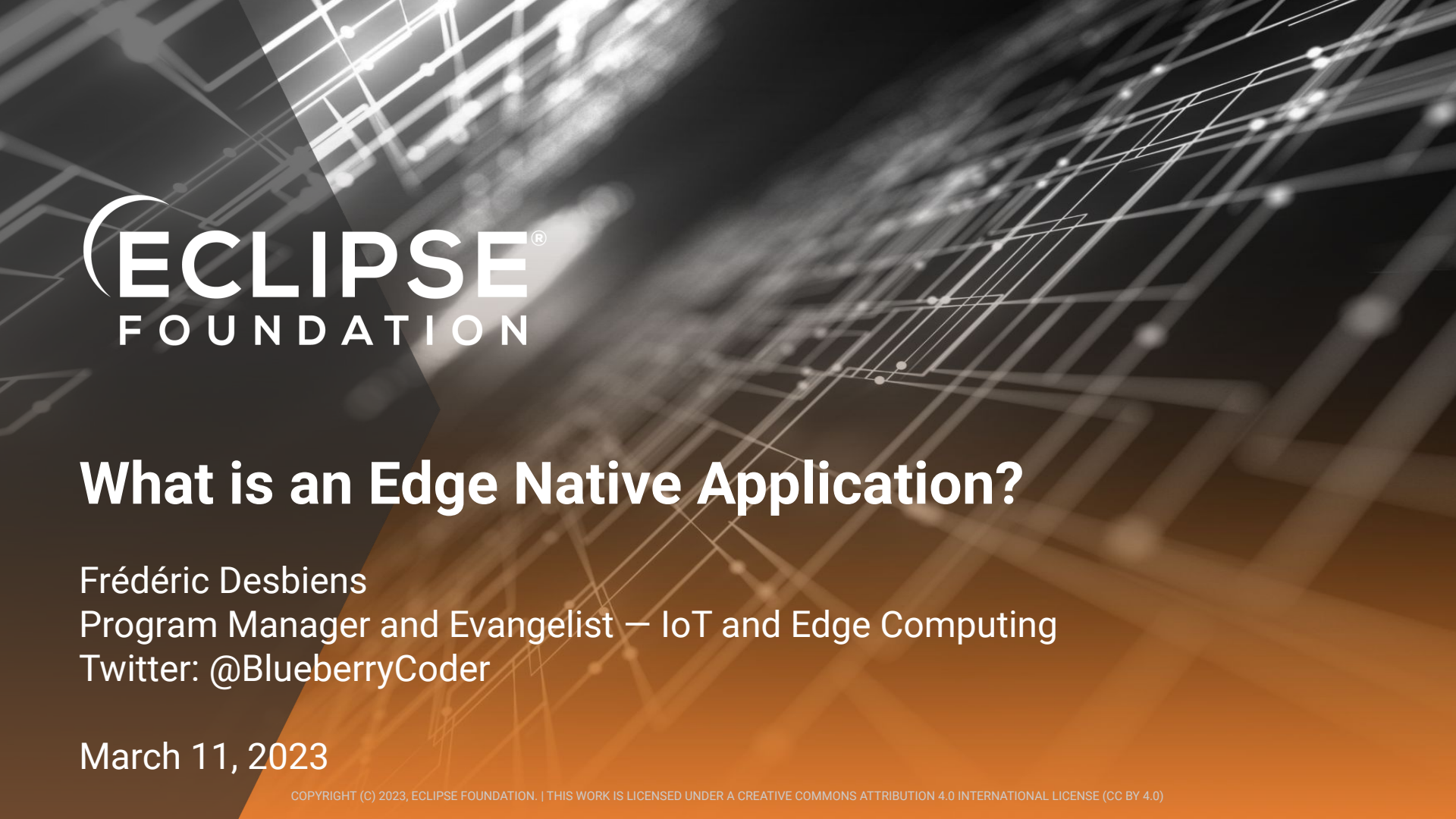

What is an Edge Native Application?

