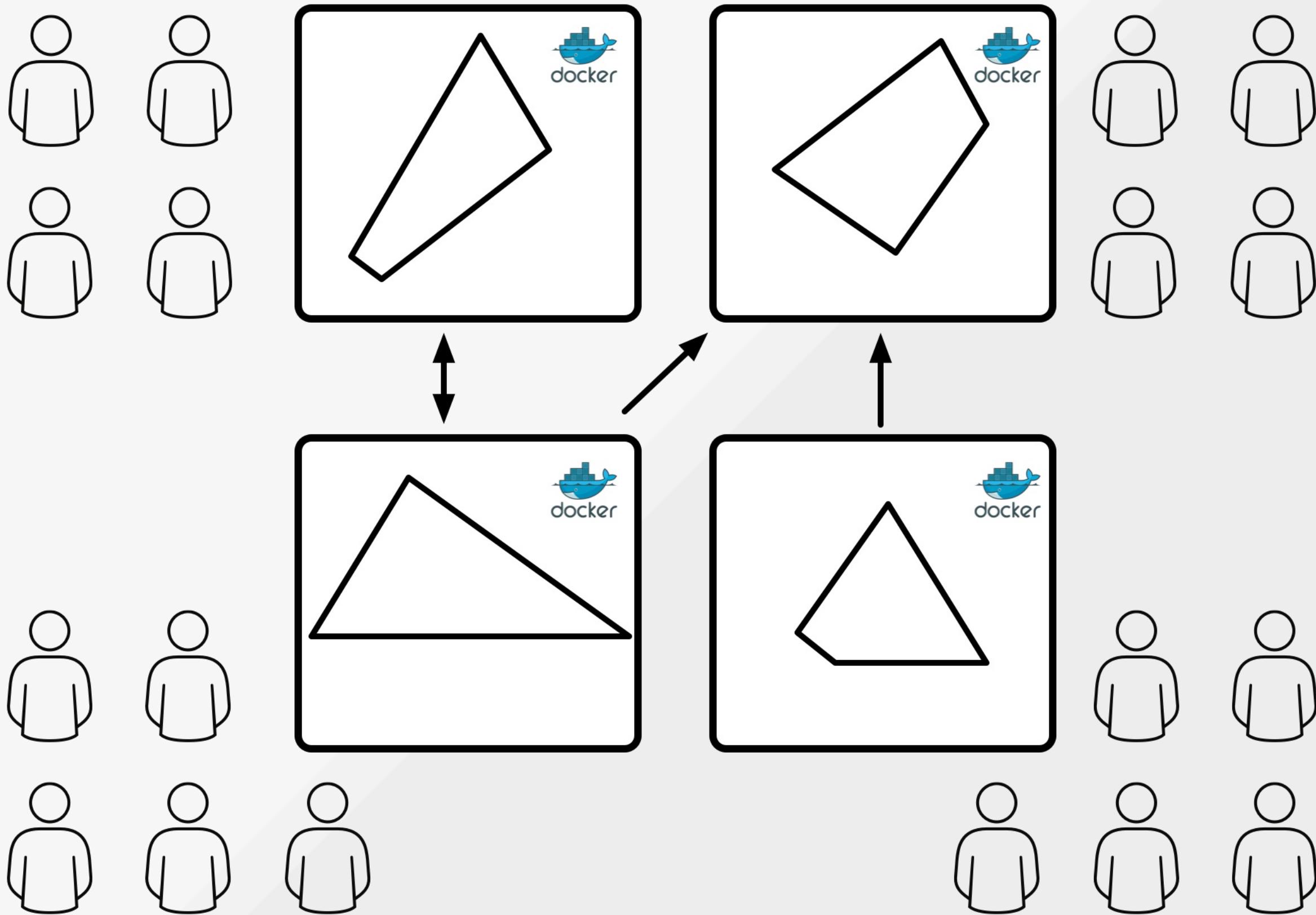
"m" for menu, "?" for other shortcuts

