Parallelism Jeopardy

Putting it all together!

Oregon State University

Mike Bailey

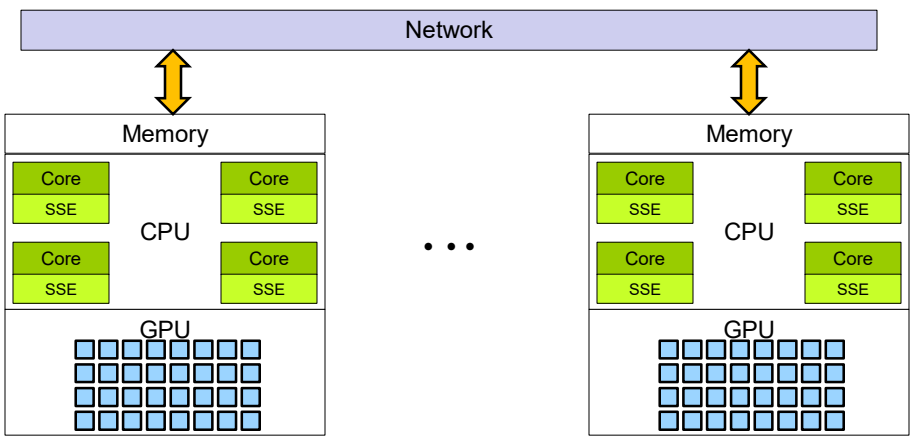**mjb@cs.oregonstate.edu**

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parallelism_jeopardy.pptx

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1

Suppose We Have This Setup

Network

Memory

Core		Core
SSE		SSE
	CPU	
Core		Core
SSE		SSE

GPU

• • •

Memory

Core		Core
SSE		SSE
	CPU	
Core		Core
SSE		SSE

GPU

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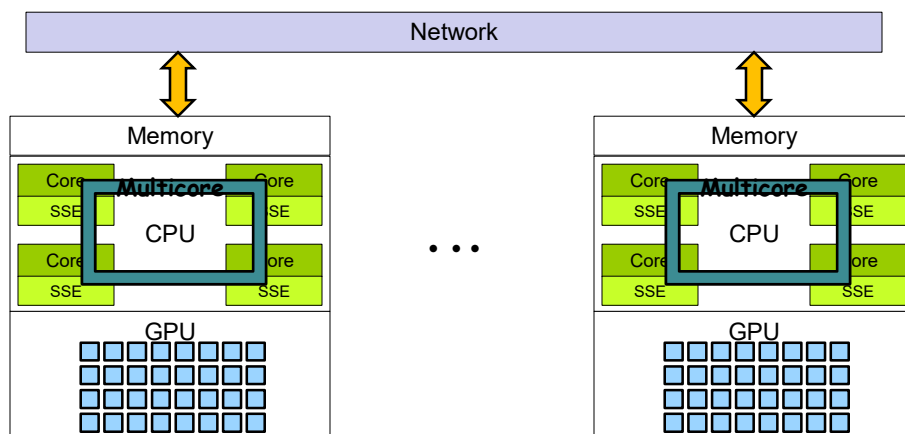
2

Welcome to *Parallelism Jeopardy!*

I'll take CS 475/575 for $800, Alex.

