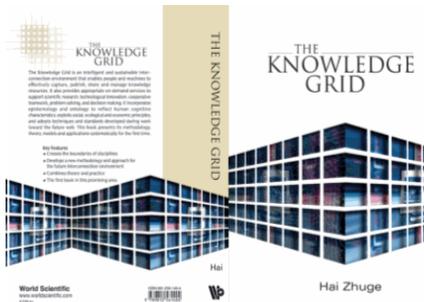


# THE KNOWLEDGE GRID

By Hai Zhuge, World Scientific, 2004, ISBN: 981-256-140-4



Reviewed by Erlin Yao<sup>1</sup>

The recent booming interest in Knowledge Grid is just there. It can at least be revealed by the tens of thousands of related entries that Google.com returns based on these two buzzwords. If the ultimate goal of Grid computing is to facilitate distributed computing power access in a seamless manner, that of Knowledge Grid is to mobilize the distributed knowledge for effective reuse. “The Knowledge Grid”, written by professor Hai Zhuge -- the founder of the China Knowledge Grid Research Group (<http://kg.ict.ac.cn>), is by far the only academic monograph dedicated to this promising research area. This monograph, for the first time, provides a systematic presentation of the underlying methodologies, theories, models and applications of the Knowledge Grid.

Instead of being yet another book on one more form of Grid middleware, “The Knowledge Grid” features three distinct writing objectives: to bridge the boundaries of disciplines related to Knowledge Grid, to provide methodologies and approaches for developing future interconnection environment, and to integrate theory with practice. System architects, researchers and academics who are interested in knowledge-based systems and Grid computing should find this monograph a valuable and unique reference. This monograph also serves well an overview of the state of the art of the Knowledge Grid research, suitable

particularly for researchers. If you want to find out if the Knowledge Grid is the killer methodology for solving knowledge sharing and integration problems or to see whether there are already better solutions on the horizon, “The Knowledge Grid”, altogether 264 pages, is a book written for providing some hints for the answers. However, if you are looking for technical details for building immediately Grid applications, you are better off with other books written around the Globus.

“The Knowledge Grid” is organized in four parts. The first part describes the methodology of the Knowledge Grid. The author systematically defines the Knowledge Grid, for the first time, as an intelligent and sustainable interconnection environment that enables people and machines to effectively capture, publish, share and manage knowledge resources. It also provides appropriate on-demand services to support scientific research, technological innovation, cooperative teamwork, problem-solving, and decision-making. It incorporates epistemology and ontology to reflect human cognitive characteristics; exploits social, ecological and economic principles; and adopts techniques and standards developed during work toward the future interconnection environment. The author also proposes the challenges and opportunities for Knowledge Grid research.

The second part of the book focuses on the Semantic Link Network and Resource Space Model — the two models proposed by the author for implementing a rich semantic layer for the next generation interconnection environment. The Semantic Link Network (SLN) model is a conceptual model to support the semantic overlay, where resources are not linked simply by hyperlinks but semantic links for enabling a particular form of semantic reasoning. The author starts from a metaphor of geographical mapping in organizing and locating resources, and then defines a Resource Space Model (RSM) as

a semantic data model for uniformly, normally and effectively specifying and managing resources. RSM essentially organizes versatile resources according to a formally defined semantic normal form so that (1) one or a set of resources can be identified given a set of resource space coordinates, and (2) constraints, operations, and several other normal forms can be defined for the guarantee of the correctness of the corresponding deduction process. The combination of the Semantic Link Network and the Resource Space Model forms a unified semantic framework for resource management in the next generation interconnection environment, and the corresponding query language and programming environment will be needed as introduced in the book.

The third part of the monograph introduces the conceptual model on knowledge flow and peer-to-peer knowledge sharing. It discusses the computational model of knowledge intensity based on a number of fundamental knowledge flow principles and proposes the knowledge spiral model for revealing the intrinsic rules of knowledge flow. For the last part, it describes the properties of diverse scale-free networks covering random graph theories, small-world effects, the idea of preferential attachments, as well as the dynamic evolution of these networks. The goal is to explore an abstract live network — a possibly high overlay for the Knowledge Grid.

Unlike other books on Grids, “The Knowledge Grid” has no lengthy sample grid applications in it and the assessment of the potential of the Knowledge Grid is very much down to earth. The author considers the Knowledge Grid as a natural evolution of computing methods and technologies, instead of a “big bang” standard that can immediately make existing and competing standards obsolete. The co-existence of the current Web and the Knowledge Grid for years to come is what being predicted by the book author.

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