Frédéric Desbiens
Program Manager and Evangelist — IoT and Edge Computing
Twitter: @BlueberryCoder

March 11, 2023

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About Me

Frédéric Desbiens
Program Manager and Evangelist — IoT and Edge Computing

B.Ed., B.Sc.A, MBA

Developer, Architect, Product Manager…

Oracle, Cisco, Pivotal…

Published author; Frequent Speaker

@BlueberryCoder
https://ca.linkedin.com/in/fredericdesbiens

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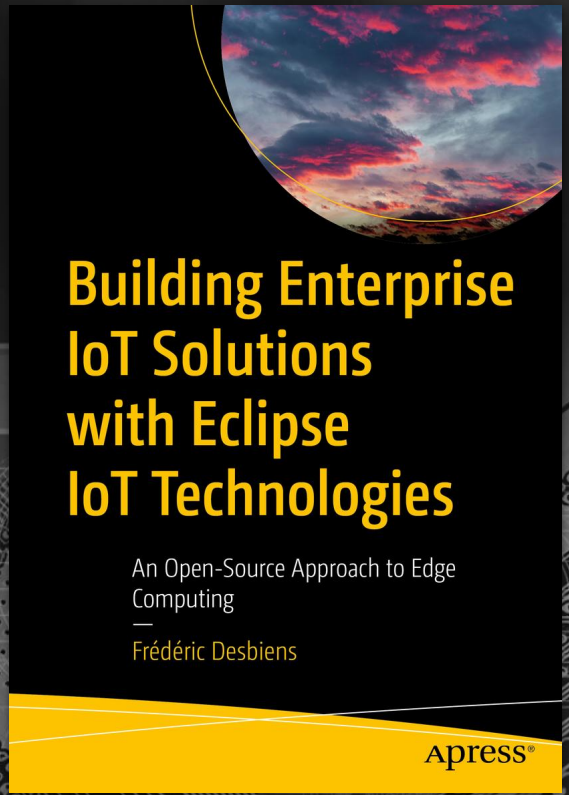
December 2022

A comprehensive overview of the open-source IoT and Edge Computing platforms available at the Eclipse Foundation

ISBN: 978-1484288818



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Agenda

- Edge VS Cloud
- Edge Native Applications
- Edge Native Runtimes
- EdgeOps

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On-demand availability of resources

- Homogeneous
- Large scale
- Centralized

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Resources anywhere and everywhere

