app	iters
arithmetic	1.00
license	50000000.00
opchain	500000000.00
lottery	100000.00

sut	ETIME
arithmetic	23.11
license	15.58
opchain	12.94
lottery	17.97

Table 1: ETIME for original application

dist	vars	xor_etime	merge_vars_etime	rnc_etime	xor_enc	merge_vars_enc	rnc_enc	xor_dec	merge_vars_dec	rnc_dec	xor_op	merge_vars_op	rnc_op
0	1	23.49	23.97	23.96	100	100	75	125	125	125	225	225	200
1	5	24.00	23.06	26.12	325	325	113	387	387	275	712	712	388
2	10	22.35	23.22	30.60	413	413	163	775	775	625	1188	1188	788
3	11	23.71	22.90	32.11	413	413	163	825	825	675	1238	1238	838

Table 2: arithmetic

vars	merge_vars_mem	rnc_mem	xor_mem
1	566.00	598.00	562.00
5	566.00	658.00	562.00
10	582.00	742.00	562.00
11	574.00	770.00	562.00

Table 3: arithmetic

dist	vars	xor_etime	merge_vars_etime	rnc_etime	xor_enc	merge_vars_enc	rnc_enc	xor_dec	merge_vars_dec	rnc_dec	xor_op	merge_vars_op	rnc_op
0	1	15.66	15.69	16.51	50	50	100	50	50	50	100	100	150
1	3	15.62	16.02	17.80	300	300	400	250	250	50	550	550	450
2	10	16.25	17.16	24.75	650	650	250	950	950	400	1600	1600	650

Table 4: license

vars	merge_vars_mem	rnc_mem	xor_mem
1	204.00	236.00	200.00
3	204.00	268.00	200.00
10	200.00	352.00	200.00

Table 5: license

dist	vars	xor_etime	merge_vars_etime	rnc_etime	xor_enc	merge_vars_enc	rnc_enc	xor_dec	merge_vars_dec	rnc_dec	xor_op	merge_vars_op	rnc_op
0	1	17.96	17.97	17.95	105	105	105	315	315	315	420	420	420
1	2	17.97	17.94	17.94	210	210	210	525	525	630	735	735	840
2	3	17.95	17.95	17.94	330	330	210	840	840	945	1170	1170	1155
3	4	17.94	17.95	17.95	1066	1066	210	3701	3701	3100	4767	4767	3310

Table 6: lottery

vars	merge_vars_mem	rnc_mem	xor_mem
1	435.00	467.00	431.00
2	431.00	479.00	431.00
3	435.00	491.00	431.00
4	431.00	507.00	431.00

Table 7: lottery

dist	vars	xor_etime	merge_vars_etime	rnc_etime	xor_enc	merge_vars_enc	rnc_enc	xor_dec	merge_vars_dec	rnc_dec	xor_op	merge_vars_op	rnc_op
0	1	13.08	13.50	20.58	500	500	1000	0	0	0	500	500	1000
1	3	14.15	15.68	50.70	2500	2500	5500	1000	1000	1000	3500	3500	6500
2	10	15.83	20.05	121.31	6500	6500	12500	10000	10000	5000	16500	16500	17500
3	16	19.20	26.85	186.09	10000	10000	8500	25500	25500	13500	35500	35500	22000
4	19	19.32	28.37	182.83	11500	11500	8000	27500	27500	13500	39000	39000	21500
5	20	19.29	28.64	182.47	12000	12000	7500	28500	28500	13500	40500	40500	21000

Table 8: opchain

vars	merge_vars_mem	rnc_mem	xor_mem
1	120.00	152.00	116.00
3	120.00	176.00	116.00
10	116.00	260.00	116.00
16	116.00	332.00	116.00
19	120.00	368.00	116.00
20	116.00	380.00	116.00

Table 9: opchain

apps	xor_ess	xor_pvs	xor_yst	merge_vars_ess	merge_vars_pvs	merge_vars_yst	rnc_ess	rnc_pvs	rnc_yst
arithmetic	-0.37	0.632	-0.06	-0.82	0.182	-0.08	0.99	0.010	0.81
license	0.96	0.177	0.07	1.00	0.002	0.16	1.00	0.043	0.94
lottery	-0.77	0.226	-0.01	-0.39	0.610	-0.00	-0.01	0.987	-0.00
opchain	0.98	0.000	0.34	0.99	0.000	0.82	0.98	0.001	8.79

Table 10: correlation between NOBFS and etime

apps	xor_ess	xor_pvs	xor_yst	merge_vars_ess	merge_vars_pvs	merge_vars_yst	rnc_ess	rnc_pvs	rnc_yst
arithmetic	1.00	0.001	71.48	1.00	0.001	71.48	0.99	0.008	57.15
license	1.00	0.000	100.00	1.00	0.000	100.00	0.98	0.136	41.79
lottery	0.85	0.147	1047.18	0.85	0.147	1047.18	0.89	0.113	867.00
opchain	0.99	0.000	1618.44	0.99	0.000	1618.44	0.98	0.001	781.86

