Course Prefix / Number: CIS4990 / CIS5990
Course Title: Cloud Deployment and Security Architecture
Course Credit Hours: 3
Schedule: Fall Semester 2015, fully online
Instructor Name and Contact Information: Norman Wilde, http://www.cs.uwf.edu/~wilde/
Prerequisites:
  • COP 2253, Programming Using Java
  • One of:
    o COP 4710, Database Systems
    o COP 4610, Operating Systems
    o COP 4634, Systems and Networks I
    o CNT 4007C, Theory and Fundamentals of Networks

This course is recommended for students in the Computer Science, Computer Information Systems, Software Engineering, Cybersecurity, and Information Technology majors.

Course Description:
An introduction to Infrastructure as a Service (IaaS) Cloud Computing for large enterprise applications. There will be a particular emphasis on Security Architecture, that is, the selection and configuration of security controls needed to protect such applications when running in the cloud.

Important Notice
In this course you will be using Amazon Web Services, which gives you an opportunity to become familiar with IaaS as offered by one of the market leaders. We will apply for an AWS in Education grant to provide each student with a $50-$100 credit to use AWS during this course. Amazon charges for each hour an “instance” (virtual computer) is running and as well for bandwidth, storage, and some other things. Amazon provides an initial "free tier" and after that charges are generally quite low (e.g. $0.02 per instance/hour) so the grant amount should be adequate for what you will do in this course. However each student will need to have a credit card to create an Amazon account that can receive this grant. (It has been reported that the Amazon account can be created using an Amazon Gift Card instead of a credit card, but your instructor has not verified this alternative.)

Please note that it is entirely your responsibility to manage you Amazon account. Especially, if you consume more than your grant amount then your card will be charged. Your instructor and the University of West Florida cannot accept responsibility for such charges.

Beware since there are a number of non-obvious ways you can consume more than you expect, including:
  • Leaving AWS instances running after an assignment is completed or at the end of the semester.
- Starting and stopping instances in rapid succession as when testing scaling in response to load. You are charged for a minimum of one hour each time an instance starts. Don't be tempted to start 1000 instances in a test!
- Running a program that turns out to contain an infinite loop accessing your instance. Bandwidth and storage charges can grow quickly.
- Etc.

You also need to conform to all Amazon Legal Policies to maintain your account. These include the Terms of Use, the Privacy Policy, etc. Particularly NO HACKING or ANYTHING THAT MIGHT LOOK LIKE HACKING. Amazon will monitor your system use and your account may be terminated. In that case you will not be able to continue in this course and may receive an 'F'.

**Course Goals:**
The goal of this course is to prepare students who, as part of their careers, want to be able to participate in software development projects that are using Infrastructure as a Service (IaaS) cloud computing. IaaS providers such as Amazon, Microsoft, IBM, and others offer a hardware platform that allows companies to deploy their software services to "virtual server computers". Then company clients can access these services via the internet using personal computers or mobile devices.

Many well-known companies and organizations are using IaaS, including LinkedIn, Netflix, the Center for Disease Control and many, many others. The companies avoid heavy expenditures on computer hardware and only pay the IaaS provider for the capacity that is actually used. Software service capacity can scale up or down, even during a single day, depending on momentary demand.

This new model of computing requires software developers to think in new ways. On the one hand they need to take advantage of the low cost and scalability of IaaS. On the other hand, there are security implications, some of which are not fully understood.

For students, there will be little or no programming required in the course since we will focus on using Amazon Web Services to deploy existing Java software to Linux platforms. However students will need to use the Linux command line to perform basic system administration tasks such as editing files, managing file permissions, and installing software.

A main focus of the course will be Cloud Security Architecture, by which we mean the selection and configuration of a set of security controls to protect cloud-deployed services. Cloud security architecture is an important emerging field and well-qualified developers are in high demand (see: Skills in Demand: Cloud security architects).

**Course Methodology:**
This course is centered around a sequence of Cloud Deployment Projects (CDPs). In most CDPs you will be given some software to deploy into the Amazon AWS cloud. In most cases you will also configure appropriate security controls for the software.

For many of the CDPs you will also contribute to a Cybersecurity related Discussion topic (DISC). In most cases these focus on answering questions about the security controls you used in the CDP and on assessing their effectiveness.
Graduate students will additionally do two small research projects during the semester. Topics will be negotiated with the instructor and may include investigating and testing some of the services available in AWS or going somewhat deeper into some Cloud or Cybersecurity topic. Each project will result in either a recorded presentation / demo or in a short written paper.

All students are expected to participate consistently in the course's other online discussions, to post requests for help and hints to your classmates, to share any thoughts on the cloud and cybersecurity, and so on.

