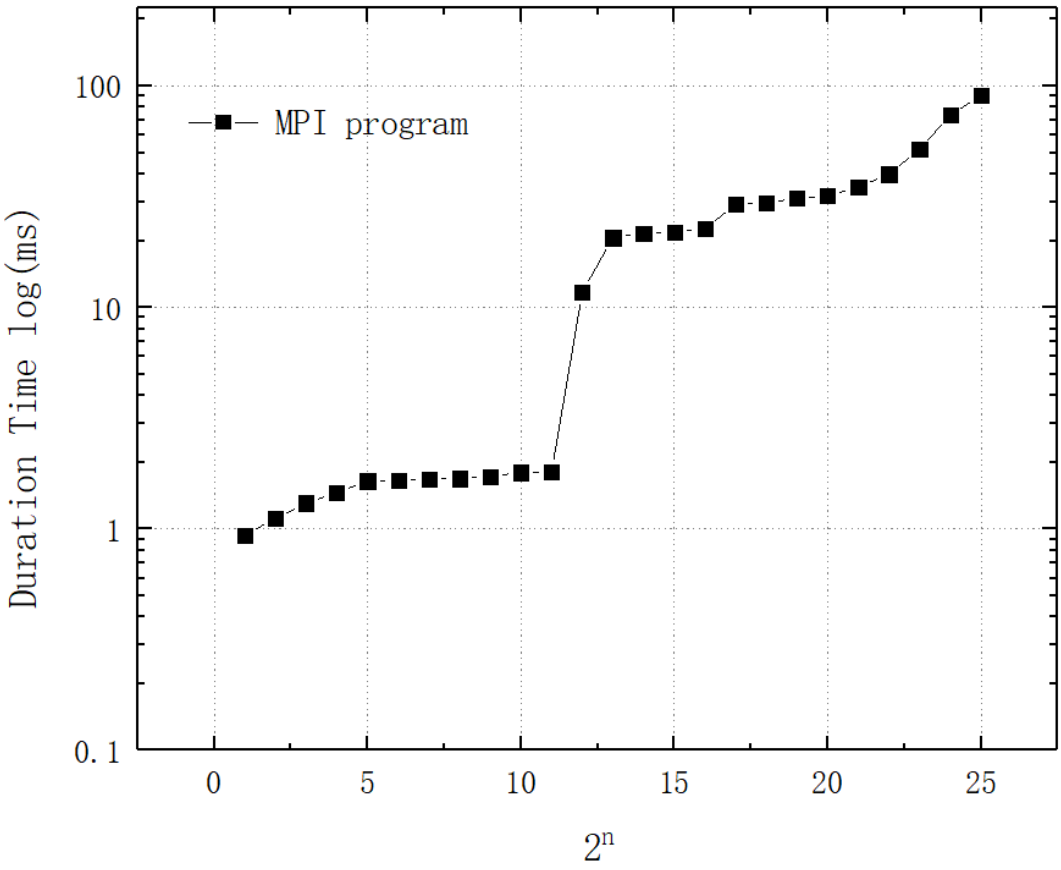
HW09 Task3 b



Estimating Latency:

Latency is the time it takes to transmit a small message from one process to another. To estimate latency, consider the transmission time for the smallest message size (e.g., n=1). When **n=1** is **0.939104** milliseconds. This time can be considered an approximation of the communication latency for this system.

Estimating Bandwidth:

Bandwidth is the rate at which data is transferred between two processes, typically measured in megabytes per second (MB/s). To estimate bandwidth, consider the transmission time for the largest message size (e.g., n=25). When **n=25** is **91.143** milliseconds. To estimate bandwidth, calculate the data transfer rate by dividing the message size (in MB) by the transmission time (in seconds).

Bandwidth (MB/s) = Message size (MB) / Transmission time (s)

For n=25, assuming each element is 4 bytes (float), the message size is 25 * 4 bytes, and the transmission time is 91.143 milliseconds. You can calculate the bandwidth accordingly.

Message Size (MB): Each element is 4 bytes (float). There are 25 elements in the message.

Message Size = 25 * 4 bytes = 100 bytes. To convert bytes to megabytes (MB), divide by 1024^2 (since 1 MB = 1024^2 bytes):

Message Size (MB) = 100 bytes / (1024^2 bytes/MB) = **0.0000953674 MB**

Transmission Time (s): The transmission time for n=25 is 91.143 milliseconds, which is equivalent to 0.091143 seconds. Now, calculate the bandwidth:

Bandwidth (MB/s) = 0.0000953674 MB / 0.091143 s ≈ **0.0010445 MB/s**

So, the estimated bandwidth for n=25 is approximately 0.0010445 MB/s. The estimated bandwidth was calculated to be **0.0010445 MB/s** based on the theoretical formula.

This estimation assumes ideal network conditions and ignores the complexities of the underlying hardware. The actual measurements, as observed from the data, show varying values of latency and bandwidth for different message sizes. As message sizes increase, the latency generally increases, which is expected. The actual bandwidth and latency measurements may not perfectly match the estimated values. Several factors could contribute to these discrepancies:

Network Conditions: The actual network conditions may not be ideal. Network congestion or other factors can affect communication performance.

Hardware Limitations: The hardware specifics of the system can impact performance. The network interface, CPU capabilities, and memory speed can all influence communication efficiency.

System Load: Other processes running on the system may affect the MPI program's performance.