

IT for Sustainability relies on the intelligent use of resources: Siemens Portfolio for Sustained Development

If you take environmental protection seriously, you won't get very far with a single green product or environmentally friendly equipment disposal alone. Far from it, companies have an obligation to develop sustainable solutions for the long-term conservation of resources. IT for Sustainability should begin as early as during the design of products and services and continue throughout their entire operational and service life. With its IT for Sustainability portfolio, Siemens IT Solutions and Services offers a holistic concept that goes far beyond "Green IT" and addresses more than just energy efficiency – it encompasses solutions for sustainable resource management.

Tactics or long-term strategy, hype or living your corporate philosophy? Nowadays hardly any other topic is as controversial as Green IT. Although it is propagated by some as a fast solution and value-added contribution of IT toward solving environmental problems, reason demands measures and strategies with a long-term perspective. In this area, cause and solution lie close together; what yesterday helped cause immense CO₂ emissions, energy consumption and ruinous exploitation of resources has today become an important component in the battle against environmental pollution and climate change: IT.

David Murphy, portfolio manager, Siemens IT Solutions and Services, explains: "The goal of IT for Sustainability is to detach economic growth from those things that have a negative impact on the environment. In this regard, the development of sustainable IT strategies and solutions will play an important role in protecting the climate. For instance, our IT for Sustainability portfolio encompasses not only infrastructure-related services but also other environmentally-relevant factors, such as solutions for the management of water and transportation, which make a significant contribution to protecting the environment and conserving resources."

In the wake of growing public environmental consciousness, the term "Green IT", which means the sustained and efficient use of the dwindling resource energy in the IT sector, initially found increasing currency. In this context, current discussions still focus on how to optimize the energy efficiency of data centers. The Experton Group is likewise in no doubt: Fewer servers and new computers with lower power consumption are an important step in taking control of energy costs and power requirements.

"With the concept of IT for Sustainability, Siemens IT Solutions and Services is taking a holistic approach and going quite a bit further than Green IT," explains Peter Arbitter, Head of Portfolio & Technology Management, Siemens IT Solutions and Services. "This is not a fad; it is a philosophy and the logical continuation of what we have already been successfully introducing and implementing for decades."

The market awakes

The portfolio of sustainable IT is the reaction to the growing need for companies to take action. If only to avoid financial, legal and environmentally related risks, companies in the future will not be able to avoid taking on a more environmentally

friendly stance. A wide variety of challenges confronting companies today and in the near future are responsible for the situation.

According to the market researchers at IDC, about three Mühleberg-type nuclear power plants would have to run continuously for an entire year in order to feed the energy hunger of German data centers. High energy consumption is not a new concern of companies; many data centers have already exhausted their capacities in regard to performance and cooling. Providing more computer capacity will be difficult unless it is possible to lower the demand for additional servers and thus the energy requirements. Here, there is a call for holistic and sustainable solution approaches.

Rising electricity prices likewise make rethinking unavoidable, with energy costs now representing a significant proportion of the costs of IT operations. According to IDC, energy today is already the second largest cost factor in the operating costs of a data center, next to maintenance and administration – with a sharply rising tendency. But cutting the performance capabilities of the IT infrastructure is no alternative, because the sharpening of compliance guidelines and safety regulations or new business models such as 'Software as a Service' (SaaS) will greatly increase the demand for computer memory and network performance even further.

This is an enormous challenge for IT managers. In the future, they will have to assess their IT infrastructure not only according to technological, but increasingly according to overall economic considerations. To cut costs on the one hand and satisfy the performance hunger of business applications on the other, more and more companies are discovering 'Green IT'. Nearly 80 percent of IT managers are convinced that the topic will play an increasingly more important role within their company – that is the result of the current IDC Green Survey. In comparison to environmental protection, however, the cost component still has greater clout. To lower costs, therefore, most companies would turn to virtual storage and servers and a leaner infrastructure.

