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GCC 8.1 vs. GCC 7.3 Compiler Benchmarking Intel/AMD x86_64

GCC 8 compiler benchmarks on Linux 64-bit for a future article on Phoronix.

Automated Executive Summary

GCC 7.3.0: Core i7 8700K had the most wins, coming in first place for 50% of the tests.

Based on the geometric mean of all complete results, the fastest (GCC 7.3.0: Core i7 8700K) was 1.466x the speed of the slowest (GCC 7.3.0: EPYC 7601). GCC 8.1.0: Core i7 8700K was 0.994x the speed of GCC 7.3.0: Core i7 8700K, GCC 7.3.0: Core i9 7980XE was 0.885x the speed of GCC 8.1.0: Core i7 8700K, GCC 8.1.0: Core i9 7980XE was 1.068x the speed of GCC 7.3.0: Core i9 7980XE, GCC 7.3.0: 2 Xeon Gold 6138 was 0.848x the speed of GCC 8.1.0: Core i9 7980XE, GCC 8.1.0: 2 Xeon Gold 6138 was 1.034x the speed of GCC 7.3.0: 2 Xeon Gold 6138, GCC 7.3.0: Ryzen 7 2700X was 1.003x the speed of GCC 8.1.0: 2 Xeon Gold 6138, GCC 8.1.0: Ryzen 7 2700X was 1.038x the speed of GCC 7.3.0: Ryzen 7 2700X, GCC 7.3.0: EPYC 7601 was 0.796x the speed of GCC 8.1.0: Ryzen 7 2700X, GCC 8.1.0: EPYC 7601 was 1.047x the speed of GCC 7.3.0: EPYC 7601.

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

SciMark (Computational Test: Monte Carlo) at 4.881x
C-Ray (Total Time) at 4.12x
Himeno Benchmark (Poisson Pressure Solver) at 3.44x
SciMark (Computational Test: Fast Fourier Transform) at 3.199x

Timed HMMer Search (Pfam Database Search) at 3.102x
Timed Linux Kernel Compilation (Time To Compile) at 2.733x
Redis (Test: LPUSH) at 2.245x
Redis (Test: SADD) at 2.147x
SciMark (Computational Test: Dense LU Matrix Factorization) at 2.113x
Redis (Test: SET) at 2.022x.

Test Systems:

GCC 7.3.0: Core i7 8700K

Processor: Intel Core i7-8700K @ 4.70GHz (6 Cores / 12 Threads), Motherboard: ASUS PRIME Z370-A (0607 BIOS), Chipset: Intel Device 3ec2, Memory: 16384MB, Disk: 118GB INTEL SSDPEK1W120GA, Graphics: AMD Radeon RX Vega 8176MB, Audio: Realtek ALC1220, Monitor: DELL P2415Q, Network: Intel Connection

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: amdgpu 18.0.1, OpenGL: 4.5 Mesa 18.0.0-rc5 (LLVM 6.0.0), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

GCC 8.1.0: Core i7 8700K

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Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

GCC 7.3.0: Core i9 7980XE

Processor: Intel Core i9-7980XE @ 4.40GHz (18 Cores / 36 Threads), Motherboard: ASUS PRIME X299-A (1004 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 16384MB, Disk: 256GB INTEL SSDPEKKW256G8, Graphics: NV134 8192MB, Audio: Realtek ALC1220, Monitor: Acer B286HK, Network: Intel Connection

OS: Ubuntu 18.04, Kernel: 4.16.2-041602-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, OpenGL: 4.3 Mesa 18.0.0-rc5, Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

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OS: Ubuntu 18.04, Kernel: 4.16.2-041602-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, OpenGL: 4.3 Mesa 18.0.0-rc5, Compiler: GCC 8.1.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

GCC 7.3.0: 2 Xeon Gold 6138

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.00 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: 256GB Samsung SSD 850 + 2000GB Seagate ST2000DM006-2DM1 + 2 x 120GB TOSHIBA-TR150, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

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OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, Compiler: GCC 8.1.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline Protection

GCC 7.3.0: Ryzen 7 2700X

Processor: AMD Ryzen 7 2700X Eight-Core @ 3.70GHz (8 Cores / 16 Threads), Motherboard: ASUS ROG CROSSHAIR VII HERO (WI-FI) (0509 BIOS), Chipset: AMD Family 17h, Memory: 8192MB, Disk: Samsung SSD 950 PRO 256GB, Graphics: MSI AMD Radeon RX 580 8192MB, Audio: AMD Ellesmere, Monitor: Acer B286HK, Network: Intel I211 Gigabit Connection + Realtek Device b822

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, OpenGL: 4.5 Mesa 18.0.0-rc5 (LLVM 6.0.0), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB Protection

GCC 8.1.0: Ryzen 7 2700X

Processor: AMD Ryzen 7 2700X Eight-Core @ 3.70GHz (8 Cores / 16 Threads), Motherboard: ASUS ROG CROSSHAIR VII HERO (WI-FI) (0509 BIOS), Chipset: AMD Family 17h, Memory: 8192MB, Disk: Samsung SSD 950 PRO 256GB, Graphics: MSI AMD Radeon RX 580 8192MB, Audio: AMD Ellesmere, Monitor: Acer B286HK, Network: Intel I211 Gigabit Connection + Realtek Device b822

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, OpenGL: 4.5 Mesa 18.0.0-rc5 (LLVM 6.0.0), Compiler: GCC 8.1.0, File-System: ext4, Screen Resolution: 3840x2160

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB Protection

GCC 7.3.0: EPYC 7601

Processor: AMD EPYC 7601 32-Core @ 2.20GHz (32 Cores / 64 Threads), Motherboard: TYAN B8026T70AE24HR (V0.05.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom Limited NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1024x768

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Security Notes: __user pointer sanitization + Full AMD retpoline Protection

GCC 8.1.0: EPYC 7601

Processor: AMD EPYC 7601 32-Core @ 2.20GHz (32 Cores / 64 Threads), Motherboard: TYAN B8026T70AE24HR (V0.05.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom Limited NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.04, Kernel: 4.15.0-20-generic (x86_64), Desktop: GNOME Shell 3.28.1, Display Driver: modesetting 1.19.6, Compiler: GCC 8.1.0, File-System: ext4, Screen Resolution: 1024x768

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Security Notes: __user pointer sanitization + Full AMD retpoline Protection

GCC 8.1 vs. GCC 7.3 Compiler Benchmarking Intel/AMD x86_64

	GCC 7.3.0: Core i7 8700K	GCC 8.1.0: Core i7 8700K	GCC 7.3.0: Core i9 7980XE	GCC 8.1.0: Core i9 7980XE	GCC 7.3.0: 2 Xeon Gold 6138	GCC 8.1.0: 2 Xeon Gold 6138	GCC 7.3.0: Ryzen 7 2700X	GCC 8.1.0: Ryzen 7 2700X	GCC 7.3.0: EPYC 7601	GCC 8.1.0: EPYC 7601
GNU MPC - M.P.B (Global Score)	10967	11000	9250	9937	8413	8797	8267	8293	6153	6133
Normalized	99.7%	100%	84.09%	90.34%	76.48%	79.97%	75.15%	75.39%	55.94%	55.75%
Standard Deviation	0.5%		0.5%	0.7%	0.1%	0.2%	0.1%	0.5%	0.2%	0.6%
GraphicsMagick - Blur	214	206	174	189	151	157	196	196	153	153
Normalized	100%	96.26%	81.31%	88.32%	70.56%	73.36%	91.59%	91.59%	71.5%	71.5%
Standard Deviation		0.3%				0.7%	0.3%			
GraphicsMagick - Sharpen (Iterations/min)	201	182	194	207	187	192	211	211	187	188
Normalized	95.26%	86.26%	91.94%	98.1%	88.63%	91%	100%	100%	88.63%	89.1%
Standard Deviation				0.3%					0.3%	
GraphicsMagick - Resizing (Iterations/min)	266	262	217	243	177	188	245	259	182	185
Normalized	100%	98.5%	81.58%	91.35%	66.54%	70.68%	92.11%	97.37%	68.42%	69.55%
Standard Deviation				1.2%		0.3%	14.8%		1%	1.1%
GraphicsMagick - HWB Color Space (Iterations/min)	289	282	225	249	207	219	274	273	208	207
Normalized	100%	97.58%	77.85%	86.16%	71.63%	75.78%	94.81%	94.46%	71.97%	71.63%
Standard Deviation		0.4%					0.2%	0.2%		
GraphicsMagick - L.A.T	120	120	100	106	89	94	151	150	111	110
Normalized	79.47%	79.47%	66.23%	70.2%	58.94%	62.25%	100%	99.34%	73.51%	72.85%
Standard Deviation		1%		0.5%				0.4%		
Fhourstones - C.C.4.S (Kpos / sec)	15660	16094	14097	14675	12642	13179	13508	13887	10394	10636
Normalized	97.31%	100%	87.59%	91.18%	78.55%	81.89%	83.93%	86.29%	64.58%	66.09%
Standard Deviation	0.1%	1.6%	0.2%	0.6%	0.2%	0.8%	1.3%	0.2%	0.3%	1%
SciMark - Composite (Mflops)	3498	3378	2668	2656	2096	2127	2551	2521	1858	1930
Normalized	100%	96.58%	76.27%	75.92%	59.91%	60.79%	72.92%	72.08%	53.12%	55.16%
Standard Deviation	1.4%	2.2%	0.4%	0.3%	0.7%	0.1%	2.4%	1.2%	0.4%	1.3%
SciMark - Monte Carlo (Mflops)	955.04	866.83	842.58	798.95	746.19	687.49	265.26	746.93	195.68	556.36
Normalized	100%	90.76%	88.22%	83.66%	78.13%	71.99%	27.77%	78.21%	20.49%	58.26%
Standard Deviation	0.2%	5.7%	6.5%	0%	5.5%	2%	0.5%	0.2%	0%	0%
SciMark - F.F.T (Mflops)	644.97	632.75	699.07	715.32	620.75	603.14	290.95	289.55	223.59	223.94
Normalized	90.17%	88.46%	97.73%	100%	86.78%	84.32%	40.67%	40.48%	31.26%	31.31%
Standard Deviation	1%	0.2%	0.6%	3.1%	0.5%	0.2%	0.1%	0.2%	0%	0.3%
SciMark - S.M.M (Mflops)	3571	3694	3001	3398	2479	2552	3063	2975	2400	2462
Normalized	96.68%	100%	81.26%	92.01%	67.11%	69.1%	82.92%	80.54%	64.98%	66.65%
Standard Deviation	0.4%	0.1%	0%	0.2%	1%	0.6%	0.6%	8.8%	0.7%	0.8%

GCC 8.1 vs. GCC 7.3 Compiler Benchmarking Intel/AMD x86_64

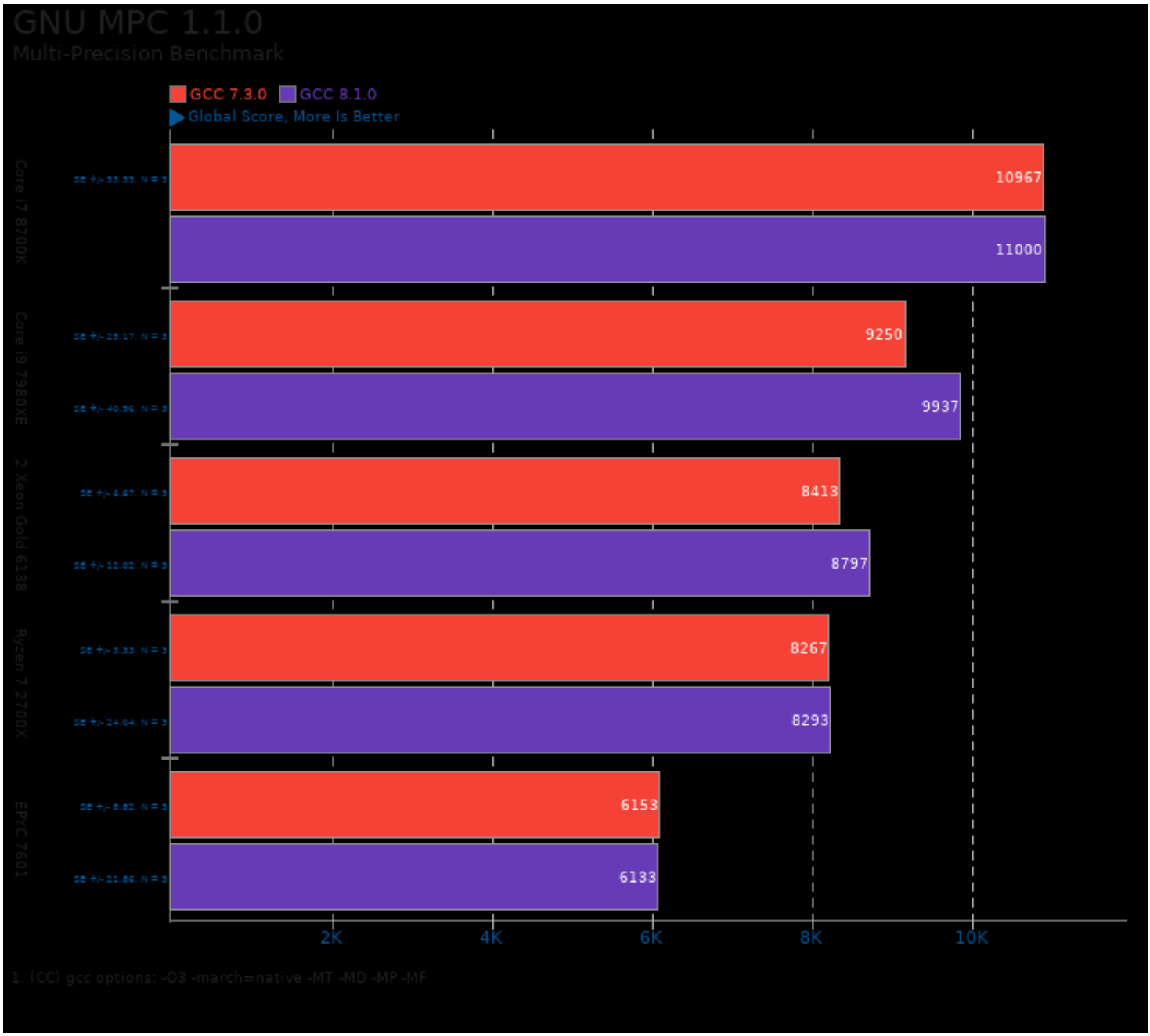
SciMark - D.L.M.F (Mflops)	9969	9355	6680	6250	4770	4927	6844	6304	4784	4719
Normalized	100%	93.84%	67.01%	62.69%	47.84%	49.42%	68.65%	63.24%	47.98%	47.34%
Standard Deviation	2.3%	4.4%	0.2%	0.2%	1.4%	0.1%	4.9%	2.2%	1.1%	3%
SciMark - J.S.O.R (Mflops)	2351	2344	2118	2116	1863	1864	2293	2292	1688	1687
Normalized	100%	99.69%	90.07%	90.01%	79.24%	79.27%	97.5%	97.46%	71.78%	71.76%
Standard Deviation	0.4%	0.6%	0.1%	0.1%	0.1%	0.1%	0.3%	0.4%	0%	0.1%
Himeno Benchmark - P.P.S (MFLOPS)	3302	3321	2721	3048	2608	2690	1289	1318	965.46	1000
Normalized	99.42%	100%	81.94%	91.77%	78.53%	81%	38.81%	39.68%	29.07%	30.13%
Standard Deviation	1.5%	0.2%	1.3%	1.1%	0%	0.6%	0.6%	0.4%	0.4%	0.4%
TSCP - A.C.P (Nodes/s)	1540210	1486216	1398624	1366694	1237148	1204151	1170873	1159047	861938	851545
Normalized	100%	96.49%	90.81%	88.73%	80.32%	78.18%	76.02%	75.25%	55.96%	55.29%
Standard Deviation	0.2%	0.6%	0.1%		0.1%	0.1%	0.1%	0.2%	0.1%	0.2%
ebizzy (Records/s)	382364	398816	655119	567977	909627	974557	580254	552150	1111609	1109200
Normalized	34.4%	35.88%	58.93%	51.1%	81.83%	87.67%	52.2%	49.67%	100%	99.78%
Standard Deviation	6.7%	2.2%	4.9%	9.4%	2.2%	3.1%	6%	6.7%	8.1%	3.4%
Redis - LPOP (Reqs/sec)	3851756	3630625	2834090	2924083	2168657	2309795	2796051	3035777	1702037	1731145
Normalized	100%	94.26%	73.58%	75.92%	56.3%	59.97%	72.59%	78.82%	44.19%	44.94%
Standard Deviation	1.6%	8.3%	2.6%	7.7%	10.4%	11.5%	0.9%	7.2%	1.9%	0.6%
Redis - SADD (Reqs/sec)	3000024	2922042	2112444	2320715	1970081	1828245	2209198	2166162	1397463	1437759
Normalized	100%	97.4%	70.41%	77.36%	65.67%	60.94%	73.64%	72.2%	46.58%	47.92%
Standard Deviation	0.3%	2.2%	6%	1.9%	3.5%	9.2%	0.7%	0.8%	1.3%	1.7%
Redis - LPUSH (Reqs/sec)	2379477	2437201	1761252	1930905	1433138	1644579	1606362	1737364	1085511	1120554
Normalized	97.63%	100%	72.27%	79.23%	58.8%	67.48%	65.91%	71.29%	44.54%	45.98%
Standard Deviation	1.6%	1%	2.4%	3.1%	2.2%	6.8%	3.4%	1.5%	1.3%	3.2%
Redis - GET (Reqs/sec)	3654543	3637270	2583124	2783213	2099681	2165366	2824673	2748172	1626715	1703998
Normalized	100%	99.53%	70.68%	76.16%	57.45%	59.25%	77.29%	75.2%	44.51%	46.63%
Standard Deviation	1.4%	1.9%	7.4%	6.5%	11.6%	11%	7.1%	2.2%	2.5%	1.9%
Redis - SET (Reqs/sec)	2592122	2547839	1962969	2127760	1583093	1752110	1917057	1974990	1281816	1295531
Normalized	100%	98.29%	75.73%	82.09%	61.07%	67.59%	73.96%	76.19%	49.45%	49.98%
Standard Deviation	2.9%	2.6%	2.6%	3.6%	6.5%	8.8%	1%	0.2%	3.3%	1.5%
NGINX Benchmark - S.W.P.S	43358	43526	44189	44475	29550	29139	36698	35566	23721	23446
Normalized	97.49%	97.87%	99.36%	100%	66.44%	65.52%	82.51%	79.97%	53.34%	52.72%
Standard Deviation	0.8%	1%	1.3%	1.2%	0.4%	1.1%	0.4%	1.9%	0.5%	1.4%
Stockfish - Total Time (ms)	2630	2621	2946	2817	3313	3182	3369	3300	4891	4451
Normalized	99.66%	100%	88.97%	93.04%	79.11%	82.37%	77.8%	79.42%	53.59%	58.89%
Standard Deviation	0.6%	0.3%	0.1%	0.2%	0.3%	0.3%	0.3%	0.1%	6%	0.1%
Timed HMMer Search - P.D.S (sec)	5.09	4.20	10.31	10.82	12.27	13.03	6.29	6.37	7.23	7.71
Normalized	82.51%	100%	40.74%	38.82%	34.23%	32.23%	66.77%	65.93%	58.09%	54.47%
Standard Deviation	0.2%	0.1%	1.8%	0.4%	0.4%	1.1%	0.2%	0.4%	1.2%	0.2%

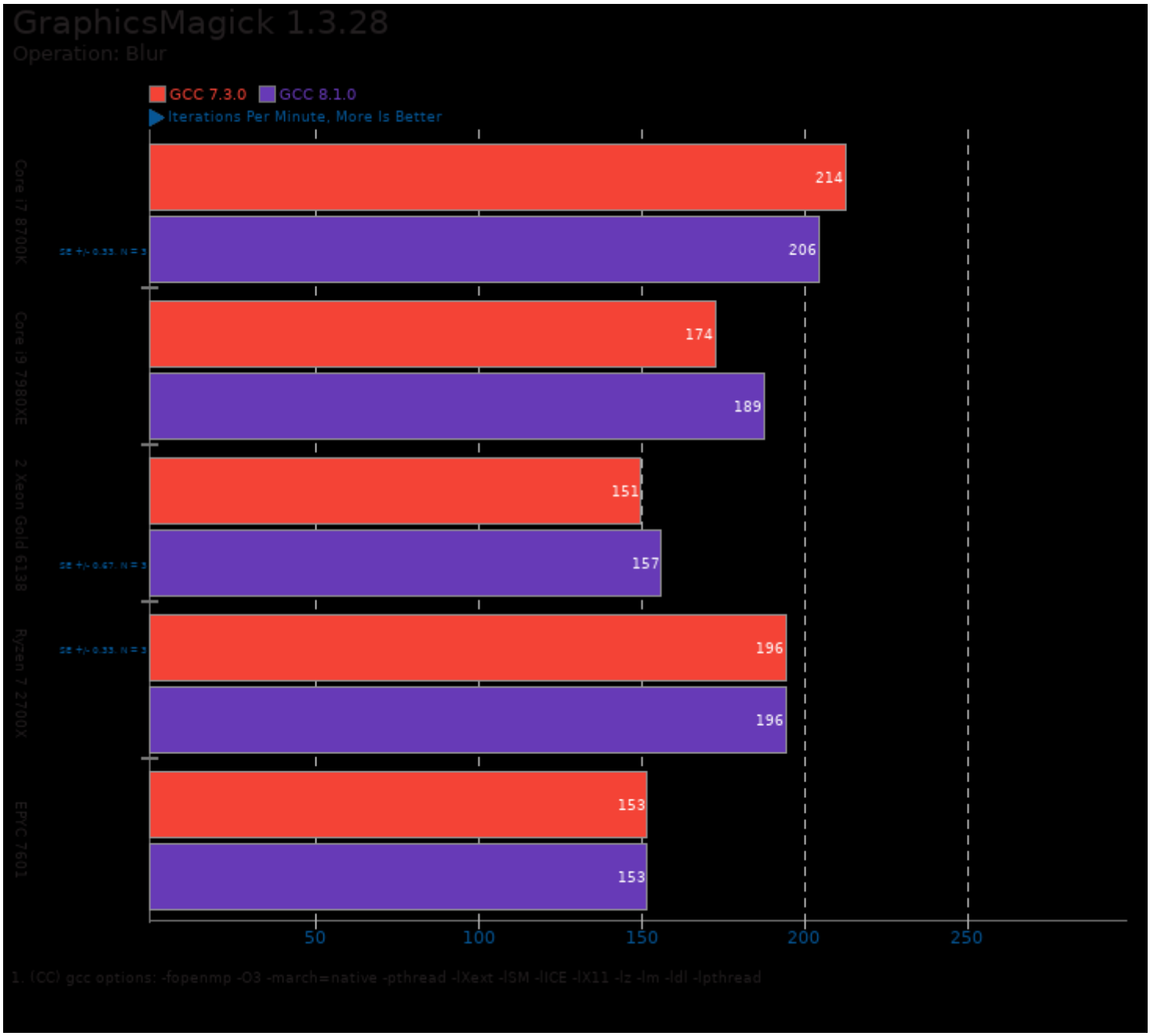
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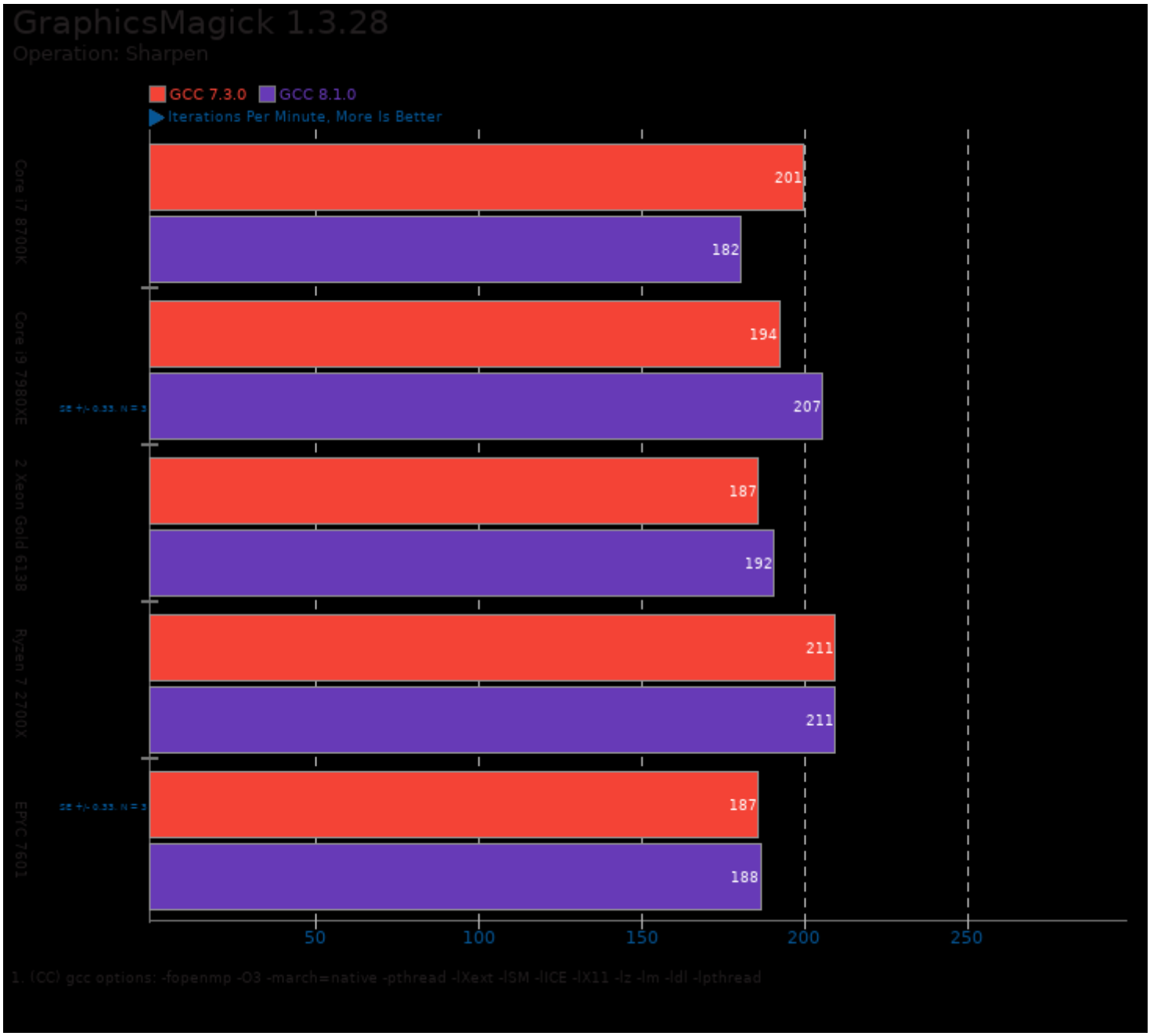
Timed Linux Kernel Compilation - Time To Compile (sec)	77.63	**81.53**	37.33	38.88	**29.83**	31.03	73.09	77.25	37.13	38.58
Normalized	38.43%	36.59%	79.91%	76.72%	100%	96.13%	40.81%	38.61%	80.34%	77.32%
Standard Deviation	1.8%	1.8%	3.9%	3.9%	6%	5.6%	2%	1.7%	4.5%	4.4%
Timed PHP Compilation - Time To Compile (sec)	55.08	56.56	**48.01**	49.64	51.80	53.73	62.14	66.81	65.45	**72.00**
Normalized	87.16%	84.88%	100%	96.72%	92.68%	89.35%	77.26%	71.86%	73.35%	66.68%
Standard Deviation	0.3%	0.8%	0.3%	0.4%	0.6%	0.6%	0.2%	1%	2.1%	1.7%
C-Ray - Total Time (sec)	9.58	8.57	5.44	5.87	6.30	**10.34**	7.79	6.64	2.92	**2.51**
Normalized	26.2%	29.29%	46.14%	42.76%	39.84%	24.27%	32.22%	37.8%	85.96%	100%
Standard Deviation	0.1%	0.6%	0.6%	1.2%	3%	9.5%	0.1%	0.3%	1.1%	0.7%
Smallpt - G.I.R.1.S (sec)	**11**	**11**	6	4	5	**3**	9	10	4	4
Normalized	27.27%	27.27%	50%	75%	60%	100%	33.33%	30%	75%	75%
Standard Deviation				11.9%			5.5%	5.8%	10.6%	15.6%
AOBench - 2048 x 2048 - Total Time (sec)	**32.30**	33.88	58.80	38.51	**61.88**	42.61	37.76	38.00	50.37	50.74
Normalized	100%	95.34%	54.93%	83.87%	52.2%	75.8%	85.54%	85%	64.13%	63.66%
Standard Deviation	0.3%	0.3%	0.3%	1.1%	1.6%	0.1%	0.8%	0.5%	0%	0%
Bullet Physics Engine - Raytests (sec)	**2.13**	2.19	2.66	2.47	2.80	2.81	2.50	2.32	**3.33**	3.09
Normalized	100%	97.26%	80.08%	86.23%	76.07%	75.8%	85.2%	91.81%	63.96%	68.93%
Standard Deviation	0.8%	1.6%	0.4%	0.6%	0.1%	0.3%	0.2%	0.8%	0.1%	0.1%
Bullet Physics Engine - 3000 Fall (sec)	**3.38**	3.39	4.18	3.79	4.57	4.37	3.82	3.75	**5.08**	5.00
Normalized	100%	99.71%	80.86%	89.18%	73.96%	77.35%	88.48%	90.13%	66.54%	67.6%
Standard Deviation	1.6%	0.5%	1%	0.1%	0.2%	0.7%	0.5%	0.2%	0%	0.1%
Bullet Physics Engine - 1000 Stack (sec)	**3.81**	3.82	4.74	4.26	5.13	4.87	4.43	4.31	**5.91**	5.74
Normalized	100%	99.74%	80.38%	89.44%	74.27%	78.23%	86%	88.4%	64.47%	66.38%
Standard Deviation	3.9%	0.7%	0.9%	0.1%	0.2%	0.4%	0.2%	0.9%	0.1%	0.3%
Bullet Physics Engine - 1000 Convex (sec)	3.70	**3.67**	4.55	4.06	4.86	4.63	4.77	3.99	**6.39**	5.34
Normalized	99.19%	100%	80.66%	90.39%	75.51%	79.27%	76.94%	91.98%	57.43%	68.73%
Standard Deviation	1.2%	0.4%	0.2%	0.2%	0.1%	0.2%	0.3%	1.1%	0.7%	0.1%
Bullet Physics Engine - 136 Ragdolls (sec)	**2.23**	**2.23**	2.68	2.44	2.88	2.76	2.28	2.29	**3.05**	**3.05**
Normalized	100%	100%	83.21%	91.39%	77.43%	80.8%	97.81%	97.38%	73.11%	73.11%
Standard Deviation	2.1%	1.7%	0.5%	1.9%	0.1%	0.5%	0.6%	0.7%	0.1%	0.2%

