



ITALY

OpenInfra Days



Organized by

IRIDEOS

BE
Binario Etico

Under the patronage of

 **AGID** | Agenzia per
l'Italia Digitale

Sponsored by

 **Mellanox**
TECHNOLOGIES


MESOSPHERE


gci SERVICE
FACTORY
part of
GENERAL COMPUTER ITALIA



ITALY

OpenInfra Days

Adriano Pezzuto

Milano, 2 Oct 2019



A photograph of the Milan skyline featuring the UniCredit Tower, a prominent curved skyscraper, and other modern buildings under a clear sky.

Cloud Native Computing at the Edge
bring the cloud native revolution everywhere

1.Cloud Native

2.Edge Computing

3.Cloud Native for the Edge

4.Edge Kubernetes



Cloud Native vs Cloud Washing

Cloud Native

- ✓ Lightweight
- ✓ Modularity
- ✓ Fault tolerance
- ✓ Elastic scaling
- ✓ Automation
- ✓ Code driven





Pets vs Cattle

The Cloud Native Revolution



- ✓ Containers
- ✓ Functions
- ✓ Orchestrators
- ✓ Git
- ✓ Object Storage
- ✓ ...

1.Cloud Native

2.Edge Computing

3.Cloud Native for the Edge

4.Edge Kubernetes



Energy



**Autonomous
Devices**



... and many more

Why Edge Computing?

