Universidad de Investigación de Tecnología
Experimental Yachay Tech
School of Mathematics and Computer sciences

Program : Undergraduate ———— Semester : VII
Subject : HPC Professor : Saravana Prakash T
Date : 14/02/2019 Time:
Semester: Jan-May-2019
Student's Surname, Name : Caluña Giovanny
Student Reg.No: 1725053910

Duration: 10 minutes *INFORMATICS LAB* Maximum Marks: 100

Neatly show all of your work. If you need to use extra paper, please indicate so and attach to this exam.
Mode of submission : Upload your answers in D2L or hard-copy at my desk

Elaboration Date : 28/02/2019- Submission Date : 16 /03/2019

1. LLC Benchmark

1.1. Performance Of MPI All reduce

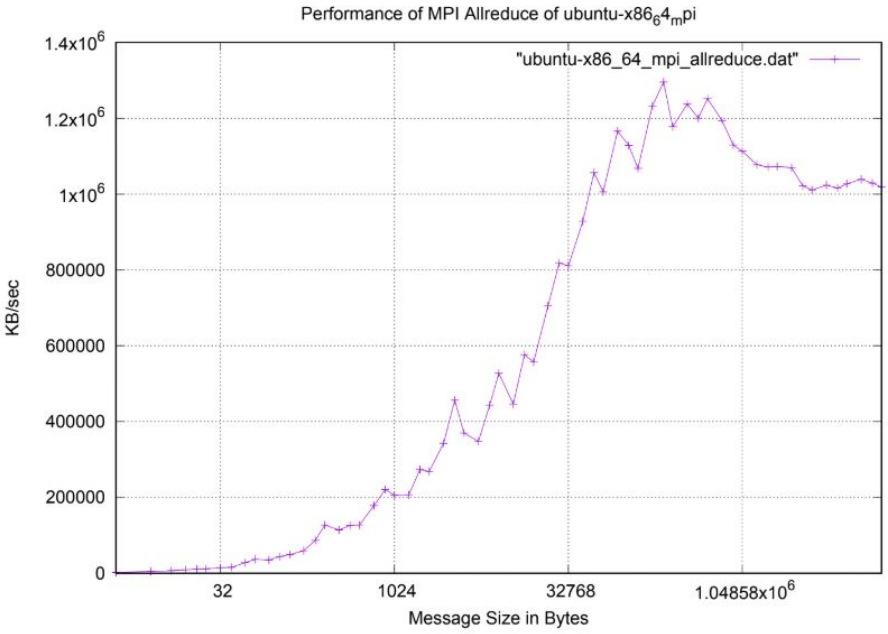

Figura 1:

MPI reduces takes an array of input elements on each process and returns an array of output elements to the root process. The output elements contain the reduced result. MPI Allreduce is identical to MPI Reduce with the exception that it does not need a root process id (since the results are distributed to all processes). Here, we can see that that the curve increase linearly reaching the maximum speed in almost $1{,}4x10^6$ KB/sec when the size of the message is between 32768 and $1{,}04858x10^6$. After that , the curve gets constant.

