SPECaccel®2023 Result

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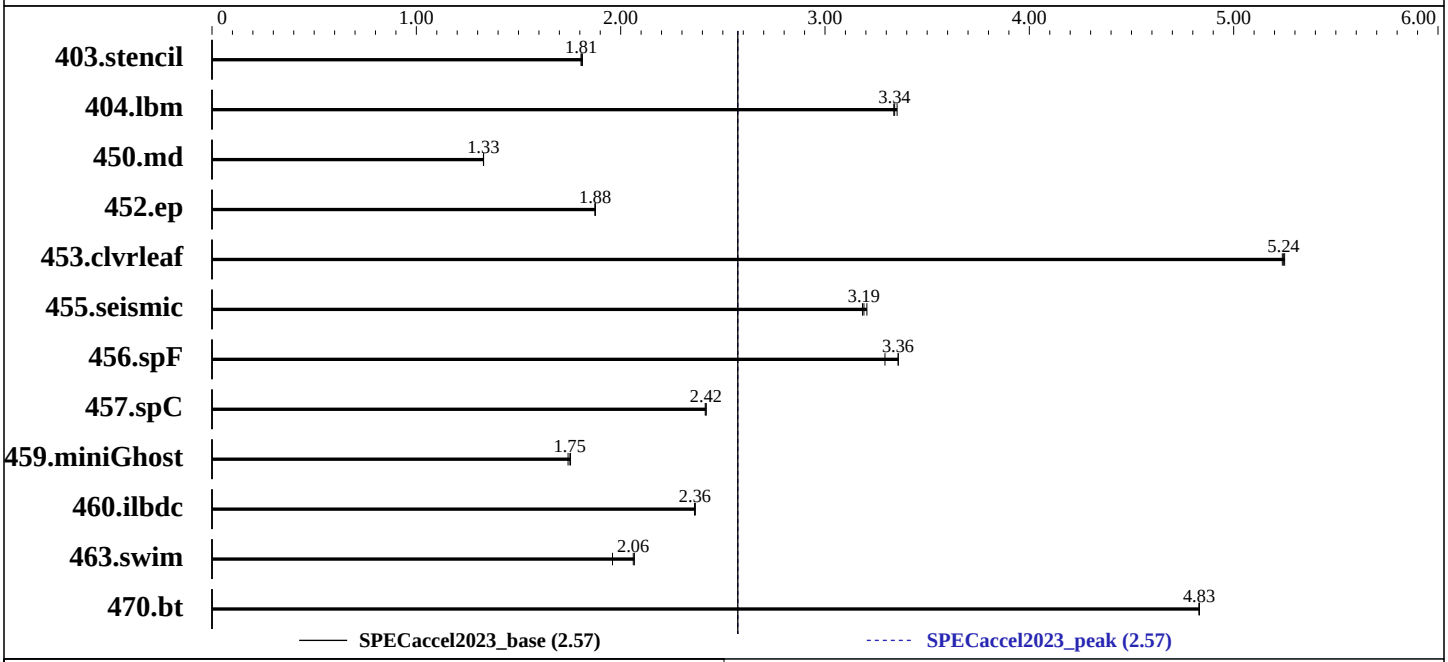
Supermciro
(Test Sponsor: NVIDIA Corporation)
Tesla A100 PCIe 80GB
120GQ-TNRT

SPECaccel 2023_base = 2.57
SPECaccel 2023_peak = 2.57

accel2023 License: 9045
Test Sponsor: NVIDIA Corporation
Tested by: NVIDIA Corporation

Test Date: Oct-2023
Hardware Availability: Mar-2023
Software Availability: Nov-2023



Hardware

CPU Name:	Intel Xeon Gold 6338
Max MHz.:	3400
Nominal:	2000
Enabled:	64 cores, 2 chips, 2 threads/core
Orderable:	2 chips
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	1280 KB I+D on chip per core
L3:	48 MB I+D on chip per chip
Other:	None
Memory:	512 GB (16x 16GB, PC3200 CL3 DDR4)
Storage:	1TB SATA
Other:	None
Base Threads Run:	1
Min. Peak Threads:	1
Max. Peak Threads:	1

Accelerator

Accel Model Name:	A100 PCIe 80GB
Accel Vendor:	NVIDIA
Accel Name:	Tesla A100 PCIe 80GB
Type of Accel:	GPU
Accel Connection:	PCIe 4.0 16x
Does Accel Use ECC:	Yes
Accel Description:	See Notes
Accel Driver:	NVIDIA UNIX x86_64 Kernel Module 525.60.13

