Guide

Cisco UCS C480 M5 Memory Guide

CISCO SYSTEMS
170 WEST TASMAN DR
SAN JOSE, CA, 95134
WWW.CISCO.COM

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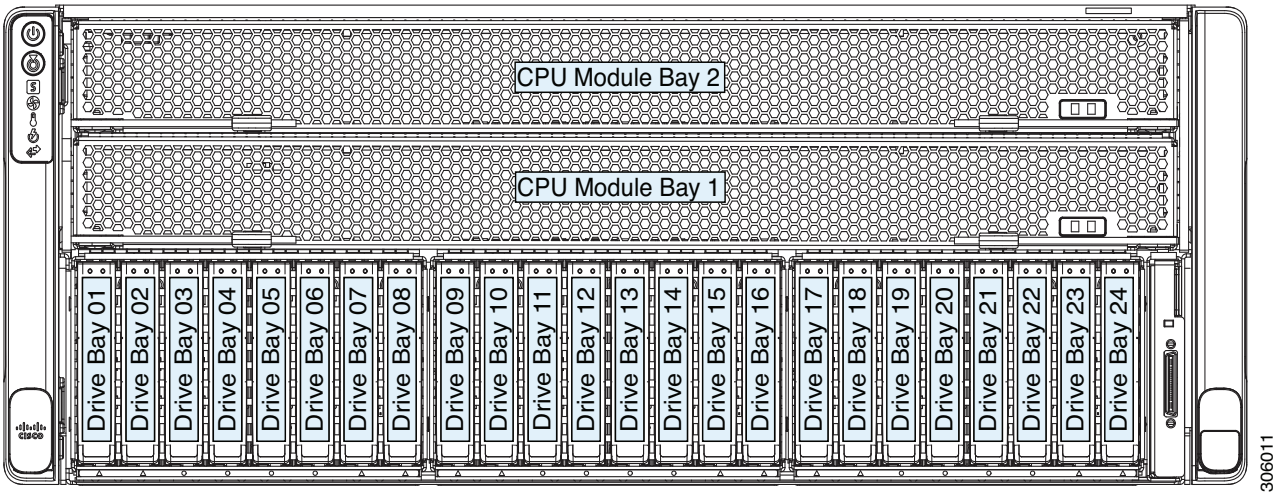
Server CPU Module Bay Layout

The front of the C480 M5 server is shown in ***Figure 1***. Notice that there are two CPU Module bays, the lower bay (Bay 1) and the upper bay (Bay 2).

The CPU numbering is as follows:

- Lower Bay: CPU1 and CPU2
- Upper Bay: CPU3 and CPU4

Figure 1 C480 CPU Module Bays



Each CPU has six memory channels, and each channel controls two memory DIMMs.

The channel numbering for each CPU is as follows:

Lower Bay:

- CPU1: A, B, C, D, E, F
- CPU2: G, H, J, K, L, M

Upper Bay:

- CPU3: A, B, C, D, E, F
- CPU4: G, H, J, K, L, M

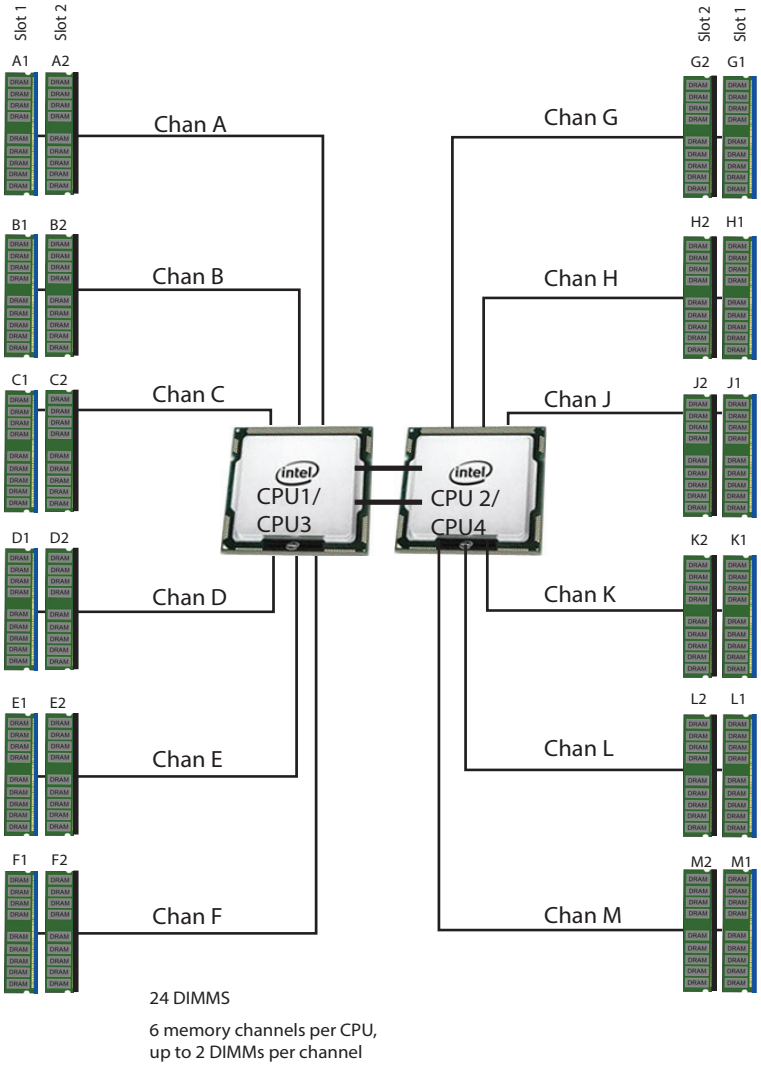
Memory Organization

The standard memory features are:

- Clock speed: Up to 2933 MHz depending on CPU memory interface speed
- Ranks per DIMM: 1, 2, 4, or 8
- Operational voltage: 1.2 V
- Registered ECC DDR4 DIMMS (RDIMMs), load-reduced DIMMs (LRDIMMs) or Intel® Optane™ Persistent Memory (PMem).

Memory is organized with six memory channels per CPU, with up to two memory devices per channel, as shown in ***Figure 2***. CPU1 and CPU2 are in the lower bay; CPU3 and CPU 4 are in the upper bay. CPU1 and CPU2 control up to 24 DIMMs and CPU3 and CPU4 also control up to 24 DIMMs, for a total of up to 48 DIMMs total for the server.

Figure 2 C480 Memory Organization



Memory Devices (DIMMs and PMem)

The available memory devices are listed in *Table 1*.

