A open source way: From Cloud Native to Edge Native

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Agenda

- What is the challenge of Edge?
- Why we need Cloud Native in Edge?
- What is CNCF KubeEdge?
- How Cooperate CNCF and Eclipse in Edge?
- Q&A

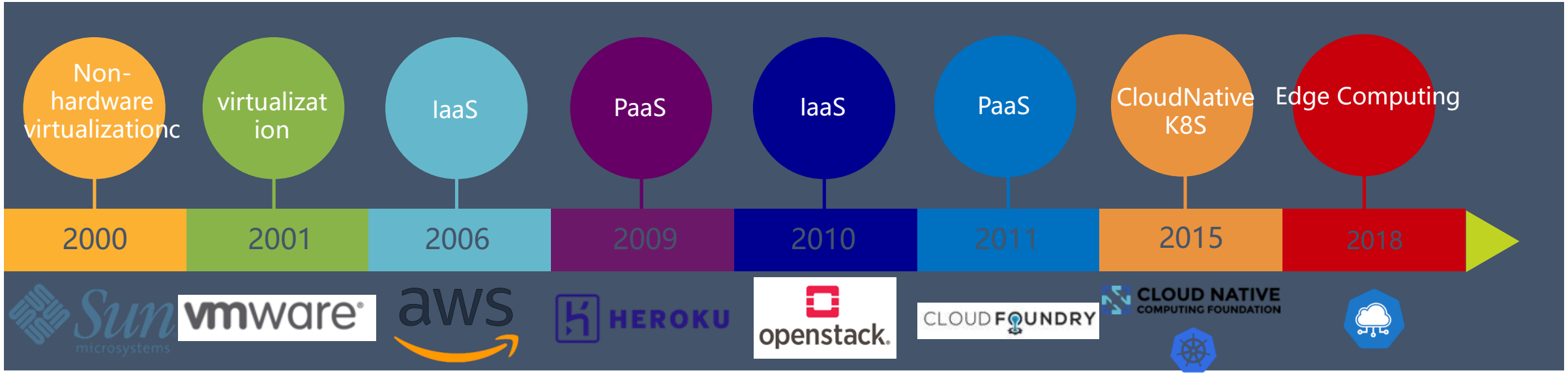
What is the challenges of Edge?

Edge Computing Challenges:

App & App mngt	Network Connection	Deployment &Operator
• Returning from cow to pet • Strong role-based for edge node • Requirement of lightweight • Half-state application • 0-trusted principle	• Huge edge node offline or online Simultaneously • Unstable network • The network topology is complex and needs to be layered.	• High deployment cost • Requirements of good IT skills • Bad environment

Why we need Cloud Native in Edge?

The Brief History of Cloud:



What is Cloud Native?

Core Components
Physical Service➡Virtual Machine➡Buildpacks➡Container

Isolation
Lightweight, and more faster boot

Immutability
From pet to cow

Vencdor
From a single closed-source vendor to multiple open-source vendors

Why we need Cloud Native in Edge?

App Lifecycle	Embedded Software Edge Today	Cloud Native Approach Edge Tomorrow
Design	Hardware Dependent	Platform Independent
	Waterfall (gate based)	Agile (iterative)
	Monolithic	Micro-services & Containers
Develop	Reinvent wheel (eg many RT OS'es)	Re-use centric
	Legacy programming models (C, ASM)	Modern small footprint programming (Go, Node.JS)
	Proprietary, expensive dev tools & closed-source	Open source, open development
Deploy	"Burn-in" a the factory with testing prior to shipping	Instant app deployment when and where needed; Zero-touch full stack deployment
	Update in field as little as possible	As many times as needed at the moment it is available
	High risk for upgrades, one way. Manual Disaster Recovery	Roll-back ability Automated verification and disaster recovery
Operate	One at a time management	At scale management with "intended state" model
	Local focused (console/serial/shell)	Network/remote focused, SD-WAN overlay integrated with apps
	Insecure due to being air-gapped (not connected) historically	"Ground to Cloud" defense in layers with PKI cryptography;
Analyze	Not easy to get statistics/diags out of device	Continuous statistics, diags and analysis
	Distributed and "ships in the night"	Centralized and aggregated
	No feedback loop / lack of automated analytics	Machine learning and insight driven

