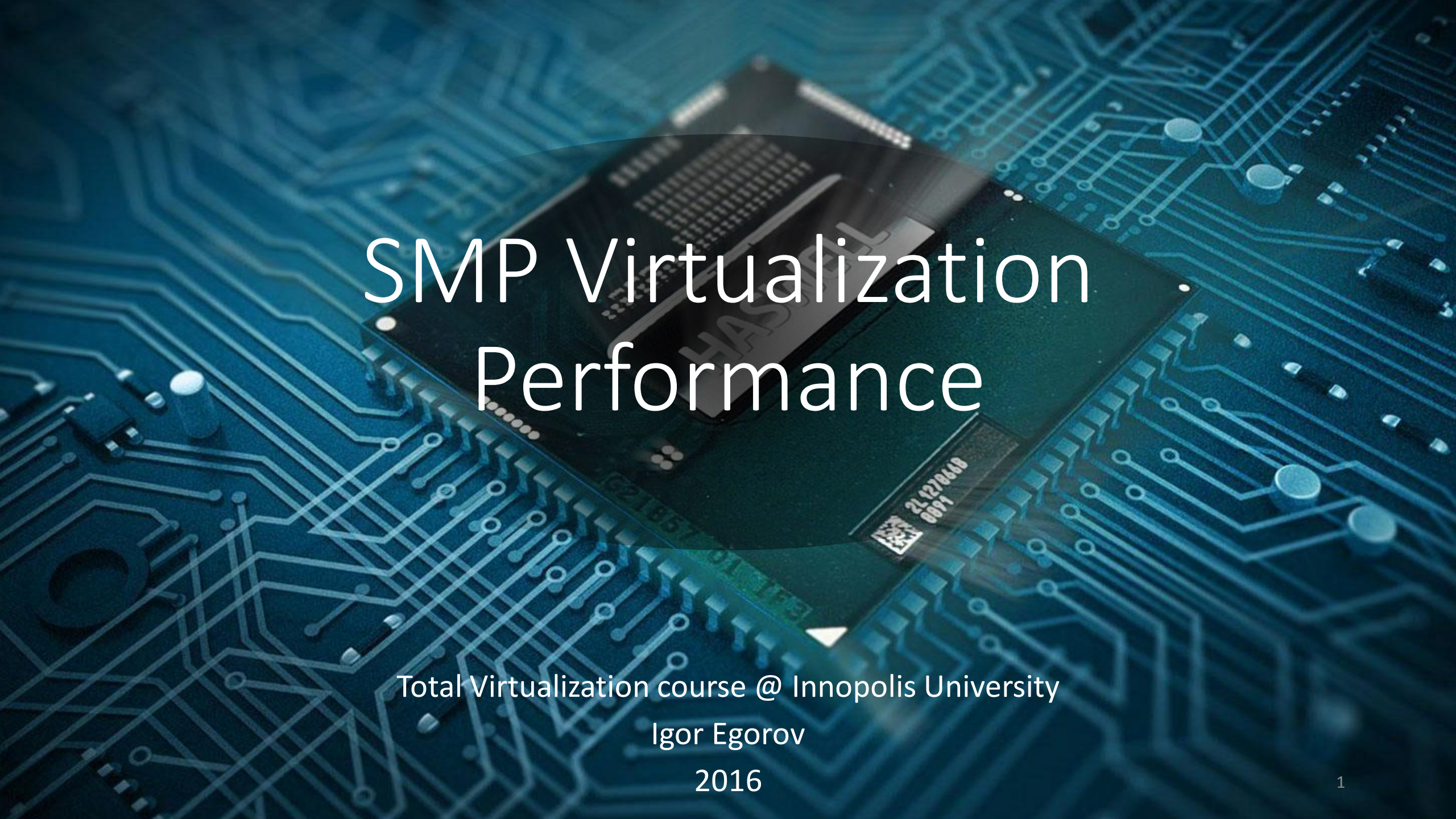


SMP Virtualization Performance

Total Virtualization course @ Innopolis University

Igor Egorov

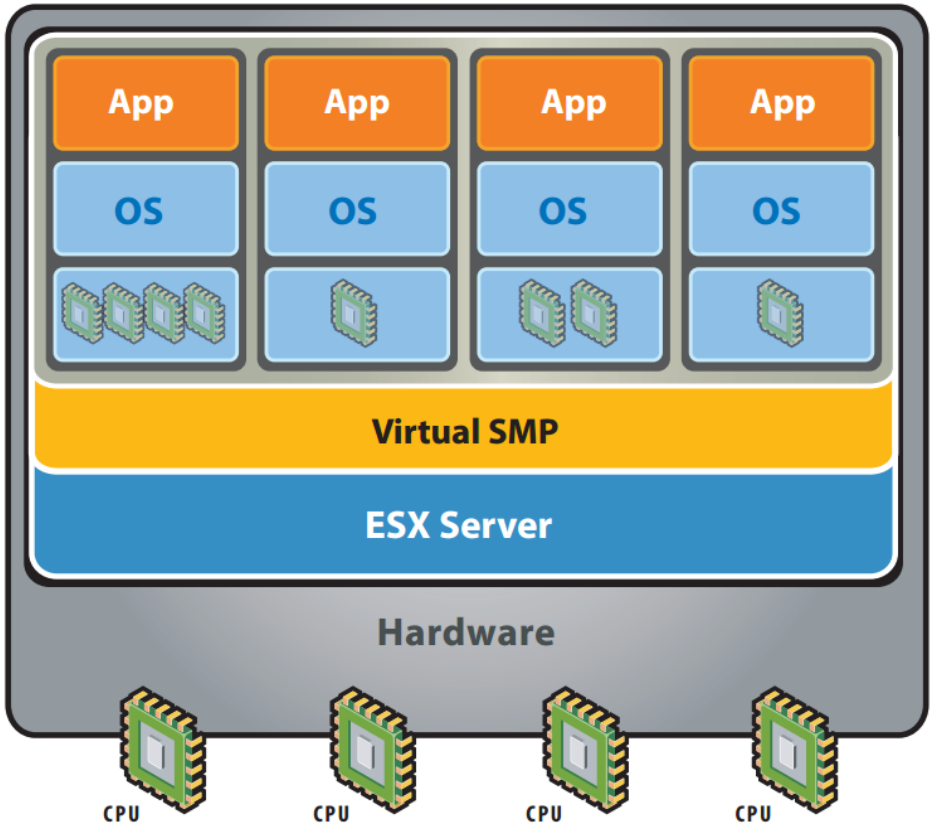
2016

Definition

AT A GLANCE

VMware® Virtual Symmetric Multi-Processing (SMP) enhances virtual machine performance by enabling a single virtual machine to use multiple physical processors, simultaneously. A unique VMware feature, Virtual SMP™ enables virtualization of the most processor- and