



# SPEChpc™ 2021 Small Result

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## Intel

Hatch: Intel Server D50DNP1SB (Xeon Platinum 8480+)

SPEChpc 2021\_sml\_base = 8.87

SPEChpc 2021\_sml\_peak = 9.73

hpc2021 License: 13

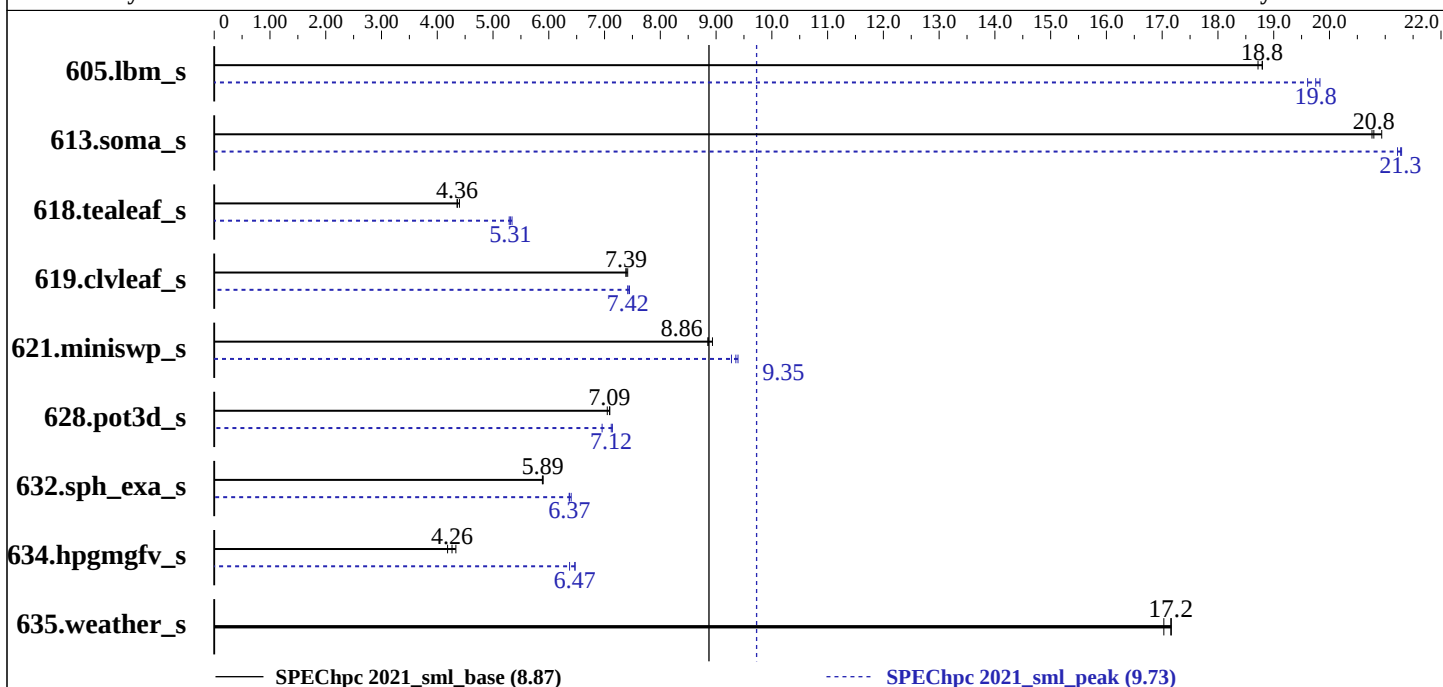
Test Sponsor: Intel

Tested by: Intel

Test Date: Apr-2025

Hardware Availability: Jan-2023

Software Availability: Mar-2025



## Results Table

| Benchmark     | Base  |       |           |            |             |             |             |             | Peak        |       |       |           |            |             |             |             |
|---------------|-------|-------|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------|-------|-----------|------------|-------------|-------------|-------------|
|               | Model | Ranks | Thrds/Rnk | Seconds    | Ratio       | Seconds     | Ratio       | Seconds     | Ratio       | Model | Ranks | Thrds/Rnk | Seconds    | Ratio       | Seconds     | Ratio       |
| 605.lbm_s     | TGT   | 8     | 1         | 82.8       | 18.7        | 82.5        | 18.8        | <b>82.5</b> | <b>18.8</b> | TGT   | 8     | 1         | 78.2       | 19.8        | <b>78.5</b> | <b>19.8</b> |
| 613.soma_s    | TGT   | 8     | 1         | 76.4       | 20.9        | <b>76.9</b> | <b>20.8</b> | 77.1        | 20.8        | TGT   | 8     | 1         | 75.4       | 21.2        | 75.1        | <b>21.3</b> |
| 618.tealeaf_s | TGT   | 8     | 1         | 466        | 4.40        | 471         | 4.36        | <b>470</b>  | <b>4.36</b> | TGT   | 8     | 1         | <b>386</b> | <b>5.31</b> | 384         | 5.34        |
| 619.clvleaf_s | TGT   | 8     | 1         | 223        | 7.42        | <b>223</b>  | <b>7.39</b> | 223         | 7.39        | TGT   | 8     | 1         | 222        | 7.42        | <b>222</b>  | <b>7.42</b> |
| 621.miniswp_s | TGT   | 8     | 1         | 123        | 8.94        | <b>124</b>  | <b>8.86</b> | 124         | 8.85        | TGT   | 8     | 1         | 117        | 9.39        | <b>118</b>  | <b>9.35</b> |
