## Dell Inc.

**PowerEdge R660 (Intel Xeon Platinum 8471N)**

**SPECrate®2017_int_base = 413**

**SPECrate®2017_int_peak = 427**

### Hardware

- **CPU Name:** Intel Xeon Platinum 8471N
- **Max MHz:** 3600
- **Nominal:** 1800
- **Enabled:** 52 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chip
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **L2:** 2 MB I+D on chip per core
- **L3:** 97.5 MB I+D on chip per chip
- **Other:** None
- **Memory:** 512 GB (8 x 64 GB 2Rx4 PC5-4800B-R)
- **Storage:** 125 GB on tmpfs
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-default
- **Compiler:** C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;
- **Parallel:** No
- **Firmware:** Version 0.3.2 released Nov-2022
- **File System:** tmpfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.

### Test Details

- **CPU2017 License:** 6573
- **Test Sponsor:** Dell Inc.
- **Tested by:** Dell Inc.
- **Hardware Availability:** Feb-2023
- **Software Availability:** Jun-2022
- **Test Date:** Dec-2022

### Results

<table>
<thead>
<tr>
<th>Spec Test</th>
<th>Base</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>502</td>
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<tr>
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<td>523</td>
<td>523</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>525</td>
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**SPEC CPU®2017 Integer Rate Result**

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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>
<th>Ratio</th>
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<tr>
<td>500.perlbench_r</td>
<td>104</td>
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<td>317</td>
<td>525</td>
<td>316</td>
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<td>505.mcf_r</td>
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<td>640</td>
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<td>523.xalancbmk_r</td>
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<tr>
<td>525.x264_r</td>
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<td>851</td>
<td>104</td>
<td>203</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
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<td>104</td>
<td>375</td>
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<tr>
<td>541.leea_r</td>
<td>104</td>
<td>586</td>
<td>294</td>
<td>587</td>
<td>293</td>
<td>104</td>
<td>586</td>
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<td>548.exchange2_r</td>
<td>104</td>
<td>377</td>
<td>723</td>
<td>376</td>
<td>724</td>
<td>104</td>
<td>377</td>
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<td>209</td>
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<td>104</td>
<td>538</td>
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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.xalanchmk_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), 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 = "/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/je5.0.1-32"

MALLOC_CONF = "retain:true"
SPEC CPU®2017 Integer Rate Result
Copyright 2017-2024 Standard Performance Evaluation Corporation

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PowerEdge R660 (Intel Xeon Platinum 8471N)

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CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

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

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.

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
- ADDDC Setting : Disabled
- DIMM Self Healing on
- Uncorrectable Memory Error : Disabled
- Virtualization Technology : Disabled
- Sub NUMA Cluster : 4-way Clustering
- DCU Streamer Prefetcher : Disabled
- LLC Prefetch : Disabled
- Dead Line LLC Alloc : Disabled
- Optimizer Mode : Enabled
- System Profile : Custom
- CPU Power Management : Maximum Performance
- CIE : Disabled
- C States : Autonomous
- Memory Patrol Scrub : Disabled
- Energy Efficiency Policy : Performance
- PCI ASPM L1 Link
- Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2022.1/bin/sysinfo
Rev: z6622 of 2021-04-07 982a61ec0915b55891ef0e16acac364d
running on localhost Wed Dec 14 12:28:15 2022

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) Platinum 8471N
- 1 "physical id"s (chips)
- 104 "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 : 52

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

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</table>

**SPECRate®2017_int_base = 413**

**SPECRate®2017_int_peak = 427**

---

### Platform Notes (Continued)

siblings : 104
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51

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):** 104
- **On-line CPU(s) list:** 0-103
- **Vendor ID:** GenuineIntel
- **Model name:** Intel(R) Xeon(R) Platinum 8471N
- **CPU family:** 6
- **Model:** 143
- **Thread(s) per core:** 2
- **Core(s) per socket:** 52
- **Socket(s):** 1
- **Stepping:** 1
- **BogoMIPS:** 3600.00
- **Flags:** fpu vme de pse mcr msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 as ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology
- **tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3 invpcid_single cdp_l2 scheck mba ibrs ibpb stibp ibrs enhanced fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha_nl avx512bw avx512vl xsaveopt xsaves xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mmwb_total cqm_mmm_local split_lock Detect avx_vnni avx512_br16 wbinvd dtherm ida arat pni pts avx512vbm lmpo pku ospke waitpkg avx512 vbmi2 gfni vae vpcmuid gqavx512 vnni avx512בהג tme avx512 vpocpcntdq la57 rpdp bus_lock_detect cldemote movdiri movdir64b enqcmd fasm md_clear serialize tsxtdtrk pconf reg arch_lbr avx512_fp16 flush_l1d arch_capabilities

- **L1d cache:** 2.4 MB (52 instances)
- **L1i cache:** 1.6 MB (52 instances)
- **L2 cache:** 104 MB (52 instances)
- **L3 cache:** 97.5 MB (1 instance)
- **NUMA node(s):** 4
- **NUMA node0 CPU(s):** 0-12,52-64
- **NUMA node1 CPU(s):** 13-25,65-77
- **NUMA node2 CPU(s):** 26-38,78-90
- **NUMA node3 CPU(s):** 39-51,91-103

