IBM Z
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Linux on IBM Z

Frequently Asked Questions

Worldwide

IBM

Table of Contents

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What are the advantages of IBM z16 for running Linux?

IBM z16 is built for Linux and cloud computing and can help expedite your transformation with an on-chip AI acceleration to enable decision velocity, quantum-safe technologies 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.

As the IBM Z® servers provide a strong Linux and cloud platform, IBM z16 does as well, delivering innovation and benefits in several areas.

Core system

- – IBM z16 has a maximum of 200 client-configurable cores running at 5.2 GHz.
- – The IFL processors on the IBM z16 multi frame 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]
- – The IFL processors on the IBM z16 single frame also provide an optional 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 (range typically 10-40%) than without the multi-threading function enabled.[1]

Sustainability

- – Consolidating Linux workloads on 5 IBM z16 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. This is equivalent to consuming about 362,000 fewer litres (95,600 gallons) of gasoline each year.[2]
- – An IBM z16 single frame or rack mount Max68 running Linux workloads can reduce the energy required by approximately 75% each year versus a compared configuration of 36 x86 servers with 1440 cores running the same Linux workloads with similar conditions and location.[3]

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

[2] Compared 5 IBM z16 Max 125 model consists of three CPC drawers containing 125 configurable cores (CPs, zIIPs, or IFLs) and two I/O drawers to support both network and external storage versus 192 x86 systems with a total of 10364 cores. IBM z16 power consumption was based on inputs to the IBM z16 IBM Power Estimation Tool for a memo configuration. x86 power consumption was based on March 2022 IDC QPI power values for 7 Cascade Lake and 5 Ice Lake server models, with 32 to 112 cores per server. All compared x86 servers were 2 or 4 socket servers. IBM Z and x86 are running 24x7x365 with production and non-production workloads. Savings assumes a Power Usage Effectiveness (PUE) ratio of 1.57 to calculate additional power for data center cooling. PUE is based on Uptime Institute 2021 Global Data Center Survey (https://uptimeinstitute.com/about-ui/press-releases/uptime-institute-11th-annual-global-data-center-survey). CO2e and other equivalencies that are based on the EPA GHG calculator (https://www.epa.gov/energy/greenhousegas-equivalencies-calculator) use U.S. National weighted averages. Results may vary based on client-specific usage and location.

[3] IBM z16 with the Crypto Express 8S card provides standardization process conducted by NIST Information Technology Laboratory. Quantum-safe APIs providing access to quantum-safe algorithms which have been selected as finalists during the PQC Quantum-safe cryptography refers to efforts to identify algorithms that are resistant to attacks by both classical and quantum computers, to keep information assets secure even after a large-scale quantum

IBM Z Integrated Accelerator for AI

- – IBM z16, with its industry first integrated on chip AI accelerator, delivers latency- optimized inferencing designed to enable clients to analyze real-time transactions, at scale.[4]
- – With IBM z16 multi frame, process up to 300 billion inference requests per day with 1ms response time using a Credit Card Fraud Detection model.[5]
- – Using one Integrated Accelerator for AI on an OLTP workload on IBM z16 single frame, you can achieve the throughput of a compared remote x86 server running inferencing on 12 cores.[6]

Security and cryptography

- – IBM z16 will position clients to use quantum-safe cryptography along with classical cryptography as they begin modernizing existing applications and building new applications.[7]
- – The new Crypto Express8S (CEX8S) is designed to meet the Federal Information Processing Standards (FIPS) 140-3 at Level 4 for cryptographic modules.
- – IBM z16 hardware accelerated encryption with Central Processor Assist for Cryptographic Functions (CPACF) is designed to provide fast encryption without any application changes.
- – With IBM z16 multi frame, 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.[8]
- – The IBM Z Security and Compliance Center helps centralize monitoring of compliance related tacks and provides an interactive view of these tasks and potential severity of control deviations. It is designed to help with automated collection and validation of relevant facts from key areas of Linux.
  - • IBM Z clients surveyed anticipate that by using the IBM Z Security and Compliance Center on IBM z16, they can potentially reduce audit preparation timelines by 55%.[9]

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computer has been built. Source: ETSI Quantum-Safe Cryptography (QSC).These algorithms are used to help ensure the integrity of a number of the firmware and boot processes. IBM z16 is the Industry-first system protected by quantum-safe technology across multiple layers of firmware.

[4] *Cited by a third-party industry analyst*
[5] *Performance result is extrapolated from IBM internal tests running local inference operations in an IBM z16 LPAR with 48 IFLs and 128 GB memory on Ubuntu 20.04 (SMT mode) using a synthetic credit card fraud detection model (https://github.com/IBM/ai-on-z-fraud-detection) exploiting the Integrated Accelerator for AI. The benchmark was running with 8 parallel threads each pinned to the first core of a different chip. The lscpu command was used to identify the core-chip topology. A batch size of 128 inference operations was used. The benchmark was executed with a single thread performing inference operations. A batch size of 128 inference operations was used. Results may vary.*
[6] *Performance results is based on IBM internal tests running an OTLP workload with credit card transaction using the Credit Card Fraud Detection (https://github.com/IBM/megacard-standalone/tree/main/models)model on IBM Machine Type 3932 vs running the OLTP workload (https://github.com/IBM/megacardstandalone) on IBM Machine Type 3932 and running inferencing on a remote x86 server running Tensor flow serving. IBM Machine Type 3932 configuration: Ubuntu 20.04 in an LPAR with 5 dedicated IFLs, 256 GB memory, and IBM FlashSystem 900 storage. x86 configuration: Ubuntu 20.04 on 24 Ice Lake Intel® Xeon® GoldCPU @ 2.80GHz with Hyperthreading turned on, 1 TB memory, local SSDs. Results may vary.*
[7] *IBM z16 with the Crypto Express 8S card provides hardware enabled quantum-safe APIs. The quantum-safe public key technology used in IBM z16 has been selected by NIST to become part of its post-quantum cryptographic standard. https://www.nist.gov/news-events/news/2022/07/nist-announces-first-four-quantum-resistant-cryptographicalgorithms*
[8] *Performance result is extrapolated from IBM internal tests running the fio 3.19 benchmark tool in an IBM 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.*
[9] *IBM does not ensure regulatory compliance. The intent is to provide a point in time statement of your current posture for a specific group of resources. The responsibility of ensuring systems are configured in accordance with regulatory controls is on the individual businesses who are using the IBM Z security and compliance Center and IBM does not take responsibility for any compliance oversights or penalties associated with data breaches. The survey consisted of 9 responses across 6 unique clients. Sourced from the IBM zSCC Sponsor User Program and zDC.*

Networking and I/O

- 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.
- Using the FCP protocol, both ports on IBM z16 FICON Express32S deliver a total combined throughput of up to 9,700 MB/s for a mix of large data block (64KB) read/write operations; a 54% increase over the total throughput of IBM z15 FICON Express16SA.[10]
- The IBM z16 FICON Express32S channel with IBM Fibre Channel Endpoint Security encrypts your data in flight, processing encryption directly on the channel hardware with less than 4% impact on maximum FCP throughput.[11]

Systems management

- On IBM z16, DPM provides a seamless, consistent and guided experience to configure low latency SMC-Dv2 network links between two or more logical partitions running on the same physical server, all through a single point of control.[12]
  This enables system administrators and system programmers to accomplish time-consuming and potentially error-prone operations with an intuitive and guided user experience.

