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Amazon Graviton2 vs. AMD EPYC 7742

Graviton2 versus AMD EPYC 7742 bare metal benchmarks by Michael Larabel.

Automated Executive Summary

EPYC 7742 64c 128t had the most wins, coming in first place for 45% of the tests.

Based on the geometric mean of all complete results, the fastest (EPYC 7742 64c 128t) was 1.507x the speed of the slowest (Graviton2 64c). EPYC 7742 64c was 0.973x the speed of EPYC 7742 64c 128t and Graviton2 64c was 0.682x the speed of EPYC 7742 64c.

The results with the greatest spread from best to worst included:

rav1e (Speed: 10) at 8.582x
NAS Parallel Benchmarks (Test / Class: LU.C) at 5.849x
CloverLeaf (Lagrangian-Eulerian Hydrodynamics) at 5.552x
OpenSSL (RSA 4096-bit Performance) at 4.886x
MariaDB (Clients: 4) at 4.42x
MariaDB (Clients: 8) at 4.315x
NAS Parallel Benchmarks (Test / Class: BT.C) at 4.18x
MariaDB (Clients: 1) at 3.659x
MariaDB (Clients: 16) at 3.575x

John The Ripper (Test: MD5) at 3.549x.

Test Systems:

Graviton2 64c

Processor: ARMv8 Neoverse-N1 (64 Cores), Motherboard: Amazon EC2 m6g.metal v1.0, Memory: 252GB, Disk: 137GB Amazon Elastic Block Store, Network: Amazon Elastic

OS: Ubuntu 20.04, Kernel: 5.4.0-1009-aws (aarch64), Compiler: GCC 9.3.0, File-System: ext4

Compiler Notes: --build=aarch64-linux-gnu --disable-libquadmath --disable-libquadmath-support --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-fix-cortex-a53-843419 --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-nls --enable-plugin --enable-shared --enable-threads=posix --host=aarch64-linux-gnu --program-prefix=aarch64-linux-gnu- --target=aarch64-linux-gnu --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-target-system-zlib=auto -v
Disk Notes: NONE / discard,relatime,rw
Java Notes: OpenJDK Runtime Environment (build 11.0.7+10-post-Ubuntu-3ubuntu1)
Python Notes: Python 2.7.18rc1 + Python 3.8.2
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl + spectre_v1: Mitigation of __user pointer sanitization + spectre_v2: Not affected + tsx_async_abort: Not affected

EPYC 7742 64c

Processor: AMD EPYC 7742 64-Core @ 2.25GHz (64 Cores), Motherboard: AMD DAYTONA_X (RDY1006G BIOS), Chipset: AMD Starship/Matisse, Memory: 252GB, Disk: 3841GB Micron_9300_MTFDHAL3T8TDP, Graphics: llvmpipe 252GB, Monitor: VE228, Network: 2 x Mellanox MT27710

OS: Ubuntu 20.04, Kernel: 5.4.0-31-generic (x86_64), Desktop: GNOME Shell 3.36.1, Display Server: X Server 1.20.8, Display Driver: modesetting 1.20.8, OpenGL: 3.3 Mesa 20.0.4 (LLVM 9.0.1 128 bits), Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand - CPU Microcode: 0x8301034
Java Notes: OpenJDK Runtime Environment (build 11.0.7+10-post-Ubuntu-3ubuntu1)
Python Notes: Python 2.7.18rc1 + Python 3.8.2
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: disabled RSB filling + tsx_async_abort: Not affected

EPYC 7742 64c 128t

Processor: AMD EPYC 7742 64-Core @ 2.25GHz (64 Cores / 128 Threads), Motherboard: AMD DAYTONA_X (RDY1006G BIOS), Chipset: AMD Starship/Matisse, Memory: 252GB, Disk: 3841GB Micron_9300_MTFDHAL3T8TDP, Graphics: llvmpipe 252GB, Monitor: VE228, Network: 2 x Mellanox MT27710

OS: Ubuntu 20.04, Kernel: 5.4.0-31-generic (x86_64), Desktop: GNOME Shell 3.36.1, Display Server: X Server 1.20.8, Display Driver: modesetting 1.20.8, OpenGL: 3.3 Mesa 20.0.4 (LLVM 9.0.1 128 bits), Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1920x1080

Amazon Graviton2 vs. AMD EPYC 7742

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand - CPU Microcode: 0x8301034
Java Notes: OpenJDK Runtime Environment (build 11.0.7+10-post-Ubuntu-3ubuntu1)
Python Notes: Python 2.7.18rc1 + Python 3.8.2
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + tsx_async_abort: Not affected

	Graviton2 64c	EPYC 7742 64c	EPYC 7742 64c 128t
BlogBench - Write (Final Score)	**18017**	39604	**48646**
Normalized	37.04%	81.41%	100%
Standard Deviation	13.1%	2.8%	2.5%
Sockperf - Throughput (Messages/sec)	**386634**	**454975**	448694
Normalized	84.98%	100%	98.62%
Standard Deviation	1.2%	2%	2%
C-Blosc - blosclz (MB/s)	**9658**	9297	**6876**
Normalized	100%	96.25%	71.19%
Standard Deviation	0.9%	0.4%	0.1%
Crypto++ - All Algorithms (MiB/s)	**636.516544**	**1388**	1388
Normalized	45.84%	100%	99.99%
Standard Deviation	0.1%	0.1%	0%
Crypto++ - Keyed Algorithms (MiB/s)	**310.970923**	**547.790418**	547.492068
Normalized	56.77%	100%	99.95%
Standard Deviation	0.1%	0.1%	0%
Crypto++ - Unkeyed Algorithms (MiB/s)	**344.032817**	303.239346	**303.112596**
Normalized	100%	88.14%	88.11%
Standard Deviation	0.1%	0%	0.1%
Crypto++ - I.E.C.P.K.A (MiB/s)	**1270**	**4206**	4195
Normalized	30.19%	100%	99.74%
Standard Deviation	0.1%	0.1%	0.1%
High Performance Conjugate Gradient (GFLOP/s)	**21.4310**	17.7464	**17.5552**
Normalized	100%	82.81%	81.91%
Standard Deviation	0%	0.1%	0.2%
NAS Parallel Benchmarks - BT.C (Mop/s)	**24463**	**102257**	92544
Normalized	23.92%	100%	90.5%
Standard Deviation	0%	2.9%	3%
NAS Parallel Benchmarks - EP.C (Mop/s)	**2236**	**4176**	4129
Normalized	53.54%	100%	98.87%
Standard Deviation	0.1%	1%	0.9%
NAS Parallel Benchmarks - EP.D (Mop/s)	**2228**	**4318**	4271
Normalized	51.6%	100%	98.91%
Standard Deviation	0.2%	0.1%	0.4%
NAS Parallel Benchmarks - FT.C (Mop/s)	**21670**	**31351**	31229
Normalized	69.12%	100%	99.61%
Standard Deviation	0%	0.7%	0.6%
NAS Parallel Benchmarks - IS.D (Mop/s)	**844.58**	967.61	**971.93**
Normalized	86.9%	99.56%	100%
Standard Deviation	0.7%	2.3%	2.6%

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NAS Parallel Benchmarks - LU.C (Mop/s)	**18642**	**109034**	102048
Normalized	17.1%	100%	93.59%
Standard Deviation	1.3%	0.2%	3.8%
NAS Parallel Benchmarks - MG.C (Mop/s)	**25893**	**42388**	38200
Normalized	61.08%	100%	90.12%
Standard Deviation	0%	0.5%	1.2%
NAS Parallel Benchmarks - SP.B (Mop/s)	**9935**	18586	**22447**
Normalized	44.26%	82.8%	100%
Standard Deviation	0.1%	2.2%	1.7%
LeelaChessZero - Eigen (Nodes/s)	2318	**4102**	**2041**
Normalized	56.51%	100%	49.76%
Standard Deviation	3%	1.6%	2.8%
Parboil - OpenMP LBM (sec)	20.609622	**17.899186**	**22.022019**
Normalized	86.85%	100%	81.28%
Standard Deviation	0.2%	2.7%	2.3%
Parboil - O.M.G (sec)	**40.121080**	93.320796	**110.139532**
Normalized	100%	42.99%	36.43%
Standard Deviation	1%	0.5%	0.5%
CloverLeaf - L.E.H (sec)	**1.61**	**0.29**	0.40
Normalized	18.01%	100%	72.5%
Standard Deviation	3%	1.2%	1.6%
Rodinia - OpenMP LavaMD (sec)	**8.131**	6.676	**6.319**
Normalized	77.71%	94.65%	100%
Standard Deviation	0%	0%	0.2%
Rodinia - OpenMP CFD Solver (sec)	**8.174**	7.676	**7.350**
Normalized	89.92%	95.75%	100%
Standard Deviation	1.1%	1.8%	2.5%
Rodinia - O.S (sec)	**13.999**	9.151	**8.936**
Normalized	63.83%	97.65%	100%
Standard Deviation	3.9%	0.4%	0.2%
Nebular Empirical Analysis Tool (sec)	**18.638**	**17.075**	17.277
Normalized	91.61%	100%	98.83%
Standard Deviation	0.9%	0.5%	0.1%
Timed MrBayes Analysis - P.P.A (sec)	**257.320**	**105.653**	106.972
Normalized	41.06%	100%	98.77%
Standard Deviation	0.2%	0.2%	1.4%
Timed MAFFT Alignment - M.S.A (sec)	**2.246**	2.160	**2.136**
Normalized	95.1%	98.89%	100%
Standard Deviation	8.5%	1%	5.3%
Go Benchmarks - json (ns/op)	1395314	**1411199**	**1273253**
Normalized	91.25%	90.22%	100%
Standard Deviation	0.6%	0.7%	2.6%
Go Benchmarks - build (ns/op)	**31136250384**	**28238211426**	29667943541
Normalized	90.69%	100%	95.18%
Standard Deviation	0.1%	1.1%	0.3%
Go Benchmarks - garbage (ns/op)	**772447**	**981570**	895616
Normalized	100%	78.7%	86.25%
Standard Deviation	2.8%	2%	2.3%
Java Gradle Build - Reactor (sec)	**491.393**	341.376	**340.723**
Normalized	69.34%	99.81%	100%
Standard Deviation	11.3%	1.5%	8.1%
Renaissance - Scala Dotty (ms)	**9768**	6577	**6532**
Normalized	66.88%	99.33%	100%
Standard Deviation	1.2%	0.6%	0.8%
Renaissance - Rand Forest (ms)	**5807**	**5005**	5012

Normalized	86.2%	100%	99.87%
Standard Deviation	1.5%	1.3%	3%
Renaissance - Apache Spark ALS (ms)	**6640**	**6202**	6325
Normalized	93.41%	100%	98.06%
Standard Deviation	1.6%	3%	2.4%
Renaissance - Apache Spark Bayes (ms)	**2676**	3426	**3530**
Normalized	100%	78.11%	75.82%
Standard Deviation	1.4%	2%	4.5%
Renaissance - Savina Reactors.IO (ms)	**33874**	**16569**	19665
Normalized	48.91%	100%	84.26%
Standard Deviation	2.9%	5.6%	6.8%
Renaissance - A.S.P (ms)	**25932**	21688	**21483**
Normalized	82.85%	99.06%	100%
Standard Deviation	2.4%	1.3%	2.5%
Renaissance - A.U.C.T (ms)	**26628**	**18077**	21717
Normalized	67.89%	100%	83.24%
Standard Deviation	6.2%	2.5%	2.3%
Renaissance - G.A.U.J.F (ms)	**2375**	**3207**	3143
Normalized	100%	74.05%	75.55%
Standard Deviation	1%	1.3%	6.6%
Nettle - aes256 (Mbyte/s)	**2783**	4795	**4795**
Normalized	58.04%	99.99%	100%
Standard Deviation	0%	0%	0%
Nettle - chacha (Mbyte/s)	**449.931**	**771.233**	771.141
Normalized	58.34%	100%	99.99%
Standard Deviation	0.2%	0%	0%
Nettle - sha512 (Mbyte/s)	**379.99**	**491.47**	491.16
Normalized	77.32%	100%	99.94%
Standard Deviation	0%	0.1%	0%
Nettle - poly1305-aes (Mbyte/s)	**949.75**	**2104**	2102
Normalized	45.15%	100%	99.94%
Standard Deviation	0.4%	0%	0%
TSCP - A.C.P (Nodes/s)	**869010**	**1029878**	1022643
Normalized	84.38%	100%	99.3%
Standard Deviation	0.1%	0.2%	0.6%
John The Ripper - Blowfish (Real C/S)	**43335**	**75564**	74914
Normalized	57.35%	100%	99.14%
Standard Deviation	0%	0%	0.1%
John The Ripper - MD5 (Real C/S)	**1275000**	4411667	**4525000**
Normalized	28.18%	97.5%	100%
Standard Deviation	0.4%	0.1%	0.2%
Node.js Express HTTP Load Test (Reqs/sec)	**6553**	7683	**7771**
Normalized	84.33%	98.87%	100%
Standard Deviation	4.7%	0.4%	2%
GraphicsMagick - Swirl (Iterations/min)	**1513**	1582	**1764**
Normalized	85.77%	89.68%	100%
Standard Deviation	0.4%	0.1%	0.5%
GraphicsMagick - Rotate (Iterations/min)	**496**	**556**	550
Normalized	89.21%	100%	98.92%
Standard Deviation	2.2%	1.4%	0.8%
GraphicsMagick - Sharpen (Iterations/min)	**717**	609	**602**
Normalized	100%	84.94%	83.96%
Standard Deviation	0.1%		
GraphicsMagick - Enhanced (Iterations/min)	**701**	864	**884**
Normalized	79.3%	97.74%	100%

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Standard Deviation		0.1%	
GraphicsMagick - Noise-Gaussian (Iterations/min)	**561**	582	**634**
Normalized	88.49%	91.8%	100%
Standard Deviation	0.2%	0.3%	0.7%
GraphicsMagick - HWB Color Space (Iterations/min)	**1018**	**1241**	1174
Normalized	82.03%	100%	94.6%
Standard Deviation	0.3%	0.2%	0.5%
dav1d - Chimera 1080p (FPS)	588.39	**456.90**	**599.05**
Normalized	98.22%	76.27%	100%
Standard Deviation	0.2%	0.5%	0.3%
dav1d - Summer Nature 4K (FPS)	**239.59**	271.32	**331.42**
Normalized	72.29%	81.87%	100%
Standard Deviation	0.5%	0.2%	0.8%
dav1d - S.N.1 (FPS)	648.05	**525.13**	**677.59**
Normalized	95.64%	77.5%	100%
Standard Deviation	0.4%	0.7%	0.4%
TTSIOD 3D Renderer - P.R.W.S.S.M (FPS)	**411.617**	**978.007**	881.381
Normalized	42.09%	100%	90.12%
Standard Deviation	10.9%	2.8%	1.2%
rav1e - 10 (FPS)	**0.311**	**2.669**	2.324
Normalized	11.65%	100%	87.07%
Standard Deviation	0%	0.3%	0.4%
VP9 libvpx Encoding - Speed 5 (FPS)	**9.02**	18.16	**18.18**
Normalized	49.61%	99.89%	100%
Standard Deviation	0.1%	0.5%	0.3%
x264 - H.2.V.E (FPS)	**140.78**	154.57	**156.16**
Normalized	90.15%	98.98%	100%
Standard Deviation	0.4%	2.9%	0.3%
Coremark - CoreMark Size 666 - I.P.S (Iterations/Sec)	**1237273**	1536926	**1988375**
Normalized	62.23%	77.3%	100%
Standard Deviation	0%	0.9%	0.4%
Himeno Benchmark - P.P.S (MFLOPS)	**2890**	3827	**3912**
Normalized	73.88%	97.83%	100%
Standard Deviation	0.7%	1.3%	2.9%
7-Zip Compression - C.S.T (MIPS)	**179794**	215715	**269626**
Normalized	66.68%	80.01%	100%
Standard Deviation	0.6%	0.4%	0.4%
asmFish - 1.H.M.2.D (Nodes/s)	105936115	**94537908**	**131314356**
Normalized	80.67%	71.99%	100%
Standard Deviation	1.2%	1.4%	1.7%
Swet - Average (Operations/sec)	**321026102**	**607550474**	605881667
Normalized	52.84%	100%	99.73%
Standard Deviation	0.2%	1.2%	0.5%
ebizzy (Records/s)	**345427**	2488944	**3075320**
Normalized	11.23%	80.93%	100%
Standard Deviation	9.2%	0.6%	2.2%
Timed GCC Compilation - Time To Compile (sec)	**1014**	856.970	**850.033**
Normalized	83.81%	99.19%	100%
Standard Deviation	0.3%	0.2%	0%

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Timed ImageMagick Compilation - Time To Compile (sec)	**28.667**	17.725	**17.074**
Normalized	59.56%	96.33%	100%
Standard Deviation	0.8%	0.6%	0.6%
Timed Linux Kernel Compilation - Time To Compile (sec)	**87.912**	29.645	**26.766**
Normalized	30.45%	90.29%	100%
Standard Deviation	1.9%	2.9%	2.7%
Timed LLVM Compilation - Time To Compile (sec)	**300.792**	**224.887**	226.620
Normalized	74.76%	100%	99.24%
Standard Deviation	2.5%	1.2%	0.2%
Timed PHP Compilation - Time To Compile (sec)	**64.152**	44.093	**42.946**
Normalized	66.94%	97.4%	100%
Standard Deviation	0.3%	0.1%	0.2%
Build2 - Time To Compile (sec)	**85.925**	**62.960**	64.256
Normalized	73.27%	100%	97.98%
Standard Deviation	0.4%	0.1%	0.4%
C-Ray - Total Time - 4.1.R.P.P (sec)	**15.545**	12.425	**11.920**
Normalized	76.68%	95.94%	100%
Standard Deviation	0.2%	0.4%	0.1%
Primesieve - 1.P.N.G (sec)	**6.328**	**4.664**	4.721
Normalized	73.7%	100%	98.79%
Standard Deviation	0.1%	0.1%	0.3%
Rust Mandelbrot - T.T.C.S.P.M (sec)	**43.031**	40.428	**39.004**
Normalized	90.64%	96.48%	100%
Standard Deviation	0.1%	0%	0%
Smallpt - G.I.R.1.S (sec)	**2.912**	2.777	**2.150**
Normalized	73.83%	77.42%	100%
Standard Deviation	0.3%	0.3%	0.3%
Node.js Octane Benchmark (Score)	**29340**	**38597**	38332
Normalized	76.02%	100%	99.31%
Standard Deviation	0.5%	0.2%	0.7%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	**21.909**	**21.763**	21.896
Normalized	99.33%	100%	99.39%
Standard Deviation	0.1%	0.4%	1.2%
Zstd Compression - C.u.1.0.3.s.i.i.C.L.1 (sec)	**9.407**	**9.003**	9.067
Normalized	95.71%	100%	99.29%
Standard Deviation	0%	2.9%	0.1%
Cython benchmark (sec)	**81.590**	**50.960**	51.379
Normalized	62.46%	100%	99.18%
Standard Deviation	0.3%	0.5%	2.2%
FLAC Audio Encoding - WAV To FLAC (sec)	**32.664**	9.871	**9.798**
Normalized	30%	99.26%	100%
Standard Deviation	0.2%	0.1%	0.2%
LAME MP3 Encoding - WAV To MP3 (sec)	**10.903**	**9.111**	9.115
Normalized	83.56%	100%	99.96%
Standard Deviation	0%	0%	0.1%
m-queens - Time To Solve (sec)	18.743	**19.039**	**12.871**
Normalized	68.67%	67.6%	100%
Standard Deviation	0%	0.4%	0.1%
Minion - Graceful (sec)	**71.134013**	**51.159415**	51.443073
Normalized	71.92%	100%	99.45%
Standard Deviation	0.2%	0.2%	0.2%

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Minion - Solitaire (sec)	**127.633151**	**77.439111**	77.673532
Normalized	60.67%	100%	99.7%
Standard Deviation	0.4%	0.8%	0.8%
Minion - Quasigroup (sec)	**165.655664**	132.636762	**132.610696**
Normalized	80.05%	99.98%	100%
Standard Deviation	0.9%	0.3%	0.4%
N-Queens - Elapsed Time (sec)	3.67	**4.007**	**2.602**
Normalized	70.9%	64.94%	100%
Standard Deviation	0%	0%	0%
Perl Benchmarks - Pod2html (sec)	**0.17490547**	0.14785560	**0.14684740**
Normalized	83.96%	99.32%	100%
Standard Deviation	0.5%	1.2%	1.5%
OpenSSL - R.4.b.P (Signs/sec)	**2628**	**12843**	12587
Normalized	20.46%	100%	98%
Standard Deviation	0%	0.2%	0%
libjpeg-turbo tjbench - D.T (Megapixels/sec)	**108.800089**	**172.621813**	172.617150
Normalized	63.03%	100%	100%
Standard Deviation	0.1%	0%	0.1%
GROMACS - Water Benchmark (Ns/Day)	**2.747**	2.501	**2.289**
Normalized	100%	91.04%	83.33%
Standard Deviation	0.4%	0.9%	1.9%
MariaDB - 1 (Queries/sec)	**3086**	11194	**11293**
Normalized	27.33%	99.12%	100%
Standard Deviation	0.5%	0.6%	4.7%
MariaDB - 4 (Queries/sec)	**1797**	**7943**	7447
Normalized	22.62%	100%	93.76%
Standard Deviation	1.7%	0.3%	2.9%
MariaDB - 8 (Queries/sec)	**1635**	**7055**	6593
Normalized	23.18%	100%	93.45%
Standard Deviation	0.7%	0.4%	0.4%
MariaDB - 16 (Queries/sec)	**1531**	**5474**	5155
Normalized	27.97%	100%	94.17%
Standard Deviation	1.1%	0.3%	0.9%
MariaDB - 32 (Queries/sec)	**1288**	**2580**	2481
Normalized	49.92%	100%	96.16%
Standard Deviation	1%	0.3%	0.4%
MariaDB - 64 (Queries/sec)	**965**	**1186**	1133
Normalized	81.37%	100%	95.53%
Standard Deviation	1.2%	0.1%	0.2%
MariaDB - 128 (Queries/sec)	**651**	534	**487**
Normalized	100%	82.03%	74.81%
Standard Deviation	0.8%	0.2%	0.1%
MariaDB - 256 (Queries/sec)	**548**	444	**403**
Normalized	100%	81.02%	73.54%
Standard Deviation	1.1%	0.1%	0.3%
MariaDB - 512 (Queries/sec)	**550**	445	**394**
Normalized	100%	80.91%	71.64%
Standard Deviation	0.7%	0.2%	0.8%
PostgreSQL pgbench - Buffer Test - Normal Load - Read Only (TPS)	**176350**	611893	**988939**
Normalized	17.83%	61.87%	100%
Standard Deviation	6.5%	1.3%	0.7%

Amazon Graviton2 vs. AMD EPYC 7742

PostgreSQL pgbench - Buffer Test - Normal Load - Read Write (TPS)	**2280**	**42359**	37418
Normalized	5.38%	100%	88.34%
Standard Deviation	6%	0.2%	0.5%
Basis Universal - ETC1S (sec)	**80.213**	**53.544**	53.661
Normalized	66.75%	100%	99.78%
Standard Deviation	0.9%	0.2%	0%
Basis Universal - UASTC Level 0 (sec)	**19.798**	**7.846**	7.855
Normalized	39.63%	100%	99.89%
Standard Deviation	2.9%	0.2%	0.1%
Basis Universal - UASTC Level 2 (sec)	**14.958**	13.207	**12.666**
Normalized	84.68%	95.9%	100%
Standard Deviation	0.1%	0.1%	0.1%
Basis Universal - UASTC Level 3 (sec)	**21.251**	19.287	**17.828**
Normalized	83.89%	92.44%	100%
Standard Deviation	0%	0.1%	0.1%
Basis Universal - U.L.2.R.P.P (sec)	**878.012**	**726.973**	728.889
Normalized	82.8%	100%	99.74%
Standard Deviation	0%	0%	0%
Darktable - Boat - CPU-only (sec)	**3.755**	**3.195**	3.492
Normalized	85.09%	100%	91.49%
Standard Deviation	0.2%	0.9%	0.8%
Darktable - Masskrug - CPU-only (sec)	**3.566**	**2.864**	3.199
Normalized	80.31%	100%	89.53%
Standard Deviation	0.7%	0.1%	0.3%
Darktable - Server Room - CPU-only (sec)	**2.585**	**1.749**	1.995
Normalized	67.66%	100%	87.67%
Standard Deviation	0.3%	0.4%	0.3%
GEGL - Crop (sec)	**12.106**	9.789	**9.782**
Normalized	80.8%	99.93%	100%
Standard Deviation	0.3%	1.2%	0.3%
GEGL - Scale (sec)	**9.597**	7.080	**7.002**
Normalized	72.96%	98.9%	100%
Standard Deviation	2.7%	0.9%	1.7%
GEGL - Cartoon (sec)	**158.724**	**114.121**	114.389
Normalized	71.9%	100%	99.77%
Standard Deviation	0.2%	0.1%	0.1%
GEGL - Reflect (sec)	**45.266**	**36.898**	37.037
Normalized	81.51%	100%	99.62%
Standard Deviation	0.1%	0.2%	0.1%
GEGL - Antialias (sec)	**54.334**	**48.624**	48.748
Normalized	89.49%	100%	99.75%
Standard Deviation	0.4%	0.1%	0.1%
GEGL - Tile Glass (sec)	**43.055**	39.078	**39.045**
Normalized	90.69%	99.92%	100%
Standard Deviation	0.1%	0.3%	0.1%
GEGL - Wavelet Blur (sec)	**85.547**	**77.870**	78.115
Normalized	91.03%	100%	99.69%
Standard Deviation	0.7%	0.1%	0.1%
GEGL - Color Enhance (sec)	**89.185**	**70.242**	70.360
Normalized	78.76%	100%	99.83%
Standard Deviation	0.1%	0.1%	0.2%
GEGL - Rotate 90 Degrees (sec)	**67.124**	**47.747**	47.926
Normalized	71.13%	100%	99.63%
Standard Deviation	0.3%	0.6%	0.1%

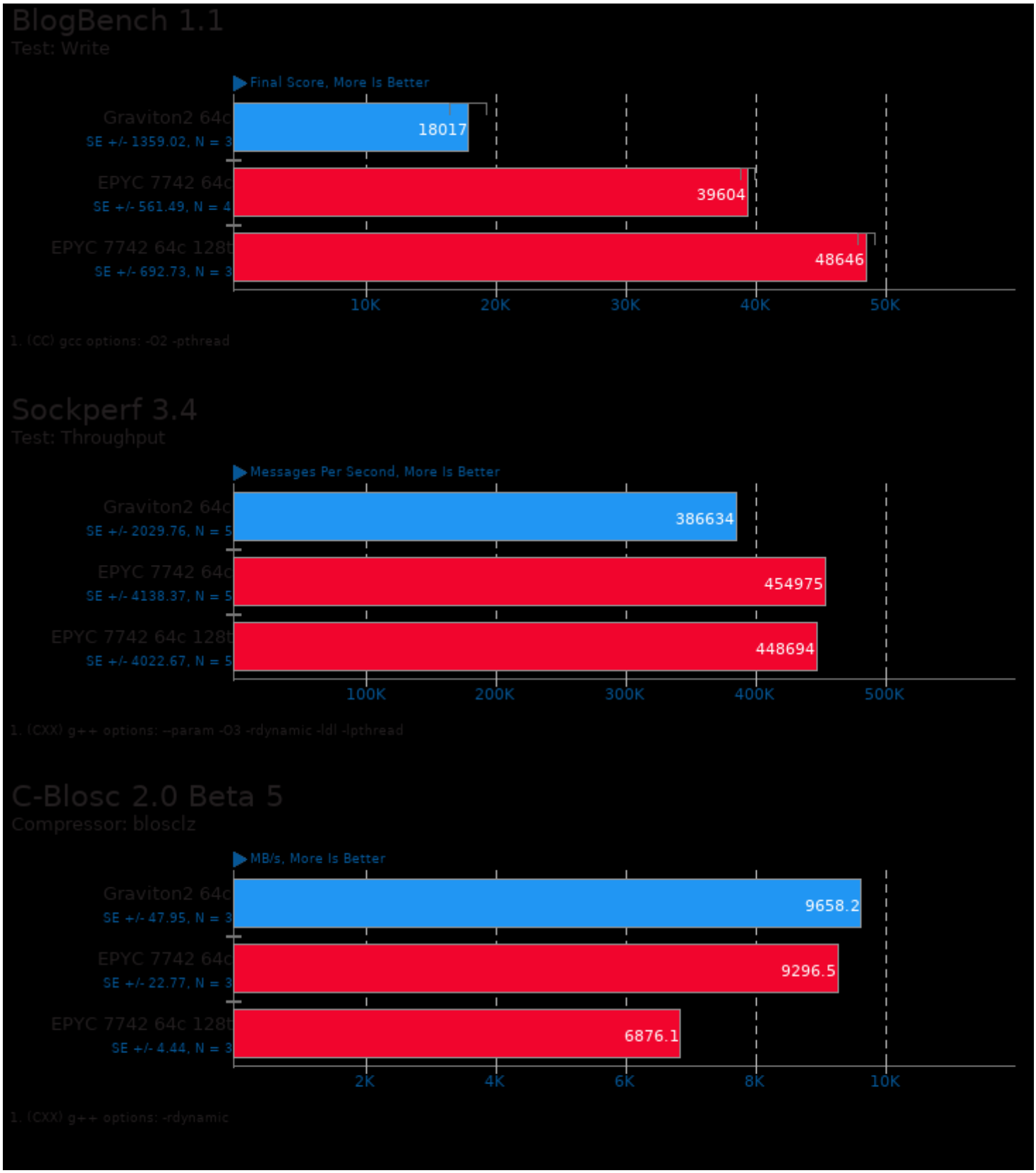
Amazon Graviton2 vs. AMD EPYC 7742

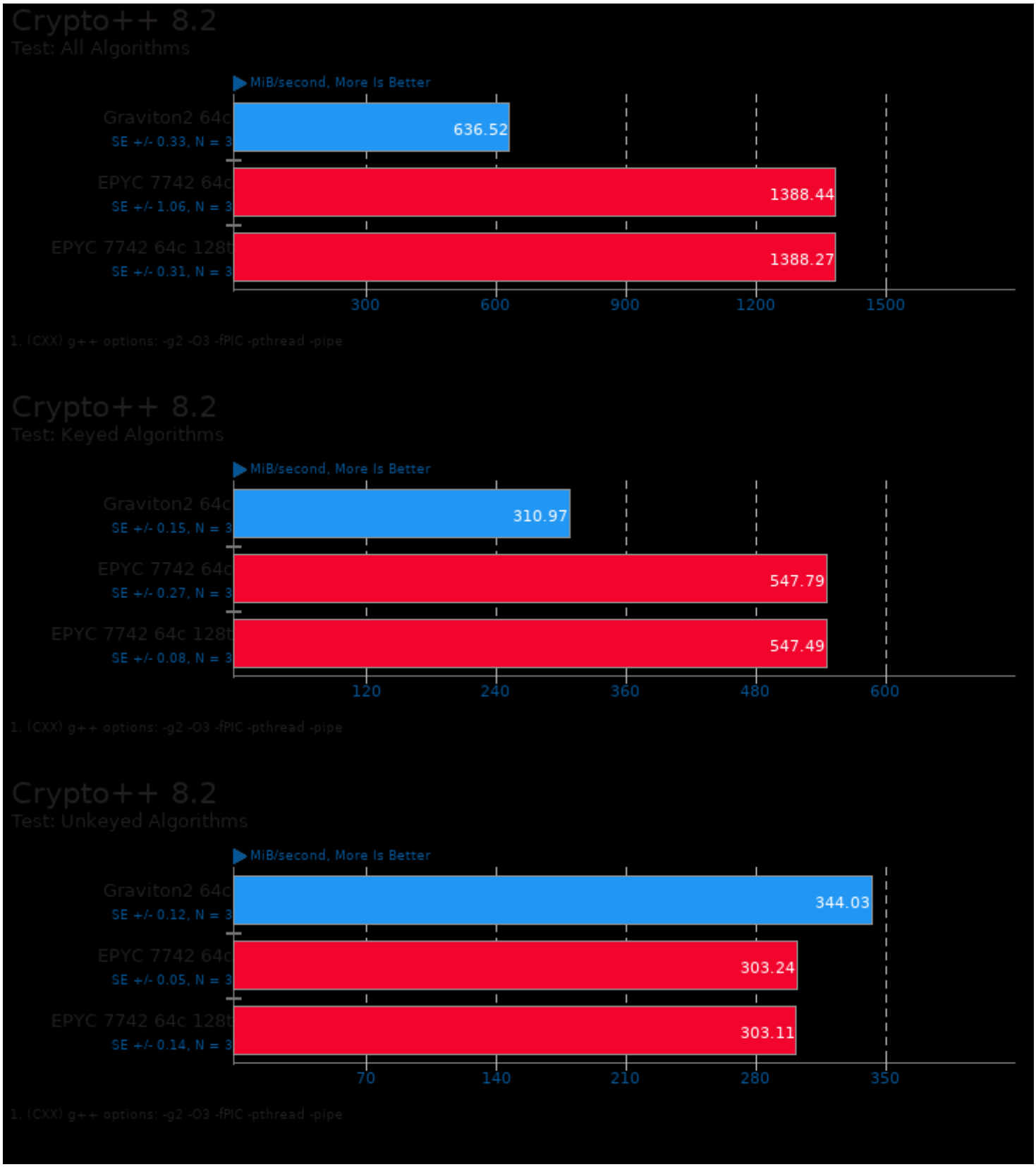
GIMP - resize (sec)	**13.246**	9.692	**9.661**
Normalized	72.94%	99.68%	100%
Standard Deviation	1.1%	1.2%	0.5%
GIMP - rotate (sec)	**22.087**	14.923	**14.705**
Normalized	66.58%	98.54%	100%
Standard Deviation	0.1%	1.8%	0.3%
GIMP - auto-levels (sec)	**26.153**	17.756	**17.638**
Normalized	67.44%	99.34%	100%
Standard Deviation	1%	1.6%	1.3%
GIMP - unsharp-mask (sec)	**31.940**	**22.007**	22.218
Normalized	68.9%	100%	99.05%
Standard Deviation	1.2%	0.3%	0.3%
RawTherapee - T.B.T (sec)	**61.395**	**55.797**	58.835
Normalized	90.88%	100%	94.84%
Standard Deviation	0.3%	0.1%	0.4%
Redis - LPOP (Reqs/sec)	1755472	**1720173**	**2168678**
Normalized	80.95%	79.32%	100%
Standard Deviation	0.7%	17.6%	8.1%
Redis - SADD (Reqs/sec)	**1340495**	1559704	**1683866**
Normalized	79.61%	92.63%	100%
Standard Deviation	2.6%	9.4%	7.1%
Redis - LPUSH (Reqs/sec)	**963399**	1150358	**1307307**
Normalized	73.69%	87.99%	100%
Standard Deviation	0.3%	0.8%	2.8%
Redis - GET (Reqs/sec)	**1644304**	1721921	**2047459**
Normalized	80.31%	84.1%	100%
Standard Deviation	2.1%	10%	7.9%
Redis - SET (Reqs/sec)	**1244328**	1405513	**1493004**
Normalized	83.34%	94.14%	100%
Standard Deviation	0.6%	6.4%	2.2%
Stress-NG - MMAP (Bogo Ops/s)	865.74	**538.85**	**934.59**
Normalized	92.63%	57.66%	100%
Standard Deviation	0.1%	0.2%	0.2%
Stress-NG - Atomic (Bogo Ops/s)	**231714**	**424050**	403797
Normalized	54.64%	100%	95.22%
Standard Deviation	0.6%	0.1%	0.1%
Stress-NG - Crypto (Bogo Ops/s)	**11364**	11923	**12828**
Normalized	88.59%	92.94%	100%
Standard Deviation	0.4%	0.3%	0.4%
Stress-NG - Malloc (Bogo Ops/s)	**712364029**	1097638087	**1248712298**
Normalized	57.05%	87.9%	100%
Standard Deviation	0.1%	0.2%	0.4%
Stress-NG - CPU Cache (Bogo Ops/s)	**13.37**	**62.25**	46.80
Normalized	21.48%	100%	75.18%
Standard Deviation	14.9%	5.6%	9.5%
Stress-NG - CPU Stress (Bogo Ops/s)	**7221**	16312	**19526**
Normalized	36.98%	83.54%	100%
Standard Deviation	0%	0.2%	0.2%
Stress-NG - Semaphores (Bogo Ops/s)	6276773	**5325536**	**9258347**
Normalized	67.8%	57.52%	100%
Standard Deviation	0.3%	0.2%	0.1%
Stress-NG - Vector Math (Bogo Ops/s)	353815	**316216**	**424667**
Normalized	83.32%	74.46%	100%
Standard Deviation	0%	0%	0%
Stress-NG - Memory Copying (Bogo Ops/s)	**10028**	**14243**	12406

