

**spec**<sup>®</sup>

**SPEC 2016亚洲峰会**  
**SPEC 2016 ASIA SUMMIT**

# **Standard Performance Evaluation Corporation**

**Steve Realmuto**

**SPEC Open Systems Group (OSG) Chair**

# About SPEC



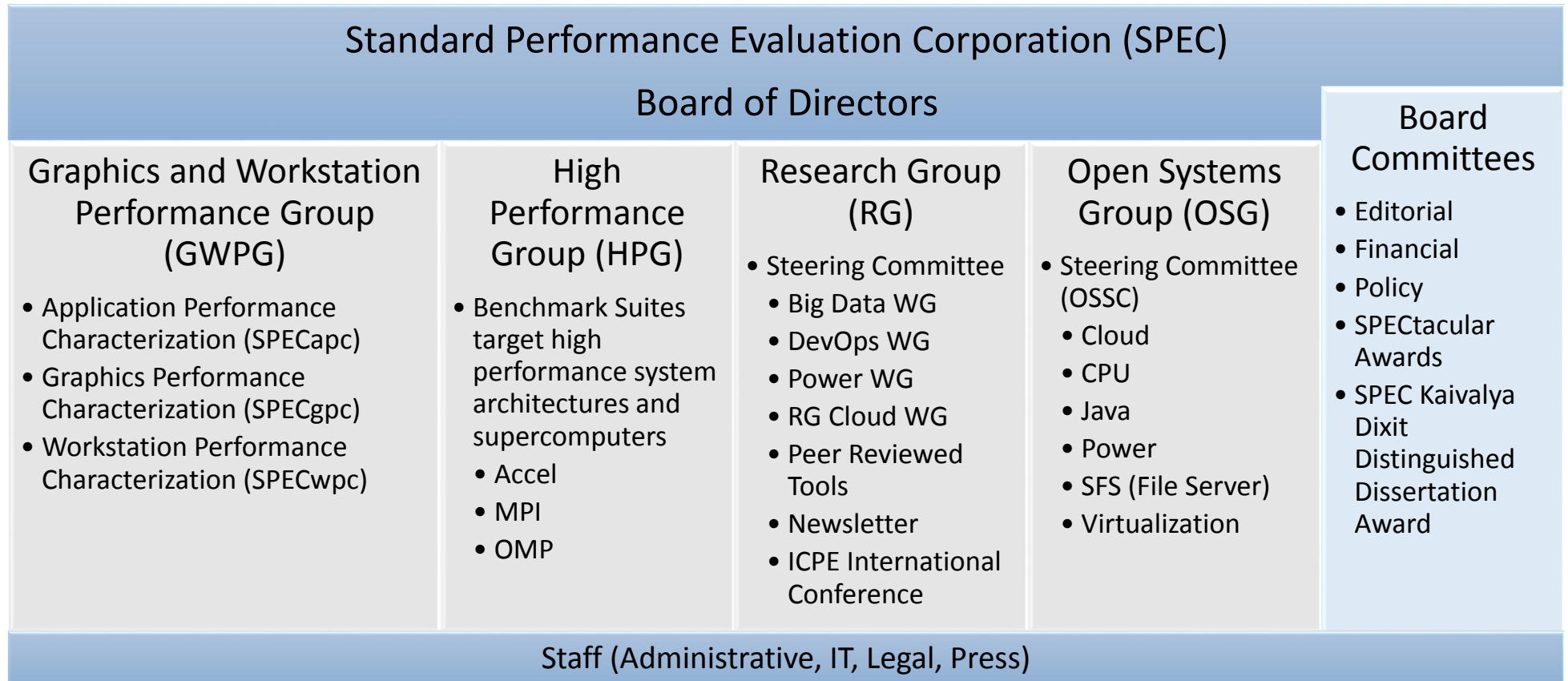
A non-profit consortium formed in 1988 to establish, maintain and endorse a standardized set of relevant benchmarks for high performance computer systems

- Develop benchmarks and tools to ensure that the marketplace has a fair and useful set of metrics to differentiate computer systems (20+)
- Review and publish results into a large public repository of well documented, peer reviewed, benchmark results (40,000+ results)
- SPEC membership is open to any interested company or entity that commits to supporting SPEC's goals (120+ members and associates)

# SPEC Organizationally



SPEC has matured to become an international organization with a broad scope encompassing four distinct groups, each with their own unique focus, and membership.

