Content from different reference book suggested "Cloud Computing Black book [Kailash Jayaswal,Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah & Kogent Learning Solutions Inc.]" by Prof. Sujata Mam and mentioned in CC Syllabus file, Presentations, Notes provided in 2023

NOTES ON BASIS OF CHP 1 Intro to CC PPT

REFER PPT IN WHICH DIAGRAMS ARE THERE IMP CONTENT

CHEATSHEET

Introduction to Cloud Computing Cheatsheet

1. Evolution of Cloud Computing:
- Explosive growth in applications: biomedical informatics, space exploration, business analytics, web 2.0 social networking (YouTube, Facebook).
- Extreme scale content generation: e-science and e-business data deluge.
- Extraordinary rate of digital content consumption: Apple iPhone, iPad, Amazon Kindle.
- Exponential growth in compute capabilities: multi-core, storage, bandwidth, virtual machines (virtualization).
- Short technology obsolescence cycles: Windows Vista, Windows 7, Java versions, C, C#, Python.
- Newer architectures: web services, persistence models, distributed file systems (Google, Hadoop), multi-core, wireless, and mobile.
- Diverse knowledge and skill levels of the workforce.

2. Traditional IT Infrastructure vs. Cloud:
- Conventional IT infrastructure struggles to handle the complexity of modern demands.
- Cloud computing offers a solution by providing scalable, on-demand resources.

3. What is Cloud Computing?
- Cloud computing is network-based computing over the Internet.
- Collection of integrated hardware, software, and Internet infrastructure forming a platform.
- Provides hardware, software, and networking services to clients.
- Hides complexity from users through simple graphical interfaces or APIs.

4. Cloud Characteristics:
- Shared/pooled resources
- Broad network access
- On-demand self-service
- Scalable and elastic
- Metered by use

5. Cloud Service Models:
- Software as a Service (SaaS): End users access applications over the Internet (e.g., Gmail).
- Platform as a Service (PaaS): Developers use a platform to create their own applications (e.g., Windows Azure).
- Infrastructure as a Service (IaaS): Rent computing power and resources (e.g., Amazon Web Services).

6. Cloud Deployment Models:
- Public Cloud: Shared infrastructure hosted by vendors (e.g., Amazon, Google).
- Private Cloud: Dedicated infrastructure for a single organization (e.g., HP data center).
- Hybrid Cloud: Combination of public and private clouds.

7. Advantages and Disadvantages:
- Advantages: On-demand resources, cost-effectiveness, scalability, flexibility.
- Disadvantages: Dependence on internet connectivity, potential security concerns.

8. Virtualization:
- Hardware-reducing, cost-saving, and energy-saving technology.
- Run multiple operating systems and applications on the same server.
- Types: Hosted architecture (emulate OS), Bare-metal architecture (run OS directly on hardware).

9. Grid Computing vs. Cloud Computing:
- Grids: Shared computing power, limited duration jobs, collaboration.
- Clouds: Leased computing power, long-term services, flexibility.

10. Cloud Computing vs. Grid Computing:
- Cloud Computing: On-demand resources, rapid elasticity, evolving faster, easier to use.
- Grid Computing: Pre-reserved resources, no rapid elasticity, specialized use cases, more expertise required.

Remember:
- Cloud computing revolutionizes IT by providing scalable and flexible solutions.
- Choose the appropriate cloud service model based on your needs.
- Virtualization enhances resource utilization and flexibility.
- Consider reliability, security, and internet connectivity when using cloud services.

NOTES

Introduction to Cloud Computing

In recent years, the world has undergone a transformative change driven by the rapid growth of applications across various domains. The surge in applications, ranging from biomedical informatics to space exploration, from business analytics to social networking platforms like YouTube and Facebook, has reshaped the digital landscape. This explosive growth has been fueled by the proliferation of digital content and the ever-increasing demand for digital consumption.

Cloud computing has emerged as a pivotal solution in this dynamic environment. It addresses the challenges posed by the exponential growth in compute capabilities, digital content generation, and consumption. The traditional IT infrastructure, characterized by manual provisioning, dedicated hardware, fixed capacity, and significant capital and operational expenses, struggles to cope with the complexities of this evolving landscape.

