

# CS15-319 / 15-619

# Cloud Computing

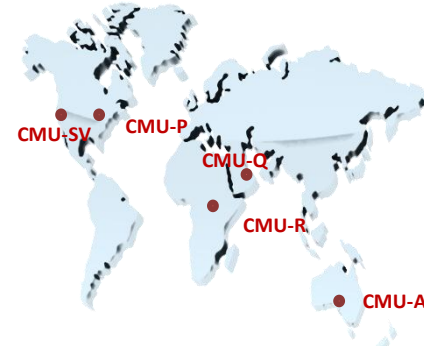
Recitation 1

Course Overview and Introduction

January 14<sup>th</sup> & 16<sup>th</sup> 2014

<http://www.qatar.cmu.edu/~msakr/15619-s14/>

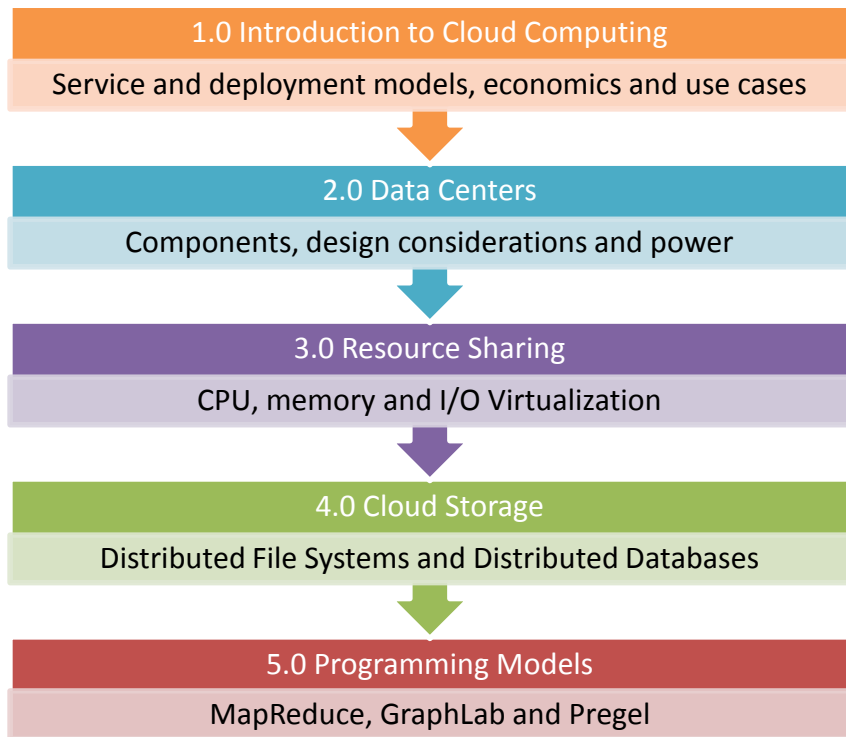
# Course Overview



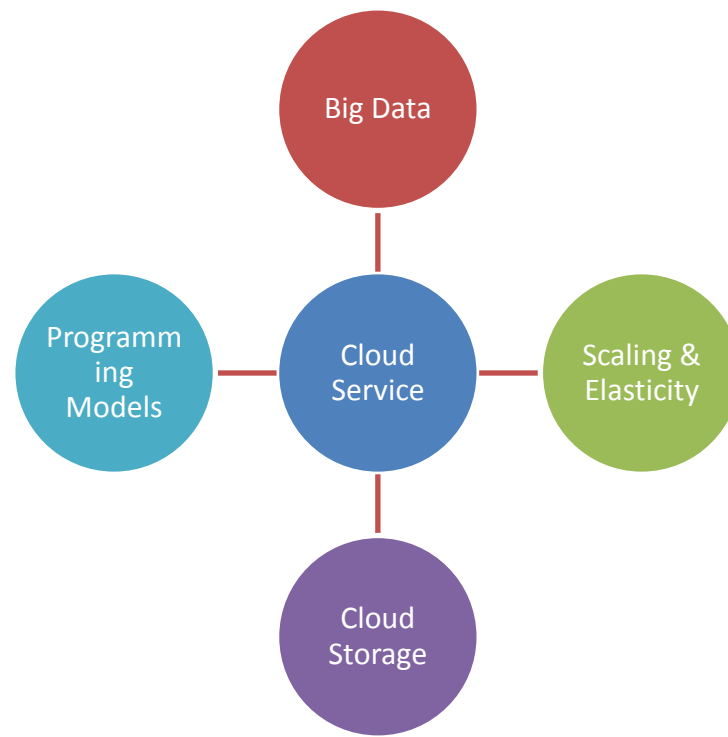
- Applied aspects of cloud computing
  - Between systems and services



