REINVENTING HPC

ISC High Performance

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KubeEdge - Introduction

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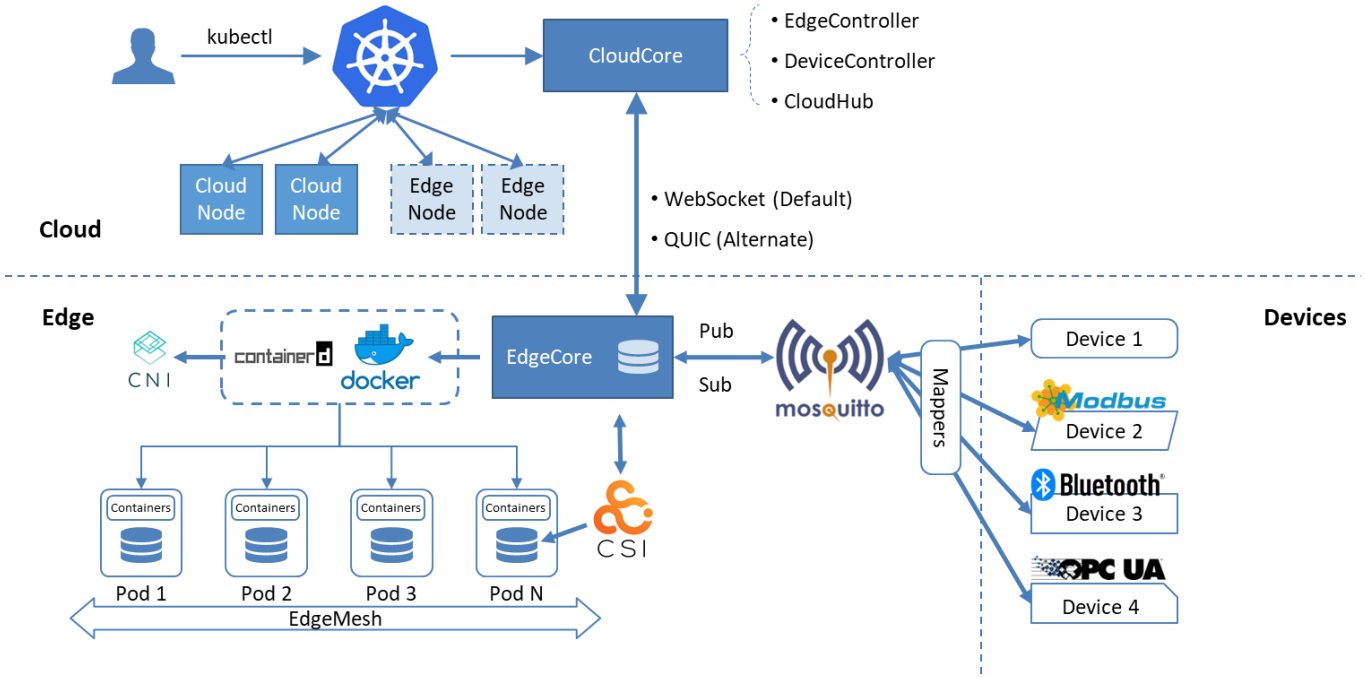
KubeEdge

KubeEdge is built upon Kubernetes and extends native containerized application orchestration and device management to hosts at the Edge.

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

Advantages

- **Kubernetes-native support:** Managing edge applications and edge devices in the cloud with fully compatible Kubernetes APIs.
- **Cloud-Edge Reliable Collaboration:** Ensure reliable messages delivery without loss over unstable cloud-edge network.
- **Edge Autonomy:** Ensure edge nodes run autonomously and the applications in edge run normally, when the cloud-edge network is unstable or edge is offline and restarted.
- **Edge Devices Management:** Managing edge devices through Kubernetes native APIs implemented by CRD.
- **Extremely Lightweight Edge Agent:** Extremely lightweight Edge Agent(EdgeCore) to run on resource constrained edge.

