



Introduction to Cloud Computing



Cloud Computing Overview

The boom in cloud computing over the past few years has caused significant interest and advancements in solutions and services: many have heard of it, but far fewer actually understand what it is and, more importantly, how it can benefit them. This whitepaper seeks to define, holistically, cloud computing and the potential benefits it offers organizations.

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WHAT IS 'CLOUD COMPUTING'?

Confusion often starts here. What is cloud computing? Let's start with what is meant by the “cloud.” In cloud computing, the word “cloud” is a metaphor for “the Internet,” and the phrase “cloud computing” is used to mean a type of Internet-based computing, where services (such as servers, storage, applications and so on) are delivered to an organization's computers and devices through the Internet as an on-demand service.

Most of us are already enjoying elements of cloud computing without necessarily being aware of it. On an individual basis, services such as online banking, public e-mail (Gmail, Hotmail, etc.) and many PC backup services are all examples of cloud computing. In the business world, many organizations are already using cloud-based CRM services, credit card processing services and the like without giving much thought to the fact that they, too, are examples of cloud computing. If most of us, individually and organizationally, are already using cloud computing services, then why is there debate about cloud adoption? Haven't we already migrated there without having to do anything more? For a variety of reasons, the answer is no. Primarily, because not all 'clouds' are created equal or have been created for the same type of use.

For organizations, some services have become readily available through the cloud. However, many core business processes—typically referred to as Line of Business (LOB) applications—have been slow to move. One reason is due to the many different Independent Software Vendors (ISVs) that develop these applications. Most ISVs write their applications with the sole purpose of delivering a very specific function, such as CRM, ERP or Analytics; and they often prefer to deliver applications with perpetual licensing on customer-procured premise servers rather than offering their services on a subscription-basis, which is a fundamental element of the cloud delivery model.

This area offers the most benefits for small- to medium-sized organizations. Applications and services are accessed via the Web instead of your hard drive. Economically, the main appeal of cloud computing is that customers use only what they need, and pay for only what they actually use. In cloud computing, the services delivered and used over the Internet are paid for by cloud customers on an “as-needed, pay-per-use” basis. With business-grade cloud providers, the infrastructure is architected for high availability and maintained by the cloud provider, not the individual cloud customers or the internal IT staff.

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CLOUD COMPUTING COMPONENTS

Cloud computing can be visualized as a solutions stack consisting of four sections:

Virtual IT

The ultimate evolution of cloud-based services—Virtual IT—is the provisioning of most or all IT services, functions and processes over the Internet. Utilizing the balance of cloud computing components (below), organizations reap the benefits of a mature IT organization without the CapEx cost to build and maintain the environment—all while simultaneously enjoying a consumption-based payment model.

Software as a Service (SaaS)

Through the application of Software as a Service, clients access shared cloud resources to host their specific applications. This allows organizations to move away from license procurement and instead pay on an as-needed basis for software licensing, thereby increasing their organization's agility and scalability. Common examples of SaaS include Salesforce, some ADP functionality, Microsoft® 365, Google apps and similar platforms where clients are guaranteed the most current versions of the solutions for a per-user monthly fee. SaaS offerings are generally considered one-dimensional as they deliver only a specific software application or function to the end user rather than the full ecosystem of IT functions, processes and applications an organization may use on a day-to-day basis.

Platform as a Service (PaaS)

PaaS is the layer of the cloud pyramid that provides a computing platform or framework as a service. Some examples of PaaS offerings are Microsoft® Azure, Amazon Web Services™ Elastic Beanstalk and Google App Engine. A cloud computing PaaS dynamically provisions, configures, reconfigures and de-provisions services as needed to cope with increases or decreases in demand. In reality, in this distributed computing model many services pull together to deliver an application or infrastructure request.

Infrastructure as a Service (IaaS)

The foundation of the cloud pyramid is the delivery of IT infrastructure through virtualization. Virtualization allows the splitting (often called abstraction) of a single physical piece of hardware into independent, self-governed environments. These separate resources can then be grouped into pools that provide virtual servers with on-demand CPUs, RAM and hard drive capacity. This abstraction provides the ability for virtual servers to scale on demand based on fluctuating client needs. However, all IaaS offerings are not created equal, and the engineering principles of how 'computing' resources are allocated to each customer's server instance differ by provider.