Software

OS:	Rocky Linux release 8.8 (Green Obsidian) 4.18.0-477.15.1.el8_8.x86_64
Compiler:	C/Fortran: Version 23.11 of NVHPC SDK
Firmware:	1.1b 11/01/2021
File System:	xfs
System State:	Run level 3 (multi-user)
Other:	None
Base Parallel Model:	LOP
Base Threads Run:	1
Peak Parallel Models:	LOP

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Software (Continued)

Max. Peak Threads: 1
Min. Peak Threads: 1

Results Table

Benchmark	Base							Peak						
	Model	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Model	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
403.stencil	LOP	243	1.81	244	1.81	**243**	**1.81**	LOP	243	1.81	244	1.81	**243**	**1.81**
404.lbm	LOP	**136**	**3.34**	136	3.34	136	3.35	LOP	**136**	**3.34**	136	3.34	136	3.35
450.md	LOP	**451**	**1.33**	452	1.33	451	1.33	LOP	**451**	**1.33**	452	1.33	451	1.33
452.ep	LOP	**221**	**1.88**	221	1.88	221	1.87	LOP	**221**	**1.88**	221	1.88	221	1.87
453.clvrleaf	LOP	190	5.25	191	5.24	**191**	**5.24**	LOP	190	5.25	191	5.24	**191**	**5.24**
455.seismic	LOP	243	3.21	**244**	**3.19**	245	3.18	LOP	243	3.21	**244**	**3.19**	245	3.18
456.spF	LOP	141	3.36	**141**	**3.36**	144	3.29	LOP	141	3.36	**141**	**3.36**	144	3.29
457.spC	LOP	224	2.41	223	2.42	**223**	**2.42**	LOP	224	2.41	223	2.42	**223**	**2.42**
459.miniGhost	LOP	336	1.75	**337**	**1.75**	339	1.74	LOP	336	1.75	**337**	**1.75**	339	1.74
460.ilbdc	LOP	235	2.36	**235**	**2.36**	235	2.36	LOP	235	2.36	**235**	**2.36**	235	2.36
463.swim	LOP	**213**	**2.06**	213	2.07	224	1.96	LOP	**213**	**2.06**	213	2.07	224	1.96
470.bt	LOP	218	4.83	**218**	**4.83**	218	4.83	LOP	218	4.83	**218**	**4.83**	218	4.83

SPEC accel2023_base = 2.57

SPEC accel2023_peak = 2.57

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

Operating System Notes

```
Shell stacksize set to unlimited via "limit stacksize unlimited"
```

Platform Notes

```
 Information from nvaccelinfo
 CUDA Driver Version:           12000
 NVRM version:                  NVIDIA UNIX x86_64 Kernel Module  525.60.13  Wed Nov 30 06:39:21 UTC 2022
 Device Number:                 0
 Device Name:                   NVIDIA A100 80GB PCIe
 Device Revision Number:        8.0
 Global Memory Size:            85024112640
 Number of Multiprocessors:     108
 Concurrent Copy and Execution: Yes
 Total Constant Memory:         65536
 Total Shared Memory per Block: 49152
 Registers per Block:           65536
 Warp Size:                     32
 Maximum Threads per Block:     1024
 Maximum Block Dimensions:      1024, 1024, 64
 Maximum Grid Dimensions:       2147483647 x 65535 x 65535
```

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Platform Notes (Continued)

```
Maximum Memory Pitch:          2147483647B
Texture Alignment:             512B
Clock Rate:                    1410 MHz
Execution Timeout:             No
Integrated Device:             No
Can Map Host Memory:           Yes
Compute Mode:                  default
Concurrent Kernels:            Yes
ECC Enabled:                   Yes
Memory Clock Rate:             1512 MHz
Memory Bus Width:              5120 bits
L2 Cache Size:                 41943040 bytes
Max Threads Per SMP:           2048
Async Engines:                 3
Unified Addressing:            Yes
Managed Memory:                Yes
Concurrent Managed Memory:     Yes
Preemption Supported:          Yes
Cooperative Launch:            Yes
Default Target:                cc80


Sysinfo program /local/home/mcolgrove/ACCELV2/bin/sysinfo
Rev: r6622 of 2021-04-07 b1a7d5f8f71be5aff70a755cad7211a0
running on ice2 Tue Oct 24 10:32:15 2023

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
   https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
   model name : Intel(R) Xeon(R) Gold 6338 CPU @ 2.00GHz
      2  "physical id"s (chips)
      128 "processors"
   cores, siblings (Caution: counting these is hw and system dependent. The following
   excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
      cpu cores : 32
      siblings  : 64
      physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
      25 26 27 28 29 30 31
      physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
      25 26 27 28 29 30 31

From lscpu from util-linux 2.34:
     Architecture:                    x86_64
     CPU op-mode(s):                  32-bit, 64-bit
     Byte Order:                      Little Endian
```

