



Memory

Memory introduction and configurations



Memory features

Purley systems have the following memory features:

- Two integrated memory controllers per CPU
- Six DDR4 channels
- Up to two DIMMs per channel
- Do not mix RDIMMs, LRDIMMs, and 3DS DIMMs in the same node.
- To decide which 16 GB DIMM to use:
 - For best RAS features, use 1Rx4
 - For top performance, use 2Rx8
- For top performance configuration, use memory capacity that is dividable by six in the DIMM counts.
- When combining DIMMs per channel, make sure you have 1, 2, or 4 ranks per channel for best performance. For example:
 - Configuring 24 GB memory per DDR4 channel: Mix 8 GB (1Rx8) with 16 GB (1Rx4). This produces two ranks per channel. Mixing with 16 GB (2Rx8) can work, but the performance will go down because this produces three ranks per channel.

*Needs M suffix CPU. Not every SKU has M suffix CPU.

DIMM	Technology
8 GB	1Rx8
16 GB	1Rx4
16 GB	2Rx8
32 GB	2Rx4
64 GB	4Rx4 LRDIMM
128 GB	8Rx4 3DS RDIMM

Memory per DDR4 channel	2-socket memory capacity	8-socket memory capacity
8 GB	96 GB	N/A
16 GB	192 GB	768 GB
24 GB	288 GB	N/A
32 GB	384 GB	1.5 TB
48 GB	576 GB	2.3 TB
64 GB	768 GB	3.0 TB
128 GB*	1.5 TB	6.1 TB
256 GB*	3.0 TB	12.2 TB

Three-dimensional stack registered DIMMs (3DS RDIMMs)

ThinkSystem servers support three-dimensional stack registered DIMMs (3DS RDIMMs). 3DS DRAM stacking technology enables higher power efficiency, higher performance, and better system scalability for in-memory computing.

3DS DIMMs will be available later. For the list of supported DIMMs, please refer to: [Lenovo ServerProven](#) website.

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Memory population rules

General population rules for DIMM:

- Mixing memory types is ~~not supported~~.
- Only ECC DIMM supported.
- Mix memory vendors only with Lenovo qualified.
- Mixing memory capacity is supported. Install higher capacity DIMM first.
- Mixing memory rank is supported. Install higher rank first on slot 0.
- 2666 memory frequency DIMMs are supported.
 - Operating speed depends on the processor model and UEFI operating mode. For example: 31xx only supports 2133 memory frequency.
- Population priority when mixing DIMM: rank > capacity

Additional rules for mirroring mode:

- Equal DIMM sizes must be installed on the populated DDR channels.
- If three DDR channels have DIMMs, then mirroring must occur across all three DIMMs:
 - Channels 0, 1, channels 1, 2, and channels 2, 0 hold primary and secondary copies.
- If two DIMMs are installed, then mirroring needs to occur across two DIMMs:
 - Channels 0, 1 hold all the primary and secondary cache lines.
- Must install equal density DRAMs on each of the DDR channel.
- Within a partition, integrated memory controllers must be configured in two or three DDR mirror channels. ~~Do not~~ mix the two.

Memory RAS mode and population requirements

System-level RAS Mode combination limitations:

- Mixing non-mirrored and mirrored mode is not allowed on the platform.
- Mixing sparing mode and mirrored mode is not allowed on the platform.

The rules on channel DIMM population and channel DIMM matching vary by the RAS mode used. However, regardless of RAS mode, the requirements for DIMM populating within a system and a channel must be met at all times.

The best RAS capability requires two ranks per channel.

For RAS modes that require matching DIMM populations, the same slot positions across channels must hold the same DIMM type with regards to size and organization.

Click different modes to view the details.

Independent mode

Rank sparing mode

Mirroring mode

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All six channels can be populated in any order and there are no DIMM matching requirements in independent channel mode. However, all channels must run at the same interface frequency.

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In rank sparing mode, one rank is the spare for the other rank on the same channel. The spare rank is held in reserve and are not available as system memory. The spare rank must have identical or larger memory capacity than any of the other ranks (sparing source ranks) on the same channel. After sparing, the sparing source rank will no longer be available as system memory.

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In mirroring mode, the memory contents are mirrored between channels 0, 1, 2 or channels 3, 4, and 5. For example, the memory contents can be mirrored between channel 0 DIMM0 and channel 1 DIMM0, between channel 0 DIMM0 and channel 2 DIMM0.

Independent mode

Rank sparing mode

Mirroring mode