Table 1 Available DDR4 DIMMs

Product ID (PID)	PID Description	Voltage	Ranks /DIMM
UCS-ML-256G8RT-H	256 GB DDR4-2933MHz LRDIMM/8Rx4 (16Gb) (3DS)	1.2 V	8
UCS-ML-128G4RT-H[1]	128 GB DDR4-2933MHz LRDIMM/4Rx4 (16Gb) (non-3DS)	1.2 V	4
UCS-ML-X64G4RT-H[1]	64 GB DDR4-2933MHz LRDIMM/4Rx4 (8Gb)	1.2 V	4
UCS-MR-X64G2RT-H[1]	64 GB DDR4-2933MHz RDIMM/2Rx4 (16Gb)	1.2 V	2
UCS-MR-X32G2RT-H[1]	32 GB DDR4-2933MHz RDIMM/2Rx4 (8Gb)	1.2 V	2
UCS-MR-X16G1RT-H[1]	16 GB DDR4-2933MHz RDIMM/1Rx4 (8Gb)	1.2 V	1
UCS-ML-128G4RW[2]	128 GB DDR4-3200MHz LRDIMM 4Rx4 (16Gb) (non-3DS)	1.2 V	4
UCS-MR-X64G2RW[2]	64 GB DDR4-3200MHz RDIMM 2Rx4 (16Gb)	1.2 V	2
UCS-MR-X32G2RW[2]	32 GB DDR4-3200MHz RDIMM 2Rx4 (8Gb)	1.2 V	2
UCS-MR-X16G1RW[2]	16 GB DDR4-3200MHz RDIMM 1Rx4 (8Gb)	1.2 V	1
Intel® Optane™ Persistent Memory Product			
UCS-MP-128GS-A0	Intel® Optane™ Persistent Memory, 128GB, 2666 MHz		
UCS-MP-256GS-A0	Intel® Optane™ Persistent Memory, 256GB, 2666 MHz		
UCS-MP-512GS-A0	Intel® Optane™ Persistent Memory, 512GB, 2666 MHz		
Intel® Optane™ Persistent Memory Product Operational Modes			
UCS-DCPMM-AD	App Direct Mode		
UCS-DCPMM-MM	Memory Mode		
Memory Mirroring Option			
N01-MMIRROR	Memory mirroring option		

Notes:

1. Cisco announced the End-of-sale of the DDR4-2933 Memory DIMM products: EOL14611 lists the product part numbers affected by this announcement. *Table 2* describes the replacement Memory DIMM product Part Numbers.
2. DDR4-3200MHz replacement part numbers will operate at the maximum speed of the Intel 2nd generation Xeon Scalable processor memory interface, ranging from 2133 MHz to 2933 MHz.

Table 2 lists the EOL Memory DIMM product part numbers and their replacement PIDs.

Table 2 EOL14611 Memory DIMM Product Part Numbers and their replacement PIDs

EOS Product Part Number (PID)	PID Description	Replacement Product PID	Replacement Product Description
UCS-MR-X16G1RT-H	16GB DDR4-2933MHz RDIMM 1Rx4 (8Gb)/1.2v	UCS-MR-X16G1RW	16GB DDR4-3200MHz RDIMM 1Rx4 (8Gb)/1.2v
UCS-MR-X32G2RT-H	32GB DDR4-2933MHz RDIMM 2Rx4 (8Gb)/1.2v	UCS-MR-X32G2RW	32GB DDR4-3200MHz RDIMM 2Rx4 (8Gb)/1.2v
UCS-MR-X64G2RT-H	64GB DDR4-2933MHz RDIMM 2Rx4 (16Gb)/1.2v	UCS-MR-X64G2RW	64GB DDR4-3200MHz RDIMM 2Rx4 (16Gb)/1.2v
UCS-ML-X64G4RT-H	64GB DDR4-2933MHz LRDIMM 4Rx4 (8Gb)/1.2v	UCS-MR-X64G2RW[1]	64GB DDR4-3200MHz RDIMM 2Rx4 (16Gb)/1.2v
UCS-ML-128G4RT-H	128GB DDR4-2933MHz LRDIMM 4Rx4 (16Gb)/1.2v	UCS-ML-128G4RW	128GB DDR4-3200MHz LRDIMM 4Rx4 (16Gb)/1.2v

NOTE: (1) Cisco doesn't support a Load Reduce DIMM (LRDIMM) 64GB Memory PID as a replacement PID of existing UCS-ML-x64G4RT-H and recommends migrating to the Registered DIMM (RDIMM) instead, delivering the best balance in performance and price.

Table 3 DDR4 Memory DIMMs / 1st and 2nd Generations Intel® Xeon® scalable processor family CPUs support

DIMM/Intel CPUs support	Intel® Xeon® scalable processor family CPUs	2nd Generation Intel® Xeon® scalable processor family CPUs	EOS date
DDR4-2933MHz			
UCS-MR-X16G1RT-H	Supported	Supported	May 11, 2022
UCS-MR-X32G2RT-H	Supported	Supported	May 11, 2022
UCS-MR-X64G2RT-H		Supported	May 11, 2022
UCS-ML-X64G4RT-H	Supported	Supported	May 11, 2022
UCS-ML-128G4RT-H		Supported	May 11, 2022
UCS-ML-256G8RT-H		Supported	
DDR4-3200MHz			
UCS-MR-X16G1RW	Supported	Supported	
UCS-MR-X32G2RW	Supported	Supported	
UCS-MR-X64G2RW		Supported	
UCS-ML-128G4RW		Supported	

Memory Configurations and Modes

DIMM Guidelines



NOTE: For more details on DIMM population and guidelines, see *DIMM Population Rules, page 15*.

- System speed is dependent on the CPU DIMM speed support. Refer to *Table 1 on page 5* for DIMM speeds.
- The C480 M5 server supports three different memory reliability, availability, and serviceability (RAS) modes:
  - Independent Channel Mode
  - Mirrored Channel Mode
  - Lockstep Channel Mode



NOTE: Mixing of Non-Mirrored and Mirrored mode is not allowed.

- Do not mix RDIMMs and LRDIMMs
- Single-rank DIMMs can be mixed with dual-rank DIMMs in the same channel
- For best performance, observe the following:
  - DIMMs with different timing parameters can be installed on different slots within the same channel, but only timings that support the slowest DIMM will be applied to all. As a consequence, faster DIMMs will be operated at timings supported by the slowest DIMM populated.
  - When one DIMM is used, it must be populated in DIMM slot 1 (farthest away from the CPU) of a given channel.
  - When single or dual rank DIMMs are populated for two DIMMs per channel (2DPC), always populate the higher number rank DIMM first (starting from the farthest slot). For example, first populate slot 1 with dual rank DIMMs. Then populate DIMM slot 2 with single-rank DIMMs.
- DIMMs for all four CPUs must always be configured identically.
- Cisco memory from previous generation servers (DDR3 and DDR4) is not compatible or supported with the UCS C480 server



NOTE: System performance is optimized when the DIMM type and quantity are equal for both CPUs, and when all channels are filled equally across the CPUs in the server.

PMem Guidelines

PMem require second generation Intel Xeon Scalable Family processors. First generation Xeon Scalable processors do not support PMem.

