



Data Centre and Virtualization

With Great Power, Comes Great Responsibility (and Cooling)

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Biography

Darren began his career as a graduate Military Officer in the RAF before moving into the commercial sector. He brings over 20 years experience in telecommunications and managed services gained at BT, MFS Worldcom, Level3 Communications, Attenda and COLT. He joined the VIRTUS (<https://virtusdatacentres.com>) team from euNetworks where he was Head of Sales for the UK, leading market changing deals with a number of large financial institutions and media agencies, and growing the company's expertise in low latency trading.

Additionally, he sits on the board of one of the industry's most innovative Mobile Media Advertising companies, Odyssey Mobile Interaction, and is interested in all new developments in this sector. Darren has an honours degree in Electronic and Electrical Engineering from University of Wales, College Swansea.

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Abstract

Data centres account for 1% of the world's total electricity usage each year, and by 2030 this is set to rise to around 3-13% with much of the power going into cooling servers and systems according to research conducted by Huawei Technologies. With the demand for cloud services, edge computing, IoT, artificial intelligence (AI), and other digital transformation technologies taking hold and hybrid workforces continue to develop, the need for efficient and sustainable data centres is increasing. In this article, the author discusses exactly why power and cooling are a crucial consideration for efficiency and performance in data centres.

Introduction

While data centres don't generate waste like other industries, this high energy – and high water-use sector faces unprecedented demand for sustainability measures, use of clean energy and efficient facilities. Although necessary to create the optimum environment for servers housed in a data centre, it's the power and cooling that consume the most water and energy, making them a crucial consideration for efficiency and performance, and whilst a laser focus on sustainability is key to the future of the data centre industry, it is not a new priority.



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For several years we have recognized the need to produce more efficient data centres, with increasingly lower Power Usage Effectiveness (PUE) and Water Usage Effectiveness (WUE) designs to ensure that not only can we deliver a premium service to our customers, cost efficiently, we are also extremely aware that we must continue to achieve our own ambitious sustainability goals.

Power

Collectively, our sector uses a huge amount of power and generates a vast amount of heat due to computational demands. Data centre power consumption alone amounts to around 416 terawatts, or 3% of all electricity generated on the planet. So, when it comes to energy use, at VIRTUS we are leading the way in UK data centre sustainability.



Carbon neutral is the stated position of many providers, but we have gone a step further and are committed to using 100% carbon zero energy sources, helping our customers to meet environmental goals whilst also providing efficiencies through cost savings and increased reliability.

All of the energy consumed at our facilities is from 100% renewable sources thanks to partnerships with companies like Bryt Energy who only procure power from wind, solar and tidal sources. This saves around 45,000,000 tonnes of CO₂ every year, which is enough to fill Wembley Stadium five times over.

We've also had great success with regards to minimizing PUEs. We strive to produce a 1.0x PUE and, according the Uptime Institute's annual survey¹, our PUEs are well below the 2020 average of 1.58x. To put it into context, all operators try to get the PUE ratio down to as near to 1.0x as possible, with most new builds falling between 1.2x and 1.4x.



Cooling

Cooling is the most power-hungry component of cloud and data centre management. On average, as much as 40% of a facility's electricity consumption goes towards cooling the servers. By increasing the efficiency of cooling systems, the data centre's environmental impact can be reduced.

We have been particularly innovative when it comes to cooling. Since 2014, we have been operating LONDON2 (certified to UTI Tier 3) using exclusively indirect evaporative cooling technology, which provides cooling with a very low energy use. When it was designed and built, we also included water sourced from a natural underground aquifer to minimize usage of mains water. At other VIRTUS sites, rainwater harvesting, and reuse of heat waste are common features as well as liquid cooling (we had our first liquid cooled customer racks back in 2015).



It was as far back as seven years ago when we first deployed adiabatic cooling. With the de-carbonization of the grid, the purchase of accredited green energy, innovation in compute and mechanical cooling, we don't see a need to use additional valuable natural resources, for instance, water, to cool. Instead, we use a closed loop chilled water system, with little to no impact on the environment driven by energy which is derived only from renewable sources. This enables us to still achieve the same PUE or less.



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When it comes to the cooling demands of Hyperscale Data Centres, the requirement tends to favour chilled water-cooling systems, where the water impact is negligible. This is because once a system is operational, only limited amounts of top-up water are required. Chilled water systems have significantly improved in terms of energy efficiency with the increase in ‘free-cooling’ capability for instance, using ambient outside temperatures for cooling.

While cooling is a vital part of keeping data centres up and running, a recent Uptime report estimated that in the US alone nearly 12.5 billion kW hours would be wasted by over-cooling in data centres and improper airflow management. This points to a wider trend of energy waste in the sector, including “zombie servers” and a significant amount of retired equipment being sent to landfill rather than recycled. To tackle this, we not only invest in comprehensive recycling schemes, but we also use highly efficient UPS (uninterruptable power supply) systems which can hibernate parts of the system when they are not being used.

Running the digital economy

This kind of constant innovation is possible because we have a team within VIRTUS Operations who have a cycle of continuous improvement. For example, they review customer data halls and manually adjust airflow or containment. This “cycle of review and optimize” uses techniques that we have developed over years of operational experience to improve data centre efficiency.

We are proud to be the UK leader in an industry that has become one of the most crucial components of business infrastructure in the modern world. We are responsible for storing and processing vast amounts of information needed to run the digital economy – if data centres don’t work, businesses won’t be able to operate. At VIRTUS, we have spent over ten years working with supply partners and customers to innovate, enhance product development and ensure that we’re providing Operational Excellence to all our customers – something we continue to do now and in the future.

Reference

- ¹ Ascierio, R. and Lawrence, A (20 July 2020), 2020 Data Center Industry Survey Results, Uptime Institute. Available at: <https://uptimeinstitute.com/2020-data-center-industry-survey-results>