

Virtualization Benchmarks

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Players in the field of Virtualization

	Synthetic Benchmarks					Application Benchmarks		
	MMU	CPU	Bonnie	TTCP		Geant4	Root	AliRoot
Native Linux	x	x	x	x		x	x	x
XEN PVM	x	x	x	x		x	x	x
XEN HVM	x					x	x	x
KVM	x	x	x	x		x	x	x
VMware Server	x	x	x	x		x	x	x
Apple	x	x	x	x		x	x	x
Parallels	x	x	x	x		x	x	x

§ Native Linux

- § The Linux installed on physical machines
- § Three Variants used
 - Linux with a 2.6.18 Kernel (SMP)
 - Linux with a 2.6.18 Kernel (Non SMP)
 - SLC4 (2.6.9-55.0.2.EL.cernsmp)

§ KVM (Kernel-based Virtual Machine)

- § Full virtualisation solution
- § Makes the use of Hardware virtualization extensions (Intel-VT and AMD-V)

- § XEN HVM (Hardware Virtual Machine)
 - § A flavor of XEN based on full virtualization
 - § Guest OS is unmodified
 - § Supports SMP and 32 bit and 64 bit guest OS

- § XEN PVM
 - § A flavour of XEN based on Paravirtualisation
 - § Guest OS modified to use special Hypercalls
 - § Supports SMP and 32 bit and 64 bit guest OS



Introduction to the Players

§ VMware Server

- § Freely available Virtualization software from VMware.
- § Is based on Full Virtualization Technique and supports SMP
- § Uses dynamic code rewriting

§ Parallels

- § Based on Full virtualization Technique
- § Does not support SMP
- § A Strong competitor of VMware Fusion

§ Apple

- § Darwin Kernel used

- § Act of running a Computer Program by running a number of standard tests and trials against it
- § To assess the performance characteristics of a computer Hardware or Software



Why Benchmarks?

- § Difficult to judge performance by the Human Eye or by specifications
- § To deliver results based on Practical tests
- § To deliver numerical results helping in more accurate testing and analysis

§ Synthetic Benchmarks

- § Check individual performance of a component

§ Application Benchmarks

- § Run actual real-world programs on the system
to test performance



Synthetic Benchmarks used

§ MMU

- § To test the Memory Management by allocating new Pages via malloc in a loop

§ CPU (nbench)

- § To test the CPU performance by generating prime numbers (sorting, IDEA, FFT algorithms are also run)

§ Bonnie

- § To test the I/O
- § Performs a series of tests (putc(), getc(), write(), read()) on a file of known size

