NEC Corporation

Express5800/R120h-2M (Intel Xeon Silver 4116)

**SPECrate2017_int_base** = 108
**SPECrate2017_int_peak** = 114

**CPU2017 License**: 9006  
**Test Date**: Sep-2018

**Test Sponsor**: NEC Corporation  
**Hardware Availability**: Jun-2018

**Tested by**: NEC Corporation  
**Software Availability**: Mar-2018

---

### Hardware

- **CPU Name**: Intel Xeon Silver 4116  
  - Max MHz.: 3000  
  - Nominal: 2100  
  - Enabled: 24 cores, 2 chips, 2 threads/core  
  - Ordernable: 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: 16.5 MB I+D on chip per chip  
  - Other: None  
- **Memory**: 192 GB (24 x 8 GB 2Rx8 PC4-2666V-R, running at 2400)  
- **Storage**: 1 x 1 TB SATA, 7200 RPM, RAID 0  
- Other: None

---

### Software

- **OS**: Red Hat Enterprise Linux Server release 7.4 (Maipo)  
  - Kernel 3.10.0-693.21.1.el7.x86_64  
- **Compiler**: C/C++: Version 18.0.2.199 of Intel C/C++ Compiler for Linux;  
  - Fortran: Version 18.0.2.199 of Intel Fortran Compiler for Linux  
- **Parallel**: No  
- **Firmware**: NEC BIOS Version U30 02/15/2018 released Mar-2018  
- **File System**: ext4  
- **System State**: Run level 3 (multi-user)  
- **Base Pointers**: 64-bit  
- **Peak Pointers**: 32/64-bit  
- Other: jemalloc memory allocator V5.0.1
NEC Corporation

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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Seconds</th>
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<td>500.perlbench_r</td>
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<td>505.mcf_r</td>
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<tr>
<td>520.omnetpp_r</td>
<td>48</td>
<td>847</td>
<td>74.3</td>
<td>849</td>
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<td>847</td>
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<td>523.xalancbmk_r</td>
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<td>466</td>
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<td>470</td>
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<td>525.x264_r</td>
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<td>207</td>
<td>48</td>
<td>412</td>
<td>204</td>
<td>411</td>
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<td>531.deepsjeng_r</td>
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<td>584</td>
<td>94.3</td>
<td>599</td>
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<td>602</td>
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<td>907</td>
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<td>548.exchange2_r</td>
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<td>557.xz_r</td>
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<td>700</td>
<td>74.1</td>
<td>48</td>
<td>694</td>
<td>74.7</td>
<td>699</td>
</tr>
</tbody>
</table>

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:
LD_LIBRARY_PATH = "*/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

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.
General Notes (Continued)

is mitigated in the system as tested and documented.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS Settings:
Thermal Configuration: Maximum Cooling
Workload Profile: General Throughput Compute
Memory Patrol Scrubbing: Disabled
LLC Dead Line Allocation: Disabled
LLC Prefetch: Enabled
Workload Profile: Custom
Sub-NUMA Clustering: Disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on r120h2m Thu Sep 13 14:02:05 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) Silver 4116 CPU @ 2.10GHz
  2 "physical id"s (chips)
  48 "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 : 12
siblings  : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel

(Continued on next page)
SPEC CPU2017 Integer Rate Result
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Platform Notes (Continued)

CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 2100.000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0-11,24-35
NUMA node1 CPU(s): 12-23,36-47
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good ncpu xtopology nonstop_tsc
aperfmpref eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma
cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_l3 cdp_l3 invpcid_single
intel_pt spec_ctrl ibpb_support tpr_shadow vmmi flexpriority ept vpid fsgsbase
tsc_adjust bni hle avx2 smep bmi2 erms invpcid rdt_a avx512f avx512dq
rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1
cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts

/cache data
  cache size : 16896 KB

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 1 2 3 4 5 6 7 8 9 10 11 24 25 26 27 28 29 30 31 32 33 34 35
  node 0 size: 97964 MB
  node 0 free: 95476 MB
  node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 36 37 38 39 40 41 42 43 44 45 46 47
  node 1 size: 98303 MB
  node 1 free: 95911 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal: 197746388 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
Platform Notes (Continued)

```
os-release:
    NAME="Red Hat Enterprise Linux Server"
    VERSION="7.4 (Maipo)"
    ID="rhel"
    ID_LIKE="fedora"
    VARIANT="Server"
    VARIANT_ID="server"
    VERSION_ID="7.4"
    PRETTY_NAME="Red Hat Enterprise Linux Server 7.4 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server
```

```
uname -a:
    Linux r120h2m 3.10.0-693.21.1.el7.x86_64 #1 SMP Fri Feb 23 18:54:16 UTC 2018 x86_64
    x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences
CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS (kernel)
```

```
run-level 3 Sep 13 13:56
SPEC is set to: /home/cpu2017
```

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 909G 454G 409G 53% /
```

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 SM BIOS" standard.

