Distributed Shared Contexts

Rosa Alarcón1, César Collazos2, and Luis A. Guerrero1

1 Department of Computer Science, Universidad de Chile, P.O. Box 2777, Santiago, Chile {ralarcon, luguerre}@dcc.uchile.cl
2 Systems Department FIET, Universidad del Cauca, Campus Tulcan, Popayán-Colombia ccollazo@unicauca.edu.co

Abstract. Mobile solutions have gone beyond the role of personal tool to offer solutions in supporting coordinated work. Mobile workers shift constantly from individual to group work, access shared virtual environments from different devices and can create new elements when disconnected (annotations, appointments, etc.). However, current approaches focus either on individual or group work, as well as on the restrictions and affordances that mobile devices and mobility provides, but they do not address the huge heterogeneity, inconsistencies and complexity derived when both working modes are mixed. We are interested in the construction of virtual environments that can be accessed transparently anywhere, anytime on anything, but also exploit the advantages that mobility aware technologies provide. Context-based design facilitates the construction of such environments because they isolate and provide structure to the application layer facilitating adaptation to devices’ characteristics, reducing the impact of devices heterogeneity and easing the shift among different working modes.

1 Introduction

When designing applications for mobile technology, the focus often relies on the restrictions and affordances that those devices provide, that is their need for dynamic reconfiguration, adaptivity, asynchronous interaction, context-awareness and lightweight middleware [1]. For instance, Personal Information Management (PIM) applications, which include calendars, to do’s, notepads, e-mail alert among others; deal with issues like limited screen size, storage and memory and disconnected operations. Their main concern is data synchronization between the mobile device and the PIM system. Although first approaches conceived a PIM as a personal server running on user’s desktop computer, current designs are based on Web servers and are integrated into enterprise’s strategies. Now, personal information can be accessed from different devices (i.e. handhelds, data-enabled cellular phones, pagers, badges, etc.), and synchronization occurs not only between the PIM and each device, but also with organizations’ databases, other networked applications and groupware.

Other approaches take advantage of different wireless networks like cellular, LAN, PAN (Personal Area Network) or BAN (Body Area Network) networks [2]. Although previous design restrictions applies in this kind of networks, users can update their versions more frequently and access huge databases on demand, or the information can be made available (pushed) to them proactively, based on their context. This area of research is known as context-aware computing [3], which are systems that examine and react to an individual’s changing context. Typically “user context” is described in
terms of the user’s current location taking into account the social (at home, at the office, etc.[4], [5], [6]), physical (light, noise, etc.[7]) and informational (guided tours, tourist maps, etc. [8], [9]) characteristics associated to the user’s current physical environment.

But mobile solutions have gone beyond the role of a personal tool to offer large-scale solutions in supporting coordinated work for teams, groups, and organizations. The adoption of mobile devices is most clearly seen in the professional world, for instance, IDC forecasts that the remote and mobile workforce will grow, in the US, to 47.1 million by the end of 2003 (37% of total workforce). Traditionally, work groups have been supported by collaborative systems that allow them sharing software artifacts, objects and self-representations enabling a virtual shared environment.

For instance, a mobile healthcare system supports workers’ activity, but also information exchange, collaboration, coordination of activities and resources and decision-making [10]. Furthermore, based on the relevance of the events that occur in the shared environment and the current user context, group members can be contacted proactively (push) through different devices either fixed or mobile [11]. In both cases contextual information related to workgroup activities (i.e. activities’ status, ongoing activities, changing artifacts, etc.) is presented to users so they can be aware of the status and progress of their work and can coordinate their future actions.

Mobile computing has become a useful and promising technology for supporting individuals, but as their potentiality is being acknowledged for professionals, it is creating new interaction paradigms for supporting work groups and organizations and adding also huge heterogeneity. However, it is very interesting that when designing context-aware systems, information must be adapted to user context; but when designing groupware systems, we are dealing with the provision of contextual information related to group activities, without taking into account users context when receiving the information; something similar occur with classic PIM systems.

Our aim is to support the development of shared applications that can be accessed anywhere, anytime on anything, but current approaches support either individuals or work groups and are designed separately or are considered merely extensions of each other, making it hard to design applications that can be easily adapted to different interaction modes (i.e. disconnected operations, mobile computing, nomadic computing, groupware applications, etc.).

In this paper, we propose a design based on multiple, possibly competing contexts (individual vs. shared) that represent users’ activities, actions and status at a high level. The set of contexts are shared by people and agents, accessed from different devices and adapted to users’ current context. By designing an application at a meta-level, the transition between different interaction modes is reduced but it is possible to provide richer contextual information. The strategy and the proposal draw from previous experiences in the subject, although our current approach is more general.

Section 2 discusses in detail the conceptual definition of context while section 3 presents the architecture proposed. Section 4 present an application based on the architecture of section 3. Finally, section 5 presents our conclusions.

2 Shared Contexts

Although the word “context” appears repeatedly in the area of context-aware computing there are not a consensual definition of its meaning. This is perfectly understandable as concept meaning is only valid in the scope of a determined context.