

# Green-Coding, Green IT and Greenification

Louis C. Tavares, Green-Coder

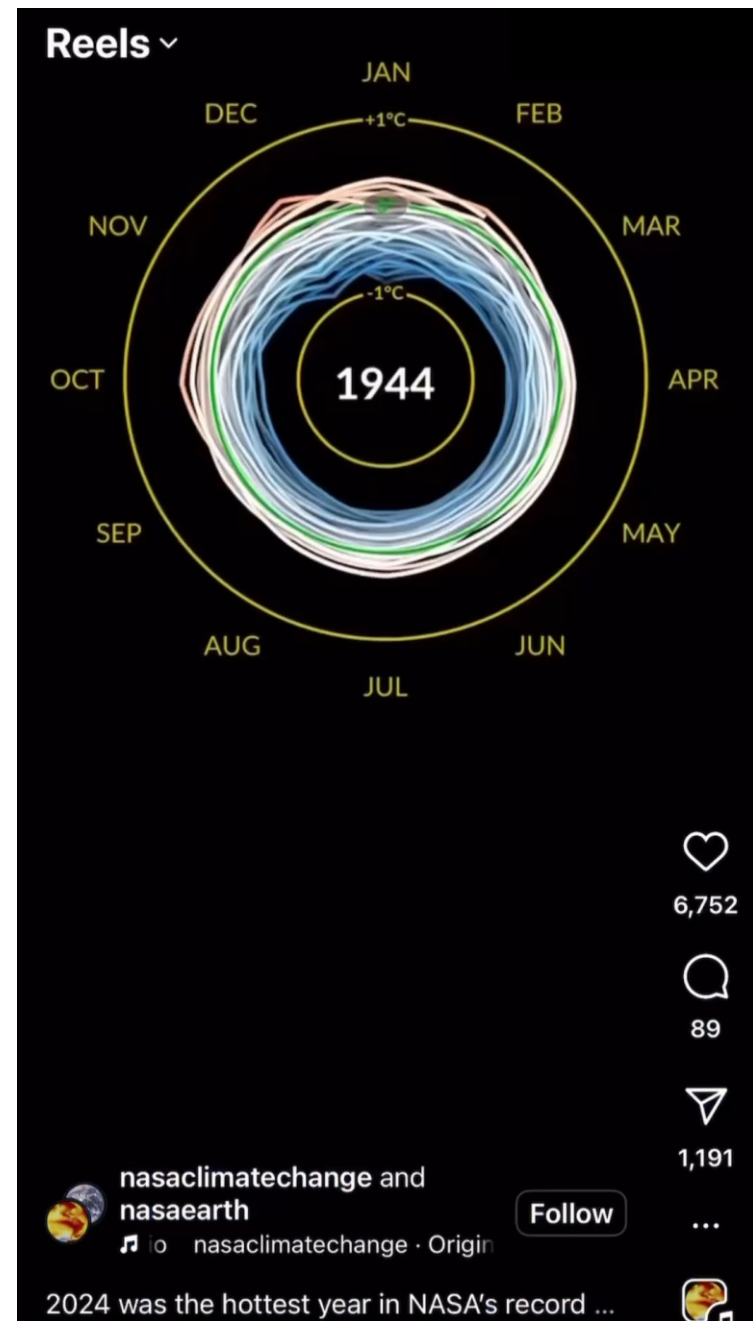
2025-02-28



# Reel about Global Warming



Link to Instagram:  
[bit.ly/435mFSR](https://bit.ly/435mFSR)



