



REVOLUTION NOT EVOLUTION

How Cloud Computing Differs from Traditional IT and Why it Matters

The Cloud is confusing... well it can be, and that's where CloudU™ comes in. CloudU is a comprehensive Cloud Computing training and education curriculum developed by industry analyst Ben Kepes. Whether you read a single whitepaper, watch a dozen webinars, or go all in and earn the CloudU Certificate, you'll learn a lot, gain new skills and boost your resume.

Enroll in CloudU today at www.rackspaceclouduniversity.com



Table of Contents

Executive Summary	1
A New Dawn or Just Another Day – Ellison vs. Benioff	2
From Water-wheel to Utility Power – An analogy for the Cloud Mainframes to Cloud –	5
A brief history of technological innovation	7
Virtualization – The ability to increase computing efficiency	9
Democratization of Computing – Bringing enterprise scale infrastructure to small and medium businesses	10
An Encoding.com Case Study: Scalability and fast provisioning – for IT at web scale	12
Commoditization of infrastructure – Enabling IT to focus on the strategic aspects of its role	15
Summary	16
About Diversity Analysis	17
About Rackspace	18

Executive Summary

Cloud Computing is a revolution that will define IT in the second decade of the 21st Century. This new form of computing is perfectly poised to provide solutions to a host of business problems within organizations large and small.

Cloud Computing will be the catalyst for the long predicted notion of “ubiquitous computing” enabling this revolution through a number of means:

- Virtualization – The ability to increase computing efficiency
- Democratization of Computing – Bringing enterprise scale infrastructure to small and medium businesses
- Scalability and fast provisioning – Bringing web scale IT at a rapid pace
- Commoditization of infrastructure – Enabling IT to focus on the strategic aspects of its role

This paper will detail the revolution that Cloud Computing is bringing to IT and will contrast the new IT from traditional approaches.

A New Dawn or Just Another Day – Ellison vs. Benioff

2010 marked the escalation of the war of words between the respective CEOs of Oracle and Salesforce.com, Larry Ellison and Marc Benioff. In the words of these larger than life figures, we can actually see an outline of many of the themes that will be explored in the following pages. Is Cloud Computing fundamentally different from what came before? What does it mean for an organization to “do” Cloud Computing? These are the questions that one must ask to answer the question “Is Cloud Computing a Revolution” or simply version 2.0 of a continuous series of innovations.

For his part, Oracle’s Ellison has a history of discounting Cloud Computing as no more than a new name for what has gone before. In a 2009 interview¹ that has become somewhat of a web cult classic, he said:

“All the Cloud is, is computers in a network... Our industry is so bizarre. I mean, they just change a term and they think they’ve invented technology.”

In some ways, Ellison is correct. Many of Cloud Computing’s most common feature – virtualization, pay-as-you-go, reduced cost and moving IT responsibility to third parties – have been around much longer than “the Cloud.” Yet there are those who argue that despite the similarities to what has come before, the Cloud is fundamentally different.

In this camp, the most vocal foil to Ellison is Salesforce.com’s Marc Benioff, himself a former Oracle executive and protégé of Ellison. In what was a drama filled keynote speech at the Oracle OpenWorld 2010 conference, Benioff outlined his own definition of Cloud Computing:²

“Our definition of Cloud Computing is multi-tenant, it’s faster, half the cost, pay as you go, it grows as you grow or shrinks as you shrink. It is extremely efficient. We’re not going to show you computers taller than you. We’re not going to show you a cloud in a box because clouds don’t come in a box. They never have. That’s the whole idea.”

“Computers taller than you” refers to Oracle’s Exalogic Elastic Cloud, an impressive mix of hardware and software designed to power web-scale enterprise applications. The point that Benioff makes with his characteristic color is that Cloud Computing is not about individual businesses buying bigger and better hardware, what Oracle calls a “Cloud in a box.” The Cloud is about businesses giving up the cost and burden of managing and maintaining hardware all together.

