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R32_5_1_Xavier_AX720_1

ARMv8 rev 0 testing with a Jetson-AGX and NVIDIA Tegra Xavier on Ubuntu 18.04 via the Phoronix Test Suite.

Automated Executive Summary

M.2 SSD had the most wins, coming in first place for 62% of the tests.

Test Systems:

eMMC

Processor: ARMv8 rev 0 @ 2.27GHz (8 Cores), Motherboard: Jetson-AGX, Memory: 16GB, Disk: 62GB Ultra USB 3.0 + 31GB HBG4a2, Graphics: NVIDIA TEGRA, Monitor: PHL 247E6, Network: 2 x Intel I210

OS: Ubuntu 18.04, Kernel: 4.9.201-tegra (aarch64), Desktop: Unity 7.5.0, Display Server: X Server 1.19.6, Vulkan: 1.2.131, Compiler: GCC 7.5.0 + CUDA 10.2, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=aarch64-linux-gnu --disable-libquadmath --disable-libquadmath-support --disable-werror --enable-bootstrap --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++ --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 -v
Disk Notes: CFQ / data=ordered,relatime,rw / Block Size: 4096
Processor Notes: Scaling Governor: tegra_cpufreq schedutil

M.2 SSD

USB 3.0

USB2.0

Micro SD Card

Processor: ARMv8 rev 0 @ 2.27GHz (8 Cores), Motherboard: Jetson-AGX, Memory: 16GB, Disk: 256GB INTEL SSDPEKKW256G8 + 62GB Ultra USB 3.0 + 31GB HBG4a2, Graphics: NVIDIA Tegra Xavier, Monitor: PHL 247E6, Network: 2 x Intel I210

OS: Ubuntu 18.04, Kernel: 4.9.201-tegra (aarch64), Desktop: Unity 7.5.0, Display Server: X Server 1.19.6, Display Driver: NVIDIA 32.5.1, OpenGL: 4.6.0, Vulkan: 1.2.131, Compiler: GCC 7.5.0 + CUDA 10.2, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=aarch64-linux-gnu --disable-libquadmath --disable-libquadmath-support --disable-werror --enable-bootstrap --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++ --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 -v
Disk Notes: none / data=ordered,relatime,rw / Block Size: 4096
Processor Notes: Scaling Governor: tegra_cpufreq schedutil

Type C

CPU Stress

Processor: ARMv8 rev 0 @ 2.27GHz (8 Cores), Motherboard: Jetson-AGX, Memory: 16GB, Disk: 256GB INTEL SSDPEKKW256G8 + 256GB Tech + 62GB Ultra USB 3.0 + 31GB HBG4a2 + 15GB i-TF, Graphics: NVIDIA Tegra Xavier, Monitor: PHL 247E6, Network: 2 x Intel I210

OS: Ubuntu 18.04, Kernel: 4.9.201-tegra (aarch64), Desktop: Unity 7.5.0, Display Server: X Server 1.19.6, Display Driver: NVIDIA 32.5.1, OpenGL: 4.6.0, Vulkan: 1.2.131, Compiler: GCC 7.5.0 + CUDA 10.2, File-System: ext4, Screen Resolution: 1920x1080

