Lenovo Group Limited

Lenovo ThinkServer RD550
(2.20 GHz, Intel Xeon E5-2699R v4)

**SPECint® Rate2006 = 1790**
SPECint_rate_base2006 = 1720

**CPU2006 license:** 9017
**Test sponsor:** Lenovo Group Limited
**Tested by:** Lenovo Group Limited

**Test date:** Dec-2016
**Hardware Availability:** Jan-2017
**Software Availability:** Sep-2016

**Hardware**
- **CPU Name:** Intel Xeon E5-2699R v4
- **CPU Characteristics:** Intel Turbo Boost Technology up to 3.60 GHz
- **CPU MHz:** 2200
- **FPU:** Integrated
- **CPU(s) enabled:** 44 cores, 2 chips, 22 cores/chip, 2 threads/core
- **CPU(s) orderable:** 1.2 chips
- **Primary Cache:** 32 KB I + 32 KB D on chip per core
- **Secondary Cache:** 256 KB I+D on chip per core
- **L3 Cache:** 55 MB I+D on chip per chip
- **Other Cache:** None
- **Memory:** 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)
- **Disk Subsystem:** 1 x 800 GB SATA SSD
- **Other Hardware:** None

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**Software**
- **Operating System:** SUSE Linux Enterprise Server 12 SP1 (x86_64)
  - Kernel 3.12.49-11-default
- **Compiler:** C/C++: Version 17.0.0.098 of Intel C/C++ Compiler for Linux
- **Auto Parallel:** No
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 32-bit
- **Peak Pointers:** 32/64-bit
- **Other Software:** Microquill SmartHeap V10.2
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Benchmark | Copies | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
Perlbench | 88 | 600 | 1430 | 601 | 1430 | 88 | 509 | 1690 | 506 | 1700 | 509 | 1690
Bzip2 | 88 | 937 | 906 | 935 | 909 | 88 | 898 | 946 | 903 | 941 | 901 | 942
Mcf | 88 | 357 | 2300 | 356 | 2290 | 88 | 335 | 2450 | 335 | 2450 | 336 | 2450
Gobmk | 88 | 728 | 1270 | 729 | 1270 | 88 | 705 | 1310 | 704 | 1310 | 704 | 1310
Hmmer | 88 | 778 | 1370 | 778 | 1370 | 88 | 734 | 1450 | 735 | 1450 | 743 | 1450
Libquantum | 88 | 98.5 | 18500 | 98.7 | 18500 | 98.3 | 18500 | 88 | 98.5 | 18500 | 98.7 | 18500 | 98.3 | 18500
H264ref | 88 | 868 | 2240 | 852 | 2290 | 88 | 844 | 2310 | 832 | 2340 | 837 | 2330
Omnitpp | 88 | 692 | 795 | 693 | 794 | 88 | 674 | 816 | 674 | 816 | 675 | 815
Astar | 88 | 655 | 943 | 657 | 940 | 655 | 943 | 88 | 655 | 943 | 657 | 940 | 655 | 943
Xalancbmk | 88 | 371 | 1640 | 368 | 1650 | 370 | 1640 | 88 | 371 | 1640 | 368 | 1650 | 370 | 1640

Results Table

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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"
Transparent Huge Pages enabled with:
- echo always > /sys/kernel/mm/transparent_hugepage/enabled
Filesystem page cache cleared with:
- echo 1 > /proc/sys/vm/drop_caches

Platform Notes

BIOS Configuration:
- Cluster On Die set to Enabled
- Early Snoop set to Disabled
- Performance Profile set to Custom
- C1E Support set to Disabled
- Core C3 set to Disabled
- Core C6 set to Disabled
- CPU Performance and Energy Bias set to Disabled
- Thermal Profile set to High Fan Speed
- Memory Power Savings set to Disabled
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on RD550-02 Fri Dec 2 15:53:26 2016
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Platform Notes (Continued)

This section contains SUT (System Under Test) info as seen by some common utilities. To remove or add to this section, see:
http://www.spec.org/cpu2006/Docs/config.html#sysinfo

From /proc/cpuinfo
model name : Intel(R) Xeon(R) CPU E5-2699R v4 @ 2.20GHz
2 "physical id"s (chips)
88 "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 : 22
siblings : 44
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
cache size : 28160 KB

