IoT, Edge and the Cloud

Hello!

Ali Akil 30

Cloud,Kubernetes,Networking Engineer/Architect

- worked on multiple projects through different technologies, basically cloud native
- perfectionist and works in structured and systematic way
- deeply understand technologies to be used in production
- eagerness to continuous learning and development

Interests besides Tech:
#economics#politics#football
#gardening#gym

Cloud

"It's just someone else's computer"

Concepts

Resource pooling

aggregating physical computing resources, into virtual resource pools that can be allocated and managed dynamically.

On-Demand

request resources such as computer, network, storage, when needed, and pay for what you use.

Rapid elasticity

automatically scale computing resources up or down in response to changes in demand.

Thoughts

Reality

Latency
Cost Management
Automation
Security
Compatibility
Compliance
Vendor Lock-in

Edge

"Free-to-use someone's else computer"

Concepts

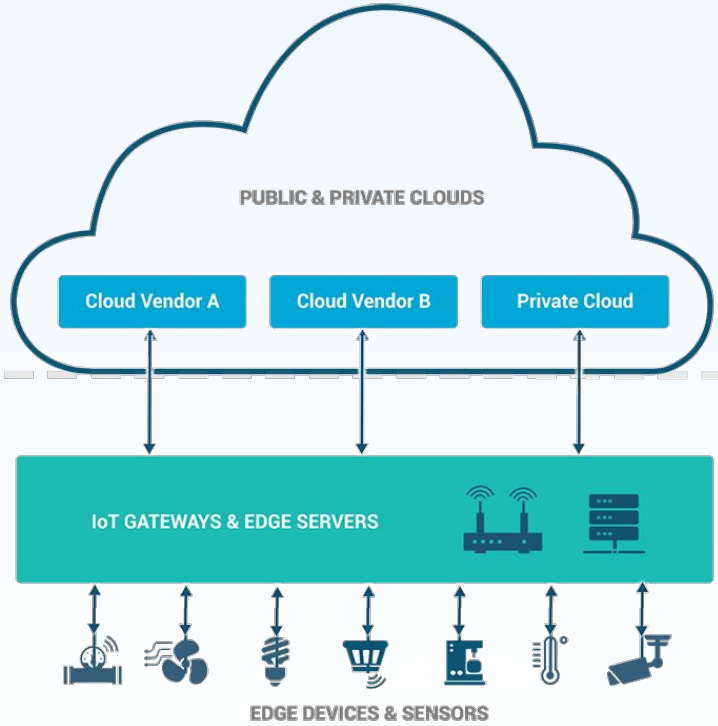
Brings data processing closer to the source

processing and analyzing data closer to where it is generated, rather than sending it to a centralized cloud

Benefits

1. reduce latency
2. saves network bandwidth and cost
3. data sovereignty and compliance

