

Online Supplement of:
“*Computational Aspects of Infeasibility Analysis in
Mixed Integer Programming*”

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This online supplement provides tables of detailed results of the computational experiments conducted for the paper “Computational Aspects of Infeasibility Analysis in Mixed Integer Programming”. In the experiments, two different approaches of conflict analysis and a hybrid approach were compared against disabling the analysis in infeasible and bound exceeding LPs at all. As test set we used a MIPLIB 2017. To address performance variability, all experiments were performed with three random seeds, resulting in 720 instance seed combinations.

Table 1 shows the overall impact of conflict graph analysis (**confgraph**), dual proof analysis (**dualproof**), and a hybrid version combining both approaches (**combined**) compared to no analysis of infeasible and bound exceeding LPs at all (**noIpInf**). Tables 2 – 4 show the individual impact of the presented presolving and updating techniques. The individual impact of applying **mir-procedure** and **filtering** are shown in Table 5 and 6, respectively. Details concerning the experimental setup, the selection of the test instances, and the discussion of the results are available in the main publication.

All tables show:

- Absolute and relative solving times in seconds (**time**, **time_Q**) and branch-and-bound nodes (**nodes**, **nodes_Q**).
- For instances that hit the time limit of 7200 seconds the gap is given in column **time**, if no primal solution was known “∞” is given.

Tables regarding the individual impact of a feature show:

- The number of dual proof constraints where **bound-cancellation** was successfully performed (**bc-run**) and the number of cancellations (**bc**).
- The number of dual proof constraints where **vbound-cancellation** was successfully performed (**vbc-run**) and the number of changed (**vb-chg**) and canceled (**vb-can**) coefficients.
- The number of improving solutions (**impr**) found during the solving process and the number of successful calls of **update**.
- The amount of separated c-MIR inequalities with a greater efficacy as the dual proof constraint (**MIR-succ**) and quotient of nonzero coefficients compared to the original dual proof constraint.
- The number of dual proof constraints that were rejected due to numerical reasons (**filter-num**) and density (**filter-num**) when applying **filtering**.

Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
30n20b8	270.17	314	268.76	0.995	225	0.717	150.59	0.557	171	0.545	149.68	0.554	171	0.545
	2040.89	7991	1228.78	0.602	3940	0.493	544.01	0.267	1286	0.161	623.60	0.306	1999	0.250
	74.75%	61015	0.00%	1.000	33226	0.545	1350.91	0.188	3345	0.055	693.56	0.096	3499	0.057
50v-10	1.43%	1029819	1.28%	1.000	862668	0.838	1.57%	1.000	1050474	1.020	1.69%	1.000	829421	0.805
	1.33%	1066193	1.27%	1.000	1070962	1.004	1.29%	1.000	914227	0.857	1.15%	1.000	867997	0.814
	1.53%	1064237	1.48%	1.000	1081273	1.016	1.26%	1.000	989821	0.930	1.37%	1.000	833134	0.783
CMS750_4	0.40%	545243	0.00%	1.000	418086	0.767	192.32	0.027	2622	0.005	185.73	0.026	2028	0.004
	1691.51	63058	1238.90	0.732	44234	0.701	371.44	0.220	2805	0.044	370.72	0.219	3254	0.052
	1368.90	50759	363.74	0.266	8870	0.175	505.84	0.370	12259	0.242	473.12	0.346	13518	0.266
academictimetables-small	∞	4126	∞	1.000	2655	0.643	∞	1.000	2449	0.594	∞	1.000	2315	0.561
	∞	3330	∞	1.000	1739	0.522	∞	1.000	3047	0.915	∞	1.000	3505	1.053
	∞	2413	∞	1.000	2564	1.063	∞	1.000	2696	1.117	∞	1.000	2681	1.111
air05	40.11	985	39.77	0.992	985	1.000	39.52	0.985	648	0.658	40.07	0.999	648	0.658
	30.60	465	31.23	1.021	465	1.000	35.63	<i>1.164</i>	716	<i>1.540</i>	36.54	<i>1.194</i>	716	<i>1.540</i>
	31.76	321	33.72	<i>1.062</i>	432	<i>1.346</i>	31.16	0.981	282	0.879	30.22	0.952	282	0.879
app1-1	2.87	2	3.50	<i>1.220</i>	2	1.000	3.52	<i>1.226</i>	2	1.000	3.53	<i>1.230</i>	2	1.000
	4.61	6	4.80	1.041	3	0.500	4.78	1.037	3	0.500	4.94	<i>1.072</i>	3	0.500
	2.97	2	3.70	<i>1.246</i>	2	1.000	3.80	<i>1.279</i>	2	1.000	4.17	<i>1.404</i>	6	<i>3.000</i>
app1-2	816.08	52	709.34	0.869	22	0.423	735.09	0.901	30	0.577	642.80	0.788	33	0.635
	781.66	46	638.65	0.817	18	0.391	730.11	0.934	25	0.543	789.47	1.010	20	0.435
	654.39	22	588.01	0.899	16	0.727	768.86	<i>1.175</i>	24	<i>1.091</i>	618.36	0.945	20	0.909
assign1-5-8	4.67%	6944258	4.64%	1.000	6976961	1.005	4.60%	1.000	6705667	0.966	4.74%	1.000	5736357	0.826
	4.53%	7117474	4.50%	1.000	5922413	0.832	4.49%	1.000	5910141	0.830	4.54%	1.000	6813236	0.957
	4.48%	6558466	4.99%	1.000	6649476	1.014	4.50%	1.000	5865668	0.894	4.80%	1.000	6333262	0.966
atlanta-ip	7.26%	15795	8.05%	1.000	13912	0.881	3.98%	1.000	14873	0.942	3.60%	1.000	18533	1.173
	7.68%	13371	4.53%	1.000	13738	1.027	8.24%	1.000	15611	1.168	3.81%	1.000	21153	1.582
	7.22%	22708	4.29%	1.000	18551	0.817	7.55%	1.000	24254	1.068	4.27%	1.000	30903	1.361
b1c1s1	14.85%	40958	17.39%	1.000	41821	1.021	14.90%	1.000	45138	1.102	17.13%	1.000	35962	0.878
	21.56%	10481	16.28%	1.000	13339	1.273	18.37%	1.000	22683	2.164	18.36%	1.000	21112	2.014

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	17.51%	19938	17.19%	1.000	23008	1.154	16.65%	1.000	20087	1.007	17.69%	1.000	18673	0.937
bab2	1.90%	3888	1.33%	1.000	3638	0.936	∞	1.000	3856	0.992	1.29%	1.000	3473	0.893
	∞	3117	0.83%	1.000	3459	1.110	∞	1.000	3397	1.090	2.44%	1.000	3262	1.047
	∞	1764	∞	1.000	1742	0.988	∞	1.000	1981	1.123	∞	1.000	1981	1.123
bab6	0.46%	3313	∞	1.000	4902	1.480	∞	1.000	5608	1.693	0.58%	1.000	4790	1.446
	0.64%	3017	1.21%	1.000	2911	0.965	1.17%	1.000	4461	1.479	1.14%	1.000	3258	1.080
	1.43%	4661	1.96%	1.000	5166	1.108	1.72%	1.000	4439	0.952	1.94%	1.000	4779	1.025
beasleyC3	31.53	97	31.66	1.004	97	1.000	31.47	0.998	83	0.856	31.56	1.001	83	0.856
	17.23	2	17.45	1.013	2	1.000	17.29	1.003	2	1.000	17.35	1.007	2	1.000
	31.84	120	31.85	1.000	120	1.000	46.75	<i>1.468</i>	424	<i>3.533</i>	47.20	<i>1.482</i>	453	<i>3.775</i>
binkar10_1	28.74	1910	29.29	1.019	1956	1.024	38.00	<i>1.322</i>	2899	<i>1.518</i>	31.34	<i>1.090</i>	2560	<i>1.340</i>
	36.65	2823	36.02	0.983	2595	0.919	29.45	0.804	2325	0.824	29.22	0.797	2246	0.796
	35.09	2658	36.61	1.043	3144	<i>1.183</i>	30.89	0.880	2376	0.894	28.71	0.818	2509	0.944
blp-ar98	0.28%	248630	0.33%	1.000	220479	0.887	0.34%	1.000	232824	0.936	0.27%	1.000	238231	0.958
	0.35%	255188	0.30%	1.000	201681	0.790	0.40%	1.000	213282	0.836	0.33%	1.000	207500	0.813
	0.27%	219266	0.22%	1.000	256441	1.170	0.25%	1.000	207438	0.946	0.32%	1.000	229423	1.046
blp-ic98	1.77%	328200	2.39%	1.000	298341	0.909	2.13%	1.000	268203	0.817	1.38%	1.000	304769	0.929
	1.79%	313664	1.39%	1.000	304794	0.972	1.54%	1.000	279606	0.891	2.41%	1.000	254061	0.810
	2.88%	311621	1.37%	1.000	283928	0.911	1.80%	1.000	284946	0.914	2.11%	1.000	278188	0.893
bnatt400	1013.96	5873	786.23	0.775	5563	0.947	1088.34	<i>1.073</i>	8660	<i>1.475</i>	970.91	0.958	6821	<i>1.161</i>
	839.92	7439	921.03	<i>1.097</i>	7122	0.957	977.85	<i>1.164</i>	5297	0.712	1105.02	<i>1.316</i>	6346	0.853
	779.62	5485	1071.66	<i>1.375</i>	8178	<i>1.491</i>	942.35	<i>1.209</i>	7395	<i>1.348</i>	745.15	0.956	5500	1.003
bnatt500	5290.44	37595	5371.93	1.015	37706	1.003	4207.70	0.795	31759	0.845	4368.17	0.826	29526	0.785
	6215.26	34819	6434.00	1.035	40497	<i>1.163</i>	6250.27	1.006	38236	<i>1.098</i>	6333.06	1.019	38962	<i>1.119</i>
	3370.42	24977	4014.00	<i>1.191</i>	27097	<i>1.085</i>	5003.35	<i>1.484</i>	29313	<i>1.174</i>	4996.90	<i>1.483</i>	29029	<i>1.162</i>
bppc4-08	1.92%	828046	1.92%	1.000	873421	1.055	1.92%	1.000	837029	1.011	1.92%	1.000	797503	0.963
	1.92%	814179	1.92%	1.000	844498	1.037	1.92%	1.000	898262	1.103	1.92%	1.000	938927	1.153
	6352.91	761343	1.92%	1.133	825334	1.084	1.92%	1.133	763383	1.003	1.92%	1.133	793397	1.042
brazil3	88.60%	8234	24.46%	1.000	7483	0.909	15.88%	1.000	8723	1.059	3360.46	0.467	2570	0.312

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	25.81%	4781	0.00%	1.000	2280	0.477	4311.70	0.599	2243	0.469	4252.19	0.591	2347	0.491
	2900.92	1474	2444.40	0.843	1101	0.747	3063.82	<i>1.056</i>	2100	<i>1.425</i>	3785.08	<i>1.305</i>	3302	<i>2.240</i>
buildingenergy	0.13%	95	0.13%	1.000	94	0.989	0.13%	1.000	91	0.958	0.13%	1.000	96	1.011
	0.15%	97	0.15%	1.000	119	1.227	0.15%	1.000	101	1.041	0.15%	1.000	85	0.876
	0.13%	13	0.13%	1.000	12	0.923	0.13%	1.000	12	0.923	0.13%	1.000	12	0.923
cbs-cta	40.09	1	40.13	1.001	1	1.000	40.16	1.002	1	1.000	40.27	1.004	1	1.000
	314.25	31	311.39	0.991	31	1.000	313.28	0.997	31	1.000	314.10	1.000	31	1.000
	35.70	1	35.76	1.002	1	1.000	35.92	1.006	1	1.000	35.77	1.002	1	1.000
chromaticindex1024-7	33.33%	986	33.33%	1.000	985	0.999	33.33%	1.000	975	0.989	33.33%	1.000	964	0.978
	33.33%	1627	33.33%	1.000	1627	1.000	33.33%	1.000	1176	0.723	33.33%	1.000	1171	0.720
	33.33%	718	0.00%	1.000	718	1.000	6472.23	0.899	772	<i>1.075</i>	6429.72	0.893	757	<i>1.054</i>
chromaticindex512-7	2004.52	707	2000.65	0.998	707	1.000	1154.13	0.576	365	0.516	1172.37	0.585	361	0.511
	33.33%	60358	0.00%	1.000	11439	0.190	3586.68	0.498	3461	0.057	3689.97	0.512	3133	0.052
	33.33%	23092	33.33%	1.000	27005	1.169	33.33%	1.000	20890	0.905	33.33%	1.000	40579	1.757
cmflsp50-24-8-8	3.64%	71420	3.98%	1.000	70708	0.990	3.39%	1.000	36887	0.516	3.98%	1.000	36090	0.505
	1.82%	57952	1.87%	1.000	66903	1.154	1.76%	1.000	44042	0.760	1.99%	1.000	85475	1.475
	∞	58514	2.86%	1.000	57828	0.988	∞	1.000	39783	0.680	4.86%	1.000	37790	0.646
co-100	48.51%	12176	1.74%	1.000	31192	2.562	2.54%	1.000	67083	5.509	1.74%	1.000	54008	4.436
	29.05%	13565	50.59%	1.000	11043	0.814	51.96%	1.000	12191	0.899	91.77%	1.000	7012	0.517
	94.07%	5635	49.46%	1.000	11744	2.084	44.78%	1.000	14277	2.534	3.18%	1.000	10565	1.875
cod105	48.29%	6746	47.86%	1.000	7069	1.048	47.90%	1.000	7067	1.048	47.57%	1.000	7261	1.076
	48.50%	6275	48.07%	1.000	6066	0.967	48.80%	1.000	6564	1.046	48.00%	1.000	6829	1.088
	47.79%	6894	48.07%	1.000	6526	0.947	48.38%	1.000	6573	0.953	48.07%	1.000	6601	0.957
comp07-2idx	1183.33%	3002	716.67%	1.000	3326	1.108	1116.67%	1.000	4030	1.342	966.67%	1.000	3996	1.331
	1316.67%	2052	2800.00%	1.000	1378	0.672	1183.33%	1.000	745	0.363	2800.00%	1.000	743	0.362
	1395.65%	1805	1700.00%	1.000	1623	0.899	1117.39%	1.000	3197	1.771	1716.67%	1.000	1449	0.803
comp21-2idx	220.19%	11966	208.58%	1.000	12927	1.080	198.83%	1.000	11442	0.956	247.43%	1.000	10931	0.914
	224.66%	7604	213.57%	1.000	8479	1.115	283.90%	1.000	10116	1.330	195.50%	1.000	9835	1.293
	230.83%	12201	237.62%	1.000	9505	0.779	239.90%	1.000	11111	0.911	248.72%	1.000	11711	0.960

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
cost266-UUE	3.89%	686321	0.00%	1.000	636741	0.928	6154.27	0.855	498762	0.727	4923.15	0.684	375684	0.547
	2.59%	585106	6.02%	1.000	636961	1.089	2.91%	1.000	31821	0.054	3728.83	0.518	294630	0.504
	2.90%	668583	0.00%	1.000	688748	1.030	7196.88	1.000	593150	0.887	4067.72	0.565	306702	0.459
cryptanalysisiskb128n5obj14	∞	102	∞	1.000	101	0.990	∞	1.000	111	1.088	∞	1.000	110	1.078
	∞	47	∞	1.000	47	1.000	∞	1.000	56	1.191	∞	1.000	59	1.255
	∞	76	∞	1.000	76	1.000	∞	1.000	91	1.197	∞	1.000	90	1.184
cryptanalysisiskb128n5obj16	∞	70	∞	1.000	70	1.000	∞	1.000	104	1.486	∞	1.000	104	1.486
	2820.78	37	2817.87	0.999	37	1.000	2794.70	0.991	37	1.000	2790.65	0.989	37	1.000
	∞	93	∞	1.000	93	1.000	∞	1.000	96	1.032	∞	1.000	97	1.043
csched007	10.27%	687997	0.00%	1.000	689922	1.003	2355.58	0.327	198606	0.289	2327.77	0.323	187288	0.272
	9.36%	802729	0.00%	1.000	700322	0.872	1855.85	0.258	142275	0.177	2613.95	0.363	220934	0.275
	1730.41	130969	0.00%	4.161	717094	5.475	4504.79	<i>2.603</i>	290068	<i>2.215</i>	3393.08	<i>1.961</i>	247755	<i>1.892</i>
csched008	2.34%	651889	1.16%	1.000	562768	0.863	1.17%	1.000	641728	0.984	2.81%	1.000	455870	0.699
	3.51%	694027	1.74%	1.000	430121	0.620	7.02%	1.000	711174	1.025	2.33%	1.000	694455	1.001
	2.34%	467706	0.00%	1.000	716469	1.532	4674.39	0.649	404774	0.865	5772.95	0.802	546382	<i>1.168</i>
cvs16r128-89	21.37%	7991	24.18%	1.000	20714	2.592	20.46%	1.000	41034	5.135	23.28%	1.000	67980	8.507
	23.73%	25623	21.16%	1.000	35091	1.370	22.20%	1.000	41958	1.638	22.61%	1.000	34973	1.365
	24.35%	25468	25.04%	1.000	72611	2.851	21.83%	1.000	21851	0.858	23.01%	1.000	47219	1.854
dano3.3	146.25	12	152.34	1.042	10	0.833	161.59	<i>1.105</i>	10	0.833	143.70	0.983	10	0.833
	142.06	12	142.36	1.002	14	<i>1.167</i>	141.75	0.998	12	1.000	142.65	1.004	14	<i>1.167</i>
	124.70	17	124.58	0.999	17	1.000	124.81	1.001	17	1.000	124.56	0.999	17	1.000
dano3.5	567.06	220	618.61	<i>1.091</i>	176	0.800	634.53	<i>1.119</i>	276	<i>1.255</i>	635.04	<i>1.120</i>	276	<i>1.255</i>
	272.91	150	275.18	1.008	150	1.000	283.65	1.039	166	<i>1.107</i>	285.81	1.047	159	<i>1.060</i>
	287.49	140	287.54	1.000	140	1.000	286.08	0.995	140	1.000	285.94	0.995	140	1.000
decomp2	2.44	1	2.47	1.012	1	1.000	2.40	0.984	1	1.000	2.39	0.980	1	1.000
	2.42	1	2.51	1.037	1	1.000	2.47	1.021	1	1.000	2.42	1.000	1	1.000
	2.46	1	2.43	0.988	1	1.000	2.43	0.988	1	1.000	2.50	1.016	1	1.000
drayage-100-23	16.27	32	16.34	1.004	32	1.000	16.51	1.015	32	1.000	16.43	1.010	32	1.000
	19.84	48	19.61	0.988	48	1.000	19.63	0.989	48	1.000	19.52	0.984	48	1.000

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	13.51	16	13.52	1.001	16	1.000	13.53	1.001	16	1.000	13.50	0.999	16	1.000
drayage-25-23	0.07%	517492	0.07%	1.000	492935	0.953	0.07%	1.000	747628	1.445	0.07%	1.000	720814	1.393
	0.07%	519847	0.07%	1.000	656944	1.264	0.07%	1.000	1043445	2.007	0.07%	1.000	790871	1.521
	6307.69	370729	5817.60	0.922	290807	0.784	0.00%	1.141	629308	1.697	6941.84	<i>1.101</i>	552534	<i>1.490</i>
dws008-01	96.91%	109911	52.83%	1.000	75442	0.686	214.11%	1.000	154301	1.404	44.84%	1.000	144766	1.317
	133.95%	98117	57.68%	1.000	81243	0.828	139.62%	1.000	168587	1.718	44.28%	1.000	157395	1.604
	144.33%	135628	54.29%	1.000	88474	0.652	184.89%	1.000	160318	1.182	52.63%	1.000	153108	1.129
eil33-2	45.91	715	92.42	<i>2.013</i>	595	0.832	67.05	<i>1.460</i>	561	0.785	81.20	<i>1.769</i>	343	0.480
	42.61	675	89.73	<i>2.106</i>	349	0.517	66.78	<i>1.567</i>	561	0.831	101.92	<i>2.392</i>	395	0.585
	37.22	571	87.43	<i>2.349</i>	517	0.905	55.12	<i>1.481</i>	615	<i>1.077</i>	105.72	<i>2.840</i>	541	0.947
eilA101-2	8.20%	18272	8.90%	1.000	11684	0.639	17.05%	1.000	11576	0.634	20.05%	1.000	11110	0.608
	13.98%	17070	13.47%	1.000	14309	0.838	13.28%	1.000	11712	0.686	13.20%	1.000	12688	0.743
	15.09%	12933	17.64%	1.000	13204	1.021	8.35%	1.000	12469	0.964	13.37%	1.000	13480	1.042
enlight_hard	0.50	1	0.50	1.000	1	1.000	0.50	1.000	1	1.000	0.50	1.000	1	1.000
	0.50	1	0.50	1.000	1	1.000	0.50	1.000	1	1.000	0.50	1.000	1	1.000
	0.50	1	0.50	1.000	1	1.000	0.50	1.000	1	1.000	0.50	1.000	1	1.000
ex10	493.68	1	495.08	1.003	1	1.000	497.29	1.007	1	1.000	493.80	1.000	1	1.000
	500.75	1	499.72	0.998	1	1.000	503.82	1.006	1	1.000	497.94	0.994	1	1.000
	575.26	1	577.33	1.004	1	1.000	580.75	1.010	1	1.000	581.12	1.010	1	1.000
ex9	28.09	1	28.15	1.002	1	1.000	28.06	0.999	1	1.000	27.98	0.996	1	1.000
	27.22	1	27.31	1.003	1	1.000	27.24	1.001	1	1.000	27.30	1.003	1	1.000
	27.70	1	27.65	0.998	1	1.000	27.58	0.996	1	1.000	27.02	0.975	1	1.000
exp-1-500-5-5	2.26	1	2.25	0.996	1	1.000	2.31	1.022	1	1.000	2.28	1.009	1	1.000
	2.21	1	2.22	1.005	1	1.000	2.22	1.005	1	1.000	2.22	1.005	1	1.000
	2.19	1	2.23	1.018	1	1.000	2.23	1.018	1	1.000	2.21	1.009	1	1.000
fast0507	263.98	1041	260.94	0.988	1045	1.004	305.72	<i>1.158</i>	1377	<i>1.323</i>	322.23	<i>1.221</i>	1284	<i>1.233</i>
	180.54	779	265.86	<i>1.473</i>	1032	<i>1.325</i>	180.00	0.997	789	1.013	280.17	<i>1.552</i>	1223	<i>1.570</i>
	160.11	709	165.64	1.035	725	1.023	245.54	<i>1.534</i>	1054	<i>1.487</i>	365.44	<i>2.282</i>	1711	<i>2.413</i>
fastxgemm-n2r6s0t2	4526.87	1024921	4436.56	0.980	1014208	0.990	4774.24	<i>1.055</i>	1136260	<i>1.109</i>	4702.82	1.039	1118937	<i>1.092</i>

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	3208.37	771817	2657.63	0.828	653762	0.847	2579.71	0.804	609753	0.790	4017.11	<i>1.252</i>	1012967	<i>1.312</i>
	3676.54	839760	2060.35	0.560	492173	0.586	4374.81	<i>1.190</i>	1031868	<i>1.229</i>	3129.08	0.851	769500	0.916
fhnw-binpack4-48	∞	4061521	∞	1.000	4056706	0.999	∞	1.000	4041612	0.995	∞	1.000	4040499	0.995
	∞	3509133	∞	1.000	3529464	1.006	∞	1.000	3536197	1.008	∞	1.000	3525851	1.005
	∞	3421178	∞	1.000	3422722	1.000	∞	1.000	3412172	0.997	∞	1.000	3413924	0.998
fhnw-binpack4-4	∞	14301362	∞	1.000	14587388	1.020	∞	1.000	14867910	1.040	∞	1.000	14733968	1.030
	∞	13031703	∞	1.000	13154203	1.009	∞	1.000	13767692	1.056	∞	1.000	13981261	1.073
	∞	12591238	∞	1.000	12342714	0.980	∞	1.000	13360396	1.061	∞	1.000	11607995	0.922
fiball	1342.69	20372	394.03	0.293	4360	0.214	600.45	0.447	5853	0.287	465.55	0.347	4111	0.202
	2372.29	38260	3821.84	<i>1.611</i>	70292	<i>1.837</i>	425.63	0.179	3216	0.084	447.14	0.188	3521	0.092
	2260.11	40321	1464.73	0.648	22881	0.567	870.35	0.385	10338	0.256	499.03	0.221	5672	0.141
gen-ip002	1637.26	6690190	1462.75	0.893	6425170	0.960	1413.15	0.863	5796348	0.866	1315.68	0.804	5856334	0.875
	1363.72	5677895	1205.12	0.884	5345710	0.941	1385.70	1.016	5542663	0.976	1295.56	0.950	5478569	0.965
	1256.64	5282471	1220.88	0.972	5404068	1.023	1308.21	1.041	5647374	<i>1.069</i>	1271.92	1.012	5583912	<i>1.057</i>
gen-ip054	2987.96	14800834	2362.69	0.791	12067757	0.815	3157.12	<i>1.057</i>	15026943	1.015	3047.64	1.020	15245360	1.030
	2406.71	11923977	2361.66	0.981	12180453	1.022	2349.71	0.976	11384216	0.955	2530.93	<i>1.052</i>	12476019	1.046
	3625.10	17356622	3148.80	0.869	15904430	0.916	4437.62	<i>1.224</i>	21063822	<i>1.214</i>	3381.24	0.933	16438070	0.947
germanrr	1.90%	2307	1.99%	1.000	3377	1.464	2.92%	1.000	2451	1.062	1.46%	1.000	3418	1.482
	0.91%	6855	2.24%	1.000	3719	0.543	2.13%	1.000	4636	0.676	2.11%	1.000	2851	0.416
	2.21%	4055	1.72%	1.000	2764	0.682	2.06%	1.000	5055	1.247	1.94%	1.000	3559	0.878
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	∞	1.000	4	1.000	∞	1.000	4	1.000
	∞	8	∞	1.000	8	1.000	∞	1.000	8	1.000	∞	1.000	8	1.000
	∞	10	∞	1.000	10	1.000	∞	1.000	10	1.000	∞	1.000	10	1.000
glass-sc	2610.23	240737	2615.32	1.002	240737	1.000	2660.27	1.019	241365	1.003	2655.26	1.017	241329	1.002
	3099.62	287279	3100.56	1.000	287279	1.000	3217.14	1.038	289206	1.007	3214.67	1.037	289206	1.007
	2829.27	259617	2834.65	1.002	259617	1.000	2831.50	1.001	251112	0.967	2819.06	0.996	251112	0.967
glass4	3361.67	3222725	3730.47	<i>1.110</i>	2847284	0.884	4404.19	<i>1.310</i>	3566262	<i>1.107</i>	4008.75	<i>1.192</i>	2705421	0.839
	3696.91	2574365	2755.59	0.745	1956253	0.760	1461.74	0.395	1253927	0.487	2392.84	0.647	1888717	0.734
	65.45%	3880956	2488.84	0.346	1896614	0.489	1664.10	0.231	1290615	0.333	2212.84	0.307	1599046	0.412

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
gmu-35-40	0.04%	2403537	0.03%	1.000	1875561	0.780	0.05%	1.000	1621723	0.675	0.05%	1.000	2051936	0.854
	0.02%	2737264	0.01%	1.000	2330157	0.851	0.03%	1.000	4847633	1.771	0.03%	1.000	2099939	0.767
	0.02%	2488628	0.02%	1.000	1935051	0.778	0.03%	1.000	2229459	0.896	0.03%	1.000	1381092	0.555
gmu-35-50	0.04%	1407863	0.04%	1.000	1082035	0.769	0.03%	1.000	2253407	1.601	0.02%	1.000	1317781	0.936
	0.05%	1367835	0.04%	1.000	1400949	1.024	0.06%	1.000	1245342	0.910	0.03%	1.000	1247342	0.912
	0.02%	1661966	0.09%	1.000	1327315	0.799	0.03%	1.000	1581744	0.952	0.04%	1.000	1016723	0.612
graph20-20-1rand	165.99%	8594	166.96%	1.000	14229	1.656	163.33%	1.000	15598	1.815	163.73%	1.000	6171	0.718
	164.20%	8533	165.69%	1.000	7958	0.933	157.48%	1.000	8521	0.999	165.38%	1.000	8277	0.970
	161.28%	8662	157.72%	1.000	5357	0.618	162.94%	1.000	12195	1.408	172.66%	1.000	7513	0.867
graphdraw-domain	1054.45	1819134	1079.90	1.024	1914872	<i>1.053</i>	1495.01	<i>1.418</i>	2660827	<i>1.463</i>	1010.47	0.958	1823083	1.002
	1592.76	2718947	1631.15	1.024	2887685	<i>1.062</i>	1201.21	0.754	2031193	0.747	1122.85	0.705	1941578	0.714
	2174.25	4328282	2647.33	<i>1.218</i>	5129739	<i>1.185</i>	1407.78	0.647	2460247	0.568	1664.67	0.766	2907888	0.672
∞ h80x6320d	72.87	4	72.75	0.998	4	1.000	69.89	0.959	4	1.000	69.54	0.954	4	1.000
	84.11	10	86.16	1.024	6	0.600	86.18	1.025	6	0.600	86.17	1.024	10	1.000
	82.69	5	82.28	0.995	5	1.000	84.54	1.022	5	1.000	86.62	1.048	5	1.000
highschool1-aigio	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
hypothyroid-k1	19.88	1	19.81	0.996	1	1.000	19.80	0.996	1	1.000	20.04	1.008	1	1.000
	20.03	1	20.18	1.007	1	1.000	20.09	1.003	1	1.000	19.99	0.998	1	1.000
	20.05	1	20.09	1.002	1	1.000	20.09	1.002	1	1.000	20.16	1.005	1	1.000
ic97_potential	0.78%	7017703	0.88%	1.000	7145954	1.018	1.00%	1.000	7395272	1.054	0.84%	1.000	7214792	1.028
	0.69%	5804129	0.63%	1.000	5798606	0.999	0.68%	1.000	5981239	1.031	0.75%	1.000	6107856	1.052
	0.83%	7802905	0.81%	1.000	7417661	0.951	0.87%	1.000	7028351	0.901	0.86%	1.000	7579116	0.971
icir97_tension	0.14%	3248344	0.08%	1.000	3177252	0.978	0.15%	1.000	3153191	0.971	0.07%	1.000	3185773	0.981
	0.19%	3075583	0.11%	1.000	3357421	1.092	0.19%	1.000	3293768	1.071	0.05%	1.000	2776552	0.903
	0.15%	2917582	0.14%	1.000	2580824	0.885	0.13%	1.000	3126098	1.071	0.08%	1.000	2729235	0.935
irish-electricity	∞	93	∞	1.000	93	1.000	∞	1.000	93	1.000	∞	1.000	93	1.000
	∞	1301	26.89%	1.000	1289	0.991	∞	1.000	1551	1.192	18.43%	1.000	1317	1.012

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	24.70%	1069	∞	1.000	1069	1.000	24.68%	1.000	1333	1.247	∞	1.000	1333	1.247
irp	11.12	5	11.67	1.049	5	1.000	11.54	1.038	4	0.800	12.51	<i>1.125</i>	6	<i>1.200</i>
	11.24	4	11.44	1.018	4	1.000	11.98	<i>1.066</i>	5	<i>1.250</i>	12.05	<i>1.072</i>	4	1.000
	10.87	4	11.70	<i>1.076</i>	5	<i>1.250</i>	11.75	<i>1.081</i>	5	<i>1.250</i>	12.58	<i>1.157</i>	5	<i>1.250</i>
istanbul-no-cutoff	237.19	303	230.84	0.973	325	<i>1.073</i>	151.26	0.638	341	<i>1.125</i>	154.02	0.649	347	<i>1.145</i>
	162.70	243	168.76	1.037	251	1.033	164.91	1.014	269	<i>1.107</i>	166.34	1.022	245	1.008
	201.52	252	210.97	1.047	318	<i>1.262</i>	291.44	<i>1.446</i>	481	<i>1.909</i>	285.14	<i>1.415</i>	475	<i>1.885</i>
k1mushroom	1903.50	8	1925.59	1.012	8	1.000	1888.10	0.992	7	0.875	1897.56	0.997	7	0.875
	1542.11	12	1552.17	1.007	12	1.000	1577.86	1.023	11	0.917	1583.93	1.027	11	0.917
	1311.58	3	1337.63	1.020	3	1.000	1300.61	0.992	3	1.000	1321.29	1.007	3	1.000
lectsched-5-obj	86.67%	470059	153.33%	1.000	176467	0.375	73.33%	1.000	146777	0.312	166.67%	1.000	148725	0.316
	166.67%	94376	146.67%	1.000	123120	1.305	120.00%	1.000	155448	1.647	120.00%	1.000	130812	1.386
	186.67%	135345	153.33%	1.000	129017	0.953	133.33%	1.000	160845	1.188	126.67%	1.000	64923	0.480
leo1	4.94%	91033	5.72%	1.000	65473	0.719	7.38%	1.000	84658	0.930	6.11%	1.000	80819	0.888
	5.18%	63501	6.06%	1.000	54706	0.861	6.74%	1.000	56994	0.898	7.14%	1.000	34905	0.550
	3.77%	124951	6.66%	1.000	72699	0.582	6.71%	1.000	78110	0.625	7.53%	1.000	45969	0.368
leo2	∞	98306	∞	1.000	92645	0.942	∞	1.000	98792	1.005	∞	1.000	101616	1.034
	∞	117321	∞	1.000	112056	0.955	∞	1.000	116130	0.990	∞	1.000	110967	0.946
	∞	119104	∞	1.000	108386	0.910	∞	1.000	111129	0.933	∞	1.000	146706	1.232
lotsize	0.65%	30540	0.54%	1.000	32475	1.063	0.57%	1.000	25529	0.836	0.67%	1.000	16786	0.550
	0.89%	19887	0.81%	1.000	18915	0.951	0.68%	1.000	17210	0.865	0.88%	1.000	20493	1.030
	0.55%	19259	0.55%	1.000	20397	1.059	0.53%	1.000	17047	0.885	0.70%	1.000	17911	0.930
mad	∞	19866742	∞	1.000	21601059	1.087	∞	1.000	17130554	0.862	∞	1.000	8295624	0.418
	∞	19368363	∞	1.000	23790571	1.228	∞	1.000	22548896	1.164	∞	1.000	14934806	0.771
	∞	25228092	∞	1.000	19697850	0.781	∞	1.000	10115378	0.401	∞	1.000	15381075	0.610
map10	1074.59	1672	1057.50	0.984	1595	0.954	1051.44	0.978	1494	0.894	1006.71	0.937	1637	0.979
	670.14	768	633.71	0.946	724	0.943	674.45	1.006	768	1.000	633.84	0.946	724	0.943
	797.43	961	788.49	0.989	965	1.004	821.19	1.030	955	0.994	792.96	0.994	965	1.004
map16715-04	1928.50	1780	1917.79	0.994	1782	1.001	2149.49	<i>1.115</i>	1961	<i>1.102</i>	2158.43	<i>1.119</i>	1933	<i>1.086</i>

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	2201.33	2317	2181.44	0.991	2323	1.003	2407.24	<i>1.094</i>	2279	0.984	2335.51	<i>1.061</i>	2173	0.938
	1987.28	1903	1978.40	0.996	1989	1.045	2052.84	1.033	1982	1.042	2160.04	<i>1.087</i>	1990	1.046
markshare2	∞	5801369	∞	1.000	7092947	1.223	∞	1.000	5339206	0.920	∞	1.000	5827069	1.004
	∞	5912079	∞	1.000	7825289	1.324	∞	1.000	6744463	1.141	∞	1.000	5581862	0.944
	∞	5830446	∞	1.000	8087128	1.387	∞	1.000	5448970	0.935	∞	1.000	5052479	0.867
markshare_4.0	236.70	2086134	57.79	0.244	506673	0.243	290.41	<i>1.227</i>	2571032	<i>1.232</i>	72.47	0.306	612396	0.294
	293.15	2638602	58.16	0.198	506440	0.192	303.00	1.034	2661583	1.009	70.48	0.240	589762	0.224
	337.30	3027177	61.29	0.182	535874	0.177	254.91	0.756	2235991	0.739	85.88	0.255	719508	0.238
mas74	1488.86	4599675	1523.56	1.023	4437792	0.965	1660.70	<i>1.115</i>	5061685	<i>1.100</i>	1680.79	<i>1.129</i>	4932223	<i>1.072</i>
	2043.77	8010454	2245.73	<i>1.099</i>	8397860	1.048	2270.66	<i>1.111</i>	8044752	1.004	2282.09	<i>1.117</i>	7992914	0.998
	1193.28	3776851	1171.70	0.982	3539157	0.937	1295.72	<i>1.086</i>	3949864	1.046	1563.59	<i>1.310</i>	4674399	<i>1.238</i>
mas76	143.17	464809	143.71	1.004	451946	0.972	135.70	0.948	423620	0.911	136.88	0.956	406104	0.874
	128.54	451893	137.95	<i>1.073</i>	445456	0.986	167.25	<i>1.301</i>	530482	<i>1.174</i>	168.46	<i>1.311</i>	525538	<i>1.163</i>
	145.73	466086	146.06	1.002	466086	1.000	143.18	0.983	448267	0.962	152.65	1.047	450422	0.966
mc11	77.69	1115	73.77	0.950	1097	0.984	169.88	<i>2.187</i>	7587	<i>6.804</i>	149.40	<i>1.923</i>	6484	<i>5.815</i>
	125.34	3364	210.52	<i>1.680</i>	9069	<i>2.696</i>	101.25	0.808	2695	0.801	80.39	0.641	1411	0.419
	304.49	15636	210.21	0.690	10462	0.669	93.14	0.306	2184	0.140	106.11	0.348	3386	0.217
mcsched	326.38	16119	329.92	1.011	15321	0.950	356.03	<i>1.091</i>	15011	0.931	318.21	0.975	11378	0.706
	250.87	9466	251.72	1.003	9346	0.987	234.36	0.934	9846	1.040	235.33	0.938	9846	1.040
	300.36	10393	302.05	1.006	10393	1.000	296.46	0.987	10929	<i>1.052</i>	306.32	1.020	12017	<i>1.156</i>
mik-250-20-75-4	37.33	18256	37.57	1.006	18256	1.000	52.24	<i>1.399</i>	23893	<i>1.309</i>	52.78	<i>1.414</i>	23893	<i>1.309</i>
	33.56	11362	33.97	1.012	11362	1.000	43.42	<i>1.294</i>	15175	<i>1.336</i>	43.96	<i>1.310</i>	15175	<i>1.336</i>
	43.44	19440	44.17	1.017	19440	1.000	51.68	<i>1.190</i>	20733	<i>1.067</i>	52.36	<i>1.205</i>	20733	<i>1.067</i>
milo-v12-6-r2-40-1	11.69%	316375	11.75%	1.000	267871	0.847	12.13%	1.000	182031	0.575	9.47%	1.000	189681	0.600
	14.53%	625060	7.15%	1.000	651134	1.042	14.88%	1.000	281347	0.450	8.96%	1.000	323326	0.517
	15.59%	417505	8.00%	1.000	352982	0.845	7.72%	1.000	253424	0.607	11.33%	1.000	417232	0.999
momentum1	6.26%	220224	18.92%	1.000	102188	0.464	17.09%	1.000	84524	0.384	24.76%	1.000	94037	0.427
	10.07%	168760	6.07%	1.000	160967	0.954	8.42%	1.000	139445	0.826	7.36%	1.000	91471	0.542
	22.05%	124661	15.71%	1.000	83468	0.670	12.48%	1.000	118833	0.953	6.53%	1.000	188055	1.509

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
mushroom-best	601.92	38299	686.16	<i>1.140</i>	45244	<i>1.181</i>	914.59	<i>1.519</i>	49975	<i>1.305</i>	579.50	0.963	27393	0.715
	149.25%	95652	168.90%	1.000	102468	1.071	152.86%	1.000	96841	1.012	134.09%	1.000	94624	0.989
	133.13%	88725	99.98%	1.000	87509	0.986	141.07%	1.000	92063	1.038	121.97%	1.000	98893	1.115
mzzv11	266.96	1684	288.00	<i>1.079</i>	1419	0.843	212.06	0.794	484	0.287	210.71	0.789	484	0.287
	272.18	942	298.87	<i>1.098</i>	998	<i>1.059</i>	339.71	<i>1.248</i>	1705	<i>1.810</i>	263.08	0.967	987	1.048
	176.40	614	175.33	0.994	614	1.000	196.13	<i>1.112</i>	616	1.003	195.89	<i>1.110</i>	616	1.003
mzzv42z	166.49	369	166.64	1.001	369	1.000	171.22	1.028	366	0.992	175.26	<i>1.053</i>	415	<i>1.125</i>
	239.97	423	238.81	0.995	423	1.000	245.79	1.024	712	<i>1.683</i>	246.00	1.025	712	<i>1.683</i>
	343.90	841	323.81	0.942	748	0.889	267.18	0.777	659	0.784	306.34	0.891	719	0.855
n2seq36q	469.42	2725	532.44	<i>1.134</i>	2724	1.000	1725.67	<i>3.676</i>	8925	<i>3.275</i>	936.81	<i>1.996</i>	5438	<i>1.996</i>
	1728.61	5439	462.25	0.267	1787	0.329	600.84	0.348	2918	0.536	1061.28	0.614	4712	0.866
	1136.74	3368	944.89	0.831	5173	<i>1.536</i>	806.68	0.710	2231	0.662	1170.79	1.030	4632	<i>1.375</i>
n3div36	2.36%	274686	2.83%	1.000	234844	0.855	2.80%	1.000	219980	0.801	2.59%	1.000	213866	0.779
	2.28%	258749	2.79%	1.000	237068	0.916	2.42%	1.000	220414	0.852	2.86%	1.000	207136	0.801
	2.32%	261492	2.65%	1.000	234539	0.897	2.42%	1.000	224994	0.860	2.69%	1.000	202891	0.776
n5-3	28.07	1142	28.62	1.020	1068	0.935	29.63	<i>1.056</i>	1184	1.037	26.40	0.941	926	0.811
	27.04	893	28.36	1.049	937	1.049	26.99	0.998	1008	<i>1.129</i>	27.79	1.028	971	<i>1.087</i>
	28.03	1195	27.38	0.977	1158	0.969	25.54	0.911	1047	0.876	27.09	0.966	1087	0.910
neos-1122047	10.16	1	9.74	0.959	1	1.000	9.89	0.973	1	1.000	9.92	0.976	1	1.000
	9.84	1	9.81	0.997	1	1.000	9.58	0.974	1	1.000	9.76	0.992	1	1.000
	9.89	1	9.77	0.988	1	1.000	10.01	1.012	1	1.000	9.70	0.981	1	1.000
neos-1171448	84.76	85	87.39	1.031	85	1.000	7.14	0.084	1	0.012	58.11	0.686	101	<i>1.188</i>
	6.21	1	83.56	<i>13.456</i>	138	<i>138.000</i>	4806.35	<i>773.969</i>	373	<i>373.000</i>	5.16	0.831	1	1.000
	2744.66	201	2743.51	1.000	201	1.000	51.43	0.019	86	0.428	51.55	0.019	86	0.428
neos-1171737	1.39%	4394	1.30%	1.000	4667	1.062	1.56%	1.000	4476	1.019	1.04%	1.000	3912	0.890
	1.56%	4065	1.04%	1.000	4331	1.065	1.04%	1.000	3545	0.872	1.56%	1.000	4009	0.986
	1.56%	3977	1.56%	1.000	4040	1.016	2.09%	1.000	8518	2.142	1.30%	1.000	11719	2.947
neos-1354092	∞	133	∞	1.000	283	2.128	∞	1.000	613	4.609	∞	1.000	613	4.609
	∞	88	∞	1.000	846	9.614	∞	1.000	821	9.330	∞	1.000	820	9.318