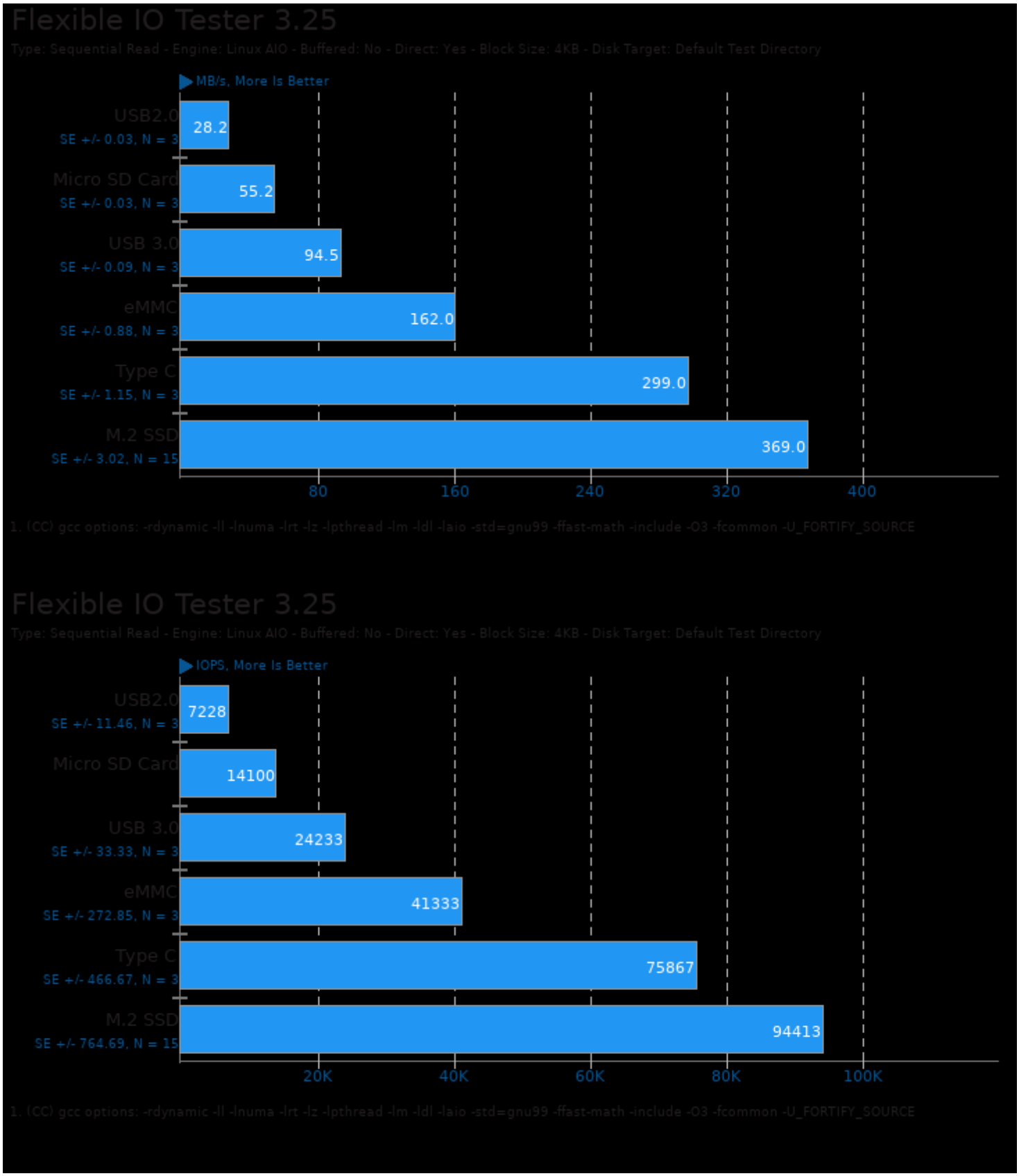
Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=aarch64-linux-gnu --disable-libquadmath --disable-libquadmath-support --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-fix-cortex-a53-843419 --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++ --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 -v
Processor Notes: Scaling Governor: tegra_cpufreq schedutil