All installed PMem must be the same size. Mixing PMem of different capacities is not supported.

PMem and DIMMs must be populated as shown in *Table 4* (6 DIMMs per CPU with 2, 4, or 6 PMem per CPU, as shown).

Table 4 2nd Generation Intel® Xeon® Scalable Processor DIMM and PMem[1] Physical Configurations (quad socket)

DIMM to PMem Count	CPU 1 (lower bay)											
	iMC1						iMC0					
	Channel 2		Channel 1		Channel 0		Channel 2		Channel 1		Channel 0	
	F2	F1	E2	E1	D2	D1	C2	C1	B2	B1	A2	A1
6 to 2		DIMM		DIMM	PMem	DIMM		DIMM		DIMM	PMem	DIMM
6 to 4		DIMM	PMem	DIMM	PMem	DIMM		DIMM	PMem	DIMM	PMem	DIMM
6 to 6	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM
DIMM to PMem Count	CPU 2 (lower bay)											
	iMC1						iMC0					
	Channel 2		Channel 1		Channel 0		Channel 2		Channel 1		Channel 0	
	M2	M1	L2	L1	K2	K1	J2	J1	H2	H1	G2	G1
6 to 2		DIMM		DIMM	PMem	DIMM		DIMM		DIMM	PMem	DIMM
6 to 4		DIMM	PMem	DIMM	PMem	DIMM		DIMM	PMem	DIMM	PMem	DIMM
6 to 6	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM
DIMM to PMem Count	CPU 3 (upper bay)											
	iMC1						iMC0					
	Channel 2		Channel 1		Channel 0		Channel 2		Channel 1		Channel 0	
	F2	F1	E2	E1	D2	D1	C2	C1	B2	B1	A2	A1
6 to 2		DIMM		DIMM	PMem	DIMM		DIMM		DIMM	PMem	DIMM
6 to 4		DIMM	PMem	DIMM	PMem	DIMM		DIMM	PMem	DIMM	PMem	DIMM
6 to 6	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM

Table 4 2nd Generation Intel® Xeon® Scalable Processor DIMM and PMem[1] Physical Configurations (quad socket)

DIMM to PMem Count	CPU 4 (upper bay)											
	iMC1						iMC0					
	Channel 2		Channel 1		Channel 0		Channel 2		Channel 1		Channel 0	
	M2	M1	L2	L1	K2	K1	J2	J1	H2	H1	G2	G1
6 to 2		DIMM		DIMM	PMem	DIMM		DIMM		DIMM	PMem	DIMM
6 to 4		DIMM	PMem	DIMM	PMem	DIMM		DIMM	PMem	DIMM	PMem	DIMM
6 to 6	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM

Notes:

1. All systems must be fully populated with four CPUs when using PMem at this time.

- Four CPUs must be installed when using PMem.
- For Memory Mode and App Direct Mode, install a minimum 2 PMem and 6 DIMMs per CPU
- When either Memory Mode or Mixed Mode is used, the recommended ratio of DIMM capacity to PMem capacity is between 1:16 and 1:2, and 1:4 achieves the best performance. For example, 6x 16 GB DIMMs + 2x 256 GB PMem is a capacity ratio of 1:5.33 (96GB:512GB). In Mixed Mode, the ratio is between memory and only the volatile portion of the PMem. This ratio requirement does not apply to App Direct mode. See *Table 5* for DCCPM memory modes.

Table 5 Intel® Optane™ Persistent Memory Modes

Intel® Optane™ DC Persistent Memory Modes	
App Direct Mode:	PMem operates as a solid-state disk storage device. Data is saved and is non-volatile. Both PMem and DIMM capacity counts towards CPU tiering (both PMem and DIMM capacities count towards the CPU capacity limit)
Memory Mode:[1]	PMem operates as a 100% memory module. Data is volatile and DRAM acts as a cache for PMem. Only PMem capacity counts towards CPU tiering (only the PMem capacity counts towards the CPU capacity limit). This is the factory default mode.
Mix Mode:	DRAM as cache. Only PMem capacity counts towards CPU tiering (only the PMem capacity counts towards the CPU capacity limit).

Notes:

1. For Memory Mode, the Intel-recommended DIMM to PMem capacity ratio in the same CPU socket is from 1:2 to 1:16.

- For each memory channel with both a PMem and a DIMM installed, the PMem is installed in channel slot 2 (closest to the CPU) and the DIMM is installed in channel slot 1.
- To maximize performance, balance all memory channels
- In configurations with PMem installed, memory mirroring is supported, with two restrictions:

- Mirroring is only enabled on the DIMMs installed in the server; The PMem themselves do not support mirroring.
- Only App Direct mode is supported. Memory mirroring cannot be enabled when PMem are in Memory Mode or Mixed Mode.

For detailed Intel PMem configurations, refer to the following link:

https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/c/hw/C480M5/install/C480M5/C480M5_chapter_011.html?bookSearch=true#concept_b1k_mbt_tgb

DIMM Memory Mirroring

Memory mirroring is supported only on the DIMMs; PMem do not support memory mirroring. When memory mirroring is enabled, the memory subsystem simultaneously writes identical data to two adjacent channels. If a memory read from one of the channels returns incorrect data due to an uncorrectable memory error, the system automatically retrieves the data from the other channel. A transient or soft error in one channel does not affect the mirrored data, and operation continues unless there is a simultaneous error in exactly the same location on a DIMM and its mirrored DIMM. Memory mirroring reduces the amount of memory available to the operating system by 50% because only one of the two populated channels provides data.

CPU/Memory Configuration With Memory Mirroring

There are two CPU modules, one in each CPU bay. The lower CPU module occupies Bay 1 and the upper CPU module occupies Bay 2. CPU 1 and CPU2 are in Bay 1; CPU 3 and 4 are in Bay 2.

Select from 4, 6, 8, or 12 DIMMs per CPU (DIMMs for all four CPUs must be configured identically). In addition, the memory mirroring option (N01-MMIRROR) as shown in *Table 1 on page 5* must be selected.

The DIMMs will be placed by the factory as shown in the following tables.

