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How Much Is Your Hardware Really Costing You?

How SAP Is Helping Usher in a New Era of Sustainable Systems and Servers

by Clarissa Götz and Sebastian Schmitt, SAP AG

Clarissa Götz (clarissa.goetz@sap.com) joined SAP in 1997 and has been in product management, focusing on performance and benchmarking topics, since 2005. Most recently, she hosted the SAP Benchmark Council subworkgroup for defining the SAP power benchmarks.

Sebastian Schmitt (sebastian.schmitt@sap.com) joined SAP in 2007. He has been a member of the Performance & Information Lifecycle Management team since 2008, and is responsible for hardware sizing from a product management perspective. He is also responsible for the cooperation of SAP and hardware vendors in the area of sizing.

Information and communication technology (ICT) currently causes 3% of overall global CO_2 emissions. That's the equivalent of what the entire airline industry emits. If business continues at its current pace, this level is on track to rise by 30% to an enormous 1.54 GT of CO_2 annually by 2020, with data center energy consumption responsible for 22% of the increase.[1] Consider too just how much it costs to support these servers and systems as energy prices continue to rise.

Why do these IT landscapes consume so much energy? One reason is the use of legacy systems. Companies still operate many legacy systems, even when they are no longer using them. These system landscapes lead to very high costs, especially for energy, cooling, and administration. Internal investigations and experiences with hosting companies and customers have shown that the total costs for a one TB legacy system can reach more than US$13,000 per month.

To significantly cut these costs — and to make your company more sustainable — you must take a critical look at your hardware and determine how much it is actually costing you. If you're using your power-hungry legacy systems for storage, consider decommissioning them and moving your data into a slimmer, more efficient information lifecycle management system called a retention warehouse. SAP NetWeaver Information Lifecycle Management makes this possible. And then, when you're looking for new hardware, be sure to evaluate all of your options to find the most energy-efficient server. SAP's new power benchmarks will make this information easily accessible.

[1] Source: McKinsey, 2008.

The Rising Costs of Maintaining a Legacy System

Many companies don't realize just how much power hardware — even unused hardware — actually consumes (see sidebar). Let's uncover where power and cooling efficiency losses are most likely to occur, and then step through an example of the costs that a system incurs even when it is no longer used for daily operations.

Imagine a server that is three-to-five years old. It has 16 CPUs and 32 GB of memory. If you assume an industry energy price of US$0.21 per kw/h, a constant server runtime, and an additional 66% power consumption for cooling, for example, then you're looking at more than US$1,000 per month for energy consumption. If you consider that a typical SAP system landscape has several physical servers, you can imagine how the total energy costs add up (see **Figure 1**).

Through internal investigation, we've found that a storage subsystem connected to an idling server only consumes 3% less power than an actively used storage subsystem. In comparison, the power consumption for an idle production server might increase by 29% when it is fully utilized.

Keeping an idle legacy system around simply for storage purposes can cost you more money than you may realize. So what is the solution?

Decommission Your Legacy Systems, Keep Your Legacy Data

With SAP NetWeaver Information Lifecycle Management, you can shut down legacy systems and transfer the data contained within them into a more energy-efficient retention warehouse system.[2] The decommissioning of non-productive systems (including both non-SAP and SAP systems) eliminates unnecessary time and money spent on keeping old systems running. And, of course, the more systems you decommission into one retention warehouse, the faster your ROI will grow. You'll make your company greener and realize enormous cost savings.

Once you've shut down a legacy system and moved all the necessary information within it to a retention warehouse system, it may be years before you need to access this information again. But if an audit is pending, you'll still be able to select specific data and load it into SAP NetWeaver Business Warehouse for reporting purposes. This way, auditors can view data even from decommissioned systems. What's more, you'll achieve substantial TCO reductions because you are preventing your legacy system from running all the time. The green aspect of this method is a very positive side effect.

Once you've decommissioned your legacy systems, you can turn your attention to your other server and system components. When it's time to replace these components, you'll want to look for more efficient replacements. This is where SAP's new power benchmarks come in.

SAP Power Benchmarks: Evaluating Technologies of the Future

In response to growing energy costs and ICT's increasing contribution to greenhouse gas emissions, SAP and its global technology partners have joined forces, pooling their expertise to define a new set of SAP standard application benchmarks that will help streamline the power consumption of SAP systems in data centers worldwide.