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Platform Notes (Continued)

```
Address sizes:                   46 bits physical, 57 bits virtual
CPU(s):                          128
On-line CPU(s) list:             0-127
Thread(s) per core:              2
Core(s) per socket:              32
Socket(s):                       2
NUMA node(s):                    2
Vendor ID:                       GenuineIntel
CPU family:                      6
Model:                           106
Model name:                      Intel(R) Xeon(R) Gold 6338 CPU @ 2.00GHz
Stepping:                        6
Frequency boost:                 enabled
CPU MHz:                         1774.338
CPU max MHz:                     3200.0000
CPU min MHz:                     800.0000
BogoMIPS:                        4000.00
Virtualization:                  VT-x
L1d cache:                       3 MiB
L1i cache:                       2 MiB
L2 cache:                        80 MiB
L3 cache:                        96 MiB
NUMA node0 CPU(s):               0-31,64-95
NUMA node1 CPU(s):               32-63,96-127
Vulnerability Itlb multihit:     Not affected
Vulnerability L1tf:              Not affected
Vulnerability Mds:               Not affected
Vulnerability Meltdown:          Not affected
Vulnerability Mmio stale data:   Mitigation; Clear CPU buffers; SMT vulnerable
Vulnerability Retbleed:          Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
prctl and seccomp
Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user
pointer sanitization
Vulnerability Spectre v2:        Mitigation; Enhanced IBRS, IBPB conditional, RSB
filling, PBRSB-eIBRS SW sequence
Vulnerability Srbds:             Not affected
Vulnerability Tsx async abort:   Not affected
Flags:                           fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx
pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2
ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt
tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
epb cat_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid
cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt
```

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Platform Notes (Continued)

```
      avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc
      cqm_occup_llc cqm_mbm_total cqm_mbm_local wbnoinvd dtherm ida arat pln pts
      avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni
      avx512_bitalg tme avx512_vpopcntdq rdpid md_clear pconfig flush_l1d
      arch_capabilities

  From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL
      L1d       48K       3M   12 Data            1
      L1i       32K       2M    8 Instruction     1
      L2       1.3M      80M   20 Unified         2
      L3        48M      96M   12 Unified         3

  /proc/cpuinfo cache data
     cache size : 49152 KB

  From numactl --hardware
  WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 2 nodes (0-1)
    node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
    28 29 30 31 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
    89 90 91 92 93 94 95
    node 0 size: 257622 MB
    node 0 free: 209175 MB
    node 1 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
    57 58 59 60 61 62 63 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112
    113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
    node 1 size: 257990 MB
    node 1 free: 244915 MB
    node distances:
    node   0   1
      0:  10  20
      1:  20  10

  From /proc/meminfo
     MemTotal:       527987596 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
     performance

  /usr/bin/lsb_release -d
     Ubuntu 20.04.6 LTS

  From /etc/*release* /etc/*version*
     debian_version: bullseye/sid
```

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Platform Notes (Continued)

```
    os-release:
       NAME="Ubuntu"
       VERSION="20.04.6 LTS (Focal Fossa)"
       ID=ubuntu
       ID_LIKE=debian
       PRETTY_NAME="Ubuntu 20.04.6 LTS"
       VERSION_ID="20.04"
       HOME_URL="https://www.ubuntu.com/"
       SUPPORT_URL="https://help.ubuntu.com/"

  uname -a:
     Linux ice2 5.4.0-153-generic #170-Ubuntu SMP Fri Jun 16 13:43:31 UTC 2023 x86_64
     x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-12207 (iTLB Multihit):                          Not affected
  CVE-2018-3620 (L1 Terminal Fault):                       Not affected
  Microarchitectural Data Sampling:                        Not affected
  CVE-2017-5754 (Meltdown):                                Not affected
  mmio_stale_data:                                        Mitigation: Clear CPU buffers; SMT
                                                            vulnerable
  retbleed:                                                Not affected
  CVE-2018-3639 (Speculative Store Bypass):                Mitigation: Speculative Store
                                                           Bypass disabled via prctl and
                                                           seccomp
  CVE-2017-5753 (Spectre variant 1):                       Mitigation: usercopy/swapgs
                                                           barriers and __user pointer
                                                           sanitization
  CVE-2017-5715 (Spectre variant 2):                      Mitigation: Enhanced IBRS, IBPB:
                                                           conditional, RSB filling,
                                                           PBRSB-eIBRS: SW sequence
  CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
  CVE-2019-11135 (TSX Asynchronous Abort):                 Not affected

  run-level 3 Aug 10 17:47

  SPEC is set to: /local/home/mcolgrove/ACCELV2
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/nvme1n1p1 ext4  916G   24G  846G   3% /local

  From /sys/devices/virtual/dmi/id
      Vendor:         Supermicro
      Product:        SYS-120GQ-TNRT
      Product Family: SMC X12

  Cannot run dmidecode; consider saying (as root)
```

