z196 is designed and optimized for growth and large-scale consolidation. z196 provides:

- Up to 80 customer processor units (PUs)
- 5-2 GHz high frequency z196 quad core processor chip.
- Up to 768 GB of memory per PU
- Up to 15 PUs available for subcapacity use
- Maximum available memory of 10 TB
- Up to 3.0 TB of maximum available memory available on z196 (depending on the model)
- Up to 1.0 TB of maximum available memory supported on z196 in any LPAR.
- Up to 3 LPARs available (4 LPARs with optional BladeCenter w) on a single z196 system.
- On-Demand: 16 gigabytes of memory per PU
- RAM technology provides protection at the dynamic random access memory (DRAM), dual inline memory module (DIMM), and memory channel level.

IBM System z9 and z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and z890 zEnterprise.

- zBX is a separate machine, machine type 2458 Model 002, attached to z196 and can be viewed as a logical extension of z196.
- With this support, heterogeneous applications distributed across multiple environments can be configured and processed in a single zEnterprise environment.

With zBX, you can process CPU intensive DB2® queries, find in Business Intelligence and Data Warehousing applications, using the IBM Smart Analytic Optimizer for DB2 z/OS, V1.1. With zBX, you can use multiple operating systems or virtual servers simultaneously on POWER® blades optimizing workload performance and capacity.

IBM System z9 and z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and z890 zEnterprise.

- An ensemble is a collection of one to eight zEnterprise CPCs, including any optionally attached zBXs that are managed as a single logical virtualized system by the Unified Resource Manager.

Reduction in the processor requirements by:
- Providing a fixed HSA (15 GB)
- Reducing the number of Power-on-Resets
- Allowing dynamic addition of a new LPAR to a new or existing LCSS.

Coupling using infiniBand®

- A zEnterprise to zEnterprise, zEnterprise to System z10, or System z10 to System z10 connection is provided by an InfiniBand Double Data Rate (12x IB-DDR) optical link with a link data rate of 6 Gigabytes per second (GBps) and maximum link distance of 150 meters (492 feet), or by an IB-DDR fiber optic link or an IB-DDR fiber optic link with a maximum unimpeded distance of 10 kilometers (6.2 miles) and a maximum repeated distance of 100 kilometers (62 miles). Each IB-DDR has a link data rate of 2.5 Gigabits (Gigabits). InfiniBand IB-DDR has a link data rate of 5 Gigabits (Gigabits).
- An I/O channel (IOC) connects information back and forth between the servers. An I/O channel connects two servers through a parallel InfiniBand interconnect support.
- Network-mode to 3 nodes on System z9 to System z9 connection is provided by an InfiniBand Single Data Rate (12x IB-DDR) fiber optic link with a link data rate of 3 Gigabytes per second (GBps) and maximum link distance of 150 meters (492 feet).

IBM System z9 Coupling Facility (zCF)

- IBM System z9 Coupling Facility (zCF) to IBM System z9 Coupling Facility (zCF) has a data rate of 12 Gigabits per second (GBps) and a maximum link distance of 10 kilometers (6.2 miles)

IBM System z9 and z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and z890 zEnterprise.

- zCF is a specialty engine designed to help free-up general computing capacity and lower overall total cost of computing for select data and transaction processing workloads.
- Using a zCF can help improve the general-purpose processor's performance.

IBM System z9 Coupling Facility (zCF)

- A zCF is a specialty engine that provides additional processing capacity exclusively for Linux on System z2 workloads.

Integrated Data Link Layer (IDL)

- An IDL is a specialty engine that provides additional processing capacity exclusively for Linux on System z2 workloads.

IBM System z9 and System z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and System z890 zEnterprise.

- An IDL is a specialty engine that provides additional processing capacity exclusively for Linux on System z2 workloads.

IBM System z9 and System z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and System z890 zEnterprise.

- A water-cooling option is available to cool the server using customer supplied chilled water and a special water circulation unit within the frame. See z196 16th Maintenance Manual for Physical and Environmental Specifications and Resource Link at http://www.ibm.com/systems/resourceLink.

