IBM z15 Model T02 delivers the cloud you want with the privacy and security you need

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At a glance

Announcing the IBM z15™ Model T02

Today's announcement extends the IBM Z® family of servers as the platform for mission-critical hybrid cloud, with new innovations across security, data privacy, and resilience for all clients.

Cloud native

You can build a hybrid cloud ecosystem designed for availability, security, and accessibility with flexibility as you deliver timely and efficient new services for your digital business. The IBM z15 server provides the availability required by your most mission-critical workloads and the security demanded by your most valuable data. The z15™ T02 delivers an entry-sized cloud platform that can be the base for transforming your applications and infrastructure. It makes it easy for administrators, developers, and architects to deliver and deploy cloud-native container-based applications. IBM® has a comprehensive portfolio of solutions to help you deploy and support your cloud environment, as well as expand access to it.

- IBM Z software offerings combine to help you integrate and manage your ideal cloud environment. IBM z/OS® Container Extensions (zCX) enables access to a large ecosystem of open source and Linux® on IBM Z applications that may be deployed and managed within the native z/OS environment without requiring a separate Linux server, using popular Docker container skills and patterns. You can use the latest open source tools, popular NoSQL databases, analytics frameworks, application servers, and so on within your z/OS environment.
- The z15 T02 delivers an agile cloud platform that makes it easy for administrators, developers, and architects to deliver and deploy cloud-native container-based applications, with no special skills required. IBM's new Cloud Paks, along with Red Hat® OpenShift®, will assist you in modernization and automation to develop, deploy, and manage cloud-native applications. Running Linux on IBM Z in an Integrated Facility for Linux (IFL) can be cost effective. It supports Kubernetes and container technologies to enhance applications that deliver microservices to their hybrid cloud environments.
- Tailored Fit Pricing for IBM Z servers gives you price stability, particularly in an unpredictable hybrid cloud environment. A transformational pricing option, it provides simple, transparent, and predictable pricing for IBM Z software running on the IBM z/OS platform within a given country.

Encryption everywhere

Pervasive encryption easily encrypts all data associated with an application, database, or cloud service -- whether on premises or in the cloud, at rest or in flight. IBM Z has taken the next step of the journey on the IBM z15 by extending this data protection throughout the enterprise. The goal is protection of data beyond the platform and into distributed and hybrid-cloud environments. IBM z15 is designed to enable data protection that can span hybrid and multiparty computing environments.

- IBM Data Privacy Passports, in conjunction with IBM z15 T02, and available via an IBM z15 only PID, is designed to enforce security and privacy protections to eligible data not only on Z, but across platforms. It is designed to provide a data-centric security solution that enables data protection that can span hybrid and multiparty computing environments. For more information about IBM Data Privacy Passports V1.0, see Software Announcement AP20-0058, dated March 10, 2020.

  Note: Data Privacy Passports supports data sources that can be accessed through a JDBC connection.

- IBM Data Privacy for Diagnostics provides clients with the capability to protect sensitive data that may be included in diagnostic dumps. Now sensitive data can be tagged such that it can be identified in dumps with no impact to dump capture times. Tagged sensitive data in dumps can be redacted before sending to third-party vendors.
- There is a new Crypto Express7S adapter introduced on the IBM z15 whose design and format have been driven by the adoption of blockchain and other highly secure applications.

Cyber resiliency

IBM Z is designed to protect against the impact of cyber-attacks by ensuring isolation of workloads at scale, by protecting against insider and external attacks and ensuring continuous service by mitigating impacts of downtime.

Secure Execution for Linux on Z is a new capability introduced with the z15 T02, available for all models of the z15 generation. Engineered to help protect against insider and outsider threats in multitenanted cloud environments, it ensures users, and even system administrators, are unable to access sensitive data in Linux-based virtual environments. Secure Execution for Linux protects the confidentiality and integrity of data at enterprise scale, by isolating data at the virtual machine level, and ensuring that only the people within the organization that have a need-to-know have access to data in the clear.

IBM Z is a market leader for uptime and resilience. The new z15 Model T02 takes resilience to a whole new level by letting you unlock the power of IBM Z to help you adapt to planned or unplanned events while keeping services and operations running smoothly and continuously.

- IBM System Recovery Boost expedites everything you need to get back ready for workload execution, including planned operating system shutdown processing, operating system initial program load (IPL), middleware and workload restart and recovery, and uniquely the client workload execution that follows, helping you catch up for lost time. It will let businesses return their systems to doing normal work faster for scenarios such as planned software maintenance and patching, restoration of services after unplanned outages, and planned or unplanned disaster recovery site switch activities.
- Enhancements in GDPS(R) combined with System Recovery Boost also expedite and streamline the execution of GDPS recovery scripts, which perform reconfiguration actions during various planned and unplanned operational scenarios. The combination of these capabilities facilitates easier testing and business continuity activities.

Flexible compute

Clients want to consume technology when and how they need it. They want the agility and flexibility it provides in order to expedite their time to market. IBM

Z is available to businesses of all sizes, from start-ups to the largest enterprise. IBM Z provides a flexible approach to deploying compute resources, with the ability to make resources available on demand, to be repurposed to meet specific requirements, and through on chip acceleration for defined workloads such as cryptography, and now compression. Flexible consumption models are available with public, private, and hybrid cloud models as well as flexible packaging designed for cloud data centers, air cooling, purpose built for cloud and new lower entry points.

- The z15 is designed with integrated accelerators to offload general processors and reduce system overhead CPU cycles for application workload processing. The IBM Integrated Accelerator for z Enterprise Data Compression is provided on each processor chip and uses industry-standard compression formats for file compression that can enable reduction in the size of data which can save storage space and increase data transfer rates.
- The z15 T02 design incorporates two Central Processor Complex (CPC) drawers for the Max65. The second drawer enhances availability by allowing concurrent drawer repair, a feature previously not available on single-frame servers. This allows a single CPC drawer in a multidrawer server, if there is sufficient memory installed, to be removed, serviced, and reinstalled without bringing the system down.
- Up to 8 TB of Redundant Array of Independent Memory (RAIM) are orderable per CPC drawer and up to 16 TB total per z15 T02, dependent on the configuration.
- Ready for the cloud data center, the IBM z15 is housed in a 19-inch frame that makes it ready for colocation and standardized facilities management.

Overview

IBM z15 Model T02 delivers the cloud you want with the privacy and security you need.

IBM Z servers are designed to help enable cloud-native development and deployment, achieve encryption everywhere, and provide cyber resiliency to protect against the impact of cyber-attacks by ensuring isolation of workloads at scale, by protecting against insider and external threats, and ensuring continuous service by mitigating the impacts of downtime. All of these together can help to provide the cloud you want with the privacy and security you need. The IBM z15 (z15) Model T02 is the newest entry model into the IBM Z family of servers. It delivers an air cooled single-frame efficient design with a lower cost of entry that can easily coexist with other platforms in a cloud data center. The z15 can help protect data and help simplify compliance efforts.

IBM z15 offers privacy and resiliency for mission-critical workloads in a hybrid cloud.

Key requirements

Refer to the Hardware requirements and Softwarerequirements sections of this announcement.

Planned availability date

May 15, 2020

New-build systems:

- IBM z15 Model T02
- Features and functions for the IBM z15 Model T02

Upgrades from ZR1:

- 3907 Model ZR1 upgrades to IBM z15 Model T02

MES orders for IBM z15 Model T02 that include the following features:

- Field-installed features and conversions on IBM z15 Model T02 that are delivered solely through a modification to the machine's Licensed Internal Code (LIC)
- HMC Table Top KMM (#0148) on IBM z15 Model T02
- HMC Rack Mount KMM (#0154) on IBM z15 Model T02
- Customer Supplied HMC KMM (#0188) on IBM z15 Model T02
- HMC Tower (#0062) on IBM z15 Model T02
- HMC Rack Mount (#0063) on IBM z15 Model T02
- TKE Rack Mount (#0087) on IBM z15 Model T02
- TKE (#0088) on IBM z15 Model T02
- TKE 9.2 LIC (#0881) on IBM z15 Model T02
- TKE Rack Mount KMM (#0156) on IBM z15 Model T02
- TKE Table Top KMM (#0157) on IBM z15 Model T02
- Customer Supplied TKE KMM (#0190) on IBM z15 Model T02
- Smart Card Reader (#0891) on IBM z15 Model T02
- Additional Smart Cards (#0900) on IBM z15 Model T02

September 17, 2020

- All remaining MES orders for IBM z15 Model T02

Description

The newest member of the IBM Z family, the IBM z15 Model T02, uses a 19-inch form factor and industry-standardized power and networking hardware. The system is configurable as a single-frame 19-inch frame system, which easily aligns with the modern cloud data center.

Today's announcement extends IBM Z leadership with IBM z15 T02, offering:

Core system:

- 65 client configurable cores, an increase of 35 over the z14 ZR1, with single processor capacity of z15 T02 for equal n-way at common client configurations, approximately 14% greater than on z14 ZR1 with some variation based on workload and configuration.
- 15% z/OS and 120% Linux maximum system capacity growth over z14 ZR1 for exceptional scale in a single footprint.
- More on-chip cache per core, compared to z14 ZR1, to help minimize memory wait times for data serving applications.
- Up to 16 terabytes (TB) of available Redundant Array of Independent Memory (RAIM) real memory per server to help simplify capacity planning, enlarge in-memory buffer pools, cache sysplex shared data and controls in Coupling Facilities, and ease deploying memory-intensive workloads.
- IBM Integrated Accelerator for z Enterprise Data Compression, designed to reduce the cost of storing, transporting, and processing data without changing applications. It replaces the zEDC Express(R) card on z14 ZR1 and older generations of IBM servers, and interoperates compatibly with the zEDC compression used on previous IBM Z platforms and with industry-standard compression used on other platforms. Improved compression ratio (using Huffman coding) and order-preserving compression result in fewer CPU cycles to enable further compression of data, improving memory, transfer, and disk efficiency.

- More than 30 new instructions codesigned and exploited by Java, new vector enhancements to improve analytics applications, and new instructions for sort acceleration.

Security and cryptography:

- A design for data protection and privacy allowing you to encrypt many new data sets transparently, which can help you to provide an envelope of protection around data placed on IBM Z. This includes cryptographic performance improvements with the Crypto Express7S adapter (#0898 or #0899) and the IBM Z processor-based cryptography with the CP Assist for Cryptographic Function (CPACF) that helps enable the protection of data in flight or at rest. This includes capacity for up to 40 HSMs.
- Hardware accelerated encryption on every core with the CPACF feature.
- Processor improvements that include Message-Security-Assist extension 9, providing support for elliptic curve cryptography authentication of messages, the generation of elliptic curve keys, and scalar multiplication. This is accomplished through a new instruction (Compute Digital Signature Authentication (KDSA)) which supports the ECDSA and EdDSA algorithms using curves P-256, P-384, P-521, Ed25519, and Ed448 and is in compliance with the Digital Signature Standard (DSS), National Institute of Standards and Technology (NIST) July 2013.
- IBM Data Privacy Passports, which is designed to protect eligible data not only on IBM Z, but across multicloud environments without application changes. For more information about IBM Data Privacy Passports V1.0, see Software Announcement AP20-0058, dated March 10, 2020.

  Note: Data Privacy Passports supports data sources that can be accessed through a JDBC connection.

Network and I/O:

- OSA-Express6S GbE, 10GbE, and 1000BASE-T, and OSA-Express7S 25GbE SR.
- FICON(R) Express16S+ (#0427, 0428) to help absorb large application and transaction spikes driven by large unpredictable analytic and mobile workloads.
- An increase in the maximum number of coupling CHPIDs per CPC from 256 with z14 ZR1 to 384 with z15 T02, which provides for improved virtualization of physical ICA SR and CE LR coupling links.
- An increase in the maximum number of physical ICA SR coupling links per CPC from 16 on z14 ZR1 to 48 on z15 T02, and per drawer from 8 on z14 ZR1 to 24 on z15 T02.
- An increase in the maximum number of physical CE LR coupling links per CPC from 32 on z14 ZR1 to 64 on z15 T02.
- These increases in the amount of ICA and CE LR connectivity make the z15 T02 a great machine for coupling, even in large sysplexes, and especially for use as a stand-alone Coupling Facility.
- An increase in the maximum number of internal coupling CHPIDs per CPC from 32 on z14 ZR1 to 64 on z15 T02.
- A new level of Coupling Facility support, CFLEVEL 24, which provides optimized latch management, improved message path resiliency, and a change to the defaults for dynamic dispatching. For details see the "Parallel Sysplex(R) enhancements" section.
- IBM zHyperLink Express1.1 (#0451), which uses a direct connect short distance link (zHyperLink) to deliver low latency connectivity between z15 T02 and FICON storage systems. Working in conjunction with your existing FICON SAN infrastructure, zHyperLink Express1.1 delivers the next generation of I/O for IBM Z storage.

Systems management and infrastructure:

- IBM Hardware Management Console (HMC) 2.15.0 with simplification updates to improve workspace and manage system time.

- IBM Z Hardware Management Appliance (#0100), which can be used to create isolated partitions for protecting data and applications from cybercriminals.
- Trusted Key Entry (TKE) 9.2 License Internal Code (LIC) (#0881).
- Flexible configuration, with a 19-inch frame taking up only two floor tiles of space.
- System Recovery Boost, which enables restoration of service from, and workload catch up after, both planned and unplanned outages faster than on any prior Z machine and with no additional IBM software costs, along with faster GDPS-orchestrated reconfiguration actions such as those involved in a planned or unplanned DR site switch.
- Non-raised-floor option, offering flexible possibilities for the data center.
- Optional top exit power and I/O cabling designed to provide increased flexibility.
- ASHRAE class A3 for robustness, data center flexibility, and energy savings.
- Upgradability to IBM z15 T02 from IBM z14(R) ZR1 and upgradability within the IBM z15 T02 family.
- IBM Dynamic Partition Manager enhancements that provide a simplified, consumable, enhanced IBM Z experience, reducing the barriers of adoption for new and existing Linux on IBM Z and z/VM(R) clients.

The performance advantage

IBM's Large Systems Performance Reference (LSPR) method is designed to provide comprehensive z/Architecture(R) processor capacity ratios for different configurations of central processors (CPs) across a wide variety of system control programs and workload environments. For IBM z15 T02, the z/Architecture processor capacity indicator is defined with AXX-ZXX, where XX is the number of installed CPs.

In addition to the general information provided for z/OS, the LSPR also contains performance relationships for z/VM and Linux operating environments.

