

# Data Access and Distribution in Hybrid Execution Environments

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Betriebssysteme und Middleware

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# The Vision: Bringing High Performance to High-Level Developers

Applications

***Tools / Libraries***

Middleware

Operating System

HyperVisor

***Hardware***

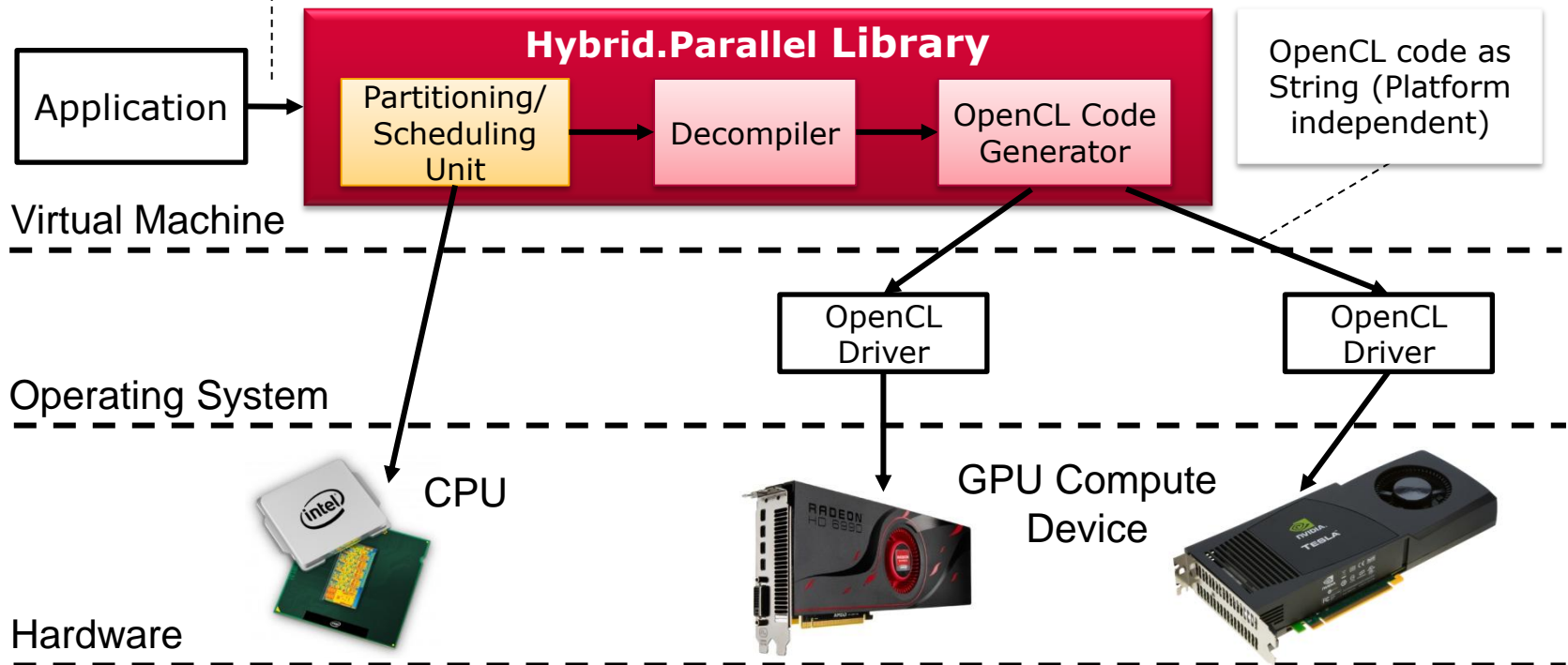


