Intelligent Power Management
From Vigyanlabs Innovations

US Patent No 8201007 - Fine grain non-intrusive distributed power management
US Patent No 9477281 - Dynamic policy driven peak power management system
US Design Patent D783037 – On Sustainability dashboards
Patent pending – Adaptive power management
Patent Pending - Prediction Based Power Management
Vigyanlabs Innovations Pvt Ltd

- Founded in 2008 by IITians Srini and Vatsa
  - Founding team has 18 US Patents
  - Srini has 28 years of experience in the IT industry – was Chief Architect at DELL, Master Architect at HP, Principal Architect of AADHAAR
  - Vatsa has 38 years of experience in the IT industry – was Director Technology Innovation Centre at DELL, Chief Architect at HP

- Deep expertise in energy efficiency solutions
- Vision to provide clean and green solutions for a sustainable planet
- Beta Testing of IPM+ for Data Centres and Smart IOT Platform for customers in USA and UK
- Investors – Kumar Vembu – Co Founder Zoho.com

- IPM+ for Personal Computing Infrastructure
- IPM+ Intelligent Asset Analyzer (IAA)
- IPM+ for Data Centres
- IPM+ Smart IOT Platform for Energy Efficiency
What is IPM+ PCI

IPM+ is a **Power Management Solution using AI/ML** models for powering adaptive power policies to deliver 30% to 50% power savings.

It is **Non-intrusive ‘Application Sensor based’**, User interaction based, Fine grain Controlled. Resources are provided to applications based on their need at any point of time.

**Built-in Soft Energy Meter** measures both power consumption and savings for Laptop, Desktop, Workstation, Intel/AMD Imbedded OS Thin clients, Tablet and Smartphones.

IPM+ consists of two parts - A **centralized Enterprise Console** for Management and Analytics and **Agents** that communicate with console via a highly optimized, lightweight, non intrusive communication protocol.

IPM+ is Patented & optimized to use limited system resources like CPU, Disk, Memory and Network bandwidth. IPM+ Soft Meter is certified for + / - 10% accuracy to a Hard Meter by Big 4 Audit Co.

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**ON AN AVERAGE IT DEVICES**

**Waste up to 50% of Energy They Draw**

(Source: Climate Savers)

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**2B computers with 250M added each year waste 500 TWH – 35% of ICT eco system consumption**

(Source: Reference.com)
IPM+ PCI – Our Patented Approach

Traditional Approach

- Time Based Policies
- Intrusive
- Device /OS Specific and Non Scalable
- Energy Benefits Not Measurable

Machine Learning
- Usage Patterns
- Application Behaviors

HW Sensors
- CPU
- Ports
- Display(s)
- HDD
- RAM
- Fan

Application Sensors
- Downloads
- Scheduled Jobs
- Printing
- Background Jobs
- Remote Access
- VPN

Actions
- Change power States (S0 to S5), Shutdown etc.
- CPU & GPU Throttling, Core parking, Governor optimization etc.
- Fan & thermal Controls
- Port Level Power Control
- Battery Performance & Charging Control

Analytics
- Power Consumption
- Power Savings
- Performance
- Utilization
- Energy Metering

IPM+ PCI Advantage

- AI/ML Models powering adaptive power Policies on the edge
- Custom made granular power schemes
- One policy Many OS / Device
- Enterprise wide Energy policies – Utilization, Rule and group driven

✓ Time Based Policies
✓ Intrusive
✓ Device /OS Specific and Non Scalable
✓ Energy Benefits Not Measurable

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**Unified power policy across wide range of OS flavors**

**Patented Deeper / Finer power optimizations**

**In depth power analytics & reports**

**Self optimizing, Self improving Autonomous power schemes powered by deep learning models**

**Dynamic Auto grouping of nodes based on AD**

**Cloud Enabled – Azure**

**Patented application sensors – custom & auto (#8201-007)**

**Printer green analytics**

**Patented Software energy metering**

**Dynamic group, Rule and Scheduler driven power savings**

**Design patented sustainability dashboards**

**Custom power schemes like Active Stand-By, Deep AS**
Technical Overview

- **Agent – server architecture**
- **FreeBSD VM appliance as Enterprise server console**
  - PHP driven Enterprise console
  - Optimized FreeBSD Kernel with optimal memory disk based high performance architecture
  - PostgreSQL database
- **Native C++ agent code with very light footprint**
  - ~3.5 MB on disk, ~25MB in memory agent
  - Less than ~20KB per day per agent network load

