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Calxeda ECX-1000 Quad-Core ARM Comparison

Comparing 1.1GHz and 1.4GHz Calxeda Highbank ECX-1000 Energy Card single quad-core nodes against an OMAP4460 PandaBoard ES and an x86 Intel Atom D525 CPU. Benchmarking from Ubuntu 12.10 on the Calxeda, PandaBoard ES, and Intel Atom systems. The ARM x86 tests for a future article on Phoronix.com.

Automated Executive Summary

1.6GHz Hardkernel Odroid-xu - ubuntu 13.07 had the most wins, coming in first place for 81% of the tests.

Based on the geometric mean of all complete results, the fastest (1.6GHz Hardkernel Odroid-xu - ubuntu 13.07) was 1.83x the speed of the slowest (1.1GHz Calxeda Highbank Node). ARM Chromebook - Ubuntu 13.04 - lubuntu was 0.718x the speed of 1.6GHz Hardkernel Odroid-xu - ubuntu 13.07, 1.4GHz Calxeda Highbank Node was 0.985x the speed of ARM Chromebook - Ubuntu 13.04 - lubuntu, Intel Atom D525 was 0.942x the speed of 1.4GHz Calxeda Highbank Node, PandaBoard ES was 0.886x the speed of Intel Atom D525, 1.1GHz Calxeda Highbank Node was 0.926x the speed of PandaBoard ES.

Test Systems:

PandaBoard ES

Processor: ARMv7 rev 10 @ 1.20GHz (2 Cores), Motherboard: OMAP4 Panda board, Memory: 1024MB, Disk: 16GB SD16G, Graphics: Texas Instruments OMAP

OS: Ubuntu 12.10, Kernel: 3.5.0-208-omap4 (armv7l), Display Server: X Server 1.12.99.904 (1.13.0 RC 4), Display Driver: fbdev 0.4.3, OpenGL: 2.1 Mesa 8.0.4, Compiler: GCC 4.7, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-sjlj-exceptions --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,c++,go,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --target=arm-linux-gnueabihf --with-arch=armv7-a --with-float=hard --with-fpu=vfpv3-d16 --with-mode=thumb -v
Processor Notes: Scaling Governor: ondemand
System Notes: Compiz was running on this system.

Intel Atom D525

Processor: Intel Atom D525 @ 1.80GHz (4 Cores), Motherboard: FOXCONN NETBOX nT-435/535, Chipset: Intel Atom D4xx/D5xx/N4xx/N5xx, Memory: 2048MB, Disk: 500GB Western Digital WD5000BEVT-2, Graphics: Intel Atom D4xx/D5xx/N4xx/N5xx IGP, Audio: Realtek ALC888, Network: Realtek RTL8111/8168B + Realtek RTL8191SEvA Wireless LAN

OS: Ubuntu 12.10, Kernel: 3.5.0-14-generic (x86_64), Desktop: Unity 6.4.0, Display Server: X Server 1.13.0, Display Driver: intel 2.20.6, OpenGL: 1.4 Mesa 8.1-devel, Compiler: GCC 4.7, File-System: ext4, Screen Resolution: 1366x768

Compiler Notes: --build=x86_64-linux-gnu --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,c++,go,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --target=x86_64-linux-gnu --with-arch-32=i686 --with-tune=generic -v
Disk Notes: DEADLINE / data=ordered,errors=remount-ro,relatime,rw
System Notes: Disk Scheduler: DEADLINE. Compiz was running on this system.

1.1GHz Calxeda Highbank Node

1.4GHz Calxeda Highbank Node

Processor: ARMv7 rev 0 (4 Cores), Motherboard: Highbank, Memory: 4096MB, Disk: 256GB SAMSUNG MZ7PC256

OS: Ubuntu 12.10, Kernel: 3.5.0-1000-highbank (armv7l), Compiler: GCC 4.7, File-System: ext4

Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-sjlj-exceptions --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,c++,go,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --target=arm-linux-gnueabihf --with-arch=armv7-a --with-float=hard --with-fpu=vfpv3-d16 --with-mode=thumb -v

ARM Chromebook - Ubuntu 13.04 - lubuntu

Processor: ARMv7 rev 4 @ 1.70GHz (2 Cores), Motherboard: SAMSUNG EXYNOS5 (Flattened Device Tree), Memory: 2048MB, Disk: 16GB SEM16G + 64GB

OS: Ubuntu 13.04, Kernel: 3.4.0 (armv7l), Desktop: LXDE 0.5.11, Display Server: X Server 1.13.0, OpenGL: 2.1 Mesa 9.0, Compiler: GCC 4.7, File-System: ext4, Screen Resolution: 1366x768

Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-sjlj-exceptions --disable-werror --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,c++,go,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --target=arm-linux-gnueabihf --with-arch=armv7-a --with-float=hard --with-fpu=vfpv3-d16 --with-mode=thumb -v
Processor Notes: Scaling Governor: ondemand

1.6GHz Hardkernel Odroid-xu - ubuntu 13.07

Calxeda ECX-1000 Quad-Core ARM Comparison

Processor: ARMv7 rev 3 @ 1.60GHz (4 Cores), Motherboard: ODROIDXU, Memory: 2048MB, Disk: 31GB 032G96

OS: Linaro 13.07, Kernel: 3.4.5 (armv7l), Compiler: GCC 4.7, File-System: ext4, Screen Resolution: 1920x1080

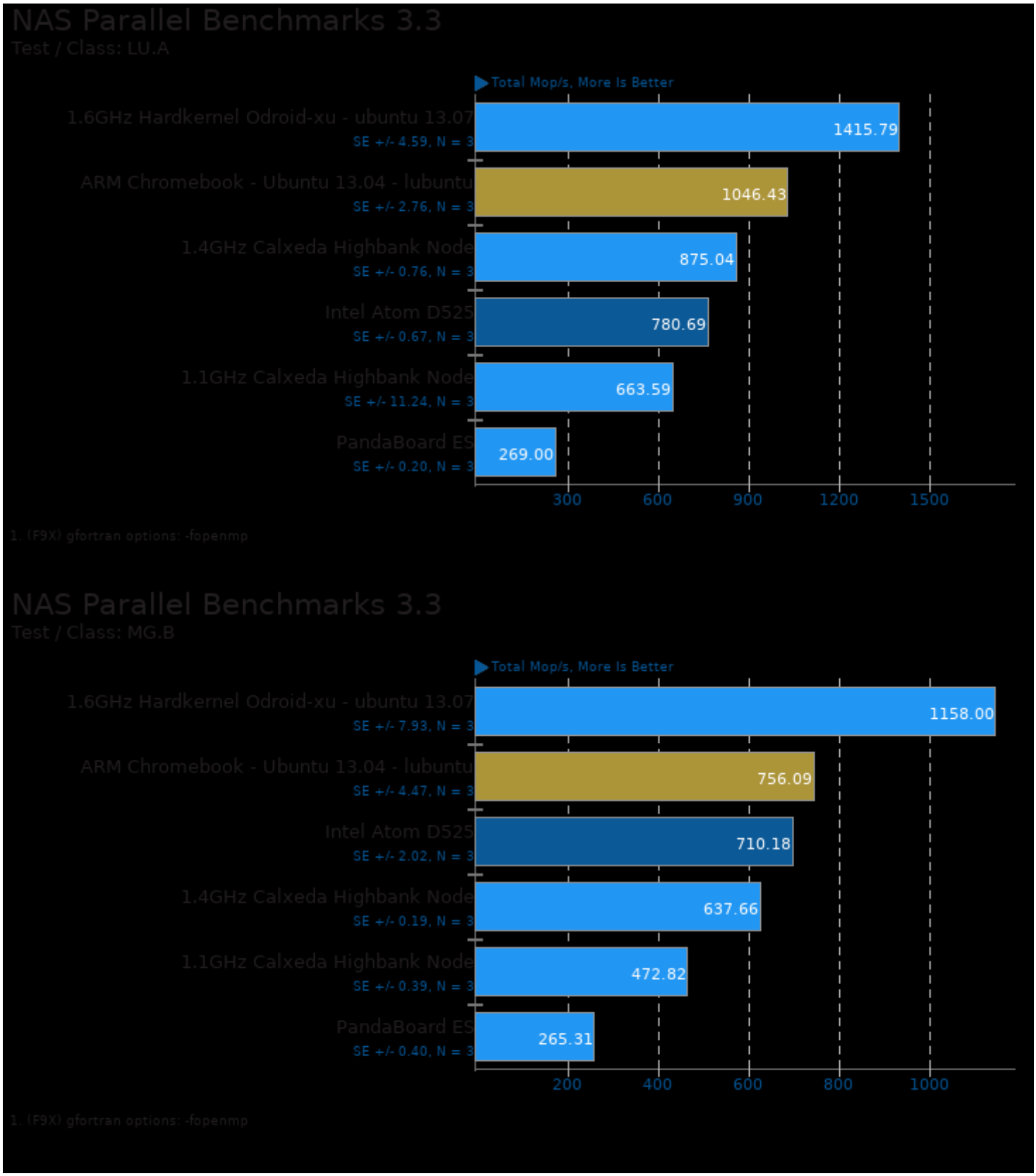
Compiler Notes: --build=arm-linux-gnueabihf --disable-cloog-version-check --disable-libitm --disable-ppl-version-check --disable-sjlj-exceptions --disable-werror --enable-checking=release --enable-clocale=gnu --enable-cloog-backend=ppl --enable-gnu-unique-object --enable-languages=c,c++,go,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --target=arm-linux-gnueabihf --with-arch=armv7-a --with-cloog --with-float=hard --with-fpu=vfpv3-d16 --with-mode=thumb -v
Processor Notes: Scaling Governor: exynos freq interactive

