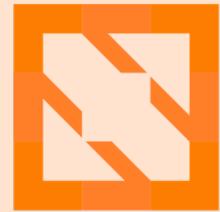




KubeCon



CloudNativeCon

Europe 2022

WELCOME TO VALENCIA



KubeEdge: From Fixed Location to Movable Edge, Latest Updates and Future

Yin Ding, Kevin Wang

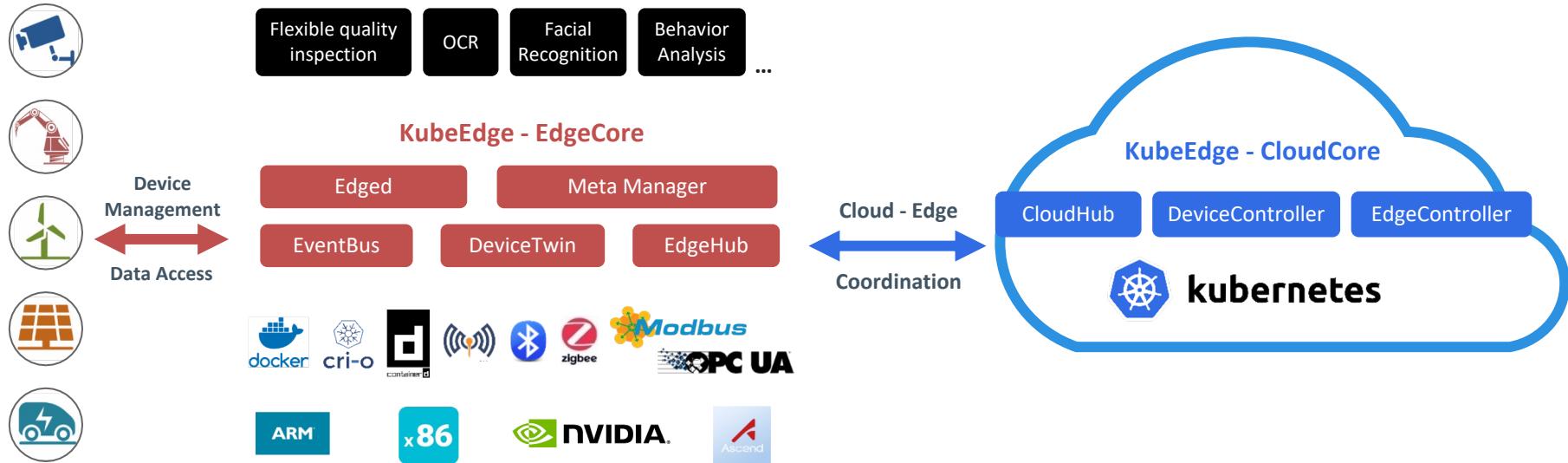
KubeEdge Maintainer



Contents

- Project History
- Key Features
- Architecture and Deployments
- Use Cases
- Performance and Scalability Tests
- Future Roadmaps

Our Journey



Launched in 2018, became CNCF Sandox project in 2019.3

Graduated to CNCF Incubation in 2020 Sep.

4.6k+ Stars, 1.3k+ Forks on github

800+ Contributors, 220+ Code Submitters

60+ Organizations

SIGs & WGs

- SIG AI
- SIG Device IOT
- SIG MEC
- WG Wireless
- SIG Robotics (new)

Checkout [Community Open Governance Doc](#) for more details

KubeEdge Key Features

- Kubernetes Native API at Edge
- Seamless Cloud-Edge Coordination
- Edge Autonomy
- Low Resource Readiness
- Simplified Device Communication
- Cloud View of Global Metrics Data



