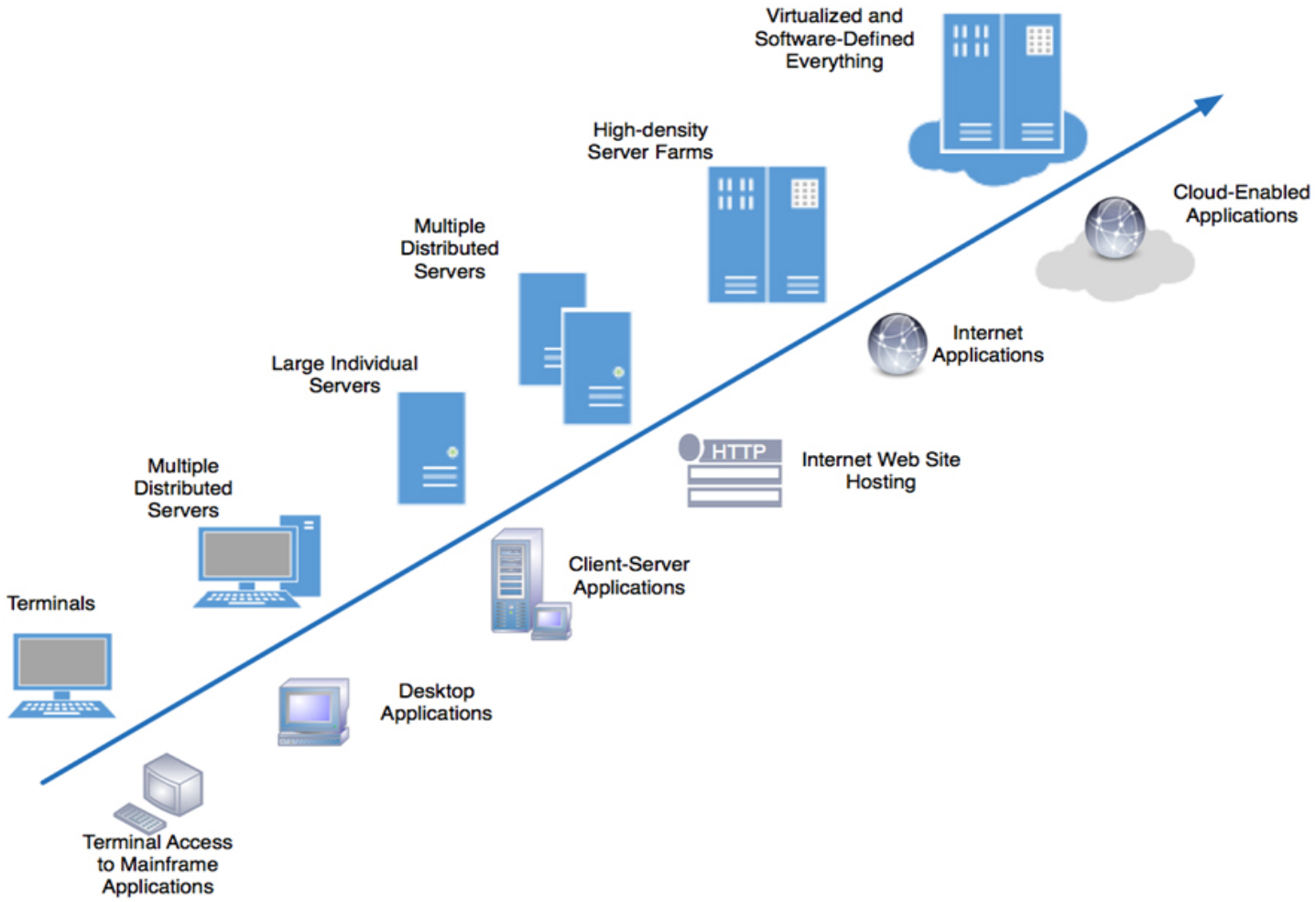
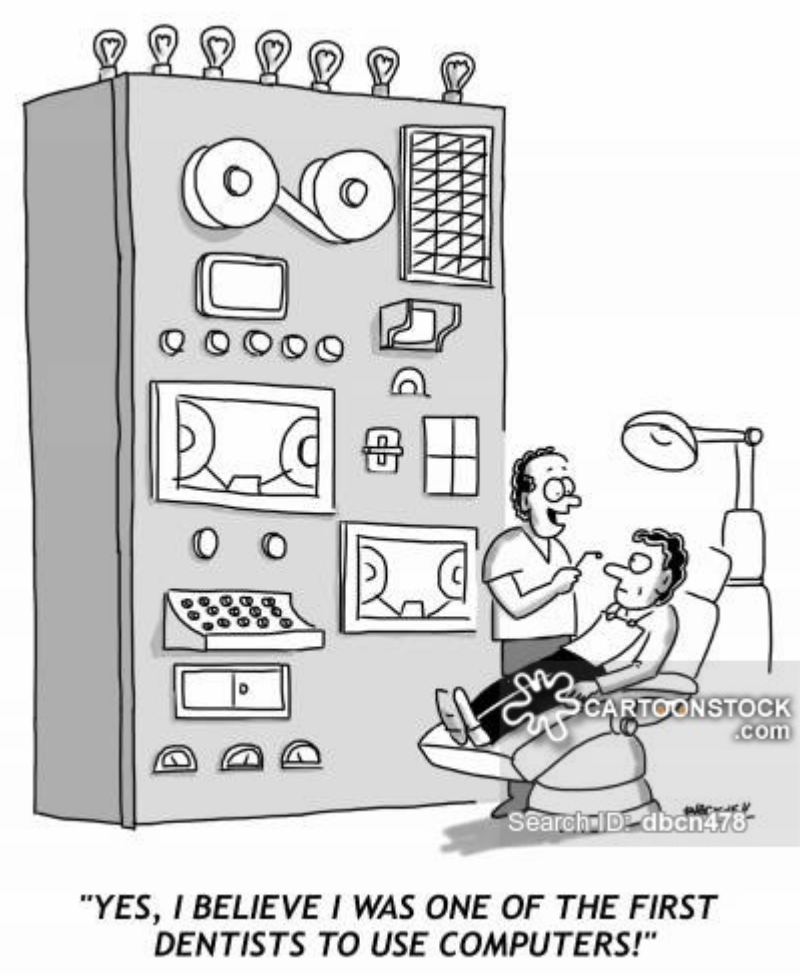
Lecture-2 : Evolution of Cloud Computing