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	∞	123	∞	1.000	641	5.211	∞	1.000	639	5.195	∞	1.000	639	5.195
neos-1445765	43.63	129	43.70	1.002	129	1.000	43.57	0.999	133	1.031	43.72	1.002	133	1.031
	44.45	161	44.17	0.994	145	0.901	45.18	1.016	185	<i>1.149</i>	44.19	0.994	141	0.876
	43.42	115	44.77	1.031	115	1.000	44.28	1.020	125	<i>1.087</i>	44.74	1.030	125	<i>1.087</i>
neos-1456979	8.35%	67269	7.30%	1.000	278148	4.135	4.89%	1.000	37787	0.562	7.49%	1.000	39961	0.594
	7.90%	50358	7.72%	1.000	38121	0.757	8.47%	1.000	42543	0.845	6.84%	1.000	38750	0.769
	6.37%	76767	7.21%	1.000	48821	0.636	7.76%	1.000	33278	0.433	7.29%	1.000	31540	0.411
neos-1582420	23.82	15	24.12	1.013	15	1.000	21.77	0.914	18	<i>1.200</i>	21.85	0.917	18	<i>1.200</i>
	10.87	9	10.91	1.004	9	1.000	10.94	1.006	9	1.000	10.92	1.005	9	1.000
	77.35	3052	85.73	<i>1.108</i>	3522	<i>1.154</i>	58.44	0.756	1411	0.462	55.49	0.717	1381	0.452
neos-2075418-temuka	7089.82	1	7125.91	1.005	1	1.000	7032.92	0.992	1	1.000	7024.05	0.991	1	1.000
	4584.98	1	4723.80	1.030	1	1.000	4548.21	0.992	1	1.000	4517.94	0.985	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
neos-2657525-crna	∞	3299274	∞	1.000	6291727	1.907	∞	1.000	3385022	1.026	∞	1.000	3064132	0.929
	∞	5517891	∞	1.000	2093469	0.379	∞	1.000	3373221	0.611	∞	1.000	3681104	0.667
	∞	1132061	∞	1.000	2988312	2.640	∞	1.000	1912631	1.690	∞	1.000	2122332	1.875
neos-2746589-doon	0.11%	162360	0.59%	1.000	55166	0.340	0.76%	1.000	51130	0.315	0.46%	1.000	55681	0.343
	0.78%	63981	0.47%	1.000	21915	0.343	0.71%	1.000	42771	0.668	0.73%	1.000	30280	0.473
	1.03%	37418	0.15%	1.000	140498	3.755	0.11%	1.000	104934	2.804	0.11%	1.000	182349	4.873
neos-2978193-inde	0.50%	565366	0.50%	1.000	532689	0.942	0.50%	1.000	573871	1.015	0.50%	1.000	549249	0.971
	0.13%	543501	0.13%	1.000	490690	0.903	0.13%	1.000	607287	1.117	0.13%	1.000	573707	1.056
	0.50%	659412	0.50%	1.000	606931	0.920	0.50%	1.000	576992	0.875	0.50%	1.000	548119	0.831
neos-2987310-joes	17.53	1	17.71	1.010	1	1.000	17.54	1.001	1	1.000	17.49	0.998	1	1.000
	15.24	1	15.49	1.016	1	1.000	15.26	1.001	1	1.000	15.31	1.005	1	1.000
	13.84	1	13.58	0.981	1	1.000	14.08	1.017	1	1.000	13.67	0.988	1	1.000
neos-3004026-krka	53.53	2711	53.11	0.992	2711	1.000	52.94	0.989	2711	1.000	53.06	0.991	2711	1.000
	62.04	3485	62.32	1.005	3485	1.000	62.38	1.005	3485	1.000	62.47	1.007	3485	1.000
	46.94	1764	46.39	0.988	1764	1.000	46.81	0.997	1764	1.000	46.28	0.986	1764	1.000
neos-3024952-loue	4345.61	243005	0.00%	1.657	716114	2.947	4622.43	<i>1.064</i>	460419	<i>1.895</i>	4646.86	<i>1.069</i>	383076	<i>1.576</i>

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	2843.41	232504	0.00%	2.532	735092	3.162	6811.25	<i>2.395</i>	146416	0.630	0.07%	2.532	688312	2.960
	0.03%	1222088	0.00%	1.000	1328073	1.087	2895.54	0.402	284214	0.233	0.04%	1.000	1114650	0.912
neos-3046615-murg	164.03%	7383815	169.34%	1.000	7294799	0.988	167.45%	1.000	7650082	1.036	169.81%	1.000	6971706	0.944
	158.67%	6758319	160.91%	1.000	6970702	1.031	165.78%	1.000	7162151	1.060	166.11%	1.000	6364063	0.942
	170.27%	6907435	171.19%	1.000	7347532	1.064	158.38%	1.000	6656911	0.964	163.66%	1.000	7613539	1.102
neos-3083819-nubu	11.13	2169	10.44	0.938	1436	0.662	8.66	0.778	1152	0.531	12.72	<i>1.143</i>	2020	0.931
	13.56	2410	14.64	<i>1.080</i>	2757	<i>1.144</i>	13.71	1.011	2810	<i>1.166</i>	12.37	0.912	1578	0.655
	8.55	1264	12.94	<i>1.513</i>	1621	<i>1.282</i>	11.86	<i>1.387</i>	1572	<i>1.244</i>	20.79	<i>2.432</i>	3812	<i>3.016</i>
neos-3216931-puriri	92.16%	5249	4697.10	0.652	6620	<i>1.261</i>	0.00%	1.000	6141	1.170	116.41%	1.000	5546	1.057
	102.21%	5127	151.91%	1.000	5234	1.021	105.05%	1.000	7914	1.544	5.50%	1.000	9705	1.893
	62.44%	10170	98.45%	1.000	8686	0.854	54.80%	1.000	4036	0.397	147.13%	1.000	4790	0.471
neos-3381206-awhea	1.20	1	1.20	1.000	1	1.000	1.18	0.983	1	1.000	1.18	0.983	1	1.000
	1.19	1	1.23	1.034	1	1.000	1.22	1.025	1	1.000	1.21	1.017	1	1.000
	1.23	1	1.23	1.000	1	1.000	1.22	0.992	1	1.000	1.20	0.976	1	1.000
neos-3402294-bobin	451.09	1373	1382.68	<i>3.065</i>	8164	<i>5.946</i>	0.00%	15.961	126719	92.294	4386.37	<i>9.724</i>	40294	<i>29.347</i>
	4298.33	85397	2561.11	0.596	17828	0.209	729.52	0.170	3567	0.042	618.95	0.144	3428	0.040
	6958.94	116536	1316.19	0.189	8496	0.073	2067.79	0.297	32941	0.283	1620.92	0.233	9242	0.079
neos-3402454-bohle	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
neos-3555904-turama	18.01%	226	18.01%	1.000	1239	5.482	18.01%	1.000	242	1.071	18.01%	1.000	145	0.642
	18.01%	1441	∞	1.000	1482	1.028	18.01%	1.000	18	0.012	∞	1.000	18	0.012
	18.01%	933	18.01%	1.000	1999	2.143	18.01%	1.000	1451	1.555	18.01%	1.000	16797	18.003
neos-3627168-kasai	0.15%	4132691	0.20%	1.000	4565939	1.105	0.19%	1.000	5323290	1.288	0.15%	1.000	4555684	1.102
	0.18%	4202463	0.05%	1.000	4997144	1.189	0.30%	1.000	4481459	1.066	0.09%	1.000	4132791	0.983
	0.13%	5322396	0.16%	1.000	5017213	0.943	0.09%	1.000	5055583	0.950	0.27%	1.000	5147129	0.967
neos-3656078-kumeu	∞	121	∞	1.000	119	0.983	∞	1.000	32	0.264	∞	1.000	32	0.264
	∞	55	∞	1.000	66	1.200	∞	1.000	78	1.418	∞	1.000	82	1.491
	∞	182	∞	1.000	145	0.797	∞	1.000	91	0.500	∞	1.000	122	0.670

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
neos-3754480-nidda	∞	20491511	∞	1.000	19451714	0.949	∞	1.000	19768212	0.965	∞	1.000	20000763	0.976
	∞	18761545	∞	1.000	20139473	1.073	∞	1.000	18945457	1.010	∞	1.000	18439214	0.983
	∞	18808301	∞	1.000	18759033	0.997	∞	1.000	19667861	1.046	∞	1.000	19108471	1.016
neos-3988577-wolgan	∞	782	∞	1.000	759	0.971	∞	1.000	309	0.395	∞	1.000	312	0.399
	∞	924	∞	1.000	724	0.784	∞	1.000	179	0.194	∞	1.000	179	0.194
	∞	207	∞	1.000	207	1.000	∞	1.000	717	3.464	∞	1.000	439	2.121
neos-4300652-rahue	469.51%	1823	431.97%	1.000	1821	0.999	469.51%	1.000	1361	0.747	431.97%	1.000	1365	0.749
	480.09%	1682	809.48%	1.000	1689	1.004	480.09%	1.000	1231	0.732	809.48%	1.000	1213	0.721
	447.02%	1843	316.83%	1.000	1814	0.984	450.30%	1.000	2129	1.155	316.83%	1.000	2127	1.154
neos-4338804-snowy	1.80%	5559491	2.07%	1.000	5279174	0.950	2.07%	1.000	4845423	0.872	1.66%	1.000	4875741	0.877
	1.66%	6018460	1.03%	1.000	6323179	1.051	0.82%	1.000	6863695	1.140	0.82%	1.000	6738902	1.120
	2.07%	4759127	1.80%	1.000	5540955	1.164	1.66%	1.000	5028993	1.057	1.66%	1.000	5067404	1.065
neos-4387871-tavua	14.63%	114709	14.99%	1.000	111191	0.969	12.49%	1.000	110732	0.965	11.39%	1.000	118375	1.032
	11.12%	123324	12.85%	1.000	114595	0.929	13.44%	1.000	124981	1.013	14.13%	1.000	116171	0.942
	13.54%	89794	19.40%	1.000	100558	1.120	15.31%	1.000	136923	1.525	18.66%	1.000	96695	1.077
neos-4413714-turia	298.75	3	300.59	1.006	2	0.667	296.43	0.992	2	0.667	299.23	1.002	2	0.667
	399.68	3	402.66	1.007	2	0.667	404.13	1.011	2	0.667	404.80	1.013	2	0.667
	278.42	3	279.01	1.002	2	0.667	276.25	0.992	2	0.667	277.10	0.995	2	0.667
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
neos-4647030-tutaki	0.01%	24622	0.01%	1.000	24883	1.011	0.01%	1.000	24546	0.997	0.01%	1.000	24413	0.992
	0.01%	23131	0.01%	1.000	22822	0.987	0.01%	1.000	23140	1.000	0.01%	1.000	22893	0.990
	0.01%	27029	0.01%	1.000	27449	1.016	0.01%	1.000	26762	0.990	0.01%	1.000	27292	1.010
neos-4722843-widden	1477.17	5194	1733.78	<i>1.174</i>	7617	<i>1.466</i>	1909.19	<i>1.292</i>	7770	<i>1.496</i>	2651.33	<i>1.795</i>	11357	<i>2.187</i>
	1122.56	3329	999.02	0.890	2137	0.642	2457.98	<i>2.190</i>	14149	<i>4.250</i>	1033.65	0.921	3376	1.014
	1228.51	6749	1837.93	<i>1.496</i>	9866	<i>1.462</i>	2060.45	<i>1.677</i>	13340	<i>1.977</i>	1714.52	<i>1.396</i>	7919	<i>1.173</i>
neos-4738912-atrato	3125.62	373759	1868.51	0.598	202053	0.541	1452.46	0.465	161598	0.432	813.40	0.260	61981	0.166
	6412.46	647654	7161.92	<i>1.117</i>	720001	<i>1.112</i>	2835.53	0.442	283058	0.437	3808.90	0.594	324992	0.502

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	416.64	42417	1097.85	<i>2.635</i>	125625	<i>2.962</i>	928.76	<i>2.229</i>	99490	<i>2.346</i>	914.39	<i>2.195</i>	95736	<i>2.257</i>
neos-4763324-toguru	45.60%	13821	47.64%	1.000	9891	0.716	45.98%	1.000	13955	1.010	46.04%	1.000	8436	0.610
	43.56%	11665	44.03%	1.000	18186	1.559	40.72%	1.000	15972	1.369	45.08%	1.000	14962	1.283
	40.43%	18283	43.24%	1.000	3715	0.203	47.52%	1.000	14763	0.807	48.94%	1.000	7145	0.391
neos-4954672-berkel	8.37%	919377	7.86%	1.000	940482	1.023	8.37%	1.000	899492	0.978	8.48%	1.000	1019990	1.109
	9.27%	793996	9.38%	1.000	726920	0.916	9.05%	1.000	745631	0.939	8.71%	1.000	819107	1.032
	8.46%	876968	8.19%	1.000	772111	0.880	7.47%	1.000	844559	0.963	8.00%	1.000	891993	1.017
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	∞	1.000	52	1.000	∞	1.000	52	1.000
	15.39%	14	15.39%	1.000	14	1.000	15.39%	1.000	14	1.000	15.39%	1.000	14	1.000
	15.20%	12	15.20%	1.000	12	1.000	15.20%	1.000	12	1.000	15.20%	1.000	12	1.000
neos-5052403-cygnat	1.56%	155	1.60%	1.000	158	1.019	1.56%	1.000	113	0.729	1.60%	1.000	113	0.729
	1.38%	1	1.38%	1.000	1	1.000	1.38%	1.000	1	1.000	1.38%	1.000	1	1.000
	1.25%	53	1.19%	1.000	53	1.000	1.25%	1.000	63	1.189	1.19%	1.000	63	1.189
neos-5093327-huahum	9.13%	57648	9.26%	1.000	49858	0.865	10.85%	1.000	56108	0.973	10.32%	1.000	49854	0.865
	8.08%	57974	13.69%	1.000	55253	0.953	8.42%	1.000	50716	0.875	10.43%	1.000	52521	0.906
	10.14%	50556	9.60%	1.000	48637	0.962	10.07%	1.000	53217	1.053	12.17%	1.000	48532	0.960
neos-5104907-jarama	∞	7	∞	1.000	7	1.000	∞	1.000	8	1.143	∞	1.000	8	1.143
	∞	10	∞	1.000	10	1.000	∞	1.000	9	0.900	∞	1.000	9	0.900
	∞	4	∞	1.000	4	1.000	∞	1.000	4	1.000	∞	1.000	4	1.000
neos-5107597-kakapo	3565.53	952680	2490.37	0.698	749477	0.787	1435.99	0.403	386342	0.406	2144.47	0.601	560533	0.588
	23.40%	2093245	4569.97	0.635	1372207	0.656	1559.83	0.217	403091	0.193	1725.41	0.240	472393	0.226
	16.19%	2768926	2772.87	0.385	895701	0.323	0.00%	1.000	2695684	0.974	5927.88	0.823	1725439	0.623
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
neos-5188808-nattai	1552.46	14414	1541.13	0.993	16039	<i>1.113</i>	1264.88	0.815	11986	0.832	1251.29	0.806	12145	0.843
	1281.73	12654	1220.92	0.953	12570	0.993	1236.94	0.965	12505	0.988	1292.07	1.008	13554	<i>1.071</i>
	1516.90	16075	1593.52	<i>1.051</i>	16725	1.040	1638.61	<i>1.080</i>	16454	1.024	1380.62	0.910	12548	0.781
neos-5195221-niemur	5368.93	179683	4134.46	0.770	132526	0.738	3739.89	0.697	66433	0.370	2813.87	0.524	47466	0.264

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	5874.02	284617	3249.42	0.553	71286	0.250	3377.21	0.575	28903	0.102	2911.85	0.496	25010	0.088
	5.01%	354114	3694.26	0.513	70193	0.198	3307.81	0.459	55697	0.157	2890.78	0.401	33779	0.095
neos-631710	14.21%	2	14.21%	1.000	2	1.000	14.21%	1.000	2	1.000	14.21%	1.000	2	1.000
	8.90%	1	8.90%	1.000	3	3.000	8.90%	1.000	5	5.000	8.90%	1.000	4	4.000
	14.21%	2	14.21%	1.000	2	1.000	14.21%	1.000	3	1.500	14.21%	1.000	3	1.500
neos-662469	0.00%	62342	0.00%	1.000	58509	0.939	0.00%	1.000	64188	1.030	0.01%	1.000	59651	0.957
	0.00%	68051	0.06%	1.000	20707	0.304	0.05%	1.000	65664	0.965	0.00%	1.000	50627	0.744
	0.00%	54762	0.01%	1.000	65512	1.196	0.01%	1.000	54495	0.995	0.01%	1.000	56995	1.041
neos-787933	1.39	1	1.35	0.971	1	1.000	1.39	1.000	1	1.000	1.37	0.986	1	1.000
	1.40	1	1.40	1.000	1	1.000	1.38	0.986	1	1.000	1.39	0.993	1	1.000
	1.34	1	1.40	1.045	1	1.000	1.39	1.037	1	1.000	1.41	<i>1.052</i>	1	1.000
neos-827175	6.15	1	6.11	0.993	1	1.000	6.11	0.993	1	1.000	6.10	0.992	1	1.000
	8.26	1	8.25	0.999	1	1.000	8.25	0.999	1	1.000	8.21	0.994	1	1.000
	10.20	1	10.21	1.001	1	1.000	10.20	1.000	1	1.000	10.23	1.003	1	1.000
neos-848589	32.63%	274	32.79%	1.000	300	1.095	32.15%	1.000	260	0.949	32.15%	1.000	256	0.934
	42.57%	159	42.95%	1.000	148	0.931	42.95%	1.000	148	0.931	42.95%	1.000	148	0.931
	45.78%	183	46.27%	1.000	179	0.978	45.78%	1.000	106	0.579	46.27%	1.000	106	0.579
neos-860300	22.39	4	22.44	1.002	5	<i>1.250</i>	17.24	0.770	3	0.750	17.27	0.771	2	0.500
	13.92	2	13.68	0.983	2	1.000	13.56	0.974	2	1.000	13.35	0.959	2	1.000
	13.70	2	15.60	<i>1.139</i>	2	1.000	23.47	<i>1.713</i>	3	<i>1.500</i>	23.18	<i>1.692</i>	3	<i>1.500</i>
neos-873061	9.28%	161	9.28%	1.000	159	0.988	9.28%	1.000	158	0.981	9.28%	1.000	155	0.963
	7.62%	145	7.72%	1.000	145	1.000	7.62%	1.000	150	1.034	7.72%	1.000	148	1.021
	6.14%	170	8.12%	1.000	170	1.000	6.14%	1.000	168	0.988	8.12%	1.000	168	0.988
neos-911970	0.36%	2189398	0.37%	1.000	1925708	0.880	0.15%	1.000	3351711	1.531	1.05%	1.000	1400854	0.640
	5.62%	1896518	2.04%	1.000	1841141	0.971	2.43%	1.000	2313331	1.220	2.49%	1.000	1814127	0.957
	0.06%	8303204	0.05%	1.000	8547758	1.029	0.06%	1.000	7659721	0.923	0.06%	1.000	11460910	1.380
neos-933966	1389.95	113	0.00%	5.180	1948	17.239	3139.55	<i>2.259</i>	425	<i>3.761</i>	1374.28	0.989	138	<i>1.221</i>
	1515.32	121	2909.77	<i>1.920</i>	292	<i>2.413</i>	1572.20	1.038	476	<i>3.934</i>	848.27	0.560	38	0.314
	2515.32	846	1869.44	0.743	757	0.895	1298.27	0.516	86	0.102	2180.73	0.867	283	0.335

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
neos-950242	100.00%	9788	100.00%	1.000	9731	0.994	100.00%	1.000	8107	0.828	100.00%	1.000	9288	0.949
	100.00%	9395	100.00%	1.000	9278	0.988	100.00%	1.000	7684	0.818	100.00%	1.000	8446	0.899
	100.00%	16489	100.00%	1.000	15600	0.946	100.00%	1.000	15869	0.962	100.00%	1.000	15629	0.948
neos-957323	50.68	2	51.16	1.009	2	1.000	85.94	<i>1.696</i>	2	1.000	86.06	<i>1.698</i>	2	1.000
	273.76	22	229.61	0.839	22	1.000	110.39	0.403	5	0.227	110.59	0.404	5	0.227
	55.25	1	55.36	1.002	1	1.000	79.87	<i>1.446</i>	2	<i>2.000</i>	80.10	<i>1.450</i>	2	<i>2.000</i>
neos-960392	1233.09	54	1229.34	0.997	54	1.000	878.66	0.713	15	0.278	881.09	0.715	15	0.278
	1355.33	88	1354.38	0.999	88	1.000	1453.26	<i>1.072</i>	102	<i>1.159</i>	1439.63	<i>1.062</i>	102	<i>1.159</i>
	2253.06	109	2241.76	0.995	109	1.000	1336.08	0.593	403	<i>3.697</i>	1363.87	0.605	403	<i>3.697</i>
neos17	541.86	806050	1106.75	<i>2.043</i>	1455127	<i>1.805</i>	14.74	0.027	10823	0.013	25.95	0.048	22460	0.028
	449.30	626324	196.55	0.437	216740	0.346	8.75	0.019	5398	0.009	9.39	0.021	5644	0.009
	200.05	247116	4928.16	<i>24.635</i>	6947962	<i>28.116</i>	8.75	0.044	5985	0.024	9.84	0.049	6376	0.026
neos5	1530.99	5010106	1273.04	0.832	4146144	0.828	1193.25	0.779	3963527	0.791	1007.54	0.658	3292114	0.657
	1875.51	6735352	1890.98	1.008	6650076	0.987	1519.55	0.810	5189427	0.770	1234.24	0.658	4202380	0.624
	2039.35	7377371	1936.64	0.950	6917171	0.938	1552.44	0.761	5422762	0.735	1183.51	0.580	4100005	0.556
neos859080	∞	15987332	0.00%	1.000	15703476	0.982	0.53	0.000	875	0.000	0.50	0.000	792	0.000
	∞	16107026	0.00%	1.000	15732597	0.977	0.50	0.000	554	0.000	0.54	0.000	655	0.000
	∞	16561424	0.00%	1.000	16195339	0.978	0.57	0.000	600	0.000	0.55	0.000	565	0.000
neos8	1.94	1	1.95	1.005	1	1.000	1.91	0.985	1	1.000	1.95	1.005	1	1.000
	1.82	1	1.83	1.005	1	1.000	1.80	0.989	1	1.000	1.89	1.038	1	1.000
	1.80	1	1.80	1.000	1	1.000	1.82	1.011	1	1.000	1.83	1.017	1	1.000
net12	2640.96	3164	2699.23	1.022	3563	<i>1.126</i>	1806.86	0.684	1650	0.521	1842.42	0.698	1211	0.383
	1019.70	3717	875.61	0.859	3088	0.831	1570.29	<i>1.540</i>	1687	0.454	1631.28	<i>1.600</i>	1816	0.489
	4039.07	4690	2087.97	0.517	4963	<i>1.058</i>	954.82	0.236	2731	0.582	1561.43	0.387	1695	0.361
netdiversion	853.05	43	901.21	<i>1.056</i>	43	1.000	894.09	1.048	43	1.000	848.00	0.994	43	1.000
	899.72	47	899.25	0.999	47	1.000	2374.72	<i>2.639</i>	88	<i>1.872</i>	2364.82	<i>2.628</i>	88	<i>1.872</i>
	1143.57	27	1370.90	<i>1.199</i>	58	<i>2.148</i>	1716.75	<i>1.501</i>	51	<i>1.889</i>	1087.12	0.951	27	1.000
nexp-150-20-8-5	0.75%	20022	0.00%	1.000	14956	0.747	4440.55	0.617	9628	0.481	3539.59	0.492	5786	0.289
	2624.56	5582	2712.74	1.034	6896	<i>1.235</i>	3420.50	<i>1.303</i>	6115	<i>1.095</i>	3635.13	<i>1.385</i>	7166	<i>1.284</i>

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	2245.93	4565	3428.03	<i>1.526</i>	10097	<i>2.212</i>	5386.25	<i>2.398</i>	10647	<i>2.332</i>	0.83%	3.206	13054	2.860
ns1116954	∞	49	∞	1.000	54	1.102	∞	1.000	41	0.837	∞	1.000	32	0.653
	∞	52	∞	1.000	46	0.885	∞	1.000	32	0.615	∞	1.000	57	1.096
	∞	66	∞	1.000	66	1.000	∞	1.000	72	1.091	∞	1.000	75	1.136
ns1208400	1325.08	10259	744.51	0.562	3153	0.307	1818.68	<i>1.373</i>	4814	0.469	419.49	0.317	2004	0.195
	2649.91	5713	2012.44	0.759	18219	<i>3.189</i>	969.97	0.366	2481	0.434	683.06	0.258	2339	0.409
	2961.80	8352	1275.03	0.430	4061	0.486	1789.77	0.604	7679	0.919	1074.09	0.363	2315	0.277
ns1644855	2955.01	14	3271.29	<i>1.107</i>	14	1.000	0.00%	2.437	77	5.500	7.37%	2.437	36	2.571
	2058.74	1	1530.45	0.743	1	1.000	0.00%	3.497	60	60.000	7.37%	3.497	79	79.000
	982.60	1	1015.27	1.033	1	1.000	973.54	0.991	1	1.000	974.47	0.992	1	1.000
ns1760995	58.41%	1	58.41%	1.000	1	1.000	58.41%	1.000	1	1.000	58.41%	1.000	1	1.000
	71.46%	1	71.46%	1.000	1	1.000	71.46%	1.000	1	1.000	71.46%	1.000	1	1.000
	48.93%	1	48.93%	1.000	1	1.000	49.34%	1.000	1	1.000	48.93%	1.000	1	1.000
ns1830653	250.48	11010	169.53	0.677	9714	0.882	231.80	0.925	13180	<i>1.197</i>	287.45	<i>1.148</i>	14558	<i>1.322</i>
	214.45	10080	191.04	0.891	7290	0.723	136.63	0.637	6054	0.601	134.33	0.626	7527	0.747
	229.69	11146	123.71	0.539	5660	0.508	153.90	0.670	9327	0.837	148.24	0.645	7267	0.652
ns1952667	1171.28	20047	0.00%	6.147	67996	3.392	1170.98	1.000	5921	0.295	∞	6.147	52208	2.604
	6250.77	62041	5036.79	0.806	57160	0.921	0.00%	1.152	63181	1.018	1392.38	0.223	9508	0.153
	∞	83514	0.00%	1.000	87894	1.052	768.05	0.107	3203	0.038	968.90	0.135	4900	0.059
nu25-pr12	6.01	97	6.29	1.047	97	1.000	5.30	0.882	53	0.546	5.36	0.892	53	0.546
	6.86	63	7.19	1.048	65	1.032	6.02	0.878	66	1.048	6.11	0.891	66	1.048
	6.09	14	6.33	1.039	26	<i>1.857</i>	6.00	0.985	16	<i>1.143</i>	6.05	0.993	16	<i>1.143</i>
nursesched-medium-hint03	4946.81%	1648	1453.90%	1.000	1442	0.875	2123.61%	1.000	1421	0.862	1657.78%	1.000	1100	0.667
	1030.86%	1061	1383.83%	1.000	1228	1.157	776.84%	1.000	1371	1.292	3021.25%	1.000	2050	1.932
	298.27%	1435	620.98%	1.000	959	0.668	437.46%	1.000	1287	0.897	1077.84%	1.000	1121	0.781
nursesched-sprint02	201.19	509	203.92	1.014	553	<i>1.086</i>	140.76	0.700	378	0.743	142.08	0.706	370	0.727
	76.96	236	77.30	1.004	236	1.000	85.08	<i>1.106</i>	409	<i>1.733</i>	85.18	<i>1.107</i>	409	<i>1.733</i>
	59.67	95	59.82	1.003	95	1.000	67.53	<i>1.132</i>	222	<i>2.337</i>	67.71	<i>1.135</i>	222	<i>2.337</i>
nw04	34.11	7	37.53	<i>1.100</i>	6	0.857	38.28	<i>1.122</i>	10	<i>1.429</i>	37.93	<i>1.112</i>	6	0.857

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	26.14	4	31.08	<i>1.189</i>	5	<i>1.250</i>	26.14	1.000	4	1.000	31.39	<i>1.201</i>	5	<i>1.250</i>
	31.72	6	35.19	<i>1.109</i>	6	1.000	32.08	1.011	6	1.000	35.16	<i>1.108</i>	6	1.000
opm2-z10-s4	27.22%	904	26.97%	1.000	904	1.000	27.22%	1.000	1081	1.196	24.70%	1.000	1000	1.106
	26.34%	621	27.07%	1.000	619	0.997	26.34%	1.000	620	0.998	27.76%	1.000	586	0.944
	36.42%	1081	24.75%	1.000	972	0.899	32.55%	1.000	1165	1.078	26.96%	1.000	1015	0.939
p200x1188c	3.56	2	3.48	0.978	2	1.000	3.55	0.997	2	1.000	3.53	0.992	2	1.000
	4.00	3	4.00	1.000	3	1.000	4.08	1.020	4	<i>1.333</i>	3.96	0.990	3	1.000
	3.60	2	3.57	0.992	2	1.000	3.62	1.006	2	1.000	3.62	1.006	2	1.000
peg-solitaire-a3	∞	3925	∞	1.000	3933	1.002	∞	1.000	5443	1.387	∞	1.000	5752	1.465
	∞	7301	∞	1.000	7171	0.982	∞	1.000	3107	0.426	∞	1.000	3557	0.487
	∞	4215	∞	1.000	4213	1.000	∞	1.000	4410	1.046	∞	1.000	3969	0.942
pg5_34	1126.04	143283	1239.19	<i>1.100</i>	149528	1.044	1259.57	<i>1.119</i>	157415	<i>1.099</i>	1173.22	1.042	148717	1.038
	1182.23	154044	1146.23	0.970	143927	0.934	1253.87	<i>1.061</i>	169115	<i>1.098</i>	1134.07	0.959	144543	0.938
	1340.20	158399	1672.40	<i>1.248</i>	201264	<i>1.271</i>	1778.08	<i>1.327</i>	195261	<i>1.233</i>	1085.15	0.810	121673	0.768
pg	105.83	2467	117.28	<i>1.108</i>	3921	<i>1.589</i>	107.89	1.019	2467	1.000	101.85	0.962	2687	<i>1.089</i>
	104.92	1059	85.91	0.819	1372	<i>1.296</i>	106.33	1.013	1059	1.000	86.23	0.822	1372	<i>1.296</i>
	111.36	1127	106.75	0.959	2311	<i>2.051</i>	112.91	1.014	1127	1.000	107.44	0.965	2311	<i>2.051</i>
physiciansched3-3	∞	304	∞	1.000	364	1.197	∞	1.000	232	0.763	∞	1.000	415	1.365
	∞	723	∞	1.000	706	0.976	∞	1.000	161	0.223	∞	1.000	313	0.433
	∞	136	∞	1.000	146	1.074	∞	1.000	325	2.390	∞	1.000	361	2.654
physiciansched6-2	201.15	1019	228.21	<i>1.135</i>	927	0.910	149.40	0.743	661	0.649	124.81	0.620	377	0.370
	335.55	1031	165.12	0.492	159	0.154	3785.01	<i>11.280</i>	756	0.733	462.02	<i>1.377</i>	2804	<i>2.720</i>
	45.04	1	44.88	0.996	1	1.000	44.69	0.992	1	1.000	44.74	0.993	1	1.000
piperout-08	867.40	161	1107.65	<i>1.277</i>	201	<i>1.248</i>	1053.28	<i>1.214</i>	316	<i>1.963</i>	797.03	0.919	130	0.807
	674.29	2169	589.39	0.874	409	0.189	626.88	0.930	797	0.367	606.54	0.900	552	0.254
	1096.60	1093	1152.90	<i>1.051</i>	926	0.847	664.35	0.606	123	0.113	923.85	0.842	596	0.545
piperout-27	140.65	2	140.54	0.999	2	1.000	140.31	0.998	2	1.000	140.11	0.996	2	1.000
	708.74	1201	224.78	0.317	475	0.396	428.30	0.604	753	0.627	275.91	0.389	566	0.471
	252.43	131	322.96	<i>1.279</i>	81	0.618	254.43	1.008	125	0.954	332.32	<i>1.316</i>	72	0.550

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
pk1	108.10	307068	120.53	<i>1.115</i>	346969	<i>1.130</i>	105.74	0.978	302166	0.984	107.55	0.995	301100	0.981
	114.56	340000	105.97	0.925	324036	0.953	121.02	<i>1.056</i>	355700	1.046	109.16	0.953	317026	0.932
	105.07	313662	109.87	1.046	322736	1.029	108.50	1.033	319989	1.020	112.34	<i>1.069</i>	328715	1.048
proteindesign121hz512p9	7.04%	711	12.82%	1.000	1105	1.554	11.56%	1.000	566	0.796	9.60%	1.000	591	0.831
	94.35%	30	13.92%	1.000	30	1.000	94.35%	1.000	435	14.500	7.94%	1.000	440	14.667
	19.25%	727	26.02%	1.000	929	1.278	23.91%	1.000	593	0.816	26.02%	1.000	593	0.816
proteindesign122trx11p8	1.98%	4	1.82%	1.000	4	1.000	1.91%	1.000	126	31.500	1.95%	1.000	3	0.750
	2.03%	100	1.99%	1.000	36	0.360	1.90%	1.000	4	0.040	1.91%	1.000	8	0.080
	1.91%	3	1.86%	1.000	4	1.333	1.94%	1.000	4	1.333	1.93%	1.000	17	5.667
qap10	86.95	3	87.28	1.004	3	1.000	88.00	1.012	3	1.000	87.99	1.012	3	1.000
	101.05	3	101.22	1.002	3	1.000	112.08	<i>1.109</i>	5	<i>1.667</i>	111.82	<i>1.107</i>	5	<i>1.667</i>
	175.11	14	175.10	1.000	14	1.000	197.20	<i>1.126</i>	15	<i>1.071</i>	197.87	<i>1.130</i>	15	<i>1.071</i>
radiationm18-12-05	7.43%	562171	5.59%	1.000	515540	0.917	12.99%	1.000	461442	0.821	12.99%	1.000	479812	0.853
	20.42%	501574	7.44%	1.000	397542	0.793	12.99%	1.000	637161	1.270	0.05%	1.000	750150	1.496
	13.00%	650099	0.04%	1.000	504948	0.777	5.60%	1.000	511409	0.787	1.89%	1.000	551080	0.848
radiationm40-10-02	29.91%	62981	27.84%	1.000	58593	0.930	53.62%	1.000	86978	1.381	67.02%	1.000	53316	0.847
	38.16%	67121	100.01%	1.000	103154	1.537	19.60%	1.000	48285	0.719	57.74%	1.000	27109	0.404
	37.12%	100900	43.31%	1.000	68901	0.683	21.66%	1.000	32312	0.320	22.69%	1.000	99008	0.981
rail01	2.42%	103	3.14%	1.000	204	1.981	2.95%	1.000	203	1.971	2.74%	1.000	200	1.942
	12.05%	100	8.83%	1.000	135	1.350	6.70%	1.000	208	2.080	25.21%	1.000	182	1.820
	6.73%	204	∞	1.000	187	0.917	6.73%	1.000	50	0.245	7.32%	1.000	183	0.897
rail02	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
rail507	160.45	671	165.79	1.033	671	1.000	152.03	0.948	623	0.928	156.67	0.976	623	0.928
	182.35	825	185.49	1.017	841	1.019	178.18	0.977	807	0.978	180.04	0.987	783	0.949
	185.01	737	183.61	0.992	733	0.995	188.09	1.017	783	<i>1.062</i>	193.43	1.046	771	1.046
ran14x18-disj-8	1734.22	641683	1540.83	0.888	578285	0.901	1734.57	1.000	649217	1.012	2109.62	<i>1.216</i>	656920	1.024
	1268.41	472072	1387.32	<i>1.094</i>	451943	0.957	1545.12	<i>1.218</i>	411381	0.871	1785.31	<i>1.408</i>	564900	<i>1.197</i>

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	1758.43	721480	1832.39	1.042	676165	0.937	1742.65	0.991	650929	0.902	1694.59	0.964	593570	0.823
rd-rplusc-21	≥ 10000%	290601	∞	1.000	365951	1.259	∞	1.000	684731	2.356	≥ 10000%	1.000	484631	1.668
	∞	352151	≥ 10000%	1.000	303110	0.861	∞	1.000	640758	1.820	≥ 10000%	1.000	737139	2.093
	∞	339770	≥ 10000%	1.000	292219	0.860	∞	1.000	719051	2.116	≥ 10000%	1.000	763715	2.248
reblock115	0.19%	1292105	0.08%	1.000	1121470	0.868	0.26%	1.000	849098	0.657	4390.48	0.610	704168	0.545
	0.19%	927963	0.13%	1.000	947601	1.021	0.19%	1.000	1243005	1.339	6605.46	0.917	882785	0.951
	0.25%	829733	0.14%	1.000	909121	1.096	0.18%	1.000	854950	1.030	5894.68	0.819	832788	1.004
rmatr100-p10	153.43	787	155.34	1.012	787	1.000	166.59	<i>1.086</i>	809	1.028	166.48	<i>1.085</i>	809	1.028
	161.02	812	165.33	1.027	812	1.000	161.08	1.000	822	1.012	162.84	1.011	822	1.012
	157.46	795	157.99	1.003	795	1.000	158.36	1.006	783	0.985	160.62	1.020	827	1.040
rmatr200-p5	21.27%	404	22.40%	1.000	400	0.990	21.27%	1.000	420	1.040	22.40%	1.000	421	1.042
	19.25%	429	19.56%	1.000	429	1.000	19.25%	1.000	431	1.005	19.56%	1.000	423	0.986
	21.58%	369	21.08%	1.000	369	1.000	21.58%	1.000	395	1.070	21.08%	1.000	403	1.092
rocl-4-11	1462.33	27778	1677.53	<i>1.147</i>	34270	<i>1.234</i>	658.34	0.450	12460	0.449	638.21	0.436	12970	0.467
	953.34	15737	995.45	1.044	15604	0.992	906.63	0.951	14955	0.950	1001.80	<i>1.051</i>	17602	<i>1.119</i>
	686.49	12985	703.24	1.024	13366	1.029	483.27	0.704	8950	0.689	498.07	0.726	9550	0.735
rocII-5-11	153.78%	3278	108.23%	1.000	3225	0.984	108.85%	1.000	3338	1.018	108.52%	1.000	3399	1.037
	109.17%	2981	108.84%	1.000	2796	0.938	153.85%	1.000	2754	0.924	109.87%	1.000	2764	0.927
	109.73%	3581	77.57%	1.000	3567	0.996	153.96%	1.000	2955	0.825	109.11%	1.000	2522	0.704
rococoB10-011000	14.19%	154404	13.62%	1.000	155341	1.006	14.38%	1.000	158057	1.024	13.71%	1.000	151103	0.979
	16.15%	157983	15.23%	1.000	163365	1.034	17.58%	1.000	156695	0.992	15.09%	1.000	143253	0.907
	13.34%	137952	12.65%	1.000	157492	1.142	14.89%	1.000	160008	1.160	12.80%	1.000	153839	1.115
rococoC10-001000	747.13	47028	1007.88	<i>1.349</i>	63164	<i>1.343</i>	1405.24	<i>1.881</i>	91581	<i>1.947</i>	765.76	1.025	53303	<i>1.133</i>
	706.86	64338	787.50	<i>1.114</i>	51175	0.795	726.91	1.028	54559	0.848	851.99	<i>1.205</i>	63090	0.981
	1271.19	115469	1345.55	<i>1.058</i>	125085	<i>1.083</i>	1454.78	<i>1.144</i>	105955	0.918	1626.91	<i>1.280</i>	162527	<i>1.408</i>
roi2alpha3n4	1512.25	15007	1606.73	<i>1.062</i>	15325	1.021	1638.42	<i>1.083</i>	14967	0.997	1424.80	0.942	12529	0.835
	1960.77	18735	1941.17	0.990	17209	0.919	2268.33	<i>1.157</i>	21011	<i>1.121</i>	1940.46	0.990	17446	0.931
	1497.10	13689	1533.64	1.024	13689	1.000	1479.60	0.988	13303	0.972	1486.54	0.993	13303	0.972
roi5alpha10n8	37.63%	5830	34.26%	1.000	5642	0.968	34.00%	1.000	5450	0.935	35.37%	1.000	5989	1.027

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Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	36.08%	5044	33.05%	1.000	6515	1.292	36.27%	1.000	6084	1.206	40.36%	1.000	6346	1.258
	32.13%	7542	32.06%	1.000	6705	0.889	39.79%	1.000	6951	0.922	32.14%	1.000	6789	0.900
roll3000	52.27	2881	46.99	0.899	3349	<i>1.162</i>	32.73	0.626	1335	0.463	36.86	0.705	1986	0.689
	61.33	3675	46.03	0.751	2170	0.590	38.03	0.620	1831	0.498	38.91	0.634	2149	0.585
	37.85	2629	41.29	<i>1.091</i>	1582	0.602	79.32	<i>2.096</i>	5947	<i>2.262</i>	60.26	<i>1.592</i>	3736	<i>1.421</i>
s100	3.09%	21	5.53%	1.000	21	1.000	3.09%	1.000	20	0.952	5.53%	1.000	20	0.952
	3.58%	32	29.84%	1.000	32	1.000	3.58%	1.000	17	0.531	29.84%	1.000	17	0.531
	1.06%	43	1.06%	1.000	43	1.000	1.06%	1.000	22	0.512	1.06%	1.000	22	0.512
s250r10	0.27%	83749	0.00%	1.000	23252	0.278	4304.43	0.598	45624	0.545	0.28%	1.000	22897	0.273
	6570.42	54164	0.00%	1.096	62268	1.150	6899.93	<i>1.050</i>	61772	<i>1.140</i>	6366.45	0.969	45426	0.839
	0.19%	45392	0.23%	1.000	34660	0.764	0.23%	1.000	34214	0.754	0.23%	1.000	31811	0.701
satellites2-40	∞	61	∞	1.000	65	1.066	∞	1.000	20	0.328	∞	1.000	19	0.311
	∞	5	∞	1.000	5	1.000	∞	1.000	4	0.800	∞	1.000	4	0.800
	∞	29	70.59%	1.000	29	1.000	∞	1.000	33	1.138	70.59%	1.000	33	1.138
satellites2-60-fs	∞	36	∞	1.000	47	1.306	∞	1.000	162	4.500	∞	1.000	33	0.917
	∞	23	∞	1.000	34	1.478	∞	1.000	39	1.696	∞	1.000	137	5.957
	∞	27	∞	1.000	236	8.741	123.08%	1.000	28	1.037	∞	1.000	28	1.037
savsched1	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
sct2	0.04%	954820	0.03%	1.000	634745	0.665	0.05%	1.000	888872	0.931	0.03%	1.000	600226	0.629
	0.03%	754716	0.05%	1.000	1052466	1.395	0.03%	1.000	573672	0.760	0.05%	1.000	659682	0.874
	0.05%	987702	0.03%	1.000	876985	0.888	0.05%	1.000	1113822	1.128	0.03%	1.000	994927	1.007
seymour1	72.90	1334	86.90	<i>1.192</i>	1624	<i>1.217</i>	77.19	<i>1.059</i>	1274	0.955	90.45	<i>1.241</i>	1627	<i>1.220</i>
	63.65	1541	64.87	1.019	1498	0.972	68.14	<i>1.071</i>	1473	0.956	67.90	<i>1.067</i>	1466	0.951
	70.25	1682	66.94	0.953	1597	0.949	73.58	1.047	1685	1.002	72.05	1.026	1822	<i>1.083</i>
seymour	0.72%	184607	0.71%	1.000	184455	0.999	0.72%	1.000	212029	1.149	0.66%	1.000	242500	1.314
	0.70%	218467	0.75%	1.000	237161	1.086	0.67%	1.000	182768	0.837	0.68%	1.000	222209	1.017
	0.66%	244475	0.68%	1.000	263532	1.078	0.64%	1.000	257621	1.054	0.74%	1.000	225373	0.922

