Chapter XVI
Mobile Workforce Management in a Service–Oriented Enterprise: Capturing Concepts and Requirements in a Multi–Agent Infrastructure

Dickson K.W. Chiu
Dickson Computer Systems, Hong Kong

S.C. Cheung
Hong Kong University of Science and Technology, Hong Kong

Ho-fung Leung
The Chinese University of Hong Kong, Hong Kong

ABSTRACT

In a service-oriented enterprise, the professional workforce such as salespersons and support staff tends to be mobile with the recent advances in mobile technologies. There are increasing demands for the support of mobile workforce management (MWM) across multiple platforms in order to integrate the disparate business functions of the mobile professional workforce and management with a unified infrastructure, together with the provision of personalized assistance and automation. Typically, MWM involves tight collaboration, negotiation, and sophisticated business-domain knowledge, and thus can be facilitated with the use of intelligent software agents. As mobile devices become more powerful, intelligent software agents can now be deployed on these devices and hence are also subject to mobility. Therefore, a multiagent information-system (MAIS) infrastructure provides a suitable paradigm to capture the concepts and requirements of an MWM as well as a phased development and deployment. In this book chapter, we illustrate our approach with a case study at a large telecommunication enterprise. We show how to formulate a scalable, flexible, and intelligent MAIS with agent clusters. Each agent cluster comprises several types of agents to achieve the goal of each phase of the workforce-management process, namely, task formulation, matchmaking, brokering, commuting, and service.
INTRODUCTION

The advancement of mobile technologies has resulted in an increasing demand for the support of mobile-workforce management (MWM) across multiple platforms anytime and anywhere. Examples include supply-chain logistics, group calendars, dynamic human-resources planning, and postal services. Existing solutions and proposals often treat the workforce as passive-moving resources and cannot cope with the current requirements for the knowledge-based economy and services, such as technical-support teams (e.g., computer- or network-support engineers and technicians).

Recent advances in hardware and software technologies have created a plethora of mobile devices with a wide range of communication, computing, and storage capabilities. New mobile applications running on these devices provide users with easy access to remote services at anytime and anywhere. Moreover, as mobile devices become more powerful, the adoption of mobile computing is imminent. The Internet is quickly evolving toward a wireless one, but the wireless Internet will not be a simple add-on to the wired Internet. New challenging problems arise from the handling of mobility, handsets with reduced screens, and varying bandwidth. Moreover, the business processes involving the workforce tends to get complicated with requirements from both within the organization’s management and external Web services (e.g., tracking and logistics integration). New mobile applications running on these devices provide users easy access to remote services regardless of where they are, and will soon take advantage of the ubiquity of wireless networking to create new virtual worlds. Therefore, the main challenge of MWM is to provide an effective integration of the ever-increasing disparate business functions in a unified platform not only to management, but also to the mobile professional workforce.

An additional challenge to MWM in service-oriented enterprises (such as telecom and computer vendors) is the provision of personalized assistance and automation to the mobile professional workforce, whose members each have different capabilities, expertise, and support requirements. Often, consultations and collaborations are required for a task. Because of their professional capabilities and responsibilities, members of the workforce have their own job preferences and scheduling that cannot be flexibly managed in a centralized manner. As mobile devices become more powerful, peer-to-peer mobile computing becomes an important computation paradigm. In particular, intelligent software agents can now run on these mobile devices and can adequately provide personalized assistance to the mobile workforce. Under the individual's instructions and preferences, these agents can be delegated to help in the negotiating and planning of personalized tasks and schedules, thereby augmenting the user’s interactive decisions. In addition, agent-based solutions are scalable and flexible, supporting variable granularities for the grouping of workforce management.

We have been working on some related pilot studies related to MWM, such as constraint-based negotiation (Chiu, Cheung, et al., 2004), m-service (mobile-service) adaptation (Chiu, Cheung, Kafeza, & Leung, 2003), and alert management for medical professionals (Chiu, Kwok, et al., 2004). Based on these results, we proceed to a larger scale case study, and the contributions of this chapter are as follows. First we formulate a scalable, flexible, and intelligent multiagent information-system (MAIS) infrastructure for MWM with agent clusters in a service-oriented enterprise. Then we propose the use of agent clusters, each comprising several types of agents to achieve the goal of each phase of the workforce-management process, namely, task formulation, matchmaking, brokering, commuting, and service. Next we formulate a methodology for the analysis and design of MWM in the context of enterprise