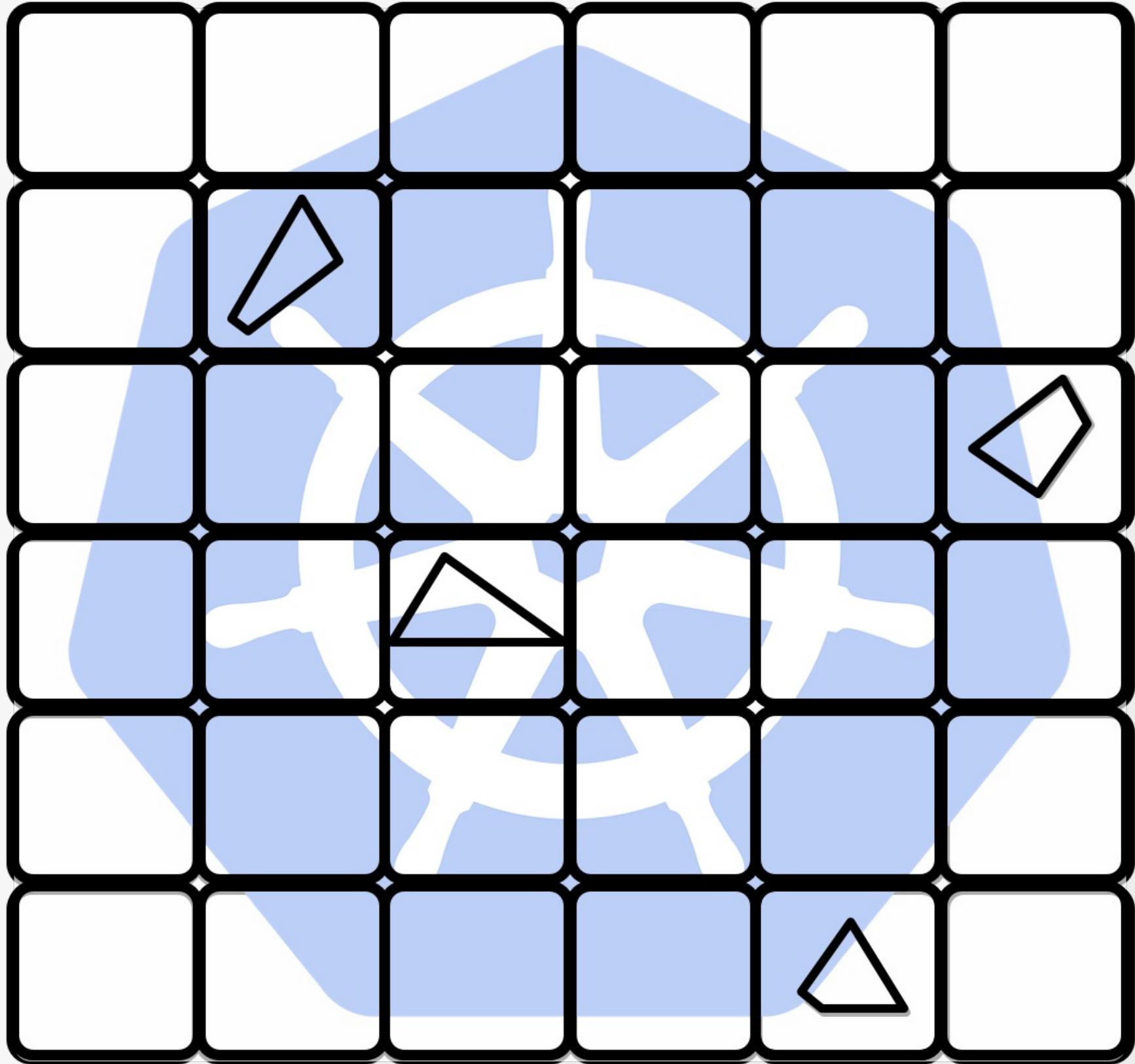










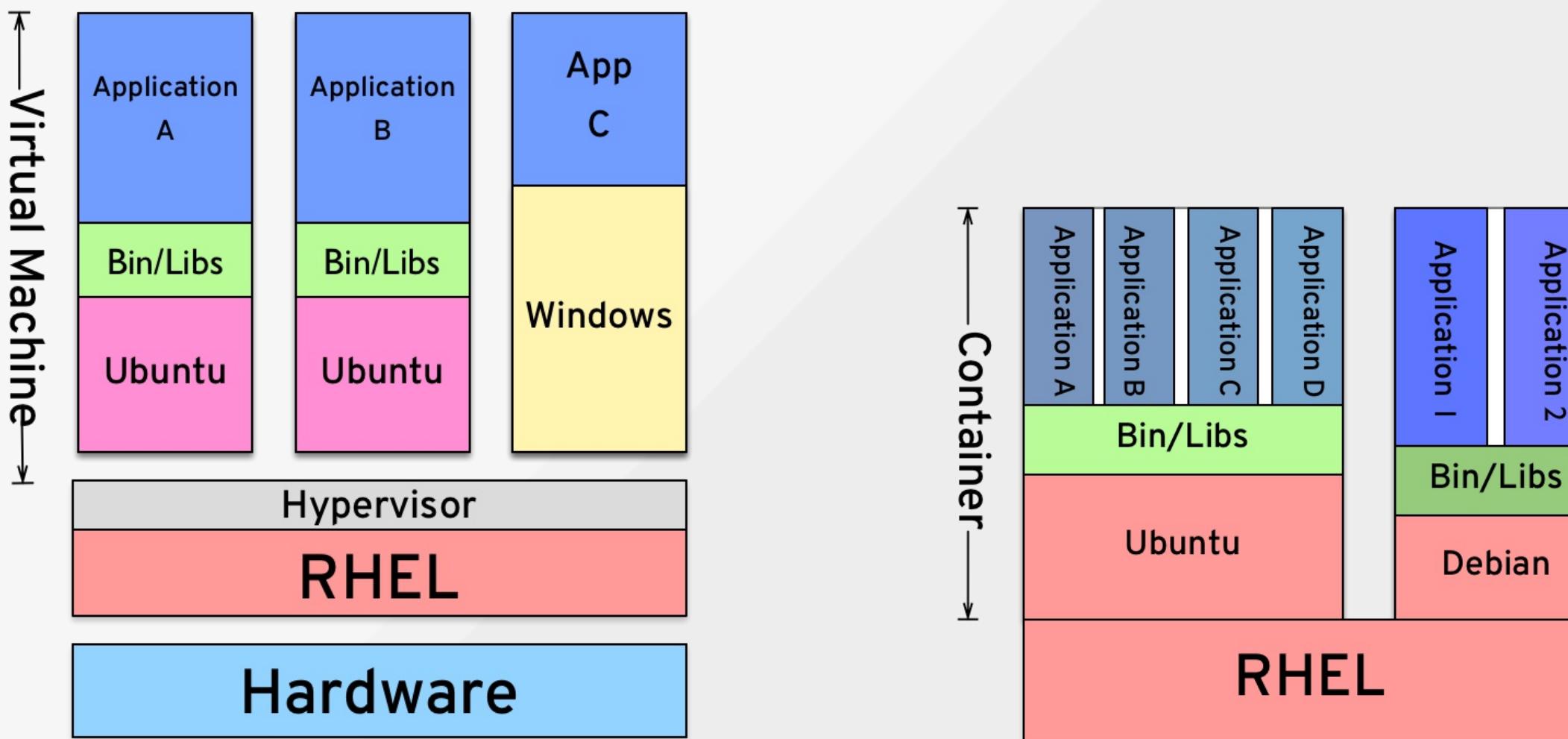




docker

VM VS. CONTAINER

Containers are **isolated**, but share the kernel and (some) files
→ **lighter** and **faster**