**Vulnerability Itlb multihit:** Not affected
**Vulnerability L1ttf:** 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/swaps barriers and __user pointer sanitization
**Vulnerability Spectre v2:** Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
**Vulnerability Srbds:** Not affected
**Vulnerability Tmx async abort:** Not affected

---

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME ONE-SIZE ALL-SIZE WAYS TYPE</th>
<th>LEVEL</th>
<th>SETS PHY-LINE COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>2.4M 12 Data</td>
</tr>
<tr>
<td>L1i</td>
<td>1M</td>
<td>2.4M 2 Data</td>
</tr>
<tr>
<td>L2c</td>
<td>104M</td>
<td>2.4M 2 Data</td>
</tr>
<tr>
<td>L3c</td>
<td>97.5M</td>
<td>1.6M 1 Data</td>
</tr>
</tbody>
</table>

(Continued on next page)
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SPECrates:
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Platform Notes (Continued)

L1i 32K 1.6M 8 Instruction 1 64 1 64
L2 2M 104M 16 Unified 2 2048 1 64
L3 97.5M 97.5M 15 Unified 3 106496 1 64

/cacheinfo cache data
  cache size : 99840 KB

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 52 53 54 55 56 57 63 64
node 0 size: 128469 MB
node 0 free: 119507 MB
node 1 cpus: 13 14 15 16 17 18 19 20 21 22 23 24 25 65 66 67 68 69 70 71 72 73 74 75 76
node 1 size: 128982 MB
node 1 free: 128706 MB
node 2 cpus: 26 27 28 29 30 31 32 33 34 35 36 37 38 78 79 80 81 82 83 84 85 86 87 88 89
node 2 size: 129017 MB
node 2 free: 128745 MB
node 3 cpus: 39 40 41 42 43 44 45 46 47 48 49 50 51 91 92 93 94 95 96 97 98 99 100 101
node 3 size: 128988 MB
node 3 free: 128733 MB
node distances:
  node 0 1 2 3
  0:  10  12  12  12
  1:  12  10  12  12
  2:  12  12  10  12
  3:  12  12  12  10

From /proc/meminfo
  MemTotal: 527829692 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
  NAME="SLES"
  VERSION="15-SP4"
  VERSION_ID="15.4"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"
  CPE_NAME=cpe:/o:suse:sles:15:sp4"

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

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store
  Bypass disabled via prctl and

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

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Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1):
Mitigation: usercopy/swapgs barriers and __user pointer sanitization

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Not affected

CVE-2019-11135 (TSX Asynchronous Abort):
Not affected

run-level 3 Dec 14 12:21
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2022.1

Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  125G  3.6G  122G   3% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor:         Dell Inc.
Product:        PowerEdge R660
Product Family: PowerEdge
Serial:         SLR6603

Additional information from dmidecode 3.2 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:
8x 002C00B3002C MTC40F2046S1RC48BA1 64 GB 2 rank 4800

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 0.3.2
BIOS Date: 11/30/2022
BIOS Revision: 0.3

(End of data from sysinfo program)

Compiler Version Notes

-----------------------------------------------------------------------------------------------
C | 502.gcc_r(peak)
-----------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------------------------

-----------------------------------------------------------------------------------------------
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base, peak)
-----------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
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(Continued on next page)
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<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316 Copyright (C) 1985-2022 Intel Corporation. All rights reserved.</td>
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

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 -xCORE-AVX512 -O3 -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

C++ benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

Fortran benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte -auto`
- `-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin`
- `-lqkmalloc`

## Peak Compiler Invocation

C benchmarks:
- `icx`

C++ benchmarks:
- `icpx`

Fortran benchmarks:
- `ifx`

## Peak Portability Flags

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.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`

(Continued on next page)
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**Peak Portability Flags (Continued)**

557.xz_r: -DSPEC_LP64

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**Peak Optimization Flags**

**C benchmarks:**

500.perlbench_r -w -std=c11 -m64 -Wl, -z, muldefs -fprofile-generate(pass 1) -fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fno-strict-overflow -L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin -lqkmalloc


505.mcf_r: basepeak = yes

525.x264_r -w -std=c11 -m64 -Wl, -z, muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fno-alias -L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin -lqkmalloc

557.xz_r: basepeak = yes

**C++ benchmarks:**

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

**Fortran benchmarks:**

(Continued on next page)
Dell Inc.  
PowerEdge R660 (Intel Xeon Platinum 8471N)  

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<tr>
<th>SPECrate®2017_int_base</th>
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<tr>
<td>SPECrate®2017_int_peak</td>
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CPU2017 License: 6573  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: Dec-2022  
Hardware Availability: Feb-2023  
Software Availability: Jun-2022

**Peak Optimization Flags (Continued)**

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/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.html

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

http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.xml

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

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