Data Center Carbon Footprint Analysis with UnityOneCloud

What Was Once Diffused And Wasteful Can Now Be Consolidated And Highly Efficient

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Introduction

To run applications, facilitate electronic communications, and provide productivity tools, every large firm relies on massive arrays of servers. However, data center construction and operation consume a significant percentage of technology budgets and add to greenhouse gas emissions. Data centers account for half of the carbon footprint of some information-intensive companies.

Carbon footprint analysis, which provides a glimpse of how a specific company may be contributing to the economy's carbon intensity, has caught the interest of corporate executives and investors. From a business standpoint, increasing carbon intensity transparency can help better manage emissions and analyze business risks and opportunities. When it comes to emissions, the old saying "what gets measured gets managed" holds true; Because emissions are closely tied to energy prices, this tracking can directly impact a company's profitability.

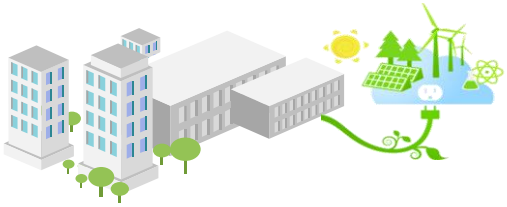
Carbon footprint analysis can be used to determine a company's absolute and relative efficiency and engage management and determine whether the organization is moving on the right path. Efficient emission management reflects the quality and rigor of operations and has the potential to provide a competitive edge. At the very least, it acts as a tool for better understanding the company's operations.

The International Energy Agency estimates that 1.0% of all global electricity is used by data centers and that by 2025, data centers will consume 1/5 of the world's power supply.

According to IDC, If all data centers in use in 2024 were designed for sustainability, then 1.6 billion metric tons CO_2 could be saved during 2021-24.

IDC predicts that cloud computing could help to prevent more than one billion metric tonnes of CO_2 emissions during 2021-24.

With the goal to reach 24/7 carbon-free energy by 2030, we can demonstrate that a carbon-free economy is possible. Our data centers are large power consumers, and if we can achieve 24/7 carbon-free energy for our data center fleet, economically, we can demonstrate that carbon-free electricity grids are within reach.



Our Sustainability Approach

We have set emissions reduction targets for our global operations and data centers that we have been striving to achieve in 2030. These targets reflect our commitment to reducing the impact of our operations on the environment.

Our Strategy

Reduce emissions from purchased energy by increasing dependence on renewable energy

- Target: 100% renewable energy globally by 2030

Reduce energy consumption by building energy-efficient data center facilities

- Our corporate design standards track closely to green certifications criteria in order to meet best-in class sustainable building standards
- Retrofitting for LED lighting, redesigning and our heating, ventilation, and air conditioning (HVAC) systems to more closely correlate to occupancy and efficiency

Key Things To Analyze Data Center Carbon Footprint

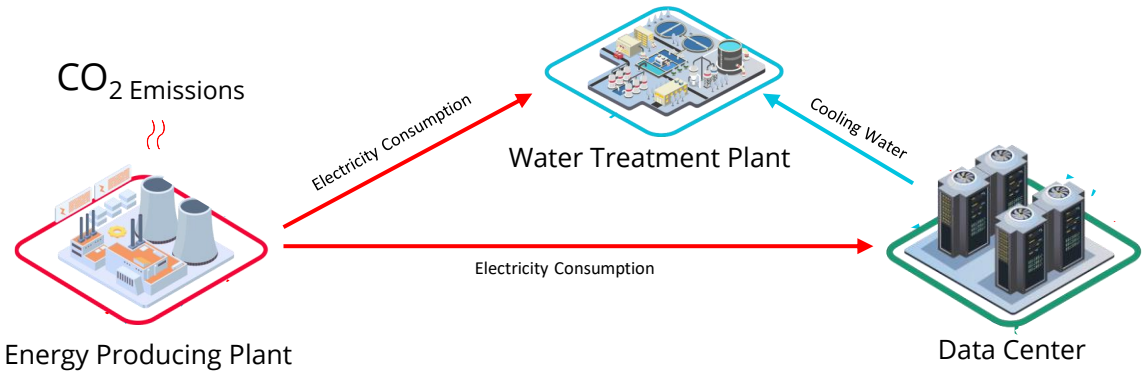


Figure 1. Data Center Carbon Footprint

Power Usage Effectiveness (PUE)

The server room or data center where the servers running the applications are housed must have their Power Usage Effectiveness (PUE) measured. PUE, or power usage effectiveness, is a metric used to assess efficiency in the data center sector. A PUE of 2.0 reflects that for every watt of IT power consumed, another watt is used to cool and deliver electricity to the IT equipment. When the PUE is close to 1.0, almost all of the energy is needed for computing.