Table 11: correlation between NOBFS and dec

apps	xor_ess	xor_pvs	xor_yst	merge_vars_ess	merge_vars_pvs	merge_vars_yst	rnc_ess	rnc_pvs	rnc_yst
arithmetic	0.95	0.052	30.12	0.95	0.052	30.12	1.00	0.004	9.12
license	0.98	0.137	62.31	0.98	0.137	62.31	0.21	0.864	6.72
lottery	0.89	0.109	300.33	0.89	0.109	300.33	0.78	0.225	31.53
opchain	1.00	0.000	590.70	1.00	0.000	590.70	0.56	0.252	257.87

Table 12: correlation between NOBFS and enc

apps	xor_ess	xor_pvs	xor_yst	merge_vars_ess	merge_vars_pvs	merge_vars_yst	rnc_ess	rnc_pvs	rnc_yst
arithmetic	1.00	0.004	101.60	1.00	0.004	101.60	0.99	0.006	66.27
license	1.00	0.053	162.31	1.00	0.053	162.31	0.91	0.271	48.51
lottery	0.86	0.139	1347.51	0.86	0.139	1347.51	0.90	0.100	898.53
opchain	0.99	0.000	2209.15	0.99	0.000	2209.15	0.95	0.004	1039.73

Table 13: correlation between NOBFS and op

apps	xor_ess	xor_pvs	xor_yst	merge_vars_ess	merge_vars_pvs	merge_vars_yst	rnc_ess	rnc_pvs	rnc_yst
arithmetic			-0.00	0.81	0.194	1.33	1.00	0.002	16.90
license			-0.00	-0.98	0.136	-0.48	1.00	0.036	12.66
lottery			-0.00	-0.45	0.553	-0.80	1.00	0.003	13.20
opchain			-0.00	-0.51	0.297	-0.14	1.00	0.000	12.00

Table 14: correlation between NOBFS and mem

sut	dist	orig_de_expr	orig_de_ops	orig_un_expr	orig_un_ops	obfs_de_expr	obfs_de_ops	obfs_un_expr	obfs_un_ops	r
arithmetic	0	0	0	67	15	5	2	79	23	0.08
arithmetic	1	0	0	67	15	15	9	69	16	0.36
arithmetic	2	0	0	67	15	20	12	64	13	0.48
arithmetic	3	0	0	67	15	21	13	63	12	0.52
license	0	0	0	33	21	1	1	48	25	0.04
license	1	0	0	33	21	8	12	41	16	0.43
license	2	0	0	33	21	18	23	31	5	0.82
lottery	0	0	0	30	12	1	0	44	28	0.00
lottery	1	0	0	30	12	2	2	43	26	0.07
lottery	2	0	0	30	12	4	3	41	25	0.11
lottery	3	0	0	30	12	13	7	32	21	0.25
opchain	0	0	0	32	94	1	3	31	91	0.03
opchain	1	0	0	32	94	5	19	27	75	0.20
opchain	2	0	0	32	94	13	45	19	50	0.47
opchain	3	0	0	32	94	20	62	12	35	0.64
opchain	4	0	0	32	94	23	64	9	33	0.66
opchain	5	0	0	32	94	24	64	8	33	0.66

Table 15: operators in enc/dec expression. $r = obfs\_de\_ops/(obfs\_de\_ops + obfs\_un\_ops)$

app	eses	pves
arithmetic	0.93	0.07
license	0.93	0.24
opchain	0.99	0.00
lottery	0.20	0.80

Table 16: correlation between operators ratio and etime (for RNC)

