Interpreting and publishing SPEC Results

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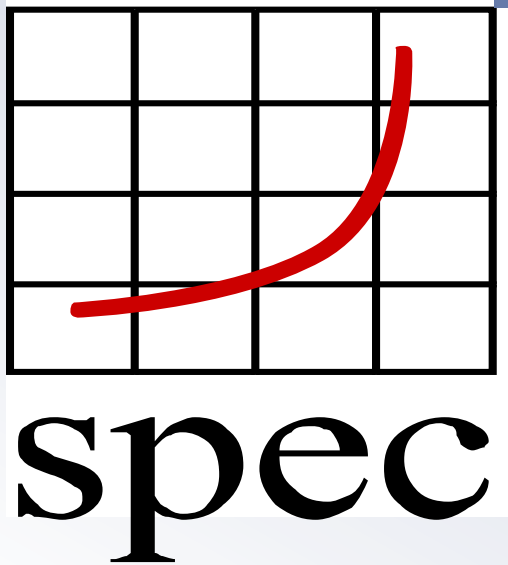

Contents

- Preparing a result for submission
- Comparing results

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Output files of a SPEC run

- In the **`result`** subdirectory
- Text files, “.txt”,
  - Preview of the Result as it would look on the SPEC website
- Log files, “.log”, “.log.debug”
  - Verbose output of the benchmark run
- Raw files, “.rsf”,
  - Above the “line” are editable fields about the run such as system or software configuration
  - Below the “line” are the encoded results. Tampering with the results will corrupt the file.

Preparing a result for submission

- Flags and Platform files
  - XML files containing detailed descriptions of the compiler flags and platform settings.
  - Required for a valid result (TODO: Add slide on this)
- Rawformat
  - Script used to format a raw file into text, html, Postscript, or PDF
  - Also performs a submission check to determine result is valid.

```
$> rawformat outputfile.rsf
$>
$> rawformat -F path/to/flagsfile.xml
```

Runs offline verification of result (similar to submission), produces same output as online

Adds flags-file to the result

- Hands-on
  - Edit the enclosed ".rsf" and use "rawformat" and the flags files to format a valid result.

Reportable results and Estimates

- Reportable, compliant results fully conform to the run and reporting rules of the benchmark
  - Different benchmark suites may have different rules
  - Valid results just pass the syntax, compliant result are more stringent. Such things as:
    - Are the software and hard components:
      - Specified using customer-recognizable names, generally available within certain time frames, documented,
      - Supported and be of production quality?
    - Do the compiler flags
      - Generate correct code and improve performance for a class of programs larger than the SPEC suites,
      - Are generally available, documented, and supported?
- Estimates
  - Results that do not meet all the run and reporting rules can still be used, if clearly marked as an Estimate
  - An estimate may be fully compliant except for one issue, such as an experimental component
    But could be numbers pulled out of thin air.

Submitting a result to SPEC

- Submitting results to SPEC for publication is *not* required for most SPEC benchmarks, including the SPEC HPG benchmarks discussed today.
- Results submitted to SPEC are reviewed before publication and may require a publication fee for non SPEC members. See: https://www.spec.org/hpg/submitting_results.html

- Process your rsf-file through rawformat to check for anything missing or faulty
- Attach your rsf-file to an email to the appropriate benchmark submission email.
  - For a list of submission emails, please contact info@spec.org

- You will receive a reply with a .sub-file attached
- In case you need to update anything, modify the sub-file, and attach to an email to
  - resubaccel@spec.org

Fair Use

- Beyond creating compliant results, how the results can be used is governed by SPEC
- The source of the result must be clear
- The date the result must be clear and correct
- All SPEC trademarks must referenced
- Metrics must be disclosed.
  - Derived metrics may be used provided the SPEC metric is given.
- Basis of comparison is disclosed (if applicable)

- Full fair use rules can be found at: https://www.spec.org/fairuse.html

Research and Academic Use

- While academics are encouraged to comply with SPEC run and reporting rules, it's understood that this may not be possible.
- Hence, academics are allowed to modify and more or else abuse the benchmarks as the needs of their research dictates. Provided that:
  - Results are marked as "estimates"
  - Deviations from the rules be clearly disclosed

