ECE 592-088
Mainframe Computer Systems

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Objective or Description: Many of the foundations for today's *cloud computing* infrastructure have roots that extend back 50 years or more. Before widespread use of microprocessors and even small-scale integrated circuit technology, *mainframe* computers were deployed in environments surprisingly similar to those now driving the expansion of contemporary cloud computing.

Because *mainframe* systems evolved in an environment where hardware was expensive in relation to the cost of software (when *hard*ware was *hard* and *soft*ware was *soft* and both exceedingly unreliable) *mainframe* system architecture was, by necessity, simpler and more refined than is the case of *microprocessor* system architecture today. Due to this simplicity and the persistence of legacy applications, *mainframe* systems have scaled to unprecedented levels of performance and reliability. More recently, *mainframe* system architecture, coincident with the enormous increase in circuit density, has taken the lead in using hardware innovation to increase software performance.

M*ainframe* systems continue to grow in installed compute capacity as the supply of qualified programmers and analysts decline. This course is designed to attract students to a specialty that is becoming increasingly lucrative as a majority of those responsible for supporting *mainframe* infrastructures are reaching retirement age.

Prerequisites: A general understanding of personal computer hardware and software and, most importantly, an interest in the evolution of computing over the last 60 years and the role *mainframe* computers played in the establishment of contemporary *cloud computing* architectures. Familiarity with current *cloud computing* architecture is helpful but not required.

Textbook: There are no traditional (printed) text books that this course relies upon. Instead the course will draw from extensive reference material available online. One of the goals of this course is to familiarize the student with the with the location and organization of this vast store of online reference material.

Topics: target is IBM Z/series mainframe

Class will be intensely hands-on and utilizes a Z/series emulation tool (Z/PDT **P**ersonal **D**evelopment **T**ool) that provides a highly interactive, responsive and fault tolerant (easy to backup and restore) environment on a Linux laptop (or local server) that runs the exact code distribution that runs on real IBM mainframes.

- hardware technology considerations (chip design, packaging, reliability, clustering and virtualization)
- instruction, memory, I/O and system architectures - evolution of and recent innovations therein
- software environments and operating system variants (Z/VM, Z/OS, Z/LINUX)
- programming models (Z/VM, Z/OS, Z/LINUX) - monthly projects to illustrate the development processes in each of the three environments
- operating system installation, configuration, performance, maintenance and console operation

Grading: Bi-weekly reading assignments/presentations/critiques (20%); monthly hands-on project Assignments (40%); one final research project and presentation (40%);