IBM LinuxONE Rockhopper II

Highlights

- The world's premier Linux system for highly secured data serving
- Engineered for performance and scale
- Foundation for data serving and next generation apps
- Unmatched security capabilities to protect from external and internal threats
- New flexible design with improved economics
- Enterprise service agility to deploy secure clouds with differentiated value

The world is experiencing a time of exponential growth in the sheer volumes of data, fueled by the digital transformation of systems, services, and interconnected devices that require strong data-serving capabilities. Businesses must be able to manage, store, and protect this information, and, most important, use it for competitive advantage. This is creating the demand to apply intelligence and insight to the data to build new services and customized experiences. From a user perspective, IT must create an environment where users have confidence that data is protected yet available from anywhere and any device. This ability to be fast and flexible in delivery of new services, with insight and security, will differentiate a business. IBM® LinuxONE® delivers unique capabilities to help with that differentiation. LinuxONE is an all-Linux enterprise platform for open innovation that combines the best of Linux and open technology with the best of enterprise computing in ONE platform. It delivers a single system built on one of the industry's fastest commercially available server processors and is designed to be the backbone of the interconnected data-driven era.

To help businesses of all sizes address new challenges and opportunities in the digital economy, IBM is introducing a new entry model in the IBM LinuxONE family. The new LinuxONE Rockhopper II® delivers secure capabilities in a 19-inch frame, with a lower cost of entry, that can co-exist with other platforms in any cloud datacenter. Built on the strong foundation of the LinuxONE Emperor II® platform, Rockhopper II leverages the industry's leading data-serving capabilities, rich open ecosystem, and most securable Linux platform in existence. Key value propositions of Emperor II such as pervasive encryption and secure service containers help to efficiently protect data and applications.

Cognitive DevOps and API exploitation helps to integrate system of records with systems of engagement. Valuable database assets can be accessed as cloud services across the customer's enterprise ecosystem. Machine learning on relevant data is designed to create deeper actionable insights and predictive behavior. These and other innovations in security, performance, and scale are carried forward on Rockhopper II; all with improved overall economics in a smaller footprint and industry-standard form factor.

New flexible design with improved economics

Rockhopper II is designed as a new entry point for the IBM LinuxONE family. It delivers function and capabilities to meet the demands for new services and better customer experiences, while securing the growing amounts of data and complying with increasingly intricate regulations. Rockhopper II can be the base for an integrated hybrid cloud with mission critical core business workloads which demand maximum security.

Rockhopper II is housed in an industry standard 19-inch, IBM supplied rack. The design includes power distribution unit (PDU)-based power, as well as redundant power, cooling, and line cords. These factors allow you to lower power costs, reduce footprint cost, and install within any existing data center—with a server rated at ASHRAE A3. By having the same footprint as other datacenter servers, you gain facility standardization.

For the first time in LinuxONE history, there is a potential for up to 16U of available frame space in the new 19-inch rack design. Businesses can choose to install switches, servers, or storage elements of their choice within the frame when space is available.

Encrypt everything with pervasive encryption

At the heart of every enterprise is data, assets which if lost or compromised could cause irreparable damage. This data is often governed by regulatory requirements with high penalties in the event of loss or inadvertent disclosure. Historically, security policies were based on selective encryption—manual selection of the most critical data. Development of a comprehensive approach to data protection required a large investment in time and money. Encryption decisions were made on where to execute, the impact to service level agreements, who has ownership of encryption, and how extensive the encryption plan is.

On LinuxONE Rockhopper II, we offer 'pervasive encryption'. The speed and capabilities of Rockhopper II allow clients to defend and protect critical assets by encrypting all data without compromising transactional throughput or response times. Instead of protecting a selective 4% of data as is common with x86 infrastructures, Rockhopper II provides a transparent and consumable approach to encrypt 100% of data. Regardless of whether the data is in-use or at-rest, it is encrypted with minimal operational overhead and zero application changes. Using workload isolation and security advances, appliances and applications can have credible protection against both external and internal threats. This type of protection is critical in the hybrid cloud environment as businesses try to accommodate placement of workloads. By encrypting as much data as possible, potential data breach risks and financial losses can be reduced, cloud infrastructures can be made secure, and compliance with regulatory mandates can be simplified, thereby reducing compliance costs.

