

## UNIT I

**Cloud Computing Basics: Cloud Computing Overview, applications, Intranets and the Cloud, Why Cloud Computing Matters, benefits, limitations, Companies in the Cloud today, Cloud services.**

### Cloud Computing Basics

1. Cloud computing is everywhere. Pick up any tech magazine or visit almost any IT website or blog and you'll be sure to see talk about cloud computing.
2. The only problem is that not everyone agrees on what it is. Ask ten different professionals

### Cloud Computing Overview

In this first section, we'll talk about what cloud computing is, and how it is developed and deployed. We'll clear up some misconceptions and make sure we all have a common understanding of the topic.

### What Is Cloud Computing?

Cloud computing is a term referred to storing and accessing data over the internet. It doesn't store any data on the hard disk of your personal computer. In cloud computing, you can access data from a remote server.

- Cloud computing gets its name as a metaphor/Image/symbol for the Internet.
- Typically, the Internet is represented in network diagrams as a cloud, as shown in Figure 1-1.
- The cloud icon represents "all that other stuff" that makes the network work. It's kind of like "etc.".
- Cloud computing promises to cut operational and capital costs and, more importantly, let IT departments focus on strategic projects instead of keeping the datacenter running.

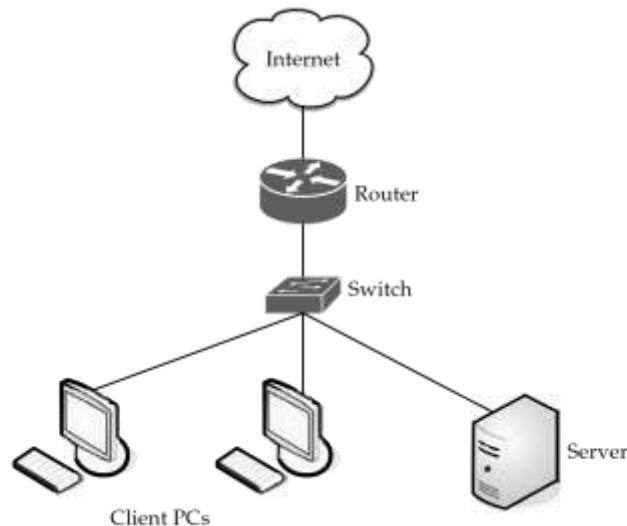


FIGURE 1-1 A cloud is used in network diagrams to depict the Internet.

### **What Works**

1. cloud computing is a construct that allows you to access applications that actually reside at a location other than your computer.
2. or other Internet-connected device; most often, this will be a distant datacenter.
3. There are many benefits to this, license cost just as much as everyone else's.
4. The beauty of cloud computing, as shown in Figure 1-2, is that another company hosts your application (or suite of applications, for that matter).
5. This means that they handle the costs of servers, they manage the software updates, and—depending on how you craft your contract—you pay less for the service.
6. Don't forget the equipment that you won't need to buy—which will result in fewer capital expenditures— you need not buy the servers nor pay for the electricity to power and cool them.
7. It's also convenient for telecommuters and traveling remote workers, who can simply log in and use their applications wherever they are.

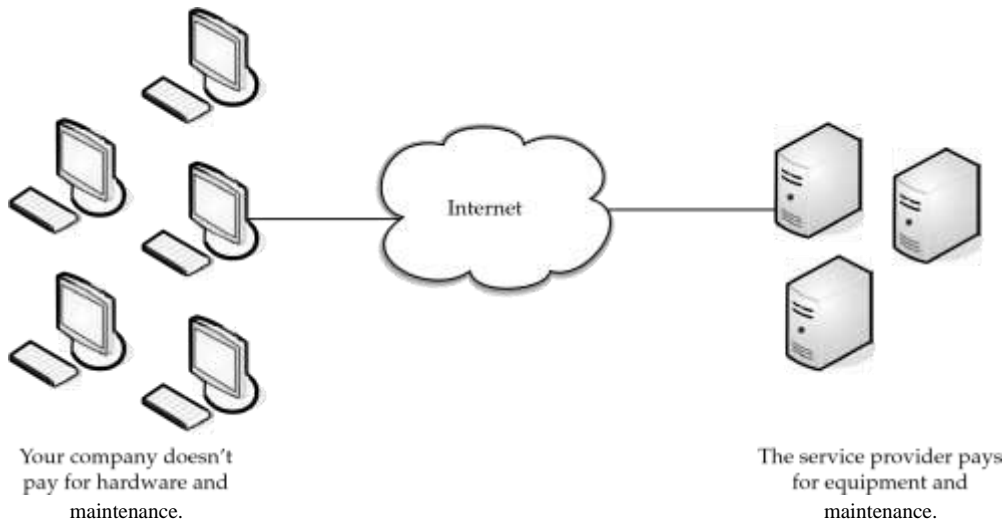
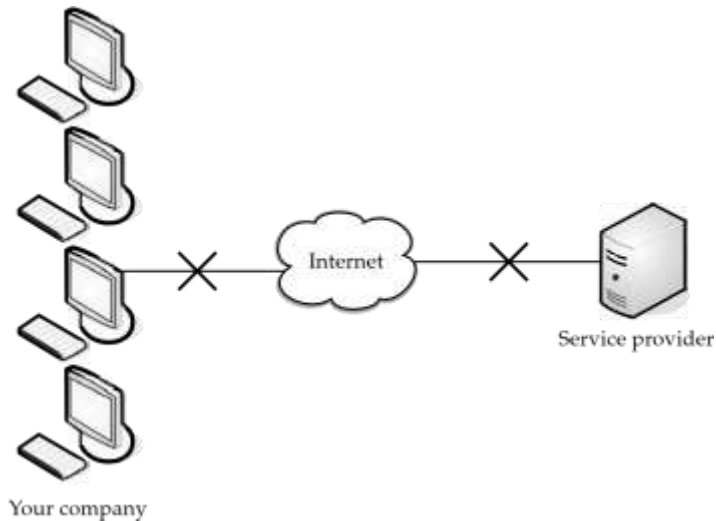


FIGURE 1-2 With cloud computing, other companies host your applications.

### Weak Links

Let's take a quick look at a few areas of potential trouble. The following illustration shows potential points of failure.



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- While an Internet outage or problems with your Internet service provider (ISP) are rare, you may not be able to access your applications and do your work.
- Not that everyone sits in one office much anymore, but if you currently have the application on your own local servers, and all those who access it are not remote,
- In July 2008, Amazon's S3 cloud storage service went down for the second time that year.
- A lot of applications were hosted by the company and all those services could not be accessed until techs could fix the problem.
- Some applications were down for eight hours.

## Application Integration Issues

- You might also find that it's more difficult to integrate your applications if they are geographically dispersed.
- That is, it is easier to manage and access your data if it is nearby, and not under someone else's control.
- For instance, if you need two applications to exchange information, it's easier to do if they both reside in the same place.
- If you have one application in-house and it has to contact another application on the cloud, it becomes far more complicated, and more prone to failure.

## Cloud Components

**In a simple, topological sense, a cloud computing solution is made up of several elements: clients, the datacenter, and distributed servers.** As shown in Figure 1-3, these components make up the three parts of a cloud computing solution.

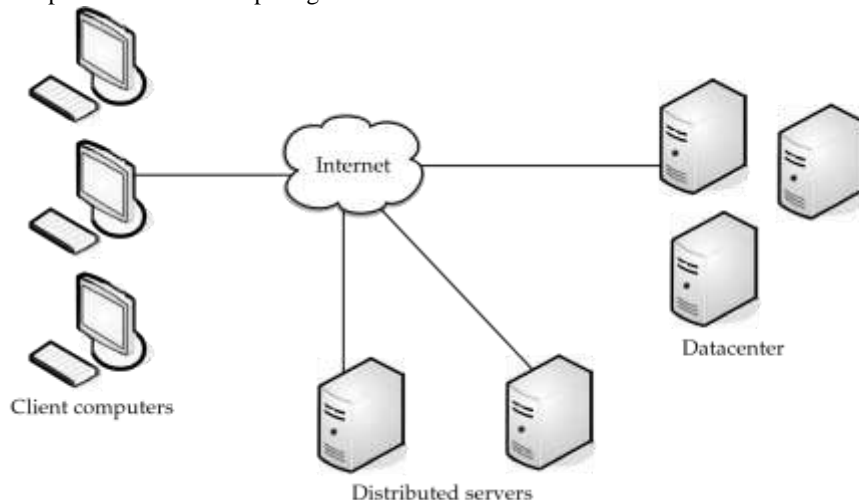


FIGURE 1-3 Three components make up a cloud computing solution.

### **Clients**

1. Clients are, in a cloud computing architecture, the exact same things that they are in a plain, old, everyday local area network (LAN).
2. They are, typically, the computers that just sit on your desk. But they might also be laptops, tablet computers, mobile phones.
3. Anyway, clients are the devices that the end users interact with to manage their information on the cloud.
4. Clients generally fall into three categories:
  - **Mobile** : Mobile devices include smartphones, like a Blackberry, Windows Mobile Smartphone, or an iPhone.
  - **Thin**: Clients are computers that do not have internal hard drives, but rather let the server do all the work, but then display the information.
  - **Thick** : This type of client is a regular computer, using a web browser like Firefox or Internet Explorer to connect to the cloud.

**Thin clients** are becoming an increasingly popular solution, because of their price and effect on the environment. Some benefits to using thin clients include

- **Lower hardware costs**: Thin clients are cheaper than thick clients because they do not contain as much hardware.
- **Lower IT costs**: Thin clients are managed at the server and there are fewer points of failure.
- **Security** Since the processing takes place on the server and there is no hard drive, there's less chance of malware invading the device. less chance of them being physically stolen.
- **Data security**: Since data is stored on the server, there's less chance for data to be lost if the client computer crashes or is stolen.
- **Less power consumption**: Thin clients consume less power than thick clients. This means you'll pay less to power them, and you'll also pay less to air-condition the office.
- **Ease of repair or replacement**: If a thin client dies, it's easy to replace. The box is simply swapped out and the user's desktop returns exactly as it was before the failure.
- **Less noise**: Without a spinning hard drive, less heat is generated and quieter fans can be used on the thin client.

### **Datacenter:**

1. The *datacenter* is the collection of servers where the application to which you subscribe is housed.
2. It could be a large room in the basement of your building or a room full of servers on the other side of the world that you access via the Internet.

### **Distributed Servers:**

- But the servers don't all have to be housed in the same location.
- Often, servers are in geographically different locations.
- This gives the service provider more flexibility in options and security.
- For instance, Amazon has their cloud solution in servers all over the world.
- If something were to happen at one site, causing a failure, the service would still be accessed through another site.
- Also, if the cloud needs more hardware, they need not throw more servers in the safe room—they can add them at another site and simply make it part of the cloud.

### **Infrastructure**

- There are several different ways the infrastructure can be deployed.
- The infrastructure will depend on the application and how the provider has chosen to build the cloud solution.
- This is one of the key advantages for using the cloud.
- Your needs might be so massive that the number of servers required far exceeds your desire or budget to run those in-house.
- Alternatively, you may only need a sip of processing power. The cloud fits both needs.

### **Grid Computing**

- Grid computing applies the resources of many computers in a network to work on a single problem at the same time.
- This is usually done to address a scientific or technical problem.
- Another well-used grid is the World Community Grid
- Grid computing necessitates the use of software that can divide and then send out pieces of the program to thousands of computers.
- It can be done throughout the computers of an organization, or it can be done as a form of public collaboration.
- Sun Microsystems offers Grid Engine software that allows engineers at companies to group the computer cycles on up to 80 workstations at a time.