## Online content on OLI



## Projects on AWS



# Teaching Staff / Getting Help

Prof. Majd F. Sakr



[msakr@cs.cmu.edu](mailto:msakr@cs.cmu.edu)  
(GHC 9125)

Suhail Rehman



[suhailr@qatar.cmu.edu](mailto:suhailr@qatar.cmu.edu)  
(2044)

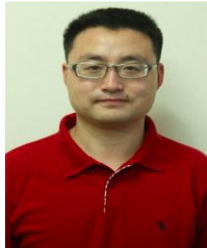
Jason Boles



[jboles@qatar.cmu.edu](mailto:jboles@qatar.cmu.edu)  
(2044)

# Teaching Assistants / Getting Help

Jiangjie (Becket) Qin



Hongchao Deng



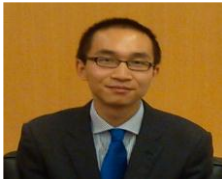
Ying Gao



Wenzhe Li



Kaiyi Liu



Guangcheng Lu



Qian Mao



Luning Pan



Ravi Chandra



Siyang Yu



Tao Yu



Xiaokang Zhang



Xialin Zhu



# Course Organization



Course Units



Course Projects



Weekly Recitations



Discussions on Piazza

# Engagement Model



**Tuesdays:** Videotaped  
**Thursdays:** Video conf. to SV

# Course Objectives

## Students will learn:

- the fundamental ideas behind **Cloud Computing**;
- the basic ideas and principles in **data center** design and management;
- the resource sharing and **virtualization** techniques that serve in offering software, computation and storage services on the cloud;
- about **cloud storage** technologies and relevant distributed file systems;
- the variety of **programming models** and develop working experience in one of them.

# Target Audience

- Technical Majors
- Juniors / Seniors / Masters
- Pre-requisites:
  - 15213 – Introduction to Computer Systems
  - Practice:
    - Unix, scripting, python, & java



# Units

Unit #	Title	Modules and Description
1	<b>Introduction</b>	Introduction to Cloud Computing Building Blocks and Service Models in Cloud Computing
2	<b>Data centers</b>	Historical Perspective Datacenter Components Design Considerations
3	<b>Virtualization</b>	Resource Abstraction Resource Sharing Sandboxing Case Study: Amazon EC2
4	<b>Cloud Storage</b>	Introduction to Storage Systems Cloud Storage Concepts Distributed File Systems (HDFS, PVFS) Cloud Databases (HBase, Cassandra) Case Studies: S3 Object Storage
5	<b>Programming Models</b>	Introduction to Programming Models Variety of Programming Models Case Study: MapReduce, Pregel, GraphLab

# Projects

- Four Projects (all students):
  0. Primer (Complete by Sunday, January 19<sup>th</sup>)
  1. Big Data
  2. Scalability and Elasticity
  3. Cloud Storage
  4. Programming Models
- 15-619 Project (extra 3-units)
  - One multi-week team project to build a complete web service.

# Online Course Content - OLI

Course content is on the Open Learning Initiative  
Students are automatically registered:

- <http://oli.cmu.edu>
  - Access through Blackboard
- Demo

My Courses >

Syllabus: Cloud Computing: Jan - May 13

Instructor: Majd Sakr ([msakr@qatar.cmu.edu](mailto:msakr@qatar.cmu.edu))

Course Key: 15319s13

[Syllabus](#) [Roster](#) [Gradebook](#) [Unscored Activities](#)

Before you begin, [Test and Configure](#) your system for use with this course.

Cloud Computing		
Assignment		Status
<b>UNIT 1: Introduction to Cloud Computing</b>		
<a href="#">Module 1: Introduction to Cloud Computing</a> ( <a href="#">Gradebook</a> ) ( <a href="#">Learning Dashboard</a> )		
<a href="#">Module 2: Building Blocks and Service Models</a> ( <a href="#">Gradebook</a> ) ( <a href="#">Learning Dashboard</a> )		
Quiz 1: Introduction to Cloud Computing	<a href="#">Checkpoint</a>	<a href="#">Not yet assigned</a> <a href="#">Due date TBD by instructor</a>

Cloud Computing Course Projects		
Assignment		Status
<b>Course Project Preparation</b>		
<a href="#">Amazon Web Services Introduction and Account Setup</a> ( <a href="#">Gradebook</a> ) ( <a href="#">Learning Dashboard</a> )		
AWS Account Setup	<a href="#">Checkpoint</a>	<b>Available Now</b> <a href="#">Due 1/21/13 12:01 AM</a>

