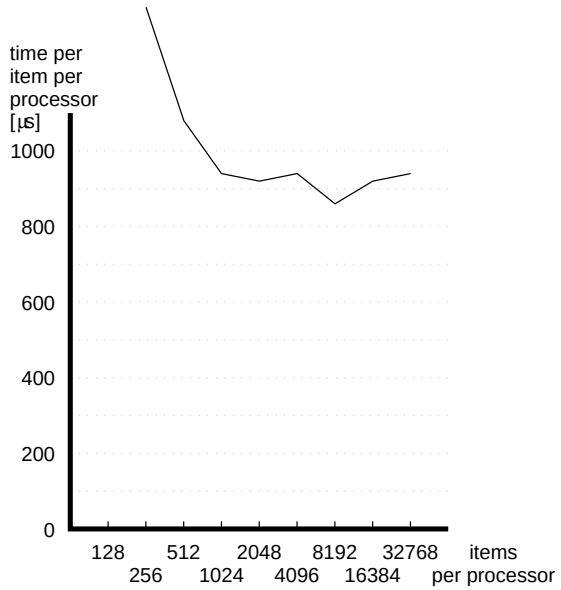
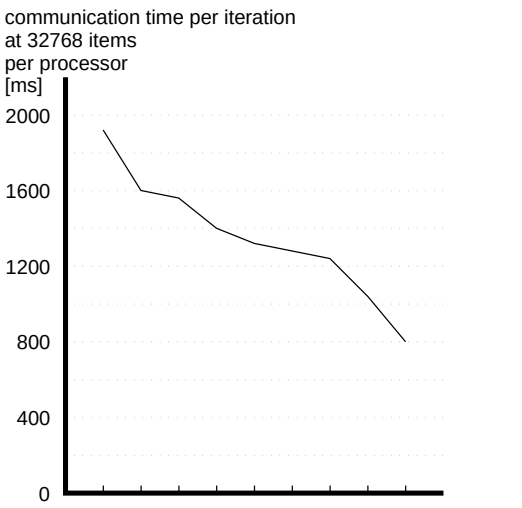
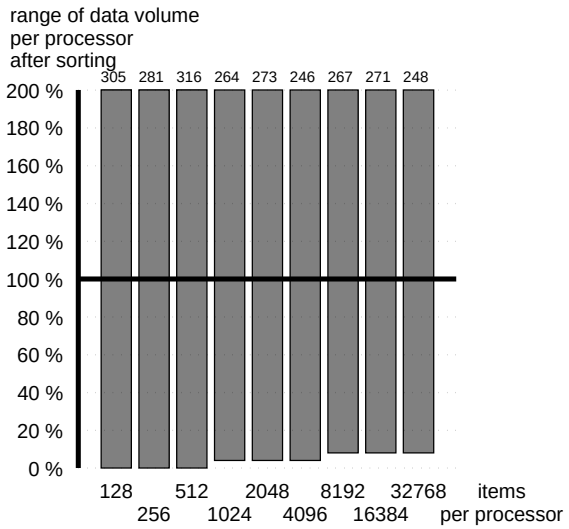
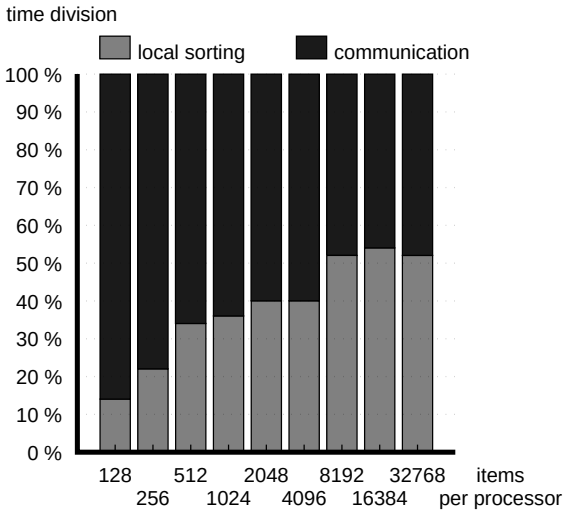
Data Sheet 1

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	3-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





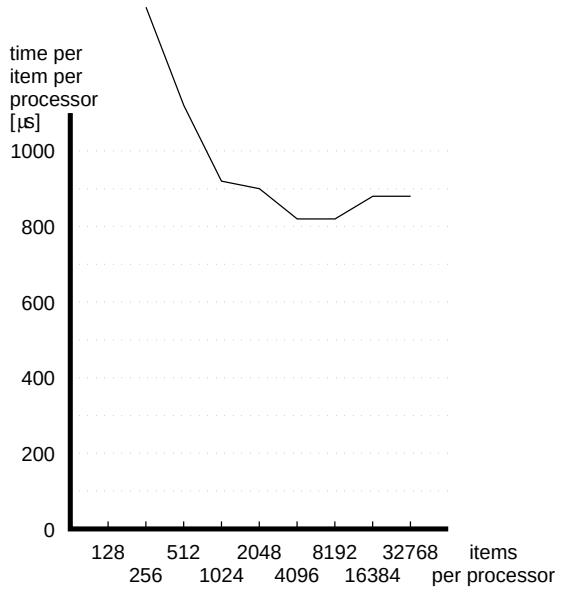


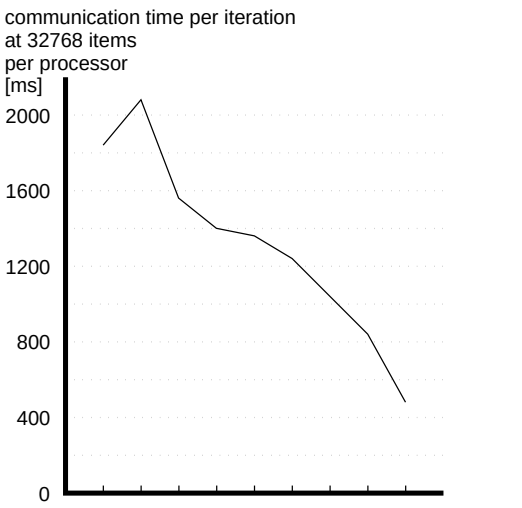


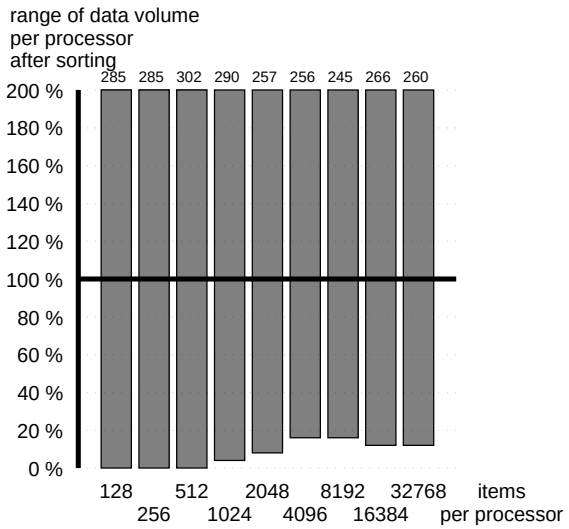
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1976	1378	1081	944	924	942	859	917	931
total time [s]	0.25	0.35	0.55	0.97	1.89	3.86	7.05	15.04	30.54
time for communication [ms]	232	294	396	671	1344	2506	3856	7553	16362
time for local sorting [ms]	39	83	212	382	880	1689	4049	8813	17231
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	2	3	29	49	136	516	806	2682
maximal number of items	391	720	1620	2704	5588	10090	21900	44475	81214
number of data packets	6849	7167	6756	6827	9049	13920	23457	41581	84270
total path length of all data packets	34608	36224	34628	35120	46604	67850	114075	196278	409104
average recursion depth	9.62	10.10	9.48	9.51	9.82	9.74	9.48	9.07	9.60

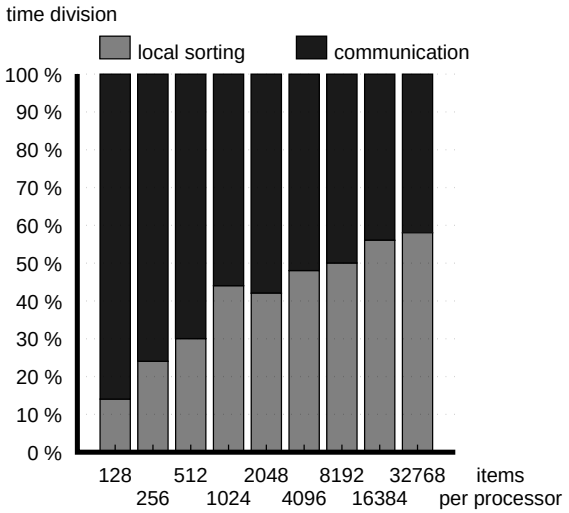
Data Sheet 2

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	3-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





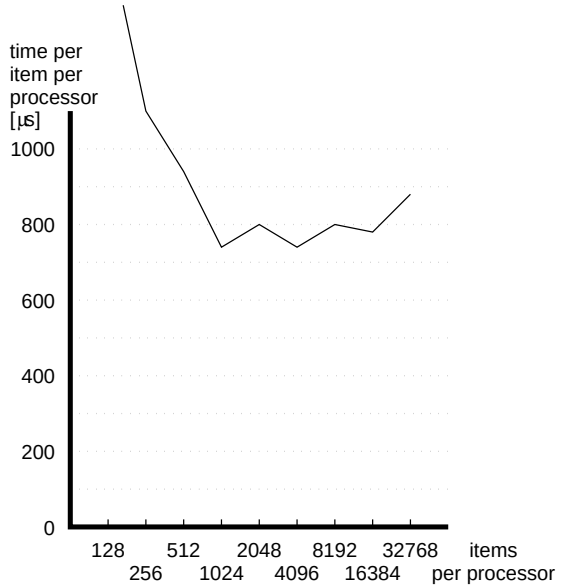


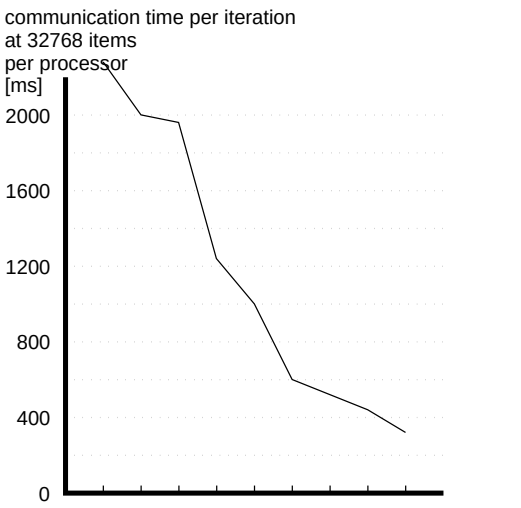


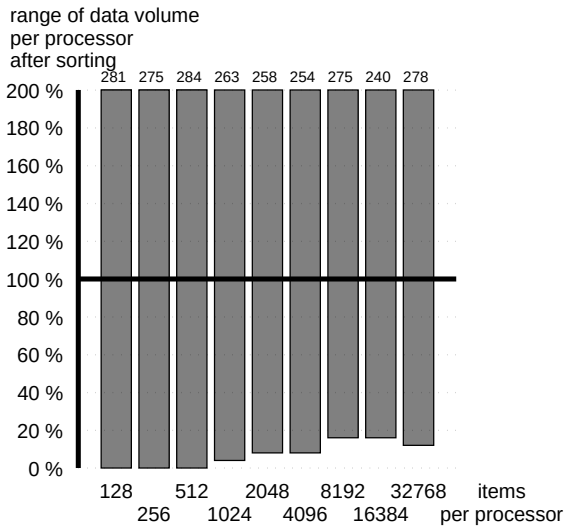
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	2077	1374	1159	913	903	815	830	878	887
total time [s]	0.27	0.35	0.59	0.94	1.85	3.34	6.80	14.39	29.10
time for communication [ms]	240	283	459	575	1313	1979	3821	6976	13645
time for local sorting [ms]	38	83	200	426	825	1780	3691	8563	18149
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	1	0	4	21	74	342	648	853	2049
maximal number of items	366	731	1545	2970	5280	10510	20139	43670	85506
number of data packets	6804	7286	7042	6836	8896	13302	23046	40781	80270
total path length of all data packets	30809	32701	32638	31290	41059	57847	98459	171073	337330
average recursion depth	9.59	10.25	9.85	9.51	9.70	9.40	9.36	8.92	9.17

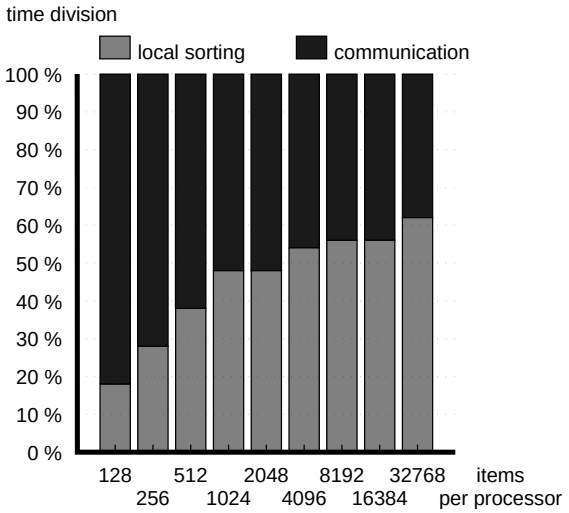
Data Sheet 3

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	3-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





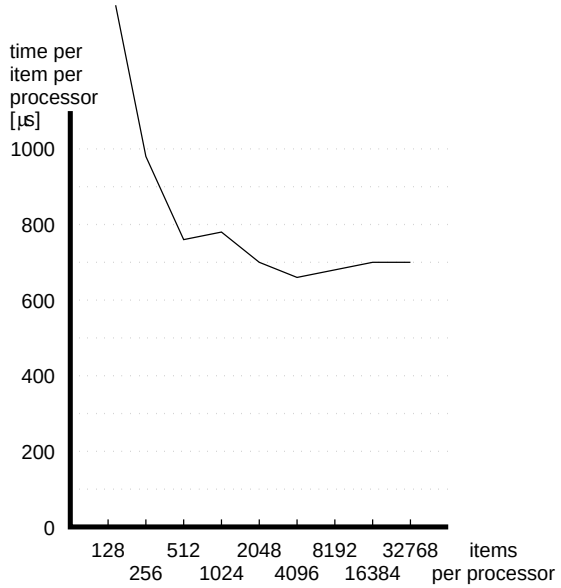


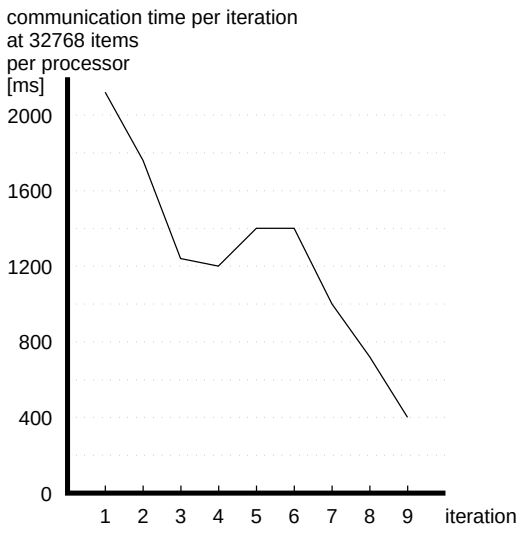


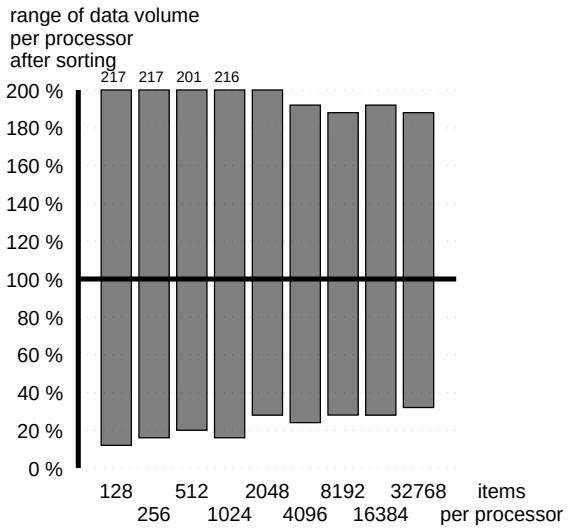
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1577	1096	935	729	791	741	804	790	888
total time [s]	0.20	0.28	0.48	0.75	1.62	3.04	6.59	12.96	29.13
time for communication [ms]	176	211	320	436	922	1549	3248	6186	12417
time for local sorting [ms]	38	82	192	383	830	1749	4191	7681	19263
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	1	6	20	76	147	617	1238	1932
maximal number of items	360	705	1456	2698	5277	10405	22497	39281	90938
number of data packets	6891	7122	6722	6960	8844	13339	23220	42702	82651
total path length of all data packets	27368	28037	27440	27985	34109	49197	84703	154494	296643
average recursion depth	9.68	10.03	9.43	9.68	9.64	9.42	9.41	9.34	9.41

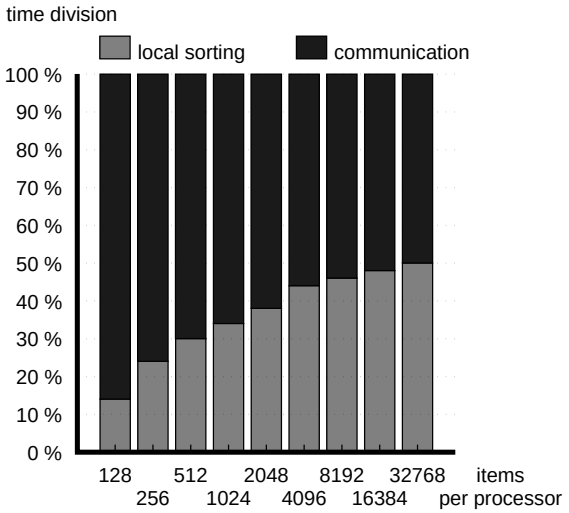
Data Sheet 4

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	log(N)-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





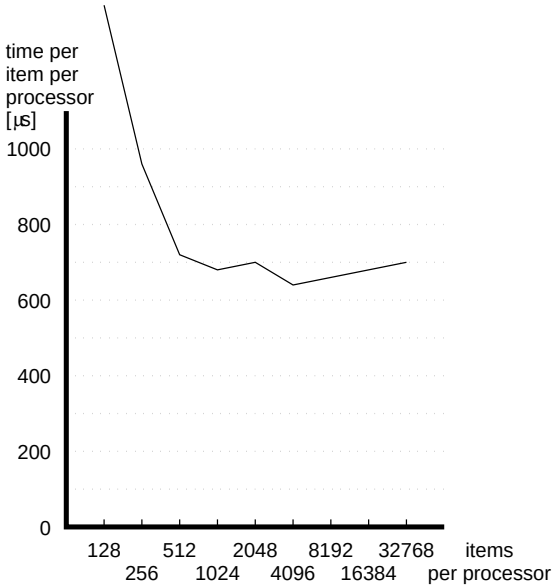


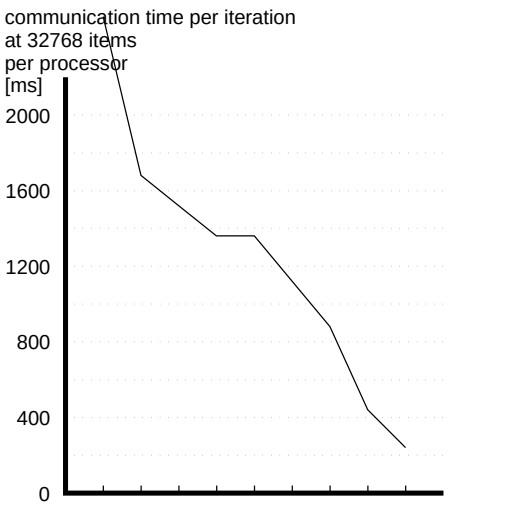


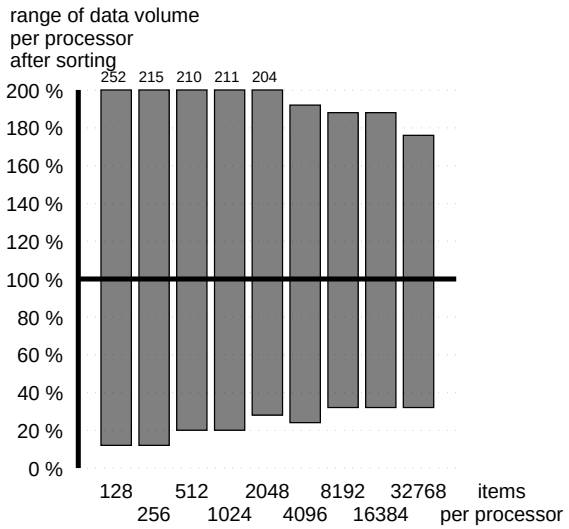
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1484	983	757	778	694	657	675	700	703
total time [s]	0.19	0.51	0.39	0.80	1.42	2.69	5.54	11.49	23.07
time for communication [ms]	168	208	295	576	970	1676	3304	6503	12443
time for local sorting [ms]	28	62	128	306	611	1307	2739	5998	12522
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	16	41	107	181	612	1082	2326	4764	11044
maximal number of items	278	558	1030	2217	4065	7923	15382	31478	61567
number of data packets	6153	6224	5949	6109	7464	11815	21070	38690	73278
total path length of all data packets	32113	31529	31367	31987	37352	60089	104205	192348	359369
average recursion depth	8.71	8.79	8.42	8.62	8.37	8.38	8.64	8.53	8.44

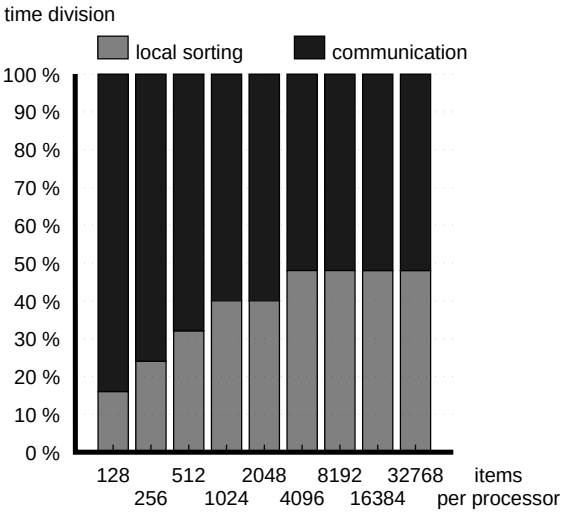
Data Sheet 5

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	log(N)-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





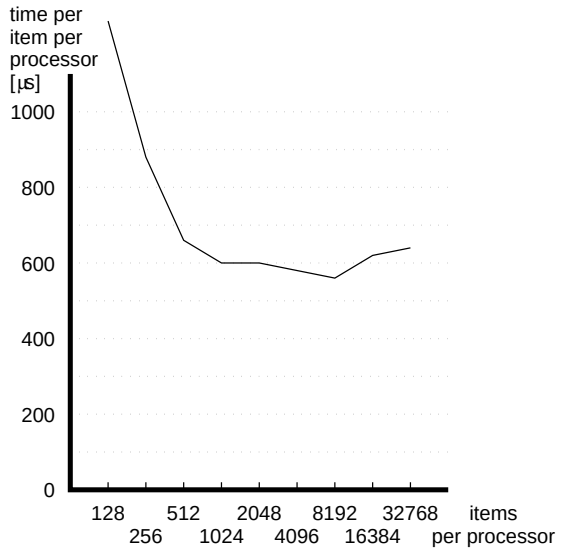


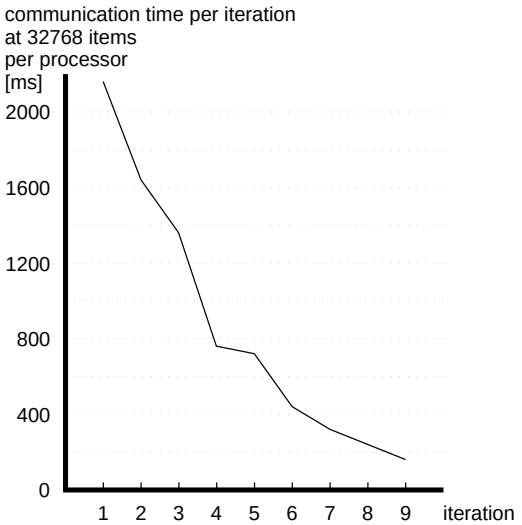


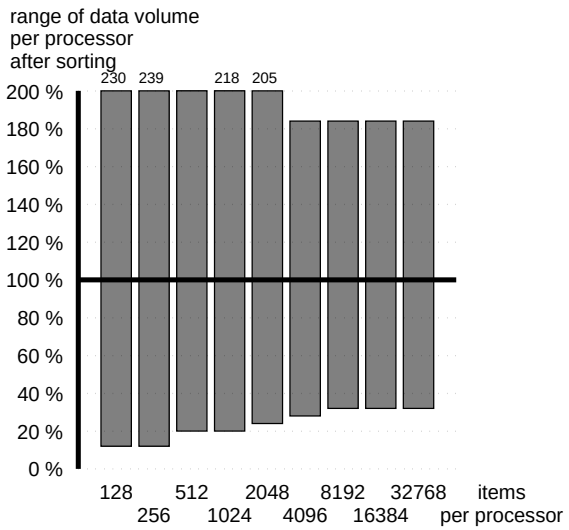
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1406	956	727	674	709	649	665	685	694
total time [s]	0.18	0.25	0.37	0.69	1.45	2.66	5.45	11.23	22.79
time for communication [ms]	154	203	285	454	929	1603	3102	6233	12388
time for local sorting [ms]	33	61	133	290	633	1293	2728	5866	11717
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	14	30	94	206	574	1053	2478	4811	10092
maximal number of items	323	552	1074	2158	4177	7922	15469	30830	57797
number of data packets	6074	6173	6004	6059	7486	11792	20701	37930	72472
total path length of all data packets	28490	28269	28145	28067	34264	52630	92083	168224	322600
average recursion depth	8.61	8.71	8.50	8.56	8.38	8.36	8.44	8.38	8.35

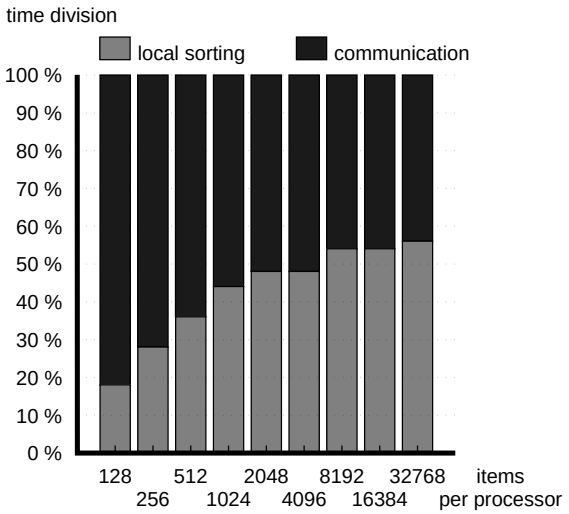
Data Sheet 6

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	log(N)-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





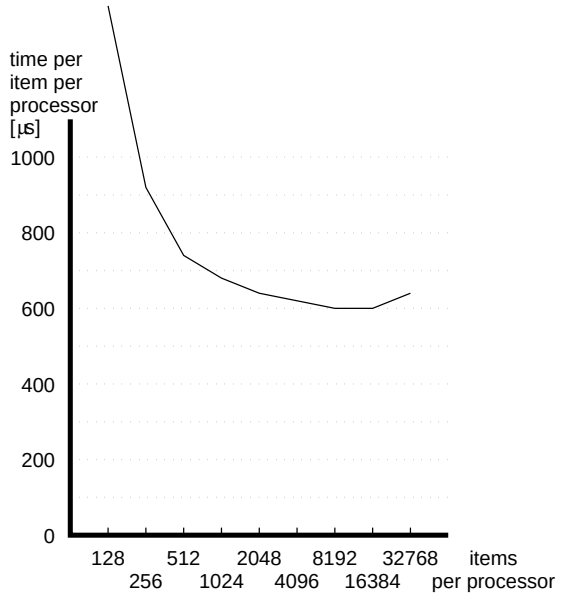


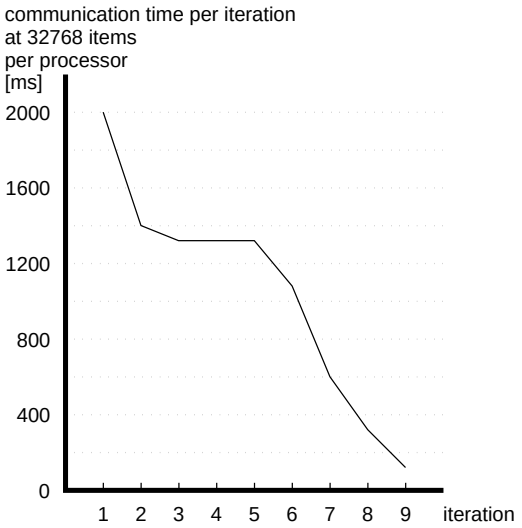


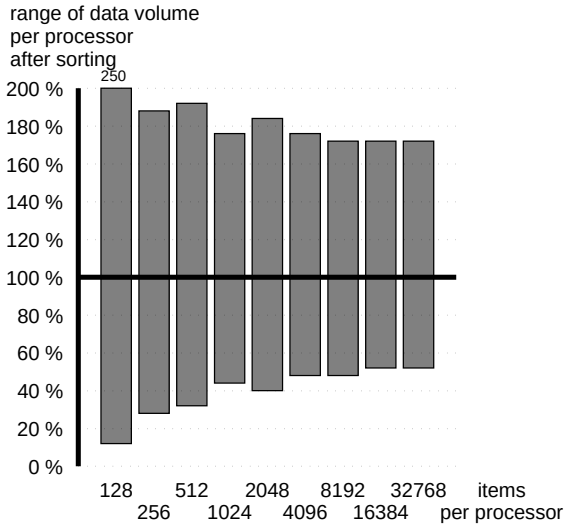
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1249	882	655	597	600	583	565	616	635
total time [s]	0.16	0.23	0.36	0.61	1.23	2.39	4.63	10.10	20.84
time for communication [ms]	141	185	239	370	706	1330	2269	5019	9191
time for local sorting [ms]	31	69	126	311	628	1226	2632	5749	12538
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	18	37	106	187	527	1128	2515	5564	10080
maximal number of items	295	613	1026	2229	4190	7541	15047	30291	60987
number of data packets	6159	6209	5982	6163	7473	11791	20490	38096	72909
total path length of all data packets	25275	25208	25186	25197	29643	46810	78296	147809	277799
average recursion depth	8.72	8.76	8.47	8.69	8.44	8.38	8.38	8.42	8.40

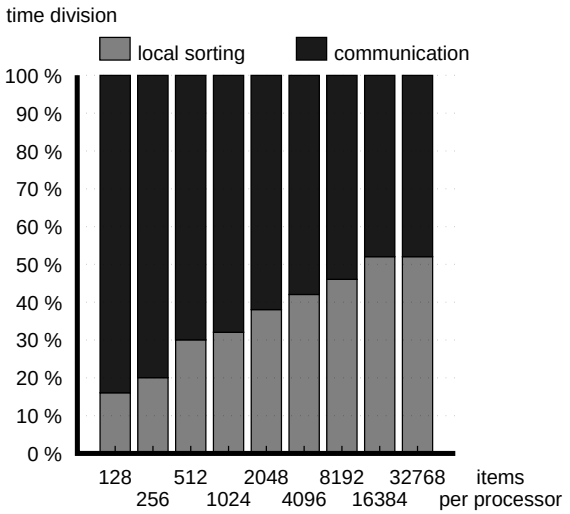
Data Sheet 7

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	$\sqrt{N}$-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





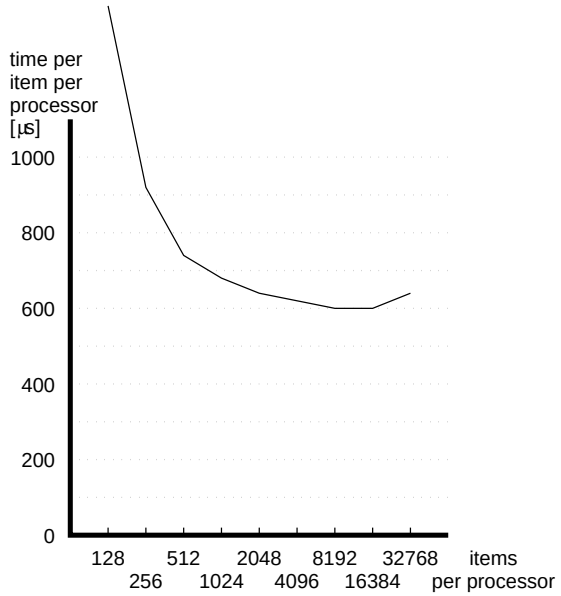


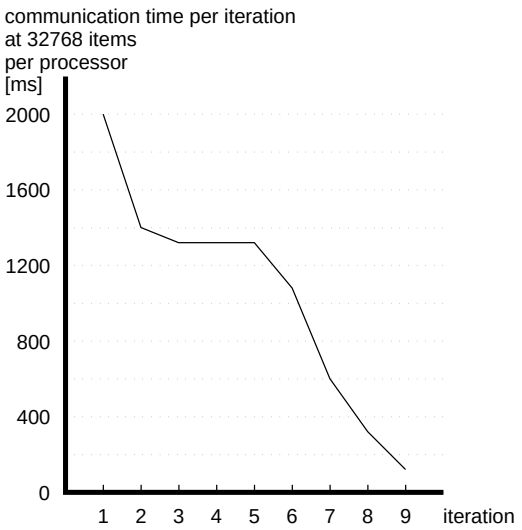


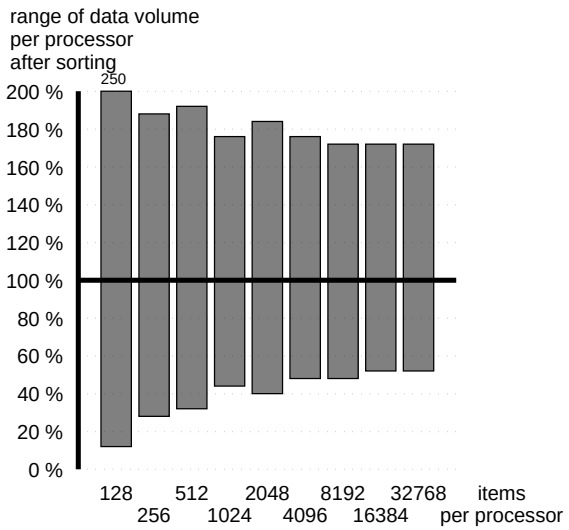
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1484	917	731	685	644	619	610	592	642
total time [s]	0.19	0.23	0.37	0.70	1.32	2.54	5.00	9.71	21.05
time for communication [ms]	163	199	288	513	887	1598	2908	4904	10524
time for local sorting [ms]	32	53	120	245	551	1173	2472	5321	11462
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	17	76	154	463	860	1998	4069	8732	16885
maximal number of items	320	486	981	1821	3747	7184	14190	28262	56076
number of data packets	6198	5852	5840	5797	7270	11438	19813	36510	70074
total path length of all data packets	31947	30858	30691	30128	37588	57776	102811	185348	363402
average recursion depth	8.77	8.30	8.29	8.22	8.28	8.14	8.12	8.07	8.08

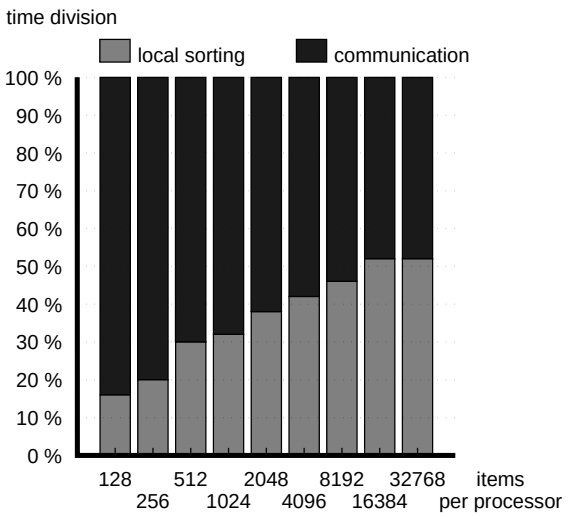
Data Sheet 8

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	$\sqrt{N}$-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





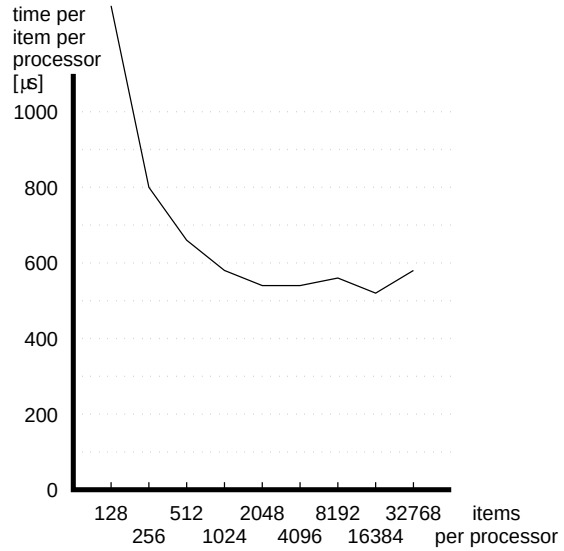


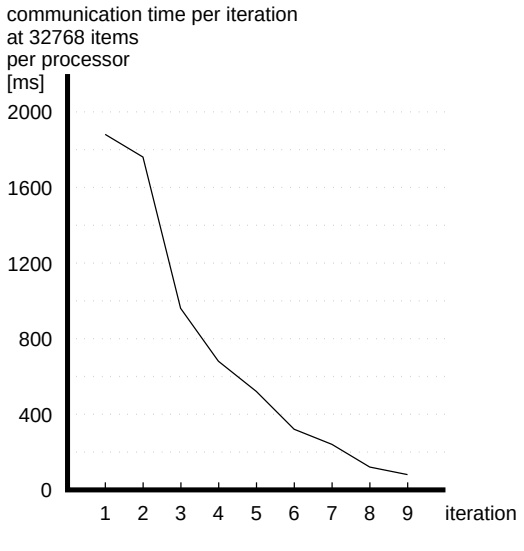


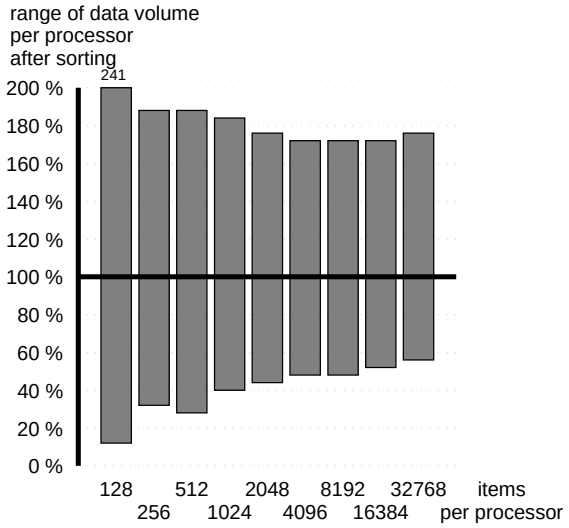
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1409	944	702	638	624	596	585	590	605
total time [s]	0.18	0.24	0.36	0.65	1.28	2.44	4.80	9.69	19.85
time for communication [ms]	153	202	277	438	853	1418	2646	4958	9577
time for local sorting [ms]	32	51	112	254	527	1174	2530	5385	11290
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	14	69	170	424	930	2081	4048	8390	17568
maximal number of items	319	477	940	1853	3533	7146	14223	28478	55696
number of data packets	6194	5956	5943	5810	7274	11330	19860	36550	70034
total path length of all data packets	28180	27784	27930	27482	33556	51712	89644	163064	312645
average recursion depth	8.76	8.44	8.41	8.24	8.23	8.11	8.13	8.06	8.07

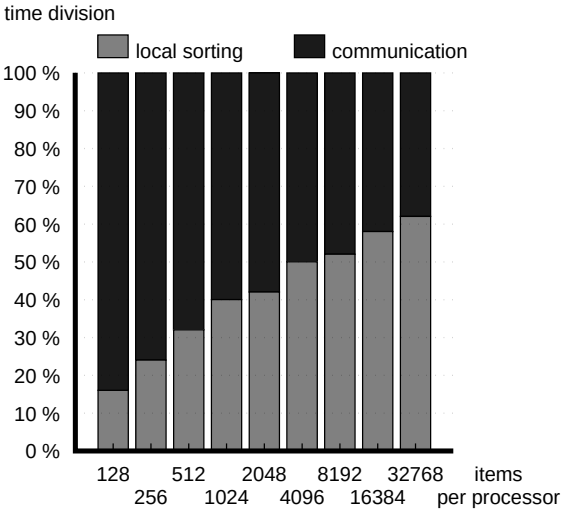
Data Sheet 9

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	$\sqrt{N}$-median of root processor		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





