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## Energy-Aware Environments for the Development of Green Applications for Cyber-Physical Systems

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### Abstract

*Cyber-Physical Systems* are usually composed by a myriad of battery-powered devices. Therefore, developers should pay attention to the energy consumption of the global system so as not to compromise the system lifetime. There are plenty of experimental studies that give hints about how to reduce the energy consumption. However, this knowledge is not readily available for the software developers of cyber-physical systems. They normally use software development environments that do not provide useful advice about the energy consumption of the software solutions being implemented. In this paper, we propose a *Developer Eco-Assistant* to integrate the experimental results obtained by researchers into the software development environments, so as to increase the energy-awareness of cyber-physical systems developers. In our solution, the energy information is obtained in real time from a repository of energy consuming concerns, where researchers store their experimental measurements. Developers use the repository to perform sustainability analyses, which, in turn, will lead to greener design/implementation decisions. In this paper, we illustrate the use of our approach in the context of cyber-physical systems development using both open source environments (e.g. JetBrains IDEs) and proprietary environments (e.g. Waspnote development environment). We experimentally demonstrate that cyber-physical systems can reduce more than 40% of its energy consumption depending on the scenario, reaching approximately 90% in some certain cases.

**Keywords:** Energy Consumption, Cyber-Physical Systems, Green Plugin,

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