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
sing326	0.28%	7428	0.21%	1.000	7300	0.983	0.28%	1.000	11141	1.500	0.15%	1.000	11755	1.583
	0.17%	7972	0.14%	1.000	4305	0.540	0.21%	1.000	7015	0.880	0.17%	1.000	8196	1.028
	0.13%	7276	0.31%	1.000	7051	0.969	0.13%	1.000	8191	1.126	0.32%	1.000	7997	1.099
sing44	0.34%	7528	0.50%	1.000	7387	0.981	0.35%	1.000	8051	1.069	0.45%	1.000	5531	0.735
	0.17%	5935	0.19%	1.000	5781	0.974	0.17%	1.000	7467	1.258	0.19%	1.000	7349	1.238
	0.25%	2788	0.27%	1.000	2746	0.985	0.25%	1.000	2361	0.847	0.27%	1.000	2267	0.813
snp-02-004-104	0.00%	9410	0.00%	1.000	7582	0.806	0.00%	1.000	13298	1.413	0.00%	1.000	14561	1.547
	0.00%	18306	0.00%	1.000	16194	0.885	0.00%	1.000	18299	1.000	0.00%	1.000	18040	0.985
	0.00%	19513	0.00%	1.000	18196	0.933	0.00%	1.000	20219	1.036	0.00%	1.000	19680	1.009
sorrell3	27.41%	15430	43.81%	1.000	15364	0.996	27.41%	1.000	41057	2.661	43.81%	1.000	41208	2.671
	19.33%	14447	35.61%	1.000	15273	1.057	19.26%	1.000	39273	2.718	35.59%	1.000	39514	2.735
	19.14%	11518	19.11%	1.000	11504	0.999	19.14%	1.000	8978	0.779	19.11%	1.000	8801	0.764
sp150x300d	4.07	3843	4.20	1.032	3843	1.000	3.98	0.978	3472	0.903	3.96	0.973	3472	0.903
	5.59	5283	5.71	1.021	5283	1.000	3.10	0.555	2569	0.486	3.12	0.558	2569	0.486
	1.16	825	1.15	0.991	825	1.000	1.34	<i>1.155</i>	848	1.028	1.29	<i>1.112</i>	848	1.028
sp97ar	0.86%	26468	0.95%	1.000	19967	0.754	1.18%	1.000	16911	0.639	0.98%	1.000	15747	0.595
	1.21%	22185	0.99%	1.000	21650	0.976	1.19%	1.000	28768	1.297	1.02%	1.000	22961	1.035
	1.57%	27393	1.51%	1.000	25908	0.946	1.94%	1.000	35662	1.302	1.53%	1.000	24828	0.906
sp98ar	0.55%	55288	0.80%	1.000	50893	0.921	1.07%	1.000	70090	1.268	1.43%	1.000	71746	1.298
	0.50%	43725	0.75%	1.000	60167	1.376	0.63%	1.000	57589	1.317	0.48%	1.000	67060	1.534
	0.63%	63020	1.26%	1.000	73947	1.173	0.58%	1.000	76587	1.215	0.98%	1.000	71271	1.131
splice1k1	6524.11	1136	307.70%	1.104	1025	0.902	304.48%	1.104	1365	1.202	309.20%	1.104	513	0.452
	308.22%	181	305.76%	1.000	687	3.796	306.15%	1.000	888	4.906	376.10%	1.000	594	3.282
	4825.07	381	0.00%	1.492	889	2.333	4823.00	1.000	580	<i>1.522</i>	358.74%	1.492	834	2.189
square41	80.44%	60	109.98%	1.000	60	1.000	80.44%	1.000	30	0.500	109.98%	1.000	30	0.500
	92.32%	21	92.32%	1.000	12	0.571	92.32%	1.000	9	0.429	89.32%	1.000	37	1.762
	78.32%	17	92.32%	1.000	17	1.000	78.32%	1.000	31	1.824	92.32%	1.000	28	1.647
square47	231.21%	4	231.21%	1.000	4	1.000	231.21%	1.000	4	1.000	231.21%	1.000	4	1.000
	231.21%	12	117.00%	1.000	12	1.000	231.21%	1.000	13	1.083	117.00%	1.000	13	1.083

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
	151.26%	5	231.21%	1.000	5	1.000	151.26%	1.000	2	0.400	231.21%	1.000	1	0.200
supportcase10	813.36%	1	803.51%	1.000	1	1.000	813.36%	1.000	1	1.000	803.51%	1.000	1	1.000
	934.71%	1	989.07%	1.000	1	1.000	934.71%	1.000	1	1.000	989.07%	1.000	1	1.000
	476.90%	15	1054.36%	1.000	15	1.000	476.90%	1.000	1	0.067	1054.36%	1.000	1	0.067
supportcase12	1.36%	1410	1.31%	1.000	1413	1.002	1.22%	1.000	1434	1.017	1.31%	1.000	1463	1.038
	1.09%	1482	1.35%	1.000	1482	1.000	1.09%	1.000	2297	1.550	1.35%	1.000	2297	1.550
	1.17%	1356	1.13%	1.000	1346	0.993	1.17%	1.000	1181	0.871	1.30%	1.000	1505	1.110
supportcase18	5.96%	218901	3.84%	1.000	240308	1.098	3.84%	1.000	423514	1.935	3.84%	1.000	419350	1.916
	3.84%	314488	5.96%	1.000	310588	0.988	3.84%	1.000	173247	0.551	5.96%	1.000	237591	0.755
	3.84%	408888	3.84%	1.000	429055	1.049	5.96%	1.000	248417	0.608	3.84%	1.000	198815	0.486
supportcase19	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
	∞	1	∞	1.000	1	1.000	∞	1.000	1	1.000	∞	1.000	1	1.000
supportcase22	∞	51	∞	1.000	51	1.000	∞	1.000	51	1.000	∞	1.000	51	1.000
	∞	18	∞	1.000	18	1.000	∞	1.000	18	1.000	∞	1.000	18	1.000
	∞	66	∞	1.000	66	1.000	∞	1.000	66	1.000	∞	1.000	66	1.000
supportcase26	7.35%	8115772	6.78%	1.000	8417897	1.037	6.39%	1.000	7850135	0.967	8.94%	1.000	8135621	1.002
	3848.74	4970066	6504.62	<i>1.690</i>	8335546	<i>1.677</i>	2878.57	0.748	3631376	0.731	5238.22	<i>1.361</i>	6761735	<i>1.360</i>
	3833.68	4290344	4861.79	<i>1.268</i>	6229516	<i>1.452</i>	3369.62	0.879	3710979	0.865	4487.28	<i>1.170</i>	5497025	<i>1.281</i>
supportcase33	2909.49	29028	620.26	0.213	4319	0.149	726.92	0.250	5039	0.174	1598.38	0.549	12756	0.439
	6808.00	104552	921.34	0.135	8143	0.078	2587.40	0.380	14983	0.143	1600.98	0.235	7176	0.069
	1885.13	13657	6423.38	<i>3.407</i>	100498	<i>7.359</i>	2300.97	<i>1.221</i>	15069	<i>1.103</i>	682.16	0.362	3786	0.277
supportcase40	998.95	10137	913.72	0.915	8676	0.856	783.23	0.784	6335	0.625	786.50	0.787	6335	0.625
	1101.47	9647	1116.91	1.014	10003	1.037	890.01	0.808	7377	0.765	946.94	0.860	7991	0.828
	1120.16	11437	851.23	0.760	6856	0.599	789.34	0.705	6970	0.609	797.74	0.712	6970	0.609
supportcase42	0.17%	483736	0.38%	1.000	508591	1.051	0.16%	1.000	475045	0.982	0.38%	1.000	305571	0.632
	0.11%	373134	0.11%	1.000	497093	1.332	0.13%	1.000	522907	1.401	0.10%	1.000	380155	1.019
	0.25%	340848	0.51%	1.000	325417	0.955	0.32%	1.000	329921	0.968	0.35%	1.000	467610	1.372
supportcase6	8.59%	24612	8.85%	1.000	21058	0.856	8.75%	1.000	19919	0.809	9.13%	1.000	18980	0.771

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
supportcase7	9.57%	14957	8.97%	1.000	13831	0.925	9.51%	1.000	14324	0.958	8.41%	1.000	17726	1.185
	7.93%	32655	9.72%	1.000	28462	0.872	8.14%	1.000	18358	0.562	9.72%	1.000	17709	0.542
	177.71	88	178.05	1.002	88	1.000	180.55	1.016	59	0.670	179.98	1.013	59	0.670
swath1	191.37	47	191.68	1.002	45	0.957	191.66	1.002	47	1.000	193.62	1.012	45	0.957
	205.05	32	210.36	1.026	32	1.000	206.60	1.008	32	1.000	210.25	1.025	32	1.000
	12.81	304	20.92	<i>1.633</i>	351	<i>1.155</i>	16.14	<i>1.260</i>	319	1.049	21.09	<i>1.646</i>	281	0.924
swath3	13.87	451	18.91	<i>1.363</i>	451	1.000	14.10	1.017	257	0.570	17.34	<i>1.250</i>	245	0.543
	11.74	278	15.91	<i>1.355</i>	292	<i>1.050</i>	14.05	<i>1.197</i>	260	0.935	19.82	<i>1.688</i>	292	<i>1.050</i>
	112.15	17832	178.65	<i>1.593</i>	24564	<i>1.378</i>	204.18	<i>1.821</i>	31466	<i>1.765</i>	226.20	<i>2.017</i>	28316	<i>1.588</i>
tbfp-network	687.17	169323	701.79	1.021	139518	0.824	151.94	0.221	21468	0.127	182.91	0.266	21837	0.129
	645.63	170136	155.37	0.241	24161	0.142	265.56	0.411	52338	0.308	427.45	0.662	74192	0.436
	1556.06	90	1553.30	0.998	90	1.000	2338.83	<i>1.503</i>	574	<i>6.378</i>	2356.81	<i>1.515</i>	574	<i>6.378</i>
thor50dday	932.14	51	934.26	1.002	51	1.000	1695.18	<i>1.819</i>	71	<i>1.392</i>	1683.80	<i>1.806</i>	71	<i>1.392</i>
	1125.11	105	1128.84	1.003	105	1.000	1095.63	0.974	99	0.943	1088.57	0.968	99	0.943
	23.05%	102	23.30%	1.000	98	0.961	23.30%	1.000	95	0.931	23.30%	1.000	95	0.931
timtab1	21.49%	12	21.49%	1.000	12	1.000	21.49%	1.000	13	1.083	21.49%	1.000	12	1.000
	14.80%	34	14.80%	1.000	34	1.000	14.80%	1.000	32	0.941	14.80%	1.000	34	1.000
	86.61	71271	77.62	0.896	57256	0.803	62.47	0.721	51558	0.723	73.73	0.851	64175	0.900
tr12-30	101.95	90517	84.55	0.829	69808	0.771	83.32	0.817	69075	0.763	67.90	0.666	51540	0.569
	79.25	69505	85.22	<i>1.075</i>	70064	1.008	54.95	0.693	44058	0.634	70.92	0.895	55054	0.792
	788.90	550004	646.27	0.819	454361	0.826	873.86	<i>1.108</i>	593676	<i>1.079</i>	606.97	0.769	423661	0.770
traininstance2	433.39	328598	695.20	<i>1.604</i>	512264	<i>1.559</i>	517.81	<i>1.195</i>	375059	<i>1.141</i>	650.32	<i>1.501</i>	475420	<i>1.447</i>
	445.40	237285	411.44	0.924	237300	1.000	473.86	<i>1.064</i>	255026	<i>1.075</i>	397.52	0.893	213946	0.902
	∞	60374	≥ 10000%	1.000	58031	0.961	∞	1.000	52932	0.877	∞	1.000	67099	1.111
traininstance6	∞	41711	∞	1.000	62456	1.497	∞	1.000	60702	1.455	∞	1.000	52063	1.248
	≥ 10000%	75652	∞	1.000	71547	0.946	≥ 10000%	1.000	56732	0.750	6286.13%	1.000	73138	0.967
	651.06%	508702	617.72%	1.000	323370	0.636	714.57%	1.000	586788	1.154	634.16%	1.000	456248	0.897
traininstance6	754.81%	391905	705.98%	1.000	381081	0.972	564.90%	1.000	393074	1.003	626.92%	1.000	347529	0.887
	809.94%	386240	969.81%	1.000	440921	1.142	650.00%	1.000	305257	0.790	520.12%	1.000	454368	1.176

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Table 1: Detailed computational results on MIPLIB 2017 benchmark. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	nolpinf		dualproof				confgraph				combined			
	time	nodes	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q	time	time _Q	nodes	nodes _Q
trento1	0.53%	54335	0.11%	1.000	35868	0.660	0.50%	1.000	56381	1.038	0.07%	1.000	57766	1.063
	0.10%	57080	0.08%	1.000	35767	0.627	0.89%	1.000	74643	1.308	0.10%	1.000	51033	0.894
	0.10%	46635	2.44%	1.000	37088	0.795	0.10%	1.000	35614	0.764	1.67%	1.000	35013	0.751
triptim1	1111.72	8	1106.21	0.995	8	1.000	1105.54	0.994	8	1.000	1099.43	0.989	8	1.000
	748.87	7	748.16	0.999	7	1.000	749.64	1.001	7	1.000	747.73	0.998	7	1.000
	1062.27	8	1052.53	0.991	8	1.000	1064.29	1.002	8	1.000	1065.09	1.003	8	1.000
uccase12	0.00%	81491	0.00%	1.000	72235	0.886	0.00%	1.000	72861	0.894	0.00%	1.000	77800	0.955
	0.00%	88801	0.00%	1.000	94285	1.062	0.00%	1.000	62126	0.700	0.00%	1.000	91468	1.030
	0.00%	97614	0.00%	1.000	94512	0.968	0.00%	1.000	88923	0.911	0.00%	1.000	98605	1.010
uccase9	1.74%	633	3.64%	1.000	544	0.859	1.83%	1.000	624	0.986	1.98%	1.000	498	0.787
	6.65%	696	8.63%	1.000	1199	1.723	3.93%	1.000	1418	2.037	1.48%	1.000	1166	1.675
	2.28%	1052	3.69%	1.000	545	0.518	1.50%	1.000	865	0.822	2.82%	1.000	550	0.523
uct-subprob	1544.63	62572	1313.02	0.850	47486	0.759	1114.60	0.722	44339	0.709	1102.62	0.714	44339	0.709
	1948.75	76073	1592.47	0.817	60418	0.794	1786.03	0.917	70090	0.921	1631.60	0.837	59559	0.783
	1870.35	66057	1960.04	1.048	64485	0.976	2367.22	<i>1.266</i>	91988	<i>1.393</i>	2506.36	<i>1.340</i>	95674	<i>1.448</i>
unitcal_7	269.85	97	264.17	0.979	89	0.918	264.89	0.982	89	0.918	272.59	1.010	89	0.918
	302.06	225	306.36	1.014	225	1.000	295.28	0.978	176	0.782	298.12	0.987	180	0.800
	399.99	452	400.05	1.000	452	1.000	384.51	0.961	436	0.965	387.18	0.968	436	0.965
var-smallemary-m6j6	1.00%	567848	0.97%	1.000	562866	0.991	1.04%	1.000	583647	1.028	0.93%	1.000	568323	1.001
	6835.13	744694	0.83%	1.053	645910	0.867	1.05%	1.053	666841	0.895	0.87%	1.053	656232	0.881
	6793.08	692932	0.00%	1.060	753437	1.087	6080.41	0.895	668644	0.965	6729.45	0.991	683202	0.986
wachplan	12.50%	244098	0.00%	1.000	249191	1.021	2545.25	0.354	240736	0.986	2340.84	0.325	219938	0.901
	12.50%	213375	0.00%	1.000	205633	0.964	3287.69	0.457	297002	<i>1.392</i>	3419.67	0.475	302179	<i>1.416</i>
	12.50%	197319	0.00%	1.000	250301	1.269	2155.54	0.299	174423	0.884	2343.95	0.326	198054	1.004

Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
30n20b8	149.73	171	149.68	1.000	171	1.000	0	0
	622.50	1999	623.60	1.002	1999	1.000	0	0
	693.71	3499	693.56	1.000	3499	1.000	0	0
50v-10	1.32%	822628	1.69%	1.000	829421	1.008	150211	29360749
	1.43%	957507	1.15%	1.000	867997	0.907	175089	32916103
	1.18%	951374	1.37%	1.000	833134	0.876	160740	30814917
CMS750_4	185.83	2028	185.73	0.999	2028	1.000	0	0
	370.78	3254	370.72	1.000	3254	1.000	0	0
	470.44	13518	473.12	1.006	13518	1.000	0	0
academictimetables _{small}	∞	2305	∞	1.000	2315	1.004	0	0
	∞	3517	∞	1.000	3505	0.997	0	0
	∞	2681	∞	1.000	2681	1.000	0	0
air05	40.03	648	40.07	1.001	648	1.000	0	0
	36.49	716	36.54	1.001	716	1.000	0	0
	30.27	282	30.22	0.998	282	1.000	0	0
app1-1	3.53	2	3.53	1.000	2	1.000	0	0
	4.89	3	4.94	1.010	3	1.000	0	0
	4.22	6	4.17	0.988	6	1.000	0	0
app1-2	642.51	33	642.80	1.000	33	1.000	0	0
	791.40	20	789.47	0.998	20	1.000	0	0
	620.27	20	618.36	0.997	20	1.000	0	0
assign1-5-8	4.73%	5752207	4.74%	1.000	5736357	0.997	0	0
	4.54%	6817803	4.54%	1.000	6813236	0.999	0	0
	4.79%	6376065	4.80%	1.000	6333262	0.993	0	0
atlanta-ip	3.60%	18583	3.60%	1.000	18533	0.997	184	4764
	3.83%	21126	3.81%	1.000	21153	1.001	239	6541
	4.27%	30903	4.27%	1.000	30903	1.000	282	8068
b1cls1	17.39%	51191	17.13%	1.000	35962	0.703	3659	2259708
	18.78%	19248	18.36%	1.000	21112	1.097	2327	1474442

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	16.14%	18968	17.69%	1.000	18673	0.984	1971	1200355
bab2	1.29%	3460	1.29%	1.000	3473	1.004	0	0
	1.10%	3382	2.44%	1.000	3262	0.965	0	0
	∞	2003	∞	1.000	1981	0.989	0	0
bab6	0.58%	4933	0.58%	1.000	4790	0.971	0	0
	1.14%	3183	1.14%	1.000	3258	1.024	0	0
	1.94%	4744	1.94%	1.000	4779	1.007	0	0
beasleyC3	31.57	83	31.56	1.000	83	1.000	2	323
	17.36	2	17.35	0.999	2	1.000	2	237
	47.26	429	47.20	0.999	453	<i>1.056</i>	173	32884
binkar10_1	37.92	2735	31.34	0.826	2560	0.936	852	689009
	30.65	2389	29.22	0.953	2246	0.940	888	717367
	29.69	2264	28.71	0.967	2509	<i>1.108</i>	961	775238
blp-ar98	0.27%	237252	0.27%	1.000	238231	1.004	0	0
	0.33%	207970	0.33%	1.000	207500	0.998	0	0
	0.32%	226917	0.32%	1.000	229423	1.011	0	0
blp-ic98	1.38%	308981	1.38%	1.000	304769	0.986	0	0
	2.41%	253422	2.41%	1.000	254061	1.003	0	0
	2.11%	278852	2.11%	1.000	278188	0.998	0	0
bnatt400	970.86	6821	970.91	1.000	6821	1.000	0	0
	1103.87	6346	1105.02	1.001	6346	1.000	0	0
	743.49	5500	745.15	1.002	5500	1.000	0	0
bnatt500	4364.76	29526	4368.17	1.001	29526	1.000	0	0
	6333.70	38962	6333.06	1.000	38962	1.000	0	0
	4967.46	29029	4996.90	1.006	29029	1.000	0	0
bppc4-08	1.92%	797858	1.92%	1.000	797503	1.000	0	0
	1.92%	934751	1.92%	1.000	938927	1.004	0	0
	1.92%	791517	1.92%	1.000	793397	1.002	0	0
brazil3	3378.81	2570	3360.46	0.995	2570	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	4235.60	2347	4252.19	1.004	2347	1.000	0	0
	3799.45	3302	3785.08	0.996	3302	1.000	0	0
buildingenergy	0.13%	96	0.13%	1.000	96	1.000	156	2885535
	0.15%	85	0.15%	1.000	85	1.000	247	4520721
	0.13%	13	0.13%	1.000	12	0.923	0	0
cbs-cta	40.10	1	40.27	1.004	1	1.000	0	0
	313.95	31	314.10	1.000	31	1.000	0	0
	35.69	1	35.77	1.002	1	1.000	0	0
chromaticindex1024-7	33.33%	968	33.33%	1.000	964	0.996	0	0
	33.33%	1176	33.33%	1.000	1171	0.996	0	0
	6469.26	757	6429.72	0.994	757	1.000	0	0
chromaticindex512-7	1180.40	361	1172.37	0.993	361	1.000	0	0
	3704.87	3133	3689.97	0.996	3133	1.000	0	0
	33.33%	40706	33.33%	1.000	40579	0.997	0	0
cmflsp50-24-8-8	4.18%	34634	3.98%	1.000	36090	1.042	2797	23254495
	1.60%	59551	1.99%	1.000	85475	1.435	5780	50843548
	2.08%	51068	4.86%	1.000	37790	0.740	4047	36193400
co-100	1.75%	53846	1.74%	1.000	54008	1.003	0	0
	91.88%	6972	91.77%	1.000	7012	1.006	0	0
	3.23%	10521	3.18%	1.000	10565	1.004	0	0
cod105	47.41%	7367	47.57%	1.000	7261	0.986	0	0
	48.07%	6763	48.00%	1.000	6829	1.010	0	0
	48.07%	6601	48.07%	1.000	6601	1.000	0	0
comp07-2idx	966.67%	4003	966.67%	1.000	3996	0.998	0	0
	2800.00%	747	2800.00%	1.000	743	0.995	0	0
	1716.67%	1416	1716.67%	1.000	1449	1.023	0	0
comp21-2idx	247.43%	10926	247.43%	1.000	10931	1.000	0	0
	195.50%	9843	195.50%	1.000	9835	0.999	0	0
	248.72%	11698	248.72%	1.000	11711	1.001	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
cost266-UUE	6047.83	463222	4923.15	0.814	375684	0.811	21812	44508041
	4081.74	333136	3728.83	0.914	294630	0.884	21176	42865500
	5401.04	414623	4067.72	0.753	306702	0.740	20643	41905352
cryptanalysisiskb128n5obj14	∞	110	∞	1.000	110	1.000	0	0
	∞	59	∞	1.000	59	1.000	0	0
	∞	91	∞	1.000	90	0.989	0	0
cryptanalysisiskb128n5obj16	∞	104	∞	1.000	104	1.000	0	0
	2798.71	37	2790.65	0.997	37	1.000	0	0
	∞	97	∞	1.000	97	1.000	0	0
csched007	2327.45	187288	2327.77	1.000	187288	1.000	0	0
	2618.01	220934	2613.95	0.998	220934	1.000	0	0
	3392.15	247755	3393.08	1.000	247755	1.000	0	0
csched008	2.81%	456376	2.81%	1.000	455870	0.999	0	0
	2.33%	690662	2.33%	1.000	694455	1.005	0	0
	5758.73	546382	5772.95	1.002	546382	1.000	0	0
cvs16r128-89	23.28%	67922	23.28%	1.000	67980	1.001	0	0
	22.61%	34961	22.61%	1.000	34973	1.000	0	0
	23.00%	47504	23.01%	1.000	47219	0.994	0	0
dano3_3	144.71	12	143.70	0.993	10	0.833	10	92385
	142.99	12	142.65	0.998	14	<i>1.167</i>	8	72422
	124.91	17	124.56	0.997	17	1.000	8	77472
dano3_5	638.53	276	635.04	0.995	276	1.000	171	1651798
	286.66	166	285.81	0.997	159	0.958	141	1364112
	287.06	140	285.94	0.996	140	1.000	55	532225
decomp2	2.45	1	2.39	0.976	1	1.000	0	0
	2.42	1	2.42	1.000	1	1.000	0	0
	2.46	1	2.50	1.016	1	1.000	0	0
drayage-100-23	16.51	32	16.43	0.995	32	1.000	0	0
	19.54	48	19.52	0.999	48	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	13.52	16	13.50	0.999	16	1.000	0	0
drayage-25-23	0.07%	774368	0.07%	1.000	720814	0.931	13184	17492
	0.07%	791377	0.07%	1.000	790871	0.999	32335	46243
	6981.60	552534	6941.84	0.994	552534	1.000	16072	21359
dws008-01	44.26%	137675	44.84%	1.000	144766	1.052	5558	15334528
	48.22%	151938	44.28%	1.000	157395	1.036	6508	18130986
	57.03%	150243	52.63%	1.000	153108	1.019	6985	19693643
eil33-2	80.75	343	81.20	1.006	343	1.000	0	0
	104.17	395	101.92	0.978	395	1.000	0	0
	105.69	541	105.72	1.000	541	1.000	0	0
eilA101-2	20.05%	11127	20.05%	1.000	11110	0.998	0	0
	13.19%	12812	13.20%	1.000	12688	0.990	0	0
	13.37%	13480	13.37%	1.000	13480	1.000	0	0
enlight_hard	0.50	1	0.50	1.000	1	1.000	0	0
	0.50	1	0.50	1.000	1	1.000	0	0
	0.50	1	0.50	1.000	1	1.000	0	0
ex10	493.40	1	493.80	1.001	1	1.000	0	0
	495.40	1	497.94	1.005	1	1.000	0	0
	581.58	1	581.12	0.999	1	1.000	0	0
ex9	29.02	1	27.98	0.964	1	1.000	0	0
	27.64	1	27.30	0.988	1	1.000	0	0
	27.67	1	27.02	0.977	1	1.000	0	0
exp-1-500-5-5	2.31	1	2.28	0.987	1	1.000	1	730
	2.22	1	2.22	1.000	1	1.000	1	730
	2.23	1	2.21	0.991	1	1.000	1	730
fast0507	323.39	1284	322.23	0.996	1284	1.000	0	0
	281.71	1223	280.17	0.995	1223	1.000	0	0
	366.66	1711	365.44	0.997	1711	1.000	0	0
fastxgemm-n2r6s0t2	5456.64	1254092	4702.82	0.862	1118937	0.892	30827	696948

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	2297.35	544145	4017.11	<i>1.749</i>	1012967	<i>1.862</i>	23016	435688
	2695.76	647594	3129.08	<i>1.161</i>	769500	<i>1.188</i>	15845	348392
fhnw-binpack4-48	∞	4024296	∞	1.000	4040499	1.004	0	0
	∞	3523510	∞	1.000	3525851	1.001	0	0
	∞	3420581	∞	1.000	3413924	0.998	0	0
fhnw-binpack4-4	∞	14776290	∞	1.000	14733968	0.997	0	0
	∞	14011682	∞	1.000	13981261	0.998	0	0
	∞	11641609	∞	1.000	11607995	0.997	0	0
fiball	465.46	4111	465.55	1.000	4111	1.000	0	0
	447.05	3521	447.14	1.000	3521	1.000	0	0
	500.06	5672	499.03	0.998	5672	1.000	0	0
gen-ip002	1308.28	5856334	1315.68	1.006	5856334	1.000	0	0
	1302.36	5478569	1295.56	0.995	5478569	1.000	0	0
	1273.67	5583912	1271.92	0.999	5583912	1.000	0	0
gen-ip054	3074.29	15245360	3047.64	0.991	15245360	1.000	0	0
	2534.26	12476019	2530.93	0.999	12476019	1.000	0	0
	3399.83	16438070	3381.24	0.995	16438070	1.000	0	0
germanrr	1.46%	3402	1.46%	1.000	3418	1.005	0	0
	2.11%	2852	2.11%	1.000	2851	1.000	0	0
	1.94%	3551	1.94%	1.000	3559	1.002	0	0
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	0	0
	∞	8	∞	1.000	8	1.000	0	0
	∞	10	∞	1.000	10	1.000	0	0
glass-sc	2667.24	241329	2655.26	0.996	241329	1.000	0	0
	3235.22	289206	3214.67	0.994	289206	1.000	0	0
	2823.90	251112	2819.06	0.998	251112	1.000	0	0
glass4	4015.23	2705421	4008.75	0.998	2705421	1.000	1	2
	2392.08	1888717	2392.84	1.000	1888717	1.000	6	8
	2194.83	1599046	2212.84	1.008	1599046	1.000	1	2

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
gmu-35-40	0.04%	2422160	0.05%	1.000	2051936	0.847	1246	1692
	0.04%	1978991	0.03%	1.000	2099939	1.061	1680	2631
	0.04%	1863551	0.03%	1.000	1381092	0.741	1375	1556
gmu-35-50	0.02%	1321065	0.02%	1.000	1317781	0.998	160	161
	0.03%	1165732	0.03%	1.000	1247342	1.070	1179	1824
	0.02%	1445028	0.04%	1.000	1016723	0.704	2200	5603
graph20-20-1rand	163.83%	6109	163.73%	1.000	6171	1.010	0	0
	165.38%	8286	165.38%	1.000	8277	0.999	0	0
	172.66%	7506	172.66%	1.000	7513	1.001	0	0
graphdraw-domain	1031.77	1757494	1010.47	0.979	1823083	1.037	35	44
	1145.40	1975394	1122.85	0.980	1941578	0.983	49	74
	1601.52	3104489	1664.67	1.039	2907888	0.937	52	78
h80x6320d	75.72	5	69.54	0.918	4	0.800	5	13270
	85.29	6	86.17	1.010	10	<i>1.667</i>	34	15863
	85.29	5	86.62	1.016	5	1.000	15	14111
highschool1-aigio	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
hypothyroid-k1	20.15	1	20.04	0.995	1	1.000	0	0
	19.95	1	19.99	1.002	1	1.000	0	0
	19.94	1	20.16	1.011	1	1.000	0	0
ic97_potential	0.84%	7215487	0.84%	1.000	7214792	1.000	3	3
	0.75%	6122912	0.75%	1.000	6107856	0.998	6	6
	0.86%	7594910	0.86%	1.000	7579116	0.998	34	34
icir97_tension	6501.51	2533775	0.07%	1.107	3185773	1.257	56411	3418436
	0.07%	3124196	0.05%	1.000	2776552	0.889	87256	5105602
	0.11%	2953553	0.08%	1.000	2729235	0.924	56505	3299716
irish-electricity	∞	93	∞	1.000	93	1.000	0	0
	27.01%	1364	18.43%	1.000	1317	0.966	43	598444

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	∞	1333	∞	1.000	1333	1.000	5	69831
irp	12.37	6	12.51	1.011	6	1.000	0	0
	12.01	4	12.05	1.003	4	1.000	0	0
	12.52	5	12.58	1.005	5	1.000	0	0
istanbul-no-cutoff	152.91	347	154.02	1.007	347	1.000	0	0
	166.08	245	166.34	1.002	245	1.000	0	0
	285.94	475	285.14	0.997	475	1.000	0	0
k1mushroom	1890.02	7	1897.56	1.004	7	1.000	0	0
	1550.04	11	1583.93	1.022	11	1.000	0	0
	1298.16	3	1321.29	1.018	3	1.000	0	0
lectsched-5-obj	166.67%	148759	166.67%	1.000	148725	1.000	0	0
	120.00%	129616	120.00%	1.000	130812	1.009	0	0
	126.67%	64823	126.67%	1.000	64923	1.002	0	0
leo1	6.11%	80401	6.11%	1.000	80819	1.005	0	0
	7.14%	34819	7.14%	1.000	34905	1.002	0	0
	7.53%	46085	7.53%	1.000	45969	0.997	0	0
leo2	∞	101572	∞	1.000	101616	1.000	0	0
	∞	110430	∞	1.000	110967	1.005	0	0
	∞	146894	∞	1.000	146706	0.999	0	0
lotsize	0.65%	12057	0.67%	1.000	16786	1.392	9904	1427070
	0.81%	50851	0.88%	1.000	20493	0.403	13067	2090525
	0.57%	17809	0.70%	1.000	17911	1.006	9579	1783889
mad	∞	13353509	∞	1.000	8295624	0.621	149479	405608
	∞	17989284	∞	1.000	14934806	0.830	160629	565760
	∞	19538859	∞	1.000	15381075	0.787	117222	324400
map10	1004.30	1637	1006.71	1.002	1637	1.000	0	0
	631.41	724	633.84	1.004	724	1.000	0	0
	791.27	965	792.96	1.002	965	1.000	0	0
map16715-04	2160.58	1933	2158.43	0.999	1933	1.000	0	0

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Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	2333.35	2173	2335.51	1.001	2173	1.000	0	0
	2160.02	1990	2160.04	1.000	1990	1.000	0	0
markshare2	∞	5818260	∞	1.000	5827069	1.002	0	0
	∞	5581862	∞	1.000	5581862	1.000	0	0
	∞	5053235	∞	1.000	5052479	1.000	0	0
markshare_4_0	72.10	612396	72.47	1.005	612396	1.000	0	0
	69.61	589762	70.48	1.012	589762	1.000	0	0
	85.86	719508	85.88	1.000	719508	1.000	0	0
mas74	1680.77	4932223	1680.79	1.000	4932223	1.000	92873	92873
	2286.80	7992914	2282.09	0.998	7992914	1.000	128510	128510
	1567.75	4674399	1563.59	0.997	4674399	1.000	98609	98609
mas76	137.46	406104	136.88	0.996	406104	1.000	13938	13938
	168.12	525538	168.46	1.002	525538	1.000	17151	17151
	150.22	450422	152.65	1.016	450422	1.000	14151	14151
mc11	167.73	8168	149.40	0.891	6484	0.794	2127	614288
	93.83	2482	80.39	0.857	1411	0.568	654	188259
	94.12	2184	106.11	<i>1.127</i>	3386	<i>1.550</i>	1370	385646
mcsched	317.83	11378	318.21	1.001	11378	1.000	0	0
	236.22	9846	235.33	0.996	9846	1.000	0	0
	306.93	12017	306.32	0.998	12017	1.000	0	0
mik-250-20-75-4	52.87	23893	52.78	0.998	23893	1.000	3977	50814
	43.87	15175	43.96	1.002	15175	1.000	2127	29061
	52.23	20733	52.36	1.002	20733	1.000	3807	48155
milov12-6-r2-40-1	8.30%	246695	9.47%	1.000	189681	0.769	18301	249990
	9.82%	263755	8.96%	1.000	323326	1.226	27361	379491
	10.19%	266711	11.33%	1.000	417232	1.564	24366	268084
momentum1	8.58%	100459	24.76%	1.000	94037	0.936	2000	672700
	7.63%	207739	7.36%	1.000	91471	0.440	2000	632676
	6.30%	127751	6.53%	1.000	188055	1.472	2203	722065

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
mushroom-best	616.01	30449	579.50	0.941	27393	0.900	2015	82418
	134.13%	94486	134.09%	1.000	94624	1.001	5944	75253
	122.03%	98065	121.97%	1.000	98893	1.008	8436	98461
mzzv11	210.49	484	210.71	1.001	484	1.000	0	0
	262.63	987	263.08	1.002	987	1.000	0	0
	196.57	616	195.89	0.997	616	1.000	0	0
mzzv42z	175.32	415	175.26	1.000	415	1.000	0	0
	243.58	712	246.00	1.010	712	1.000	0	0
	306.93	719	306.34	0.998	719	1.000	0	0
n2seq36q	927.69	5438	936.81	1.010	5438	1.000	0	0
	1061.23	4712	1061.28	1.000	4712	1.000	0	0
	1169.86	4632	1170.79	1.001	4632	1.000	0	0
n3div36	2.58%	218772	2.59%	1.000	213866	0.978	0	0
	2.86%	207276	2.86%	1.000	207136	0.999	0	0
	2.68%	205006	2.69%	1.000	202891	0.990	0	0
n5-3	28.03	1124	26.40	0.942	926	0.824	108	100504
	29.00	959	27.79	0.958	971	1.013	203	191466
	29.06	1213	27.09	0.932	1087	0.896	96	91628
neos-1122047	10.00	1	9.92	0.992	1	1.000	0	0
	9.79	1	9.76	0.997	1	1.000	0	0
	9.81	1	9.70	0.989	1	1.000	0	0
neos-1171448	57.80	101	58.11	1.005	101	1.000	2	21
	5.15	1	5.16	1.002	1	1.000	2	23
	51.31	86	51.55	1.005	86	1.000	2	22
neos-1171737	1.04%	3912	1.04%	1.000	3912	1.000	69	4277
	1.56%	3999	1.56%	1.000	4009	1.003	58	3353
	1.04%	11889	1.30%	1.000	11719	0.986	306	23789
neos-1354092	∞	613	∞	1.000	613	1.000	0	0
	∞	830	∞	1.000	820	0.988	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	∞	639	∞	1.000	639	1.000	0	0
neos-1445765	43.75	133	43.72	0.999	133	1.000	0	0
	44.26	141	44.19	0.998	141	1.000	0	0
	44.82	125	44.74	0.998	125	1.000	0	0
neos-1456979	7.49%	40037	7.49%	1.000	39961	0.998	2070	3273
	6.84%	38580	6.84%	1.000	38750	1.004	1659	2480
	7.31%	31436	7.29%	1.000	31540	1.003	1598	2633
neos-1582420	21.78	18	21.85	1.003	18	1.000	0	0
	10.89	9	10.92	1.003	9	1.000	0	0
	55.11	1381	55.49	1.007	1381	1.000	0	0
neos-2075418-temuka	6997.21	1	7024.05	1.004	1	1.000	0	0
	4532.11	1	4517.94	0.997	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-2657525-crna	∞	3044031	∞	1.000	3064132	1.007	0	0
	∞	3690202	∞	1.000	3681104	0.998	0	0
	∞	2110438	∞	1.000	2122332	1.006	0	0
neos-2746589-doon	0.47%	54070	0.46%	1.000	55681	1.030	0	0
	0.73%	30207	0.73%	1.000	30280	1.002	0	0
	0.11%	183194	0.11%	1.000	182349	0.995	0	0
neos-2978193-inde	0.50%	542072	0.50%	1.000	549249	1.013	17897	273210178
	0.13%	567306	0.13%	1.000	573707	1.011	17835	272478661
	0.50%	536991	0.50%	1.000	548119	1.021	21148	323366127
neos-2987310-joes	17.79	1	17.49	0.983	1	1.000	1	52
	15.29	1	15.31	1.001	1	1.000	1	42
	13.87	1	13.67	0.986	1	1.000	1	42
neos-3004026-krka	53.08	2711	53.06	1.000	2711	1.000	0	0
	61.96	3485	62.47	1.008	3485	1.000	0	0
	46.48	1764	46.28	0.996	1764	1.000	0	0
neos-3024952-loue	4646.63	383076	4646.86	1.000	383076	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	0.07%	687963	0.07%	1.000	688312	1.001	0	0
	0.05%	1106581	0.04%	1.000	1114650	1.007	0	0
neos-3046615-murg	169.81%	6970717	169.81%	1.000	6971706	1.000	0	0
	166.11%	6369831	166.11%	1.000	6364063	0.999	0	0
	163.72%	7603729	163.66%	1.000	7613539	1.001	0	0
neos-3083819-nubu	12.75	2020	12.72	0.998	2020	1.000	0	0
	12.42	1578	12.37	0.996	1578	1.000	0	0
	20.73	3812	20.79	1.003	3812	1.000	0	0
neos-3216931-puriri	116.41%	5521	116.41%	1.000	5546	1.005	0	0
	7159.50	9731	5.50%	1.006	9705	0.997	0	0
	147.13%	4812	147.13%	1.000	4790	0.995	0	0
neos-3381206-awhea	1.19	1	1.18	0.992	1	1.000	0	0
	1.20	1	1.21	1.008	1	1.000	0	0
	1.24	1	1.20	0.968	1	1.000	0	0
neos-3402294-bobin	3065.94	16574	4386.37	<i>1.431</i>	40294	<i>2.431</i>	644	1394
	1633.59	11810	618.95	0.379	3428	0.290	29	96
	2712.34	22655	1620.92	0.598	9242	0.408	179	382
neos-3402454-bohle	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-3555904-turama	18.01%	146	18.01%	1.000	145	0.993	0	0
	∞	18	∞	1.000	18	1.000	0	0
	18.01%	16934	18.01%	1.000	16797	0.992	0	0
neos-3627168-kasai	0.10%	4724171	0.15%	1.000	4555684	0.964	249389	15427453
	0.07%	5205816	0.09%	1.000	4132791	0.794	129233	8161046
	0.07%	4925938	0.27%	1.000	5147129	1.045	198826	16328781
neos-3656078-kumeu	∞	32	∞	1.000	32	1.000	0	0
	∞	82	∞	1.000	82	1.000	0	0
	∞	122	∞	1.000	122	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
neos-3754480-nidda	∞	19992472	∞	1.000	20000763	1.000	445975	50463522
	∞	18587877	∞	1.000	18439214	0.992	421595	42225596
	∞	18152036	∞	1.000	19108471	1.053	364389	41023048
neos-3988577-wolgan	∞	310	∞	1.000	312	1.006	0	0
	∞	179	∞	1.000	179	1.000	0	0
	∞	439	∞	1.000	439	1.000	0	0
neos-4300652-rahue	431.97%	1366	431.97%	1.000	1365	0.999	639	3103
	813.20%	1205	809.48%	1.000	1213	1.007	478	2320
	316.83%	2125	316.83%	1.000	2127	1.001	718	2424
neos-4338804-snowy	1.66%	4865547	1.66%	1.000	4875741	1.002	0	0
	0.82%	6730558	0.82%	1.000	6738902	1.001	0	0
	1.66%	5069364	1.66%	1.000	5067404	1.000	0	0
neos-4387871-tavua	11.46%	114951	11.39%	1.000	118375	1.030	6667	6579165
	14.12%	116934	14.13%	1.000	116171	0.993	7571	7450182
	18.68%	96140	18.66%	1.000	96695	1.006	6492	6305428
neos-4413714-turia	296.85	2	299.23	1.008	2	1.000	1	1
	403.95	2	404.80	1.002	2	1.000	1	1
	285.79	2	277.10	0.970	2	1.000	0	0
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-4647030-tutaki	0.01%	24399	0.01%	1.000	24413	1.001	18	13495
	0.01%	22843	0.01%	1.000	22893	1.002	20	15460
	0.01%	27221	0.01%	1.000	27292	1.003	34	28007
neos-4722843-widden	2640.30	11357	2651.33	1.004	11357	1.000	0	0
	1022.28	3376	1033.65	1.011	3376	1.000	0	0
	1715.11	7919	1714.52	1.000	7919	1.000	0	0
neos-4738912-atrato	811.47	61981	813.40	1.002	61981	1.000	0	0
	3825.61	324992	3808.90	0.996	324992	1.000	0	0

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Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	916.83	95736	914.39	0.997	95736	1.000	0	0
neos-4763324-toguru	46.04%	8436	46.04%	1.000	8436	1.000	0	0
	45.08%	14960	45.08%	1.000	14962	1.000	0	0
	48.94%	7145	48.94%	1.000	7145	1.000	0	0
neos-4954672-berkel	8.81%	1012935	8.48%	1.000	1019990	1.007	105716	11413161
	8.69%	798448	8.71%	1.000	819107	1.026	100039	11144234
	7.63%	870007	8.00%	1.000	891993	1.025	112504	12275201
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	0	0
	15.39%	14	15.39%	1.000	14	1.000	0	0
	15.20%	12	15.20%	1.000	12	1.000	0	0
neos-5052403-cygnat	1.60%	113	1.60%	1.000	113	1.000	0	0
	1.38%	1	1.38%	1.000	1	1.000	0	0
	1.19%	63	1.19%	1.000	63	1.000	0	0
neos-5093327-huahum	10.34%	52594	10.32%	1.000	49854	0.948	4579	51311347
	10.74%	52498	10.43%	1.000	52521	1.000	4942	55271261
	12.17%	51549	12.17%	1.000	48532	0.941	5145	57673811
neos-5104907-jarama	∞	8	∞	1.000	8	1.000	0	0
	∞	9	∞	1.000	9	1.000	0	0
	∞	4	∞	1.000	4	1.000	0	0
neos-5107597-kakapo	2138.51	560533	2144.47	1.003	560533	1.000	0	0
	1724.48	472393	1725.41	1.001	472393	1.000	0	0
	5915.74	1725439	5927.88	1.002	1725439	1.000	0	0
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-5188808-nattai	1223.97	11765	1251.29	1.022	12145	1.032	311	279857
	1257.42	13094	1292.07	1.028	13554	1.035	417	373585
	1341.10	12634	1380.62	1.029	12548	0.993	413	374195
neos-5195221-niemur	2827.57	47466	2813.87	0.995	47466	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	2906.16	25010	2911.85	1.002	25010	1.000	0	0
	2885.99	33779	2890.78	1.002	33779	1.000	0	0
neos-631710	14.21%	2	14.21%	1.000	2	1.000	0	0
	8.90%	4	8.90%	1.000	4	1.000	0	0
	14.21%	3	14.21%	1.000	3	1.000	0	0
neos-662469	0.01%	59651	0.01%	1.000	59651	1.000	0	0
	0.00%	50515	0.00%	1.000	50627	1.002	0	0
	0.01%	57704	0.01%	1.000	56995	0.988	0	0
neos-787933	1.38	1	1.37	0.993	1	1.000	0	0
	1.40	1	1.39	0.993	1	1.000	0	0
	1.35	1	1.41	1.044	1	1.000	0	0
neos-827175	6.16	1	6.10	0.990	1	1.000	0	0
	8.14	1	8.21	1.009	1	1.000	0	0
	10.21	1	10.23	1.002	1	1.000	0	0
neos-848589	32.15%	247	32.15%	1.000	256	1.036	26	11963526
	42.57%	151	42.95%	1.000	148	0.980	1	464090
	46.27%	106	46.27%	1.000	106	1.000	17	7822005
neos-860300	17.20	2	17.27	1.004	2	1.000	0	0
	13.31	2	13.35	1.003	2	1.000	0	0
	23.08	3	23.18	1.004	3	1.000	0	0
neos-873061	9.28%	159	9.28%	1.000	155	0.975	17	562652
	7.72%	148	7.72%	1.000	148	1.000	5	171769
	8.12%	168	8.12%	1.000	168	1.000	6	189338
neos-911970	1.05%	1400846	1.05%	1.000	1400854	1.000	907	976
	3.01%	1931001	2.49%	1.000	1814127	0.939	171	211
	0.04%	10359753	0.06%	1.000	11460910	1.106	97138	97261
neos-933966	1374.27	138	1374.28	1.000	138	1.000	0	0
	846.61	38	848.27	1.002	38	1.000	0	0
	2186.79	283	2180.73	0.997	283	1.000	0	0

