Foreword

Before you read this book, it’s useful to have some context on VMware’s view of cloud computing and to place this in a historical context that helps us understand why the cloud is becoming the new computing paradigm and why it’s important to simplify IT so that businesses can focus on core functions, not on the plumbing.

**Cloud = How, Not Where**

Cloud computing is about *how* computing is getting done, not *where* it is getting done. The great promise of the cloud is that it will enable things to get done faster and more cheaply—by removing and hiding complexity. The popular press often associates cloud computing with workloads running off-premises at an external, public computing provider. VMware has a broader view of cloud computing that does not tie computing to a location and advocates a much more flexible form of computing that spans locations and enables greater application development agility and portability by presenting a common platform with consistent management. But to appreciate this view of cloud computing, we should first ask how things got so complex in the first place.

**How IT Got Complex, and How We Intend to Simplify It**

Computer systems have continuously evolved to balance the capabilities of the technology era against the requirements of the users, whether they are programmers or end users, resulting in trade-offs that made sense at the time.

Batch processing mainframes above all optimized the use of the scarce and expensive computing resources. People were willing to be inconvenienced as long as every scarce CPU cycle was used effectively. Timesharing systems were designed to give the illusion that each user had their own computer, along with access to shared file storage, but the compromise was that the response time deteriorated as more demands were placed on the shared computers. Since computers were still relatively expensive, end users were willing to live with those constraints.

As computer components declined in price, thanks to the semiconductor revolution, distributed computing and personal computers arose. Each user or group of users benefited from control over their own machine, although they lost convenient sharing of data and also encountered relatively low CPU utilization rates, which wasted the full potential of machines. Client-server systems arose to address these limitations by providing highly interactive user interfaces on personal computers, along with centrally managed servers with shared data and processing.
But the cost was the need to manage ever increasing complexity. Now there were many more independently movable pieces. Keeping track of the interdependencies led to dramatic increases in operational cost. Attempts to fix this have resulted in even more layers and more complexity, turning into a truly Sisyphean task. We are now paying for the sins of our past. Inertia and the desire to retain compatibility have kept the IT industry on this path, since the costs of switching to a new paradigm were considered too high to offset the costs of complexity.

This very inertia often does not allow us to truly recognize the opportunity for change. But, standing back, it is now becoming apparent that a new model of computing offers hope.

The VMware View of Cloud Computing

VMware’s view of cloud computing is twofold. First, we stitch together compute resources so as to appear as one large computer behind which the complexity is hidden. By coordinating, managing, and scheduling resources such as CPUs, network, storage, and firewalls in a consistent way across internal and external premises, we create a flexible cloud infrastructure platform. This platform includes security, automation and management, interoperability and openness, self-service, pooling, and dynamic resource allocation. In the view of cloud computing we are advocating, applications can run within an external provider, in internal IT premises, or in combination as a hybrid system—it matters how they are run, not where they are run.

In the past, people have used terms such as utility, grid, or on-demand computing to describe these approaches to computing. These are not new terms: comparisons of computing to a public utility such as a telephone system date back to the early 1960s in academia and were certainly popularized by industry in the 1990s. However, these systems did not achieve the level of popularity originally hoped for.

Some historical perspective will also help us understand why this form of computing is needed today and why cloud has become the new paradigm. Super-servers built on clusters of commodity hardware components were foreseen many years ago. What was not apparent at that time was that new software is required to exploit its capabilities. It was assumed that conventional systems software and applications could run on top of the superservers, but now it is apparent to us that conventional software does not fully exploit the servers’ capabilities. Many off-the-shelf applications did not dynamically scale, and it was difficult to reconfigure them to meet new demands. Although new specialized software architectures can be developed to take advantage of these systems, they will not be compatible with existing applications. Is there a way we can address these two potentially conflicting needs?

The emergence of extremely high-performance, low-cost standard hardware, virtualization, and modern programming platforms now allow us to do this. We can apply the hardware dividend that the continuing semiconductor revolution gives us to the purpose of eliminating complexity while retaining compatibility.

VMware’s vision for cloud computing addresses this. The virtualization technology at its foundation enables it to accommodate existing applications and extends them with ad-
ditional system services and a programming model to form the basis of a new model of computing.

The vSphere system has the flexibility to make existing workloads run well—in many cases, better than physical systems. The first book in this series (Deploying the VMware Infrastructure [2008]) explains how vSphere enabled server consolidation and solutions such as novel forms of disaster recovery.

The virtualization system is a key foundation for the cloud computing system. The magic lies in its ability to encapsulate applications, along with associated middleware and operating systems, in a black box. Once we have applications encapsulated, we can then jack the boxes up, figuratively speaking, slide different system services underneath them, and even slide the black boxes around in real time to take full advantage of the underlying capabilities in a transparent way. This is what enables us to run existing applications in a more efficient, flexible way—cutting the tentacles of complexity that bind applications to the underlying infrastructure.

VMware vSphere has evolved to provide additional capabilities to form this new infrastructure layer for cloud computing. This was described in the second book in this series (Foundation for Cloud Computing with VMware vSphere 4 [2010]).

The next step is to take system resources and aggregate them to an even larger scale, to place resources such as networking, firewalls, and storage under its control, and to add appropriate management to support a more advanced form of cloud computing. By securely delivering these resources as virtual datacenters, organizations can efficiently deliver these resources to users. This book discusses this next step in the evolution of VMware technology.

**In Closing**

This book describes the foundation for this form of cloud computing. It is by no means the end of the story. Although we have not yet completely achieved our vision, we have created a solid basis for cloud computing and are working on more innovations. Simplification of IT is a large and formidable problem to solve, but that is our goal. I hope you enjoy reading this book and learning how VMware is taking on this challenge.

Paul Maritz  
*Chief Executive Officer, VMware Inc.*
The Blind Men and the Cloud

Sam Charrington

It was six men of Info Tech
To learning much inclined,
Who went to see the Cloud
(Though all of them were blind),
That each by observation
Might satisfy his mind.

The First approached the Cloud,
So sure that he was boasting,
“I know exactly what this is…
This Cloud is simply Hosting.”

The Second grasped within the Cloud,
Saying, “No it’s obvious to me,
This Cloud is grid computing…
Servers working together in harmony!”

The Third, in need of an answer,
Cried, “Ho! I know its source of power—
It’s a utility computing solution
Which charges by the hour.”

The Fourth reached out to touch it,
It was there, but it was not.
“Virtualization,” said he.
“That’s precisely what we’ve got!”

The Fifth, so sure the rest were wrong
Declared “It’s sass [sic] you fools,
Applications with no installation
It’s breaking all the rules!”

The Sixth (whose name was Benioff),
Felt the future he did know,
He made haste in boldly stating,
“This *IS* Web 3.0.”

And so these men of Info Tech
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were partly wrong!