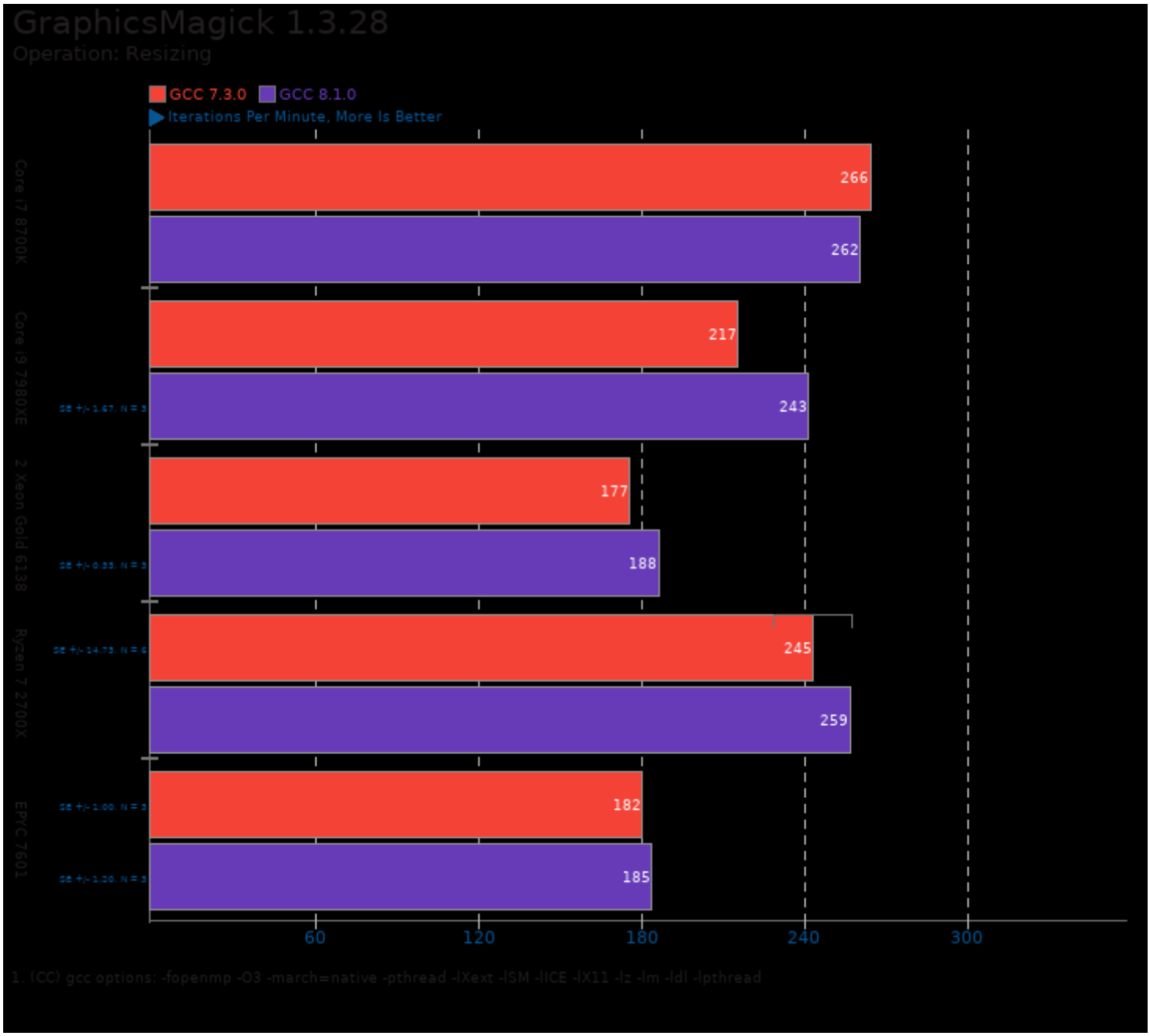
GCC 8.1 vs. GCC 7.3 Compiler Benchmarking Intel/AMD x86_64

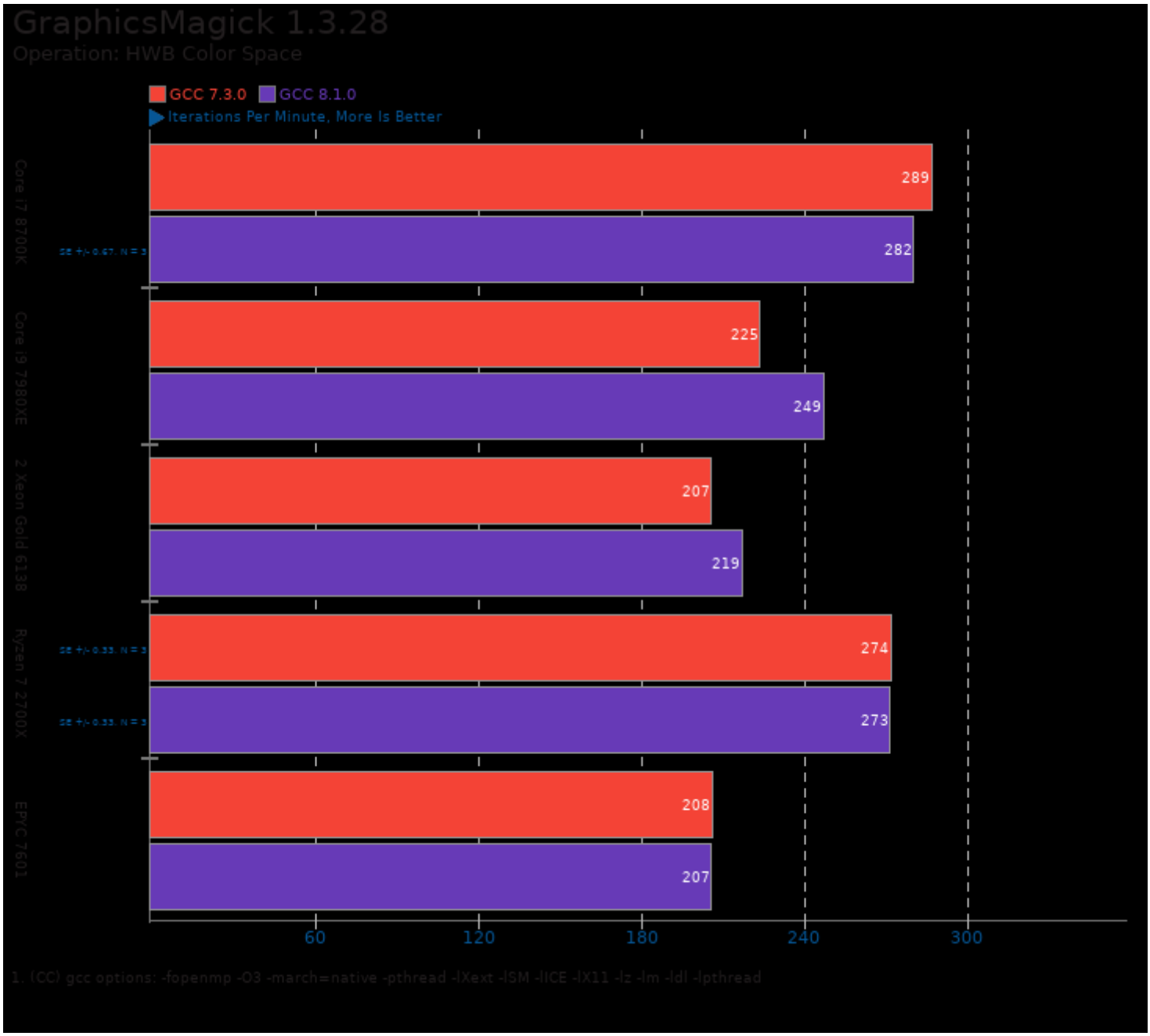
Bullet Physics Engine - Prim Trimesh (sec)	**0.79**	0.80	0.98	0.88	1.04	1.00	0.84	0.84	**1.12**	**1.12**
Normalized	100%	98.75%	80.61%	89.77%	75.96%	79%	94.05%	94.05%	70.54%	70.54%
Standard Deviation	1.4%	0.8%	0.8%	0.3%	0.4%	0.3%	0.2%	1.6%	0.1%	0.1%
Bullet Physics Engine - Convex Trimesh (sec)	**0.93**	0.96	1.15	1.03	1.23	1.25	1.10	0.99	**1.47**	1.32
Normalized	100%	96.88%	80.87%	90.29%	75.61%	74.4%	84.55%	93.94%	63.27%	70.45%
Standard Deviation	0.6%	1.5%	0.4%	0.3%	0.2%	4.2%	0.3%	0.3%	0.1%	0.1%
FLAC Audio Encoding - WAV To FLAC (sec)	7.81	**7.57**	10.11	8.94	10.21	9.44	9.28	9.54	12.26	**12.50**
Normalized	96.93%	100%	74.88%	84.68%	74.14%	80.19%	81.57%	79.35%	61.75%	60.56%
Standard Deviation	0.7%	1.4%	3.5%	0.9%	0.4%	0.7%	0.5%	3.2%	0.1%	0.9%
LAME MP3 Encoding - WAV To MP3 (sec)	8.08	7.97	11.13	9.93	11.14	10.07	8.39	**7.88**	**11.32**	10.60
Normalized	97.52%	98.87%	70.8%	79.36%	70.74%	78.25%	93.92%	100%	69.61%	74.34%
Standard Deviation	0.9%	1.6%	0%	1.4%	0.1%	0.2%	0.2%	0%	0.5%	0%

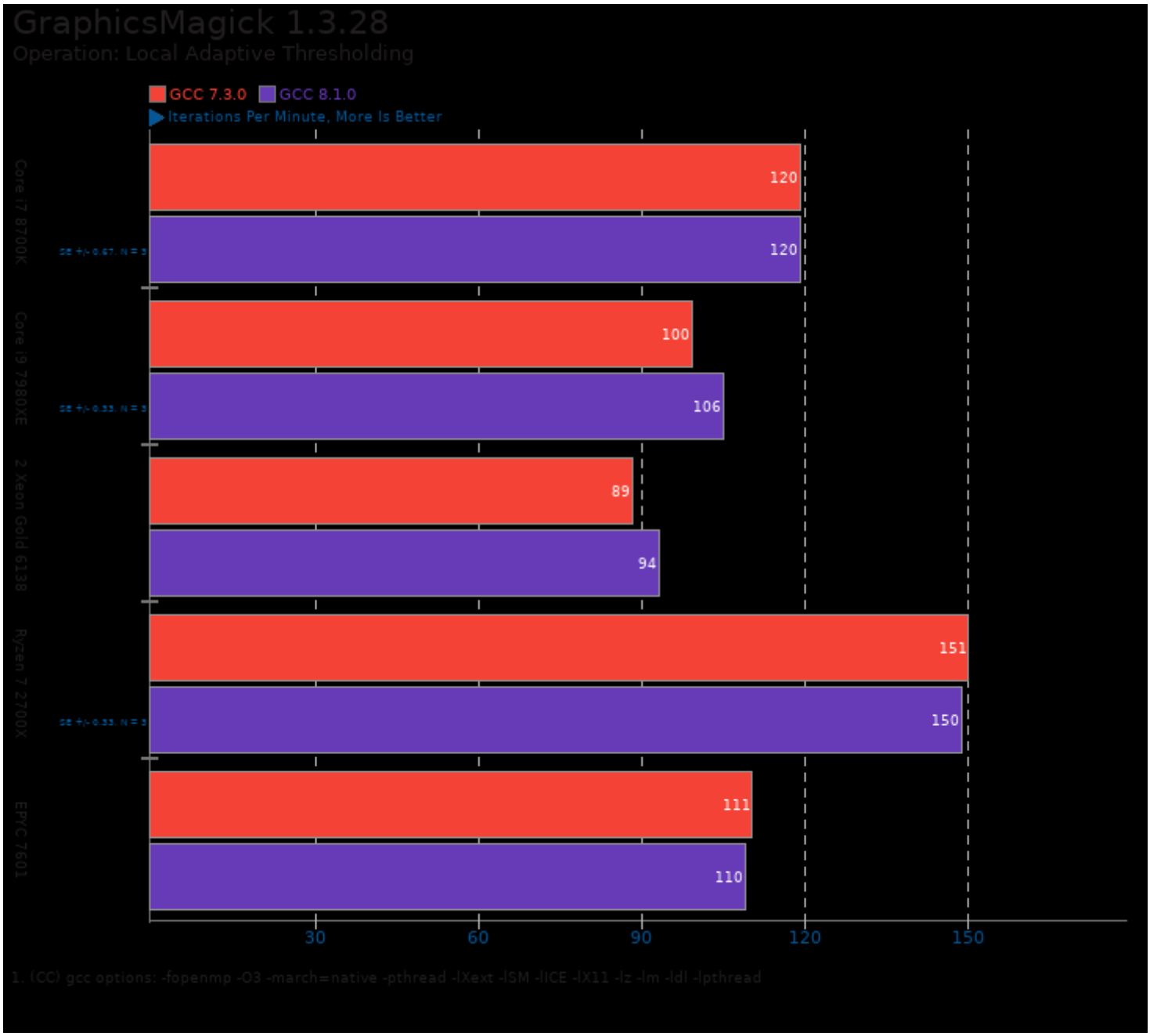

GNU MPC 1.1.0
Multi-Precision Benchmark
GCC 7.3.0
GCC 8.1.0
Global Score, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
10967
11000
9250
9937
8413
8797
8267
8293
6153
6133
2K
4K
6K
8K
10K
1. (CC) gcc options: -O3 -march=native -MT -MD -MP -MF

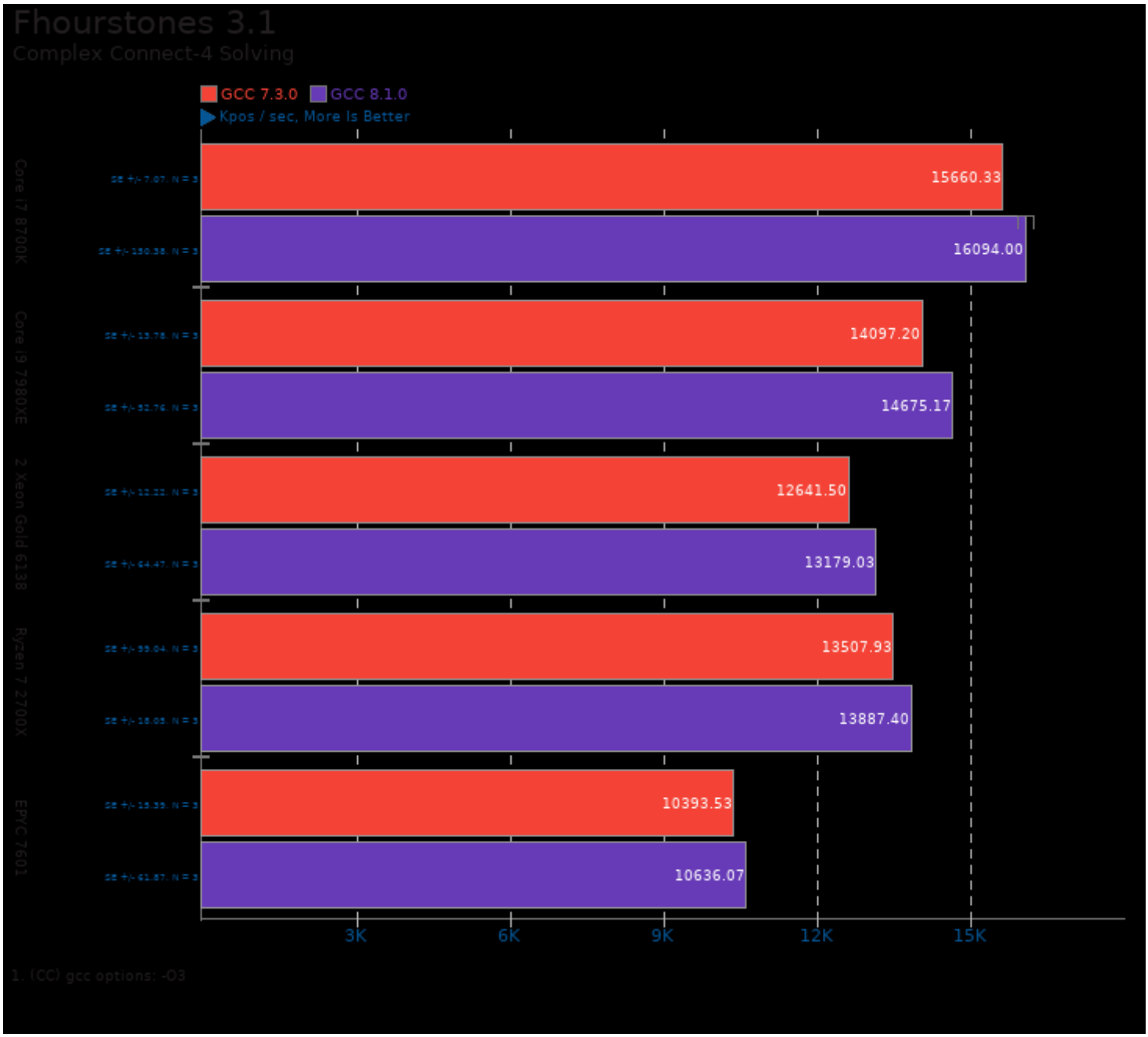

GraphicsMagick 1.3.28
Operation: Blur
GCC 7.3.0
GCC 8.1.0
Iterations Per Minute, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
214
206
174
189
151
157
196
196
153
153
50
100
150
200
250
1. (CC) gcc options: -fopenmp -O3 -march=native -pthread -lXext -lSM -lICE -lX11 -lz -lm -ldl -lpthread

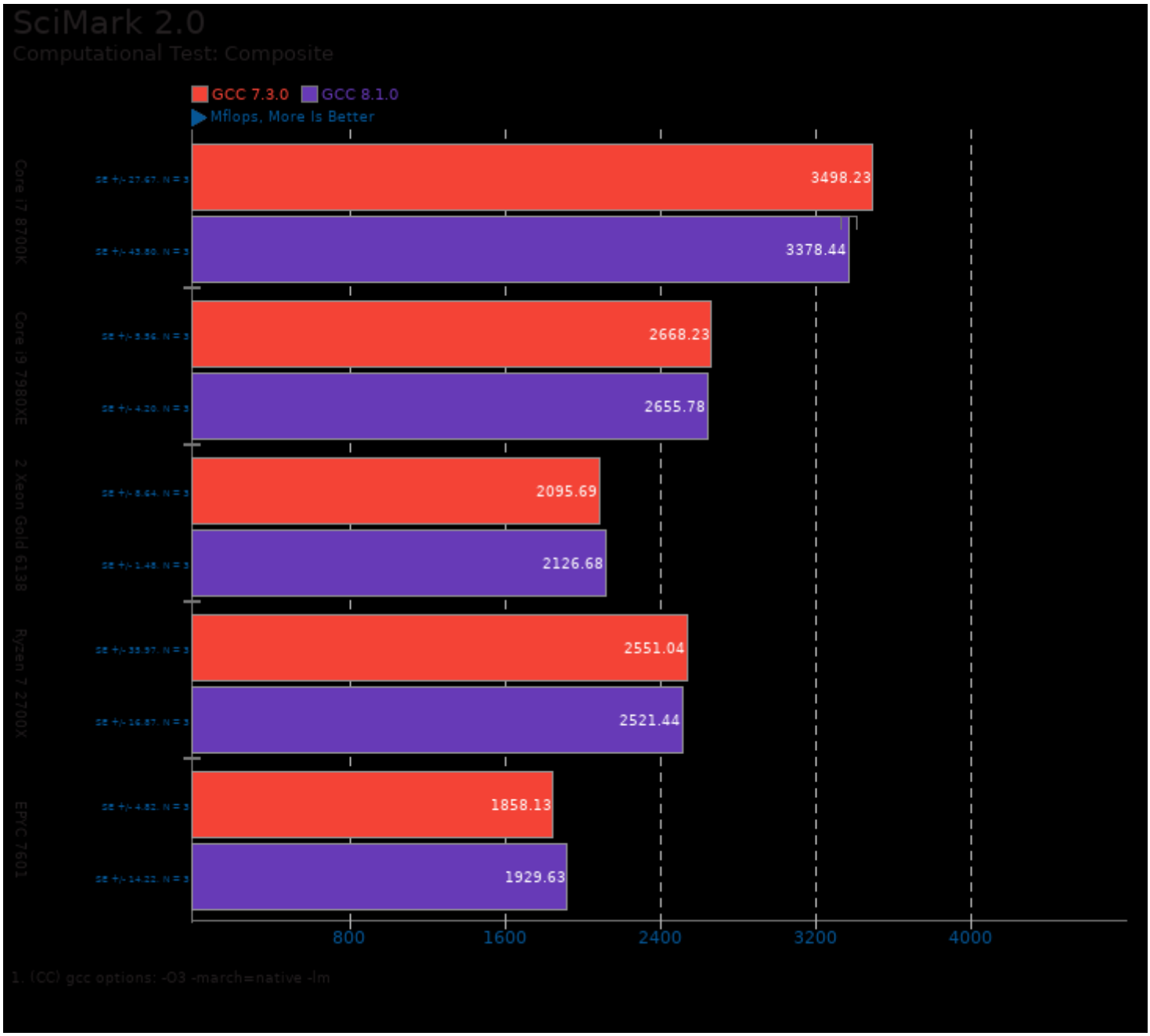

GraphicsMagick 1.3.28
Operation: Sharpen
GCC 7.3.0
GCC 8.1.0
Iterations Per Minute, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
201
182
194
207
187
192
211
211
187
188
50
100
150
200
250
1. (CC) gcc options: -fopenmp -O3 -march=native -pthread -lXext -lSM -lICE -lX11 -lz -lm -ldl -lpthread

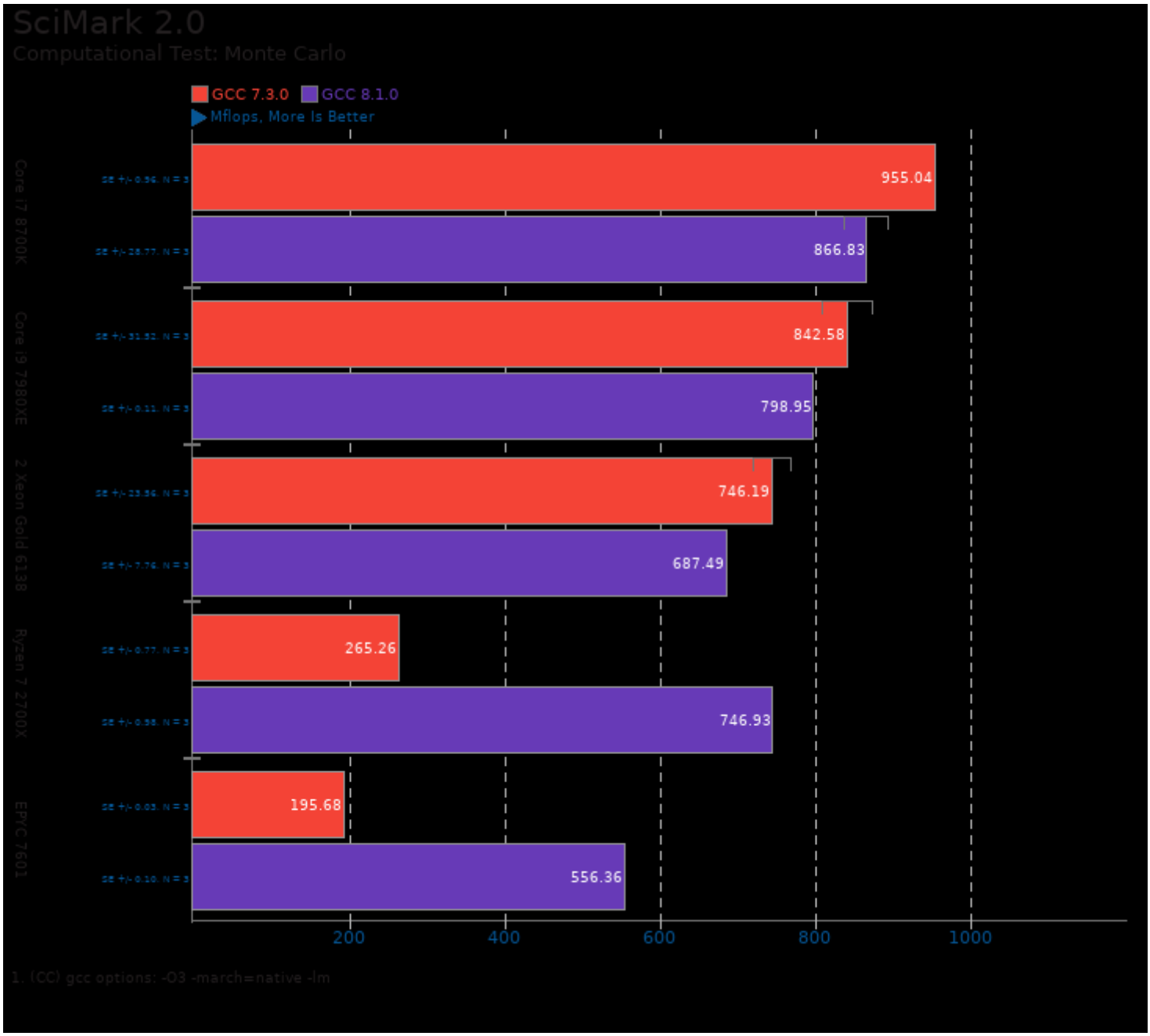

GraphicsMagick 1.3.28
Operation: Resizing
GCC 7.3.0
GCC 8.1.0
Iterations Per Minute, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
266
262
217
243
177
188
245
259
182
185
60
120
180
240
300
1. (CC) gcc options: -fopenmp -O3 -march=native -pthread -lXext -lSM -lICE -lX11 -lz -lm -ldl -lpthread

