Microsoft Azure

Azure webinar series

Building Sustainable Apps with Kubernetes

Presentation art created with Bing AI

Welcome

How do I ask a question?

If you have a technical or content-related question, please use the Q&A window

We will address the questions as they come in

Can I view this presentation after the webinar?

Yes, this presentation is being recorded

A link to the recorded presentation will be sent to the email address you used to register

Meet our speaker

Steven Murawski

Principal Cloud Advocate

Microsoft Azure

What are Sustainable Applications?

Design Principles for Sustainable Software

Energy Efficiency

Hardware Efficiency

Carbon Efficiency

Carbon Awareness

Principle 1: Energy Efficiency

Designing Energy Efficient Workloads

Apply coding standards and best practices

Use code analysis tools and testing frameworks

Optimize the code

Designing Energy Efficient Workloads

Apply coding standards and best practices

Improve the:

- Readability
- Maintainability
- Security of the code.

Designing Energy Efficient Workloads

Use code analysis tools and testing frameworks

Detect and fix:

- Bugs
- Errors
- Vulnerabilities in the code.

Designing Energy Efficient Workloads

Optimize the code

Optimize:

- Performance
- Scalability
- Reliability

- **Remove:**
  - Unnecessary or redundant computations, loops, or calls.

Principle 2: Hardware Efficiency

Hardware Efficient Workloads

Workload optimization

Logging

Cluster configuration

Node configuration

Hardware Efficient Workloads

Workload optimization

- Scaling
- Storage
- Network & Connectivity
- Scheduling
- Availability & Reliability

