Combined Parallelism

Putting it all together!

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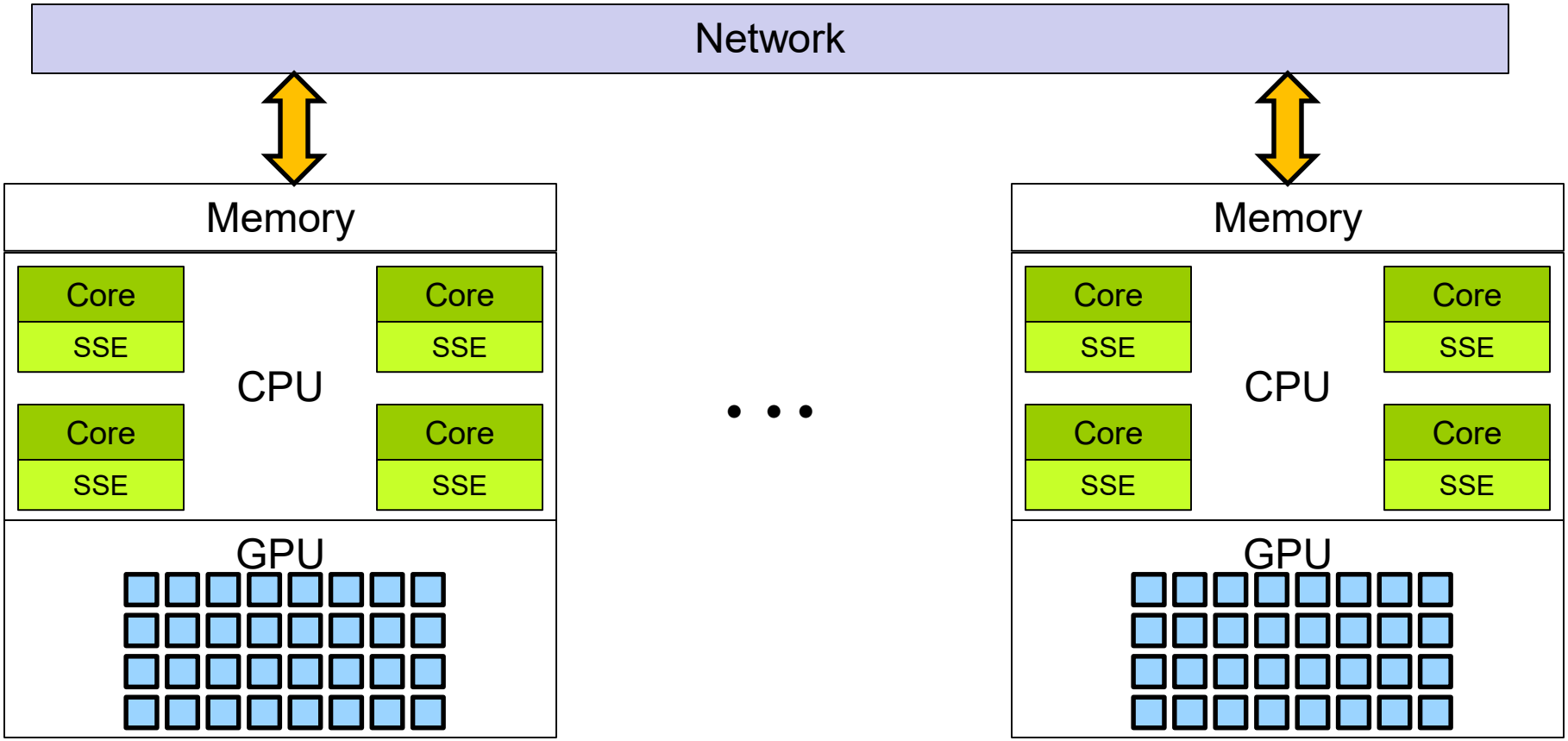
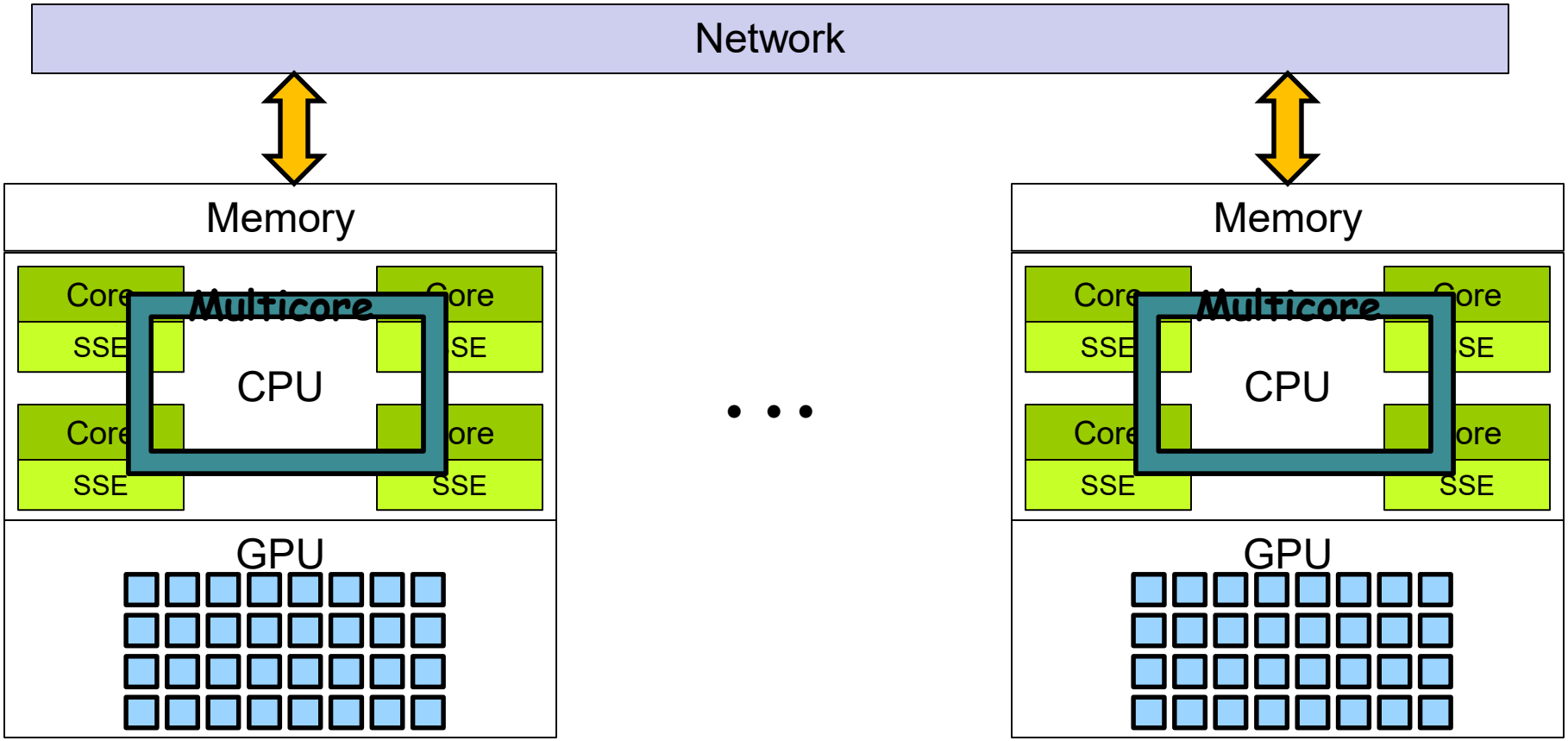
Suppose We Have This Setup



