

IBM Hybrid Cloud Overview

Building a sustainable Infrastructure

2023 TPF Users Group Conference
April 24-26, Dallas, TX

Rick Schoonmaker – raschoon@us.ibm.com
IBM LinuxONE Platform Product Management Lead



Where have I been?

My wild ride through IBM

TPF Management

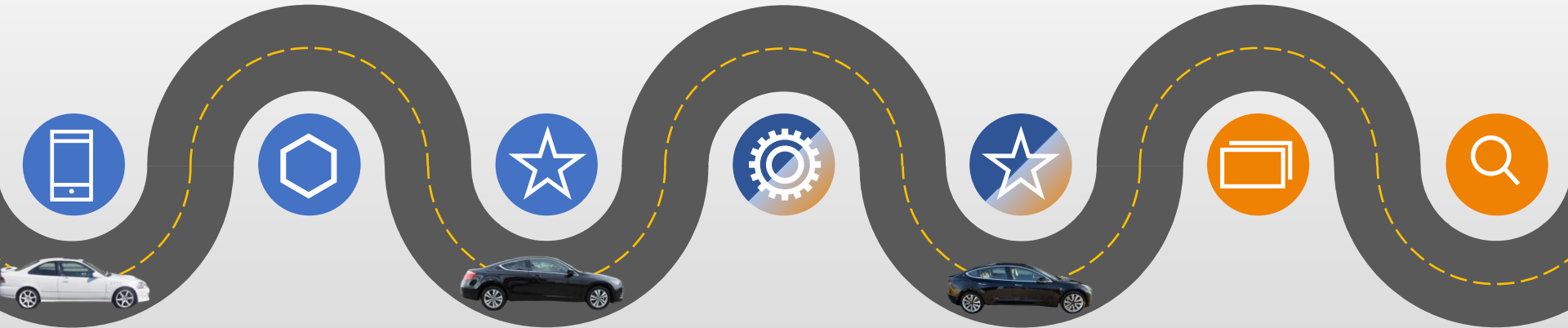
- TPDFDF, Languages, Tools Team, IT Team, ID

IBM zSystems and LinuxONE WW Client Care Manager

- WW Crit Sit Office

LinuxONE Platform Product Management Program Director

- Responsible for LoZ and LinuxONE HW, Linux Distros and Alliances, Virtualization, OCP, Add-ons, ICIC, SDS, CloudPaks



TPF Developer

- Comms, MATIP, OSA, TPF Mail Server, Web Services

TPF Lab Program Director

- Design, Dev, Test, ID, Support, Service

IBM zSystems HW Principal Product Manager

- Overall responsibility for the z15 and LinuxONE single-frame program

Hybrid Cloud Introduction

Many companies initially rolled out a public cloud everything and everywhere decree...many companies quickly realized that may not have been the best call. Turns out, at enterprise scale, the cloud is not always as easy, performant, secure, sustainable, or cheap as initially believed.

Perhaps there is a better middle ground in there someplace, such as utilizing a hybrid cloud strategy.

Colocation, Security, Consolidation, Sustainability, Scalability, Flexibility, Hybrid cloud value, AI



Enterprise-grade Linux

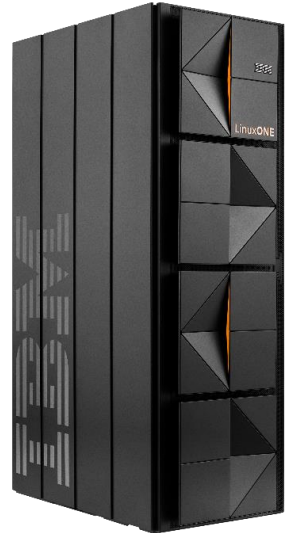
The best of **ENTERPRISE COMPUTING**

- Dynamic Resource Allocation
- Non-Disruptive Scalability
- Continuous Business Availability
- Operational Efficiency
- Trusted Security
- Data and Transaction Serving



The best of **LINUX & OPEN**

- Freedom & Agility
- Standards Based
- Speed of Innovation
- Developer Productivity
- Community Collaboration
- Quality of Software



Timeline for Linux on the platform



Red Hat

- Red Hat® delivers Linux Solutions for IBM's S/390

Red Hat Enterprise Linux 3 becomes available



Biggest Linux on IBM eServer® zSeries® client now runs more than 290 cores



[IBM Big Green consolidation of 3,900 x86 servers to only 30 Linux on Z](#)



IBM Enterprise Linux Server, based on zEnterprise



IBM celebrates 100 years of innovation – including support for Linux



The Ideas that Shaped a Century

3,000 ISV applications available for Linux on Z



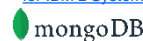
IBM Launches z13 and LinuxONE Emperor



Open Mainframe Project launched by Linux Foundation

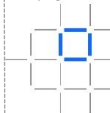


MongoDB announces support for IBM z Systems



IBM z14@ and LinuxONE Emperor II™

IBM Blockchain for Linux on Z and LinuxONE



IBM and Red Hat join forces to advance hybrid cloud



- IBM launches new IBM z15™ and LinuxONE III server systems with on-chip zEDC



- IBM Cloud™ Hyper Protect Services launched, built on LinuxONE



IBM launches new IBM z16™ and LinuxONE Emperor 4 server systems with Quantum safe technology



IBM launches LinuxONE Bare Metal servers



IBM unveils Linux software and services for S/390 server



IBM announces plan to invest \$1B in developing and marketing Linux

SUSE Linux S/390 released



Major ISVs available for Linux on Z including SAP and Oracle 9i

Linux on Z is used for mission-critical applications by customers



1,000 ISV applications available for Linux on Z



Security and performance improvements with IBM System z10®



400 IBM software products now available for Linux on Z

IBM Systems™ Magazine special edition about Linux on Z



IBM Launches New zEnterprise EC12 Secure Cloud-Focused Mainframe System

KVM available for Linux on Z

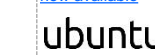


OpenStack available for Linux on Z



openstack.

