DS-255 Jan 3:1

System Virtualization

Instructor

J. Lakshmi
Email: jlakshmi@iisc.ac.in

Teaching Assistant

None
Email:

Department: CDS

Course Time: Tue., Thu., 2:00 - 3.30 PM

Lecture venue: CDS Classroom 202

Detailed Course Page: http://www.serc.iisc.in/facilities/system-virtualization-2/

Announcements

Course Announcement for "System Virtualization" DS255 3:1 Jan 2018,

Tuesday and Thursday 2 â€“ 3.30pm

Venue: CDS â€“ 202

First Class: Jan 2, 2018 2PM CDS-202

All lectures will be posted on the course page after discussion in the class.

Course weblink: http://www.serc.iisc.in/facilities/system-virtualization-2/

Brief description of the course

Virtualization is the key mechanism on Cloud systems. This course can be treated as an advanced Operating Systems course.

Course aims to expose the students to the current architectures and mechanisms used for virtualizing systems to have deeper insight into these systems and thus enable to use such setups better and potentially lead one to innovate for better system architectures with improved resource utilization and safer environments.

Prerequisites

Basic course on operating systems (undergrad-level) and consent of the instructor.

Syllabus

Virtualization as a construct for resource sharing;

System abstraction layers and modes of virtualization;

Mechanisms for system virtualization â€“ binary translation, emulation, paravirtualization and hardware virtualization;

Virtualization using HAL layer â€“ Exposing physical hardware through HAL (example of x86 architecture) from an OS perspective;

System bootup process; Virtual Machine Monitor; Processor virtualization; Memory Virtualization; NIC virtualization; Disk virtualization; Graphics card virtualization;

OS-level virtualization or Process VMsÂ and the container model;

OS resource abstractions and virtualization constructs(Linux Dockers example) ;

Virtualization using APIs or HLL VMs â€“ JVM example.

Course outcomes

Contemporary Cloud data centers are complex distributed system setups involving many technologies to deliver the common goals of cloud computing paradigm. As a result of this course the student gets to understand the conceptual constructs of system virtualization that is extensively used as a building block in many of the cloud datacenters. This course prepares them to understand, architect, use and innovate the distributed systems architectures in such setups.

Grading policy

The course evaluation will be based on assignments(40%), case-study seminars/system architecture exploration projects (20%) and exams(40%).

Assignments

As part of this course, students will need to successfully complete 5-6 assignments that will be mostly based on the material covered in the lectures. Each assignment will have 6-7 questions that will make the student use

the conceptual understanding of the topics to answer ranging from simple to varying degree of complexity.

For each assignment 1-2 questions will be open ended and thought provoking to elicit deeper exploration and application of the concepts to an interesting contemporary problem or use-case.

Assignments will be emailed and responses maybe submitted through reply email. Ensuring that the responses reach within the assignment submission deadline is studentâ€™s responsibility. Late submission within one working week (5 days) after the deadline is permitted but will incur 2% reduction of marks on 12hr basis.

After the week of overdue, assignment submission will not be accepted and treated as non submission.

Resources

J. Smith, R. Nair, Virtual Machines: Versatile Platforms for Systems and Processess, Morgan Kaufman, 2005. (Main Text Book to follow)

D. Bovet, M. Casti, Understanding the Linux Kernel, Third Edition, Oâ€™Reilly, 2005.

Wolfgang Mauerer, Linux Kernel Architecture, Wiley India, 2012.

D. Chisnall, The Definitive Guide to the Xen Hypervisor, Prentice Hall, 2007

R. Bryant, D. Oâ€™Hallaron, Computer Systems: A Programmerâ€™s Perspective (2nd Edition), Addison Wesley, 2010

Current literature