| 628.pot3d_s   | TGT   | 8     | 1         | 236        | 7.09        | 238         | 7.05        | <b>236</b>  | <b>7.09</b> | TGT   | 8     | 1         | <b>235</b> | <b>7.12</b> | 241         | 6.96        |
| 632.sph_exa_s | TGT   | 8     | 1         | 391        | 5.89        | <b>390</b>  | <b>5.89</b> | 390         | 5.90        | TGT   | 8     | 1         | 361        | 6.37        | <b>361</b>  | <b>6.37</b> |
| 634.hpgmgfv_s | TGT   | 8     | 1         | <b>229</b> | <b>4.26</b> | 233         | 4.19        | 225         | 4.33        | TGT   | 8     | 1         | 151        | 6.47        | <b>151</b>  | <b>6.47</b> |
| 635.weather_s | TGT   | 8     | 1         | 153        | 17.0        | 151         | 17.2        | <b>152</b>  | <b>17.2</b> | TGT   | 8     | 1         | 153        | 17.0        | 151         | <b>17.2</b> |

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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 D50DNP1SB (Xeon Platinum 8480+)  
Interconnect: Mellanox HDR  
Compute Nodes Used: 1  
Total Chips: 2  
Total Cores: 112  
Total Threads: 224  
Total Memory: 1 TB  
Max. Peak Threads: 1

### Software Summary

Compiler: Intel oneAPI Compiler 2025.1.0  
MPI Library: Intel MPI Library 2021.15 for Linux OS  
Other MPI Info: None  
Other Software: None  
Base Parallel Model: TGT  
Base Ranks Run: 8  
Base Threads Run: 1  
Peak Parallel Models: TGT  
Minimum Peak Ranks: 8  
Maximum Peak Ranks: 8  
Max. Peak Threads: 1  
Min. Peak Threads: 1

### Node Description: Intel Server D50DNP1SB (Xeon Platinum 8480+)

#### Hardware

Number of nodes: 1  
Uses of the node: Compute  
Vendor: Intel  
Model: Intel Server D50DNP1SB (2 x Intel Xeon Platinum 8480+, 2.0GHz)  
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: 1 TB (16x64 GB DDR5 2Rx4 PC5-4800B-R)  
Disk Subsystem: 1 x 1 1TB NVMe M.2 INTEL SSDPELKH010T8  
Other Hardware: None  
Accel Count: 4  
Accel Model: Intel Data Center GPU Max 1550  
Accel Vendor: Intel  
Accel Type: GPU  
Accel Connection: PCIe Gen5 x16  
Accel ECC enabled: yes  
Accel Description: Intel Data Center GPU Max 1550  
Adapter: Mellanox ConnectX-6 HDR  
Number of Adapters: 1  
Slot Type: PCI-Express 4.0 x16  
Data Rate: 200Gbit/s  
Ports Used: 1

