



Linux on IBM Z

Modernize for hybrid cloud and AI with the powerful and secure Linux platform for business



Linux at its best

Using open-source Linux® solutions is a smart way to run your IT and cloud services—it's a fact.

Hybrid IT is real, look no further for solutions that leverage your investments and the strengths of your existing IT and cloud services in a seamless way.

Linux on IBM Z® provides you an impressive Linux and private cloud environment, especially for workloads that require high levels of resilience, flexibility, and security.

Co-locating workloads on IBM Z—meaning Linux workloads run side-by-side with IBM z/OS®, IBM z/VSE®, IBM z/TPF, or Red Hat® OpenShift® Container Platform—can not only benefit from great performance and operational efficiency, but also leverages your investments in existing assets, and opens the doors to tap into a vast open source ecosystem to enrich existing IT solution architectures with.

Linux on IBM Z benefits from the strengths and capabilities of outstanding IBM Z technology, such as unparalleled resiliency, encryption everywhere, high utilization and extreme scalability.

Linux on IBM Z provides you the Linux and cloud environment needed to modernize for hybrid cloud.

Linux on IBM z16™

IBM z16 is built for hybrid cloud and can help expedite your transformation with new on-chip AI acceleration, provided by IBM's Telum™ processor, to enable decision velocity, quantum-safe technologies to designed to help protect your business now and into the future, a flexible infrastructure to meet the resiliency and compliance demands, and with capabilities to accelerate modernization and delivery of new services.

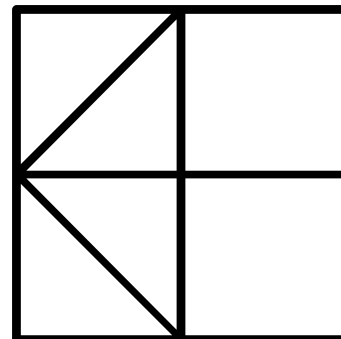
Highlights

- Secure and open
- Scalable and flexible
- Resilient and trustworthy
- Efficient co-location
- Sustainable
- Economical

“Running applications on z/OS side-by-side with Linux has given us the operational flexibility on IBM Z to gradually modernize our clients’ applications, while still leveraging our extensive experience with the trusted and highly reliable IBM platform.”

A key design point for all IBM Z servers is to provide a strong Linux and cloud platform, and this is continued with these IBM z16 capabilities:

- IBM z16’s new Telum processor provides an Integrated Accelerator for AI is designed for high-speed, real-time inferencing at scale.
- IBM z16 quantum-safe technology is designed to enable you to act now to help future proof your business.
- New Crypto Express8S is designed to meet the FIPS 140-3 at Level 4 for cryptographic modules.
- IBM z16 has a maximum of 200 client-configurable cores.
- Single processor capacity of IBM z16 for equal n-way at common client configurations is approximately 11% greater than on IBM z15™ with some variation based on workload and configuration.¹
- The IFL processors on the IBM z16 also provide an optional IBM z16 multi-threading technology capability; with the multi-threading function enabled, the performance capacity of an IFL is expected to typically be up to 25% higher than without the multi-threading function enabled.¹
- IBM z16, with its industry first integrated on chip AI accelerator, delivers latency-optimized inferencing designed to enable customers to analyze real-time transactions, at scale.²
- RoCE Express3 10 GbE and 25 GbE LR and SR provide low latency TCP/IP networking connectivity, and support SMC-R and SMC-Rv2 protocols.
- With IBM z16 Dynamic Partition Manager is designed to enable system administrators and system programmers to accomplish time-consuming and potentially error-prone operations with an intuitive and guided user experience.
- The new IBM Z Security and Compliance Center is designed to help simplify and streamline compliance tasks, providing a centralized, interactive dashboard for a consolidated view of compliance posture and system-generated evidence in near real time.



Open as-a-service and cloud environment

IBM z16 provides the foundation for application modernization and hybrid cloud velocity by delivering leading hybrid cloud infrastructure to support the optimization of existing mission-critical applications and data.

IBM z16 and the accompanying IBM Z and cloud software, which is developed to support a cloud-native experience, delivers a broad set of open and industry-standard tools, including container and Kubernetes technologies, and an agile DevOps methodology to accelerate modernization.

These capabilities deliver speed to market and agility for both development and operational teams as IBM z16 integrates as a critical component of hybrid cloud.

Securing the enterprise

On IBM z16 with the Integrated Accelerator for AI, run OLTP transactions with intransactional fraud detection with up to 2x more throughput per drawer versus on IBM z15 T01.³

Pervasive encryption is enabled with Linux on IBM Z. It is transparent to existing applications and designed to improve the usability and performance of encrypting/decrypting, leveraging the continuously improved on-processor cryptography

IBM z16 hardware accelerated encryption with Central Processor Assist for Cryptographic Functions (CPACF) and the Crypto Express accelerators.