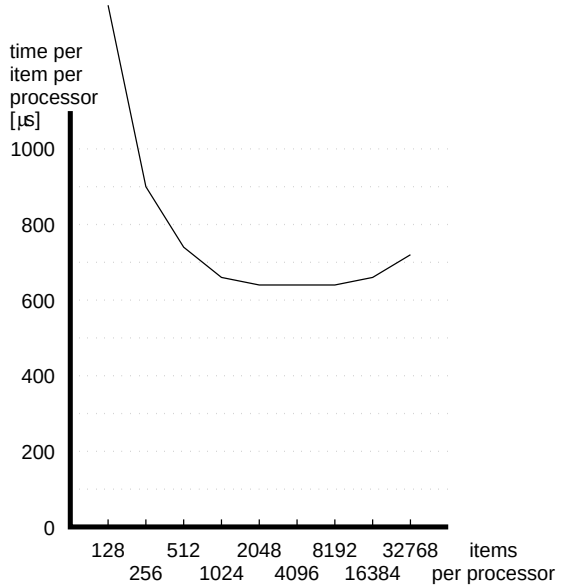


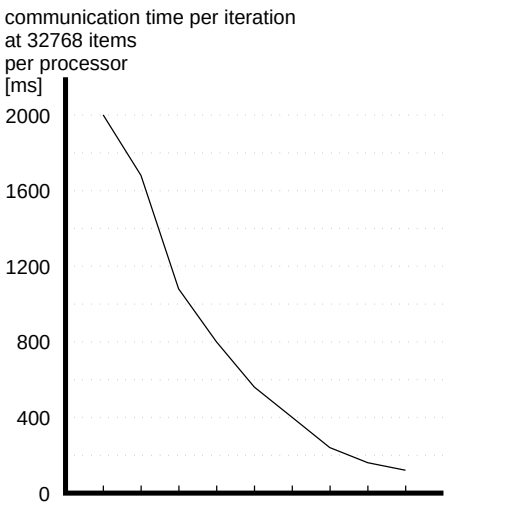


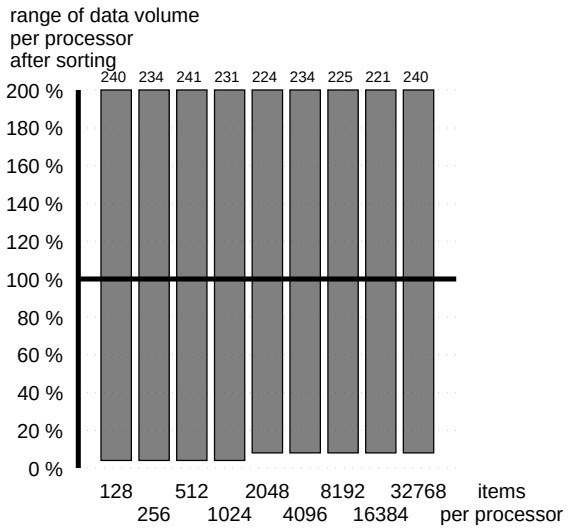
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1273	800	669	579	545	544	555	527	571
total time [s]	0.16	0.20	0.34	0.60	1.12	2.23	4.55	8.65	18.75
time for communication [ms]	149	166	251	381	647	1154	2238	3754	7548
time for local sorting [ms]	30	54	117	258	528	1137	2459	5289	11880
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	19	80	142	410	877	2028	4046	8707	17788
maximal number of items	308	482	955	1895	3600	6975	14082	28177	58829
number of data packets	6183	5926	5937	5797	7284	11262	19866	36510	70104
total path length of all data packets	25382	25133	25043	24682	29441	46005	78937	148757	283101
average recursion depth	8.75	8.40	8.40	8.28	8.22	8.13	8.13	8.07	8.07

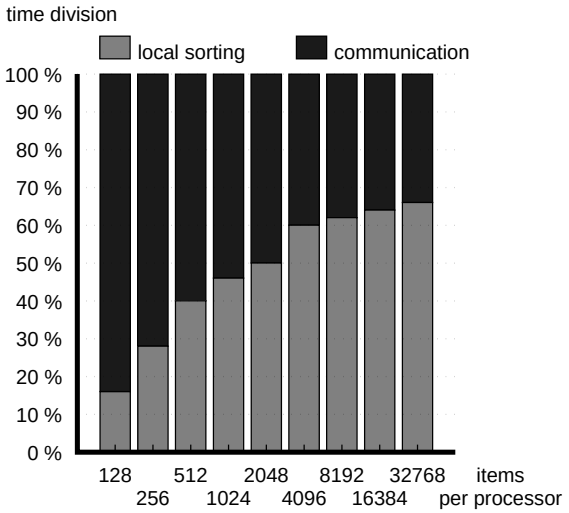
Data Sheet 10

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of 3-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





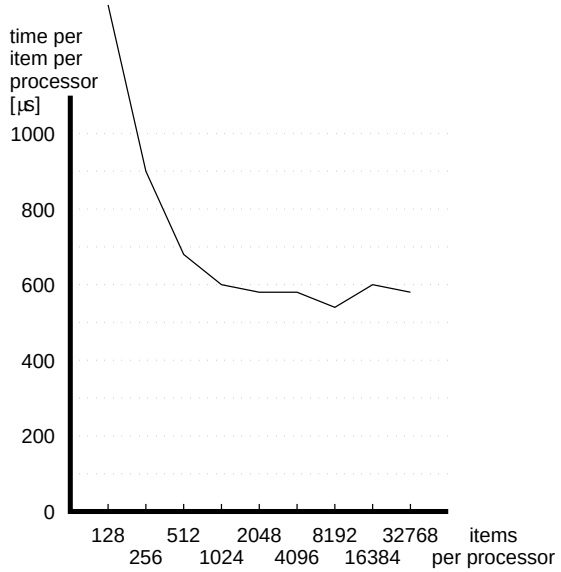


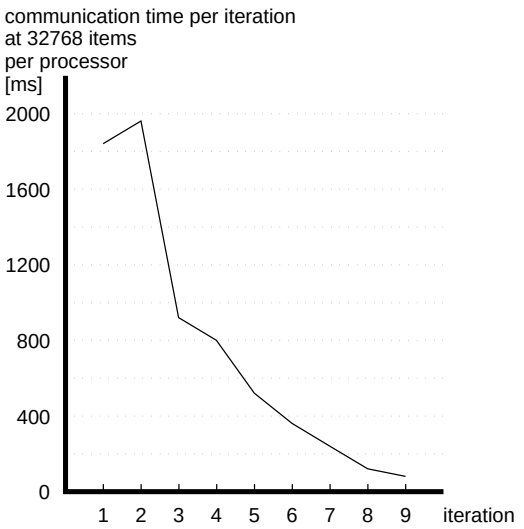


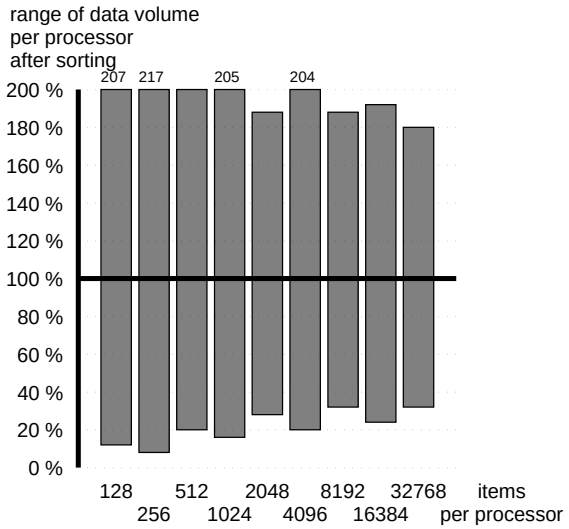
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1359	905	739	653	644	633	629	661	719
total time [s]	0.17	0.23	0.38	0.67	1.32	2.60	5.16	10.84	23.59
time for communication [ms]	151	179	241	378	679	1098	2078	4148	8281
time for local sorting [ms]	30	67	155	332	702	1641	3341	7124	16436
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	6	6	25	53	159	230	548	1294	2071
maximal number of items	307	598	1233	2367	4584	9595	18466	36287	78649
number of data packets	5759	5768	5768	5792	7407	11575	20020	37037	71320
total path length of all data packets	24390	24362	24466	24469	30786	46741	80102	147258	283578
average recursion depth	8.20	8.19	8.18	8.20	8.20	8.20	8.20	8.20	8.20

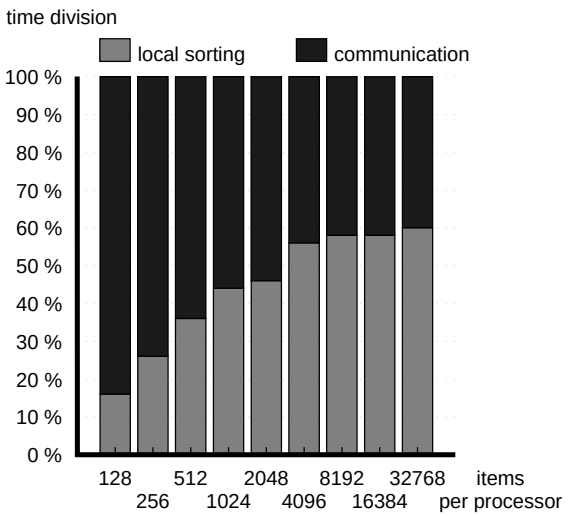
Data Sheet 11

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of log(N)-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





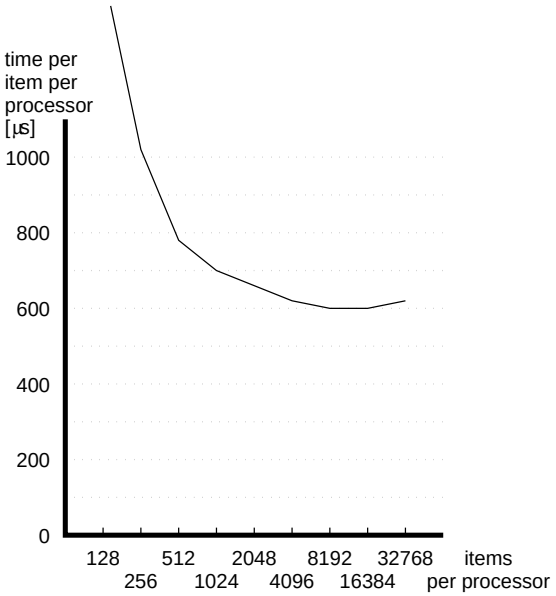


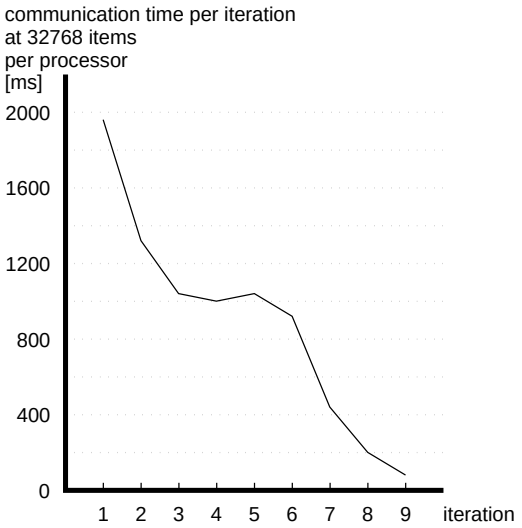


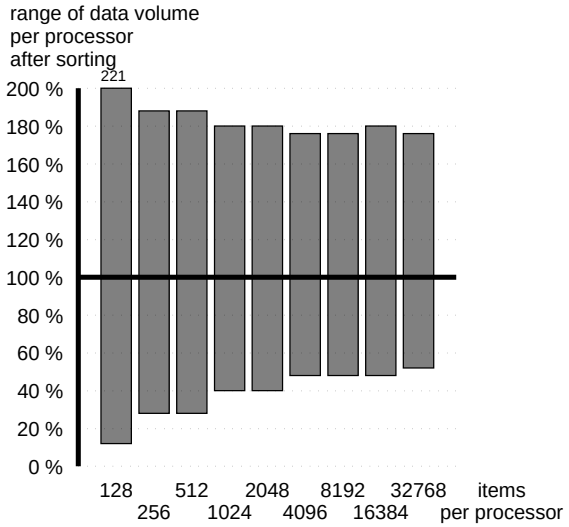
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1343	905	685	602	572	585	549	600	580
total time [s]	0.17	0.23	0.35	6.62	1.17	2.40	4.51	9.85	19.03
time for communication [ms]	151	182	230	355	632	1104	1976	4244	8045
time for local sorting [ms]	28	59	126	286	570	1387	2714	6023	11825
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	22	33	96	180	554	823	2558	3885	10515
maximal number of items	265	545	1026	2095	3866	8377	15520	31581	58370
number of data packets	5698	5774	5703	5753	7359	11377	19939	36587	70153
total path length of all data packets	24396	24092	24441	24216	30787	45293	82017	147053	284238
average recursion depth	8.12	8.20	8.11	8.16	8.10	8.14	8.08	8.12	8.08

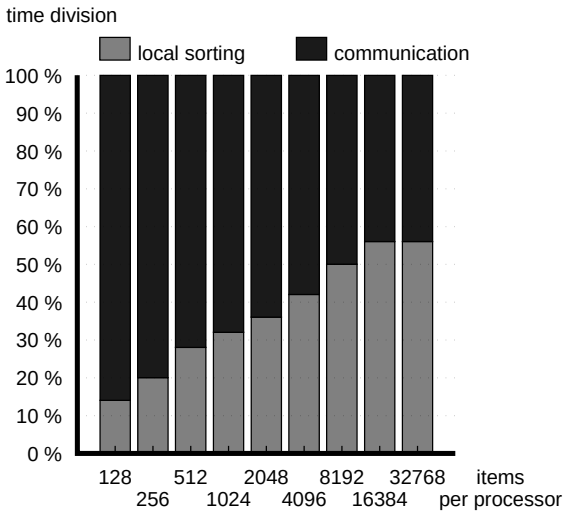
Data Sheet 12

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





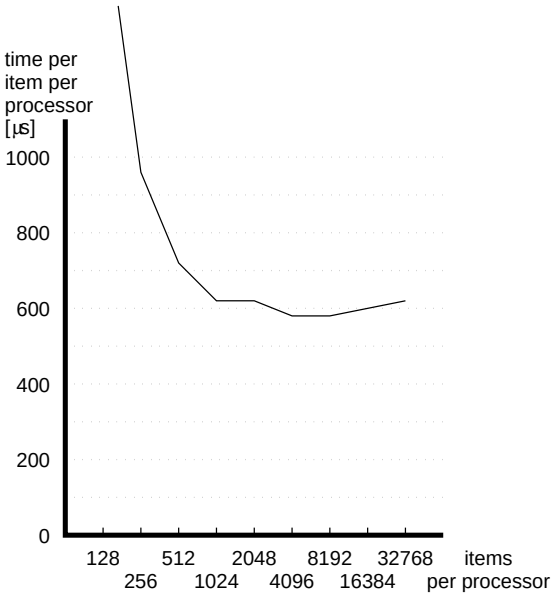


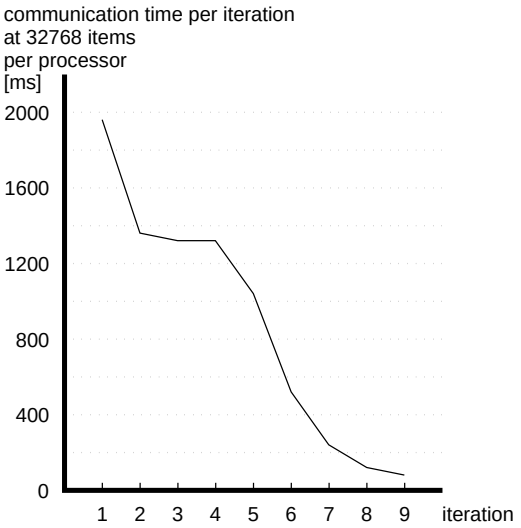


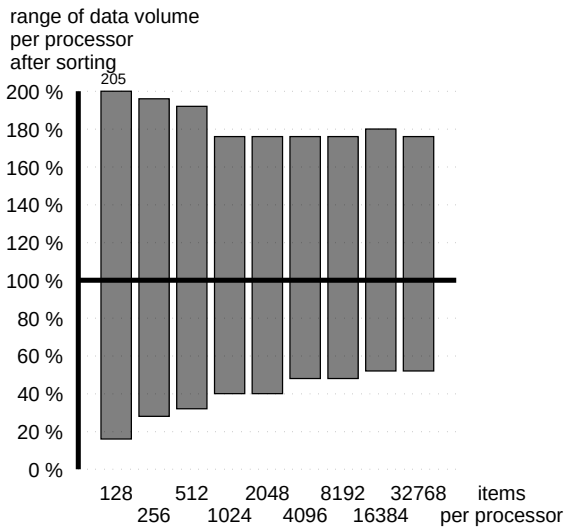
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1452	1022	784	695	663	614	597	610	611
total time [s]	0.19	0.26	0.40	0.71	1.36	2.52	4.90	10.04	20.05
time for communication [ms]	168	218	305	517	945	1571	2581	4661	9237
time for local sorting [ms]	29	52	117	248	547	1172	2552	5705	11727
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	17	74	151	426	840	1919	3813	8157	16812
maximal number of items	284	483	959	1855	3682	7267	14469	29788	57356
number of data packets	5764	5692	5706	5670	7278	11655	20062	36818	70216
total path length of all data packets	29686	30942	30967	30143	38225	57784	96999	164197	330664
average recursion depth	8.20	8.10	8.11	8.06	8.06	8.03	8.03	8.02	8.01

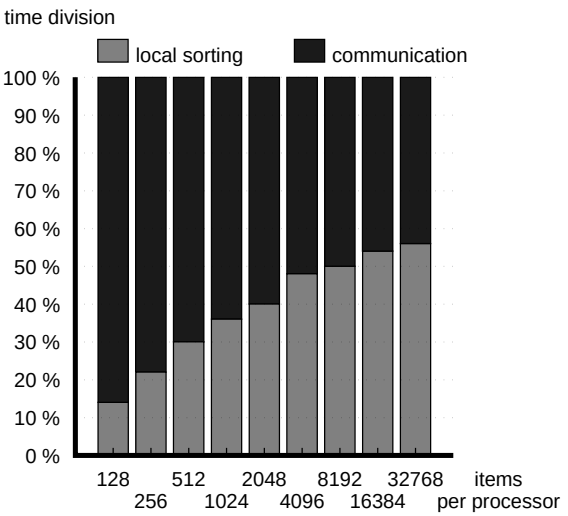
Data Sheet 13

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





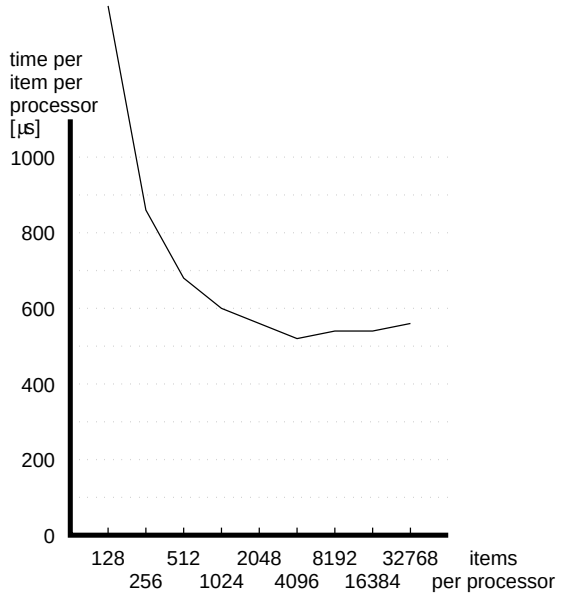


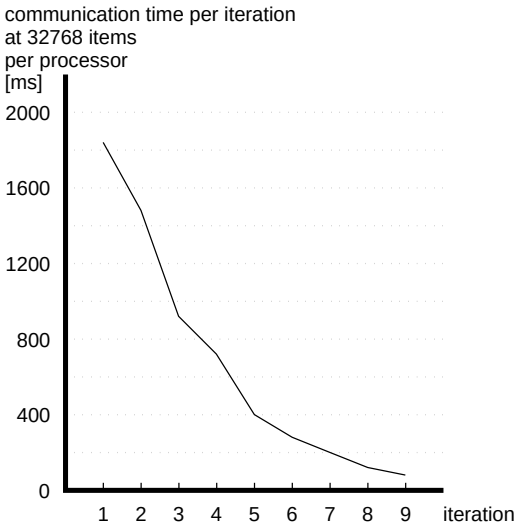


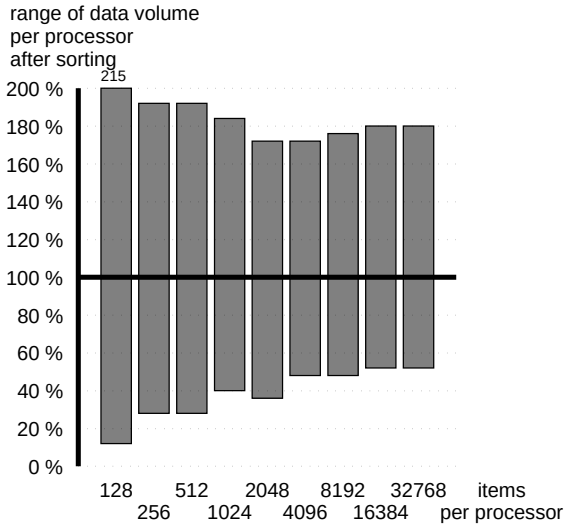
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1515	952	722	619	622	585	580	605	615
total time [s]	0.19	0.24	0.37	0.63	1.28	2.40	4.76	9.92	20.17
time for communication [ms]	176	203	274	420	812	1312	2451	4655	9081
time for local sorting [ms]	28	55	114	246	540	1184	2508	5604	11755
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	23	75	167	414	861	1996	3933	8266	17336
maximal number of items	263	505	958	1810	3605	7266	14273	29606	57932
number of data packets	5769	5696	5706	5674	7246	11692	20037	36813	70185
total path length of all data packets	27277	26706	26779	26880	32974	54059	91350	168108	317981
average recursion depth	8.21	8.11	8.11	8.07	8.06	8.03	8.03	8.02	8.01

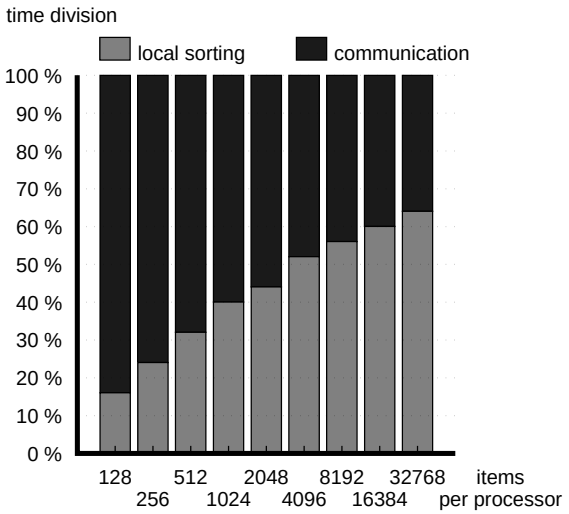
Data Sheet 14

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





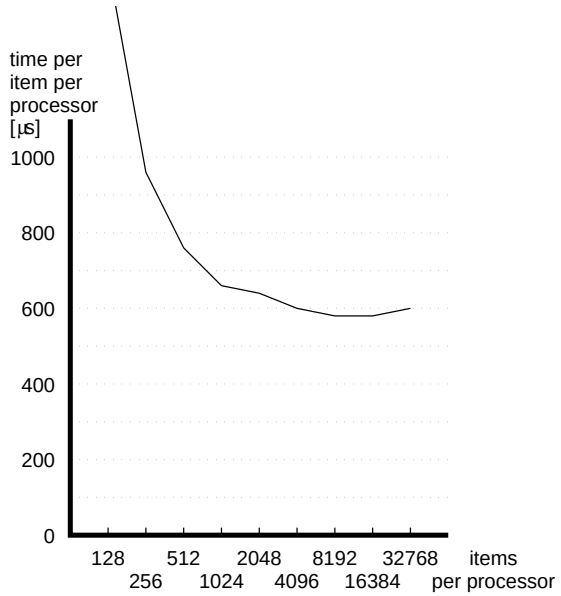


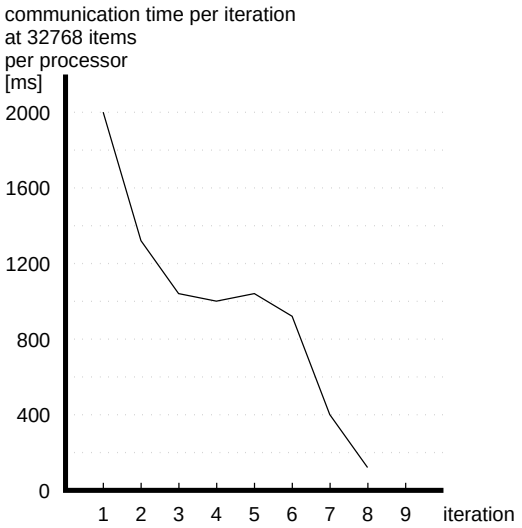


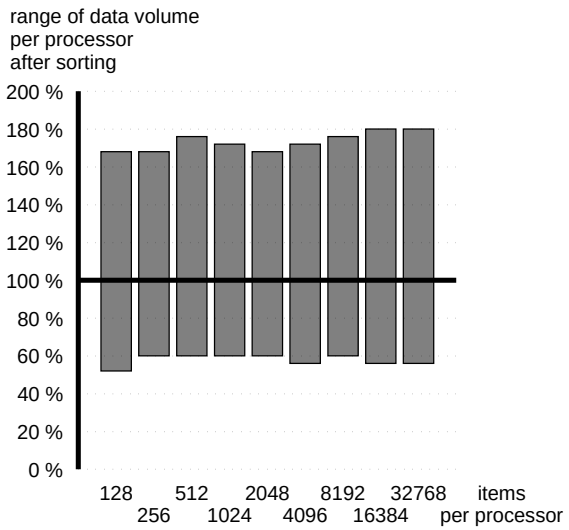
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1390	870	671	594	561	529	534	544	567
total time [s]	0.18	0.22	0.34	0.61	1.15	2.17	4.38	8.93	18.61
time for communication [ms]	158	180	240	363	656	1120	2068	3553	6900
time for local sorting [ms]	30	55	120	261	535	1136	2512	5605	12090
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	16	75	150	415	768	2024	3858	8271	17014
maximal number of items	275	490	991	1903	3563	7105	14279	29407	59538
number of data packets	5757	5698	5699	5673	7214	11727	20075	36834	70184
total path length of all data packets	23968	24315	24404	24358	29534	48470	82400	151431	286745
average recursion depth	8.19	8.10	8.10	8.06	8.07	8.03	8.03	8.02	8.02

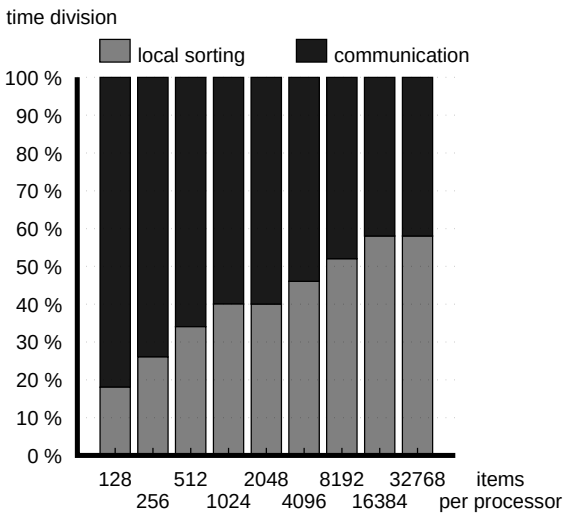
Data Sheet 15

Quicksort	with final local sorting and odd-even sort for 2 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





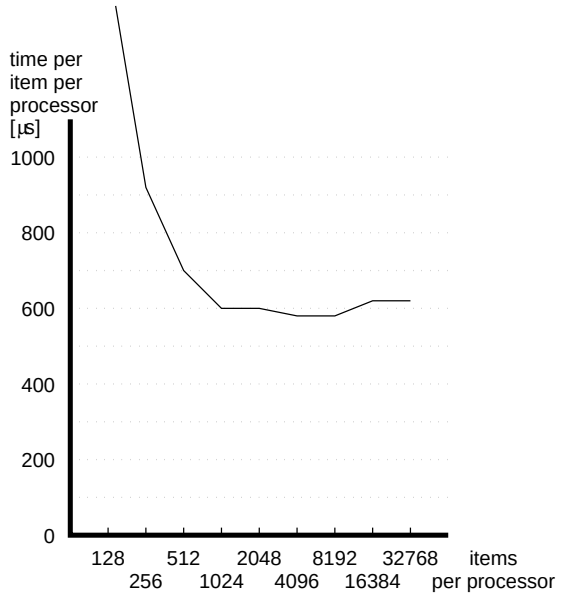


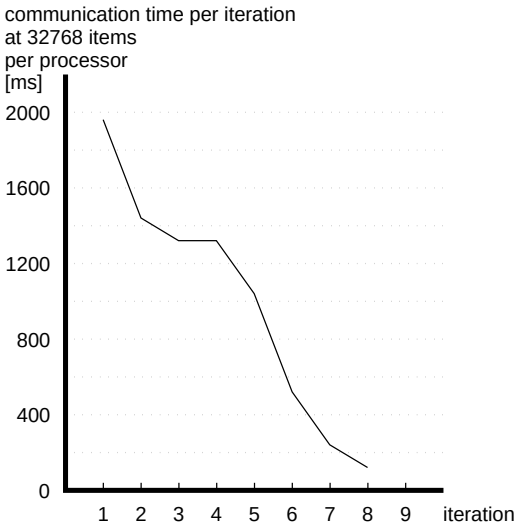


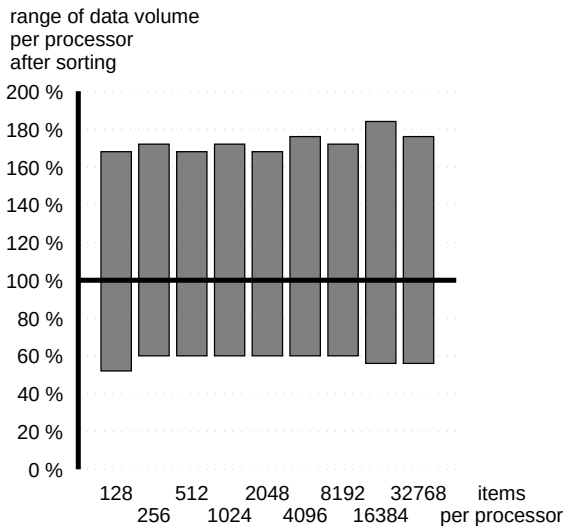
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1460	960	757	669	649	605	584	588	610
total time [s]	0.19	0.25	0.39	0.69	1.33	2.48	4.79	9.66	20.01
time for communication [ms]	167	203	0.30	482	910	1472	2489	4486	8942
time for local sorting [ms]	20	47	110	243	513	1157	2534	5563	11836
time for odd-even sort [ms]	15	24	39	69	93	144	234	486	870
minimum number of items	68	154	315	611	1192	2365	4762	9344	18988
maximal number of items	213	432	896	1775	3470	7149	14423	29331	58502
number of data packets	5572	5496	5498	5550	7178	11517	19949	36759	70056
total path length of all data packets	29837	30935	30934	30484	38660	58960	98820	167187	335409
average recursion depth	7.44	7.30	7.30	7.19	7.19	7.09	7.07	7.05	7.04

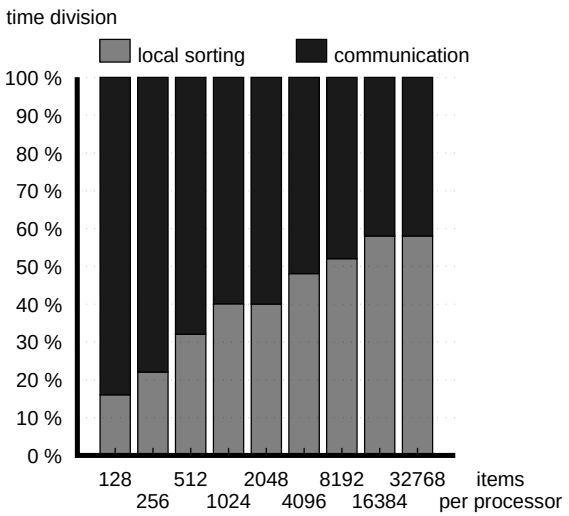
Data Sheet 16

Quicksort	with final local sorting and odd-even sort for 2 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





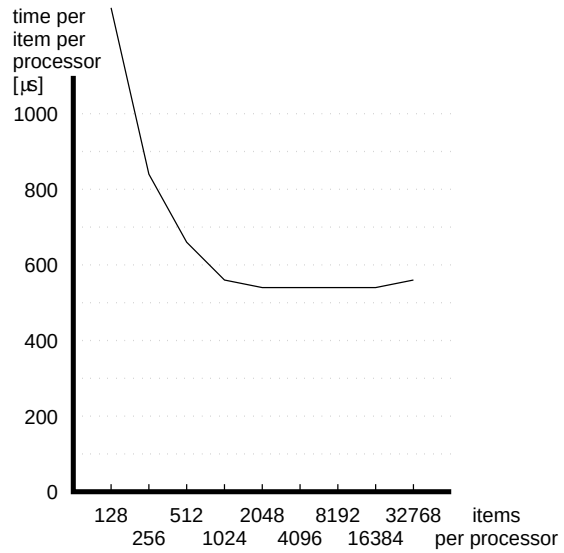


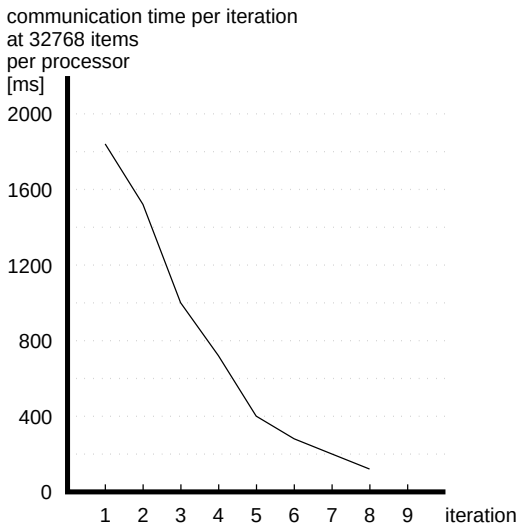


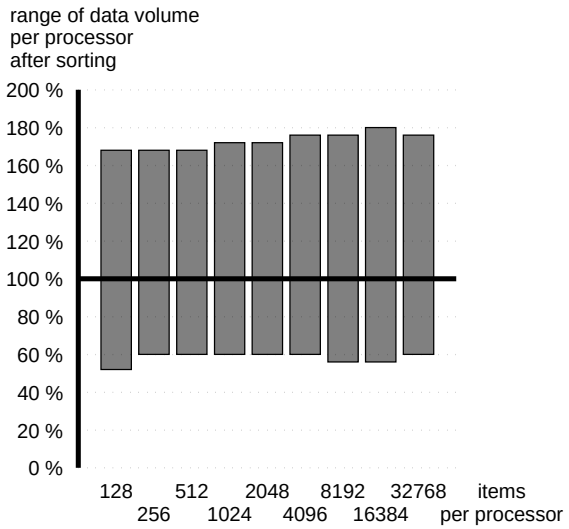
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1460	921	698	602	601	576	583	614	616
total time [s]	0.19	0.24	0.36	0.62	1.23	2.36	4.78	10.07	20.21
time for communication [ms]	169	195	266	409	790	1320	2414	4567	8913
time for local sorting [ms]	20	48	102	237	515	1154	2531	5729	11805
time for odd-even sort [ms]	10	10	20	30	52	97	186	350	709
minimum number of items	70	154	312	603	1235	2376	4780	9378	18905
maximal number of items	212	436	863	1760	3448	7188	14244	29981	57631
number of data packets	5559	5479	5502	5549	7165	11583	19905	36645	70074
total path length of all data packets	27944	27429	27496	28151	35211	58343	99494	184515	350933
average recursion depth	7.42	7.28	7.30	7.18	7.19	7.09	7.09	7.05	7.03

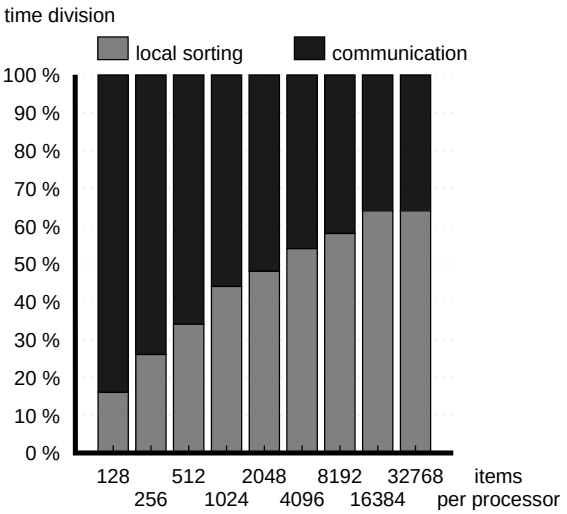
Data Sheet 17

Quicksort	with final local sorting and odd-even sort for 2 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





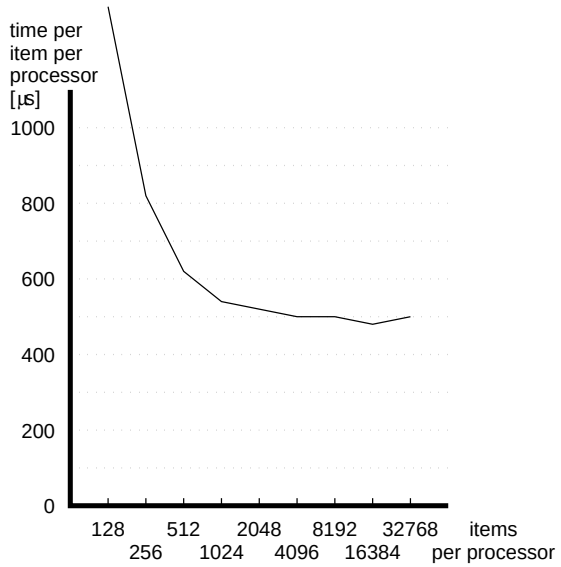


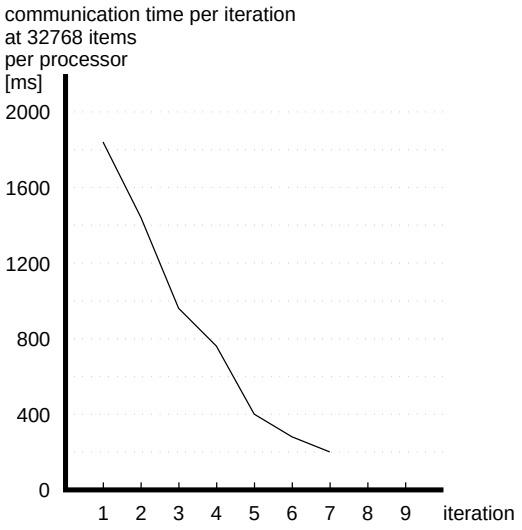


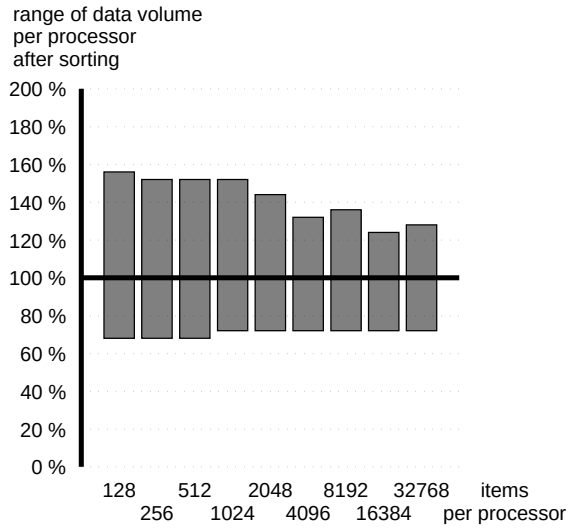
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1280	847	644	553	545	536	537	546	557
total time [s]	0.16	0.22	0.33	0.57	1.11	2.20	4.41	8.96	18.27
time for communication [ms]	151	173	232	353	641	1091	2004	3452	6789
time for local sorting [ms]	20	48	102	240	525	1176	2596	5614	11677
time for odd-even sort [ms]	10	10	20	30	51	96	186	359	708
minimum number of items	71	156	310	611	1195	2407	4693	9652	18846
maximal number of items	216	434	867	1760	3511	7189	14621	29541	58123
number of data packets	5577	5498	5483	5552	7107	11623	19940	36775	70049
total path length of all data packets	25299	25741	25855	26657	33469	56437	97230	182348	346793
average recursion depth	7.46	7.30	7.26	7.20	7.19	7.09	7.09	7.03	7.04

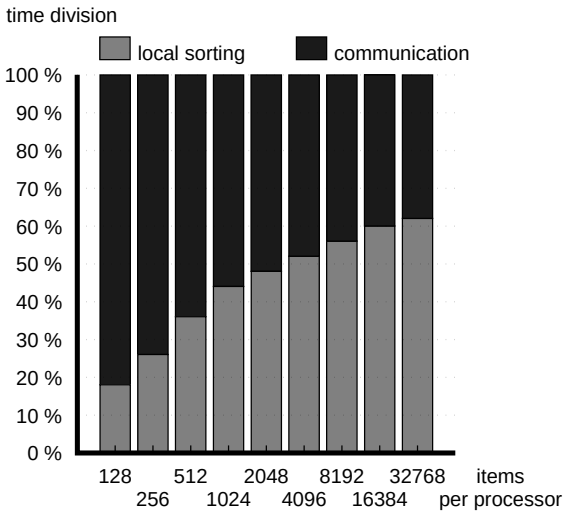
Data Sheet 18

Quicksort	with final local sorting and odd-even sort for 3 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





