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Chapter V

Secure Semantic Grids

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Abstract

This chapter first describes the developments in semantic grids and then discusses the security aspects. Semantic grids integrate Semantic Web and grid technologies. They also integrate knowledge management with Semantic Web and the grids. There is much interest on applying the semantic grid for many applications in science and engineering. Therefore, it is critical that the semantic grids be secure. We will also discuss Semantic Web mining and privacy implications relevant to semantic grids.

Introduction

The Semantic Web is essentially the next generation Web. Tim Berners-Lee's vision is to have machine understandable Web pages (Berners-Lee & Fischetti, 2000). Subsequently, he invented the Semantic Web. Semantic Web essentially integrates many technologies including Web database management, Web

services, and infrastructures. Furthermore, Berners-Lee has designed the layered architecture for the Semantic Web, including layers for XML (eXtensible Markup Language), RDF (Resource Description Framework), and Web Rules and Query. Many developments have been reported on the developments of the Semantic Web. Ontologies and ontology management techniques have been developed. Much progress has been made on information integration.

While progress was made on the Semantic Web, the global grid community started focusing on building the next generation grid. The term grid evolved from power grids where millions of power lines have to be supported by the grid. Similarly with the computing grid, millions of resources that form the grid have to be allocated efficiently to the computationally intensive tasks. Typically, these tasks are those carried out for scientists and engineers.

The semantic grid is a new term that has evolved over the last couple of years. It essentially integrates Semantic Webs with the global grids. That is, grid computing has to be made more intelligent. Integrating ontologies and Semantic Web technologies into grid computing will enable the development of semantic grids. There has been some progress on semantic grids (see for example IEEE, 2004). However, security for semantic grid has received little attention. To achieve security for the semantic grid, we need security for the Semantic Web and secure grids. It is only recently that security has been examined for Semantic Webs and grids (Bertino, 2004; Thuraisingham, 2004a). This chapter attempts to incorporate security for semantic grids.

The organization of this chapter is as follows. We discuss semantic grids including a discussion of Semantic Webs, grids, and integration issues. Knowledge management will also be discussed. Then, we discuss security issues including secure Semantic Web, secure grids, secure integration, and secure knowledge management. Some further considerations in related topics such as Semantic Web mining and privacy considerations will be then be discussed.

Semantic Grids

Overview

Several technologies have to work together to develop the semantic grid. These include the Semantic Web, the global grid, and the integration of the two technologies. The Semantic Web is essentially about machine understandable

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