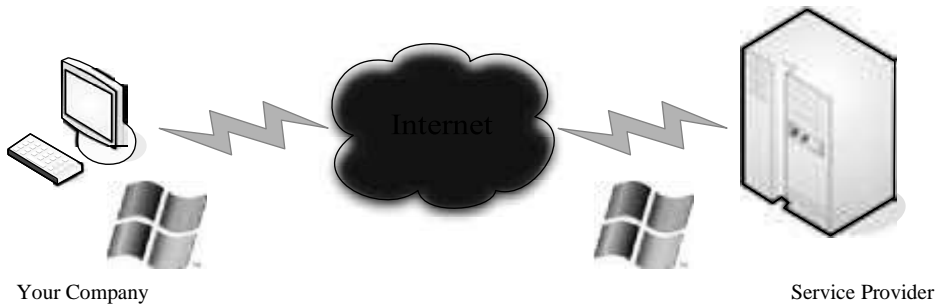
Grid computing is interesting for several reasons:

- It is a cost-effective way to use a given amount of computer resources.
- It is a way to solve problems that need a great amount of computing power.
- The resources of several computers can be shared together, without one computer managing the other.

In grid computing, a large project is divided among multiple computers to make use of their resources.

### Full Virtualization

- Full virtualization is a technique in which a complete installation of one machine is run on another.
- The result is a system in which all software running on the server is within a virtual machine.



- In a fully virtualized deployment, the software running on the server is displayed on the clients.
- This sort of deployment allows not only unique applications to run, but also different operating systems.
- Virtualization is related to cloud computing because it is one of the ways in which you will access services on the cloud.
- That is, the remote datacenter may be delivering your services in a fully virtualized format.

Full virtualization has been successful for several purposes:

- Sharing a computer system among multiple users
- Dividing users from each other and from the control program
- Imitating hardware on another machine

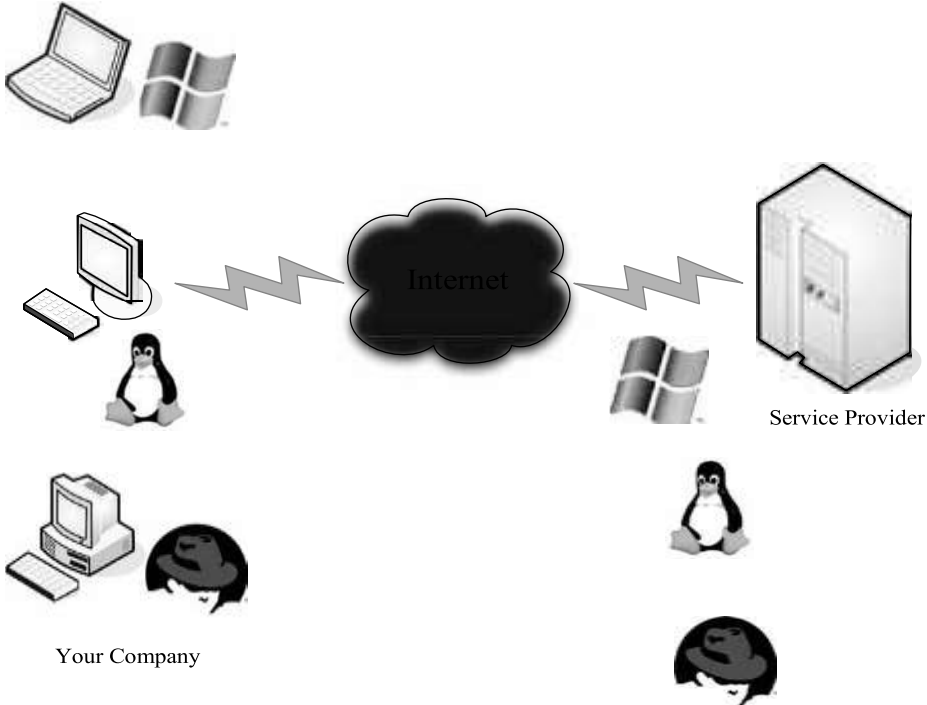
### Paravirtualization

- *Paravirtualization* allows multiple operating systems to run on a single hardware device at the same time by more efficiently using system resources, like processors and memory.

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- but in paravirtualization, its management module operates with an operating system that has been adjusted to work in a virtual machine.
- Paravirtualization typically runs better than the full virtualization model.



In a paravirtualized deployment, many different operating systems can run simultaneously.

- For example, a new Windows deployment may not be available as a guest OS for the solution.
- Security can be at risk because the guest OS has more control of the underlying hardware, and there is a risk of impacting the hardware and all the guest systems on the host.
- Paravirtualization also allows for better scaling.

Paravirtualization works best in these sorts of deployments:

- **Disaster recovery** : In the event of a disaster, guest instances can be moved to other hardware until the equipment can be repaired.
- **Migration** : Moving to a new system is easier and faster because guest instances can be removed from the underlying hardware.



- **Capacity management** : Because of easier migrations, capacity management is simpler to implement. It is easier to add more processing power or hard drive capacity in a virtualized environment.

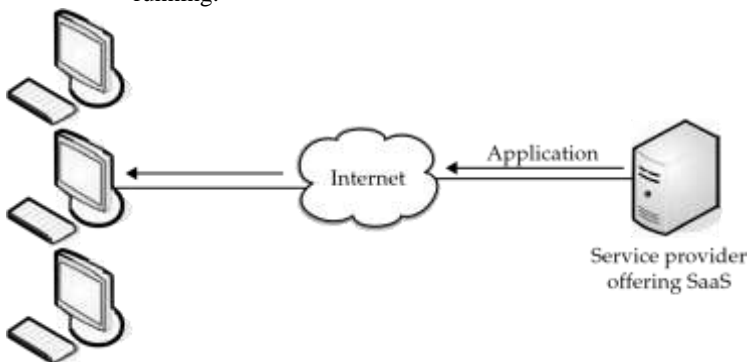
## Services

1. The term services in cloud computing is the concept of being able to use reusable, components across a vendor's network.
2. This is widely known as "as a service." Offerings with *as a service* as a suffix include characters like the following:

- Low barriers to entry, making them available to small businesses
- Large scalability
- Multitenancy, which allows resources to be shared by many users
- Device independence, which allows users to access the systems on different hardware

## Software as a Service

- Software as a Service (SaaS) is the model in which an application is hosted as a service to customers who access it via the Internet.
- When the software is hosted off-site, the customer doesn't have to maintain it or support it.
- On the other hand, it is out of the customer's hands when the hosting service decided to change it.
- The idea is that you use the software out of the box as is and do not need to make a lot of changes or require integration to other systems.
- The provider does all the patching and upgrades as well as keeping the infrastructure running.



Clients of software from the service provider.

SaaS provides an application or piece

The more you use it, the more you'll be billed. On the other hand,.

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- For vendors, SaaS has the appeal of providing stronger protection of their intellectual property as well as creating a continuous stream of income.
  - software that performs a simple task without much need to interact with other systems makes them ideal candidates for SaaS. Some of these applications include
  - Customer resource management (CRM)
  - Video conferencing
  - IT service management
  - Accounting
  - Web analytics
  - Web content management
1. SaaS was developed specifically to use web tools, like the browser.
  2. This makes them web-native.
  3. SaaS provides network-based access to commercially available software.
  4. Since the software is managed at a central location, customers can access their applications wherever they have web access.
  5. **Benefits** One of the biggest benefits of SaaS is, of course, costing less money than buying/purchasing the application outright.
  6. The service provider can offer cheaper, more reliable applications than organizations can by themselves. **Some other benefits include the following:**
- **Familiarity with the World Wide Web** : Most workers have access to a computer and know how to use it on the World Wide Web. As such, the learning curve for using external applications can be much smaller.
  - **Smaller staff** : IT systems require the overhead of salaries, benefits, insurance, and building space. The ability to farm out applications reduces the need for as much IT staff.
  - **Customization** : Older applications were difficult to customize and required tinkering with the code. SaaS applications are much easier to customize and can give an organization exactly what they want.
  - **Better marketing** : A provider who had developed an application for a very narrow market might have had problems marketing that application. However, with SaaS, the entire world is open to the providers.
  - **Web reliability** : We talked earlier about how the World Wide Web can be seen as a source of failure. And while that is sporadically true, the fact of the matter is that the Web is generally quite reliable.
  - **Security** :Secure Sockets Layer (SSL) is widely used and trusted. This allows customers to reach their applications securely without having to employ complex back-end configurations, like virtual private networks (VPNs).

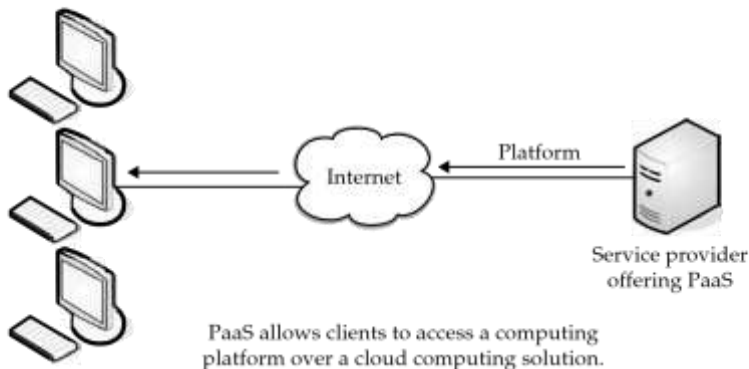
- **More bandwidth** : Bandwidth has increased greatly in recent months and quality of service improvements are helping data flow. This will allow organizations to trust that they can access their applications with low latencies and good speeds.

### Platform as a Service

- Platform as a Service (PaaS) is another application delivery model.
- PaaS supplies all the resources required to build applications and services completely from the Internet, without having to download or install software.

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**NOTE** PaaS is also known as cloudware.



- PaaS services include application design, development, testing, deployment, and hosting.
- Other services include team collaboration, web service integration, database integration, security, scalability, storage, state management, and versioning.
- PaaS generally offers some support to help the creation of user interfaces, and is normally based on HTML or JavaScript.
- Because PaaS is expected to be used by many users simultaneously, it is designed with that sort of use in mind, and generally provides automatic facilities for concurrency management, scalability, failover, and security.
- PaaS also supports web development interfaces which allow the construction of multiple web services.
- The interfaces are also able to access databases and reuse services that are within a private network.

#### **PaaS Options PaaS is found in one of three different types of systems:**

- **Add-on development facilities** : These allow existing SaaS applications to be customized. Often, PaaS developers and users are required to purchase subscriptions to the add-on SaaS application.

- **Stand-alone environments** : These environments do not include licensing, technical, or financial dependencies on specific SaaS applications and are used for general developments.
- **Application delivery-only environments** : These environments support hosting level services, like security and on-demand scalability. They do not include development, debugging, and test capabilities.

