Pega Cloud and sustainability

How Pega Cloud helps clients achieve sustainability targets

Introduction

Cloud computing has revolutionized the way businesses and individuals store, access, and process data, contributing to the improvement of the environment and sustainability. Cloud computing provides numerous benefits, including reducing carbon footprint, increasing resource utilization and efficiency, lowering energy consumption, and promoting a greener economy. Pega's as-a-Service offering, Pega Cloud®, uses leading public cloud infrastructure to power client cloud services, and has become Pega clients' *preferred choice for the operation and management of their Pega ecosystem*. As such, Pega Cloud clients get the benefits not only inherent in public cloud infrastructure but also ***Pega Cloud-specific features that further improve sustainability***.

Partnering for client success

Pega is unique in the industry in terms of offering a multi-cloud strategy[1]: We offer Pega Cloud with either Amazon Web Services (AWS) or Google Cloud Platform (GCP) as the underlying Infrastructure as-a-Service (IaaS) provider. As such, we and our clients can take advantage of the *innovative ways our IaaS partners operate* from a sustainability perspective. In addition, ***Pega invests in sustainability*** *in our cloud services* ***– over and above what the underlying IaaS provides*** – to drive sustainability gains even further.

This paper explores how our as-a-Service offering, which uses public cloud and Pega-specific capabilities, reduces carbon footprint, and contributes to improvement of the environment and sustainability. But before we get into the details, let's frame out the landscape for enterprise solutions and computing. A recent paper published by *Science* magazine(1) indicates that the *amount of computing done in data centers increased 550% between 2010 and 2018*. Yet, the amount of ***energy consumption attributable to data centers grew only 6%*** during the same period. These energy efficiency gains outpace anything in any other major economic sector. According to the International Energy Agency (IEA), data centers power more applications for more people than ever before in history, yet still account for *just 1% of global electricity consumption* – the same proportion they did in 2010. Ironically, hyperscale data center campuses attract scrutiny for their energy usage yet have proven to be *far more efficient* than local servers operated within enterprise-specific data centers. Why is that?