§ Ttcp

- § To test the Network Performance by sending and receiving data through TCP



Application Benchmarks used

§ Geant4

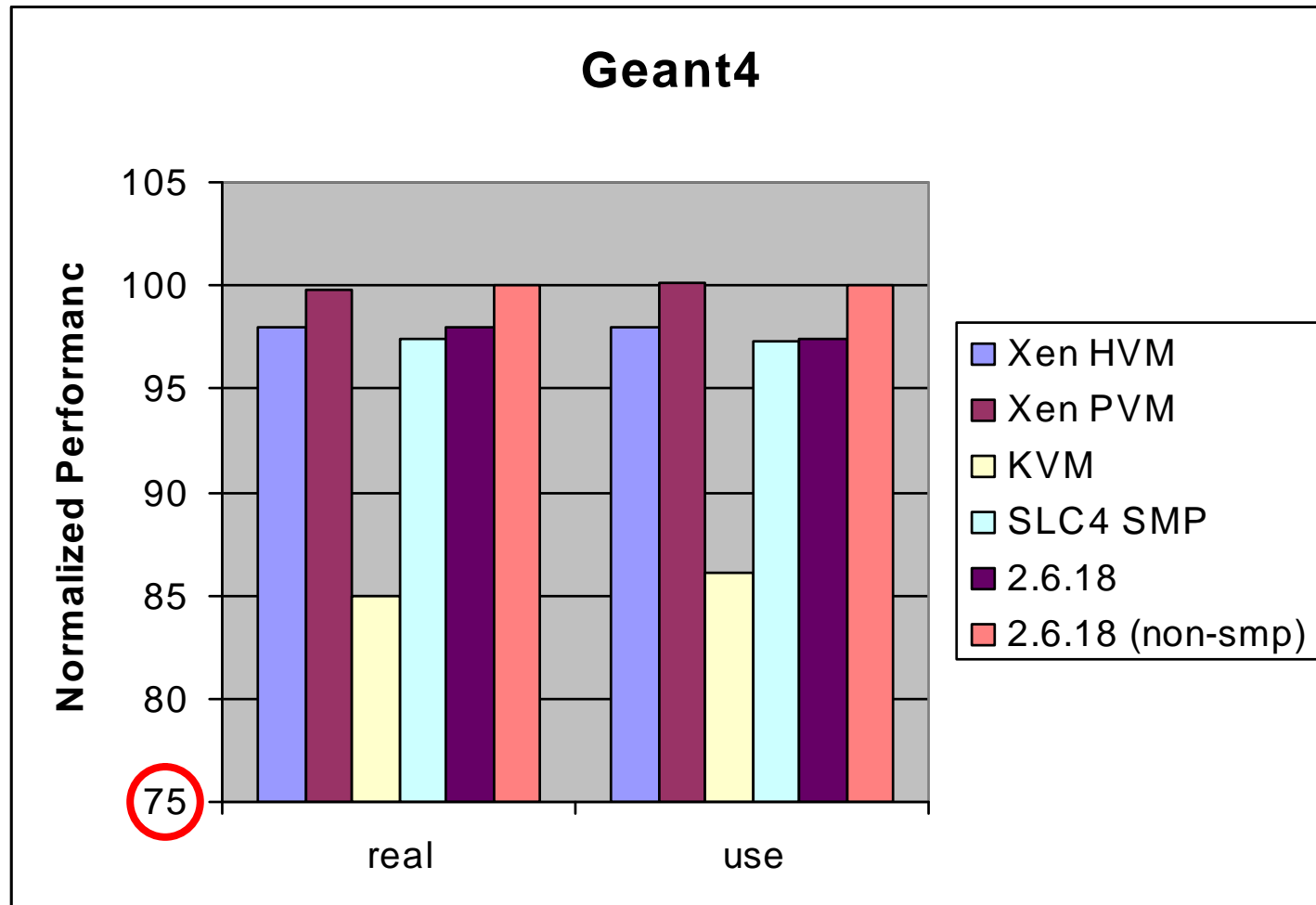
§ A compute intensive application. A Platform for the simulation of the passage of Particles through matter.

