Preface

OVERVIEW OF CLOUD COMPUTING

The advancements in Information and Communication Technology are forcing enterprises to rethink their Business Models and strategy for their business. It has become a necessity for every enterprise to keep pace with these advancements. It is also required that executives working in the enterprises are not dispensed with for lack of knowledge regarding emerging trends. In the present business scenario success is no longer guaranteed for enterprises that have financial resources and size on their side. Smaller enterprises that are flexible are providing products or services at a faster pace and lower cost. It is also because of the advancements in internet, enterprises no longer have to hire a consultant who lives nearby. As boundaries are shrinking, the level of competition is going up. More and more competition means enterprises are chasing the same dollar. Now it has become imperative for enterprises to adapt themselves to changing market conditions and government regulations of different countries. Enterprises need to plan for their business in both domestic and international markets. The better strategy should be integrating business, the knowledge of domain experts, and emerging concepts in information and communication technology to gain competitive advantage in the global market scenario. Cloud computing facilitates to achieve the above strategy.

Cloud computing is one of the concepts among the number of other concepts provided by information and communication technology. It may be said that the concepts of cloud computing is the result of the advancements in Internet. In the present Information and Communication Technology scenario, new technologies appear at high speed in the market place and at the same speed they are disappearing. Cloud computing is predicted to have more longevity.

It is said that global virtual enterprises are gaining importance because of cloud computing. The business world is in the midst of a significant transition largely due to the emergence of global virtual teams.

The importance of cloud computing is felt in the virtual enterprises. Cloud computing provides mechanism for sharing and coordinating the use of diverse resources. This mechanism enables the creation of geographically and organizationally distributed components of virtual computing systems. Cloud computing supports virtualization in respect of applications, devices, networking, storage, and servers Further it can be said cloud computing facilitates the economies across the globe closely interconnected and integrated.

There are four components that need to be integrated under cloud computing for the development of business models for virtual organizations. They are business process, application software, system software, and infrastructure such as servers, network, and database. Adding intelligence to the process of developing new models or to existing models and their management makes lots of sense because business models need considerable expertise.
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There are four cloud deployment approaches. They represent specific types of cloud environments. Each cloud environment has its own characteristics. Cloud computing is generally classified as public, private, community, and hybrid clouds.

- **Public Cloud:** This cloud infrastructure is owned by an organization selling cloud services to the general public or to a business enterprise or to a large industry group.
- **Private Cloud:** This cloud infrastructure is owned or leased by single enterprise and is operated solely for that organization.
- **Community Cloud:** This cloud infrastructure is shared by several organizations and supports a specific community.
- **Hybrid Cloud:** This cloud infrastructure is composition of two or more clouds such as private, community or public those are unique entities. They are bound together by standardized or proprietary technology that enables data and application portability.

Further the cloud environment consists of generally three core components which refer to three types of services such as Software services, Platform services and Infrastructure services. These services are generally defined as Software as a Service (SaaS), Platform as a service (PaaS), and Infrastructure as a service (IaaS). However, a number of other specialized services are available. They are 1) Storage as a service, Database as a service, Security as a service, Communication as a service, Management as a service, Integration as a service, Testing as a service. Enterprises can choose a deployment model along with a particular or combination of the various services indicated above.

Notwithstanding the benefits that cloud computing offers, there are some issues and challenges associated while implementing cloud computing concept in enterprises. They are 1) Data Management and Governance, 2) Service management and Governance product, 3) Process control and monitoring, 4) Infrastructure and system reliability and availability. These issues are addressed and they are provided solutions by the expert groups in the vendor organizations who provide the cloud computing services.

**GLOBALIZATION SCENARIO**

In the present global Virtual Enterprises Environment Cloud Computing provides mechanism for sharing and coordination of the use of diverse resources thus enable their creation from geographically and organizationally components of virtual computing systems. This book emphasizes that cloud computing sufficiently integrates resources to deliver desired qualities of services. Further the book indicates that cloud computing facilities support management of credentials and policies when computations span multiple enterprises, and resource management protocols. Further it supports services that support secure remote access to Computing, Data Resources, and Co-Allocation of multiple resources. This book explains that cloud computing provides solution to application virtualization, storage virtualization and server virtualization. The above solutions are mainly needed for Global Virtual Enterprises.
BENEFITS FROM CLOUD COMPUTING

Data intense applications in cloud computing environment occur in scientific and business domains. Scientists require mechanism to transfer, publish, replicate, discover, share and analyze data. Business application in domains such as financial services, research and development, and online business services need to maintain database consisting regionally or worldwide. There is a good scope for carrying out research activities for developing business models for manufacturing, healthcare, education, and government sectors.