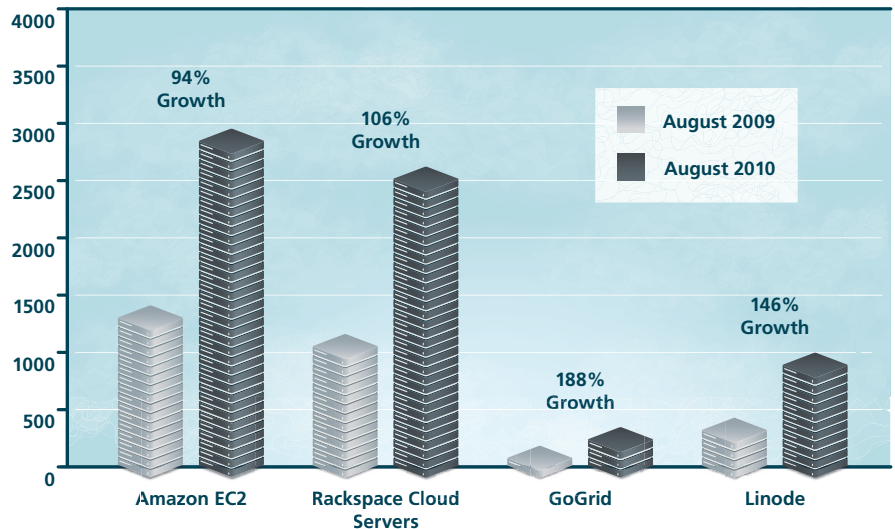
This author agrees with Benioff. Traditional hardware and software vendors, like Oracle, have a vested interest in arguing that Cloud Computing is best implemented by doing more of what companies have traditionally done to gain efficacies. Buy more hardware and software. Buy better hardware and software. In support of Benioff’s position, another well-known IT executive, Werner Vogels of Amazon Web Services, commented that “if you have to buy more hardware just to get started it is not a Cloud...”³

The Growth of the Cloud

As Ellison and Benioff spar over definitions and what constitutes a “true Cloud” the market continues to explode.

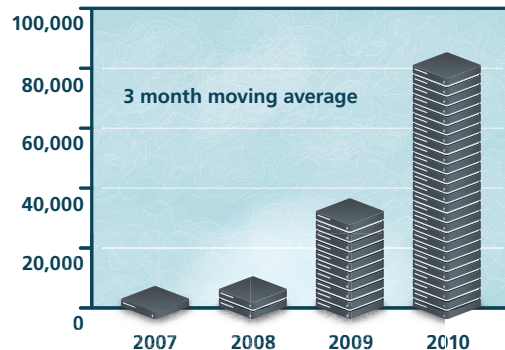
Cloud Computing covers a range of activities from replacement of on-premise infrastructure, through development platforms and on to on-demand applications. Given such a breadth of areas that Cloud Computing touches, statistics are useful as a general indication of trends rather than a source of accurate predictions. While the numbers that various analyst firms give as their estimate of the Cloud Computing market’s size differ (see infographic), one thing they all agree on is the rapid growth of all parts of the Cloud Computing market.⁴

Number of Websites Using Cloud Providers



Source: Jack of All Clouds

Amazon’s Virtual Computers Created per day



Source: The Economist

So just what *is* Cloud Computing, and why is it so different from what has come before? The following pages will detail four main areas in which Cloud Computing allows businesses to break from the past:

- Virtualization – The ability to increase computing efficiency
- Democratization of Computing – Bringing enterprise scale infrastructure to small and medium businesses
- Scalability and fast provisioning – Bringing web scale IT at a rapid pace
- Commoditization of infrastructure – Enabling IT to focus on the strategic aspects of its role

Each of these areas does not itself create a computing revolution: virtualization as Ellison would point out, has been around for some time, but together, they are changing computing forever. Let's see how.

