ANALYSE TO OPTIMISE

Rich Kenny, group IT director at Techbuyer, MD at Interact, discusses slashing energy usage, carbon emissions and cost in the data centre server estate

The data centre sector is under increasing scrutiny for the amount of energy it consumes. As many in the sector have pointed out, data centres facilitate enormous energy savings in other areas, for example travel avoidance, smart metering and balancing a potentially patchy renewable grid. However, articulating how much benefit this represents against how much energy is used is impossible without the relationship between compute power and energy draw as a sector.

This is something that the Interact tool aims to analyse with accurate measurements on the energy usage of individual makes and models of servers and recommendations on how the same workload could be delivered with lower energy draw. As a result of this, data centres can start to calculate the energy impact of other efficiency increasing measures such as virtualisation, containerisation and application choices.

THE PROBLEM WITH DATA

Data is a problem in all decision making in the sector. As a starting point there are no incontrovertible figures on how many data centres exist in the UK, partly because there is debate over the actual definition of a data centre and partly because those in the industry are wary of reporting publicly to protect their businesses.

Perhaps unsurprisingly given the information above, no-one knows the aggregated energy usage of those data centres. Estimates that exist, like the often used 2.89TWh figure for 2018, rely on figures from large facilities that must report on energy consumption according to UK regulations. Small and medium facilities, as well as data centres run by the government and public sector, universities, enterprise, and telecoms, on the other hand, do not have their data captured.

We could take a side route and measure by data transfer to give an idea of scale, but this is stymied as well. Internet exchanges are indicators of spikes and growth but only cover part of the story. The rest – aggregated network energy on providing the services to individuals or internal data transfers within organisations – are not publicly available.

INDUSTRY SOLUTIONS

Cloud service providers are attempting to quantify energy usage of their services for their customers to make informed choices about the efficiency of running cloud-based applications against keeping on-premise solutions. However, it is difficult to understand the boundaries on the metrics or how they are calculated. PUE, CUE and the like are all useful key performance indicators, as are the overall carbon footprint of the company and its use of algorithms to optimise operations. However, without understanding how much of the estate is idle, how much is overprovisioned to cater for traffic spikes and how far the facilities are from each other (so how much energy is lost in data transfer), it is difficult for customers to understand the precise impact.

Assessing the impact of software operations within the data centre is a huge challenge and requires understanding the energy draw on the bare metal servers as a starting point. From there, you can make estimations on energy draw associated with virtualisation, containerisation, and the like.

Until now, obtaining that information was nigh on impossible. Efficiency tended to be measured at the facility rather than in the IT load and a lot of work was done to optimise the cooling and the Mechanical and Electrical energy usage. With most of the heavy lifting already completed on this, we are now looking at incremental gains. This means that looking at optimising server efficiency, as expressed by units of work delivered per watt used.

HOW INTERACT INNOVATION HELPS

The Server Energy Rating Tool by SPECpower is the accepted benchmark for energy star rating for server manufacturers. This measures a variety of workloads and applies a geometric mean to them to produce a standardised metric of performance per watt. It is a great starting point but does not allow for direct comparisons between makes and models of servers in real life situations, where configurations have an impact, as do workload and the PUE of the building.

Interact takes the published data and collates it with thousands of hours of benchmark tests carried out over a two-year research project with University of East London. It allows data centre managers to make informed choices on which servers need replacing, and entirely vendor neutral advice on what to replace them with. The methodology has been validated by a peer-reviewed study in Elsevier's Sustainable Computing: Informatics and Systems and represents the first opportunity for data centres to ensure hardware is providing the lowest energy usage for unit of compute power. The team, co-funded by Innovate UK, also published a ground-breaking paper in the IEEE Transactions on Sustainable Computing called Optimizing server refresh cycles: The case for circular economy with an aging Moore's Law early in 2021.

Results over the first year in terms of energy savings, cost, and scope 2 and 3 emissions are startling. Interact has delivered more than 100 proof of concepts in 2021, resulting in average five-year savings of £880,000 and 8.3m kWh per data centre, and a reduction of 2,800 tonnes of CO_2e emissions during use phase. Large cloud providers, credit card providers, and colocations are beginning to use it to optimise their server estates because the tool offers them a scientifically verified method of optimising the hardware.

Whilst the data centre sector is a complex system of systems and other areas need to be looked at, Interact highlights what the sector can do when it applies analysis to each part of the system. With more data centres looking at optimising their server energy, there is a greater understanding of the carbon footprint of the sector as a whole. This enables us to demonstrate best practice, report accurate data to our customers and ultimately address the question of how much energy digital saves compared to how much it draws.

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Rich Kenny is the managing director at Interact and group IT director at Techbuyer, a machine learning software company with a world first SaaS tool that optimises energy and carbon usage of servers. His research and development focus are hardware energy efficiency and the environmental and economic impacts of IT hardware during creation, use and disposal. He is a firm believer in the circular economy and sustainable solutions for IT hardware.
Rich has contributed to the UK's Industrial Strategy through the Business, Energy and Industrial Strategy (BEIS) Committee and co-authored research published in multiple peer-reviewed journals, most recently the IEEE Journal of Sustainable Computing and Elsevier: Informatics and Systems.

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