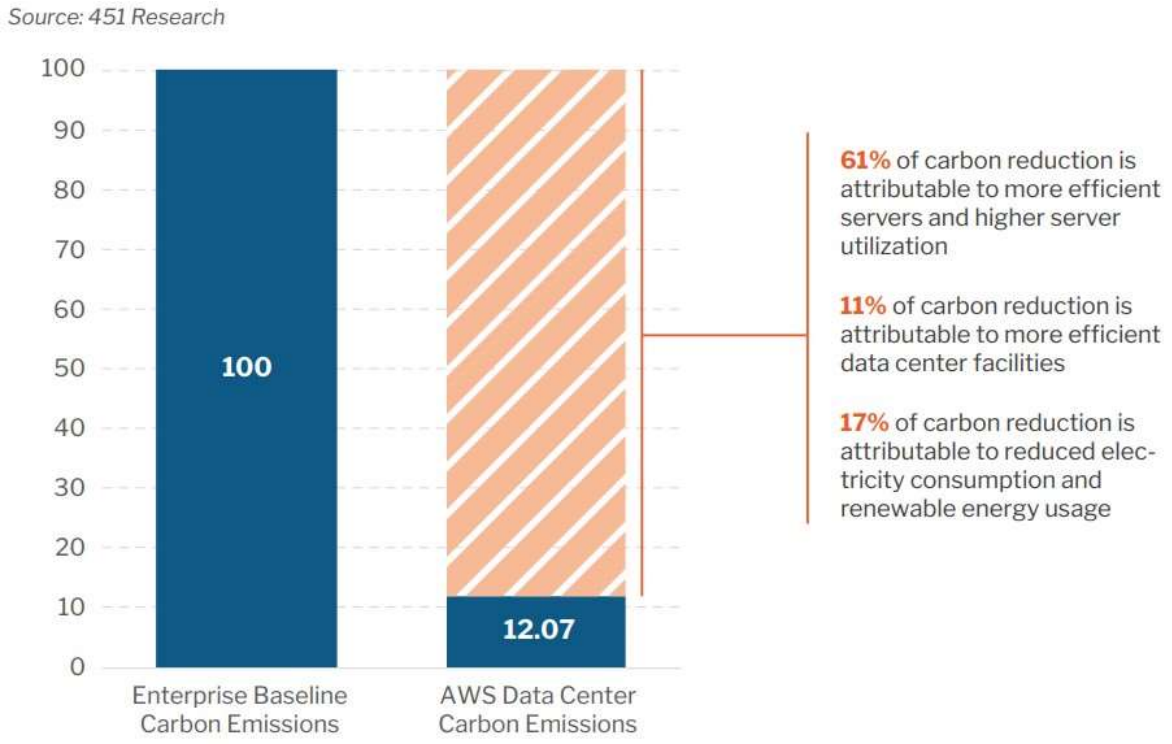
Utilization and increased efficiency

In general, large global organizations have made great strides in improving efficient utilization of computing resources. In particular, broad adoption of virtualization has enabled organizations to make much more efficient use of hardware resources, while at the same time pursuing workload consolidation strategies to drive utilization. However, *running data centers and IT is not a core competency of most enterprises*, many of which lack the expertise and resources to make major investments in infrastructure efficiency.

Amazon Web Services (AWS), one of Pega's IaaS partners for Pega Cloud, commissioned a study by 451 Research(2). Over 300 U.S. companies with revenue ranging from $10M to $1B were surveyed.

[1] as of the date of publication

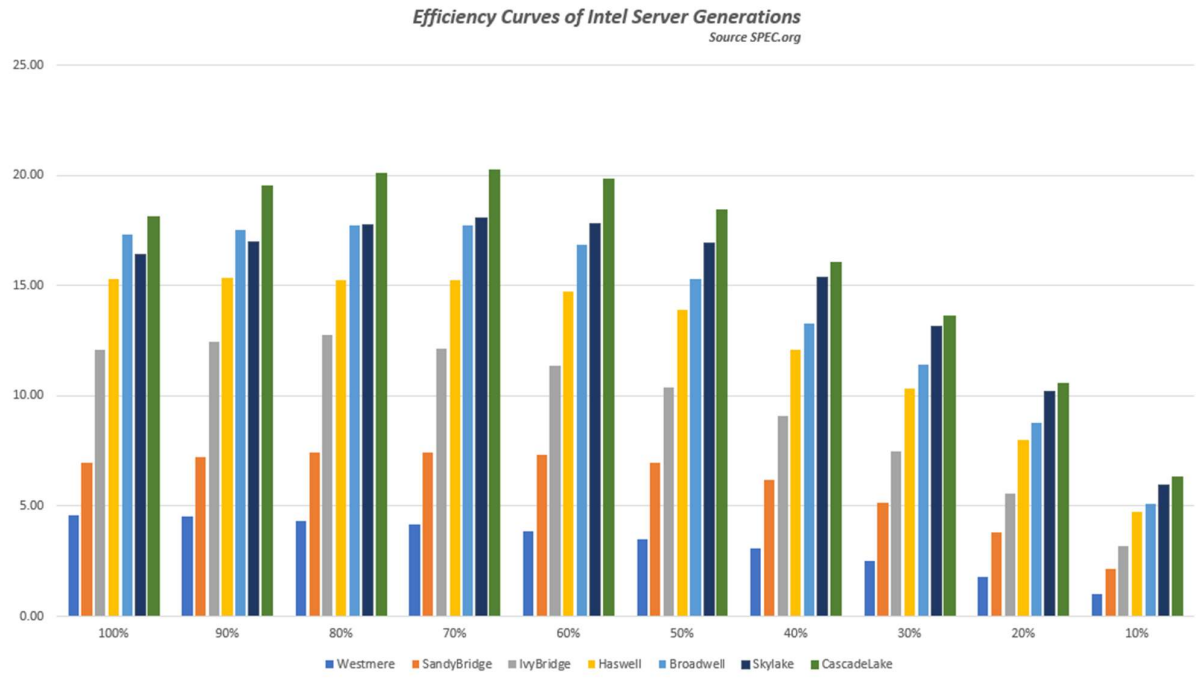
The survey determined that, on balance, the composite server utilization across survey respondents was *18%*. Cloud service providers (CSPs) have a fundamental, structural advantage over enterprises that manage their own data centers: *Computing infrastructure delivered via cloud services is core to their business*. Their entire organizations work together to ensure high infrastructure efficiency by design. Compared to the baseline carbon emissions of the organizations surveyed, AWS performs the same tasks with an *88% lower carbon footprint, the bulk of which can be attributed to more efficient servers and higher utilization*:



Hardware refresh speed and structural factors

The 451 Research study[2] points to a number of reasons why individual enterprises can't keep up with CSPs. For one, the survey found that respondents keep servers for just over four years on average, with some extending for as long as 7–8 years. Servers 4–8 years old are *far less efficient than newer generation hardware*. And even then, when enterprises invest in newer infrastructure, they still must provision for peak demand – and many energy-efficiency measures are *only viable at the scale of thousands of servers and when applying advanced design techniques* (e.g., efficiency-optimized custom servers, wide temperature bands, and indirect evaporative cooling).