Cloud Computing Defined

At its core, cloud computing is a revolutionary concept that enables convenient, on-demand network access to a shared pool of configurable computing resources. These resources encompass networks, servers, storage, applications, and services. Cloud computing operates over the Internet, providing users with hardware, software, and networking services seamlessly.

This model of computing hides the intricate details of underlying infrastructure from both users and applications, offering a simplified interface or API for interaction. Cloud computing can be understood as a natural progression from utility computing, offering a platform that supports diverse requirements and applications.

Key Characteristics of Cloud Computing

Cloud computing is defined by five essential characteristics:

1. On-Demand Self-Service: Users can access resources and services as needed without requiring human intervention.

2. Ubiquitous Network Access: Users can access cloud services anytime, anywhere, using any device with an internet connection.

3. Resource Pooling: Computing resources are pooled to serve multiple clients, promoting efficient utilization and scalability.

4. Rapid Elasticity: Cloud resources can be quickly scaled up or down based on demand, allowing for efficient resource allocation.

5. Pay-as-You-Go: Users are charged based on their actual usage of resources, mirroring the utility pricing model.

Cloud Service Models

Cloud computing offers three primary service models:

1. Software as a Service (SaaS): End-users can access applications and services hosted in the cloud, without the need for local installations or maintenance. Examples include web-based email services like Gmail and collaboration tools like Google Docs.

2. Platform as a Service (PaaS): Developers can build, deploy, and manage applications without concerning themselves with the underlying infrastructure. PaaS provides a development environment and runtime platform for creating software. Examples include Microsoft Azure and Salesforce's PaaS offerings.

3. Infrastructure as a Service (IaaS): Users can provision and manage virtualized computing resources such as virtual machines, storage, and networks. IaaS offers greater control over the infrastructure while abstracting hardware details. Notable IaaS providers include Amazon Web Services (AWS) and Google Cloud Platform (GCP).

Deployment Models of Cloud

Cloud computing deployment models include:

1. Public Cloud: Cloud infrastructure is owned and operated by third-party providers, offering services to multiple organizations over the internet. Examples include AWS, GCP, and Microsoft Azure.

2. Private Cloud: Cloud infrastructure is dedicated to a single organization and may be hosted internally or externally. Private clouds provide greater control and security, making them suitable for sensitive data and applications.

3. Hybrid Cloud: Combines elements of both public and private clouds, allowing data and applications to be shared between them. Hybrid clouds offer flexibility and efficiency, enabling organizations to leverage the benefits of both models.

Advantages and Disadvantages of Cloud Computing

Advantages:
- On-demand resource provisioning.
- Scalability and flexibility.
- Reduced operational and maintenance costs.
- Rapid development and deployment.
- Global accessibility and collaboration.

Disadvantages:
- Dependency on internet connectivity.
- Limited control over infrastructure.
- Security and privacy concerns.
- Vendor lock-in risks.
- Potential data transfer costs.

In conclusion, cloud computing has revolutionized the IT landscape, offering unprecedented scalability, accessibility, and cost-efficiency. With its various service models and deployment options, cloud computing has transformed the way organizations deliver and consume technology services, enabling innovation and growth in an increasingly digital world.

SUMMARY
The introduction to cloud computing highlights the profound changes that the world has undergone due to various factors, including explosive application growth, digital content generation and consumption, technological advancements, and evolving architectures. The conventional IT infrastructure struggles to manage this complexity. Cloud computing emerges as a solution to these challenges, defined as a network-based computing model taking place over the Internet.

Cloud computing simplifies complex infrastructure details by offering integrated hardware, software, and networking services through a platform. It features characteristics like on-demand self-service, ubiquitous network access, resource pooling, rapid elasticity, and pay-as-you-go pricing. Cloud services can be categorized into three models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), each serving different user needs.

The architecture overview of cloud computing includes shared/pooled resources, broad network access, on-demand self-service, scalability and elasticity, and metered usage. Cloud deployment models consist of public, private, and hybrid clouds, each catering to different security and resource needs. The evolution of cloud operating systems is also discussed, along with examples like Eye OS and Glide OS.

Grid computing is compared to cloud computing, with grid computing focusing on distributed computing power and storage, while cloud computing emphasizes leased computing resources. Grids and clouds have distinct advantages and drawbacks, with grids designed for collaboration and open-source technologies, and clouds offering reliability, ease of use, and proprietary technologies.

