

# Distributed Systems - Project 1

## Distributed Matrix Multiplication

Firstname Lastname (login name)

November 4, 2016

### 1 Summary

### 2 Plots and Graphs

#### 2.1 N=1152 (1 Core per Machine)

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#### 2.2 N=1152 (4 Cores per Machine)

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#### 2.3 N=1440 (1 Core per Machine)

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#### 2.4 N=1440 (4 Cores per Machine)

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#### 2.5 N=2304 (1 Core per Machine)

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#### 2.6 N=2304 (4 Cores per Machine)

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Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.101	0.077	10.215	10.393	0.115	10.096	1.000	1.000
2	2	0.475	1.004	4.602	6.082	0.758	4.416	1.709	0.854
4	4	1.200	1.784	2.770	5.754	1.515	2.647	1.806	0.452
6	6	1.650	1.934	1.981	5.565	1.848	1.871	1.868	0.311
12	12	3.540	3.007	1.168	7.716	3.295	1.076	1.347	0.112
16	16	4.714	3.406	0.829	8.948	4.085	0.809	1.161	0.073

Table 1: N=1152 (16 Machines x 1 Core)

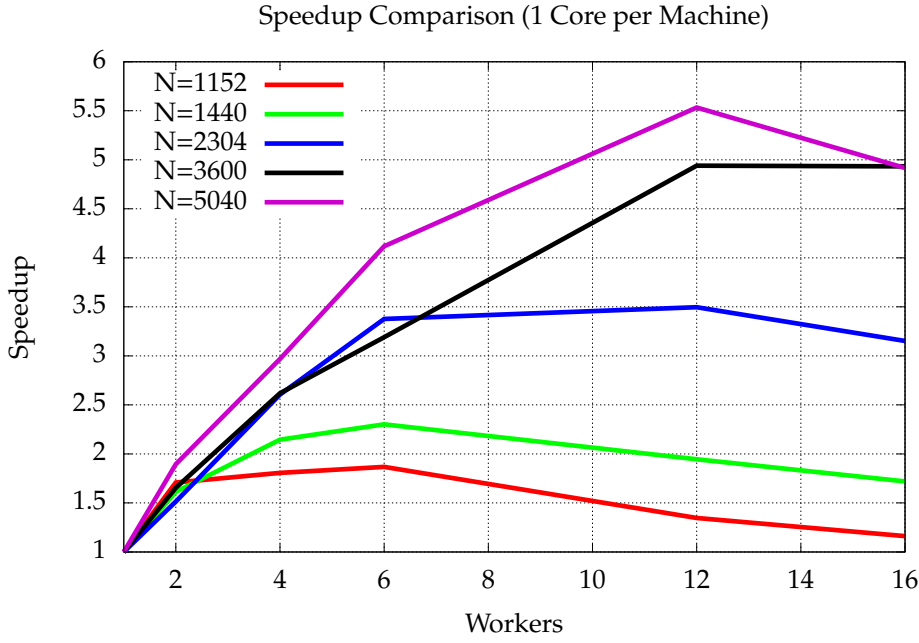


Figure 1: Speedup Summary (1 Core per Machine)

