IBM Software: A green strategy for your entire organization

Executive summary

With today's market realities—rising energy costs; shrinking power and space capacity; increased regulatory scrutiny; and higher customer expectations—going green is not only socially responsible, it's an economic imperative. Traditional green IT strategies have focused on the data center alone, which accounts for only 2% of global CO_2 emissions.[1] For IT to impact the other 98% requires a new paradigm—one in which software is the key to realizing energy efficiencies throughout the organization—dramatically reducing environmental impact and energy costs. This paper explores optimization strategies around the key areas of people, workloads and infrastructure, including entry points, relevant solutions, and demonstrated benefits being achieved today with IBM Software solutions. Utilization of these capabilities can help you meet the increasing challenges of energy efficiency, cost containment and compliance.

Why go green?

There is a "perfect storm" gathering around energy consumption worldwide, as organizations and businesses face the unprecedented convergence of increasing energy demands and costs, diminishing capacities, heightened awareness and rigorous regulatory scrutiny.

Governments are placing tighter restrictions and regulations around energy generation and consumption. For example, the European Union (EU) announced that 20% of its total energy usage will come from renewable sources—a goal far beyond Kyoto requirements. Organizations have to improve their energy efficiency to comply with external and internal goals and regulations, be able to track their energy consumption and report on their improvements. Several regulations are already in place and more are coming.

Energy costs are increasing worldwide. Oil is projected by some to hit $200 a barrel. Energy availability is no longer a given. Customers worldwide are being capped on their available power. The impact spans all aspects of energy consumption but is especially critical with the rapid growth of data center needs. In a recent survey, approximately 70% of data center owners cited the availability of power and cooling as their number one concern.

We are simultaneously experiencing a change in how we do business. Online collaboration has reduced the need for travel, but the resulting rapid increase in worldwide collaborative operations and access to systems is pressuring IT systems to 24x7x365 availability, further increasing the energy demands of IT. It is estimated that IT workloads double every two years, driving the need for additional servers, storage, and supporting infrastructure—not to mention the staffing required to maintain these systems. The increased staffing enlarges the carbon footprint and further drives energy demand from facilities like office space, lighting, power and cooling.

There is also a growing social responsibility aspect that is particularly prominent in some parts of the world such as the EU. Organizations are realizing that being green is good for business, positively affecting brand image and fast becoming a competitive differentiator for customers, partners and suppliers. The fact that going green can reduce costs and thus improve the bottom line simply increases the level of interest in going green.

But how do organizations go green? Currently there is a focus on deploying more efficient systems and on tracking energy consumption. Projects with the primary focus of increasing greenness are also exploring optimization of business process along with infrastructure improvements. As the energy stakes rise, a more pervasive approach is essential. Software is the key component in helping organizations go green from the inside out.

How is software helping organizations go green?

When we think of "green" our first thoughts are generally around IT equipment and facilities requirements. We look at alternatives such as virtualization to improve server efficiency, or powering off unused equipment. However, IT accounts for only 2% of worldwide carbon emissions[1], so focusing green IT efforts on the data center dramatically limit potential results. Consider the following examples of how software can help:

- *Reduce commuting with online collaboration and increasing work from home*
- *Reduce business travel by using online collaboration*
- *Shift workloads to underutilized servers to reduce energy and floor space needs*
- *Schedule execution of workload to off-peak hours to use lower-cost energy*
- *Effectively manage asset life cycles*
- *Optimize applications to reduce needed IT resources and energy*
- *Consolidate and virtualize to eliminate floor space and computing infrastructure*
- *Optimize HVAC for hot spots to reduce energy consumption*
- *Effectively manage your data storage needs*
- *Reduce the power consumption when workloads decrease*
- *Optimize business processes to reduce the energy footprint and costs of operations*
- *Reduce use of paper by enabling business processes to use eForms and images*

IBM Software offers a broad range of capabilities to improve energy efficiency throughout the organization. With solutions for effective business process management, application development tooling, extensive collaboration offerings, optimized information storage and management, and system management software to manage and monitor energy consumption, software from IBM provides a critical linchpin for becoming "green".

IBM Software's capabilities help organizations to focus their efforts in three key areas—**People, Workloads, and Infrastructure**.

People directly and indirectly contribute to the carbon footprint in a range of ways, from the impact of the commute to and from the office, to the physical office space and its energy requirements. IBM Software enables organizations to optimize people resources and collaboration beyond boundaries to drive business growth while reducing travel and physical real estate costs.