# The Hybrid Parallel Project

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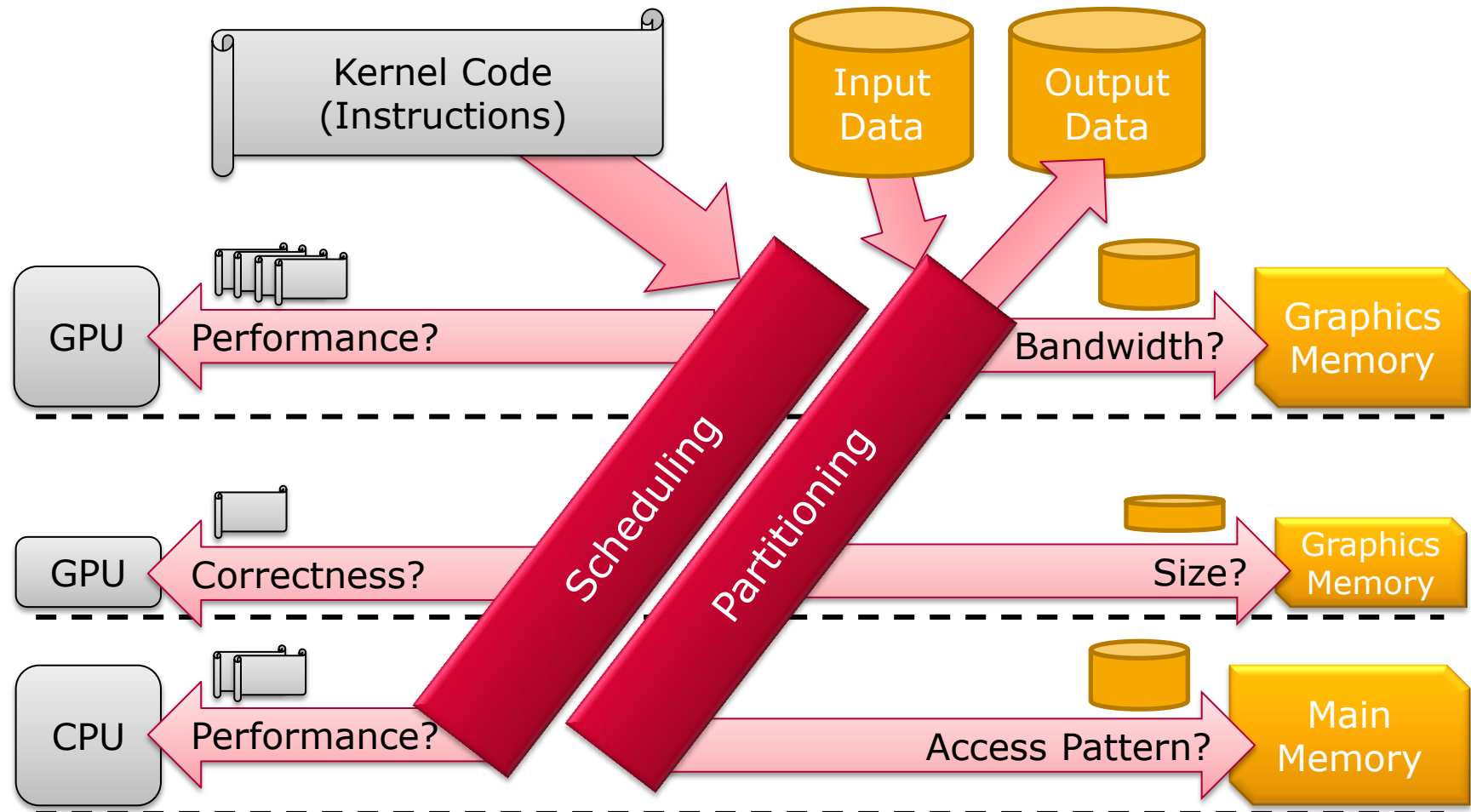
```
// based on Task Parallel Library
Threading.Tasks.Parallel.For(0, dataSize, action);

// our Library
Hybrid.Parallel.For(0, dataSize, action);
```



# The Partitioning and Scheduling Unit

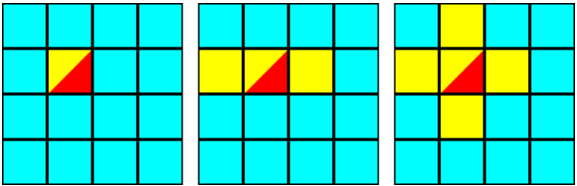
4



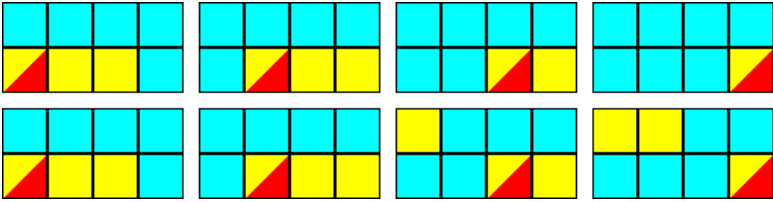
# Declaration and Mapping of Data Access Patterns

