NEC Corporation
Express5800/T110j-S (Intel Xeon E-2224G)

SPECrate®2017_int_base = 29.2
SPECrate®2017_int_peak = 30.1

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
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<tbody>
<tr>
<td>OS: Red Hat Enterprise Linux Server release 7.7 (Maipo)</td>
<td>CPU Name: Intel Xeon E-2224G</td>
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<tr>
<td>Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux</td>
<td>Max MHz: 4700</td>
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<tr>
<td>Firmware: No</td>
<td>Nominal: 3500</td>
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<tr>
<td>File System: ext4</td>
<td>Enabled: 4 cores, 1 chip</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
<td>Orderable: 1 chip</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
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<tr>
<td>Peak Pointers: 32/64-bit</td>
<td>L2: 256 KB I+D on chip per core</td>
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<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
<td>L3: 8 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Power Management: --</td>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Memory: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-E)</td>
<td>L2: 256 KB I+D on chip per core</td>
</tr>
<tr>
<td>Storage: 1 x 1 TB SATA, 7200 RPM</td>
<td>L3: 8 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other: None</td>
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**NEC Corporation**

Express5800/T110j-S (Intel Xeon E-2224G)

**Results Table**

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<td>15.0</td>
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</tbody>
</table>

**Submit Notes**

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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"

IRQ balance service was stopped using "systemctl stop irqbalance.service"

**Environment Variables Notes**

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

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

**General Notes**

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

Transparent Huge Pages enabled by default

Prior to runcpu invocation

Filesystem page cache synced and cleared with:
```
sync; echo 3 > /proc/sys/vm/drop_caches
```
## NEC Corporation

**Express5800/T110j-S (Intel Xeon E-2224G)**

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**SPEC CPU®2017 Integer Rate Result**

**CPU2017 License:** 9006  
**Test Date:** Nov-2019  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Hardware Availability:** Nov-2019  
**Software Availability:** Aug-2019

### General Notes (Continued)

- 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.

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:**  
- VT-x: Disabled  
- Energy Efficient P-state: Disabled  
- Energy Efficient Turbo: Disabled

**Sysinfo program** /home/cpu2017/bin/sysinfo  
**Rev:** r6365 of 2019-08-21 295195f888a3d7edeb1e6e46a485a0011  
**running on t110js Tue Nov 12 15:51:28 2019**

**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) E-2224G CPU @ 3.50GHz  
1 "physical id"s (chips)  
4 "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 : 4  
siblings : 4  
physical 0: cores 0 1 2 3
```

From lscpu:

```
Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 4  
On-line CPU(s) list: 0-3  
Thread(s) per core: 1  
Core(s) per socket: 4  
Socket(s): 1
```

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

NEC Corporation

Express5800/T110j-S (Intel Xeon E-2224G)

SPECrate®2017_int_base = 29.2
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CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation

Test Date: Nov-2019
Hardware Availability: Nov-2019
Software Availability: Aug-2019

Platform Notes (Continued)

NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2224G CPU @ 3.50GHz
Stepping: 10
CPU MHz: 4461.090
CPU max MHz: 4700.0000
CPU min MHz: 800.0000
BogoMIPS: 7008.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-3

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 pdpiegb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nop1 xtopology nonstop_tsc
aperfmpref eagercpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpc pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch intel_pt ssbd ibpb stibp
tpr_shadow vmi fexpreor ept vpid fsgsbase tsc_adjust bmi1 hle avx2 sme12
erms invpcid rtm mpx rdseed adx smap clflushopt xsaveopt xsavec xgetbv1 dtherm ida
arat pin pts hwp hwp_notify hwp_act_window hwp_epp md_clear spec_ctrl intel_stibp
flush_l1d

/proc/cpuinfo cache data
  cache size : 8192 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0 1 2 3
  node 0 size: 65283 MB
  node 0 free: 63398 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 65719080 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:

(Continued on next page)
### SPEC CPU®2017 Integer Rate Result

**NEC Corporation**

Express5800/T110j-S (Intel Xeon E-2224G)

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<td>Hardware Availability: Nov-2019</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation

---

**Platform Notes (Continued)**

NAME="Red Hat Enterprise Linux Server"  
VERSION="7.7 (Maipo)"  
ID="rhel"  
ID_LIKE="fedora"  
VARIANT="Server"  
VARIANT_ID="server"  
VERSION_ID="7.7"  
PRETTY_NAME="Red Hat Enterprise Linux Server 7.7 (Maipo)"

redhat-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)  
system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)  
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.7:ga:server

uname -a:

```
Linux t110js 3.10.0-1062.el7.x86_64 #1 SMP Thu Jul 18 20:25:13 UTC 2019 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion
- Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT disabled
- CVE-2017-5754 (Meltdown): Mitigation: PTI
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

run-level 3 Nov 12 15:45

SPEC is set to: /home/cpu2017  
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 908G 79G 783G 10% /

From /sys/devices/virtual/dmi/id

- BIOS: American Megatrends Inc. F01 08/21/2019
- Vendor: NEC
- Product: Express5800/T110j-S [N8100-2799Y]
- Serial: 0000002

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.