In other words, Green IT has long since become much more than a passing fad; it is a real necessity – especially when we consider the study carried out by the scientist Lawrence Koomley of the Lawrence Berkeley National Laboratories. According to the study, about €5.2 billion were spent in 2005 to supply power to servers and the infrastructure necessary for their operation. Since the year 2000, the power requirements of servers have doubled, and by the year 2010, energy requirements will soar by another 40 percent.

When waste becomes resource

The "cradle-to-cradle" principle ensures that production is taking an increasingly intelligent and environmentally friendly path. According to this principle, products and materials can circulate as technical or biological nutrients in circulating systems – from cradle to cradle – and be reused virtually endlessly. This is a fundamentally new approach for the production of ecologically intelligent products. It leads to comprehensive product quality and makes it possible to recover nearly 100% of all the materials contained, instead of depositing them as waste, burning them, or incorporating them in a lower-value recycling process. Contrast this with the cradle-to-grave principle, in which products at the end of their 'life' are banished to waste repositories or simply burned. However, this requires an unending supply of resources and repositories.

And we should not forget the constantly rising electricity prices and legal requirements to reduce CO₂ emissions in production. Since the topic has now become a permanent agenda item of politics, company strategists must also expect further restrictions.

Siemens expert Murphy sums up: “As market drivers, we see on the one hand the scarcity and rising costs of resources. On the other hand, pressure is being exerted on companies to live up to their corporate responsibility in the area of CO₂ reduction. As a result, there are now numerous guidelines for the environmentally friendly design of products, such as the Energy Using Products (EUP) guideline issued by the European Parliament.”

Companies as ‘citizens of the world’ with growing environmental consciousness

The Munich technology enterprise sees itself well prepared for the fast growing market for sustained IT. Siemens is the only company in the world that combines the know-how of software solutions and IT processes with energy and building systems technology under one roof. The company has therefore bundled all its competencies and developed a sustainable concept for IT solutions and services.

According to Murphy, the essential unique selling proposition of IT for Sustainability is “the holistic concept. Currently, everyone in the market is talking about the term Green IT. However, Green IT refers only to energy efficiency. In contrast, IT for Sustainability deals not only with infrastructure-relevant services for data centers, such as transformational data center or desktop and application virtualization; the portfolio also encompasses a wide variety of sustainable solutions for intelligent resource management.” Accordingly, the Siemens approach to sustainable IT also includes topics such as energy, water and transportation management.

In this context, Green IT will remain an energy-efficient element in the portfolio. However, the overall strategy of IT for Sustainability will focus on aspects such as sustainable environment and society as well as corporate governance. The concept thus answers the question of the social responsibility of companies. In the future, this will increasingly be a criterion by which they are judged by their customers and markets. Even now, according to a survey by the business auditing and consulting firm PricewaterhouseCoopers (PwC), nearly three out of four surveyed (72 percent) are spending more money on environmentally friendly technologies.

Focus on resource management

Another point covered by the portfolio is the resource water. In this area, Siemens provides a modular solution designed to support authorities in water management. The water management system provides a central informational, analytical and monitoring instrument for active water management. It offers the respective departments, public agencies and, above all, interested citizens comprehensive access to the environmental data “water”.

Above all in regard to the Master Water Guidelines of the European Commission, water management is becoming increasingly important. According to the guidelines from the year 2000, all bodies of water in the EU should have good water quality by the year 2015. Based on these guidelines, the member states are obligated to present plans for water management in river watersheds by the end of 2009.

Of course, as would be expected of the inventor of the working principle of the most important power generators, Siemens also offers sophisticated solutions for energy management. In the face of the worldwide scarcity of resources, stricter requirements for environmental protection, and growing societal pressure for a more ecological commitment, companies are increasingly focusing on energy and resource efficiency. For this purpose, Sappi (South African Pulp and Paper Industries), one of the world’s largest paper and cellulose manufacturers, utilizes the Decentralized Energy

Management System (DEMS) from Siemens IT Solutions and Services. It is used for the demand-based planning and control of energy production and distribution and goes far beyond mere energy data management.