Results

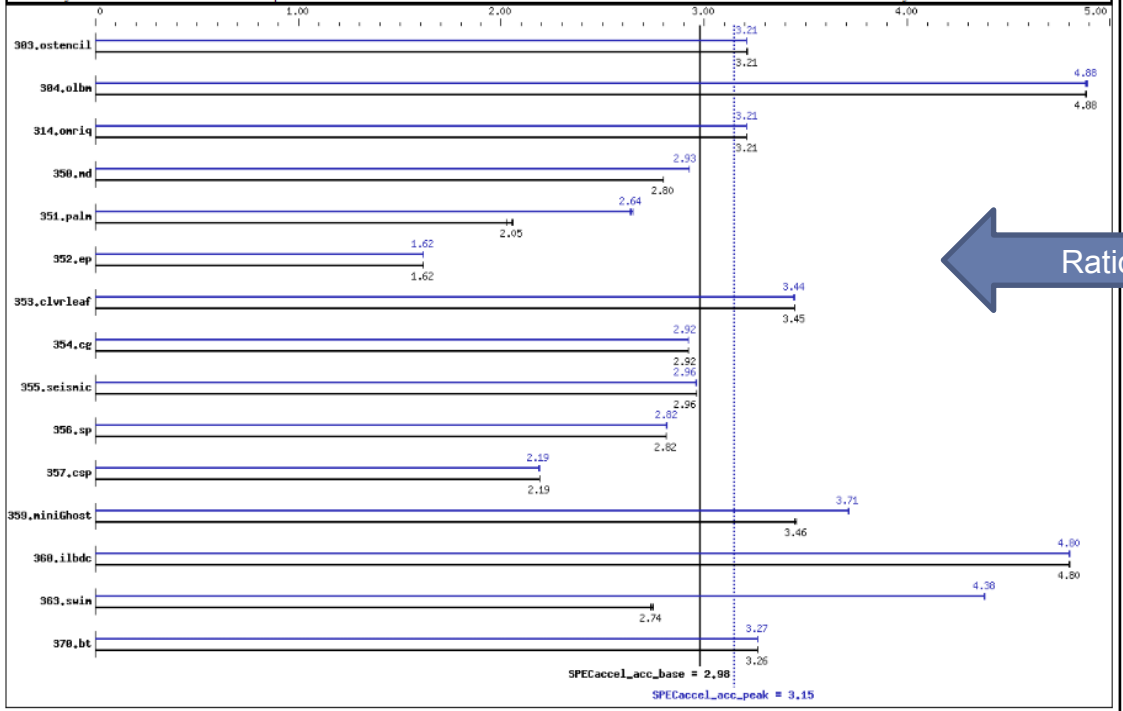
SPEC® ACCEL_ACC Result

Copyright 2014 Standard Performance Evaluation Corporation

ASUS (Test Sponsor: NVIDIA Corporation)
NVIDIA Tesla K40c
ASUS P9X79 Motherboard

SPECaccel_acc_base =	2.98
SPECaccel_acc_energy_base =	3.49
SPECaccel_acc_peak =	3.15
SPECaccel_acc_energy_peak =	3.63

ACCEL license:	019	Test date:	Feb-2014
Test sponsor:	NVIDIA Corporation	Hardware Availability:	Nov-2013
Tested by:	NVIDIA Corporation	Software Availability:	Feb-2014



Hardware

CPU Name:	Intel Core i7-3930K
CPU Characteristics:	
CPU MHz:	3200
CPU MHz Maximum:	3800
FPU:	Integrated
CPU(s) enabled:	6 cores, 1 chip, 6 cores/chip, 2 threads/core
CPU(s) orderable:	1 chip
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	256 KB I+D on chip per core

Accelerator

Accel Model Name:	Tesla K40c
Accel Vendor:	NVIDIA
Accel Name:	NVIDIA Tesla K40c
Type of Accel:	GPU
Accel Connection:	PCIe 3.0 16x
Does Accel Use ECC:	No
Accel Description:	GPU Boost set to maximum graphic clock frequency of 875 MHz. See notes below.
Accel Driver:	NVIDIA UNIX x86_64 Kernel Module 319.60

Metrics

Ratios

Hardware disclosure

Power disclosure

Detailed results

Power

Power Supply:	1200 W
Power Supply Details:	Thermaltake SMART M1200W
Max. Power (W):	398.64
Idle Power (W):	94.87
Min. Temperature (C):	26.56

Power Analyzer

Power Analyzer:	Power Analyzer
Hardware Vendor:	Xitron Technologies, Inc.
Model:	2801
Serial Number:	28011109005
Input Connection:	RS232 via USB-adapter
Metrology Institute:	NIST
Calibration By:	Micro Precision Calibration, Inc.
	220081222038459
	02.20.2014
	1.6.2 (372e138a; 2013-12-04)
Setup Description:	connected to the single power supply that powers the system
Current Ranges Used:	2.0A
Voltage Range Used:	135V