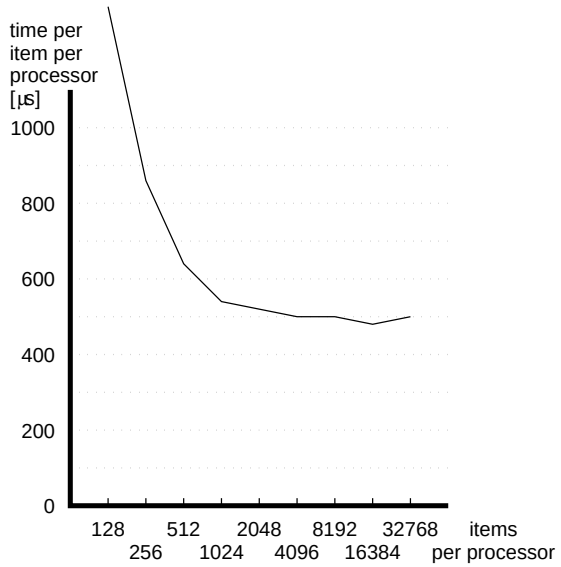


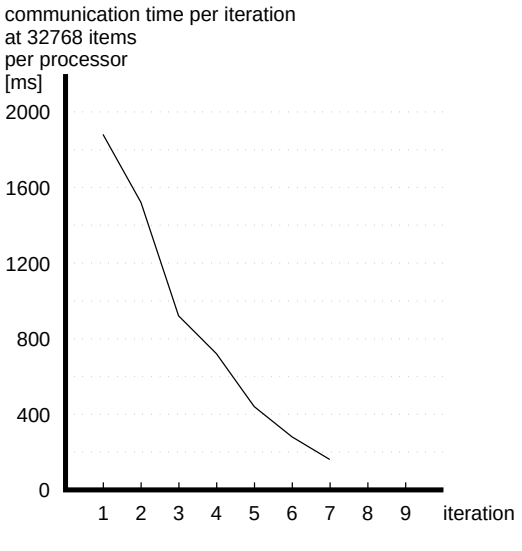


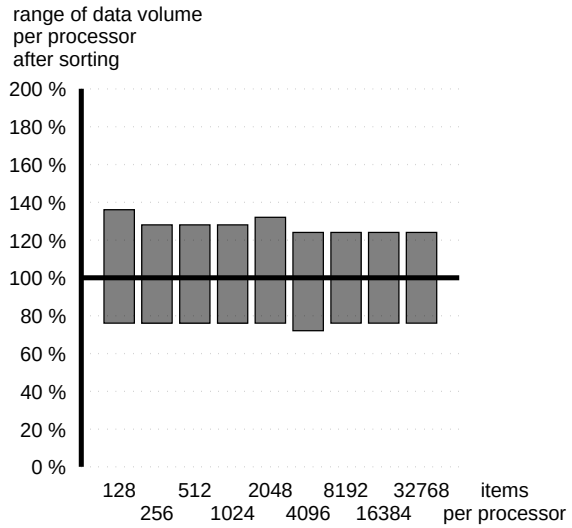
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1320	823	630	539	521	500	494	490	501
total time [s]	0.17	0.21	0.32	0.55	1.07	2.05	4.05	8.04	16.44
time for communication [ms]	149	170	226	344	623	1073	1950	3397	6615
time for local sorting [ms]	20	41	90	207	428	862	1933	3890	8419
time for odd-even sort [ms]	13	20	37	69	128	261	517	1032	2076
minimum number of items	85	179	352	735	1445	3020	5925	12082	23485
maximal number of items	198	387	784	1563	2934	5406	11158	20541	41331
number of data packets	5416	5367	5368	5552	7166	11699	20099	36873	70453
total path length of all data packets	26655	26854	26897	28134	35910	58494	101810	185917	355964
average recursion depth	6.85	6.80	6.80	6.84	6.83	6.93	6.90	6.96	6.94

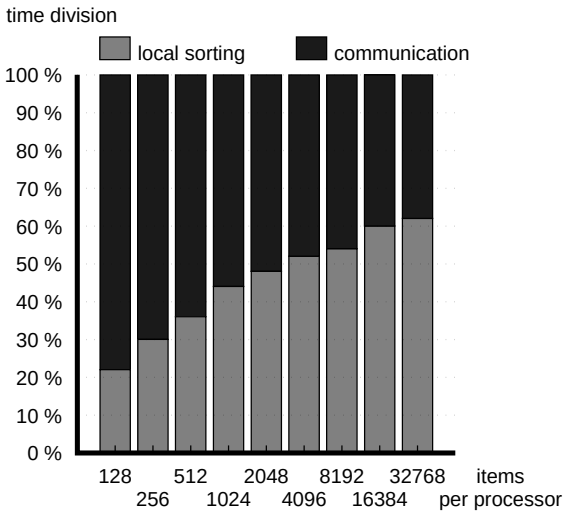
Data Sheet 19

Quicksort	with final local sorting and odd-even sort for 4 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





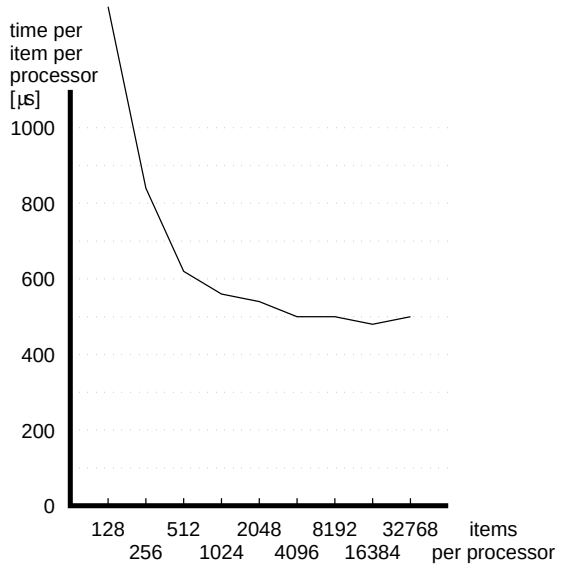


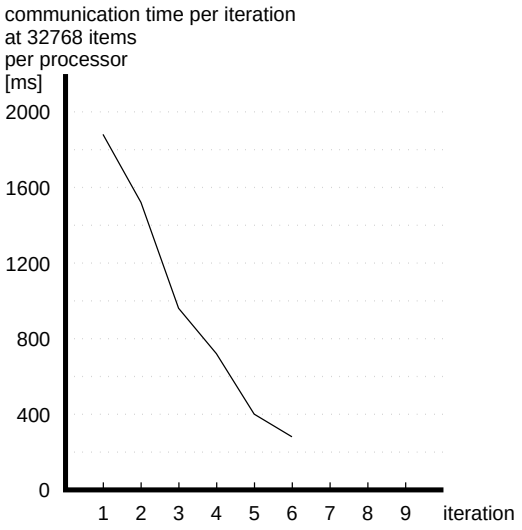


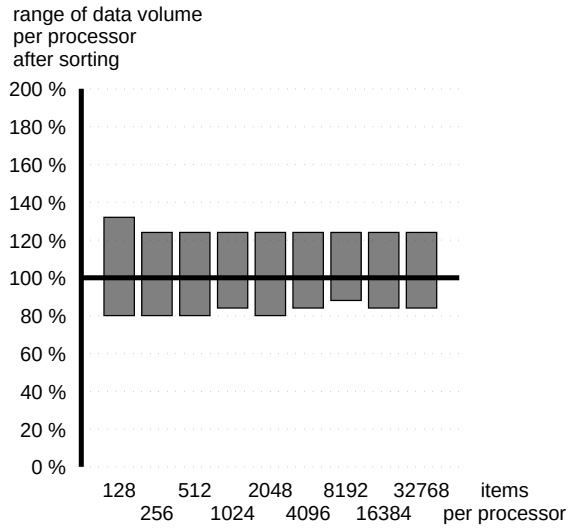
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1312	855	632	547	527	505	497	490	510
total time [s]	0.17	0.22	0.32	0.56	1.08	2.07	4.08	8.04	16.75
time for communication [ms]	150	170	225	340	616	1046	1948	3357	6614
time for local sorting [ms]	20	40	83	177	396	815	1761	3821	8442
time for odd-even sort [ms]	20	30	46	84	157	303	604	1178	2363
minimum number of items	96	195	393	778	1553	3025	6105	12305	24311
maximal number of items	175	330	664	1297	2667	5071	10122	20238	40840
number of data packets	5356	5303	5303	5634	7393	12425	21568	40541	77585
total path length of all data packets	27711	28354	28372	31361	41090	71718	126290	241762	463534
average recursion depth	6.50	6.37	6.37	6.24	6.29	6.14	6.15	6.07	6.08

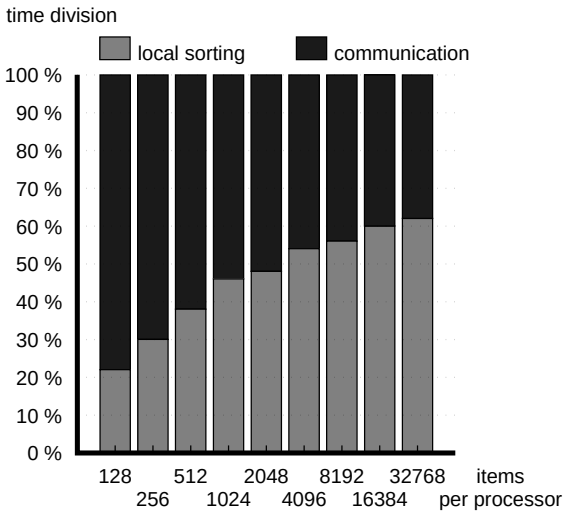
Data Sheet 20

Quicksort	with final local sorting and odd-even sort for 5 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





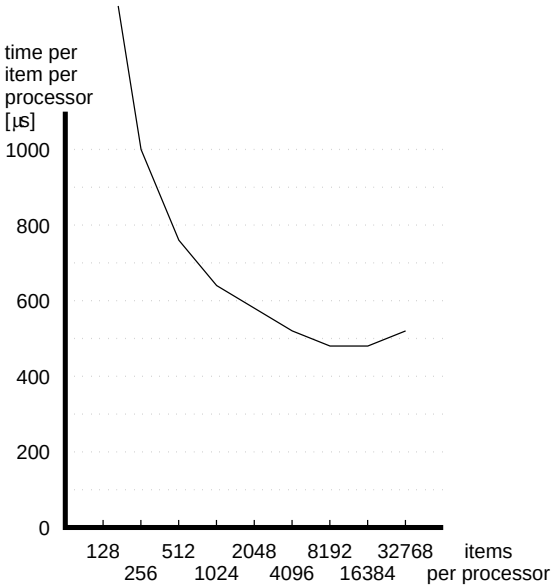


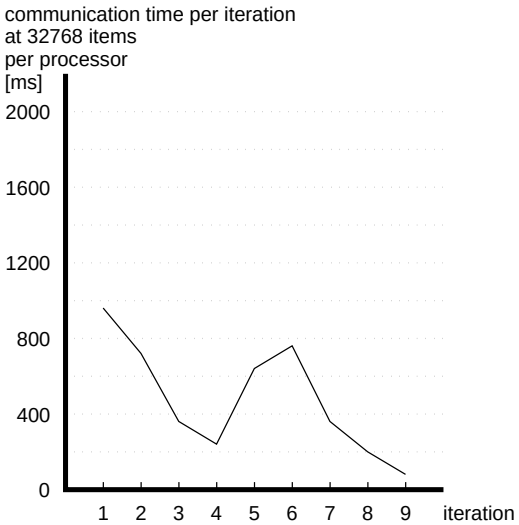


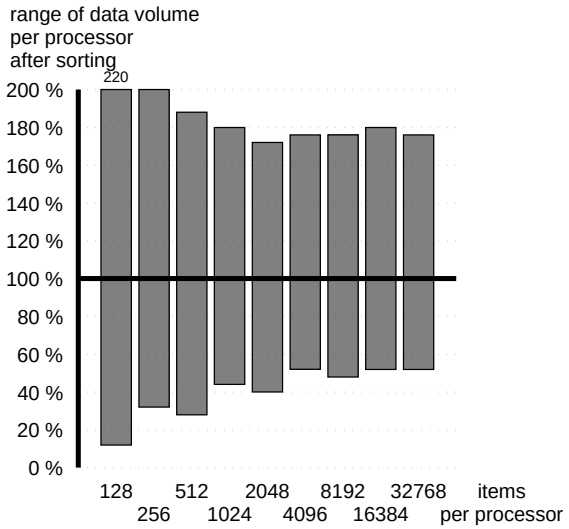
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1328	835	632	555	535	509	494	489	499
total time [s]	0.17	0.21	0.32	0.57	1.10	2.09	4.05	8.04	16.40
time for communication [ms]	141	169	218	334	608	1023	1880	3257	6360
time for local sorting [ms]	20	39	80	176	379	828	1777	3818	8087
time for odd-even sort [ms]	20	31	58	99	195	342	688	1267	2545
minimum number of items	101	206	416	852	1679	3481	7052	13984	28094
maximal number of items	167	321	642	1267	2540	5060	10105	20325	40130
number of data packets	5332	5287	5291	5675	7580	12604	21963	40891	78483
total path length of all data packets	28859	29526	29626	32754	43916	74510	131764	246694	474808
average recursion depth	6.19	6.06	6.05	6.05	6.03	6.00	6.00	6.00	6.00

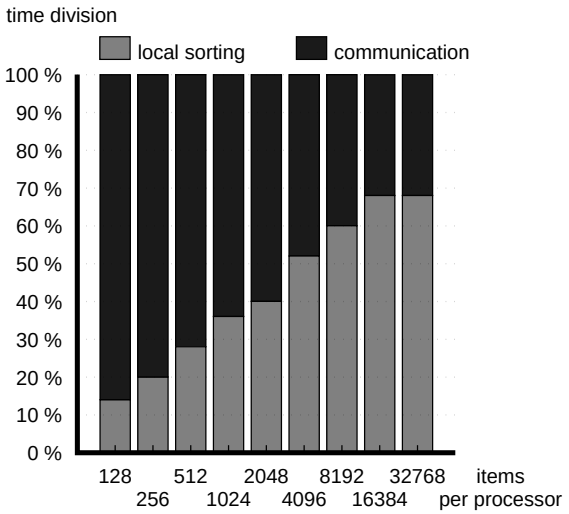
Data Sheet 21

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





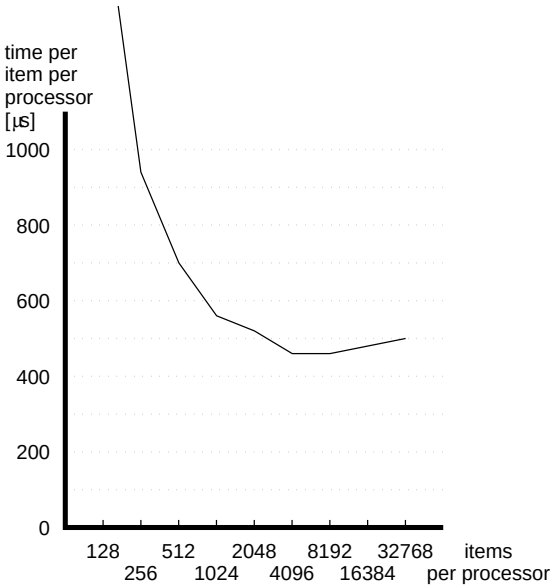


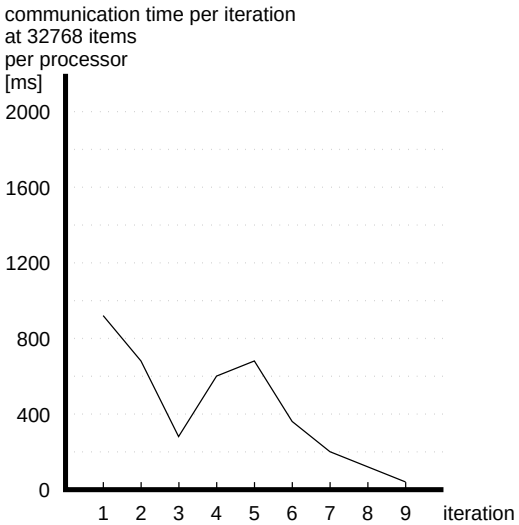


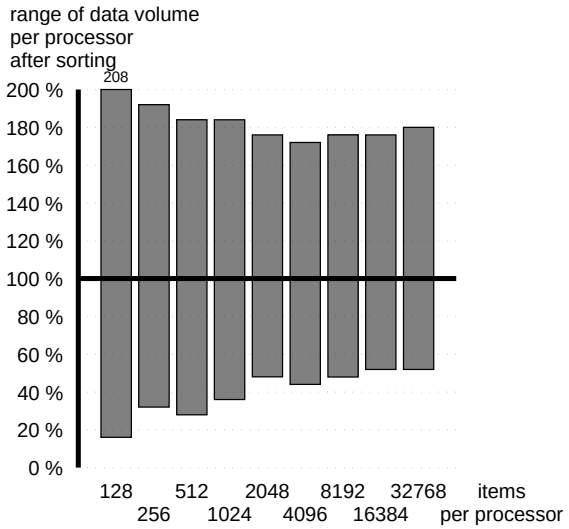
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1601	1011	753	633	582	514	485	471	521
total time [s]	0.20	0.26	0.39	0.65	1.19	2.11	3.98	7.73	17.10
time for communication [ms]	188	223	302	456	749	1110	1691	2726	5777
time for local sorting [ms]	29	58	116	252	534	1177	3553	5535	11935
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	17	79	141	448	819	2072	3853	8207	17181
maximal number of items	284	515	944	1842	3560	7261	14410	29339	58252
number of data packets	3663	3620	3631	3606	3919	6175	10323	18824	35498
total path length of all data packets	26629	22662	24765	23142	24967	34219	55362	89271	183908
average recursion depth	8.20	8.10	8.11	8.06	8.06	8.03	8.03	8.02	8.02

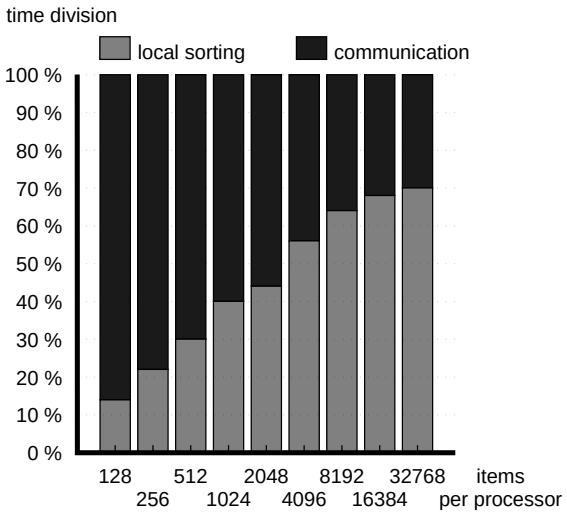
Data Sheet 22

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





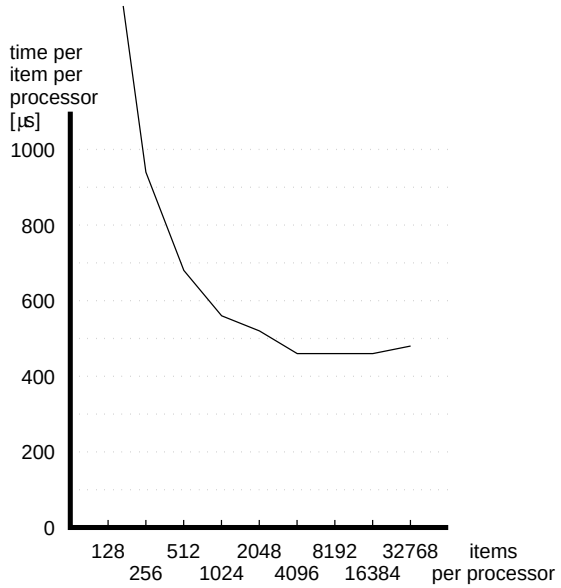


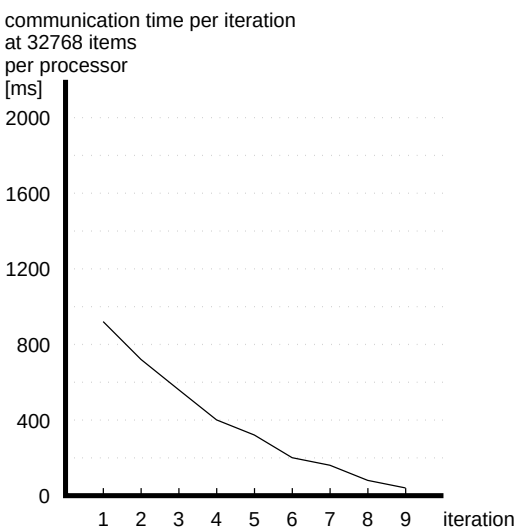


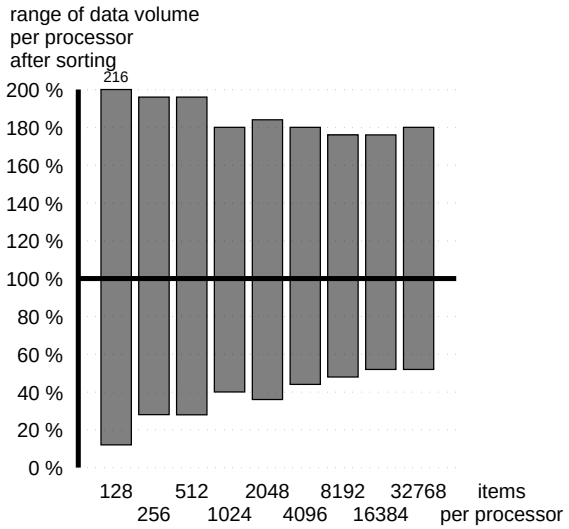
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1679	948	691	560	515	467	463	471	501
total time [s]	0.21	0.24	0.35	0.57	1.06	1.92	3.80	7.73	16.43
time for communication [ms]	198	200	258	369	596	884	1443	2583	5024
time for local sorting [ms]	30	56	115	251	542	1129	2540	5551	12036
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	18	80	145	374	951	1868	4027	8330	16937
maximal number of items	267	489	940	1884	3622	7014	14288	28977	58834
number of data packets	3667	3623	3631	3617	3925	6139	10337	18699	35520
total path length of all data packets	23179	20150	21369	20573	21964	31703	52735	93023	178591
average recursion depth	8.21	8.10	8.10	8.07	8.06	8.02	8.03	8.02	8.02

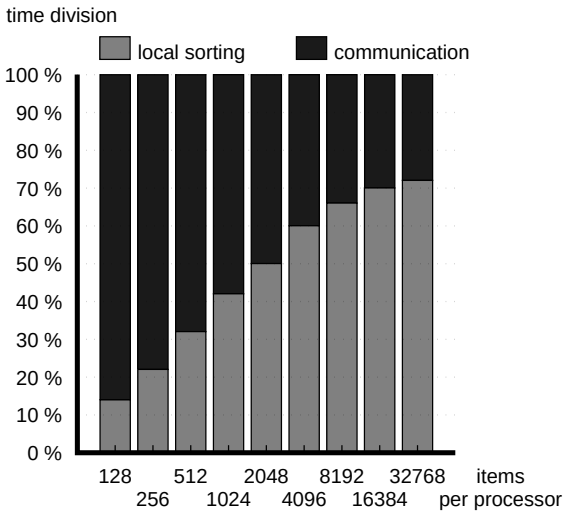
Data Sheet 23

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





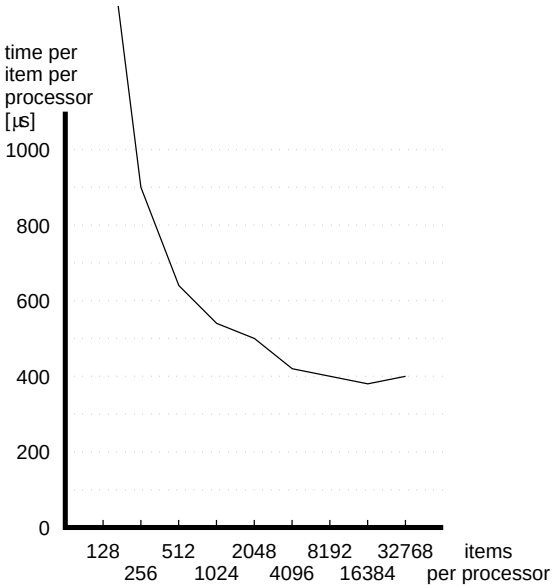


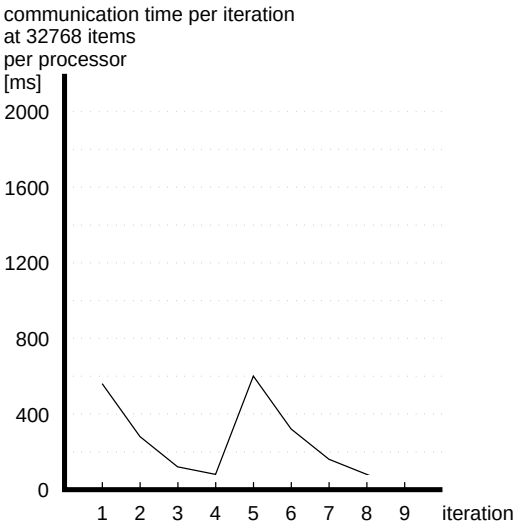


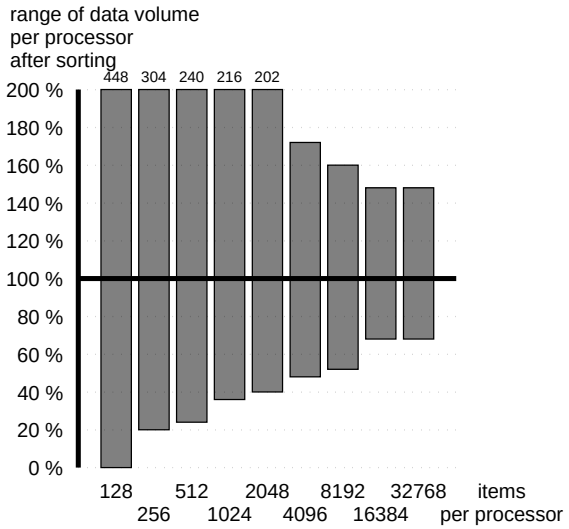
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1554	944	689	555	518	468	456	466	489
total time [s]	0.20	0.24	0.35	0.57	1.06	1.92	3.74	7.65	16.03
time for communication [ms]	179	197	244	350	564	815	1337	2371	4505
time for local sorting [ms]	29	55	120	246	552	1176	2522	5498	12039
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	17	74	153	430	771	1869	3856	8393	16738
maximal number of items	279	506	1008	1826	3732	7357	14443	28849	58837
number of data packets	3666	3624	3625	3616	3943	6127	10344	18805	35533
total path length of all data packets	24048	24097	24154	24219	25107	38256	64560	116644	219934
average recursion depth	8.21	8.10	8.10	8.07	8.07	8.03	8.03	8.02	8.02

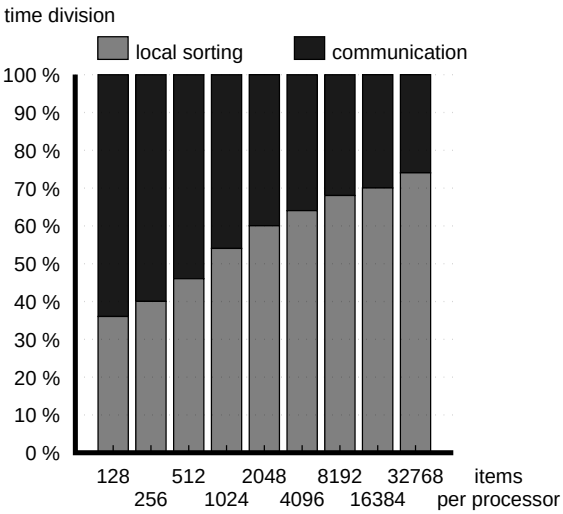
Data Sheet 24

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	no





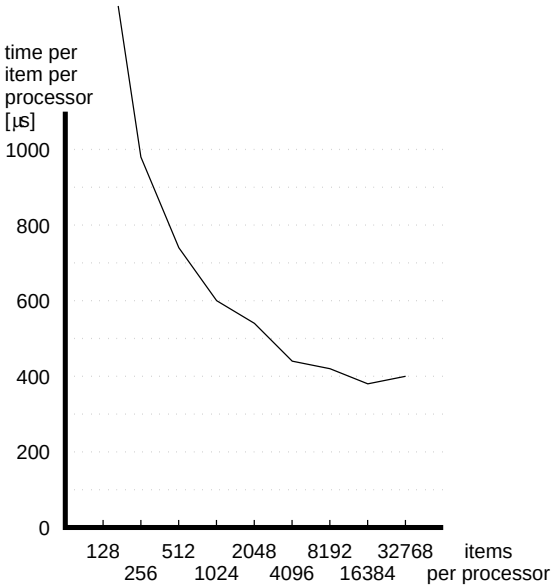


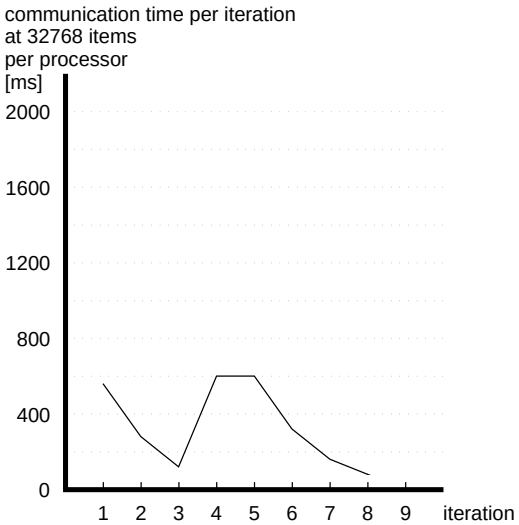


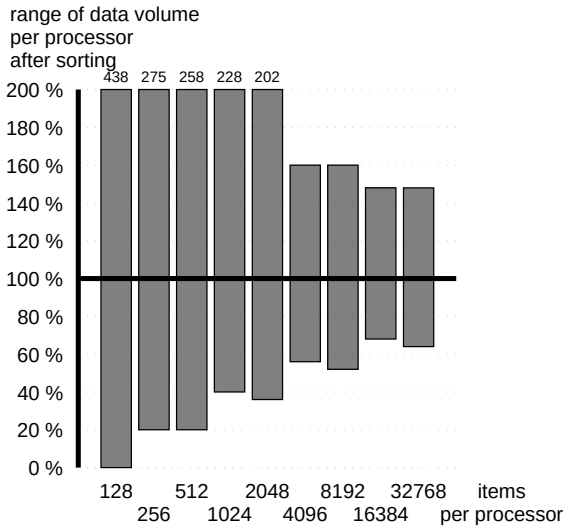
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1445	909	647	540	496	423	400	381	394
total time [s]	0.18	0.23	0.33	0.55	1.02	1.74	3.28	6.26	12.94
time for communication [ms]	120	140	181	251	406	618	1057	1851	3399
time for local sorting [ms]	65	94	159	305	615	1130	2273	4452	9637
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	1	52	116	368	789	1907	4246	10954	22338
maximal number of items	573	781	1239	2206	4134	6965	13025	24030	48776
number of data packets	3537	3551	3558	3571	4357	6576	10760	19123	35785
total path length of all data packets	15540	15568	15586	15684	18469	26565	42540	73573	135956
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

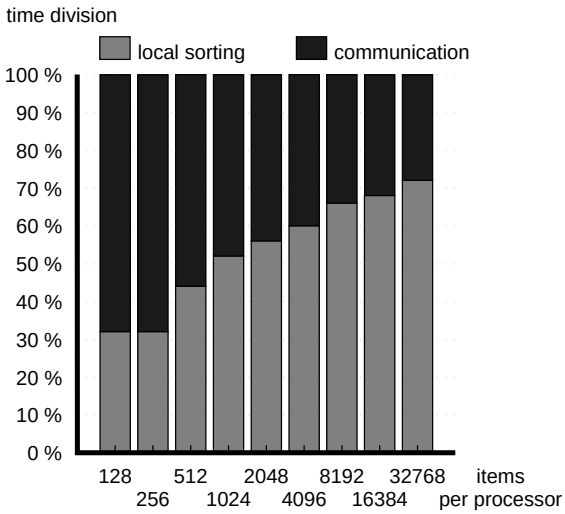
Data Sheet 25

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	no





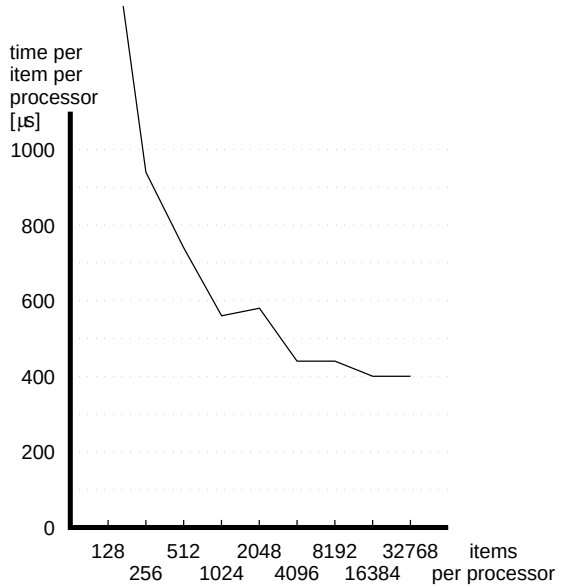


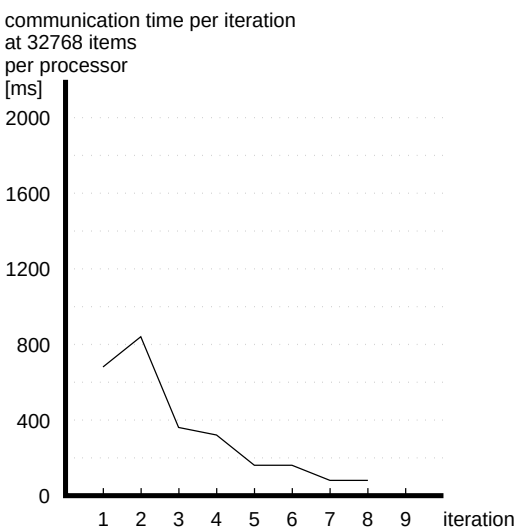


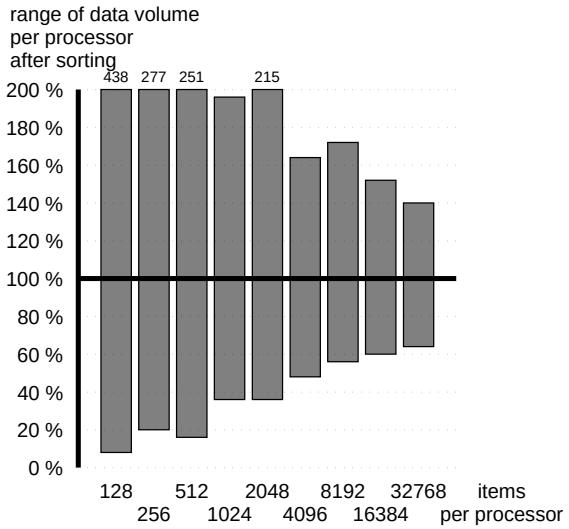
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1593	972	732	605	535	437	422	389	406
total time [s]	0.20	0.25	0.37	0.62	1.10	1.79	3.46	6.40	13.34
time for communication [ms]	140	167	216	300	483	718	1174	2093	3911
time for local sorting [ms]	63	82	169	322	617	1.08	2292	4338	9450
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	1	47	101	397	766	2218	4135	11052	20640
maximal number of items	560	704	1323	2334	4139	6632	13106	23401	47224
number of data packets	3535	3542	3559	3574	4372	6571	10777	19121	35793
total path length of all data packets	18539	18588	18628	18779	22414	32932	52930	92193	171421
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

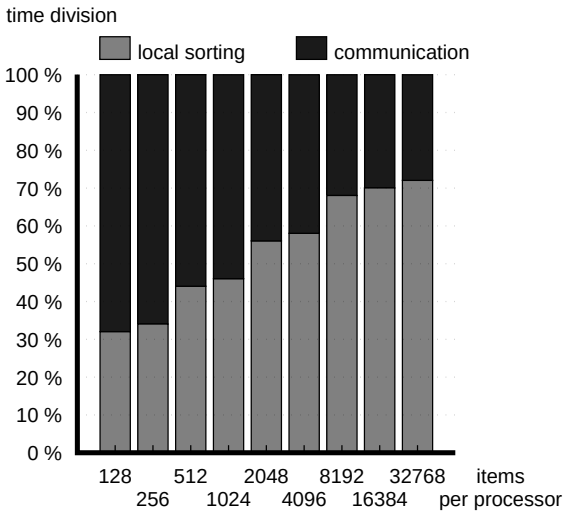
Data Sheet 26

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	no





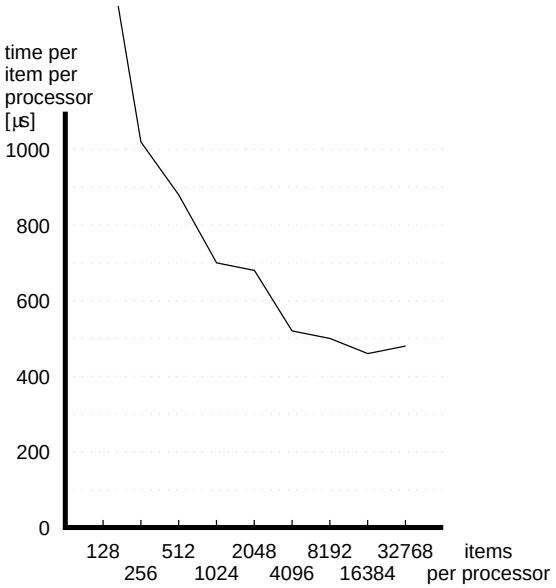


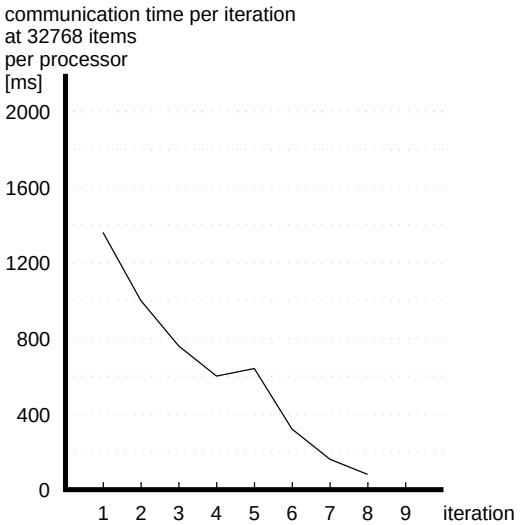


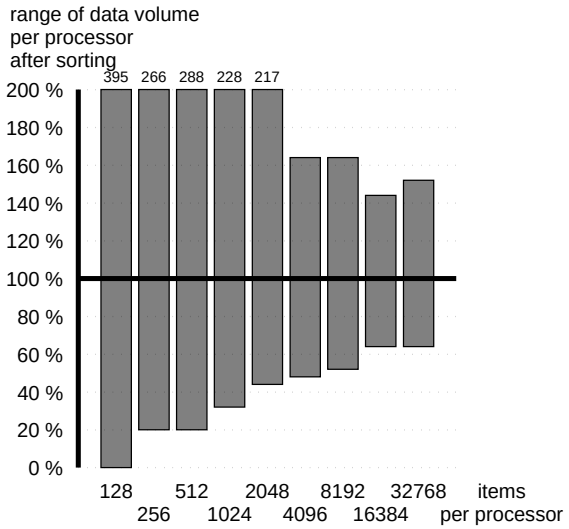
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1538	948	734	563	577	439	445	414	395
total time [s]	0.20	0.24	0.38	0.58	1.18	1.80	3.65	6.80	12.96
time for communication [ms]	140	161	217	311	513	753	1161	2037	3773
time for local sorting [ms]	63	81	165	274	670	1056	2502	4779	9307
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	8	54	90	373	756	1969	4610	10038	20923
maximal number of items	560	711	1288	2018	4397	6657	14205	25086	46402
number of data packets	3536	3555	3559	3573	4386	6557	10788	19131	35772
total path length of all data packets	23919	23913	23966	24109	28185	41429	68071	118941	221541
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

