



Highlights

- More memory, cache enhancements and improved input or output (I/O) bandwidth to serve up more data to support exponential mobile transaction volumes
 - Real-time insights at the point of impact with integrated analytics and transaction processing
 - Data and services are securely delivered, with minimal risk, on the most reliable platform
 - Improved data resilience with Storage Attached Network (SAN) Fabric Priority
 - Enabled for open source innovation.
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IBM z13 (z13)

New market forces are changing the face of every industry, requiring almost every business to transform and embrace digital business. This means supporting existing clients with new services and offerings, while helping new businesses and citizens gain access to products, services and societal benefits. A successful transformation requires an IT infrastructure that is efficient, secure, adaptive and integrated. It must be designed to handle the explosive growth of increasingly mobile clients, be able to leverage vast amounts of new data and provide deeper real-time insight at the point for greatest business impact. All deployed within a secure and resilient cloud-ready infrastructure.

The IBM® z13 (z13) provides the infrastructure that will help differentiate a refined digital business. It offers the capacity and processing power to improve business performance and growth. The z13 helps better protect sensitive transactions to minimise business risk and client exposure, while helping to deliver on service level agreements for an exceptional customer experience. New economic efficiencies allow the z13 to offer more throughput and capabilities with less impact to the IT budget.

Performance and Scale help improve client experience

The z13 is available with up to 141 configurable processor units for performance and scaling advantages over prior generations of the mainframe, supporting up to 8,000 virtual servers on a single footprint.



With changes in the chip technology industry, microprocessor frequency is no longer the primary means to achieve performance. Hence, the new 22nm 8-core processor chip achieves performance gains over IBM zEnterprise EC12 (zEC12) by the following micro-architecture innovations:

- Increased instruction parallelism through wider instruction decode bandwidth, increased execution bandwidth and a more aggressive out-of-order-execution
- Economies of scale, using simultaneous multi-threading (SMT) to execute two instruction streams (or threads) on a processor core which delivers more throughput for Linux on z Systems and IBM z Integrated Information Processor (zIIP) eligible workloads
- Single Instruction Multiple Data (SIMD), a vector processing model providing instruction level parallelism, to speed workloads such as analytics and mathematical modeling. For example, Common Business Oriented Language (COBOL) 5.2 and PL/I 4.5 exploit SIMD and improved floating point enhancements to deliver improved performance over and above that provided by the faster processor
- On chip cryptographic and compression coprocessors receive a performance boost improving both general processors and Integrated Facility for Linux (IFL) cryptographic performance and allowing compression of more data, helping to save disk space and reducing data transfer time
- Redesigned cache architecture, leveraging our leadership eDRAM technology to provide twice as much second level cache and substantially more third and fourth level caches compared to the zEC12. Bigger and faster caches help to avoid untimely swaps and memory waits while maximising the throughput of concurrent workloads.

The z13 offers up to 10 Terabytes (TB) of memory – 3X more than the zEC12. This will advantage many types of users. Linux application servers, database servers, analytic and cloud workloads running native or under z/VM or under KVM for IBM z Systems, may see performance benefits when taking advantage of large shared, virtualised memory. Large memory

can reduce latency and central processing unit (CPU) cost and improving operational efficiency for WebSphere Application Server and Java™ applications running on z/OS by allowing larger heaps without an increase in paging. Large memory for IBM MQ V8 can help to cost effectively manage the increasing message volumes generated from today's mobile and cloud applications.

New scale, intelligent and resilient I/O infrastructure

The z13 uses industry standard Peripheral Component Interconnect Express (PCIe) Generation 3 technology in the PCIe I/O drawer to support FICON, Crypto Express, OSA-Express and our Flash Express solid state disk. The PCIe I/O features allow better granularity and lower energy consumption along with the exploitation of industry standards.

The use of direct memory-to-memory communications can help to speed up cross systems communications. Shared Memory Communications via Remote Direct Memory Access (SMC-R) can offer up to 50 percent CPU savings for FTP file transfers across z/OS systems versus standard Transmission Control Protocol/Internet Protocol (TCP/IP)¹. The next generation of 'network-in-a-box' technology – Shared Memory Communications – Direct Access Method (SMC-D) can help increase throughput when compared with current Hipersockets technology.

The z13 I/O provides increased scale and addressability providing flexibility in consolidating more servers into a single footprint. The number of I/O devices per channel is increased to 32 K and the number of Logical Channel Subsystems (LCSS) has increased to 6, with 4 available sub channel sets.