1.2. Performance of MPI All to all

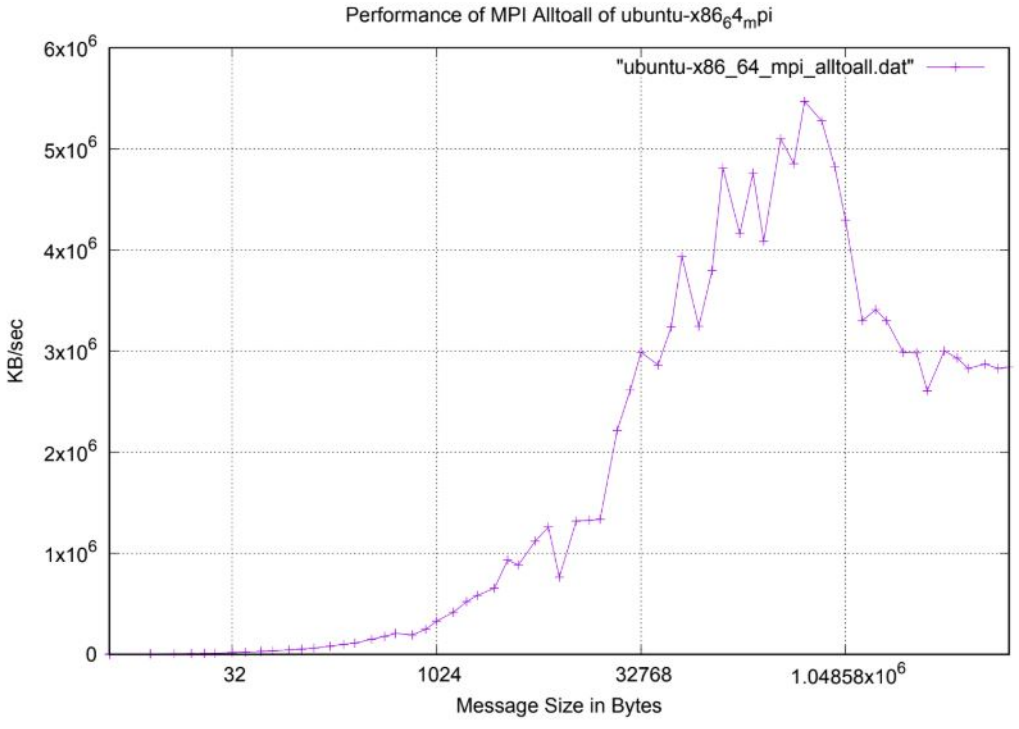

Figura 2:

MPI Alltoall is a collective operation in which all processes send the same amount of data to each other, and receive the same amount of data from each other.In the graph, we can see that when the size of message is close to $1x10^6$ the speed reachs ist best point. However, when the size of message is bigger the speed decreases because of managing that amount of data between process hinder the transmission.

1.3. Bidirectional MPI Bandwidth

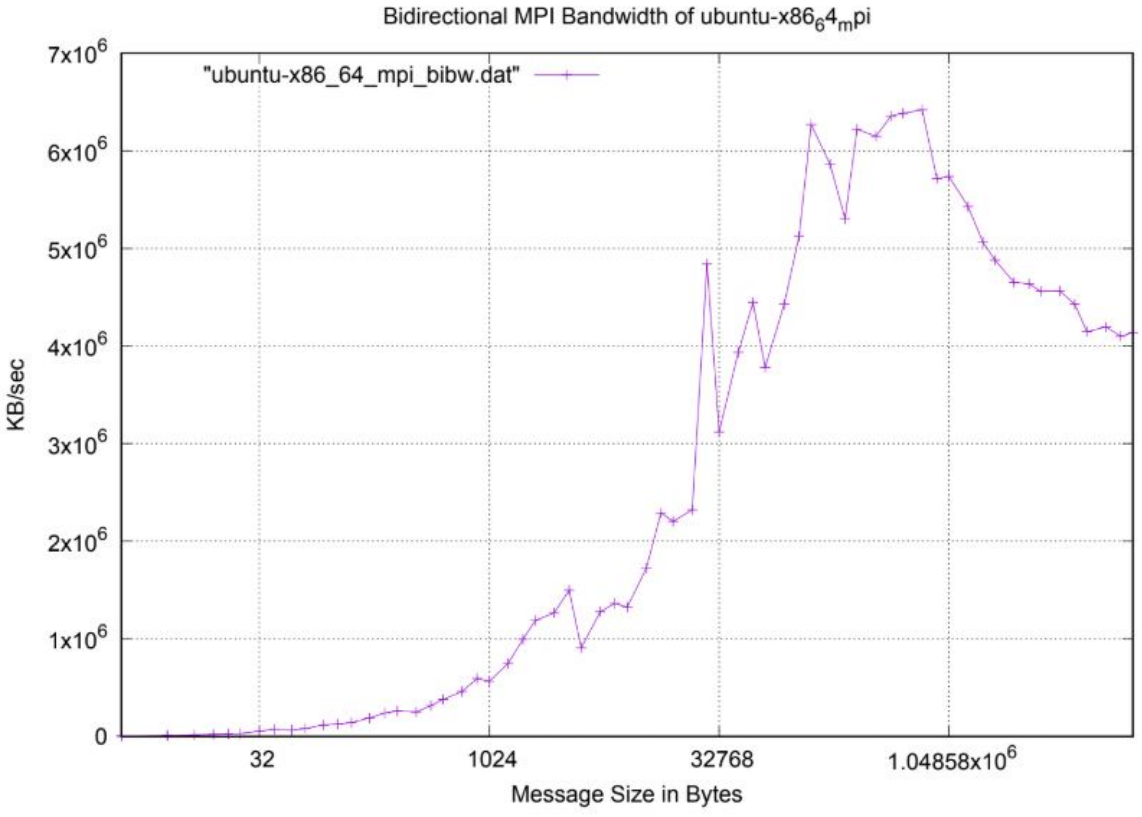

Figura 3:

Here, we can see that the bidirectional bandwidth behaves very similar to the unidirectional bandwidth. However, we can see that the maximum speed is maintained for a bigger interval.