	CPU 1 DIMM Placement in Channels (for identical ranked DIMMs) CPU 1	CPU 2 DIMM Placement in Channels (for identical ranked DIMMs) CPU 2
8	(A1,B1); (D1,E1)	(G1, H1); (K1, L1)
12	(A1, B1, C1); (D1, E1, F1)	(G1, H1, J1); (K1, L1, M1)
16	(A1, A2, B1, B2); (D1, D2, E1, E2)	(G1, G2, H1, H2); (K1, K2, L1, L2)
24	(A1, A2, B1, B2, C1, C2); (D1, D2, E1, E2, F1, F2)	(G1, G2, H1, H2, J1, J2); (K1, K2, L1, L2, M1, M2)

	CPU 3 DIMM Placement in Channels (for identical ranked DIMMs) CPU 3	CPU 4 DIMM Placement in Channels (for identical ranked DIMMs) CPU 4
8	(A1,B1); (D1,E1)	(G1, H1); (K1, L1)
12	(A1, B1, C1); (D1, E1, F1)	(G1, H1, J1); (K1, L1, M1)
16	(A1, A2, B1, B2); (D1, D2, E1, E2)	(G1, G2, H1, H2); (K1, K2, L1, L2)
24	(A1, A2, B1, B2, C1, C2); (D1, D2, E1, E2, F1, F2)	(G1, G2, H1, H2, J1, J2); (K1, K2, L1, L2, M1, M2)

NOTE: System performance is optimized when the DIMM type and quantity are equal for both CPUs, and when all channels are filled equally across the CPUs in the server.

Normal CPU/Memory Configuration (no memory mirroring)

There are two CPU modules, one in each CPU bay. The lower CPU module occupies Bay 1 and the upper CPU module occupies Bay 2. CPU 1 and CPU2 are in Bay 1; CPU 3 and 4 are in Bay 2.

Select from 4, 6, 8, or 12 DIMMs per CPU (DIMMs for all four CPUs must be configured identically). The DIMMs will be placed by the factory as shown in the following tables.

CPU 1 DIMM Placement in Channels (for identically ranked DIMMs)	
4	(A1, B1); (D1, E1)
6	(A1, B1, C1); (D1, E1, F1)
8	(A1, A2, B1, B2); (D1, D2, E1, E2)
12	(A1, A2, B1, B2, C1, C2); (D1, D2, E1, E2, F1, F2)

CPU 2 DIMM Placement in Channels (for identically ranked DIMMs)	
4	(G1, H1); (K1, L1)
6	(G1, H1, J1); (K1, L1, M1)
8	(G1, G2, H1, H2); (K1, K2, L1, L2)
12	(G1, G2, H1, H2, J1, J2); (K1, K2, L1, L2, M1, M2)

CPU 3 DIMM Placement in Channels (for identically ranked DIMMs)	
4	(A1, B1); (D1, E1)
6	(A1, B1, C1); (D1, E1, F1)
8	(A1, A2, B1, B2); (D1, D2, E1, E2)
12	(A1, A2, B1, B2, C1, C2); (D1, D2, E1, E2, F1, F2)

CPU 4 DIMM Placement in Channels (for identically ranked DIMMs)	
4	(G1, H1); (K1, L1)
6	(G1, H1, J1); (K1, L1, M1)
8	(G1, G2, H1, H2); (K1, K2, L1, L2)
12	(G1, G2, H1, H2, J1, J2); (K1, K2, L1, L2, M1, M2)

System Speeds

Memory will operate at the maximum speed of the Intel Xeon Scalable processor memory controller, ranging from 2133 MHz to 2933 MHz for M5 servers. Check CPU specifications for supported speeds.

Physical Layout

Each CPU has six channels:

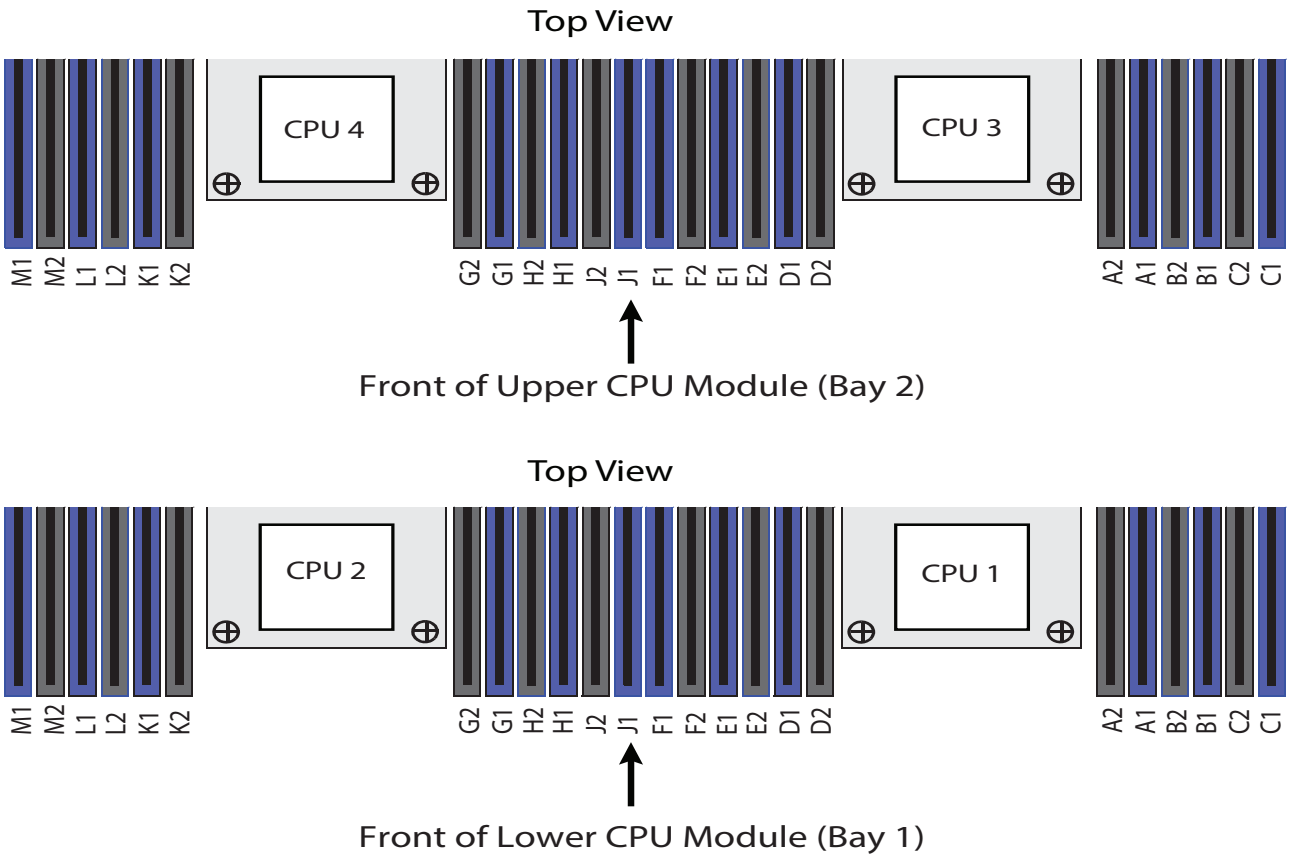
- CPU1 and CPU3 have channels A, B, C, D, E, and F
- CPU2 and CPU 4 have channels G, H, J, K, L, and M

Each channel has two slots: slot 1 and slot 2. The blue-colored DIMM slots are for slot 1 and the black slots for slot 2.

