CS528
Introduction to Cloud

A Sahu

Dept of CSE, IIT Guwahati

Outline

- What is Cloud Computing?
- (HPC, Data Center, Grid) Vs Cloud
- Virtualization
- Advantage of Cloud System : User Prospects
- Dis-advantage of Cloud System : User Prospects

Pricing Model

- Soap HUL Pears Example 75g Rs 22/-, 150g Rs 100/-
  - Depends on Customer
  - **Shampoo pouch are cheaper (Rs per ml)**
- CCD Coffee: Core 2, IITG Lib, GS Road, Airport cost 15, 40, 110, and 180
  - **Cost Depends on Location**
- PC : Desktop, Workstation and Server
  - Customers set are different, **so cost is not proportional**: Rs 30K, 80K, 150k
- Processor: i3, i5, i7, i9 8th Generation
 - Price per Core: $32, $45 and $60

HPC/Grid Vs Cloud

- Grid/HPC : Self owned
  - Too costly : CAPEX (Capital Expenditure)
  - IITG HPC Example: 10.6 Crores, 3800 J cores
  - OPEX : Operational cost, AC, electricity, AMC
- Cloud : User and Owner are Separated
  - Lets of VC own the HPC but users uses as RENT
  - User get cheaply at need time
  - Owner get a lots of demand for USE
  - Win-Win for Both,   Example Public BUS
- OLA, UBER, Any Taxi Service
  - Get a CAR and used for Taxi

Utility Model

- Do we require to own a car to ride?
- Rent a CAR for 1 month (schedule your self how you will use)
- Rent a CAR for 1 Day (schedule your self how you will use)
- Use Pickup or Drop service, personalized
  - Src-Dst defined
- Use shared services: Piggy back with others

Utility Computing
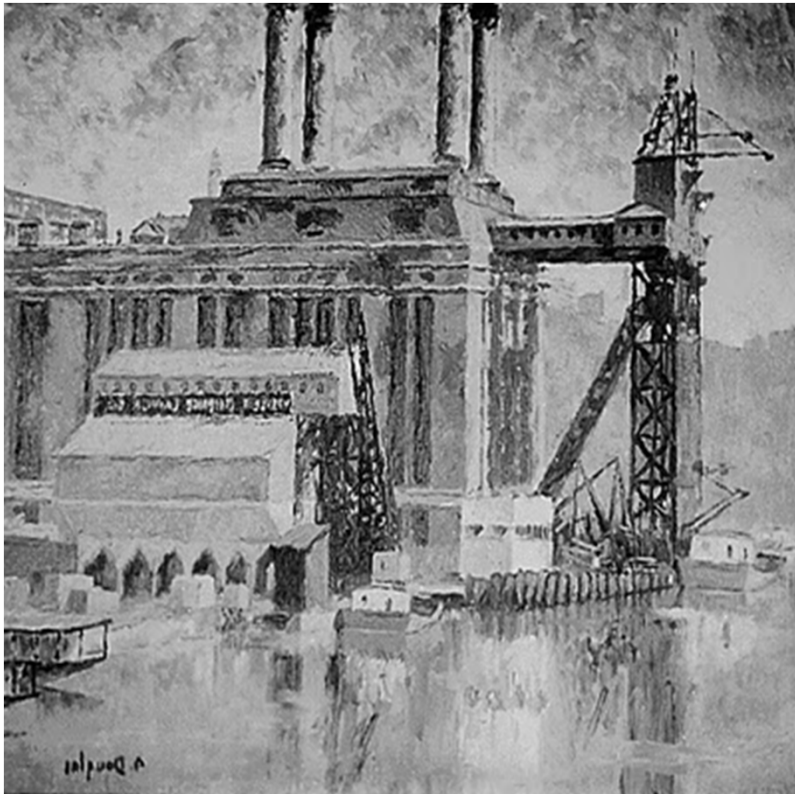
- Long been a vision
- Grid computing failed to really catch on
- Technology advances as well as a viable business model have helped Cloud Computing catch on
- Cloud Computing allows for fuller utilization of hardware
- Energy consumption is turning into a major issue

Cloud Computing Economic Benefits

- Most identifiable economic benefit of cloud computing is
  - direct cost savings, which occur from changes within the organization and the data centers that house the IT infrastructure.
  - Supply Side – Large scale data centers lower cost due to superior buying power

Cloud Computing Economic Benefits

- Other economic benefit of cloud
  - Demand Side – Allowing multiple users across varying industries regions & time zones allowing for server utilization
  - Multi-user efficiency – Increasing # of users lowers server cost per tenant
  - Data center efficiency – Advanced data center designs reduce power loss and improved cooling

What is Cloud Computing?