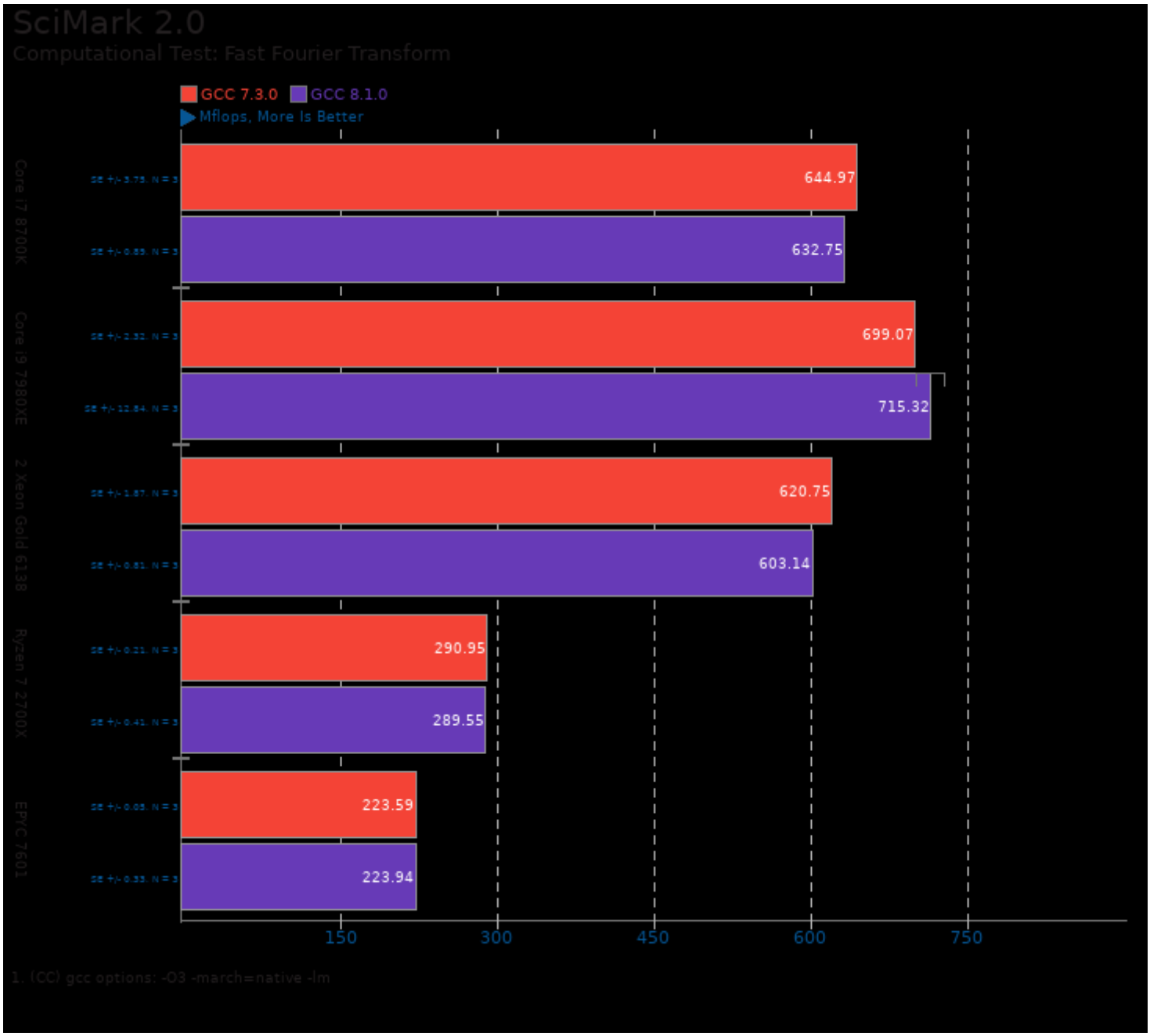

GraphicsMagick 1.3.28
Operation: HWB Color Space
GCC 7.3.0
GCC 8.1.0
Iterations Per Minute, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
289
282
225
249
207
219
274
273
208
207
60
120
180
240
300
1. (CC) gcc options: -fopenmp -O3 -march=native -pthread -lXext -lSM -lICE -lX11 -lz -lm -ldl -lpthread

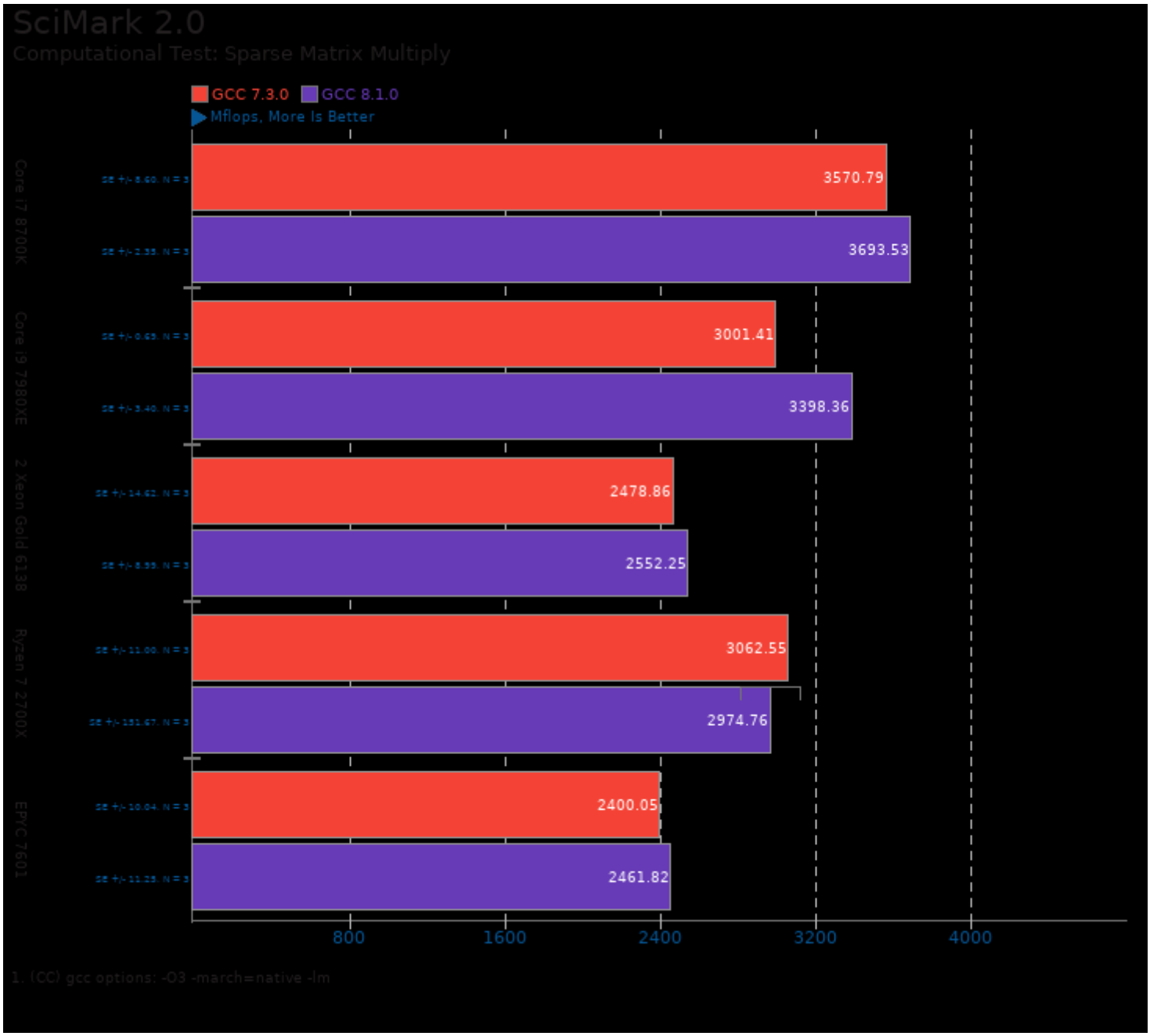

GraphicsMagick 1.3.28
Operation: Local Adaptive Thresholding
GCC 7.3.0
GCC 8.1.0
Iterations Per Minute, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
SE +/- 0.67, N = 3
SE +/- 0.33, N = 3
SE +/- 0.33, N = 3
120
120
100
106
89
94
151
150
111
110
30
60
90
120
150
1. (CC) gcc options: -fopenmp -O3 -march=native -pthread -lXext -lSM -lICE -lX11 -lz -lm -ldl -lpthread

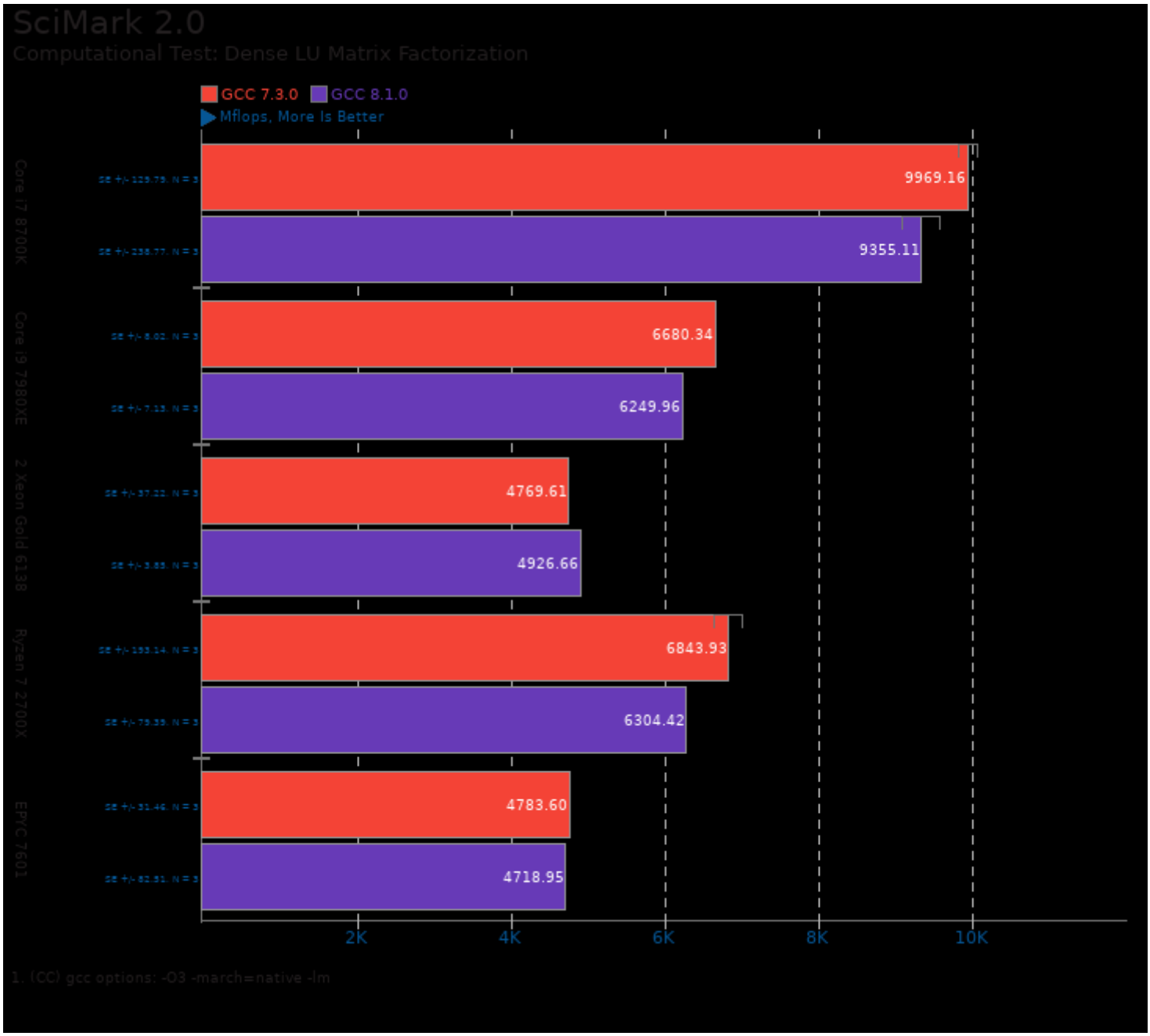

Fhourstones 3.1
Complex Connect-4 Solving
GCC 7.3.0
GCC 8.1.0
Kpos / sec, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
15660.33
16094.00
14097.20
14675.17
12641.50
13179.03
13507.93
13887.40
10393.53
10636.07
3K
6K
9K
12K
15K
1. (CC) gcc options: -O3

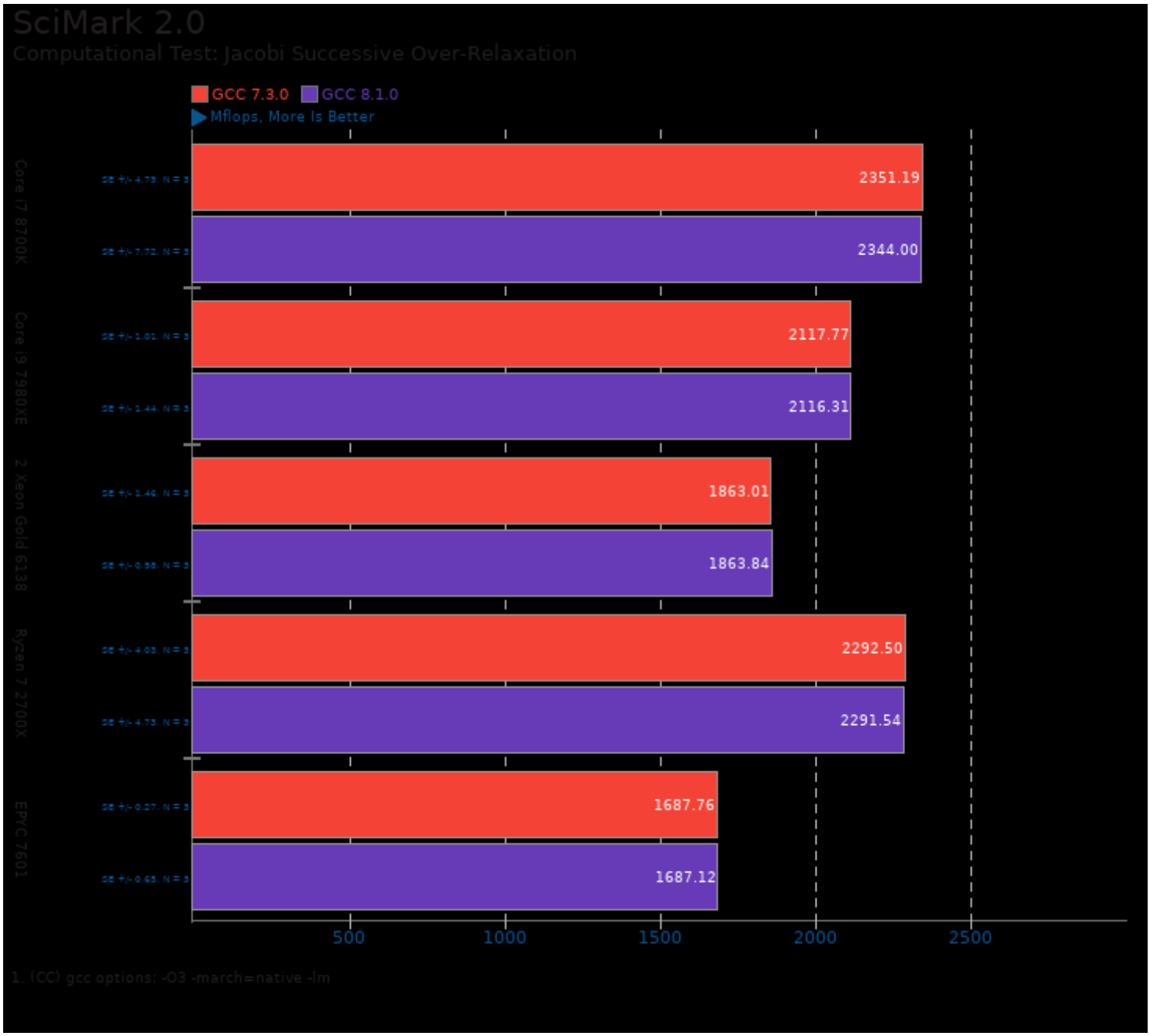

SciMark 2.0
Computational Test: Composite
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3498.23
3378.44
2668.23
2655.78
2095.69
2126.68
2551.04
2521.44
1858.13
1929.63
800
1600
2400
3200
4000
1. (CC) gcc options: -O3 -march=native -lm

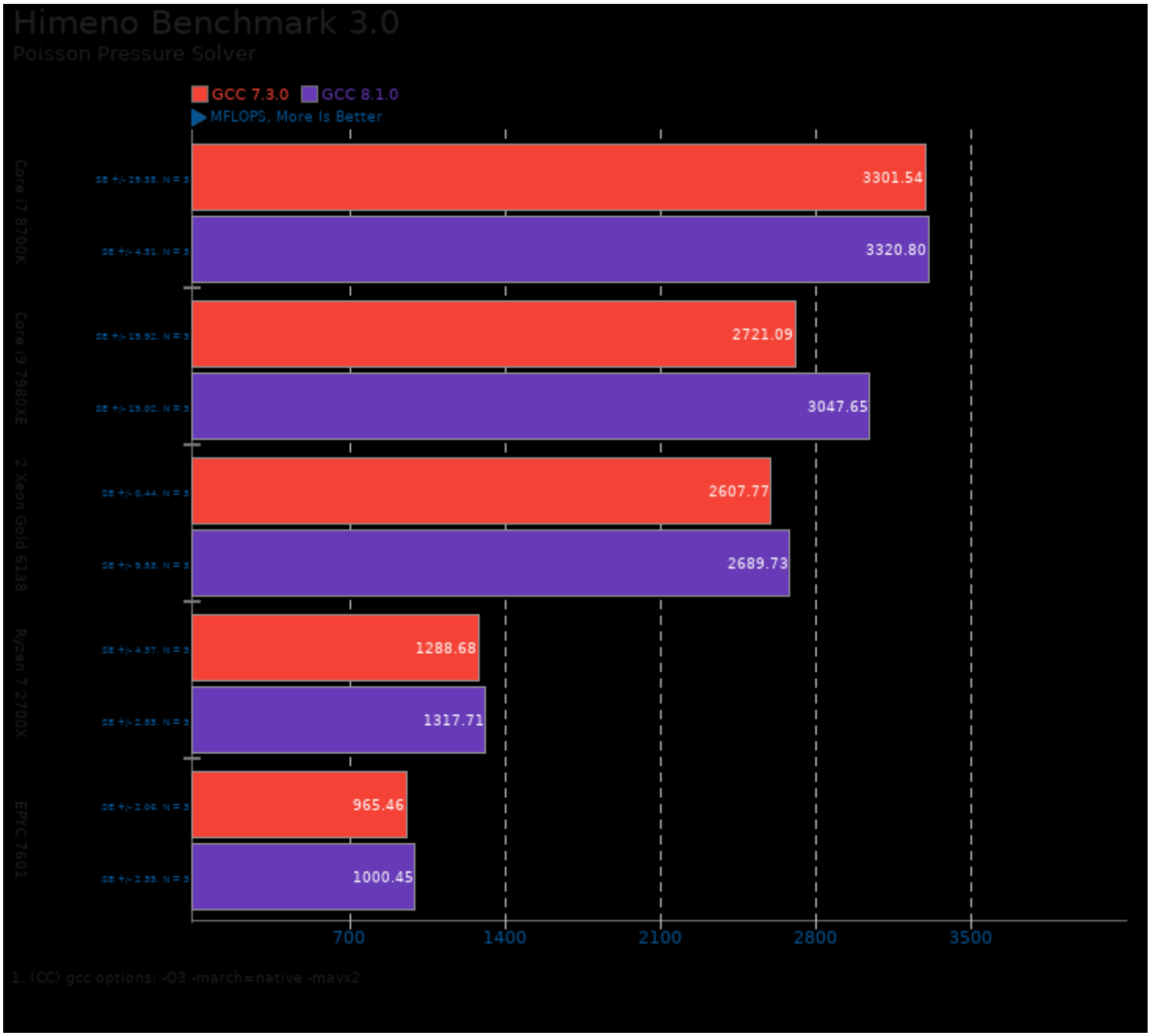

SciMark 2.0
Computational Test: Monte Carlo
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
955.04
866.83
842.58
798.95
746.19
687.49
265.26
746.93
195.68
556.36
200
400
600
800
1000
1. (CC) gcc options: -O3 -march=native -lm

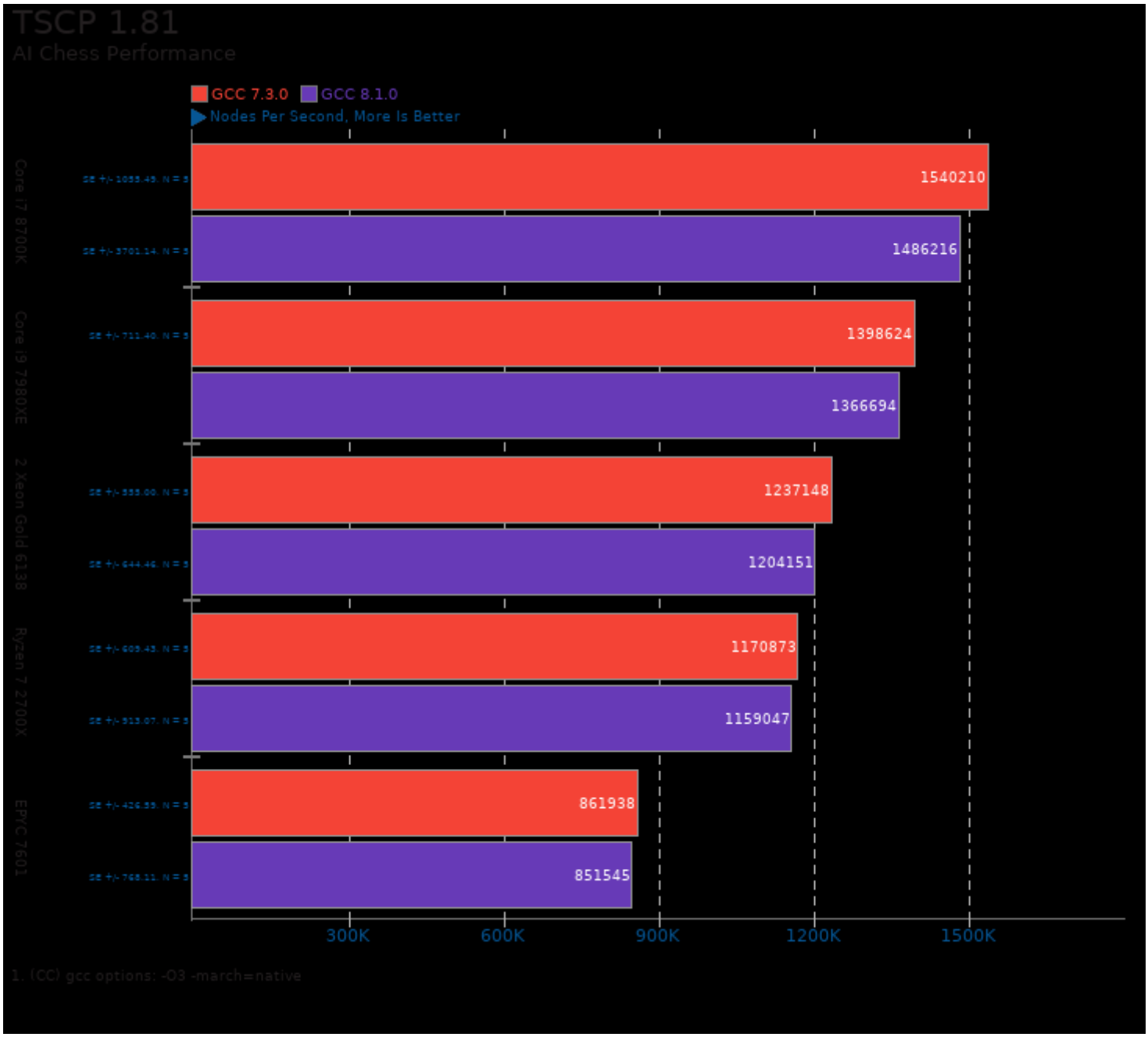

SciMark 2.0
Computational Test: Fast Fourier Transform
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
644.97
632.75
699.07
715.32
620.75
603.14
290.95
289.55
223.59
223.94
150
300
450
600
750
1. (CC) gcc options: -O3 -march=native -lm

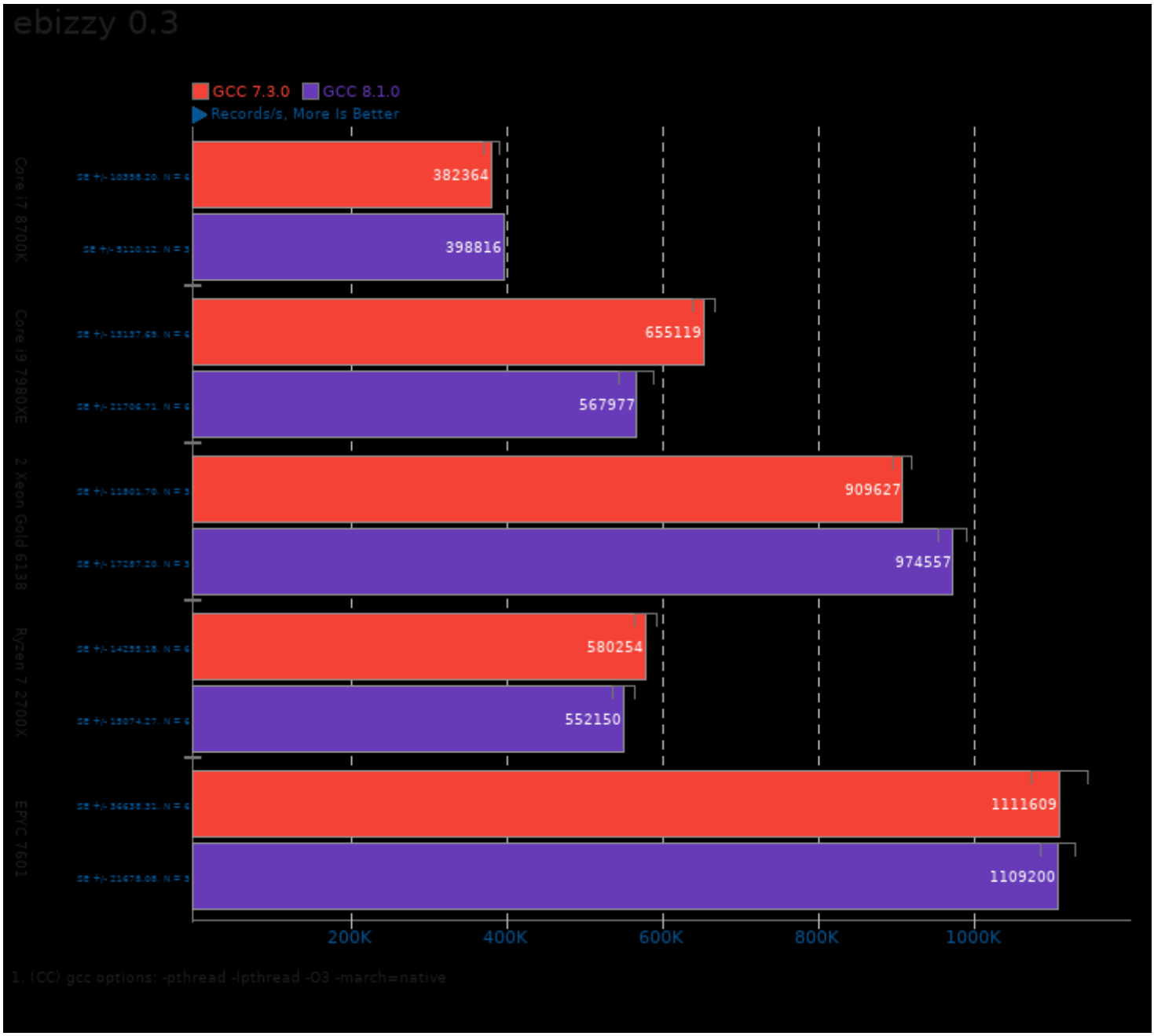

SciMark 2.0
Computational Test: Sparse Matrix Multiply
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3570.79
3693.53
3001.41
3398.36
2478.86
2552.25
3062.55
2974.76
2400.05
2461.82
800
1600
2400
3200
4000
1. (CC) gcc options: -O3 -march=native -lm

