The Future of Green IT: Top Technology Strategies Organizations Can Implement to Save Energy and Costs

White Paper | Parallels Remote Application Server

Introduction

For many organizations, achieving more energy-efficient IT operations is a top priority. The energy costs associated with information technology can be extremely high, prompting many companies to look for ways to reduce their consumption and shrink their carbon footprint.

Today's employees rely on an array of computing devices to work. Smartphones, laptops, tablets, desktop computers, and more all rely on energy to operate.

But as computing power increases, so does energy consumption. According to Digital Information World, communication networks consume 36% of global energy, data centers consume 30%, and computing devices consume 34%.

One of the most efficient ways to reduce energy costs in data centers is through virtualization technology. The virtualization process develops a software-driven or virtual representation of an organization's IT environment, which can include servers, virtual applications, and networks.

The right IT decisions can play a crucial role in cutting an organization's energy costs. Reducing the amount of power required for data center operation can lessen the amount of electricity generated from fossil fuels, which are a direct contributor to greenhouse gas emissions.

Green IT strategies aim to reduce the costs and environmental impacts associated with traditional IT. Cloud migrations, server consolidation, and virtualization are all key components of a company's green IT initiatives. Green data centers can offer the same features and functionalities of traditional data centers but use less energy and space.

The use of cloud computing, virtual machines, and other virtualization innovations can help increase computing power without consuming excess energy.

In this white paper, we will explore how organizations can reduce their IT energy footprint and become greener through the creation and adoption of IT programs and services.

Top Sources of Energy Costs in the IT Sector

Energy usage accounts for nearly 20% of annual costs for a standard office building. A company's IT department typically consumes most of the energy and power. According to the Commercial Buildings Energy Consumption Survey (CBECS), computers and associated equipment account for the largest share of electricity consumption.

Data centers are key contributors to this excess consumption, requiring significant energy to manage network devices, storage drives, servers, and cooling and power provision systems.

In the US alone, industry experts estimate that data centers consumed over 90 billion kilowatt hours of electricity in a single year. This rate of consumption shows no sign of slowing. By 2030, experts estimate that IT-related energy usage will increase by 50%.

Plug Loads and Data Centers

In today's digitized world, businesses depend on their hardware and software technology stacks to remain competitive. From computers to servers and everything in between, an organization's office and IT equipment accounts for a significant amount of its total energy demand.

Plug loads are a key source of energy waste in an office, comprising approximately 30% of total electricity use. A plug load is the energy used by any equipment that is plugged in to an outlet, such as computers, monitors, and imaging equipment (e.g., printers and copiers).

Desktop computers, for example, use 60 to 300 watts of power to operate (or more if they contain special features like power graphics cards).

Data centers are also energy-intensive, using 10 to 50 times the energy demand of typical commercial office spaces. This is because they support the network infrastructure, servers, and digital storage equipment required to meet demands for data creation, processing, and storage.

According to the International Energy Agency, data centers consume approximately 200 terawatt-hours (TWh) of electricity per year. This translates to nearly 1% of global electricity use.

Cooling and Ventilation

In addition to direct energy consumption, data centers consume large quantities of water to control and dissipate heat throughout the facility.

Traditional data centers need extensive cooling systems, and cooling is the highest operational cost outside the equipment load itself. Around 40% of a data center's energy consumption goes to powering its ventilation and cooling systems.

A standard data center uses around 3 to 5 million gallons of water per day to keep equipment from overheating, equivalent to the amount used in a city of 30,000–50,000 people.

According to the US Department of Energy, a midsize data center uses approximately 130 million gallons of water annually, which is roughly the same amount of water as three average-size hospitals.

Server Sprawl and Underutilization

Servers make up a large portion of a company's IT legacy hardware. With an average lifespan of three to five years, aging servers often lack the processing power required to handle processor-intensive workloads.

This means that it takes more legacy servers to do the same amount of work as a single new server, which increases server sprawl within the data center. Overcrowding due to server sprawl raises related facilities and energy costs.

Inefficiencies in how systems are used also contribute to excess energy costs in the IT sector. When idle, most servers still use 50% of their rated power. The average utilization rate of physical servers is 20%, meaning even idle servers use significant amounts of power at high costs.

Underutilization of servers can also create "zombie servers," which run with no visibility or external communications, and contribute no useful function or computing resources.

