IBM LinuxONE Emperor 4 Overview

Building a sustainable Infrastructure

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IBM

Sustainability is a rapidly growing area of focus for many organizations

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51% of CEOs name sustainability as their greatest challenges for their organization over the next 2–3 years*

CIOs and CTOs identify sustainability as the top area where technology will have the greatest impact over the next 3 years**

Data centers around the world consume 200 to 250 Terrawatt-hours*** of electricity

* The IBM Institute of business value: Own your impact
** The IBM Institute for Business Value: Sustainability as a transformation catalyst
*** The IBM Institute for Business Value: IT sustainability beyond the data center

Imagine a server that could do the work of up to 2,000 x86 cores[1]

A server that could reduce the energy consumption of your data center by 75% and its CO2e footprint by over 850 metric tons each year.[2]
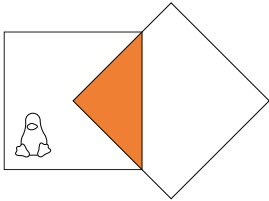
[1] [2] see disclaimer chart for full claims

Introducing IBM LinuxONE Emperor 4
Building a sustainable infrastructure

Reduce your **energy consumption** and costs with a highly efficient system

Deliver consistent transactional service levels with a **massively scalable** system

Build **privacy and protection** with a cyber-resilient system

Sustainability, without compromise

IBM LinuxONE Emperor 4 –
Building a sustainable infrastructure

Reduce your energy consumption and costs with a highly efficient system

- **Designed for sustainability**, without compromising security, performance and scale

- **Optimized architecture** to meet the needs of a modern responsible digital business.

- Designed to run at the **highest level of utilization** for maximum efficiency

- Built in **resiliency** for the new climate reality

Consolidate x86 server workloads onto
IBM LinuxONE Emperor 4™ and reduce energy
consumption by 75%, and datacenter floor space by 50%*

* 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.

Reduce your carbon footprint and your physical footprint

x86 and IBM LinuxONE™ energy and floor space comparisons for Asia Pacific Insurance Company

Consolidated 55 x86 Servers onto one LinuxONE

62% less energy

86% less datacenter floor space

* Results from Carbon Footprint Assessment by IBM IT Economics Team

Modernizing their IT infrastructure to support their sustainability goals

Citi partnered with MongoDB and IBM to migrate their MongoDB instances to IBM LinuxONE

Achieved a big win for our sustainability strategy

Enhanced the security capabilities of our service offering

Increased performance by 15%

Improved customer service

"We leveraged innovative technologies that improved our customer experience, enhanced the security capabilities of our service offering and allowed us to make a significant mark in our drive to net-zero carbon emissions. Really all in all a great story"

Martin Kennedy, Managing Director
Mainframe and Host System Services
Technology Infrastructure, Citibank

Exponential IT growth

Managing the increased demands of a modern digital business

- Accelerating digital transformation

- Growth in data and AI

- Fluctuating business demands

1,500%
growth of internet usage since 2010, with

40%
growth in 2021[*]

* The IBM Institute for Business Value: IT sustainability beyond the data center

IBM LinuxONE Emperor 4 –
Building a sustainable infrastructure

Deliver consistent transactional service levels with a massively scalable system

- **Scale up** or **scale out** in one massively scalable system

- Add **capacity** permanently or temporarily, on demand

- **Re-allocate** resources on-the-fly to align with business priorities

A single IBM LinuxONE Emperor 4 can do
the work of up to 2000 x86 cores [*]

[*] IBM internal tests show that when running WebSphere and DB2 workloads, IBM LinuxONE Emperor 4 requires 16 times fewer cores than the compared x86 servers. If you scale this up
to a complete IT solution this means when running this workload, the IBM LinuxONE Emperor 4 Max 125 would be doing the work of about 2000 cores of the compared x86 servers.