- Distributed
- Small scale
- Heterogeneous

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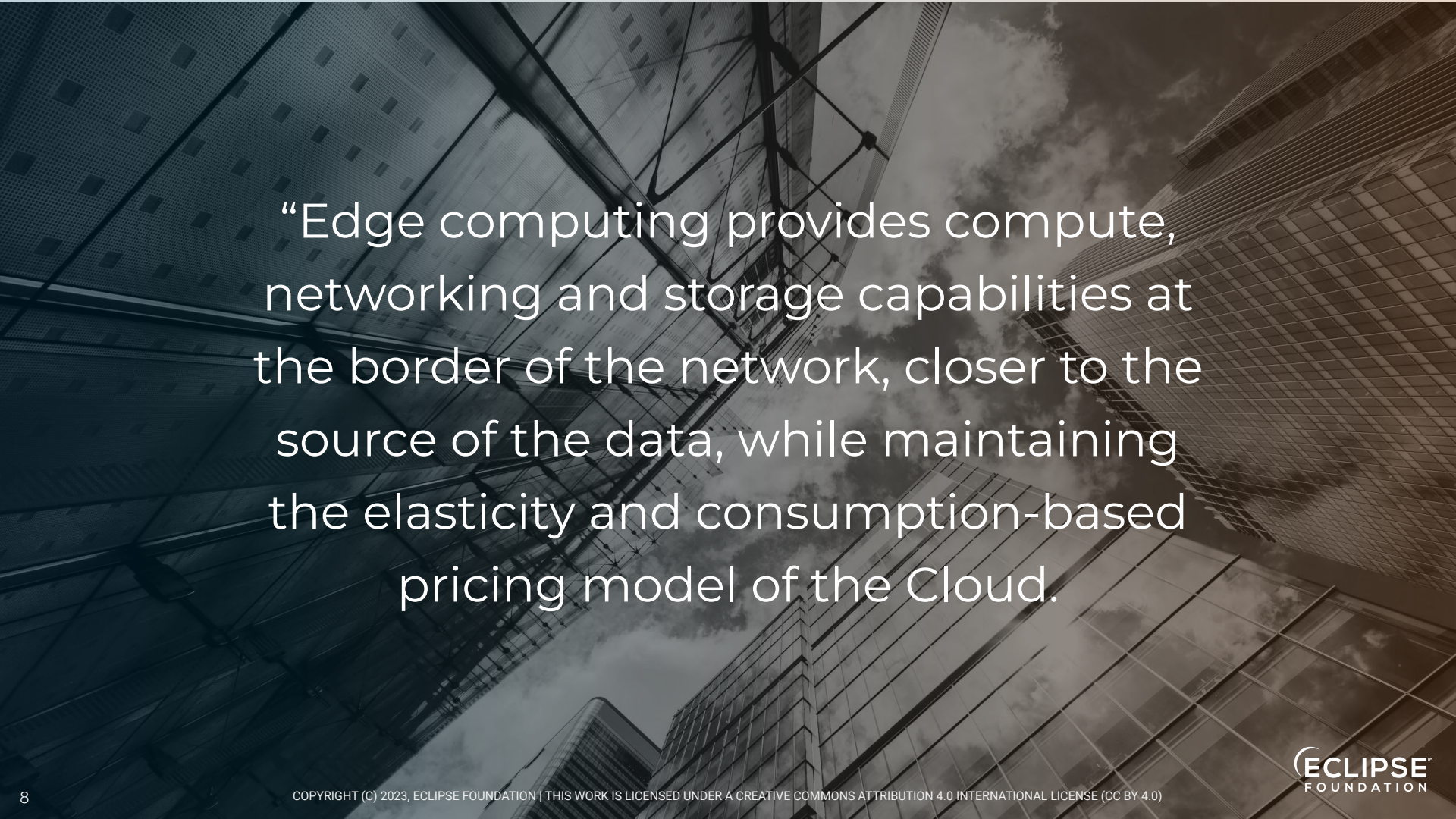

