Introduction to Cloud Computing

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Course Information

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Course Presenter's Biography

Dr. Phillip A. Laplante is Professor of Software and Systems Engineering at The Pennsylvania State University. He received his B.S., M.Eng., and Ph.D. from Stevens Institute of Technology and an MBA from the University of Colorado. He is a Fellow of the IEEE and SPIE and has won international awards for his teaching, research and service. Since 2010 he has led the effort to develop a national licensing exam for software engineers. He has worked in avionics, CAD, and software testing systems and he has published more than 30 books 200 scholarly papers. He is a licensed professional engineer in the Commonwealth of Pennsylvania. He is also a frequent technology advisor to senior executives, investors, entrepreneurs and attorneys and actively serves on corporate technology advisory boards. His research interests are in software testing, requirements engineering and software quality and management. Prior to his appointment at Penn State he was a software development professional, technology executive, college president and entrepreneur.

Syllabus

About this course

Cloud computing is one of the hottest technical topics today, with broad-ranging effects across IT, Information Architecture, Business, Software Engineering, and Data Storage. This course serves as an introduction to cloud computing for individuals and organizations.

Prerequisites

No previous programming or architecture knowledge is necessary

Time Commitment

Approximately six hours total, self-paced

Deadlines

All coursework, assignments, and tests must be complete by 10 November, 23:30 UTC

What you'll learn

- Basic concepts of cloud computing
- The NIST model for cloud infrastructure elements
- Cloud infrastructure from the consumer and producer views
- Basic issues in cloud security
- Cloud usage scenarios
- Consumer-provider relationships
- Economics and benefits analysis

Grading

Assignment Type	# of Assignments	# Droppable	# of Attempts Allowed	% of Overall Grade
Knowledge Check	10	3	1	20
Part Quiz	3	0	1	40
Final Test	1	0	1	40

Letter Grade	Overall Percentage to Earn
A	90-100
B	80-89
C	70-79
D	65-70
F	0-64

Course Outline

Part 1: Overview of Cloud Computing

- Advantages, History, and Characteristics of Cloud Computing
- Service & Deployment Models, Infrastructure, and Consumer View
- Security and Scenarios
- Assumptions, Terms of Service, & Promises
- Limitations, Obligations, Recommendations, & Implications
- Summary of Part 1
- Part 1 Quiz

Part 2: Dynamic Interactions and Computing Architectures

- Overview
- Service, Deployment, Scope, and Control
- SaaS Interaction Dynamics and Software Stack Control
- SaaS Benefits, Issues and Concerns, Suitability, and Recommendations
- PaaS Dynamics and Software Stack Control
- PaaS Benefits, Issues and Concerns, Suitability, and Recommendations
- IaaS Abstract Interaction Dynamics and Software Stack Control
- IaaS Operational View
- IaaS Benefits
- IaaS Issues and Concerns, and Recommendations
- Summary of Part 2
- Part 2 Quiz

Part 3: Economics of Cloud Computing

- Overview
- Review of Service Models
- SWOT Analysis and Value Proposition
- General Cloud Computing Risks
- Risks 2: Performance, Network Dependence, Reliability, Outages, and Safety Critical Processing
- Risks 3: Compliance and Information Security
- Value and Risk of Open Source Software
- Cloud Computing Cost Analysis
- Selecting an IaaS Provider
- Cloud Standards and Intercloud Interoperability
- Recommendations for Successful Cloud Migration
- Summary of Part 3
- Part 3 Quiz

Discussion Guidelines

We ask you to build community and share, in your own words, your thoughts about the course content and any about news or research related to the class. We ask that you use the discussion space as:

- A forum for discussing topics raised in the course and demonstrate your understanding or application of the course material
- A medium to discuss questions about assignments, readings, and course content with peers and course staff
- A medium for collaboration and the exchange of ideas.
- An online meeting place for social interaction among peers.

Discussion boards are moderated by the course instructional team.

For more information on discussion boards, please see below and refer to the discussion board details https://www.edx.org/blog/getting-most-out-edx-discussion-forums.

In order for discussion boards to run smoothly, please refer to the guidelines below for basic discussion board etiquette. How you phrase your posts is important. Please remember that the participants in the course come from all over the world, representing a variety of cultures and speaking many different languages. Be respectful of others and be aware of the tone of your posts. Think through and re-read your posts before posting! A few guidelines are outlined below.

