



Preface

This book on Grid and Cloud Computing captures the advances in the field from Grid Computing to Cloud Computing. The text is presented in two parts—part one deals with Grid Computing while part two deals with Cloud Computing.

New material capturing the advancements in the field of Grid Computing have been added in part one on Grid Computing with the most prominent new model addition as Vishwa work which represents the peer-to-peer grid computing framework. Vishwa framework allows any node to be added to grid computing platform and represents a very light weight framework. It allows both windows and linux nodes to be made part of the grid framework. It is an excellent platform to teach grid computing middleware and programming framework. Vishwa framework is available for download from our lab website (dos.iitm.ac.in) along with several tutorials and sample programs. It is currently being used by several universities for teaching grid computing. In the application section, Arogysree has been added which is a grid based telemedicine framework for rural India. This work is the result of an IndoGerman collaborative research project and gives an insight of developing practical grid computing applications at scale.

Part two on Cloud Computing deals with the programming models, efficient execution of programs on cloud infrastructure and models for hybrid clouds. The predominant programming model on cloud is map-reduce abstraction. However, map-reduce programming abstraction has several limitations. Extensions to map-reduce model by addition of a function for generation of recursive program splits and shared address space for map functions has been added and this abstraction is called Generate-Map-Reduce (GMR). Programming smart applications on the cloud has been demonstrated using GMR abstraction.

The most likely short term and near long term trend in cloud infrastructure is going to be hybrid clouds consisting of an internal private cloud which co-exists along with a public cloud. One use case derived is connection of multifunction devices (such as printers) as part of a private cloud and formation of a hybrid cloud by connecting the private cloud with a public cloud. In this specific case, as printing jobs arrive at the private cloud, there is need to process the jobs. The processing jobs involve graphic computations on the images, etc. Often these are compute intense jobs and the private cloud of multifunction devices may not be best suited for processing these compute intense jobs. With the hybrid clouds, it is possible to cloud burst the jobs from the internal cloud to the public cloud to meet the QOS requirements.

Cloud bursting algorithms for bursting the load from the internal cloud to external cloud have been studied in depth. There are several ways the external cloud can be integrated into an internal cloud based on the job characteristics. When computation to data ratio is high, the external cloud can be used to accelerate the computations by bursting the load from internal cloud to external cloud. On the other hand if the computation to data ratio is low, the external cloud can be used to stabilize the internal cloud when the load in the internal cloud peaks.

The book also covers the emerging trends in cloud computing and the beginning chapter of part two gives a comprehensive coverage of the emerging trends in cloud computing.

The work presented is a joint work of a number of my students and their names are included in the appropriate chapters. IIT Madras has supported this activity and I acknowledge the support from Center for Continuing Education, IIT, Madras. My wife Bhavani and our two daughters Pooja and Sowmya are always a source of strength and support in all my activities including the revision of this book.

Web Resource

Software developed for the models proposed in the text namely ARC, DP, P-COBRA and Sneha-Samuham are made available online at <http://highered.mheducation.com/sites/9339221478>