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#### Software

Accelerator Driver: 25.05.32567  
Adapter: Mellanox ConnectX-6 HDR  
Adapter Driver: --  
Adapter Firmware: 20.38.1900  
Operating System: SUSE Linux Enterprise Server 15 SP6  
6.4.0-150600.23.42-default  
Local File System: lustre  
Shared File System: LUSTRE FS  
System State: Run level 5  
Other Software: None



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### Node Description: Intel Server D50DNP1SB (Xeon Platinum 8480+)

#### Hardware (Continued)

Interconnect Type: Mellanox HDR

### Interconnect Description: Mellanox HDR

#### Hardware

Vendor: Mellanox  
Model: Mellanox HDR  
Switch Model: Mellanox Technologies MT28908 Family InfiniBand Switch  
Number of Switches: 12  
Number of Ports: 40  
Data Rate: 200 Gbit/s  
Firmware: 20.38.1900  
Topology: Fat-tree  
Primary Use: MPI Traffic, LustreFS traffic

#### Software

: --

### Submit Notes

The config file option 'submit' was used.

### General Notes

Environment variables set by runhpc before the start of the run:  
LIBOMPTARGET\_LEVEL\_ZERO\_USE\_IMMEDIATE\_COMMAND\_LIST = "all"  
I\_MPI\_FABRICS=shm:ofi  
I\_MPI\_OFFLOAD=1  
I\_MPI\_OFFLOAD\_CELL=tile  
I\_MPI\_OFFLOAD\_TOPOLIB=level\_zero  
I\_MPI\_OFFLOAD\_CELL\_LIST=0,1,2,3,4,5,6,7  
For the following tests src.alt was used in PEAK:  
613 618 619 621 628 632 634

### Platform Notes

|                            |                |
|----------------------------|----------------|
| Device Vendor              | Intel          |
| Device Version             | OpenCL 3.0 NEO |
| Driver Version             | 25.05.32567    |
| Base clock                 | 900MHZ         |
| Max clock frequency        | 1600MHZ        |
| Tiles                      | 2              |
| Slices per Tile            | 1              |
| Max compute units per Tile | 512            |

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## Platform Notes (Continued)

|                                    |                   |
|------------------------------------|-------------------|
| Sub-slices per slice               | 64                |
| EUs per sub-slice                  | 8                 |
| Threads per EU                     | 8                 |
| Max work item dimensions           | 3                 |
| Max work item sizes                | 1024x1024x1024    |
| Max work group size                | 1024              |
| Preferred work group size multiple | 32                |
| Max sub-groups per work group      | 64                |
| Sub-group sizes                    | 16, 32            |
| L1 Cache per EU                    | 65536             |
| L2 cache size                      | 427819008         |
| Global memory size                 | 137438953472      |
| Address bits                       | 64, Little-Endian |

## Compiler Version Notes

=====

CXXC 632.sph\_exa\_s(base, peak)

-----

Intel(R) oneAPI DPC++/C++ Compiler 2025.1.0 (2025.1.0.20250317)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir:  
/lfs/lfs17/mknyazev/intel/2025.1/oneapi/compiler/2025.1/bin/compiler  
Configuration file:  
/lfs/lfs17/mknyazev/intel/2025.1/oneapi/compiler/2025.1/bin/compiler/./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 2025.1.0 (2025.1.0.20250317)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir:  
/lfs/lfs17/mknyazev/intel/2025.1/oneapi/compiler/2025.1/bin/compiler  
Configuration file:  
/lfs/lfs17/mknyazev/intel/2025.1/oneapi/compiler/2025.1/bin/compiler/./icx.cfg

-----

=====

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

-----

ifx (IFX) 2025.1.0 20250317  
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## Compiler Version Notes (Continued)

=====

```
FC 628.pot3d_s(base, peak)
```

-----

```
ifx: command line warning #10157: ignoring option '-W'; argument is of wrong
type
ifx (IFX) 2025.1.0 20250317
Copyright (C) 1985-2025 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: -DUSE_MPI
613.soma_s: -DUSE_MPI -DSPEC_NO_VAR_ARRAY_REDUCE
618.tealeaf_s: -DUSE_MPI
619.clvleaf_s: -DUSE_MPI
628.pot3d_s: -DUSE_MPI
635.weather_s: -DUSE_MPI
```