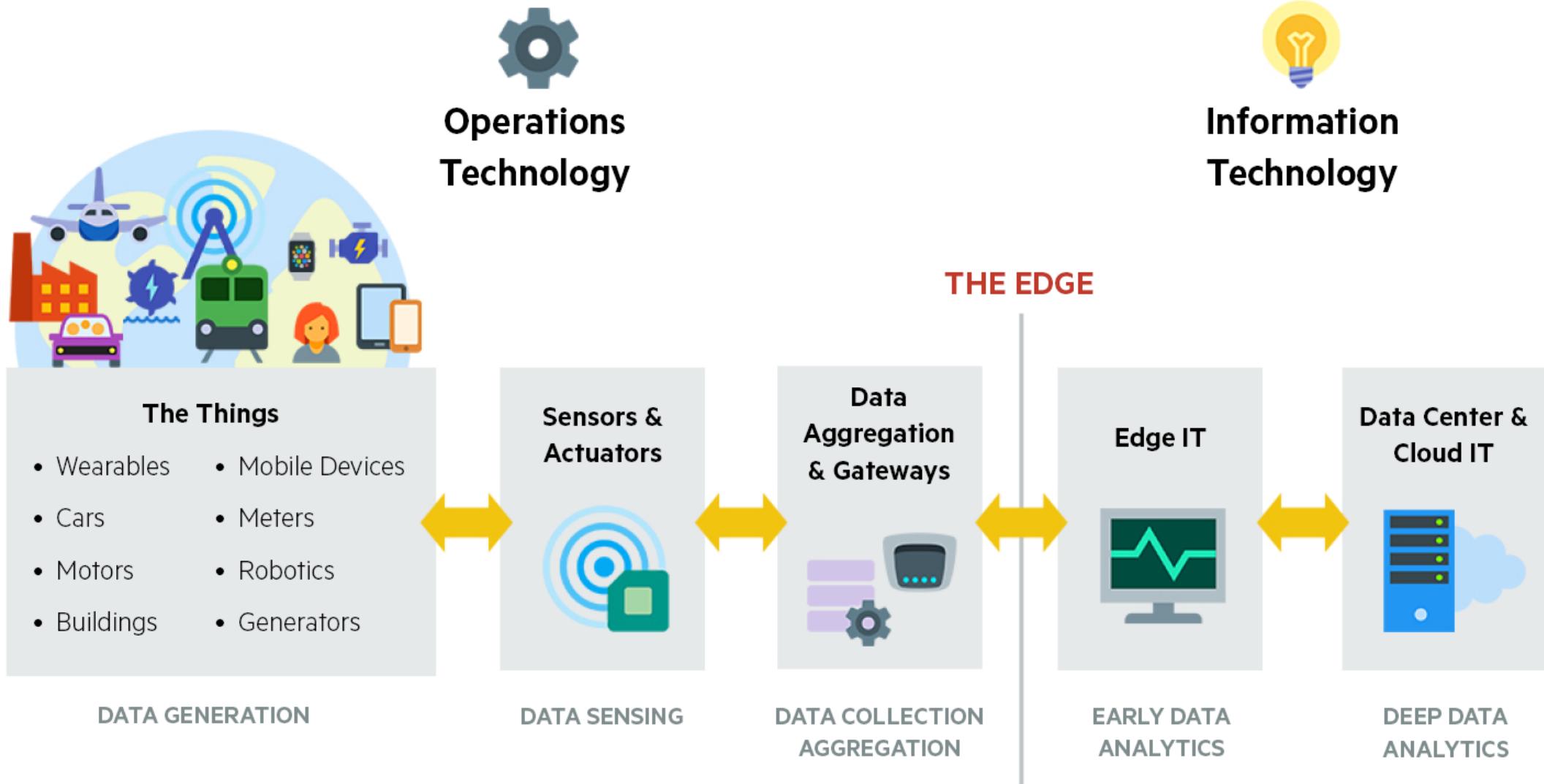


Image source: leanbi.ch

Edge Computing Architecture

Edge Computing advantages

- ✓ Respond in real time
- ✓ Operate inline and offline
- ✓ Reduce communication, processing and storage costs
- ✓ Maximise security and privacy

1.Cloud Native

2.Edge Computing

3.Cloud Native for the Edge

4.Edge Kubernetes

Bring the Cloud Native Revolution to the Edge

- ✓ Same tools and methodologies
- ✓ Reuse of competencies
- ✓ Agility
- ✓ Automation
- ✓ Avoid silos
- ✓ Reduce Vendor Lock-In
- ✓ Open Source

