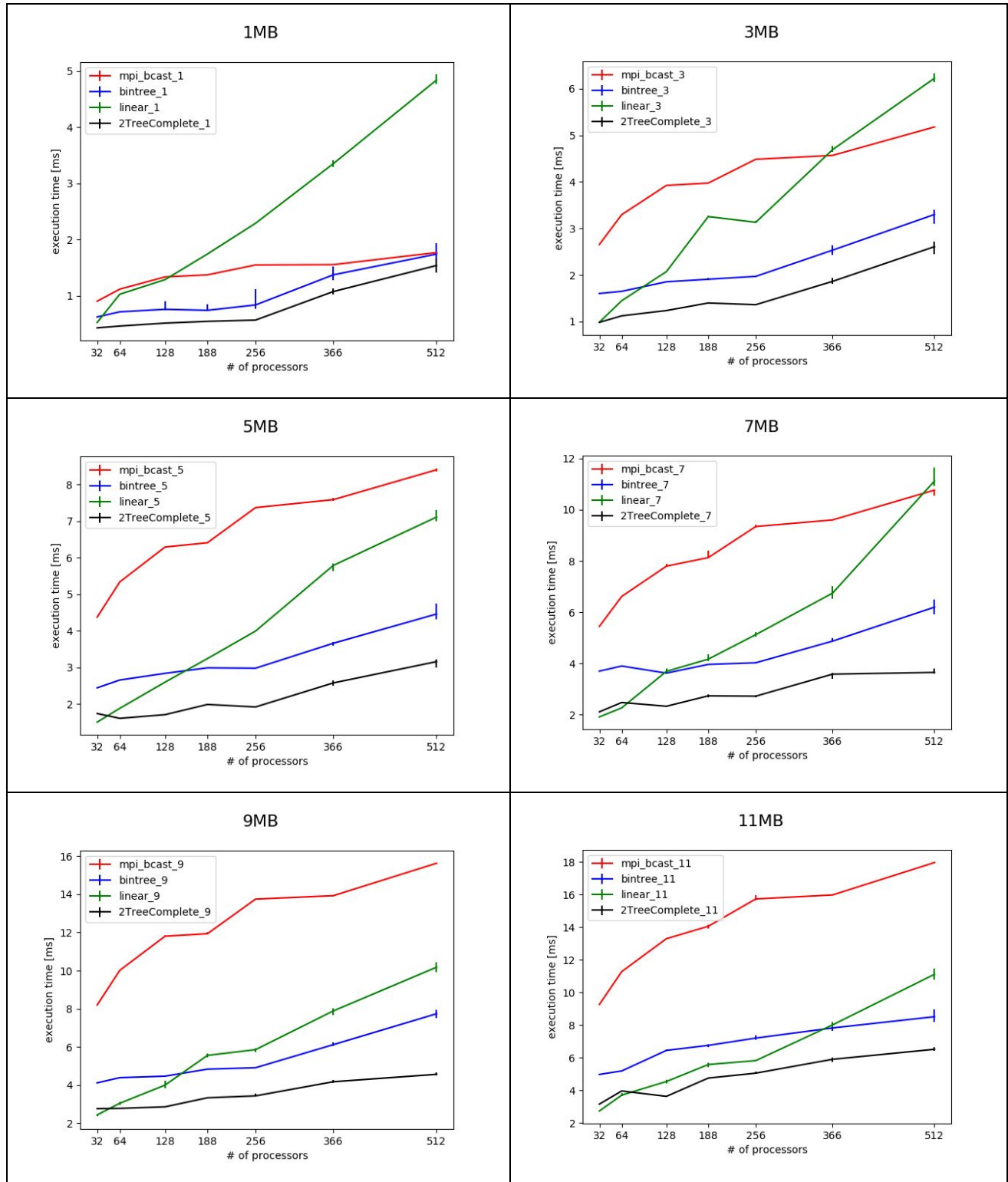# Comparisons on different message sizes(optimal values)
(x_values(no of processors) = 32, 64, 128, 188, 256, 512)

Formulas used for calculating chunk values :

1. Linear Pipeline

$$T_{LP} = (L + o + (N \times (o + G \times (s \div N)))) + (L + o + (o + G \times (s \div N))) \times (P - 2)$$

The first part of the equation corresponds to the time taken by root processor to send all chunks. Then the second part is time taken by (P - 2) number of processors excluding the root and the leaf to send the last chunk, since the other chunks has already been sent in parallel and is considered in the first part.

2. Pipeline Binary Tree

$$T_{PBT} = ((L + o + (2 \times N \times (o + G \times (\tfrac{s}{N})))) + (L + o + 2 \times (o + G \times (\tfrac{s}{N}))) \times (\text{floor}(\log_2(P - 1)) - 1))$$

3. Two Tree Pipeline

$$T_{BTT} = (L + 3 \times o + s \times G) + T_{PBT}(\tfrac{s}{2})$$

Parameters Values Used :

L = 1.589921
G = 0.000103
Value of o varies depending upon the value of chunk size.