- One of World’s largest banks
  - 240,000 nodes
  - 27,000 branches
  - 900+ dynamic groups
  - 20 Million events per day
- Powered by
  - 32 Core machine with 40GB RAM
  - 70% peak CPU usage
  - 75% RAM on average

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IPM+ Savings at India’s Largest Bank since July 2016

Baseline consumption: 61.67 GWh

Current consumption: 38.75 GWh

Savings: 22.92 GWh

22946 TONS OF CO2 SAVED

20.49 Cr Direct INR

2174 MILLION LITERS OF WATER

588363
IDEA REDUCED ITS ENERGY CONSUMPTION BY WHOPPING 65% in ON PCs USING IPM+ ENERGY MANAGEMENT SOLUTION

Idea’s Energy Management includes regular monitoring of energy consumption on a daily basis, which helps the company take corrective measures on an immediate basis. The company’s average square feet consumptions have reduced over a period and match the benchmarks for office spaces.

IPMPlus, which is a solution implemented by Vigyan labs to monitor and manage power utilisation by laptops and desktops, implements predetermined power management policies on the host system to curb wastage of power. IPMPlus has successfully enabled savings of around 65% in power consumption and helped reduce emissions. We are going ahead with 6,988 machines under IPMPlus solution, which will give us additional power savings.

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IPM+ Savings at a Leading Life Insurance Co for the period April’17 to Mar’18

Baseline, Consumption and Savings for Apr’17 to Mar’18

- Baseline kWh: 416
- Consumption kWh: 442
- Savings kWh: 858

Savings in Lacs(Rs)

- Baseline kWh
- Consumption kWh
- Savings kWh

ENVIRONMENTAL IMPACT

- 4500 PCs
  Laptop & Desktops
- 416 Mwh
  UNITS OF ENERGY SAVED
- 395 MILLION
  LITERS OF WATER SAVED
- 422.3 METRIC
  TONS OF CO2 SAVED
Annual Benefits achieved by Leading Housing Finance Co in Jan-Dec 2017

Equivalent Savings

- 1500 PC Desktops
- 43304 Kgs Coal Burned
- 12.96 Lacs INR
- 11.16 MILLION LITERS OF WATER
- 117.47 TONS OF CO2
- 2937 FULL GROWN TREES

IPM+ IMPACT per year, estimated benefits
Ref: EPA Greenhouse Gas Equivalence Calculator
Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
IPM+ impact is way beyond IT power savings
Significant savings in building cooling and energy consumption

A large multi-national BPO company implemented IPM+ across multiple buildings

<table>
<thead>
<tr>
<th>BEFORE IPM+</th>
<th>AFTER IPM+</th>
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<tr>
<td>Floor Area (SQFT)</td>
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<td>Consumption (KWH)</td>
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<td>Seats (Count)</td>
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<td>Consumption per seat (KWH)</td>
<td>80.7</td>
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<td>Floor Area (SQFT)</td>
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<td>Consumption (KWH) - Average</td>
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<td>Seats (Count)</td>
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<td>Consumption per seat (KWH)</td>
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</table>

~20% Savings on building energy consumption
IPM+ Pilot Savings at a leading Car manufacturer in India

**ENVIRONMENTAL IMPACT FROM 7000 PCS**

- **688 Mwh** UNITS OF ENERGY SAVED
- **654 MILLION** LITERS OF WATER SAVED
- **709 METRIC TONS OF CO2 SAVED**
- **17725**

**Savings kwh on 216 PC on 13 days** 1061
**Savings kwh Per PC / Day** 0.38
**Savings kWh Per PC (260 days)** 98.24
**Annual Savings (Rs) / PC @10/kWh** 982
Security Overview

