Chapter 68
The Concept of Interoperability for AAL Systems

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ABSTRACT

e-Health considers the healthcare environment as an electronic workspace where different Medical Information Systems (MIS) supports the automation of information processing, the exchange of medical and administrative data and the automation of medical workflow. AAL systems are MISs of special purposes that use wireless technology to provide healthcare to citizens. By their nature AAL systems are totally distributed, they include various medical and other users' devices and the mobility of people increases their complexity and creates advanced requirements for the communication of data. Effectiveness and functionality of AAL premise interoperability at all levels of communication. In this chapter the definitions of interoperability are examined and how these are specialized for the healthcare area as well. In addition, the applied technologies and some significant issues that regard interoperability are analyzed.

1 INTRODUCTION: OVERVIEW OF AAL SYSTEMS

The most significant feature of Ambient Assisted Living (AAL) systems is *mobility* of patients that is supported by wireless devices, which's basic characteristics are: they are associated with a particular person and applications can be targeted to that individual; their owners take them wherever they are; they offer direct links to vital information and caregivers and to peer groups that can provide social support; they are essentially small computers that can capture, store and process information.

When talking about AAL systems, we are talking about wireless medical applications. There are two major categories of wireless applications in the area of healthcare: applications for monitor physiological functions and send the information to physicians; applications that provide information

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and feedback directly to patients, thus encouraging them to pay attention to and take o more active role in managing their health.

Applications of first category rely in sensors that are portable, wearable or implantable. Communications for these applications are typically "upstream". Applications of second category are primarily "downstream" although more advanced applications may involve two-way communication. Most of them are based on test messaging using short message service of cell phones. Latest applications use multimedia message service or two-way video.

2 DEFINING INTEROPERABILITY

2.1 The General Definition

At the very top of an '*interoperability* scale' are three levels, each one subdivided: functional, syntactic, and semantic. Full sharing of information requires that the two top levels of interoperability are reached: functional and syntactic interoperability: the ability of two or more systems to exchange information (so that it is human readable by the receiver); semantic interoperability: the ability for information shared by systems to be understood at the level of formally defined domain concepts (so that the information is computer processable by the receiving system).

To make interoperability clearly described, the terms of *interfacing* and *integration* have to be defined. The distinction between interfacing, integration and interoperability is extremely important.

Interface: a boundary at which interaction occurs between two systems, processes, etc. An interface defines how to access an object.

Integration: combination of diverse application entities into a relationship which functions as a whole

Interoperability: a state which exists between two application entities when, with regard to a specific task, one application entity can accept data from the other and perform that task in an appropriate and satisfactory manner without the need for extra operator intervention.

This definition of interoperability, in its mention of a specific task, usefully distinguishes interoperability from integration. It also brings precision and operational meaningfulness to the IEEE and ISO definition of interoperability namely

the ability of two or more systems to exchange data, and to mutually use the information that has been exchanged

2.2 Interoperability in E-Health

The most known definitions of interoperability for healthcare systems are of three international organizations, CEN, IEE and HIMSS. These examine interoperability from different perspectives:

- HIMSS describe the dimensions that comprise a more expansive notion of interoperability
- CEN defines a broad array of user-driven interoperability functional profiles
- IEEE analyses the modules of an interoperability' s functional model

Studying these definitions, a common area of interoperability in e-Health is defined as presented in Table 1.

2.3 HIMSS Definition

The HIMSS Integration and Interoperability Steering Committee (I&I) (formed in September 2004) attempted to develop an interoperable definition of interoperability that the entire healthcare industry could agree to. Starting from the general definition, I&I concerned interoperability as "the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for