



KubeCon



CloudNativeCon

India 2026

**KubeEdge DeepDive: Extending Kubernetes
To the Edge With Real-World Industry Use
Case**



Kubecon India:



– Ronak Raj

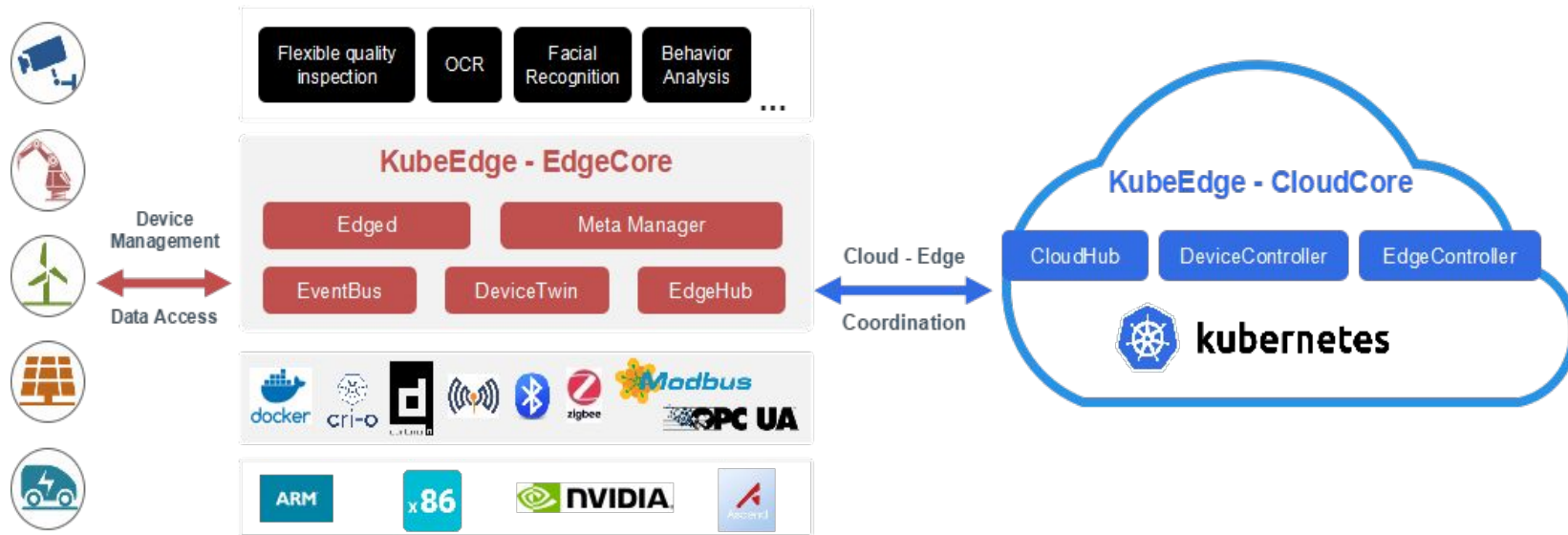
AI Researcher, LFX@CNCF/KubeEdge

Special Thanks

Special thanks to **KubeEdge** (CNCF Graduated Project), **Yue Bao** (KubeEdge Maintainer), **Zimu Zheng** (KubeEdge Approver), and **Shijing Hu** (KubeEdge Reviewer) for their support and contributions.



About KubeEdge: Kubernetes Meets Edge Computing



- Edge Computing scenarios oriented, designed for edge-cloud collaboration
- Consistent experience of **Applications, Resources, Data, Devices**, etc. Collaboration between cloud & edge
- The **first** Cloud Native Edge Cloud Computing OSS Project
- Open Governance, connecting Cloud Native and Edge Computing Ecosystem

KubeCon India:

KubeEdge: Key Points

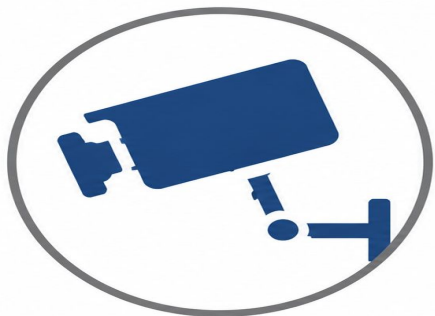


2024

- Kubernetes compatibility [Manage edge workloads using standard Kubernetes.]
- Autonomous Edge Computing [Keep applications running despite network interruptions.]
- Cloud–Edge–Device Integration [Connect infrastructure, applications, and devices through a unified platform.]