§ Root

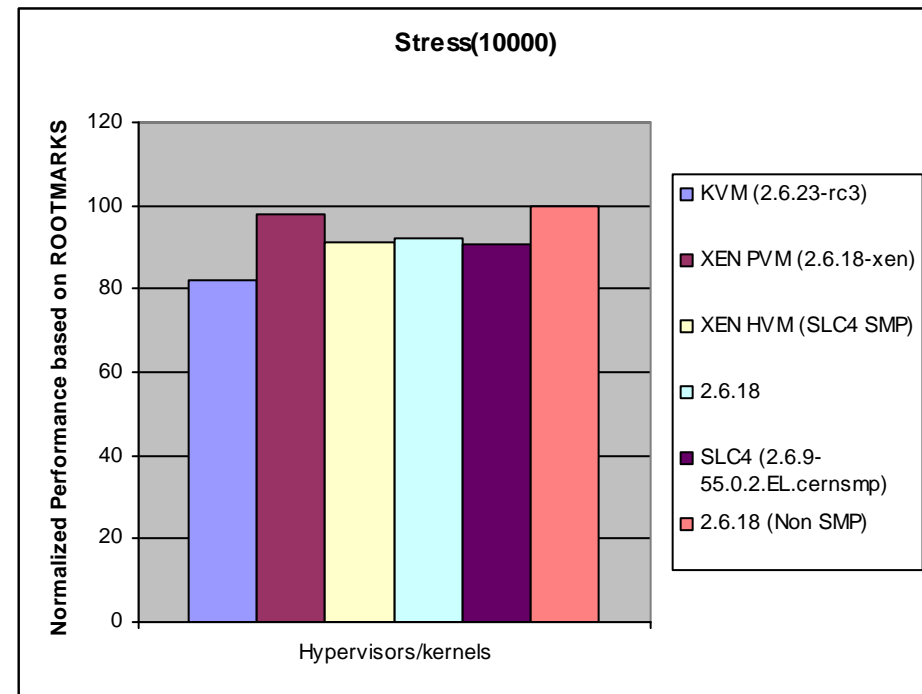
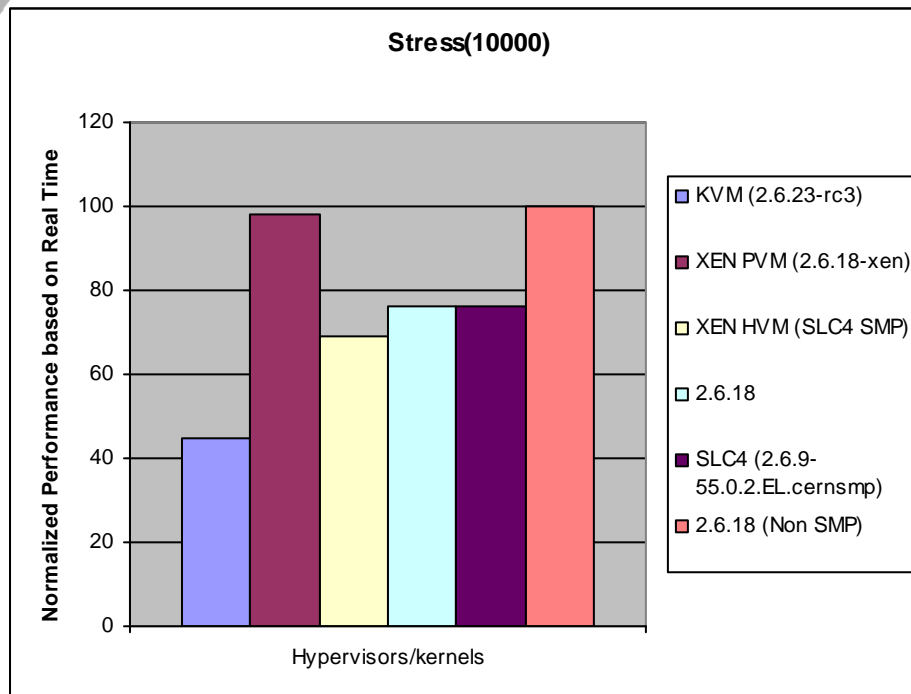
§ A data analysis application, somewhat I/O intensive

