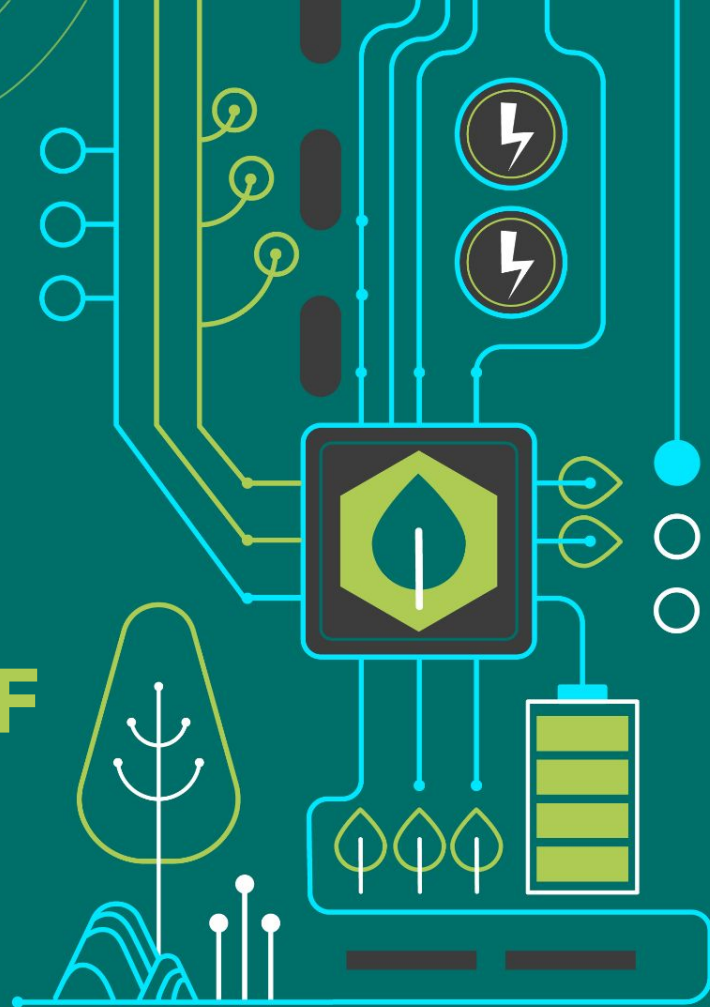




Green
Software
Foundation

Introduction to the GSF

Building a trusted ecosystem of people, standards, tooling and best practices for green software.



Who am I?

Abhishek Gupta

Chair, Standards Working Group
@ Green Software Foundation

<https://abhishek-gupta.ca>

https://twitter.com/atg_abhishek

<https://linkedin.com/in/abhishekguptamcgill>

Founder and Principal Researcher, Montreal AI Ethics Institute
Senior Responsible AI Leader & Expert, BCG
Fellow, Augmented Collective Intelligence, BCG Henderson
Institute
Author, The AI Ethics Brief and State of AI Ethics Report



About Our Foundation

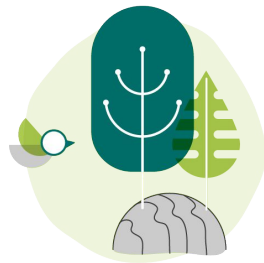


Why do we need a Foundation?



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.



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.