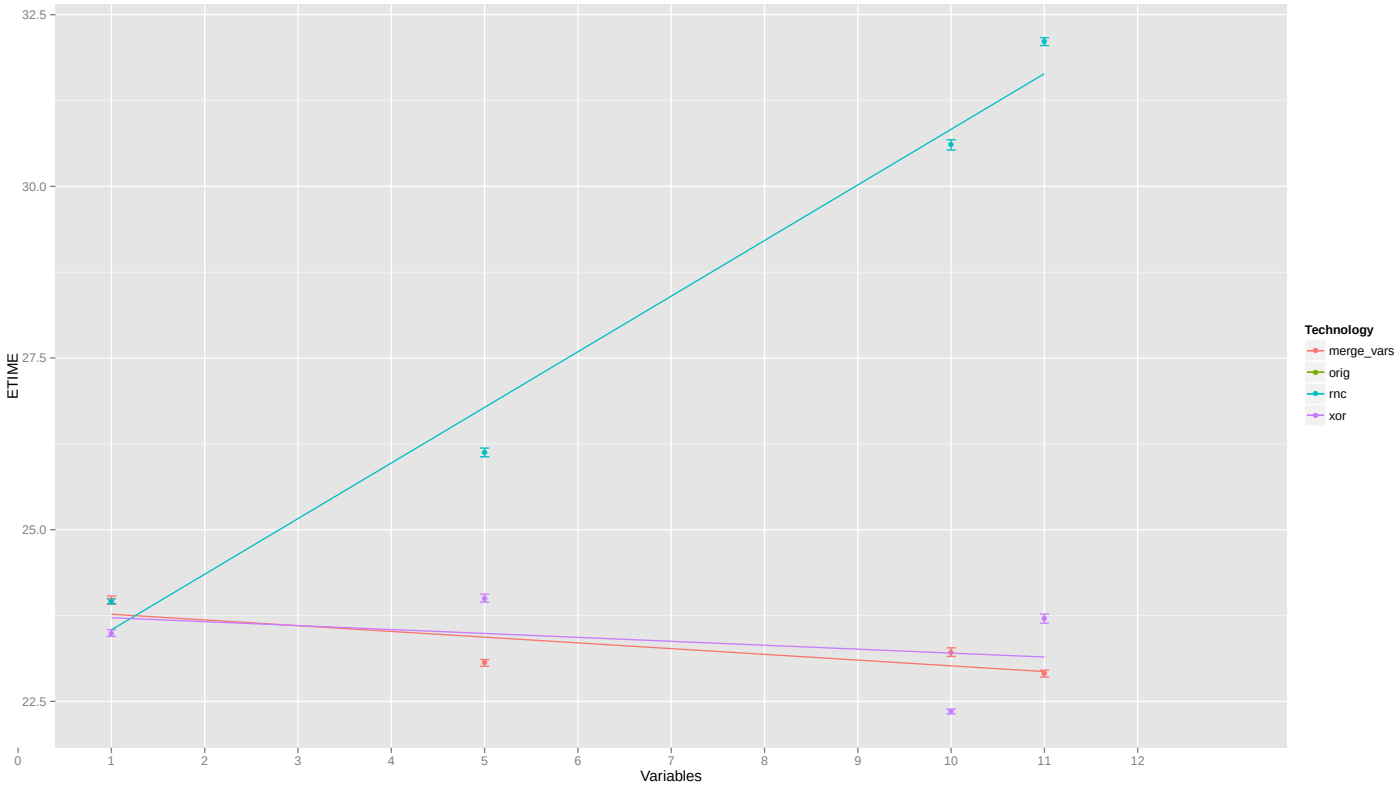

Figure 1: ETIME vs OBFS - arithmetic

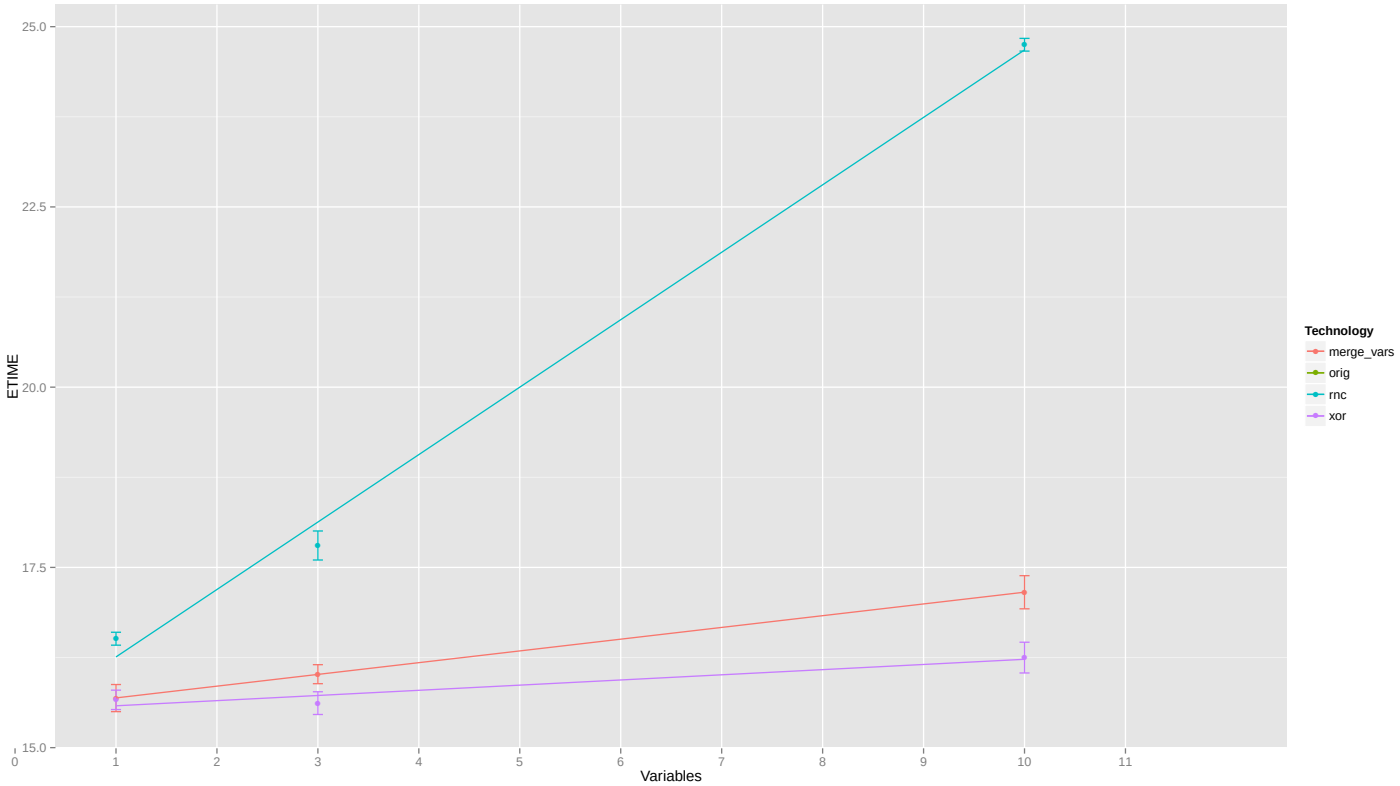

