# SPECaccel®2023 Result

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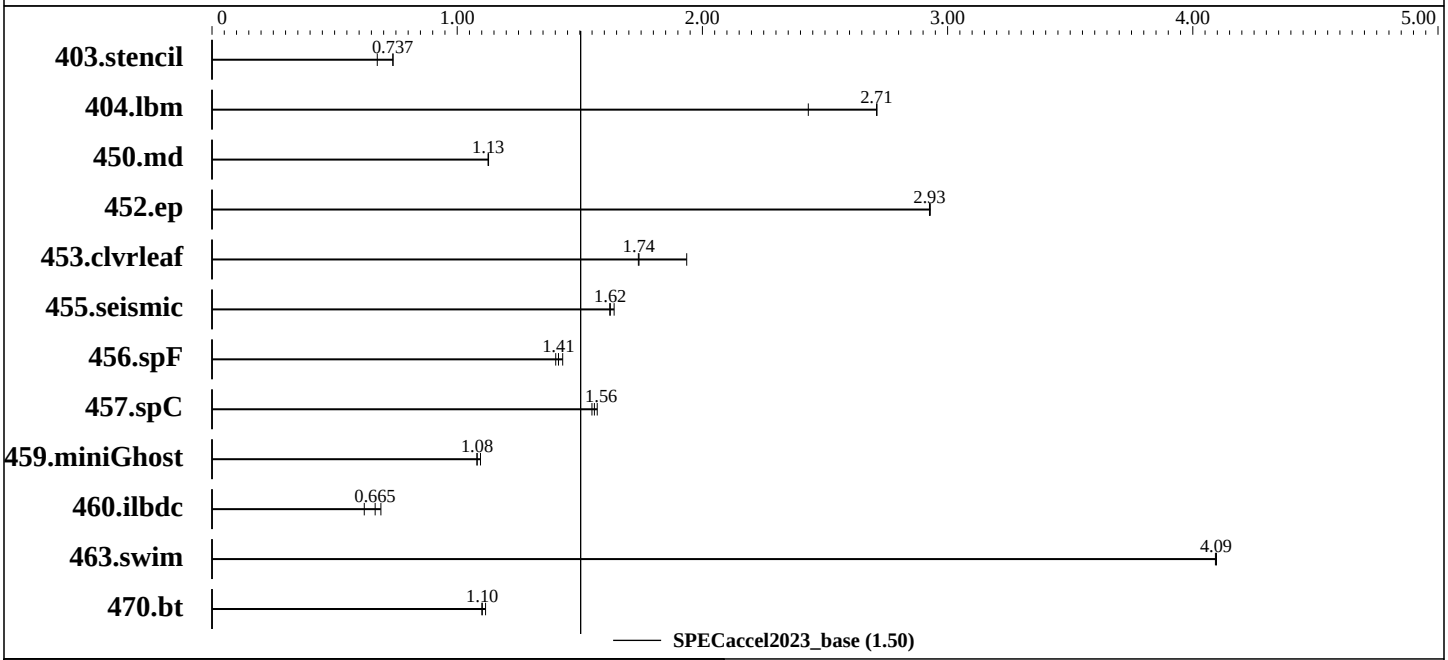
## Cisco Systems
## AMD EPYC 9684X
## Cisco UCS C245 M8

SPECaccel 2023_base = 1.50

SPECaccel 2023_peak = Not Run

**accel2023 License:** 9019
**Test Sponsor:** Cisco Systems
**Tested by:** Cisco Systems

**Test Date:** May-2024
**Hardware Availability:** Jun-2024
**Software Availability:** Feb-2024




### Hardware

| | |
|---|---|
| CPU Name: | AMD EPYC 9684X |
| Max MHz.: | 3700 |
| Nominal: | 2550 |
| Enabled: | 192 cores, 2 chips, 2 threads/core |
| Orderable: | 1,2 chips |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| L2: | 1 MB I+D on chip per core |
| L3: | 1152 MB I+D on chip per chip, 96 MB shared / 8 cores |
| Other: | None |
| Memory: | 1536 GB (24 x 64 GB 2Rx4 PC5-5600B-R, running at 4800 MHz) |
| Storage: | 1 x 1.6 TB NVMe SSD |
| Other: | None |
| Base Threads Run: | 384 |
| Min. Peak Threads: | -- |
| Max. Peak Threads: | -- |

