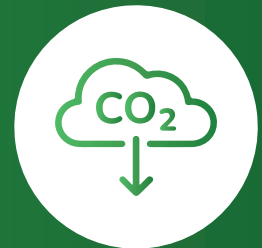# IBM LinuxONE 4
A sustainability perspective

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July 2024

The no-compromise option

So many IT-related decisions involve trade-offs of one kind or another, and this is certainly the case when it comes to the hosting of Linux workloads. Wherever your Linux VMs and application stacks run, you'll generally be gaining some benefits and giving up others. On-premises x86 environments offer familiarity and control, but it's hard to scale them without creating complexity and seeing costs and carbon emissions soar. The public cloud can help to a degree, but this means giving up an element of control and sovereignty, and can lead to issues if you separate latency-sensitive workloads from the data they depend on. Plus the data centers that power public clouds are reported to be responsible for over 3% of global carbon emissions anyway.

It's against this backdrop that we consider IBM LinuxONE 4, the latest incarnation of IBM's open, flexible platform for running Linux workloads at scale. With configurations to meet the needs of smaller, growing companies as well as large enterprises, IBM LinuxONE 4 has been designed to maximize energy efficiency and sustainability without sacrificing performance and control.

Based on input from IBM, this paper deals with some of the questions frequently heard from IT teams interested in the sustainability benefits of LinuxONE 4:

1 What is it about the LinuxONE architecture that makes it such a sustainable option?

3 Which workloads can benefit from this alternative architectural approach, and why?

2 How does LinuxONE 4 deliver sustainability without compromising on performance?

4 What kind of tangible TCO and environmental impact can I expect in the real world?

Relevant platform attributes

What makes LinuxONE 4 so eco-friendly?

In contrast to x86 systems, the LinuxONE architecture is vertically integrated, meaning that all key elements of the hardware and software stack have been engineered to work together optimally. As part of this, the principle of 'green by design' is applied throughout, with maximizing the performance-per-watt and minimizing the physical footprint being fundamental design objectives from the outset.

In practical terms, highly efficient resource utilization means the LinuxONE architecture supports extreme workload densities, with ultra efficient hardware-assisted virtualization enabling secure time-slicing of system components across very large numbers of workload instances. The result is a design that potentially replaces hundreds of underutilized commodity boxes with a single highly utilized system. Put simply, with LinuxONE 4, you need less hardware and less energy to do the same amount of work, drastically cutting manufacturing and operations related carbon emissions.

"Sustainability and energy efficiency weren't afterthoughts, they were fundamental requirements that guided the entire design of the LinuxONE architecture from day one."

Marcel Mitran
IBM Fellow, CTO for LinuxONE

Beyond these fundamental platform attributes, the environmental contribution of LinuxONE 4 is further enhanced through IBM's commitment to sustainable manufacturing, reuse and recyclability, energy efficient facilities, and green logistics practices.

How are performance compromises avoided?

At the heart of LinuxONE 4 lies the Telum processor, the same CPU design found in the IBM Z mainframes that power so much of the world's economy. With up to 16 physical cores running at 5.2GHz, large multi-level caches, compression and encryption accelerators, and on-board AI inferencing, Telum delivers extreme performance, pretty much regardless of what you throw at it.

But it goes further than raw core performance. The architecture's advanced virtualization capabilities are not just about making the most efficient use of resources. The way in which cores, memory and I/O bandwidth can be shared across hundreds of virtual servers in real-time practically eliminates contention. This delivers QoS consistency for critical applications, as well as absolute speed and low latency, without the need for over-provisioned silos that are often required in x86 environments.

Another key performance enabler is near linear scalability. While the base LinuxONE 4 Express comes with just 4 activated cores, additional cores can be easily activated on-demand up to the full 16-core capacity. Growth paths also exist for the larger LinuxONE models - with up to 68 cores for LinuxONE Rockhopper 4 and 200 cores for LinuxONE Emperor 4. With clustering options along the way, the platform enables you to scale out as well as up, supporting whichever growth strategy suits you best.

The bottom line on performance is that the Telum processor, combined with efficient virtualization, seamless scalability, and consistent throughput, means you can focus on sustainability and not worry about running into a performance wall with IBM LinuxONE 4, even if demands grow rapidly.

Targeting to get the best results

Which workloads can benefit, and why?

A wide range of enterprise workload categories are well positioned to capitalize on the green computing advantages of the LinuxONE architecture:

Data Serving and Transaction Processing: High-volume databases, financial transactions, core banking, digital assets and other data-intensive workloads are an ideal fit. LinuxONE's extreme density and sophisticated resource management allows very efficient consolidation of such workloads.

Cloud and Cloud-Native: LinuxONE 4 provides an energy efficient, secure and resilient platform for hosting VMs, containers and serverless environments for private/hybrid cloud infrastructure. Its efficient virtualization maximizes multi-tenant resource utilization.

Analytics and AI: LinuxONE 4 allows co-locating analytics and AI workloads in proximity to large data sets to minimize data movement. On-chip AI inferencing acceleration further enhances efficiency and sustainability with these use cases.

Consolidation Opportunities: Organizations can dramatically reduce their hardware footprint, energy usage and e-waste by consolidating existing x86 Linux silos onto a single optimized LinuxONE 4 system, regardless of specific workloads.

"Organizations running large-scale data serving workloads like databases, financial transactions, core banking and digital assets are prime candidates to realize LinuxONE's sustainability advantages"

Marcel Mitran
IBM Fellow, CTO for LinuxONE

In essence, any use case dealing with large data volumes, demanding performance requirements, multi-tenant hosting or mixed workloads can benefit from LinuxONE's sustainability advantage.

What kind of tangible impact can I expect?

The extreme density, performance-per-watt, and efficient resource utilization of LinuxONE translates directly into lower energy usage, reduced physical data center footprints, and decreased carbon emissions throughout the system's lifecycle.

In a previous announcement, IBM details a series of comparative tests and makes the claim that "Consolidating Linux workloads on 5 IBM LinuxONE Emperor 4 systems instead of running them on compared x86 servers under similar conditions can reduce energy consumption by 75%, space by 50%, and the CO_2e footprint by over 850 metric tons annually." Building on this, it should be possible to realize significant reductions in hardware costs, software licensing fees and operating expenses.

Check out IBM LinuxONE 4 - Sustainability for more information, or run your own numbers through the IBM LinuxONE TCO and CO_2e Calculator to get a feel for the likely benefit in your specific environment.

If IBM LinuxONE 4 looks like it might be the right solution to help you meet your sustainability goals we suggest contacting IBM or one of its partners to get a more accurate real-world assessment and to talk through adoption and migration practicalities.

Company details

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