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Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
neos-950242	100.00%	9312	100.00%	1.000	9288	0.997	0	0
	100.00%	8505	100.00%	1.000	8446	0.993	0	0
	100.00%	15629	100.00%	1.000	15629	1.000	0	0
neos-957323	86.10	2	86.06	1.000	2	1.000	0	0
	110.81	5	110.59	0.998	5	1.000	0	0
	79.78	2	80.10	1.004	2	1.000	0	0
neos-960392	879.21	15	881.09	1.002	15	1.000	0	0
	1447.09	102	1439.63	0.995	102	1.000	0	0
	1364.81	403	1363.87	0.999	403	1.000	0	0
neos17	14.58	10185	25.95	<i>1.780</i>	22460	<i>2.205</i>	2747	155764
	10.20	6549	9.39	0.921	5644	0.862	359	19702
	7.67	4115	9.84	<i>1.283</i>	6376	<i>1.549</i>	601	34787
neos5	985.69	3170813	1007.54	1.022	3292114	1.038	51655	154941
	1960.29	6799306	1234.24	0.630	4202380	0.618	62208	178075
	1431.38	4934304	1183.51	0.827	4100005	0.831	56177	163393
neos859080	0.52	792	0.50	0.962	792	1.000	0	0
	0.53	655	0.54	1.019	655	1.000	0	0
	0.52	565	0.55	<i>1.058</i>	565	1.000	0	0
neos8	1.95	1	1.95	1.000	1	1.000	0	0
	1.84	1	1.89	1.027	1	1.000	0	0
	1.81	1	1.83	1.011	1	1.000	0	0
net12	1838.09	1211	1842.42	1.002	1211	1.000	0	0
	1627.97	1816	1631.28	1.002	1816	1.000	0	0
	1557.45	1695	1561.43	1.003	1695	1.000	0	0
netdiversion	846.23	43	848.00	1.002	43	1.000	0	0
	2381.00	88	2364.82	0.993	88	1.000	0	0
	1086.46	27	1087.12	1.001	27	1.000	0	0
nexp-150-20-8-5	5904.05	10910	3539.59	0.600	5786	0.530	14898	15639667
	1.20%	20440	3635.13	0.505	7166	0.351	7298	7952684

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Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	2297.43	2837	0.83%	3.134	13054	4.601	5620	6163405
ns1116954	∞	32	∞	1.000	32	1.000	0	0
	∞	57	∞	1.000	57	1.000	0	0
	∞	75	∞	1.000	75	1.000	0	0
ns1208400	417.80	2004	419.49	1.004	2004	1.000	0	0
	680.25	2339	683.06	1.004	2339	1.000	0	0
	1074.25	2315	1074.09	1.000	2315	1.000	0	0
ns1644855	7.37%	36	7.37%	1.000	36	1.000	0	0
	7.37%	79	7.37%	1.000	79	1.000	0	0
	964.29	1	974.47	1.011	1	1.000	0	0
ns1760995	58.41%	1	58.41%	1.000	1	1.000	0	0
	71.46%	1	71.46%	1.000	1	1.000	0	0
	49.34%	1	48.93%	1.000	1	1.000	0	0
ns1830653	287.87	14558	287.45	0.999	14558	1.000	0	0
	133.15	7527	134.33	1.009	7527	1.000	0	0
	147.56	7267	148.24	1.005	7267	1.000	0	0
ns1952667	∞	52524	∞	1.000	52208	0.994	0	0
	1404.32	9508	1392.38	0.991	9508	1.000	0	0
	968.78	4900	968.90	1.000	4900	1.000	0	0
nu25-pr12	5.30	53	5.36	1.011	53	1.000	0	0
	6.04	66	6.11	1.012	66	1.000	0	0
	6.02	16	6.05	1.005	16	1.000	0	0
nursesched-medium-hint03	1657.78%	1113	1657.78%	1.000	1100	0.988	0	0
	3021.25%	2062	3021.25%	1.000	2050	0.994	0	0
	1077.84%	1121	1077.84%	1.000	1121	1.000	0	0
nursesched-sprint02	140.68	370	142.08	1.010	370	1.000	0	0
	85.08	409	85.18	1.001	409	1.000	0	0
	67.68	222	67.71	1.000	222	1.000	0	0
nw04	38.05	6	37.93	0.997	6	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	31.40	5	31.39	1.000	5	1.000	0	0
	35.20	6	35.16	0.999	6	1.000	0	0
opm2-z10-s4	24.70%	1010	24.70%	1.000	1000	0.990	0	0
	27.76%	580	27.76%	1.000	586	1.010	0	0
	26.96%	1011	26.96%	1.000	1015	1.004	0	0
p200x1188c	3.51	2	3.53	1.006	2	1.000	0	0
	4.76	2	3.96	0.832	3	<i>1.500</i>	3	1249
	3.62	2	3.62	1.000	2	1.000	0	0
peg-solitaire-a3	∞	5760	∞	1.000	5752	0.999	0	0
	∞	3566	∞	1.000	3557	0.997	0	0
	∞	3965	∞	1.000	3969	1.001	0	0
pg5_34	1260.38	149366	1173.22	0.931	148717	0.996	12176	12548686
	1334.91	170764	1134.07	0.850	144543	0.846	17535	19386420
	1266.61	151919	1085.15	0.857	121673	0.801	18696	21243804
pg	113.10	3604	101.85	0.901	2687	0.746	475	531333
	88.16	1065	86.23	0.978	1372	<i>1.288</i>	421	506326
	74.36	1291	107.44	<i>1.445</i>	2311	<i>1.790</i>	768	922690
physiciansched3-3	∞	417	∞	1.000	415	0.995	0	0
	∞	313	∞	1.000	313	1.000	0	0
	∞	363	∞	1.000	361	0.994	0	0
physiciansched6-2	124.74	377	124.81	1.001	377	1.000	1	102
	465.63	2804	462.02	0.992	2804	1.000	0	0
	44.54	1	44.74	1.004	1	1.000	0	0
piperout-08	791.24	130	797.03	1.007	130	1.000	0	0
	617.51	552	606.54	0.982	552	1.000	0	0
	914.01	596	923.85	1.011	596	1.000	0	0
piperout-27	140.40	2	140.11	0.998	2	1.000	0	0
	276.77	566	275.91	0.997	566	1.000	0	0
	331.44	72	332.32	1.003	72	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
pk1	111.14	304863	107.55	0.968	301100	0.988	9412	103204
	109.43	324617	109.16	0.998	317026	0.977	10622	130403
	115.59	331290	112.34	0.972	328715	0.992	8973	95646
proteindesign121hz512p9	9.60%	579	9.60%	1.000	591	1.021	0	0
	7.94%	432	7.94%	1.000	440	1.019	0	0
	26.01%	602	26.02%	1.000	593	0.985	0	0
proteindesign122trx11p8	1.95%	3	1.95%	1.000	3	1.000	0	0
	1.91%	8	1.91%	1.000	8	1.000	0	0
	1.93%	17	1.93%	1.000	17	1.000	0	0
gap10	87.95	3	87.99	1.000	3	1.000	0	0
	112.11	5	111.82	0.997	5	1.000	0	0
	198.19	15	197.87	0.998	15	1.000	0	0
radiationm18-12-05	12.99%	478942	12.99%	1.000	479812	1.002	0	0
	0.05%	756043	0.05%	1.000	750150	0.992	0	0
	1.89%	551002	1.89%	1.000	551080	1.000	0	0
radiationm40-10-02	67.02%	51902	67.02%	1.000	53316	1.027	0	0
	57.74%	26807	57.74%	1.000	27109	1.011	0	0
	22.69%	98555	22.69%	1.000	99008	1.005	0	0
rail01	2.74%	201	2.74%	1.000	200	0.995	0	0
	25.21%	183	25.21%	1.000	182	0.995	0	0
	7.32%	178	7.32%	1.000	183	1.028	0	0
rail02	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
rail507	157.47	623	156.67	0.995	623	1.000	0	0
	178.99	783	180.04	1.006	783	1.000	0	0
	193.76	771	193.43	0.998	771	1.000	0	0
ran14x18-disj-8	1646.55	581323	2109.62	<i>1.281</i>	656920	<i>1.130</i>	40771	4211033
	1325.91	421619	1785.31	<i>1.346</i>	564900	<i>1.340</i>	40555	4129085

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	1620.56	585345	1694.59	1.046	593570	1.014	39060	3993649
rd-rplusc-21	≥ 10000%	457613	≥ 10000%	1.000	484631	1.059	277	354
	≥ 10000%	688442	≥ 10000%	1.000	737139	1.071	162	165
	≥ 10000%	606726	≥ 10000%	1.000	763715	1.259	117	117
reblock115	4402.19	704168	4390.48	0.997	704168	1.000	0	0
	6584.39	882785	6605.46	1.003	882785	1.000	0	0
	5885.72	832788	5894.68	1.002	832788	1.000	0	0
rmatr100-p10	168.13	809	166.48	0.990	809	1.000	900	4785858
	164.49	822	162.84	0.990	822	1.000	927	4920613
	160.06	783	160.62	1.003	827	<i>1.056</i>	719	3828632
rmatr200-p5	22.40%	423	22.40%	1.000	421	0.995	247	5912115
	19.56%	427	19.56%	1.000	423	0.991	200	4772878
	21.08%	392	21.08%	1.000	403	1.028	331	7867800
rocI-4-11	637.01	12970	638.21	1.002	12970	1.000	0	0
	1001.58	17602	1001.80	1.000	17602	1.000	0	0
	499.15	9550	498.07	0.998	9550	1.000	0	0
rocII-5-11	108.38%	3526	108.52%	1.000	3399	0.964	72	1539
	109.24%	2882	109.87%	1.000	2764	0.959	78	1994
	109.11%	2527	109.11%	1.000	2522	0.998	67	1983
rococoB10-011000	13.69%	151842	13.71%	1.000	151103	0.995	0	0
	15.11%	142431	15.09%	1.000	143253	1.006	0	0
	12.79%	154266	12.80%	1.000	153839	0.997	0	0
rococoC10-001000	766.88	53303	765.76	0.999	53303	1.000	0	0
	850.38	63090	851.99	1.002	63090	1.000	0	0
	1631.18	162527	1626.91	0.997	162527	1.000	0	0
roi2alpha3n4	1556.68	14465	1424.80	0.915	12529	0.866	6050	15069
	1940.55	17446	1940.46	1.000	17446	1.000	1160	2162
	1490.30	13303	1486.54	0.997	13303	1.000	656	1508
roi5alpha10n8	35.35%	6064	35.37%	1.000	5989	0.988	4891	20517

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	38.11%	6792	40.36%	1.000	6346	0.934	4223	16719
	32.14%	6775	32.14%	1.000	6789	1.002	5672	34410
roll3000	36.98	1986	36.86	0.997	1986	1.000	190	204
	39.08	2149	38.91	0.996	2149	1.000	97	100
	57.27	3491	60.26	<i>1.052</i>	3736	<i>1.070</i>	234	255
s100	5.53%	20	5.53%	1.000	20	1.000	0	0
	29.84%	17	29.84%	1.000	17	1.000	0	0
	1.06%	22	1.06%	1.000	22	1.000	0	0
s250r10	0.28%	22905	0.28%	1.000	22897	1.000	0	0
	6373.62	45426	6366.45	0.999	45426	1.000	0	0
	0.23%	31617	0.23%	1.000	31811	1.006	0	0
satellites2-40	∞	19	∞	1.000	19	1.000	0	0
	∞	4	∞	1.000	4	1.000	0	0
	70.59%	33	70.59%	1.000	33	1.000	0	0
satellites2-60-fs	∞	33	∞	1.000	33	1.000	0	0
	∞	137	∞	1.000	137	1.000	0	0
	∞	28	∞	1.000	28	1.000	0	0
savsched1	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
sct2	0.05%	629842	0.03%	1.000	600226	0.953	26218	17933421
	0.03%	978502	0.05%	1.000	659682	0.674	20691	15761940
	0.03%	1085466	0.03%	1.000	994927	0.917	20090	14101828
seymour1	70.11	1234	90.45	<i>1.290</i>	1627	<i>1.318</i>	101	12890
	66.75	1474	67.90	1.017	1466	0.995	98	12630
	72.97	1811	72.05	0.987	1822	1.006	112	14950
seymour	0.66%	242716	0.66%	1.000	242500	0.999	0	0
	0.68%	221477	0.68%	1.000	222209	1.003	0	0
	0.74%	225445	0.74%	1.000	225373	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
sing326	0.15%	9102	0.15%	1.000	11755	1.291	523	4451567
	0.17%	8193	0.17%	1.000	8196	1.000	432	3687168
	0.32%	7833	0.32%	1.000	7997	1.021	853	7436397
sing44	0.45%	5559	0.45%	1.000	5531	0.995	249	2726406
	0.19%	7342	0.19%	1.000	7349	1.001	345	3412177
	0.27%	2281	0.27%	1.000	2267	0.994	292	2356604
snp-02-004-104	0.00%	13214	0.00%	1.000	14561	1.102	1021	66292537
	0.00%	13792	0.00%	1.000	18040	1.308	1027	66670952
	0.00%	20296	0.00%	1.000	19680	0.970	761	49407474
sorrell3	43.77%	41816	43.81%	1.000	41208	0.985	0	0
	35.59%	39431	35.59%	1.000	39514	1.002	0	0
	19.11%	8842	19.11%	1.000	8801	0.995	0	0
sp150x300d	3.97	3472	3.96	0.997	3472	1.000	483	7352
	3.08	2569	3.12	1.013	2569	1.000	379	7030
	1.25	848	1.29	1.032	848	1.000	154	3892
sp97ar	0.98%	15747	0.98%	1.000	15747	1.000	0	0
	1.02%	22961	1.02%	1.000	22961	1.000	0	0
	1.53%	24828	1.53%	1.000	24828	1.000	0	0
sp98ar	1.43%	71905	1.43%	1.000	71746	0.998	0	0
	0.48%	67033	0.48%	1.000	67060	1.000	0	0
	0.98%	70824	0.98%	1.000	71271	1.006	0	0
splice1k1	309.20%	513	309.20%	1.000	513	1.000	0	0
	376.10%	588	376.10%	1.000	594	1.010	0	0
	358.74%	837	358.74%	1.000	834	0.996	0	0
square41	109.98%	30	109.98%	1.000	30	1.000	0	0
	89.32%	38	89.32%	1.000	37	0.974	0	0
	92.32%	28	92.32%	1.000	28	1.000	0	0
square47	231.21%	4	231.21%	1.000	4	1.000	0	0
	117.00%	13	117.00%	1.000	13	1.000	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	231.21%	1	231.21%	1.000	1	1.000	0	0
supportcase10	803.51%	1	803.51%	1.000	1	1.000	0	0
	989.07%	1	989.07%	1.000	1	1.000	0	0
	1054.36%	1	1054.36%	1.000	1	1.000	0	0
supportcase12	1.31%	1467	1.31%	1.000	1463	0.997	4	3668
	1.35%	2282	1.35%	1.000	2297	1.007	3	9352
	1.30%	1505	1.30%	1.000	1505	1.000	0	0
supportcase18	3.84%	420841	3.84%	1.000	419350	0.996	0	0
	5.96%	236784	5.96%	1.000	237591	1.003	0	0
	3.84%	198854	3.84%	1.000	198815	1.000	0	0
supportcase19	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
supportcase22	∞	51	∞	1.000	51	1.000	0	0
	∞	18	∞	1.000	18	1.000	0	0
	∞	66	∞	1.000	66	1.000	0	0
supportcase26	8.97%	8093481	8.94%	1.000	8135621	1.005	0	0
	5245.24	6761735	5238.22	0.999	6761735	1.000	0	0
	4513.92	5497025	4487.28	0.994	5497025	1.000	0	0
supportcase33	1603.38	12756	1598.38	0.997	12756	1.000	0	0
	1613.08	7176	1600.98	0.992	7176	1.000	0	0
	686.38	3786	682.16	0.994	3786	1.000	0	0
supportcase40	785.32	6335	786.50	1.002	6335	1.000	3435	3882029
	895.45	7377	946.94	<i>1.058</i>	7991	<i>1.083</i>	3287	3679797
	1262.35	13443	797.74	0.632	6970	0.518	3246	3640658
supportcase42	0.25%	360836	0.38%	1.000	305571	0.847	8724	105301052
	0.13%	375683	0.10%	1.000	380155	1.012	10045	120744588
	0.10%	393957	0.35%	1.000	467610	1.187	12490	150888216
supportcase6	9.13%	19067	9.13%	1.000	18980	0.995	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
	8.41%	17731	8.41%	1.000	17726	1.000	0	0
	9.74%	17577	9.72%	1.000	17709	1.008	0	0
supportcase7	183.33	59	179.98	0.982	59	1.000	20	144588
	193.92	45	193.62	0.998	45	1.000	50	353440
	212.36	32	210.25	0.990	32	1.000	58	412750
swath1	24.58	287	21.09	0.858	281	0.979	454	1376538
	17.70	245	17.34	0.980	245	1.000	400	1114929
	24.35	294	19.82	0.814	292	0.993	461	1323181
swath3	194.53	20962	226.20	<i>1.163</i>	28316	<i>1.351</i>	2976	5359114
	185.36	21524	182.91	0.987	21837	1.015	2503	5135046
	423.46	73931	427.45	1.009	74192	1.004	6596	9134234
tbfp-network	2324.14	574	2356.81	1.014	574	1.000	0	0
	1692.27	71	1683.80	0.995	71	1.000	0	0
	1094.11	99	1088.57	0.995	99	1.000	0	0
thor50dday	23.30%	102	23.30%	1.000	95	0.931	7	137376
	21.49%	11	21.49%	1.000	12	1.091	1	15902
	14.80%	33	14.80%	1.000	34	1.030	0	0
timtab1	67.33	55554	73.73	<i>1.095</i>	64175	<i>1.155</i>	3180	13023
	75.16	59915	67.90	0.903	51540	0.860	2308	9403
	74.07	56992	70.92	0.957	55054	0.966	3368	14105
tr12-30	719.89	499158	606.97	0.843	423661	0.849	1462	18234
	619.77	456738	650.32	1.049	475420	1.041	909	6551
	448.35	263384	397.52	0.887	213946	0.812	6901	86516
traininstance2	∞	66199	∞	1.000	67099	1.014	0	0
	∞	50671	∞	1.000	52063	1.027	0	0
	6286.13%	73943	6286.13%	1.000	73138	0.989	0	0
traininstance6	632.46%	456745	634.16%	1.000	456248	0.999	0	0
	626.92%	346228	626.92%	1.000	347529	1.004	0	0
	524.49%	451546	520.12%	1.000	454368	1.006	0	0

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Table 2: Detailed computational results on MIPLIB 2017 benchmark with and without nonzero cancellation with variable bounds. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	bound-cancellation disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	bc-run	bc
trento1	0.07%	58583	0.07%	1.000	57766	0.986	11359	107265
	0.14%	39213	0.10%	1.000	51033	1.301	9360	85619
	0.09%	46478	1.67%	1.000	35013	0.753	4102	22028
triptim1	1094.23	8	1099.43	1.005	8	1.000	0	0
	748.83	7	747.73	0.999	7	1.000	0	0
	1061.97	8	1065.09	1.003	8	1.000	0	0
uccase12	0.00%	78128	0.00%	1.000	77800	0.996	950	7994835
	0.00%	95474	0.00%	1.000	91468	0.958	1028	8631329
	0.00%	88904	0.00%	1.000	98605	1.109	689	5594630
uccase9	1.57%	482	1.98%	1.000	498	1.033	79	570590
	5.01%	941	1.48%	1.000	1166	1.239	70	509055
	3.47%	669	2.82%	1.000	550	0.822	74	553523
uct-subprob	1109.37	44339	1102.62	0.994	44339	1.000	0	0
	1628.10	59559	1631.60	1.002	59559	1.000	0	0
	2489.68	95674	2506.36	1.007	95674	1.000	0	0
unitcal_7	271.08	91	272.59	1.006	89	0.978	65	87377
	297.46	176	298.12	1.002	180	1.023	163	200638
	385.89	436	387.18	1.003	436	1.000	117	133914
var-smallemary-m6j6	0.93%	565917	0.93%	1.000	568323	1.004	3995	3995
	0.87%	657875	0.87%	1.000	656232	0.998	2386	2386
	6763.76	683202	6729.45	0.995	683202	1.000	8795	8795
wachplan	2345.94	219938	2340.84	0.998	219938	1.000	0	0
	3425.94	302179	3419.67	0.998	302179	1.000	0	0
	2346.42	198054	2343.95	0.999	198054	1.000	0	0

Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
30n20b8	149.46	171	149.68	1.001	171	1.000	40	111	0
	902.33	2334	623.60	0.691	1999	0.856	678	1459	14
	1993.61	6739	693.56	0.348	3499	0.519	1293	2668	6
50v-10	1.46%	842135	1.69%	1.000	829421	0.985	0	0	0
	1.31%	954981	1.15%	1.000	867997	0.909	0	0	0
	1.27%	921415	1.37%	1.000	833134	0.904	0	0	0
CMS750_4	185.43	2028	185.73	1.002	2028	1.000	0	0	0
	369.97	3254	370.72	1.002	3254	1.000	0	0	0
	477.67	13518	473.12	0.990	13518	1.000	0	0	0
academic timetables small	∞	2306	∞	1.000	2315	1.004	0	0	0
	∞	3503	∞	1.000	3505	1.001	0	0	0
	∞	2681	∞	1.000	2681	1.000	0	0	0
air05	40.09	648	40.07	1.000	648	1.000	0	0	0
	36.49	716	36.54	1.001	716	1.000	0	0	0
	30.44	282	30.22	0.993	282	1.000	0	0	0
app1-1	3.52	2	3.53	1.003	2	1.000	0	0	0
	4.86	3	4.94	1.016	3	1.000	0	0	0
	4.20	6	4.17	0.993	6	1.000	1	2	0
app1-2	643.76	33	642.80	0.999	33	1.000	0	0	0
	792.56	20	789.47	0.996	20	1.000	0	0	0
	620.83	20	618.36	0.996	20	1.000	0	0	0
assign1-5-8	4.74%	5732154	4.74%	1.000	5736357	1.001	960	992	4
	4.55%	6747183	4.54%	1.000	6813236	1.010	1059	1178	4
	4.79%	6372276	4.80%	1.000	6333262	0.994	1701	1838	26
atlanta-ip	7.06%	18035	3.60%	1.000	18533	1.028	459	6857	2
	3.33%	16022	3.81%	1.000	21153	1.320	842	11057	1
	6.53%	25264	4.27%	1.000	30903	1.223	685	16019	0
blcls1	16.96%	49593	17.13%	1.000	35962	0.725	5134	432099	12
	15.64%	18924	18.36%	1.000	21112	1.116	3174	277493	9

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	17.51%	18530	17.69%	1.000	18673	1.008	3478	260211	6
bab2	1.29%	3468	1.29%	1.000	3473	1.001	0	0	0
	1.10%	3325	2.44%	1.000	3262	0.981	0	0	0
	∞	1934	∞	1.000	1981	1.024	0	0	0
bab6	0.58%	4900	0.58%	1.000	4790	0.978	0	0	0
	0.83%	3265	1.14%	1.000	3258	0.998	0	0	0
	1.94%	4770	1.94%	1.000	4779	1.002	0	0	0
beasleyC3	31.53	83	31.56	1.001	83	1.000	1	27	0
	17.31	2	17.35	1.002	2	1.000	0	0	0
	46.61	422	47.20	1.013	453	<i>1.073</i>	177	1447	0
binkar10.1	33.57	2517	31.34	0.934	2560	1.017	1240	7279	0
	35.96	2777	29.22	0.813	2246	0.809	1197	8144	0
	34.91	3245	28.71	0.822	2509	0.773	1361	8621	1
blp-ar98	0.27%	237012	0.27%	1.000	238231	1.005	0	0	0
	0.33%	207612	0.33%	1.000	207500	0.999	0	0	0
	0.32%	227469	0.32%	1.000	229423	1.009	0	0	0
blp-ic98	1.38%	306270	1.38%	1.000	304769	0.995	0	0	0
	2.41%	253836	2.41%	1.000	254061	1.001	0	0	0
	2.11%	277183	2.11%	1.000	278188	1.004	0	0	0
bnatt400	971.53	6821	970.91	0.999	6821	1.000	0	0	0
	1098.53	6346	1105.02	1.006	6346	1.000	0	0	0
	744.01	5500	745.15	1.002	5500	1.000	0	0	0
bnatt500	4375.67	29526	4368.17	0.998	29526	1.000	0	0	0
	6333.53	38962	6333.06	1.000	38962	1.000	0	0	0
	4953.66	29029	4996.90	1.009	29029	1.000	0	0	0
bppc4-08	1.92%	796242	1.92%	1.000	797503	1.002	0	0	0
	1.92%	931523	1.92%	1.000	938927	1.008	0	0	0
	1.92%	795486	1.92%	1.000	793397	0.997	0	0	0
brazil3	3372.83	2570	3360.46	0.996	2570	1.000	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	4262.59	2347	4252.19	0.998	2347	1.000	0	0	0
	3798.56	3302	3785.08	0.996	3302	1.000	0	0	0
buildingenergy	0.13%	96	0.13%	1.000	96	1.000	95	1157	0
	0.15%	85	0.15%	1.000	85	1.000	234	6070	0
	0.13%	11	0.13%	1.000	12	1.091	0	0	0
cbs-cta	40.16	1	40.27	1.003	1	1.000	0	0	0
	312.39	31	314.10	1.005	31	1.000	0	0	0
	35.54	1	35.77	1.006	1	1.000	0	0	0
chromaticindex1024-7	33.33%	965	33.33%	1.000	964	0.999	0	0	0
	33.33%	1171	33.33%	1.000	1171	1.000	0	0	0
	6422.81	757	6429.72	1.001	757	1.000	0	0	0
chromaticindex512-7	1186.43	361	1172.37	0.988	361	1.000	0	0	0
	3697.86	3133	3689.97	0.998	3133	1.000	0	0	0
	33.33%	40637	33.33%	1.000	40579	0.999	0	0	0
cmflsp50-24-8-8	3.97%	39309	3.98%	1.000	36090	0.918	4145	4645516	549
	1.41%	63823	1.99%	1.000	85475	1.339	8145	5052250	29
	2.87%	39253	4.86%	1.000	37790	0.963	4752	4640838	169
co-100	1.75%	53888	1.74%	1.000	54008	1.002	0	0	0
	91.90%	6911	91.77%	1.000	7012	1.015	0	0	0
	3.28%	10392	3.18%	1.000	10565	1.017	0	0	0
cod105	47.41%	7351	47.57%	1.000	7261	0.988	0	0	0
	48.00%	6831	48.00%	1.000	6829	1.000	0	0	0
	48.07%	6601	48.07%	1.000	6601	1.000	0	0	0
comp07-2idx	966.67%	4002	966.67%	1.000	3996	0.999	0	0	0
	2800.00%	756	2800.00%	1.000	743	0.983	0	0	0
	1716.67%	1421	1716.67%	1.000	1449	1.020	0	0	0
comp21-2idx	247.43%	10922	247.43%	1.000	10931	1.001	850	850	0
	195.39%	9851	195.50%	1.000	9835	0.998	1497	1497	0
	248.72%	11719	248.72%	1.000	11711	0.999	210	210	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
cost266-UUE	5308.10	429467	4923.15	0.927	375684	0.875	3071	3825	0
	4336.47	321297	3728.83	0.860	294630	0.917	3277	4109	0
	4817.89	393239	4067.72	0.844	306702	0.780	2977	3606	0
cryptanalysisiskb128n5obj14	∞	110	∞	1.000	110	1.000	27	69	0
	∞	60	∞	1.000	59	0.983	6	12	0
	∞	90	∞	1.000	90	1.000	10	12	0
cryptanalysisiskb128n5obj16	∞	102	∞	1.000	104	1.020	16	21	1
	2793.60	37	2790.65	0.999	37	1.000	6	20	0
	∞	97	∞	1.000	97	1.000	24	30	0
csched007	2365.33	188163	2327.77	0.984	187288	0.995	230	336	1
	2836.56	253975	2613.95	0.922	220934	0.870	28458	107892	4
	2928.44	236575	3393.08	<i>1.159</i>	247755	1.047	30510	99040	43
csched008	5642.08	538941	2.81%	1.276	455870	0.846	50411	86777	5206
	4488.44	354389	2.33%	1.604	694455	1.960	41848	57525	4297
	3959.91	446069	5772.95	<i>1.458</i>	546382	<i>1.225</i>	57820	80863	6112
cvs16r128-89	23.28%	67974	23.28%	1.000	67980	1.000	0	0	0
	22.61%	34962	22.61%	1.000	34973	1.000	0	0	0
	23.00%	47519	23.01%	1.000	47219	0.994	0	0	0
dano3_3	143.27	10	143.70	1.003	10	1.000	7	14	0
	139.35	14	142.65	1.024	14	1.000	8	47	0
	124.76	17	124.56	0.998	17	1.000	7	59	0
dano3_5	641.80	276	635.04	0.989	276	1.000	215	12596	0
	285.77	159	285.81	1.000	159	1.000	164	3429	0
	286.86	140	285.94	0.997	140	1.000	66	2080	0
decomp2	2.43	1	2.39	0.984	1	1.000	0	0	0
	2.44	1	2.42	0.992	1	1.000	0	0	0
	2.44	1	2.50	1.025	1	1.000	0	0	0
drayage-100-23	16.41	32	16.43	1.001	32	1.000	0	0	0
	19.60	48	19.52	0.996	48	1.000	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	13.49	16	13.50	1.001	16	1.000	0	0	0
drayage-25-23	0.07%	722284	0.07%	1.000	720814	0.998	0	0	0
	0.07%	794527	0.07%	1.000	790871	0.995	0	0	0
	6923.71	552534	6941.84	1.003	552534	1.000	0	0	0
dws008-01	52.26%	147234	44.84%	1.000	144766	0.983	75033	8450388	2594
	50.24%	153128	44.28%	1.000	157395	1.028	74230	8346962	1341
	45.74%	159713	52.63%	1.000	153108	0.959	71740	7187186	969
eil33-2	79.52	343	81.20	1.021	343	1.000	0	0	0
	102.50	395	101.92	0.994	395	1.000	0	0	0
	105.71	541	105.72	1.000	541	1.000	0	0	0
eilA101-2	20.05%	11030	20.05%	1.000	11110	1.007	0	0	0
	13.20%	12683	13.20%	1.000	12688	1.000	0	0	0
	13.37%	13542	13.37%	1.000	13480	0.995	0	0	0
enlight_hard	0.50	1	0.50	1.000	1	1.000	0	0	0
	0.50	1	0.50	1.000	1	1.000	0	0	0
	0.50	1	0.50	1.000	1	1.000	0	0	0
ex10	492.89	1	493.80	1.002	1	1.000	0	0	0
	501.87	1	497.94	0.992	1	1.000	0	0	0
	578.19	1	581.12	1.005	1	1.000	0	0	0
ex9	28.90	1	27.98	0.968	1	1.000	0	0	0
	27.40	1	27.30	0.996	1	1.000	0	0	0
	27.37	1	27.02	0.987	1	1.000	0	0	0
exp-1-500-5-5	2.26	1	2.28	1.009	1	1.000	1	10	0
	2.25	1	2.22	0.987	1	1.000	1	10	0
	2.22	1	2.21	0.995	1	1.000	1	10	0
fast0507	321.56	1284	322.23	1.002	1284	1.000	0	0	0
	278.55	1223	280.17	1.006	1223	1.000	0	0	0
	364.27	1711	365.44	1.003	1711	1.000	0	0	0
fastxgemm-n2r6s0t2	3502.66	824448	4702.82	<i>1.343</i>	1118937	<i>1.357</i>	60810	1584297	4898

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	4248.99	1034836	4017.11	0.945	1012967	0.979	46119	1227625	4252
	3917.93	929719	3129.08	0.799	769500	0.828	31382	742061	3380
fhnw-binpack4-48	∞	4074733	∞	1.000	4040499	0.992	0	0	0
	∞	3516591	∞	1.000	3525851	1.003	0	0	0
	∞	3420906	∞	1.000	3413924	0.998	0	0	0
fhnw-binpack4-4	∞	14366166	∞	1.000	14733968	1.026	51	62	0
	∞	11775368	∞	1.000	13981261	1.187	134	154	1
	∞	13192866	∞	1.000	11607995	0.880	16	18	0
fiball	303.30	1648	465.55	<i>1.535</i>	4111	<i>2.495</i>	0	0	0
	449.28	3521	447.14	0.995	3521	1.000	0	0	0
	501.25	5672	499.03	0.996	5672	1.000	0	0	0
gen-ip002	1311.44	5832063	1315.68	1.003	5856334	1.004	0	0	0
	1222.63	5492464	1295.56	<i>1.060</i>	5478569	0.997	0	0	0
	1418.15	5917739	1271.92	0.897	5583912	0.944	0	0	0
gen-ip054	2293.06	11460069	3047.64	<i>1.329</i>	15245360	<i>1.330</i>	0	0	0
	2676.80	13353033	2530.93	0.946	12476019	0.934	0	0	0
	3264.40	16306455	3381.24	1.036	16438070	1.008	0	0	0
germanrr	2.11%	6179	1.46%	1.000	3418	0.553	1296	930657	6012
	1.61%	4773	2.11%	1.000	2851	0.597	1008	674103	6698
	2.12%	5323	1.94%	1.000	3559	0.669	1188	692698	5680
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	0	0	0
	∞	9	∞	1.000	8	0.889	0	0	0
	∞	10	∞	1.000	10	1.000	0	0	0
glass-sc	2649.20	241329	2655.26	1.002	241329	1.000	0	0	0
	3219.69	289206	3214.67	0.998	289206	1.000	0	0	0
	2820.67	251112	2819.06	0.999	251112	1.000	0	0	0
glass4	1436.38	1198005	4008.75	<i>2.791</i>	2705421	<i>2.258</i>	20465	44945	88
	2209.95	1777925	2392.84	<i>1.083</i>	1888717	<i>1.062</i>	13000	28057	48
	3657.58	3399800	2212.84	0.605	1599046	0.470	8277	17765	39

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Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
gmu-35-40	0.02%	2015603	0.05%	1.000	2051936	1.018	0	0	0
	0.03%	2078303	0.03%	1.000	2099939	1.010	0	0	0
	0.03%	1384935	0.03%	1.000	1381092	0.997	0	0	0
gmu-35-50	0.02%	1215213	0.02%	1.000	1317781	1.084	0	0	0
	0.03%	1233124	0.03%	1.000	1247342	1.012	0	0	0
	0.04%	1017587	0.04%	1.000	1016723	0.999	0	0	0
graph20-20-1rand	163.73%	6141	163.73%	1.000	6171	1.005	0	0	0
	165.38%	8297	165.38%	1.000	8277	0.998	0	0	0
	172.66%	7506	172.66%	1.000	7513	1.001	0	0	0
graphdraw-domain	1027.09	1921032	1010.47	0.984	1823083	0.949	27570	108505	8
	1275.78	2267753	1122.85	0.880	1941578	0.856	34372	128150	27
	1309.75	2462138	1664.67	<i>1.271</i>	2907888	<i>1.181</i>	32887	126476	14
h80x6320d	69.51	4	69.54	1.000	4	1.000	5	272	0
	85.96	10	86.17	1.002	10	1.000	36	321	0
	83.19	5	86.62	1.041	5	1.000	12	292	0
highschool1-aigio	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
hypothyroid-k1	20.03	1	20.04	1.000	1	1.000	0	0	0
	20.14	1	19.99	0.993	1	1.000	0	0	0
	20.10	1	20.16	1.003	1	1.000	0	0	0
ic97_potential	0.93%	7108440	0.84%	1.000	7214792	1.015	84920	224548	13768
	0.52%	5988038	0.75%	1.000	6107856	1.020	97136	233798	16056
	0.78%	7276195	0.86%	1.000	7579116	1.042	77811	213437	12467
icir97_tension	0.09%	2933900	0.07%	1.000	3185773	1.086	67327	344855	928
	6818.43	3051060	0.05%	1.056	2776552	0.910	104698	382048	1002
	0.09%	2846197	0.08%	1.000	2729235	0.959	61307	244198	479
irish-electricity	∞	93	∞	1.000	93	1.000	0	0	0
	26.52%	1693	18.43%	1.000	1317	0.778	89	39582	2

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	∞	1333	∞	1.000	1333	1.000	337	5098	0
irp	12.40	6	12.51	1.009	6	1.000	0	0	0
	12.01	4	12.05	1.003	4	1.000	0	0	0
	12.56	5	12.58	1.002	5	1.000	0	0	0
istanbul-no-cutoff	149.11	347	154.02	1.033	347	1.000	66	185	0
	167.55	290	166.34	0.993	245	0.845	38	73	0
	297.83	502	285.14	0.957	475	0.946	73	113	0
k1mushroom	1856.86	7	1897.56	1.022	7	1.000	0	0	0
	1582.93	11	1583.93	1.001	11	1.000	0	0	0
	1321.39	3	1321.29	1.000	3	1.000	0	0	0
lectsched-5-obj	106.67%	138890	166.67%	1.000	148725	1.071	837	921	7
	100.00%	210835	120.00%	1.000	130812	0.620	468	568	8
	126.67%	65555	126.67%	1.000	64923	0.990	763	901	13
leo1	6.11%	80656	6.11%	1.000	80819	1.002	0	0	0
	7.14%	34875	7.14%	1.000	34905	1.001	0	0	0
	7.53%	45860	7.53%	1.000	45969	1.002	0	0	0
leo2	∞	101644	∞	1.000	101616	1.000	0	0	0
	∞	111132	∞	1.000	110967	0.999	0	0	0
	∞	146904	∞	1.000	146706	0.999	0	0	0
lotsize	0.59%	17696	0.67%	1.000	16786	0.949	10346	265616	25
	0.83%	19280	0.88%	1.000	20493	1.063	14718	624095	0
	0.64%	18285	0.70%	1.000	17911	0.980	11090	555863	1
mad	∞	10114842	∞	1.000	8295624	0.820	0	0	0
	∞	19840612	∞	1.000	14934806	0.753	0	0	0
	∞	15915645	∞	1.000	15381075	0.966	0	0	0
map10	1016.84	1752	1006.71	0.990	1637	0.934	474	212302	0
	630.06	724	633.84	1.006	724	1.000	446	181921	0
	804.26	979	792.96	0.986	965	0.986	491	196147	0
map16715-04	2163.19	1963	2158.43	0.998	1933	0.985	1083	841521	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	2367.79	2208	2335.51	0.986	2173	0.984	969	691969	0
	2108.62	2038	2160.04	1.024	1990	0.976	1158	882361	0
markshare2	∞	5803228	∞	1.000	5827069	1.004	0	0	0
	∞	5608533	∞	1.000	5581862	0.995	0	0	0
	∞	5025745	∞	1.000	5052479	1.005	0	0	0
markshare_4_0	73.22	612396	72.47	0.990	612396	1.000	0	0	0
	70.45	589762	70.48	1.000	589762	1.000	0	0	0
	86.21	719508	85.88	0.996	719508	1.000	0	0	0
mas74	1681.25	4932223	1680.79	1.000	4932223	1.000	0	0	0
	2315.16	7992953	2282.09	0.986	7992914	1.000	0	0	0
	1600.10	4642890	1563.59	0.977	4674399	1.007	0	0	0
mas76	137.17	417210	136.88	0.998	406104	0.973	0	0	0
	174.18	542396	168.46	0.967	525538	0.969	0	0	0
	147.94	449431	152.65	1.032	450422	1.002	0	0	0
mc11	132.52	5754	149.40	<i>1.127</i>	6484	<i>1.127</i>	2031	8841	0
	91.51	2220	80.39	0.878	1411	0.636	547	2836	0
	95.10	2350	106.11	<i>1.116</i>	3386	<i>1.441</i>	1339	8682	0
mcsched	318.23	11378	318.21	1.000	11378	1.000	0	0	0
	235.42	9846	235.33	1.000	9846	1.000	0	0	0
	305.24	12017	306.32	1.004	12017	1.000	0	0	0
mik-250-20-75-4	52.59	23893	52.78	1.004	23893	1.000	0	0	0
	43.86	15175	43.96	1.002	15175	1.000	0	0	0
	52.22	20733	52.36	1.003	20733	1.000	0	0	0
milo-v12-6-r2-40-1	10.25%	262756	9.47%	1.000	189681	0.722	29443	793993	8057
	12.14%	300898	8.96%	1.000	323326	1.075	48855	996254	9224
	12.55%	157419	11.33%	1.000	417232	2.650	50731	1460603	21597
momentum1	15.92%	109291	24.76%	1.000	94037	0.860	16334	3142408	146
	6.21%	196564	7.36%	1.000	91471	0.465	19615	3121036	101
	7.40%	196735	6.53%	1.000	188055	0.956	24263	3816211	95

