SONY

Applying Cilium at Edge with KubeEdge

Tomoya Fujita

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Who am I?

- Tomoya Fujita
  - Software Engineer, Sony R&D US Laboratory
  - ROS (Robot Operating System) Project Management Committee
  - IEEE Robotics and Automation Practice Senior Editorial Board
  - KubeEdge SIG Robotics Co-Chair

A couple of publishments at CNCF...

- Edge Native Applications Principles Whitepaper
- Edge Native Application Design Behaviors Whitepaper

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Application at Edge Situation

- Broad use cases. (live streaming, entertainment, car, end user device, robots…)
- Distributed and Connected System.
- Collaborative and Orchestrated Application.
- Circulatory Functioning System and Development. (Edge AI, Modularity)
- Specific Hardware Acceleration. (Platform Dependencies, Proprietary)
- **Network Connectivity. (Application Bridge and Proxy)**

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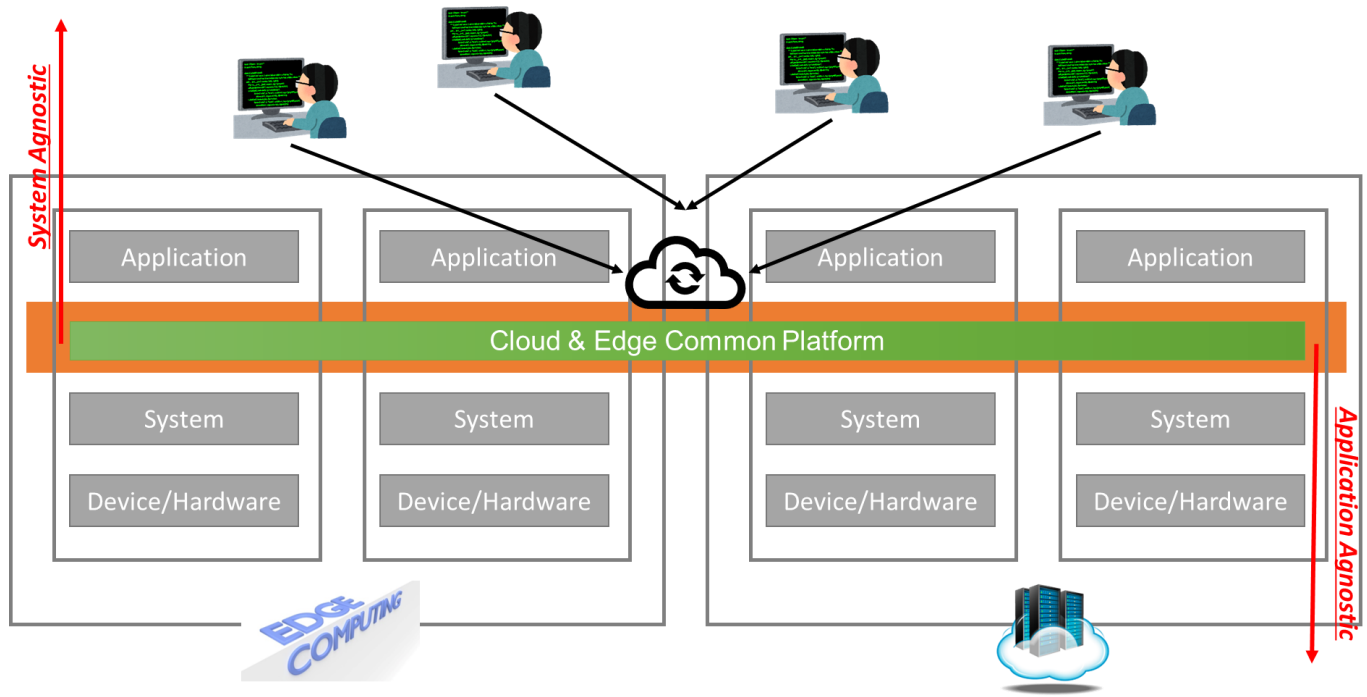
- **Network Connectivity. (… …and Proxy)**

But the truth is…
statically configured and integrated.

What we want at Edge?

- Flexible and Configurable Application Deployment.
- Application Agnostic Network Configuration.
- Extend Device Capability. (More than it has)
- System Global Observability.
- Platform Agnostic Infrastructure.