TARGET AUDIENCES

This book offers comprehensive view of cloud computing concepts being used with collaborative technologies across multiple sectors such as Education, Health-Care, Manufacturing, Government agencies, and Business enterprises. This book would be useful as reference for research scholars, research and development departments in industries. It is also a course supplement to the students pursuing computer science and information technology related subjects. This is also a good resource for software professionals who are involved in developing business applications in cloud computing environment.

GIST OF THE CHAPTERS

The book is broadly divided under six sections covering 1) Concepts and Framework, 2) Education Sector, 3) Conceptual Business Models, 4) Supply Chain in Cloud Computing, 5) Health Sector, and 6) Technologies Issues. The contributors of this book are from academics, and professionals who are involved in research related to the concept of cloud computing and developing business models using this concept.

In the Introduction N. Raghavendra Rao explains the emergence of cloud computing, perceptions and misconceptions on cloud computing. The author narrates the working of data centers in the era when mainframe systems were popular. Further he compares data center in main frame era with global virtual data center under cloud computing environment. He expresses both are similar. The advent of internet has facilitated cloud computing supporting global virtual data centers. He has made a reference of grid computing and the reason not becoming popular even though it has almost similar features of cloud computing. He also talks about the relevance of cloud computing in the domains such as Home Sciences, Financial Services, Research Collaboration, and Government Agencies. He explains the various cost aspects in the cloud computing environment.

Mouna Jouini and Latifa Ben Arfa Rabai in their chapter, “Design Challenges of Cloud Computing” talk about the challenges that arise while designing a system under cloud computing environment they also highlight the key characteristics, cloud computing, cloud computing architecture, and core foundation capabilities. They also make a reference of user tools. They also talk about stakeholder’s categories and their concerns. They explain about the security threats from the angle of host, customers, data centers, and virtual machines. They indicate handling of security requirements in cloud computing environment.
The Chapter titled “An Interoperability Framework for Enterprise Application in Cloud Environments” written by Jose C. Delgado explains a multidimensional enterprise architecture framework and multidimensional interoperability framework. The author also talks about reducing coupling in interoperability. Further the author compares with the other interoperability framework. The author observes that the world is increasingly both distributed and interconnected. The author remarks that interoperability is crucial and the existing standards are not enough to ensure enterprise information systems.

R. Todd Stephen’s chapter titled “Design Considerations for a Corporate Cloud Service Catalogue” gives the background of the organization AT RT Inc. The author describes the traditional services of a cloud registry and observes there is a need for a cloud service registry built on solid usability principles that can be used by an average user. Further the author explains business oriented cloud service catalog and usability criteria for an application system. The author discusses a case study on the basis of the research conducted by a team at the author’s organization. The main aim of this chapter is the author is sharing the team experience at the author’s organization and the team’s observations on their research project.

Chaka Chaka, author of the chapter “Personal Mobile Cloud Computing Affordability for Higher Education: One Example in South Africa” explains the concept of personal mobile cloud computing. The author observes internet service providers and social networking sites support the devices which have internet access. The author feels that personal mobile computing is not given importance in respect of higher education. In the literature review in the area of higher education sector, the author presents a brief summary and synthesis of case studies related to the use and deployment of cloud computing in the selected higher education institutions. Further the author has divided the participants in two groups who were enrolled in two different undergraduate courses at a rural university in South Africa for the research study. These two groups speak English as a second language.

Camilius Sanga and George Kibirige in their chapter “Applying KOLB Experiential Theory with Cloud Computing in Higher Educational Institutions: Tanzania” observe that free and open source software has revolutionized the entire information and communication technology. They also mention that in developing countries, several countries are converting into digital libraries using low cost technologies due to open access. They point out many libraries in Tanzania have limited budget for information and communications technology services. They also talk about new aspects of this technology in libraries. Further, they discuss the creation of cloud libraries. They highlight the challenges, opportunities and the role of cloud library. They have also presented the current status of application of information technology in the libraries in some selected Tanzania’s higher learning institutions. They have stressed the importance of applying KOLB experiential learning by making use of cloud computing in relation to library.

K. Hariharnath, author of the chapter titled “Big Data in Cloud Computing Environment for Market Trends” observes the concept of big data can be made use of in the cloud computing environment for assessing market trends of the manufacturing products. The author explains a business developed by a textile mill in India applying the concepts of big data, cloud computing and virtual reality in their business model. The author gives the background of the 3G textile mills and their approach in creating a business model by them. This mill has been in the business over five decades. The unique aspect of this mill is, it is being managed by a management team who belong to three different generations. Their approach and decisions are based on their experience, business insight and education. They realized the globalization scenario is affecting their market share in the market. At the recommendations of the consultants, a business model has been designed on the basis of making use of the concepts such as Big Data, Cloud Computing and Virtual Reality. Further the author explains this business model has helped 3G Textiles to remain competitive in the global market.
N. Raghavendra Rao in his chapter titled “Cloud Computing: an Enabler in Managing Natural Resources in a Country” observes that economic development has helped to raise the standard of living and has also led to mis-management of natural resources. This has also resulted in environmental issues. The author explains the components of natural resources and human activities on natural resources. The Author talks about a model for making use of space technology and cloud computing to create a knowledge based system for natural resources. This model will mainly be useful for the various government departments which are involved in the management of natural resource and environmental issues. Further the author suggests a model for handling damages caused by natural disasters. The author stresses the major problem in the developing countries is the identification of the effects on the mismanagement of natural resources. The author feels that cloud based natural resources data model will help the government in a country to change their practices for using the natural resources.

