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Micron® DDR5 Server DRAM: High-performance memory for next-gen workloads

As you read this, your business is generating terabytes of new data

You need super latency, energy efficiency, and bandwidth to manage it

Micron DDR5 server DRAM delivers unparalleled performance, offering more than double the bandwidth[1] of DDR4. With integrated power management circuits (PMICs) to reduce power consumption and costs, Micron DDR5 is the ideal solution for businesses that require real-time responsiveness, scalability, and reliability. It's well-suited for resource-intensive tasks like AI and HPC.

Key benefits

- Faster processing times for real-time applications and industry-specific AI
- More than double the bandwidth of DDR4 to meet the increasing demands of data-intensive industries
- Enhanced energy efficiency for better power management and reducing TCO
- Broad compatibility with a wide range of server platforms

Learn more about DDR5

Industry applications

The following examples show how some industries can benefit from high-performance server memory
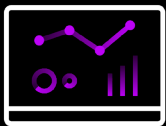
Finance

- Real-time financial analytics and modeling
- Risk management and fraud detection
- High-speed processing for trading and transactions

Healthcare

- Real-time patient monitoring and diagnostics
- Secure and rapid access to electronic health records (EHR)
- AI-driven predictive analytics for better patient outcomes

SaaS

- Low-latency performance to improve customer experience
- Scalable platforms to support rapid user growth
- AI-driven personalization and insights

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Test results show improved performance, bandwidth and power efficiency

High-capacity DDR5 RDIMMs

Micron high-capacity DDR5 main memory offers a market-leading 128GB DDR module leveraging monolithic 32Gb DRAM for a >45% increase in bit density on 1β node[2]

- 17% lower latency for AI inference[3]

High-performance, high-capacity MRDIMM

Micron MRDIMMs help you achieve the best bandwidth and lowest latency, even at the highest capacities

- 39% increase in bandwidth[4]
- 40% lower load latency[5]
- 11% better task energy efficiency[6]

Near memory

Main memory

Expansion memory

Local SSD data cache

Networked data lakes
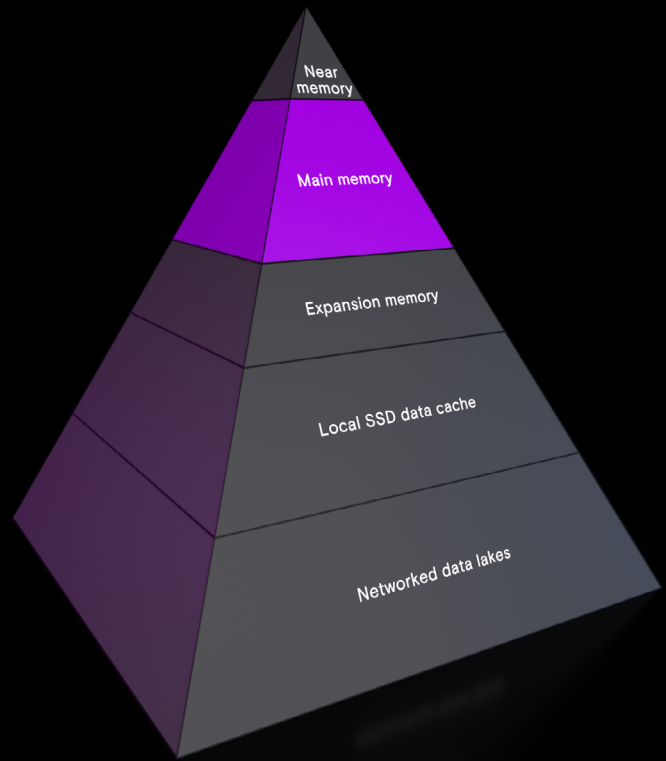
HPC – SPEC CPU on MRDIMM

SPEC CPU[7] benchmarks reveal that MRDIMMs show superior high-performance computing (HPC) performance compared to RDIMMs

- 12% better INTSpeed Geomean score with MRDIMMs over RDIMMs
- 9% better FPRATE Geomean score with MRDIMMs over RDIMMs
- ~40-50% more bandwidth with MRDIMMs over RDIMMs

Geomean score
(Higher is better)