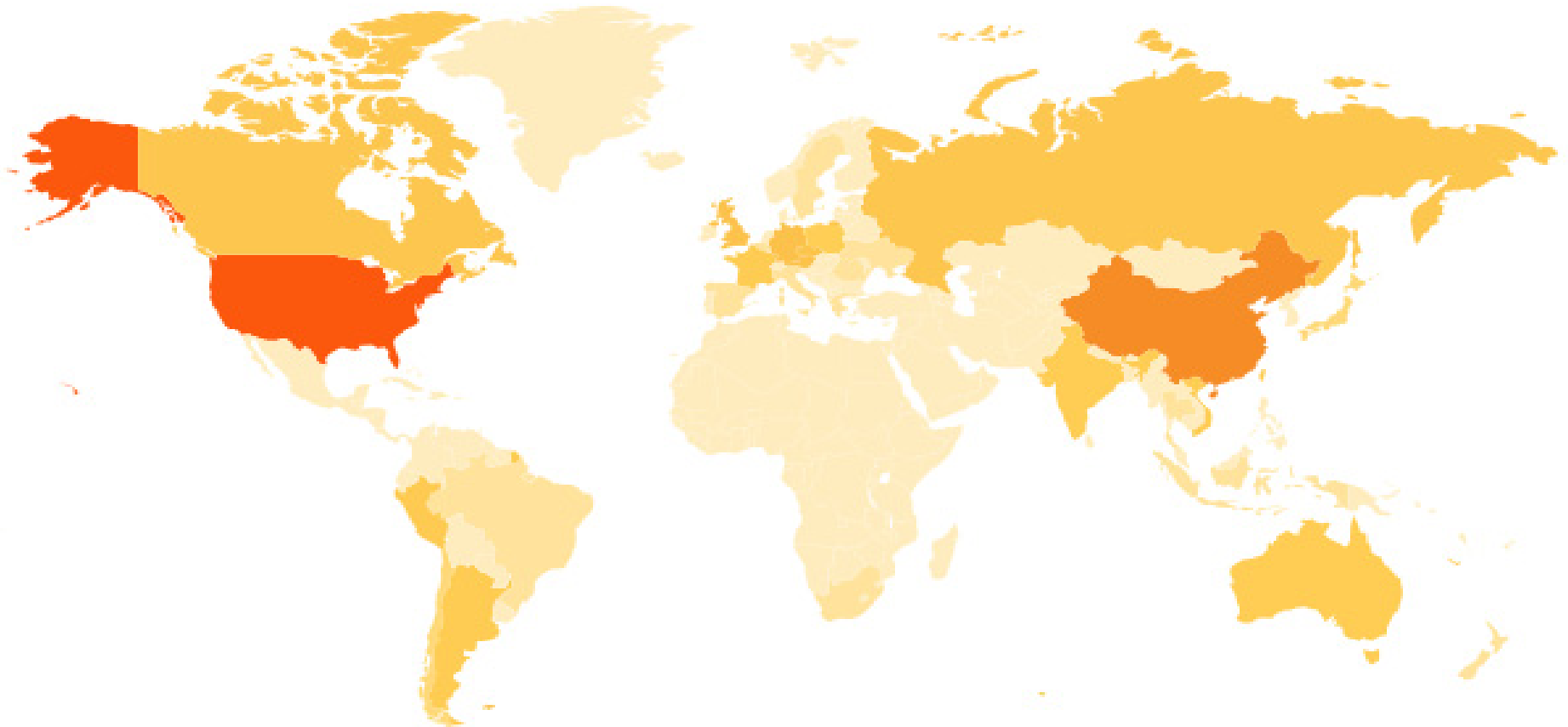


# SPEC Internationally



SPEC fosters collaboration across the globe, with over 120 commercial companies, educational institutions, and government agencies participating.

China accounts for ~25% of global media coverage.



# SPEC Members and Associates



## Members

Acer Inc. \* Action S.A. \* Advanced Micro Devices \* Amazon Web Services, Inc. \* Apple Inc. \* ARM \* Avere Systems \* Bull SAS \* Cavium Inc. \* Ciara Technologies Inc. \* Cisco Systems, Inc. \* Dell, Inc. \* Digital Ocean \* E4 Computer Engineering SPA \* Fujitsu \* Gartner, Inc. \* Google, Inc.\* Hangzhou H3C Technologies Co. \* Hitachi Data Systems \* Hitachi \* Hewlett Packard Enterprise \* HP Inc. \* Huawei Technologies Co. \* IBM \* Inspur Corporation \* Intel \* Lenovo \* M Computers \* Microsoft \* NEC - Japan \* NetApp \* NVIDIA \* Oracle \* OVH SAS \* Primary Data \* Principled Technologies \* Pure Storage \* Qualcomm Technologies Inc. \* Quanta Computer Inc. \* Red Hat \* Samsung \* SAP AG \* Seagate \* SGI \* Sugon \* Super Micro Computer, Inc. \* SUSE \* Symantec Corporation \* Taobao (Alibaba) \* Unisys \* Via Technologies \* VMware \*