- Memory:
  - 4x Samsung M391A2K43BB1-CTD 16 GB 2 rank 2667

(End of data from sysinfo program)
### Compiler Version Notes

<table>
<thead>
<tr>
<th>Language</th>
<th>Applications</th>
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<tbody>
<tr>
<td>C</td>
<td>502.gcc_r(peak)</td>
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<tr>
<td></td>
<td>Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version</td>
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<tr>
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<td>19.0.4.227 Build 20190416</td>
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<tr>
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<td>Copyright (C) 1985-2019 Intel Corporation. All rights reserved.</td>
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### SPEC CPU®2017 Integer Rate Result

**NEC Corporation**

**Express5800/T110j-S (Intel Xeon E-2224G)**

<table>
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<tr>
<th>CPU2017 License:</th>
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<tr>
<td>Test Sponsor:</td>
<td>NEC Corporation</td>
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<td>NEC Corporation</td>
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**SPECrate®2017_int_base = 29.2**

**SPECrate®2017_int_peak = 30.1**

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<tr>
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<tr>
<td>Hardware Availability:</td>
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#### Compiler Version Notes (Continued)

```
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
```

<table>
<thead>
<tr>
<th><strong>C++</strong></th>
<th>523.xalancbmk_r(peak)</th>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
</tbody>
</table>

#### Base Compiler Invocation

**C benchmarks:**

```
icc -m64 -std=c11
```

**C++ benchmarks:**

```
icpc -m64
```

**Fortran benchmarks:**

```
ifort -m64
```

#### Base Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
```

(Continued on next page)
## NEC Corporation

**Express5800/T110j-S (Intel Xeon E-2224G)**

**SPECrate\(^\text{\textregistered}\)2017\_int\_base = 29.2**

**SPECrate\(^\text{\textregistered}\)2017\_int\_peak = 30.1**

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### Base Portability Flags (Continued)

- 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:**
- `-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
- `-lqkmalloc`

**C++ benchmarks:**
- `-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
- `-lqkmalloc`

**Fortran benchmarks:**
- `-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64`
- `-lqkmalloc`

### Peak Compiler Invocation

**C benchmarks (except as noted below):**
- `icc -m64 -std=c11`
- `502.gcc_r.icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

**C++ benchmarks (except as noted below):**
- `icpc -m64`
- `523.xalancbmk_r.icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/ia32_lin`

(Continued on next page)
NEC Corporation  
Express5800/T110j-S (Intel Xeon E-2224G)  

| SPECrate®2017_int_base = 29.2 |
| SPECrate®2017_int_peak = 30.1 |

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Test Date:** Nov-2019  
**Hardware Availability:** Nov-2019  
**Tested by:** NEC Corporation  
**Software Availability:** Aug-2019

**Peak Compiler Invocation (Continued)**

Fortran benchmarks:  
ifort -m64

**Peak Portability Flags**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>-D_FILE_OFFSET_BITS=64</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>523.xalancbk_r</td>
<td>-D_FILE_OFFSET_BITS=64 -DSPEC_LINUX</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

**Peak Optimization Flags**

C benchmarks:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4 -fno-strict-overflow -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4 -fno-alias -L/usr/local/je5.0.1-32/lib -ljemalloc</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>basepeak = yes</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4 -fno-alias -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>-Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc</td>
</tr>
</tbody>
</table>

(Continued on next page)
PEC CPU®2017 Integer Rate Result

NEC Corporation

Express5800/T110j-S (Intel Xeon E-2224G)

SPECrate®2017_int_base = 29.2
SPECrate®2017_int_peak = 30.1

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Nov-2019
Tested by: NEC Corporation
Hardware Availability: Nov-2019
Software Availability: Aug-2019

Peak Optimization Flags (Continued)

C++ benchmarks:

520.omnetpp_r: -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64
-lqkmalloc

523.xalancbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX2 -O3 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:

548.exchange2_r: basepeak = yes

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

Tested with SPEC CPU®2017 v1.1.0 on 2019-11-12 01:51:28-0500.
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