



## Resource Guide

# Cloud Computing Fundamentals

*As the leading trend in information technology, there are a few very important things that IT and business decision makers need to understand about cloud computing. This TechRepublic Resource Guide provides a brief overview from the combined editorial resources of BNET, TechRepublic, and ZDNet.com.*

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*Cloud computing will need specialized guides -- sherpas -- who can combine technical expertise, business savvy, constantly current knowledge, and the ability to focus its most able people on a small set of clients.*

## Mini-glossary: Cloud Computing Terms You Should Know

By Deb Shinder

*You don't have to know everything about cloud computing, but a familiarity with the terminology will help you follow the trends and industry developments. This glossary offers a rundown of the terms you're likely to come across.*

Cloud computing is one of the hottest topics in IT these days, with Microsoft, Google, Amazon, and other big players joining in the fray. However, the technology brings with it new terminology that can be confusing. Here are some common cloud-related terms and their meanings.

Note: This glossary is also available as a [PDF download](#).

### **Advertising-based pricing model**

A pricing model whereby services are offered to customers at low or no cost, with the service provider being compensated by advertisers whose ads are delivered to the consumer along with the service.

### **Amazon EC2**

Amazon's Elastic Compute Cloud Web service, which provides resizable computing capacity in the cloud so developers can enjoy great scalability for building applications.

### **Amazon S3**

Amazon Simple Storage Services — Amazon's cloud storage service.

### **CDN**

Content delivery network — A system consisting of multiple computers that contain copies of data, which are located in different places on the network so clients can access the copy closest to them.

### **Cloud**

A metaphor for a global network, first used in reference to the telephone network and now commonly used to represent the Internet.

### **Cloud broker**

An entity that creates and maintains relationships with multiple cloud service providers. It acts as a liaison between cloud services customers and cloud service providers, selecting the best provider for each customer and monitoring the services.

### **Cloud operating system**

A computer operating system that is specially designed to run in a provider's datacenter and be delivered to the user over the Internet or another network. Windows Azure is an example of a cloud operating system or "cloud layer" that runs on Windows Server 2008. The term is also sometimes used to refer to cloud-based client operating systems such as Google's Chrome OS.

### **Cloud Oriented Architecture**

A term coined by Jeff Barr at Amazon Web Services to describe an architecture where applications act as services in the cloud and serve other applications in the cloud environment.

### **Cloud portability**

The ability to move applications and data from one cloud provider to another. See also Vendor lock-in.

### **Cloud provider**

A company that provides cloud-based platform, infrastructure, application, or storage services to other organizations and/or individuals, usually for a fee.

### **Cloud storage**

A service that allows customers to save data by transferring it over the Internet or another network to an offsite storage system maintained by a third party.

### **Cloudsourcing**

Replacing traditional IT services with cloud services.

**Cloudstorming**

Connecting multiple cloud computing environments.

**Cloudware**

Software that enables creating, deploying, running, or managing applications in the cloud.

**Cluster**

A group of linked computers that work together as if they were a single computer, for high availability and/or load balancing.

**Consumption-based pricing model**

A pricing model whereby the service provider charges its customers based on the amount of the service the customer consumes, rather than a time-based fee. For example, a cloud storage provider might charge per gigabyte of information stored. See also Subscription-based pricing model.

**Customer self-service**

A feature that allows customers to provision, manage, and terminate services themselves, without involving the service provider, via a Web interface or programmatic calls to service APIs.

**Disruptive technology**

A term used in the business world to describe innovations that improve products or services in unexpected ways and change both the way things are done and the market. Cloud computing is often referred to as a disruptive technology because it has the potential to completely change the way IT services are procured, deployed, and maintained.

**Elastic computing**

The ability to dynamically provision and de-provision processing, memory, and storage resources to meet demands of peak usage without worrying about capacity planning and engineering for peak usage.

**External cloud**

Public or private cloud services that are provided by a third party outside the organization.

**Google App Engine**

A service that enables developers to create and run Web applications on Google's infrastructure and share their applications via a pay-as-you-go, consumption-based plan with no setup costs or recurring fees.

**Google Apps**

Google's SaaS offering that includes an office productivity suite, email, and document sharing, as well as Gmail, Google Talk for instant messaging, Google Calendar and Google Docs, spreadsheets, and presentations.

**HaaS**

Hardware as a service; see IaaS.

**Hosted application**

An Internet-based or Web-based application software program that runs on a remote server and can be accessed via an Internet-connected PC or thin client. See also SaaS.