● 1DPC 64GB RDIMM (2Rx4) 6400 MT/s   ● 1DPC 64GB MRDIMM (2Rx4) 8800 MT/s

SPEC CPU IntSpeed

12% increase

- 8.49
- 9.52

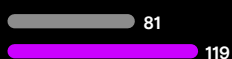**SPEC CPU FPRate**

9% increase

- 1770
- 1930

Highest memory bandwidth (GB/s) comparison

● 1DPC 64GB RDIMM (2Rx4) 6400 MT/s   ● 1DPC 64GB MRDIMM (2Rx4) 8800 MT/s

IntSpeed

47% increase

- 81
- 119

FPRate
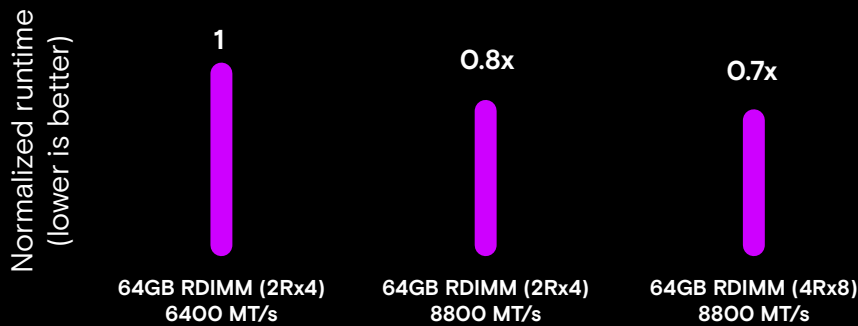
39% increase

- 1026
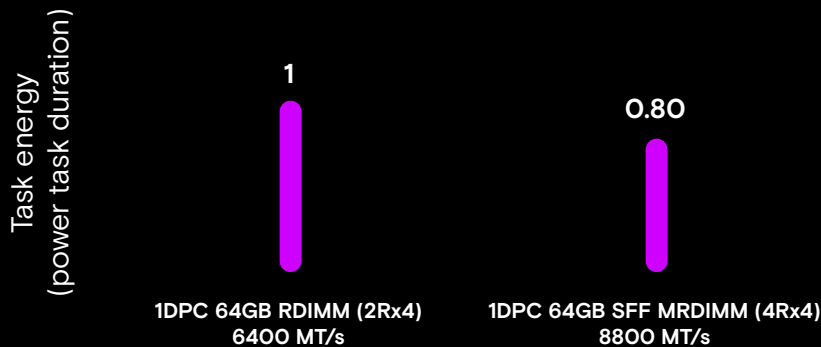- 1424

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HPC – CFD OpenFOAM with MRDIMM

Testing with OpenFOAM Computational Fluid Dynamics (CFD) software demonstrates the performance and energy efficiency advantages of MRDIMMs over RDIMMs for HPC workloads[7]

- 0.07x speedup with 64GB MRDIMMs (4Rx8 8800 MT/s) over 6400 MT/s RDIMMs on Intel® Xeon® 6 with P-cores
- 20% better task-energy with 64GB MRDIMMs (4Rx8 8800 MT/s) over 6400 MT/s RDIMMs
- 0.08x speedup with 64GB MRDIMMs (2Rx4 8800 MT/s) over 6400 MT/s RDIMMs

OpenFOAM runtime – 1P/96c
MotorBike Mesh – 600x300x300

Normalized runtime (lower is better)

1	0.8x	0.7x
64GB RDIMM (2Rx4) 6400 MT/s	64GB RDIMM (2Rx4) 8800 MT/s	64GB RDIMM (4Rx8) 8800 MT/s

OpenFOAM benchmark
MotorBike 600x300x300 task energy

Task energy (power task duration)

| 1	0.80
1DPC 64GB RDIMM (2Rx4) 6400 MT/s	1DPC 64GB SFF MRDIMM (4Rx4) 8800 MT/s

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HPC – Solar Physics (POT3D) on MRDIMM

MRDIMMs achieve better performance and energy efficiency than RDIMMs in Solar Physics (POT3D) simulations for HPC[7]

- 1.3x speedup with 128GB TFF MRDIMMs (4Rx8 8800 MT/s) over 6400 MT/s RDIMMs on Intel® Xeon® 6 with P-cores
- 13% better task-energy with 128GB TFF MRDIMMs (4Rx8 8800 MT/s) over 6400 MT/s RDIMMs

POT3D large mesh2
(Speedup)

