Sustainable Programming: How Your Program Code Can Leverage Power-Saving Technology

Applies to:

Performance, Scalability, Green IT, Programming, Sustainability, Performance-optimized coding, energy-saving technologies, Main Memory Computing

Summary

How to best embrace the emerging power-saving technology trends is a challenge primarily for the technology developers at SAP. Software must support the available power saving techniques at both the hardware and the software level. On the hardware level CPUs, the main power consumers, are getting more and more power-aware. On the software level, SAP software must support and actively integrate the new power management functionalities of the CPUs and the operating systems.

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Author Bio

Heiko Gerwens is the leading performance expert for SAP financial service applications. He joined SAP in 1997 and has worked in the performance and scalability team. During this time he has been involved in the development of many applications including customer projects that implement these applications. He supports customers, partners, consulting agents, and the field organization that deals with all aspects of performance, scalability, and sizing.

Detlef Thoms has twelve years of SAP experience that he has gained in Development Support, as SCM Senior Solution Consultant in numerous SAP implementation projects and in the SAP NetWeaver RIG as RIG Expert for the Master Data Management portfolio. In January 2011 he joined the Product Management as Product Expert for Performance & Scalability across the SAP portfolio.

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Overview

Let us have a look at the emerging power-saving technology trends. How to best embrace them is a challenge primarily for the technology developers at SAP.

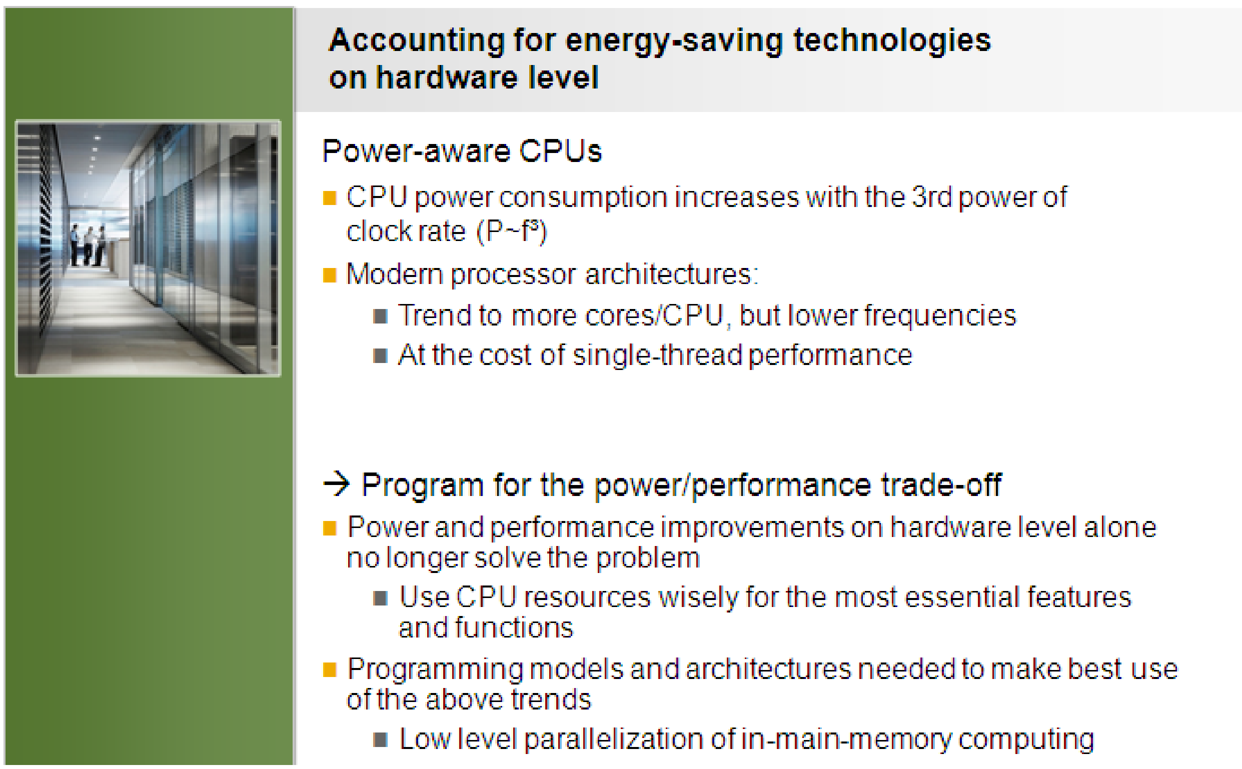
Software must support the available power saving techniques at both the hardware and the software level. The question is: What has to be done to enable this?