Zededa ,<<Cloud-Native Edge for Connected Operations>>

Building Edge platform With Kubernetes

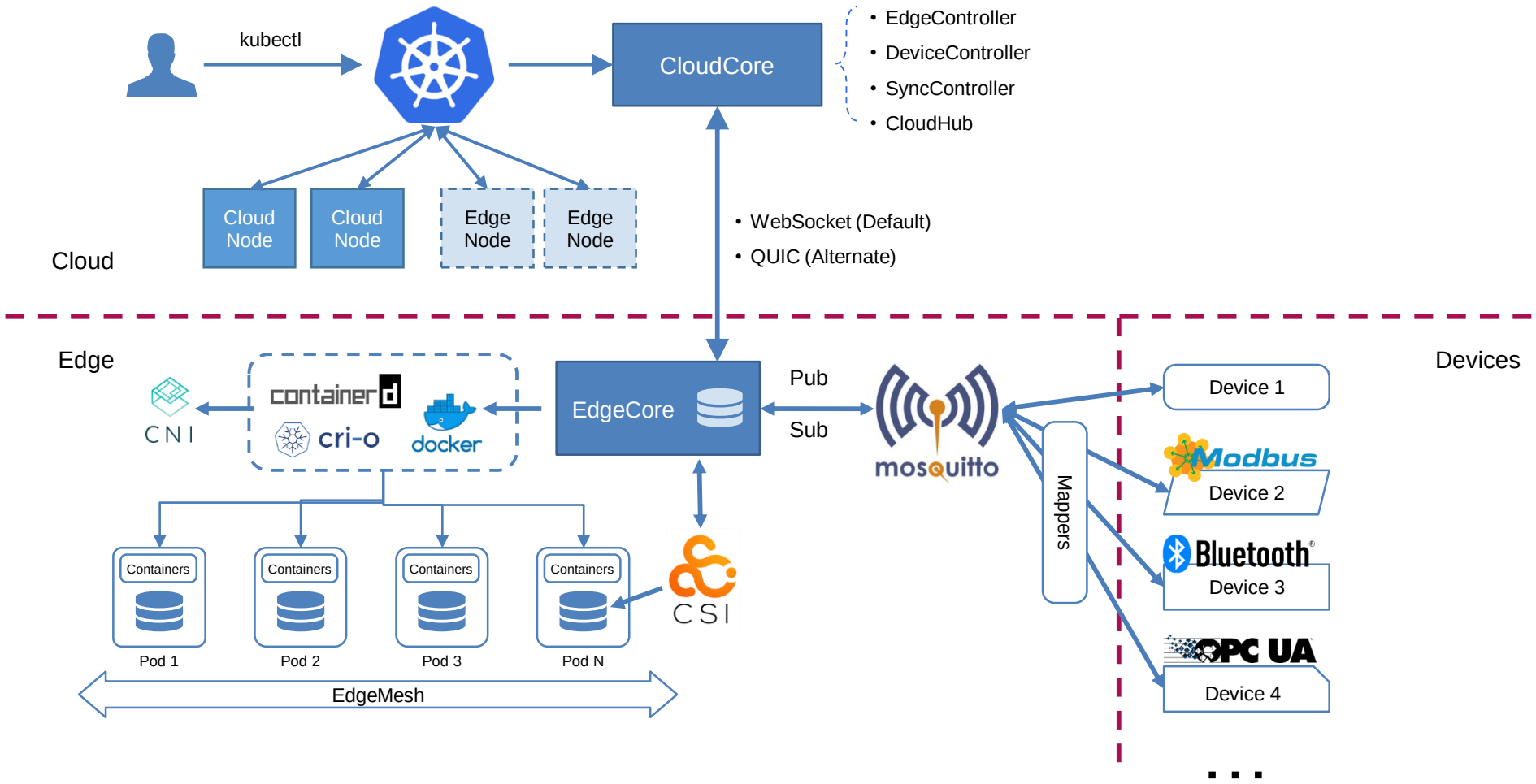
- Gaps
- Limited resource at Edge
  - Not enough for vanilla K8s, even just a Kubelet.
- Unstable network
  - Private network, limited bandwidth, latency, etc.
- Need autonomy at Edge
  - Edge may get offline/disconnected often
  - Should not evict/migrate applications when disconnected
- Device management at Edge
  - Quite different requirement with current device pluginccc