Amazon Graviton2 vs. AMD EPYC 7742

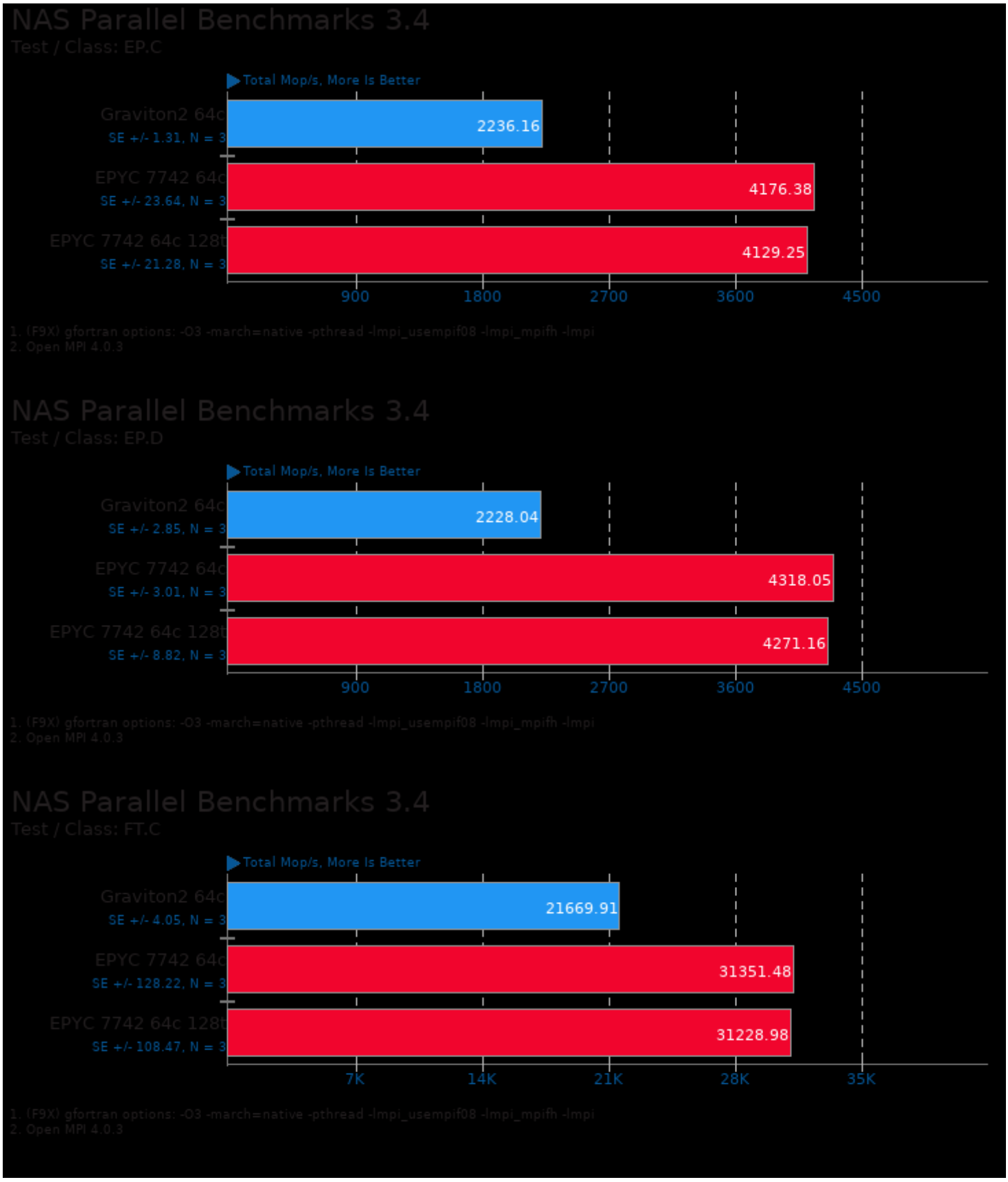
Normalized	70.4%	100%	87.1%
Standard Deviation	0%	10.5%	0.5%
Stress-NG - Context Switching (Bogo Ops/s)	21475660	**15203224**	**26364845**
Normalized	81.46%	57.66%	100%
Standard Deviation	0.8%	2.3%	10.5%
Stress-NG - G.C.S.F (Bogo Ops/s)	**3519134**	5116591	**6797663**
Normalized	51.77%	75.27%	100%
Standard Deviation	0.2%	1.2%	2.8%
Stress-NG - G.Q.D.S (Bogo Ops/s)	**441.76**	565.80	**741.19**
Normalized	59.6%	76.34%	100%
Standard Deviation	0.4%	2.5%	0.3%
Stress-NG - S.V.M.P (Bogo Ops/s)	**10623061**	22845900	**26968237**
Normalized	39.39%	84.71%	100%
Standard Deviation	1.6%	1.3%	5.4%
Optcarrot - O.B (FPS)	**68.67**	106.94	**107.11**
Normalized	64.11%	99.84%	100%
Standard Deviation	1%	0.6%	0.8%
Apache Cassandra - Writes (Op/s)	**266989**	**211622**	220011
Normalized	100%	79.26%	82.4%
Standard Deviation	2.6%	2.1%	2.1%

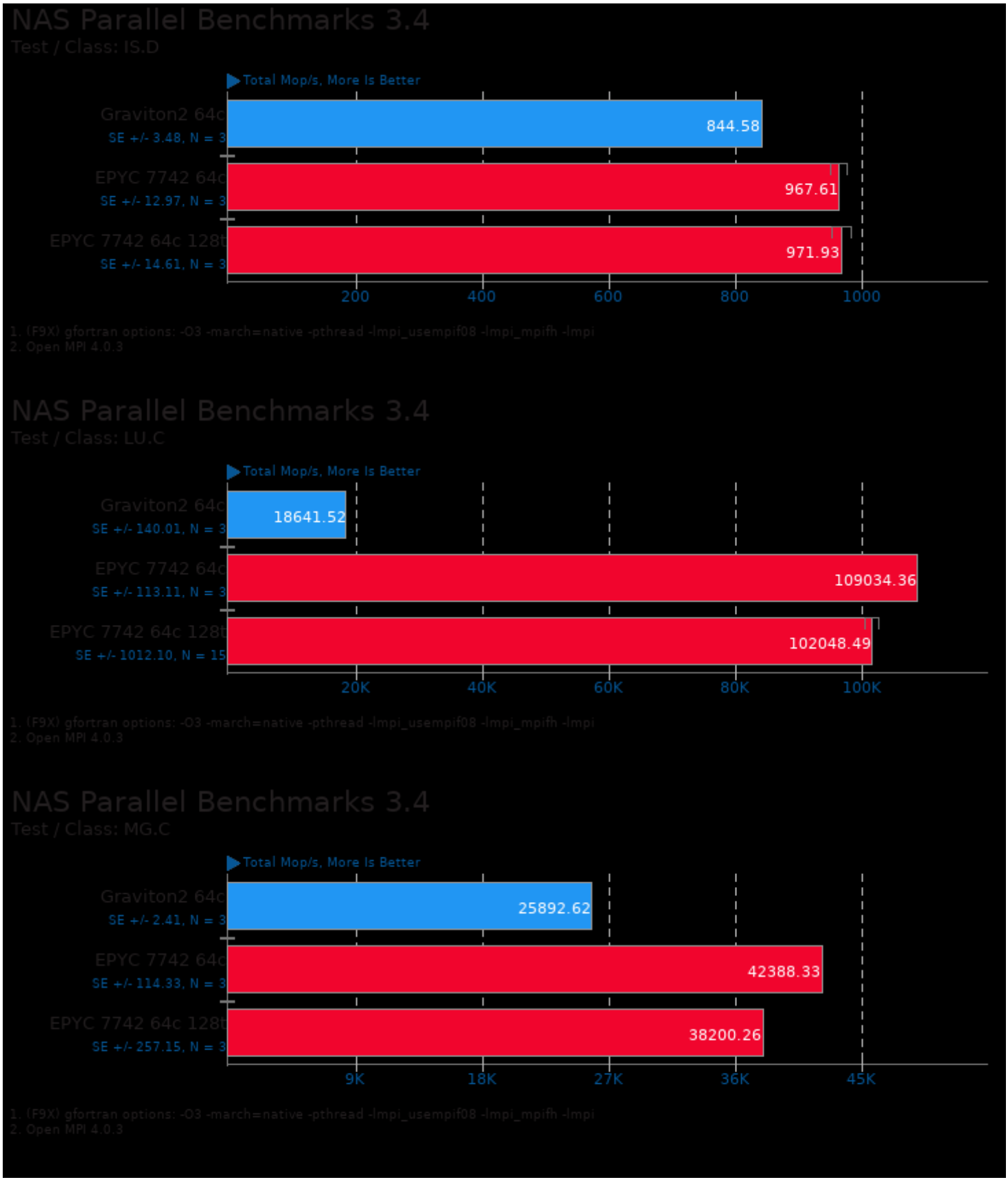
Amazon Graviton2 vs. AMD EPYC 7742




Crypto++ 8.2
Test: All Algorithms
MiB/second, More Is Better
Graviton2 64c
SE +/- 0.33, N = 3
636.52
EPYC 7742 64c
SE +/- 1.06, N = 3
1388.44
EPYC 7742 64c 128t
SE +/- 0.31, N = 3
1388.27
300
600
900
1200
1500
1. (CXX) g++ options: -g2 -O3 -fPIC -pthread -pipe
Crypto++ 8.2
Test: Keyed Algorithms
MiB/second, More Is Better
Graviton2 64c
SE +/- 0.15, N = 3
310.97
EPYC 7742 64c
SE +/- 0.27, N = 3
547.79
EPYC 7742 64c 128t
SE +/- 0.08, N = 3
547.49
120
240
360
480
600
1. (CXX) g++ options: -g2 -O3 -fPIC -pthread -pipe
Crypto++ 8.2
Test: Unkeyed Algorithms
MiB/second, More Is Better
Graviton2 64c
SE +/- 0.12, N = 3
344.03
EPYC 7742 64c
SE +/- 0.05, N = 3
303.24
EPYC 7742 64c 128t
SE +/- 0.14, N = 3
303.11
70
140
210
280
350
1. (CXX) g++ options: -g2 -O3 -fPIC -pthread -pipe

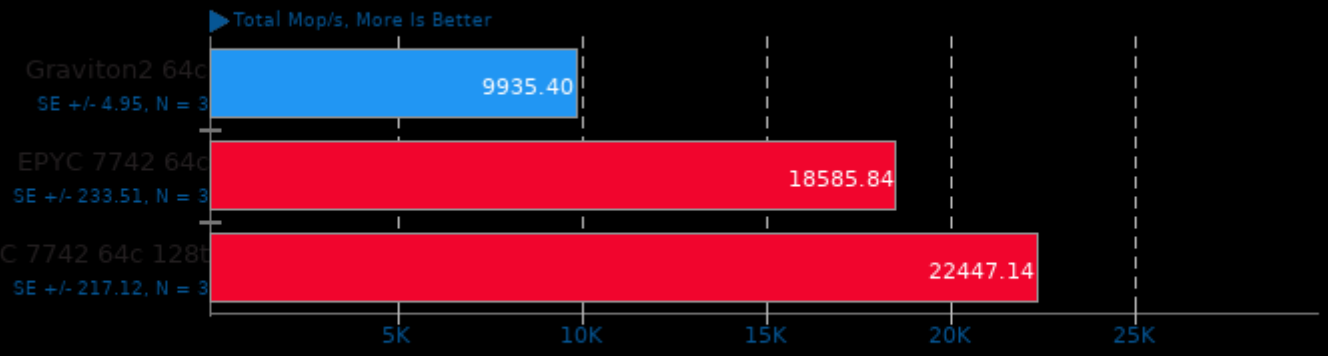

Crypto++ 8.2
Test: Integer + Elliptic Curve Public Key Algorithms
MiB/second, More Is Better
Graviton2 64c
SE +/- 0.65, N = 3
1270.01
EPYC 7742 64c
SE +/- 2.97, N = 3
4206.42
EPYC 7742 64c 128t
SE +/- 2.27, N = 3
4195.35
900
1800
2700
3600
4500
1. (CXX) g++ options: -g2 -O3 -fPIC -pthread -pipe
High Performance Conjugate Gradient 3.1
GFLOP/s, More Is Better
Graviton2 64c
SE +/- 0.00, N = 3
21.43
EPYC 7742 64c
SE +/- 0.01, N = 3
17.75
EPYC 7742 64c 128t
SE +/- 0.02, N = 3
17.56
5
10
15
20
25
1. (CXX) g++ options: -O3 -ffast-math -ftree-vectorize -pthread -lmpi_cxx -lmpi
NAS Parallel Benchmarks 3.4
Test / Class: BT.C
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 4.67, N = 3
24463.10
EPYC 7742 64c
SE +/- 1483.41, N = 4
102257.04
EPYC 7742 64c 128t
SE +/- 1221.04, N = 5
92544.26
20K
40K
60K
80K
100K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3


NAS Parallel Benchmarks 3.4
Test / Class: EP.C
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 1.31, N = 3
2236.16
EPYC 7742 64c
SE +/- 23.64, N = 3
4176.38
EPYC 7742 64c 128t
SE +/- 21.28, N = 3
4129.25
900
1800
2700
3600
4500
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3
NAS Parallel Benchmarks 3.4
Test / Class: EP.D
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 2.85, N = 3
2228.04
EPYC 7742 64c
SE +/- 3.01, N = 3
4318.05
EPYC 7742 64c 128t
SE +/- 8.82, N = 3
4271.16
900
1800
2700
3600
4500
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3
NAS Parallel Benchmarks 3.4
Test / Class: FT.C
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 4.05, N = 3
21669.91
EPYC 7742 64c
SE +/- 128.22, N = 3
31351.48
EPYC 7742 64c 128t
SE +/- 108.47, N = 3
31228.98
7K
14K
21K
28K
35K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3


NAS Parallel Benchmarks 3.4
Test / Class: IS.D
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 3.48, N = 3
844.58
EPYC 7742 64c
SE +/- 12.97, N = 3
967.61
EPYC 7742 64c 128t
SE +/- 14.61, N = 3
971.93
200
400
600
800
1000
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3
NAS Parallel Benchmarks 3.4
Test / Class: LU.C
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 140.01, N = 3
18641.52
EPYC 7742 64c
SE +/- 113.11, N = 3
109034.36
EPYC 7742 64c 128t
SE +/- 1012.10, N = 15
102048.49
20K
40K
60K
80K
100K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3
NAS Parallel Benchmarks 3.4
Test / Class: MG.C
Total Mop/s, More Is Better
Graviton2 64c
SE +/- 2.41, N = 3
25892.62
EPYC 7742 64c
SE +/- 114.33, N = 3
42388.33
EPYC 7742 64c 128t
SE +/- 257.15, N = 3
38200.26
9K
18K
27K
36K
45K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3

NAS Parallel Benchmarks 3.4

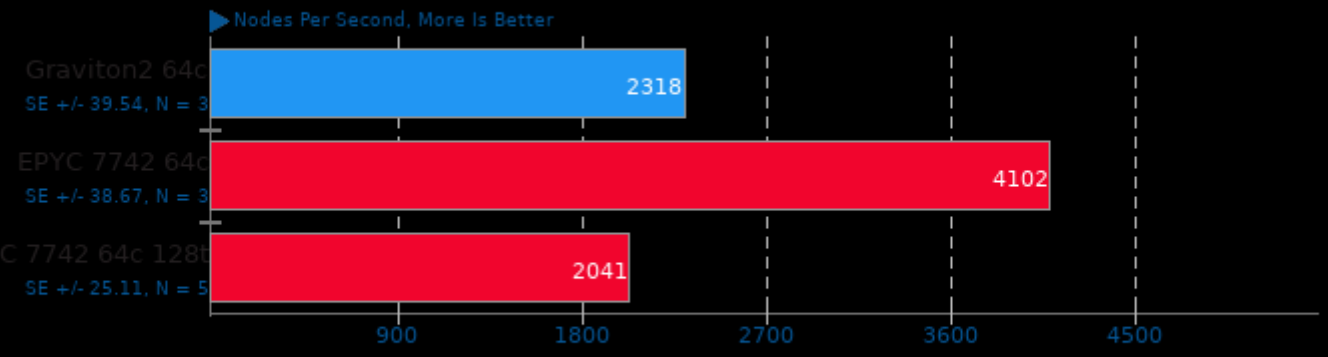
Test / Class: SP.B



1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Open MPI 4.0.3

LeelaChessZero 0.25

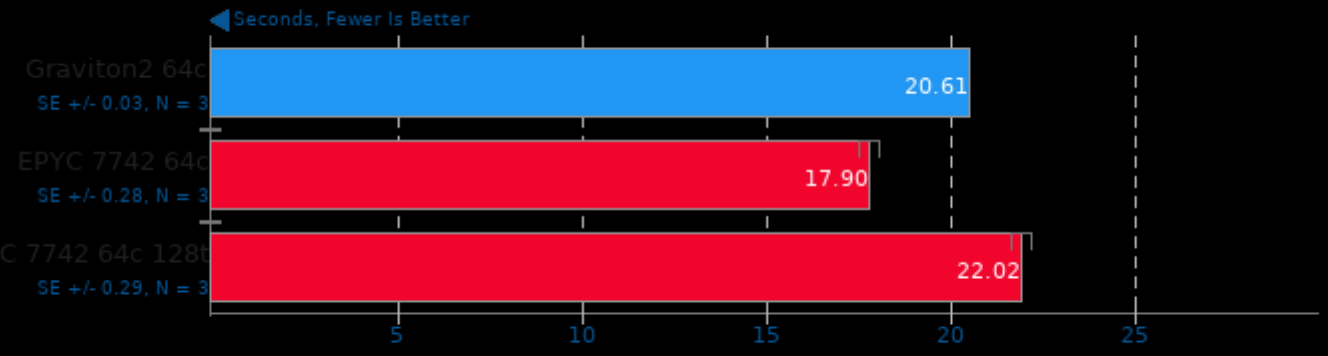
Backend: Eigen



1. (CXX) g++ options: -pthread

Parboil 2.5

Test: OpenMP LBM

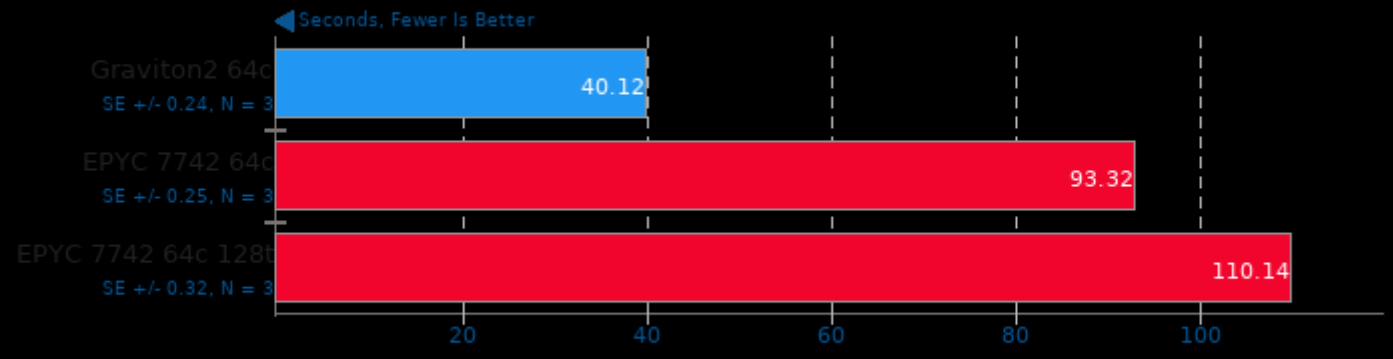


1. (CXX) g++ options: -lm -lpthread -lgomp -O3 -ffast-math -fopenmp

Amazon Graviton2 vs. AMD EPYC 7742

Parboil 2.5

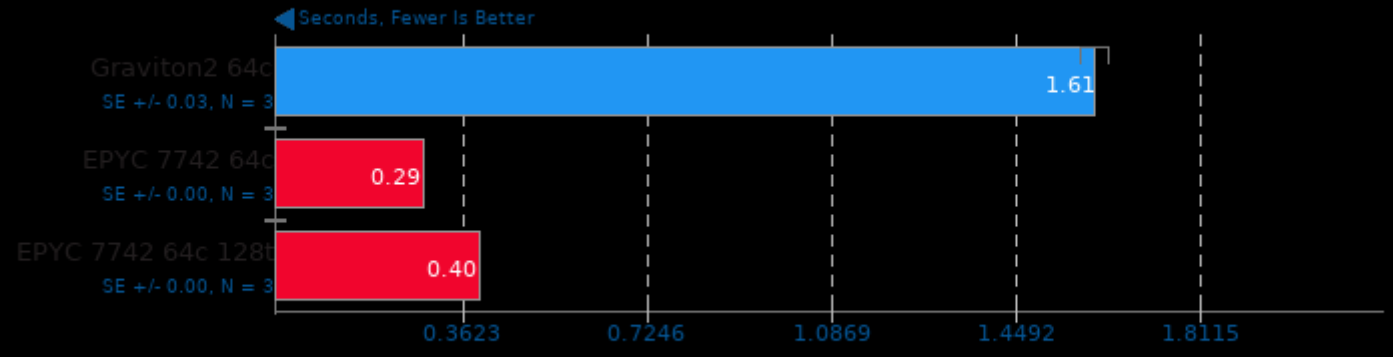
Test: OpenMP MRI Gridding



1. (CXX) g++ options: -lm -lpthread -lgomp -O3 -ffast-math -fopenmp

CloverLeaf

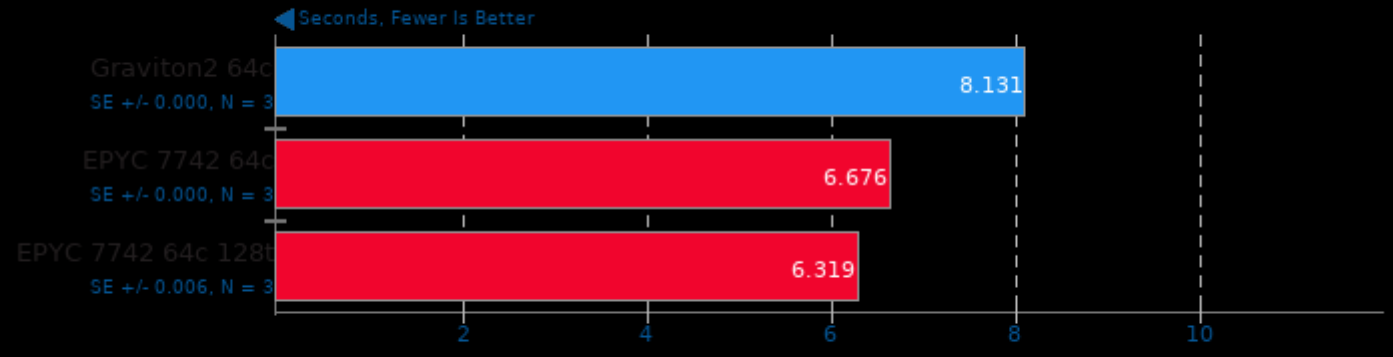
Lagrangian-Eulerian Hydrodynamics



1. (F9X) gfortran options: -O3 -march=native -funroll-loops -fopenmp

Rodinia 2.4

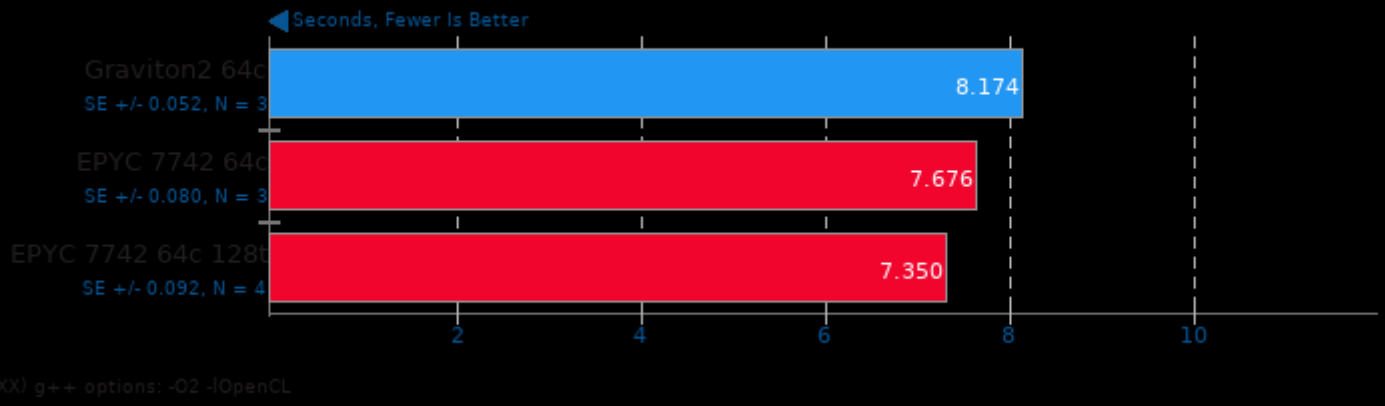
Test: OpenMP LavaMD



1. (CXX) g++ options: -O2 -lOpenCL

Rodinia 2.4

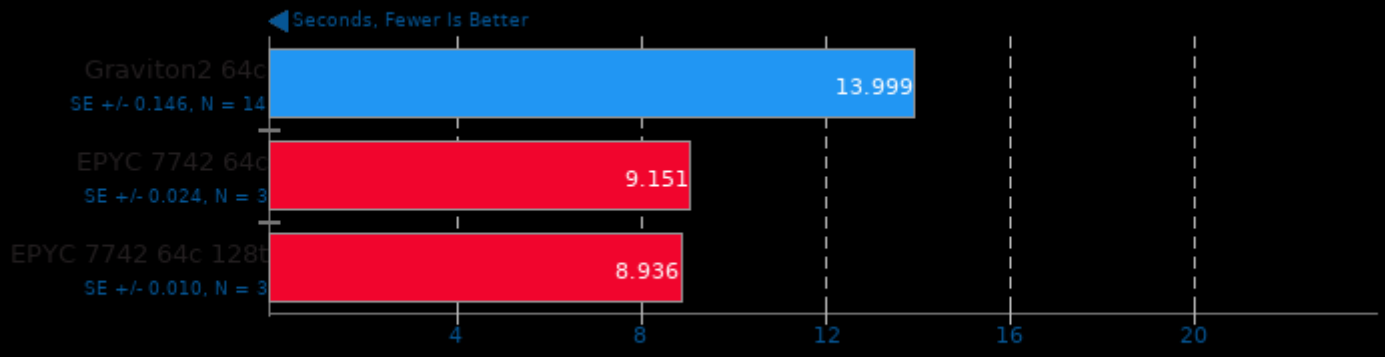
Test: OpenMP CFD Solver



1. (CXX) g++ options: -O2 -lOpenCL

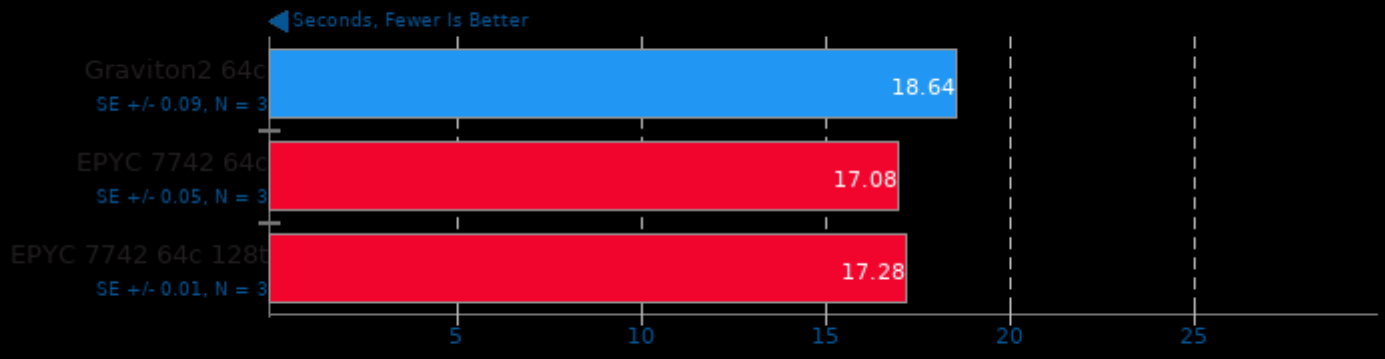
Rodinia 2.4

Test: OpenMP Streamcluster



1. (CXX) g++ options: -O2 -lOpenCL

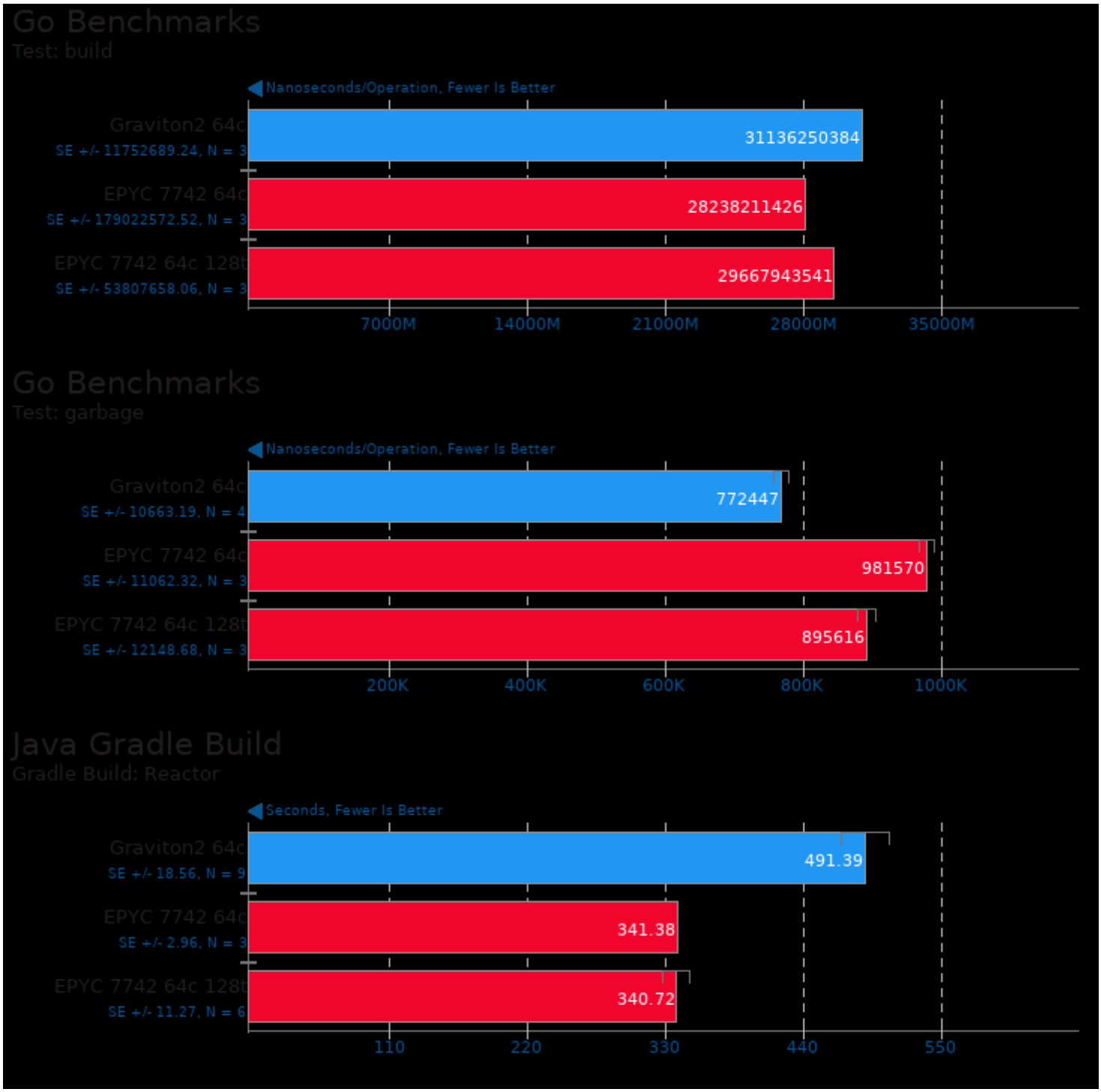
Nebular Empirical Analysis Tool 2020-02-29

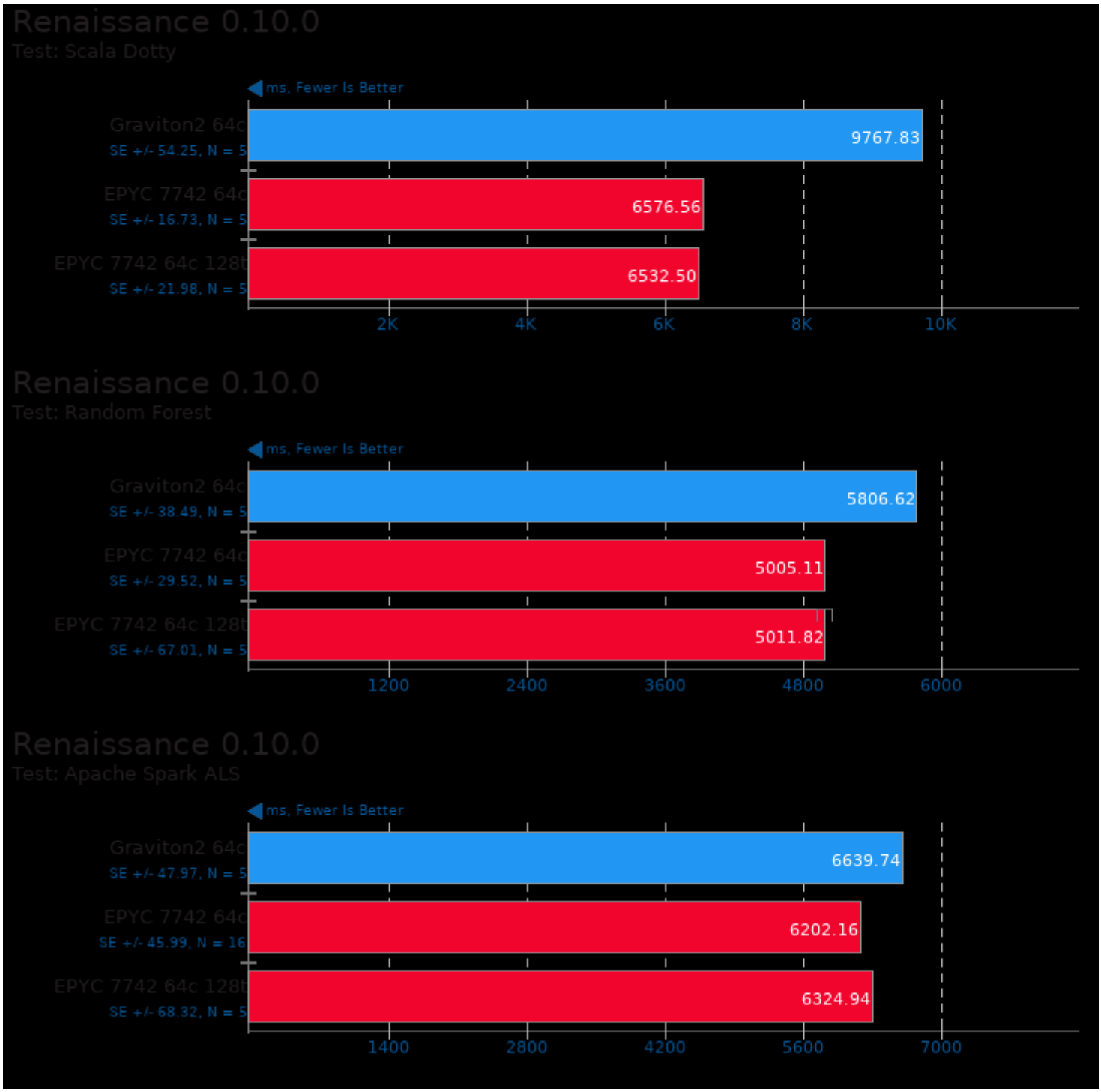


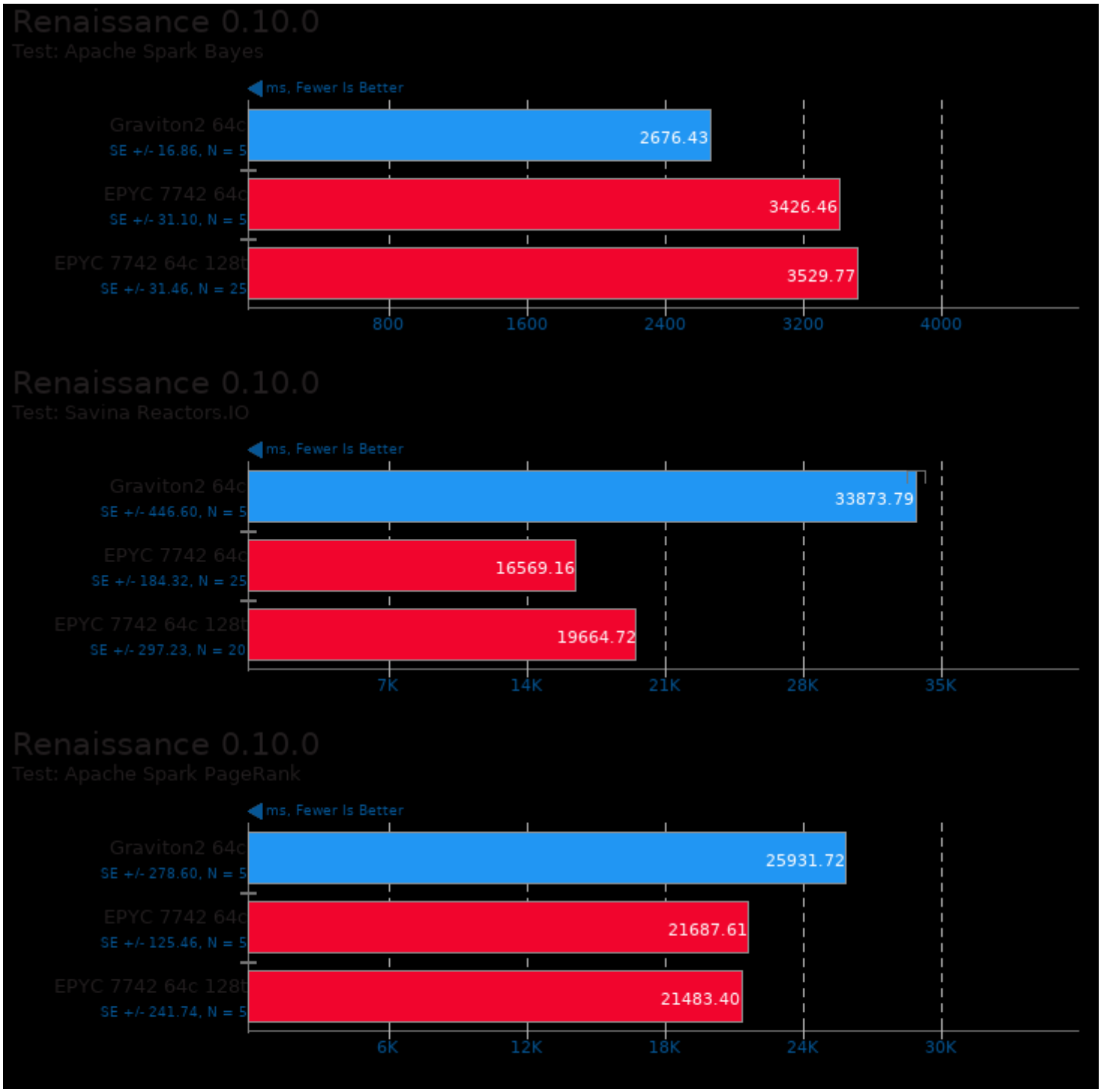
1. (F9X) gfortran options: -cpp -ffree-line-length-0 -Jsource/ -fopenmp -O3 -fno-backtrace