## Base Optimization Flags

C benchmarks:

```
-O3 -xCORE-AVX512 -flto -mprefer-vector-width=512 -ffast-math
-fopenmp -fopenmp-targets=spir64_gen
-ftarget-register-alloc-mode=pvc:auto
-Xopenmp-target-backend '-device pvc -revision_id 0x2f' -DSPEC_COLLAPSE
-fopenmp-optimistic-collapse
```

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## Base Optimization Flags (Continued)

C++ benchmarks:

-O3 -xCORE-AVX512 -flto -mprefer-vector-width=512 -ffast-math  
-fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f' -DSPEC\_COLLAPSE

Fortran benchmarks:

-DSPEC\_COLLAPSE -O3 -xCORE-AVX512 -flto -mprefer-vector-width=512  
-ffast-math -fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f'  
-DSPEC\_ACCEL\_AWARE\_MPI -fopenmp-target-loopopt

## Base Other Flags

Fortran benchmarks:

628.pot3d\_s: -Wno-incompatible-function-pointer-types

## Peak Compiler Invocation

C benchmarks:

mpiicc -cc=icx

C++ benchmarks:

mpiicpc -cxx=icpx

Fortran benchmarks:

mpiifort -fc=ifx

## Peak Portability Flags

605.lbm\_s: -DUSE\_MPI  
613.soma\_s: -DUSE\_MPI -DSPEC\_NO\_VAR\_ARRAY\_REDUCE  
618.tealeaf\_s: -DUSE\_MPI  
619.clvleaf\_s: -DUSE\_MPI  
628.pot3d\_s: -DUSE\_MPI  
635.weather\_s: -DUSE\_MPI



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## Peak Optimization Flags

C benchmarks:

605.lbm\_s: -O3 -xCORE-AVX512 -flto -mprefer-vector-width=512  
-ffast-math -fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:large  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f'  
-fopenmp-optimistic-collapse -DSPEC\_COLLAPSE

613.soma\_s: -O3 -xCORE-AVX512 -flto -mprefer-vector-width=512  
-ffast-math -fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f'  
-DSPEC\_COLLAPSE -fopenmp-optimistic-collapse

618.tealeaf\_s: Same as 605.lbm\_s

621.miniswp\_s: Same as 613.soma\_s

634.hpgmgfv\_s: -O3 -xCORE-AVX512 -flto -mprefer-vector-width=512  
-ffast-math -fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f'  
-DSPEC\_COLLAPSE -DSPEC\_ACCEL\_AWARE\_MPI  
-fopenmp-optimistic-collapse

C++ benchmarks:

-O3 -xCORE-AVX512 -flto -mprefer-vector-width=512 -ffast-math  
-fiopenmp -fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f' -DSPEC\_COLLAPSE

Fortran benchmarks:

619.clvleaf\_s: -DSPEC\_COLLAPSE -O3 -xCORE-AVX512 -flto  
-mprefer-vector-width=512 -ffast-math -fiopenmp  
-fopenmp-targets=spir64\_gen  
-ftarget-register-alloc-mode=pvc:auto  
-Xopenmp-target-backend '-device pvc -revision\_id 0x2f'  
-DSPEC\_ACCEL\_AWARE\_MPI -fopenmp-target-loopopt

628.pot3d\_s: Same as 619.clvleaf\_s

635.weather\_s: basepeak = yes



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## Peak Other Flags

Fortran benchmarks:

628.pot3d\_s: -Wno-incompatible-function-pointer-types

The flags file that was used to format this result can be browsed at  
[http://www.spec.org/hpc2021/flags/Intel\\_compiler\\_flags.2025-05-22.00.html](http://www.spec.org/hpc2021/flags/Intel_compiler_flags.2025-05-22.00.html)

You can also download the XML flags source by saving the following link:  
[http://www.spec.org/hpc2021/flags/Intel\\_compiler\\_flags.2025-05-22.00.xml](http://www.spec.org/hpc2021/flags/Intel_compiler_flags.2025-05-22.00.xml)

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