# Syllabus

- Updated on webpage
- Provides details on:
  - Course Objectives
  - Learning Outcomes
  - Policies
  - Grading
  - Tentative Schedule

## 15-319/15619: CLOUD COMPUTING

ONLINE LEARNING INITIATIVE  
COURSE DESCRIPTION & SYLLABUS  
CARNEGIE MELLON UNIVERSITY IN QATAR  
SPRING 2013

### 1. OVERVIEW

**Title:** Cloud Computing  
**Units:** 15319 is 9 units and 15-619 is 12 units.  
**Pre-requisites for CMU Students:** A "C" or better in 15-213.  
**Pre-requisites for Others:** Knowledge of Computer Systems, Java programming.  
**OLI Course Link:** <http://community.oli.cmu.edu>  
**OLI Course Key:** 15319s13  
**Piazza Link:** <https://piazza.com/class#spring2013/1531915619>  
**Course Calendar:** [Google Calendar Link](#)  
**Course Mailing List:** [15319-s13@lists.qatar.cmu.edu](mailto:15319-s13@lists.qatar.cmu.edu)

### 2. COURSE DESCRIPTION

This on-line course gives students an overview of the field of Cloud Computing, its enabling technologies, main building blocks, and hands-on experience through 4 projects utilizing a public cloud (Amazon Web Services). Cloud computing services are being adopted widely across a variety of organizations and in many domains. Simply, cloud computing is the delivery of computing as a service over a network, whereby distributed resources are rented, rather than owned, by an end user as a utility.

The course will introduce this domain and cover the topics of data centers, virtualization, cloud storage, and programming models. As an introduction, we will discuss the motivating factors, benefits, challenges, and service models. Modern data centers enable many of the economic and technological benefits of the cloud paradigm; hence, we will describe several concepts behind data center design and management. Next, we will focus on virtualization as a key cloud technique for offering software, computation and storage services. We will study how CPU, memory and I/O resources are virtualized, with examples from Xen and VMWare, and present real use cases such as Google App Engine and Amazon EC2. Subsequently, students will learn about different cloud storage concepts including data distribution, durability, consistency and redundancy. HDFS, PVFS and S3 will be presented as examples of underlying distributed file systems. Students will understand the details of the MapReduce programming model and gain a broad overview of alternative programming models such as Pregel, Dryad, Dremel, and GraphLab, among others.

Students will work with Amazon Web Services, use them to rent and provision compute resources and then program and deploy applications that run on these resources. In addition, students will work with cloud storage systems and learn to develop applications in the MapReduce programming paradigm.

# Grading

Course Elements	#	Weight
Projects	4 or 5	75%
OLI Unit Checkpoint Quizzes	5	25%

- All projects are equal weight
  - 18.75% for 15-319
  - 15% for 15-619
- All quizzes are equal weight
  - 5% for each quiz

# Academic Integrity

It is the responsibility of each student to produce her/his own original academic work.

- Individual work:
  - Weekly Project Modules
  - Unit Checkpoint Quizzes
- Team work:
  - 15-619 Project

Read the [university policy on Academic Integrity](#).

# What is Cheating

- Sharing code or other electronic files either by copying, retyping, looking at, or supplying a copy of any file.
- Copying answers to any checkpoint quiz from another individual, published or unpublished written sources, and electronic sources.
- Collaborating with another student or another individual on Unit Checkpoint Quizzes or Project Module Checkpoint Quizzes.
- Sharing written work, looking at, copying, or supplying work from another individual, published or unpublished written sources, and electronic sources.
- Collaboration in team projects is strictly limited to the members of the team.
- ...

# Tentative Schedule

Date	OLI Content	Quiz	Project	Extra Project
13-Jan-14	Unit 1 – Introduction		Primer	
20-Jan-14		Unit 1 Checkpoint Quiz	Project 1	
27-Jan-14	Unit 2 – Datacenters			
3-Feb-14		Unit 2 Checkpoint Quiz	Project 2	
10-Feb-14	Unit 3 – Virtualization			
17-Feb-14				
24-Feb-14		Unit 3 Checkpoint Quiz	Project 3	
3-Mar-14	Unit 4 – Cloud Storage			
17-Mar-14				
24-Mar-14		Unit 4 Checkpoint Quiz		15-619 Extra Project
31-Mar-14	Unit 5 – Programing Models			
7-Apr-14				
14-Apr-14				
21-Apr-14				
28-Apr-14		Unit 5 Checkpoint Quiz	Project 4	