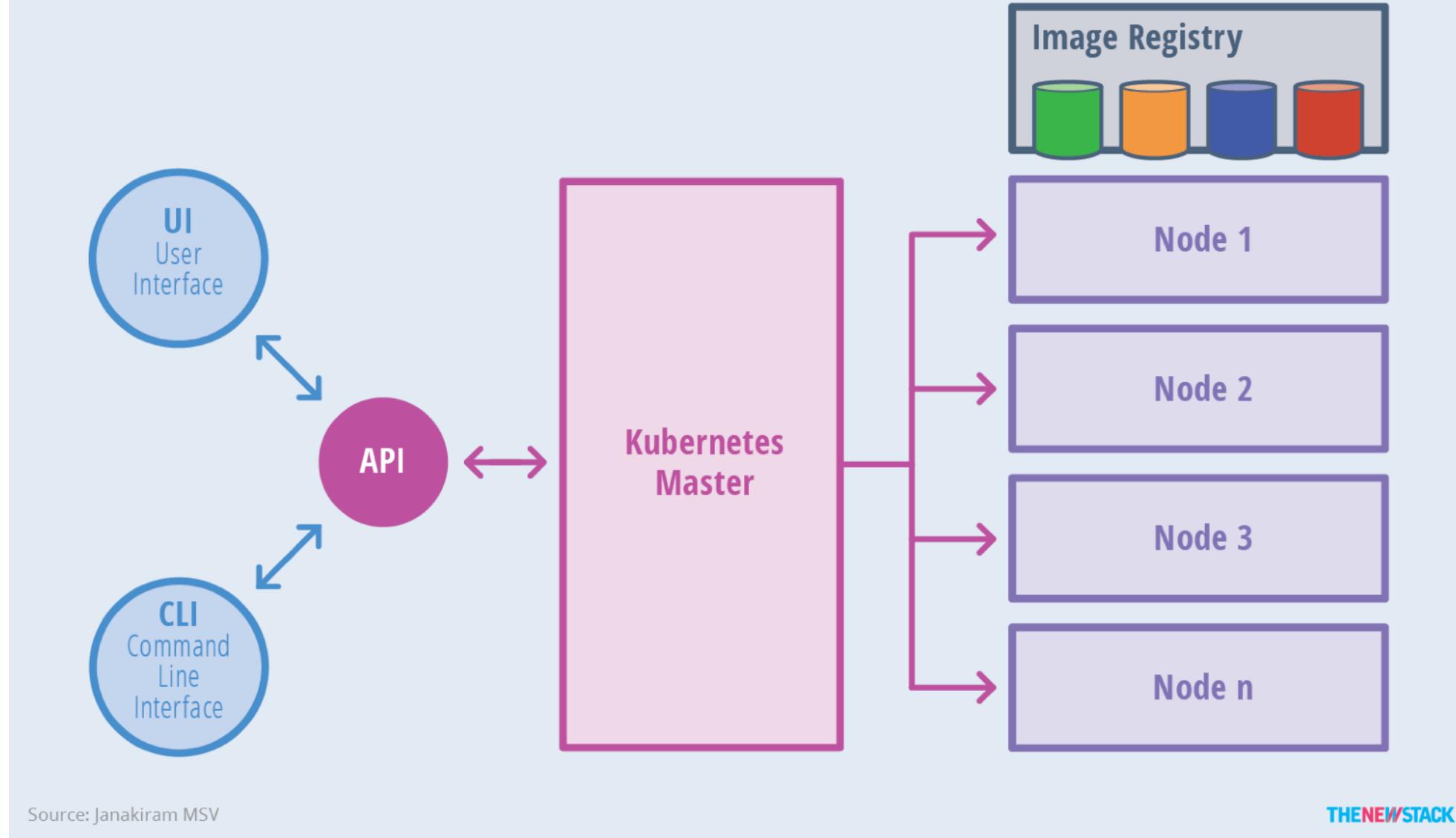
1.Cloud Native

2.Edge Computing

3.Cloud Native for the Edge

4.Edge Kubernetes

Kubernetes Architecture



Source: Janakiram MSV

THE NEW STACK

Why Kubernetes for the Edge?

- ✓ Highly Scalable
- ✓ Universal Scheduler
- ✓ Declarative System
- ✓ Programmable Platform





Highly Scalable

- ✓ Single Kubernetes cluster:
- ✓ Up to 5000 worker nodes
- ✓ Up to 150000 pods
- ✓ Up to 300000 containers
- ✓ Federation of multiple clusters

Universal Scheduler

- ✓ Containers
- ✓ Functions
- ✓ Virtual Machines
- ✓ JVMs
- ✓ Edge resources
- ✓ Cloud resources
- ✓ ...





Declarative System

```
---  
apiVersion: v1  
kind: Room  
metadata:  
  name: kitchen  
  namespace: default  
  labels:  
    exposition: north  
spec:  
  lights:  
  - name: lamp-01  
    brightness: 0.8  
    position: 45°  
  - name: lamp-02  
    brightness: 0.3  
    position: 180°  
  - name: lamp-03  
    brightness: 1.0  
    position: 90°
```

Programmable Platform

```
// custom controller  
for {  
    desired := getDesiredState()  
    current := getCurrentState()  
    reconcile(desired, current)  
}
```



Kubernetes in the Edge Architecture

- A. The whole Kubernetes is deployed at the Edge
- B. The Control Plane resides at Cloud and workers at the Edge
- C. The Control Plane and the Edge abstraction are deployed at the Cloud