Resource Utilization Factor

Measuring how much of the server's maximum processing capacity is being used successfully is also important. The utilization rate, which is commonly expressed as a percentage, is defined as the overall extent to which data center servers are used.

The Carbon Emission Factor

The CO2 emissions of the energy sources should be measured to quickly assess the relative sustainability of the data centers, compare the results, and determine if any energy efficiency and/or sustainable energy improvements need to be made. The CO2 emission is measured (kg CO2e per kWh) of the electricity used to power the server room (PDU) or data center (Facility)

Challenges In Reducing Data Center Carbon Emissions

A carbon emission factor of purchased electricity is required to calculate the carbon footprint of a particular data center. Two identically sized and designed data centers using electricity produced by different generation means, such as renewables, hydropower, natural gas or coal, will have a potentially very different carbon footprint (factors can vary by a factor of nearly four depending on the region in the US itself).

No One Power Source for Energy

Electricity Generating Utilities Does Not Depend On One Power Source

The utility, which generates various forms of raw power into electricity, is rarely one monolithic entity. Utilities generate their power from several sources: coal, natural gas, oil, nuclear reactor, hydroelectric, tides, and wind farms.

All Power Sources Have Different Carbon Intensity

The electricity may get generated from varying CO2-intensive plants. For, e.g. Coal or Gas-operated Energy Utilities generate more CO2 than hydro or wind-powered energy utilities.

Not All Power Sources Have Same Carbon Intensity

Carbon Emission by Energy Source Type

Fuel Type	Percentage Of Global Primary Energy Supply	Percentage Of Global CO_2 Emissions
Oil	34%	38%
Coal	26%	42%
Natural Gas	21%	20%
Clean Energy*	19%	0%

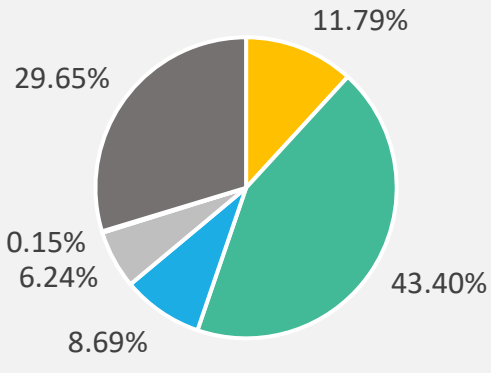
*includes nuclear, hydro, geothermal, solar, tide, wind, combustible renewables, and waste

Source Of Power Varies By Location

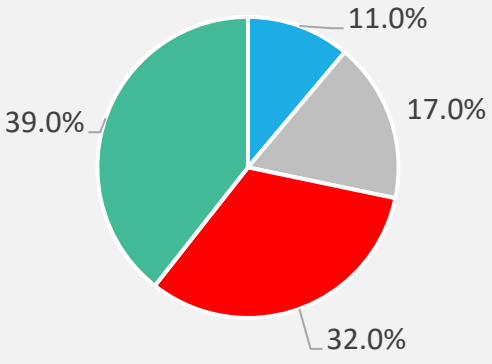
Not All Geographic Locations Have Same Source Of Power

The local source of power generation has a major impact on a data center's carbon Footprint. The power source used by these Energy utilities may vary to a large extent at different locations.

Power Source in California



Power Source in Texas



Solar Natural Gas Nuclear Wind Coal Renewables

Measures To Reduce Carbon Footprint

Infrastructure Virtualization

The single largest factor to increase the efficiency of typical server rooms is higher server utilization. for e.g., through virtualization or adopting Software Defined architecture of the Data Center facility.