§ AliRoot

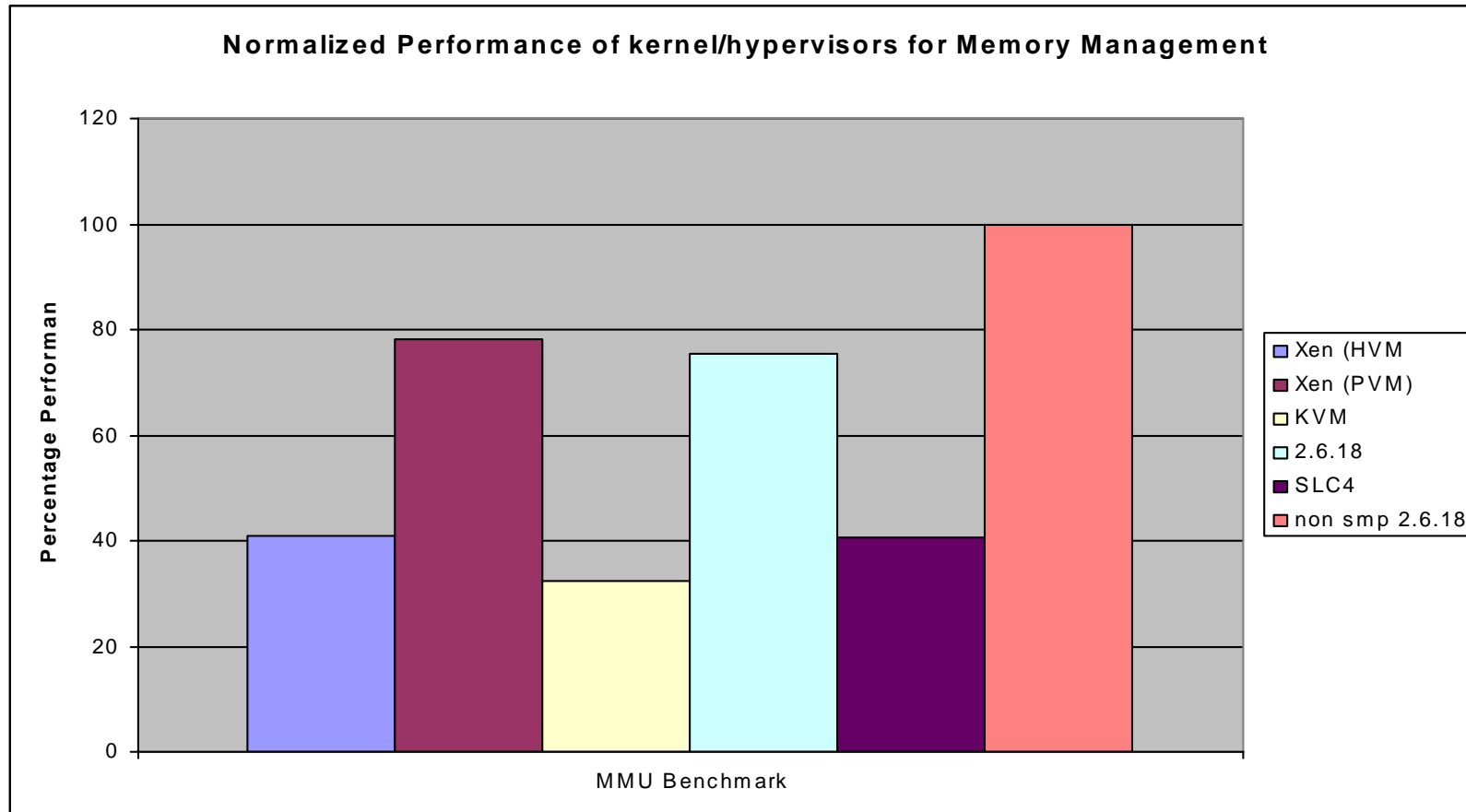
§ A simulation/reconstruction framework



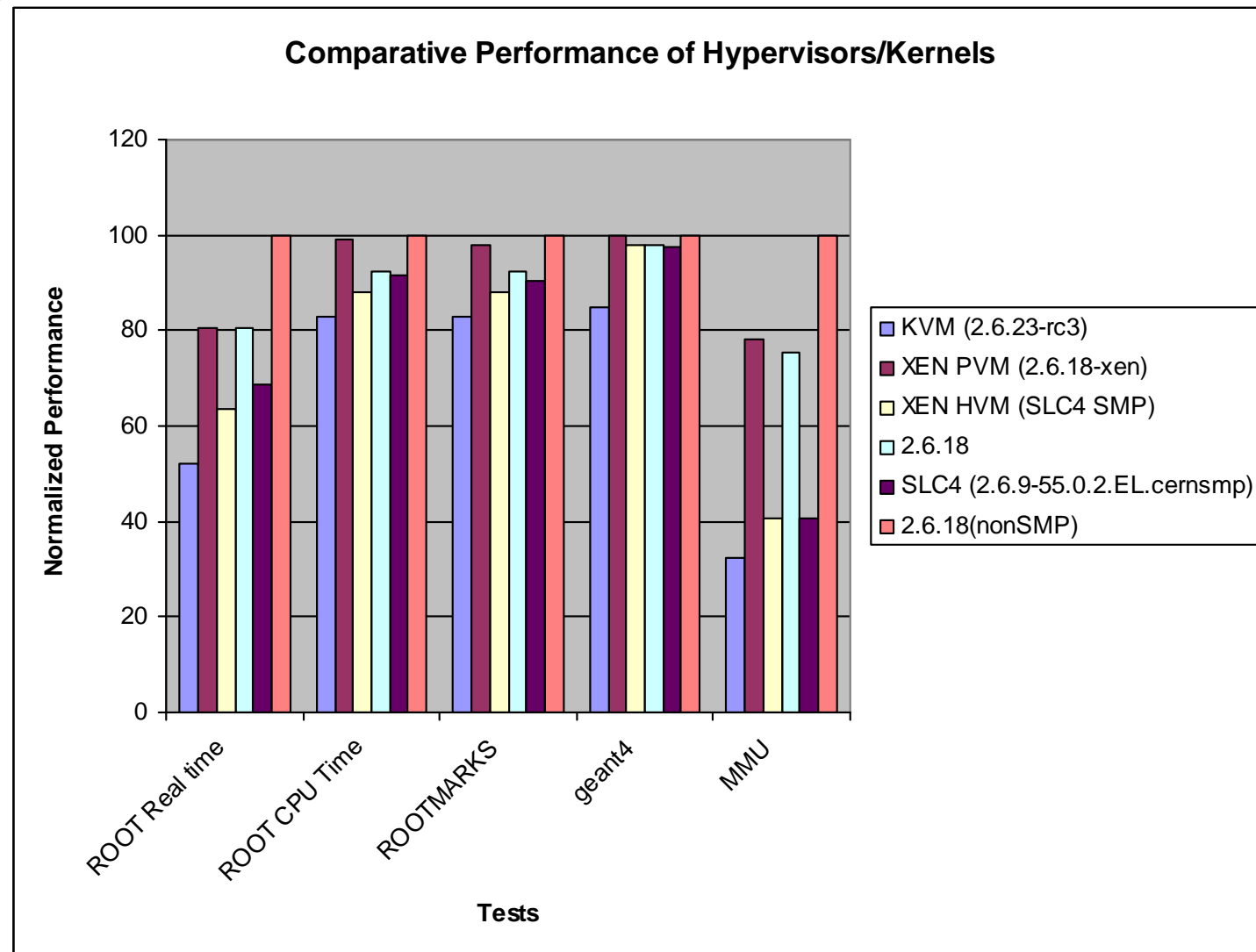