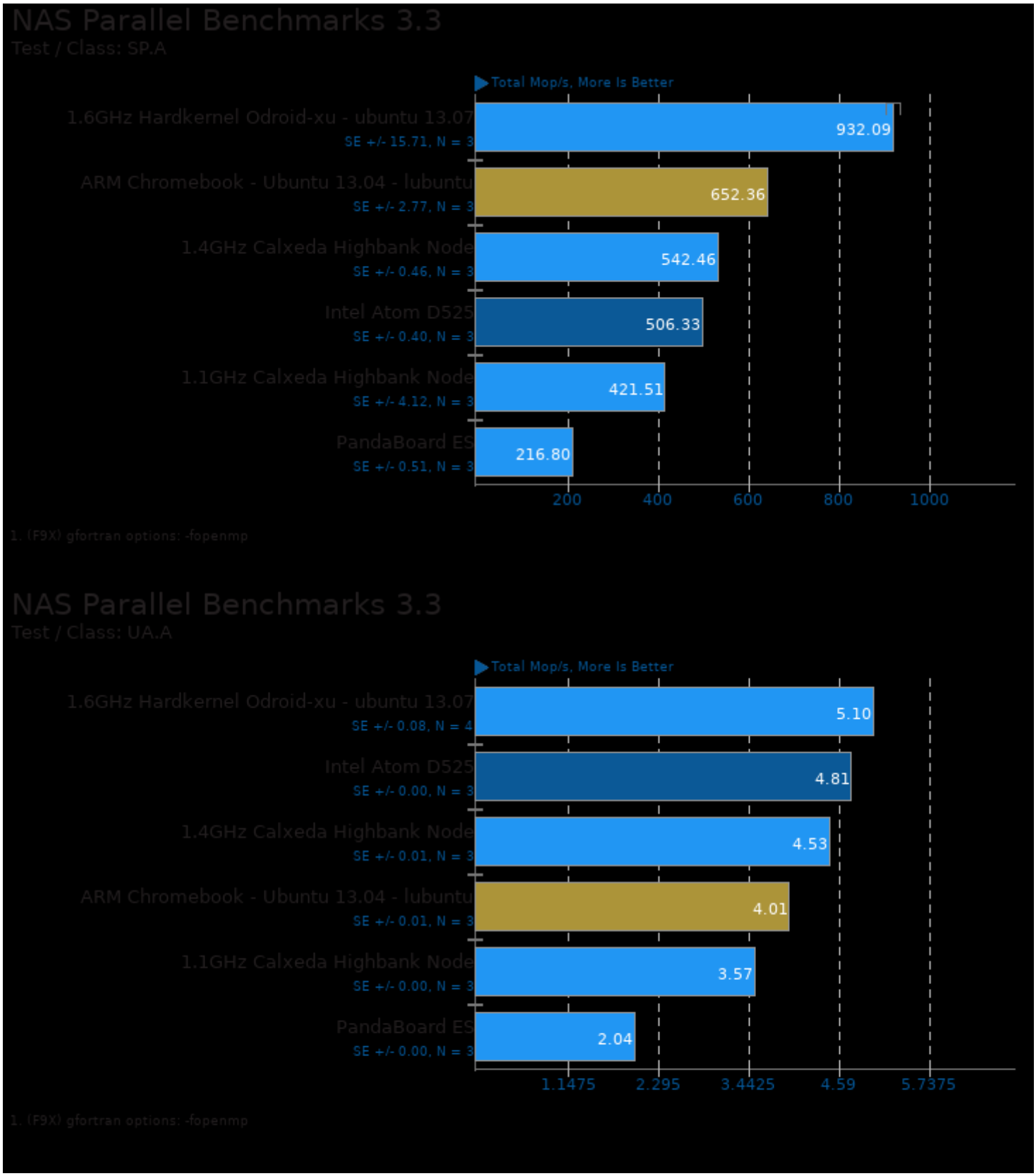
	PandaBoard ES	Intel Atom D525	1.1GHz Calxeda Highbank Node	1.4GHz Calxeda Highbank Node	ARM Chromebook - Ubuntu 13.04 -	1.6GHz Hardkernel Odroid-xu - ubuntu 13.07
NAS Parallel Benchmarks - LU.A (Mop/s)	**269.00**	780.69	663.59	875.04	1046	**1351**
Normalized	19%	55.14%	46.87%	61.81%	73.91%	95.42%
Standard Deviation	0.1%	0.1%	2.9%	0.2%	0.5%	1.3%
NAS Parallel Benchmarks - MG.B (Mop/s)	**265.31**	710.18	472.82	637.66	756.09	**1158**
Normalized	22.91%	61.33%	40.83%	55.07%	65.29%	100%
Standard Deviation	0.3%	0.5%	0.1%	0.1%	1%	1.2%
NAS Parallel Benchmarks - SP.A (Mop/s)	**216.80**	506.33	421.51	542.46	652.36	**932.09**
Normalized	23.26%	54.32%	45.22%	58.2%	69.99%	100%
Standard Deviation	0.4%	0.1%	1.7%	0.1%	0.7%	2.9%
NAS Parallel Benchmarks - UA.A (Mop/s)	**2.04**	4.81	3.57	4.53	4.01	**5.10**
Normalized	40%	94.31%	70%	88.82%	78.63%	100%
Standard Deviation	0.3%	0%	0.2%	0.3%	0.3%	3.2%
FFTE - N.6.1.C.F.R (MFLOPS)	548.78	942.93	**501.69**	643.43	**1466**	1387
Normalized	37.44%	64.33%	34.23%	43.9%	100%	94.64%
Standard Deviation	0%	0.1%	1.8%	0.7%	1.9%	0.3%
7-Zip Compression - C.S.T (MIPS)	**886**	2089	1706	2176	1698	**2901**
Normalized	30.54%	72.01%	58.81%	75.01%	58.53%	100%
Standard Deviation	2%	0.4%	0.9%	0.4%	1.8%	0.2%
x264 - H.2.V.E (FPS)	**4.70**	11.35	9.07	11.82	10.84	**19.69**
Normalized	23.75%	57.35%	45.83%	59.73%	54.78%	99.49%
Standard Deviation	0.2%	0.8%	0.1%	0.3%	1.3%	1.5%
Smallpt - G.I.R.1.S (sec)	**2419**	1007	1326	1033	1291	**687**
Normalized	28.4%	68.22%	51.81%	66.51%	53.21%	100%
Standard Deviation	0.1%	0.1%	0.2%	0.1%	0.2%	0.2%
LAMMPS Molecular Dynamics Simulator - Rhodopsin Protein (Loop		459.73	**464.02**	365.85	192.31	**187.07**
Normalized		40.69%	40.32%	51.13%	97.28%	100%
Standard Deviation		0.4%	3.4%	1.3%	0.5%	0.2%
C-Ray - Total Time (sec)		371.20	**390.45**	303.69	332.54	**170.81**