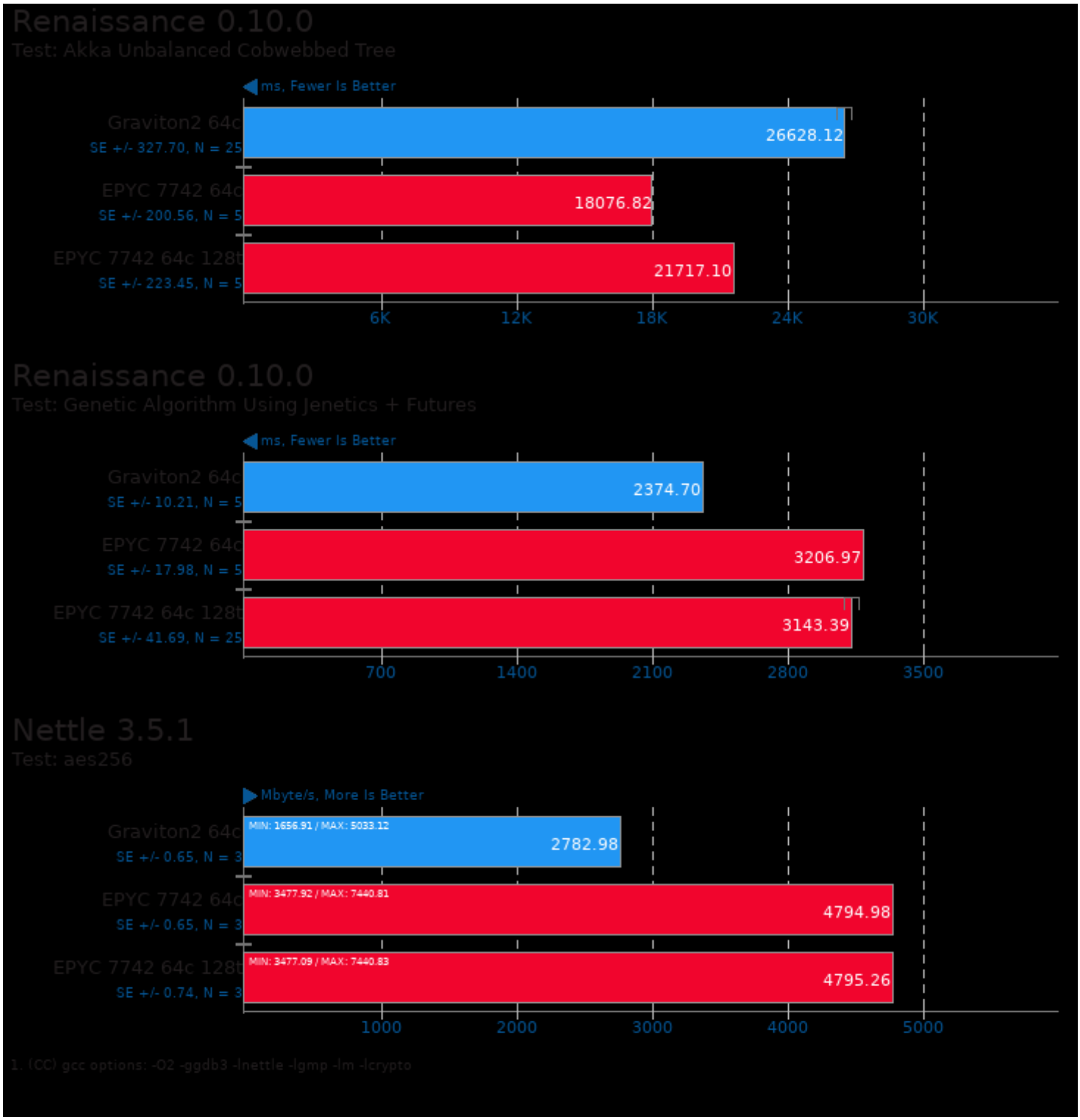

Timed MrBayes Analysis 3.2.7
Primate Phylogeny Analysis
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.26, N = 3
257.32
EPYC 7742 64c
SE +/- 0.12, N = 3
-mmmx -msse -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -msse4a -msha -maes -mavx -mfma -mavx2 -mrdrnd -mbmi -mbmi2 -madx -mabm
105.65
EPYC 7742 64c 128t
SE +/- 0.84, N = 3
-mmmx -msse -msse2 -msse3 -mssse3 -msse4.1 -msse4.2 -msse4a -msha -maes -mavx -mfma -mavx2 -mrdrnd -mbmi -mbmi2 -madx -mabm
106.97
60
120
180
240
300
1. (CC) gcc options: -O3 -std=c99 -pedantic -lm
Timed MAFFT Alignment 7.392
Multiple Sequence Alignment
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.049, N = 15
2.246
EPYC 7742 64c
SE +/- 0.013, N = 3
2.160
EPYC 7742 64c 128t
SE +/- 0.029, N = 15
2.136
0.5054
1.0108
1.5162
2.0216
2.527
1. (CC) gcc options: -std=c99 -O3 -lm -lpthread
Go Benchmarks
Test: json
Nanoseconds/Operation, Fewer Is Better
Graviton2 64c
SE +/- 5211.56, N = 3
1395314
EPYC 7742 64c
SE +/- 5729.12, N = 3
1411199
EPYC 7742 64c 128t
SE +/- 16777.18, N = 4
1273253
300K
600K
900K
1200K
1500K

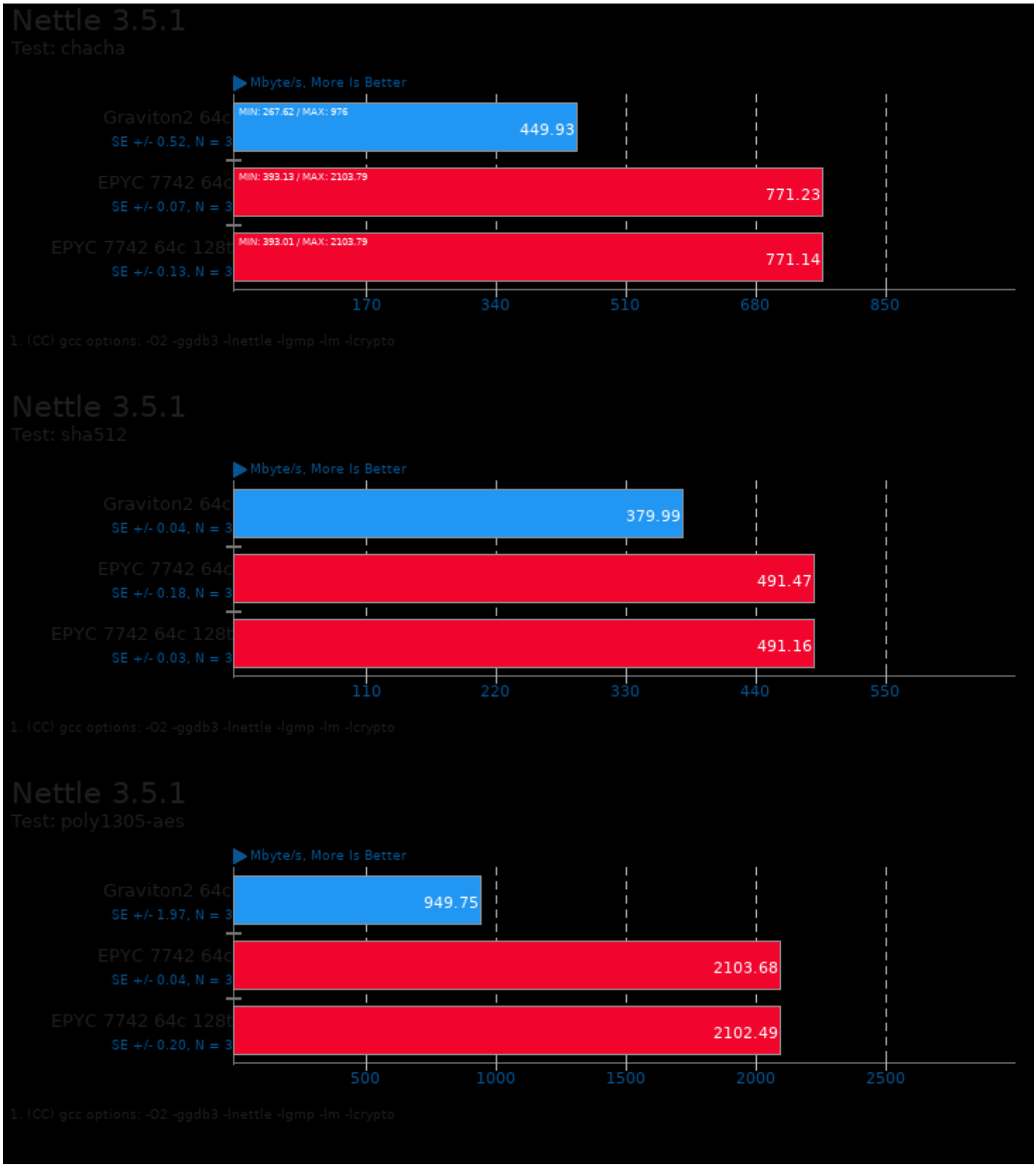
Amazon Graviton2 vs. AMD EPYC 7742

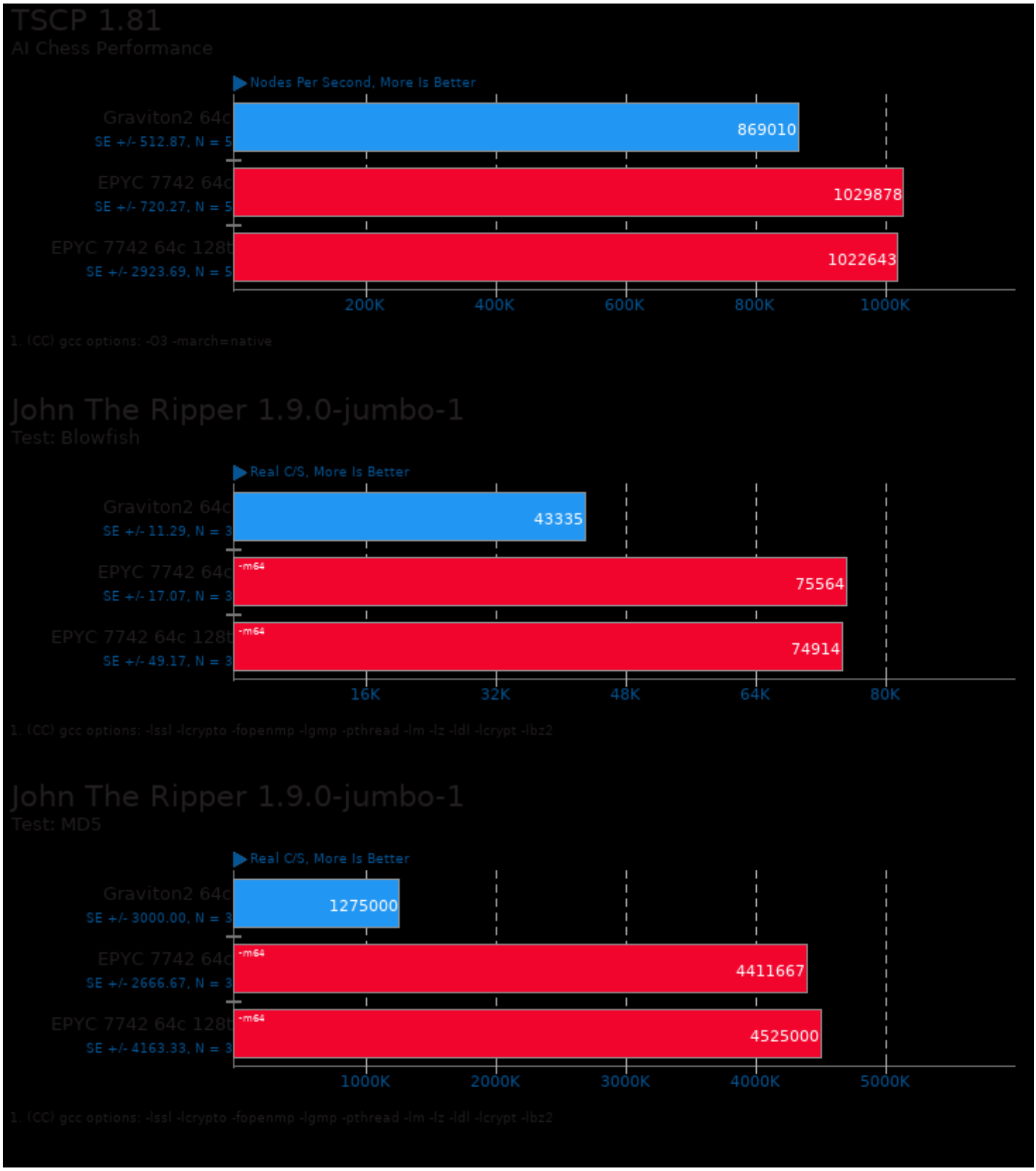



Renaissance 0.10.0
Test: Scala Dotty
ms, Fewer Is Better
Graviton2 64c
SE +/- 54.25, N = 5
9767.83
EPYC 7742 64c
SE +/- 16.73, N = 5
6576.56
EPYC 7742 64c 128t
SE +/- 21.98, N = 5
6532.50
2K
4K
6K
8K
10K
Renaissance 0.10.0
Test: Random Forest
ms, Fewer Is Better
Graviton2 64c
SE +/- 38.49, N = 5
5806.62
EPYC 7742 64c
SE +/- 29.52, N = 5
5005.11
EPYC 7742 64c 128t
SE +/- 67.01, N = 5
5011.82
1200
2400
3600
4800
6000
Renaissance 0.10.0
Test: Apache Spark ALS
ms, Fewer Is Better
Graviton2 64c
SE +/- 47.97, N = 5
6639.74
EPYC 7742 64c
SE +/- 45.99, N = 16
6202.16
EPYC 7742 64c 128t
SE +/- 68.32, N = 5
6324.94
1400
2800
4200
5600
7000

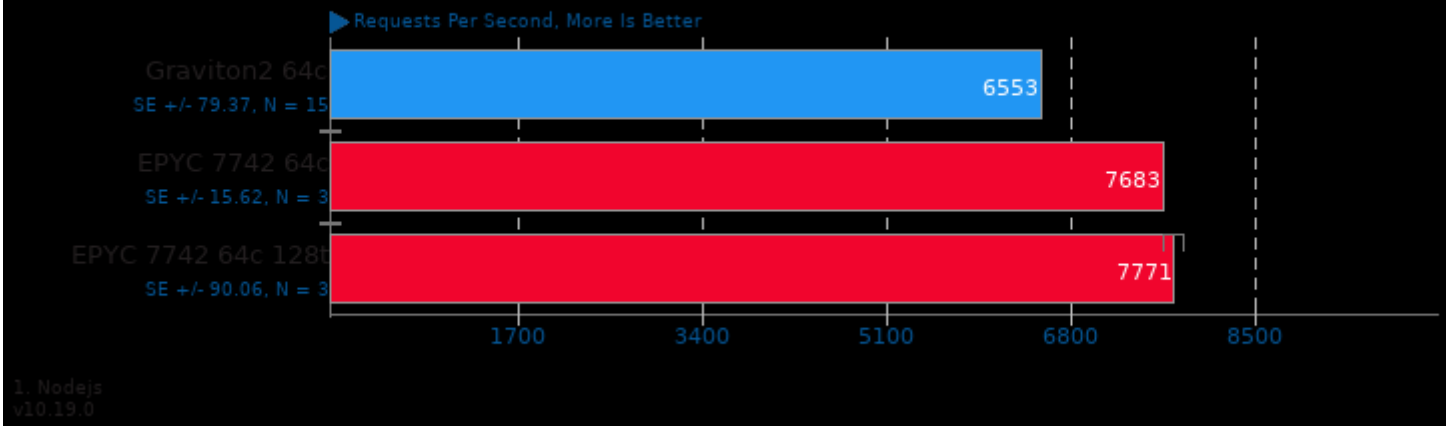

Renaissance 0.10.0
Test: Apache Spark Bayes
ms, Fewer Is Better
Graviton2 64c
SE +/- 16.86, N = 5
2676.43
EPYC 7742 64c
SE +/- 31.10, N = 5
3426.46
EPYC 7742 64c 128t
SE +/- 31.46, N = 25
3529.77
800
1600
2400
3200
4000
Renaissance 0.10.0
Test: Savina Reactors.IO
ms, Fewer Is Better
Graviton2 64c
SE +/- 446.60, N = 5
33873.79
EPYC 7742 64c
SE +/- 184.32, N = 25
16569.16
EPYC 7742 64c 128t
SE +/- 297.23, N = 20
19664.72
7K
14K
21K
28K
35K
Renaissance 0.10.0
Test: Apache Spark PageRank
ms, Fewer Is Better
Graviton2 64c
SE +/- 278.60, N = 5
25931.72
EPYC 7742 64c
SE +/- 125.46, N = 5
21687.61
EPYC 7742 64c 128t
SE +/- 241.74, N = 5
21483.40
6K
12K
18K
24K
30K


Renaissance 0.10.0
Test: Akka Unbalanced Cobwebbed Tree
ms, Fewer Is Better
Graviton2 64c
SE +/- 327.70, N = 25
26628.12
EPYC 7742 64c
SE +/- 200.56, N = 5
18076.82
EPYC 7742 64c 128t
SE +/- 223.45, N = 5
21717.10
6K
12K
18K
24K
30K
Renaissance 0.10.0
Test: Genetic Algorithm Using Jenetics + Futures
ms, Fewer Is Better
Graviton2 64c
SE +/- 10.21, N = 5
2374.70
EPYC 7742 64c
SE +/- 17.98, N = 5
3206.97
EPYC 7742 64c 128t
SE +/- 41.69, N = 25
3143.39
700
1400
2100
2800
3500
Nettle 3.5.1
Test: aes256
Mbyte/s, More Is Better
Graviton2 64c
SE +/- 0.65, N = 3
MIN: 1656.91 / MAX: 5033.12
2782.98
EPYC 7742 64c
SE +/- 0.65, N = 3
MIN: 3477.92 / MAX: 7440.81
4794.98
EPYC 7742 64c 128t
SE +/- 0.74, N = 3
MIN: 3477.09 / MAX: 7440.83
4795.26
1000
2000
3000
4000
5000
1. (CC) gcc options: -O2 -ggdb3 -lnettle -lgmp -lm -lcrypto


Nettle 3.5.1
Test: chacha
Mbyte/s, More Is Better
Graviton2 64c
SE +/- 0.52, N = 3
MIN: 267.62 / MAX: 976
449.93
EPYC 7742 64c
SE +/- 0.07, N = 3
MIN: 393.13 / MAX: 2103.79
771.23
EPYC 7742 64c 128t
SE +/- 0.13, N = 3
MIN: 393.01 / MAX: 2103.79
771.14
170
340
510
680
850
1. (CC) gcc options: -O2 -ggdb3 -lnettle -lgmp -lm -lcrypto
Nettle 3.5.1
Test: sha512
Mbyte/s, More Is Better
Graviton2 64c
SE +/- 0.04, N = 3
379.99
EPYC 7742 64c
SE +/- 0.18, N = 3
491.47
EPYC 7742 64c 128t
SE +/- 0.03, N = 3
491.16
110
220
330
440
550
1. (CC) gcc options: -O2 -ggdb3 -lnettle -lgmp -lm -lcrypto
Nettle 3.5.1
Test: poly1305-aes
Mbyte/s, More Is Better
Graviton2 64c
SE +/- 1.97, N = 3
949.75
EPYC 7742 64c
SE +/- 0.04, N = 3
2103.68
EPYC 7742 64c 128t
SE +/- 0.20, N = 3
2102.49
500
1000
1500
2000
2500
1. (CC) gcc options: -O2 -ggdb3 -lnettle -lgmp -lm -lcrypto


TSCP 1.81
AI Chess Performance
Nodes Per Second, More Is Better
Graviton2 64c
SE +/- 512.87, N = 5
869010
EPYC 7742 64c
SE +/- 720.27, N = 5
1029878
EPYC 7742 64c 128t
SE +/- 2923.69, N = 5
1022643
200K
400K
600K
800K
1000K
1. (CC) gcc options: -O3 -march=native
John The Ripper 1.9.0-jumbo-1
Test: Blowfish
Real C/S, More Is Better
Graviton2 64c
SE +/- 11.29, N = 3
43335
EPYC 7742 64c
SE +/- 17.07, N = 3
-m64
75564
EPYC 7742 64c 128t
SE +/- 49.17, N = 3
-m64
74914
16K
32K
48K
64K
80K
1. (CC) gcc options: -lssl -lcrypto -fopenmp -lgmp -pthread -lm -lz -ldl -lcrypt -lbz2
John The Ripper 1.9.0-jumbo-1
Test: MD5
Real C/S, More Is Better
Graviton2 64c
SE +/- 3000.00, N = 3
1275000
EPYC 7742 64c
SE +/- 2666.67, N = 3
-m64
4411667
EPYC 7742 64c 128t
SE +/- 4163.33, N = 3
-m64
4525000
1000K
2000K
3000K
4000K
5000K
1. (CC) gcc options: -lssl -lcrypto -fopenmp -lgmp -pthread -lm -lz -ldl -lcrypt -lbz2

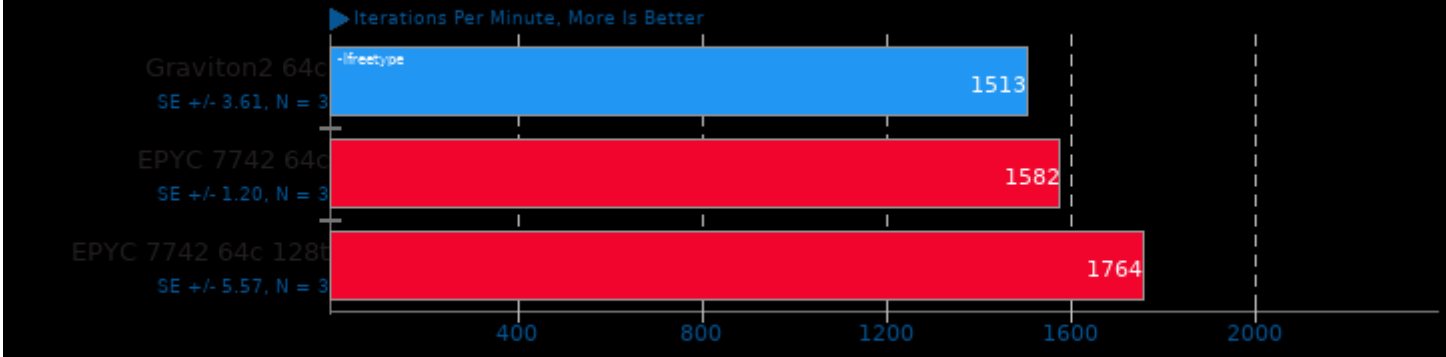
Node.js Express HTTP Load Test



1. Nodejs v10.19.0

GraphicsMagick 1.3.33

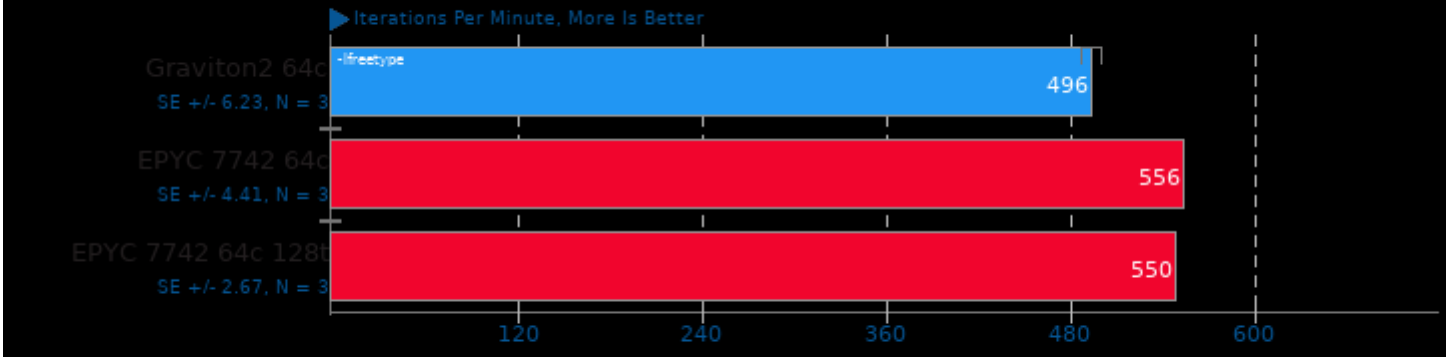
Operation: Swirl



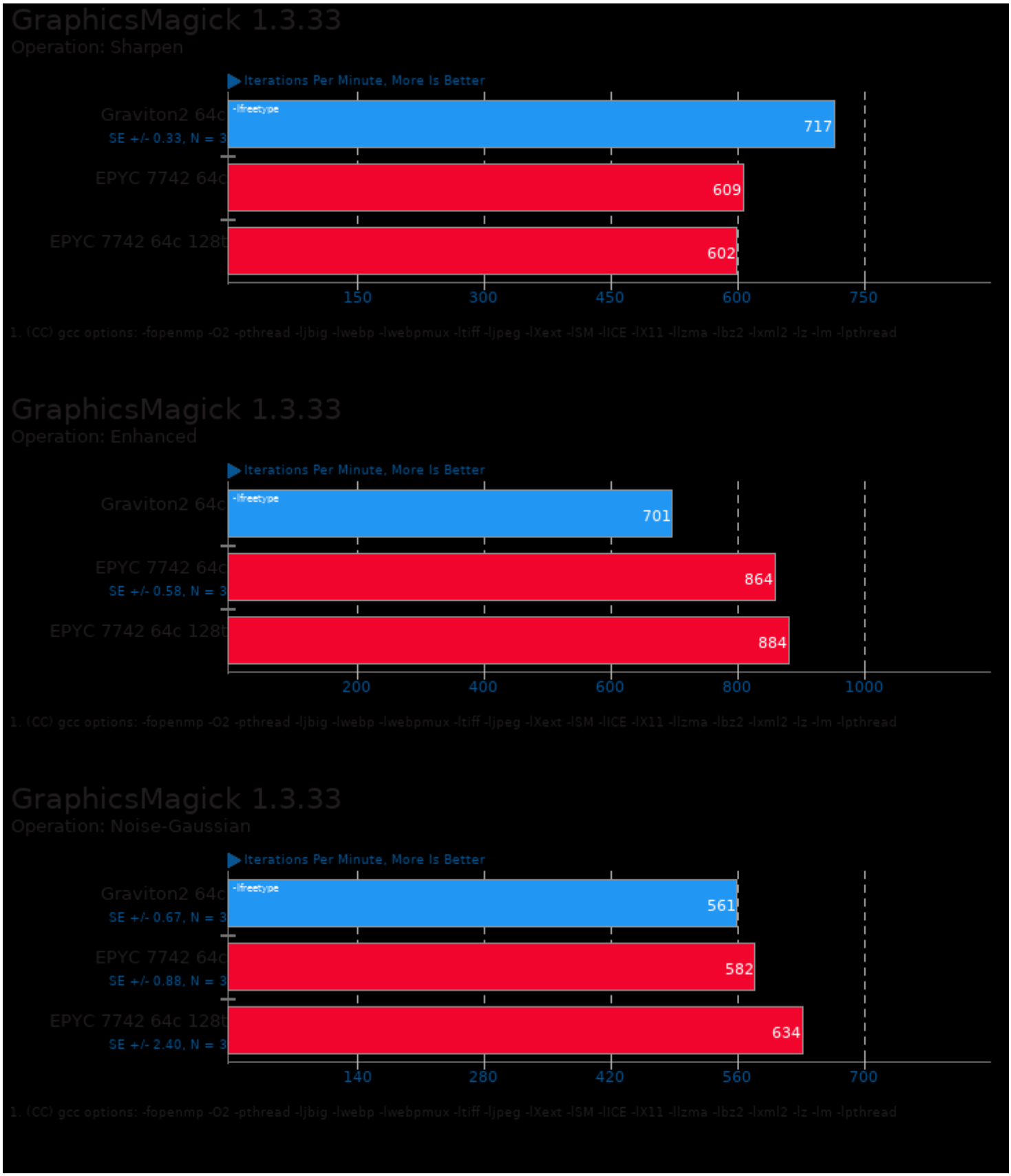
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread

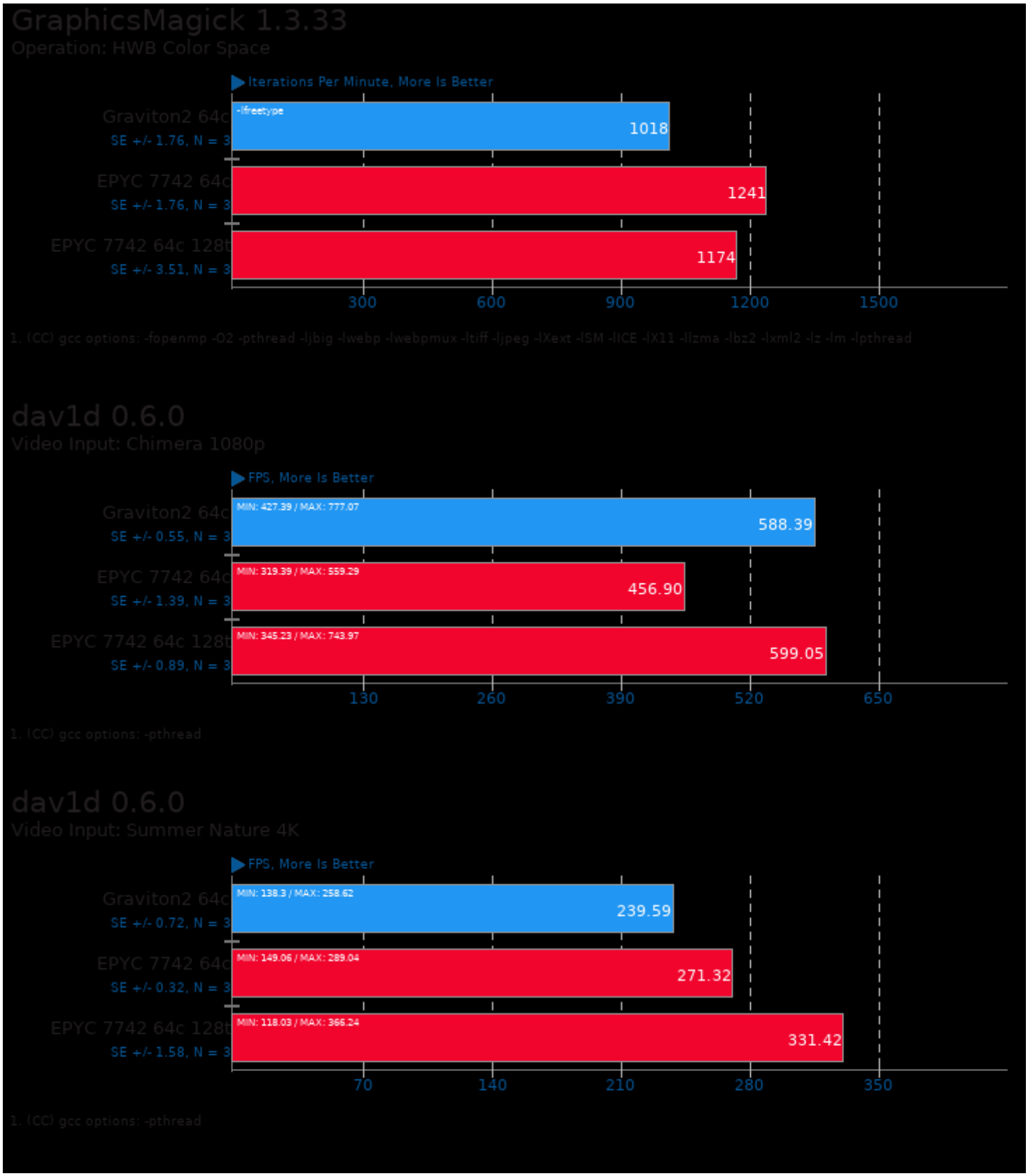
GraphicsMagick 1.3.33

Operation: Rotate

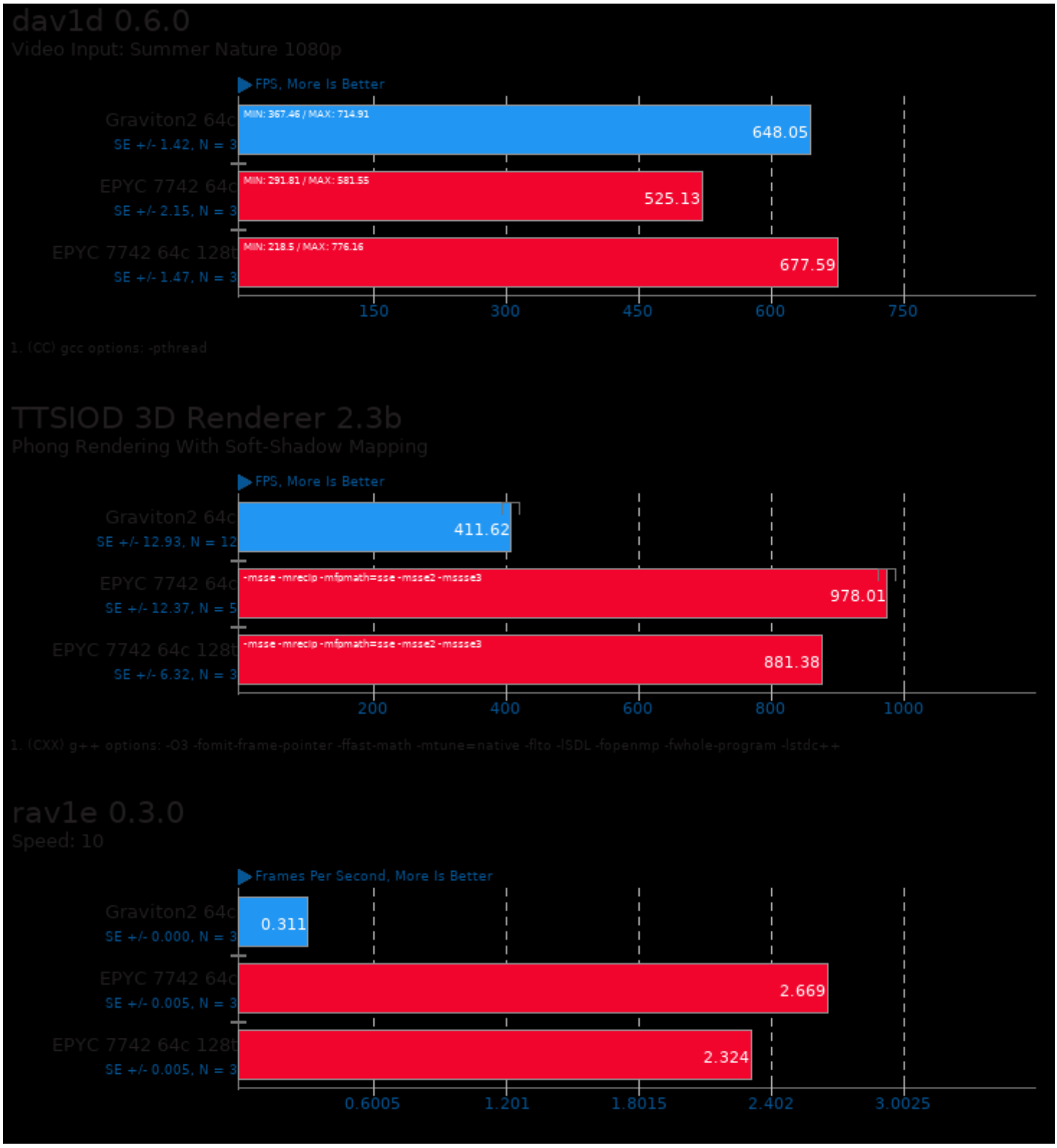


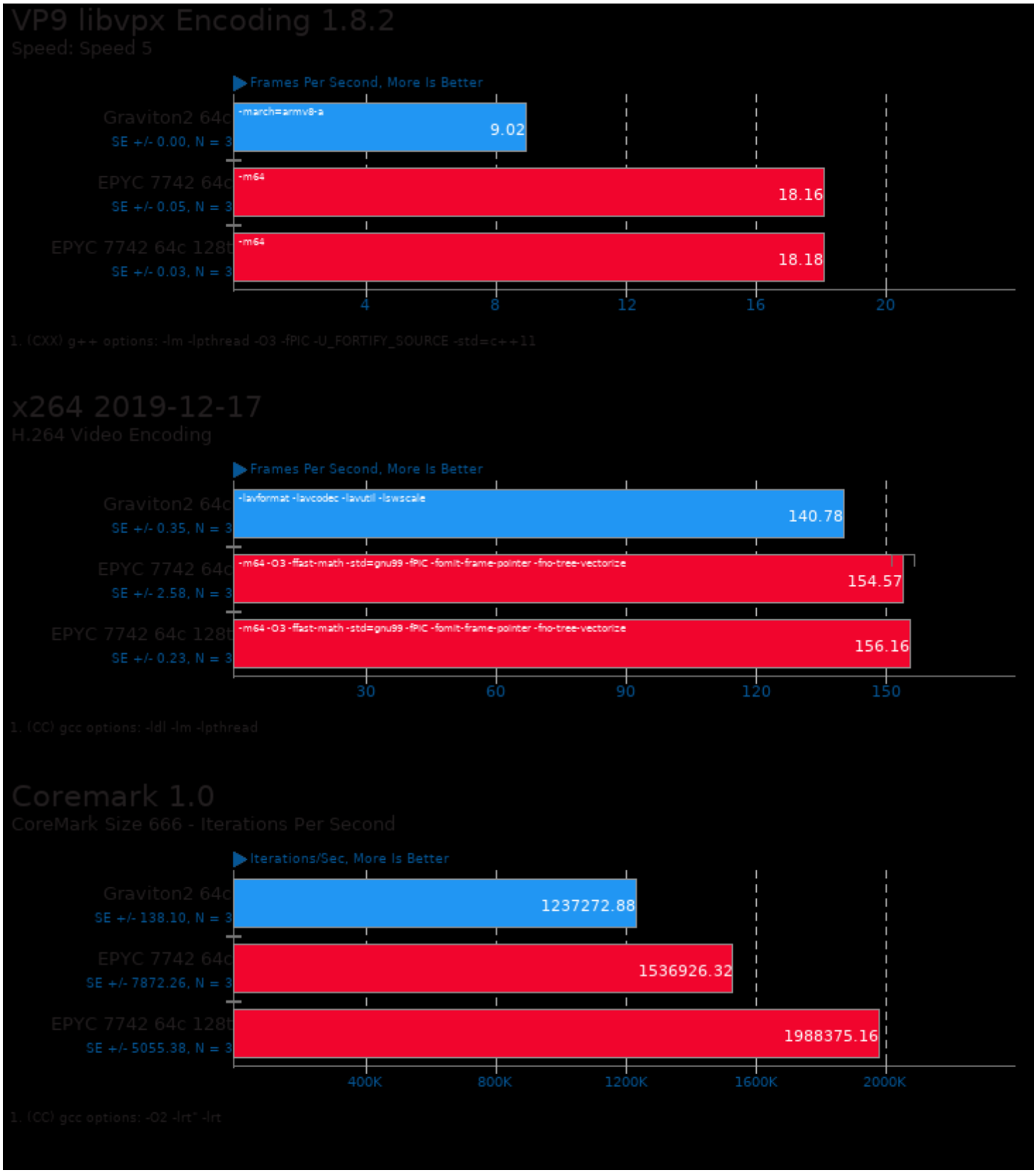
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread


GraphicsMagick 1.3.33
Operation: Sharpen
Iterations Per Minute, More Is Better
Graviton2 64c
-lfreetype
717
SE +/- 0.33, N = 3
EPYC 7742 64c
609
EPYC 7742 64c 128t
602
150
300
450
600
750
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Enhanced
Iterations Per Minute, More Is Better
Graviton2 64c
-lfreetype
701
EPYC 7742 64c
SE +/- 0.58, N = 3
864
EPYC 7742 64c 128t
884
200
400
600
800
1000
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Noise-Gaussian
Iterations Per Minute, More Is Better
Graviton2 64c
-lfreetype
561
SE +/- 0.67, N = 3
EPYC 7742 64c
582
SE +/- 0.88, N = 3
EPYC 7742 64c 128t
634
SE +/- 2.40, N = 3
140
280
420
560
700
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread

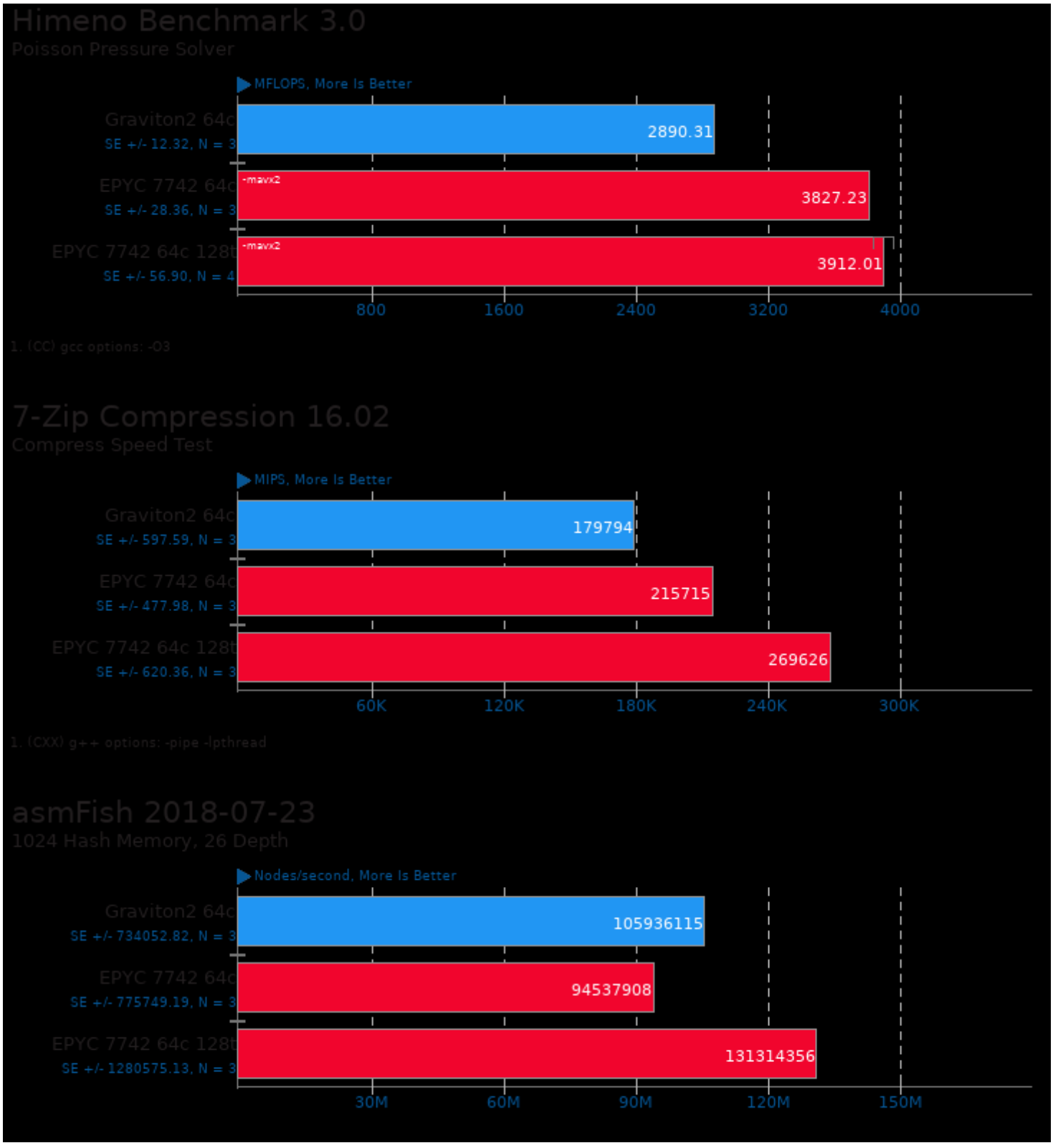

GraphicsMagick 1.3.33
Operation: HWB Color Space
Iterations Per Minute, More Is Better
Graviton2 64c
SE +/- 1.76, N = 3
-lfreetype
1018
EPYC 7742 64c
SE +/- 1.76, N = 3
1241
EPYC 7742 64c 128t
SE +/- 3.51, N = 3
1174
300
600
900
1200
1500
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lxml2 -lz -lm -lpthread
dav1d 0.6.0
Video Input: Chimera 1080p
FPS, More Is Better
Graviton2 64c
SE +/- 0.55, N = 3
MIN: 427.39 / MAX: 777.07
588.39
EPYC 7742 64c
SE +/- 1.39, N = 3
MIN: 319.39 / MAX: 559.29
456.90
EPYC 7742 64c 128t
SE +/- 0.89, N = 3
MIN: 345.23 / MAX: 743.97
599.05
130
260
390
520
650
1. (CC) gcc options: -pthread
dav1d 0.6.0
Video Input: Summer Nature 4K
FPS, More Is Better
Graviton2 64c
SE +/- 0.72, N = 3
MIN: 138.3 / MAX: 258.62
239.59
EPYC 7742 64c
SE +/- 0.32, N = 3
MIN: 149.06 / MAX: 289.04
271.32
EPYC 7742 64c 128t
SE +/- 1.58, N = 3
MIN: 118.03 / MAX: 366.24
331.42
70
140
210
280
350
1. (CC) gcc options: -pthread

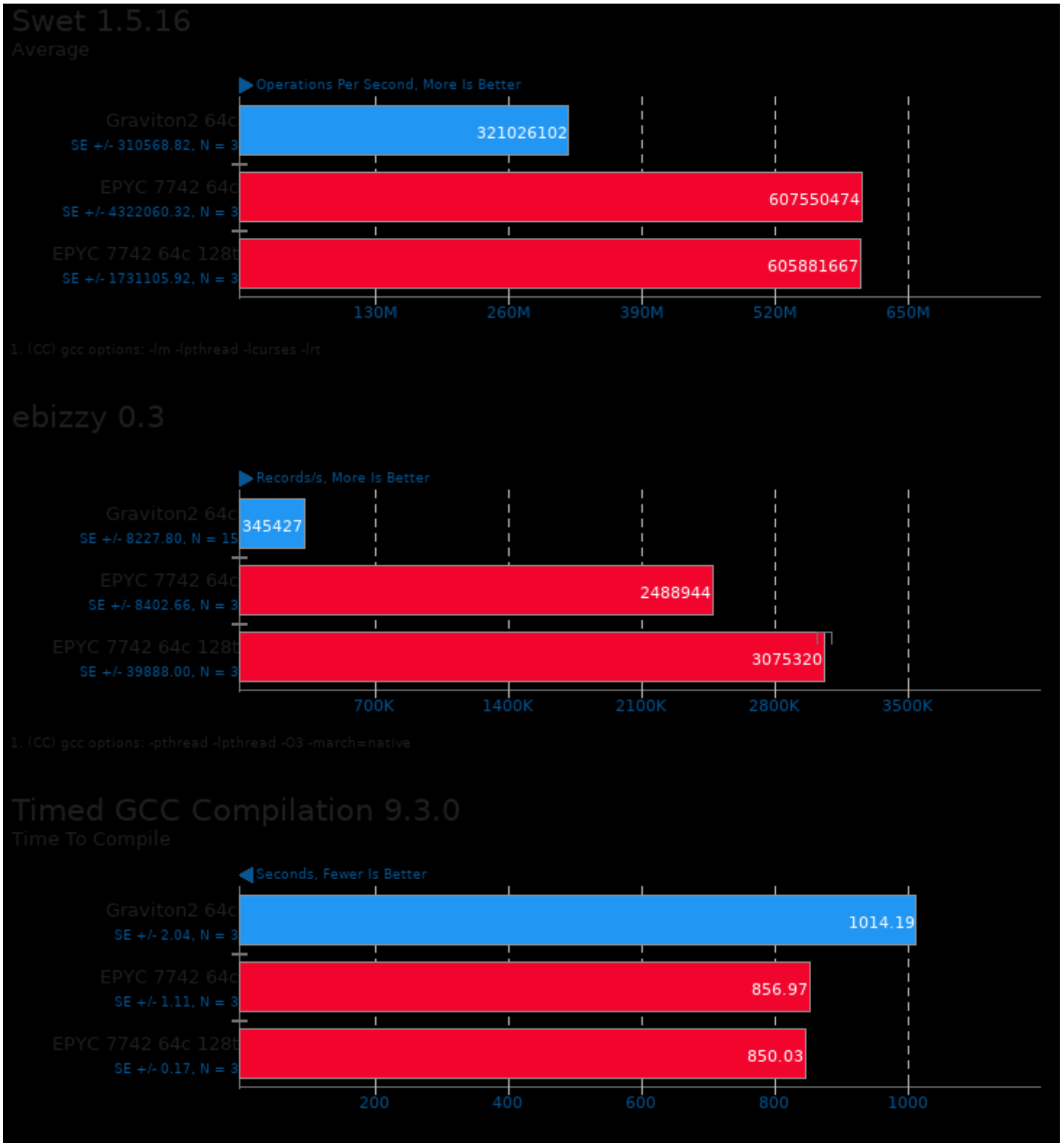
Amazon Graviton2 vs. AMD EPYC 7742

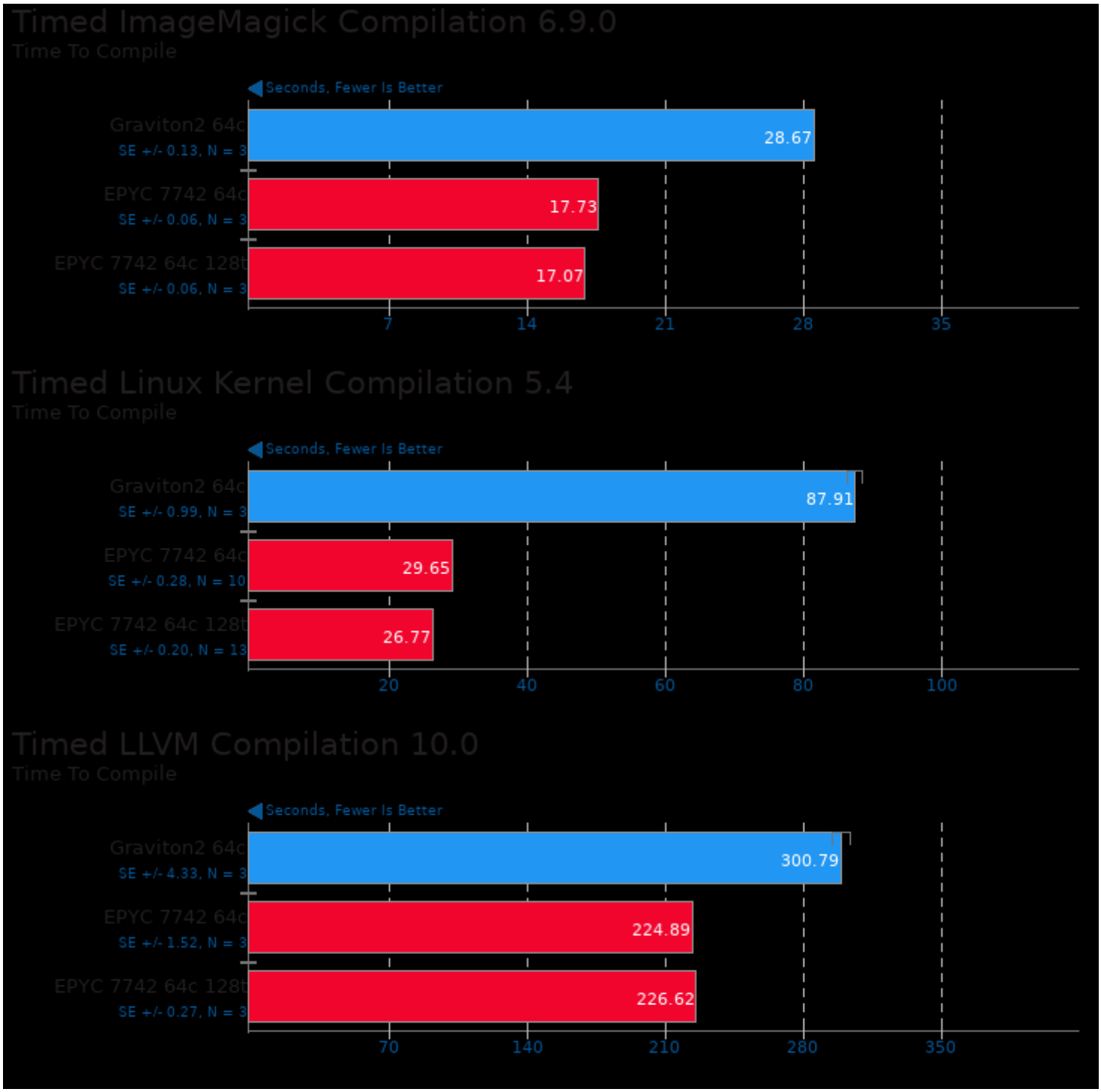


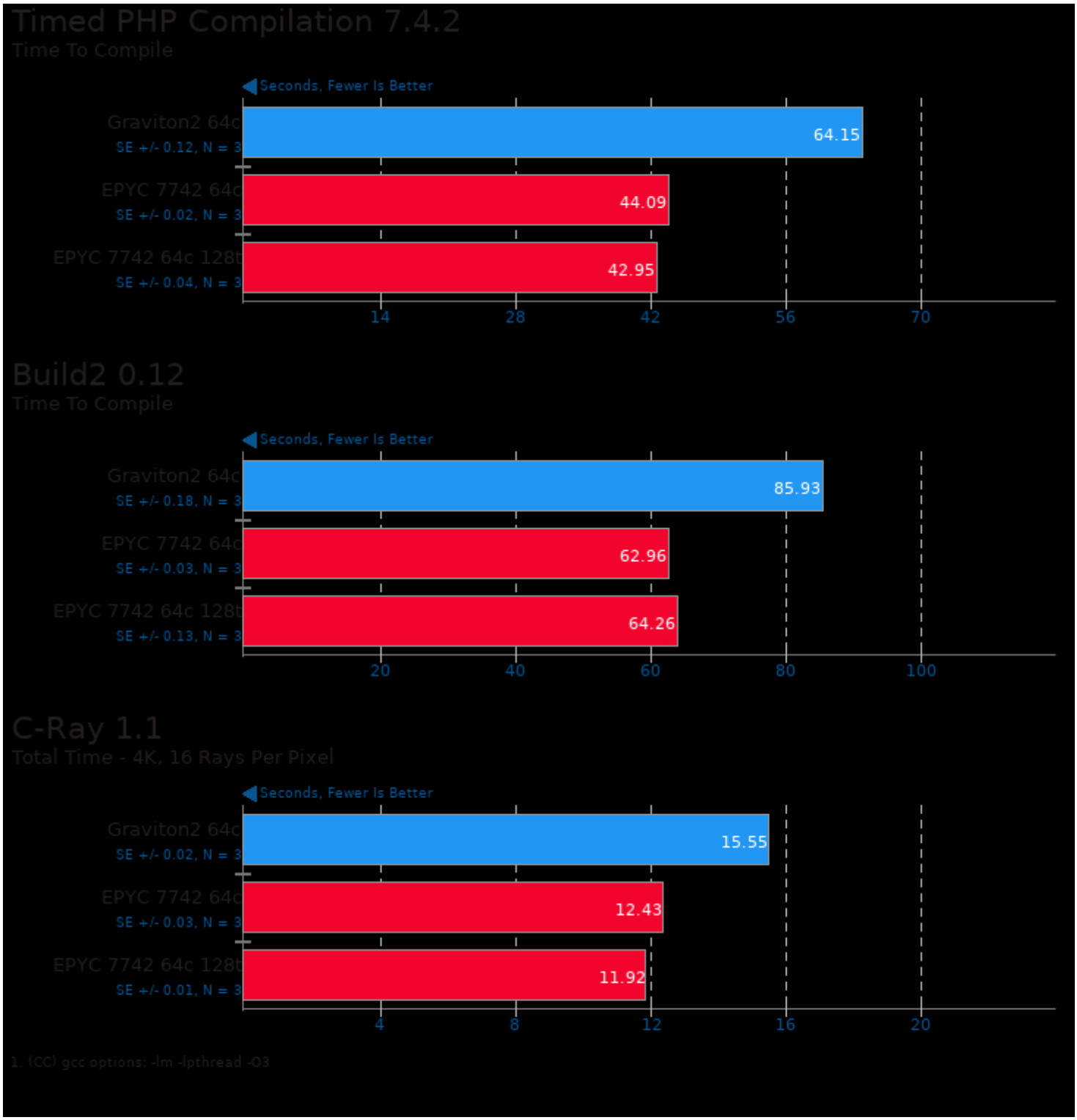

VP9 libvpx Encoding 1.8.2
Speed: Speed 5
Frames Per Second, More Is Better
Graviton2 64c
SE +/- 0.00, N = 3
-march=armv8-a
9.02
EPYC 7742 64c
SE +/- 0.05, N = 3
-m64
18.16
EPYC 7742 64c 128t
SE +/- 0.03, N = 3
-m64
18.18
4
8
12
16
20
1. (CXX) g++ options: -lm -lpthread -O3 -fPIC -U_FORTIFY_SOURCE -std=c++11
x264 2019-12-17
H.264 Video Encoding
Frames Per Second, More Is Better
Graviton2 64c
SE +/- 0.35, N = 3
-lavformat -lavcodec -lavutil -lswscale
140.78
EPYC 7742 64c
SE +/- 2.58, N = 3
-m64 -O3 -ffast-math -std=gnu99 -fPIC -fomit-frame-pointer -fno-tree-vectorize
154.57
EPYC 7742 64c 128t
SE +/- 0.23, N = 3
-m64 -O3 -ffast-math -std=gnu99 -fPIC -fomit-frame-pointer -fno-tree-vectorize
156.16
30
60
90
120
150
1. (CC) gcc options: -ldl -lm -lpthread
Coremark 1.0
CoreMark Size 666 - Iterations Per Second
Iterations/Sec, More Is Better
Graviton2 64c
SE +/- 138.10, N = 3
1237272.88
EPYC 7742 64c
SE +/- 7872.26, N = 3
1536926.32
EPYC 7742 64c 128t
SE +/- 5055.38, N = 3
1988375.16
400K
800K
1200K
1600K
2000K
1. (CC) gcc options: -O2 -lrt" -lrt

Amazon Graviton2 vs. AMD EPYC 7742



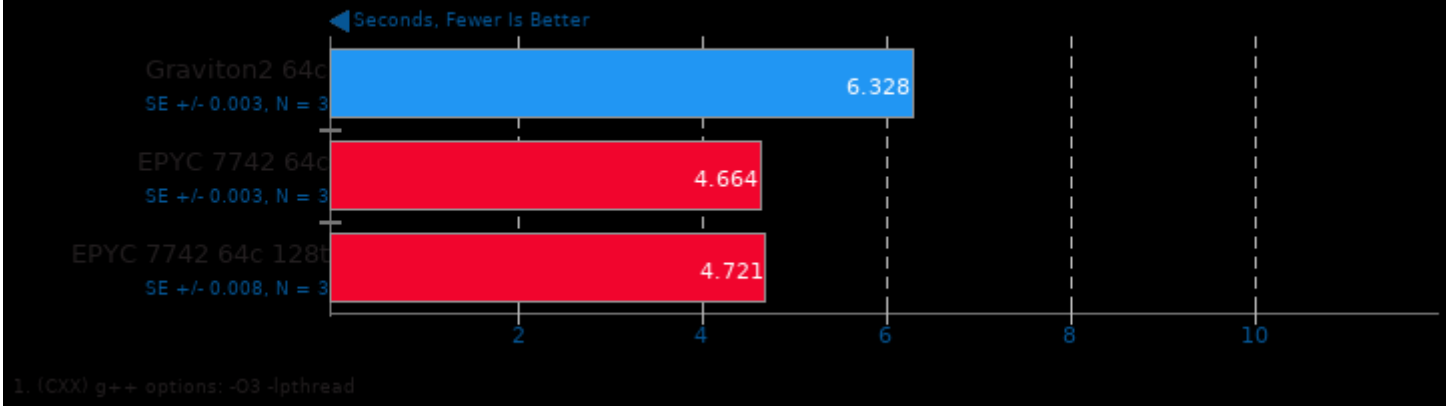

Swet 1.5.16
Average
Operations Per Second, More Is Better
Graviton2 64c
SE +/- 310568.82, N = 3
321026102
EPYC 7742 64c
SE +/- 4322060.32, N = 3
607550474
EPYC 7742 64c 128t
SE +/- 1731105.92, N = 3
605881667
130M
260M
390M
520M
650M
1. (CC) gcc options: -lm -lpthread -lcurses -lrt
ebizzy 0.3
Records/s, More Is Better
Graviton2 64c
SE +/- 8227.80, N = 15
345427
EPYC 7742 64c
SE +/- 8402.66, N = 3
2488944
EPYC 7742 64c 128t
SE +/- 39888.00, N = 3
3075320
700K
1400K
2100K
2800K
3500K
1. (CC) gcc options: -pthread -lpthread -O3 -march=native
Timed GCC Compilation 9.3.0
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 2.04, N = 3
1014.19
EPYC 7742 64c
SE +/- 1.11, N = 3
856.97
EPYC 7742 64c 128t
SE +/- 0.17, N = 3
850.03
200
400
600
800
1000


Timed ImageMagick Compilation 6.9.0
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.13, N = 3
28.67
EPYC 7742 64c
SE +/- 0.06, N = 3
17.73
EPYC 7742 64c 128t
SE +/- 0.06, N = 3
17.07
7
14
21
28
35
Timed Linux Kernel Compilation 5.4
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.99, N = 3
87.91
EPYC 7742 64c
SE +/- 0.28, N = 10
29.65
EPYC 7742 64c 128t
SE +/- 0.20, N = 13
26.77
20
40
60
80
100
Timed LLVM Compilation 10.0
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 4.33, N = 3
300.79
EPYC 7742 64c
SE +/- 1.52, N = 3
224.89
EPYC 7742 64c 128t
SE +/- 0.27, N = 3
226.62
70
140
210
280
350


Timed PHP Compilation 7.4.2
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.12, N = 3
64.15
EPYC 7742 64c
SE +/- 0.02, N = 3
44.09
EPYC 7742 64c 128t
SE +/- 0.04, N = 3
42.95
14
28
42
56
70
Build2 0.12
Time To Compile
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.18, N = 3
85.93
EPYC 7742 64c
SE +/- 0.03, N = 3
62.96
EPYC 7742 64c 128t
SE +/- 0.13, N = 3
64.26
20
40
60
80
100
C-Ray 1.1
Total Time - 4K, 16 Rays Per Pixel
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.02, N = 3
15.55
EPYC 7742 64c
SE +/- 0.03, N = 3
12.43
EPYC 7742 64c 128t
SE +/- 0.01, N = 3
11.92
4
8
12
16
20
1. (CC) gcc options: -lm -lpthread -O3

Primesieve 7.4

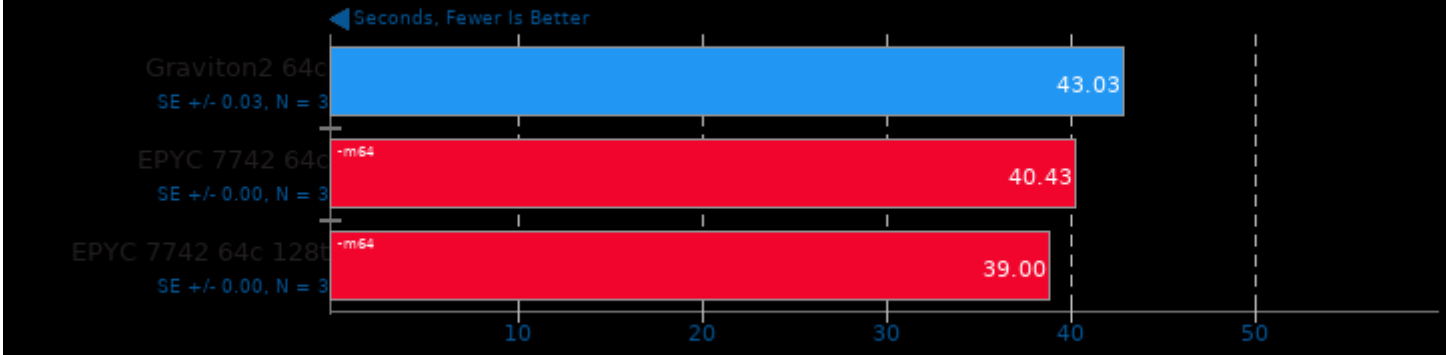
1e12 Prime Number Generation



1. (CXX) g++ options: -O3 -lpthread

Rust Mandelbrot

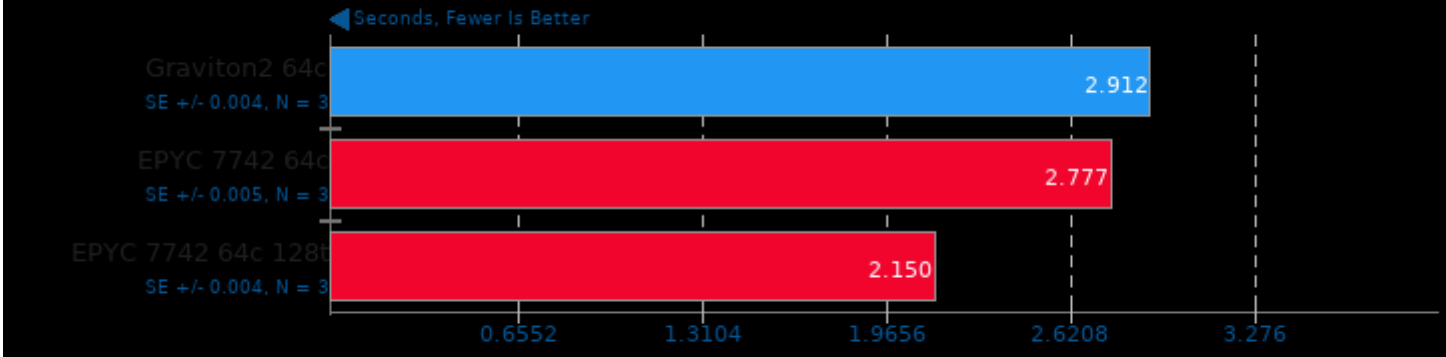
Time To Complete Serial/Parallel Mandelbrot



1. (CC) gcc options: -pie -nodefaultlibs -lutil -ldl -lrt -lpthread -lgcc_s -lc -lm

Smallpt 1.0

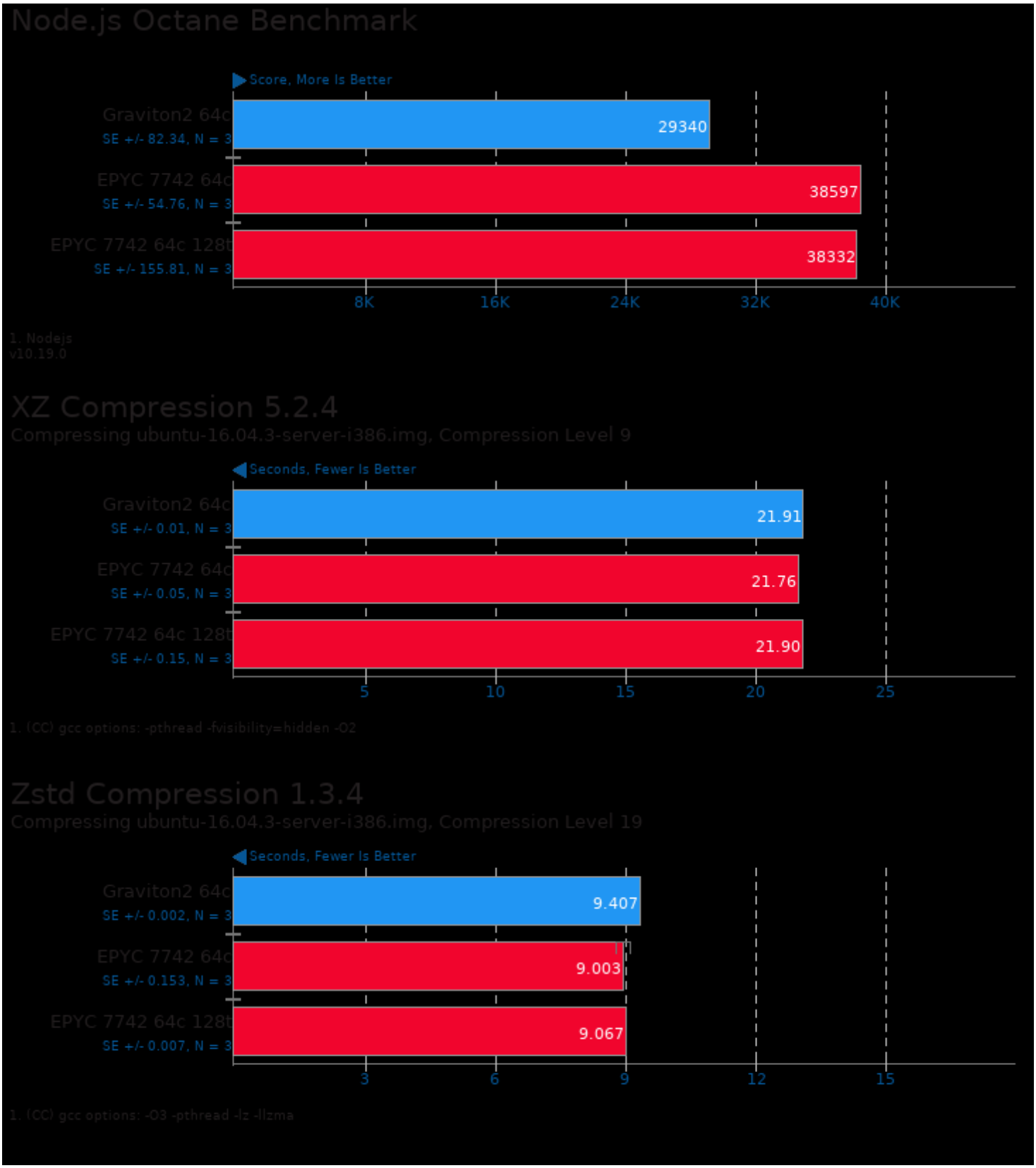
Global Illumination Renderer; 128 Samples



1. (CXX) g++ options: -fopenmp -O3

Amazon Graviton2 vs. AMD EPYC 7742

Node.js Octane Benchmark

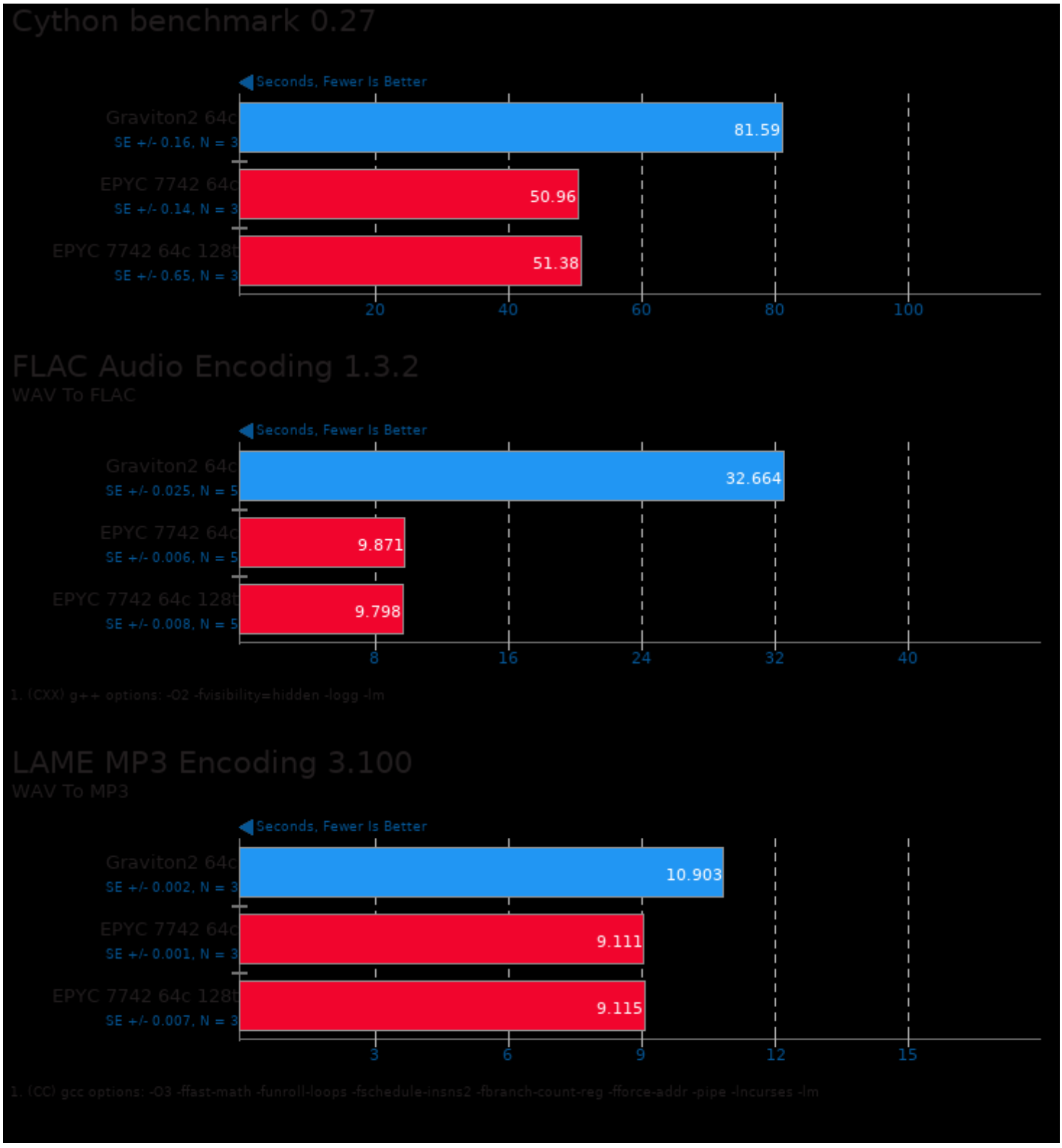


XZ Compression 5.2.4

Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9

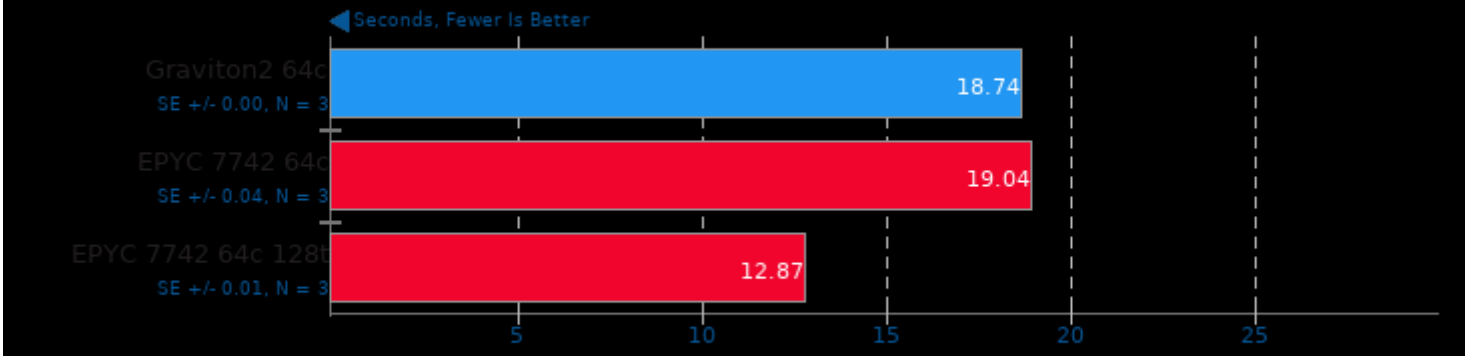
Zstd Compression 1.3.4

Compressing ubuntu-16.04.3-server-i386.img, Compression Level 19


Cython benchmark 0.27
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.16, N = 3
81.59
EPYC 7742 64c
SE +/- 0.14, N = 3
50.96
EPYC 7742 64c 128t
SE +/- 0.65, N = 3
51.38
20
40
60
80
100
FLAC Audio Encoding 1.3.2
WAV To FLAC
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.025, N = 5
32.664
EPYC 7742 64c
SE +/- 0.006, N = 5
9.871
EPYC 7742 64c 128t
SE +/- 0.008, N = 5
9.798
8
16
24
32
40
1. (CXX) g++ options: -O2 -fvisibility=hidden -logg -lm
LAME MP3 Encoding 3.100
WAV To MP3
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.002, N = 3
10.903
EPYC 7742 64c
SE +/- 0.001, N = 3
9.111
EPYC 7742 64c 128t
SE +/- 0.007, N = 3
9.115
3
6
9
12
15
1. (CC) gcc options: -O3 -ffast-math -funroll-loops -fschedule-insns2 -fbranch-count-reg -fforce-addr -pipe -lncurses -lm

