



Reduce the Energy and Environmental footprint of the Digital Economy with IPMPlus™

1 Overview

The onset of the digital economy has seen the rapid proliferation of smartphones, tablets, laptops, digital TVs, and the computer servers, networks and storage devices that form the back-end of the so called “cloud”. These devices are always on, consume significant amounts of power and cause environmental damage due to CO2 emissions and e-waste.

Power Consumption in the digital economy has now caught the attention of the mainstream media. It has been reported that the digital economy now uses a tenth of the world’s electricity with significantly negative implications for the economy and the environment. Several reports also show that the annual power consumption of an Apple iPhone to be more than that of a refrigerator.

With all the doomsday predictions of media pundits, it would appear as if spiraling power consumption and environmental damage is a fait accompli for all of us. It need not be. It is indeed possible to optimize the operations of these devices to reduce their power consumption and reduce their emission footprint, so that the digital economy is no longer a threat to the overall economy or the environment.

2 Mandating Energy Efficiency

Countries around the world are taking strict actions, supported by technology, for an energy efficient future. In the US, Energy Star (<http://www.energystar.gov/>) is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect the climate through superior energy efficiency. Under EPA’s leadership, American consumers, businesses, and organizations have made investments in energy efficiency that are transforming the market for efficient products and practices, creating jobs, and stimulating the economy. Now in its 20th year, the Energy Star program has boosted the adoption of energy efficient products, practices, and services through valuable partnerships, objective measurement tools, and consumer education.

Apart from EPA and Energy Star, energy utility companies provide extensive rebates and support programs for energy efficient technology deployments in various states. ComED, in the state of Illinois, provide \$15 per PC rebate in energy bills for installation of energy saving software in those computers (<http://pcpower-rebates-il.com/>).

Several other countries around the world are also mandating energy efficiency through reduced emissions and other means. It is expected that the Kyoto protocol will mandate these requirements with strict binding targets for reduction of emissions and e-waste.

3 What is IPMPlus™?

The IPMPlus™ brand of software was developed to address these power consumption issues in the digital economy. IPMPlus™ works across the entire spectrum of devices, from mobile phones & tablets to PCs & laptops to the back-end infrastructure of the digital economy. The core concepts & techniques behind IPMPlus™ have been patented.

4 IPMPlus™ Use Cases

Let us examine the IPMPlus™ differentiators through a few use-cases:

- **Watching Video** – assume that we're watching a Full Screen Video on a Handheld, Laptop or Desktop. Traditionally, using conventional techniques, no power conservation is possible. IPMPlus™ handles this situation in a different way, using its built-in intelligence. Most standard computers today have a CPU and a GPU (Graphics Processor Unit). Playing video requires a lot of GPU power but very little CPU power. Hence, IPMPlus™ minimizes the CPU power consumption, without making any changes to the GPU and display. This results in a great user experience, with about 20% power saved in most cases. A laptop with battery charge for 120 minutes can easily last for 140-150 minutes.
- **Media Presentation** – assume that we're showing a PPT. We cannot put the laptop on a power saving mode due to the risk of the screen going blank or the machine going to sleep or hibernation. IPMPlus™ intelligently recognizes this. It keeps the monitor on, while lowering the power consumption of other components like CPU and HDD. This results in around 50% savings, and a laptop with charge for 120 minutes will easily last for about 180 minutes.
- **Software Downloads** – all of us frequently download software and prefer downloading large software during off-hours, e.g. at night. If we activate the power saving mode, it blindly puts the machine to sleep or hibernation after some time. If we don't, the machine remains ON for a long duration resulting in wastage of power and reduced asset life. Once again, IPMPlus™ intelligently handles this situation. It recognizes the need to keep the machine on for the software download. It also recognizes that this activity doesn't require much power and accordingly shuts off the monitor and puts the CPU in low-power mode. Once the download is complete, it also silently puts the machine to hibernation.

5 Power Management using IPMPlus™

IPMPlus™ follows a four-step approach to Power Management – **Discover, Measure, Analyze and Optimize, Save**. The challenge in Power Management is in discovery and measurement of power usage patterns and initiating appropriate action to conserve power. IPMPlus™, with its pioneering software-based power metering (SoftEM™), helps organizations discover their digital assets, meter power consumption, analyze power consumption data and activate power savings through patented techniques.



Following are the key features of IPMPlus™:

- **Multi-OS, multi-platform support:** IPMPlus™ works seamlessly across handhelds, desktops & laptops, back-end servers, network equipment & storage arrays. It supports Android, Windows and Linux, Solaris, IBM AIX Operating systems. It also supports Intel, AMD, ARM, SPARC, PowerPC processor platforms. Individual users can be up & running, with IPMPlus™, in minutes while enterprises will take less than a day to be fully functional with IPMPlus™.

- **Fine-grained, application sensing:** Traditional power schemes operate at a macro level, using time-based interventions, activated only after the system goes idle, e.g. standby system after 5 minutes. The assumption here is that the system state becomes idle, only when the users stop interacting with it, irrespective of the applications running on the device.

