Chapter 3.13
HealthGrids in Health Informatics:
A Taxonomy

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ABSTRACT

Healthcare is a vast domain encapsulating not only multiple sub-domains or sub-sectors but also many diverse operations and logistics within each sub-sector. This diversity needs to be handled in a systematic and well-characterized manner in order to maintain consistency of various healthcare tasks. Integration of health information systems within each healthcare sub-sectors is crucial for ubiquitous access and sharing of information. The emerging technology of HealthGrids holds the promise to successfully integrate health information systems and various healthcare entities onto a common, globally shared and easily accessible platform. Many different types of HealthGrids exist but there lacks a taxonomy to classify them into a hierarchical order. This chapter presents a well-characterized taxonomy of different types of HealthGrid and classifies them into four major types, namely BioGrid, MediGrid, PharmaGrid and CareGrid. Each of these HealthGrids possesses dedicated features and functionalities. The proposed taxonomy serves to better understand the realtionship among various HealthGrid types and would lay a basis for future research.

INTRODUCTION

Healthcare is currently going through a series of technological advancements and modifications. Health information has always been of great importance to society and has a strong impact on various social aspects. Due to its nature, health information has to be dealt with great care and confidentiality. At the same time, it has to be shared and exchanged across various organizations or individuals to provide improved healthcare service. Two of the most important disciplines in Health Informatics today are bioinformatics and medical informatics. As Computer Science and Biotechnology communities join forces to create new technologies for the advancement of medical science and improvement

of medical service delivery (Stewart, 2004), this might prove to be promising for enabling people to lead normal, healthy lives.

It is widely recognised today that the healthcare industry requires customized solutions with respect to information integration. The information sharing techniques currently available are not sufficient to meet the requirements of an integrated health care system. The state of electronic information integration in healthcare lags noticeably behind other business domains such as banking, insurance and electronic commerce (Bilykh et al., 2003). There is a need for health information systems to be fully integrated with each other and provide interoperability across various organizational domains for ubiquitous access and sharing. Moreover, due to rapid progress of biotechnology an increasing number of life science databases are becoming available that are being operated and managed individually (Tohsato et al., 2005). Many existing solutions still do not offer the desired levels of utility/functionality or sophistication that a health information system demands.

The emerging Grid technologies hold out the promise of a global information channel that is far more powerful and uniquely distinct from the existing internet framework (Naseer and Stergioulas, 2006b). By definition:

"Grid is a large-scale, high-performance, always-on and dynamic, although geographically distributed yet networked, infrastructure that comprises and seamlessly unifies a variety of autonomous, heterogeneous components such as processes, resources, network layers, interfaces, protocols and services, with strong, consistent and controlled relationships among them." (Naseer and Stergioulas, 2006b)

HealthGrid is a Grid used in the context of healthcare. HealthGrids are expected to successfully integrate health information systems and various healthcare entities, including humans and non-humans, such as scientists, scientific tools, medical instruments, physicians, patients and all types of healthcare data or medical information, onto a common (global) platform that would be shared and easily accessible (Breton et al., 2005). In such a scenario, each health information system is composed of various distinct components, which are integrated in a way that each component has its well-defined semantics and ontology and is well-aware of all other components.

Considering the vast nature of the heathcare domain (Alexopoulos et al., 2007), it can not be assumed that only one HealthGrid would be sufficient for the entire healthcare domain. However, many small HealthGrids could be combined together to form a giant HealthGrid infrastructure in order to facilitate collaborative work and resource sharing. There are several existing medical classifications, terminologies and taxonomies (Alexopoulos et al., 2007) but such a taxonomy that illustrates how the various HealthGrids could be classified does not exist yet. Therefore a taxonomy is needed that classifies various types of HealthGrids and lays-out a hierarchical structure that is simple to understand but is yet systematic & well-characterized. Such a taxonomy would be beneficial for understanding, in detail, the realtionship among various HealthGrid types and would lay a basis for the future research.

This chapter offers a systematic taxonomy of the HealthGrids. It first outlines the characteristic features and functionalities of HealthGrids, and reflects on the need for Grid technology in healthcare. The taxonomy of HealthGrids is proposed, based on their functionality, purpose, and application area. Finally, this chapter reflects on the future of HealthGrids in Health Informatics and draws some conclusions.

HEALTHCARE NEEDS GRID TECHNOLOGY

The case for the use of Grid technology in healthcare arises mainly from the need to improve,

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