# SPEChpc™ 2021 Small Result



## Intel

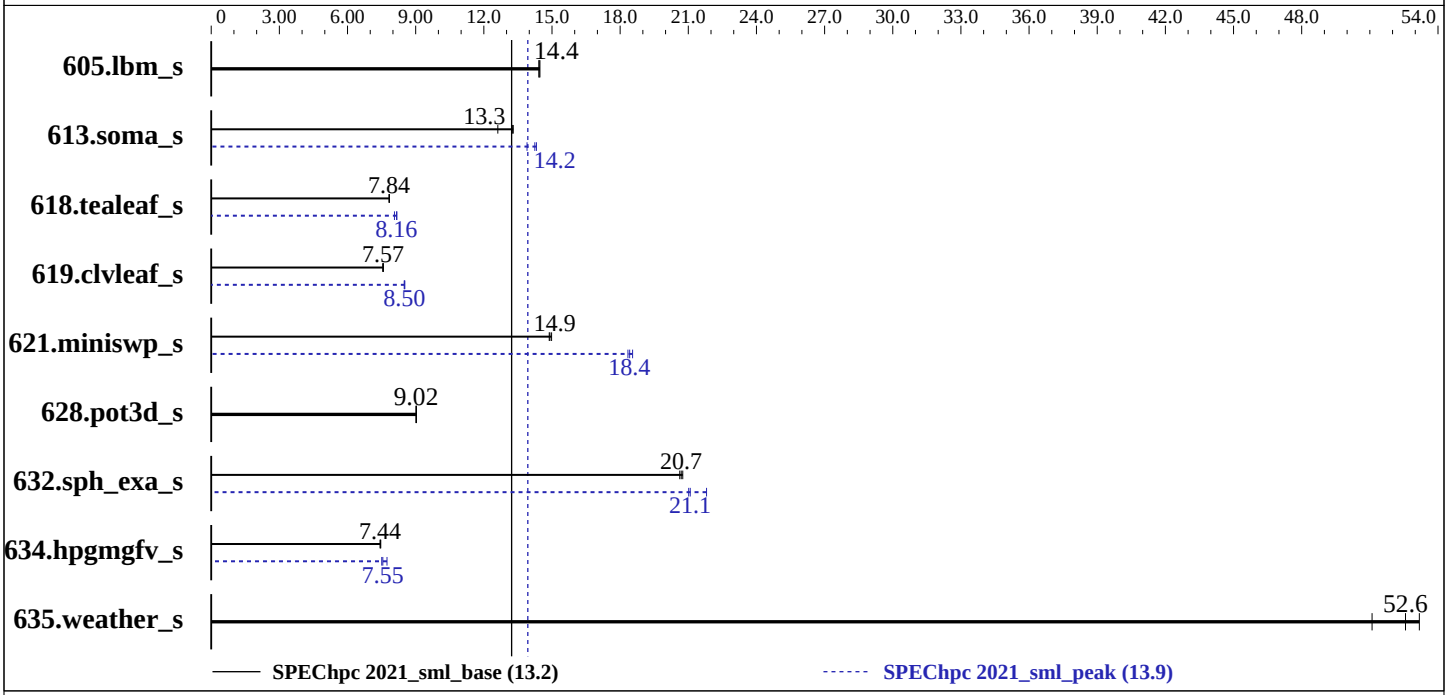
Endeavour: Intel Server D50DNP2MFALACB (Intel Xeon Platinum 8480+)