With IBM z16, scale up your I/O intensive Linux applications and protect your data at rest with up to 12 million read-only I/O operations per second and 10 million R/W operations per second to an encrypted filesystem with FCP attached storage.⁴

To meet regulatory and auditing needs, the IBM RACF® Security Server for IBM z/VM® provides a security system that includes access control and auditing functionality, handles resource authorization, privileged command access, and logon controls.

Secure Execution for Linux is a Trusted Execution Environment (TEE) on IBM Z designed to deliver better security at greater scale than alternative offerings. It enables workloads to run in full isolation with protection from both internal and external threats across a hybrid cloud, ensuring the integrity of each application and its data. It is supported for KVM based virtual machines, hosting a supported Linux distribution.

It is important to mention that IBM Z is the world's only server with the high level EAL5+ hardware security certification. It guarantees that the IBM Z principal security features are reliably applied, allowing for isolation and protection of the deployed workloads, while the isolation capability inside the server offers significant operational simplicity.

Scalable and flexible

The high workload density, with up to thousands of virtual Linux servers on an IBM z16, usually means fewer components, lower management effort, and fewer software licenses compared to competitive platforms. As well, IBM Z servers provide the ability to grow inside an existing server, simply by adding system resources. Hence, Linux on IBM Z can grow 'on-demand' along with your business.

Impressive scalability—horizontal and vertical—is provided with the IBM Z capabilities in combination with virtualization technologies. Resources can be prioritized dynamically and efficiently between workloads, delivering them whenever and wherever they are needed.

z/VM virtualization technologies offers deep integration with IBM Z, allowing for high levels of resource sharing, data-in-memory techniques, outstanding I/O bandwidth, availability, and security.

KVM virtualization allows to make use of Linux administration skills on IBM Z. KVM is delivered with the Linux distributions for IBM Z, enables the open virtualization ecosystem and is optimized to benefit from the IBM Z capabilities, like Secure Execution.

Simplified infrastructure management is provided with IBM Cloud Infrastructure Center for compute, network, and storage resources for Linux virtual machines based on z/VM and Red Hat KVM.

IBM Dynamic Partition Manager provides a simplified configuration for Linux servers, allowing for a quick and easy adoption of Linux on IBM Z, z/VM, and KVM.

IBM Z technologies are designed to support high efficiency. One example, the compression acceleration on the processor chip (Integrated Accelerator for zEnterprise Data Compression), can reduce the size of data to save storage space and also increase data transfer rates.

IBM HiperSockets™ allow for fast internal communication with co-located workloads using virtual communication facilities, eliminating the need for physical cabling. And with SMC-Dv2 (Shared Memory Communications), you can get even faster performance and lower latency, while saving compute resources.

Using the FCP protocol, a single IBM z16 FICON Express32S port delivers up to 6,400 MB/s for a mix of large data block (64KB) read/write operations; 2x the throughput of an IBM z15 FICON Express16SA port.⁵

Highly resilient and trustworthy

The IBM Z enterprise platform is designed for resiliency, meaning the ability to adapt to planned or unplanned events while keeping services and operations running. IBM Z servers help to avoid or recover from failures to minimize business disruptions, realized through component reliability, redundancy, and features that assist in providing fault avoidance and tolerance, as well as permitting concurrent maintenance and repair.

Further strengthening resilience of the Linux and cloud workloads, are solutions such as:

- Live Guest Relocation, enabled with the z/VM SSI⁶ feature and KVM, allowing for the non-disruptive move of running virtual Linux servers from one member of a cluster to another.
- IBM GDPS[®] can provide multi-platform resiliency for Linux servers. It allows for disaster and failure recovery and ensures data consistency across multiple sites. When running GDPS with z/OS, you can benefit from a single point of control for the z/OS and Linux environments.
- The IBM Spectrum[®] Scale storage software family is designed to provide high availability through advanced clustering technologies, dynamic file system management and data replication.

Unlike with distributed systems or public clouds—resilience, availability, and failover capabilities can be expected for Linux on IBM Z.

Efficient co-location

Co-location can make a big difference. Businesses and IT organizations must provide fast access to data, and since most enterprise workloads are multi-tiered workloads, running across web, application, and database tiers, it is not easy to achieve.

When these multi-tiered workloads have communication patterns that are network intensive, meaning they either frequently communicate or exchange many messages in order to complete a single transaction, or they exchange large amounts of data, then the physical location and proximity of the tiers can make a huge difference.