- Cloud Computing is a general term
- **Used to describe a new class of network based computing that takes place over the Internet**,
  - Basically a step on from Utility Computing
  - A collection/group of integrated and networked hardware, software and Internet infrastructure (called a platform).
  - Using the Internet for communication and transport provides hardware, software and networking services to clients

What is Cloud Computing?

- These platforms
  - hide the complexity and details of the underlying infrastructure from users and applications
  - by providing very simple graphical interface or API (Applications Programming Interface).

What is Cloud Computing?

- In addition, the platform provides on demand services, that are always on, anywhere, anytime and any place.

- Pay for use and as needed, elastic
  - Scale Up and Down in capacity and functionalities

- The H/W and S/W services are available to
  - general public, enterprises, corporations and businesses markets

Cloud Summary

- Cloud computing : an umbrella term used to refer to Internet based development and services

- A number of characteristics define cloud data, applications services and infrastructure:
  - **Remotely hosted**: Services or data are hosted on remote infrastructure.
  - **Ubiquitous**: Services or data are available from anywhere.
  - **Commodified**: The result is a utility computing model similar to traditional that of traditional utilities, like gas and electricity - you pay for what you would want!

Pro and Cons
of
Cloud Computing

Opportunities of Use of Cloud

- It enables services to be used without any understanding of their infrastructure.

- Cloud computing works using economies of scale:
  - It potentially lowers the outlay expense for start up companies, as they would no longer need to buy their own software or servers.
  - Cost would be by on-demand pricing.
  - Vendors and Service providers claim costs by establishing an ongoing revenue stream.

- Data and services are stored remotely but accessible from "anywhere".

Advantages of Cloud Computing : 1

- **Improved performance**
- With few large programs hogging your computer's memory, you will see better performance from your PC.
- Computers in a cloud computing system boot and run faster
  - Because they have fewer programs and processes loaded into memory…

Advantages of Cloud Computing :2

- **Reduced software costs**
- Instead of purchasing expensive software applications, you can get most of what you need for **free-ish!**

  – Most cloud computing applications today, such as the Google Docs suite.

- Better than paying for similar commercial software

  – which alone may be justification for switching to cloud applications.

Advantages of Cloud Computing :3

- **Universal document access**

- That is not a problem with cloud computing, because you do not take your documents with you.

- Instead, they stay in the cloud, and you can access them whenever you have a computer and an Internet connection

- Documents are instantly available from wherever you are

Advantages of Cloud Computing :4

- **Latest version availability**
- When you edit a document at home, that edited version is what you see when you access the document at work.
- The cloud always hosts the latest version of your documents
  - as long as you are connected, you are not in danger of having an outdated version

Advantages of Cloud Computing: 5

- **Unlimited storage capacity**

- Cloud computing offers virtually limitless storage.

- Your computer's current 1 Tbyte hard drive is small compared to the hundreds of Pbytes available in the cloud.

Advantages of Cloud Computing: 6

- **Increased data reliability**
- Unlike desktop computing, in which
  - if a hard disk crashes and destroy all your valuable data,
  - A computer crashing in the cloud should not affect the storage of your data.
  - if your personal computer crashes, all your data is still out there in the cloud, still accessible
- In a world where
  - Few individual desktop PC users back up their data on a regular basis,
  - Cloud computing is a data-safe computing platform!

Advantages of Cloud Computing: 7

- **Lower computer costs**
- To run cloud computing's web-based applications
  - You do not need a high-powered and high-priced computer
- Since applications run in the cloud, not on the PC
  - Your PC does not need high processing power or hard disk space demanded by traditional desktop software.
- When you are using web-based applications
  - Your PC can be less expensive, with a smaller hard disk, less memory, more energy efficient processor
  - PC does not even need a CD/DVD drive,
  - No software programs have to be loaded
  - No document files need to be saved.