CLOUD NATIVE COMPUTING FOUNDATION

KubeEdge

https://github.com/kubeedge

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

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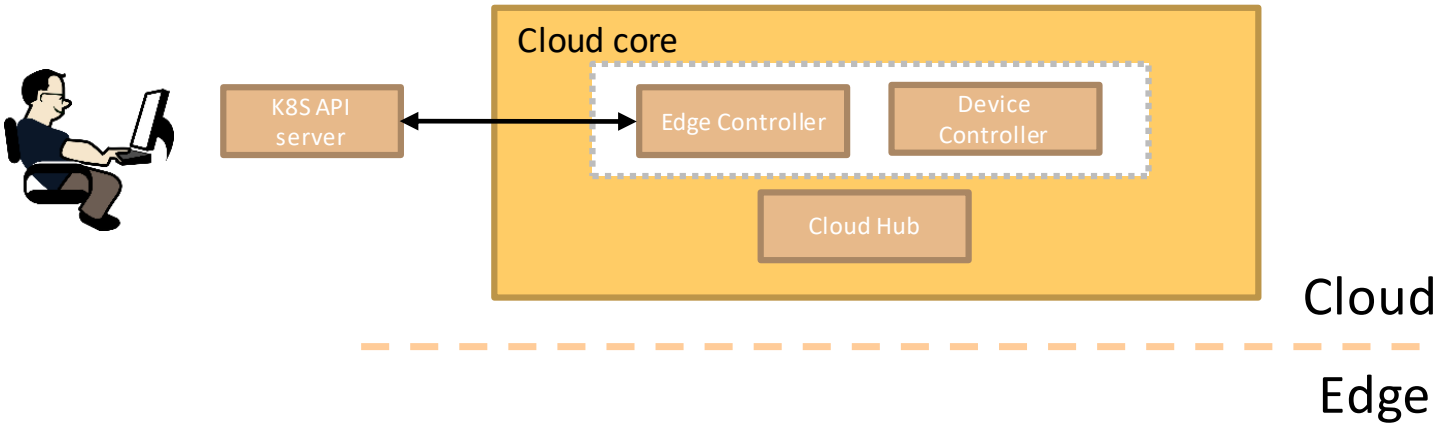
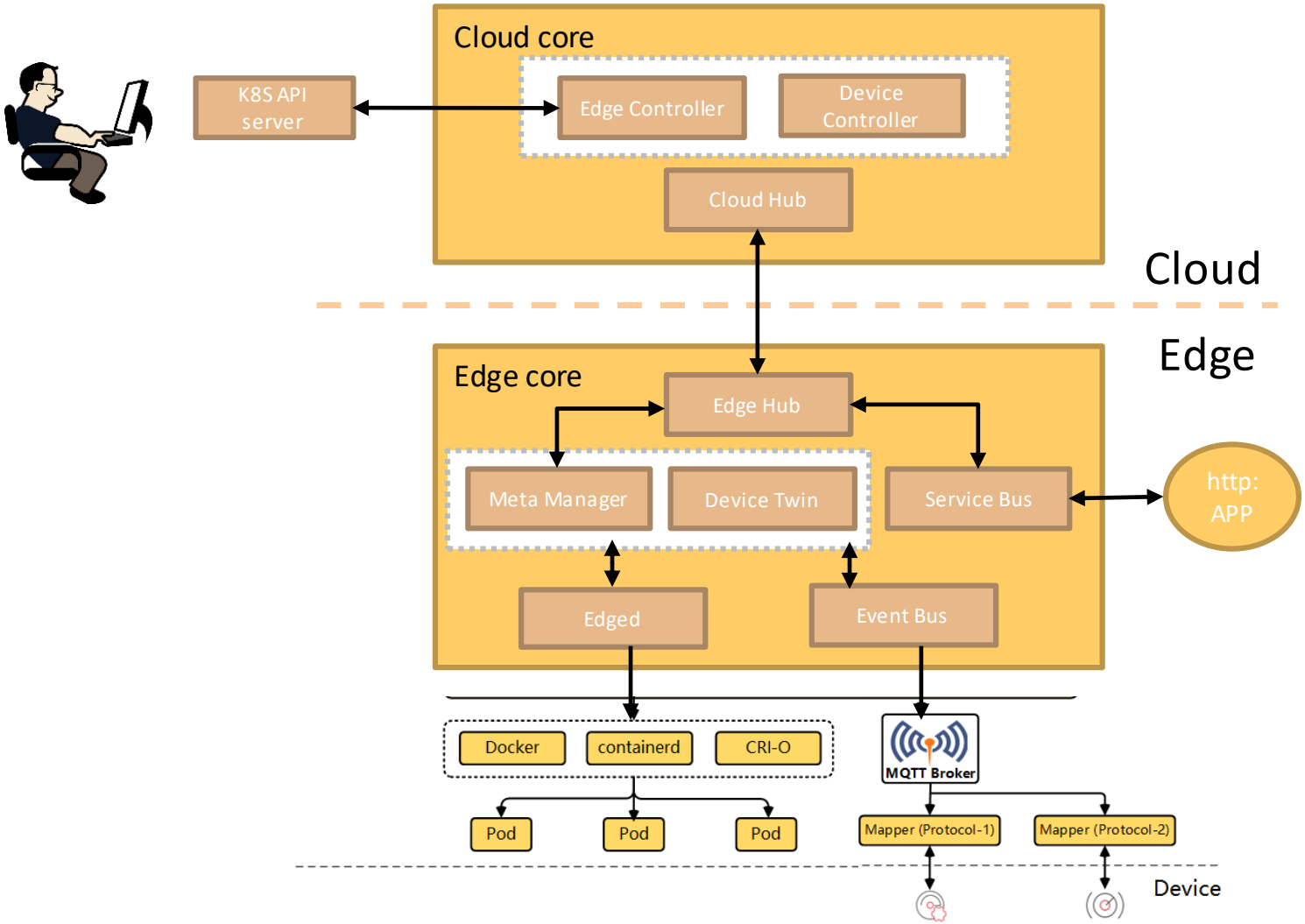
KubeEdge