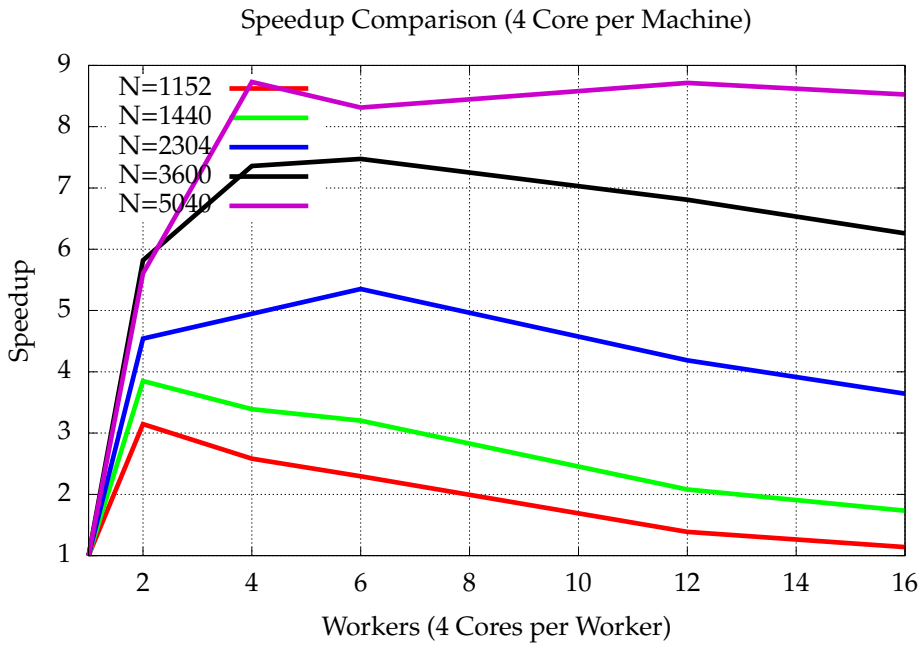


Figure 2: Speedup Summary (4 Core per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.101	0.077	10.215	10.393	0.115	10.096	1.000	1.000
2	8	0.480	1.109	1.713	3.303	0.824	1.688	3.147	0.393
4	16	1.237	1.919	0.870	4.026	1.596	0.796	2.582	0.161
6	24	1.620	2.170	0.738	4.528	1.914	0.626	2.295	0.096
12	48	3.462	3.470	0.559	7.491	3.466	0.319	1.387	0.029
16	64	4.579	3.970	0.577	9.127	4.281	0.261	1.139	0.018

Table 2: N=1152 (4 Machines x 4 Cores)

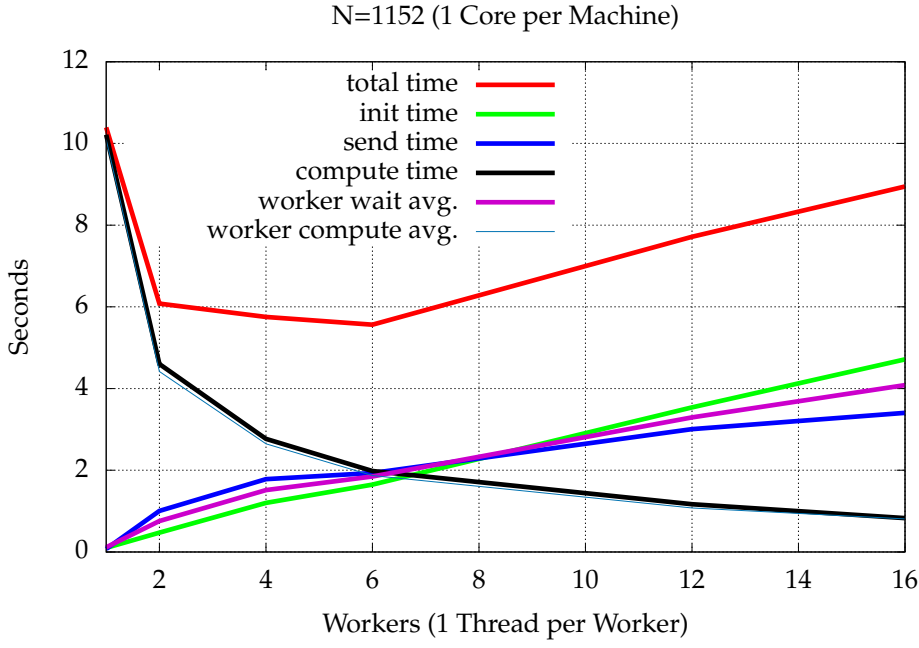


Figure 3: N=1152 (1 Core per Machine)