The **infrastructure**—including data centers, buildings, factories and trucks—is a major consumer of energy; in fact, the industrial sector consumes 47% of worldwide energy demand.[2] IBM's software capabilities can enable organizations to visualize, control and automate the infrastructure to deliver new levels of power efficiency and to optimize operations by leveraging consolidation and virtualization.

Business **workloads** are executed by people on the infrastructure within organizations, and their underlying processes and applications directly influence energy needs. Effective workload management includes the ongoing improvement of business and IT information and processes to ensure that a continual focus is placed on reducing the carbon impact of the organization. IBM Software enables efficient execution of business workloads with processes and applications designed to maximize energy efficiency while meeting business needs.

Empower people to save energy

It isn't exactly news that the carbon footprint produced by commuting to work or related business travel is a large portion of the total daily carbon emissions produced worldwide. The United States alone releases 27 tons of CO_2 per person per year; worldwide, the average is estimated at 5.5 tons.[3] It is also estimated that **44%** of this CO_2 release is due to driving and flying.[3] Any actions taken to reduce these emissions will have a direct and positive impact on an organization's green efforts. Fortunately, today there are many collaboration tools available to help you achieve your green objectives without sacrificing organizational efficiency or customer satisfaction.

How to get started?

- *Reduce business and client travel with online collaboration*
- *Reduce employee commuting*
- *Enable collaborative online training*

One can easily reduce CO_2 emissions by eliminating travel to meetings utilizing IBM Lotus® Sametime® Web conferencing to conduct online meetings. You may find that you can run your meetings as effectively, and potentially more efficiently, than a typical face-to-face meeting.

Lotus Sametime Web conferencing capabilities provide fast, easy and cost-effective ways to schedule, manage and attend meetings. Lotus Sametime Unyte product offers the alternative of using a service provider to hold Web conferences and to further enhance your meetings with optional integrated audio and video capabilities. Work teams or customers can connect from different locations and collaborate dynamically, sharing presentation materials and documents in real time—and without spending the time, money and energy required for business travel. You can share files, and even desktops, and can let participants make updates to your files by giving them control of your desktop, or for example allow a help-desk consultant to take control for fast and easy technical support. Exchange ideas and arrive at decisions more quickly in a Web conference that includes group chat, instant messaging, whiteboard and polling capabilities. The reduction in carbon emissions associated with each Web conference meeting versus a face-to-face meeting will add up quickly in your efforts to be green. No travel is required, no traffic is produced, and no travel-related CO_2 is generated.

Optimizing People Activities

- *Lotus Sametime Web Conferencing reduces need to travel for meetings*
- *Rational Team Concert allows global development teams acting as local team*
- *Lotus Sametime enables organizational instant messaging anytime / anyplace*

Green collaborative efforts can also be directly applied to your software development activities. IBM Rational® Team Concert empowers your Development team to leverage development skills globally while working like a local team. Rational Team Concert allows your development process activities to be defined and will track completion of tasks and activities, keeping global team members current on completed and pending process steps. With Rational Team Concert, developer workspaces can be shared online between remote team members, allowing them to share design, development and debugging activities worldwide from their discrete locations—no commuting, no traveling and no carbon emissions.

With IBM Learning Accelerator for WebSphere® Portal, you can deliver education and training online asynchronously to customers and employees at the locations that are convenient for them. No need to assemble the attendees in a central location or provide an in-person instructor—the education is delivered when and where it is convenient for the recipient without incurring travel, emissions and costs.

No discussion of how to optimize people around green would be complete without considering the positive impact of resource virtualization will have. The hardware benefits of resource virtualization are detailed in the Infrastructure section of this paper; but the people benefits are equally important. A virtualized environment requires fewer physical devices and fewer people to support and maintain the physical environment. So for example, instead of requiring ten physical devices to run an application, you might be able to leverage virtualization to consolidate the workloads to fewer servers, eliminating the need to have someone configure and maintain the numerous physical machines, and allowing the associated people and infrastructure resources to be deployed to other activities.

Green benefits being achieved today

- *Approximately 42% of IBM's 350,000 employees do not regularly come into a traditional office, but instead work from remote locations like home or on the road, saving the company $100 million annually in real estate costs[4]*
- *One IBM customer reported savings of up to $70,000 for a single event from the reduction in hotel and travel costs by leveraging collaboration software[4]*

Optimizing workloads with green results

There are two important areas of optimizing workloads. First, there is the business workload that is defined by the business process activities that your organization performs daily. This business workload is represented by the multiple business processes that utilize people and consume energy for each process execution. Understanding your business processes and where the critical and expensive steps in those processes are will allow you to redesign and automate your processes or activities with a focus on reducing energy consumption. The second focus of workload optimization is the applications and systems that support the business processes.