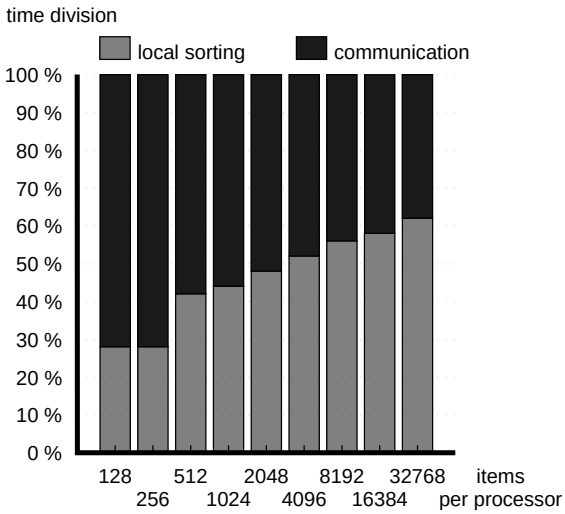
Data Sheet 27

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	yes





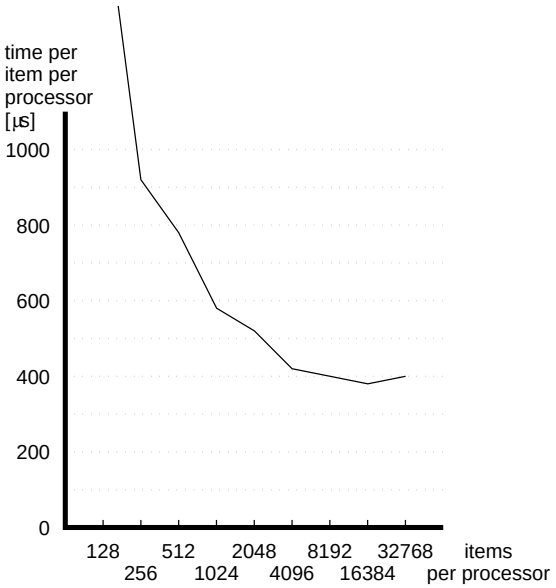


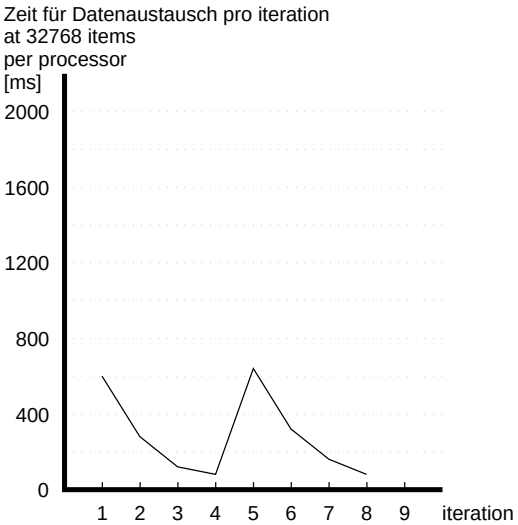


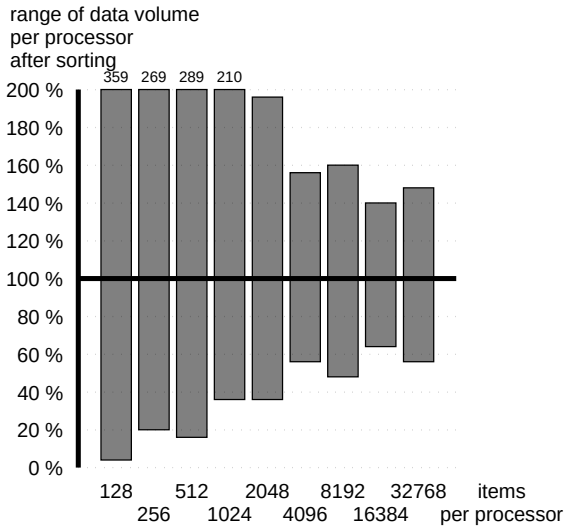
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1499	1015	888	708	680	526	497	463	482
total time [s]	0.19	0.26	0.45	0.73	1.39	2.18	4.08	7.60	15.83
time for communication [ms]	142	181	260	418	736	1086	1790	3177	6054
time for local sorting [ms]	55	76	194	321	685	1086	2312	4451	9891
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	1	47	110	339	870	2014	4259	10258	20750
maximal number of items	505	681	1478	2337	4446	6677	13493	23589	49536
number of data packets	3531	3556	3555	3571	4412	6536	10775	19121	35814
total path length of all data packets	29201	29433	29322	29507	35432	51741	84664	149301	278246
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

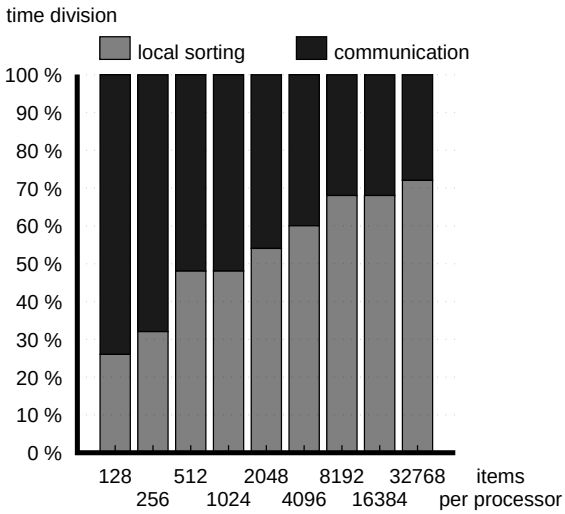
Data Sheet 28

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	yes





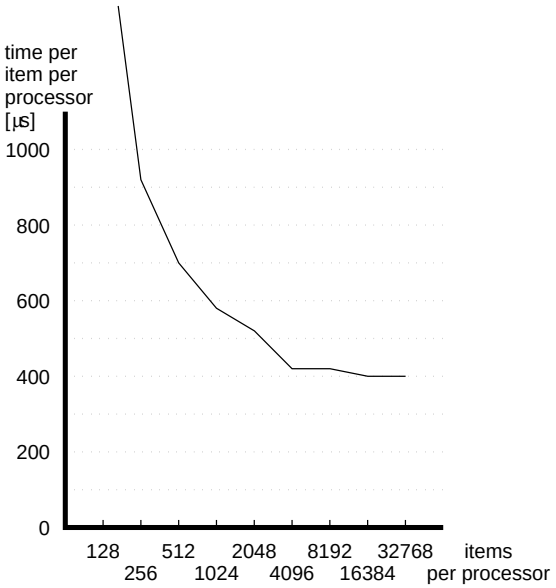


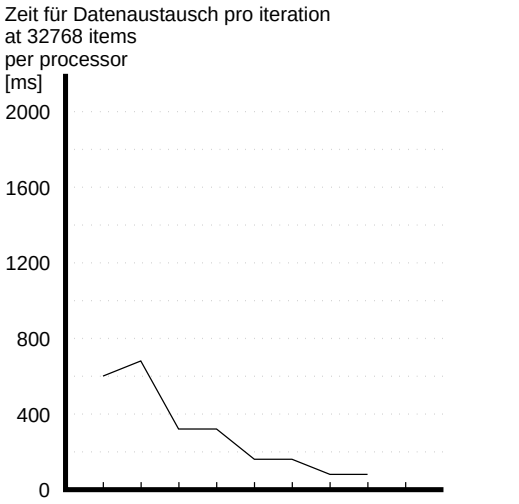


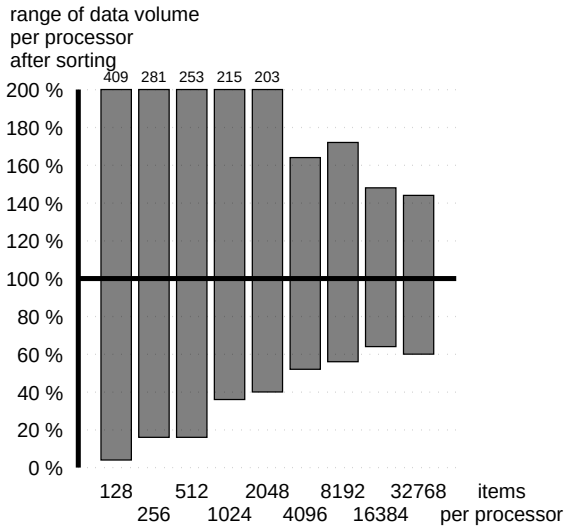
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1468	917	790	582	514	412	410	378	402
total time [s]	0.19	0.23	0.40	0.60	1.05	1.69	3.36	6.22	13.19
time for communication [ms]	140	160	213	310	467	670	1076	1867	3498
time for local sorting [ms]	49	76	193	298	591	1029	2299	4348	9735
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	3	52	85	374	747	2267	3910	10464	17727
maximal number of items	459	689	1480	2158	4005	6435	13096	23233	49005
number of data packets	3530	3547	3551	3577	4380	6520	10776	19150	35834
total path length of all data packets	15013	15070	15047	15187	18029	25894	41908	73226	135705
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

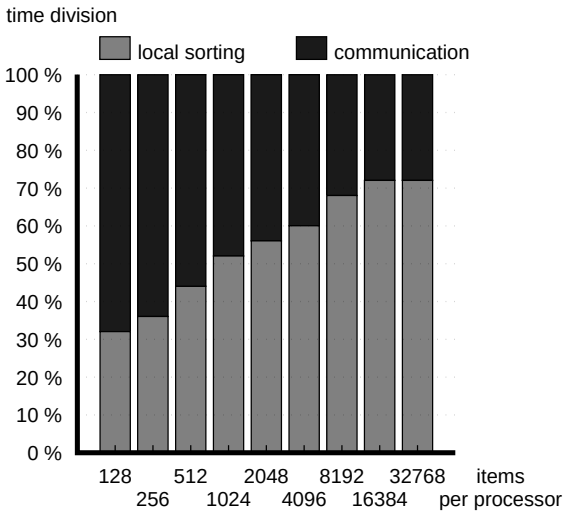
Data Sheet 29

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	yes





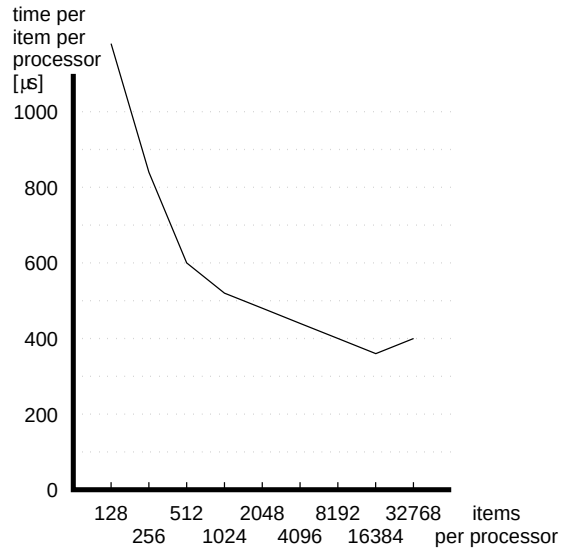


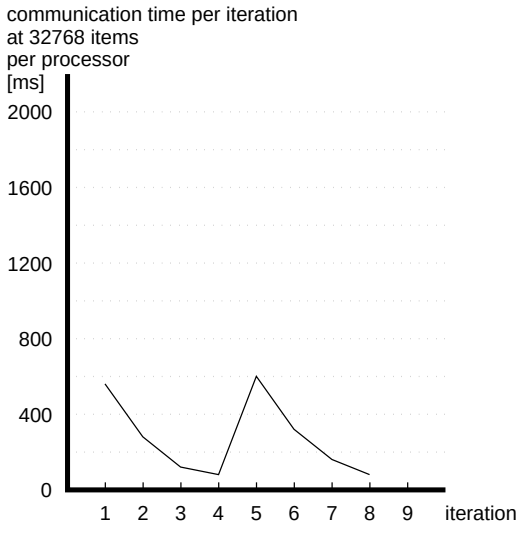


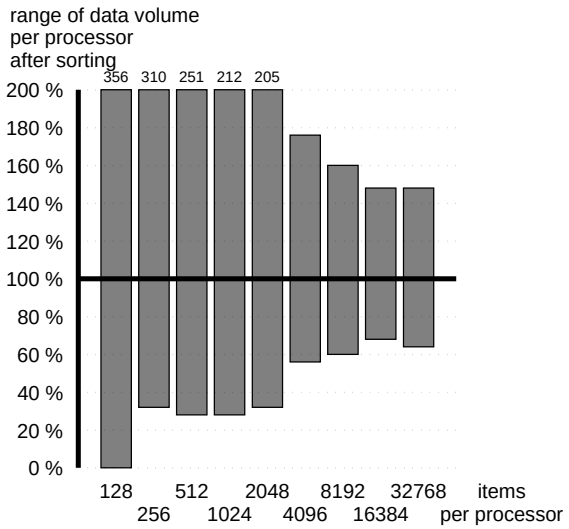
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1491	925	694	579	523	427	427	392	395
total time [s]	0.19	0.24	0.36	0.59	1.07	1.75	3.51	6.44	12.99
time for communication [ms]	130	157	199	290	465	680	1093	1913	3512
time for local sorting [ms]	57	83	167	303	607	1080	2431	4565	9518
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	3	46	81	336	823	2150	4733	10711	19446
maximal number of items	524	721	1296	2205	4155	6694	14028	24176	47667
number of data packets	3525	3547	3553	3573	4387	6499	10776	19141	35822
total path length of all data packets	17110	17231	17267	17376	20097	29210	48124	83724	155318
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

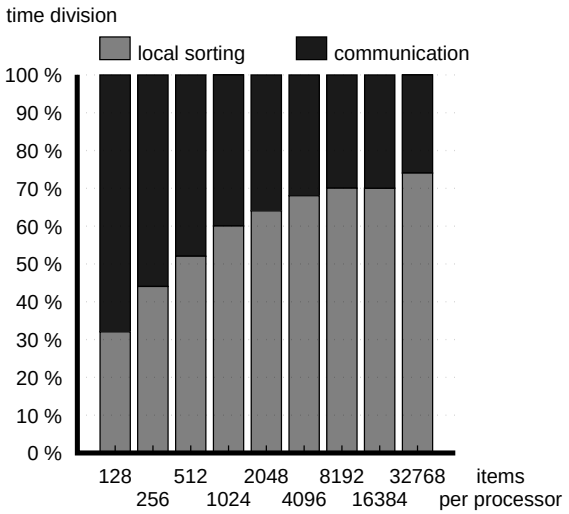
Data Sheet 30

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





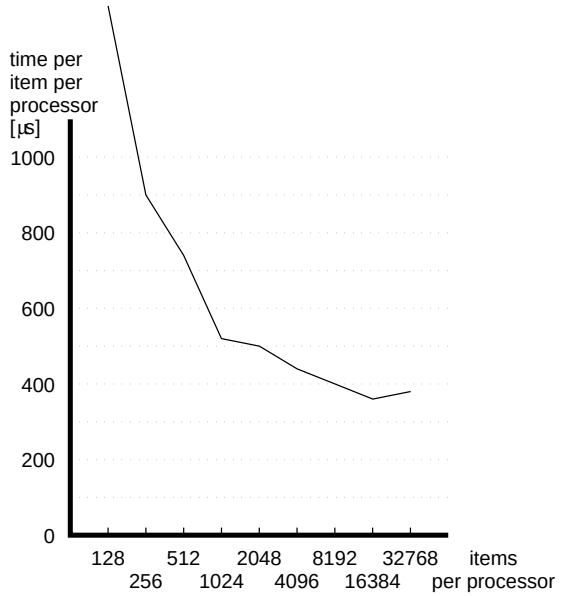


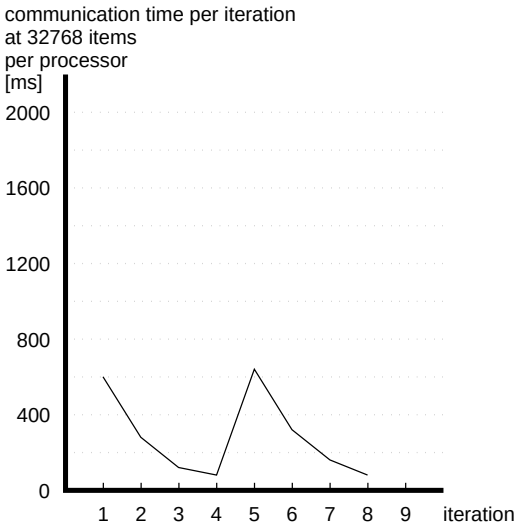


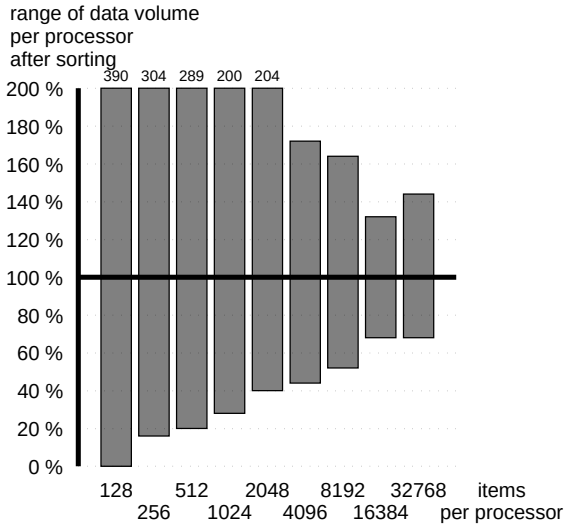
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1171	831	597	525	488	437	395	368	391
total time [s]	0.15	0.21	0.31	0.54	1.00	1.79	3.24	6.05	12.83
time for communication [ms]	109	120	150	219	376	589	980	1814	3369
time for local sorting [ms]	49	93	156	318	630	1200	2292	4335	9506
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	80	144	300	656	2298	4772	10983	21139
maximal number of items	456	794	1286	2180	4215	6953	13183	23528	47285
number of data packets	2048	2048	2048	2049	3217	5375	9572	17929	34582
total path length of all data packets	7680	7680	7680	7681	12018	20303	36134	67504	129597
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

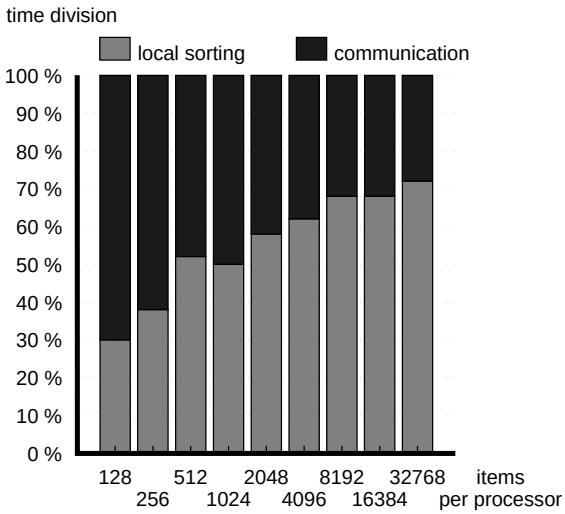
Data Sheet 31

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





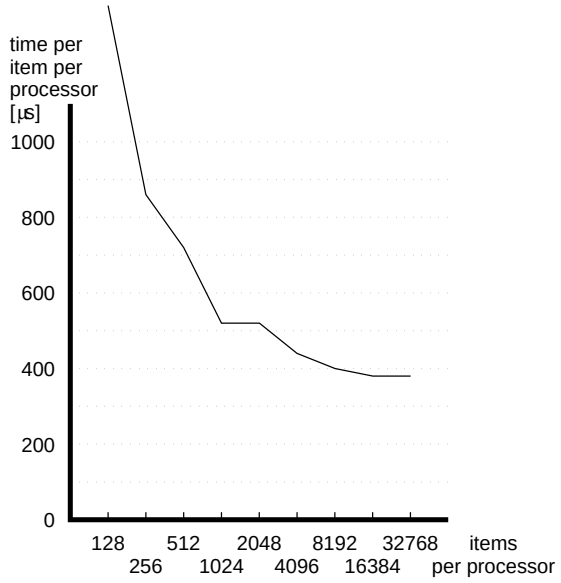


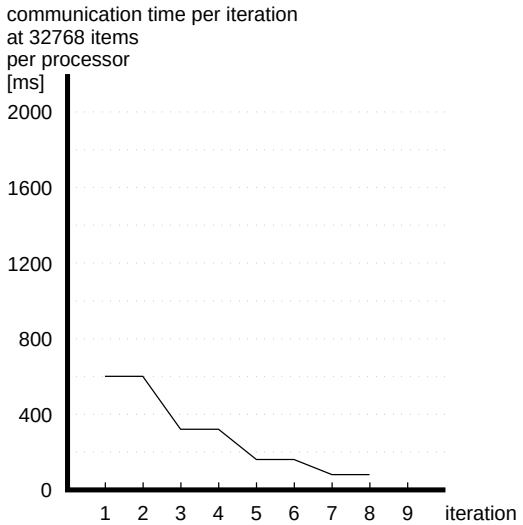


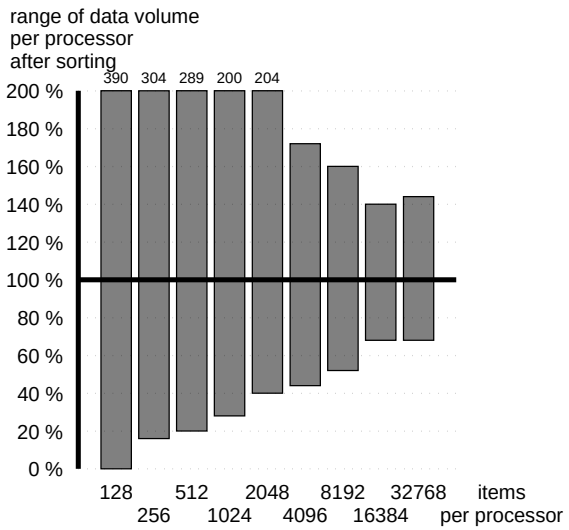
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1406	779	740	518	508	433	401	356	386
total time [s]	0.18	0.40	0.38	0.53	1.04	1.78	3.30	5.85	12.66
time for communication [ms]	125	140	180	263	433	650	1069	1886	3453
time for local sorting [ms]	54	89	196	269	609	1120	2282	4009	9278
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	40	99	297	800	1763	4412	10879	21962
maximal number of items	500	779	1482	2037	4180	7000	13357	21845	46942
number of data packets	2048	2048	2048	2048	3255	5453	9535	17942	34566
total path length of all data packets	7680	7680	7680	7680	12141	20583	35933	67606	129575
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

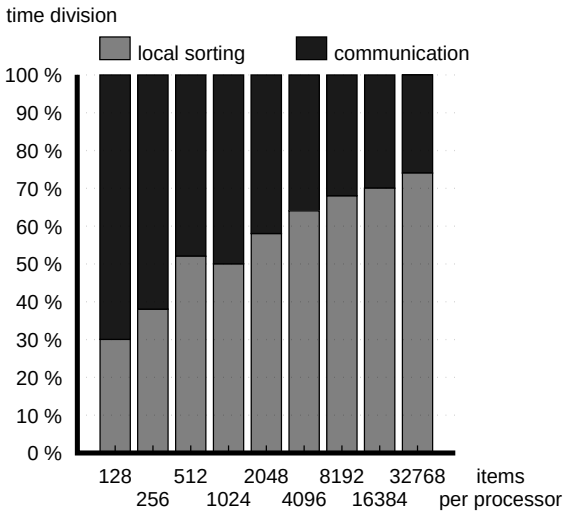
Data Sheet 32

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





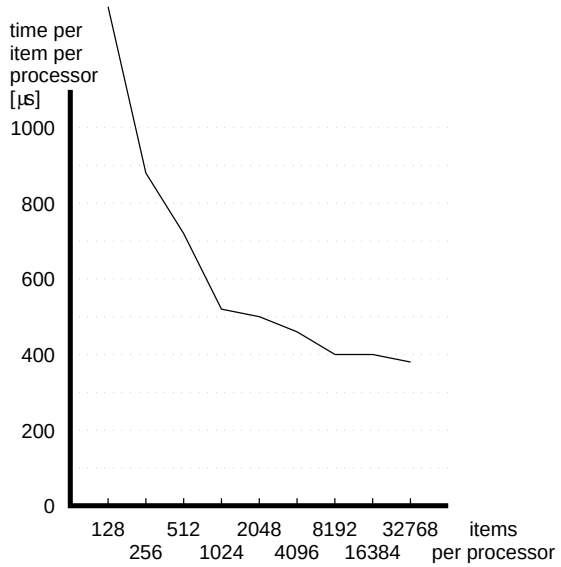


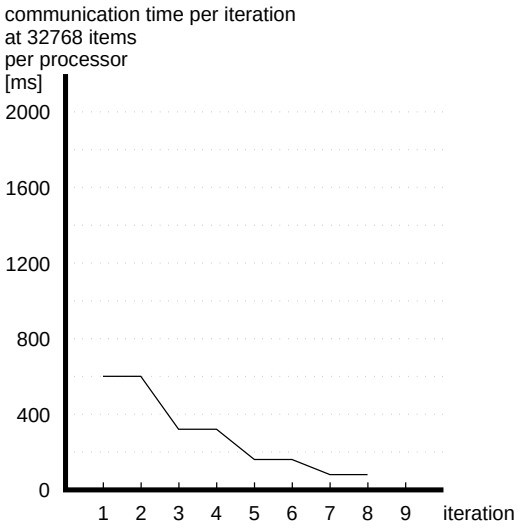


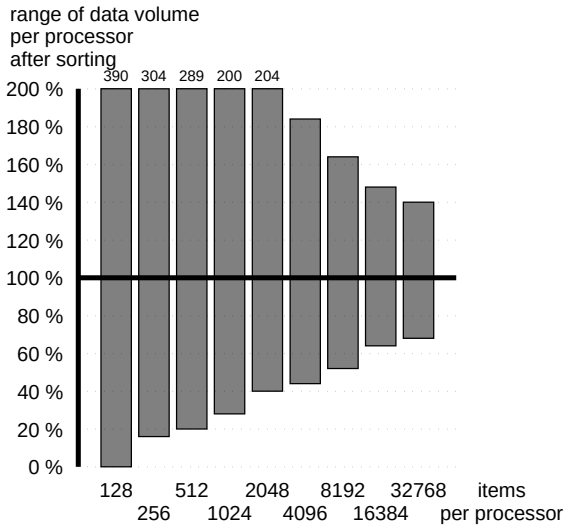
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1351	870	726	511	511	433	396	377	388
total time [s]	0.17	0.22	0.37	0.52	1.05	1.78	3.25	6.19	12.74
time for communication [ms]	120	140	180	259	439	650	1063	1850	3413
time for local sorting [ms]	53	84	198	269	608	1126	2196	4343	9386
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	40	99	297	800	1763	4413	10879	21962
maximal number of items	500	779	1482	2037	4180	6999	13142	23088	46942
number of data packets	2048	2048	2048	2048	3254	5451	9537	17939	34568
total path length of all data packets	8800	8800	8800	8800	14346	23937	41525	77527	148246
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

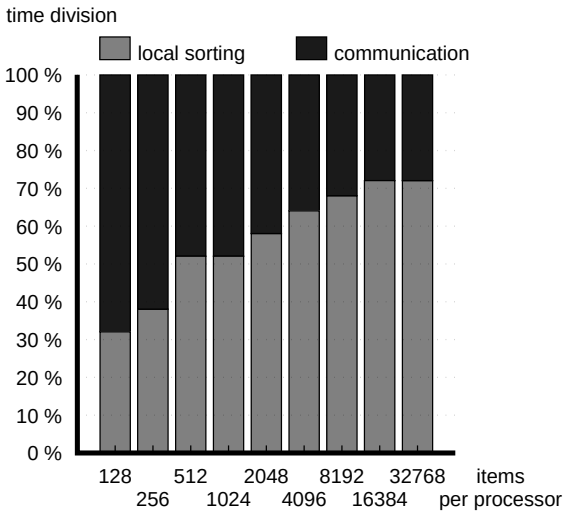
Data Sheet 33

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	modified Hilbert numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





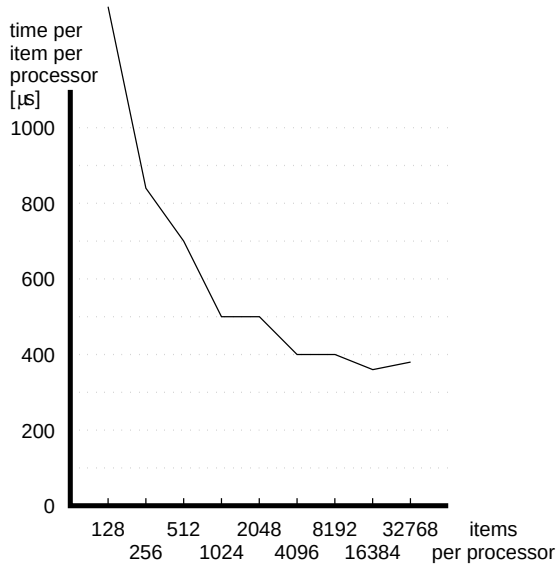


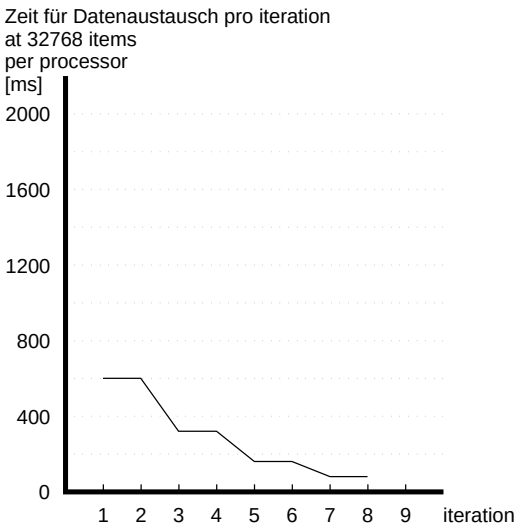


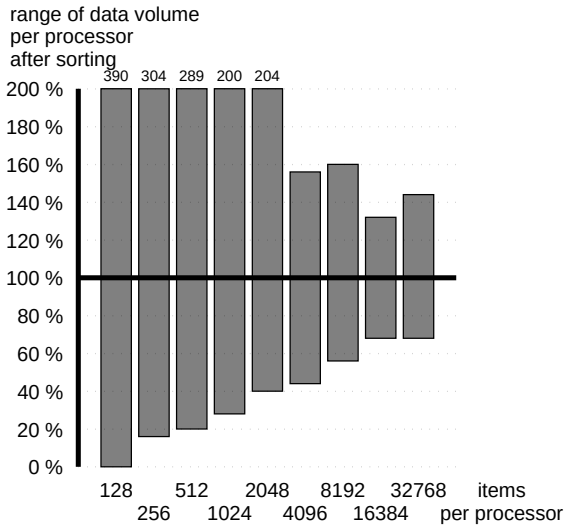
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1328	874	722	514	507	462	403	390	378
total time [s]	0.17	0.22	0.37	0.53	1.04	1.90	3.30	6.40	12.41
time for communication [ms]	120	140	178	258	439	645	1050	1863	3404
time for local sorting [ms]	57	86	199	269	606	1244	2287	4537	9019
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	40	99	297	800	1763	4285	10546	21962
maximal number of items	500	779	1482	2037	4180	7559	13357	24179	45651
number of data packets	2048	2048	2048	2048	3255	5450	9535	17930	34562
total path length of all data packets	8128	8128	8128	8128	13211	22074	38355	71574	137052
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

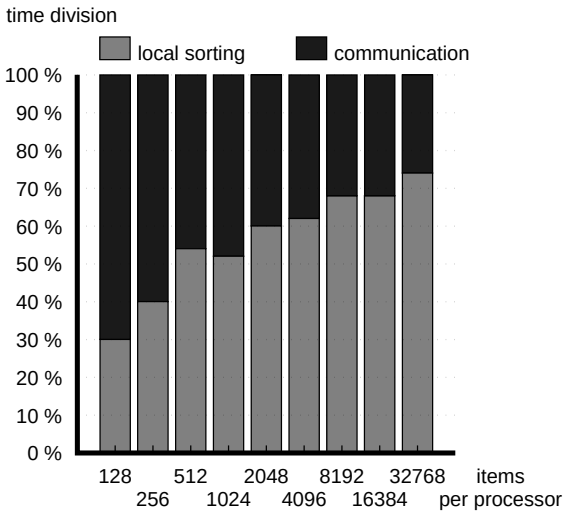
Data Sheet 34

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	H numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





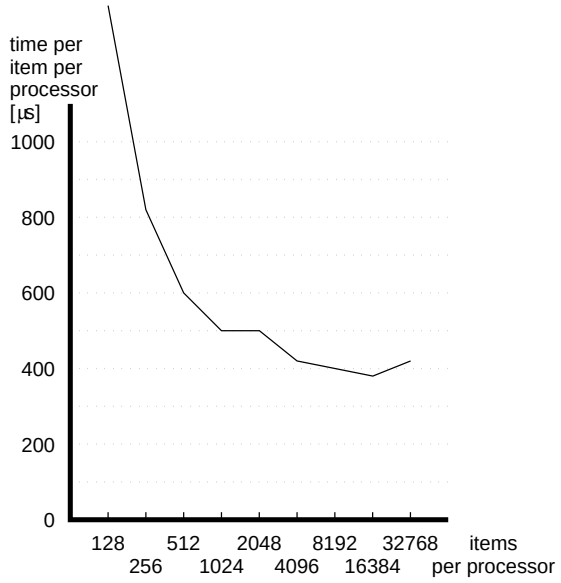


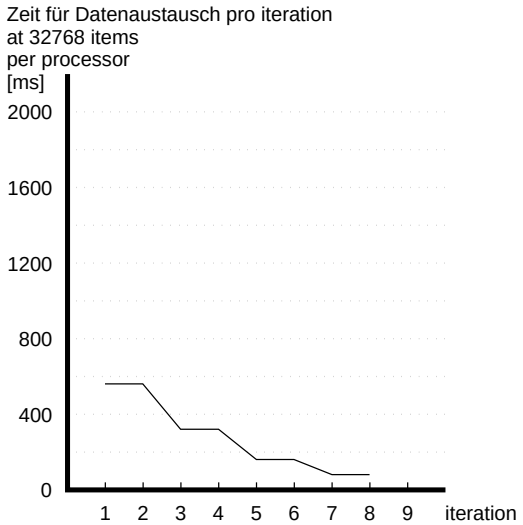


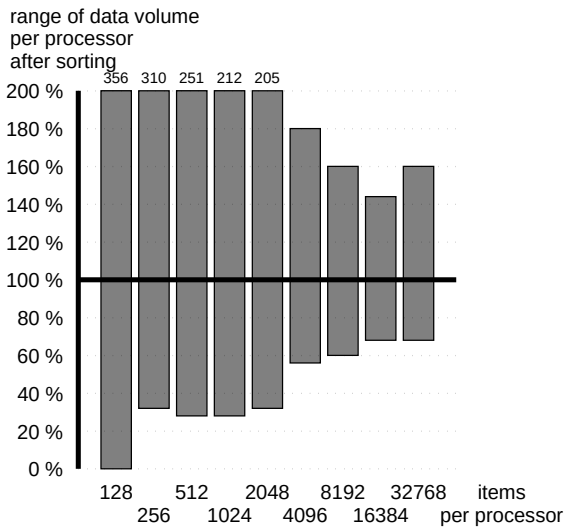
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1320	831	703	500	502	400	393	354	390
total time [s]	0.17	0.21	0.36	0.51	1.03	1.64	3.23	5.82	12.81
time for communication [ms]	110	130	170	248	421	629	1037	1844	3396
time for local sorting [ms]	49	89	197	268	608	1.02	2196	4006	9459
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	40	99	297	800	1763	4458	10879	21962
maximal number of items	500	779	1482	2037	4180	6337	13142	21845	46942
number of data packets	2048	2048	2048	2048	3254	5455	9531	17947	34563
total path length of all data packets	7680	7680	7680	7680	12466	20839	36279	67742	129469
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

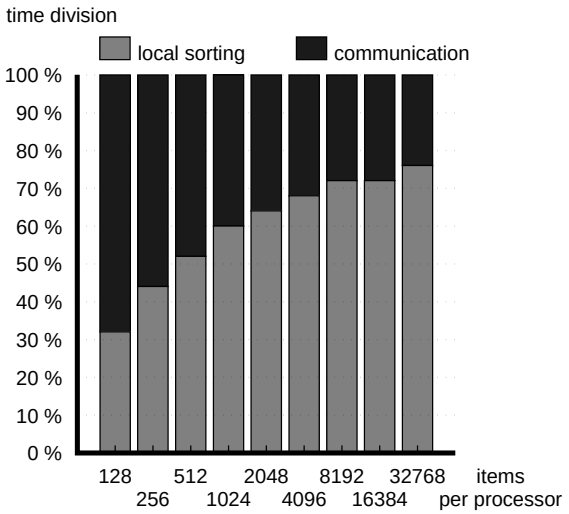
Data Sheet 35

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Z numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





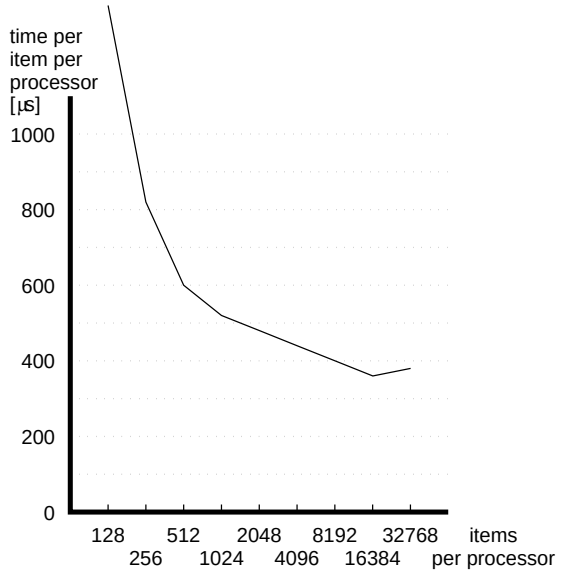


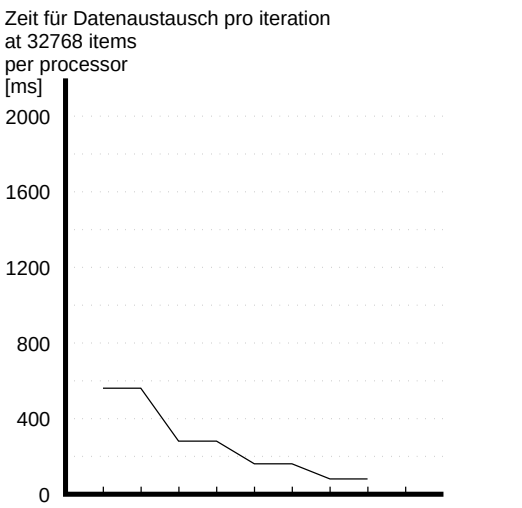


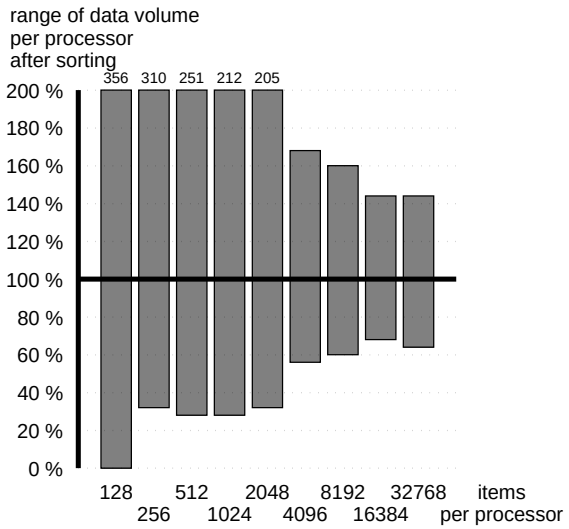
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1171	820	595	496	491	428	400	379	424
total time [s]	0.15	0.21	0.30	0.51	1.01	1.76	3.28	6.23	13.91
time for communication [ms]	102	120	150	210	379	589	976	1789	3343
time for local sorting [ms]	49	89	154	294	629	1160	2323	4476	10562
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	80	144	300	656	2341	4772	10945	22040
maximal number of items	456	794	1286	2179	4215	7434	13183	23771	52519
number of data packets	2048	2048	2048	2049	3219	5372	9576	17936	34562
total path length of all data packets	7936	7936	7936	7937	12676	21240	37522	69965	133795
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

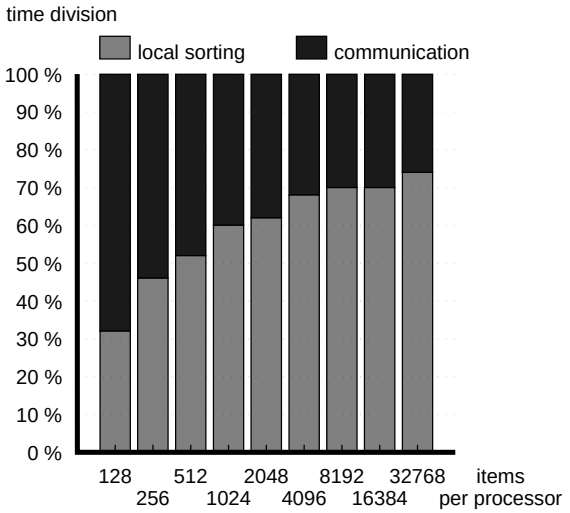
Data Sheet 36

Quicksort	with final local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Shuffle numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