The capacity per processor engine of an IBM z15 T02 (8562) processor is expected to provide approximately a 14% increase over that of a z14 ZR1 (3907), with some variation, based on workload and configuration. The largest IBM z15 T02 is expected to provide approximately 15% more z/OS capacity and 120% more Linux on IBM Z capacity than the largest z14 ZR1. The IFL and zIIP processors on the IBM z15 T02 also provide an optional IBM z15 T02 multithreading technology capability; with the multithreading function enabled, the performance capacity of an IFL or zIIP is expected to typically be up to 25% higher than without the multithreading function enabled.

The LSPR contains the Internal Throughput Rate Ratios (ITRRs) for IBM z15 T02 and the previous-generation IBM Z processor families based upon measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user may experience will vary depending upon considerations such as the level of multiprogramming in the user's job stream, the I/O configuration, the workload processed, and the LPAR configuration. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance estimates stated.

For more detailed performance information, consult the Large Systems Performance Reference (LSPR) available at the Resource Link(R) website.

Next-generation availability

z15 T02 features:

- Processor and memory PU refresh, RAIM memory, and cache symbol ECC are designed to provide a robust computing platform.
- PU sparing, array macro sparing, micro-array masking integrated sparing, and expanded optics as a FRU are used to reduce repair actions.
- The wide use of redundancy in the power and service network continues with the z15 T02 family. A "power redundancy test" is provided so that clients can verify the server is power redundant before servicing their power feeds.

IBM Integrated Accelerator for z Enterprise Data Compression provides industry-standard DEFLATE compression and decompression acceleration at greater throughput than any software-based implementation. A processor chip based accelerator replaces the zEDC Express I/O card supported in previous IBM Z systems, delivering higher bandwidth without increasing CPU cost. Moving this functionality onto the IBM z15 T02 processor chip allows for improved integration, better performance, and lower latency than other solutions available on the market.

Compression using the IBM Integrated Accelerator for zEnterprise(R) Data Compression allows the ability to reduce the amount of data to be processed, stored, and transferred. Doing so can help reduce storage cost and increase effective network bandwidth.

Implemented as an architected instruction, the IBM Integrated Accelerator for z Enterprise Data Compression enables simplified exploitation compared to the previous design point. It can be utilized by an increased number of partitions and guests, without the need for dedicated hypervisor or operating system support. The high throughput and increased number of supported guests is designed to improve any capacity planning requirements for compression acceleration in the z15 T02 server.

As an integrated part of the z15 T02 processor chip, using the IBM Integrated Accelerator for z Enterprise Data Compression does not require the purchase of a hardware feature or usage of I/O slots.

IBM Integrated Accelerator for z Enterprise Data Compression is designed to ensure full interoperability and compatibility with DEFLATE-compliant data created and processed within and outside the IBM Z ecosystem. Support for this new accelerator is integrated into z/OS, maintaining existing APIs without requiring any updates or adaptations on an application level. The new design point allows for synchronous execution of compression for very low latency and high throughput by utilizing the zlib API support delivered with z/OS or the new instruction itself. In addition, IBM Integrated Accelerator for z Enterprise Data Compression continues to support an asynchronous execution mode for authorized users under z/OS as an optimization for large data sets. No software feature is required to use the hardware-accelerated zlib implementation under z/OS or the instruction itself. As a result, the IBM z15 T02 server allows acceleration of compression for a number of applications (for example, Java-based applications or IBM Sterling™ Connect:Direct(R) V5.2, to name a few) instantly, out of the box.

Compression of data provides great potential for you in terms of cost saving and elapsed time reduction. The IBM Integrated Accelerator for z Enterprise Data Compression in z15 T02 makes compression in z15 T02 available and accessible.

Enterprise data protection: IBM z15 T02 extends the z14 ZR1 pervasive encryption story throughout the enterprise to protect eligible data not only on IBM Z, but across multicloud environments. You can control access to eligible data shared with business partners and your ecosystem. This includes crypto enhancements, IBM Data Privacy Passports (requires additional software), and IBM Z Data Privacy for Diagnostics. For more information about IBM Data Privacy Passports, see Software Announcement AP20-0058, dated March 10, 2020.

Note: Data Privacy Passports supports data sources that can be accessed through a JDBC connection.

Cloud transformation: IBM z15 T02 enables your cloud transformation with industry-standard, do-it-yourself, IBM Z-backed cloud services including open containers, IBM cloud deployment, and ECC improvements for blockchain.

Common Criteria Evaluation Assurance Level 5+ (EAL 5+) certification

The IBM z15 T02 is designed for Common Criteria Evaluation Assurance Level 5+ (EAL5+) certification for security of logical partitions. This means that the IBM z15 T02 is designed to prevent an application running on one operating system image on

one LPAR from accessing application data running on a different operating system image on another LPAR on the server.

Common Cryptographic Architecture (CCA) enhancements

Enhancements with the z15 T02 continue to deliver critical cryptographic capabilities that address the ever-changing security requirements across the globe around key management and distribution, data management and compliance, and protecting enterprise data. The Crypto Express7S is designed to meet the Federal Information Processing Standard (FIPS) 140-2 at Level 4 for cryptographic modules. IBM's Common Cryptographic Architecture Release 7.0 (CCA 7.0) is designed to be certified to meet the HSM requirements from the Payment Card Industry Security Standards Council (PCI-SSC). Its unique design eases migration of applications and keys and expands to add new cryptographic algorithm support. CCA 6.3 also meets the PCI HSM requirements. CCA 7.0 includes the enhancements from the limited availability release CCA 6.3. The release adds an additional key distribution method by including callable services in support of ASC X9 Technical Report 34. TR-34 outlines an interoperable protocol for secure distribution of symmetric keys using asymmetric techniques. This protocol can be used to distribute symmetric keys from host systems to key receiving devices such as ATMs or POS terminals. Using the protocol is expected to allow clients to eliminate costs associated with manual key loading by two separate employees who must physically load keys into the ATM or other key-receiving device. This feature facilitates a secure and cost-effective method for remote-managed rotation of encryption keys.

The release enhancements include complete native support for X.509 certificates for RSA or ECC public keys. All CCA services that accept public keys have been enhanced to accept an X.509 certificate. The X.509 certificate is validated and may be optionally authenticated against the Public Key Infrastructure (PKI) managed internally to the CEX6S / CEX7S. The trust anchors that underpin the PKI are loaded using security from a Trusted Key Entry (TKE) workstation to help enable a secured management path. This expansion of X.509 certificate support includes the new X9 TR-34 services mentioned above.

The release has also been enhanced to create PCI-HSM compliant-tagged RSA and AES key tokens. A compliant-tagged key token is managed by CCA firmware according to the requirements of PCI-HSM compliance mode. A coprocessor in compliance mode must be available to use compliant-tagged key tokens. Also, compliance-based methods to check master keys have been added to CCA. The Key Test2 callable service can now be used to verify the value of a master key as defined in ANS X9.24 Part 1, using either the NIST SP 800-38B block cipher-based MAC algorithm, called CMAC, or the encrypt zeros method. This will prove useful during compliance audits.

In addition, features that support the use of the AES algorithm in banking applications have been enhanced. This includes a new method for formatting the PAN data for authenticated PAN change requests based on the ISO 9564-1 standard. The new method includes an AES-based key management feature that enforces special usage for authentication keys for translation of PINs in ISO-4 PIN blocks. This increases the protection over this sensitive operation by adding an additional measure of control.

Available with the CCA 7.1 release, the Crypto Express7S HSM on z15 supports a lattice-based cryptography algorithm for generating and verifying digital signatures. This method can be used in conjunction with existing RSA and Elliptic Curve digital signature methods to support dual or hybrid digital signature schemes.

CCA 7.1 features Edwards Elliptic Curves Ed25519 and Ed448, which are added to secure key support for key management, digital signature creation, and verification.

Protected key support is also enhanced for Elliptic curve, allowing NIST Prime curves P-256, P-384, and P-521 as well as the added Edwards Ed25519 and Ed448 curves. Private keys for these curves may be exported to the CPACF for accelerated performance.

TR-31 key import and export is also enhanced with the addition of HMAC key support. Now CCA TR-31 import and export can process HMAC keys for exchange with partner organizations. A further TR-31 enhancement allows export of PIN(R) Encryption keys that support encryption and decryption, allowing key interchange with certain payment networks.

Finally, two new callable services are added in support of the German Banking Industry Committee *Die Deutsche Kreditwirtschaft* (DK) financial services requirements.

IBM continues to add enhancements as finance industry standards are released or updated with support for AES-based methods and protocols.

Enterprise PKCS #11 enhancements

EP11 is specifically designed for clients seeking support for open standards and enhanced security.

The EP11 library provides an interface very similar to the industry-standard PKCS #11 API. Existing applications using PKCS #11 will benefit from using EP11 as they can be migrated easily to IBM Z and by that benefit from enhanced security using secure key cryptography.

EP11 provides many interesting additions to the PKCS #11 with Login Sessions, attribute bound keys, and different operational modes.

EP11 (BSI-DSZ-CC-1094) is designed to meet the requirements of the BSI (Federal Office for Information Security in Germany) for conformance with common criteria in version 3.1 (rev. 4) with Evaluation Assurance Level (EAL) 4.

EP11 4.7 adds support for the Crypto Express7S adapter as well as support of the PKCS #11 v2.4 standard.

New functionality consists of support for SHA3, EdDSA (sign/verify with Ed25519 and Ed448), and EdDH (derive with C25519 and C448).

In addition, EP11 4.7 introduces support for EP11 key blobs (AES, TDES, and selected ECC) exportable to Central Processor Assist for Cryptographic Function (CPACF) for use in protected mode encryption, authorized with respective key attributes. With protected mode WrapKey the secure EP11 key is returned to the host caller reenciphered under the CPACF wrapping key for direct usage in a CPACF encryption instruction. The clear key value of the operational key is never available in host storage.

Furthermore, it supports a lattice-based cryptography algorithm for generating and verifying digital signatures.

Trusted Key Entry (TKE) 9.2 Licensed Internal Code (LIC): The TKE 9.2 level of LIC is designed to support the following functions:

- TKE 9.2 is required to manage the Crypto Express7S Adapter running in Common Cryptographic Architecture (CCA) or IBM Enterprise PKCS #11 (EP11) mode if you manage your modules from the TKE. Remember, TKE is required to manage modules that run in EP11 mode or CCA domains in PCI-compliant mode.
- With TKE 9.2, you can use AT-TLS connections between the TKE workstation and the host that is running the TKE host transaction program. If you configure the TCP/IP port in the host transaction program to use AT-TLS, you must select the new check box in your TKE workstation host definition to specify you are using a TLS connection.
- TKE 9.2 can be used to exploit the following enhancements available in various releases of CCA firmware levels:
  - TKE 9.2 will allow you to create AES operational key parts with the PCI-compliant tag turned on. You can use these parts when you load your AES operational keys, if the CCA level supports the tag.

  - When you display Access Control Point (ACP) tracking information, tracking interval information will be included if the CCA firmware level returns the information. You will be able to tell when tracking was turned on, if or when tracking was turned off, and the number of times tracking was turned off and back on from the last time tracking data was cleared.
  - When you display master key information, you will have new options for selecting how the verification pattern is calculated if the CCA firmware supports the ENC-0 and CMAC calculations.
- With TKE 9.2, you can now select the IBM Enterprise PKCS #11 Transport Wrapping Key Policy. This policy is used to select the EP11 transport wrapping key strength. Select this policy if you require the EP11 transport wrapping key to be a true 256-bit AES key. If the policy is selected, the transport wrapping key is derived using Diffie-Hellman Key Exchange of 521-bit Elliptic Curve (EC) public keys between the TKE and the host crypto module running IBM Enterprise PKCS #11 (EP11). You can only select this policy when:
  - All your EP11 smart cards are at the minimum part level 00RY790 (Blue smart cards).
  - All your EP11 smart cards are at the minimum applet version V0.6. (The minimum applet support first appeared in TKE 9.2.)
  - All your host IBM Enterprise PKCS #11 modules are at API version 6.02 or later.
- TKE 9.2 has new features that simplify existing management tasks:
  - You can configure your host definition so that it will automatically accept modules that are successfully authenticated. You can select the option to automatically accept modules when you create a host definition or add the option to existing host definitions through the change host function.
  - The utility that allows you to copy key parts in binary files onto smart cards will allow you to select more than one file at a time. This will simplify the process of moving from binary key part files to smart card key part management.
  - With any attempt to delete a role or authority from a Common Cryptographic Architecture (CCA) mode host crypto module from inside of a TKE domain group, the delete will be attempted on every module included in the group. Previously the operation would stop the first time the role or authority was not found on a module in the group.
  - When TKE 9.2 detects that a Linux host supports long user IDs you will be able to enter user IDs with up to 32 characters.
  - The TKE Workstation Logon Wizard includes a new step that encourages you remove excess authority from the DEFAULT role after your TKE Workstation administrator profiles have been created.
- The following are important notes about upgrading existing TKE workstations to TKE 9.2:
  - TKE workstations with feature codes 0847 and 0849 cannot be upgraded to TKE 9.2 LIC.
  - TKE workstations with feature code 0080, 0081, 0085, or 0086 can be upgraded to TKE 9.2 LIC only if the TKE workstation feature is assigned to a z14 ZR1 server or later.
  - You will have to buy a new local adapter crypto feature for the TKE if your TKE is at a pre-TKE 9.0 LIC level.

FICON Express16S+

FICON Express16S+ supports a link data rate of 16 gigabits per second (Gbps) and autonegotiation to 8 Gbps for synergy with current-generation switches, directors, and storage devices. With support for native FICON, High Performance FICON for z Systems(R) (zHPF), and Fibre Channel Protocol (FCP), the IBM z15 T02 server is designed to help you to prepare for an end-to-end 16 Gbps infrastructure to meet the lower latency and increased bandwidth demands of your applications.

The FICON Express16S+ adapter will work with your existing fiber optic cabling environment, both single-mode and multimode optical cables.

The zHPF protocol:

In laboratory measurements using FICON Express16S+ in a z15 T02 with the zHPF protocol and small data transfer I/O operations, FICON Express16S+ operating at 16 Gbps achieved a maximum of 314,000 IOs/sec.

In laboratory measurements, using FICON Express16S+ in a z15 T02 with the zHPF protocol and a mix of large sequential read and write data transfer I/O operations, FICON Express16S+ operating at 16 Gbps achieved a maximum throughput of 3200 MB/s.

This performance data was measured in a controlled environment running an I/O driver program under z/OS. The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed.

The FCP protocol:

In laboratory measurements, using FICON Express16S+ in an IBM z15 T02 with the FCP protocol for small data transfer I/O operations, FICON Express16S+ operating at 16 Gbps achieved 380,000 IOPS.