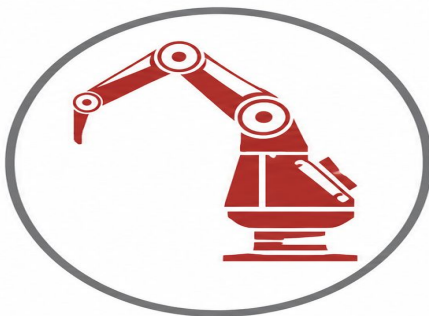
KubeCon India:

KubeEdge in Action: Bringing Cloud Native to the Physical World



Intelligent Surveillance

Real-Time Video Analytics at the Edge



Smart Robotics

Cloud-Native Robotics at Scale



Smart Agriculture

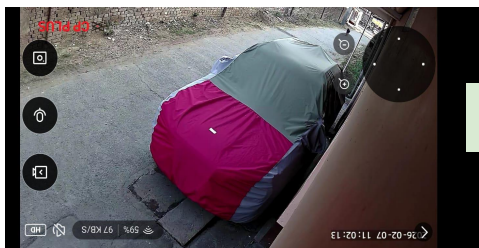
Edge Intelligence for Precision Farming

Extending Kubernetes Beyond the Datacenter—to Robots, Farms, and Smart Infrastructure.

kubeCon India:



4 Traditional Cameras



WiFi On



WiFi Off

Wi-Fi OFF / No Signal



KubeEdge's Surveillance

Edge Autonomy: Local EdgeCore handles processing and caching offline. Syncs automatically when Wi-Fi recovers.

Open Data Ownership: Native Kubernetes cluster orchestrates your storage. Zero subscription fees, zero vendor lock-in.

Lightweight AI Deployment:

- YOLOv5/v8 Pods for accurate detection.
- Local Notification Triggers via open-source gateways.



Edge Microprocessors



AI Model Deployment



Cloud-Edge Synergy

Subscribe for Cloud Recording

Activate Now

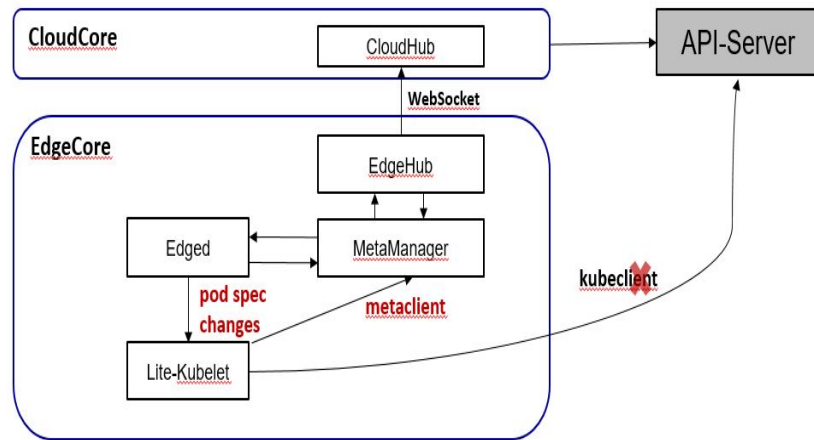
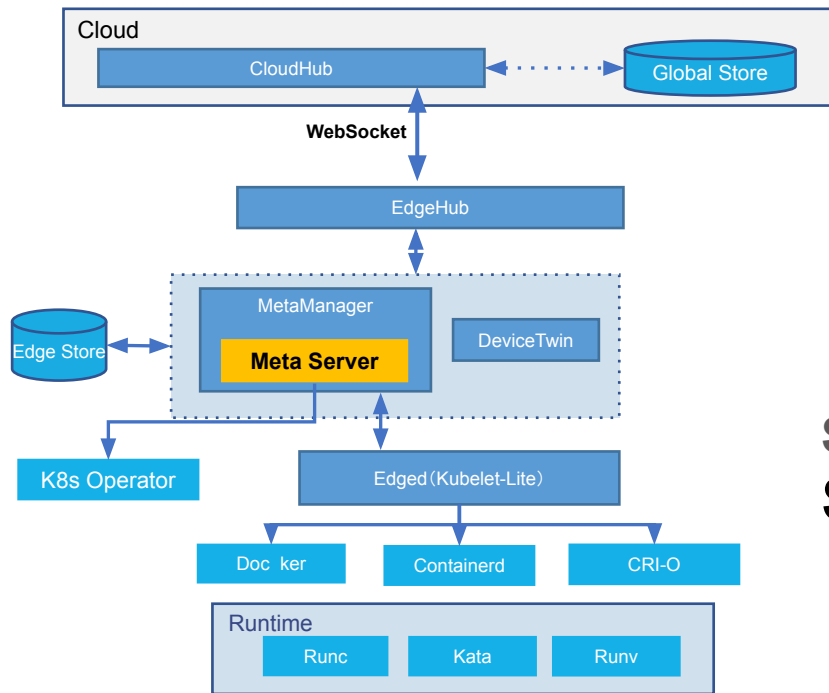
Premium

Kubecon India:



