HETEROGENEITY, INTEROPERABILITY AND QUALITY OF CONTEXT IN MOBILE DEVICES

Heterogeneity :

Mobile devices can exist in many forms. There are great differences among these devices, and this heterogeneity can affect communication performance and the design of communication protocols. It is evident there are differences in size, computational power, memory, disk, and battery capacity of various mobile computing devices. The ability of an ad hoc mobile device to act as a server or service provider will depend on its computation, memory, storage, and battery life capacity. The presence of heterogeneity implies that some devices are more powerful than others, and some can be servers while others can only be clients. In addition, relaying packets for others can result in a device expelling its own energy. Hence, a mobile node should examine its own "well-being" before committing to forwarding packets on the behalf of others.

Heterogeneity arises in a wide range of scenarios in mobile opportunistic networks and is one of key factors that govern the performance of packet forwarding algorithms. While the heterogeneity has been empirically investigated and exploited in the design of new forwarding algorithms, it has been typically ignored or marginalized when it comes to rigorous performance analysis of such algorithms.

Interoperability

The ability of a network to operate with other networks, such as two systems based on different protocols or technologies. Each data-centric mobile middleware has a unique abstraction of the data. They vary in data format, mode of operation etc. As each of these middlewares has some advantage over others, it is important to establish interoperability among these. There might be application-level interconnection among these components. But that is disadvantageous.

Context awareness

Context awareness is defined complementary to location awareness. Whereas location may serve as a determinant for resident processes, context may be applied more flexibly with mobile computing with any moving entities, especially with bearers of smart communicators. Context awareness originated as a term from ubiquitous computing or as so-called pervasive computing which sought to deal with linking changes in the environment with computer systems, which are otherwise static. Although it originated as a computer science term, it has also been applied to

business theory in relation to business process management issues. Context-aware computing refers to a general class of mobile systems that can sense their physical environment, and adapt their behavior accordingly.

Context-aware systems are a component of a ubiquitous computing or pervasive computing environment. Three important aspects of context are: (1) where you are; (2) who you are with; and (3) what resources are nearby. Although location is a primary capability, location-aware does not necessarily capture things of interest that are mobile or changing. Context-aware in contrast is used more generally to include nearby people, devices, lighting, noise level, network availability, and even the social situation, e.g., whether you are with your family or a friend from school.

Qualities of context

It is common sense to understand that context awareness did not originate in computer science or the organizational learning literature (management literature). The word "context" stems from a study of human "text"; and the idea of "situated cognition," that context changes the interpretation of text, is an idea that goes back many thousand years. One of many example of recorded ancient analysis of context and interpretation is the writings of the Legalist school of philosophers, who were influential between 500-60 B.C. in China. In Western philosophy, one could easily identify ideas about "context awareness" from Greek epistemology. A search for the words "situated learning" will show that the study of context awareness goes back at least as early as Charles Pierce and other American pragmatics. Linguistics has discussed context awareness as early as the formation of the discipline.

Context defines some rules of inter-relationship of features in processing any entities as a binding clause.

Various categorizations of context have been proposed in the past. Dey and Abowd (1999) distinguish between the context types *location*, *identity*, *activity* and *time*. Kaltz et al. (2005) identified the categories *user&role*, *process&task*, *location*, *time* and *device* to cover a broad variety of mobile and web scenarios. They emphasize yet for these classical modalities that any optimal categorization depends very much on the application domain and use case. Beyond more advanced modalities may apply when not only single entities are addressed, but also clusters of entities that work in a coherence of context, as e.g. teams at work or also single bearers with a multiplicity of appliances.

Some classical understanding of context in business processes is derived from the definition of AAA applications[4] with the following three categories:

- Authentication, which means i.e. confirmation of stated identity
- Authorisation, which means i.e. allowance to accrual or access to location, function, data
- Accounting, which means i.e. the relation to order context and to accounts for applied labour, granted license, and delivered goods,

these three terms including additionally location and time as stated.

In computer science context awareness refers to the idea that computers can both sense, and react based on their environment. Devices may have information about the circumstances under which they are able to operate and based on rules, or an intelligent stimulus, react accordingly. The term context-awareness in ubiquitous computing was introduced by Schilit (1994).[5][6] Context aware devices may also try to make assumptions about the user's current situation. Dey (2001) define context as "any information that can be used to characterize the situation of an entity." [7]

While the computer science community initially perceived the context as a matter of user location, as Dey discuss, in the last few years this notion has been considered not simply as a state, but part of a process in which users are involved; thus, sophisticated and general context models have been proposed (see survey), to support context-aware applications which use them to (a) adapt interfaces, (b) tailor the set of application-relevant data, (c) increase the precision of information retrieval, (d) discover services, (e) make the user interaction implicit, or (f) build smart environments. For example: a context aware mobile phone may know that it is currently in the meeting room, and that the user has sat down. The phone may conclude that the user is currently in a meeting and reject any unimportant calls.[9]

Context aware systems are concerned with the acquisition of context (e.g. using sensors to perceive a situation), the abstraction and understanding of context (e.g. matching a perceived sensory stimulus to a context), and application behaviour based on the recognized context (e.g. triggering actions based on context).[10] As the user's activity and location are crucial for many applications, context awareness has been focused more deeply in the research fields of location awareness and activity recognition.

Context awareness is regarded as an enabling technology for ubiquitous computing systems. Context awareness is used to design innovative user interfaces, and is often used as a part of ubiquitous and wearable computing. It is also beginning to be felt in the internet with the advent of hybrid search engines. Schmidt, Beigl & Gellersen[11] define *human factors* and *physical environment* as two important aspects relating to computer science. More recently, much work has also been done to ease the *distribution of context information*, and several middleware solutions have been designed to transparently implement context management and provisioning in the mobile system (see the survey [12]).

Human factors related context is structured into three categories: information on the user (knowledge of habits, emotional state, biophysiological conditions), the user’s social environment (co-location of others, social interaction, group dynamics), and the user’s tasks (spontaneous activity, engaged tasks, general goals). Likewise, context related to physical environment is structured into three categories: location (absolute position, relative position, co-location), infrastructure (surrounding resources for computation, communication, task performance), and physical conditions (noise, light, pressure).