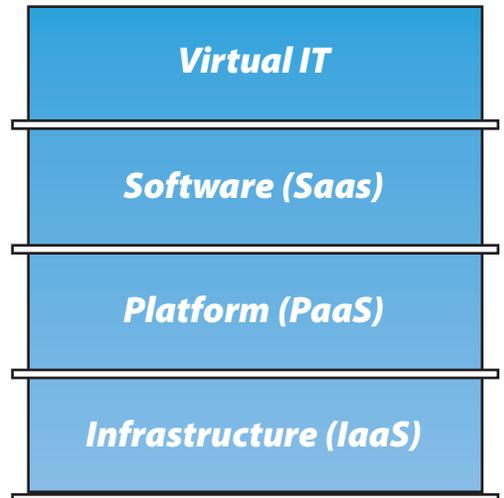
There may also be references to "Virtual Desktop" or "Desktop as a Service (DaaS)" solutions. While this technology isn't quite as mainstream as Software as a Service, DaaS will become a front-runner within the next few years and is considered the next evolution of cloud computing. DaaS works by delivering a familiar desktop user-interface (UI) along with many business applications to PCs, laptops, tablets and smartphones. Desktop as a Service is the cloud computing equivalent of premise-based VDI (Virtual Desktop Infrastructure) and, in addition to its productivity and availability benefits, brings significant cost savings to organizations with fewer than 300 users.

An example of a Hybrid Cloud environment where users access public cloud-based services and private (internal) cloud services.

TYPES OF CLOUD COMPUTING

Public Cloud

Public cloud (also referred to as an 'external' cloud) describes the conventional meaning of cloud computing: scalable, dynamically provisioned, often virtualized resources available over the Internet from an off-site third-party provider, which divides resources and bills its customers on a 'utility' basis.



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Broadview Networks is a good example of an organization that offers public cloud services, including hosted subscription-based applications, LOB application hosting, messaging and virtual desktops, virtual servers and IP telephony. Other solutions include Microsoft® 365, Google Apps and Salesforce.

Private Cloud

Private cloud (also referred to as a 'corporate' or 'internal' cloud) is a term used to denote a proprietary computing architecture providing hosted services on private networks. This type of cloud computing is generally used by large companies, and allows their corporate network and data center administrators to effectively become in-house 'service providers' catering to 'customers' within the corporation. However, a private cloud negates most of the benefits of cloud computing, as organizations still need to purchase, set up and manage their own cloud and on-premise systems.

Hybrid Cloud

It has been suggested that a hybrid cloud environment, combining resources from internal and external providers, will become the most popular choice for enterprises. For example, a company could choose to use a public cloud service for general computing but choose to store its business-critical data within its own data center. This may be because larger organizations are likely to have already invested heavily in the infrastructure required to provide resources in-house; enterprises may also be concerned about the security and/or impact on compliance requirements of public clouds (please see the security section of this document for more on this subject). A hybrid cloud is generally not as attractive for businesses in the small- to medium-sized segment that do not employ large and sophisticated IT staffs, as deploying, managing and administering this environment is still IT intensive.

WHAT'S WITH ALL THIS TERMINOLOGY?

Similar to any technical arena, a variety of terms are often used when describing cloud solutions or services. Below is a compilation of some of the more common terms:

Public cloud: Public cloud is a reference to a variety of solutions available to the general public—consumers and organizations—that provide many types of services from the overall cloud stack. Public clouds are often multi-tenant environments where many users leverage a shared infrastructure and services model to lower the overall cost of services.

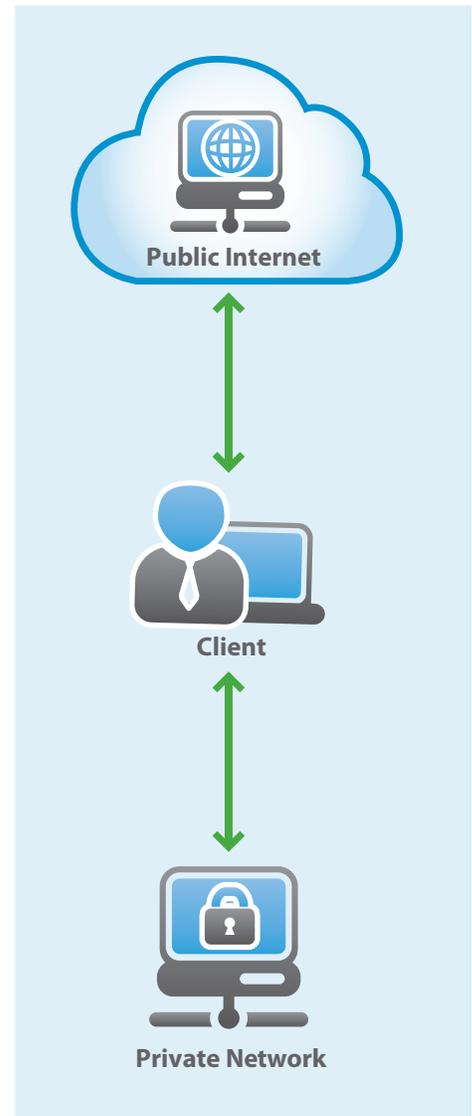
Private Cloud: The phrase used to describe a cloud computing platform implemented within the corporate firewall, under the control of the IT department. Private clouds are designed to offer similar features and benefits of public cloud systems, but private clouds remove a number of objections to the cloud computing model, including control over enterprise and customer data, worries about security and issues regarding regulatory compliance.