Temperature Meter

Temperature Meter:	Temperature Meter
Hardware Vendor:	Digi
Model:	DigiWATCHPORT_H
Serial Number:	WS34682143
Input Connection:	USB
PTDaemon Version:	1.6.2 (372e138a; 2013-12-04)
Setup Description:	Position 5mm above intake fan

Base Results Table

Benchmark	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio
303.ostencil	45.8	3.17	16.8	384	367	3.15	45.7	3.17	16.6	374	364	3.18	45.8	3.17	16.8	375	366	3.16
304.olbm	194	2.35	56.1	296	290	2.78	194	2.35	56.3	298	291	2.77	194	2.35	56.1	299	290	2.78
314.omriq	354	2.70	131	375	369	2.92	354	2.70	131	375	371	2.91	354	2.70	132	376	372	2.90
350.md	90.6	2.78	31.6	354	349	2.97	90.7	2.78	31.7	367	349	2.97	90.7	2.78	31.6	363	349	2.97
351.palm	184	2.01	42.0	238	228	2.54	189	1.96	43.1	237	228	2.48	184	2.01	42.0	241	228	2.55
352.ep	330	1.60	83.8	275	254	1.96	330	1.61	83.9	256	254	1.96	330	1.61	83.5	255	253	1.97
353.clvrleaf	145	3.07	46.0	322	317	3.42	145	3.07	45.9	322	317	3.43	145	3.07	45.8	325	316	3.44
354.cg	144	2.84	41.5	328	289	3.37	144	2.84	41.5	328	289	3.37	144	2.84	41.4	326	288	3.38
355.seismic	133	2.79	38.2	298	288	3.38	133	2.79	38.1	298	287	3.39	133	2.79	38.1	297	287	3.39
356.sp	118	2.35	33.9	292	288	2.74	118	2.35	33.8	291	288	2.74	118	2.35	33.8	291	287	2.74
357.csp	143	1.89	39.3	286	275	2.24	143	1.89	39.1	285	274	2.25	143	1.89	39.2	288	275	2.25
359.miniGhost	132	2.80	37.0	304	281	3.21	132	2.80	36.8	304	280	3.23	132	2.80	36.8	302	280	3.23
360.ilbdc	7.3	3.77	29.7	315	305	4.37	97.3	3.77	29.6	314	305	4.38	97.4	3.77	29.7	314	305	4.38
			2.59	23.5	266	265	3.23	88.4	2.60	23.4	265	264	3.25	88.4	2.60	23.4	265	264	3.25
			2.95	21.3	284	281	3.56	75.7	2.95	21.1	281	279	3.58	75.7	2.95	21.1	282	279	3.58

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Peak Results Table

Benchmark	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio	Seconds	Ratio	Energy (kJ)	Maximum Power	Average Power	Energy Ratio
303.ostencil	45.7	3.17	16.8	373	366	3.16	45.7	3.17	16.8	373	368	3.15	45.7	3.17	16.7	374	364	3.18
304.olbm	194	2.35	56.2	303	290	2.78	194	2.35	56.0	295	289	2.79	194	2.35	56.0	295	289	2.79
314.omriq	354	2.70	131	375	370	2.92	354	2.70	131	399	371	2.92	354	2.70	131	391	370	2.92
350.md	86.7	2.91	31.0	364	358	3.03	86.7	2.91	31.1	365	359	3.02	86.7	2.91	31.0	363	358	3.03
351.palm	145	2.54	34.7	256	238	3.09	145	2.55	34.6	251	239	3.09	145	2.55	34.5	251	238	3.10
352.ep	330	1.60	83.6	255	253	1.97	330	1.61	83.8	272	254	1.96	330	1.60	83.9	273	254	1.96
353.clvrleaf	145	3.07	45.9	322	316	3.43	145	3.07	45.6	322	315	3.45	145	3.07	45.7	321	315	3.45
354.cg	144	2.84	41.5	328	288	3.38	144	2.84	41.5	339	289	3.38	144	2.84	41.7	328	290	3.36
355.seismic	133	2.79	38.1	297	287	3.39	133	2.79	38.2	297	288	3.38	133	2.79	38.2	304	288	3.38
356.sp	118	2.35	33.7	291	287	2.75	118	2.35	33.8	291	288	2.74	118	2.35	33.7	292	287	2.75
357.csp	143	1.89	39.2	278	274	2.25	143	1.89	39.1	278	274	2.25	143	1.89	39.2	278	275	2.24
359.miniGhost	121	3.04	35.1	336	289	3.39	121	3.04	35.1	339	289	3.39	121	3.04	35.2	333	290	3.38
360.ilbdc	97.3	3.77	29.6	312	304	4.40	97.3	3.77	29.6	326	304	4.40	97.3	3.77	29.6	312	305	4.38
363.swim	57.2	4.02	17.2	302	300	4.42	57.2	4.02	17.1	300	298	4.45	57.3	4.02	17.1	300	299	4.43
370.bt	75.7	2.95	21.2	283	280	3.56	75.7	2.95	21.2	283	280	3.56	75.8	2.94	21.5	291	283	3.52

