BASIC VS. INTELLIGENT PDUs
Understanding the Differences

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WHAT ARE THE DIFFERENCES BETWEEN BASIC AND INTELLIGENT PDUS?

Let's begin with the basics:

A rack mount power strip, or rack power distribution unit (PDU), is a device fitted with many outlets that distribute electric power to servers, storage devices, and networking equipment located within racks or cabinets in a data center.

Leading analyst firm IHS divides them into two main categories[1]:

1) **Basic PDUs** provide reliable power distribution.

2) **Intelligent PDUs** provide advanced features like power metering, environmental monitoring, and remote outlet control.

Intelligent PDUs can be broken down into the following subcategories:

a) **Metered Inlet PDUs**
b) **Metered Outlet PDUs**
c) **Switched PDUs**
d) **Switched PDUs with Outlet Metering**

Each subcategory of Intelligent PDU has features that can help data centers to reduce operating costs, increase uptime/availability, improve mean time to repair (MTTR), become energy efficient, and manage existing capacity.

[1] IHS Electronics and Media. (2013, November). The World Market for Rack Power Distribution Units – 2013 Edition

WHY IS CHOOSING THE RIGHT PDU IMPORTANT?

Finding Better Long Term Value

As IT buyers struggle with smaller budgets, a lower price point isn't just a deciding factor -- it's the deciding factor. Since basic PDUs retail for less, they may appear to be a better buy.

Others may not believe that the advanced features of Intelligent Rack PDUs provide additional value, or that their organizations have the time or resources to benefit from them.

As a result, many buyers choose basic PDUs despite the fact that Intelligent PDUs provide greater value and cost savings in the long term.

To understand why Intelligent PDUs are the better purchase, we must first examine the common issues they can resolve.

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MAJOR CHALLENGES NEARLY ALL DATA CENTERS NOW FACE

The single most important objective of the data center is to ensure business continuity. The rack PDU helps to do this by delivering stable, reliable, and adequate power to all devices – servers, storage, and networking equipment – plugged into it. But, consider some of the other major challenges faced by data centers.

- Power Capacity Management and Provisioning

- Energy Management

- Environment Management

- Physical and Network Security

- Computing Capacity Demand

- Asset and Change Management

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POWER CAPACITY MANAGEMENT AND PROVISIONING

Many data centers grow in a chaotic and unplanned way. Technicians often plug new equipment into the first available outlet with little understanding of how much electrical capacity is available. This can result in blown fuses and cause downtime.

In 2013, the average cost of downtime was **a staggering $7,908 per minute**[2].

[2] The Ponemon Institute. (2013, December). 2013 Cost of Data Center Outages.

$7,908
Average cost of downtime per minute

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ENERGY MANAGEMENT

12-18%

Capacity at which the average server operates

Many data centers support more infrastructure than needed. One report found that **the average server operates at only 12-18% capacity**[3].

The report concludes that the adoption of several best practices could cut electrical consumption by as much as 40%.

[3] Natural Resources Defense Council (NRDC). (2014, August) Data Center Efficiency Assessment.

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[3] Natural Resources Defense Council (NRDC). (2014, August) Data Center Efficiency Assessment.

ENVIRONMENT MANAGEMENT

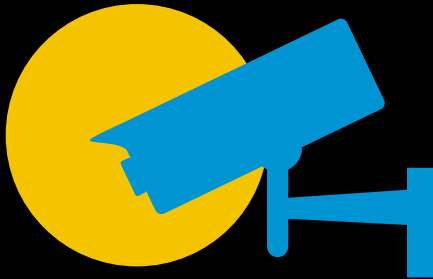While IT equipment accounts for 50% of energy costs, another 37% goes to cooling and circulating air.

Data centers often overcool to prevent equipment failure, but can **save up to 3% on their current energy bill for each degree Fahrenheit they raise the thermostat**[4].