. Some other factors influencing adoption include

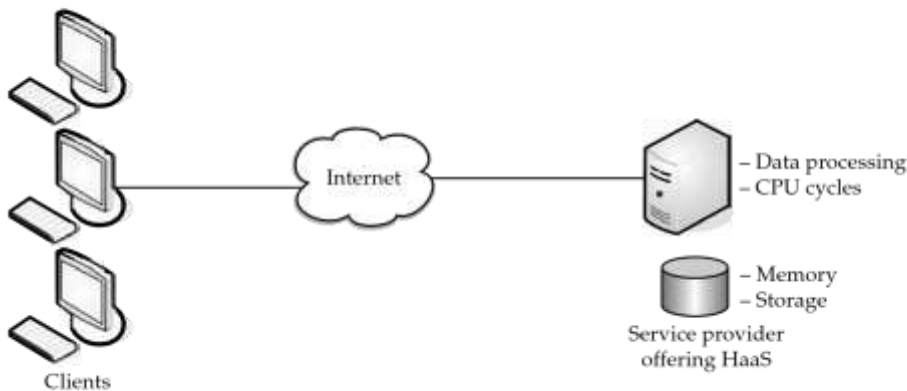
- The ability of geographically isolated development teams to work together
- The ability to merge web services from multiple sources
- The ability to realize cost savings from using built-in infrastructure services for security, scalability, and failover, rather than having to obtain and test them separately
- The ability to realize cost savings from using higher-level programming abstractions

### Hardware as a Service

- Hardware as a Service (HaaS) is the next form of service available in cloud computing.
- Where SaaS and PaaS are providing applications to customers, HaaS doesn't. It simply offers the hardware so that your organization can put whatever they want onto it.

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**NOTE** *HaaS is sometimes also called Infrastructure as a Service (IaaS).*



HaaS allows service providers to rent hardware resources.

- Rather than purchase servers, software, racks, and having to pay for the datacenter space for them, the service provider rents those resources.

*HaaS allows you to "rent" such resources as*

- Server space
- Network equipment

- Memory
  - CPU cycles
  - Storage space
1. Additionally, the infrastructure can be dynamically scaled up or down, based on the application resource needs.
  2. Further, multiple tenants can be on the equipment at the same time.
  3. Resources are typically billed based on a utility computing basis, so providers charge by how many resources are consumed.

HaaS involves several pieces:

- **Service level agreements** : This is an agreement between the provider and client, guaranteeing a certain level of performance from the system.
- **Computer hardware** : These are the components whose resources will be rented out. Service providers often have this set up as a grid for easier scalability.
- **Network** : This includes hardware for firewalls, routers, load balancing, and so on.
- **Internet connectivity** : This allows clients to access the hardware from their own organizations.
- **Platform virtualization environment** :This allows the clients to run the virtual machines they want.
- **Utility computing billing** : Typically set up to bill customers based on how many system resources they use.

## Applications

- we have applications running on our laptops, servers, phones and the like. cloud computing brings you applications, a way of viewing, manipulating, and sharing data.
- Like their desktop applications exist in cloud computing, but what will differ for you is how you interact with those applications.
- The most common are storage and database. In this section, we'll take a closer look at storage and database functionality.

## Storage

Somewhat similar to HaaS, one of the uses for cloud computing is simply storage.

But there are different options when it comes down to cloud storage.

## Database

*Databases* are sources for information with links within the information that help make the data searchable.

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Distributed databases, like Amazon's SimpleDB, spread information among physically dispersed hardware. But to the client, the information seems to be located in one place. The advantages of such a database include the following:

- **Improved availability** : If there is a fault in one database system, it will only affect one fragment of the information, not the entire database.
- **Improved performance** : Data is located near the site with the greatest demand and the database systems are parallelized, which allows the load to be balanced among the servers.
- **Price** : It is less expensive to create a network of smaller computers with the power of one large one.
- **Flexibility** : Systems can be changed and modified without harm to the entire database.

Naturally there are disadvantages, including

- **Complexity** : Database administrators have extra work to do to maintain the system.
- **Labor costs**: With that added complexity comes the need for more workers on the payroll.
- **Security** : Database fragments must be secured and so must the sites housing the fragments.
- **Integrity** : It may be difficult to maintain the integrity of the database if it is too complex or changes too quickly.
- **Standards** : There are currently no standards to convert a centralized database into a cloud solution.

## Synchronization

- Synchronization, as with Microsoft's Live Mesh or Apple's MobileMe, allows content to be refreshed across multiple devices.
- For instance, if you have a spreadsheet on your computer and then upload it to the storage service, the next time you check your PDA, that file will be downloaded onto it.

## Database Services

Another "as a service" offering that is becoming prevalent in the world of cloud computing is **Database as a Service (DaaS)**. The idea behind DaaS is to avoid the complexity and cost of running your own database.

DaaS offers these benefits:

- **Ease of use** :There are no servers to provision and no redundant systems to worry about. You don't have to worry about buying, installing, and maintaining hardware for the database.
- **Power** : Depending on your vendor, you can get custom data validation to ensure accurate information. You can create and manage the database with ease.

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- **Integration:** The database can be integrated with your other services to provide more value and power. For instance, you can tie it in with calendars, email, and people to make your work more powerful.
- **Management :** Because large databases benefit from endless cropping and optimization, typically there are expensive resources dedicated to this task. With some DaaS offerings, this management can be provided as part of the service for much less expense. So it's possible that you are using the service in Chicago, the physical servers are in Washington state, and the database administrator is in the Philippines.

There are a number of providers out there, but let's take a closer look at two of the biggest players.

## MS SQL

1. SQL Server. They announced the cloud extension of that tool in the spring of 2008 by introducing Microsoft SQL Server Data Services (SSDS).
2. SSDS looks very similar to Amazon's SimpleDB,
3. with a straightforward, schema-free data storage, a pay-as-you-go payment system.
4. It is also able to start small and scale larger as needed.
5. While it looks similar to SimpleDB,
6. It varies greatly. First, one of the main selling points of SSDS is that it integrates with Microsoft's Sync Framework, which is a .NET library for synchronizing dissimilar data sources.
7. Microsoft wants SSDS to work as a data hub, synchronizing data on multiple devices so they can be accessed offline.

There are three core concepts in SSDS:

- **Authority** An *authority* is both a billing unit and a collection of containers.
- **Container** A *container* is a collection of entities and is what you search within.
- **Entity** An *entity* is a name and value pairs.

## Oracle

In the fall of 2008 Oracle introduced three services to provide database services to cloud users. Customers can license

- Oracle Database 11g
  - Oracle Fusion Middleware
  - Oracle Enterprise Manager
1. The products are available for use on Amazon Web Services' Elastic Compute Cloud (Amazon EC2).
  2. Oracle delivered a set of free Amazon Machine Images (AMIs) to its customers so they could quickly and efficiently deploy Oracle's database solutions.

3. Developers can take advantage of automated software deployment to rapidly build applications using Oracle's popular development tools such as Oracle Application Express, Oracle JDeveloper, Oracle Enterprise Pack for Eclipse, and Oracle Workshop for WebLogic.
4. The Oracle Secure Backup Cloud Module also enables encrypted data backups to help ensure complete privacy in the cloud environment. It's fully integrated with Oracle Recovery Manager and Oracle Enterprise Manager, providing users with familiar interfaces for cloud-based backups.

## **Intranets and the Cloud**

- If your operation is not big as Amazon S3 cloud computing, you can use the same sorts of principles within your organization to develop your IT infrastructure.
- By setting up thin clients to run applications and services on a local server, rather than on their desktops, you facility the costs of deployment and maintenance, as well as reducing power costs.

*In this section we'll talk about the merits of developing your own in-house "cloud" and what is used in its composition.*

### **Components**

- There are two main components in client/server computing: servers and thin or light clients.
- The network map in Figure 1-5 shows how they are deployed.
- The servers house the applications your organization needs to run, and the thin clients—which do not have hard drives—display the results.

### **Hypervisor Applications**

- Applications like VMware or Microsoft's Hyper-V allow you to virtualize your servers so that multiple virtual servers can run on one physical server.
- They also make it possible to install different operating systems on the same machine.
- For example, you may need Windows Vista to run one application, while another application requires Linux. It's easy to set up the server to run both operating systems.



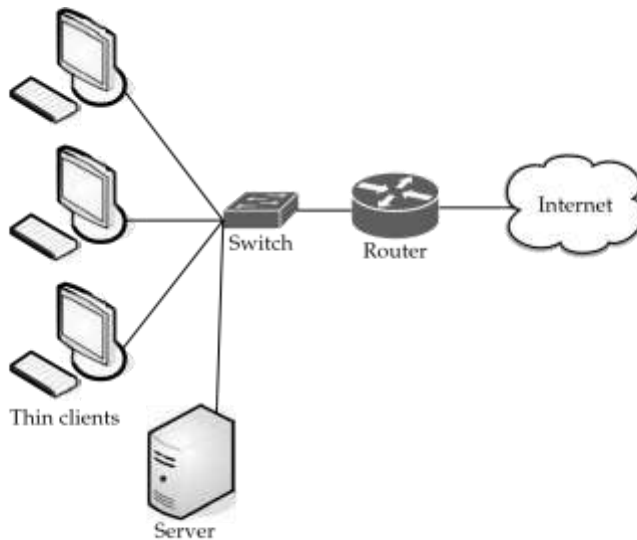


FIGURE 1-5 A client/server computing deployment consists of servers and thin clients.

Thin clients use an application program to communicate with an application server. Most of the processing is done down on the server, and sent back to the client.

## First Movers in the Cloud

- There are scores of vendors who offer cloud services.
- What they have to offer varies based on the vendor and their pricing models are different, as well.
- Let's take a look at some of the big names in the world of cloud computing and talk, briefly, about what they have to offer.
- let's look at the names you already know: Amazon, Google, and Microsoft.

## Amazon

Amazon was one of the first companies to offer cloud services to the public, and they are very advanced. Amazon offers a number of cloud services, including

- **Elastic Compute Cloud (EC2)** : Offers virtual machines and extra CPU cycles for your organization.
- **Simple Storage Service (S3)**: Allows you to store items up to 5GB in size in Amazon's virtual storage service.
- **Simple Queue Service (SQS)** : Allows your machines to talk to each other using this message-passing API.

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- **SimpleDB:** A web service for running queries on structured data in real time. This service works in close conjunction with Amazon Simple Storage Service (Amazon S3) and Amazon Elastic Compute Cloud (Amazon EC2), collectively providing the ability to store, process, and query data sets in the cloud.
  1. These services can be difficult to use, because they have to be done through the command line.
  2. That said, if you are used to working in a command-line environment, you shouldn't have much trouble using the services.
  3. Amazon's virtual machines are versions of Linux distributions, so those who are experienced with Linux will be right at home.
  4. In fact, applications can be written on your own machine and then uploaded to the cloud.
  5. Amazon is the most extensive cloud service to date. You can see more about Amazon's cloud services at <http://aws.amazon.com>.

## Google

- Google offers online documents and spreadsheets, and encourages developers to build features for those and other online software, using its Google App Engine.
- Google reduced the web applications to a core set of features, and built a good framework for delivering them.
- Google also offers handy debugging features.
- Groups and individuals will likely get the most out of App Engine by writing a layer of Python that sits between the user and the database.
- Look for Google to add more features to add background processing services.
- It can be found online at [code.google.com/appengine/](http://code.google.com/appengine/).

## Microsoft

- Microsoft's cloud computing solution is called Windows Azure,
- An operating system that allows organizations to run Windows applications and store files and data using Microsoft's datacenters.
- It's also offering its Azure Services Platform, which are services that allow developers to establish user identities, manage workflows, synchronize data, and perform other functions as they build software programs on Microsoft's online computing platform.

### Key components of Azure Services Platform include

- **Windows Azure** : Provides service hosting and management and low-level scalable storage, computation, and networking.
- **Microsoft SQL Services** : Provides database services and reporting.
- **Microsoft .NET Services** : Provides service-based implementations of .NET Framework concepts such as workflow.