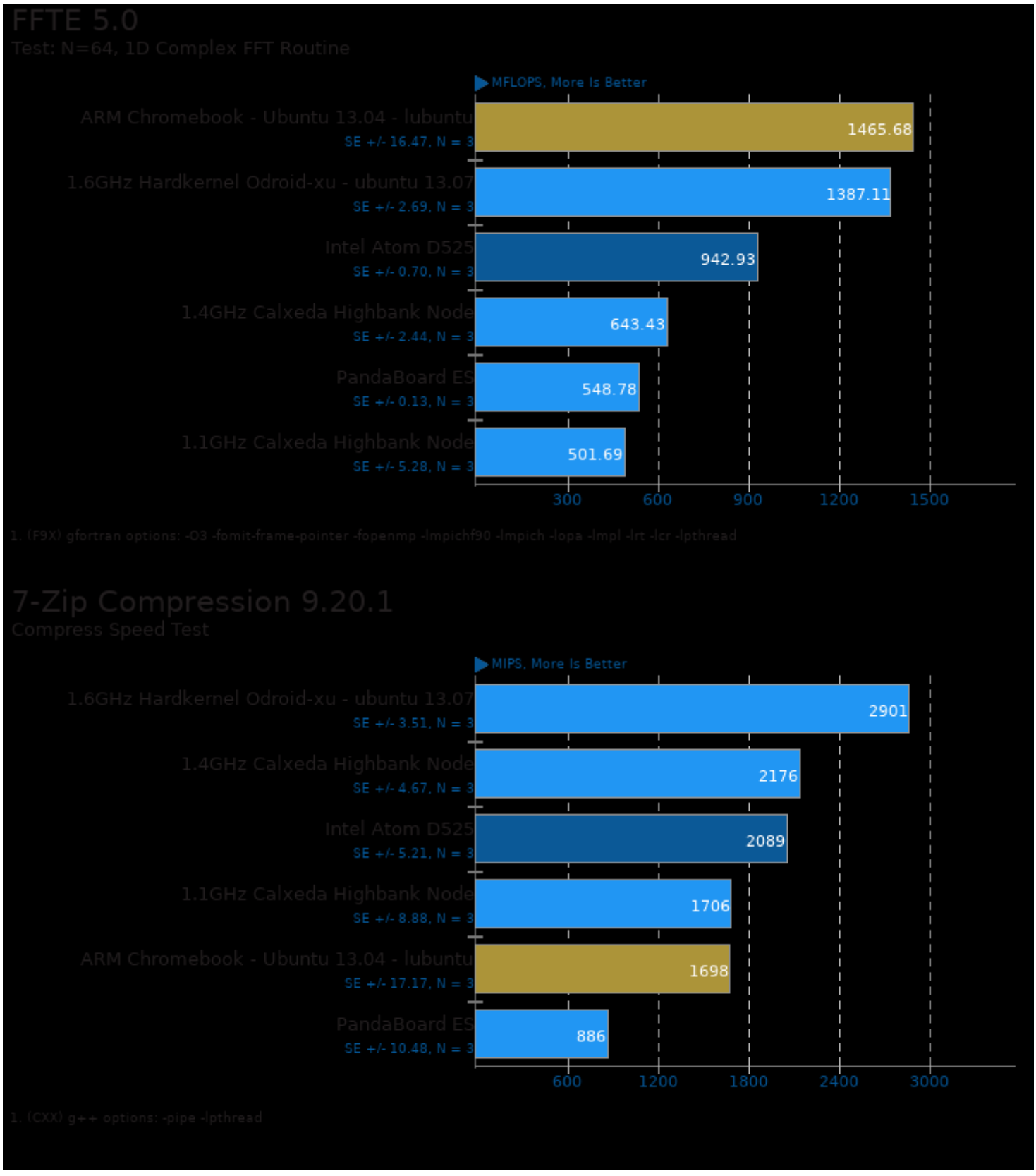
Calxeda ECX-1000 Quad-Core ARM Comparison

Normalized	46.02%	43.75%	56.24%	51.37%	100%
Standard Deviation	0.1%	0.1%	0.1%	8.6%	1%
Apache Benchmark - S.W.P.S (Reqs/sec)	3073	4015	**5272**	1824	**1762**
Normalized	58.3%	76.16%	100%	34.59%	33.43%
Standard Deviation	0.4%	2.5%	0.2%	0.4%	0.7%

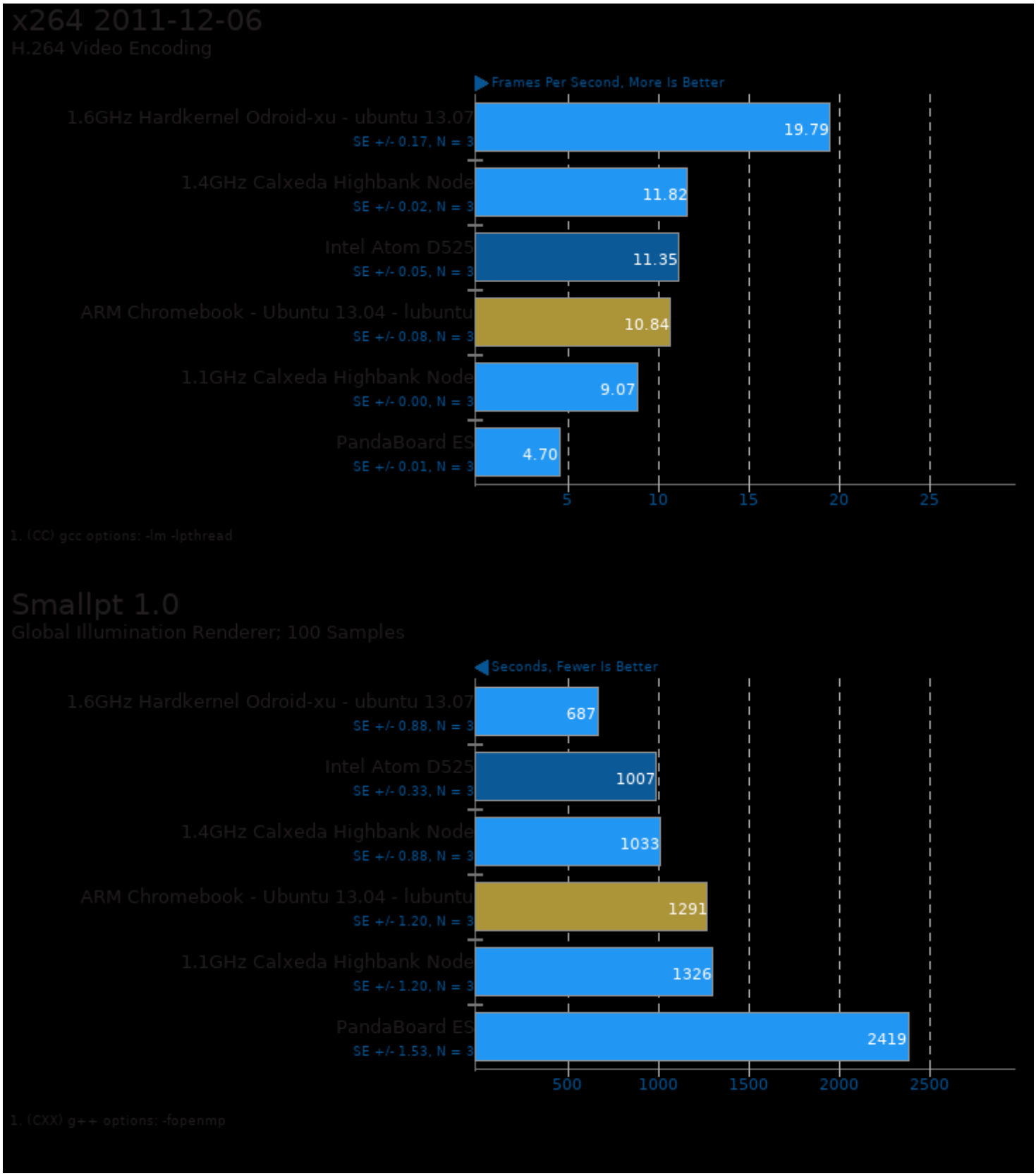
Calxeda ECX-1000 Quad-Core ARM Comparison



