INTRODUCTION TO CLOUD COMPUTING

UML CLOUD COMPUTING CLUB

DISCORD:

ENGAGE:

I. Introduction

Welcome to the UML Cloud Computing Club!

I. INTRODUCTION: ABOUT US

- Faculty Advisor: Dr. Johannes Weis
- President: Martin Marwad
- Vice-President: Matthew Kostandin
- Secretary: Nuno Mestre
- Treasurer: Matthew Harper

INTRODUCTION: ABOUT US

- Raising awareness and interest in cloud computing among students.
- Providing a platform for students to learn and experiment with cloud computing technologies.
- Building a community of like-minded students who share an interest in cloud computing.
- Organizing events and activities that help students develop their cloud computing skills and knowledge.
- Creating networking opportunities for students to connect with industry professionals in the cloud computing field.

INTRODUCTION: ICE BREAKER!

Go around the room and list:

- **Name**
- **Major**
- **Freshman/Sophomore/Junior/Senior/Graduate?**
- **What interests you about cloud computing? (Can be specific or just your general curiosity about the topic.)**

II. What is Cloud Computing?

II. WHAT IS CLOUD COMPUTING

- Definition and background of cloud computing
- Comparison with traditional computing models
- Examples of cloud computing in use

II. WHAT IS CLOUD COMPUTING: FAST FACTS

- Cloud computing was a $371.4 billion industry in 2020, projected to be $832.1 billion by 2025.

- Over 70% of American companies plan to increase their cloud budgets in 2022.

- 94% of enterprises use cloud services.

- By 2025, there will be over 100 zettabytes of data stored in the cloud. (1 zettabyte = 1 billion terabytes, which is 1 trillion gigabytes.)

- Human error is to blame for 88% of cloud breaches. Cloud security is a top concern for 75% of enterprises.

- Remote work has increased due to cloud computing.

II. WHAT IS CLOUD COMPUTING: DEFINITIONS

- NIST (National Institute of Standards and Technology) definition of Cloud Computing: Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (networks, virtual machines, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

- Informal definition: Cloud computing refers to the delivery of on-demand computing resources and services over the internet, allowing users to access and use resources as needed, without the need for on-premises infrastructure or hardware maintenance.

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II. WHAT IS CLOUD COMPUTING: DEFINITIONS

Where did the term "cloud computing" originate from?

- The term cloud computing is believed to have originated in 1996 when Compaq (computer manufacturer acquired by HP) used the phrase in an internal document.

- Ramnath Chellappa is credited with being the first to use the term cloud computing in its modern context in a 1997 lecture titled "Intermediaries in Cloud-Computing".

- The term was then popularized in 2006 when Google and Amazon began using the phrase to describe their services.

II. WHAT IS CLOUD COMPUTING: REAL WORLD EXAMPLES

- Data backup and disaster recovery

- Website and application hosting

- Big data analytics and machine learning

- Software development and testing

- Virtual desktop infrastructure (VDI)

- Content delivery networks (CDN)

- Internet of Things (IoT) processing and analysis

- Video and audio streaming

- Email and productivity applications (e.g. Microsoft Office 365)

- Customer relationship management (CRM) and enterprise resource planning (ERP) systems.

II. WHAT IS CLOUD COMPUTING: CAREER OUTLOOKS

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III. Cloud Computing Models

III. CLOUD COMPUTING MODELS

- Overview of cloud computing service models: IaaS, PaaS, SaaS
- Advantages and disadvantages of each model
- Use cases and examples

III. CLOUD COMPUTING MODELS: PUBLIC, PRIVATE, AND HYBRID

There are three types of clouds:

- A **public cloud** is a type of cloud computing where services are offered over the internet to anyone who wants to use them. It's owned and operated by a third-party cloud service provider, and users share computing resources like servers and storage.

- A **private cloud** is a cloud computing model where the cloud infrastructure is dedicated to a single organization. It's usually maintained on-premises, but can also be hosted by a third-party service provider. Private clouds offer more control and security, but require more resources to maintain.

- A **hybrid cloud** is a combination of public and private clouds, allowing organizations to benefit from both models. Hybrid clouds provide flexibility, enabling businesses to use public cloud resources for non-sensitive workloads, while keeping sensitive data in a private cloud for security reasons.

III. CLOUD COMPUTING MODELS: IaaS, PaaS, and SaaS

IaaS, PaaS, and SaaS are the three main cloud computing service models.

- **IaaS (Infrastructure as a Service)** is a cloud computing model where a third-party provider hosts and maintains the underlying infrastructure, including servers, storage, networking, and virtualization. Users typically rent the infrastructure and use it to deploy and run their own applications.

- **PaaS (Platform as a Service)** is a cloud computing model where a third-party provider offers a platform on which users can build, deploy, and manage their own applications. PaaS providers typically offer tools and services for application development, deployment, and scaling, as well as middleware, database management, and other infrastructure components.

- **SaaS (Software as a Service)** is a cloud computing model where a third-party provider hosts and delivers software applications over the internet. Users typically access the applications through a web browser or API, and the provider manages all aspects of the software, including maintenance, security, and upgrades.