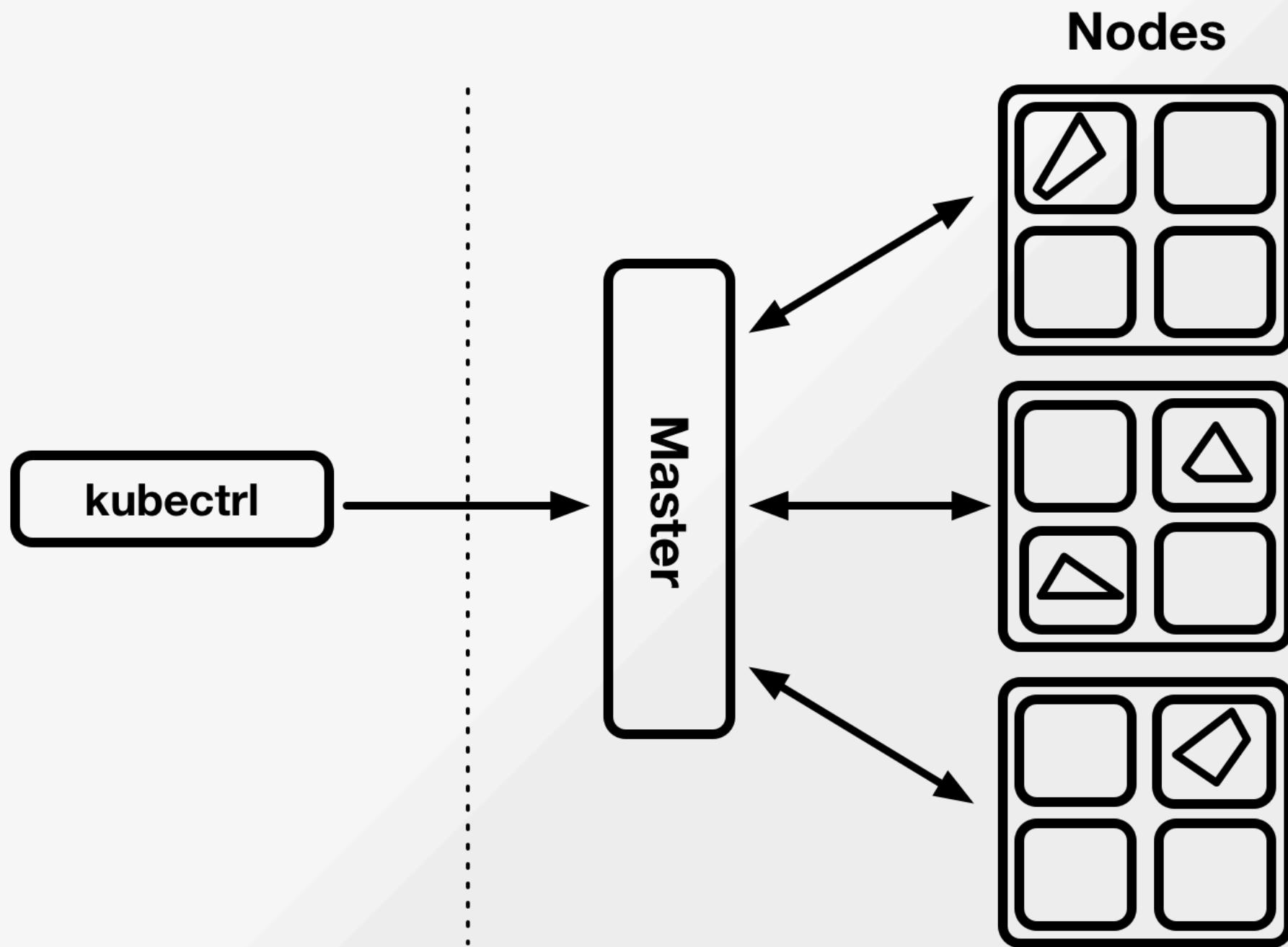




KUBERNETES

- Open Source orchestration system
for Docker containers
 - Scheduling
 - Horizontal scaling
 - Self-healing
 - Service discovery
 - Automated rollout and rollbacks