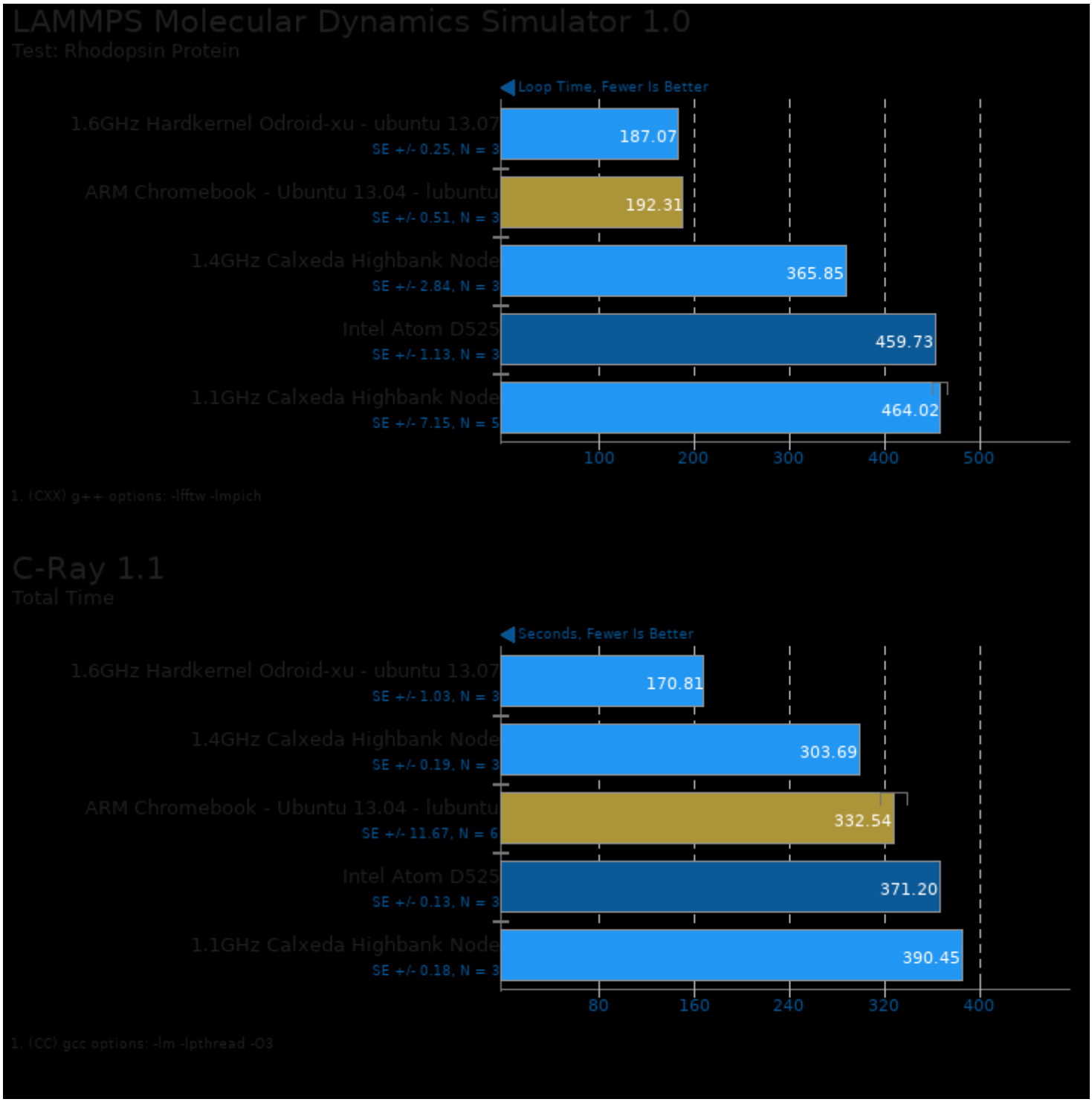

NAS Parallel Benchmarks 3.3
Test / Class: SP.A
Total Mop/s, More Is Better
1.6GHz Hardkernel Odroid-xu - ubuntu 13.07
SE +/- 15.71, N = 3
932.09
ARM Chromebook - Ubuntu 13.04 - lubuntu
SE +/- 2.77, N = 3
652.36
1.4GHz Calxeda Highbank Node
SE +/- 0.46, N = 3
542.46
Intel Atom D525
SE +/- 0.40, N = 3
506.33
1.1GHz Calxeda Highbank Node
SE +/- 4.12, N = 3
421.51
PandaBoard ES
SE +/- 0.51, N = 3
216.80
200
400
600
800
1000
1. (F9X) gfortran options: -fopenmp
NAS Parallel Benchmarks 3.3
Test / Class: UA.A
Total Mop/s, More Is Better
1.6GHz Hardkernel Odroid-xu - ubuntu 13.07
SE +/- 0.08, N = 4
5.10
Intel Atom D525
SE +/- 0.00, N = 3
4.81
1.4GHz Calxeda Highbank Node
SE +/- 0.01, N = 3
4.53
ARM Chromebook - Ubuntu 13.04 - lubuntu
SE +/- 0.01, N = 3
4.01
1.1GHz Calxeda Highbank Node
SE +/- 0.00, N = 3
3.57
PandaBoard ES
SE +/- 0.00, N = 3
2.04
1.1475
2.295
3.4425
4.59
5.7375
1. (F9X) gfortran options: -fopenmp


FFTE 5.0
Test: N=64, 1D Complex FFT Routine
MFLOPS, More Is Better
ARM Chromebook - Ubuntu 13.04 - lubuntu
SE +/- 16.47, N = 3
1465.68
1.6GHz Hardkernel Odroid-xu - ubuntu 13.07
SE +/- 2.69, N = 3
1387.11
Intel Atom D525
SE +/- 0.70, N = 3
942.93
1.4GHz Calxeda Highbank Node
SE +/- 2.44, N = 3
643.43
PandaBoard ES
SE +/- 0.13, N = 3
548.78
1.1GHz Calxeda Highbank Node
SE +/- 5.28, N = 3
501.69
300
600
900
1200
1500
1. (F9X) gfortran options: -O3 -fomit-frame-pointer -fopenmp -lmpichf90 -lmpich -lopa -lmpl -lrt -lcr -lpthread
7-Zip Compression 9.20.1
Compress Speed Test
MIPS, More Is Better
1.6GHz Hardkernel Odroid-xu - ubuntu 13.07
SE +/- 3.51, N = 3
2901
1.4GHz Calxeda Highbank Node
SE +/- 4.67, N = 3
2176
Intel Atom D525
SE +/- 5.21, N = 3
2089
1.1GHz Calxeda Highbank Node
SE +/- 8.88, N = 3
1706
ARM Chromebook - Ubuntu 13.04 - lubuntu
SE +/- 17.17, N = 3
1698
PandaBoard ES
SE +/- 10.48, N = 3
886
600
1200
1800
2400
3000
1. (CXX) g++ options: -pipe -lpthread

