**SPEC® CPU2017 Floating Point Rate Result**

**Dell Inc.**

PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.3</td>
<td>45.8</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Feb-2018

**Hardware Availability:** Sep-2017

**Tested by:** Dell Inc.

**Software Availability:** Sep-2017

### Hardware

- **CPU Name:** Intel Xeon Bronze 3104
- **Max MHz.:** 1700
- **Nominal:** 1700
- **Enabled:** 12 cores, 2 chips
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
  - L2: 1 MB I+D on chip per core
  - L3: 8.25 MB I+D on chip per chip
- **Other:** None
- **Memory:** 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2133)
- **Storage:** 1 TB SATA 7200 RPM
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 12 SP3 (x86_64) 4.4.14-94.11-default
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;
  - Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Version 1.3.7 released Feb-2018
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None

---

The table below contains the results of the SPEC CPU2017 benchmark.

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<th>SPECrate2017_fp_peak</th>
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<tbody>
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<td>12</td>
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<td>554.roms_r</td>
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</tbody>
</table>

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**Software**

- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
Results Table

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</tbody>
</table>

SPECrate2017_fp_base = 45.3
SPECrate2017_fp_peak = 45.8

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor.

For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

General Notes

Environment variables set by runcpu before the start of the run:

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.
Transparent Huge Pages enabled by default.
Prior to runcpu invocation.

(Continued on next page)
Dell Inc.
PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

**General Notes (Continued)**

Filesystem page cache synced and cleared with:
```
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
```

**Platform Notes**

BIOS settings:
- Sub NUMA Cluster disabled
- Virtualization Technology disabled
- System Profile set to Custom
- CPU Performance set to Maximum Performance
- C States set to Autonomous
- C1EE disabled
- Uncore Frequency set to Dynamic
- Energy Efficiency Policy set to Performance
- Memory Patrol Scrub disabled
- CPU Interconnect Bus Link Power Management disabled
- PCI ASPM L1 Link Power Management disabled
- Sysinfo program /root/cpu2017/bin/sysinfo
- Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b091c0f
- running on linux-ejwa Fri Feb 16 09:05:05 2018

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
```
model name : Intel(R) Xeon(R) Bronze 3104 CPU @ 1.70GHz
   2 "physical id"s (chips)
   12 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 6
siblings : 6
physical 0: cores 0 1 2 3 4 5
physical 1: cores 0 1 2 3 4 5
```

From lscpu:
```
Architecture:     x86_64
CPU op-mode(s):   32-bit, 64-bit
Byte Order:       Little Endian
CPU(s):           12
On-line CPU(s) list: 0-11
Thread(s) per core: 1
Core(s) per socket: 6
```
Dell Inc.
PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

SPECrate2017_fp_base = 45.3
SPECrate2017_fp_peak = 45.8

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Platform Notes (Continued)

- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Bronze 3104 CPU @ 1.70GHz
- Stepping: 4
- CPU MHz: 1696.031
- BogoMIPS: 3392.06
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 8448K
- NUMA node0 CPU(s): 0,2,4,6,8,10
- NUMA node1 CPU(s): 1,3,5,7,9,11
- Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
- /proc/cpuinfo cache data
  cache size : 8448 KB

From /proc/cpuinfo

From numactl --hardware

WARNING: a numactl 'node' might or might not correspond to a physical chip.

Available: 2 nodes (0-1)
  node 0 cpus: 0 2 4 6 8 10
  node 0 size: 95349 MB
  node 0 free: 94900 MB
  node 1 cpus: 1 3 5 7 9 11
  node 1 size: 96750 MB
  node 1 free: 96406 MB

node distances:
  node 0 1
  0: 10 21
  1: 21 10

From /proc/meminfo

MemTotal: 196709968 KB
HugePages_Total: 0

(Continued on next page)
Platform Notes (Continued)

Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*

SuSE-release:
    SUSE Linux Enterprise Server 12 (x86_64)
    VERSION = 12
    PATCHLEVEL = 3
    # This file is deprecated and will be removed in a future service pack or release.
    # Please check /etc/os-release for details about this release.

os-release:
    NAME="SLES"
    VERSION="12-SP3"
    VERSION_ID="12.3"
    PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
    ID="sles"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:
    Linux linux-ejwa 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)
    x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Feb 15 01:43

SPEC is set to: /root/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 btrfs 855G 36G 820G 5% /

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

    BIOS Dell Inc. 1.3.7 02/09/2018
    Memory:
    3x 002C00B3002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666, configured at 2133
    9x 00A00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666, configured at 2133
    4x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base)
==============================================================================
icc (ICC) 18.0.0 20170811

(Continued on next page)
### Compiler Version Notes (Continued)

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

```
CC   519.lbm_r(peak) 544.nab_r(peak)
---
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
---
CXXC 508.namd_r(base) 510.parest_r(base)
---
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
---
CXXC 508.namd_r(peak) 510.parest_r(peak)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
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CC  511.povray_r(base) 526.blender_r(base)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
iccc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
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Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
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FC  507.cactuBSSN_r(base)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
```

(Continued on next page)
SPEC CPU2017 Floating Point Rate Result

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PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

SPECrate2017_fp_base = 45.3
SPECrate2017_fp_peak = 45.8

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Compiler Version Notes (Continued)

icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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FC 507.cactuBSSN_r(peak)
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icc (ICC) 18.0.0 20170811
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ifort (IFORT) 18.0.0 20170811
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FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64
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Dell Inc.
PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

SPECrates:
- SPECrates\_fp\_base = 45.3
- SPECrates\_fp\_peak = 45.8

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**Base Optimization Flags**

**C benchmarks:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**C++ benchmarks:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**Fortran benchmarks:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**Benchmarks using both Fortran and C:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**Benchmarks using both C and C++:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**Benchmarks using Fortran, C, and C++:**
- xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- qopt-mem-layout-trans=3

**Base Other Flags**

**C benchmarks:**
- m64 -std=c11

**C++ benchmarks:**
- m64

**Fortran benchmarks:**
- m64

**Benchmarks using both Fortran and C:**
- m64 -std=c11

**Benchmarks using both C and C++:**
- m64 -std=c11

**Benchmarks using Fortran, C, and C++:**
- m64 -std=c11
Dell Inc.
PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)

SPECrate2017_fp_base = 45.3
SPECrate2017_fp_peak = 45.8

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3
538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3
544.nab_r: Same as 519.lbm_r

C++ benchmarks:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3

Fortran benchmarks:

(Continued on next page)
## Peak Optimization Flags (Continued)

503.bwaves_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte`

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: `-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte`

Benchmarks using both Fortran and C:
- `prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte`

Benchmarks using both C and C++:
- `prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3`

Benchmarks using Fortran, C, and C++:
- `prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte`

## Peak Other Flags

C benchmarks:
- `-m64 -std=c11`

C++ benchmarks:
- `-m64`

Fortran benchmarks:
- `-m64`

Benchmarks using both Fortran and C:
- `-m64 -std=c11`

Benchmarks using both C and C++:
- `-m64 -std=c11`

(Continued on next page)
### Dell Inc.

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<th>PowerEdge M640 (Intel Xeon Bronze 3104, 1.70 GHz)</th>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

**Test Date:** Feb-2018  
**Hardware Availability:** Sep-2017

**Software Availability:** Sep-2017

#### Peak Other Flags (Continued)

Benchmarks using Fortran, C, and C++:

- `m64`  
- `-std=c11`

The flags files that were used to format this result can be browsed at:


You can also download the XML flags sources by saving the following links:


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