

# SPEC — Spotlight on the International Standards Group (ISG)\*

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## ABSTRACT

The driving philosophy for the Standard Performance Evaluation Corporation (SPEC) is to ensure that the marketplace has a fair and useful set of metrics to differentiate systems, by providing standardized benchmark suites and international standards. This poster-paper gives an overview of SPEC with a focus on the newly founded International Standards Group (ISG).

## CCS CONCEPTS

• **General and reference** → **Computing standards, RFCs and guidelines; Metrics**; • **Hardware** → **Enterprise level and data centers power issues; Power and energy**; • **Software and its engineering** → **Software development techniques**.

## KEYWORDS

SPEC, SERT, Rating Tool, Benchmark, Energy Efficiency, Power, Server, Storage, Datacenter, EPA, International Standards

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## 1 IN A NUTSHELL

SPEC [4] was formed from the instigation and sponsorship of Electronic Engineering Times (E.E. Times) and by the cooperative development work of Hewlett-Packard Corp., Sun Microsystems Inc., Apollo Computer Inc., and MIPS Computer Systems Inc. Their effort to develop a benchmark standardizing activity was converted into a non-profit corporation of the state of California, on November 14, 1988. Its mission is to ensure the marketplace has a fair and useful set of metrics to differentiate the newest generation platforms, ranging from symmetric multiprocessing (SMP) and Non-Uniform

Memory Architecture (NUMA) to clustered multiprocessing server systems.

SPEC has grown to become one of the most successful performance standardization bodies. SPEC's community has developed more than 30 industry-standard benchmarks for system performance evaluation, in a variety of application areas and provided thousands of benchmark licenses globally. SPEC publishes several hundred different performance results each quarter, spanning a variety of system performance disciplines. Lately, SPEC expanded its objectives to collaborate with national and international organizations to design and improve benchmarking standards worldwide in a new group.

SPEC peer reviews all submitted results and allows publication of benchmark results only if the results are found to be in compliance with run rules. Members closely monitor the public usage of SPEC results to ensure its accordance with SPEC's General Availability and Fair Use rules.

The SPEC membership is open to any interested company or entity and currently includes computer hardware and software companies, educational institutions, and government agencies.

## 2 ORGANIZATION AND OVERVIEW

The Corporation is comprised of a Board of Directors (BoD), officers, president, and a staff (SPEC Headquarters) to carry out the business of SPEC. The BoD has established several SPEC Board Committees to handle specific tasks and supports several benchmark development groups under SPEC's umbrella. Each of the groups can support subcommittees, working groups, or project groups on its own. SPEC has established five of those groups: the Open Systems Group (OSG), the High Performance Group (HPG), the Graphics and Workstation Performance Group (GPWG), the Research Group (RG) [1], and most recently the International Standards Group (ISG) [3]. These groups cover the major areas of desktop, workstation, handheld devices, server benchmarking and performance evaluation, and standardization.

*Open System Group.* The OSG is organized into several committees and working groups focusing on the development of component- and system-level benchmarks for desktop, workstations, handheld devices, and servers running open operating system environments (e.g., SPEC Cloud IaaS 2018, SPEC CPU 2017, SPECjEnterprise 2018 Web Profile, SPECjbb 2015, SPECstorage Solution 2020, SPECpower\_ssj 2008, SPEC virt\_sc 2013).

\*Poster-Paper

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*High Performance Group.* The HPG develops benchmarks representing large, real applications in scientific and technical computing, supporting industry-standard parallel APIs, OpenMP, and MPI. HPG benchmarks are designed to run on several data sets sizes (from a few minutes to days of execution time).

*Graphics and Workstation Performance Group.* The GWPG has two Project Groups for developing consistent, repeatable graphics and workstation performance benchmarks that reflect user experiences with popular applications. The Application Performance Characterization (SPECcapc) and the Graphics Performance Characterization (SPECgpc) were formed to provide a broad set of standardized benchmarks for graphics and workstation applications, as well as graphics systems running under OpenGL and other APIs.