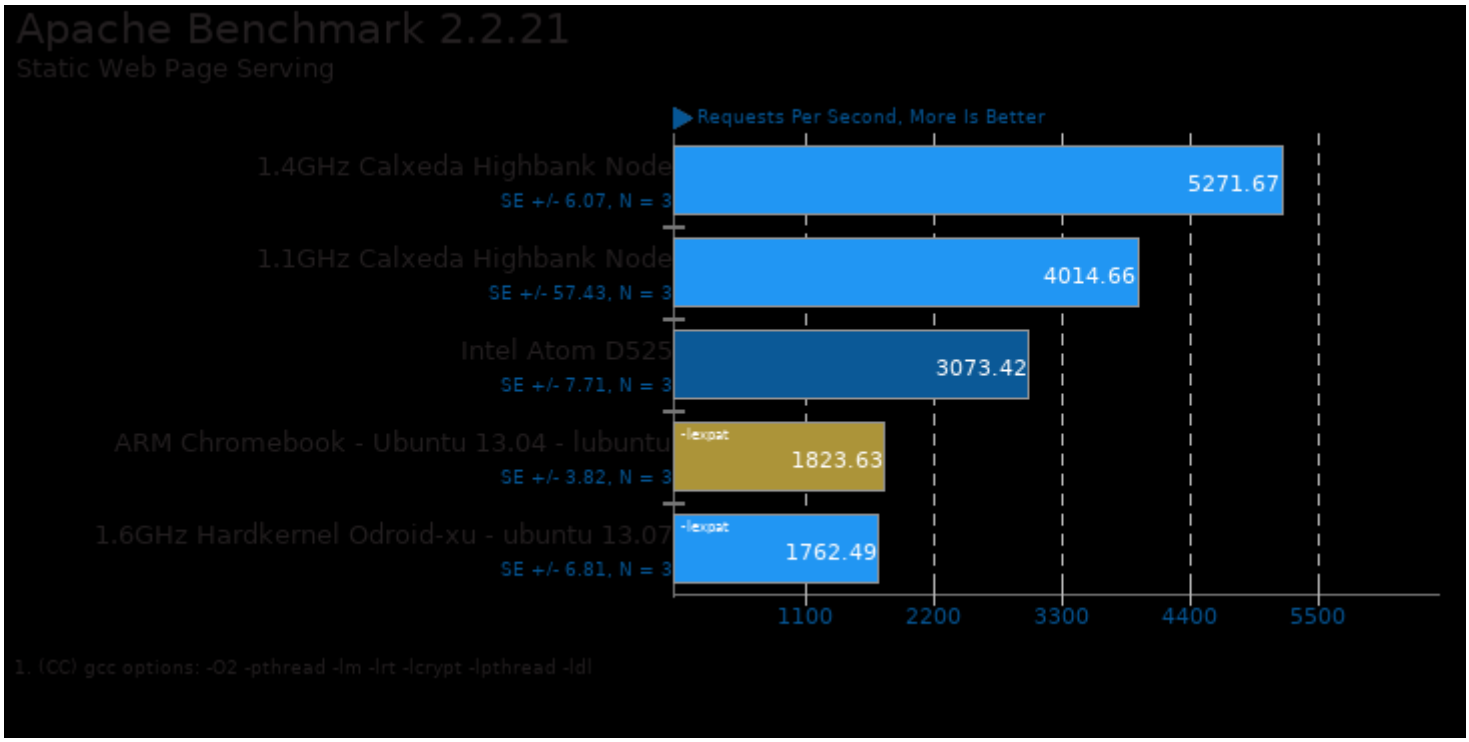
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Calxeda ECX-1000 Quad-Core ARM Comparison

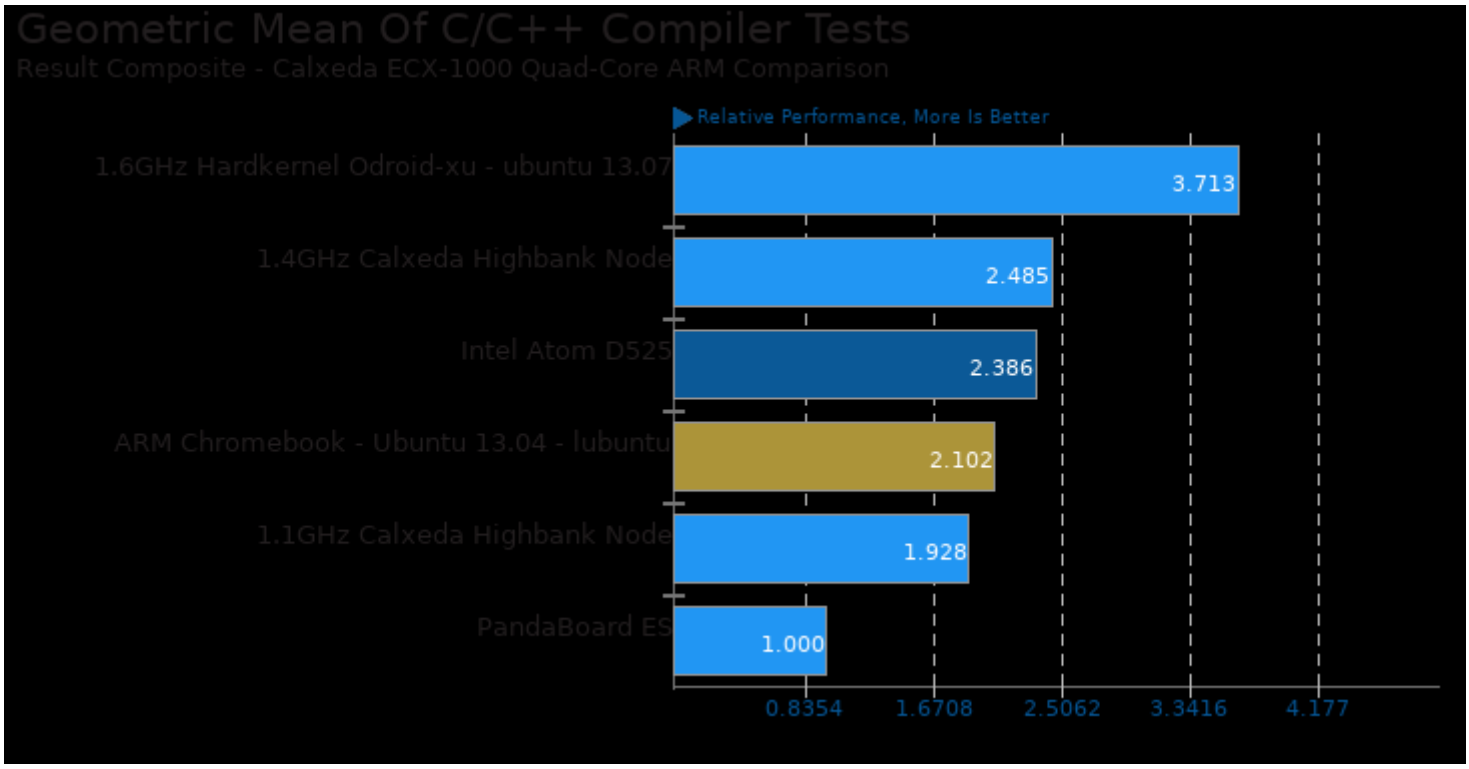


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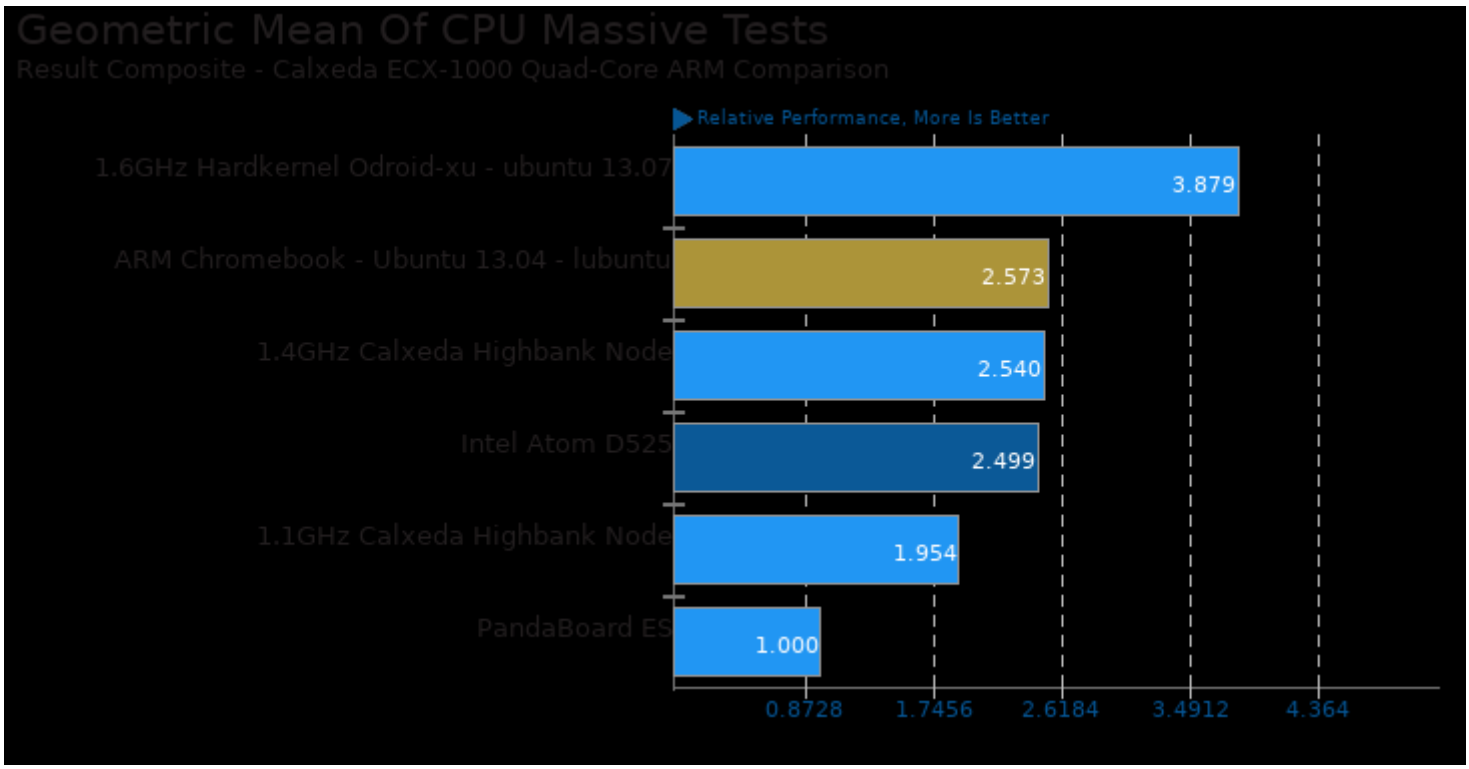