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- **Live Services** : Used to share, store, and synchronize documents, photos, and files across PCs, phones, PC applications, and web sites.
- **Microsoft SharePoint Services and Microsoft Dynamics CRM Services** : Used for business content, collaboration, and solution development in the cloud.

## Why Cloud Computing Matters- Why is cloud computing important?

1. For developers, cloud computing provides increased amounts of storage and processing power to run the applications they develop.
2. Cloud computing also enables new ways to access information, process and analyze data, and connect people and resources from any location anywhere in the world.
3. For IT departments, cloud computing offers more flexibility in computing power, often at lower costs.
4. With cloud computing, IT departments don't have to engineer for peak-load capacity, because the peak load can be spread out among the external assets in the cloud.
5. And, because additional cloud resources are always at the ready, companies no longer have to purchase assets (servers, workstations, and the like) for infrequent intensive computing tasks.
6. If you need more processing power, it's always there in the cloud—and accessible on a cost-efficient basis.
7. For end users, cloud computing offers all these benefits and more.
8. An individual using a web-based application isn't physically bound to a single PC, location, or network.
9. His applications and documents can be accessed wherever he is, whenever he wants.
10. Gone is the fear of losing data if a computer crashes.
11. Documents hosted in the cloud always exist, no matter what happens to the user's machine.
12. And then there's the benefit of group collaboration, for both individuals and organizations.
13. Users from around the world can collaborate on the same documents, applications, and projects, in real time.
14. It's a whole new world of collaborative computing, all enabled by the notion of cloud computing.
15. For everyone concerned, cloud computing does all this at lower costs, because the cloud enables more efficient sharing of resources than does traditional network computing.
16. When you tap into the power of the cloud, you get supercomputing power at PC prices—something that offers particular appeal to individuals and small businesses.
17. And, with cloud computing, hardware doesn't have to be physically adjacent to a firm's office or data center; cloud infrastructure can be located anywhere, including and especially areas with lower real estate and electricity costs.

## Why Cloud Computing important?

- **Cost savings.** In the past, it's been quite expensive to run, manage and deploy local systems; it has also taken a lot of capital. Most cases involve very technical people that you have to compensate with a lot of money to maintain all the stuff for you. Since you no longer need to run, manage and deploy the systems, there are big cost savings to be had.

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- **Scalability.** Cloud computing means you no longer need to worry about having to upgrade systems since it's all hosted elsewhere. You literally just need to make a phone call or click a button to increase your server capacity. If you acquire a company tomorrow and they have 50 staff, the cloud gives you unlimited elastic scale so you can add those 50 users and get them up and running straight away.
- **Keep up with the latest technology.** With cloud computing, you never have to worry about upgrading and updating. The cloud makes sure you are getting the latest servers and are always upgraded with the next version. When a new patch comes out, it is automatically deployed, so you don't have to worry about any of that technical stuff anymore. Cloud computing keeps you on the cutting edge with the most up-to-date technology.
- **Mobility.** Since the cloud is hosted, you are no longer confined to the office. You can take your information mobile and work from tablets and mobile devices. Staff can work from an office computer, from home, or from a client site. The cloud increases the efficiency of an organisation by giving staff more mobility. They can be on site with a client and still enter notes directly into sales reports.
- **Disaster recovery.** Improved up-time is the result of better disaster recovering in the cloud. Your cloud hosting can take advantage of the best enterprise systems; in the event of server failure, it automatically fails over to another server. This is something that you definitely cannot achieve inside a small organisational IT environment, because to implement that sort of disaster recovery would be costly and capital intensive.

## Challenges of Cloud Computing

- **Data security.** Although established, reliable cloud computing vendors will have the latest, most sophisticated data security systems available on the market, there is still a concern that sensitive information might be at risk because data is not hosted locally. This concern is totally reasonable; your data is hosted somewhere else. *Who knows what goes on over there?* To alleviate this concern, make sure you deal only with reputable, established vendors that have a proven track record.
- **Increased dependency on Internet connection.** Cloud computing makes your organisation dependent on the reliability of an Internet connection. When it's offline, you're offline. Before moving to the cloud, make sure you consult your IT guy and make sure your Internet connection can handle it.

Cloud computing is not a one-size-fits-all affair. Just as the hardware and software configuration you use in your organization is different from that of the company down the street, your cloud computing needs will be different as well.

This chapter will help you understand how your organization can best use cloud computing, and which solutions might be most appropriate for your needs. And while we talk about what cloud computing is good for, we also talk about cloud computing limitations. That is, cloud computing is not perfect, and there are times when you shouldn't turn to it. We'll examine those cases, as well.

## **When You Can Use Cloud Computing**

Whether or not you should use cloud computing depends on a number of factors, including

- Cost/benefit ratio
- Speed of delivery
- How much capacity you will use
- Whether your data is regulated
- Your organization's corporate and IT structure

There may be times when the need you have is a perfect match for cloud computing.

But there may also be times when cloud computing is simply not a good match for your needs. In this section we'll take a look at both what you can use clouds for, and when you should steer clear of them.

## **Scenarios**

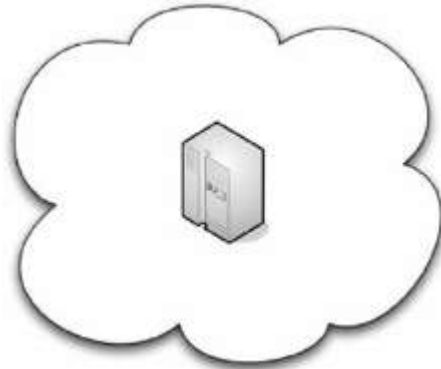
There are three different major implementations of cloud computing. How organizations are using cloud computing is quite different but the uses generally fall into one of these three solutions

## **Compute Clouds**

Compute clouds allow access to highly scalable, inexpensive, on-demand computing resources that run the code that they're given. Three examples of compute clouds are

- Amazon's EC2
- Google App Engine
- Berkeley Open Infrastructure for Network Computing (BOINC)

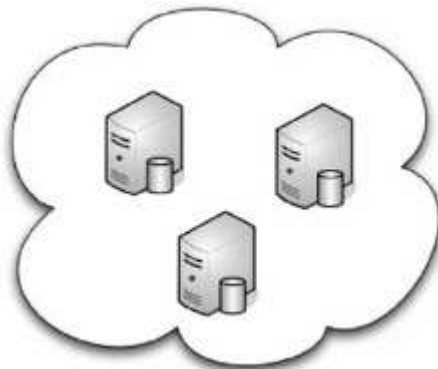
Compute clouds are the most flexible in their ,it simply depends on the application the user wants to access.



Compute clouds allow you to access applications maintained on a provider's equipment.

## **Cloud Storage**

One of the first cloud offerings was cloud storage and it remains a popular solution. Cloud storage is a big world. There are already in excess of 100 vendors offering cloud storage. This is an ideal solution if you want to maintain files off-site.



Cloud storage allows you to store your data on a vendor's equipment.

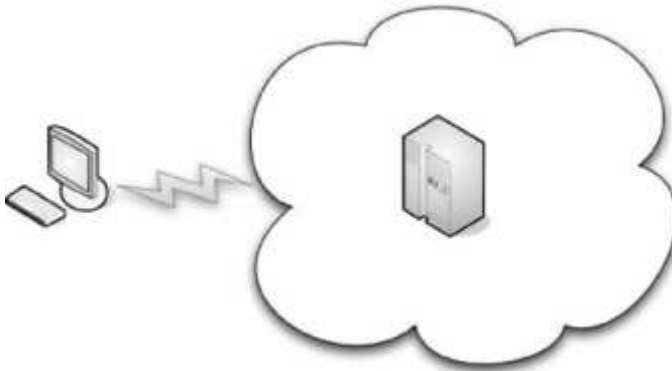
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Security and cost are the top issues in this field and vary greatly, depending on the vendor you choose. Currently, Amazon's S3 is the top dog.

## Cloud Applications:

- Cloud applications differ from compute clouds in that they utilize software applications that rely on cloud infrastructure.
- Cloud applications are versions of Software as a Service (SaaS) and include such things as web applications that are delivered to users via a browser or application like Microsoft Online Services.
- These applications offload hosting and IT management to the cloud.



Cloud applications deliver applications that depend on the infrastructure of the Internet itself.

Cloud applications often eliminate the need to install and run the application on the customer's own computer, thus alleviating the burden of software maintenance, ongoing operation, and support. Some cloud applications include

- Peer-to-peer computing (like BitTorrent and Skype)
- Web applications (like MySpace or YouTube)
- SaaS (like Google Apps)
- Software plus services (like Microsoft Online Services)

## When You Shouldn't Use Cloud Computing

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**The fact of the matter is there** are plenty of cases where cloud computing may not be appropriate, for any reason ranging from cost to hardware requirements to simply not needing it. **Why Cloud Computing Matters**

## **Minding the Details**

- If you want to use cloud computing and post data covered by Health Insurance Portability and Accounting on it, you are out of luck, That's sensitive healthcare information
- Even so, Google and Microsoft are both moving forward on health records services: Microsoft is working on its HealthVault and Google Health promises to be a huge outpouring of private health data online.
- While the intent seems well-meaning—to give consumers access to their healthcare data—all it takes is one tiny breach to let sensitive data loose.
- An issue of more concern for the sensitivity of private data is that there are laws and policy that allow the government freer access to data on a cloud than on a private server.
- For example, the Stored Communications Act allows the FBI access to data without getting a warrant or the owner's consent.

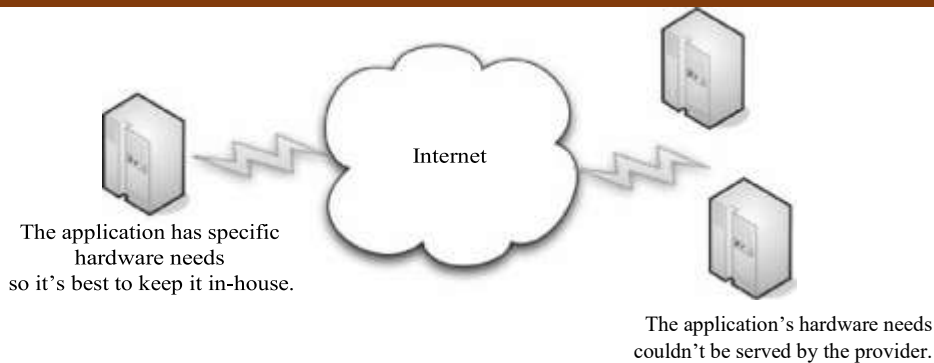
## **Geopolitical Concerns/affairs**

- It may simply be illegal to post your information on a cloud. If you are in Canada (for instance) and you want to post your data on an American cloud, you're out of luck.
- The Canadian government has declared that government IT workers may not use network services that are operating within U.S. borders.
- The reason is that the Canadian data stored on those servers could be negatively impacted based on the Patriot Act.
- Sure, Canada might be the friendly neighbor of the United States to the north, but at this point in time, they have a great policy.
- All it would take is for the U.S. government to seize a server with foreign data on it.
- And the same can be said of clouds operating outside the United States.
- You probably don't know the laws (if there are any) governing your privacy and protection in a foreign country.

## **Hardware Dependencies**

- If you have an application that requires specific hardware, chips, or drivers, a cloud solution might not be a good fit for you.





- First, if you have special hardware needs, the chances are lower that the service provider will have the precise hardware you need.
- That can significantly narrow your options when it comes to shopping around and finding a good deal.