SPEChpc 2021_sml_base = 13.2

SPEChpc 2021_sml_peak = 13.9

**hpc2021 License:** 13
**Test Sponsor:** Intel
**Tested by:** Intel

**Test Date:** Jul-2023
**Hardware Availability:** Jan-2023
**Software Availability:** Apr-2023




## Results Table

| Benchmark | Base | | | | | | | | | Peak | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model | Ranks | Thrds/Rnk | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Model | Ranks | Thrds/Rnk | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 605.lbm_s | OMP | 128 | 14 | **107** | **14.4** | 107 | 14.4 | 107 | 14.5 | OMP | 128 | 14 | **107** | **14.4** | 107 | 14.4 | 107 | 14.5 |
| 613.soma_s | OMP | 128 | 14 | **121** | **13.3** | 120 | 13.3 | 127 | 12.6 | OMP | 32 | 56 | 115 | 13.9 | **112** | **14.2** | 112 | 14.3 |
| 618.tealeaf_s | OMP | 128 | 14 | 262 | 7.83 | **262** | **7.84** | 261 | 7.84 | OMP | 128 | 14 | 251 | 8.17 | **251** | **8.16** | 254 | 8.07 |
| 619.clvleaf_s | OMP | 128 | 14 | 219 | 7.55 | **218** | **7.57** | 218 | 7.58 | OMP | 128 | 14 | 194 | 8.52 | 194 | 8.50 | **194** | **8.50** |
| 621.miniswp_s | OMP | 128 | 14 | 73.4 | 15.0 | 73.9 | 14.9 | **73.8** | **14.9** | OMP | 64 | 28 | 59.3 | 18.5 | **59.7** | **18.4** | 60.0 | 18.3 |
| 628.pot3d_s | OMP | 128 | 14 | **186** | **9.02** | 185 | 9.04 | 186 | 9.02 | OMP | 128 | 14 | **186** | **9.02** | 185 | 9.04 | 186 | 9.02 |
| 632.sph_exa_s | OMP | 128 | 14 | 111 | 20.8 | **111** | **20.7** | 112 | 20.6 | OMP | 896 | 2 | 105 | 21.8 | **109** | **21.1** | 109 | 21.0 |
| 634.hpgmgfv_s | OMP | 128 | 14 | 131 | 7.46 | 131 | 7.44 | **131** | **7.44** | OMP | 896 | 2 | 126 | 7.74 | **129** | **7.55** | 130 | 7.51 |
| 635.weather_s | OMP | 128 | 14 | 48.9 | 53.2 | 50.9 | 51.1 | **49.5** | **52.6** | OMP | 128 | 14 | 48.9 | 53.2 | 50.9 | 51.1 | **49.5** | **52.6** |

**SPEChpc 2021_sml_base = 13.2**

**SPEChpc 2021_sml_peak = 13.9**

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

**hpc2021 License:** 13
**Test Sponsor:** Intel
**Tested by:** Intel

**Test Date:** Jul-2023
**Hardware Availability:** Jan-2023
**Software Availability:** Apr-2023

### Hardware Summary

| | |
|---|---|
| Type of System: | Homogenous Cluster |
| Compute Node: | Intel Server D50DNP2MFALACB (Xeon 8480+) |
| Interconnect: | Mellanox HDR |
| Compute Nodes Used: | 16 |
| Total Chips: | 32 |
| Total Cores: | 1792 |
| Total Threads: | 3584 |
| Total Memory: | 8 TB |
| Max. Peak Threads: | 56 |

### Software Summary

| | |
|---|---|
| Compiler: | Intel oneAPI Compiler 2023.1.0 |
| MPI Library: | Intel MPI Library 2021.9 for Linux OS |
| Other MPI Info: | None |
| Other Software: | None |
| Base Parallel Model: | OMP |
| Base Ranks Run: | 128 |
| Base Threads Run: | 14 |
| Peak Parallel Models: | OMP |
| Minimum Peak Ranks: | 32 |
| Maximum Peak Ranks: | 896 |
| Max. Peak Threads: | 56 |
| Min. Peak Threads: | 2 |