Chunks Value Calculated Using formula :
(NP /MS/BinaryTree/TwoTree/linearPipeline)

NP	MS	BinaryTree	TwoTree	linearPipeline
32	1048576	9	15	37
64	1048576	9	17	53
128	1048576	12	17	78
188	1048576	12	21	78
256	1048576	14	21	102

366	1048576	14	23	102
512	1048576	14	23	102
32	3145728	17	29	66
64	3145728	29	29	87
128	3145728	29	29	133
188	3145728	29	29	161
256	3145728	29	29	204
366	3145728	29	39	236
512	3145728	29	39	236
32	5242880	25	37	78
64	5242880	25	49	124
128	5242880	28	49	182
188	5242880	28	49	196
256	5242880	36	49	232
366	5242880	36	49	320
512	5242880	37	49	341
32	7340032	29	41	106
64	7340032	29	51	155
128	7340032	34	69	193
188	7340032	34	69	265
256	7340032	40	69	275
366	7340032	40	69	325
512	7340032	40	69	448
32	9437184	33	45	89
64	9437184	37	53	158
128	9437184	40	65	224
188	9437184	40	65	297
256	9437184	44	65	341
366	9437184	44	89	400
512	9437184	44	89	418
32	11534336	34	47	109
64	11534336	38	55	178
128	11534336	45	65	244
188	11534336	45	79	312
256	11534336	45	79	363
366	11534336	45	79	433
512	11534336	54	79	489

Note :

The chunk values calculated using the formulas are an approximation.
Hence, during our experiment we used for different values of chunks.

1. Calculated Value.
2. Calculated minus 10%.
3. Calculated minus 20%.
4. Calculated minus 30%.

The final graphs are drawn using the minimum chunks value out of these
for each and every value of processors and message size for each
algorithm.

Chunks Used for different values:

1. **2TreeComplete**

Process ors	Message Sizes					
	1MB	3MB	5MB	7MB	9MB	11MB
32	10%	0%	0%	20%	30%	0%
64	0%	0%	0%	0%	0%	10%
128	10%	0%	0%	0%	0%	10%
188	20%	10%	0%	0%	0%	0%
256	20%	0%	0%	10%	0%	10%
366	20%	0%	0%	0%	0%	0%
512	10%	30%	0%	0%	0%	0%

2. Linear Pipeline

Processors	Message Sizes					
	1MB	3MB	5MB	7MB	9MB	11MB
32	0%	0%	10%	0%	0%	20%
64	20%	20%	10%	0%	10%	30%
128	10%	30%	0%	0%	10%	0%
188	10%	30%	0%	10%	20%	20%
256	30%	30%	20%	0%	0%	10%
366	30%	10%	10%	20%	20%	10%
512	30%	20%	20%	10%	0%	20%

3. BinTree

Processors	Message Sizes					
	1MB	3MB	5MB	7MB	9MB	11MB
32	30%	0%	10%	0%	0%	10%
64	0%	0%	10%	0%	0%	0%
128	0%	0%	30%	10%	10%	0%
188	0%	20%	20%	10%	0%	20%
256	0%	10%	20%	10%	10%	0%
366	30%	30%	20%	20%	20%	20%
512	0%	10%	0%	0%	0%	0%

Gain using optimal value over calculated value.(in %)

1. 2TreeComplete

	32mb	64mb	128mb	188mb	256mb	366mb	512mb
1	0.889454	0.00000	6.716189	10.118819	3.919596	11.803925	0.007777
3	0.000000	0.00000	0.000000	1.625021	0.000000	0.000000	6.734288
5	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000
7	10.761468	0.00000	0.322523	0.000000	3.061445	0.000000	0.000000
9	8.122992	0.00000	0.000000	0.000000	0.000000	0.228332	0.000000
11	0.000000	7.33981	19.308749	0.000000	0.832203	0.000000	0.000000

2. LinearPipeline

	32mb	64mb	128mb	188mb	256mb	366mb	512mb
1	0.000000	6.151524	0.874254	0.143586	37.298763	32.870761	33.241264
3	0.000000	4.674128	21.666643	17.159337	7.320765	5.746045	24.114116
5	0.457618	7.342395	0.000000	0.000000	35.113571	10.072209	49.680757
7	0.000000	0.000000	0.000000	26.029365	0.000000	34.761706	9.043133
9	0.000000	3.940497	11.024169	10.642547	0.000000	37.743306	0.000000
11	0.000000	0.765373	0.000000	16.977416	31.004490	39.065871	43.773709

3. Bintree

	32mb	64mb	128mb	188mb	256mb	366mb	512mb
1	1.644890	1.056312	0.331140	0.000000	0.000000	5.687317	0.000000
3	0.000000	0.000000	0.000000	0.595725	1.600985	4.167629	1.083074
5	8.595395	6.181565	5.410343	2.480945	3.969101	9.693637	0.000000
7	0.000000	0.000000	11.532071	11.520448	14.800718	6.971294	0.000000
9	0.000000	0.000000	2.730418	0.000000	19.723635	19.069917	0.023100
11	13.290014	0.000000	0.000000	1.249070	0.000000	0.984796	0.000000