# SPEC CPU® 2017 Integer Rate Result

Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4314, 2.40 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
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<tbody>
<tr>
<td>228</td>
<td>236</td>
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</table>

Dell Inc.  

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.

Software Availability: Apr-2021  
Test Date: May-2021

## CPU

### Hardware

- **CPU Name:** Intel Xeon Silver 4314  
- **Max MHz:** 3400  
- **Nominal:** 2400  
- **Enabled:** 32 cores, 2 chips, 2 threads/core  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 1.25 MB I+D on chip per core  
- **L3:** 24 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
- **Storage:** 125 GB on tmpfs  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)  
  4.18.0-240.el8.x86_64  
- **Compiler:** C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;  
  Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;  
  C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
- **Parallel:** No  
- **Firmware:** Version 1.1.3 released Apr-2021  
- **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.

## SPECrate®2017

![SPECrate®2017 Graph]

- `500.perlbench_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 155  
  - SPECrate®2017_int_peak: 180

- `502.gcc_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 190  
  - SPECrate®2017_int_peak: 218

- `505.mcf_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 150  
  - SPECrate®2017_int_peak: 377

- `520.omnetpp_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 284  
  - SPECrate®2017_int_peak: 461

- `523.xalancbmk_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 482  
  - SPECrate®2017_int_peak: 482

- `525.x264_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 377  
  - SPECrate®2017_int_peak: 463

- `531.deepsjeng_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 173  
  - SPECrate®2017_int_peak: 173

- `541.leela_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 170  
  - SPECrate®2017_int_peak: 170

- `548.exchange2_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 128  
  - SPECrate®2017_int_peak: 128

- `557.xz_r`  
  - Copies: 64  
  - SPECrate®2017_int_base: 0  
  - SPECrate®2017_int_peak: 0

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Standard Performance Evaluation Corporation (info@spec.org)  
https://www.spec.org/
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Results Table

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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/cpu2017-1.1.7-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/je5.0.1-32"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1

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)
**General Notes (Continued)**

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.

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

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

---

**Platform Notes**

BIOS Settings:
- Sub NUMA Cluster: 2-Way Clustering
- Virtualization Technology: Disabled

- System Profile: Custom
- CPU Power Management: Maximum Performance
  - C1E: Disabled
  - C States: Autonomous
  - Memory Patrol Scrub: Disabled
  - Energy Efficiency Policy: Performance
- CPU Interconnect Bus Link
  - Power Management: Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.7-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Wed May 19 05:03:34 2021

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 4314 CPU @ 2.40GHz 
  2 "physical id"s (chips) 
  64 "processors" 
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

(Continued on next page)
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SPECrate®2017_int_base = 228
SPECrate®2017_int_peak = 236

Platform Notes (Continued)

cpu cores : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4314 CPU @ 2.40GHz
Stepping: 6
CPU MHz: 3041.001
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 24576K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60
NUMA node1 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62
NUMA node2 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63
Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf 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 invpcid_single intel_pinn ssbd mba ibrs ibpb ibrs enhanced fs.gsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha_ha avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cmq_llc cmq_occup_llc cmq_mbb_total cmq_mbb_local split_lock_detect wbnoinvd dtgsm ida arat pln pts avx512vmbmi umip pku ospke avx512_vbmi2 gfnl vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
cache size : 24576 KB

(Continued on next page)
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Test Date: May-2021
Hardware Availability: Apr-2021
Software Availability: Dec-2020

Platform Notes (Continued)

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 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60
  node 0 size: 126310 MB
  node 0 free: 127904 MB
  node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
  node 1 size: 127312 MB
  node 1 free: 119688 MB
  node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
  node 2 size: 126890 MB
  node 2 free: 128802 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63
  node 3 size: 126943 MB
  node 3 free: 128835 MB
  node distances:
    node   0   1   2   3
    0:  10  11  20  20
    1:  11  10  20  20
    2:  20  20  10  11
    3:  20  20  11  10

From /proc/meminfo
  MemTotal:       527805516 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.3"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
  Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020

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

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**SPECrate®2017_int_base = 228**

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**Platform Notes (Continued)**

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 seccomp
- CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swaps 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 May 19 05:02

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.7-ic2021.1

- **Filesystem**
  - Type: tmpfs
  - Size: 125G
  - Used: 4.4G
  - Avail: 121G
  - Use%: 4%

From /sys/devices/virtual/dmi/id

- **Vendor:** Dell Inc.
- **Product:** PowerEdge C6520
- **Product Family:** PowerEdge

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:**
  - 6x 002C00B3002C 18ASF4G72PD2-3G2E1 32 GB 2 rank 3200, configured at 2666
  - 10x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666

- **BIOS:**
  - **Vendor:** Dell Inc.
  - **Version:** 1.1.3
  - **Date:** 04/27/2021
  - **Revision:** 1.1

(End of data from sysinfo program)
### Dell Inc.

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**Compiler Version Notes**

```
C       | 500.perlbench_r(peak)

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C       | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------------------------------------------------------
C       | 500.perlbench_r(base) 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 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------------------------------------------------------
C       | 500.perlbench_r(peak)

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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C       | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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| 525.x264_r(base, peak) 557.xz_r(base, peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
```

(Continued on next page)
### Compiler Version Notes (Continued)

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

```
C       | 500.perlbench_r(peak)
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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C       | 502.gcc_r(peak)
---------|---------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C       | 500.perlbench_r(base) 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 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
          | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
---------|----------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Fortran  | 548.exchange2_r(base, peak)
---------|----------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/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
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries

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<td>SPECrate®2017_int_peak = 236</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** May-2021  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2020

---

## Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`  
- `-lqkmalloc`

---

## Peak Compiler Invocation

C benchmarks (except as noted below):
- `icx`

500.perlbmk_r: `icc`

C++ benchmarks:
- `icpx`

Fortran benchmarks:
- `ifort`

---

## Peak Portability Flags

500.perlbmk_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`  
557.xz_r: `-DSPEC_LP64`

---

## Peak Optimization Flags

C benchmarks:
- `500.perlbmk_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)`  
- `xCORE-AVX512 -ipo -O3 -no-prec-div`  
- `qopt-mem-layout-trans=4 -fno-strict-overflow`  
- `mbranches-within-32B-boundaries`  
- `-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`  
- `-lqkmalloc`

(Continued on next page)
Peak Optimization Flags (Continued)

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/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:

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:

http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
## SPEC CPU®2017 Integer Rate Result

**Dell Inc.**  
PowerEdge C6520 (Intel Xeon Silver 4314, 2.40 GHz)

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<thead>
<tr>
<th>Speciation</th>
<th>Value</th>
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<td>228</td>
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<tr>
<td>SPECrate®2017_int_peak</td>
<td>236</td>
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</table>

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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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