Harvard Extension School
Cloud Services, Infrastructure and Computing
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Course Description
Off-premise/cloud services, infrastructure and computing have have replaced in-house data centers across businesses of every size. Businesses rely on cloud services because of their extremely high efficiency, ease of setup and their ability to scale with demand. It is essential for today's engineers to understand how robust architectures can be implemented on a cloud platform, and to understand in depth which services and tools are available for them to use. We will be using Amazon Web Services (AWS).

Attendance & Support
Attendance is not mandatory, although there are deadlines for homeworks and the semester exam. All lectures and labs will be recorded and can be replayed at any time. Questions may be asked of the teaching staff through the online discussion board.

Pre-requisites
This course will not be a programming course and you will not be evaluated on the quality of your code, but it is expected that you are capable of reading and modifying code. Languages used will be Java and Python.
Familiarity with basic Unix commands is a plus.

Objectives
-- Overview of the core features and services that form the backbone of modern cloud-based solutions
-- Analyses of typical use cases benefiting from cloud-based services and the corresponding solution architectures
-- Deep-dive into technical implementations of key services
-- Hands-on experience of building and scaling crucial services

The course will aim to cover a very broad range of cloud technologies, rather than deep dive into a specific technological area. By the end of this course you will have a solid understanding of the most commonly used cloud platform services. Although we will be using AWS for this course, the concepts learned here can be applied to other cloud providers.

Grading
There will be weekly homeworks worth 100 points each for weeks 1-12. The lowest graded homework will be dropped and will not count toward your final grade. Bonus problems may occasionally be offered on homework assignments enabling you to make up for lost points. Assignments may be turned in up to three days late, but with a 10% penalty for each late day. After three days the assignment can no longer be submitted.

There will be a final project at the end of the semester worth 200 points. The main objective of the final project will be to investigate a cloud technology not already covered in the course, or to go significantly deeper into a topic covered during the course.

Schedule

Week	Topic
Week 1	Introduction - Overview of Cloud Services: what is IaaS, PaaS, SaaS, etc - Registration and account setup - IAM - Identity and Access Management - Proper security group configuration practices - Billing alerts / usage monitoring
Week 2	Infrastructure as a Service - Scaling concepts: vertical / horizontal scaling of hardware and software - Elastic Cloud Compute (EC2) - Intro - Operating System options - EC2 Security Groups - AWS Workspaces
Week 3	AMIs and Elastic Block Storage - EC2 in depth - AMIs - EBS - Publishing AMIs, using marketplace AMIs - Attaching and detaching storage options
Week 4	Virtual Private Clouds and Network Management - Virtual Private Clouds - Subnets - Internet Gateways - Route Tables - NAT Gateways - Hybrid Environments and VPC Peering
Week 5	Data Storage and Content Delivery Networks - Simple Storage Service (S3) - Elastic File System (EFS) - CloudFront
Week 6	Route 53, AWS SDK, Messaging - Domain Name Service - The AWS SDK - Simple Notification Service (SNS) - Simple Queue Service (SQS)

Week 7	Load Balancing and Auto Scaling - Vertical versus horizontal scaling revisited - Load balancers: Application, Network, Classic
Week 8	Serverless Applications - JSON - API Gateway - RESTful Web Services - Docker Containers
Week 9	Data Analytics - Big Data Overview - Elastic MapReduce (EMR) - What is MapReduce, typical use cases
Week 10	Databases - Aurora and Relational Databases - DynamoDB and NoSQL Databases
Week 11	Machine Learning - Timeline of ML - ML Categories - Amazon ML
Week 12	Amazon Alexa - Voice User Interface (VUI) and the evolution from GUI - Natural Language Processing - Lambda functions
	Thanksgiving Break
Week 14	IoT Core - What is IoT; sensors, actuators, mesh networks - Typical IoT use cases; how is data collected and used - Typical IoT tools for messaging, data storage
Week 15	Guest Speaker - Topic TBA
Week 16	Final Project Presentations

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