Cloud app: Short for cloud application, cloud app is the phrase used to describe a software application that is never installed on a local computer. Instead, the application is accessed via the Internet.

Cloud OS: A phrase frequently used in place of Platform as a Service (PaaS) to denote an association with cloud computing's operating system.

Cloud provider: A service provider that offers customers computing resources, storage or software services via a private network (private cloud) or public network (public cloud). Usually, it means the storage and software is available for access via the Internet.

Cloud storage: Also called online storage, Internet storage or hosted storage, cloud storage is a data storage management solution enabling individuals or organizations to store their data on the Internet using a service provider rather



An example of a Hybrid Cloud environment, where users access both public cloud-based services and private (internal) cloud services.

than storing the data locally on a physical disk, such as a hard drive or tape backup.

Enterprise app: The term used to describe applications, or software that a business would use to assist the organization in solving enterprise problems. When the word “enterprise” is combined with “application,” it usually refers to a software platform that is too large and too complex for individual or small business use.

Internal cloud: Another name for a private cloud.

Multi-tenant: In cloud computing, multi-tenant is the phrase used to describe multiple customers using the same public cloud.

Cloud enablement: The process of making available one or more of the following services and infrastructures to create a public cloud computing environment.

WHAT SERVICES CAN BE USED IN THE CLOUD?

Numerous services can be delivered through cloud computing by taking advantage of the distributed cloud model. The following are brief descriptions of a few of the most popular Broadview Networks cloud computing offerings:

Office Anywhere®

Office Anywhere® is an application on-demand delivery environment that revolutionizes the way desktop, infrastructure, storage and LOB applications are delivered to users. It removes the need for expensive desktop PCs and reduces the cost of providing network services to end users, regardless of their physical location. Office Anywhere® delivers applications to desktops, laptops, tablets and smartphones with a familiar interface that behaves like a regular PC. The software and data that customers access are housed in remote, highly secure data centers rather than on their own premise-based machines or servers. Users can simply access their Office Anywhere® environment via an Internet connection from anywhere in the world. Office Anywhere® simplifies administration with automation tools that reduce common requests, such as adding users or restricting access rights, to a few mouse clicks. Since Office Anywhere® is designed for the business, all services are architected with high availability, and the service offerings include backups with multiple copies of data.

Hosted E-mail

As more organizations depend on e-mail for cost-effective communication and collaboration, they are increasingly turning to hosted e-mail plans. Offering the world’s premier e-mail platform (Microsoft Exchange®) as well as an open-source, cost-effective messaging, collaboration and document management platform, this service lets organizations large and small reap the benefits of enterprise-grade e-mail without having to invest in the costly infrastructure. E-mail is stored centrally on managed servers, providing redundancy and fast connectivity from any location. This allows users to access their e-mail, calendar, contacts and shared files by a variety of means, including Outlook® clients, Web Access, mobile and BlackBerry clients using ActiveSync and NotifySync.

Cloud Storage and Backup

Cloud storage is growing in popularity due to the benefits it provides, such as simple, CapEx-free costs, anywhere access and the removal of the burden of in-house maintenance and management. It is the delivery of data storage as a service from the cloud provider, with access via the Internet and billing calculated on capacity used in a certain period (e.g., per month).

Virtual Servers

Virtual servers are the next generation of server environment, replacing the conventional concept of the dedicated server. Virtual servers offer the same flexibility as physical ones,

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with the added bonus of easy-to-use web portal management and on-demand scaling to address variable utilization. You can directly control the amount of processing power and space you use, meaning you don't have to pay for hardware you don't need. Typically, you can make changes to your virtual server at anytime without the costs associated with purchasing and maintaining additional hardware and resources.

Hosted IP Telephony (IPT)

Hosted IP Telephony is a means of carrying phone calls and services across private and public digital networks, and in some cases across the public Internet. In terms of basic usage and functionality, IPT is no different from traditional telephony, and an IPT-enabled telephone works exactly like a 'normal' one but has distinct cost, mobility, administrative, and business continuity advantages. A hosted IPT system replaces expensive phone systems, installation, handsets, dedicated phone lines and numbers with a simple, cost-efficient alternative that is available to use on a monthly subscription basis. Typically, a pre-configured handset just needs to be plugged into your broadband or office network to allow access to features such as voicemail, ACD, sim-ring and more.