m-queens 1.2

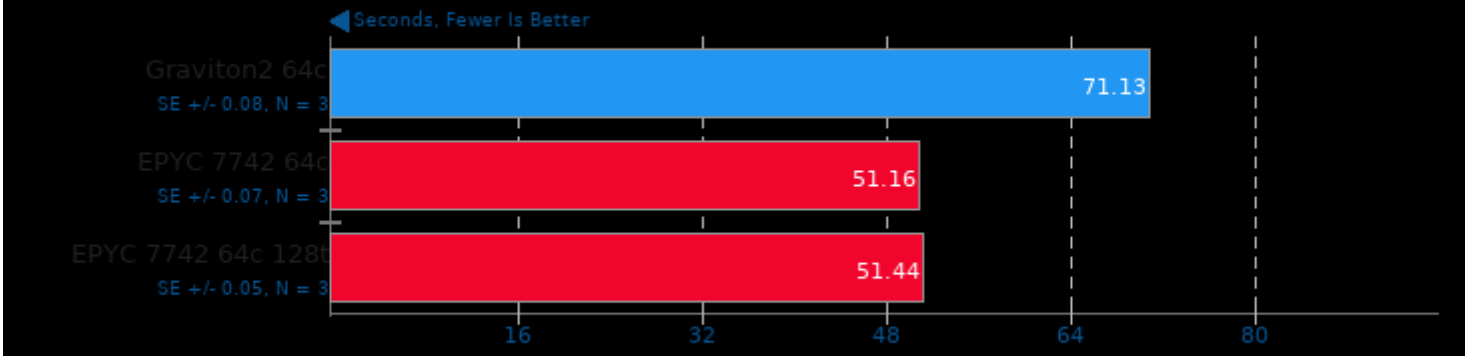
Time To Solve



1. (CXX) g++ options: -fopenmp -O2 -march=native

Minion 1.8

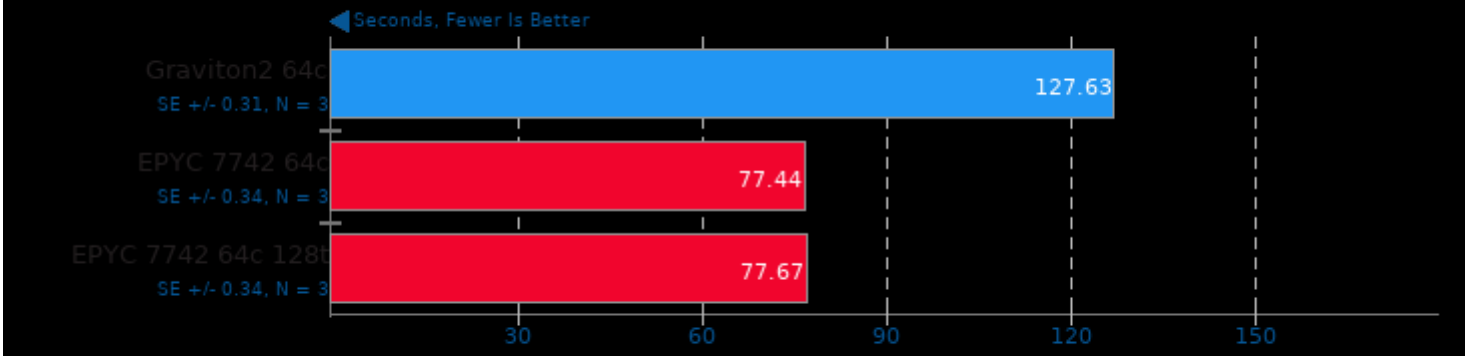
Benchmark: Graceful



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

Minion 1.8

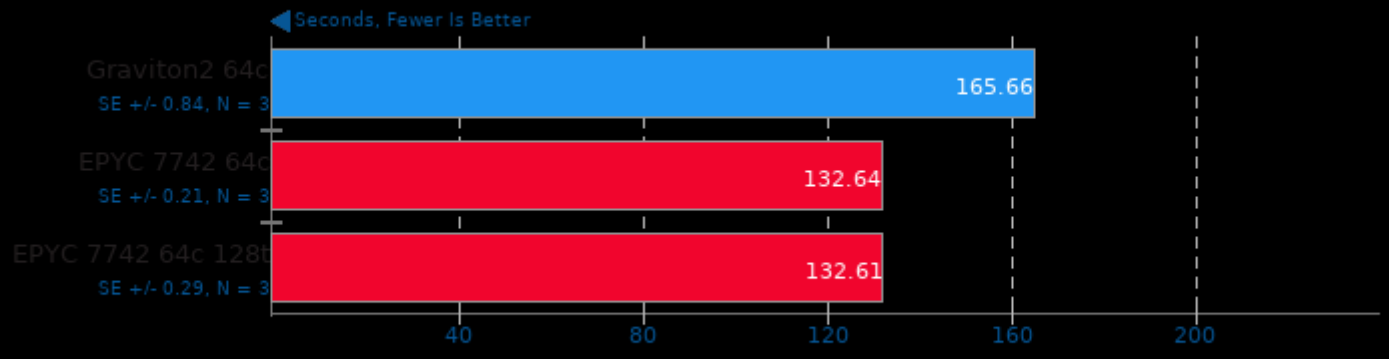
Benchmark: Solitaire



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

Minion 1.8

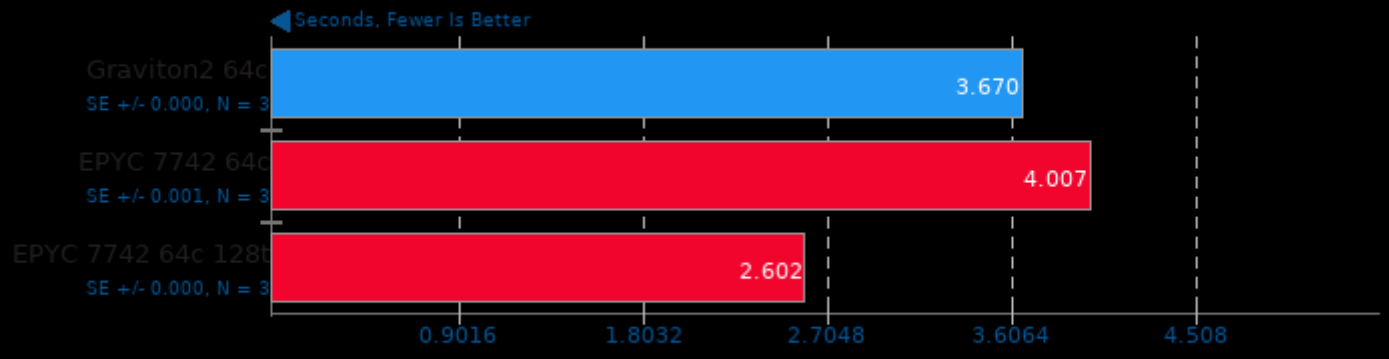
Benchmark: Quasigroup



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

N-Queens 1.0

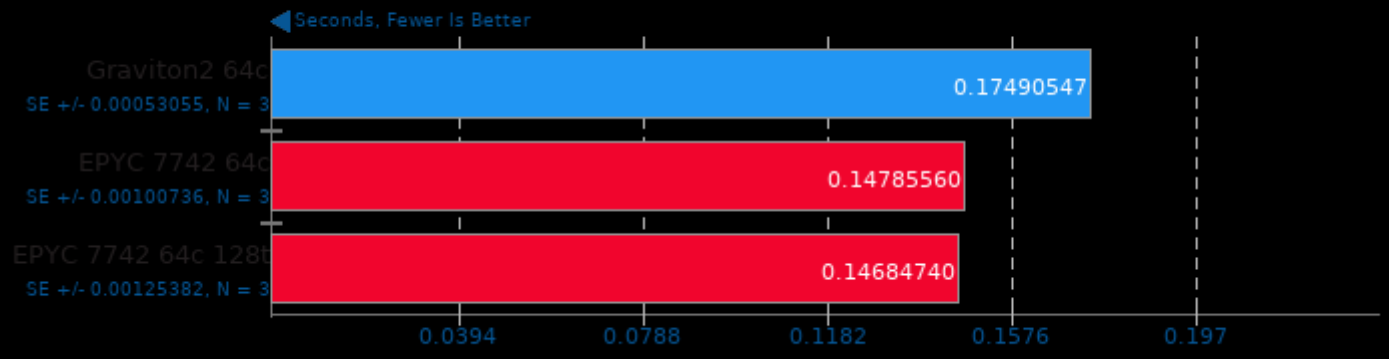
Elapsed Time

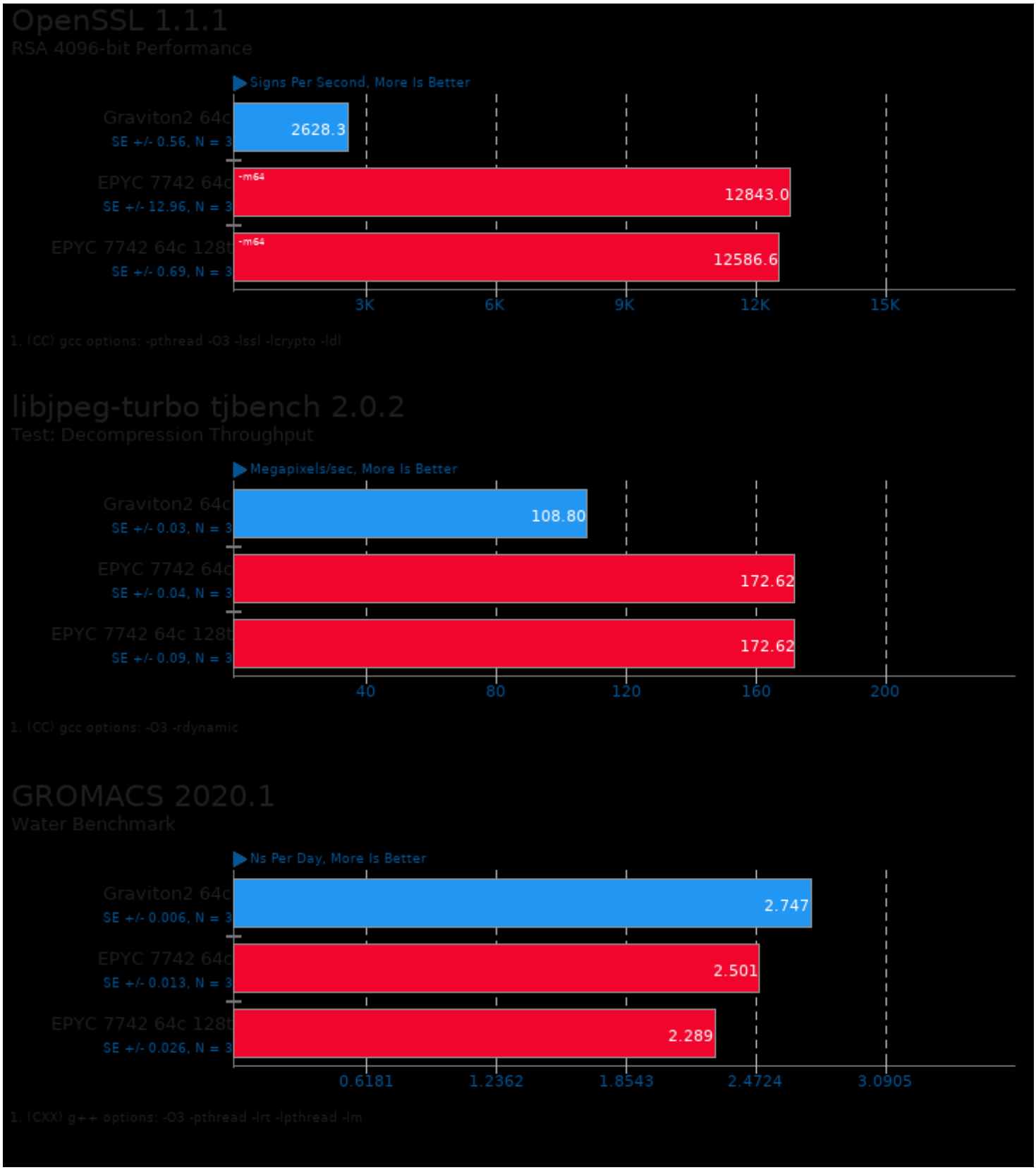


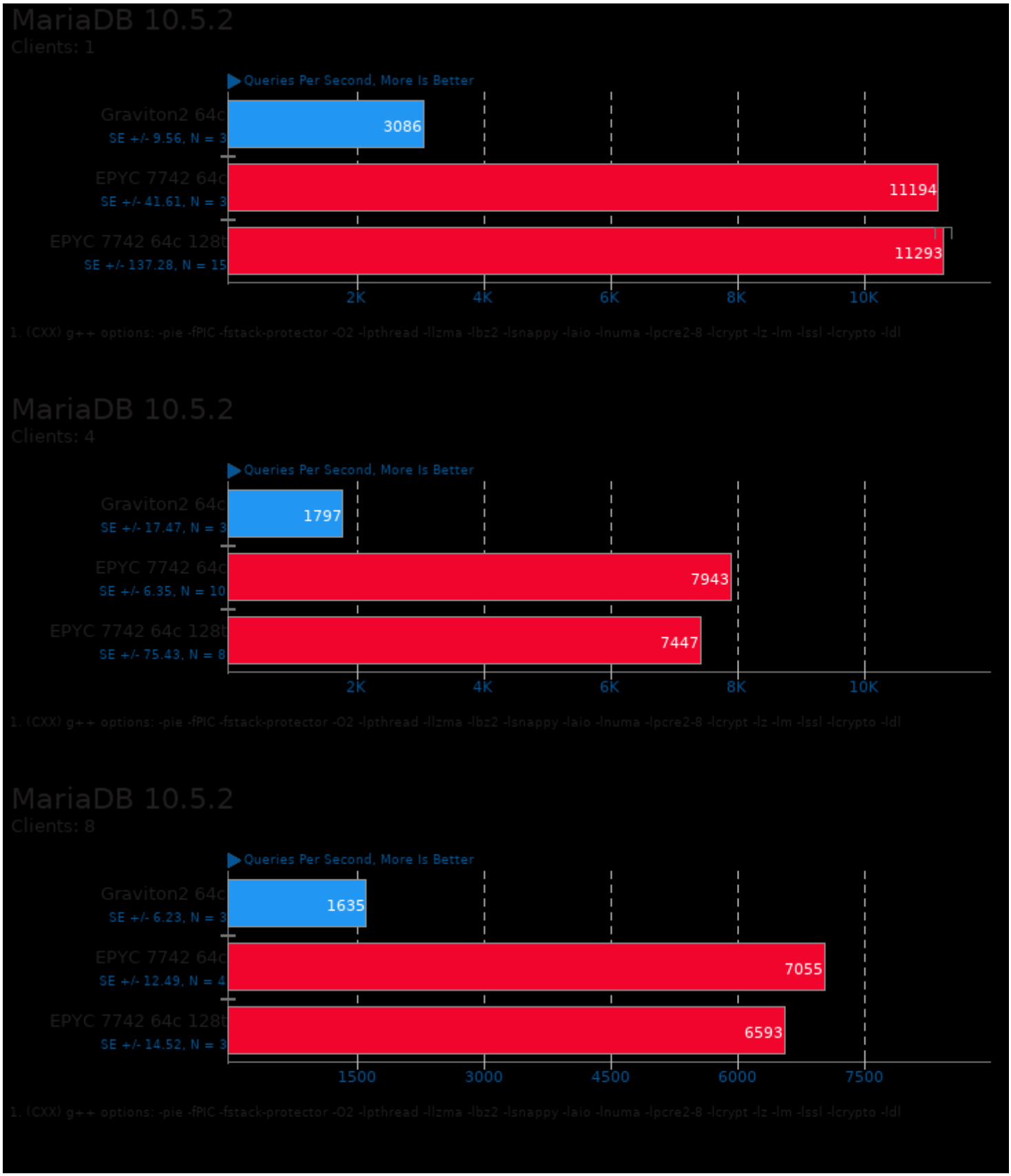
1. (CC) gcc options: -static -fopenmp -O3 -march=native

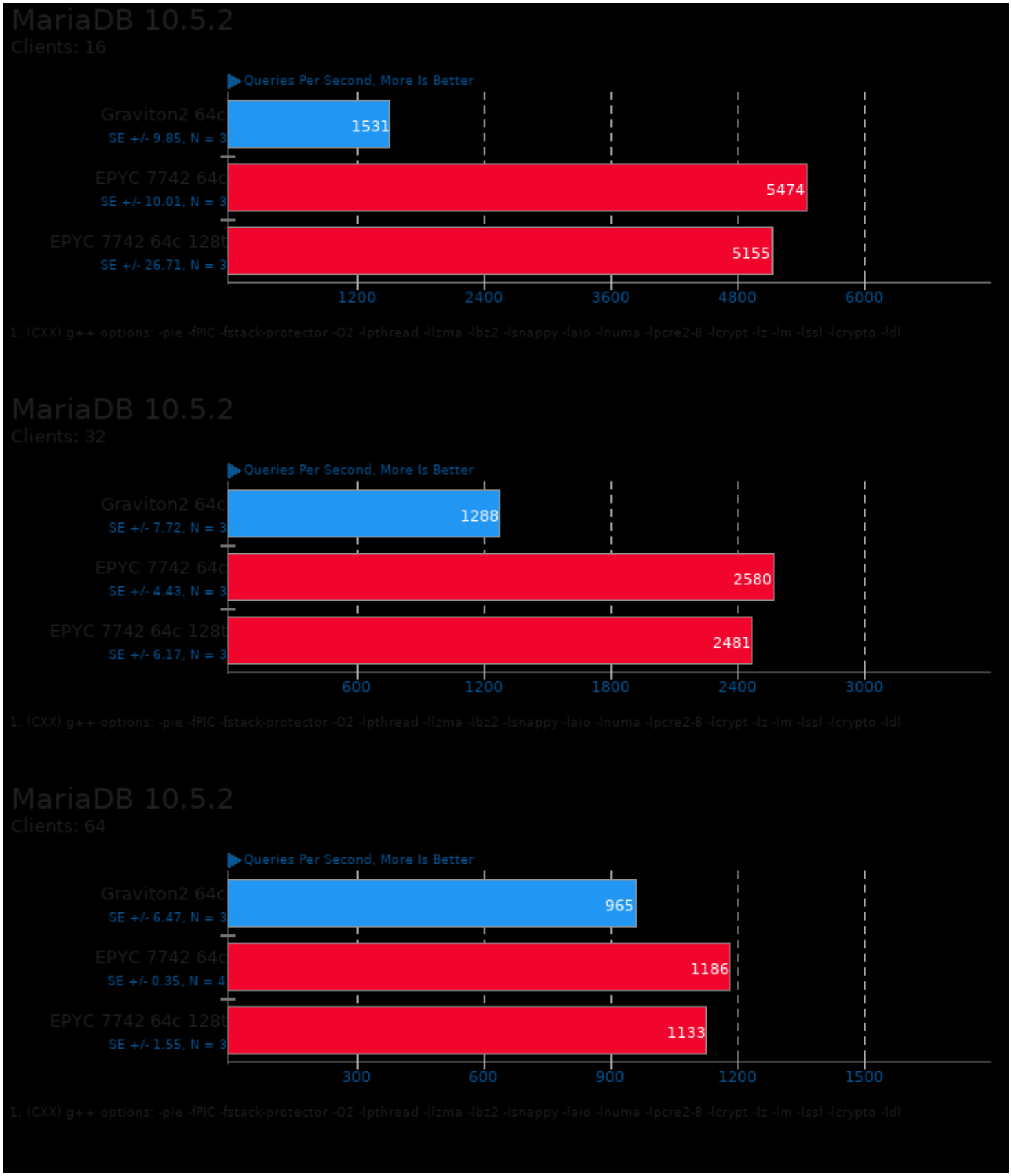
Perl Benchmarks

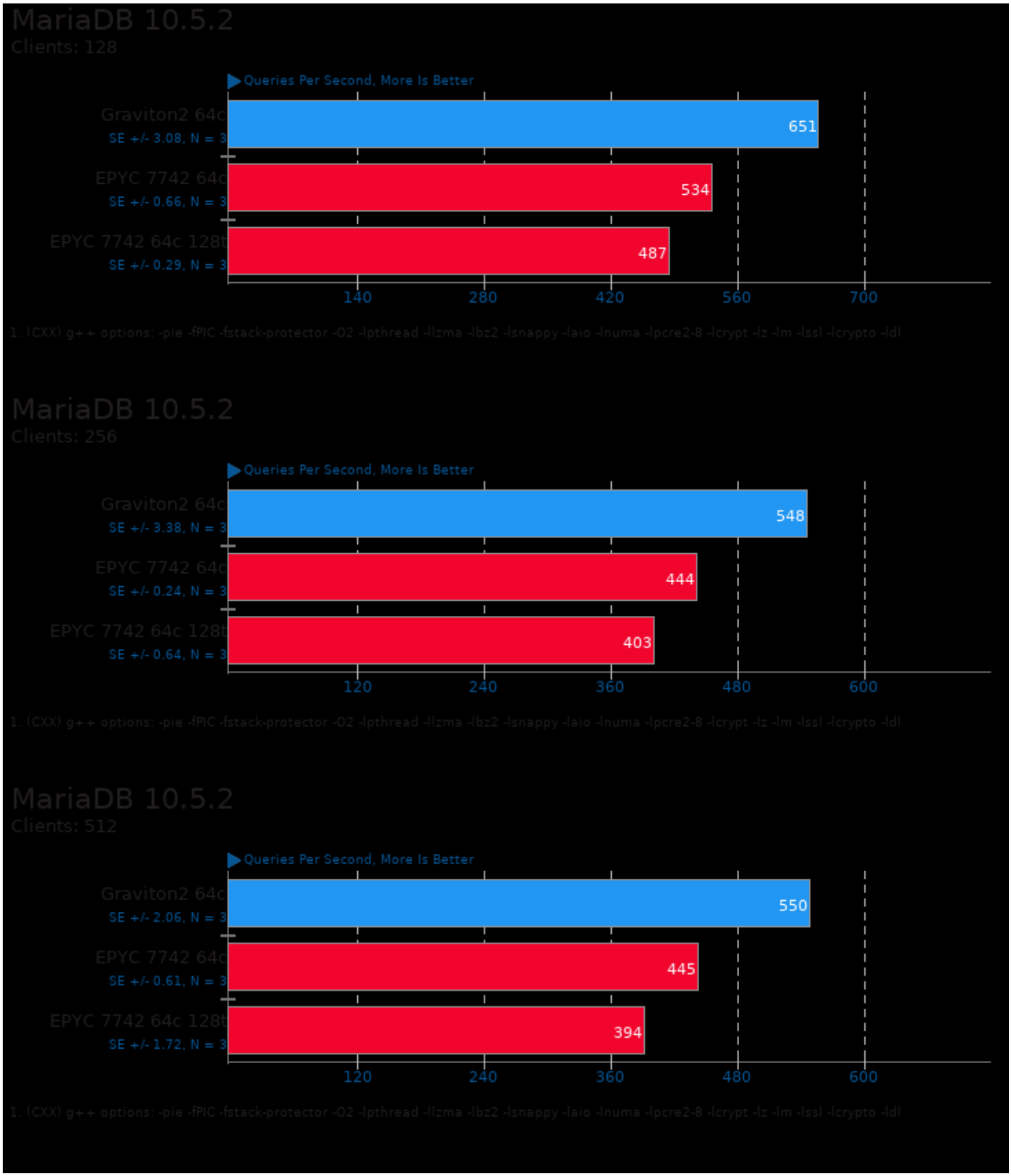
Test: Pod2html




OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
Graviton2 64c
SE +/- 0.56, N = 3
2628.3
EPYC 7742 64c
SE +/- 12.96, N = 3
-m64
12843.0
EPYC 7742 64c 128t
SE +/- 0.69, N = 3
-m64
12586.6
3K
6K
9K
12K
15K
1. (CC) gcc options: -pthread -O3 -lssl -lcrypto -ldl
libjpeg-turbo tjbench 2.0.2
Test: Decompression Throughput
Megapixels/sec, More Is Better
Graviton2 64c
SE +/- 0.03, N = 3
108.80
EPYC 7742 64c
SE +/- 0.04, N = 3
172.62
EPYC 7742 64c 128t
SE +/- 0.09, N = 3
172.62
40
80
120
160
200
1. (CC) gcc options: -O3 -rdynamic
GROMACS 2020.1
Water Benchmark
Ns Per Day, More Is Better
Graviton2 64c
SE +/- 0.006, N = 3
2.747
EPYC 7742 64c
SE +/- 0.013, N = 3
2.501
EPYC 7742 64c 128t
SE +/- 0.026, N = 3
2.289
0.6181
1.2362
1.8543
2.4724
3.0905
1. (CXX) g++ options: -O3 -pthread -lrt -lpthread -lm

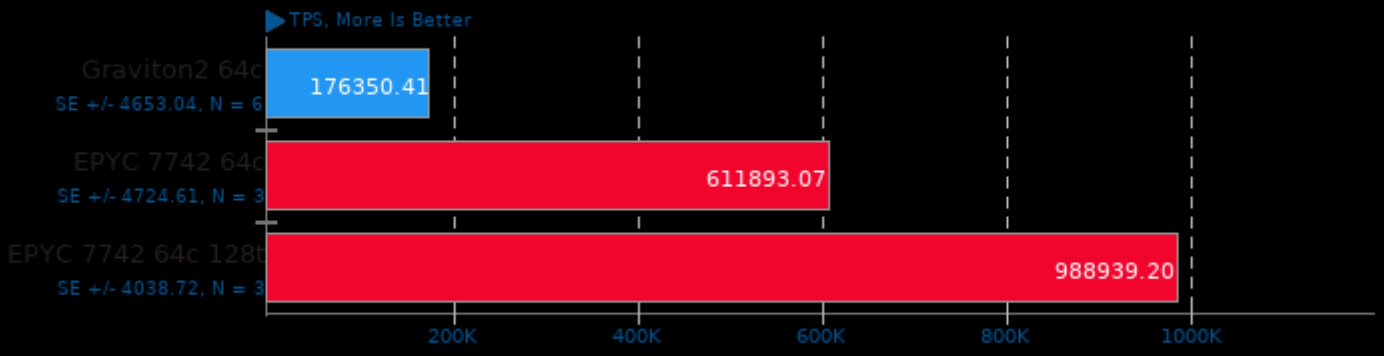

MariaDB 10.5.2
Clients: 1
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 9.56, N = 3
3086
EPYC 7742 64c
SE +/- 41.61, N = 3
11194
EPYC 7742 64c 128t
SE +/- 137.28, N = 15
11293
2K
4K
6K
8K
10K
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 4
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 17.47, N = 3
1797
EPYC 7742 64c
SE +/- 6.35, N = 10
7943
EPYC 7742 64c 128t
SE +/- 75.43, N = 8
7447
2K
4K
6K
8K
10K
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 8
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 6.23, N = 3
1635
EPYC 7742 64c
SE +/- 12.49, N = 4
7055
EPYC 7742 64c 128t
SE +/- 14.52, N = 3
6593
1500
3000
4500
6000
7500
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl


MariaDB 10.5.2
Clients: 16
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 9.85, N = 3
1531
EPYC 7742 64c
SE +/- 10.01, N = 3
5474
EPYC 7742 64c 128t
SE +/- 26.71, N = 3
5155
1200
2400
3600
4800
6000
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 32
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 7.72, N = 3
1288
EPYC 7742 64c
SE +/- 4.43, N = 3
2580
EPYC 7742 64c 128t
SE +/- 6.17, N = 3
2481
600
1200
1800
2400
3000
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 64
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 6.47, N = 3
965
EPYC 7742 64c
SE +/- 0.35, N = 4
1186
EPYC 7742 64c 128t
SE +/- 1.55, N = 3
1133
300
600
900
1200
1500
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl


MariaDB 10.5.2
Clients: 128
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 3.08, N = 3
651
EPYC 7742 64c
SE +/- 0.66, N = 3
534
EPYC 7742 64c 128t
SE +/- 0.29, N = 3
487
140
280
420
560
700
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 256
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 3.38, N = 3
548
EPYC 7742 64c
SE +/- 0.24, N = 3
444
EPYC 7742 64c 128t
SE +/- 0.64, N = 3
403
120
240
360
480
600
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl
MariaDB 10.5.2
Clients: 512
Queries Per Second, More Is Better
Graviton2 64c
SE +/- 2.06, N = 3
550
EPYC 7742 64c
SE +/- 0.61, N = 3
445
EPYC 7742 64c 128t
SE +/- 1.72, N = 3
394
120
240
360
480
600
1. (CXX) g++ options: -pie -fPIC -fstack-protector -O2 -lpthread -llzma -lbz2 -lsnappy -laio -lnuma -lpcre2-8 -lcrypt -lz -lm -lssl -lcrypto -ldl

PostgreSQL pgbench 12.0

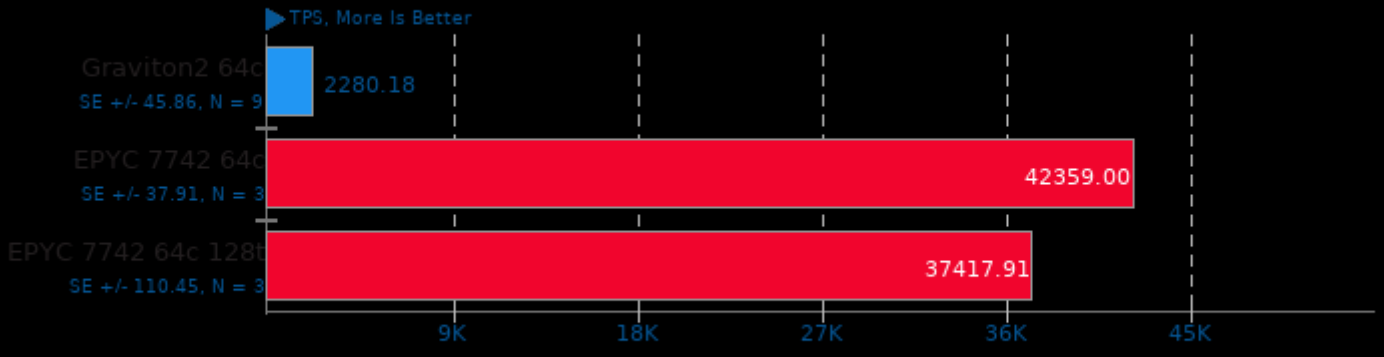
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only



1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -lcrypt -ldl -lm

PostgreSQL pgbench 12.0

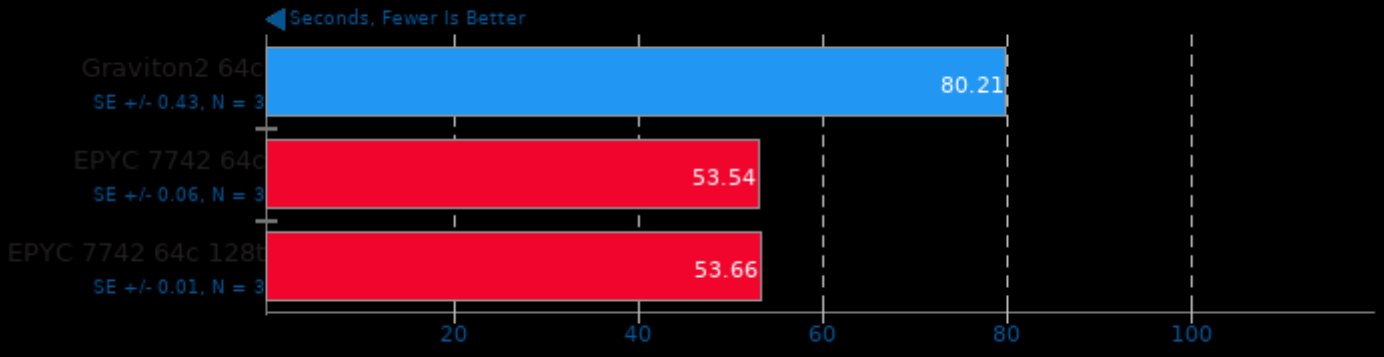
Scaling: Buffer Test - Test: Normal Load - Mode: Read Write



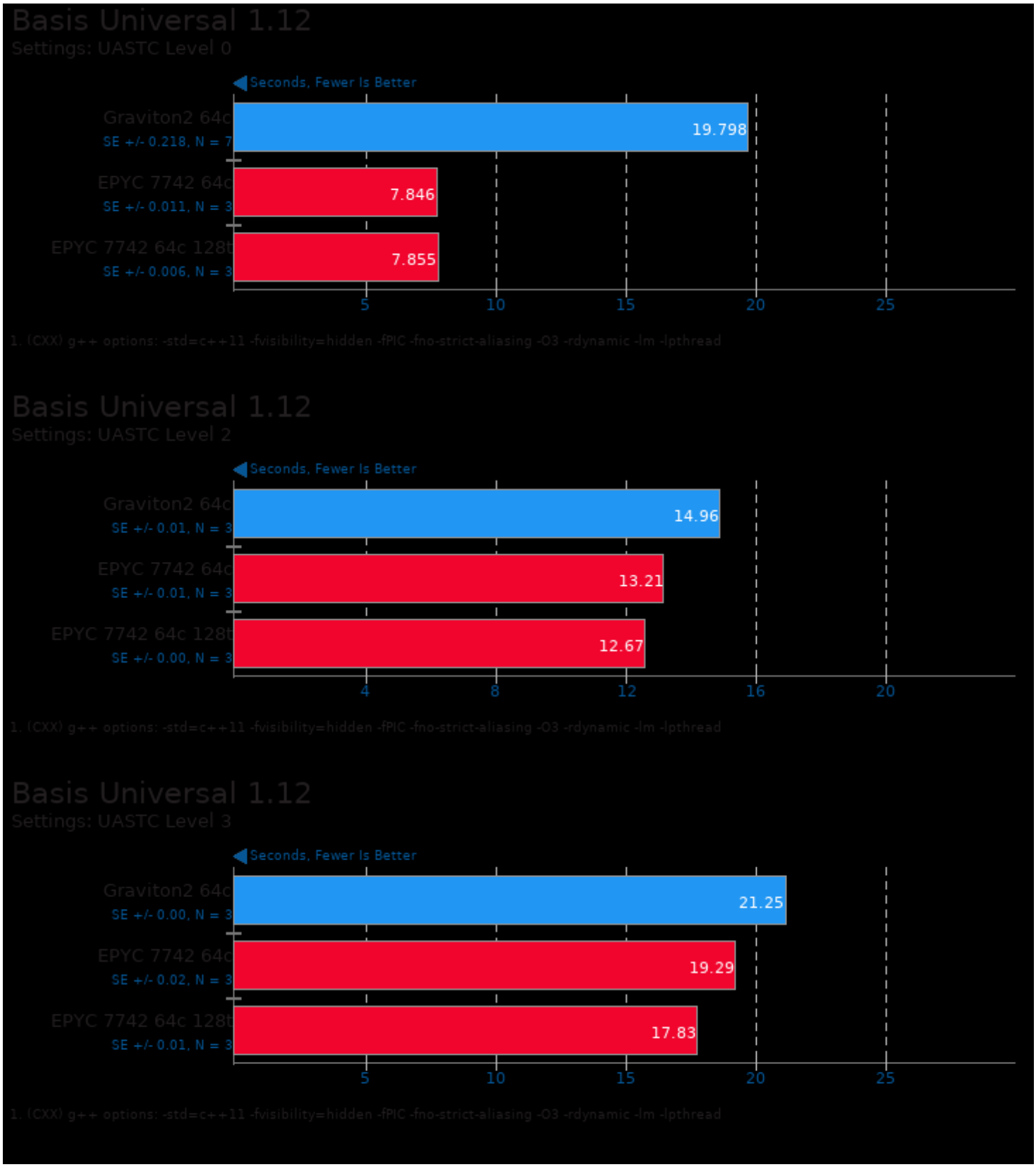
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -lcrypt -ldl -lm

