**Multithreaded Merge Sort**

**Assumptions**

* Serial algorithm vs. Parallel algorithm
* Thread is an abstraction of a “virtual processor” (multicores CPU & multiprocessors)
* **Multithread**: multithreading a single algorithm so that some of its instructions may be executed simultaneously
* Threads may switch/exchange data or results, **shared memory** allows each thread to directly access any location of memory
* **Greedy scheduler** assigns as many strands to processors as possible in each time step

**Key Concepts for Multithreading:**

* Work: the sum of the time taken by each thread
* Span: the longest time it takes to execute threads along any path of the computational DAG (directed acyclic graph)

[insert pic]

* Parallelism: the ratio of the amount of work that can be done in parallel to the total amount of work required to complete a task
* Slackness: the (parallel) slackness of a multithreaded computation executed on an ideal parallel computer with P processors to be the ratio: **S = (T\_1 / T\_Inf \* P)**
* Spawn
* Sync

**Pseudocode of Multithreaded Merge Sort:**

**[To insert]**

**DAG**

**[To insert]**

**Time Complexity Analysis:**

*Sources:*

1. *Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. and Stein, Clifford. Introduction to Algorithms Third Edition. The MIT Press, 2009.*