[4] Gartner, Inc. (2013, October 7). Top 10 Techniques to Improve Data Center Cooling Efficiency

3%

Savings for each 1°F increase

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PHYSICAL AND NETWORK SECURITY

The demand for secure access control for cabinets and aisles is rising. In 2011, Health Net, Inc., one of America's largest publicly traded health care companies, reported a loss of information that compromised the personal health records of up to 1.9 million individuals nationwide when several server drives went missing from a data center managed by IBM.

It has also become important for data centers to meet regulatory frameworks like: SSAE-16, SAS 70, FISMA, FEDRAMP, PCI DSS, GLBA, HIPAA, and SOX. Why?

According to a recent study by the Ponemon Institute and IBM, the cost of a data breach to a company is on average **$145 per affected individual and $3.5M per incident**[5].

[5] The Ponemon Institute. (2014, May).
2014 Cost of Data Breach Study: Global Analysis

$3.5 Million

The average cost of a data center breach (per incident)

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COMPUTING CAPACITY DEMAND

Although data centers are simultaneously shrinking and expanding, the one trend that will remain constant for the foreseeable future is the demand for more computing capacity.

Gartner forecasts that 4.9 billion connected devices will be in use in 2015, up 30 percent from 2014, and will reach **25 billion devices by 2020**[6].

This rapid expansion will have far greater power requirements than data centers have ever experienced in the past.

25 Billion
Connected devices by the year 2020

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[6]Gartner, Inc. (2014, November 11). Gartner Says 4.9 Billion Connected "Things" Will Be in Use in 2015
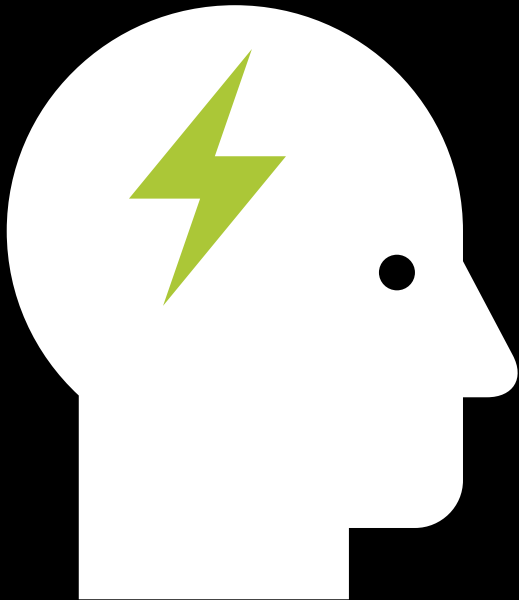
ASSET AND CHANGE MANAGEMENT

$714K
Yearly Cost of Misplaced Assets

For data centers that are expanding, keeping track of assets manually can be cumbersome and quite costly.

One study notes that the process of inventory collection, inventory reconciliation, finding misplaced assets,
manual repository updates, and replacement of misplaced assets has **a yearly cost of $714k and approximately 706 man days**[7].

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[7]Braswell, Keith. (2014, April 28). Automated Asset Tracking in the Data Center: How IBM Reduced the Time/Cost of Tracking Data Center Assets

CONQUERING THESE CHALLENGES REQUIRES AN INTELLIGENT APPROACH

In short, data centers are facing more challenges than ever before. These challenges need to be addressed in order to contain operating costs and meet new business demands. Data centers will need to make optimal use of power, space, cooling, and people.

The Intelligent PDU is the Platform That Can Address All of These Issues.

Now we will discuss how to select the right rack PDU for your data center, how to deliver reliable power to your rack, and how to create a reliable, operationally efficient, and environmentally sound data center for today and for the future.

Let's See How the Rack PDU You Choose Can Make All the Difference.

THE DIFFERENT TYPES OF INTELLIGENT PDUS

METERED INLET PDUS

Metered Inlet PDUs meter power at the PDU-level, and display the data both locally and over a network. Metering helps users determine power usage and available capacity of the circuits feeding the rack, which makes it easier to provision equipment.

By metering at the inlet-level, users can avoid overloading circuits and easily calculate efficiency metrics like power usage effectiveness (PUE).