1.4. Performance MPI Broadcast

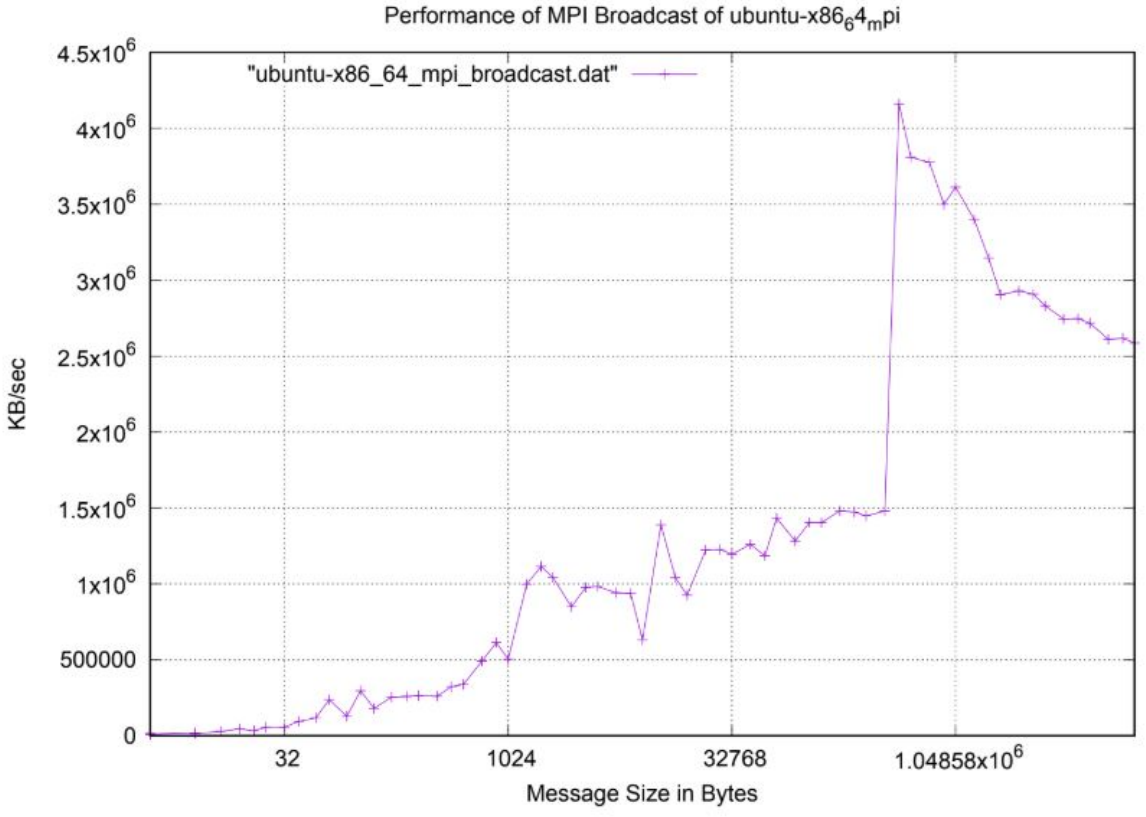

Figura 4:

A broadcast is one of the standard collective communication techniques. During a broadcast, one process sends the same data to all processes in a communicator. One of the main uses of broadcasting is to send out user input to a parallel program, or send out configuration parameters to all processes. We can see that the speed increase slowly until a point. There is an abrupt change from $1{,}5x10^6$ to $4{,}2x10^6$. it's worth say, that the speed reached is faster that the all reduce test.