Computing Paradigm Shift



Mainframe Computing



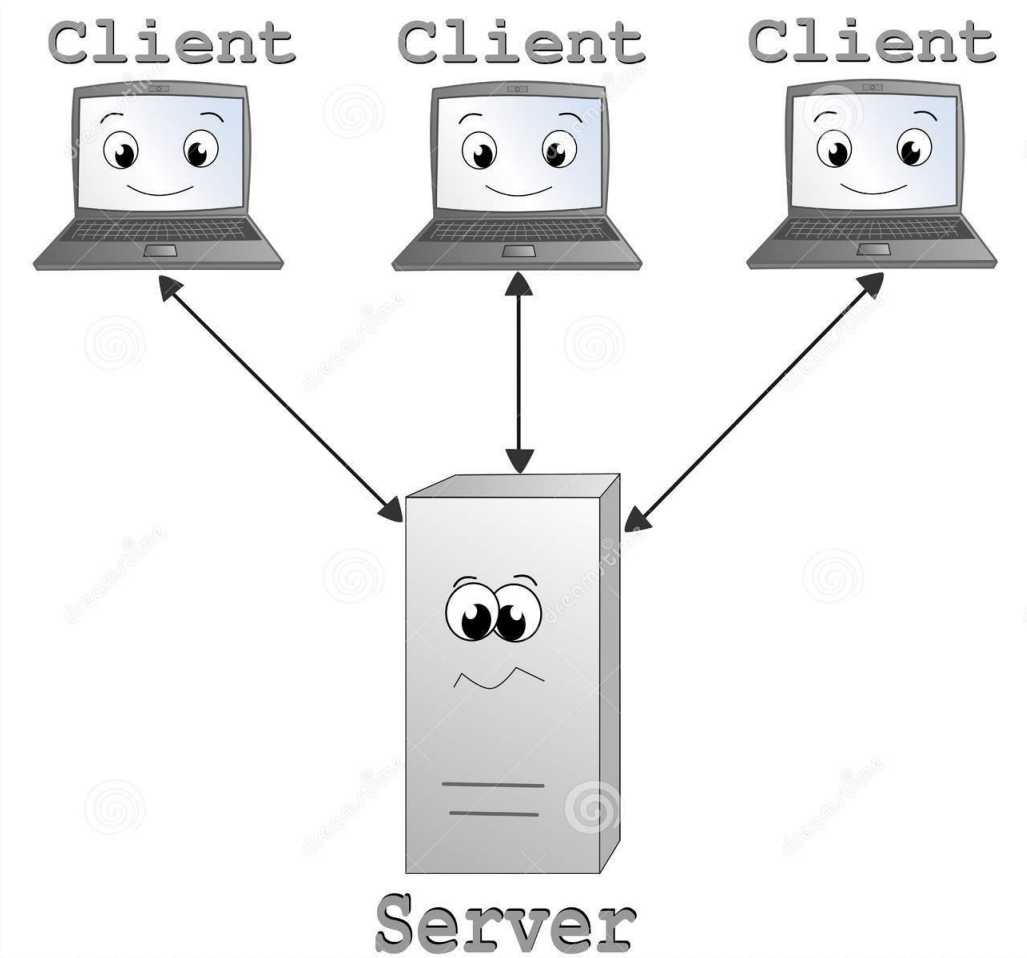
- Jobs, Batches - Processing
- To carry out some mundane and routine jobs such as payroll, accounts, inventory thus sparing employees from tedious jobs.
- It was available in one location, and anyone who needs it must go to computer center for availing it.

Personal Computing

"Tech support says the problem is located somewhere between the keyboard and my chair."

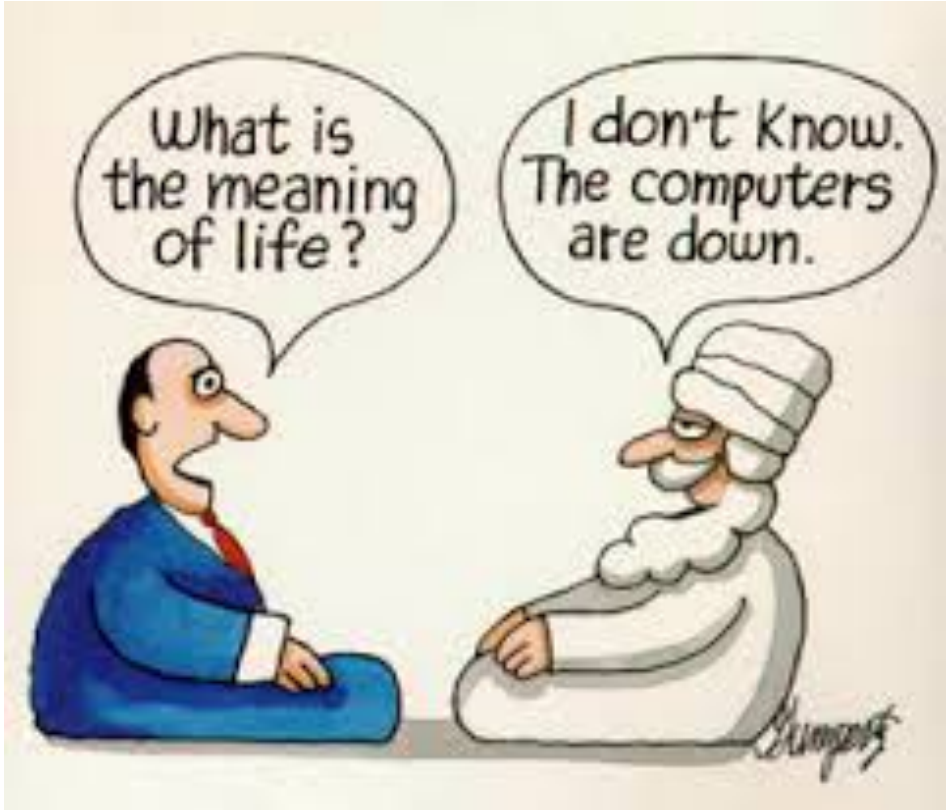
- Desktop computing - personal computer small enough to fit conveniently in an individual workspace.
- Providing computers to each employee on their desktop or workspace.
- Decentralized computing.
- Less expensive, easy to upgrade and less accessories needed.
- Information sharing with other users is a tedious process.