>1.3x

1.0

1DPC 128GB RDIMM (2Rx4)
6400 MT/s

1DPC 128GB TFF MRDIMM (4Rx4)
8800 MT/s

HPC – Solar Physics (POT3D) on MRDIMM
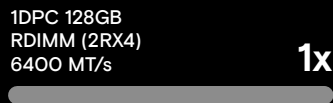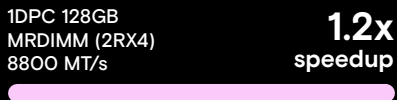
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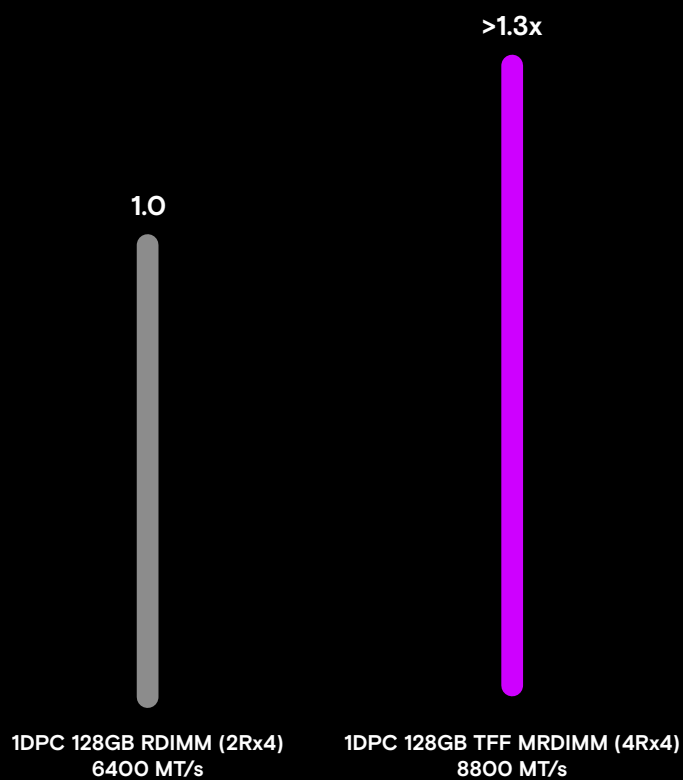
AI SVM with MRDIMM

MRDIMMs deliver significant performance gains over RDIMM for artificial intelligence (AI) support vector machine (SVM) workloads

Support vector machine supervised machine learning (ML) with 2.4TB dataset

- 1.2x improvement in SVM performance with 128GB MRDIMM bandwidth on Intel® Xeon® 6 with P-cores
- 1.7x improvement in SVM performance using 256GB MRDIMM extra capacity and bandwidth
- 10x reduction in storage I/O with 256GB MRDIMMs compared to 128GB RDIMMs

Apache SPARK AI SVM improvement
Speedup (higher is better)

1DPC 256GB
MRDIMM (4RX4)
8800 MT/s
1.7x speedup

1DPC 128GB
MRDIMM (2RX4)
8800 MT/s
1.2x speedup

1DPC 128GB
RDIMM (2RX4)
6400 MT/s
1x

Average memory used
Data in GB

24x 256GB
DIMMS
(6TB total)
5,564

24x 128GB
DIMMS
(3TB total)
2,998

Data movement to/from storage
Reduction in data movement

24x 256GB
DIMMS
(6TB total) **0.1x**

24x 128GB
DIMMS
(3TB total)
1.0x

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AI RAG VectorDB MRDIMM

MRDIMMs achieve performance gains and lower latency over RDIMMs when using retrieval-augmented generation (RAG) to provide additional context for large language models (LLMs) to improve the quality of response
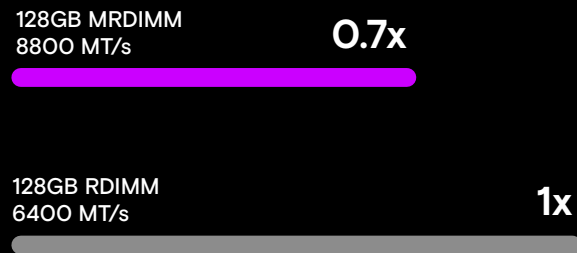
MRDIMM 128GB vs RDIMM 128GB