resource-intensive enterprise applications such as databases, ERP and CRM.

New – 4-way Virtual SMP. The Virtual SMP capability has been extended from two to four processors in VMware Infrastructure 3.



https://www.vmware.com/pdf/vsmp_datasheet.pdf

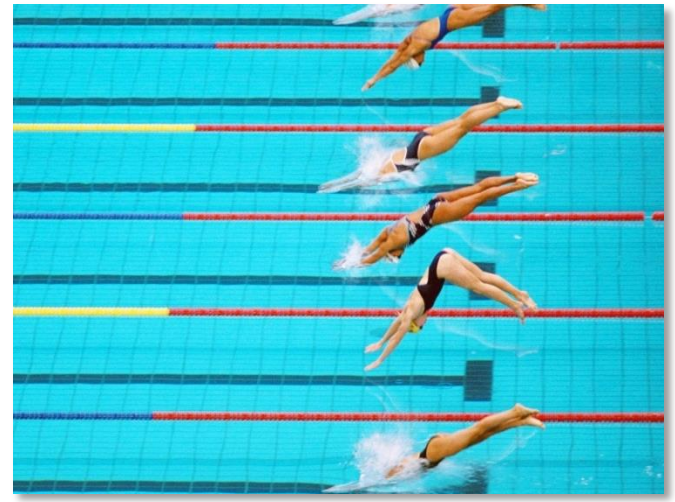
Project Objective

Evaluate vSMP performance comparing to SMP

- App that can run threads on single or different CPUs
- App that measures execution time remotely and independently

