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Performance Analysis

This report compares two modern storage devices: a 7200 RPM SATA HDD and an NVMe SSD. The comparison focuses on key performance metrics like interface, read/write speeds, IOPS, and latency.

Storage Type	Interface	Sequential Read/Write (MB/s)	Random Read/Write (IOPS)	Latency (ms)
7200 RPM SATA HDD	SATA III (6 Gbps)	150 / 130	100 / 200	8-12
NVMe SSD	PCIe 4.0 (NVMe)	5000 / 4500	600,000 / 550,000	0.02

The NVMe SSD is far superior to the traditional HDD in every performance category. The HDD uses the older SATA interface, which limits its data transfer speeds. It relies on mechanical parts that cause higher latency and lower IOPS. In contrast, the NVMe SSD uses the PCIe interface, which provides massive bandwidth and almost instant access times.

In real-world use, these differences are easily noticeable. When booting an operating system, an HDD may take over a minute to load Windows or Linux, while an NVMe SSD can complete the same task in 10 to 15 seconds. Similarly, loading a large video game from an HDD often involves long wait times and slower texture loading, while an NVMe SSD allows near-instant load screens and smoother gameplay transitions. This huge performance gap is why SSDs, especially NVMe models, have become the new standard for performance computing.

Future of Storage Research: DNA Data Storage

DNA data storage is an emerging technology that aims to use deoxyribonucleic acid (DNA) molecules to store digital data. Instead of using electrical signals or magnetic fields, DNA storage encodes binary data (0s and 1s) into sequences of nucleotides represented by A, T, G, and C. Specialized machines can read and write this information by sequencing and synthesizing DNA strands.

The main advantage of DNA storage is its incredible density. A single gram of DNA could theoretically hold up to 215 petabytes of data. It is also extremely durable—DNA can last for thousands of years if kept in proper conditions. This makes it ideal for archiving massive

amounts of data, such as scientific research records, historical archives, and government data.

However, there are still major challenges. Writing and reading DNA data is currently very slow and expensive. The process requires specialized lab equipment and chemicals, making it impractical for everyday use. Error correction is also a challenge, as small mistakes in DNA synthesis or sequencing can corrupt the stored data. Researchers are working to improve these aspects, and major tech companies are investing in this field.

In the future, DNA data storage could revolutionize how we think about long-term data storage. It may not replace SSDs or HDDs for daily use, but it could become the ultimate archival solution, offering unmatched density and longevity.