	eMMC	M.2 SSD	USB 3.0	USB2.0	Micro SD Card	Type C	CPU Stress

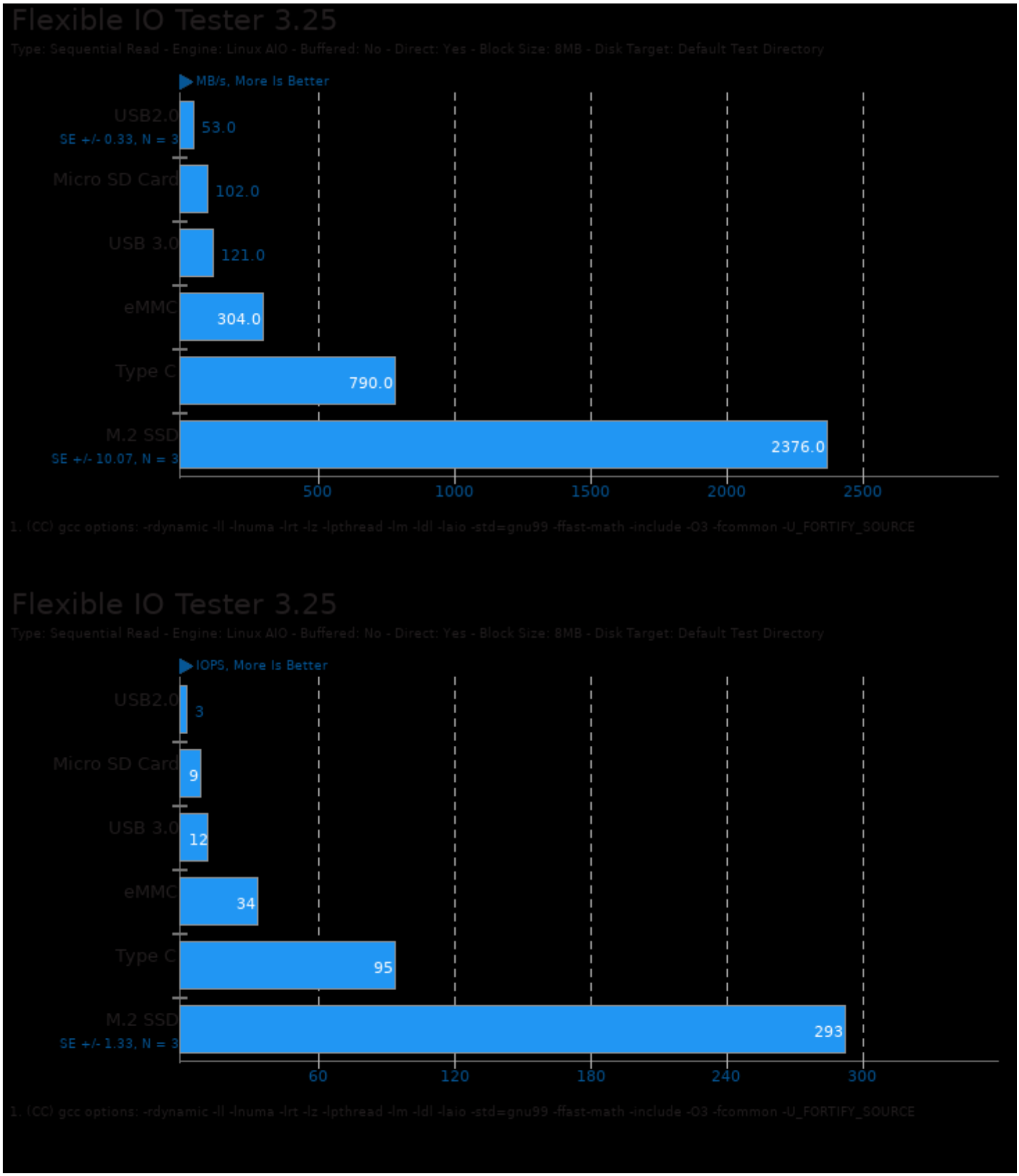
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (MB/s)	162	**369**	94.5	**28.2**	55.2	299	
Normalized	43.9%	100%	25.61%	7.64%	14.96%	81.03%	
Standard Deviation	0.9%	3.2%	0.2%	0.2%	0.1%	0.7%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (IOPS)	41333	**94413**	24233	**7228**	14100	75867	
Normalized	43.78%	100%	25.67%	7.66%	14.93%	80.36%	
Standard Deviation	1.1%	3.1%	0.2%	0.3%		1.1%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 8MB (MB/s)	304	**2376**	121	**53.0**	102	790	
Normalized	12.79%	100%	5.09%	2.23%	4.29%	33.25%	
Standard Deviation		0.7%		1.1%			
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 8MB (IOPS)	34	**293**	12	**3**	9	95	
Normalized	11.6%	100%	4.1%	1.02%	3.07%	32.42%	
Standard Deviation		0.8%					
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (MB/s)	93.2	222	24.6	25.1	**23.6**	**257**	
Normalized	36.26%	86.38%	9.57%	9.77%	9.18%	100%	
Standard Deviation	5.1%	0.3%	2%	0.5%	4.4%	1.4%	
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (IOPS)	23846	56900	6364	6426	**6054**	**65800**	
Normalized	36.24%	86.47%	9.67%	9.77%	9.2%	100%	
Standard Deviation	5.1%	0.2%	0.4%	0.3%	4.6%	1.5%	
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 8MB (MB/s)	137	282	**38.6**	48.4	66.8	**285**	
Normalized	48.07%	98.95%	13.54%	16.98%	23.44%	100%	
Standard Deviation	1.5%		0.5%	1%	0.2%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 8MB (IOPS)	14	**32**	**2**	3	5	**32**	
Normalized	43.75%	100%	6.25%	9.38%	15.63%	100%	
Stress-NG - Crypto (Bogo Ops/s)							1190
Standard Deviation							1.1%
Stress-NG - Forking (Bogo Ops/s)							6591
Standard Deviation							1.5%
Stress-NG - CPU Stress (Bogo Ops/s)							766.00
Standard Deviation							29.2%
Stress-NG - Matrix Math (Bogo Ops/s)							6288
Standard Deviation							0.4%