Advantages of Cloud Computing : 8

- **Instant software updates**

- You are no longer faced with choosing between obsolete software and high upgrade costs.

- When the application is web-based
  - Updates happen automatically
  - Available the next time you log into the cloud.

- When you access a web-based application
  - You get the latest version
  - Without needing to pay for or download an upgrade.

Advantages of Cloud Computing : 9

- **Improved document format compatibility.**

- You do not have to worry
  - About the documents you create on your machine being compatible with other users' applications or OSes

- There are potentially no format incompatibilities
  - When everyone is sharing documents and applications in the cloud.

Advantages of Cloud Computing :10

- **Easier group collaboration**
- Sharing documents leads directly to better collaboration.
- Many users do this as it is an important advantages of cloud computing
  - multiple users can collaborate easily on documents and projects

Advantages of Cloud Computing : 11

- **Device independence**

- You are no longer tethered to a single computer or network.

- Changes to computers, applications and documents follow you through the cloud.

- Move to a portable device, and your applications and documents are still available.

Challenges in Using the Cloud

- In parallel there has been backlash against cloud computing
- Use of cloud computing means
  - Dependence on others and that could possibly limit flexibility and innovation
- The others are likely become the
  - Bigger Internet companies like Google and IBM, who may monopolise the market.
- Some argue that this use of supercomputers is
  - A return to the time of mainframe computing that the PC was a reaction against.

Disadvantages of Cloud Computing : 1

- **Security could prove to be a big issue**
- It is still unclear how safe out-sourced data is
- when using these services ownership of data is not always clear.

Disadvantages of Cloud Computing : 2

- **Issues relating to policy and access**
- If your data is stored abroad whose policy do you adhere to?
- What happens if the remote server goes down?
- How will you then access files?
- There have been cases of users being locked out of accounts and losing access to data.

Disadvantages of Cloud Computing : 3

- **Requires a constant Internet connection**
- Cloud computing is impossible if you cannot connect to the Internet.
- Since you use the Internet to connect to both your applications and documents
  - if you do not have an Internet connection you cannot access anything
  - Even your own documents.
- A dead Internet connection means no work
  - In areas where Internet connections are few or inherently unreliable
  - this could be a deal-breaker.

Disadvantages of Cloud Computing : 4

- **Does not work well with low-speed connections**

- Similarly, a low-speed Internet connection, such as that found with dial-up services, makes cloud computing painful at best and often impossible.

- Web-based applications require a lot of bandwidth to download, as do large documents.

Disadvantages of Cloud Computing : 5

- **Features might be limited**

- This situation is bound to change, but today many web-based applications simply are not as full-featured as their desktop-based applications.

- For example, you can do a lot more with Microsoft PowerPoint than with Google Presentation's web-based offering

Disadvantages of Cloud Computing : 6

- **Can be slow Even with a fast connection**
  - Web-based applications can sometimes be slower than Accessing a similar software program on your desktop PC.
- Everything about the program, from the interface to the current document
  - Has to be sent back and forth from your computer to the computers in the cloud.
- If the cloud servers happen to be backed up at that moment, or
- if the Internet is having a slow day, you would not get the instantaneous access

Disadvantages of Cloud Computing : 7

- **Stored data might not be secure**
- With cloud computing, all your data is stored on the cloud.
  - The questions is How secure is the cloud?
- Can un-authorised users gain access to your confidential data?

Disadvantages of Cloud Computing : 8

- **Stored data can be lost**

- Theoretically, data stored in the cloud is safe, replicated across multiple machines.

- But on the off chance that your data goes missing, you have no physical or local backup.
  - Put simply, relying on the cloud puts you at risk if the cloud lets you down.

Disadvantages of Cloud Computing : 9

- **HPC Systems and General concern**
  - Not clear that you can run compute-intensive HPC applications that use MPI/OpenMP!
  - Scheduling is important with this type of application
    - as you want all the VM to be co-located to minimize communication latency!

- General Concerns:
  - Each cloud systems uses different protocols and different APIs
    - may not be possible to run applications between cloud based systems
  - Amazon has created its own DB system (not SQL 92), and workflow system (many popular workflow systems out there)
    - so your normal applications will have to be adapted to execute on these platforms.