Ubuntu 16.04 LTS for IBM LinuxONE and IBM z Systems is now available



IBM Cloud Private brings containers and Kubernetes to Linux on Z and LinuxONE



Red Hat OpenShift available on Z and on LinuxONE



- Red Hat Runtimes and IBM Cloud Pak for Application s 4.2 available on Z and on LinuxONE



IBM announces the Telum Processor for real-time inferencing at scale using popular AI frameworks and leveraging the on-chip AIU.



23 Years of Linux on the platform



8 Years of LinuxONE



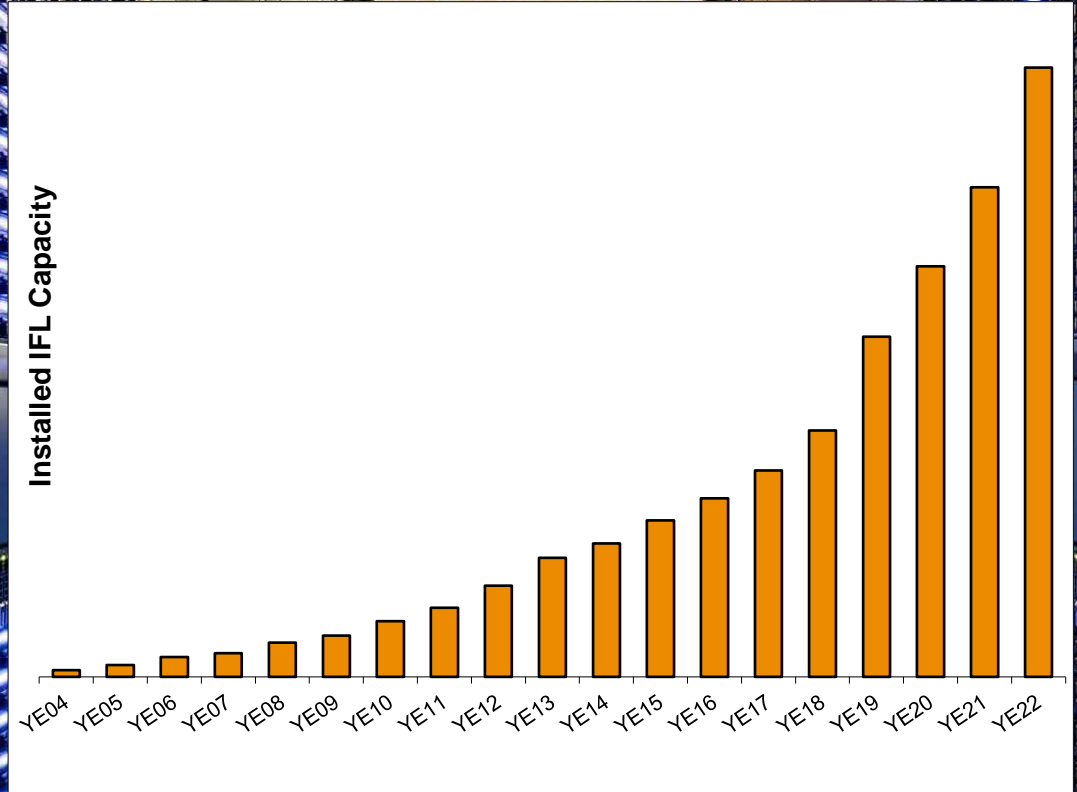
3 Years of Red Hat OpenShift on the platform

Linux on Z and LinuxONE Momentum

Continuous investment and expansion of our open-source software ecosystem

Rapidly increasing adoption of Linux, with 2022 being the best year ever and over half of all IBM zSystems accounts running Linux

24% growth in installed IFL MIPS this past year



IBM z16 Product Portfolio



IBM z16 Multi Frame

Designed to support the growth in IT requirements for multi-frame clients, with superior scalability & efficiency with up to 200 cores



IBM z16 Single Frame

Designed for roll-in, roll-out single-frame clients, providing enriched capabilities and improved performance per core

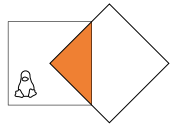


IBM z16 Rack Mount

New entry point rack mount option, components designed for colocation with other technologies IBM-installed in customer-supplied rack

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 to 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

Introducing IBM LinuxONE 4

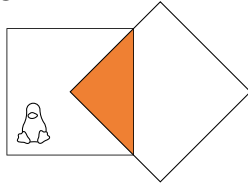
Helping you turn your sustainability strategy into action

Rockhopper 4
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 z16 Rack Mount

Flexibility across data center ecosystems

Why offer Rack Mount options?

