CS3210

Parallel Computing

Changes from Monday in Green

Lab 1

Mon (4pm)
Tues (2pm)

About Myself

Keven Loo

- Year 3 Computer Science
- Focus areas
  - Parallel Computing
  - Algorithms & Theory
- Contact
  - Will try to reply within 24h
  - Telegram: @Aulud
  - Email: keven@comp.nus.edu.sg

bit.ly/telegram-cs3210-t0104

Telegram Group

- Discuss lab, tutorial or past-year Qs
- Talk about parallel programming or architectures in general

- Slides (if any) posted here
- Regarding assignment questions
  - Post on LumiNUS forums/email us
  - **Fairness: will not debug submissions**

- **Consultations**
  - Drop me a message to arrange a time

Expectations

Labs vs. Tutorials

- Labs
  - Hands-on exercises on concepts/paradigms covered in class
  - No need to complete lab worksheet before session
  - Recommended: read lab worksheet before attending session
  - Lab write-up due end of week
  - Graded (2% each) based on effort, not correctness!

- Requirements
  - SOC account: to gain access to Sunfire (where you can then access the machines in the Parallel Computing Lab)

Expectations

Labs vs. Tutorials

- Tutorials
  - Structured questions on concepts covered in class
  - Attempt questions in tutorial worksheet before session
  - In-class: small-group discussion followed by walkthrough
  - Short MCQ quiz (1% each) during tutorial session

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Lab Conduct

- Form lab pairs in the same session
  - For pair programming and assignment of lab machines in subsequent weeks (the lab machines are not the same!)
  - Each pair in its own breakout room - can independently share their screen (for discussion/debugging)

- Different from assignment pairings
  - Today: random assignment
  - Subsequent weeks: follow LumiNUS pairings
  - Register under Class and Groups > Class Groups > (select your tutorial session) > join a pair

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Programming Assignments

- Form assignment pairs
  - Optional (you can choose to work solo)
  - Pair members need not be from same tutorial session
  - No need to register on LumiNUS
- Three assignments, each lasting 2 - 3 weeks
  - Assignment 1: Shared-memory programming (processes, threads, OpenMP)
  - Assignment 2: GPU programming (CUDA)
  - Assignment 3: Distributed programming (OpenMPI)

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Lab Machines

- Access the lab machines via SSH through Sunfire
  - See LumiNUS gradebook for your account username (e.g. 0123X) and password (e.g. 012345)
  - No networked file system - accounts on each machine are independent
  - Installed: Vim, Git, **`perf`**, **`htop`**, OpenMPI, **`tmux`**, **`curl`**
  - Request for additional packages: drop me a message

- Commands
  - To Sunfire: **`ssh <your SOC ID>@sunfire.comp.nus.edu`**
  - To lab machines: **`ssh <username>@<node name>`**

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Lab Machine Info

- Node names are: **`soctf-pdc-<node ID>`**
  - Available: typically 9am - 6pm on weekdays (probably more)

Node IDs	001 - 008	009 - 016	018 - 019	020 - 021
CPU	Xeon Silver 4114	Intel Core i7-7700	Xeon Silver 4114	Intel Core i9-9700
# sockets	1	1	2	1
# cores/skt	10	4	10	8
SMT?	Yes	Yes	Yes	No
RAM (GB)	32	32	64 (NUMA)	32
SWAP (GB)	2	2	~9	~14

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Lab 1 Submission Instructions

- **Due Friday 2pm**
  - Each student submits their own ZIP archive
  - Name it A0123456Z.zip
  - **OK to submit the same code as your lab partner**

- **Contents**
  - Your code for ex7 and ex8
  - **README (text file) with instructions for compiling your code AND your 1-paragraph of comments/observations for ex9**

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Errata

- Page 4 - below exercise 4
  - "~~Although the threads are synchronized, you may still~~ Although you have joined (cleaned up) all threads before printing the final result, you may still see a wrong final result since the threads are not synchronised."

- Page 7 - exercise 9
  - Limit the number of total items (numbers) produced by the ~~consumers~~ producers to 100…"

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Clarifications

- Page 6 - exercises 7 and 8
  - The producers and consumers should be left to run indefinitely until the process is stopped
  - **If this does not work out for you, it is OK if you let your producers and consumers run for a given number of items**
  - You may modify the program to let the consumer print a message each time it consumes an item, to show progress

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Clarifications

- Page 6 - exercise 8
  - The pthread library has two different types of semaphores: named and unnamed semaphores
  - https://www.man7.org/linux/man-pages/man7/sem_overview.7.html

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Thank you! Any questions?

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bit.ly/cs3210-t04-qn