TCOM 690-001
SCALABLE INTERNET ARCHITECTURES
Building Scalable and Reliable Networks
George Mason University

Instructor: Dr. Peter Paris & Puneeth Ranjan Komaragiri

Course Prerequisites:

TCOM 514, 515 and 509/529 are highly recommended to be successful in this class.

- TCOM 514 – Basic Switching
- TCOM 515 – Internet Protocol Routing
- TCOM 509/529 – Internet Protocols/Advanced Internet Protocols

**This course assumes you are already familiar with routing and switching concepts.

Course Time and Location:

Time: Friday 4:30 p.m. – 7:10 p.m.
Location: ENGR 5358
Email: pkomarag@gmu.edu
Office Hours: On Request

Course Description:

The objective of this course is to provide the concepts and protocols associated with designing highly available and scalable networks on the cloud. The course aims to provide an in-depth introduction to server class operating systems, focusing on its use in various Internet and enterprise deployments. These topics will uncover techniques used to support an enterprise cloud network. Additional topics will include, but not limited to, an introduction to networking in virtualized environments and fundamentals of cloud computing. This course includes exercises and lab work that applies concepts learned throughout the course.

Week	Date	Topic
1	01/25	Intro to AWS & Linux 101
2	02/01	Linux Networking and Troubleshooting
3	02/08	Storage concepts and Lab
4	02/15	Introduction to DNS and lab
5	02/22	Virtual private cloud and its Implementation
6	03/01	Advanced VPC connectivity options (VPN to your Cloud Infrastructure)
7	03/08	Scaling, Avoiding Failures and Mission-Critical Environments
8	03/22	Load balancing: Basic and Advanced concepts
9	03/29	Mid-term
10	04/05	Cloud Security & Lab (Guest Lecture)
11	04/12	Monitoring your infrastructure on the cloud (Guest Lecture)
12	04/19	Using Python with AWS Part 1
13	04/26	Using Python with AWS Part 2
14	05/03	Final Exam

Course Text Book: AWS Certified Solutions Architect Official Study Guide: Associate Exam 1st Edition (Optional, You can use the AWS public documentation instead)

Link: https://www.amazon.com/Certified-Solutions-Architect-Official-Study/dp/1119138558/ref=sr_1_1?ie=UTF8&qid=1481128971&sr=8-1&keywords=solutions+architect+aws

Additional Course Materials:

WEEK 1 & 2

Red Hat Enterprise Linux 6 Installation Guide
http://docs.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/6/html/Installation_Guide/index.html

Linux Networking:
Link [1] : http://www.tldp.org/HOWTO/NET3-4-HOWTO.html

WEEK 3

Cloud Storage Options:
https://d0.awsstatic.com/whitepapers/AWS%20Storage%20Services%20Whitepaper-v9.pdf

WEEK 4

DNS: DNS in Action (For understanding the DNS basics) (https://www.amazon.com/DNS-Action-implementation-configuration-administration/dp/1904811787)
AWS DNS : http://docs.aws.amazon.com/es_es/Route53/latest/DeveloperGuide/Welcome.html

WEEK 5 & 6

Virtual Private Cloud: http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/vpc-ug.pdf

Advanced VPC Connectivity:
http://docs.aws.amazon.com/es_es/AmazonVPC/latest/UserGuide/vpn-connections.html

VPN Devices

1) Understand how AWS VPN works:
http://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/VPC_VPN.html

Software VPN using Openswan

- Getting started:
  https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/6/html/Security_Guide/openswan.html
  http://www.slashroot.in/linux-ipsec-site-site-vpnvirtual-private-network-configuration-using-openswan
  http://linux.die.net/man/5/ipsec.conf

WEEK 7

Scalable Internet Architectures
by Theo Schlossnagle
ISBN: 978-0672326998

AWS Auto-scaling: http://docs.aws.amazon.com/es_es/autoscaling/latest/userguide/WhatIsAutoScaling.html

WEEK 8 & 9

Load balancing concepts:
Load Balancing Servers, Firewalls and Caches

by Chandra Kopparapu
ISBN: 978-0471415503

AWS Load balancing: https://www.amazon.com/Elastic-Load-Balancing-Developer-Guide-ebook/dp/B007S3WO7O/ref=sr_1_1?ie=UTF8&qid=1472405371&sr=8-1&keywords=aws+load+balancing#nav-subnav

AWS ELB Link: https://aws.amazon.com/elasticloadbalancing/

WEEK 10

AWS Cloud Monitoring:
http://docs.aws.amazon.com/es_es/AmazonCloudWatch/latest/monitoring/WhatIsCloudWatch.html

WEEK 11

Cloud Security: https://aws.amazon.com/security/introduction-to-cloud-security/
IAM: http://docs.aws.amazon.com/es_es/IAM/latest/UserGuide/introduction.html
HSM: http://docs.aws.amazon.com/es_es/cloudhsm/latest/userguide/cloud-hsm-overview.html

WEEK 12-13

Python: https://docs.python.org/3/tutorial/introduction.html
Boto3 Library: http://boto3.readthedocs.io/en/latest/

Course Grading:

Homework /Labs: 20%
Midterm: 40%
Final: 40%

The final class grades are assessed as follows:
A+ (99.00 – 100)
A (95.00 – 98.99)
A- (90.00 – 94.99)
B+ (80.00 – 89.00)

Blackboard:

All course material, announcements and grades will be posted on the class Blackboard page. Please check Blackboard at least once a week to make sure that you have the Latest course information.
***** You are responsible for checking updated content on Blackboard. *****

Labs/Exercises:

Location: In-Class or GMU Telecom Lab (*See Course Schedule*)
Students must be present to receive credit for labs and exercises.

**** You cannot make up the exams, midterm or final, and you must take the midterm and the final during the scheduled timeslots - **ABSOLUTELY NO EXCEPTIONS!** - Coordinate your travel accordingly. ****

Academic Integrity:

The integrity of the University community is affected by the individual choices made by each of us. GMU has an *Honor Code* with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

Please note that any violation of the *Honor Code* will be immediately reported to Dr. Paris and the Honor Committee without exception.

GMU Links:

http://catalog.gmu.edu
http://universitypolicy.gmu.edu

Accommodations for Disabilities:

If you are a student with a disability and you need academic accommodations, please see me and contact the *Office for Disability Services* (ODS) at 993-2474, *http://ods.gmu.edu*. All academic accommodations must be arranged through the *ODS.*

Other Resources:

Writing Center: The GMU Writing Center is available to all students to assist in any written assignment. Please consult the following URL for more detailed information about the resources available to you as a student:
http://writingcenter.gmu.edu/index.php

University Libraries: The GMU University Library system is available to all students. Please consult the following URL for more detailed information about their resources:
http://library.gmu.edu