SPEChpc™ 2021 Medium Result

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IBM

(Test Sponsor: Oak Ridge National Laboratory)

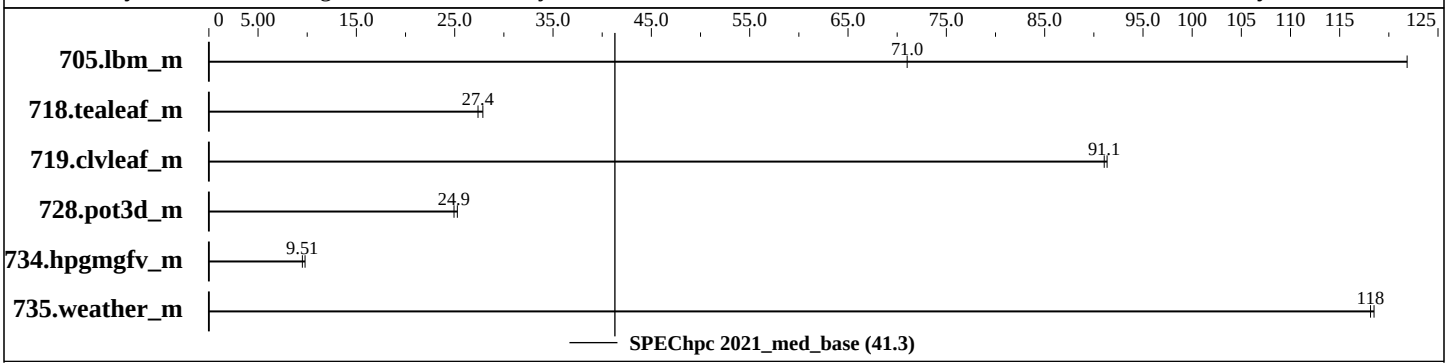
Summit: IBM Power System AC922 (IBM Power9, Tesla V100-SXM2-16GB)

SPEChpc 2021_med_base = 41.3

SPEChpc 2021_med_peak = Not Run

hpc2021 License: 056A
Test Sponsor: Oak Ridge National Laboratory
Tested by: Oak Ridge National Laboratory

Test Date: Sep-2021
Hardware Availability: Nov-2018
Software Availability: Jul-2021



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
705.lbm_m	ACC	4200	1	**17.3**	**71.0**	10.1	122											
718.tealeaf_m	ACC	4200	1	48.4	27.9	**49.3**	**27.4**											
719.clvleaf_m	ACC	4200	1	20.3	91.3	**20.3**	**91.1**											
728.pot3d_m	ACC	4200	1	**74.2**	**24.9**	73.2	25.3											
734.hpgmgfv_m	ACC	4200	1	102	9.78	**105**	**9.51**											
735.weather_m	ACC	4200	1	20.3	118	**20.3**	**118**											

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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:	IBM Power System AC922
Interconnect:	Mellanox InfiniBand
Compute Nodes Used:	700
Total Chips:	1400
Total Cores:	15400
Total Threads:	61600
Total Memory:	350 TB
Max. Peak Threads:	--

Software Summary

Compiler:	C/C++/Fortran: Version 21.7 of NVHPC Toolkit
MPI Library:	Spectrum MPI Version 10.4.0.3
Other MPI Info:	None
Other Software:	None
Base Parallel Model:	ACC
Base Ranks Run:	4200
Base Threads Run:	1
Peak Parallel Models:	Not Run
Minimum Peak Ranks:	--
Maximum Peak Ranks:	--
Max. Peak Threads:	--
Min. Peak Threads:	--

Node Description: IBM Power System AC922

Hardware

Number of nodes:	700
Uses of the node:	compute
Vendor:	IBM
Model:	IBM Power System AC922
CPU Name:	IBM POWER9 2.1 (pvr 004e 1201)
CPU(s) orderable:	2 chips
Chips enabled:	2
Cores enabled:	22
Cores per chip:	44
Threads per core:	4
CPU Characteristics:	Up to 3.8 GHz
CPU MHz:	2300
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	512 KB I+D on chip per core
L3 Cache:	110 MB I+D on chip per chip
Other Cache:	None
Memory:	512 GB (16 x 32 GB RDIMM-DDR4-2666)
Disk Subsystem:	2 x 800 GB (Samsung Electronics Co Ltd NVMe SSD Controller 172Xa/172Xb)
Other Hardware:	None
Accel Count:	4
Accel Model:	Tesla V100-SXM2-16GB
Accel Vendor:	NVIDIA Corporation
Accel Type:	GPU
Accel Connection:	NVLink 2.0
Accel ECC enabled:	Yes
Accel Description:	See Notes
Adapter:	Mellanox ConnectX-5
Number of Adapters:	2
Slot Type:	None
Data Rate:	100 Gb/s (4X EDR)