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
mushroom-best	655.70	32432	579.50	0.884	27393	0.845	2354	63226	2347
	162.32%	93046	134.09%	1.000	94624	1.017	2438	8272	1397
	121.99%	91607	121.97%	1.000	98893	1.080	2289	9665	3624
mzzv11	210.47	484	210.71	1.001	484	1.000	151	2944	1
	295.69	1237	263.08	0.890	987	0.798	93	1908	8
	195.49	616	195.89	1.002	616	1.000	131	2863	0
mzzv42z	170.41	366	175.26	1.028	415	<i>1.134</i>	41	491	2
	245.85	712	246.00	1.001	712	1.000	119	1129	1
	307.42	719	306.34	0.996	719	1.000	84	790	14
n2seq36q	928.18	5438	936.81	1.009	5438	1.000	0	0	0
	1068.12	4712	1061.28	0.994	4712	1.000	0	0	0
	1165.81	4632	1170.79	1.004	4632	1.000	0	0	0
n3div36	2.59%	214521	2.59%	1.000	213866	0.997	0	0	0
	2.86%	206708	2.86%	1.000	207136	1.002	0	0	0
	2.69%	203288	2.69%	1.000	202891	0.998	0	0	0
n5-3	26.44	926	26.40	0.998	926	1.000	0	0	0
	27.87	971	27.79	0.997	971	1.000	0	0	0
	27.03	1087	27.09	1.002	1087	1.000	0	0	0
neos-1122047	9.85	1	9.92	1.007	1	1.000	0	0	0
	10.12	1	9.76	0.964	1	1.000	0	0	0
	10.02	1	9.70	0.968	1	1.000	0	0	0
neos-1171448	57.62	101	58.11	1.009	101	1.000	1	2	0
	5.14	1	5.16	1.004	1	1.000	1	2	0
	51.32	86	51.55	1.004	86	1.000	1	2	0
neos-1171737	1.04%	3914	1.04%	1.000	3912	0.999	201	39010	9
	1.56%	3995	1.56%	1.000	4009	1.004	146	22485	2
	1.04%	23961	1.30%	1.000	11719	0.489	870	171876	48
neos-1354092	∞	613	∞	1.000	613	1.000	16	44	0
	∞	820	∞	1.000	820	1.000	8	40	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	∞	639	∞	1.000	639	1.000	13	51	0
neos-1445765	43.55	133	43.72	1.004	133	1.000	0	0	0
	44.21	141	44.19	1.000	141	1.000	0	0	0
	44.33	125	44.74	1.009	125	1.000	0	0	0
neos-1456979	7.49%	39962	7.49%	1.000	39961	1.000	317	342	0
	6.84%	38683	6.84%	1.000	38750	1.002	386	411	0
	7.31%	31468	7.29%	1.000	31540	1.002	260	295	2
neos-1582420	22.35	18	21.85	0.978	18	1.000	99	748	0
	10.95	9	10.92	0.997	9	1.000	23	183	0
	56.60	1485	55.49	0.980	1381	0.930	343	6636	3
neos-2075418-temuka	6994.03	1	7024.05	1.004	1	1.000	0	0	0
	4557.40	1	4517.94	0.991	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
neos-2657525-crna	∞	1033738	∞	1.000	3064132	2.964	305338	1287499	4384
	∞	6445549	∞	1.000	3681104	0.571	260563	1054254	4131
	∞	2050011	∞	1.000	2122332	1.035	167202	651015	2934
neos-2746589-doon	0.46%	55574	0.46%	1.000	55681	1.002	55	59	0
	0.73%	30244	0.73%	1.000	30280	1.001	17	17	0
	0.11%	183064	0.11%	1.000	182349	0.996	16	16	0
neos-2978193-inde	0.50%	556781	0.50%	1.000	549249	0.986	17677	1380705	6909
	0.13%	592342	0.13%	1.000	573707	0.969	15133	278686	11049
	0.50%	554918	0.50%	1.000	548119	0.988	14906	869905	5391
neos-2987310-joes	17.78	1	17.49	0.984	1	1.000	0	0	0
	15.38	1	15.31	0.995	1	1.000	0	0	0
	13.98	1	13.67	0.978	1	1.000	0	0	0
neos-3004026-krka	53.47	2711	53.06	0.992	2711	1.000	0	0	0
	62.71	3485	62.47	0.996	3485	1.000	0	0	0
	46.89	1764	46.28	0.987	1764	1.000	0	0	0
neos-3024952-loue	0.16%	539688	4646.86	0.645	383076	0.710	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
neos-3046615-murg	0.04%	572811	0.07%	1.000	688312	1.202	0	0	0
	0.06%	712436	0.04%	1.000	1114650	1.565	0	0	0
	168.57%	6790987	169.81%	1.000	6971706	1.027	44944	176979	361
neos-3083819-nubu	165.23%	6304071	166.11%	1.000	6364063	1.010	52191	188828	378
	165.34%	6624957	163.66%	1.000	7613539	1.149	53660	197797	217
	12.85	2020	12.72	0.990	2020	1.000	0	0	0
neos-3216931-puriri	12.41	1578	12.37	0.997	1578	1.000	0	0	0
	13.15	1783	20.79	<i>1.581</i>	3812	<i>2.138</i>	0	0	0
	121.93%	5930	116.41%	1.000	5546	0.935	1653	18527	171
neos-3381206-awhea	136.59%	7016	5.50%	1.000	9705	1.383	3122	31056	292
	44.24%	7052	147.13%	1.000	4790	0.679	1084	12570	125
	1.17	1	1.18	1.009	1	1.000	0	0	0
neos-3402294-bobin	1.18	1	1.21	1.025	1	1.000	0	0	0
	1.58	1	1.20	0.759	1	1.000	0	0	0
	4393.77	40294	4386.37	0.998	40294	1.000	0	0	0
neos-3402454-bohle	626.24	3428	618.95	0.988	3428	1.000	0	0	0
	1615.76	9242	1620.92	1.003	9242	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
neos-3555904-turama	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	18.01%	145	18.01%	1.000	145	1.000	0	0	0
neos-3627168-kasai	∞	18	∞	1.000	18	1.000	0	0	0
	18.01%	16848	18.01%	1.000	16797	0.997	0	0	0
	0.15%	4666430	0.15%	1.000	4555684	0.976	247098	1484594	60869
neos-3656078-kumeu	0.08%	3864489	0.09%	1.000	4132791	1.069	128677	534359	5538
	0.32%	4890974	0.27%	1.000	5147129	1.052	200184	1553577	21135
	∞	32	∞	1.000	32	1.000	2	10	0
	∞	82	∞	1.000	82	1.000	7	6	4
	∞	120	∞	1.000	122	1.017	20	28	9

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
neos-3754480-nidda	∞	19392247	∞	1.000	20000763	1.031	404243	2137015	0
	∞	17983261	∞	1.000	18439214	1.025	334081	1932375	0
	∞	18621407	∞	1.000	19108471	1.026	318601	1714950	0
neos-3988577-wolgan	∞	309	∞	1.000	312	1.010	0	0	0
	∞	179	∞	1.000	179	1.000	0	0	0
	∞	439	∞	1.000	439	1.000	0	0	0
neos-4300652-rahue	431.97%	1366	431.97%	1.000	1365	0.999	857	556334	33
	809.48%	1234	809.48%	1.000	1213	0.983	671	435322	135
	316.83%	2125	316.83%	1.000	2127	1.001	862	558266	51
neos-4338804-snowy	2.07%	4480880	1.66%	1.000	4875741	1.088	4688	7594	60
	0.82%	6599181	0.82%	1.000	6738902	1.021	5834	9204	62
	1.80%	4918723	1.66%	1.000	5067404	1.030	3873	7160	29
neos-4387871-tavua	15.21%	101425	11.39%	1.000	118375	1.167	16112	2131445	18596
	11.14%	129374	14.13%	1.000	116171	0.898	19318	2188084	25944
	16.55%	90590	18.66%	1.000	96695	1.067	17305	2381097	26390
neos-4413714-turia	295.68	2	299.23	1.012	2	1.000	0	0	0
	403.01	2	404.80	1.004	2	1.000	0	0	0
	285.26	2	277.10	0.971	2	1.000	0	0	0
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
neos-4647030-tutaki	0.01%	24564	0.01%	1.000	24413	0.994	34	1457	0
	0.01%	23168	0.01%	1.000	22893	0.988	34	3708	0
	0.01%	26780	0.01%	1.000	27292	1.019	39	276	0
neos-4722843-widden	4370.53	21244	2651.33	0.607	11357	0.535	3551	4044	15
	884.93	3347	1033.65	<i>1.168</i>	3376	1.009	506	925	1
	2413.56	11399	1714.52	0.710	7919	0.695	1494	5039	43
neos-4738912-atrato	950.47	90901	813.40	0.856	61981	0.682	168	704	0
	3625.90	323637	3808.90	<i>1.050</i>	324992	1.004	60	293	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	881.55	90544	914.39	1.037	95736	<i>1.057</i>	2085	8935	0
neos-4763324-toguru	46.04%	8436	46.04%	1.000	8436	1.000	176	176	0
	45.08%	14925	45.08%	1.000	14962	1.002	274	274	0
	48.94%	7145	48.94%	1.000	7145	1.000	147	147	0
neos-4954672-berkel	9.85%	1090964	8.48%	1.000	1019990	0.935	108821	3526157	0
	8.67%	801213	8.71%	1.000	819107	1.022	102348	3809289	0
	8.26%	863316	8.00%	1.000	891993	1.033	115288	3611058	2
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	0	0	0
	15.39%	14	15.39%	1.000	14	1.000	0	0	0
	15.20%	12	15.20%	1.000	12	1.000	0	0	0
neos-5052403-cygnnet	1.60%	113	1.60%	1.000	113	1.000	0	0	0
	1.38%	1	1.38%	1.000	1	1.000	0	0	0
	1.19%	63	1.19%	1.000	63	1.000	0	0	0
neos-5093327-huahum	10.59%	49160	10.32%	1.000	49854	1.014	5081	2892297	0
	10.40%	51911	10.43%	1.000	52521	1.012	5112	2880628	0
	8.03%	61483	12.17%	1.000	48532	0.789	5859	3208411	2
neos-5104907-jarama	∞	8	∞	1.000	8	1.000	0	0	0
	∞	9	∞	1.000	9	1.000	1	4	0
	∞	4	∞	1.000	4	1.000	1	5	0
neos-5107597-kakapo	2198.25	613736	2144.47	0.976	560533	0.913	11	10	1
	2305.69	750515	1725.41	0.748	472393	0.629	6	8	0
	6433.70	2382549	5927.88	0.921	1725439	0.724	53	29	24
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
neos-5188808-nattai	1274.06	12152	1251.29	0.982	12145	0.999	1101	69281	1096
	1276.88	13260	1292.07	1.012	13554	1.022	1630	96022	1784
	1338.51	12446	1380.62	1.031	12548	1.008	1384	97379	1411
neos-5195221-niemur	2934.65	62937	2813.87	0.959	47466	0.754	87	89	4

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	3296.69	29661	2911.85	0.883	25010	0.843	25	26	0
	2900.15	34651	2890.78	0.997	33779	0.975	32	33	2
neos-631710	14.21%	2	14.21%	1.000	2	1.000	0	0	0
	8.90%	4	8.90%	1.000	4	1.000	0	0	0
	14.21%	3	14.21%	1.000	3	1.000	0	0	0
neos-662469	0.00%	62896	0.01%	1.000	59651	0.948	0	0	0
	0.04%	57183	0.00%	1.000	50627	0.885	0	0	0
	0.05%	61397	0.01%	1.000	56995	0.928	0	0	0
neos-787933	1.36	1	1.37	1.007	1	1.000	0	0	0
	1.37	1	1.39	1.015	1	1.000	0	0	0
	1.39	1	1.41	1.014	1	1.000	0	0	0
neos-827175	6.17	1	6.10	0.989	1	1.000	0	0	0
	8.18	1	8.21	1.004	1	1.000	0	0	0
	10.21	1	10.23	1.002	1	1.000	0	0	0
neos-848589	32.15%	257	32.15%	1.000	256	0.996	5	264	0
	42.57%	149	42.95%	1.000	148	0.993	1	181	0
	46.27%	106	46.27%	1.000	106	1.000	1	2	0
neos-860300	17.26	2	17.27	1.001	2	1.000	0	0	0
	13.27	2	13.35	1.006	2	1.000	0	0	0
	22.98	3	23.18	1.009	3	1.000	0	0	0
neos-873061	9.28%	159	9.28%	1.000	155	0.975	16	93	6
	7.72%	148	7.72%	1.000	148	1.000	6	77	4
	8.12%	168	8.12%	1.000	168	1.000	7	8477	2
neos-911970	0.31%	3332161	1.05%	1.000	1400854	0.420	62333	694283	581
	2.34%	1566613	2.49%	1.000	1814127	1.158	121933	985857	391
	0.06%	7963827	0.06%	1.000	11460910	1.439	203731	1482860	52
neos-933966	1376.54	138	1374.28	0.998	138	1.000	0	0	0
	847.64	38	848.27	1.001	38	1.000	0	0	0
	2191.68	283	2180.73	0.995	283	1.000	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled			combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can	
neos-950242	100.00%	9417	100.00%	1.000	9288	0.986	0	0	0	
	100.00%	8406	100.00%	1.000	8446	1.005	0	0	0	
	100.00%	15615	100.00%	1.000	15629	1.001	0	0	0	
neos-957323	86.64	2	86.06	0.993	2	1.000	0	0	0	
	110.48	5	110.59	1.001	5	1.000	0	0	0	
	79.79	2	80.10	1.004	2	1.000	0	0	0	
neos-960392	882.16	15	881.09	0.999	15	1.000	0	0	0	
	1459.84	102	1439.63	0.986	102	1.000	0	0	0	
	1365.45	403	1363.87	0.999	403	1.000	0	0	0	
neos17	26.07	22460	25.95	0.995	22460	1.000	0	0	0	
	9.23	5644	9.39	1.017	5644	1.000	0	0	0	
	9.76	6376	9.84	1.008	6376	1.000	0	0	0	
neos5	1013.70	3292114	1007.54	0.994	3292114	1.000	0	0	0	
	1235.27	4202380	1234.24	0.999	4202380	1.000	0	0	0	
	1192.31	4100005	1183.51	0.993	4100005	1.000	0	0	0	
neos859080	0.51	792	0.50	0.980	792	1.000	0	0	0	
	0.58	655	0.54	0.931	655	1.000	2	2	0	
	0.54	565	0.55	1.019	565	1.000	0	0	0	
neos8	1.92	1	1.95	1.016	1	1.000	3	5	0	
	1.85	1	1.89	1.022	1	1.000	3	5	0	
	1.83	1	1.83	1.000	1	1.000	2	4	0	
net12	2011.11	1524	1842.42	0.916	1211	0.795	243	1269	3	
	1787.13	1927	1631.28	0.913	1816	0.942	416	1785	0	
	2262.14	2710	1561.43	0.690	1695	0.625	326	1572	2	
netdiversion	845.87	43	848.00	1.003	43	1.000	0	0	0	
	2379.98	88	2364.82	0.994	88	1.000	0	0	0	
	1084.62	27	1087.12	1.002	27	1.000	0	0	0	
nexp-150-20-8-5	3548.55	5786	3539.59	0.997	5786	1.000	1482	1601	0	
	2864.29	3863	3635.13	<i>1.269</i>	7166	<i>1.855</i>	770	944	0	

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	0.83%	13081	0.83%	1.000	13054	0.998	1410	1989	0
ns1116954	∞	32	∞	1.000	32	1.000	0	0	0
	∞	57	∞	1.000	57	1.000	0	0	0
	∞	75	∞	1.000	75	1.000	0	0	0
ns1208400	418.52	2004	419.49	1.002	2004	1.000	0	0	0
	682.86	2339	683.06	1.000	2339	1.000	0	0	0
	1073.99	2315	1074.09	1.000	2315	1.000	0	0	0
ns1644855	7.37%	36	7.37%	1.000	36	1.000	7	178	534
	7.37%	79	7.37%	1.000	79	1.000	3	125	162
	976.72	1	974.47	0.998	1	1.000	3	125	162
ns1760995	58.41%	1	58.41%	1.000	1	1.000	0	0	0
	71.46%	1	71.46%	1.000	1	1.000	0	0	0
	49.34%	1	48.93%	1.000	1	1.000	0	0	0
ns1830653	288.54	14558	287.45	0.996	14558	1.000	0	0	0
	133.25	7527	134.33	1.008	7527	1.000	0	0	0
	147.20	7267	148.24	1.007	7267	1.000	0	0	0
ns1952667	∞	53397	∞	1.000	52208	0.978	0	0	0
	1391.80	9508	1392.38	1.000	9508	1.000	0	0	0
	970.44	4900	968.90	0.998	4900	1.000	0	0	0
nu25-pr12	5.38	53	5.36	0.996	53	1.000	27	74	0
	6.04	66	6.11	1.012	66	1.000	18	95	0
	6.11	16	6.05	0.990	16	1.000	13	30	1
nursesched-medium-hint03	1657.78%	1118	1657.78%	1.000	1100	0.984	0	0	0
	1847.99%	2091	3021.25%	1.000	2050	0.980	0	0	0
	1077.84%	1150	1077.84%	1.000	1121	0.975	0	0	0
nursesched-sprint02	142.25	370	142.08	0.999	370	1.000	0	0	0
	85.40	409	85.18	0.997	409	1.000	0	0	0
	67.56	222	67.71	1.002	222	1.000	0	0	0
nw04	38.01	6	37.93	0.998	6	1.000	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	31.46	5	31.39	0.998	5	1.000	0	0	0
	35.17	6	35.16	1.000	6	1.000	0	0	0
opm2-z10-s4	24.70%	997	24.70%	1.000	1000	1.003	0	0	0
	27.76%	584	27.76%	1.000	586	1.003	0	0	0
	26.96%	1015	26.96%	1.000	1015	1.000	0	0	0
p200x1188c	3.55	2	3.53	0.994	2	1.000	0	0	0
	3.96	3	3.96	1.000	3	1.000	0	0	0
	3.57	2	3.62	1.014	2	1.000	0	0	0
peg-solitaire-a3	∞	5756	∞	1.000	5752	0.999	0	0	0
	∞	3578	∞	1.000	3557	0.994	0	0	0
	∞	3962	∞	1.000	3969	1.002	0	0	0
pg5_34	1151.97	139447	1173.22	1.018	148717	<i>1.066</i>	20081	3853057	0
	1522.31	172430	1134.07	0.745	144543	0.838	31619	4252733	0
	994.39	128293	1085.15	<i>1.091</i>	121673	0.948	31923	3326334	0
pg	99.44	2781	101.85	1.024	2687	0.966	628	136418	0
	80.58	794	86.23	<i>1.070</i>	1372	<i>1.728</i>	585	102074	0
	88.23	848	107.44	<i>1.218</i>	2311	<i>2.725</i>	1063	182388	0
physiciansched3-3	∞	415	∞	1.000	415	1.000	0	0	0
	∞	313	∞	1.000	313	1.000	0	0	0
	∞	361	∞	1.000	361	1.000	0	0	0
physiciansched6-2	124.88	377	124.81	0.999	377	1.000	0	0	0
	465.94	2804	462.02	0.992	2804	1.000	0	0	0
	44.79	1	44.74	0.999	1	1.000	0	0	0
piperout-08	515.83	71	797.03	<i>1.545</i>	130	<i>1.831</i>	1010	2509	19
	659.36	1079	606.54	0.920	552	0.512	433	680	0
	1256.04	962	923.85	0.736	596	0.620	257	364	39
piperout-27	141.24	2	140.11	0.992	2	1.000	0	0	0
	271.59	566	275.91	1.016	566	1.000	15	40	0
	236.88	87	332.32	<i>1.403</i>	72	0.828	68	117	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
pk1	107.24	301100	107.55	1.003	301100	1.000	0	0	0
	109.48	317026	109.16	0.997	317026	1.000	0	0	0
	112.59	328715	112.34	0.998	328715	1.000	0	0	0
proteindesign121hz512p9	9.62%	571	9.60%	1.000	591	1.035	134	275	0
	11.98%	443	7.94%	1.000	440	0.993	52	58	0
	26.01%	603	26.02%	1.000	593	0.983	18	28	0
proteindesign122trx11p8	1.99%	2	1.95%	1.000	3	1.500	36	41	0
	1.92%	2	1.91%	1.000	8	4.000	92	111	0
	1.93%	17	1.93%	1.000	17	1.000	143	202	0
qap10	87.97	3	87.99	1.000	3	1.000	0	0	0
	111.85	5	111.82	1.000	5	1.000	0	0	0
	197.59	15	197.87	1.001	15	1.000	0	0	0
radiationm18-12-05	12.98%	412813	12.99%	1.000	479812	1.162	8460	27217	1073
	14.84%	533800	0.05%	1.000	750150	1.405	14094	39121	1726
	5.57%	751483	1.89%	1.000	551080	0.733	8455	26581	1531
radiationm40-10-02	62.90%	99496	67.02%	1.000	53316	0.536	1110	3484	213
	24.75%	95368	57.74%	1.000	27109	0.284	1725	8522	421
	43.31%	85305	22.69%	1.000	99008	1.161	3380	17079	453
rail01	2.74%	205	2.74%	1.000	200	0.976	0	0	0
	25.21%	182	25.21%	1.000	182	1.000	0	0	0
	7.32%	183	7.32%	1.000	183	1.000	0	0	0
rail02	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
rail507	157.07	623	156.67	0.997	623	1.000	0	0	0
	177.68	783	180.04	1.013	783	1.000	0	0	0
	194.14	771	193.43	0.996	771	1.000	0	0	0
ran14x18-disj-8	1872.99	682276	2109.62	<i>1.126</i>	656920	0.963	46693	824935	3
	1372.27	416671	1785.31	<i>1.301</i>	564900	<i>1.356</i>	45871	749904	5

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	2082.12	785350	1694.59	0.814	593570	0.756	44838	749522	5
rd-rplusc-21	≥ 10000%	422103	≥ 10000%	1.000	484631	1.148	3413	3721	0
	≥ 10000%	501179	≥ 10000%	1.000	737139	1.471	6536	7402	0
	≥ 10000%	639178	≥ 10000%	1.000	763715	1.195	2948	3340	1
reblock115	5110.88	779543	4390.48	0.859	704168	0.903	0	0	0
	5854.84	786695	6605.46	<i>1.128</i>	882785	<i>1.122</i>	0	0	0
	4579.73	661438	5894.68	<i>1.287</i>	832788	<i>1.259</i>	0	0	0
rmatr100-p10	166.64	809	166.48	0.999	809	1.000	0	0	0
	163.04	822	162.84	0.999	822	1.000	0	0	0
	160.71	827	160.62	0.999	827	1.000	0	0	0
rmatr200-p5	22.40%	423	22.40%	1.000	421	0.995	0	0	0
	22.02%	421	19.56%	1.000	423	1.005	0	0	0
	21.08%	393	21.08%	1.000	403	1.025	0	0	0
rocl-4-11	636.15	12127	638.21	1.003	12970	<i>1.070</i>	96	656	11
	890.92	15544	1001.80	<i>1.124</i>	17602	<i>1.132</i>	159	956	7
	480.74	8974	498.07	1.036	9550	<i>1.064</i>	144	875	6
rocII-5-11	153.95%	3381	108.52%	1.000	3399	1.005	165	235	0
	155.01%	2626	109.87%	1.000	2764	1.053	160	231	0
	109.27%	2695	109.11%	1.000	2522	0.936	97	116	0
rococoB10-011000	13.69%	151830	13.71%	1.000	151103	0.995	0	0	0
	15.08%	143682	15.09%	1.000	143253	0.997	0	0	0
	12.80%	153757	12.80%	1.000	153839	1.001	0	0	0
rococoC10-001000	770.61	53303	765.76	0.994	53303	1.000	0	0	0
	851.05	63090	851.99	1.001	63090	1.000	0	0	0
	1629.78	162527	1626.91	0.998	162527	1.000	0	0	0
roi2alpha3n4	1425.48	12529	1424.80	1.000	12529	1.000	0	0	0
	1941.34	17446	1940.46	1.000	17446	1.000	0	0	0
	1490.05	13303	1486.54	0.998	13303	1.000	0	0	0
roi5alpha10n8	35.37%	6022	35.37%	1.000	5989	0.995	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled			combined					
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
roll3000	40.38%	6261	40.36%	1.000	6346	1.014	0	0	0
	32.14%	6789	32.14%	1.000	6789	1.000	0	0	0
	36.69	1986	36.86	1.005	1986	1.000	539	1438	14
s100	55.83	3453	38.91	0.697	2149	0.622	642	2465	68
	37.30	2319	60.26	<i>1.616</i>	3736	<i>1.611</i>	1155	3483	31
	14.04%	18	5.53%	1.000	20	1.111	0	0	0
s250r10	29.84%	17	29.84%	1.000	17	1.000	0	0	0
	1.06%	22	1.06%	1.000	22	1.000	0	0	0
	0.28%	23082	0.28%	1.000	22897	0.992	0	0	0
satellites2-40	6324.93	45426	6366.45	1.007	45426	1.000	0	0	0
	0.23%	31934	0.23%	1.000	31811	0.996	0	0	0
	∞	19	∞	1.000	19	1.000	1	1	0
satellites2-60-fs	∞	4	∞	1.000	4	1.000	0	0	0
	70.59%	33	70.59%	1.000	33	1.000	2	2	0
	∞	33	∞	1.000	33	1.000	1	1	0
savsched1	∞	137	∞	1.000	137	1.000	18	18	0
	∞	28	∞	1.000	28	1.000	1	1	0
	∞	1	∞	1.000	1	1.000	0	0	0
sct2	∞	1	∞	1.000	1	1.000	0	0	0
	0.03%	626617	0.03%	1.000	600226	0.958	9604	114239	6447
	0.05%	555785	0.05%	1.000	659682	1.187	10379	205028	3020
seymour1	0.03%	1529359	0.03%	1.000	994927	0.651	12226	162541	7626
	73.25	1554	90.45	<i>1.235</i>	1627	1.047	85	235	3
	69.25	1466	67.90	0.981	1466	1.000	67	147	3
seymour	71.80	1822	72.05	1.003	1822	1.000	100	224	3
	0.66%	242183	0.66%	1.000	242500	1.001	0	0	0
	0.68%	221519	0.68%	1.000	222209	1.003	0	0	0
	0.74%	225942	0.74%	1.000	225373	0.997	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled			combined					
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
sing326	0.30%	8603	0.15%	1.000	11755	1.366	933	1132189	87
	0.15%	8634	0.17%	1.000	8196	0.949	851	996582	17
	0.14%	9576	0.32%	1.000	7997	0.835	1405	1673762	17
sing44	0.45%	5586	0.45%	1.000	5531	0.990	422	163964	0
	0.19%	7471	0.19%	1.000	7349	0.984	661	583858	0
	0.26%	2798	0.27%	1.000	2267	0.810	560	631983	1
snp-02-004-104	0.00%	15367	0.00%	1.000	14561	0.948	1880	27689	0
	0.00%	13656	0.00%	1.000	18040	1.321	1712	29797	0
	0.00%	20392	0.00%	1.000	19680	0.965	1431	24076	0
sorrell3	43.81%	41058	43.81%	1.000	41208	1.004	0	0	0
	35.59%	39358	35.59%	1.000	39514	1.004	0	0	0
	19.11%	8959	19.11%	1.000	8801	0.982	0	0	0
sp150x300d	3.96	3472	3.96	1.000	3472	1.000	164	355	91
	3.12	2569	3.12	1.000	2569	1.000	85	334	5
	1.32	848	1.29	0.977	848	1.000	43	124	2
sp97ar	0.98%	15764	0.98%	1.000	15747	0.999	0	0	0
	1.02%	22814	1.02%	1.000	22961	1.006	0	0	0
	1.53%	24818	1.53%	1.000	24828	1.000	0	0	0
sp98ar	1.43%	71712	1.43%	1.000	71746	1.000	0	0	0
	0.48%	66738	0.48%	1.000	67060	1.005	0	0	0
	0.98%	71775	0.98%	1.000	71271	0.993	0	0	0
splice1k1	309.20%	514	309.20%	1.000	513	0.998	0	0	0
	376.10%	596	376.10%	1.000	594	0.997	0	0	0
	358.74%	837	358.74%	1.000	834	0.996	0	0	0
square41	109.98%	30	109.98%	1.000	30	1.000	5	10	0
	89.32%	38	89.32%	1.000	37	0.974	25	61	0
	92.32%	27	92.32%	1.000	28	1.037	1	4	0
square47	231.21%	4	231.21%	1.000	4	1.000	0	0	0
	117.00%	13	117.00%	1.000	13	1.000	8	35	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	231.21%	1	231.21%	1.000	1	1.000	0	0	0
supportcase10	803.51%	1	803.51%	1.000	1	1.000	0	0	0
	989.07%	1	989.07%	1.000	1	1.000	0	0	0
	1054.36%	1	1054.36%	1.000	1	1.000	0	0	0
supportcase12	1.31%	1473	1.31%	1.000	1463	0.993	0	0	0
	1.35%	2292	1.35%	1.000	2297	1.002	0	0	0
	1.16%	1772	1.30%	1.000	1505	0.849	0	0	0
supportcase18	3.84%	419796	3.84%	1.000	419350	0.999	0	0	0
	5.96%	236635	5.96%	1.000	237591	1.004	0	0	0
	3.84%	198642	3.84%	1.000	198815	1.001	0	0	0
supportcase19	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
	∞	1	∞	1.000	1	1.000	0	0	0
supportcase22	∞	51	∞	1.000	51	1.000	0	0	0
	∞	18	∞	1.000	18	1.000	0	0	0
	∞	66	∞	1.000	66	1.000	0	0	0
supportcase26	9.03%	8673498	8.94%	1.000	8135621	0.938	73790	151824	42
	3841.51	5550476	5238.22	<i>1.364</i>	6761735	<i>1.218</i>	42236	84405	1
	6080.50	7794727	4487.28	0.738	5497025	0.705	53692	110623	3
supportcase33	1500.01	11787	1598.38	<i>1.066</i>	12756	<i>1.082</i>	537	558	0
	3162.80	24151	1600.98	0.506	7176	0.297	378	398	0
	1337.69	7556	682.16	0.510	3786	0.501	493	518	0
supportcase40	788.54	6258	786.50	0.997	6335	1.012	3743	337428	0
	1223.53	11722	946.94	0.774	7991	0.682	3507	313703	0
	803.81	6970	797.74	0.992	6970	1.000	3421	289071	0
supportcase42	0.14%	464240	0.38%	1.000	305571	0.658	0	0	0
	0.13%	547707	0.10%	1.000	380155	0.694	0	0	0
	0.28%	258072	0.35%	1.000	467610	1.812	7	7	0
supportcase6	9.13%	19201	9.13%	1.000	18980	0.988	0	0	0

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
	8.41%	17726	8.41%	1.000	17726	1.000	0	0	0
	9.72%	17624	9.72%	1.000	17709	1.005	0	0	0
supportcase7	180.82	59	179.98	0.995	59	1.000	31	9612	0
	193.14	47	193.62	1.002	45	0.957	74	40227	0
	208.73	32	210.25	1.007	32	1.000	110	53430	0
swath1	22.03	438	21.09	0.957	281	0.642	920	47380	8
	16.68	227	17.34	1.040	245	<i>1.079</i>	734	34806	3
	18.37	266	19.82	<i>1.079</i>	292	<i>1.098</i>	877	44868	3
swath3	242.86	33006	226.20	0.931	28316	0.858	7278	384774	27
	180.43	21033	182.91	1.014	21837	1.038	6664	349970	22
	417.85	70960	427.45	1.023	74192	1.046	13631	680849	110
tbfp-network	2323.97	574	2356.81	1.014	574	1.000	0	0	0
	1683.53	71	1683.80	1.000	71	1.000	0	0	0
	1088.02	99	1088.57	1.001	99	1.000	0	0	0
thor50dday	23.30%	95	23.30%	1.000	95	1.000	7	970	0
	21.49%	11	21.49%	1.000	12	1.091	1	93	0
	14.80%	34	14.80%	1.000	34	1.000	0	0	0
timtab1	68.29	57181	73.73	<i>1.080</i>	64175	<i>1.122</i>	4716	36866	894
	73.22	55234	67.90	0.927	51540	0.933	3310	25860	474
	76.52	60784	70.92	0.927	55054	0.906	4993	39870	964
tr12-30	864.04	604848	606.97	0.702	423661	0.700	27858	133842	0
	708.84	522569	650.32	0.917	475420	0.910	35144	103546	70
	516.81	295635	397.52	0.769	213946	0.724	19017	155457	0
traininstance2	∞	50327	∞	1.000	67099	1.333	708	919	1
	∞	40455	∞	1.000	52063	1.287	1261	1759	13
	$\geq 10000\%$	55987	6286.13%	1.000	73138	1.306	600	737	15
traininstance6	794.97%	405190	634.16%	1.000	456248	1.126	3860	5136	58
	655.46%	320501	626.92%	1.000	347529	1.084	5435	7060	66
	576.79%	324532	520.12%	1.000	454368	1.400	7637	10460	52

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Table 3: Detailed computational results on MIPLIB 2017 benchmark with and without variable bound constraint substitution. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	vbound-cancellation disabled		combined						
	time	nodes	time	time _Q	nodes	nodes _Q	vbc-run	vb-chg	vb-can
trento1	0.07%	58586	0.07%	1.000	57766	0.986	11	13	0
	0.07%	61566	0.10%	1.000	51033	0.829	6	9	0
	0.09%	51991	1.67%	1.000	35013	0.673	7	9	0
triptim1	1098.59	8	1099.43	1.001	8	1.000	0	0	0
	747.80	7	747.73	1.000	7	1.000	0	0	0
	1061.53	8	1065.09	1.003	8	1.000	0	0	0
uccase12	0.00%	78983	0.00%	1.000	77800	0.985	1786	20788	401
	0.00%	87529	0.00%	1.000	91468	1.045	1908	25777	296
	0.00%	88050	0.00%	1.000	98605	1.120	1329	12004	336
uccase9	1.51%	408	1.98%	1.000	498	1.221	186	148817	0
	2.05%	1099	1.48%	1.000	1166	1.061	163	124154	0
	6.85%	1274	2.82%	1.000	550	0.432	151	126318	0
uct-subprob	1111.65	44339	1102.62	0.992	44339	1.000	0	0	0
	1634.73	59559	1631.60	0.998	59559	1.000	0	0	0
	2514.17	95674	2506.36	0.997	95674	1.000	0	0	0
unitcal_7	267.83	89	272.59	1.018	89	1.000	118	6578	0
	296.79	176	298.12	1.004	180	1.023	282	68304	0
	384.88	436	387.18	1.006	436	1.000	231	66533	0
var-smallemary-m6j6	0.81%	615295	0.93%	1.000	568323	0.924	0	0	0
	0.87%	658145	0.87%	1.000	656232	0.997	0	0	0
	6693.63	683202	6729.45	1.005	683202	1.000	0	0	0
wachplan	2341.48	219938	2340.84	1.000	219938	1.000	0	0	0
	3644.81	333384	3419.67	0.938	302179	0.906	0	0	0
	2345.88	198054	2343.95	0.999	198054	1.000	0	0	0

Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
30n20b8	149.78	171	149.68	0.999	171	1.000	3	0
	773.41	2674	623.60	0.806	1999	0.748	5	36
	474.09	3834	693.56	<i>1.463</i>	3499	0.913	6	76
50v-10	1.36%	860023	1.69%	1.000	829421	0.964	27	2
	1.38%	977162	1.15%	1.000	867997	0.888	28	4
	1.42%	1024944	1.37%	1.000	833134	0.813	30	2
CMS750_4	173.21	2061	185.73	<i>1.072</i>	2028	0.984	10	52
	532.83	9672	370.72	0.696	3254	0.336	8	112
	372.77	9265	473.12	<i>1.269</i>	13518	<i>1.459</i>	8	133
academictimetablesmall	∞	2317	∞	1.000	2315	0.999	1	0
	∞	3512	∞	1.000	3505	0.998	11	0
	∞	2681	∞	1.000	2681	1.000	2	0
air05	40.26	648	40.07	0.995	648	1.000	24	62
	36.13	716	36.54	1.011	716	1.000	32	90
	31.36	282	30.22	0.964	282	1.000	8	18
app1-1	3.50	2	3.53	1.009	2	1.000	2	0
	4.88	3	4.94	1.012	3	1.000	2	15
	4.16	6	4.17	1.002	6	1.000	2	14
app1-2	643.47	33	642.80	0.999	33	1.000	2	0
	791.07	20	789.47	0.998	20	1.000	2	6
	616.82	20	618.36	1.002	20	1.000	2	0
assign1-5-8	4.73%	6050427	4.74%	1.000	5736357	0.948	4	9
	4.54%	6084457	4.54%	1.000	6813236	1.120	7	73
	5.04%	6173436	4.80%	1.000	6333262	1.026	9	63
atlanta-ip	3.60%	18545	3.60%	1.000	18533	0.999	130	0
	3.78%	21656	3.81%	1.000	21153	0.977	16	0
	4.27%	30914	4.27%	1.000	30903	1.000	32	0
blc1sl	16.77%	44740	17.13%	1.000	35962	0.804	35	1195
	17.31%	17207	18.36%	1.000	21112	1.227	30	810

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	18.01%	19831	17.69%	1.000	18673	0.942	27	596
bab2	1.29%	3473	1.29%	1.000	3473	1.000	7	0
	1.10%	3384	2.44%	1.000	3262	0.964	5	0
	∞	1981	∞	1.000	1981	1.000	0	0
bab6	0.58%	4937	0.58%	1.000	4790	0.970	10	0
	0.83%	3277	1.14%	1.000	3258	0.994	4	0
	1.94%	4745	1.94%	1.000	4779	1.007	7	0
beasleyC3	31.50	83	31.56	1.002	83	1.000	5	1
	17.47	2	17.35	0.993	2	1.000	6	2
	48.04	432	47.20	0.983	453	1.049	8	72
binkar10_1	33.75	2544	31.34	0.929	2560	1.006	7	207
	30.29	2325	29.22	0.965	2246	0.966	6	218
	31.18	2376	28.71	0.921	2509	<i>1.056</i>	11	344
blp-ar98	0.30%	231185	0.27%	1.000	238231	1.030	28	6
	0.30%	224114	0.33%	1.000	207500	0.926	39	4
	0.27%	240188	0.32%	1.000	229423	0.955	51	4
blp-ic98	2.79%	289253	1.38%	1.000	304769	1.054	29	13
	1.20%	282117	2.41%	1.000	254061	0.901	24	17
	1.59%	296470	2.11%	1.000	278188	0.938	27	8
bnatt400	973.43	6821	970.91	0.997	6821	1.000	1	0
	1102.38	6346	1105.02	1.002	6346	1.000	1	0
	745.47	5500	745.15	1.000	5500	1.000	1	0
bnatt500	4382.63	29526	4368.17	0.997	29526	1.000	0	0
	6339.53	38962	6333.06	0.999	38962	1.000	0	0
	4987.35	29029	4996.90	1.002	29029	1.000	0	0
bppc4-08	1.92%	793025	1.92%	1.000	797503	1.006	16	117
	1.92%	758030	1.92%	1.000	938927	1.239	17	100
	1.92%	867081	1.92%	1.000	793397	0.915	17	153
brazil3	3363.61	2570	3360.46	0.999	2570	1.000	11	1

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	4255.56	2347	4252.19	0.999	2347	1.000	8	2
	3826.38	3357	3785.08	0.989	3302	0.984	5	2
buildingenergy	0.13%	96	0.13%	1.000	96	1.000	3	0
	0.15%	85	0.15%	1.000	85	1.000	4	0
	0.13%	12	0.13%	1.000	12	1.000	3	0
cbs-cta	40.14	1	40.27	1.003	1	1.000	3	0
	315.38	31	314.10	0.996	31	1.000	3	0
	35.38	1	35.77	1.011	1	1.000	3	0
chromaticindex1024-7	33.33%	964	33.33%	1.000	964	1.000	1	0
	33.33%	1155	33.33%	1.000	1171	1.014	1	0
	6365.47	757	6429.72	1.010	757	1.000	1	0
chromaticindex512-7	1187.48	361	1172.37	0.987	361	1.000	1	0
	3708.09	3133	3689.97	0.995	3133	1.000	1	0
	33.33%	40438	33.33%	1.000	40579	1.003	1	0
cmfsp50-24-8-8	4.18%	35061	3.98%	1.000	36090	1.029	11	70
	0.61%	62731	1.99%	1.000	85475	1.363	8	403
	3.37%	44705	4.86%	1.000	37790	0.845	5	96
co-100	1.75%	54134	1.74%	1.000	54008	0.998	53	85
	29.30%	16731	91.77%	1.000	7012	0.419	20	64
	53.41%	6553	3.18%	1.000	10565	1.612	36	163
cod105	47.86%	7036	47.57%	1.000	7261	1.032	4	4
	47.98%	6632	48.00%	1.000	6829	1.030	5	6
	48.06%	6622	48.07%	1.000	6601	0.997	4	4
comp07-2idx	966.67%	4001	966.67%	1.000	3996	0.999	16	0
	2800.00%	744	2800.00%	1.000	743	0.999	7	0
	1716.67%	1440	1716.67%	1.000	1449	1.006	6	0
comp21-2idx	247.37%	10996	247.43%	1.000	10931	0.994	13	0
	195.50%	9836	195.50%	1.000	9835	1.000	23	0
	248.72%	11698	248.72%	1.000	11711	1.001	17	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
cost266-UUE	5113.69	369616	4923.15	0.963	375684	1.016	50	1885
	4355.08	351526	3728.83	0.856	294630	0.838	45	1721
	5036.66	371569	4067.72	0.808	306702	0.825	35	1319
cryptanalysisiskb128n5obj14	∞	110	∞	1.000	110	1.000	0	0
	∞	56	∞	1.000	59	1.054	0	0
	∞	90	∞	1.000	90	1.000	0	0
cryptanalysisiskb128n5obj16	∞	105	∞	1.000	104	0.990	0	0
	2795.28	37	2790.65	0.998	37	1.000	1	0
	∞	96	∞	1.000	97	1.010	0	0
csched007	2900.82	240564	2327.77	0.802	187288	0.779	25	2
	3154.88	277315	2613.95	0.829	220934	0.797	22	2
	2678.68	234286	3393.08	<i>1.267</i>	247755	<i>1.057</i>	16	5
csched008	2.91%	606571	2.81%	1.000	455870	0.752	9	75
	7127.81	931841	2.33%	1.010	694455	0.745	9	21
	2381.21	228445	5772.95	<i>2.424</i>	546382	<i>2.392</i>	9	41
cvs16r128-89	22.58%	107264	23.28%	1.000	67980	0.634	11	141
	25.13%	25750	22.61%	1.000	34973	1.358	20	160
	20.85%	49613	23.01%	1.000	47219	0.952	13	174
dano3_3	143.45	10	143.70	1.002	10	1.000	6	1
	142.21	14	142.65	1.003	14	1.000	4	0
	125.10	17	124.56	0.996	17	1.000	5	2
dano3_5	638.30	276	635.04	0.995	276	1.000	6	22
	283.74	166	285.81	1.007	159	0.958	6	49
	284.61	140	285.94	1.005	140	1.000	5	16
decomp2	2.45	1	2.39	0.976	1	1.000	1	0
	2.46	1	2.42	0.984	1	1.000	2	0
	2.48	1	2.50	1.008	1	1.000	1	0
drayage-100-23	16.50	32	16.43	0.996	32	1.000	4	0
	19.56	48	19.52	0.998	48	1.000	4	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	13.43	16	13.50	1.005	16	1.000	3	0
drayage-25-23	0.07%	720400	0.07%	1.000	720814	1.001	10	0
	0.07%	792532	0.07%	1.000	790871	0.998	12	0
	6925.29	552534	6941.84	1.002	552534	1.000	14	0
dws008-01	44.37%	143681	44.84%	1.000	144766	1.008	4	162
	43.13%	142800	44.28%	1.000	157395	1.102	10	353
	53.94%	151056	52.63%	1.000	153108	1.014	29	650
eil33-2	78.78	561	81.20	1.031	343	0.611	13	430
	78.80	561	101.92	<i>1.293</i>	395	0.704	15	452
	64.23	613	105.72	<i>1.646</i>	541	0.883	6	85
eilA101-2	8.90%	11021	20.05%	1.000	11110	1.008	28	390
	13.47%	11503	13.20%	1.000	12688	1.103	16	313
	17.64%	12058	13.37%	1.000	13480	1.118	17	305
enlight_hard	0.50	1	0.50	1.000	1	1.000	1	0
	0.50	1	0.50	1.000	1	1.000	1	0
	0.50	1	0.50	1.000	1	1.000	1	0
ex10	493.43	1	493.80	1.001	1	1.000	1	0
	499.89	1	497.94	0.996	1	1.000	1	0
	576.48	1	581.12	1.008	1	1.000	1	0
ex9	28.57	1	27.98	0.979	1	1.000	1	0
	26.88	1	27.30	1.016	1	1.000	1	0
	27.26	1	27.02	0.991	1	1.000	1	0
exp-1-500-5-5	2.28	1	2.28	1.000	1	1.000	7	1
	2.23	1	2.22	0.996	1	1.000	3	1
	2.23	1	2.21	0.991	1	1.000	3	1
fast0507	305.46	1377	322.23	<i>1.055</i>	1284	0.932	8	11
	180.55	789	280.17	<i>1.552</i>	1223	<i>1.550</i>	8	9
	249.56	1054	365.44	<i>1.464</i>	1711	<i>1.623</i>	8	10
fastxgemm-n2r6s0t2	4634.71	1091678	4702.82	1.015	1118937	1.025	5	103

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	1847.11	404965	4017.11	<i>2.175</i>	1012967	<i>2.501</i>	6	233
	5106.21	1218045	3129.08	0.613	769500	0.632	7	291
fhnw-binpack4-48	∞	4043398	∞	1.000	4040499	0.999	0	0
	∞	3528303	∞	1.000	3525851	0.999	0	0
	∞	3412684	∞	1.000	3413924	1.000	0	0
fhnw-binpack4-4	∞	14866266	∞	1.000	14733968	0.991	0	0
	∞	14002290	∞	1.000	13981261	0.998	0	0
	∞	11625787	∞	1.000	11607995	0.998	0	0
fiball	534.20	5059	465.55	0.871	4111	0.813	8	1
	423.45	3216	447.14	<i>1.056</i>	3521	<i>1.095</i>	8	6
	579.49	5313	499.03	0.861	5672	<i>1.068</i>	8	50
gen-ip002	1399.45	6075461	1315.68	0.940	5856334	0.964	22	552
	1305.34	5725874	1295.56	0.993	5478569	0.957	19	477
	1375.26	5885796	1271.92	0.925	5583912	0.949	19	518
gen-ip054	3344.49	16710950	3047.64	0.911	15245360	0.912	21	733
	2452.64	12245498	2530.93	1.032	12476019	1.019	23	1009
	4133.81	20348199	3381.24	0.818	16438070	0.808	27	864
germanrr	1.46%	3402	1.46%	1.000	3418	1.005	3	0
	2.11%	2852	2.11%	1.000	2851	1.000	7	0
	1.94%	3527	1.94%	1.000	3559	1.009	8	0
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	0	0
	∞	8	∞	1.000	8	1.000	0	0
	∞	10	∞	1.000	10	1.000	0	0
glass-sc	2651.11	241329	2655.26	1.002	241329	1.000	5	15
	3208.66	289206	3214.67	1.002	289206	1.000	5	14
	2820.59	251112	2819.06	0.999	251112	1.000	5	0
glass4	3197.72	2512983	4008.75	<i>1.254</i>	2705421	<i>1.077</i>	38	966
	2281.42	2101434	2392.84	1.049	1888717	0.899	44	953
	2001.07	1508903	2212.84	<i>1.106</i>	1599046	<i>1.060</i>	40	660