[*] see disclaimer chart for full claims (1)

A European financial institution reduced greenhouse gas emissions while saving costs with Oracle workload consolidation onto IBM LinuxONE

Business goal:
Evaluate the anticipated energy consumption, taking into account the EU's direction on **reducing greenhouse gases over the next 10 years**

Business Results:
- Consolidated **149 cores** of Oracle DB running on **16 x86 servers** onto **10 IFLs** running on **1 LinuxONE** system.

- **A 60% reduction in the number of Oracle licenses** was required for LinuxONE compared to traditional x86 servers due to a high core consolidation ratio.

- Energy consumption has been reduced by 70%

70%
C02e reduction

60%
SW license reduction

15:1
x86 to LinuxONE core ratio

How much could you be saving?
Try the TCO Calculator

LinuxONE for all, at any scale

From a single core in the IBM Cloud to the world's most powerful Linux-only system

Used by businesses of all sizes, from start-ups to some of the world's largest enterprises

You choose the right fit for you, for your workload or for your business, at any scale
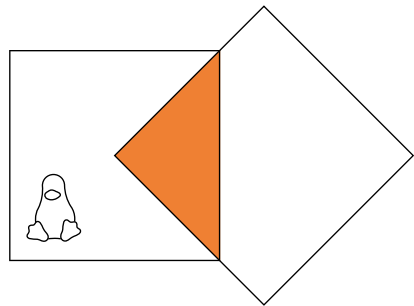
LinuxONE Emperor 4

LinuxONE III Express

IBM Cloud Hyper Protect Services

IBM Hyper Protect Virtual Servers

IBM LinuxONE Bare Metal Servers

Plastic Bank

Powering the Plastic Bank revolution across the world is IBM Blockchain running on a hybrid cloud infrastructure, which is based on an IBM LinuxONE platform connected to the IBM Cloud®.

"We are planning for over 1 million branches around the world, bringing us closer to our goal of eradicating ocean plastic. We have no doubt that IBM technology can help us get there."

-- Shaun Frankson,
Co-founder and
Chief Technology Officer,
Plastic Bank

https://www.ibm.com/case-studies/plastic-bank-systems-linuxone

Mitigating the impacts of cyber attacks

$4.35M
the average cost of a data breach according to an IBM report in July 2022

83%
of organizations studied have had more than one security breach

81%
of executives consider security a brand attribute that differentiates their organization

Source: IBM: Cost of a Data Breach Report 2022

IBM LinuxONE Emperor 4 –
Building a sustainable infrastructure

Build privacy and protection with a cyber-resilient system

- **Quantum-safe** to protect data, workloads and infrastructure now and in the future

- **Confidential computing** to protect data in-use

- **Pervasive encryption** to protect data at-rest and in-flight

- **Simplified compliance** to improve audit readiness

Execute up to 20 billion secure transactions per day with microservice-based applications running on Red Hat OpenShift Container Platform *

* With IBM LinuxONE Emperor 4, execute up to 20 billion HTTPS transactions per day with OLTP microservice applications running on Red Hat OpenShift Container Platform.

*·see disclaimer chart for full claims (3)

Quantum-safe technology
for a new cryptographic era

There will be a time when the power of quantum may crack public key cryptographic security protection …

Harvest now, decrypt later

Lifecycle of data

Replacing current encryption

Industry first quantum-safe enterprise Linux system

Protect sensitive data with quantum-safe cryptography

Create crypto inventory to aid migration and modernization planning

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Leverage NIST selected IBM co-developed quantum-safe algorithms

LinuxONE
Hardware-based security for confidential computing

In multi-workload environments data can be visible to administrators and vulnerable to attack

Malicious insiders

Compromised credentials

Technically enforced isolation of workloads at massive scale

Delivers data integrity by protecting data at rest, in flight and in use

Administrators can still perform their role but do not have data access

Trading digital assets with trust and security: Phoenix Systems & KORE Technologies

Solution:

– IBM LinuxONE

– IBM Hyper Protect
 Virtual Servers

– IBM Blockchain

Solution Value:

✓ Boosts processing power
 eight-fold

✓ End-to end-security via data
 encryption and isolation of
 customer environments

✓ Simplifies compliance with
 regulatory policies

✓ Seamless scaling and speed
 of delivery of
 new applications code
 via containerization

"It puts our clients' minds at rest, as the moment they hear IBM, they know that their digital assets will be safe. And with the introduction of IBM Hyper Protect Virtual Servers, we get the benefit of containerization alongside end-to-end encryption of data."