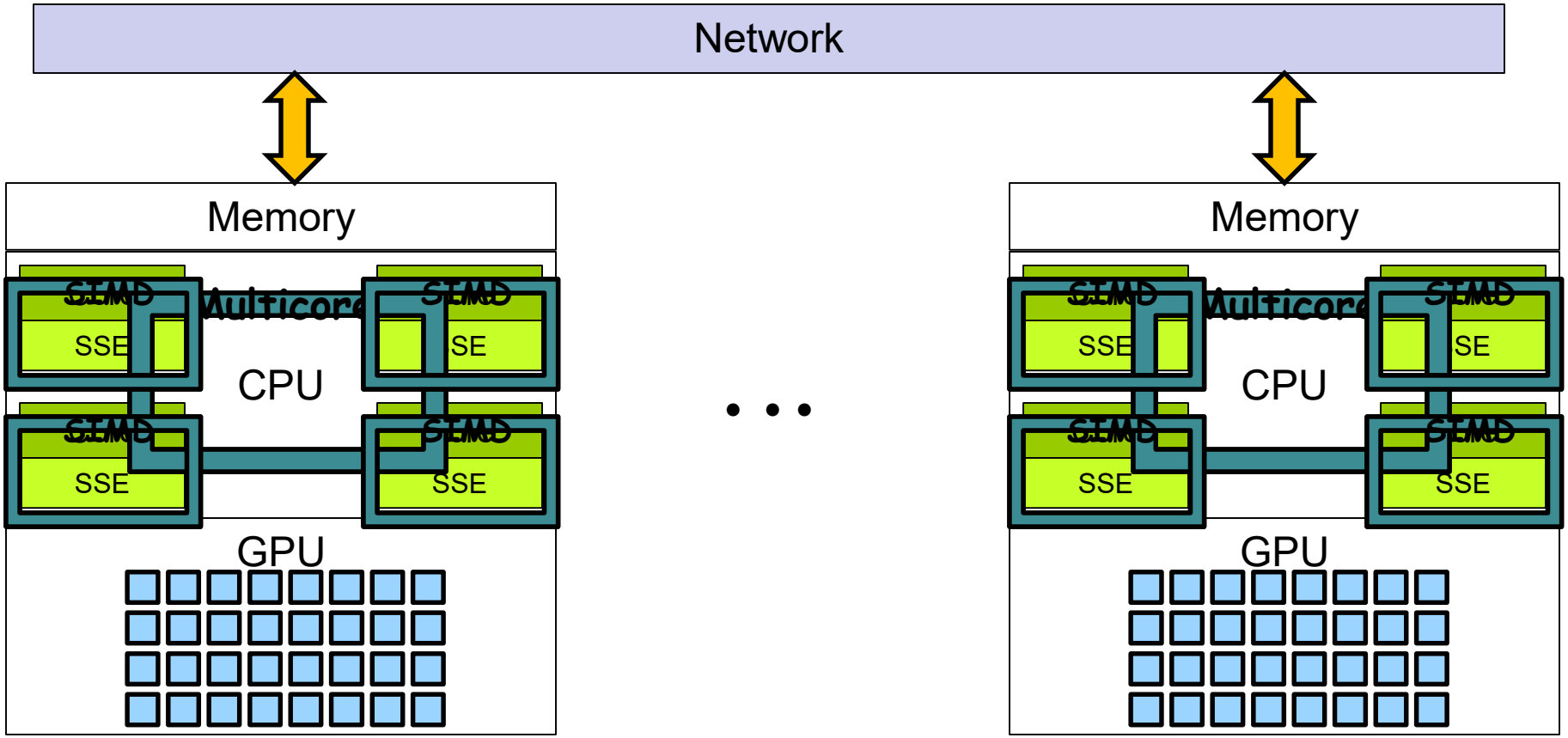
Welcome to *Count the Parallelisms!*

I'll take Parallel Programming for $800, please.