In addition, adopting new, energy efficient server platforms more frequently has a material impact on energy efficiency as well. The latest generation Intel servers still show a factor of 2–3X difference between their peak efficiency point (approximately 70% load) and their light load range (10–20%):



The implication is that moving workloads to the cloud can help enterprises *steeply reduce energy consumption and their carbon footprint compared to their internal operations*. While enterprises are making gains as they utilize virtualization and consolidate workloads, their adoption cycles for newer server technology lag those of CSPs. Couple more rapid adoption of new technology with greater efficiency as discussed earlier and CSPs have a clear edge. Finally, the CSP business model also plays a significant role: Offering shared and monetized infrastructure drives *server utilization far above what individual enterprises are generally able to achieve*.

Electricity usage reduction

Another major source of inefficiency for enterprises is cooling. The 451 Research study[2] found that most enterprises utilize a tight, acceptable server inlet temperature under 72° F (22°C) and mechanical refrigeration to cool the air in the data hall throughout the year, which is highly energy intensive. AWS for example, utilizes evaporative cooling instead of compressors, allowing data centers to operate with wider temperature bands. In 2016, Google implemented an AI-powered recommendation system[3] to improve the efficiency of their data centers. Every five minutes, cloud-based AI pulls snapshots of data center cooling from thousands of sensors, which are then fed into deep, neural networks and predict how different combinations of potential actions affect energy consumption. In just the first three months, Google saw a 30% energy savings as a result of deploying this AI recommendation system, including AI "learning" to take advantage of winter and producing colder than normal water to further reduce energy needed for cooling.

Enterprises are hard-pressed to match the gains of CSPs like AWS and Google, *both used in the operation of Pega Cloud*. ASHRAE, a global society advancing human well-being through sustainable technology built for the environment, encourages adoption of wider temperature bands, from 64.4°F (18°C) to 80.6°F (27°C). 451 Research concludes that many enterprises will find this difficult to implement. It's challenging to make data centers with tight temperature bands run a more flexible climatic regime where server settings would need to change, server fans would need to spin faster, and air handlers would need to react with more airflow (thereby *increasing* energy usage and offsetting much of the savings).

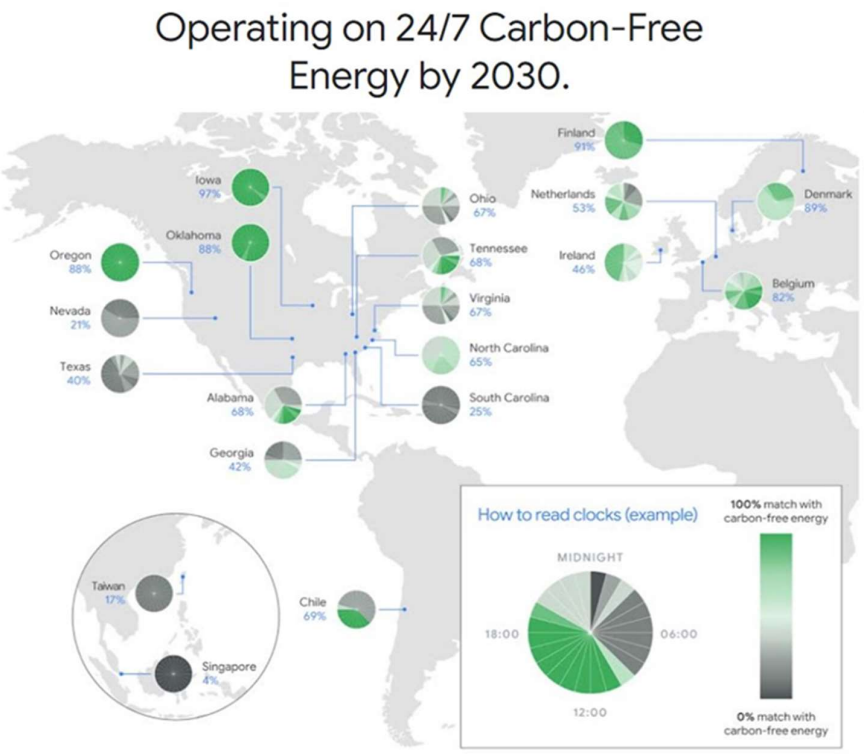
In addition, enterprises generally report low electrical distribution efficiency, with outdated and/or under-utilized equipment often being the root cause. Under-utilized servers don't operate efficiently at low load; CSPs, whose business model *incents them to drive up server utilization and supports many clients across virtualized hardware*, are able to operate far more efficiently and reduce overall electricity usage across client workloads. CSPs have an inherent advantage that supports a dramatic reduction in electricity usage.

