Container deployments

- Multi-container deployments alone don’t address issues of **scalability** and **fault-tolerance**.
  - Multi-container deployments must be replicated manually
  - Multi-container deployments must be manually restarted if something goes wrong
- Instead of using multi-container deployments alone, we resort to **container orchestration** frameworks.
- One of the most popular is **Kubernetes (k8s)**

Kubernetes

- Deployments/services defined declaratively by means of a YAML file.
- Kubernetes objects
  - Nodes
  - Pods
  - Deployments
  - Services

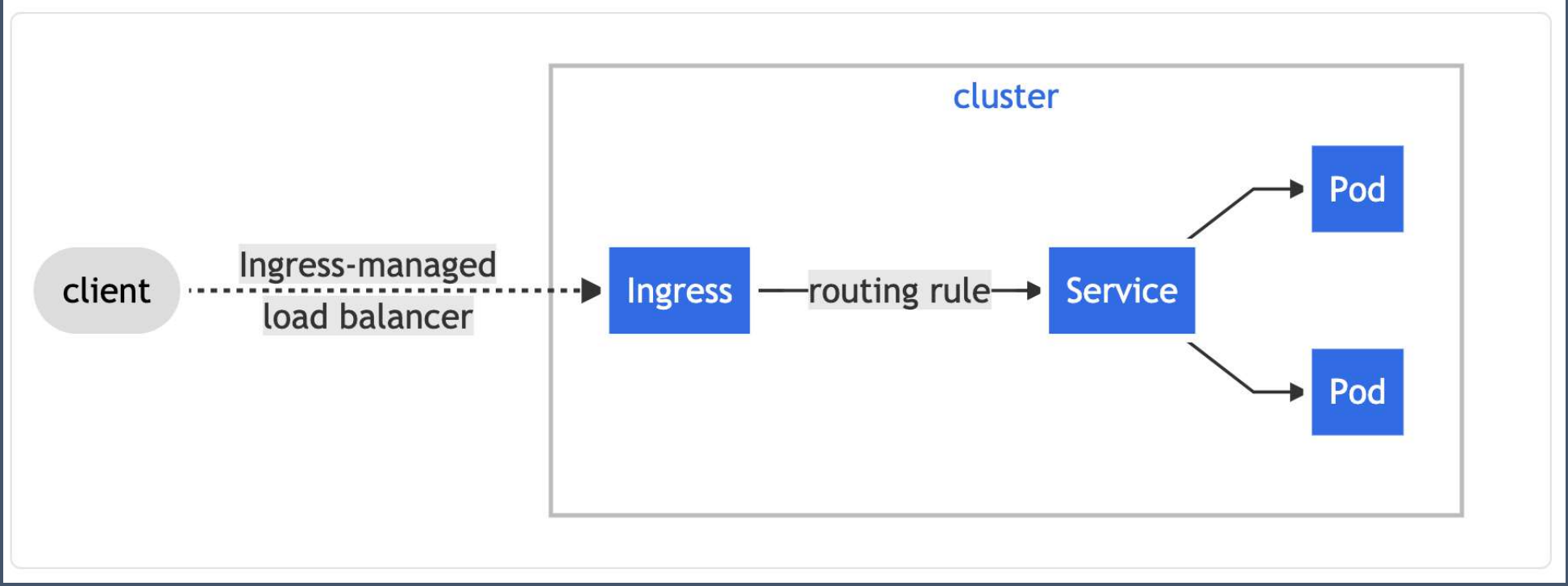
Kubernetes

- **Nodes**
  - Physical (or virtual) machines in a k8s cluster
  - Managed by the control plane
- **Pods**
  - Application running on a node
  - Single- or multi-container application
- Several types of workloads (a set of pods)
  - **Deployment:** stateless applications
  - **StatefulSet:** applications with a persistent state
  - **Job:** a task that runs to completion and stop

Kubernetes

- **Service:** an way of exposing an application
  - Transparent way for other services to find a given application
  - Defined as a set of pods and a port number
- **Ingress:** manages external access
  - Can be load balancer, SSL termination, etc.
  - Routes external traffic to services in the cluster
  - Implemented by an **ingress controller** (like nginx)

Kubernetes


cluster
client
Ingress-managed
load balancer
Ingress
routing rule
Service
Pod
Pod

Exercises

- Requirements
  - Azure Student subscription
  - Kubernetes local installation
  - Azure CLI
- Deploy example application cloudapp (DS_Examples)
  1. As a local k8s cluster (using docker desktop)
  2. As a cloud application (using Azure App Services)

Azure

- https://portal.azure.com
- Resource groups
  - Located somewhere
  - Include all other resources: clusters, instances, etc.
- Azure Container Registry
  - Cloud registry for Azure apps
  - Pay by storage amount

Azure

- Azure Container Instances (ACI)
  - Support for single and multi-container deployments
  - Support for public and private container registries (ACR, DockerHub)
- Azure Kubernetes Service (AKS)
  - Very flexible configuration
  - ACR can be attached to cluster
    - Other container registries possible (DockerHub)