As an example, slots A1, B1, C1, D1, E1, and F1 belong to slot 1, while A2, B2, C2, D2, E2, and F2 belong to slot 2.

Figure 3 shows how slots and channels are physically laid out on the motherboard. The slots on the right half of the motherboard (channels A, B, C, D, E, and F) are associated with CPU 1 for the lower bay and CPU 3 for the upper bay, while the slots on the left half of the motherboard (channels G, H, J, K, L, and M) are associated with CPU 2 for the lower bay and CPU 4 for the upper bay. The slot 1 (blue) slots are always located farther away from a CPU than the corresponding slot 2 (black) slots. Slot 1 slots (blue) are populated before slot 2 slots (black).

Figure 3 Physical Layout of C480 M5 CPU Channels and Slots



DIMM Population Rules

When considering the memory configuration of your server, consider the following items:

- Each channel has two DIMM slots (for example, channel A = slots A1 and A2).
  - A channel can operate with one or two DIMMs installed.
  - If a channel has only one DIMM, populate slot 1 first (the blue slot).
- When both CPUs are installed, populate the DIMM slots of each CPU identically.
  - For 1, 2, 3, 4, and 6 DIMMs per socket configurations, fill the blue slots (slot 1) in the memory channels as per recommended DIMM populations in ***DIMM Population Order, page 17***.
  - For 8 and 12 DIMMs per socket configurations, fill the blue slots (slot 1) and black slots (slot 2) as per recommended DIMM populations in ***DIMM Population Order, page 17***.
  - Refer to ***DIMM Population Order, page 17*** for more details.
- For best memory performance, use identical DIMM types within a server (same speed, size and ranks).
- For optimum performance, populate at least one DIMM per memory channel per CPU.
- When populating DIMM slots for optimal performance, multiples of 12 DIMMs are best because there are 6 memory channels per CPU socket and 2 CPUs must be populated.
- For populations of 1 DIMM per channel (1DPC) and 2DPC, with Intel Xeon scalable processors, all supported DIMMs on Cisco UCS M5 servers run at their labeled speed provided the processor supports that speed.
- At the same memory speed, 2 DPC may perform slightly better than 1 DPC for RDIMMs (workload dependent).
- For small to medium memory capacities, whenever possible, install dual rank RDIMMs for optimal performance. Dual rank RDIMMs perform slightly better than single rank RDIMMs. Single rank DIMMs limit the performance of memory-intensive workloads in 1 DIMM per channel configurations.

- When mixing DIMMs, the following rules must be followed:
  - RDIMMs cannot be mixed with LRDIMMs.
  - RDIMMs of different sizes can be mixed within a channel. When mixing RDIMMs of different densities (sizes), populate DIMMs with the highest density first. For example, if you have to mix 32 GB RDIMMs with 16 GB RDIMMs, then populate the 32 GB DIMMs in blue slots (or slot 1) and then 16 GB DIMMs in black slots (or slot 2).
  - RDIMMs of different ranks can be mixed within a channel. When mixing RDIMMs with different ranks, populate RDIMMs with the higher rank first. For example, when mixing dual-rank RDIMMs with single-rank RDIMMs populate the dual-rank RDIMMs in blue slots first and then single-rank RDIMMs in black slots.
  - 64 GB 2933 MHz LRDIMMs can only be mixed with 128 GB 2933 MHz LRDIMMs.
  - Mixing 16GB, 32GB, and 64GB DDR4-3200MHz RDIMMs is supported.
  - 128GB DDR4-3200MHz LRDIMMs cannot be mixed with other 16GB, 32GB, and 64GB DDR4-3200MHz RDIMMs
  - 128GB DDR4-3200MHz non-3DS LRDIMM cannot be mixed with the 256GB DDR4-2933MHz (3DS)IMMs.
  - 64 GB 2666-MHz LRDIMMs can only be mixed with 32 GB 2666-MHz LRDIMMs.
- Any DIMM installed in a DIMM socket for which the CPU is absent is not recognized.
- Observe the DIMM mixing rules shown in ***Table 6***

Table 6 DIMM Rules for C480 M5 Servers

DIMM Parameter	DIMMs in the Same Channel	DIMM in the Same Slot[1]
DIMM Capacity RDIMM = 16, 32, 64 LRDIMM = 64 GB (2933 MHz only), 128 GB	DIMMs in the same channel (for example, A1 and A2) can have different capacities.	For best performance, DIMMs in the same slot (for example, A1, B1, C1, D1, E1, F1) should have the same capacity.
DIMM Speed 2933 MHz or 3200 MHz	DIMMs will run at the lowest speed of the CPU installed	DIMMs will run at the lowest speed of the CPU installed
DIMM Type RDIMMs or LRDIMMs	Do not mix: ■ DIMMs with different clock rates in a channel ■ RDIMMs and LRDIMMs with any other DIMMs	Do not mix DIMM types in a slot

Notes:

1. Although different DIMM capacities can exist in the same slot, this will result in less than optimal performance. For optimal performance, all DIMMs in the same slot should be identical.

DIMM Population Order

Populate the DIMMs for a CPU according to *Table 7*.

Table 7 C480 M5 DIMM Population Order

	Populate CPU1 or CPU 3 Slots		Populate CPU2 or CPU 4 Slots	
	Blue Slots	Black slots	Blue slots	Black slots
1	(A1)	-	(G1)	-
2	(A1, D1)	-	(G1, K1)	-
3	(A1, B1, C1)	-	(G1, H1, J1)	-
4	(A1,B1); (D1,E1)	-	(G1,H1); (K1,L1)	-
6	(A1,B1); (C1,D1); (E1, F1)	-	(G1,H1); (J1,K1); (L1, M1)	-
8	(A1,B1); (D1,E1)	(A2,B2); (D2,E2)	(G1,H1); (K1,L1)	(G2,H2); (K2,L2)
12	(A1,B1); (C1,D1); (E1, F1)	(A2,B2); (C2,D2); (E2, F2)	(G1, H1); (J1, K1); (L1, M1)	(G2,H2); (J2,K2); (L2,M2)

NOTE: 5, 7, 9, 10, 11 DIMMs per CPU is not recommended.

- The maximum combined memory allowed in the 12 DIMM slots controlled by any one CPU is 768 GB. To populate the 12 DIMM slots with more than 768 GB of combined memory, you must use a high-memory CPU that has a PID that ends with an “M”, for example, UCS-CPU-6134M.
- All DIMMs must be DDR4 DIMMs that support ECC. Non-buffered UDIMMs and non-ECC DIMMs are not supported.
- Memory mirroring reduces the amount of memory available by 50 percent because only one of the two populated channels provides data. When memory mirroring is enabled, you must install DIMMs in even numbers of channels.
- NVIDIA M-Series GPUs can support only less than 1 TB memory in the server.
- NVIDIA P-Series, V-series, and T-series GPUs can support 1 TB or more memory in the server.
- AMD FirePro S7150 X2 GPUs can support only less than 1 TB memory in the server.