Figure 2: ETIME vs OBFS - license

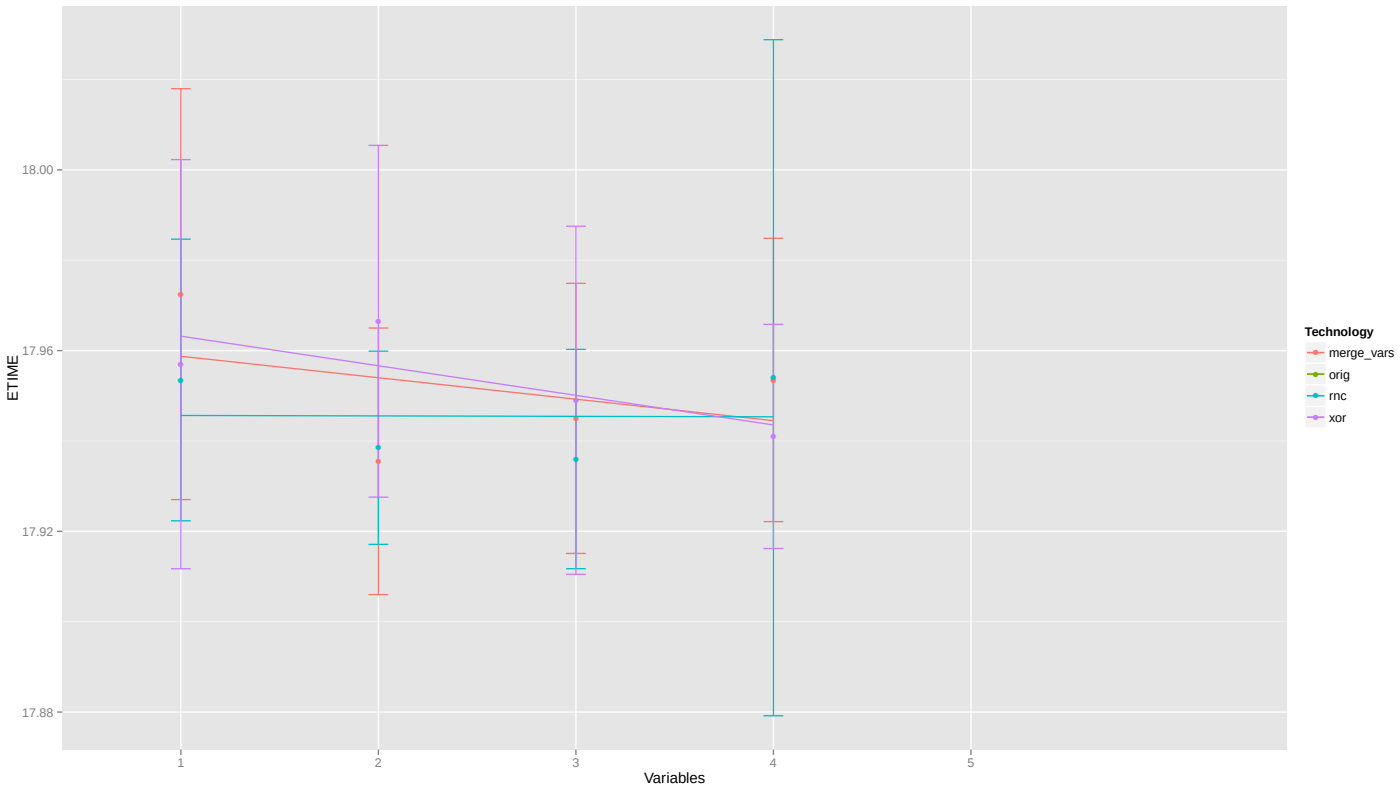