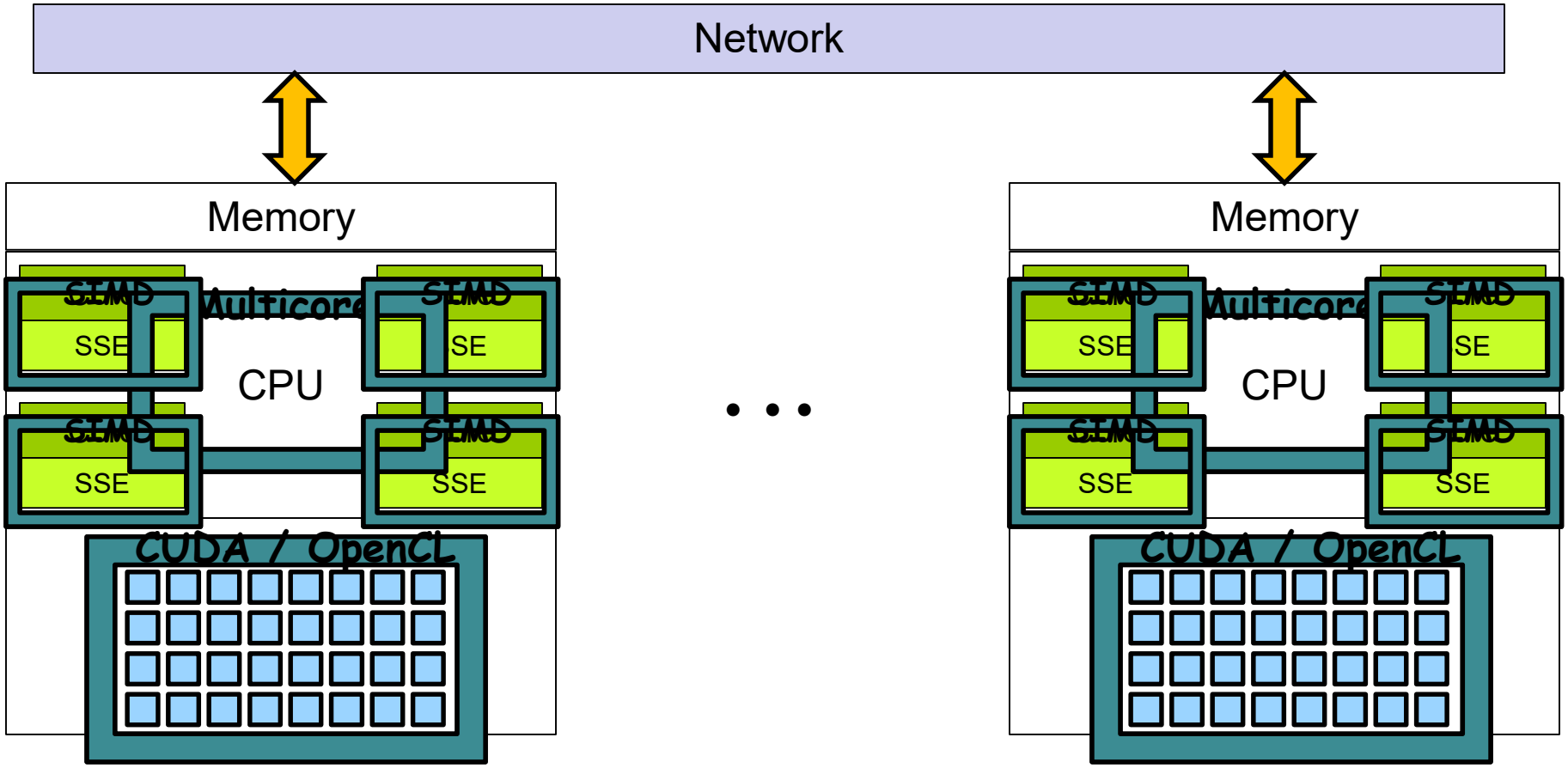
IN A MULTI-CPU DISTRIBUTED SYSTEM, THIS IS THE TOTAL NUMBER OF DIFFERENT KINDS OF PARALLELISMS THAT WE CAN COMBINE