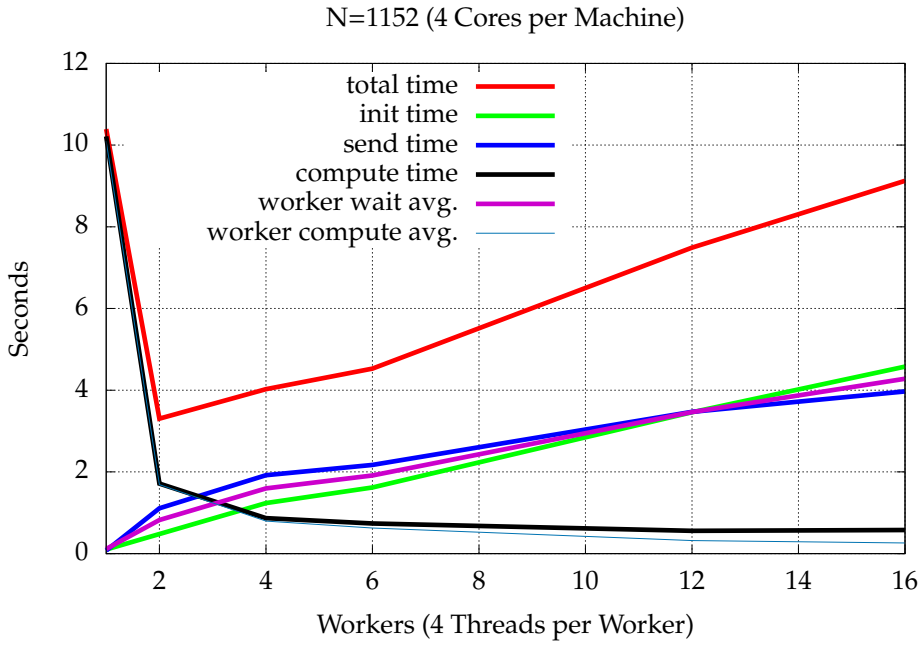


Figure 4: N=1152 (4 Cores per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.080	0.088	19.858	20.027	0.138	19.693	1.000	1.000
2	2	0.461	1.518	10.428	12.408	1.045	10.176	1.614	0.807
4	4	1.188	2.760	5.384	9.332	2.012	5.219	2.146	0.536
6	6	1.647	3.047	4.007	8.701	2.456	3.672	2.302	0.384
12	12	3.538	4.610	2.145	10.294	4.123	2.033	1.945	0.162
16	16	4.710	5.258	1.676	11.644	5.030	1.550	1.720	0.107

Table 3: N=1440 (16 Machines x 1 Core)