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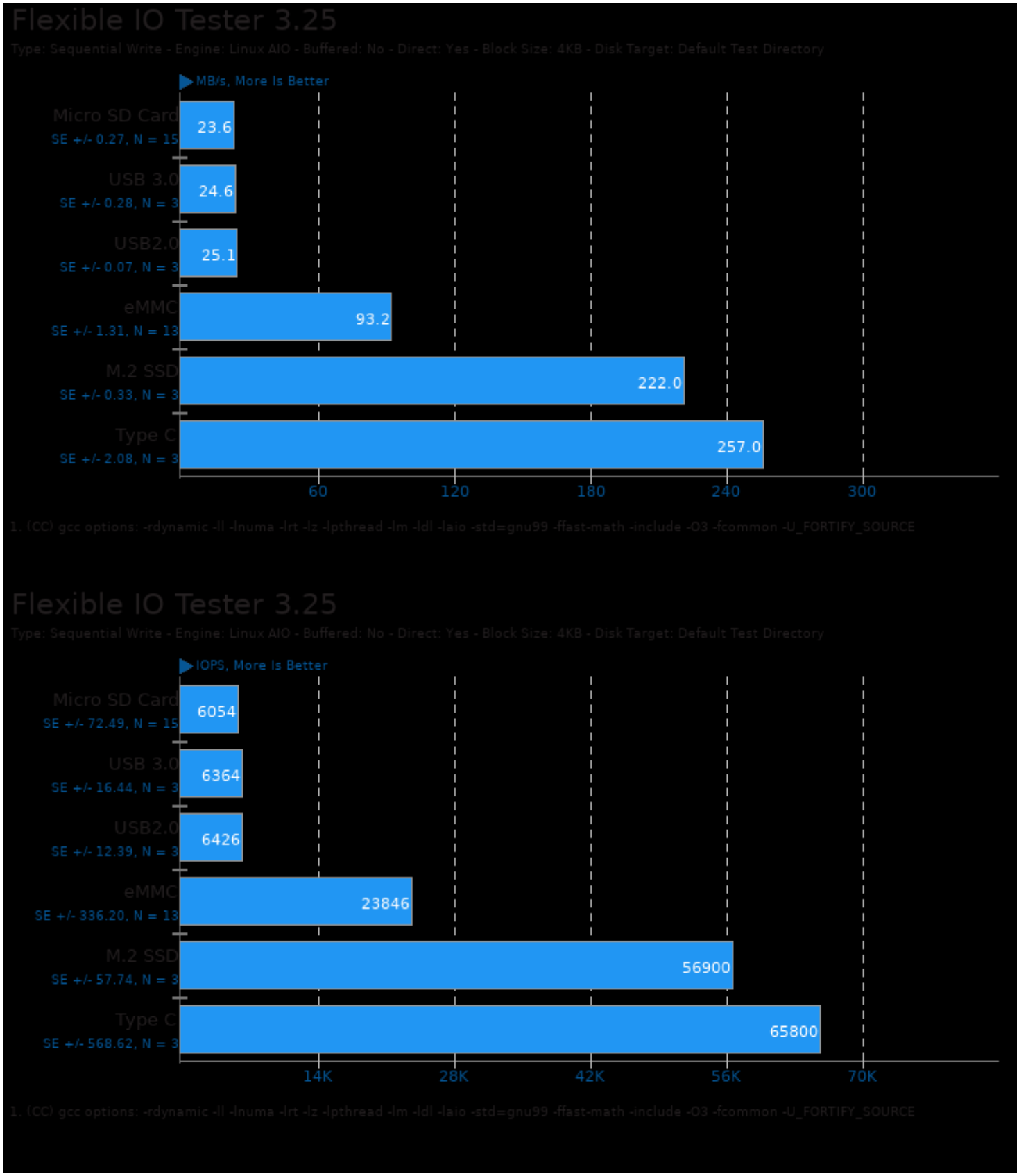
Stress-NG - Vector Math (Bogo Ops/s)	24875
Standard Deviation	0.4%
Stress-NG - Memory Copying (Bogo Ops/s)	1761
Standard Deviation	0.2%
Stress-NG - G.C.S.F (Bogo Ops/s)	115612
Standard Deviation	3.2%
Stress-NG - G.Q.D.S (Bogo Ops/s)	20.34
Standard Deviation	3%