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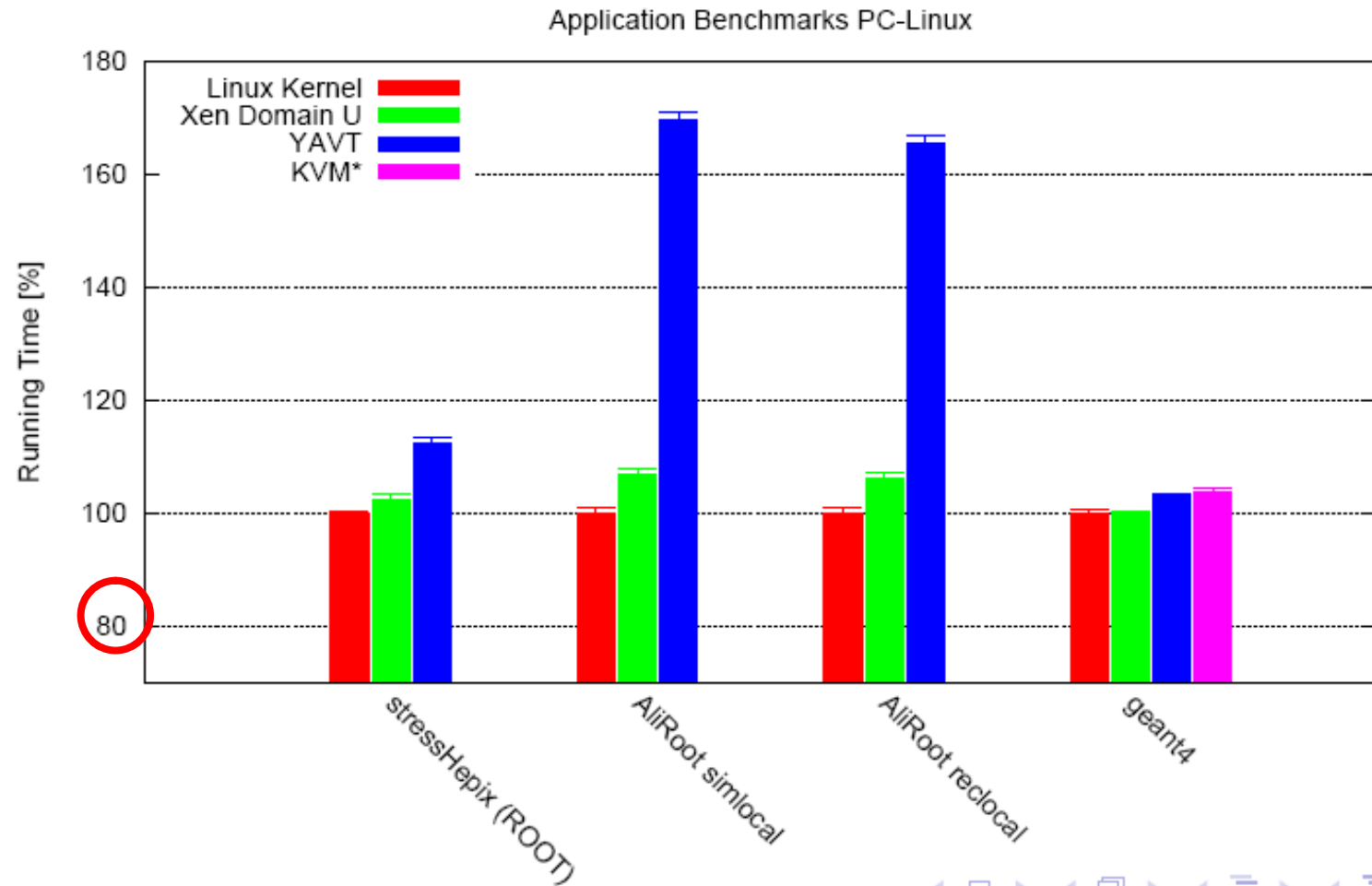
Courtesy: Irfan Habib