(Continued on next page)

Software

Accelerator Driver:	NVIDIA CUDA 450.80.02
Adapter:	Mellanox ConnectX-5
Adapter Driver:	4.9-2.2.4.1
Adapter Firmware:	16.29.1016
Operating System:	Red Hat Enterprise Linux 8.2
Local File System:	xfs
Shared File System:	250 PB IBM Spectrum Scale parallel filesystem over 4X EDR InfiniBand
System State:	Multi-user, run level 3
Other Software:	None

Node Description: IBM Power System AC922

Hardware (Continued)

Ports Used: 2
Interconnect Type: EDR InfiniBand

Interconnect Description: Mellanox InfiniBand

Hardware

Vendor: Mellanox
Model: Mellanox Switch IB-2
Switch Model: Mellanox IB EDR Switch IB-2
Number of Switches: 1
Number of Ports: 36
Data Rate: 100 Gb/s
Firmware: --
Topology: Non-blocking Fat-tree
Primary Use: MPI Traffic and GPFS access

Software

: --

Submit Notes

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

General Notes

```
 MPI startup command:
   jsrun command was used to launch job using 1 GPU/rank.
Detailed information from nvaccelinfo

CUDA Driver Version:           11000
NVRM version:                  NVIDIA UNIX ppc64le Kernel Module  450.80.02  Wed Sep 23 00:55:04 UTC 2020

Device Number:                 0
Device Name:                   Tesla V100-SXM2-16GB
Device Revision Number:        7.0
Global Memory Size:            16911433728
Number of Multiprocessors:     80
Concurrent Copy and Execution: Yes
Total Constant Memory:         65536
Total Shared Memory per Block: 49152
Registers per Block:           65536
Warp Size:                     32
Maximum Threads per Block:     1024
Maximum Block Dimensions:      1024, 1024, 64
Maximum Grid Dimensions:       2147483647 x 65535 x 65535
```

(Continued on next page)

General Notes (Continued)

```
Maximum Memory Pitch:          2147483647B
Texture Alignment:             512B
Clock Rate:                    1530 MHz
Execution Timeout:             No
Integrated Device:             No
Can Map Host Memory:           Yes
Compute Mode:                  exclusive-process
Concurrent Kernels:            Yes
ECC Enabled:                   Yes
Memory Clock Rate:             877 MHz
Memory Bus Width:              4096 bits
L2 Cache Size:                 6291456 bytes
Max Threads Per SMP:           2048
Async Engines:                 4
Unified Addressing:            Yes
Managed Memory:                Yes
Concurrent Managed Memory:     Yes
Preemption Supported:          Yes
Cooperative Launch:            Yes
  Multi-Device:                Yes
Default Target:                cc70
```

Compiler Version Notes

```
==============================================================================
 CC  705.lbm_m(base) 718.tealeaf_m(base) 734.hpgmgfv_m(base)
------------------------------------------------------------------------------
/usr/lib64/crt1.o:(.rodata+0x8): undefined reference to ‘main’
pgacclnk: child process exit status 1: /usr/bin/ld
nvc 21.7-0 linuxpower target on Linuxpower
NVIDIA Compilers and Tools
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------------------------------------------------------------------------------

==============================================================================
 FC  719.clvleaf_m(base) 728.pot3d_m(base) 735.weather_m(base)
------------------------------------------------------------------------------
nvfortran 21.7-0 linuxpower target on Linuxpower
NVIDIA Compilers and Tools
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------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`mpicc`

Fortran benchmarks:
`mpif90`

Base Optimization Flags

C benchmarks:
`-O3 -acc=gpu`

Fortran benchmarks:
`-O3 -acc=gpu`

The flags file that was used to format this result can be browsed at
`http://www.spec.org/hpc2021/flags/nv2021_flags.html`

You can also download the XML flags source by saving the following link:
`http://www.spec.org/hpc2021/flags/nv2021_flags.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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