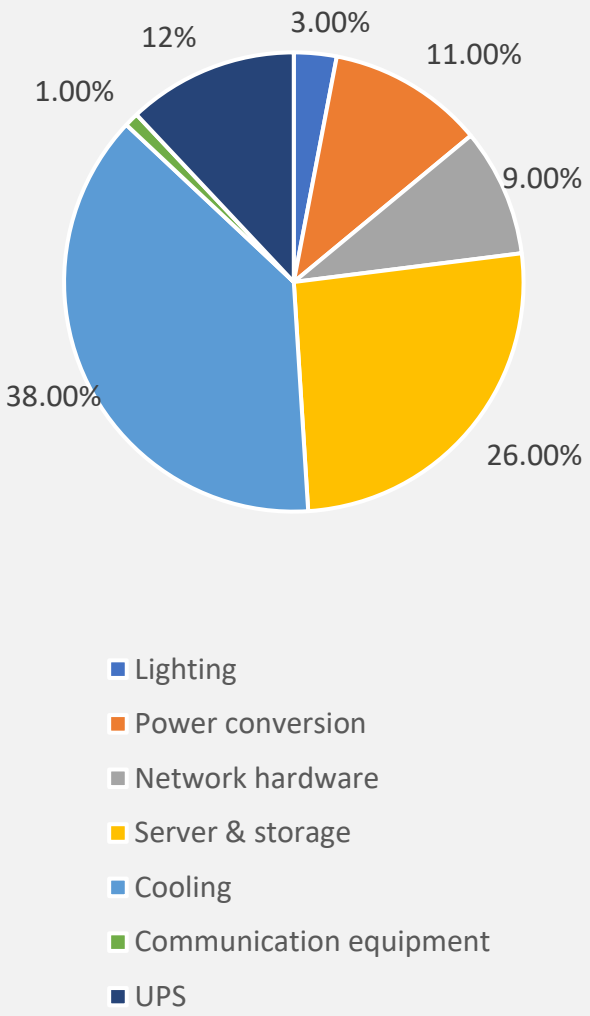
Kill Zombie Servers

A study conducted by Stanford University found that about 30% of servers in data centers were described as “comatose” or “zombie” which doesn’t provide computing facility for at least six months. It is estimated that electrical usage could be reduced by 40% through eradicating comatose servers and improving energy efficiency..

Data Center Building

Physical construction, natural cooling, light, and ventilation are all part of the data center's architecture and design. Using materials such as Terracotta for roofing and painting the roofs white can help to reduce the amount of electricity required to cool the Data Center. The power supply required for computer room air conditioning (CRAC) can be taken from green energy sources such as wind or solar.

Fig 2. Distribution Of Energy Consumption In Different Components Of Data Center



Tools To Manage And Monitor Carbon Footprint Of Data Centers

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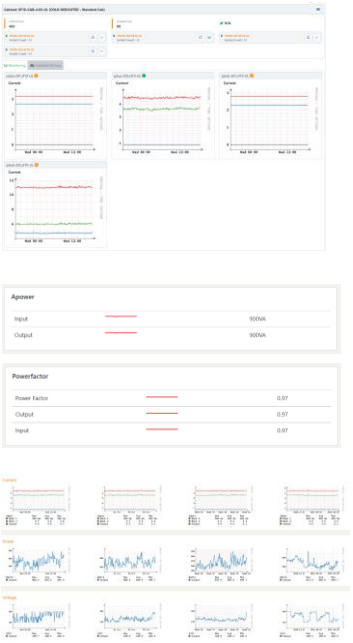
Data Center Energy Consumption Analysis Tool

Global PDU Level Energy Factors

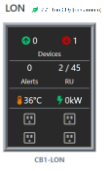


- Measure and analyze your energy distribution per PDU level globally
- Reduce costs by optimizing the energy consumed by your resources globally
- Get customized alerts on carbon emission to meet regional regulations

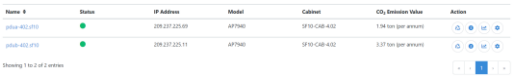
Data Center Carbon Emission Analysis Tool

Cabinet Level CO_2 Emission

Data Center Level CO_2 Emission



PDU Level CO_2 Emission



- Measure and analyze your carbon emission at Data Center, Cabinet, and PDU level
- Compare your geographical carbon footprint globally
- Ensure regional co_2 emission regulations

How UnityOneCloud Helps To Reduce Carbon Footprint Through 3 Simple Features

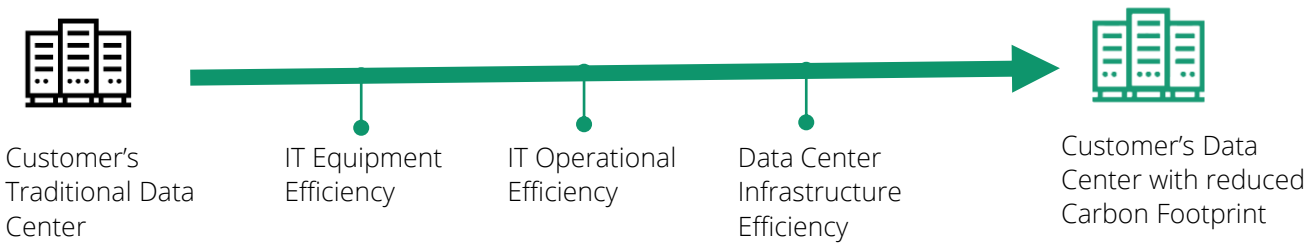


Figure 4: Customer Journey To Reduce Carbon Footprint With UnityOneCloud

IT Equipment Efficiency

UnityOneCloud helps to manage and monitor all the virtualized IT equipment in the data center including virtual firewalls, Load balancers, switches, etc. Customers can deploy or delete new virtual devices in the data center through a single pane of glass.