Figure 3: ETIME vs OBFS - lottery

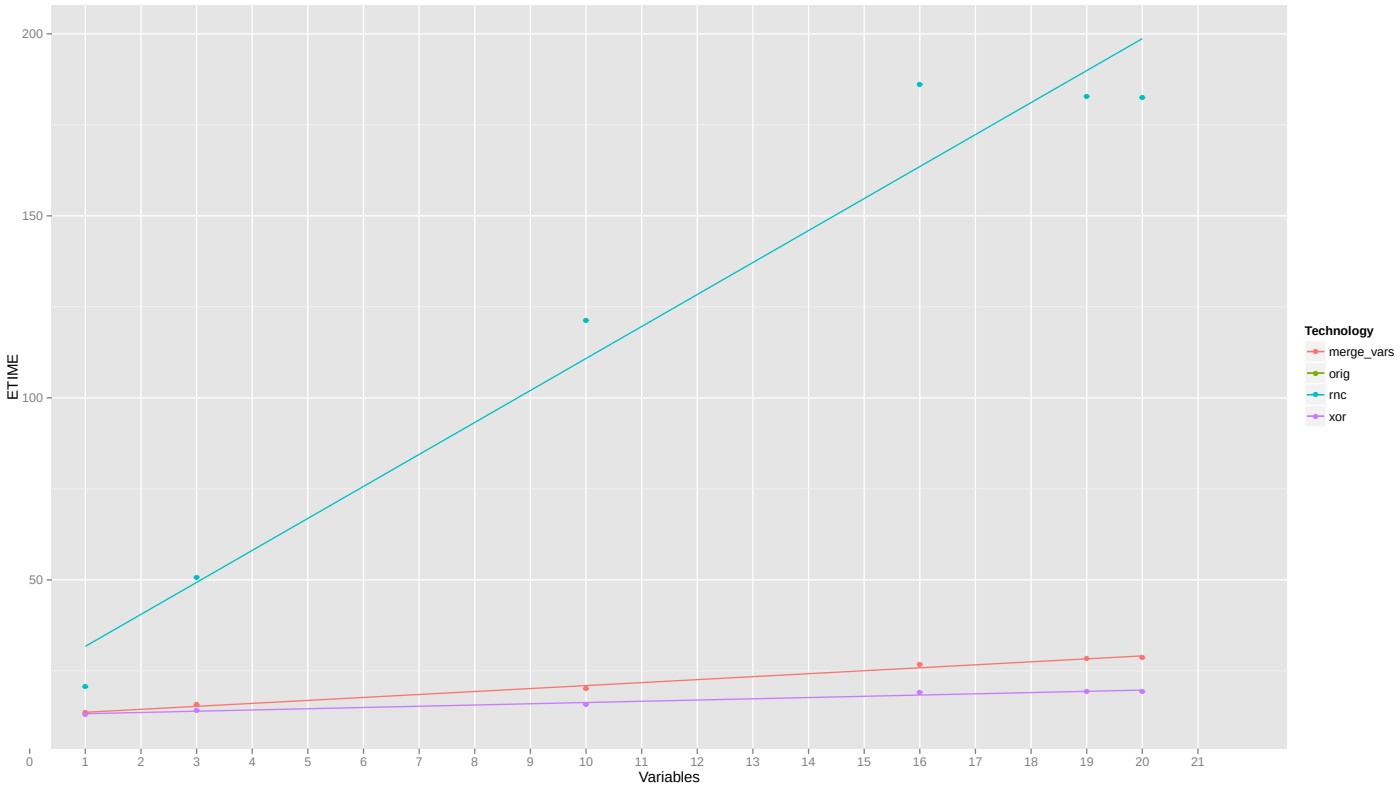

Figure 4: ETIME vs OBFS - opchain