METERED OUTLET PDUS

Metered Outlet PDUs meter power at the outlet-level, and can display the data both locally and over a network. Like metered inlet PDUs, outlet-metered models help users to determine power usage and available capacity at the rack, and facilitate provisioning.

Most importantly, outlet-level metering allows users to understand the actual power consumption at the device or server-level which makes it possible to compare efficiencies and allocate costs to specific business units or customers.

SWITCHED PDUS

Switched PDUs offer the features of Metered Inlet PDUs and also provide controlled on/off switching of individual outlets or groups of outlets. They enable authorized users to power cycle devices remotely in a specific order, offer power sequencing delays to minimize inrush currents, and prevent unauthorized device provisioning.

They are crucial in remote and colo facility deployments since they allow you to quickly restore service by rebooting servers. Devices that are not in use can be powered off remotely to conserve energy.

SWITCHED PDUS WITH OUTLET METERING

Switched PDUs with Outlet Metering combine all the capabilities of Switched PDUs with those of Outlet Metered PDUs.

TACKLING POWER, ENERGY, AND CAPACITY

Intelligent PDUs provide metering at the inlet, outlet, and PDU branch circuit level.

- Metering at the PDU inlet provides overall power data where power information on individual pieces of IT equipment are not needed - perhaps a rack filled with the same 1U "pizza box" servers. It also helps to ensure that you don't trip a breaker on the facility panel, and have enough capacity available.

- Metering at the outlet allows data center managers to meter individual IT devices, even ones with multiple power supplies.

- Metering at the PDU branch circuit level provides a warning if a circuit is becoming heavily loaded and runs the risk of tripping.

- Intelligent PDUs also monitor circuit breakers so that users know when and where a trip occurs, and are able to reset it quickly.

REAL-TIME DATA COLLECTION

Intelligent PDUs collect real-time current (amps), voltage, power (kVA, kW) and energy consumption (kWh) with +/- 1% billing-grade accuracy.

- Benchmark entire racks and individual IT devices to identify inefficient equipment and ghost servers for decommissioning, consolidation, or virtualization.

- Identify when more power is going to a rack than needed, and deploy the "stranded power" elsewhere.

- Use data to drive energy efficient behavior and support customer bill-back reports and sustainability initiatives.

- Intelligent PDUs also work alongside Data Center Infrastructure Management (DCIM) solutions to provide analytics and reports that alert you to trouble, and help you understand real-time power load, trends, and capacity at all levels of infrastructure.
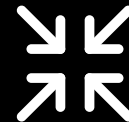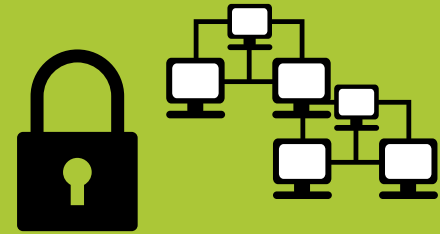
MANAGING DATA CENTER ENVIRONMENTS

Intelligent PDUs power plug-and-play environment sensors that help data centers make better use of cooling resources.

- Environmental monitoring sensors for temperature, humidity, airflow, and air pressure, give you the confidence to raise ambient temperatures and adjust fan speeds in CRAHs and CRACs.

- Sensor data viewed from DCIM Monitoring Software allows you to see temperature in real time across an entire data center or several data centers.

- Sensors allow you to optimize your data center ecosystem to ensure that you are meeting guidelines and set points, reducing operational costs, and improving your PUE.

- Environmental sensor data can also help you to discover and reclaim unused data center capacity and defer capital investments in equipment and facilities.

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SAFEGUARDING INFRASTRUCTURE

Intelligent PDUs support door lock systems that restrict access to individual cabinets, groups of cabinets, and entire aisles.

- Intelligent door locks control access to containment doors, and cabinet doors (front and back) using an ID card reader.

- All activity is logged: cards, users, lock/unlock history, open/closed doors, alarms.

Sensors supported by Intelligent PDUs can alert data centers to environmental hazards.

- Contact closure sensors can make a webcam snap a picture whenever a cabinet door is opened, and digital proximity sensors can detect motion around a cabinet.