© NASA Climate Change – Instagram @nasacclimatechange

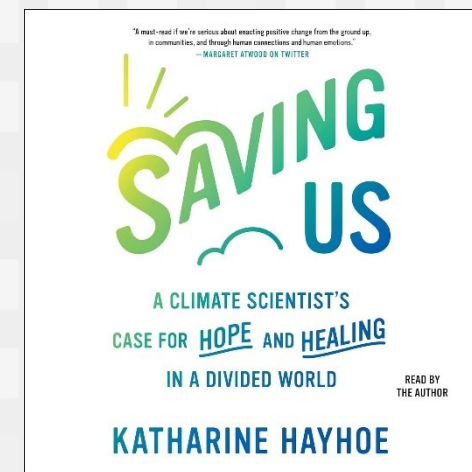


“What do you need to **solve the climate crisis?** The answer is, **everyone.**”



[amzn.to/3DcTD96](https://amzn.to/3DcTD96)

**Dr. Katharine Hayhoe, PhD**  
Canadian atmospheric scientist – Nature Conservancy’s Chief Scientist



## Video – Some of our Sustainability Projects at CGI Space

CGI  
delivers secure,  
mission-critical  
space systems  
to support  
climate missions

**et essentiels pour soutenir les missions climatiques.**



[bit.ly/41eLBEU](https://bit.ly/41eLBEU)

CGI – Space Industry and Sustainable Development (YouTube)

[cgi.com/space](https://cgi.com/space)

Today's **leaders understand** that becoming a **sustainable organization** is not only the right thing to do; it's the **smartest way to achieve business outcomes.**

**CGI Sustainability Services and Solutions**  
[cgi.com/sustainability](https://cgi.com/sustainability)



# Agenda

Topic	Slide
<a href="#"><u>Current Context</u></a>	07
<a href="#"><u>The Cloud Business Model Paradox</u></a>	08
<a href="#"><u>Choosing a Programming Language</u></a>	09
<a href="#"><u>The Python Problem... and Solution?</u></a>	11
<a href="#"><u>The Java Headache and Mitigations</u></a>	12
<a href="#"><u>Advices from a Green Coder</u></a>	13
<a href="#"><u>Demo – Containerized Apps</u></a>	14
<a href="#"><u>Chat About Cases and Certification</u></a>	15
<a href="#"><u>Some Links #1</u></a>	17
<a href="#"><u>Some Links #2</u></a>	18
<a href="#"><u>Contact us</u></a>	19





