Dataset	Size (GB)	Num of attribute	Measure	Type
Network payload - uniform - 5GB	5	6	SUM	Synthetic
Network payload - uniform - 10GB	10	6	SUM	Synthetic
Network payload - uniform - 20GB	20	6	SUM	Synthetic
Network payload - uniform - 40GB	40	6	SUM	Synthetic
Network payload - skew - 20GB	20	6	SUM	Synthetic
ISH 44GB	44	6	SUM	Real

RUN TIME AVG (in second)

Dataset (GB)	Naive	HII	MRCUBE
5GB	2303	1497	1131
10GB	3240	2250	2103
20GB	6294	4160	4689
Skew 20GB	6040	4130	4225
40GB	11487	8183	9292

RUN TIME STD (in second)

Dataset	Naive	HII	MRCube
5GB	28	25	128
10GB	51	35	42
20GB	145	70	70
40GB	70	56	90
Skew 20GB	21	51	42
ISH 44GB	85	122	7941

NUMBER OF BATCH

Dataset (GB)	MRCUBE	HII	Naive
5GB	10	36	64
10GB	17	36	64
20GB	22	36	64
Skew 20GB	26	36	64
40GB	23	36	64

RUN TIME - NAIVE

Dataset	1st	2nd	3rd	AVG	STDDEV
5GB	2325	2315	2271	2303	28
10GB	3262	3182	3277	3240	51
20GB	6189	6460	6232	6294	145
40GB	11535	11405	11519	11487	70
Skew 20GB	6023	6064	6033	6040	21
ISH 44GB	11113	11016	10943	11024	85

RUN TIME - HII

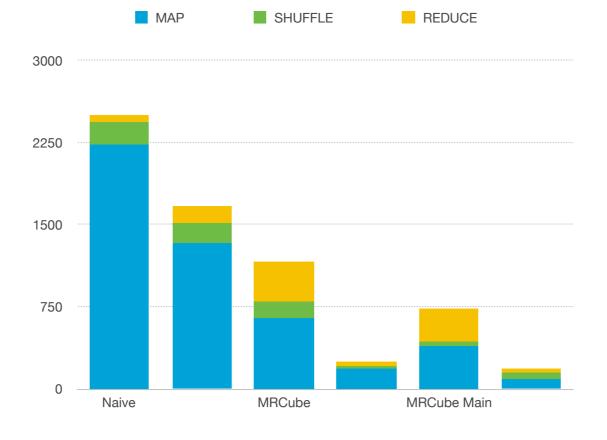| Dataset	1st	2nd	3rd	AVG	STDDEV
5GB	1527	1480	1486	1497	25
10GB	2285	2252	2214	2250	35
20GB	4241	4116	4122	4160	70
40GB	8218	8212	8118	8183	56
Skew 20GB	4104	4189	4096	4130	51
ISH 44GB	7479	7639	7399	7506	122

RUN TIME - MRCUBE

Dataset	1st	2nd	3rd	AVG	STDDEV
5GB	1036	1277	1080	1131	128
10GB	2093	2150	2068	2103	42
20GB	4666	4711	4690	4689	22
40GB	9233	9396	9245	9292	90
Skew 20GB	4241	4256	4176	4225	42
ISH 44GB	e	13647	13861	9170	7941

PHASE RUN TIME - 5GB (in second) - AVERAGE

Phase	Naive	HII	MRCube	MRCube Est	MRCube Main	MRCube-Final
MAP	2237	1334	651	178	392	81
SHUFFLE	205	175	138	27	41	70
REDUCE	63	159	370	38	294	38

Phase	
Estimate	0.21
Main	0.63
Fianl	0.16

PHASE RUN TIME - 5GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	2259	2248	2205	1338	1323	1341	662	607	684
SHUFFLE	270	196	149	157	168	201	82	136	198
REDUCE	63	64	62	185	153	141	363	359	388

PHASE RUN TIME -10GB (in second) - AVERAGE

Phase	Naive	HII	MRCube	MRCube Main	MRCube Main	MRCube-Final
MAP	3133	1828	1467	259	950	258
SHUFFLE	167	275	227	47	118	62
REDUCE	104	408	625	65	480	80

Phase	
Estimate	0.16
Main	0.67
Fianl	0.17

PHASE RUN TIME - 10 GB (in second)