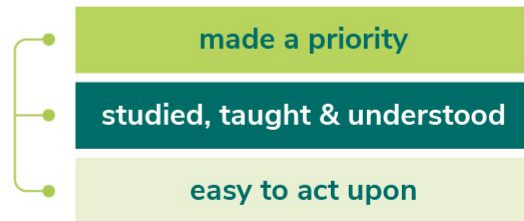
Who we serve

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

We need changes in



so that the environmental effects from software are



Structure

Linux Foundation

Steering Committee



Standards WG



Policy WG



Open Source WG



Community WG



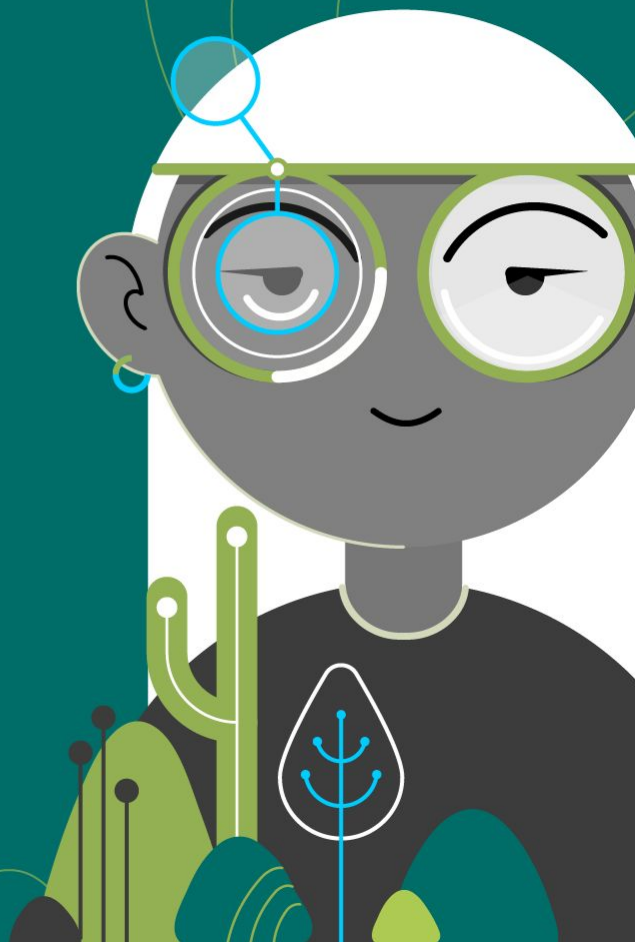
Green
Software
Foundation



Annual Report

2022

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The Year in Green Software



First newsletter



First translation



First elections



GSF Global
Summit 2022



State of Green
Software Project



GSF Speakers Bureau



CarbonHack22



COP27 event



SCI approved and
submitted to ISO



Green Software for
Practitioners course



GSF Patterns
catalog

Representing the Global Software Industry

Our steering members

accenture

avanade

BCG
GAMMA

GitHub

Globant

intel

Microsoft

NTT DATA
Trusted Global Innovator

/thoughtworks

UBS

Our general members

AMADEUS

AVEVA

13

University of
BRISTOL

Container
Solutions

ELECTRICITY MAPS

<epam>

FUTUREWEI
Technologies

Goldman
Sachs

INTESA SANPAOLO

KERING

LEADERS
FOR
CLIMATE
ACTION.

Lnu.se

Mastercard

NITIE

NRI

Open-UK

roost

SDIA

TEXAS
STATE
UNIVERSITY

THE EXPLORERS

THE GREEN WEB
FOUNDATION

Time for the Planet

Shell

Supercritical

SYNGENIO AG

UNIVERSITÀ
DEL SALENTO

virtasant

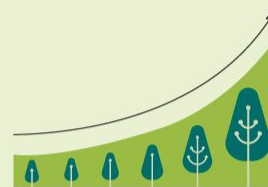
vmware

WattTime

We are Growing



Total number of countries represented:
190+



Growth of membership:
from 26 to 40



Individual members:
970



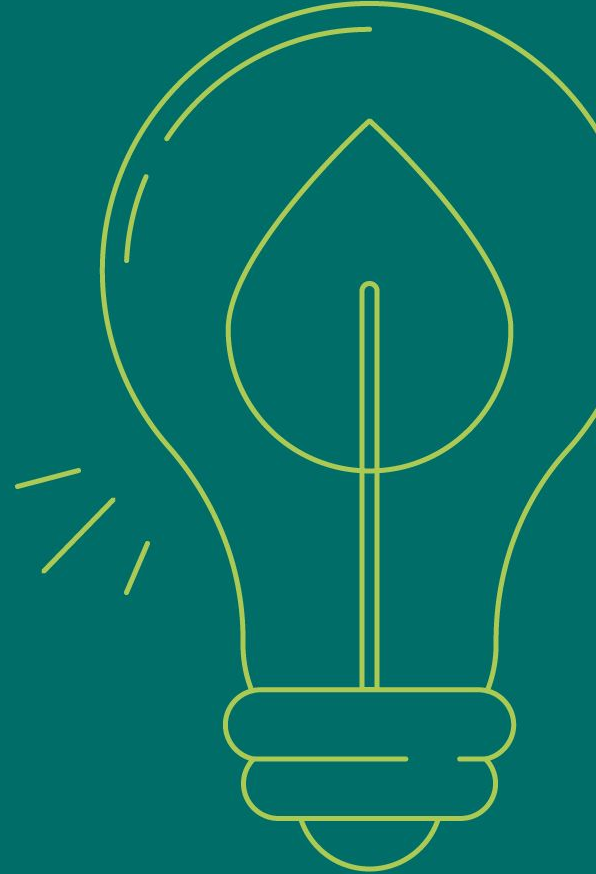
languages



projects



Our Projects





Measuring:

What you can't measure,
you can't improve



Measuring Software Emissions

The Software Carbon Intensity (SCI)

We were able to release V1.0 of our Software Carbon Intensity (SCI) specification this year. The SCI is one of the core pieces for reducing carbon

emissions in software. It allows measuring emissions and modeling ways on how to reduce them. The next steps include use cases and case studies, some of which are already in process. We are also working on submitting the SCI for ISO certification. Version 2.0 is anticipated for release in 2023.