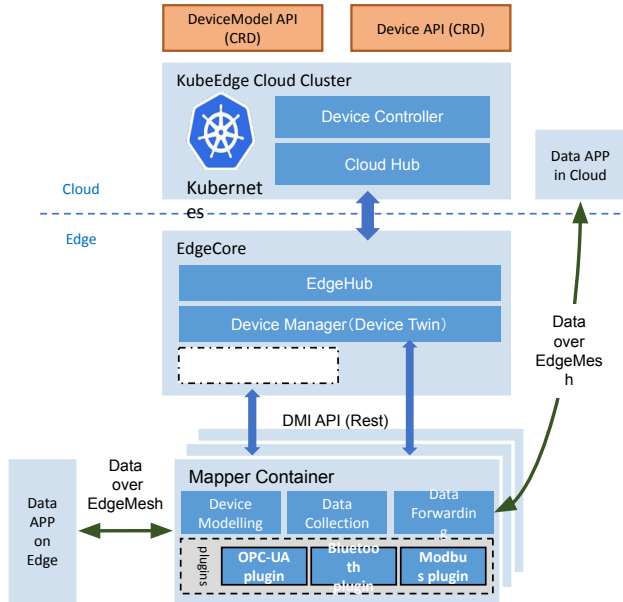
Features updates:

- Support image pre-pull on the edge
- Support Auto-Restarting for edge modules
- Support more deployment fields override for edgeapplications

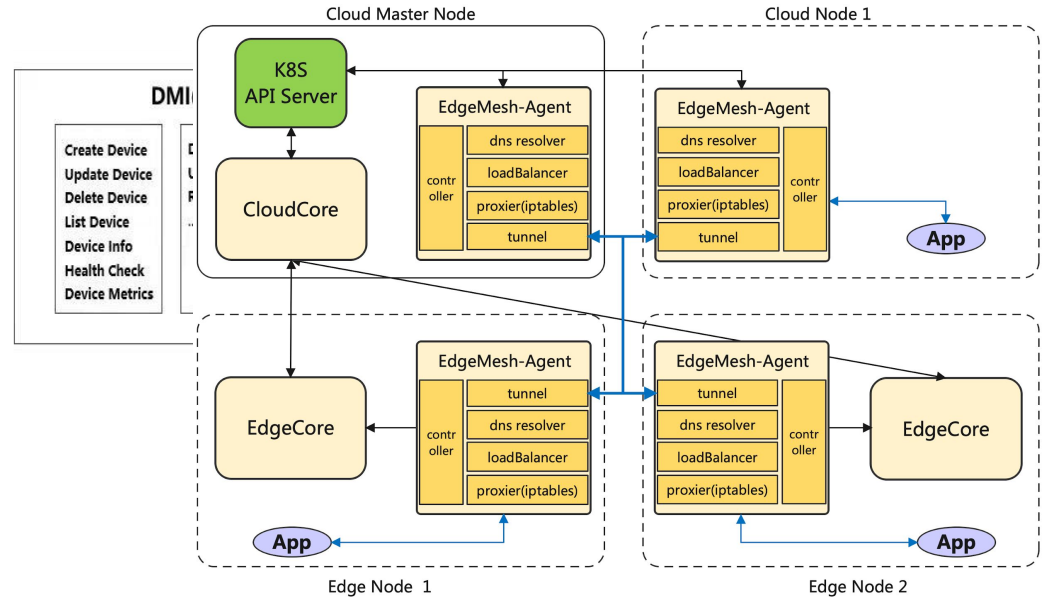


Surviving the Wi-Fi Blindspot SIG Node: Edge Architecture

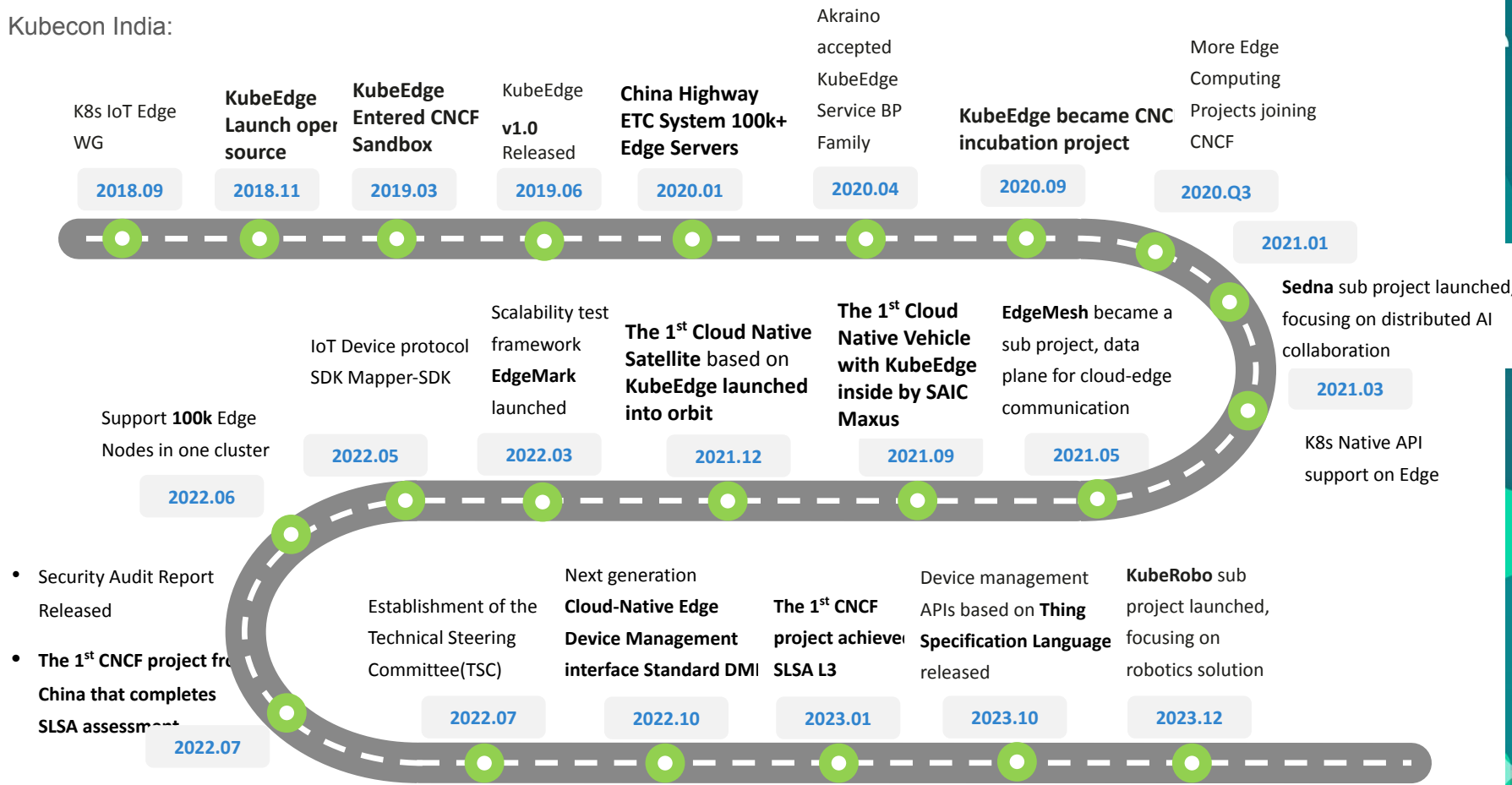
Turning Dumb Cameras Smart (The DMI & EdgeMesh Edge)