From Water-wheel to Utility Power – An analogy for the Cloud

Technology has a way of grinding on, despite vested interests of vendors and industries built upon a particular way of doing things. To understand the revolutionary qualities of Cloud Computing, it is appropriate to utilize a well-worn, but accurate analogy that compares Cloud Computing to a traditional utility service like water or electricity. Nicholas Carr's book *The Big Switch*⁵ is an excellent introductory read to this subject. In a previous article⁶ appearing in the Spring 2005 issue of the MIT Sloan Management Review, Carr wrote that;

“...As a business resource, information technology today looks a lot like electric power did at the start of the last century [when it was routinely produced by individual businesses rather than utility providers]... executives are routinely sidetracked from their real business... by the need to keep their company's private IT infrastructure running smoothly.”

Noting the similarities between computing and a technology that most would agree is best handled by specialists rather than individual firms, Carr then moves onto a discussion about the consequences of self provisioning infrastructure and the resulting overcapacity that often accompanies it:

“When overcapacity is combined with redundant functionality, the conditions are ripe for a shift to centralized supply. Yet companies continue to invest large sums in maintaining and even expanding their private, subscale data centers. Why? For the same reason that manufacturers continued to install private electric generators during the early decades of the 20th century: because of the lack of a viable, large-scale utility model. But such a model is now emerging...”

The model that Carr says is emerging is Cloud Computing. Cloud Computing provides specific economics that are beneficial under many situations – especially anytime demand is erratic, the organization is in a state of change or when pressure comes to bear to move from CapEx to OpEx.

While the metaphor comparing Cloud Computing to utility power helps explain the nearly inexorable forces compelling business to adopt this new

model, it doesn't position this latest technology in the more recent context of massive technological shifts. For that, we can look at the shift that saw mainframes transformed into Clouds over the course of only a few decades.

Mainframes to Cloud – A brief history of technological innovation

It is worth briefly reviewing where Cloud Computing sits in the continuum of computing innovations, each of which were seen as revolutionary in their time. Initial widespread corporate computing occurred within a shared resources model where massive mainframe computers took up acres of space within dingy basements and users would book time for both the machines themselves and the skilled technicians who knew how to operate them. Their use case was generally narrow business analysis and hence computing had a very narrow sphere of influence.

With the advent of mini computers and later the personal computer in the 1970s, we saw the ability to utilize the benefits of technology rolled out to a much broader audience. While still relatively expensive and functionally basic machines the personal computer put computing onto (almost) any desktop in a reasonably well resourced organization.

The advent of the Internet, however, changed things forever, both from the perspective of the network and the perspective of individual computers. The increased reliability and reduced cost of the internet (in comparison to proprietary networks) along with the decreasing cost of computers, led to increased use of web based applications. This, along with the demand for application access via multiple devices using multiple form factors, led to a rapid growth in Cloud Computing – at an infrastructure, a platform and an application level.

It is worth drawing parallels between the resistance to adoption of Cloud Computing, and that of adoption of the Internet generally. In his book *Management Strategies for the Cloud Revolution: How Cloud Computing Is Transforming Business and Why You Can't Afford to Be Left Behind*,⁷ Charles Babcock discusses the competitive pressures that gradually led to adoption of the Internet. As he points out:

“ At one time corporations built out high-performance proprietary networks to link... different locations... As the Internet became the default connection between universities, government agencies and some companies, the cost of not having an [Internet protocol] network internally went up and up. ”

So too will the economics of Cloud Computing render previous approaches as increasingly cost prohibitive. This step change in the approach to technology will be caused by four major shifts, the first of which is virtualization.

Virtualization – The ability to increase computing efficiency

Picture if you will a traditional server. Housed in a noisy cabinet somewhere, a server is a computer that can generally do one thing at a time. It may fill the role of email server, database server or web server but running multiple processes concurrently risks reliability and efficiency, so typically servers are operated as single use machines. While this may be a robust way of providing a service, it is inefficient since many times servers have excess processing capacity above what is used by a single application.

Virtualization was developed to overcome this limitation of physical hardware as it enables multiple pseudo-servers to be run on one physical device. This division of a single physical server into multiple “virtual” servers containing multiple sets of segregated data is the backbone of Cloud Computing as it allows for far greater flexibility and resource utilization. Virtualization not only brings efficiency gains in terms of processing power but also saves electric power, space and cooling since the number of physical machines running is greatly reduced. To illustrate this point, studies⁸ have found that Cloud applications consume 90% less energy than on-premise ones.