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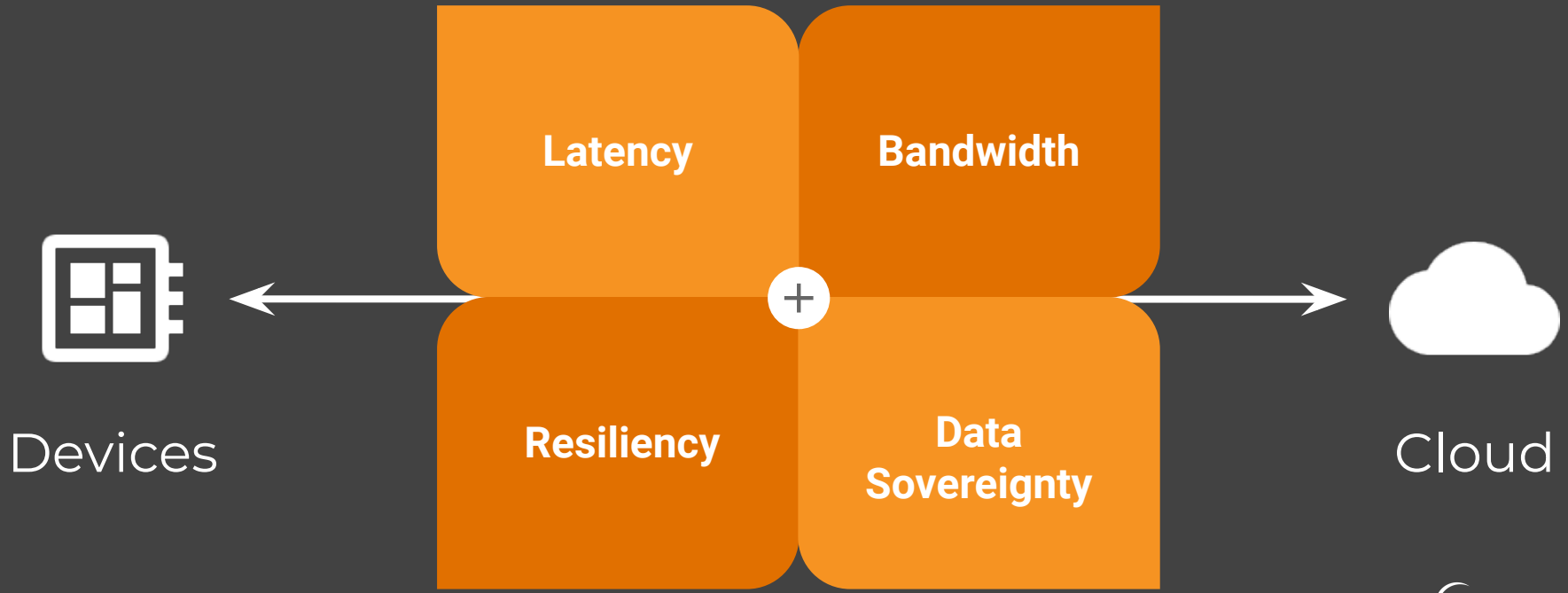
Edge Computing
What it Can Do For You



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Commonalities With Cloud Native Applications

- Rely on **microservices**
- They **expose APIs**, often in a RESTful way
- Made of **loosely coupled services** to avoid creating affinities and to enhance the resiliency of the application
- They are built by teams leveraging a **DevOps approach**, with a focus on continuous integration and continuous deployment (CI/CD)

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Specific Characteristics of Edge Native Apps

Long lifespan

Need to maintain for years, if not decades

Heterogenous

Complete solution requires many players

Constraints

Power, compute, environmental, etc.

Connectivity

Unknowns: stability + reliability concerns

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Edge Computing: IT or OT?

Information Technology	Operational Technology
Off-the-shelf	Purpose-built
Replaceable	Controls critical infrastructure
Frequent updates	Infrequent updates

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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

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Edge Native Applications

Optimized for field use
Resilient
Adapted to mobility
Orchestrated
Zero Trust security model
Zero Touch onboarding

Since they often run on constrained hardware, edge native applications are optimized for size and power consumption.

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Edge Native Applications

Optimized for field use
Resilient
Adapted to mobility
Orchestrated
Zero Trust security model
Zero Touch onboarding

Edge Native applications assume that nodes, services, and even the network may fail at any time.

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Edge Native Applications

Optimized for field use
Resilient
Adapted to mobility
Orchestrated
Zero Trust security model
Zero Touch onboarding

Edge Native applications not only connect to mobile networks but can also be deployed on nodes onboard vehicles. They are not only location-aware but can leverage location-based routing when needed.

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Edge Native Applications

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The components of Edge Native applications are often deployed inside containers, but virtual machines, serverless functions, and binaries can also be involved. The lifecycle of all these deployment artifacts must be carefully orchestrated, whether to scale up or down certain services or to stage incremental updates.

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Edge Native Applications

Optimized for field use
Resilient
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The Zero Trust model implies that, by default, no device is trusted. This involves systematic device authentication and authorization and limitations on the scope and timeframe of the access granted. Data must be encrypted in motion and at rest.