**Course Learning Outcomes:**

On completing this course, students will be able to:

- CLO 1. Employ the public Infrastructure as a Service (IaaS) cloud known as Amazon Web Services (AWS) to deploy an existing computer application using cloud computing technologies such as load balancing and auto-scaling.
- CLO 2. As part of application deployment, use security controls and technologies available in AWS such as identity and access management, virtual private clouds, security groups, etc.
- CLO 3. Appraise the usefulness of the above-mentioned controls and technologies in terms of relevant security principles and/or attack methods.
- CLO 4. Compare and contrast public IaaS with other cloud technologies and models, particularly with respect to resource requirements and security issues.

**Additional Learning Outcomes for Graduate Students:**

- CLO 5: Students will demonstrate that they can research independently specific topics in cloud computing and security that are assigned by the instructor
- CLO 6: Students will demonstrate that they can communicate the results of such research either in a well-organized presentation or in a brief coherent written report.

**Topics**

- Module 1. Introduction (CDP)
- Module 2. Basic Linux Administration (CDP)
- Module 3. Basic Service Deployment (CDP)
- Module 4. Secure Cloud System Administration (DISC - CDP)
- Module 5. Partitioning the system architecture (DISC - CDP)
- Module 6. Scalability I (DISC - CDP)
- Module 7. Scalability II (CDP)
- Module 8. Transport Layer Security I (CDP)
- Module 10. Introduction to Authentication and Authorization (DISC - CDP)
- Module 11. Logging for intrusion detection and incident recovery (DISC - CDP)
- Module 12. Other cloud technologies and models (DISC)
- Module 13. Creating an Amazon Machine Image (CDP)
Texts / Materials:

Required Texts:
None. We will use materials available online

Required Materials:
  o Internet Access (broadband is recommended)
  o Activated UWF ArgoNet E-mail Account
  o Maintain an Amazon account as described above

Grading / Evaluation:

For undergraduate students:
  o 44% Cloud Deployment Projects (CDP)
  o 36% Discussion Assignments (DISC)
  o 16% Participation in Other Discussions
  o 4% Other Assignments

For graduate students:
  o 33% Cloud Deployment Projects (CDP)
  o 27% Discussion Assignments (DISC)
  o 12% Participation in Other Discussions
  o 3% Other Assignments
  o 25% Independent Research Projects

Letter grades will be assigned as follows:

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On-Time Policy
Students are expected to complete all assignments on time as specified in the course schedule unless there are very unusual extenuating circumstances (e.g. serious health problem, death in the family, etc.). Any such circumstance must be reported to the instructor not later than the due date. Otherwise, assignments up to a week late will be penalized 10 percentage points and assignments up to two weeks late will be penalized 20 percentage points. Any work submitted later than that will be accepted only at the instructor’s discretion.
Minimum Technical Skills and Special Technology Utilized by Students

This course is totally online. All instructional content and interaction takes place over the WWW. In addition to baseline word processing skills and sending/receiving email with attachments, students will be expected to search the internet and upload / download files. In addition, students may need one or more of the following plug-ins:

- PuTTY and PuTTYgen (ssh client): [PuTTY and puttygen](http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html)
- Configure your computer for Online Room sessions: [http://support.blackboardcollaborate.com/ics/support/default.asp?deptID=8336&task=knowledge&questionID=1473](http://support.blackboardcollaborate.com/ics/support/default.asp?deptID=8336&task=knowledge&questionID=1473)

Expectations for Academic Conduct / Plagiarism Policy

- Academic Conduct Policy: [Web Site] | [PDF Format]
- UWF Library [Online Tutorial: Plagiarism](http://ufw.edu/library)

Assistance for Students with Disabilities

The University of West Florida supports an inclusive learning environment for all students. If there are aspects of the instruction or design of this course that hinder your full participation, such as time-limited exams, inaccessible web content, or the use of non-captioned videos and podcasts, reasonable accommodations can be arranged. Prior to receiving accommodations, you must register with the SDRC by filling out an [Enrollment Application](http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html). Appropriate academic accommodations will be determined based on the documented needs of the individual. For information regarding the registration process, email [sdrc@uwf.edu](mailto:sdrc@uwf.edu) or call (850) 474-2387.

Follow this link for information on accessibility features in UWF's Learning Management System (LMS), Desire2Learn.

Assistance for Military and Veterans

The University of West Florida (UWF) is excited to have a center dedicated to supporting our military and veteran students. With the growing number of veterans returning to school, UWF will continue to grow support through additions such as this Military & Veteran Resource Center. The goal of this center is to provide a “one-stop” location for all military and veteran students to simplify the transition process from the military to an academic environment. You may contact the MVRC at 850.474.2550 or visit [http://uwf.edu/militaryveterans/](http://uwf.edu/militaryveterans/).
Weather Emergency Information
In the case of severe weather or other emergency, the campus might be closed and classes cancelled. Official closures and delays are announced on the UWF website and broadcast on WUWF-FM.

- WUWF-FM (88.1MHz) is the official information source for the university. Any pertinent information regarding closings, cancellations, and the re-opening of campus will be broadcast.
- In the event that hurricane preparation procedures are initiated, the UWF Home Web Page and Argus will both provide current information regarding hurricane preparation procedures, the status of classes and the closing of the university.