### **Server Control**

- If your application demands complete control over everything that is running, A cloud solution may not be right for you.
- If you need detailed control over the amount of memory, CPU, hard drive specs, or interfaces, then the cloud isn't an appropriate match for your application.
- After all, these are all things managed by the service provider.

### **Cost**

- One of the big draws of cloud computing is cost. That is, it tends to be less expensive to run an application on a cloud than to invest in the infrastructure, buy the application outright, and then manage it day to day.
- However, over time, it may cost more to pay the cloud subscription than to have simply bought the servers yourself, so it is important to factor in everything from facilities, staff, software, and hardware.
- Cost and the way clouds operate are a moving target. Some have suggested that the cloud might bring servers into the client's datacenter. Another school of thought is a concept called *cloud bursting*. In this scenario, on-demand capacity can be provisioned to a cloud.

### **Lack of Need**

Now, there are certainly cases where cloud computing is advantageous for you. And in those cases, by all means use it. However, if you are just moving applications to the cloud for the fashion of it, take a look at some *old pictures of "fashionable" people*.

### **Integration with Existing Applications**

- If you mix oil and water, you get a lava lamp.

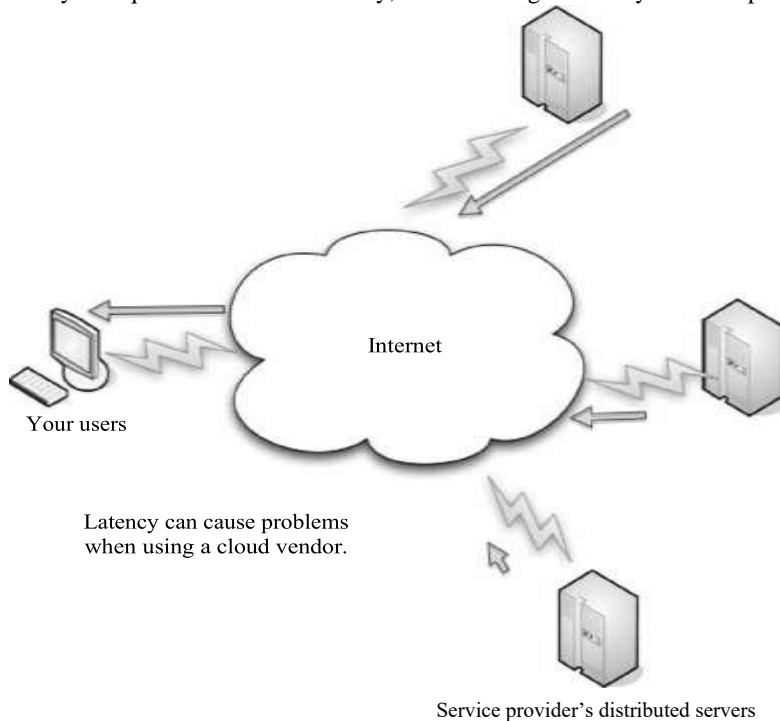
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- The fact of the matter is that if you have two applications that need to integrate, it's best for one not to be located on-site and a second on the cloud.
- It creates problems with security, speed, and reliability. For instance, if you have two databases—one with sensitive data housed locally, and one with non sensitive data on a cloud—the chances that the sensitive data will find its way to the cloud are very good.
- Also, if you are trying to run a high-speed application in-house and you rely on data from the cloud, the application will only run as fast as the cloud will allow.
- This also leads to questionable reliability. Will data be compromised or damaged from all the flying around it has to do?

### Latency problems

- Since your data and application are located on a series of servers geographically disparate from your own site, it is going to take some time for the data to reach you.
- This isn't an issue of hours or days—or even minutes.
- But if you require data instantaneously, the cloud might not be your best option.



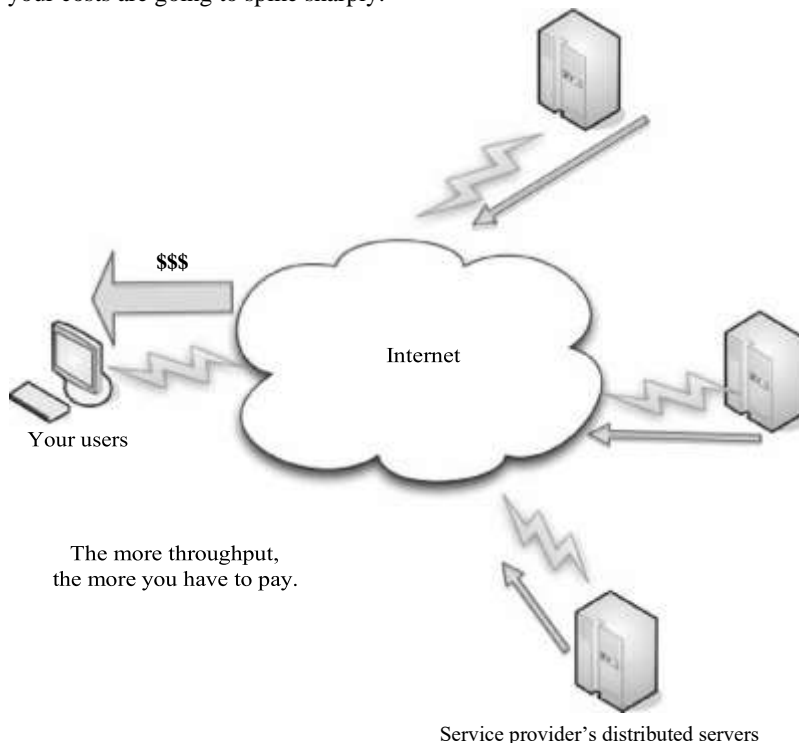
There's still travel time involved with your data. Now, it might be the case that a worker can request given data and it comes through in less than a second, and that speed is fine. However, if that same worker needs the data faster than a second, it might not be coming through fast enough.

### Throughput Demands

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- Since cloud computing is generally billed in a utility format, you pay for what you use.
- That's great and it seems fair, until you deploy applications that use a lot of throughput and costs start to rise. For instance, if you are streaming high-definition video over 100 sources, your costs are going to spike sharply.



It's best to do the math on these sorts of things. Take into account what a server, power, and all other hardware will cost. Figure in the price of management and associated IT personnel costs and then compare that with what a service provider will charge you. **If it's cheaper to buy the server, it might be best to forget about the cloud for now. But even if the cost is the same, you need to ask yourself what business you want to be in.**

### Advantages and Disadvantages of Cloud Computing / Benefits and limitations

#### Benefits/Advantages

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**Cost Savings:** Cost saving is the biggest benefit of cloud computing. It helps you to save substantial capital cost as it does not need any physical hardware investments. Also, you do not need trained personnel to maintain the hardware. The buying and managing of equipment is done by the cloud service provider.

**Strategic edge :** Cloud computing offers a competitive edge over your competitors. It helps you to access the latest and applications any time without spending your time and money on installations.

**High Speed :** Cloud computing allows you to deploy your service quickly in fewer clicks. This faster deployment allows you to get the resources required for your system within fewer minutes.

**Back-up and restore data :** Once the data is stored in a Cloud, it is easier to get the back-up and recovery of that, which is otherwise very time taking process on-premise.

**Automatic Software Integration :** In the cloud, software integration is something that occurs automatically. Therefore, you don't need to take additional efforts to customize and integrate your applications as per your preferences.

**Reliability:** Reliability is one of the biggest pluses of cloud computing. You can always get instantly updated about the changes.

**Mobility :** Employees who are working on the premises or at the remote locations can easily access all the could services. All they need is an Internet connectivity.

**Unlimited storage capacity:** The cloud offers almost limitless storage capacity. At any time you can quickly expand your storage capacity with very nominal monthly fees.

**Collaboration:** The cloud computing platform helps employees who are located in different geographies to collaborate in a highly convenient and secure manner.

**Quick Deployment:** Last but not least, cloud computing gives you the advantage of rapid deployment. So, when you decide to use the cloud, your entire system can be fully functional in very few minutes. Although, the amount of time taken depends on what kind of technologies are used in your business.

## **Other Important Benefits**

Apart from the above, some other advantages of cloud computing are:

- On-Demand Self-service

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- Multi-tenancy
- Offers Resilient Computing
- Fast and effective virtualization
- Provide you low-cost software
- Offers advanced online security
- Location and Device Independence
- Always available, and scales automatically to adjust to the increase in demand
- Allows pay-per-use
- Web-based control & interfaces
- API Access available.

## Disadvantages of Cloud Computing/ limitations

Here, are significant challenges of using Cloud Computing

**Performance Can Vary :** When you are working in a cloud environment, your application is running on the server which simultaneously provides resources to other businesses. Any greedy behavior or DDOS attack on your tenant could affect the performance of your shared resource.

**Technical Issues:** Cloud technology is always prone to an outage and other technical issues. Even, the best cloud service provider companies may face this type of trouble despite maintaining high standards of maintenance.

**Security Threat in the Cloud:** Another drawback while working with cloud computing services is security risk. Before adopting cloud technology, you should be well aware of the fact that you will be sharing all your company's sensitive information to a third-party cloud computing service provider. Hackers might access this information.

**Downtime:** Downtime should also be considered while working with cloud computing. That's because your cloud provider may face power loss, low internet connectivity, service maintenance, etc.

**Internet Connectivity:** Good Internet connectivity is a must in cloud computing. You can't access cloud without an internet connection. Moreover, you don't have any other way to gather data from the cloud.

**Lower Bandwidth:** Many cloud storage service providers limit bandwidth usage of their users. So, in case if your organization surpasses the given allowance, the additional charges could be significantly costly

**Lacks of Support:** Cloud Computing companies fail to provide proper support to the customers. Moreover, they want their user to depend on FAQs or online help, which can be a tedious job for non-technical persons.

-OR-

## Benefits

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**1. The Cost** Having set up own infrastructure and its maintenance system is certainly a time consuming and costly affair, Right from the cost of heavy load servers, the licensed software, and huge maintenance team, every cost can be saved and spent where necessary. Plus, if business demands a scaling, the infrastructure has to scale high to match up the scenario. This kind of upgrade requirement ends up in a new purchase of either hardware, software or both.

Migrating to cloud saves you from hiring an IT maintenance team and paying regularly for costly updates. In addition to that, you can scale up or down quite easily and pay as per your use to cloud services.

## **2. Relief From Backup & Recovery Management**

The very first thing needs to be done is its safety. What if the solely dedicated server crashes followed by a failure of a backup system? It's like a nightmare, correct?

For the industries such as banking and finance, cloud service is a huge blessing. Because a miss of single transaction can result in a big news causing penalties or court cases. Opting for cloud computing means to get completely out of the picture for a backup system. Here, the data storage is distributed amongst connected server instead of one place. Right from the data security to legal compliance, everything is cloud service provider's responsibility. Everything would be automatically taken care of with the best measures.

**3. Scaling is just one email away:** In case, your business is progressing high resulting in a big leap. Definitely, your IT infrastructure will have to cope up with that leap. Cloud computing allows you to upgrade to higher measures by sending just an email. All you need to do is to send an email or to call a service provider mentioning your needs and you would notice it's happening immediately. The big organizations like schools, colleges and even e-commerce sites where user loads can increase tremendously, an IT infrastructure gets scaled up immediately and the cost would be nominal compared to setting up yet another hardware system along with necessary software upgrades.

**4. Inter-department collaboration is no longer a headache now:** The cloud computing came into an existence when large enterprises started failing in inter-department collaboration especially across the multi-locations. The cloud computing services provide a big sense of relief because of data security, scalability and an ease of access attached to it. The cloud computing services bring employees, users, customers and third parties from various locations under one roof and eliminate those time-consuming. For example, a real estate field is associated with masons, contractors, builders, architects and many more people. Here a cloud-based portal can help quick and seamless sharing of necessary data confidentially to a relevant person.