Ultimately, the introduction emphasizes that cloud computing is a transformative concept that addresses the evolving needs of modern computing, allowing organizations to efficiently manage resources, enhance scalability, and adapt to changing technological landscapes.

SUMMARY IN POINTS

Summary of "Introduction to Cloud Computing":

What has changed the world:
- Explosive growth in various applications such as biomedical informatics, space exploration, business analytics, and social networking platforms like YouTube and Facebook.
- Enormous amounts of content generation and consumption, driven by digital devices like smartphones, tablets, and e-readers.
- Exponential growth in computing capabilities, including multi-core processors, storage, bandwidth, and virtualization technology.
- Rapid obsolescence of technologies, leading to frequent updates and changes in software and hardware.
- Emergence of new architectures like web services, distributed file systems (e.g., Google, Hadoop), wireless, and mobile technologies.
- Diverse levels of knowledge and skills among the workforce.

Challenges of traditional IT infrastructure:
- Inability to handle the complexity of rapidly evolving technologies and demands.
- Difficulty in managing diverse knowledge and skill levels of the workforce.
- Inefficiency in resource allocation and utilization.

Cloud Computing Defined:
- Cloud Computing refers to network-based computing that takes place over the Internet, offering integrated and networked hardware, software, and infrastructure.
- It hides the underlying infrastructure complexity and details from users and applications, providing a simplified interface or API.
- Cloud computing has five essential characteristics: on-demand self-service, ubiquitous network access, resource pooling, rapid elasticity, and pay-as-you-go pricing.

Differences between Conventional and Cloud Computing:
- Conventional computing involves manual provisioning, dedicated hardware, fixed capacity, and capital expenses.

- Cloud computing offers self-provisioning, shared hardware, elastic capacity, pay-as-you-go pricing, and operational expenses.

Cloud Service Models:
1. Infrastructure as a Service (IaaS): Provides virtualized computing resources over the Internet, including virtual machines, storage, and networking.
2. Platform as a Service (PaaS): Offers a platform for developers to build and deploy applications without managing the underlying infrastructure.
3. Software as a Service (SaaS): Delivers software applications over the Internet on a subscription basis, accessible via a web browser.

Cloud Deployment Models:
- Public Cloud: Infrastructure hosted by a cloud vendor and shared by multiple organizations.
- Private Cloud: Dedicated infrastructure for a single organization, not shared with others.
- Hybrid Cloud: Combination of private and public clouds, offering greater flexibility and security.

Advantages of Cloud Computing:
- On-demand resource availability
- Ubiquitous network access
- Location-independent resource pooling
- Rapid elasticity for scaling
- Pay-as-you-go pricing based on usage

Disadvantages of Cloud Computing:
- Dependency on Internet connectivity
- Limited functionality offline
- Security concerns for sensitive data

Virtualization:
- Virtualization technology allows running multiple operating systems and applications on the same physical hardware.
- It reduces IT costs, increases efficiency, and enhances flexibility.
- Virtualization can be achieved through various solutions like KVM, Xen, and vSphere.

Differences between Distributed, Grid, and Cloud Computing:
- Distributed computing involves sharing tasks across multiple computers within a network.
- Grid computing focuses on sharing computing power and storage capacity across different sites, often for research collaborations.
- Cloud computing provides access to leased computing power and storage capacity from centralized data centers.

Comparison between Cloud and Grid Computing:
- Cloud computing offers on-demand resources and rapid elasticity, while grid computing involves pre-reserved resources and lacks rapid scalability.
- Cloud computing uses a client-server architecture for business and public needs, whereas grid computing is used for specific purposes.

Cloud Computing vs. Grid Computing:
- Cloud computing is characterized by on-demand resources and rapid scalability.
- Grid computing involves pre-reserved resources and is typically used for specific purposes.
- Cloud computing has a lower expertise requirement compared to grid computing.

In conclusion, cloud computing has transformed the way businesses and individuals use and access computing resources, providing flexible, scalable, and cost-effective solutions to various technological challenges.