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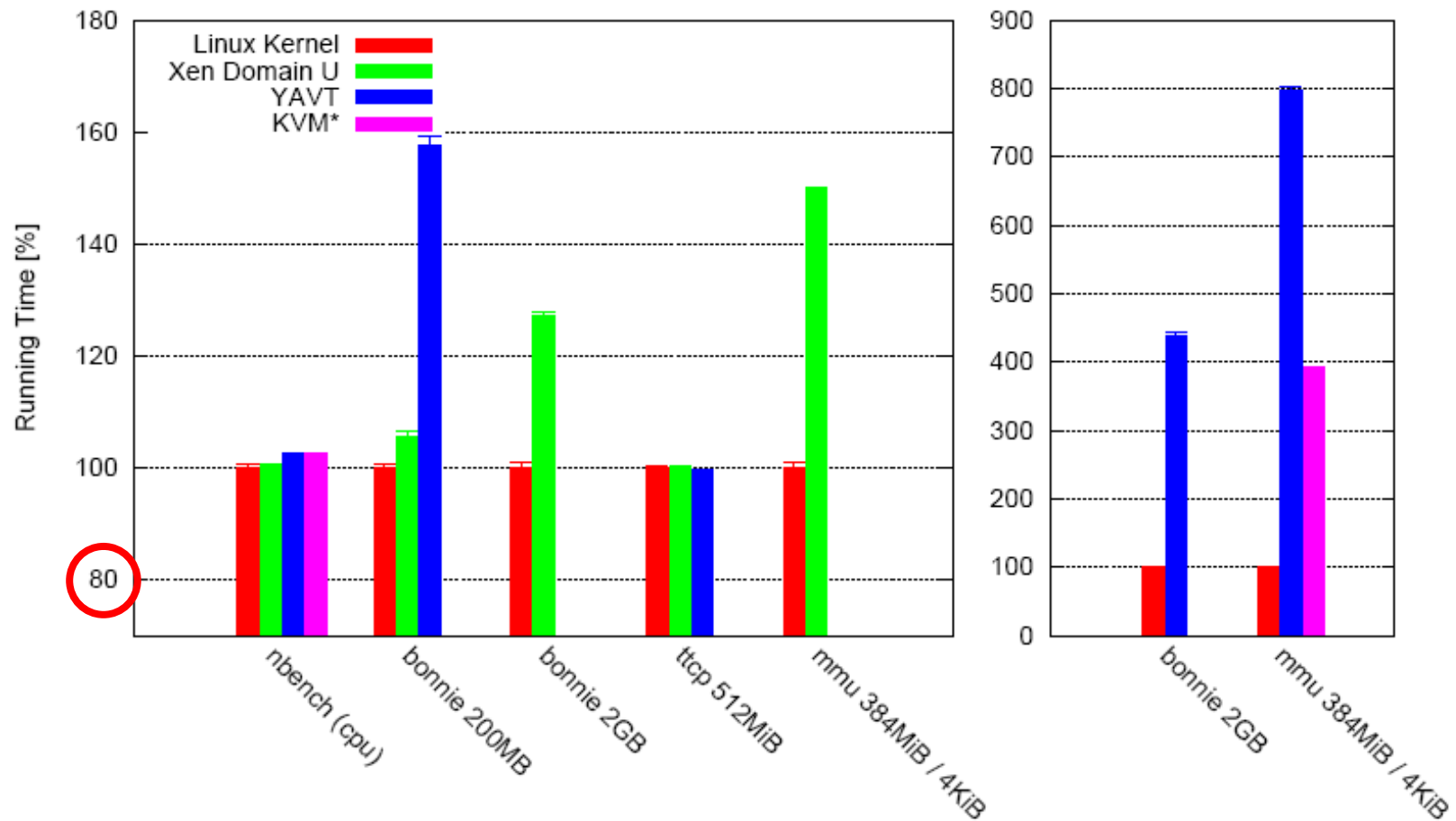


