



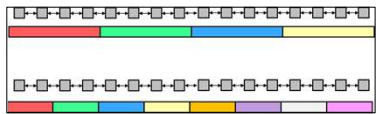
The Compute : Communicate Ratio




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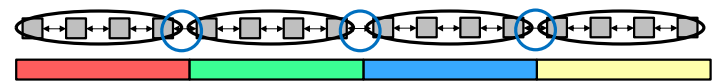
compute_communicate_ratio.pptx




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1

1D Compute-to-Communicate Ratio





Intracore computing




Intercore communication

Compute : Communicate ratio = N : 2

where N is the number of compute cells per core

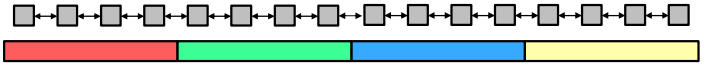
In the above drawing, Compute : Communicate is 4 : 2



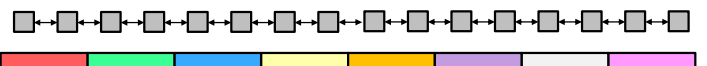
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2

How do more Cores Interact with the Compute-to-Communicate Ratio?



In this case, with 4 cores, Compute : Communicate = 4 : 2




In this case, with 8 cores, Compute : Communicate = 2 : 2

Think if it as a *Goldilocks and the Three Bears* sort of thing. :-)

Too little *Compute : Communicate* and you are spending all your time sharing data values across threads and doing too little computing

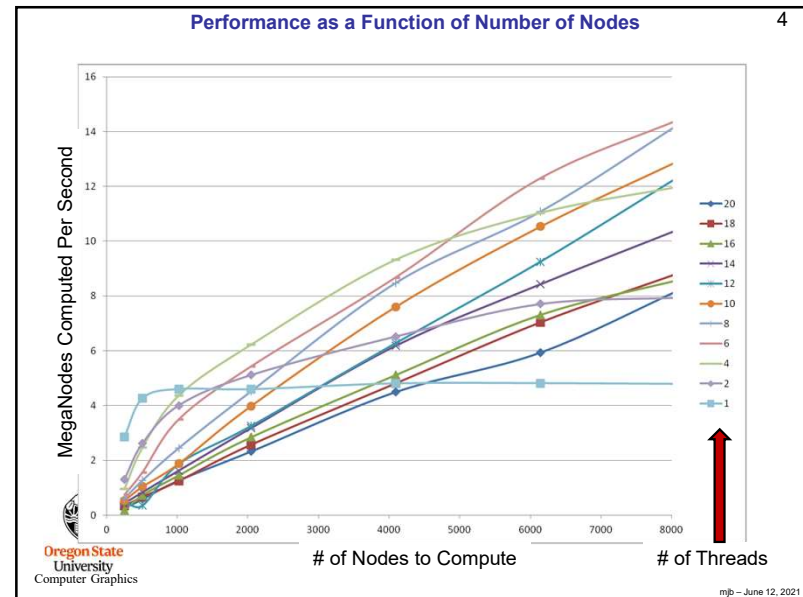
Too much *Compute : Communicate* and you are not spreading out your problem among enough threads to get good parallelism.