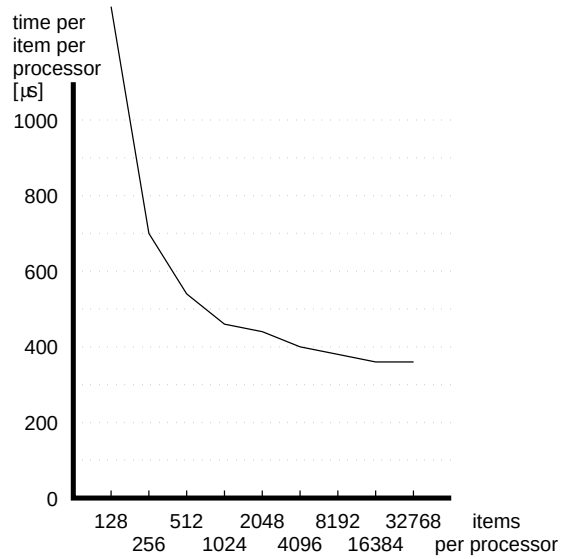


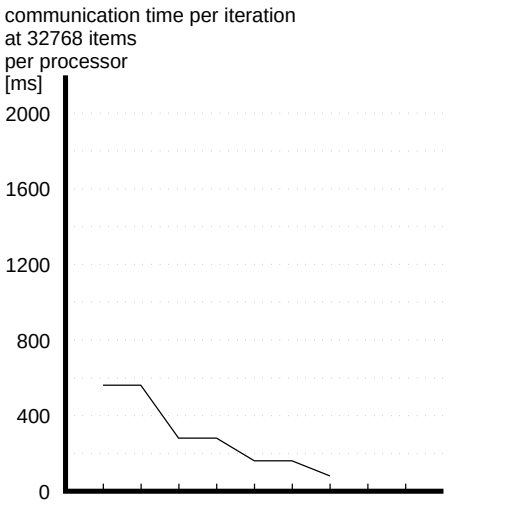


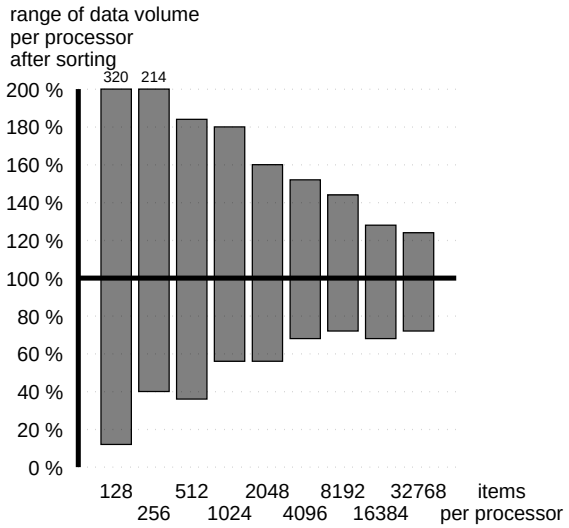
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1139	820	603	517	488	437	395	370	386
total time [s]	0.15	0.21	0.31	0.53	1.00	1.79	3.25	6.08	12.68
time for communication [ms]	100	117	148	208	377	580	973	1784	3330
time for local sorting [ms]	49	96	157	319	633	1201	2292	4354	9377
time for odd-even sort [ms]	0	0	0	0	0	0	0	0	0
minimum number of items	0	80	144	300	656	2341	4772	10984	21105
maximal number of items	456	794	1286	2180	4215	6953	13195	23628	47139
number of data packets	2048	2048	2048	2049	3217	5372	9571	17930	34578
total path length of all data packets	7680	7680	7680	7681	12269	20599	36332	67729	129507
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

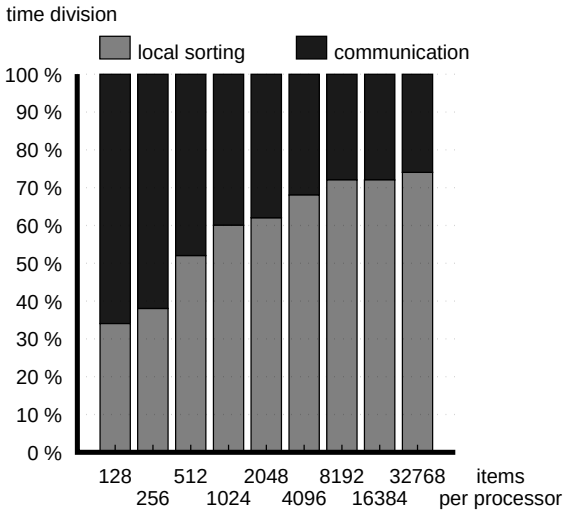
Data Sheet 37

Quicksort	with final local sorting and odd-even sort for 2 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Shuffle numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





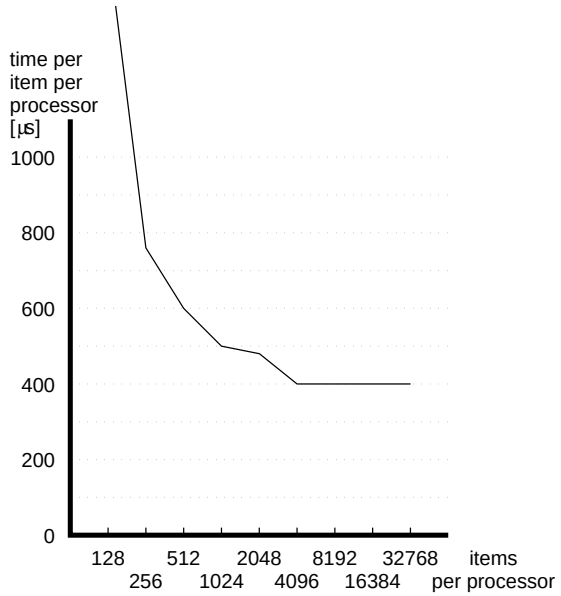


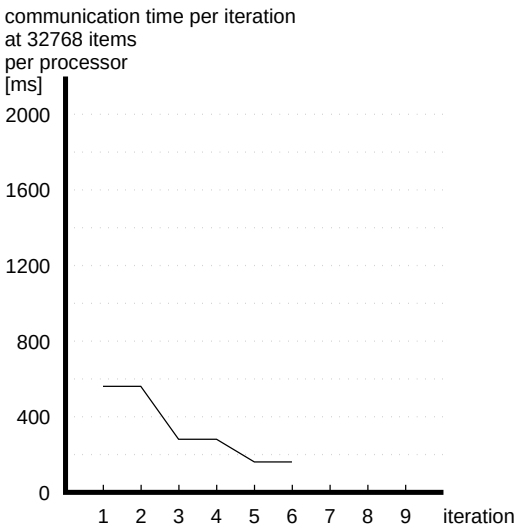


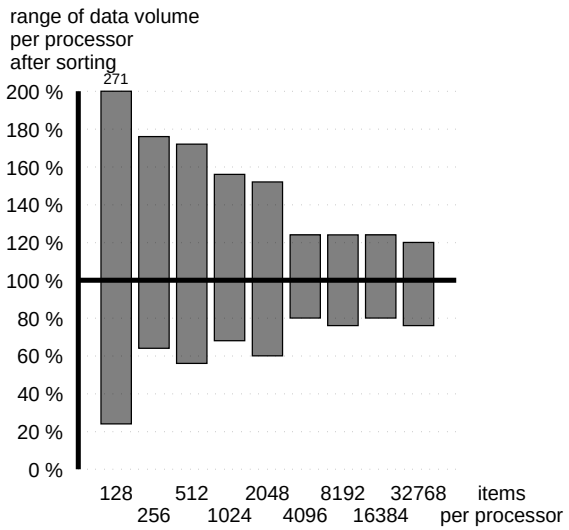
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1108	706	548	460	439	406	390	351	370
total time [s]	0.14	0.18	0.28	0.47	0.90	1.67	3.20	5.76	12.14
time for communication [ms]	100	110	140	194	350	548	900	1654	3092
time for local sorting [ms]	41	60	129	250	489	1019	2094	3756	8363
time for odd-even sort [ms]	10	10	20	32	60	111	208	363	722
minimum number of items	17	102	180	570	1133	2780	5875	11357	23794
maximal number of items	410	550	952	1829	3246	6220	11919	20796	41102
number of data packets	2048	2048	2048	2186	3475	5890	10616	20031	38765
total path length of all data packets	7680	7680	7680	7818	12527	21117	37376	69830	133696
average recursion depth	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

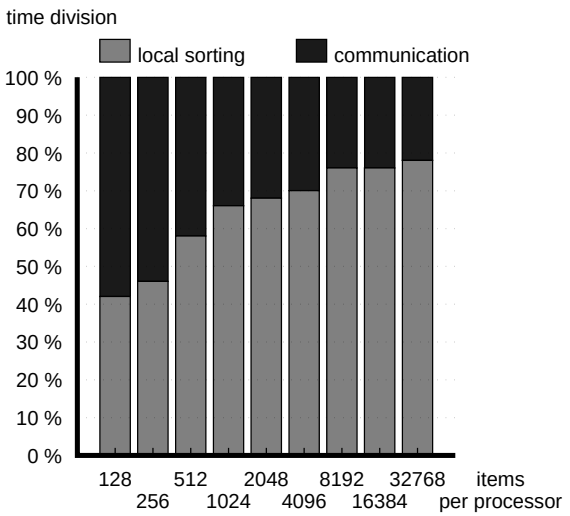
Data Sheet 38

Quicksort	with final local sorting and odd-even sort for 4 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Z numbering
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





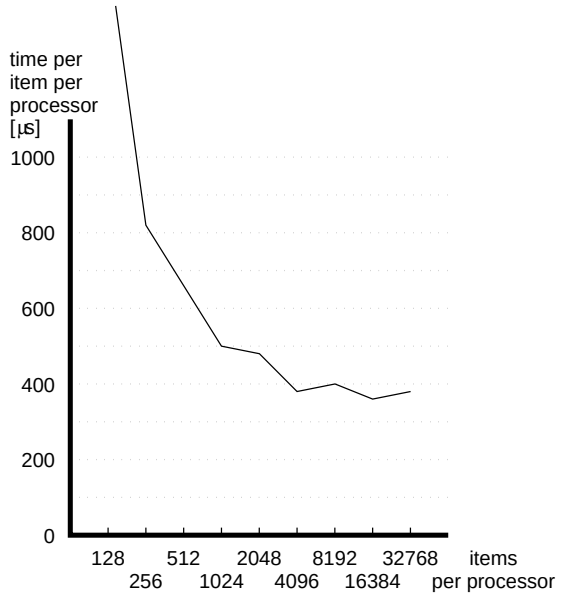


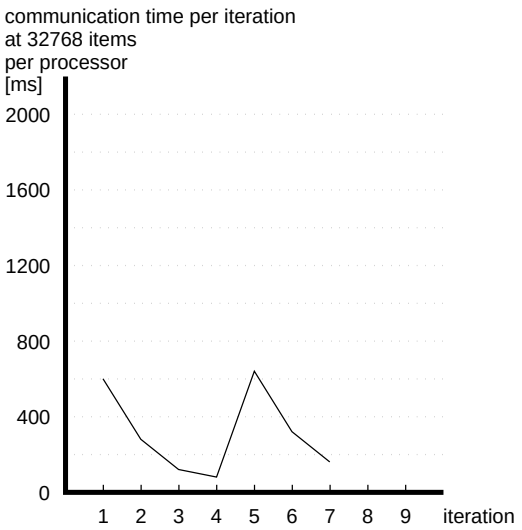


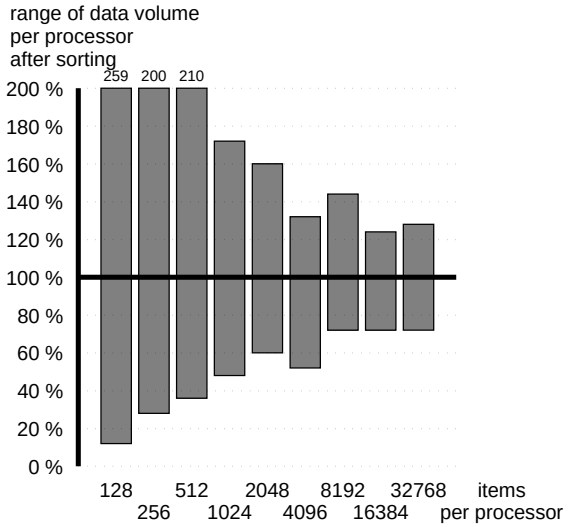
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1241	761	606	507	484	402	410	402	406
total time [s]	0.16	0.19	0.31	0.52	0.99	1.65	3.36	6.61	13.34
time for communication [ms]	90	108	130	180	330	510	835	1530	2865
time for local sorting [ms]	39	59	120	229	479	829	1860	3782	7932
time for odd-even sort [ms]	28	34	63	109	204	338	669	1303	2580
minimum number of items	33	168	280	686	1244	3270	6321	13465	25471
maximal number of items	347	455	876	1610	3076	5130	10261	20042	39625
number of data packets	2304	2304	2304	2696	4400	7598	13931	26415	51460
total path length of all data packets	7936	7936	7936	8328	13472	22825	40701	76217	146367
average recursion depth	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00

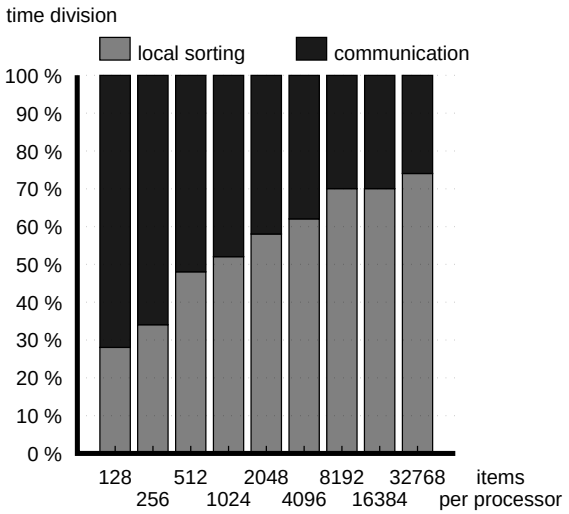
Data Sheet 39

Quicksort	with final local sorting and odd-even sort for 2 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





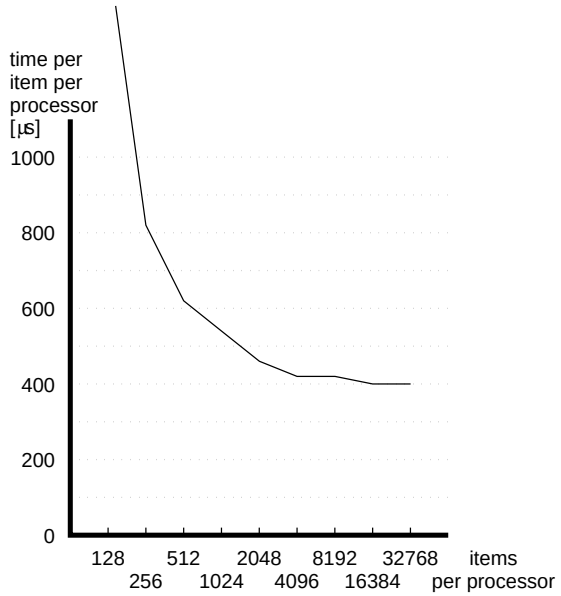


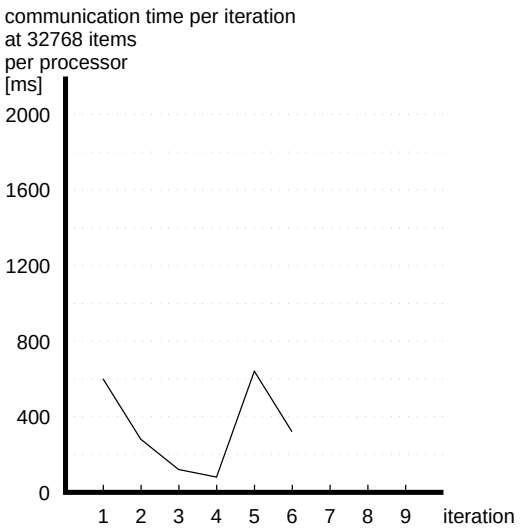


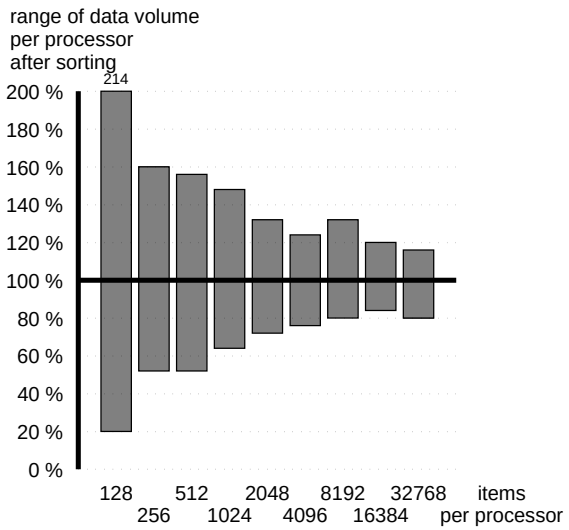
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1249	820	660	507	471	390	404	352	390
total time [s]	0.16	0.21	0.34	0.52	0.97	1.60	3.31	5.78	12.78
time for communication [ms]	120	140	177	250	410	610	996	1761	3220
time for local sorting [ms]	36	61	144	240	500	899	2118	3733	8856
time for odd-even sort [ms]	10	10	21	35	60	99	207	352	737
minimum number of items	17	73	181	479	1200	2161	5988	11849	23489
maximal number of items	332	514	1079	1751	3312	5475	11875	20000	42159
number of data packets	2048	2048	2049	2175	3526	5981	10587	20040	38760
total path length of all data packets	7680	7680	7681	7807	12412	21111	36983	69704	133768
average recursion depth	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

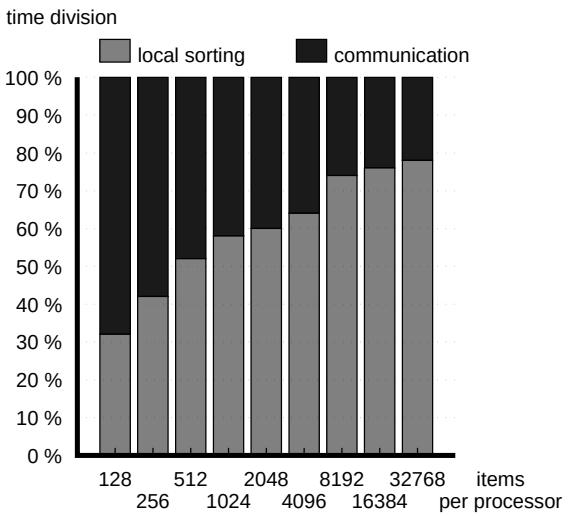
Data Sheet 40

Quicksort	with final local sorting and odd-even sort for 4 Proc.		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of $\sqrt{N}$-medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





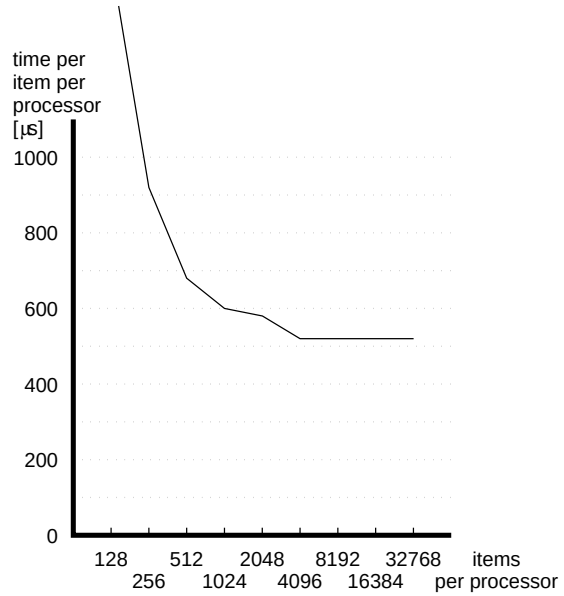


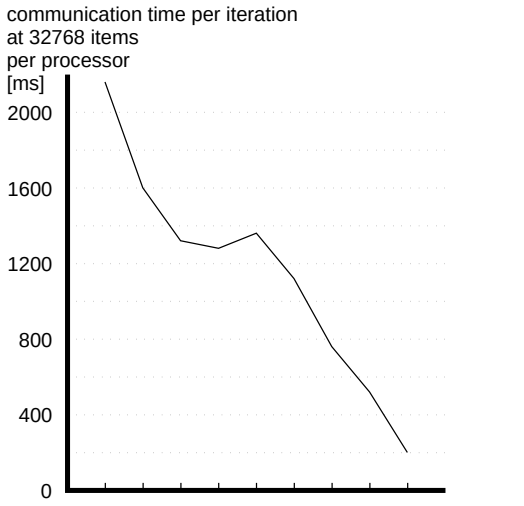


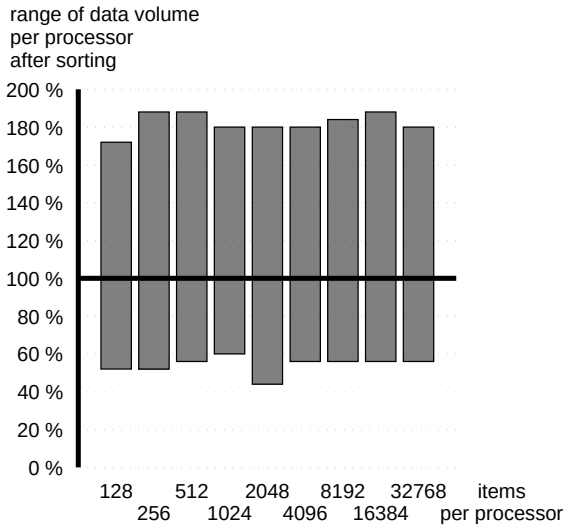
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1249	820	628	531	460	419	430	396	402
total time [s]	0.16	0.21	0.32	0.54	0.94	1.72	3.53	6.51	13.21
time for communication [ms]	111	130	160	230	381	560	900	1610	2919
time for local sorting [ms]	30	58	107	210	400	839	1931	3647	7901
time for odd-even sort [ms]	24	33	60	99	177	326	700	1263	2493
minimum number of items	26	129	257	675	1458	3038	6570	13710	26183
maximal number of items	274	409	792	1527	2683	5031	10857	19421	38340
number of data packets	2304	2304	2304	2703	4453	7687	13856	26432	51475
total path length of all data packets	7680	7680	7680	8079	12963	22155	39072	73872	142159
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

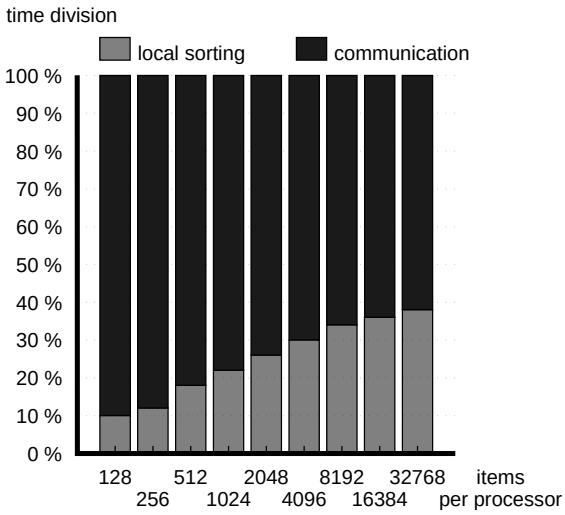
Data Sheet 41

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





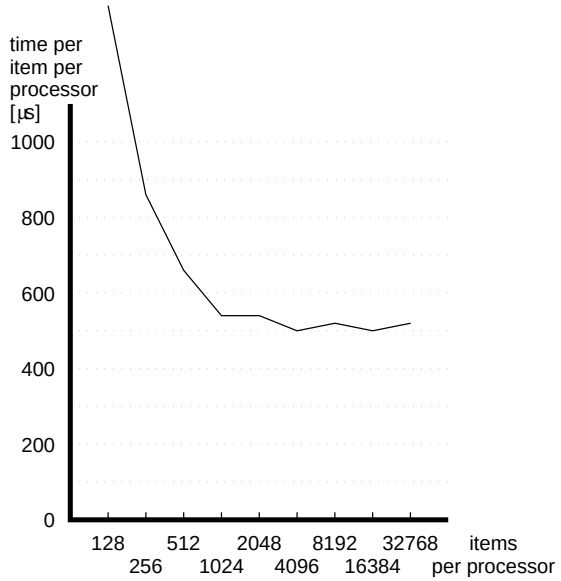


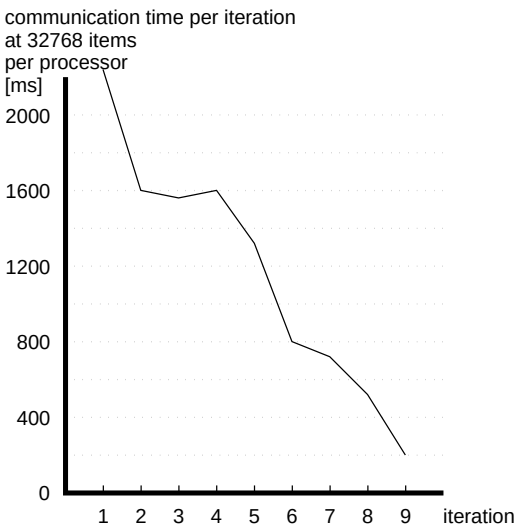


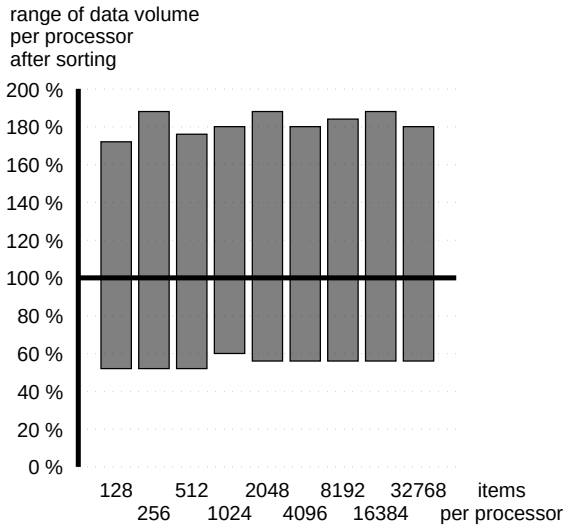
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1406	913	671	608	585	515	522	515	525
total time [s]	0.18	0.23	0.34	0.62	1.20	2.11	4.28	8.45	17.22
time for communication [ms]	171	220	300	506	940	1525	3005	5669	11237
time for local sorting [ms]	19	30	69	140	319	670	1524	3182	6905
minimum number of items	66	135	284	607	938	2319	4612	9216	18345
maximal number of items	218	485	963	1845	3696	7433	14987	31081	58893
number of data packets	5617	5639	5637	5642	7340	11493	19777	36510	69962
total path length of all data packets	26799	26039	24244	25567	31968	47915	83747	149185	284578
average recursion depth	8.01	8.03	8.02	8.02	8.02	8.01	8.02	8.02	8.03

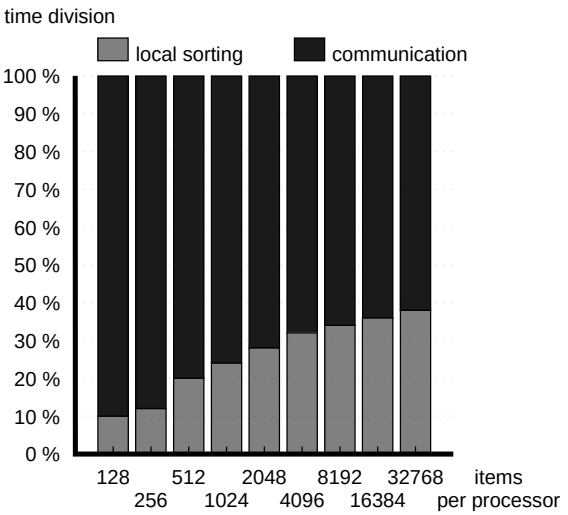
Data Sheet 42

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





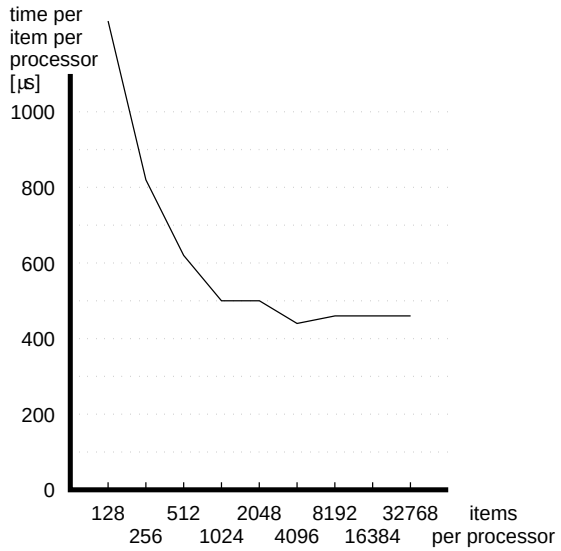


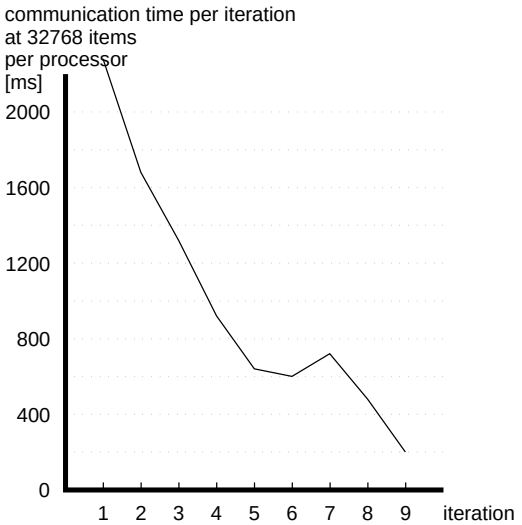


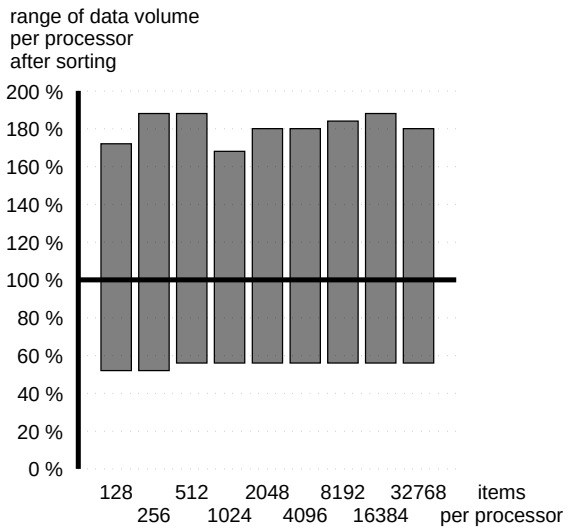
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1351	862	664	537	541	500	524	512	522
total time [s]	0.17	2.20	3.40	0.55	1.11	2.05	4.30	8.40	17.15
time for communication [ms]	170	209	290	439	848	1465	3023	5614	11209
time for local sorting [ms]	19	30	69	142	319	670	1526	3181	6905
minimum number of items	66	135	262	609	1153	2319	4612	9225	18353
maximal number of items	218	485	910	1845	3849	7433	14988	31093	58893
number of data packets	5617	5639	5628	5640	7342	11494	19779	36514	69964
total path length of all data packets	26977	27227	26957	27213	34255	53212	90824	166741	318452
average recursion depth	8.01	8.03	8.01	8.02	8.03	8.01	8.02	8.02	8.03

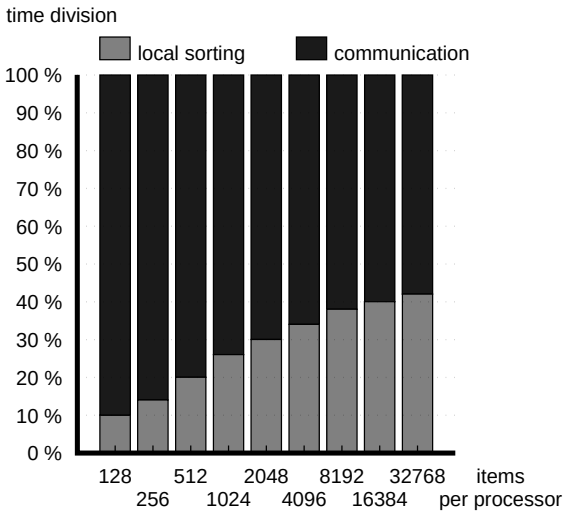
Data Sheet 43

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of medians		
reduced communication	no	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





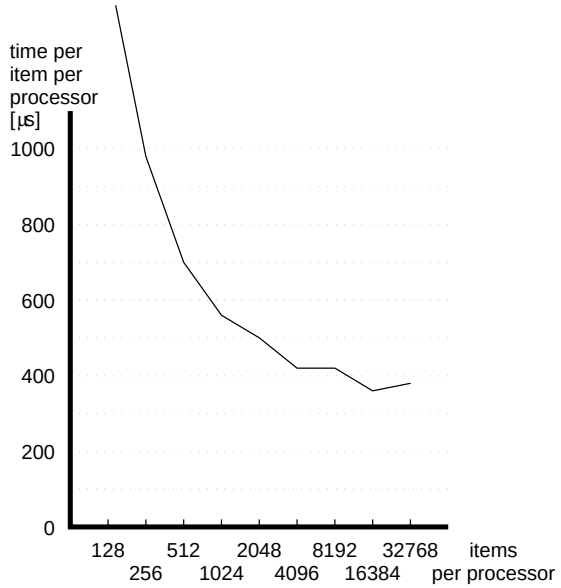


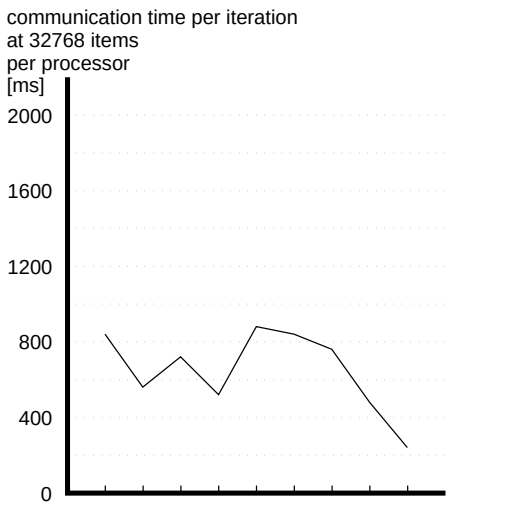


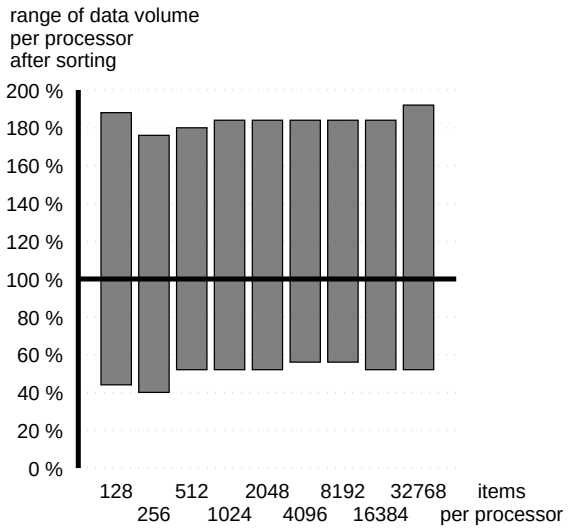
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1249	820	624	505	494	449	451	455	468
total time [s]	0.16	0.21	0.32	0.52	1.01	1.84	3.70	7.46	15.36
time for communication [ms]	160	190	274	408	752	1253	2430	4684	9421
time for local sorting [ms]	19	30	69	141	319	670	1523	3180	6904
minimum number of items	66	135	284	600	1166	2319	4612	9208	18363
maximal number of items	218	485	963	1724	3722	7433	14914	31104	58893
number of data packets	5617	5639	5633	5636	7341	11494	19781	36514	69954
total path length of all data packets	24423	24723	24428	24668	31324	48124	81763	151296	286555
average recursion depth	8.01	8.03	8.01	8.01	8.02	8.01	8.02	8.02	8.02

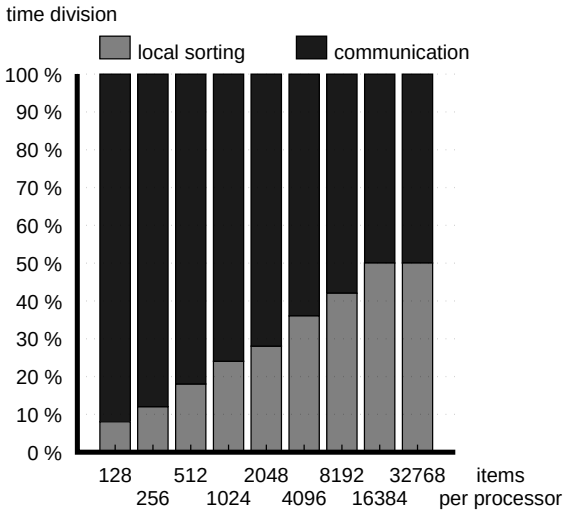
Data Sheet 44

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	no





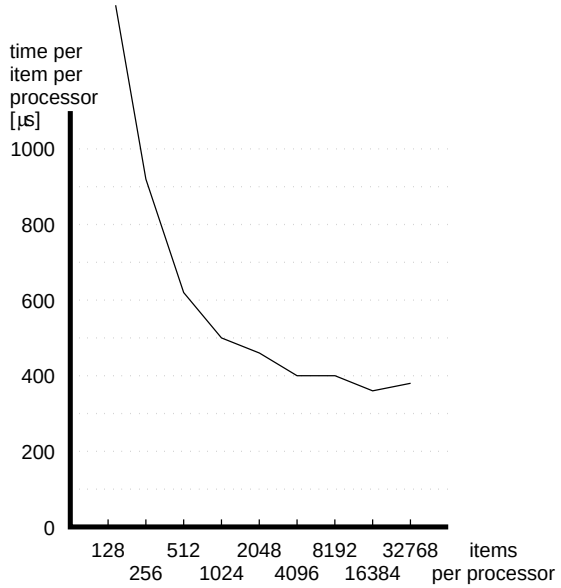


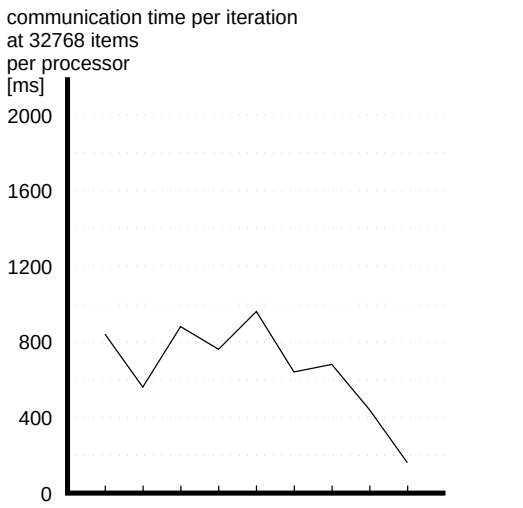


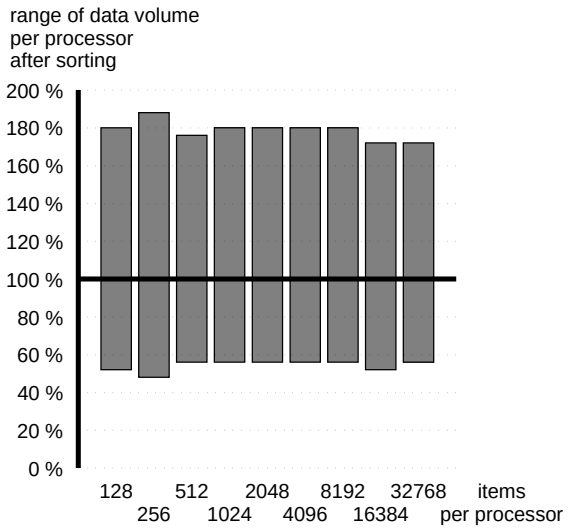
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1585	979	706	555	506	429	412	362	390
total time [s]	0.20	0.25	0.36	0.57	1.04	1.76	3.38	5.94	12.80
time for communication [ms]	200	230	310	450	780	1175	2105	3162	6819
time for local sorting [ms]	19	30	69	141	316	670	1523	3183	6904
minimum number of items	56	101	275	546	1061	2262	4466	8792	17445
maximal number of items	241	446	917	1881	3747	7546	15203	30064	62857
number of data packets	3569	3582	3584	3589	4040	6150	10310	18346	35002
total path length of all data packets	19855	17382	17960	18115	19941	28397	48484	74728	159889
average recursion depth	8.03	8.02	8.02	8.03	8.03	8.02	8.03	8.02	8.02