Modernize for hybrid cloud

- With IBM z16 in the hybrid cloud, you can unlock lower 5-year total cost of ownership (TCO) and up to 2.5 times more value than a public cloud-only approach.[13]
- IBM z16 and cloud together is the better architecture for business innovation, because it takes a platform approach to provide a single integrated fabric across all those silos. You can have a common cloud experience that enables consistent, agile practices, which supports interoperability and secure integration of workloads and data from on IBM z16 across hybrid cloud, regardless of where the capabilities are required.
  Differentiation comes from unmatched support for data gravity between applications and data colocated on IBM z16 systems across Linux on IBM Z and z/OS®, achieving real-time AI at scale, and providing you with intelligent and trusted systems and platforms.
  IBM z16 and supporting IBM Z and Red Hat® software provide an unprecedented combination of speed, reliability, and security along with a cloud-native experience centered on industry standards, open tools, and pioneering intelligence. This combination delivers an open and flexible architecture that helps empower clients to use the best fit IT for their business needs to deliver more value than a public cloud-only approach.

To learn more: IBM z16 , IBM® LinuxONE 4

Which Linux distributions are on IBM z16 and IBM® LinuxONE 4?

IBM supports running the following Linux distributions on IBM z16 and IBM® LinuxONE:

- – SUSE Linux Enterprise Server: SLES 15 SP3 with service and SLES 12 SP5 with service.
- – Red Hat Enterprise Linux: RHEL 9.0 with service, RHEL 8.4 with service, and RHEL 7.9 with service.
- – Canonical: Ubuntu 20.04 LTS with service and Ubuntu 22.04 LTS with service.

Note: The support statements for IBM z16 also cover the KVM hypervisor on distribution levels that have KVM support.

For minimum required and recommended distribution levels refer to the 'Tested platforms' website.

What makes Linux on IBM Z an efficient Linux and cloud environment?

IBM Z is designed to be an integral part of your hybrid cloud approach. With Linux on IBM Z, you can run noncontainerized workloads and transform your IT environment into a cloud, always with industry-leading levels of data privacy, security, and resiliency.

Linux on IBM Z demonstrates a perfect infrastructure for all kind of Linux solutions and cloud services. It is designed for:

- – Maximum scalability to enable you to exceed client expectations,
- – High security levels with pervasive encryption for consumable data protection and ultimate security inside the server (EAL5+ certification),
- – Resilience and continuous availability without risk of downtime, providing high levels of security and governance,
- – Great agility and portability through tooling for cloud-native development,
- – Open APIs to unleash and amplify core assets,
- – Efficient operations with rapid deployment, configuration, and management of virtual Linux servers.

Enterprises can maintain on-premises control of both, new cloud-based and existing IT assets, to meet their needs on security, SLAs, privacy, compliance, and regulatory requirements. The Linux on IBM Z environment allows for rapid innovation and expansion of new services, which can be connected and integrated with the existing assets on IBM Z—therefore providing an excellent environment for on-premises cloud deployments.

Impressive scalability—horizontal and vertical—is provided with the IBM Z capabilities in combination with the virtualization technologies based on IBM z/VM® and KVM. Resources can be assigned dynamically and efficiently between workloads, whenever and wherever they are needed.

IBM Z allows for fast internal communication, with the HiperSockets<, Shared Memory Communication technologies, and zdsfs you can get fast performance between Linux and z/OS®, as well as between Linux and Linux, while saving compute power. Colocating data and applications on IBM Z also supports efficiency, allowing for data serving with minimal latency, elimination of network handling, and centralized management.

Pervasive encryption with Linux on IBM Z servers is transparent to existing applications and targeted to improve the usability and performance of encrypting/decrypting data in-flight and at-rest, leveraging the CPACF and the Crypto Express accelerators. IBM provides quantum safe technology with the IBM Z and IBM® LinuxONE systems. The IBM z16 system uses quantum safe methods inside its hardware and firmware to protect customer hardware investments against potential quantum threats. Starting with Crypto Express 7S, adapters in CCA or EP11 mode provide first versions of quantum-safe cryptographic algorithms accessible to Linux software.

Building cloud-native applications and modernizing existing applications to be integrated in cloud environments need to be done in an open, portable manner that helps clients improve time to value., the agile cloud-native world of containers and Kubernetes is reinforced by the security features, scalability, and reliability of IBM Z servers.

The open Linux environment on IBM Z supports container technologies and DevOps tooling, enterprise-level support for Java<, Node.js, Spring, and open source, e.g., Jenkins, Terraform, Packer, Chef, and many more (see: Validated Open Source Software) to automate most of the software development processes like build, conflict management, dependency management.

Red Hat Ansible® Automation Platform empowers businesses to automate a wide range of IT tasks, from configuration management to application deployment, thus transforming their operations. Common use cases for Ansible Automation Platform are e.g., infrastructure provisioning, application deployment, configuration management, security automation, and staying compliant and up to date.

Container technologies are available from the Linux distribution partners and from the open source community to be deployed on a Linux distribution. Red Hat OpenShift® Container Platform comes with an included Linux operating system and does not need a separate Linux distribution; it is deployed in virtual machines based on z/VM® or Red Hat Enterprise Linux KVM.

Cloud-native deployments & container hosting
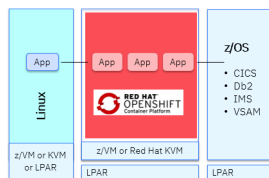
Red Hat OpenShift
- Faster innovation and time-to-value with well-defined recommendations and best practices
- Simplification with a consistent set of APIs, defined for developers and administrators
- Adapt enterprise DevOps with consistent, cloud native development, and CI/CD tooling
- Safer deployments with automated and secured orchestration and life-cycle management
- Kubernetes device plug-in for IBM Crypto Express (CEX) cards
- Co-locate containerized apps beside existing apps and data

IBM Cloud Paks
- Pre-certified containerized software and foundational services
- Build, modernize, and manage applications securely
- Simplify collection and analysis of data, apply intelligent automation, automate labor-intensive IT processes, increase operational agility

IBM Z Security and Compliance Center
- Increase productivity of compliance resources by reducing audit preparation time
- Interactive dashboard provides view of current compliance posture for PCI-DSS and NIST SP800-53 regulations
- Track compliance drift over time with dashboard style visualizations

IBM z/OS Cloud Broker
- Integrates z/OS-based services and resources into private cloud
- Empowers organizations to operate z/OS with the cloud agility and flexibility
- Leverage the strengths of the z/OS platform while enhancing applications

More containerized apps
Hosted at the IBM Z and IBM® LinuxONE Container Registry
- Images are built from scratch by IBM
- IBM controls the contents of the channel
- Images are scanned by IBM Vulnerability Manager
- Image digest hashes published to enable secure pull

Learn more about the IBM Z and LinuxONE Security and Compliance Center

With this open and connected environment developers and administrators can seamlessly build today's business applications, and these cloud-native applications can be easily integrated with existing data across the hybrid cloud approach.