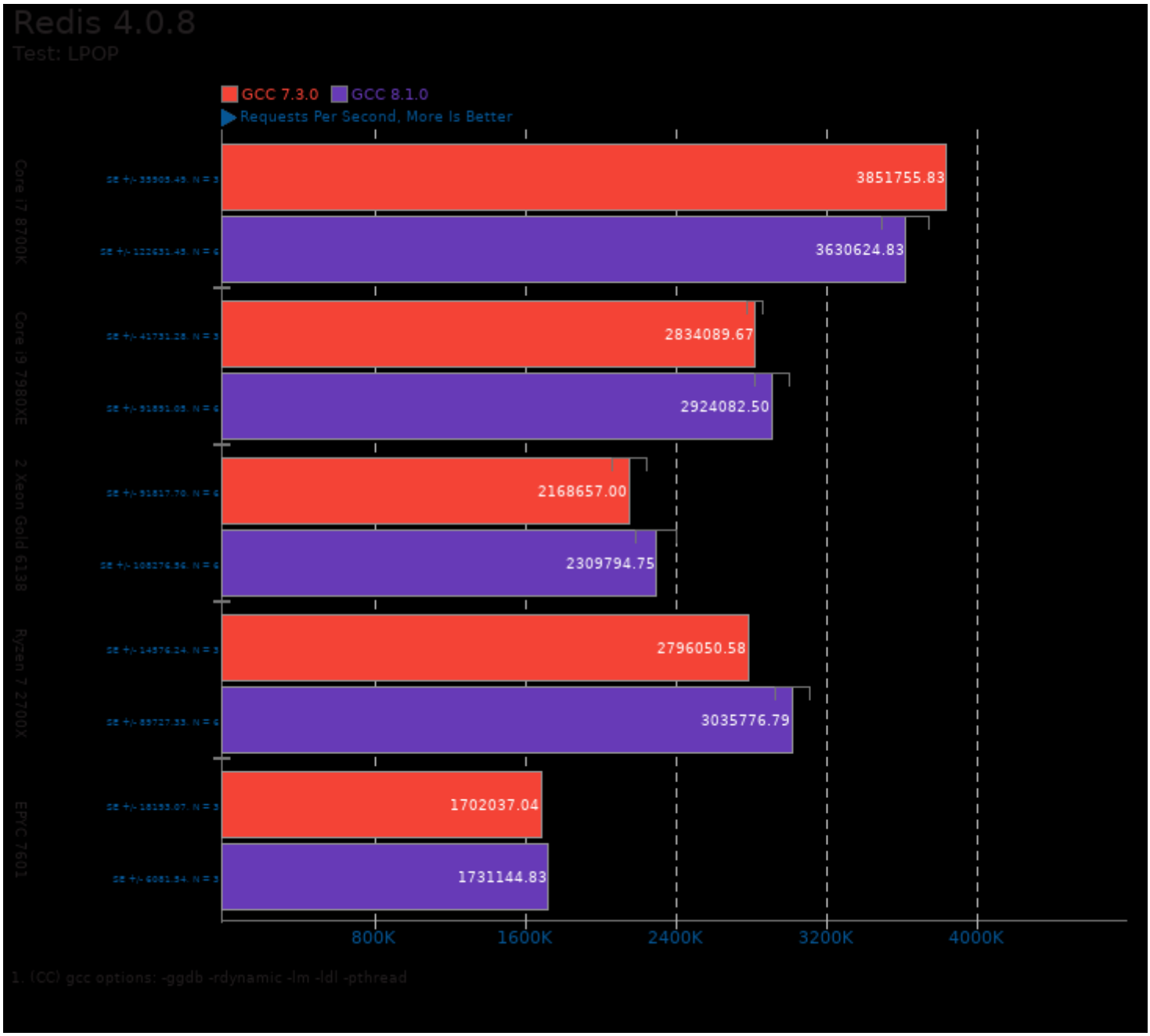

SciMark 2.0
Computational Test: Dense LU Matrix Factorization
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
9969.16
9355.11
6680.34
6249.96
4769.61
4926.66
6843.93
6304.42
4783.60
4718.95
2K
4K
6K
8K
10K
1. (CC) gcc options: -O3 -march=native -lm

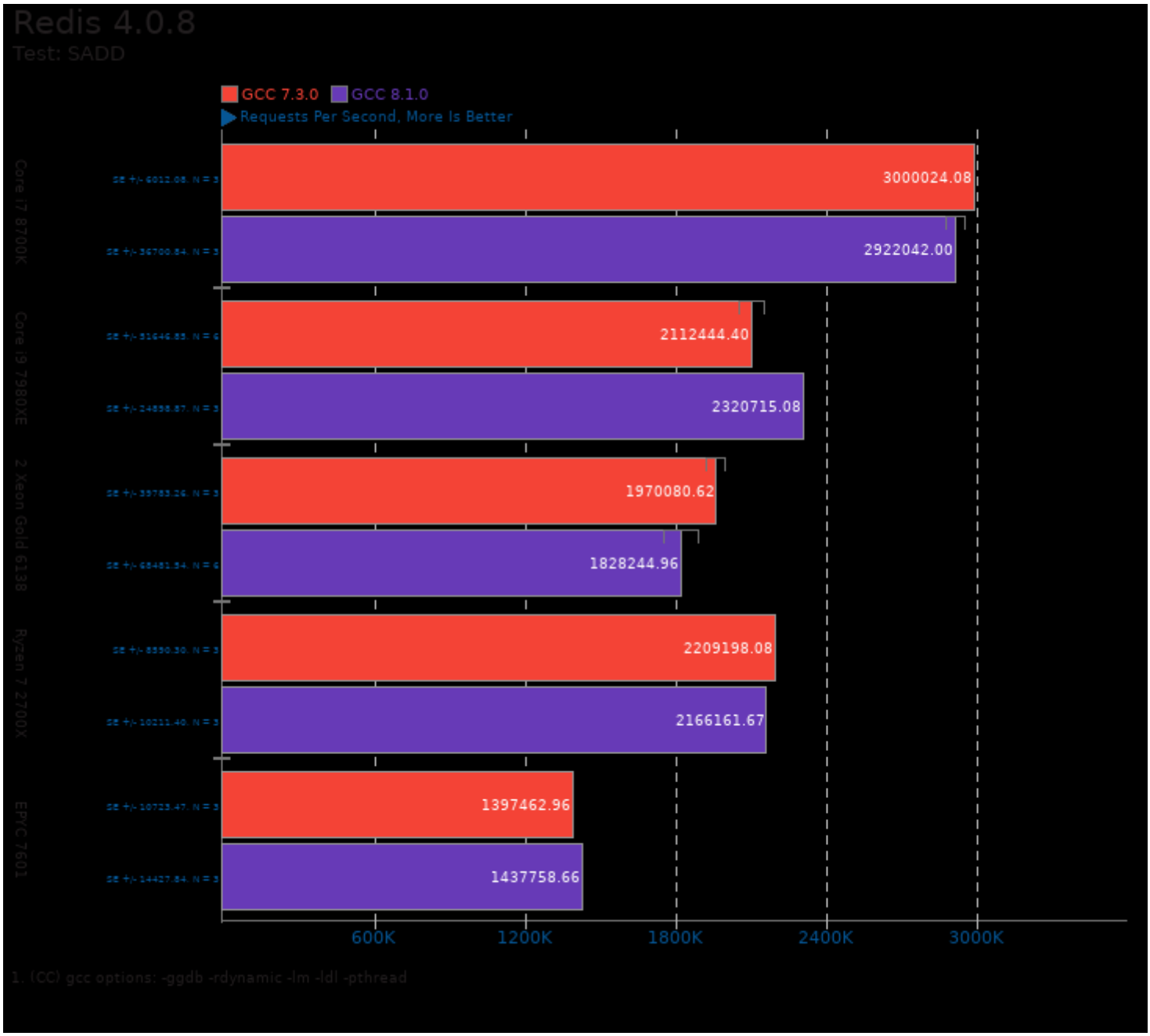

SciMark 2.0
Computational Test: Jacobi Successive Over-Relaxation
GCC 7.3.0
GCC 8.1.0
Mflops, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2351.19
2344.00
2117.77
2116.31
1863.01
1863.84
2292.50
2291.54
1687.76
1687.12
500
1000
1500
2000
2500
1. (CC) gcc options: -O3 -march=native -lm

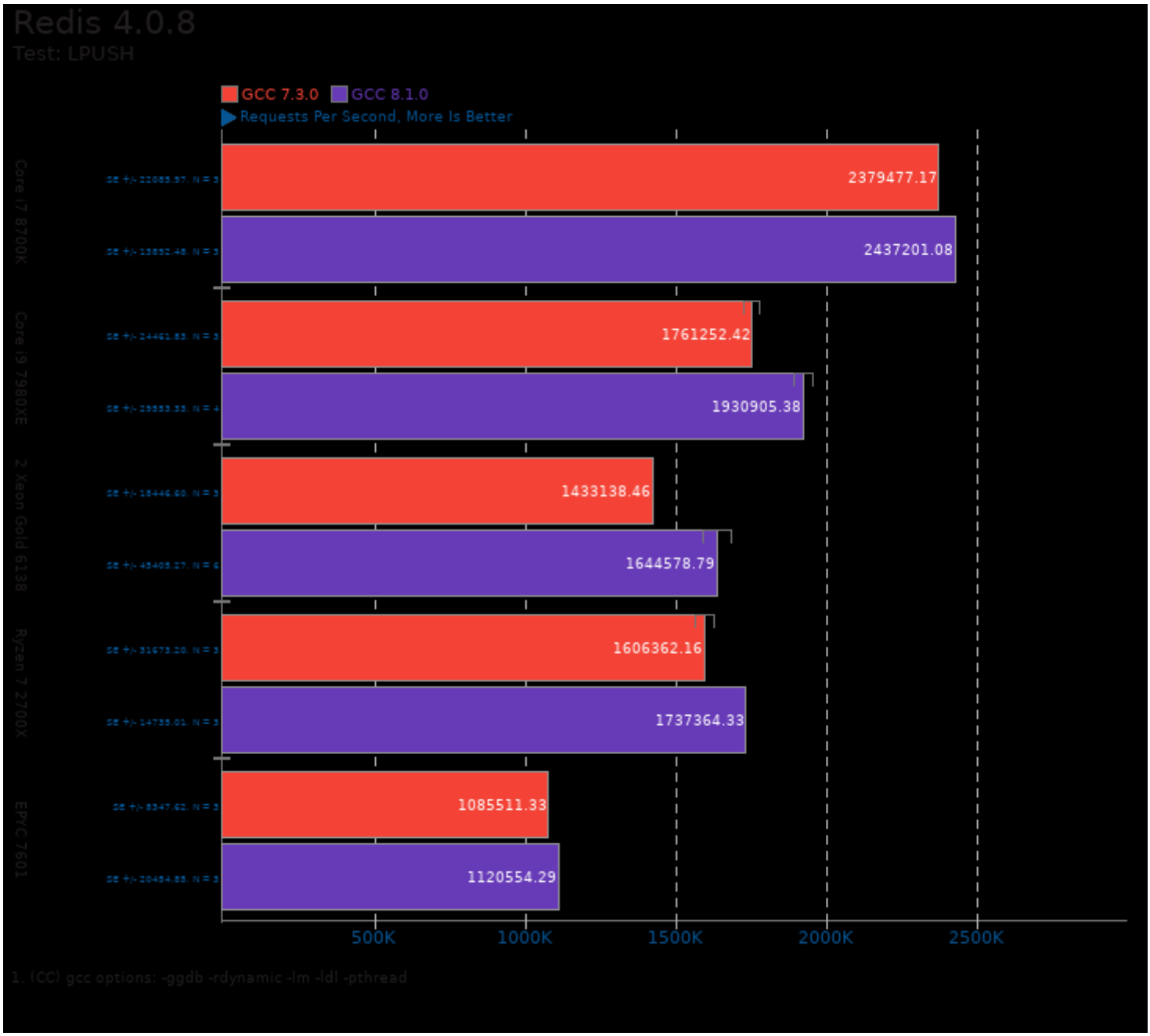

Himeno Benchmark 3.0
Poisson Pressure Solver
GCC 7.3.0
GCC 8.1.0
MFLOPS, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3301.54
3320.80
2721.09
3047.65
2607.77
2689.73
1288.68
1317.71
965.46
1000.45
700
1400
2100
2800
3500
1. (CC) gcc options: -O3 -march=native -mavx2

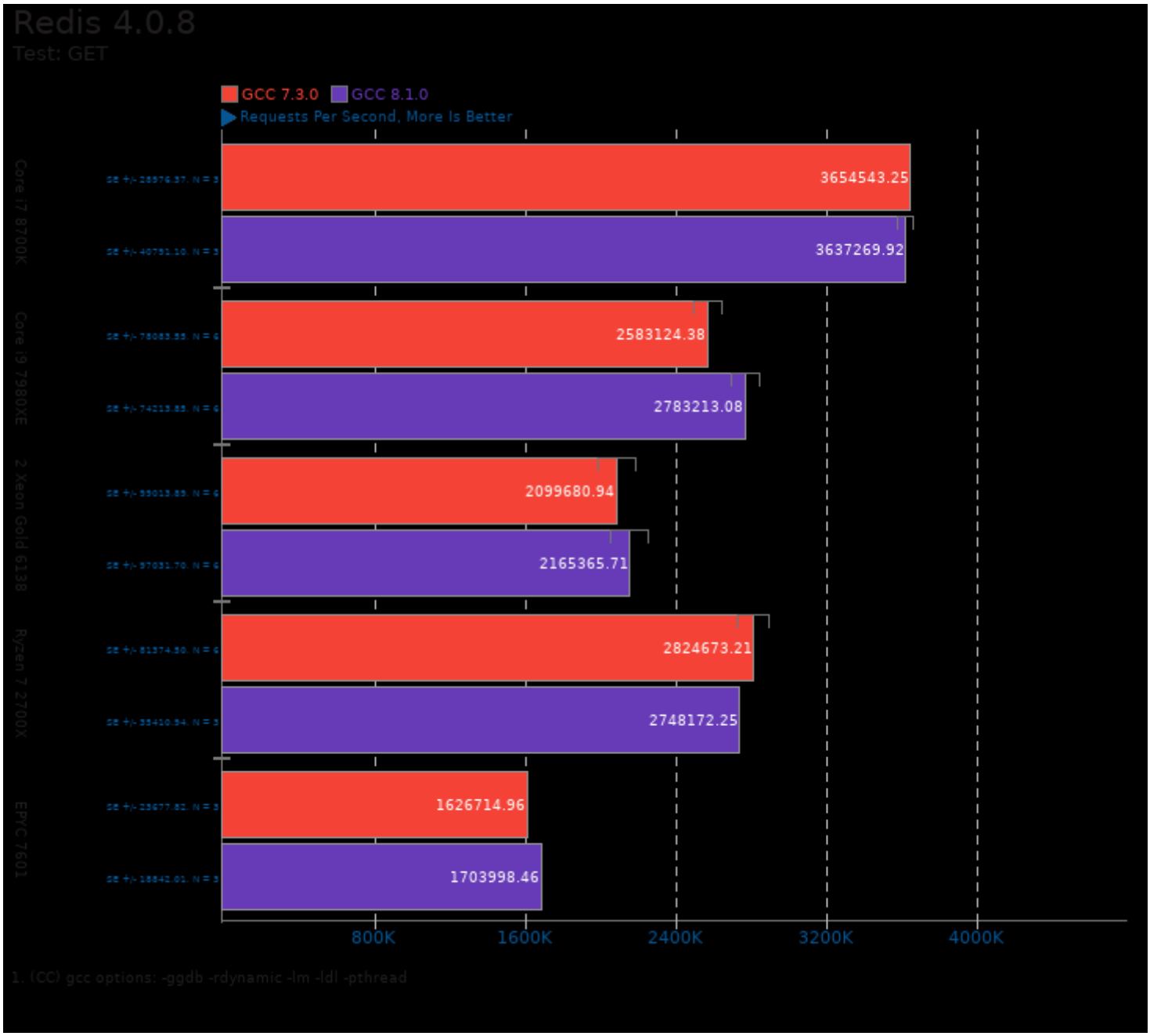

TSCP 1.81
AI Chess Performance
GCC 7.3.0
GCC 8.1.0
Nodes Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
1540210
1486216
1398624
1366694
1237148
1204151
1170873
1159047
861938
851545
300K
600K
900K
1200K
1500K
1. (CC) gcc options: -O3 -march=native

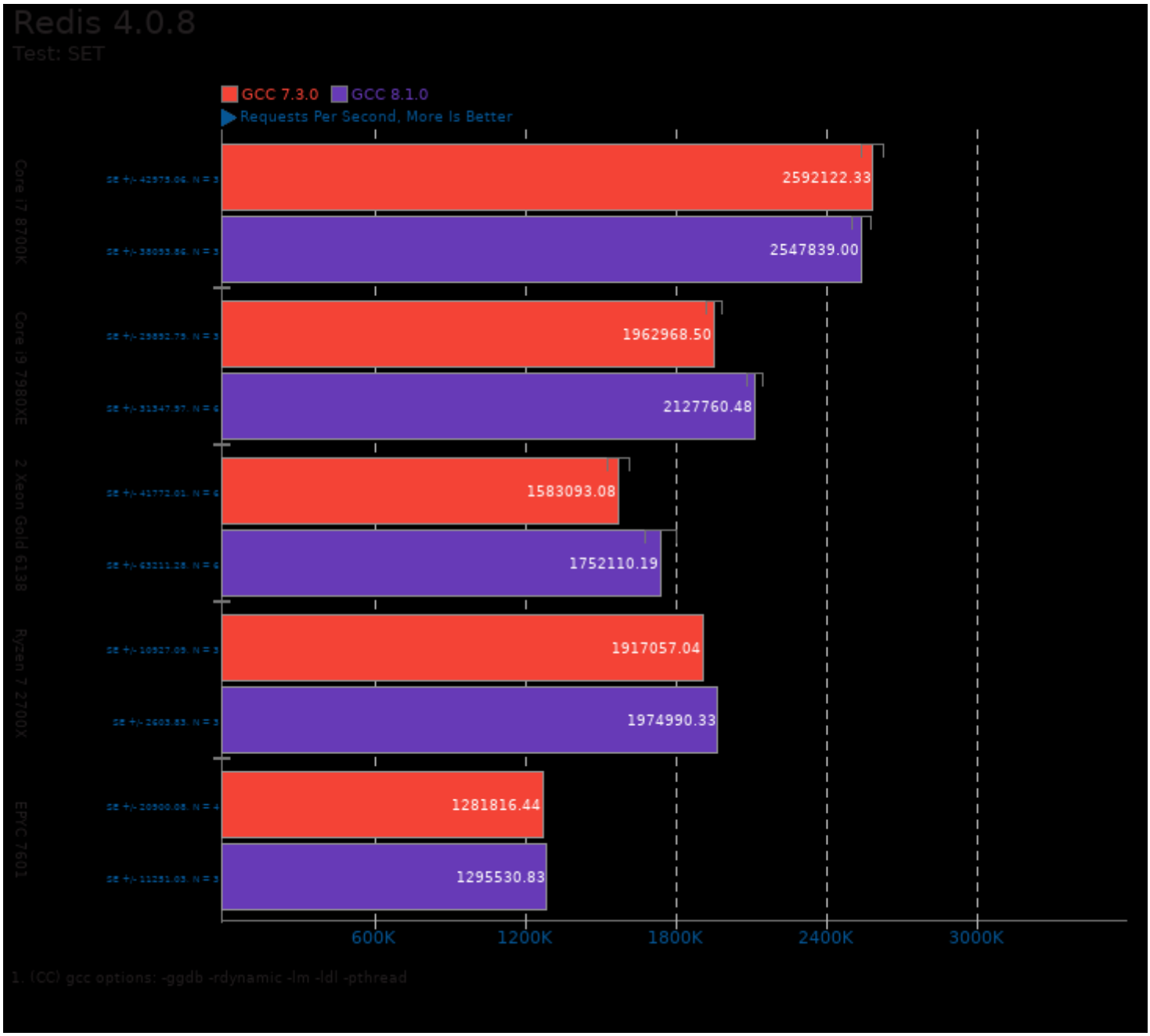

ebizzy 0.3
GCC 7.3.0
GCC 8.1.0
Records/s, More Is Better
382364
398816
655119
567977
909627
974557
580254
552150
1111609
1109200
200K
400K
600K
800K
1000K
1. (CC) gcc options: -pthread -lpthread -O3 -march=native

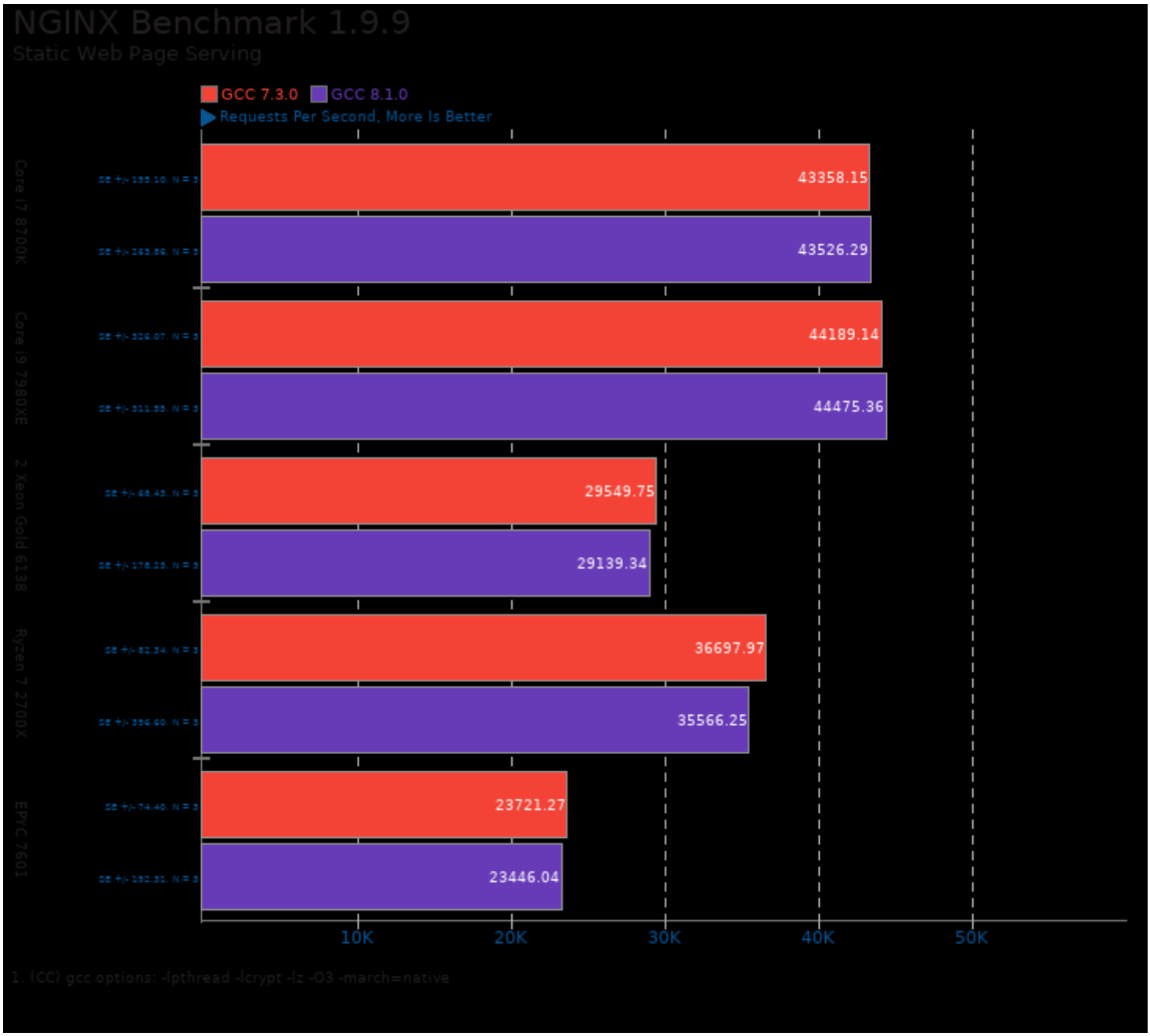

Redis 4.0.8
Test: LPOP
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3851755.83
3630624.83
2834089.67
2924082.50
2168657.00
2309794.75
2796050.58
3035776.79
1702037.04
1731144.83
800K
1600K
2400K
3200K
4000K
1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

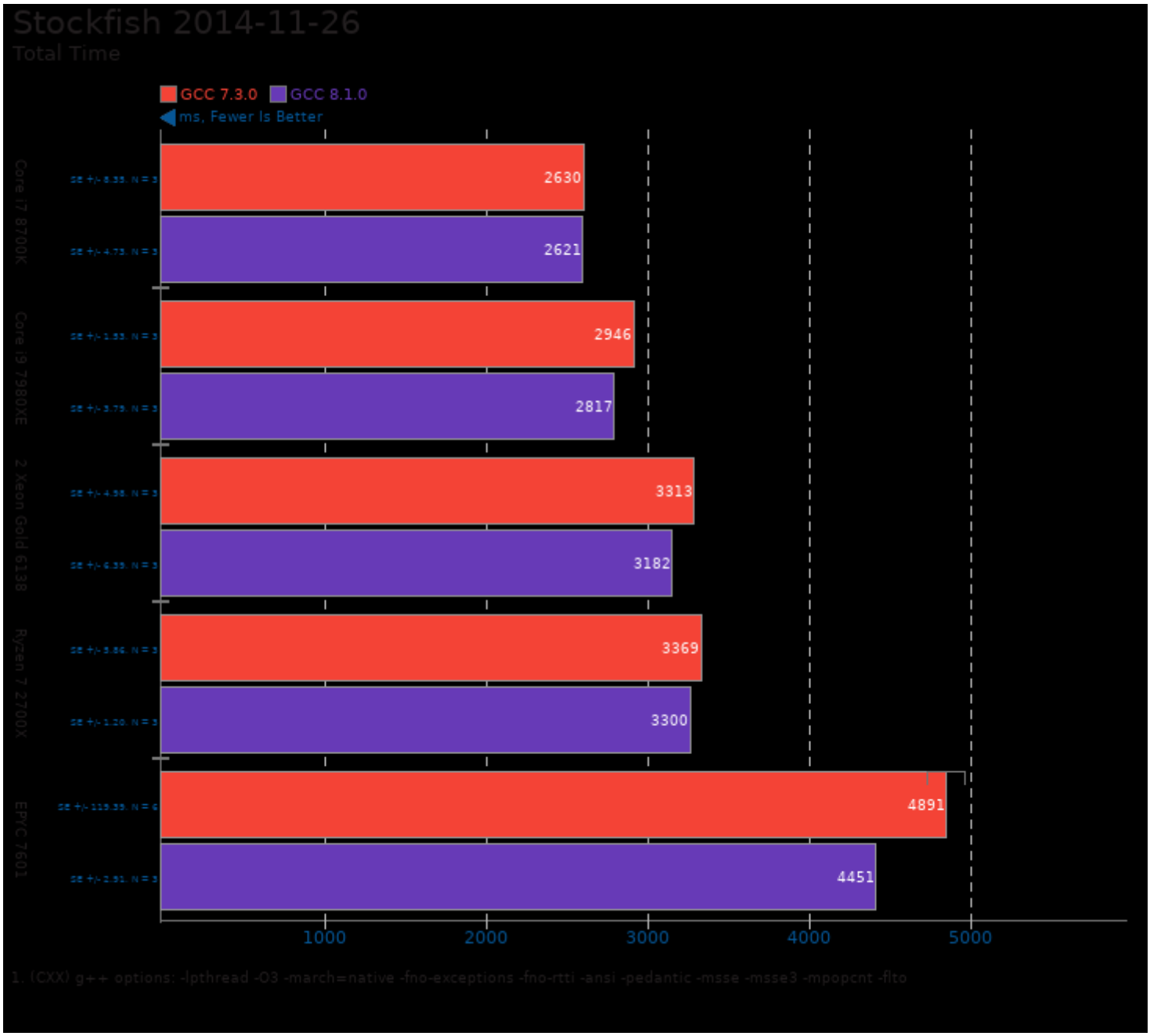

Redis 4.0.8
Test: SADD
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3000024.08
2922042.00
2112444.40
2320715.08
1970080.62
1828244.96
2209198.08
2166161.67
1397462.96
1437758.66
600K
1200K
1800K
2400K
3000K
1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