Kubernetes

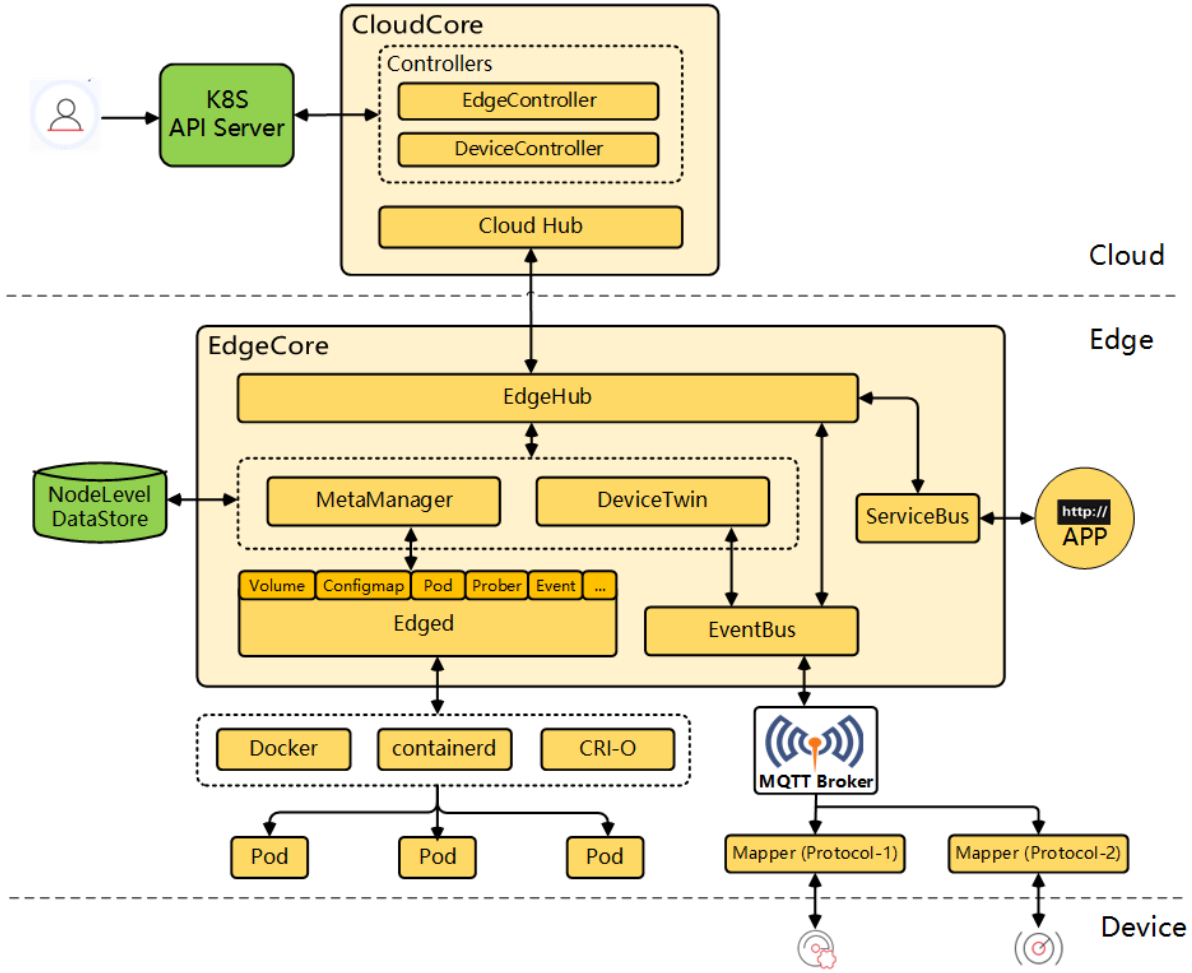
- Application Deployment and Orchestration.
- Device Capability and Label Control.
- Auto- Scaling and Healing.
- Roll Up/Down, Canary Test.
- Role Based Access Control.
- Device-Plugin / Container Device Interfaces.
- **Container Network Interfaces. (Cilium)**

Looks great, but missing edge specific environmental situation…
e.g) CPU consumption, edge autonomy, lossy network, local caching and synchronization…

KubeEdge

is built upon Kubernetes and provides core infrastructure support for networking, application deployment and metadata synchronization between cloud and edge.

- Cloud-Edge Coordination
- Edge Computing
- Edge Autonomy
- Simplified Deployment
- Kubernetes-native Support
- Resource Efficient
- ~~**CNI Unsupported…**~~



https://kubeedge.io/docs/

KubeEdge meets Cilium !!!