The hundreds or thousands of software applications that run every day to support your business or organization indirectly have a carbon footprint associated with them. While applications don't get in a car and drive to work or take flights on business trips, they do utilize resources, and therefore, do drive energy consumption and CO_2 emissions. Applications require CPUs to execute the millions of instructions required to complete transactions and units of work. Storage devices for source code, executables and the information used and produced as the applications execute all consume energy and facilities space, and produce e-waste. While it may not be immediately obvious, there are actions you can take that will make your applications greener, reducing both the energy and resources required to keep your business running.

Optimizing Workloads

- *System z virtualization capabilities to consolidate workloads*
- *Rational Transformation Workbench to reduce application footprint*
- *IBM Tivoli Monitoring for understanding IT component efficiency*
- *FileNet Content Manager and IBM Content Manager eliminate need to produce and store paper documents*
- *IBM Service Management to automate processes*
- *WebSphere Business Modeler and WebSphere Business Monitor to model and monitor processes*

How to get started?

- *Replace paper forms with eForms in business processes*
- *Increase automation to achieve more with less environmental impact*
- *Model, automate processes and workflows, gain end-to-end process visibility*
- *Take advantage of SOA to dynamically allocate and optimize workloads across servers and applications*
- *Leverage charge back accounting for services consumed*
- *Address environmental regulatory requirements*

The same considerations that apply to making your daily life greener also apply to greening your applications. Are you using resources most efficiently? Are you able to reduce resource consumption? Should you consider a switch from what you are currently using to a more energy efficient alternative? Let's look at how to begin making your applications greener using the capabilities available from IBM.

Optimize your applications for green

There are many aspects you can consider: reducing energy and resources required to run the application, reducing the application footprint size, and reducing the physical storage requirements for the information storage needed by the application to store information.

To reduce the application footprint size you need to be able to determine how much of the application is really being used, and if there is unnecessary bulk in the application. The IBM Rational Transformation Workbench performs analysis on your application source code, looking for code that will never get executed. For large applications it has been estimated that Rational Transformation Workbench can be used to eliminate 15% to 20% of code from the application that would never have been executed, translating into green by directly reducing the application in-memory execution time footprint. This also translates into a reduction in the physical storage required by the application.

A key aspect of greening your applications is to increase the efficiency of the platform, or platforms, on which the applications execute. Reducing the number of physical machines required to run your applications will result in making your applications more efficient. DB2® for z/OS® and IMS leverage System z™ servers' virtualization capabilities to run hundreds of DB2 data servers on a single server, thus leveraging the cost benefits of data center asset consolidation. IBM Informix® Dynamic Server with extremely fast OnLine Transaction Performance (OLTP) means fewer servers, less power, and reduced space requirements.

IBM WebSphere Studio Asset Analyzer can be used to analyze the source code across your enterprise and can help you gain intellectual control over your code assets, enabling you to discover code that may be orphaned, code that can be moved to more efficient platforms, and code that may require change due to a proposed update. WebSphere Studio Asset Analyzer can be integrated with IBM Rational Asset Manager, supporting the governance of assets as they are shared, leveraged and moved through the development lifecycle. Sharing assets enables greater IT throughput with less waste and duplication of processing.

Utilizing SOA principles to decompose monolithic applications into reusable services will also help with your application efficiency and energy consumption objectives. You no longer have to dedicate specific servers to support the application but can instead dynamically allocate resources as needed to support the world associated with each service. The service performance characteristics defined for the services allow the SOA infrastructure to provision and allocate the needed resources to support the service workload and deallocate the resources when no longer required.

Optimizing the performance of applications can further reduce server energy costs by reducing server footprint and server processing time required to support the applications. System z provides the platform that you can utilize to achieve your footprint and optimization objectives. With the information learned from the WebSphere Studio Asset Analyzer results, you can utilize IBM Rational Developer for System z or IBM Rational Business Developer to build application processing and Web services for accessing data or functions now residing on System z servers. You can also enable new application functions using Enterprise Generation Language (EGL) produced with IBM Rational Business Developer. Rational Business Developer allows application developers familiar with high-level languages such as Java™ or COBOL to produce applications and Web services that will run on System z servers without requiring knowledge of System z servers. EGL deploys to various System z server runtimes, increasing an organization's effectiveness and flexibility. This results in your applications running on a single resource capable of extremely high throughput and reliability with a smaller carbon footprint and less e-waste than running the same application on multiple resources.