- Flexibility for “system-in-a-box” footprints
 - Opportunities to include Storage, SAN, switches in converged solutions
 - Maintains investment protection for upgrades
- Allows installation to structured racks aisles
 - Optimize colocation center sustainability & services experience
 - Integrate into existing Hot/Cold aisle thermal management data center configurations



*Thermal Containment Unit
with top air cap and standardized racks*

tateinc.com



50U tall racks in a data center hall

ibm.com

IBM z16 Rack Mount



Hardware Management Assembly & support devices (5U)



z16 Server Base (5U)



PCIe+ IO Expansion Enclosure (8U)

IBM z16 10U+ Rack mount

Delivers extraordinary scalability, performance and availability for data centers with demanding AIX, z/OS and Linux applications

[Download performance report](#)

[Talk to an expert](#)



IBM z16 server capabilities

- Newly offered in a rack mount configurations, 10U to 39U
- For use with client-owned 19" racks & power distribution units
- Exploits the z16 highly scalable and resilient server base
- Range of scalability options
 - Up to 3 optional PCIe+ IO expansion enclosures (up to 48 adapters)
 - Optional secondary server base expansion (up to 68 IBM Telum processor cores at 4.6GHz)
- Hardware management support is included with the server base, including secure remote access options
- Enterprise- level installation, warranty and 24x7 support included under warranty umbrella (#0515)

IBM z16 Single Frame & Rack Mount w/ IBM Telum processor

IBM Telum Processor

- New Integrated AI Accelerator for high-speed inferencing, in addition to accelerators for encryption and compression
- 7nm technology @ 4.6GHz, up to 4 Dual Chip Modules (DCMs) per CPC drawer
- 13% single-thread performance improvement over z15 T02
- Quantum-Safe system, complemented by new Crypto Express8S HSMs

Flexible compute design

- Up to 68 customer-configurable cores
 - Up to 6 standard CPs
 - Up to 67 zIIPs, with zCX containerization options
 - Up to 68 IFLs for prime Linux on Z capacity
- Up to 14% max system capacity growth over z15 T02 with z/OS
- Up to 21% max system capacity growth over z15 T02 with Linux on Z
- Options that fit data center strategies: IBM-provided single frame for roll-in, roll-out ease, or rack mount configuration for customer-supplied rack infrastructure
- Power options – IBM iPDU (single frame) or customer-defined PDU (rack mount)
- Up to 3 I/O PCIe+ Drawers available for I/O expansion up to 48 adapters
- New FICON Express32S for enhanced speed and consolidation opportunities

Memory

- Up to 16 TB RAIM memory with physical memory encryption
- 2 TB Virtual Flash Memory

IBM z16 4.6GHz

Machine Type 3932
Single Frame Model A02*

Overall Sizing

CPC Drawer	Customer PUs	Max Memory
1	32	8 TB
2	68	16 TB

Feature-Based Sizing

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

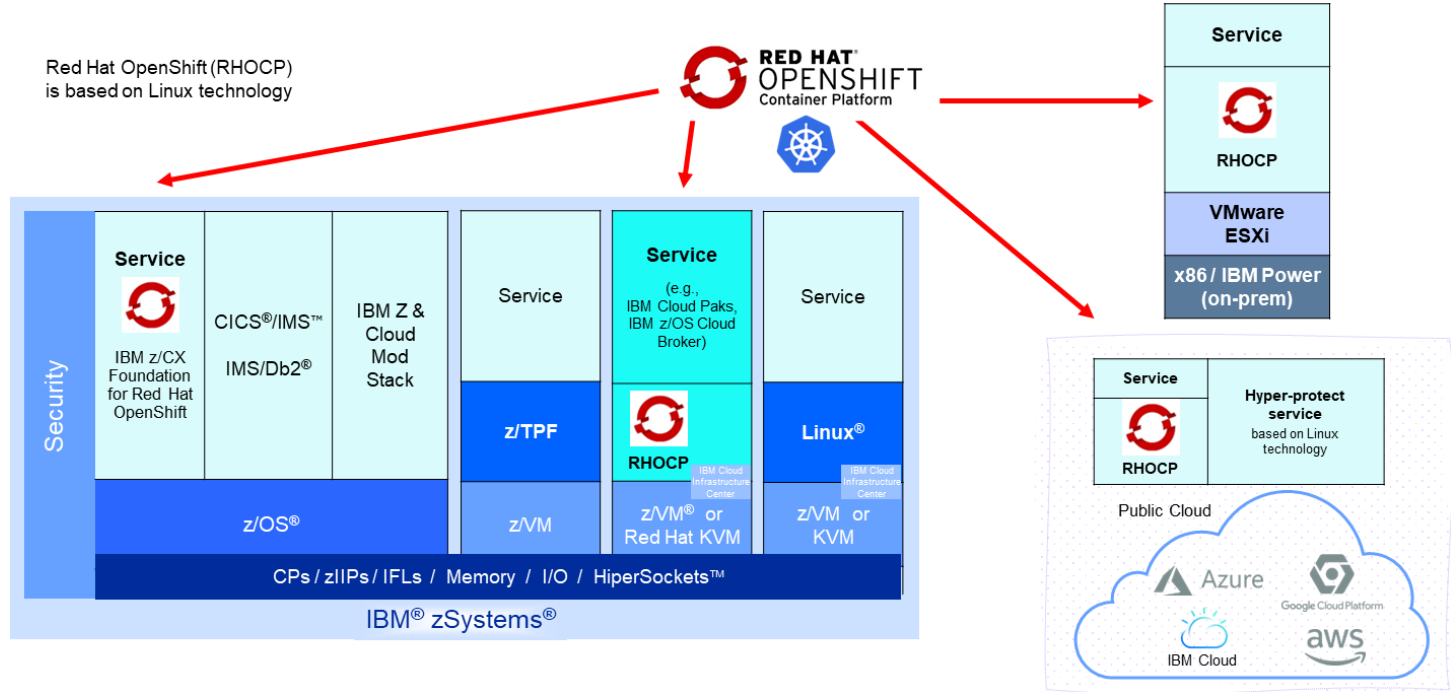
*Rack mount configuration (FC #0515, AGZ)

