# School of Computing Science and Engineering

**Course Code : BCSE4067** **Course Name: Cloud computing Technologies**

GALGOTIAS UNIVERSITY

(Under the Uttar Pradesh Private Universities Act No. 12 of 2019)

## SYSTEM MODELS FOR DISTRIBUTED AND CLOUD COMPUTING

# SYSTEM MODELS FOR DISTRIBUTED AND CLOUD COMPUTING

Distributed and cloud computing systems are built over a large number of autonomous computer nodes.

# Classification of distributed and cloud computing system

- Massive systems are considered highly scalable, and can reach web-scale connectivity, either physically or logically.
- Massive systems are classified into four groups: clusters, P2P networks, computing grids, and Internet clouds over huge data centers.
- In terms of node number, these four system classes may involve hundreds, thousands, or even millions of computers as participating nodes.
- These machines work collectively, cooperatively, or collaboratively at various levels.

**Table 1.2** Classification of Parallel and Distributed Computing Systems

| Functionality, Applications | Computer Clusters [10,28,38] | Peer-to-Peer Networks [34,46] | Data/ Computational Grids [6,18,51] | Cloud Platforms [1,9,11,12,30] |
|---|---|---|---|---|
| Architecture, Network Connectivity, and Size | Network of compute nodes interconnected by SAN, LAN, or WAN hierarchically | Flexible network of client machines logically connected by an overlay network | Heterogeneous clusters interconnected by high-speed network links over selected resource sites | Virtualized cluster of servers over data centers via SLA |
| Control and Resources Management | Homogeneous nodes with distributed control, running UNIX or Linux | Autonomous client nodes, free in and out, with self-organization | Centralized control, server-oriented with authenticated security | Dynamic resource provisioning of servers, storage, and networks |
| Applications and Network-centric Services | High-performance computing, search engines, and web services, etc. | Most appealing to business file sharing, content delivery, and social networking | Distributed supercomputing, global problem solving, and data center services | Upgraded web search, utility computing, and outsourced computing services |
| Representative Operational Systems | Google search engine, SunBlade, IBM Road Runner, Cray XT4, etc. | Gnutella, eMule, BitTorrent, Napster, KaZaA, Skype, JXTA | TeraGrid, GriPhyN, UK EGEE, D-Grid, ChinaGrid, etc. | Google App Engine, IBM Bluecloud, AWS, and Microsoft Azure |

# Cloud

A cloud is a pool of virtualized computer resources. A cloud can host a variety of different workloads, including batch-style backend jobs and interactive and user-facing applications.

A cloud allows workloads to be deployed and scaled out quickly through rapid provisioning of virtual or physical machines. The cloud supports redundant, self-recovering, highly scalable programming models that allow workloads to recover from many unavoidable hardware/software failures.

The idea is to move desktop computing to a service-oriented platform using server clusters and huge databases at data centers. Cloud computing leverages its low cost and simplicity to benefit both users and providers. Machine virtualization has enabled such cost-effectiveness.