```
BIOS NEC U30 02/15/2018
Memory:
    24x HPE 876319-081 8 GB 2 rank 2666, configured at 2400
```

(End of data from sysinfo program)

Compiler Version Notes

```
==============================================================================
<table>
<thead>
<tr>
<th>CC</th>
<th>500.peribench_r(base)</th>
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<th>557.xz_r(base)</th>
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</thead>
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```

```
icc (ICC) 18.0.2 20180210
```

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Compiler Version Notes (Continued)

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==============================================================================
CC 500.perlbench_r(peak) 502.gcc_r(peak) 505.mcf_r(peak) 525.x264_r(peak)
557.xz_r(peak)
------------------------------------------------------------------
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
541.leela_r(base)
------------------------------------------------------------------
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(peak) 523.xalancbmk_r(peak) 531.deepsjeng_r(peak)
541.leela_r(peak)
------------------------------------------------------------------
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC 548.exchange2_r(base)
------------------------------------------------------------------
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC 548.exchange2_r(peak)
------------------------------------------------------------------
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

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Base Compiler Invocation (Continued)

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:
-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:
-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs
-L/usr/local/je5.0.1-64/lib -ljemalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icc -m64 -std=c11

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### SPEC CPU2017 Integer Rate Result

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### Peak Compiler Invocation (Continued)

502.gcc_r:

- `icc -m32 -std=c11 -L/home/prasadj/specdev/IC18u2_Internal/lin_18_0_20180210/compiler/lib/ia32_lin`

C++ benchmarks (except as noted below):

- icpc -m64

523.xalancbmk_r:

- icpc -m32 -L/home/prasadj/specdev/IC18u2_Internal/lin_18_0_20180210/compiler/lib/ia32_lin

Fortran benchmarks:

- ifort -m64

### Peak Portability Flags

#### C benchmarks:

500.perlbench_r:

- `-DSPEC_LP64`  
- `-DSPEC_LINUX_X64`

502.gcc_r:

- `-D_FILE_OFFSET_BITS=64`

505.mcf_r:

- `-DSPEC_LP64`

520.omnetpp_r:

- `-DSPEC_LP64`

523.xalanchbmk_r:

- `-D_FILE_OFFSET_BITS=64`  
- `-DSPEC_LINUX`

525.x264_r:

- `-DSPEC_LP64`

531.deepsjeng_r:

- `-DSPEC_LP64`

541.leela_r:

- `-DSPEC_LP64`

548.exchange2_r:

- `-DSPEC_LP64`

557.xz_r:

- `-DSPEC_LP64`

### Peak Optimization Flags

#### C benchmarks:

500.perlbench_r:

- `-Wl,-z,muldefs`  
- `-prof-gen(pass 1)`  
- `-prof-use(pass 2)`  
- `-ipo`

- `-xCORE-AVX512`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=3`

- `-fno-strict-overflow`  
- `-L/usr/local/je5.0.1-64/lib`  
- `ljemalloc`

502.gcc_r:

- `-Wl,-z,muldefs`  
- `-prof-gen(pass 1)`  
- `-prof-use(pass 2)`  
- `-ipo`

- `-xCORE-AVX512`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=3`

- `-L/usr/local/je5.0.1-32/lib`  
- `ljemalloc`

505.mcf_r:

- `basepeak = yes`

525.x264_r:

- `-Wl,-z,muldefs`  
- `-prof-gen(pass 1)`  
- `-prof-use(pass 2)`  
- `-ipo`

- `-xCORE-AVX512`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=3`

- `-fno-alias`  
- `-L/usr/local/je5.0.1-64/lib`  
- `ljemalloc`

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Peak Optimization Flags (Continued)

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: basepeak = yes

541.leela_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-64/lib -ljemalloc

Fortran benchmarks:

548.exchange2_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.xml
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.xml

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

Tested with SPEC CPU2017 v1.0.5 on 2018-09-13 01:02:04-0400.
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