Accounting for energy-saving technologies on hardware level

On the hardware level CPUs, the main power consumers, are getting more and more power-aware. The power consumption of a CPU increases roughly with the 3rd power of its clock rate [http://en.wikipedia.org/wiki/Dynamic_frequency_scaling]. Therefore, the trend of new power-aware architectures is towards more cores/CPUs running at lower frequencies. As a result of this, single-thread performance is reduced.

What you can do: Because power efficiency is in focus now, we can no longer count on the hardware to solve performance problems in our program code. Instead, your must keep the power / performance tradeoff in mind at all times by using CPU resources wisely for the most essential features and functions.

Software architects will need to define programming models and architectures that can make best use of the above trends, e.g. provide for low-level parallelization in-main-memory computing.



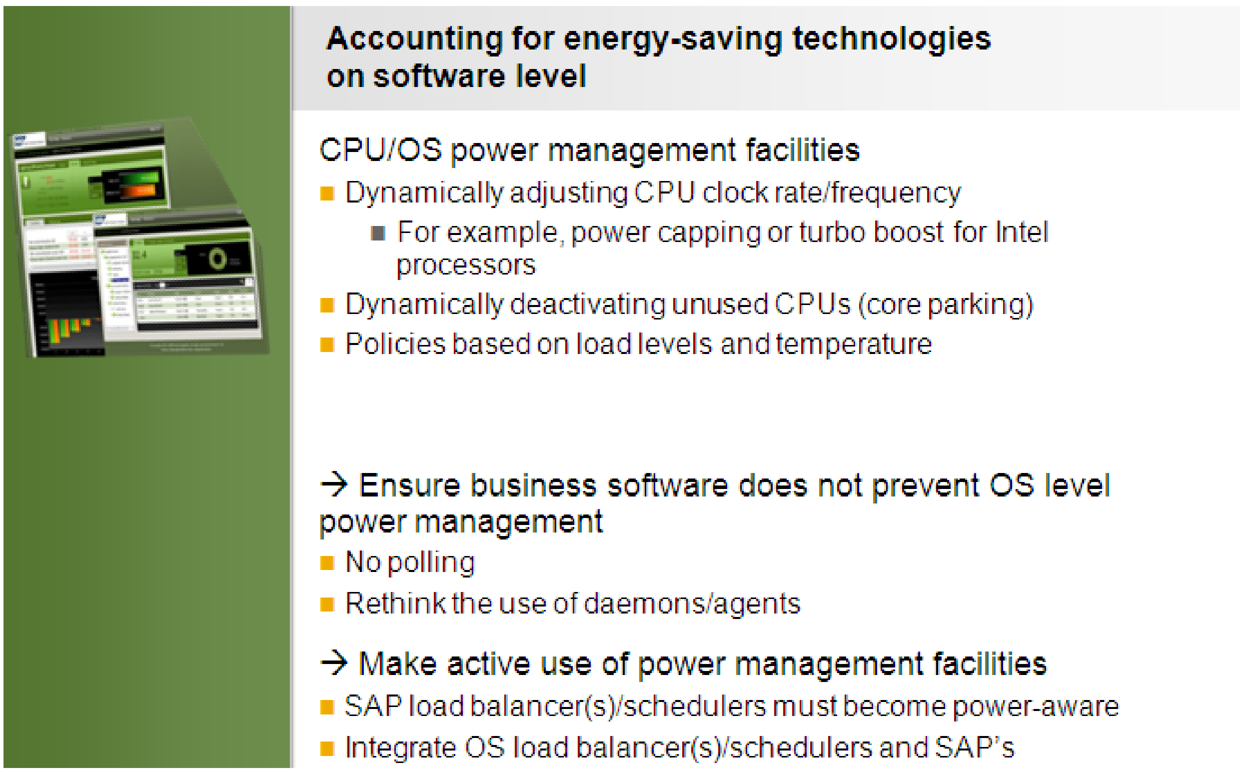
Accounting for energy-saving technologies on software level

On the software level, SAP software must support and actively integrate the new power management functionalities of the CPUs and the operating systems. Examples of these are:

- Dynamically adjusting CPU clock rate/frequency (e.g. power capping or turbo boost for Intel processors)
- Dynamically deactivating unused CPUs (e.g. core parking in Windows Server 2008 R2)
- Policies based on load levels and temperature

What you can do: At a minimum, ensure that your software does not prevent OS level power management facilities. For example, make sure there is no polling and rethink your use of daemons / agents.