Project Context

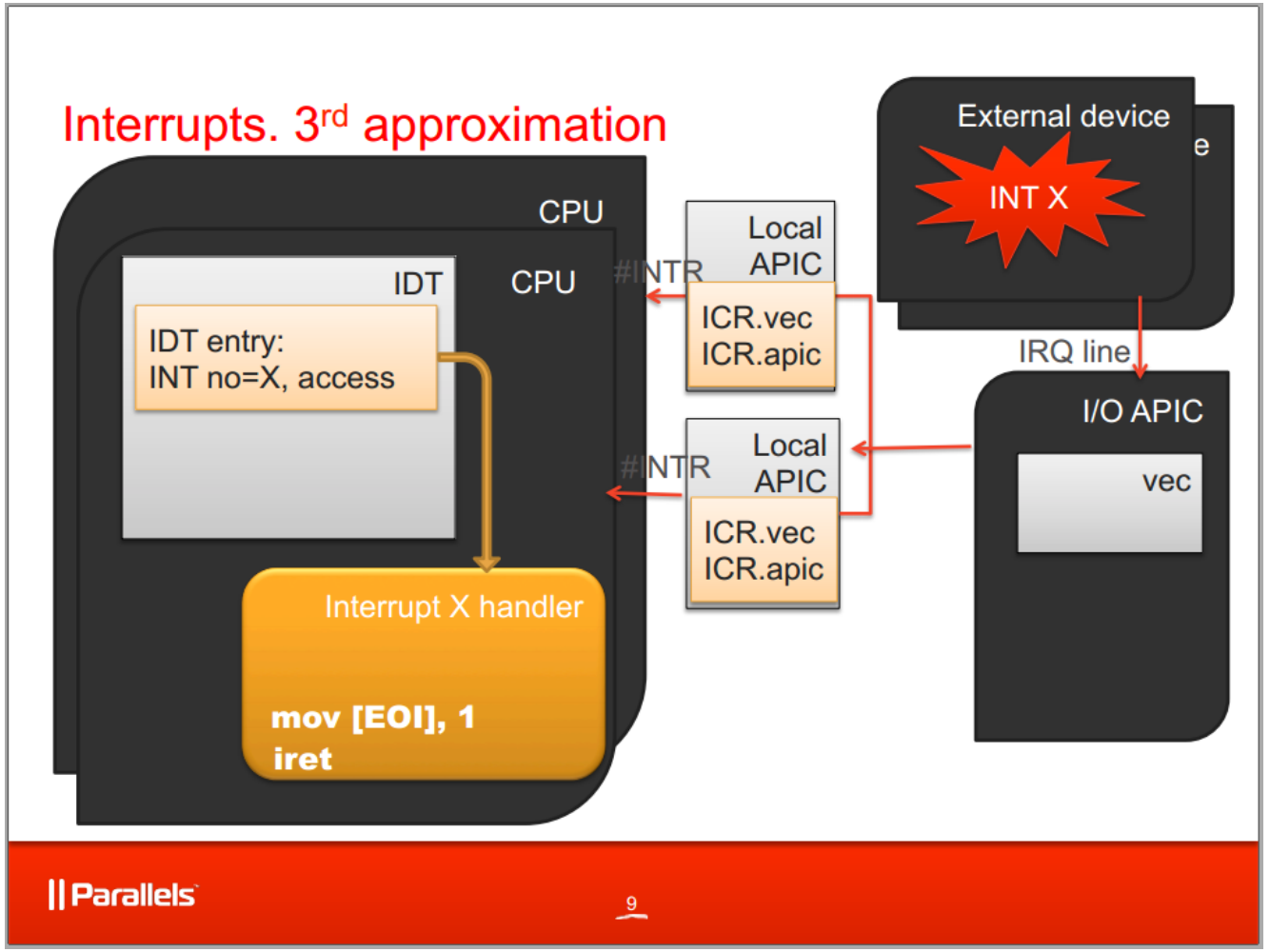
- Two threads (concurrent, not parallel)
- Mutex-based synchronization
- Bare-metal and virtualized systems
- UP and SMP systems
- Remote control over TCP



Where performance disappears?