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
gmu-35-40	0.04%	2454791	0.05%	1.000	2051936	0.836	13	2
	0.04%	3192925	0.03%	1.000	2099939	0.658	16	2
	0.02%	2471843	0.03%	1.000	1381092	0.559	14	2
gmu-35-50	0.05%	1058467	0.02%	1.000	1317781	1.245	24	2
	0.04%	1089662	0.03%	1.000	1247342	1.145	28	2
	0.02%	1100457	0.04%	1.000	1016723	0.924	17	2
graph20-20-1rand	165.64%	17122	163.73%	1.000	6171	0.360	8	9
	163.77%	12599	165.38%	1.000	8277	0.657	4	3
	170.23%	7147	172.66%	1.000	7513	1.051	6	5
graphdraw-domain	844.42	1611437	1010.47	<i>1.197</i>	1823083	<i>1.131</i>	34	1967
	1195.65	2105392	1122.85	0.939	1941578	0.922	30	1906
	1739.95	2981841	1664.67	0.957	2907888	0.975	53	3429
h80x6320d	69.85	4	69.54	0.996	4	1.000	4	0
	86.37	10	86.17	0.998	10	1.000	8	0
	86.44	5	86.62	1.002	5	1.000	4	0
highschool1-aigio	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
hypothyroid-k1	19.86	1	20.04	1.009	1	1.000	3	6
	19.89	1	19.99	1.005	1	1.000	3	6
	19.98	1	20.16	1.009	1	1.000	3	6
ic97_potential	0.76%	7683335	0.84%	1.000	7214792	0.939	53	2599
	0.55%	5887400	0.75%	1.000	6107856	1.037	42	1745
	0.67%	7649850	0.86%	1.000	7579116	0.991	44	2364
icir97_tension	6649.86	2386444	0.07%	1.083	3185773	1.335	23	618
	0.07%	3173604	0.05%	1.000	2776552	0.875	12	433
	0.09%	2964514	0.08%	1.000	2729235	0.921	18	591
irish-electricity	∞	93	∞	1.000	93	1.000	0	0
	18.60%	1306	18.43%	1.000	1317	1.008	5	24

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	∞	1333	∞	1.000	1333	1.000	0	0
irp	12.33	6	12.51	1.015	6	1.000	6	3
	11.95	4	12.05	1.008	4	1.000	6	3
	12.47	5	12.58	1.009	5	1.000	6	3
istanbul-no-cutoff	151.14	341	154.02	1.019	347	1.018	8	189
	165.39	269	166.34	1.006	245	0.911	4	63
	291.78	481	285.14	0.977	475	0.988	9	154
k1mushroom	1879.06	7	1897.56	1.010	7	1.000	4	4
	1577.48	11	1583.93	1.004	11	1.000	7	11
	1303.96	3	1321.29	1.013	3	1.000	3	2
lectsched-5-obj	146.67%	159156	166.67%	1.000	148725	0.934	9	143
	153.33%	138540	120.00%	1.000	130812	0.944	28	442
	126.67%	66813	126.67%	1.000	64923	0.972	11	169
leo1	6.60%	82988	6.11%	1.000	80819	0.974	34	35
	7.00%	71808	7.14%	1.000	34905	0.486	16	39
	7.29%	57961	7.53%	1.000	45969	0.793	17	22
leo2	∞	91966	∞	1.000	101616	1.105	18	18
	∞	121421	∞	1.000	110967	0.914	11	16
	∞	110548	∞	1.000	146706	1.327	19	30
lotsize	0.64%	15336	0.67%	1.000	16786	1.095	12	689
	0.91%	24653	0.88%	1.000	20493	0.831	12	737
	0.64%	18045	0.70%	1.000	17911	0.993	19	892
mad	∞	13053639	∞	1.000	8295624	0.636	35	133
	∞	17417457	∞	1.000	14934806	0.857	30	86
	∞	11042944	∞	1.000	15381075	1.393	34	150
map10	995.07	1494	1006.71	1.012	1637	<i>1.096</i>	13	311
	675.54	768	633.84	0.938	724	0.943	9	159
	830.50	955	792.96	0.955	965	1.010	10	253
map16715-04	2177.21	1961	2158.43	0.991	1933	0.986	7	221

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	2434.77	2281	2335.51	0.959	2173	0.953	6	215
	2080.59	1982	2160.04	1.038	1990	1.004	7	356
markshare2	∞	5338861	∞	1.000	5827069	1.091	20	204
	∞	6726451	∞	1.000	5581862	0.830	21	240
	∞	5463573	∞	1.000	5052479	0.925	26	286
markshare_4.0	342.25	2928397	72.47	0.212	612396	0.209	17	475
	307.25	2661583	70.48	0.229	589762	0.222	14	399
	260.24	2235991	85.88	0.330	719508	0.322	16	467
mas74	1696.01	5115429	1680.79	0.991	4932223	0.964	10	77
	2206.78	8092045	2282.09	1.034	7992914	0.988	5	71
	1302.75	3949864	1563.59	<i>1.200</i>	4674399	<i>1.183</i>	9	80
mas76	140.01	420665	136.88	0.978	406104	0.965	6	75
	167.53	525538	168.46	1.006	525538	1.000	5	0
	150.34	450422	152.65	1.015	450422	1.000	5	0
mc11	142.22	5552	149.40	<i>1.050</i>	6484	<i>1.168</i>	10	375
	102.84	3115	80.39	0.782	1411	0.453	10	253
	94.23	2184	106.11	<i>1.126</i>	3386	<i>1.550</i>	7	150
mcsched	358.30	15011	318.21	0.888	11378	0.758	9	297
	234.81	9846	235.33	1.002	9846	1.000	17	662
	298.88	10929	306.32	1.025	12017	<i>1.100</i>	22	634
mik-250-20-75-4	53.03	23893	52.78	0.995	23893	1.000	11	0
	43.71	15175	43.96	1.006	15175	1.000	11	0
	52.33	20733	52.36	1.001	20733	1.000	11	0
mil0-v12-6-r2-40-1	10.59%	212864	9.47%	1.000	189681	0.891	17	12
	7.61%	320341	8.96%	1.000	323326	1.009	17	17
	11.47%	384685	11.33%	1.000	417232	1.085	12	16
momentum1	6.01%	153736	24.76%	1.000	94037	0.612	15	79
	7.74%	100854	7.36%	1.000	91471	0.907	58	28
	6.80%	210209	6.53%	1.000	188055	0.895	81	456

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
mushroom-best	871.57	47519	579.50	0.665	27393	0.576	9	21
	134.13%	94492	134.09%	1.000	94624	1.001	10	0
	122.00%	98582	121.97%	1.000	98893	1.003	14	0
mzzv11	209.76	484	210.71	1.005	484	1.000	8	2
	263.27	987	263.08	0.999	987	1.000	15	2
	196.39	616	195.89	0.997	616	1.000	7	0
mzzv42z	170.76	366	175.26	1.026	415	<i>1.134</i>	26	17
	244.76	712	246.00	1.005	712	1.000	32	1
	307.27	719	306.34	0.997	719	1.000	55	9
n2seq36q	927.84	5438	936.81	1.010	5438	1.000	20	1
	554.86	2560	1061.28	<i>1.913</i>	4712	<i>1.841</i>	22	1
	423.63	2461	1170.79	<i>2.764</i>	4632	<i>1.882</i>	17	3
n3div36	2.58%	216338	2.59%	1.000	213866	0.989	13	0
	2.87%	205084	2.86%	1.000	207136	1.010	18	0
	2.68%	207580	2.69%	1.000	202891	0.977	17	0
n5-3	28.06	1124	26.40	0.941	926	0.824	16	196
	28.38	1026	27.79	0.979	971	0.946	14	328
	25.67	1047	27.09	<i>1.055</i>	1087	1.038	23	147
neos-1122047	10.10	1	9.92	0.982	1	1.000	1	0
	9.64	1	9.76	1.012	1	1.000	1	0
	9.83	1	9.70	0.987	1	1.000	1	0
neos-1171448	57.94	101	58.11	1.003	101	1.000	13	7
	5.18	1	5.16	0.996	1	1.000	9	3
	51.08	86	51.55	1.009	86	1.000	11	3
neos-1171737	1.04%	3910	1.04%	1.000	3912	1.001	11	2
	1.56%	3991	1.56%	1.000	4009	1.005	13	0
	1.21%	12968	1.30%	1.000	11719	0.904	13	68
neos-1354092	∞	613	∞	1.000	613	1.000	0	0
	∞	824	∞	1.000	820	0.995	0	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	∞	639	∞	1.000	639	1.000	0	0
neos-1445765	43.58	133	43.72	1.003	133	1.000	9	21
	44.46	141	44.19	0.994	141	1.000	7	15
	45.05	125	44.74	0.993	125	1.000	6	12
neos-1456979	7.49%	39937	7.49%	1.000	39961	1.001	15	0
	6.84%	38787	6.84%	1.000	38750	0.999	14	0
	7.29%	31530	7.29%	1.000	31540	1.000	11	0
neos-1582420	21.82	18	21.85	1.001	18	1.000	3	0
	10.91	9	10.92	1.001	9	1.000	3	0
	55.38	1381	55.49	1.002	1381	1.000	10	0
neos-2075418-temuka	6992.57	1	7024.05	1.005	1	1.000	0	0
	4534.31	1	4517.94	0.996	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-2657525-crna	∞	1304023	∞	1.000	3064132	2.350	7	49
	∞	3691411	∞	1.000	3681104	0.997	9	16
	∞	1979657	∞	1.000	2122332	1.072	3	10
neos-2746589-doon	0.47%	54848	0.46%	1.000	55681	1.015	4	0
	0.73%	30136	0.73%	1.000	30280	1.005	9	0
	0.11%	182671	0.11%	1.000	182349	0.998	6	0
neos-2978193-inde	0.50%	553211	0.50%	1.000	549249	0.993	3	0
	0.13%	580943	0.13%	1.000	573707	0.988	3	0
	0.50%	551656	0.50%	1.000	548119	0.994	3	0
neos-2987310-joes	17.52	1	17.49	0.998	1	1.000	3	0
	15.39	1	15.31	0.995	1	1.000	3	0
	13.79	1	13.67	0.991	1	1.000	3	0
neos-3004026-krka	53.23	2711	53.06	0.997	2711	1.000	1	0
	61.93	3485	62.47	1.009	3485	1.000	1	0
	46.80	1764	46.28	0.989	1764	1.000	1	0
neos-3024952-loue	6210.32	563456	4646.86	0.748	383076	0.680	18	687

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	0.04%	663494	0.07%	1.000	688312	1.037	8	184
	0.04%	518511	0.04%	1.000	1114650	2.150	10	144
neos-3046615-murg	162.59%	7294477	169.81%	1.000	6971706	0.956	18	255
	161.31%	6839354	166.11%	1.000	6364063	0.931	22	290
	168.01%	6542495	163.66%	1.000	7613539	1.164	23	201
neos-3083819-nubu	12.84	2020	12.72	0.991	2020	1.000	18	0
	12.51	1578	12.37	0.989	1578	1.000	18	0
	20.72	3812	20.79	1.003	3812	1.000	13	0
neos-3216931-puriri	68.24%	9619	116.41%	1.000	5546	0.577	2	3
	151.50%	8053	5.50%	1.000	9705	1.205	4	2
	147.09%	4739	147.13%	1.000	4790	1.011	2	4
neos-3381206-awhea	1.19	1	1.18	0.992	1	1.000	6	0
	1.19	1	1.21	1.017	1	1.000	1	0
	1.23	1	1.20	0.976	1	1.000	2	0
neos-3402294-bobin	1966.80	10587	4386.37	<i>2.230</i>	40294	<i>3.806</i>	14	49
	1373.45	9979	618.95	0.451	3428	0.344	20	168
	636.11	1194	1620.92	<i>2.548</i>	9242	<i>7.740</i>	10	87
neos-3402454-bohle	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-3555904-turama	18.01%	146	18.01%	1.000	145	0.993	1	0
	∞	18	∞	1.000	18	1.000	0	0
	18.01%	16865	18.01%	1.000	16797	0.996	2	0
neos-3627168-kasai	0.12%	4335846	0.15%	1.000	4555684	1.051	50	1333
	0.08%	4565755	0.09%	1.000	4132791	0.905	56	1250
	0.33%	4670340	0.27%	1.000	5147129	1.102	33	978
neos-3656078-kumeu	∞	32	∞	1.000	32	1.000	0	0
	∞	82	∞	1.000	82	1.000	0	0
	∞	122	∞	1.000	122	1.000	0	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
neos-3754480-nidda	∞	19643977	∞	1.000	20000763	1.018	18	988
	∞	18575479	∞	1.000	18439214	0.993	16	850
	∞	19127316	∞	1.000	19108471	0.999	10	510
neos-3988577-wolgan	∞	311	∞	1.000	312	1.003	0	0
	∞	179	∞	1.000	179	1.000	0	0
	∞	439	∞	1.000	439	1.000	0	0
neos-4300652-rahue	438.74%	1351	431.97%	1.000	1365	1.010	5	0
	809.48%	1212	809.48%	1.000	1213	1.001	3	0
	316.83%	2128	316.83%	1.000	2127	1.000	10	0
neos-4338804-snowy	2.07%	4824212	1.66%	1.000	4875741	1.011	64	946
	1.66%	6401707	0.82%	1.000	6738902	1.053	87	861
	1.93%	5669262	1.66%	1.000	5067404	0.894	75	840
neos-4387871-tavua	11.43%	116247	11.39%	1.000	118375	1.018	11	0
	14.12%	116863	14.13%	1.000	116171	0.994	11	0
	18.62%	97491	18.66%	1.000	96695	0.992	9	0
neos-4413714-turia	297.22	2	299.23	1.007	2	1.000	11	0
	405.05	2	404.80	0.999	2	1.000	10	0
	278.04	2	277.10	0.997	2	1.000	13	0
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-4647030-tutaki	0.01%	24542	0.01%	1.000	24413	0.995	3	10
	0.01%	23181	0.01%	1.000	22893	0.988	3	14
	0.01%	27226	0.01%	1.000	27292	1.002	3	0
neos-4722843-widden	1099.90	3196	2651.33	<i>2.411</i>	11357	<i>3.554</i>	12	123
	1359.60	4991	1033.65	0.760	3376	0.676	14	146
	1598.32	9232	1714.52	<i>1.073</i>	7919	0.858	14	231
neos-4738912-atrato	814.33	61981	813.40	0.999	61981	1.000	43	0
	2792.15	233679	3808.90	<i>1.364</i>	324992	<i>1.391</i>	37	12

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	1786.70	209078	914.39	0.512	95736	0.458	26	1
neos-4763324-toguru	46.04%	8436	46.04%	1.000	8436	1.000	13	0
	45.08%	14925	45.08%	1.000	14962	1.002	17	0
	48.94%	7145	48.94%	1.000	7145	1.000	27	0
neos-4954672-berkel	9.33%	1070376	8.48%	1.000	1019990	0.953	35	1139
	9.91%	781488	8.71%	1.000	819107	1.048	44	1319
	8.33%	797459	8.00%	1.000	891993	1.119	33	1085
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	0	0
	15.39%	14	15.39%	1.000	14	1.000	1	0
	15.20%	12	15.20%	1.000	12	1.000	1	0
neos-5052403-cygnat	1.60%	113	1.60%	1.000	113	1.000	3	0
	1.38%	1	1.38%	1.000	1	1.000	3	0
	1.19%	63	1.19%	1.000	63	1.000	3	0
neos-5093327-huahum	9.83%	53063	10.32%	1.000	49854	0.940	20	707
	11.12%	50174	10.43%	1.000	52521	1.047	12	428
	8.66%	56149	12.17%	1.000	48532	0.864	10	368
neos-5104907-jarama	∞	8	∞	1.000	8	1.000	0	0
	∞	9	∞	1.000	9	1.000	0	0
	∞	4	∞	1.000	4	1.000	0	0
neos-5107597-kakapo	1811.40	496089	2144.47	<i>1.184</i>	560533	<i>1.130</i>	27	1852
	1535.93	414462	1725.41	<i>1.123</i>	472393	<i>1.140</i>	27	1811
	4448.80	1366902	5927.88	<i>1.332</i>	1725439	<i>1.262</i>	37	2236
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-5188808-nattai	1269.55	11975	1251.29	0.986	12145	1.014	11	268
	1234.26	12593	1292.07	1.047	13554	<i>1.076</i>	8	83
	1631.65	16454	1380.62	0.846	12548	0.763	10	150
neos-5195221-niemur	3679.70	76893	2813.87	0.765	47466	0.617	95	3308

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	3187.50	31424	2911.85	0.914	25010	0.796	29	1488
	2916.47	28673	2890.78	0.991	33779	<i>1.178</i>	93	4025
neos-631710	14.21%	2	14.21%	1.000	2	1.000	1	0
	8.90%	4	8.90%	1.000	4	1.000	2	1
	14.21%	3	14.21%	1.000	3	1.000	1	0
neos-662469	0.01%	59467	0.01%	1.000	59651	1.003	59	0
	0.04%	59400	0.00%	1.000	50627	0.852	71	1
	0.04%	71726	0.01%	1.000	56995	0.795	51	1
neos-787933	1.37	1	1.37	1.000	1	1.000	3	2
	1.41	1	1.39	0.986	1	1.000	3	2
	1.41	1	1.41	1.000	1	1.000	3	2
neos-827175	6.12	1	6.10	0.997	1	1.000	3	0
	8.31	1	8.21	0.988	1	1.000	4	0
	10.27	1	10.23	0.996	1	1.000	3	0
neos-848589	32.15%	257	32.15%	1.000	256	0.996	5	23
	42.95%	147	42.95%	1.000	148	1.007	5	0
	46.27%	106	46.27%	1.000	106	1.000	4	0
neos-860300	17.33	2	17.27	0.997	2	1.000	3	0
	14.80	3	13.35	0.902	2	0.667	3	5
	23.07	3	23.18	1.005	3	1.000	6	0
neos-873061	9.28%	158	9.28%	1.000	155	0.981	11	0
	7.72%	148	7.72%	1.000	148	1.000	10	0
	8.12%	168	8.12%	1.000	168	1.000	6	0
neos-911970	0.54%	3799466	1.05%	1.000	1400854	0.369	17	61
	4.07%	2515229	2.49%	1.000	1814127	0.721	20	448
	0.06%	7182902	0.06%	1.000	11460910	1.596	12	35
neos-933966	1374.06	138	1374.28	1.000	138	1.000	17	0
	846.71	38	848.27	1.002	38	1.000	13	0
	2181.81	283	2180.73	1.000	283	1.000	15	5

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
neos-950242	100.00%	9258	100.00%	1.000	9288	1.003	1	0
	100.00%	8374	100.00%	1.000	8446	1.009	1	0
	100.00%	15629	100.00%	1.000	15629	1.000	1	0
neos-957323	86.33	2	86.06	0.997	2	1.000	7	0
	110.83	5	110.59	0.998	5	1.000	7	2
	79.92	2	80.10	1.002	2	1.000	7	0
neos-960392	882.26	15	881.09	0.999	15	1.000	3	1
	1457.65	102	1439.63	0.988	102	1.000	3	2
	1368.03	438	1363.87	0.997	403	0.920	5	1
neos17	26.69	23451	25.95	0.972	22460	0.958	18	69
	9.22	5644	9.39	1.018	5644	1.000	19	55
	9.75	6418	9.84	1.009	6376	0.993	28	213
neos5	1164.17	3845856	1007.54	0.865	3292114	0.856	9	80
	1506.52	5016275	1234.24	0.819	4202380	0.838	10	181
	1732.23	5988757	1183.51	0.683	4100005	0.685	10	106
neos859080	0.50	792	0.50	1.000	792	1.000	0	0
	0.57	655	0.54	0.947	655	1.000	0	0
	0.53	565	0.55	1.038	565	1.000	0	0
neos8	1.98	1	1.95	0.985	1	1.000	5	9
	1.84	1	1.89	1.027	1	1.000	5	10
	1.82	1	1.83	1.005	1	1.000	6	10
net12	1669.10	1277	1842.42	<i>1.104</i>	1211	0.948	3	15
	1619.21	1816	1631.28	1.007	1816	1.000	2	13
	1598.93	2932	1561.43	0.977	1695	0.578	3	9
netdiversion	849.86	43	848.00	0.998	43	1.000	6	0
	2368.28	88	2364.82	0.999	88	1.000	3	0
	1083.46	27	1087.12	1.003	27	1.000	5	0
nexp-150-20-8-5	3581.20	5786	3539.59	0.988	5786	1.000	7	0
	3684.79	7166	3635.13	0.987	7166	1.000	9	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	0.83%	12958	0.83%	1.000	13054	1.007	9	0
ns1116954	∞	32	∞	1.000	32	1.000	0	0
	∞	57	∞	1.000	57	1.000	0	0
	∞	72	∞	1.000	75	1.042	0	0
ns1208400	415.49	2004	419.49	1.010	2004	1.000	1	0
	685.36	2339	683.06	0.997	2339	1.000	1	1
	1073.71	2315	1074.09	1.000	2315	1.000	1	0
ns1644855	7.37%	36	7.37%	1.000	36	1.000	1	0
	7.37%	79	7.37%	1.000	79	1.000	1	0
	975.51	1	974.47	0.999	1	1.000	2	3
ns1760995	58.41%	1	58.41%	1.000	1	1.000	2	0
	71.46%	1	71.46%	1.000	1	1.000	2	0
	48.93%	1	48.93%	1.000	1	1.000	2	0
ns1830653	268.69	18612	287.45	<i>1.070</i>	14558	0.782	7	17
	147.82	10024	134.33	0.909	7527	0.751	8	56
	149.87	9029	148.24	0.989	7267	0.805	12	31
ns1952667	∞	52537	∞	1.000	52208	0.994	0	0
	1411.45	9508	1392.38	0.986	9508	1.000	1	0
	967.39	4900	968.90	1.002	4900	1.000	1	0
nu25-pr12	5.37	53	5.36	0.998	53	1.000	8	0
	6.03	66	6.11	1.013	66	1.000	7	0
	6.06	16	6.05	0.998	16	1.000	10	0
nursesched-medium-hint03	1657.78%	1113	1657.78%	1.000	1100	0.988	10	0
	3021.25%	2054	3021.25%	1.000	2050	0.998	4	0
	1075.72%	1164	1077.84%	1.000	1121	0.963	7	0
nursesched-sprint02	141.95	370	142.08	1.001	370	1.000	6	1
	85.43	409	85.18	0.997	409	1.000	7	5
	67.74	222	67.71	1.000	222	1.000	8	11
nw04	37.96	6	37.93	0.999	6	1.000	8	0

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	32.44	6	31.39	0.968	5	0.833	9	3
	35.14	6	35.16	1.001	6	1.000	7	0
opm2-z10-s4	25.32%	1059	24.70%	1.000	1000	0.944	23	199
	27.05%	652	27.76%	1.000	586	0.899	7	85
	24.75%	1172	26.96%	1.000	1015	0.866	31	294
p200x1188c	3.50	2	3.53	1.009	2	1.000	5	0
	3.97	3	3.96	0.997	3	1.000	5	0
	3.60	2	3.62	1.006	2	1.000	5	0
peg-solitaire-a3	∞	5754	∞	1.000	5752	1.000	0	0
	∞	3573	∞	1.000	3557	0.996	0	0
	∞	3962	∞	1.000	3969	1.002	0	0
pg5_34	1342.11	158032	1173.22	0.874	148717	0.941	10	144
	956.96	135411	1134.07	<i>1.185</i>	144543	<i>1.067</i>	13	94
	1368.44	164501	1085.15	0.793	121673	0.740	12	107
pg	85.76	1362	101.85	<i>1.188</i>	2687	<i>1.973</i>	13	136
	81.84	812	86.23	<i>1.054</i>	1372	<i>1.690</i>	8	121
	93.53	1122	107.44	<i>1.149</i>	2311	<i>2.060</i>	11	137
physiciansched3-3	∞	414	∞	1.000	415	1.002	0	0
	∞	313	∞	1.000	313	1.000	0	0
	∞	361	∞	1.000	361	1.000	0	0
physiciansched6-2	124.61	377	124.81	1.002	377	1.000	3	4
	467.18	2804	462.02	0.989	2804	1.000	1	0
	44.63	1	44.74	1.002	1	1.000	1	0
piperout-08	769.39	107	797.03	1.036	130	<i>1.215</i>	13	658
	617.54	797	606.54	0.982	552	0.693	34	400
	668.62	123	923.85	<i>1.382</i>	596	<i>4.846</i>	91	4694
piperout-27	141.37	2	140.11	0.991	2	1.000	2	0
	277.50	566	275.91	0.994	566	1.000	4	26
	254.35	125	332.32	<i>1.307</i>	72	0.576	23	300

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
pk1	107.76	302166	107.55	0.998	301100	0.996	14	373
	122.66	355700	109.16	0.890	317026	0.891	14	380
	126.62	358285	112.34	0.887	328715	0.917	19	659
proteindesign121hz512p9	12.82%	562	9.60%	1.000	591	1.052	12	8
	15.55%	449	7.94%	1.000	440	0.980	7	20
	26.02%	588	26.02%	1.000	593	1.009	4	0
proteindesign122trx11p8	1.95%	3	1.95%	1.000	3	1.000	1	0
	1.91%	8	1.91%	1.000	8	1.000	1	0
	1.93%	17	1.93%	1.000	17	1.000	2	0
qap10	88.17	3	87.99	0.998	3	1.000	3	0
	112.00	5	111.82	0.998	5	1.000	4	0
	197.84	15	197.87	1.000	15	1.000	4	0
radiationm18-12-05	1.88%	517161	12.99%	1.000	479812	0.928	26	927
	5.59%	517931	0.05%	1.000	750150	1.448	24	983
	3.73%	605173	1.89%	1.000	551080	0.911	20	809
radiationm40-10-02	25.78%	124923	67.02%	1.000	53316	0.427	9	37
	38.15%	118074	57.74%	1.000	27109	0.230	17	114
	21.66%	97696	22.69%	1.000	99008	1.013	21	489
rail01	2.74%	205	2.74%	1.000	200	0.976	5	0
	25.21%	182	25.21%	1.000	182	1.000	5	0
	7.32%	183	7.32%	1.000	183	1.000	7	0
rail02	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
rail507	153.87	623	156.67	1.018	623	1.000	6	2
	178.70	807	180.04	1.007	783	0.970	6	9
	189.56	783	193.43	1.020	771	0.985	5	5
ran14x18-disj-8	1607.37	507875	2109.62	<i>1.312</i>	656920	<i>1.293</i>	17	47
	1299.76	415692	1785.31	<i>1.374</i>	564900	<i>1.359</i>	16	137

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	1706.14	566717	1694.59	0.993	593570	1.047	17	29
rd-rplusc-21	≥ 10000%	497574	≥ 10000%	1.000	484631	0.974	17	29
	≥ 10000%	586101	≥ 10000%	1.000	737139	1.258	12	115
	≥ 10000%	842608	≥ 10000%	1.000	763715	0.906	4	44
reblock115	0.08%	1094405	4390.48	0.610	704168	0.643	56	8
	6529.63	948735	6605.46	1.012	882785	0.930	56	47
	6270.39	823230	5894.68	0.940	832788	1.012	47	25
rmatr100-p10	169.97	809	166.48	0.979	809	1.000	5	125
	163.48	822	162.84	0.996	822	1.000	5	106
	161.37	783	160.62	0.995	827	<i>1.056</i>	6	164
rmatr200-p5	22.40%	420	22.40%	1.000	421	1.002	2	0
	19.56%	422	19.56%	1.000	423	1.002	4	114
	21.08%	393	21.08%	1.000	403	1.025	5	98
rocl-4-11	661.34	12554	638.21	0.965	12970	1.033	4	23
	914.24	15146	1001.80	<i>1.096</i>	17602	<i>1.162</i>	6	32
	482.83	8950	498.07	1.032	9550	<i>1.067</i>	3	20
rocII-5-11	108.07%	3433	108.52%	1.000	3399	0.990	7	66
	154.30%	2803	109.87%	1.000	2764	0.986	4	51
	109.83%	2798	109.11%	1.000	2522	0.901	9	21
rococoB10-011000	13.71%	151272	13.71%	1.000	151103	0.999	35	9
	15.03%	166329	15.09%	1.000	143253	0.861	35	12
	12.78%	167142	12.80%	1.000	153839	0.920	23	5
rococoC10-001000	883.92	55404	765.76	0.866	53303	0.962	21	1
	1049.18	63513	851.99	0.812	63090	0.993	22	4
	1106.25	108129	1626.91	<i>1.471</i>	162527	<i>1.503</i>	20	1
roi2alpha3n4	1645.16	14967	1424.80	0.866	12529	0.837	10	27
	2230.29	20396	1940.46	0.870	17446	0.855	11	26
	1488.02	13303	1486.54	0.999	13303	1.000	7	26
roi5alpha10n8	34.27%	5403	35.37%	1.000	5989	1.108	11	14

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	33.16%	6052	40.36%	1.000	6346	1.049	10	14
	32.12%	6941	32.14%	1.000	6789	0.978	5	12
roll3000	35.36	2179	36.86	1.042	1986	0.911	9	12
	37.96	1831	38.91	1.025	2149	<i>1.174</i>	10	12
	38.62	1824	60.26	<i>1.560</i>	3736	<i>2.048</i>	15	6
s100	∞	18	5.53%	1.000	20	1.111	3	0
	29.84%	17	29.84%	1.000	17	1.000	2	0
	1.06%	22	1.06%	1.000	22	1.000	3	0
s250r10	0.28%	23002	0.28%	1.000	22897	0.995	6	0
	6224.25	45419	6366.45	1.023	45426	1.000	7	1
	0.23%	31614	0.23%	1.000	31811	1.006	9	0
satellites2-40	∞	19	∞	1.000	19	1.000	1	0
	∞	4	∞	1.000	4	1.000	1	0
	70.59%	33	70.59%	1.000	33	1.000	3	1
satellites2-60-fs	∞	33	∞	1.000	33	1.000	1	0
	∞	105	∞	1.000	137	1.305	4	16
	∞	28	∞	1.000	28	1.000	1	0
savsched1	∞	1	∞	1.000	1	1.000	2	0
	∞	1	∞	1.000	1	1.000	2	0
	∞	1	∞	1.000	1	1.000	2	0
sct2	0.03%	1108320	0.03%	1.000	600226	0.542	14	12
	0.03%	957797	0.05%	1.000	659682	0.689	19	3
	0.03%	1359038	0.03%	1.000	994927	0.732	20	3
seymour1	80.87	1539	90.45	<i>1.118</i>	1627	<i>1.057</i>	28	418
	65.65	1370	67.90	1.034	1466	<i>1.070</i>	37	290
	72.74	1685	72.05	0.991	1822	<i>1.081</i>	50	744
seymour	0.70%	229603	0.66%	1.000	242500	1.056	11	18
	0.72%	224343	0.68%	1.000	222209	0.990	14	30
	0.67%	251797	0.74%	1.000	225373	0.895	13	16

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
sing326	0.15%	11732	0.15%	1.000	11755	1.002	87	0
	0.17%	8343	0.17%	1.000	8196	0.982	138	0
	0.31%	8062	0.32%	1.000	7997	0.992	7	0
sing44	0.45%	5552	0.45%	1.000	5531	0.996	23	0
	0.19%	7382	0.19%	1.000	7349	0.996	30	0
	0.27%	2269	0.27%	1.000	2267	0.999	8	0
snp-02-004-104	0.00%	14354	0.00%	1.000	14561	1.014	11	111
	0.00%	13369	0.00%	1.000	18040	1.349	28	532
	0.00%	23506	0.00%	1.000	19680	0.837	10	56
sorrell3	43.81%	41141	43.81%	1.000	41208	1.002	5	0
	35.59%	39485	35.59%	1.000	39514	1.001	7	0
	19.11%	8909	19.11%	1.000	8801	0.988	6	0
sp150x300d	3.99	3472	3.96	0.992	3472	1.000	4	0
	3.15	2569	3.12	0.990	2569	1.000	4	0
	1.34	848	1.29	0.963	848	1.000	4	0
sp97ar	1.11%	22615	0.98%	1.000	15747	0.696	21	4
	0.69%	27883	1.02%	1.000	22961	0.823	33	4
	1.02%	24604	1.53%	1.000	24828	1.009	25	4
sp98ar	0.83%	43658	1.43%	1.000	71746	1.643	26	3
	0.87%	43138	0.48%	1.000	67060	1.555	21	7
	1.21%	66073	0.98%	1.000	71271	1.079	27	5
splice1k1	304.58%	1099	309.20%	1.000	513	0.467	5	22
	306.97%	648	376.10%	1.000	594	0.917	6	34
	4746.83	532	358.74%	1.517	834	1.568	4	6
square41	109.98%	30	109.98%	1.000	30	1.000	5	4
	89.32%	38	89.32%	1.000	37	0.974	4	4
	92.32%	27	92.32%	1.000	28	1.037	5	6
square47	231.21%	4	231.21%	1.000	4	1.000	3	2
	117.00%	13	117.00%	1.000	13	1.000	4	4

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
	231.21%	1	231.21%	1.000	1	1.000	3	2
supportcase10	803.51%	1	803.51%	1.000	1	1.000	2	0
	989.07%	1	989.07%	1.000	1	1.000	2	0
	1054.36%	1	1054.36%	1.000	1	1.000	2	0
supportcase12	1.31%	1486	1.31%	1.000	1463	0.985	5	168
	1.11%	2031	1.35%	1.000	2297	1.131	3	15
	1.30%	1408	1.30%	1.000	1505	1.069	3	73
supportcase18	3.84%	431569	3.84%	1.000	419350	0.972	5	7
	5.96%	190081	5.96%	1.000	237591	1.250	4	2
	3.84%	198696	3.84%	1.000	198815	1.001	6	5
supportcase19	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
supportcase22	∞	51	∞	1.000	51	1.000	0	0
	∞	18	∞	1.000	18	1.000	0	0
	∞	66	∞	1.000	66	1.000	0	0
supportcase26	10.01%	7955502	8.94%	1.000	8135621	1.023	20	642
	3371.98	4347822	5238.22	<i>1.553</i>	6761735	<i>1.555</i>	13	590
	5922.38	7264783	4487.28	0.758	5497025	0.757	21	618
supportcase33	1568.43	13263	1598.38	1.019	12756	0.962	9	1
	1615.24	7176	1600.98	0.991	7176	1.000	6	0
	680.69	3786	682.16	1.002	3786	1.000	10	0
supportcase40	782.31	6335	786.50	1.005	6335	1.000	20	355
	946.22	7931	946.94	1.001	7991	1.008	24	517
	801.52	6970	797.74	0.995	6970	1.000	24	507
supportcase42	0.12%	405169	0.38%	1.000	305571	0.754	57	2576
	0.12%	467910	0.10%	1.000	380155	0.812	34	1232
	0.24%	345585	0.35%	1.000	467610	1.353	19	794
supportcase6	9.13%	19336	9.13%	1.000	18980	0.982	14	1

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
supportcase7	8.92%	13800	8.41%	1.000	17726	1.284	11	8
	9.74%	17532	9.72%	1.000	17709	1.010	12	1
	180.95	59	179.98	0.995	59	1.000	7	76
swath1	193.47	47	193.62	1.001	45	0.957	4	30
	210.50	32	210.25	0.999	32	1.000	4	80
	21.15	285	21.09	0.997	281	0.986	9	22
swath3	17.95	257	17.34	0.966	245	0.953	4	3
	18.29	260	19.82	<i>1.084</i>	292	<i>1.123</i>	6	13
	243.56	31878	226.20	0.929	28316	0.888	13	6
tbfp-network	183.58	21504	182.91	0.996	21837	1.015	8	3
	421.75	74953	427.45	1.014	74192	0.990	7	7
	2356.43	574	2356.81	1.000	574	1.000	11	0
thor50dday	1681.30	71	1683.80	1.001	71	1.000	3	0
	1089.98	99	1088.57	0.999	99	1.000	5	0
	23.30%	95	23.30%	1.000	95	1.000	9	0
timtab1	21.49%	12	21.49%	1.000	12	1.000	12	0
	14.80%	33	14.80%	1.000	34	1.030	9	0
	73.25	60661	73.73	1.007	64175	<i>1.058</i>	72	36
tr12-30	65.75	49252	67.90	1.033	51540	1.046	68	164
	70.44	54418	70.92	1.007	55054	1.012	52	93
	720.20	499607	606.97	0.843	423661	0.848	20	841
traininstance2	657.58	486251	650.32	0.989	475420	0.978	18	655
	403.35	215444	397.52	0.986	213946	0.993	16	373
	∞	66630	∞	1.000	67099	1.007	15	17
traininstance6	∞	44225	∞	1.000	52063	1.177	5	15
	∞	73356	6286.13%	1.000	73138	0.997	10	9
	609.06%	548117	634.16%	1.000	456248	0.832	18	122
traininstance6	229.50%	453251	626.92%	1.000	347529	0.767	39	180
	673.91%	395633	520.12%	1.000	454368	1.148	26	295

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Table 4: Detailed computational results on MIPLIB 2017 benchmark with and without updating dual boundexceeding proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	update disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	impr	update
trento1	0.08%	55337	0.07%	1.000	57766	1.044	42	4
	0.06%	73064	0.10%	1.000	51033	0.698	36	2
	3.98%	36871	1.67%	1.000	35013	0.950	35	2
triptim1	1109.49	8	1099.43	0.991	8	1.000	6	0
	752.71	7	747.73	0.993	7	1.000	3	0
	1066.26	8	1065.09	0.999	8	1.000	4	0
uccase12	0.00%	76857	0.00%	1.000	77800	1.012	11	66
	0.00%	84315	0.00%	1.000	91468	1.085	12	99
	0.00%	89984	0.00%	1.000	98605	1.096	12	97
uccase9	1.98%	545	1.98%	1.000	498	0.914	8	20
	2.73%	702	1.48%	1.000	1166	1.661	8	29
	1.40%	614	2.82%	1.000	550	0.896	7	4
uct-subprob	1114.97	44339	1102.62	0.989	44339	1.000	19	2
	1813.07	65873	1631.60	0.900	59559	0.904	21	1
	2485.14	94985	2506.36	1.009	95674	1.007	21	3
unitcal_7	273.78	89	272.59	0.996	89	1.000	2	0
	296.89	176	298.12	1.004	180	1.023	3	75
	386.01	436	387.18	1.003	436	1.000	2	0
var-smallemary-m6j6	1.07%	568063	0.93%	1.000	568323	1.000	6	33
	0.86%	671886	0.87%	1.000	656232	0.977	4	14
	6115.89	669677	6729.45	<i>1.100</i>	683202	1.020	4	17
wachplan	2340.02	219938	2340.84	1.000	219938	1.000	1	0
	3427.00	302179	3419.67	0.998	302179	1.000	1	0
	2343.20	198054	2343.95	1.000	198054	1.000	1	0

Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
30n20b8	149.79	171	149.68	0.999	171	1.000	14	1.27
	621.66	1999	623.60	1.003	1999	1.000	285	0.84
	688.46	3499	693.56	1.007	3499	1.000	510	0.82
50v-10	2.18%	747722	1.69%	1.000	829421	1.109	7156	0.43
	1.36%	1062430	1.15%	1.000	867997	0.817	3951	0.46
	1.14%	826465	1.37%	1.000	833134	1.008	2537	0.52
CMS750_4	185.34	2028	185.73	1.002	2028	1.000	0	0.00
	371.03	3254	370.72	0.999	3254	1.000	0	0.00
	472.14	13518	473.12	1.002	13518	1.000	0	0.00
academictimetablesmall	∞	2317	∞	1.000	2315	0.999	0	0.00
	∞	3503	∞	1.000	3505	1.001	0	0.00
	∞	2673	∞	1.000	2681	1.003	0	0.00
air05	40.21	648	40.07	0.997	648	1.000	0	0.00
	36.72	716	36.54	0.995	716	1.000	0	0.00
	30.45	282	30.22	0.992	282	1.000	0	0.00
app1-1	3.50	2	3.53	1.009	2	1.000	0	0.00
	4.93	3	4.94	1.002	3	1.000	0	0.00
	4.16	6	4.17	1.002	6	1.000	0	0.00
app1-2	644.43	33	642.80	0.997	33	1.000	0	0.00
	791.01	20	789.47	0.998	20	1.000	0	0.00
	619.82	20	618.36	0.998	20	1.000	0	0.00
assign1-5-8	4.74%	5735311	4.74%	1.000	5736357	1.000	1723	1.50
	4.54%	6824672	4.54%	1.000	6813236	0.998	1766	1.51
	4.80%	6338756	4.80%	1.000	6333262	0.999	2108	1.52
atlanta-ip	3.64%	18389	3.60%	1.000	18533	1.008	125	0.56
	3.75%	22064	3.81%	1.000	21153	0.959	252	0.74
	4.26%	31162	4.27%	1.000	30903	0.992	130	0.66
b1cls1	17.12%	36011	17.13%	1.000	35962	0.999	39	0.52
	18.37%	21102	18.36%	1.000	21112	1.000	28	0.52

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	17.69%	18661	17.69%	1.000	18673	1.001	37	0.47
bab2	1.29%	3493	1.29%	1.000	3473	0.994	0	0.00
	1.10%	3384	2.44%	1.000	3262	0.964	0	0.00
	∞	1980	∞	1.000	1981	1.001	0	0.00
bab6	0.58%	4926	0.58%	1.000	4790	0.972	0	0.00
	1.14%	3242	1.14%	1.000	3258	1.005	0	0.00
	1.94%	4745	1.94%	1.000	4779	1.007	0	0.00
beasleyC3	31.55	83	31.56	1.000	83	1.000	0	0.00
	17.35	2	17.35	1.000	2	1.000	0	0.00
	47.00	453	47.20	1.004	453	1.000	6	1.18
binkar10.1	30.74	2538	31.34	1.020	2560	1.009	407	0.11
	29.10	2233	29.22	1.004	2246	1.006	323	0.13
	28.98	2529	28.71	0.991	2509	0.992	407	0.12
blp-ar98	0.27%	237752	0.27%	1.000	238231	1.002	0	0.00
	0.33%	208073	0.33%	1.000	207500	0.997	0	0.00
	0.32%	228758	0.32%	1.000	229423	1.003	0	0.00
blp-ic98	1.38%	309577	1.38%	1.000	304769	0.984	0	0.00
	2.41%	255635	2.41%	1.000	254061	0.994	0	0.00
	2.11%	281142	2.11%	1.000	278188	0.989	0	0.00
bnatt400	972.47	6821	970.91	0.998	6821	1.000	0	0.00
	1101.70	6346	1105.02	1.003	6346	1.000	0	0.00
	743.69	5500	745.15	1.002	5500	1.000	0	0.00
bnatt500	4372.13	29526	4368.17	0.999	29526	1.000	0	0.00
	6325.95	38962	6333.06	1.001	38962	1.000	0	0.00
	4992.95	29029	4996.90	1.001	29029	1.000	0	0.00
bppc4-08	1.92%	800013	1.92%	1.000	797503	0.997	0	0.00
	1.92%	886475	1.92%	1.000	938927	1.059	3	0.71
	1.92%	817145	1.92%	1.000	793397	0.971	10	0.38
brazil3	3363.06	2570	3360.46	0.999	2570	1.000	121	0.78

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	4255.44	2347	4252.19	0.999	2347	1.000	19	0.75
	3795.74	3302	3785.08	0.997	3302	1.000	1	1.07
buildingenergy	0.13%	95	0.13%	1.000	96	1.011	95	0.00
	0.15%	85	0.15%	1.000	85	1.000	234	0.00
	0.13%	12	0.13%	1.000	12	1.000	0	0.00
cbs-cta	40.13	1	40.27	1.003	1	1.000	0	0.00
	314.48	31	314.10	0.999	31	1.000	0	0.00
	35.73	1	35.77	1.001	1	1.000	0	0.00
chromaticindex1024-7	33.33%	968	33.33%	1.000	964	0.996	0	0.00
	33.33%	1155	33.33%	1.000	1171	1.014	0	0.00
	6425.84	757	6429.72	1.001	757	1.000	0	0.00
chromaticindex512-7	1185.02	361	1172.37	0.989	361	1.000	0	0.00
	3707.63	3133	3689.97	0.995	3133	1.000	0	0.00
	33.33%	40832	33.33%	1.000	40579	0.994	0	0.00
cmflsp50-24-8-8	3.98%	35760	3.98%	1.000	36090	1.009	1326	0.21
	2.09%	81376	1.99%	1.000	85475	1.050	2330	0.14
	3.80%	35336	4.86%	1.000	37790	1.069	456	0.19
co-100	1.74%	54003	1.74%	1.000	54008	1.000	0	0.00
	91.77%	7012	91.77%	1.000	7012	1.000	0	0.00
	3.05%	10693	3.18%	1.000	10565	0.988	0	0.00
cod105	47.41%	7347	47.57%	1.000	7261	0.988	0	0.00
	48.00%	6829	48.00%	1.000	6829	1.000	0	0.00
	48.06%	6621	48.07%	1.000	6601	0.997	0	0.00
comp07-2idx	966.67%	3999	966.67%	1.000	3996	0.999	22	0.51
	2800.00%	745	2800.00%	1.000	743	0.997	12	0.43
	1716.67%	1454	1716.67%	1.000	1449	0.997	15	0.44
comp21-2idx	247.43%	10854	247.43%	1.000	10931	1.007	15	0.50
	195.50%	9837	195.50%	1.000	9835	1.000	473	0.52
	248.72%	11693	248.72%	1.000	11711	1.002	20	0.51