No way without IT: The data center of the 21st century will become ever larger, ever thriftier

However, none of these approaches will work without a reliable IT infrastructure. For this reason, data centers must be geared to sustainability. Several trends are currently converging which, in light of increasingly complex requirements and specifications, are increasingly shifting the focus of public attention to the operators of data centers. For instance, new regulations for data archiving require that companies store ever larger quantities of data for legally specified time periods. And customers expect 7x24h network access to electronic services. Both the speed and the unpredictability of processes are growing. Consequently, data centers must be agile and adaptable. At the same time, however, companies must help ameliorate the effects on the environment caused by the energy consumption of data centers.

It is therefore no wonder that the costs for the operation of data centers are increasing, while valuable IT capacities remain underutilized. In the past it was often simpler to put new applications onto new servers than to determine how applications and data could be distributed efficiently. As a result, data centers have rapidly grown in size and complexity in recent years. Now the limits of growth have been reached. The limitations of space, electrical power and air conditioning are driving more and more data centers to the limits of the possible and are currently forcing companies to reexamine their entire data center infrastructure.

First invest; then protect and save

In response to these challenges, Siemens IT Solutions and Services, together with other Corporate Groups such as Siemens Building Technologies and Siemens Industry Automation (formerly Siemens A&D), has developed a holistic solution portfolio: the "Transformational Data Center". This covers everything from business-oriented solutions for sustainability to environmentally friendly IT outsourcing, through to the environmentally friendly structuring and operation of data centers.

"In our services and solutions in the area of IT for Sustainability, we have incorporated our many years of experience as an operator of data centers," explains Arbitter. "For instance, for years we have been using ground water for cooling in our own data center in Munich instead of blowing heat into the air through air-conditioning systems at a great cost in energy. In the data center in Paderborn, we are using the method of waste heat utilization for energy recovery. These examples, which have been practiced for a long time, show that Green IT is no longer just a hype topic, because there has always been a discussion of energy efficiency."

Consequently, data center planning geared to sustainability begins with the so-called 'site selection', in which a setup area is chosen as close as possible to an environmentally friendly energy source. In building the data centers, key considerations include the use of environmentally friendly building materials, effective power supply and cooling systems, alternative power supply sources such as heat pumps, the use of LED lighting, evaporation coolers, wind and solar power, as well as a decentralized energy supply. Virtualization and the dense packing of servers also increase capacity utilization and lower space requirements.

“In setting up a modern and flexible data center, we support companies through our extensive consulting and integration offerings in the Transformation Data Center. These encompass services and consulting for strategy development, construction, planning and startup, as well as the maintenance and outsourcing of modern data centers,” explains Arbitter. Ultimately, the key to success in setting up future-proof and sustainable IT infrastructures is the holistic approach. For this reason, the offerings of the Transformation Data Center also include functions for assessment and target operating, a virtual enterprise computing platform, and components for active energy management and automation.

Step by step to greater efficiency

In the assessment stage, the first step is to analyze the existing IT infrastructure and set up a green-field approach. In this kind of approach, the task is analyzed from the ground up and without limiting constraints. Among other things, the experts check energy efficiency and costs as well as heat and cooling. This brings to light the potential which can be exploited with the aid of suitable applications and tools for combination and homogenization.

To systematically exploit the savings potential, in the second step a target operating model is created. This method is used to record the requirements for standardization and integration (data sharing). The operating model ensures that the IT infrastructure satisfies the respective business requirements. “The target operating model incorporates both the costs for procurement of new IT and the monthly operating costs of the data center. The assessment is done in harmony with the business strategy,” emphasizes Arbitter.

One way to greater energy efficiency is offered by Siemens in the third stage with the Virtual Enterprise Computing Platform (VECP), which serves as a holistic platform for energy planning and control of business processes. The key is the successful combination of ecology and economy. For example, within VECP, users can utilize a function that automatically monitors the thermographics of the data center by remote control and also monitors the entire consumption of alternating current. If a certain number of servers should get too hot, for example, the platform provides specific instructions as to when and where to cool instead of lowering the temperature of the entire data center. VECP also identifies the place where new exhaust openings need to be placed or where load balancing is necessary in order to reduce processor utilization or heat in specific spots. The application is integrated in the existing business processes. This substantially lessens the demand for additional local servers.