Adoption pattern: Modernization

The vision of hybrid cloud with Red Hat OpenShift

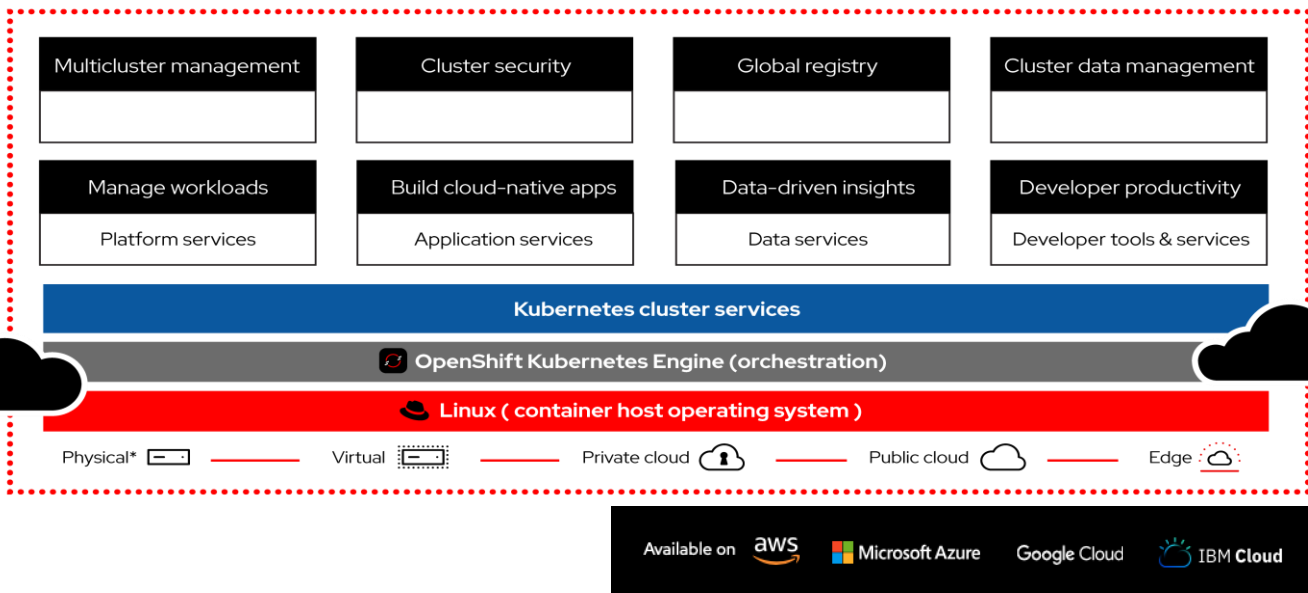
Hybrid workloads and multiple Red Hat OpenShift clusters can run in parallel on a physical IBM zSystems server.

Adapt enterprise DevOps with consistent, cloud native development, and CI/CD tooling.



What is OpenShift?

With the Red Hat OpenShift Container Platform (OCP) you can quickly build, deploy, run, and manage applications anywhere, securely and at scale. Red Hat OpenShift is an enterprise-ready hybrid cloud application platform with deployment and infrastructure options that support every application and environment, and delivers a consistent experience across public cloud, on-premise, hybrid cloud, or edge architecture.



Key messages:

- Container management
- Targets enterprise
- Integrates entire stack
- Multi cloud

Why & What is RH OpenShift on zSystems?

Common and self-contained Container Orchestration solution based on Linux

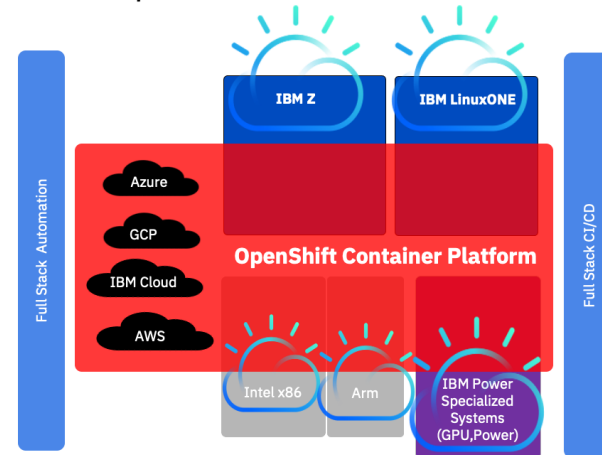
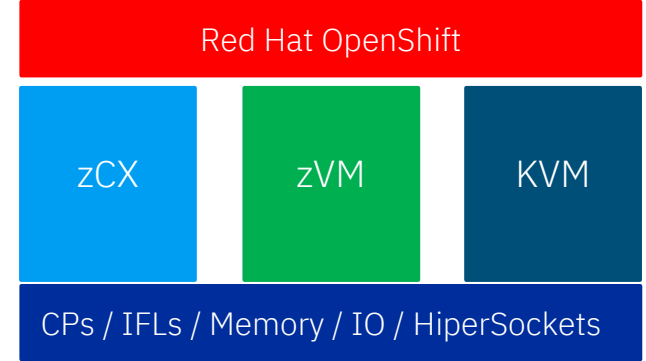
- Kubernetes Distribution provided by RH with many additional features
- Automated full stack installation based on RH Container OS (RHCOS)
- Common mechanisms for high availability, scalability, security, and CI/CD → complete ecosystem
- Taking advantage of zSystems specific HW capabilities → Use of Crypto Cards, Secure Execution, etc

Available since February 2020 based with OCP 4.2.