- Threads sync through the mutex
- Mutex is a Windows Kernel Object
- Kernel Object operations require syscalls
- Syscall leads to VMEXIT

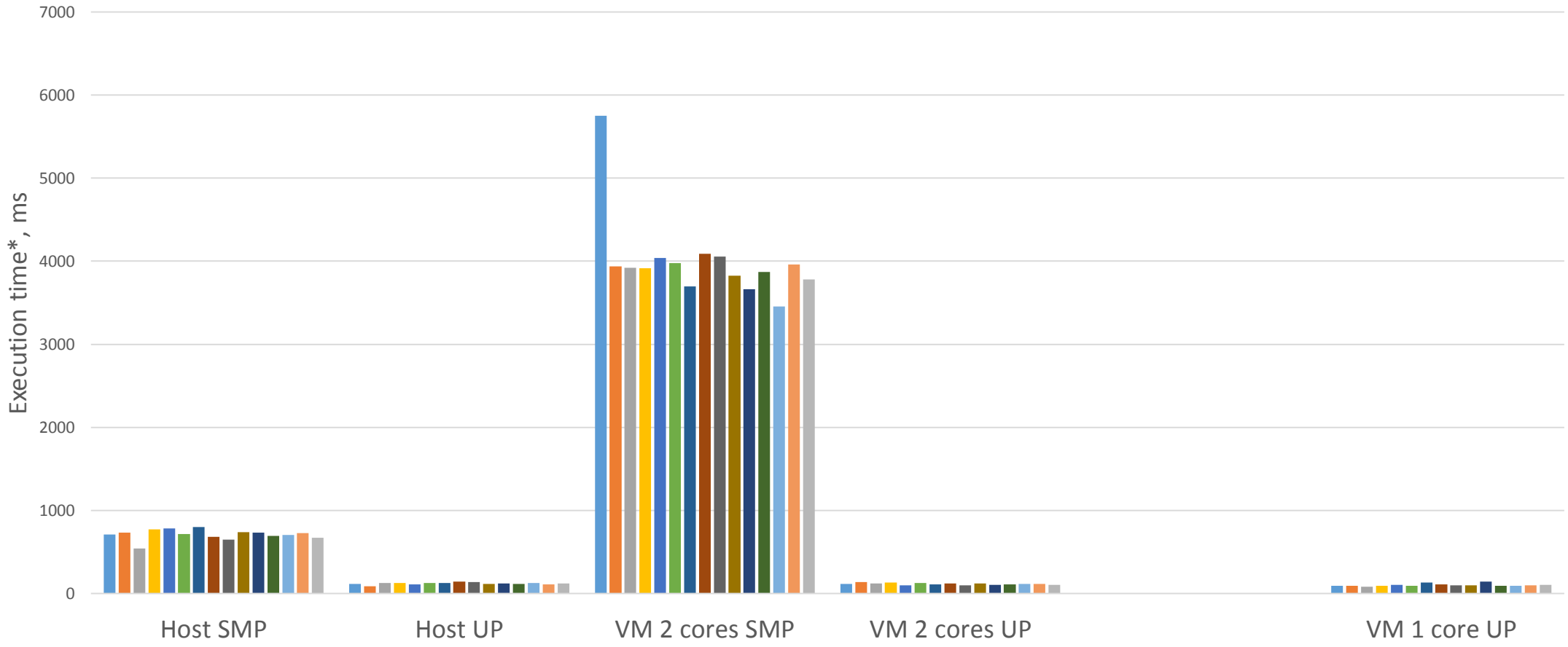
Where performance disappears? (2)