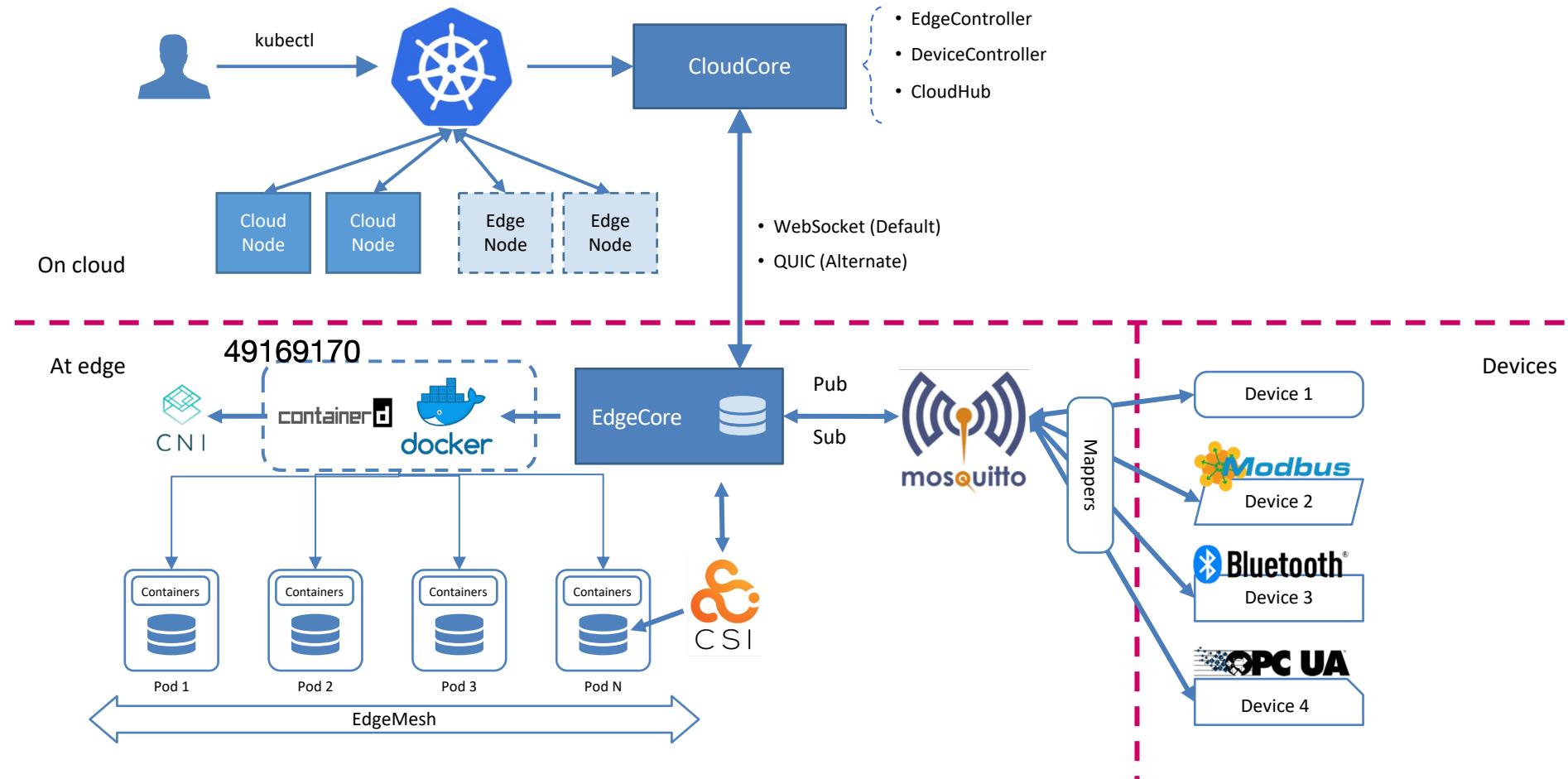
KubeEdge

<https://kubedge.io>

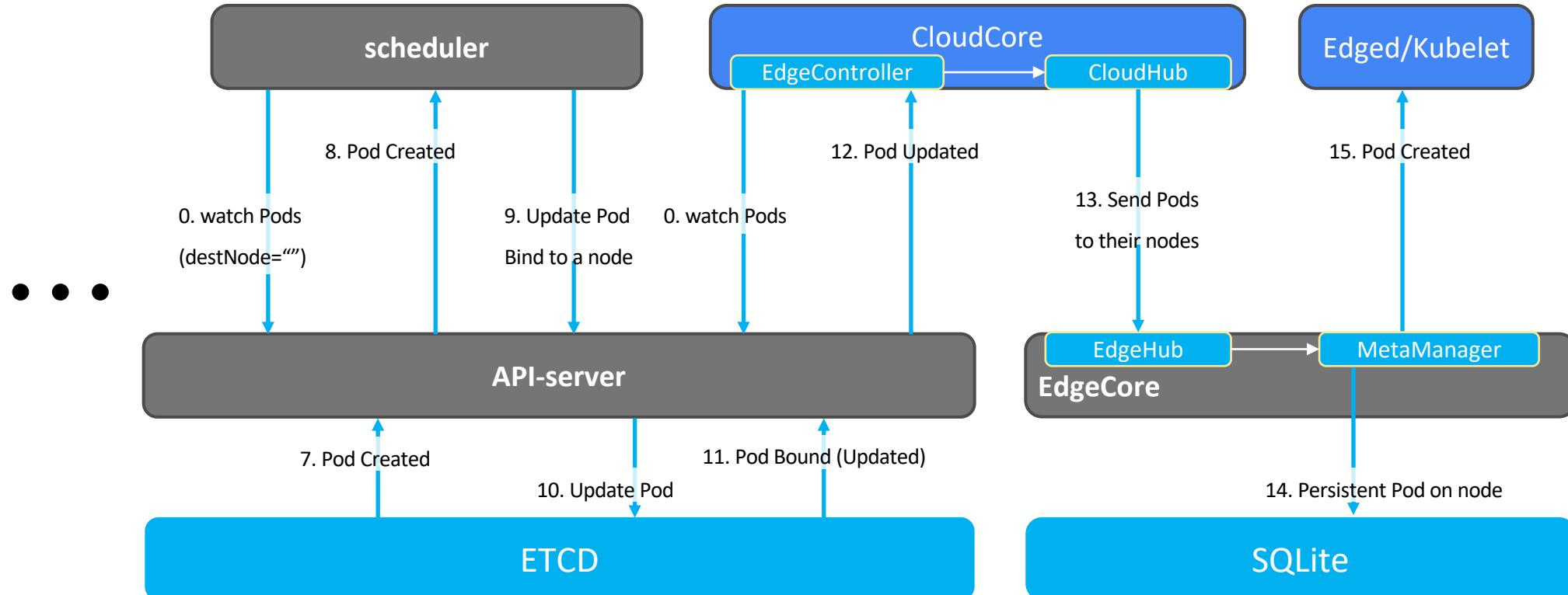
What's New

- Active-Active HA Support of CloudCore for Large Scale Cluster
- Mapper Framework updates
- Custom HTTP Request Routing between Cloud and Edge for Applications
- EdgeMesh Architecture Upgrade
- EdgeMesh Cross LAN Communication
- Device Management Interface
- *Support 100,000 Edge Nodes and manage 1,000,000 pods

