Tråde synkronisering og parallelisering

Kursus 8
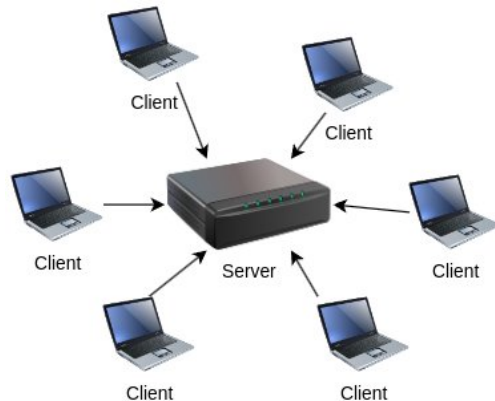
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Parallelisering in java

- Tråd vs process
  - Dødlås
- Beskyttelse af kritisk section
  - Mutex og semaphore
  - Java: `synchronized` (Atmoic)

one process
one thread

one process
multiple threads

multiple processes
one thread per process

multiple processes
multiple threads per process
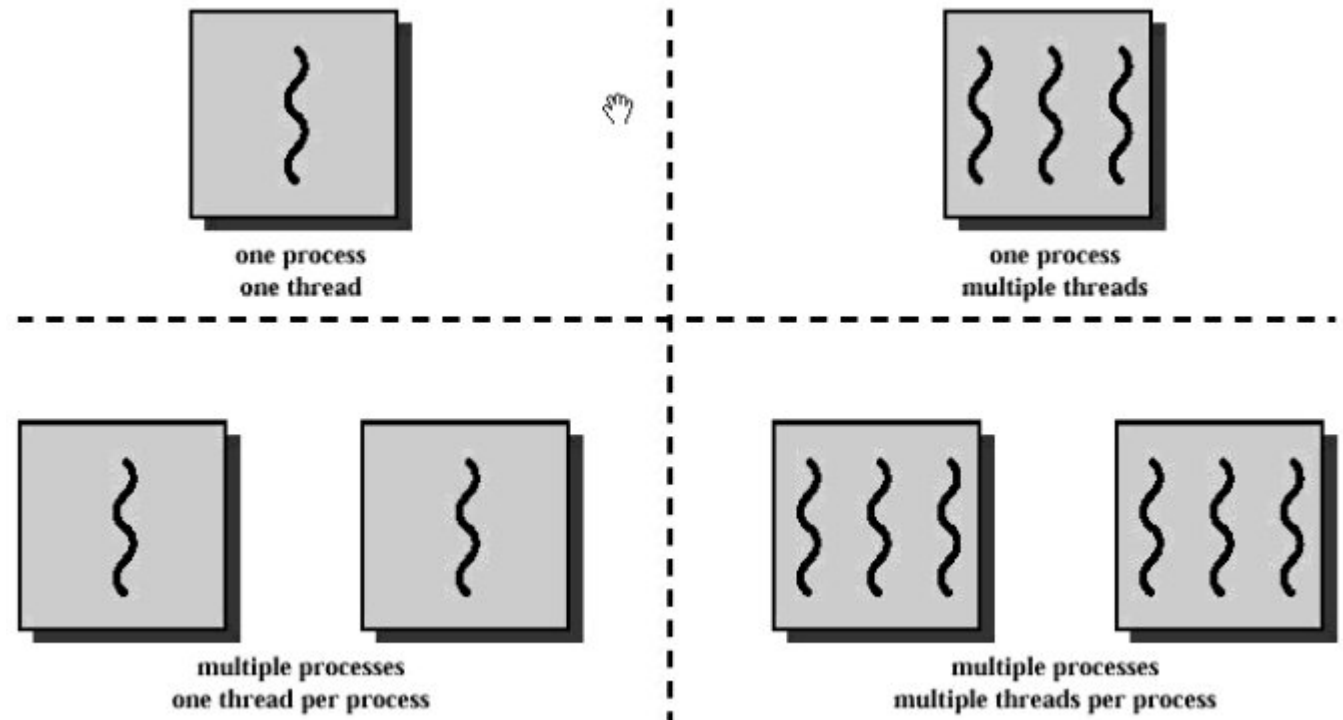
Opgave 3: Skalering, Race condition

- 16000 tråde!
- TrainList is threadsafe
  - CopyOnWriteArrayList


```java
final int numberOfTrainsimulators = 16_000; // My laptop. about 17000.
// We begin to run into scaling problems because of the CopyOnWrite likely
// "os::commit_memory() failed; error='Not enough space' (errno=12)"
Thread[] trainsimulators = new Thread[numberOfTrainsimulators];


// The trainlist is shared among the threads
TrainsList trains = new TrainsList();


// Periodically print the size of the train list
new Thread(() -> {
    while (true) {
        System.out.println(trains.size());
        Thread.sleep(1000);
    }
}).start();


// Create and start each simulator
for (int i = 0; i < numberOfTrainsimulators; i++) {
    TrainCLISimulator trainsim = new TrainCLISimulator(trains);
    trainsimulators[i] = new Thread(trainsim);
    trainsimulators[i].start();
}
```