- zSystems delivers lockstep with OpenShift X86 schedules
- Feature parity not yet entirely reached for OCP Base, but close
- Delivered 10 OCP releases incl. new platforms like KVM and z/CX and many new features.

Benefits for zSystems platform

- Modernization by providing state of the art development infrastructure
- Colocation of cloud-native applications close to zSystems hosted data



Workloads on IBM zSystems & LinuxONE

Benefits

Low Latency and Large Volume Data and Transaction processing

- 5.2GHz thread performance
- 8-15x more cache-per-thread
- 320 dedicated I/O channels
- Compression Acceleration

Enterprise class infrastructure – Elastic, Scalable and Resilient

- 85 EAL5+ LPARs
- Self healing memory & core sparing
- Non-disruptive system maintenance
- Hardware-optimized virtualization

Security and Compliance

- On-chip Quantum Safe**
- CEX7S Quantum Safe algorithm support
- FIPS-140-2 Level 4 HSM
- Crypto acceleration per-core
- 16TB secure enclaves



Adoption Patterns

Enterprise Hybrid Cloud

- 2.4M containers-per-box
- Capacity-on-demand
- Non-disruptive scale-out and scale-up

Data Gravity and Digital Transformation

- 7x shorter batch windows
- 10x lower online transaction latency
- Low latency in-transaction AI **

Secure Cloud Native

- Confidential computing
- Pervasive encryption
- Cyber resilience
- Integrated compliance automation**

Extreme Consolidation and scalable Data Serving

- 60% lower Total Cost of Ownership

99.99999%
system availability *

4:1 better data-center footprint
2:1 lower power envelope

3.8x better Java throughput,
24x faster Java Garbage Collection

*z/OS and
LinuxONE

IBM Hybrid Cloud Strategy Overview / © 2023 IBM Corporation

Enterprise grade. **Open** by design. **Secured** by LinuxONE

**z16 only

European Bank Modernization from large monolithic to an agile configuration

Business Requirements

Client needed to improve agility and minimize risk of large monolithic integration broker and MQ components that support critical business applications.

Client wanted to modernize to containerized microservices, still benefitting from the reliability and scalability with IBM zSystems.

In Production

Modernization from large monolithic 'integration broker' to more agile configuration – still using the benefits of colocation on IBM zSystems.

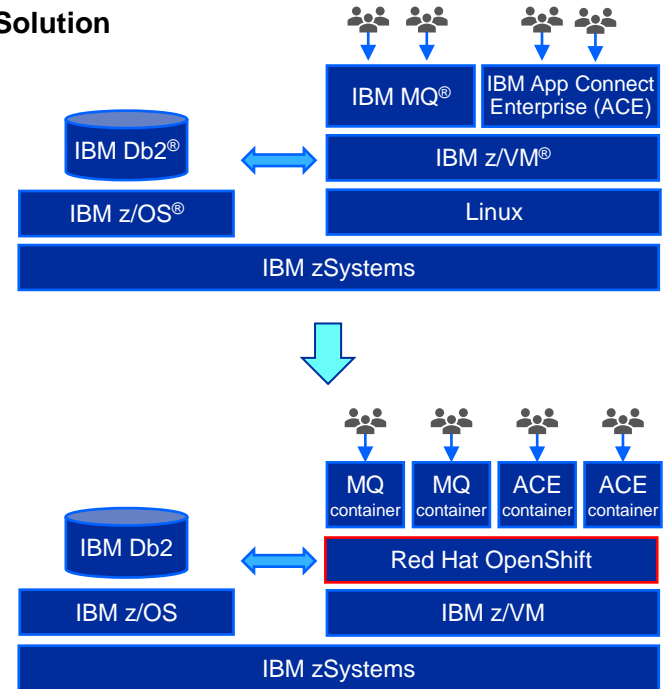
Solution Benefits

The client decided to implement Red Hat OpenShift on IBM zSystems and 'IBM Cloud Pak® for Integration' to take advantage of the platform's scalability, reliability, and lower TCO.

The client is taking advantage of the containerized 'IBM App Connect Enterprise' server and 'IBM MQ' instances to allow for a more agile development and production rollout of various microservices instead of changing the current large monolithic implementation.

Using Red Hat OpenShift along with pipeline technologies enables the client to be more responsive to business needs.

Solution



Large client in NA Modernization on IBM zSystems

Business Requirements

Increase competitive business offerings by extending and modernizing the integration with existing assets while maintaining SLAs and keeping risk and cost low.

In Production

Containerized services running in OpenShift are co-located on the same IBM zSystems system with z/OS Db2 data and CICS for low latency, high volume transaction processing

