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# Seeding Environmental Sustainability Into the Cloud Native Community

**Max Körbächer | Co-Founder Liquid Reply**

#ossummit @mkoerbi

THE LINUX FOUNDATION

# Max Körbächer - Co-Founder @ Liquid Reply

My work is all about
**Kubernetes Consultancy & Cloud Native Advisory**

- Former Enterprise Architect, yet design and build hyper converged infrastructures and cloud agnostic solutions
- Contributed 2,5y to the Kubernetes release team, related K8s technologies and initiated the CNCF Environmental Sustainability Working Group

**mkoerbaecher**

**mkoerbi**

REPLY
LIQUID

# Our CNCF Working Group for Environmental Sustainability is proposed as CNCF Technical Advisory Group

Depending on when you will see this, we are either a WG or already a TAG

# Terminology

**Emissions:** Umbrella term for many kind of pollution, mostly understood as Greenhouse Gases (GHG) but can be also micro particles.

**Greenhouse Gas:** Any kind of gasses caused by nature or human activities that trap heat in the atmosphere. GHG includes **carbon dioxide**, methane, ozone and others.

**Carbon Footprint:** Is the total amount of greenhouse gasses, often carbon dioxide, that a person, family, company, organization, or building (like a data center) releases to the environment.

**Embodied (Carbon) Emissions:** Embodied, sometimes referred to as Embedded, Carbon Emissions are all emissions caused during a good's production.

**Scopes - Where and how are emissions caused?**

**Scope 1:**
Emissions from sources that an organisation owns or controls directly – for example from burning fuel in our fleet of vehicles

**Scope 2:**
Emissions that a company causes indirectly when the energy it purchases and uses is produced. For example, by using cloud resources.

**Scope 3:**
Emissions that are not produced by the company itself, and not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for, up and down its value chain. E.g. the server you are using on you IaaS or Cloud provider.

# The Problem

## Global Data Centers

Consuming around **2%** of the global energy.

Expected to grow within the next couple of years by **additional 2%**.

Reaching a peak of **12%** of the consumed energy by 2024

*treat this numbers with care, studies to this are old

## Data, Distribution and Digitalization

The explosion of **data generation, connecting everything and the digital opening** of not yet well connected countries will lead to an **exponential growth**.

Old systems and hardware as well as data center are not very efficient.

## Carbon emissions are everywhere

Carbon emissions are caused in **any step of the production** of products and services.

This also counts for IT. The **major part** of carbon emissions are caused by the production of chips, server and other hardware components.

Our goal is to advocate for, develop, support, and help evaluate environmental sustainability initiatives in Cloud Native Technologies, to help reach net-zero goals and simplifying the processes to do so.

# Main Activities

## Growth

Identify, define, and develop tooling

## Community

Reaching out to the people and placing environmental sustainability close to your heart

## Quantification

Of energy consumption of applications

## Collaboration

With other foundations and groups

## Recommendations

Recommendations to reduce energy consumption of software

## Evaluate

Technological and architectural health of projects

# Better together*

Green Software Foundation

Change the culture of building software across the tech industry, so sustainability becomes a core priority to software teams, just as important as performance, security, cost and accessibility.

OPEN Compute Project®

The Open Compute Project (OCP) is a collaborative community focused on redesigning hardware technology to efficiently support the growing demands on compute infrastructure.

OS-C

OS-C is establishing an Open Source collaboration community to build a data and software platform that will dramatically boost global capital flows into climate change mitigation and resilience.

