

Q) Based on the timing results, roughly estimate the latency and bandwidth of this point-to-point communication and discuss how well these estimations match with the hardware specification.

Ans) Based on the results,

Bandwidth = Data transferred/Time to transfer

$$= (2^{25} * 4) \text{ Bytes} / 0.1446$$

$$\sim 885 \text{ MB/s}$$

Latency = 0.03417 ms

[Note: Bandwidth was calculated using the highest $n=2^{25}$ and Latency using lowest $n=2$]

The CPU Model for the node is Intel(R) Xeon(R) CPU E5-2640 v4 which has the Bus speed roughly mentioned as 8 GB/s.

Hence, the observed bandwidth is 10x times slower than the theoretical specification.

Some of the performance loss might be caused by MPI functions to make these measurements which introduces some overhead from the software side. Multiple cores might be sharing the full bandwidth but since we are only utilizing two of them, the performance might be impacted due to that. Also, in order to optimize for certain cases, the MPI might copy the message internally into some fast-access shared memory (like L3 cache), then the other process retrieves it there, or the other process can get the memory address directly.