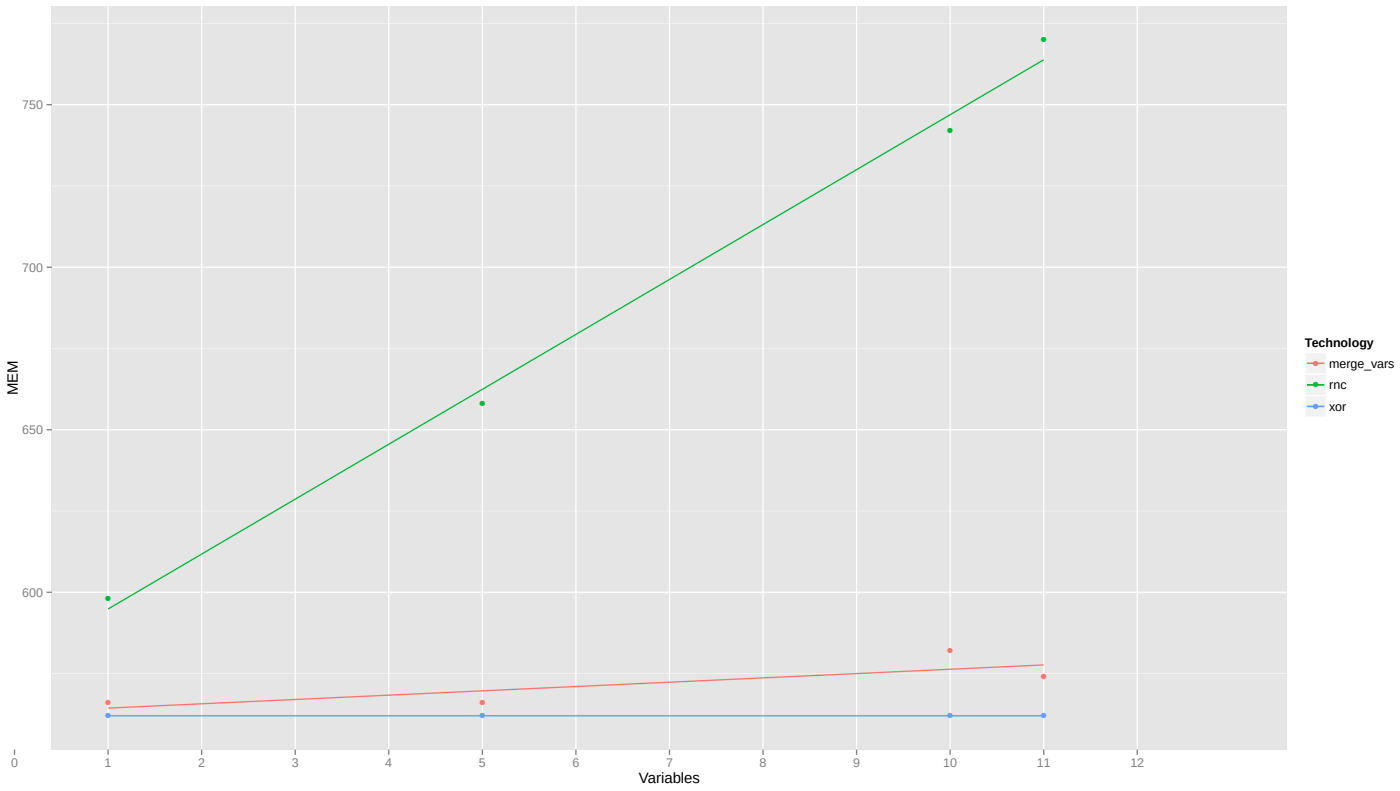

Figure 5: MEM vs OBFS - arithmetic

