



Efficiency and Innovation: An Analyst's Guide to IBM LinuxONE for Modern Enterprise Workloads



Introduction

Enterprise IT leaders face significant challenges today, including rising operational costs, data center space and power constraints, and the need for greater sustainability. Organizations today seek IT infrastructure that is adaptable across an ever-changing mix of high-volume transaction workloads and internal business applications.

Modern infrastructure must provide efficiency, resilience, scalability, and security while being cost-effective. This requires an IT optimization strategy that can address the demanding needs of today's workloads, support new local and hybrid cloud applications, and increasingly AI models and applications. This paper reviews the LinuxONE platform as a strategic platform to address current and changing consumption models, scalability, reliability, and operational cost management.



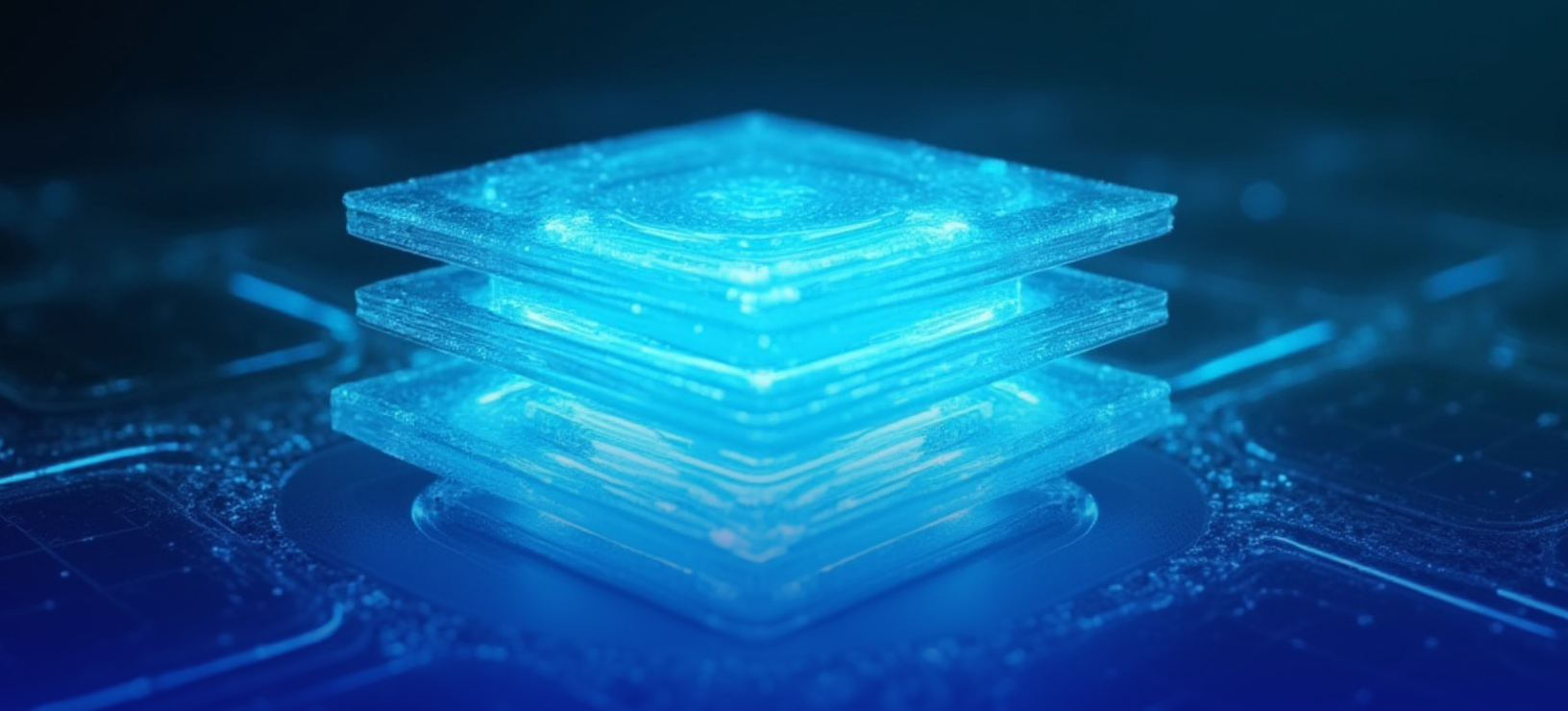
Modern Workload Platform for IT Optimization

The continuous growth of IT consumption, accelerated by the adoption of artificial intelligence and other modern technologies, puts a strain on existing data center resources. Finding strategies that support broader capabilities as the business adapts to market opportunities and challenges is a top priority for CIOs and CTOs.