- Benefits
- Containerized Application
  - Build once, run anywhere
  - Lightweight base image
- General application abstraction
  - Already become standard
  - Same experience across cloud and edge
- Extendable Architecture
  - Extendable API machinery
  - Easy to add customized componentscc

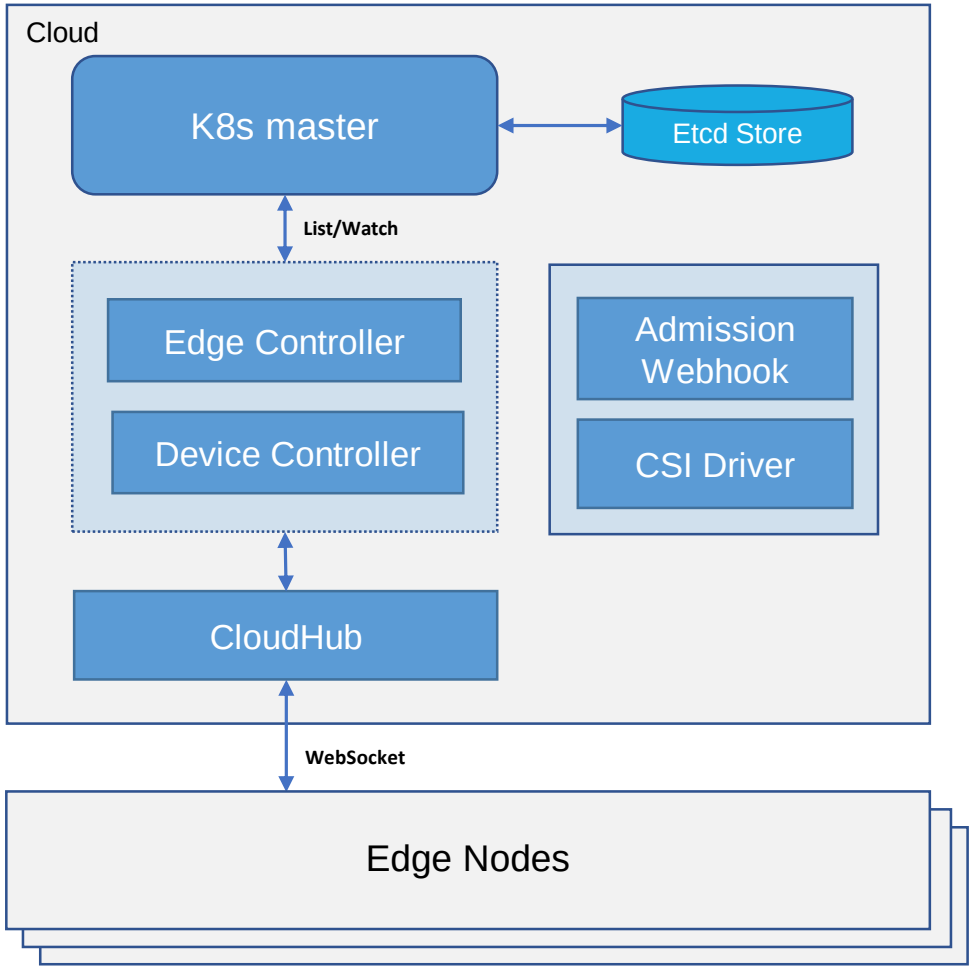
What is KubeEdge?