These SAP power benchmarks, which were added to the SAP standard application benchmark suite in December 2009, provide performance

[2] For more information, see "Running a System Decommissioning Project with SAP NetWeaver Information Lifecycle Management: A Hands-On, 7-Step Guide" by Tanja Kaufmann and Claudia Dangers in the July-September 2009 issue of *SAPinsider* (sapinsider.wispubs.com).

What Are the Top Power Consumers in an SAP System?

CPU: The biggest power consumer is the CPU. Here, the degree of power consumption depends largely on the CPU speed and the complexity of the processor architecture.

- With traditional CPUs, load does not significantly impact overall power consumption. Older CPUs — which are prevalent in legacy systems — have no means of adjusting their speed to the requirements of the system, so even lower load levels do not significantly impact overall power consumption. In terms of energy consumption, the difference between an idle server and a server that's under load is almost negligible.
- Emerging generations of CPUs can adjust their clock rates and their power consumption to the current system requirements and load levels. The power consumption of a CPU increases approximately with the third power of its clock rate. That's why new, power-aware architectures tend to have more cores/CPUs running with lower frequencies.

Memory: Although memory energy costs today tend to be lower than those for CPUs, new technology trends — like in-memory computing, for instance — require much more memory, so the relative portion of power consumed by memory will also increase.

Power supply unit (PSU): The energy consumption of the PSU depends on its efficiency. Some PSUs are responsible for up to 20% of a server's total energy consumption.

Storage: Here, there has been a shift from power-hungry, hard-drive disks (HDDs) to energy-efficient, solid-state disks (SSDs). With HDDs, the amount of power consumed depends on the number of spindles needed to meet required throughput. SSDs have flash-integrated circuits and no moving parts, so they are much more efficient. Moreover, SSDs achieve a far higher I/O throughput per device and thus require significantly fewer devices. However, SSD technology is still maturing and is relatively expensive. To reap the full performance benefits of SSDs, the entire technology layer, which integrates SSD technology into the system, must be redesigned.

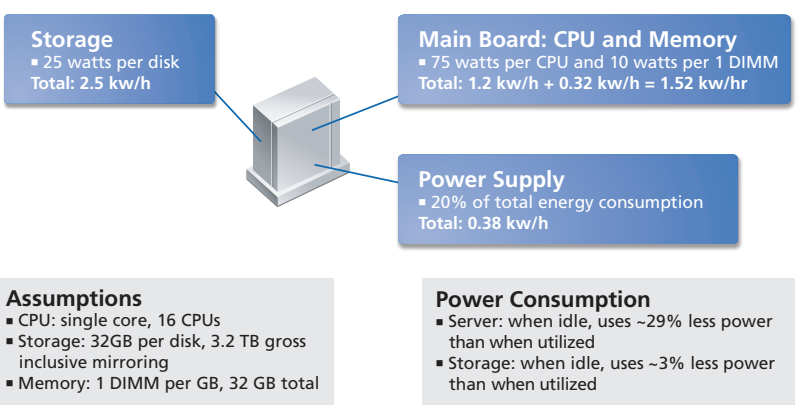


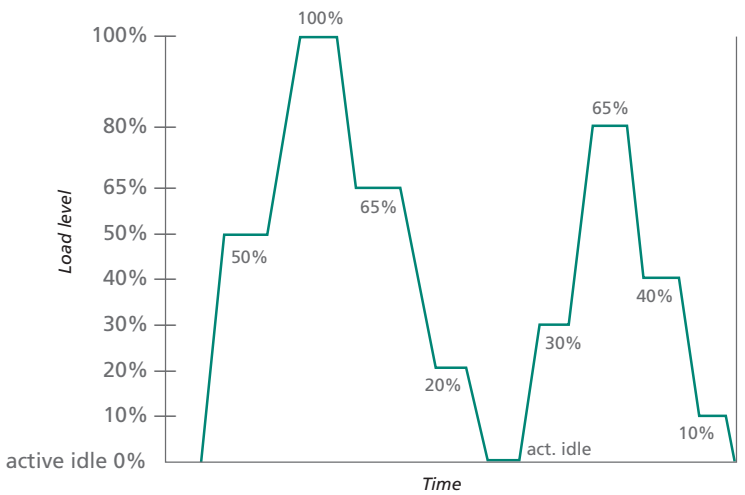
FIGURE 1 ▲ Server components and the energy they consume

throughput figures and measure the power that was consumed while achieving this throughput.[3] Most benchmarking partners were keen to join SAP in defining these benchmarks, wanting to make their technologies more competitive and more power-efficient for SAP systems. The benefits of the new benchmarks are manifold:

- Using benchmark information, customers exploring new hardware will be able to assess a product's power consumption and corresponding SAP throughput at different load levels and determine the power consumption of different system components and technologies. With this information, customers can make the best possible (and most sustainable!) choice for their particular business environment.
- The benchmarks allow participating SAP partners to optimize their hardware to run SAP solutions in the most power-efficient way possible. In addition, the benchmark results can help demonstrate the power-saving capabilities of their technologies.
- Research and development groups within SAP use the benchmark methodology to measure and report power consumption to help them gauge and improve the effect that their software has on the power consumption of underlying hardware.

[3] See www.sap.com/solutions/benchmark/power-benchmarks.epx.

FIGURE 2 ▼ The load levels tested by the SAP power benchmarks



A Quick Look at SAP Benchmarks

Pitting systems against each other to optimize the underlying technologies of an SAP environment is nothing new for the SAP partner ecosystem. For more than 17 years, SAP and its technology partners have been developing and running SAP standard application benchmarks to optimize the performance and scalability of up-and-coming technologies. Because the benchmark tools create a scalable, predictable, and reproducible load, they generate reliable, valid, and comparable results. SAP customers have been using these results for many years to make their hardware decisions.

See **www.sap.com/benchmark** or "Take the Guesswork Out of Your Next Hardware Purchase" by Dr. Ulrich Marquard in the April-June 2008 issue of *SAPinsider* (**sapinsider.wispubs.com**) for more information.

A Closer Look at SAP Power Benchmarks

There are two types of SAP power benchmarks:

- The SAP server power benchmark provides information on the power consumed by the server(s) in an SAP system environment. Currently, technology partners are piloting this benchmark, and the first results are expected in the near future.
- The SAP system power benchmark is designed to show the power consumption of the entire SAP system, including the server, the storage system, and the network between the two. This benchmark is currently in the definition phase.

The benchmarks have a fixed load profile based on the sales and distribution (SD) benchmark.[4] Of the existing benchmarks, the SD benchmark is the most popular and is well understood by SAP customers. It covers a sell-from-stock scenario that includes the creation of a sales order with five line items, the corresponding delivery note for the order, the posting of a goods issue, and the creation of an invoice — in one benchmark loop.

We chose the SD benchmark because sales order processing is one of the most common and essential business processes, and the SD benchmark renders a well-known, platform-independent unit of measurement called SAPS. 100 SAPS equates to 2,000 fully business-processed order line items (as described above) per hour.

The SAP power benchmarks track the power consumption (in watts) and the corresponding SAP throughput (in SAPS) at different load levels (see **Figure 2**). Currently, productive SAP systems will typically experience different load levels during the course of a business day. To reflect this,

[4] See www.sap.com/solutions/benchmark/sd.epx.

the SAP power benchmarks use varying load levels to test the capacity and power consumption of the system. This also helps partners show how their technology is able to adapt power consumption to varying load levels.

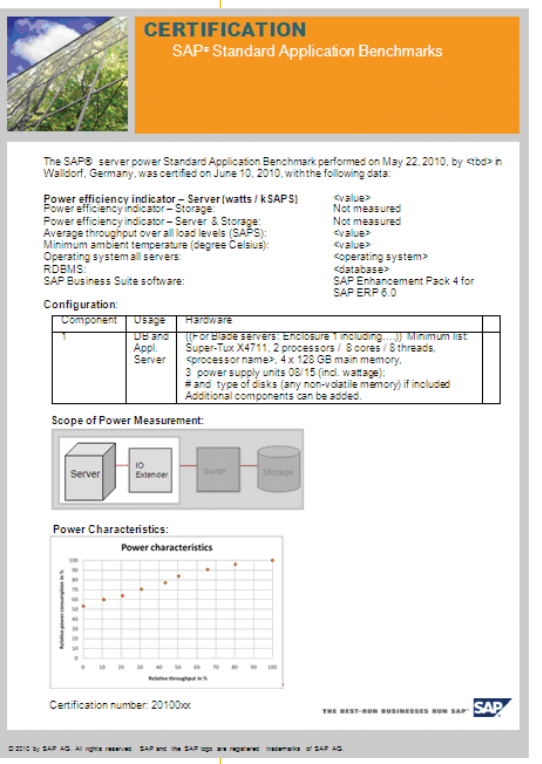
What Can Customers Learn from SAP Power Benchmarks?