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
cost266-UUE	5039.76	383777	4923.15	0.977	375684	0.979	35	0.05
	3690.46	294630	3728.83	1.010	294630	1.000	37	0.07
	4047.47	306702	4067.72	1.005	306702	1.000	17	0.07
cryptanalysisiskb128n5obj14	∞	110	∞	1.000	110	1.000	0	0.00
	∞	55	∞	1.000	59	1.073	0	0.00
	∞	90	∞	1.000	90	1.000	0	0.00
cryptanalysisiskb128n5obj16	∞	105	∞	1.000	104	0.990	0	0.00
	2799.12	37	2790.65	0.997	37	1.000	0	0.00
	∞	96	∞	1.000	97	1.010	0	0.00
csched007	3089.69	186152	2327.77	0.753	187288	1.006	167	1.07
	3376.84	272891	2613.95	0.774	220934	0.810	236	1.05
	2753.44	225167	3393.08	<i>1.232</i>	247755	<i>1.100</i>	205	1.12
csched008	1.16%	528705	2.81%	1.000	455870	0.862	39830	1.08
	3986.19	370049	2.33%	1.806	694455	1.877	95479	1.07
	6352.31	516838	5772.95	0.909	546382	<i>1.057</i>	96670	1.05
cvs16r128-89	23.28%	67993	23.28%	1.000	67980	1.000	0	0.00
	22.61%	34961	22.61%	1.000	34973	1.000	0	0.00
	23.00%	47542	23.01%	1.000	47219	0.993	0	0.00
dano3_3	144.01	10	143.70	0.998	10	1.000	0	0.00
	142.48	14	142.65	1.001	14	1.000	0	0.00
	124.93	17	124.56	0.997	17	1.000	0	0.00
dano3_5	635.51	276	635.04	0.999	276	1.000	46	0.01
	285.29	159	285.81	1.002	159	1.000	23	0.01
	286.06	140	285.94	1.000	140	1.000	15	0.01
decomp2	2.42	1	2.39	0.988	1	1.000	0	0.00
	2.47	1	2.42	0.980	1	1.000	0	0.00
	2.43	1	2.50	1.029	1	1.000	0	0.00
drayage-100-23	16.49	32	16.43	0.996	32	1.000	0	0.00
	19.62	48	19.52	0.995	48	1.000	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	13.51	16	13.50	0.999	16	1.000	0	0.00
drayage-25-23	0.07%	722507	0.07%	1.000	720814	0.998	0	0.00
	0.07%	798785	0.07%	1.000	790871	0.990	0	0.00
	6880.95	552534	6941.84	1.009	552534	1.000	0	0.00
dws008-01	46.68%	137095	44.84%	1.000	144766	1.056	36767	0.18
	48.40%	176861	44.28%	1.000	157395	0.890	35465	0.20
	47.52%	167529	52.63%	1.000	153108	0.914	33665	0.21
eil33-2	78.12	343	81.20	1.039	343	1.000	0	0.00
	101.86	395	101.92	1.001	395	1.000	0	0.00
	103.61	541	105.72	1.020	541	1.000	0	0.00
eilA101-2	20.05%	11042	20.05%	1.000	11110	1.006	0	0.00
	13.19%	12903	13.20%	1.000	12688	0.983	0	0.00
	13.37%	14025	13.37%	1.000	13480	0.961	0	0.00
enlight_hard	0.50	1	0.50	1.000	1	1.000	0	0.00
	0.50	1	0.50	1.000	1	1.000	0	0.00
	0.50	1	0.50	1.000	1	1.000	0	0.00
ex10	494.11	1	493.80	0.999	1	1.000	0	0.00
	501.07	1	497.94	0.994	1	1.000	0	0.00
	577.37	1	581.12	1.006	1	1.000	0	0.00
ex9	27.83	1	27.98	1.005	1	1.000	0	0.00
	27.26	1	27.30	1.001	1	1.000	0	0.00
	27.82	1	27.02	0.971	1	1.000	0	0.00
exp-1-500-5-5	2.27	1	2.28	1.004	1	1.000	0	0.00
	2.21	1	2.22	1.005	1	1.000	0	0.00
	2.24	1	2.21	0.987	1	1.000	0	0.00
fast0507	318.59	1284	322.23	1.011	1284	1.000	0	0.00
	276.89	1223	280.17	1.012	1223	1.000	0	0.00
	360.83	1711	365.44	1.013	1711	1.000	0	0.00
fastxgemm-n2r6s0t2	4242.55	988905	4702.82	<i>1.108</i>	1118937	<i>1.131</i>	28031	0.59

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	2081.00	481982	4017.11	<i>1.930</i>	1012967	<i>2.102</i>	21034	0.56
	3463.31	800783	3129.08	0.903	769500	0.961	14363	0.56
fhnw-binpack4-48	∞	4061123	∞	1.000	4040499	0.995	0	0.00
	∞	3518315	∞	1.000	3525851	1.002	0	0.00
	∞	3409002	∞	1.000	3413924	1.001	0	0.00
fhnw-binpack4-4	∞	15353678	∞	1.000	14733968	0.960	81	1.09
	∞	13725022	∞	1.000	13981261	1.019	205	1.21
	∞	11634465	∞	1.000	11607995	0.998	84	1.27
fiball	467.24	4111	465.55	0.996	4111	1.000	18	0.47
	449.57	3521	447.14	0.995	3521	1.000	8	17.21
	500.19	5672	499.03	0.998	5672	1.000	17	37.59
gen-ip002	1418.20	6087223	1315.68	0.928	5856334	0.962	5748	0.47
	1287.18	5462632	1295.56	1.007	5478569	1.003	5224	0.47
	1263.62	5583755	1271.92	1.007	5583912	1.000	5725	0.47
gen-ip054	3377.24	17017459	3047.64	0.902	15245360	0.896	31206	0.51
	2379.40	11995879	2530.93	<i>1.064</i>	12476019	1.040	28121	0.51
	3269.89	16034948	3381.24	1.034	16438070	1.025	38360	0.50
germanrr	1.46%	3402	1.46%	1.000	3418	1.005	7	1.43
	2.11%	2854	2.11%	1.000	2851	0.999	6	1.42
	1.94%	3562	1.94%	1.000	3559	0.999	9	1.44
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	0	0.00
	∞	8	∞	1.000	8	1.000	0	0.00
	∞	10	∞	1.000	10	1.000	0	0.00
glass-sc	2682.48	241329	2655.26	0.990	241329	1.000	0	0.00
	3214.72	289206	3214.67	1.000	289206	1.000	0	0.00
	2814.93	251112	2819.06	1.001	251112	1.000	0	0.00
glass4	4034.07	3057251	4008.75	0.994	2705421	0.885	2044	0.64
	1869.97	1494449	2392.84	<i>1.280</i>	1888717	<i>1.264</i>	1172	0.62
	2101.40	1854280	2212.84	<i>1.053</i>	1599046	0.862	476	0.66

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
gmu-35-40	0.05%	2049300	0.05%	1.000	2051936	1.001	33	0.84
	0.03%	2081244	0.03%	1.000	2099939	1.009	64	0.83
	0.03%	1310351	0.03%	1.000	1381092	1.054	49	0.83
gmu-35-50	0.02%	1327256	0.02%	1.000	1317781	0.993	52	0.75
	0.03%	1247462	0.03%	1.000	1247342	1.000	12	0.74
	0.04%	1018626	0.04%	1.000	1016723	0.998	5	0.82
graph20-20-1rand	163.83%	6111	163.73%	1.000	6171	1.010	0	0.00
	165.38%	8260	165.38%	1.000	8277	1.002	0	0.00
	172.66%	7489	172.66%	1.000	7513	1.003	0	0.00
graphdraw-domain	1014.34	1788814	1010.47	0.996	1823083	1.019	1033	0.86
	1180.52	1989742	1122.85	0.951	1941578	0.976	1117	0.89
	1675.10	2907888	1664.67	0.994	2907888	1.000	956	0.91
h80x6320d	69.46	4	69.54	1.001	4	1.000	0	0.00
	86.02	10	86.17	1.002	10	1.000	2	1.74
	85.29	5	86.62	1.016	5	1.000	2	1.52
highschool1-aigio	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
hypothyroid-k1	19.94	1	20.04	1.005	1	1.000	0	0.00
	19.86	1	19.99	1.007	1	1.000	0	0.00
	19.91	1	20.16	1.013	1	1.000	0	0.00
ic97_potential	0.78%	7119448	0.84%	1.000	7214792	1.013	48200	1.08
	0.63%	6496840	0.75%	1.000	6107856	0.940	54828	1.11
	0.81%	7458325	0.86%	1.000	7579116	1.016	41892	1.07
icir97_tension	0.09%	3094293	0.07%	1.000	3185773	1.030	30127	0.15
	5939.53	2269531	0.05%	1.212	2776552	1.223	47607	0.14
	0.11%	3113728	0.08%	1.000	2729235	0.877	28506	0.12
irish-electricity	∞	93	∞	1.000	93	1.000	0	0.00
	26.60%	1359	18.43%	1.000	1317	0.969	71	0.10

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	∞	1333	∞	1.000	1333	1.000	337	0.37
irp	12.53	6	12.51	0.998	6	1.000	0	0.00
	12.07	4	12.05	0.998	4	1.000	0	0.00
	12.62	5	12.58	0.997	5	1.000	0	0.00
istanbul-no-cutoff	154.51	347	154.02	0.997	347	1.000	0	0.00
	166.45	245	166.34	0.999	245	1.000	0	0.00
	286.40	475	285.14	0.996	475	1.000	6	0.41
k1mushroom	1889.56	7	1897.56	1.004	7	1.000	0	0.00
	1594.37	11	1583.93	0.993	11	1.000	0	0.00
	1318.45	3	1321.29	1.002	3	1.000	0	0.00
lectsched-5-obj	153.33%	173223	166.67%	1.000	148725	0.859	1718	0.88
	106.67%	129184	120.00%	1.000	130812	1.013	1006	0.50
	133.33%	63608	126.67%	1.000	64923	1.021	587	0.81
leo1	6.11%	80654	6.11%	1.000	80819	1.002	0	0.00
	7.14%	34868	7.14%	1.000	34905	1.001	0	0.00
	7.53%	45878	7.53%	1.000	45969	1.002	0	0.00
leo2	∞	101695	∞	1.000	101616	0.999	0	0.00
	∞	110297	∞	1.000	110967	1.006	0	0.00
	∞	146844	∞	1.000	146706	0.999	0	0.00
lotsize	0.67%	16481	0.67%	1.000	16786	1.019	4	0.82
	0.88%	20469	0.88%	1.000	20493	1.001	2	1.40
	0.70%	18014	0.70%	1.000	17911	0.994	2	0.93
mad	∞	13194508	∞	1.000	8295624	0.629	36	0.67
	∞	13913907	∞	1.000	14934806	1.073	145	0.59
	∞	16445546	∞	1.000	15381075	0.935	44	0.68
map10	1001.07	1640	1006.71	1.006	1637	0.998	112	0.74
	630.31	724	633.84	1.006	724	1.000	117	0.75
	805.35	979	792.96	0.985	965	0.986	113	0.75
map16715-04	2157.11	1933	2158.43	1.001	1933	1.000	63	0.96

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	2330.54	2173	2335.51	1.002	2173	1.000	62	0.96
	2123.63	1977	2160.04	1.017	1990	1.007	70	0.96
markshare2	∞	5824114	∞	1.000	5827069	1.001	0	0.00
	∞	5581007	∞	1.000	5581862	1.000	0	0.00
	∞	5023615	∞	1.000	5052479	1.006	0	0.00
markshare_4.0	73.16	612396	72.47	0.991	612396	1.000	0	0.00
	70.50	589762	70.48	1.000	589762	1.000	0	0.00
	86.61	719508	85.88	0.992	719508	1.000	0	0.00
mas74	1678.96	4932223	1680.79	1.001	4932223	1.000	5015	1.08
	2275.04	7992914	2282.09	1.003	7992914	1.000	11712	1.09
	1569.06	4674399	1563.59	0.997	4674399	1.000	5842	1.09
mas76	135.44	406104	136.88	1.011	406104	1.000	702	1.12
	167.03	525538	168.46	1.009	525538	1.000	765	1.13
	148.41	450422	152.65	1.029	450422	1.000	736	1.13
mc11	147.87	6484	149.40	1.010	6484	1.000	29	1.85
	80.00	1411	80.39	1.005	1411	1.000	6	2.00
	104.92	3386	106.11	1.011	3386	1.000	21	1.85
mcsched	317.74	11378	318.21	1.001	11378	1.000	0	0.00
	235.29	9846	235.33	1.000	9846	1.000	0	0.00
	306.34	12017	306.32	1.000	12017	1.000	0	0.00
mik-250-20-75-4	52.68	23893	52.78	1.002	23893	1.000	167	0.32
	43.90	15175	43.96	1.001	15175	1.000	212	0.32
	52.15	20733	52.36	1.004	20733	1.000	213	0.29
milo-v12-6-r2-40-1	10.82%	260926	9.47%	1.000	189681	0.727	13811	0.84
	11.22%	297446	8.96%	1.000	323326	1.087	24417	0.83
	10.31%	224778	11.33%	1.000	417232	1.856	30891	0.76
momentum1	8.61%	101918	24.76%	1.000	94037	0.923	6578	0.15
	6.30%	124819	7.36%	1.000	91471	0.733	8924	0.16
	6.17%	196712	6.53%	1.000	188055	0.956	10931	0.15

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
mushroom-best	575.72	26972	579.50	1.007	27393	1.016	1310	0.65
	134.00%	94997	134.09%	1.000	94624	0.996	1580	0.85
	100.03%	82549	121.97%	1.000	98893	1.198	2824	0.88
mzzv11	210.46	484	210.71	1.001	484	1.000	2	0.87
	263.22	987	263.08	0.999	987	1.000	4	0.78
	195.36	616	195.89	1.003	616	1.000	0	0.00
mzzv42z	175.15	415	175.26	1.001	415	1.000	1	0.95
	244.76	712	246.00	1.005	712	1.000	6	0.94
	308.91	719	306.34	0.992	719	1.000	4	0.87
n2seq36q	925.30	5438	936.81	1.012	5438	1.000	0	0.00
	1064.07	4712	1061.28	0.997	4712	1.000	0	0.00
	1167.24	4632	1170.79	1.003	4632	1.000	0	0.00
n3div36	2.56%	225155	2.59%	1.000	213866	0.950	0	0.00
	2.84%	212152	2.86%	1.000	207136	0.976	0	0.00
	2.67%	212483	2.69%	1.000	202891	0.955	0	0.00
n5-3	26.47	926	26.40	0.997	926	1.000	3	0.17
	27.69	971	27.79	1.004	971	1.000	2	0.09
	27.24	1087	27.09	0.994	1087	1.000	0	0.00
neos-1122047	9.69	1	9.92	1.024	1	1.000	0	0.00
	9.66	1	9.76	1.010	1	1.000	0	0.00
	9.82	1	9.70	0.988	1	1.000	0	0.00
neos-1171448	7.19	1	58.11	<i>8.082</i>	101	<i>101.000</i>	1	1.00
	4163.96	322	5.16	0.001	1	0.003	1	1.00
	51.15	86	51.55	1.008	86	1.000	1	1.00
neos-1171737	1.04%	3921	1.04%	1.000	3912	0.998	29	0.54
	1.30%	3941	1.56%	1.000	4009	1.017	16	0.52
	1.21%	17078	1.30%	1.000	11719	0.686	199	0.56
neos-1354092	∞	613	∞	1.000	613	1.000	3	1.00
	∞	830	∞	1.000	820	0.988	1	0.50

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	∞	639	∞	1.000	639	1.000	3	0.83
neos-1445765	43.81	133	43.72	0.998	133	1.000	0	0.00
	44.21	141	44.19	1.000	141	1.000	0	0.00
	44.68	125	44.74	1.001	125	1.000	0	0.00
neos-1456979	7.49%	39921	7.49%	1.000	39961	1.001	0	0.00
	6.84%	38705	6.84%	1.000	38750	1.001	1	0.34
	7.31%	31441	7.29%	1.000	31540	1.003	0	0.00
neos-1582420	21.72	18	21.85	1.006	18	1.000	53	1.31
	10.82	9	10.92	1.009	9	1.000	18	0.67
	54.77	1381	55.49	1.013	1381	1.000	323	0.56
neos-2075418-temuka	6956.95	1	7024.05	1.010	1	1.000	0	0.00
	4539.56	1	4517.94	0.995	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
neos-2657525-crna	∞	1566240	∞	1.000	3064132	1.956	193448	1.13
	∞	3679874	∞	1.000	3681104	1.000	172895	1.15
	∞	2117578	∞	1.000	2122332	1.002	102544	1.11
neos-2746589-doon	0.46%	57311	0.46%	1.000	55681	0.972	1	0.65
	0.73%	31231	0.73%	1.000	30280	0.970	0	0.00
	0.11%	187900	0.11%	1.000	182349	0.970	3	0.82
neos-2978193-inde	0.50%	564299	0.50%	1.000	549249	0.973	3126	0.01
	0.13%	597757	0.13%	1.000	573707	0.960	2312	0.01
	0.50%	566106	0.50%	1.000	548119	0.968	3982	0.01
neos-2987310-joes	17.66	1	17.49	0.990	1	1.000	0	0.00
	15.44	1	15.31	0.992	1	1.000	0	0.00
	13.71	1	13.67	0.997	1	1.000	0	0.00
neos-3004026-krka	53.25	2711	53.06	0.996	2711	1.000	0	0.00
	62.55	3485	62.47	0.999	3485	1.000	0	0.00
	46.71	1764	46.28	0.991	1764	1.000	0	0.00
neos-3024952-loue	4367.65	401234	4646.86	<i>1.064</i>	383076	0.955	6231	7.28

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	0.07%	703845	0.07%	1.000	688312	0.978	24515	7.14
	0.06%	877914	0.04%	1.000	1114650	1.270	14504	7.07
neos-3046615-murg	167.80%	7177613	169.81%	1.000	6971706	0.971	1756	0.95
	166.97%	6299859	166.11%	1.000	6364063	1.010	1967	0.96
	165.78%	6632917	163.66%	1.000	7613539	1.148	2441	0.96
neos-3083819-nubu	12.03	2020	12.72	<i>1.057</i>	2020	1.000	172	1.02
	11.24	1578	12.37	<i>1.101</i>	1578	1.000	398	1.03
	18.90	3812	20.79	<i>1.100</i>	3812	1.000	471	1.01
neos-3216931-puriri	167.08%	7443	116.41%	1.000	5546	0.745	191	0.75
	48.17%	10428	5.50%	1.000	9705	0.931	294	0.78
	145.61%	4910	147.13%	1.000	4790	0.976	112	0.76
neos-3381206-awhea	1.20	1	1.18	0.983	1	1.000	0	0.00
	1.23	1	1.21	0.984	1	1.000	0	0.00
	1.21	1	1.20	0.992	1	1.000	0	0.00
neos-3402294-bobin	4388.20	40294	4386.37	1.000	40294	1.000	0	0.00
	623.92	3428	618.95	0.992	3428	1.000	0	0.00
	1624.98	9242	1620.92	0.998	9242	1.000	0	0.00
neos-3402454-bohle	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
neos-3555904-turama	18.01%	145	18.01%	1.000	145	1.000	0	0.00
	∞	18	∞	1.000	18	1.000	0	0.00
	18.01%	16864	18.01%	1.000	16797	0.996	0	0.00
neos-3627168-kasai	0.17%	4712130	0.15%	1.000	4555684	0.967	4738	1.17
	0.09%	4139311	0.09%	1.000	4132791	0.998	3038	1.09
	0.27%	5183140	0.27%	1.000	5147129	0.993	3765	1.15
neos-3656078-kumeu	∞	32	∞	1.000	32	1.000	0	0.00
	∞	79	∞	1.000	82	1.038	2	0.08
	∞	122	∞	1.000	122	1.000	1	0.67

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
neos-3754480-nidda	∞	19975340	∞	1.000	20000763	1.001	1097	0.29
	∞	18490973	∞	1.000	18439214	0.997	1076	0.30
	∞	19202321	∞	1.000	19108471	0.995	384	0.32
neos-3988577-wolgan	∞	309	∞	1.000	312	1.010	0	0.00
	∞	180	∞	1.000	179	0.994	0	0.00
	∞	439	∞	1.000	439	1.000	0	0.00
neos-4300652-rahue	438.74%	1353	431.97%	1.000	1365	1.009	165	0.08
	809.48%	1234	809.48%	1.000	1213	0.983	178	0.13
	316.83%	2125	316.83%	1.000	2127	1.001	146	0.22
neos-4338804-snowy	1.37%	5465626	1.66%	1.000	4875741	0.892	23455	0.85
	0.82%	7085230	0.82%	1.000	6738902	0.951	29841	0.81
	2.07%	6055267	1.66%	1.000	5067404	0.837	19238	0.94
neos-4387871-tavua	11.38%	120515	11.39%	1.000	118375	0.982	3047	0.31
	13.13%	120082	14.13%	1.000	116171	0.967	3835	0.28
	13.51%	96819	18.66%	1.000	96695	0.999	2449	0.35
neos-4413714-turia	303.39	2	299.23	0.986	2	1.000	0	0.00
	416.44	2	404.80	0.972	2	1.000	0	0.00
	282.20	2	277.10	0.982	2	1.000	0	0.00
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
neos-4647030-tutaki	0.01%	24465	0.01%	1.000	24413	0.998	15	0.97
	0.01%	22665	0.01%	1.000	22893	1.010	15	0.97
	0.01%	27208	0.01%	1.000	27292	1.003	5	0.78
neos-4722843-widden	2638.33	11357	2651.33	1.005	11357	1.000	9	0.04
	1020.20	3376	1033.65	1.013	3376	1.000	41	0.37
	1707.37	7919	1714.52	1.004	7919	1.000	28	0.18
neos-4738912-atrato	702.38	60433	813.40	<i>1.158</i>	61981	1.026	16069	0.41
	3660.73	324992	3808.90	1.040	324992	1.000	43651	0.39

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	867.84	95736	914.39	<i>1.054</i>	95736	1.000	16467	0.82
neos-4763324-toguru	46.04%	8436	46.04%	1.000	8436	1.000	0	0.00
	45.06%	15192	45.08%	1.000	14962	0.985	0	0.00
	48.94%	7145	48.94%	1.000	7145	1.000	0	0.00
neos-4954672-berkel	8.46%	956670	8.48%	1.000	1019990	1.066	3126	0.53
	8.88%	783295	8.71%	1.000	819107	1.046	2272	0.50
	8.73%	837840	8.00%	1.000	891993	1.065	2753	0.49
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	0	0.00
	15.39%	14	15.39%	1.000	14	1.000	0	0.00
	15.20%	12	15.20%	1.000	12	1.000	0	0.00
neos-5052403-cygnnet	1.60%	113	1.60%	1.000	113	1.000	0	0.00
	1.38%	1	1.38%	1.000	1	1.000	0	0.00
	1.19%	63	1.19%	1.000	63	1.000	0	0.00
neos-5093327-huahum	10.30%	50228	10.32%	1.000	49854	0.993	1	0.05
	10.43%	52521	10.43%	1.000	52521	1.000	3	0.04
	12.13%	49012	12.17%	1.000	48532	0.990	1	0.05
neos-5104907-jarama	∞	8	∞	1.000	8	1.000	0	0.00
	∞	9	∞	1.000	9	1.000	0	0.00
	∞	4	∞	1.000	4	1.000	0	0.00
neos-5107597-kakapo	2672.94	882141	2144.47	0.802	560533	0.635	46	0.67
	1724.83	472393	1725.41	1.000	472393	1.000	9	0.66
	3597.91	1115823	5927.88	<i>1.648</i>	1725439	<i>1.546</i>	112	0.80
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
neos-5188808-nattai	1283.68	12101	1251.29	0.975	12145	1.004	251	0.16
	1300.65	13483	1292.07	0.993	13554	1.005	355	0.18
	1336.30	12479	1380.62	1.033	12548	1.006	396	0.17
neos-5195221-niemur	3115.64	62799	2813.87	0.903	47466	0.756	11	0.27

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	2897.10	25010	2911.85	1.005	25010	1.000	3	0.18
	2854.80	45135	2890.78	1.013	33779	0.748	2	0.22
neos-631710	14.21%	2	14.21%	1.000	2	1.000	0	0.00
	8.90%	4	8.90%	1.000	4	1.000	0	0.00
	14.21%	3	14.21%	1.000	3	1.000	0	0.00
neos-662469	0.00%	61996	0.01%	1.000	59651	0.962	2350	1.04
	0.01%	60229	0.00%	1.000	50627	0.841	1435	1.01
	0.01%	58756	0.01%	1.000	56995	0.970	3004	1.03
neos-787933	1.35	1	1.37	1.015	1	1.000	0	0.00
	1.38	1	1.39	1.007	1	1.000	0	0.00
	1.34	1	1.41	<i>1.052</i>	1	1.000	0	0.00
neos-827175	6.08	1	6.10	1.003	1	1.000	0	0.00
	8.24	1	8.21	0.996	1	1.000	0	0.00
	10.18	1	10.23	1.005	1	1.000	0	0.00
neos-848589	32.79%	254	32.15%	1.000	256	1.008	1	0.00
	42.57%	152	42.95%	1.000	148	0.974	0	0.00
	46.27%	106	46.27%	1.000	106	1.000	1	0.00
neos-860300	17.20	2	17.27	1.004	2	1.000	0	0.00
	13.35	2	13.35	1.000	2	1.000	0	0.00
	23.15	3	23.18	1.001	3	1.000	0	0.00
neos-873061	9.28%	155	9.28%	1.000	155	1.000	0	0.00
	7.72%	148	7.72%	1.000	148	1.000	1	0.28
	8.12%	168	8.12%	1.000	168	1.000	1	0.73
neos-911970	1.05%	1400844	1.05%	1.000	1400854	1.000	155	1.58
	2.49%	1814171	2.49%	1.000	1814127	1.000	963	2.56
	0.06%	11518168	0.06%	1.000	11460910	0.995	83	1.74
neos-933966	0.31%	1275	1374.28	0.191	138	0.108	2	0.31
	1567.83	476	848.27	0.541	38	0.080	2	0.31
	1294.09	86	2180.73	<i>1.685</i>	283	<i>3.291</i>	2	0.31

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
neos-950242	100.00%	9254	100.00%	1.000	9288	1.004	0	0.00
	100.00%	8343	100.00%	1.000	8446	1.012	0	0.00
	100.00%	15577	100.00%	1.000	15629	1.003	0	0.00
neos-957323	86.44	2	86.06	0.996	2	1.000	0	0.00
	110.13	5	110.59	1.004	5	1.000	0	0.00
	79.86	2	80.10	1.003	2	1.000	0	0.00
neos-960392	875.61	15	881.09	1.006	15	1.000	0	0.00
	1448.19	102	1439.63	0.994	102	1.000	0	0.00
	1365.59	403	1363.87	0.999	403	1.000	0	0.00
neos17	25.68	22460	25.95	1.011	22460	1.000	0	0.00
	9.26	5644	9.39	1.014	5644	1.000	0	0.00
	9.63	6376	9.84	1.022	6376	1.000	3	0.74
neos5	1010.47	3292114	1007.54	0.997	3292114	1.000	0	0.00
	1224.74	4202380	1234.24	1.008	4202380	1.000	0	0.00
	1182.22	4100005	1183.51	1.001	4100005	1.000	0	0.00
neos859080	0.50	792	0.50	1.000	792	1.000	0	0.00
	0.55	655	0.54	0.982	655	1.000	0	0.00
	0.53	565	0.55	1.038	565	1.000	0	0.00
neos8	1.98	1	1.95	0.985	1	1.000	1	0.98
	1.86	1	1.89	1.016	1	1.000	0	0.00
	1.83	1	1.83	1.000	1	1.000	0	0.00
net12	1900.74	1237	1842.42	0.969	1211	0.979	41	0.31
	1748.89	1895	1631.28	0.933	1816	0.958	85	0.30
	1562.61	1695	1561.43	0.999	1695	1.000	33	0.30
netdiversion	842.53	43	848.00	1.006	43	1.000	0	0.00
	2369.77	88	2364.82	0.998	88	1.000	0	0.00
	1086.77	27	1087.12	1.000	27	1.000	0	0.00
nexp-150-20-8-5	3491.23	5786	3539.59	1.014	5786	1.000	0	0.00
	3633.98	7166	3635.13	1.000	7166	1.000	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	0.83%	13146	0.83%	1.000	13054	0.993	1	1.01
ns1116954	∞	32	∞	1.000	32	1.000	0	0.00
	∞	57	∞	1.000	57	1.000	0	0.00
	∞	73	∞	1.000	75	1.027	0	0.00
ns1208400	418.27	2004	419.49	1.003	2004	1.000	0	0.00
	681.63	2339	683.06	1.002	2339	1.000	0	0.00
	1071.93	2315	1074.09	1.002	2315	1.000	0	0.00
ns1644855	7.37%	36	7.37%	1.000	36	1.000	0	0.00
	7.37%	79	7.37%	1.000	79	1.000	0	0.00
	976.27	1	974.47	0.998	1	1.000	0	0.00
ns1760995	58.41%	1	58.41%	1.000	1	1.000	0	0.00
	71.46%	1	71.46%	1.000	1	1.000	0	0.00
	49.34%	1	48.93%	1.000	1	1.000	0	0.00
ns1830653	287.45	14558	287.45	1.000	14558	1.000	0	0.00
	133.82	7527	134.33	1.004	7527	1.000	0	0.00
	147.17	7267	148.24	1.007	7267	1.000	0	0.00
ns1952667	∞	59183	∞	1.000	52208	0.882	22770	0.98
	1283.87	9508	1392.38	<i>1.085</i>	9508	1.000	2910	0.99
	920.29	4900	968.90	<i>1.053</i>	4900	1.000	1183	0.95
nu25-pr12	5.27	53	5.36	1.017	53	1.000	5	0.76
	6.01	66	6.11	1.017	66	1.000	8	1.16
	6.02	16	6.05	1.005	16	1.000	5	0.77
nursesched-medium-hint03	1657.78%	1115	1657.78%	1.000	1100	0.987	0	0.00
	3021.25%	2083	3021.25%	1.000	2050	0.984	1	0.51
	1077.84%	1128	1077.84%	1.000	1121	0.994	0	0.00
nursesched-sprint02	141.76	370	142.08	1.002	370	1.000	0	0.00
	85.07	409	85.18	1.001	409	1.000	0	0.00
	67.95	222	67.71	0.996	222	1.000	0	0.00
nw04	38.20	6	37.93	0.993	6	1.000	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	31.45	5	31.39	0.998	5	1.000	0	0.00
	35.06	6	35.16	1.003	6	1.000	0	0.00
opm2-z10-s4	24.70%	996	24.70%	1.000	1000	1.004	0	0.00
	27.76%	583	27.76%	1.000	586	1.005	0	0.00
	26.96%	1015	26.96%	1.000	1015	1.000	0	0.00
p200x1188c	3.54	2	3.53	0.997	2	1.000	0	0.00
	3.98	3	3.96	0.995	3	1.000	0	0.00
	3.61	2	3.62	1.003	2	1.000	0	0.00
peg-solitaire-a3	∞	5762	∞	1.000	5752	0.998	0	0.00
	∞	3581	∞	1.000	3557	0.993	0	0.00
	∞	3962	∞	1.000	3969	1.002	0	0.00
pg5_34	1147.46	145007	1173.22	1.022	148717	1.026	10834	0.09
	1093.92	134018	1134.07	1.037	144543	<i>1.079</i>	14587	0.07
	964.61	125934	1085.15	<i>1.125</i>	121673	0.966	16980	0.07
pg	106.20	2983	101.85	0.959	2687	0.901	429	0.08
	86.34	1354	86.23	0.999	1372	1.013	379	0.10
	105.03	2596	107.44	1.023	2311	0.890	705	0.08
physiciansched3-3	∞	412	∞	1.000	415	1.007	0	0.00
	∞	313	∞	1.000	313	1.000	0	0.00
	∞	359	∞	1.000	361	1.006	0	0.00
physiciansched6-2	124.53	377	124.81	1.002	377	1.000	0	0.00
	459.96	2804	462.02	1.004	2804	1.000	0	0.00
	44.81	1	44.74	0.998	1	1.000	0	0.00
piperout-08	821.29	149	797.03	0.970	130	0.872	24	1.29
	606.63	552	606.54	1.000	552	1.000	0	0.00
	944.95	788	923.85	0.978	596	0.756	15	1.38
piperout-27	140.27	2	140.11	0.999	2	1.000	0	0.00
	272.83	566	275.91	1.011	566	1.000	0	0.00
	330.74	72	332.32	1.005	72	1.000	6	0.75

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
pk1	108.50	306046	107.55	0.991	301100	0.984	118	0.59
	108.33	316310	109.16	1.008	317026	1.002	23	0.61
	114.96	338401	112.34	0.977	328715	0.971	76	0.62
proteindesign121hz512p9	9.60%	579	9.60%	1.000	591	1.021	56	0.84
	7.94%	443	7.94%	1.000	440	0.993	47	0.86
	26.02%	598	26.02%	1.000	593	0.992	81	0.86
proteindesign122trx11p8	1.95%	3	1.95%	1.000	3	1.000	21	0.74
	1.91%	8	1.91%	1.000	8	1.000	124	0.33
	1.93%	17	1.93%	1.000	17	1.000	26	0.72
qap10	87.80	3	87.99	1.002	3	1.000	0	0.00
	111.64	5	111.82	1.002	5	1.000	0	0.00
	196.87	15	197.87	1.005	15	1.000	0	0.00
radiationm18-12-05	9.31%	426457	12.99%	1.000	479812	1.125	1044	0.59
	14.84%	781939	0.05%	1.000	750150	0.959	2527	0.63
	0.02%	513263	1.89%	1.000	551080	1.074	1609	0.61
radiationm40-10-02	67.02%	52863	67.02%	1.000	53316	1.009	19	0.42
	57.74%	27496	57.74%	1.000	27109	0.986	15	0.42
	22.69%	98439	22.69%	1.000	99008	1.006	109	0.39
rail01	2.74%	201	2.74%	1.000	200	0.995	0	0.00
	25.21%	183	25.21%	1.000	182	0.995	0	0.00
	7.32%	185	7.32%	1.000	183	0.989	0	0.00
rail02	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
rail507	156.61	623	156.67	1.000	623	1.000	0	0.00
	179.24	783	180.04	1.004	783	1.000	0	0.00
	192.93	771	193.43	1.003	771	1.000	0	0.00
ran14x18-disj-8	1875.03	579341	2109.62	<i>1.125</i>	656920	<i>1.134</i>	5926	0.87
	1631.15	596062	1785.31	<i>1.095</i>	564900	0.948	5346	0.86

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	1762.48	651842	1694.59	0.961	593570	0.911	5795	0.88
rd-rplusc-21	≥ 10000%	632597	≥ 10000%	1.000	484631	0.766	6281	1.00
	≥ 10000%	518812	≥ 10000%	1.000	737139	1.421	8674	0.95
	≥ 10000%	787540	≥ 10000%	1.000	763715	0.970	5071	0.95
reblock115	4385.16	704168	4390.48	1.001	704168	1.000	12	1.24
	6590.03	882785	6605.46	1.002	882785	1.000	19	1.22
	5883.59	832788	5894.68	1.002	832788	1.000	25	1.29
rmatr100-p10	163.96	809	166.48	1.015	809	1.000	0	0.00
	161.56	822	162.84	1.008	822	1.000	0	0.00
	159.59	827	160.62	1.006	827	1.000	0	0.00
rmatr200-p5	22.40%	428	22.40%	1.000	421	0.984	0	0.00
	19.56%	424	19.56%	1.000	423	0.998	0	0.00
	21.08%	393	21.08%	1.000	403	1.025	0	0.00
rocI-4-11	639.46	12970	638.21	0.998	12970	1.000	29	0.85
	1001.23	17602	1001.80	1.001	17602	1.000	43	0.80
	497.78	9550	498.07	1.001	9550	1.000	52	0.73
rocII-5-11	108.31%	3304	108.52%	1.000	3399	1.029	131	0.67
	152.76%	2791	109.87%	1.000	2764	0.990	119	0.69
	109.22%	2858	109.11%	1.000	2522	0.882	72	0.74
rococoB10-011000	13.70%	151342	13.71%	1.000	151103	0.998	0	0.00
	15.08%	143535	15.09%	1.000	143253	0.998	0	0.00
	12.80%	153848	12.80%	1.000	153839	1.000	0	0.00
rococoC10-001000	766.14	53303	765.76	1.000	53303	1.000	0	0.00
	843.78	63090	851.99	1.010	63090	1.000	0	0.00
	1616.05	162527	1626.91	1.007	162527	1.000	0	0.00
roi2alpha3n4	1416.86	12529	1424.80	1.006	12529	1.000	0	0.00
	1926.56	17446	1940.46	1.007	17446	1.000	0	0.00
	1475.88	13303	1486.54	1.007	13303	1.000	0	0.00
roi5alpha10n8	35.37%	6060	35.37%	1.000	5989	0.988	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	40.38%	6271	40.36%	1.000	6346	1.012	0	0.00
	32.14%	6790	32.14%	1.000	6789	1.000	0	0.00
roll3000	36.75	1986	36.86	1.003	1986	1.000	17	1.06
	38.84	2149	38.91	1.002	2149	1.000	55	1.10
	59.94	3736	60.26	1.005	3736	1.000	18	1.15
s100	14.04%	18	5.53%	1.000	20	1.111	0	0.00
	29.84%	17	29.84%	1.000	17	1.000	0	0.00
	1.06%	22	1.06%	1.000	22	1.000	0	0.00
s250r10	0.27%	23455	0.28%	1.000	22897	0.976	0	0.00
	6127.84	45426	6366.45	1.039	45426	1.000	0	0.00
	0.22%	34654	0.23%	1.000	31811	0.918	0	0.00
satellites2-40	∞	19	∞	1.000	19	1.000	0	0.00
	∞	4	∞	1.000	4	1.000	0	0.00
	70.59%	33	70.59%	1.000	33	1.000	1	0.26
satellites2-60-fs	∞	33	∞	1.000	33	1.000	1	0.01
	∞	137	∞	1.000	137	1.000	1	0.23
	∞	28	∞	1.000	28	1.000	0	0.00
savsched1	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
sct2	0.03%	679457	0.03%	1.000	600226	0.883	1243	0.47
	0.03%	830638	0.05%	1.000	659682	0.794	202	0.53
	0.03%	1096527	0.03%	1.000	994927	0.907	311	0.64
seymour1	90.48	1627	90.45	1.000	1627	1.000	0	0.00
	68.11	1466	67.90	0.997	1466	1.000	0	0.00
	71.89	1822	72.05	1.002	1822	1.000	0	0.00
seymour	0.66%	242385	0.66%	1.000	242500	1.000	0	0.00
	0.68%	222870	0.68%	1.000	222209	0.997	0	0.00
	0.74%	226598	0.74%	1.000	225373	0.995	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
sing326	0.15%	11732	0.15%	1.000	11755	1.002	400	0.69
	0.17%	8401	0.17%	1.000	8196	0.976	395	0.68
	0.31%	8062	0.32%	1.000	7997	0.992	546	0.63
sing44	0.45%	5563	0.45%	1.000	5531	0.994	169	0.80
	0.19%	7451	0.19%	1.000	7349	0.986	290	0.67
	0.27%	2269	0.27%	1.000	2267	0.999	261	0.69
snp-02-004-104	0.00%	15069	0.00%	1.000	14561	0.966	734	0.00
	0.00%	18040	0.00%	1.000	18040	1.000	884	0.00
	0.00%	19680	0.00%	1.000	19680	1.000	375	0.00
sorrell3	43.81%	41078	43.81%	1.000	41208	1.003	0	0.00
	35.59%	39485	35.59%	1.000	39514	1.001	0	0.00
	19.11%	8947	19.11%	1.000	8801	0.984	0	0.00
sp150x300d	3.96	3472	3.96	1.000	3472	1.000	0	0.00
	3.12	2569	3.12	1.000	2569	1.000	0	0.00
	1.31	848	1.29	0.985	848	1.000	0	0.00
sp97ar	0.98%	15805	0.98%	1.000	15747	0.996	0	0.00
	1.02%	22713	1.02%	1.000	22961	1.011	0	0.00
	1.53%	24818	1.53%	1.000	24828	1.000	0	0.00
sp98ar	1.43%	71917	1.43%	1.000	71746	0.998	0	0.00
	0.48%	67062	0.48%	1.000	67060	1.000	0	0.00
	0.98%	71914	0.98%	1.000	71271	0.991	0	0.00
splice1k1	309.20%	514	309.20%	1.000	513	0.998	0	0.00
	376.26%	581	376.10%	1.000	594	1.022	0	0.00
	358.74%	837	358.74%	1.000	834	0.996	0	0.00
square41	109.98%	30	109.98%	1.000	30	1.000	12	0.94
	89.32%	38	89.32%	1.000	37	0.974	11	0.85
	92.32%	28	92.32%	1.000	28	1.000	0	0.00
square47	231.21%	4	231.21%	1.000	4	1.000	0	0.00
	117.00%	13	117.00%	1.000	13	1.000	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	231.21%	1	231.21%	1.000	1	1.000	0	0.00
supportcase10	803.51%	1	803.51%	1.000	1	1.000	0	0.00
	989.07%	1	989.07%	1.000	1	1.000	0	0.00
	1054.36%	1	1054.36%	1.000	1	1.000	0	0.00
supportcase12	1.31%	1473	1.31%	1.000	1463	0.993	46	0.42
	1.35%	2297	1.35%	1.000	2297	1.000	199	0.78
	0.97%	1502	1.30%	1.000	1505	1.002	118	0.74
supportcase18	3.84%	422401	3.84%	1.000	419350	0.993	0	0.00
	5.96%	238082	5.96%	1.000	237591	0.998	0	0.00
	3.84%	199099	3.84%	1.000	198815	0.999	0	0.00
supportcase19	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
	∞	1	∞	1.000	1	1.000	0	0.00
supportcase22	∞	51	∞	1.000	51	1.000	0	0.00
	∞	18	∞	1.000	18	1.000	0	0.00
	∞	66	∞	1.000	66	1.000	0	0.00
supportcase26	9.30%	8027495	8.94%	1.000	8135621	1.013	22612	0.71
	4654.53	5763770	5238.22	<i>1.125</i>	6761735	<i>1.173</i>	13464	0.66
	3870.89	4822910	4487.28	<i>1.159</i>	5497025	<i>1.140</i>	11349	0.58
supportcase33	1593.48	13435	1598.38	1.003	12756	0.949	415	0.48
	1752.51	8942	1600.98	0.914	7176	0.803	89	0.43
	671.18	3786	682.16	1.016	3786	1.000	158	0.37
supportcase40	787.68	6335	786.50	0.999	6335	1.000	308	0.14
	1057.65	9809	946.94	0.895	7991	0.815	220	0.16
	1002.89	9904	797.74	0.795	6970	0.704	175	0.15
supportcase42	0.38%	304886	0.38%	1.000	305571	1.002	433	0.00
	0.10%	380785	0.10%	1.000	380155	0.998	997	0.00
	0.35%	471537	0.35%	1.000	467610	0.992	766	0.00
supportcase6	9.13%	19697	9.13%	1.000	18980	0.964	0	0.00

