EECS 211: Advanced System Software Lecture 5

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Lecture 5: Overview

- Operating Systems Review
  - Prerequisite Quiz Discussion
- The Nachos System
  - Introduction
  - Overview
- Assignment 1
  - Introduction to Nachos, Threads
- Assignment 2
  - Concurrency and Synchronization

Operating Systems Review

- Prerequisite Quiz Discussion
  - Results
    - Overall quite positive
    - Most seem to be well-prepared
    - Some may need improvement in C/C++ programming…
  - Solution
    - **`PrerequisiteQuiz_Solution.pdf`**

The Nachos System

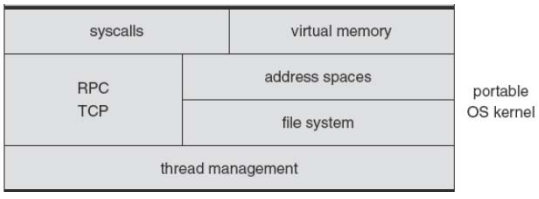
- Introduction
  - *"Not Another Completely Heuristic Operating System"*
  - Instructional operating system
    - designed by Th. Anderson, UC Berkeley (in early 90's)
    - designed for teaching (undergraduate level!)
  - Simple, but working system
    - Concepts are learned by hands-on experimentation
  - Covers most significant concepts of a modern OS
    - threads and process synchronization
    - multi-programming
    - file systems
    - virtual memory
    - networking
  - Usable in regular Unix environment
  - Well-documented source code freely available

The Nachos System

- Documentation
  - Text book, 7th edition, Appendix D
    - Local copy available on course web site
  - Source code (!)
    - Well-commented C/C++ code
  - Additional online resources
    - Nachos home page
    - Nachos roadmap
    - Wikipedia entry
- Why not Linux?
  - Huge size and complexity
  - Development and test environment (“naked PCs”?)
  - Debugging (nightmare!)

The Nachos System

- Overview
  - Kernel:
    - Compiled C/C++ code
    - normal (debug’able) Unix process



The Nachos System

- Overview
  - User code:
    - Cross-compiled C/C++ code
    - emulated by MIPS simulator
  - Kernel:
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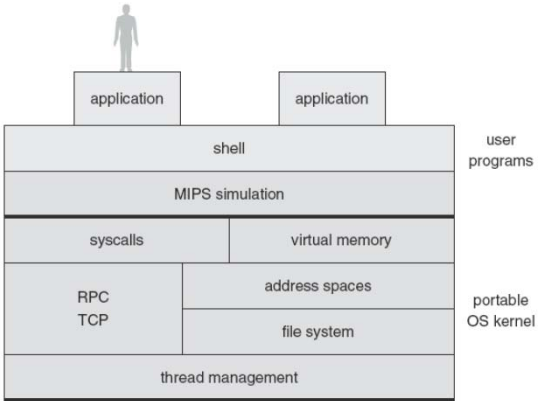
    - normal (debug'able) Unix process



The Nachos System

- Overview
  - User code:
    - Cross-compiled C/C++ code
    - emulated by MIPS simulator
  - Kernel:
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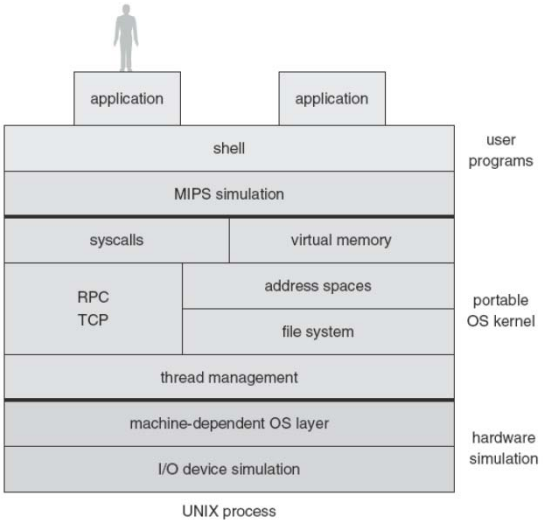
    - normal (debug'able) Unix process
  - I/O System:
    - simulated by Unix process I/O



Assignment 1

- Introduction to the Nachos System
  - Task 1: Read the overview chapter
    - Text book, Appendix D (contents online)
  - Task 2: Install the software
    - Setup environment, copy tar-ball, unpack, compile, test
  - Task 3: *Understand* the Nachos system!
    - Read documents and source code
- Deliverables
  - Log output for **`./nachos -rs 42`**
  - What is the purpose of **`SWITCH()`**?
  - Why is **`SWITCH()`** not implemented in C/C++?
  - Why does the execution order change with –rs option?
- Due by email to **`doemer@uci.edu`**
  - Wednesday, January 26, 2011, at 2pm (sharp!)

Assignment 2

- Thread Synchronization in Nachos
  - Task 1: Implement the missing locks and condition variables
    - files **`synch.h`** and **`synch.cc`**
  - Task 2: Test the locks and condition variables
    - file **`threadtest.cc`**
      (based on **`threadtest.cc.W11templateA2`**)
    - implement *safe* scheduling of strictly alternating threads
      - *no change in execution order due to any* **`-rs value`***!*
- Deliverables
  - code for locks, condition variables, and safe test case
  - log file of test runs with five different random seeds
  - Email to **`doemer@uci.edu`**
- Due by email to **`doemer@uci.edu`**
  - Wednesday, February 2, 2011, at 2pm (sharp!)