Hardware Efficient Workloads

Logging

- Cluster
- Node
- Workload

Hardware Efficient Workloads

Cluster configuration

- Scaling
- RBAC

Hardware Efficient Workloads

Node configuration

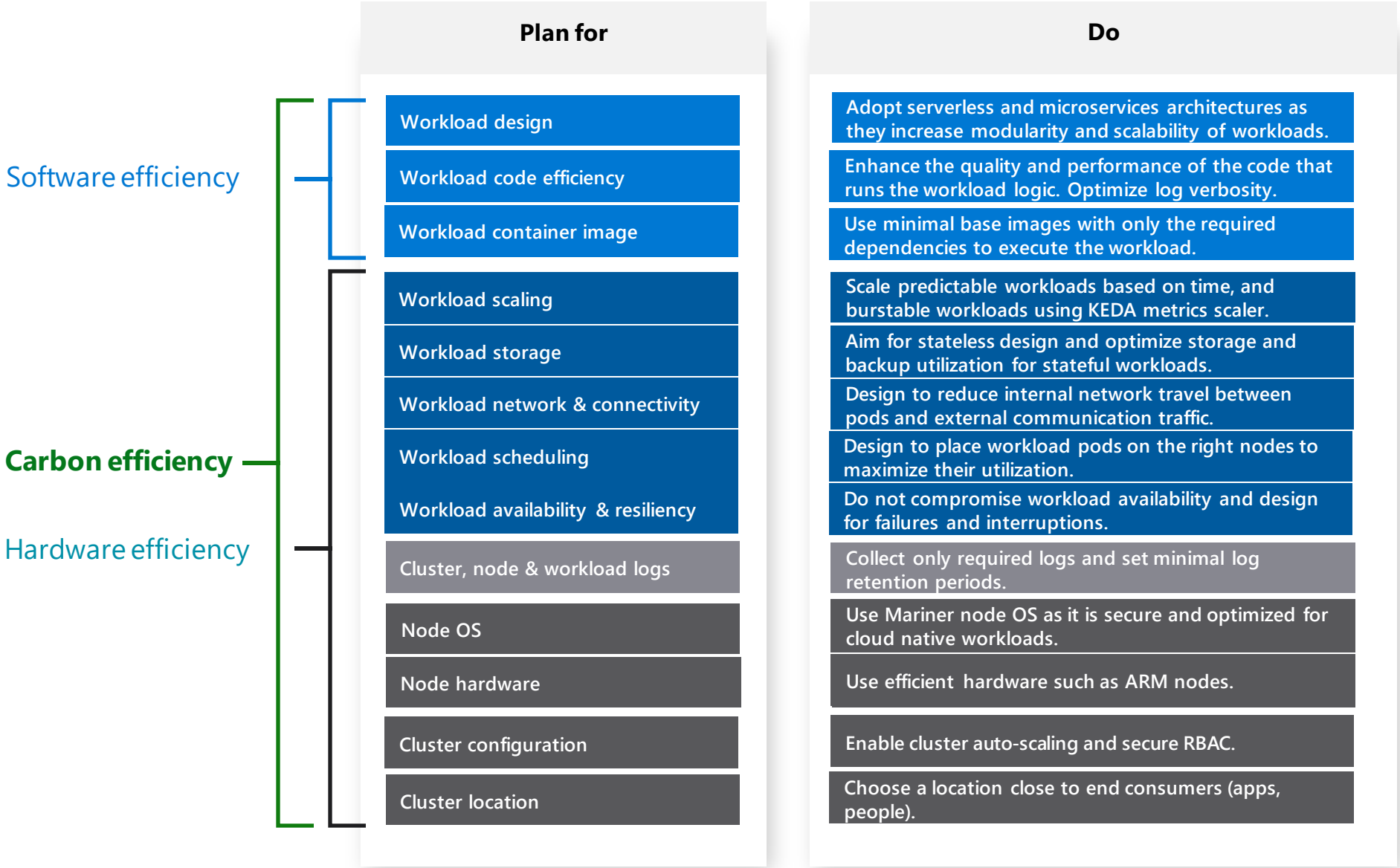
- Node OS
- Node Hardware

Principle 3: Carbon Efficiency

Carbon Efficient Workloads

- **Carbon** is often used as a broad term to refer to the impact of all types of emissions and activities on global warming.
- **Carbon efficient workloads** minimize the amount of carbon generated per unit of work.
- **Carbon efficiency** is a function of software and hardware efficiency and local power sources.

Building sustainable workloads



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Measuring Emissions by Proxy

Building a Carbon Scoring Dashboard

- Cost
- Performance
- Carbon emissions of the infrastructure (if known/available)
- Usage over time (requests, users, API calls, etc.)
- Any extra measurement that is relevant to the application