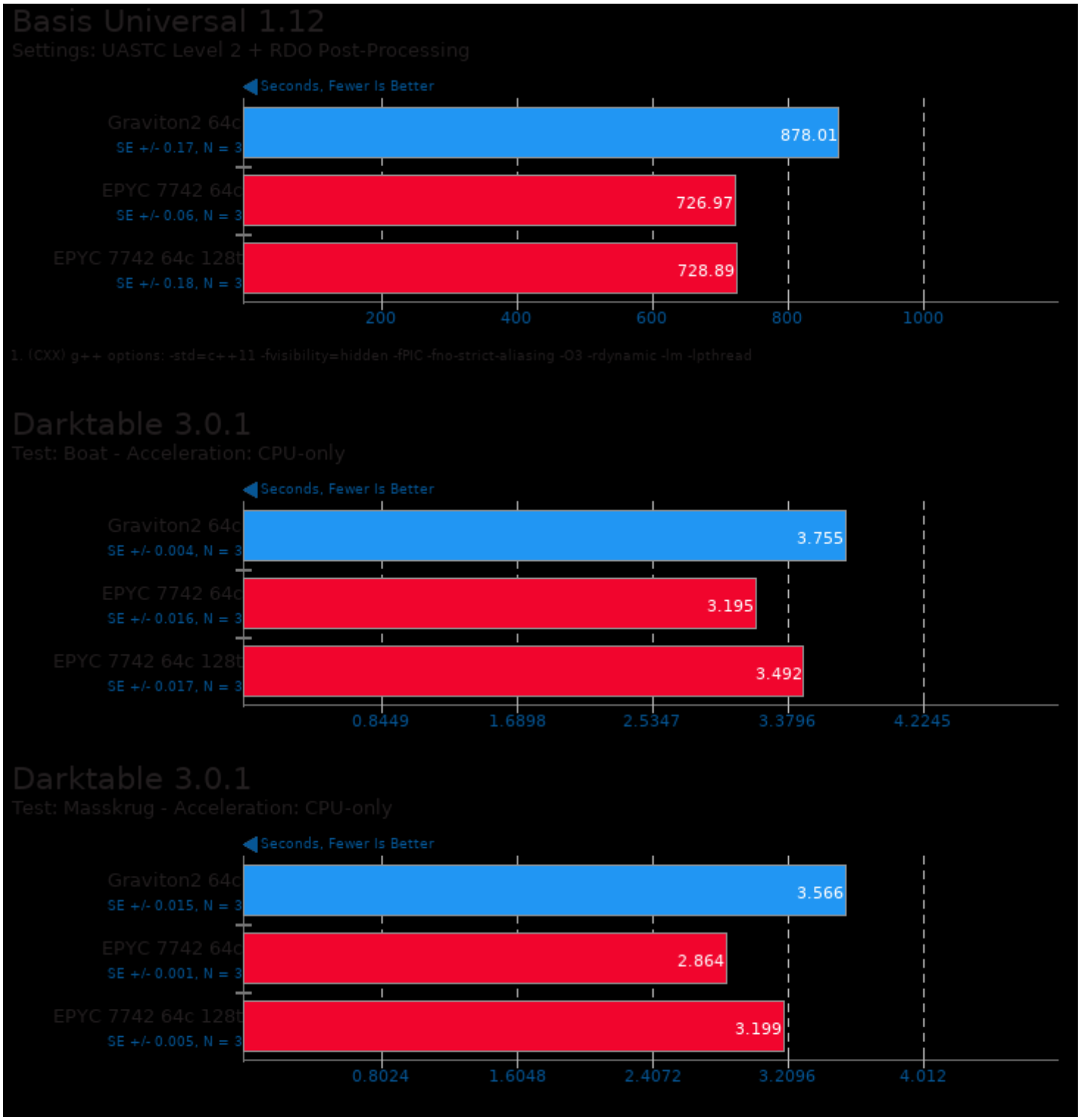
Basis Universal 1.12

Settings: ETC1S

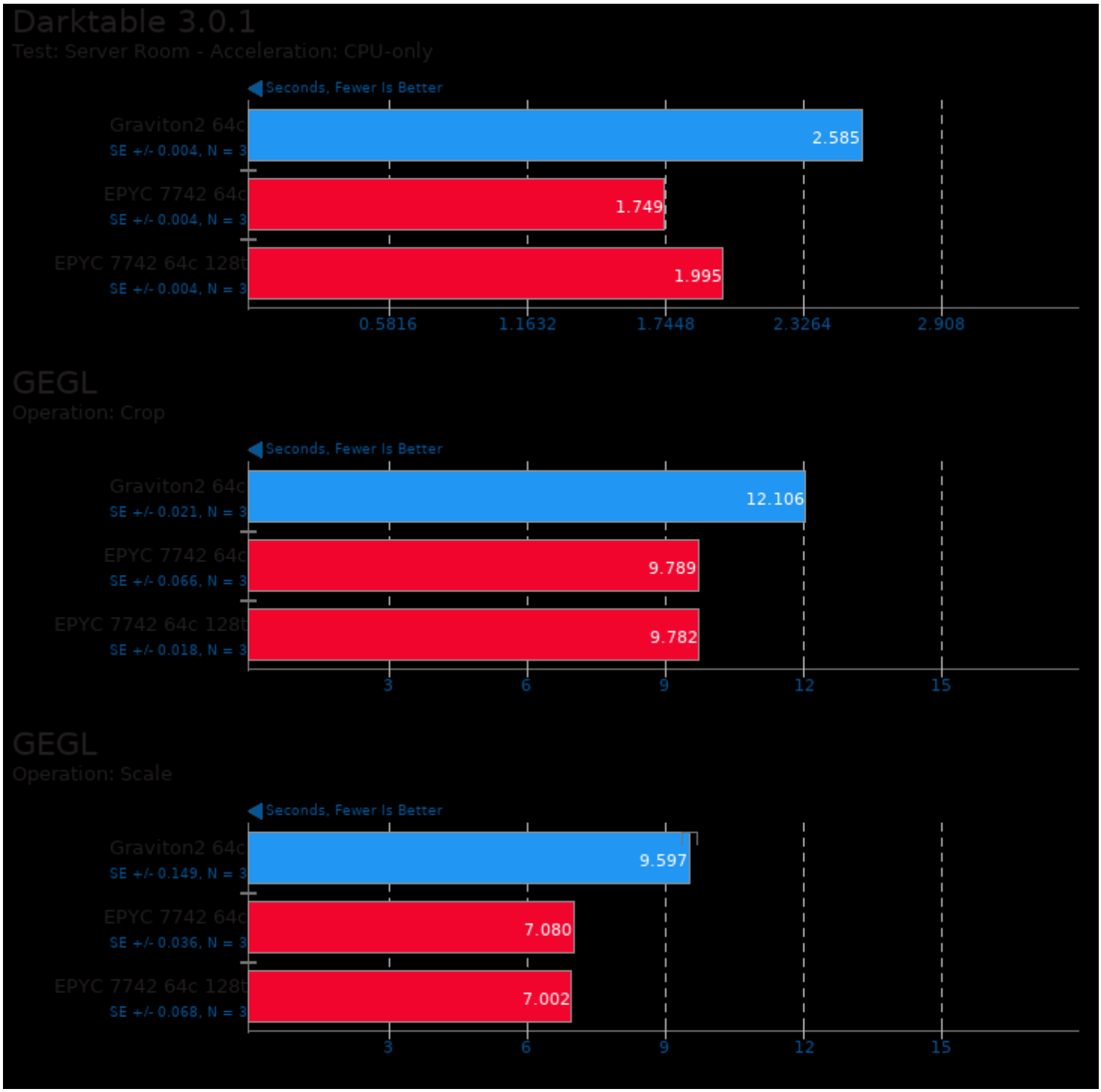


1. (CXX) g++ options: -std=c++11 -fvisibility=hidden -fPIC -fno-strict-aliasing -O3 -rdynamic -lm -lpthread

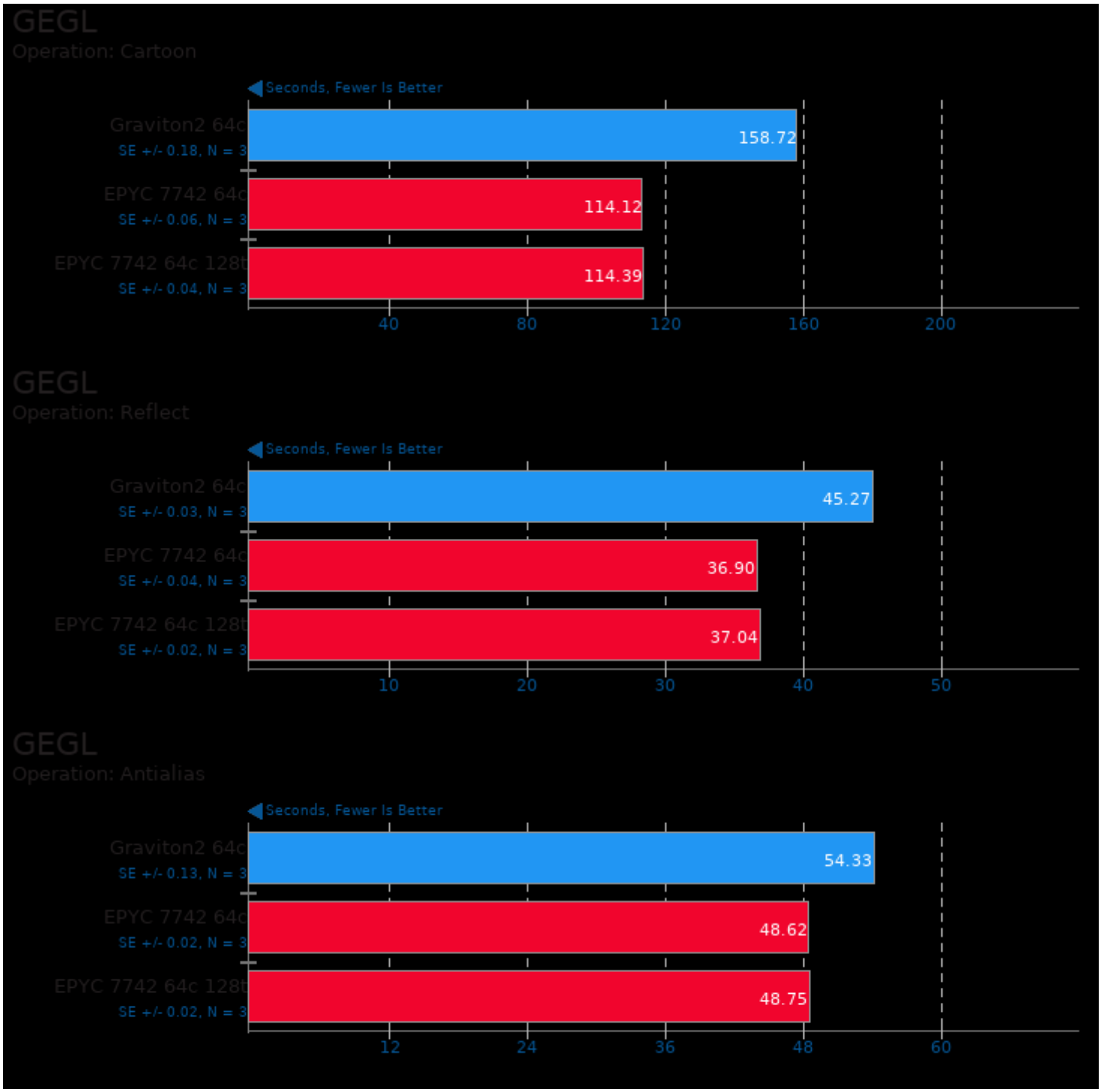

Basis Universal 1.12
Settings: UASTC Level 0
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.218, N = 7
19.798
EPYC 7742 64c
SE +/- 0.011, N = 3
7.846
EPYC 7742 64c 128t
SE +/- 0.006, N = 3
7.855
5
10
15
20
25
1. (CXX) g++ options: -std=c++11 -fvisibility=hidden -fPIC -fno-strict-aliasing -O3 -rdynamic -lm -lpthread
Basis Universal 1.12
Settings: UASTC Level 2
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.01, N = 3
14.96
EPYC 7742 64c
SE +/- 0.01, N = 3
13.21
EPYC 7742 64c 128t
SE +/- 0.00, N = 3
12.67
4
8
12
16
20
1. (CXX) g++ options: -std=c++11 -fvisibility=hidden -fPIC -fno-strict-aliasing -O3 -rdynamic -lm -lpthread
Basis Universal 1.12
Settings: UASTC Level 3
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.00, N = 3
21.25
EPYC 7742 64c
SE +/- 0.02, N = 3
19.29
EPYC 7742 64c 128t
SE +/- 0.01, N = 3
17.83
5
10
15
20
25
1. (CXX) g++ options: -std=c++11 -fvisibility=hidden -fPIC -fno-strict-aliasing -O3 -rdynamic -lm -lpthread


Basis Universal 1.12
Settings: UASTC Level 2 + RDO Post-Processing
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.17, N = 3
878.01
EPYC 7742 64c
SE +/- 0.06, N = 3
726.97
EPYC 7742 64c 128t
SE +/- 0.18, N = 3
728.89
200
400
600
800
1000
1. (CXX) g++ options: -std=c++11 -fvisibility=hidden -fPIC -fno-strict-aliasing -O3 -rdynamic -lm -lpthread
Darktable 3.0.1
Test: Boat - Acceleration: CPU-only
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.004, N = 3
3.755
EPYC 7742 64c
SE +/- 0.016, N = 3
3.195
EPYC 7742 64c 128t
SE +/- 0.017, N = 3
3.492
0.8449
1.6898
2.5347
3.3796
4.2245
Darktable 3.0.1
Test: Masskrug - Acceleration: CPU-only
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.015, N = 3
3.566
EPYC 7742 64c
SE +/- 0.001, N = 3
2.864
EPYC 7742 64c 128t
SE +/- 0.005, N = 3
3.199
0.8024
1.6048
2.4072
3.2096
4.012

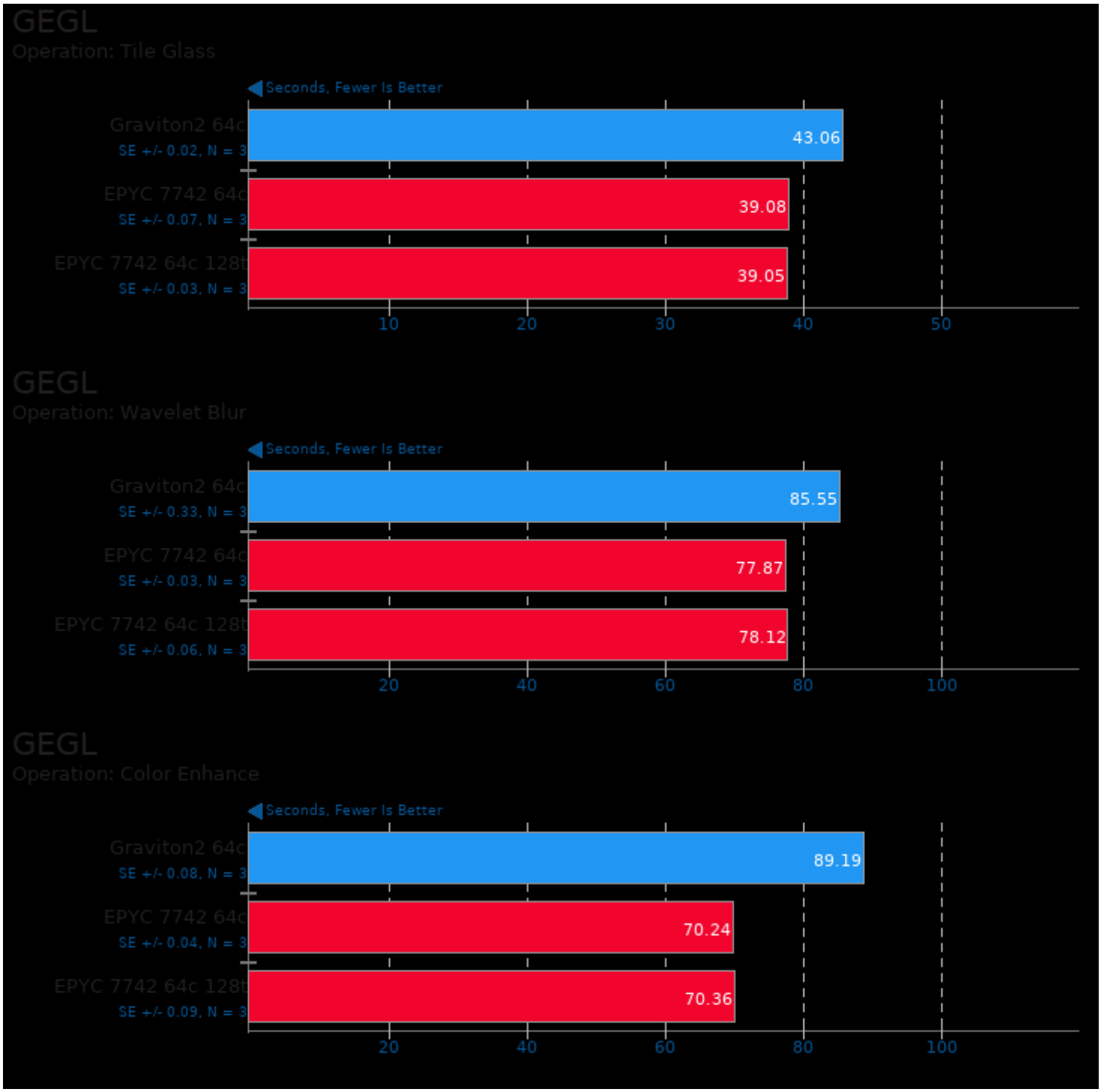
Amazon Graviton2 vs. AMD EPYC 7742



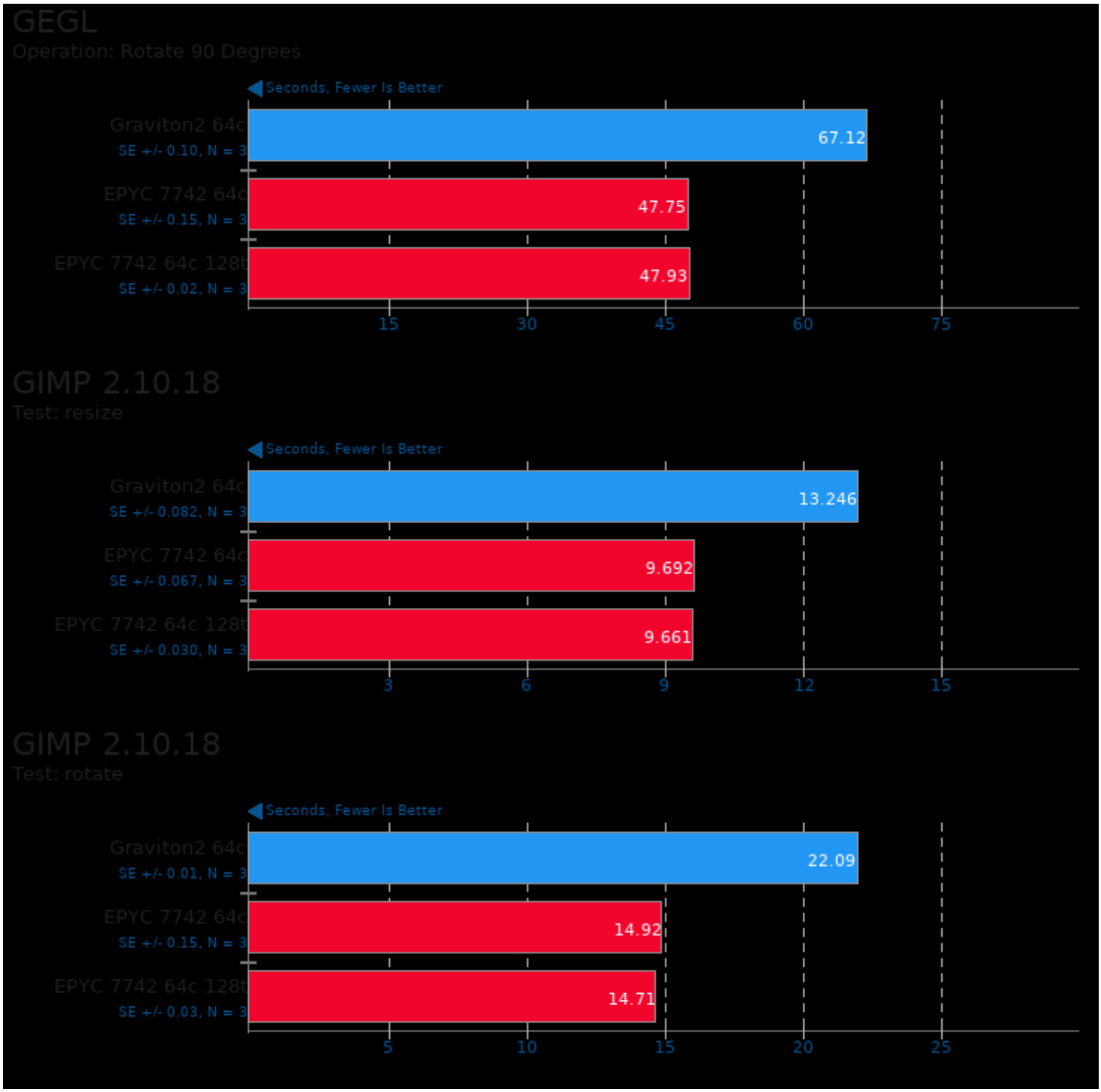
Amazon Graviton2 vs. AMD EPYC 7742

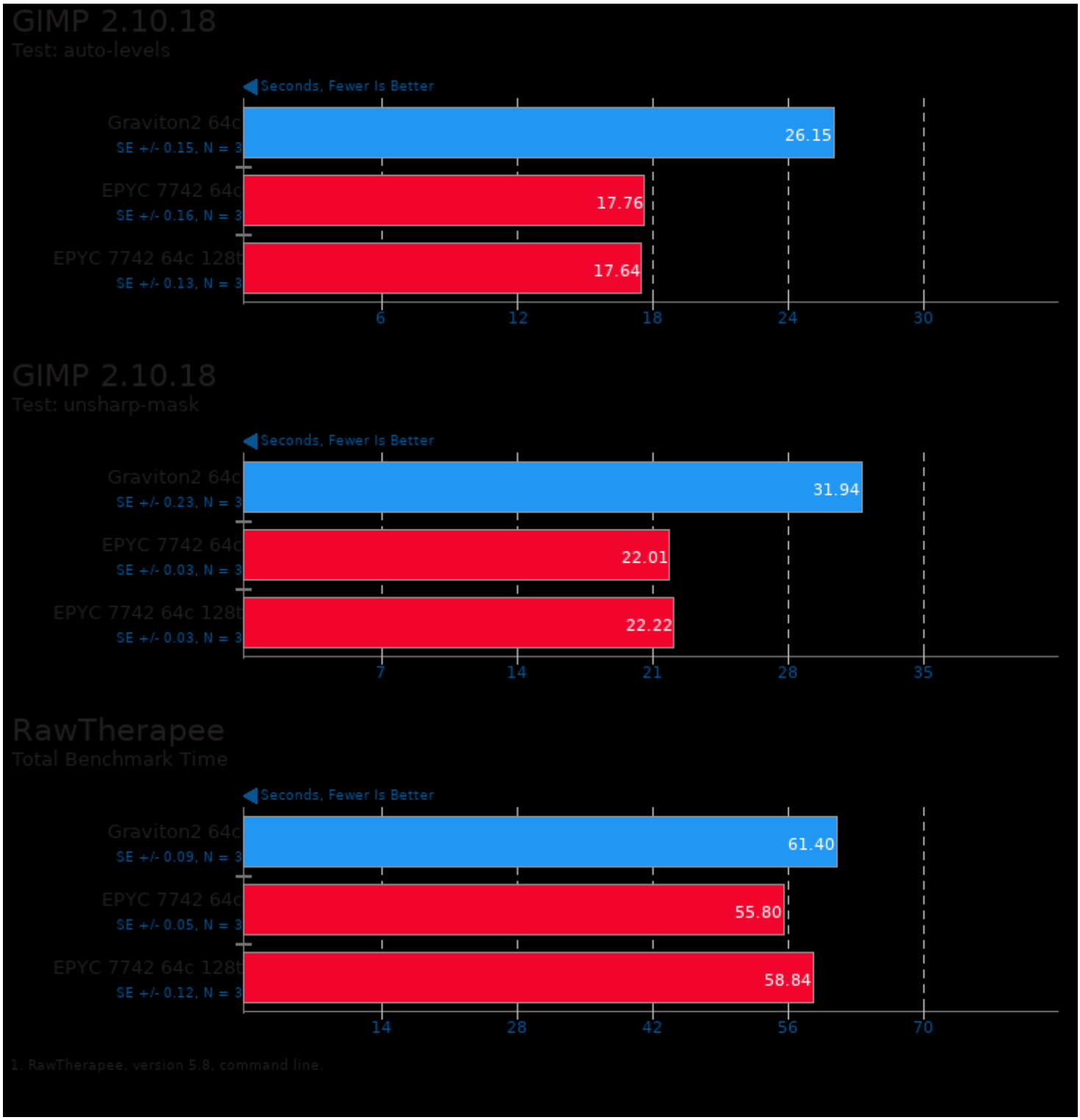


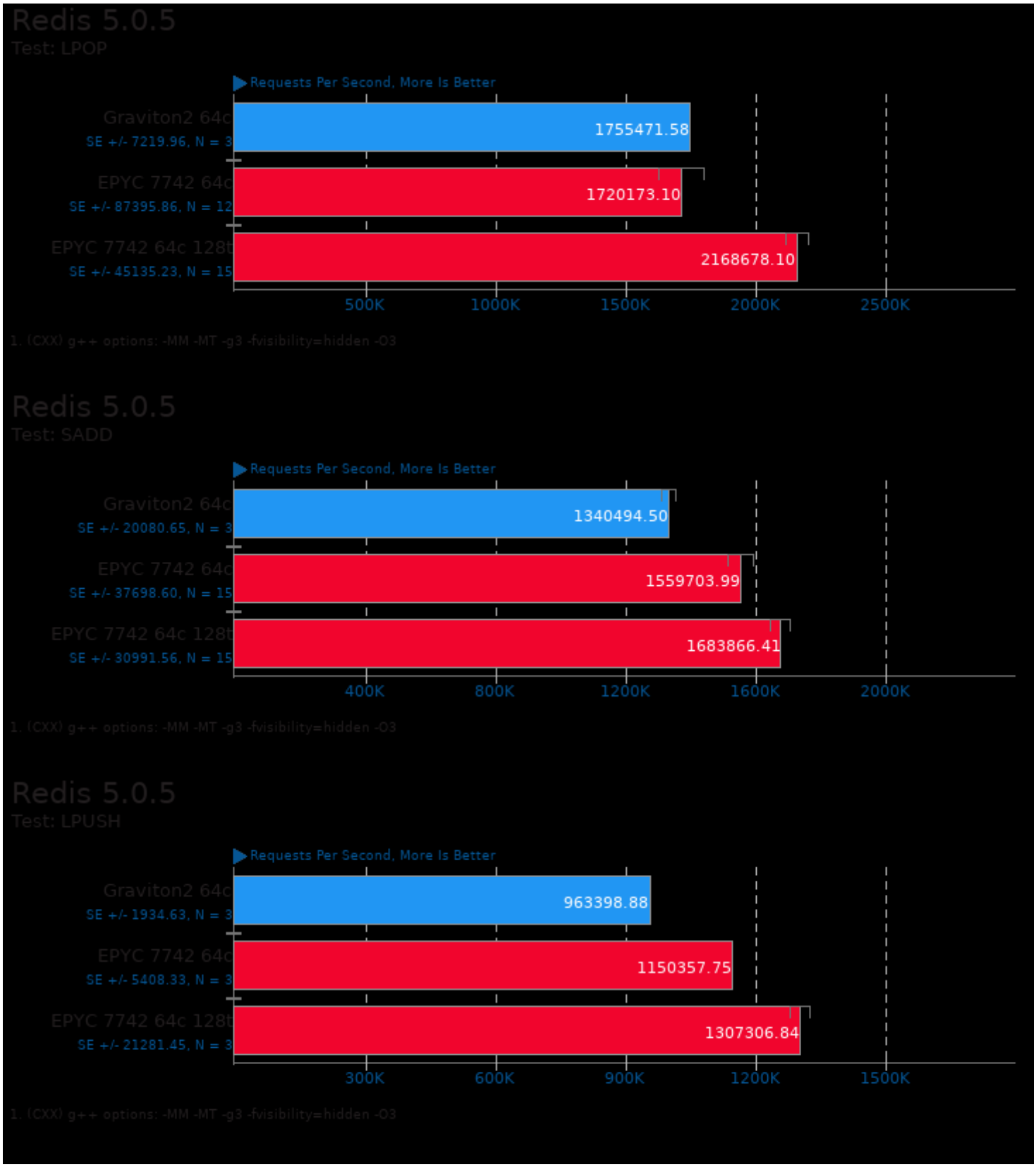
Amazon Graviton2 vs. AMD EPYC 7742

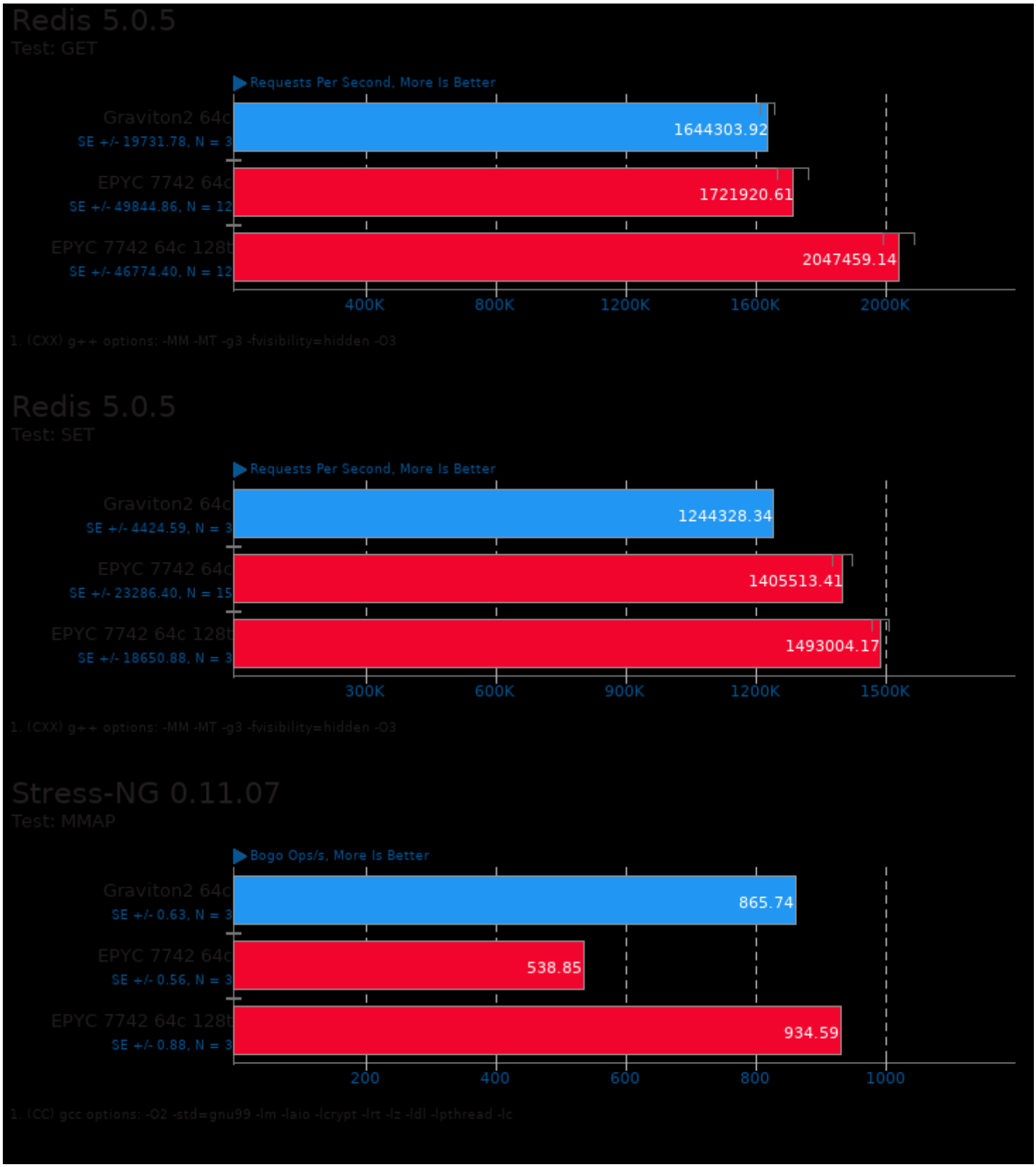


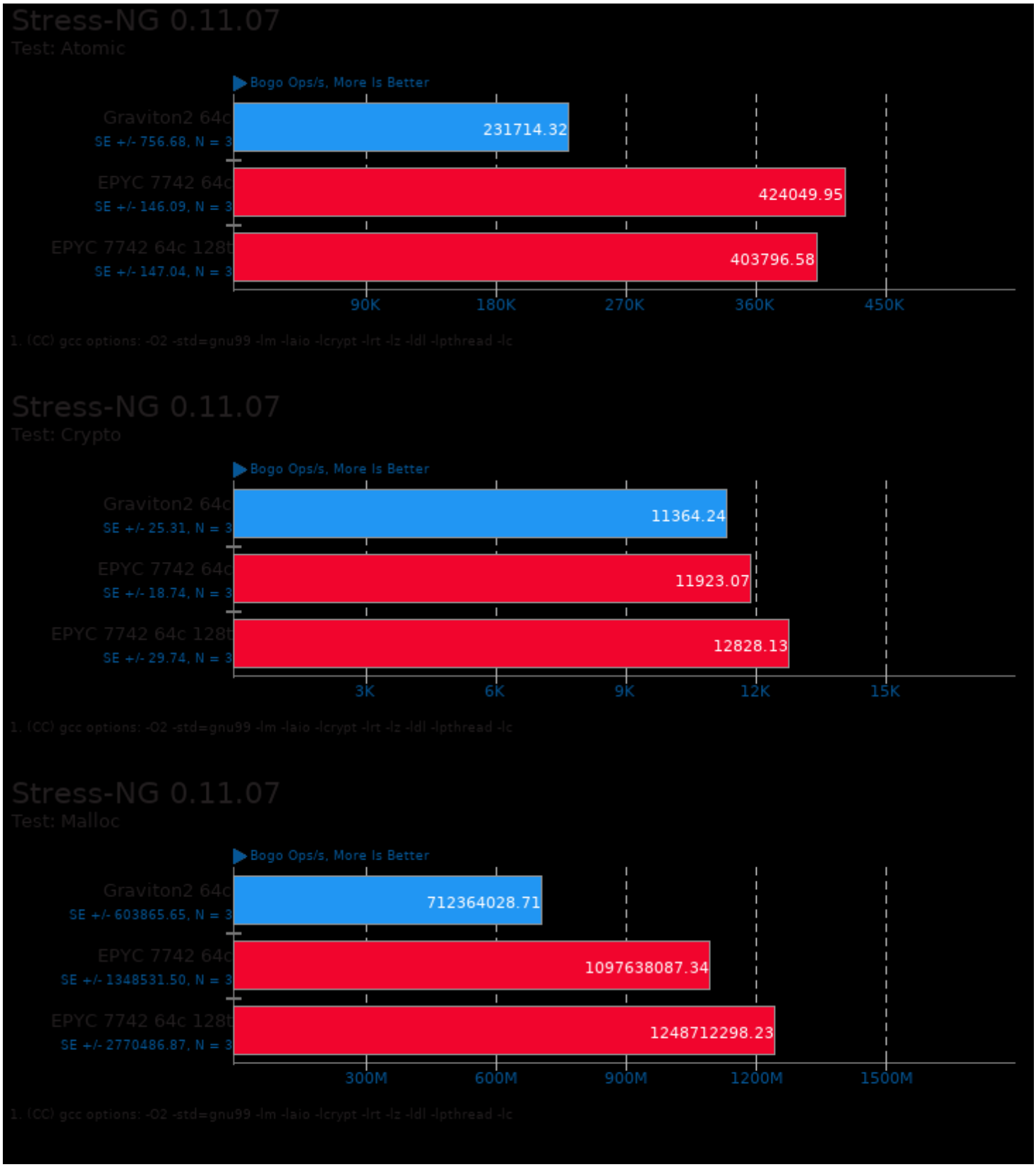
Amazon Graviton2 vs. AMD EPYC 7742

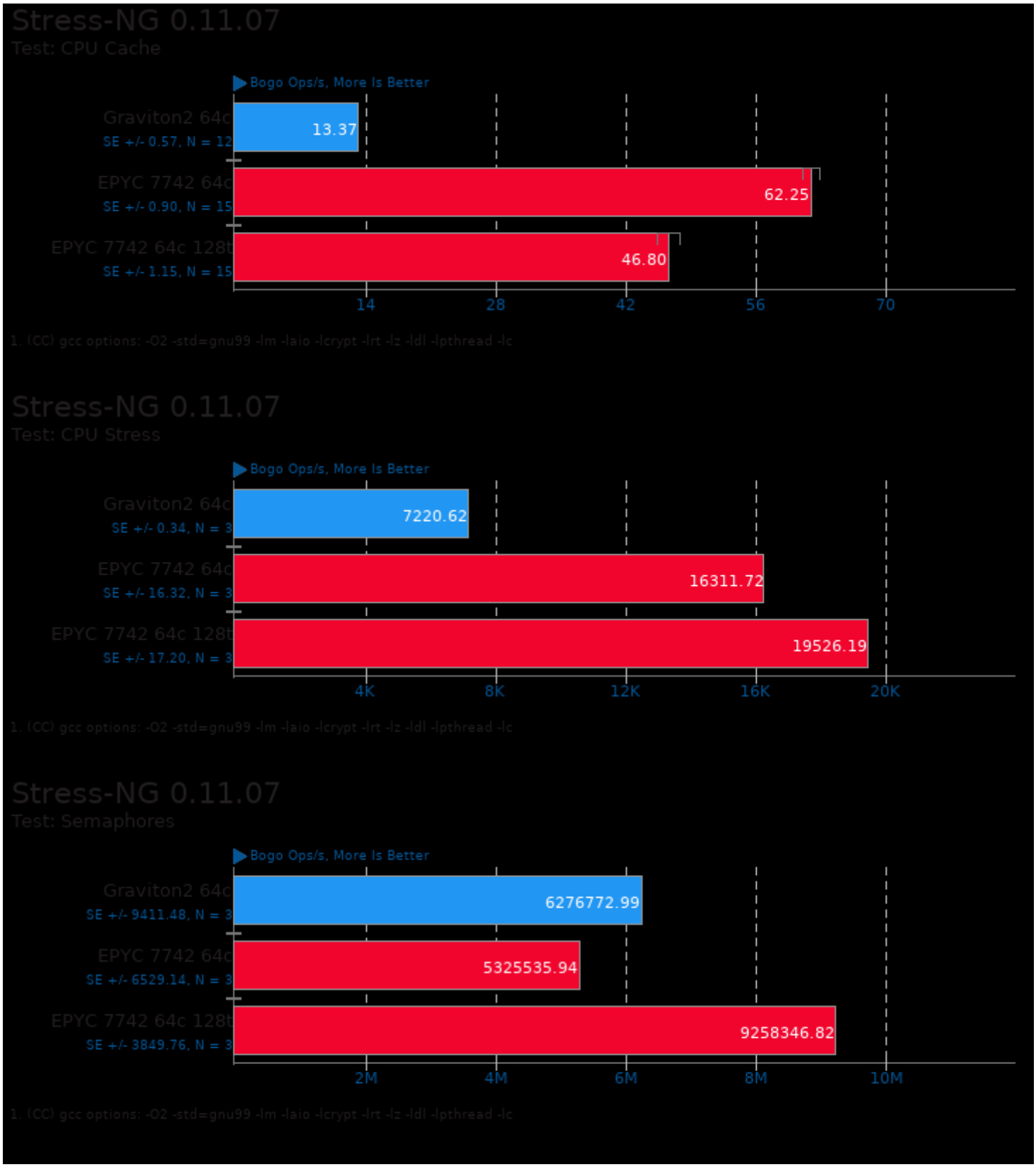


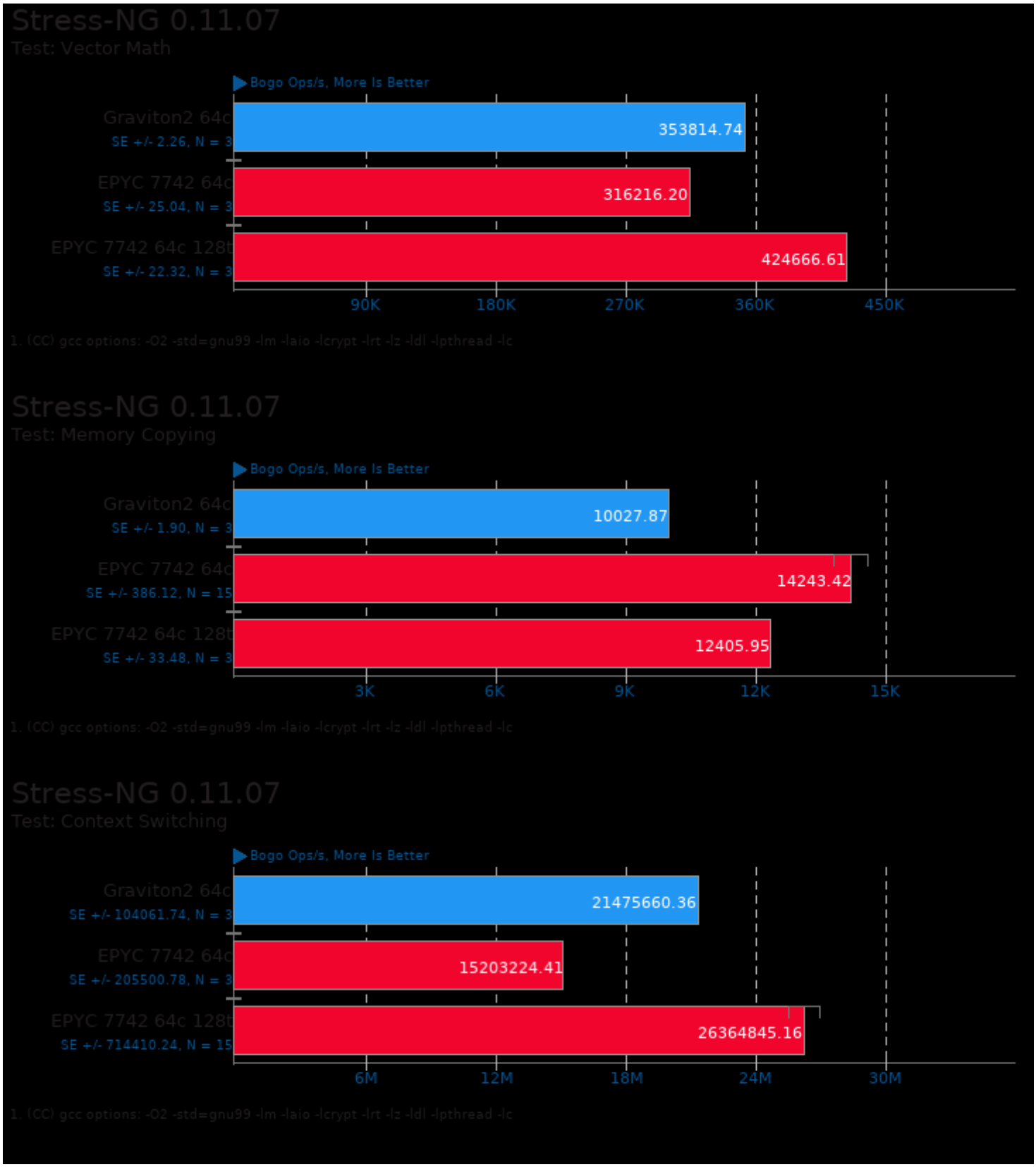

GIMP 2.10.18
Test: auto-levels
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.15, N = 3
26.15
EPYC 7742 64c
SE +/- 0.16, N = 3
17.76
EPYC 7742 64c 128t
SE +/- 0.13, N = 3
17.64
6
12
18
24
30
GIMP 2.10.18
Test: unsharp-mask
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.23, N = 3
31.94
EPYC 7742 64c
SE +/- 0.03, N = 3
22.01
EPYC 7742 64c 128t
SE +/- 0.03, N = 3
22.22
7
14
21
28
35
RawTherapee
Total Benchmark Time
Seconds, Fewer Is Better
Graviton2 64c
SE +/- 0.09, N = 3
61.40
EPYC 7742 64c
SE +/- 0.05, N = 3
55.80
EPYC 7742 64c 128t
SE +/- 0.12, N = 3
58.84
14
28
42
56
70
1. RawTherapee, version 5.8, command line.