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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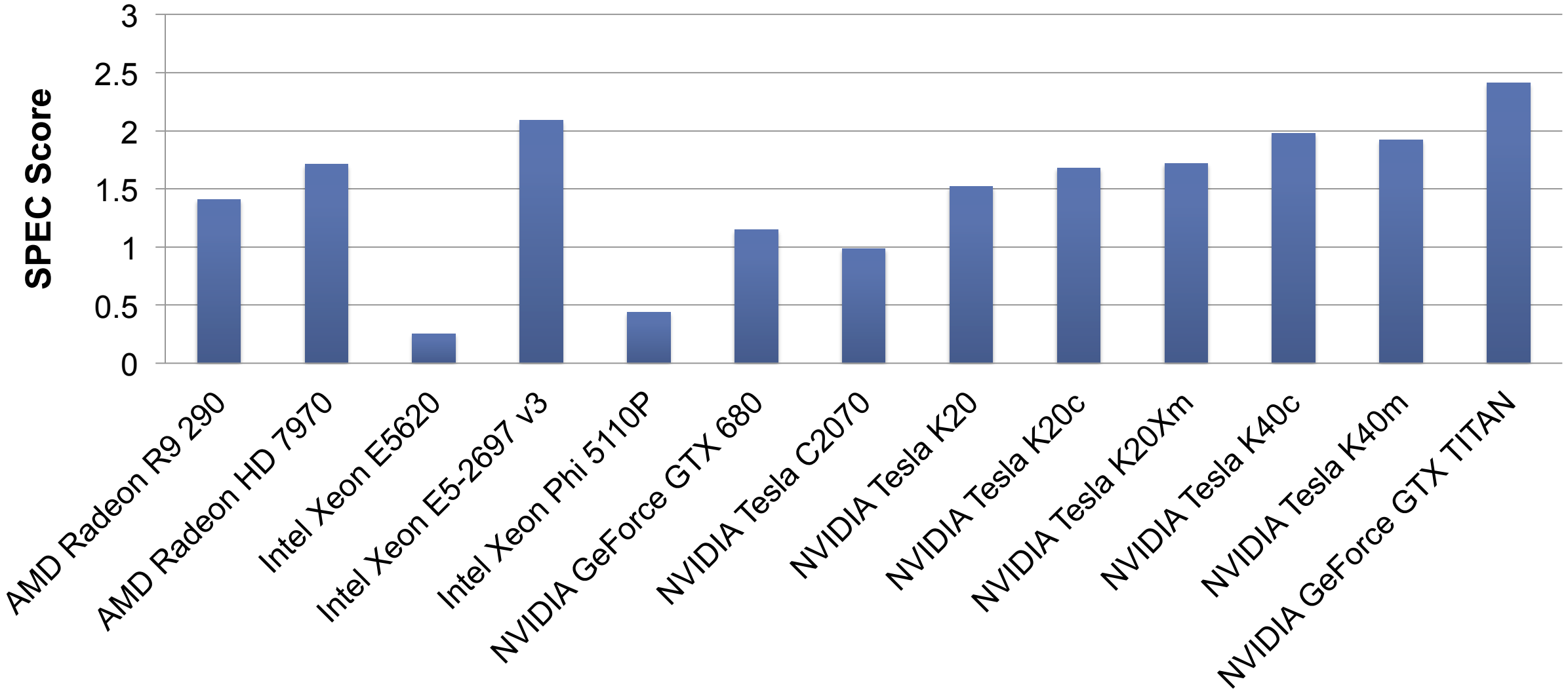
- Preparing a result for submission
- Comparing results

Use Cases (at IU)

- Comparing performance and energy
- Comparing performance of hypervisors
- Comparing HPC systems at a site
- Compare compiler performance over time
- Compare performance of different compilers
- Scalability study for different interconnects
- System setup questions like to use HT or not, which OS to use
- Compare accelerator performance