In laboratory measurements, using FICON Express16S+ in an IBM z15 T02 with the FCP protocol for large block read and write operations, FICON Express16S+ operating at 16 Gbps achieved a maximum throughput of 3200 MB/s.

The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed.

The FCP protocol is supported by z/VM, z/VSE(R), and Linux on IBM Z. See the Software requirements section.

Cleaning discipline for FICON Express16S+ fiber optic cabling: With the introduction of 16 Gbps link data rates, it is even more critical to ensure your fiber optic cabling infrastructure performs as expected. Proper fiber optic inspection, cleaning, and maintenance is required to help ensure that the "data gets through." With 16 Gbps link data rates over multimode fiber optic cabling, link loss budgets and distances are reduced. Single-mode fiber optic cabling is more "reflection sensitive." With high link data rates and single-mode fiber optic cabling there is also less margin for error. The cabling is no longer scratch-tolerant and contaminants such as dust and oil can present a problem. To keep the data flowing, proper handling of fiber trunks and jumper cables is critical as well as thorough cleaning of fiber optic connectors. Work with your data center personnel or IBM personnel to ensure you have fiber optic inspection and cleaning procedures in place.

Channel subsystem (CSS) scalability: The IBM z15 T02 server, like the IBM z14 Model ZR1 and z13s(R) servers, has support for three logical channel subsystems (LCSSs), which are required to support the 40 LPARs for z15 T02, and three subchannel sets.

OSA-Express Adapters

The OSA-Express7S 25 Gigabit Ethernet (25GbE) feature was introduced on z14 Model ZR1, and with z15 T02, additional features complete the full family of the OSA-Express6S generation of adapters. OSA-Express6S features will provide support for 1000BASE-T Ethernet for copper environments, in addition to 10 Gigabit Ethernet (10GbE) and Gigabit Ethernet (GbE) for single-mode and multimode fiber optic environments. They also retain the same form factor and port granularity -- two ports per feature for the 1000BASE-T Ethernet and Gigabit Ethernet features, and one port per feature for the 10 Gigabit Ethernet and 25 Gigabit Ethernet features.

The OSA-Express6S family of features (#0422, #0423, #0424, #0425, #0426, #0429) are exclusive to the z15 T02 and IBM LinuxONE III. They are supported by z/OS, z/VM, z/VSE, z/TPF, and Linux on IBM Z. See the Software requirements section.

IBM Virtual Flash Memory

IBM Virtual Flash Memory (VFM) is designed to help improve availability and handling of paging workload spikes when running z/OS V2.1 and higher. With this support, z/OS is designed to help improve system availability and responsiveness by using VFM across transitional workload events such as market openings, and for diagnostic data collection. z/OS is designed to help improve processor performance by supporting middleware exploitation of pageable large (1 MB) pages.

Using VFM can help availability by reducing latency from paging delays that can occur at the start of the workday or during other transitional periods. It is also designed to help eliminate delays that can occur when collecting diagnostic data during failures. VFM can also be used in Coupling Facility images to provide extended capacity and availability for workloads making use of WebSphere® MQ Shared Queues structures.

VFM can therefore help organizations meet their most demanding service level agreements and compete more effectively. VFM is designed to be easy to configure, and to provide rapid time to value.

IBM Virtual Flash Memory is the replacement for the Flash Express features (#0402, #0403) that were available on the IBM zEC12 and IBM z13s®. No application changes are required to change from IBM Flash Express to VFM.

IBM zHyperLink Express1.1

IBM zHyperLink Express1.1 is a direct connect, short distance IBM Z I/O adapter offering extremely low latency connectivity to FICON storage systems. Working in conjunction with your existing FICON SAN infrastructure, zHyperLink fosters a new I/O paradigm for IBM mainframes. zHyperLink improves application response time, cutting I/O-sensitive workload response time by up to 50% without requiring application changes. zHyperLink Express1.1 is a 2-port adapter that resides in the PCIe I/O drawer and supports direct connectivity to FICON storage systems at distances up to 150 m. It is fully compatible with zHyperLink Express on earlier machines. It is fully compatible with the zHyperlink adapters in both the current generation DS89xx and previous generation DS888x FICON storage systems.

Note: This response time estimate is based on IBM internal measurements and projections that assume 75% or more of the workload response time is associated with read DASD I/O and the storage system random read cache hit ratio is above 80%. The actual performance that any user will experience may vary.

IBM Z Hardware Management Appliance

New with IBM z15 T02, the Hardware Management Console (HMC) hardware will no longer have CD/DVD drives as part the HMC server hardware. A new optional IBM Z Hardware Management Appliance can be ordered with the z15 T02 to provide HMC/SE functions within the CPC frame, eliminating the need for separate HMCs outside of the frame. Multiple new capabilities will be available on HMC 2.15.0, including:

- Delivering RSA SecurID authentication using that new centralized server on z/OS
- New user management controls for both HMC and SE tasks, resulting in a better user experience and providing the desired user task/object protection across the HMC/SE
- A new option for audit support for remote syslog/Splunk support
- An improved dashboard status overview visible when viewing tasks on all tabs, not just when viewing the home tab

z/OS support for the IBM z15 T02

New functions in z/OS continue to enhance the role of IBM Z, with support for IBM z15 T02 and its role in helping you provide solutions for a trusted digital economy.

Capabilities designed to optimize high availability, performance, security, and operational flexibility can help organizations grow and secure their most critical transaction environments. In addition to base processor support, z/OS provides support for these IBM z15 T02 functions and features:

- Cryptography enhancements available with Crypto Express7S. With Cryptographic Support for V2R2 - V2R4 (ICSF FMID HCR77D1), ICSF will provide the following new features:
  - Support for the new Crypto Express7S adapter, configured as a CCA coprocessor, an EP11 coprocessor, or an accelerator.
  - The ability to use CP Assist for Cryptographic Function (CPACF) for certain clear-key ECC operations. ICSF can now call CPACF instructions to perform ECC key generation, key derivation, and digital signature generation and verification using a subset of the NIST curves. The CPACF on IBM z15 T02 also supports the Ed448 and Ed25519 curves.
  - A new SMF record whenever a master key is changed. Certain compliance regulations mandate the periodic rotation of encryption keys, including the master keys loaded into coprocessors. As part of the master key change process, an SMF record will now be written every time the new master key is promoted to the current master key as part of the change master key ceremony.
  - A health check that verifies a system's ability to use the NIST recommended PSS signature algorithms. It is not obvious that the ECC master key is required when generating and using RSA keys enabled for PSS signatures, so a health check will help clients understand the need for this additional master key so they can begin to exploit the recommended algorithms.
  - Support for CCA Release 5.5 and CCA Release 6.3 including:
    -- New services in support of ANSI TR-34 remote key loading.
    -- PCI HSM compliance for AES and RSA keys.
    -- Additional AES-based financial services.
    -- Note: These functions were made available on ICSF FMD HCR77D0 with PTFs for APAR OA57089.
  - With ICSF APAR OA58358, ICSF is enhanced to provide the following enhancements to the PKCS#11 support:
    -- New lattice-based cryptography algorithm for key pair generation.
    -- Protected key capabilities.
    -- A new HMAC mechanism making use of SHA-3 hashing.
    -- Support for Edwards curves (Ed25519 and Ed448).
  - With ICSF APAR OA58377, ICSF can exploit the Message-Security-Assist extension 9 function in CPACF to provide support for Elliptic Curve Cryptography operations.
  - With ICSF APAR OA58880, ICSF is updated to provide:
    -- Full support across CCA and PKCS#11 callable services for a lattice-based cryptographic algorithm for key generation and digital signature operations, both clear key and secure key.
    -- The addition of Elliptic Curve Cryptography operations to its CCA protected key functions.
    -- Enhancements to the TR-31 callable services to support using key blocks to export and import HMAC keys.
    -- The addition of Edwards curves (Ed25519 and Ed448) to its CCA key generation and digital signature operations.
- Coupling Facility Level (CFLEVEL) 24.
- Exploitation of the IBM Integrated Accelerator for z Enterprise Data Compression, which replaces the zEDC Express card on z14 ZR1 and older generations of servers. This includes both the synchronous execution through the z/OS provided

zlib library as well as the asynchronous support for authorized programs. There are no required z/OS configuration changes for existing zEDC Express users. The existing z/OS license feature is required for the asynchronous support on z15 T02.

- Exploitation of System Recovery Boost, which is designed to enable restoration of service from, and workload catch up after, both planned and unplanned outages faster than on any prior Z machine and with no additional IBM software costs, along with faster GDPS-orchestrated reconfiguration actions such as those involved in a planned or unplanned DR site switch. Results may vary by user based on individual workload, configuration, and software levels.
- Exploitation of IBM Z Data Privacy for Diagnostics, a new capability with z/OS which is designed to help tighten dump protection for data that will need to be shared with others. It allows a business to make informed decisions about sharing diagnostic data before it is sent.
- Inclusion of z/OS Container Extensions (zCX) in IBM z/OS, furthering the IBM Z work on Linux. zCX provides the ability to run Linux on z Docker containers in z/OS in addition to the existing ability to run Linux on z Docker containers natively, or with z/VM or KVM, or using LinuxONE or securely using Secure Services. For more information, see Software Announcement AP19-0326, dated July 23, 2019, IBM z/OS Version 2 Release 4.

See the Software requirements section of this announcement for the minimum z/OS requirements for IBM z15 T02 and its features.

Compiler support for IBM z15 T02: A key strength of the IBM enterprise compilers, Enterprise COBOL, Enterprise PL/I, and z/OS XL C/C++, is the continual support of the latest Z hardware architectures. The latest releases of the compilers (Enterprise COBOL for z/OS V6.3, Enterprise PL/I for z/OS V5.3, and z/OS V2R4 XL C/C++) make available a new ARCH(13) level to exploit the new hardware instructions available on the IBM z15 T02 models in z/Architecture mode. Application developers can recompile using the new ARCH(13) compiler option to instruct the compiler to generate code for applications that exploits instructions available on z15 T02. This translates into immediate support of z15 T02 and improved application performance without any source code changes.

The latest release of IBM Automatic Binary Optimizer for z/OS (ABO) makes available a new ARCH(13) level to exploit the instructions available on the IBM z15 T02 models in z/Architecture mode. Using ABO to optimize existing VS COBOL II to Enterprise COBOL V4.2 modules allows these modules to obtain improved computation performance without the need for recompilation on z15 T02 hardware.

Node.js, an open source language runtime, is available and supported on z15 T02 and on z/OS, IBM SDK for Node.js -z/OS, V8.0 supports the open source Node.js V8.0 level, which is designed to provide extra security and performance by leveraging the capabilities of IBM Z.

z/VM support for the IBM z15 T02

z/VM provides the following support for the IBM z15 (Models T01 and T02) servers:

- Guest enablement to exploit the following function on IBM z15:
  - Miscellaneous-Instruction-Extensions Facility 3
  - Vector Enhancements Facility 2
  - Vector Packed Decimal Enhancement Facility
  - Synchronous execution for on-chip data compression, deflate-conversion
  - Message-Security-Assist extension 9
  - Crypto Express7S adapter shared and dedicated guest support
  - Support is in the base of z/VM 7.2 and available for z/VM V6.4 and V7.1 with the PTFs for APARs VM66248, VM66321, VM66332, and VM66325.
- Enhancement to the TCP/IP stack and NETSTAT OSAINFO command to provide support for the OSA-Express7S 25 GbE adapter.

  - Support is in the base of z/VM 7.2 and available for z/VM V6.4 and V7.1 with the PTF for APAR PI99085.
- Installation of z/VM using a USB flash drive.
- System Recovery Boost feature of the z15 server allowing z/VM to boost general-purpose processors running at sub-capacity to full capacity for up to 60 minutes during z/VM system initialization and workload bring-up and for up to 30 minutes during workload quiesce, system shutdown, and system abend processing. z/VM System Recovery Boost support primarily benefits z/VSE and z/TPF guest environments.
  - Support is in the base of z/VM 7.2 and available for z/VM V7.1 with the PTF for APAR VM66283.

For further details, review the z/VM website and the hardware PSP bucket 8562DEVICE z/VM subset.

z/VM new function portal

The z/VM Continuous Delivery News web page will be the primary vehicle used by IBM to describe new functions that are planned for z/VM. It is the recommended way to keep track of future development and support plans for the z/VM product. IBM recommends subscribing to this page to be notified of changes. To subscribe, click the Notify Me link in the left-side navigation bar. Additional instructions are included on the VM Site File Change Notification web page.

Additional z/VM V7.1 enhancements during 2019 and 2020 include:

- Dynamic crypto: With the PTF for APAR VM66266, z/VM provides dynamic crypto support, which enables dynamic changes to the AP Cryptographic (crypto) environment on a z/VM system, allowing the addition or removal of crypto hardware to be less disruptive to the system and its guests.
- VSwitch Priority Queuing support: With PTFs for APARs VM66219, VM66223, and PH04703, z/VM exploits OSA-Express Priority Queuing when it is available on a VSwitch's uplink port; without this support, all VSwitch outbound traffic to the external network is transmitted at the same priority. When VSwitch Priority Queuing is enabled, z/VM will establish multiple OSA QDIO output queues, and transmit data to the external network at different priorities.
- Support for 80 logical processors: With the PTFs for APARs VM66265 and VM66296, z/VM supports 80 logical processors on z15, LinuxONE III, z14, LinuxONE Emperor II, and LinuxONE Rockhopper II servers, relieving the previous limitation of 64 logical processors per LPAR. This allows clients to run more workload on z/VM by increasing the number of supported logical processors, which is especially important when multithreading is enabled. From a client's perspective, this will allow defining more logical processors for running workload on each LPAR, possibly requiring fewer LPARs to support the same workload.
- EAV paging: With the PTFs for APARs VM66263 and VM66297, z/VM supports paging space located anywhere on Extended Address Volumes, allowing clients to define sufficient paging capacity for z/VM partitions with large memory sizes while reducing the burden of managing a larger number of smaller paging devices. As systems continue to grow, the need for paging space has increased. This z/VM support allows allocation and use of paging space on ECKD devices above cylinder 65520 up to the 1 TB (1,182,006 cylinder) limit.
- Fast minidisk erase: With the PTFs for APARs VM65784, VM66288, and PH14249, the CPFMTXA utility is enhanced to erase data on minidisks more quickly, and the Directory Maintenance Facility (DirMaint) is enhanced to use this new support in CPFMTXA. This can be especially beneficial when DirMaint is used to delete a user ID and its minidisks.
- RACF(R) Multi-Factor Authentication (MFA): With the PTF for APAR VM66338, Multi-Factor Authentication (MFA) support within RACF provides for the establishment of a user's identity by utilizing more than one type of authentication. This provides greater security by requiring an additional form of proof to avoid an exposure if one token (for example, a password) becomes compromised. Previously, authentication of identity during the logon process could be met only

by using a password or passphrase. MFA enables support for an external service to authenticate tokens that have been generated after a successful multi-factor authentication.