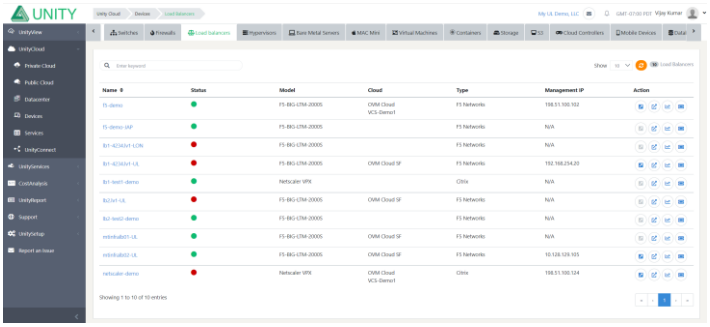


Fig 3. Virtualize And Manage Data Center Devices

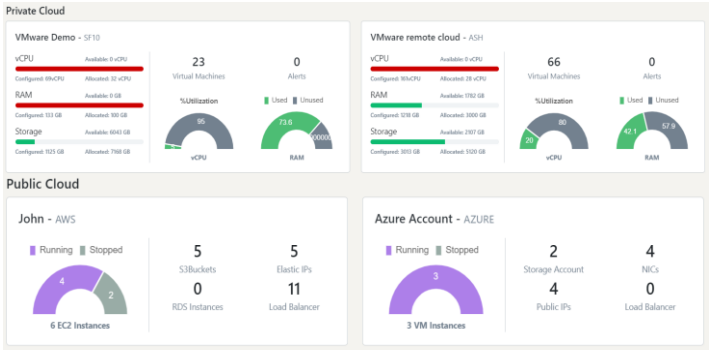


Fig 4. Real Time Resource Utilization Insights

IT Operational Efficiency

UnityOneCloud gives a real time monitoring on performance, health, utilization of all the resources including vCPU's, vRAM's, Storage, Bandwidth, etc. Customers can optimize their resource utilization and reduce their energy consumption by shutting down the zombie resources/devices in the environment.

Data Center Infrastructure Efficiency

UnityOneCloud allows to monitor and manage the energy and cooling of data center devices. Customer can increase their energy efficiencies by optimizing the power required by the CRAC to cool the devices in the data center.

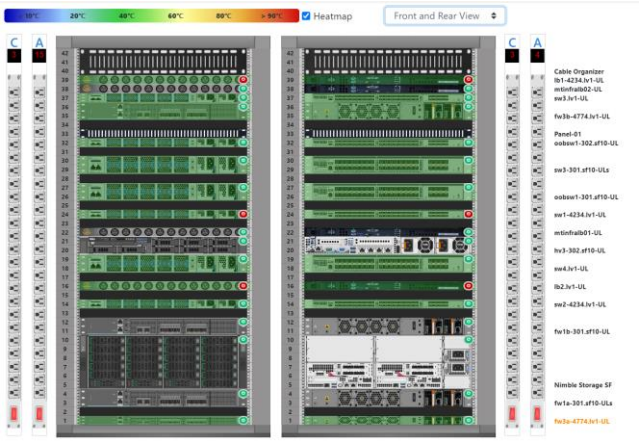


Fig 5. Front & Rear Heat Map Of Cabinets

Conclusion

Data centers have evolved into an important component of today's computing infrastructures. It's no surprise that the number of data centers is likely to grow dramatically as more firms turn to them for co-location services, cloud solutions, and compliance assurances. With so many new data centers coming up, it's worth considering the harsh realities of data center power use. Even with new breakthroughs in sustainable energy solutions, the fact remains that both small and large data centers consume a significant amount of energy.

Data center owners are under pressure to minimise their data center's energy use for political, social, and economic reasons. Many data centers constructed today have made no meaningful effort to reduce their energy consumption. Traditional power and cooling systems are inefficient, with large levels of stranded capacity and low server usage. As a result, data centers have a much larger carbon footprint than is necessary.

UnityOneCloud Advantage

UnityOneCloud is a Multicloud Management SaaS Platform for managing your Real-World Hybrid Cloud Environment from Data Centers, Power Distribution Units (PDUs), Bare-Metal Servers, Networking Devices, Private Clouds (VMware, Hyper-V, and OpenStack), Public Clouds (AWS, GCP, and Azure) to Containers.

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