While virtualization is an enabler for Cloud Computing, Cloud Computing itself enables some major shifts within organizations. The first of these is the tendency for Cloud Computing to democratize technology in a way not seen previously.

Democratization of Computing – Bringing enterprise scale infrastructure to small and medium businesses

Cloud Computing is facilitating a seismic shift in terms of business development. Formerly, entrepreneurs who wished to start a business had to invest significant capital into hardware and software licenses. Even the simplest of businesses required expensive software licenses, a server or two and the associated administration cost of keeping it all running.

The availability of Cloud Computing solutions has led to a massive shift in the availability of computing power. It is now almost effortless for an entrepreneur to set themselves up with some infrastructure and applications upon which to run their business. With many Cloud Computing providers, a server capable of running many of the most common web or business applications can be rented for around \$11/month. A recent study by Github⁹ indicates that less than 25% of Y Combinator start-ups are self hosting their web infrastructure. No longer is enterprise scale infrastructure the exclusive domain of enterprises.

This democratization is analogous to the widespread availability of the word processor. Formerly the creation of documents was the sole preserve of the typing pool, an overworked shared resource which, like the mainframe, needed to be scheduled or booked in advance and needed a skilled operator to make it work.

Office productivity applications enabled even the least dexterous of executives to create professional reports and letters, all from the comfort of their own PC. This move, while arguably detrimental to those who made their living working in a typing pool, greatly increased the efficiencies and timeliness of document creation.

The ease, economics and speed of provisioning Cloud Computing resources is enabling an entire generation of businesses to be founded – one needs only look at the meteoric growth of question and answer site Quora.com, which in December 2009 began to experience usage spikes of 5 – 10 times its normal load. By utilizing Cloud Computing for their infrastructure needs, Quora was able handle the load with relatively few issues.¹⁰ In the same way that most people would consider it bizarre to have to send work away to have a document created (and to have to wait days for the work to be done), so too will we regard computing. It is our

contention that in a few years time, the need to wait for the provisioning of infrastructure, the need for skilled engineers to perform the tasks and the need for administrative staff to “keep the lights on” will be but a distant memory.

This democratization of computing is paralleled by an ability to rapidly scale infrastructure to levels previously unobtainable by all but the largest organizations.

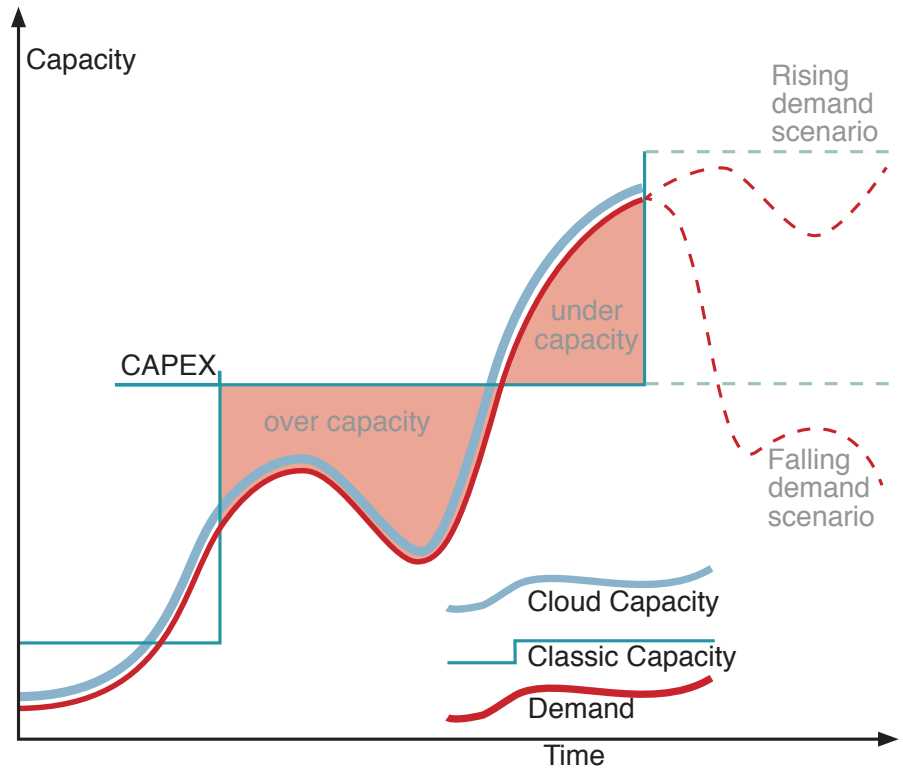
An Encoding.com Case Study:

Encoding.com¹¹ is a company that provides video transcoding services to allow for the integration of video transcoding into workflows. Video transcoding is the process of converting one video file format, like Flash, into another format, like Windows Media. What this means is that content delivery sites such as MTV, PBS and online training establishments are able to move video processing off their own servers and onto a third party provider that is built to allow them to scale up their processing at will. In order to build a scalable product, Encoding.com decided from the outset to reduce hardware costs by using cloud computing to meet their rapidly changing processing needs¹²

Video encoding is a very processor intensive task and hence they decided to integrate with two separate Cloud Computing providers to enable video encoding with almost limitless scale. They're also able to route jobs to the closest processing centre to the customer to increase efficiency. These types of activities and the growing business that they support would not have been possible without Cloud Computing.

Scalability and fast provisioning – for IT at web scale

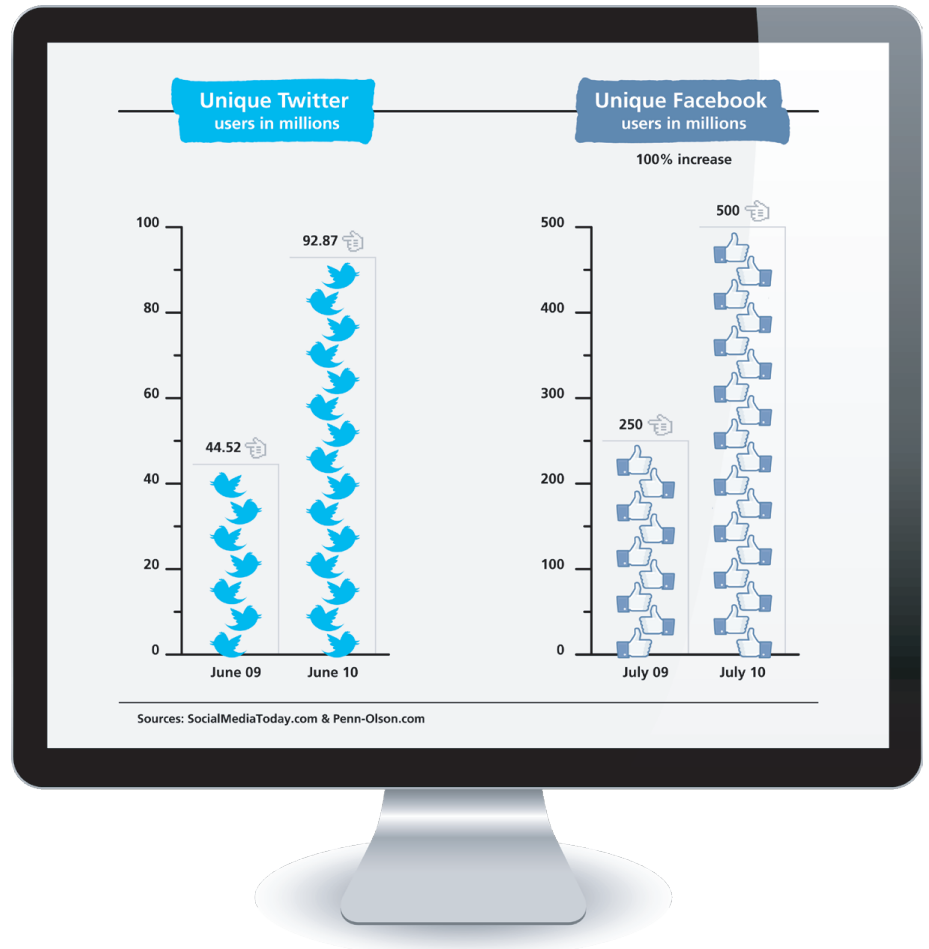
The diagram below¹³ indicates the traditional “boom and bust” of infrastructure provisioning. For any organization where workload is erratic, there will always be one of two situations:



1. An over provision of servers creating unused capacity and hence significantly higher cost per process than is desirable
2. An under provision of servers that creates significant impacts in terms of service levels

Neither of these two situations are desirable as both result in direct economic impacts; either through higher costs or through decreased outputs caused by service degradation. As we have noted before, the businesses of today are seeing far higher levels of volatility in their computing needs – one only need look at the infographic below detailing the relative growth of both Twitter and Facebook to see that a traditional approach towards physical hardware cannot hope to keep up with scaling demand. While most companies will not see the amazing growth that Twitter and Facebook have experienced, the speed at which information travels

around the web has created “viral” phenomena where company websites can experience huge traffic spikes after being profiled on a television show like Oprah or evening the local evening news.¹⁴



Cloud Computing enables organizations to maintain infrastructure at required levels at all times, and as such it enables cost savings to be gained by virtue of the fact that, despite the per unit price from a utility service provider potentially being higher than an owned resource, aggregate cost can be reduced by paying only for what is required when it is required.

Having the ability to scale is beneficial, but not when it comes at the cost of significant administration and management. Luckily, Cloud Computing also commoditizes infrastructure which frees up IT departments to focus on their key strategic objectives.

Commoditization of infrastructure – Enabling IT to focus on the strategic aspects of its role

It's hard to overstate just how much the IT role is changing in the face of Cloud Computing. Cloud Computing vendors are often quick to use cost reduction as their main selling point for the Cloud, but it would appear that users are more thoughtful than this and perceive the business agility gains to be the number one benefit of a move to the cloud. A recent SandHill report¹⁵ found that around 50% of respondents consider agility as their primary reason for adopting the Cloud. A similar result came from Information Week¹⁶ which found that over 65% of respondents cited agility to business needs as a driver for Cloud Computing

It's not hard to believe these statistics when one remembers the estimates that put IT maintenance at around 80% of total IT expenditure.¹⁷ When one considers that Cloud infrastructure is still nascent and the vast majority of servers are still managed in-house, this presents a significant opportunity and a significant change agent for traditional IT.

The underlying trend here is pressure upon IT departments to produce greater outputs, with less resourcing – Cloud Computing offers the ability for IT departments to apply resources as, and where, they are needed.

Clearly the savings to be gained from a move to the Cloud free up IT resources for adding business value rather than simply maintaining the status quo – this change however will require IT personnel to embrace the new world order and learn a new set of skills that the organization will require. IT departments, and individual IT personnel, will need to move from being primarily technologists with a modicum of business knowledge, to being truly balanced professionals who can equally mix technical ability with an understanding of the business drivers.

It's hard not to resort to hyperbole when discussing just how much Cloud Computing allows organizations to focus on their core business. The very fact that they are able to abstract responsibility for what are essentially commodity services to a third party drives significantly more value to the organization than any mere financial benefit through cost reductions that Cloud Computing can bring. Few people would argue that IT departments should be focusing on high-level strategic work. We contend that Cloud Computing enables this to occur more readily than ever before.

Summary

2011, and the decade after it, will go down in history as the era of the Cloud in the same way that the 60s was the era of the mainframe. Cloud Computing offers a massive benefit to organizations and it is our contention that any organization or individual who routinely interacts with technology solutions will have to learn how to work with the Cloud.

While some practitioners may feel threatened by this changing paradigm, we believe the opportunities are ripe for the creation of a new breed of IT worker – one who is in equal parts a technician and a business person, someone who is of true strategic value to the organization and someone who is much more than a simple maintainer of technology assets.