- Contact closure sensors can support smoke detectors, while water/leak sensors can alert you to a broken pipe.

- Vibration sensors detect shaking from earthquakes or damaged fans.

- Operation, administration, and setup is centrally managed to ensure strict security adherence.

Intelligent PDUs also offer security protocols that eliminate unauthorized network access.

- Directory services support advanced authorization options and permissions, LDAP/S, RADIUS and Active Directory®.

- 256-bit AES encryption and strong passwords.

MEETING THE DEMAND FOR INCREASED COMPUTING CAPACITY

Intelligent PDUs can distribute the higher voltages needed to support high density deployments reliably, and prevent tripped circuit breakers with real-time metering at the rack PDU branch circuit.

- Running higher voltages at lower currents means smaller cables that use less copper, weigh less, use less space, and cost less.

- Higher voltages, especially when deployed as three-phase power, are a good way to increase rack power capacity without adding to cable clutter and blocking cooling air in under-floor plenums.

- High-powered racks, coupled with in-row or overhead local cooling, also eliminate the energy waste from moving air across a room since cooling is localized.

- Real-time metering at the rack PDU branch circuit provides early warning if a circuit is becoming heavily loaded and runs the risk of tripping.

- Rack PDU circuit branch metering is particularly important when dealing with high-power consumption devices such as blade servers, because higher draws create an even greater chance of tripping a breaker and experiencing unplanned downtime.

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REMOTE MANAGEMENT

Intelligent PDUs provide remote management capabilities to ensure data center uptime and staff productivity.

- Staff can use outlet-level switching to reboot servers and quickly restore services, especially when managing a colo facility or remote deployment.

- Remotely access power and environmental data from multiple PDUs without ever having to step foot in the data center.

- Sequence power across multiple PDUs to IT lab and production equipment with one or more power feeds to minimize inrush current and to boot up devices in a particular order.

- Send staff notifications via email, SNMP, or text message alerting them to potential issues that can lead to downtime.

- Provision outlets for new equipment without having to physically venture into the data center. Turnoff remaining outlets to prevent the installation of unauthorized devices.
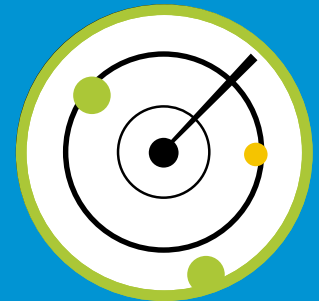
MAKING IT EASIER TO FIND AND MANAGE ASSETS

Intelligent PDUs support intelligent asset tags and sensors, and integrate with DCIM Operations Software to provide automated, accurate, and reliable asset management.

- Replaces Excel® spreadsheets, Visio® diagrams, and home-grown systems that are often labor intensive, inaccurate, and incomplete.

- Automates IT asset tracking to help you better understand exactly what you have and where it is located, down to the 1U-level.

- Manages workflow by enabling you to generate change requests, automate device moves, and maintain a complete audit trail of requests and work orders for compliance.

DCIM Operations Software goes outside of the rack and monitors your complete data center(s) including facility objects.

- Real-time views of your entire data center including servers, storage, networking equipment, rack PDUs, patch panels, and applications. Also, see floor PDUs, branch circuit panels, UPSs, RPPs, and CRAC units.

- Mappings of physical relationships between all of these devices allow you to see how the entire power and network chain in the data center is connected down to the port level.

CISCO SAVES $8.6M ANNUALLY BY DEPLOYING INTELLIGENT PDUS

In 2011, when Cisco sought to reduce its energy consumption and costs, its labs were an obvious target: they accounted for 60% of the company's total power use, yet occupied only about 10% of its real-estate space. The labs consumed more than 900MWh of power a year, had a combined annual electricity bill of more than $80M, and were the single largest source of operational greenhouse gas (GHG) emissions for the company.

The two-year initiative was completed in July 2013. Though the company saved $9million dollars total, over $8.6 million in savings alone were from intelligent PDUs deployed in all new, existing, and retrofit labs. One key feature that allowed the company to saved big was having the ability to power off lab equipment while not in use.

