New Mexico Tech
Department of Computer Science

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CS589: Cloud Computing and Applications -- Spring 2009

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Instructor

Dongwan Shin, Assistant Professor
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Date, Location, Class Website URL

Mon. PM 3:30-6:00 (Cramer 221)

http://www.cs.nmt.edu/~doshin/t/s09/cs589/

Description

The primary objective of this course is to provide the techniques and practices of cloud computing, often called the internet as a platform. In addition, this course is to explore the current challenges facing cloud computing. Mainly focusing on cloud computing models, techniques, and architectures, this course will provide students with the advanced level of knowledge and hand-on experience in designing and implementing cloud-based software systems. Topics include advanced web technologies (AJAX and Mashup), distributed computing models and technologies, software as a service (SaaS), virtualization, pallelization, security/privacy, and current issues of advanced research in cloud computing. Course works include two homework assignments and a term project.

Objectives

On completion of this course, students will

- have a comprehensive knowledge of cloud computing techniques,
- have a comprehensive knowledge of best practices in cloud computing,
- Be able to understand what are the current challenges in cloud computing, and
- be able to understand how to design and implement cloud-based applications.

Topics (Tentative)

Date	Topic	Assignment	Due	Notes
1/26	No Class, Make-up class: Jan. 30 (Friday), 2:00-4:30PM			
1/30	Introduction and Project Discussion (slides)			
2/2	SOA, Web Services, and SaaS (slides)			
2/9	AJAX and Mashup (slides)			
2/16	Introduction to MapReduce (slides)			

- MapReduce: Simplified Data Processing on Large Clusters, by Jeffrey Dean and Sanjay Ghemawat (2004)

Date	Topic	Assignment	Due	Notes
2/23	More on MapReduce and GFS (slides)	hw1		papers, assignment

- Google's MapReduce Programming Model - revisited, by Ralf Lammel (2006)
- The Google File System, by Sanjay Ghemawat et al (2003)
- Interpreting the Data: Parallel Analysis with Sawzall, by Rob Pike et al (2006)

Date	Topic	Assignment	Due	Notes
3/2	Virtualization in Cloud Computing (Invited Speaker: Dr. Song Fu) Introduction to Hadoop			

- Hadoop Website
- Virtualization Techniques for the Cloud

Date	Topic	Assignment	Due	Notes
3/9	Parallelization in Cloud Computing (Invited Speaker: Dr. Liebrock)		hw1 due on 3/20	
3/23	Cloud computing overview			

- Cloud Control with Distributed Rate Limiting, by Raghavan et al. (Presentation by Derek, Summary)

Date	Topic	Assignment	Due	Notes
3/30	Web 2.0	hw2		

- Privacy-enhanced Sharing of Personal Data on the Web, by Mannan and Oorschot (Presentation by James,

Summary)
- Why Web 2.0 is Good for Learning and for Research: Principles and Prototypes, by Ullrich et al. (Presentation by Krishina, Summary)

4/6   Mashup

- Subspace: Secure Cross-domain Communication for Web Mashups, by Jackson and Wang (Presentation by Tomas, Summary)
- SMash: Secure Component Model for Cross-Domain Mashups on Unmodified Browsers, by Keukelaere et al. (Presentation by Ashish, Summary)

4/13   Web Services

- Restful Web Services vs. "Big" Web Services: Making the Right Architectural Decision, by Pautasso et al. (Presentation by Rodrigo, Summary)
- eBag - A Ubiquitous Web Infrastructure for Nomadic Learning, by Brodersen et al. (Presentation by Aaron, Summary)

4/20   Virtualization   hw2

- Xen and the Art of Virtualization, by Barham et al. (Presentation by Richard, Summary)
- Virtual Clusters for Grid Communities, by Zhang et al. (Presentation by Vince, Summary)

4/27   Distributed Computing

- PNUTS: Yahoo!'s Hosted Data Serving Platform, by Cooper et al. (Presentation by Komal, Summary)
- Improving MapReduce Performance in Heterogeneous Environments, by Zaharia et al. (Presentation by Noah, Summary)

| 5/11 | Project Presentation I, (9:00-11:30AM) | | Templates for ppt and final report |
| 5/11 | Project Presentation II (ppt), (3:30-6:00PM) | Grade(hw, presentation, project) | Project Report |

Textbooks

No textbook is required: we will mostly use research articles, technical reports, and technical specifications on the subject of cloud computing. They will be posted on our class website as well as discussion board.

For your background knowledge on the subject, however, a list of recommended, not complete at all, reference books is as follows:

- AJAX Construction Kit: Building Plug-and-Play Ajax Applications, Michael Morrison
- AJAX Security, Billy Hoffman and Bryan Sullivan
- Parallel Programming, Barry Wilkinson and Michael Allen

Class Discussion Board and Mailing List

We have a google group (NMT-CS-Cloud09) websist created for class/project /homework discusion. You will be invited to join the group.

- [Group home page](#)

Grading Policy

- Homework (including programming assignments) (30%)
- Class presentation and participation (20%)
- Final project and class presentation (50%)

> **Note**
>
> Depending on the final class size, the project may be done individually or in teams. Project topics will be chosen under mutual agreement between the instructor and students. Each student (or team) will deliver a 35-minute presentation in class and submit a 15-page final report (12pt, dbl space) (excluding implementation codes). For more information about your final projects, click ([here](#)). **No late submission** will be accepted (both homework and final reports must be submitted before the class on due date). Finally, your letter grades will be given based on the following scale.

- **A**: 93 ~ 100, **A-**: 90 ~ 92
- **B+** : 87 ~ 89, **B**: 83 ~ 86, **B-**: 80 ~ 82
- **C+** : 77 ~ 79, **C**: 73 ~ 76, **C-**: 70 ~ 72
- **D+** : 67 ~ 69, **D**: 60 ~ 66
- **F**: 59 and less

> **Warning**
>
> Class attendance is **mandatory**. Excessive unexcused absences (more than three) will result in the failure of the course.

Important Dates

First Day of Classes: January 30, 2009
Proposal Due: February 23, 2009
Spring Break (No Class):   March 9, 2009
Project Presentation: April 27, May 4 and 11, 2009
Project Report Due: May 11, 2009
Last Day of Classes: May 11, 2009

Academic Honesty

Students' responsibility is to have the full knowledge of New Mexico Tech's Academic Honesty Policy (click here). It strongly forbids Academic Dishonesty defined as follows: **"cheating**: the use of unauthorized material during a test, or the act of copying from another student; **plagiarism**: the unauthorized use or use without proper citation of either someone's published work, unpublished material in someone else's computer files or material derived from the Internet; **theft**: any form of unauthorized procurement of academic documents, e.g., exams, student reports; **falsification**: any form of illegal alteration of academic documents for any purpose including improper alteration of experimental data obtained in the laboratory; **impersonation**: the act of permitting another person to substitute for oneself at an examination; obstruction: interference with or sabotage of the work of any other person through vandalism or theft; **assistance**: the act of helping another to commit fraud in any of the above-mentioned ways." I will not tolerate any type of incidents and works involving academic dishonesty, and I will take action appropriate to their severity.