### Dell Inc.

**PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)**

**SPECrates:**

- `SPECrates®2017_int_base` = 74.1
- `SPECrates®2017_int_peak` = 76.5

<table>
<thead>
<tr>
<th>SPEC CPU 2017 Integer Rate Result</th>
<th>Dell Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License:</td>
<td>55</td>
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<td>Test Sponsor:</td>
<td>Dell Inc.</td>
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<td>Tested by:</td>
<td>Dell Inc.</td>
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<td>Test Date:</td>
<td>May-2021</td>
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<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Feb-2021</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Silver 4310T
- **Max MHz:** 3400
- **Nominal:** 2300
- **Enabled:** 10 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chip
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **L2:** 1.25 MB I+D on chip per core
- **L3:** 15 MB I+D on chip per chip
- **Other:** None
- **Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
- **Storage:** 225 GB on tmpfs
- **Other:** None

#### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
  - 4.18.0-240.15.1.el8_3.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
- **Parallel:** No
- **Firmware:** Version 0.9.0 released May-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical 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.

#### SPEC CPU®2017 Integer Results

<table>
<thead>
<tr>
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<tr>
<td>SPECrate®2017_int_base = 74.1</td>
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**500.perlbench_r**

- SPECrate®2017_int_base = 49.1
- SPECrate®2017_int_peak = 57.4

**502.gcc_r**

- SPECrate®2017_int_base = 63.8
- SPECrate®2017_int_peak = 71.7

**505.mcf_r**

- SPECrate®2017_int_base = 52.5
- SPECrate®2017_int_peak = 125

**520.omnetpp_r**

- SPECrate®2017_int_base = 54.4
- SPECrate®2017_int_peak = 93.3

**523.xalancbmk_r**

- SPECrate®2017_int_base = 53.5
- SPECrate®2017_int_peak = 148

**525.x264_r**

- SPECrate®2017_int_base = 40.9
- SPECrate®2017_int_peak = 155

**531.deepsjeng_r**

- SPECrate®2017_int_base = 147
- SPECrate®2017_int_peak = 155

**541.leela_r**

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**548.exchange2_r**

- SPECrate®2017_int_base = 147
- SPECrate®2017_int_peak = 155

**557.xz_r**

- SPECrate®2017_int_base = 147
- SPECrate®2017_int_peak = 155

---

**CPU Name:** Intel Xeon Silver 4310T

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- Nominal: 2300
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- Orderable: 1 chip
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**Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)

**Storage:** 225 GB on tmpfs

**Other:** None

**OS:** Red Hat Enterprise Linux 8.3 (Ootpa)

- 4.18.0-240.15.1.el8_3.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 0.9.0 released May-2021

**File System:** tmpfs

**System State:** Run level 5 (graphical 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.
Dell Inc.

PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

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

SPECrate®2017_int_base = 74.1
SPECrate®2017_int_peak = 76.5

Results Table

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</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"

Environment Variables Notes

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

LD_LIBRARY_PATH = 
"/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/je5.0.1-32"
MALLOCC_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
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 numaclt i.e.:
Dell Inc. PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz) SPEC CPU®2017 Integer Rate Result

| SPECrate®2017_int_base = 74.1 |
| SPECrate®2017_int_peak = 76.5 |

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.
Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

General Notes (Continued)

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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Mon May 24 04:15:18 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 4310T CPU @ 2.30GHz
 1 "physical id"s (chips)
 20 "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 : 10
siblings : 20

(Continued on next page)
Dell Inc.

PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

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CPU2017 License: 55
Test Date: May-2021
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Platform Notes (Continued)

physical 0: cores 0 1 2 3 4 5 6 7 8 9

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 20
On-line CPU(s) list: 0-19
Thread(s) per core: 2
Core(s) per socket: 10
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
Stepping: 6
CPU MHz: 1062.619
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 15360K
NUMA node0 CPU(s): 0-19
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 arch_perfmon pebs bts rep_good nopl
  xtopology nonstop_tsc cpuid
  aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
  fma cx16
  xtr pdc 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_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase
  tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
  avx512dq rdseed adx smap avx512ifma
  clflushopt clwb intel_pt avx512cd sha_h ni avx512bw avx512vl xsaveopt
  xsaveopt xsave xgetbv1
  xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect
  wbnoinvd dtlsrm ida arat pln pts avx512vmbi umip pku ospke avx512_vmbi
  gfni vaes vpcmullq dq avx512_vnni avx512_bitalg tme avx512_vpopcntdq
  la57 rdpid md_clear pconfig flush_l1d
  arch_capabilities

/proc/cpuinfo cache data
  cache size: 15360 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 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
  node 0 size: 499671 MB

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

Dell Inc.
PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

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CPU2017 License: 55
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Platform Notes (Continued)

node 0 free: 498382 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 527818112 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="rhe1"
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 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST
2021 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/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

(Continued on next page)
**Dell Inc.**

PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

**SPEC CPU®2017 Integer Rate Result**

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** May-2021  
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**Platform Notes (Continued)**

**run-level 5** May 24 04:05

**SPEC is set to:** /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 7.0G 219G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id

Vendor: Dell Inc.  
Product: PowerEdge XR12

Memory:
4x 002C069D002C 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200, configured at 2666
4x 00AD063200AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 0.9.0
BIOS Date: 05/10/2021
BIOS Revision: 0.9

(End of data from sysinfo program)

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**Compiler Version Notes**

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**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

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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

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### Compiler Version Notes (Continued)

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Dell Inc. PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz) SPECrate®2017_int_base = 74.1
SPECrate®2017_int_peak = 76.5

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**Compiler Version Notes (Continued)**

```
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.xalanchmk_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.
```

**Base Compiler Invocation**

- C benchmarks: icx
- C++ benchmarks: icpx
- Fortran benchmarks: ifort
SPEC CPU®2017 Integer Rate Result

Dell Inc.
PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

| CPU2017 License: 55 | SPECRate®2017_int_base = 74.1 |
| Test Sponsor: Dell Inc. | SPECRate®2017_int_peak = 76.5 |
| Tested by: Dell Inc. | |

| Test Date: May-2021 | Hardware Availability: Jul-2021 |
| Software Availability: Feb-2021 | |

**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.leea_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`
- `-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.perlbench_r: icc`

(Continued on next page)
Dell Inc.
PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)

| SPECrate®2017_int_base = 74.1 |
| SPECrate®2017_int_peak = 76.5 |

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

Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Peak Compiler Invocation (Continued)

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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
557.xz_r:  -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_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

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generatedefault.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

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# SPEC CPU®2017 Integer Rate Result

**Dell Inc.**

PowerEdge XR12 (Intel Xeon Silver 4310T, 2.30 GHz)  

### SPECrate®2017_2017_int_base = 74.1  
SPECrate®2017_2017_int_peak = 76.5

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## Peak Optimization Flags (Continued)

- 525.x264_r (continued):
  - -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:


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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 v1.1.5 on 2021-05-24 05:15:17-0400.  
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