The new FICON Express16S links, which auto-negotiates to 4, 8 and 16 Gigabits per second (Gbps), help improve I/O and DB2 transactional latency to reduce elapsed time for some batch jobs such as SAP workloads. I/O bound batch jobs can expect a reduction in elapsed time using FICON Express16S versus FICON Express8S.

IBM Systems Data Sheet

FICON Dynamic Routing can help to lower costs, improve performance and help ensure resilience by incorporating the pervasive Storage Area Network (SAN) dynamic routing policies supported by switch vendors. Businesses can experience simplified configuration and capacity planning as it pertains to network performance and utilisation through the use of FICON Dynamic Routing.

Because the faster link speed technologies are more sensitive to the quality of the cabling infrastructure, z13 is the first system to use a standards-based approach for enabling Forward Error Correction (FEC) for a complete end-to-end (E2E) solution. FEC technology will allow FICON Express16S to operate at higher speeds, over longer distances, with reduced power and higher throughput, while retaining the same reliability and robustness that FICON has traditionally been known for.

The new High Performance FICON for z Systems (zHPF) Extended Distance II capability can help allow clients using multi-site configurations to receive an I/O service time improvement when writing data remotely (remote site recovery). zHPF Extended Distance II capability will benefit GDPS or TPC-R HyperSwap configurations where the secondary direct access storage device (DASD) subsystem is in another site.

SAN Fabric Priority will help extend z/OS workload management policies into SAN fabric to manage congestion by prioritising important work to avoid congestion in the fabric and switches.

IBM zHyperWrite, designed to improve DB2 log write performance with DS8870 and z/OS for Metro Mirror environment, is supported on z13. IBM zHyperWrite can help to reduce up to 43 percent of the DB2 write operations and deliver up to 80 percent throughput improvement.

Trustful, reliable and secure for less risk

The intrinsic platform security and privacy for transactions and sensitive data helps enable z Systems to be the secure enterprise application server and data vault. IBM z Systems employ multiple cryptographic engines. Integrated into each central

processor (CP) microprocessor chip is a cryptographic coprocessor that provides CP Assist for Cryptographic Function (CPACF) to deliver cryptographic and hashing functions in support of clear-key operations. Exclusive to z Systems is the protected key CPACF which provides the speed of processor-based cryptography while helping to keep sensitive keys private from applications and the operating system (OS).

The next generation of cryptographic coprocessor is available with the Crypto Express5S feature, installed in the peripheral component interconnect Express (PCIe) I/O drawer. The Crypto Express5S offers a state of the art (SOTA) tamper resistant cryptographic coprocessor for secure-key operations along with new hardware assists to encrypt data faster than Crypto Express4S, allowing for more data to transfer successfully across the internet to support public and private cloud and mobile workloads. The Crypto Express5S feature supports three configuration options - accelerator (SSL), secure CCA (Common Crypto Architecture) and Enterprise PKCS#11 modes.

The z13 and the Crypto Express5S offer enhanced public key support for constrained environments using hardware assisted Elliptic Curve Cryptography (ECC). ECC, initially supported on the zEC12 and zBC12, provides algorithms with much shorter key lengths than RSA keys for similar cryptographic strength. This makes ECC cryptography ideal for mobile and smartcards where memory constraints may be a consideration.

The z13 offers VISA format preserving encryption (VFPE) for payment card account numbers and can help provide additional security by enabling legacy databases and applications to contain encrypted data of sensitive fields without having to undertake a restructure of the database or applications. FPE is a valuable tool for payment card applications that helps to maintain the character length between input clear text and resulting cipher text.

Enterprise Linux qualities of service

IT organisations require a robust and effective workload deployment platform for consolidation, to help eliminate server sprawl and complexity, as well as re-deployment and new workload deployment. The z13 enables enterprise-grade Linux, one designed to be more robust and trusted for critical workloads, has higher performance and throughput at a lower cost per transaction and is integrated with new open capabilities that will lead to wider adoption of open source content. You need z Systems qualities of service for your applications and the z13, along with open source investments, delivers enhancements to availability, scale and security to meet these demands.

The z13 can support exponential growth for Linux on z Systems with up to 141 integrated facility for Linux (IFL) specialty engines and 85 logical partitions (compared to 60 on the zEC12). Coupled with better utilisation of up to 10 TB of memory for Linux on z Systems, z13 can help improve response time for clients and support the ability to make faster business decisions. The memory increase opens opportunities such as in-memory data marts and in-memory analytics.