1.5. Latency of MPI Send

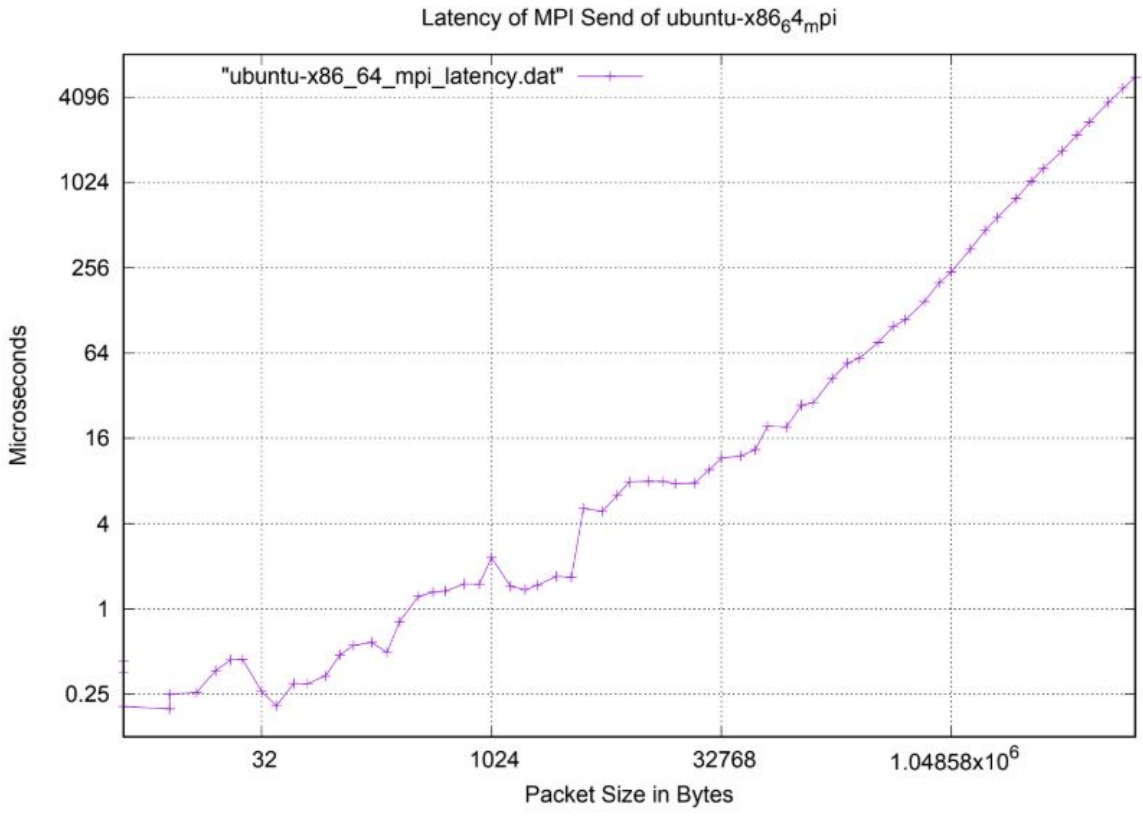

Figura 5:

In data processing networks latency is the sum of time delays within a network. A delay is caused by the delay in the propagation and transmission of packets within the network or between different components of a machine.We can see that the latency increase very linearly, it means that the delay depends on the size of the message.