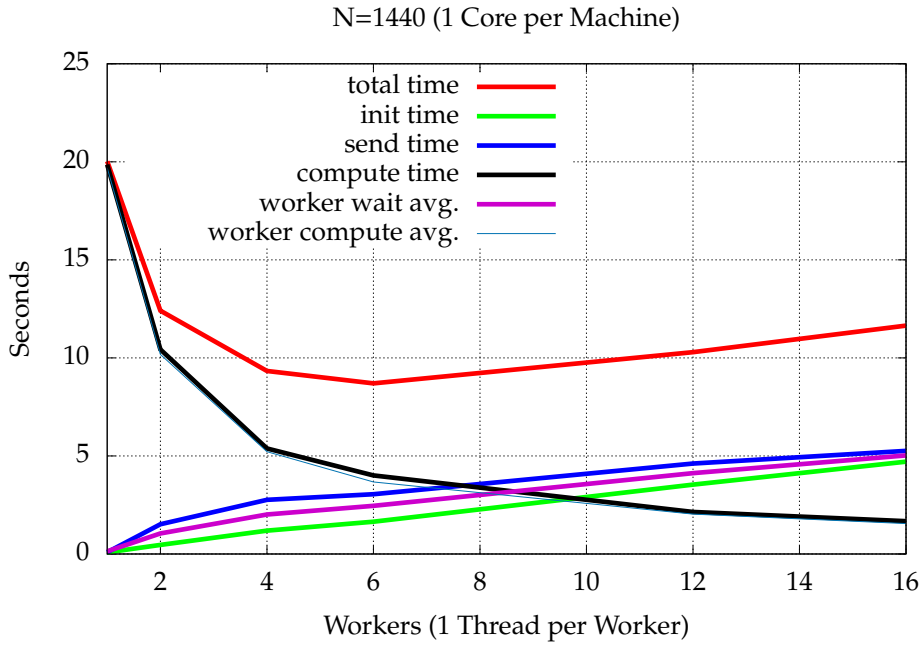


Figure 5: N=1440 (1 Core per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.080	0.088	19.858	20.027	0.138	19.693	1.000	1.000
2	8	0.444	1.654	3.104	5.202	1.102	3.097	3.850	0.481
4	16	1.148	3.069	1.690	5.907	2.138	1.650	3.390	0.212
6	24	1.580	3.441	1.231	6.251	2.599	1.154	3.204	0.133
12	48	3.458	5.227	0.939	9.625	4.351	0.569	2.081	0.043
16	64	4.572	5.989	0.998	11.558	5.284	0.450	1.733	0.027

Table 4: N=1440 (4 Machines x 4 Cores)

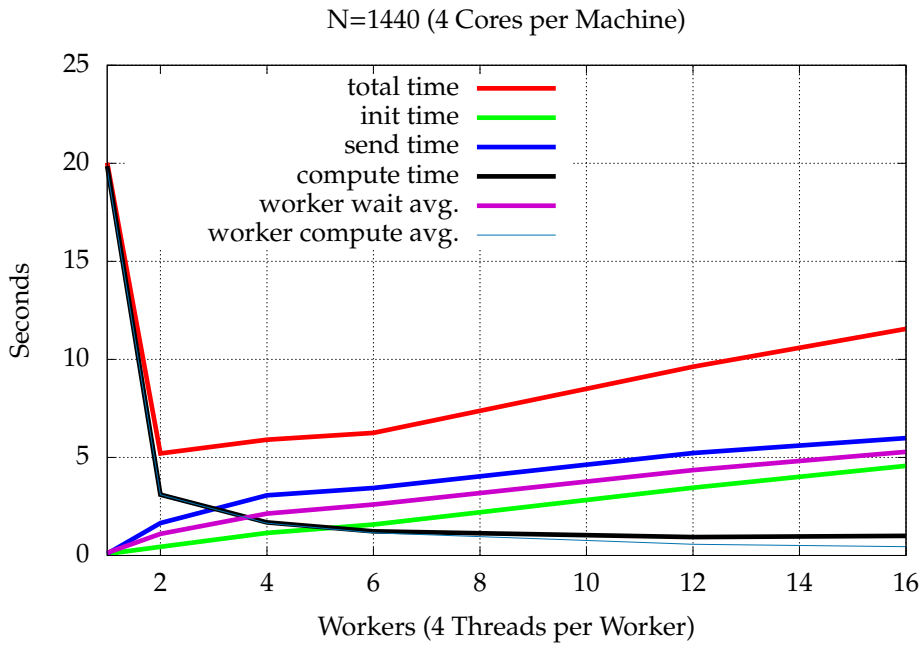


Figure 6: N=1440 (4 Cores per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.085	0.195	81.530	81.810	0.272	81.210	1.000	1.000
2	2	0.462	3.808	49.733	54.002	2.266	45.338	1.515	0.757
4	4	1.196	6.987	23.219	31.403	4.239	21.692	2.605	0.651
6	6	1.637	7.722	14.872	24.231	5.091	14.649	3.376	0.563
12	12	3.524	11.897	7.972	23.394	7.839	8.076	3.497	0.291
16	16	4.716	13.537	7.700	25.952	9.228	6.363	3.152	0.197

Table 5: N=2304 (16 Machines x 1 Core)