DIAGRAMS

Certainly, I've formatted the text to better represent the structure and content you provided. Here's the text-based diagram layout for the "Introduction to Cloud Computing":

Introduction to Cloud Computing

Changes in the World:

- Explosive growth in applications:
  - Biomedical informatics
  - Space exploration
  - Business analytics
  - Web 2.0 social networking: YouTube, Facebook

- Extreme scale content generation:
  - E-science and e-business data deluge

- Extraordinary rate of digital content consumption:
  - Digital gluttony: Apple iPhone, iPad, Amazon Kindle

- Exponential growth in compute capabilities:
  - Multi-core processors
  - Storage capacity
  - Bandwidth
  - Virtual machines (virtualization)

- Very short cycle of obsolescence in technologies:
  - Windows Vista, Windows 7
  - Java versions
  - C, C#, Python

- Newer architectures:
  - Web services
  - Persistence models
  - Distributed file systems/repositories (Google, Hadoop)
  - Multi-core processors

- Wireless and mobile technologies

- Diverse knowledge and skill levels of the workforce

Challenges for Traditional IT Infrastructure:

Can traditional IT infrastructure manage this complexity?

What is Cloud Computing?

- Cloud Computing is a general term for network-based computing over the Internet.
- A step beyond Utility Computing.
- Collection of integrated hardware, software, and Internet infrastructure (platform).
- Provides hardware, software, and networking services to clients.
- Hides underlying infrastructure complexity with simple interfaces/APIs.

Comparison: Conventional vs. Cloud Computing:

Conventional:
- Manually Provisioned
- Dedicated Hardware
- Fixed Capacity
- Pay for Capacity
- Capital & Operational Expenses

Cloud:
- Self-provisioned
- Shared Hardware
- Elastic Capacity
- Pay for Use
- Operational Expenses

Working Definition of Cloud Computing:

Cloud computing is a model for enabling on-demand network access to configurable computing resources:
- Networks, servers, storage, applications, services.
- Rapidly provisioned and released with minimal management effort.
- Promotes availability and comprises essential characteristics, service models, deployment models.

Key Cloud Characteristics:

1. Shared/pooled resources
2. Broad network access
3. On-demand self-service
4. Scalable and elastic
5. Metered by use

Essential Cloud Attributes:

- Resources drawn from a common pool
- Build economies of scale
- Common infrastructure runs efficiently
- Open standards and APIs
- Available from anywhere with an internet connection
- Near real-time delivery through self-serve web interface
- Dynamically allocated and released resources
- Services are metered, like a utility

Role of Cloud in IT:

- Cloud readiness depends on process independence, integration points, security needs, architecture health, desired platform, cost, and application type.

Cloud Computing Services: IaaS, PaaS, SaaS:

- IaaS (Infrastructure as a Service)
- PaaS (Platform as a Service)
- SaaS (Software as a Service)
- Examples: Amazon, Google, Microsoft, Salesforce

Cloud Deployment Models:

1. Private Cloud
2. Community Cloud
3. Public Cloud
4. Hybrid Cloud

Cloud Operating Systems:

- Various cloud operating systems available.

Virtualization:

- Hardware reducing, cost and energy-saving technology.
- Run multiple OSes and applications on the same server.
- Before: Single OS image per machine, tightly coupled software and hardware.
- After: Hardware-independent, manage OS and app as a single unit.

Grid Computing vs. Cloud Computing:

- Grids enable shared computing power.
- Clouds provide leased computing power and storage capacity.
- Grids are open source, while clouds are proprietary.
- Grids support distributed work, clouds are used for long-term services.

- Both have benefits and drawbacks.

Feel free to ask if you need further clarification or information on any specific part of this content!

SIMULATED QA

Simulated Q&A: Introduction To Cloud Computing

Q1: What factors have led to the need for cloud computing in the modern world?

A1: The modern world has witnessed explosive growth in applications across various fields such as biomedical informatics, space exploration, business analytics, and social networking platforms like YouTube and Facebook. This growth has resulted in an extreme scale of content generation and a rapid rate of digital content consumption through devices like Apple iPhone, iPad, and Amazon Kindle. Additionally, the exponential growth in compute capabilities, including multi-core processors and virtualization, has further added to the complexity. Moreover, the fast cycle of technology obsolescence and the emergence of newer architectures like web services, distributed file systems, and wireless technologies contribute to the changing landscape.

Q2: What is cloud computing, and how does it differ from traditional IT infrastructure?

