Chapter XII

Privacy Threats in Emerging Ubicomp Applications:
Analysis and Safeguarding

Elena Vildjiounaite, VTT Technical Research Centre of Finland, Finland

Tapani Rantakokko, Finwe LTD, Finland

Petteri Alahuhta, VTT Technical Research Centre of Finland, Finland

Pasi Ahonen, VTT Technical Research Centre of Finland, Finland

David Wright, Trilateral Research and Consulting, UK

Michael Friedewald, Fraunhofer Institute Systems and Innovation Research, Germany

Abstract

Realisation of the Ubicomp vision in the real world creates significant threats to personal privacy due to constant information collection by numerous tiny sensors, active information exchange over short and long distances, long-term storage of

large quantities of data, and reasoning based on collected and stored data. An analysis of more than 100 Ubicomp scenarios, however, shows that applications are often proposed without considering privacy issues, whereas existing privacy-enhancing technologies mainly have been developed for networked applications and, thus, are not always applicable to emerging applications for smart spaces and personal devices, especially because the users and their data are not spatially separated in such applications. A partial solution to the problem of users' privacy protection could be to allow users to control how their personal data can be used. The authors' experience with mobile phone data collection, nevertheless, suggests that when users give their consent for the data collection, they don't fully under-stand the possible privacy implications. Thus, application developers should pay attention to privacy protection; otherwise, such problems could result in users not accepting Ubicomp applications. This chapter suggests guidelines for estimating threats to privacy, depending on real world application settings and the choice of technology; and guidelines for the choice and development of technological safe-guards against privacy threats.

Introduction

After having read a large number of scenarios of emerging Ubicomp applications (found in project deliverables and research publications which describe prototypes of smart spaces, smart personal devices, objects and their functionalities) and vi-sionary future Ubicomp scenarios (found mainly in roadmaps), we concluded that most scenarios present a sunny, problem-free vision of our future. With the excep-tion of the surveillance problem in some cases, most scenarios do not consider the privacy issues that the new technologies are likely to raise. For example, they do not discuss possible privacy problems due to conflicts between people's interests or personal curiosity.

The discovery that Ubicomp technologies raise privacy problems is not new; and research into privacy protection is actively going on, but after a state-of-the art review of work on privacy protection, we have come to the conclusion that most of this work deals with privacy protection in such network applications as m-commerce, Web browsing, virtual meetings, location-based services, and so forth, where users can be physically separated from their personal data. Even in these applications, no scalable solutions fully applicable in real life exist, and this lack of protection allows large-scale eavesdropping, as we know from the news (Web site of the American Civil Liberties Union and the ACLU Foundation, 2006).

The work on privacy protection in smart spaces and in connection with personal devices is even less mature than that concerned with network applications, while

Related Content

Ubiquitous Computing History, Development, and Scenarios

Jimmy Chong, Stanley See, Lily Leng-Hiang Seah, Sze Ling Koh, Yin-Leng Thengand Henry B.L. Duh (2008). *Ubiquitous Computing: Design, Implementation and Usability (pp. 1-8).*

www.irma-international.org/chapter/ubiquitous-computing-history-development-scenarios/30515

Design and Implementation of the Embed Computer Based on CompactPCI Express Bus

Feng Guo, Zhenxing Yin, Liang Wuand Hao Shen (2011). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 1-6).*

www.irma-international.org/article/design-implementation-embed-computer-based/59706

The Ubiquitous Portal

Arthur Tatnall (2010). *Ubiquitous and Pervasive Computing: Concepts, Methodologies, Tools, and Applications (pp. 28-34).*

www.irma-international.org/chapter/ubiquitous-portal/37774

Modern Educational Technique Center Educational Media Management Based on Design and Practice of Questionnaire

Hou Jie (2011). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 35-38).*

www.irma-international.org/article/modern-educational-technique-center-educational/62294

Hybrid Log-based Fault Tolerant Scheme for Mobile Computing System

Zhenpeng Xu, Hairong Chenand Weini Zeng (2015). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 46-58).*

www.irma-international.org/article/hybrid-log-based-fault-tolerant-scheme-for-mobile-computing-system/165564