Hybrid Edge Cloud



The Cloud

- Big Data Processing
- Machine Learning
- Long-term Storage

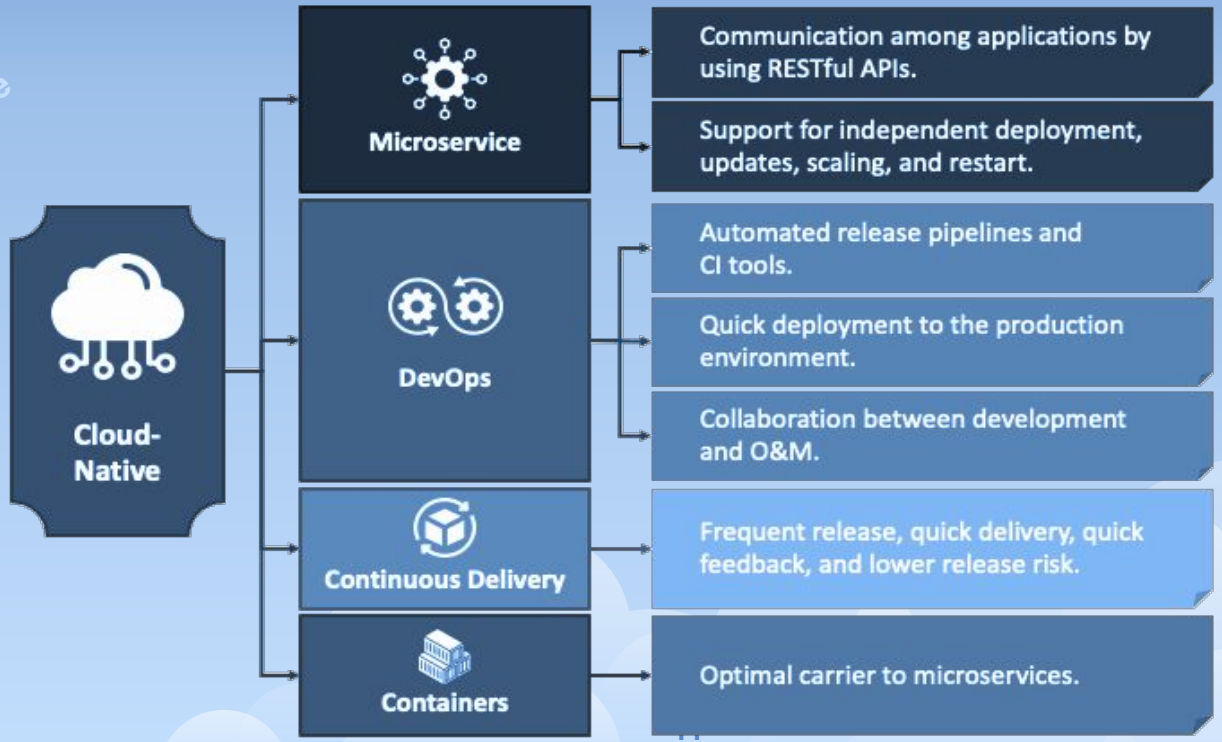
The Edge

- Data Collection and Aggregation
- Real-time AI and Control
- Secure and On-Premise
- Send and Receive from the Cloud

Cloud Native

“build and run independent, loosely coupled, scalable applications in dynamic environments such as public, private, and hybrid clouds”