WHY SWITCH FROM TRADITIONAL IT TO THE CLOUD?

One reason so many organizations are embracing cloud computing is flexibility. Increasing capacity or adding functionality when needed—without having to invest in infrastructure—is made easy. The need to train personnel is also reduced. Even the ability to reduce capacity due to market or seasonal changes is just a few keystrokes away, with accompanying reductions in costs.

Removal/reduction of capital expenditure

What makes cloud services even more attractive is their scalability. If your business grows, rather than adding capacity to existing equipment, you simply demand only those additional resources you need from the cloud provider. If, on the other hand, your requirements shrink, you are able to reduce your capacity on demand without having to absorb equipment you no longer need. Simply put, this allows you to pay as you go with regard to cloud services. The avoidance of high capital expense costs to provision new services, combined with a predictable monthly charge, allows organizations to more closely align IT costs to cash flow.

Reduced administration costs

Since the job of maintaining, patching, upgrading or downgrading is all handled by the cloud provider, valuable IT resources are released. A good cloud provider offers technical support 365/7/24 included in its service, further alleviating IT resource burdens. All of this means that the released IT resources are able to focus on improving business-critical processes to improve competitiveness and develop competitive business advantages.

Improved resource utilization

Combining resources in the cloud reduces costs and maximizes utilization by delivering resources only when they are needed. Organizations needn't worry about over-provisioning for a service whose use does not meet its predictions or under-provisioning for one that becomes unexpectedly popular. Moving more and more applications, infrastructure and even support into the cloud can free up precious time, effort and budgets to concentrate on the real job of exploiting technology to improve the mission of the company. It really comes down to making better use of your time—focusing on your business and allowing cloud providers to manage the resources to get you to where you need to go. Sharing computing power among multiple tenants can improve utilization rates, as servers are not left idle, which can reduce costs significantly while increasing the speed of application development.

Economies of scale

Until the advent of cloud computing, only very large companies and organizations could embrace the economy of scale that came with highly efficient, large data centers. This gave those companies an advantage that ultimately resulted in savings which often allowed more aggressive pricing for their customers. Cloud computing, for those embrac-

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ing it, levels the playing field. The same efficiencies and cost controls are available to small- and medium-sized companies, allowing them competitive parity with anyone.

Scalability on demand

Scalability and flexibility are highly valuable advantages offered by cloud computing, allowing customers to react quickly to changing IT needs, adding or subtracting capacity and users as and when required, and responding to real rather than projected requirements. Even better, because cloud computing follows a utility model in which service costs are based on actual consumption, you pay for only what you use. Customers benefit from greater elasticity of resources without paying a premium for large scale.

Quick and easy implementation

Without the need to purchase hardware, software licenses or implementation services, a company can get its cloud computing arrangement off the ground in minutes. Additional services and/or functionality can be implemented in a similarly agile manner.

Helps smaller businesses compete

Historically, there has been a huge disparity between the IT resources available to small businesses and enterprises. Cloud computing has made it possible for smaller companies to compete on an even playing field with much bigger competitors. 'Renting' IT services instead of investing in hardware and software makes these services much more affordable, and means that capital can be used for other vital projects. Providers take enterprise technology and offer SMBs services for a low monthly fee that would otherwise cost hundreds of thousands of dollars.

Quality of service

Your selected vendor should offer 24/7 customer support and an immediate response to emergency situations. Additionally, support should include user self-servicing tools to allow users to address common needs immediately.

Guaranteed SLA-driven uptime

Always ask a prospective provider about reliability and guaranteed service levels—ensure your applications and/or services are always online and accessible. As a rule, don't accept anything less than 99.9%.

Anywhere access

Cloud-based IT services let you access your applications and data securely from any location via an Internet connection. It's easier to collaborate, too; with the application and the data stored in the cloud, multiple users can work together on the same project, share calendars and contacts etc. It has been pointed out that if your Internet connection fails, you will not be able to access your data. However, due to the 'anywhere access' nature of the cloud, users can simply connect from a different location or utilize alternative broadband access strategies such as 3G/4G wireless—so if your office connection fails, you can access your data from home or the nearest Wi-Fi enabled point. Because of this, flexible/remote working is easily enabled, allowing you to cut overhead, meet new working regulations and keep your staff happy!