A2: Cloud computing is a network-based computing model that takes place over the Internet. It encompasses a collection of integrated and networked hardware, software, and internet infrastructure, referred to as a platform. Unlike traditional IT infrastructure, cloud computing offers self-provisioning, shared hardware, elastic capacity, and pay-as-you-go billing. It hides the underlying infrastructure's complexity by providing a simple graphical interface or API for users and applications. This contrasts with conventional IT, which involves manual provisioning, dedicated hardware, fixed capacity, and higher capital and operational expenses.

Q3: Can you provide a working definition of cloud computing?

A3: Cloud computing is a model that enables convenient, on-demand network access to a shared pool of configurable computing resources, such as networks, servers, storage, applications, and services. This access can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud model is defined by five essential characteristics, three service models, and four deployment models.

Q4: What are the common characteristics or attributes of cloud computing?

A4: Cloud computing exhibits several key characteristics:
- On-demand self-service: Users can provision resources as needed.
- Ubiquitous network access: Accessible anytime, anywhere, from any device.
- Location-independent resource pooling: Resources are drawn from a common pool.
- Rapid elasticity: Resources can be quickly scaled up or down based on demand.
- Pay-as-you-go: Users are billed based on their usage, similar to utility billing.

Q5: Can you explain the differences between shared/pooled resources in conventional computing and cloud computing?

A5: In conventional computing, resources are manually provisioned and often dedicated to specific tasks. This results in fixed capacity and high operational expenses. In contrast, cloud computing offers shared or pooled resources, where resources are drawn from a common pool. This approach allows for better resource utilization, economies of scale, and efficient use of the common infrastructure.

Q6: How do public, private, and hybrid clouds differ in terms of deployment models?

A6: Deployment models in cloud computing include:
- Public cloud: Resources are hosted by a cloud vendor and shared by multiple organizations.
- Private cloud: Resources are dedicated to a single organization and not shared externally.
- Hybrid cloud: Combines both public and private cloud elements, allowing organizations to balance security and flexibility needs.

Q7: What are the main differences between Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)?

A7: IaaS provides virtualized computing resources over the internet, including storage, networks, and virtual machines. PaaS offers a platform for developers to build, deploy, and manage applications without worrying about underlying infrastructure. SaaS delivers software applications over the internet, accessible via web browsers, without the need for installation.

Q8: What are the benefits and drawbacks of cloud computing compared to grid computing?

A8: Cloud computing offers on-demand resources, rapid elasticity, and a client-server architecture suitable for business and public needs. It evolves faster and requires lower expertise to use. On the other hand, grid computing involves pre-reserved resources, lacks rapid elasticity, and is more complex, catering to specific purposes. It evolves slower and requires a higher level of expertise. Grid computing serves as a foundation for cloud computing but is not necessarily part of it.

Q9: What are the advantages and disadvantages of cloud computing?

A9: Advantages of cloud computing include resource availability on demand, rapid scalability, flexibility, and cost savings. Disadvantages include dependence on internet connectivity, potential data security concerns, and the need to trust proprietary cloud providers. Additionally, cloud computing doesn't work offline, which can be problematic in areas with unreliable internet connections.

Q10: How does virtualization contribute to cloud computing, and what are its benefits?

A10: Virtualization is a technology that enables multiple operating systems and applications to run on the same physical server simultaneously. In cloud computing, virtualization helps in efficient resource utilization, hardware independence, rapid provisioning, and better management of computing resources. It reduces IT costs, increases efficiency, and offers flexibility by allowing various operating systems and applications to coexist on the same hardware.

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8 MARKS QUESTION & ANSWER

It seems like you've provided a lot of detailed information about cloud computing, including its characteristics, advantages, disadvantages, deployment models, and a comparison with grid computing. However, if you're looking for an 8-mark question and answers in points format, here's a condensed version:

Question: Explain the concept of Cloud Computing and its key characteristics.

Answer:

Cloud Computing is a modern paradigm of network-based computing that occurs over the Internet. It involves the integration of hardware, software, and internet infrastructure to provide computing services to users. Cloud platforms offer a simplified interface or API to hide the underlying infrastructure complexity. The essential characteristics of Cloud Computing include:

1. On-Demand Self-Service: Users can provision resources as needed, without human intervention from service providers.
2. Ubiquitous Network Access: Services are accessible anytime, anywhere, from any device with an internet connection.
3. Resource Pooling: Computing resources are pooled and shared among multiple users, optimizing efficiency.
4. Rapid Elasticity: Resources can be quickly scaled up or down to handle varying workloads.
5. Pay-as-You-Go: Users are charged based on usage, promoting cost-effectiveness.