What are the key differentiating benefits of Linux on IBM Z?
- Reduced risk with outstanding protection and high availability
- Highly efficient operations for new and existing services
- Security and data protection with pervasive encryption
- Impressive scalability, horizontal and vertical, in combination with virtualization technologies
- Predictable cost and long-term cost-effectiveness
- Maximized return on existing IT investments

What are the advantages of colocating Linux side-by-side with z/OS on IBM Z?

Colocation can make a significant difference. When multi-tiered workloads, workloads with tiers across the web, applications, and databases, have communication patterns that are network intensive, meaning they either frequently communicate, exchange many messages, in order to complete a single transaction, or they exchange large amounts of data, e.g., big data type solutions such as analytics related workloads, then the physical location or proximity of the workloads can make a difference (see: The benefits of colocating workloads on IBM Z).

When these multi-tiered workloads have communication patterns that are network intensive, meaning they either frequently communicate, exchange many messages, in order to complete a single transaction, or they exchange large amounts of data, e.g., big data type solutions such as analytics related workloads, then the physical location or proximity of the workloads can make a difference.

The colocation of Linux workloads side-by-side with workloads running on IBM z/OS, Red Hat OpenShift Container Platform, running e.g., IBM Cloud Paks®, other container technologies, IBM z/TPF, or 21CS VSE^n [14] on any IBM Z server provide the unique opportunity to connect related workloads on one system, thereby benefiting in performance and operational efficiency. With the immense capacity improvements of IBM z16, all environments, Linux and z/OS, containers, z/TPF, and 21CS VSE^n can be expanded at the same time without the need to add an additional server.

The performance benefits are based on the optimized, internal communication between the workloads:

- Large cache sizes allow for efficient data serving with minimal latency, the elimination of network traffic handling, and high I/O bandwidth provides impressive throughput.
- Technologies such as HiperSockets, Shared Memory Communication (SMC), or sdsfs further improve internal communication.

Operational efficiency is based on the streamlined infrastructure with less components:

- The colocation allows for a centralized management of the workloads, things such as security identity or disaster recovery can be done by an all-encompassing solution.
- The colocation allows for a smaller network infrastructure (firewalls, routers, switches, etc.) with fewer points of attack that need to be secured, and thus improving the level of security.

When the IT capacity needs to be expanded, an IBM Z server can grow the by simply adding system resources into the existing server, on the fly, without affecting the business.

What is pervasive encryption with Linux on IBM Z?

Pervasive encryption for Linux on IBM Z servers is transparent to existing applications and targeted to improve the usability and performance of encrypting/decrypting data in-flight and at-rest, leveraging the improved on-processor Central Processor Assist Crypto Functions (CPACF) and the Crypto Express accelerator.

Encryption support is an integral part of the Linux operating system. The concept with Linux for IBM Z is providing differentiation without being different. This is accomplished by integrating exploitation of the

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[14] *IBM z/VSE has achieved end of life and has been replaced by 21CS VSE^n. Support for 21CS VSE^n is provided by 21CS. For more information, see 21CS website.*

IBM Z encryption hardware (CPACF, Crypto Express, true random number generator) into strategic components of the stack. The encryption functions are integrated in Linux kernel, openSSL, openCryptoki, GSKIT, and Java 8/JCE, and the 'protected key' support is integrated into the Linux kernel and infrastructure.

A premier goal of pervasive encryption is to leverage the IBM Z hardware acceleration in a way that is transparent to the applications and is highly consumable. Clients do not have to change their encryption approach; they simply get consumable data protection for data in-flight and data at-rest.

Linux encryption for data in-flight: Linux is well equipped for encrypting all data in-flight using protocols like TLS, IPSec, or SSH. Exploiting the excellent cryptographic performance of IBM Z, Linux users can afford to pervasively encrypt their network traffic in a transparent manner using OpenSSL, OpenSSH, and IPSec.

In addition, the on-chip true random number generator allows to generate irreproducible unique data which is the basis to generate high quality cryptographic keys.

Linux encryption of Data-at-rest: Recent Linux kernels support end-to-end encryption of block devices (e.g., disk partitions, logical volumes) with dm-crypt using the CPACF protected key technology via the standard Linux Unified Key Setup version 2 (LUKS2) format.

- To learn more see the video Pervasive Encryption for Data Volumes (4:58), and read the documentation Pervasive Encryption for Data Volumes (PDF, 9.6MB).

Detailed information how to you can create a secure environment that uses cryptographic hardware, write cryptographic applications is available at: ibm.com/docs/en/linux-on-systems?topic=linuxone-security.

Note: Pervasive encryption is not a feature that you can switch on or off.

IBM Secure Execution for Linux is a z/Architecture® security technology that is introduced with IBM z15® and IBM® LinuxONE III. It protects data of workloads that run in a KVM guest from being inspected or modified by the server environment.

IBM Fibre Channel Endpoint Security, along with the IBM Hyper Protect Data Controller, is designed to contribute to the IBM Z approach of encryption everywhere. It is a new end-to-end solution that helps ensure all corporate and client data is accessed only by trusted servers and storage devices, and the integrity and confidentiality of the data are protected as it is exchanged over Fibre Channel links.

