CS 111: Operating Systems Principles 01/05/2015

Professor Eggert Monday

Winter 2015

LECTURE #1

**COURSE OVERVIEW:**

**Course website:**

cs.ucla.edu/classes/winter2015/cs111

**Textbook:**

Saltzer & Kaasheek, Principles of Computer Systems Design (2009)

**Course Organization & Grading:**

-17 lectures

Exams:

1 midterm (open notes/book)

-based off assignments (labs)

1 final

Assignments:

4 labs

all Linux based

work in groups of 2

Lab 1) write a shell (creating pipes, …) with performance features

Lab 2) kernel hacking

Lab 3) writing a file system

Lab 4) distributed

2 minilabs //not Linux based

-work on solo

topics:

-scheduling

-virtual memory

Design Problem

-work in groups of 2

-pick from one lab

Scribe Notes (HTML 5 or 4.01)

-work on groups of 4

-due one week after chosen lecture

1 research/review paper (2-3 pages)

|  |  |
| --- | --- |
| 1/9 | Midterm |
| 2/9 | Final |
| 1/3 (total) | Labs |
| 2/15(total) | Minilabs |
| 1/12 | Design Problem |
| 1/20 | Scribe Notes |
| 1/15 | Research/review paper |

**Introduction**

**Operation System Related Headlines:**

Red Star 3.0: North Korea launches its own OS

2014-12-31 Sky News (UK)

<http://news.sky.com/story/1400203/red-star-3-0-north-korea-launches-its-own-os>

Crouton for Chromebooks: Run Ubuntu in a browser tab

2014-12-28 liliputing

<http://liliputing.com/2014/12/crouton-chromebooks-run-ubuntu-browser-tab.html>

Samsung’s troubled Tizen software ready for prime time on TVs

2014-01-05 c | net

<http://www.cnet.com/news/samsungs-troubled-tizen-software-ready-for-primetime-on-tvs-at-ces-2015/>

Quote from the Economist:

“We don’t offer a ready-made programme, but an entire operation system”

by Marina Weisbard, Germany Pirate Party, 2013-01-05

**Common Systems Problems**

**I. Incommensurate Scaling (Quantitative)**

**Diseconomies of Scale:**

Definition: As a product grows larger, the more expensive per unit it is.

An example of diseconomies of scale is star network. A star network is a local-area network that uses nodes to connect to other devices. As the number of nodes increases, the price increases at an alarming rate. This is because there are more connections made and the system becomes more complex.

Problem: Diseconomies of scale could cause breakage which happens when the product becomes too big and therefore too expensive to produce and sell. An analogy would be stretching Professor Eggert twice his height and width. He would collapse because his bone density would not be able to support his mass.

**Economies of Scale:**

Definition: As a product grows larger, the cheaper it is per unit.

An example of economies of scale is a pin factory. Rather than hand-making each pin, machines could be used to make more pins in the same time therefore increasing efficiency and decreasing cost.

Problem: Economies of scale can cause waste which occurs when too much product is created and therefore must be thrown away. However, the product would still be created in mass because it is cheaper than making it by hand.

**II. Emergent Properties (Qualitative)**

Definition: Emergent properties are properties that are not accounted for at time of creation.

**Piracy at UCLA**

An example is UCLA’s campus network. The internet began at UCLA and made it so students could access resources in their dorm rooms and on campus easily. However, a problem dealing with pirating media and lead of copyright infringements arose. 80% of the network was used for pirating rather than studying.

**Tacoma Narrows Bridge**

Another example is the Tacoma Narrows Bridge. The creators made the bridge accounting for all natural phenomenons, but did not consider resonant properties. One day the wind hit the right resonance frequency and the bridge fell down.

**III. Propagation of Effects**

Definition: Small changes made to one area can cause bigger problems in another seemingly unrelated area.

The smallest change can cause an operating system to crash.

**Japanese Text Encoding**

Microsoft encountered this problem with their Japanese text encoding. A space of two bytes was allotted to allow for all Japanese characters. A separate component that the system used to organize files was the file system. The problem was that when the system read certain Japanese characters, the character was interpreted as a backslash and an error message would be outputted. These two seemingly unrelated components happened to overlap in this particular situation.

**IV. Design Tradeoffs**

**Waterbed Effect:** Getting rid of one problem but actually pushing the problem somewhere else or creating a problem elsewhere.

**V. Complexity**

**Moore’s Law:** complexity doubles every 18-24 months at the cheapest design point

**Kryder’s Law:** A disk drive’s capacity grows by a factor of 2 every 13 months