Further benefits are offered by the immense flexibility. For example, new components can be added to cool spots, or existing components can be replaced, without overloading the cooling capacity. The function “Active Energy Management” facilitates more effective space planning and the monitoring of peak energy consumption. For the measurement of heat development, for example, sensors can be used. Energy and cost savings are the result.

Standardization through process management and methodology

Last but not least, there is the automation of the IT processes, which is considered the key to efficient IT management. Otherwise, it is hardly possible to implement uniform standards within an organization. The basis of process management in the IT area is provided by the frameworks of the IT Infrastructure Library (ITIL) and Meta Object

Facility (MOF). Their goal is holistic management of the IT processes – from design to implementation, right through to documentation with an IT-based tool. “Automation enables companies to reduce their operating costs and implement changes in their IT faster. The risk of failure for critical IT solutions can be minimized. Compliance with legal requirements is monitored and ensured”, explains Arbitter.

The outsourcing solution SieQuence from Siemens enables the flexible alignment of IT services with individual business goals. It consists of four stages, with each stage building upon the functions of the previous ones: starting with solution of ad-hoc problems, to the avoidance of incidents, and on to the attainment of maximum availability of systems and applications. Arbitter comments: “With SieQuence we are expanding the portfolio of the Transformation Data Center. The outsourcing model can be used for the infrastructure and also for the full range of the customer’s applications and processes. Initially, we concentrate on improving the cost/benefit ratio and develop a long-term roadmap for optimization of the IT and business processes.”

Threefold combination helps save energy and cut the costs of operation

Innovations that provide more sustainability in IT operations build upon a foundation of standardization, industrialization and virtualization. For example, most companies nowadays no longer want to operate proprietary legacy applications on separate systems, which is both expensive and risky. The trend is much more toward standardization, although the strength of the trend varies greatly among the individual sectors. This is because standardization is an important prerequisite for the industrialization of operational processes, i.e. the most efficient, reproducible provision of services. The advantage for customers, aside from cost efficiency, is also environmentally friendly operation of data centers.

Another effective method of lowering costs and simultaneously getting control of the high power consumption in the data centers is to replace many servers of different origin by a few powerful servers from one or a few manufacturers. This not only drives down energy costs, it also reduces the costs of server management, administration and maintenance. We should not forget that, according to an IDC survey, their proportion of IT operating costs is four and a half times as great as the cost of the electrical power. The converse of this cost relationship is obvious: In the greatest cost block, operation, company and operator can save simultaneously on two fronts. As a result of server consolidation, the operator thus achieves sustained savings in energy, hardware and administration costs.

For instance, Commerzbank has already consolidated its server farm and hired Siemens IT Solutions and Services for service and support. The result: 30 percent lower IT costs in comparison to the previous situation.

Targeted consolidation is also the direction taken by the Herkules project of the German Armed Forces. 60 percent of the project, which encompasses 1,500 German locations, will be implemented by Siemens IT Solutions and Services. One of the goals of the largest outsourcing project in Europe is to replace more than 7,000 servers throughout Germany with a few, but substantially more powerful computers. The gigantic Herkules project is an example of how the high costs in data centers can be lowered above all through server modernization and consolidation, leading inevitably to a drop in the costs for power and operations.

Arbitter describes the consolidation of Siemens data centers and the reduction in power consumption as follows: “Siemens IT Solutions and Services has also consolidated its own data centers and computer rooms and has reduced the number of

locations in Germany from over 100 to under 30. In the last three years, we have systematically optimized our data centers and switched to larger, significantly more efficient computers. Simply by replacing older equipment with more powerful equipment, we have achieved a reduction in consumption by a factor of five”.

Lean and environmentally friendly – virtual hardware

When often hundreds of rack-based servers line up row after row in data centers, it costs not just expensive setup locations. Over the years, wiring, installation, configuration, administration, upgrading and maintenance gobble up huge sums of money. As the number of servers with different operating systems rises, monitoring costs also skyrocket. The associated increase in complexity is difficult for operators to manage. Components of these server farms, which have grown organically over the years, also include the many transformers and systems for static or dynamic uninterruptible power supply. In addition there are the measures for cooling, heat dissipation, and power reduction of consumption. Without suitable precautions and with energy prices rising, the costs of power are increasing all the time.

