ErdOS: An energy-aware social operating system for mobile handsets

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ABSTRACT

Current mobile handsets are equiped with a wide range of resources from sensors to multiple wireless interfaces. Those resources are ubiquitous by nature and can be replicated at a specific place and time over neighbouring nodes. There are many situations in which accessing resources available in surrounding handsets is efficient in terms of energy and usability (e.g. cellular networks while roaming). However, current operating systems do not facilitate it. This poster introduces ErdOS, a new energy-aware OS paradigm in which mobile handsets can share their resources by exploiting the existing social relationships among the users.

1. INTRODUCING ERDOS

Energy is still the main limitation in mobile handsets due to an inefficient energy management by existing mobile OS. Simultaneous use of the diverse hardware systems embedded in a modern smartphone by the applications would limit many handsets to just a few hours of operation. The main reason is that modern mobile OS are built on top of general-purpose OS that do not consider energy as a fundamental resource. They provide a limited control over the hardware and energy resources demanded by applications. However, energy requires a proactive management compared to other resources since once an energy unit has been allocated to an application, it cannot be reclaimed until the users manually plug their handsets. Previous energy-aware OS for mobile handsets such as Cinder [3] have many limitations since they do not take into account the interdependencies among the different resources caused by the applications and the impact of users' interaction with the devices [4]. The OS needs to know when and where energy will be demanded and when there will be future charging opportunities.

Computing resources can be replicated among neighbouring nodes and can provide different features, energy demands and resolution. ErdOS is an energy-aware social OS in which handsets can share their local resources with nearby devices opportunistically using low-energy wireless connectivities and the social links among the users to provide access control policies. ErdOS aims to improve both the handset usability and to extend the battery life by making an efficient, proactive and distributed management of the available resources customised for each user and device. For example, it is more energy efficient for a handset with the GPS interface OFF to request location information to neighbouring nodes opportunistically (in case there is any with the information available or the sensor ON) using low-energy wireless interfaces rather than switching ON the GPS.

ErdOS manages both local and remote resources in mobile environments and decides where to access a resource. To make such a decision, ErdOS takes into account the energy costs and the implications on the users' experience of performing this action. However, energy consumption in the handset depends on users' habits, social interactions (e.g. incoming emails) and the context in which the users' interaction with the applications takes place (e.g. the signal strength of the cellular network at a location has implications on the energy consumption). As a result, it requires a system adapted to each user. ErdOS allocates resources at a higher level of abstraction called *activity* rather than to applications. That concept was previously introduced by Rialto OS [2]. In our approach, those *activities* are hierarchical and span from social activities and daily habits like going to the pub to applications run at those scenarios. ErdOS follows a proactive resources management by predicting the individual needs of each activity aided by contextual information (e.g. location and time) both to efficiently manage the resources demands of each activity and also to advertise what can be offered to neighbouring nodes.

In this poster we will describe the motivation behind ErdOS, how contextual information can help to allocate resources and forecast their demand, its architecture, potential applications and also some preliminary results about the benefits of sharing cellular network. Still in its early stages, a prototype will be developed as an Android OS extension.

2. ADDITIONAL INFORMATION

Narseo Vallina-Rodriguez is a PhD student at the University of Cambridge. No demo is planed with the poster. More information and details about the system can be found at [1].

3. REFERENCES

[1] ErdOS. `http://www.cl.cam.ac.uk/~nv240/erdos.html`.
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