With system management tools such as those from the IBM Tivoli® Composite Application Management (ITCAM) family, customers can better understand the performance of their applications, detecting bottlenecks and inefficiencies, which can then be addressed to create a more efficient application. Likewise, IBM Tivoli Monitoring offers a range of system monitoring tools to monitor the efficiency of application components such as databases, application servers and operating systems. With the announcement of IBM Tivoli Monitoring for Green Energy, the Tivoli Monitoring capabilities have been extended to include power consumption and thermal awareness and management for these metrics, enabling a much-needed bridge for the bond between traditional IT awareness and the emerging "green awareness" needs.

As we look at effective deployment of application components, the ability to discover IT resources and their relationships provides an important tool for understanding the physical hosting of application components and their linkages. IBM Tivoli Application Dependency Discovery Manager provides this much valued functionality.

Optimize your processes for green

Your business and development processes should also be part of your green workload optimization efforts. Consider the impact of eliminating the flow of paper through your business processes, which are typically resource intensive. Utilizing FileNet® Content Manager and IBM Content Manager, you can eliminate paper associated with your processes and go paperless with digitized content and information assets. Content-centric business processes can be further optimized through FileNet BPM to reduce and simplify resource utilization.

Combining automated process workflows with digital process content allows you to move toward achieving a green process that is carbon neutral. IBM WebSphere Business Modeler allows you to model your business processes, reflecting both manual and automated activities. Once modeled, you can monitor these processes using WebSphere Business Monitor and optimize the processes with WebSphere Process Server or WebSphere Business Services Fabric to ensure optimum performance and efficiency.

The green benefits of digital records and process artifacts go beyond improving your processes. Eliminating the need to consume, store and manage paper documents and content translates into needing less facilities space for storage, and less energy to light, heat and cool that space. Archival and retrieval of digitized records further eliminates costs and CO_2 emissions associated with transporting paper documents to and from off-site storage facilities, which themselves require energy to light, heat and cool.

Optimizing your business processes for green allows that process to automate manual activities, and make activities that can't be automated perform in the most efficient manner and location. IBM Service Management (ISM) provides process workflows that allow automated assignment of tasks to any individuals, regardless of their physical location. Through Tivoli Asset Management for IT (TAMIT), employees can see, online, what tasks are awaiting their attention, what process artifacts are currently associated with the process and task, and what additional process artifacts are required to complete the task or activity. Through the use of Tivoli's Change and Configuration Management Database (CCMDB), resources and their relationships can be managed, and resources can be provisioned or updated, leveraging a rich change control process. If efficient management of incidents is a requirement, then Tivoli Service Request Manager is the answer. Through Tivoli's Service Management offerings, the full gamut of requirements for effective process management can be obtained.

Leveraging the Smart SOA approach enables you to achieve energy efficient processes. By utilizing the SOA foundation capabilities you can transform a monolithic process into a set of manageable and monitorable services utilized to support that process. Once you have your processes decomposed into services, the SOA infrastructure allows you to decide where and how those services are fulfilled in accordance with your energy efficiency objectives. You can quickly adjust your processes to react to changes in your energy efficiency goals or for factors external to your process but which could potentially keep you from achieving your goals.

In summary, to make your applications greener, utilize the many tools that are available to reduce the physical resources necessary to run those applications on fewer physical systems, while maintaining your service level but with less energy usage. Reducing the application footprint can reduce the carbon footprint associated with your applications. Effective monitoring and discovery of IT assets provides valuable information for ongoing efficiency management. Your processes can be made greener and more efficient, allowing tasks and activities to be managed and completed globally, with process content and records being stored paper-free.

Green benefits being achieved today

- *A large financial institution reported a reduction in average process cycle times by 50% with process automation and digitalized process content[4]*
- *A major consulting company was able to achieve carbon-neutral operations by automating internal content-based processes*

Maximize infrastructure efficiencies

Customers are instituting a range of solutions to improve their energy efficiencies. From industry leading data compression and tiered data storage techniques to increased use of virtualization; to tighter integration of IT and facilities; to monitoring and reporting on IT component energy usage—customers worldwide are placing a focus on understanding their energy utilization and addressing its impact from both a financial and environmental perspective.

How to get started?

