SPEChpc™ 2021 Small Result

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Intel

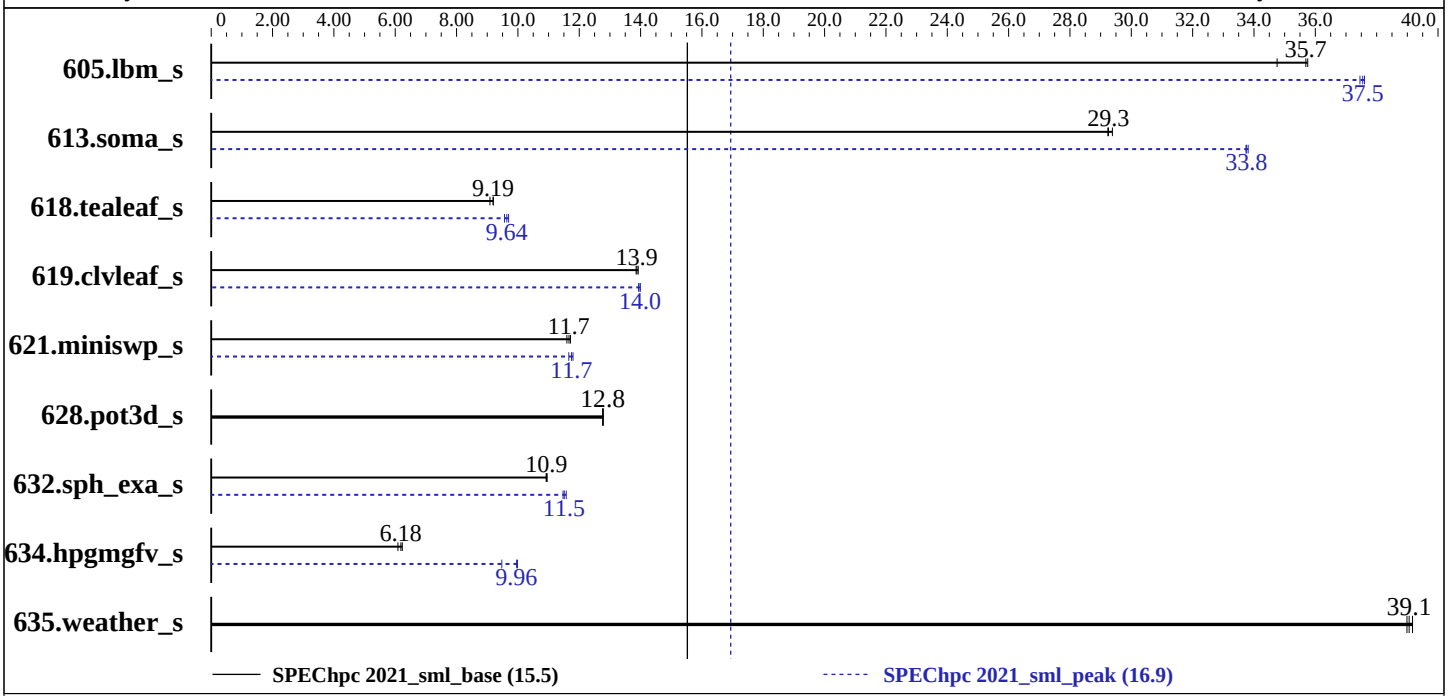
Hatch: Intel Server D50DNP1SB (Xeon Platinum 8480+)

SPEChpc 2021_sml_base = 15.5

SPEChpc 2021_sml_peak = 16.9

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	Seconds	Ratio
605.lbm_s	TGT	16	1	44.6	34.8	**43.4**	**35.7**	43.4	35.8	TGT	16	1	41.4	37.5	41.2	37.6	**41.3**	**37.5**
613.soma_s	TGT	16	1	54.5	29.4	**54.7**	**29.3**	54.7	29.2	TGT	16	1	47.4	33.7	47.3	33.8	**47.4**	**33.8**
618.tealeaf_s	TGT	16	1	223	9.20	**223**	**9.19**	226	9.09	TGT	16	1	214	9.56	211	9.70	**213**	**9.64**
619.clvleaf_s	TGT	16	1	119	13.9	119	13.9	**119**	**13.9**	TGT	16	1	118	14.0	118	13.9	**118**	**14.0**
621.miniswp_s	TGT	16	1	94.9	11.6	93.9	11.7	**94.3**	**11.7**	TGT	16	1	94.3	11.7	**93.6**	**11.7**	93.2	11.8
628.pot3d_s	TGT	16	1	**131**	**12.8**	131	12.8	131	12.8	TGT	16	1	**131**	**12.8**	131	12.8	131	12.8
632.sph_exa_s	TGT	16	1	211	10.9	**210**	**10.9**	210	11.0	TGT	16	1	200	11.5	**200**	**11.5**	199	11.6
634.hpgmgfv_s	TGT	16	1	156	6.23	**158**	**6.18**	160	6.09	TGT	16	1	103	9.48	**97.9**	**9.96**	97.6	9.99
635.weather_s	TGT	16	1	66.4	39.2	66.7	39.0	**66.6**	**39.1**	TGT	16	1	66.4	39.2	66.7	39.0	**66.6**	**39.1**

SPEChpc 2021_sml_base = 15.5

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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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Software Availability: Mar-2025

Hardware Summary

Type of System:	Homogenous Cluster
Compute Node:	Intel Server D50DNP1SB (Xeon Platinum 8480+)
Interconnect:	Mellanox HDR
Compute Nodes Used:	2
Total Chips:	4
Total Cores:	224
Total Threads:	448
Total Memory:	2 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:	16
Base Threads Run:	1
Peak Parallel Models:	TGT
Minimum Peak Ranks:	16
Maximum Peak Ranks:	16
Max. Peak Threads:	1
Min. Peak Threads:	1

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

Hardware

Number of nodes:	2
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 SSDPELKX010T8
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

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:
613 618 621 632 634
```

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
Copyright (C) 1985-2025 Intel Corporation. All rights reserved.
```

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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`
`-fiopenmp -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

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 -DSPEC_ACCEL_AWARE_MPI -fopenmp-optimistic-collapse`

618.tealeaf_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`

621.miniswp_s: `Same as 618.tealeaf_s`

634.hpgmgfv_s: `Same as 613.soma_s`

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: `basepeak = yes`

635.weather_s: `basepeak = yes`

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`

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`

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

Tested with SPEChpc2021 v1.1.9 on 2025-04-23 15:22:12-0400.
Report generated on 2025-05-22 11:01:22 by hpc2021 PS formatter v1.0.3.
Originally published on 2025-05-21.