**5. Cloud Is Available 24 X 7 And It's Paperless:** Opting for cloud computing means not only data security but also the 24X7 accessibility of the data anywhere in the world. With everything on the cloud, you no longer have to store your file on your office PC. At your home, or even though you're mobile, you can easily access your valuable data anytime. Moreover, cloud computing helps to make the paperless world. Because every data is doubly secure and accessible in few seconds, you no longer have to keep its paper format to show or study or even email.

## **Limitations**

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**1. Internet dependence:** Everything at the cloud is accessible through internet only. If the cloud server faces some issues, so will your application. Plus, if you use an internet service that fluctuates a lot, the cloud computing is not for you. Even the biggest service providers face quite long downtimes. In certain scenarios, it's become a crucial decision to opt for cloud services.

**2. Data incompatibility:** This is varied as per different service providers. Sometimes, a vendor locks in the customer by using proprietary rights so that a customer can't switch to another vendor. For example, there is a chance that a vendor doesn't provide compatibility with Google Docs or Google Sheets. As your customers or employees are becoming advanced, your business may be in crucial need for it. So ensure your contract with the provider as per your terms, not them.

**3. Security breach threats :** Again, the data transactions happen through internet only. Though your cloud service provider claims to be one of the best-secured-service providers, it should be your call finally. Because cloud computing history has noted big accidents, before. So if you own a business where a single miss or corruption of data is not at all acceptable, you should think 100 times before going for the cloud, especially for large-scale business. But for small business owners, the question here is – will you be able to provide more security levels to your applications than a cloud service provider does?

**4. Various costs:** Is your current application compatible enough to take to clouds? The common mistake business owners do is to invite unrequired expense in order to be highly-advanced. As per the current scenario and near future analysis, if your current infrastructure is serving the needs, then migrating to the clouds would not be recommended. Because it may happen that to be compatible with clouds, your business applications need to be re-written. Moreover, if your business demands huge data transfers, every month you would be billed huge as well. Sometimes, having set up own infrastructure can save you from this kind of constant high billings.

**5. Customer support:** Before opting for clouds, check out the query resolving time. With time, service providers are going modern but still check for the best. If your business faces heavy traffic every day and heavier on weekends, then a quick fix is always on top priority. The best cloud service provider must have optimum support for technical difficulties via email, call, chat or even forums. Choose the one who provides the highest support.

## Companies in the Cloud today

We will take a closer look at some of the cloud computing heavyweights, like Google, Microsoft, Yahoo!, Salesforce.com, IBM, and others. We'll take some time to talk about what they offer, and how they might benefit your own cloud efforts.

### Google

The cloud is certainly one of Google's biggest business ventures, and they offer a couple of tools to help draw customers to their cloud. In this section, we'll talk about what Google offers.

#### Google App Engine

Google App Engine enables developers to build their web apps on the same infrastructure that powers Google's own applications.





## Features

Google App Engine, developers can accomplish the following tasks:

- **Write code once and deploy** : Configuring multiple machines for web serving and data storage can be expensive and time-consuming. Google App Engine makes it easier to deploy web applications by dynamically providing computing resources as they are needed. Developers write the code, and Google App Engine takes care of the rest.
- **Absorb and run in traffic** : When a web app surges in popularity, the sudden increase in traffic can be overwhelming for applications of all sizes, from startups to large companies. With automatic replication and load balancing, Google App Engine makes it easier to scale from one user to one million of Google's scalable infrastructure.
- **Easily integrate with other Google services** : It's unnecessary and inefficient for developers to write components like authentication and email from scratch for each new application. Developers using Google App Engine can make use of built-in components and Google's broader library of APIs that provide plug-and-play functionality for simple but important features.

## Cost

- Google enticed developers by offering the App Engine for free,
- Free quota to get started: 500MB storage and enough CPU and bandwidth for about 5 million pageviews per month
- In response to developer feedback, Google App Engine will provide new APIs. The image-manipulation API enables developers to scale, rotate, and crop images on the server.
- More information about Google App Engine is available at <http://code.google.com/appengine/>.

## Google Web Toolkit

- With Google Web Toolkit, developers can develop and debug web applications in the familiar Java programming language, and then deploy them as highly optimized JavaScript.
- In doing so, developers sidestep browser compatibility and enjoy significant performance and productivity gains.
- Google Health is one recently launched application to use Google Web Toolkit.
- Google Web Toolkit includes Java 5 language support so that developers can enjoy using the full capabilities of the Java 5 syntax.
- The compiler in Google Web Toolkit 1.5 produces faster code than ever, delivering performance gains big enough for end users to notice .
- Google Web Toolkit also continues to provide a rich and growing set of libraries that help developers build world-class tested, reusable libraries for implementing user interfaces, data structures, client/server communication, internationalization, testing, and accessibility.
- More information about Google Web Toolkit is available at <http://code.google.com/webtoolkit/>.

## **EMC-Now Dell EMC(Egan, Marino Corporation)**

- EMC Corporation is the world leader in products, services, and solutions for information storage and management that help organizations extract value from their information.
- It introduced its Symmetric V-Max system in April 2009, claiming that it is the first management system to support high-end virtual datacenters.
- The system allows customers with vast storage needs to easily manage and expand storage systems without interfering with day-to-day operations.
- This system allows multiple datacenters to be run as if they were one, making their management much easier and more efficient.

### **Technologies**

But EMC's reach goes far beyond virtualized datacenter management. Their other fields of expertise include

- **Archiving** : Creating accessible online archives that offer a reduced operational cost by shrinking backup windows and making restores faster.
- **Backup and recovery** : Different tools combine EMC's recovery management offerings, backup technologies, and management strategies to ensure that you have a solid backup and recovery practice.
- **Enterprise content management** : Content-enabled solutions help mitigate risk without imposing overly complex technologies on your organization.
- **Intelligent information management** : Using various technologies allows organizations to discover, store, and act on information in intelligent ways.
- **IT management** : IT management is simplified and its cost reduced through automation, virtualization, and process efficiencies.
- **Duplication** :Data protection and remote replication technologies provide disaster recovery options.
- **Security** : Organizations can deploy products with capabilities for access control, data protection, and auditing.
- **Storage**: Processes and technologies that help manage data and efficiently maintain it.
- **Virtualization** : Products including VMware backup and other EMC virtualization tools improve the management and flexibility for virtual infrastructures.

### **VMware Acquisition**

- EMC expanded their virtualization offerings in early 2009 when they acquired VMware, Inc., a rapidly growing, privately held software company specializing in industry-standard virtual computing software.
- EMC acquired VMware in a cash transaction with a final value of approximately US\$625 million.

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- EMC will operate VMware as a separate software subsidiary of EMC. The VMware name, brand, and products will all be maintained, and VMware employees will remain focused on developing, selling, and servicing VMware's products and solutions

## NetApp

- NetApp is an organization that creates storage and data management solutions for their customers.
- Their goal is to deliver cost efficiency and accelerate business breakthroughs.
- In 1992 they introduced the world's first networked storage device.
- The company continues to introduce new technologies that reduce the costs of IT.
- NetApp claims they can cut your IT costs in half, use up to 80 percent less storage, hold off on datacenter expansion, and speed up your time to market.

### Offerings

1. NetApp was one of the first companies in the cloud, offering datacenter consolidation and storage services, as well as virtualization.
2. Their products include a platform OS, storage services, storage security, software management, and protection software.
3. In addition to these services, they also partner with other industry leaders to develop new offerings for NetApp's clients.

### Cisco Partnership

1. NetApp and Cisco are teaming up to provide customers with unified, dynamic datacenter solutions that are based on Cisco's Unified Computing System and NetApp Unified Storage Architecture.
2. Cisco and NetApp are working together to certify the combined solution, and the companies will also collaborate on customer support and marketing activities.
3. The Cisco Unified Computing System -This allows customers to reduce the complexities often associated with datacenter virtualization, lower costs, and improve asset utilization.
4. NetApp will provide flexible and powerful storage solutions for the Cisco Unified Computing System that will be tested for interoperability in virtualized datacenter environments.

## Microsoft

- Microsoft offers a number of cloud services for organizations of any size—from enterprises or individuals.

### Azure Services Platform

- The Azure Services Platform is a cloud computing and services platform hosted in Microsoft datacenters.
- The Azure Services Platform supplies a broad range of functionality to build applications to serve individuals or large enterprises, and everyone in between.

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- The platform offers a cloud operating system and developer tools.
- Azure services can be used individually or in conjunction with one another to build new applications or to enhance existing ones.

Let's take a closer look at the Azure Services Platform components.

## Windows Azure

- Windows Azure is a cloud-based operating system that enables the development, hosting, and service management environment for the Azure Services Platform.
- Windows Azure gives developers an on-demand compute and storage environment that they can use to host, scale, and manage web applications through Microsoft datacenters.
- To build applications and services, developers can use the Visual Studio skills they already have. Further, Azure supports different technology like XML.

### Windows Azure can be used to

- Add web service capabilities to existing applications
- Build and modify applications and then move them onto the Web
- Make, test, debug, and distribute web services efficiently and inexpensively
- Reduce the costs of IT management

## SQL Services

- Microsoft SQL Services extends SQL Server capabilities to the cloud as web-based services.
- This allows the storage of structured. SQL Services
- Delivers a set of integrated services that allow relational queries, search, reporting, analytics, integration, and synchronization of data.
- This can be done by mobile users, remote offices, or business partners.

## .NET Services

- Microsoft .NET Services are a set of Microsoft-hosted, developer-oriented services that provide the components required by many cloud-based and cloud-aware applications.
- .NET Services are similar to the .NET Framework, providing high-level class libraries that make development much more robust.
- .NET Services can help developers focus more on their end product than on building and deploying their own cloud-based infrastructure.
- .NET Services are also available to other development technologies through the use of industry-standard protocols, like REST, SOAP, and HTTP.(web services)

## Live Services

- Live Services is a development center and supplier of software development kits for Windows Live and Azure Services platforms.
- It gives information about getting started with Windows Live services, current documentation and APIs, and samples.

### **Windows Live**

- Windows Live is an integrated set of online services that makes it easier and more fun for consumers to communicate and share with others.
- The new generation of Windows Live includes updated experiences for photo sharing, email, and instant messaging, as well as integration with multiple third-party sites.
- The release also includes Windows Live Essentials, free downloadable software that enhances consumers' Windows experience by helping them simplify and enjoy digital content scattered across their PC, phone, and on web sites.
- For more information about Windows Live, go to <http://www.windowslive.com>.

Consumers can create online content and share it in many places across the Web.

*To help make it simple for Windows Live customers to keep their friends up to date, Microsoft collaborated with companies including Flickr, LinkedIn Corp., Pandora Media Inc., Photobucket Inc., Twitter, WordPress, and Yelp Inc.*

### **Communicating and Collaborating**

Windows Live makes it easier for consumers to manage their digital life and keep their life in sync. These are some of the highlights:

- **Windows Live** provides social features available to all customers, including an updated profile, a “what’s new” feed of activities across the network, and web, photo sharing, and on-the-go access from virtually any device with Windows Live SkyDrive. Online storage is increasing from 5GB to 25GB.
- **Windows Live Messenger** includes more personalization, a “what’s new” feed with updates from contacts across the Web, drag-and-drop photo sharing in the conversation window,
- **Windows Live Hotmail** was recently upgraded and is now faster and has 80 percent more effective spam filtering compared with previous versions of Hotmail. Upcoming changes include the ability to bring multiple email accounts together, the ability to put multiple email addresses onto almost any device, increased storage, and a revamped calendar that makes it easier to share calendars with others, subscribe to multiple calendars, and use your calendar with Microsoft Outlook.
- **Windows Live Groups**, a place for groups to collaborate online, includes a shared calendar, shared storage, a shared email address, and shared instant messaging.