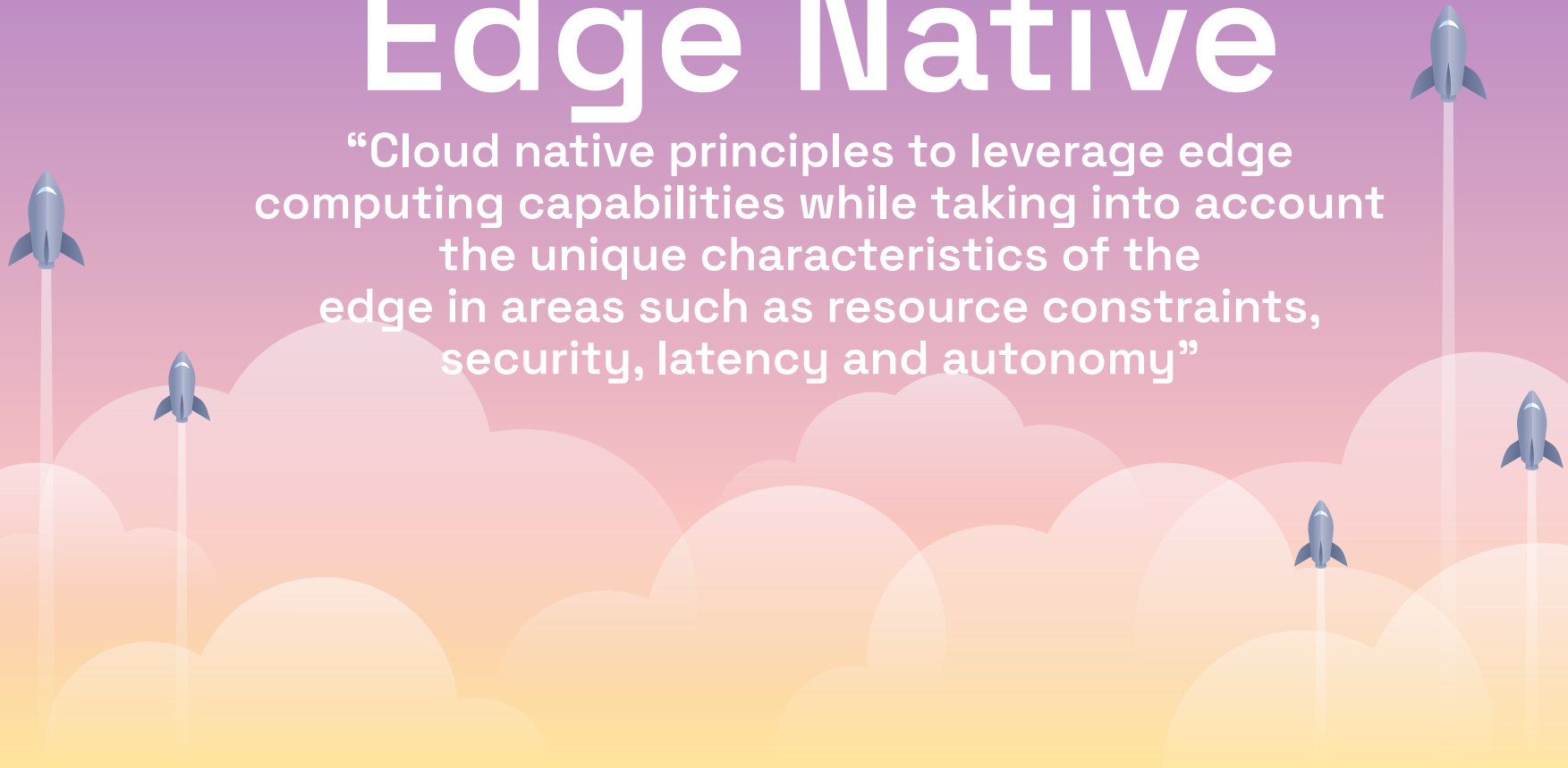
Concepts



Kubernetes
GitOps
Declarative API
Immutable Infrastructure
CI/CD
Tracing

Edge Native

“Cloud native principles to leverage edge computing capabilities while taking into account the unique characteristics of the edge in areas such as resource constraints, security, latency and autonomy”