**Node Description: Intel Server D50DNP2MFALACB (Xeon 8480+)**

### Hardware

| | |
|---|---|
| Number of nodes: | 16 |
| Uses of the node: | Compute |
| Vendor: | Intel |
| Model: | Intel Server D50DNP2MFALACB (Xeon 8480+) |
| CPU Name: | Intel Xeon Platinum 8480+ |
| CPU(s) orderable: | 1, 2 chips |
| Chips enabled: | 2 |
| Cores enabled: | 112 |
| Cores per chip: | 56 |
| Threads per core: | 2 |
| CPU Characteristics: | Turbo Boost Technology up to 3.8 GHz |
| CPU MHz: | 2000 |
| Primary Cache: | 32 KB I + 48 KB D on chip per core |
| Secondary Cache: | 2 MB I+D on chip per core |
| L3 Cache: | 105 MB I+D on chip per chip |
| Other Cache: | None |
| Memory: | 512 GB (16 x 32 GB 2Rx8 PC5-4800B) |
| Disk Subsystem: | 1 x 1 TB NVMe U.2 2.5" SSD |
| Other Hardware: | None |
| Accel Count: | None |
| Accel Model: | None |
| Accel Vendor: | None |
| Accel Type: | None |
| Accel Connection: | None |
| Accel ECC enabled: | None |
| Accel Description: | None |
| Adapter: | Mellanox ConnectX-6 HDR |
| Number of Adapters: | 1 |
| Slot Type: | PCI-Express 4.0 x16 |
| Data Rate: | 200Gbit/s |
| Ports Used: | 1 |
| Interconnect Type: | Mellanox HDR |

### Software

| | |
|---|---|
| Accelerator Driver: | None |
| Adapter: | Mellanox ConnectX-6 HDR |
| Adapter Driver: | 5.9-0.5.5 |
| Adapter Firmware: | 20.36.1010 |
| Operating System: | Rocky Linux 8.7 (Green Obsidian)<br>4.18.0-372.32.1.el8_6.crt3.x86_64 |
| Local File System: | NFS |
| Shared File System: | PANASAS FS |
| System State: | Multi-user |
| Other Software: | None |

## Interconnect Description: Mellanox HDR

### Hardware

| | |
|---|---|
| Vendor: | Mellanox |
| Model: | Mellanox HDR |
| Switch Model: | Mellanox MQM8790-HS2F Quantum HDR InfiniBand Switch |
| Number of Switches: | 18 |
| Number of Ports: | 40 |
| Data Rate: | 200 Gbit/s |
| Firmware: | 20.36.1010 |
| Topology: | Fat-tree |
| Primary Use: | MPI Traffic |

### Software

: --

## Submit Notes

```
The config file option 'submit' was used.
```

## General Notes

```
The PANASAS filesystem as described on this result page was formerly
generally available.  At the time of this publication, it may
not be shipping, and/or may not be supported, and/or may fail
to meet other tests of General Availability described in the
SPEC HPG Policy document, http://www.spec.org/hpg/policy.html
```

## Compiler Version Notes

```
==============================================================================
 CXXC 632.sph_exa_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler 2023.1.0 (2023.1.0.20230320)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir:
  /global/panfs01/admin/opt/intel/oneAPI/2023.1.0.46401/compiler/2023.1.0/linux/bin-llvm
Configuration file:
  /global/panfs01/admin/opt/intel/oneAPI/2023.1.0.46401/compiler/2023.1.0/linux/bin-llvm/../bin/icpx.cfg
------------------------------------------------------------------------------

==============================================================================
 CC  605.lbm_s(base, peak) 613.soma_s(base, peak) 618.tealeaf_s(base)
     621.miniswp_s(base) 634.hpgmgfv_s(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler 2023.1.0 (2023.1.0.20230320)
Target: x86_64-unknown-linux-gnu
```

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## Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir:
  /global/panfs01/admin/opt/intel/oneAPI/2023.1.0.46401/compiler/2023.1.0/linux/bin-llvm
Configuration file:
  /global/panfs01/admin/opt/intel/oneAPI/2023.1.0.46401/compiler/2023.1.0/linux/bin-llvm/../bin/icx.cfg
------------------------------------------------------------------------------

==============================================================================
 CC  618.tealeaf_s(peak) 621.miniswp_s(peak) 634.hpgmgfv_s(peak)
------------------------------------------------------------------------------
icc: remark #10441: The Intel(R) C++ Compiler Classic (ICC) is deprecated and
  will be removed from product release in the second half of 2023. The
  Intel(R) oneAPI DPC++/C++ Compiler (ICX) is the recommended compiler moving
  forward. Please transition to use this compiler. Use '-diag-disable=10441'
  to disable this message.
icc: command line warning #10148: option
  '-Wno-incompatible-function-pointer-types' not supported
icc (ICC) 2021.9.0 20230302
Copyright (C) 1985-2023 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  619.clvleaf_s(peak)
------------------------------------------------------------------------------
ifort (IFORT) 2021.9.0 20230302
Copyright (C) 1985-2023 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  619.clvleaf_s(base) 628.pot3d_s(base, peak) 635.weather_s(base, peak)
------------------------------------------------------------------------------
ifx (IFX) 2023.1.0 20230320
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`mpiicc -cc=icx`