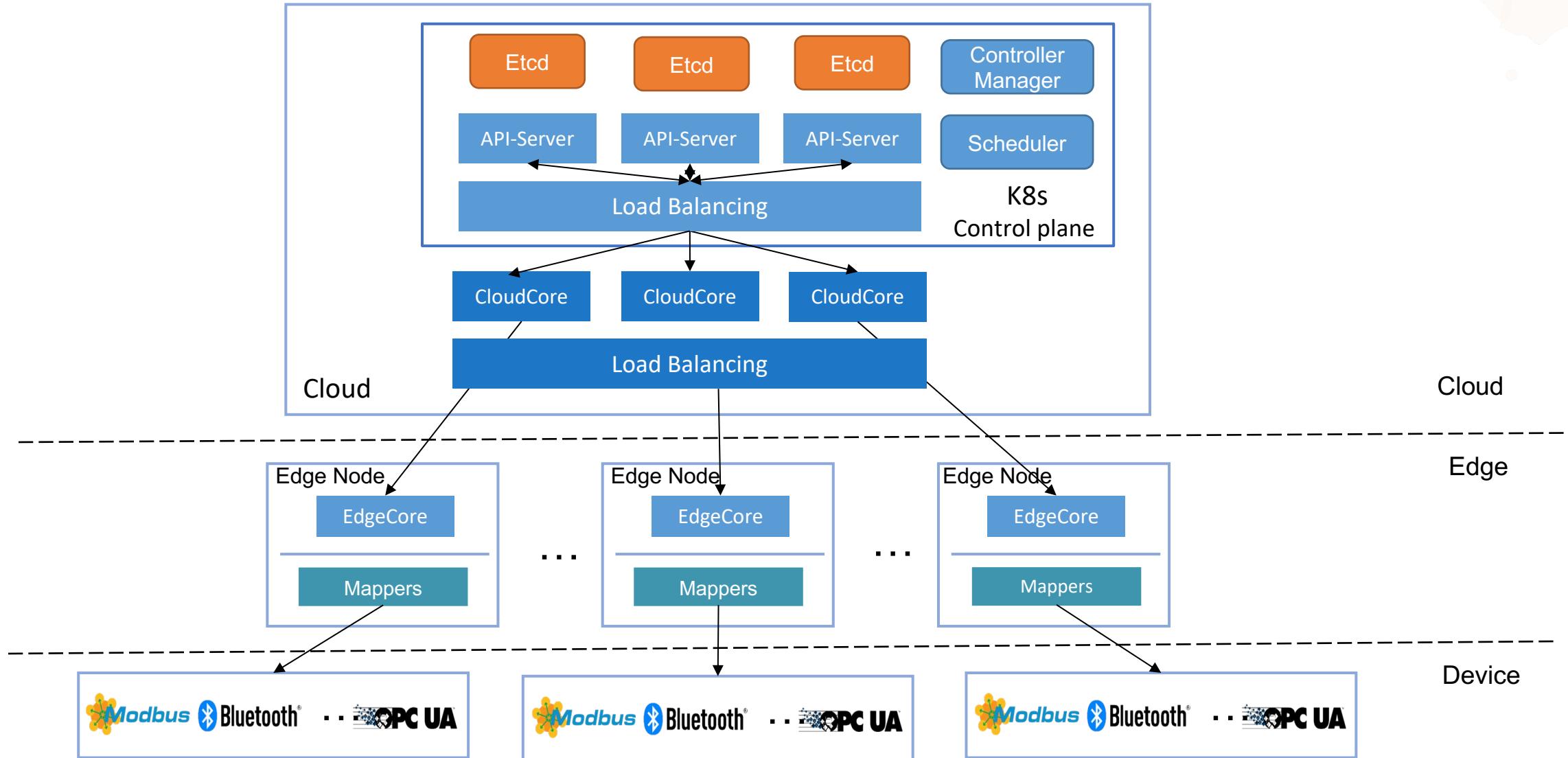
Architecture



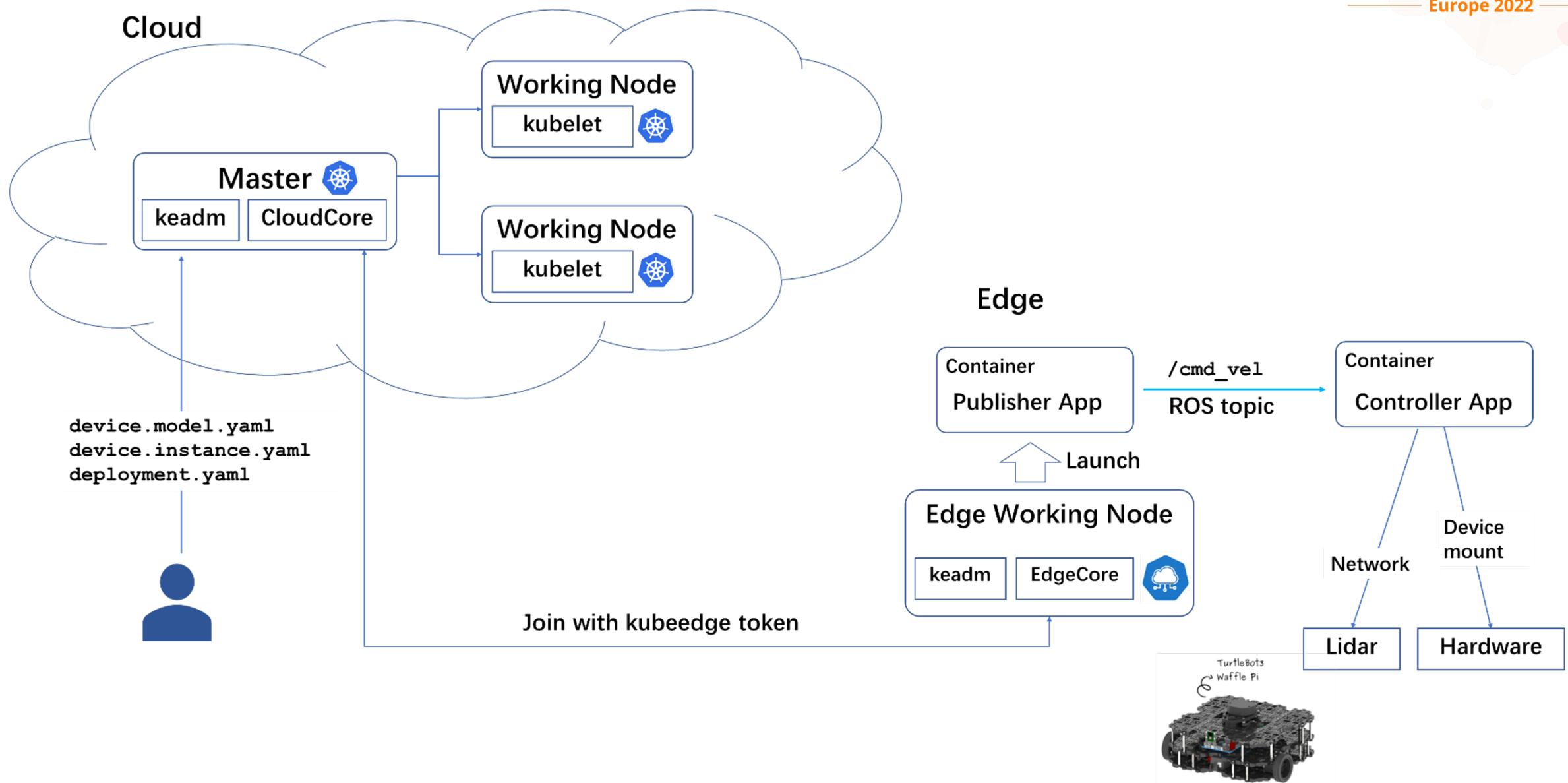
Deploy App to Edge Node



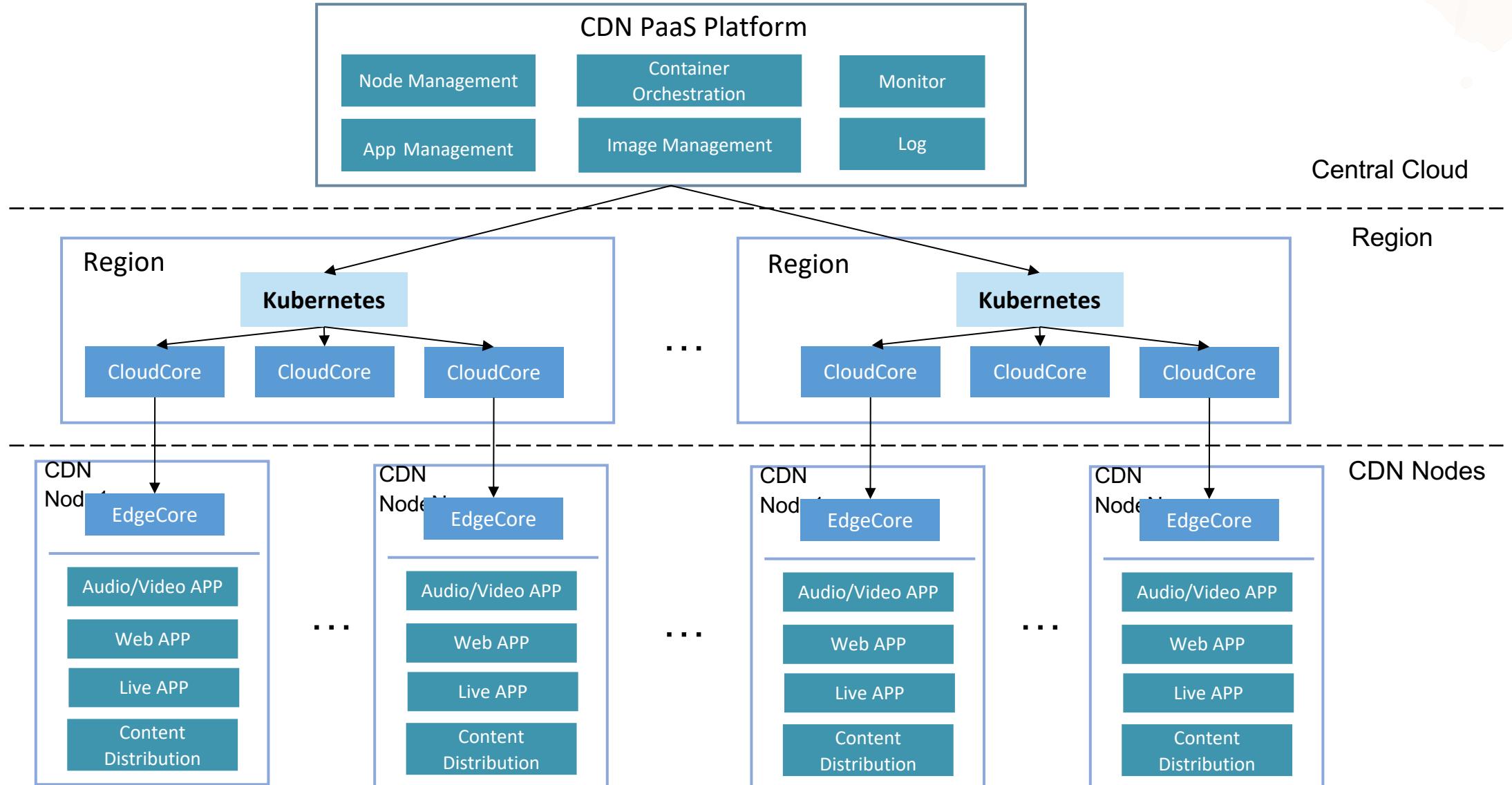
KubeEdge HA Deployment



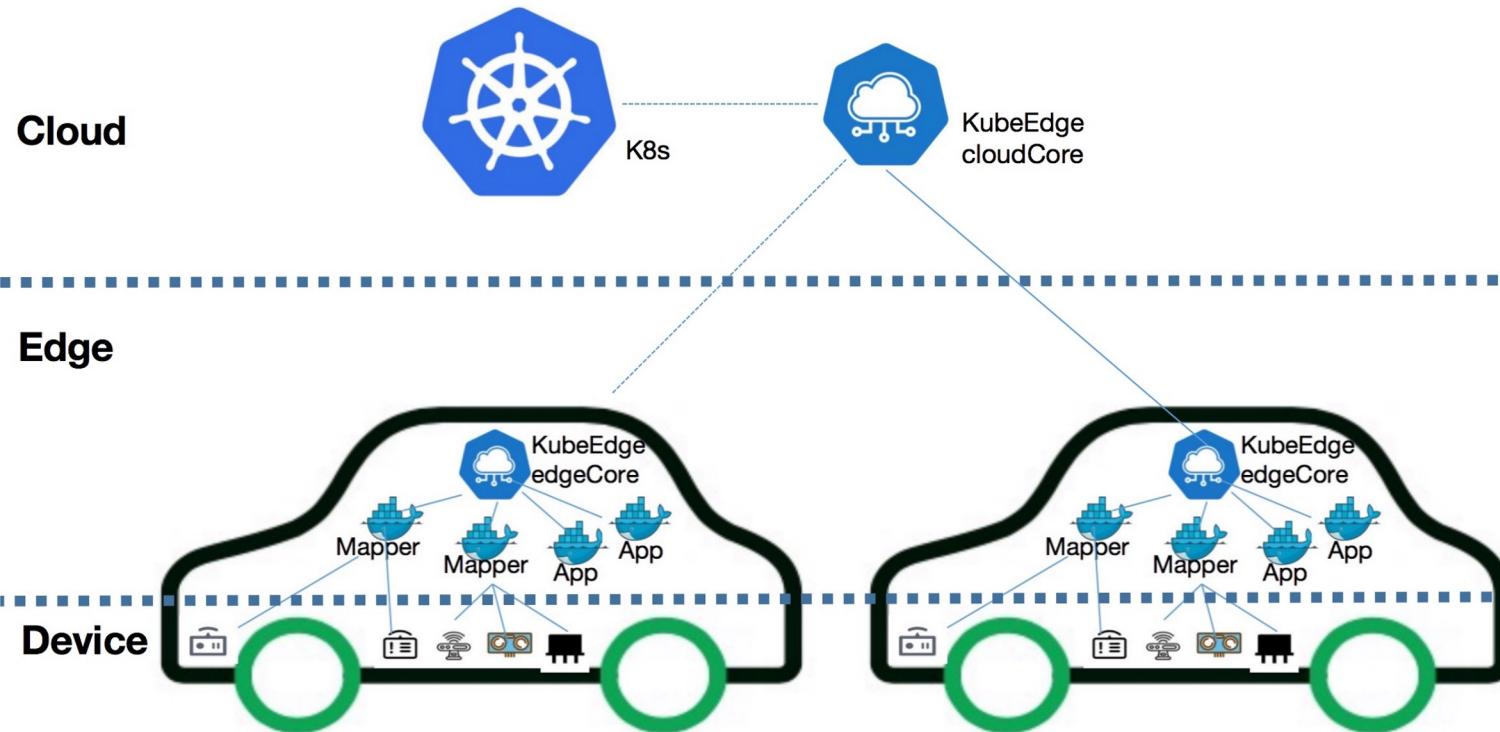
Robotics Deployment