SPEC ACCEL OpenCL



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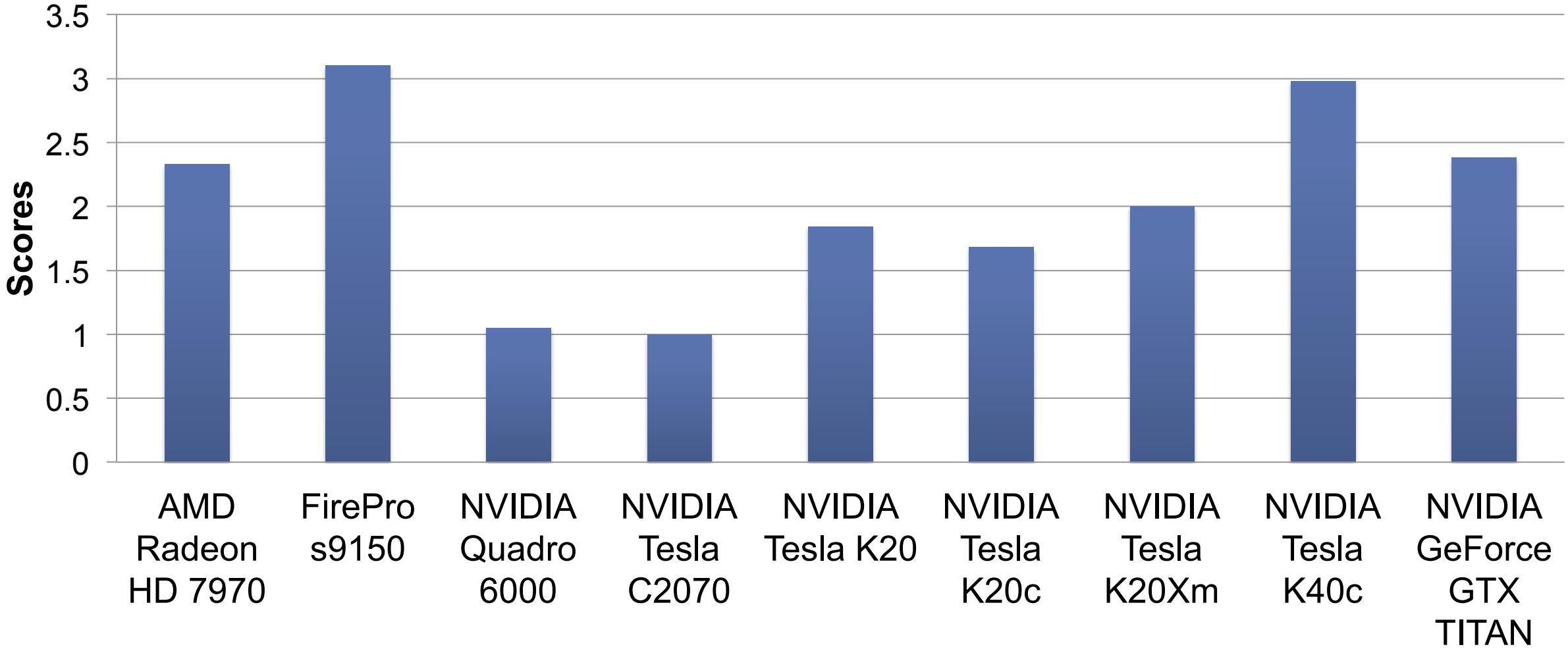