Calxeda ECX-1000 Quad-Core ARM Comparison

These geometric means are based upon test groupings / test suites for this result file.

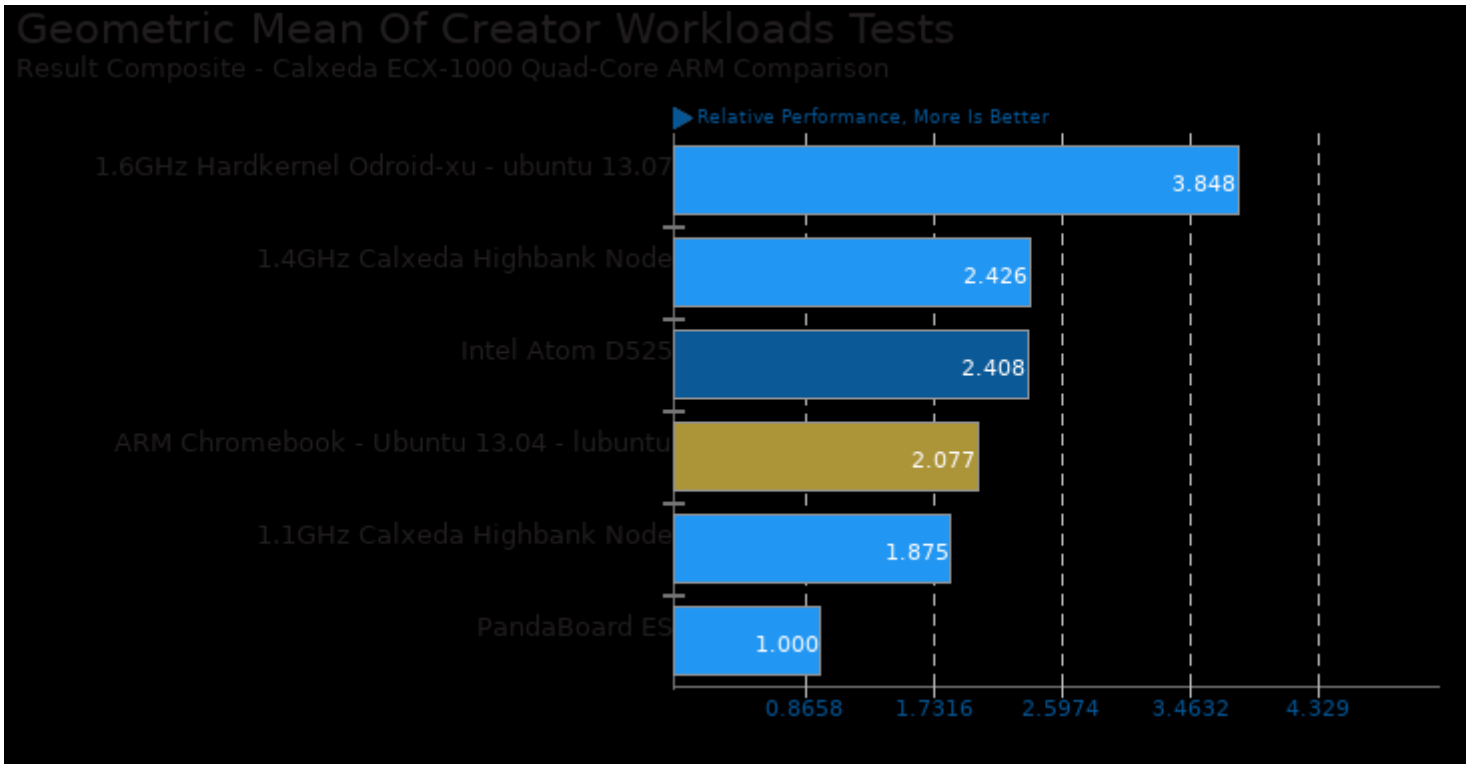


Geometric mean based upon tests: pts/c-ray, pts/compress-7zip, pts/apache, pts/x264 and pts/lammps

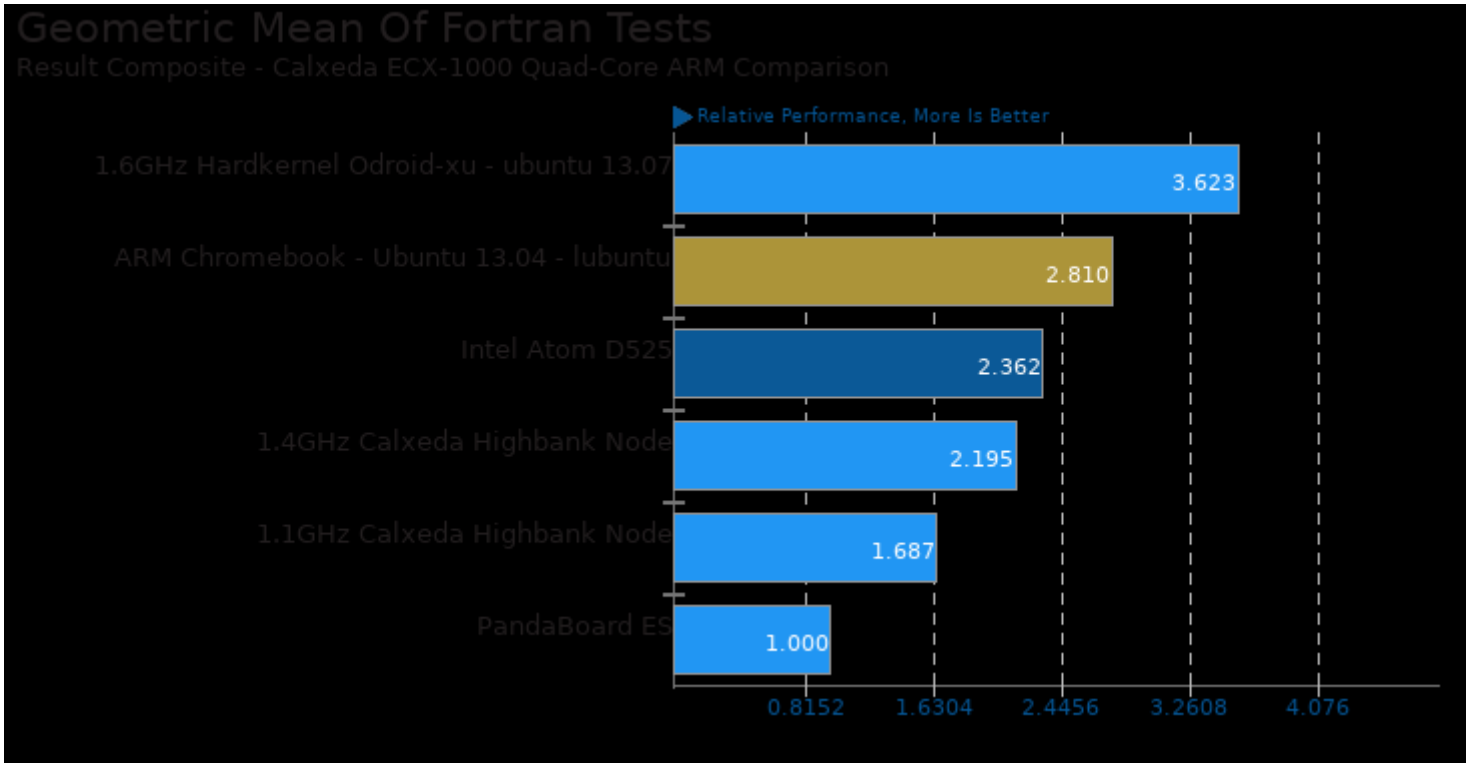


Geometric mean based upon tests: pts/apache, pts/c-ray, pts/compress-7zip, pts/x264, pts/lammps and pts/npb