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Platform Notes (Continued)

```
    chmod +s /usr/sbin/dmidecode

 BIOS:
    BIOS Vendor:       American Megatrends International, LLC.
    BIOS Version:      1.1b
    BIOS Date:         11/01/2021

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C          | 457.spC(base)
------------------------------------------------------------------------------
/usr/bin/ld: /usr/lib/x86_64-linux-gnu/crt1.o: in function ‘_start’:
(.text+0x24): undefined reference to ‘main’
pgacclnk: child process exit status 1: /usr/bin/ld
nvc 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
NVIDIA Compilers and Tools
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------------------------------------------------------------------------------

==============================================================================
C          | 403.stencil(base) 404.lbm(base) 452.ep(base) 470.bt(base)
------------------------------------------------------------------------------
nvc 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
NVIDIA Compilers and Tools
Copyright (c) 2023, NVIDIA CORPORATION & AFFILIATES.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C          | 457.spC(base)
------------------------------------------------------------------------------
/usr/bin/ld: /usr/lib/x86_64-linux-gnu/crt1.o: in function ‘_start’:
(.text+0x24): undefined reference to ‘main’
pgacclnk: child process exit status 1: /usr/bin/ld
nvc 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
NVIDIA Compilers and Tools
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------------------------------------------------------------------------------

==============================================================================
C          | 403.stencil(base) 404.lbm(base) 452.ep(base) 470.bt(base)
------------------------------------------------------------------------------
nvc 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
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```

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Compiler Version Notes (Continued)

```
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------------------------------------------------------------------------------

==============================================================================
Fortran    | 450.md(base) 455.seismic(base) 456.spF(base) 460.ilbdc(base)
           | 463.swim(base)
------------------------------------------------------------------------------
nvfortran 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
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------------------------------------------------------------------------------

==============================================================================
Fortran, C | 453.clvrleaf(base) 459.miniGhost(base)
------------------------------------------------------------------------------
nvfortran 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
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nvc 23.11-0 64-bit target on x86-64 Linux -tp icelake-server
NVIDIA Compilers and Tools
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------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
nvc

Fortran benchmarks:
nvfortran

Benchmarks using both Fortran and C:
nvfortran nvc

Base Portability Flags

403.stencil: -DSPEC_NO_NOTHING
457.spC: -mcmodel=medium -Wl,--no-relax

Base Optimization Flags

C benchmarks:
`-Ofast -mp=gpu -Mfprelaxed -Mstack_arrays -static-nvidia`

Fortran benchmarks:
`-Ofast -mp=gpu -Mfprelaxed -Mstack_arrays -static-nvidia`

Benchmarks using both Fortran and C:

453.clvrleaf: `-Ofast -mp=gpu -Mfprelaxed -Mstack_arrays -static-nvidia`

459.miniGhost: `-Mnomain -Ofast -mp=gpu -Mfprelaxed -Mstack_arrays -static-nvidia`

Peak Optimization Flags

C benchmarks:

403.stencil: `basepeak = yes`

404.lbm: `basepeak = yes`

452.ep: `basepeak = yes`

457.spC: `basepeak = yes`

470.bt: `basepeak = yes`

Fortran benchmarks:

450.md: `basepeak = yes`

455.seismic: `basepeak = yes`

456.spF: `basepeak = yes`

460.ilbdc: `basepeak = yes`

463.swim: `basepeak = yes`

Benchmarks using both Fortran and C:

453.clvrleaf: `basepeak = yes`

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Peak Optimization Flags (Continued)

459.miniGhost: `basepeak = yes`

The flags file that was used to format this result can be browsed at
`http://www.spec.org/accel2023/flags/nv2023_flags_v2.html`

You can also download the XML flags source by saving the following link:
`http://www.spec.org/accel2023/flags/nv2023_flags_v2.xml`

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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