-- Isabella Brom
COO at KORE Technologies

Check out the [***case study***](#)

IBM LinuxONE Emperor 4
Building a sustainable infrastructure

Up to 200 LinuxONE cores across 32 IBM Telum™ processors

7nm technology, 5.2GHz

Up to 40TB memory

Quantum-safe encryption

On-chip accelerators for AI, data compression, and encryption

One, two, three or four 19" frames

Up to 125 LinuxONE cores in a single 19'' frame

Up to 16 internal NVMe carrier cards for flash storage

Unique architectural design to maximize efficiencies

Up to 20 billion encrypted transactions per day[3]

A single IBM LinuxONE can do the work of up to 2000 x86 cores[1]

[1] [3] see disclaimer chart for full claims

Get started today with a 30-day LinuxONE free trial

1. Scan the QR code
2. Send the **pre-populated** email
3. Our team will help you get started

PSST – having trouble scanning? Email zaas.client.acceleration@ibm.com

Claims and disclaimers

1. IBM internal tests show that when running WebSphere and DB2 workloads, IBM LinuxONE Emperor 4 requires 16 times fewer cores than the compared x86 servers. If you scale this up to a complete IT solution this means when running this workload, the IBM LinuxONE Emperor 4 Max 125 would be doing the work of about 2000 cores of the compared x86 servers.

DISCLAIMER: This is an IBM internal study designed to replicate a typical IBM customer workload usage in the marketplace. Results may vary. The core consolidation study targeted comparison of the following IBM LinuxONE and x86 servers: IBM LinuxONE Emperor 4 Max 125 system consists of three CPC drawers containing 125 configurable processor units (IFLs or zIIPs) and two I/O drawers to support both network and external storage. Lenovo ThinkSystem SR650 (2U) with two 2nd Gen Intel® Xeon® Platinum processors 2.1 GHz, 16 cores per CPU. Both the x86-based and LinuxONE solutions had access to the same storage array. The workloads consisted of a transactional application running on WebSphere Application Server and IBM DB2 simulating core online banking functions. The actual test results were extrapolated to the stated above x86 servers using IDC QPI metrics and IBM sizing methodology using the following assumptions on a typical IT environment of a banking client using x86 servers. The production IT environment has 16 x86 servers running at 50% average utilization. There are 48 x86 servers in the non-production IT environments: development (4 environments with 2 servers each, 8 servers total), development test environment (4 servers), system integration test environment (8 servers), performance test environment (16 servers), user acceptance test environment (4 servers), production fix test environment (8 servers). A typical average CPU utilization is 7% across all non-production environments. An equivalent LinuxONE Emperor 4 solution requires a single Max 125 server running at 85% average utilization across all IT environments separated using LPAR technology.

2. 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 CO2e footprint by over 850 metric tons annually.

DISCLAIMER: Compared 5 IBM Machine Type 3931 Max 125 model consists of three CPC drawers containing 125 configurable cores (CPs, zIIPs, or IFLs) and two I/O drawers to support both network and external storage versus 192 x86 systems with a total of 10364 cores. IBM Machine Type 3931 power consumption was based on inputs to the IBM Machine Type 3931 IBM Power Estimation Tool for a memo configuration. x86 power consumption was based on March 2022 IDC QPI power values for 7 Cascade Lake and 5 Ice Lake server models, with 32 to 112 cores per server. All compared x86 servers were 2 or 4 socket servers. IBM Machine Type 3931   and x86 are running 24x7x365 with production and non-production workloads. Savings assumes a Power Usage Effectiveness (PUE) ratio of 1.57 to calculate additional power for data center cooling. PUE is based on Uptime Institute 2021 Global Data Center Survey (https://uptimeinstitute.com/about-ui/press-releases/uptime-institute-11th-annual-global-data-center-survey). CO2e and other equivalencies that are based on the EPA GHG calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator) use U.S. National weighted averages. Results may vary based on client-specific usage and location.