June 4, 2024 · 10 min read

Tomoya Fujita

This blog introduces how to enable Cilium

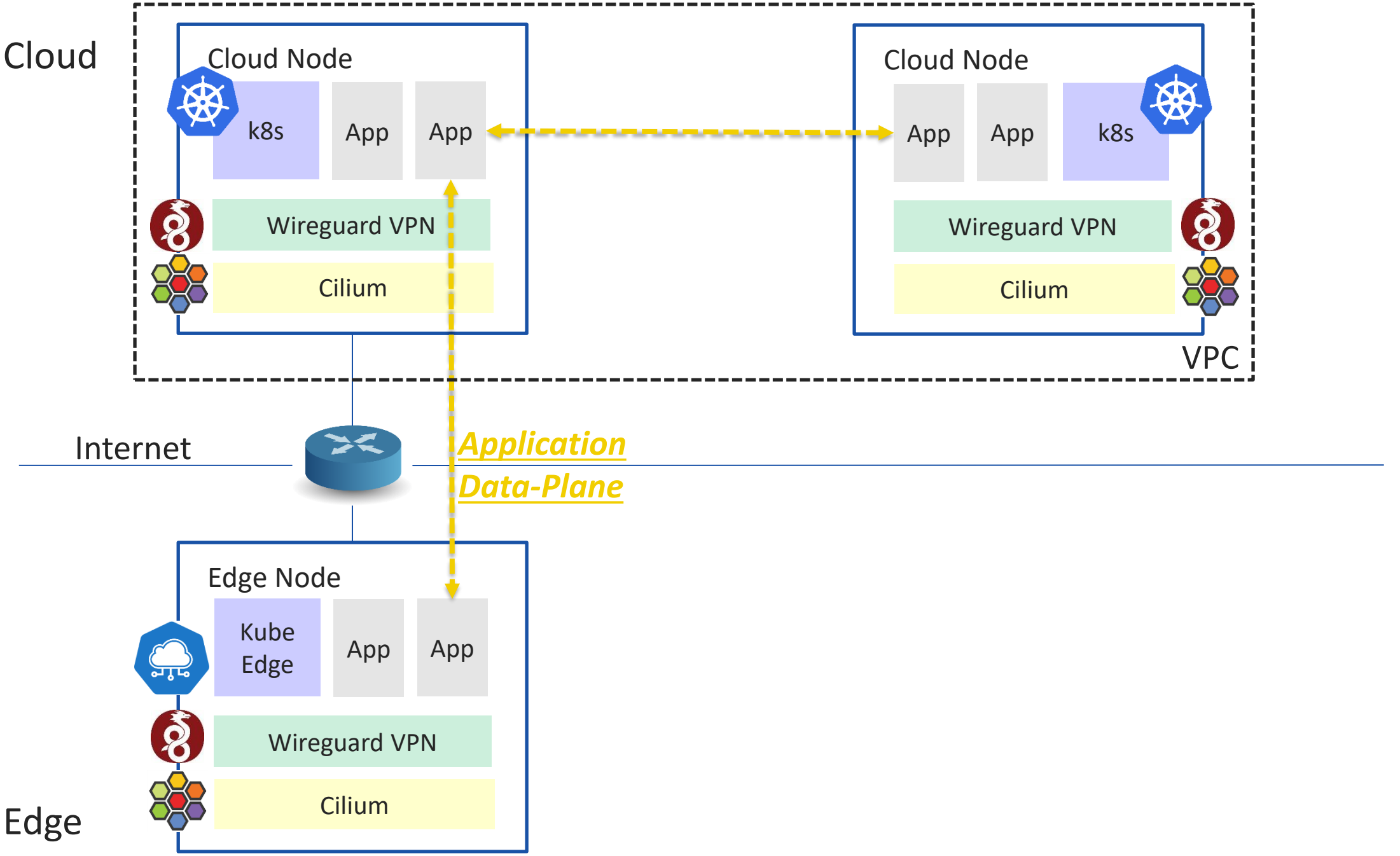
Why Cilium for KubeEdge

Cilium is the one of the most advanced and efficient container network interface plugin for Kubernetes, that provides network connectivity and security for containerized applications in Kubernetes clusters. It leverages eBPF (extended Berkeley Packet Filter) technology to implement networking and security policies at the Linux kernel level, allowing for high-performance data plane operations and fine-grained security controls.

And KubeEdge extends the cluster orchestration capability down to edge environments to provide unified cluster management and sophisticated edge specific features.

Enabling Cilium with KubeEdge allows us to take advantage of both benefits even for edge computing environments. We can deploy the application containers where `EdgeCore` running and bind Cilium to connect with workloads in the cloud infrastructure. This is because Cilium can also enable WireGuard VPN with transparent encryption of traffic between Cilium-managed endpoints.