IPMPlus™ uses a fine-grained, application sensing approach that does power management based on the specific needs of the applications running on the device. This makes the power management approach highly flexible for a large variety of usage scenarios. With its built-in intelligence, IPMPlus™ helps save power even when computers are in active use.

- **Non-intrusive:** IPMPlus™, through its application sensing approach to power management, is completely non-intrusive, i.e. it can seamlessly work with your existing systems without any adverse impact. This is unlike the traditional, time-based, macro level power policies that other vendors offer.
- **Support for Distributed Infrastructure:** In an enterprise, it is essential to support distributed infrastructure, which means operating in a multi-location, multi-network setup. IPMPlus™ is architected for distributed infrastructure through its management console and agent setup. Agents can reside on the individual devices, operating in a disconnected mode, and synchronizing with the console when necessary. The product is architected to scale **up to 100,000+ nodes and has been benchmarked and certified at IBM Innovation Labs in Bangalore, India.**
- **Automatic Power Metering:** Traditional power management methods are not capable of quantifying the power consumption and associated savings. This is due to the lack of a built-in power measurement capability. IPMPlus™, through its SoftEM™ power meter, provides a near real-time quantification of power consumption and savings achieved in the infrastructure (typically set to 10 minute intervals and accuracy up to 1 Watt-Hour). These numbers are also correlated to the cost of power and reduction in CO2 emissions, depending on the location of the enterprise globally. With its ability to discover and group systems, IPMPlus™ allows enterprise-wide Power Management Schemes, and by applying customized policies for different groups, it helps enterprises cascade Green IT targets to business functions across locations.

6 Power Metering through SoftEM™

Software-based power metering uses a software algorithm that detects the system configuration and other system parameters like CPU load and clock speed. These values are used by the power measurement algorithm to compute power consumed. The Power Meter provides 2 modes of calibration:

- **Automatic Calibration** – In this mode, the system fetches the power ratings of the device from the IPMPlus™ database. This works in most scenarios, where standard commercial models of computers are being used by an enterprise.
- **Manual Calibration** – This mode is useful when non-standard configurations are being used or highly precise power measurements are required. In this option, the equipment is manually calibrated using an industry standard power meter. This involves taking power consumption readings (in watts) for various power states like On, Off, Standby, Idle, etc. and adding them to IPMPlus™.

The above calibration data is correlated by the IPMPlus™ software measurement algorithm with the actual system usage (e.g. duration for which monitor is on or off, brightness of the monitor, clock speeds at which the CPU is running, etc.) to compute the power measurement.

The power measurement is done by IPMPlus™ agents and stored locally on each device. This data is synchronized with the IPMPlus™ Enterprise Console, usually at 10 minute frequency. This ensures that there is only minimal amount of network footprint for IPMPlus™ operations.

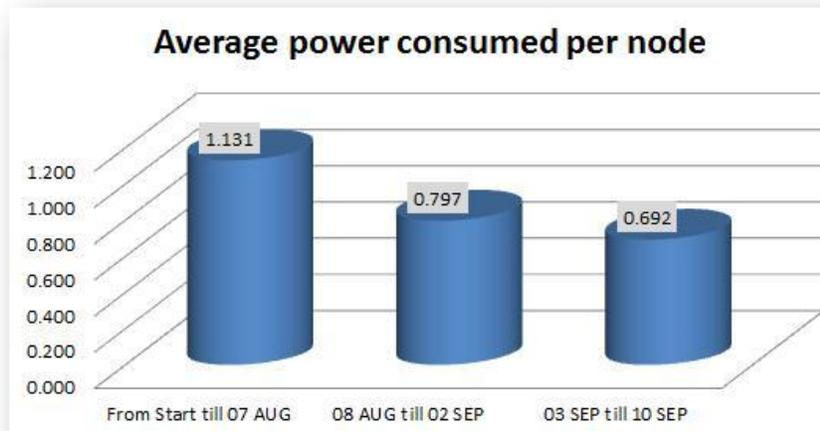
Power Measured is reported in Kilowatt-hours (kWh), at an aggregate level for the enterprise through the Enterprise Console. A breakdown for various groups as well as individual nodes is available in the detailed group-wise/node-wise power consumption reports. A snapshot of the IPMPlus™ Enterprise Power dashboard is shown below.



7 IPMPlus™ Field Results

IPMPlus™ has been extensively deployed in different organizations in India, across a wide variety of domains. The examples below illustrate the benefits of IPMPlus™, using results from the field.

- In a multi-national heavy manufacturing company, IPMPlus™ was able to significantly reduce the power consumption per-machine.