# Current Context

01

**Technology acceleration:** AI / gen-AI, big data and cloud computing

02

**Increasing Carbon Footprint of Bad Code:**  $\text{Energy} \propto \text{CO}_2 \propto \text{Cost}$

03

**Companies want to cut costs:** that include jobs... but rebound effect (Green-Coding)

04

**Coders Key Role:** propose and implementing greener solutions

# The Cloud Business Model Paradox

## The Cloud Business Model

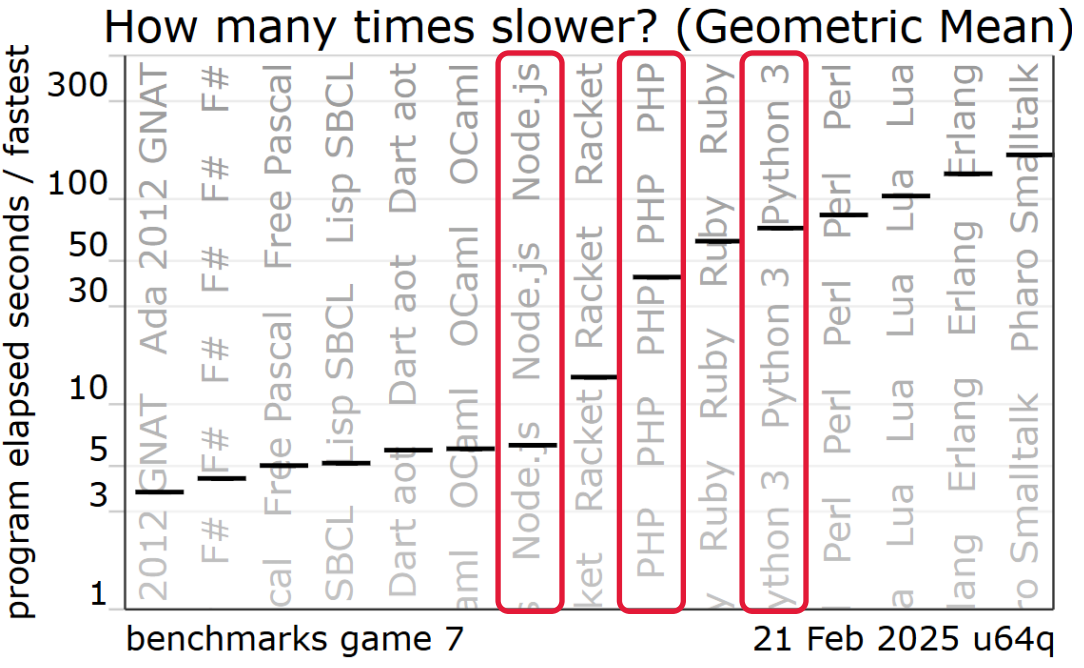
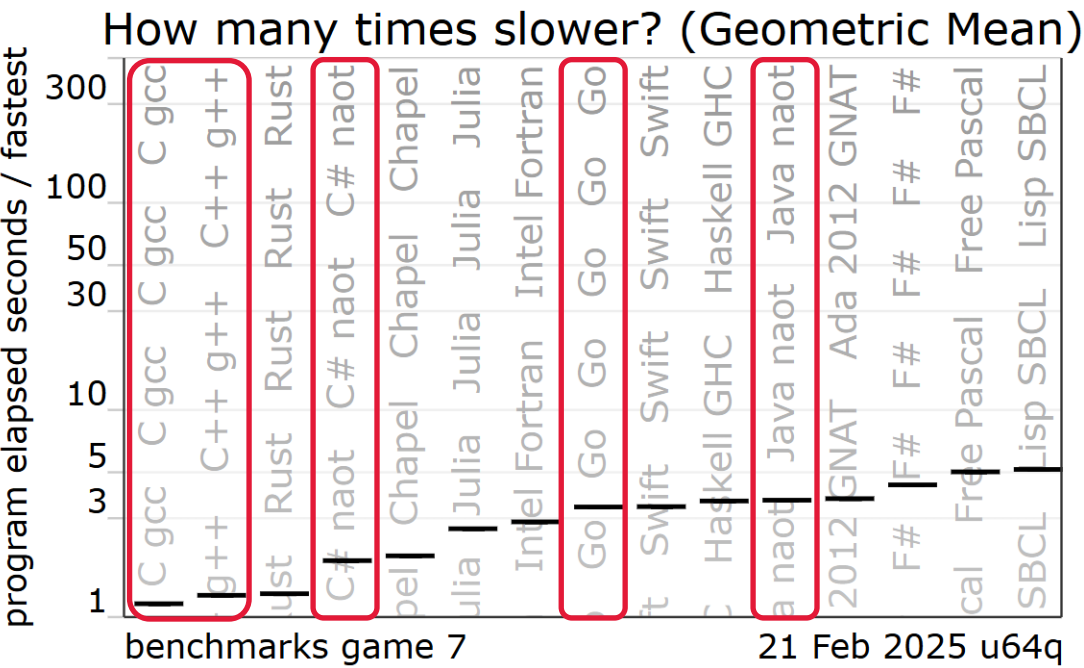
- Pay per Use (vCPU, Memory, Storage, Network etc.)

## The Paradox Question

- How do we trust the “Cloud Providers” to have our Green interest in mind, if we making components much more efficient (consuming less energy) means a negative impact in their pay-per-use model?