Memory Capacities for CPU Classes

This following material describes the configurable memory capacities using DIMMs and PMem for various classes of 2nd Generation Intel® Xeon® Scalable Processors and Intel® Xeon® Scalable Processors used in C480 M5 servers.

All DIMM Configurations

This section describes the memory capacities for configurations that use all DIMMs.

All DIMM Configurations for 2nd Generation Intel® Xeon® Scalable Processors

Table 8 through *Table 10* show the possible configurations for 2nd Generation Intel® Xeon® Scalable Processors populated with all DIMMs.

Table 8 2nd Gen "M" CPUs With All DIMM Memory (4, 6, 8, or 12 DIMMs per CPU)[1]

Number of DIMMs per CPU	Capacity Per DIMM (GB)				
	16	32	64	128	256
	Total Capacity per CPU (GB)				
4	64	128	256	512	1024
6	96	192	384	768	1536
8	128	256	512	1024	2048
12	192	384	768	1536	N/A

Notes:

1. Total DIM M capacity for 2nd Gen "M" CPUs cannot exceed 2048 GB



NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 2048 GB and therefore cannot be configured.

Table 9 2nd Gen "L" CPUs With All DIMM Memory (4, 6, 8, or 12 DIMMs per CPU)[1]

Number of DIMMs per CPU	Capacity Per DIMM (GB)				
	16	32	64	128	256
	Total Capacity per CPU (GB)				
4	64	128	256	512	1024
6	96	192	384	768	1536
8	128	256	512	1024	2048
12	192	384	768	1536	3072

Notes:

1. Total DIM M capacity for 2nd Gen "L" CPUs cannot exceed 3072 GB

Table 10 2nd Gen non-"M" and non-"L" CPU All DIMM Memory (4, 6, 8, or 12 DIMMs per CPU)[1]

Number of DIMMs per CPU	Capacity Per DIMM (GB)				
	16	32	64	128	256
	Total Capacity per CPU (GB)				
4	64	128	256	512	1024
6	96	192	384	768	N/A
8	128	256	512	1024	N/A
12	192	384	768	N/A	N/A

Notes:

1. Total DIM M capacity for 2nd Gen non-"M" and non-"L" CPUs cannot exceed 1024 GB



NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 1024 GB and therefore cannot be configured.

All DIMM Configurations for Intel® Xeon® Scalable Processors

Table 11 and *Table 12* show the possible configurations for Intel® Xeon® Scalable Processors populated with all DIMMs.

NOTE: Intel® Xeon® Scalable Processors do not support PMem and do not support 256 GB DIMMs.

Table 11 Regular "M" CPU All DIMM Memory (4, 6, 8, or 12 DIMMs per CPU)

Number of DIMMs per CPU	Capacity Per DIMM (GB)			
	16	32	64	128
	Total Capacity per CPU (GB)			
4	64	128	256	512
6	96	192	384	768
8	128	256	512	1024
12	192	384	768	1536

Table 12 Regular non-"M" CPU All DIMM Memory (4, 6, 8, or 12 DIMMs per CPU)[1]

Number of DIMMs per CPU	Capacity Per DIMM (GB)			
	16	32	64	128
	Total Capacity per CPU (GB)			
4	64	128	256	512
6	96	192	384	768
8	128	256	512	N/A
12	192	384	768	N/A

Notes:

1. Total DIM M capacity for regular non-"M" CPUs cannot exceed 768 GB

NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 768 GB and therefore cannot be configured.

Mixed DIMM/PMem Configurations

This section describes the memory capacities for configurations that use a combination of DIMMS and PMem.

DIMM/PMem Configurations for 2nd Generation Intel® Xeon® Scalable Processors

Table 21, *Table 22*, and *Table 23* show the possible configurations for 2nd Generation Intel® Xeon® Scalable Processors populated with combinations of DIMMs and PMem. When PMem are selected, there must be 6 DIMMs per CPU and can be 2, 4, or 6 PMem per CPU, depending on CPU class (“M”, “L”, or regular class) and PMem capacity. Selection of PMem also requires that all CPUs be fully populated. The tables below show configurations for 1 CPU. For Memory Mode and Mixed Memory Mode, the Intel-recommended DIMM to PMem capacity ratio for the same CPU is from 1:2 to 1:16. The green-shaded cells of the table indicate ratios within that range, while the red-shaded portions indicate ratios outside that range. For App Direct Mode, the ratio requirement does not apply.

For 2nd Generation Intel® Xeon® Scalable Processors:

- DIMMs and PMem are supported
- CPU PIDs ending in “M” support up to a limit of 2048 GB per CPU
- CPU PIDs ending in “L” support up to a limit of 4608 GB per CPU
- All other CPU PIDs support up to a limit of 1024 GB per CPU
- For the App Direct Mode, both PMem and DIMM capacities count towards the CPU capacity limit
- For the Memory Mode and Mixed Mode only the PMem capacity counts towards the CPU capacity limit. DIMMs are used for cache only and do not counts toward the CPU capacity limit.

App Direct Mode

The following tables apply to the App Direct Mode. For App Direct Mode, the DIMM to PMem ratio requirement does not apply.

Table 13 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	256
Total Capacity per CPU	**352**	**448**	**640**	**1024**	**1792**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	512	512
Total Capacity per CPU	**608**	**704**	**896**	**1280**	**2048**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	1024	1024	1024	1024	N/A
Total Capacity per CPU	**1120**	**1216**	**1408**	**1792**	N/A

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	512	512
Total Capacity per CPU	**608**	**704**	**896**	**1280**	**2048**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	1024	1024	1024	1024	N/A
Total Capacity per CPU	**1120**	**1216**	**1408**	**1792**	N/A

Table 13 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 4 PMem	**512 x4**	**512 x4**	**512 x4**	**512 x4**	**512 x4**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	N/A
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	768	768	N/A
Total Capacity per CPU	**864**	**960**	**1152**	**1536**	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	N/A
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	N/A
Total PMem Capacity (GB)	1536	1536	1536	1536	N/A
Total Capacity per CPU	**1632**	**1728**	**1920**	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected

NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 2048 GB and therefore cannot be configured.