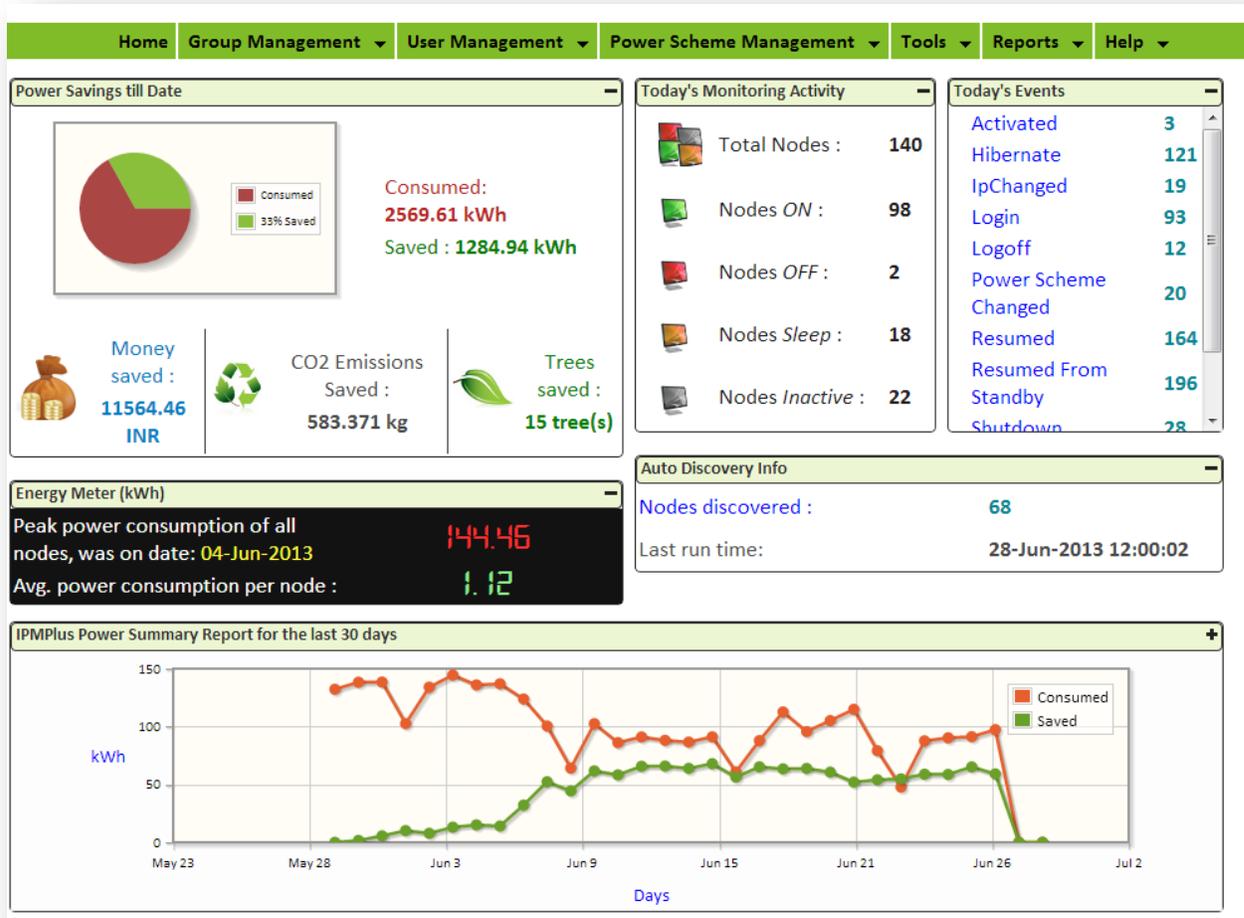
IPMPlus™ also provide sophisticated analytics, which can help derive deeper understanding of power usage patterns, as shown below for the same customer.



(b) In a defense sector organization, IPMPlus™ is helping extend the battery life of military grade rugged laptops, which is of immense value to the military. Following is a snippet of the results.

Test Case	Time taken without IPMPlus (Mins)	Time taken with IPMPlus (Mins)	Battery Extension (Mins)	Savings %
Idle Laptop - Full Drain	258	395	137	53.1%
Play Video - Full Drain	90	110	20	22.2%

(c) For a leading Healthcare Provider, IPMPlus™ helped achieve 33% energy savings amounting to 1285 units of electricity. The dashboard is shown below.



8 Product Certifications & Awards

- United States Patent on Fine-grained, Non-intrusive, Distributed IT Infrastructure Power Management System (U.S Patent – 8201007).
- Winner of Red Herring Asia Top 100 Awards, 2013.
- Winner of NASSCOM Technology Innovation of the Year 2013.
- Winner of NASSCOM IP4Biz Enterprise Product with strong IP, 2012.
- Runner-up of AIMA – Dr. J.S.Juneja Award for Creativity & Innovation for Micro Small & Medium Enterprises.



- IPMPlus™ is certified by Microsoft (Windows 7 & Windows 8 Certified).
- IPMPlus™ Enterprise Edition is an IBM Partner product.
- 100% clean software certification from Softpedia.
- IPMPlus™ is certified ComED software for energy rebates in US. (ComED in the state of Illinois (USA) provide \$15 per PC rebate in energy bills for installation of energy saving software in computers powered by electricity from ComED (<http://pcpower-rebates-il.com/>)).
- IPMPlus™ is also certified for energy rebates from San Diego Gas & Electric and Pacific Gas & Electric.