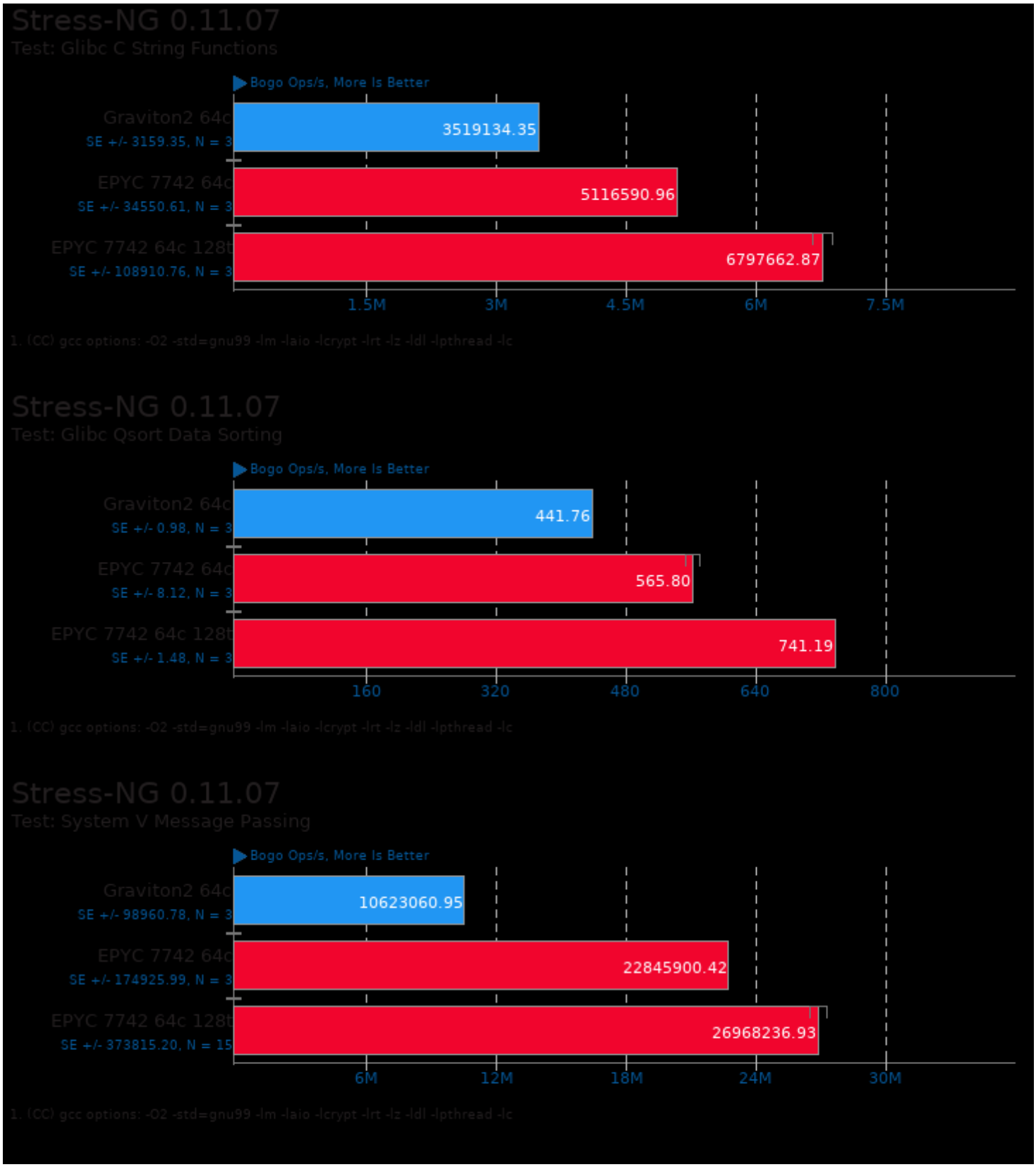

Redis 5.0.5
Test: LPOP
Requests Per Second, More Is Better
Graviton2 64c
SE +/- 7219.96, N = 3
1755471.58
EPYC 7742 64c
SE +/- 87395.86, N = 12
1720173.10
EPYC 7742 64c 128t
SE +/- 45135.23, N = 15
2168678.10
500K
1000K
1500K
2000K
2500K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3
Redis 5.0.5
Test: SADD
Requests Per Second, More Is Better
Graviton2 64c
SE +/- 20080.65, N = 3
1340494.50
EPYC 7742 64c
SE +/- 37698.60, N = 15
1559703.99
EPYC 7742 64c 128t
SE +/- 30991.56, N = 15
1683866.41
400K
800K
1200K
1600K
2000K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3
Redis 5.0.5
Test: LPUSH
Requests Per Second, More Is Better
Graviton2 64c
SE +/- 1934.63, N = 3
963398.88
EPYC 7742 64c
SE +/- 5408.33, N = 3
1150357.75
EPYC 7742 64c 128t
SE +/- 21281.45, N = 3
1307306.84
300K
600K
900K
1200K
1500K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3

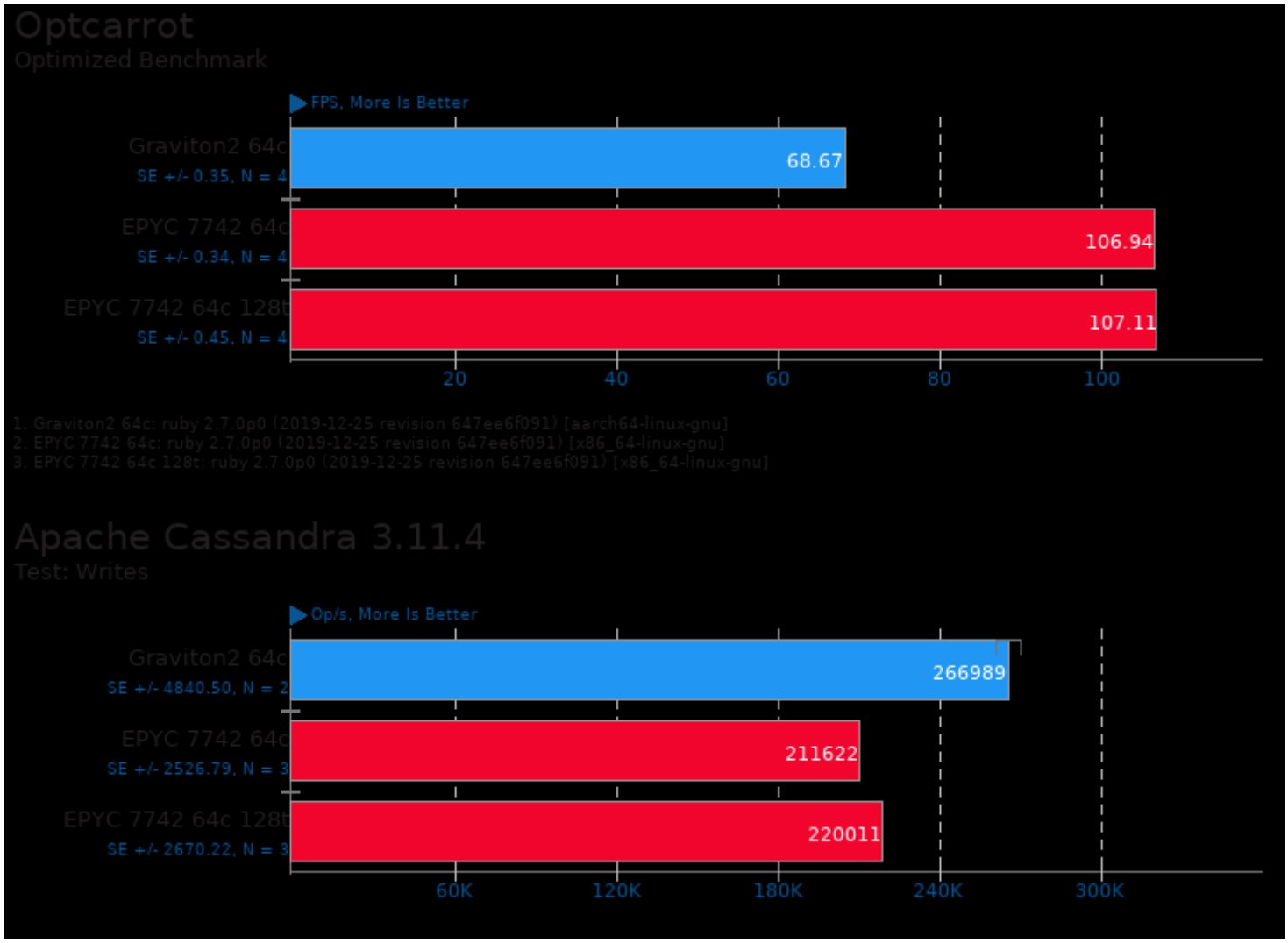

Redis 5.0.5
Test: GET
Requests Per Second, More Is Better
Graviton2 64c
SE +/- 19731.78, N = 3
1644303.92
EPYC 7742 64c
SE +/- 49844.86, N = 12
1721920.61
EPYC 7742 64c 128t
SE +/- 46774.40, N = 12
2047459.14
400K
800K
1200K
1600K
2000K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3
Redis 5.0.5
Test: SET
Requests Per Second, More Is Better
Graviton2 64c
SE +/- 4424.59, N = 3
1244328.34
EPYC 7742 64c
SE +/- 23286.40, N = 15
1405513.41
EPYC 7742 64c 128t
SE +/- 18650.88, N = 3
1493004.17
300K
600K
900K
1200K
1500K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3
Stress-NG 0.11.07
Test: MMAP
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 0.63, N = 3
865.74
EPYC 7742 64c
SE +/- 0.56, N = 3
538.85
EPYC 7742 64c 128t
SE +/- 0.88, N = 3
934.59
200
400
600
800
1000
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc


Stress-NG 0.11.07
Test: Atomic
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 756.68, N = 3
231714.32
EPYC 7742 64c
SE +/- 146.09, N = 3
424049.95
EPYC 7742 64c 128t
SE +/- 147.04, N = 3
403796.58
90K
180K
270K
360K
450K
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Crypto
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 25.31, N = 3
11364.24
EPYC 7742 64c
SE +/- 18.74, N = 3
11923.07
EPYC 7742 64c 128t
SE +/- 29.74, N = 3
12828.13
3K
6K
9K
12K
15K
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Malloc
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 603865.65, N = 3
712364028.71
EPYC 7742 64c
SE +/- 1348531.50, N = 3
1097638087.34
EPYC 7742 64c 128t
SE +/- 2770486.87, N = 3
1248712298.23
300M
600M
900M
1200M
1500M
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

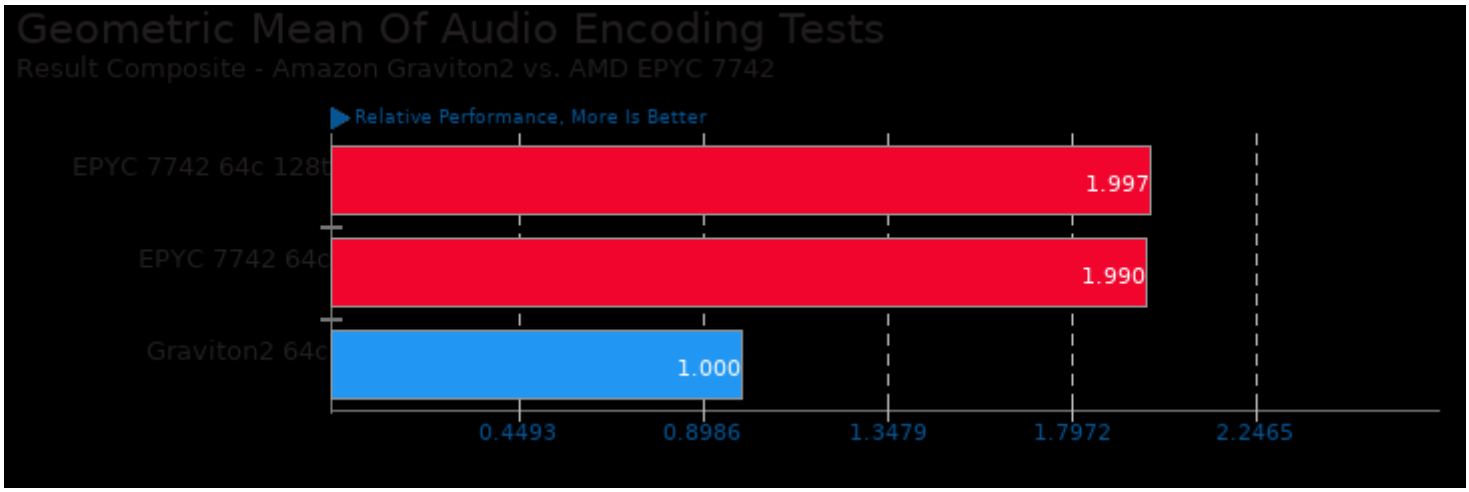

Stress-NG 0.11.07
Test: CPU Cache
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 0.57, N = 12
13.37
EPYC 7742 64c
SE +/- 0.90, N = 15
62.25
EPYC 7742 64c 128t
SE +/- 1.15, N = 15
46.80
14
28
42
56
70
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: CPU Stress
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 0.34, N = 3
7220.62
EPYC 7742 64c
SE +/- 16.32, N = 3
16311.72
EPYC 7742 64c 128t
SE +/- 17.20, N = 3
19526.19
4K
8K
12K
16K
20K
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Semaphores
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 9411.48, N = 3
6276772.99
EPYC 7742 64c
SE +/- 6529.14, N = 3
5325535.94
EPYC 7742 64c 128t
SE +/- 3849.76, N = 3
9258346.82
2M
4M
6M
8M
10M
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc


Stress-NG 0.11.07
Test: Vector Math
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 2.26, N = 3
353814.74
EPYC 7742 64c
SE +/- 25.04, N = 3
316216.20
EPYC 7742 64c 128t
SE +/- 22.32, N = 3
424666.61
90K
180K
270K
360K
450K
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Memory Copying
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 1.90, N = 3
10027.87
EPYC 7742 64c
SE +/- 386.12, N = 15
14243.42
EPYC 7742 64c 128t
SE +/- 33.48, N = 3
12405.95
3K
6K
9K
12K
15K
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Context Switching
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 104061.74, N = 3
21475660.36
EPYC 7742 64c
SE +/- 205500.78, N = 3
15203224.41
EPYC 7742 64c 128t
SE +/- 714410.24, N = 15
26364845.16
6M
12M
18M
24M
30M
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

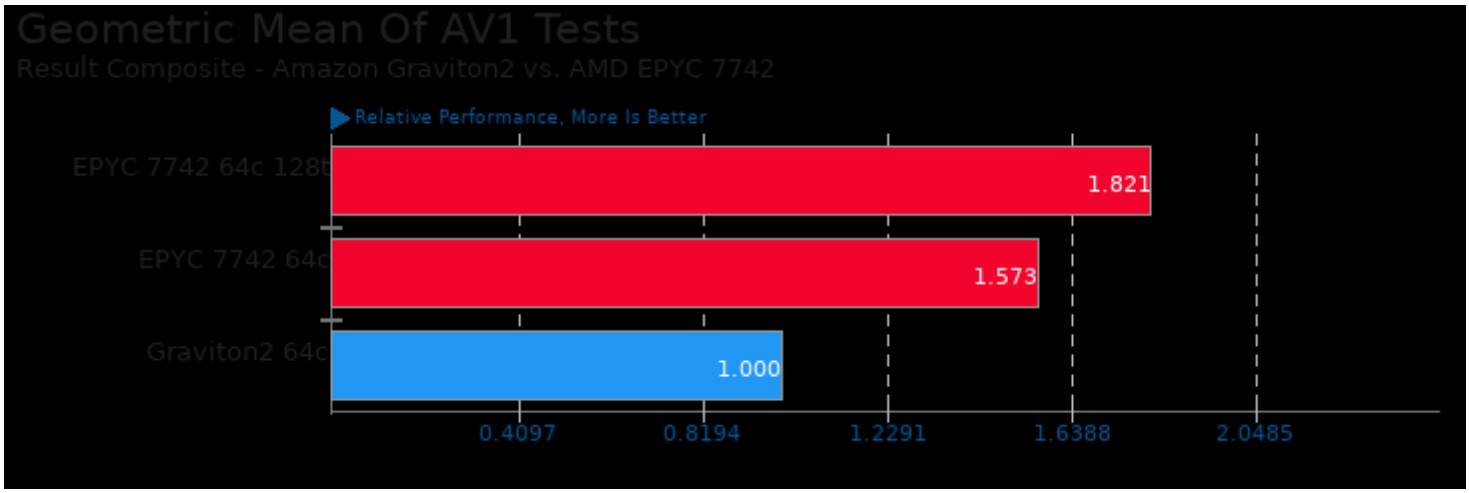

Stress-NG 0.11.07
Test: Glibc C String Functions
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 3159.35, N = 3
3519134.35
EPYC 7742 64c
SE +/- 34550.61, N = 3
5116590.96
EPYC 7742 64c 128t
SE +/- 108910.76, N = 3
6797662.87
1.5M
3M
4.5M
6M
7.5M
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: Glibc Qsort Data Sorting
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 0.98, N = 3
441.76
EPYC 7742 64c
SE +/- 8.12, N = 3
565.80
EPYC 7742 64c 128t
SE +/- 1.48, N = 3
741.19
160
320
480
640
800
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc
Stress-NG 0.11.07
Test: System V Message Passing
Bogo Ops/s, More Is Better
Graviton2 64c
SE +/- 98960.78, N = 3
10623060.95
EPYC 7742 64c
SE +/- 174925.99, N = 3
22845900.42
EPYC 7742 64c 128t
SE +/- 373815.20, N = 15
26968236.93
6M
12M
18M
24M
30M
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc


Optcarrot
Optimized Benchmark
FPS, More Is Better
Graviton2 64c
SE +/- 0.35, N = 4
68.67
EPYC 7742 64c
SE +/- 0.34, N = 4
106.94
EPYC 7742 64c 128t
SE +/- 0.45, N = 4
107.11
20
40
60
80
100
1. Graviton2 64c: ruby 2.7.0p0 (2019-12-25 revision 647ee6f091) [aarch64-linux-gnu]
2. EPYC 7742 64c: ruby 2.7.0p0 (2019-12-25 revision 647ee6f091) [x86_64-linux-gnu]
3. EPYC 7742 64c 128t: ruby 2.7.0p0 (2019-12-25 revision 647ee6f091) [x86_64-linux-gnu]
Apache Cassandra 3.11.4
Test: Writes
Op/s, More Is Better
Graviton2 64c
SE +/- 4840.50, N = 2
266989
EPYC 7742 64c
SE +/- 2526.79, N = 3
211622
EPYC 7742 64c 128t
SE +/- 2670.22, N = 3
220011
60K
120K
180K
240K
300K

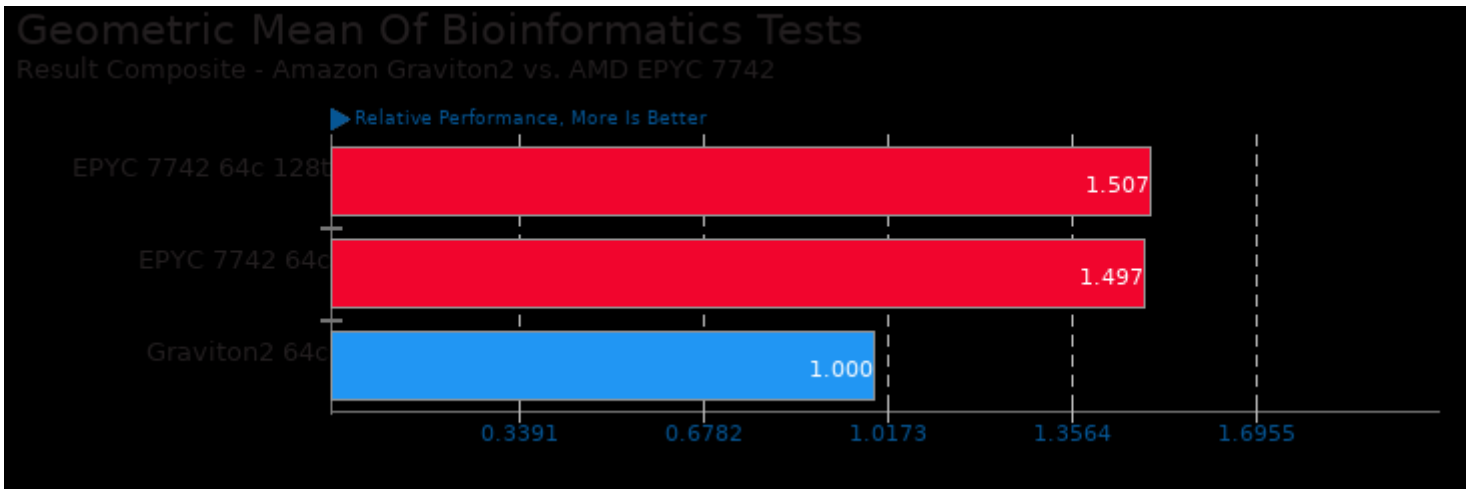
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac

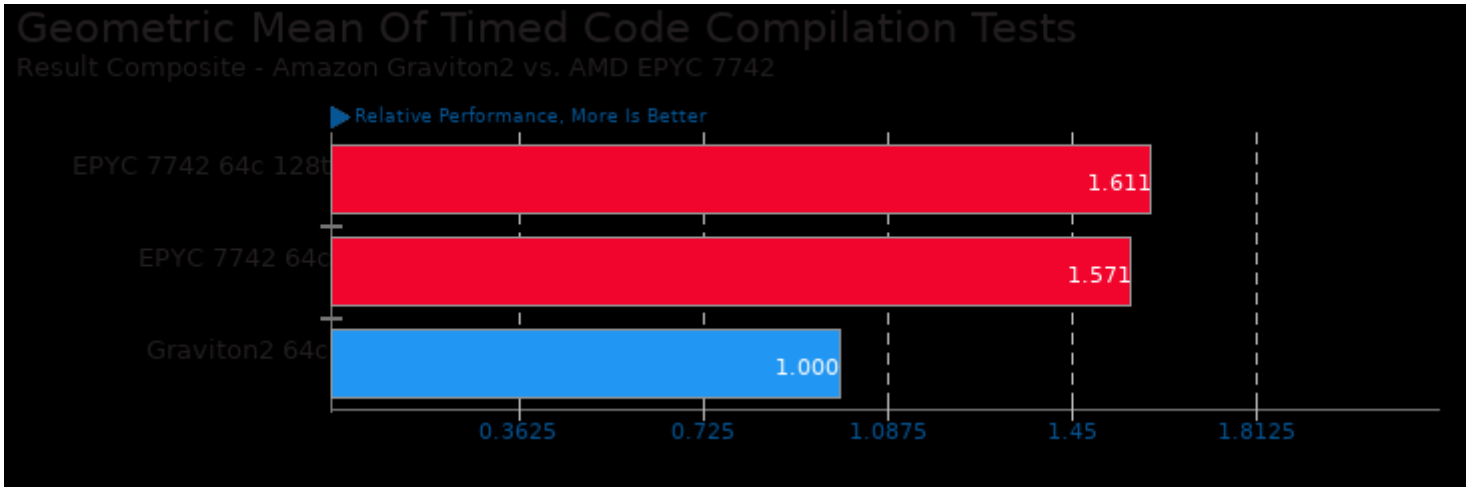


Geometric mean based upon tests: pts/dav1d and pts/rav1e



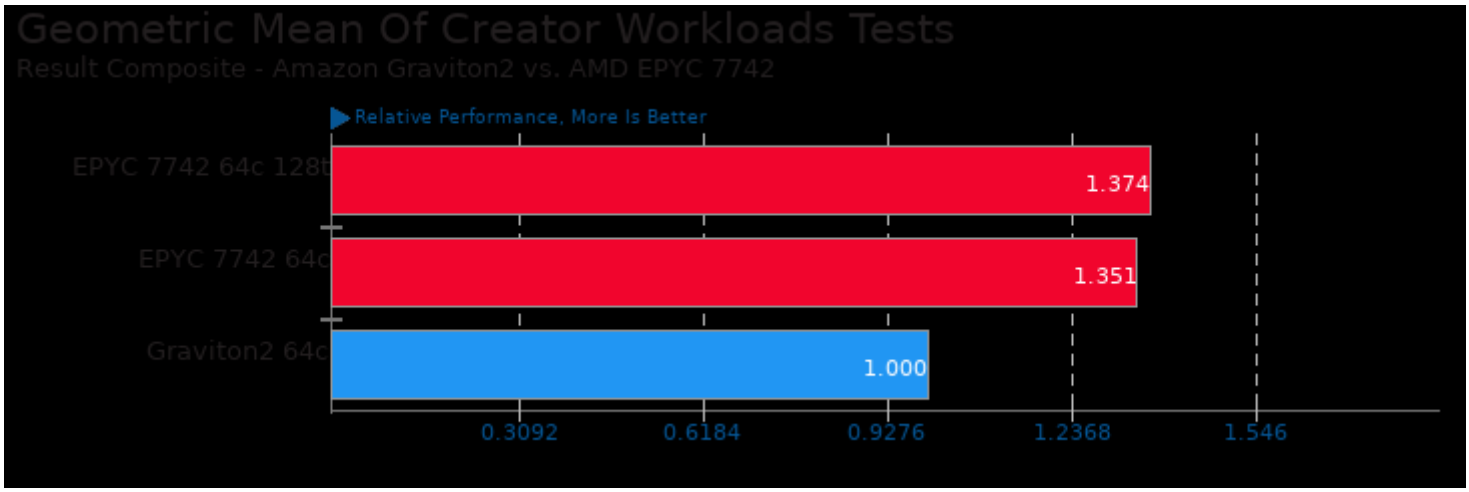
Geometric mean based upon tests: pts/himeno, pts/mrbayes and pts/mafft

Geometric mean based upon tests: pts/tscp, pts/lczero, pts/asmfish, pts/n-queens and pts/m-queens

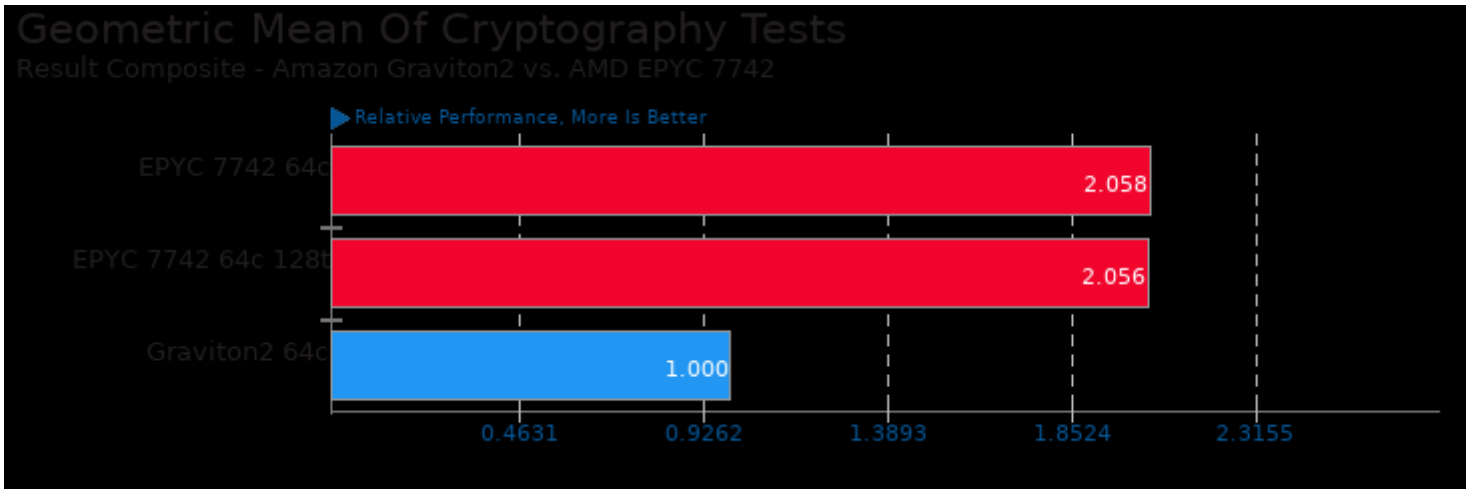


Geometric mean based upon tests: pts/build-php, pts/build-linux-kernel, pts/build-imagemagick, pts/build-gcc, pts/build-llvm and pts/build2

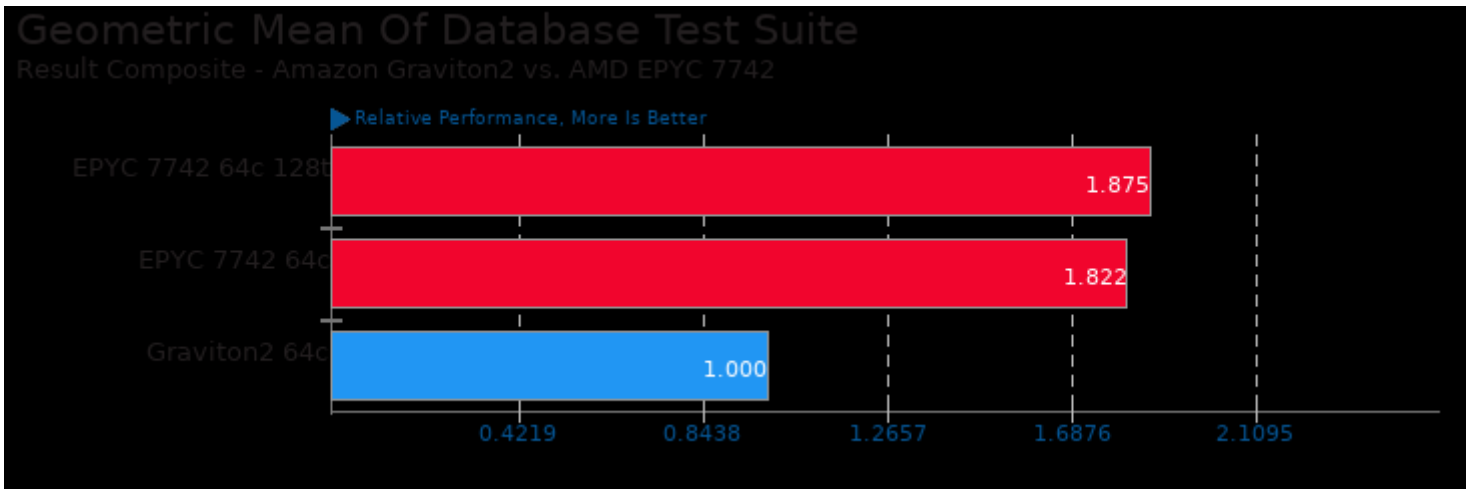
Geometric mean based upon tests: pts/compress-7zip, pts/compress-zstd, pts/compress-xz and pts/blosc



Geometric mean based upon tests: pts/c-ray, pts/smallpt, pts/ttsiod-renderer, pts/x264, pts/vpxenc, pts/dav1d, pts/rav1e, pts/encode-mp3, pts/encode-flac, pts/graphics-magick, system/rawtherapee, pts/tjbench, system/gimp, system/darktable, system/gegl and pts/basis

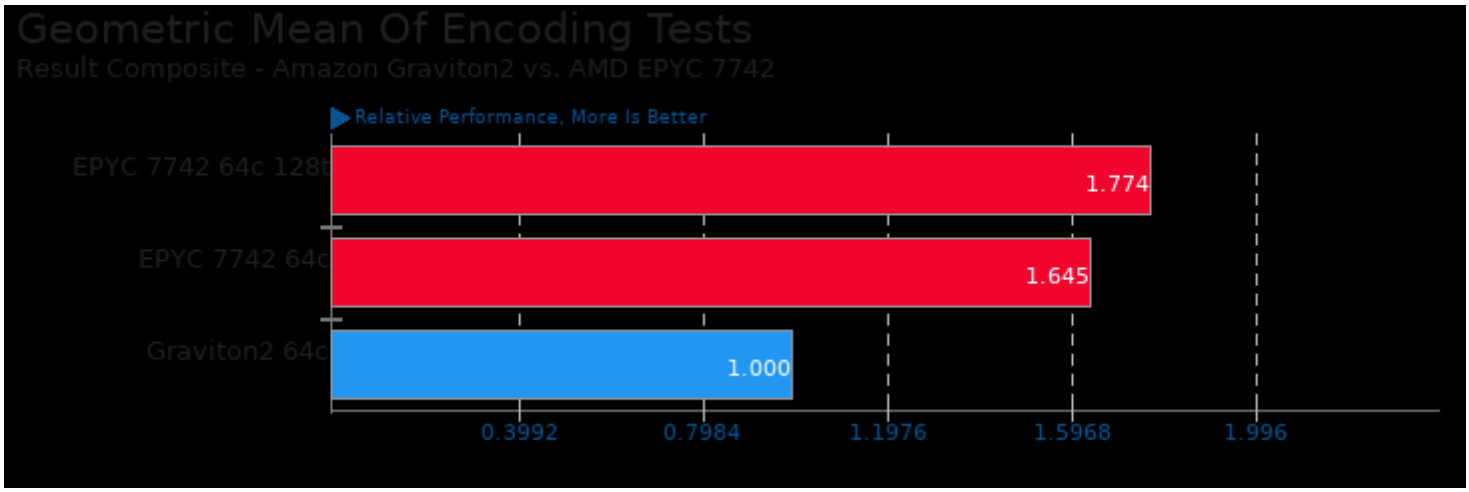


Geometric mean based upon tests: pts/openssl, pts/john-the-ripper, pts/cryptopp and pts/nettle

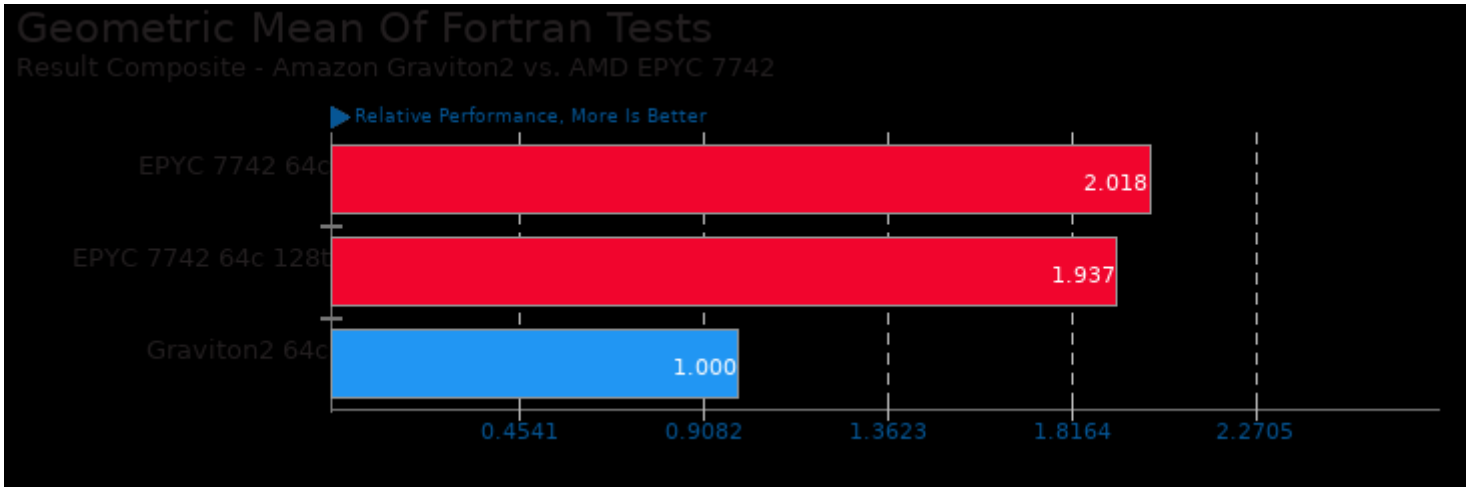


Geometric mean based upon tests: pts/redis, pts/cassandra, pts/pgbench and pts/mysqlslap