- TLS certificate verification: With the PTFs for APARs PH18435, VM66348, and VM66349, the TCP/IP TLS/SSL server has been enhanced to allow authentication of client certificates, host name validation, and extraction of fields from a certificate. Client certificate authentication support allows a server to verify a client by examining the certificate it presents to ensure it has been signed by a certificate authority that the server trusts and that it has not expired. The client authentication support that was previously added to dynamically secured Telnet connections has been expanded to the z/VM FTP and SMTP servers. Additionally, the PORT statement in the TCPIP configuration file has been updated to allow client certificate authentication for statically secured connections. Host name validation support allows a client to verify the identity of a server by passing a string containing a host name, domain name, or IP address on the handshake request. The string will be compared to fields in the server certificate. If the string is not contained within the server certificate, the client may decide to fail the handshake. In addition to the above support, new APIs extract fields from a client or server certificate.

z/VSE support for the IBM z15 T02

z/VSE V6.2 and its stand-alone utilities run entirely in z/Architecture mode.

Access to a Parallel Sysplex environment: Parallel Sysplex is a synergy between hardware and software -- a highly advanced technology for clustering designed to enable the aggregate capacity of multiple z/OS systems to be applied against common workloads. z/OS combined with z15, z15 T02, z14, z14 ZR1, z13(R), and z13s servers, Coupling Facilities, Server Time Protocol (STP), and ICA SR and CE LR coupling links allows you to harness the power of multiple systems as though they were a single logical computing system.

Coupling links provide a path to transmit and receive Coupling Facility (CF) data as well as STP timekeeping messages. The CF data may be exchanged between z/OS and the CF or between CFs.

STP - Time synchronization for Parallel Sysplex is designed to allow events occurring in different servers to be properly sequenced in time, by synchronizing the clocks of those servers. STP is designed for servers that have been configured in a Parallel Sysplex or a basic sysplex (without a Coupling Facility), as well as servers that are not in a sysplex but need time synchronization.

STP is a server-wide facility that is implemented in the Licensed Internal Code (LIC), presenting a single view of time to Processor Resource/Systems Manager (PR/SM). STP uses a message-based protocol in which timekeeping information is passed over externally defined coupling links between servers. The STP design introduced a concept called Coordinated Timing Network (CTN), a collection of servers and Coupling Facilities that are time-synchronized to a time value called Coordinated Server Time.

IBM z14 Model ZR1 introduced a new Graphical User Display for the STP network and configuration. As a result, with z15 T02, the STP configuration panels are removed from the SE. For more information, see the Hardware Management Console (HMC) HMC/SE section below, "Removal of System (Sysplex) Time task".

In order to match the new hardware and coupling changes, STP has been updated to make use of the oscillators in Drawers 1 and 2 (up to a total of 4). Pulse Per Second connections on the first two drawers can be selected from among the four oscillator cards in the first two drawers. STP may use the increased number of coupling channels that can be defined in z15 Model T02.

STP enhancements: With this announcement IBM z15 introduces a new external time source option for STP, called Precision Time Protocol (PTP), which is the subject of the IEEE 1588 standard. The use of PTP is most important for clients facing

regulatory issues, such as in the financial industry, where tight synchronization to a Universal Coordinated Time source is demanded by new regulations.

IBM Z today can achieve excellent time accuracy where NTP together with Pulse Per Second are used as a time source, but IBM Z is likely just one part of your processing environment. Pulse Per Second is not an option for much of the other equipment in your data center, and it can be complicated to have to manage multiple timing protocols. The use of a PTP time source offers you an opportunity to begin to migrate to a single timing protocol that will meet all of your needs, and help to meet the regulations.

Precision Time Protocol (PTP) does not alleviate the need to also use Pulse Per Second to meet the regulations for this particular generation of IBM Z. Pulse Per Second can be used in conjunction with PTP to achieve higher time accuracy than PTP alone. This limitation is planned to be removed with future systems, as noted in the Statement of Direction released with IBM z15 on September 12, 2019. This is a first step toward our goal of simplifying your data center time management needs.

Parallel Sysplex enhancements: The IBM z15 T02 provides a new level of Coupling Facility support, CFLEVEL 24, which provides the following Coupling Facility enhancements:

- CFCC Fair Latch Manager provides improved work management efficiency contributing to better CF processor scaling as well as improved arbitration for internal CF serialization of resources.
- A CFCC message path resiliency enhancement provides improved resiliency of message path connectivity through new transparent recovery processing for certain types of link initialization errors that can occur as z/OS images in the Parallel Sysplex are being IPLed.
- The CFCC dynamic dispatching option default is changed to make use of DYNDISP=THIN for CF images using shared processors. Support for Coupling Facility Thin Interrupts has been available since the IBM zEC12/zBC12 generation of server, and provides by far the most efficient and well-performing option for Coupling Facility images using shared processors. Clients who have explicitly specified other DYNDISP options should also consider changing to explicitly specify DYNDISP=THIN, on CFLEVEL 24 or higher, making use of the new default.

Coupling link constraint relief: IBM z15 T02 provides additional physical and logical coupling link connectivity compared to z14 ZR1. The maximum number of physical ICA SR coupling links (ports) is increased from a maximum of 16 per CPC on z14 ZR1 to 48 per CPC. The maximum number of Internal Coupling Channels (ICP) is increased from 32 on z14 ZR1 to 64, and the maximum overall number of allowed coupling channels (CHPIDs) per CPC is increased from 256 to 384. There is a increase in maximum number of CE LR coupling links from 32 to 64 (ZR1 to T02). These higher limits on z15 T02 support higher levels of connectivity and physical consolidation using ICA SR, higher levels of connectivity and physical consolidation for CE LR, as well as the concurrent use of ICA SR and CE LR links for coupling link technology.

Hardware Management Console (HMC) HMC/SE: The IBM z15 T02 Hardware Management Console and Support Element will support:

May 15th 2020 deliverables:

HMC security audit enhancement: Remote Syslog/Splunk support

- The HMC 2.15.0 release will provide a new option for audit support. Previously, the HMC users could use the Audit and Log Management task or Scheduled Operations to offload xml and html formatted logs. New HMC support will now be available to offload Security Logs, Audit Logs, Console Events, Hardware Messages, and SNMP and WebServices Automation Logs using a Remote SysLog Consolidation Server (for example, Splunk). In addition, SNMP API support was also added for offloading Audit Logs and Console Events while previously supporting Security Logs.
- **HMC dashboard/status overview**

- The HMC 2.15.0 has been enhanced to address the viewing of the Status Overview, Exceptions, Operating System Messages, and Hardware Messages indicator area in the Tabbed Workspace environment. That indicator area is now presented so that it is visible when viewing tasks on all tabs, not just when viewing the home tab. There will now be a Compact Masthead Status Bar display along with "Docked" and "Expanded" display areas.

- **HMC remote browser window sizing**
  - When using a remote browser connection into the HMC, there are now controls to persist the window size for subsequent browser connections into the HMC. Prior to HMC 2.15.0, the HMC browser connection into the HMC always launched a full-screen window, and while this could be resized, any subsequent initial HMC invocations would be a full-screen window size.

- **HMC/SE no DVD support**
  - New-build HMCs shipped with the HMC 2.15.0 level will no longer have CD/DVD drives as part of the HMC server hardware. The HMC will now provide two main options for functional and service operations: USB media or electronic. Solutions will be provided for both for:
    - -- Firmware required for the HMC or Support Element/CPC
    - -- eBoD (eBusiness on Demand) records (for example, On Off Capacity on Demand, Capacity Backup Unit (Disaster Recovery))
    - -- Operating system code (used for Load from Removable Media or Server task)
  - USB Flash Memory Drive solutions are available, but if USB Flash Memory Drive is not acceptable for a client environment, there will be electronic network options to address those client environments.
  - If the client requires a non-USB solution, that client should order feature code 0846 (No Physical Media Option). This will then provide instructions on how to electronically deliver the required content via the network using various options: zRSF (Z Remote Support Facility), IBM Resource Link, and FTP/SFTP/FTPS Server connections from the HMC. Note that for an electronic-only delivery environment, there is a requirement that there are two HMCs on every unique network subnet where a Hardware Management Console, Support Element, or Trusted Key Entry workstation is connected.
  - If USB is acceptable, generally the appropriate USB Flash Memory Drive media will be shipped with whatever feature is being delivered. There are also two feature codes available for USB Flash Memory Drive Media, which can be ordered if required:
    - -- Feature code 0843: USB Load media which can be used for IBM Z operating system code
    - -- Feature code 0848: USB Backup media which can be used for HMC or SE Critical Data Backup task

- **HMC User Management controls to include HMC and SE tasks**
  - Prior to HMC 2.15.0, there were a moderate number of client tasks that were available directly on the HMC, but were available only by using the Single Object Operations task to launch those tasks indirectly from the SE (Support Element). In addition, most clients don't create unique users for the SE environment, but only create users for the HMC. When SE-only tasks are launched via Single Object Operations, the user authority from User Management is inherited from default user roles on the SE (for example, SYSPROG, OPERATOR, and so on) rather than based on user controls for unique user roles on the HMC.
  - With HMC 2.15.0, most SE-only client tasks (for example, Channel Problem Determination, Crypto Config/Mgmt, Advanced Facilities, Perform Model Conversion (On/Off Capacity on Demand, Capacity Backup Unit, and so on)) are now available directly on the HMC without having to utilize Single Object Operations. This also includes physical channel objects (PCHIDs) being available directly on the HMC.
  - HMC 2.15.0 will also provide user management controls for both HMC and SE tasks based on HMC User Management definitions, and those HMC/SE user and object access controls can be replicated across all HMCs using the HMC Data

Replication task. These two major enhancements will result in a better user experience as well as provide the desired user task/object protection across the HMC/SE that the clients require for all their uniquely defined users.

- **HMC Integrated 3270 Console performance enhancements**
  - For security reasons it is recommended to use the HMC Integrated 3270 Console rather than HMC Operating System Messages when managing IBM Z operating system environments via an HMC console window. This is a strong consideration when managing z/OS because the Integrated 3270 Console requires HMC users to log into their RACF user IDs, but HMC Operating System Messages provides z/OS system console RACF user authority.
  - In HMC 2.15.0 further enhancements were made for the HMC Integrated 3270 Console that provide significant performance responsiveness for that task. These enhancements are present in the HMC 2.15.0 and will be effective not only when managing IBM z15 T02 CPC LPARs, but also for z14 ZR1 and z13s LPARs.
- **Removal of zBX support**
  - HMC 2.15.0 no longer supports zBX (IBM z BladeCenter Extension). The HMC 2.15.0 removed the zEnterprise Unified Resource Manager and Ensemble support, and the z15 T02 system no longer supports connections to zBX. If there is still a need for zBX support, the z14 ZR1 HMC 2.14.1 or earlier levels can be used, and the zBX can only have connections to z14 ZR1 CPCs or earlier.
- **HMC n-2 legacy system support**
  - HMC 2.15.0 supports only two previous generations of systems (z14, z13, and z13s) while also supporting IBM z15 T02. This change will improve the number and extent of new features and functions that are able to be pretested and maintained in a given release with IBM's continued high-reliability qualification procedures. This change is also in alignment with the n-2 support strategy for sysplex coupling.
  - z14 ZR1 HMC level 2.14.1 or earlier levels will continue to maintain support for n-4 systems, and can be used to support systems prior to z13s.
- **Removal of System (Sysplex) Time task**
  - The HMC 2.15.0 no longer supports the System (Sysplex) Time task on the Support Element. The System (Sysplex) Time task was replaced by the "Manage System Time" task on the Hardware Management Console 2.14.0 release as announced in Hardware Announcement AG17-0044, dated July 17, 2017. There are significant enhancements in the Manage System Time task that clients should utilize as part of their time management activities. More information on Manage System Time can be found in z14 ZR1 publications as well as in YouTube video education modules on the HMC YouTube launching page.
- **HMC/SE support for System Recovery Boost**
  - The Hardware Management Console and Support Element will provide a display indication when System Recovery Boost is active for a partition. This can be seen at the main HMC/SE Tree UI view as well as on the Image Details and Monitors Dashboard panels.
  - In addition, an Audit Log entry is logged specifying which specific type of System Recovery Boost (zIIP capacity boost or speed boost) is turned on or off. Each log entry also includes the partition number.
- **HW API efficiency enhancements as part of GDPS for System Recovery Boost**
  - The Hardware Management Console and Support Element has implemented specific code enhancements in support of improving the efficiency of the system recovery image reconfiguration activities under the direction of GDPS. These enhancements include additional memory caching in SE memory, asynchronous HMC/SE security logging, and asynchronous updates of Activation Profiles.

November 14, 2019 deliverable:

- **IBM Z Hardware Management Appliance**
  - Starting with IBM z15 T02 and IBM LinuxONE III, the IBM Z Hardware Management Appliance feature code 0100 can be ordered to provide the HMC/SE functionality to be contained within redundant physical servers inside the CPC frame. When you order the IBM Z Hardware Management Appliance feature, this will provide logically a Primary and Alternate Support Element and two peer Hardware Management Consoles on two physical servers in the CPC frame. This eliminates the need for having to manage a separate physical server or servers for one or more HMCs outside of the frame. For the User Interface experience you must use remote browsing controls from your own workstation into HMC within the IBM Z Hardware Management Appliance.
  - If you have multiple systems, you don't need to order the Hardware Management Appliance feature for all systems. The recommendation is that you consider having the IBM Z Hardware Management Appliance features on one or two CPCs, but the rest of the CPCs don't need to include Hardware Management Appliance features. (Those CPCs would have redundant Support Elements.)
  - The IBM Z Hardware Management Appliance feature is optional. Physical HMCs (both Mini Tower and rack mounted) are still available features to be used.