III. CLOUD COMPUTING MODELS: IaaS

Pros:

- **Scalability**: Customers can scale up or down their infrastructure as needed, without the need to purchase additional physical hardware or face hardware obsolescence.

- **Cost-effective**: Customers only pay for the infrastructure components they need and use, instead of having to invest in and maintain their own hardware and data centers.

- **Easy to manage**: Customers don't need to worry about maintaining the hardware or network infrastructure, freeing up IT staff to focus on other tasks.

- **Geographical flexibility**: Customers can choose to host their infrastructure in a variety of regions or data centers to ensure low latency or meet regulatory requirements.

Cons:

- **Security concerns**: Customers may have concerns about data privacy and security when using IaaS, as they are relying on a third-party provider to manage and secure their infrastructure.

- **Dependency**: Customers are dependent on the provider's infrastructure and need to ensure that their provider is reliable and available at all times.

- **Complexity**: IaaS can be complex, especially when trying to manage and configure multiple infrastructure components.

- **Customization**: Although customers have more control over their infrastructure than with other cloud service models, there may be some restrictions on customization.

III. CLOUD COMPUTING MODELS: IaaS

Examples of IaaS providers include:

- Amazon Web Services (AWS)

- Microsoft Azure

- Google Cloud Platform

- IBM Cloud

- Oracle Cloud

III. CLOUD COMPUTING MODELS: PaaS

Pros:

- **Quick deployment**: PaaS allows developers to quickly deploy their applications, as the infrastructure is already set up and ready to use.

- **Scalability**: PaaS providers offer scalable infrastructure, which can be easily adjusted based on the application's changing needs.

- **Cost-effective**: PaaS is a cost-effective solution, as users pay only for the resources they need, and don't have to invest in physical infrastructure.

- **Easy collaboration**: PaaS makes it easy for multiple developers to collaborate on an application by providing shared tools and resources.

- **Reduced complexity**: PaaS reduces the complexity of managing and maintaining infrastructure, allowing developers to focus on building and improving their applications.

Cons:

- **Limited control**: PaaS users have limited control over the underlying infrastructure, which may be a concern for some developers.

- **Vendor lock-in**: PaaS users are typically tied to a specific vendor, which may make it difficult to switch providers or move to an on-premise solution.

- **Security concerns**: As PaaS providers manage the underlying infrastructure, users may have concerns about the security of their applications and data.

- **Customization limitations**: PaaS may have limitations on the customization of the underlying infrastructure, which may be a concern for some applications.

III. CLOUD COMPUTING MODELS: PaaS

Common examples of PaaS providers include:

- Heroku

- Google App Engine

- Microsoft Azure

- AWS Elastic Beanstalk.

III. CLOUD COMPUTING MODELS: SaaS

Pros:

- **Low up-front costs**: With SaaS, there is no need to purchase and maintain servers or IT infrastructure, which reduces upfront costs.
- **Easy deployment and management**: SaaS applications are typically easy to deploy and manage, and the software provider is responsible for updates and maintenance.
- **Accessible from anywhere**: SaaS applications can be accessed from anywhere with an internet connection, making them ideal for remote work.
- **Scalable**: SaaS applications can be easily scaled up or down to meet changing business needs.
- **Easy integration**: SaaS applications can be easily integrated with other cloud-based services.

Cons:

- **Dependence on the provider**: Users are reliant on the software provider for updates, maintenance, and data security.
- **Customization limitations**: Customizing a SaaS application beyond the features and options provided by the provider can be challenging.
- **Security concerns**: SaaS applications require trust in the provider to secure user data and maintain data privacy.
- **Integration limitations**: Integrating SaaS applications with on-premises applications can be challenging.

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III. CLOUD COMPUTING MODELS: SaaS

Common examples of SaaS applications include:

- Google Workspace (formerly G Suite)

- Microsoft Office 365

- Salesforce

- Dropbox

- Slack

- Zoom

- HubSpot

- Adobe Creative Cloud

IV. Key Cloud Computing Technologies

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IV. KEY CLOUD COMPUTING TECHNOLOGIES

- **Cloud Storage**: A service that allows you to store and retrieve data over the internet, such as Amazon S3 and Google Cloud Storage.

- **Cloud Databases**: A service that allows you to create, manage, and scale databases in the cloud, such as Amazon RDS and Azure SQL Database.

- **Cloud Security**: A set of tools and technologies used to protect data, applications, and infrastructure in the cloud, such as AWS Identity and Access Management (IAM) and Google Cloud Security Command Center.

- **Cloud Networking**: A service that provides a set of tools and technologies used to connect and manage cloud resources and applications, such as Amazon VPC and Azure Virtual Network.

- **Cloud Analytics**: A service that provides tools for processing and analyzing large amounts of data in the cloud, such as Amazon Redshift and Google BigQuery.

V. Cloud Computing Demo

V. CLOUD COMPUTING DEMO

- CloudFormation

VI. Conclusion

VI. CONCLUSION

- We hope this served as a good introduction to what cloud computing is and what it can be used for.

- Club meetings every Thursday, 6:30pm. Future meetings will be more interactive and hands on, so please bring laptops!