The way out of what adds up to an expensive status quo is systematic consolidation of the server landscape by means of virtualization. To achieve this, Siemens IT Solutions and Services is also working closely with several chairs of the Technical University Munich (TUM). The technological foundation for consolidation is a virtualization solution, such as VMware, which makes it possible to take applications that until now have been run on distributed servers and combine them with their operating systems to run on powerful servers in the form of ‘virtual machines’. Modern blade servers can serve as examples of such performance pillars.

For Arbitter this is the key to efficient IT operations: “In the next five years, the goal will be to achieve greater flexibility for the IT infrastructure through blade servers. Computing power can be completely detached from the infrastructure. Furthermore, the high packing density of blades reduces the demand for setup space, which, particularly in data centers, is expensive.”

Likewise, the compact thin clients, which access the virtual desktop in the data center, will play a larger role in the future – and will replace conventional PCs on employees’ desks. This will provide high-availability desktops, with central maintenance and administration of resources, in the data center. At the same time, it will be possible to access the individual client from any given place in the network. Arbitter considers the specific advantages of desktop virtualization: “For the IT department, this offers a number of advantages. For one thing, the maintenance costs for PCs can be cut; for another, the concept offers greater security. At the same time, complete desktops can be implemented centrally on the server, and working groups and departments can be set up within minutes.”

Even today, according to information from the German Federal Environmental Agency, about six million metric tons of the greenhouse gas carbon dioxide can be saved in data centers with thin clients. The conversion of one-third of the PCs in Germany to thin clients would save about one million metric tons of CO₂ and about 100,000 metric tons of material annually. This shows that, in addition to energy savings, attention is also focusing on material efficiency and the scarcity of resources.

Without changes in the existing IT infrastructure of the company, nearly all the applications can be virtualized and updated individually. Instead of whole system environments, individual software applications are virtualized, which saves installation

and support costs. The applications run with the existing user rights, in order to avoid conflicts with other programs.

That a reduction in the number of servers by a factor of five and more is no rarity is shown in numerous projects carried out by Siemens IT Solutions and Services. According to expert calculations, the consolidation possible through virtualization and the use of Green-IT components can lead to an amortization period of under 18 months. The result is even clearer if we take into account an expansion of data center capacity and the additional expense for air conditioning and power supply.

Consolidation potential without additional costs

However, one question remains open: How can we exploit the consolidation potential in the data center without investing too much in new servers and supplementary components, tools and measures? To answer this question, a method for consolidation planning was developed in the Department of Information Science at the Technical University of Munich. The starting point for the use of this method is the representation of a complete cost/performance picture for the existing server farm. These calculations incorporate all cost factors as well as their anticipated development over the next four years. For a sound cost/performance assessment, all the cooling/heat cycles should also be included. At the same time, the depreciation periods for the individual server systems should not be overlooked, as they are important in order to find the financially justifiable point of entry for specific new procurements.

In order to take due account of the costs mentioned above in the consolidation planning for a data center, the Chair for Internet-Based Business Systems of TU Munich worked together with Siemens IT Solutions and Services to develop software that takes into account the costs in the data center for consolidation planning. In addition to mathematical optimization, automated analysis of historical utilization data plays an especially important role.

The planning work begins with an analysis of the workloads of the existing server configurations. This examination and assessment must incorporate all applications and servers for the environment to be consolidated. Resource needs of the applications – such as CPU query or network throughput – are usually cyclic. Thus, user-interactive servers display a typical work-hours-related load profile and low weekend load. In contrast, batch processing runs often take place at night, while ERP systems for salary calculations show monthly regularities. If two applications with contradictory load profiles are combined on the same server, it tends to produce a uniform utilization of resources. The capacity utilization rate of the servers is thus significantly improved.