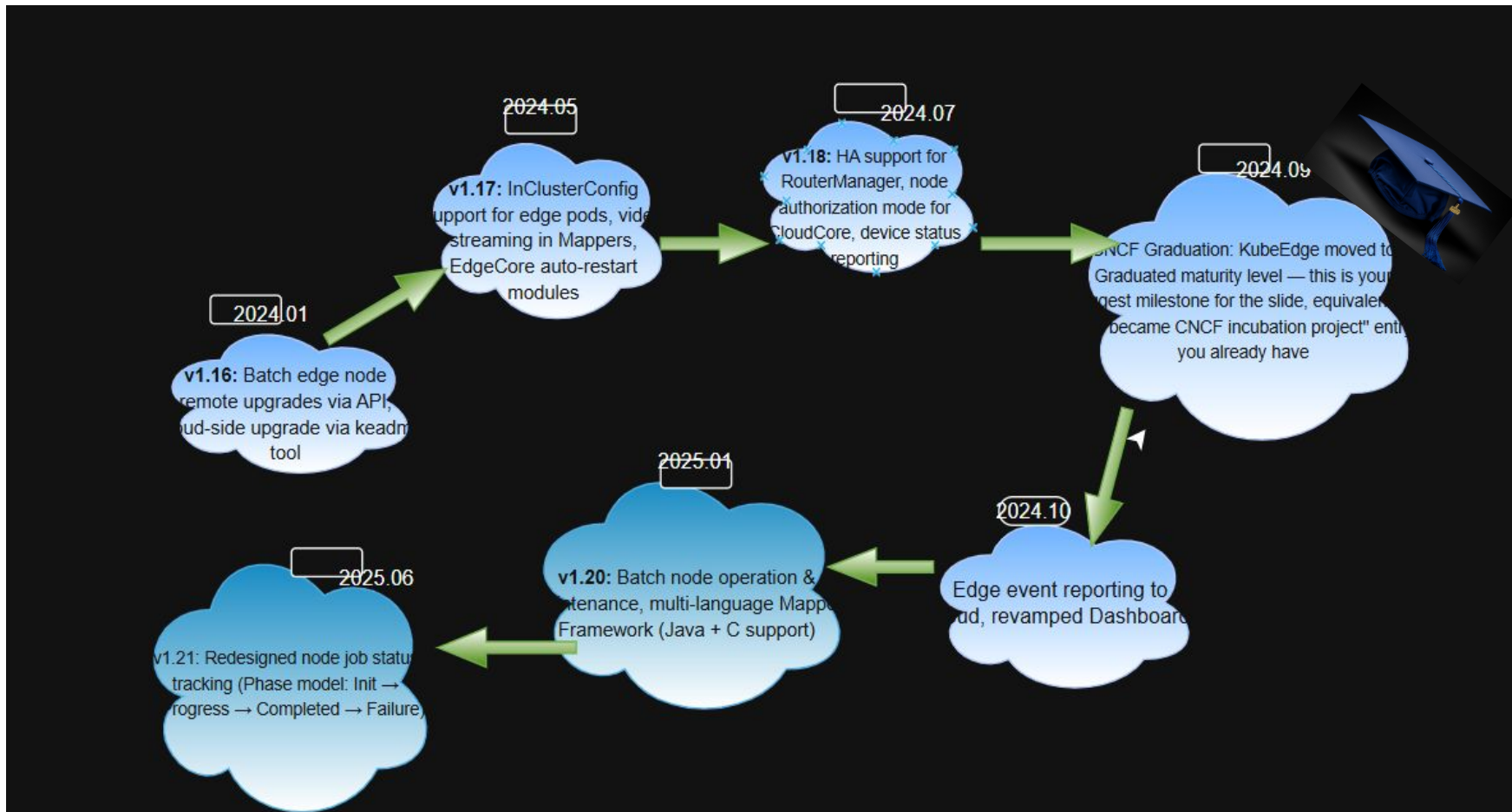
- ✓ Decoupled control plane and data plane for IoT devices
- ✓ Device (data) as a Service
- ✓ Help developers to focus on their own application development
- ✓ Reduced channel congestion between cloud and edge
- ✓ A more flexible and unified way to manage IoT Devices