Principle 4: Carbon Awareness

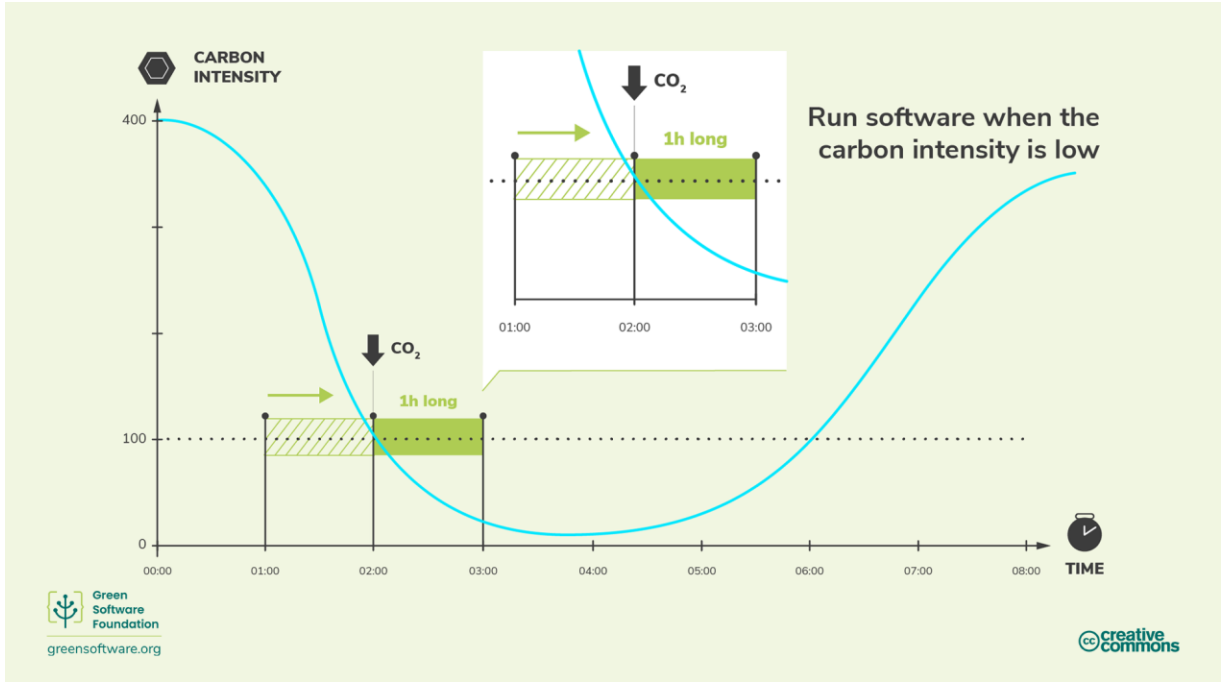
Designing Carbon Aware Workloads

DEMAND SHIFTING

DEMAND SHAPING

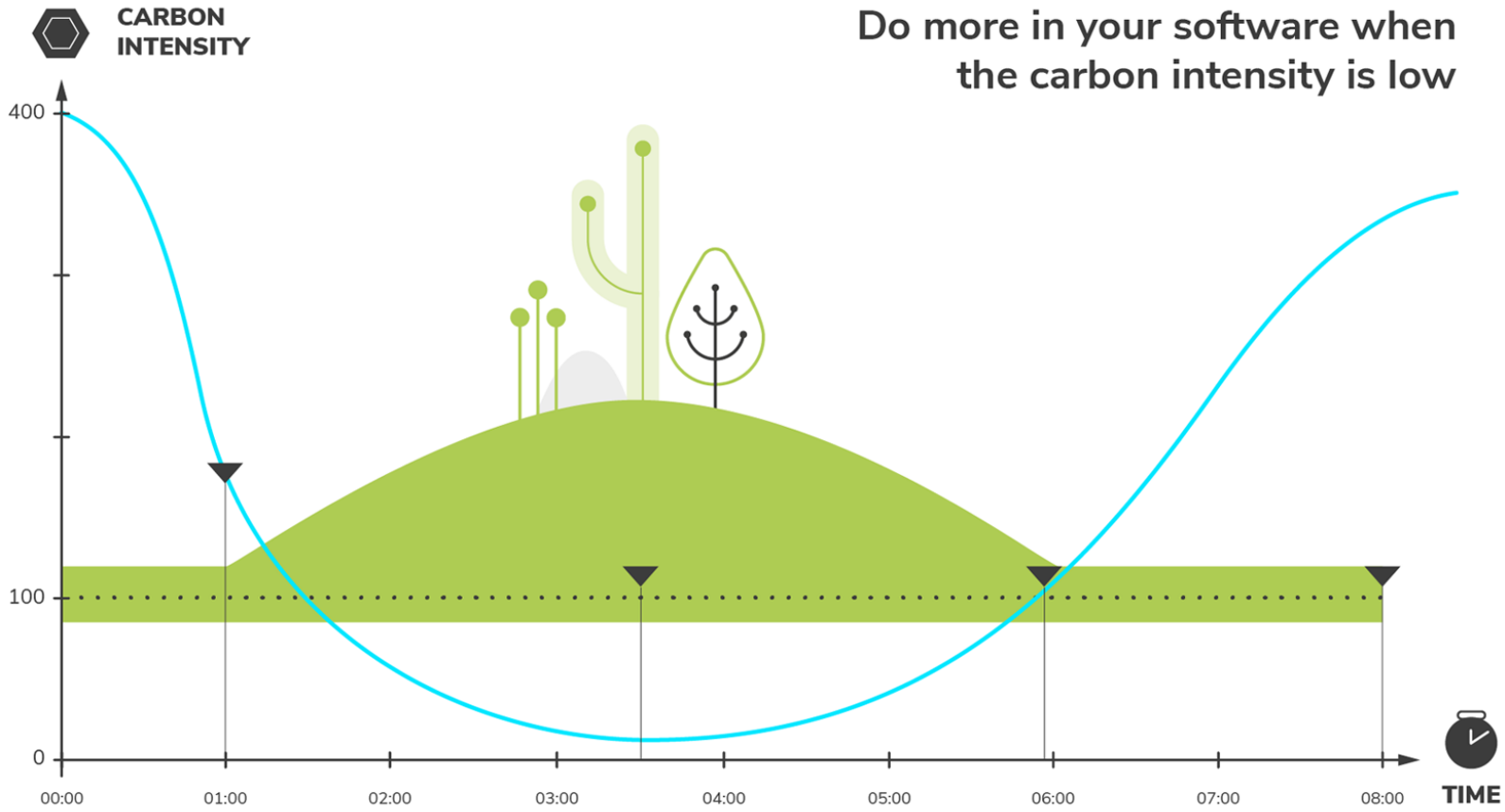
Demand Shifting

Spatial



Temporal