# Choosing a Programming Language



© Isaac Gouy. (n. d.). The Computer Language Benchmarks Game. [bit.ly/3QtWXzZ](https://benchmarksgame-team.pages.debian.net/benchmarksgame/)

Energy efficiency of programming languages (Benchmarks Game)

<https://benchmarksgame-team.pages.debian.net/benchmarksgame/energy-efficiency.html>

<https://benchmarksgame-team.pages.debian.net/benchmarksgame/>



“Every **inefficient** line of **code** isn't just a **technical debt** – it's a **financial burden** and a **carbon footprint** that silently impacts our companies and the planet.  
Let's code responsibly for a sustainable future.”

Louis C. Tavares

# The Python Problem... and Solution?

1

## What's wrong with Python here?

Widely used in AI implementations for its simplicity and extensive libraries like TensorFlow, PyTorch, and Scikit-learn etc.

But as per previous slide... slow  
(energy hungry)

- Xenia Tech – Common Programming Languages In Government And Banking: [bit.ly/3EMNotk](https://bit.ly/3EMNotk)
- Blockchain Council – Programming Languages in Government and Banking: [bit.ly/3Xdnmpg](https://bit.ly/3Xdnmpg)

2

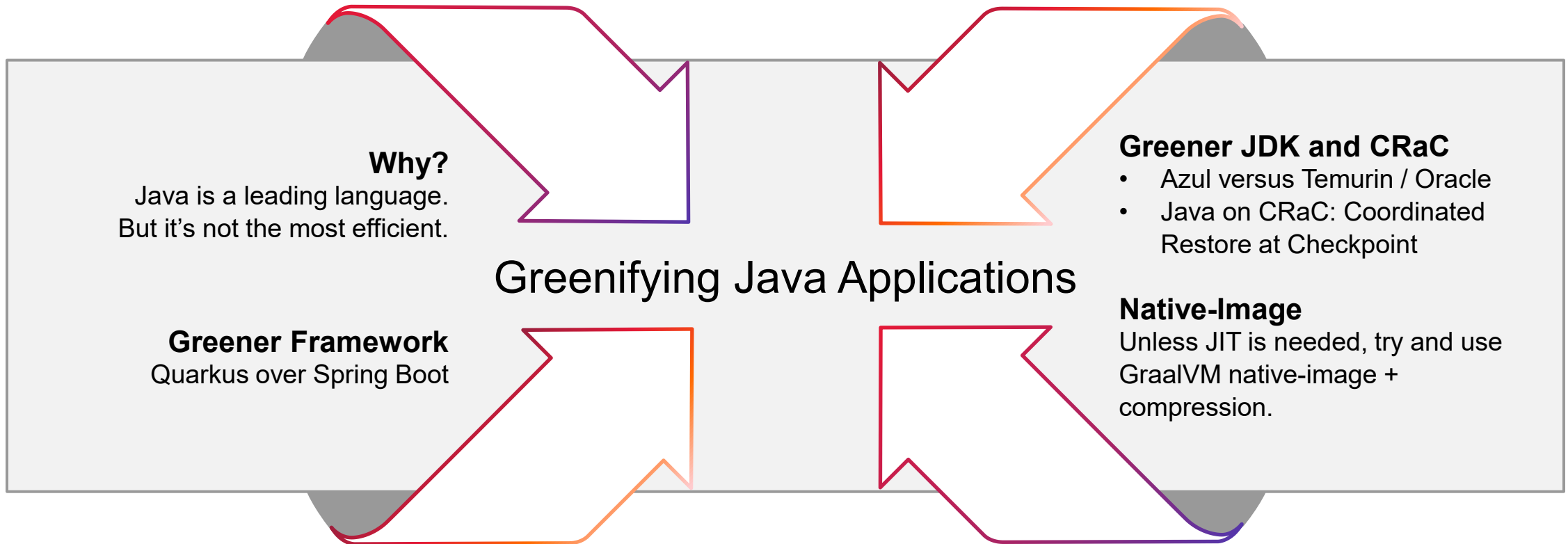
## Is Cython a Better Option?