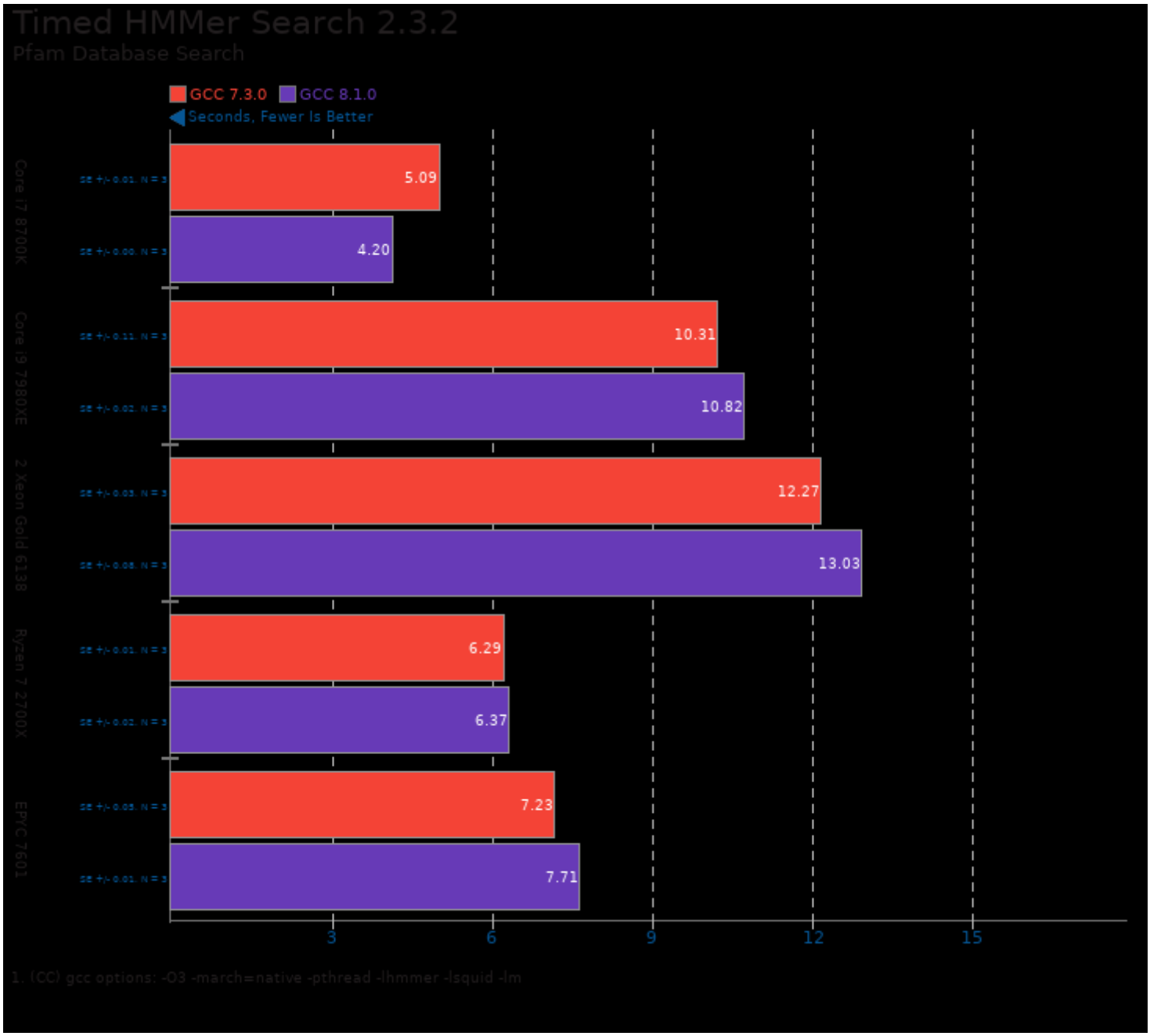

Redis 4.0.8
Test: LPUSH
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2379477.17
2437201.08
1761252.42
1930905.38
1433138.46
1644578.79
1606362.16
1737364.33
1085511.33
1120554.29
500K
1000K
1500K
2000K
2500K
1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

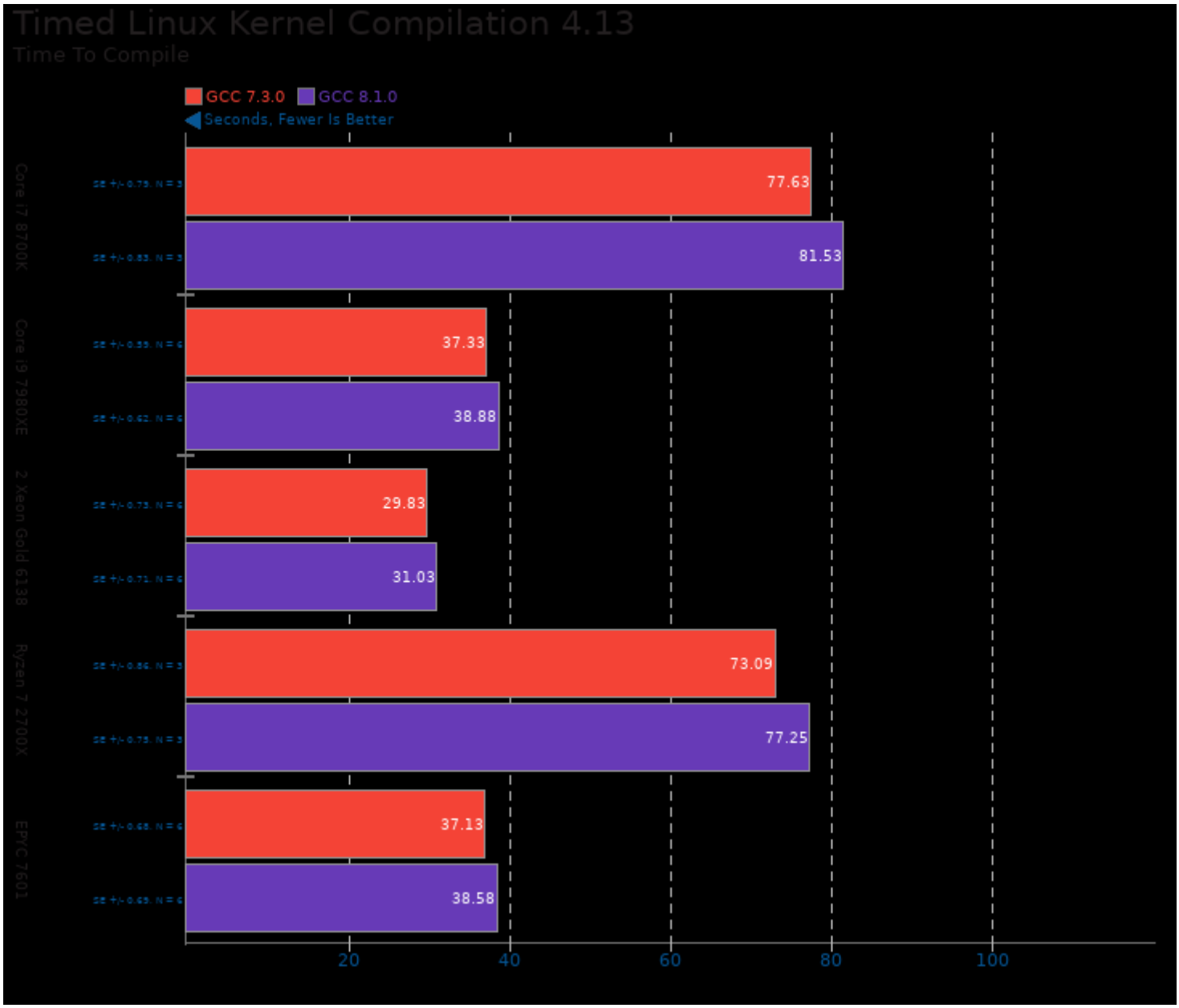

Redis 4.0.8
Test: GET
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3654543.25
3637269.92
2583124.38
2783213.08
2099680.94
2165365.71
2824673.21
2748172.25
1626714.96
1703998.46
800K
1600K
2400K
3200K
4000K
1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

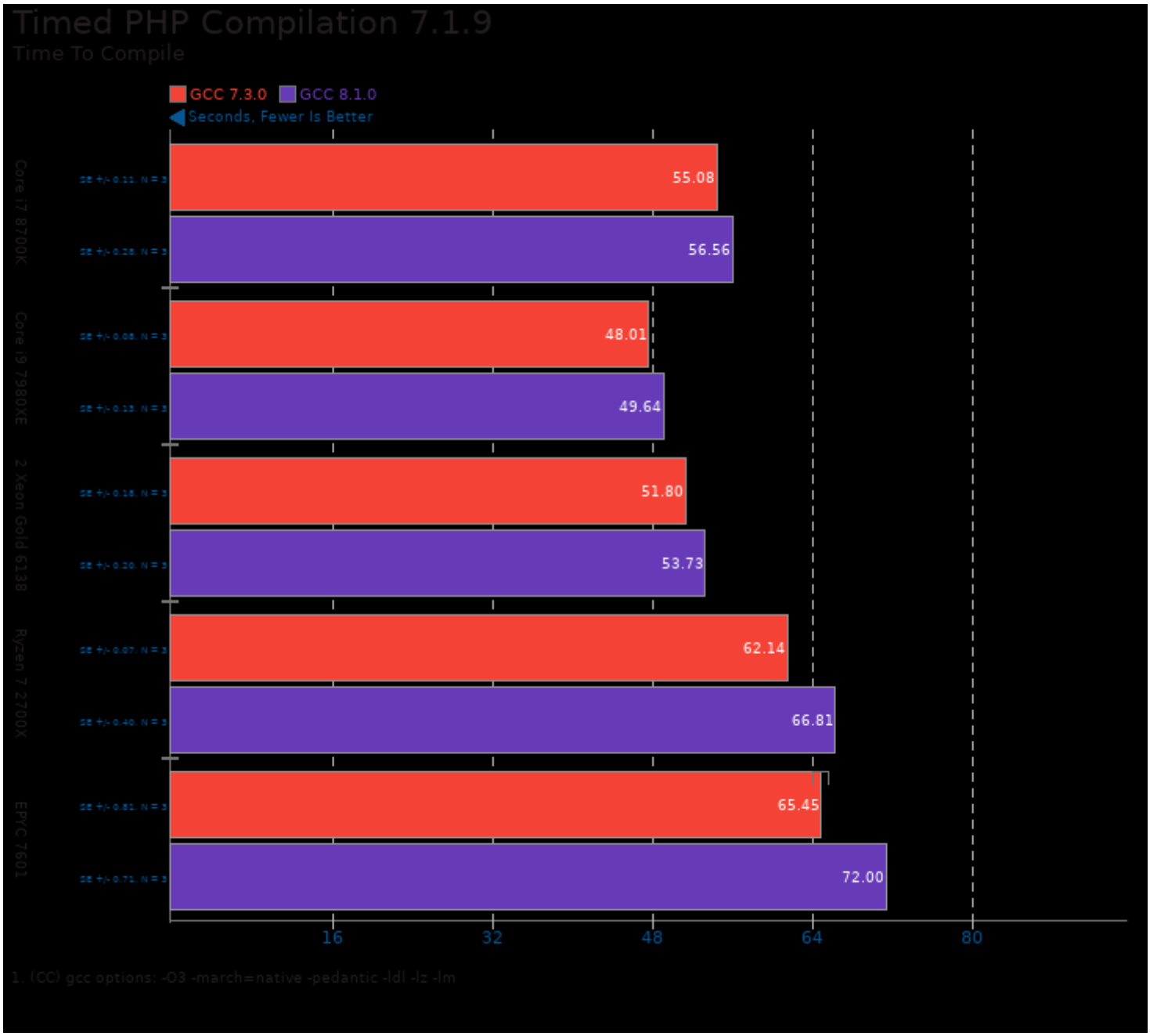

Redis 4.0.8
Test: SET
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2592122.33
2547839.00
1962968.50
2127760.48
1583093.08
1752110.19
1917057.04
1974990.33
1281816.44
1295530.83
600K
1200K
1800K
2400K
3000K
1. (CC) gcc options: -ggdb -rdynamic -lm -ldl -pthread

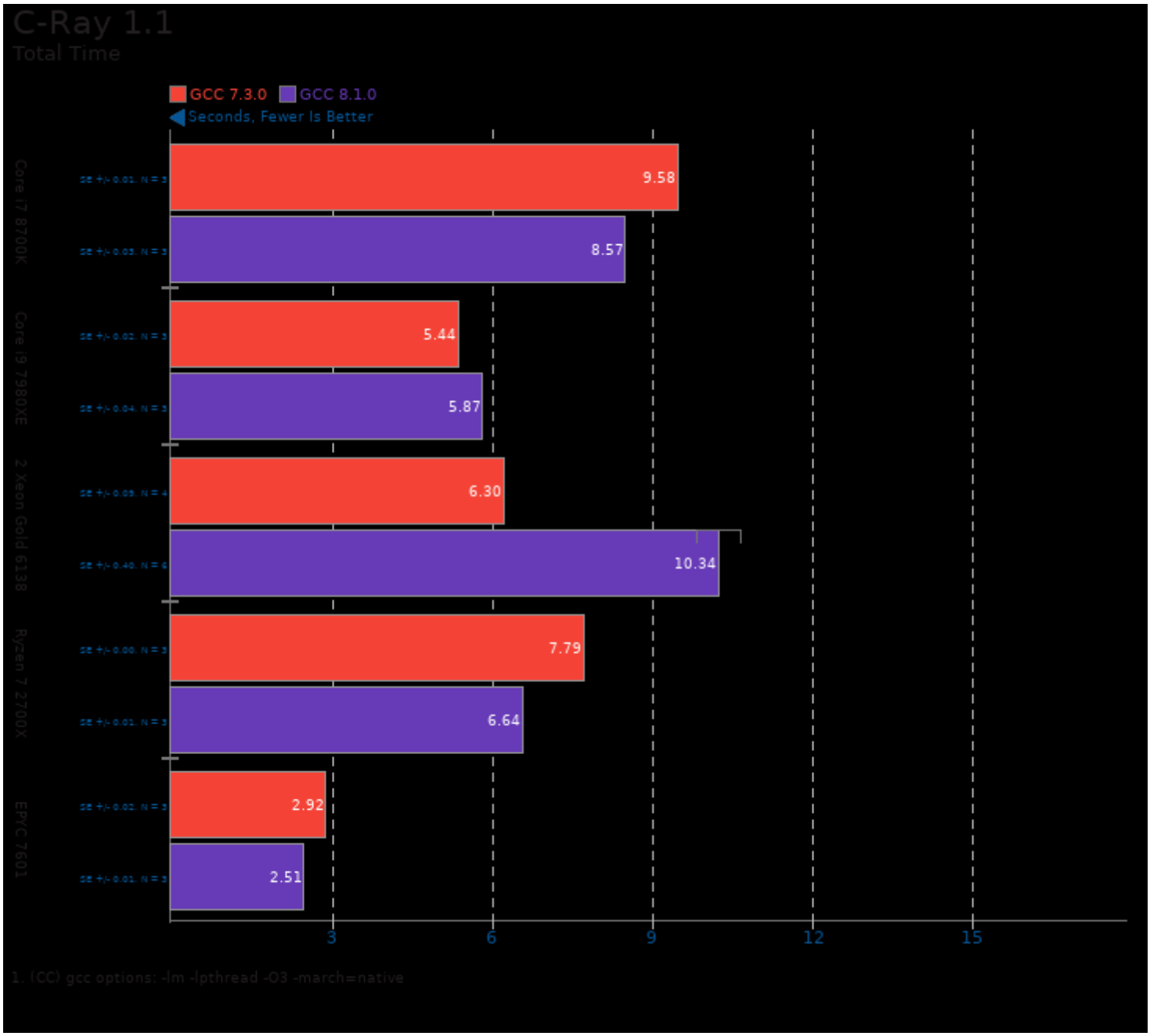

NGINX Benchmark 1.9.9
Static Web Page Serving
GCC 7.3.0
GCC 8.1.0
Requests Per Second, More Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
43358.15
43526.29
44189.14
44475.36
29549.75
29139.34
36697.97
35566.25
23721.27
23446.04
10K
20K
30K
40K
50K
1. (CC) gcc options: -lpthread -lcrypt -lz -O3 -march=native

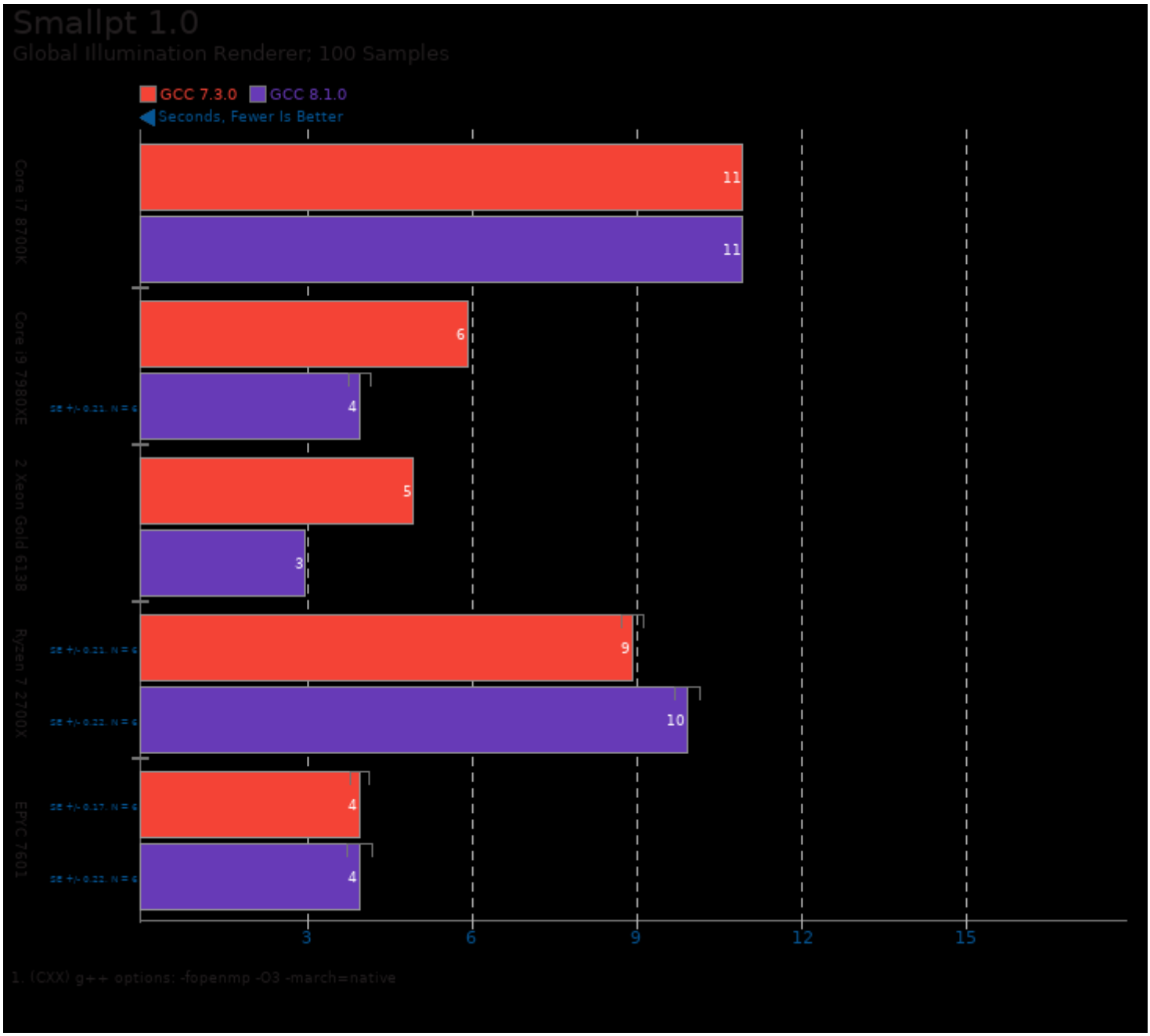

Stockfish 2014-11-26
Total Time
GCC 7.3.0
GCC 8.1.0
ms, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2630
2621
2946
2817
3313
3182
3369
3300
4891
4451
1000
2000
3000
4000
5000
1. (CXX) g++ options: -lpthread -O3 -march=native -fno-exceptions -fno-rtti -ansi -pedantic -msse -msse3 -mpopcnt -flto

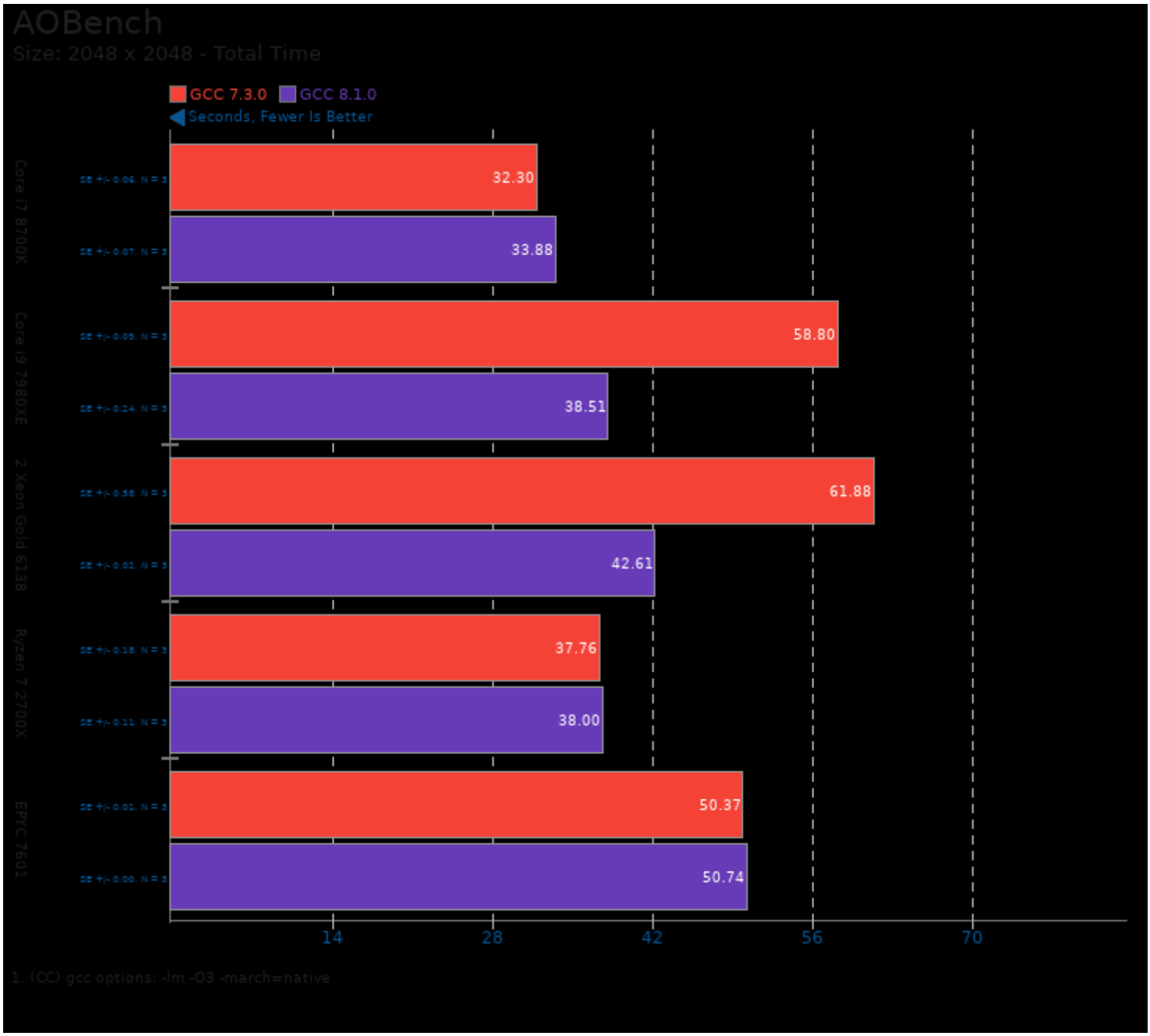

Timed HMMer Search 2.3.2
Pfam Database Search
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
5.09
4.20
10.31
10.82
12.27
13.03
6.29
6.37
7.23
7.71
3
6
9
12
15
1. (CC) gcc options: -O3 -march=native -pthread -lhmmer -lsquid -lm

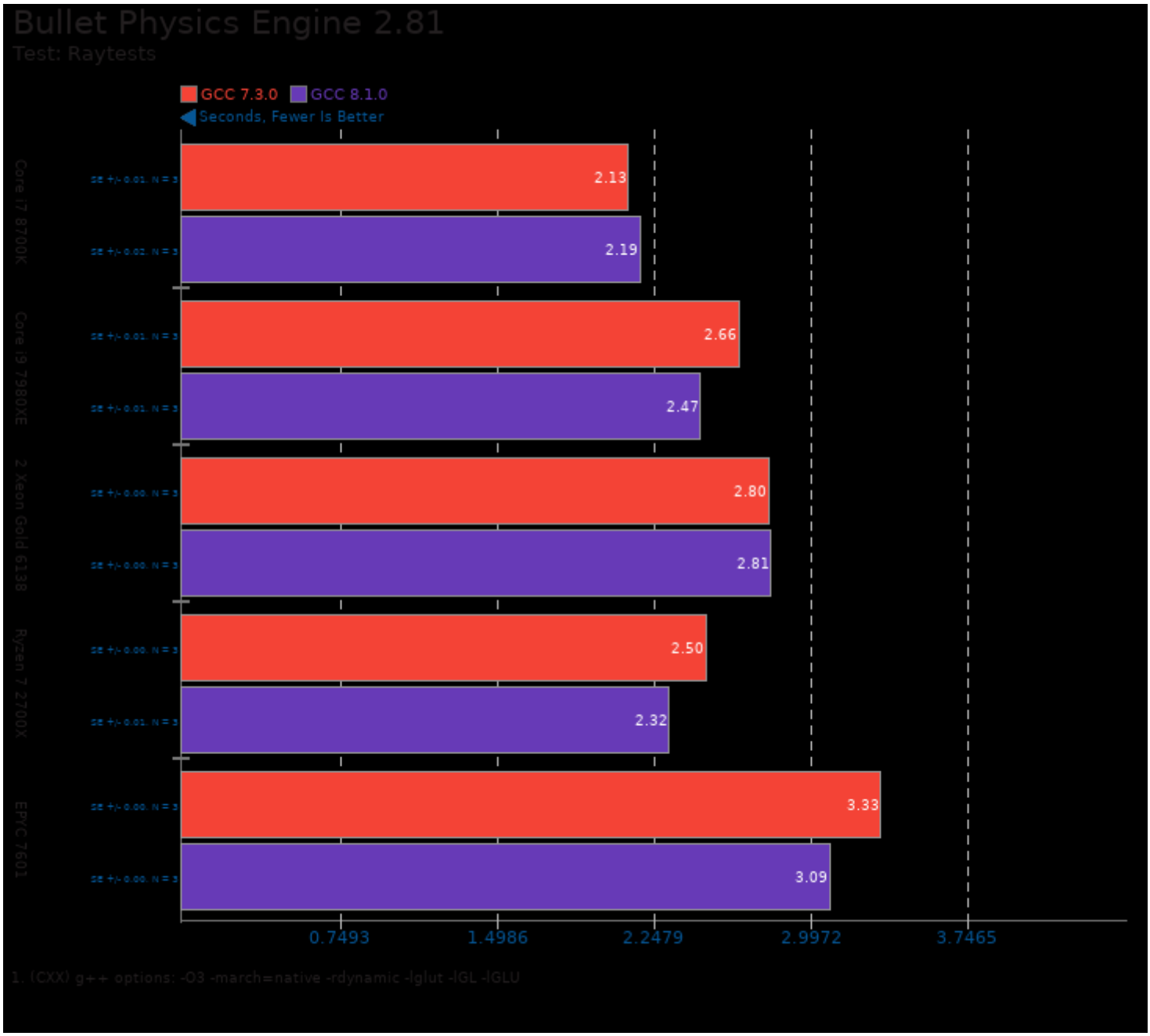

Timed Linux Kernel Compilation 4.13
Time To Compile
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
77.63
81.53
37.33
38.88
29.83
31.03
73.09
77.25
37.13
38.58
20
40
60
80
100

