



# SPEC CPU®2017 Integer Rate Result

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## Fujitsu

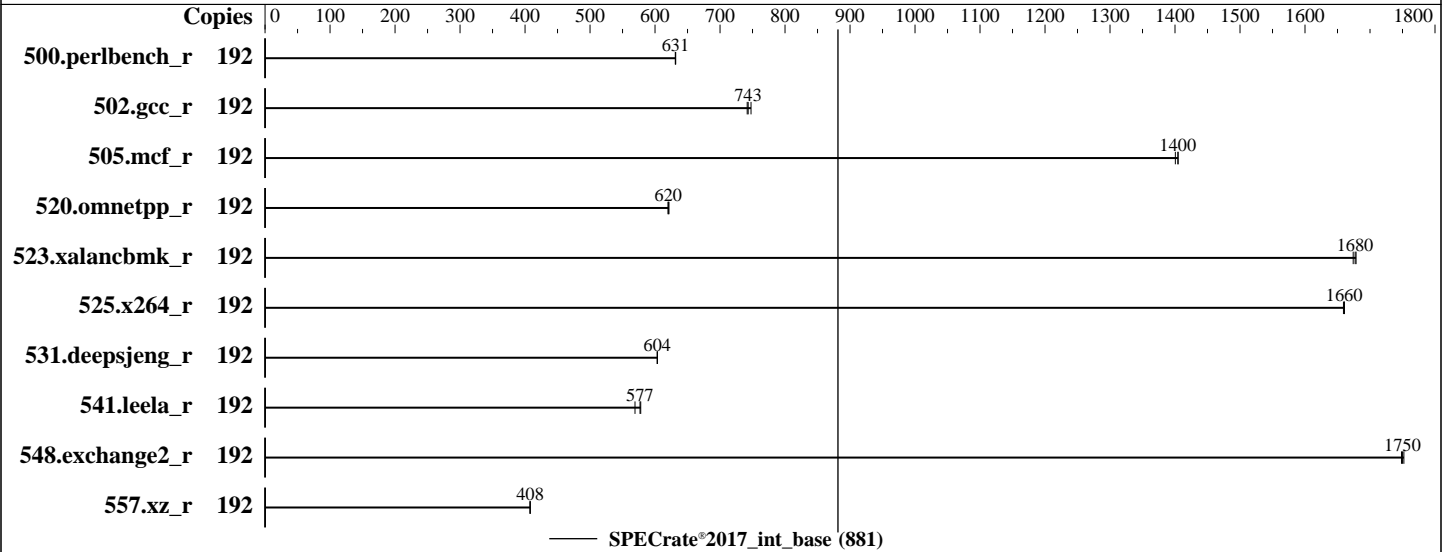
PRIMEQUEST 4400E, Intel Xeon Gold 6418H,  
2.10GHz

SPECrate®2017\_int\_base = 881

SPECrate®2017\_int\_peak = Not Run

CPU2017 License: 19  
Test Sponsor: Fujitsu  
Tested by: Fujitsu

Test Date: Apr-2023  
Hardware Availability: Jun-2023  
Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Gold 6418H  
Max MHz: 4000  
Nominal: 2100  
Enabled: 96 cores, 4 chips, 2 threads/core  
Orderable: 2,4 chips  
Cache L1: 32 KB I + 48 KB D on chip per core  
L2: 2 MB I+D on chip per core  
L3: 60 MB I+D on chip per chip  
Other: None  
Memory: 2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)  
Storage: 1 x 1.92 TB SATA SSD  
Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP4  
5.14.21-150400.22-default  
Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++  
Compiler for Linux;  
Fortran: Version 2023.0 of Intel Fortran Compiler  
for Linux;  
Parallel: No  
Firmware: Fujitsu BIOS Version V1.0.0.0 R1.10.0 for  
D3986-A1x. Released Jun-2023  
tested as V1.0.0.0 R0.20.0 for D3986-A1x Apr-2023  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: Not Applicable  
Other: None  
Power Management: BIOS set to prefer performance at  
the cost of additional power usage