All these services work with Windows Live Essentials, a free suite of applications for communication and sharing that also works with leading email, photo, and blogging services worldwide.

### **Exchange Online**

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- Microsoft Exchange Online is a Microsoft-hosted enterprise messaging service based on Microsoft Exchange Server 2007.
- Because it is a cloud service, you and your employees can access messages from anywhere.
- Exchange Online servers are geographically spread.
- The service is aimed management duties by removing your need to deploy, configure, monitor, and upgrade on-site email solutions.

These are the key features of the online standard version of the solution:

- A 5GB mailbox ,shared calendar, contacts, tasks
- Outlook Client Connectivity including Outlook Anywhere• Outlook Web Access
- Virus/spam filtering via Exchange Hosted Filtering
- Push email for Microsoft Windows Mobile 6.0/6.1 and Exchange ActiveSync 12 devices
- Email synchronization for Nokia E series and N series and iPhone 2.0
- Built-in business continuity and disaster recovery capabilities

## SharePoint Services

1. SharePoint Services provides communities for team collaboration and makes it easy for users to work together on documents, tasks, contacts, events, and other information.
2. SharePoint sites are made up of Web Parts and Windows ASP.NET-based components.
3. Web Parts are designed to be add-ons to web pages and configured by site administrators and users to create complete page-based applications.
4. SharePoint sites are places where teams can participate in discussions, shared document collaboration, and surveys.
5. Microsoft Office System programs use SharePoint site content.
6. Team collaborative content—like documents, lists, events, and so forth—can be read and edited with Microsoft Office Word. Picture editing is also possible.
7. SharePoint also allows managers to customize the content and layout of sites so that site members can access and work with relevant information.

## Microsoft Dynamics CRM

- Microsoft Dynamics CRM Online is an on-demand customer relationship management service hosted and managed by Microsoft.
- The Internet service delivers a full suite of marketing, sales, and service capabilities through a web browser or directly into Microsoft Office and Outlook.
- It provides “instant-on” access to businesses that want a full-featured CRM solution with no IT infrastructure investment or setup required. visit <http://crm.dynamics.com>.

## Amazon

- Amazon may be the most widely known cloud vendor.
- They offer services on many different fronts, from storage to platform to databases.

## Amazon Elastic Compute Cloud (Amazon EC2)

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- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that offers resizable compute capacity in the cloud and is designed to make web scaling easier for developers.
- Amazon EC2 provides a simple web interface that allows you to obtain and configure capacity with little difficulty.
- It allows you control of your computing resources.
- Amazon EC2 cuts the time it takes to obtain and boot new server instances to a few minutes, allowing you to change scale as your needs change.
- Amazon EC2 can run Microsoft Windows Server 2003 and is a way to deploy applications using the Microsoft Web Platform, including ASP.NET, and Internet Information Server (IIS).
- Amazon EC2 allows you to run Windows-based applications on Amazon's cloud computing platform.
- This might be web sites, web-service hosting, high-performance computing, data processing, ASP.NET application hosting, or any other application requiring Windows software.
- EC2 also supports SQL Server Express and SQL Server Standard and makes those offerings available to customers on an hourly basis.

## **Amazon SimpleDB**

- For database services, Amazon offers its Amazon SimpleDB.
- It provides core database functions of data indexing and querying.
- This service works closely with Amazon Simple Storage Service (Amazon S3) and Amazon EC2.
- This provides the ability to store, process, and query data sets in the cloud.
- Amazon SimpleDB is—as the name says—simpler.
- It requires no schema, automatically indexes data, and provides a simple API for storage and access.
- This makes the process easier to manage and eliminates the administrative burden of data modeling, index maintenance, and performance tuning.

## **Amazon Simple Storage Service (Amazon S3)**

1. Amazon Simple Storage Service (Amazon S3) is Amazon's storage solution for the Internet.
2. It is designed to make web-scale computing easier for developers.
3. Amazon S3 utilizes a simple web services interface that can be used to store and retrieve any amount of data from anywhere on the Web.
4. It gives developers access to the same data storage infrastructure that Amazon uses to run its own retail empire.

## **Amazon CloudFront**

- Amazon CloudFront is a web service for content delivery.
- It works in conjunction with other Amazon Web Services to give developers and businesses an easy way to distribute content to clients.

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- Amazon promises low latency, high data transfer speeds.
- The service delivers content using a global network of edge locations.

## **Amazon Simple Queue Service (Amazon SQS)**

- Amazon Simple Queue Service (Amazon SQS) offers a scalable, hosted queue for storing messages as they travel between computers.
- Developers can move data between distributed components of their applications that perform different tasks.
- Amazon SQS allows an automated workflow to be created and works closely with Amazon EC2 and other Amazon Web Services.

## **Elastic Block Store**

- Amazon also launched its Amazon Elastic Block Store (Amazon EBS) Amazon EC2 is an infrastructure service that provides resizable compute capacity in the cloud.
- With Amazon EBS, storage volumes can be programmatically created,
- Amazon EBS is well suited for databases, as well as many other applications that require running a file system.

## **Salesforce.com**

Salesforce.com made its name with the success of its flagship Salesforce.com automation application. Today, the company has three primary areas of focus:

- **The Sales Cloud** : The popular cloud computing sales application
- **The Service Cloud** : The platform for customer service that lets companies tap into the power of customer conversations no matter where they take place
- **Your Cloud** : Powerful capabilities to develop custom applications on its cloud computing platform, Force.com

The company has made its platform available to other companies as a place to build and deploy their software services. Force.com offers

- A relational database
- User interface options
- Business logic
- Apex, an integrated development environment(test app)
- Workflow and approvals engine
- Programmable interface
- Automatic mobile device deployment
- Web services integration
- Reporting and analytics



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## Force.com

- Force.com is Salesforce.com's on-demand cloud computing platform—billed by Salesforce.com as the world's first PaaS.
- The Force.com platform offers global infrastructure and services for database, logic, workflow, integration, user interface, and application exchange.
- Force.com delivers PaaS, a way to create and deploy business apps that allows companies and developers to focus on what their applications do, rather than the software and infrastructure to run them.

## Visualforce

- As part of the Force.com platform, Visualforce provides the ability to design application user interfaces for practically any experience on any screen.
- Visualforce features and capabilities include
  - **Pages** :Enables the design definition of an application's user interface.
  - **Components** : Provides the ability to create new applications that automatically match the look and feel of Salesforce.com applications or easily customize and extend the Salesforce.com user interface to specific requirements.

## Salesforce.com CRM

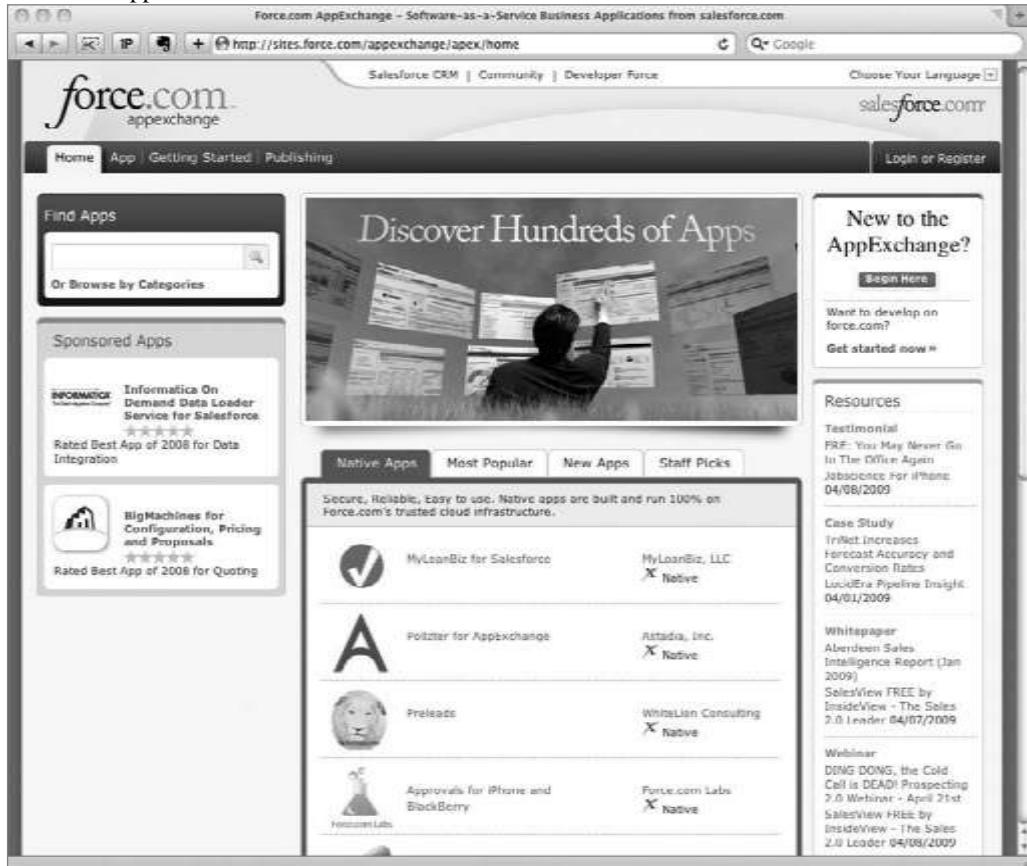
- Salesforce.com is a leader in cloud computing customer relationship management (CRM) applications.
- Its CRM offering consists of the Sales Cloud and the Service Cloud and can be broken down into five core applications:
  - **Sales** : Easily the most popular cloud computing sales application, easy to customize..
  - **Marketing** : With Salesforce.com CRM Marketing, marketers can put the latest web technologies with their sales The application empowers customers to manage multichannel campaigns and provide up-to-date messaging to sales
  - **Service**: The Service Cloud is the new platform for customer service. As it is on Web, the Service Cloud allows companies to instantly connect to collaborate in real time, share sales information, and follow joint processes. Just like LinkedIn can share tasks and contacts.
  - **Collaboration** : Salesforce.com CRM can help an organization work more efficiently with customers, partners, and employees by allowing them to collaborate among themselves in the cloud. Some of the capabilities include
    - Create and share content in real time using Google Apps and Salesforce.com
    - Track and deliver presentations using Content Library
    - Give your community a voice using Ideas and Facebook

**Analytics** : Force.com offers real-time reporting, calculations, and dashboards so a business is better able to optimize performance, decision making, and resource allocation.

## AppExchange

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1. Launched in 2005, AppExchange is a directory of applications built for Salesforce.com by third-party developers.
2. Users can purchase and add to their Salesforce.com environment. When it launched, AppExchange offered 70 applications.



This allows for the development of applications serving a broad range of business requirements:

- Finance
- Electronic signatures
- Document management
- Project management
- Credit and collections
- Mobile workforce management
- Data cleansing
- Professional services management

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- Human resources

## IBM

1. IBM offers cloud computing services to help businesses of all sizes take advantage of this increasingly attractive computing model.
2. IBM is applying its industry-specific consulting expertise and established technology record to offer secure services to companies in public, private, and hybrid cloud models.