# CLOUD:

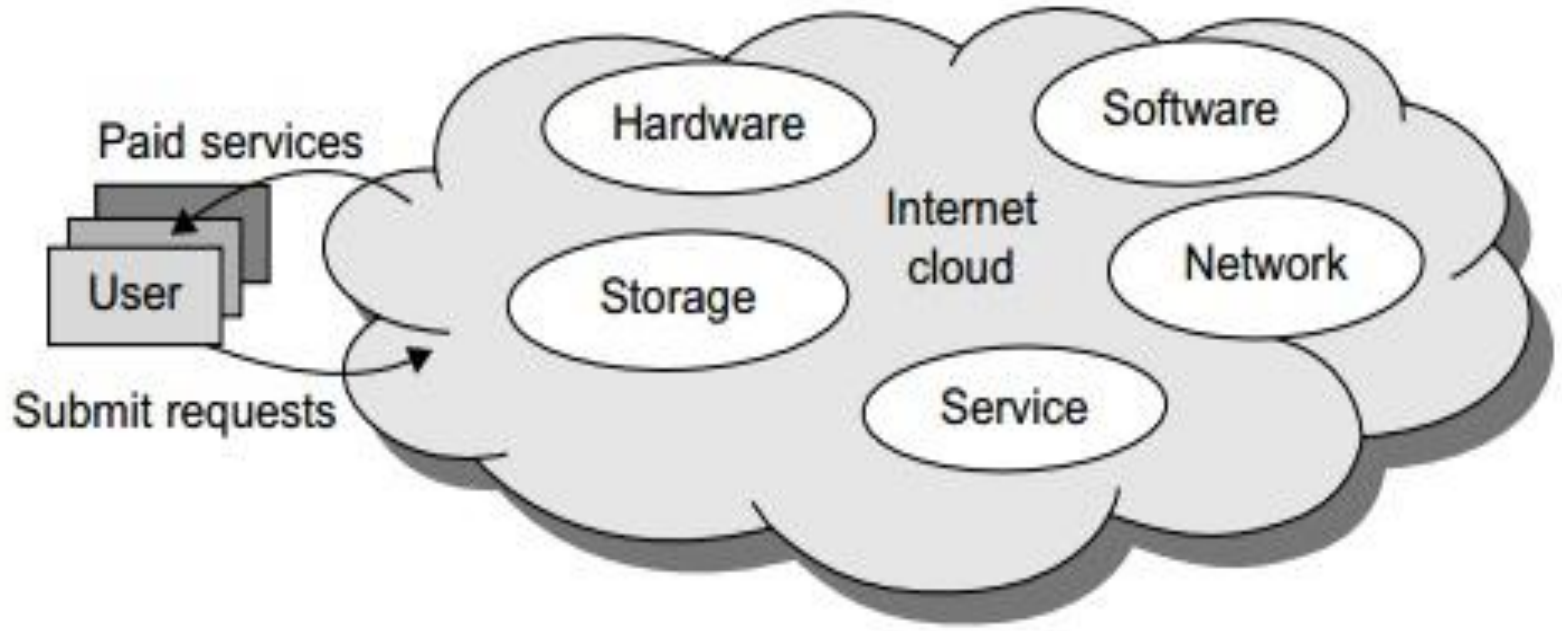


**FIGURE 1.18**

Virtualized resources from data centers to form an Internet cloud, provisioned with hardware, software, storage, network, and services for paid users to run their applications.

# Cloud service models

Cloud computing as an on-demand computing paradigm resolves or relieves us from the problems like:

- constant system maintenance
- poor utilization
- increasing costs associated with
  - hardware/software upgrades

## ***Cloud service models:***

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

# Infrastructure as a Service (IaaS)

- This model puts together infrastructures demanded by users—namely servers, storage, networks, and the data center fabric.
- The user can deploy and run on multiple VMs running guest OSes on specific applications.
- The user does not manage or control the underlying cloud infrastructure, but can specify when to request and release the needed resources.

# Platform as a Service (PaaS)

- This model enables the user to deploy user-built applications onto a virtualized cloud platform.
- PaaS includes middleware, databases, development tools, and some runtime support such as Web 2.0 and Java.
- The platform includes both hardware and software integrated with specific programming interfaces.
- The provider supplies the API and software tools (e.g., Java, Python, Web 2.0, .NET). The user is freed from managing the cloud infrastructure.

# Software as a Service (SaaS)

- This refers to browser-initiated application software over thousands of paid cloud customers.
- The SaaS model applies to business processes, industry applications, consumer relationship management (CRM), enterprise resources planning (ERP), human resources (HR), and collaborative applications.
- On the customer side, there is no upfront investment in servers or software licensing.
- On the provider side, costs are rather low, compared with conventional hosting of user applications.

# Service Models

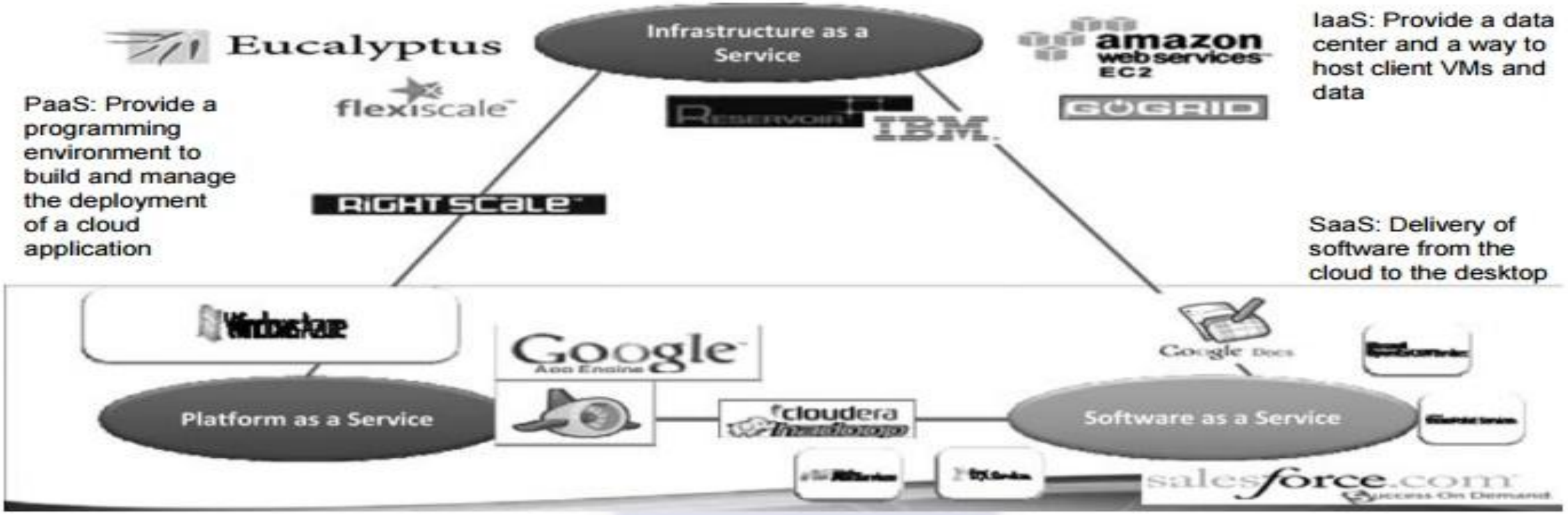


**FIGURE 1.19**

Three cloud service models in a cloud landscape of major providers.

# Thank You