About Diversity Analysis

Diversity Analysis is a broad spectrum consultancy specializing in SaaS, Cloud Computing and business strategy. Our research focuses on the trends in these areas with greater emphasis on technology, business strategies, mergers and acquisitions. The extensive experience of our analysts in the field and our closer interactions with both vendors and users of these technologies puts us in a unique position to understand their perspectives perfectly and, also, to offer our analysis to match their needs. Our analysts take a deep dive into the latest technological developments in the above mentioned areas. This, in turn, helps our clients stay ahead of the competition by taking advantage of these newer technologies and, also, by understanding any pitfalls they have to avoid.

Our Offerings: We offer both analysis and consultancy in the areas related to SaaS and Cloud Computing. Our focus is on technology, business strategy, mergers and acquisitions. Our methodology is structured as follows:

- Research Alerts
- Research Briefings
- Whitepapers
- Case Studies

We also participate in various conferences and are available for vendor briefings through Telephone and/or Voice Over IP.



About Rackspace

Rackspace® Hosting is the service leader in Cloud Computing, and a founder of OpenStack™, an open source Cloud platform. The San Antonio-based company provides Fanatical Support® to its customers, across a portfolio of IT services, including Managed Hosting and Cloud Computing. Rackspace has been recognized by Bloomberg BusinessWeek as a Top 100 Performing Technology Company and was featured on Fortune's list of 100 Best Companies to Work For. The company was also positioned in the Leaders Quadrant by Gartner Inc. in the "2010 Magic Quadrant for Cloud Infrastructure as a Service and Web Hosting." For more information, visit www.rackspace.com.



About the Author *Ben Kepes*

Ben Kepes is an analyst, an entrepreneur, a commentator and a business adviser. His business interests include a diverse range of industries from manufacturing to property to technology. As a technology commentator he has a broad presence both in the traditional media and extensively online. Ben covers the convergence of technology, mobile, ubiquity and agility, all enabled by the Cloud. His areas of interest extend to enterprise software, software integration, financial/accounting software, platforms and infrastructure as well as articulating technology simply for everyday users. More information on Ben and Diversity Limited can be found at <http://diversity.net.nz>

Endnotes

- [1] <http://www.youtube.com/watch?v=KmXJSeMaoTY>
- [2] <http://www.cbronline.com/blogs/cbr-rolling-blog/salesforcecom-fires-back-at-oracles-ellison-benioff-oracle-openworld-220910>
- [3] <http://twitter.com/Werner/status/25005220624>
- [4] <http://www.economist.com/node/17797794>
<http://www.jackofallclouds.com/201%8/state-of-the-cloud-august-2010/>
- [5] <http://www.amazon.com/Big-Switch-Rewiring-Edison-Google/dp/0393062287>
- [6] <http://www.nicholasgarr.com/articlesmt/archives/endofcorporatecomputing.shtml>
- [7] <http://www.amazon.com/Management-Strategies-Cloud-Revolution-Transforming/dp/0071740759>
- [8] Cloud Computing Emissions Comparison, Nucleus Research, 2010
- [9] <http://jpf.github.com/domain-profiler/ycombinator.html?2010>
- [10] <http://techcrunch.com/2011/01/05/quora-surge/>
- [11] <http://www.encoding.com/>
- [12] see video http://www.youtube.com/watch?v=n6l0kMLYP6c&feature=player_embedded
- [13] <http://www.chades.net/>
- [14] <http://www.penn-olson.com/201%2/10/infographic-facebooks-amazing-growth/>, <http://blog.facebook.com/blog.php?post=409753352130>, <http://socialmediatoday.com/dirktherabbit/162555/twitter%E2%80%99s-growth-doubles-becomes-more-international>
- [15] <http://www.reuters.com/article/idUS144602338520100818>
- [16] <http://www.informationweek.com/news/software/showArticle.jhtml?articleID=211300562>
- [17] <http://www.gartner.com/it/page.jsp?id=497088>