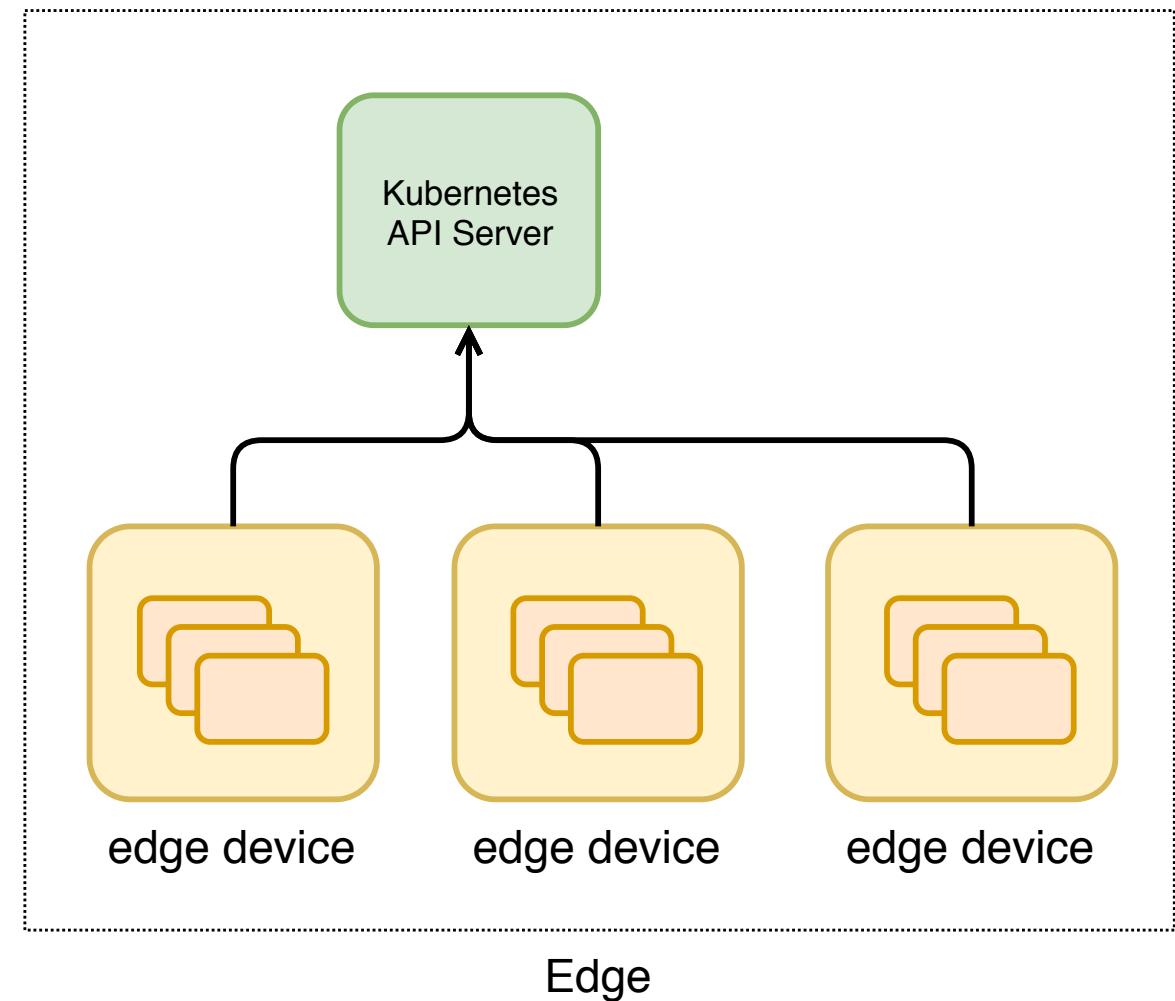
Lightweight Kubernetes distros

✓ CP and workers at the Edge

✓ Canonical [[MicroK8s](#)]