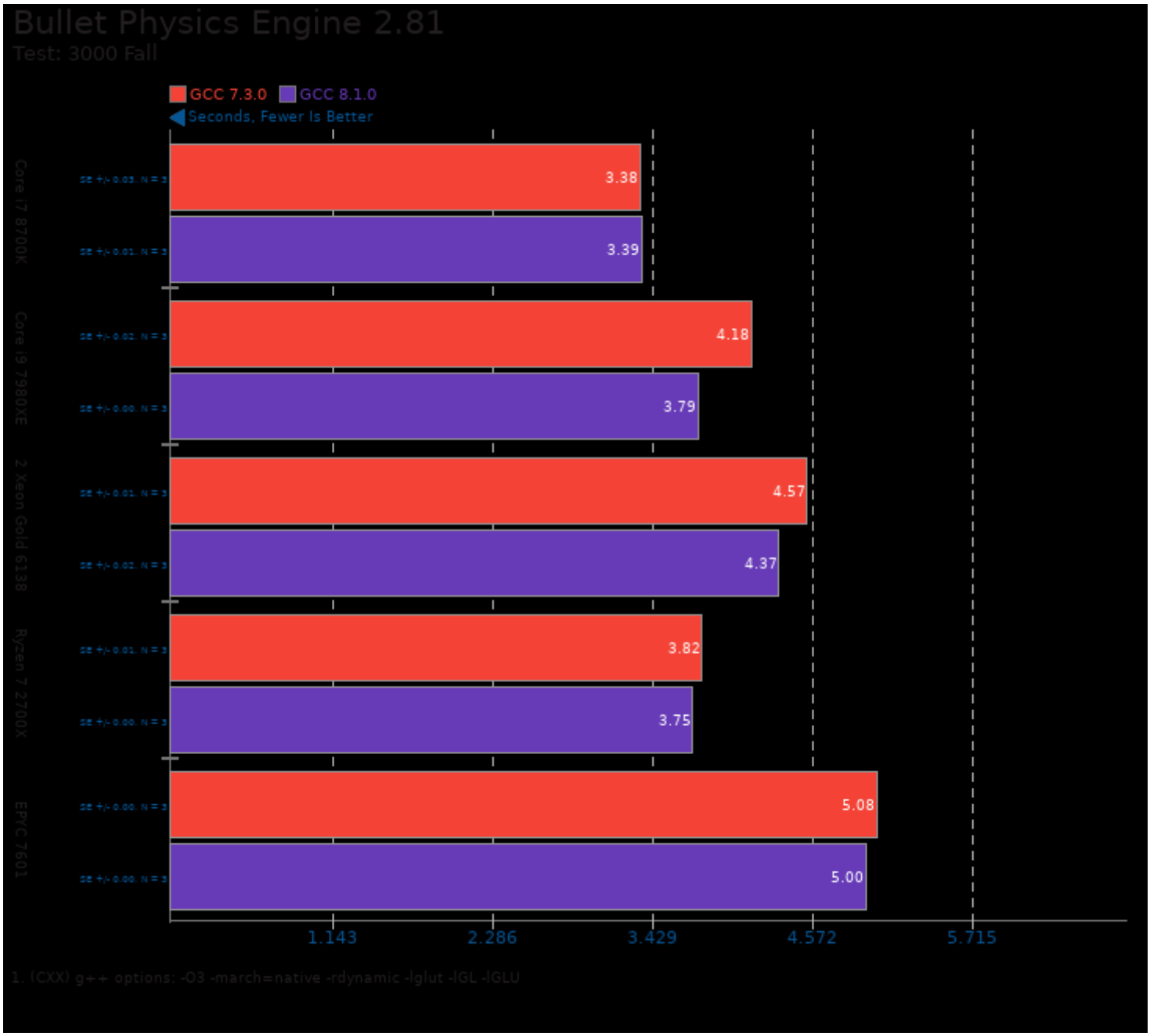

Timed PHP Compilation 7.1.9
Time To Compile
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
55.08
56.56
48.01
49.64
51.80
53.73
62.14
66.81
65.45
72.00
16
32
48
64
80
1. (CC) gcc options: -O3 -march=native -pedantic -ldl -lz -lm

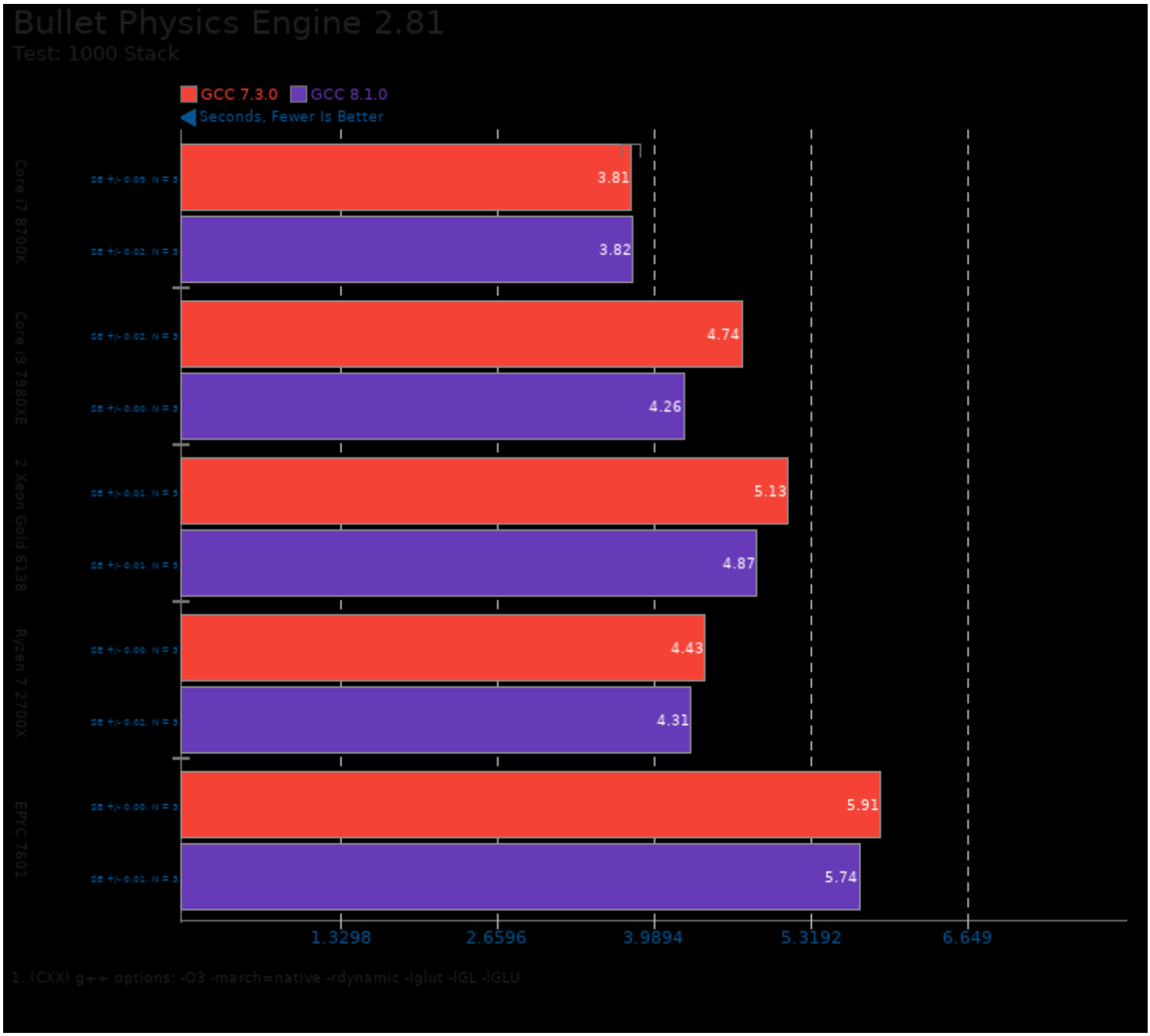

C-Ray 1.1
Total Time
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
9.58
8.57
5.44
5.87
6.30
10.34
7.79
6.64
2.92
2.51
3
6
9
12
15
1. (CC) gcc options: -lm -lpthread -O3 -march=native

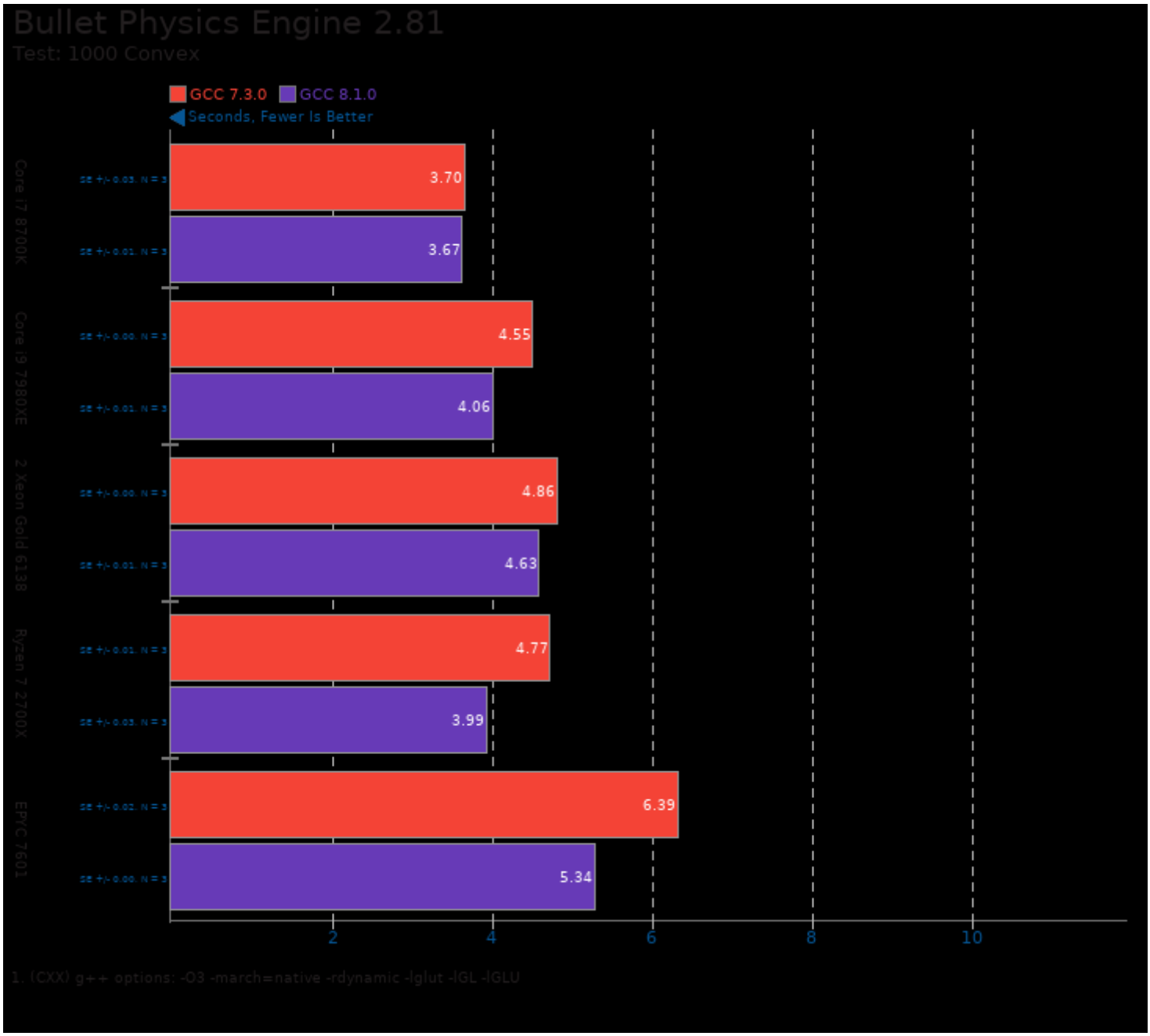

Smallpt 1.0
Global Illumination Renderer; 100 Samples
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
11
11
6
4
5
3
9
10
4
4
3
6
9
12
15
1. (CXX) g++ options: -fopenmp -O3 -march=native

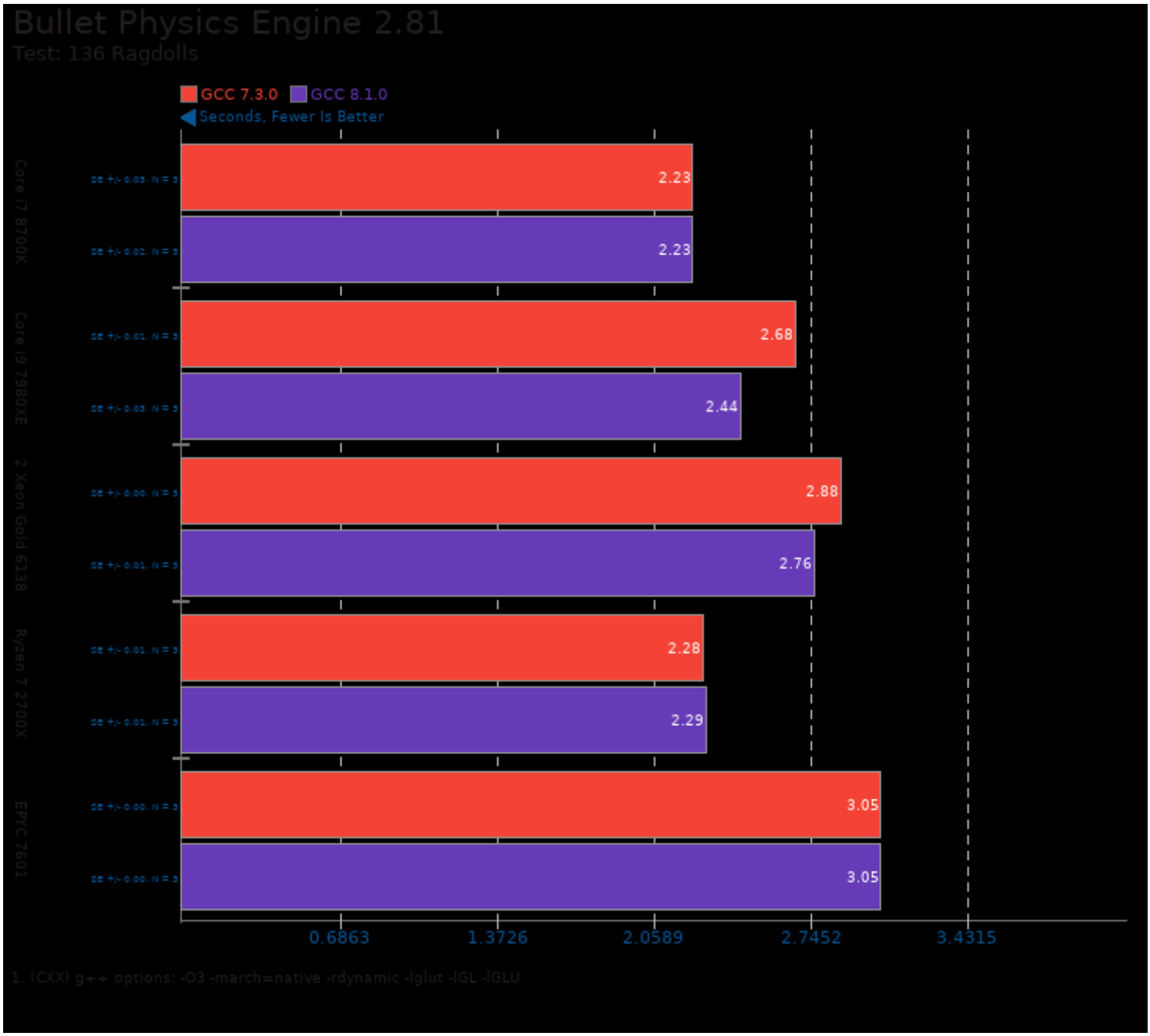

AOBench
Size: 2048 x 2048 - Total Time
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
32.30
33.88
58.80
38.51
61.88
42.61
37.76
38.00
50.37
50.74
14
28
42
56
70
1. (CC) gcc options: -lm -O3 -march=native

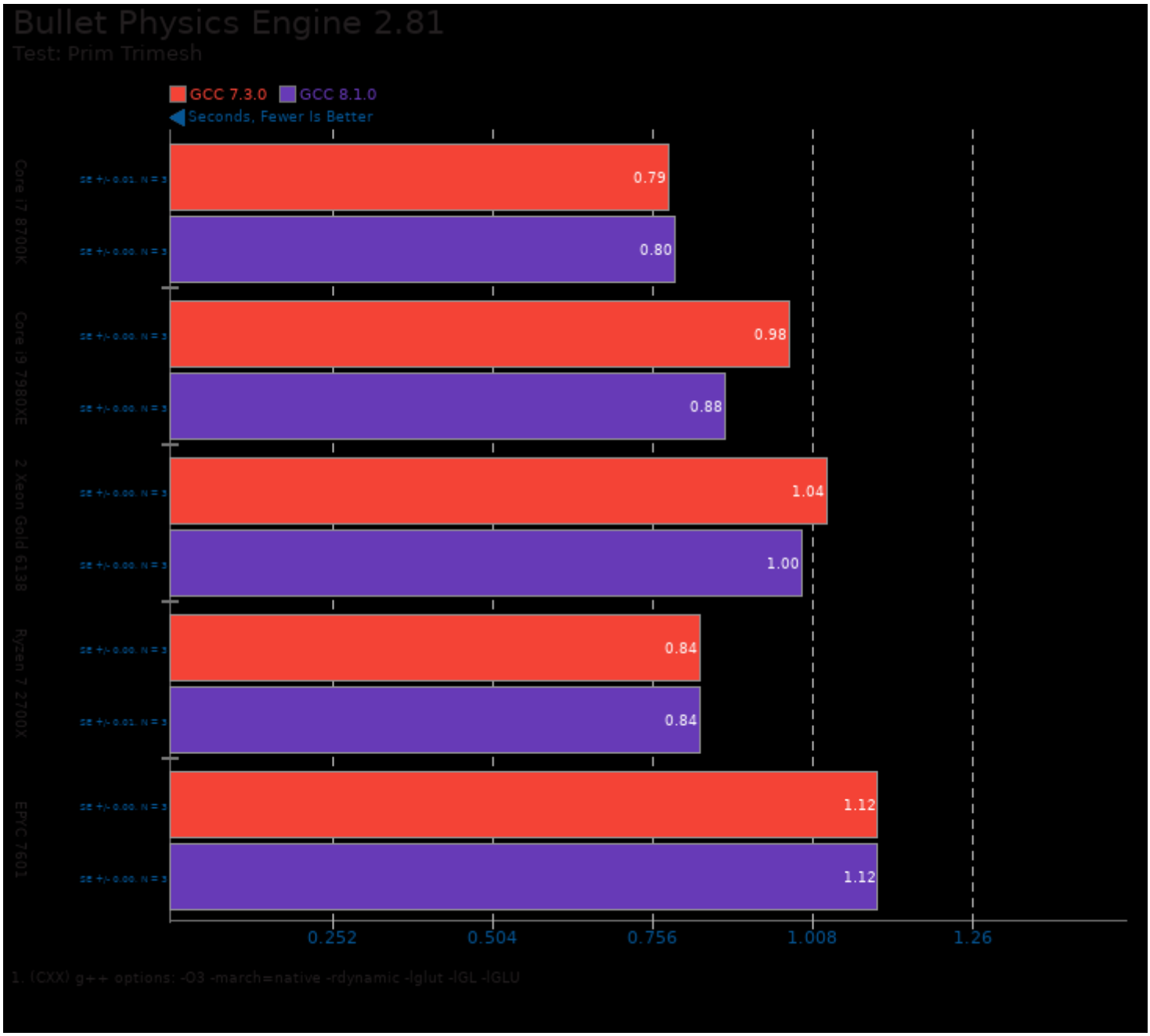

Bullet Physics Engine 2.81
Test: Raytests
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2.13
2.19
2.66
2.47
2.80
2.81
2.50
2.32
3.33
3.09
0.7493
1.4986
2.2479
2.9972
3.7465
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU

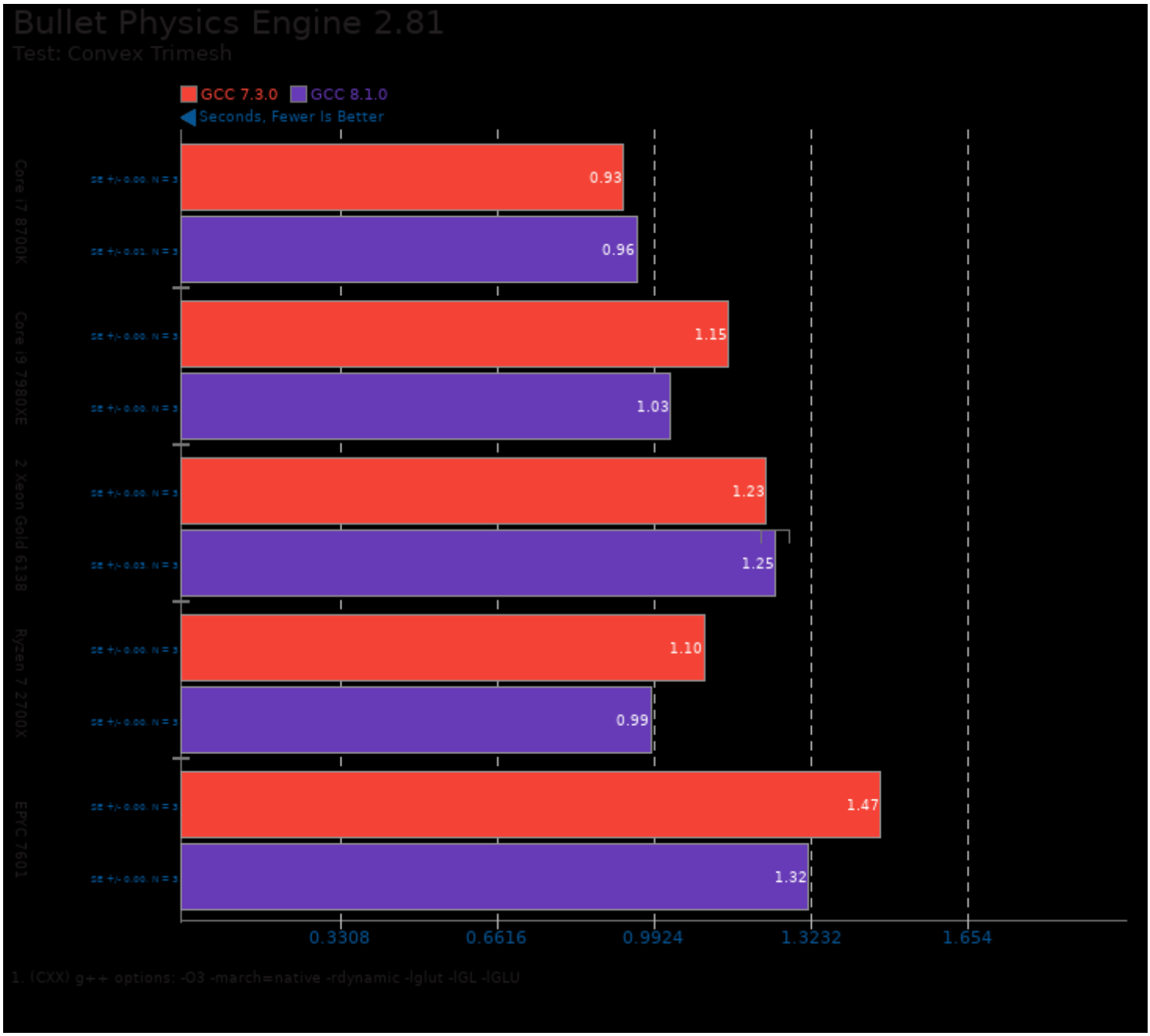

Bullet Physics Engine 2.81
Test: 3000 Fall
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3.38
3.39
4.18
3.79
4.57
4.37
3.82
3.75
5.08
5.00
1.143
2.286
3.429
4.572
5.715
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU

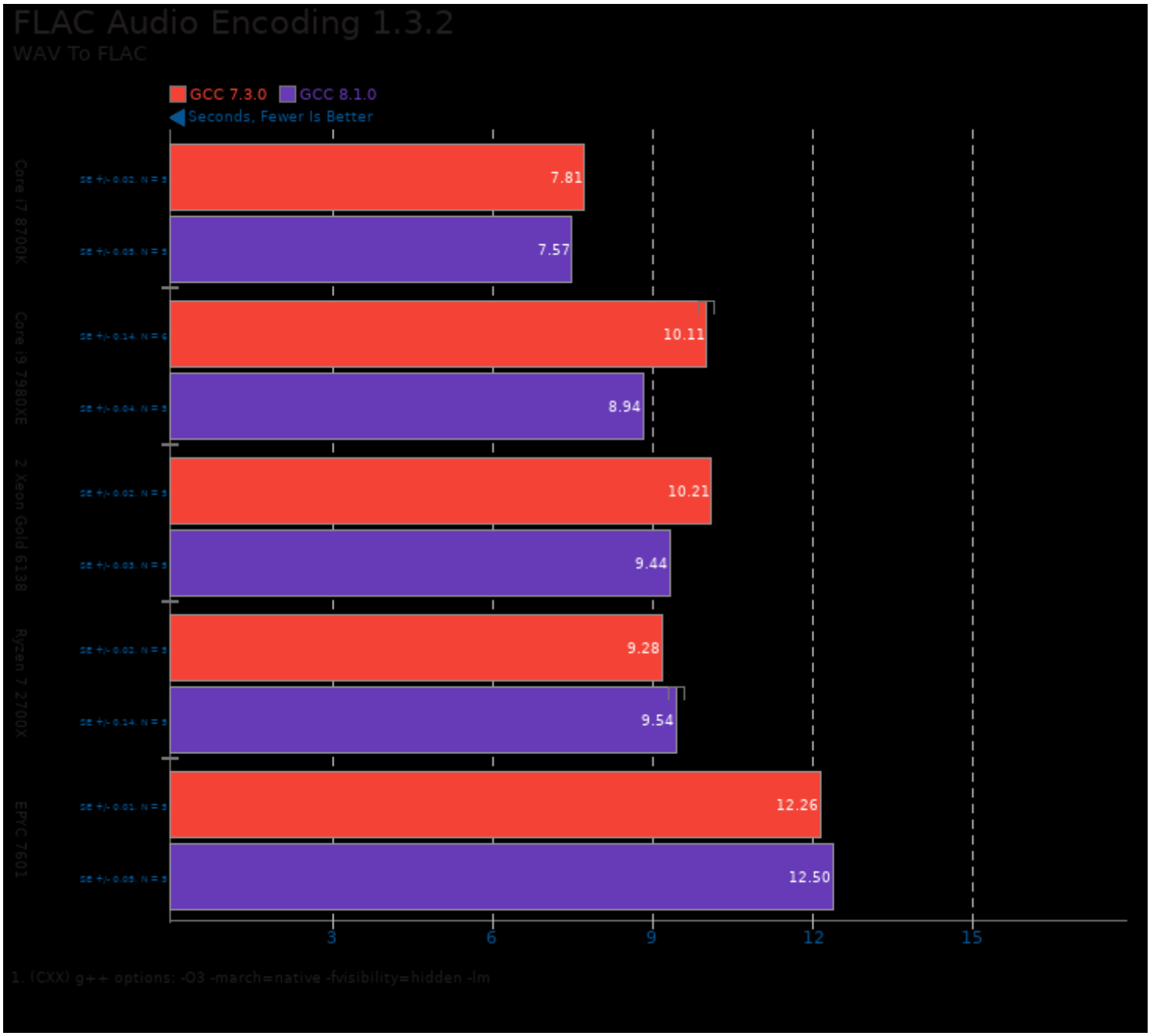

Bullet Physics Engine 2.81
Test: 1000 Stack
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3.81
3.82
4.74
4.26
5.13
4.87
4.43
4.31
5.91
5.74
1.3298
2.6596
3.9894
5.3192
6.649
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU

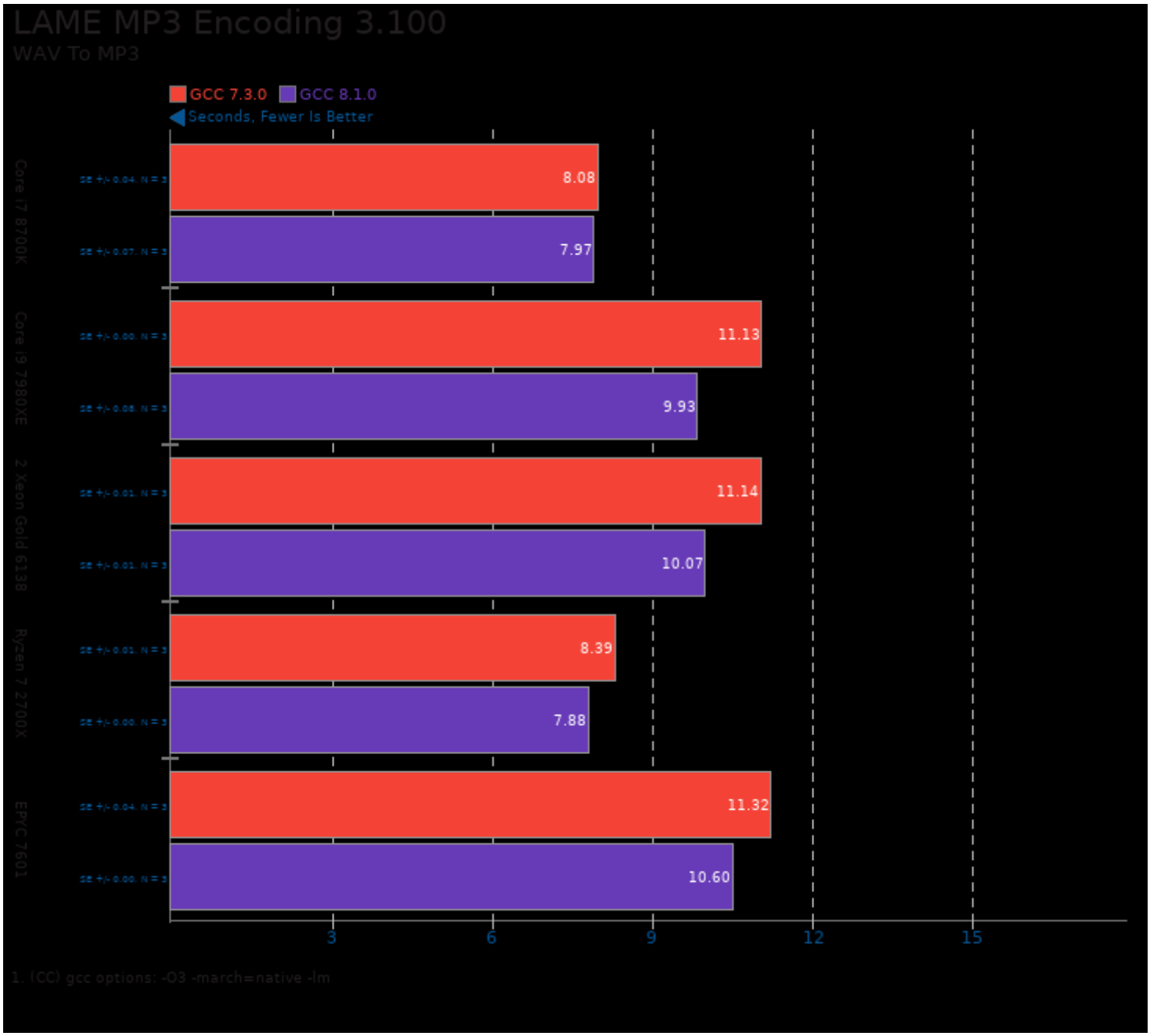

Bullet Physics Engine 2.81
Test: 1000 Convex
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
3.70
3.67
4.55
4.06
4.86
4.63
4.77
3.99
6.39
5.34
2
4
6
8
10
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU


Bullet Physics Engine 2.81
Test: 136 Ragdolls
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
2.23
2.23
2.68
2.44
2.88
2.76
2.28
2.29
3.05
3.05
0.6863
1.3726
2.0589
2.7452
3.4315
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU

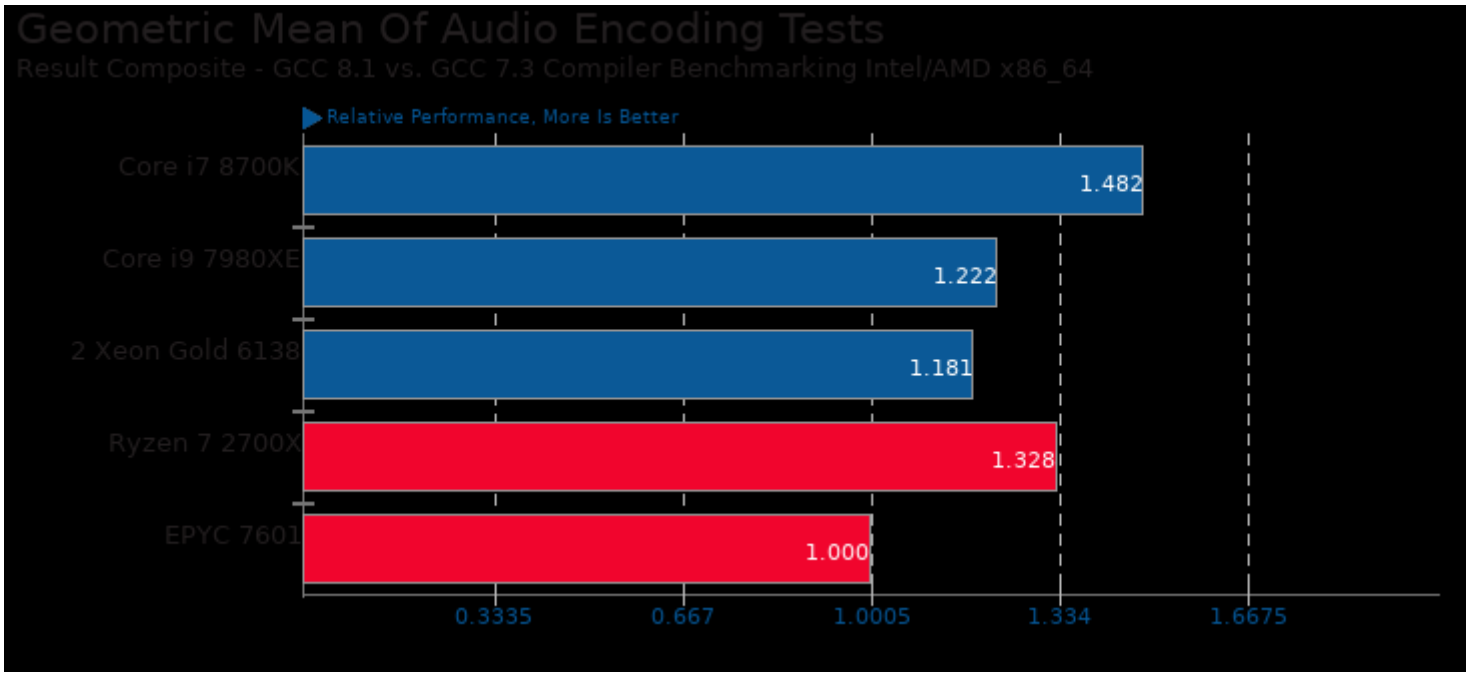

Bullet Physics Engine 2.81
Test: Prim Trimesh
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
0.79
0.80
0.98
0.88
1.04
1.00
0.84
0.84
1.12
1.12
0.252
0.504
0.756
1.008
1.26
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU


Bullet Physics Engine 2.81
Test: Convex Trimesh
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
0.93
0.96
1.15
1.03
1.23
1.25
1.10
0.99
1.47
1.32
0.3308
0.6616
0.9924
1.3232
1.654
1. (CXX) g++ options: -O3 -march=native -rdynamic -lglut -lGL -lGLU

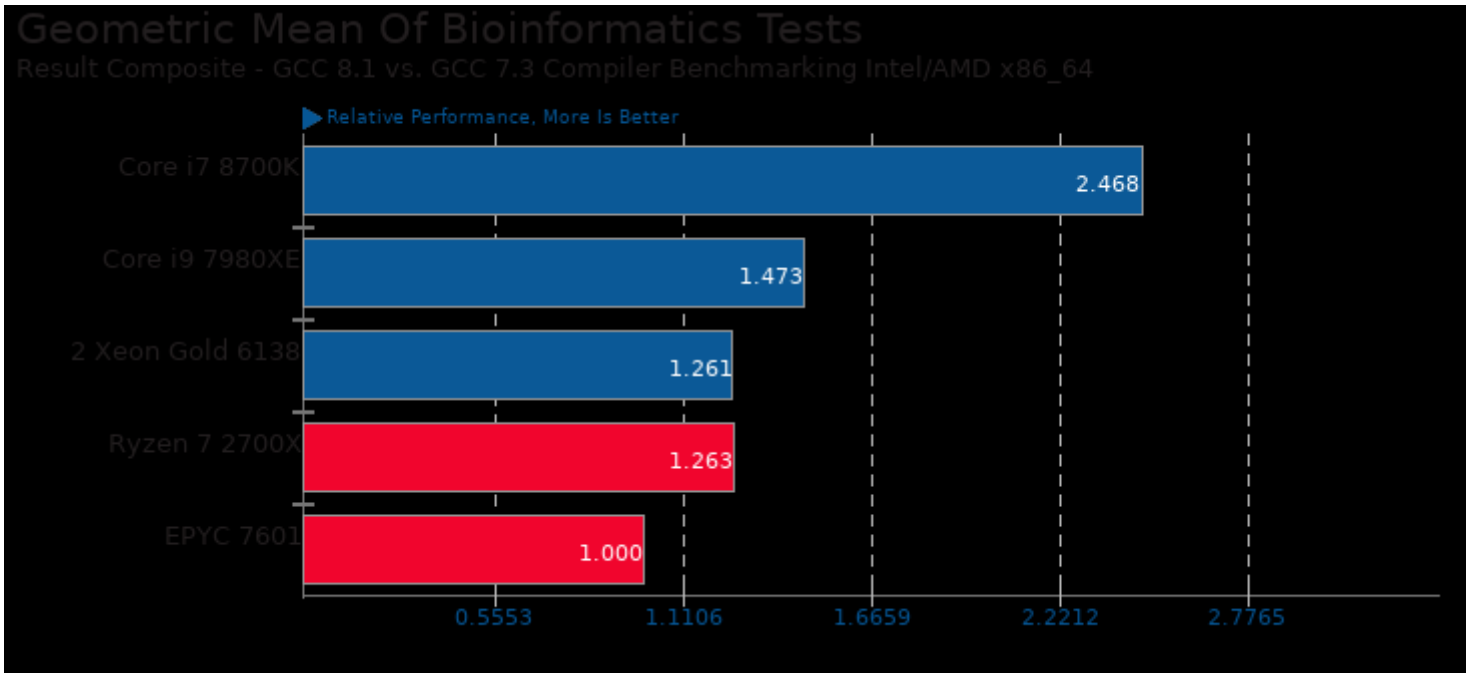

FLAC Audio Encoding 1.3.2
WAV To FLAC
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
7.81
7.57
10.11
8.94
10.21
9.44
9.28
9.54
12.26
12.50
3
6
9
12
15
1. (CXX) g++ options: -O3 -march=native -fvisibility=hidden -lm


LAME MP3 Encoding 3.100
WAV To MP3
GCC 7.3.0
GCC 8.1.0
Seconds, Fewer Is Better
Core i7 8700K
Core i9 7980XE
2 Xeon Gold 6138
Ryzen 7 2700X
EPYC 7601
8.08
7.97
11.13
9.93
11.14
10.07
8.39
7.88
11.32
10.60
3
6
9
12
15
1. (CC) gcc options: -O3 -march=native -lm

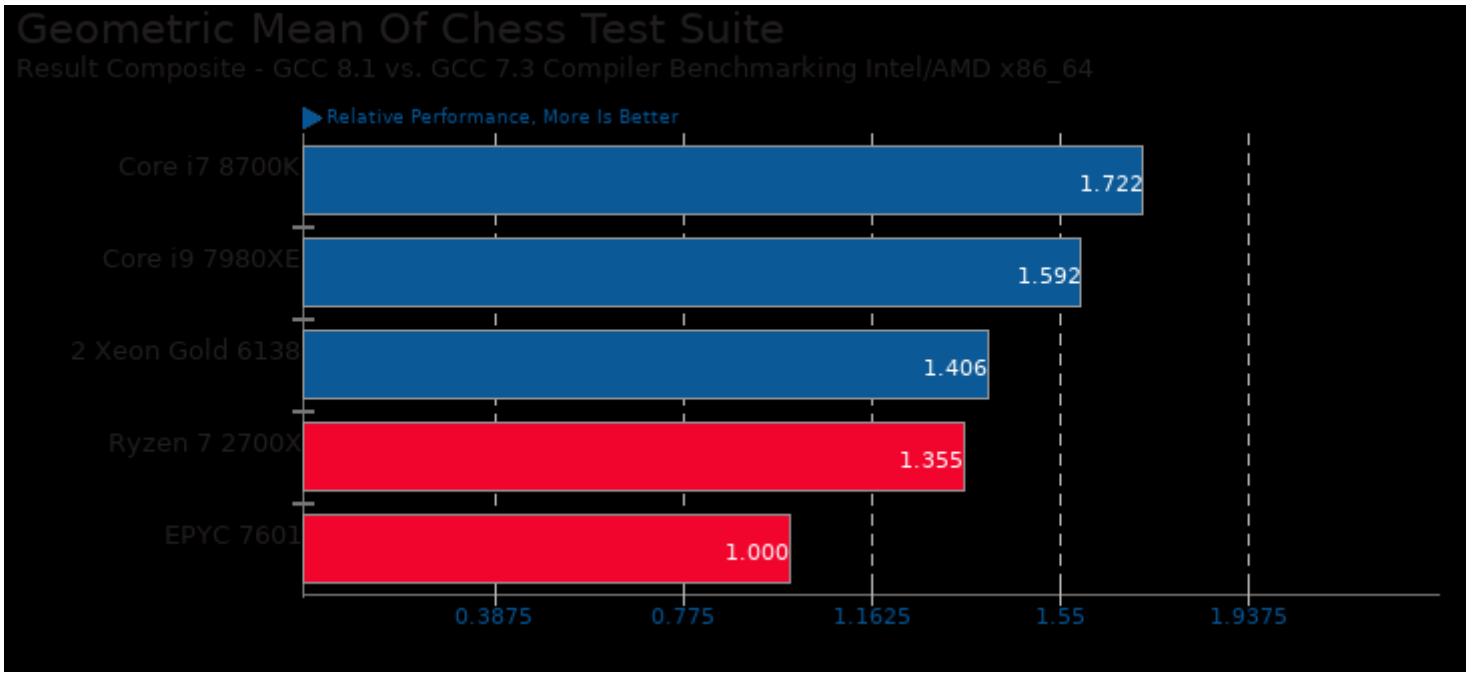
These geometric means are based upon test groupings / test suites for this result file.



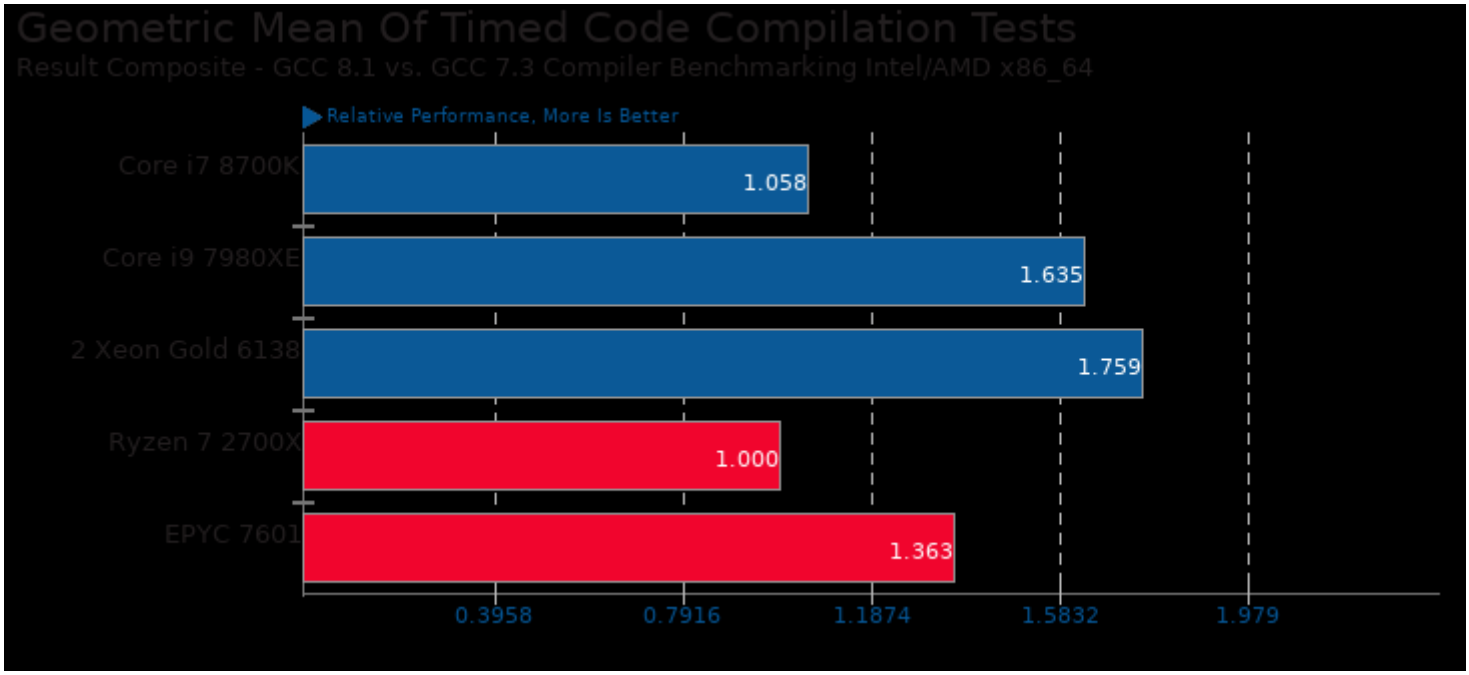
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



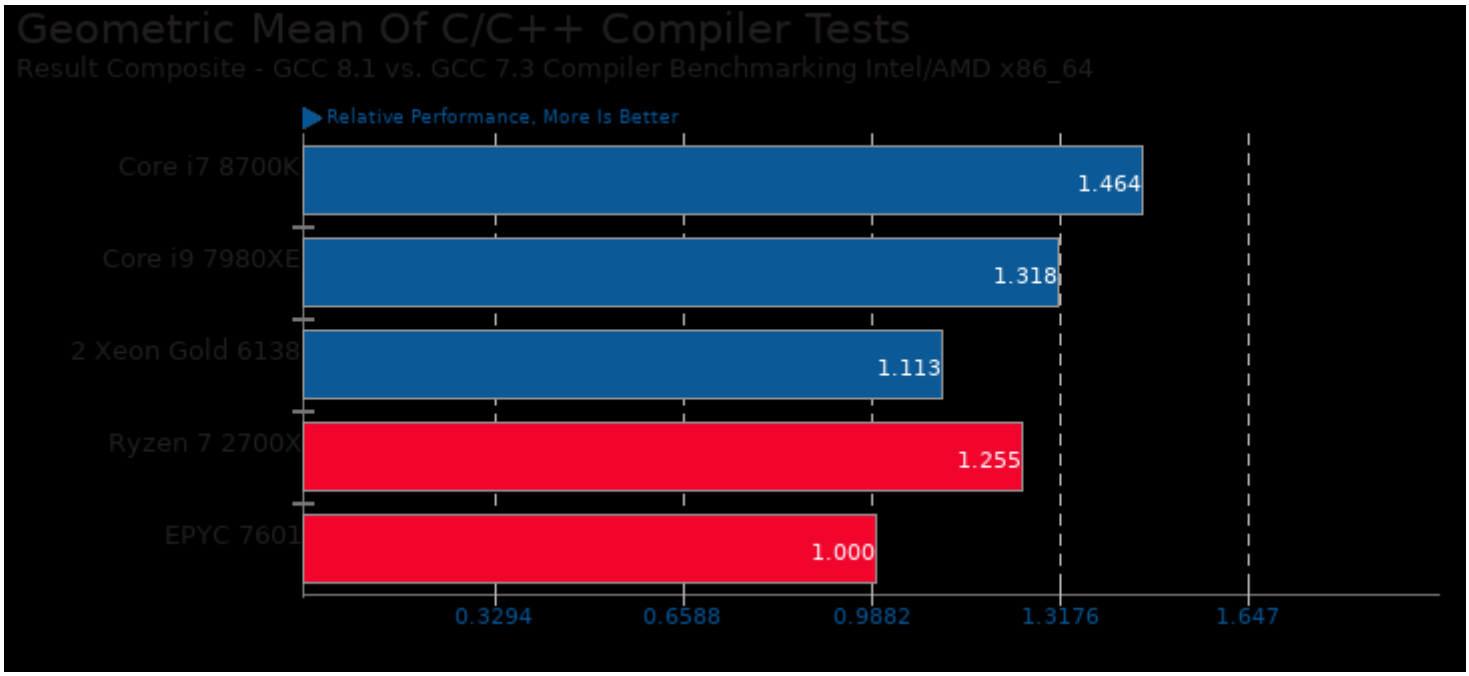
Geometric mean based upon tests: pts/himeno and pts/hmmer



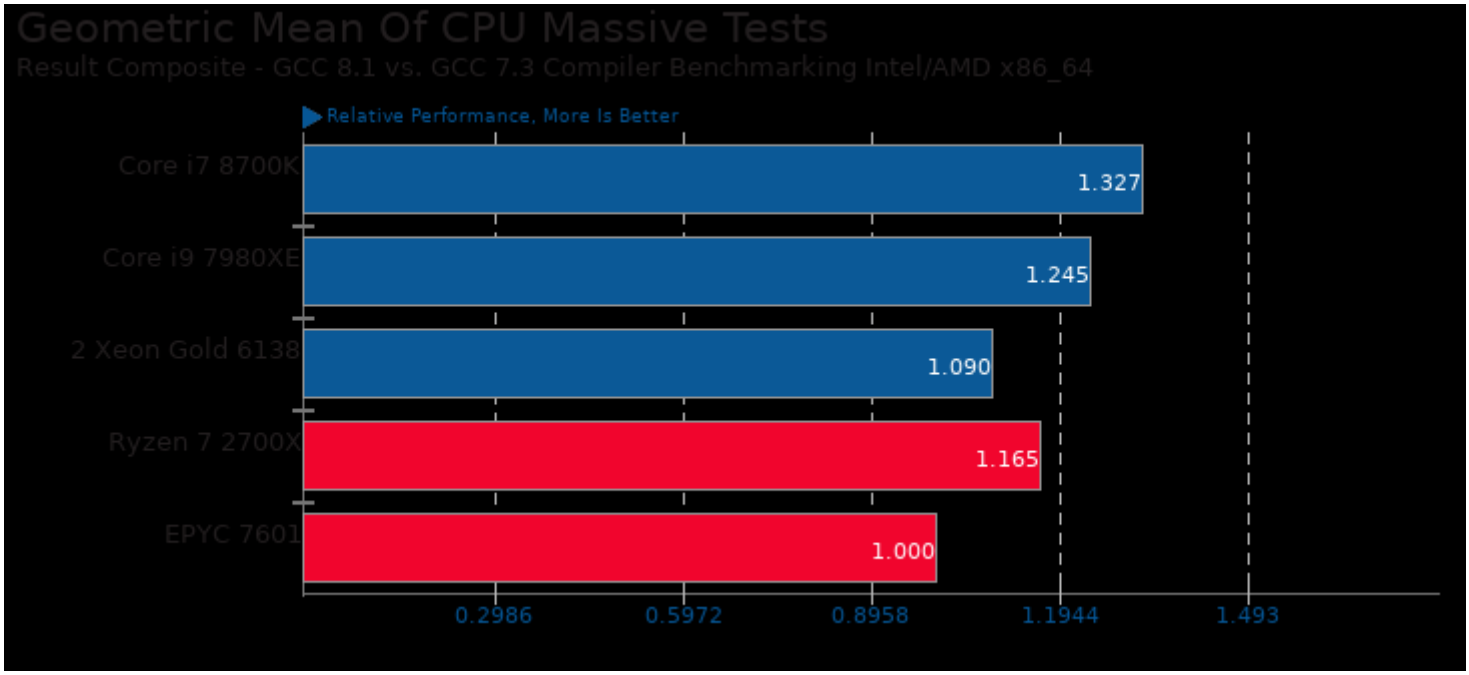
Geometric mean based upon tests: pts/tscp and pts/stockfish



