

**Benchmark  
Procurement Guidelines  
for**

**Government PC Buyers**

**Q1, 2006 Edition**

## THE USE OF BENCHMARKS IN TECHNICAL SPECIFICATIONS FOR THE PROCUREMENT OF PERSONAL COMPUTERS, NOTEBOOKS AND SERVERS

### The use of brand names or partial technical features in government procurement specifications is biased and often illegal

In many countries around the world, including the European Union and its Member States, the United States, Canada and Japan, laws, regulations and guidelines provide that the use in technical specifications of tenders for the supply of personal computers, notebooks and servers of brand names and of other partial technical features not directly related to the performance is illegal and discriminatory.

Similar principles are also required of countries participating in the World Trade Organization (WTO) Government Procurement Agreement (GPA), in the Procurement Guidelines under IBRD Loans and IDA Credits published by the World Bank and in the Common Guidelines for Procurement by Organizations in the UN System. Additionally, the courts, antitrust authorities and contracting authorities in many countries around the world have ruled that such specifications are prohibited.

#### *The use of brand names in government procurement specifications*

In many countries, the use of brand names is illegal because it has the effect of excluding specific products from the tenders. Further, the use of brand names with the words “or equivalent” is broadly recognized as illegal in tenders for the supply of PCs, notebooks and servers since it is possible to easily describe the object of the tenders without using brand names. In addition, this kind of specification not only gives rise to uncertainty as to what is considered “equivalent”, but also instills bias into the procurement process such that the specific brand mentioned will always be considered the preference of the purchasing authority.

#### *The use of partial technical features*

Technical specifications that describe the performance required by a microprocessor by using only one specific feature such as, for example, the clock rate, are discriminatory because that specification alone cannot in general correctly identify the performance required from different brand microprocessors and therefore tends to favor only one specific brand of microprocessor.

As an example, the specification of the **clock rate or frequency** of a microprocessor (in MHz or GHz) is not in itself indicative of the performance of the microprocessor, and perhaps more importantly, does not accurately distinguish the relative performance difference between different brand microprocessors. Put simply, the performance of the microprocessor is the product of the clock rate multiplied by the instructions per clock (**IPC**). A microprocessor with a high IPC but low clock rate may therefore have a better performance than a competing processor with a low IPC and a high clock rate.

Given the many different factors which determine the global performance of microprocessors and the different underlying architectures used by microprocessors manufacturers, technical specifications including a combination of different features such as, for example, the clock rate, and other features relating to the IPC such as the front side bus speed or the size or level of cache memory, are very difficult to define accurately and fairly across different manufacturers components. Consequently, the use of partial technical features usually favors a specific product while discriminating against others.

### The use of brand names and of partial technical features in government procurement specifications inhibits competition and cost savings

Technical specifications mentioning brand names or partial technical features are not only illegal, but they also restrict competition for the award of tenders. As a result of this restricted competition, contracting authorities are prevented from achieving the best value for their money. In short, open competition is crucial for tax-funded contracting authorities because competition naturally drives prices down and promotes purchasing decisions based on the best performing products offered at the most competitive prices.

### The use of benchmarks to describe computer performance

Fair and open competition is the only way to achieve savings in procurement, and to access broader choice and a larger supply in terms of producers and offerings from each PC or server system producer (OEM).

To ensure government agencies enjoy both the benefits of fair and open competition and comply with procurement regulations, the use of accurate performance measures for computers and specifications that are brand-neutral, objective, and based on real-world system level (not component level) application performance measurements are necessary. The best way to describe such system level performance is to use standardized benchmark scores based on the rigorous testing methods developed by qualified independent third-party benchmarking firms or industry standard consortiums that are widely recognized and supported by the semiconductor microprocessor and consumer electronics industries.

The advantage of using standardized benchmarks is that they provide the potential buyer with a specific, easily comparable measure for the performance of a computer in an objective, vendor-neutral way. In addition, the use of benchmarks allows contracting authorities to draft simple yet accurate technical performance specifications for computers based on a defined benchmark score.

Finally, given that benchmarks measure the performance of the whole computer or server and not only of the microprocessor, they guarantee a minimum level of performance for the system that automatically takes into account the complexities and possible price and performance tradeoffs inherent in the collection of components that comprise a computer.

## Cost savings realized by the use of brand neutral benchmark - based specifications

Experiences around the world show that the use of brand neutral benchmark based specifications excludes any discrimination and allows all potential bidders to participate in the tenders on a level playing field. More importantly, fair and open competition allows contracting authorities to achieve consistent savings since they can always get the most suitable product at the best possible price.

For example, a recent study commissioned by the European Union<sup>1</sup> found that competitive bids have yielded an average savings of 30 percent.

