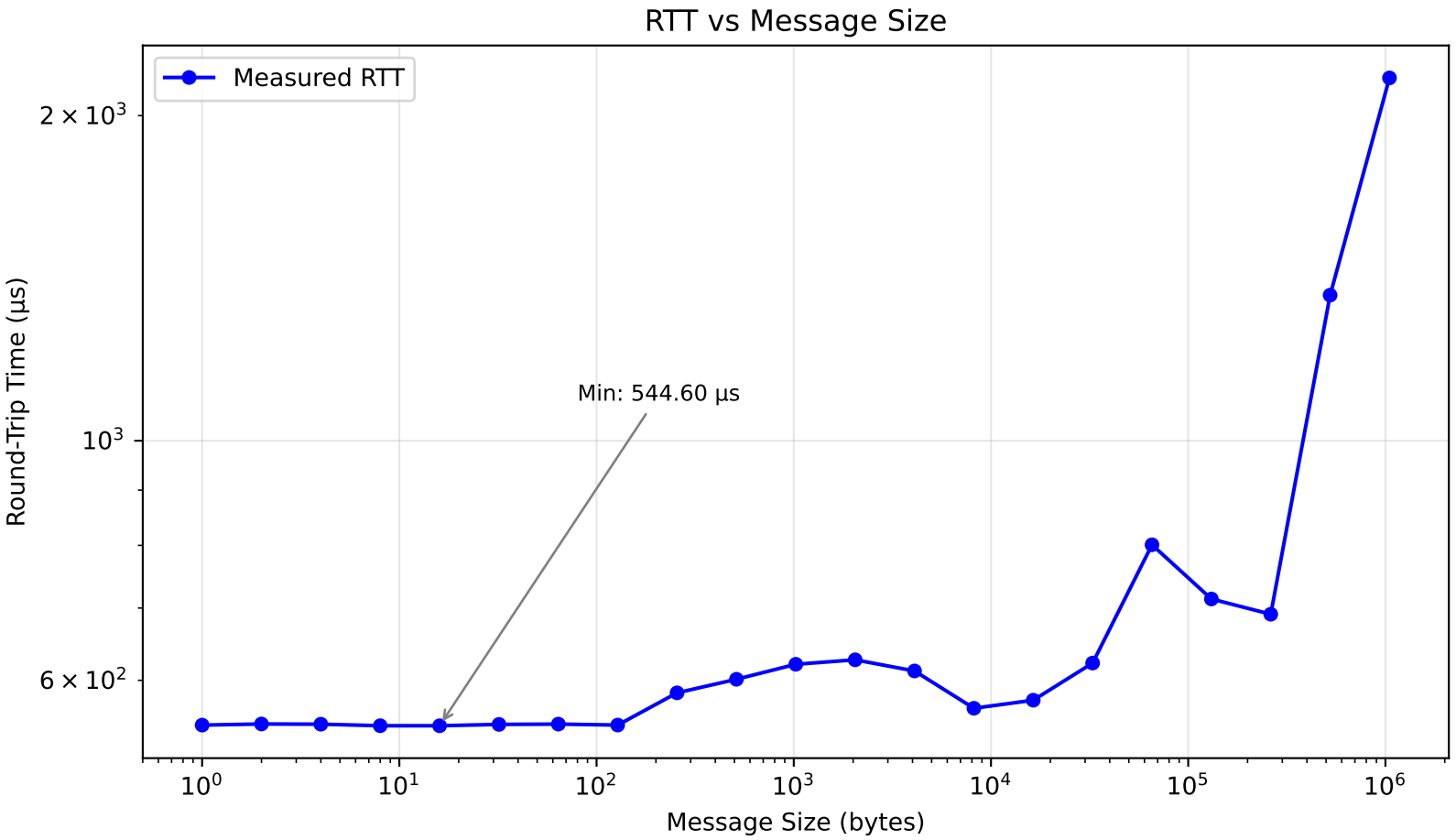
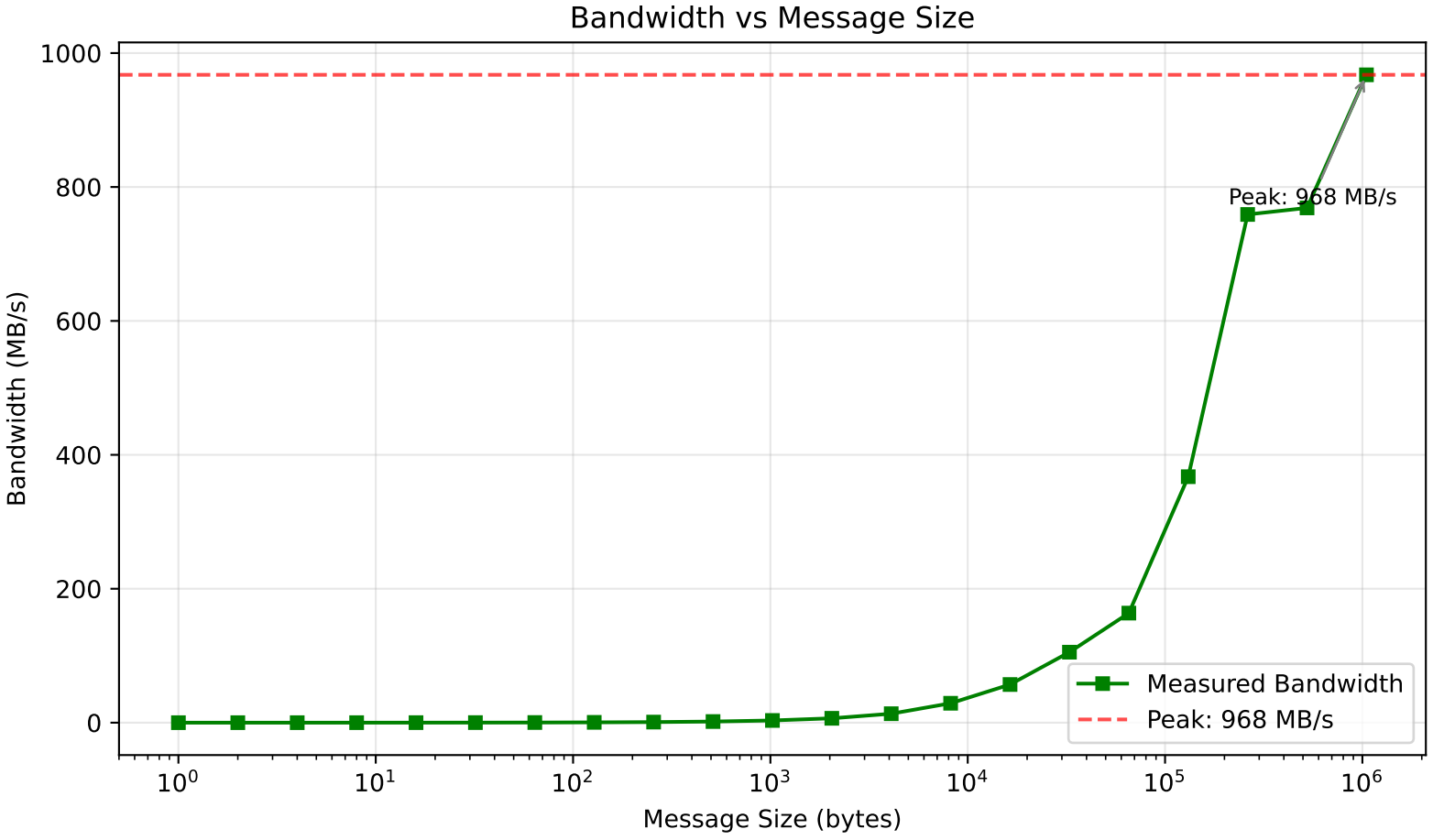
MPI Ping-Pong Results





Results Summary

Parameter	Value	Method
Latency (α)	272.30 µs	RTT/2 for small messages
Bandwidth (β)	968 MB/s	Peak observed throughput
Buffer Size	~128 B	Send time increase threshold

How I Got These Numbers:

Latency: For small messages, most of the time is network overhead rather than data transfer. The minimum RTT I measured was 544.60 µs, so one-way latency is about 272.30 µs. This is typical for real network communication.

Bandwidth: Peak throughput was 968 MB/s (7.7 Gbps) at larger message sizes where data transfer dominates over latency overhead.

Buffer Size: MPI buffers small messages so Send() can return immediately. The buffer threshold is around ~128 B, where send times start increasing significantly as MPI switches to rendezvous protocol.

Communication Model:

$$T(n) = \alpha + n/\beta$$

Where T(n) is transfer time for n bytes, α = 272.30 µs, β = 968 MB/s

Notes:

- Latency of 272 µs is consistent with network communication
- Bandwidth of ~1.0 GB/s suggests a fast interconnect (InfiniBand or similar)
- Bandwidth increases with message size as fixed overhead becomes less significant