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# Preface

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There are lots of books on cloud computing in the market today. This one is not intended for “supergeeks” looking for the next revelation in “geek know-how.” In fact, it attempts to present cloud computing in a way that anyone can understand. We do include technical material, but we do so in a way that allows managers and technical people alike to understand what exactly cloud computing is and what it is not. We try to clear up the confusion about current buzzwords such as PaaS, SaaS, etc., and let the reader see how and why the technology has evolved to become “the cloud” as we know and use it today.

In the Introduction we explain what cloud computing is, its characteristics, and the challenges it will face in the future. The biggest challenges that companies will face as they move into the cloud are secure data storage, high-speed access to the Internet, and standardization. Storing large amounts of data in centralized locations while preserving user privacy, security, identity, and their application-specific preferences raises many concerns about data protection. These concerns, in turn, lead to questions about the legal framework that should be implemented for a cloud-oriented environment.

In Chapter 1 we discuss the evolution of cloud computing, including hardware, software, and server virtualization. In order to discuss some of the issues involved in the cloud concept, it is important to place the development of computational technology in a historical context. Looking at the cloud’s evolutionary development, and the problems encountered along the way, provides some key reference points to help us understand the challenges that had to be overcome by those who were responsible for the development of the Internet and the World Wide Web. These challenges fell into three primary categories: hardware, software, and virtualization. We discuss how the rules computers use to communicate came about, and how the

development of networking and communications protocols helped drive the technology growth we have seen in the last two decades or so. This, in turn, has driven even more changes in protocols and forced the creation of new technologies to mitigate concerns and improve the methods used to communicate over the Internet. The rise of web browsers led to huge growth in use of the Internet and a migration away from the traditional data center toward cloud computing.

In Chapter 2 we discuss the advent of web-based services delivered from the cloud, including Communication-as-a-Service (CaaS), Infrastructure-as-a-Service (IaaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). As technology has migrated from the traditional on-premises model to the new cloud model, service offerings have evolved almost daily. We provide some basic exposure to where the technology is today, and we give you a feel for where it will likely be in the not too distant future.

In Chapter 3 we discuss what is required from service providers to make the services described in Chapter 2 available. We describe the basic approach to service-oriented architecture (SOA) as it applies to data center design, how companies can build highly automated private cloud networks that can be managed from a single point, and how server and storage virtualization is used across distributed computing resources. We discuss what it takes to build a cloud network, the evolution from the managed service provider model to cloud computing and SaaS and from single-purpose architectures to multipurpose architectures, the concept and design of data center virtualization, the role and importance of collaboration, SOA as an intermediate step and the basic approach to data center-based SOA, and lastly, the role of open source software in data centers and where and how it is used in the cloud architecture.

In Chapter 4 we provide a virtualization practicum that guides you through a step-by-step process for building a virtualized computing infrastructure using open source software. The beauty of virtualization solutions is that you can run multiple operating systems simultaneously on a single computer. So that you could really understand how powerful that capability is, we show you how to do it for yourself. We show you how to download and install the Sun VirtualBox, how to install and configure it, and how to add a virtual operating environment on top of your existing operating system. In learning the basics of using the Sun xVM VirtualBox, you will also gain knowledge about what virtualization is and how it can be used.

Chapter 5 discusses the importance and relevance of federation, presence, identity, and privacy in cloud computing and the latest challenges, solutions, and potential future for each in the cloud. Building a seamless federated communications capability in a cloud environment, one that is capable of supporting people, devices, information feeds, documents, application interfaces, and other entities, depends on the architecture that is implemented. The solution chosen must be able to find such entities, determine their purpose, and request presence data so that others can interact with them in real time. This process is known as discovery.

The extension of virtualization and virtual machines into the cloud is affecting enterprise security because the traditional enterprise network perimeter is evaporating. In Chapter 6 we identify security as the greatest challenge in cloud computing, particularly with regard to the SaaS environment. Although there is a significant benefit to leveraging cloud computing, security concerns have led some organizations to hesitate to move critical resources to the cloud.

Corporations and individuals are concerned about how security and compliance integrity can be maintained in this new environment. Even more concerning, though, is the corporations that are jumping to cloud computing while being oblivious to the implications of putting critical applications and data in the cloud. Chapter 6 addresses the security concerns of the former and educates the latter. Moving critical applications and sensitive data to a public and shared cloud environment is a major concern for corporations that are moving beyond their data center's network perimeter defense. To alleviate these concerns, a cloud solution provider must ensure that customers can continue to have the same security and privacy controls over their applications and services, provide evidence to these customers that their organization and customers are secure and they can meet their service-level agreements, and show how can they prove compliance to their auditors.

Regardless of how the cloud evolves, it needs some form of standardization so that the market can evolve and thrive. Standards also allow clouds to interoperate and communicate with each other. In Chapter 7 we introduce some of the more common standards in cloud computing. Although we do not analyze each standard in depth, you should gain a feel for how and why each standard is used and, more important, a better understanding of why they evolved. Most current standards evolved from necessity, as individuals took a chance on new innovation. As these innovative techniques became

acceptable to users and implementers, more support for the technique ensued. At some point, the innovation began to be considered a “standard,” and groups formalized protocols or rules for using it. We discuss the Open Cloud Consortium and the Distributed Management Task Force as examples of cloud-related working groups.

Innovation leading to success in cloud services depends ultimately on acceptance of the application by the user community. In Chapter 8 we present some of the applications that are gaining acceptance among end users. We look at some of the most popular SaaS offerings for consumers and provide an overview of their benefits and why, in our opinion, they are helping to evolve our common understanding of what collaboration and mobility will ultimately mean in our daily lives. We examine five particularly successful SaaS offerings, YouTube, Zimbra, Facebook, Zoho, and DimDim, looking at them from both the user perspective and the developer/implementer perspective. This dual perspective should give you a clear understanding of how such offerings are transforming our concept of computing by making much traditional desktop-type software available from the cloud.

In Chapter 9 we detail the transition from fixed devices connected to the Internet to the new mobile device–empowered Internet. While it is essentially the same Internet, it has become tremendously more accessible, and advances in telephony, coupled with the use of the Internet, have led to some very compelling, powerful offerings. In this chapter we provide an overview of the more common offerings and how their widespread use will affect the cloud computing world. When more than 90% of your user base depends on mobile devices for common applications such as email, contacts, and media streaming or sharing, you cannot take the same approach as you used with statically connected Internet devices such as laptops and desktop PCs. It is a brave, new cloud-based world we are entering.

We hope that what you take away from reading this book is knowledge that separates hype from reality in talking about cloud computing. It seems that everyone you ask has a different answer. Most of the time, each answer you hear is based on one person’s experience with the cloud or with his or her desire to capitalize on the cloud for profit. Our intent is to present the cloud as an evolving, changing entity that does so out of demand from the Internet community itself. The technologies that are used in the cloud often give rise to new uses. For example, 10 years ago, you needed custom applications to watch video, the right codec had to be used for the right software,

etc. It was more trouble than watching the video was worth. Today, there is a *de facto* standard. Look at how YouTube has come about as a result of such innovation. After you read this book, you will know about the cloud, but not from the perspective of any one source; you will know from the perspective of how technological innovation has actually made it what it is.