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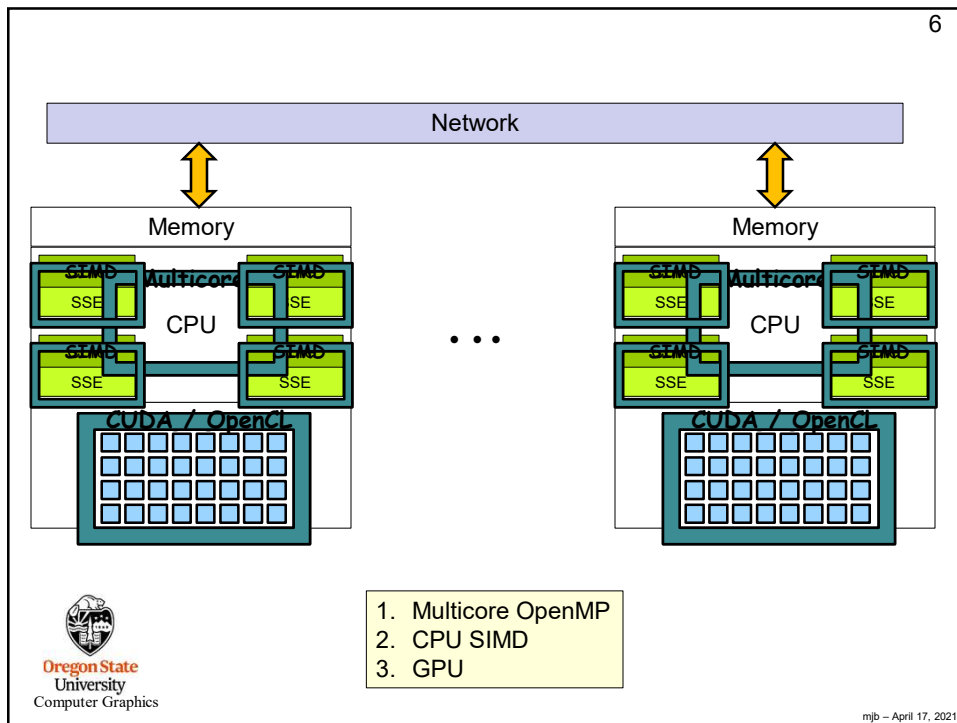
Network

Memory

Multicore CPU

Core SSE Core SSE Core SSE Core SSE

GPU

• • •

Memory

Multicore CPU

Core SSE Core SSE Core SSE Core SSE

GPU

1. Multicore OpenMP

Network

Memory

SIMD SSE   Multicore   SIMD SE

CPU

SIMD SSE   SIMD SSE

GPU

. . .

Memory

SIMD SSE   Multicore   SIMD SE

CPU

SIMD SSE   SIMD SSE

GPU

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1. Multicore OpenMP
2. CPU SIMD

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Network

Memory

SIMD SSE   Multicore   SIMD SE

CPU

SIMD SSE   SIMD SSE

CUDA / OpenCL

. . .

Memory

SIMD SSE   Multicore   SIMD SE

CPU

SIMD SSE   SIMD SSE

CUDA / OpenCL

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1. Multicore OpenMP
2. CPU SIMD
3. GPU

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6

What is "4", Alex?
This is how modern supercomputers work!
And, over the last 10 weeks, you have learned about using all 4 – congratulations!

Network

MPI

Memory

SIMD

Multicore

SIMD

SSE

SE

CPU

SIMD

SIMD

SSE

SSE

CUDA / OpenCL

. . .