Alternate System Door Locking Latches

Similar to predecessor offerings, the IBM z15 T02 is provided with a key operated locking latch assembly to physically secure each system door. Based on the growing needs and requests for enhanced system physical security as well as to satisfy the evolving controlled accessibility, monitoring, and auditability associated with IT equipment, IBM recognizes that clients may wish to deploy other locking mechanisms. One solution that can provide these functions is available from SouthCo. If desired, Door Locking Security Kits may be procured directly from SouthCo. These kits are provided on a per system frame basis and may require some additional hardware (such as electrical wiring) to connect to a facilities security infrastructure. Note that the client adds this non-IBM hardware at their own risk, but installation of the kit does not require any permanent alteration to the system doors. If installation assistance is desired, contact the manufacturer or their suggested installation providers for additional information. You can also contact IBM GTS who will assist in installing the SouthCo key operating locking latch. Note, if this alteration is completed, the following restrictions apply:

1. The electronic locking latches and any additional enabling hardware (for example, junctionbox, door sensors, associated wire and cabling, and so on) shall be removed and the originally supplied door latches be reinstalled prior to returning the system to IBM as part of aTechnology Exchange or a System MES.
2. The supporting TSS team member must be notified of this system alteration and the appropriate provisions enabled to ensure any contracted accessibility to the system is provided. Should this not be done, then a delay in system serviceability may be witnessed.
3. The additional aftermarket hardware provided by SouthCo has not been included in the compliance certifications that cover the IBM z15.

Enhancements to software pricing Technology Transition Offerings:
Complementing the announcement of the IBM z15 T02 server, IBM is introducing:

- A new Technology Transition Offering (TTO) called Technology Update Pricing for the IBM z15 T02
- New and revised Transition Charges for Sysplexes or Multiplexes TTOs for actively coupled Parallel Sysplexes (z/OS), Loosely Coupled Complexes (z/TPF), and Multiplexes (z/OS and z/TPF)
- z15 T02 server eligibility for Tailored Fit Pricing for IBM Z offerings

Technology Update Pricing for the IBM z15 T02 extends the software price/performance provided by AWLC and CMLC for z15 T02 servers. The new and revised Transition Charges for Sysplexes or Multiplexes offerings provide a transition to Technology Update Pricing for the IBM z15 T02 for clients who have not yet fully migrated to z15 T02 servers. This ensures that aggregation benefits are maintained

and also phases in the benefits of Technology Update Pricing for the IBM z15 T02 pricing as clients migrate.

When a z15 T02 server is in an actively coupled Parallel Sysplex or a Loosely Coupled Complex, you may choose either aggregated Advanced Workload License Charges (AWLC) pricing or aggregated Parallel Sysplex License Charges (PSLC) pricing, subject to all applicable terms and conditions.

When a z15 T02 server is part of a Multiplex under Country Multiplex Pricing (CMP) terms, Country Multiplex License Charges (CMLC), Multiplex zNALC (MzNALC), and Flat Workload License Charges (FWLC) are the only pricing metrics available, subject to all applicable terms and conditions.

For additional information about software pricing for the z15 T02 server, see Software Announcement AP19-0389, dated September 12, 2019, Technology Transition Offerings for the IBM z15 T02 offer price-performance advantages.

When a z15 T02 server is running z/VSE, you may choose Mid-Range Workload License Charges (MWLC), subject to all applicable terms and conditions.

For more information about AWLC, CMLC, Tailored Fit Pricing for IBM Z, MzNALC, PSLC, MWLC, or the Technology Update Pricing and Transition Charges for Sysplexes or Multiplexes TTO offerings, see the IBM Z software pricing website.

Machines eligible to participate in Country Multiplex Pricing

At the time a client first implements a Multiplex, machines currently eligible to be included in the new Multiplex cannot be older than two generations prior to the most recently available server. The most recent server at any given point in time will be considered generation N, and the prior two generations as N-1 and N-2 respectively.

IBM Z hardware family generations concurrent with the general availability of the z15 T02:

Full name	Short name	Machine type	CMP machine generation
IBM z15 T02	z15 T02	8562	N
IBM z15	z15	8561	N
IBM z14	z14	3906	N-1
IBM z14 ZR1	z14 ZR1	3907	N-1
IBM z13s	z13s	2964	N-2
IBM z13(R)	z13	2965	N-2
IBM zEnterprise EC12	zEC12	2827	N-3
IBM zEnterprise BC12	zBC12	2828	N-3
IBM zEnterprise 196	z196	2817	N-4
IBM zEnterprise 114	z114	2818	N-4

Product positioning

IBM z15 T02 is built for a secure, "always on" world because clients need assurance that their data is safe, and services are always on and fulfilled instantly.

The z15 T02 is designed to provide an entry-level agile cloud infrastructure that can be the base for transforming clients' applications and infrastructure. The z15 makes it easy for administrators, developers, and architects to deliver and deploy cloud-native container-based applications, with no special skills required. IBM's new Cloud Paks, along with Red Hat OpenShift, will assist clients in modernization and automation to develop, deploy, and manage cloud-native applications. Running Linux

on IBM Z supports Kubernetes and container technologies to enhance applications that deliver microservices to their hybrid cloud environments.

Introduced on IBM z14(R), pervasive encryption easily encrypts all data associated with an application, database, or cloud service -- whether on premises or in the cloud, at rest or in flight. IBM Z has taken the next step of the journey on the IBM z15 by extending this data protection throughout the enterprise. The goal is protection of data beyond the platform and into distributed and hybrid cloud environments.

IBM Data Privacy Passports, used in conjunction with the z15, provides a data-centric security model for the protection of eligible data throughout its lifecycle. As a result, only the authorized application or user can view subsections of the data. Pervasive encryption is not mandatory, but complementary. Data Privacy Passports does not require z/OS data set encryption and z/OS data set encryption does not require Data Privacy Passports. This technology is intended to be implemented on the IBM z15 to enable protection for eligible data that can span computing environments.

Note: Data Privacy Passports supports data sources that can be accessed through a JDBC connection.

Key to a strong security position is being able to control access to data shared with business partners and ecosystems. A new capability with z/OS helps by tightening dump protection for data that will need to be shared with others. IBM Z Data Privacy for Diagnostics allows a business to make informed decisions about sharing diagnostic data before it is sent. When sending diagnostic information to vendors, there is a risk of accidentally sharing sensitive data. This often poses a problem for organizations that must comply with the GDPR laws and/or other data privacy laws. Because of this, organizations are often forced to make a choice between serviceability or compliance when it comes to requesting help in diagnosing system problems. Now sensitive data can be tagged such that it can be identified in dumps with no impact to dump capture times. Tagged sensitive data in dumps can be secured and redacted before sending to third-party vendors.

The new Secure Execution for Linux capability fortifies and protects data when running multiple workloads in the same environment. Providing service isolation and data protection from internal and external threats, Secure Execution for Linux allows clients to build a multitenant hosting solution for their hybrid multicloud.

The IBM z15 T02 is designed to help clients reduce instances of downtime, reduce the length of downtime, and mitigate the impact of downtime. IBM System Recovery Boost is a new function on IBM z15 that is available with z/OS and with z/VM(R) and z/TPF when running on general-purpose processors. It can help clients recover workloads faster than on prior Z machines. System Recovery Boost expedites system shutdown processing, system IPL (Initial Program Load), middleware/ workload restart and recovery, and the client workload execution.

IBM System Recovery Boost will let you return your system to normal work faster, not just following a disaster, but after many kinds of disruptions, both planned and unplanned. It can help businesses catch up for lost time and get back to production more quickly and can help recover lost business transactions faster than previously possible, reducing impacts to service level agreements (SLAs) for recovery in multisite environments.

The IBM z15 T02 provides the infrastructure to meet the demands of digital transformation in a hybrid cloud world. The z15 T02 is housed in a 19-inch air-cooled single-frame designed with Intelligent Power Distribution Unit (iPDU) based power along with redundant power, cooling, and line cords. These factors can help reduce power costs, reduce footprint cost, and facilitate installation in virtually any existing data center.

The z15 T02 twelve-core processor chip leverages the density and efficiency of 14 nm silicon-on-insulator technology to deliver a new 98 MIPS entry point and 156 capacity options available for a wide range of workloads. The IBM z15 T02 is available with five feature-based sizing options -- Max4, Max13, Max21, Max31,

and Max65. The new z15 T02 will have up to 65 client configurable cores serving a mixture of general processors and specialty engines such as zIIPs and IFLs.

With a Max65, you have the option for two CPC drawers to add another layer of inherent resiliency/HA, allowing air-cooled single-frame clients to take advantage of concurrent drawer repairs for the first time. The z15 T02 also has the option of single- or three-phase power to accommodate data center requirements.

There is up to 16 TB of Redundant Array of Independent Memory (RAIM) per z15 T02 to drive transaction throughput with up to 8 TB of RAIM orderable per CPC drawer. IBM Virtual Flash Memory (VFM) is now located in the RAIM and provides high levels of availability and performance. VFM can help reduce latency for critical paging that might otherwise impact the availability and performance of key workloads.

The Integrated Accelerator for zEDC replaces the IBM zEDC Express(R) adapter on earlier Z servers. The z15 T02 integrates new file compression capabilities with an on-chip compression coprocessor. The Integrated Accelerator for zEDC can help reduce data storage requirements and costs, as well as help clients manage the massive amounts of data that is being generated, updated, shared, and stored every day. It increases data transfer rates to boost throughput without adversely impacting response times. The Integrated Accelerator for zEDC interoperates compatibly with the zEDC compression used on previous platforms and with industry-standard compression used on other platforms. The processor chip provides a new hardware-accelerated approach using a new coprocessor designed to reduce elapsed and CPU times for many Db2 batch workloads. (Results may vary by client based on individual workload, configuration, and software levels.)

IBM Z has taken the next step of the secure, resilient hybrid cloud infrastructure journey with the IBM z15 T02. The z15 delivers the platform that is powerful, integrated, and agile with the operational efficiency that maximizes your bottom line.

Statement of general direction

TLS 1.0 for OSA, HMC, and SE: IBM z15 is planned to be the last IBM Z server to support the use of the Transport Layer Security protocol version 1.0 (TLS 1.0) for establishing secure connections to the Support Element (SE), Hardware Management Console (HMC), and OSA-Integrated Console Controller (channel path type OSC).

A new use of System Recovery Boost: In the future, IBM plans to introduce a new use of System Recovery Boost that will focus on a limited number of short-duration boosts. These boosts are mediated by the operating system and designed to improve system resiliency during specific focused recovery actions.

Prepaid token expiration: Beginning with IBM z15 Model T02, prepaid tokens for On/Off Capacity on Demand (On/Off CoD) will expire 5 years after the LICCC expiration date.

Reserved space for DS8910F: In the future, IBM plans to test a co-located DS8910F solution that can be utilized in the 16U Reserved space for single phase power z15 T02 model. Clients must consider leaving enough room for the reserved space and staying with the single phase power option, if they would like to consider configuring this option and co-locating their storage in the future.

Client-side chilled water cooling: IBM z15 is planned to be the last IBM Z server to offer client-side chilled water cooling. For future systems, clients would have a choice of radiator-cooled or air-cooled system. High efficiency radiator or air cooling options, especially in conjunction with Power Distribution Unit (PDU) power configurations, will be the future focus for new client installations.

Future HMC hardware: IBM z15 is planned to be the last server to offer the ability to order stand-alone Hardware Management Console (HMC) hardware. For

future systems, new HMC hardware can be ordered only in the form of the Hardware Management Appliance feature (#0100) which was introduced on IBM z15. The Hardware Management Appliance feature provides redundant HMCs and Support Elements (SEs) that reside inside the Central Processor Complex (CPC) frame, and the ability to eliminate stand-alone HMC hardware (tower or rack mounted) outside the CPC frame. Stand-alone HMC hardware (tower or rack mounted) can still be ordered and used with IBM z15.

Statements by IBM regarding its plans, directions, and intent are subject to change or withdrawal without notice at the sole discretion of IBM. Information regarding potential future products is intended to outline general product direction and should not be relied on in making a purchasing decision. The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for IBM products remain at the sole discretion of IBM.

Reference information

For more information about z/VM V7.2 Preview, see Software Announcement AP20-0085, dated April 14, 2020.

For more information about IBM z15, see Hardware Announcement AG19-0032, dated September 12, 2019.

For more information about IBM LinuxONE III, see Hardware Announcement AG19-0015, dated September 12, 2019.

For more information about IBM Wave for z/VM V1.2, see Software Announcement AP19-0392, dated September 12, 2019.

For more information about IBM Data Privacy Passports V1.0 beta program, see Software Announcement AP19-0429, dated September 12, 2019.

For more information about IBM Data Privacy Passports V1.0, see Software Announcement AP20-0058, dated March 10, 2020.

For more information about IBM z/OS Version 2 Release 4, see Software Announcement AP19-0326, dated July 23, 2019.

For more information about IBM z14 Model ZR1, see Hardware Announcement AG18-0018, dated April 10, 2018.

For more information about IBM LinuxONE Rockhopper II, see Hardware Announcement AG18-0019, dated April 10, 2018.