Solution Benefits

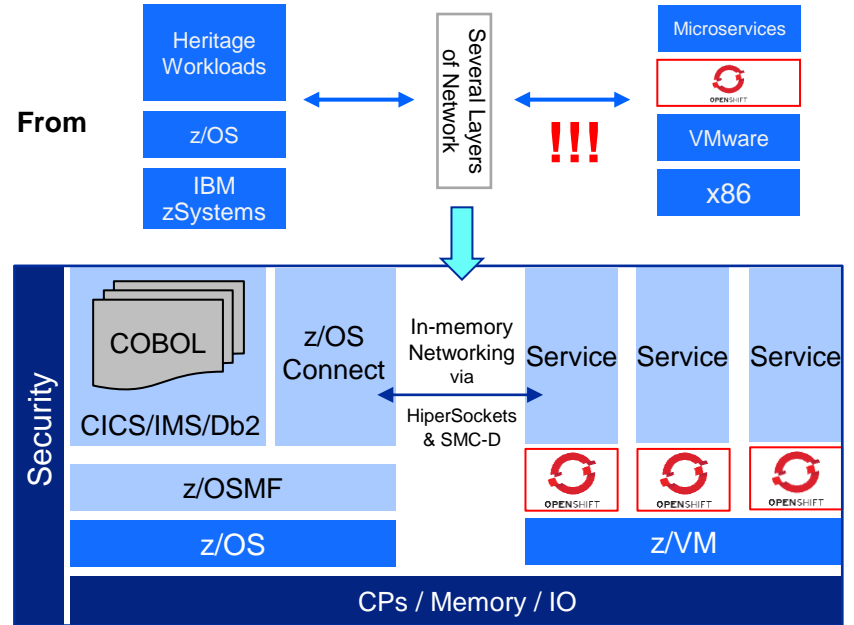
7.3x lower transaction latency compared to the equivalent distributed systems architecture

Developers got a platform agnostic development environment

Extend the container platform all the way to IBM zSystems

Exploiting co-location on IBM zSystems, the clients benefits from lower transaction latency compared to the equivalent distributed architecture, offering a more competitive and efficient service to its customers.

Solution Elements



Client in LA

Accelerate enterprise digital transformation

Business Requirement

Client drives digital transformation to cloud and microservices and needs reliability, security and performance, as well as an integrated and standard platform that allows software transformation and migration in an agile, flexible and easy way

Solution Benefits

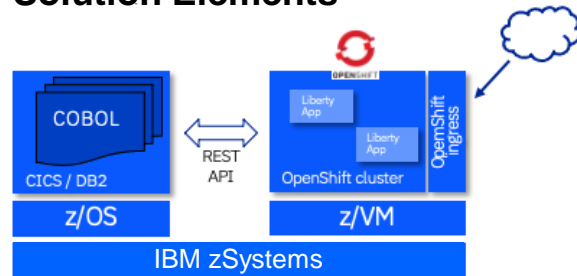
Red Hat OpenShift based services run co-located with existing z/OS assets on the same IBM zSystems system, benefiting from low latency and high scalability.

Client started its transformation by using Java, now using Liberty on Red Hat OpenShift in z/VM based virtual machines on IBM zSystems.

In Production

- CI/CD pipeline integration with OpenShift on IBM zSystems
- Application portability
 - IBM WebSphere® (x86) to Liberty (s390x)
- Better scalability with Red Hat OpenShift on IBM zSystems
- From 1500 queries/min to 650,000 queries/min
 - 43x improvement

Solution Elements



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 z16 and LinuxONE 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

Leverage NIST selected IBM co-
developed quantum-safe algorithms

Linux on Z and 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](#)



Promoting positive digital citizenship through data privacy research: Toronto Metropolitan University

Solution:

Utilizing the IBM LinuxONE platform to test various open-source blockchain-based technologies

Solution Value:

Emerging technologies introduce new possibilities for data privacy solutions that could benefit:

- ✓ Complying with changing data privacy regulations
- ✓ Addressing consumer distrust towards third party usage of sensitive personal information
- ✓ Combatting the rise in cyber security attacks

Check out the [blog post](#)

“We’re excited to kick off research of emerging data privacy technologies with the IBM LinuxONE platform. Ultimately, we hope this research will help bring open-source data privacy tools to consumers who may not have the resources to set up solutions on their own.”

-- Dr. Anatoliy Gruzd,
Canada Research Chair in Privacy-Preserving Digital Technologies

IBM Linux on Z and LinuxONE 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 CO2e footprint by over 850 metric tons annually.



*see disclaimer chart for full claims (2)

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

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

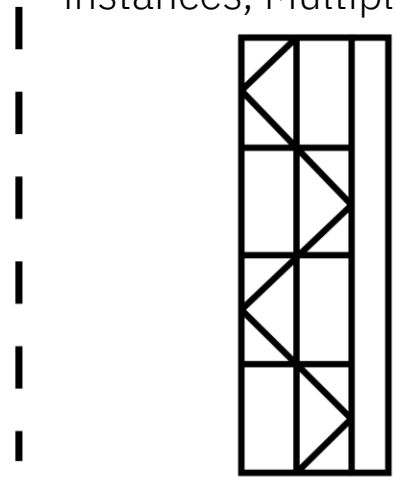
Migrating OpenShift workloads to LinuxONE

256 Cores running
MongoDB instances



X86 racks

19 Cores running
RedHat OpenShift, MongoDB
instances, Multiple partitions, VMs



LinuxONE



After the workload is moved to Linux on Z, sustainability software shows:

Reduced greenhouse gas emissions.

