Cloud-based network services could reduce enterprise carbon emissions

October 2023

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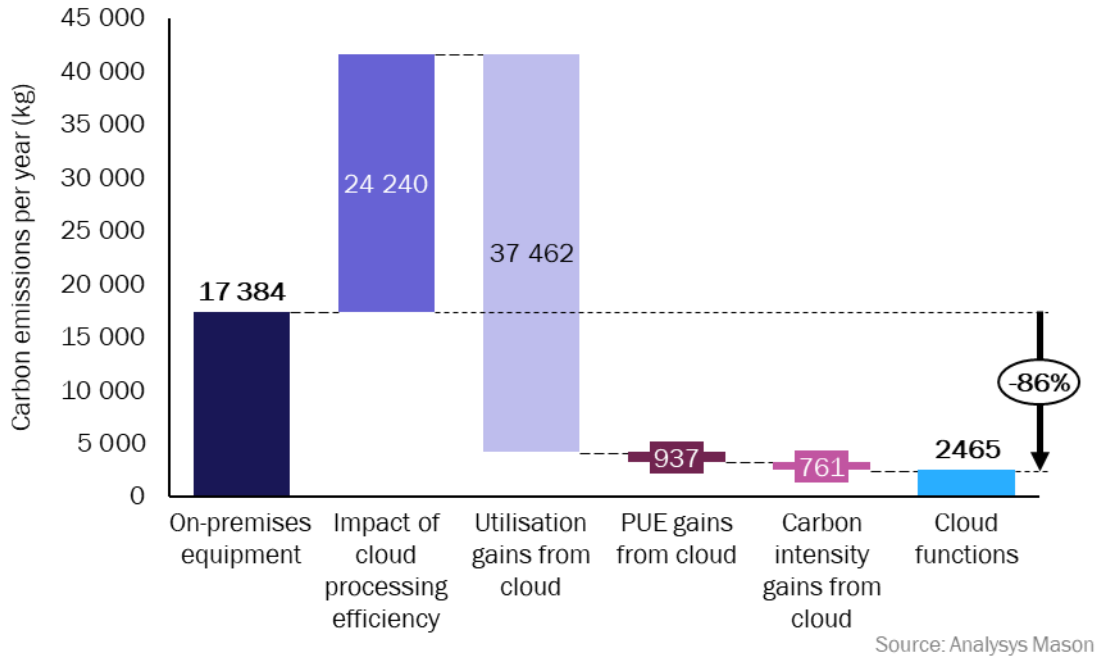
How can businesses reduce their carbon emissions? One approach is to consider turning off some of their network equipment and replacing it with a cloud alternative. We have just published our new report for Cloudflare on the carbon savings of cloud-based enterprise network functions. If enterprises were to replace some 'on-premises' functions with a cloud-based equivalent, it may be possible to reduce the associated energy-related annual carbon emissions by 78–96%, depending on the size of the enterprise.

The enterprise network functions in the scope of the analysis include a broad range of security, management and optimisation functions, including: network firewall, intrusion detection system (IDS), intrusion prevention system (IPS), virtual private network (VPN) concentrator, load balancing, wide area network (WAN) optimisation, software-defined WAN (SD-WAN), secure web gateway (SWG), web application firewall (WAF), and distributed denial of service (DDoS) mitigation. Functions such as routing and switching are likely to have to remain on-premises, and so are not included in the analysis.

Enterprises often deploy these network functions on their own premises or in data centres as dedicated pieces of equipment, which are consuming power 24 hours a day, 7 days a week, despite mostly being required only in office hours. By contrast, cloud functions used shared servers, which aggregate the demand from thousands of businesses. As demand from one business falls away, demand from another picks up, and cloud servers are expected, at least in principle, to make more efficient use of the electricity required to provide those network functions.

The results for a typical large enterprise moving some enterprise network functions to the cloud are shown in Figure 1.

Figure 1: Breakdown of potential carbon savings from moving enterprise network functions from on-premises to Cloudflare products, large enterprise scenario



Most of the reduction in carbon emissions is attributed to the much higher utilisation of the cloud servers relative to on-premises devices. However, the analysis also revealed a trade-off between those utilisation gains, and a lower processing efficiency of cloud servers. This is a consequence of cloud servers being general-purpose hardware, whereas on-premises equipment tends to be designed for a specific function. However, the processing inefficiency is more than compensated for by the gains from higher utilisation.

We also calculated carbon savings from the increased power efficiency of cloud data centres (compared to on-premises facilities). And finally, we accounted for differences in the carbon intensity (kilograms of carbon per unit of electricity generated) in the local electricity generation grid used by an average data centre vs. the local grid used by an average on-premises location.

How we came to these conclusions

Understanding and measuring how the transition from ‘on-premises’ to cloud can reduce emissions is challenging. The relationship between energy use and carbon emissions must be calculated robustly, and must include concepts such as the ‘power usage effectiveness’ (PUE) of the on-premises server room or data centre, along with the carbon intensity of electricity generation from the relevant local grid.

However, there are even more complex issues associated with making a fair comparison between the typical power consumption of physical on-premises equipment (which are typically dedicated to a single enterprise) relative to cloud-based servers, which are used by thousands of different customers.

Our analysis used a combination of desk research, industry intelligence and information provided by Cloudflare. Information on the on-premises network functions was sourced from datasheets published by equipment vendors. The input assumptions for the cloud functions were sourced primarily from Cloudflare. We worked closely with a wide range of Cloudflare’s business functions to create an innovative approach to attributing the

shared central processing unit (CPU) resources to individual functions, and then allocating this to units of service provided to customers.

Stakeholders in the TMT industry have a growing need to put numbers on the carbon impact of enterprise activities

Against a backdrop of rising energy costs and growing scrutiny of greenhouse gas (GHG) emissions, businesses are looking to cut energy use and to demonstrate the sustainability of their operations.

Regulatory authorities are turning up the pressure. In 2022, the US Securities and Exchange Commission (SEC) and the European Commission (EC) announced changes to sustainability reporting for companies. From around 2024, some companies will have to start providing new information on sustainability activities related to Scope 1 and Scope 2 emissions in their financial and management reports. In addition, the Science Based Targets initiative (SBTi) provides a voluntary framework for organisations to set targets to reduce the carbon impact of their operations.

Analyses such as that described above can contribute usefully to the discussion of how enterprises can reduce their carbon emissions, but the analysis could be developed further. Every organisation will have a unique combination of legacy network equipment and cloud functions. In addition, further work is required to go beyond the Scope 2 emissions considered in the study, to explore how enterprises can reduce their Scope 3 emissions too (that is, those carbon emissions that are attributable to the wider value chain).

Analysys Mason can help organisations to estimate the carbon impact of networks. Such organisations include those that are looking to understand the impact of their internal networks, and network providers that are looking to showcase the impact of their solutions. In addition to calculating the emissions that are attributable to electricity use, we have unrivalled knowledge of the telecoms, media and technology (TMT) sector enabling us to independently assess how the evolution of networks can contribute to a more sustainable future for all.

For more information, read about Analysys Mason's sustainability-related expertise and services.

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