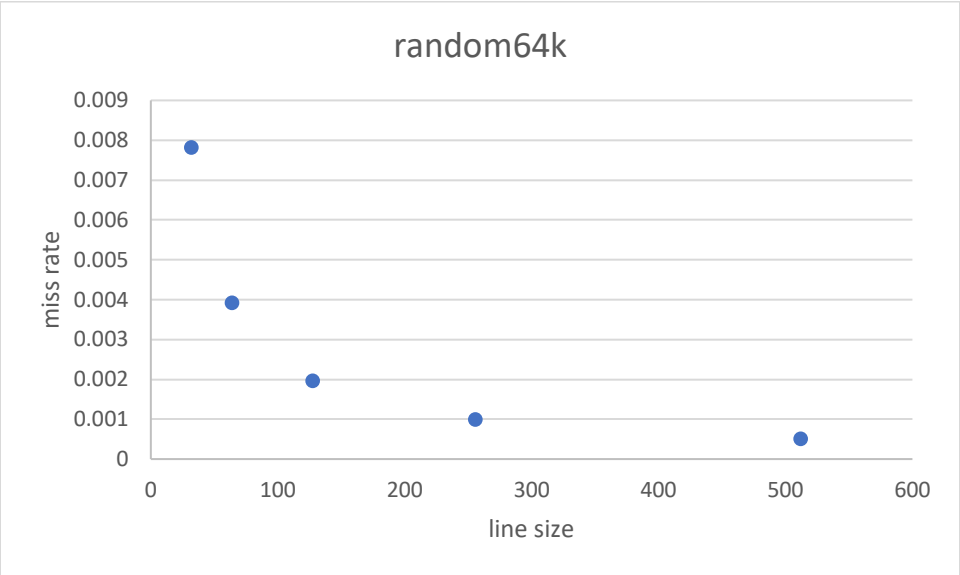
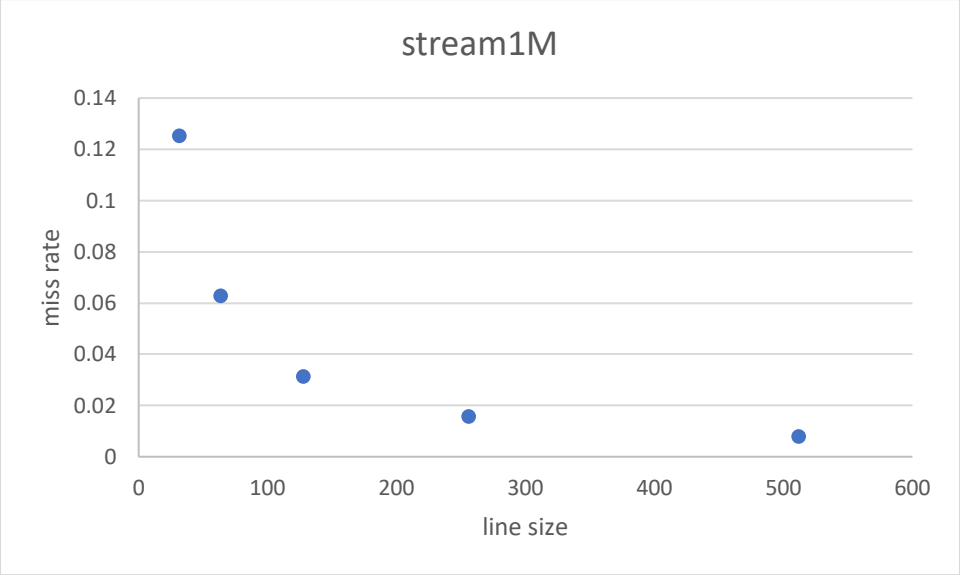
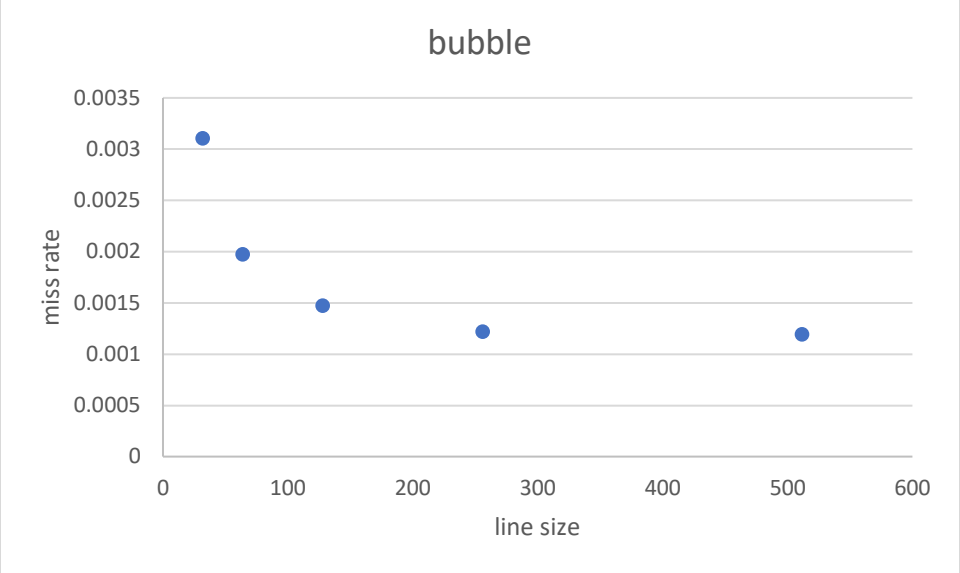
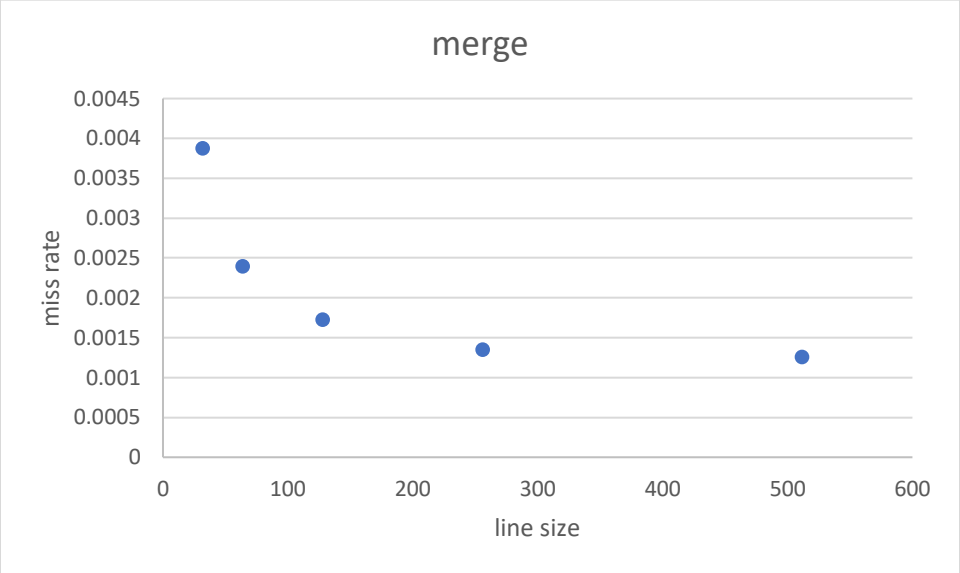
1. Data structure: a struct containing the following elements: a addr_t array of length 128 to store tags, a Boolean array of length 128 to store valid bit, a Boolean array of length 128 to store dirty bit, and a int array of length 128 to store the lru_counter. Length chosen to be 128 for different set associativity requirements.