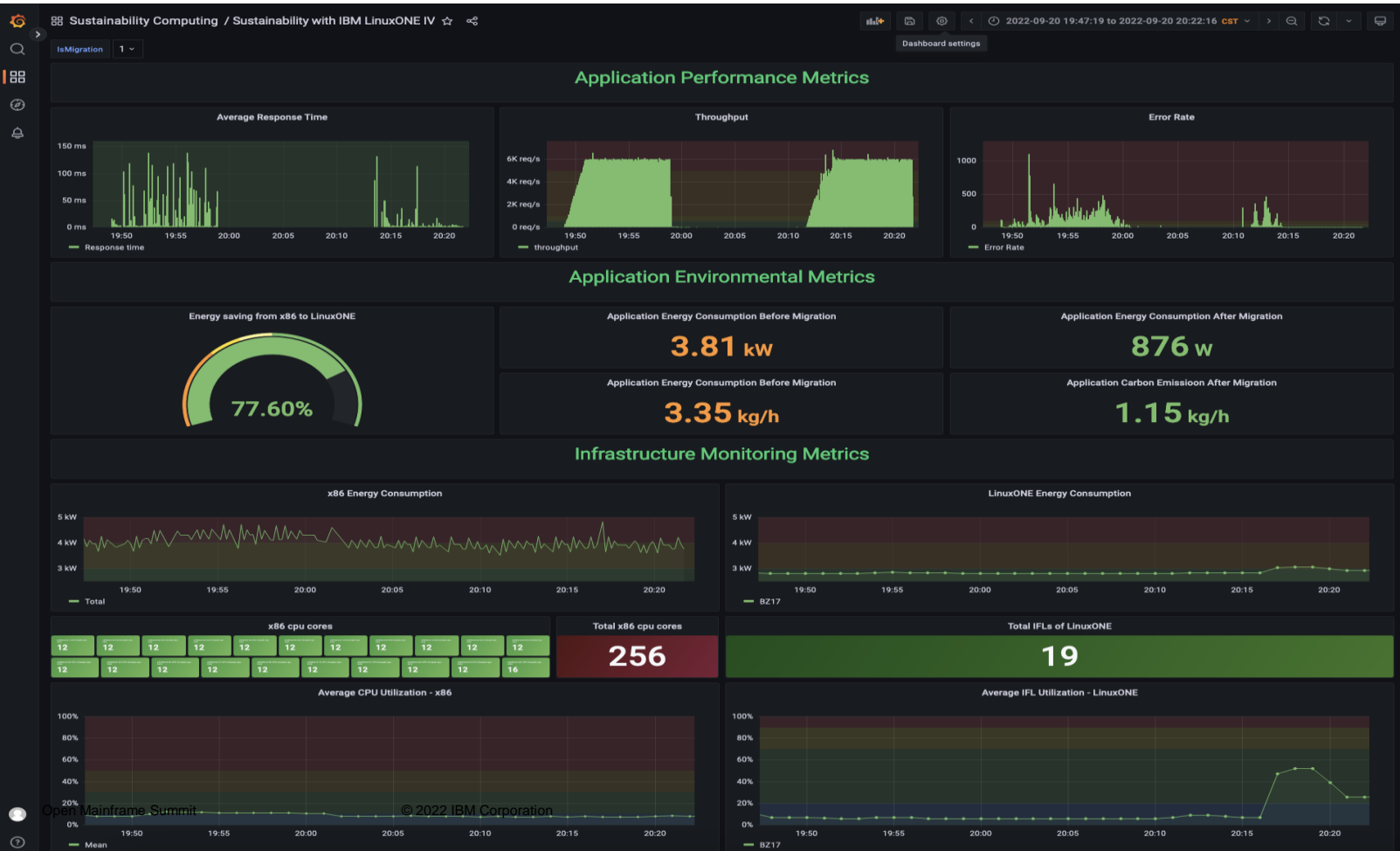
Reduced electricity consumption.

Improved response time and error rate.

Full demo: <https://www.ibm.com/products/linuxone-emperor-4/sustainability>



Sustainability Dashboard to Visualize Sustainability Metrics



Application Performance Metrics including Response Time, Throughput, and Error Rate

Application Environmental Metrics including Energy Consumption, Carbon Emission, and Energy Saving after migration from x86 to LinuxONE

Infrastructure Monitoring Metrics including Power Consumption, CPU/IFL Cores, and CPU/IFL Utilization of x86 and LinuxONE clusters

IBM Infrastructure sustainability leadership spans the full product lifecycle



IBM Supply Chain utilizes recycled packaging, lighter packaging for reduced emissions during transportation & low impact sourcing

- *Hybrid pallets & lightweight packaging saves cost and 1,400+ MT of CO2 emissions per year.*
- *99% of wood-based packaging comes from sustainably managed forests*