Network Computing



- Networked computers - Local Area network (LAN) achieved this.
- In the networked computing model - a relatively powerful computer - **server** is loaded with all software needed
- Each user to provided with a connected - **terminal** to access and work

Internet Computing



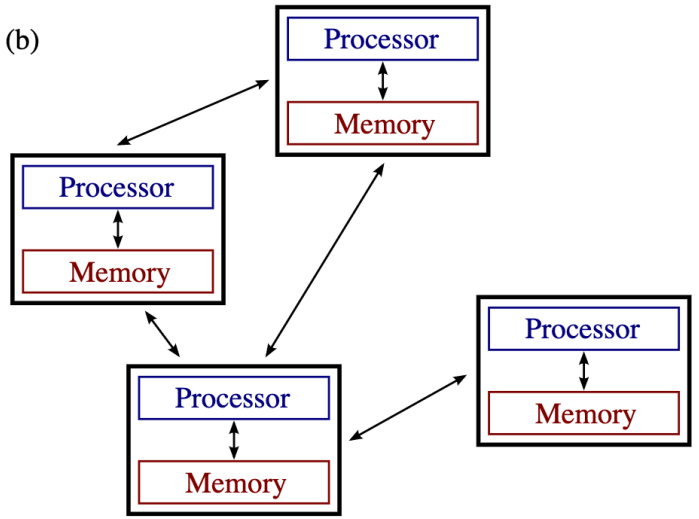
- Network computing such as LAN connected uses within an office or institutions.
- Internet computing - connect organizations located in different geographical locations.

Distributed computing

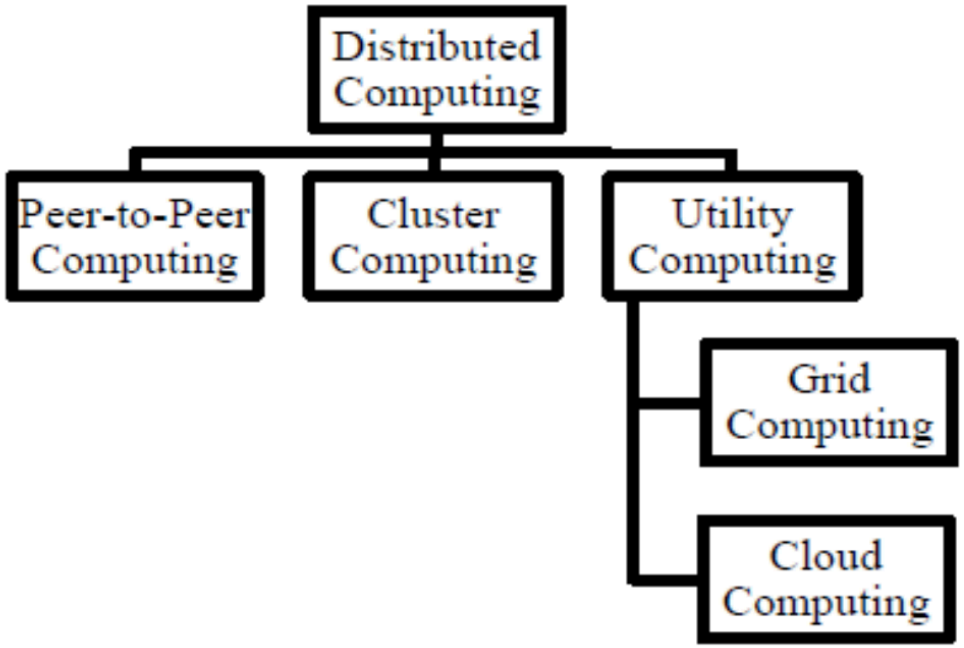
- Distributed computing is a field of computer science that studies distributed systems