Modern IT platforms must support a diverse and evolving set of workloads, moving beyond traditional applications to include containerized and cloud-native solutions. This includes everything from conventional transactional databases and application servers to new digital customer experience systems. These platforms must also handle a variety of modern programming languages such as Java, Node.js, Python, and Go, along with popular application stacks such as Apache Tomcat and Red Hat JBoss.

Organizations today are dealing with a combination of legacy systems and new workloads, which require a platform that is powerful, adaptable, and resilient enough to meet various business needs. The demand for AI workloads is rapidly growing. This trend calls for platforms that can accommodate the significant power and space requirements associated with compute-intensive tasks, along with larger sets of general-purpose applications. Additionally, organizations are also consolidating workloads and databases, resulting in reduced licensing costs, improved performance, and lower energy expenses.

IBM LinuxONE is positioned as a strategic solution for modern IT optimization. Through its ability to aggregate large, diverse sets of workloads, LinuxONE systems can more effectively consolidate workloads on a single platform, balancing resource peaks and valleys, resulting in more predictable and efficient utilization. For example, as outlined in the recent Signal65 [Workload Consolidation on IBM LinuxONE report](#), LinuxONE is shown to achieve 76.5% lower cumulative cost, 91% lower energy costs and 82% less data center space than an equivalent x86 environment.



Engineering for Enterprise Efficiency

Central to the LinuxONE platform is its use of the Telum II Processor, featuring a 5.5 GHz clock speed and extensive L1/L2 cache. Telum II cache sizes are eight to fifteen times larger than those of typical x86 systems. They are one of the attributes contributing to LinuxONE's scalability and ability to handle diverse workloads.

Virtualization: LinuxONE uses Logical Partitions, or LPARs, for virtualization, allowing for up to 85 LPARs on a single system. Each LPAR can be compared to a bare-metal server, but it has the unique advantage of sharing resources such as processors, memory, and I/O across multiple partitions.

This resource pooling, along with robust EAL 5+ isolation, provides the security of a dedicated server while also delivering the efficiency of a shared environment. Resources can be dynamically and non-disruptively redistributed between LPARs to scale up or scale out as workloads change. The importance of LinuxONE's isolation and efficiencies due to this virtualization architecture should not be underestimated.

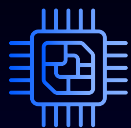
"With this architecture, up to 85 logically isolated servers, each running a distinct hypervisor instance, can co-exist on a single LinuxONE system sharing compute, memory, and I/O resources. This allows for highly efficient resource utilization while maintaining strict air-gap isolation. IBM customer data shows that this approach enables LinuxONE servers to achieve 80-95% CPU utilization."

Pause-Less Garbage Collection: Java Virtual Machines (JVMs) pausing to perform garbage collection is a vexing problem that can impact user experience, service level agreements, and system performance. LinuxONE pause-less garbage collection reduces JVM pauses by up to 90%, minimizing disruptions and increasing system responsiveness and performance.

Data Processing Units (DPUs): DPUs offload I/O tasks from the main processors, freeing up cores for other work. LinuxONE's DPUs improve I/O performance and reduce CPU overhead. The platform also includes built-in hardware accelerators for quantum-safe cryptography and compression, which are crucial for enterprise use cases involving sensitive data and large datasets. Additionally, a built-in AI accelerator on the chip comes standard with the system.

LinuxONE's specialized hardware, including DPUs, accelerators for quantum-safe cryptography, compression, and AI, is highly adaptable to environments such as Red Hat OpenShift private container clouds. This enhances container workload efficiency, provides strong encryption, and tackles AI/ML workloads requiring acceleration.

IBM LinuxONE: Power, Security, and Efficiency at Scale



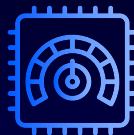
Core Processing Power
5.5 GHz, 8–15x cache vs x86



Virtualization & Scalability
Up to 85 LPARs Dynamic scaling



Efficiency Gains
Pause-less GC → 90% Better SLAs



High Utilization Rates
Up to 85 LPARs Dynamic scaling

Specialized Hardware



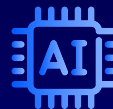
DPUs offload I/O



Quantum-safe Crypto



Compression



AI acceleration



Optimized for
Red Hat OpenShift

Signal65 Report, July 2025

Modern and Future-Ready

LinuxONE is optimized for workload modernization. The platform is well-suited for bursty, transactional, and multi-tenant applications and can be a modernization target for workloads on x86 servers.

The platform supports a broad range of enterprise data management workloads, including PostgreSQL, IBM Db2, and MongoDB. It also runs modern languages such as Java, Node.js, Ruby, Python, and Go, as well as popular application stacks such as Apache Tomcat, Apache Kafka, and Red Hat JBoss. For hybrid cloud and container orchestration, it supports Red Hat OpenShift, Advanced Cluster Management, and Kubernetes.