The easy to use and implement GDPS Virtual Appliance for Linux on z Systems, based on GDPS/PPRC Multiplatform Resiliency for z Systems (xDR) technology, can help provide high availability (HA) in case of system, application, or network failure. The fully integrated appliance helps provide Continuous Availability and Disaster Recovery (DR) solutions for Linux on z Systems.

Another feature, IBM z Advanced Workload Analysis Reporter (IBM zAware), is designed to offer near real-time diagnostics to help you identify potential problems in your z Systems environment. It is an analytics solution executed in firmware, which intelligently examines message logs for potential deviations, inconsistencies or anomalies. With rapid identification of message anomalies, organisations can accelerate their response to resolve problems, focus their efforts more precisely, address IT problems quickly, minimise availability

lapses and intervene in IT problems before they become more severe. Previously available only for z/OS, with z13, it is now supported on Linux on z Systems too.

IBM Spectrum Scale for Linux on z Systems V4.2, based on General Parallel File System (GPFS) technology is a fast and highly available/scalable cluster file system that is designed for high-performance parallel file access and parallel I/O to single or multiple files. It delivers proven reliability, scalability and performance with automated failure recovery and decentralised data management for simplifying administration. IBM Spectrum Scale V4.2 Standard Edition extends support of backup and restore functions to protect data in the file system and enables space management of data. The Advanced Edition supports asynchronous DR, enabling establishment of a primary (active) / secondary (passive) relationship at the fileset level.

IBM KVM for z Systems provides skills portability for clients with existing KVM implementations on alternative architectures. KVM for z Systems has the potential to create new possibilities for delivery of open source tools, databases and management software to further lower the cost of Linux on z Systems deployments. For those accustomed to non-IBM management tools, IBM plans to introduce IBM Dynamic Partition Manager to simplify z Systems hardware and virtual infrastructure management for KVM for z Systems including integrated dynamic I/O management.

z13 is the mainframe optimised for the digital era

Built on z Systems core values and strengths, the z13 delivers innovations and technologies to enable digital business. It is designed to handle the explosive growth of increasingly mobile clients and employees, able to leverage new and vast amounts of data and can provide deeper real-time insight at the point for greatest business impact. All this needs to be deployed within a secure and resilient cloud-ready infrastructure.

IBM Systems
Data Sheet

IBM z13 (2964) at a glance

Processor Core Types: CP / IFL / ICF / zIIP* / Standard SAP(s) / Additional SAP(s) / Spares

Model	Minimum	Maximum
N30	0 [†] / 0 [†] / 0 [†] / 0 / 7 / 0 / 2	30 / 30 / 30 / 20 / 7 / 4 / 2
N63	0 [†] / 0 [†] / 0 [†] / 0 / 14 / 0 / 2	63 / 63 / 63 / 42 / 14 / 8 / 2
N96	0 [†] / 0 [†] / 0 [†] / 0 / 21 / 0 / 2	96 / 96 / 96 / 64 / 21 / 12 / 2
NC9	0 [†] / 0 [†] / 0 [†] / 0 / 28 / 0 / 2	129 / 129 / 129 / 86 / 28 / 16 / 2
NE1	0 [†] / 0 [†] / 0 [†] / 0 / 28 / 0 / 2	141 / 141 / 141 / 94 / 28 / 16 / 2

Coupling Links

IC maximum	32
ICA SR maximum	40 ports [‡]
12x HCA3-O InfiniBand maximum	32 ports [‡]
1x HCA3-O LR InfiniBand maximum	64 ports [‡]

Channels

FICON Express16S / FICON Express8S / FICON Express8 [§] / OSA-Express5S / OSA-Express4S [§]	Maximum: 320 / 320 / 64 / 96 / 96
Flash Express	8 (4 pairs – 8 PCIe adapters); offered in pairs
HiperSockets	Up to 32 high-speed 'virtual' Local Area Networks

Cryptography

Crypto Express5S	Minimum order 2 features; Maximum order 16 features
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Compression Acceleration

zEDC Express	8 – minimum recommended is 2
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RDMA over Converged Ethernet (RoCE)

10 GbE RoCE Express	16 – minimum recommended is 2
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IBM Systems
Data Sheet