Memory

SIMD

Multicore

SIMD

SSE

SE

CPU

SIMD

SIMD

SSE

SSE

CUDA / OpenCL

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

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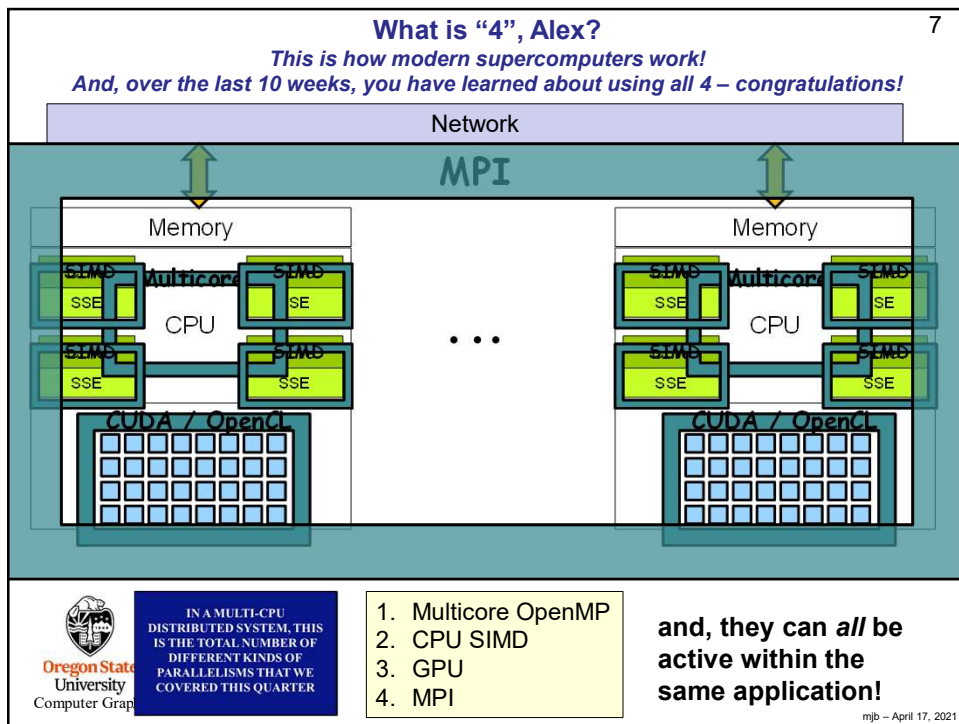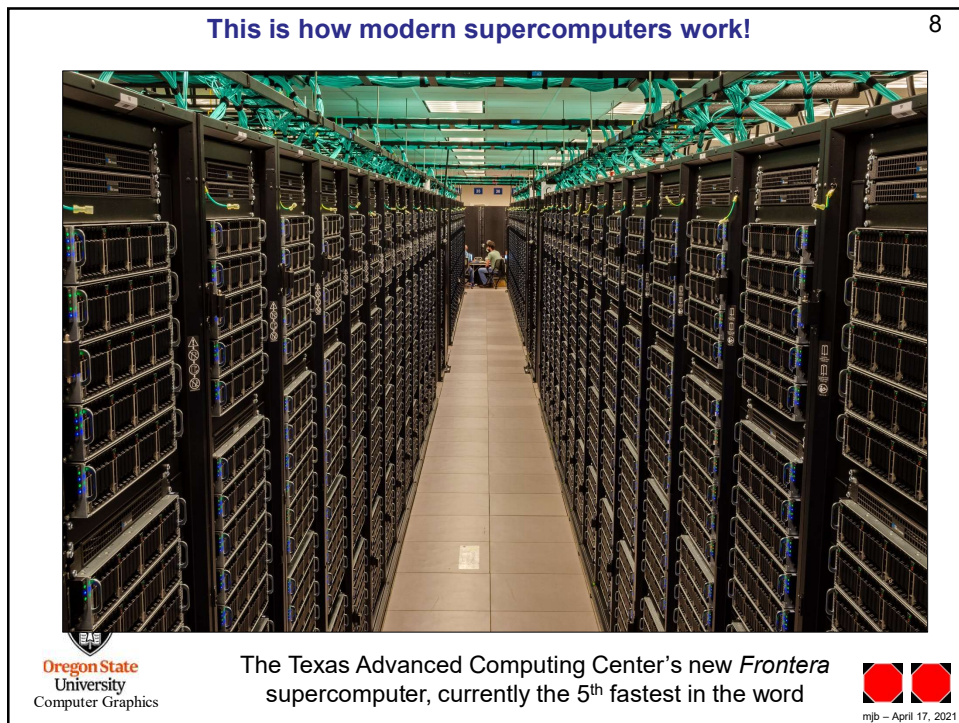2. CPU SIMD
3. GPU
4. MPI

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

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This is how modern supercomputers work!

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The Texas Advanced Computing Center's new *Frontera* supercomputer, currently the 5th fastest in the word

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