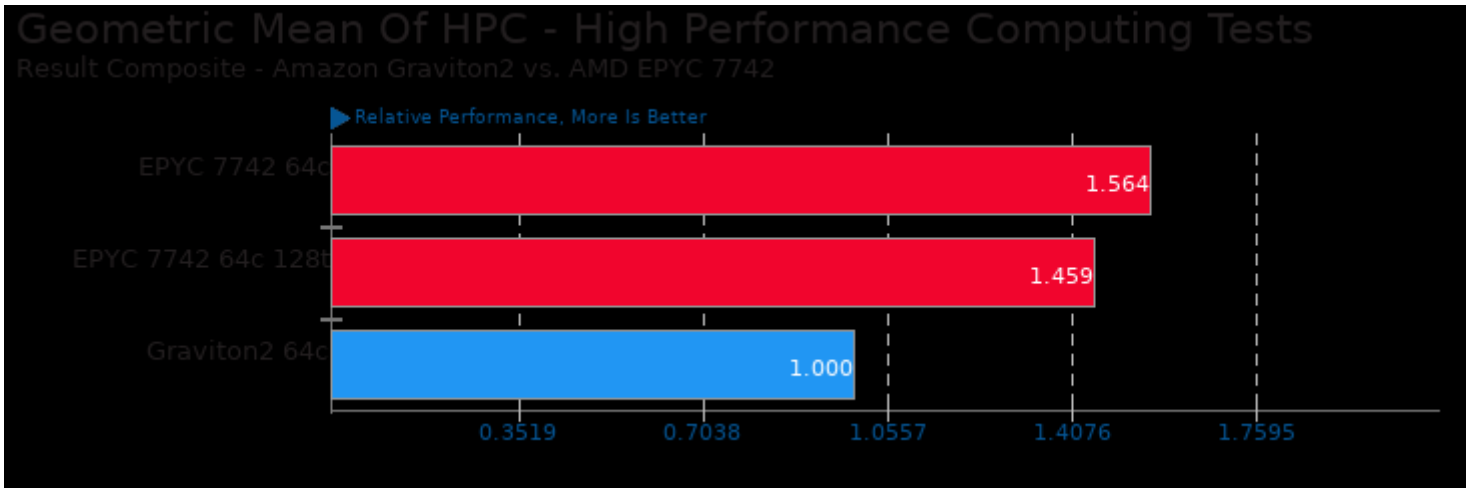
Amazon Graviton2 vs. AMD EPYC 7742



Geometric mean based upon tests: pts/encode-mp3, pts/encode-flac, pts/x264, pts/vpxenc, pts/dav1d and pts/rav1e

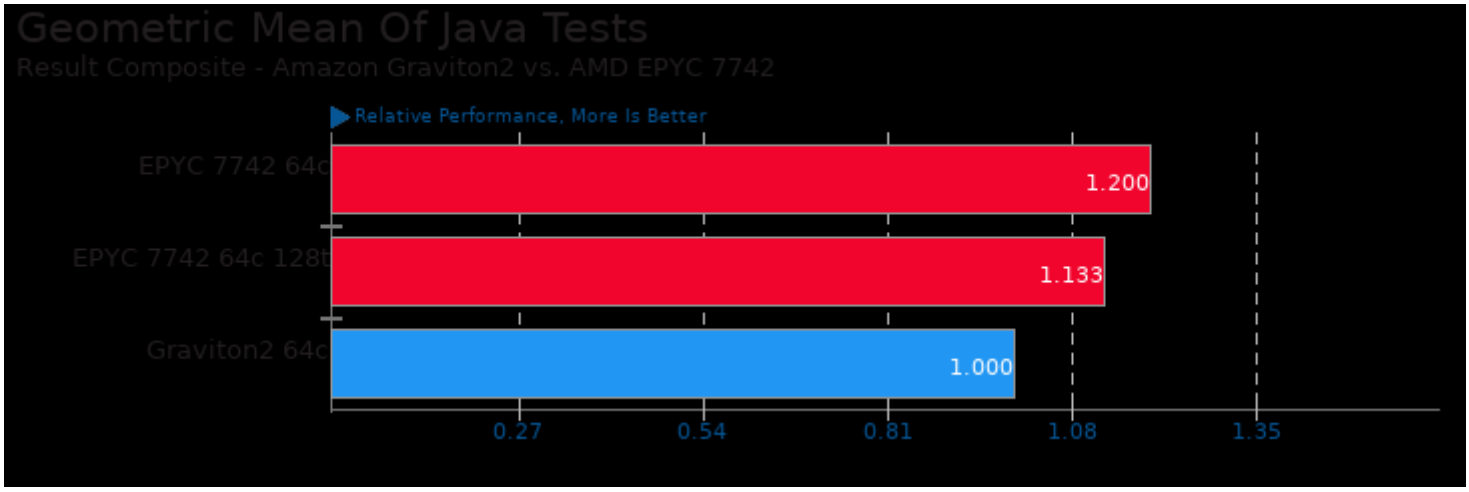


Geometric mean based upon tests: pts/hpcg, pts/npb, pts/cloverleaf and pts/neat

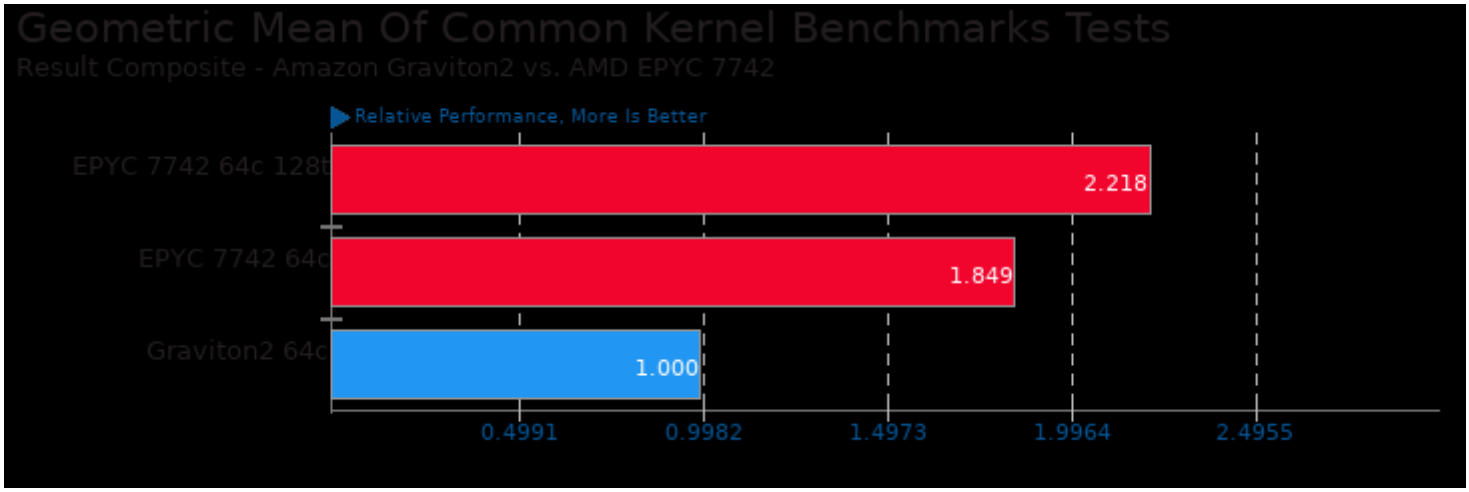


Geometric mean based upon tests: pts/npb, pts/rodinia, pts/parboil, pts/hpcg, pts/neat, pts/gromacs, pts/cloverleaf, pts/himeno, pts/mrbayes, pts/mafft and pts/lczero

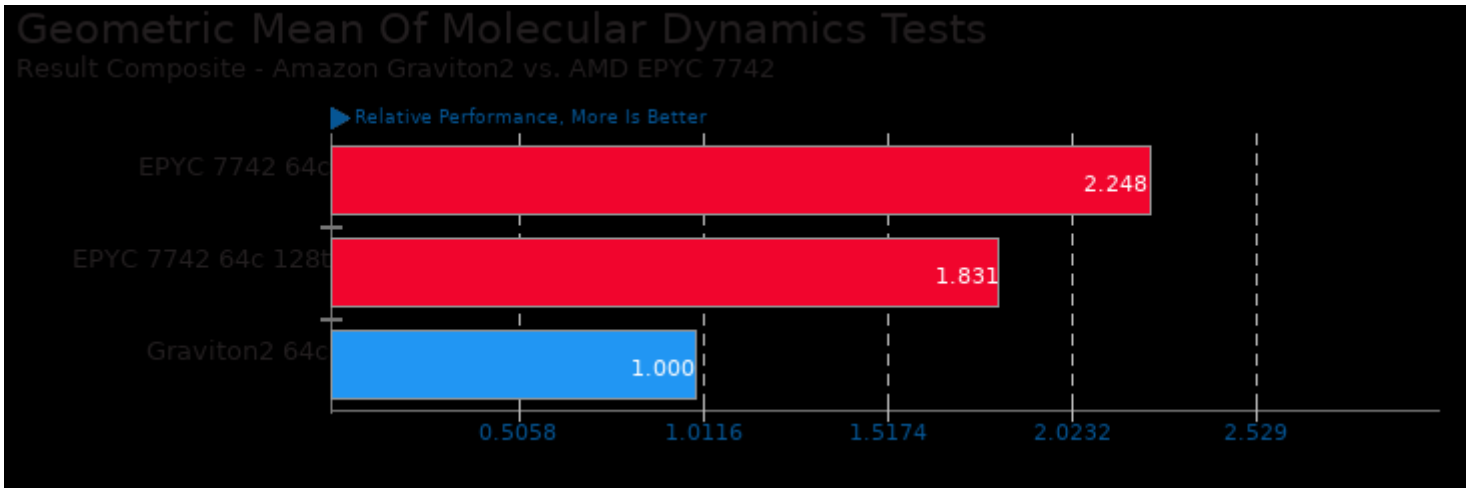
Geometric mean based upon tests: pts/graphics-magick, system/rawtherapee, pts/tjbench, system/gimp, system/darktable and system/gegl



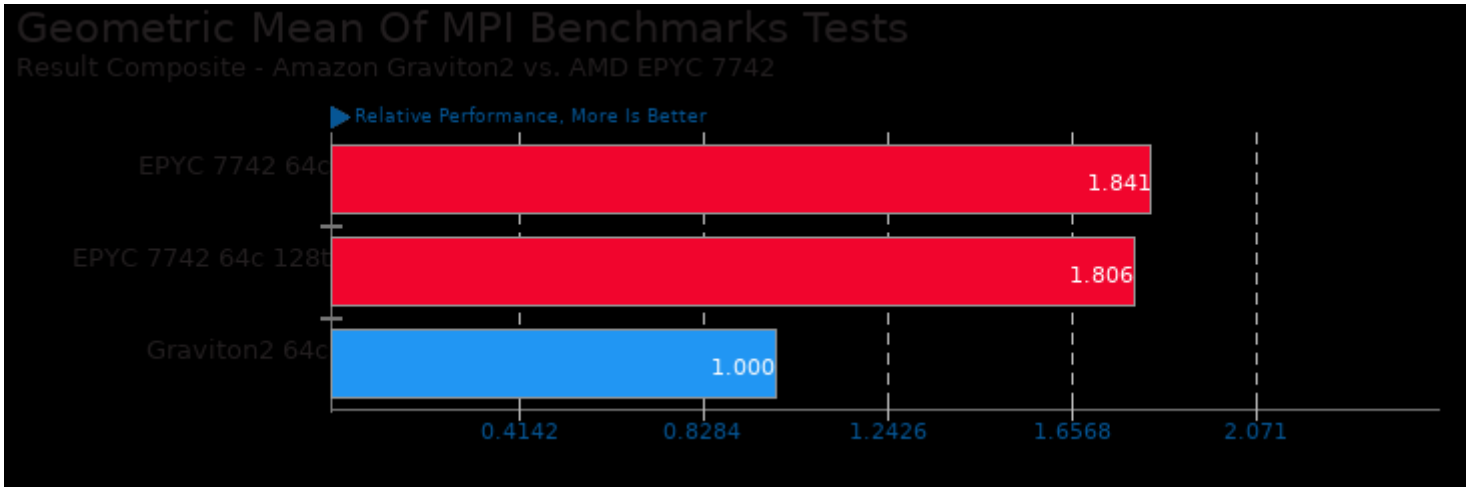
Geometric mean based upon tests: pts/java-gradle-perf and pts/renaissance



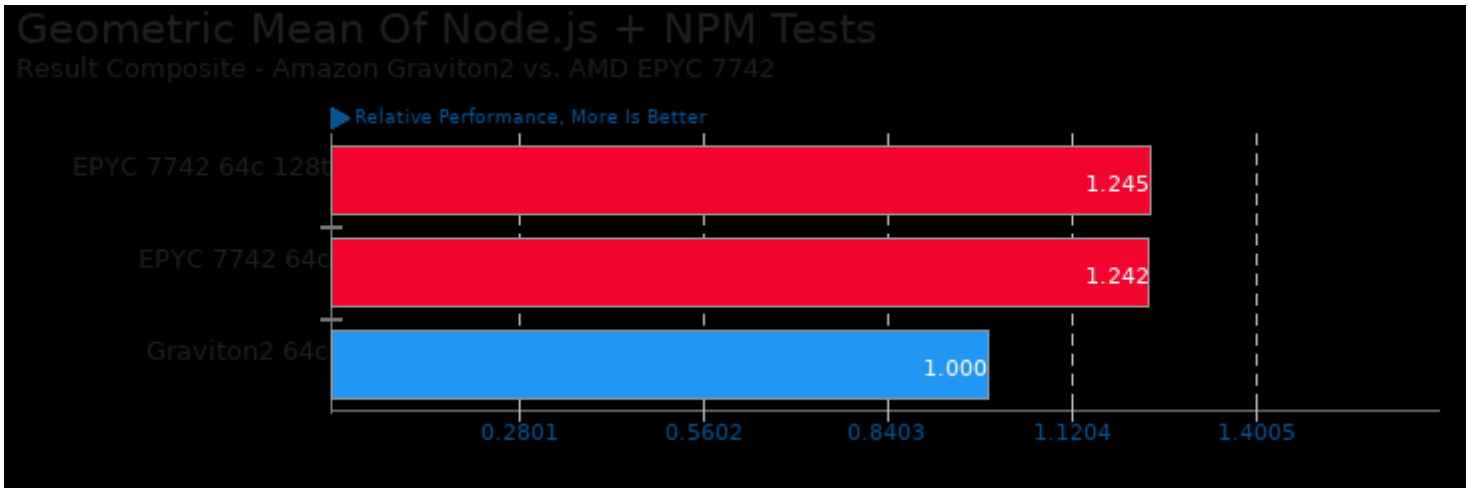
Geometric mean based upon tests: pts/pgbench, pts/openssl and pts/stress-ng



Geometric mean based upon tests: pts/gromacs and pts/cloverleaf

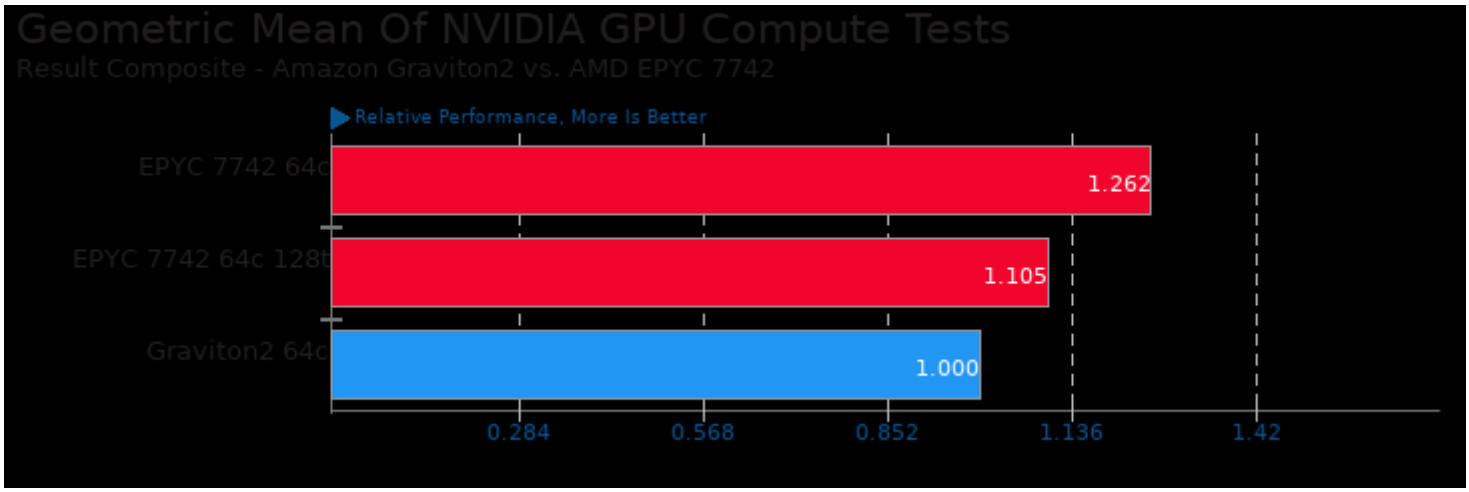


Geometric mean based upon tests: pts/gromacs, pts/hpcg, pts/mrbayes and pts/npb

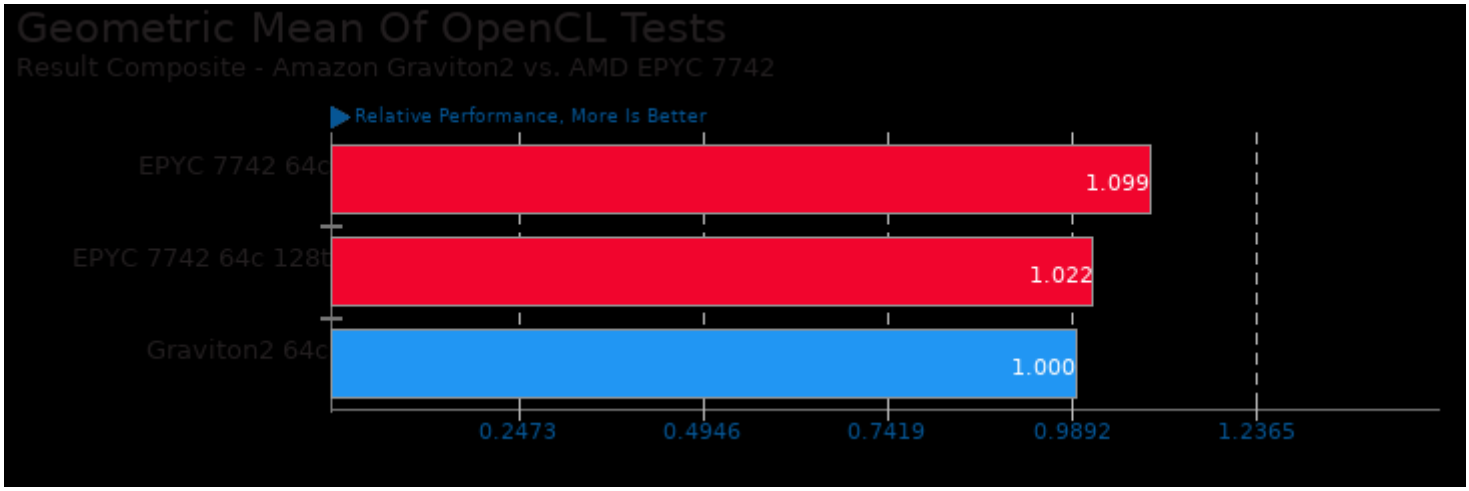


Geometric mean based upon tests: pts/node-express-loadtest and pts/node-octane

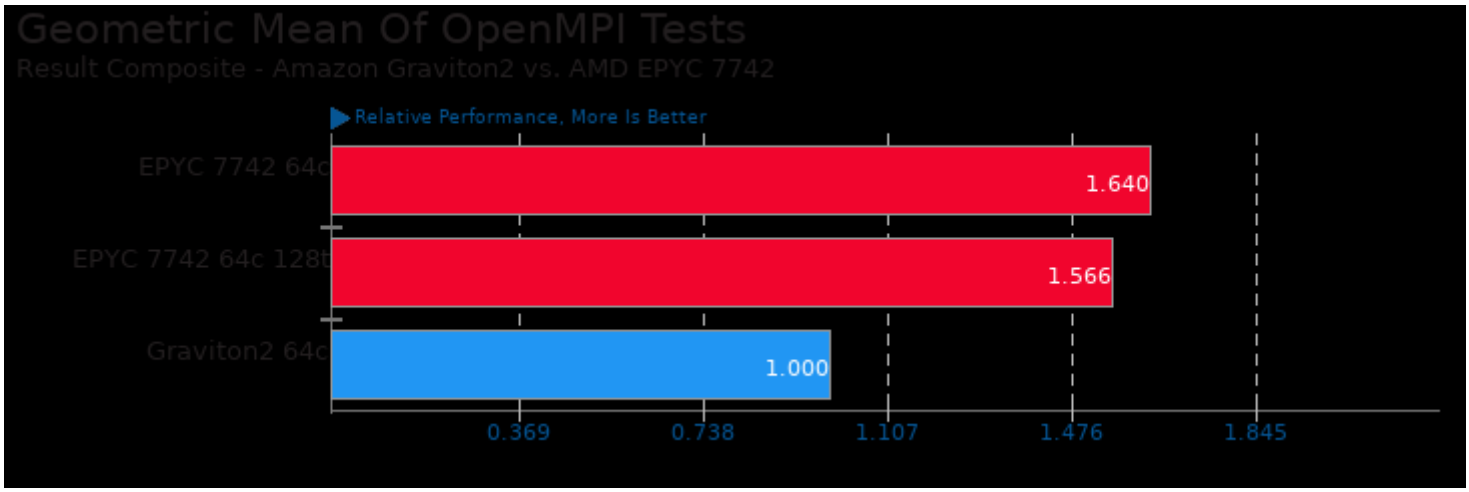
Amazon Graviton2 vs. AMD EPYC 7742



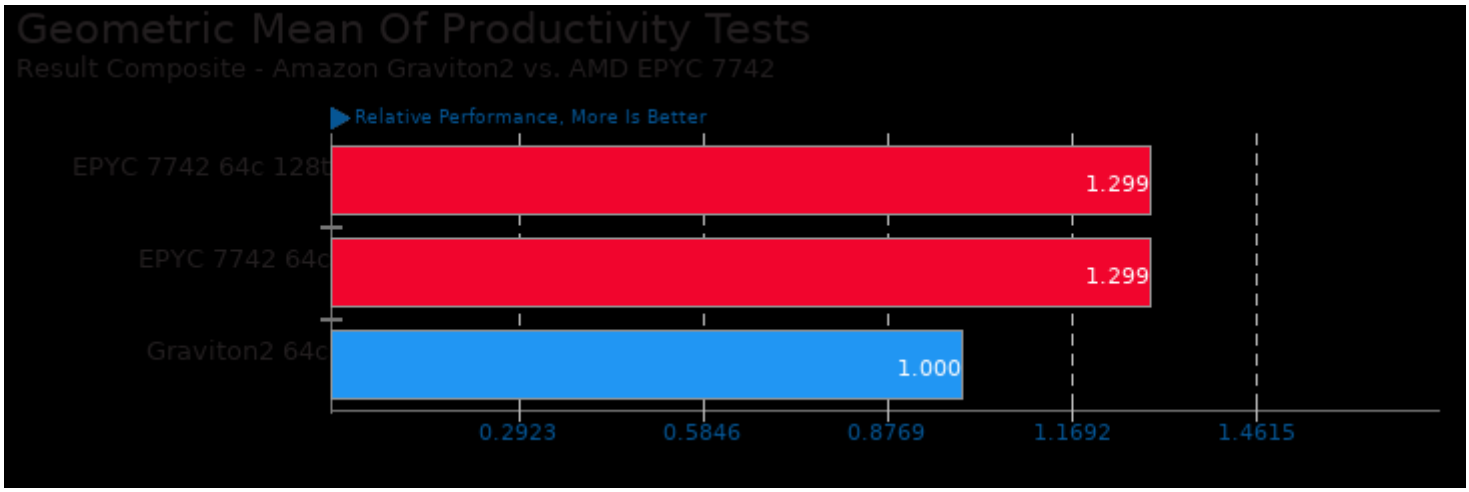
Geometric mean based upon tests: pts/gromacs, pts/rodinia and pts/lczero



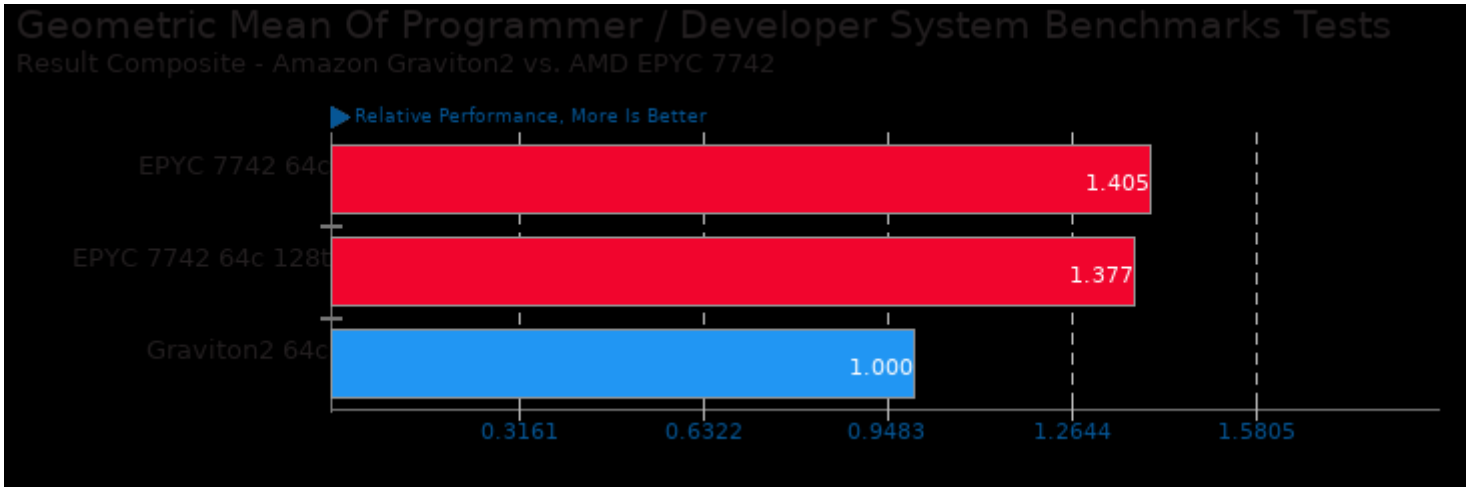
Geometric mean based upon tests: pts/rodinia, pts/parboil and system/darktable



Geometric mean based upon tests: pts/hpcg, pts/npb, pts/parboil, pts/cloverleaf, pts/rodinia, pts/mrbayes and pts/gromacs



Geometric mean based upon tests: system/gimp and system/gegl

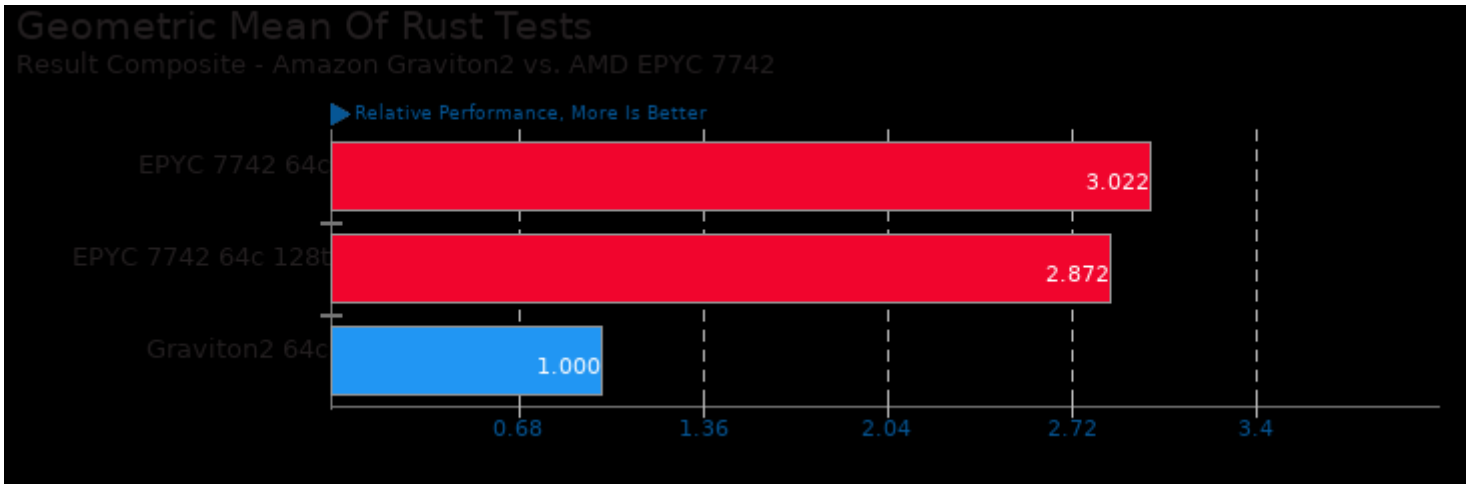


Geometric mean based upon tests: pts/blosc, pts/compress-zstd, pts/build-php, pts/build-linux-kernel, pts/build-imagemagick, pts/build-gcc, pts/build-llvm and pts/build2

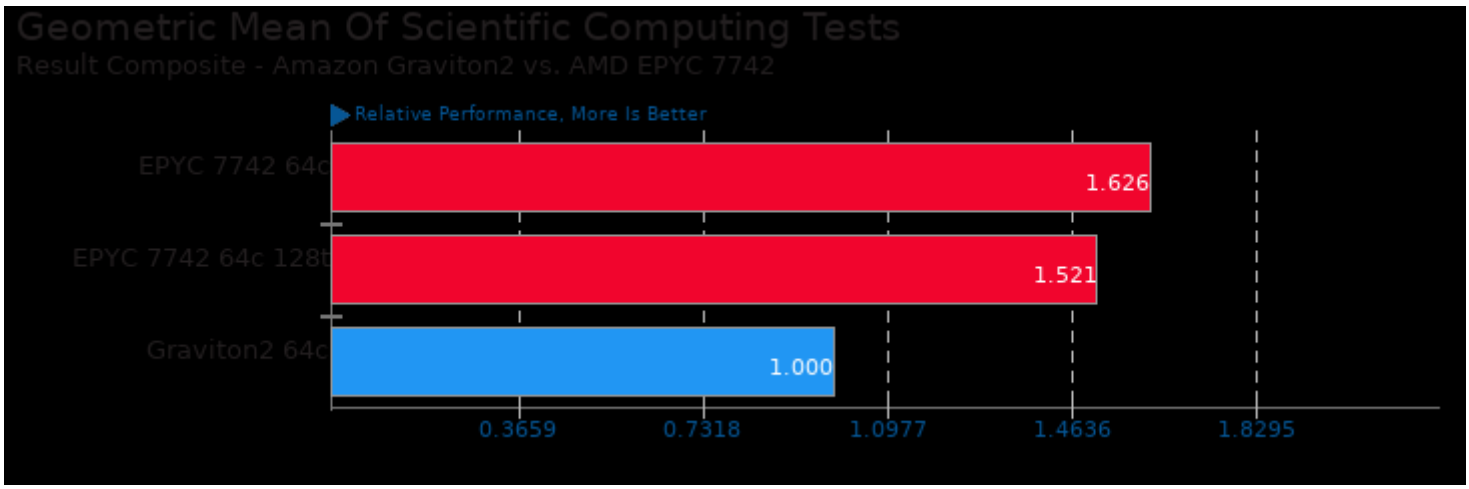
Geometric mean based upon tests: pts/parboil and pts/build-llvm

Amazon Graviton2 vs. AMD EPYC 7742

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



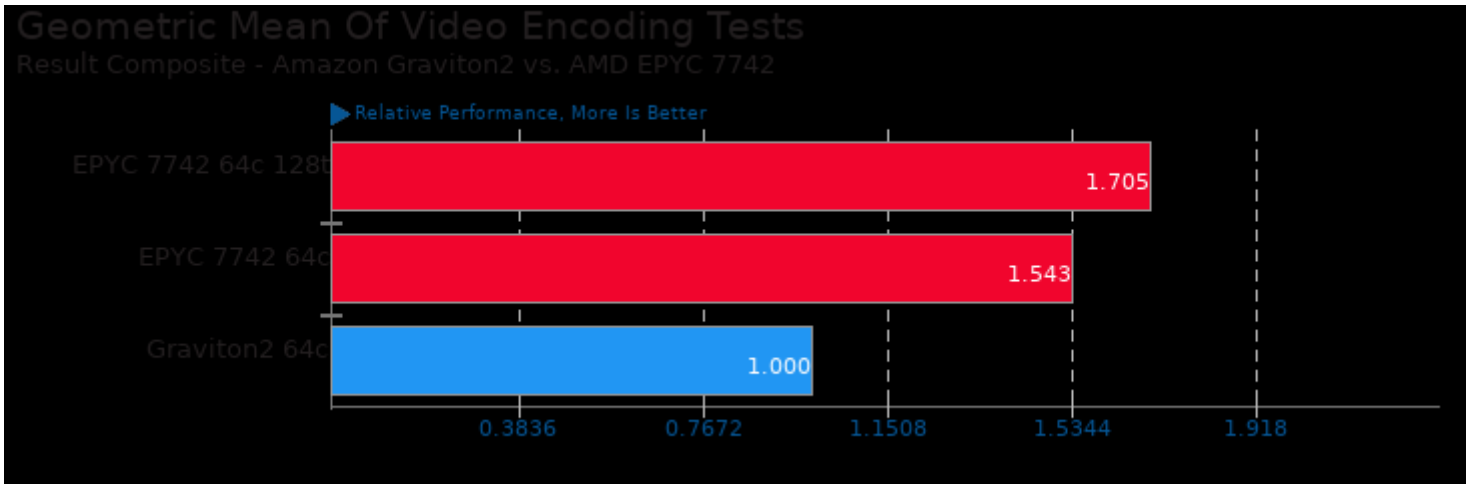
Geometric mean based upon tests: pts/rav1e and pts/rust-mandel



Geometric mean based upon tests: pts/neat, pts/gromacs, pts/cloverleaf, pts/himeno, pts/mrbayes and pts/mafft

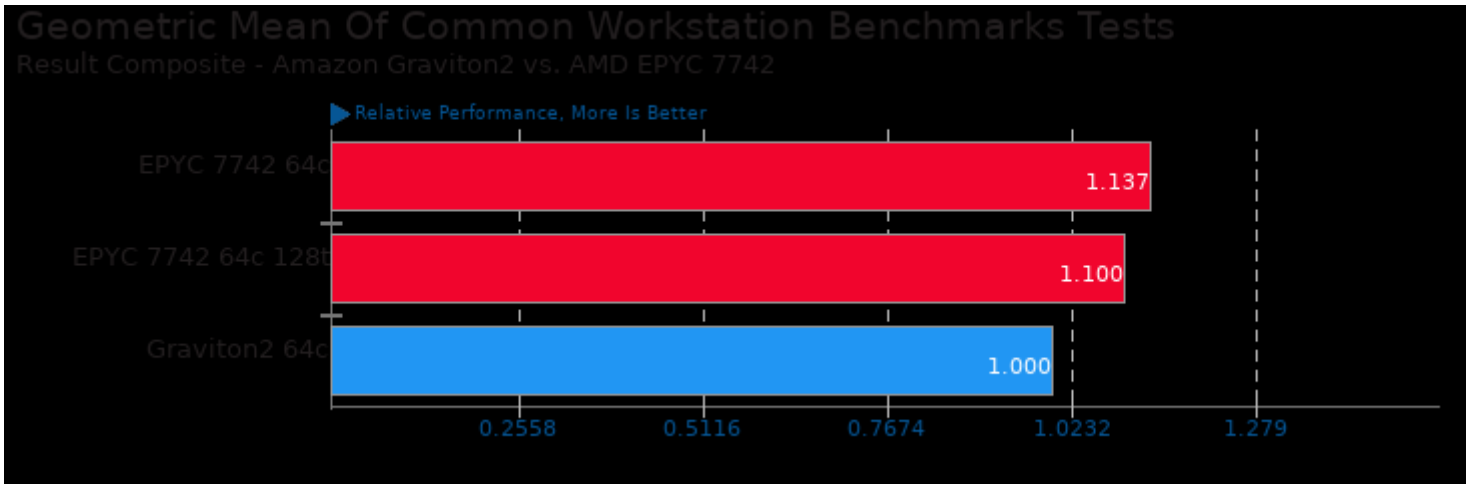
Geometric mean based upon tests: pts/blogbench, pts/ebizzy, pts/mysqlslap, pts/pgbench, pts/redis, pts/cassandra, pts/node-express-loadtest, pts/openssl and pts/perl-benchmark

Geometric mean based upon tests: pts/node-express-loadtest, pts/swet, pts/node-octane, pts/encode-flac, pts/encode-mp3, pts/minion, pts/perl-benchmark, pts/tjbench, pts/redis and pts/optcarrot



Geometric mean based upon tests: pts/x264, pts/vpxenc, pts/dav1d and pts/rav1e

Amazon Graviton2 vs. AMD EPYC 7742



Geometric mean based upon tests: pts/rodinia, pts/parboil, pts/himeno and pts/swet

This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 21:56.