- A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another

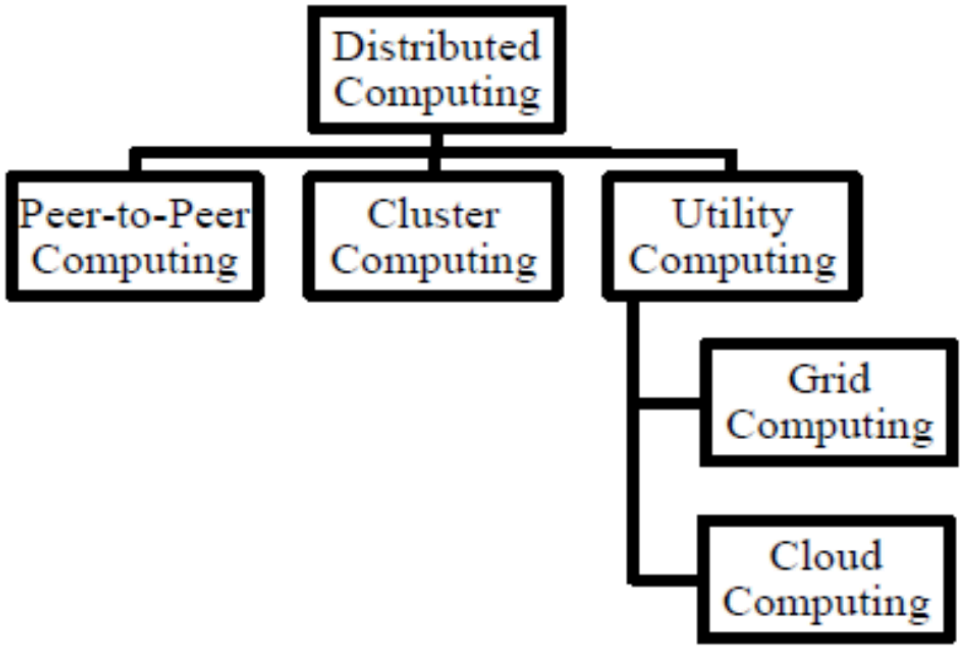
- Applications of distributed computing : Intranets, Internet, WWW, email.



