Reconfiguration Service in Mobile Middleware

Ramya Sri Kalyanaraman
ramya@hiit.fi

Abstract

Dynamic reconfiguration to the changing environment is an essential aspect of ubiquitous mobile terminals. While striving towards reconfigurability in mobile devices, we must understand the technical constraints involved in reconfiguration. Variations in factors, such as, terminal size, memory, power usage, network coverage play a vital role in dynamic reconfiguration. With the proliferation of mobile computing, enabling end users to switch between multiple mobile devices will become a general requirement. In order to relieve the user from manually configuring the device every time, a reconfigurable device will spontaneously adapt itself to the changing environment.

Providing reconfigurability for small mobile devices presents various challenges to application designers and developers in terms of system integrity, and energy and memory consumption. Reconfiguration service at the middleware level enables a device to adapt itself to its environment, and helps to perform smooth state transition between devices maintaining the system integrity. In addition, reconfiguration service can be advantageous to achieve power and memory saving. Also, the network services in the device will be utilized more efficiently based on the available network connection and bandwidth. The key requirements to achieve reconfiguration are identified as follows:

Heterogeneity The service architecture needs to be independent of actual devices.

Extensibility New functionality must be possible to add to the architecture depending upon future needs.

Adaptivity The service needs to adapt itself to the device's changing environment.

Portability The reconfiguration service as a component should be possible to port onto different device architectures.

Transparency The applications developed over the reconfiguration service should not be burdened with the intricacies of low level reconfiguration service architecture.

Fault-tolerance The device must remain operational even if the reconfiguration service fails.

System Integrity Irrespective of the operations performed on the device by the reconfiguration service, the integrity of various system components needs to be maintained.

Based on the requirements we propose a reference model comprising the essential functionalities of reconfiguration. To reinforce our reference model, we discuss few practical user scenarios where the need for reconfiguration is showcased. One common scenario in our daily life where reconfiguration service could be useful is when the user in a low bandwidth network tries to upload some files to his work repository situated in a remote server. The reconfiguration service in the middleware can be informed by the device's network monitor about the poor bandwidth quality of the network. A reconfiguration decision to apply file compression technique can help the user in successfully completing the file upload.

We present a brief overview about the current status of the research item, the challenges experienced and envisioned in providing reconfiguration service at the middleware level. Our future work on reconfiguration service will concentrate on addressing the research challenges such as fault tolerance, portability, and system integrity. To summarize, ubiquitous computing with user friendly applications built over reconfiguration service enabled middleware are not far from reality!