*Research Group.* The RG has been established to serve as a platform for collaborative research efforts in the area of quantitative system evaluation and analysis, fostering the interaction between industry and academia in the field. The group's scope includes computer benchmarking, performance evaluation, and experimental system analysis considering both classical performance metrics and other non-functional system properties. A significant milestone in the collaboration recently has been published in an educational book spanning the most critical benchmarking topics [2].

*International Standards Group.* The ISG is the newest group within SPEC. It was founded in November 2020 to oversee the establishment of standardized benchmarks primarily developed for use in government regulations and programs. Additionally, the ISG collaborates with national and international standard development organizations to enhance global standards through trusted advisors. Their goals are to foster collaboration, development, and contribution to national and international standards. Among others, the ISG already collaborates, or plans to collaborate with:

- China National Institute for Standardization (CNIS)
- European Commission (EU)
- Japan Electronics and Information Technology Industry Association (JEITA)
- United States Environmental Protection Agency (EPA)
- South Korean Ministry of Knowledge Economy (MKE)
- ISO/IEC JTC 1 Information Technology
- The Green Grid (TGG)
- Storage Networking Industry Association (SNIA)
- MLCommons Association (MLperf Power WG)
- Transaction Performance Council (TPC)

The ISG creating members already have achieved the standardization of the server energy effectiveness metric (SEEM) with the release of ISO/IEC 21836:2020<sup>1</sup> in August 2020. They also are contributing to additional standards and the ISG is now responsible for the future development of the Server Efficiency Rating Tool (SERT) suite and metric that already has been adopted by the U.S. EPA with Version 3.0 of the Server Energy Star program<sup>2</sup>, the EU with commission regulation 2019/424<sup>3</sup>, and the Japanese Ministry of Economy, Trade and Industry<sup>4</sup>.

<sup>1</sup><https://www.iso.org/standard/71926.html>

<sup>2</sup><https://www.spec.org/sert/EPA-adopts-SERT-2.0.1-press-release.html>

<sup>3</sup><https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0424>

<sup>4</sup>[https://www.meti.go.jp/english/press/2019/0329\\_009.html](https://www.meti.go.jp/english/press/2019/0329_009.html)

### 3 BENCHMARK DEVELOPMENT

The benchmark development is driven by the interest of the members who provide engineering resources to design and implement a new benchmark or workload. There are formal and informal processes in each SPEC group by which consensus is built and tasks are distributed. In general, one or more members request establishing a working group to investigate the new area of interest. This working group will create a specific proposal, and after approval, a subcommittee or project group tackles implementation. When the benchmark is complete, it begins a general membership review. The release materials are polished, and members run benchmarks for the first round of submissions, which are generally concurrent with the final release. The BoD approves product pricing and any related releases. Once released, the benchmark will be maintained and enter regular submission, review, and publication cycle.

### 4 RESULT PUBLICATION

SPEC publishes a large set of benchmark results online. Measurements most often are performed and submitted to SPEC by hardware and software vendors testing their own system although, non-vendors publish results as well. Prior to publication, the results undergo peer review. During this review, the full disclosure report (FDR) is examined by members of the benchmark committee, including competitors of the submitting vendors. Questions to any aspect of run-rule compliance may be raised and answered before the result is accepted for publication. Additionally, FDRs document all the configuration details and tuning parameters required for an independent party to duplicate the result on the same system.

### 5 CONCLUSION

Two significant advantages of SPEC development methods are low cost and open review. Cost is lowered by shared development, common test methodology, and applicability to a range of platforms from single processor systems to clusters. Confidence in results is increased by public availability of the benchmark code, drivers, and detailed run and reporting rules, peer review, and ability of independent third parties to reproduce test results. Further advantages are the future participation in national and international standardization to achieve a fair and level playing field for all involved.

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