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Chapter XI
Using Grid for Data Sharing to Support Intelligence in Decision Making

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ABSTRACT

This chapter is about conceptualizing the applicability of grid related technologies for supporting intelligence in decision-making. It aims to discuss how the open grid service architecture—data, access integration (OGSA-DAI) can facilitate the discovery of and controlled access to vast data-sets, to assist intelligence in decision making. Trust is also identified as one of the main challenges for intelligence in decision-making. On this basis, the implications and challenges of using grid technologies to serve this purpose are also discussed. To further the explanation of the concepts and practices associated with the process of intelligence in decision-making using grid technologies, a minicase is employed incorporating a scenario. That is to say, "Synergy Financial Solutions Ltd" is presented as the minicase, so as to provide the reader with a central and continuous point of reference.

INTRODUCTION

This section provides grounding in intelligence informed decision making technologies, their application and integration within the modern organisations.

Scott-Morton first articulated the concepts of decision support systems (DSS) in the early 1970s under the general term of management support systems (MSS). Further works on "bounded rationality" from Simon (1977) and "classification types of DSS" from Keen and Scott-Morton (1978), Alter (1980), Holsapple and Whinston (1996) have led us to understand that DSS is a set of concepts associated with supporting the decision making process via the use of appropriate resources. These (resources) may include but are not limited to users, data, models, software, and hardware.

Computer-based developments over the last four decades have facilitated decision makers with numerous tools to support operational, tactical and/or strategic level of enquiries within the environment of an organization. In relation to intelligent decisions, the use of expert systems (ES) and knowledge management systems (KMS) have evolved over the years by developments in computational science including data mining, data visualization, intelligent agents, artificial intelligence, and neural networks. One of the purposes of these technologies is to provide managers (decision makers) with a holistic view hence, the ability to analyze data derived from a collection of multiple dispersed and potentially heterogeneous sources (Han, 2000).

One of the challenges for such facilitation is the method of data integration, which aims to provide seamless and flexible access to information from multiple autonomous, distributed and heterogeneous data sources through a query interface (Calvanese, Giacomo, & Lenzerini, 1998; Levy, 2000; Ullman, 1997). In the context of DSS, there are "two broad classes of approaches to data integration: Data Warehousing and Database Federation" (Reinoso Castillo, Silvescu, Caragea, Pathak, & Honavar, 2004). Practices in relation to the data warehouse approach cover the acquisition, extraction, transformation, and loading of the data into a centralized repository, which can then be queried using a unified query interface. The approach further allows interactive analysis of multidimensional data of variable granularity with multifunctionalities such as summarization, consolidation, and aggregation (Nguyen, Min Tjoa, & Mangisengi, 2003), as well as, the ability to represent data in cube format (Nieto-Santisteban, Gray, Szalay, Annis, Thakar, & O'Mullane, 2004). The key difference of the data federation approach is, that decision makers can query directly the dispersed heterogeneous data sources and hence, users are required to impose their own ontologies in relation to the data requested.

The informational needs of a decision maker are not limited to those prementioned and are very seldom limited to data, but include other type of resources, which may be required to be accessed from multiple dispersed sources. The resources may include but are not limited to databases, software, hardware, or even instruments such as satellites, seismographers, detectors and PDAs. For example think of an emergency situation caused by an earthquake. The emergency management team will be required to make real-time intelligent decisions and act accordingly to save lives, property, and the environment by assessing multiple dispersed resources (Asimakopoulou, Anumba, & Bouchlaghem, 2005). This particular decision making process will require team working and collaboration from a number of dispersed decision makers whose decisions may be depended on each other's interactions. Resource integration at that level will support decision makers since it will allow them to view satellite images of the affected area, observe seismic activity, forecast, simulate and run "what if" scenarios, collaborate with experts and the authorities. This will assist decision makers to prioritize and ultimately make decisions, which will be disseminated to available rescue teams who will take then care of the operational tasks. This dissemination may typically involve a server broadcasting decisions to heterogeneous mobile devices such as personal digital assistants (PDAs).

The volume of the data-sets is typically measured in terabytes and will soon reach petabytes (Antonioletti et al., 2005). These data-sets are

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