### Accelerator

| | |
|---|---|
| Accel Model Name: | AMD EPYC 9684X |
| Accel Vendor: | AMD |
| Accel Name: | AMD EPYC 9684X |
| Type of Accel: | CPU |
| Accel Connection: | N/A |
| Does Accel Use ECC: | Yes |
| Accel Description: | 2 x AMD EPYC 9684X |
| Accel Driver: | N/A |

### Software

| | |
|---|---|
| OS: | Red Hat Enterprise Linux release 9.2 (Plow) 5.14.0-284.11.1.el9_2.x86_64 |
| Compiler: | Intel oneAPI DPC++/C++ Compiler, Version 2024.0.2 |
| Firmware: | Version C245M8.4.3.4.225.0319240301 released Mar-2024 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Other: | None |

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### Software (Continued)

Base Parallel Model: SMD
Base Threads Run: 384
Peak Parallel Models: Not Run
Max. Peak Threads: --
Min. Peak Threads: --

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Model | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 403.stencil | SMD | 653 | 0.674 | 596 | 0.739 | **597** | **0.737** | | | | | | | |
| 404.lbm | SMD | 187 | 2.43 | 168 | 2.71 | **168** | **2.71** | | | | | | | |
| 450.md | SMD | 532 | 1.13 | **532** | **1.13** | 533 | 1.13 | | | | | | | |
| 452.ep | SMD | 142 | 2.93 | **142** | **2.93** | 142 | 2.93 | | | | | | | |
| 453.clvrleaf | SMD | 517 | 1.94 | 575 | 1.74 | **574** | **1.74** | | | | | | | |
| 455.seismic | SMD | 476 | 1.64 | 481 | 1.62 | **480** | **1.62** | | | | | | | |
| 456.spF | SMD | **336** | **1.41** | 339 | 1.40 | 332 | 1.43 | | | | | | | |
| 457.spC | SMD | **346** | **1.56** | 348 | 1.55 | 344 | 1.57 | | | | | | | |
| 459.miniGhost | SMD | 539 | 1.09 | **546** | **1.08** | 546 | 1.08 | | | | | | | |
| 460.ilbdc | SMD | **834** | **0.665** | 806 | 0.689 | 894 | 0.621 | | | | | | | |
| 463.swim | SMD | **107** | **4.09** | 107 | 4.10 | 108 | 4.09 | | | | | | | |
| 470.bt | SMD | 946 | 1.12 | **957** | **1.10** | 959 | 1.10 | | | | | | | |

**SPEC accel2023_base = 1.50**

**SPEC accel2023_peak = Not Run**

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

## Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
```

## General Notes

```
Environment variables set by runaccel before the start of the run:
FORT_BUFFERED = "true"
KMP_AFFINITY = "compact,0,granularity=thread"
KMP_BLOCKTIME = "infinite"
KMP_HW_SUBSET = "2S,96C,2T"
KMP_LIBRARY = "turnaround"
KMP_STACKSIZE = "128M"
OMP_DYNAMIC = "FALSE"
OMP_WAIT_POLICY = "active"
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, the CVE-2017-5753 (Spectre variant 1)
is mitigated in the system as tested and documented.
```

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## 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.

## Platform Notes

```
Sysinfo program /home/specaccel/bin/sysinfo
Rev: r6622 of 2021-04-07 b1a7d5f8f71be5aff70a755cad7211a0
running on rhel92nvme Thu May  9 18:53:37 2024

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 : AMD EPYC 9684X 96-Core Processor
      2  "physical id"s (chips)
      384 "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 : 96
      siblings  : 192
      physical 0: cores 0 1 2 3 4 5 6 7 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 52 53
      54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81
      82 83 84 85 86 87 88 89 90 91 92 93 94 95
      physical 1: cores 0 1 2 3 4 5 6 7 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 52 53
      54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81
      82 83 84 85 86 87 88 89 90 91 92 93 94 95

From lscpu from util-linux 2.37.4:
     Architecture:                    x86_64
     CPU op-mode(s):                  32-bit, 64-bit
     Address sizes:                   52 bits physical, 57 bits virtual
     Byte Order:                      Little Endian
     CPU(s):                          384
     On-line CPU(s) list:             0-383
     Vendor ID:                       AuthenticAMD
     BIOS Vendor ID:                  Advanced Micro Devices, Inc.
     Model name:                      AMD EPYC 9684X 96-Core Processor
     BIOS Model name:                 AMD EPYC 9684X 96-Core Processor
     CPU family:                      25
     Model:                           17
     Thread(s) per core:              2
     Core(s) per socket:              96
```

**(Continued on next page)**

## Platform Notes (Continued)