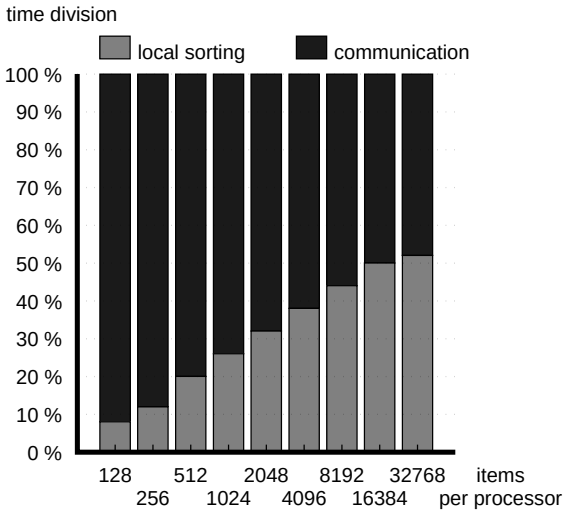
Data Sheet 45

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	yes





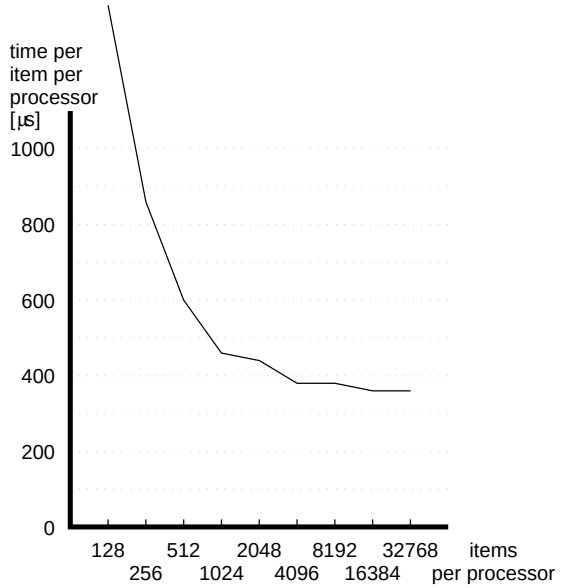


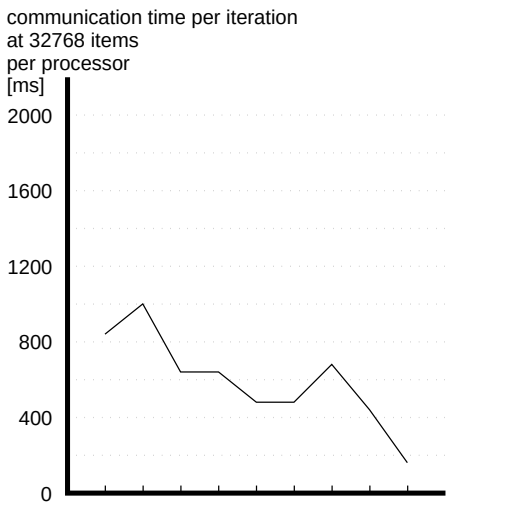


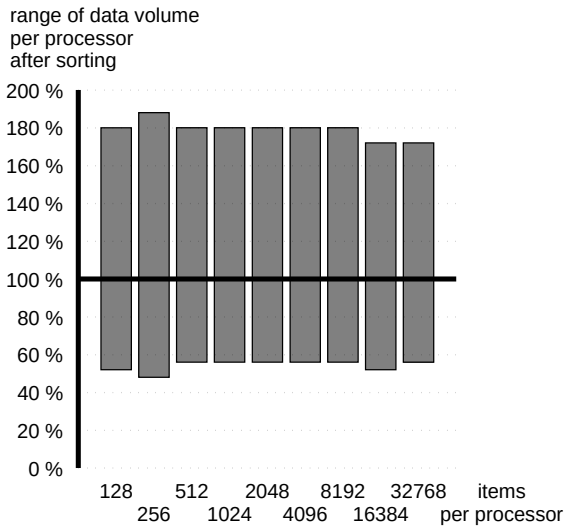
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1507	929	624	507	465	405	394	360	379
total time [s]	0.19	0.24	0.32	0.52	0.95	1.66	3.23	5.90	12.43
time for communication [ms]	190	219	270	403	692	1073	1959	3122	6489
time for local sorting [ms]	18	30	69	140	319	670	1523	3181	6903
minimum number of items	67	122	289	579	1133	2297	4586	8752	17844
maximal number of items	231	481	893	1856	3690	7432	14614	28355	55954
number of data packets	3580	3589	3576	3588	3998	6101	10217	18359	34990
total path length of all data packets	18791	17577	15638	16467	17716	25882	42998	72260	142993
average recursion depth	8.03	8.03	8.01	8.02	8.02	8.02	8.02	8.01	8.02

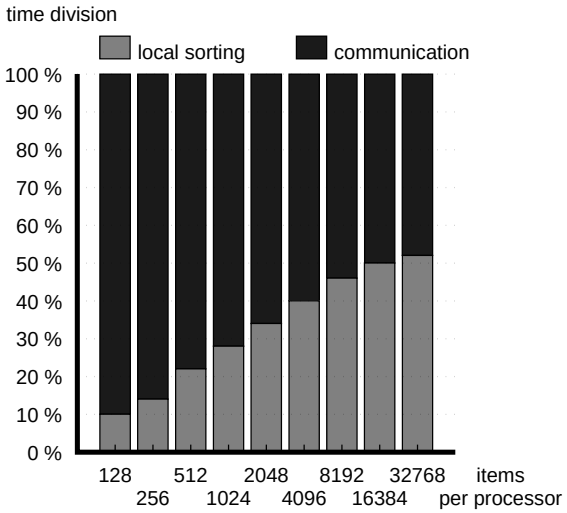
Data Sheet 46

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	no
exact partner processors	no	**data exchange inversion**	yes





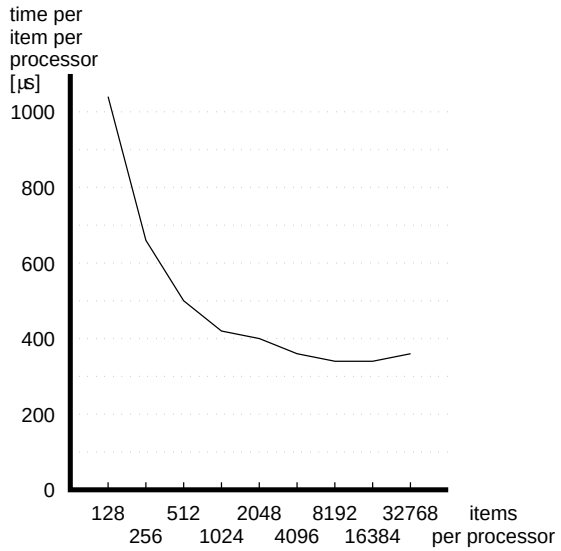


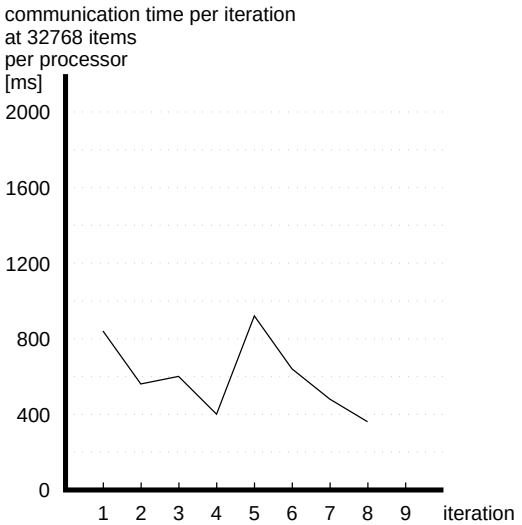


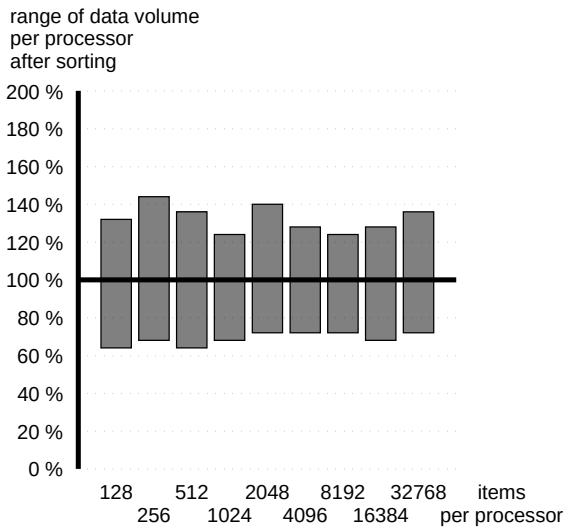
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1390	859	603	468	433	381	372	357	367
total time [s]	0.18	0.22	0.31	0.48	0.89	1.57	3.05	5.86	12.07
time for communication [ms]	178	200	260	369	629	979	1779	3076	6129
time for local sorting [ms]	19	30	70	143	319	670	1524	3181	6909
minimum number of items	67	122	279	563	1171	2297	4587	8752	17844
maximal number of items	231	481	922	1840	3649	7425	14614	28355	55954
number of data packets	3580	3589	3581	3591	4018	6100	10218	18356	34991
total path length of all data packets	18717	18267	17772	17950	19211	28556	47291	81575	160750
average recursion depth	8.03	8.03	8.02	8.03	8.02	8.02	8.02	8.01	8.02

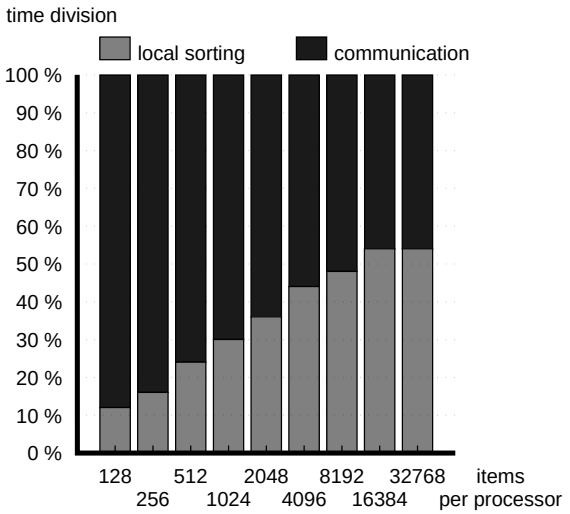
Data Sheet 47

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	no





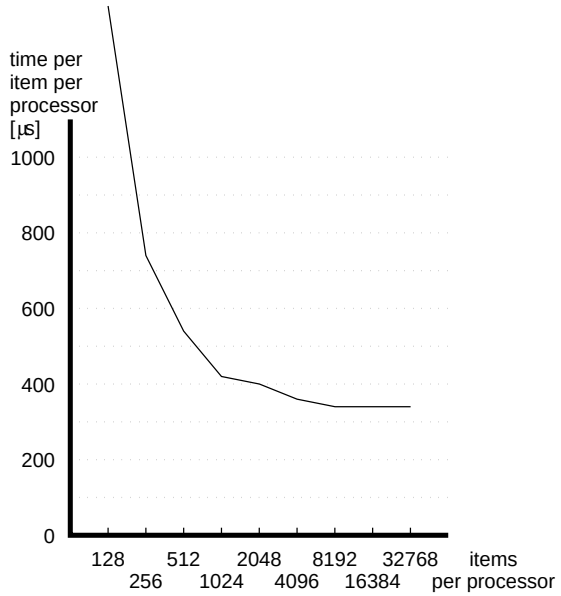


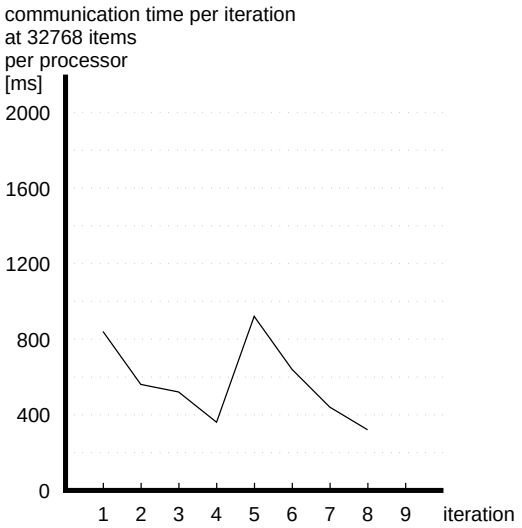


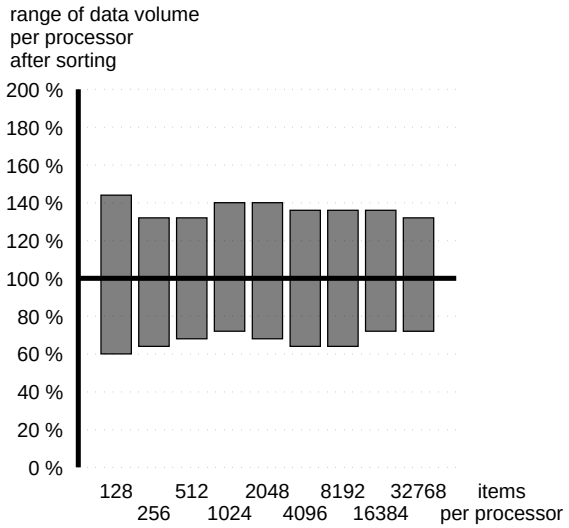
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1038	664	507	426	395	356	349	341	355
total time [s]	0.13	0.17	0.26	0.44	0.81	1.46	2.86	5.59	11.66
time for communication [ms]	130	160	219	320	554	879	1589	2810	5678
time for local sorting [ms]	18	30	69	143	319	670	1523	3183	6907
minimum number of items	80	169	321	703	1462	2886	6011	11303	23933
maximal number of items	169	366	706	1290	2881	5246	10225	20950	44019
number of data packets	3539	3562	3560	3580	4114	6194	10373	18412	35225
total path length of all data packets	16060	15901	15758	16403	17862	26203	42352	73119	141266
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

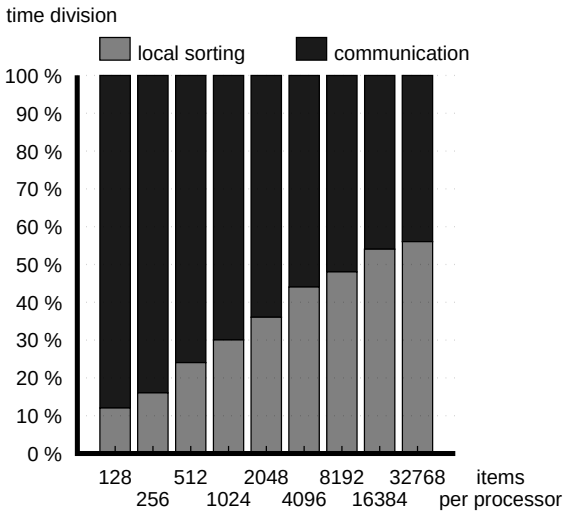
Data Sheet 48

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	yes





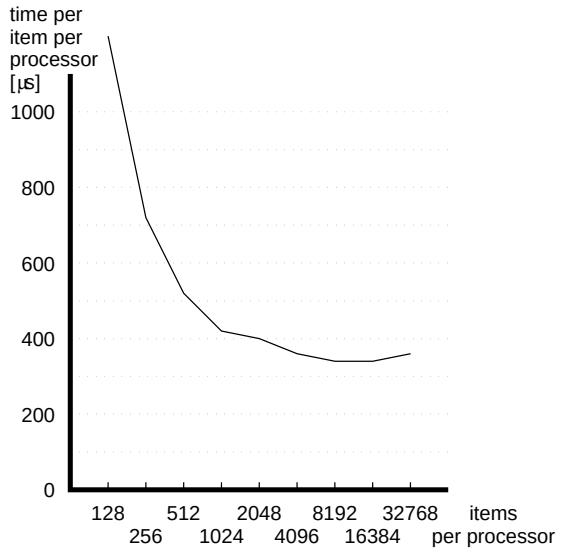


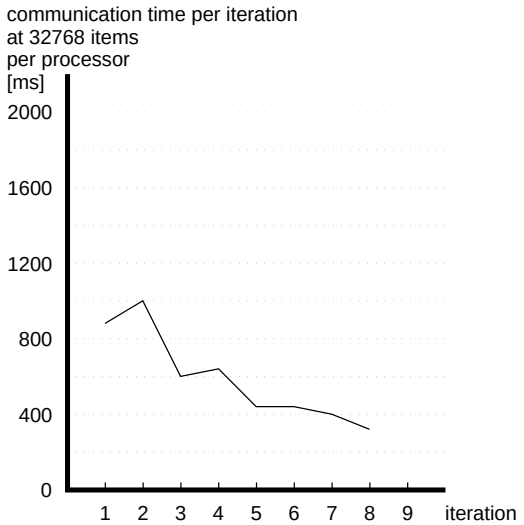


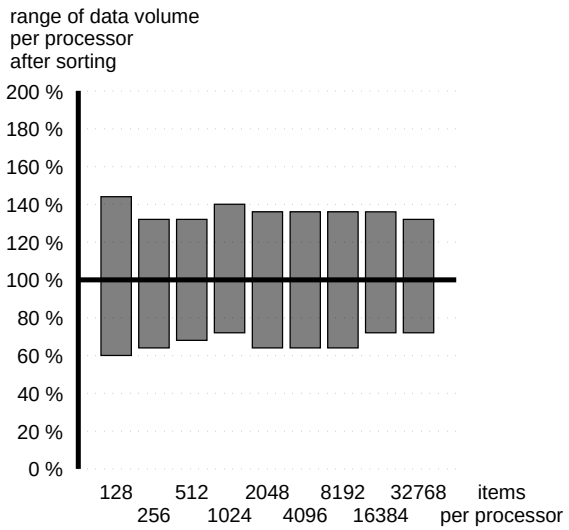
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1202	742	540	439	401	356	345	338	349
total time [s]	0.15	0.19	0.28	0.45	0.82	1.46	2.83	5.56	11.46
time for communication [ms]	150	170	229	336	560	879	1558	2778	5526
time for local sorting [ms]	18	30	69	142	319	670	1526	3183	6901
minimum number of items	75	168	355	732	1351	2548	5217	11619	23319
maximal number of items	184	336	669	1449	2836	5587	11160	22554	42954
number of data packets	3559	3559	3570	3575	4082	6117	10193	18338	34880
total path length of all data packets	15699	15580	15386	15580	17135	24960	40445	71766	136219
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

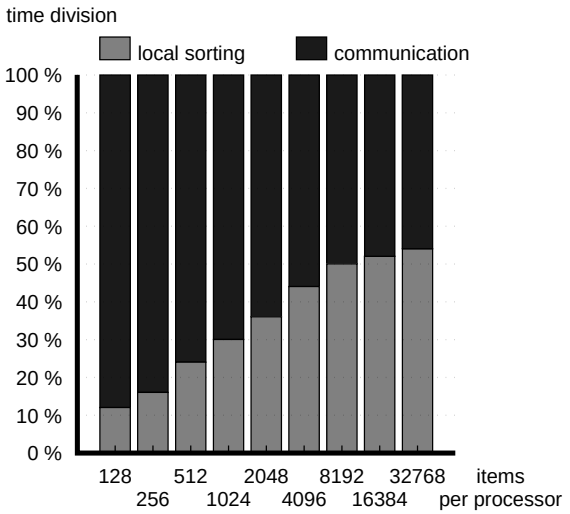
Data Sheet 49

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	no	**data exchange inversion**	yes





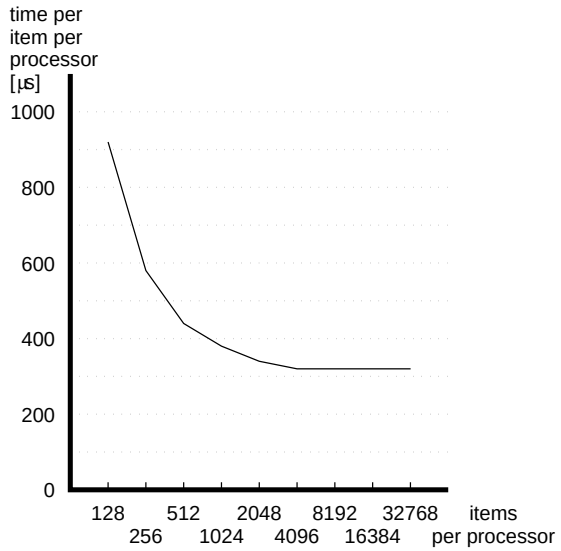


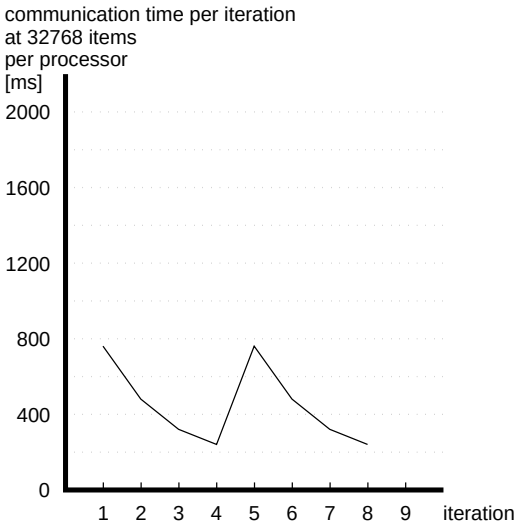


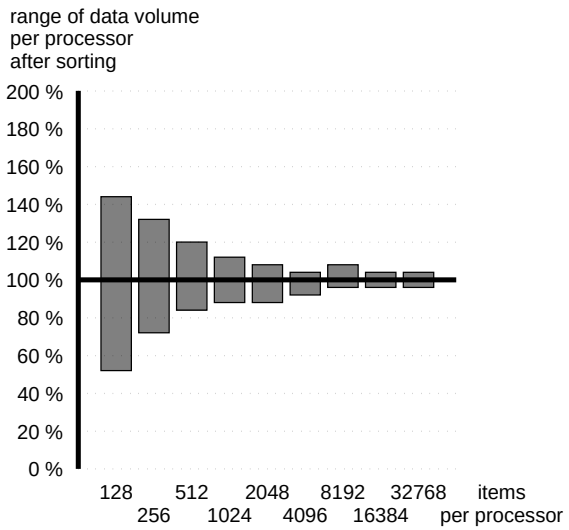
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1093	726	525	429	396	357	346	342	354
total time [s]	0.14	0.19	0.27	0.44	0.82	1.46	2.84	5.62	11.62
time for communication [ms]	140	164	220	330	558	879	1569	2830	5685
time for local sorting [ms]	19	30	69	141	317	670	1525	3182	6904
minimum number of items	75	168	351	757	1331	2548	5217	11619	23319
maximal number of items	184	336	675	1449	2826	5587	11160	22554	42954
number of data packets	3559	3559	3575	3575	4088	6117	10192	18337	34877
total path length of all data packets	17291	17376	17300	17406	18736	27730	45821	81227	154633
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

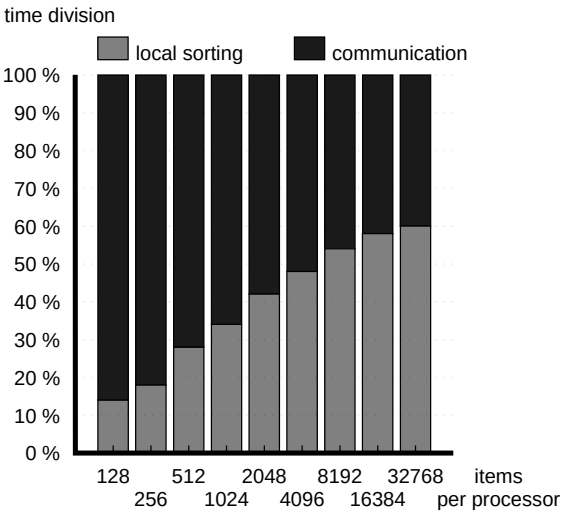
Data Sheet 50

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	row major
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





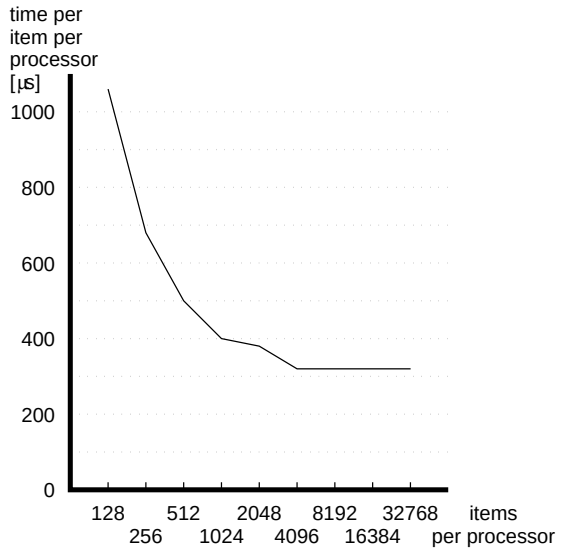


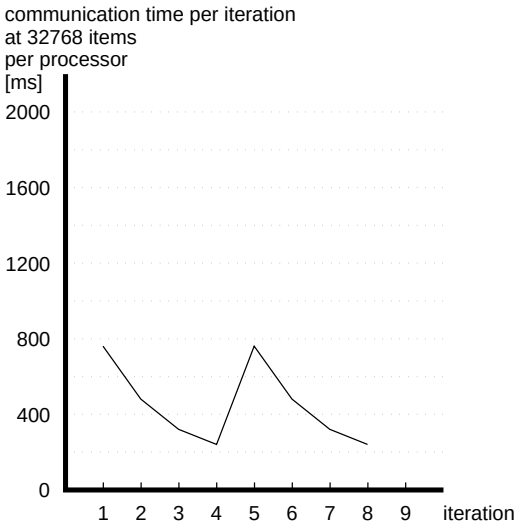


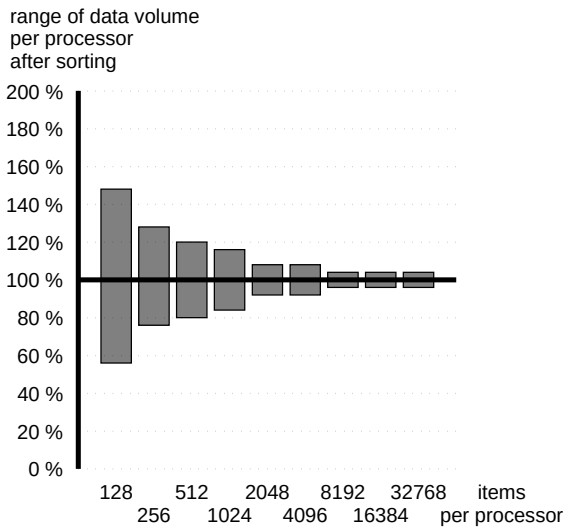
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	929	585	449	371	345	312	313	311	322
total time [s]	0.12	0.15	0.23	0.38	0.71	1.28	2.57	5.11	10.58
time for communication [ms]	114	131	180	269	448	699	1299	2327	4591
time for local sorting [ms]	18	30	69	141	314	670	1524	3181	6906
minimum number of items	71	188	420	905	1835	3784	7869	15871	31905
maximal number of items	182	337	618	1161	2232	4330	8767	16945	33500
number of data packets	2048	2048	2048	2048	3511	5705	9988	18303	34775
total path length of all data packets	7680	7680	7680	7680	13300	21521	37530	68717	130452
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

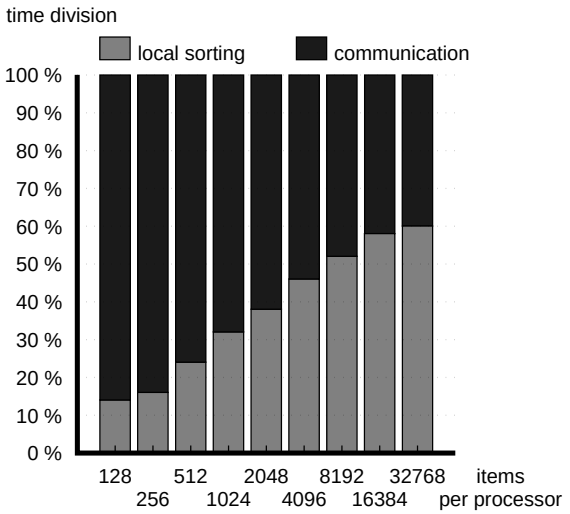
Data Sheet 51

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	snake-like
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





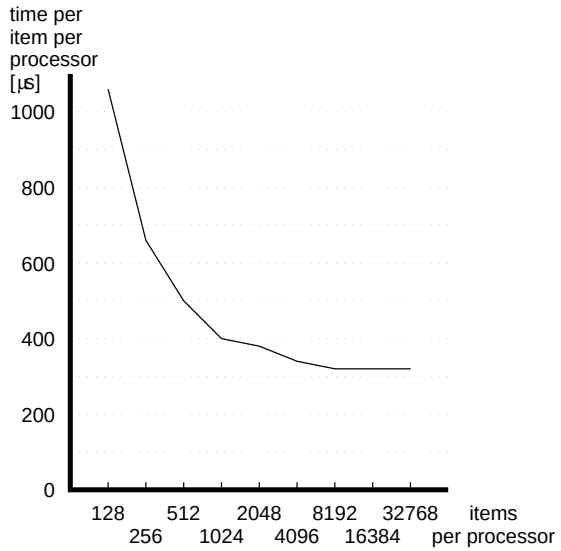


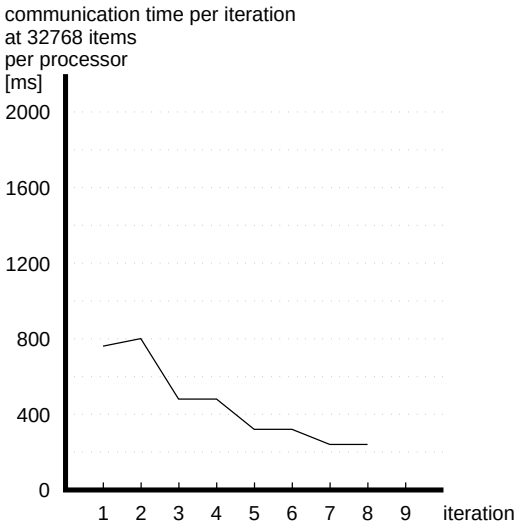


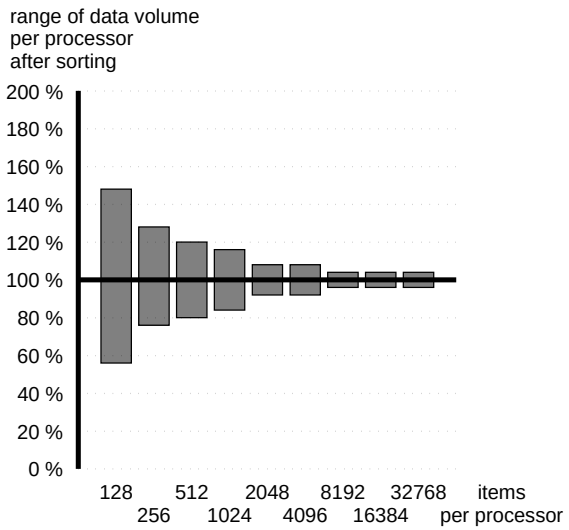
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1061	683	507	410	377	328	321	315	324
total time [s]	0.14	0.18	0.26	0.42	0.77	1.35	2.63	5.17	10.64
time for communication [ms]	130	160	210	309	509	762	1360	2392	4702
time for local sorting [ms]	19	30	69	143	319	670	1527	3181	6904
minimum number of items	71	196	401	878	1871	3840	7872	15832	31917
maximal number of items	189	331	622	1174	2225	4346	8593	16952	33505
number of data packets	2048	2048	2048	2048	3541	5750	9979	18310	34794
total path length of all data packets	7680	7680	7680	7680	13497	21666	37487	68712	130486
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

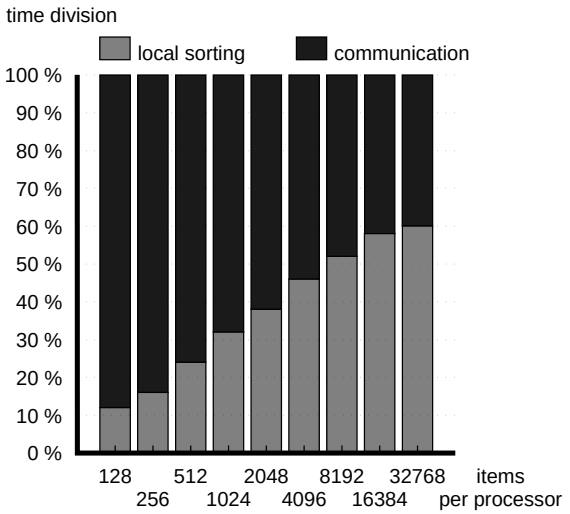
Data Sheet 52

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Hilbert numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





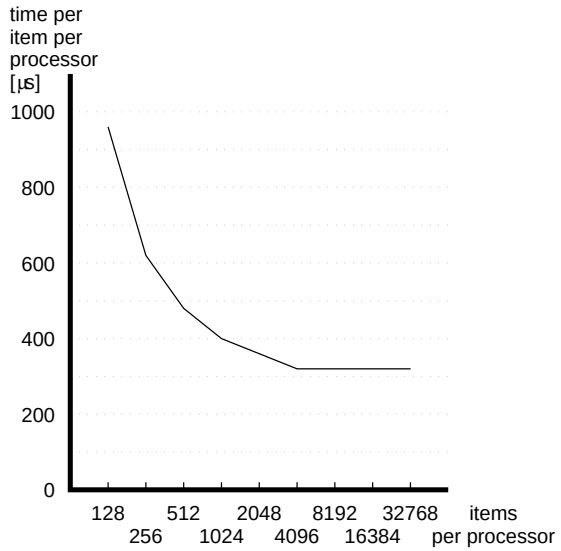


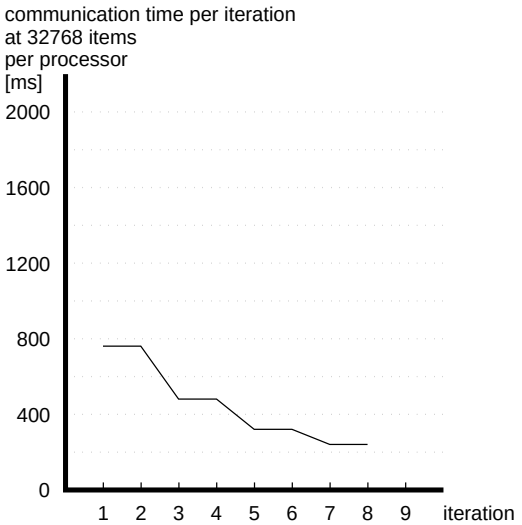


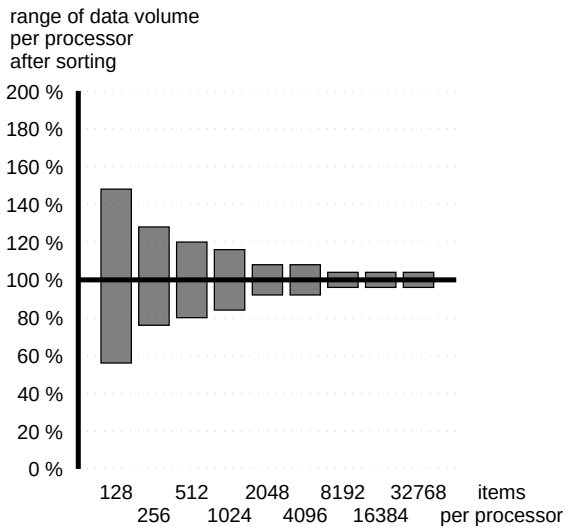
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1061	664	507	410	385	333	323	316	325
total time [s]	0.14	0.17	0.26	0.42	0.79	1.37	2.65	5.19	10.66
time for communication [ms]	130	150	210	310	530	780	1379	2406	4720
time for local sorting [ms]	19	30	69	140	319	670	1525	3181	6907
minimum number of items	71	196	409	879	1871	3840	7872	15849	31912
maximal number of items	189	331	622	1174	2225	4346	8607	16952	33489
number of data packets	2048	2048	2048	2048	3542	5750	9978	18310	34793
total path length of all data packets	8800	8800	8800	8800	15568	25004	43182	78878	149563
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

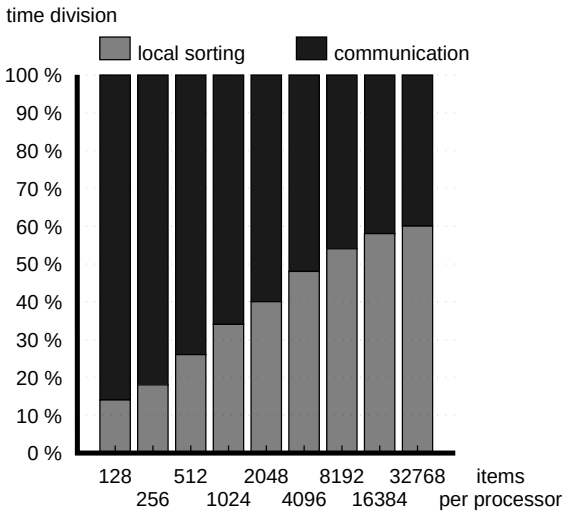
Data Sheet 53

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	H numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	yes





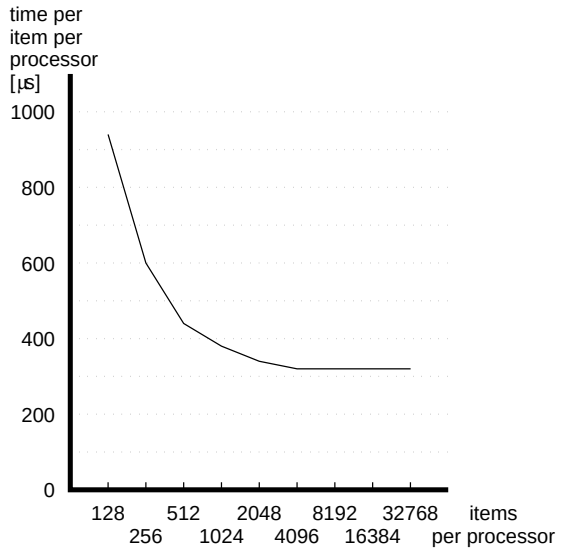


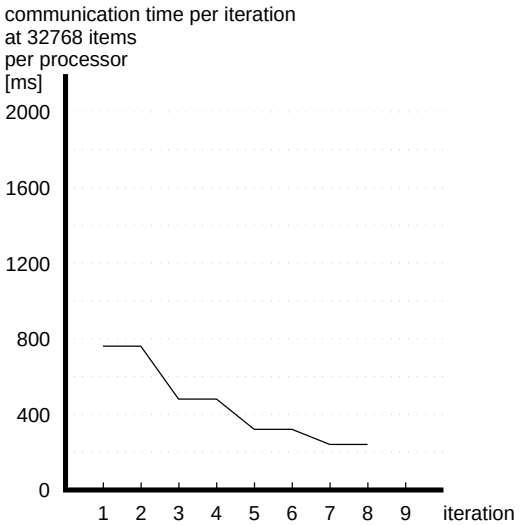


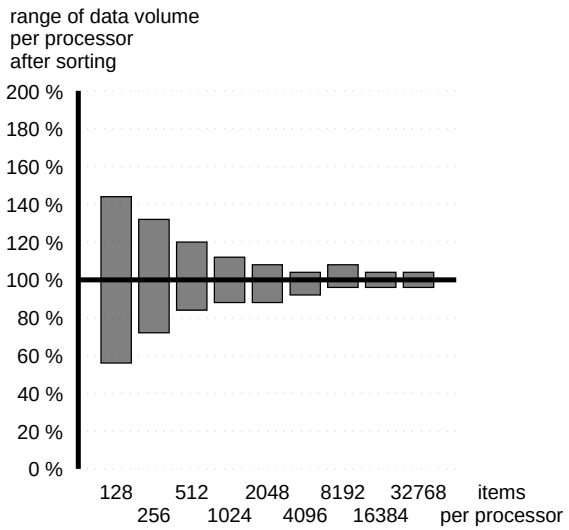
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	952	624	472	396	368	325	319	314	324
total time [s]	0.12	0.16	0.24	0.41	0.75	1.34	2.62	5.15	10.63
time for communication [ms]	120	140	199	290	497	750	1345	2374	4689
time for local sorting [ms]	19	30	69	145	318	670	1524	3180	6906
minimum number of items	71	196	409	877	1871	3840	7872	15828	31912
maximal number of items	189	331	622	1174	2225	4346	8608	16952	33488
number of data packets	2048	2048	2048	2048	3542	5750	9978	18311	34793
total path length of all data packets	7680	7680	7680	7680	13596	21808	37704	68845	130525
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

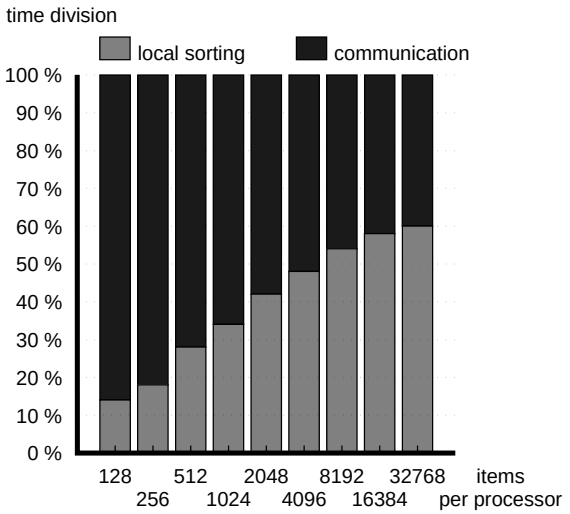
Data Sheet 54

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Z numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