The table below shows an overview on the most used solutions:

Security & Cryptography

- Protect and future-proof data with pervasive encryption and quantum safe technology
- Gain visibility and reduce risk with continuous compliance and intelligent security solutions
- Detect and report security events with solutions that integrate with the existing environment

IBM Crypto Express adapter (HSM) support

- Tamper-sensing and tamper-responding, high-performance cryptographic operations
- Supports specialized crypto APIs and functions, including those that are required with quantum-safe cryptography and in the banking industry
- Up to 60 Crypto Express adapters – up to thousands VMs can access a dedicated virtual HSM

CP Assist for Cryptographic Function (CPACF)

- Coprocessor that supports Pervasive Encryption by providing fast synchronous cryptographic services
- Encryption: DES, TDES, AES
- Hashing: SHA-1, SHA-2, SHA-3, SHAKE
- Random Number Generation: PRNG, DRNG, TRNG
- CPACF accelerator built into every core

IBM Hyper Protect Servers

- Provides hardware-level security for virtual servers
- Apps and data are always private and protected from internal and external threats
- Protects workloads throughout the app lifecycle – from build through to deploy and manage

IBM Secure Execution for Linux

- Protects workloads from internal and external threats
- Protects data at-rest, data in-flight, and also data in-use
- Supports boot images that are fully encrypted and measured by the image owner
- Provides trusted execution environment (TEE) and an attestation function

IBM Z Security and Compliance Center

- Simplifies compliance and helps reduce risk
- Centralized, interactive dashboard with out-of-the-box profiles built for regulatory requirements

Linux Secure Boot

- Ensures that only approved operating systems can be IPLed
- Verifies that malicious code hasn't been inserted
- Uses digital key pairs to check that SystemTap and other startup code hasn't been altered
- Reduces a Linux server security risk

What are the detailed benefits of Linux on IBM Z?

- **Resilience, High Availability and Business Continuity**
  - IBM Z servers are designed to avoid or recover from failures to minimize business disruptions – even in a single footprint through error prevention, error detection and correction, and error recovery
  - IBM Z servers provide spare cores for transparent failover, and the Redundant Array of Independent Memory (RAIM) subsystem helps to eliminate failures
  - z/VM Single System Image (SSI) feature supports simple systems management, non-disruptive maintenance, and concurrent support for virtual machines.
  - All-encompassing disaster recovery solution with IBM GDPS® allows for multiplatform resiliency capabilities for native Linux, Linux guests under z/VM or KVM (Kernel-based Virtual Machine), and z/OS
  - Advanced clustering technologies, dynamic file system management, and data replication available with IBM Storage Scale (former IBM Spectrum® Scale)
- **Highly Efficient Operation**
  - Outstanding scalability, horizontal and vertical, based on the immense total IBM Z capacity and virtualization technologies
  - Growth inside the server, and the possibility to add resources on the fly without disruption
  - Low operational effort based on centralized management IT environment, for example for backup and disaster recovery
  - Easy to manage through intuitive tools and open APIs
  - Less IT equipment requires less maintenance
  - Streamlined infrastructure with fewer equipment allows for fast configuration changes – if required

- Outstanding security
  - Pervasive encryption enablement with hardware accelerated encryption for high performance
    - Dedicated cryptographic coprocessor on each core provides hardware accelerated encryption of CPACF
    - Crypto Express accelerators
  - End-to-end encryption of block devices (e.g., disk partitions, logical volumes) with dm-crypt using the CPACF protected key technology supporting the LUKS2 format
  - Generate irreproducible unique data, which is the basis to generate high quality cryptographic keys, with new on-chip true random number generator
  - EAL 5+ hardware security certification provides isolation and protection of Linux, z/VM, KVM, z/OS, z/TPF, 21CS VSE^n and container environments
    - IBM Z is the world's only commercial servers with an EAL 5+ hardware security certification
  - IBM RACF® Security Server for z/VM as the backbone for Linux security provides security systems that includes access control and auditing functionality
  - Fewer network components (routers, switches, etc.) reduce security risks
- High performance
  - IBM Z processors have large and fast caches avoiding untimely swaps and memory waits while maximizing the throughput of concurrent workloads
  - On-chip accelerated compression for reduction in the size of data to save storage space and for increasing data transfer rates
  - Simultaneous Multithreading (SMT) with high efficiency based on thread/resource balancing, performance optimized key virtualization, etc.
  - Single instruction, multiple data (SIMD) provides reduced processor quiesce effects, lower cache misses, lower pipeline disruption, and an increased parallelism
  - Pause-less garbage collection to enable Java applications to run faster
  - Low latency, high throughput, and low external network traffic delivered by cross-memory data transfer
  - Shared Memory Communication (SMC) helps to reducing the processor consumption and improves latency and throughput for network communication
  - High I/O bandwidth throughput with network cards
- Predictable cost and long-term cost-effectiveness
  - *See next question, 'What are the potential cost savings of using Linux on IBM Z?'*

What are the potential cost savings of using Linux on IBM Z?

Linux on IBM Z can help lower your IT costs in several areas. The potential areas of cost savings are:

- **Operational management** – a single IBM Z server, running up to thousands of virtual Linux servers, can mean less effort for the systems and operational management. Fewer physical servers can mean less hardware maintenance, less network management, and simpler software patching. Think of all servers, cables, switches, routers that will not be required with a single server environment.
  - In addition, an intelligent virtualization management can help you on your productivity. IBM Z capacity can be activated on demand for rapid provisioning of new LPARs and virtual Linux servers versus setting up a distributed server that requires procurement, installation, configuration, security administration, and workload deployment.

- Colocating Linux side-by-side with z/OS, containers like Red Hat OpenShift, z/TPF or 21CS VSE[n] on the same IBM Z server can benefit from the fast, internal network communication, resource sharing, and an all-encompassing high availability solution with unique arrangements for administration, security, backup, and disaster recovery.
  - **Security** – Linux on IBM Z leverages the most secure commercial servers available, with powerful encryption–protecting data 24/7, and help to achieve compliance and meet regulatory objectives. IBM Z is enabling the world of pervasive encryption for Linux. Transparent exploitation of the fast encryption is given to the Linux workloads. Clients do not have to change their current encryption approach; they simply can get consumable data protection for data in-flight and data at-rest.
  - **Business continuity** – Linux on IBM Z provides trusted operations, it can scale up and out to meet spikes in server activity, helping to minimize costly transaction delays and potentially devastating system crashes. IBM Z is continuously strengthening its unparalleled resiliency through innovations. The suite of the IBM Z built-in features can rapidly respond to, or even anticipate, threats to system health, helping to prevent costly system downtime.
    - Reliable disaster recovery for a distributed server environment can also become difficult as more servers with potentially different components, hundreds or thousands of parts, and new configurations are added over time. In contrast, a condensed server environment comprised of one or a few IBM Z servers can facilitate replication for disaster recovery. Availability and disaster recovery solutions, such as z/VM SSI, IBM Storage Scale, or IBM GDPS, enhance the platform capabilities.
  - **Workload integration and colocation** – integrating Linux workloads with solutions running on z/OS, container platforms like Red Hat OpenShift, z/TPF, and 21CS VSE[n] on the same IBM Z server can not only benefit from the fast communication and operational efficiencies, but as well with the API economy, the existing business competencies can be used in new ways, delivering services into next generation applications accessible via services. The support of standards such as Web Services and REST with JSON is important to make it easier to build new applications.
  - **Software licensing** – Linux on IBM Z can support the consolidation of multiple x86 cores onto a single IBM Z core. This can result in a dramatic cost reduction since software licensing costs for Linux are usually priced per core.
  - **Maintenance** – the maintenance costs of a single IBM Z server can replace the maintenance costs of many x86 servers. As well, it is not only the server maintenance, the maintenance of all the network components which are not required with a single server environment, is omitted as well.
  - **Energy and space consumption** – Linux on an IBM Z server can allow for fewer servers and network components, which can help on savings in physical space and electricity consumption.
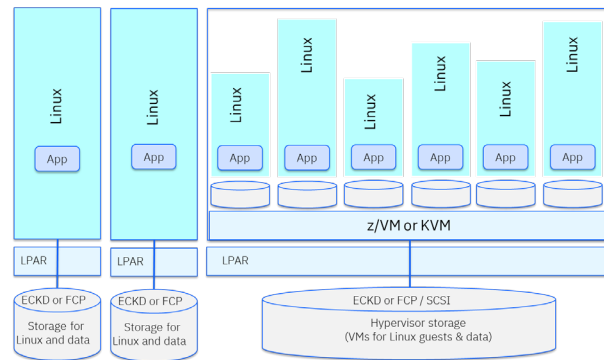
Is Shared Memory Communication (SMC) supported on Linux on IBM Z?