**Hybrid cloud**

A networking environment that includes multiple integrated internal and/or external providers.

**IaaS**

Infrastructure as a service — Cloud infrastructure services, whereby a virtualized environment is delivered as a service over the Internet by the provider. The infrastructure can include servers, network equipment, and software.

### **IBM Smart Business**

IBM's cloud solutions, which include IBM Smart Business Test Cloud, IBM Smart Analytics Cloud, IBM Smart Business Storage Cloud, IBM Information Archive, IBM Lotus Live, and IBM LotusLive iNotes.

### **Internal cloud**

A type of private cloud whose services are provided by an IT department to those in its own organization.

### **Mashup**

A Web-based application that combines data and/or functionality from multiple sources.

### **Microsoft Azure**

Microsoft cloud services that provide the platform as a service (see PaaS), allowing developers to create cloud applications and services.

### **Middleware**

Software that sits between applications and operating systems, consisting of a set of services that enable interoperability in support of distributed architectures by passing data between applications. So, for example, the data in one database can be accessed through another database.

### **On-demand service**

A model by which a customer can purchase cloud services as needed; for instance, if customers need to utilize additional servers for the duration of a project, they can do so and then drop back to the previous level after the project is completed.

### **PaaS**

Platform as a service — Cloud platform services, whereby the computing platform (operating system and associated services) is delivered as a service over the Internet by the provider.

### **Pay as you go**

A cost model for cloud services that encompasses both subscription-based and consumption-based models, in contrast to traditional IT cost model that requires up-front capital expenditures for hardware and software.

### **Private cloud**

Services offered over the Internet or over a private internal network to only select users, not available to the general public.

### **Public cloud**

Services offered over the public Internet and available to anyone who wants to purchase the service.

### **SaaS**

Software as a service — Cloud application services, whereby applications are delivered over the Internet by the provider, so that the applications don't have to be purchased, installed, and run on the customer's computers. SaaS providers were previously referred to as ASP (application service providers).

### **Salesforce.com**

An online SaaS company that is best known for delivering customer relationship management (CRM) software to companies over the Internet.

### **Service migration**

The act of moving from one cloud service or vendor to another.

### **Service provider**

The company or organization that provides a public or private cloud service.

### **SLA**

Service level agreement — A contractual agreement by which a service provider defines the level of service, responsibilities, priorities, and guarantees regarding availability, performance, and other aspects of the service.

### **Subscription-based pricing model**

A pricing model that lets customers pay a fee to use the service for a particular time period, often used for SaaS services. See also Consumption-based pricing model.

### **Utility computing**

Online computing or storage sold as a metered commercial service in a way similar to a public utility

### **Vendor lock-in**

Dependency on the particular cloud vendor and difficulty moving from one cloud vendor to another due to lack of standardized protocols, APIs, data structures (schema), and service models.

### **Vertical cloud**

A cloud computing environment that is optimized for use in a particular industry, such as health care or financial services.

### **Virtual private data center**

Resources grouped according to specific business objectives.

### **VPC**

Virtual private cloud — A private cloud that exists within a shared or public cloud, e.g., the Amazon VPC that allows Amazon EC2 to connect to legacy infrastructure on an IPsec VPN.

### **Windows Live Services**

Microsoft's cloud-based consumer applications, which include Windows Live Mail, Windows Live Photo Gallery, Windows Live Calendar, Windows Live Events, Windows Live Skydrive, Windows Live Spaces, Windows Live Messenger, Windows Live Writer, and Windows Live for Mobile.

## **About the Author**

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Debra Littlejohn Shinder is a technology consultant, trainer and writer who has authored a number of books on computer operating systems, networking, and security. These include Scene of the Cybercrime: Computer Forensics Handbook, published by Syngress, and Computer Networking Essentials, published by Cisco Press. She is co-author, with her husband, Dr. Thomas Shinder, of Troubleshooting Windows 2000 TCP/IP and the best-selling Configuring ISA Server 2000, ISA Server and Beyond and Configuring ISA Server 2004.

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Deb currently specializes in security issues and Microsoft products; she has been an MCSE since 1998 and has been awarded Microsoft's Most Valuable Professional (MVP) status in Windows Server Security. A former police officer and police academy instructor, she lives and works in the Dallas-Ft Worth area and teaches computer networking and security and occasional criminal justice courses at Eastfield College in Mesquite, TX.