Product number

Description	Machine Type	Model	Feature Number
IBM z15	8562	T02	
RFID Tag			0036

CHINA ONLY			
Description	**Machine Type**	**Model**	**Feature Number**
IBM z15	8562	T02	
PRC Tokens			6803
PRC Tokens Alteration			6804
PRC 1 MSU day			6806
PRC 100 MSU days			6807

CHINA ONLY			
Description	**Machine Type**	**Model**	**Feature Number**
PRC 10000 MSU days			6808
PRC 1 IFL day			6809
PRC 100 IFL days			6810
PRC 1 ICF day			6811
PRC100 ICF days			6812
PRC 1 zIIP day			6813
PRC 100 zIIP days			6814
PRC 1 SAP day			6815
PRC 100 SAP days			6816
PRC Tokens Authorization			9904

CHINA ONLY			
Description	**Machine Type**	**Model**	**Feature Number**
MTU 1 - D			0001
MTU 100 -D			0002
MTU 1 -V			0003
MTU 100 -V			0004
GTU 1 - D			0005
GTU 100 - D			0006
GTU 1 -V			0007
GTU 100 -V			0008
GTU 1000 - D			0009
GTU 1000 - V			0010
Migration Offering Machine			0014
Blue Letter Internal			0015
HW for DPM			0016
Non RSF On/Off CoD			0032
Serv Docs Optional Print			0033
OSA-ICC 3215 Enablement			0034
HMC			0062
HMC Rack Mount			0063
TKE Rack Mount			0087
TKE			0088
OEM Generic Indicator			0093
WWPN Persistence			0099
IBM Z HW Mgmt Appliance			0100
Linux Hosting Foundation			0103
Container Hosting Foundation			0104
Secure Execution for Linux			0115
1 CPE Capacity Unit			0116
100 CPE Capacity Unit			0117
10000 CPE Capacity Unit			0118

Description	Machine Type	Model	Feature Number
1 CPE Capacity Unit-IFL			0119
100 CPE Capacity Unit-IFL			0120
1 CPE Capacity Unit-ICF			0121
100 CPE Capacity Unit-ICF			0122
1 CPE Capacity Unit-zIIP			0125
100 CPE Capacity Unit-zIIP			0126
1 CPE Capacity Unit-SAP			0127
100 CPE Capacity Unit-SAP			0128
Fanout Airflow PCIe			0137
HMC Table Top KMM			0148
HMC Rack Keybd/ Monitor/Mouse			0154
TKE Rack Keybd/ Monitor/Mouse			0156
TKE Table Top KMM			0157
PCIe+ Fanout			0175
ICA SR1.1			0176
Client Must Provide HMC KMM			0188
Client Must Provide TKE KMM			0190
2965 w/o TEIO & w/o HtR			0196
2965 w/o TEIO & w/HtR			0197
2965 w/TEIO & w/ o HtR			0198
2965 w/TEIO & w/ HtR			0199
3907 w/o Ht Reduction			0205
3907 w/Ht Reduction			0206
US English			0235
France			0236
German/Austrian			0237
LA Spanish			0238
Spain			0239
Italian			0240
French Canadian			0241
Portuguese			0242
UK English			0243
Norwegian			0244
Sweden Finland			0245
Netherlands			0246
Belgian French			0247
Denmark			0248
Swiss French/ German			0249

Description	Machine Type	Model	Feature Number
Returning MT Digit 1			0389
Returning MT Digit 2			0390
Returning MT Digit 3			0391
Returning MT Digit 4			0392
Plant of MFG Digit 1			0393
Plant of MFG Digit 2			0394
Serial Number Digit 1			0395
Serial Number Digit 2			0396
Serial Number Digit 3			0397
Serial Number Digit 4			0398
Serial Number Digit 5			0399
PCIe Interconnect(R) Gen4			0421
OSA-Express6S GbE LX			0422
OSA-Express6S GbE SX			0423
OSA-Express6S 10 GbE LR			0424
OSA-Express6S 10 GbE SR			0425
OSA-Express6S 1000BASE-T			0426
FICON(R) Express16S+ LX			0427
FICON Express16S + SX			0428
OSA-Express7S 25 GbE SR			0429
10 GbE RoCE Express2.1			0432
Coupling Express LR			0433
25 GbE RoCE Express2.1			0450
zHyperLink Express1.1			0451
Model T02			0505
200-208V 60/30A 3Ph PDU			0629
380-415V 32A, 3Ph WYE PDU			0630
Ethernet Switch			0631
IBM Virtual Flash Memory			0643
Max4			0649
Max13			0650
Max21			0651
Max31			0652

Description	Machine Type	Model	Feature Number
Max65			0653
CPC PSU			0666
32GB USB Load Media			0843
4768 Crypto Adapter			0844
No Physical Media			0846
32GB USB Backup Media			0848
TKE 9.2 LIC			0881
TKE Smart Card Reader			0891
Crypto Express7S (2 port)			0898
Crypto Express7S (1 port)			0899
TKE addl smart cards			0900
UID Label for DoD			0998
STP Enablement			1021
EMEA Special Operations			1022
VFM/Flash Converted, 1to1			1121
64 GB Memory			1500
72 GB Memory			1501
80 GB Memory			1502
88 GB Memory			1503
96 GB Memory			1504
128 GB Memory			1505
160 GB Memory			1506
192 GB Memory			1507
224 GB Memory			1508
256 GB Memory			1509
288 GB Memory			1510
320 GB Memory			1511
352 GB Memory			1512
384 GB Memory			1602
416 GB Memory			1513
448 GB Memory			1604
480 GB Memory			1514
512 GB Memory			1515
576 GB Memory			1516
640 GB Memory			1517
704 GB Memory			1518
768 GB Memory			1519
896 GB Memory			1520
1024 GB Memory			1521
1152 GB Memory			1522
1280 GB Memory			1523
1408 GB Memory			1524
1536 GB Memory			1525
1664 GB Memory			1526
1792 GB Memory			1527
1920 GB Memory			1528
2048 GB Memory			1529
2304 GB Memory			1530

Description	Machine Type	Model	Feature Number
2560 GB Memory			1531
2816 GB Memory			1532
3072 GB Memory			1533
3328 GB Memory			1534
3584 GB Memory			1535
3840 GB Memory			1536
4352 GB Memory			1537
4864 GB Memory			1538
5376 GB Memory			1539
5888 GB Memory			1540
6400 GB Memory			1541
6912 GB Memory			1542
7424 GB Memory			1543
7936 GB Memory			1544
8448 GB Memory			1545
8960 GB Memory			1546
9472 GB Memory			1547
9984 GB Memory			1548
10496 GB Memory			1549
11008 GB Memory			1550
11520 GB Memory			1551
12032 GB Memory			1552
12544 GB Memory			1553
13056 GB Memory			1554
13568 GB Memory			1555
14080 GB Memory			1556
14592 GB Memory			1557
15104 GB Memory			1558
15616 GB Memory			1559
16128 GB Memory			1560
32 GB Mem DIMM (5/feat)			1642
64 GB Mem DIMM (5/feat)			1643
128 GB Mem DIMM (5/feat)			1644
256 GB Mem DIMM (5/feat)			1645
512 GB Mem DIMM (5/feat)			1646
LICCC Ship Via Net Ind			1750
IFL			1945
ICF			1946
zIIP			1947
Unassigned IFL			1948
SAP (optional)			1949
8GB FTR Converted Mem			1979
16GB FTR Converted Mem			1980
8GB Memory Cap Incr			1981
16GB Memory Cap Incr			1982
128GB Memory Cap Incr			1983

Description	Machine Type	Model	Feature Number
64GB FTR Converted Mem			1988
CPC1 Reserve			2271
Lift Tool Kit			3100
Extension Ladder			3101
MSS Sales Flag A			3668
MSS Sales Flag B			3669
CPACF Enablement			3863
PCIe+ I/O Drawer			4021
A Frame Air			4039
CP-A			4800
CP-B			4801
CP-C			4802
CP-D			4803
CP-E			4804
CP-F			4805
CP-G			4806
CP-H			4807
CP-I			4808
CP-J			4809
CP-K			4810
CP-L			4811
CP-M			4812
CP-N			4813
CP-O			4814
CP-P			4815
CP-Q			4816
CP-R			4817
CP-S			4818
CP-T			4819
CP-U			4820
CP-V			4821
CP-W			4822
CP-X			4823
CP-Y			4824
CP-Z			4825
0-Way Processor A00			4826
1-Way Processor A01			4827
1-Way Processor B01			4828
1-Way Processor C01			4829
1-Way Processor D01			4830
1-Way Processor E01			4831
1-Way Processor F01			4832
1-Way Processor G01			4833
1-Way Processor H01			4834
1-Way Processor I01			4835
1-Way Processor J01			4836

Description	Machine Type	Model	Feature Number
1-Way Processor K01			4837
1-Way Processor L01			4838
1-Way Processor M01			4839
1-Way Processor N01			4840
1-Way Processor O01			4841
1-Way Processor P01			4842
1-Way Processor Q01			4843
1-Way Processor R01			4844
1-Way Processor S01			4845
1-Way Processor T01			4846
1-Way Processor U01			4847
1-Way Processor V01			4848
1-Way Processor W01			4849
1-Way Processor X01			4850
1-Way Processor Y01			4851
1-Way Processor Z01			4852
2-Way Processor A02			4853
2-Way Processor B02			4854
2-Way Processor C02			4855
2-Way Processor D02			4856
2-Way Processor E02			4857
2-Way Processor F02			4858
2-Way Processor G02			4859
2-Way Processor H02			4860
2-Way Processor I02			4861
2-Way Processor J02			4862
2-Way Processor K02			4863
2-Way Processor L02			4864
2-Way Processor M02			4865
2-Way Processor N02			4866
2-Way Processor O02			4867

Description	Machine Type	Model	Feature Number
2-Way Processor P02			4868
2-Way Processor Q02			4869
2-Way Processor R02			4870
2-Way Processor S02			4871
2-Way Processor T02			4872
2-Way Processor U02			4873
2-Way Processor V02			4874
2-Way Processor W02			4875
2-Way Processor X02			4876
2-Way Processor Y02			4877
2-Way Processor Z02			4878
3-Way Processor A03			4879
3-Way Processor B03			4880
3-Way Processor C03			4881
3-Way Processor D03			4882
3-Way Processor E03			4883
3-Way Processor F03			4884
3-Way Processor G03			4885
3-Way Processor H03			4886
3-Way Processor I03			4887
3-Way Processor J03			4888
3-Way Processor K03			4889
3-Way Processor L03			4890
3-Way Processor M03			4891
3-Way Processor N03			4892
3-Way Processor O03			4893
3-Way Processor P03			4894
3-Way Processor Q03			4895
3-Way Processor R03			4896
3-Way Processor S03			4897
3-Way Processor T03			4898

Description	Machine Type	Model	Feature Number
3-Way Processor U03			4899
3-Way Processor V03			4900
3-Way Processor W03			4901
3-Way Processor X03			4902
3-Way Processor Y03			4903
3-Way Processor Z03			4904
4-Way Processor A04			4905
4-Way Processor B04			4906
4-Way Processor C04			4907
4-Way Processor D04			4908
4-Way Processor E04			4909
4-Way Processor F04			4910
4-Way Processor G04			4911
4-Way Processor H04			4912
4-Way Processor I04			4913
4-Way Processor J04			4914
4-Way Processor K04			4915
4-Way Processor L04			4916
4-Way Processor M04			4917
4-Way Processor N04			4918
4-Way Processor O04			4919
4-Way Processor P04			4920
4-Way Processor Q04			4921
4-Way Processor R04			4922
4-Way Processor S04			4923
4-Way Processor T04			4924
4-Way Processor U04			4925
4-Way Processor V04			4926
4-Way Processor W04			4927
4-Way Processor X04			4928
4-Way Processor Y04			4929

Description	Machine Type	Model	Feature Number
4-Way Processor Z04			4930
5-Way Processor A05			4931
5-Way Processor B05			4932
5-Way Processor C05			4933
5-Way Processor D05			4934
5-Way Processor E05			4935
5-Way Processor F05			4936
5-Way Processor G05			4937
5-Way Processor H05			4938
5-Way Processor I05			4939
5-Way Processor J05			4940
5-Way Processor K05			4941
5-Way Processor L05			4942
5-Way Processor M05			4943
5-Way Processor N05			4944
5-Way Processor O05			4945
5-Way Processor P05			4946
5-Way Processor Q05			4947
5-Way Processor R05			4948
5-Way Processor S05			4949
5-Way Processor T05			4950
5-Way Processor U05			4951
5-Way Processor V05			4952
5-Way Processor W05			4953
5-Way Processor X05			4954
5-Way Processor Y05			4955
5-Way Processor Z05			4956
6-Way Processor A06			4957
6-Way Processor B06			4958
6-Way Processor C06			4959
6-Way Processor D06			4960

Description	Machine Type	Model	Feature Number
6-Way Processor E06			4961
6-Way Processor F06			4962
6-Way Processor G06			4963
6-Way Processor H06			4964
6-Way Processor I06			4965
6-Way Processor J06			4966
6-Way Processor K06			4967
6-Way Processor L06			4968
6-Way Processor M06			4969
6-Way Processor N06			4970
6-Way Processor O06			4971
6-Way Processor P06			4972
6-Way Processor Q06			4973
6-Way Processor R06			4974
6-Way Processor S06			4975
6-Way Processor T06			4976
6-Way Processor U06			4977
6-Way Processor V06			4978
6-Way Processor W06			4979
6-Way Processor X06			4980
6-Way Processor Y06			4981
6-Way Processor Z06			4982
A00 Capacity Marker			4983
A01 Capacity Marker			4984
B01 Capacity Marker			4985
C01 Capacity Marker			4986
D01 Capacity Marker			4987
E01 Capacity Marker			4988
F01 Capacity Marker			4989
G01 Capacity Marker			4990
H01 Capacity Marker			4991

Description	Machine Type	Model	Feature Number
I01 Capacity Marker			4992
J01 Capacity Marker			4993
K01 Capacity Marker			4994
L01 Capacity Marker			4995
M01 Capacity Marker			4996
N01 Capacity Marker			4997
O01 Capacity Marker			4998
P01 Capacity Marker			4999
Q01 Capacity Marker			5000
R01 Capacity Marker			5001
S01 Capacity Marker			5002
T01 Capacity Marker			5003
U01 Capacity Marker			5004
V01 Capacity Marker			5005
W01 Capacity Marker			5006
X01 Capacity Marker			5007
Y01 Capacity Marker			5008
Z01 Capacity Marker			5009
A02 Capacity Marker			5010
B02 Capacity Marker			5011
C02 Capacity Marker			5012
D02 Capacity Marker			5013
E02 Capacity Marker			5014
F02 Capacity Marker			5015
G02 Capacity Marker			5016
H02 Capacity Marker			5017
I02 Capacity Marker			5018
J02 Capacity Marker			5019
K02 Capacity Marker			5020
L02 Capacity Marker			5021
M02 Capacity Marker			5022

Description	Machine Type	Model	Feature Number
N02 Capacity Marker			5023
O02 Capacity Marker			5024
P02 Capacity Marker			5025
Q02 Capacity Marker			5026
R02 Capacity Marker			5027
S02 Capacity Marker			5028
T02 Capacity Marker			5029
U02 Capacity Marker			5030
V02 Capacity Marker			5031
W02 Capacity Marker			5032
X02 Capacity Marker			5033
Y02 Capacity Marker			5034
Z02 Capacity Marker			5035
A03 Capacity Marker			5036
B03 Capacity Marker			5037
C03 Capacity Marker			5038
D03 Capacity Marker			5039
E03 Capacity Marker			5040
F03 Capacity Marker			5041
G03 Capacity Marker			5042
H03 Capacity Marker			5043
I03 Capacity Marker			5044
J03 Capacity Marker			5045
K03 Capacity Marker			5046
L03 Capacity Marker			5047
M03 Capacity Marker			5048
N03 Capacity Marker			5049
O03 Capacity Marker			5050
P03 Capacity Marker			5051
Q03 Capacity Marker			5052
R03 Capacity Marker			5053