- *"Smart" consolidation, virtualization and optimization*
- *Integrate management of your IT and facility equipment*
- *Efficiently compress information to reduce storage requirements*
- *Model energy usage by asset and location*
- *Monitor energy usage against thresholds*

The current growth rate of data is considered by many to be unsustainable, but there is much that can be done to manage growth and associated storage costs through IBM technologies that provide data compression, tiered data storage, and application retirement. IBM's leading enterprise data server platform, DB2, provides deep data compression capabilities that can reduce storage requirements upwards of 80%. Effective use of different types of storage that correspond to the value of information to reduce energy requirements can be achieved with IBM Optim.

An easy entry point for optimizing your infrastructure for green is to reduce the physical storage required for source, executables and information used and produced by applications, using the Storage Optimization Feature available with DB2 version 9. This improves energy efficiency by reducing the physical storage needed to support the application, which has the ripple effect of reducing energy and facilities space needs, plus the indirect reduction of future e-waste by not having to dispose of the storage in the future.

To further reduce the energy and facilities requirements associated with storing applications and data, another step could be to take advantage of blade servers. The IBM Information Server Blade is a completely integrated offering comprised of IBM BladeCenter® hardware, the IBM Information Server data integration software platform, and implementation services. This capability consolidates and moves massive amounts of data to increase business insight and manage growing information overload problems. IBM Information Server has long been implemented in grid deployments, demonstrating significant performance improvements and costs savings.

With the increased focus on energy awareness, many companies are now making an assessment of their data center efficiency. Collecting the data, analyzing it, and making improvements to the physical data center and its components are just a starting point. The data center is a living entity, constantly under change internally, but also under constant pressure for change due to variable outside influences such as political pressures, limits on available power, increasing environmental regulatory compliance requirements, and financial impacts such as ever-escalating power costs.

Ongoing monitoring of the data center and supporting facilities is addressed through the use of Tivoli products such as IBM Tivoli Monitoring (ITM), OMEGAMON, and Tivoli Composite Application Management (ITCAM). Tivoli has announced business partnerships with a range of the world's leading facilities providers—such as Johnson Controls, Eaton, APC, and Liebert—to provide integration between facilities elements such as power and thermal management. In addition, Tivoli Monitoring for Green Energy integrates with the IBM Systems Director Active Energy Manager™ capability to provide monitoring and management for IBM and selected non-IBM hardware, allowing, for example, the ability to manage the

power consumption of an IBM server while using the Tivoli ITCAM software to assure that the application response time is maintained. Maximo Spatial allows rich visualization of the datacenter, allowing one to visualize the temperature mix across the datacenter.

The usage of "energy aware" consoles and dashboards are also a focus for many customers. Through products such as IBM Cognos BI, WebSphere Portal, IBM Tivoli Business Service Management, Tivoli monitoring, IBM Lotus Insight Manager and IBM WebSphere Business Monitor, one can construct dashboards to reflect, analyze, and report on metrics and events relative to their green initiatives.

IBM's TotalStorage Productivity Center software helps the IT administrator address the need to maintain a highly tuned and energy-efficient storage environment. TotalStorage Productivity Center enables you to reduce wasted disk space and conserve disk space by identifying duplicate data, orphan data, temporary data, non-business data, and access frequency of data files that could be migrated to less expensive secondary storage platforms. Together with IBM's Tivoli Storage Manager, automated processes can be established to move aged data to tiered storage platforms like tape media, thus saving energy costs from all infrequently accessed spinning disk drives.

In the area of virtualization, storage virtualization complements server virtualization when it comes to maximizing data center efficiencies. The IBM System Storage SAN Volume Controller is designed to migrate data without disruption, making it easier and quicker to implement more energy-efficient storage. New space-efficient functions significantly boost storage utilization while providing the greatest flexibility in managing storage utilization within mixed-vendor storage environments.

Performance improvements on the server can provide substantial savings in infrastructure. IBM Lotus Domino® 8 introduced significant compression features that enable customers to save storage, reduce backup storage and system backup time, and reduce network usage. Savings range from 20% to 40% depending on usage patterns. Lotus Domino 8.5 will introduce further disk space reductions via the DAOS feature. For a simple example, if a group of 12 people on the same e-mail server receive an attachment of 5 Mb, only 5 Mb will be written to disk, a disk space savings of 92%. IBM Lotus Quickr™ further improves the efficiency associated with file sharing and storage by sending links to a repository instead of distributing large attachments.