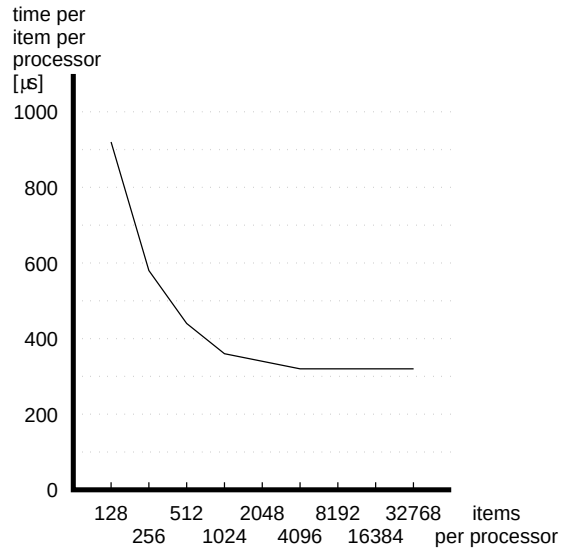


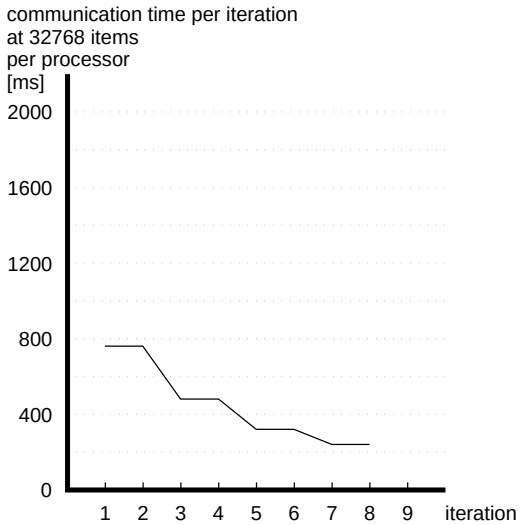


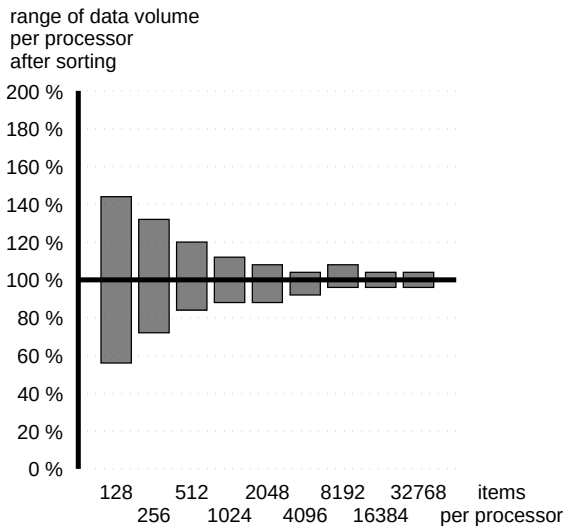
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	937	600	449	374	346	313	313	311	323
total time [s]	0.12	0.15	0.23	0.38	0.71	1.29	2.57	5.11	10.59
time for communication [ms]	110	130	180	270	449	700	1299	2329	4649
time for local sorting [ms]	19	30	69	143	318	670	1524	3181	6905
minimum number of items	71	188	420	905	1835	3784	7869	15871	31905
maximal number of items	182	337	618	1161	2232	4330	8767	16945	33500
number of data packets	2048	2048	2048	2048	3511	5704	9989	18304	34775
total path length of all data packets	7936	7936	7936	7936	13832	22299	38897	71078	134816
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

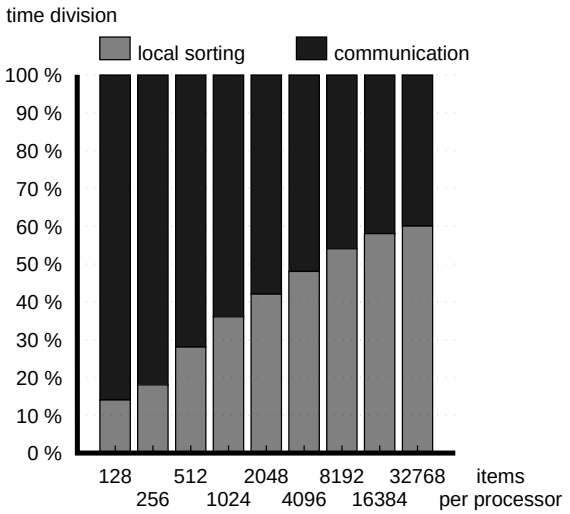
Data Sheet 55

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	1	**processor numbering**	Shuffle numbering
pivot selection	Median of medians		
reduced communication	yes	**exact bisection**	yes
exact partner processors	yes	**data exchange inversion**	no





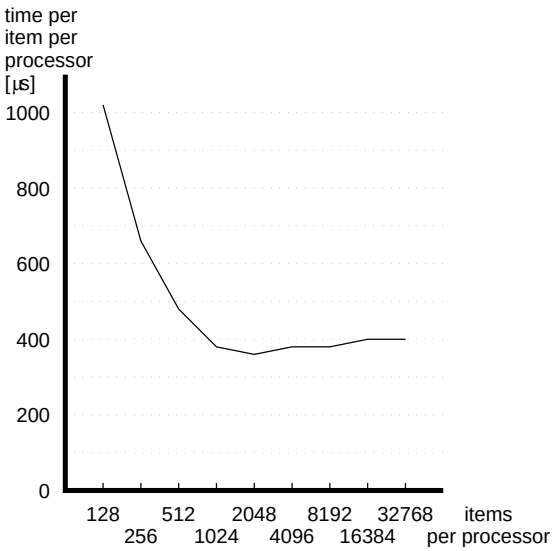


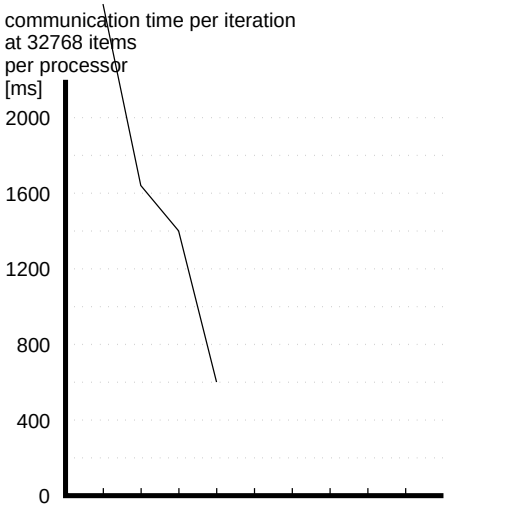


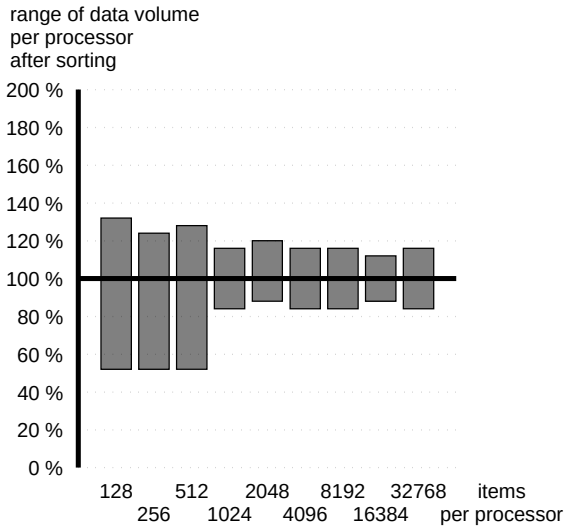
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	913	585	449	365	342	312	313	311	322
total time [s]	0.12	0.15	0.23	0.37	0.70	1.28	2.57	5.10	10.59
time for communication [ms]	110	130	180	260	446	694	1294	2322	4604
time for local sorting [ms]	19	30	69	141	319	670	1524	3182	6908
minimum number of items	71	188	420	905	1835	3784	7869	15871	31905
maximal number of items	182	337	618	1161	2232	4330	8767	16945	33500
number of data packets	2048	2048	2048	2048	3511	5705	9988	18303	34775
total path length of all data packets	7680	7680	7680	7680	13397	21586	37652	68797	130471
average recursion depth	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00

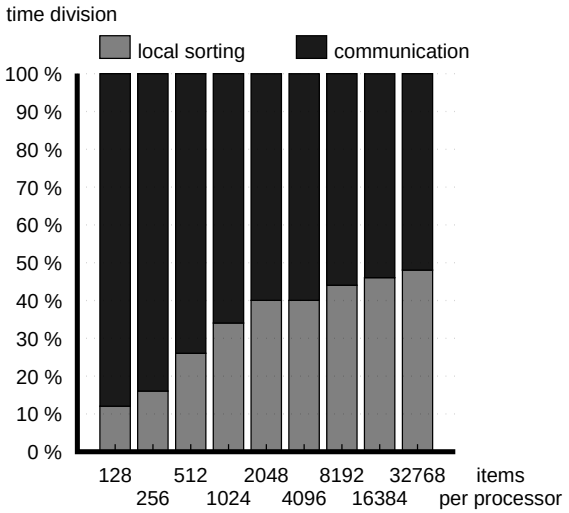
Data Sheet 56

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	row major
pivot selection	multi-median of pivot candidates		
reduced communication	no	**exact partitioning**	no
exact partner processors	no	**data exchange inversion**	no





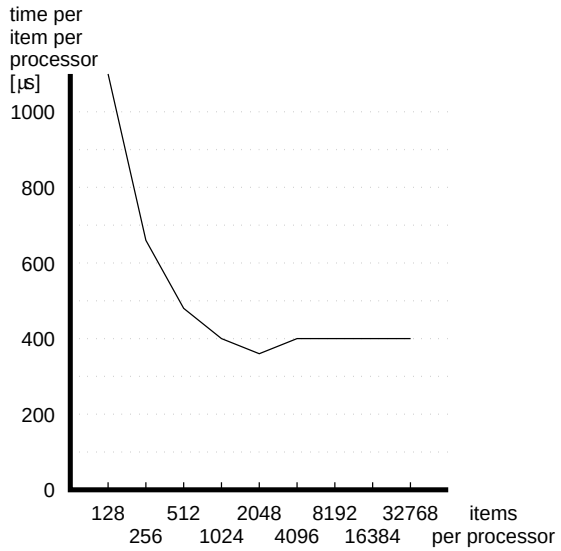


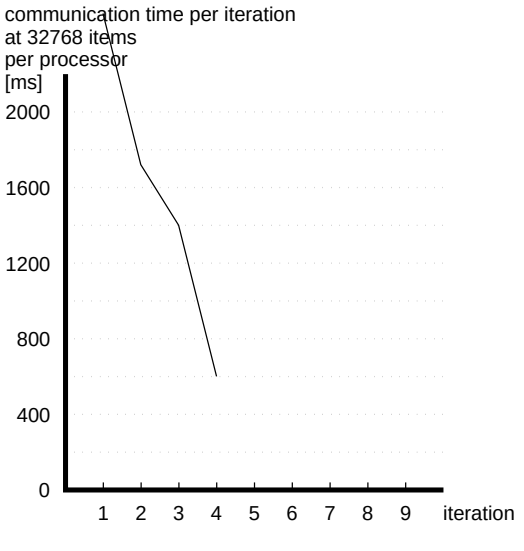


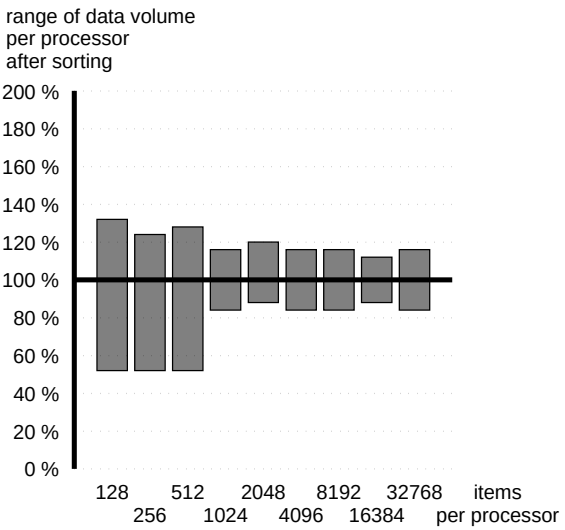
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1015	660	488	378	351	383	388	392	403
total time [s]	0.13	0.17	0.25	0.39	0.72	1.57	3.18	6.44	13.23
time for communication [ms]	130	150	200	270	462	989	1905	3663	7287
time for local sorting [ms]	17	30	69	142	319	670	1523	3183	6904
minimum number of items	66	129	276	842	1781	3446	7020	14126	28169
maximal number of items	171	322	653	1174	2454	4798	9660	18418	37511
number of data packets	4763	4775	4772	4778	4779	7209	11591	20042	36735
total path length of all data packets	28711	28362	26824	26561	26578	39142	62509	107223	195858
average recursion depth	4.02	4.02	4.01	4.00	4.00	4.00	4.00	4.00	4.00

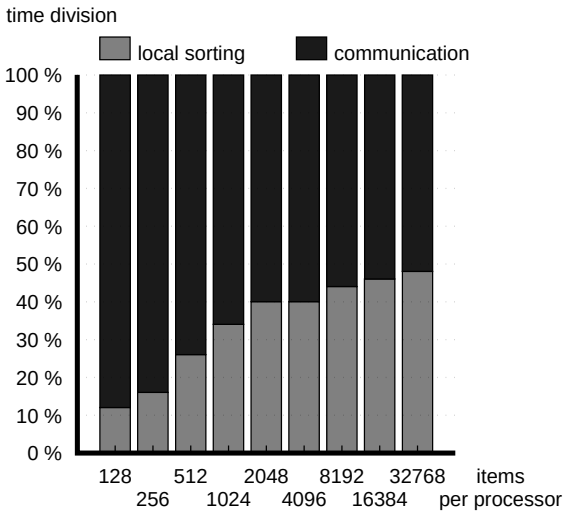
Data Sheet 57

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	snake-like
pivot selection	multi-median of pivot candidates		
reduced communication	no	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	no





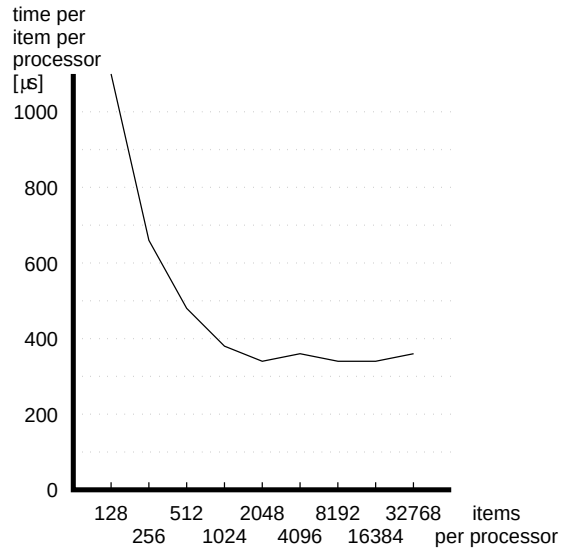


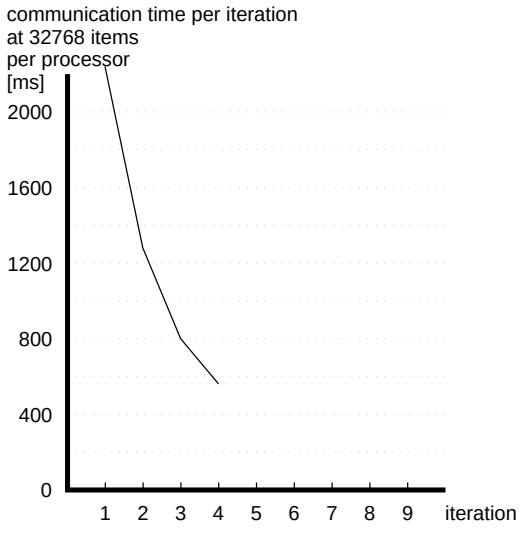


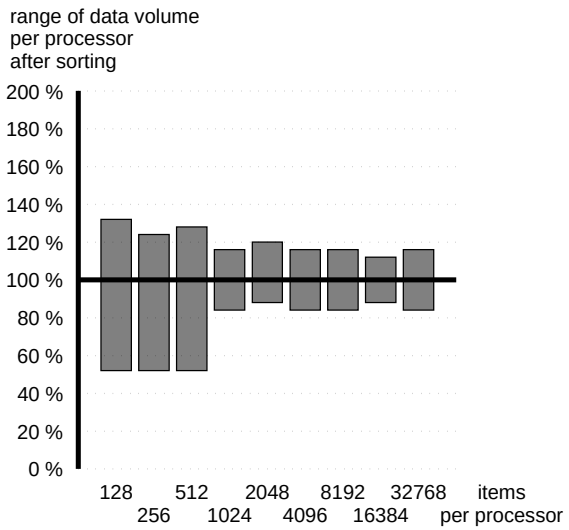
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1093	667	488	390	360	391	392	393	403
total time [s]	0.14	0.17	0.25	0.40	0.74	1.61	3.22	6.45	13.25
time for communication [ms]	130	154	203	287	479	1017	1952	3665	7306
time for local sorting [ms]	19	30	69	142	318	670	1526	3180	6906
minimum number of items	66	129	276	842	1781	3446	7020	14126	28169
maximal number of items	171	322	653	1174	2454	4798	9660	18418	37511
number of data packets	4763	4775	4772	4778	4779	7209	11591	20042	36735
total path length of all data packets	27709	27851	27899	27973	27966	41442	66234	113528	207353
average recursion depth	4.02	4.02	4.01	4.00	4.00	4.00	4.00	4.00	4.00

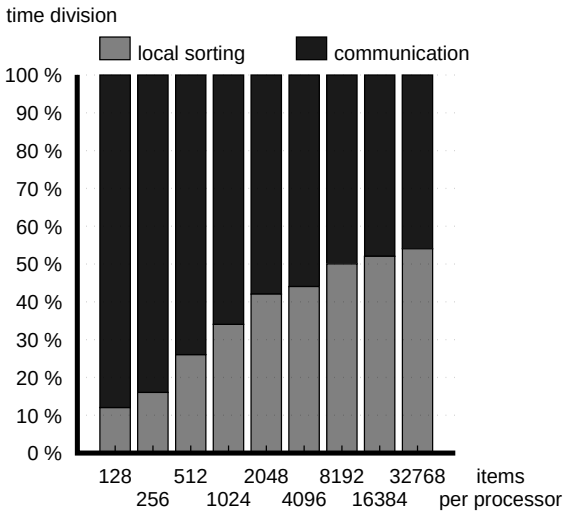
Data Sheet 58

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	no	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	no





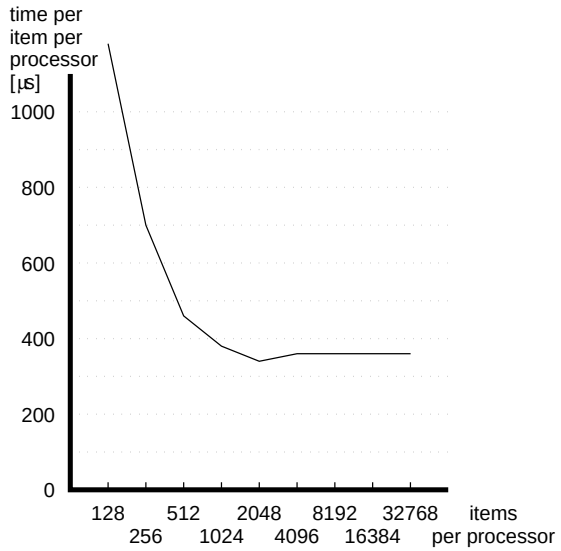


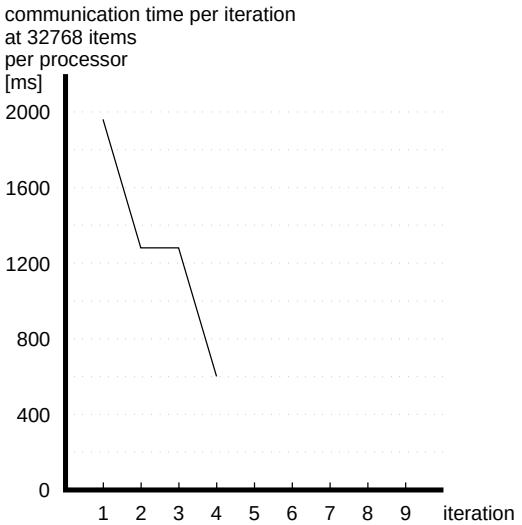


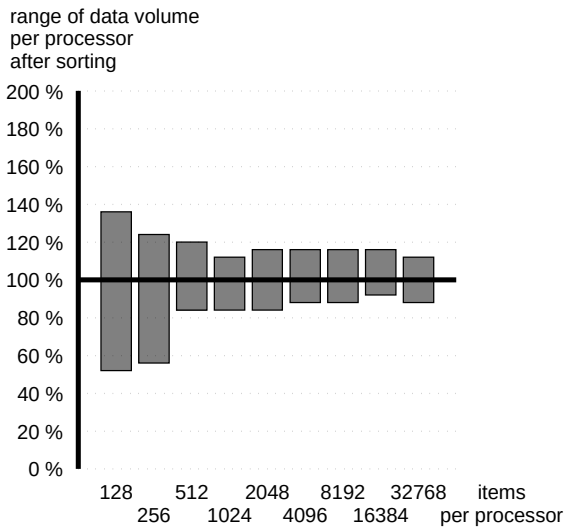
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1093	667	488	376	340	355	347	350	361
total time [s]	0.14	0.17	0.25	0.39	0.70	1.46	2.85	5.74	11.86
time for communication [ms]	138	154	200	272	438	869	1571	2963	5916
time for local sorting [ms]	19	30	69	140	315	670	1523	3182	6902
minimum number of items	66	129	276	842	1781	3446	7020	14126	28169
maximal number of items	171	322	653	1174	2454	4798	9660	18418	37511
number of data packets	4763	4775	4772	4778	4779	7209	11591	20042	36735
total path length of all data packets	21809	21863	21493	21501	21468	31948	50800	87116	158737
average recursion depth	4.02	4.02	4.01	4.00	4.00	4.00	4.00	4.00	4.00

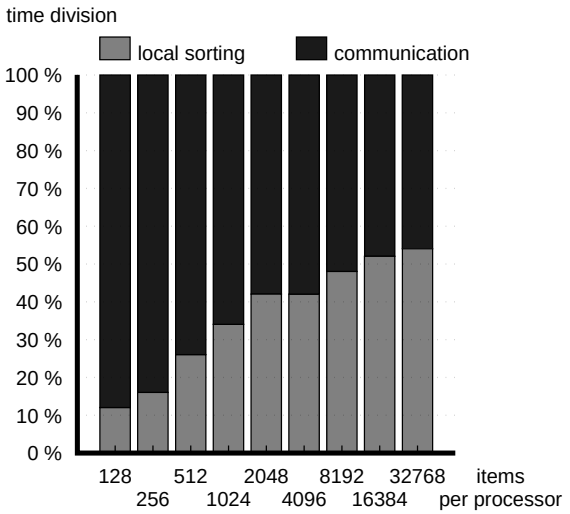
Data Sheet 59

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	row major
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	no





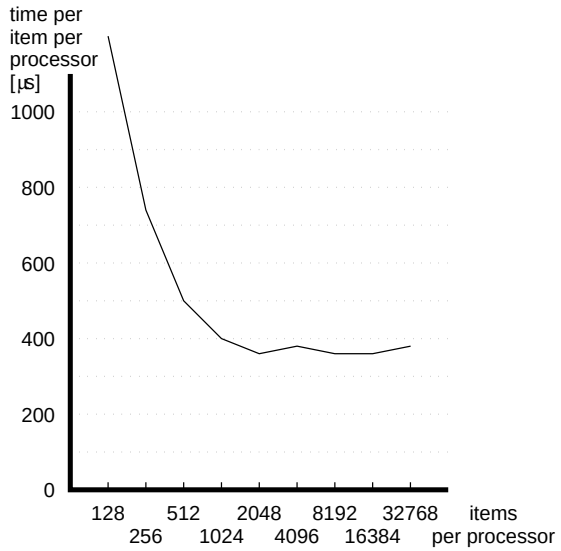


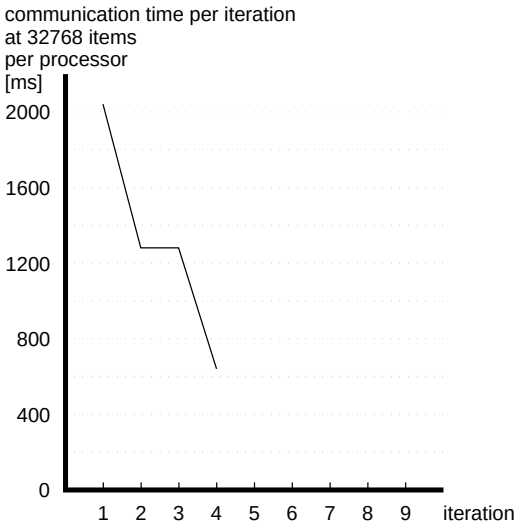


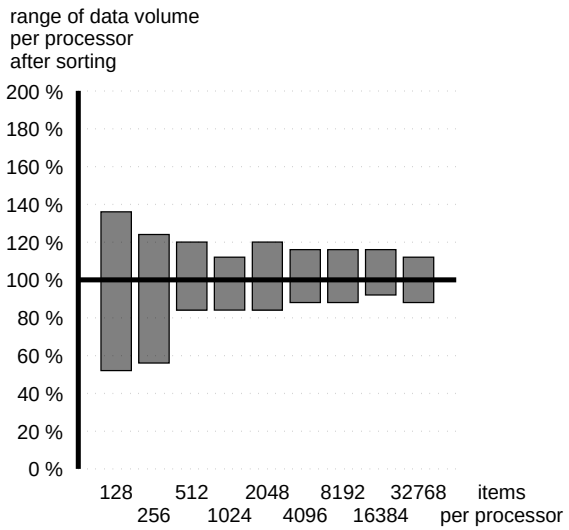
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1171	703	462	379	343	361	355	354	368
total time [s]	0.15	0.18	0.24	0.39	0.70	1.48	2.91	5.81	12.09
time for communication [ms]	146	169	190	270	446	898	1640	3025	6151
time for local sorting [ms]	19	30	70	142	319	670	1523	3182	6903
minimum number of items	69	141	424	876	1761	3650	7166	14826	29307
maximal number of items	172	321	610	1166	2437	4741	9634	19071	37283
number of data packets	3731	3747	3746	3750	3754	5548	8810	15217	27739
total path length of all data packets	26602	25864	24516	24535	24540	35220	55398	94537	171852
average recursion depth	4.02	4.01	4.00	4.00	4.00	4.00	4.00	4.00	4.00

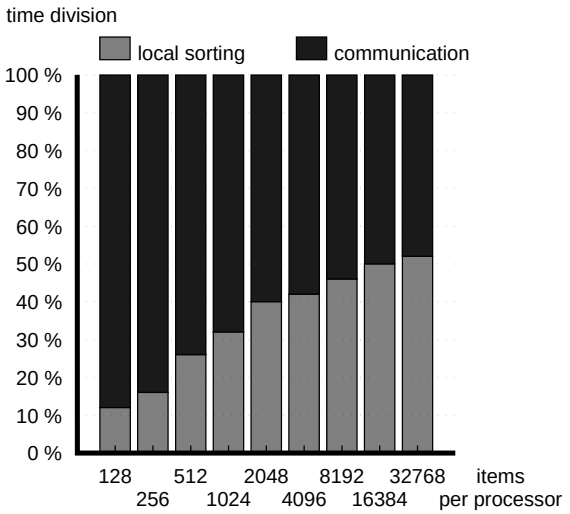
Data Sheet 60

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	snake-like
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	no





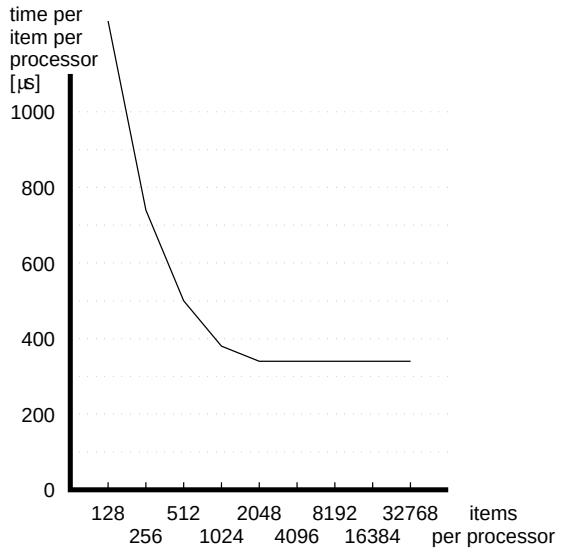


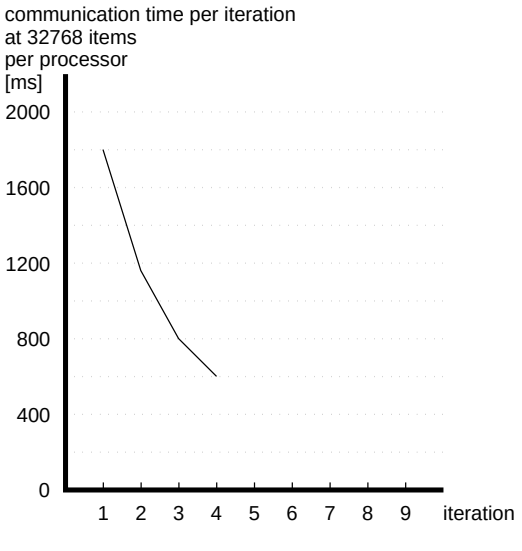


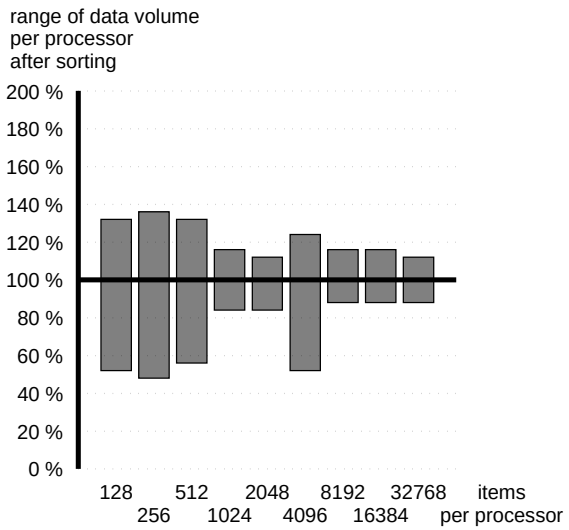
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1202	734	507	400	366	376	367	363	372
total time [s]	0.15	0.19	0.26	0.41	0.75	1.54	3.01	5.97	12.22
time for communication [ms]	150	170	210	300	489	959	1734	3187	6280
time for local sorting [ms]	19	30	70	141	319	670	1526	3182	6904
minimum number of items	69	141	424	876	1761	3650	7166	14826	29307
maximal number of items	172	321	610	1166	2437	4741	9634	19071	37283
number of data packets	3731	3747	3746	3750	3754	5548	8810	15217	27739
total path length of all data packets	25918	26159	26158	26161	26176	37765	59927	102296	185772
average recursion depth	4.02	4.01	4.00	4.00	4.00	4.00	4.00	4.00	4.00

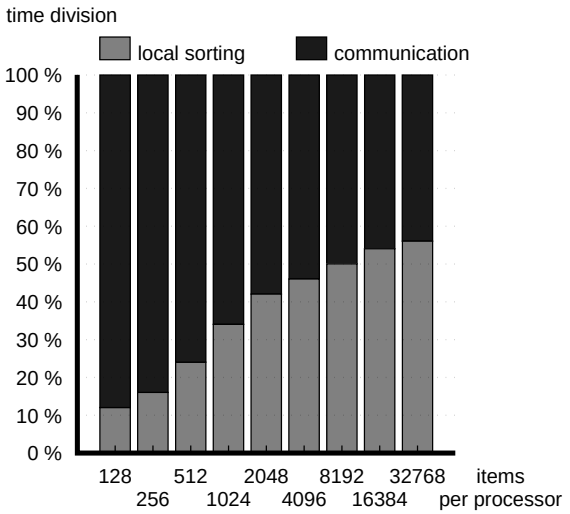
Data Sheet 61

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	no





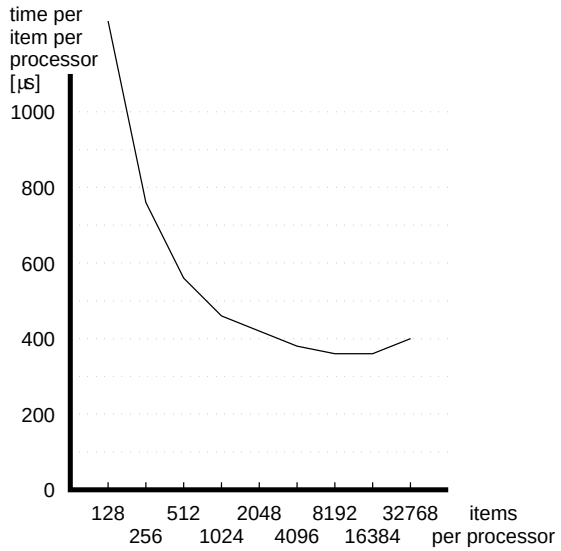


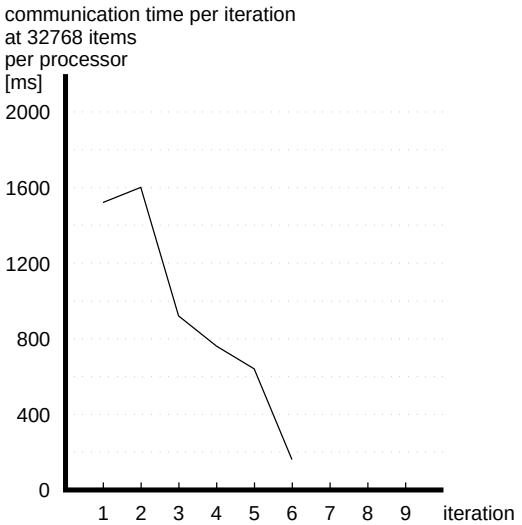


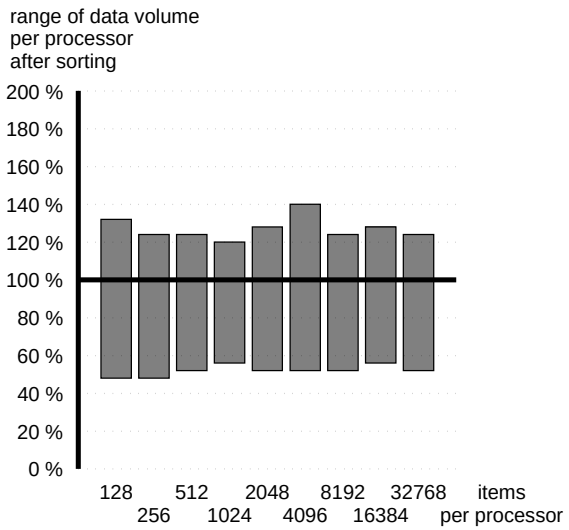
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1241	734	505	379	340	342	337	336	344
total time [s]	0.16	0.19	0.26	0.39	0.70	1.41	2.76	5.52	11.29
time for communication [ms]	150	170	210	278	437	817	1490	2742	5351
time for local sorting [ms]	19	30	69	144	319	670	1526	3181	6902
minimum number of items	66	122	278	865	1741	2131	7106	14309	29258
maximal number of items	171	352	674	1183	2280	5107	9464	19046	36816
number of data packets	3732	3738	3747	3752	3752	5500	8767	15201	27696
total path length of all data packets	22044	21932	21738	21764	21760	31635	49423	84613	152934
average recursion depth	4.03	4.02	4.01	4.00	4.00	4.01	4.00	4.00	4.00

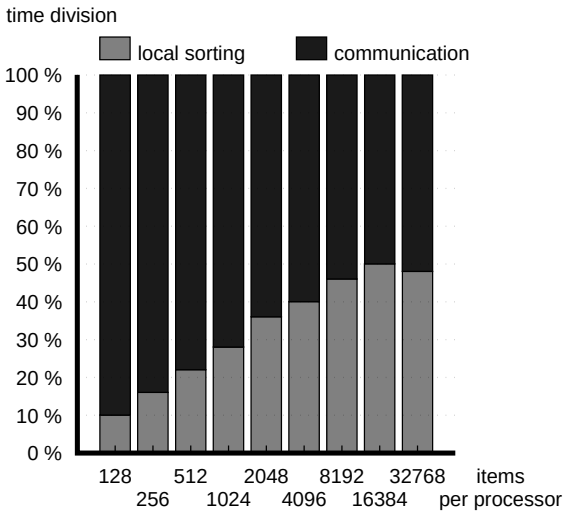
Data Sheet 62

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	2	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	yes





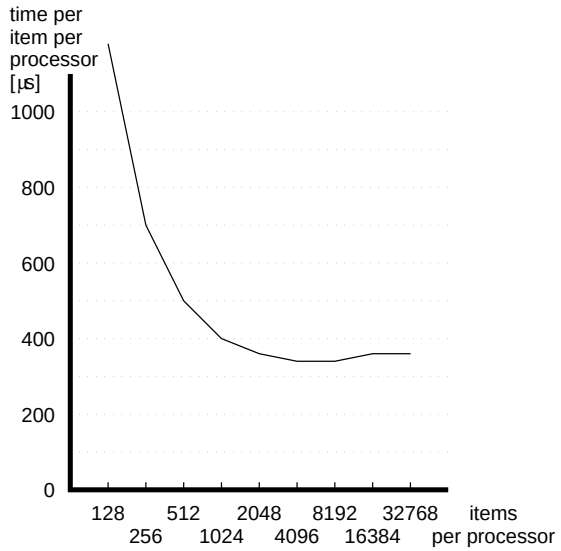


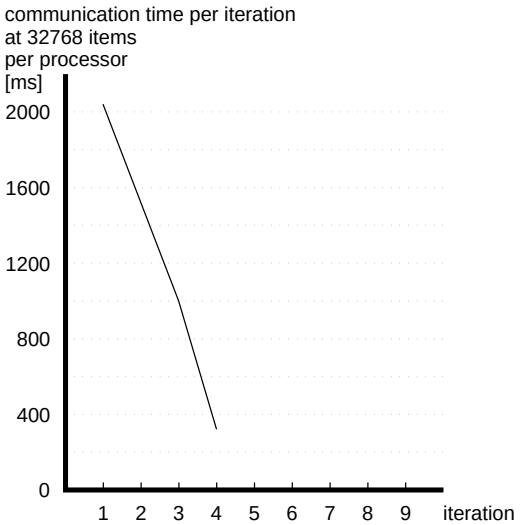


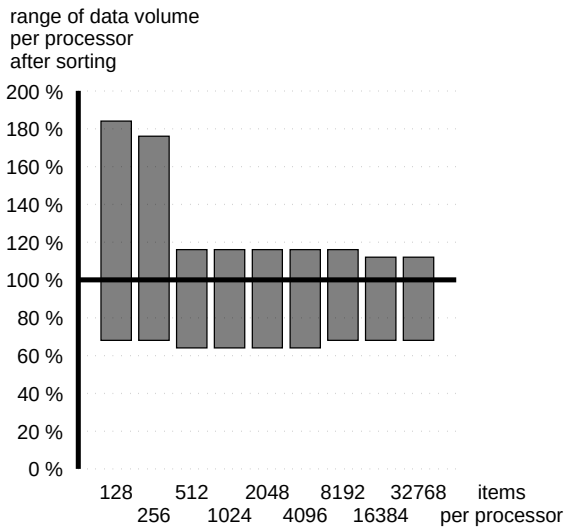
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1249	757	552	459	416	380	365	369	407
total time [s]	0.16	0.19	0.28	0.47	0.85	1.56	3.00	6.07	13.354
time for communication [ms]	160	180	239	359	591	979	1721	3288	7416
time for local sorting [ms]	19	30	69	140	319	670	15.25	3183	6903
minimum number of items	60	118	259	554	1085	2194	4227	8957	17358
maximal number of items	170	320	633	1231	2609	5811	10069	20707	40508
number of data packets	3484	3491	3494	3502	3502	5693	8709	15852	29705
total path length of all data packets	21484	21595	21529	21540	21632	33754	51104	92914	172440
average recursion depth	5.10	5.10	5.10	5.10	5.10	5.11	5.10	5.10	5.10

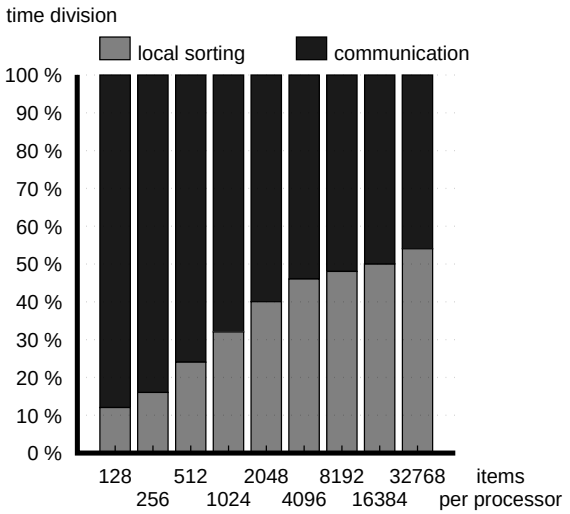
Data Sheet 63

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	4	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	yes