Technical support

Robust technical support from a potential provider should include 24/7 contact/call center service as well as appropriate self-service tools. This approach is designed to allow clients the benefit of self-servicing for instant response, as well as deep technical skills that can be leveraged in situations that warrant such. In essence, the provider becomes part of the virtual IT support for the organization.

Disaster recovery/backup

Recent research has indicated that around 90% of businesses do not have adequate disaster recovery or business continuity plans, leaving them vulnerable to any disruptions that might occur. A variety of services can improve risk posture, ranging cloud backup

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(allowing you to store important files from your desktop or office network within redundant data centers) to having an entire desktop environment available on demand in the event of a catastrophe. Mission-critical services can be hosted on cloud-based servers, allowing an organization's clients access even if the organization is down for whatever reason. Finally, anytime, anywhere access to mission-critical tools and data ensures your employees can be productive regardless of their location, connection or access device.

Automation

One of the fundamental building blocks of cloud computing, automation tools simplify and speed the provisioning of virtual servers, computing resources and storage. Moreover, administrative functions that once took in-house IT staff members many individual complex steps to complete are reduced to the click of a mouse. The process to add users, change access rights, publish and deploy applications, de-provision services or on-board new employees is done in seconds rather than hours or days.

SHOULD I BE CONCERNED ABOUT SECURITY?

Many companies considering adopting cloud computing raise concerns about the security of data being stored and accessed via the Internet. What many people don't realize is that credible cloud vendors adhere to strict privacy policies and sophisticated security measures, with data encryption one example. Companies can choose to encrypt data before even storing it on a third-party provider's servers. Thus, many cloud vendors offer organizations greater data security and confidentiality than companies that choose to store their data in-house. However, not all vendors offer the same level of security. Technology analyst and consulting firm Gartner lists seven security issues to bear in mind when considering a particular vendor's services:

- 1. Privileged user access** — enquire about who has access to data and about the hiring and management of such administrators,
- 2. Regulatory compliance** — make sure a vendor is willing to undergo external audits and/or security certifications,
- 3. Data location** — ask if a provider allows for any control over the location of the data,
- 4. Data segregation** — make sure that encryption is available at all stages and that these "encryption schemes were designed and tested by experienced professionals,"
- 5. Recovery** — find out what will happen to data in the case of a disaster; does the vendor offer complete restoration and, if so, how long that would take,
- 6. Investigative support** — inquire whether a vendor has the ability to investigate any inappropriate or illegal activity, and
- 7. Long-term viability** — ask what will happen to data if the company goes out of business; how will data be returned and in what format?

In today's global economy, service organizations or service providers must demonstrate that they have adequate controls and safeguards when they host or process data belonging to their customers. The SAS 70 Type 2 certification, developed by the American Institute of Certified Public Accountants (AICPA), represents that a service organization has been through an in-depth audit of its control objectives and control activities, which include controls over information technology and related processes.

Generally speaking, however, security is usually improved by keeping data in one logically-centralized environment vs. disparate locations including laptops, desktops and USB devices. In SAS 70 certified data centers, security is typically better than traditional systems, in part because providers are able to put advanced management, security, redundancy and control systems and practices in place that many organizations would not be able to cost-justify.

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CONCLUSION

When your business grows, your IT needs grow, too. Similarly, during periods of economic downturn, you may not need the same level of IT provisioning. The scalability and speed of deployment offered by cloud computing means you can adjust the level of IT services you require based on dynamic market conditions—paying for only what you need. Enhanced security, along with resilience and the flexibility and responsiveness of cloud-based IT services, means that you can react quickly to a changing business environment. Waste (of time and resources) is reduced, allowing you to effectively do more with less. This provides you a leaner, more efficient IT model that is available on demand.

Moving to a cloud computing model can help your organization survive in a tough economic climate by equipping you with the latest business tools and giving you access to advanced technologies at a fraction of the cost of purchasing and running the same systems in-house. Check that your provider can deliver the type(s) and quality of service you require, and before you know it, you'll be able to enjoy the organizational benefits and competitive advantages of cloud computing.

Broadview Networks is a network-based business communications provider serving customers nationwide. It provides the total solution for business communications, including a full suite of cloud-based computing services, local and long-distance voice communications, premises-based and patented hosted VoIP systems, data services encompassing VPN- and MPLS-enabled applications, traditional telephone hardware, high-speed Internet services, a full suite of managed services and a range of professional services. The Company provides an innovative portfolio of bundled, hosted IP phone and cloud computing services designed to meet the unique application requirements of diverse workforce groups. Broadview customers benefit from award-winning customer service, including a Web-based account management tool and a primary point-of-contact for real-time, personal customer care.



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