*Some of their features include*

- **Industry-specific business consulting services for cloud computing** : built economic model for building private clouds, and/or moving data and applications off-site in a public or hybrid cloud model.
- **Technology consulting, design, and implementation services** : IBM Global Technology Services offers services to help clients install, configure, and deliver cloud computing inside the datacenter.

## Services

1. IBM's consulting services use economic modeling for building and integrating clouds.
2. IBM can help companies find the most effective balance, and manage it all as one integrated strategy.
3. In addition, cloud technology consulting services are intended to help clients create roadmaps for reconstructing their IT environments.
4. IBM will apply expert-level skills, methods, guidance, and project management techniques to help clients plan, configure, and test the servers, storage, and technologies necessary to support a dynamic technology environment.

## Movement to the Cloud

1. In addition to consulting services, IBM is helping new clients move into the cloud.
2. Example - human services agencies, economic development services, citizenship, and immigration services, childhood development programs, a K-5 school, and seniors' programs.

## Security

1. IBM initiated a company wide project to form a unified and full security planning for cloud computing environments.
2. simplified security management and enforcement, offering enterprise customers the same security guarantees that are equivalent to or better than what they can expect in traditional computing environments.

## Partnerships

### Yahoo! Research

1. Yahoo! takes a different approach to the cloud—while it doesn't offer the same sorts of services as Google and Microsoft,

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2. Yahoo! has focused its cloud energies on providing a science that helps improve business processes.
3. Its scientists examine data-driven analysis, high-quality search, algorithms, and economic models.
4. Yahoo! manages large data repositories and researchers mine information from this collection.
5. Yahoo! collaborate with academic and research institutions and provides an academic setting.

### **Collaboration**

1. Yahoo! and Computational Research Laboratories (CRL) set out in a partnership to research cloud computing.
2. As part of their agreement, CRL will make available to researchers one of the world's top five supercomputers,
3. which has substantially more processors than any supercomputer currently available for cloud computing research.

### **SAP and IBM**

1. SAP is using the cloud to migrate SAP applications live across remote IBM POWER6 systems.
2. It designed to provide companies with a range of cloud computing solutions to meet their specific business needs.

### **HP, Intel, and Yahoo!**

1. HP, Intel Corporation, and Yahoo! have created a global, multidatacenter, open-source test bed for the advancement of cloud computing research and education.
2. The goal of the initiative is to promote open collaboration among industry, academia, and governments by removing the financial and logistical barriers to research in data-intensive, Internet-scale computing.

### **Test Bed**

1. The HP, Intel, and Yahoo! Cloud Computing Test Bed provides a globally distributed, Internet-scale testing environment
2. designed to encourage research on the software, datacenter management, and hardware issues associated with cloud computing at a larger scale than ever before.
3. The initiative will also support research into cloud applications and services.

### **IBM and Amazon**

1. IBM also entered into an agreement with Amazon Web Services to deliver IBM's software to clients and developers.
2. The pay-as-you-go model provides clients with access to development and production instances of IBM DB2, Informix Dynamic Server, WebSphere Portal, Lotus Web Content Management, WebSphere sMash, SUSE Linux operating system software in the Amazon EC2 environment.

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3. IBM and Amazon Web Services are helping to address these challenges by making it easier for software developers to build solutions based on open standards and backed up by the necessary technical resources to help simplify the proces

## Cloud Computing Services

In this section we'll talk about the different ways your organization can utilize different services.

### Infrastructure as a Service

1. In this scenario, you are using the cloud provider's machines.
2. Another term for this type of computing is Everything as a Service. That is, you are using a virtualized server and running software on it.
3. One of the most powerful is *Amazon Elastic Compute Cloud (EC2)*.
4. Another player in the field is *GoGrid*.

#### Amazon EC2:

- Amazon Elastic Compute Cloud (<http://aws.amazon.com/ec2>) is a web service that provides resizable computing capacity in the cloud.
- Amazon EC2's simple web service provides control of computing resources and lets organizations run on Amazon's computing environment.
- Amazon EC2 reduces the time required to obtain and boot new server instances.
- It allowing quick scaling capacity, both up and down, as computing requirements change.
- Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use.
- Windows and SQL Server Support for Amazon EC2 Customers
- Such that Amazon EC2 provides an environment for deploying ASP.NET web sites, and other Windows based applications.
- Amazon EC2 Service Level Agreement offers customers a Service Level Agreement (SLA). The Amazon EC2 SLA guarantees 99.95 percent availability of the service.
- Thousands of customers employ the compute power of Amazon EC2 to build scalable and reliable solutions.
- **Load balancing** : Enables customers to balance incoming requests and distribute traffic across multiple Amazon EC2 compute instances.
- **Auto-scaling** Automatically grows and shrinks usage of Amazon EC2 compute capacity based on application requirements.
- **Monitoring** Enables customers to monitor operational metrics of Amazon EC2, providing even better visibility into usage of the AWS cloud.
- **Management Console** Provides a simple, point-and-click web interface that lets customers manage and access cloud resources

#### GoGrid

- GoGrid is a service provider of Windows and Linux cloud-based server hosting, and offers 32-bit and 64-bit editions of Windows Server 2008 within its cloud computing infrastructure.

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- Parent company ServePath is a Microsoft Gold Certified Partner, and launched Windows Server 2008 dedicated hosting in February of this year.
- GoGrid becomes one of the first Infrastructure as a Service (IaaS) providers to offer Windows Server 2008 “in the cloud.”
- The Windows Server 2008 operating system from Microsoft offers increased server stability, manageability, and security over previous versions of Windows Server.
- GoGrid enables system administrators to quickly and easily create, deploy, load-balance, and manage Windows and Linux cloud servers within minutes.
- GoGrid offers what it calls Control in the Cloud™ with its web-based Graphical User Interface (GUI) that allows for “point and click” deployment of complex and flexible network infrastructures, which include load balancing and multiple web and database servers, all set up with icons through the GUI.

## Platform as a Service

- Platform as a Service (PaaS) is a way to build applications and have them hosted by the cloud provider.
- It allows you to deploy applications without having to spend the money to buy the servers on which to house them.
- In this section we’ll take a closer look at companies **RightScale and Google**.

## RightScale

1. RightScale partnership, increase its cloud management platform to support emerging clouds from new vendors, including FlexiScale and GoGrid.
2. while continuing its support for Amazon’s EC2.
3. RightScale is also working with to ensure compatibility with their cloud offerings.
4. RightScale offers an integrated management dashboard, where applications can be deployed once and managed across these and other clouds.
5. Businesses can take advantage of the nearly infinite scalability of cloud computing by using RightScale to deploy their applications on a supported cloud provider.
6. RightScale cloud management platform to automatically deploy and manage their web applications—scaling up when traffic demands, and scaling back as appropriate—allowing them to focus on their core business objectives.

## Salesforce.com

- Salesforce.com offers Force.com as its on-demand platform.
- Force.com features breakthrough Visualforce technology, which allows customers, developers, and ISVs (Independent Software Vendor) to design any app, for any user, anywhere with the world’s first User Interface-as-a-Service.
- The Force.com platform offers global infrastructure and services for database, logic, workflow, integration, user interface, and application exchange.
- The Force.com platform gives customers the power to run multiple applications within the same Salesforce instance.

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- Allowing all of a company's Salesforce applications to share a common security model, data model.
- Visualforce provides a page-based model, built on standard HTML and web presentation technologies, Visualforce includes the following features and capabilities:
- **Pages** : application's user interface. This enables developers to create new pages using standard web technologies including HTML,. Pages allows developers to create any user experience with standard web technologies that will be immediately familiar to any web developer. Visualforce automatically detects a user's device, and gives them the ability to automatically deliver the right experience to the right device.
- **Components** : This provides the ability to create new applications that automatically match the look and feel of Salesforce applications or customize and extend the Salesforce user interface to specific customer and user requirements
- **Logic controllers** :The controller enables customers to build any user interface behavior. Customers are able to use Visualforce to quickly create a new look and feel that of existing application functionality.

### Software as a Service

We talked Software as a Service (SaaS) in previous chapter, but let's talk about it in more depth, with a further examination of Salesforce and Google.

- SaaS is simply the cloud vendor providing the given piece of software you want to use, on their servers.
- That is, unlike PaaS in which you developed your own application, SaaS provides the application for you.
- whether the provider supplies the application (SaaS) or simply provides a mechanism to develop your own applications (PaaS).
- Google or Salesforce that offer both types of services. For instance, not only can you build an application with Salesforce, but you can also allow others to use the application you developed.

*Let's delve a little more deeply into Salesforce and Google.*

### Google App Engine and Salesforce

- Google has partnered with Salesforce to make it easy for companies of all sizes to run their business in the cloud with Salesforce for Google Apps.
- The combination of the Google Apps suite of productivity applications and the Salesforce suite of Customer Relationship Management (CRM) applications enables businesses to effectively communicate and collaborate without any hardware or software to download, install, or maintain.
- Salesforce for Google Apps is a combination of essential applications for business productivity (email, calendaring, documents, spreadsheets, presentations, instant messaging) and CRM (sales, marketing, service and support, partners) that enables an



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entirely new way for business professionals to communicate, collaborate, and work together in real time over the Web.

- **Salesforce and Gmail** Businesses can now easily send, receive, and store email communication, keeping a complete record of customer interactions for better sales execution and improved customer satisfaction.
- **Salesforce and Google Docs** Create, manage, and share online Google Documents, Google Spreadsheets, and Google Presentations within your sales organization, marketing group, or support team for instant collaboration.
- **Salesforce and Google Talk** Instantly communicate with colleagues or customers from Salesforce and optionally attach Google Talk conversations to customer or records stored in Salesforce.
- **Salesforce and Google Calendar** Expose sales tasks and marketing campaigns from Salesforce on Google Calendar.

## Software plus Services

- Microsoft's take on SaaS is slightly different with their Software plus Services (sometimes they shorten it to S+S). In this model, typical SaaS is boosted with software running locally.
- That is, you run some software on-site and reach out to the cloud for additional services.
- This provides the flexibility of using a cloud provider, and also the reliability of having data stored on-site, as well.
- Example Microsoft's Business Productivity Online Suite, part of Microsoft Online Services, is available for trial to businesses of all sizes in 19 countries

## How Those Applications Help Your Business

why a move to the cloud helps your organization.

## Operational Benefits

The following are some of the operational benefits:

- **Reduced cost** : Since technology is paid incrementally, your organization saves money in the long run.
- **Increased storage** : You can store more data on the cloud than on a private network. Plus, if you need more it's easy enough to get that extra storage.
- **Automation** Your IT staff no longer needs to worry that an application is up to date—that's the provider's job.
- **Flexibility** You have more flexibility with a cloud solution. Applications can be tested and deployed..
- **Better mobility** : Users can access the cloud from anywhere with an Internet connection.
- **Better use of IT staff** : IT staff no longer has to worry about server updates and other computing issues. They can focus on duties that matter, rather than being maintenance staff.

## Economic Benefits

These are some benefits to consider:

- **People** : by moving to the cloud, you will rely on fewer staffers. By having fewer staff members, you can look at your team and decide if such-and-such a person is necessary.
  - **Hardware**: if you need more storage, it's just a matter of upping your subscription costs with your provider, instead of buying new equipment.
  - **Pay as you go** : you just pay for what you use.
  - **Time to market** : One of the greatest benefits of the cloud is the ability to get apps up and running in a little of the time .
  - You had to find a host, configure the machine, ship the machine, and manage the machine. With a cloud, you can spin up a new instance in seconds.
- END-