Software architects will need to investigate how to use of these power management facilities. Available implementations must become power-aware, and the schedulers on different levels have to work together to avoid the different levels i.e. hardware, hypervisor, OS, SAP dispatcher counteracting each other and thus prevent power saving.

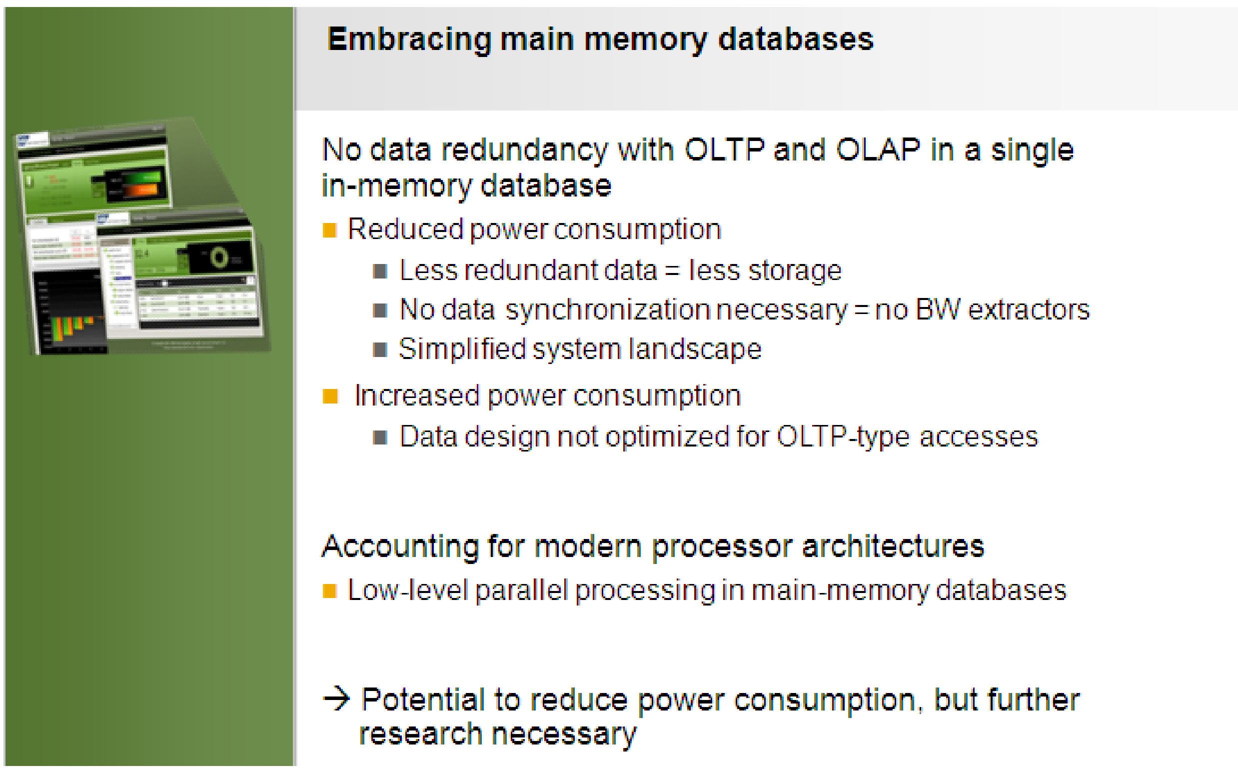


Main Memory Computing

One direction that in-memory computing is going is to achieve unified realtime analytical capabilities by combining OLTP (Online transaction procession) and OLAP (Online analytical processing) in a single in-memory database. This could reduce the power consumption by requiring less redundant data which implicitly reduces the required storage and simplifies system landscapes (that is, no separate data warehouse). However, the potential power savings could be counterbalanced by a data design that is not optimized for OLTP-type accesses. This could increase the power consumption again (i.e. cause more CPU cycles).

On top of this one needs to consider the fact, that because all memory resides now in main memory, physical read accesses down to the data in a storage tier will be significantly reduced. Since in traditional OLTP systems the storage tier has to support a large number of physical read accesses it has to contain a large number of hard disk drives (much larger than necessary to support the data volume requirements). This in turn leads to a high power consumption of the storage tier. This won't be necessary any more with new in memory techniques.

With respect to modern processor architectures, low-level parallel processing in main-memory databases could also affect the power consumption positively. These technologies have to be investigated further to discover their potential to reduce the power consumption.



Please let us know what you think about how software should support the available power saving techniques at both the hardware and the software level.

How important is this topic within your company?

Your insights will help us immensely.

Please give us feedback via the corresponding SDN blogs or via mail:

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