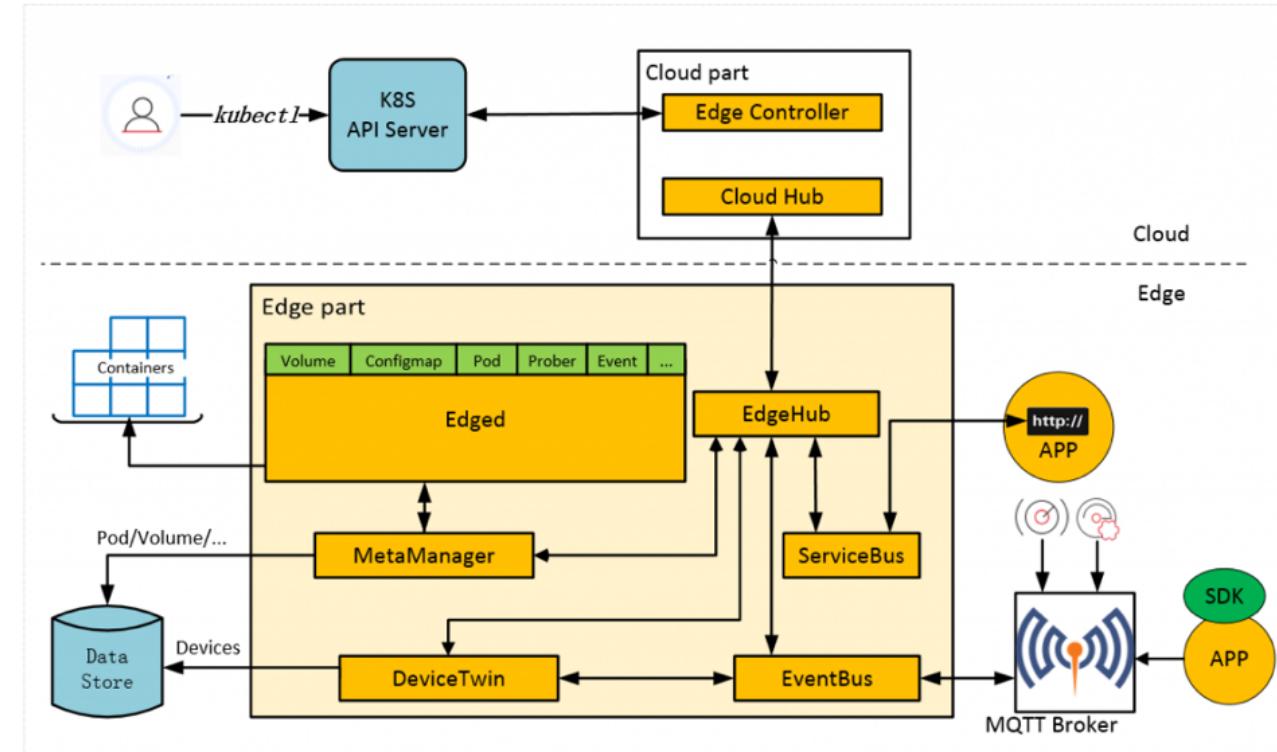
✓ Rancher [[K3s](#)]:

- 512 MB di RAM per Control Plane
- 75 MB di RAM per worker.
- Linux Kernel 3.10+
- HW x86_64, ARMv7, ARM64



