IBM LinuxONE Rockhopper 4 Overview

Help you turn your sustainability strategy into action

Nada Santiago
Principal Product Manager,
IBM LinuxONE Hardware Solutions

Introducing IBM LinuxONE Rockhopper 4

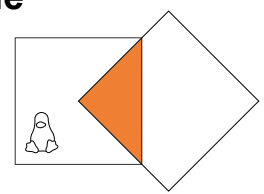
Helping you turn your sustainability strategy into action

Announce:
April 4th, 2023

GA:
May 17th, 2023

Sustainability, Without Compromise

- Designed to reduce your **energy consumption** and **Physical footprint** without compromising scale, security or performance
- Deliver **data protection**, **resiliency** and **privacy** at scale through confidential computing for workload isolation and end-to-end encryption of data
- Deliver **Flexible** consumption options, on-prem or off-prem, available at any **scale**



Available in your own rack or ours

IBM® LinuxONE 4 product Portfolio

IBM® LinuxONE Emperor 4 won the Sustainable Product Award at the SEAL 2022 Business Sustainability Awards

Building your sustainable infrastructure

IBM® LinuxONE Emperor 4

Generally available

Multi frame 5.2GHz, up 200 Linux cores

NEW: IBM® LinuxONE Rockhopper 4

Announce April 4, Available on May 17

Single frame, 4.6 GHz, up to 68 Linux cores

NEW: IBM® LinuxONE Rockhopper 4 Rack Mount

Announce April 4, Available on May 17

Parallel scalability to the Rockhopper 4

Plugs in a customer's rack, designed for colocation with other technologies

IBM® LinuxONE Rockhopper 4 –
Helping you turn your sustainability strategy into action

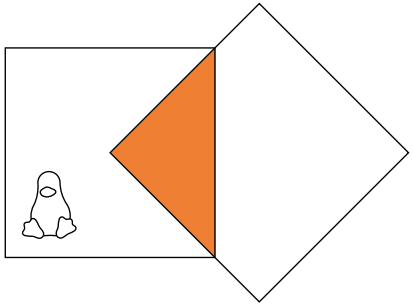
Reduce your energy consumption and costs with a highly efficient system

- **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
- HMC Environmental dashboard with system and partition level **power monitoring**
- TCO and CO2 Calculator to Determine CO2e emission differences between x86 and IBM® LinuxONE running similar workloads

Consolidating Linux workloads on an IBM® LinuxONE Rockhopper 4 system instead of running them on compared x86 servers under similar conditions can reduce energy consumption by 75% and datacenter space by 67%

DISCLAIMER: Compared IBM Machine Type 3932 Max 68 model consisting of a CPC drawer and an I/O drawer to support network and external storage with 68 IFLs and 7 TB of memory in 1 frame versus compared 36 x86 servers (2 Skylake Xeon Gold Chips, 40 Cores) with a total of 1440 cores. IBM Machine Type 3932 Max 68 model power consumption was measured on systems and confirmed using the IBM Power estimator for the IBM Machine Type 3932 Max 68 model configuration. x86 power values were based on Feb. 2023 IDC QPI power values and reduced to 55% based on measurements of x86 servers by IBM and observed values in the field. The x86 server compared to uses approximately .6083 KWhr, 55% of IDC QPI system watts value. Savings assumes the Worldwide Data Center Power Utilization Effectiveness (PUE) factor of 1.55 to calculate the additional power needed for cooling. PUE is based on Uptime Institute 2022 Global Data Center Survey (https://uptimeinstitute.com/resources/research-and-reports/uptime-institute-global-data-center-survey-results-2022). x86 system space calculations require 3 racks. Results may vary based on client-specific usage and location.

Leverage economies of scale with LinuxONE



Reduce IT costs by running enterprise software on LinuxONE

Run containerized workloads on LinuxONE

Consolidate per core licenses to drive TCO savings

Reduce total cost of ownership on average by 47%*

How much could you be saving?
Try the TCO Calculator

* Results based on an aggregate of customer studies across industries done by the IBM IT Economics Team

An Asian insurance company reduced energy consumption and avoided building a new datacenter

Business goal:
Comply with government regulations while facing high rental cost for DR center, insufficient floor space and electricity supply, limited people for operation and maintenance

Solution:

- Added LinuxONE to their private cloud resource pool
- Replaced 55 x86-based servers (mostly Java, some database) with 1 IBM LinuxONE server
- 21:1 consolidation ratio

Business Results:

- Reduced energy consumption by 70%
- Reduced software costs by 90%
- Reduced their datacenter floor space requirements by 75%

70%
Reduction in electricity consumption

90%
Reduction in software cost

75%
Reduction in floor space

* Results from Carbon Footprint Assessment by IBM IT Economics Team

Amret (Cambodia) Temenos Core Banking Win

Amret is a leading micro-finance institution and one of the top 10 financial institutions in Cambodia.