Premier Linux system for highly secured data serving

The enhancements of Rockhopper II are essential to enabling pervasive encryption and supporting a secure cloud strategy. Unlike Intel cores, Rockhopper II has dedicated encryption co-processors that help to encrypt data more than 8 times faster than x86. The Central Processor Assist for Cryptographic Function (CPACF), standard on every core, supports pervasive encryption by providing hardware acceleration for encryption operations. Dramatic improvements in hardware acceleration make support of pervasive encryption affordable. CPACF is used for encryption of data in-flight and data at-rest. Rockhopper II offers 6x faster encryption than the original Rockhopper for like modes and data sizes with the CPACF.

The new Crypto Express6S feature provides accelerated encryption / decryption and tamper-sensing plus responding key management with a 2x SSL or TLS performance boost compared to the previous generation (Crypto Express5S). The performance boost is due to increased processor frequency and improved parallelism. Crypto Express6S supports Accelerator for SSL (Secure Sockets Layer) transactions that are used to establish an encrypted link between a web server and a browser. It also supports Secure Key cryptographic operations to certify that keys never leave the secure coprocessor boundary unencrypted. This ensures that keys are not visible to the applications and operating system in clear text form. The use of protected keys on LinuxONE protects data without giving up performance, creating industry-leading secure Java performance via SSL that is 2 to 3 times faster than x86 alternatives.

Coupling facility (CF) encryption is a key piece of pervasive encryption helping to protect CF data end to end, using encryption that's transparent to applications. Although no encryption happens on the CF itself, data is encrypted on a host in the sysplex using CPACF on a per-workload, per-structure basis, using established policies before being sent to the CF. The data written to the CF remains encrypted until it is read from the CF and decrypted by a host elsewhere in the sysplex. Thus, the encrypted data is safe in-flight as it flows to the Coupling Facility, as well as when it is at-rest on the CF.

As a patented, IBM-exclusive technology, IBM Secure Service Container helps to protect client data from both external attacks and insider threats. It provides workload isolation and encryption by encapsulating data and restricting administrator access to containers to defend against the misuse of privileged

user credentials. Business applications can run in an easily-packaged, completely isolated environment that does not require application code to be re-written. IBM Secure Service Container leverages LinuxONE's EAL5+ certification for vertical isolation of workloads and achieves horizontal isolation separating the running application from the underlying Host environment. Intel servers are unprotected from side-channel attacks with only portions of the application secured in enclave technology. Secure Service Container is designed to offer the highest security level available for protected key management (FIPS 140-2 level 4), a level of protection not available on x86 servers. The use of protected keys helps to secure data without giving up performance. Secure Java performance via SSL, for example, is 2 to 3 times faster on LinuxONE than on x86 alternatives.

For Rockhopper II, IBM Secure Service Container technology has been enhanced for application deployment simplification. Previously, only select IBM appliances could run in the container, but this change now allows clients and vendors to build Docker container based applications that can then integrate with and take advantage of the extreme security of this secure container environment. Secure Service Container is now available as a service, so clients can deploy their workloads as secure services when demanded for business-critical operations, simplified DevOps, and improved time to value.

Engineered for performance and scale

With up to 30 configurable cores, Rockhopper II has performance and scaling advantages over the previous 20 cores available in the original Rockhopper offering. This 10% greater capacity over its predecessor is accomplished using a 40% smaller footprint, thereby magnifying the value of Rockhopper II per square foot. With 1.5 times more on-chip cache per core, the new Rockhopper II minimizes memory waits and maximizes the throughput of concurrent workloads, making it the perfect choice for data-serving. With capacity to do the work of hundreds of x86 servers in a single footprint, Rockhopper II has a 3-year running cost below x86.[1] Massive memory and I/O bandwidth has been built into the system to support fast in-memory workloads and real-time analytics that bring more insights and new business value.

Rockhopper II provides unrivaled performance and vertical scale to support larger workloads with less latency and less admin complexity. It is possible to scale up to 330,000 Docker containers in a single system, move data faster than alternative platforms with 2.1x higher throughput, and host larger databases without the added cost and latency of fragmenting data across server farms.[1] For example, Rockhopper II can host 240 concurrent databases executing a total of 58 billion database transactions per day on a single system.

The LinuxONE platform has industry-exclusive I/O processors for data-intensive workloads. Hundreds of additional processors are built into Rockhopper II that are not part of the general processor count. These extra processors are entirely dedicated to I/O processing and accelerate data-intensive workloads while assuring data integrity without any additional cost. On x86 systems, this work is done with standard processors that drive incremental costs.

High-speed connectivity to data is critical to achieve exceptional transaction throughput. The new FICON® Express16S+ feature is designed to boost I/O rates and reduce single stream latency. The 16Gb channel with a 3x start rate combined with a new 10 GbE RoCE Express2 adapter helps absorb large application and transaction spikes driven by unpredictable analytic and mobile workloads. These features help absorb large application and transaction spikes driven by unpredictable cloud, analytic and mobile workloads.