1. Multicore OpenMP



1. **Multicore OpenMP**
2. **CPU SIMD**

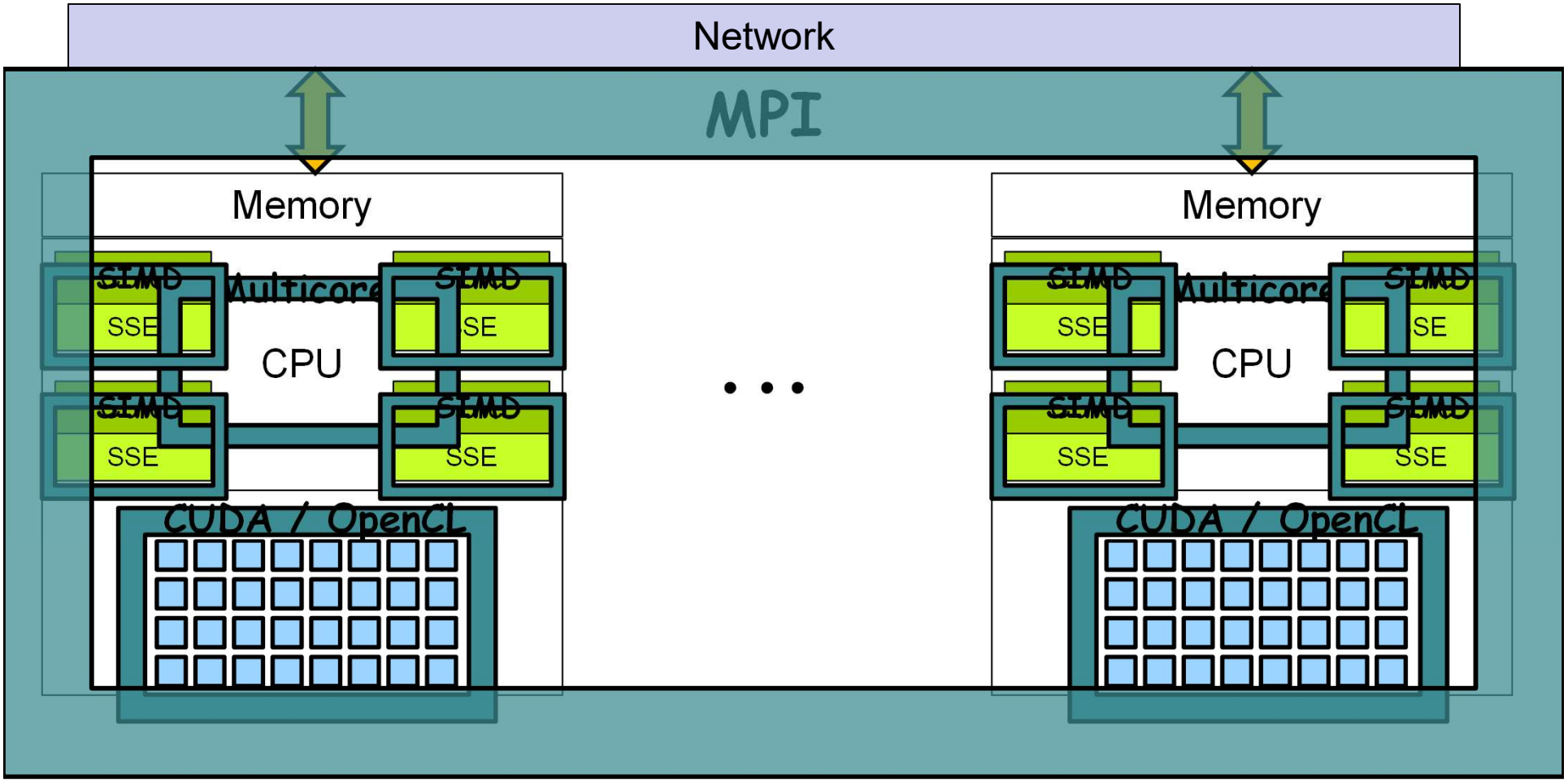


1. **Multicore OpenMP**
2. **CPU SIMD**
3. **GPU**

What is "4"?

This is how modern supercomputers work!

And, over the last 10 weeks, you have learned about using all 4 – congratulations!