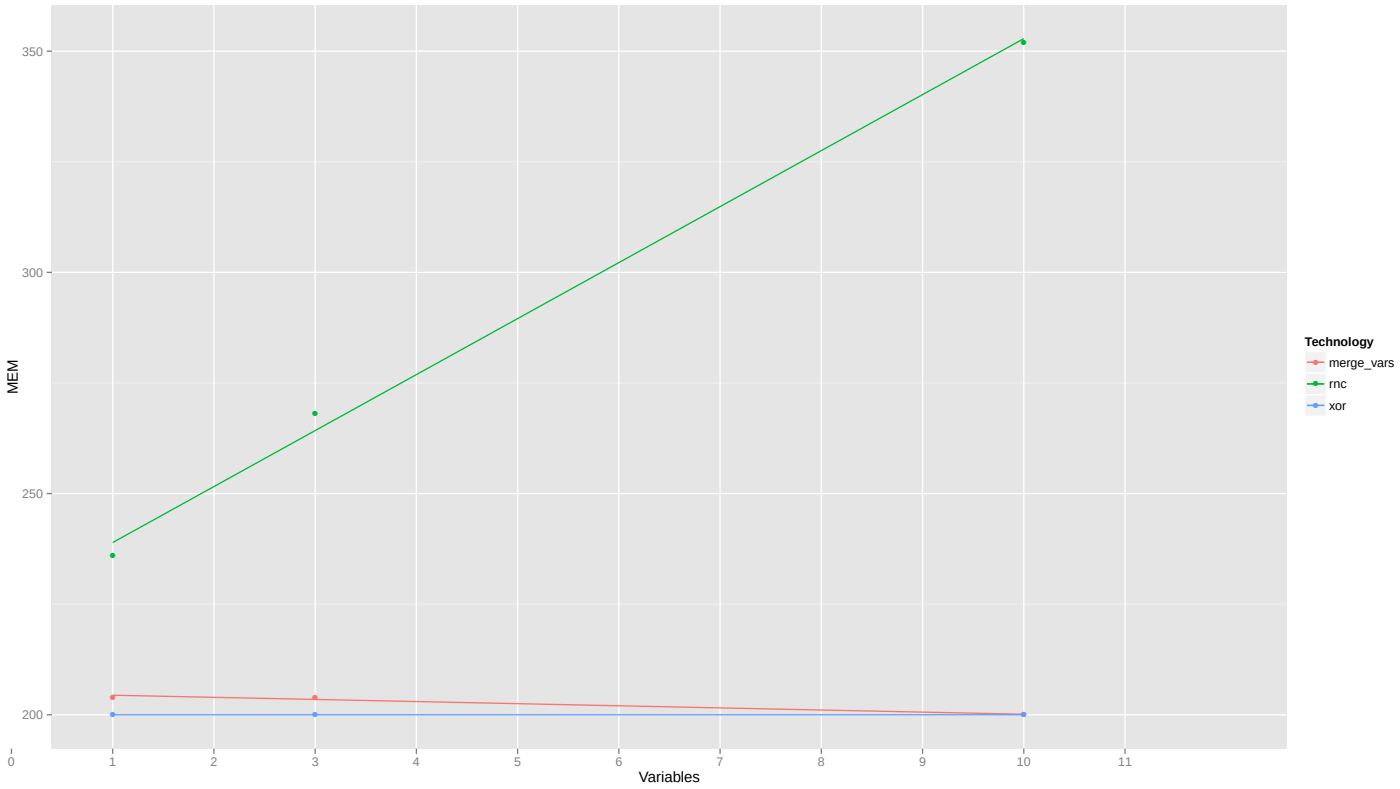

Figure 6: MEM vs OBFS - license

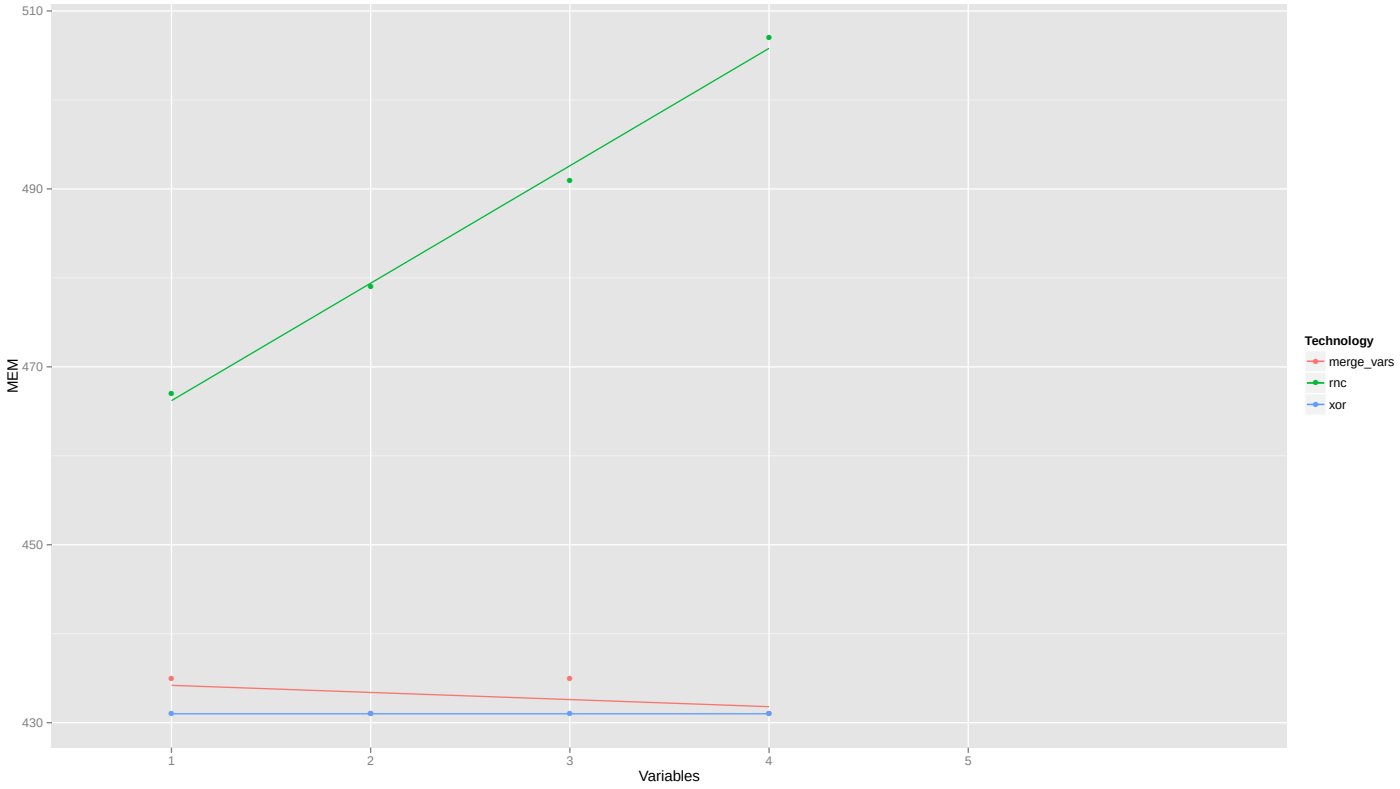