## Eight Ways that Cloud Computing will Change Business

By Dion Hinchcliffe

*When a major change arrives on the IT scene it's not always clear what the implications will be, if any, and so for large organizations a risk-managed wait-and-see attitude tends to prevail. Occasionally however some shifts offer cost savings, improvements to operations, or ways to tackle business problems that offer significant strategic advantage. The larger the benefit in one or more of these areas, then the more strategic the advance is and the greater potential it will impact the bottom line.*

[Cloud computing](#) is quickly beginning to shape up as one of these major changes and the hundreds of thousands of business customers of cloud offerings from Amazon ([Amazon Web Services](#)), Salesforce ([Force.com](#)), and Google (many offerings, including [Google App Engine](#)), including a growing number of Fortune 500 companies, is showing both considerable interest and momentum in the space.

### Cloud Computing: A delicate balance of risk and benefit

To be clear, there are currently unanswered questions and inherent challenges — even some major risks — in adopting cloud computing for more than so-called “edge” computing of minor applications and non-critical business systems. Notably, these include security of enterprise data that stored in the cloud, risk of lock-in to cloud platform vendors, loss of control over cloud resources run and managed by someone else, and reliability.

On the other side of the coin are some benefits that can potentially change the game for many firms that are willing to be very proactive in managing potential downside. These include access to completely different levels of scale and economics in terms of the ability to scale very rapidly and to operate IT systems more cheaply than previously possible. Easier change management of infrastructure including maintenance and upgrades (cloud vendors extensively virtualize and commoditize the underlying components to make them non-disruptive to replace and improve) as well as offering improved agility to deploy solutions and choice between vendors, particularly when [cloud interoperability](#) becomes more of a reality than it is today. Cloud computing also offers an onramp to new computing advances such as non-relational databases, new languages, and frameworks that are designed to encourage scalability and take advantage of new innovations such as [modern Web identity](#), [open supply chains](#), and other advances.



From <http://blogs.zdnet.com/Hinchcliffe>

In fact, cloud computing holds the potential to dramatically change the businesses that adopt it, even if the technologies are only used internally. While these possibilities are only now starting to become clear, we can get a decent sense of these now:

## 8 ways that cloud computing will change business

1. **The creation of a new generation of products and services.** The economics of cloud computing lets innovative companies create products that either weren't possible before or are significantly less expensive than the competition (or just more profitable.) This part of cloud computing is an arms race and there are short windows of opportunity since competitors can often put the economic advantages of cloud computing into their product formulations fairly quickly once they see that it works for you. Where it gets interesting is that many business ideas that required prohibitive amounts of computing power, scale, or radically new business models (the aforementioned open supply chains and [Global SOA](#)) but couldn't be implemented due to existing technical limitations or cost-effectiveness, can now be realized. Every improvement in storage, processing power, or technology enables innovations that weren't possible before (high speed Internet, for instance, made products like YouTube possible) and cloud computing makes these opportunities unusually accessible. Smart companies will take notice.
2. **A new lightweight form of real-time partnerships and outsourcing with IT suppliers.** Companies that did traditional outsourcing of their IT services a few years ago already know what this feels like; a large part of what used to be in-house is now being done somewhere else and changing anything is *hard*. But unlike traditional outsourcing of IT, cloud computing will provide agility and control that traditional outsource cannot match for the most part. Don't like your cloud vendor? Unless you negotiated a long-term contract, you can often switch far easier than changing IT outsourcers. In fact, many cloud computing relationships consist of nothing more than a cancel-at-the-end-of-the-month commitment and corporate invoice. For many companies, this will actually be improvement over what they have now and give them choices they perhaps never had when everything required internal execution or to go through the outsourcing supplier relationship.
3. **A new awareness and leverage of the greater Internet and Web 2.0 in particular.** Most companies are still notoriously critical of Web technologies as "not serious" computing. But the Web has grown up considerably in the Web 2.0 era and the challenges in scale, performance, and satisfying fickle audiences of millions has created technologies, solutions, and architectures that can address them in powerful yet economic ways that many enterprise systems are finding hard to match. When cloud computing is adopted by an organization, they will find themselves thrown into the pool with the rest of the online world in many ways, whether this is the employment of social tools, SaaS, non-relational databases or a host of other technologies in their new cloud. And in the end, this will serve them very well and allow many companies to acquire the [skills and perspectives](#) required to compete effectively in the 21st century.
4. **A reconciliation of traditional SOA with the cloud and other emerging IT models.** A [great post this week](#) from our very own Joe McKendrick illustrates how SOA is evolving because of the cloud. The advent of cloud technologies will have to be dealt with and somehow encompassed by SOA initiatives that are already looking at their current toolset of heavyweight approaches and technologies with an eye towards seeking [an onramp to change and improvement](#). [Web-Oriented Architecture](#) fits very well with cloud technologies which are heavily Web-based and it's a natural, lightweight way of building SOA at virtually every level of the organization. For many organizations, the cloud will likely be the straw that broke the back of traditional SOA and move it to a place where it will meet new business and technical requirements, faster rates of changes, and new business conditions.
5. **The rise of new industry leaders and IT vendors.** While we're seeing many of the top players in computing use their existing strengths to create successful cloud computing offerings, there were also be a new generation of companies that businesses generally aren't