• Strong Security Credentials
  – Security Audits & Risk Assessments by security experts with 20+ years experience in HP Security Labs
  – VAPT testing – 50,000+ test cases across 100 URLs and 900+ parameters
  – TLS 1.2+ / SSL for all communications
  – Privacy certification based on European GDPR in progress

• Security clearance certification
  – Certifications by Defence Labs
  – Certified by CERT-IN Govt. of India empanelled auditors
  – Certified by one of the largest banks in the world and deployed in more than 300,000 computers including all core banking branches
Security Testing

- **Security Auditing & Risk Assessment**
  - This involves a hands-on internal inspection of the software often including a line-by-line review of the source code to assess security issues within the software and to ensure that secure coding guidelines are followed
  - Tools Used: YASCA, CPP Check, RIPS, Manual Code review with detailed checklists including OWASP checklist elements

- **Vulnerability Scanning and Assessment**
  - This typically uses a third party tool with custom extensions and involves scanning the application both statically and dynamically for security vulnerabilities
  - Tools Used: BURP Suite with plug-ins and custom extensions including OWASP Top 10 coverage running on 100+ unique URLs covering 900+ parameters using 50,000+ test cases, nmap and Nessus scanner

- **Penetration testing**
  - This is typically the most effective way to practically find potential loopholes in the software. This involves trying to enter the application or its specific functionalities via various methods to find out unintended access
  - Tools Used: Customized Protocol Scanners and Network Scanner scripts, Custom Sniffers, BURP Suite custom plug ins

- **Authentication and Authorization testing**
  - This involves testing the entire access control and authentication mechanism for unintended access and hacking
  - Tools Used: Custom scripts, sniffers, capture and replay tools for role escalation, role switch, password hijack etc

- **Ethical hacking**
  - Conducted by our seasoned security experts involving various custom designed penetration testing methods
  - Experts who spent more than 20 years in HP Security Labs
### Power Consumption and IPM+ Savings under various environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Baseline / PC / Yr (kWh)</th>
<th>IPM+ Policy / Yr / Kwh</th>
<th>Savings / PC / Yr (kWh)</th>
<th>Energy Rate / Kwh</th>
<th>Amount (Rs)</th>
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IPM+ Dashboard – Power Module

ENERGY METRICS FROM THE TIME OF IPM+ INSTALLATION ON August 03, 2016

- 38% Energy Saved
- 4.27 MWh Energy Consumed
- 2.86 MWh Energy Saved
- 20385.31 ₹ Money Saved
- 2.66 mTon CO₂ Emission Saved
- 252.42 m³ Water Saved
- 66 Trees Saved

REPORTING STATISTICS

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<th>Total Devices</th>
<th>Reported within a day</th>
<th>Reported within a week</th>
<th>Reported within a month</th>
<th>Reported more than a month ago</th>
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<tr>
<td>50</td>
<td>32</td>
<td>7</td>
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ENERGY METER

- 14.33 kWh
- 0.026 VRA
- Peak Energy Consumed*: March 21, 2018
- Avg Node Energy Consumed per hour*: n.a.

COMPARATIVE ENERGY TREND

- Baseline consumption (KWh) (pre)
- Post IPM+ consumption (KWh) (post)

AVERAGE ENERGY TREND

- Node Count (pre)
- Average node energy consumed per day (KWh) (post)

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Few of our Customers

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HOW IPM+ HELPS SAVE OUR PLANET

**REDUCES**

- Electricity Consumption
- Cooling Loads
- Peak Load Demand Charges
- Air Pollution & Carbon Footprint
- Water Wastage

**IMPROVES**

- Laptop Battery Life
- PC Life
- Productivity
- Bottom Line

IPM+ helps to reduce heat emission from PC resulting in reduced HVAC load and drop in AC energy bills.

By reducing the power consumed in a PC by up to 50% IPM+ helps increase PC/Laptop battery life and hardware Life span.
Thank You.

JOIN THE EVERGREEN REVOLUTION

ipmplus.com  fb.com/IPMPlus