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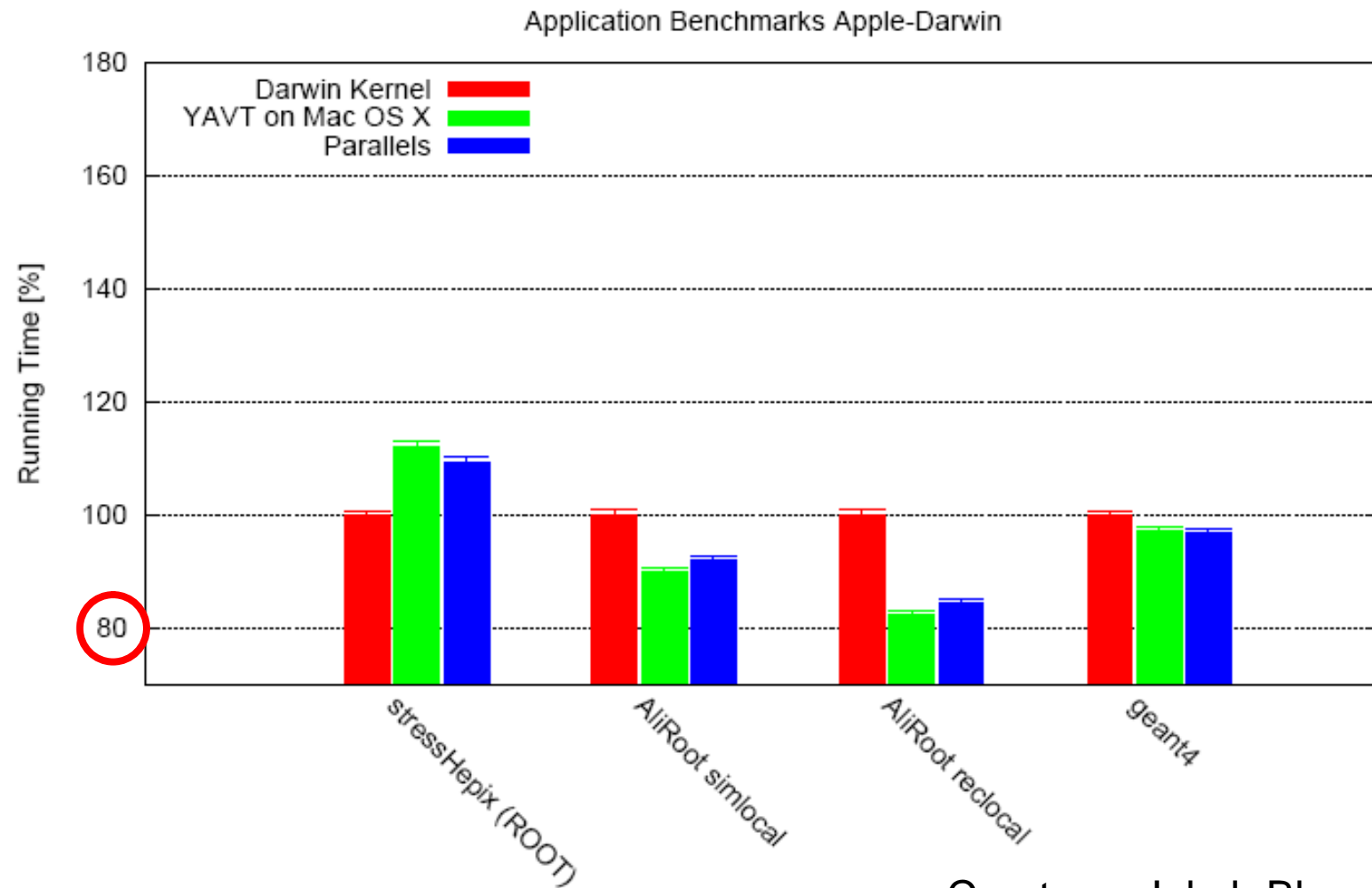


