Chapter 1
From Mainframe to Cloud

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ABSTRACT

The adoption of cloud computing accelerated significantly over the past few years, and this trend will remain. As cloud-computing technologies and vendors mature, more educational institutions will adopt the Internet-based computing style. Organizations will use cloud computing to reduce the cost of e-mail, IT infrastructure, data centers and storage, and business applications. Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models. The absence of a clear definition of cloud computing is slowing the adoption of cloud computing by needlessly increasing user apprehension and obscuring the cloud's benefits. Organizations need to understand cloud computing before they can realize its benefits and avoid its risks. This chapter clears up confusion about the cloud by defining cloud computing and its characteristics, architectural model, benefits, and shortcomings. This chapter provides the definition of the concept of cloud computing and cloud computing as a service. Subsequently, it explores the characteristics of different types of clouds, as well as the security aspect of this technology. Major trends of cloud computing, such as social computing, context-aware computing, and pattern based strategy, are described. In a conclusion, the authors provide an overview of future use of cloud computing.

INTRODUCTION

History of Cloud Computing

The concept of cloud computing dates from the earliest years of computing. The notion of an individual personal computer was laughable; computers were expensive, fragile, and rare. Computers were designed with the assumption they would run many programs for many users. This was simply the most efficient solution to the limited resources of the day. The underlying concept of cloud computing dates back to the 1960s when John McCarthy opined that computation may someday be organized as a public utility (Abelson, 1999). While the introduction of affordable personal computers in the 1970s and 1980s was a huge step forward in many ways, it was a big setback for cloud computing. At that time, most users preferred to store data on floppy drives, rather than in a remote, centralized location. Also, applications were quite platform-dependent; a PC user might have no way of communicating or sharing data with the Apple user next door. It was a big step back for security as well; with system administration the responsibility of data loss, crashes, and virus infections became widespread. With the popularization of the World Wide Web in the 1990s, the world changed. At that time, most users' Internet needs were simple: look up information, send email, etc. But over time, the way people use the Internet has changed. Cloud computing promises a future where the only local application most users will need is a Web browser.

Modern Cloud Computing

The term *cloud* might have originated in the telecommunications industry. The basic idea is that the most efficient path for data to flow from Point A to Point B cannot be pre-determined by a human operator. Rather, you must trust your switching system to route the data efficiently on a moment-by-moment basis. The term *telecom cloud* refers to the following abstract process; the user you broadcasts its message into the cloud and trusts it to come out the other side, without knowing or caring what happens to the data in between. Hence, cloud computing can be seen as a movement to apply the telecom industry's innovations and economies of scale to the computer industry. The first scholarly use of the term *cloud computing* appears in a 1997 lecture by Ramnath Chellappa of the University of Texas (Chellappa, 1997). Key players in cloud computing of the late-twentieth century included IBM, Microsoft, and Amazon.

Cloud computing became widely recognized around the year 2007, when the Google Docs service went mainstream. Google provided a full, virtualized office suite that could be accessed for free from any Internet-connected computer. In a world where an office software suite can cost hundreds of dollars, the appeal of such a service is obvious. Many cloud applications targeted at individual consumers are free to use. However, there is also a growing category of paid cloud applications targeted at scientists. The benefit is to reduce the IT budget by "outsourcing" critical applications to the cloud. Data backup, security, development of new features, etc. become the responsibility of the application's provider, rather than an internal IT department.

Another growing cloud computing application is cloud based customer relationship management. As the idea of "Software as a Service" (SaaS) became widespread, comparisons with other industries became useful. Cell phone users, for example, will gladly sign a service contract and pay a monthly fee, as long as they get the features they want. Having this in mind, it is necessary to think of the many ways in which businesses that provide cloud computing services can deepen and enrich their relationship with the users.

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