Question: Describe the deployment models of Cloud Computing and provide examples for each.

Answer:

Cloud Computing offers several deployment models to cater to different needs:

1. Public Cloud: Infrastructure is hosted by a vendor and shared among various organizations. Example: Amazon Web Services (AWS), Google Cloud Platform (GCP).
2. Private Cloud: Dedicated infrastructure for a single organization, ensuring higher security. Example: HP Data Center, IBM Cloud.
3. Community Cloud: Shared infrastructure for specific communities with common concerns. Managed by the organization or third-party. Example: Research collaborations.
4. Hybrid Cloud: Combination of public and private clouds. Critical applications hosted on private clouds, while less-sensitive data on public clouds.

Question: Compare and contrast Cloud Computing with Grid Computing.

Answer:

Cloud Computing and Grid Computing share similarities but have distinct differences:

Cloud Computing:
- Resources are on-demand and scalable.
- Offers rapid elasticity and is well-suited for business and public needs.

- Evolves rapidly and is more user-friendly, requiring lower expertise to use.
- Provides services via a client-server architecture.
- More commercially oriented and often available for various purposes.
- Supports data and application mobility.

Grid Computing:
- Resources are pre-reserved and lack rapid elasticity.
- Generally used for specific purposes, such as research collaborations.
- Evolves more slowly and requires higher expertise to operate.
- Doesn't rely on a client-server architecture.
- Typically not as commercially oriented as cloud computing.
- Focuses on resource sharing across distributed sites.

While cloud computing can incorporate grid computing principles, grids are not necessarily clouds or part of clouds.

Question: What are the advantages and disadvantages of Cloud Computing?

Answer:

Advantages:
1. Cost Savings: Reduced infrastructure costs and pay-as-you-go pricing.
2. Scalability: Resources can be easily scaled up or down to meet demand.
3. Flexibility: Enables rapid deployment and experimentation with new services.
4. Accessibility: Allows remote access from anywhere with an internet connection.
5. Resource Efficiency: Pooled resources lead to better utilization and efficiency.
6. Reliability: Cloud providers offer high availability and disaster recovery.

Disadvantages:
1. Internet Dependency: Requires constant internet connectivity for access.
2. Security Concerns: Sensitive data may be exposed to potential breaches.
3. Limited Control: Users may have limited control over hardware and infrastructure.
4. Vendor Lock-In: Difficult to switch providers due to proprietary technologies.
5. Downtime: Cloud outages can lead to service interruptions.
6. Data Transfer Costs: Moving large amounts of data can incur additional charges.

Remember, for a more formal assessment, you might want to structure the answers with proper introductory sentences, bullet points, and clear headings.

FLASHCARDS/KEY TERMS
Flashcards: Introduction to Cloud Computing

Card 1: What has changed the world now…
- Explosive growth in applications: biomedical informatics, space exploration, business analytics, web 2.0 social networking (YouTube, Facebook).
- Extreme scale content generation: e-science and e-business data deluge.
- Extraordinary rate of digital content consumption: Apple iPhone, iPad, Amazon Kindle.

- Exponential growth in compute capabilities: multi-core, storage, bandwidth, virtual machines (virtualization).
- Very short cycle of obsolescence in technologies: Windows Vista, Windows 7, Java versions, C, C#, Python.
- Newer architectures: web services, persistence models, distributed file systems/repositories (Google, Hadoop), multi-core, wireless and mobile.
- Diverse knowledge and skill levels of the workforce.

Card 2: What is Cloud Computing?
- Cloud Computing is a model for network-based computing over the Internet.
- It involves integrated and networked hardware, software, and Internet infrastructure.
- Provides hardware, software, and networking services to clients.
- Platforms hide complexity and provide simple interfaces/APIs.
- Offers convenience, on-demand network access, and shared configurable resources.
- Characterized by essential attributes: On-Demand, Ubiquitous Network Access, Location Independent Resource Pooling, Rapid Elasticity, Pay-as-You-Go.