Distributed computing models



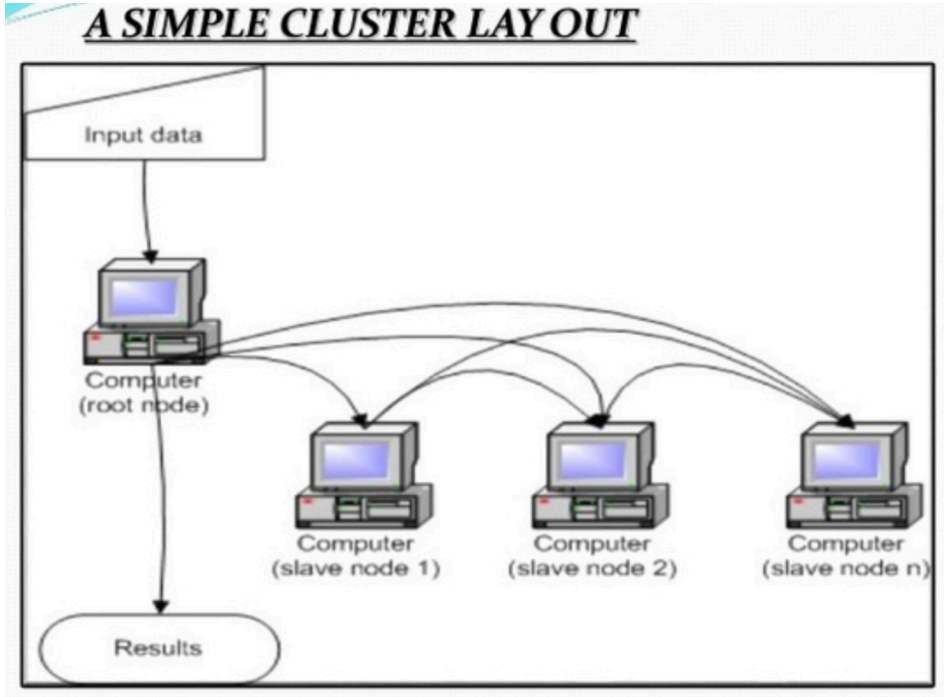
Distributed computing models



- In P2P system, every node acts as both a client and a server
- Nodes act autonomously
- No global view of the entire system

Cluster Computing

- A computer cluster is a group of linked computers, working together closely thus in many respects forming a single computer.
- The components of a cluster are connected to each other through fast local area networks.
- Clusters are mainly used for load balancing and providing high availability.
- Requirements for computing increasing fast.
  - More data to process
  - More compute intensive algorithms available