Historical view of power, temperature, and utilization data of your system

- Using the Environment Efficiency Statistics tool, you can view a historical display of system power consumption, system temperature, blade CPU utilization, and CF utilization data. This data will assist you in monitoring the performance of your system.

Energy consumption reduction

- You can reduce the energy consumption of your system by enabling power saving mode or setting a peak power consumption limit.

- To enable power saving mode, use the Set Power Saving, Customize Schedule Operations, or Customize/Deactivate Allocation Profiles and zEnterprise for Power Management tasks.
- The Active Energy Manager (ADM), or SNMP and CIM APIs. To limit the peak power consumption, use the Set Power Cap task.

- Capacity of power saving mode includes:
  - Ability to perform a permanent LCC/upgrade while temporary resources are active
  - Ability to install and activate multiple temporary records at any given time
  - Ability to re-enable XCF External Link (XCF XEL) on a single temporary record
  - Disaster recovery solutions:
    - Ability to move affinity events (CFE) - Short range - 3 days
    - Ability to move temporary applications
  - Ability to set a period of time for an On/Off record
  - Ability to set a period of time for an order record
  - Ability to set an On/Off period record, which allows you to order, download, activate, and deactivate On/Off upgrades without actually setting real capacity or incurring costs
  - Automatic renewal of On/Off record

- zEnterprise System z9 and System z890 zEnterprise BladeCenter add BladeCenter w to IBM System z9 and System z890 zEnterprise.

- z196 offers support for 4 CPU and CBU records on an initial z196 order.
- 45 available subcapacity settings.

HyperSocket® provides the ability to diagnose network problems using the Network Traffic Analyzer (NHA). A single logical partition can connect up to 32 HyperSockets.

HyperDispatch helps provide increased scalability and performance of higher n-way and multi-book z196 systems by improving the way workloads are dispatched across the server. HyperDispatch accomplishes this improvement by recognizing the physical processor where the workload was started and then dispatching subsequent work to the same physical processor. This intelligent dispatching helps reduce the movement of cache and data, and improves CPU time and performance. Support to dynamically optimize the CPU-to-book allocation of physical processor (PLUs). Available with zEnterprise PR/SM™ System z10 PR/SM, and z950 functions.

Large page size support (1 MB pages) provides performance improvement for a select set of applications, primarily long running memory access intensive applications.

Reduced Power Cap and unplanned server outages through:

- Enhanced power availability — Program directed re-IPL
- Dynamic oscillator switchover — Redundant I/O interconnect power maintenance
- System-initiated CHPD reconfiguration
- Concurrent CHPD fanout card hot-plug and rebase

Flexible memory provides the additional resources to maintain a constant level of memory.

Redundant I/O interconnect helps maintain critical connections to devices, z196 allows a single book, in a multibook server, to be concurrently removed from the server and reinstalled during an upgrade or repair.

Dynamic oscillator switchover z196 has two primary and a backup. If a primary card failure occurs, the backup card is designed to detect the failure, switch over, and provide the clock signal to the server temporarily.

Enriched book availability allows a single book, in a multibook server, to be concurrently removed from the server and reinstalled during an upgrade or repair.

Enhanced book availability is a function of the support for Concurrent Book Add (CBA).

Redundant I/O interconnect helps maintain critical connections to devices, z196 allows a single book, in a multibook server, to be concurrently removed from the server and reinstalled during an upgrade or repair.

Configuration Book Add (CBA) is a function of the support for Concurrent Book Add (CBA).

Flexible memory provides the additional resources to maintain a constant level of memory.

Redundant I/O interconnect helps maintain critical connections to devices, z196 allows a single book, in a multibook server, to be concurrently removed from the server and reinstalled during an upgrade or repair.

Water-cooling option — A water-cooling option is available to cool the server using customer supplied chilled water and a special water circulation unit within the frame.

Top and side I/O cabling

- z196 provides the ability to route all I/O cables, ESCON, FICON, OSA-Express, 12x InfiniBand, 1x InfiniBand, and 3x, as well as 1000BASE-T Ethernet cabling from I/O cages or I/O drawers out through the top of the frame.