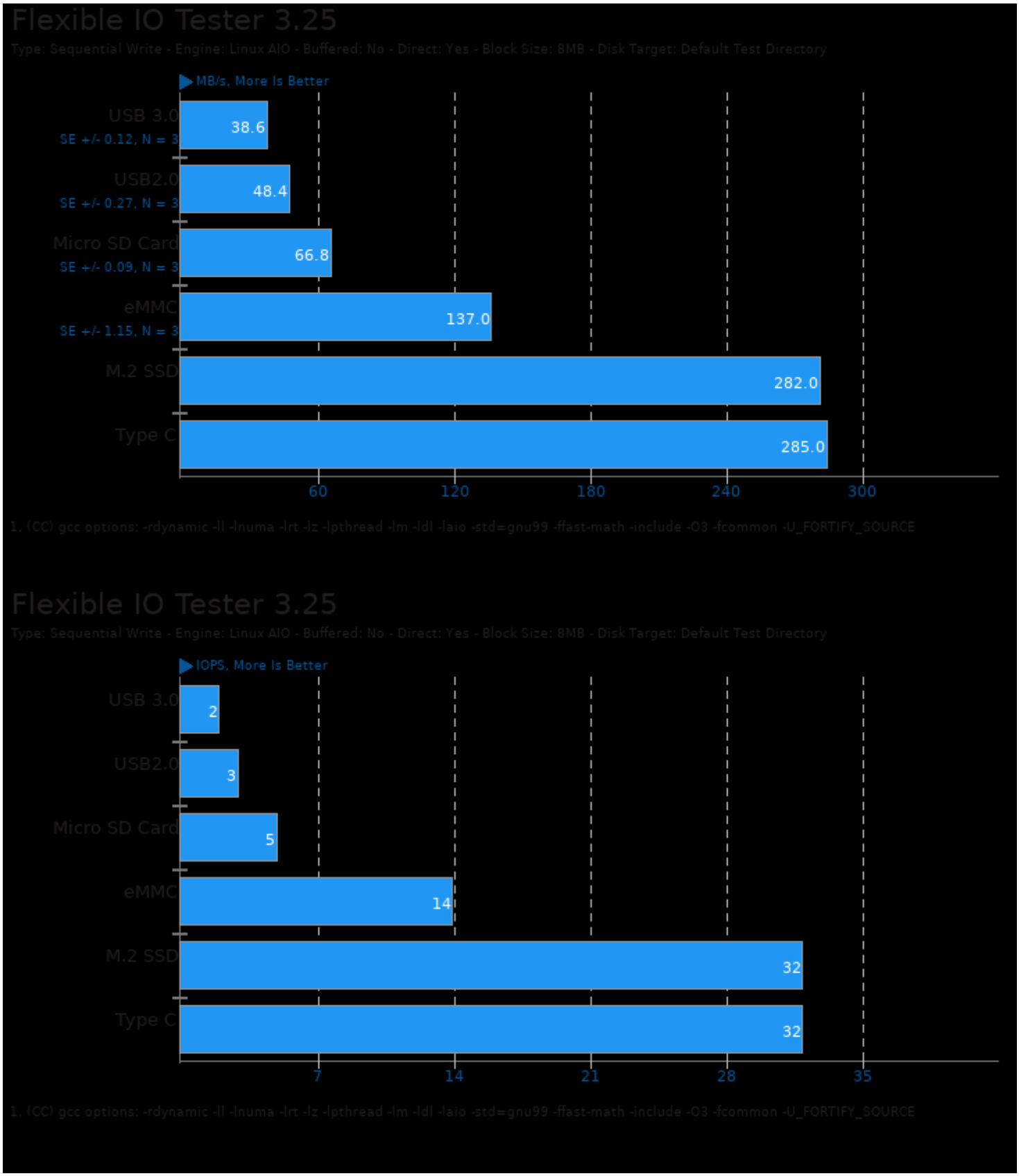

Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
USB2.0
SE +/- 0.03, N = 3
28.2
Micro SD Card
SE +/- 0.03, N = 3
55.2
USB 3.0
SE +/- 0.09, N = 3
94.5
eMMC
SE +/- 0.88, N = 3
162.0
Type C
SE +/- 1.15, N = 3
299.0
M.2 SSD
SE +/- 3.02, N = 15
369.0
80
160
240
320
400
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE

Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
USB2.0
SE +/- 11.46, N = 3
7228
Micro SD Card
14100
USB 3.0
SE +/- 33.33, N = 3
24233
eMMC
SE +/- 272.85, N = 3
41333
Type C
SE +/- 466.67, N = 3
75867
M.2 SSD
SE +/- 764.69, N = 15
94413
20K
40K
60K
80K
100K
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE


Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 8MB - Disk Target: Default Test Directory
MB/s, More Is Better
USB2.0
53.0
SE +/- 0.33, N = 3
Micro SD Card
102.0
USB 3.0
121.0
eMMC
304.0
Type C
790.0
M.2 SSD
2376.0
SE +/- 10.07, N = 3
500
1000
1500
2000
2500
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE

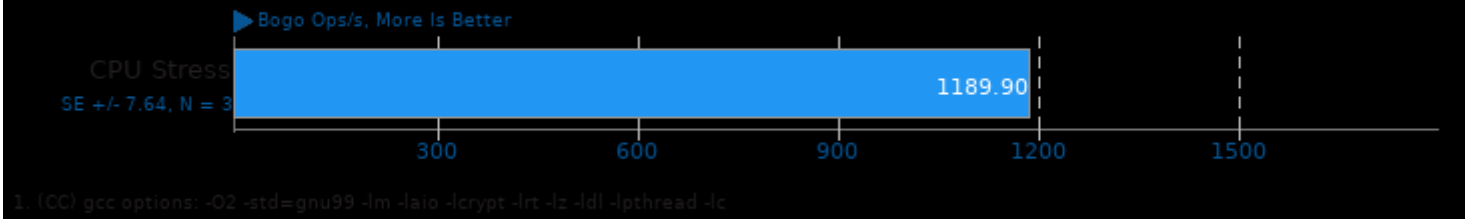
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 8MB - Disk Target: Default Test Directory
IOPS, More Is Better
USB2.0
3
Micro SD Card
9
USB 3.0
12
eMMC
34
Type C
95
M.2 SSD
293
SE +/- 1.33, N = 3
60
120
180
240
300
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE


Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
Micro SD Card
SE +/- 0.27, N = 15
23.6
USB 3.0
SE +/- 0.28, N = 3
24.6
USB2.0
SE +/- 0.07, N = 3
25.1
eMMC
SE +/- 1.31, N = 13
93.2
M.2 SSD
SE +/- 0.33, N = 3
222.0
Type C
SE +/- 2.08, N = 3
257.0
60
120
180
240
300
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE
Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
Micro SD Card
SE +/- 72.49, N = 15
6054
USB 3.0
SE +/- 16.44, N = 3
6364
USB2.0
SE +/- 12.39, N = 3
6426
eMMC
SE +/- 336.20, N = 13
23846
M.2 SSD
SE +/- 57.74, N = 3
56900
Type C
SE +/- 568.62, N = 3
65800
14K
28K
42K
56K
70K
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE


Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 8MB - Disk Target: Default Test Directory
MB/s, More Is Better
USB 3.0
38.6
SE +/- 0.12, N = 3
USB2.0
48.4
SE +/- 0.27, N = 3
Micro SD Card
66.8
SE +/- 0.09, N = 3
eMMC
137.0
SE +/- 1.15, N = 3
M.2 SSD
282.0
Type C
285.0
60
120
180
240
300
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE
Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 8MB - Disk Target: Default Test Directory
IOPS, More Is Better
USB 3.0
2
USB2.0
3
Micro SD Card
5
eMMC
14
M.2 SSD
32
Type C
32
7
14
21
28
35
1. (CC) gcc options: -rdynamic -ll -lnuma -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE

Stress-NG 0.11.07

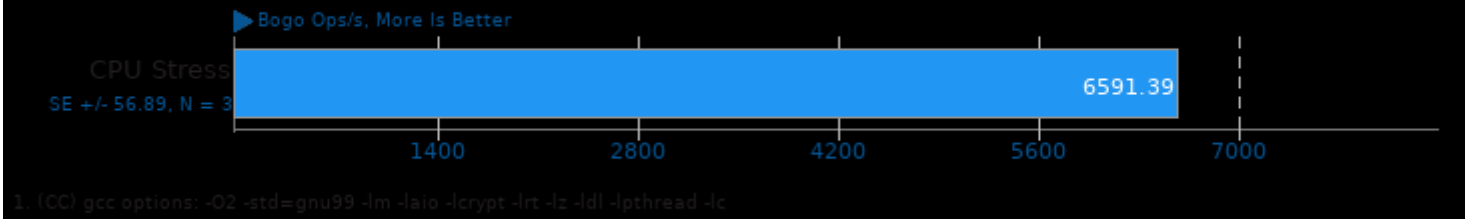
Test: Crypto



1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

Stress-NG 0.11.07

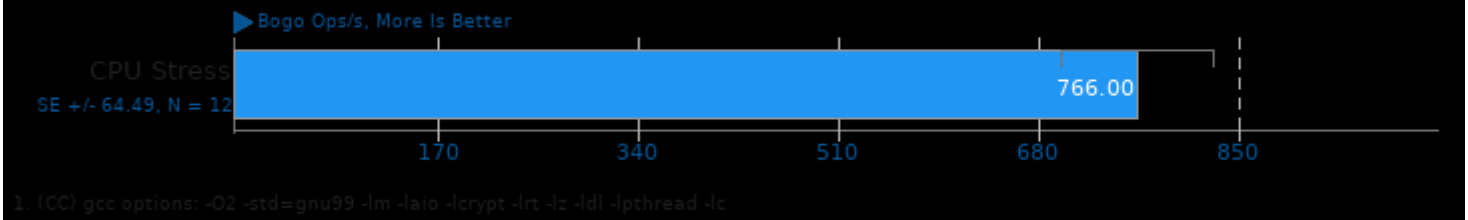
Test: Forking



1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

Stress-NG 0.11.07

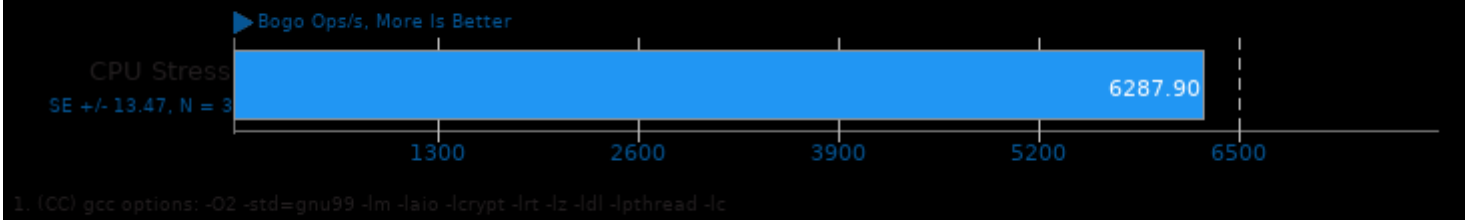
Test: CPU Stress



1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