used to dealing with as suppliers. Amazon and Google are two firms that generally aren't regarded as deeply experienced in the enterprise, and [there are many others](#). While it doesn't seem that we'll see many entirely new players compete with the big firms, it's certainly not out of the question (and given the opportunity, likely from an investment standpoint) that we'll see some very well-funded new cloud startups that lack the baggage of existing leaders (thereby moving very quickly) and bring a new sensibility (radical openness and transparency, new technologies, and Web-focus) that's often needed with cloud computing. We may see perhaps even before the downturn ends. Either way, the industry landscape will be remade by cloud computing as it is one of the very few new IT developments that will be very broadly adopted in the next several years.

6. **More self-service IT from the business-side.** Many cloud solutions, particularly as they relate to SaaS, will require increasingly less and less involvement from the IT department. Business users will be able to adopt many future cloud computing solutions entirely using self-service. This also heralds, as McKendrick indicates, that many of these scenarios will be much smaller and more numerous, tapping into the [The Long Tail of IT demand](#).
7. **More tolerance for innovation and experimentation from businesses.** With fewer technical and economic barriers to creating new ways to improve the business (LOB, marketing, sales, customer service, IT, horizontal services), cloud computing will enable prototyping and market validation of new approaches much faster and less expensively than before. While legal, branding, and compliance will often struggle to keep up the pace with the rest of the organization, there will be gradual thawing of the glacial pace of change as business possibilities become, well, more possible in the cloud computing world. This won't fix the often broken innovation mechanisms in businesses, but then again, cloud computing is so accessible that many new internal entrepreneurs (see previous point) will use the tools to create new solutions anyway.
8. **The slow-moving, dinosaur firms will have trouble keeping up more nimble adopters and fast-followers.** Not adopting cloud computing doesn't spell the immediate demise of traditional companies that aren't good at making technology and cultural transitions (and make no mistake, cloud computing is a big cultural change), but it will pile onto other recent advancements and make it even harder to compete in the modern business environment. In the end, those too slow to adopt the benefits while managing the risk are likely going to face serious and growing economic and business disadvantage.

For many organizations in the short term the apparent potential of the individual changes above will often not be sufficient to them to make the transition to cloud computing, particularly as the cloud market is so new and major players such as IBM and HP have yet to arrive in full force. But gaining competency in cloud computing today by conducting pilots and building skills will server companies well and begin to position them for the future IT landscape. Longer term, cloud computing is increasingly appearing to be a transformative change in the business landscape.

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## About the Author

Dion Hinchcliffe is founder and chief technology officer for the Enterprise Web 2.0 advisory and consulting firm [Hinchcliffe & Company](#), based in Alexandria, Virginia. A veteran of software development, Dion has been working for two decades with leading-edge methods to accelerate project schedules and raise the bar for software quality. He has extensive practical experience with enterprise technologies and he consults, speaks, and writes prolifically on IT and software architecture. Dion still works in the trenches with enterprise IT clients in the federal government and Fortune 1000. He also speaks and publishes about Web 2.0 and SOA on a regular basis. Dion is working on a book about Web 2.0 for Addison-Wesley and is currently editor-in-chief of the Web 2.0 Journal and AjaxWorld Magazine.



