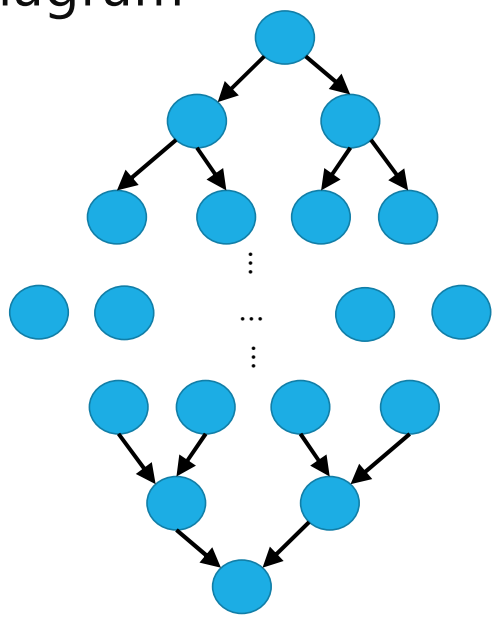
Useful Diagram

One node per O(1) operation



Divide to create threads.

Base Case computations

`Join` and combine to create final answer.

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Definitions

$T_?$ is running time with ? Processors, so span is "you always have a processor available"

Work: T_1
Total computation required.

Span: T_∞
Longest path in graph of computation. "critical path"

Speedup: for P processors: $\frac{T_1}{T_P}$
ideally: speedup will be close to P ("perfect linear speedup")

Parallelism: $\frac{T_1}{T_\infty}$

the speedup when you have as many processors as you can use (there's a point at which another one won't actually help).

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Amdahl's Law

Suppose our program takes 100 seconds.

And S is 1/3 (i.e. 33 seconds).

What is the running time with

3 processors

6 processors

22 processors

67 processors

1,000,000 processors (approximately).

Amdahl's Law

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

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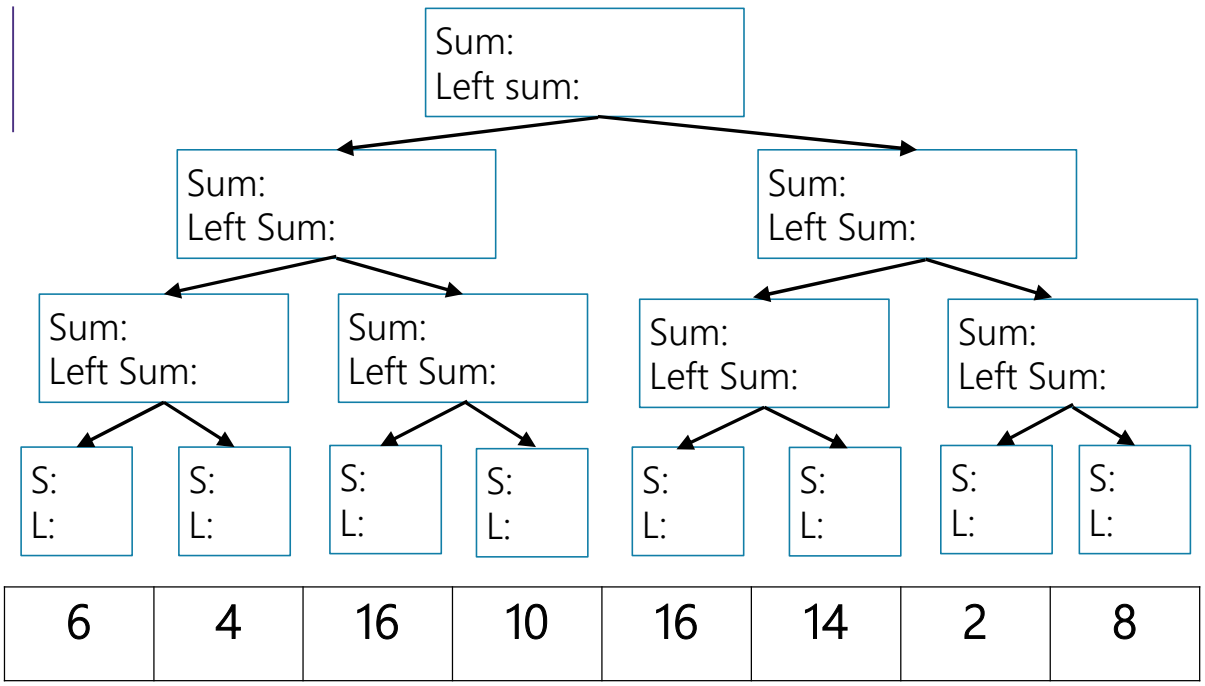

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