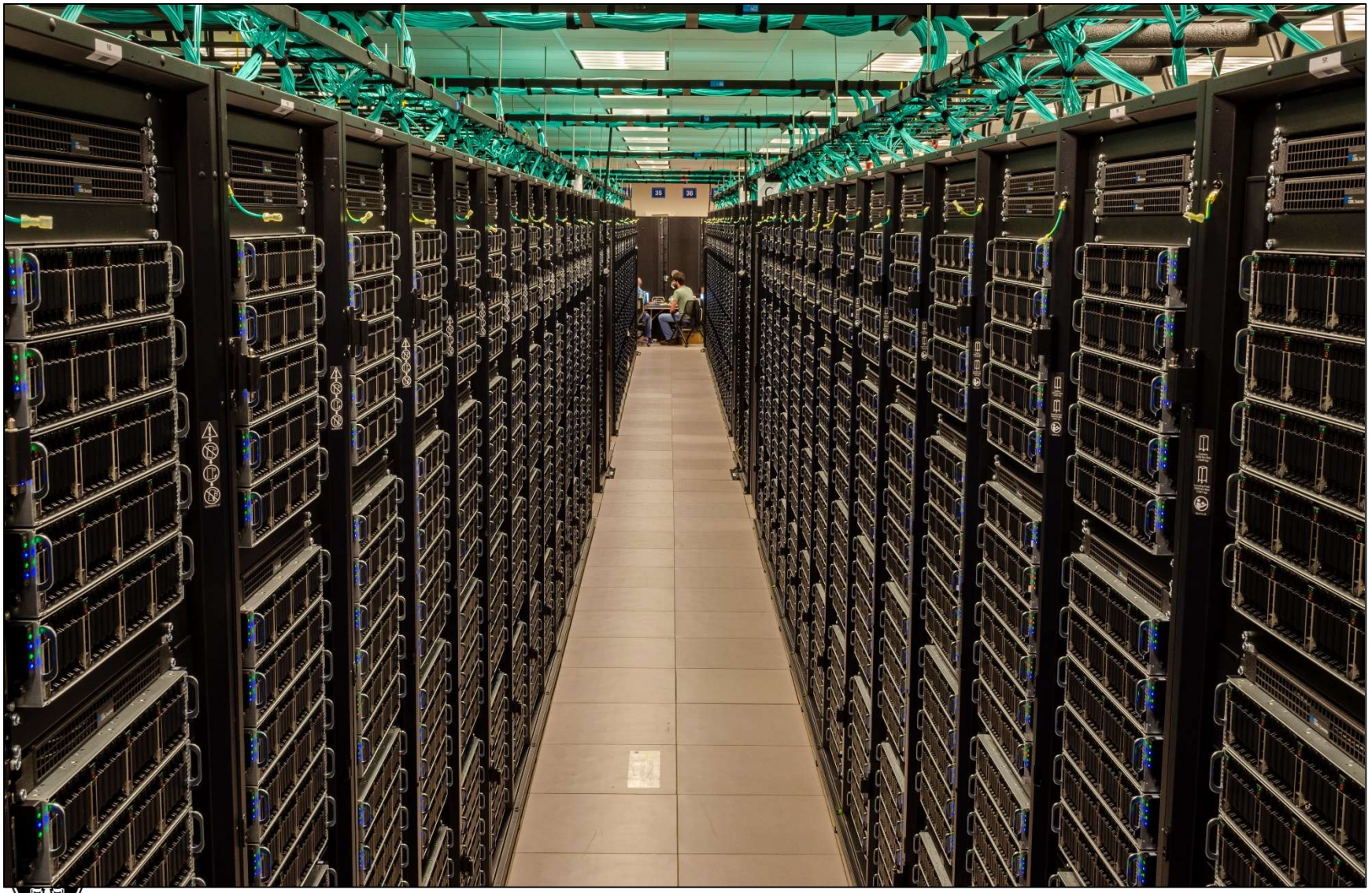


IN A MULTI-CPU DISTRIBUTED SYSTEM, THIS IS THE TOTAL NUMBER OF DIFFERENT KINDS OF PARALLELISMS THAT WE COVERED THIS QUARTER

1. **Multicore OpenMP**
2. **CPU SIMD**
3. **GPU**
4. **MPI**

and, they can *all* be active within the same application!

This is how modern supercomputers work!



The Texas Advanced Computing Center's *Frontera* supercomputer