In the Cloud

- **CloudHub:** a web socket server responsible for watching changes at the cloud side, caching and sending messages to EdgeHub.
- **EdgeController**: an extended kubernetes controller which manages edge nodes and pods metadata so that the data can be targeted to a specific edge node.
- **DeviceController:** an extended kubernetes controller which manages devices so that the device metadata/status data can be synced between edge and cloud.

KubeEdge



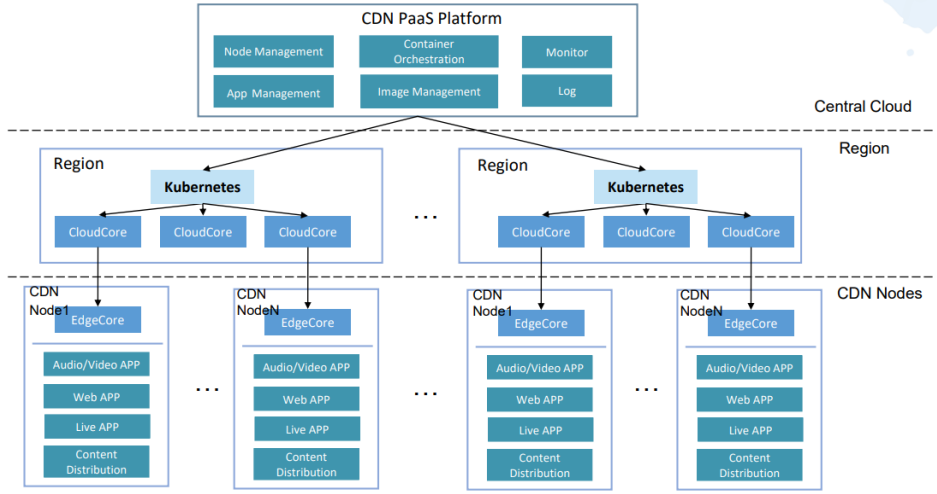
EventBus: a MQTT client to interact with MQTT servers (mosquitto), offering publish and subscribe capabilities to other components.

ServiceBus: an HTTP client to interact with HTTP servers (REST), offering HTTP client capabilities to components of cloud to reach HTTP servers running at edge.