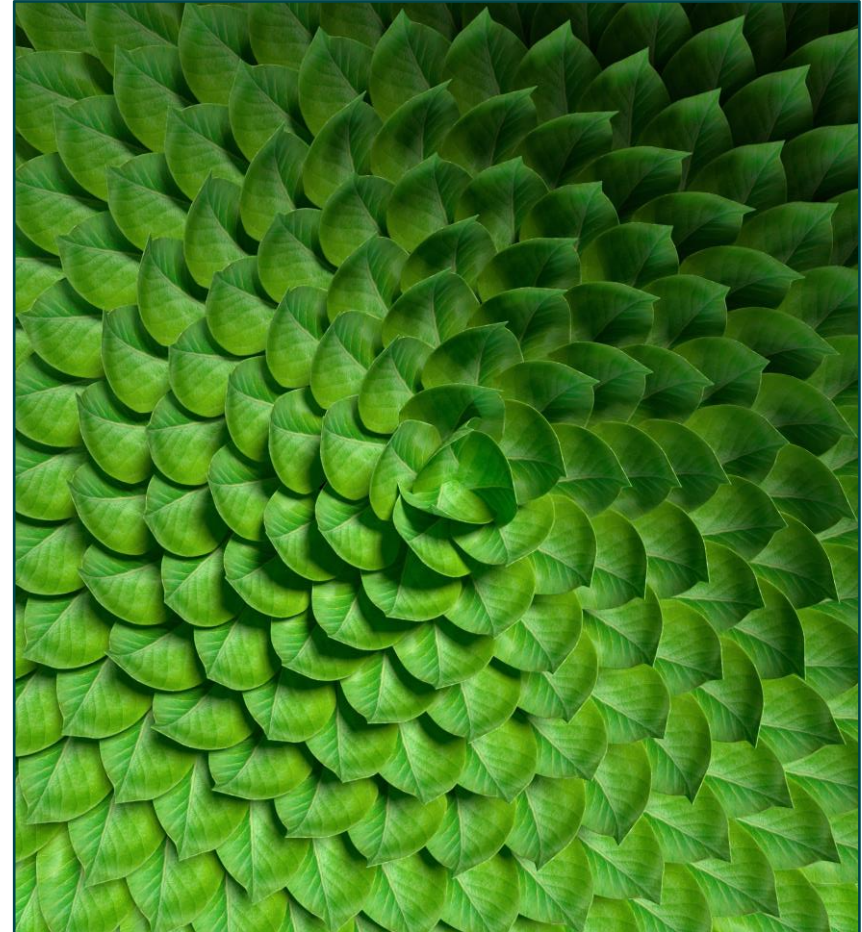


30+ years of pro-active product takeback and reclamation programs

- *<3% of end-of-life products & product waste relinquished to landfills*
- *Battery reclamation achieves significant cost savings and prevents 130 MT of waste per year*
- *Hardware product features may carry forward on system upgrades*



Published product carbon footprint reports for increased consumer transparency



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 4 – Helping you turn your sustainability strategy into action

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 Emperor system,
200 cores, up to 40TB



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.

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

Banking without the waiting:

Sagicor Bank Jamaica accelerates its core processes and positions itself to launch new services with IBM LinuxONE technology and Temenos



Client Challenge:

Sagicor Bank Jamaica was experiencing significant DB2 performance issues with their close of business (COB) processing costing thousands of dollars annually.

Solution Value:

Solution allowed Sagicor to run online database organization in parallel to operations tasks

IBM's Winning Solution:

- LinuxONE Servers
- DB2 (deployed using Data Protection Manager)
- Red Hat RHEL
- IBM FlashSystem 7200
- Red Hat OpenShift

50%

Shorter end-of-day closing time

\$4.1M

7-year TCO savings

3 - 4

Years

Full ROI

“[I]t was critical that we invested in and moved to a technology that not only allowed us to optimize our core banking but that will help us move forward on our digital transformation and pivot to cloud.”

Mark Clarke

Vice President of IT, Sagicor Bank Jamaica

Check out the [blog post](#)

Leverage economies of scale with Linux on Z and LinuxONE

Reduce IT costs by running enterprise software on Linux on Z and LinuxONE

Run containerized workloads on the platform

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 & CO2e Calculator](#)

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 \cong **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%
CO₂e
reduction

60%
SW license
reduction

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>



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

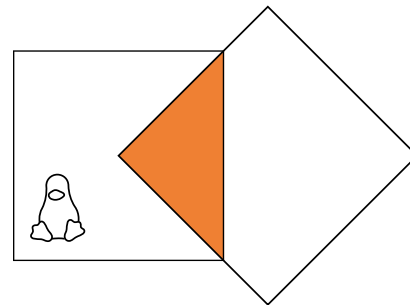
Check out the [case study](#)

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®.

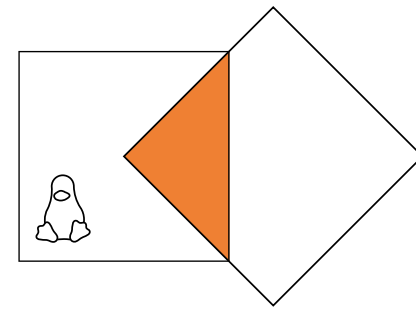
“We are planning for over 1 million branches around the world, bringing us closer to our goal of eradicating ocean plastic. We have no doubt that IBM technology can help us get there.”

-- 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 Linux on Z and 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**
 - Fiorana, Infosys Finacle, Intellect, Pennant, SunTec, Software AG
- **Modernization & Cloud Native**
 - Red Hat OpenShift
 - IBM Cloud Paks
 - IBM Cloud Infrastructure Center
 - Others
- **Digital asset custody**
 - IBM Hyper Protect Digital Asset Infrastructure
- **Co-location with IBM Z workloads**
- **Any combination of the above**

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 day³

A single IBM LinuxONE can do the work of up to 2000 x86 cores¹

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.

³ 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.



^{1 3}see disclaimer chart for full claims

IBM LinuxONE Rockhopper 4

Building a sustainable infrastructure

Up to 68 LinuxONE cores

7nm technology, 4.6 GHz

Up to 16TB memory

Quantum-safe encryption

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

Can be plugged in an IBM or customer's 19" rack

Up to 16 internal NVMe carrier cards for flash storage

A single IBM LinuxONE Rockhopper 4 can do the work of up to 36 x86 servers.

A single IBM LinuxONE Rockhopper 4 can do the work of up to 1440 x86 cores.



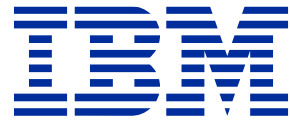
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³ With IBM LinuxONE Emperor 4, execute up to 20 billion HTTPS transactions per day with OLTP microservice applications running on Red Hat OpenShift Container Platform.

Summary

- Consolidation
- Security
- Sustainability
- Hybrid cloud
- Co-location with z/TPF for latency-sensitive aspects of OLTP workloads
- z/TPF calling popular AI frameworks running on co-located Linux doing real-time inferencing at scale via AIU
- Flexibility
(multi-frame, single-frame, rack mount)





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