# Course Administration

- Students are automatically registered on OLI through [blackboard.andrew.cmu.edu](https://blackboard.andrew.cmu.edu)
- A *\*single\** Piazza course page is created
  - We manually register students to Piazza
- Schedule of units and quizzes is on OLI
  - Weekly project modules are due on Sundays
  - Content quizzes are due on Thursdays

# Special Note on Amazon EC2



- Paid Cloud Service – billed by the hour
- Start a resource only when you need it
- To explore, use a micro instance
  - You can keep one micro instance running 24x7
- Terminate all other resources as soon as you are done with them
- Students will be penalized for over usage
  - We have a fixed budget, do not abuse the resources!

# Check AWS Services Charges

Amazon Web Services

Sign Up My Account / Console English

AWS Products & Solutions AWS Product Information Support

**Account**

- Account Activity**
- AWS Identity and Access Management
- AWS Management Console
- Consolidated Billing
- Reserved Instance Marketplace Setting
- DevPay
- Manage Your Account
- Payment Method
- Personal Information
- Security Credentials
- Usage Reports
- Billing Alerts
- Billing Preferences

**Cost Allocation Report**

- Manage Cost Allocation Report

## Account Activity

W... | Sign Out  
Account Number 1732-1996-3889

**New Billing Console**

The Account Activity page is moving to the AWS Management Console, and it has a fresh new look. You're invited to [Preview the Billing Console](#) and to leave us feedback using the link located at the bottom of the Billing Console page.

You are eligible for the [AWS Free Usage Tier](#). See the [Getting Started Guide AWS Free Usage Tier](#) to learn how to get started with the free usage tier.

Your account is enabled for monitoring estimated charges. [Set your first billing alert](#) to receive an e-mail when charges reach a threshold you define. [Learn More](#)

### This Month's Activity as of January 12, 2014

The statement period for this report is January 1 - January 31, 2014. The charges on this page currently show activity through approximately 01/12/2014 21:06 GMT.

Select a different statement:

## Summary

https://portal.aws.amazon.com/gp/aws/developer/account?ie=UTF8&action=activity-summary

https://portal.aws.amazon.com/gp/aws/manageYourAccount

# Check AWS Services Charges

**This Month's Activity as of August 26, 2013**

The statement period for this report is August 1 - August 31, 2013. The charges on this page currently show activity through approximately 08/26/2013 19:01 GMT.

Select a different statement:

### Summary

<b>AWS Service Charges</b>	<b>\$0.00</b>
<b>Usage Charges and Recurring Fees</b> <small>(More Info)</small>	\$0.00
<small>View estimated charges</small>	
<b>Total new charges for this statement</b>	<b>\$0.00</b>

All charges this month will be paid for by AWS Account 9392-2385-3384.

### Details

[Expand All Services](#) | [Collapse All Services](#) | [Printer Friendly Version](#)

<b>AWS Service Charges</b>	<b>\$0.00</b>	
<b>Amazon Elastic Compute Cloud</b>	<b>\$0.00</b>	
<small>Download Usage Report &gt;</small>		
EDU_Course_Sakr_CarnegieMellon_Summer2013	Credit	-4.94
		<b>-4.94</b>
<b>US East (Northern Virginia) Region</b>		
<b>Amazon EC2 running Linux/UNIX</b>		
\$0.060 per M1 Standard Small (m1.small) Linux/UNIX instance-hour (or partial hour)	6 Hrs	0.36
\$0.006 per Micro Instance (t1.micro) instance-hour (or partial hour) (blended price)*	650 Hrs	4.04
<b>Amazon EC2 EBS</b>		
\$0.080 per GB-month of provisioned storage under monthly free tier (blended price)*	6.785 GB-Mo	0.54
\$0.00 for the first 2 million I/O requests under monthly free tier	116,945 IOs	0.00
<b>Amazon CloudWatch</b>		
\$0.00 per request - first 1,000,000 requests	7 Requests	0.00
		<b>4.94</b>
<b>Amazon SimpleDB</b>	<b>\$0.00</b>	
<small>Download Usage Report &gt;</small>		

# This Week

- Become familiar with OLI
  - Content (Units 1 through 5)
  - Projects (Primer, 1 through 4)
- Check that you were enrolled on Piazza
- Create an account on AWS
  - [Submit your AWS account number here](#)
- Complete Project Primer by Sunday
- Start reading Unit 1 on OLI

# Questions?