If the IT landscape is especially heterogeneous and complex, cartography software can be used. It, too, is the result of close cooperation between Siemens IT Solutions and Services and TUM – in this case in collaboration with the Chair for Software Engineering of Business Information Systems. The map model not only provides planners and integrators with a 3D view of the hardware and software used, it also provides a clear and detailed view of their relationships to the organization and personnel. In this way, even the most complex IT landscapes and all their interactions can be understood for the purpose of targeted server consolidation. The advantages of visually supported planning and execution are clear: reliable project development, targeted investment, a clear reduction in project costs and risks, and substantial cost savings later on in IT operations, accompanied by a simultaneously high level of IT service.

Ecology and economy together

Whether business is "greening" or not – the fact is that power consumption and cooling are currently still being given so little consideration by the majority of companies in Europe that they are, for example, hardly included in IT tenders at all. Ecological aspects as fundamental targets in the deployment and operation of IT are still in the distant future. Gartner makes the point: Nowadays it is less a question of whether companies are dealing with environmental topics, but of the risks they take if they ignore those topics.

Accordingly, sustainable IT is no passing fad; so much should long since have become clear to informed IT managers. In fact, the development departments of many IT companies have already been working for years to find more environmentally friendly designs for their products.

It can also pay off for users to take energy efficiency into consideration in their purchasing decisions, as is shown by the current study on PCs by the British Energy Saving Trust. According to the study, even for state-of-the-art devices, consumers can reduce energy consumption by another one-sixth through environmentally friendly behavior.

In addition to environmental considerations, therefore, cost savings also argue in favor of sustainable IT. For many data centers, energy consumption will become one of the largest cost factors in the next five years. Accordingly, the Experton Group of CIOs recommends combining the economical and ecological benefits, because sustainable IT helps companies and IT managers with their current dilemma. On the one hand, the IT must become even more powerful even in the face of existing cost pressure, which leads to more CO₂ emissions. On the other hand, environmental regulations require a reduction of CO₂ emissions both within and outside data centers.

But other reasons also play a role in the use of sustainable technologies, such as the minimization of maintenance costs and image enhancement. In addition, future or existing legal regulations are named by companies as motivation for the commitment to green IT. Furthermore, according to Forrester Research, 19 percent of companies believe that the green technologies will make IT more sustainable and dependable.

Murphy sums up: "In the future, IT will play an important role in protecting the climate. Since computing power and data volume are rising, the pursuit of low-power computers alone will not be enough. What is required are intelligent holistic solutions which can achieve a sustainable lessening and control of the energy requirements of companies only through the effective utilization of existing resources. Our IT for Sustainability portfolio supports companies in their attempts to meet the economical, ecological and social needs of society, because companies increasingly want to be judged by their customers and markets based on their commitment to the environment and to society".

Box: [supplemental for various placements in the press]

Current studies appeal to companies

The results of a recent survey by Gartner offer further fuel for public discussion. While in recent years above all the manufacturing industry and transportation have been held responsible for those things that have a negative impact on the environment, the power consumption of ITC (information and telecommunications technology) are now

becoming more important in the area of climate policy.

The findings:

- ITC is responsible for about two percent of CO₂ emissions.
- ITC accounts for about six percent of worldwide value creation.
- The energy costs of companies account for about five percent of their total budget.
- This figure is expected to triple in the next five years.

The reasons:

- Energy-hungry data centers and growing requirements for computing power

The prognosis:

- Increasingly more and faster servers will continue to increase the energy consumption of hardware and air conditioning.

The challenges (based on analyses by IDC):

- Many companies waste enormous quantities of energy through oversized IT infrastructures.
- Servers that run around the clock are utilized only ten percent.
- To make this clear: If the utilization level was at least 50 percent, the energy saved in a single large data center would cover the power requirements of 200,000 private households.

The conclusions:

- Economic growth in the future must be uncoupled more intensively from energy consumption.
- To achieve this, energy-efficient products would have to be designed, produced, used in an efficient operating structure, and recycled throughout all economic sectors.
- Intelligent ITC infrastructures and devices can make an important and beneficial contribution toward lowering energy costs and protecting the environment.