Energy Reservation Service for Smart Phone Applications

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1. INTRODUCTION
Thanks to high computing capabilities, people started using smart phones as PC replacement: their importance for personal or business purposes makes users more and more dependent on them. Therefore, users need guarantees on the execution of their critical applications. The notion of critical applications is subjective and depends on the user so he must decide by himself which applications are critical.

If reducing the power consumption of smart phones devices is essential to improve their battery lifetime, increasing reliability demands efficient control of the power drain to guarantee energy availability. An operating system can consider the energy delivered by the battery as a first-class resource [1]. However actual operating systems don't have abilities to control the power consumptions of the devices, even with accurate energy estimations [2].

Guaranteeing energy implies that the power consumed by applications is known. The power draw of hardware components based on hardware states has been accurately modeling [2]. However, few smart phones can use these power models because of the hardware diversity. Furthermore, fined-grained power models introduce noticeable power overhead. For limiting the additional energy cost, a built-in current sensor is used to profile the power consumption of applications and to control the remaining energy.

This paper proposes a service that insures the energy needed by critical applications at a time chosen by the user.

2. ENERGY RESERVATION SERVICE

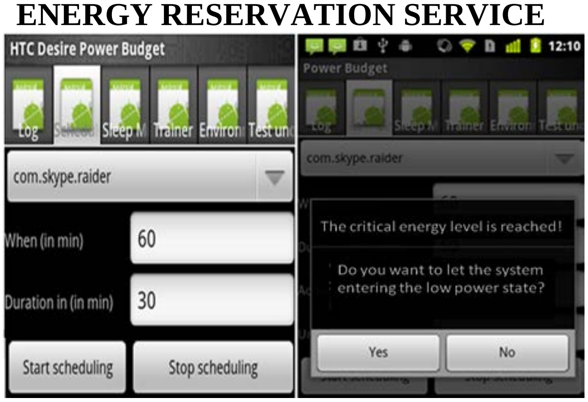

Figure 1: Energy Reservation Service GUI

Before starting the service, the user must define which applications are critical, when (critical time) and how long he plans to use them (Fig 1). Any applications can be executed while the service is supervising the remaining energy. Before the system runs out of energy reserved for executing the critical applications, the service warns the user if the critical time is not reached and proposes to let the system entering a low power state (Fig 1). As the environment (Wi-Fi SSID, screen brightness) may have important impact on the system power consumption, the energy need is reevaluated when the environment is changing.

3. IMPLEMENTATION
Developed on the top of the Android Power Management, the service is started by the user after he has chosen the critical applications, their durations and the critical time (Fig. 2-1). Then, the energy controller computes the energy needed by the critical applications (critical energy) by using the power profiled by the current sensor in the power database (Fig. 2-2). Each time a non critical application is executed (Activity change, Fig. 2-3), the energy controller verifies that enough energy is available. Otherwise it asks the user to let the system entering the low power state (Fig. 2-1 and 2-5). If the environment monitor detects an environment change, the energy controller reevaluates the energy need of critical applications (Fig. 2-4).

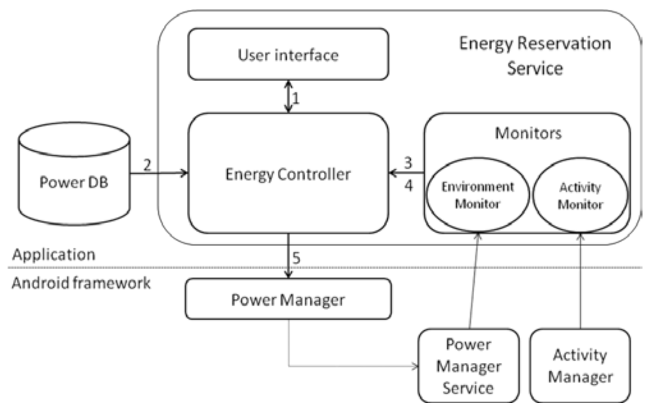

Figure 2: Architecture of the Energy Reservation Service

4. REFERENCES
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