Around 30% of physical servers in data centers are considered zombie servers, and estimates suggest that there are over 10 million zombie servers worldwide. The energy waste from these systems is equivalent to the electricity generated by eight major power plants.

Unused and underutilized servers also take up significant physical space in a data center, increasing IT energy costs by having them plugged in and the cooling requirements to protect this heat-generating equipment.

5 Strategies to Reduce IT Energy Costs

It's clear that your organization's data center and IT equipment power requirements can greatly increase operating costs. Fortunately, there are several ways to reduce your company's IT energy footprint, benefiting both the environment and your business's bottom line.

1. Virtualize Your IT Environment

Virtualization is the process of using software to create a virtual version of something, including servers, operating systems, network resources, and storage devices.

By deploying virtualization technology across their digital assets, companies can improve server usage by approximately 40%, increasing it anywhere from 10–20% to 50–60%. Virtualization can help a company consolidate physical servers, decrease energy consumption, and enhance server utilization.

A virtualized IT environment does more than reduce hardware requirements. It also helps reduce costs associated with data center storage space, power, heating, and cooling requirements.

Consolidating servers through virtual machines can reduce an organization's energy costs by 40–80%. In addition, each virtual machine runs its own operating system, essentially functioning like an independent endpoint device, all while running on just a portion of its underlying hardware.

2. Migrate to Cloud Storage and Computing

Transitioning from on-premises deployments to cloud services is another way to help reduce data center cooling and energy requirements. Cloud storage gives organizations the ability to save data and files on remote, off-site storage systems that are accessible through the internet.

Cloud computing facilitates on-demand availability of system resources, such as storage, databases, software, and servers. Organizations that leverage cloud computing can access resources hosted at a remote data center, rather than having to install and maintain them on-premises.

With cloud computing, companies can use fewer servers and reduce energy consumption, lowering the data center's carbon impact.

When companies use their own private data centers, they often have low utilization rates because they purchased excess equipment in anticipation of server usage spikes. Cloud storage, however, consolidates hardware use and operates servers at high efficiency rates.

According to the International Data Corporation (IDC), cloud computing adoption could save billions of tons of CO_2 emissions by 2024. This is because large-scale cloud storage centers are more effective at managing power capacity and cooling requirements and leverage the most power-efficient servers.

3. Embrace Remote and Hybrid Work Models

The business world has undergone a digital transformation over the past few years, with remote work shifting from a "nice-to-have" perk to a "must-have" expectation for many companies.

Remote work contributes to energy conversation in several ways. For example, less vehicle traffic means reduced gas consumption, fewer emissions, and improved air quality.

The average home also consumes much less energy than an office building. While the energy costs shift to the employees, studies suggest that home energy use is around half of office energy use. Allowing employees to work remotely decreases power consumption at brick-and-motor offices and workplaces.

Employers reap the savings from reduced employee overhead, while employees save costs associated with in-office work, such as paying for gas, parking passes, lunches, and more.

Remote work opportunities not only reduce a company's IT energy footprint—they also save employers an average of $11,000 per year per half-time remote worker. Extrapolate that to a full-time scenario, and every remote worker is reducing company costs by $22,000.

4. Minimize and/or Eliminate Idle Equipment

Relative to its capacity, IT equipment tends to be underutilized. Idle equipment still consumes power, wasting energy while increasing a company's utility costs.

Removing a single unused or underused server can save $500 in energy costs annually, in addition to cost savings relative to hardware and licensing requirements.

Start by taking an inventory of your data center, looking at all of the servers to identify those that are performing limited, single or infrequent tasks.

Distributed computing can minimize idle IT equipment by linking computers into clusters over a network in order to share data and processing power. These clusters can be easily scaled through a scale-out architecture, which manages higher loads by adding new hardware instead of replacing existing hardware.

In a distributed computing environment, each computer in the cluster runs in parallel, allocating different tasks to different computers to increase overall performance. The computing clusters will also copy or replicate data across all the servers, eliminating the risk of a single point of failure.

Distributed computing systems often use low-cost hardware. While the initial deployment cost is typically higher than a single system, distributed systems can be more cost-effective over time thanks to their scalability.