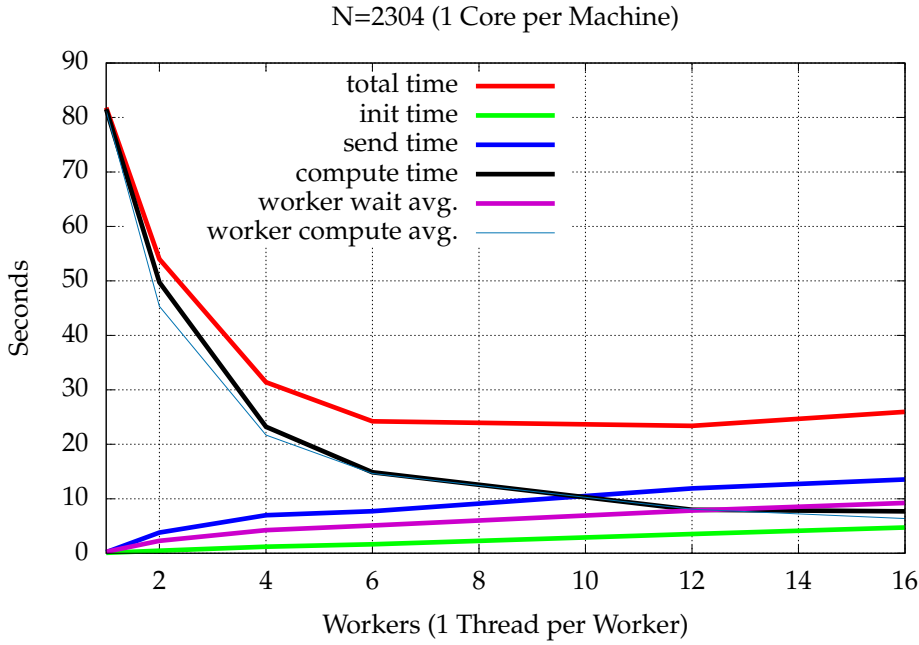


Figure 7: N=2304 (1 Core per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.085	0.195	81.530	81.810	0.272	81.210	1.000	1.000
2	8	0.437	4.054	13.519	18.010	2.401	12.857	4.542	0.568
4	16	1.159	8.168	7.209	16.535	4.742	6.334	4.948	0.309
6	24	1.600	9.145	4.545	15.290	5.725	4.720	5.351	0.223
12	48	3.414	13.694	2.434	19.542	8.661	2.220	4.186	0.087
16	64	4.572	15.485	2.398	22.455	10.076	1.671	3.643	0.057

Table 6: N=2304 (4 Machines x 4 Cores)