Digital assets represent a new class of workloads that financial institutions and other large enterprises are exploring. Efficiency and security are critical to effectively managing these workloads. LinuxONE protects sensitive workloads from compromise by end-to-end encryption and protection for data in use, at rest, and in transit. LinuxONE Security and Compliance Center gathers compliance data essential to PCI-DSS, GDPR, and HIPAA regulations.

A Platform for IT Modernization

LinuxONE delivers many vital advancements in system architecture, performance, virtualization, and hardware design necessary to support today's enterprise workloads and the changing workloads of the future.

The LinuxONE architecture consolidates diverse workloads from applications, databases, and containers to AI models and applications. Engineered for efficiency across diverse workloads, LinuxONE improves overall utilization, reduces power consumption, and considers budget otherwise allocated to virtualization software.

LinuxONE serves as a viable platform for organizations seeking to modernize their IT infrastructure and applications while addressing the demands of intense workloads like AI. It also functions as a lower-cost virtualization alternative, reducing the dependency on additional third-party licenses as workloads grow.





Securely Enabling Innovation in Financial Services

Digital Assets: The Enterprise Use Case

Demand from institutional investors for securing digital assets is growing as they seek faster settlement, greater transparency, and new revenue opportunities in emerging digital financial markets. Specifically, Tier 1 banks, asset managers, and global financial institutions are exploring their expansion into stablecoins, tokenized financial assets, and Central Bank Digital Currencies (CBDCs) in order to remain competitive as the lion's share of new financial products moving forward will involve digital assets in some form.

In this modernizing financial market, digital asset custody (DAC) becomes a critical business imperative because it underpins the secure management of digital value. Without it, institutions cannot safely launch or scale the digital assets that are core to modern financial products. The requirement for DAC is further emphasized by the introduction of guidelines and regulations such as the Guiding and Establishing National Innovation for U.S. Stablecoins (GENIUS) Act in the U.S. and the Markets in Crypto-Assets Regulation (MiCA) regulation in Europe.

Digital Asset Custody: Enabling Transformation of Traditional Financial Markets

At the core of DAC is the secure custody of cryptographic keys and wallets, which serve as the gateway to asset ownership and transaction authority. Private keys are required to verify ownership and authorize transactions of digital assets. As a result, their loss or compromise can result in the irreversible loss of the digital asset, and their security is paramount. DAC solutions should facilitate a secure, verifiable, and transparent environment for transacting and managing digital assets. Such capabilities include non-repudiation, which ensures that transactions cannot be denied after being signed, immutability of transaction records once written to the blockchain, and tamper-evident logs for a verifiable audit trail of all custody-related actions.

DAC helps institutions reduce the time, cost, and reconciliation burdens associated with traditional financial transactions. This is achieved through tokenization, which is the process of converting real-world or financial assets into digital tokens on a blockchain, and on-chain settlement, where transactions are executed and finalized directly on a distributed ledger. These capabilities allow digital assets to move near-instantly, 24/7, across borders, without legacy settlement processes and intermediaries that add delays and operational risk.

Perhaps most importantly, DAC plays a material role in building institutional trust in digital finance. Without robust custody, institutional adoption of decentralized and tokenized finance models will remain limited. Secure DAC mitigates systemic risk by providing enterprise-grade controls for wallet protection, transaction authorization, and access governance, alongside redundancy and resilience for continuity of critical operations in high-stakes environments.

At the same time, as adoption grows, so does the regulatory and insurance focus on custody standards, in order to mitigate risk. For example, emerging regulatory frameworks such as the GENIUS Act and AICPA criteria for stablecoin assurance are setting new benchmarks for auditability and internal controls. Insurance providers are introducing policies specifically designed for DAC, often requiring advanced security measures such as offline signing orchestration for reduced exposure and subsequently lowered premiums.

IBM LinuxONE: Enabling Secure Digital Asset Custody

As Tier 1 financial institutions move to enable DAC, their underlying IT infrastructure must adapt to meet the resulting requirements for security, scalability, compliance, and operational resilience. IBM LinuxONE offers a platform engineered to address the complex requirements of DAC, exceeding what commodity x86 architectures and do-it-yourself (DIY) approaches can provide.

IBM LinuxONE's engineered, purpose-built approach more efficiently addresses DAC requirements when compared to requiring extensive customization and layering of third-party tools. It also helps CIOs and CTOs to more quickly and confidently comply with emerging digital asset regulations, especially given that IBM is actively and closely engaged with industry standards bodies and regulators to anticipate and align with evolving requirements. As an additional value-add, it provides auditable, policy-driven controls that support both internal and external governance frameworks.

