Chapter 12
Semantic Web Architecture to Provide E-Health Content and Services

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ABSTRACT

This chapter is aimed at introducing the Semantic Web, the related common languages, and the Semantic Web Services Architecture as a hope for future information services architecture on the Web. In particular, the chapter will focus on the current and prospective (or practical and potential) contributions of the Semantic Web technologies in providing e-Health content and services to its potential users worldwide. To stay health-focused and to illustrate the potentials of the health related services, a real-life journey of a health consumer seeking health information services has been used as the context throughout this chapter. This consumer's journey will help the readers to comprehend the superior aspects of the Semantic Web technologies as an emerging upgrade to the current physical architecture.

INTRODUCTION

Steve is a 59-year-old carpenter working in the rural area of Victoria British Columbia, Canada. He lives with his wife, Sara, and his two daughters, Mary (16) and Kathy (14). Steve has a history of heart-related issues which first appeared as a heart attack ten years ago, when Steve was on a trip to Toronto. Steve was diagnosed with mild hypertension and a moderate blockage of two of his heart's vessels and, since that time, has been under the supervision of Dr. Roberts for the required treatments and follow-ups. Two months ago, after another episode of hypertension symptoms, Steve was advised by Dr. Roberts to take serious action to help lower his blood pressure. Mary, Steve's older daughter, suggested that Steve search the Internet. She encouraged her father to read online health guidelines to discover techniques to lower blood pressure. She also thought he might find stories about how others had been successful in lowering their high blood pressure. Following his daughter's advice, Steve entered "how to lower my blood pressure" in the Google search box. Approximately 48,000,000

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information links were identified by Google as relevant material. Steve scanned the first few search results pages, checking several of the sites mentioned, but after about thirty minutes became quite frustrated. Steve wondered:

1. How to know if a Web site is a trusted one.
2. How to find stories regarding individuals' experiences of fighting hypertension.
3. How to locate the best and most practical advice among forty eight million Web pages.
4. If the Internet could help locate an online forum or club through which others discuss similar health issues.
5. If the Internet could help to find health-related resources such as health-related products or clinics, clubs, and health centers with services and facilities to help in individual cases.
6. ……

Very soon, Steve realized that he had overestimated the informational power of the current World Wide Web (WWW). He had entered into a facility which housed a billion (or more) books without an index, shelves, or indeed, book titles! Instead, the World Wide Web only offered an inadequate search machine that could only locate the books that had any mention of the keywords he entered. Therefore, locating 48 million related resources out of the existing billions was deemed a success!

The story above happens to perhaps millions of people who seek health-related content and services online every day. The state of information accessibility and availability on the World Wide Web is not what its founder, Tim Berners-Lee, originally planned (Berners-Lee, 1998). His original goal was to build a universal network of logically-related, meaningful content, called the Semantic Web (SW) in which the descriptions of online resources and their content could be understood by software agents processing users' information requests such as those Steve made. However, contrary to this original goal, the first Web language introduced (Hypertext Markup Language (HTML)) —and the related protocol (Hypertext Transfer Protocol (HTTP)) allowed anyone, worldwide, to post almost any type of content, including health-related content, independent of its meaning and content structure. This simplicity in the health information domain very quickly resulted in a plethora of health and medical resources (documents, services, etc.) posted on the Web that were (and are) haphazardly interrelated through their physical machine address (i.e., IP address), making information retrieval inefficient and unsatisfactory.

To make the World Wide Web more efficiently usable, a global upgrade to the Semantic Web is inevitable. During such an upgrade, the physical Web currently functioning primarily as a global storage for health/medical-related resources should evolve into a universal provider of health information services, which will enable users worldwide to locate the information (and services) they need, to monitor their updates, and to compare and finally select the ones best match their preference. Such an improvement would make the current inaccessible *black box* of health information into a practical and handy Web of interrelated health resource and services within which discovering the quality and relevant resources regarding a health topic such as blood pressure would be a minor job.

The goal of this chapter is to review and discuss the various steps to be taken to make the Semantic Web happen. In this chapter, various aspects of the Semantic Web architecture (in its current vision) and the latest service models will be discussed using health resources and e-Health services as domains of context/example. Pursuing this goal, the chapter, after some introductory definitions, will begin with a discussion of the shortcomings of the current physical Web architecture in providing e-Health content and services and will continue with the description of the technologies (XML,