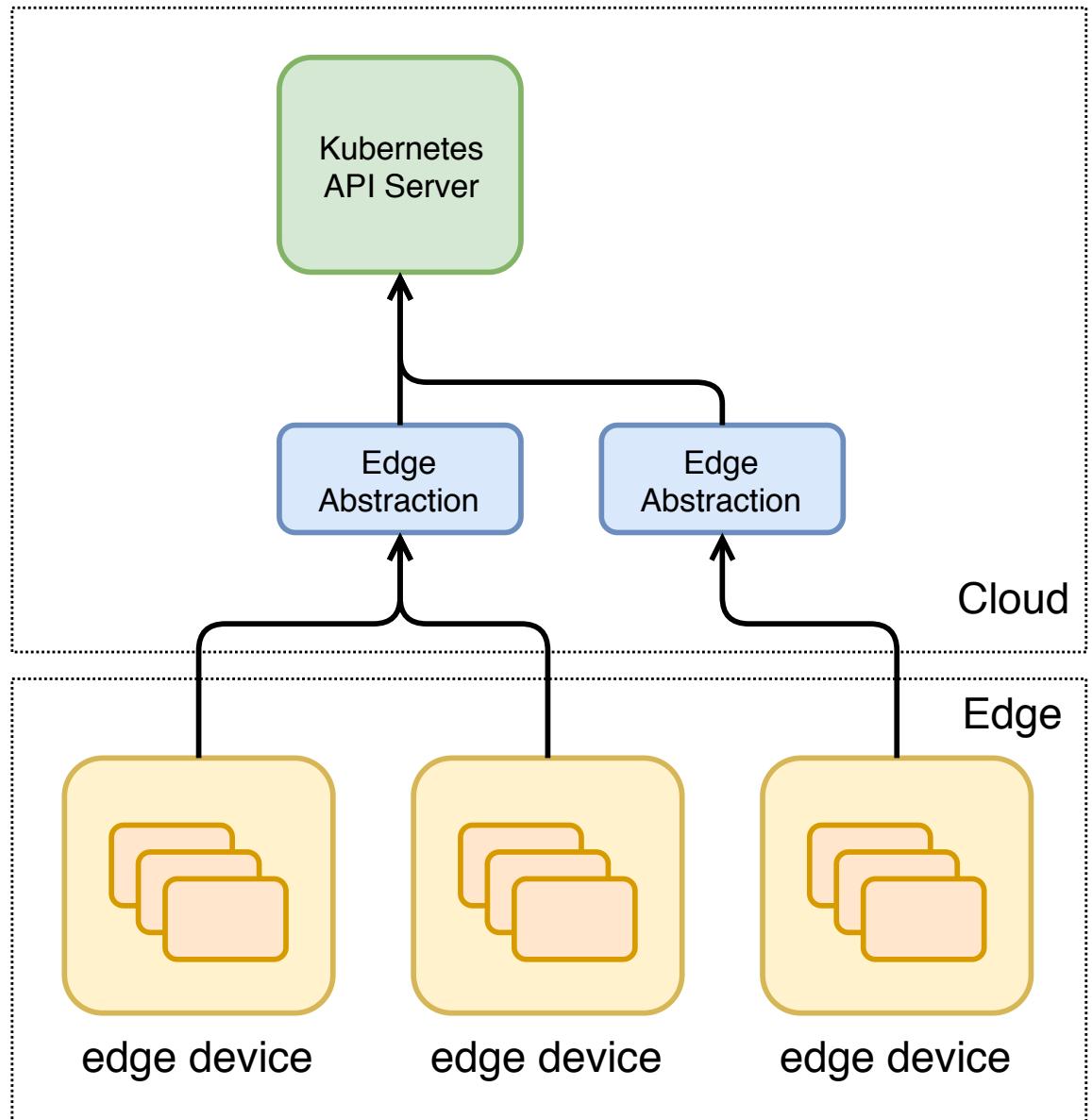
Specialised Kubernetes distros

- ✓ Control Plane at the Cloud
- ✓ Workers at the Edge
- ✓ End devices run containers
- ✓ MQTT for M2M Communication
- ✓ Based on [\[KubeEdge\]](#) by Huawei