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Edge Native Applications

Optimized for field use
Resilient
Adapted to mobility
Orchestrated
Zero Trust security model
Zero Touch onboarding

Edge Native applications require credentials for authentication, authorization, and even device attestation. The latter involves using certificates or similar means to prove a device's unique identity and trustworthiness. Zero Touch onboarding means that such credentials can be deployed from a central location as soon as a device connects to the network.

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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 you 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?

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All I Need is Kubernetes!

How is Stateful Kubernetes Going for You?

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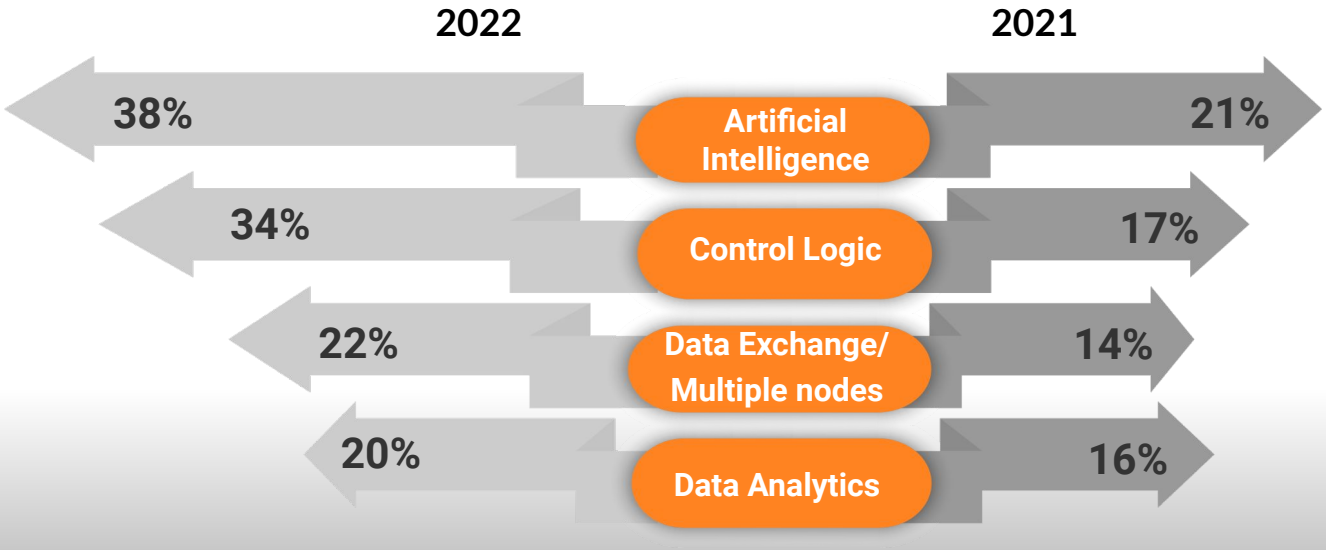
Eclipse IoT Developer Survey 2022

Top Edge Computing Workloads



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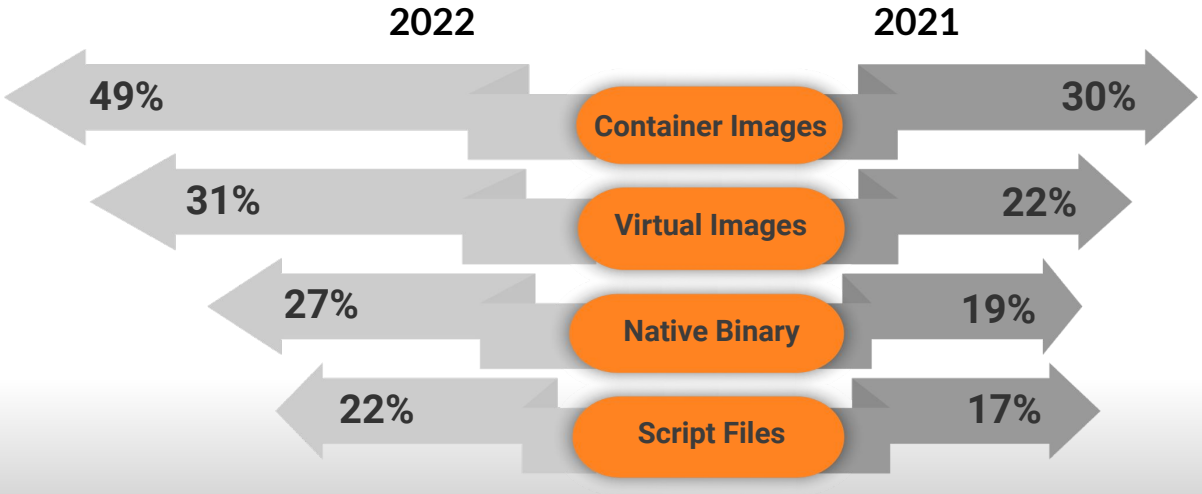
Eclipse IoT Developer Survey 2022