IBM z13 (2964) at a glance

Processor Memory

Model	Minimum	Maximum
N30	64 Gigabytes (GB)	2.5 TB**
N63	64 GB	5.0 TB
N96	64 GB	7.5 TB
NC9	64 GB	10.0 TB
NE1	64 GB	10.0 TB
Upgradeability	Upgradeable within the z13 family Upgrading to the NE1 from other z13 models will require a planned outage Upgradeable from IBM zEnterprise EC12 and IBM zEnterprise 196 Upgradeable from z13s N20 to z13 N30 air-cooled (radiator) only Upgradeable from LinuxONE Emperor L30 (to N30, N63, N96, NC9 and NE1); from L63 (to N63, N96, NC9 and NE1); from L96 (to N96, NC9 and NE1); from LC9 (to NC9 and NE1); and from LE1 (to NE1)	

Supported Operating Systems

z/OS	z/OS V2.2 z/OS V2.1 z/OS V1.13 z/OS V1.12 (toleration) Available via IBM Software Support Services (SSS)
z/VM	z/VM 6.3 z/VM 6.2 (toleration)
Linux on z Systems	Red Hat Enterprise Linux (RHEL) 5, 6 and 7 SUSE Linux Enterprise Server (SLES) 11 and 12 For minimum or recommended levels please see IBM Tested platforms page ibm.com/systems/z/os/linux/resources/testedplatforms.html
z/VSE	z/VSE 5.1 and subsequent releases
z/TPF	z/TPF 1.1
AIX on POWER7 blade located in zBX	AIX 5.3 (TL 12+ and up), AIX 6.1 (TL 5+ and up) and AIX 7.1 and subsequent releases
Linux on System x on HX5 blade located in zBX Model 004	RHEL 5.5 and up, 6.0 and up, 7.0 and up and SLES 10 (SP4) and up, SLES 11 SP1 and up, SLES 12 and up – 64 bit only
Microsoft Windows on HX5 blade located in zBX Model 004	Microsoft Windows Server 2008 (SP2), Microsoft Windows Server 2008 R2, Microsoft Windows Server 2012, Microsoft Windows Server 2012 R2 (Datacentre Edition recommended) – 64 bit only

IBM z13 (2964) at a glance

Supported Hypervisors

KVM for IBM z Systems	KVM for IBM z 1.1 with SUSE SLES SP1 guests
PS701 in zBX Model 004	PowerVM Enterprise Edition – VIOS 2.2.3
HX5 in zBX Model 004	KVM – Red Hat Enterprise Virtualisation Hypervisor (RHEV-H) 6.5

IBM z BladeCenter Extension (zBX) Model 004

WebSphere DataPower Integration Appliance XI50 for zEnterprise	Minimum: 0	Maximum: 28 ^{††}
IBM BladeCenter PS701 Express POWER7 blade	Minimum: 0	Maximum: 112 ^{††}
IBM BladeCenter HX5 blade	Minimum: 0	Maximum: 56 ^{††}

Why IBM?

As you transform your business by examining your business processes, technology, products and services, IBM remains your trusted partner. You want smart, robust technology solutions without sending your budget out of control. We have the total expertise – in systems, software, delivery and financing – to help you refresh and optimise your IT for the constant flow of opportunities and challenges you face. Our experts can help you configure, design and implement a z13 solution optimised for the needs of your business.

For more information

To learn more about the IBM z13 (z13), please contact your IBM representative or IBM Business Partner (BP), or visit the following website: ibm.com/uk/systems/z13

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* If ordering a zIIP, one or more general purpose processor (CP) per the specialty engine is required. IBM has modified the ratio of zIIP to CPs to be 2:1. Up to two zIIP processors may be purchased for every general purpose processor purchased on the server.

† There must be at least one CP, IFL or ICF ordered on the server. No IFL is required unless ordering an IFL only server – model capacity identifier 400. No ICF is required unless ordering an ICF only server – model capacity identifier 400. If you order a 400 no CP is orderable.

‡ N30 (i.e. 1 Drawer) Coupling Feature and Port Maximums:

ICA SR: 10 Features, 20 Ports
12X HCA3-O: 4 Features, 8 Ports
1X HCA3-O LR: 4 Features, 16 Ports

§ Carry forward only

** Provides the minimum physical memory required to hold base purchase memory plus 96 GB HSA

†† The blades for BladeCenter PS701 Express blade, BladeCenter HX5 blade and DataPower XI50z can be shared in the same BladeCenter chassis – note that DataPower XI50z blades are 'doublewide' and use two slots. Total zBX capacity cannot exceed 112 total blades.

¹ Based on internal IBM benchmarks in a controlled environment using z/OS V2R1 Communications Server FTP client and FTP server, transferring a 1.2 GB binary file using SMC-R (10 GbE RoCE)