Lee Gillam, Simon Broome, and Debbie in their chapter titled “IPCRESS: Tracking Intellectual Property through Supply Chains in Clouds” observe that document archives and systems of any organization, coherently managed or not, can contain variety of high-value information relating to collaborating and competing business, business transactions, research and development plans, market analysis and strategy. Large organizations may have such documents spread widely across numerous siloed business units, with highly evolved but desperate systems, approaches and practices. The authors indicate the lack of a readily definable organizational boundary is inherent in supply chains and becomes amplified when supply chains act through software as a service. This chapter is based on a collaborative research and development project between Jaguar Land Over, University of Surrey and Geo Lang Ltd and with funding from the UK Government backed technology strategy board for 18 months. The authors of this chapter constructed the intellectual property protecting cloud services in supply chains (IPC Press) system to address supply chains and barriers to cloud adoption related data security and resilience. They explain that IPC Press, as a project is developing a capability for tracking IP through supply chains, offering cloud services to i) Prevent IP leakage ii) Detect IP leakage or theft and iii) Identify information retention beyond allowed periods.

Kijopkin Kasemswap author of “The Role of Cloud Computing in Global Supply Chain” observes that in the global market place, internet, the low cost processing capacity open standard and loosely coupled information technology infrastructure has been widely recognized as a tremendous enabler for collaboration. The author explains the role of cloud computing in the supply chain. Further the author talks about the theoretical and the practical concept of cloud computing. The author also gives an overview of e-scms and the organizational information process theory concerning information processing requirements and information capability. The author also examines the extent to which environmental uncertainty, task uncertainty and inter organizational uncertainty effect intention to adopt cloud computing concepts in supply chain.

N. Raghavendra Rao, Author of the chapter titled “Establishing Synergy between Cloud Computing and Collaborative Technology in Medical Informatics”, observes health has been concern of major importance across the globe. The kind and amount of resource available now is increasing day by day. Information technology has been the most important new resource in the present century. Emergence of new tools and devices has been helping the medical profession. The author in his chapter talks about a virtual hospital scenario in India under the cloud computing environment. Further the author explains pervasive devices and virtual reality concept can be made use with the cloud computing in virtual hospital. The author discusses three case illustrations to support his approach in making use of cloud computing with collaborative technology. In one case illustration the author talks about health care
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information system in the virtual hospital scenario. In another case illustration e author explains the rational method in discovering a drug under cloud computing environment. In the third case illustration, the author stresses the importance of evidence based learning by medical students across the globe under cloud computing based health care system. The author is of the opinion in the era of globalization, cloud computing along with the collaboration technology will provide a lot of scope for developing knowledge based health care models.

Dilip Kumar, Bibhudatta Sahoo, and Tarni Mandal authors of the chapter titled “Heuristic Task Consolidation Techniques for Energy Efficient CloudComputing” observe that cloud computing has emerged from the concepts of heterogeneous distributed computing, and autonomic computing. The authors say that the cloud computing environment provides high performance servers and high speed mass storage devices to manage growing demand for computations and large volume data. These resources are the major source of the power consumption in data centers including air conditioning and cooling equipment. The authors indicate that data centers are the world’s highest consumers of electricity. They discuss in their chapter the resource allocation problem in cloud computing as a linear programming problem with the objective of minimizing energy consumption in computation. They have applied heuristic approach in handling the resource allocation problem.

Souravkanti Addya, Bibhudutta Sahoo and Ashok Kumar Turuk, authors of the chapter titled “Virtual machine Placement Strategy for CloudComputing Data Center” observe that cloud computing technology uses the internet and central remote servers to maintain data and application. They indicate in their chapter that the use of online resources has been on increase in the last one decade. This has resulted in the increase of servers at data centers. They explain that virtualization provides the proper resources utilization. They express that the optimum placement of virtual machine server can minimize the power consumption at data center. Further they discussed that simulated annealing optimization technique has been applied in their model for virtual machine placement strategy for cloud data center.

IMPACT OF THIS BOOK

In the technology domain developments now in process are very different from the kind of information handling systems and procedures used in the past. Cloud computing has become ubiquitous. It will provide more computation power and storage for less investment than any other current computing solution. This book mainly focuses on developing business models under cloud computing and highlights the value of cloud computing in the different sectors. Further the book talks about managing virtualization resources.

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