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kube Edge releases:





KubeCon



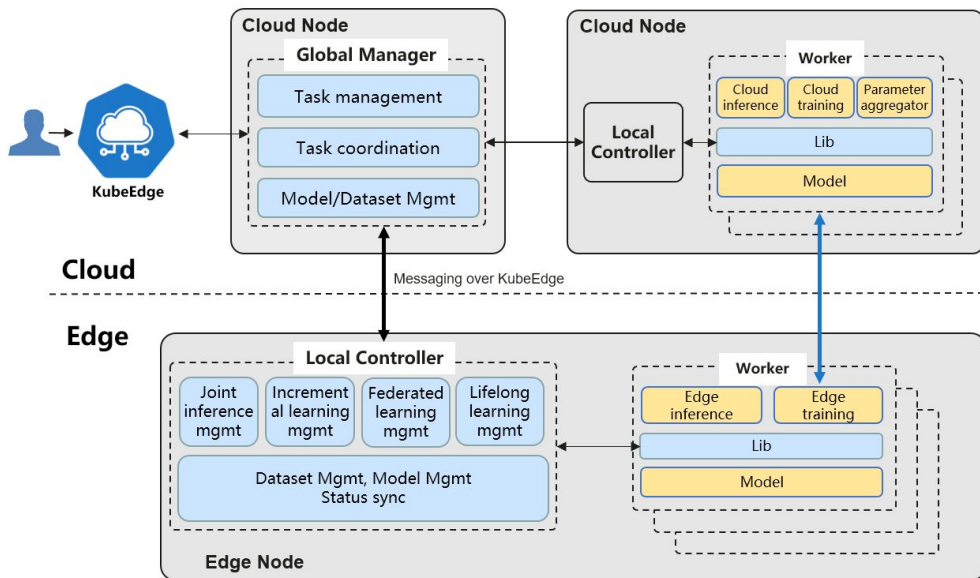
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Edge AI



KubeEdge/ Sedna:



AI framework fueled by edge-cloud synergy

- Dataset and model management across the edge and cloud

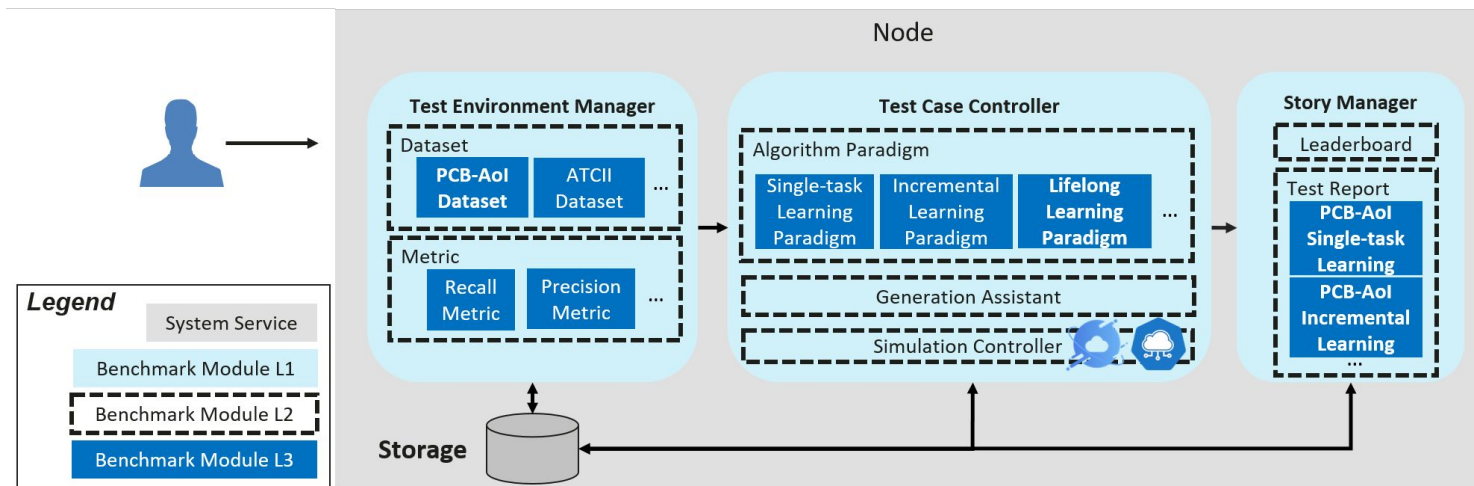
Training and inference frameworks fueled by edge-cloud synergy