Description	Machine Type	Model	Feature Number
S03 Capacity Marker			5054
T03 Capacity Marker			5055
U03 Capacity Marker			5056
V03 Capacity Marker			5057
W03 Capacity Marker			5058
X03 Capacity Marker			5059
Y03 Capacity Marker			5060
Z03 Capacity Marker			5061
A04 Capacity Marker			5062
B04 Capacity Marker			5063
C04 Capacity Marker			5064
D04 Capacity Marker			5065
E04 Capacity Marker			5066
F04 Capacity Marker			5067
G04 Capacity Marker			5068
H04 Capacity Marker			5069
I04 Capacity Marker			5070
J04 Capacity Marker			5071
K04 Capacity Marker			5072
L04 Capacity Marker			5073
M04 Capacity Marker			5074
N04 Capacity Marker			5075
O04 Capacity Marker			5076
P04 Capacity Marker			5077
Q04 Capacity Marker			5078
R04 Capacity Marker			5079
S04 Capacity Marker			5080
T04 Capacity Marker			5081
U04 Capacity Marker			5082
V04 Capacity Marker			5083
W04 Capacity Marker			5084

Description	Machine Type	Model	Feature Number
X04 Capacity Marker			5085
Y04 Capacity Marker			5086
Z04 Capacity Marker			5087
A05 Capacity Marker			5088
B05 Capacity Marker			5089
C05 Capacity Marker			5090
D05 Capacity Marker			5091
E05 Capacity Marker			5092
F05 Capacity Marker			5093
G05 Capacity Marker			5094
H05 Capacity Marker			5095
I05 Capacity Marker			5096
J05 Capacity Marker			5097
K05 Capacity Marker			5098
L05 Capacity Marker			5099
M05 Capacity Marker			5100
N05 Capacity Marker			5101
O05 Capacity Marker			5102
P05 Capacity Marker			5103
Q05 Capacity Marker			5104
R05 Capacity Marker			5105
S05 Capacity Marker			5106
T05 Capacity Marker			5107
U05 Capacity Marker			5108
V05 Capacity Marker			5109
W05 Capacity Marker			5110
X05 Capacity Marker			5111
Y05 Capacity Marker			5112
Z05 Capacity Marker			5113
A06 Capacity Marker			5114
B06 Capacity Marker			5115

Description	Machine Type	Model	Feature Number
C06 Capacity Marker			5116
D06 Capacity Marker			5117
E06 Capacity Marker			5118
F06 Capacity Marker			5119
G06 Capacity Marker			5120
H06 Capacity Marker			5121
I06 Capacity Marker			5122
J06 Capacity Marker			5123
K06 Capacity Marker			5124
L06 Capacity Marker			5125
M06 Capacity Marker			5126
N06 Capacity Marker			5127
O06 Capacity Marker			5128
P06 Capacity Marker			5129
Q06 Capacity Marker			5130
R06 Capacity Marker			5131
S06 Capacity Marker			5132
T06 Capacity Marker			5133
U06 Capacity Marker			5134
V06 Capacity Marker			5135
W06 Capacity Marker			5136
X06 Capacity Marker			5137
Y06 Capacity Marker			5138
Z06 Capacity Marker			5139
Additional CBU Test			6805
Total CBU Years Ordered			6817
CBU Records Ordered			6818
Single CBU CP Year			6820
25 CBU CP Year			6821
Single CBU IFL Year			6822
25 CBU IFL Year			6823
Single CBU ICF Year			6824

Description	Machine Type	Model	Feature Number
25 CBU ICF Year			6825
Single CBU zIIP Year			6828
25 CBU zIIP Year			6829
Single CBU SAP Year			6830
25 CBU SAP Year			6831
CBU Replenishment			6832
Capacity for Planned Event			6833
OPO Sales Flag			6835
OPO Sales Flag - Alteration			6836
30A/208V 14ft w/ TwistLock			7892
30A/208V 14ft w/ Russelstoll			7893
32A/250V Cord EMEA & AP			7894
32A/250V Cord Aus & NZ			7895
32A/250V Cord Korea			7896
32A/250V LSZH Cord			7897
Top Exit Cabling w/Top Hat			7898
Bottom Exit Cabling			7899
Top Exit Cabling w/o TopHat			7928
30A/400V 3Ph Wye w/Hubbell			7946
32A/380-415V 3Ph Wye			7947
32A/380-415V 3Ph Wye LSZH			7948
30A/250V 3Ph w/ Hubbell			7952
30A/250V 3Ph w/ Cut End			7953
FQC Bracket & Mounting Hdw			7960
LC Duplex 6.6ft Harness			7961
Non Raised Floor Support			7998
LC Duplex 8.5ft Harness			7999
19in Earthquake Kit, RF			8010
19in Earthquake Kit, NRF			8011
Multi Order Ship Flag			9000
Multi Order Rec Only Flag NB			9001
Multi Order Rec Only Flag MES			9002
RPO Action Flag			9003

Description	Machine Type	Model	Feature Number
Downgraded PUs Per Request			9004
On Off CoD Act 100 IFL Days			9874
On Off CoD Act 100 ICF Days			9875
On Off CoD Act 100 CP Days			9876
On Off CoD Act 100 zIIP Days			9877
On Off CoD Act 100 SAP Days			9878
On Off CoD Act IFL Days			9888
On Off CoD Act ICF Days			9889
On Off COD authorization			9896
On Off CoD Act Cap CP Days			9897
Perm upgr authorization			9898
CIU Activation (Flag)			9899
On-Line CoD Buying (Flag)			9900
On Off CoD Act zIIP Days			9908
On Off CoD Act. SAP Days			9909
CBU authorization			9910
CPE authorizataion			9912
OPO Sales Authorization			9913
1 MSU day			9917
100 MSU days			9918
10000 MSU days			9919
1 IFL day			9920
100 IFL days			9921
1 ICF day			9922
100 ICF days			9923
1 zIIP day			9924
100 zIIP days			9925
1 SAP day			9928
100 SAP days			9929
Height Reduce Ship			9975
Height Reduce for Return			9976

Description	Machine Type	Model	Feaure Number
IBM z15	8561	T01	
Secure Execution for Linux			0115
LC Duplex 8.5ft Harness			7999

Description	Machine Type	Model	Feature Number
IBM z14	3906	M01	
		M02	
		M03	
		M04	

Description	Machine Type	Model	Feature Number
		M05	
32GB USB Load Media			0843
IBM z14	3907	ZR1	
32GB USB Load Media			0843
LC Duplex 8.5ft Harness			7925

Features that may carry forward on an upgrade: The following features may be retained if they are installed at the time of an upgrade to the IBM z15 Model T02

Description	Machine Type	Model	Feature Number
IBM z15	8652	T02	
HW for DPM			0016
OSA-ICC 3215 Enablement			0034
TKE Rack Mount w/4768			0080
TKE w/4768			0081
HMC Tower			0082
HMC Rack Mount			0083
TKE Rack Mount			0085
TKE			0086
TKE Rack Mount			0087
TKE			0088
HMC Tower			0095
HMC Rack Mount			0096
HMC Table Top KMM			0148
HMC Rack Keybd/ Monitor/Mouse			0154
TKE Rack Keybd/ Monitor/Mouse			0156
TKE Table Top KMM			0157
ICA SR fanout			0172
Client Must Provide TKE KeyBd			0189
FICON Express8S 10Km LX			0409
FICON Express8S SX			0410
10 GbE RoCE Express			0411
10 GbE RoCE Express2			0412
OSA-Express5S GbE LX			0413
OSA-Express5S GbE SX			0414
OSA-Express5S 10 GbE LR			0415
OSA-Express5S 10 GbE SR			0416
OSA-Express5S 1000BASE-T			0417
FICON Express16S LX			0418

Description	Machine Type	Model	Feature Number
FICON Express16S SX			0419
OSA Express6S GbE LX			0422
OSA Express6S GbE SX			0423
OSA Express6S 10 GbE LR			0424
OSA Express6S 10 GbE SR			0425
OSA Express6S 1000BASE T			0426
FICON Express16S + 10KM LX			0427
FICON Express16S + SX			0428
OSA Express7S 25 GbE SR			0429
25GbE RoCE Express2			0430
zHyperLink Express			0431
Coupling Express LR			0433
Addl smart cards			0884
TKE Smart Card Reader			0885
Crypto Express5S			0890
TKE Smart Card Reader			0891
TKE addl smart cards			0892
Crypto Express6S			0893
TKE addl smart cards			0900
STP Enablement			1021
Lift Tool Kit			3100
Extension ladder			3101
CPACF Enablement			3863
Additional CBU Test			6805
CBU Records Ordered			6818
Capacity for Planned Event			6833
30A/208V 14ft w/ TwistLock			7892
30A/208V 14ft w/ Russelstoll			7893
On Off COD authorization			9896
Perm upgr authorization			9898
On-Line CoD Buying (Flag)			9900
CBU authorization			9910
CPE authorizataion			9912

Model conversions

From Machine Type	From Model	To Machine Type	To Model	
3907	ZR1	8562	T02	(*)

(*) Parts removed as a result of a model conversion become the property of IBM.

Feature conversions

The feature conversion list for IBM z15 Model T02 is now available in the "Library" section of Resource Link(R). This list can be obtained at Resource Link .

Using the instructions on the Resource Link panels, obtain a user ID and password. Resource Link has been designed for easy access and navigation.

Publications

The following publications are available now in the "Library" section of Resource Link:

Title	Order Number
IBM 8562 Installation Manual for Physical Planning (IMPP)	GC28-7011
IBM 8562 Installation Manual for Physical Planning (IMPP) -- Russian version	GC28-7008
PR/SM Planning Guide	SB10-7175
IOCP User's Guide for ICP IOCP	SB10-7172
Planning for Fiber Optic Links (FICON(R)/ FCP, Coupling Links, OSA, and zHyperLink Express)	GA23-1408

The following publications are shipped with the product and will be available at planned availability in the "Library" section of Resource Link:

Title	Order Number
IBM 8562 Installation Manual	GC28-7009
IBM 8562 Service Guide	GC28-7010
IBM 8562 Safety Inspection	GC28-7007
Service Guide for TKE Workstations (Version 7.0)	GC28-6980
Systems Safety Notices	G229-9054
IBM Important Notices	G229-9056
IBM Z Statement of Limited Warranty	GC28-6979
License Agreement for Machine Code	SC28-6872
License Agreement for Machine Code Addendum for Cryptography	GC27-2635
Systems Environmental Notices and User Guide	Z125-5823

The following publications will be available at planned availability in the "Library" section of Resource Link:

Title	Order Number
IBM 8562 Parts Catalog	GC28-7012
Service Guide for 2461 Hardware Management Console	GC28-6990
Service Guide for 2461 Support Element	GC28-6991
SNMP Application Programming Interfaces	SB10-7171
Capacity on Demand User's Guide	SC28-6985

Title	Order Number
CHPID Mapping Tool User's Guide	GC28-6984
Hardware Management Console Web Services API (V2.15.0)	SC27-2638
IBM Dynamic Partition Manager (DPM) Guide	SB10-7176
Secure Service Container User's Guide	SC28-7005
Stand-Alone IOCP User's Guide	SB10-7173
FICON CTC Reference	SB10-7174
Maintenance Information for Fiber Optics (FICON/FCP, Coupling Links, OSA, and zHyperLink Express)	SY27-7696
Integrating the HMC's Broadband RSF into your Enterprise	SC28-6986
Hardware Management Console Security	SC28-6987
SCSI IPL -- Machine Loader Messages	SC28-7006
OSA-Express Customer's Guide and Reference	SA22-7935
OSA/SF on the Hardware Management Console	SC14-7580
OSA Integrated Console Controller User's Guide	SC27-9003

Resource Link: Publications for IBM Z can be obtained at the Resource Link website.

Using the instructions on the Resource Link panels, obtain a user ID and password. Resource Link has been designed for easy access and navigation.

HMC and SE console documentation

At planned availability, the Hardware Management Console (HMC) and Support Element (SE) console documentation (Version 2.15.0) will be available from IBM Resource Link and the consoles.

You can also find HMC videos at the IBM Z Hardware Management Console Videos website.

To access the IBM Publications Center Portal, go to the IBM Publications Center website.

The following publications are available. To order, contact your IBM representative.

Title	Order Number
IBM z15 T02 Technical Introduction	SG24-8850-01
IBM Z Functional Matrix	REDP-5157-05

To download these Redbooks(R) publications, go to the IBM Z Redbooks website.

For other IBM Redbooks publications, go to the main IBM Redbooks website.

The IBM Knowledge Center provides you with a single point of reference where you can access product documentation for IBM operating systems and server software. Through a consistent framework, you can efficiently find information and personalize your access by going to IBM Knowledge Center for all your product information needs.

To access the IBM Publications Center Portal, go to the IBM Publications Center website.

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided. A large number of publications are available online in various file formats, which can currently be downloaded.

National language support

Not applicable.

Services

IBM Systems Lab Services

IBM Systems Lab Services offers a wide array of services available for your enterprise. It brings expertise on the latest technologies from the IBM development community and can help with your most difficult technical challenges.

IBM Systems Lab Services exists to help you successfully implement emerging technologies so as to accelerate your return on investment and improve your satisfaction with your IBM systems and solutions. Services examples include initial implementation, integration, migration, and skills transfer on IBM systems solution capabilities and recommended practices. IBM Systems Lab Services is one of the service organizations of IBM's world-renowned IBM Systems Group development labs.

For details on available services, contact your IBM representative or go to the Lab Services website.

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These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an on-demand business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or go to the IBM Global Technology Services(R) website.

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or go to the Resiliency Services website.

Details on education offerings related to specific products can be found on the IBM authorized training website.

Technical information

EMC conformance

- ANSI C63.4 (2014) with FCC Method 47 CFR Part 15, Subpart B (USA)
- ICES-003 Issue 6 (2016) (Canada)
- EN55032:2012/AC:2013 and EN 55024 (CE Mark Compliance for European Union Countries)
- Korean KN32 and KN35 (Korean EMC Standards)
- VCCI V-3 EMI Regulations (Japan)
- Taiwan BSMI CNS13438 (Taiwan EMC Standard)
- AS/NZS CISPR 32:2013 (Australia and New Zealand)
- GB 9254 & GB 17625.1 if applicable (People's Republic of China EMC Standards)
- SASO ICCP Document No. EMC.CVG (Saudi Arabia)
- GOST 30805.22, GOST CISPR 24, GOST R 51317.3.X Series (Eurasian Economic Union EMC Standards)

Physical specifications

Thephysical specificationsfor IBM z15 Model T02 are now available in the "Library" section of Resource Link in the *Installation Manual for Physical Planning* (IMPP).

This information can be obtained at Resource Link.

Using the instructions on the Resource Link panels, obtain a user ID and password.

Resource Link has been designed for easy access and navigation.

Operating environment

Theoperating environment informationfor IBM z15 Model T02 is now available in the "Library" section of Resource Link in the *Installation Manual for Physical Planning* (IMPP).