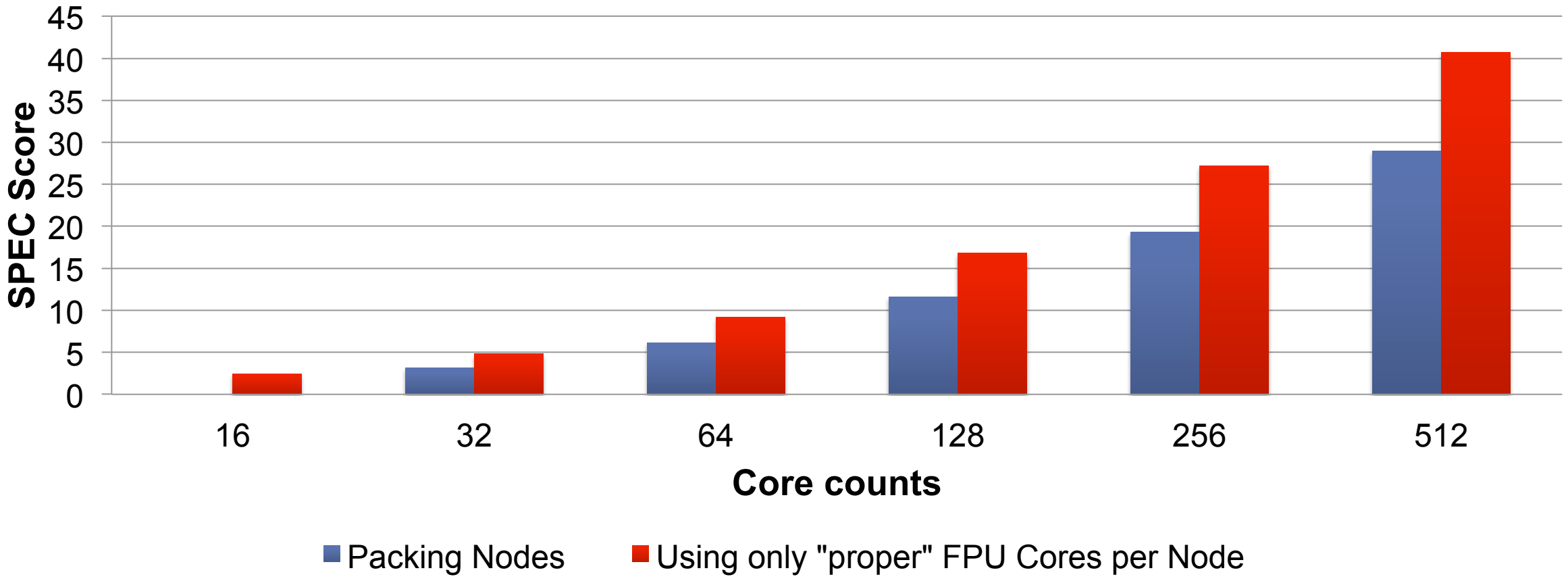
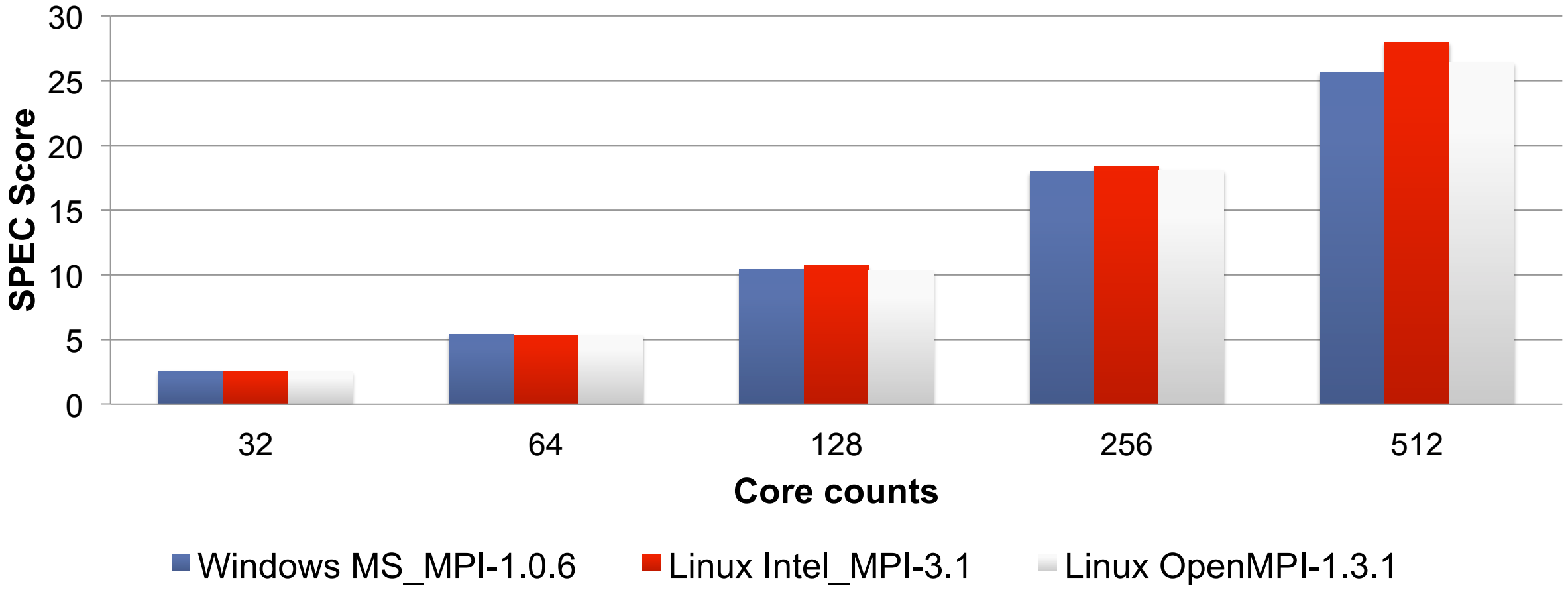


