

# Extending a Closed-World with Guest Devices

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**Abstract.** Health institutions are always on the lookout for cost-effective means to keep visitors informed on their relatives' well-being. The provision of such information is highly personalised, and thus, human interaction is often difficult to replace. Yet, if the hospital has an ambient intelligence (AmI) system that continually collects and reasons about context cues, the visitor's mobile phone becomes a valuable resource through which inferred events of interest can be communicated.

**Key words:** Ambient Intelligence, Context-Awareness, Semantic Web

## 1 Introduction

Visitors in a hospital regularly ask for information related to their loved ones. Whilst human interaction is irreplaceable in some situations, answering the less important queries is risky for the health worker who might suddenly be needed elsewhere due to an emergency. In order to relieve staff from these tasks, health-care institutions are exploring how they can leverage existing infrastructure to add intelligence to their environment. Mobile phones present a valuable opportunity in this regard as they are ubiquitous, personal and appropriate for alerts.

## 2 Device Discovery and Utilisation

The proposed architecture continuously senses for devices in the hospital. Upon discovery of a new device, the system explores how it can be used. A welcome note is subsequently sent to the mobile phone advising the user that she will be receiving a software application. Upon installation, this application is used as a communication gateway between the mobile device and the centralised system. The mobile phone user can use this application to identify herself and set up preferences, thus enabling a personalised service.

The system is capable of understanding the context in which it is operating and adapting accordingly. For instance, both Bluetooth and Wi-Fi discovery mechanisms run in parallel. If a device is discovered by both technologies, the higher-end Wi-Fi is preferred. The same concept is extended to the mobile phone's platform. Devices with the latest version of the MIDP receive a richer J2ME application than the older ones. Discovered device meta-data such

as the model type is augmented with semantic meta-data provided by device manufacturers such as [1]. These relationships are maintained centrally in a knowledge-base in the form of RDF triples. The user profile and preferences are communicated via RDF mark-up, and alerts are sent to the mobile in XML. The hospital's context is modelled by an ontology as in [2].

The idea being presented raises issues of data privacy. Who should be alerted with whose context? Which events should be communicated electronically and which ones should not? For this purpose, the system is policy-aware as promoted in [3]. Its declarative policy, developed in Rei, ties the permissions, obligations and prohibitions of entities to particular contexts in order to direct the system's workflow and control the dissemination of sensitive patient information in varying circumstances. An example of a constraint that can be enforced is to restrict patient information access to visitors who are not the first of kin.

This architecture provides numerous benefits to visitors and hospital staff when the centralised system is enriched with contextual sensors. As the AmI system is location-aware, the device can provide directions from the visitor's position to the patient ward, and it can inform visitors on the patient's movements and consultant visits. Furthermore, since the hospital rooms are equipped with cameras, unfortunate events such as patient falls can be detected and reported. The system can also alleviate the tasks of security personnel by warning visitors on their mobile phone if they inadvertently step into an unauthorised zone.

### 3 Conclusion

In this poster, we presented an architecture that exploits mobile devices to interact with dynamically changing users. Due to their attributes, mobile phones will play a critical role in the forthcoming AmI era. The notion of a client application communicating with its environment's centralised system is promising, both in healthcare and beyond. Such usage scenarios can help define new needs for the next generation mobile phones, and hence drive cellular and wireless networking technologies towards an ever more context-aware mobile phone.

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