Should You Bring Kubernetes on Your Edge Roadtrip?

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Should You Bring Kubernetes at the Edge?

Maybe?
Agenda

➢ A Few Definitions
➢ Edge Computing Workloads
➢ Kubernetes at the Edge
➢ Our Vision: EdgeOps
What is the Cloud?

On-demand availability of resources

- Homogeneous
- Large scale
- Centralized
What is the Edge?

Resources anywhere and everywhere

- Distributed
- Small scale
- Heterogeneous
Edge computing provides compute, networking and storage capabilities at the border of the network, closer to the source of the data, while maintaining the elasticity and consumption-based pricing model of the Cloud.
Cloud Native

- DevOps
- Agile
- Microservices
- Containers
- Repair / Repave
- Rotate
The Challenges Edge Computing Addresses

- Latency
- Bandwidth
- Resiliency
- Data Sovereignty

Devices → + → Cloud
What Makes Edge Native Different

- The network will degrade or fail
- Optimize for size and power
- Zero Trust
Edge Computing

Workloads
Edge-To-Cloud: A Continuum
One Continuum; Three Planes

**Data**
Software components being deployed

**Control**
Control the applications or the infrastructure
Real-time monitoring

**Management**
Manage the applications or the infrastructure
Device configuration
Top Edge Computing Workloads

Edge Gateways
- Artificial Intelligence: 21%
- Control Logic: 19%
- Data Analytics: 13%
- Sensor Fusion: 12%

Edge Servers
- Artificial Intelligence: 21%
- Control Logic: 17%
- Data Analytics: 16%
- Sensor Fusion: 10%
Top Edge Computing Artifacts Deployed for IoT Solutions

- **Edge Gateways**
  - Container Images: 19%
  - Native Binary: 17%
  - Script Files: 13%
  - Serverless Function: 12%
  - Virtual Images: 22%

- **Edge Servers**
  - Container Images: 30%
  - Native Binary: 15%
  - Script Files: 22%
  - Serverless Function: 17%
  - Virtual Images: 12%
Types of Operating Systems

- **Time-Sharing**
  - Maximize hardware utilization

- **Real-Time**
  - Guarantee latency
Kubernetes
At The Edge
Kubernetes at the Edge

Source: G. Baldoni, L. Cominardi, M. Groshev, A. De la Oliva and A. Corsaro, "Managing the far-Edge: are today’s centralized solutions a good fit?"
## A wider Set of Alternatives

<table>
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<tr>
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<th>Cloud Managed</th>
<th>Edge Only</th>
<th>K8s integration</th>
<th>Focus</th>
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Adapted from: G. Baldoni, L. Cominardi, M. Groshev, A. De la Oliva and A. Corsaro, "Managing the far-Edge: are today’s centralized solutions a good fit?".
The modern car is a datacenter

Should it run Kubernetes?
Use case: Automotive

Which of those would you run in containers?
The modern factory is a datacenter

Should it run Kubernetes?
Use Case: Industrial Automation

Source: Eclipse BaSyx project documentation
The decision process involves a fragment of the whole data set

The error function cannot always ask for outside help

Optimization is influenced by local conditions
Architecture Considerations

> **How predictable should the latency of your system be?**
  * Mission-critical systems have real-time requirements

> **Can you afford to lose data?**
  * How stateful is your application?
  * Are your instances unique?

> **How constrained are your edge nodes and infrastructure?**
  * There is little to no elasticity at the far edge

> **How far should the control plane be from the Edge?**
  * How autonomous are your edge devices and servers?
One Last Thing...

How is Stateful Kubernetes Going for You?
When Kubernetes Could Be a Bad Fit

1. Real-Time
2. Mission Critical
3. Constrained Devices
4. Heterogeneous Hardware
It Takes a Village to Build the Edge
Our Vision:

EdgeOps
Download the White Paper

https://hubs.la/H0L379c0
EdgeOps
Adapting DevOps for the Edge

Challenges
- Latency
- Bandwidth
- Resiliency
- Data sovereignty

Characteristics
- Long lifespan
- Heterogeneous
- Constraints
- Connectivity

Deployment
- Workloads
- Artifacts
- Strategies

DevOps Principles
Short Lifecycle, Collaboration, Continuous Integration and Delivery (CI/CD), Microservices, Infrastructure as Code
Delivering Open Source Edge Platforms. Now.

EdgeOps

Code first
Simplify and streamline production Edge deployments

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Thank You

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