Table 14 2nd Gen "L" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	256
Total Capacity per CPU	**352**	**448**	**640**	**1024**	**1792**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	512	512
Total Capacity per CPU	**608**	**704**	**896**	**1280**	**2048**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
Total Capacity per CPU	**1120**	**1216**	**1408**	**1792**	**2560**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	512	512
Total Capacity per CPU	**608**	**704**	**896**	**1280**	**2048**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
Total Capacity per CPU	**1120**	**1216**	**1408**	**1792**	**2560**

Table 14 2nd Gen "L" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**512 x4**	**512 x4**	**512 x4**	**512 x4**	**512 x4**
Total PMem Capacity (GB)	2048	2048	2048	2048	2048
Total Capacity per CPU	**2144**	**2240**	**2432**	**2816**	**3584**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	768	768	768
Total Capacity per CPU	**864**	**960**	**1152**	**1536**	**2304**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	**256 x6**
Total PMem Capacity (GB)	1536	1536	1536	1536	1536
Total Capacity per CPU	**1632**	**1728**	**1920**	**2304**	**3072**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**512 x6**	**512 x6**	**512 x6**	**512 x6**	**512 x6**
Total PMem Capacity (GB)	3072	3072	3072	3072	3072
Total Capacity per CPU	**3168**	**3264**	**3456**	**3840**	**4608**

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected

Table 15 2nd Gen non-“L” and non-”M” CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	N/A
Total Capacity per CPU	**352**	**448**	**640**	**1024**	N/A

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	N/A	N/A
Total Capacity per CPU	**608**	**704**	**896**	N/A	N/A

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	N/A	N/A
Total Capacity per CPU	**608**	**704**	**896**	N/A	N/A

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Table 15 2nd Gen non-“L” and non-”M” CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU) *(continued)*

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 4 PMem	**512 x4**	**512 x4**	**512 x4**	**512 x4**	**512 x4**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	N/A	N/A	N/A
Total Capacity per CPU	**864**	**960**	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	**256 x6**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**512 x6**	**512 x6**	**512 x6**	**512 x6**	**512 x6**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected



NOTE:

- The cells marked with N/A indicate a memory capacity configuration that would be more than the allowable 1024 GB and therefore cannot be configured.
- Configurations of any 6 DIMMs and 2 512 GB PMem, or any 6 DIMMs and any 6 PMem are not valid, because they always exceed the 1024 GB capacity limit.

Memory Mode and Mixed Mode

The following tables apply to the Memory Mode and Mixed Mode. The recommended DIMM:PMem ratio for Memory Mode is from 1:2 to 1:16. Ratios in that range are indicated in green shading below; ratios outside that range are indicated in red shading. In Mixed Mode, the ratio is between memory and only the volatile portion of the PMem and is not specifically called out in the tables below because the ratio depends on how much of the PMem memory has been allocated to volatile memory.



NOTE: For Memory and Mixed Modes, DIMMs are used as cache and do not factor into CPU capacity.

Table 16 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	256
DIMM:PMem capacity ratio per CPU	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**	**2:0.167**
Total Capacity per CPU	**256**	**256**	**256**	**256**	**256**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB) (cache only)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	512	512
DIMM:PMem capacity ratio per CPU	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**

Table 16 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB) (cache only)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	**1:10.67**	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB) (cache only)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	512	512
DIMM:PMem capacity ratio per CPU	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB) (cache only)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	**1:10.66**	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**

Table 16 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**512 x4**	**512 x4**	**512 x4**	**512 x4**	**512 x4**
Total PMem Capacity (GB)	2048	2048	2048	2048	2048
DIMM:PMem capacity ratio per CPU	**1:21.33**	**1:10.66**	**1:5.33**	**1:2.67**	**1:1.33**
Total Capacity per CPU	**2048**	**2048**	**2048**	**2048**	**2048**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	768	768	768
DIMM:PMem capacity ratio per CPU	**1:8**	**1:4**	**1:2**	**1:1**	**1:0.5**
Total Capacity per CPU	**768**	**768**	**768**	**768**	**768**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	**256 x6**
Total PMem Capacity (GB)	1536	1536	1536	1536	1536
DIMM:PMem capacity ratio per CPU	**1:16**	**1:8**	**1:4**	**1:2**	**1:1**
Total Capacity per CPU	**1536**	**1536**	**1536**	**1536**	**1536**

Table 16 2nd Gen "M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**512 x6**	**512 x6**	**512 x6**	**512 x6**	**512 x6**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
DIMM:PMem capacity ratio per CPU	**1:32**	**1:16**	**1:8**	**1:4**	**1:2**
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected



NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 2048 GB for "M" CPUs and therefore cannot be configured.

Table 17 2nd Gen "L" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	256
DIMM:PMem capacity ratio per CPU	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**	**1:0.67**
Total Capacity per CPU	**256**	**256**	**256**	**256**	**256**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	512	512

Table 17 2nd Gen "L" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
DIMM:PMem capacity ratio per CPU	1:5.33	1:2.67	1:1.33	1:0.67	1:0.33
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	1:10.66	1:5.33	1:2.67	1:1.33	1:0.67
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	512	512
DIMM:PMem capacity ratio per CPU	1:5.33	1:2.67	1:1.33	1:0.67	1:0.33
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	1:10.66	1:5.33	1:2.67	1:1.33	1:0.67
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**512 x4**	**512 x4**	**512 x4**	**512 x4**	**512 x4**
Total PMem Capacity (GB)	2048	2048	2048	2048	2048
DIMM:PMem capacity ratio per CPU	1:21.33	1:10.66	1:5.33	1:2.67	1:1.33
Total Capacity per CPU	**2048**	**2048**	**2048**	**2048**	**2048**

Table 17 2nd Gen "L" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	768	768	768
DIMM:PMem capacity ratio per CPU	**1:8**	**1:4**	**1:2**	**1:1**	**2:1**
Total Capacity per CPU	**768**	**768**	**768**	**768**	**768**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	**256 x6**
Total PMem Capacity (GB)	1536	1536	1536	1536	1536
DIMM:PMem capacity ratio per CPU	**1:16**	**1:8**	**1:4**	**1:2**	**1:1**
Total Capacity per CPU	**1536**	**1536**	**1536**	**1536**	**1536**

Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 6 PMem	**512 x6**	**512 x6**	**512 x6**	**512 x6**	**512 x6**
Total PMem Capacity (GB)	3072	3072	3072	3072	3072
DIMM:PMem capacity ratio per CPU	**1:32**	**1:16**	**1:8**	**1:4**	**1:2**
Total Capacity per CPU	**3072**	**3072**	**3072**	**3072**	**3072**

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected

Table 18 2nd Gen non-"L" and non-"M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU)

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**128 x2**	**128 x2**	**128 x2**	**128 x2**	**128 x2**
Total PMem Capacity (GB)	256	256	256	256	256
DIMM:PMem capacity ratio per CPU	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**	**1:0.67**
Total Capacity per CPU	**256**	**256**	**256**	**256**	256

Table 18 2nd Gen non-“L” and non-”M” CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU) *(continued)*