Yes, the SMC protocol is an addition to TCP/IP and can be used transparently. It can be used for connections through:

- Shared Memory Communications through RDMA (SMC-R) with RoCE devices
- Shared Memory Communications Direct (SMC-D) with ISM devices

SMC-R uses sockets over RDMA (Remote Direct Memory Access) communications protocol. It provides host-to-host direct memory communications w/o significant TCP/IP processing costs.

SMC-D uses Internal Shared Memory (ISM) technology within the IBM Z system. It does not require any additional physical hardware (adapters, card slots, switches, PCI infrastructure, etc.).

Learn more: SMC for Linux on IBM Z and see the Linux on IBM Z SMC FAQ

Does SMC-D replace HiperSockets?

No, SMC-D supplements HiperSockets, just like SMC-R supplements traditional TCP connections. The major reasons for that are:

- SMC supports TCP only - not UDP
- The initial setup of each connection always requires traditional connectivity. Even if both peers support SMC-D and/or SMC-R, there is always the possibility that a connection using SMC-D/R cannot be established, and traditional connectivity will be used instead.

What is zdsfs?

Through the zdsfs file system, applications on Linux can read z/OS physical sequential data sets (PS) and partitioned data sets (PDS) on the DASD. In the Linux file system, physical sequential data sets are represented as files. Partitioned data sets are represented as directories that contain the PDS members as files. Other z/OS data set formats, such as extended format data sets or VSAM data sets, are not supported. zdsfs is optimized for sequential read access.

Does Linux support IBM Integrated Accelerator for z Enterprise Data Compression on IBM Z?

Yes, Linux will support the IBM Integrated Accelerator for zEDC, offering a compression acceleration solution designed for high performance, industry standard, and low latency compression.

Linux workloads, independent of the virtualized environment, can benefit for the Integrated Accelerator for zEDC; it will be most beneficial for workloads such as:
- Java (e.g., IBM WebSphere® Application Server)
- Backup (e.g., for Databases)
- Network traffic (e.g., Apache, NGINX)
- IBM MQ®

Where can I get commercial Linux distributions for IBM Z?

Commercial distributions are available from the IBM Linux distribution partners: Canonical, Red Hat, and SUSE.

- Red Hat: www.redhat.com/en/technologies/linux-platforms/enterprise-linux
- SUSE: www.suse.com/products/systemz

- Ubuntu: www.ubuntu.com/server

IBM suggests that these distributions be your first choice for production environments because of their availability of service and support from the Linux distributors partners and IBM Services.

Is IBM working together with the Linux Foundation on Linux for IBM Z?

Yes, the Linux Foundation has established an Open Mainframe Project for vendors, users, and academia to work together to advance Linux tools and technologies for enterprise innovation. The Open Mainframe Project is intended to serve as a focal point for deployment and use of the Linux OS in a mainframe computing environment. More information is available at www.openmainframeproject.org

Where do I find more information about Linux on IBM Z?

You can ask your IBM or Business Partner representative, or look at the web page and blogs
- 'Linux and Mainframe' at: linux.mainframe.blog
- 'Linux on IBM Z' at: linux-on-z.blogspot

What are the most used solutions running on IFLs on IBM Z?

The table below shows an overview on the solutions, ask your IBM representative or Business Partner for details.

IFL use cases solutions	Data serving	Cloud-native deployments & container hosting	Security & Cryptography
	• IBM® Db2® • IBM Cloud Pak® for Data • Oracle • MongoDB • PostgreSQL - Enterprise DB, Fujitsu Enterprise Postgres **Software-Defined Storage** • IBM Spectrum Fusion™ (Red Hat OpenShift) • IBM Storage Scale (Hybrid & AI)	• Red Hat® OpenShift® • IBM Cloud Paks – e.g., Cloud Pak for Integration, Cloud Pak for Data • IBM z/OS Cloud Broker • IBM Z Security and Compliance Center • … containerized apps	• IBM Crypto Express adapter (HSM) support • IBM Hyper Protect Servers • IBM Secure Execution for Linux® • Linux Secure Boot • IBM Z Security and Compliance Center

Consolidation Virtualization Multi-tenant isolation
• IBM z/VM®
• KVM
  • Canonical
  • Red Hat
  • SUSE
• LPAR
	Agile connectivity
	via API and architecture
	• IBM Cloud Pak for Integration, incl. API Connect, App Connect, Aspera®, Event Streams, Event Endpoint Management, DataPower®, MQ
	• IBM App Connect
	• IBM MQ
	
	IBM z/OS co-location
	• Access to open source ecosystem
	• Application hosting
		Application hosting Transactional workloads
		• ISV apps, e.g., Temenos, Finacle, …, .NET
		• IBM WebSphere® Liberty
		• Open source apps
		• AI
		• IBM Db2 Analytics Accelerator
			Infrastructure management and automation
			• IBM Cloud Infrastructure Center (IaaS management)
			• Red Hat Ansible® Automation Platform (use of Playbooks)

Which open source software can be used with Linux on IBM Z?

Linux on IBM Z provides you the choice and flexibility to select from the growing ecosystem of open source software for building your business applications. Most current information about the open source software packages that have been validated for Linux on IBM Z can be found at: ibm.com/community/z/open-source-software

We also invite you to also join the community at: ibm.com/community/z/ibmz

Where can Independent Software Vendor (ISV) products find?

You can also ask your IBM or Business Partner representative, or look at the following resources:

- IBM Business Partner Directory: ibm.com/partnerworld/bpdirectory
- Red Hat product catalog - search page
- SUSE partner software catalog for IBM Z
- Ubuntu software partners

Is a cluster file system technology available for Linux on IBM Z?

