Module Name:
Cloud Data Centers

Credits:
5

Module Aim:
This module provides an overview of the field of Cloud Computing, and an in-depth study into its enabling technologies and main building blocks.

Learning Outcomes:
On successful completion of this module, students will be able to:

1. Explain the core concepts of the cloud computing paradigm: How and why this paradigm shift came about, the characteristics, advantages, and challenges brought about by the various models and services in cloud computing
2. Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in efficiency, cost, security and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, secure, elastic and cost-efficient.
3. Apply software defined networking and outline their role in enabling the cloud computing system model.

Curriculum:

Topic	**Scope**
Cloud Service Models	Cloud Computing concept and characteristics. Cloud Delivery and Deployment Models. Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Public, private, community and hybrid clouds. Brief introduction of Amazon AWS Cloud and Google Cloud Platform (GCP).
Virtualization	Introduction to the concept of virtualization and hypervisors; role of a hypervisor; Paravirtualization vs full virtualization.
Cloud Data Center Architecture	Cloud datacenter topologies such as Fat Tree, VL2, and Leaf-Spine.
Cloud Data Center Networking	SDN Definition, Path Computation Element, Forwarding and Control Element, OpenFlow Controllers, RESTful APIs, MiniNet

Cloud Security	Various security issues such as DDos attack and information leakage, and countermeasures such as Virtual Private Clouds and firewalls.
New trends in Cloud Computing	Mobile Cloud Computing, Network Functions Virtualisation, and Advanced Resource Management in Cloud Datacenter (Virtual Data Center (VDC) Embedding and VM/Container resource mapping to the physical resources in cloud datacenters).

Assessment:
This module is evaluated on continuous assessment, followed by a final project. *There will be no written assessment.* The assessment breakdown is as follows:

1. Continuous Assessment (In-lab assessment based on weekly tasks) – 70%
2. Project (submission and demonstration at the end of the semester) – 30%

Important Dates and Timeline:

1. Week 1 – 5: Salesforce architecture (with weekly tasks)
2. Week 6 onwards: Cloud Data center architecture (with 8 lab tasks)
3. Week 4 COB Friday: Submit your project proposal (to be uploaded to CDC GIT Classroom).

Please note:

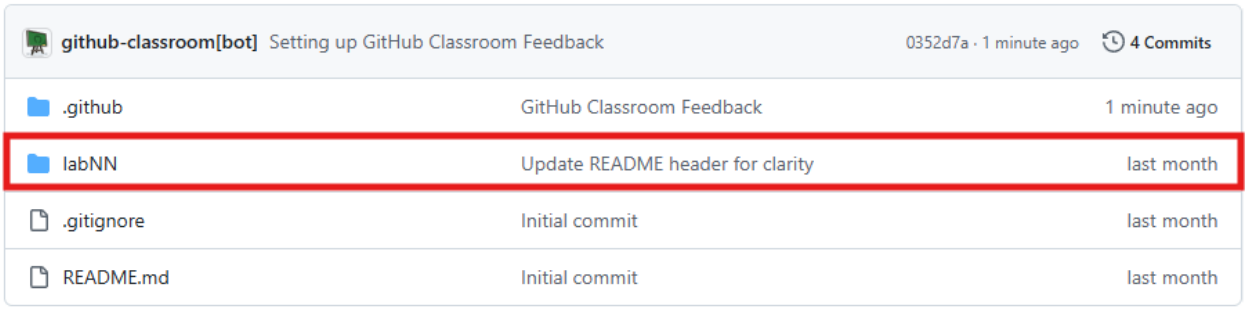
- No extension will be given in proposal submission.
- The proposal must clearly outline (Title, Abstract, Scope of the project, Objectives and Deliverables, Technologies used including the cloud stack, detailed Gantt Chart that aligns deliverables and milestones).
- Final report (covering the above, as well as overall learning), short PowerPoint presentation, and a working demo must be prepared for project evaluation.
- *The schedule for project demos will be posted after Week 6 on Blackboard*.
- Students are encouraged to maintain a weekly journal of the project progress (No particular format is mandated, and students are free to even maintain a *GIT based progress tracker*).

GIT Classroom access:

GIT Classroom Cloud Data Center Assignment
https://classroom.github.com/a/u-A2Y5rw

- Use your *@setu.ie* linked GIT account to access this resource. Please note that in some cases you will receive a confirmation email from GIT bot to validate access.

(Weekly assignments from Week 6 onwards must be pushed to the above-mentioned Cloud Data Center Assignment repository).
Please ensure that you label each week's work properly. For each week, replace ***LabNN*** with respective week's work (For instance, Lab01, Lab02, etc.)



*(Please ensure that you are able to access, and clone the repository. In case of access issues, please drop an email with **subject**: GIT Access Issue)*

Visiting Hours:
Tuesday (2-5 PM) C202.

Dr. Omer Ali
omer.ali@setu.ie