Use Case – Manage Large Scale CDN Nodes

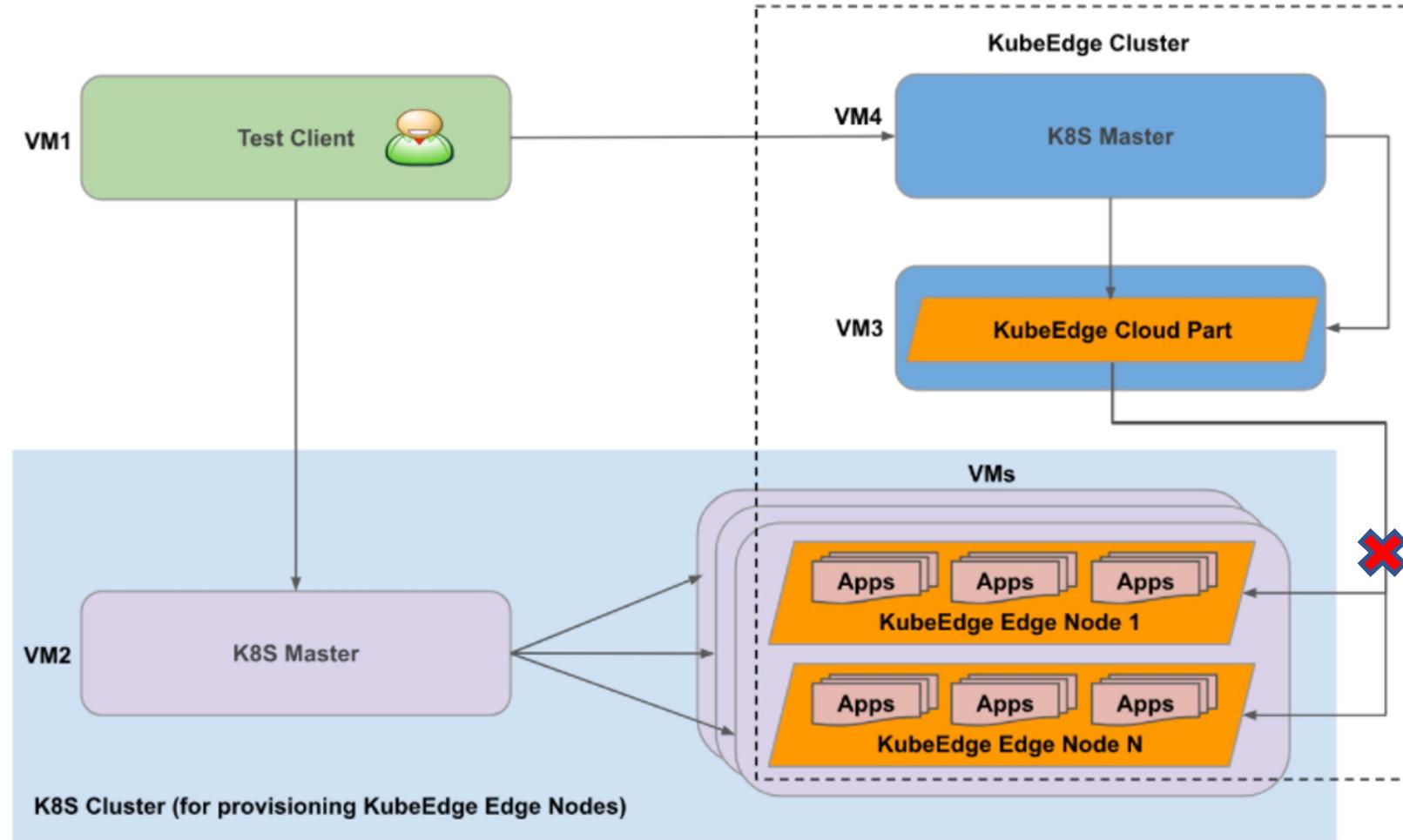


Use Case – vehicle-cloud collaboration platform



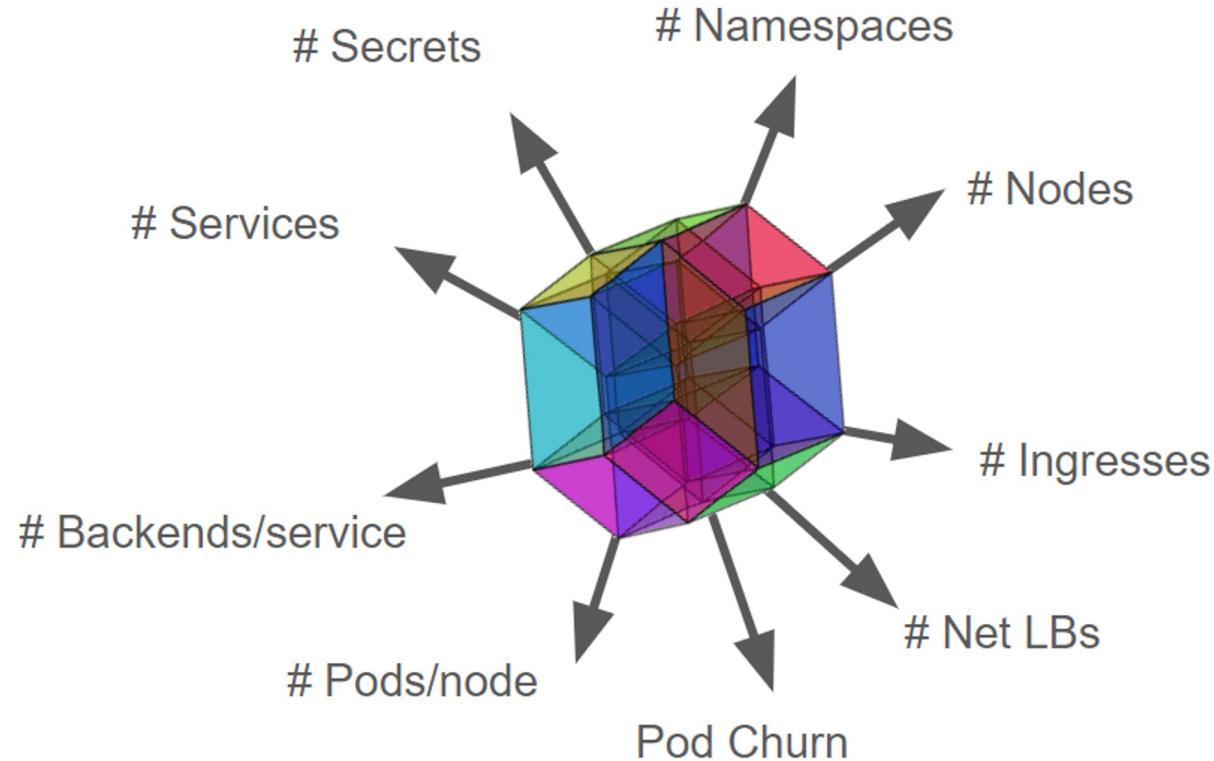
- Large scale
 - Manage 100,000+ vehicles per cluster
 - Manage million-level devices per cluster
- Light-weighted architecture
- Flexible expansion
 - Multi-K8s clusters
 - Customized endpoints rules, channels
- others
 - Edge autonomy, and other features ...
 - Stable: CNCF edge computing framework
 - Very active community and quick response

KubeEdge Performance Tests



- Service Level Objectives Tested
 - Latency
 - Throughput
 - Scalability
 - CPU Usage
 - Memory Usage
- For Unstable Cloud-Edge Network
 - Disconnect the Cloud-Edge Network
 - Network delay simulation
 - Network bandwidth control