*just a selection, there are many more fantastic organizations

# Better together*

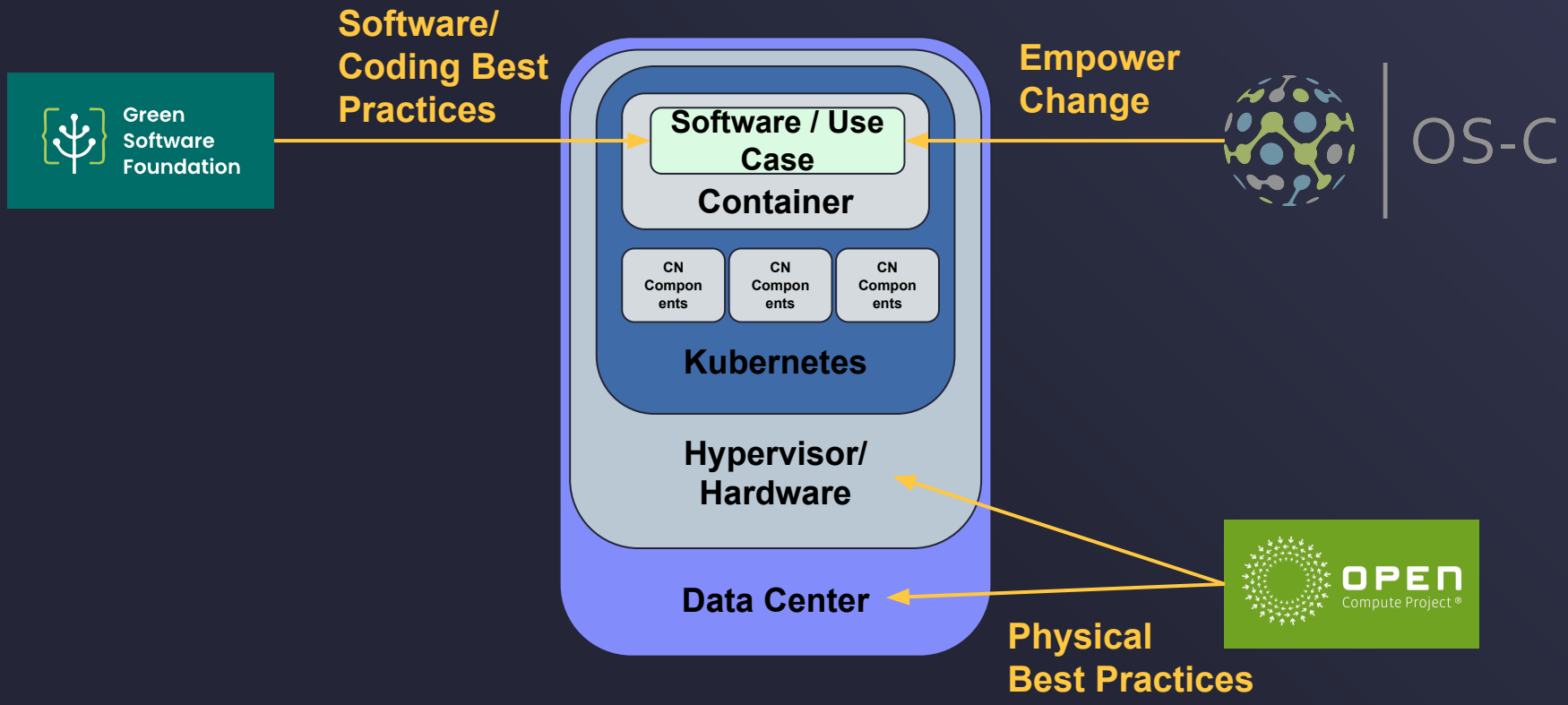

- culture of building software
- sustainability as core priority for software teams
- Software Carbon Intensity (SCI) Specification


- redesigning hardware
- support growing demands on compute infrastructure
- Heat reuse & future technology