It's difficult to find the "sweet spot" without running experiments

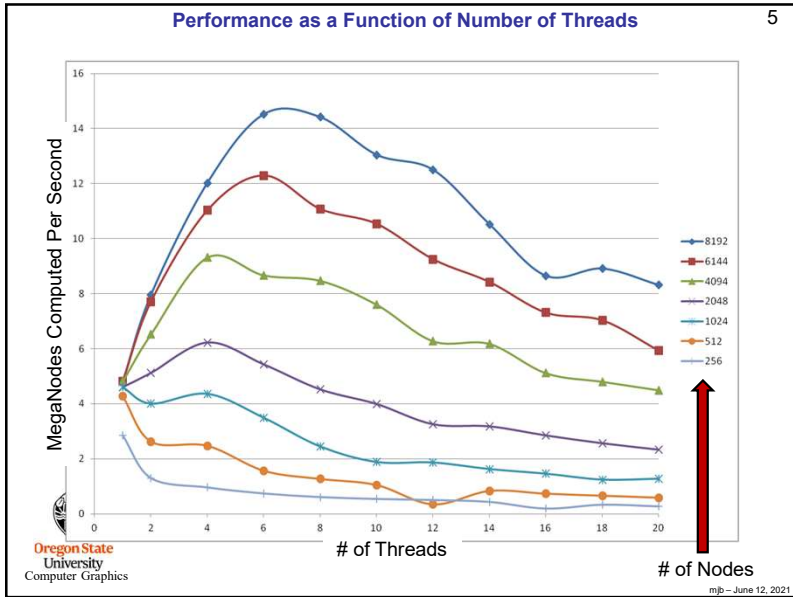


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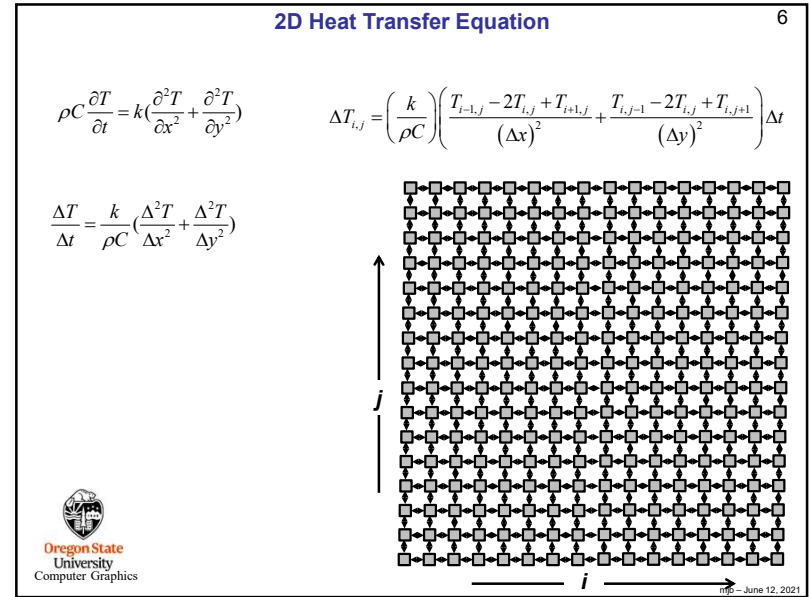
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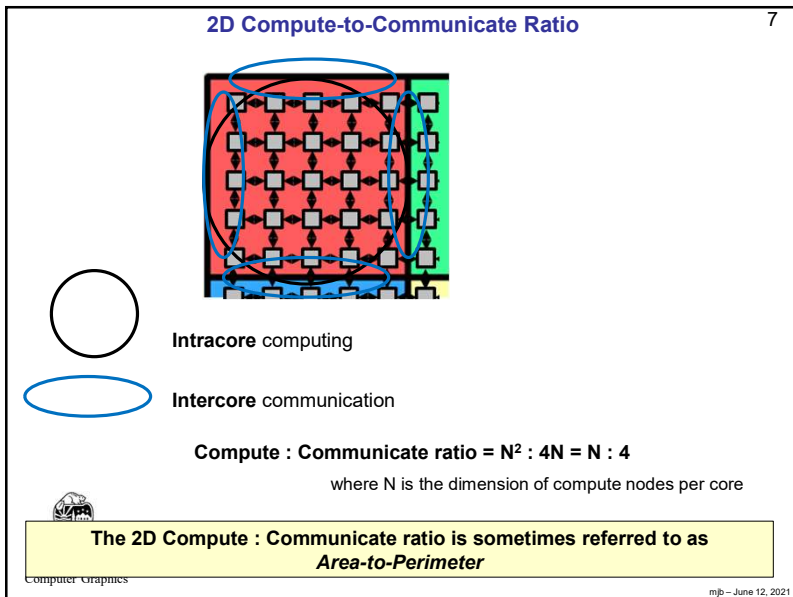
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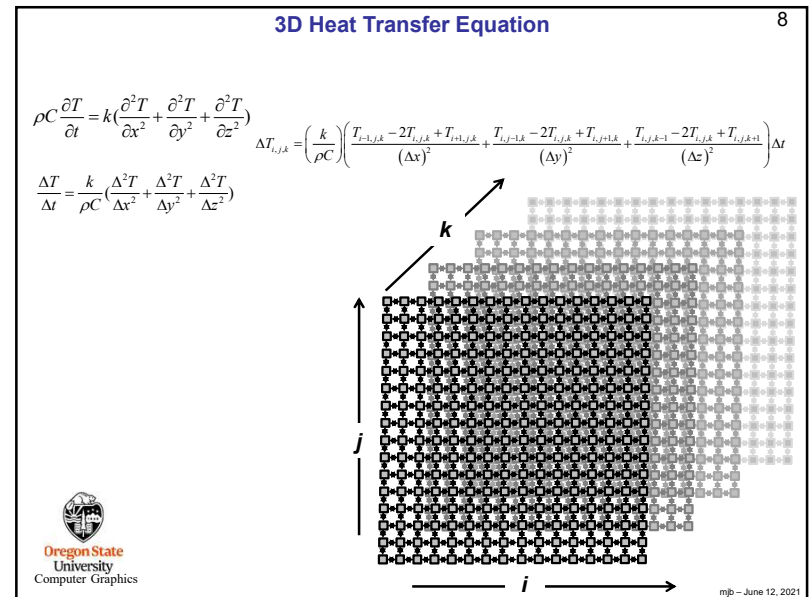
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6



7



8

3D Compute-to-Communicate Ratio

9

$$\text{Compute : Communicate ratio} = N^3 : 6N^2 = N : 6$$

where N is the dimension of compute nodes per core

In 3D the Compute : Communicate ratio is sometimes referred to as
Volume-to-Surface



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