With double the available memory of the original Rockhopper, the 8 TB of real memory offered in Rockhopper II creates opportunities for in-memory data marts and large buffer pools for data access. More data in memory means more efficient vertical scaling and real-time business insights with in-memory analytics. The system has also been optimized for Java with a recent exploitation of cryptographic acceleration and a pause-less garbage collection capability.

Rockhopper II can also support higher transactional volumes and greater data movement. Distributed platforms are structurally limited by the fact they must fragment data and can only handle cross workload utilization rates in the 20-30% range. With a shared-everything architecture, Rockhopper II is designed to run at or near 100% resource utilization, making it ideal for data-centric workloads demanding uninterrupted service delivery. Part of service delivery is being able to handle workload spikes. When distributed platforms scale, they must traverse through a multitude of slower, often disparate, systems which can be slowed even further due to bandwidth limits and network traffic. Rockhopper II has the power to grow workloads vertically with instant scale. This granular scalability allows tying infrastructure investment to business growth without having to buy capacity before it is required.

Foundation for data serving and next generation apps

Rockhopper II was built to be a secure, data-serving cloud where the protection, accuracy, and availability of your most sensitive data matters most. It provides a simpler structure that can scale vertically, avoiding the x86 problem of continually having to build out systems and floor space to meet demand.

Unlike copies of data that distributed platforms rely on, Rockhopper II maintains a real-time, single source of truth, ensuring the data is always in-sync and not an outdated copy. By having all data neatly secured on a single system, insights can be instantly gained and acted upon through analytics and machine learning. A newly redesigned Rockhopper II form factor packs more power into a single footprint and provides even better economies of scale for any cloud or IT environment.

Blockchain is a revolutionary technology that allows members of a supply chain to share a digital ledger to record transactions in a common, transparent, and accessible record. Cryptographically enforced privacy ensures that members only see the parts of the ledger relevant to them, and that transactions are secure, authenticated, and verifiable. Businesses and customers around the globe need to interface with each other to exchange assets such as currency, services, and information. Experts believe that Blockchain will do for transactions what the Internet did for information. As a system designed for secure data-serving, IBM chose LinuxONE to run their global IBM Blockchain Platform, illustrating the confidence of LinuxONE.

Open Source technology is driving the future and IBM is leading the charge with continued investment in the Linux ecosystem. Rockhopper II provides a unique platform for any Linux solution requiring high availability, security features, or scalability and supports a wealth of open source products such as Go, Python, Scala, Node.js, Docker, Spark, MongoDB, PostgreSQL, and MariaDB. Rockhopper II allows clients to take advantage of transformative technologies like Blockchain, gain cognitive insights with Spark analytics, scale vertically with unmatched speed, provide highly-secure data serving capabilities, and leverage the use of application programming interfaces (APIs) to deliver new customer services.

IBM LinuxONE Rockhopper II at a glance		
Rockhopper II Models	Cores: Minimum* – Maximum	Memory: Minimum – Maximum
LR1 Max4	1 – 4	64 GB – 2 TB†
LR2 Max12	1 – 12	64 GB – 4 TB
LR3 Max24	1 – 24	64 GB – 8 TB
LR4 Max30	1 – 30	64 GB – 8 TB
Cryptography		
Crypto Express6S / Crypto Express5S§	Minimum 2 features; Maximum 16 features	
Disk Connectivity		
FICON® Express16S+ / FICON Express16S§ / FICON Express8S§	Maximum features**	
Max4	16	
Max12	32	
Max24, Max30	64	
NIC – Connectivity		
10GbE RoCE Express2, 10GbE RoCE Express§§	4 Maximum features** – minimum recommended is 2	
OSA-Express6S / OSA-Express5S§ / OSA-Express4S§ / 1000-BaseT§	Maximum features**	
Max4	16	
Max12	32	
Max24, Max30	48	
High Speed “Virtual” LANS		
HiperSockets™	Up to 32 high-speed “virtual” Local Area Networks	
Supported Linux distributors		
Red Hat	Red Hat Enterprise Linux (RHEL) 6, and 7	
SUSE	SUSE Linux Enterprise Server (SLES) 11 and 12	
Canonical	Ubuntu 16.04 LTS	