Benefits

Decouple applications from infrastructure

it's about how software is built and deployed, not where it run

Manageable systems with minimal toil

1. Lower release risk
2. Efficiency
3. Huge ecosystem

Edge Native & Cloud Native

Similarities

Apps and services portability

Applications and services abstract their coupling from the infrastructure

Observability

OpenTelemetry

Prometheus

Jeager

Manageability

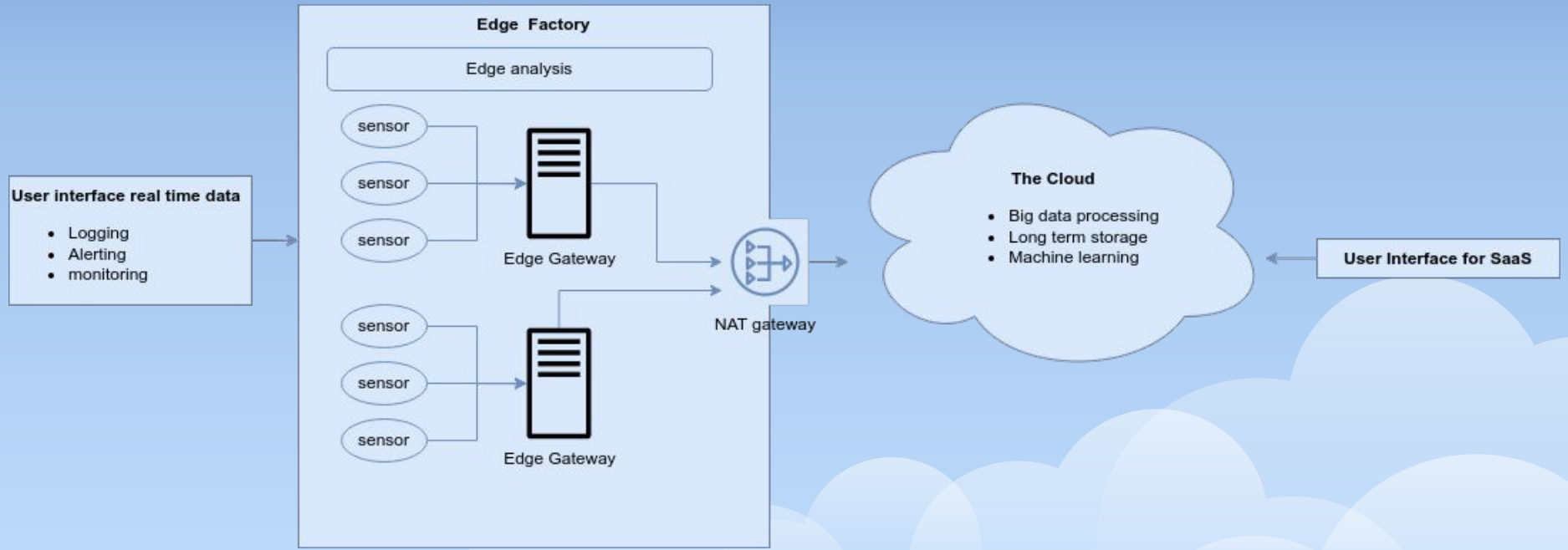
Different tooling options are provided to manage apps and resources at scale.

Differences

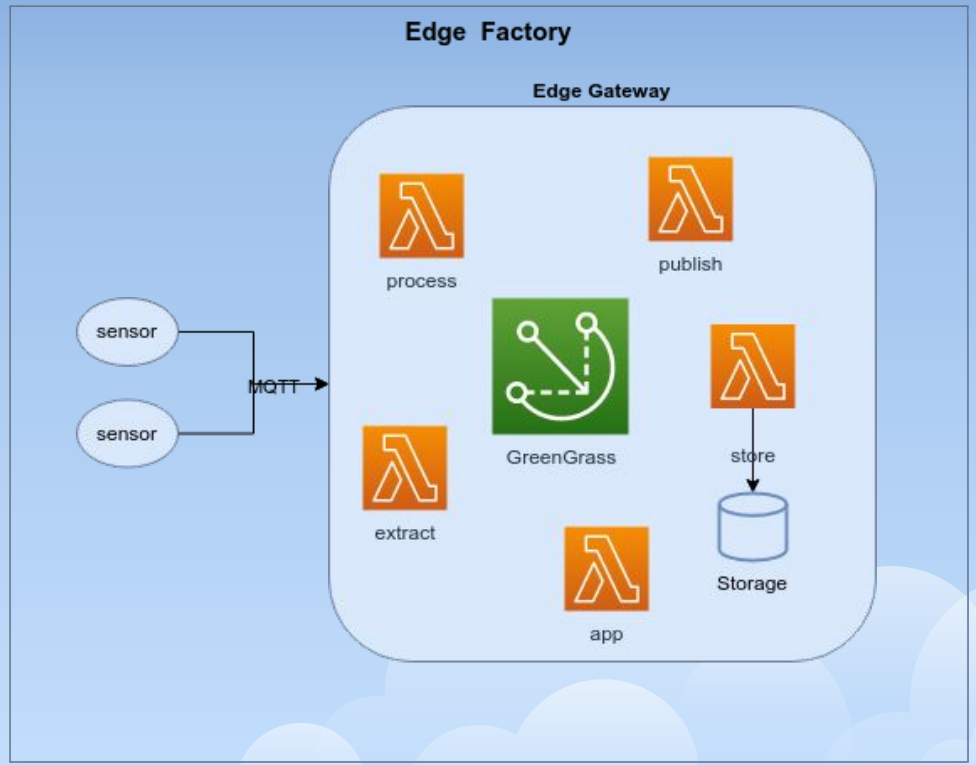
ATTRIBUTES	CLOUD NATIVE	EDGE NATIVE
App Model	Mostly microservice components that are built stateless for load balanced horizontal scaling.	Mosty stateful monolithic apps
Resilience	outsourced to cloud providers using redundant nodes spread across failure domains.	expected to fail, relying on the infrastructure architecture itself to manage resiliency.
Scalability	Horizontal and unlimited scaling	vertical and limited scaling
Data	process and store, centralized model	caching, streaming, real-time and distributed model.
Security	Trusted fabric within secure facilities	Zero trust in insecure environments.
Interacting with external resources	Local hardware resources.	interact with the local environment: cameras, sensors, actuators.