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	192	484	631	<b><u>484</u></b>	<b><u>631</u></b>	484	632							
502.gcc_r	192	367	742	364	748	<b><u>366</u></b>	<b><u>743</u></b>							
505.mcf_r	192	222	1400	221	1400	<b><u>221</u></b>	<b><u>1400</u></b>							
520.omnetpp_r	192	<b><u>406</u></b>	<b><u>620</u></b>	406	620	405	621							
523.xalancbmk_r	192	121	1670	<b><u>121</u></b>	<b><u>1680</u></b>	121	1680							
525.x264_r	192	202	1660	203	1660	<b><u>202</u></b>	<b><u>1660</u></b>							
531.deepsjeng_r	192	365	603	<b><u>365</u></b>	<b><u>604</u></b>	365	604							
541.leela_r	192	559	569	<b><u>551</u></b>	<b><u>577</u></b>	550	578							
548.exchange2_r	192	288	1750	<b><u>287</u></b>	<b><u>1750</u></b>	287	1750							
557.xz_r	192	<b><u>508</u></b>	<b><u>408</u></b>	508	408	508	408							

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

## Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk\_r / 623.xalancbmk\_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 [https://www.spec.org/cpu2017/Docs/runrules.html#rule\\_1.4](https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4)), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

## 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"

## Environment Variables Notes

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

```
LD_LIBRARY_PATH =
  "/home/Benchmark/speccpu/lib/intel64:/home/Benchmark/speccpu/lib/ia32:/home/Benchmark/speccpu/je5.0.1-32"
MALLOC_CONF = "retain:true"
```



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## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM  
 memory using Red Hat Enterprise Linux 8.4  
 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`  
 runcpu command invoked through numactl i.e.:  
`numactl --interleave=all runcpu <etc>`  
 NA: 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.

## Platform Notes

BIOS configuration:  
 DCU Streamer Prefetcher = Disabled  
 Package C State limit = C0  
 LLC Dead Line Alloc = Disabled  
 CPU Performance Boost = Aggressive  
 SNC (Sub NUMA) = Enable SNC2  
 FAN Control = Full  
 System date was wrongly set. The actual date is Apr-2023

Sysinfo program /home/Benchmark/speccpu/bin/sysinfo  
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
 running on localhost Fri Apr 29 21:02:30 2022

SUT (System Under Test) info as seen by some common utilities.

### Table of contents

1. `uname -a`
2. `w`
3. Username
4. `ulimit -a`
5. `sysinfo process ancestry`
6. `/proc/cpuinfo`
7. `lscpu`
8. `numactl --hardware`
9. `/proc/meminfo`
10. `who -r`
11. Systemd service manager version: `systemd 249 (249.11+suse.124.g2bc0b2c447)`
12. Failed units, from `systemctl list-units --state=failed`
13. Services, from `systemctl list-unit-files`
14. Linux kernel boot-time arguments, from `/proc/cmdline`
15. `cpupower frequency-info`
16. `sysctl`
17. `/sys/kernel/mm/transparent_hugepage`
18. `/sys/kernel/mm/transparent_hugepage/khugepaged`
19. OS release
20. Disk information
21. `/sys/devices/virtual/dmi/id`
22. `dmidecode`
23. BIOS

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### Platform Notes (Continued)

```

-----
1. uname -a
Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
x86_64 x86_64 x86_64 GNU/Linux

-----
2. w
 21:02:30 up 2 min,  1 user,  load average: 1.75, 1.89, 0.82
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
root      tty1    -             21:01   13.00s 2.65s  0.19s /home/Benchmark/PTU/ptat -mon -i 5000000
-filter 0x3f -ts -y

-----
3. Username
From environment variable $USER:  root

-----
4. ulimit -a
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size               (blocks, -f) unlimited
pending signals         (-i) 8253938
max locked memory       (kbytes, -l) 64
max memory size         (kbytes, -m) unlimited
open files              (-n) 1024
pipe size               (512 bytes, -p) 8
POSIX message queues    (bytes, -q) 819200
real-time priority      (-r) 0
stack size              (kbytes, -s) unlimited
cpu time                (seconds, -t) unlimited
max user processes      (-u) 8253938
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
-bash
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=192 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base -o all intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=192 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.001/templots/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/Benchmark/speccpu

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 6418H
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping       : 7

```

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### Platform Notes (Continued)

```
microcode      : 0x2b0001b0
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 24
siblings       : 48
4 physical ids (chips)
192 processors (hardware threads)
physical id 0: core ids 0-23
physical id 1: core ids 0-23
physical id 2: core ids 0-23
physical id 3: core ids 0-23
physical id 0: apicids 0-47
physical id 1: apicids 128-175
physical id 2: apicids 256-303
physical id 3: apicids 384-431
```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

