

The data collected from these simulations are included in a supplementary Excel document included with submission. Each simulation was performed 32 times and the total time stored. The bandwidth was then calculated by multiplying the number of ranks by the block size and 32, then divided by the execution time to get the number of MB transferred per second. The general trend shows that doubling the number of MPI ranks nearly doubles the bandwidth. The theoretical maximum would be that twice as many processors writing/reading memory would allow for twice the bandwidth. Of course some overhead means that this cannot be exactly doubled but the results are close. Write time appeared to be slightly slower than read time (within 10%). My prediction for why this is the case is the need for the operating system to allocate more memory occasionally as the file grows in size. Allocating and moving memory takes a lot of time on the disk so this slows down the process. Scratch memory was significantly slower than NVMe by about an entire order of magnitude. This was expected because the NVMe drives are designed in the system to handle a log of bandwidth whereas the scratch memory is much slower.

Number of MPI Ranks vs. Bandwidth (MB/s) – Grouped by Read/Write and NVMe/Scratch