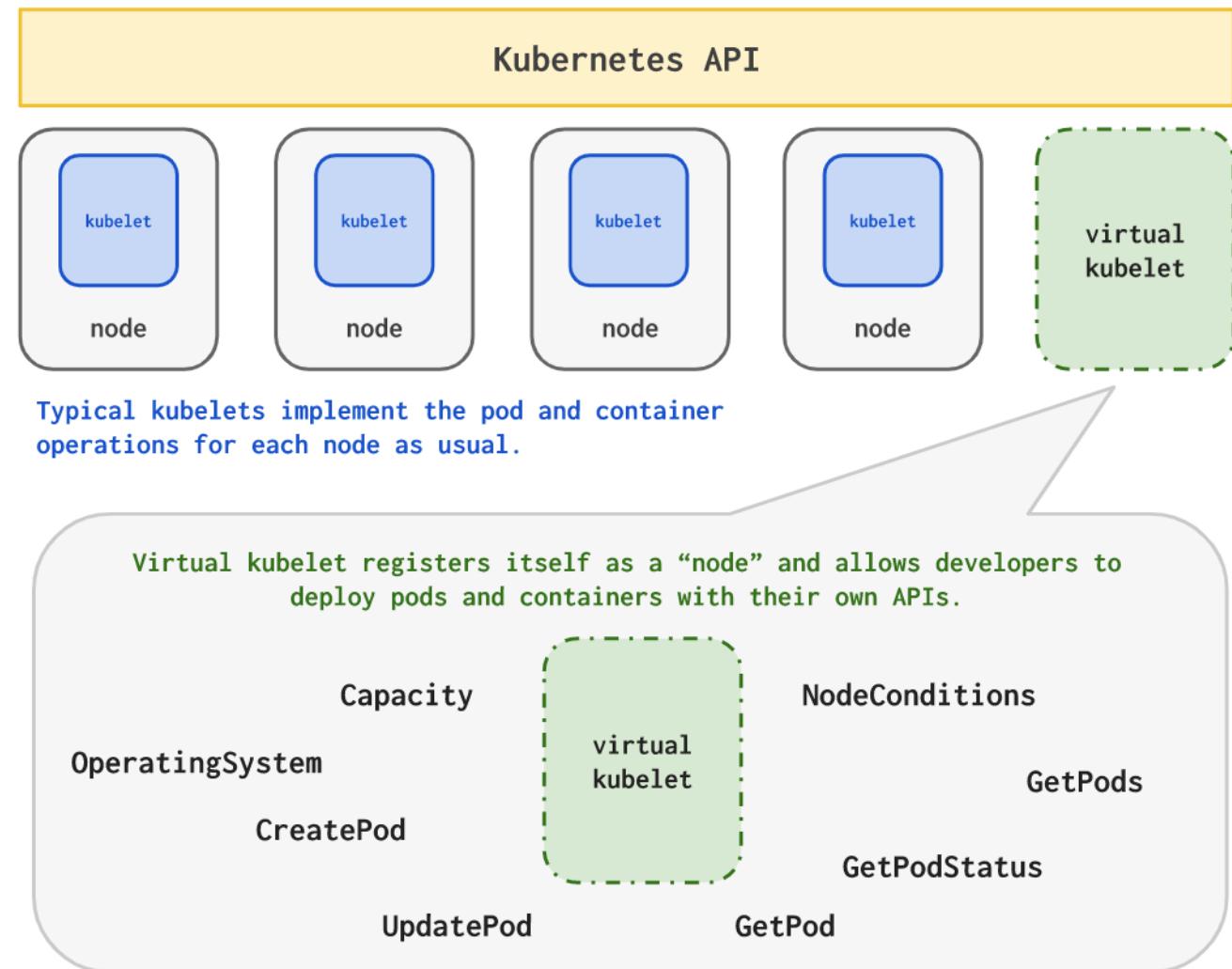
Edge Abstraction

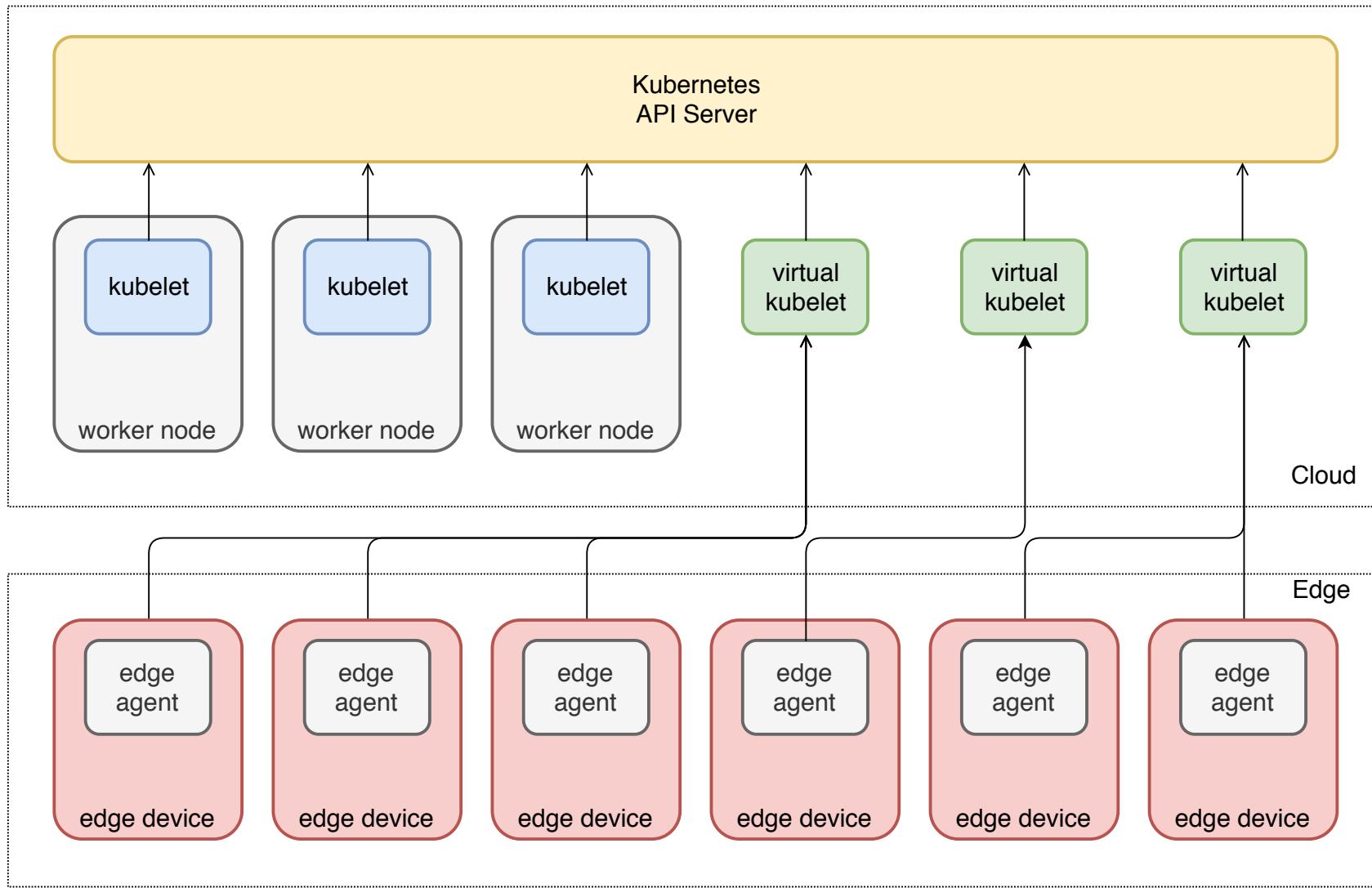
- ✓ Control Plane at the Cloud
- ✓ Edge nodes abstraction
- ✓ Standard Kubernetes APIs
- ✓ Based on [\[virtual-kubelet\]](#) by Microsoft



How virtual-kubelet works

“Virtual Kubelet is an implementation of the Kubernetes kubelet that masquerades as a real kubelet for the purpose of connecting a Kubernetes cluster to other APIs. This allows Kubernetes Nodes to be backed by other services.”





Clastix Edge Platform Architecture - codename “Armadillo”



Clastix Tech Ltd
27, Old Gloucester Street
WC1N 3AX London, UK

clastix.io
hello@clastix.io

Thank You!