The diagram illustrates the formula for Software Carbon Intensity (SCI). The formula is $SCI = ((E * I) + M) \text{ per } R$. Each variable is color-coded and linked to a callout box: **E** (orange) is 'Energy consumed by software in kWh', **I** (green) is 'Carbon emitted per kWh of energy, gCO2/kWh', **M** (blue) is 'Carbon emitted through the hardware that the software is running on', and **R** (grey) is 'Functional Unit; this is how software scales, for example per user or per device'.

$$SCI = ((E * I) + M) \text{ per } R$$

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



Green Software Practitioners Course

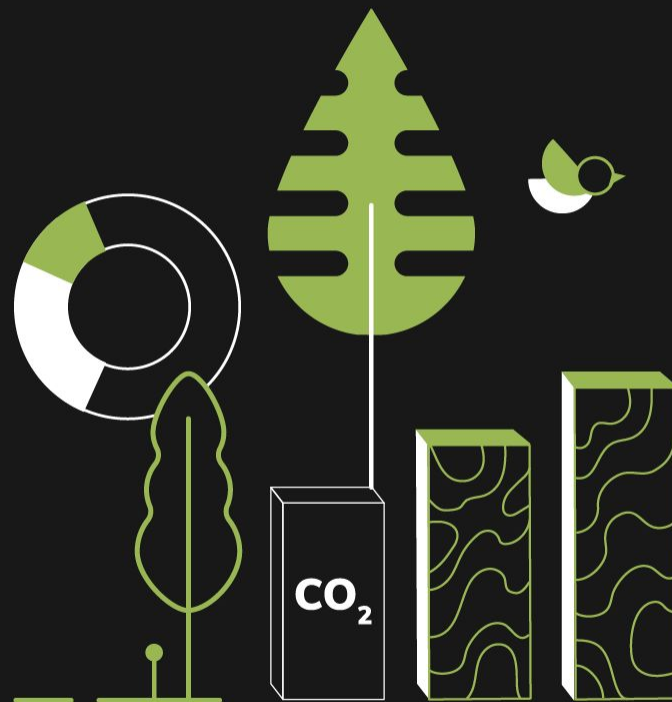
Our [Green Software Practitioners course](#) went live in November 2022. It aims to fill the void in green software education. This free online course covers the basics of green software, and participants can get trained up quickly, acquiring the necessary knowledge at their own pace. It intends to establish a minimum and consistent level of understanding for developers. The certificate of completion ensures recognition for the knowledge gained in decarbonizing software.





State of Green Software Report

On November 10th, we announced the launch of our SOGS survey. It is the most comprehensive survey to ever be conducted on the topic of green software. There is a great need for information on the green software ecosystem, which the [SOGS report](#) will cover. We intend to conduct the survey on an annual basis, revealing best practices, industry metrics, cutting-edge developments and more.





Green Software Patterns

[Our Patterns catalog](#) is an online open-source consolidated database of green software patterns categorized by field of engineering, technology and domain. Anyone can submit a pattern, triggering a detailed review process by the foundation's experts, who will look specifically at that pattern's ability to reduce carbon emissions. As of this year, we have a collection of the first batch of patterns which were reviewed and approved by the GSF. We anticipate publishing more patterns on a quarterly basis going forward.





Speakers Bureau

We were also able to announce the launch of our [Speakers Bureau](#) during COP27. Recognizing the demand for expert presenters in the green software arena, the website caters to different geographies and languages. It features a catalog of speakers in green software and facilitates the search and booking of the most knowledgeable practitioners in the field.

There are currently 80 speakers registered, all subject-matter experts willing to speak about green software at industry and corporate events. An extended version of the Speakers Bureau with added features is slated for release in 2023.