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F5 NEVER RUNS OUT OF COOLING CAPACITY THANKS TO ENVIRONMENT SENSORS

F5's product development lab in Seattle, WA, houses the work of 25 separate technology teams, and provides access to more than 300 developers and testers who test and deploy new software services while shuffling equipment in and out of the lab. So when the lab began running out of power and cooling capacity, something had to be done urgently.

"First we wanted to monitor all of the power for all of the teams that were in our lab. We wanted to see what they were using and we needed to be able to monitor at a high level," said Kiel Anderson, Senior Lab Network Engineer at F5. "Our next problem was that we were running out of cooling. We had a total AC outage here once and our entire lab had no air conditioning for four hours. About 30 minutes into it, it started getting too hot in there. These were both big drivers for pushing to get software for real-time monitoring," said Anderson.

DCIM software and environmental sensors were deployed as a part of a comprehensive iterative strategy that has produced a marked reduction in energy consumption and an increase in total capacity.

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EBAY'S NEW DATA CENTERS ARE TWICE AS RELIABLE AND 50% LESS EXPENSIVE TO OPERATE

As one of the world's largest Internet commerce platforms, eBay demands extreme data center reliability; any downtime would impact transactions worth more than $2,000 a second. Thus its global data center team must excel simultaneously in delivering uptime and flexibility, while keeping costs down – a truly complex challenge, requiring constant innovation to be successful.

To enable maximum savings, eBay deployed Intelligent rack PDUs that provide precise energy consumption data for every single power supply, of every single server. This information passes upstream to eBay's building management and asset tracking systems in real time, achieving what Green Grid terms PUE Category 3 (or PUE3) monitoring.

"[Intelligent PDUs] can provide me with the precision required to calculate my true operational costs for every server, down to the last penny," says Dean Nelson, eBay's Senior Director of Data Center Strategy and Operations.

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UF HEALTH SHANDS SAVES 50% IN ASSET TRACKING EFFICIENCY WITH DCIM OPERATIONS SOLUTION

When the Shands IT team in Gainesville, Florida became responsible for three additional data centers, the team began looking for new tools that would help answer what equipment was in each data center and exactly where every server, UPS, and device was located – and how they were connected.
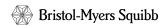
The old way of tracking IT assets, Excel spreadsheets and Visio floor plans, was not flexible enough to support the added scope of multiple remote data centers – nor the ever-increasing demands on IT to support changes for a growing business. The IT team wanted a better and efficient way to track assets and capacity.

"We now have a seamless workflow process – from ticket creation to data center deployment. Requests come into the service desk, which then places the request into [DCIM Operations Software]. Based on space, power and network connectivity information, [DCIM]… helps pick an optimal location for placing the server," says Joseph Keena, Manager of Data Center Operations at UF Health Shands.

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UFHealth
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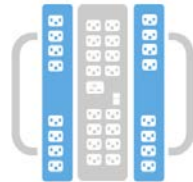# LEADING COMPANIES THAT KNOW MORE AND MANAGE SMARTER WITH INTELLIGENT PDUS

SEE HOW RARITAN CAN CHANGE THE WAY YOU MANAGE YOUR DATA CENTER'S BIGGEST CHALLENGES

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+31 (0)10 - 284 40 40

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EUROPEAN HEADQUARTERS
Jan van Galenstraat 59
3115 JG Schiedam - The Netherlands

Phone: +31 (0)10 284 4040
Email: sales.europe@raritan.com

RARITAN FRANCE
120, Rue Jean Jaurés
92300 Levellois-Perret - France

Phone: +33 (0)1 4756 2039
Email: sales.france@raritan.com

RARITAN UNITED KINGDOM
4th Floor, 25-26 Lime Street
London, EC3M 7HR - United Kingdom

Phone: +44 (0)20 7090 1390
Email: sales.uk@raritan.com

RARITAN GERMANY
Kaistraße 18
40221 Düsseldorf - Germany

Phone: +49 (0)375 / 271 349 47-99
Email: sales.germany@raritan.com