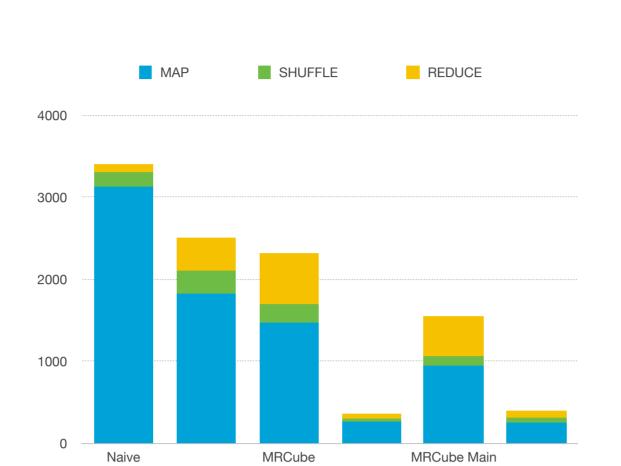| Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	3155	3075	3169	1825	1771	1890	1494	1485	1424
SHUFFLE	177	144	180	286	284	255	238	223	221
REDUCE	104	104	105	452	452	320	589	654	633

PHASE RUN TIME - 20GB (in second) - AVERAGE

Phase	Naive	HII	MRCube	MRCube Est	MRCube Main	MRCube-Final
MAP	6080	3515	3531	447	2480	604
SHUFFLE	1106	688	715	89	456	170
REDUCE	210	636	1130	124	914	92

Phase	
Estimate	0.12
Main	0.72
Fianl	0.16

PHASE RUN TIME - 20GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	5992	6248	6000	3597	3473	3477	3571	3528	3494
SHUFFLE	1004	1280	1035	748	643	674	712	756	678
REDUCE	193	208	229	634	639	635	1085	1125	1180

PHASE RUN TIME - 40GB (in second) - AVERAGE

Phase	Naive	HII	MRCube	MRCube Est	MRCube Main	MRCube-Final
MAP	11019	6616	6706	877	4567	1262
SHUFFLE	1804	1472	1573	267	937	369
REDUCE	464	1568	2543	294	2150	99

Phase	
Estimate	0.13
Main	0.71
Fianl	0.16

PHASE RUN TIME - 40GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	11066	10941	11050	6654	6628	6567	6719	6743	6658
SHUFFLE	1867	1728	1817	1467	1459	1490	1569	1602	1550
REDUCE	465	461	466	1561	1579	1564	2500	2640	2491

PHASE RUN TIME - Skew 20GB (in second) - AVERAGE

Phase	Naive	HII	MRCube	MRCube Est	MRCube Main	MRCube-Final
MAP	5897	3419	3475	430	2459	586
SHUFFLE	787	596	830	590	80	160
REDUCE	140	698	1046	129	713	204

Phase	
Estimate	0.21
Main	0.61
Fianl	0.18

PHASE RUN TIME - Skew 20GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	5879	5921	5891	3406	3478	3374	3387	3528	3512
SHUFFLE	779	781	801	598	590	602	1027	756	707
REDUCE	141	140	139	674	701	719	859	1125	1154

PHASE RUN TIME - ISH 44GB (in second) - AVERAGE

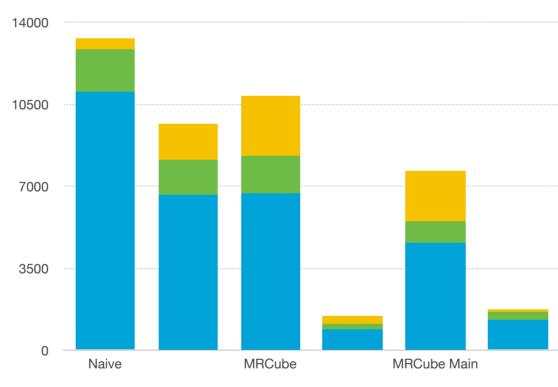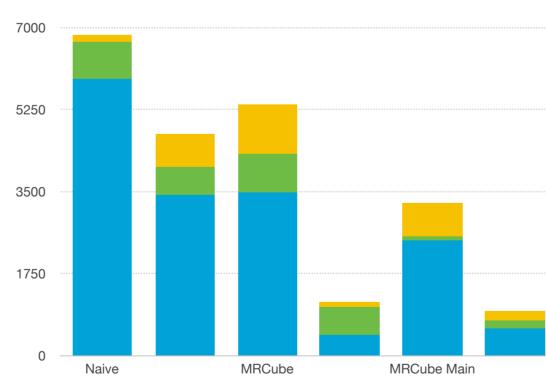| Phase	Naive	HII	MRCube	MRCube Est	MRCube Main	MRCube-Final
MAP	10968	7072	13251	792	12063	396
SHUFFLE	2563	1606	3071	179	2646	246
REDUCE	62	430	636	71	539	26