ARCHITECTURE



KUBERNETES IN THE CLOUD

- Google Container Engine (GKE)
- Azure Container Service
- AWS EC2
 - Stackpoint.io
 - Kubernetes Operations
 - CoreOS Tectonic
- Digital Ocean

RASPI CLUSTER

- 4 Raspberry Pi 3
- Wifi Router
- 6 Port USB charger
- 32 GB SD-Cards
- Costs: ~ 300 €
- Install via Ansible
- kubeadm



Full Story: <https://ro14nd.de/kubernetes-on-raspberry-pi3>

MINIKUBE

- Single-node Kubernetes cluster inside a VM
- No Docker daemon required
- Ideal for local development
- Supports DNS, NodePorts, Volumes, ...
- <https://github.com/kubernetes/minikube>



fabric8

FABRIC8

- **Microservices Platform** for Kubernetes & OpenShift
- Upstream projects for openshift.io
- Themes:
 - Continuous Delivery
 - Management UI
 - Funktion
 - Quickstarts
 - Tooling

FABRIC8-MAVEN-PLUGIN

- Creates **Docker images** and **resource descriptors**
- Zero-configuration with **opinionated defaults**
- Full-configuration with **enrichable fragments**
- <https://maven.fabric8.io>

GOALS

| | |
|-------------------------|---|
| fabric8:build | Build application images (Docker, S2I binary, S2I source) |
| fabric8:resource | Create Kubernetes and OpenShift resource descriptors |
| fabric8:apply | Apply resource descriptors to a running cluster |

CONFIGURATION

- Zero Config
 - Opinionated Defaults
 - Limited configuration options
- XML Configuration
 - Restricted configuration syntax
- Resource Fragments
 - Most powerful
 - Verbose

ZERO CONFIG

- Generators for Image generation

```
<build>
  <plugins>
    <plugin>
      <groupId>io.fabric8</groupId>
      <artifactId>fabric8-maven-plugin</artifactId>
      <version>3.3.0</version>
    </plugin>
    <plugin>
      <groupId>org.springframework.boot</groupId>
      <artifactId>spring-boot-maven-plugin</artifactId>
    </plugin>
  </plugins>
</build>
```

RESOURCE FRAGMENTS

- Resource fragment

src/main/fabric8/pong-rc.yml

```
spec:  
replicas: 1  
template:  
  spec:  
    containers:  
      - name: pong  
    ports:  
      - containerPort: 8080
```

- **Enrichers** add missing pieces

GENERATORS

- Extract Docker image configuration from pom.xml
- Supported technologies:
 - Spring Boot
 - Wildfly Swarm
 - Fat Jars
 - Eclipse Vert.x
 - Webapps
 - Karaf

ENRICHERS

- Add default Kubernetes resources
- Update existing resources
- E.g.
 - Default Deployment and Service
 - Git information as labels
 - Add healthchecks
 - Add OpenShift routes
 -

PROFILES

- Named collection of enrichers and generators
- -Dfabric8.profile to select

| | |
|-----------|-------------------------------------|
| raw | No enrichment |
| explicit | Only default objects |
| minimal | Small enrichments |
| aggregate | Combine resources from dependencies |

K8S & OPENSHIFT

- Kubernetes:
 - Docker builds
 - Deployments
 - Ingress
- OpenShift
 - S2I & Docker Binary Builds
 - DeploymentConfig
 - ImageStream
 - Template