Demand Shaping



Green Software Foundation

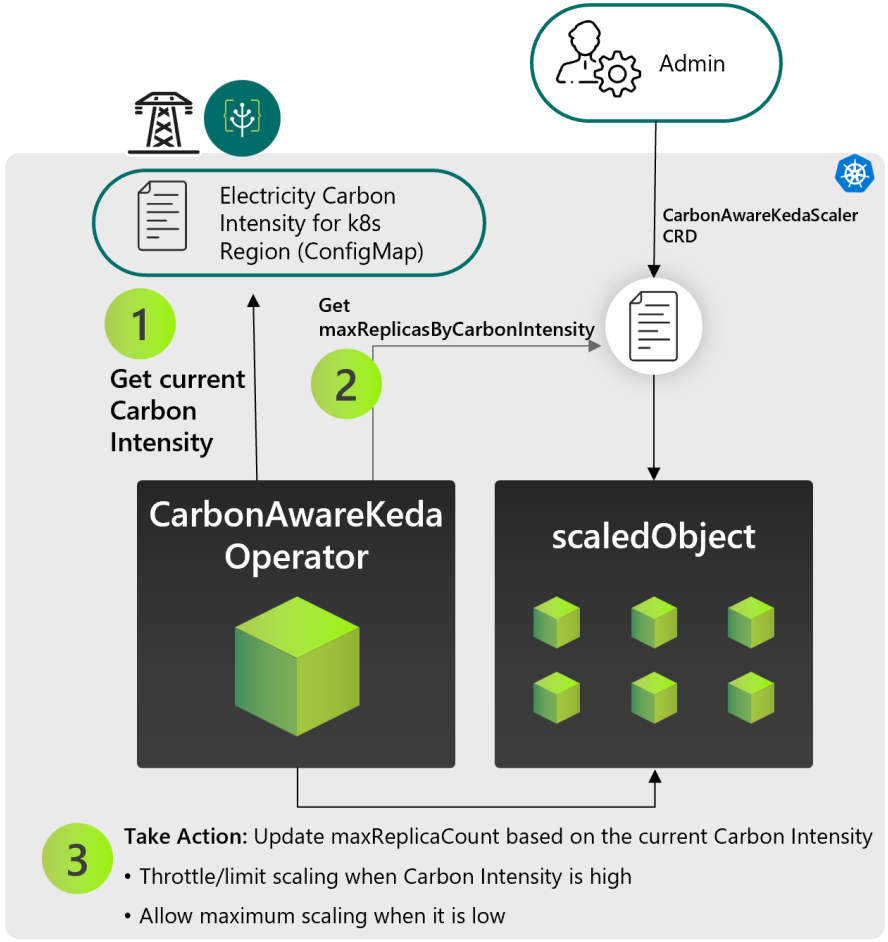
greensoftware.org

creative commons

Microsoft Azure

Demand Shaping

Carbon aware KEDA Operator



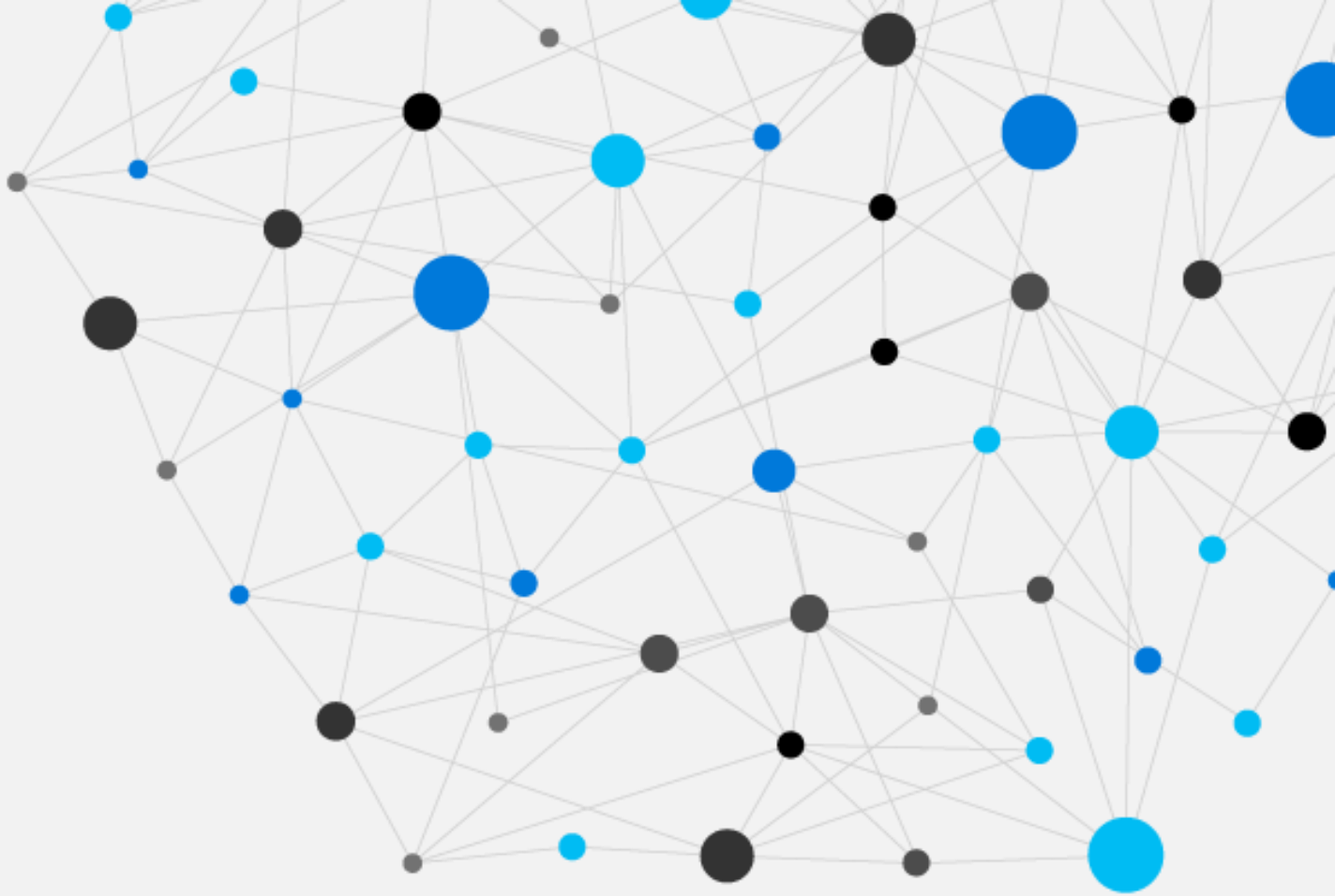
Step 0: Admin creates CarbonAwareKedaScaler

Every 1 hour:
CarbonAwareKeda Operator:

1. Gets the current carbon intensity
2. Gets KEDA targetRef scaling inputs
3. Updates targetRef MaxReplicaCount based on current carbon intensity