Up to orders of magnitude faster  
(more efficient... uses much less energy)



[pybenchmarks.org/u64q/cython.php](https://pybenchmarks.org/u64q/cython.php)

# The Java Headache and Mitigations



# Advices from a Green Coder – Ask Questions

## Do we need this?

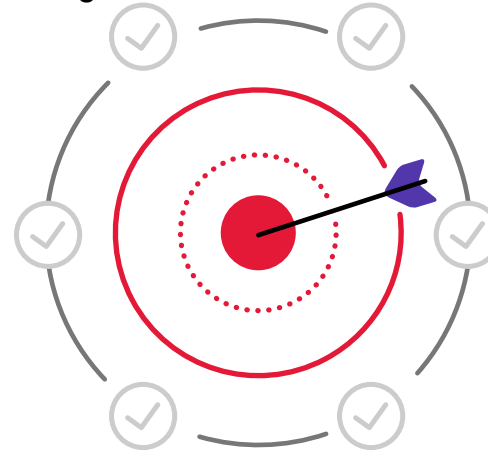
If a process is not really necessary, coding it will impact the environment for nothing

## Can I use a greener language/framework?

Whenever possible, as a coder, push for greener (more efficient) programming languages and frameworks

## Can I use Green-Coding Tools?

Use the tools in the market, Google Lighthouse, SonarQube Plugins etc. for Green Coding



## Can I do Reactive?

Reactive Programming offers significant improvements in performance and energy efficiency, for modern applications that require high responsiveness and scalability

## Can I do Native?

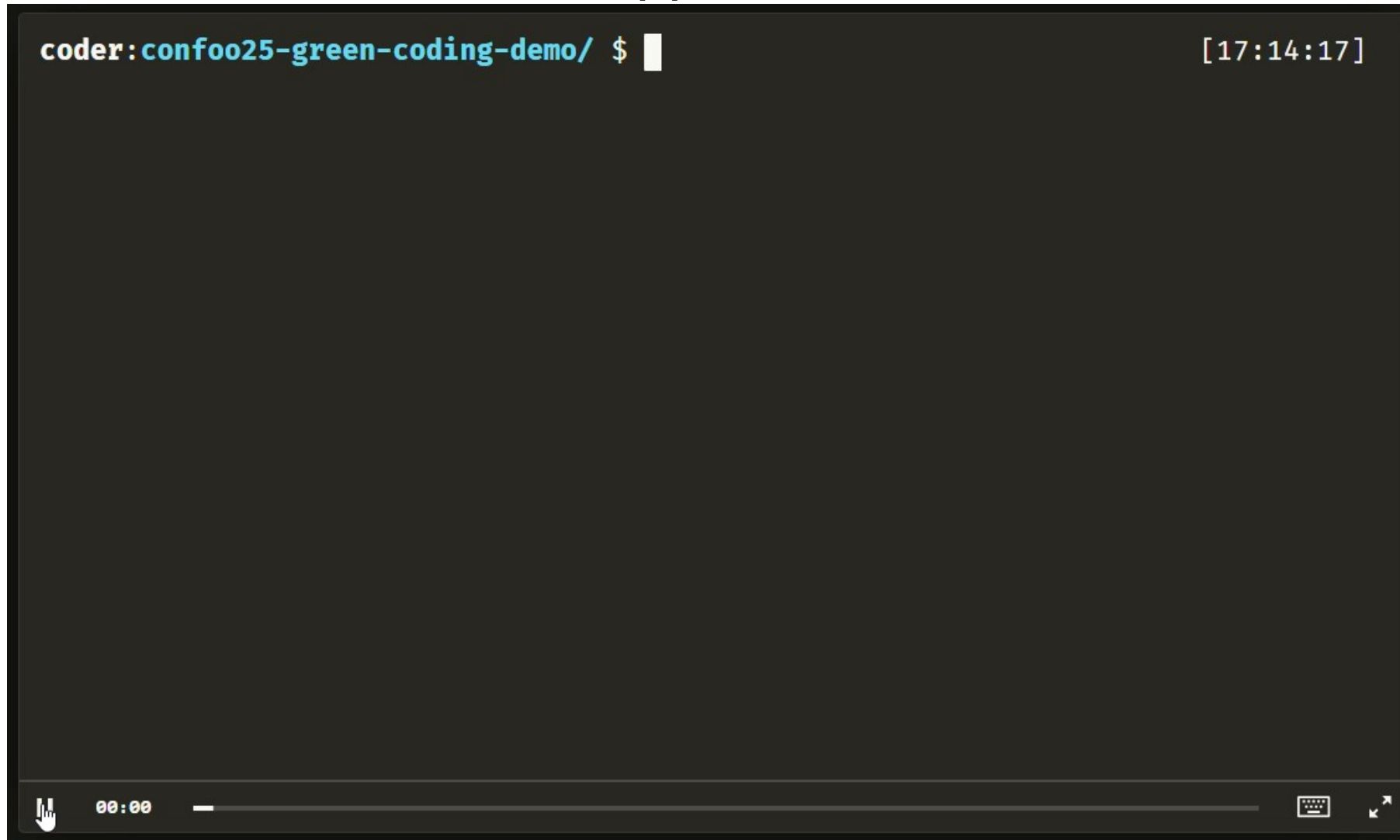
Native builds (ELF executables, .exe), C/C++, Rust, C#, Java GraalVM Native-Image...

