A satellite view of the Earth, showing the Americas in the center. The image is slightly faded and serves as a background for the text.

Energy Efficient Computing

Michael Bane





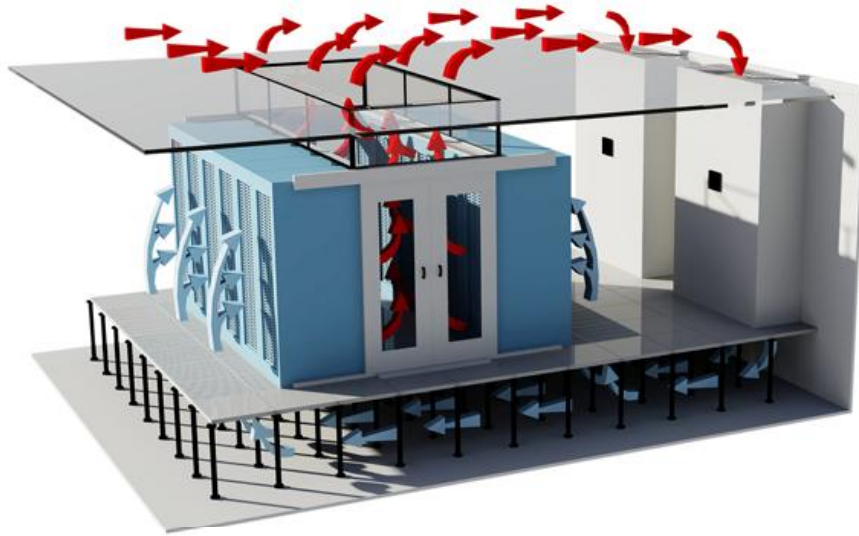


motorsport.com



© Reuters

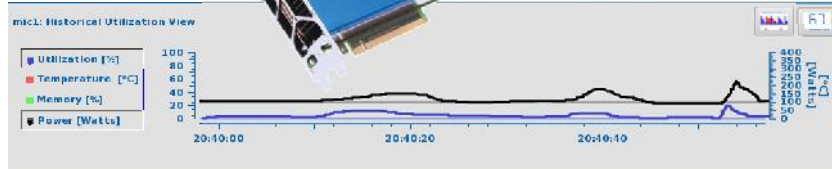




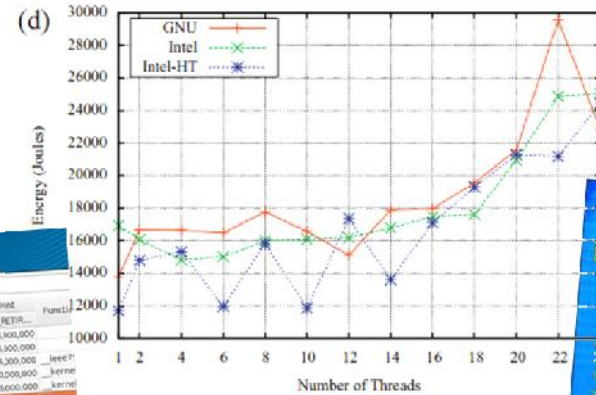
```

jobname      serial.qsub
jobnumber    4
taskid       undefined
account      sge
priority     0
qsub_time    20Apr2014 13:17:07 2014
start_time   20Apr2014 13:27:10 2014
end_time     20Apr2014 13:30:08 2014
granted_pe   Def
slots        1
failed       0
exit_status  0
total_Watts 0.0012
ru_wallclock 181
ru_utime     0.001
ru_stime    0.007
ru_maxrss   1516
  
```

ARM



Variation of Energy with Threads on Zen (DC-B)



Trefethen et al, J Comp Sci



Introducing **CUDA 6**

OpenACC
DIRECTIVES FOR ACCELERATORS

FORTRAN
C, C++
OpenMP
MPI

Grouping	Module / Function	Hardware Event Count	Funcs/
CPU_CLK_U	REST_REST...	13,212,000,000	8,228,000,000
		11,478,000,000	5,966,000,000
		3,352,000,000	2,224,000,000
		2,472,000,000	950,000,000
		1,970,000,000	996,000,000
		1,211,000,000	634,000,000
		1,244,000,000	264,000,000
		496,000,000	176,000,000
		402,000,000	18,000,000
		52,000,000	18,000,000
		36,000,000	18,000,000

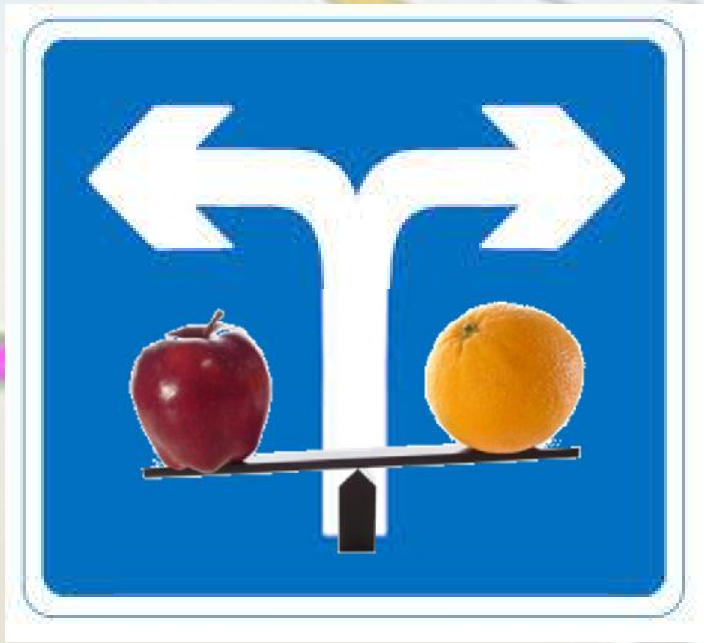


Windows Azure



Condor
High Throughput Computing





37 W

Destination: max research per Watt