Architecture

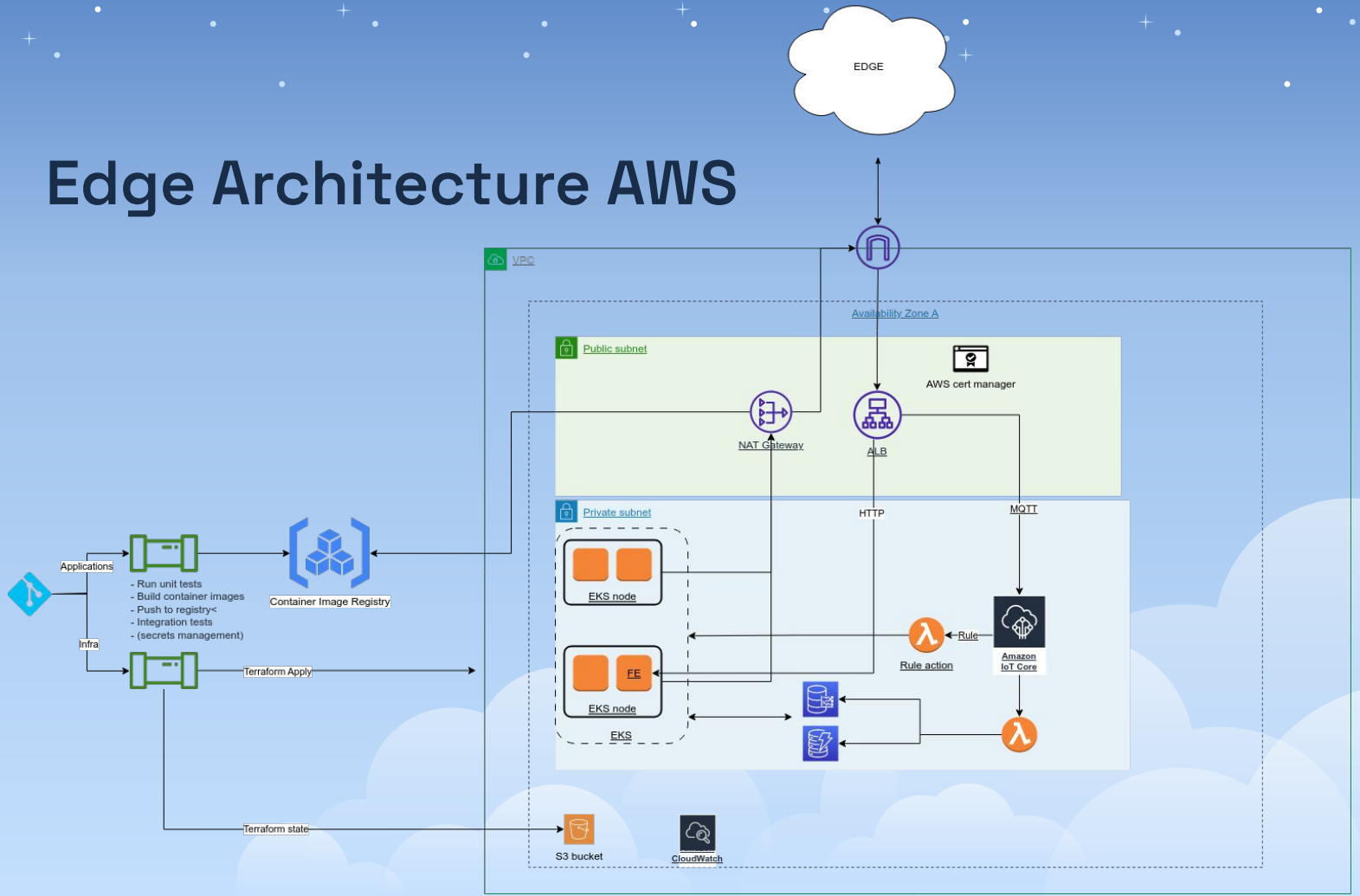
High Overview Architecture



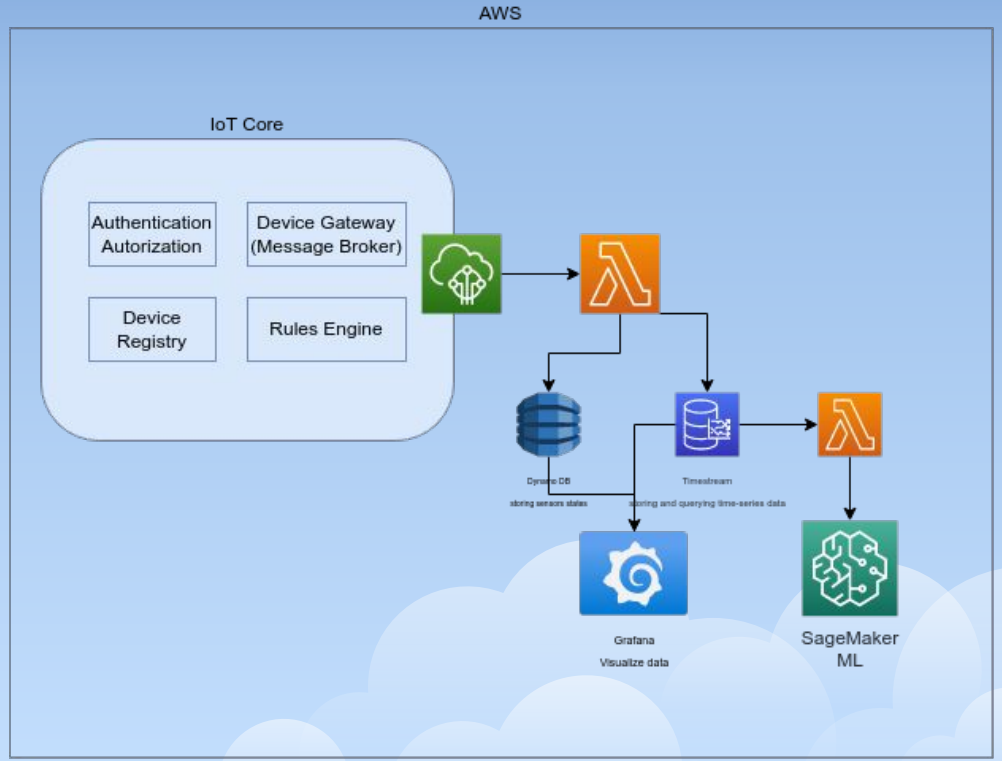
Edge Architecture AWS



Edge Architecture AWS



Cloud Architecture AWS



KubeEdge

Kubernetes distribution optimized for edge devices

Benefits

Kubernetes Native API at Edge

Autonomic Kube-API Endpoint at Edge, support to run third-party plugins and applications that depends on Kubernetes APIs on edge nodes.

Edge Autonomy

Metadata persistent per node, no list-watch needed during node recovery, get ready faster.
Autonomous operation of edge even during disconnection from cloud.

Low Resource Ready

Optimized usage of resource at the edge. Memory footprint down to ~70MB.