- *Business Goal*: Support client's digital transformation journey by implementing new core banking infrastructure.

- *Solution:* Consolidated **292** Oracle Exadata cores onto **18** IBM LinuxONE cores. Upgraded Temenos T24 to latest version with a redesign.

"IBM LinuxONE has been running our core banking system for many years without any disruptions. The high-availability and reliability of this platform allows us to serve the needs of our customers in today's very fast changing digital environment.....so many positive results and improvements"

Sajjad Khan, CIO, Amret

16:1
Exadata-to-LinuxONE core consolidation

90%
Oracle database licensing reduction

52%
lower TCO than with Oracle Exadata

$3.8M
Savings in Oracle licensing/support and Exadata costs

50%
Reduction in batch job completion times

40%
Or less resource utilization across all layers

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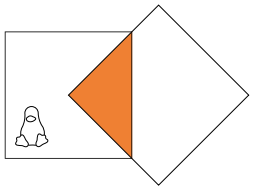
- Deliver **Flexible** consumption options, on-prem or off-prem, available at any **scale**



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 Rockhopper 4 –
Helping you turn your sustainability strategy into action

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

IBM® LinuxONE Rockhopper 4 systems, with GDPS, IBM DS8000 series with HyperSwap and running a Red Hat OpenShift Container Platform environment, are designed to deliver 99.99999% availability

DISCLAIMER: IBM internal data based on measurements and projections was used in calculating the expected value. Necessary components include IBM LinuxONE Emperor 4; IBM z/VM V7.2 systems collected in a Single System Image, each running RHOCP 4.10 or above; IBM Operations Manager; GDPS 4.5 for management of data recovery and virtual machine recovery across metro distance systems and storage, including Metro Multi-site workload and GDPS Global; and IBM DS8000 series storage with IBM HyperSwap. A MongoDB v4.2 workload was used. Necessary resiliency technology must be enabled, including z/VM Single System Image clustering, GDPS xDR Proxy for z/VM, and Red Hat OpenShift Data Foundation (ODF) 4.10 for management of local storage devices. Application-induced outages are not included in the above measurements. Other configurations (hardware or software) may provide different availability characteristics.

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

Solution:

- IBM LinuxONE
- IBM Hyper Protect Virtual Servers
- Digital Assets Infrastructure

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

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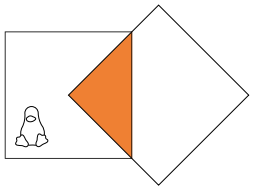

Exponential IT growth

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 Rockhopper 4 –
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Deliver Flexible consumption options, on-prem or off-prem, available at any scale

- **Scale up** or **scale out** in one massively scalable system
- **Re-allocate** resources on-the-fly to align with business priorities
- **Co-locate** Storage, SAN, switches in the same rack

A LinuxONE Rockhopper 4 Max 68 running Linux workloads can do the work of a compared configuration of 36 x86 servers with 1440 cores running the same Linux workloads with similar conditions and location

One system, 1-**68** cores, up to 16TB, Factory frame or Rack mounted

DISCLAIMER: Compared IBM Machine Type 3932 Max 68 model consisting of CPC drawers with 68 IFLs and 7 TB and an I/O drawer to support network and external storage in 1 frame versus compared 36 x86 servers (2 Skylake Xeon Gold Chips, 40 Cores) with a total of 1440 cores in 3 frames. Equivalent performance is based on IBM internal measurements, the March 10, 2023 IDC Qualitative Performance Indicator https://www.idc.com/getdoc.jsp?containerId=IDC_P39056 and IBM internal IT Economics tools which account for utilization rates and virtualization. Results may vary based on client-specific usage and location.

Met Office

Ensuring timely delivery of essential weather data to millions of customers

The Met Office migrated its meteorological databases from x86 systems to a resilient, high-performance and scalable IBM® LinuxONE platform — ensuring it can handle massive peaks in requests.

Solution Value:

- Cuts operational costs through database consolidation
- Ensures millions of customers can access critical weather data 24x7
- Support provided by a single team

"We can bet the business on LinuxONE — and I can sleep easily in the knowledge that we can absolutely rely on our data delivery systems."