Top Edge Computing Artifacts Deployed for IoT Solutions



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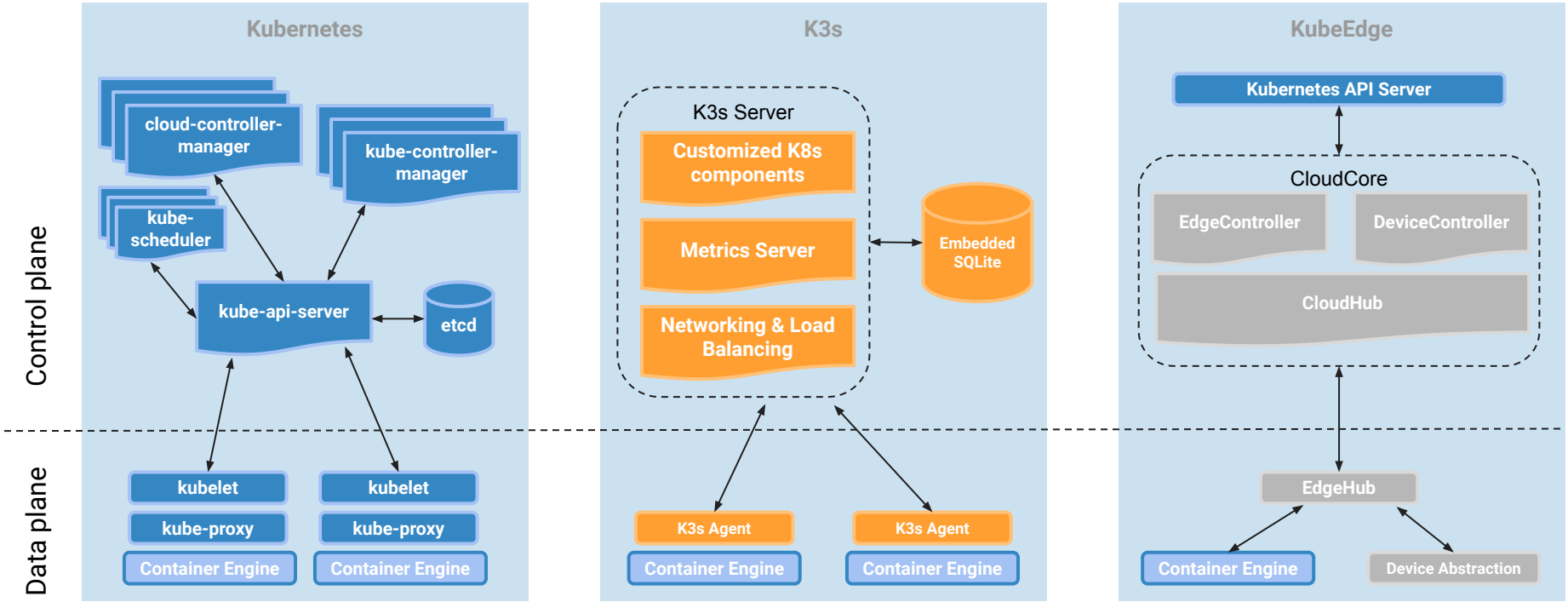
Kubernetes at the Edge



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?".