1.6. MPI Perfomrance Reduce

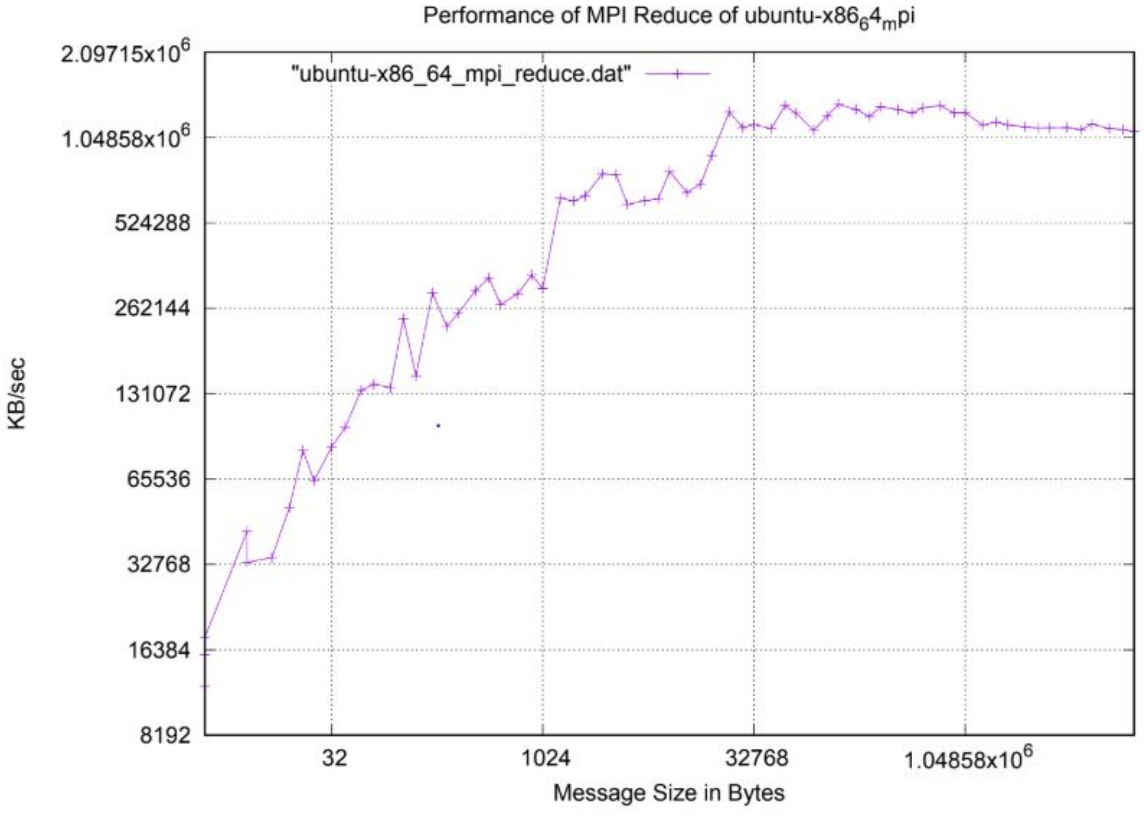

Figura 6:

Here, we can see that the speed increses faster than in the funtion allreduce. This is because we just obtain one value from the message array. At the begginig it is not even posssible reach the maxim speed because the sent pack is so small . So, in this case the maxim speed is reached in a bigger message size and the speed is get constant because of the recution made by the function.