Yes, IBM Storage Scale (former IBM Spectrum Scale) for Linux on IBM Z is available. It provides a high performance shared-disk file management solution, intended for fast, reliable access to data from multiple nodes in a cluster environment.

Storage Scale is designed to provide high availability through advanced clustering technologies, dynamic file system management, and data replication. Storage Scale can continue to provide data access even when the cluster experiences storage or node malfunctions. Its scalability and performance are designed

to meet the needs of data intensive applications such as business intelligence or scalable file serving. Applications can transparently access files using standard file system interfaces.

See the detailed information in the IBM Documentation

Does IBM offer an IBM GDPS solution for Linux on IBM Z?

Yes, in form of the IBM GDPS/PPRC (*Peer-To-Peer Remote Copy)* Multiplatform Resiliency for IBM Z (also known as xDR). It provides disaster and failure recovery from a single point of control and ensures data consistency across multiple sites. GDPS/PPRC is the variant of GDPS that performs synchronous data replication using IBM Metro Mirror (aka PPRC) technology.

More information is available at: IBM GDPS is described in the Redbook: IBM GDPS Family of Products: An Introduction to Concepts and Capabilities.

IBM Z Virtualization Technology FAQ

What is IBM Z virtualization technology?

IBM Z virtualization technology allows clients to create virtual processors, communications, memory, I/O, and networking resources, thus helping to reduce the overhead of planning, purchasing, and installing hardware to consolidate and support new workloads.

The virtualization technology for IBM Z platforms is composed of a hardware and a hypervisor virtualization (z/VM and KVM). Important, IBM Z virtualization is not an afterthought; it is designed in from the bottom up.

More information is available at: ibm.com/it-infrastructure/z/capabilities/virtualization

Which hypervisors and virtualization technologies are available on IBM Z?
- IBM Processor Resource/System Manager (PR/SM$^<$) or via Dynamic Partition Manager (DPM): Firmware based virtualization to securely share and partition hardware resources.
- IBM z/VM: IBM software mainframe virtualization that can be traced back to the beginning of virtualization in computing.
- KVM: Open source virtualization that supports multiple hardware architectures.
- IBM Hyper Protect Virtual Servers: A partition for specialized containers, fully encrypted, with limited and encrypted network access and no access for system administrators.

What does the IBM Z hardware provide?

The IBM Z hardware provide the foundation with functions critical to the success of virtualization, particularly on a large scale. The IBM Z hardware partitioning, managed by the Processor Resource/System Manager (PR/SM), allows to divide one physical server into logical partitions (LPAR) running a mix of multiple instances of the following operating systems: z/OS, Linux, container platforms, e.g., Red Hat OpenShift Container Platform, z/TPF, 21CS VSE^n, and multiple instances of the following hypervisors: z/VM and KVM. This is referred to as the 'Standard Mode'.

The IBM Z system resources can be dedicated to a particular LPAR or shared across LPARs. The IBM Z LPAR technology is the only commercial platform with EAL5 security classification. This certification means that although different workloads are running on the same hardware, they are protected when running in separate partitions; one LPAR cannot reach across boundaries into the next LPAR and compromise its security.

Another administrative mode, the IBM Dynamic Partition Manager (DPM), is available for Linux-only environments running on IBM Z and IBM® LinuxONE.

IBM Hyper Protect Virtual Servers protect Linux workloads on IBM Z throughout the application lifecycle – from build through to deploy and manage. You can be confident that applications and data are always private and protected from internal and external threats.

The inter-partition communication, called HiperSockets, provides high-speed TCP/IP connectivity through the system memory and eliminates the need for any physical cabling or external networking connection between servers running in different LPARs.

What is IBM Dynamic Partition Manager?

IBM Dynamic Partition Manager (DPM) is designed to perform simplified configuration for Linux users. DPM allows to be quickly configure LPARs, along with the management of system resources including integrated dynamic I/O management, as easily as other virtualized environments. It was developed for new-to-Z users working on servers with KVM on IBM Z, z/VM, Hyper Protect Virtual Servers, and Linux for IBM Z as a partition-hosted operating system.

The DPM is not a replacement for PR/SM – it is PR/SM. More specifically, it is a new administrative mode of PR/SM that allows for simplified configuration of partitions, associated resources, and I/O.

DPM is provided with all IBM z16, IBM z15, IBM z14, IBM z13s®, IBM z13®, and IBM® LinuxONE servers. DPM provides simplified, consumable, and enhanced partition lifecycle and dynamic I/O management capabilities via the Hardware Management Console (HMC) to:

- Create and provision an environment includes the creation of new partitions, assignment of processors and memory, and configuration of I/O adapters (network, FCP storage, crypto, and accelerators)
- Manage the environment by modifying system resources without disrupting running workloads
- Monitor and troubleshoot the environment to identify the source identification of system failures, conditions, states, or events that may lead to workload degradation

This simplifies system administration tasks for those with limited IBM Z skills. Learn more: Dynamic Partition Manager Guide

What is IBM z/VM?

IBM z/VM is a highly secure and scalable hypervisor and virtualization technology for 'traditional' and cloud infrastructure and for running critical applications. z/VM supports Linux, z/OS, Red Hat OpenShift Container Platform, z/TPF, and 21CS VSEⁿ operating systems on IBM Z and IBM® LinuxONE servers. It can host up to thousands of virtual servers on a single system.

What are the feature functions in z/VM V7.3?

IBM z/VM V7.3 is available since September 2022. The detailed information can be found on the http://www.vm.ibm.com/zvm730 and z/VM Continuous Delivery News web pages.

Is Sub-capacity pricing available on z/VM?

Yes, sub-capacity pricing for the z/VM operating environment is available. Software pricing at less than full machine capacity can provide more flexibility and improved cost of computing as a client manages the volatility and growth of new workloads.

The client benefits of sub-capacity pricing for select z/VM programs will be:

- Pay for z/VM programs based on defined workload requirements and not necessarily the full engine capacity of the machine.
- Add hardware capacity for new workloads, capabilities, and functions, e.g., KVM or appliances, and not have IBM software pricing for z/VM programs automatically increase for existing workload
- Buy new hardware capacity for future growth with no immediate increase to their IBM software bill provided that no additional software capacity is required at that time.
- Potentially benefit from improved price performance as workloads grow.

Is KVM on IBM Z like open source KVM for other instruction-set architectures?

Yes, KVM is an open virtualization alternative for IBM Z. KVM provides standard Linux and KVM interfaces for operational control of the environment. In addition, KVM integrates with standard OpenStack virtualization management tooling, enabling enterprises to easily integrate Linux servers into their existing infrastructure and cloud offerings.

KVM is an ideal choice for clients who want open virtualization while taking advantage of the robustness, scalability, and security of the IBM Z platform. KVM delivers a Linux-familiar administrator experience that can enable simplified virtualization management and operation and allows for easy integration into existing infrastructure and cloud offerings.