Savings that can be achieved by adopting brand neutral benchmark based specifications are illustrated by the following two practical examples:

### *a) Tender issued by the Ministry of Education in Turkey*

In March 2005, Turkey's Ministry of Education issued a tender for more than 100,000 units. Initially, the specifications would have limited PC OEMs to supply only expensive, Intel Pentium 4-based solutions. The tender as written was in direct violation of Turkey's existing Procurement Act, and World Bank Rules. Through a process of education, procurement officials in Turkey incorporated standard system benchmark scores into the tender, resulting in a more open bidding process. Ultimately, the chosen solution saved the Turkish government about \$15 million compared to the original unfair and biased tender.

### *b) Tender issued by the Ministry of Education in Poland*

Poland's Ministry of Education issued a tender for 70,000 computers at the beginning of 2005. As written, the tender violated the Poland Public Procurement Act of January 29, 2004, because it called for systems with 2.4 GHz CPUs and 1 MB cache. The only processor that could meet this specific criteria was the 2.4GHz Intel Pentium 4. However, other processors were also available in the market that could match or exceed the performance of this Intel product. Therefore, the specifications amounted to a violation of the aforementioned act, which forbids the use of brand names in technical specifications. The ministry rewrote the tender, outlining system performance requirements based on industry standard benchmarks. The cost of the winning bid was nearly 50 percent lower than what it would have been had the bid been filled based on the initial biased specification—saving Poland's taxpayers millions of dollars.

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<sup>1</sup> **A report on the functioning of public procurement markets in the EU: Benefits from the application of EU directives and challenges for the future, 03/02/2004**  
[http://europa.eu.int/comm/internal\\_market/publicprocurement/docs/public-proc-market-final-report\\_en.pdf](http://europa.eu.int/comm/internal_market/publicprocurement/docs/public-proc-market-final-report_en.pdf)

## How to Use Industry Standard Benchmarks

With regards to the way of using benchmarks, contracting authorities have a choice between several different approaches:

- One approach consists in consulting one of the lists that are published and constantly updated by all benchmark creators and that include the description of many different configurations of computers or servers and the benchmark score achieved by each configuration. The contracting authority shall pick the benchmark score of its preferred configuration among the ones in the lists and use it as a reference for the performance required by the computer to be procured.
- Alternatively, if the contracting authority does not find in the lists prepared by the benchmark creators any suitable computer or server configuration, it can ask one or more of the computer manufacturers (“OEMs”) to provide it with the benchmark score of the desired configuration to be used as a reference in the tender to be issued. This approach allows contracting agencies to compare benchmark scores from competing OEMs and set standards for future purchases based on OEM supplied benchmarks.
- If the contracting authority has no idea about the desired configuration it can also check on the lists prepared by the benchmark creators or ask one of the OEMs the benchmark score of its current machines and then require computers or servers that achieve a benchmark score exceeding by X% the score of the current machines.
- Finally, a contracting authority can directly acquire one (or more) of the benchmarks available on the market and perform autonomously all the testing desired to find the benchmark score of the most suitable configuration.

## Benchmarking Computer Performance for Desktop PCs and Notebooks

With regard to desktops and notebooks, the most reliable and objective benchmarks are application-based benchmarks, i.e. benchmarks that measure the performance of computer systems by testing actual software applications in usage scenarios that are representative of how a computer is actually used. This kind of benchmark is more suitable than synthetic benchmarks, which measure performance of computers by using non-application based tests that either try to estimate the performance of software applications or try to isolate a specific subsystem of a computer and measure its performance.

Given the rapid rate of change in computer technology, the underlying architecture of the microprocessor, and application software, benchmarks are generally updated on an annual basis. Currently, BAPCo’s SYSmark® 2004 SE is a highly recommended benchmark to measure performance of desktops and notebooks for its accuracy,

objectivity, simplicity, and widespread adoption. Alternatively, if for some reason SYSmark 2004 is not utilized, PC World's WorldBench 5.0 is also recommended.

**Mobile Computing – Measuring Battery Life:** An accurate benchmark for measuring battery performance and energy use in notebook computers is BAPCo's MobileMark 2005.

**BAPCo:** BAPCo is a non-profit consortium that develops and distributes a set of application-based benchmarks for PCs and notebooks based on popular software applications and operating systems. BAPCo's current members include companies such as AMD, Intel, ATi Technologies, CNET, Dell, Hewlett-Packard, Microsoft, Nvidia, Toshiba and Ziff Davis Media.

