

Exercise 3

To compile: unzip our uploaded code, and run `make` inside `code/`. The slurm scripts are stored inside `code/slurm/`.

3.1 Measure Latency

The MPI ping-pong implementation in `code/src/latency.cpp` is measuring the roundtrip latency for each ping pong exchange 100000 times. This results in the latencies observed in Figure 1. Visualized in red are the times for two ranks running on the same node, while the communication between two ranks on two different nodes is visualized in blue.

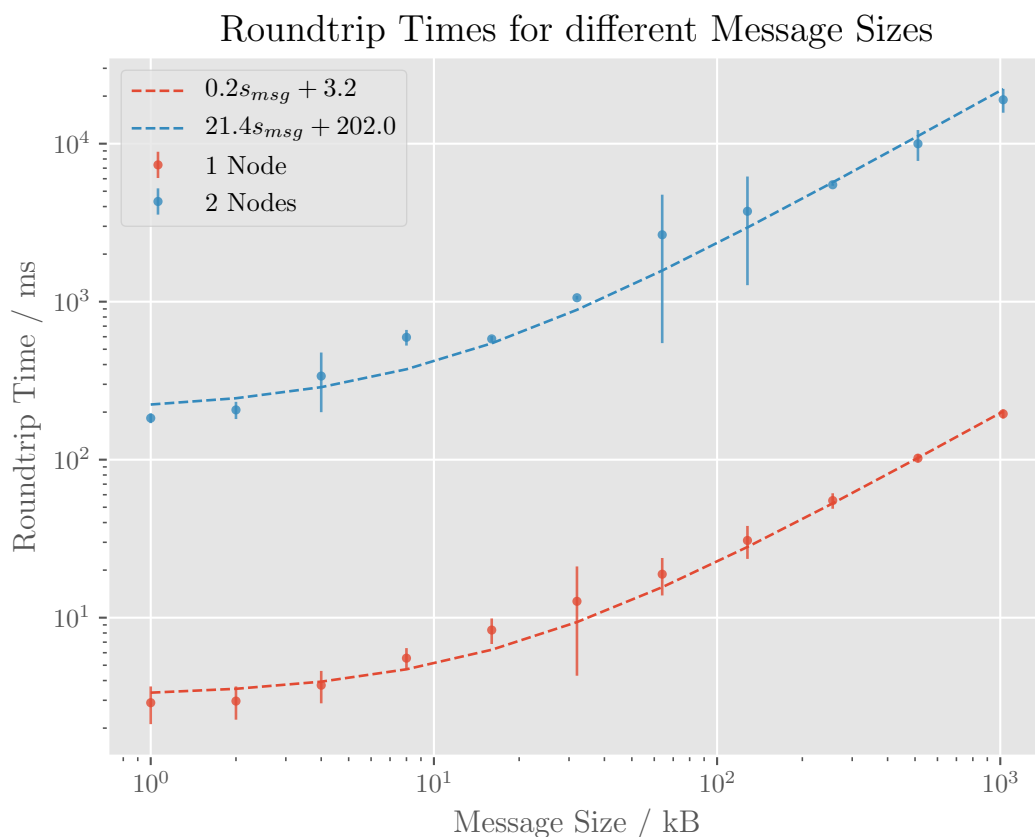


Figure 1: Roundtrip Latency over 100000 ping-pong exchanges

Both times the Latency roughly increases linearly with message size and for the communication between nodes a distinct offset and worse latency scaling can be observed

The scaling behaves worse by two magnitudes when comparing between node-to-node and inter-node communication.

3.2 Measure Bandwidth

The MPI flood-test implementation in `code/src/bandwidth.cpp` is measuring the bandwidth over an average of 1000 messages, repeating this measurement 100 times. This results in the band-

widths observed in Figure 2.

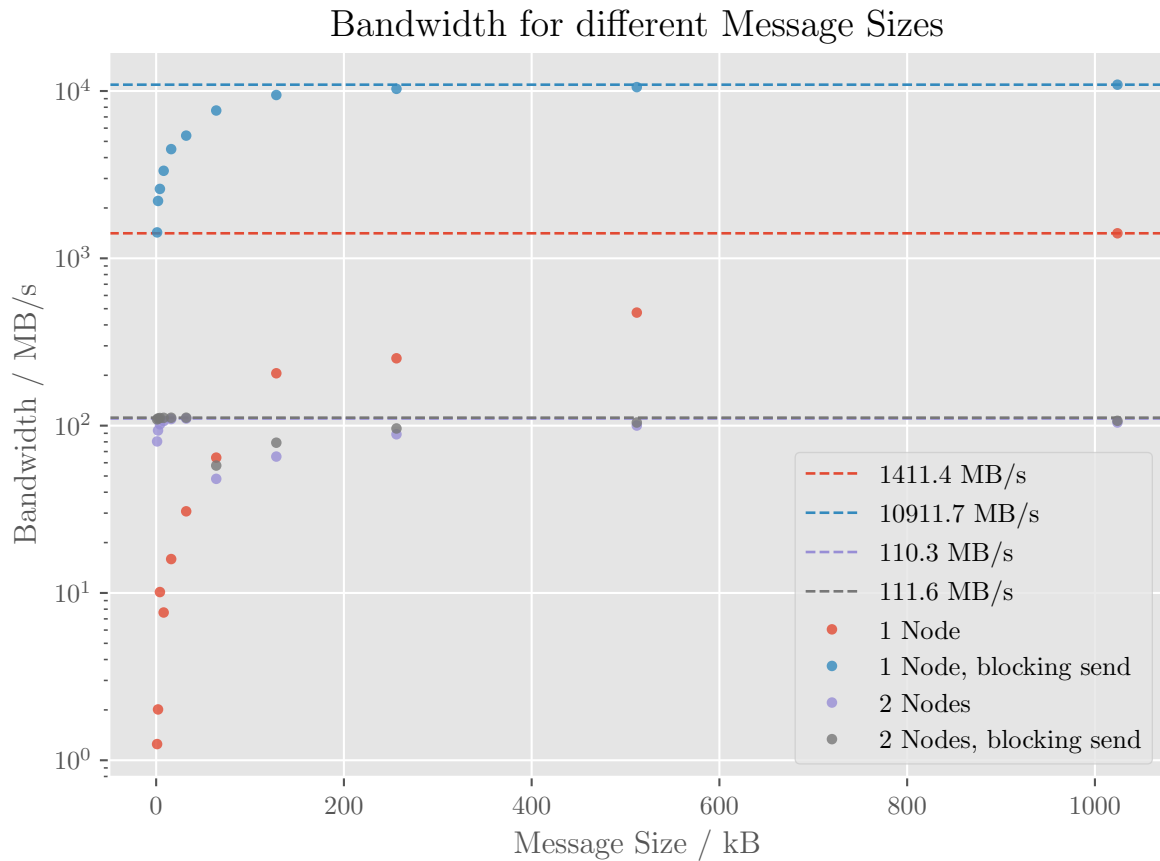


Figure 2: Bandwidth over 100000 flood-messages

Here a distinct increase in bandwidth is visible when communicating between two nodes. Additionally the communication between two nodes seems to be capped at ≈ 111 MB/s, in which case the interconnect may be the reason (1 Gb/s minus additional overhead). **No distinct difference between blocking and non-blocking send** is observable when communication between nodes.

For the communication within one node, a distinct difference between blocking and non-blocking send was observable, here the **blocking send bandwidth was around 30 % higher**.

3.3 Matrix multiply — sequential