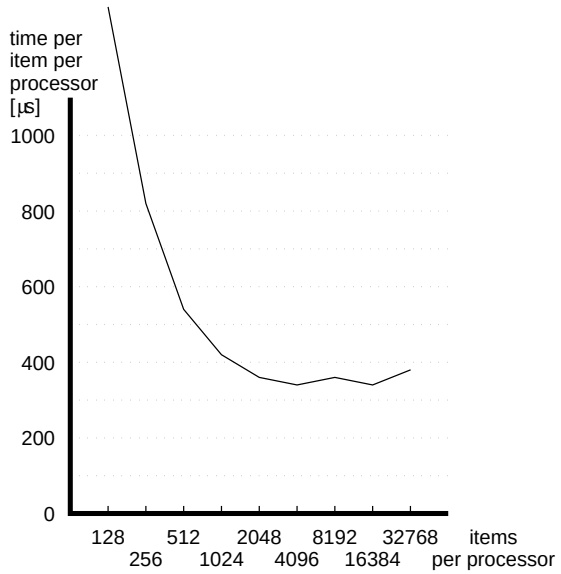


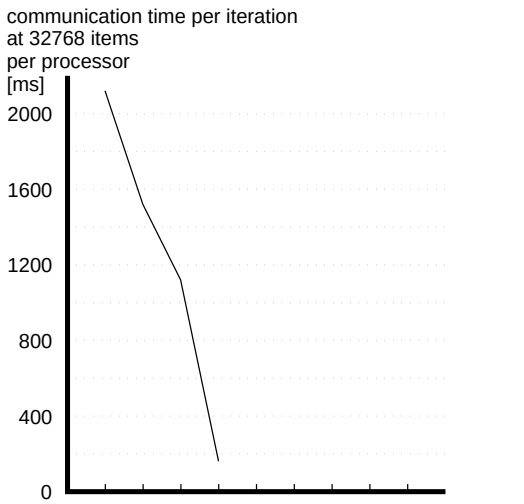


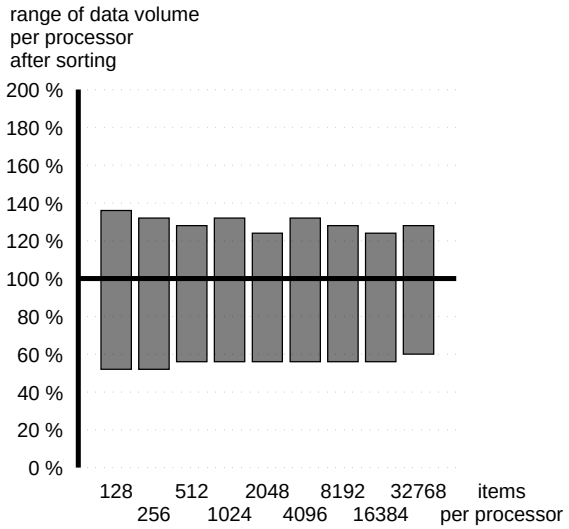
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1186	710	507	409	353	332	349	357	362
total time [s]	0.15	0.18	0.26	0.42	0.72	1.36	2.86	5.86	11.89
time for communication [ms]	150	170	210	307	465	779	1588	3084	5948
time for local sorting [ms]	19	30	69	141	319	670	1525	3182	6902
minimum number of items	87	169	336	672	1344	2649	5503	11093	21926
maximal number of items	235	453	592	1168	2348	4690	9662	18286	36537
number of data packets	3937	3938	3950	3954	4151	4422	7876	14582	26251
total path length of all data packets	26395	26306	26520	26631	26902	27042	47941	89107	157514
average recursion depth	3.99	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

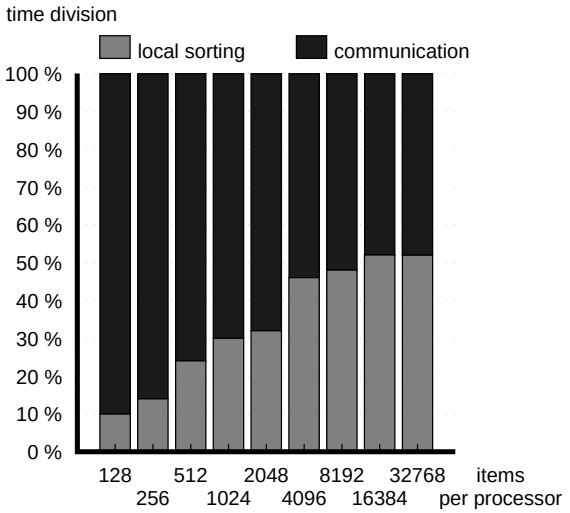
Data Sheet 64

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	5	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	yes





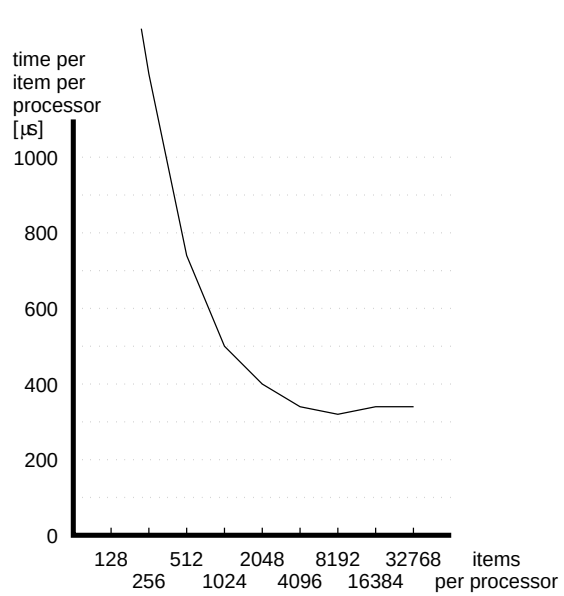


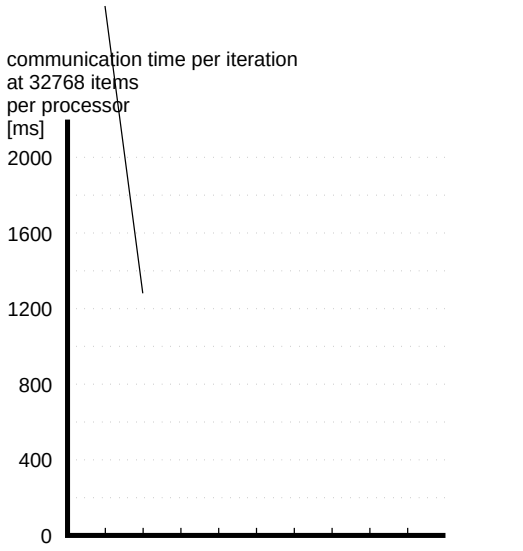


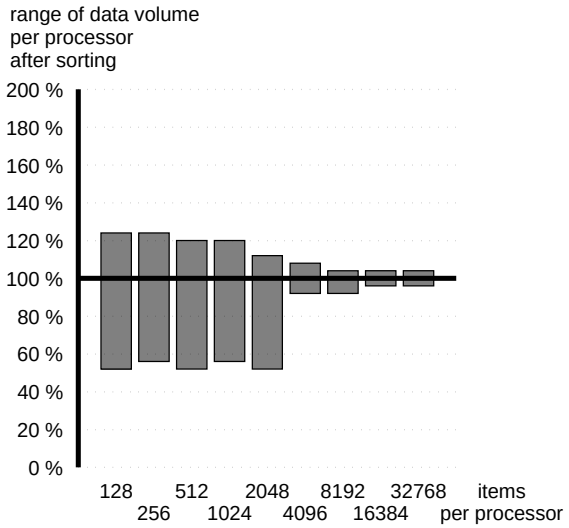
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1343	816	542	427	366	337	364	349	376
total time [s]	0.17	0.21	0.28	0.44	0.75	1.38	2.99	5.73	12.34
time for communication [ms]	170	190	229	321	487	798	1717	2954	6404
time for local sorting [ms]	19	30	70	141	319	671	1524	3180	6903
minimum number of items	64	130	285	592	1172	2370	4673	9498	19027
maximal number of items	172	336	657	1334	2568	5331	10341	20398	41323
number of data packets	4405	4416	4417	4422	4429	4510	9198	12511	24042
total path length of all data packets	29116	29272	29280	29285	29302	29508	52672	79505	153174
average recursion depth	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31

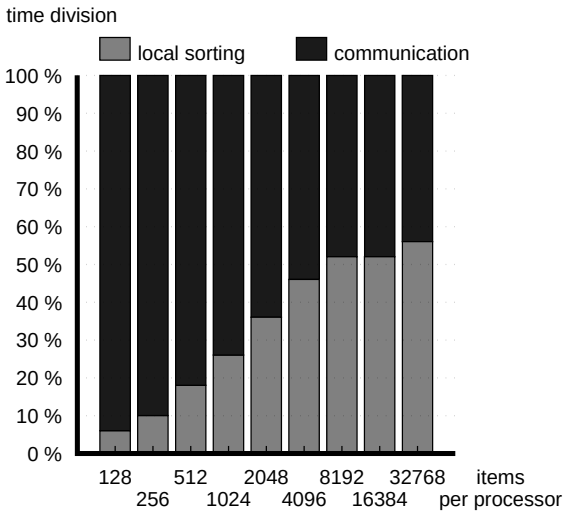
Data Sheet 65

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	15	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	no
exact partner processors	no	**data exchange inversion**	yes





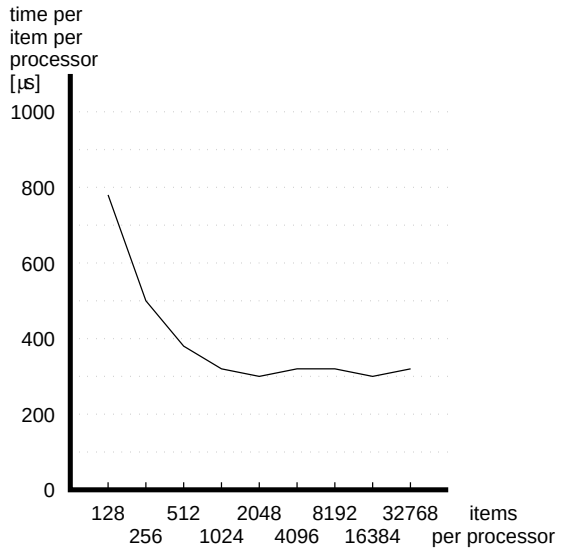


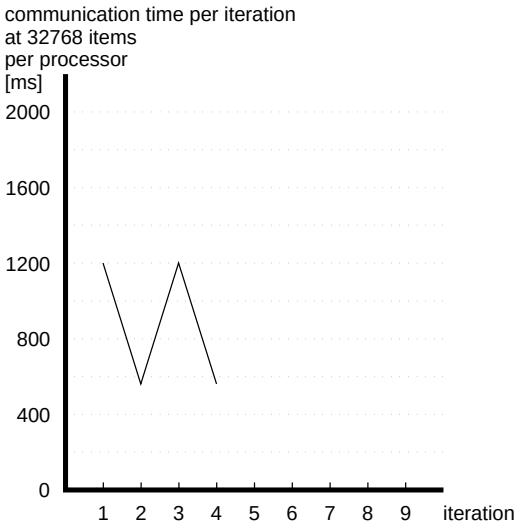


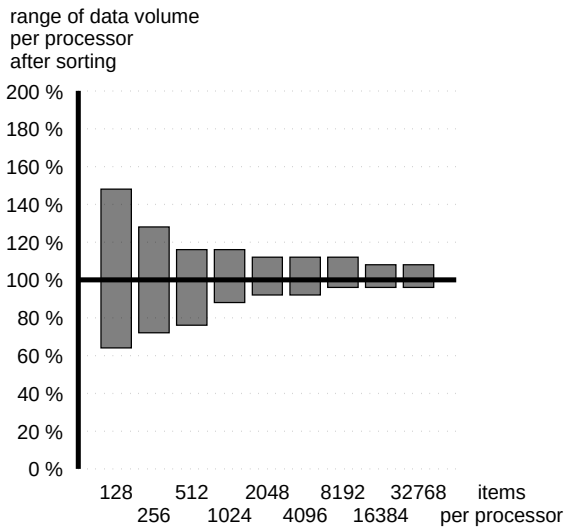
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	2265	1217	749	507	399	337	326	349	348
total time [s]	0.29	0.31	0.38	0.52	0.82	1.38	2.68	5.72	11.43
time for communication [ms]	289	300	340	406	557	801	1402	2945	5489
time for local sorting [ms]	19	30	70	143	319	671	1525	3181	6905
minimum number of items	65	145	272	552	1092	3850	7482	15498	31534
maximal number of items	161	322	614	1224	2298	4540	8661	17146	34022
number of data packets	7813	7870	7879	7903	7906	7919	7919	13544	21820
total path length of all data packets	56017	56059	56359	56257	56423	56274	56291	95028	153226
average recursion depth	2.05	2.02	2.02	2.01	2.01	2.00	2.00	2.00	2.00

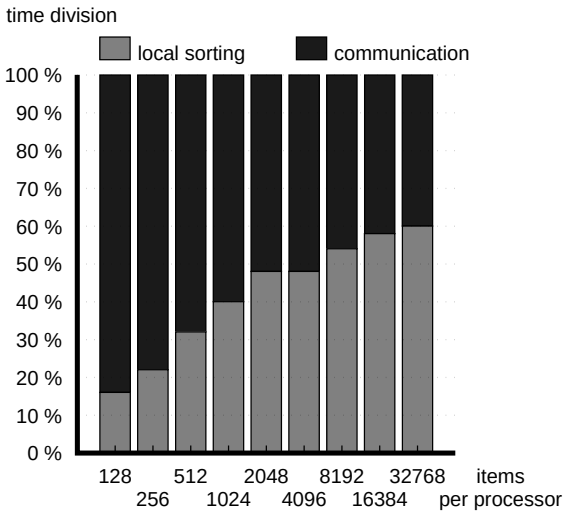
Data Sheet 66

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	row major
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	yes





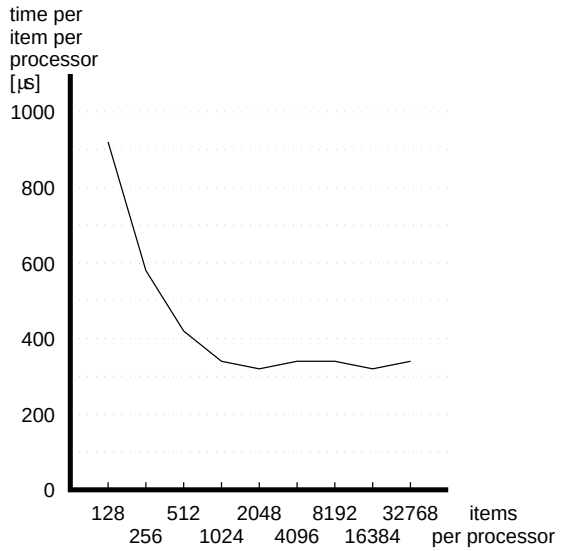


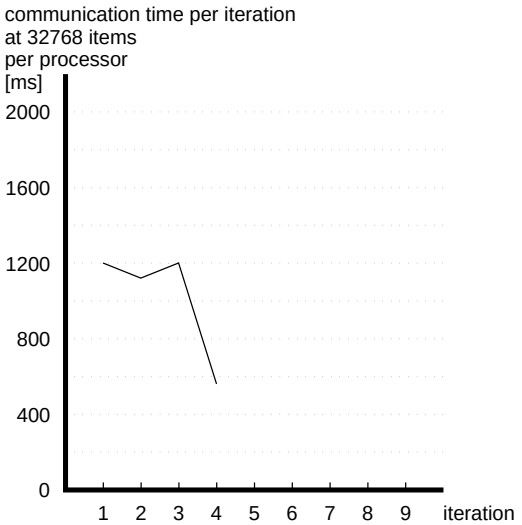


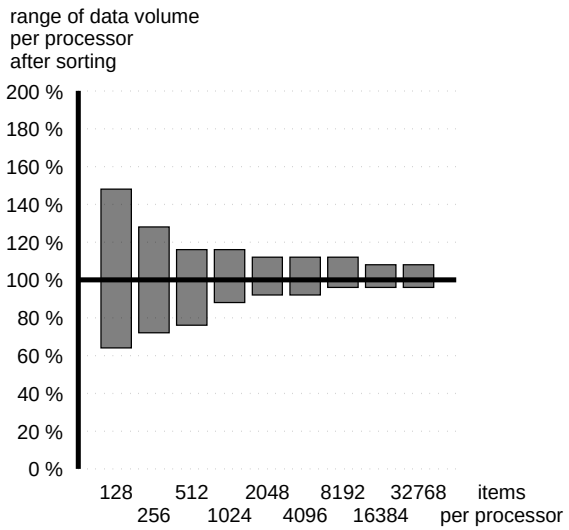
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	781	507	386	312	292	314	313	310	320
total time [s]	0.10	0.13	0.20	0.32	0.60	1.29	2.57	5.08	10.50
time for communication [ms]	18	110	150	210	340	707	1298	2301	4505
time for local sorting [ms]	100	30	69	142	314	670	1526	3181	6904
minimum number of items	81	181	388	913	1884	3818	7781	15866	31960
maximal number of items	190	330	603	1188	2248	4394	8711	16982	33560
number of data packets	4096	4096	4096	4096	4096	7019	11421	19919	36600
total path length of all data packets	12800	12800	12800	12800	12800	22121	35928	62385	114410
average recursion depth	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

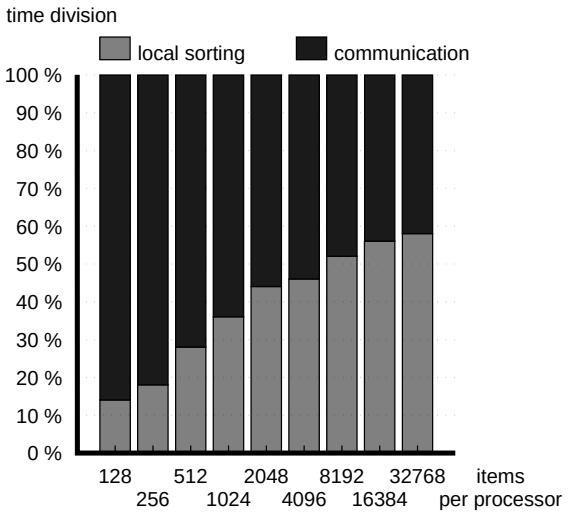
Data Sheet 67

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	snake-like
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	no





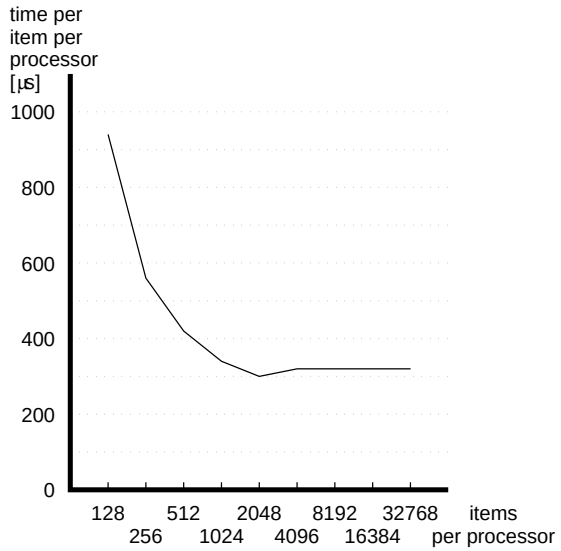


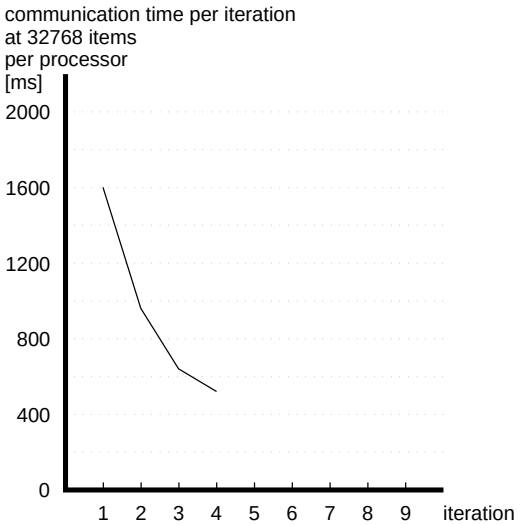


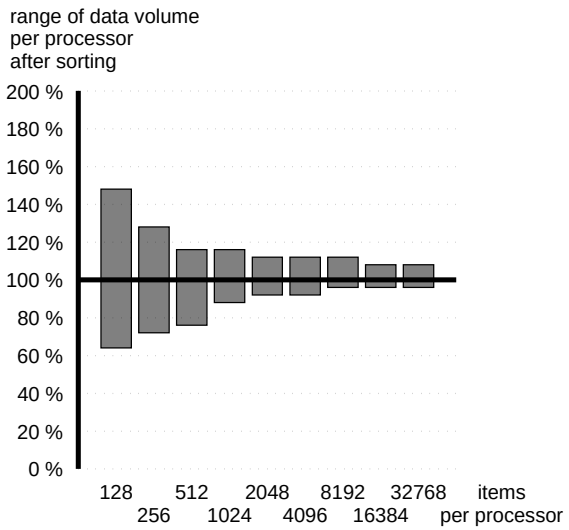
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	921	585	429	341	317	339	332	327	336
total time [s]	0.12	0.15	0.22	0.35	0.65	1.39	2.73	5.38	11.04
time for communication [ms]	110	130	170	240	390	803	1451	2600	5105
time for local sorting [ms]	19	30	69	140	319	670	1523	3180	6904
minimum number of items	81	181	388	913	1884	3818	7776	15866	31972
maximal number of items	190	330	603	1186	2248	4394	8711	16982	33560
number of data packets	4096	4096	4096	4096	4096	7020	11423	19917	36601
total path length of all data packets	16896	16896	16896	16896	16896	29050	47350	82292	151079
average recursion depth	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

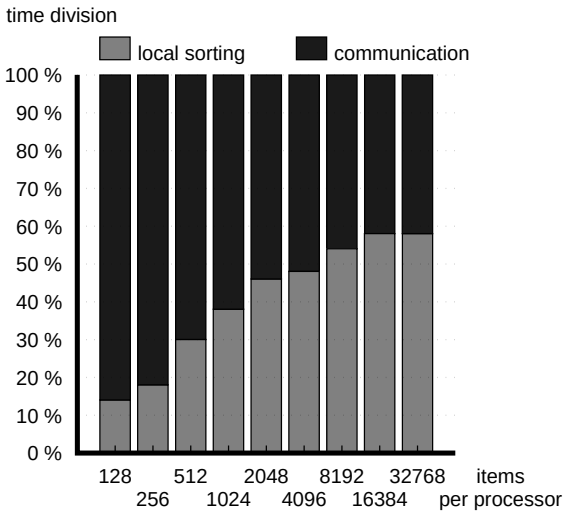
Data Sheet 68

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	Hilbert numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	yes





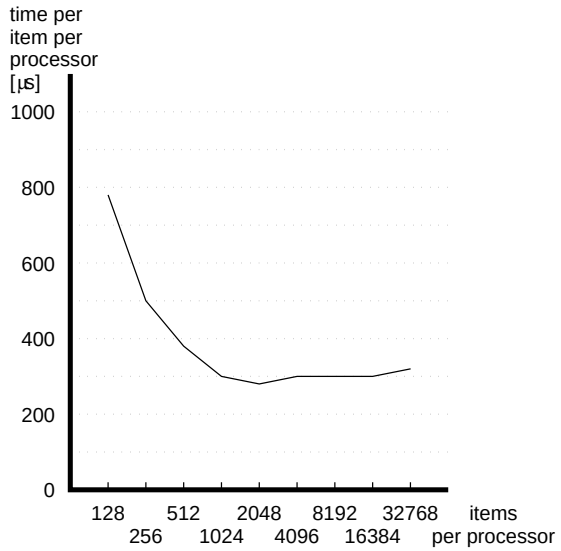


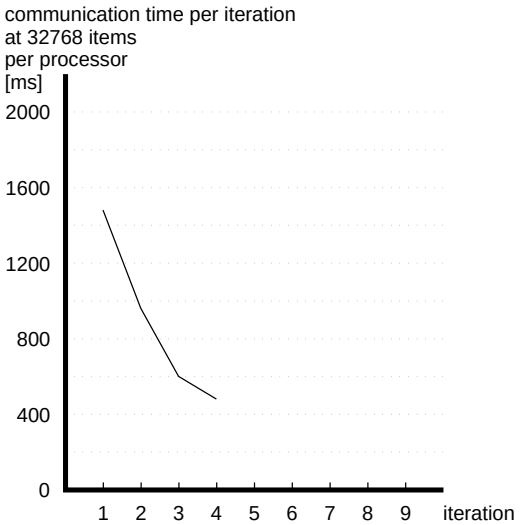


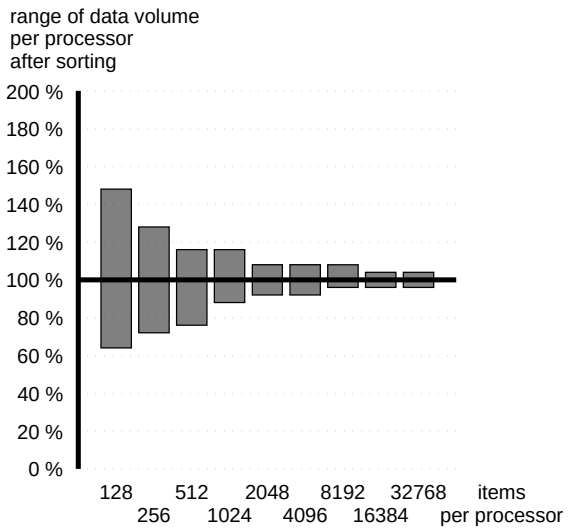
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	937	569	419	332	299	313	312	311	325
total time [s]	0.12	0.15	0.21	0.34	0.61	1.29	2.57	5.11	10.69
time for communication [ms]	120	130	170	229	360	703	1290	2335	4749
time for local sorting [ms]	18	30	70	140	318	670	1523	3181	6905
minimum number of items	81	181	388	913	1884	3818	7778	15866	31970
maximal number of items	190	330	603	1188	2248	4394	8711	16982	33560
number of data packets	4096	4096	4096	4096	4096	7019	11422	19918	36600
total path length of all data packets	17376	17376	17376	17376	17376	30469	49274	85123	155717
average recursion depth	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

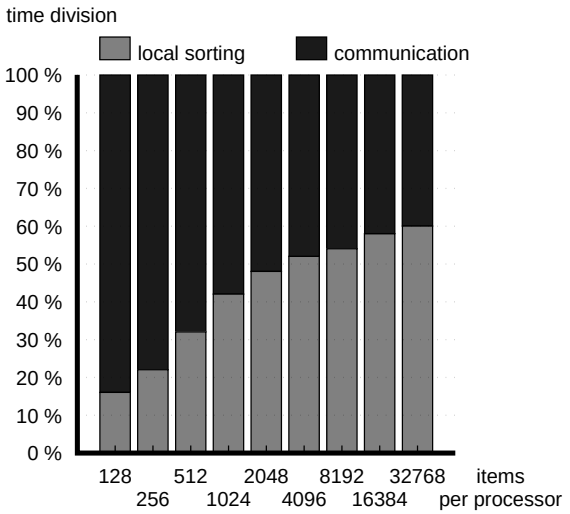
Data Sheet 69

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	3	**processor numbering**	Shuffle numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	no





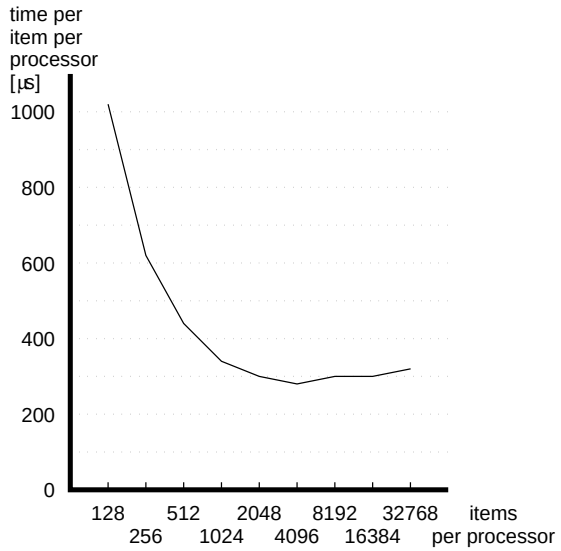


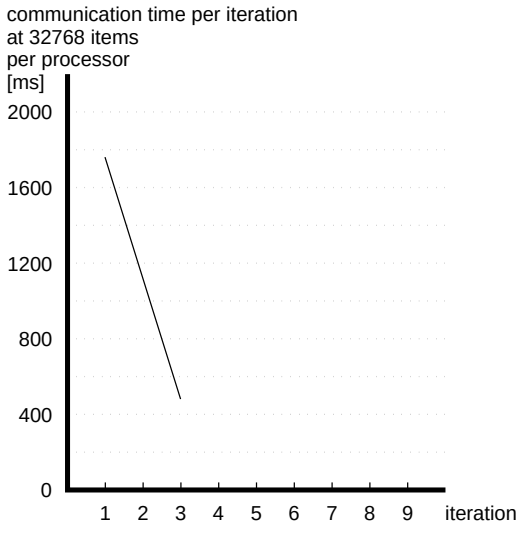


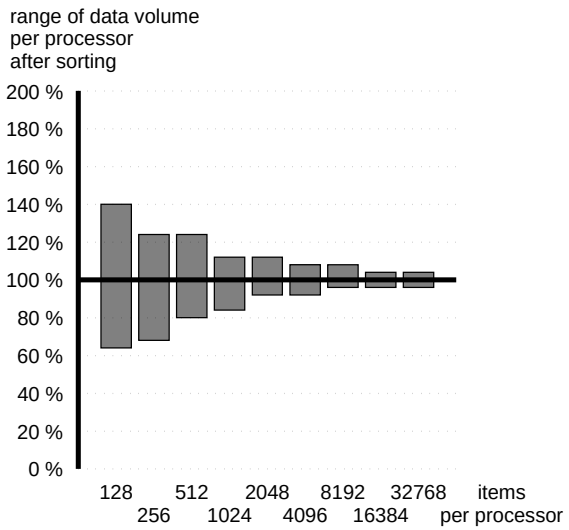
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	781	503	372	302	283	303	307	308	321
total time [s]	0.10	0.13	0.19	0.31	0.58	1.24	2.53	5.06	10.54
time for communication [ms]	100	110	141	200	318	658	1250	2274	4555
time for local sorting [ms]	19	30	69	140	317	670	1526	3181	6904
minimum number of items	81	181	388	913	1884	3818	7780	15866	31959
maximal number of items	190	330	603	1188	2248	4394	8711	16982	33560
number of data packets	4096	4096	4096	4096	4096	7019	11421	19919	36600
total path length of all data packets	15360	15360	15360	15360	15360	26790	43506	75266	137601
average recursion depth	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

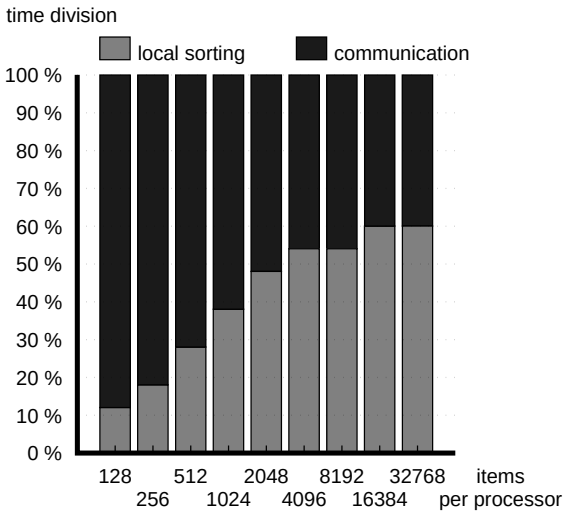
Data Sheet 70

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	7	**processor numbering**	Shuffle numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	no





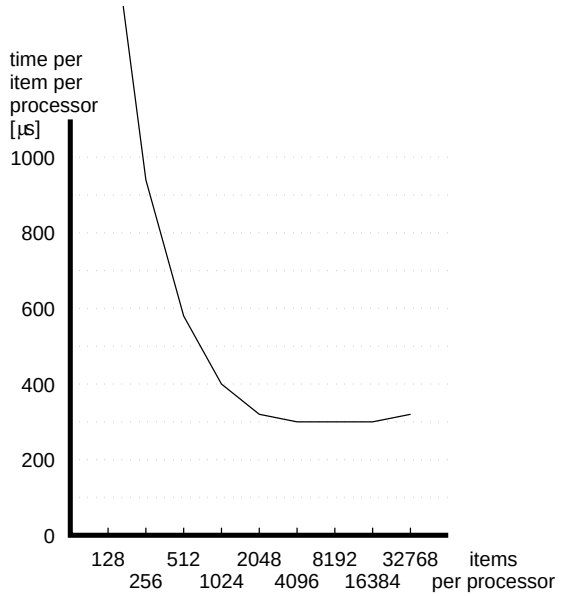


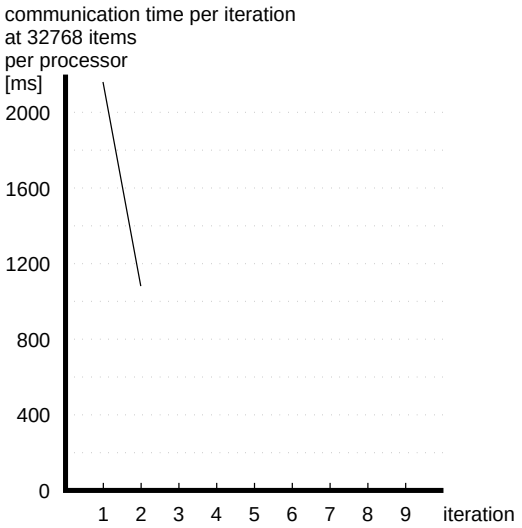


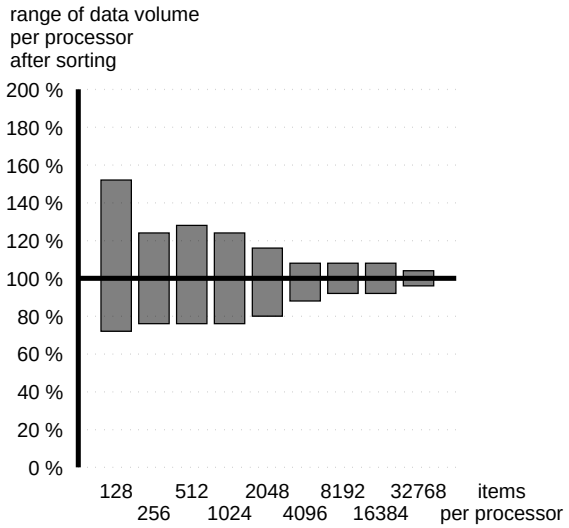
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1022	620	431	332	300	284	307	303	315
total time [s]	0.13	0.16	0.22	0.34	0.62	1.17	2.53	4.99	10.35
time for communication [ms]	130	140	177	230	356	582	1250	2207	4414
time for local sorting [ms]	19	30	69	140	319	670	1522	3181	6902
minimum number of items	83	179	407	863	1848	3843	7801	15788	32010
maximal number of items	178	319	629	1155	2262	4422	8688	16941	33477
number of data packets	5120	5120	5120	5120	5120	5816	9875	16445	29114
total path length of all data packets	26624	26624	26624	26624	26624	27328	47330	77489	134747
average recursion depth	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

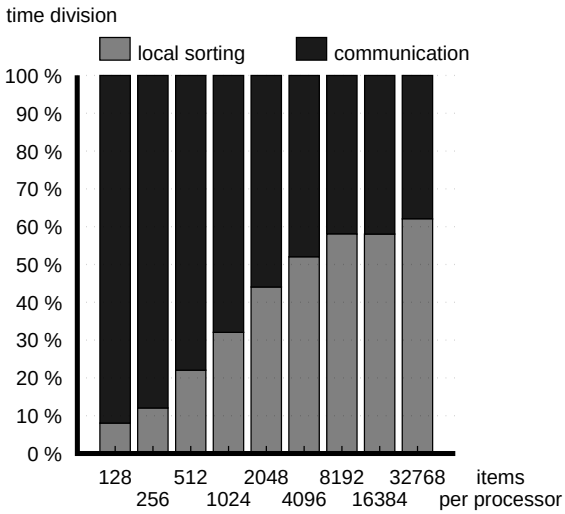
Data Sheet 71

Quicksort	with initial local sorting		
machine	GCel with 256 processors		
number of pivots	15	**processor numbering**	Shuffle numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	no





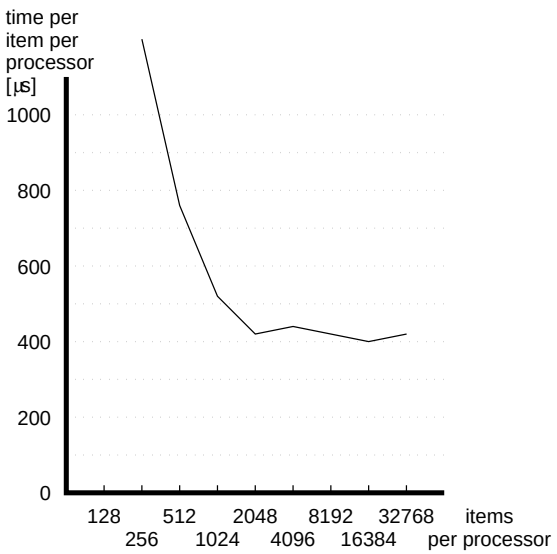


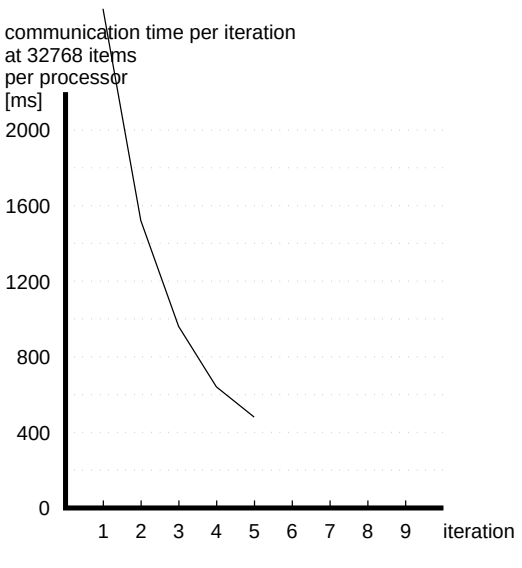


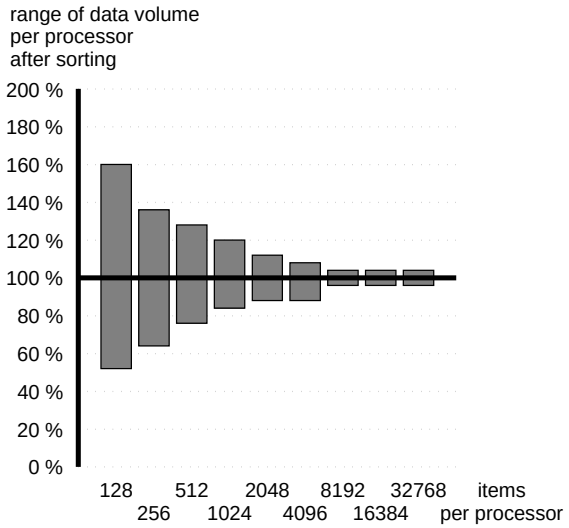
items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	1569	933	583	400	329	293	292	306	313
total time [s]	0.20	0.24	0.30	0.41	0.67	1.21	2.40	5.03	10.28
time for communication [ms]	200	219	250	295	411	620	1125	2244	4341
time for local sorting [ms]	19	30	69	142	319	670	1526	3181	6902
minimum number of items	92	190	386	774	1637	3616	7473	15284	31667
maximal number of items	193	314	658	1259	2404	4503	8893	17407	34381
number of data packets	8192	8192	8192	8192	8192	8192	8192	14034	22888
total path length of all data packets	51200	51200	51200	51200	51200	51200	51200	89284	144688
average recursion depth	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

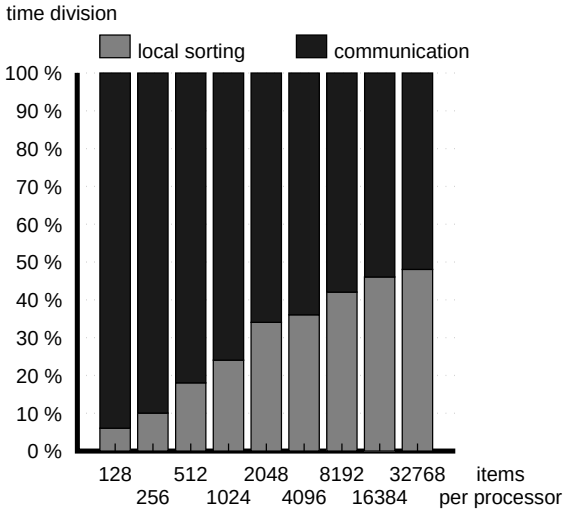
Data Sheet 72

Quicksort	with initial local sorting		
machine	GCel with 1024 processors		
number of pivots	3	**processor numbering**	Shuffle numbering
pivot selection	multi-median of pivot candidates		
reduced communication	yes	**exact partioning**	yes
exact partner processors	yes	**data exchange inversion**	no









items per processor	128	256	512	1024	2048	4096	8192	16384	32768
time per item per processor [μs]	2093	1210	759	527	427	445	421	402	412
total time [s]	0.27	0.31	0.39	0.54	0.88	1.83	3.45	6.60	13.53
time for communication [ms]	269	290	340	422	616	1247	2182	3819	7595
time for local sorting [ms]	19	30	75	140	323	703	1526	3223	7123
minimum number of items	66	165	392	878	1803	3644	7742	15581	31892
maximal number of items	204	346	636	1221	2279	4457	8657	17036	33889
number of data packets	20480	20480	20480	20480	20480	34894	56920	99435	182799
total path length of all data packets	126976	126976	126976	126976	126976	221504	359614	622514	1137188
average recursion depth	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00