Stress-NG 0.11.07

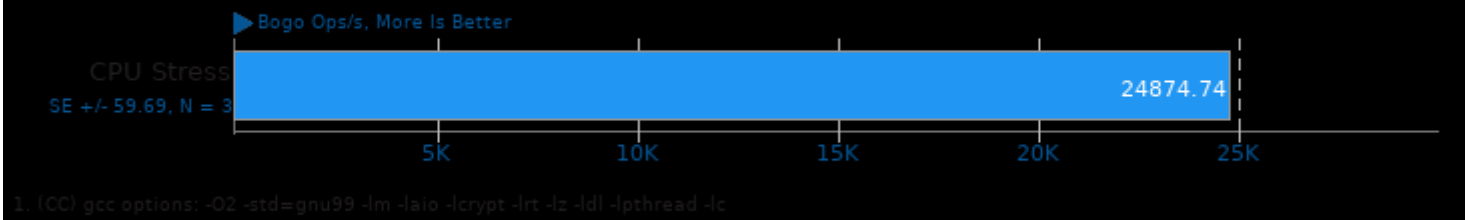
Test: Matrix Math



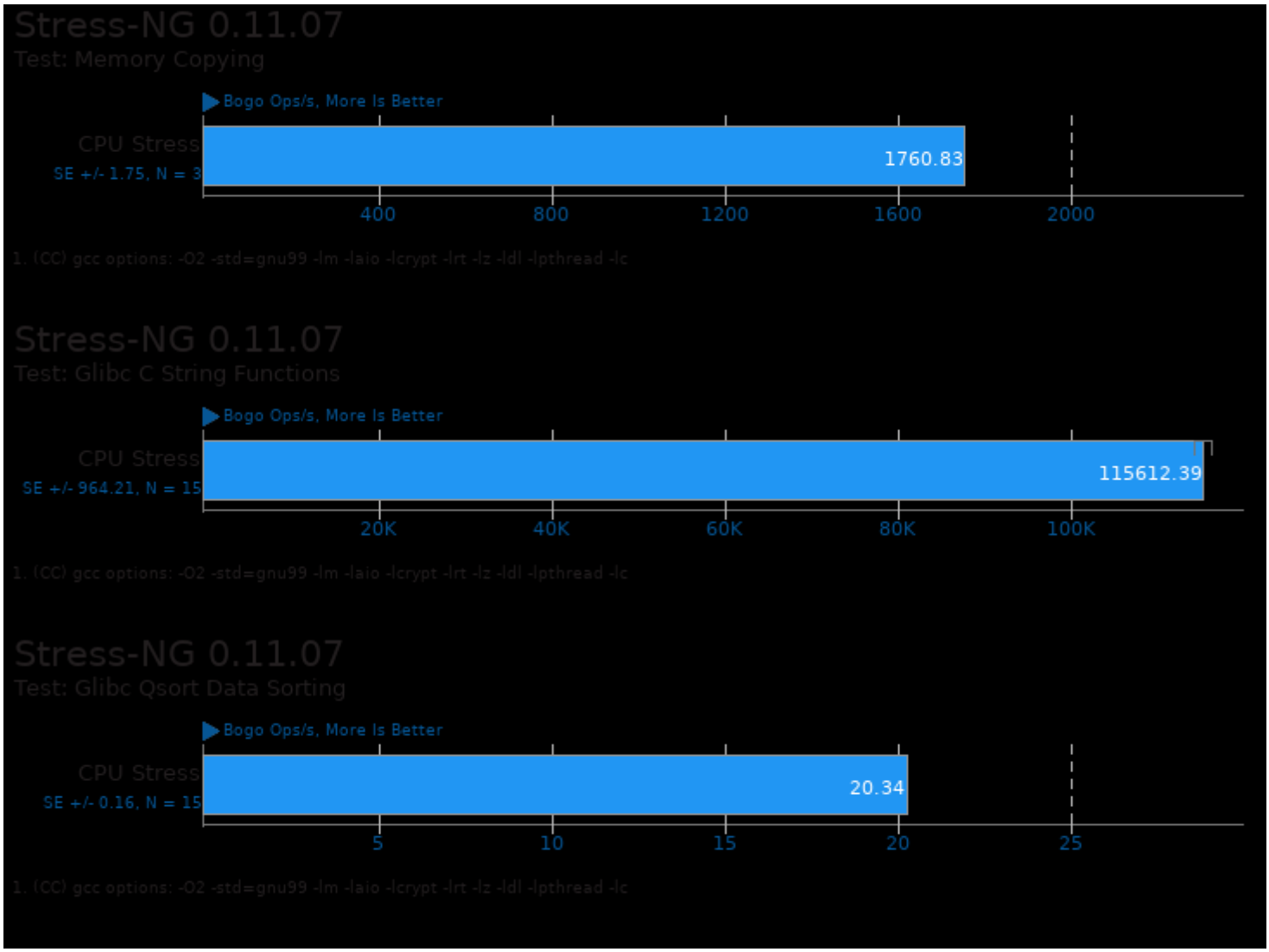
1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc

Stress-NG 0.11.07

Test: Vector Math



1. (CC) gcc options: -O2 -std=gnu99 -lm -laio -lcrypt -lrt -lz -ldl -lpthread -lc



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