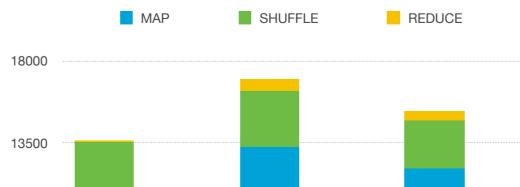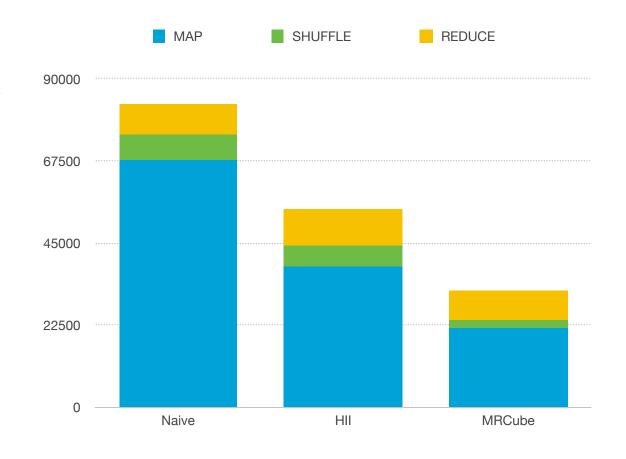## PHASE RUN TIME - ISH 44GB (in second)

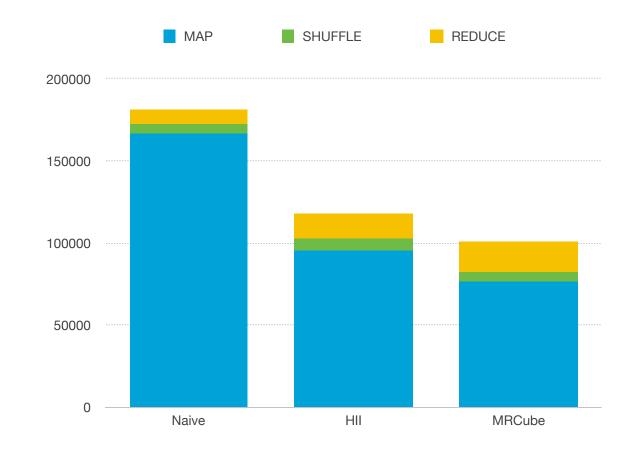| Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	11041	10944	10890	7043	7195	6980	13501	13020	13234
SHUFFLE	2672	2687	2332	1706	1585	1529	3430	2847	2937
REDUCE	69	68	50	434	440	416	676	617	617

TOTAL AMOUNT OF WORK - 5GB (in second) - AVERAGE

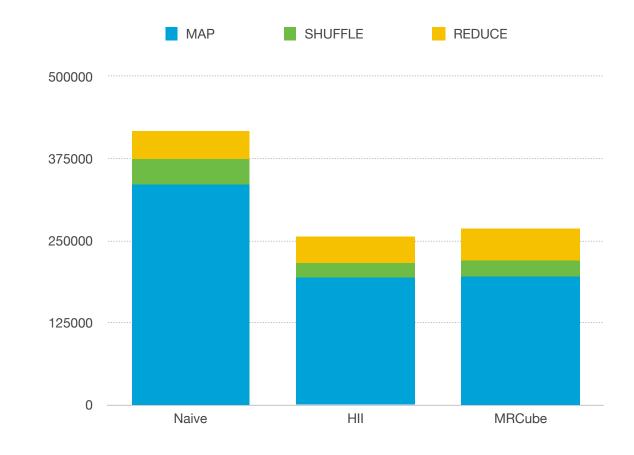| Phase	Naive	HII	MRCube
MAP	67598	38557	21458
SHUFFLE	6931	5871	2381
REDUCE	8586	9693	7843

TOTAL AMOUNT OF WORK- 5GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	68893	66995	66908	38831	38584	38256	21550	21241	21584
SHUFFLE	9142	6631	5022	5215	5618	6781	2545	1994	2604
REDUCE	10801	8291	6667	9054	9454	10573	7955	7523	8051

TOTAL AMOUNT OF WORK -10GB (in second) - AVERAGE

Phase	Naive	HII	MRCube
MAP	166961	95469	76394
SHUFFLE	5650	7244	6086
REDUCE	8556	15151	18278

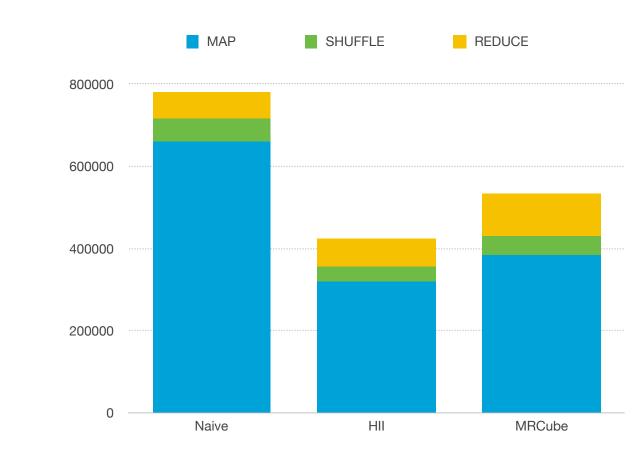### TOTAL AMOUNT OF WORK - 10 GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	167626	165798	167459	95644	94704	96059	76823	76504	75855
SHUFFLE	5985	4865	6100	7127	7040	7565	6463	6438	5357
REDUCE	8888	7759	9022	15185	15052	15217	18866	18572	17396