**Bonus:** **compress** executables and dynamic libs with **UPX** ([upx.github.io](https://upx.github.io)). 50%-70% less storage, faster network load, download times, lower distribution and storage costs

## Is the operation efficient?


“The first rule of any technology used in a business is that **automation** applied to an **efficient operation** will magnify the efficiency. The second is that **automation** applied to an **inefficient operation** will magnify the inefficiency.” – Bill Gates

# Demo – Containerized Apps - Java x Native x Rust



[Demo Recording @Asciinema](#)

[github.com/louis-cgi](https://github.com/louis-cgi)



## Quick Chat about Real Cases and Green-Coding Certification

The Green-Coding Certification is a work-in-progress by my team at CGI Montreal. Like Energy Star, we'll evaluate and analyse Green maturity of systems and infrastructure.

[Ubisoft partners with CGI for Green IT strategy](#)

Follow me in LinkedIn for more.





“The world will not be **destroyed** by those who do evil, but **by those who watch them without doing anything.**”

**Albert Einstein**  
(probably)

# Some Links #1

- [digitalcollage.org](https://digitalcollage.org)  
A workshop to understand, as a team and in a fun way, the impact of digital technologies on the environment and how to reduce it.
- [benchmarksgame-team.pages.debian.net/benchmarksgame](https://benchmarksgame-team.pages.debian.net/benchmarksgame)  
The Computer Language Benchmarks Game.
- [pybenchmarks.org/u64q/cython.php](https://pybenchmarks.org/u64q/cython.php)  
Cython x Python Benchmarks
- [baeldung.com/openjdk-crac-hot-application-instances-scaling](https://baeldung.com/openjdk-crac-hot-application-instances-scaling)  
Effective Scaling of Hot Application Instances with OpenJDK CRaC Help in Container
- [quarkus.io/performance](https://quarkus.io/performance)  
Quarkus Performance - Quarkus
- [baeldung.com/spring-native-intro](https://baeldung.com/spring-native-intro)  
Native Images with Spring Boot and GraalVM | Baeldung
- [reactivemanifesto.org](https://reactivemanifesto.org)  
The Reactive Manifesto