5. Improve Cooling Processes

As mentioned, electrical equipment generates vast amounts of heat, requiring efficient cooling to keep them within an optimal temperature range. Around 40% of a data center's energy is used by cooling systems. Fortunately, there are ways to reduce power consumption while still protecting temperature-sensitive equipment.

Variable-Speed Fan Drives

Traditional computer room air conditioning (CRAC) units rely on standard fans that cannot vary in speed to match the data center's heat load.

Variable-speed fan drives only consume power while in operation, and their running speed is determined by advanced thermostatic data measurements. By slowing down during low CPU usage, variable-speed fans decrease power usage with each non-turning blade.

Reducing fan speed can decrease overall power consumption of data center equipment by 20%. A fan's power draw has an exponential relationship with its operating speed. As such, reducing the fan speed by 20% will generate almost 50% savings in energy consumption.

Numerous options are available for retrofitting CRAC and computer room air handling (CRAH) units with variable-speed fan drives. When purchasing new servers, look for those that come standard with variable speed fans to deliver sufficient cooling while running slower.

Liquid Cooling

Another option companies can explore is liquid cooling, which is more effective than using fans to blow air across heated equipment. Liquid cooling uses liquid to dissipate heat, similar to the way a car radiator works.

In a data center, a closed system of tubes carries the cooling liquid from one component to another. The pumps that power the liquid cooling system consume less power than fans in traditional CRAC/CRAH units.

Several options are available when it comes to liquid cooling technologies:

- Liquid immersion cooling transfers heat through direct contact with server components that are submerged in the coolant bath. The heated coolant exits through the top of the rack, circulates through a water loop to a cooling mechanism, and a heat exchanger returns cooled liquid to the rack.
- Rear-door heat exchangers are mounted on the back of hardware racks to pull hot air from the equipment. They are often used to maximize the efficiency of air conditioning systems and can save up to 50% on overall data center energy costs.
- Direct-to-chip cooling uses a cold plate to remove heat from high-power rack components. They typically have greater heat removal capabilities than rear-door heat exchangers and can be integrated with both new and existing servers.

  This cooling process can remove up to 75% of the heat generated by rack equipment, so it works best in a hybrid approach with other cooling technologies.

While liquid cooling has higher upfront costs than traditional air-cooling techniques, its efficiency leads to lower operating costs. This is because liquid cooling allows for better space utilization, reducing the data center's footprint while supporting high processing density.

Advance Your Green IT Initiatives with Parallels RAS

As evidenced in this white paper, there are several strategies organizations can use to make progress on their green IT initiatives.

Virtualization technologies make more efficient use of available resources, including energy. By installing a virtual infrastructure, organizations can enable multiple operating systems and applications to run on fewer servers. This reduces overall energy use, cooling requirements, server sprawl, and storage requirements.

Parallels® Remote Application Server (RAS) is a leading virtual desktop infrastructure (VDI) solution that is simple to install and maintain. It enables remote and hybrid employees to safely access work files, applications, and desktops from anywhere, on any device—including personal devices, such as laptops, smartphones, and tablets.

Parallels RAS helps contribute to green IT initiatives in a number of ways, from virtualization to reducing hardware costs, deploying cloud environments, enabling a fully remote workforce, and more.

Virtualization uses fewer physical machines and has lower system cooling requirements. Implementing VDI solutions can help lower organizational electricity consumption and costs.

Parallels RAS pairs well with thin client devices, which are energy efficient and have a longer lifespan than traditional PCs. This helps lower the carbon footprint within a company's data center.

The solution also enhances the delivery of virtual applications and desktops in public cloud services, hybrid cloud deployments, and on-premises private cloud infrastructures. Virtual desktops and applications prolong the use of existing hardware by enabling it to be accessed remotely, which extends its usable shelf life.

Parallels RAS enables organizations to reduce their IT energy costs and advance green IT initiatives by:

- Creating a secure digital workspace with virtual desktops and applications, enabling remote work opportunities.
- Transforming any thin client into a fully functional workstation, reducing energy overall consumption.
- Enabling the use of virtual machines, which require fewer data center servers, thus reducing energy consumption and cooling costs.
- Allowing employees to use their own devices, which reduces organizational hardware costs and enables companies to invest these funds into furthering green IT programs.

Learn how Parallels RAS can help your company advance green IT initiatives and save costs.