



# SPEChpc™ 2021 Small Result

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## Intel

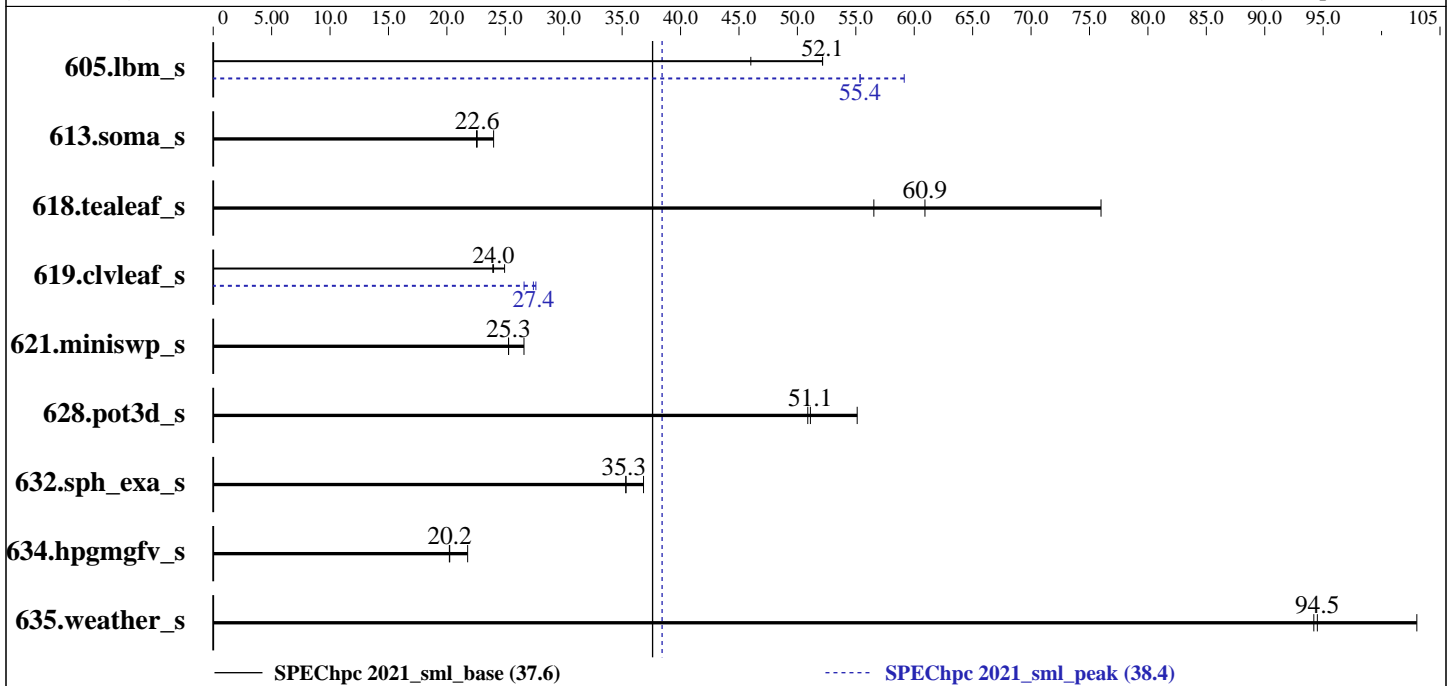
Endeavour: Intel Server D50DNP2MFALACB (Intel Xeon Platinum 8480+)

SPEChpc 2021\_sml\_base = 37.6

SPEChpc 2021\_sml\_peak = 38.4

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	512	14	33.7	46.0	<b>29.7</b>	<b>52.1</b>	29.7	52.2	OMP	512	28	26.2	59.1	28.0	55.4	<b>28.0</b>	<b>55.4</b>
613.soma_s	OMP	512	14	66.7	24.0	<b>70.8</b>	<b>22.6</b>	71.0	22.5	OMP	512	14	66.7	24.0	<b>70.8</b>	<b>22.6</b>	71.0	22.5
618.tealeaf_s	OMP	512	14	<b>33.7</b>	<b>60.9</b>	27.0	76.0	36.3	56.5	OMP	512	14	<b>33.7</b>	<b>60.9</b>	27.0	76.0	36.3	56.5
619.clvleaf_s	OMP	512	14	66.2	24.9	<b>68.8</b>	<b>24.0</b>	69.0	23.9	OMP	512	28	59.7	27.6	<b>60.2</b>	<b>27.4</b>	62.0	26.6
621.miniswp_s	OMP	512	14	41.4	26.6	43.5	25.3	<b>43.5</b>	<b>25.3</b>	OMP	512	14	41.4	26.6	43.5	25.3	<b>43.5</b>	<b>25.3</b>
628.pot3d_s	OMP	512	14	30.4	55.1	32.9	50.9	<b>32.8</b>	<b>51.1</b>	OMP	512	14	30.4	55.1	32.9	50.9	<b>32.8</b>	<b>51.1</b>
632.sph_exa_s	OMP	512	14	62.4	36.8	65.1	35.3	<b>65.1</b>	<b>35.3</b>	OMP	512	14	62.4	36.8	65.1	35.3	<b>65.1</b>	<b>35.3</b>
634.hpgmgfv_s	OMP	512	14	44.8	21.8	<b>48.2</b>	<b>20.2</b>	48.2	20.2	OMP	512	14	44.8	21.8	<b>48.2</b>	<b>20.2</b>	48.2	20.2
635.weather_s	OMP	512	14	25.2	103	<b>27.5</b>	<b>94.5</b>	27.6	94.2	OMP	512	14	25.2	103	<b>27.5</b>	<b>94.5</b>	27.6	94.2

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



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### Hardware Summary

Type of System: Homogenous Cluster  
Compute Node: Intel Server D50DNP2MFALACB (Xeon 8480+)  
Interconnect: Mellanox HDR  
Compute Nodes Used: 64  
Total Chips: 128  
Total Cores: 7168  
Total Threads: 14336  
Total Memory: 32 TB  
Max. Peak Threads: 28

### 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: 512  
Base Threads Run: 14  
Peak Parallel Models: OMP  
Minimum Peak Ranks: 512  
Maximum Peak Ranks: 512  
Max. Peak Threads: 28  
Min. Peak Threads: 14

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

#### Hardware

Number of nodes: 64  
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)  
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



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## Interconnect Description: Mellanox HDR

### Hardware

### Software

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

: --

## 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, peak)  
621.miniswp\_s(base, peak) 634.hpgmgfv\_s(base, peak)  
-----

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

=====  
FC 619.clvleaf\_s(peak)  
=====

ifort (IFORT) 2021.9.0 20230302

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=====

=====  
FC 619.clvleaf\_s(base) 628.pot3d\_s(base, peak) 635.weather\_s(base, peak)  
=====

ifx (IFX) 2023.1.0 20230320

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=====

## 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



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## 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:

```
mpiicc -cc=icx
```

C++ benchmarks:

```
mpiicpc -cxx=icpx
```

Fortran benchmarks (except as noted below):

```
mpiifort -fc=ifx
```

```
619.clvleaf_s: mpiifort
```



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

613.soma\_s: basepeak = yes

618.tealeaf\_s: basepeak = yes

621.miniswp\_s: basepeak = yes

634.hpgmgfv\_s: basepeak = yes

C++ benchmarks:

632.sph\_exa\_s: basepeak = yes

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
```

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## Peak Other Flags (Continued)

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](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](http://www.spec.org/hpc2021/flags/Intel_compiler_flags.2023-08-16.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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