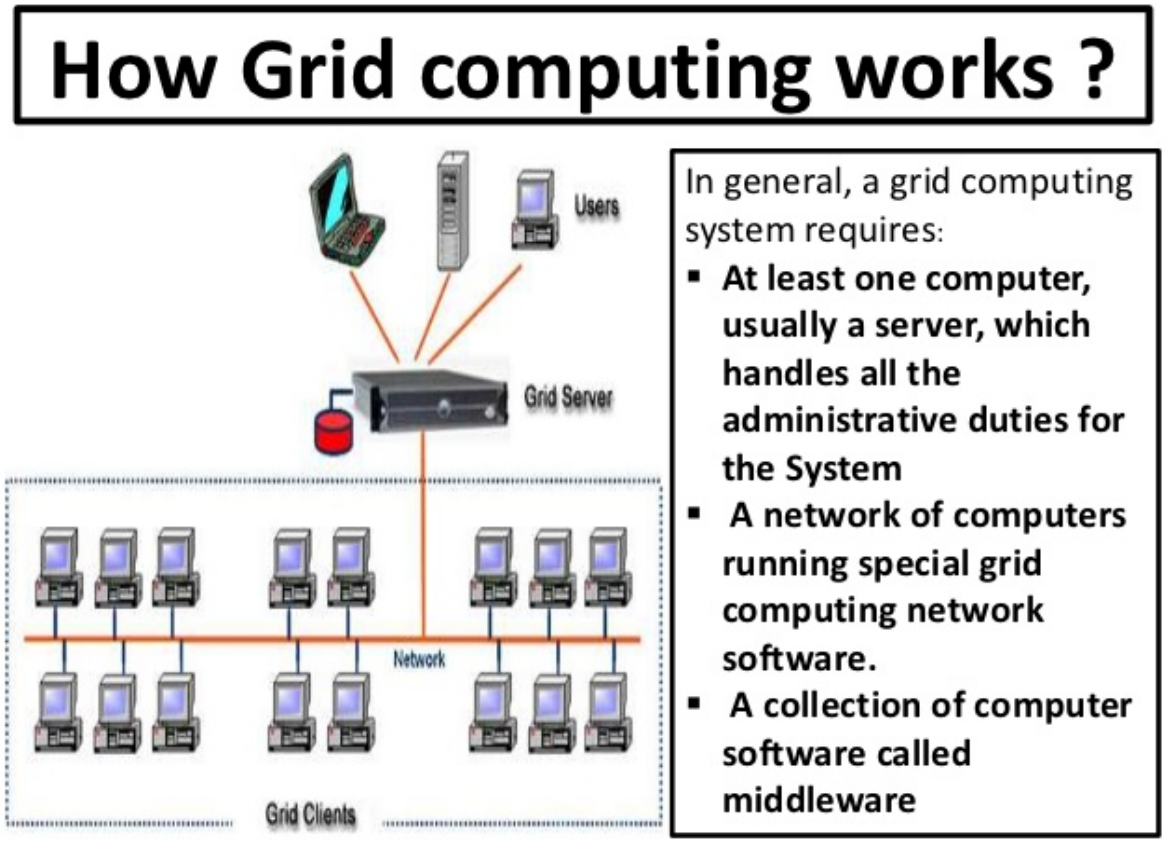
Cluster Computing

Benefits	Drawbacks
• High Availability • Reducing cost • Manageability	• Problem in Finding Fault • The machines in a cluster are dedicated to work as a single unit • The computers in the cluster are normally contained in a single location

Utility Computing

Utility computing is a service provisioning model in which a service provider makes computing resources and infrastructure management available to the customer as per the need, and charges them for specific usage rather than a fixed rate.

Grid Computing



- Computing power available within an enterprise is not sufficient to carry out the computing task.
- Data required for the processing is generated at various geographical locations.
- GC requires the use of software that can divide and farm out pieces of a program as one large system image to several thousand computers.

Grid Computing

Benefits	Drawbacks
• Enables applications to be easily scaled . • Better utilization of resources . • Parallelization of processing .	• Proprietary approach should be eliminated. • There is a single point of failure if one unit on the grid degrades. • Physical location of HW and SW are not known

Grid Computing vs Cluster Computing

- Cluster is homogenous
  - The cluster computers all have the same hardware and OS.
  - The computers in the cluster are normally contained in a single location
- Grids are heterogeneous.
  - Run different operating systems and have different hardware.
- Grid are inherently distributed by its nature over a LAN, metropolitan or WAN.

Cloud Computing - A vision to reality

Three decades ago, John Gage (Sun Microsystems) made the prophetic statement that:

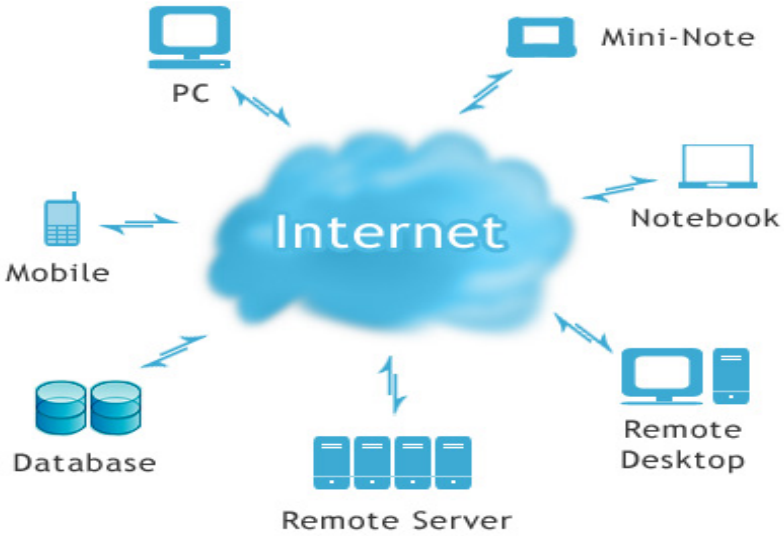
"The network is the computer."