This information can be obtained at Resource Link.

Using the instructions on the Resource Link panels, obtain a user ID and password.

Resource Link has been designed for easy access and navigation.

Hardware requirements

The hardware requirements for the IBM Z servers, features, and functions are identified. A new driver level is required.

HMC (V2.15.0) plus MCLs and the Support Element (V2.15.0) became available on September 23, 2019. You should review the PSP buckets for minimum Machine Change Levels (MCLs) and software PTF levels before IPLing operating systems.

The new functions available on the Hardware Management Console (HMC) version 2.15.0, as described, apply exclusively to IBM z15. However, the HMC version 2.15.0 will also support the systems listed in the table below.

Machine Family	Machine Type	Firmware Driver	SE Version
z14	3906	36	2.14.1
z14	3906	32	2.14.0
z14 ZR1	3907	36	2.14.1
z14 ZR1	3907	32	2.14.0
z13(R)	2964	27	2.13.1
z13s(R)	2965	27	2.13.1

Software requirements

IBM z15 requires at a minimum:

- z/OS V2.4 with PTFs.*
- z/OS V2.3 with PTFs.*
- z/OS V2.2 with PTFs.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM 7.2.
- z/VM V7.1 with PTFs.
- z/VM V6.4 with PTFs.
- z/VSE(R) V6.2 with PTFs.
- z/TPF V1.1 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:

- SUSE Linux Enterprise Server (SLES) 15 SP1 with service, SLES 12 SP4 with service.
- Red Hat Enterprise Linux (RHEL) 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
- Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.
- The support statements for IBM z15 also cover the KVM hypervisor on distribution levels that have KVM support.

For minimum required and recommended distribution levels refer to the IBM Z website.

* IBM z/OS V2.3 or higher with IBM z15 will require a minimum of 8 GB of memory. When running as a z/VM guest or on an IBM System z(R) Personal Development Tool, a minimum of 2 GB will be required for z/OS V2.3. If the minimum is not met, a warning WTOR will be issued at IPL. Continuing with less than the minimum memory could impact availability. A migration health check was introduced for z/OS V2.2 and z/OS V2.1 with PTFs to warn you when an LPAR on an IBM z15 system has been configured with less than 8 GB.

The following software requirements are listed for features and capabilities supported on IBM z15:

FICON Express16S+ (CHPID type FC) when utilizing FICON or Channel-To-Channel (CTC) requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2.
- z/VM V7.1.
- z/VM V6.4.
- z/VSE V6.2 with PTFs.
- z/TPF V1.1 with PTFs
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

FICON Express16S+ (CHPID type FC) for support of zHPF single track operations requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2.
- z/VM V7.1.
- z/VM V6.4.
- z/VSE V6.2 with PTFs.
- z/TPF V1.1 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:

  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

FICON Express16S+ (CHPID type FC) for support of zHPF multitrack operations requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2.
- z/VM V7.1.
- z/VM V6.4.
- z/VSE V6.2 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

FICON Express16S+ (CHPID type FCP) for support of SCSI devices requires at a minimum:

- z/VM V7.2.
- z/VM V7.1.
- z/VM V6.4.
- z/VSE V6.2 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

FICON Express16S+ (CHPID type FCP) support of hardware data router requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

T10-DIF support by the FICON Express16S features when defined as CHPID type FCP requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.

- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

OSA-Express7S 25 GbE SR (#0429) requires at a minimum:

CHPID type OSD:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 with PTFs (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2.
- z/VM V7.1 with PTFs.
- z/VM V6.4 with PTFs.
- z/VSE V6.2 with PTFs.
- z/TPF V1.1 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

Checksum offload for IPv6 packets (CHPID type OSD):

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

Checksum offload for LPAR-to-LPAR traffic for IPv4 and IPv6 packets (CHPID type OSD):

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.

- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

Large Send for IPv6 packets (CHPID type OSD):

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

CHPID type OSE supporting 4 or 2 ports per feature:

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 for guest exploitation.
- z/VM V6.4 for guest exploitation.
- z/VSE V6.2 with PTFs.

Crypto Express7S (2 port) (#0898) Toleration, which treats Crypto Express7S cryptographic coprocessors and accelerators as Crypto Express6 coprocessors and accelerators, requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- z/VSE V6.2 with PTFs.
- z/TPF V1.1. with PTFs, accelerator mode only.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

Crypto Express7S (1 port) (#0899) Toleration requires at a minimum:

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.

- z/OS V2.1 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- z/VSE V6.2 with PTFs.
- z/TPF V1.1 with PTFs, accelerator mode only.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

Crypto Express7S (1 port) (#0899) support of VISA Format Preserving Encryption requires at a minimum:

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2 with the Enhanced Cryptographic Support for z/OS V2.2 (HCR77B0) web deliverable installed.
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

Crypto Express7S (1 port) (#0899) exploitation requires at a minimum:

- z/OS V2.4 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/OS V2.3 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/OS V2.2 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/VM V7.2 for guest exploitation and exploitation within the z/VM TLS/SSL server.
- z/VM V7.1 with PTFs for guest exploitation and exploitation within the z/VM TLS/SSL server.
- z/VM V6.4 with PTFs for guest exploitation and exploitation within the z/VM TLS/SSL server.
- z/TPF V1.1 with PTFs accelerator mode only.
- Linux on IBM Z-IBM is working with its Linux distribution partners to provide support in future distribution releases.

Crypto Express7S (1 port) (#0899) support of PCI-HSM compliance requires at a minimum:

- z/OS V2.4 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/OS V2.3 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/OS V2.2 with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

10 GbE RoCE Express2.1 (#0432) for Shared Memory Communications - Remote Direct Memory Access (SMC-R) requires at a minimum:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/VM V7.2 for guest exploitation.

- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.5 LTS with service.

10 GbE RoCE Express2.1 (#0432) for Ethernet communications (which does not require a peer OSA) including Single Root I/O Virtualization (SR-IOV) requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

10 GbE RoCE Express2.1 (#0432) for TCP/IP requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service and SLES 12 SP4 with service.
  - RHEL 8.0 with service and RHEL 7.7 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

25 GbE RoCE Express2.1 (#0450) for Shared Memory Communications - Remote Direct Memory Access (SMC-R) requires at a minimum:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

25 GbE RoCE Express2.1 (#0450) for Ethernet communications (which does not require a peer OSA) including Single Root I/O Virtualization (SR-IOV) requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service.
  - RHEL 8.0 with service.
  - Ubuntu 18.04.1 LTS with service.

25 GbE RoCE Express2.1 (#0450) for TCP/IP requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service and SLES 12 SP4 with service.
  - RHEL 8.0 with service and RHEL 7.7 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

IBM Integrated Coupling Adapter Fanout (ICA SR1.1) (#0176) requires at a minimum:

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 with PTFs (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/OS V1.13 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2 to define, modify, and delete CHPID type CS5 when z/VM is the controlling LPAR for dynamic I/O.
- z/VM V7.1 to define, modify, and delete CHPID type CS5 when z/VM is the controlling LPAR for dynamic I/O.
- z/VM V6.4 to define, modify, and delete CHPID type CS5 when z/VM is the controlling LPAR for dynamic I/O.

Support for 384 Coupling CHPIDs, 48 physical ICA SR coupling links, and 64 ICP internal coupling channels requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 with PTFs (extended service contract only).

Support for CFLEVEL 24 Coupling Facility enhancements requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 with PTFs (extended service contract only).

Coupling Express LR (#0433) requires at a minimum:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 with PTFs (extended service contract only).

- z/OS V1.13 (compatibility only, extended support contract for IBM Software Support Services for z/OS required with PTFs).
- z/VM V7.2 to define, modify, and delete CHPID type CS5 when z/VM is the controlling LPAR for dynamic I/O.
- z/VM V7.1 with PTFs to define, modify, and delete CL5 CHPID types when z/VM is the controlling LPAR for dynamic I/O.
- z/VM V6.4 with PTFs to define, modify, and delete CL5 CHPID types when z/VM is the controlling LPAR for dynamic I/O.

zHyperLink Express1.1 (#0451) Reads support requires at a minimum:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/OS V2.1 with PTFs (extended service contract only).

zHyperLink Express1.1 (#0451) Writes support requires at a minimum:

- z/OS V2.4.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.

IBM Virtual Flash Memory (VFM) (#0604) requires at a minimum:

- z/OS V2.4.
- z/OS V2.3.
- z/OS V2.2.
- z/OS V2.1 (extended service contract only).

XL C/C++ support of ARCH(13) and TUNE(13) parameters requires at a minimum:

- z/OS V2.4 with PTFs.

CPU Measurement Facility requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/VM V7.2.
- z/VM V7.1 with PTFs.
- z/VM V6.4 with PTFs.
- z/TPF V1.1 with PTFs.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 15 SP1 with service, SLES 12 SP4 with service.
  - RHEL 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

Integrated Accelerator for z Enterprise Data Compression requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/OS V2.2 with PTFs.
- z/VM V7.2 for guest exploitation.

- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SLES 12 SP5 with service.

System Recovery Boost requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.
- z/VM V7.2.
- z/VM V7.1 with PTFs.
- z/TPF V7.1 with PTFs.

IBM Z Data Privacy for Diagnostics requires at a minimum:

- z/OS V2.4 with PTFs.
- z/OS V2.3 with PTFs.

Lattice-based Cryptography support requires at a minimum:

- z/OS V2.4 with PTFs and with Cryptographic Support for z/OS V2.2 -- z/OSV2.4 (HCR77D1).
- z/OS V2.3 with coexistence PTFs for SMF and with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/OS V2.2 with coexistence PTFs for SMF and with Cryptographic Support for z/OS V2.2 --z/OS V2.4 (HCR77D1).
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

Greater than 16 CEX adapters requires at a minimum:

- z/OS V2.2 with PTFs for native exploitation.
- z/OS V2.3 with PTFs for native exploitation.
- z/OS V2.4 with PTFs for native exploitation.
- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.
- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SUSE Linux Enterprise Server (SLES) 15 SP1 with service, SLES 12 SP4 with service.
  - Red Hat Enterprise Linux (RHEL) 8.0 with service, RHEL 7.7 with service, and RHEL 6.10 with service.
  - Ubuntu 18.04.1 LTS with service and Ubuntu 16.04.6 LTS with service.

Format Preserving Encryption requires at a minimum:

- z/VM V7.2 for guest exploitation.
- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

ECC Curve Support requires at a minimum:

- z/VM V7.2 for guest exploitation.

- z/VM V7.1 with PTFs for guest exploitation.
- z/VM V6.4 with PTFs for guest exploitation.

Secure Execution for Linux requires support in the KVM host and the KVM guest, at a minimum:

- IBM supports running the following Linux on IBM Z distributions as a KVM guest on IBM z15:
  - SLES 12 SP5.
  - RHEL 8.1.
  - RHEL 7.8
  - IBM is working with its Linux distribution partners to provide support in future distribution releases.
- IBM supports running the following Linux on IBM Z distributions as a KVM guest on IBM z15:
  - IBM is working with its Linux distribution partners to provide support in future distribution releases.

Enhanced PCI store requires at a minimum:

- Linux on IBM Z-IBM supports running the following Linux on IBM Z distributions on IBM z15:
  - SUSE Linux Enterprise Server (SLES) 12 SP5 with service.
  - Red Hat Enterprise Linux (RHEL) 8.1 with service

Planning information

Client responsibilities

Information on customer responsibilities for site preparation can be found in the"Library"section of Resource Link.

Cable orders

Not applicable.

Installability

The average installation time for an IBM z15 is approximately 22 installer hours. This does not include planning hours. This assumes a full System Assurance Product Review, and implementation of the cable services have been performed. See your IBM representative for details on these services.

Security, auditability, and control

The IBM z15 uses the security and auditability features and functions of host hardware, host software, and application software.

The client is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

IBM Systems Lab Services

For details on available services, contact your IBM representative or go to the Lab Services website.

Terms and conditions

Products - terms and conditions

Warranty period

One year.

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM. An IBM part or feature installed during the initial installation of an IBM machine is subject to the full warranty period specified by IBM. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.

International Warranty Service

International Warranty Service allows you to relocate any machine that is eligible for International Warranty Service and receive continued warranty service in any country where the IBM machine is serviced. If you move your machine to a different country, you are required to report the machine information to your Business Partner or IBM representative.

The warranty service type and the service level provided in the servicing country may be different from that provided in the country in which the machine was purchased. Warranty service will be provided with the prevailing warranty service type and service level available for the eligible machine type in the servicing country, and the warranty period observed will be that of the country in which the machine was purchased.

The following types of information can be found on the International Warranty Service website:

- Machine warranty entitlement and eligibility
- Directory of contacts by country with technical support contact information
- Announcement Letters

Warranty service

The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country and location specific information. IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. The following service is available as warranty for your machine type.

- 24 hours per day, 7 days a week, same day response

Warranty service upgrades

If required, IBM will provide repair service depending on the types of maintenance service specified for the machine. Contact your local representative.

The following service is provided.

- 24 hours per day, 7 days a week, same day response.

Usage plan machine

No.

IBM hourly service rate classification

Three.

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

General terms and conditions

Field-installable features

Yes.

Model conversions

Yes.

Machine installation

Installation is performed by IBM. IBM will install the machine in accordance with the IBM installation procedures for the machine.

In the United States, contact IBM at 1-800-IBM-SERV (426-7378). In other countries contact the local IBM office.

Graduated program license charges apply

No.

Licensed Internal Code

IBM Licensed Internal Code (LIC) is licensed for use by a customer on a specific machine, designated by serial number, under the terms and conditions of the IBM License Agreement for Machine Code, to enable a specific machine to function in accordance with its specifications, and only for the capacity authorized by IBM and acquired by the customer. You can obtain the agreement by contacting your IBM representative or visiting the License Agreement for Machine Code and Licensed Internal Code website.

Specific Machine Type Model:

- 8562-T02

Licensed Machine Code

Not applicable.

Machine Code License Acceptance Requirement

Acceptance-By-Use Machine: Yes, acceptance of the Machine Code license terms is conveyed through the user's initial use of the Machine.

Other Installed Licensed Code

None.

Educational allowance

Not applicable.

Prices

For all local charges, contact your local IBM representative or IBM Business Partner.

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AP distribution

Country/Region	Announced
ASEAN *	Yes
India/South Asia **	Yes
Australia	Yes
Hong Kong	Yes
Macao SAR of the PRC	Yes
Mongolia	Yes
New Zealand	Yes
People's Republic of China	Yes
South Korea	Yes
Taiwan	Yes

* Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam

** Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka

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IBM Directory of worldwide contacts