- 20% more queries per second processed with MRDIMMs, boosting RAG performance
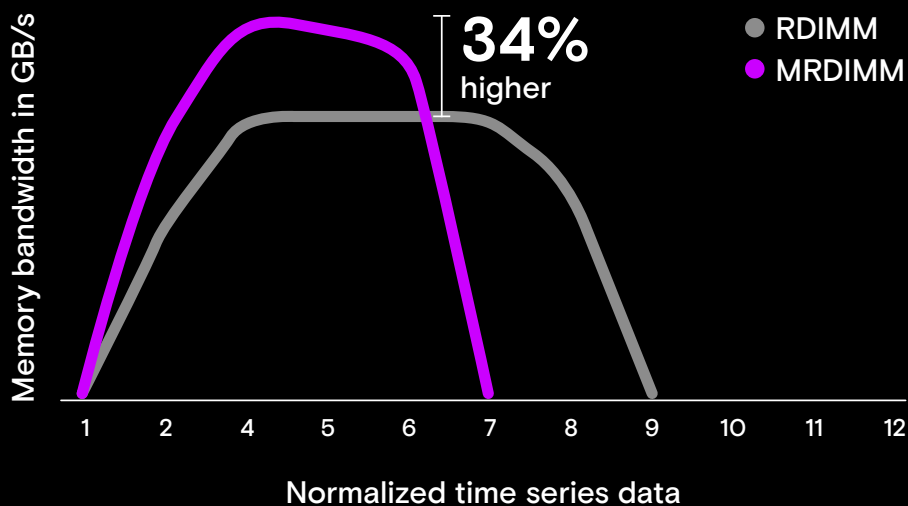- 34% higher peak memory bandwidth utilization with 30% lower memory latency

Queries per second (QPS) improvement for 15K parallel queries
(higher is better)

128GB MRDIMM
8800 MT/s
1.2x

128GB RDIMM
6400 MT/s
1x

Memory latency for vector search
(lower is better)

128GB MRDIMM
8800 MT/s
0.7x

128GB RDIMM
6400 MT/s
1x

Memory bandwidth access pattern

Memory bandwidth in GB/s

34% higher

● RDIMM
● MRDIMM

1   2   3   4   5   6   7   8   9   10   11   12

Normalized time series data

AI SVM with 128GB high-capacity RDIMM

128GB RDIMMs offer higher GB/core for AI support vector machine (SVM) tasks

SVM supervised ML with 2TB dataset

- 1.3x faster SVM performance on 5th Gen AMD EPYC™ processors (Turin) with 128GB RDIMMs compared to 96GB RDIMMs on 4th Gen AMD EPYC™ processors (Genoa), due to increased memory capacity, clock speed, and core count
- 1.3x higher system memory bandwidth utilization achieved with 128GB RDIMMs on high-core count Turin CPUs

Normalized execution time speedup
(higher is better)

AMD Turin + 128GB@6400 MT/s — **1.3x**

AMD Genoa + 96GB@4800 MT/s — **1x**

System memory bandwidth utilization
(higher is better)

AMD Turin + 128GB@6400 MT/s — **1.3x**

AMD Genoa + 96GB@4800 MT/s — **1x**

Find your ideal memory solutions

Whether you're upgrading existing systems or building new servers, our experts are here to help you find the right memory solution and capacity.

We rigorously test configurations across diverse platforms and workloads to innovative solutions for complex challenges. Our expert insights and test data can give you the tools you need to upgrade and optimize your system, no matter your workload.

Find your fit at microncpg.com/DDR5

1. DDR5 launch data rate of 4800 MT/s transfers 1.5x (50%) more data than the maximum standard DDR4 data rate of 3200 MT/s. JEDEC projected speeds of 8800 MT/s are 2.75x faster than DDR4's maximum standard data rate of 3200 MT/s.
2. As compared to previous 1α node generation.
3. Based on JEDEC specification.
4. Empirical Intel Memory Latency Checker (Intel MLC) data comparing 128GB MRDIMM 8800 MT/s against 128GB RDIMM 6400 MT/s.
5. Empirical Stream Triad data comparing 128GB MRDIMM 8800 MT/s against 128GB RDIMM 6400 MT/s @1TB.
6. Empirical OpenFOAM task energy comparing 128GB MRDIMM 8800 MT/s against 128GB RDIMM 6400 MT/s.
7. Intel® Xeon® 6 with P-cores Avenue City CPU 96 Cores, 2.7GHz (step 0) BIOS BHSDCRB1.IPC.0030.D67.2404051303

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