Building green software with the Software Carbon Intensity Specification

Green Software Foundation - Building a trusted ecosystem of people, standards, tooling and best practices for green software.
Who am I?

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Agenda

- Introduction
- Structure of the GSF
- Projects
- Software Carbon Intensity
- Q&A
Structure

Why we exist and how we are structured
Our Theory Of Change

Mission
Change how we build so there are zero harmful environmental effects.

Vision
We are building a trusted ecosystem of people, standards, tooling and best practices for creating and building green software.

Who we serve
Primarily software practitioners
Secondarily leaders, policy makers, students, and anyone in software adjacent roles.

We need changes in
- Tech culture
- Knowledge
- Tooling

so that the environmental effects from software are
- made a priority
- studied, taught & understood
- easy to act upon
Why do we need a Foundation?

Enable Collaboration
Gives organisations clarity regarding patent rights, IP, copyright with shared work and agreed methods of coming to a decision.

Trusted Ecosystem
Create an ecosystem of standards, tooling and best practices which can be trusted by enterprises, governments and the public.

Increased Market Size
Increases the demand for people, services, and products that support the creation and maintenance of green software.
We Represent the Global Software Industry

Our members operate in over 190 countries

with a global workforce of over 1.5 million people

Five of our members are FORTUNE Global 500 companies

Our steering members

accenture
avanade
BCG GAMMA
GitHub

Globant
intel
Microsoft
NTT DATA

thoughtworks
UBS

Our general members

amadeus
AVEVA
University of BRISTOL
Container Solutions

<epam>
FUTUREWEI
Goldman Sachs
KERING

leaders for climate action

Texas State University
The Green Web Foundation

SuperCritical

University of Salento
virtasant
vmware
Projects

A few of the projects being run in the Foundation
Green Software Practitioner Certification

- Training and certification for Green Software.
- Goal is 1 million practitioners certified by end of 2023.
Green Software Patterns Catalog

- Catalog of best practices for building Green Software.
- Verified by subject matter experts from the GSF.
- Agreed via consensus by all member organizations.
- Apply any of these patterns in your software and it will reduce your emissions.
Releasing a toolkit that enables developers to easily build applications that do more when the electricity is cleaner and less when it’s dirty.

One of the hottest topics in green software.

Focus of the Carbon Hack 22.
Carbon Hack 22 is about building software that can reduce the amount of carbon emissions generated through software using the new Carbon Aware API.

grnsft.org/hack22/api
Software Carbon Intensity

- Release of version 1.0 of the Software Carbon Intensity Specification.
- Helps organizations *eliminate* emissions.
- Essential part of any *Net Zero* strategy.

Tags: Tech Culture, Tooling
What makes software green?

**Carbon Efficiency**
Emit the least amount of carbon possible

**Energy Efficiency**
Consume the least amount of electricity possible

**Hardware Efficiency**
Use the least amount of embodied carbon possible

**Carbon Awareness**
Do more when the electricity is clean and less when it’s dirty
Do totals tell the whole story?

Q1: Carbon emissions are 34 tonnes

Q2: Carbon emissions *increased* to 52 tonnes
Do totals tell the whole story?

Q1: Carbon emissions are 3.3g per User
Q2: Carbon emissions are 2.9g per User
Software Carbon Intensity (SCI)

The SCI score is a rate of carbon emissions, not a total. The equation is a simple and elegant solution to the extremely complex problem behind it:

\[
SCI = \left( \left( E \times I \right) + M \right) \text{ per } R
\]

- **Carbon emitted per kWh of energy, gCO2/kWh**
- **Carbon emitted through the hardware that the software is running on**
- **Energy consumed by software in kWh**
- **Functional Unit; this is how software scales, for example per user or per device**

The “per R” is what makes the SCI into a tool that works for every software domain, every use case, and every person.
Core characteristics

As this specification develops, the following core characteristics shall remain true:

- The SCI is sensitive to carbon awareness, energy efficiency, and hardware efficiency
- The SCI takes a systems-impact view
- The SCI is easy to implement
- The SCI encourages the use of granular data

Exclusions

Only actions that eliminate emissions reduce an SCI score. As such, an SCI score cannot be reduced through carbon offsets, such as market-based measures.
Launching Q1 2023

The State of Green Software will be the first report to map the new green software ecosystem, from key stakeholders to regulatory frameworks, from impact metrics to academic literature, open source tooling to actionable design patterns.

Get involved, take the 5 min survey now

Take the survey now

grnsft.org/sogs/survey
Thank you!

https://greensoftware.foundation