IBM LinuxONE spans layered, pre-integrated capabilities that are required for securing cryptographic keys, wallets, and transaction workflows for digital assets. Going beyond what commodity hardware can provide, these capabilities include:

- Pervasive encryption, including memory encryption to protect data in use
- Hardware-based crypto acceleration, reducing latency for secure signing and validation operations
- Confidential computing, which isolates and protects sensitive processes from OS, admin, and infrastructure-level threats
- Quantum-safe cryptography, to protect digital assets against post-quantum threats
- Integrated FIPS140-2 level 4 certified hardware security modules (HSMs) for secure key storage and access enforcement
- EAL5+ isolated logical partitions for air-gapped isolation on shared infrastructure
- AI-powered security analytics, enabling proactive threat detection and anomaly identification.

The ability to implement offline, or "cold," wallets is a best practice, and in many jurisdictions, a regulatory requirement, for DAC. It is also, however, one of the most challenging aspects of secure DAC. Cold wallets are isolated from network access, which significantly reduces the attack surface and protects against remote compromise, but their implementation is complex. Today, most offline signing processes rely on manual, error-prone steps that introduce both inefficiency and security vulnerabilities. Current approaches are not scalable, involving a high degree of manual intervention, and they introduce several security loopholes.

Recognizing this, IBM developed the Offline Signing Orchestrator (OSO) that leverages secure enclaves provided by confidential computing combined with integrated HSM, Hipersockets in-memory networking within the LinuxONE system. It enables policy-driven offline signing workflows, minimizing human intervention, secure transaction handoffs between hot and cold environments, and automated enforcement of segregation-of-duties and multi-approval governance.

By combining OSO with LinuxONE's inherent hardware protections for DAC, institutions gain a scalable, audit-ready solution for cold wallet orchestration, removing friction while enhancing compliance and resilience.

Furthermore, collaborations with leading Digital Asset Custody ISVs build upon IBM's cold storage and LinuxONE infrastructure, reinforcing secure, policy-driven orchestration. These joint efforts combine domain expertise in digital asset operations with IBM's secure infrastructure, delivering value through enhanced compliance, operational resilience, and accelerated time-to-market for institutional-grade custody solutions.

BM LinuxONE for Digital Asset Custody (DAC)

Why DAC Requires Specialized Infrastructure



Security



Scalability



Compliance



Resilience



Purpose-Built vs. DIY

IBM engineered platform > commodity + 3rd party layers
Faster regulatory compliance



Governance & Compliance

Auditable, policy-driven controls
Supports internal & external frameworks

Pre-Integrated Capabilities



Pervasive encryption



Hardware crypto acceleration



Confidential computing



Quantum-safe crypto



EAL5+ LPARs

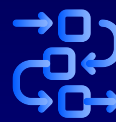


AI-powered analytics



Cold Wallet Challenge

Regulatory requirement
Manual, error-prone, not scalable



IBM OSO Solution

Secure enclaves + HSMs
Automated offline signing
Policy-driven, multi-approval workflows



Collaborations with DAC ISVs

Combine IBM infrastructure + domain expertise
Enhanced compliance & accelerated time-to-market

**Scalable, Audit-Ready Digital Asset Custody
Powered by IBM LinuxONE**



Conclusion

IBM LinuxONE is a highly capable platform that meets the current and future demands of modern enterprise IT. Its advanced engineering, rooted in the Telum II processor, provides a robust foundation for a wide variety of workloads from traditional to emerging. The platform's unique architectural features, such as LPAR virtualization and onboard DPUs, address core business challenges related to efficiency and sustainability by enabling higher utilization rates and lower operational costs compared to fragmented x86 environments.

The platform's capability to consolidate diverse workloads, from databases and applications to containerized and AI solutions, positions it as a strategic choice for IT leaders. It provides a single platform that can handle the unpredictability of today's workload mix while offering the scalability and resilience required for future growth. The non-disruptive, dynamic resource allocation capabilities ensure that businesses can adapt to changing demands without compromising service levels.

Finally, LinuxONE serves as more than just a platform for IT optimization; it is a secure foundation for business innovation. Its pre-engineered security and compliance features, demonstrated in the DAC use case, provide a significant advantage over do-it-yourself approaches. By offering integrated hardware accelerators, confidential computing, and specialized solutions such as the OSO, LinuxONE enables organizations to pursue new opportunities, such as digital finance, with confidence and reduced risk.

Important Information About This Report

AUTHORS

Mitch Ashley

Vice President & Practice Lead Software
Lifecycle Engineer | The Futurum Group

Krista Case

Research Director, Cybersecurity | The Futurum Group

PUBLISHER

Futurum Research

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ABOUT IBM

IBM is a global provider of enterprise technology solutions with a focus on hybrid cloud, AI, and infrastructure platforms. The company's LinuxONE platform is engineered to support large-scale, mission-critical workloads with features such as advanced virtualization, pervasive encryption, and workload consolidation. Positioned for industries with high security and compliance requirements, LinuxONE is designed to deliver scalability, efficiency, and resilience in environments where reliability is essential.



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