Calxeda ECX-1000 Quad-Core ARM Comparison

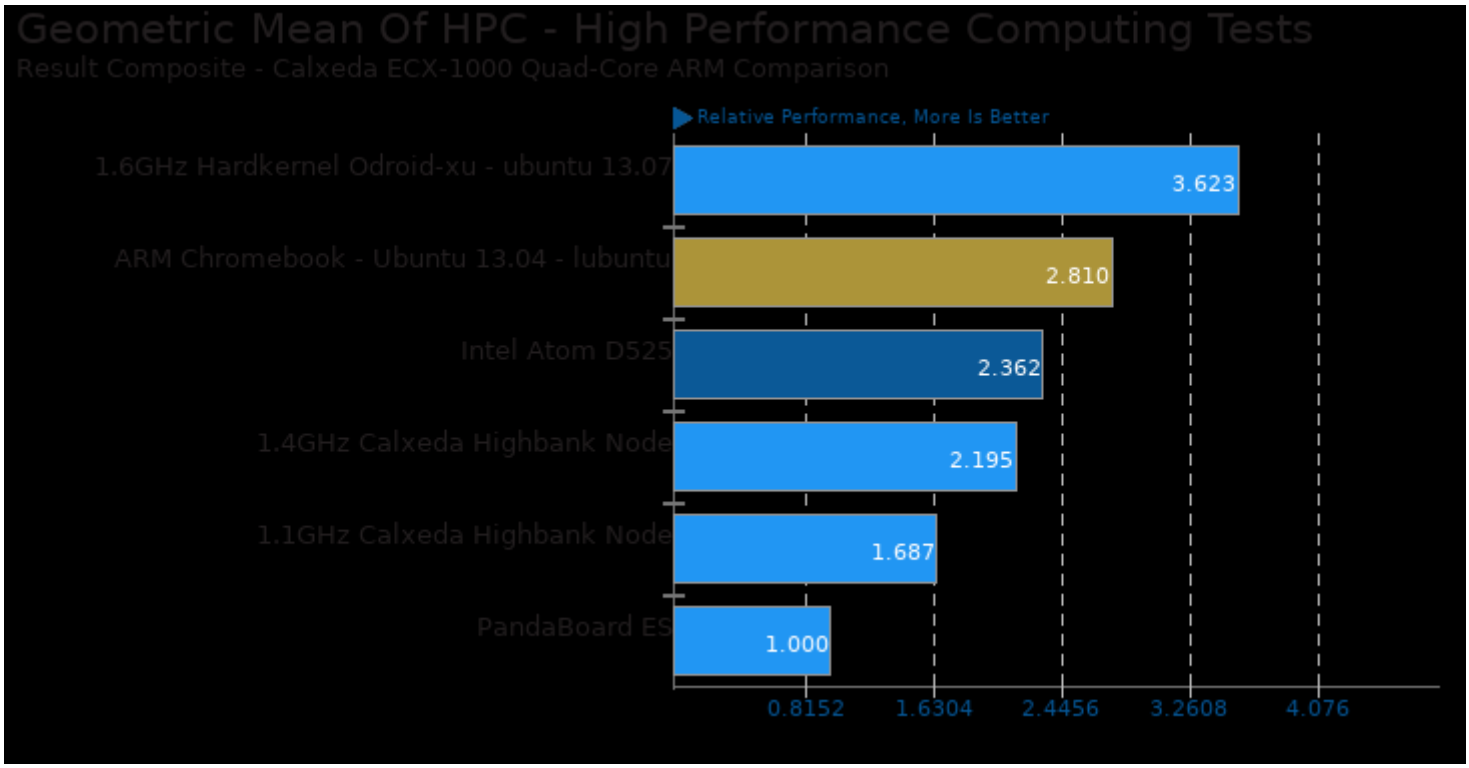


Geometric mean based upon tests: pts/c-ray, pts/smallpt and pts/x264

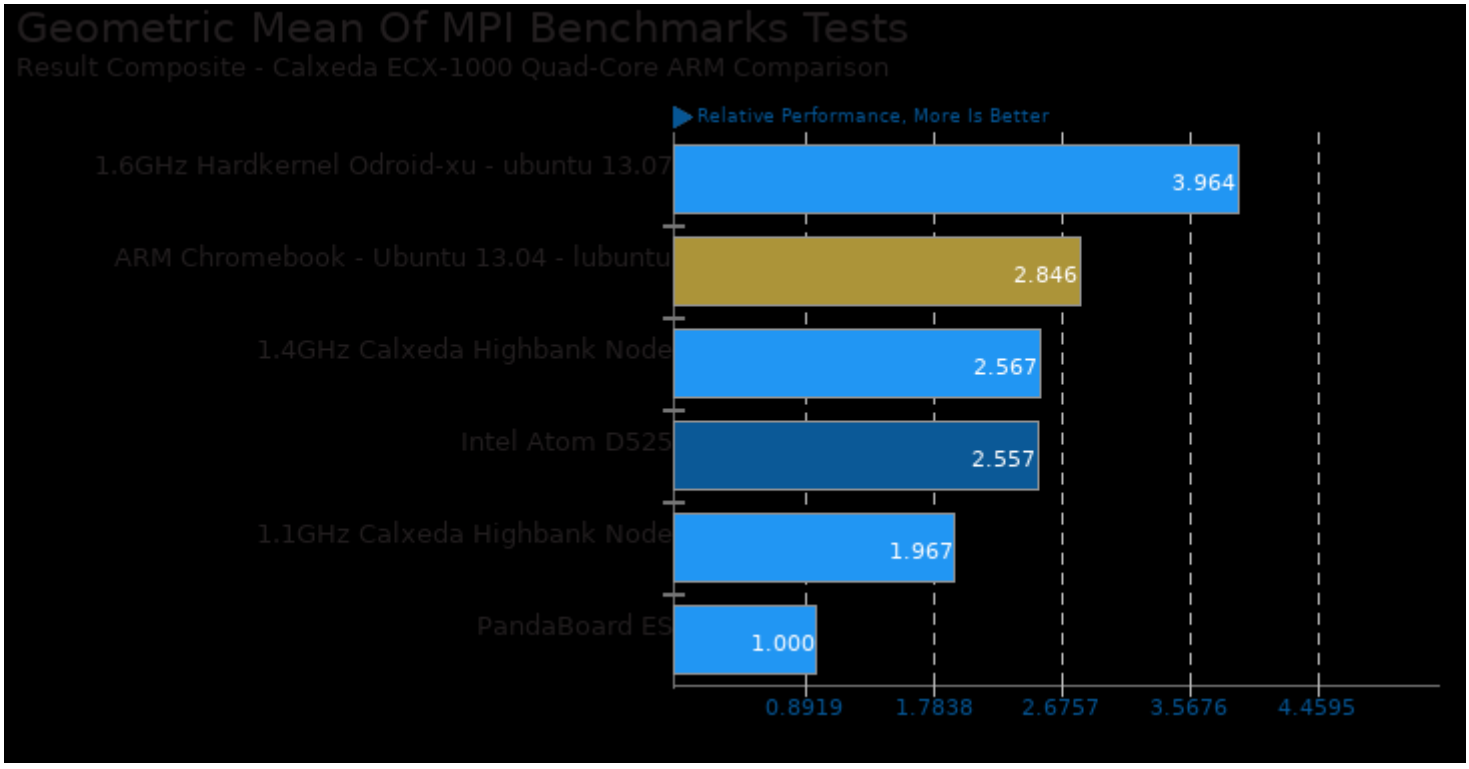


Geometric mean based upon tests: pts/npb, pts/ffte and pts/lammps

Calxeda ECX-1000 Quad-Core ARM Comparison

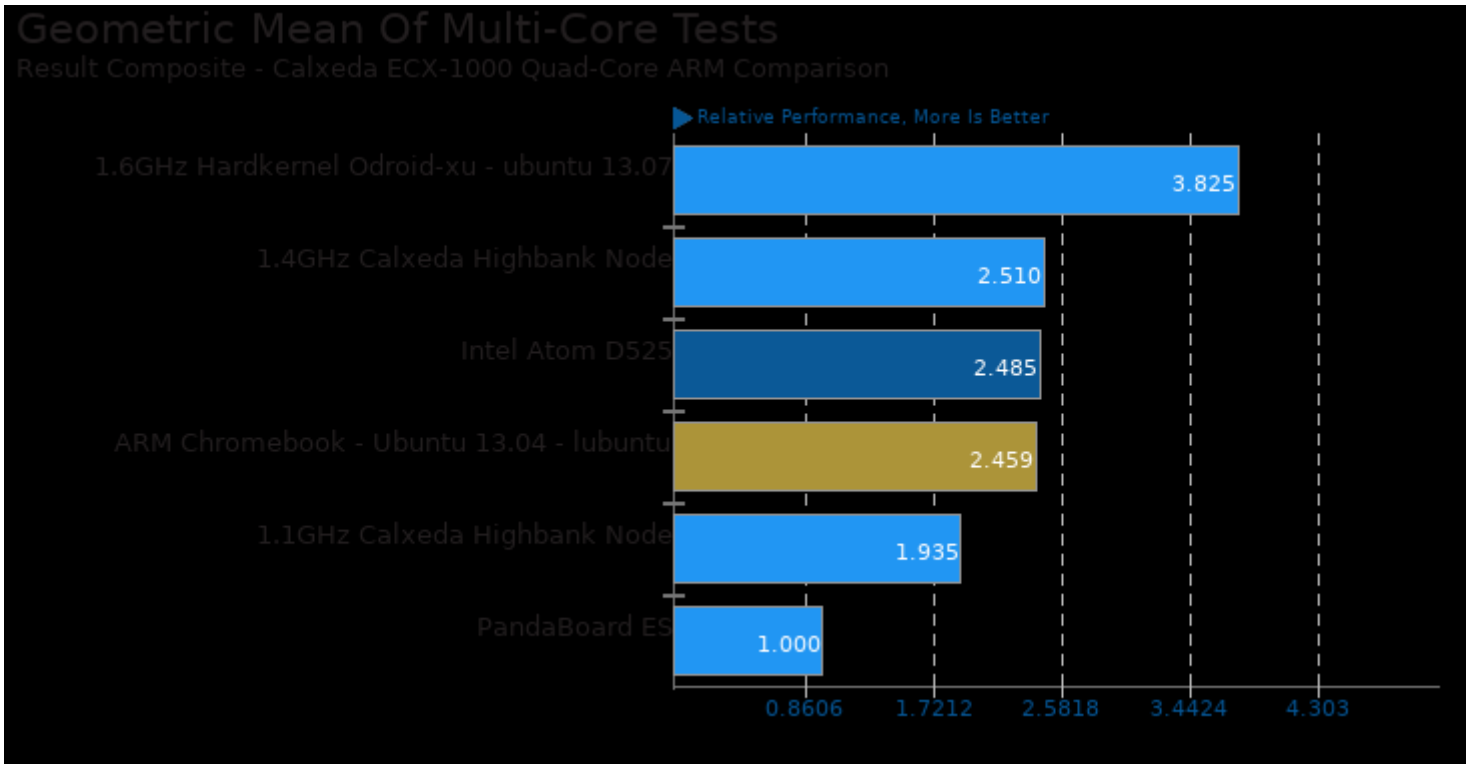


Geometric mean based upon tests: pts/npb, pts/ffte and pts/lammps