- Joint inference
- Incremental learning
- Federated learning
- Lifelong learning

Open ecosystem

- Compatible with mainstream AI frameworks: TensorFlow, PyTorch, Paddle, MindSpore, etc.
- Provides extended interfaces for developers to quickly integrate third-party algorithms

KubeEdge/ Ianvs:



- **AI Benchmarking Framework:** A modular system for standardizing and evaluating distributed AI models at the edge.¹²
- **Edge-Cloud Synergy:** Fuels training and inference through seamless collaboration between cloud and edge components.²
- **Advanced Learning Paradigms:** Supports Joint, Federated, Incremental, and Lifelong Learning models.²
- **Open and Extensible:** Compatible with mainstream AI frameworks like TensorFlow and PyTorch for easy algorithm integration

examples/

Single-task

Computer Vision
cityscapes
pcb-aoi
yaobaa
phys_scene_gen
Cloud_robotics

LLM & language task
Government
government_rag
llm_simple_qa
smart_coding
llm-edge-benchmark

Robotics & embodied AI
cloud_VLA_finetune
RoboDK_Palletizing
IndustrialEIG

Specialised domain tasks
GovDoc2Poster
aoa

LifeLong

bdd
cityscapes
cityscapes-synthia
robot
robot-cityscapes
pcb-aoi
cityscapes-synthia[scene based]

Federated

cifar100[FL]
cifar100[FCL]
cifar100[fcf-ssi]
cifar100[sedna]
PIPL
federated-llm

Cloud Edge collaborative

Cloud_Robotics
TAB
cloud-edge-llm
cloud-edge-spec
decoding

Multi-Edge Inference

imagenet
MOT17

LFx

Example Restoration 1

contributor: abhishek
Goal: 1) e2e restoration of lifelong learning example
2) establish CI/CD pipeline infrastructure for automated validation

Example Restoration 2

contributor: nishant
Goals:
1) e2e restoration of Cityscapes-Synthia Lifelong learning-Curb Detection Lifelong Learning-Semantic Segmentation Llm Agent LLM-Edge Benchmark

Example Restoration 3

contributor : Kai-wei Chou
Goals: In progress

- Diagnose & fix bugs across examples, including dependency manifests, license scan, and runtime configurations.
- Documentation modernization, including revamp tutorials with reproducible step-by-step guides, publish developer-focused debugging playbooks for common failures. Write and upload the corresponding blog to the KubeEdge Website.
- Advanced: Build a CI pipeline testing examples with GitHub Actions against multiple Python versions, critical lanvs/upstream updates, and block PRs that break validated examples

KubeEdge/ Ianvs:

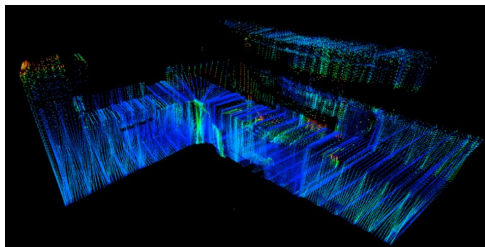
Ianvs — release roadmap

v0.1.0

Core framework + PCB-AoI

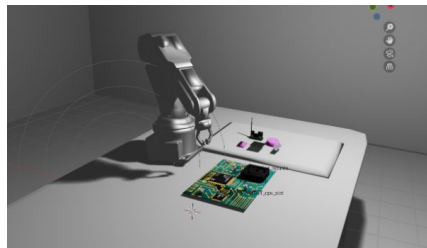
- Benchmarking framework
- Test env & case management
- PCB-AoI public dataset
- Single-task & incremental learning
- Leaderboards & test reports

v0.1.0



Point Cloud Processing

Embodied Intelligence

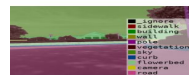


v0.2.0

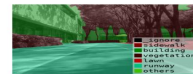
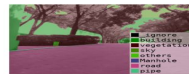
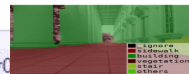
v0.2.0

Lifelong learning

- Full lifecycle: task def → handling
- Unknown task recognition
- BWT / FWT metrics
- Result visualisation
- Cloud-robotics dataset & examples

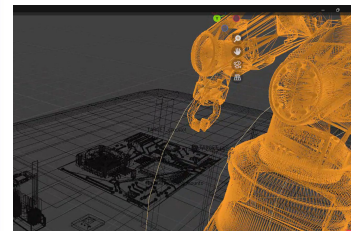


front



LLM testing & cloud-edge inference

- Gov, coding & edge LLM benchmarks
- Cloud-edge collaborative inference
- Speculative decoding (EAGLE)
- Pedestrian tracking (ByteTrack)
- Personalised LLM & multimodal algos



