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**Perceptions and Expectations of Ubiquitous Computing:
Experiments with BirdDog a Prototype Person Locator**

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1. Introduction

An emerging trend is the move towards providing users with ubiquitous access to their familiar computing environment. This environment contains the information, both private and shared they need to get their job done. It might also contain information that systems in the user's immediate physical environment may need in order to determine access rights or tailor services to individual user requirements. Various techniques have been devised that achieve this goal ranging from time-sharing systems to networked systems of personal computers. In all cases establishing contact with this environment requires the user to go through a sometimes elaborate sign-on sequence taking several seconds and usually requiring the user to type a name and password.

Now applications are emerging that rely for their success on users being automatically recognised and instantly connected with their information processing environment. Consider how the overhead of moving to a nearby terminal or even simply signing on may critically disturb the flow of work. For example, a salesman needing to consult a phone list to call a supplier, check a configuration of parts by using a simulator, or use a spreadsheet to illustrate how costs breakdown may simply lose the customer's attention if he breaks away for even a few seconds.

Active badges provide a simple mechanism for automatically sensing the arrival and identity of a user at a location. They are worn like a conventional badge but regularly emit a signal identifying the wearer which can be received by sensors located on the walls and ceilings of rooms and corridors in buildings. This signal-detecting event can easily generate an automatic sign-on sequence on nearby terminal equipment. Although this capability enables several novel and potentially powerful applications it also supports a range of personnel tracking applications - a potentially invasive feature that users may remain unconscious of.

We are interested in understanding how users trade off the benefits of automatic tracking against the perceived social risks. We would like to understand what safeguards, both legal and technical, people consider necessary and to explore ways of supporting them.

The experiments described in the paper were devised as a way of getting empirical information about the learnability, usability and acceptability to users of ubiquitous computing. Staff and visitors to EuroPARC were asked to fill in a daily inventory in which they recorded successful and unsuccessful attempts to recall facts, documents, events, persons and things. Many of the failures related to persons and accordingly we designed BirdDog, a realtime person locator, which is specifically intended to take advantage of the new badge technology now available at EuroPARC and to allow us to address some general empirical questions related to ubiquitous computing. One very important question is the extent to which users will be willing to trade perceived loss of privacy for readier access to information relating to others. The principle we are testing here is that of 'information and privacy symmetry'. That is to say we intend to support modes of use which will make it possible for users to negotiate symmetric information exchange with other users. BirdDog is a system which allows users to obtain information on the physical location of other users. A BirdDog user can 'ask' about any other user who has given an appropriate permission. Participation in the BirdDog experiments was voluntary and one of the objects of study was the reasons users turn out to have for participating (or not participating) in the experiments. Another object of study was the process of negotiating information exchange relationships. Participants were interviewed at the start of the study about their reasons for participating and were then given a weekly questionnaire on use of BirdDog. Individuals who raised concerns during the study were interviewed about these as soon as practicable after the concern had been raised. The study stopped after the