TOTAL AMOUNT OF WORK - 20GB (in second) - AVERAGE

Phase	Naive	HII	MRCube
MAP	335647	192461	196242
SHUFFLE	37590	23353	22697
REDUCE	43275	40113	49910

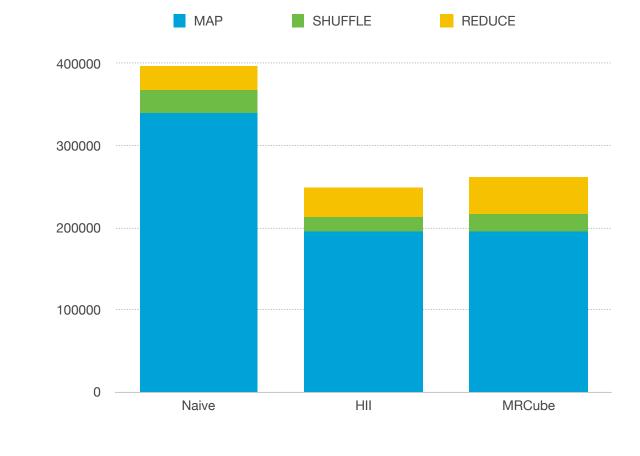### PHASE RUN TIME - 20GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	335964	336863	334115	193244	191995	192145	196838	197045	194843
SHUFFLE	34128	43493	35149	25378	21808	22874	23135	22767	22189
REDUCE	39726	49098	41002	42025	38704	39610	50028	50371	49332

TOTAL AMOUNT OF WORK - 40GB (in second) - AVERAGE

Phase	Naive	HII	MRCube
MAP	660478	319185	383426
SHUFFLE	53505	35458	46825
REDUCE	65063	67925	104780

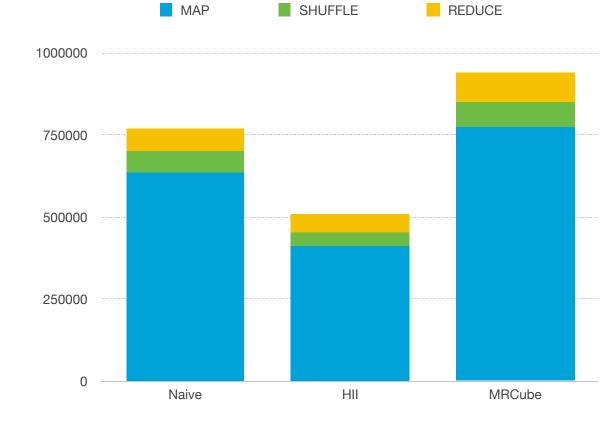### PHASE RUN TIME - 40GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	662061	659163	660211	381818	383593	192145	381614	383799	384867
SHUFFLE	54880	50690	54946	42307	41195	22874	46478	47019	46978
REDUCE	66502	62227	66461	82216	81951	39610	103014	105661	105666

TOTAL AMOUNT OF WORK - 20GB Skew (in second) - AVERAGE

Phase	Naive	HII	MRCube
MAP	340240	194905	195200
SHUFFLE	26727	18893	20962
REDUCE	30171	35392	45896

PHASE RUN TIME - 20GB Skew (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	339904	341293	340035	194346	196410	193961	193712	197045	194843
SHUFFLE	26449	26513	27221	19503	19978	17199	17930	22767	22189
REDUCE	29898	29955	30662	35983	36609	33586	37986	50371	49332

TOTAL AMOUNT OF WORK - ISH 40GB (in second) - AVERAGE

Phase	Naive	HII	MRCube
MAP	634978	410037	772986
SHUFFLE	66103	43431	77904
REDUCE	67587	53592	86924

PHASE RUN TIME - ISH 44GB (in second)

Phase	1st Naive	2nd Naive	3rd Naive	1st HII	2nd HII	3rd HII	1st MRCube	2nd MRCube	3rd MRCube
MAP	632437	631881	640617	409264	411565	409283	771939	774558	772461
SHUFFLE	69163	67911	61236	42362	46631	41301	85438	69479	78797
REDUCE	70725	69474	62562	52552	56873	51351	94930	78318	87526