Our Events





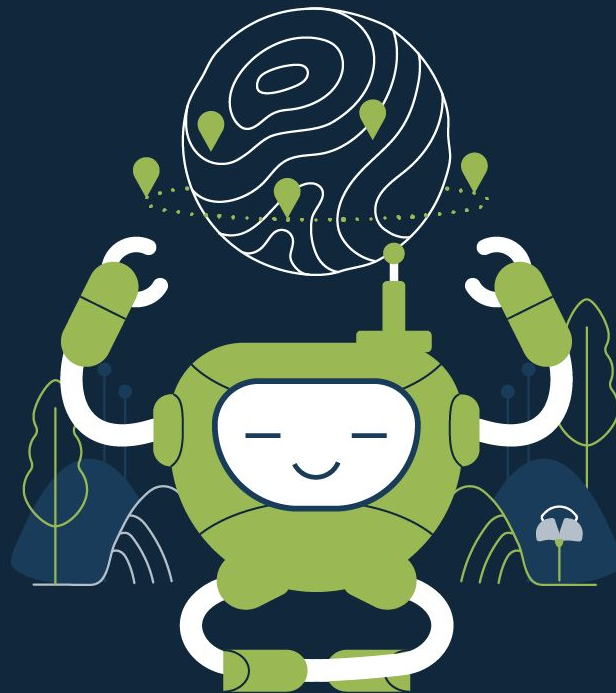
GSF Global Summit 2022

In June we held our first global summit, in which we shared our vision of changing how software is built and how to make sustainability a core priority in software development. Meetup members in 14 different countries participated in the 12-day event with various regional sessions, in-person, hybrid and virtual, culminating in the global closing ceremonies. The Global Summit stands for learning and collaboration across the continents.

It was amazing to see how so many like-minded individuals converged to talk about green software in an interactive and energizing setting. The GSF was able to provide educational content and networking opportunities for technologists looking to be more sustainable in their work.

One of the core messages was the promotion of using the Software Carbon Intensity (SCI) approach to measure carbon emissions in software. It gives developers an actionable tool to hard-wire carbon reduction into their applications.

If you have missed any of the events, session recordings can be found [here](#)! New events will be accessible through our [Meetup](#) page.

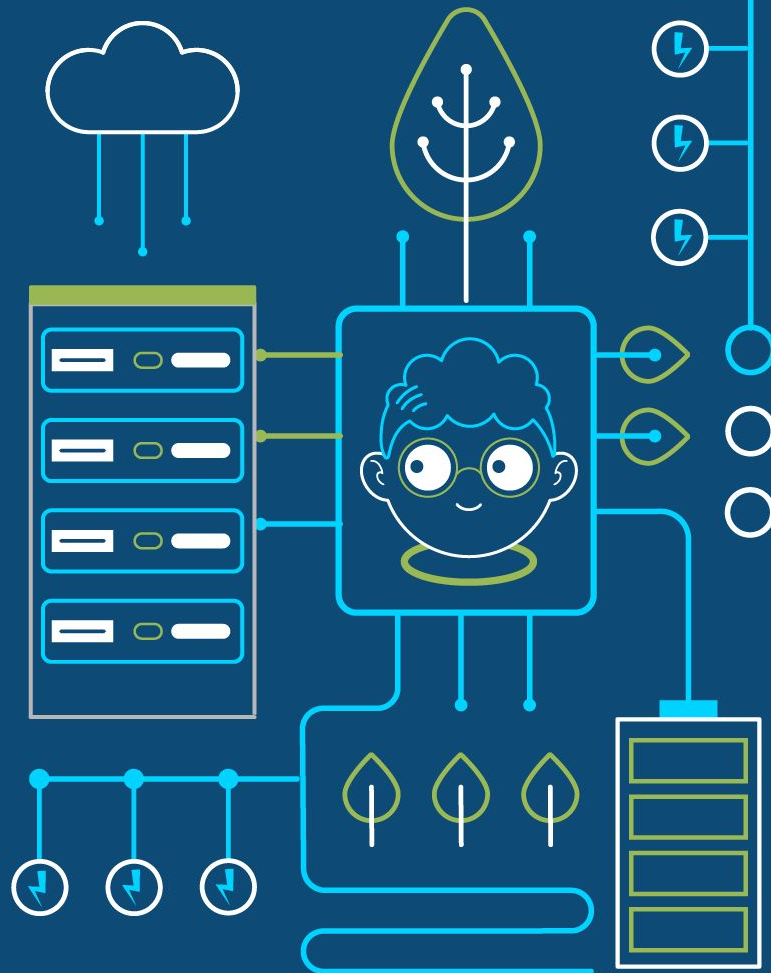




CarbonHack22

On October 13th we kicked off our first ever hackathon with winners announced on November 10th during the COP27 Decarbonization Day. We engaged developers from around the globe to build the best carbon aware application using our Carbon Aware SDK. There were 51 projects entries and a total of 395 participants. The total prize money from our sponsors amounted to US\$100,000.