Based on that, co-location of data and applications helps on efficiency, provides data serving with low latency, eliminates network handling, and helps on centralizing system administration.

Sustainable

IBM Z servers are designed to make a powerful improvement in sustainability by design.

IBM Z servers align with best practices for reducing electricity consumption, including that they require a small number of physical systems, that they are high energy-efficiency systems, and that they enable high compute and resource utilization.

Running workloads on a centralized infrastructure such as IBM Z can contribute to a more environmentally sustainable IT environment.

Workloads on IFLs on IBM Z can consume less energy compared to distributed server environments⁷, contributing to fewer greenhouse gas emissions.

IBM Z integration capabilities are designed to provide extremely high speed and security-rich connections between applications and data inside and across servers. Technologies such as HiperSockets and Shared Memory Communication further improve latency and throughput.

Using the Linux on IBM Z can help you expand the capabilities and attractiveness of your services. In a hybrid cloud, you can also combine your on-premises workloads with the advantages of IBM Z's security services in the IBM Cloud[®] as well.

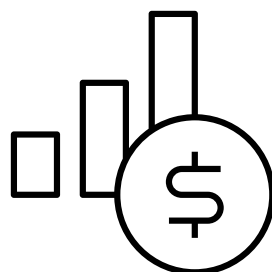
Economical

Operational efficiency is supported by running up to thousands of virtual Linux servers on one IBM Z server, with outstanding scalability, horizontal and vertical, based on the immense total IBM Z capacity. Usually this results in less effort for maintenance and administration compared to other platforms and provides potential cost reduction in several areas.

The ability to add resources to an existing server on the fly, to share and reconfigure resources dynamically, and to run Linux side-by-side with other operating systems—benefiting thereby from unique arrangements for the system—also support operational efficiency.

With the DevOps software portfolio developers and administrators can deliver automation to develop, deploy, and manage cloud-native applications while utilizing the portability and agility through tight integration with tools and runtimes. In one IBM Z system, existing back-office data and applications are co-located to take advantage of close proximity, and integrate with cloud native.

Taking these different aspects of running Linux on IBM Z into consideration, it seems obvious that they can also provide an economic advantage compared to other platforms. The potential cost advantages are based on the high capacity of IBM Z servers that provides low cost per workload, the integrated IBM Z system design providing high performance and throughput per core, on-chip acceleration for AI, encryption, and data compression, centralized operation that enables less management and administration effort, and the proven security and continuity capabilities available with built-in features and proven high availability and disaster recovery solutions.



Why IBM?

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 and intelligent foundation for the future.

Our experts can help you configure, design, and implement Linux on IBM Z, optimized for your needs.

For more information

To learn more about Linux on IBM Z, please contact your IBM representative, your Red Hat representative, or IBM Business Partner.

1. Based on internal measurements. Results may vary by customer based on individual workload, configuration and software levels. Visit LSPR website for more details at: <https://www-40.ibm.com/servers/resource/ib03060.nsf/pages/lspindex>
2. Cited by a third-party industry analyst
3. Performance results is extrapolated from IBM internal tests running on OLTP workload with credit card transaction Credit Card Fraud Detection (<https://github.com/IBM/ai-on-z-fraud-detection>) model on IBM z16 vs running the OLTP workload on IBM z15 T01. IBM z16 configuration: Ubuntu 20.04 in an LPAR with 12 dedicated IFLs, 128 GB memory, and IBM Flash System 9200 storage. IBM z15 T01 configuration: Ubuntu 20.04 in an LPAR with 10 dedicated IFLs, 128 GB memory, and IBM Flash System 9200 storage. Results may vary.
4. Performance result is extrapolated from IBM internal tests running the fio 3.19 benchmark tool in a z16 LPAR with 12 IFLs and 64 GB memory on RHEL 8.5 (SMT mode) using the XFS filesystem format with luks2 encryption and two FICON Express 32S features. The fio benchmarking tool was run with 128 parallel threads using 8 volumes on FS9200 equally distributed over the two nodes and file size of 150GB on each volume. Results may vary.
5. Performance results are based on laboratory measurements done on IBM z16 using an internal Linux on IBM Z microbenchmark to execute FCP I/O operations on a single FICON Express32S port. The FICON Express32S port operated at a 32Gbps link data rate. The workload consisted of an even mix of 64KB read/write data transfer I/O operations. Results may vary.
6. z/VM SSI = z/VM Single System Image, for more information: <https://www.vm.ibm.com/ssi/>
7. See: <https://www.ibm.com/downloads/cas/G3QK9D8V>

Learn more:

[Linux on IBM Z](#)

[IBM z16](#)

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