Cloud-Robotics

ianvs Public

Edit Pins

Unwatch 8

Fork 142

Star 167

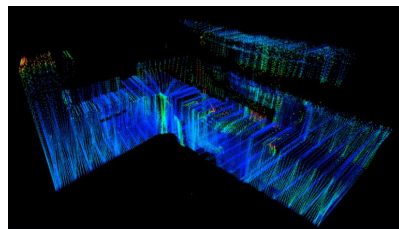
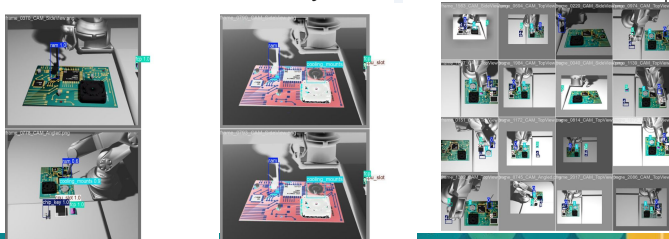
KubeEdge/ lanvs on Embodied Intelligence:

\$2 Trillion



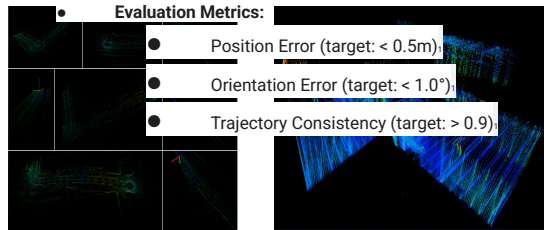
Deformable Component Assembly

- **Contributor:** Ronak Raj¹
- **Dataset Link:** [Deformable Assembly Dataset](#)¹
- **Scope:** Access the Dataset, Access Baseline Algorithms, Use Defined Metrics¹
- **End Users:** Developers, Students, Researchers¹
- **Algorithms:** YOLOv8, Force/Torque Sensors¹
- **Metrics:** Accuracy Score¹



LiDAR-Inertial Pose Estimation

- **Contributor:** Ansh Rastogi
- **Benchmark Project:** LiDAR-Inertial Pose Estimation Benchmark¹
- **Algorithm:** LLIO (LiDAR-Inertial-Lidar-Odometry)¹
- **Algorithm Details:** Uses iterative Kalman filtering for sensor fusion between LiDAR point clouds and IMU measurements to provide robust 6DOF pose estimation.¹
- **Dataset:** KITTI Vision Benchmark Suite odometry dataset¹
- **Evaluation Metrics:**



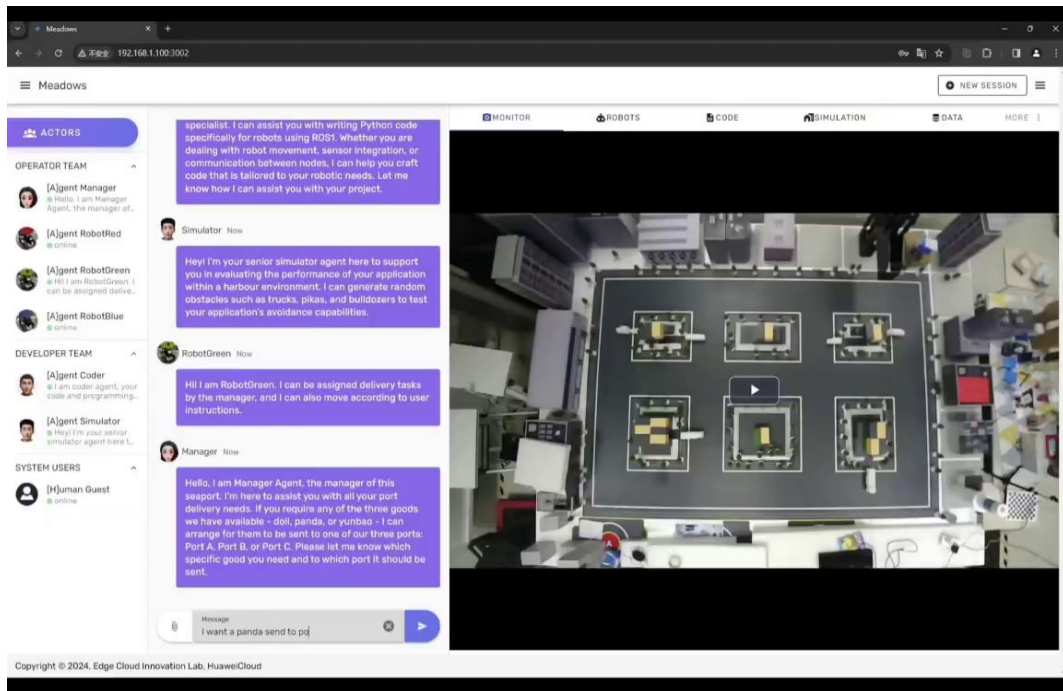
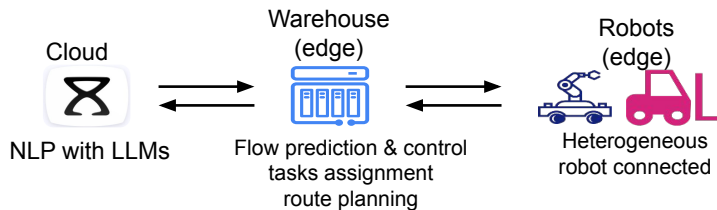
RoboDK Palletizing