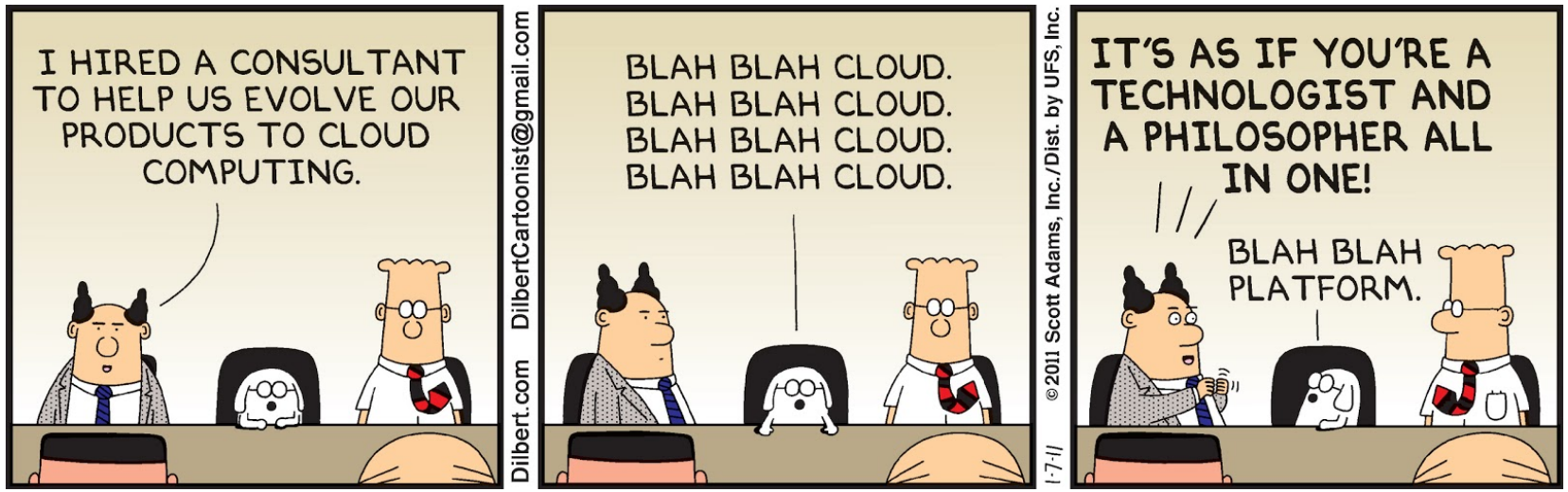
Twenty-five years later, the advent of Cloud Computing has finally made this a reality.

http://www.tmforum.org/CloudServicesBrokerage/10617/home.html
http://cloudcomputingcompaniesnow.com
http://archive.opengroup.org/public/member/q400/gage.jpg

Definition of Cloud Computing

NIST defines Cloud Computing as[1]: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."





http://cloudcomputingcompaniesnow.com/

[1] P. Mell and T. Grance. The NIST definition of cloud computing. NIST Special Publication 800-145, 2011.

Cloud Computing

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- The datacenter - hardware and software is what we will call a Cloud.

Cloud Computing

Benefits	Drawbacks
• Disaster recovery • Increased Scalability • Faster Deployment • Metered Service • Highly Automated	• Constant Internet Connection • High Speed Internet Required • Data Stored is not secure

Grid Vs Cluster Vs Cloud Computing

Properties	Cluster	Grid	Cloud
On-demand self-Service	No	No	Yes
Broad network access	Yes	Yes	Yes
Resource pooling	Yes	Yes	Yes
Rapid elasticity	No	No	Yes
Measured service	No	Yes	Yes