MISC

fabric8:install

Install local development environment

fabric8:cluster-start

Start minikube or minishift

fabric8:watch

Watch for changes and redeployments

fabric8:debug

Debug into pods

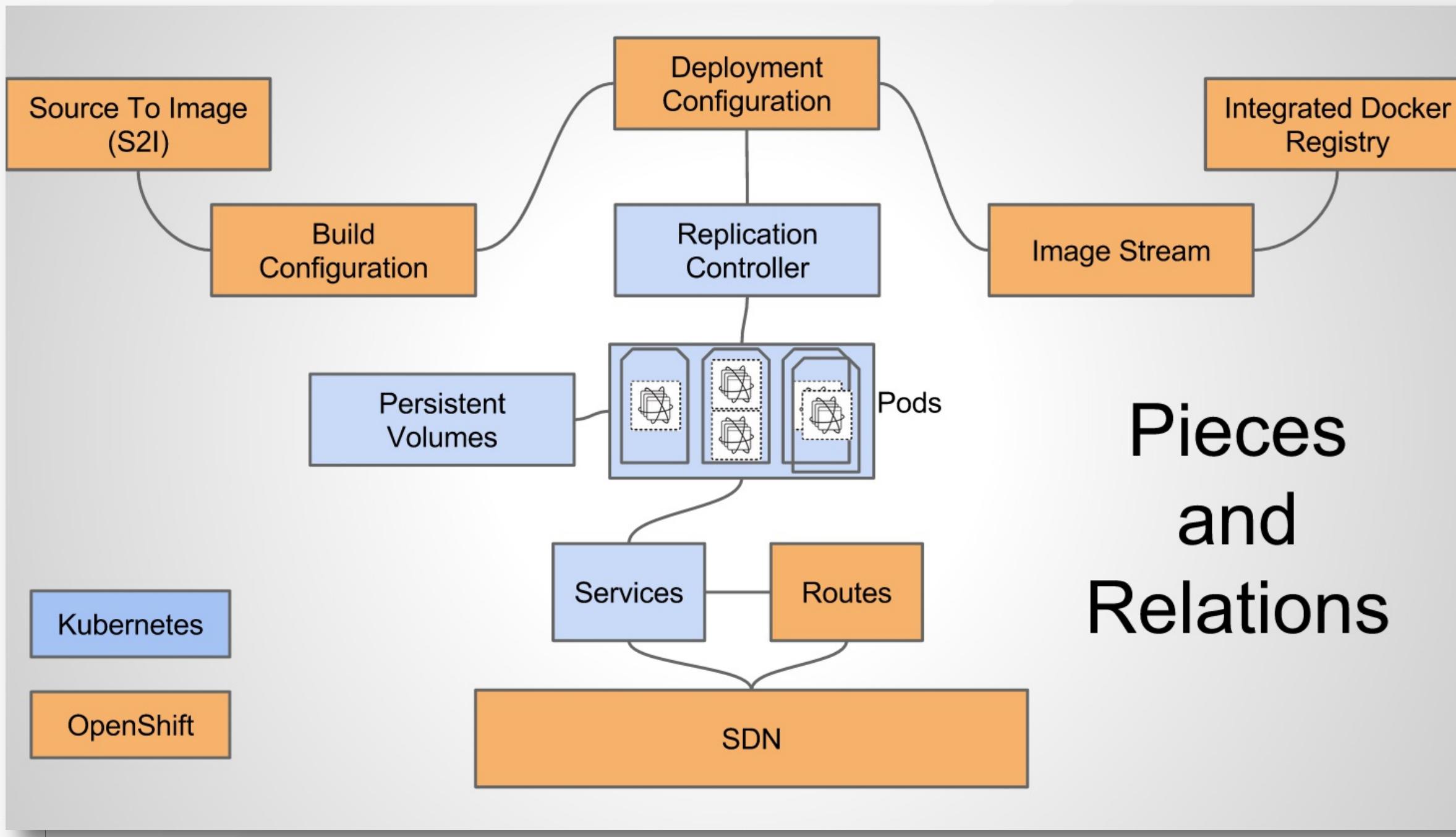


OPENShift

OPENSHIFT

- Adds the **BUILD** to Kubernetes
- Developer and Operation Tools
- Infrastructure Services
 - Registry, Router, OAuth2 Security
- Volume Management
- Multi tenancy
- Management UI

OPENSHIFT EXTRAS



MINISHIFT

- Single-node OpenShift Origin cluster inside a VM
- Based on oc cluster up
- Supports routes, registry, s2i builds,
- <https://github.com/minishift/minishift>

WRAP UP

- Starting with Kubernetes can be almost as easy as with Docker
- Kubernetes and OpenShift are powerful orchestration platforms with enterprise grade features.
- Use `fabric8-maven-plugin` for Java apps

Kubernetes Patterns



Patterns, Principles, and Practices
for Designing Cloud Native Applications

Bilgin Ibryam & Roland Huss

<https://leanpub.com/k8spatterns>





QUESTIONS ?