Number of DIMMs[1]/PMem per CPU					
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**256 x2**	**256 x2**	**256 x2**	**256 x2**	**256 x2**
Total PMem Capacity (GB)	512	512	512	512	512
DIMM:PMem capacity ratio per CPU	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	**1:10.66**	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**128 x4**	**128 x4**	**128 x4**	**128 x4**	**128 x4**
Total PMem Capacity (GB)	512	512	512	512	512
DIMM:PMem capacity ratio per CPU	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**	**1:0.33**
Total Capacity per CPU	**512**	**512**	**512**	**512**	**512**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536
Capacity Per PMem(GB) x 4 PMem	**256 x4**	**256 x4**	**256 x4**	**256 x4**	**256 x4**
Total PMem Capacity (GB)	1024	1024	1024	1024	1024
DIMM:PMem capacity ratio per CPU	**1:10.66**	**1:5.33**	**1:2.67**	**1:1.33**	**1:0.67**
Total Capacity per CPU	**1024**	**1024**	**1024**	**1024**	**1024**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 2 PMem	**512 x2**	**512 x2**	**512 x2**	**512 x2**	**512 x2**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
DIMM:PMem capacity ratio per CPU	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	96	192	384	768	1536

Table 18 2nd Gen non-"L" and non-"M" CPU DIMM/PMem Memory (6 DIMMs per CPU, and 2, 4, or 6 PMem per CPU) *(continued)*

Number of DIMMs[1]/PMem per CPU					
Capacity Per PMem(GB) x 6 PMem	**128 x6**	**128 x6**	**128 x6**	**128 x6**	**128 x6**
Total PMem Capacity (GB)	768	768	768	768	768
DIMM:PMem capacity ratio per CPU	**1:8**	**1:4**	**1:2**	**1:1**	**2:1**
Total Capacity per CPU	**768**	**768**	**768**	**768**	**768**
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**256 x6**	**256 x6**	**256 x6**	**256 x6**	**256 x6**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
DIMM:PMem capacity ratio per CPU	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A
Capacity Per DIMM(GB) x 6 DIMMs	**16 x6**	**32 x6**	**64 x6**	**128 x6**	**256 x6**
Total DIMM Capacity (GB)	N/A	N/A	N/A	N/A	N/A
Capacity Per PMem(GB) x 6 PMem	**512 x6**	**512 x6**	**512 x6**	**512 x6**	**512 x6**
Total PMem Capacity (GB)	N/A	N/A	N/A	N/A	N/A
DIMM:PMem capacity ratio per CPU	N/A	N/A	N/A	N/A	N/A
Total Capacity per CPU	N/A	N/A	N/A	N/A	N/A

Notes:

1. If PMem are selected, 6 DIMMs per CPU must also be selected.



NOTE: The cells marked with N/A indicate a memory capacity that would be more than the allowable 1024 GB for non "M" and non "L" CPUs and therefore cannot be configured.

Installing a DIMM or DIMM Blank

To install a DIMM or a DIMM blank into a slot on the blade server, follow these steps.

Procedure

Step 1 Open both DIMM connector latches.

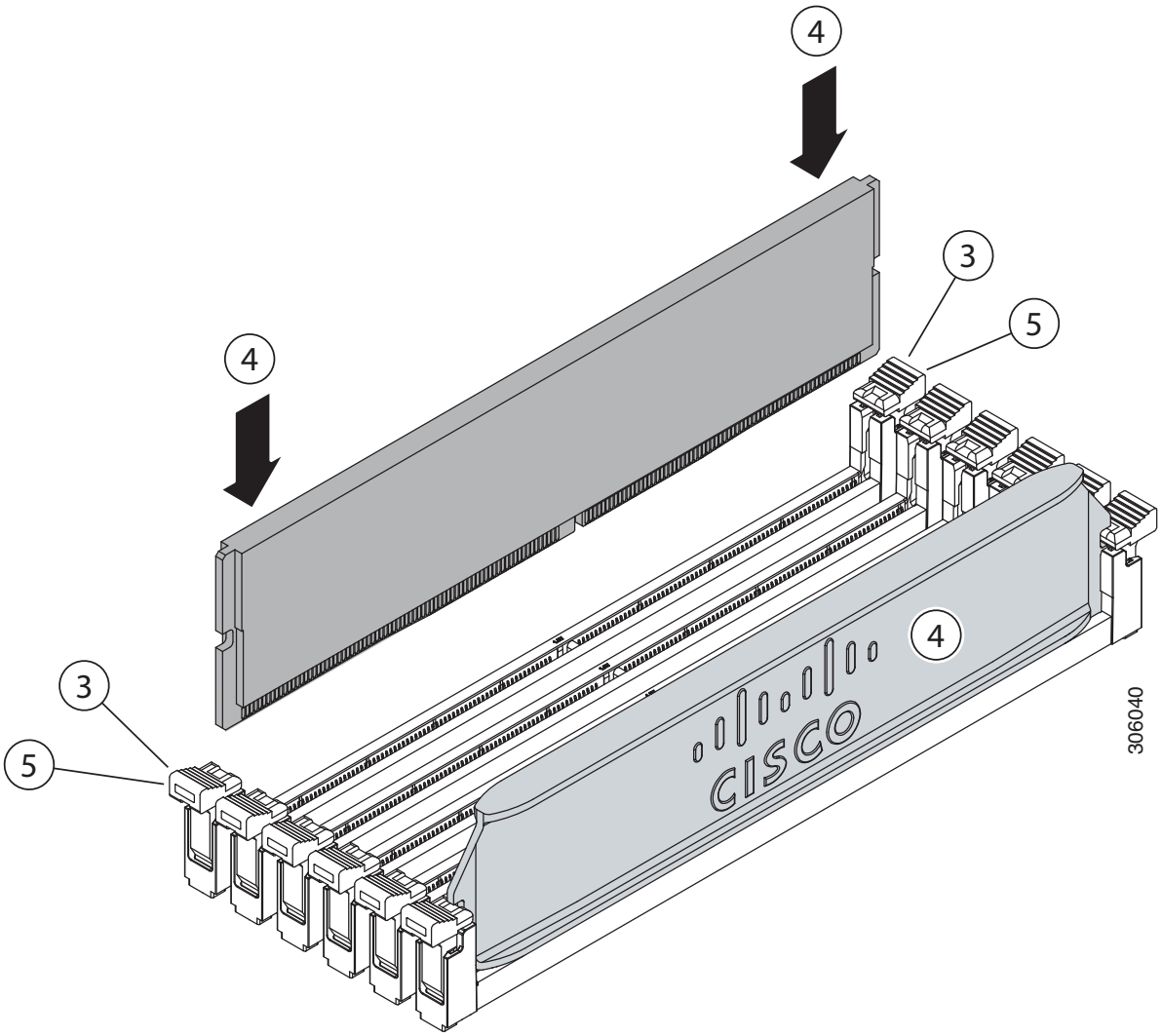
Step 2 Press evenly on both ends of the DIMM until it clicks into place in its slot

Note: Ensure that the notch in the DIMM aligns with the slot. If the notch is misalignment is possible damage the DIMM, the slot, or both.

Step 3 Press the DIMM connector latches inward slightly to seat them fully.

Step 4 Populate all slots with a DIMM or DIMM blank. A slot cannot be empty.

Figure 4 Installing Memory





Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

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