



Green Design and Refactoring: two sides of the same coin

Green Design and Refactoring share the **same goal**: to reduce the ecological footprint of software while operating in complementary ways during different stages of the software life cycle.

In today's software development landscape, environmental sustainability is no longer optional—it's a vital necessity. The IT sector is responsible for a growing share of global CO₂ emissions. In response to this challenge, two complementary approaches are emerging: Green Design, which incorporates sustainability from the very beginning of the design process, and Green Refactoring, which sustainably optimizes existing software—both ecologically and economically.

Green Design

Green Design is an approach to software development that integrates environmental sustainability principles directly into the development process, aiming to **reduce energy impact** and carbon footprint of software from the earliest design stages.

Its effectiveness lies in its ability to prevent energy inefficiencies from the outset, following the principle that:

the greenest code is
the code that isn't written 77

Core Principles

ENERGY EFFICIENCY as a business requirement



RESOURCE OPTIMIZATION and use of coding best practices



IMPACT MEASURABILITY throughout the software life cycle

Green Refactoring

Green Refactoring aims to measure

Key phases of Refactoring

the code's sustainability index before and after the intervention.

This involves intervening on unoptimized existing code, taking concrete steps toward sustainability in already deployed systems, with a particular focus on reducing the ecological footprint of the code.





INCREMENTAL IMPLEMENTATION of prioritized interventions



FUNCTIONAL VERIFICATION and measurement of energy savings

The Continuum of Software Sustainability

Green Design and Green Refactoring are not mutually exclusive approaches. On the contrary, their integration creates a virtuous cycle of continuous improvement, with many synergies and points of contact:

Knowledge Sharing

Lessons learned from refactoring existing systems inform design practices for new developments. Green Design principles guide refactoring efforts, allowing for a two-way transfer of knowledge.

Common Tools

Many measurement, analysis, and optimization tools can be used in both approaches—such as energy profilers for analyzing existing code and validating new implementations, or calculation indicators to quantify a code's environmental impact.

Organizational Culture

Green Design and Green Refactoring foster an organizational culture focused on awareness of the technical choices' impact and on continuous improvement.



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