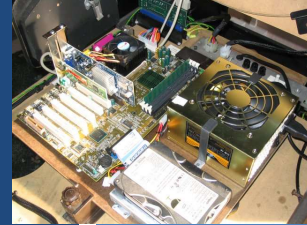


TCSS 422: OPERATING SYSTEMS

Condition Variables, Concurrency Problems



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OBJECTIVES

- Midterm Review
- Tutorial 1 Questions
- Homework 1 Questions
- Homework 2
- Ch. 30
 - Condition Variables
- Ch. 32
 - Concurrency Problems

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L10.2

UBUNTU INSTALLATION

■ Logical volume option for installing Ubuntu

Install (as superuser)

Installation type

This computer currently has no detected operating systems. What would you like to do?

☒ Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

☐ Encrypt the new Ubuntu installation for security
You will choose a security key in the next step.

☐ Use LVM with the new Ubuntu installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.

☐ Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

Quit Back Install Now

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L10.3


HELLO KERNEL MODULE

- Can be downloaded here:
- http://faculty.washington.edu/wlloyd/courses/tcss422/examples/assignments/a2/hello_module.tar.gz
- Package installation if not already installed:
- ```
apt-get install build-essential
linux-headers-`uname -r`
```
- Trace system log file: `/var/logs/syslog`
- ```
tail -fn 100 /var/log/syslog
```

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L10.4



CHAPTER 30 – CONDITION VARIABLES

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L10.5

CONDITION VARIABLES

- There are many cases where a thread wants to wait for another thread before proceeding with execution
- Consider when a precondition must be fulfilled before it is meaningful to proceed ...

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L10.6

CONDITION VARIABLES - 2



- Support a signaling mechanism to alert threads when preconditions have been satisfied
- Eliminate busy waiting
- Alert one or more threads to “consume” a result, or respond to state changes in the application
- Threads are placed on an **explicit queue** (FIFO) to wait for signals
- **Signal**: wakes one thread
broadcast wakes all (ordering by the OS)

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CONDITION VARIABLES - 3

■ Condition variable

```
pthread_cond_t c;
```

- Requires initialization

■ Condition API calls

```
pthread_cond_wait(pthread_cond_t *c, pthread_mutex_t *m); // wait()
pthread_cond_signal(pthread_cond_t *c); // signal()
```

- **wait()** accepts a mutex parameter
 - Releases lock, puts thread to sleep
- **signal()**
 - Wakes up thread, awakening thread acquires lock

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CONDITION VARIABLES - QUESTIONS

- Why would we want to put waiting threads on a queue... why not use a stack?
 - Queue (FIFO), Stack (LIFO)
 - Using condition variables eliminates busy waiting by putting threads to “sleep” and yielding the CPU.
- Why do we want to not busily wait for the lock to become available?
- A program has 10-threads, where 9 threads are waiting. The working thread finishes and broadcasts that the lock is available. What happens next?

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L10.9

MATRIX GENERATOR

Matrix generation example

Chapter 30
signal.c

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L10.10