Card 3: Conventional vs. Cloud Computing
Conventional:
- Manually Provisioned
- Dedicated Hardware
- Fixed Capacity
- Pay for Capacity
- Capital & Operational Expenses

Cloud:
- Self-provisioned
- Shared Hardware
- Elastic Capacity
- Pay for Use
- Operational Expenses

Card 4: Working Definition of Cloud Computing
- Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources.
- Resources include networks, servers, storage, applications, and services.
- Rapid provisioning and release with minimal management effort.
- Promotes availability and has five essential characteristics, three service models, and four deployment models.

Card 5: Five Key Cloud Characteristics/Attributes
1. Shared/Pooled Resources
2. Broad Network Access
3. On-Demand Self-Service
4. Scalable and Elastic
5. Metered by Use

Card 6: Cloud Service Models: IaaS, PaaS, SaaS
- IaaS (Infrastructure as a Service): Rent computing power and storage.
- PaaS (Platform as a Service): Provide development platform and tools.
- SaaS (Software as a Service): Access software applications via the cloud.

Card 7: Cloud Deployment Models
- Private Cloud: Dedicated to a single organization.
- Community Cloud: Shared by a specific community.
- Public Cloud: Available to the general public.
- Hybrid Cloud: Combination of public and private clouds.

Card 8: Virtualization
- Virtualization reduces hardware costs and energy consumption.
- Run multiple operating systems and applications on the same server.
- Offers flexibility and better resource utilization.
- Different types of virtualization: KVM, Xen, Vsphere, Hyper-V.

Card 9: Cloud vs. Grid Computing
- Cloud computing focuses on leased resources and services.
- Grid computing focuses on sharing distributed computing power.
- Clouds are more suited for long-term services and commercial needs.
- Grids are used for distributed research collaborations.

Card 10: Cloud Computing Advantages
- On-demand resource availability.
- Cost efficiency.
- Hardware independence.
- Scalability and flexibility.
- Pay-as-you-go pricing.
- Simplified management.

Card 11: Cloud Computing Disadvantages
- Requires Internet connectivity.
- No functionality without an Internet connection.
- Limited offline access.
- Data security concerns.
- Dependency on external providers.

Card 12: Cloud Operating Systems
- Examples: Eye OS, Amoeba OS, Glide OS, Start force, myGoya, CorneliOS, Lucid Desktop, Cloudo, Ghost, Zimdesk, Start force.

Card 13: Cloud Computing Applications
- Audio Player
- Evernote Viewer
- Video Player
- Media Player

- Flash Player
- Google Document Viewer
- Messenger
- Sticky Note
- Web Browser Lite

Card 14: Cloud Ready?
Factors indicating readiness for cloud adoption:
- Independence of processes, applications, and data.
- Well-defined integration points.
- Adequate security measures.
- Healthy core enterprise architecture.
- Alignment with web-based platforms.
- Cost considerations.
- New applications.

Card 15: Cloud Service Delivery Models
- SaaS: End users access cloud-hosted applications.
- PaaS: Developers use platforms for application creation.
- IaaS: Network architects rent computing power and resources.

Card 16: Cloud Deployment Models
- Private Cloud: Dedicated to a single organization.
- Community Cloud: Shared by a specific community.
- Public Cloud: Available to the general public.
- Hybrid Cloud: Combination of public and private clouds.

Card 17: Cloud vs. Grid vs. Distributed Computing
- Cloud focuses on leased resources and services.
- Grid enables shared distributed computing power.
- Distributed computing has multiple nodes collaborating on a task.

Card 18: Cloud Computing vs. Grid Computing
- Cloud Computing emphasizes on-demand resource availability.
- Grid Computing emphasizes distributed collaboration and resources.
- Clouds are more suited for long-term services and commercial needs.
- Grids are used for distributed research collaborations.

Card 19: Virtualization and Cloud Computing
- Virtualization reduces hardware costs and increases efficiency.
- Allows running multiple operating systems and applications on the same server.
- Improves resource utilization and flexibility.
- Facilitates cloud computing deployment.

Card 20: Cloud Computing Advantages
- On-demand resource availability.
- Cost efficiency.

- Hardware independence.
- Scalability and flexibility.
- Pay-as-you-go pricing.
- Simplified management.

Card 21: Cloud Computing Disadvantages
- Requires Internet connectivity.
- No functionality without an Internet connection.
- Limited offline access.
- Data security concerns.
- Dependency on external providers.