Kubernetes Scalability <> #Nodes



From Kubernetes sig-scalability

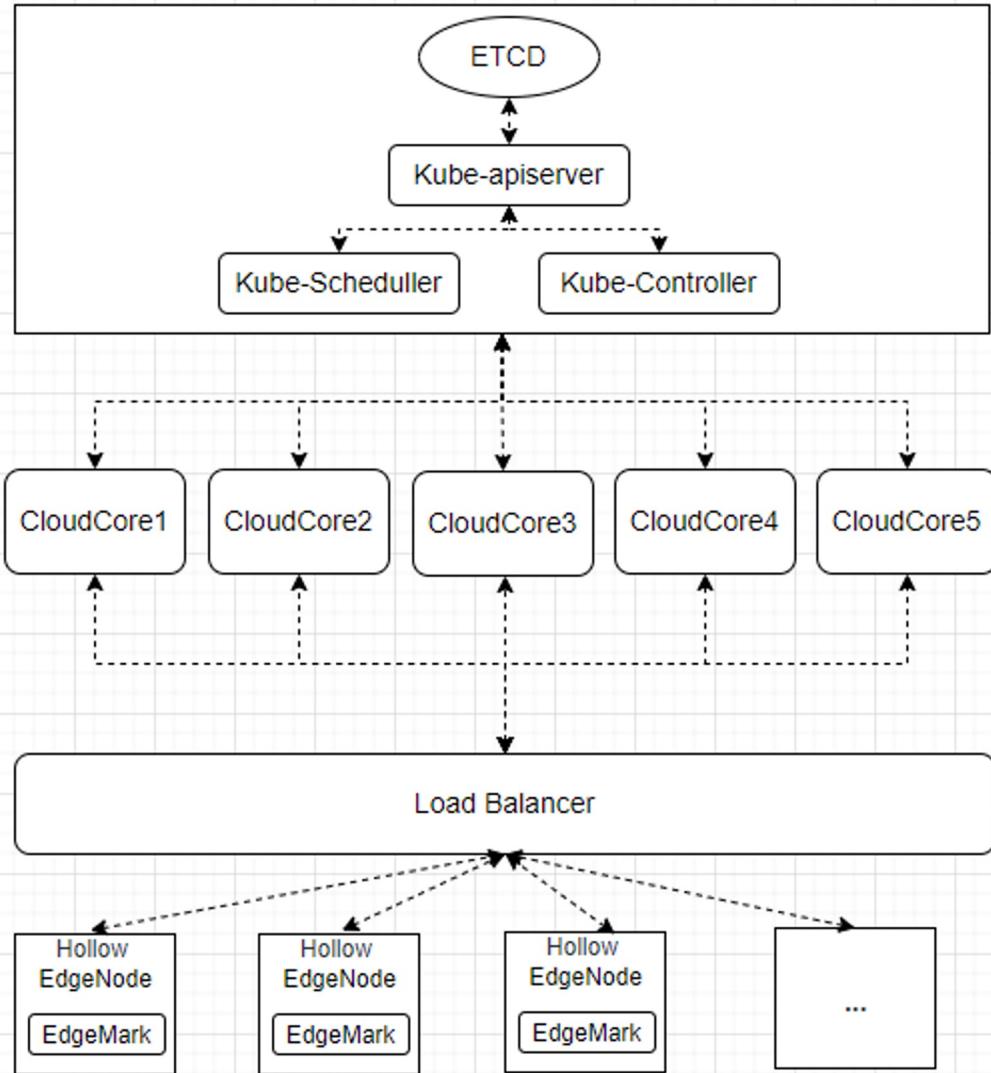
- **Kubernetes Scalability thresholds**

<https://github.com/kubernetes/community/blob/master/sig-scalability/configs-and-limits/thresholds.md>

- **Kubernetes scalability and performance SLIs/SLO**

<https://github.com/kubernetes/community/blob/master/sig-scalability/slos/slos.md>

KubeEdge Scalability Tests



- **ClusterLoader2** Kubernetes density test configuration

<https://github.com/kubernetes/perf-tests/blob/master/clusterloader2/testing/density/config.yaml>

| Maximum type | Maximum value |
|------------------------------|---------------|
| Number of Nodes | 100,000 |
| Number of Pods | 1,000,000 |
| Number of Pods per node | 10 |
| Number of Namespaces | 400 |
| Number of Pods per Namespace | 2,500 |