Experiment Conditions

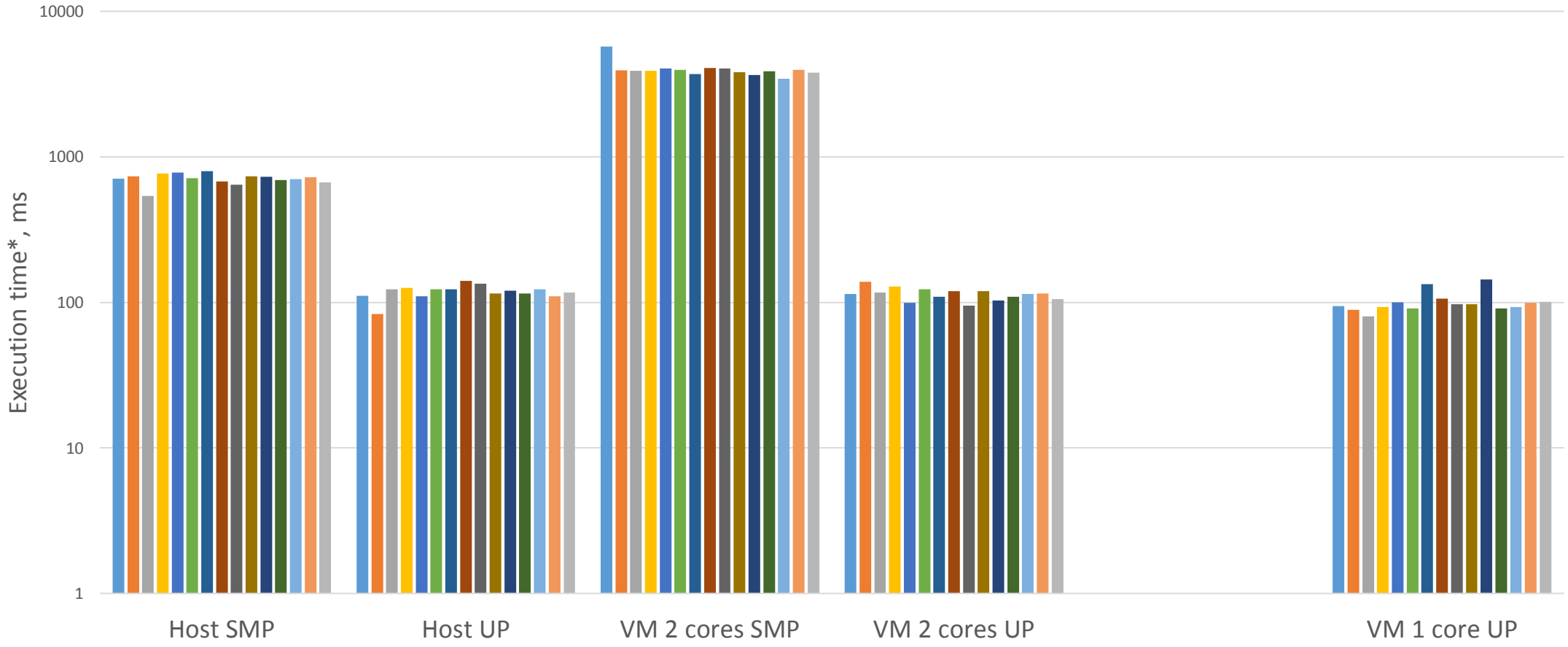
- Host: Windows® 8.1 Pro x64
- Guest: Windows® 8.1 Pro x64 (2 CPUs and 1 CPU)
- Host CPU: Intel® Core™ i3 M370 (has VT-x)
- Virtualization engine: VMware® Workstation 12 Pro

Experiment Results



* Lower is better

Experiment Results (Logarithmic scale)



* Lower is better

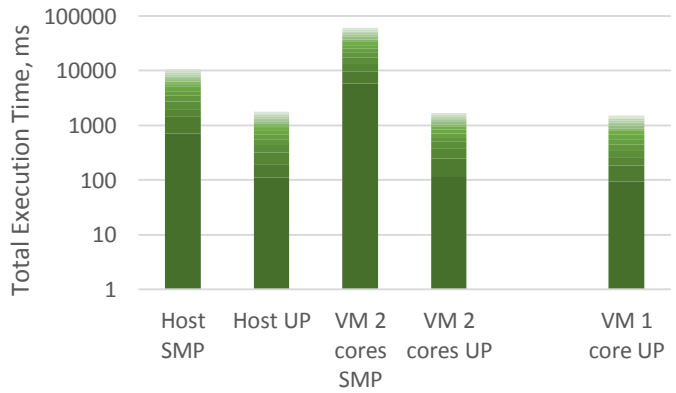
Experiment Results (Raw Data)

	Host SMP	Host UP	VM 2 cores SMP	VM 2 cores UP		VM 1 core UP
	708	111	5750	114		94
	733	83	3937	138		89
	540	123	3920	117		80
	771	126	3916	129		93
	781	110	4040	99		100
	714	123	3979	123		91
	799	123	3699	109		133
	680	141	4089	119		106
	646	134	4054	95		97
	736	115	3824	119		97
	731	120	3664	103		144
	692	115	3873	109		91
	701	123	3456	114		93
	726	110	3963	115		99
	667	117	3783	105		101
Average	708	118	3996	114		101
Deviation	60	13	496	11		16
Min	540	83	3456	95		80
Max	799	141	5750	138		144