Many customers are combining workloads to increase the performance utilization of their servers. IBM WebSphere Virtual Enterprise provides the ability to effectively aggregate and manage workloads while maintaining service levels, by implementing sophisticated workload classification and flow controls.

Virtualization of workloads—aggregating many logical images onto a single physical server—has long proven successful on System z servers. The acceptance of virtualization technologies across other hardware platforms has now reached the level where many production level workloads are now being consolidated. The ability to monitor and effectively account for virtualized workloads is provided by Tivoli Monitoring and IBM Tivoli Usage and Accounting Manager. As the dynamic movement and combination of workloads increase, capabilities such as those provided by IBM Tivoli Distributed Workload Broker will be key.

One can consolidate disparate applications onto a single physical machine with Tivoli Provisioning Manager (TPM). With TPM, one can, for example, provision a given server for use by one application during the day, and then reprovision the server with a completely different configuration (operating system, middleware, applications, resources, etc.) for use by a different application during the night. Coupled with IBM Tivoli Monitoring, TPM can track resource usage by the application and add or remove servers in order to maintain a higher target utilization.

Energy availability issues can, in some cases, be addressed by effective time-of-day management of IT demands. The IBM Tivoli Workload Scheduler provides the ability to effectively schedule work for improved efficiency.

Tivoli Monitoring for Green Energy integrates with IBM's Active Energy Manager, providing the ability to monitor and manage power consumption and temperatures across IBM's server and storage family and those of selected partners. This offering will also include a series of reporting around your green needs, allowing financial estimates for energy improvements such as server consolidation.

The introduction of targeted hardware solutions, such as those available from the IBM WebSphere DataPower® family of offerings, can improve the energy effectiveness of IT solutions. These specialized appliances can improve efficiency and reduce environmental impacts.

As we look at optimizing infrastructure, even the modest integration of IT and facilities elements provide a level of awareness never before possible. Through a series of close relationships with industry leading facilities and building automation providers, Tivoli will enable the integration of IT and facilities information enabling monitoring, visualization, and even automated actions for facilities.

Green benefits being achieved today

- *A major education institution reported a reduction in floor space of 40% – 50%, and a 30% reduction in power and cooling costs*
- *With DB2 9, a financial institution is seeing compression rates up to 83% on the data warehouse tables, with projected cost savings of more than $2 million USD initially, and projected ongoing savings of $500,000 USD a year*
- *A major corporation used a cluster of Information Server Blades at a cost of around $300,000 USD running 24 Intel® microprocessors to crunch through a massive data warehousing job in 45 minutes, compared to previously running on a $3 million USD server and taking five and a half hours*

Next steps: Choose your entry points

It has been estimated that energy costs consume 10% to 15% of an organization's IT budget, and this percentage is rising. Companies worldwide are looking at ways to make improvements in energy efficiency without impacting the quality of service provided. IBM is focused on helping companies achieve their green objectives with IBM Software capabilities that enable optimization of people, workloads and infrastructure.

So among those focus areas, where do you start? It is really up to you, as there are a variety of entry points, allowing you to choose the best paths for your organization. If reducing travel costs is a priority, consider collaboration solutions like Lotus Sametime Web Conferencing. If you have education requirements but no money in the budget for educational travel, utilize IBM Learning Accelerator for WebSphere Portal to allow delivery of education directly to the person's computer. If you are running out of capacity to run your applications while also being constrained on floor space or energy availability, IBM server virtualization capabilities managed by Tivoli software could help you address that problem. If your processes are labor and/or paper intensive, IBM's process automation and digital records capabilities can help.

Activities focused on managing data growth are critical. Compression of data, reduction of duplicate data, and other means to manage the growth of your data can improve your environment.

As you implement your green efforts, you will want to provide unified views of data center resources, IT services, and costs in the context of energy utilization. Also look to establish policy-based management to ensure efficient use of available resources and capabilities while maintaining service levels, and implement closed-loop monitoring and management to ensure optimal power consumption as workloads vary across business cycles. With the powerful capabilities and breadth of the IBM Software portfolio, there is no shortage of ways to reduce environmental impact, improve energy efficiencies and reduce associated costs.

For more information

To learn more about IBM Software solutions for a greener world, please contact your IBM marketing representative or IBM Business Partner, or visit the following Web site: **ibm.com**/software/green

[1] Green IT: A New Industry Shock Wave, Gartner, October 2007

[2] Curbing the growth of global energy demand – McKinsey Quarterly, July 2007

[3] The Nature Conservancy (www.nature.org)

[4] IBM Corporation