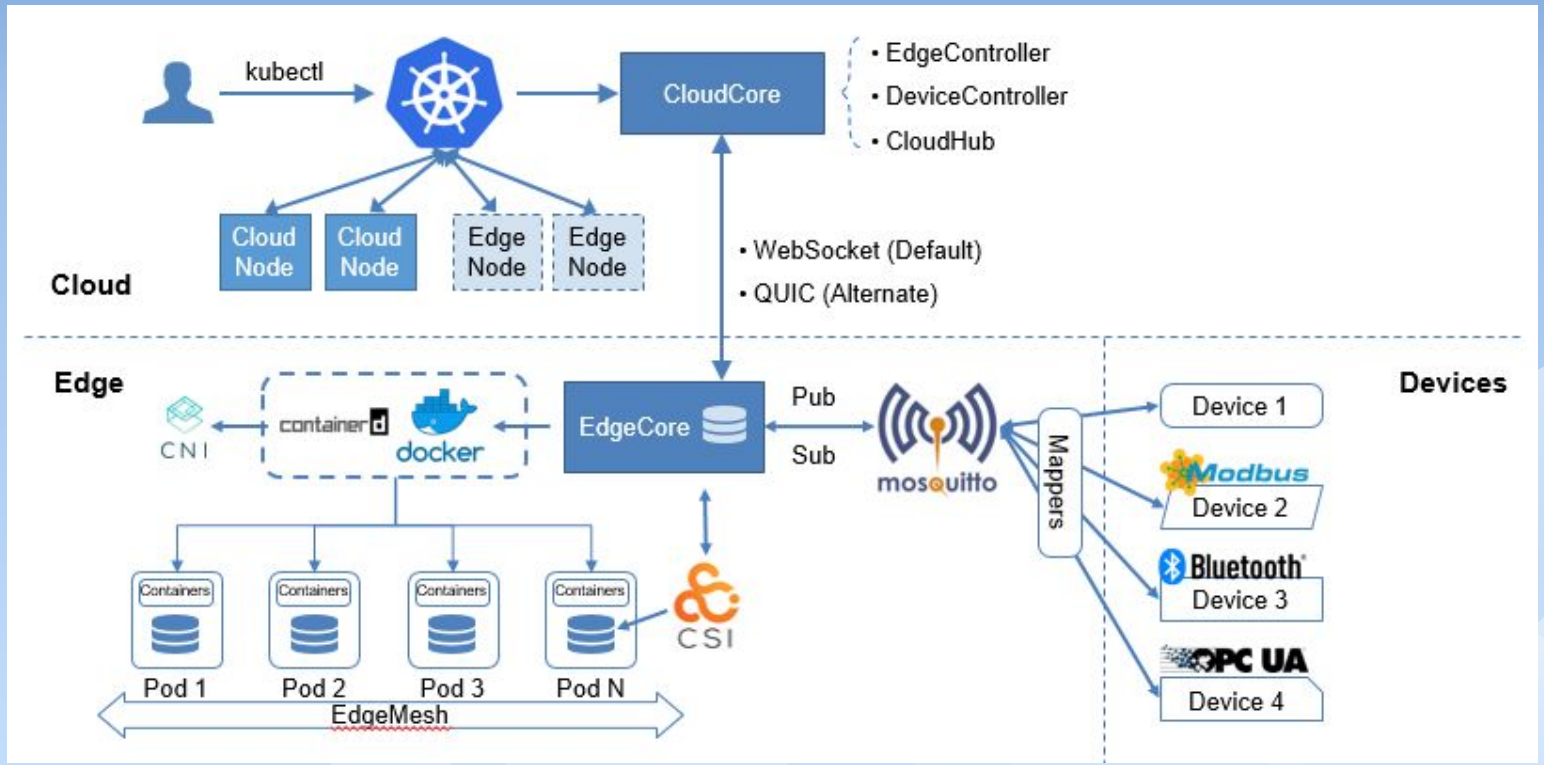
Simplified Device Communication

Easy communication between application and devices for IOT and Industrial Internet.