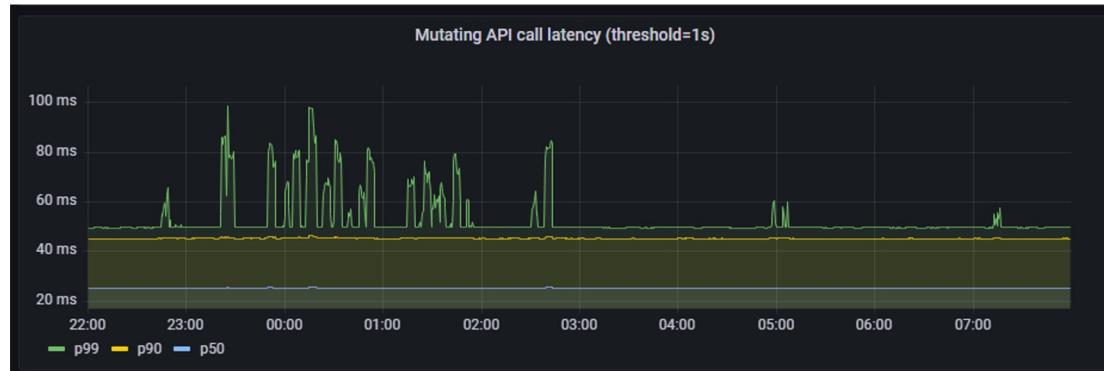
*100,000 Edge Nodes and 1,000,000 pods

KubeEdge Scalability Tests Results

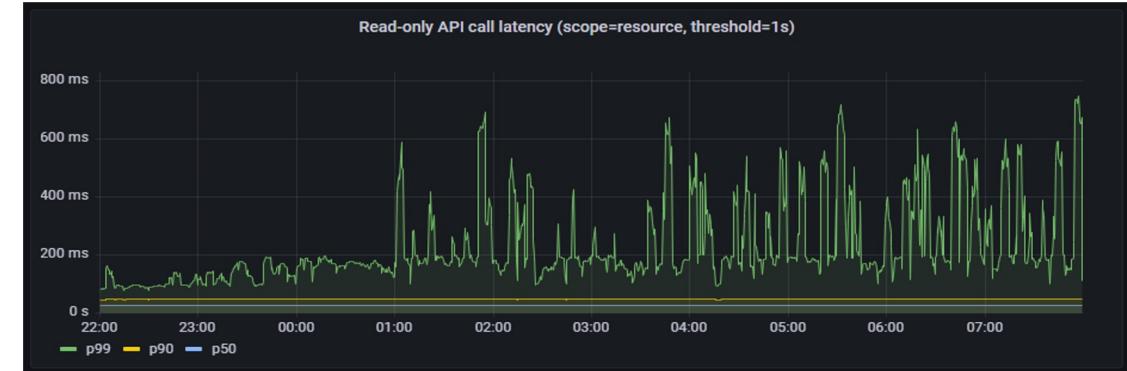


API Responsiveness Latency

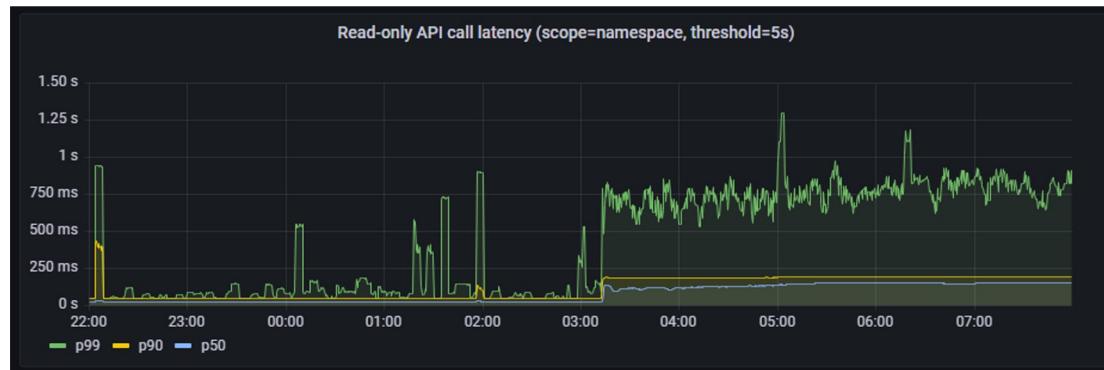
- mutating API latency (threshold=1s) :



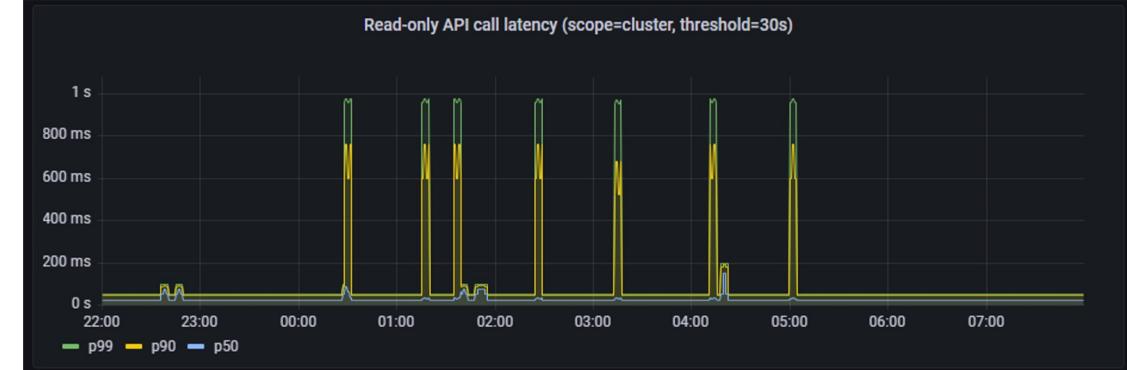
- Read-only API call latency(scope=resource, threshold=1s)



- Read-only API call latency(scope=namespace, threshold=5s)



- Read-only API call latency(scope=cluster, threshold=30s)



KubeEdge Scalability Tests Results

PodStartupLatency

| metric | p50(ms) | p90(ms) | p99(ms) | SLO(ms) |
|--------------------|---------|---------|---------|---------|
| pod_startup | 1688 | 2751 | 4087 | 5000 |
| create_to_schedule | 0* | 0* | 1000 | N/A |
| schedule_to_run | 1000 | 1000 | 1000 | N/A |
| run_to_watch | 1087 | 1674 | 2265 | N/A |
| schedule_to_watch | 1657 | 2724 | 3070 | N/A |

* kube-apiserver does not support RFC339NANO, only degree of second. ClusterLoader2 shows 0 for fast responses.

Conclusions

- KubeEdge supports 100,000 Edge Nodes and manage 1,000,000 pods
 - Full test report will be published post KubeCon EU 2022



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Future Roadmap

Technical

- Cross subnet communication support on the edge.
- Storage: edge cloud collaboration
- Strong security edge protection.
- Decentralized Security for applications on the edge.
- Edge device management extensibility, Device Mapper SDK.
- Managing Clusters at edge from cloud (aka. EdgeSite).

Community

- Formal Technical Steering Committee (TSC)
- Better Contributor Experience
- More contributor events
- More cross community collaboration
 - EdgeX Foundry
 - Akri
 - Eclipse
 - WasmEdge

Join us!

- **Website:** <https://kubeedge.io>
- **Github:** <https://github.com/kubeedge/>
- **Slack channel:** <https://kubeedge.slack.com> | [sign up here](#)
- **Weekly community meeting:** <https://zoom.us/j/4167237304> | [Subscribe Meeting Calendar](#)
- **Documentation:** <https://docs.kubeedge.io/en/latest/>
- **Mailing List:** <https://groups.google.com/forum/#!forum/kubeedge>
- **Twitter:** <https://twitter.com/KubeEdge>



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Thank you!