Further more, we can also rely on Cilium Tetragon Security Observability and Runtime Enforcement to confine security risk and vulnerability in edge environment.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Kube
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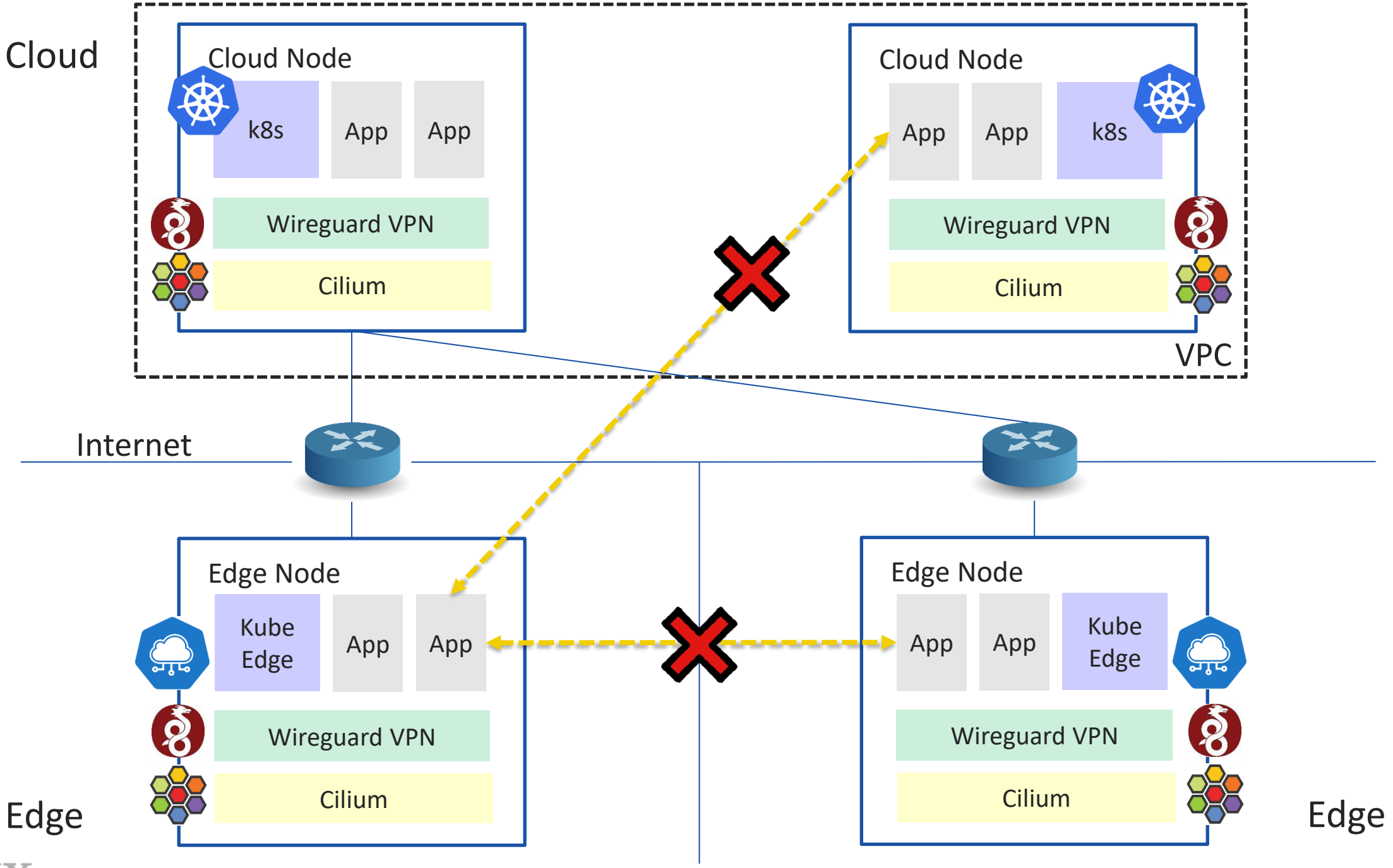
Edge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Edge

Open Discussion

- Enable wireguard with different network topologies.
  - In default `point-to-point`
  - `Hub-and-spoke`, `point-to-site` and `site-to-site` can also be supported?
- More Edge Features
  - Work In Progress with PoC environment.
  - More light-weight, less memory and less storage space?
  - ...
- Cilium goes everywhere like million devices at Edge?