#### 7. lscpu

From lscpu from util-linux 2.37.2:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         46 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                192
On-line CPU(s) list:   0-191
Vendor ID:             GenuineIntel
Model name:            Intel(R) Xeon(R) Gold 6418H
CPU family:            6
Model:                 143
Thread(s) per core:    2
Core(s) per socket:    24
Socket(s):             4
Stepping:              7
CPU max MHz:           4000.0000
CPU min MHz:           800.0000
BogoMIPS:              4200.00
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 nopl xtopology
                        nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                        ds_cpl vmx smx est tm2 ssse3 sdbg 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 cpuid_fault epb cat_l3 cat_l2 cdp_l3
                        invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
                        tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle
                        avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap
                        avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                        xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                        cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                        arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbmi umip pku
                        ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                        tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
                        enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16
                        amx_tile flush_lld arch_capabilities
Virtualization:        VT-x
L1d cache:             4.5 MiB (96 instances)
L1i cache:             3 MiB (96 instances)
L2 cache:              192 MiB (96 instances)
```

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### Platform Notes (Continued)

```

L3 cache:                240 MiB (4 instances)
NUMA node(s):            8
NUMA node0 CPU(s):       0-11,96-107
NUMA node1 CPU(s):       12-23,108-119
NUMA node2 CPU(s):       24-35,120-131
NUMA node3 CPU(s):       36-47,132-143
NUMA node4 CPU(s):       48-59,144-155
NUMA node5 CPU(s):       60-71,156-167
NUMA node6 CPU(s):       72-83,168-179
NUMA node7 CPU(s):       84-95,180-191
Vulnerability Itlb multihit: Not affected
Vulnerability Lltf:      Not affected
Vulnerability Mds:       Not affected
Vulnerability Meltdown:  Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds:     Not affected
Vulnerability Tsx async abort: Not affected

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	4.5M	12	Data	1	64	1	64
L1i	32K	3M	8	Instruction	1	64	1	64
L2	2M	192M	16	Unified	2	2048	1	64
L3	60M	240M	15	Unified	3	65536	1	64

8. numactl --hardware

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

```

available: 8 nodes (0-7)
node 0 cpus: 0-11,96-107
node 0 size: 257621 MB
node 0 free: 255753 MB
node 1 cpus: 12-23,108-119
node 1 size: 258041 MB
node 1 free: 257121 MB
node 2 cpus: 24-35,120-131
node 2 size: 258041 MB
node 2 free: 257355 MB
node 3 cpus: 36-47,132-143
node 3 size: 258007 MB
node 3 free: 257304 MB
node 4 cpus: 48-59,144-155
node 4 size: 258041 MB
node 4 free: 257369 MB
node 5 cpus: 60-71,156-167
node 5 size: 258041 MB
node 5 free: 257362 MB
node 6 cpus: 72-83,168-179
node 6 size: 258041 MB
node 6 free: 257527 MB
node 7 cpus: 84-95,180-191
node 7 size: 257670 MB
node 7 free: 257167 MB
node distances:
node  0  1  2  3  4  5  6  7
0:  10  12  21  21  21  21  31  31
1:  12  10  21  21  21  21  31  31
2:  21  21  10  12  31  31  21  21

```

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### Platform Notes (Continued)

3:	21	21	12	10	31	31	21	21
4:	21	21	31	31	10	12	21	21
5:	21	21	31	31	12	10	21	21
6:	31	31	21	21	21	21	10	12
7:	31	31	21	21	21	21	12	10

```
9. /proc/meminfo
   MemTotal:      2113033200 kB
```

```
10. who -r
     run-level 3 Apr 29 21:00
```

```
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
     Default Target Status
     multi-user      degraded
```

```
12. Failed units, from systemctl list-units --state=failed
     UNIT          LOAD    ACTIVE SUB    DESCRIPTION
     * sep5.service loaded failed failed systemd script to load sep5 driver at boot time
```

```
13. Services, from systemctl list-unit-files
     STATE          UNIT FILES
     enabled        YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron display-manager getty@
                     haveged irqbalance iscsi issue-generator kbdsettings kdump kdump-early klog lvm2-monitor
                     nscd postfix purge-kernels rollback rsyslog sep5 smartd sshd wicked wickedd-auto4
                     wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
     enabled-runtime systemd-remount-fs
     disabled        accounts-daemon appstream-sync-cache autofs autoyast-initscripts blk-availability
                     bluetooth-mesh boot-sysctl ca-certificates chrony-wait chronyd console-getty cups
                     cups-browsed debug-shell ebttables exchange-bmc-os-info firewalld gpm grub2-once
                     haveged-switch-root ipmi ipmievd iscsi-init iscsid iscsiio issue-add-ssh-keys kexec-load
                     lunmask man-db-create multipathd nfs nfs-blkmap nmb numad ostree-remount rdisc rpcbind
                     rpmconfigcheck rsyncd rtkit-daemon serial-getty@ smartd_generate_opts smb snmpd snmptrapd
                     speech-dispatcherd systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                     systemd-time-wait-sync systemd-timesyncd udisks2 upower
     indirect        wickedd
```

```
14. Linux kernel boot-time arguments, from /proc/cmdline
     BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
     root=UUID=8b4cfla0-f943-46c1-a409-c2bca0c1173e
     splash=silent
     mitigations=auto
     quiet
     security=apparmor
     crashkernel=324M,high
     crashkernel=72M,low
```

```
15. cpupower frequency-info
     analyzing CPU 0:
     current policy: frequency should be within 800 MHz and 4.00 GHz.
                     The governor "powersave" may decide which speed to use
                     within this range.
     boost state support:
```