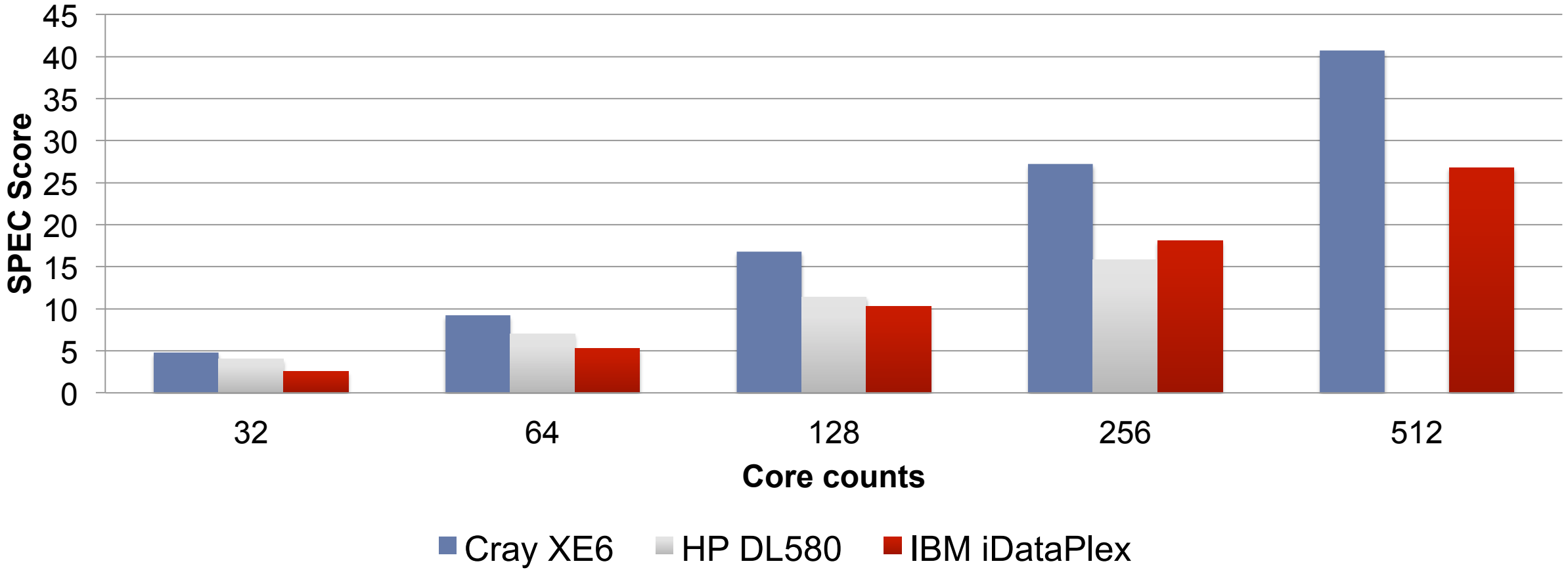
SPEC MPI2007 Medium
Cray XE6 (AMD Opteron 6380)