-- Graham Mallin, Executive Head of Technology at the Met Office

https://www.ibm.com/case-studies/met-office

IBM Case Study
SUSE Success Story

App Modernization and Consolidation at Brazilian Credit Union

Challenge

Growing fast, Sicoob must cope with extra transactions at short notice. They wanted to combat the increased IT complexity that resulted without impacting service quality

Solution

Sicoob chose SLES on IBM® LinuxONE as its strategic platform, working closely with IBM to migrate and consolidate member databases to IBM® DB2® LUW with BLU Acceleration®

Results

- Saves **$2.5 million a year** thanks to a huge increase in available processing power.
- Accommodates a **50% increase** in business volumes with **40% fewer cores**.
- Enables faster, easier system management with built-in configuration tools.
- **331% reduction in electricity** costs alone.
- **25% faster cache** clearance.

"One of SICOOB's many social initiatives is reducing carbon emissions. For that reason, energy efficiency was a key criterion in our search for a new server platform."
— Claudio Kitayama, IT infrastructure analyst at SICOOB

A US Health Insurance Company

Deploys LinuxONE servers with Red Hat OpenShift and Ansible solution for better performance and automation

Client Challenge

- Migrate its existing applications to a red Hat OpenShift – based container hosting environment.
- Client needed to deploy multiple environments for many different internal clients within a compressed time frame
- More agility needed in the client's DevOps process to better meet customer demand
- Complex regulatory, security, and networking requirements
- Need for improved automation

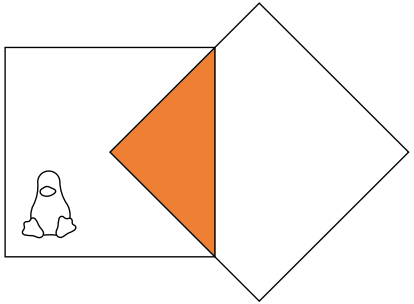
IBM Solution

- Moved applications to new **LinuxONE** infrastructure
- Leveraged the existing **z/VM** and related operational infrastructure
- Integrated the latest **Red Hat OpenShift** with compliance with FIPS and GitOps/ArgoCD capabilities for security and further automation
- Extended the existing **Ansible** automation into the LinuxONE environments

Client Benefits

- Increased agility in DevOps process and cloud native development
- Client now has LinuxONE performance scalability and RAS capabilities
- Ansible automation provides an easily extensible framework for a streamlined internal cloud service
- Client has ability to replicate the solution to other areas of the company

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

IBM LinuxONE 4

IBM LinuxONE III Express

IBM Cloud Hyper Protect Services

IBM Hyper Protect Virtual Servers

IBM LinuxONE Bare Metal Servers

Plastic Bank

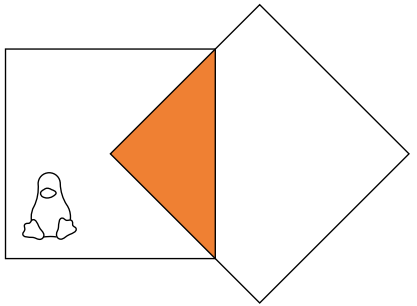
Powering the Plastic Bank revolution across the world is IBM Blockchain running on a hybrid cloud infrastructure, which is based on an IBM LinuxONE platform connected to the IBM Cloud®.

"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

Ideal use cases for IBM LinuxONE 4 for sustainability, security, scale



- Data serving
  - IBM Db2
  - MongoDB
  - Oracle Database
  - PostgreSQL
    - EDB
    - Fujitsu Enterprise Postgres
    - Community/other editions
  - Open-source NoSQL databases
  - IBM Blockchain Platform
- Java application serving
  - IBM WebSphere Application Server
  - JBoss
  - Oracle WebLogic Server
- ISV applications
  - Fiorano, Infosys Finacle, Intellect, Pennant, SunTec, Software AG, Temenos
- Modernization & Cloud Native
  - Red Hat OpenShift
  - IBM Cloud Paks
  - Others
- Digital asset custody
  - IBM Hyper Protect Digital Asset Infrastructure
- Any combination of the above

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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

A European financial institution reduced its GHG emissions and TCO by consolidating Oracle workloads onto IBM LinuxONE

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

Solution:

- Replaced 16 x86-based servers with 1 IBM LinuxONE server
- Databases running on **149** cores of x86 required only **10** LinuxONE cores (149:10 = 14.9:1 ≅ **15:1**)

Business Results:

- Reduced energy consumption by 70%
- Reduced the number of software licenses required by 60%, due to a high core-consolidation ratio

15:1
x86-to-LinuxONE core ratio

70%
CO_2e reduction

60%
SW license reduction

Nowy Styl

Smart system consolidation — accelerating performance with style

By deploying Oracle Database on LinuxONE, Nowy Styl increased system speed and security:

Increases key system processing speeds by ~450%

A shop material planning report that used to take 187 minutes to process is now completed in 60 minutes — a 68% shorter time.