Bringing it all together

Pega offers clients a *true, multi-cloud strategy*: Pega Cloud is available with either AWS or Google GCP as the underlying IaaS provider. As such, we and our clients can take advantage of the innovative ways our IaaS partners operate from a sustainability perspective. AWS is already using more than 95% of energy from renewable sources and plans to be 100% on renewables by 2025[(5)]. Google is targeting 100% renewables by 2030[(4)]. Presently, about two-thirds of Pega Cloud regions on which we operate are "green" (i.e. either AWS regions powered by at least 95% renewables or GCP regions for which 75% of energy consumed is carbon free). And we include these factors in our evaluation criteria when selecting additional Pega Cloud offered regions.

Our infrastructure partners continue to invest in innovation as well. For example, in some parts of the world, most electricity comes from fossil fuels like natural gas (e.g. Singapore), whereas in other areas, wind is abundant and drives carbon-free energy availability up significantly (e.g. Oklahoma). Google is utilizing forward-looking models for each regional grid and data center, considering global trends, local conditions (renewable resources, policies, market structures), and actions Google can take to accelerate clean energy progress[(4)].

These plans have gained momentum with the shift in energy production technology: From 2009 to 2019, costs for wind and solar *declined 70% and 89%*, respectively, *effectively out-competing carbon-based resources in more and more markets*. In Denmark, Google agreed to buy power from the country's first, subsidy-free solar farm and couple it with wind power already available on the Danish grid, making one of their newest data centers a high, carbon-free performer right from the start. And similarly, when grid carbon intensity and renewable energy are both factored to calculate relative carbon efficiency, AWS enjoys an *8.5X advantage* compared to the median of companies in the 451 Research survey[(2)].



Source: *24/7 by 2030: Realizing a Carbon-free Future*

Pega, operating the Pega Platform™ and other application solutions on Pega Cloud, has introduced new features and leveraged technologies that allow *sustainability gains to go even further*. Through auto-scaling, auto-hibernation and other energy efficient cloud technologies, Pega Cloud helped ***reduce Pega's carbon emissions by 50% during 2023***. Auto-hibernation pauses the cloud resources for non-production environments during periods of inactivity. We also migrate workloads to more efficient instance types over time and target database instances to run on the most efficient processor types, based on each specific workload profile.

Our latest cloud services technology capitalizes on an architectural shift, which allows for improved scalability and self-healing, independent service updates, and improved fault tolerance. With microservices and containerization, we offer shared backing services to clients. In this way, we take advantage of similar efficiency methods, optimizing the use of compute resources across Pega Cloud clients, while maintaining security and isolation.

Summary

Cloud computing is an innovative, enabling technology that has transformed the way businesses and individuals access and process data. And as we've shown, it has also contributed to the improvement of the environment and sustainability. Cloud computing reduces carbon emissions through virtualization, energy-efficient servers, and reducing waste through consolidation.

Companies like Amazon Web Services and Google Cloud Platform have made significant progress toward their goal of using 100% renewable energy. Pega's cloud offering takes a "best-of-the-best" approach – using industry-leading IaaS providers who continue to drive efficiency and utilization with innovative ideas and technology – and couples it with the ***most efficient and effective way to consume Pega (Pega Cloud)***. Pega continues to provide clients with not only the best Pega experience, *but one that drives sustainability*. The impact of cloud computing on carbon emissions is significant, and it will continue to be a key enabler for the transition to a low-carbon economy. As individuals and businesses

continue to adopt cloud computing, we can expect to see a significant reduction in carbon emissions, which will lead to a more sustainable future for our planet.

Sources:

(1) Recalibrating global data center energy-use estimates: https://www.science.org/doi/10.1126/science.aba3758

(2) The Carbon Reduction Opportunity of Moving to Amazon Web Services: https://d39w7f4ix9f5s9.cloudfront.net/e3/79/42bf75c94c279c67d777f002051f/carbon-reduction-opportunity-of-moving-to-aws.pdf

(3) Safety-first AI for autonomous data center cooling and industrial control: https://www.blog.google/inside-google/infrastructure/safety-first-ai-autonomous-data-center-cooling-and-industrial-control/

(4) 24/7 by 2030: Realizing a Carbon-free Future: https://www.gstatic.com/gumdrop/sustainability/247-carbon-free-energy.pdf

(5) Sustainability in the Cloud: https://sustainability.aboutamazon.com/environment/the-cloud?energyType=true