Multi-core programming

Lab 1: Laws of parallel programming

Lab sessions schedule

12/2	Introduction, laws of parallel programming	Janwillem Swalens (me)
19/2	Erlang: introduction	
26/2	Erlang: concurrency	
5/3	Erlang: concurrency and distribution	
12/3	Clojure: introduction	
19/3	Clojure: concurrency	
26/3	Clojure: STM	
2/4	Clojure: STM and concurrent testing	
9/4	*Easter holiday*	
16/4	*Easter holiday*	
23/4	Java Fork/Join: introduction	Steven Adriaensen
30/4	Java Fork/Join: prefix sum	
7/5	Java: shared memory and locks	Janwillem Swalens (me)
14/5	Channels	
21/5	MapReduce	

Examination

Projects:	Announcement	Deadline
33% Erlang	5/3	27/4
33% Clojure	26/3	11/5
33% Java	7/5	15/6

Oral defense during exam session (June)

Questions?

- Solutions on PointCarré after session
- Janwillem Swalens
  jswalens@vub.ac.be
  F.10.719
- Steven Adriaensen
  steven.adriaensen@vub.ac.be
- Tom Van Cutsem
  tvcutsem@vub.ac.be
- http://soft.vub.ac.be/~tvcutsem/multicore/

Exercise 1: Hello World!

Material on PointCarré: `HelloWorld.java`

Idea: problem split in smaller tasks

Print "Hello World!"

Print a character

Typical problem: synchronization

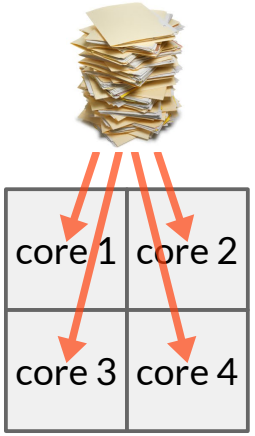
Exercise 2: concurrency vs. parallelism

`ConcurrencyInsteadOfPerformance.java`

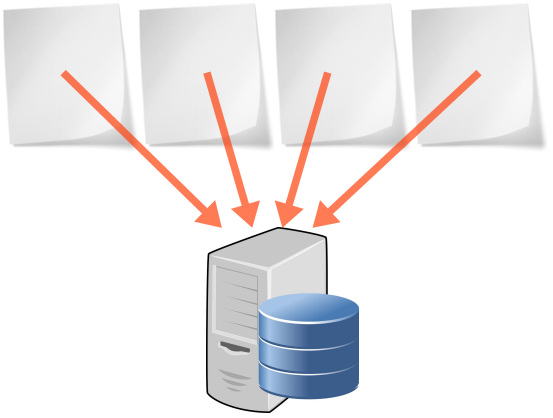
Calculate prime numbers

Problem: responsiveness

Parallelism:
divide work over resources



Concurrency:
limited resources



Exercise 3: Amdahl's law

$$S_P = \frac{T_1}{T_P} = \frac{1}{S + \frac{1-S}{P}}$$

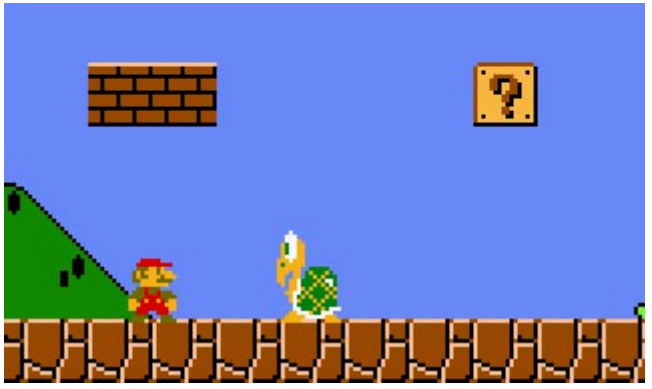
- S_P = speed-up on P processors
- P = # processors
- S = sequential portion

Exercise 4: Gustafson's law

$$S_P = \frac{T_1}{T_P} = P - (P-1)S$$

- S_P = speed-up
- P = # processors
- S = sequential portion

More processors? Let's do more work!



By next week... install Erlang

[required] Erlang (http://www.erlang.org)

- Windows: download .exe from http://www.erlang.org/download.html
- Mac OS (using Homebrew[1]): `brew install erlang`
- Linux: `sudo apt-get install erlang`

[optional] Erlide (http://erlide.org and http://erlide.org/installation/)

1. Download Eclipse Standard from http://eclipse.org/downloads/
2. Help → Install new software...
   Add... http://erlide.org/update
   Select "Erlang IDE" and install
   Restart when asked.
3. You may need to update the location of your Erlang install in Window → Preferences → Erlang → Installed runtimes (normally default is correct).
   Restart again.

[1] http://brew.sh/