1.7. Roundtrip time of MPI Send

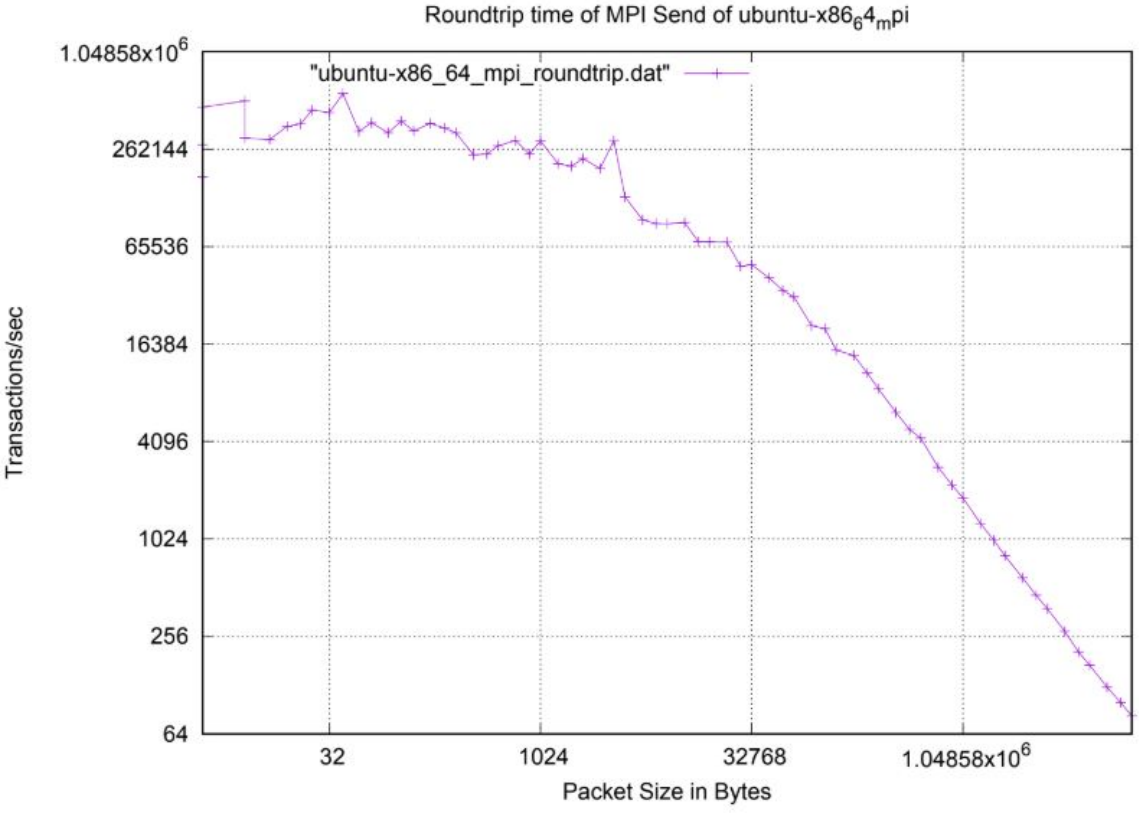

Figura 7:

Round-trip time (RTT) is the length of time it takes for a signal to be sent plus the length of time it takes for an acknowledgement of that signal to be received. In the graph, we can see that the speed is greater when the sent message is small because the packet can travel very fast in an empty path. However, when the message size increase the speed of the packet decreases considerably because of the channel is full and the packet must wait to return.

1.8. Unidirectional MPI Bandwidth

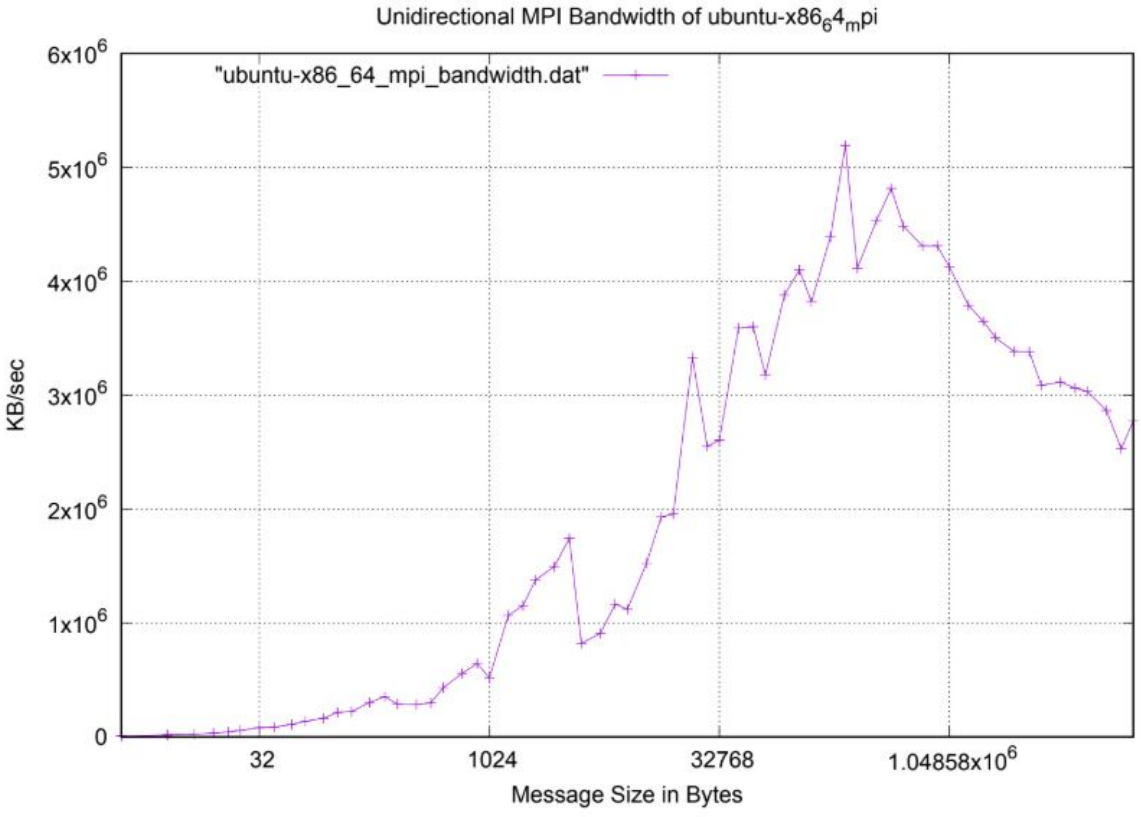

Figura 8:

Bandwidth is the maximum rate of data transfer across a given path. Bandwidth may be characterized as network bandwidth, data bandwidth or digital bandwidth Here, we can see that that the maximum rate is reached when the message size is close to 60000 Bytes. After that,the path is fully so the speed get slower.