KVM on IBM Z is optimized to exploit the z/Architecture for scalability, performance, security, and resiliency.
- IBM's base information on KVM: ibm.com/products/kvm
- IBM Blog "KVM on IBM Z": kvmonz.blogspot.com

What is IBM Cloud Infrastructure Center?

With IBM Cloud Infrastructure Center, you get an infrastructure management solution in support of infrastructure-as-a-service computing.

Cloud Infrastructure Center provides a ready-to-use solution for:
- Lifecycle management of the infrastructure, including on-premises deployments of virtual machines based on IBM z/VM and Red Hat KVM.
- Deployment of Linux images, which can include non-containerized workloads, such as MongoDB.
- Support to simplify the deployment of Red Hat OpenShift Container Platform1 clusters.
- User consumption of services via the self-service portal.
- Integration with cloud management tools to provision and orchestrate workloads, using OpenStack-compatible APIs to interact with IBM Cloud Paks, Red Hat Ansible, Terraform, VMware vRealize, and others.

Cloud Infrastructure Center is based on industry standards and leverages common skills for cloud management.

How does the IBM Cloud Infrastructure Center relate to IaaS?

IBM Cloud Infrastructure Center is an IaaS offering that provides a consistent, industry-standard user experience to define, instantiate, and manage the lifecycle of virtual infrastructure, deployment of images (operating system and applications), and policies to maximize resource utilization. Cloud Infrastructure Center provides an industry-proven turn-key solution.

What are the popular use cases of IBM Cloud Infrastructure Center?

The popular use cases are:
- Deployment of on-premises database-as-a-service
- Deployment support of Red Hat OpenShift clusters
- Infrastructure as a service management for service providers
- Simplified experience with virtualization on IBM Z and IBM® LinuxONE

For more information see the IBM Whitepaper: Empower how you deploy, manage, and integrate infrastructure as a service.

Can IBM Cloud Infrastructure Center be integrated with other cloud management tools?

Cloud Infrastructure Center provides foundational, scalable Infrastructure-as-a-Service (IaaS) management to connect, provision, and orchestrate Linux-based virtual machine instances on the IBM Z and IBM® LinuxONE platforms.

With its built-in OpenStack compatible APIs, Cloud Infrastructure Center is based on the de facto industry standard for vendor-agnostic IaaS management, enabling an easy integration to higher-level cloud management tools, such as IBM Cloud Paks, Red Hat tooling, Terraform, or VMware vRealize Automation.
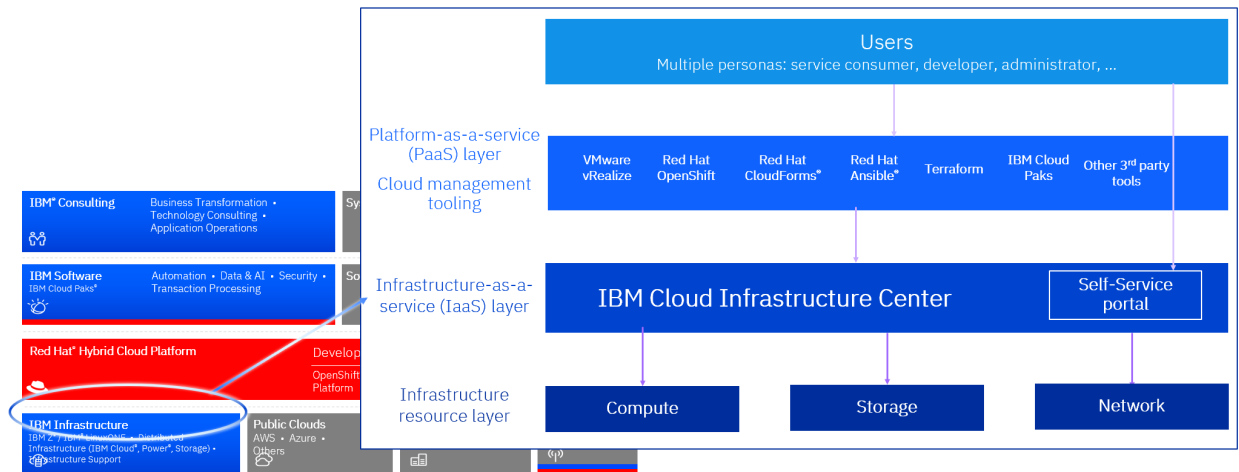
IBM Cloud Infrastructure Center can serve as the infrastructure as a service integration point to IBM Z and IBM® LinuxONE, so that IBM Z and IBM® LinuxONE can be easily consumed in the cloud management layer.

Where do I find more information IBM Cloud Infrastructure Center?

You can ask your IBM or Business Partner representative, or look at the 'IBM Cloud Infrastructure Center' web page at: ibm.com/products/cloud-infrastructure-center

What is the IBM Integrated Facility for Linux (IFL)?

The IBM Integrated Facility for Linux (IFL) is a processor dedicated to run Linux workloads on IBM Z servers. It is an optional feature, attractively priced and supported by z/VM, KVM on IBM Z, and the Linux distributions for IBM Z.

An IFL provides the functionality of a general-purpose processor (CP), and since z13, the IFL provides an optional multithreading technology (SMT) and Single Instruction Multiple Data (SIMD), designed to improve the performance capacity.

Since an IFL can run many virtual servers, a consolidation onto an IFL can result in less IT costs, especially when the software licensing costs are priced per core.

The inclusion of an IFL will not increase charges for IBM Z software running on general purpose processors.

What are the values of the IFL?

The IFL processor enables you to purchase attractive priced processing capacity exclusively for Linux workloads:

- The IFL is always a full capacity processor.
- The IFL provides the functionality of a "standard" processor on an IBM Z server.
- The IFL provides an optional multithreading technology (SMT) and Single Instruction Multiple Data (SIMD), since z13.
- HiperSockets can be used for communication between virtual Linux servers and Linux and other operating system images.
- z/VM, as well as most IBM Linux middleware products are priced per processor (core) with a one-time-charge (OTC) and an annual, optional maintenance charge, called Subscription and Support (S&S).
- Many software vendors have adopted the IBM pricing model for the Linux workloads.
- The IFL does not increase charges for IBM Z software running on "standard" processors in the server. It does not affect the MSU rating or the IBM Z model designation.

Can I buy an IBM Z server that is made up entirely of IFL engines and no "standard" engines?

Yes, dedicated IBM Z Linux servers – "Linux-only servers" - are available. You can order "IFL-only" servers that are based on the IBM z16, z15, z14 and z13 server technology, IBM® LinuxONE servers are "IFL-only" as well. For more information, ask your IBM or Business Partner representative.

What types and portions of workloads are eligible/authorized to execute on IFLs?