From /proc/meminfo
MemTotal: 264551928 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 1
# 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-SP1"
VERSION_ID="12.1"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME=":cpe:/o:suse:sles:12:sp1"

uname -a:
(8d714a0) x86_64 x86_64 x86_64 GNU/Linux
run-level 3 Dec 2 15:52

SPEC is set to: /home/cpu2006-1.2-ic16.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 689G 17G 672G 3% /home
Additional information from dmidecode:

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**Platform Notes (Continued)**

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 LENOVO PB1TS362 03/24/2016
Memory:
16x Hynix Semiconductor HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz
8x NO DIMM NO DIMM

(End of data from sysinfo program)

**Environment variables set by runspec before the start of the run:**
LD_LIBRARY_PATH = "~/home/cpu2006-1.2-ic16.0/libs/32:/home/cpu2006-1.2-ic16.0/libs/64:/home/cpu2006-1.2-ic16.0/sh10.2"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.2
runcspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

**Base Compiler Invocation**

C benchmarks:
icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32

C++ benchmarks:
icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32

**Base Portability Flags**

400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32
401.bzip2: -D_FILE_OFFSET_BITS=64
403.gcc: -D_FILE_OFFSET_BITS=64
429.mcf: -D_FILE_OFFSET_BITS=64
445.gobmk: -D_FILE_OFFSET_BITS=64
456.hmmer: -D_FILE_OFFSET_BITS=64
458.sjeng: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
462.libquantum: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
464.h264ref: -D_FILE_OFFSET_BITS=64
471.omnetpp: -D_FILE_OFFSET_BITS=64
473.astar: -D_FILE_OFFSET_BITS=64
483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
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| Software Availability | Sep-2016 |

### Base Optimization Flags

C benchmarks:
- `-xCORE-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-qopt-mem-layout-trans=3`  

C++ benchmarks:
- `-xCORE-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-qopt-mem-layout-trans=3`  
- `-Wl,-z,muldefs`  
- `-L/sh10.2`  
- `-lsmartheap`  

### Base Other Flags

C benchmarks:
- `403.gcc`: `-Dalloca=_alloca`  

### Peak Compiler Invocation

C benchmarks (except as noted below):
- `icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32`  
- `400.perlbench`: `icc -m64`  
- `401.bzip2`: `icc -m64`  
- `456.hmmer`: `icc -m64`  
- `458.sjeng`: `icc -m64`  

C++ benchmarks:
- `icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32`  

### Peak Portability Flags

- `400.perlbench`: `-DSPEC_CPU_LP64`  
- `401.bzip2`: `-DSPEC_CPU_LP64`  
- `403.gcc`: `-D_FILE_OFFSET_BITS=64`  
- `429.mcf`: `-D_FILE_OFFSET_BITS=64`  
- `445.gobmk`: `-D_FILE_OFFSET_BITS=64`  
- `456.hmmer`: `-DSPEC_CPU_LP64`  
- `458.sjeng`: `-DSPEC_CPU_LP64`  
- `462.libquantum`: `-D_FILE_OFFSET_BITS=64`  
- `464.h264ref`: `-D_FILE_OFFSET_BITS=64`  
- `471.omnetpp`: `-D_FILE_OFFSET_BITS=64`  
- `473.astar`: `-D_FILE_OFFSET_BITS=64`
Peak Portability Flags (Continued)

483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX

Peak Optimization Flags

C benchmarks:

400.perlbench: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
  -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
  -no-prec-div(pass 2) -auto-ilp32 -qopt-mem-layout-trans=3

401.bzip2: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
  -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
  -no-prec-div(pass 2) -qopt-prefetch -auto-ilp32
  -qopt-mem-layout-trans=3

403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div
  -qopt-mem-layout-trans=3

429.mcf: basepeak = yes

458.sjeng: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
  -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
  -no-prec-div(pass 2) -qopt-mem-layout-trans=3

462.libquantum: basepeak = yes

C++ benchmarks:

471.omnetpp: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
  -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
  -no-prec-div(pass 2)
  -qopt-ra-region-strategy=block
  -qopt-mem-layout-trans=3 -Wl,-z,muldefs
  -L/sh10.2 -lsmartheap

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Peak Optimization Flags (Continued)

473.astar: basepeak = yes
483.xalancbmk: basepeak = yes

Peak Other Flags

C benchmarks:

403.gcc: -Dalloca=_alloca

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/intel-ic17.0-official-linux64.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revE.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revE.xml

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