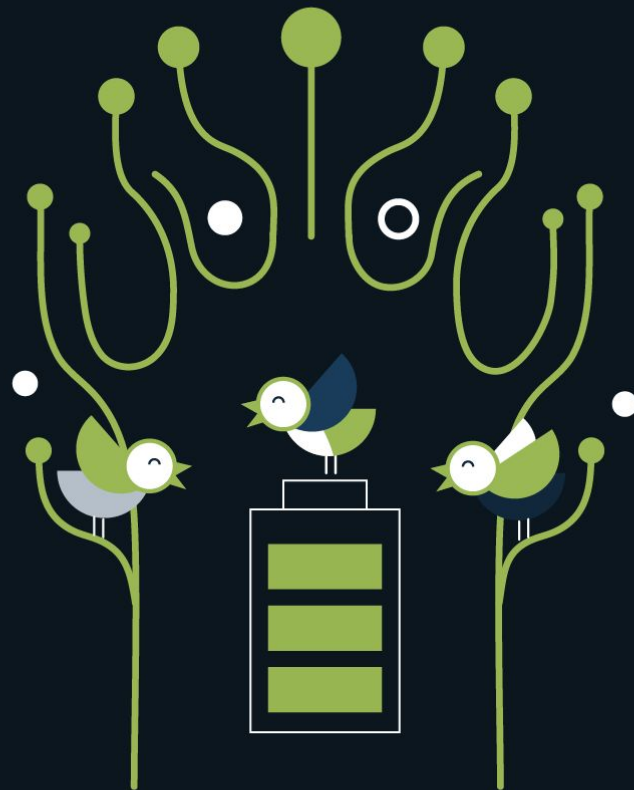
[CarbonHack](#) lays the foundation for continued innovation and development in green software. Adding carbon aware features to an application means we can eliminate part of its carbon footprint and reduce greenhouse gas emissions. The winner of this year's contest developed a plugin that enables carbon-aware scheduling of AI training jobs on geographically distributed clients. Many other groundbreaking projects were submitted.





Decarbonize Software at COP27

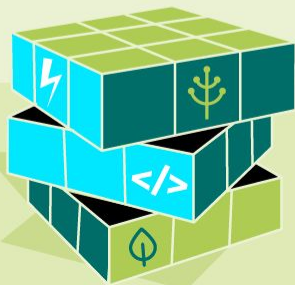
Coinciding with COP27, we held our [Decarbonize Software Event](#), promoting the most relevant developments in green computing. We shared the advancement of our Training and Patterns projects, the Speakers Bureau, SCI, Carbon Aware SDK and the State of Green Software report. There were a number of panel discussions on a variety of green software topics and we announced the winners of CarbonHack22.





Reducing Emissions:

Carbon Elimination, Avoidance
and Removal



Great Things are Planned



Q1 2023

GSF Annual Report



Q2 2023

State of Green Software Report



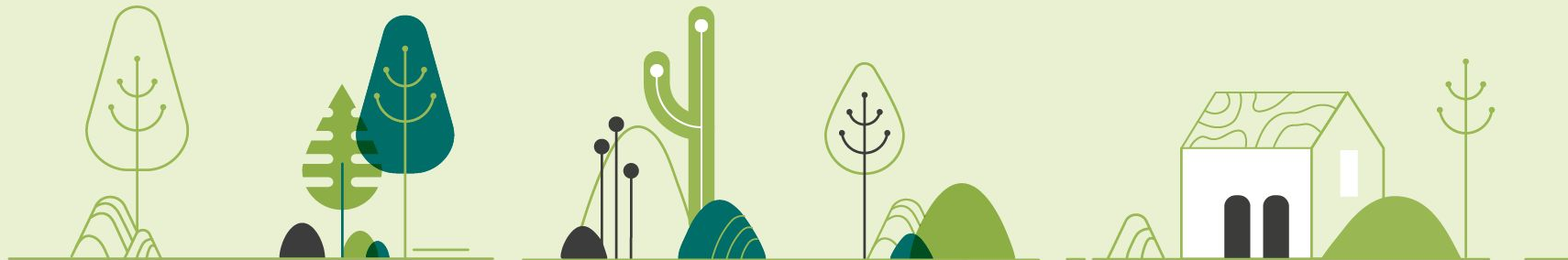
Q3 2023

TEDx GSF



Q4 2023

CarbonHack23 - COP28





Join Us!

If you want to join us on our journey, head to
<https://grnsft.org/report/join-us>