IBM authorizes clients to use IFLs only to execute the processing of Eligible Workloads of specific Programs expressly authorized by IBM as specified in the "Authorized Use Table for IBM Machines". The table can be found at: ibm.com/systems/support/machine_warranties/machine_code/aut.html

Can I run Linux on a standard IBM Z processor?

Yes, Linux runs on the "standard" processors on an IBM Z server, an IFL is not required. This also applies to z/VM and KVM. Based on that, workloads running in virtual machines based on z/VM or KVM can run on the "standard" processors as well.

Can I run z/VM in an LPAR which has a mix of standard and IFL processors?

Yes. The IBM z16, z15, z14, z13, z13s, zEC12, and zBC12 support z/VM-mode logical partitions (LPARs), which allow multiple types of IBM Z processors to be defined in the same z/VM LPAR, including:

- Central Processors (CPs)
- Integrated Facility for Linux Processors (IFLs)
- IBM Z Systems Integrated Information Processors (zIIPs)
- IBM Z Systems Application Assist Processors (zAAPs)
- Internal Coupling Facility Processors (ICFs)

z/VM exploits this capability by expanding its guest support for specialty processors to allow these processor types to be defined as virtual CPUs.

Where can I get more information on the Integrated Facility for Linux (IFL)?

The information is available at: ibm.com/products/integrated-facility-for-linux

What IBM Storage products are available to support the Linux distributions on IBM Z?

The Linux on IBM Z is supported with the

- IBM FlashSystem® (including IBM Storwize®),
- IBM SAN Volume Controller (SVC),
- IBM System Storage® DS8000® series,

The most current information is available at: IBM System Storage Interoperation Center (SSIC) - ibm.com/systems/support/storage/ssic/interoperability.wss

Please insert the details of your selected configuration:

1. Select the 'Storage Model'
2. select 'IBM Z' or 'IBM LinuxONE' as 'Host Platform'
3. select the Linux distribution (Red Hat, SUSE or Ubuntu) from the 'Operating Systems' pull-down

Revise Selected Criteria - click link below to change search query
New Search > Host Platform > Storage Model >

Configuration Results = 4 359   SSIC Education and Help

Storage Family
IBM System Storage SAN Volume Controller

Storage Model
SVC Host Attachment

Storage Version (Export Selected Version)
7 selections

Cloud Platform
1 selection

Cloud Orchestration
3 selections

Cloud Driver
2 selections

Connection Protocol
3 selections

Host Platform
IBM Z

Server Model (Compatibility Resources)
IBM Z (All)

Operating System
Select your Linux distribution

Adapter (HBA, CNA, etc)
10 selections

SAN or Networking
37 selections

Clustering
<none>

Multipathing
4 selections

Supported Feature
6 selections

Submit   Configuration Results = 4 359   SSIC Education and Help

Support, Services and Education

What are the IBM tested and Linux distribution partner certified Linux environments on IBM Z?

You can ask your IBM or Business Partner representative, or look at the "Tested Platforms" web page

Does IBM provide tuning tips for Linux on IBM Z?

Yes, the Linux team for IBM Z provides a collection of tips and observations at the "Tuning hints & tips" web page ibm.com/docs/en/linux-on-systems?topic=performance-hot-topics

Which collateral provides technical guidance and experiences?

IBM Redbooks® typically provide positioning and value guidance, installation and implementation experiences, typical solution scenarios, and step-by-step "how-to" guidelines. They often include sample code and other support materials that are also available as downloads from this site; Linux on IBM Z related Redbooks

Do IBM and the Linux distributors offer support services for Linux on IBM Z?

Yes. IBM Global Services does offer support for Linux on IBM Z from Canonical, Red Hat, and SUSE. IBM is delivering high quality, reliable, comprehensive remote support. We offer a full portfolio of flexible Linux remote support services including support for Linux with Linux Subscription, which authorizes you, access to the distributor's version of Linux and to maintenance packages, updates, and upgrades. The service provides unlimited calls for unlimited callers and assistance. See: IBM Technical Services – Infrastructure expertise, or visit: ibm.com/services/infrastructure

The Linux distributor partners offer support, please contact them for questions about their service and support offerings.

What services are available for Linux on IBM Z?

IBM Global Services offer services. The latest information is found at IBM Technical Services – Infrastructure expertise

What education is available for the Linux on IBM Z environment?

IBM provides almost every month a webcast, featuring latest technical features, hints, and tips. Replays and information about the upcoming themes are found at the 'Linux on IBM Z and IBM® LinuxONE - Technical Webcast Sessions' web page.

Education classes are available to introduce you to Linux and give you the hands-on experience you need to install and configure Linux on IBM Z.
The information is found at ibm.com/training/search?query=linux on z

Resources

Linux on IBM Z	ibm.com/z/linux
IBM documentation for Linux on IBM Z	ibm.com/docs/en/linux-on-systems?topic=linux-z-linuxone
Tested platforms	ibm.com/support/pages/node/6191619
Integrated Facility for Linux (IFL)	ibm.com/de-de/products/integrated-facility-for-linux
Technical webcast sessions - Linux on IBM Z	ibm.com/support/pages/node/6351445
IBM z/VM virtualization	ibm.com/products/zvm and www.vm.ibm.com/newfunction
KVM for IBM Z	IBM blog: kvmonz.blogspot.com IBM base KVM information: ibm.com/products/kvm
IBM Cloud Infrastructure Center	ibm.com/products/cloud-infrastructure-center
IBM Dynamic Partition Manager (DPM)	ibm.com/support/pages/ibm-z-dynamic-partition-manager-dpm-guide
Storage Interoperation Center (SSIC)	ibm.com/systems/support/storage/ssic/interoperability.wss
Open source software community	ibm.com/community/z
Validated open source software IBM Z	ibm.com/community/z/open-source-software
Examples of Dockerfiles	github.com/linux-on-ibm-z/dockerfile-examples
– IBM Business Partner Directory – Red Hat catalog – SUSE catalog – Canonical (Ubuntu)	– ibm.com/partnerworld/bpdirectory/ – Red Hat product catalog - search page – SUSE partner software catalog – Ubuntu software partners
IBM Z	ibm.com/it-infrastructure/z
IBM® LinuxONE	ibm.com/it-infrastructure/linuxone
IBM Storage Systems	www.ibm.com/storage

Linux distributions for IBM Z

Red Hat	www.redhat.com/en/technologies/linux-platforms/enterprise-linux
SUSE	www.suse.com/products/systemz
Ubuntu	ubuntu-on-big-iron.blogspot.com/?view=sidebar

Red Hat products

Red Hat OpenShift Container Platform	access.redhat.com/products/red-hat-openshift-container-platform/
Red Hat Ansible Automation Platform	www.redhat.com/en/technologies/management/ansible