Geometric mean based upon tests: pts/build-php and pts/build-linux-kernel



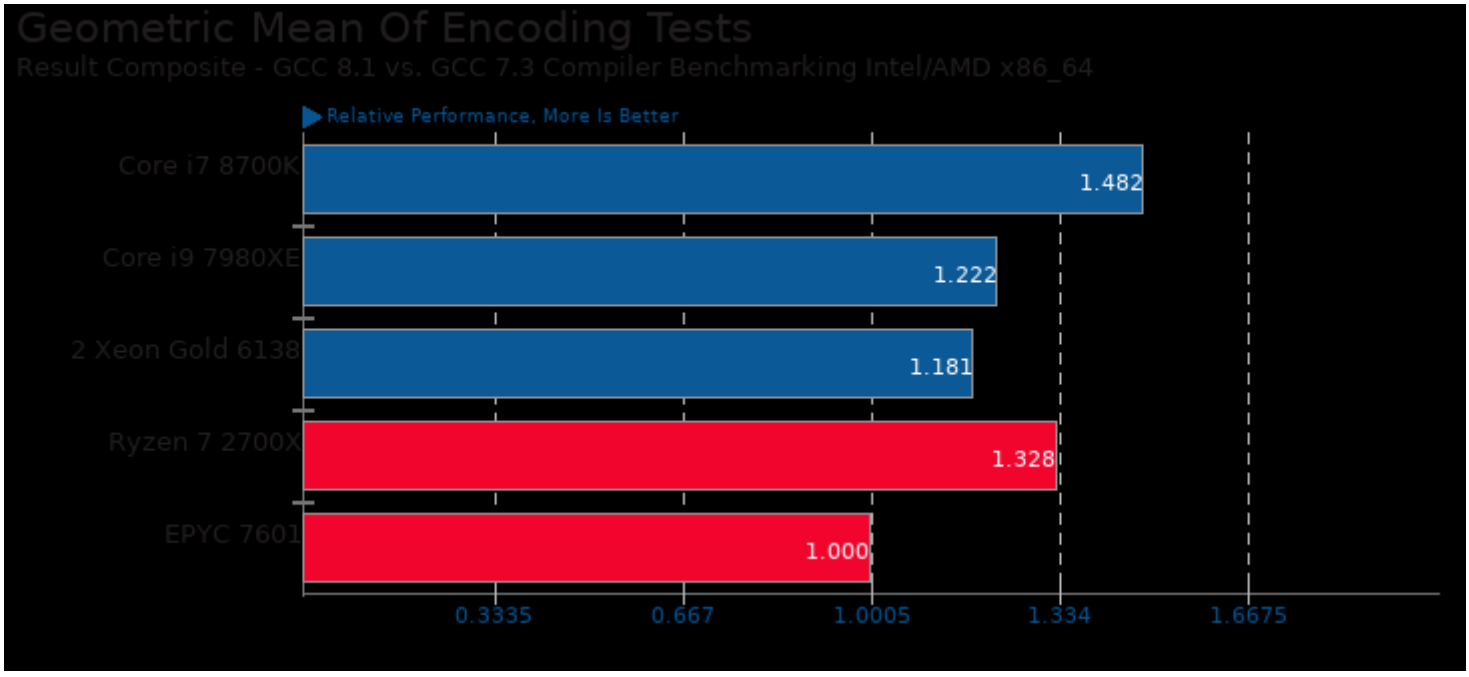
Geometric mean based upon tests: pts/scimark2, pts/aobench, pts/tscp, pts/graphics-magick, pts/himeno, pts/stockfish, pts/hmmer, pts/build-php, pts/c-ray, pts/bullet, pts/encode-mp3, pts/encode-flac and pts/nginx



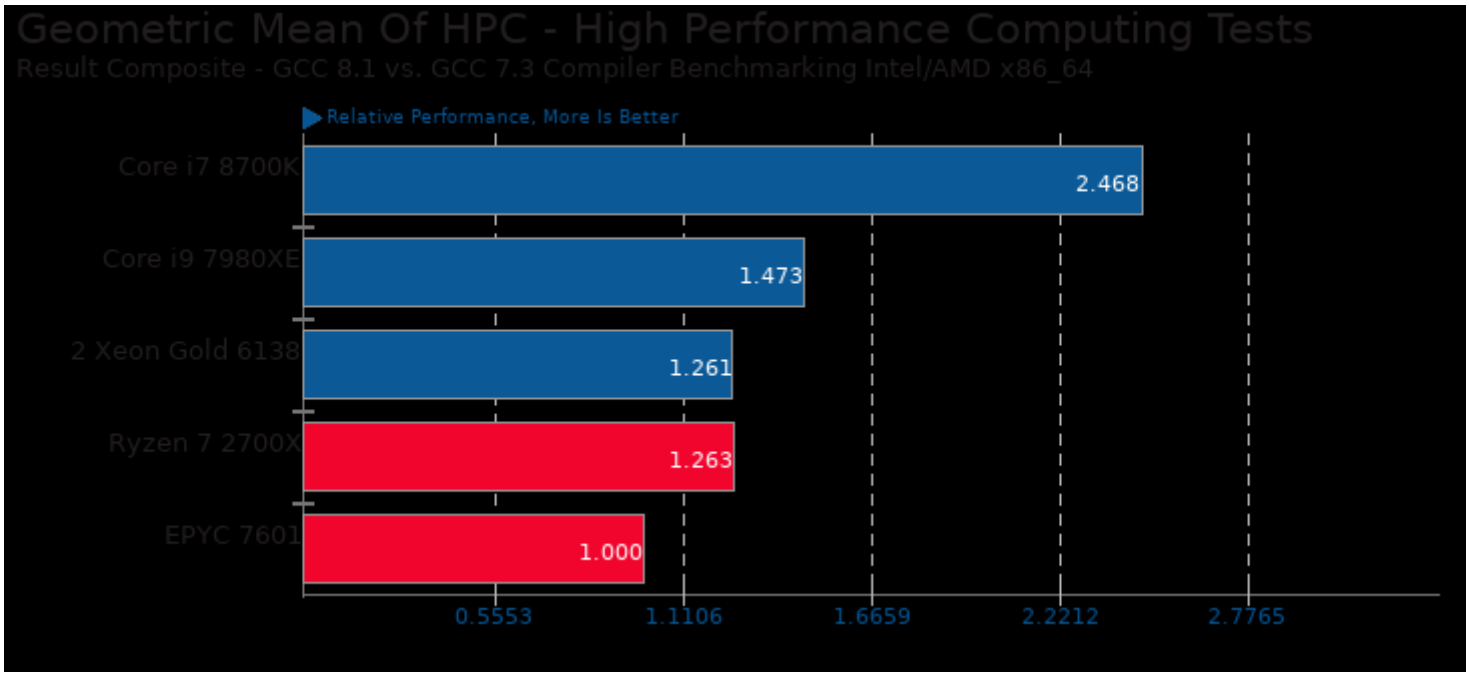
Geometric mean based upon tests: pts/build-linux-kernel, pts/build-php, pts/c-ray, pts/ebizzy, pts/encode-flac, pts/encode-mp3, pts/graphics-magick, pts/himeno, pts/hmmer, pts/nginx, pts/redis and pts/stockfish



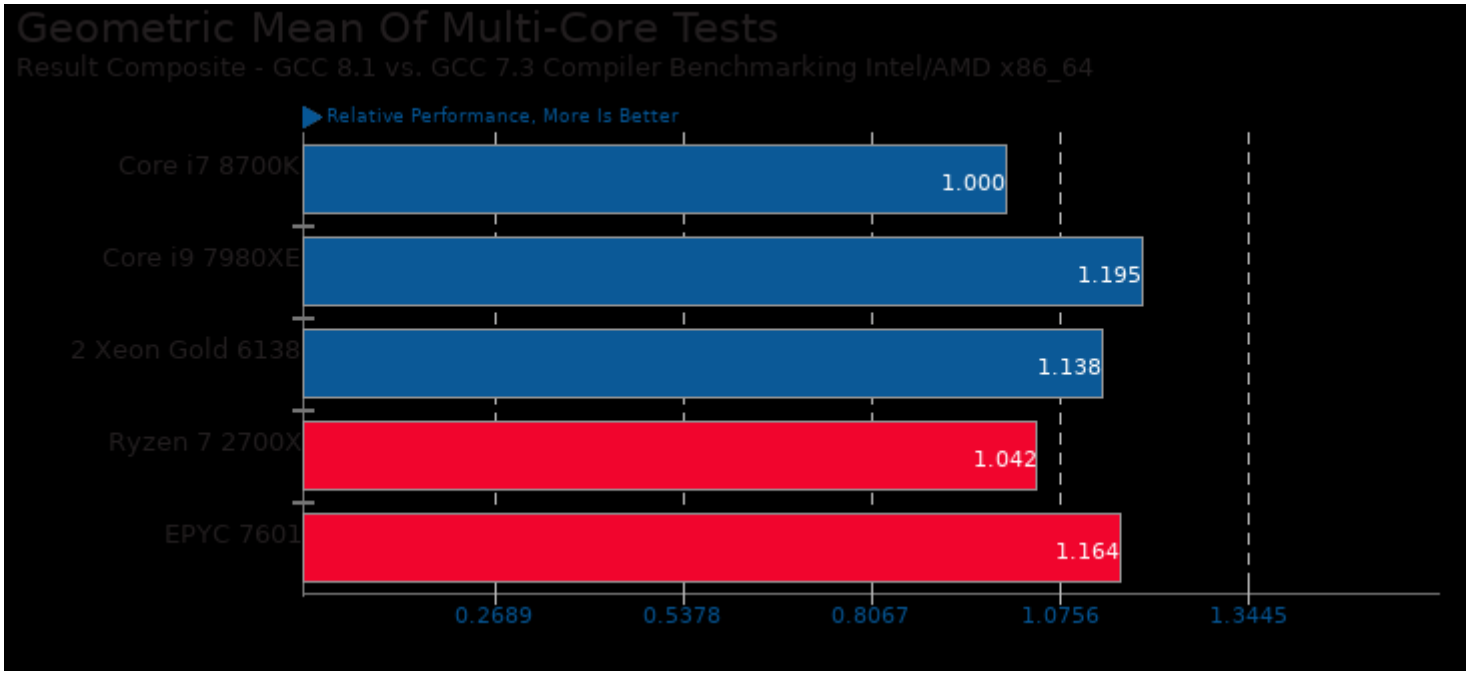
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/smallpt, pts/encode-mp3, pts/encode-flac and pts/graphics-magick



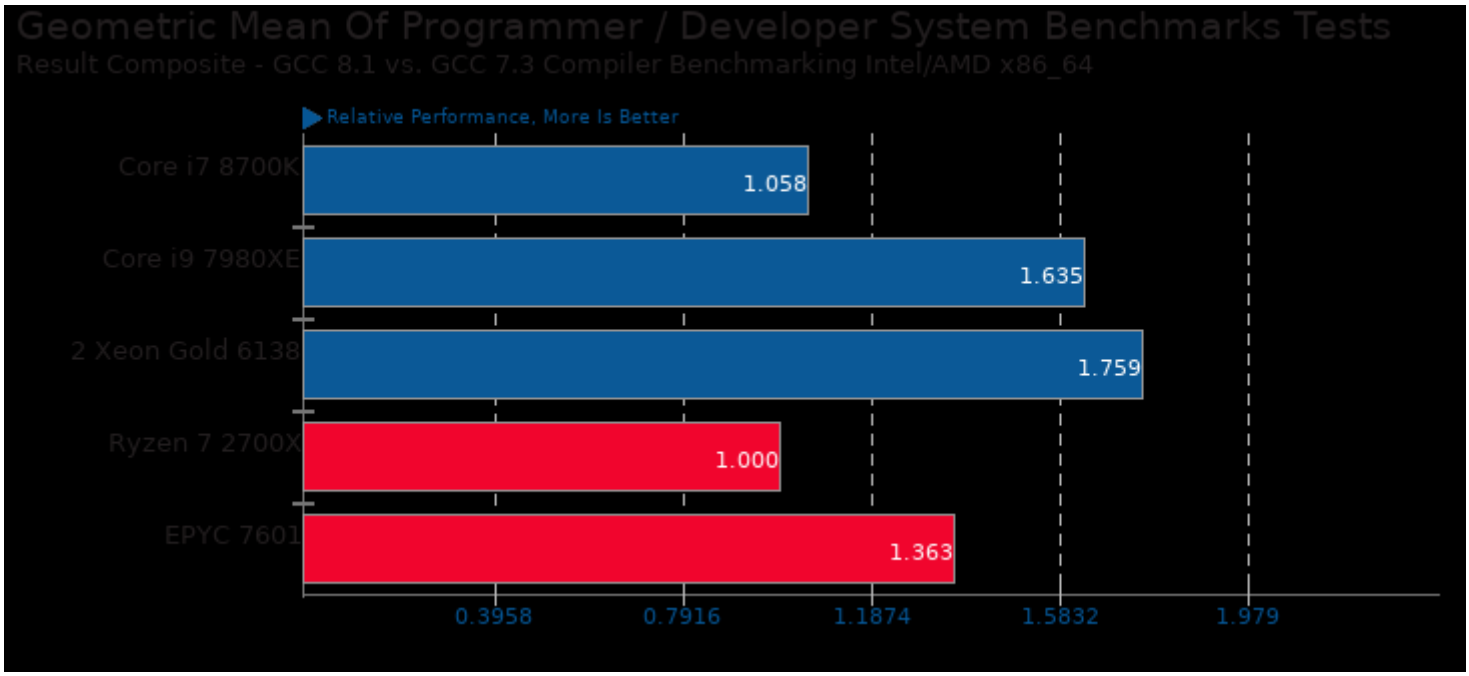
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



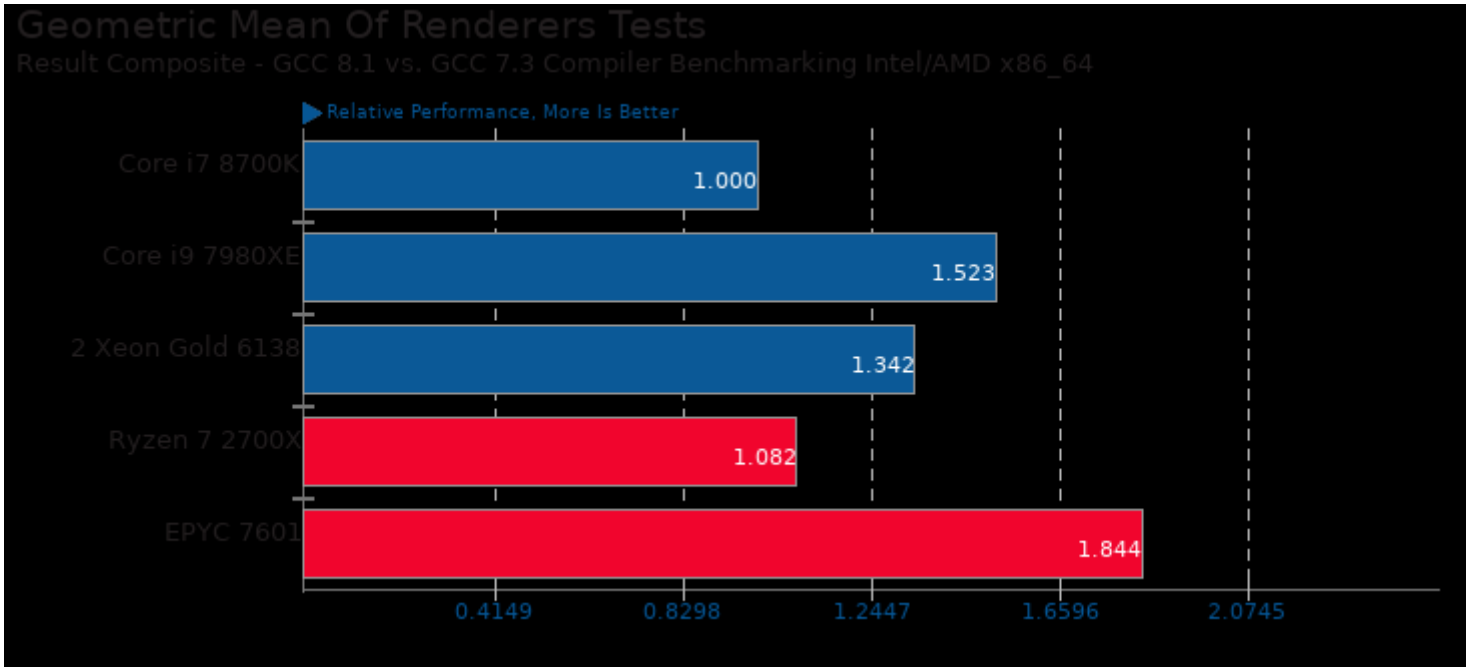
Geometric mean based upon tests: pts/himeno and pts/hmmer



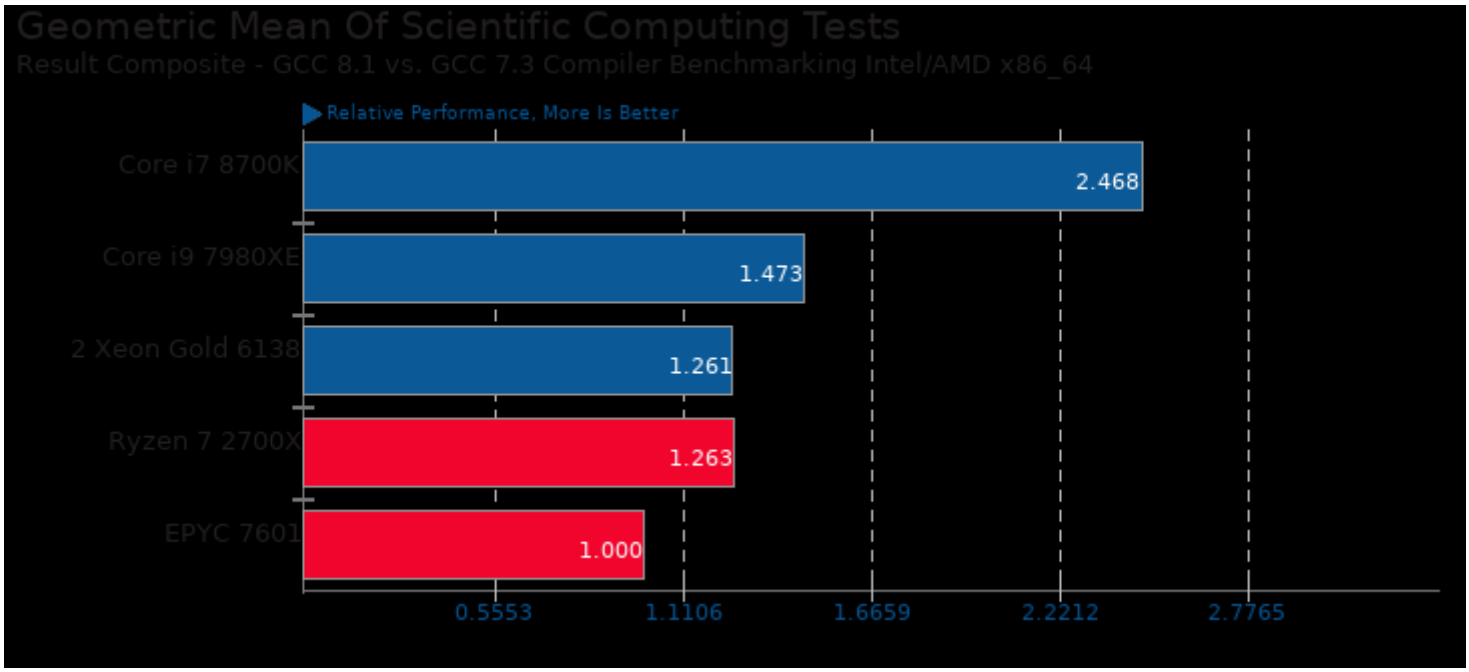
Geometric mean based upon tests: pts/c-ray, pts/stockfish, pts/smallpt, pts/ebizzy, pts/graphics-magick, pts/build-php, pts/build-linux-kernel and pts/aobench



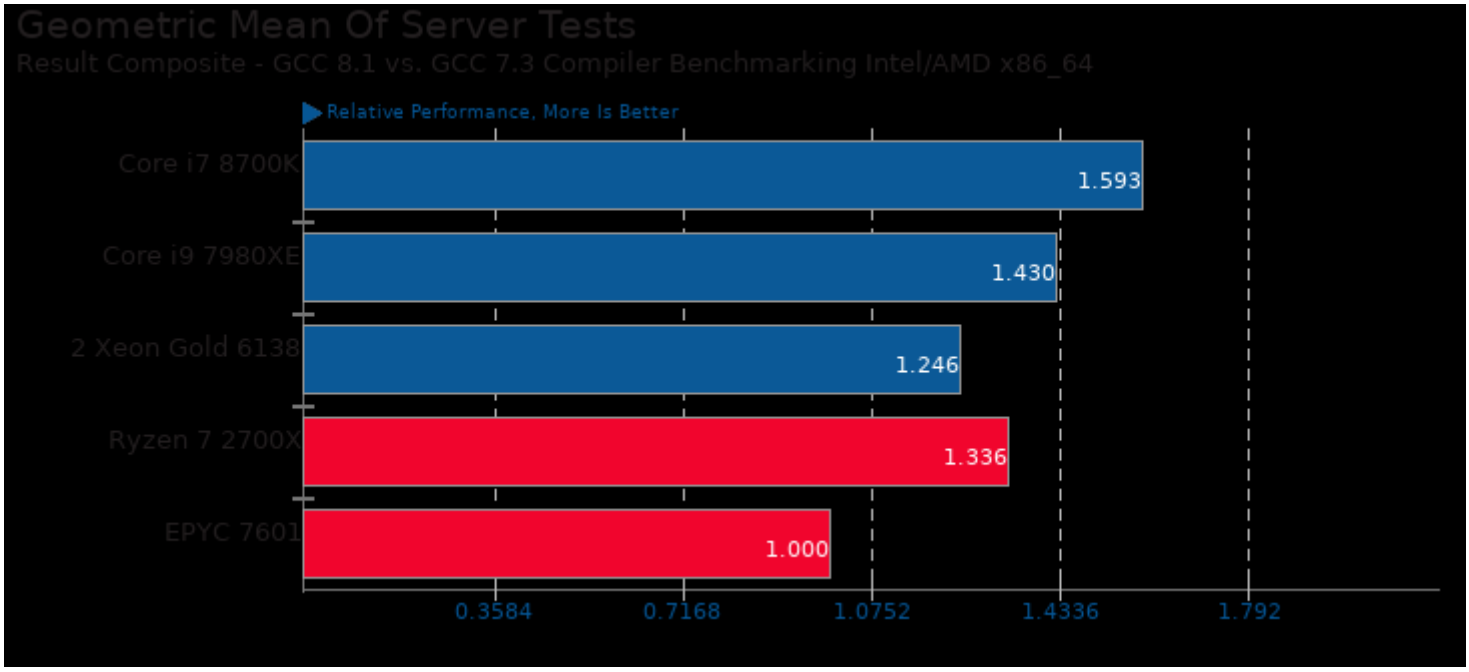
Geometric mean based upon tests: pts/build-php and pts/build-linux-kernel



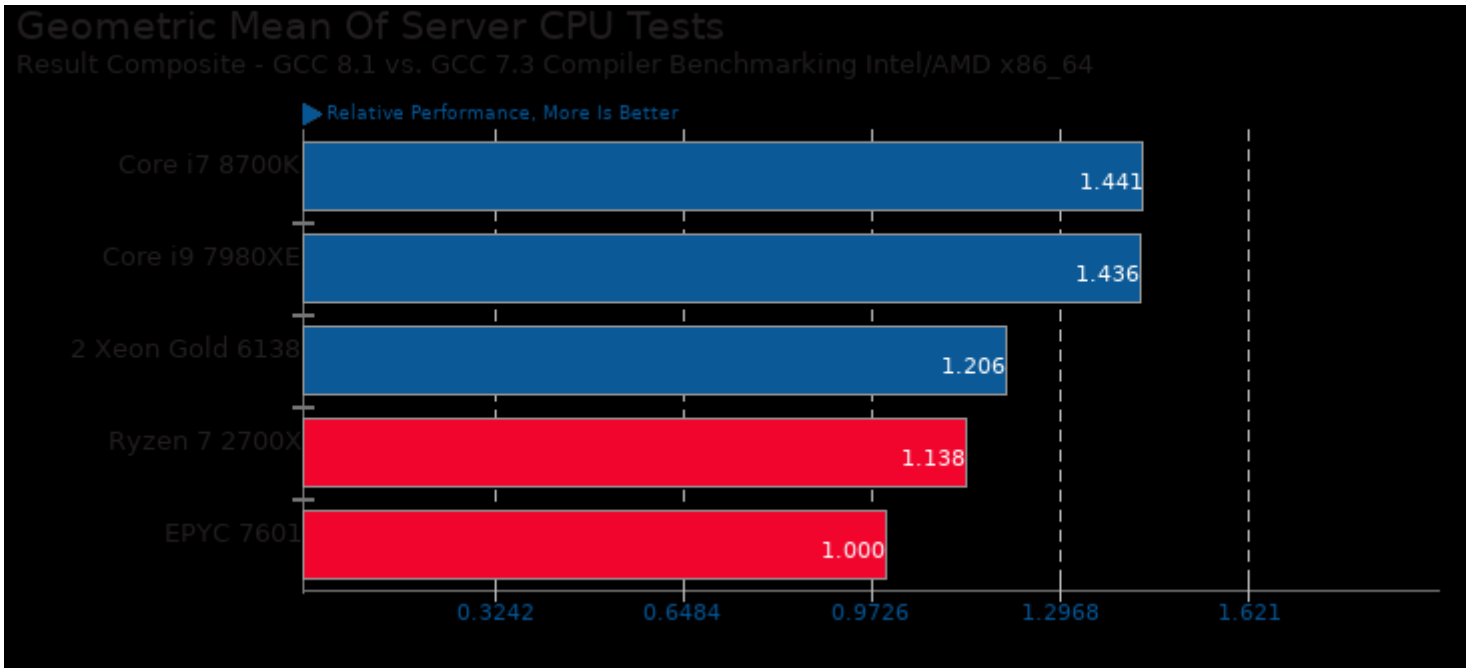
Geometric mean based upon tests: pts/c-ray, pts/aobench and pts/smallpt



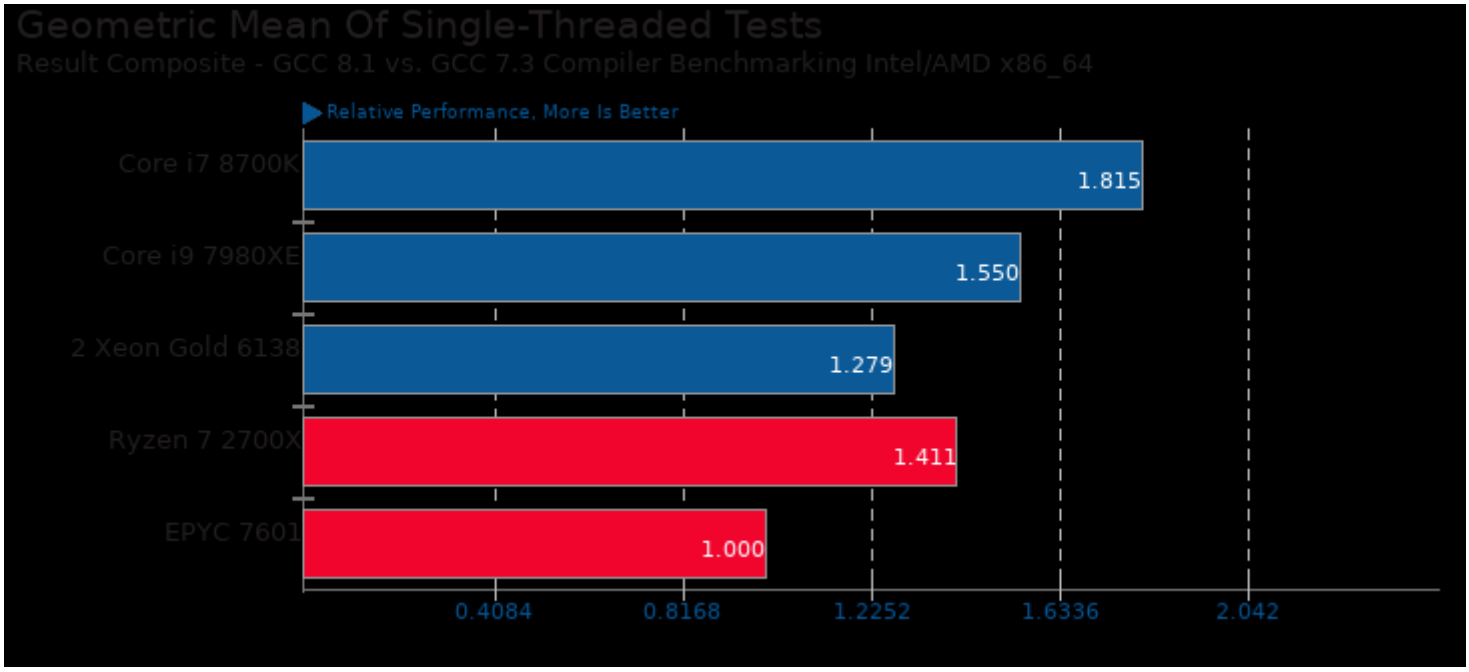
Geometric mean based upon tests: pts/himeno and pts/hmmer



Geometric mean based upon tests: pts/nginx, pts/ebizzy and pts/redis



Geometric mean based upon tests: pts/himeno, pts/stockfish, pts/build-linux-kernel, pts/build-php, pts/c-ray and pts/redis



Geometric mean based upon tests: pts/fhourstones, pts/scimark2, pts/encode-flac, pts/encode-mp3, pts/redis and pts/nginx

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