Container and Serverless at Edge Connected to Cloud

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About Me

- Chief Architect of Cloud Platform @ Huawei
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Container and Serverless @ Edge Cloud

What Is Edge Cloud

- Computing resources at edge and managed by Cloud - extension of central cloud
- Resource ownership – cloud provider or customers
- Apps are scheduled & deployed onto edge from Cloud
- Bidirectional communication between edge and cloud.

Why We Do Edge Cloud

- Video surveillance scenario
- Industry IoT scenario
- Smart home scenario
Challenges for Edge Cloud

- Resource constraints
- Network instability (self managed when offline)
- No access from public network (private network)
- Manage multi-tenant edge resources from cloud
- Edge to edge communication
What happens when an edge node lost the network connection?

- No communication channel for data plane
- No serverless@edge support – push serverless functions to edge node.
HL Design for Edge Cloud

- CloudHub / EdgeHub
- Edge Controller
- Metadata Sync & Local Store
- KubeEdge
- EventHub

CloudHub / EdgeHub

Edge Controller

Metadata Sync & Local Store

KubeEdge

EventHub

Events from devices

Containers

Functions

Cloud

Edge Controller

EdgeSync

CloudHub

Kubernetes API Server

Container & Serverless Function Repository

EdgeSync

EdgeHub

Func Repo

EventHub

Edge Sync

KubeEdge

Edge Node
CloudHub & Edge Hub

- A custom protocol over TCP/IP designed for edge-cloud communication
- Is reliable, bi-directional multiplex channel with scalability and multi-tenancy on cloud end.
- Support http (current), websocket, grpc and tcp/ip
- AuthN: Edge node uses certificate to authenticate itself to the cloud
Edge Controller

- An Kubernetes controller plugin managing edge nodes, including registering new edge nodes.
- Watch app spec changes on behalf of edge nodes & sync metadata to edge nodes.
- Update Kubernetes on node and app status on the edge through CloudHub / Edge Hub.
Metadata Sync

- Trimmed down version (MVCC/gRPC/Raft) of ETCD on edge storing a copy of metadata relevant to that edge node
- App (pod) spec changes (new deploy, or upgrade or remove exist app) sync from cloud to edge
- Node and app status data sync from edge to cloud
KubeEdge

- KubeEdge manages runtime environment and app (container) lifecycle on the edge nodes.

- KubeEdge is an optimized version of kubelet on edge managing lifecycle of containers & functions.

- KubeEdge can work offline when network connection is lost. It also responds to edge events & starts corresponding functions on the edge.
Thank You.