The results of the SAP power benchmarks are verified and certified by SAP on behalf of the SAP Benchmark Council. The certificate (see **Figure 3**) contains an overview of the benchmark results; interested customers can also request more detailed results information from SAP (by emailing **benchmark@sap.com**) or from the hardware partner. This certificate includes:

- The benchmark results section, including the **power efficiency indicator**, which is expressed as watts/kSAPS (power consumed per throughput achieved) in the SAP server power benchmark.[5] The results here also include the average throughput achieved over all load levels (in SAPS) and the minimum ambient temperature, which is important because of the temperature's effect on power consumption.
- The **benchmark configuration section**, which lists all power consumption-relevant components — and includes information about the server, the types of database servers and application servers, the number and types of processors, the number of cores and threads, the amount of main memory, the number and types of power supply units and their wattage, the enclosure for blade systems, the storage, and the network infrastructure components.
- The **scope of power measurement graphic**, which shows the rough setup of the tested components that have their own power supply. This indicates which components of the setup were included in the calculation of the power efficiency indicator (represented in Figure 3 by the non-greyed-out area of the scope of power measurement graphic). For example, it will show that the SAP server power benchmark includes only the server components.
- The **power characteristics graphic**, which shows the relative power consumption against the relative throughput as a percentage. This shows the power efficiency of a server at particular load levels, for example, and how well the system handles idle power consumption.

To ensure a fair playing field for the benchmarking partners, and to guarantee valid and reliable benchmarking results for customers, the benchmarks (as with all SAP standard application benchmarks) are subject to strict testing rules and a clearly defined measurement methodology for benchmark throughput, power consumption, ambient temperature, and other environmental conditions.

For more details about the benchmarks, please visit **www.sap.com/solutions/benchmark/power-benchmarks.epx**.


CERTIFICATION
SAP® Standard Application Benchmarks

The SAP® server power Standard Application Benchmark performed on May 22, 2010, by <tbd> in Walldorf, Germany, was certified on June 10, 2010, with the following data:

Power efficiency indicator – Server (watts / kSAPS)	<value>
Power efficiency indicator – Storage:	Not measured
Power efficiency indicator – Server & Storage:	Not measured
Average throughput over all load levels (SAPS):	<value>
Minimum ambient temperature (degree Celsius):	<value>
Operating system all servers:	<operating system>
RDBMS:	<database>
SAP Business Suite software:	SAP Enhancement Pack 4 for SAP ERP 6.0

Configuration:

Component	Usage	Hardware
1	DB and Appl. Server	(([For blade servers: Enclosure 1 including ...])) Minimum list: Super-Tux X4711, 2 processors / 8 cores / 8 threads, <processor name>, 4 x 128 GB main memory, 3 power supply units 08/15 (incl. wattage); # and type of disks (any non-volatile memory) if included Additional components can be added.

Scope of Power Measurement:

Power Characteristics:

Certification number: 20100xx

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FIGURE 3 ▲ An example of what an SAP power benchmark certificate looks like

Summary

Running a sustainable business — from both a cost-focused and a green point of view — can be a challenge. But IT can do its part by turning a critical eye to the hardware that supports a company's software and solutions. If a company is holding onto its old legacy systems for storage purposes, now is the time to calculate what those power-hungry systems might really be costing your business.

Decommissioning legacy systems — while still ensuring access to the important data stored within them — is possible with SAP NetWeaver Information Lifecycle Management, which enables the transfer of data into modern, energy-efficient systems. And, to help customers choose the most energy-efficient hardware setup for their business needs, customers can turn to SAP power benchmarks to assess the efficiency and sustainability of SAP partners' hardware servers and systems. ■

[5] Note that in the SAP system power benchmark, this indicator is yet to be defined.