Blog <https://ro14nd.de>

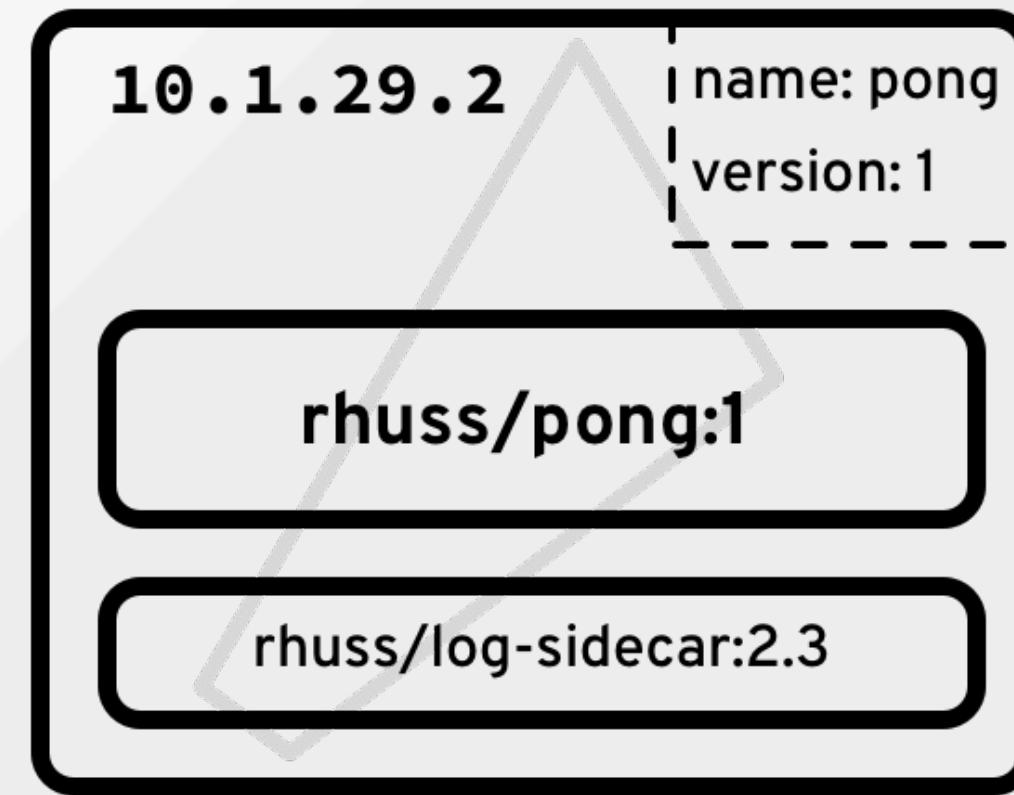
Slides `firefox $(curl -sL bit.ly/k8s-for-java-devs | sh)`





POD

- Kubernetes Atom
- One or more containers sharing:
 - IP and ports
 - Volumes
- Ephemeral IP address



LABELS

- Metadata attachable to every resource object
- Used to categorize stuff
- Important for selectors
- "Freeform"

REPLICATION CONTROLLER

- Responsible for managing **Pods**
- **replicas** : Number of **Pod** copies to keep
- Label selector choose **Pods**
- Holds a template for creating new **Pods**

Replication Controller

replicaCount:

3

Selector:

```
name: pong  
version: 1
```

10.1.29.2

```
name: pong  
version: 1
```

10.1.29.3

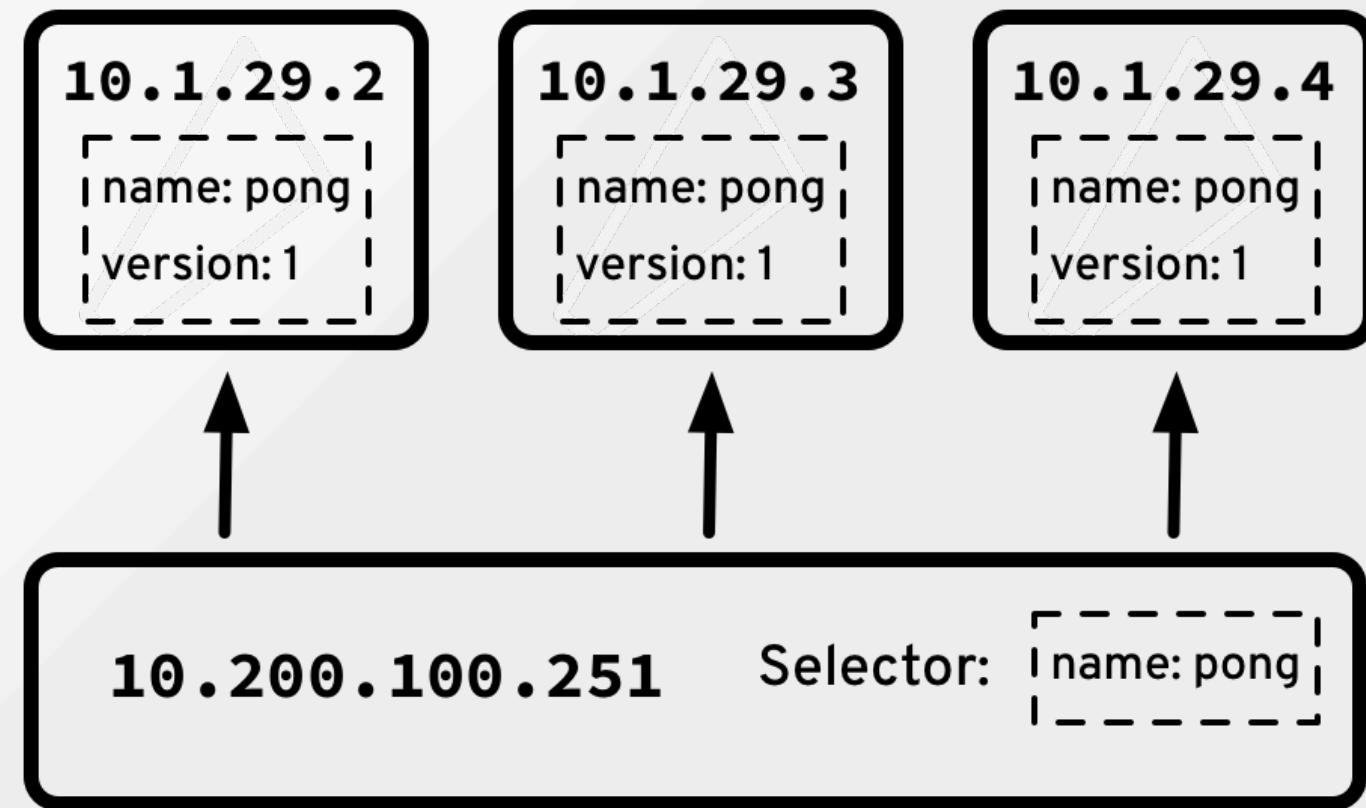
```
name: pong  
version: 1
```

10.1.29.4

```
name: pong  
version: 1
```

SERVICE

- Proxy for a set of **Pods**
- **Pods** selected by **Label** selector
- Permanent IP address



ROLLING UPDATE

- kubectl rolling-update
- Downscale of old **replication controller**
- Upscale of new **replication controller**

VOLUMES

- Distributed storage
- Support types:
 - Local
 - NFS
 - Gluster
 - Ceph
 - ...

MISC FEATURES

- Secrets
- ConfigMaps
- ServiceAccounts
- Health & Liveness Checks
- Ingress