IBM LinuxONE Rockhopper II at a glance		
Supported Hypervisors		
IBM z/VM®	z/VM 6.4	
KVM	KVM hypervisor which is offered with the following Linux distributions: SLES12 SP2 or higher, and Ubuntu 16.04 or higher	
IBM partitioning technology	Up to 40 LPARs for secure workload isolation	
Typical Physical Weight‡	Minimum configuration weight of new build 1621 lbs (735 kg)†† Maximum configuration weight of new build 1753 lbs (795 kg)††	
Weight without side covers	without overhead cabling 1621 lbs (735 kg)	with overhead cabling adds approx. 12 lbs (5 kg) 1633 lbs (740 kg)
Weight with side covers adds approx. 42.7 lbs (19.4 kg)	without overhead cabling 1663 lbs (754 kg)	with overhead cabling adds approx. 12 lbs (5 kg) 1675 lbs (760 kg)
	Note: optional seismic resistance hardware adds approx. 78 lbs (35 kg)	
Product Dimensions (D x W x H) without side covers	Without overhead cabling 42.1 x 23.6 x 79.3 inches (107 x 60 x 201.5 cm)	With overhead cabling increases height 4.3 inches 42.1 x 23.6 x 83.6 inches (107 x 60 x 212.3 cm)
Product Dimensions (D x W x H) with side covers	Without overhead cabling 47.4 x 24.6 x 79.5 inches (120.4 x 62.4 x 202 cm)	With overhead cabling increases height 4.3 inches 47.4 x 24.6 x 83.8 inches (120.4 x 62.4 x 212.8 cm)
Airflow (Capacity of Exhaust)	2000 cubic meters / hour (1200 CFM)	

Why IBM?

IBM has been committed to Linux since 1999. As you transform your business and differentiate yourself in a trust economy, IBM remains your partner. We have the total expertise—in systems, software, delivery and financing—to help you create a secure, open, and intelligent foundation for the future. Our experts can help you configure, design and implement a solution optimized for the needs of your business.

For more information

Contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/systems/linuxone/enterprise-linux-systems/rockhopperII.html

Additionally, IBM Global Financing provides numerous payment options to help you acquire the technology you need to grow your business. We provide full lifecycle management of IT products and services, from acquisition to disposition. For more information, visit: **ibm.com**/financing

** Two ports per feature

§§ When RoCE Express is carried forward and used in combination with a RoCE Express2, the maximum combination cannot exceed 4 features

†† Minimum configuration weight is estimated without side covers, overhead cabling, and seismic resistance hardware. Maximum configuration weight is estimated with side covers, overhead cabling, and seismic resistance hardware.

[1] Performance comparison based on IBM Internal tests comparing Rockhopper cloud with one comparably configured private x86 cloud and one comparably configured public cloud running an aggregation of light, medium and heavy workloads designed to replicate typical IBM customer workload usage in the marketplace. System configurations are based on equivalence ratios derived from IBM internal studies and are as follows: Public Cloud configuration: total of 219 instances (128 for light workloads, 64 for medium workloads and 27 for heavy workloads); x86 Cloud configuration: total of eleven x86 systems each with 24 Intel E7-8857 v2 3.0GHz cores, 512 GB memory, and 7x400 GB SSDs; Rockhopper Cloud configuration: total of 32 Linux cores, 3806 GB memory, and Storwize v7000 with 47x400 GB SSDs. Price comparison estimates based on a 3YR Total Cost of Ownership (TCO) using publicly available U.S. prices (including a 20 percent discount for middleware) current as of January 1, 2015. Public Cloud TCO estimate includes costs (US East Region) of infrastructure (instances, data out, storage, support, free tier/reserved tier discounts), middleware and labor. Rockhopper and x86 TCO estimates include costs of infrastructure (system, memory, storage, virtualization, OS, cloud management), middleware, power, floor space and labor. Results may vary based on actual workloads, system configurations, customer applications, and other environment variables. Users should verify applicable data for their specific environment.

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Route 100
Somers, NY 10589

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Actual available storage capacity may be reported for both uncompressed and compressed data and will vary and may be less than stated.

* There must be at least one IFL ordered on the server. If ordering an IBM LinuxONE Rockhopper II with Elastic Pricing, the minimum Linux cores must be six (6), independent of the model that is purchased.

§ Carry forward only

† Provides the minimum physical memory required to hold base purchase memory plus 64 GB HSA

‡ The Power® Estimator tool includes weight data and has the capability to provide a more accurate weight for your particular configuration. Log on to Resource Link at **ibm.com**/servers/resourcelink. Navigate to Tools, then to Power and weight estimation. Specify the quantity for the features that are installed in your machine. This tool estimates the power consumption for the specified configuration.

Please Recycle

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