# Chapter 3.10
# Role of Wireless Grids in Outsourcing and Offshoring: Approaches, Architectures, and Technical Challenges

**Ashish Agarwal**
*Carnegie Mellon University, USA*

**Amar Gupta**
*University of Arizona and MIT, USA*

## ABSTRACT

The growing incidence of outsourcing and offshoring of professional applications is motivating increasing interest in the use of grid computing and grid topologies for meeting the infrastructure requirements. A Wireless Grid facilitates the exchange of information and the interaction between heterogeneous wireless and wired devices. Depending on the nature of the interactions among the constituencies served by the wireless grid, various layouts can be envisaged to provide ubiquitous services. A wireless grid is similar to the wired grid in terms of its distributed nature, the requirement for standards and protocols, and the need for adequate Quality of Service. In addition, a Wireless Grid has to deal with the complexities of the limited power of the mobile devices, the limited bandwidth, and the increased dynamic nature of the interactions involved. The ability of the grid models to address outsourcing needs is contingent upon the efficient resolution of multiple technical challenges.

## INTRODUCTION

Many of the outsourcing and offshoring initiatives require ubiquitous access to computing resources (Gupta, 2008; Crk, Sorenson, & Mitra, 2008; Mitra & Gupta, 2008). Vendors providing these services have to deliver on promised service level agreements. However, they may face cost constraints and may not have the initial capability to provide the desired level of services. Vendors face a similar challenge while introducing a new service that may have inadequate initial customer base to justify investment in costly infrastructure. These challenges are compounded when the customers demand 24x7 access to applications and support. In order to achieve this requirement, one needs a globally distributed work environment in which members of the global team work on a project

around the clock, possibly by establishing multiple collaborating centers at strategic locations around the globe (Gupta & Seshasai, 2007; Seshasai & Gupta, 2007; Denny, Mani, Sheshu, Swaminathan, & Samdal, 2008; Denny, Crk, & Sheshu, 2008). Further this setup should be responsive to the dynamic business environment in order to facilitate agility and innovation (Mitra & Gupta, 2007; Mitra & Gupta, 2005). Two important drivers of decisions related to outsourcing are: improving the quality of information technology; and gaining access to new and proprietary technology. However, these drivers also introduce technical risk for the concerned outsourcing initiatives (Ross & Westerman, 2004). One way to mitigate some of these challenges is to pool resources across different initiatives and multiple vendors. In this environment, grid computing is becoming popular among service providers (Network World, 2006). Based on these developments, we explore the growing role of using a Wireless Grid for outsourcing initiatives that require ubiquitous access to computing services.

Foster (2002) offers a checklist for recognizing a "grid". A grid allows:

- Coordination of resources that are not subject to centralized control;
- Use of standard, open, general-purpose protocols and interfaces; and
- Delivery of non-trivial qualities of service.

In order to be classified as a grid, all three criteria must be met. The Wireless Grid meets all these criteria and is fueled by technological advances in grid computing and wireless technology. The ultimate vision of the grid is that of an adaptive network that offers secure, inexpensive, and coordinated real-time access to dynamic, heterogeneous resources, potentially traversing geographic boundaries but still able to maintain the desirable characteristics of a simple distributed system, such as stability, transparency, scalability and flexibility. The technologies originally developed for use in a wired environment are now being augmented to operate in wireless situations. The development of the wireless technologies such as 802.11, GPRS and 3G has extended the reach of wireless services to more individuals. With the ubiquity and indispensability of wireless technologies established, these technologies are now making inroads into grids.

In the following sections, we describe the drivers of the wireless grid technology, the grid architecture and topology, and finally the challenges that need to be addressed in order for these wireless grids to be extensively deployed in offshoring applications. For the remainder of this paper, a grid implies a Wireless Grid (unless expressly denoted otherwise).

## KEY CHARACTERISTICS

### Driving Forces

The development of the wireless grid technologies is governed by three driving forces:

- **New User Interaction Modalities and Form Factors:** Traditional applications that can exist on the Wired Grid need to expand their scope by extending the interactions to mobile devices through adapting the user interface to small screens, small keyboards, and other I/O modalities such as speech. The mobile access interface needs to address the issue of connectivity of mobile devices.
- **Limited Computing Resources:** Wireless applications need to share the resources and provide access to additional computational resources to mitigate the constraints imposed by limited storage, computational capability, and power of mobile devices.
- **Additional New Supporting Infrastructure Elements:** New applications, especially ones involving dynamic and unforeseen