3. With IBM LinuxONE 4, execute up to 20 billion HTTPS transactions per day with OLTP microservice applications running on Red Hat OpenShift Container Platform.

DISCLAIMER: Performance result is extrapolated from IBM internal tests running in an IBM LinuxONE Emperor 4 LPAR with 24 dedicated cores, 560 GB memory and DASD storage the Acme Air microservice benchmark (https://github.com/blueperf/acmeair-mainservice-java) on Red Hat OpenShift Container Platform (RHOCP) 4.9 using RHEL 8.4 KVM. On 4 RHOCP Compute nodes 4 Acme Air instances were running in parallel, each driven remotely from JMeter 5.2.1 with 384 parallel users. The KVM guests with RHOCP Compute nodes were configured with 12 vCPUs and 64 GB memory each. The KVM guests with RHOCP Management nodes and RHOCP Infrastructure nodes were configured with 4 vCPUs and 16 GB memory each. Results may vary

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Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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Backup

System Design to Enable Growth
IBM LinuxONE Emperor 4 With Telum Processor

Flexible compute design

- Available in one to four 19" frames based on capacity needs
- Two power options – iPDU for electrical efficiency and Bulk Power Assembly, no Internal Battery Feature
- Quantum-safe system with new Crypto Express8S card

IBM Telum Processor

- 7nm technology, 5.2GHz, 4 Dual Chip Modules (DCM) per CPC drawer
- 8 Cores/Chip, 2 Chips/DCM
- Up to 200 client configurable cores
- New integrated AI Accelerator capability of processing up to 300B deep learning inference request per day with 1ms latency

Memory

- Up to 40TB RAIM memory
- Transparent memory encryption
- 32TB memory per LPAR

To the Data

- Execute up to 14 million encrypted FCP read IOPS using the IBM Fibre Channel Endpoint Security solution
- IBM Adapter for NVMe allows SSD connection to IO subsystem
- Higher bandwidth and IO rates with FCP Express32S

CPC Drawers	Client PUs	Max Memory
1	39	10 TB
2	82	20 TB
3	125	30 TB
4	168	40 TB
4 (Max)	200	40 TB

Linux

KVM

z/VM

Event Summary for the LinuxONE Emperor 4 Announcement

Tuesday, September 13th - IBM LinuxONE: Building a Sustainable Infrastructure Panel (Virtual)

- Time: 10:00 AM -11:00 PM Eastern Time

- Meet the LinuxONE Emperor 4. Hear from enterprises and startups how a sustainable approach to IT can be good for your business as well as the planet. Discover how to progress from setting sustainability goals to reducing your carbon footprint with thought leaders

- Register: https://webinars.on24.com/Systems/LinuxONE

Tuesday, September 13th - Friday, September 16th - IBM at Open Source Summit – EU/Dublin (Live & Virtual)

- Reception: September 13 from 7:30PM IST

- Keynote Session announcing the LinuxONE Emperor 4: September 14th 10:30- 10:45 AM IST

- IBM / Client / ISV Breakout Session discussing mechanisms to secure and scale data with sustainability in mind on the LinuxONE platform: September 14th 12:10-50 PM IST

- Register: https://events.linuxfoundation.org/open-source-summit-europe/register/

Thursday, September 15th - LinuxONE Track at IBM Z Day 2022 (Virtual)

- Time: 8:00 AM - 4:00 PM Eastern Time

- LinuxONE track: Build a sustainable infrastructure with LinuxONE

- Register: ibm.biz/ibmzday-2022

Wednesday, September 21st - Thursday, September 22nd - Open Mainframe Summit – Philadelphia, PA (Live & Virtual)

- Keynote Speech on "The Sustainability Trailblazers": September 21st – 9:30-40 AM EST

- Register: https://events.linuxfoundation.org/open-mainframe-summit/