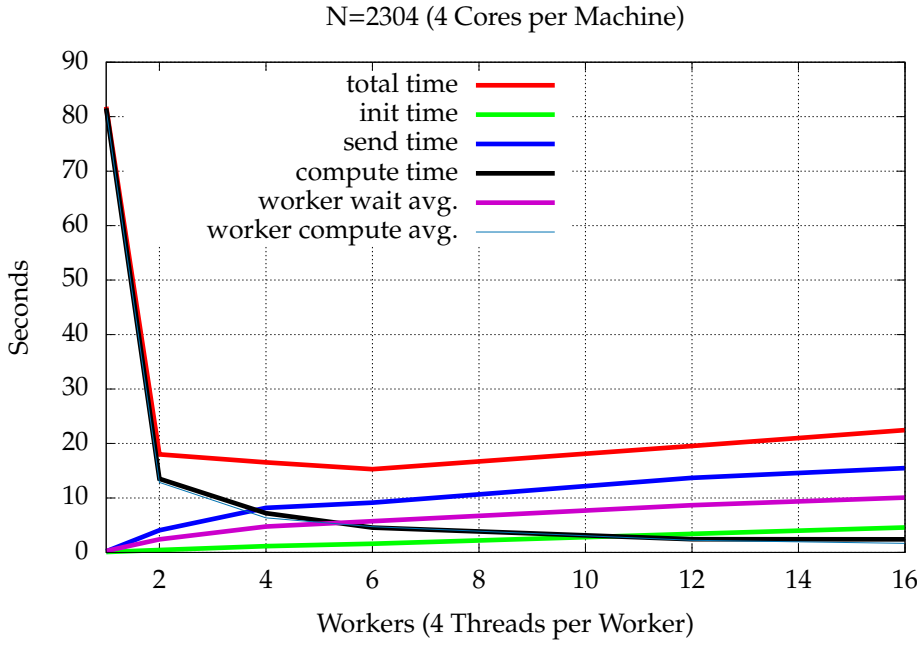


Figure 8: N=2304 (4 Cores per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.087	0.476	310.506	311.070	0.649	309.795	1.000	1.000
2	2	0.464	9.354	178.157	187.974	5.262	166.981	1.655	0.827
4	4	1.383	19.595	97.786	118.764	11.051	87.238	2.619	0.655
6	6	2.384	22.063	73.040	97.487	13.797	59.396	3.191	0.532
12	12	3.565	29.001	30.404	62.970	16.465	29.215	4.940	0.412
16	16	4.762	34.354	23.932	63.048	19.669	22.993	4.934	0.308

Table 7: N=3600 (16 Machines x 1 Core)

## 2.7 N=3600 (1 Core per Machine)

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## 2.8 N=3600 (4 Cores per Machine)

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## 2.9 N=5040 (1 Core per Machine)

This is some analysis of the graph seen in table ??.

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.087	0.476	310.506	311.070	0.649	309.795	1.000	1.000
2	8	0.449	9.802	43.199	53.450	5.516	42.579	5.820	0.727
4	16	1.166	19.597	21.504	42.267	10.541	22.128	7.360	0.460
6	24	1.609	22.541	17.473	41.623	12.894	17.052	7.474	0.311
12	48	3.467	34.204	8.026	45.696	18.970	7.829	6.807	0.142
16	64	4.580	38.830	6.289	49.699	21.805	6.205	6.259	0.098

Table 8: N=3600 (4 Machines x 4 Cores)

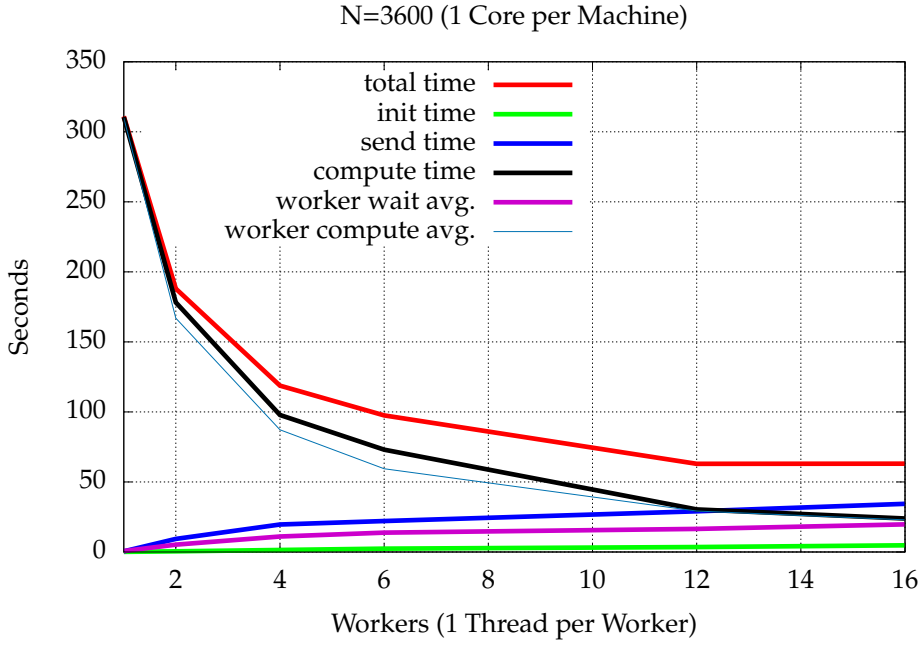


Figure 9: N=3600 (1 Core per Machine)