```
      Socket(s):                          2
      Stepping:                           2
      Frequency boost:                    enabled
      CPU max MHz:                        3715.4290
      CPU min MHz:                        1500.0000
      BogoMIPS:                           5092.25
      Flags:                              fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
      pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
      pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
      aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
      popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
      misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
      bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba
      perfmon_v2 ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm
      rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni
      avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
      cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat
      npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
      pausefilter pfthreshold avic v_vmsave_vmload vgif x2avic v_spec_ctrl avx512vbmi umip
      pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
      avx512_vpopcntdq la57 rdpid overflow_recov succor smca fsrm flush_l1d
      Virtualization:                     AMD-V
      L1d cache:                          6 MiB (192 instances)
      L1i cache:                          6 MiB (192 instances)
      L2 cache:                           192 MiB (192 instances)
      L3 cache:                           2.3 GiB (24 instances)
      NUMA node(s):                       2
      NUMA node0 CPU(s):                  0-95,192-287
      NUMA node1 CPU(s):                  96-191,288-383
      Vulnerability Itlb multihit:        Not affected
      Vulnerability L1tf:                 Not affected
      Vulnerability Mds:                  Not affected
      Vulnerability Meltdown:             Not affected
      Vulnerability Mmio stale data:      Not affected
      Vulnerability Retbleed:             Not affected
      Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
      prctl
      Vulnerability Spectre v1:           Mitigation; usercopy/swapgs barriers and __user
      pointer sanitization
      Vulnerability Spectre v2:          Mitigation; Retpolines, IBPB conditional, IBRS_FW,
      STIBP always-on, RSB filling, PBRSB-eIBRS Not affected
      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       32K       6M    8 Data            1    64        1             64
```

**(Continued on next page)**

## Platform Notes (Continued)

```
      L1i       32K       6M    8 Instruction     1    64        1              64
      L2         1M     192M    8 Unified         2  2048        1              64
      L3        96M     2.3G   16 Unified         3 98304        1              64

 /proc/cpuinfo cache data
    cache size : 1024 KB

 From numactl --hardware
 WARNING: a numactl 'node' might or might not correspond to a physical chip.
   available: 2 nodes (0-1)
   node 0 cpus: 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 52 53 54 55 56
   57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85
   86 87 88 89 90 91 92 93 94 95 192 193 194 195 196 197 198 199 200 201 202 203 204 205
   206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227
   228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249
   250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271
   272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287
   node 0 size: 773695 MB
   node 0 free: 770093 MB
   node 1 cpus: 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114
   115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136
   137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158
   159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
   181 182 183 184 185 186 187 188 189 190 191 288 289 290 291 292 293 294 295 296 297 298
   299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320
   321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342
   343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364
   365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383
   node 1 size: 774031 MB
   node 1 free: 770341 MB
   node distances:
   node   0   1
     0:  10  32
     1:  32  10

 From /proc/meminfo
    MemTotal:       1584872276 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

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

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance
```

**(Continued on next page)**

## Platform Notes (Continued)

```
From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="9.2 (Plow)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="9.2"
      PLATFORM_ID="platform:el9"
      PRETTY_NAME="Red Hat Enterprise Linux 9.2 (Plow)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 9.2 (Plow)
   system-release: Red Hat Enterprise Linux release 9.2 (Plow)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:9::baseos

uname -a:
   Linux rhel92nvme 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12
   10:45:03 EDT 2023 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
mmio_stale_data:                                         Not affected
retbleed:                                                Not affected
CVE-2018-3639 (Speculative Store Bypass):                Mitigation: Speculative Store
                                                         Bypass disabled via prctl
CVE-2017-5753 (Spectre variant 1):                       Mitigation: usercopy/swapgs
                                                         barriers and __user pointer
                                                         sanitization
CVE-2017-5715 (Spectre variant 2):                       Mitigation: Retpolines, IBPB:
                                                         conditional, IBRS_FW, STIBP:
                                                         always-on, RSB filling,
                                                         PBRSB-eIBRS: Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):                 Not affected

run-level 3 May 9 18:53 last=5

SPEC is set to: /home/specaccel
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/nvme1n1p25 xfs   1.3T  961G  291G  77% /home