Demo

Carbon Awareness with Kubernetes



Measuring the Carbon Intensity of Software

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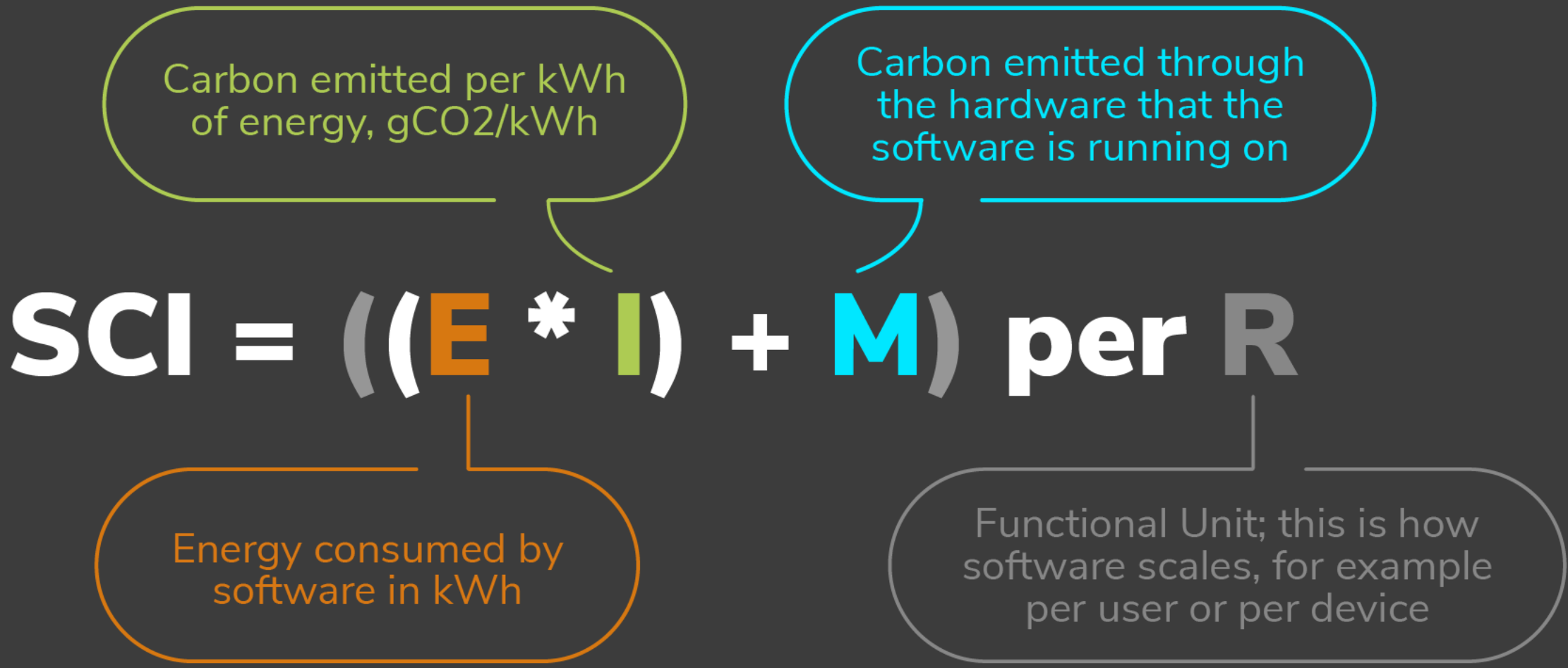

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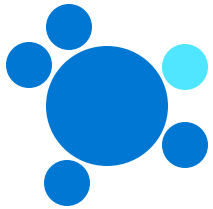
Resources



Sustainable software engineering practices in Azure Kubernetes Service

https://aka.ms/aks/learn-sustainable-software

Principals of Green Software

https://aka.ms/priniciples-of-green-software

Carbon Aware Keda Operator (on GitHub)