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A wider Set of Alternatives

Platform	Cloud Managed	Edge Only	K8s integration	Focus
AWS Outposts	Yes	No	Offers K8s	Containers, VMs
Eclipse fog05	Yes	Yes	Yes	Binaries, Containers, VMs
Eclipse ioFog	Yes	Yes	Yes	Containers
Eclipse Kanto	Yes	Yes	No	Containers, IoT
EdgeX Foundry	Yes	No	No	IoT
Fledge	Yes	No	No	Industry 4.0
K3s	No	Yes	Is K8s	Containers
KubeEdge	Yes	Possible	Is K8s	Containers
OpenHorizon	Yes	No	Yes	Containers

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?".

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EdgeOps

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Download the White Paper

SCAN ME

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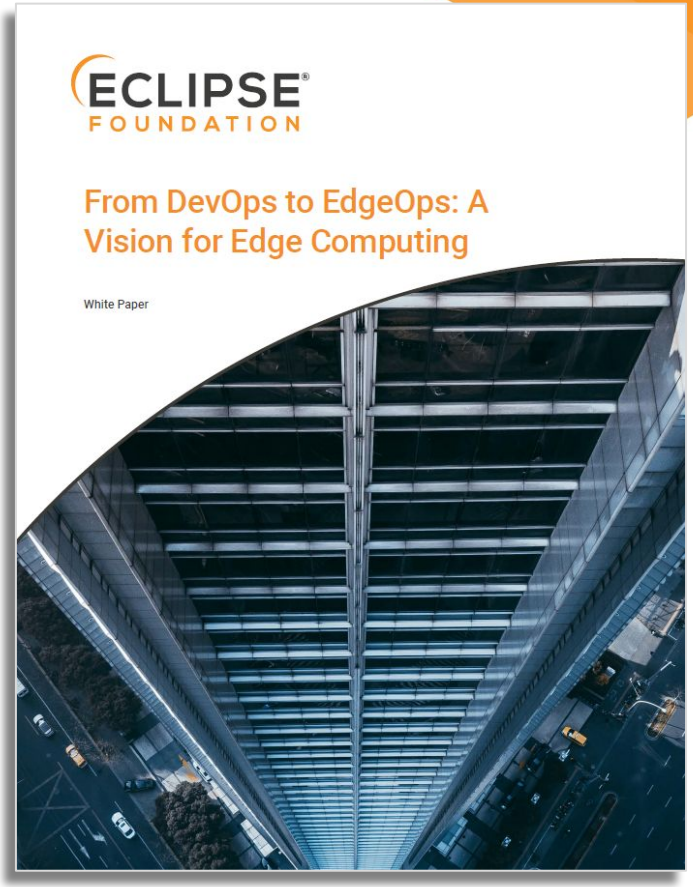

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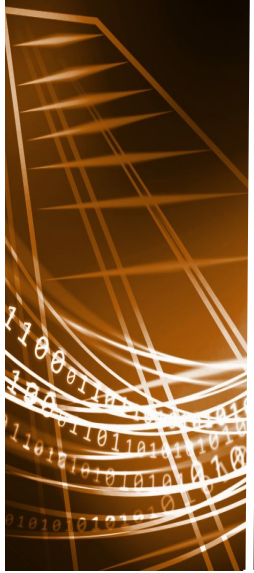
EdgeOps

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

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It Takes a Village to Build the Edge

Color Logos Represent Eclipse Projects

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To Learn More

See my article on opensource.com!

https://opensource.com/article/23/3/what-edge-native-application

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Thank You

Frédéric Desbiens
@BlueberryCoder

@EdgeNativeWG
edgenative.eclipse.org

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