A key process replication report that used to take 62 minutes to prepare is now completed in 16 minutes — a 74% shorter time.

A key production scheduling planning report that used to require 111 minutes to prepare is now available in 24 minutes — a 78% shorter time.

Provides more layers of security

through more powerful data encryption capabilities

Enables more growth for the future

without increasing the overall cost of software licenses or increasing footprint

Check out the case study

IBM LinuxONE Expert Care

A simplified support approach to optimize availability and reduce costs

Flexible coverage term

Select coverage term of 1-5 years

Code updates

Remote or on-site code updates once a year

Predictive alerts

A state-of-the-art analytical tool suite which includes predictive alerts

Enhanced response time

2 hours initial response for severity 1 and severity 2 cases

IBM Expert Labs services for IBM LinuxONE

Security

- Analyze Cyber Security Risk
- Analyze Continuous Compliance
- Analyze Quantum Safe Posture
- Implement Pervasive Encryption
- Implement Encryption Key Management
- Implement Multi-Factor Authentication
- Implement zSecure

Modernization

- Implement AI on IBM zSystems
- Implement Red Hat OpenShift
- Implement IBM Cloud Infrastructure Center
- Implement z/OS® Connect
- Implement z/OS Container Extensions
- Analyze Currency and Migration

Cyber Resiliency

- Analyze IBM zSystems Resiliency

Linux

- Analyze and Implement Migration to LinuxONE
- Implement Hyper Protect Digital Asset Platform
- Implement IBM Db2® Analytics Acceleration

IBM Expert Assist

IBM Expert Labs services units provide flexibility to address client's project needs

Expertise Connect

Subscription services that establish a long-term relationship with IBM Expert Labs, with access to IBM Expert Labs Consultants (SME)

Additional Services

IBM Expert Labs services customized to address client's needs

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

IBM LinuxONE Rockhopper 4
Machine type: 3932
Model LA2

Flexible compute design

- Available as single frame, or as rack modular for customer data-center-defined racks for new location spaces
- Two power options – IBM iPDU or customer-defined PDU/power management with DCIM sustainability tool integrations
- Quantum-safe system with new Crypto Express8S card

IBM Telum Processor

- 7nm technology, 4.6GHz, 4 Dual Chip Modules (DCM) per CPC drawer, up to 2 drawers
- 8 Cores/Chip, 2 Chips/DCM
- Up to 68 linux cores
- New integrated AI Accelerator for high-speed inferencing, in addition to accelerators for crypto, compression and sort

Memory

- Up to 16TB RAIM memory
- Transparent memory encryption
- 16TB memory per LPAR

To the Data

- 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	32	8 TB
2	68	16 TB

CPC Feature	Client PUs	Max Memory
Max 5	5	4 TB
Max 16	16	4 TB
Max 32	32	8 TB
Max 68	68	16 TB

Linux z/VM KVM

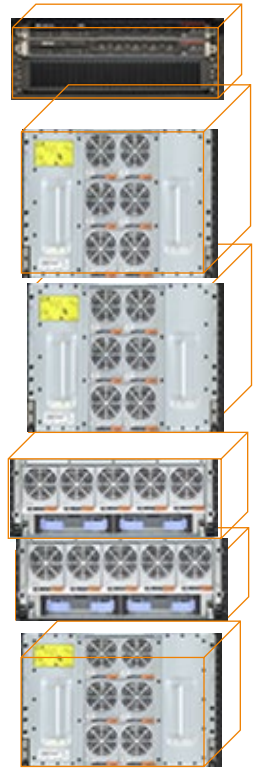
Two Air Cooled Options:
19” IBM Single Frame or New Rack-mount option for Client rack/PDU integration

LinuxONE Rockhopper 4 Proposed 19” IBM Single Frame

- 19” IBM-supplied frame
- IBM iPDUs factory-installed
- SSR Installed
- No 16U Reserved Space
  - Avoids moving HW later

LinuxONE Rockhopper 4 Proposed Rack-Mount * (19” EIA standard units)

- Installed in a client rack
  - Use client/colo standard
  - Leave rack in place
- SSR Installed, continuous EIAs in frame
  - Common config = 18U
  - Max config = 39U
- Other storage, switch, etc hardware can be bundled into the same all-in-one solution footprint



** Not available in all geographies*