From /sys/devices/virtual/dmi/id
    Vendor:         Cisco Systems Inc
    Product:        UCSC-C245-M8SX
```

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## Platform Notes (Continued)

```
     Serial:         WZP2733019E

  Additional information from dmidecode 3.3 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:
      24x 0xCE00 M321R8GA0PB0-CWMCH 64 GB 2 rank 5600, configured at 4800

  BIOS:
     BIOS Vendor:       Cisco Systems, Inc.
     BIOS Version:      C245M8.4.3.4.225.0319240301
     BIOS Date:         03/19/2024
     BIOS Revision:     5.27

  (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C           | 403.stencil(base) 404.lbm(base) 452.ep(base) 457.spC(base)
            | 470.bt(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler 2024.1.0 (2024.1.0.20240308)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /home/intel_tools/compiler/compiler/2024.1/bin/compiler
Configuration file:
  /home/intel_tools/compiler/compiler/2024.1/bin/compiler/../icx.cfg
------------------------------------------------------------------------------

==============================================================================
Fortran     | 450.md(base) 455.seismic(base) 456.spF(base) 460.ilbdc(base)
            | 463.swim(base)
------------------------------------------------------------------------------
ifx (IFX) 2024.1.0 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran, C  | 453.clvrleaf(base) 459.miniGhost(base)
------------------------------------------------------------------------------
ifx (IFX) 2024.1.0 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler 2024.1.0 (2024.1.0.20240308)
Target: x86_64-unknown-linux-gnu
```

**(Continued on next page)**

## Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir: /home/intel_tools/compiler/compiler/2024.1/bin/compiler
Configuration file:
  /home/intel_tools/compiler/compiler/2024.1/bin/compiler/../icx.cfg
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
icx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

## Base Portability Flags

450.md: -80
457.spC: -Wl,--no-relax(icx)(*) -shared-intel -Wl,--no-relax(icx)
459.miniGhost: -nofor-main

(*) Indicates a portability flag that was found in a non-portability variable.

## Base Optimization Flags

C benchmarks:

403.stencil: -qopenmp -Ofast -O3 -march=common-avx512
-mprefer-vector-width=512
-qopt-multiple-gather-scatter-by-shuffles -flto -ffast-math
-qopt-dynamic-align -fvec-peel-loops
-qopt-streaming-stores always -Xclang
-fopenmp-declare-target-scalar-defaultmap-firstprivate
-fimf-precision=low

404.lbm: Same as 403.stencil

452.ep: Same as 403.stencil

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## Base Optimization Flags (Continued)

457.spC: `-qopenmp -Ofast -O3 -march=common-avx512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -flto -ffast-math -qopt-dynamic-align -fvec-peel-loops -qopt-streaming-stores always -Xclang -fopenmp-declare-target-scalar-defaultmap-firstprivate -fimf-precision=low -mcmodel=medium`(*)

470.bt: `Same as 403.stencil`

Fortran benchmarks:
`-qopenmp -Ofast -O3 -march=common-avx512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -flto -ffast-math -qopt-dynamic-align -fvec-peel-loops -qopt-streaming-stores always -nostandard-realloc-lhs -align array32byte -auto -fimf-accuracy-bits-sqrt=14 -fimf-precision=low`

Benchmarks using both Fortran and C:
`-qopenmp -Ofast -O3 -march=common-avx512 -mprefer-vector-width=512 -qopt-multiple-gather-scatter-by-shuffles -flto -ffast-math -qopt-dynamic-align -fvec-peel-loops -qopt-streaming-stores always -Xclang -fopenmp-declare-target-scalar-defaultmap-firstprivate -fimf-precision=low -nostandard-realloc-lhs -align array32byte -auto -fimf-accuracy-bits-sqrt=14`

(*) Indicates an optimization flag that was found in a portability variable.

The flags file that was used to format this result can be browsed at
`http://www.spec.org/accel2023/flags/Intel_compiler_flags_accel.2024.html`

You can also download the XML flags source by saving the following link:
`http://www.spec.org/accel2023/flags/Intel_compiler_flags_accel.2024.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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