## To Make the Most of Cloud Computing, Companies Are Going to Need Sherpas

By Erik Sherman

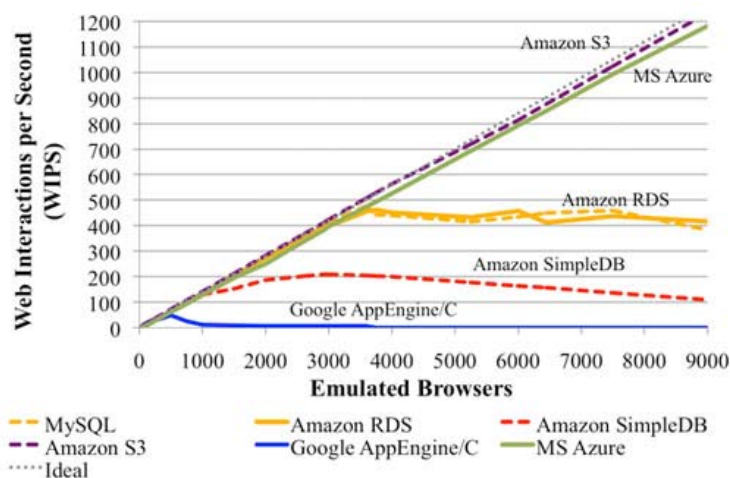
*Cloud computing will need specialized guides -- sherpas -- who can combine technical expertise, business savvy, constantly current knowledge, and the ability to focus its most able people on a small set of clients.*

Cloud computing promises simplicity to corporations: drop the data centers and plug a business directly into online resources. But outward simplicity belies the complexity of sorting through hype and the technical complexities to make cloud computing work. To do so, corporations will need a new type of specialist — a cloud sherpa, if you will — who can cut through the tangle and connect together online building blocks to make a virtual system that can offer real performance at the right price.

The big problem in cloud computing is that a company must assemble mysterious black boxes that offer functions, but little to no insight into how they work. IT veterans get thrown because the metrics they use to monitor performance are unavailable, and not all clouds are good for all needs, no matter what vendors want customers to think. Like mountaineers in the Himalayas guided by Tibetan sherpas, executives must rely on people who understand the territory:

- The technical landscape of who offers what
- Different routes through the landscape
- The implementation, performance, and cost implications of each choice

A trip to a few web sites can illuminate the mounting complexities. For example, a [joint initiative](#) of the Computer Science Department of ETH Zürich has begun to examine high scalability computing, including an [end-to-end performance study](#) of some existing cloud computing offerings. Running one standard benchmark to simulate a Web site, the group found that **Microsoft** (MSFT) Azure and **Amazon** (AMZN) S3 could scale performance linearly as users increased from 1 to 9000. Database services on Amazon didn't do as well, and **Google** (GOOG) AppEngine trailed far behind, as this graph from the group shows:



But straight performance results only tell you so much. In this test, Google AppEngine was the most cost-effective for small workloads, while Azure was least expensive for medium- to large-workloads. Additionally, the study leaves some big questions. How do you combine issues of storage and database performance? You might even wonder what part of Microsoft Azure the group tested, because it was unclear. To use the results, you need someone who can dig into them and translate the information to know how it could affect your operations.

Scalability is important, but how quickly and reliably will information get from the cloud to the corporate client? As the company's CIO told me last fall, **Inteva**, an auto manufacturing spin-off from **Delphi**, moved most of its IT infrastructure to cloud services but kept the manufacturing systems at its factories. The company literally had only two hours from the arrival of a car-company order to delivery of the manufactured parts.

With a cloud resource, you have no control over its operation nor the decisions that can affect performance. A vendor could make a passing decision in operating its system that could slow Inteva down unacceptably. A single Internet outage could be disastrous. So each factory had to have its own manufacturing IT system on premises.

One consulting group, **CloudHarmony**, has posted the results of download speed tests for a series of cloud service providers, including Amazon and **IBM**. This is useful data, and yet the information is limited. Downloading a file is far different from monitoring throughput on a continuing basis. A business also needs to understand how much moving data costs. At what point does speed of data delivery push make the service unacceptably expensive for the business?

The complications only increase. How do you allocate and pay for services so that you can scale operations up and down as necessary? How do you meaningfully monitor performance if you can't see directly into the black box? What business functions must stay in-house, and does the answer change as new cloud services become available?

Most IT departments can't afford the time to obsessively follow cloud vendors already on the market, analyze the trade-offs between offerings, and track every new development. Companies will need specialized guides who can help them sort through services, build systems by connecting possibly disparate vendors, and ensure that the result delivers the desired performance ... and the cost savings.

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## **About the Author**

Erik Sherman is a freelance writer, editor, and photographer. His work has appeared in such publications as the New York Times Magazine, Newsweek, Fortune, Inc, Newsweek Japan, the Financial Times, Chief Executive, Advertising Age, and CIO Insight. Before going into journalism, he was head of product marketing at a publicly-held technology company and later was an independent business consultant.



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