# Some Links #2

- [gr491.isit-europe.org](https://gr491.isit-europe.org)  
**EU GR491**, The Handbook of sustainable design of digital services | ISIT
- [ecoresponsable.numerique.gouv.fr/publications/referentiel-general-ecoconception](https://ecoresponsable.numerique.gouv.fr/publications/referentiel-general-ecoconception)  
**(FR) Référentiel général d'écoconception de services numériques (RGESN)** - Numérique écoresponsable
- [a.co/d/86glVMg](https://a.co/d/86glVMg)  
**(Book/FR) Ecoconception web** : les 115 bonnes pratiques: Doper son site et réduire son empreinte écologique
- [chromewebstore.google.com/detail/blipmdconlkpinefehnmmfjpmphbjk](https://chromewebstore.google.com/detail/blipmdconlkpinefehnmmfjpmphbjk)  
**Google Lighthouse** is an open-source, automated tool for improving the performance, quality, and correctness of your web apps.
- [chromewebstore.google.com/detail/mofbfhffeklkbebfclfaifefjflcpad](https://chromewebstore.google.com/detail/mofbfhffeklkbebfclfaifefjflcpad)  
**GreenIT-Analysis** - measure the ecoIndex of a web site, verify the application of web eco-design best practices
- [sonarplugins.com/search.html?query=ecocode](https://sonarplugins.com/search.html?query=ecocode)  
**Provide a list of static code analyzers** (for some languages) to highlight code structures that may have a **negative ecological impact**: energy and resources over-consumption, "fatware", shortening terminals' lifespan, etc.



# Q&A Time

## Contact us



**Louis C. Tavares**

**Green Coder / Green Architect**

CGI – Director Consulting Expert

[louis.tavares@cgi.com](mailto:louis.tavares@cgi.com)

[linkedin.com/in/lctavares](https://linkedin.com/in/lctavares)

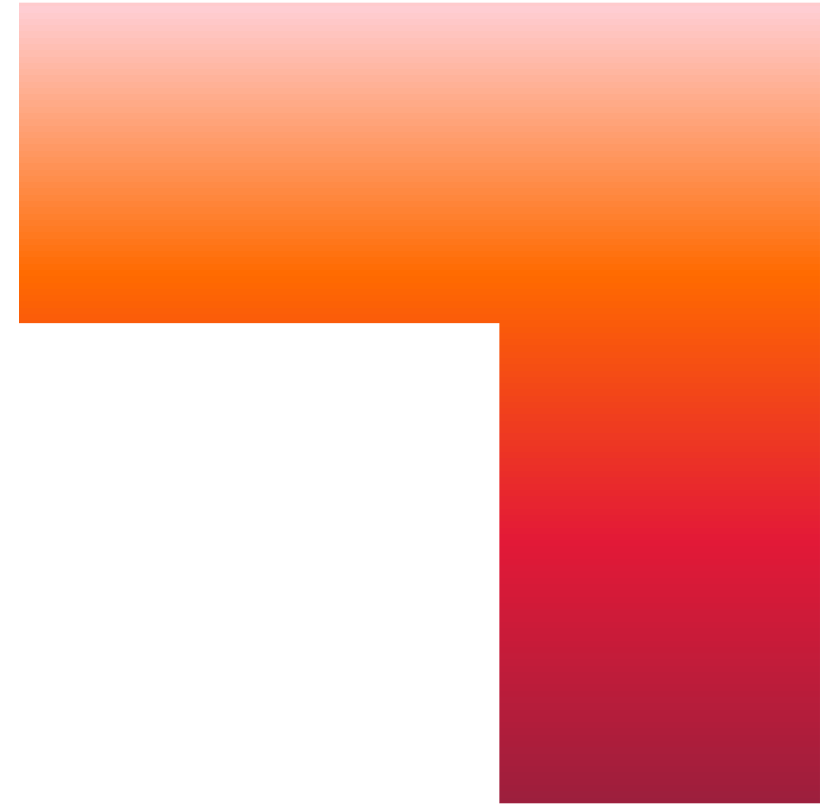


# Insights you can act on

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-focused to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

[cgi.com](https://cgi.com)



**CGI**