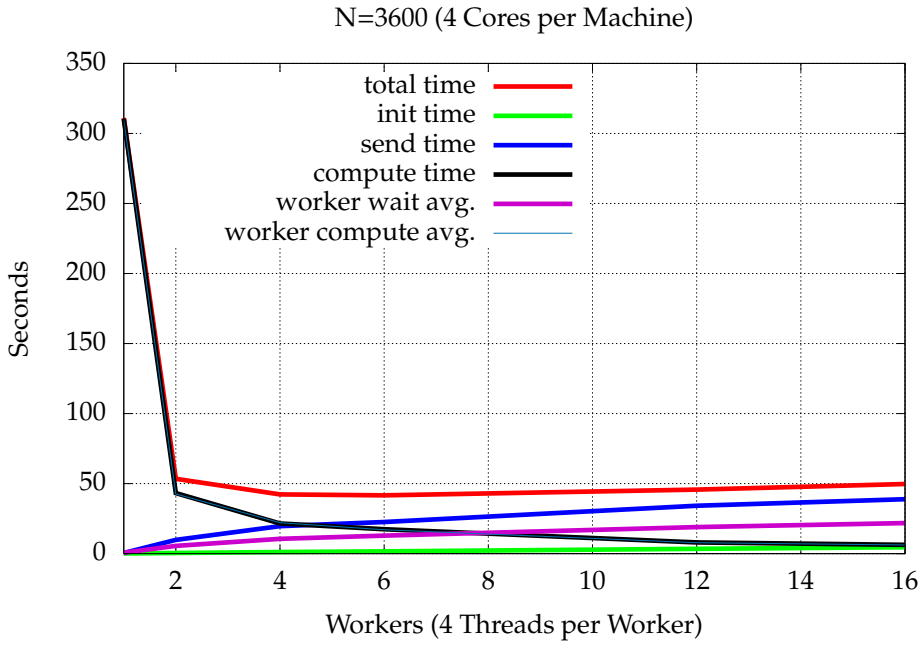


Figure 10: N=3600 (4 Cores per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.090	0.936	852.081	853.107	1.546	850.426	1.000	1.000
2	2	0.471	18.482	431.266	450.218	10.160	432.698	1.895	0.947
4	4	1.217	32.252	253.870	287.339	17.706	228.874	2.969	0.742
6	6	1.652	35.474	170.050	207.176	20.676	152.516	4.118	0.686
12	12	3.550	57.468	93.148	154.166	30.446	79.556	5.534	0.461
16	16	4.775	68.518	100.203	173.496	34.958	63.629	4.917	0.307

Table 9: N=5040 (16 Machines x 1 Core)

