Poster: A Smart Scheduling Mechanism for Energy Saving in Android System

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1. INTRODUCTION

In this paper we provides a smart scheduling mechanism to address the issue of power efficiency on Android-based smartphones. We design an algorithm in the network kernel to align the applications to enable the scheduling ability for synchronizing the time of periodic applications. We first analyze the measurement of multiple applications and the result of delay test in Android kernel, based on which the algorithm manages the data traffic by dropping packets to defer the sync time of applications to shorten their time difference. By minimizing the synchronization time difference between applications, we can align the applications to achieve simultaneous synchronization. Additionally, we also consider applications of different periods to offer a synchronization solution of a fuller extent. To implement the idea, we design the algorithm for different application types. This algorithm is composed of several mechanisms: approaching, aligning, and maintaining.

Approaching: Assume that two applications have the same period of sync. If one application is delayed by the technique and the other application is not, their sync time will get closer next time. At first, these two applications have time difference t originally. If the sync of App 1 is deferred by MAX DELAY TIME, next round their difference will be shortened to t-MAX DELAY TIME. If we keep using the technique for the following rounds, they will have the time difference that is less than MAX DELAY TIME, getting chances to transmit together eventually. By then, the next mechanism will be adopted.

Aligning: In Fig. 1(a), these two applications are close, but they are still sent out separately in original system. In our proposed system, as shown in Fig. 1(b), the packet of App 1 can be buffered, so it can wait for a packet of App 2 as long as it can. When the packet of App 2 arrives in waiting period, these two packets can be sent out together. The system will consume less energy by reducing the amount of extra power in overhead. The black lines in Fig. 1 stand for the power level of wireless device. In original scheme, the two transmissions are separate, so the overhead is doubled.

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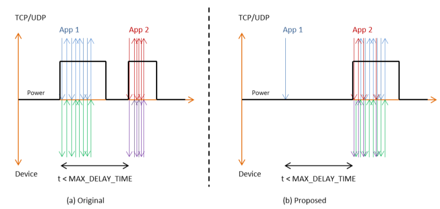

Figure 1: An example of aligning two near applications

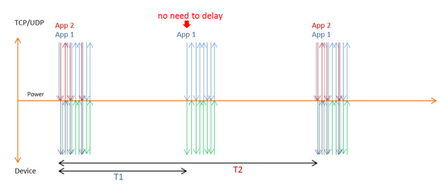

Figure 2: An example of considering different periods and maintaining the alignment

In proposed scheme, the two transmissions are combined into single one, so the overhead is nearly the same as that in one transmission, halved compared with the original scheme.

Maintaining In Fig. 2, App 1 and App 2 are aligned at a moment, transmitting DNS packets at the same time. After T1, the DNS packet of App 1 arrives. The system first detects that the expected arrival of next DNS packet of App 2 is larger than MAX DELAY TIME, which means that there's no alignment action for the two applications. Next, the system calculates the next arrival of DNS packet of App 1 and the corresponding new time difference. In the example, the system finds out that without delaying the current DNS packet of App 1, the time difference of next App 1 sync and next App 2 sync is smaller than MAX DELAY TIME, which means that they will be aligned next time. As a result, the system sends out the current DNS packet of App 1 directly. By doing so, the property of alignment remains, enabling us to save power in the subsequent rounds.

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