Frame body cabling

- Two optional bolt-down kits (one for refrigerated/air-cooled models and one for water-cooled models) are available to help secure the frame and its interior components, while exposed to vibrations and shocks. The kits supply parts to cover raised floor heights from 9-13 inches, 12-22 inches, and 12-36 inches.

High Voltage DC universal input option

- Ability to run off of 100v-240v (50-60 Hz) voltage DC power (380-570 volts) in addition to AC power. The direct high voltage DC design improves data center energy efficiency and decreases the need for any conversion.

Continued
OSTA-Express and OSA-Express 3

Note: OSA-Express2 features can only be carried forward:

- OSA-Express3 GNE LX (4 ports per feature)
- OSA-Express3 GNE SX (4 ports per feature)
- OSA-Express3 1000BASE-T Ethernet (4 ports per feature)
- OSA-Express3 10 GBE LR (2 ports per feature)
- OSA-Express3 10 GBE SR (2 ports per feature)
- OSA-Express2 features:
  - OSA-Express2 GNE LX (2 ports per feature)
  - OSA-Express2 GNE SX (2 ports per feature)
- Enhancements:
  - OSA-Express3 CHPID type OSM provides connectivity to the intranode management network (INMN)
  - OSA-Express3 CHPID type OSG provides connectivity and access control to the intraensemble data network (IEDN)
  - Inbound workload queuing (IWQ) for OSA-Express3

Cryptographic options:

- Configurable Crypto Express3 feature.
- CPSIP for Cryptographic Function (CPACF), which delivers cryptographic support on every PU with data encryption/decryption. CPACF also provides a high performance secure key function that ensures the privacy of key material used for encryption operations.
- CPACF support includes AES for 128-, 192-, and 256-bit keys; SHA-1, SHA-224, SHA-256, SHA-384, and SHA-512 for message processing; PRNG, DES, and D/E5.

- Using the Support Element, you can enable or disable the encrypt DE key and encrypt AES key functions of the CPACF.
- Elliptic Curve Cryptography (ECC) and RSA public-key cryptography support
- User Defined Extension (UDE) support.
- Remote loading of ATMs and POSIX keys.
- Dynamically add, move, or delete a Crypto Express3 feature to or from an LPAR.
- Cryptographic migration wizard on TKE for migrating configuration data from one Cryptographic coprocessor to another Cryptographic coprocessor.
- The tamper-resistant hardware security module, which is contained within the Crypto Express3 is designed to meet the FIPS 140-2 Level 4 security requirements for hardware security modules.

- Fiber Quick Connect (FQC), an optional feature, is a fiber harness integrated in the 296 frame for a "quick" connect to ESCON and FICON Lx channels.

SIMP Client Licenses 3.0 support

FCF Level 17 support

TKE 7.0 Licensed Internal Code (LIC) support

z/VM-mode partition (LPAR) support to contain processor types (CPs), I/OFs, z/IPS, z/APS, and ICFs

Plan ahead memory is an optional feature, allows you to prepare to future memory upgrades. The memory upgrades can be made nondisruptively and also concurrently.

Worldwide Port Number (WPN) prediction tool

- The WPWNN prediction tool assists in planning and setting up your Storage Area Networks (SANs) environment. The WPWNN prediction tool can calculate WPWNs for virtual and physical ports before the installation of z196.
- Therefore, you can be up and running much faster after the server is installed.
- This tool applies to all FICON channels defined as CHPID type FCP for communication with SCSI devices. The WPWNN prediction tool is located on Resource Link.

Support to control user access to the HMC using a pattern name that defines:

- Search criteria used to identify specific user IDs
- LDAP server used for authentication
- HMC user ID template used to identify login permissions for the user IDs using this template
- List of HMCs that can be accessed.

Enhanced security using digital signatures

- Digitally Signed Firmware (Licensed Internal Code) support provided by the HMC and the SE.
- This provides the following benefits: Enables that no malware can be installed on System z products during firmware updates (such as, transmission of MCL files, delivery of code loads, and restoration of critical data).
- Designed to comply with FIPS (Federal Information Processing Standard) 140-2 Level 1 for Cryptographic LIC (Licensed Internal Code) changes.

