SPEChpc™ 2021 Tiny Result

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Intel

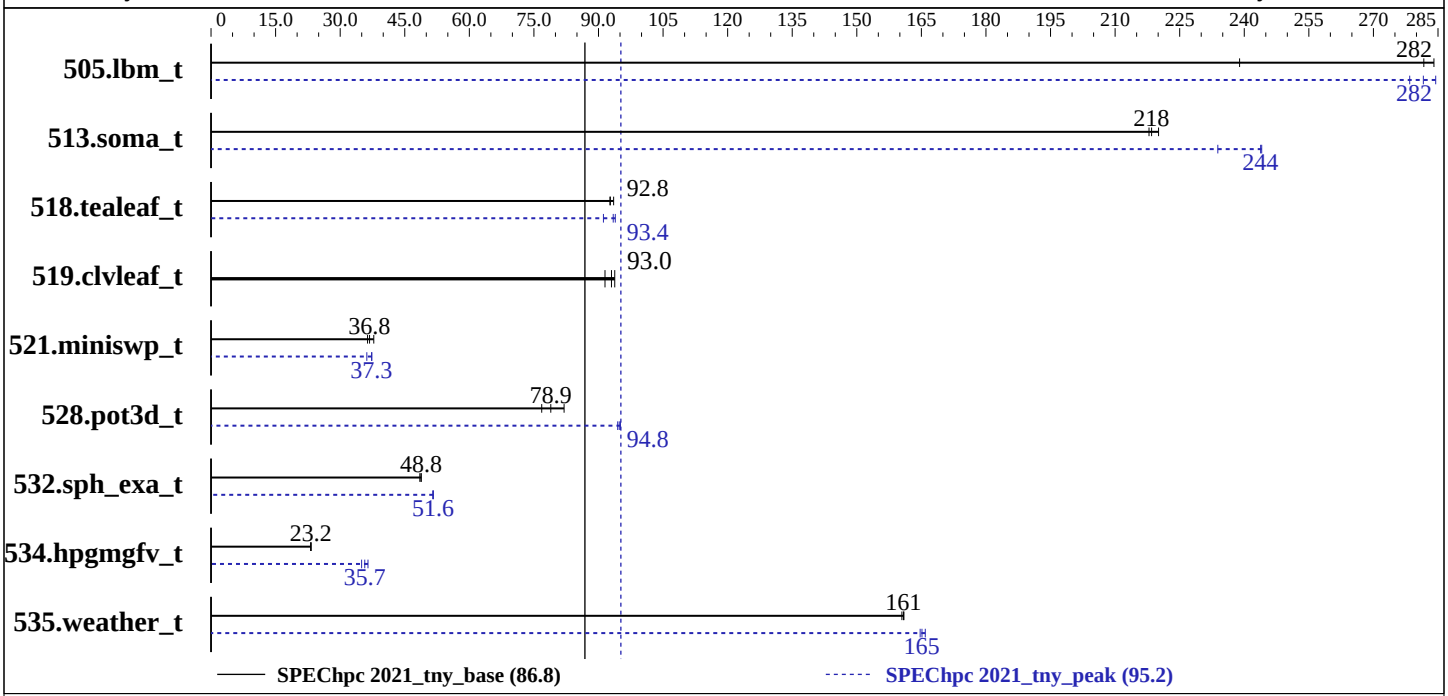
Hatch: Intel Server D50DNP1SB (Xeon Platinum 8480+)