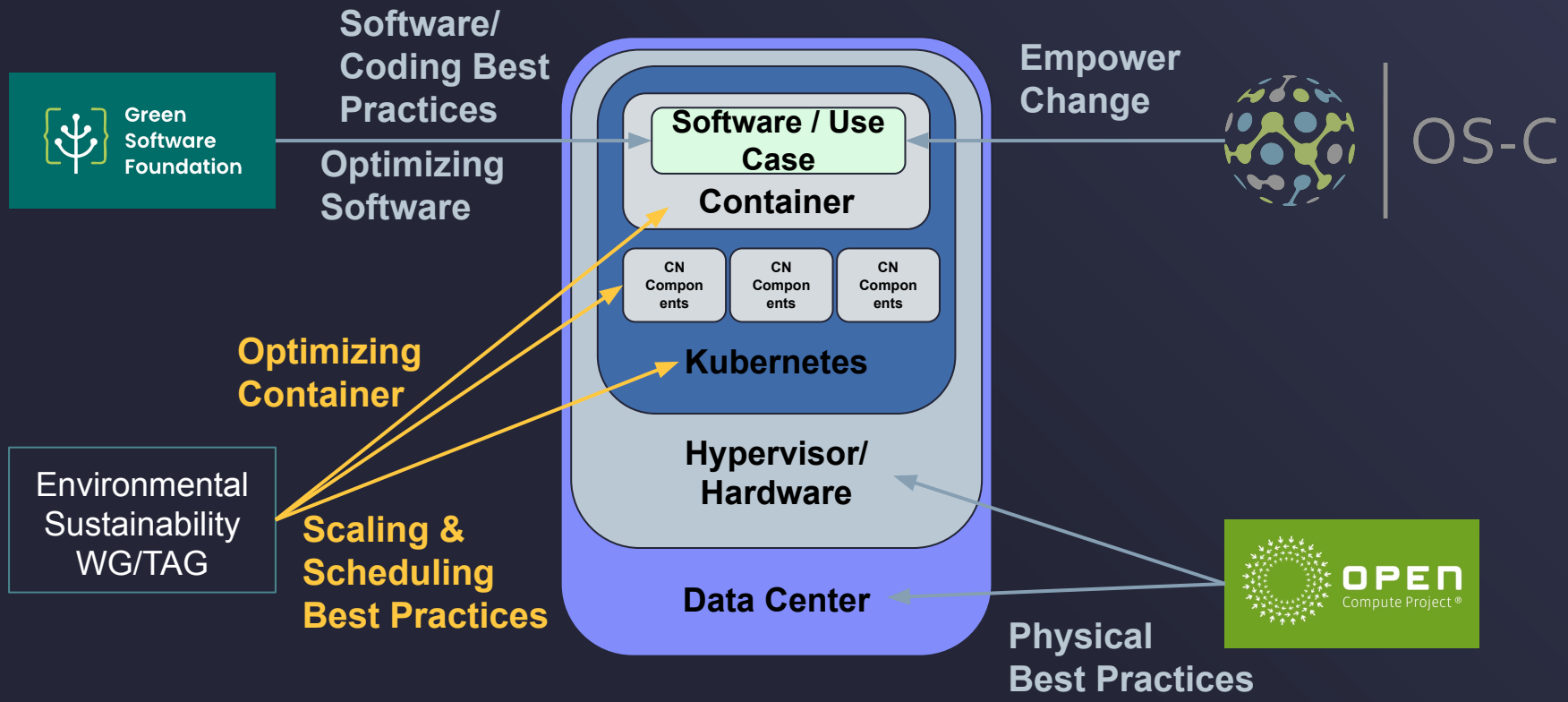

- data & software platform to empower sustainable solutions
- tools that manage climate-related risk and finance climate solutions

*just a selection, there are many more fantastic organizations

# Cloud Native Perspective



# Cloud Native Perspective




the here given examples should show how the different initiatives play together

I believe we can be only successful if we are working together solving the different dimensions within the computing environment.

This will be even more important with growing edge computing, massive data and large scaled AI.

# Challenges & Solutions

The super power of Kubernetes relies in its capability to

- run nearly anywhere
- effectively manage workload
- being an extensible platform
- strongly integrates with hypervisors and cloud providers

and therefore being a perfect target for optimizations

For sure, K8s also can be an overhead solution, but I believe it is possible to define the break even point for sustainability, performance and efficiency.

What could Kubernetes and Cloud Native do?

# The Cloud Native “Can and have to”

## Can do*

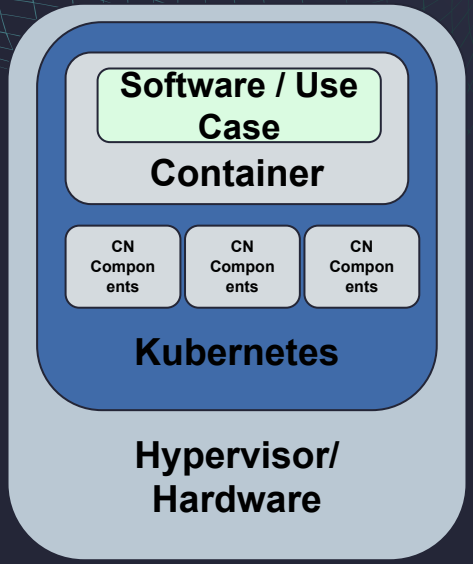
Optimize Container Images

Schedule containers for high density

Scale containers to zero

Scale clusters to zero

Optimize nodes, HW (e.g. ARM based) and OS




## Have to*

A future without container?

Schedule based on carbon data

Scale based on carbon data

Design architectures for sustainability

Improve power management

*selection of topics that are obvious

A key missing link:

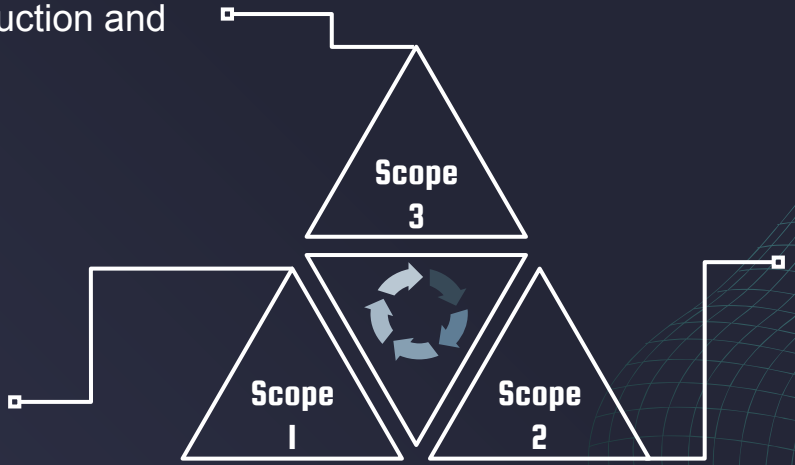
Data about energy consumption

AND

Data on caused CO2 emissions per kWh

# The final boss fight

Here are from our perspective >80% of carbon caused. Through manufacturing, construction and transportation.




This is very software, cloud native and Kubernetes can get better.

Not very relevant, except you produce your own energy

# Join Us - Change things

Talk with us on the CNCF Slack, find a team to work with or show us your ideas!

Find us on the CNCF GitHub, discuss current working artifacts and review our deliverables.

Join our mailing list and most importantly virtual meetings!

# We have to start now

And everyone, every profession has to be part of it, to ensure a planet which is worth to live at

# THANKS!

Does anyone have any questions?

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