Courtesy: Jakob Blomer

Synthetic Benchmarks PC-Linux

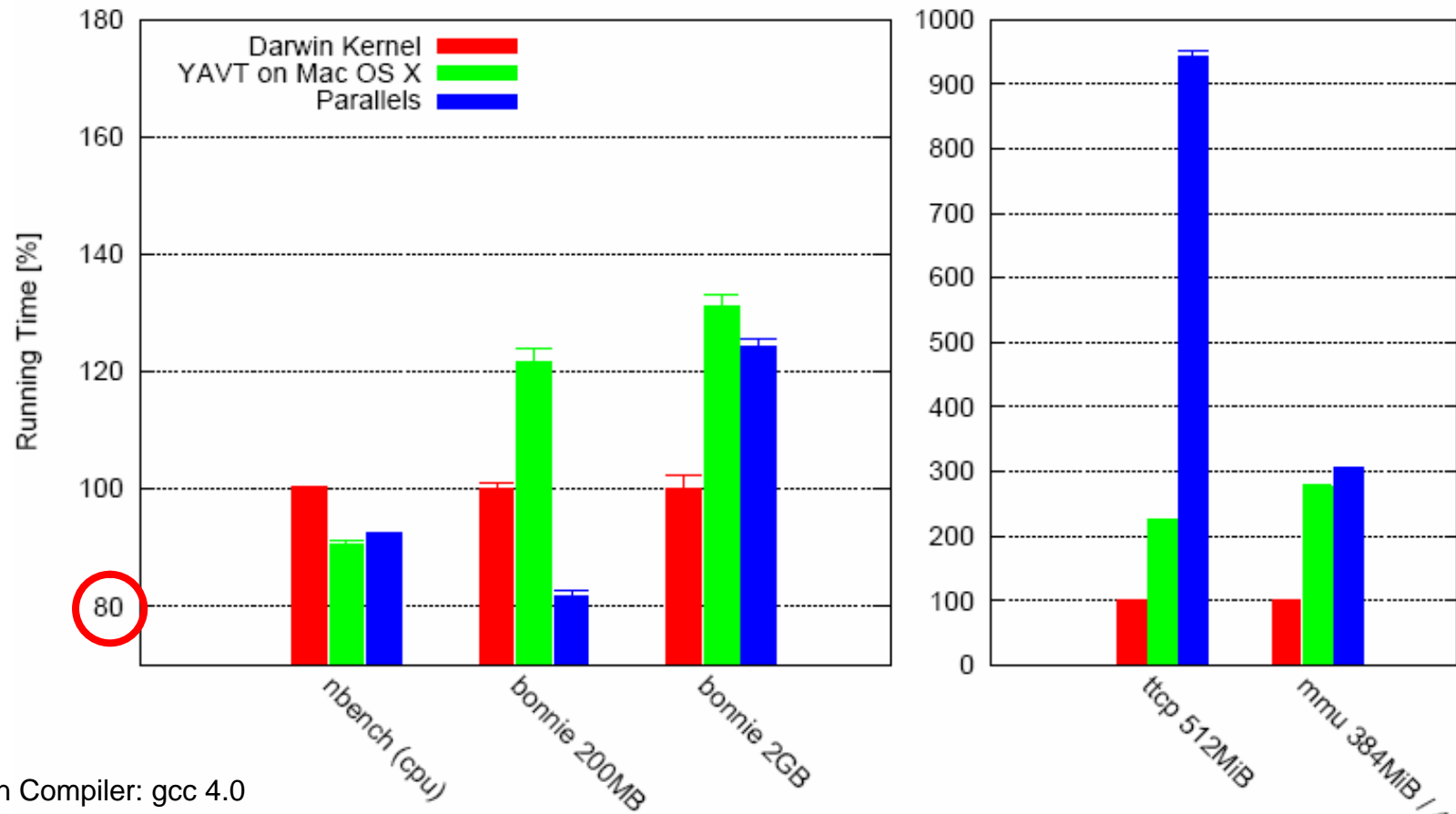


Courtesy: Jakob Blomer



Courtesy: Jakob Blomer

Synthetic Benchmarks Apple-Darwin



Darwin Compiler: gcc 4.0

Courtesy: Jakob Blomer



Still to be done

§ Comparison between VMware ESX Server and XEN



Conclusions & Interesting Facts

- § KVM, a lightweight tool but still a long way to go
- § XEN PVM guests have a loss of 1% to 3% CPU performance
- § Hardware virtualized guests have generally poor I/O performance as compared to Paravirtualization
- § Page Fault handling still not efficient



Thank you for your
attention