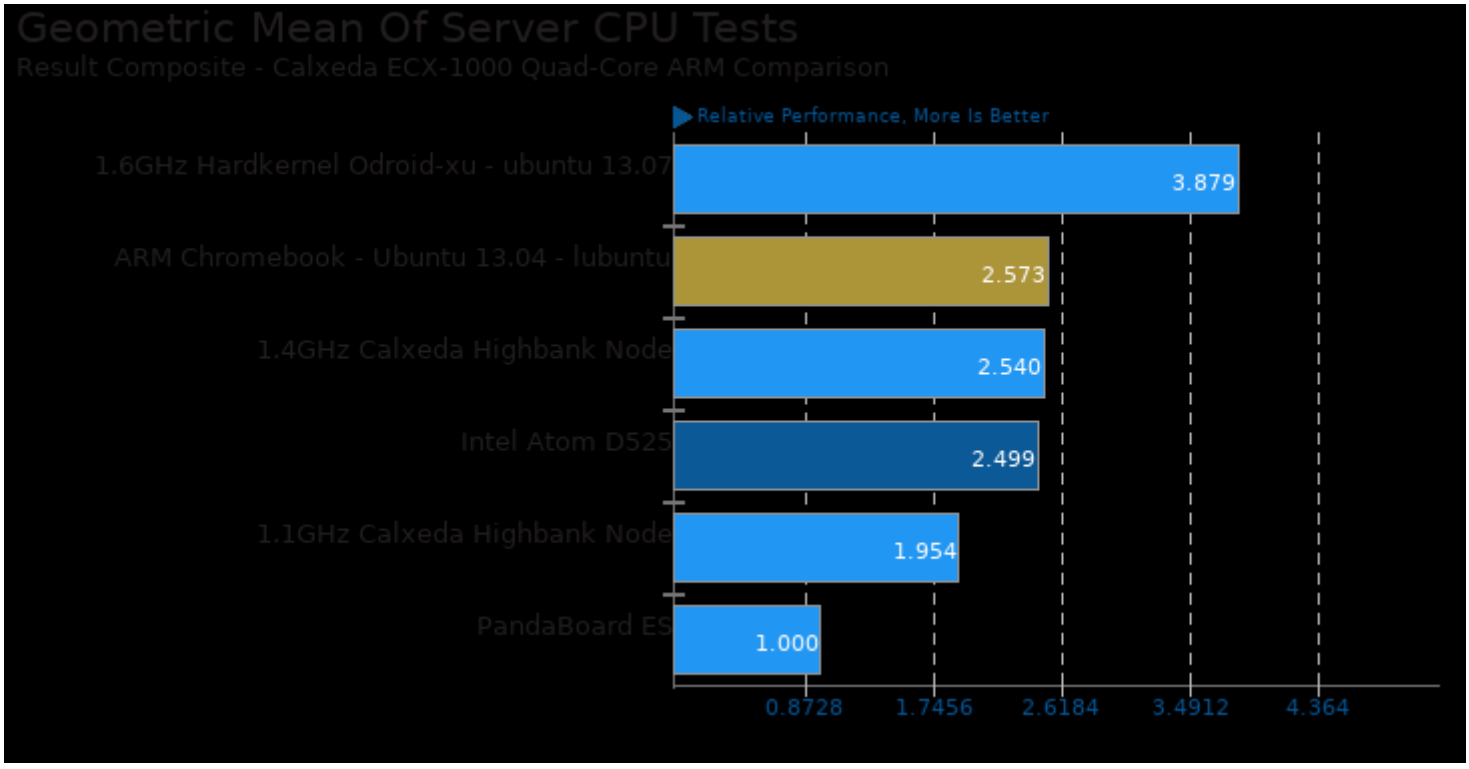


Geometric mean based upon tests: pts/lammps and pts/npb

Calxeda ECX-1000 Quad-Core ARM Comparison



Geometric mean based upon tests: pts/c-ray, pts/x264, pts/npb, pts/smallpt, pts/lammps and pts/compress-7zip



Geometric mean based upon tests: pts/npb, pts/x264, pts/compress-7zip and pts/c-ray

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 01:28.