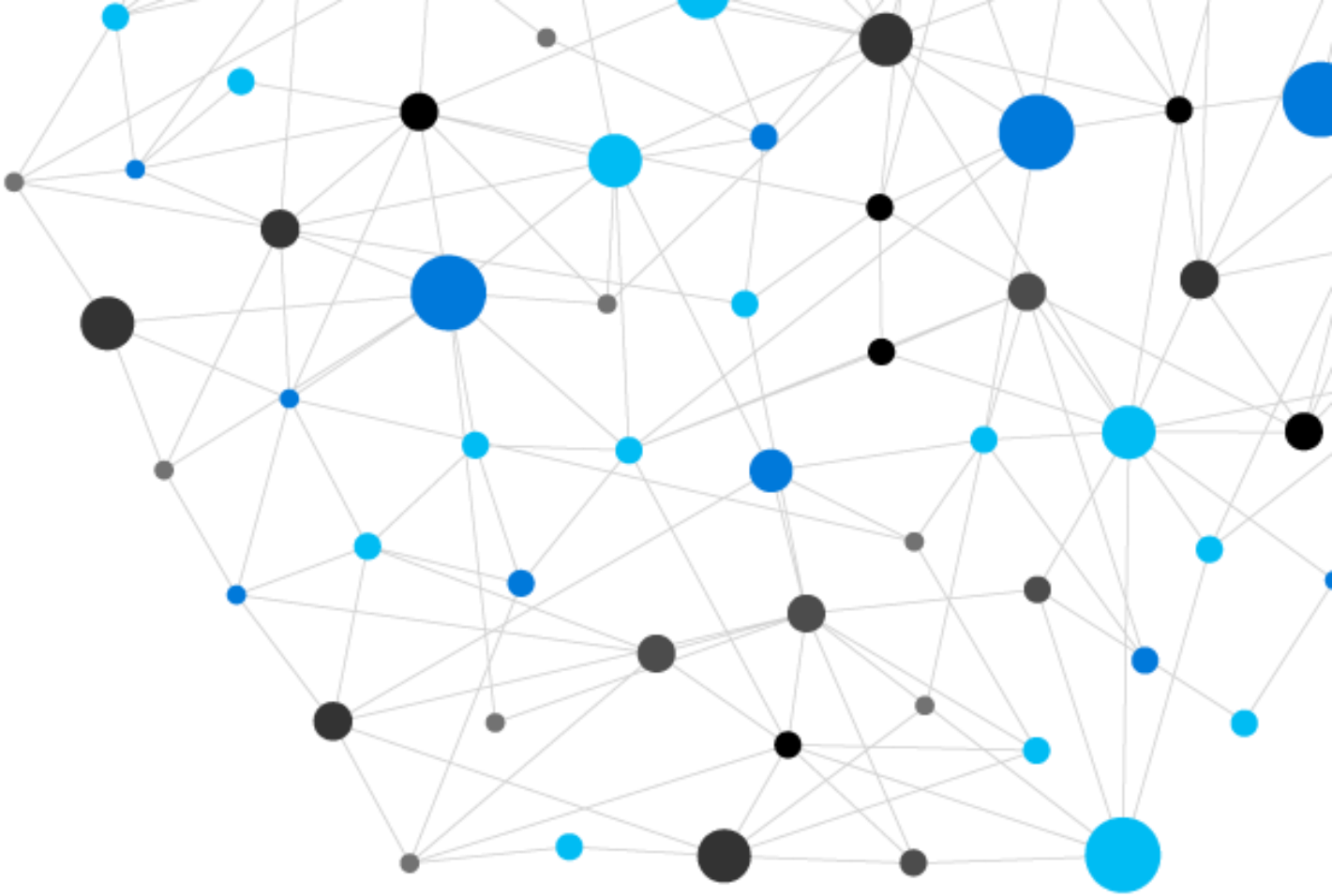
https://aka.ms/carbon-aware-keda-operator

Sustainable Workloads (Well Architected Framework)

https://aka.ms/waf/sustainable

Q&A

Please submit your questions into the Q&A window. We have Subject Matter Experts ready to answer your questions.



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