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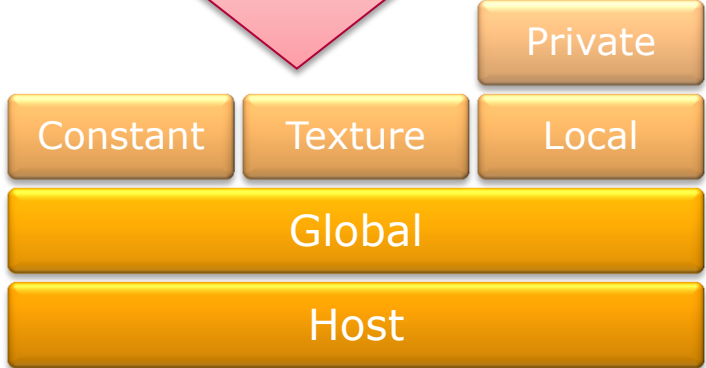
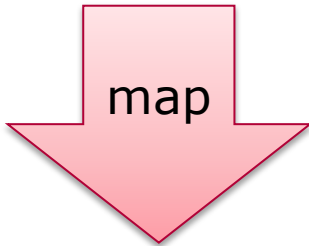
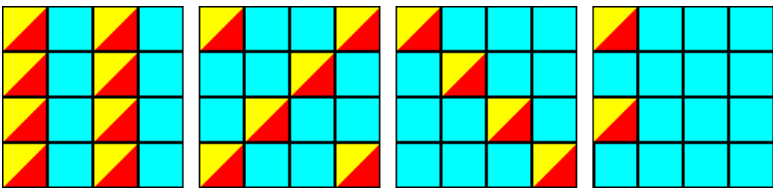
Access to Neighbors:  
None, One, Two-Dimensional



Access to Neighbors: Simple vs. Ring



Strided Access: 1, 2, 4, 8



# Survey of Data Access Patterns

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Example	Pattern	Access	Frequency	Stride	Neighbors	Borders
<b>Dot Product</b>	Linear	Read Only, Write Only	Once	Huge	Many	Ignore
<b>Average</b>	Linear	Read Only, Write Only	Exactly 3 Times, Once	0	2 (1D)	Ring Fashion
<b>Summing Vectors</b>	Linear	Read Only, Write Only	Once	0	0	Ignore
<b>Ripple</b>	Linear	Write Only	Never, Once	0	0	Ignore
<b>Heat Transfer</b>	Linear	Read Only, Write Only	Exactly 5 Times	0	4 (2D)	Ignore
<b>Histogram</b>	Linear, Arbitrary	Read Only, Write Only	Once, Frequent	0	0	Ignore
<b>Convolution</b>	Linear	Read Only, Write Only	Exactly 5 Times	0	4 (2D)	Fix Value (5.0)

