CS 354 Spring 2025 (Park)

WHAT CS 354 IS ABOUT

1. What is an operating system?

An OS (or kernel) is software that manages an underlying hardware (i.e., computing system).

Manages for whom? Apps and humans.

What computing systems? Desktops, servers, smart phones and other handheld systems, routers, special purpose embedded systems, super computers, etc.

Why? Shield apps/humans from complex hardware details. Hardware tends to be a shared resource, i.e., shared across apps and users. It helps to have a third party (i.e., manager) to mediate.

2. Computing system landscape relevant for us

CPU types: CISC and RISC

XINU lab: x86-compatible Intel Galileo boards equipped with Quark X1000 processors.

Overall landscape: x86 Intel/AMD, ARM, MIPS, etc.

Additional in-class discussion.

3. CS 354 lab assigments

Lab assignments will entail kernel programming
on dedicated x86 Galileo backend machines in the XINU Lab.

We will also cover other operating systems (Linux/UNIX, Windows)
and hardware platforms.

Lab projects are challenging and time consuming.
Important to not overload (check your schedule) and be proactive.

4. Why not just do system programming (in UNIX, Linux or Windows) and learn about OS concepts without actually coding a kernel?

It's not the same.

5. When coding kernels, why not use virtual machines instead of real hardware?

It's not the same.

6. Why not use Linux for kernel coding?

Pros/cons. Linux pro: Popular production kernel so can be very useful in work environments. Con: Code base, even with trimming, is large and complex. Introduces significant overhead and difficult to know all parts of the system.

XINU pro: Very compact kernel, you will get to see (almost) all of the source code and understand it (as needed for lab assignments). Con: Not a wide-spread kernel in use compared to Linux.

Several years ago the dept. did consider switching to Linux kernel programming
for teaching operating systems. We decided
against it by carefully weighing pros/cons.

7. Overall

CS 354 will cover design and performance of modern operating systems on
today's computing systems. The scope applies to operating systems such as Solaris,
Linux, Windows, Mobile OS (Android, iOS), etc. And hardware platforms such
as x86, MIPS/ARM, specialized embedded systems, etc.