Heterogenous

Native support of x86, ARMv7, ARMv8

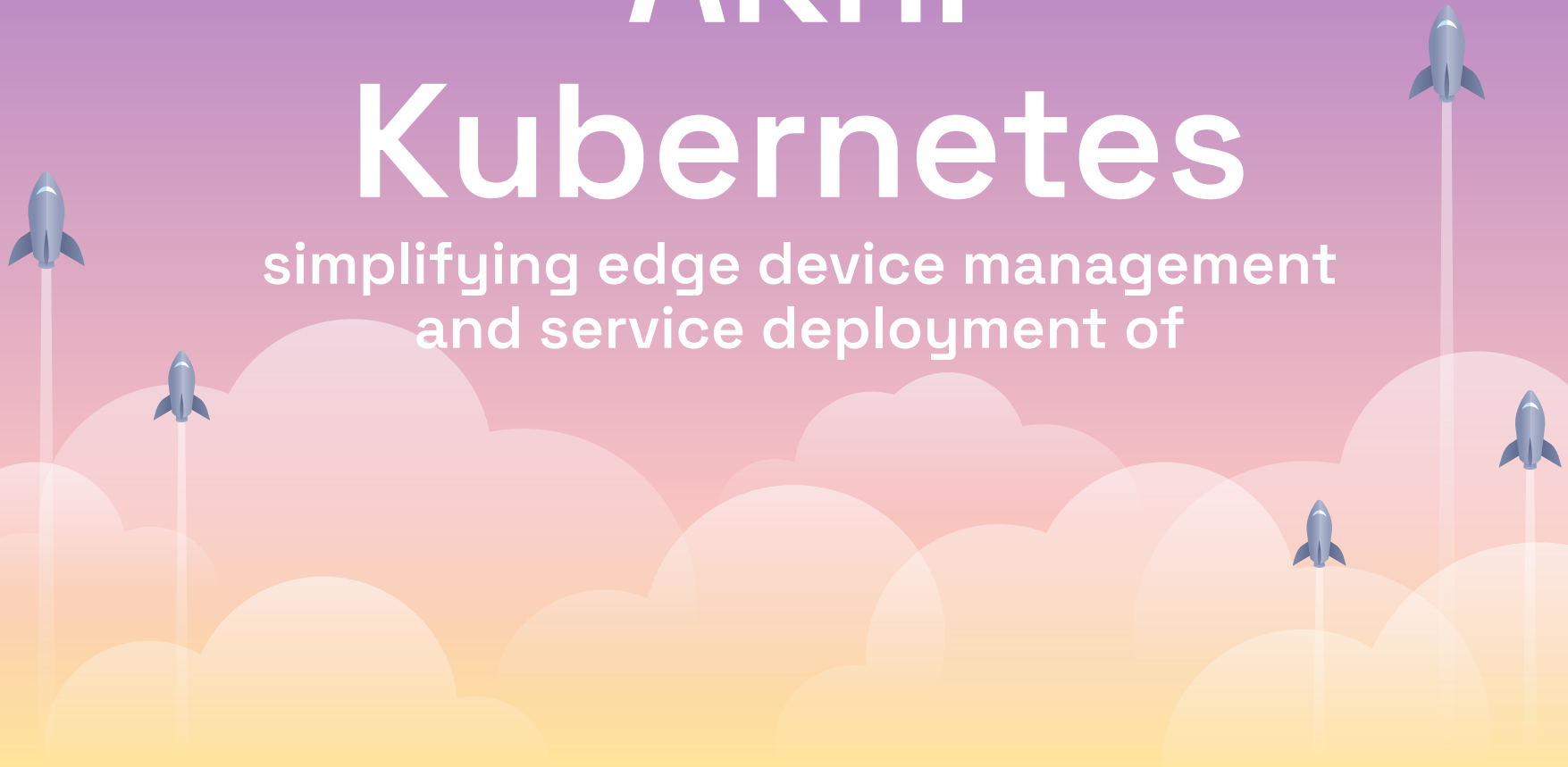
KubeEdge Architecture



AKRI

Kubernetes

simplifying edge device management
and service deployment of



Thanks!

Any questions?