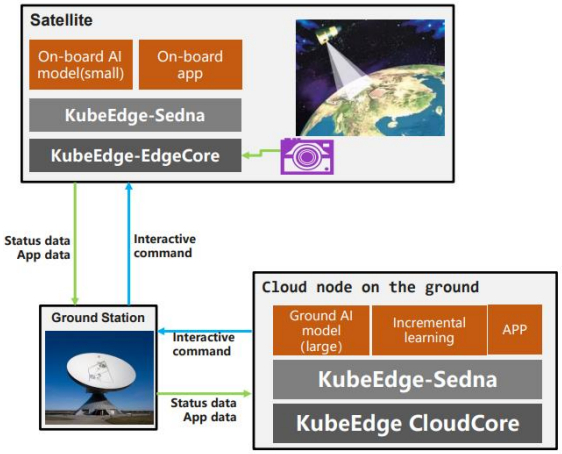
Edged: an agent that runs on edge nodes and manages containerized applications.

KubeEdge – use cases

Use Case – Manage Large Scale CDN Nodes

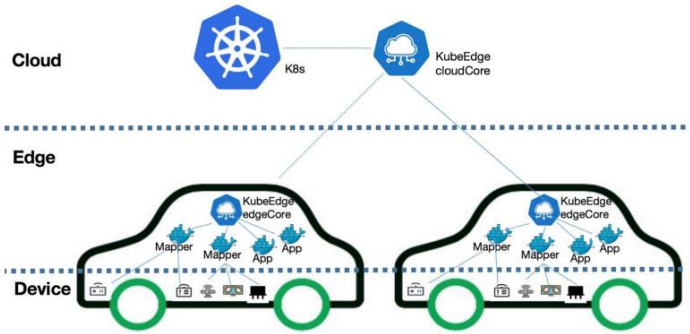


Cloud-Native Satellite



- Lifecycle Management for edge node and cloud-native applications
- Highly reliable satellite-ground data transmission and synchronization
- Multi-model joint inference, less satellite resource consumption
- Incremental learning, auto tuning, higher model accuracy
- Unified IoT device modeling, easier device access

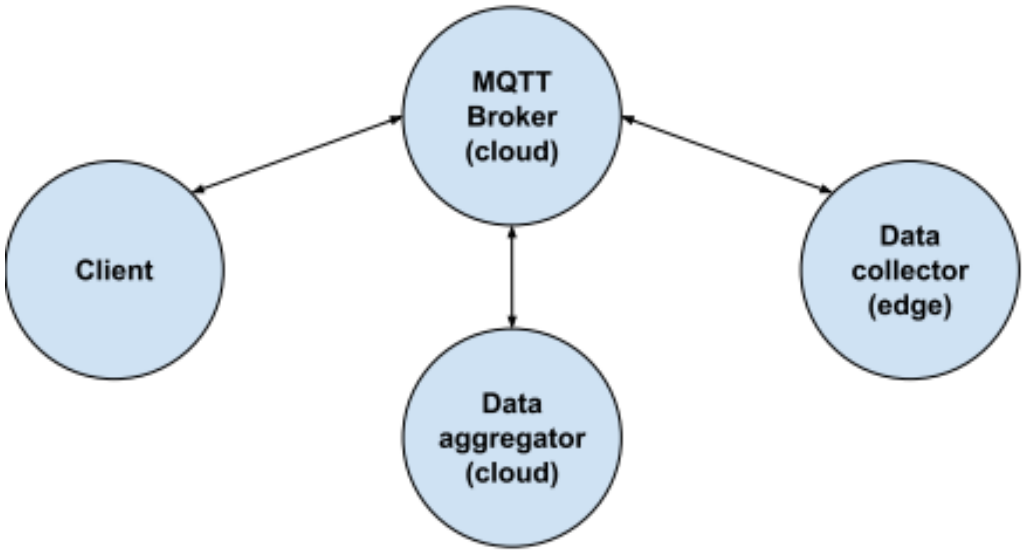
Use Case – vehicle-cloud collaboration platform



- 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

MQTT Data Aggregation and Collection at the Edge

Goal: Deploy on the cluster a MQTT data aggregator (cloud), a data collector (edge) and client (check figure).



Follow the instructions in hands-on to complete the deployment