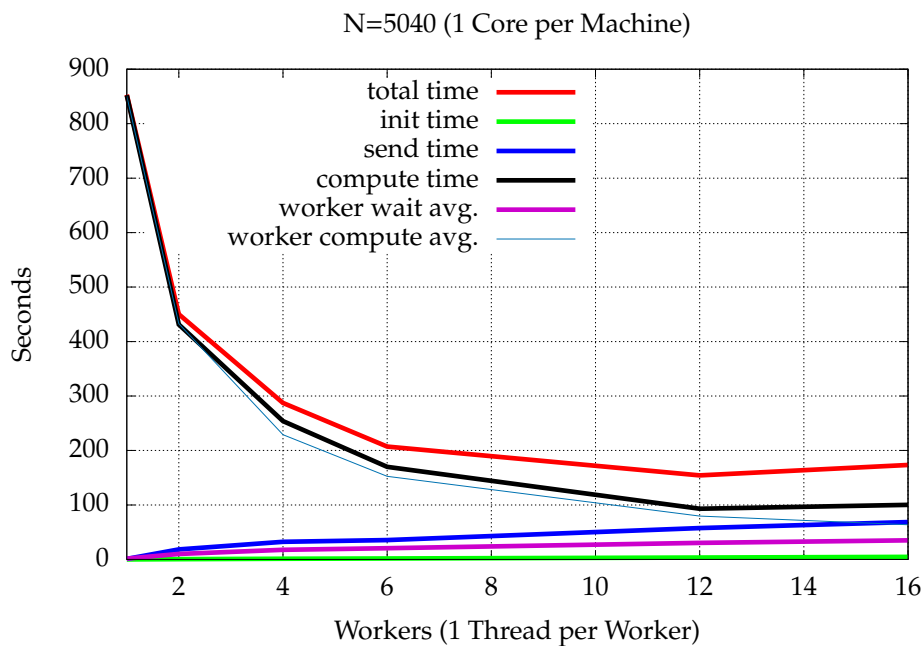


Figure 11: N=5040 (1 Core per Machine)

Workers	Threads	Init (s)	Send (s)	Comp (s)	Total(s)	wwa (s)	wca (s)	Speedup	Efficiency
1	1	0.090	0.936	852.081	853.107	1.546	850.426	1.000	1.000
2	8	0.450	19.253	132.463	152.165	10.603	122.971	5.606	0.701
4	16	1.179	38.011	58.530	97.720	19.992	58.973	8.730	0.546
6	24	1.614	45.094	55.936	102.644	24.656	49.709	8.311	0.346
12	48	3.434	70.993	23.459	97.887	36.963	23.411	8.715	0.182
16	64	4.585	79.316	16.166	100.068	41.845	17.377	8.525	0.133

Table 10: N=5040 (4 Machines x 4 Cores)

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## 2.10 N=5040 (4 Cores per Machine)

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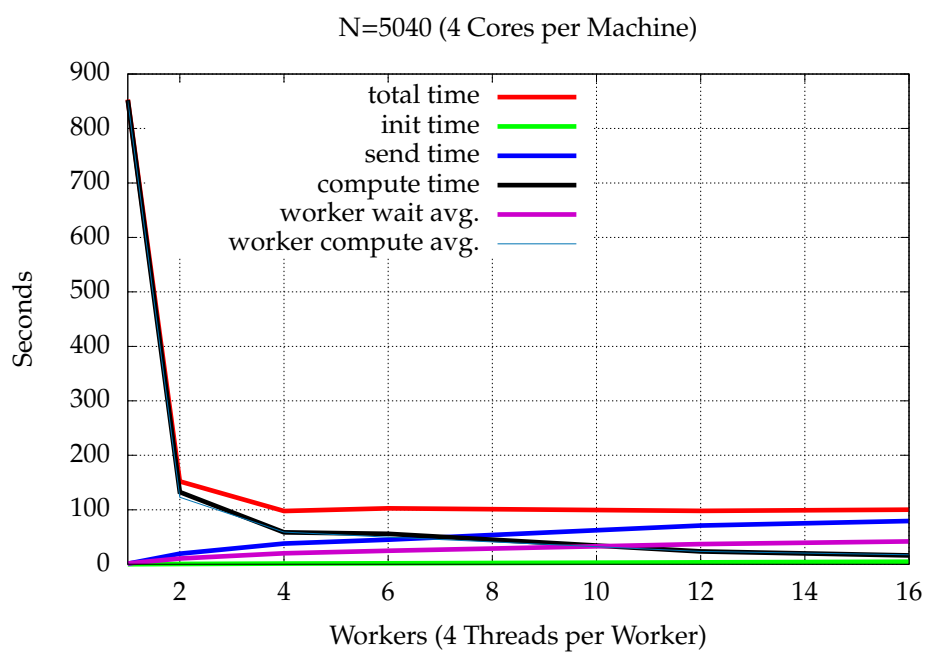


Figure 12: N=5040 (4 Cores per Machine)