- KubeEdge is built upon Kubernetes and provides fundamental infrastructure support for network, application deployment and metadata synchronization between cloud and edge.
- **KubeEdge provides**
  - **Seamless Cloud-Edge Communication** for both metadata and data
  - **Edge Autonomy**: Autonomous operation of Edge even during disconnection from cloud.
  - **Low Resource Ready**: KubeEdge can work in constrained resource situations (low memory, low bandwidth, low compute)
  - **Simplified Device Communication**: Easy communication between application and devices for IOT and IIOT
- Entered CNCF sandbox in March 2019
- Stars: 400+ , Forks: **600+,** member organizations: **25+**
- Cross community collaboration
  - K8s iot edge WG
  - Akraino
    - ELIOT BP Family
    - KubeEdge Edge Service BP

KubeEdge Architecture

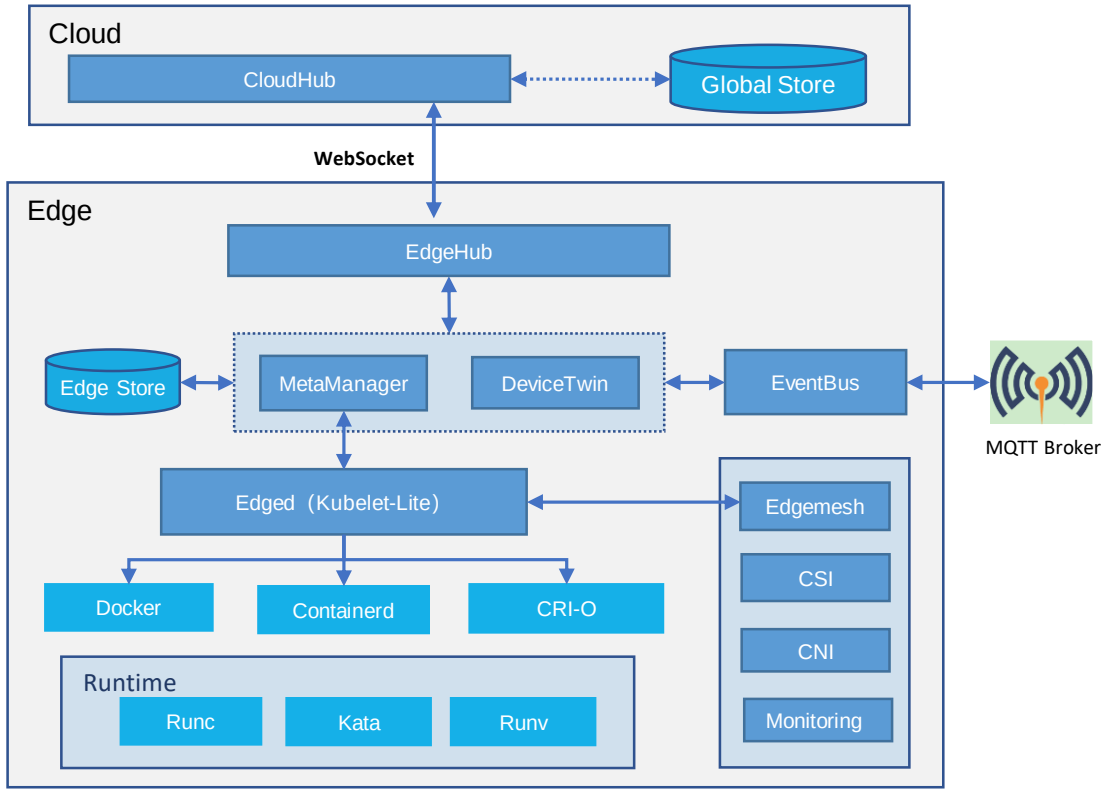


KubeEdge Architecture – Cloud



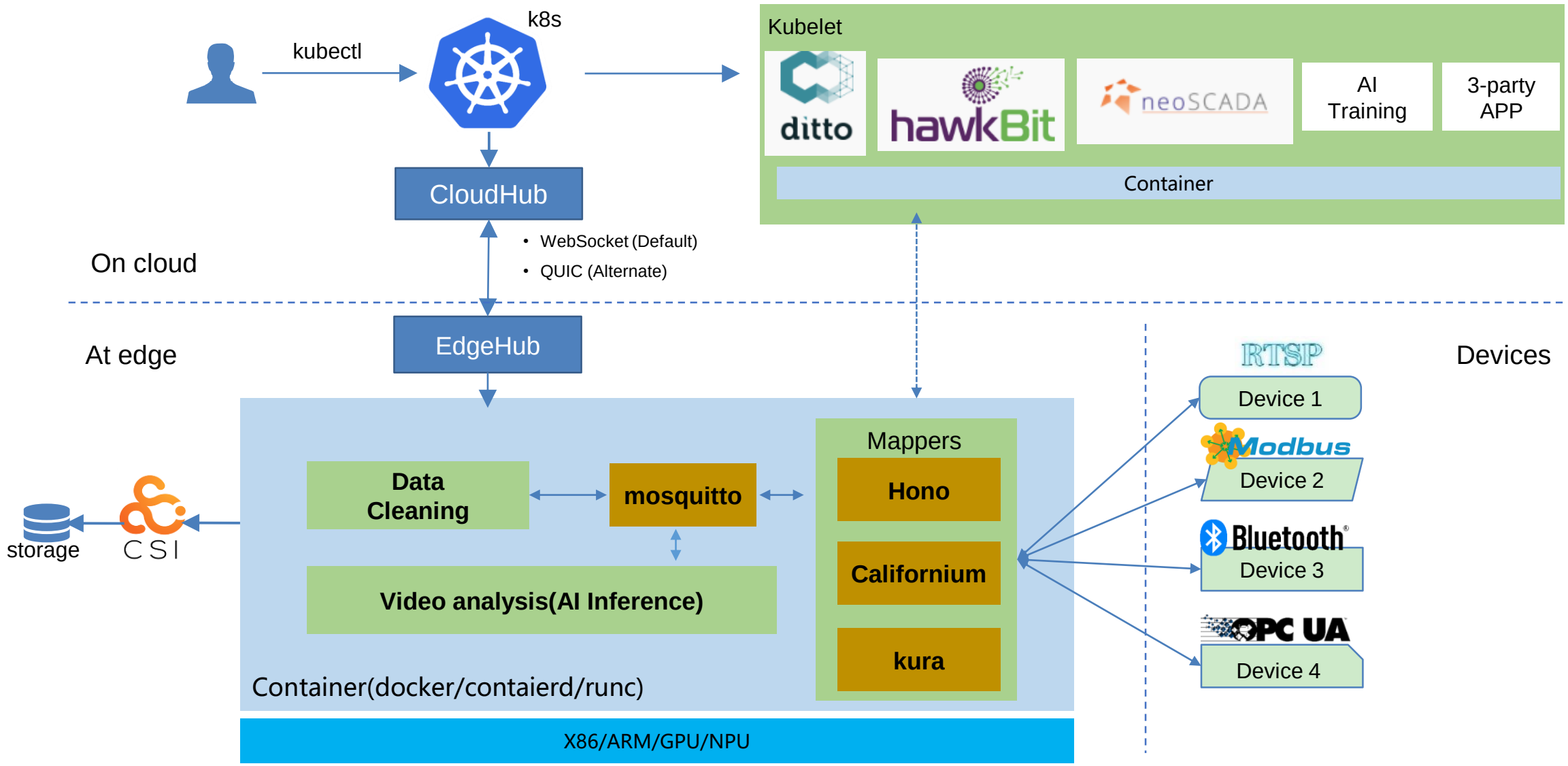
- EdgeController
  - Shadow management for nodes, applications at edge
- Device API/DeviceController
  - IOT/Edge device modeling
  - Shadow management for devices at edge
- CSI Driver
  - Hook storage provisioning etc. to edge
- Admission Webhook
  - Extended API validation
  - Best practice enforcement

KubeEdge Architecture – Edge



- EdgeHub
  - Messaging over WebSocket
- MetaManager
  - Node level metadata persistence
- Edged
  - Kubelet-lite
  - Pod lifecycle management etc.
- DeviceTwin
  - Sync device status between cloud, edge node and device
- EventBus
  - MQTT client
- ServiceBus
  - HTTP client

How Collaboration CNCF KubeEdge and Eclipse in Cloud2Edge



KubeEdge Resources

- Website: https://kubeedge.io
- **Github: https://github.com/kubeedge/**
- **Slack channel: https://kubeedge.slack.com**
- Mailing List: https://groups.google.com/forum/#!forum/kubeedge
- Bi-weekly community meeting: https://zoom.us/my/kubeedge
- Twitter: https://twitter.com/KubeEdge
- Documentation: https://docs.kubeedge.io/en/latest/c

Thanks