C++ benchmarks:
`mpiicpc -cxx=icpx`

Fortran benchmarks:
`mpiifort -fc=ifx`

## Base Portability Flags

605.lbm_s: `-lstdc++ -std=c++14`
613.soma_s: `-lstdc++ -std=c++14`
618.tealeaf_s: `-lstdc++ -std=c++14`
621.miniswp_s: `-lstdc++ -std=c++14`
634.hpgmgfv_s: `-lstdc++ -std=c++14`

## Base Optimization Flags

C benchmarks:
`-O3 -Ofast -xCORE-AVX512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -fiopenmp -ffast-math -flto -funroll-loops`

C++ benchmarks:
`-O3 -Ofast -xCORE-AVX512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -fiopenmp -ffast-math -flto -funroll-loops`

Fortran benchmarks:
`-O3 -Ofast -xCORE-AVX512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -fiopenmp -ffast-math -flto -funroll-loops -nostandard-realloc-lhs -align array64byte`

## Base Other Flags

C benchmarks:
`-Ispecmpitime -Wno-incompatible-function-pointer-types`

C++ benchmarks:
`-Ispecmpitime`

Fortran benchmarks:

619.clvleaf_s: `-Ispecmpitime`

## Peak Compiler Invocation

C benchmarks (except as noted below):
`mpiicc`

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## Peak Compiler Invocation (Continued)

605.lbm_s: `mpiicc -cc=icx`

613.soma_s: `mpiicc -cc=icx`

C++ benchmarks:
`mpiicpc -cxx=icpx`

Fortran benchmarks (except as noted below):
`mpiifort -fc=ifx`

619.clvleaf_s: `mpiifort`

## Peak Portability Flags

605.lbm_s: `-lstdc++ -std=c++14`
613.soma_s: `-lstdc++ -std=c++14`
618.tealeaf_s: `-lstdc++ -std=c++14`
621.miniswp_s: `-lstdc++ -std=c++14`
634.hpgmgfv_s: `-lstdc++ -std=c++14`

## Peak Optimization Flags

C benchmarks:

605.lbm_s: `basepeak = yes`

613.soma_s: `-O3 -Ofast -xCORE-AVX512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -fiopenmp -ffast-math -flto -funroll-loops`

618.tealeaf_s: `-O3 -Ofast -xCORE-AVX512 -ansi-alias -qopenmp -ipo -qopt-zmm-usage=high -qopt-multiple-gather-scatter-by-shuffles`

621.miniswp_s: `Same as 618.tealeaf_s`

634.hpgmgfv_s: `Same as 618.tealeaf_s`

C++ benchmarks:
`-O3 -Ofast -xCORE-AVX512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -fiopenmp -ffast-math -flto -funroll-loops`

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## Peak Optimization Flags (Continued)

Fortran benchmarks:

619.clvleaf_s: `-O3 -Ofast -xCORE-AVX512 -ansi-alias -qopenmp -ipo -qopt-zmm-usage=high -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs -align array64byte`

628.pot3d_s: `basepeak = yes`

635.weather_s: `basepeak = yes`

## Peak Other Flags

C benchmarks:
`-Ispecmpitime -Wno-incompatible-function-pointer-types`

C++ benchmarks:
`-Ispecmpitime`

Fortran benchmarks:

619.clvleaf_s: `-Ispecmpitime`

The flags file that was used to format this result can be browsed at
`http://www.spec.org/hpc2021/flags/Intel_compiler_flags.2023-08-16.html`

You can also download the XML flags source by saving the following link:
`http://www.spec.org/hpc2021/flags/Intel_compiler_flags.2023-08-16.xml`



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

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