**BAPCo SYSmark® 2004 SE** measures the performance of computers by running real software applications through a series of operations. Comprehensive performance insights make SYSmark one of the industry's most respected benchmarks for client performance. The aggregate SYSmark 2004 score is the product of the two usage scenarios:

1. **SYSmark 2004 - Office Productivity** which contains scientifically designed workloads that represent a range of activities that an office productivity worker may encounter; and
2. **SYSmark 2004 – Internet Content Creation** which measures performance of the computer in relation to the typical applications used when working on the internet.

The aggregate SYSmark 2004 score is recommended, although the Office Productivity or the Internet Content Creation score may also be used independently.

**BAPCo MobileMark® 2005** is specifically designed to measure the battery life of notebooks when they are not plugged-in.

Additional information on the above benchmarks can be found at [www.bapco.com](http://www.bapco.com).

**PC World WorldBench 5.0:** PC World Communications, Inc., is a subsidiary of International Data Group, the world's leading technology media, research, and event company. WorldBench is an applications-based benchmark that automatically installs a series of programs on the computer and then runs various tests to see how those applications perform on the system. The individual times for each test are used to create a composite score that indicates a system's overall performance relative to other systems that have also run WorldBench. Additional information can be found at [www.pcworld.com](http://www.pcworld.com).

## Benchmarking Computer Performance for Servers and Workstations

Because of the diverse and often targeted applications used on servers and workstations, it is important to utilize benchmarks that are designed for the specific applications that the contracting authority is most likely to use. A rich set of industry standard consortiums and other development/auditing organizations exist to aid in the performance specification. Two leading organizations are:

**Standard Performance Evaluation Corporation (SPEC®):** SPEC is a non-profit organization formed to establish, maintain and endorse a standardized set of relevant benchmarks that can be applied to the newest generation of high-performance computers. SPEC's members include AMD, Intel, Acer Inc., Apple Computer, Inc., ATI Research, Bull S.A., Dell, Fujitsu Siemens, Hewlett-Packard, Hitachi Ltd., IBM, Microsoft, NEC – Japan, Novell, NVIDIA, Oracle, SAP AG and Sun. For more information see [www.spec.org](http://www.spec.org).

**Transaction Processing Performance Council (TPC):** The TPC is a non-profit organization founded to define transaction processing and database benchmarks and to disseminate objective, verifiable TPC performance data to the industry. TPC's members include AMD, Intel, Bull, Fujitsu, Dell, IBM, Novell, Hitachi, HP, Nec, Oracle and Sun. For more information see [www.tpc.org](http://www.tpc.org).

Given changes in computer technology, the underlying architecture of the microprocessor and application software, benchmarks are regularly updated. The following benchmarks are currently recommended:

### Database Servers

TPC-C (<http://www.tpc.org/tpcc/>)

TPC-H (<http://www.tpc.org/tpch/>)

SAP Standard Application Benchmarks (<http://www50.sap.com/benchmark/>)

### Messaging Servers

MMB3 (<http://www.microsoft.com/exchange/evaluation/performance/mmb3.asp>)

Lotus NotesBench (<http://www.notesbench.org/bench.nsf>)

### Web Servers

SPECweb2005: <http://www.spec.org/web2005/>

### Java Client/Servers

jAppServer2004 (<http://www.spec.org/jAppServer2004/>)

JBB2000 (<http://www.spec.org/jbb2000/>)

SPECjbb2005: <http://www.spec.org/jbb2005/>

### Computational Servers and Workstations

SPEC CPU2000 (<http://www.spec.org/cpu2000/>)

HPC 2002 (<http://www.spec.org/hpc2002/>)

OMP 2001 (<http://www.spec.org/omp/>)

Fluent (<http://www.fluent.com/software/fluent/fl5bench/>)

### Graphics Workstations

SPECviewperf 8.1 <http://www.spec.org/gpc/opc.static/vp81info.html>

SPECapc for 3ds max 7 <http://www.spec.org/gpc/apc.static/max7info.html>

SPECapc for Maya 6.5 <http://www.spec.org/gpc/apc.static/maya65info.html>

SPECapc for pro/ENGINEER 2001 (<http://www.spec.org/gpc/apc.static/proe2001info.html>)

SPECapc for Solid Edge V14 (<http://www.spec.org/gpc/apc.static/se14info.html>)

SPECapc for SolidWorks 2003 (<http://www.spec.org/gpc/apc.static/sw2003.html>)

### Other Considerations

Although performance is perhaps the single most important attribute to consider when purchasing a PC or server computer system, there are other factors to consider that may be equally important or deserve consideration. These include:

- Energy consumption
- Compliance with environmental standards, materials content, and product end-of-life management
- Heat dissipation
- Acoustic noise reduction
- Technical support
- Etc.

For more information about these topics, please visit: <http://www.amd.com>.

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