- **Contributor:** CGL Learner
- **Dataset:** RoboDK Palletizing Dataset
- **Dataset Link:** [RoboDK Palletizing Dataset](#)
- **Scope:** Benchmarking Embodied Intelligence for Industrial Palletizing scenarios using the RoboDK simulation environment.
- **End Users:** Developers, Students, and Researchers
- **Algorithms:** YOLOv8 (for object detection), GraspNet (for grasping), Kalman filtering (for joint denoising).
- **Metrics:** map50 (Mean Average Precision at IoU=0.5), map90 (Mean Average Precision at IoU=0.9).

KubeEdge/ lanvs:



KubeEdge Based Orchestration Across Multiple Cloud Native Robots



Challenges

- Difficult for robots to comprehend natural language
- Risk of robots congestion due to increased deployment scale
- Difficulties in accessing & managing diverse robots

Benefits

- NLP-driven task understanding & task execution based on **multi-robot coordination**
- E2E deployment cycle of cloud-edge system reduced **30%**
- Robots management efficiency improved **25%**
- Integration cycle for new robots shortened **from months to days**

KubeEdge's Growth:



OSPP



CNCF - KubeEdge: AI PCs as Managed Edge Nodes for Workload...
This program focuses on how AI PCs can be integrated into the KubeEdge ecosystem as a...

Project Overview | **Project Statistics**

Required Skills: C++, Rust, Python, Edge AI, +5

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Alternatives to iptables/manager via APls/server...
Currently, in KubeEdge, the control-plane components often require to restrict requests...

Project Overview | **Project Statistics**

Required Skills: C++, Python, Go

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Cloud-Robotics AI Benchmarking for Edge cloud...
Description: Research and market outside provides by industry members of KubeEdge SIG.

Project Overview | **Project Statistics**

Required Skills: Python, C++

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Comprehensive Example Restoration for Iamc...
Series of new on KubeEdge, SIG is about different benchmark toolkit. As more and more...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go, Java, Kotlin

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2



CNCF - KubeEdge: Improve the KubeEdge website
Improve the design/ux of the KubeEdge website

Project Overview | **Project Statistics**

Required Skills: Web Design, Frontend Development, UX/UI

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Service Comprehensive example...
Series of new on KubeEdge, SIG is about different benchmark toolkit. As more and more...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go, Java, Kotlin

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Deploy Small Language Models & OPEA...
KubeEdge as a public edge computing platform built on the Kubernetes ecosystem, infra...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Design more tests for specific scenarios of edges...
We need to design a framework for adding more tests capability for the specific scenarios of edge...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Improve the KubeEdge website
Improve the design/ux of the KubeEdge website

Project Overview | **Project Statistics**

Required Skills: Web Design, Frontend Development, UX/UI

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CNCF - KubeEdge: Service Comprehensive example...
Series of new on KubeEdge, SIG is about different benchmark toolkit. As more and more...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go, Java, Kotlin

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

KubeEdge: Connecting the Physical and Digital World, Enhancing the Cloud

2018: Core CNCF Project Launch

2021: Scalability (100k nodes) & Edge AI

2024: Robot & Orchestration at Scale

2026+: Cloud-Native AI/ML Fusion

Exponential Ecosystem Growth

CNCF - KubeEdge: Comprehensive Example Restoration for Iamc...
Series of new on KubeEdge, SIG is about different benchmark toolkit. As more and more...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go, Java, Kotlin

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Deep Integration with AMD DICE Nodes (2023 Term 3)
2023 focus on deep integration with AMD DICE nodes, exploring computing performance, and...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Go

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Device Anomaly Detection Framework (2025 Term 3)
The current KubeEdge platform represents device status using three status: Discovered...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Node.js

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Edge-Cloud Collaborative Framework for...
This program aims to explore how KubeEdge can support real-world embedded for applications...

Project Overview | **Project Statistics**

Required Skills: C++, Rust, Python, +2

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Edge-Native Inference for Lightweight LLMs...
This program focuses on evaluating KubeEdge as an edge robot infrastructure for lightweight large...

Project Overview | **Project Statistics**

Required Skills: Rust, Python, Rust, Go, +3

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Enable and verify KubeEdge support on RISC-V (2026...
With the rapid growth of the AI/ML ecosystem, an increasing number of edge computing devices...

Project Overview | **Project Statistics**

Required Skills: Rust, Open...

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

CNCF - KubeEdge: Device Anomaly Detection Framework (2025 Term 3)
The current KubeEdge platform represents device status using three status: Discovered...

Project Overview | **Project Statistics**

Required Skills: Python, Rust, Node.js

Active Teams: 2023 Term 3, 2024 Term 1, 2024 Term 2

Diverse Partnerships Across Industry, Academia and Research





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India 2026

Thank You!!!!