SPEChpc 2021_tny_base = 86.8

SPEChpc 2021_tny_peak = 95.2

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
505.lbm_t	TGT	16	1	9.42	239	**7.99**	**282**	7.92	284	TGT	16	1	7.91	284	8.08	278	**7.99**	**282**
513.soma_t	TGT	16	1	17.0	218	**16.9**	**218**	16.8	220	TGT	16	1	15.8	234	**15.2**	**244**	15.2	244
518.tealeaf_t	TGT	16	1	**17.8**	**92.8**	17.8	92.7	17.6	93.5	TGT	16	1	17.6	93.9	**17.7**	**93.4**	18.1	91.1
519.clvleaf_t	TGT	16	1	**17.7**	**93.0**	17.6	93.8	18.0	91.5	TGT	16	1	**17.7**	**93.0**	17.6	93.8	18.0	91.5
521.miniswp_t	TGT	16	1	44.0	36.4	**43.5**	**36.8**	42.3	37.8	TGT	16	1	44.2	36.2	**42.9**	**37.3**	42.8	37.3
528.pot3d_t	TGT	16	1	25.9	82.0	27.7	76.8	**26.9**	**78.9**	TGT	16	1	22.5	94.5	**22.4**	**94.8**	22.3	95.1
532.sph_exa_t	TGT	16	1	39.9	48.8	40.2	48.5	**40.0**	**48.8**	TGT	16	1	37.8	51.6	37.8	51.5	**37.8**	**51.6**
534.hpgmgfv_t	TGT	16	1	50.6	23.2	50.8	23.1	**50.6**	**23.2**	TGT	16	1	32.2	36.5	33.6	35.0	**32.9**	**35.7**
535.weather_t	TGT	16	1	20.1	160	**20.1**	**161**	20.0	161	TGT	16	1	19.4	166	**19.5**	**165**	19.6	165

SPEChpc 2021_tny_base = 86.8

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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:	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

(Continued on next page)

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:
505 513 518 521 528 532 534 535
```

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 532.sph_exa_t(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  505.lbm_t(base, peak) 513.soma_t(base, peak) 518.tealeaf_t(base, peak)
      521.miniswp_t(base, peak) 534.hpgmgfv_t(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  519.clvleaf_t(base, peak) 535.weather_t(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  528.pot3d_t(peak)
------------------------------------------------------------------------------
ifx: command line warning #10034: Unrecognized keyword '-optimistic-collapse'
  for option '-fopenmp'
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.
------------------------------------------------------------------------------

==============================================================================
 FC  528.pot3d_t(base)
------------------------------------------------------------------------------
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

505.lbm_t: `-DUSE_MPI`
513.soma_t: `-DUSE_MPI -DSPEC_NO_VAR_ARRAY_REDUCE`
518.tealeaf_t: `-DUSE_MPI`
519.clvleaf_t: `-DUSE_MPI`
528.pot3d_t: `-DUSE_MPI`
535.weather_t: `-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
```

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:

528.pot3d_t: `-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

505.lbm_t: -DUSE_MPI
513.soma_t: -DUSE_MPI -DSPEC_NO_VAR_ARRAY_REDUCE
518.tealeaf_t: -DUSE_MPI
519.clvleaf_t: -DUSE_MPI
528.pot3d_t: -DUSE_MPI
535.weather_t: -DUSE_MPI

Peak Optimization Flags

C benchmarks:

505.lbm_t: -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'
-DSPEC_COLLAPSE -fopenmp-optimistic-collapse

513.soma_t: -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

518.tealeaf_t: -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

521.miniswp_t: -O3 -xCORE-AVX512 -flto -mprefer-vector-width=512
-ffast-math -fiopenmp -fopenmp-targets=spir64_gen
-ftarget-register-alloc-mode=pvc:small
-Xopenmp-target-backend '-device pvc -revision_id 0x2f'
-DSPEC_COLLAPSE -fopenmp-optimistic-collapse
-fopenmp-targets=spir64_gen="-fp-model=fast"
-fopenmp-target-loopopt

534.hpgmgfv_t: Same as 513.soma_t

C++ benchmarks:
-O3 -xCORE-AVX512 -flto -mprefer-vector-width=512 -ffast-math
-fiopenmp -fopenmp-targets=spir64_gen
-ftarget-register-alloc-mode=pvc:auto

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Peak Optimization Flags (Continued)

C++ benchmarks (continued):
-Xopenmp-target-backend '-device pvc -revision_id 0x2f' -DSPEC_COLLAPSE

Fortran benchmarks:

519.clvleaf_t: basepeak = yes

528.pot3d_t: -DSPEC_COLLAPSE -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_ACCEL_AWARE_MPI
-fopenmp-target-loopopt

535.weather_t: -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

Peak Other Flags

Fortran benchmarks:

528.pot3d_t: -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.

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