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### Platform Notes (Continued)

Supported: yes  
Active: yes

```

-----
16. sysctl
kernel.numa_balancing          1
kernel.randomize_va_space     2
vm.compaction_proactiveness    20
vm.dirty_background_bytes      0
vm.dirty_background_ratio      10
vm.dirty_bytes                 0
vm.dirty_expire_centisecs     3000
vm.dirty_ratio                 20
vm.dirty_writeback_centisecs   500
vm.dirtytime_expire_seconds    43200
vm.extfrag_threshold           500
vm.min_unmapped_ratio          1
vm.nr_hugepages                0
vm.nr_hugepages_mempolicy      0
vm.nr_overcommit_hugepages     0
vm.swappiness                  60
vm.watermark_boost_factor      15000
vm.watermark_scale_factor      10
vm.zone_reclaim_mode           0
-----
17. /sys/kernel/mm/transparent_hugepage
defrag          always defer defer+madvice [madvice] never
enabled         [always] madvice never
hpage_pmd_size 2097152
shmem_enabled   always within_size advise [never] deny force
-----
18. /sys/kernel/mm/transparent_hugepage/khugepaged
alloc_sleep_millisecs  60000
defrag                 1
max_ptes_none          511
max_ptes_shared        256
max_ptes_swapped       64
pages_to_scan          4096
scan_sleep_millisecs   10000
-----
19. OS release
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise Server 15 SP4
-----
20. Disk information
SPEC is set to: /home/Benchmark/speccpu
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       xfs   1.8T   55G  1.7T   4% /
-----
21. /sys/devices/virtual/dmi/id
Vendor:          FUJITSU LIMITED
-----
22. dmidecode
Additional information from dmidecode 3.2 follows.  WARNING: Use caution when you interpret this section.

```

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### Platform Notes (Continued)

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:**

- 9x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800
- 4x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800
- 1x Samsung M321R8GA0BB0-CQKMG 64 GB 2 rank 4800
- 18x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

-----  
23. BIOS

(This section combines info from /sys/devices and dmidecode.)

```

BIOS Vendor:      FUJITSU
BIOS Version:     V1.0.0.0 R0.20.0 for D3986-A1
BIOS Date:        04/28/2023
BIOS Revision:    0.20
Firmware Revision: 1.0

```

### Compiler Version Notes

```

=====
C      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
=====

```

```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
=====

```

```

=====
C++    | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
=====

```

```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
=====

```

```

=====
Fortran | 548.exchange2_r(base)
=====

```

```

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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=====

```

### Base Compiler Invocation

**C benchmarks:**

icx

**C++ benchmarks:**

icpx

**Fortran benchmarks:**

ifx



# SPEC CPU®2017 Integer Rate Result

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## Fujitsu

PRIMEQUEST 4400E, Intel Xeon Gold 6418H,  
2.10GHz

SPECrate®2017\_int\_base = 881

SPECrate®2017\_int\_peak = Not Run

**CPU2017 License:** 19  
**Test Sponsor:** Fujitsu  
**Tested by:** Fujitsu

**Test Date:** Apr-2023  
**Hardware Availability:** Jun-2023  
**Software Availability:** Dec-2022

## 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:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```

### C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```

### Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```

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

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>

<http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-SPR-RevB.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

<http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-SPR-RevB.xml>



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