2. Plot of miss rate vs. line size for each trace (32, 64, 128, 256, 512)






bubble
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
miss rate
0
100
200
300
400
500
600
line size


merge
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
miss rate
0
100
200
300
400
500
600
line size

3. After comparing output of multiple trace files. It is determined that lowest miss rate is achieved with maximum associativity and maximum line size. In other words, line size = 512, associativity = 8.

	overall miss rate	write miss rate	read miss rate	writeback traffic	memory access	bytes refered	main memory
random64k	0.00048828	N/A	0.00048828	0	65536	134217728	134152192
bubble	0.00104803	0.0009415	0.00106036	812544	3392512	3237039616	3233647104
merge	0.00113461	0.000905	0.00117438	1189888	4460544	3931356160	3926895616
stream1M	0.0078125	N/A	0.0078125	0	1048576	134217728	133169152

	line size	accesses	hits	misses	miss rate	wb	write misses	writes	read misses	reads	write miss rate	read miss rate	wb traffic
random	32	262144	260096	2048	0.0078125	0	0	0	2048	262144	#DIV/0!	0.0078125	0
	64	262144	261120	1024	0.0039063	0	0	0	1024	262144	#DIV/0!	0.00390625	0
	128	262144	261632	512	0.0019531	0	0	0	512	262144	#DIV/0!	0.00195313	0
	256	262144	261888	256	0.0009766	0	0	0	256	262144	#DIV/0!	0.00097656	0
	512	262144	262016	128	0.0004883	0	0	0	128	262144	#DIV/0!	0.00048828	0
	overall	1310720	1306752	3968	0.0030273	0	0	0	3968	1310720	#DIV/0!	0.00302734	
bubble	32	6322343	6302726	19617	0.0031028	6545	6140	656333	13477	5666010	0.009355007	0.00237857	209440
	64	6322343	6309889	12454	0.0019698	3935	3235	656333	9219	5666010	0.0049289	0.00162707	251840
	128	6322343	6313038	9305	0.0014718	2609	1755	656333	7550	5666010	0.002673948	0.00133251	333952
	256	6322343	6314653	7690	0.0012163	1955	1018	656333	6672	5666010	0.001551042	0.00117755	500480
	512	6322343	6314802	7541	0.0011928	1705	628	656333	6913	5666010	0.000956831	0.00122008	872960
	overall	31611715	31555108	56607	0.0017907	16749	12776	3281665	43831	28330050	0.003893146	0.00154716	
merge	32	7678430	7648727	29703	0.0038684	12571	10538	1133678	19165	6544752	0.009295408	0.0029283	402272
	64	7678430	7660054	18376	0.0023932	7285	5529	1133678	12847	6544752	0.004877046	0.00196295	466240
	128	7678430	7665234	13196	0.0017186	4576	2998	1133678	10198	6544752	0.00264449	0.0015582	585728
	256	7678430	7668099	10331	0.0013455	3122	1718	1133678	8613	6544752	0.001515421	0.00131602	799232
	512	7678430	7668811	9619	0.0012527	2489	1050	1133678	8569	6544752	0.000926189	0.00130929	1274368
	overall	38392150	38310925	81225	0.0021157	30043	21833	5668390	59392	32723760	0.003851711	0.00181495	
stream	32	262144	229376	32768	0.125	0	0	0	32768	262144	#DIV/0!	0.125	0
	64	262144	245760	16384	0.0625	0	0	0	16384	262144	#DIV/0!	0.0625	0
	128	262144	253952	8192	0.03125	0	0	0	8192	262144	#DIV/0!	0.03125	0
	256	262144	258048	4096	0.015625	0	0	0	4096	262144	#DIV/0!	0.015625	0
	512	262144	260096	2048	0.0078125	0	0	0	2048	262144	#DIV/0!	0.0078125	0
	overall	1310720	1247232	63488	0.0484375	0	0	0	63488	1310720	#DIV/0!	0.0484375	