Figure 7: MEM vs OBFS - lottery

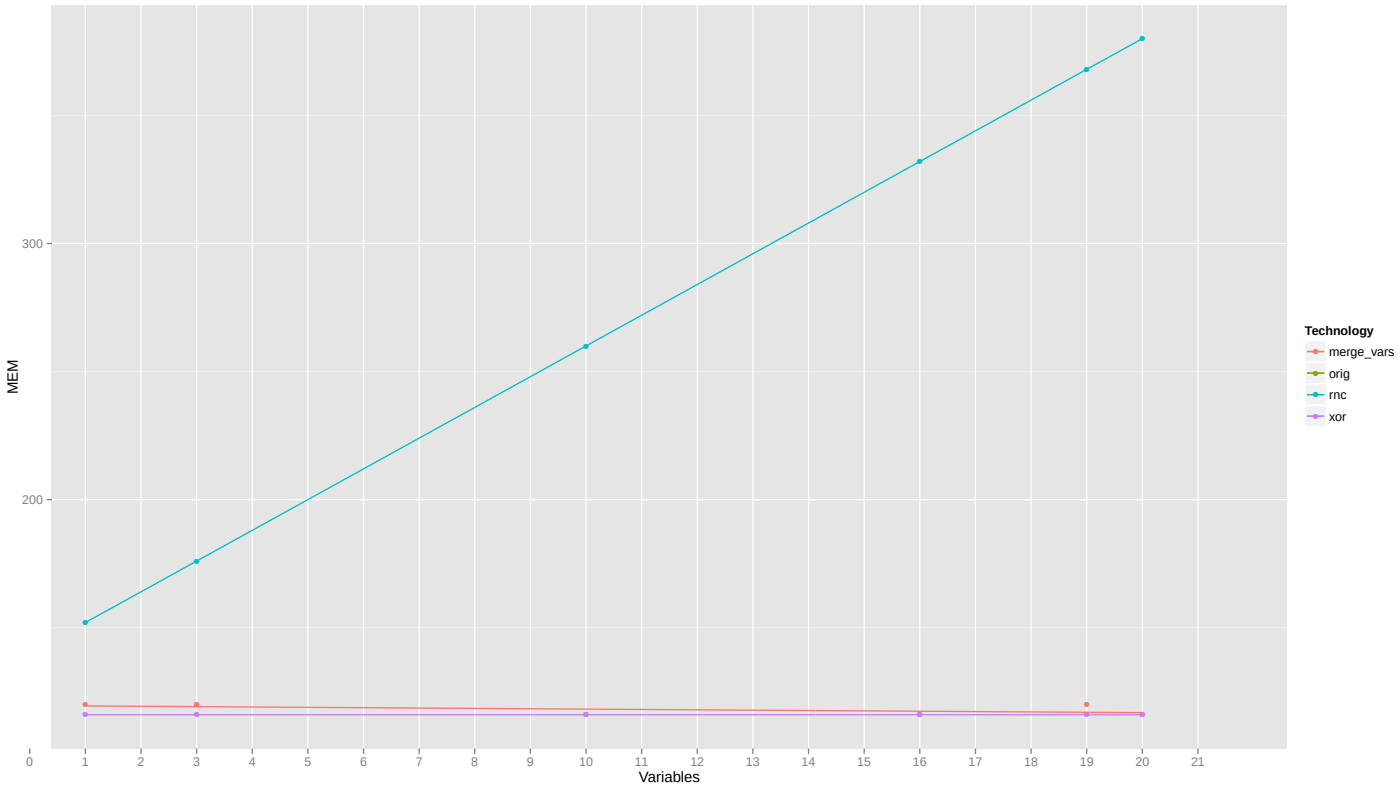

Figure 8: MEM vs OBFS - opchain