## Associates

Academia Sinica, Institute of Information Science \* Argonne National Laboratory \* Charles University \* China Academy of Telecommunication Research \* Dresden University of Technology ZIH \* fortiss GmbH \* Helmholtz-Zentrum Dresden Rossendorf (HZDR) \* Indiana University \* JAIST \* Karlsruhe Institute of Technology \* Leibniz Rechenzentrum - Germany \* National University of Singapore \* Oak Ridge National Laboratory \* Ohio State University \* Pennsylvania State University \* Purdue University \* RWTH Aachen University \* Technische Universität Darmstadt \* Technische Universität Dresden \* Tsinghua University \* University of Aizu - Japan \* University of California - Berkeley \* University of Cologne \* University of Delaware \* University of Illinois at Urbana-Champaign \* University of Maryland \* University of Miami \* University of Texas at Austin \* University of Tsukuba \* University of Wuerzburg \* Virginia Polytechnic Institute and State University \*

## Research Group

Advanced Strategic Technology LLC \* ARM \* bankmark UG \* Barcelona Supercomputing Center\* BEZNet \* Charles University \* Cisco Systems \* Cloudera, Inc \* Compilaflows \* Delft University of Technology \* Dell \* fortiss GmbH \* Friedrich-Alexander-University Erlangen-Nuremberg \* Goethe University Frankfurt, Big Data Lab \* Hewlett Packard Enterprise \* Huawei \* IBM \* Imperial College London \* Institute for Information Industry, Taiwan \* Intel \* Karlsruhe Institute of Technology \* Kiel University \* Lund University \* Microsoft \* NICTA \* NovaTec Consulting GmbH \* Oracle \* Purdue University \* Queen's University \* Red Hat \* RWTH Aachen University \* Salesforce.com \* San Diego Supercomputing Center \* San Francisco State University \* SAP AG \* SINTEF \* Software Performance and Scalability Consulting \* Tata Consultancy Services \* Technica Corporation \* Technische Universität Darmstadt \* Technische Universität Dresden \* The MITRE Corporation \* Umea University \* University of Alberta \* University of Coimbra \* University of Lugano \* University of Minnesota \* University of North Florida \* University of Paderborn \* University of Stuttgart \* University of Texas at Austin \* University of Wuerzburg \* VMware \* York University \*



# Graphics and Workstation Performance Group (GWPG)



**GWPG** benchmarks measure the performance of professional-level workstations and graphics subsystems

<https://www.spec.org/gwpg/>

The Graphics Performance Characterization (**SPECgpc**) group establishes graphics performance benchmarks for systems running under OpenGL and other application programming interfaces (APIs).

The group's SPECviewperf benchmark is the most popular standardized software worldwide for evaluating performance based on professional-level CAD/CAM, digital content creation, and visualization applications.

<http://www.spec.org/gwpg/gpc.static/overview.html>

The Application Performance Characterization (**SPECapc**) group provides a broad-ranging set of standardized benchmarks spanning popular CAD/CAM, digital content creation, and visualization applications.

[http://www.spec.org/gwpg/apc.static/apc\\_overview.html](http://www.spec.org/gwpg/apc.static/apc_overview.html)

The Workstation Performance Characterization (**SPECwpc**) group has created a benchmark that measures the performance of workstations running algorithms used in popular professional applications, but without requiring the full application and associated licensing to be installed on the system under test.

[http://www.spec.org/gwpg/wpc.static/wpc\\_overview.html](http://www.spec.org/gwpg/wpc.static/wpc_overview.html)

# High-Performance Group (HPG)



**HPG** benchmarks target high performance system architectures, such as symmetric multiprocessor systems, workstation clusters, distributed memory parallel systems, and traditional vector and vector parallel supercomputers.

<https://www.spec.org/hpg/>

## HPG Benchmark Suites

- **SPEC ACCEL** focuses on the performance of highly parallel compute intensive applications using hardware acceleration using the OpenCL and OpenACC standards.
- **SPEC MPI** is SPEC's benchmark suite for measuring performance of compute intensive applications using the Message-Passing Interface (MPI) across a wide range of cluster and SMP hardware.
- **SPEC OMP** is designed for measuring performance using applications based on the OpenMP 3.1 standard for shared-memory parallel processing. The benchmark also includes an optional metric for measuring energy consumption.