Auditable function

- HMC/SE tasks are available to generate, view, save, and offload audit reports, to set up a schedule for generating, saving, and offloading audit information, to receive email notifications for select security log events, and to remove the predefined password rules to prevent them from being mistakenly used.
- You can also manually offload or set up a schedule to automatically offload HMC and Support Element log files, which can help satisfy audit requirements.

This section lists the features/functions that are not supported on z196:

- OSA-Express is not supported on z196.
- OSA-Express 10 GBE LX is not supported on z196.
- Crypto Express 2 is not supported on z196.
- FICON Express and FICON Express2 are not supported on z196.
- The ETR feature is not supported on z196.
- ISCI-4 links are not supported on z196.
- ISCI-6 links are not supported on z196.
- ISCI-8 links are not supported on z196.
- S3C-2 links are not supported on z196.
- S3C-3 links in compatibility mode are not supported on z196 (CHPID types CFS and CFR).
- P0XCC and P0CCA are not supported on z196.
- High-frequency z196 quad core processor chip (5.2 GHz operation in system)
- CORE-4 order of execution of instructions
- Hardware accelerators on the chip for data compression, cryptographic functions, and digital floating point
- Integrated SMP communications
- Instructions added to the z196 chip to improve compiled code efficiency
- Enablement for hardware-based cache optimization
- 2196 support for 1 MB page frames
- Full hardware support for Hardware Decimal Floating-point Unit (HDFU)
- 64-bit general registers
- 64-bit integer instructions. Most ESA/390 architecture instructions with 32-bit operands have new 64-bit and 32- to 64-bit analogs.
- 64-bit addressing is supported for both operands and instructions for both real addressing and virtual addressing.

With the expanded capacity of z196 and enhancements to the I/O infrastructure, IBM continues to facilitate the consolidation of multiple servers into one z196 with a substantial increase in:   - Available memory
- Advanced virtualization
- LPARs
- Speed using InfiniBand
- Available processors in a single footprint

IBM's Large Systems Performance Reference (LSPR) method provides comprehensive z/Architecture processor capacity data for different configurations of Central Processor Units across a wide variety of system control program & workload environments.

The following table lists the five z196 models and some of their characteristics, such as range of PUs allowed, the memory range of each model, and the number of InfiniBand connections, and the range of I/O cages and I/O drawers that can be installed.

### z196 Models Overview

<table>
<thead>
<tr>
<th>Model number</th>
<th>Maximum number of books allowed</th>
<th>CPU Type (Capacity Identifier)</th>
<th>Available Quantity</th>
<th>CPU Type (Capacity Identifier)</th>
<th>Available Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>M15</td>
<td>One book</td>
<td>CPT (7xx)</td>
<td>00 - 15</td>
<td>CPT (7xX)</td>
<td>00 - 15</td>
</tr>
<tr>
<td>M32</td>
<td>Two books</td>
<td>CPT (7xx)</td>
<td>00 - 15</td>
<td>CPT (7xX)</td>
<td>00 - 15</td>
</tr>
<tr>
<td>M49</td>
<td>Three books</td>
<td>CPT (7xx)</td>
<td>00 - 15</td>
<td>CPT (7xX)</td>
<td>00 - 15</td>
</tr>
<tr>
<td>M66</td>
<td>Four books</td>
<td>CPT (7xx)</td>
<td>00 - 15</td>
<td>CPT (7xX)</td>
<td>00 - 15</td>
</tr>
<tr>
<td>M80</td>
<td>Six books</td>
<td>CPT (7xx)</td>
<td>00 - 15</td>
<td>CPT (7xX)</td>
<td>00 - 15</td>
</tr>
</tbody>
</table>

### References:

1. Depends on the 2817 machine model.
2. For all 2817 models.
3. One model number can be used.

NOTE: These values are the same for both the refrigeration/air-cooled and the water-cooled models.

With the expanded capacity of z196 and enhancements to the I/O infrastructure, IBM continues to facilitate the consolidation of multiple servers into one z196 with a substantial increase in:

- Available memory
- Advanced virtualization
- LPARs
- Speed using InfiniBand
- Available processors in a single footprint

The implementation of 64-bit z/Architecture can help reduce problems associated with lack of addressable memory by making the addressing capability unlimited (16 Exahaste).