# The Vision: Bringing High Performance to Everybody

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Applications

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***Operating System***

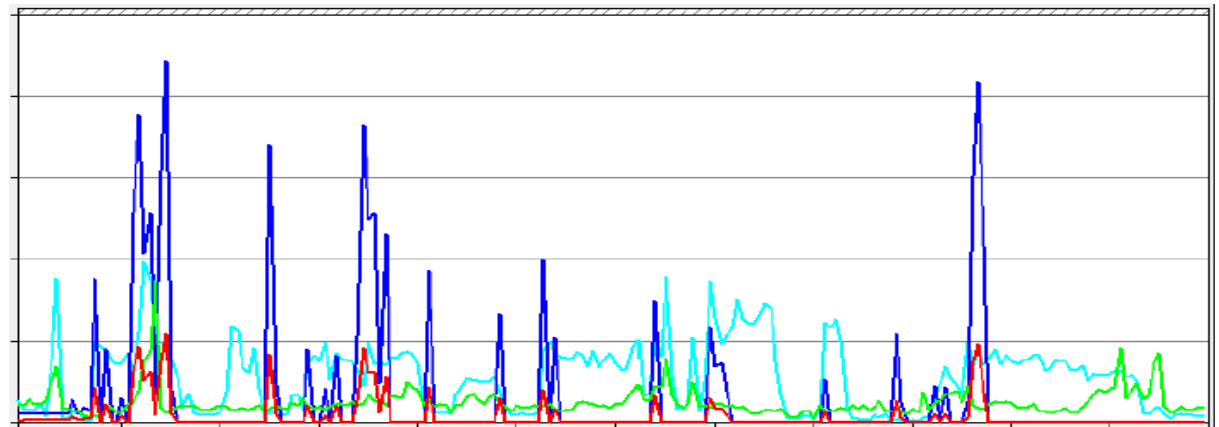
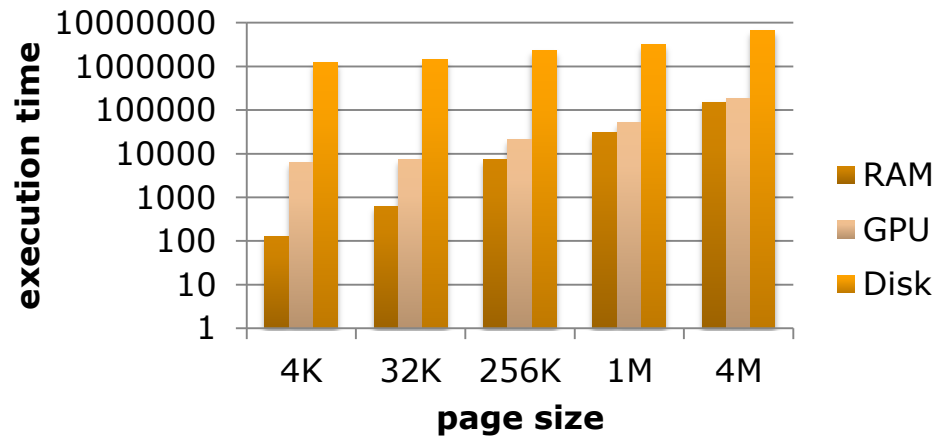
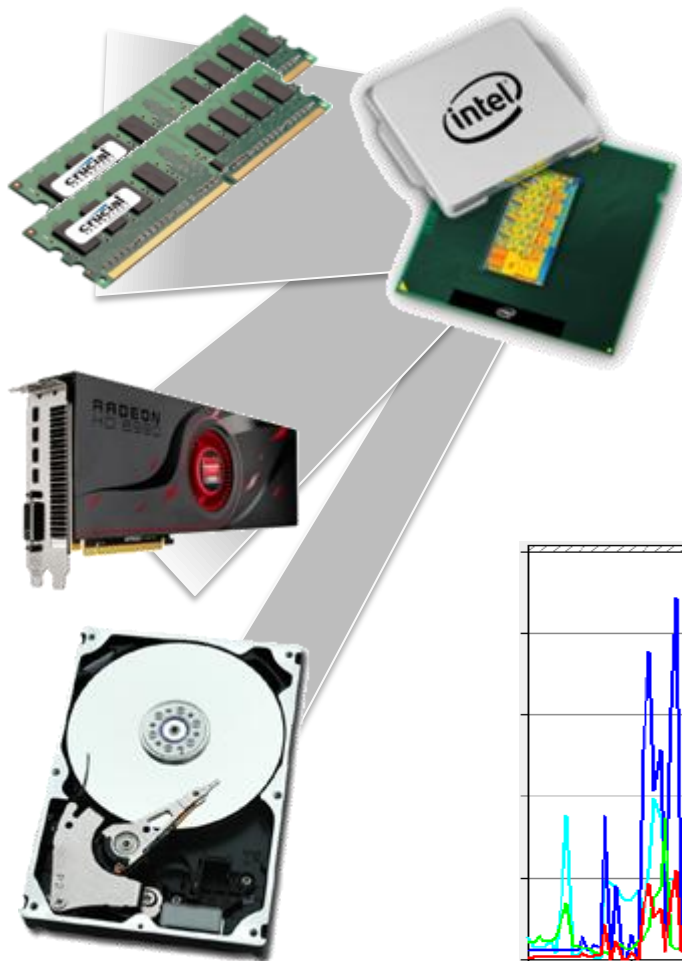
HyperVisor

***Hardware***



# Faster OS-Paging with GPUs

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# Extending the Hybrid Parallel Project

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