- Please limit your posts/responses to 200 words or less (by request of EdX). In other words, be concise in your posts/responses.
- Reflect on and respond to Discussion Board questions and post your contribution, in your own words.
- To build community, we ask that you review 1-2 items posted by your classmates and respond to at least one of those postings.
- Before posting, read what others have previously posted to avoid repeating comments. You can always upvote good posts. Click on the green “plus” button so that good posts and/or responses can be found more easily. You can search by votes to find the most interesting posts.
- Never use derogatory language or make insensitive comments. (You should flag inappropriate posts!)
- Do not personally attack people. It’s fine to disagree, but use facts and reasons to back up an argument, not personal attacks.
- Stick to the topic of the discussion board.
- Remember that humor is often difficult to convey in text – avoid it if people might not understand what you are trying to say.
- Avoid slang and use appropriate spelling – given the diversity in the class, what might mean something to you will not mean the same thing to someone else. Correct spelling and grammar will help others to understand you and provide useful responses. Avoid using ALL CAPS, abbrv of wrds (abbreviation of words), and excessive punctuation!!!!!!!!!
- Use correct grammar.
- If you reference something, provide everyone with the link or reference.
- Notify the course staff of bugs. Include [STAFF] at the beginning of your post’s title – this will help us identify your question or problem and respond to it.

Cloud consumer or consumer

a person or organization that is a customer of a cloud resources; note that a cloud customer may itself be a cloud and that clouds may offer services to one another. Also called customer or user.

Client

a machine or software application that accesses a cloud over a network connection, perhaps on behalf of a consumer

Cloud provider or provider

an organization that provides cloud services.

Community cloud

a cloud where the infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns, such as shared mission, security requirements, policy, and compliance considerations.

Denial of service attack

a cyberattack in which a server is flooded with requests in order to severely slow server processing capability.

Firewall

software and/or hardware that is used to control access and provide security between a computer and a network.

Guest operating system

an operating system running within a virtual machine.

Hybrid cloud

a cloud where the infrastructure is a composition of two or more distinct cloud infrastructures, either private, community, or public, which remain unique entities, but are bound together by standardized or proprietary technology.

Hypertext transfer protocol (HTTP)

a text based communication protocol for sharing information between computers.

Infrastructure as a Service (IaaS)

when a consumer is able to access processing, storage, networks, and other fundamental computing resources.

Intercloud gateway

an intercloud communication capability analogous to an Internet Router.

Latency

the time delay that a system experiences when processing a request.

Man-in-the-middle attack

a type of attack where an eavesdropping system “impersonates,” that is, simulates, the transmitting and receiving parties over a network for the purposes of capturing sensitive information.

Persistent local storage (PLS)

simulated, disk-like electronic storage for virtual machines used to preserve their work as the VMs are de-allocated and later reallocated. This storage is not permanently bound to any specific computer system.

Privacy

a system quality that addresses the confidentiality of data for specific entities, such as consumers or others whose information is processed in a system.

Private cloud

a cloud where the infrastructure is provisioned for exclusive use by a single organization with multiple consumers.

Public cloud

a cloud where the infrastructure is provisioned for open use by the general public.

Public key cryptography

an encryption method that uses a two-part key: a public key and a private key. Users generally distribute their public key and secure their private key.

Reliability

a system quality often measured as the probability that a system will offer failure-free service for a specified period of time within the bounds of a specified environment.

Safety-critical system

a hardware or software system that can affect the health, safety or welfare of the public and is usually regulated by government authorities.

Software as a Service (SaaS)

when a provider provides the capability for a consumer is to use the provider’s applications running on a cloud infrastructure.

SWOT analysis

a strategic decision making process that considers the strengths, weaknesses, opportunities and threats to some enterprise or organization.

Virtual machine (VM)

a software program that emulates a model of computer hardware. The computer can be controlled through software instructions sent over a network.

Virtual machine sprawl

when VMs are created and allowed to persist even when unneeded. VM sprawl can inflate costs and compromise security.

Virtual machine monitor (VMM)

also called the hypervisor. VMMs use hardware to synthesize one or more virtual machines (VMs).

Virtualization

the simulation of the software and/or hardware upon which other software runs.

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