# SPEC Research Group (RG)



## Mission Statement

Provide a platform for collaborative research efforts in the areas of computer benchmarking and quantitative system analysis

Provide metrics, tools and benchmarks for evaluating early prototypes and research results as well as full-blown implementations

Foster interactions and collaborations btw. industry and academia

## Venue to discuss your work

Discuss with experts performance measurement methods of systems

Discover novel methods and current trends in performance engineering

Connect with leading organizations in the field of performance evaluation

Annual ICPE International Conference (<https://icpe2017.spec.org/>)

## Performance in a broad sense

Classical performance metrics: response time, throughput, scalability, resource/cost/energy, efficiency, elasticity, plus dependability in general: availability, reliability, and security



<https://research.spec.org>



# Open Systems Group (OSG)



The **OSG** focuses on component and system-level benchmarks for desktop systems, high-end workstations and servers running open systems environments.

There are currently six active subcommittees within OSG. Several are responsible for multiple benchmarks and tools.

**OSG Cloud** recently released the **SPEC Cloud IaaS 2016** Benchmark to address the metrics important to the measurement of performance in both public and private clouds, specifically Infrastructure-as-a-Service (IaaS) cloud platforms.

**CPU** contains two benchmark suites: SPECint for measuring and comparing compute-intensive integer performance, and SPECfp for measuring and comparing compute-intensive floating point performance.

**Java** client and server-side benchmarks include **JVM2008**, **JBB2015**, the **SPECjEnterprise** (Java EE) Enterprise Application Server benchmarks, and the Java Message Service benchmark **SPECjms2007**.

The **Power** committee developed **SPECpower\_ssj2008**, the SPEC benchmark for evaluating the energy efficiency for server class computers, as well as the SPEC **PTDaemon**, Server Efficiency Rating Tool (**SERT**), and **Chauffeur** Worklet Development Kit (WDK).

The latest Solution File Server (**SFS**) benchmark, **SPEC SFS2014**, measures file server throughput and response time of end-to-end storage solutions for specific applications.

The **Virtualization** committee's **SPEC VIRT\_SC 2013** benchmark measures the end-to-end performance of datacenter servers used in virtualized server consolidation.

In-depth information on all OSG benchmarks and tools can be found at <https://www.spec.org/osg/>

# SPEC Advantages



Costs of benchmarking are kept down since:

The work of development, testing, and reviews is spread across members.

Benchmark code, drivers, and detailed run and reporting rules are provided by SPEC.

A standardized suite of code that has already been ported to a wide variety of platforms is offered.

Peer review saves time and expense over 3rd party audits.

Benchmarks are retired and updated regularly to keep pace with technology.

SPEC encourages and provides the infrastructure to support the development of new benchmarks whenever there is sufficient interest.

# Membership Benefits



Join us and participate in cutting edge benchmark development

Access to group's benchmarks

Free publication of results

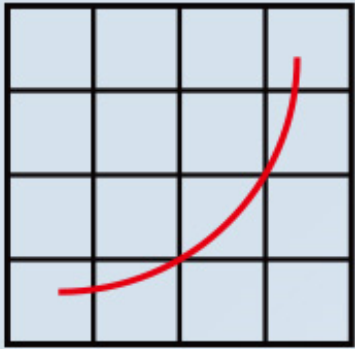
Influence the development of new benchmarks and tools

Contribute ideas and get information on the latest thinking in commercial engineering

Real world experience for grad students aiding in dissertation research and job searches

Connect with dozens of leading universities globally for research collaboration

Opportunity to participate in ICPE International Conference with SPEC 'free' registration



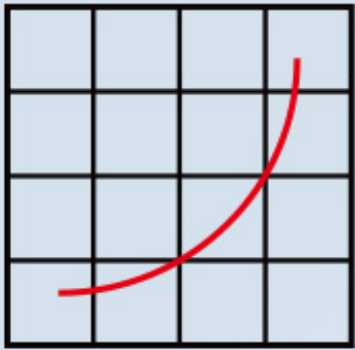
**spec**<sup>®</sup>

**SPEC 2016亚洲峰会**  
**SPEC 2016 ASIA SUMMIT**

**Q&A**

info@spec.org

[www.spec.org](http://www.spec.org)



**spec**<sup>®</sup>

**SPEC 2016亚洲峰会**  
**SPEC 2016 ASIA SUMMIT**

**Thank you!**