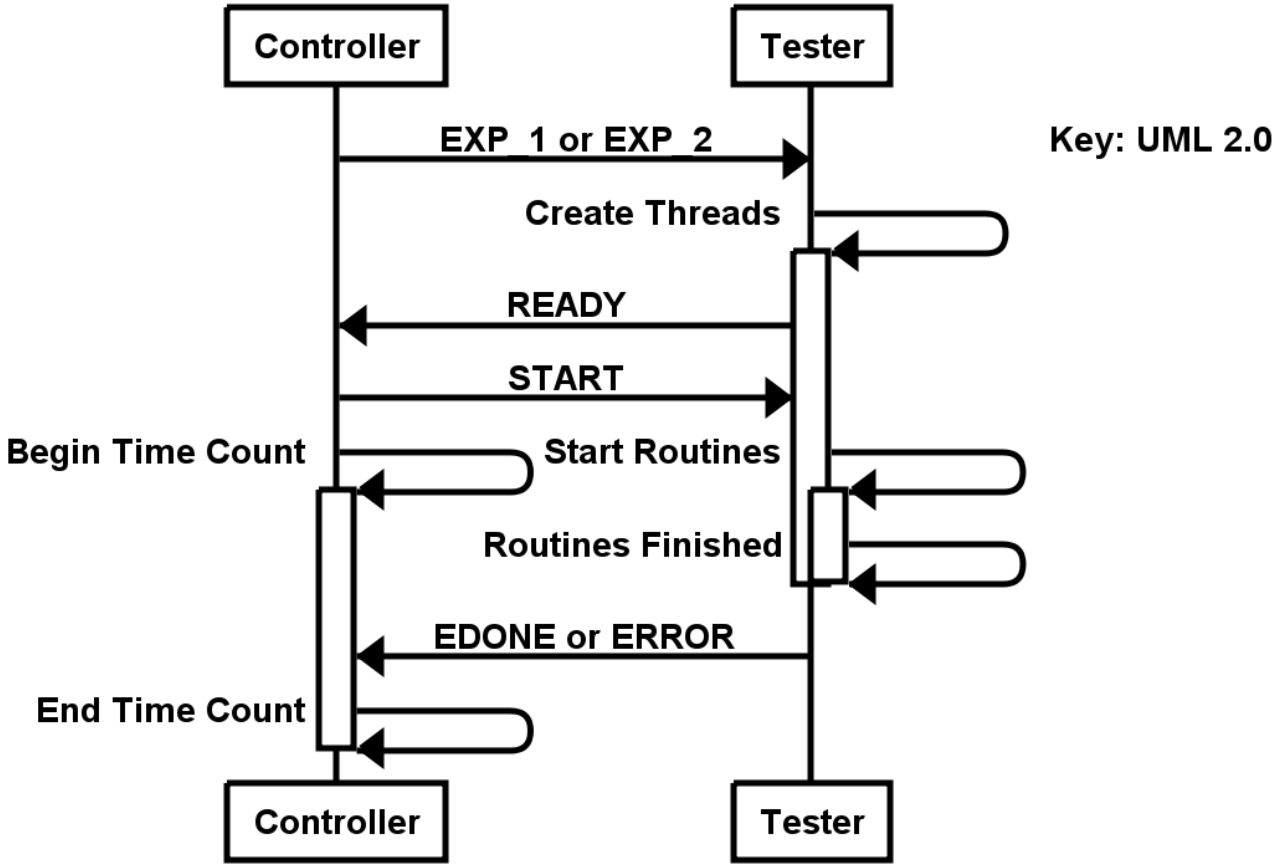
Results Analysis

- SMP brings overhead even in non-virtualized environment (up to 6-7 times slower rather than UP)
- vSMP performance worse than SMP (up to 6 times slower)
- UP mode has the same performance level for all test conditions
- UP is faster than vSMP up to 36 times

