Lecture Intro (1)

Introduction to Cloud Computing:

* Cloud computing provides ubiquitous (=everywhere), convenient and on demand access to shared pools or configurable computing resources such as servers, storage, applications and services.
* Key attributes include scalability, rapid provisioning and reduced management effort.

Traditional vs Cloud Computing Models

* Traditional model
  + Organizations owned or leased hardware and software resources
  + Significant capital expenditure (CAPEX) and risks
  + Challenges included overprovisioning and underutilization
* Cloud Model
  + IT resources provided as a service
  + Pay as you go model reduces CAPEX and shifts focus to operational expenditure (OPEX)

Cloud Computing Service Models

* Laa5 (Infrastructure as a Service: Provision of hardware resources like VMs, storage and network.
* PaaS (Platform as a Service): Tools for application development.
* SaaS (Software as a Service): Ready to use applications hosted in the cloud
* Other Services: Security, AI, databases and analytics as services

Principles of Cloud Computing

* Resource Pooling: Aggregation of resources to serve multiple users dynamically.
* Multitenancy: Sharing physical infastructure among users while ensuring isolation
* Elasticity: Automatic scaling of resources based on demand.
* Pay as You go: Payment based on usage
* Automation: Dynamic provisioning/deprovisioning of resources through APIs

Benefits of Cloud Computing

* Economic
  + Reduction in CAPEX and operational costs
  + Economies of scale and global reach
* Productivity
  + Faster time to market and competitive advantage
  + Simplified infrastructure management
* Other Benefits
  + Enhanced performance, reliability, availability and security.
  + Agility in software development via services like data storage, monitoring and alerting.

Cloud vs Grid Computing

* Grid computing
  + Distributed systems leveraging multiple geographically distributed computers.
  + Suited for large-scale scientific computations
* Cloud Computing
  + Centralized resource management and services through virtualization

Suggested Questions for Exam Preparation for this Lecture

1. Define Cloud Computing and explain its key characteristics
2. What are the three main cloud computing service models?
3. Explain the concept of resource pooling and multitenancy in cloud computing
4. How does the pay as you go model benefit organizations economically?
5. List the primary benefits of cloud computing and explain how it enhances productivity and reduces costs
6. Describe the role of virtualization in enabling cloud computing
7. Differentiate between grid computing and cloud computing with examples.

Model Answers of the above questions

1. Cloud computing is a model for enabling ubiquitous, on-demand network access to shared pools of configurable computing resources such as servers, storage, applications, and services. These resources can be rapidly provisioned and released with minimal management effort or service provider interaction.   
     
   Key Characteristics:  
   On demand Self Service: Users can provision resources as needed automatically   
     
   Broad Network Access: Resources are accessible over the internet from various devices  
     
   Resource Pooling: Resources are shared among multiple users while maintaining isolation  
     
   Elasticity: Automatic scaling of resources based on demand  
     
   Measured Service: Pay as you go pricing model
2. There are three PaaS, SaaS and last laaS
3. Resource Pooling is:   
     
   Aggregating computing resources (e.g., servers, storage, and networks) to serve multiple users dynamically. Resources are allocated and reallocated based on demand using techniques like load balancing and predictive analytics.  
     
   Multitenancy:  
     
   Multiple users (tenants) share the same physical infrastructure while remaining isolated from each other. This ensures that one user’s activities do not impact others. Virtualization enables multitenancy by partitioning hardware into separate virtual machines.
4. The pay-as-you-go model ensures organizations only pay for the resources they use. This eliminates overprovisioning and underutilization costs, reduces upfront CAPEX, and aligns costs directly with business growth. It is particularly beneficial for startups and businesses with fluctuating demands.
5. **Cost Savings**: Pay-as-you-go pricing eliminates CAPEX and reduces OPEX.  
     
   **Productivity**: Reduced time to market and faster development cycles due to pre-built tools and services.  
     
   **Flexibility and Agility**: Resources can be scaled instantly to meet changing demands  
     
   **Global Reach**: Services can be accessed worldwide, reducing latency and labor costs.  
     
   **Security Improvements**: Providers offer advanced physical and network security measures.  
     
   **Performance and Reliability**: High availability and fault tolerance due to resource pooling and redundancy.
6. Virtualization creates virtual versions of hardware resources, allowing multiple virtual machines to run on a single physical machine. This enables resource pooling, multitenancy, and scalability. Virtualization also supports automation by enabling resources to be provisioned/deprovisioned dynamically.
7. Grid Computing:  
     
   Focuses on distributing computing tasks across geographically dispersed systems.  
     
   Used for large-scale scientific computations  
     
   Cloud Computing:  
     
   Centralized management of virtualized resources delivered as services over the internet   
     
   Examples include Amazon Web Services and Google Cloud Platform

Articles that he gave in the intro

Cloud Migration Framework for SMEs (Small and Medium Enterprises)

* SMEs often hesitate to adopt cloud computing due to lack of expertise, concerns over costs and data privacy issues.
* Migration frameworks include pre migration assessments, feasibility checks and service mapping to optimize cloud adoption
* Key considerations for SMEs:
  + Interoperability: understanding how on premises services fit cloud models
  + Provider Selection Criteria: Based on service offerings, costs, compliance and support
  + Data Privacy and Security: Often mitigated by shared responsibility models offered by providers

Economic Impacts of Cloud Computing

* Cloud computing offers significant cost saving through reduced CAPEX and operational efficiency, particularly for SMEs
* Adoption boosts economic growth by creating jobs, fostering innovation and enabling business to scale efficiently.

Case Study: Migration to IaaS (Infrastructure as a Service)

* Mitigating legacy systems to cloud computing like Amazon EC2 can reduce infrastructure costs by 37% over five years
* Risks include dependency on third party providers and initial learning curves for IT teams
* Support issues can be minimized through cloud hosted solutions

Benefits and Risks in Cloud Migration

* Benefits
  + Scalability
  + Cost Efficiency
  + Global Reach
  + Innovation
* Risks
  + Dependency on providers
  + Data security and compliance issues
  + Challenges in managing hybrid environments

WE ARE NOT OBLIGED TO LEARN THESE THINGS FROM THE ARTICLES BUT LEARN LIKE 1-2 QUESTIONS SO YOU KNOW WHAT IS GOING ON

Lecture 2