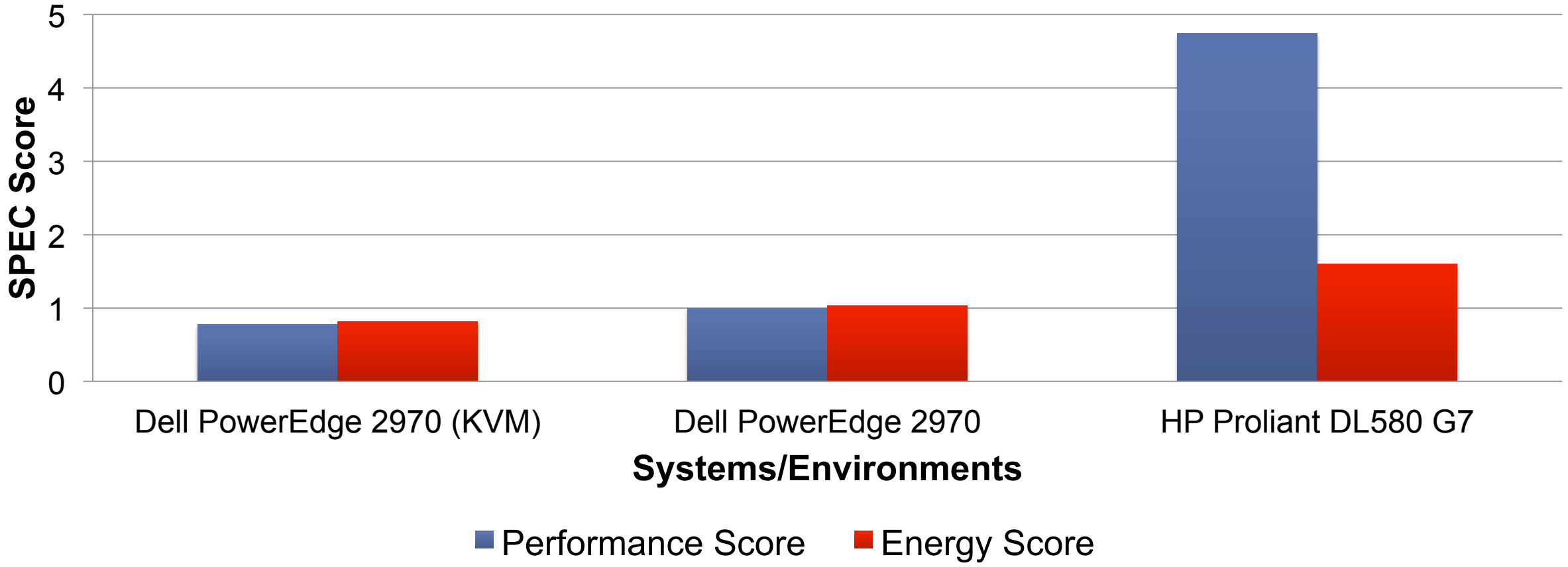
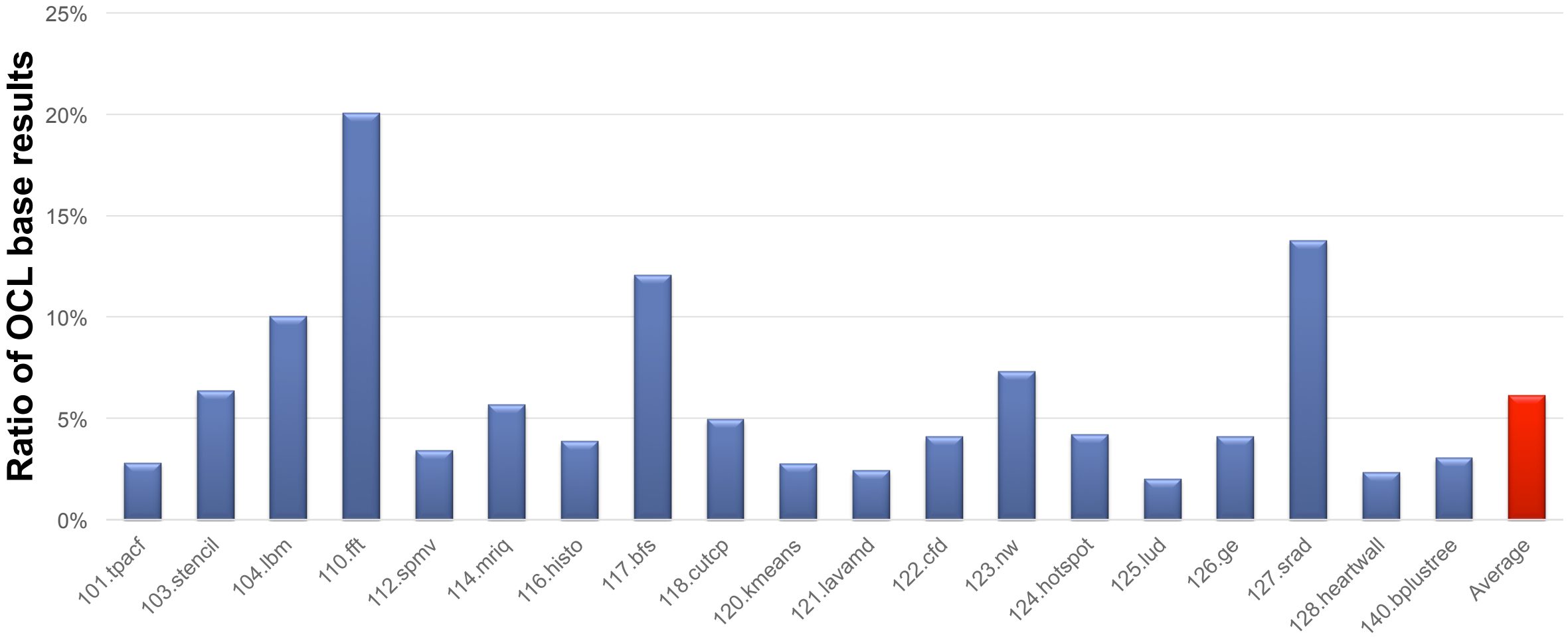
SPEC MPI2007 Medium
IBM iDataPlex (Intel Xeon L5420)



SPEC MPI2007 Medium
Available HPC Systems at IU



SPEC OMP2012
Performance and Energy



SPEC ACCEL
The effect of ECC (Using result #21 and #22, NVIDIA K40c, base)