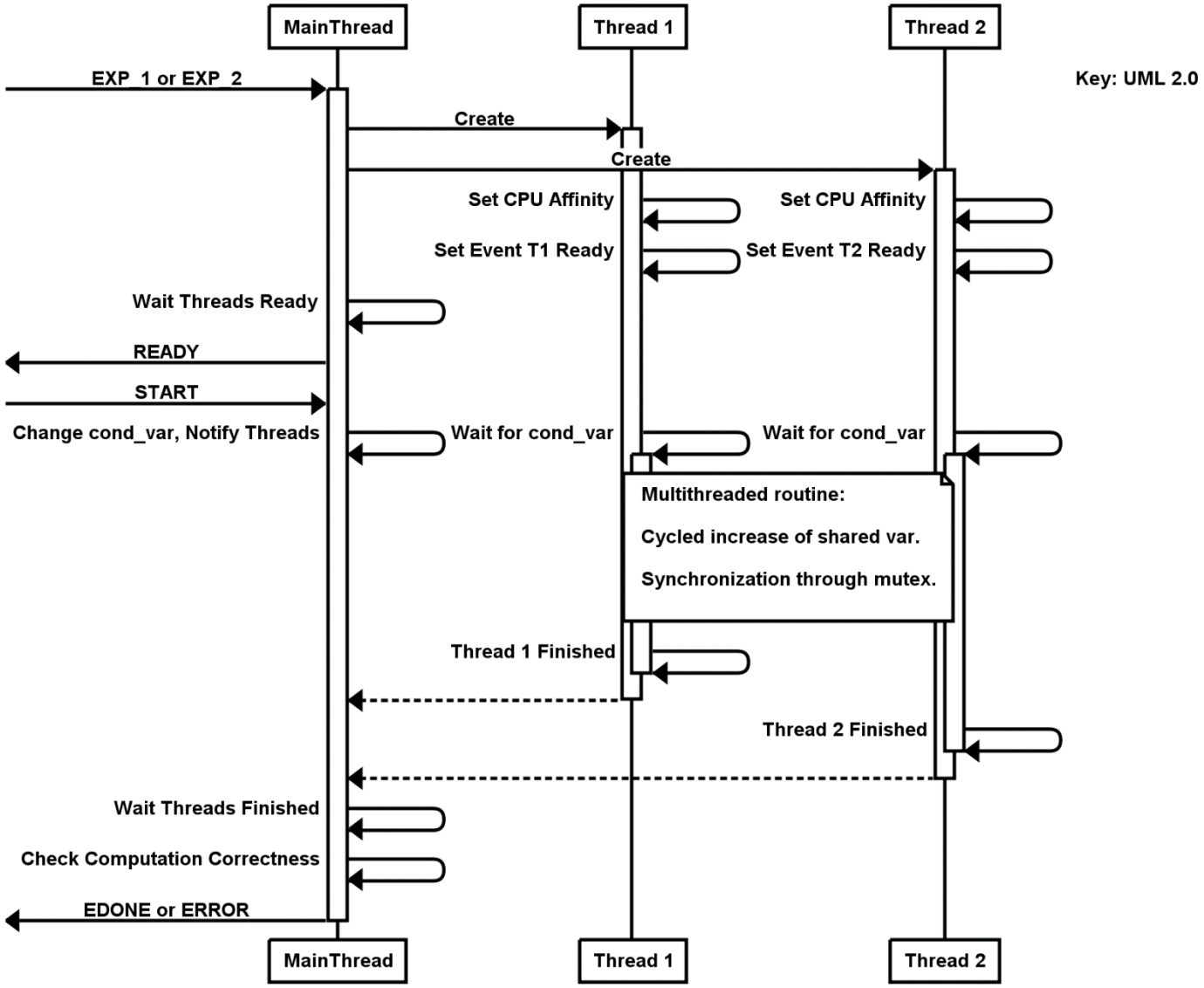
	Host SMP	Host UP	VM 2 cores SMP	VM 2 cores UP		VM 1 core UP
Average	708	118	3996	114		101
Deviation	60	13	496	11		16
Min	540	83	3456	95		80
Max	799	141	5750	138		144



Test Applications Transaction Protocol



Test Application Model



References

Source code and this slides are available here:

https://github.com/dxyozh/vsmp_perf

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