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
	8.35%	18186	8.41%	1.000	17726	0.975	0	0.00
	9.72%	17735	9.72%	1.000	17709	0.999	0	0.00
supportcase7	183.36	59	179.98	0.982	59	1.000	14	0.04
	193.18	45	193.62	1.002	45	1.000	24	0.09
	208.38	32	210.25	1.009	32	1.000	53	0.06
swath1	17.54	281	21.09	<i>1.202</i>	281	1.000	4	0.31
	14.91	245	17.34	<i>1.163</i>	245	1.000	0	0.00
	16.43	292	19.82	<i>1.206</i>	292	1.000	2	0.27
swath3	198.93	28316	226.20	<i>1.137</i>	28316	1.000	42	0.42
	158.44	21837	182.91	<i>1.154</i>	21837	1.000	40	0.41
	374.36	74192	427.45	<i>1.142</i>	74192	1.000	74	0.32
tbfp-network	2339.45	574	2356.81	1.007	574	1.000	0	0.00
	1691.29	71	1683.80	0.996	71	1.000	0	0.00
	1086.54	99	1088.57	1.002	99	1.000	0	0.00
thor50dday	23.30%	113	23.30%	1.000	95	0.841	1	0.70
	21.49%	11	21.49%	1.000	12	1.091	0	0.00
	14.80%	31	14.80%	1.000	34	1.097	0	0.00
timtab1	73.22	62076	73.73	1.007	64175	1.034	1556	0.82
	67.45	51540	67.90	1.007	51540	1.000	1122	0.82
	69.67	51236	70.92	1.018	55054	<i>1.075</i>	1687	0.85
tr12-30	696.54	475823	606.97	0.871	423661	0.890	5284	0.64
	719.59	515503	650.32	0.904	475420	0.922	7899	0.69
	406.41	226138	397.52	0.978	213946	0.946	2847	0.69
traininstance2	∞	66539	∞	1.000	67099	1.008	662	0.94
	∞	48459	∞	1.000	52063	1.074	1188	0.96
	6286.13%	73306	6286.13%	1.000	73138	0.998	696	0.95
traininstance6	794.89%	279783	634.16%	1.000	456248	1.631	6464	0.94
	648.14%	357229	626.92%	1.000	347529	0.973	4040	0.95
	561.81%	459177	520.12%	1.000	454368	0.990	5508	0.94

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Table 5: Detailed computational results on MIPLIB 2017 benchmark with and without applying flowcover and MIR function. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	mir-procedure disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	MIR-succ	MIR-coef _Q
trento1	0.07%	58820	0.07%	1.000	57766	0.982	145	1.02
	0.10%	51318	0.10%	1.000	51033	0.994	83	0.81
	4.72%	44905	1.67%	1.000	35013	0.780	97	0.94
triptim1	1110.12	8	1099.43	0.990	8	1.000	0	0.00
	745.67	7	747.73	1.003	7	1.000	0	0.00
	1060.52	8	1065.09	1.004	8	1.000	0	0.00
uccase12	0.00%	92859	0.00%	1.000	77800	0.838	873	0.10
	0.00%	91202	0.00%	1.000	91468	1.003	926	0.11
	0.00%	82292	0.00%	1.000	98605	1.198	657	0.11
uccase9	1.98%	496	1.98%	1.000	498	1.004	89	0.39
	1.48%	1145	1.48%	1.000	1166	1.018	69	0.34
	2.82%	550	2.82%	1.000	550	1.000	72	0.38
uct-subprob	1111.26	44339	1102.62	0.992	44339	1.000	0	0.00
	1628.25	59559	1631.60	1.002	59559	1.000	0	0.00
	2491.33	95674	2506.36	1.006	95674	1.000	0	0.00
unitcal_7	271.15	89	272.59	1.005	89	1.000	53	0.17
	297.80	180	298.12	1.001	180	1.000	117	0.20
	384.00	436	387.18	1.008	436	1.000	113	0.23
var-smallemery-m6j6	0.93%	567102	0.93%	1.000	568323	1.002	184	2.09
	0.87%	657094	0.87%	1.000	656232	0.999	18	1.72
	6758.47	683202	6729.45	0.996	683202	1.000	2235	1.65
wachplan	2328.24	219938	2340.84	1.005	219938	1.000	3	0.52
	3378.02	301974	3419.67	1.012	302179	1.001	4	0.26
	2340.68	198054	2343.95	1.001	198054	1.000	0	0.00

Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
30n20b8	149.54	171	149.68	1.001	171	1.000	0	0
	582.65	1959	623.60	<i>1.070</i>	1999	1.020	0	290
	659.88	3242	693.56	<i>1.051</i>	3499	<i>1.079</i>	0	73
50v-10	1.55%	825087	1.69%	1.000	829421	1.005	0	154395
	1.31%	912826	1.15%	1.000	867997	0.951	0	177166
	1.16%	826673	1.37%	1.000	833134	1.008	0	161381
CMS750_4	185.66	2028	185.73	1.000	2028	1.000	0	0
	371.41	3254	370.72	0.998	3254	1.000	0	0
	474.76	13518	473.12	0.997	13518	1.000	0	0
academictimetables-small	∞	2465	∞	1.000	2315	0.939	0	124
	∞	2803	∞	1.000	3505	1.250	0	165
	∞	2707	∞	1.000	2681	0.990	0	136
air05	40.50	597	40.07	0.989	648	<i>1.085</i>	0	70
	40.16	674	36.54	0.910	716	<i>1.062</i>	0	107
	38.17	417	30.22	0.792	282	0.676	0	152
app1-1	3.52	2	3.53	1.003	2	1.000	0	0
	4.90	3	4.94	1.008	3	1.000	0	0
	4.17	6	4.17	1.000	6	1.000	0	0
app1-2	642.45	33	642.80	1.001	33	1.000	0	0
	790.19	20	789.47	0.999	20	1.000	4	0
	619.92	20	618.36	0.997	20	1.000	2	0
assign1-5-8	4.61%	6907107	4.74%	1.000	5736357	0.831	0	396422
	4.61%	6309496	4.54%	1.000	6813236	1.080	0	480273
	4.78%	6421846	4.80%	1.000	6333262	0.986	0	441734
atlanta-ip	7.14%	18001	3.60%	1.000	18533	1.030	0	184
	3.68%	20488	3.81%	1.000	21153	1.032	3	240
	2.49%	22976	4.27%	1.000	30903	1.345	3	287
blc1s1	17.19%	47377	17.13%	1.000	35962	0.759	123	39
	20.72%	11994	18.36%	1.000	21112	1.760	67	12

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	18.10%	19088	17.69%	1.000	18673	0.978	76	75
bab2	1.32%	3984	1.29%	1.000	3473	0.872	0	108
	1.97%	3402	2.44%	1.000	3262	0.959	0	111
	∞	2004	∞	1.000	1981	0.989	0	0
bab6	0.58%	5249	0.58%	1.000	4790	0.913	0	226
	1.14%	3189	1.14%	1.000	3258	1.022	0	39
	1.94%	4622	1.94%	1.000	4779	1.034	0	153
beasleyC3	31.74	83	31.56	0.994	83	1.000	0	0
	17.39	2	17.35	0.998	2	1.000	0	0
	45.80	461	47.20	1.031	453	0.983	0	142
binkar10_1	31.70	2560	31.34	0.989	2560	1.000	0	0
	29.11	2246	29.22	1.004	2246	1.000	0	0
	28.80	2509	28.71	0.997	2509	1.000	0	0
blp-ar98	0.43%	196402	0.27%	1.000	238231	1.213	0	20326
	0.23%	217611	0.33%	1.000	207500	0.954	0	19963
	0.23%	207939	0.32%	1.000	229423	1.103	0	20227
blp-ic98	1.51%	281795	1.38%	1.000	304769	1.082	0	32075
	2.26%	288443	2.41%	1.000	254061	0.881	0	20280
	2.06%	268446	2.11%	1.000	278188	1.036	0	26047
bnatt400	966.88	6821	970.91	1.004	6821	1.000	0	0
	1102.20	6346	1105.02	1.003	6346	1.000	0	0
	743.13	5500	745.15	1.003	5500	1.000	0	0
bnatt500	4360.93	29526	4368.17	1.002	29526	1.000	0	0
	6313.03	38962	6333.06	1.003	38962	1.000	0	0
	4990.78	29029	4996.90	1.001	29029	1.000	0	0
bppc4-08	1.92%	700039	1.92%	1.000	797503	1.139	0	330814
	1.92%	790062	1.92%	1.000	938927	1.188	1	82475
	1.92%	713373	1.92%	1.000	793397	1.112	6	9683
brazil3	58.33%	3691	3360.46	0.467	2570	0.696	0	808

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	66.63%	4714	4252.19	0.591	2347	0.498	0	921
	2726.35	1732	3785.08	<i>1.388</i>	3302	<i>1.906</i>	0	504
buildingenergy	0.13%	96	0.13%	1.000	96	1.000	0	0
	0.15%	85	0.15%	1.000	85	1.000	0	0
	0.13%	12	0.13%	1.000	12	1.000	0	0
cbs-cta	40.06	1	40.27	1.005	1	1.000	0	0
	314.43	31	314.10	0.999	31	1.000	0	0
	35.85	1	35.77	0.998	1	1.000	0	0
chromaticindex1024-7	33.33%	968	33.33%	1.000	964	0.996	0	0
	33.33%	1190	33.33%	1.000	1171	0.984	0	0
	6450.57	757	6429.72	0.997	757	1.000	0	0
chromaticindex512-7	1186.41	361	1172.37	0.988	361	1.000	0	0
	3700.18	3133	3689.97	0.997	3133	1.000	0	0
	33.33%	40589	33.33%	1.000	40579	1.000	0	0
cmflsp50-24-8-8	3.98%	35922	3.98%	1.000	36090	1.005	4	0
	2.00%	83678	1.99%	1.000	85475	1.021	5	0
	4.86%	37970	4.86%	1.000	37790	0.995	6	1
co-100	2.13%	49439	1.74%	1.000	54008	1.092	0	10588
	2.83%	24888	91.77%	1.000	7012	0.282	0	3700
	2.98%	10921	3.18%	1.000	10565	0.967	1	4373
cod105	47.77%	6892	47.57%	1.000	7261	1.054	0	2007
	48.00%	6864	48.00%	1.000	6829	0.995	0	1967
	48.07%	6601	48.07%	1.000	6601	1.000	0	2170
comp07-2idx	600.00%	3934	966.67%	1.000	3996	1.016	0	293
	633.33%	2475	2800.00%	1.000	743	0.300	0	254
	866.67%	2862	1716.67%	1.000	1449	0.506	0	198
comp21-2idx	244.83%	9501	247.43%	1.000	10931	1.151	0	1035
	228.25%	9080	195.50%	1.000	9835	1.083	0	1576
	225.16%	11555	248.72%	1.000	11711	1.014	0	957

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
cost266-UUE	5067.55	431331	4923.15	0.972	375684	0.871	549	0
	3361.61	257227	3728.83	<i>1.109</i>	294630	<i>1.145</i>	899	0
	4827.79	427959	4067.72	0.843	306702	0.717	735	0
cryptanalysisiskb128n5obj14	∞	111	∞	1.000	110	0.991	0	0
	∞	56	∞	1.000	59	1.054	0	0
	∞	91	∞	1.000	90	0.989	0	0
cryptanalysisiskb128n5obj16	∞	103	∞	1.000	104	1.010	0	0
	2794.79	37	2790.65	0.999	37	1.000	0	0
	∞	97	∞	1.000	97	1.000	0	0
csched007	2423.01	170977	2327.77	0.961	187288	<i>1.095</i>	0	27804
	3761.60	303028	2613.95	0.695	220934	0.729	0	31144
	3193.45	251998	3393.08	<i>1.063</i>	247755	0.983	0	33239
csched008	1.16%	578225	2.81%	1.000	455870	0.788	0	85766
	1.74%	933994	2.33%	1.000	694455	0.744	0	201461
	2824.43	262789	5772.95	<i>2.044</i>	546382	<i>2.079</i>	0	175259
cvs16r128-89	21.28%	26025	23.28%	1.000	67980	2.612	0	11794
	20.14%	31825	22.61%	1.000	34973	1.099	0	9091
	22.24%	18170	23.01%	1.000	47219	2.599	0	10489
dano3_3	144.34	10	143.70	0.996	10	1.000	0	0
	142.93	14	142.65	0.998	14	1.000	0	0
	125.01	17	124.56	0.996	17	1.000	0	0
dano3_5	638.76	276	635.04	0.994	276	1.000	0	0
	285.45	159	285.81	1.001	159	1.000	4	0
	286.05	140	285.94	1.000	140	1.000	0	0
decomp2	2.43	1	2.39	0.984	1	1.000	0	0
	2.51	1	2.42	0.964	1	1.000	0	0
	2.42	1	2.50	1.033	1	1.000	0	0
drayage-100-23	16.52	32	16.43	0.995	32	1.000	0	0
	19.73	48	19.52	0.989	48	1.000	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	13.56	16	13.50	0.996	16	1.000	0	0
drayage-25-23	0.07%	838013	0.07%	1.000	720814	0.860	0	28888
	0.07%	735476	0.07%	1.000	790871	1.075	0	56406
	0.07%	645482	6941.84	0.964	552534	0.856	0	29536
dws008-01	49.94%	161878	44.84%	1.000	144766	0.894	13	2563
	47.11%	139898	44.28%	1.000	157395	1.125	8	3232
	51.83%	146064	52.63%	1.000	153108	1.048	7	3808
eil33-2	96.65	501	81.20	0.840	343	0.685	0	2699
	93.48	467	101.92	<i>1.090</i>	395	0.846	0	2273
	90.81	599	105.72	<i>1.164</i>	541	0.903	0	2593
eilA101-2	18.35%	11303	20.05%	1.000	11110	0.983	0	6659
	14.26%	10736	13.20%	1.000	12688	1.182	0	9758
	8.77%	12629	13.37%	1.000	13480	1.067	0	8679
enlight_hard	0.50	1	0.50	1.000	1	1.000	0	0
	0.50	1	0.50	1.000	1	1.000	0	0
	0.50	1	0.50	1.000	1	1.000	0	0
ex10	491.38	1	493.80	1.005	1	1.000	0	0
	497.33	1	497.94	1.001	1	1.000	0	0
	577.73	1	581.12	1.006	1	1.000	0	0
ex9	28.59	1	27.98	0.979	1	1.000	0	0
	27.27	1	27.30	1.001	1	1.000	0	0
	27.35	1	27.02	0.988	1	1.000	0	0
exp-1-500-5-5	2.29	1	2.28	0.996	1	1.000	0	0
	2.23	1	2.22	0.996	1	1.000	0	0
	2.24	1	2.21	0.987	1	1.000	0	0
fast0507	310.09	1346	322.23	1.039	1284	0.954	0	499
	294.63	1481	280.17	0.951	1223	0.826	0	574
	264.35	1019	365.44	<i>1.382</i>	1711	<i>1.679</i>	0	628
fastxgemm-n2r6s0t2	4764.24	1133328	4702.82	0.987	1118937	0.987	0	10346

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	3160.65	753635	4017.11	<i>1.271</i>	1012967	<i>1.344</i>	0	8655
	4161.96	1036974	3129.08	0.752	769500	0.742	0	1400
fhnw-binpack4-48	∞	4052201	∞	1.000	4040499	0.997	0	0
	∞	3547482	∞	1.000	3525851	0.994	0	0
	∞	3418593	∞	1.000	3413924	0.999	0	0
fhnw-binpack4-4	∞	14763749	∞	1.000	14733968	0.998	0	0
	∞	14074973	∞	1.000	13981261	0.993	0	0
	∞	11745635	∞	1.000	11607995	0.988	0	0
fiball	464.37	4111	465.55	1.003	4111	1.000	0	0
	444.67	3521	447.14	1.006	3521	1.000	0	1
	501.66	5672	499.03	0.995	5672	1.000	0	7
gen-ip002	1656.56	6963244	1315.68	0.794	5856334	0.841	0	279
	1291.40	5478569	1295.56	1.003	5478569	1.000	0	0
	1276.81	5583912	1271.92	0.996	5583912	1.000	0	0
gen-ip054	3075.10	15245360	3047.64	0.991	15245360	1.000	0	0
	2551.41	12476019	2530.93	0.992	12476019	1.000	0	0
	3374.80	16438070	3381.24	1.002	16438070	1.000	0	0
germanrr	1.31%	3431	1.46%	1.000	3418	0.996	0	389
	1.48%	5813	2.11%	1.000	2851	0.490	0	525
	1.93%	3657	1.94%	1.000	3559	0.973	0	541
gfd-schedulen180f7d50m30k18	∞	4	∞	1.000	4	1.000	0	0
	∞	9	∞	1.000	8	0.889	0	0
	∞	10	∞	1.000	10	1.000	0	0
glass-sc	2687.32	240771	2655.26	0.988	241329	1.002	0	22536
	3226.08	289204	3214.67	0.996	289206	1.000	0	27228
	2855.82	251112	2819.06	0.987	251112	1.000	0	24774
glass4	2961.34	2175685	4008.75	<i>1.354</i>	2705421	<i>1.243</i>	8368	3633
	1734.58	1609175	2392.84	<i>1.379</i>	1888717	<i>1.174</i>	5279	2200
	3446.14	2337682	2212.84	0.642	1599046	0.684	2522	1558

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
gmu-35-40	0.03%	2446361	0.05%	1.000	2051936	0.839	3	120300
	0.04%	2099536	0.03%	1.000	2099939	1.000	5	95182
	0.02%	2456805	0.03%	1.000	1381092	0.562	1	94971
gmu-35-50	0.01%	1354235	0.02%	1.000	1317781	0.973	43	139924
	0.04%	1049496	0.03%	1.000	1247342	1.189	10	83282
	0.05%	1032089	0.04%	1.000	1016723	0.985	3	69768
graph20-20-1rand	170.36%	10337	163.73%	1.000	6171	0.597	0	582
	163.28%	13477	165.38%	1.000	8277	0.614	1	1259
	165.75%	7264	172.66%	1.000	7513	1.034	0	999
graphdraw-domain	813.34	1597956	1010.47	<i>1.242</i>	1823083	<i>1.141</i>	0	2246
	1082.01	1869096	1122.85	1.038	1941578	1.039	0	3630
	1619.84	3139503	1664.67	1.028	2907888	0.926	0	2339
h80x6320d	69.58	4	69.54	0.999	4	1.000	0	3
	84.66	8	86.17	1.018	10	<i>1.250</i>	0	2
	85.95	5	86.62	1.008	5	1.000	0	2
highschool1-aigio	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
hypothyroid-k1	19.72	1	20.04	1.016	1	1.000	0	0
	19.69	1	19.99	1.015	1	1.000	0	0
	20.09	1	20.16	1.003	1	1.000	0	0
ic97_potential	0.76%	7316855	0.84%	1.000	7214792	0.986	0	5223
	0.71%	6411766	0.75%	1.000	6107856	0.953	0	5125
	0.78%	7129049	0.86%	1.000	7579116	1.063	0	6662
icir97_tension	0.07%	3168421	0.07%	1.000	3185773	1.005	0	0
	0.05%	2775918	0.05%	1.000	2776552	1.000	0	0
	0.08%	2726949	0.08%	1.000	2729235	1.001	0	0
irish-electricity	∞	93	∞	1.000	93	1.000	0	0
	18.81%	1362	18.43%	1.000	1317	0.967	32	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	∞	1333	∞	1.000	1333	1.000	21	0
irp	12.07	5	12.51	1.036	6	<i>1.200</i>	0	18
	12.02	4	12.05	1.002	4	1.000	0	3
	12.21	4	12.58	1.030	5	<i>1.250</i>	0	20
istanbul-no-cutoff	153.32	347	154.02	1.005	347	1.000	0	0
	166.23	245	166.34	1.001	245	1.000	0	0
	285.04	475	285.14	1.000	475	1.000	0	0
klmushroom	1847.86	7	1897.56	1.027	7	1.000	0	0
	1529.62	11	1583.93	1.036	11	1.000	0	0
	1298.65	3	1321.29	1.017	3	1.000	0	2
lectsched-5-obj	166.67%	148446	166.67%	1.000	148725	1.002	0	0
	120.00%	130915	120.00%	1.000	130812	0.999	0	0
	126.67%	65168	126.67%	1.000	64923	0.996	0	0
leo1	7.00%	91974	6.11%	1.000	80819	0.879	0	12149
	4.70%	59437	7.14%	1.000	34905	0.587	0	8365
	7.01%	81485	7.53%	1.000	45969	0.564	0	9683
leo2	∞	100359	∞	1.000	101616	1.013	1	35
	∞	131264	∞	1.000	110967	0.845	0	61
	∞	132093	∞	1.000	146706	1.111	0	1106
lotsize	0.55%	17847	0.67%	1.000	16786	0.941	1529	46
	0.94%	19920	0.88%	1.000	20493	1.029	1651	516
	0.53%	21271	0.70%	1.000	17911	0.842	1323	66
mad	∞	15657701	∞	1.000	8295624	0.530	0	194702
	∞	14489476	∞	1.000	14934806	1.031	0	176105
	∞	12926670	∞	1.000	15381075	1.190	0	171031
map10	1010.05	1637	1006.71	0.997	1637	1.000	0	0
	633.89	724	633.84	1.000	724	1.000	0	0
	797.63	965	792.96	0.994	965	1.000	0	0
map16715-04	2158.04	1933	2158.43	1.000	1933	1.000	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	2336.90	2173	2335.51	0.999	2173	1.000	0	0
	2156.27	1990	2160.04	1.002	1990	1.000	0	0
markshare2	∞	6363355	∞	1.000	5827069	0.916	0	473529
	∞	5837837	∞	1.000	5581862	0.956	0	463495
	∞	5995287	∞	1.000	5052479	0.843	0	426947
markshare_4_0	139.43	1159084	72.47	0.520	612396	0.528	0	101
	174.69	1459529	70.48	0.403	589762	0.404	0	249
	188.56	1569373	85.88	0.455	719508	0.458	0	381
mas74	1776.06	5268095	1680.79	0.946	4932223	0.936	0	123857
	2335.34	8710934	2282.09	0.977	7992914	0.918	0	196722
	1338.68	4115864	1563.59	<i>1.168</i>	4674399	<i>1.136</i>	0	130366
mas76	139.27	419261	136.88	0.983	406104	0.969	0	1122
	168.64	525538	168.46	0.999	525538	1.000	0	22101
	150.32	450422	152.65	1.016	450422	1.000	0	337
mc11	148.49	6584	149.40	1.006	6484	0.985	12	1
	80.74	1474	80.39	0.996	1411	0.957	7	0
	98.44	2267	106.11	<i>1.078</i>	3386	<i>1.494</i>	64	0
mcsched	233.03	11746	318.21	<i>1.366</i>	11378	0.969	0	11
	344.61	14710	235.33	0.683	9846	0.669	0	23
	245.04	8130	306.32	<i>1.250</i>	12017	<i>1.478</i>	0	17
mik-250-20-75-4	52.56	23893	52.78	1.004	23893	1.000	0	0
	43.93	15175	43.96	1.001	15175	1.000	0	0
	52.11	20733	52.36	1.005	20733	1.000	0	0
milo-v12-6-r2-40-1	9.51%	330534	9.47%	1.000	189681	0.574	27	18887
	11.70%	214581	8.96%	1.000	323326	1.507	29	29850
	13.03%	246468	11.33%	1.000	417232	1.693	12	24987
momentum1	15.78%	74695	24.76%	1.000	94037	1.259	278	2935
	8.32%	188426	7.36%	1.000	91471	0.485	258	2937
	8.46%	133071	6.53%	1.000	188055	1.413	479	2508

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
mushroom-best	629.63	31333	579.50	0.920	27393	0.874	0	1970
	94.47%	85861	134.09%	1.000	94624	1.102	0	6006
	133.60%	98305	121.97%	1.000	98893	1.006	0	8499
mzzv11	209.59	594	210.71	1.005	484	0.815	0	116
	283.02	1116	263.08	0.930	987	0.884	0	50
	196.03	616	195.89	0.999	616	1.000	0	89
mzzv42z	176.70	396	175.26	0.992	415	1.048	0	33
	239.57	757	246.00	1.027	712	0.941	0	96
	308.36	770	306.34	0.993	719	0.934	0	52
n2seq36q	1218.36	6925	936.81	0.769	5438	0.785	0	1268
	1127.30	2937	1061.28	0.941	4712	<i>1.604</i>	0	810
	362.20	2014	1170.79	<i>3.232</i>	4632	<i>2.300</i>	0	844
n3div36	2.77%	194933	2.59%	1.000	213866	1.097	0	49323
	2.61%	179060	2.86%	1.000	207136	1.157	0	47721
	2.83%	179013	2.69%	1.000	202891	1.133	0	47069
n5-3	26.33	926	26.40	1.003	926	1.000	0	0
	27.63	971	27.79	1.006	971	1.000	0	0
	27.10	1087	27.09	1.000	1087	1.000	0	0
neos-1122047	10.01	1	9.92	0.991	1	1.000	0	0
	9.92	1	9.76	0.984	1	1.000	0	0
	10.09	1	9.70	0.961	1	1.000	0	0
neos-1171448	57.51	101	58.11	1.010	101	1.000	0	0
	5.17	1	5.16	0.998	1	1.000	0	0
	51.25	86	51.55	1.006	86	1.000	0	0
neos-1171737	1.04%	3926	1.04%	1.000	3912	0.996	0	0
	1.56%	3997	1.56%	1.000	4009	1.003	0	0
	1.30%	11743	1.30%	1.000	11719	0.998	0	0
neos-1354092	∞	613	∞	1.000	613	1.000	0	0
	∞	830	∞	1.000	820	0.988	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	∞	639	∞	1.000	639	1.000	0	0
neos-1445765	43.66	133	43.72	1.001	133	1.000	0	147
	45.21	185	44.19	0.977	141	0.762	0	125
	45.16	125	44.74	0.991	125	1.000	0	146
neos-1456979	6.59%	59322	7.49%	1.000	39961	0.674	0	5198
	6.05%	39099	6.84%	1.000	38750	0.991	0	5469
	5.70%	58112	7.29%	1.000	31540	0.543	0	4153
neos-1582420	21.95	18	21.85	0.995	18	1.000	0	91
	10.94	9	10.92	0.998	9	1.000	0	23
	45.13	1201	55.49	<i>1.230</i>	1381	<i>1.150</i>	0	341
neos-2075418-temuka	7087.30	1	7024.05	0.991	1	1.000	0	0
	4565.54	1	4517.94	0.990	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-2657525-crna	∞	1528526	∞	1.000	3064132	2.005	0	148309
	∞	1961242	∞	1.000	3681104	1.877	0	121366
	∞	2021833	∞	1.000	2122332	1.050	1	105063
neos-2746589-doon	0.60%	41263	0.46%	1.000	55681	1.349	0	18019
	0.73%	19582	0.73%	1.000	30280	1.546	0	12358
	0.11%	149437	0.11%	1.000	182349	1.220	0	23239
neos-2978193-inde	0.50%	551173	0.50%	1.000	549249	0.997	0	0
	0.13%	582870	0.13%	1.000	573707	0.984	0	0
	0.50%	547662	0.50%	1.000	548119	1.001	0	0
neos-2987310-joes	17.53	1	17.49	0.998	1	1.000	0	0
	15.20	1	15.31	1.007	1	1.000	0	0
	13.92	1	13.67	0.982	1	1.000	0	0
neos-3004026-krka	53.34	2711	53.06	0.995	2711	1.000	0	0
	62.15	3485	62.47	1.005	3485	1.000	0	0
	46.66	1764	46.28	0.992	1764	1.000	0	0
neos-3024952-loue	4655.80	383076	4646.86	0.998	383076	1.000	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	0.07%	689174	0.07%	1.000	688312	0.999	0	7592
	0.04%	1114735	0.04%	1.000	1114650	1.000	0	0
neos-3046615-murg	169.81%	6945244	169.81%	1.000	6971706	1.004	0	0
	166.18%	6350455	166.11%	1.000	6364063	1.002	0	0
	163.78%	7585476	163.66%	1.000	7613539	1.004	0	0
neos-3083819-nubu	10.59	750	12.72	<i>1.201</i>	2020	<i>2.693</i>	0	587
	11.06	914	12.37	<i>1.118</i>	1578	<i>1.726</i>	0	929
	17.29	2598	20.79	<i>1.202</i>	3812	<i>1.467</i>	0	1470
neos-3216931-puriri	102.17%	8202	116.41%	1.000	5546	0.676	0	908
	127.35%	9370	5.50%	1.000	9705	1.036	2	1889
	146.80%	4854	147.13%	1.000	4790	0.987	0	515
neos-3381206-awhea	1.18	1	1.18	1.000	1	1.000	0	0
	1.23	1	1.21	0.984	1	1.000	0	0
	1.21	1	1.20	0.992	1	1.000	0	0
neos-3402294-bobin	2927.48	23532	4386.37	<i>1.498</i>	40294	<i>1.712</i>	0	2407
	1177.76	7141	618.95	0.526	3428	0.480	0	215
	2598.45	26596	1620.92	0.624	9242	0.347	0	556
neos-3402454-bohle	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-3555904-turama	18.01%	160	18.01%	1.000	145	0.906	0	22
	∞	18	∞	1.000	18	1.000	0	2
	18.01%	2288	18.01%	1.000	16797	7.341	7	2965
neos-3627168-kasai	0.27%	4524556	0.15%	1.000	4555684	1.007	1176	160196
	0.08%	4096583	0.09%	1.000	4132791	1.009	1704	10707
	0.29%	4799230	0.27%	1.000	5147129	1.072	203	143528
neos-3656078-kumeu	∞	32	∞	1.000	32	1.000	0	0
	∞	82	∞	1.000	82	1.000	0	0
	∞	122	∞	1.000	122	1.000	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
neos-3754480-nidda	∞	19644660	∞	1.000	20000763	1.018	178916	52749
	∞	17700365	∞	1.000	18439214	1.042	111935	108610
	∞	19361020	∞	1.000	19108471	0.987	111385	87787
neos-3988577-wolgan	∞	309	∞	1.000	312	1.010	0	0
	∞	179	∞	1.000	179	1.000	0	0
	∞	439	∞	1.000	439	1.000	0	0
neos-4300652-rahue	482.22%	1381	431.97%	1.000	1365	0.988	0	639
	825.63%	1274	809.48%	1.000	1213	0.952	0	488
	292.94%	2406	316.83%	1.000	2127	0.884	0	723
neos-4338804-snowy	1.66%	4826235	1.66%	1.000	4875741	1.010	0	0
	0.82%	6661157	0.82%	1.000	6738902	1.012	0	0
	1.66%	5118687	1.66%	1.000	5067404	0.990	0	0
neos-4387871-tavua	13.49%	106621	11.39%	1.000	118375	1.110	0	7096
	10.75%	124065	14.13%	1.000	116171	0.936	0	8132
	13.96%	113215	18.66%	1.000	96695	0.854	0	7109
neos-4413714-turia	297.41	2	299.23	1.006	2	1.000	0	1
	403.92	2	404.80	1.002	2	1.000	0	1
	272.63	3	277.10	1.016	2	0.667	0	1
neos-4532248-waihi	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-4647030-tutaki	0.01%	24433	0.01%	1.000	24413	0.999	0	0
	0.01%	22711	0.01%	1.000	22893	1.008	0	0
	0.01%	26981	0.01%	1.000	27292	1.012	0	0
neos-4722843-widden	2662.61	11357	2651.33	0.996	11357	1.000	0	0
	1031.93	3416	1033.65	1.002	3376	0.988	16	0
	1707.07	7919	1714.52	1.004	7919	1.000	0	0
neos-4738912-atrato	1811.58	189048	813.40	0.449	61981	0.328	0	23163
	3350.87	293417	3808.90	<i>1.137</i>	324992	<i>1.108</i>	0	57398

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	744.51	98248	914.39	<i>1.228</i>	95736	0.974	0	17171
neos-4763324-toguru	19.99%	8572	46.04%	1.000	8436	0.984	0	3555
	7.38%	14545	45.08%	1.000	14962	1.029	0	4939
	16.27%	15033	48.94%	1.000	7145	0.475	0	2598
neos-4954672-berkel	8.57%	952460	8.48%	1.000	1019990	1.071	2075	113794
	8.42%	897757	8.71%	1.000	819107	0.912	2681	80306
	7.87%	845279	8.00%	1.000	891993	1.055	2516	64177
neos-5049753-cuanza	∞	52	∞	1.000	52	1.000	0	0
	15.39%	14	15.39%	1.000	14	1.000	0	0
	15.20%	12	15.20%	1.000	12	1.000	0	0
neos-5052403-cygnet	1.60%	113	1.60%	1.000	113	1.000	0	6
	1.38%	1	1.38%	1.000	1	1.000	0	0
	1.19%	63	1.19%	1.000	63	1.000	0	9
neos-5093327-huahum	10.70%	50333	10.32%	1.000	49854	0.990	1300	0
	11.49%	50392	10.43%	1.000	52521	1.042	1173	0
	8.45%	56530	12.17%	1.000	48532	0.859	1077	0
neos-5104907-jarama	∞	8	∞	1.000	8	1.000	0	0
	∞	9	∞	1.000	9	1.000	0	0
	∞	4	∞	1.000	4	1.000	0	0
neos-5107597-kakapo	2135.00	560533	2144.47	1.004	560533	1.000	10	0
	1717.55	472676	1725.41	1.005	472393	0.999	31	0
	3237.82	1073257	5927.88	<i>1.831</i>	1725439	<i>1.608</i>	108	0
neos-5114902-kasavu	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
neos-5188808-nattai	1249.67	12145	1251.29	1.001	12145	1.000	0	0
	1288.24	13554	1292.07	1.003	13554	1.000	0	0
	1377.84	12548	1380.62	1.002	12548	1.000	0	0
neos-5195221-niemur	2728.17	53512	2813.87	1.031	47466	0.887	67	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	2892.34	24415	2911.85	1.007	25010	1.024	36	0
	2857.51	31131	2890.78	1.012	33779	<i>1.085</i>	30	0
neos-631710	14.21%	2	14.21%	1.000	2	1.000	0	0
	8.90%	4	8.90%	1.000	4	1.000	0	0
	14.21%	3	14.21%	1.000	3	1.000	0	0
neos-662469	0.01%	58801	0.01%	1.000	59651	1.014	0	14409
	0.05%	63742	0.00%	1.000	50627	0.794	0	10313
	0.06%	61333	0.01%	1.000	56995	0.929	0	13271
neos-787933	1.39	1	1.37	0.986	1	1.000	0	0
	1.37	1	1.39	1.015	1	1.000	0	0
	1.35	1	1.41	1.044	1	1.000	0	0
neos-827175	6.14	1	6.10	0.993	1	1.000	0	0
	8.19	1	8.21	1.002	1	1.000	0	0
	10.24	1	10.23	0.999	1	1.000	0	0
neos-848589	32.15%	256	32.15%	1.000	256	1.000	2	0
	42.57%	153	42.95%	1.000	148	0.967	1	0
	46.27%	106	46.27%	1.000	106	1.000	0	0
neos-860300	17.23	2	17.27	1.002	2	1.000	0	0
	13.32	2	13.35	1.002	2	1.000	0	0
	23.14	3	23.18	1.002	3	1.000	0	0
neos-873061	9.28%	157	9.28%	1.000	155	0.987	0	17
	15.19%	141	7.72%	1.000	148	1.050	0	5
	8.12%	168	8.12%	1.000	168	1.000	0	6
neos-911970	0.76%	1608307	1.05%	1.000	1400854	0.871	0	62647
	2.98%	709744	2.49%	1.000	1814127	2.556	0	127461
	0.06%	8197877	0.06%	1.000	11460910	1.398	0	204690
neos-933966	3653.20	466	1374.28	0.376	138	0.296	0	12
	0.31%	2765	848.27	0.118	38	0.014	0	12
	2099.25	215	2180.73	1.039	283	<i>1.316</i>	0	26

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
neos-950242	100.00%	9329	100.00%	1.000	9288	0.996	0	0
	100.00%	8438	100.00%	1.000	8446	1.001	0	0
	100.00%	15646	100.00%	1.000	15629	0.999	0	0
neos-957323	81.84	7	86.06	<i>1.052</i>	2	0.286	0	4
	130.66	12	110.59	0.846	5	0.417	0	32
	91.28	1	80.10	0.878	2	<i>2.000</i>	0	5
neos-960392	879.61	15	881.09	1.002	15	1.000	0	0
	1447.01	102	1439.63	0.995	102	1.000	0	0
	1366.35	403	1363.87	0.998	403	1.000	0	1
neos17	16.19	12038	25.95	<i>1.603</i>	22460	<i>1.866</i>	0	2737
	9.91	6153	9.39	0.948	5644	0.917	0	350
	10.19	6745	9.84	0.966	6376	0.945	0	616
neos5	1008.28	3292114	1007.54	0.999	3292114	1.000	0	0
	1234.92	4202380	1234.24	0.999	4202380	1.000	0	0
	1187.61	4100005	1183.51	0.997	4100005	1.000	0	0
neos859080	0.53	792	0.50	0.943	792	1.000	0	0
	0.57	655	0.54	0.947	655	1.000	0	25
	0.54	565	0.55	1.019	565	1.000	0	0
neos8	1.94	1	1.95	1.005	1	1.000	0	0
	1.81	1	1.89	1.044	1	1.000	0	0
	1.84	1	1.83	0.995	1	1.000	0	0
net12	1841.31	1211	1842.42	1.001	1211	1.000	0	0
	1625.53	1816	1631.28	1.004	1816	1.000	0	0
	1563.27	1695	1561.43	0.999	1695	1.000	0	0
netdiversion	843.61	43	848.00	1.005	43	1.000	0	0
	2360.01	88	2364.82	1.002	88	1.000	0	0
	1086.34	27	1087.12	1.001	27	1.000	0	0
nexp-150-20-8-5	5607.49	7209	3539.59	0.631	5786	0.803	0	14901
	3991.89	9681	3635.13	0.911	7166	0.740	0	7301

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	2066.62	3123	0.83%	3.484	13054	4.180	0	5623
ns1116954	∞	30	∞	1.000	32	1.067	0	0
	∞	57	∞	1.000	57	1.000	0	0
	∞	76	∞	1.000	75	0.987	0	0
ns1208400	300.18	1187	419.49	<i>1.397</i>	2004	<i>1.688</i>	0	204
	684.48	2737	683.06	0.998	2339	0.855	0	10
	1079.72	2315	1074.09	0.995	2315	1.000	0	25
ns1644855	7.37%	36	7.37%	1.000	36	1.000	0	0
	7.37%	79	7.37%	1.000	79	1.000	0	0
	974.40	1	974.47	1.000	1	1.000	0	0
ns1760995	58.41%	1	58.41%	1.000	1	1.000	0	0
	71.46%	1	71.46%	1.000	1	1.000	0	0
	48.93%	1	48.93%	1.000	1	1.000	0	0
ns1830653	237.00	14947	287.45	<i>1.213</i>	14558	0.974	0	1345
	151.53	7206	134.33	0.886	7527	1.045	0	955
	158.50	8634	148.24	0.935	7267	0.842	0	1000
ns1952667	∞	52490	∞	1.000	52208	0.995	0	0
	1410.99	9508	1392.38	0.987	9508	1.000	0	3988
	966.39	4900	968.90	1.003	4900	1.000	0	0
nu25-pr12	5.40	53	5.36	0.993	53	1.000	0	78
	6.08	66	6.11	1.005	66	1.000	0	67
	6.05	16	6.05	1.000	16	1.000	0	39
nursesched-medium-hint03	1979.33%	1208	1657.78%	1.000	1100	0.911	0	37
	1056.82%	1254	3021.25%	1.000	2050	1.635	0	4
	666.65%	1304	1077.84%	1.000	1121	0.860	0	19
nursesched-sprint02	143.09	377	142.08	0.993	370	0.981	0	73
	85.66	409	85.18	0.994	409	1.000	0	22
	68.77	222	67.71	0.985	222	1.000	0	40
nw04	37.96	6	37.93	0.999	6	1.000	0	5

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	31.58	5	31.39	0.994	5	1.000	0	4
	35.83	6	35.16	0.981	6	1.000	0	10
opm2-z10-s4	30.57%	781	24.70%	1.000	1000	1.280	0	15
	24.92%	791	27.76%	1.000	586	0.741	0	28
	26.91%	751	26.96%	1.000	1015	1.352	0	127
p200x1188c	3.55	2	3.53	0.994	2	1.000	0	0
	4.50	3	3.96	0.880	3	1.000	0	3
	3.59	2	3.62	1.008	2	1.000	0	0
peg-solitaire-a3	∞	3657	∞	1.000	5752	1.573	0	1618
	∞	3703	∞	1.000	3557	0.961	0	993
	∞	4176	∞	1.000	3969	0.950	0	1037
pg5_34	1174.65	148717	1173.22	0.999	148717	1.000	0	0
	1139.04	144543	1134.07	0.996	144543	1.000	0	0
	1087.84	121673	1085.15	0.998	121673	1.000	0	0
pg	101.75	2687	101.85	1.001	2687	1.000	0	0
	86.34	1372	86.23	0.999	1372	1.000	0	0
	108.14	2311	107.44	0.994	2311	1.000	0	0
physiciansched3-3	∞	415	∞	1.000	415	1.000	0	0
	∞	313	∞	1.000	313	1.000	0	0
	∞	361	∞	1.000	361	1.000	0	2
physiciansched6-2	124.94	377	124.81	0.999	377	1.000	0	3
	464.85	2804	462.02	0.994	2804	1.000	0	0
	44.74	1	44.74	1.000	1	1.000	0	0
piperout-08	805.46	130	797.03	0.990	130	1.000	0	0
	610.42	552	606.54	0.994	552	1.000	0	0
	919.29	596	923.85	1.005	596	1.000	0	0
piperout-27	140.91	2	140.11	0.994	2	1.000	0	0
	276.16	566	275.91	0.999	566	1.000	0	0
	331.58	72	332.32	1.002	72	1.000	0	0

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
pk1	107.22	301100	107.55	1.003	301100	1.000	0	0
	109.73	317026	109.16	0.995	317026	1.000	0	0
	111.84	328715	112.34	1.004	328715	1.000	0	0
proteindesign121hz512p9	9.60%	579	9.60%	1.000	591	1.021	0	10
	15.68%	459	7.94%	1.000	440	0.959	0	104
	26.02%	593	26.02%	1.000	593	1.000	2	1
proteindesign122trx11p8	1.95%	3	1.95%	1.000	3	1.000	1	38
	1.92%	2	1.91%	1.000	8	4.000	2	213
	1.93%	17	1.93%	1.000	17	1.000	0	128
qap10	92.05	3	87.99	0.956	3	1.000	0	8
	95.66	3	111.82	<i>1.169</i>	5	<i>1.667</i>	0	3
	172.24	14	197.87	<i>1.149</i>	15	<i>1.071</i>	0	3
radiationm18-12-05	12.99%	480152	12.99%	1.000	479812	0.999	1	0
	0.05%	749612	0.05%	1.000	750150	1.001	3	0
	1.89%	550712	1.89%	1.000	551080	1.001	4	0
radiationm40-10-02	67.02%	53842	67.02%	1.000	53316	0.990	0	0
	57.74%	26955	57.74%	1.000	27109	1.006	0	0
	22.69%	97004	22.69%	1.000	99008	1.021	0	0
rail01	2.40%	187	2.74%	1.000	200	1.070	0	24
	25.38%	210	25.21%	1.000	182	0.867	0	17
	7.37%	104	7.32%	1.000	183	1.760	0	28
rail02	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
rail507	157.23	623	156.67	0.996	623	1.000	0	91
	179.18	783	180.04	1.005	783	1.000	0	105
	195.62	769	193.43	0.989	771	1.003	0	175
ran14x18-disj-8	2223.47	684795	2109.62	0.949	656920	0.959	0	41179
	1761.00	648842	1785.31	1.014	564900	0.871	0	41046

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	1620.85	536125	1694.59	1.045	593570	<i>1.107</i>	0	39520
rd-rplusc-21	≥ 10000%	519165	≥ 10000%	1.000	484631	0.933	4	492
	≥ 10000%	676605	≥ 10000%	1.000	737139	1.089	4	25
	≥ 10000%	570746	≥ 10000%	1.000	763715	1.338	9	176
reblock115	0.15%	1086376	4390.48	0.610	704168	0.648	0	40664
	0.16%	1076715	6605.46	0.917	882785	0.820	0	53241
	0.06%	823999	5894.68	0.819	832788	1.011	0	52934
rmatr100-p10	166.19	809	166.48	1.002	809	1.000	0	0
	162.12	822	162.84	1.004	822	1.000	0	0
	160.95	827	160.62	0.998	827	1.000	0	0
rmatr200-p5	22.40%	423	22.40%	1.000	421	0.995	0	0
	19.56%	422	19.56%	1.000	423	1.002	0	0
	21.08%	402	21.08%	1.000	403	1.002	0	0
rocI-4-11	638.68	12970	638.21	0.999	12970	1.000	0	0
	1001.90	17602	1001.80	1.000	17602	1.000	0	0
	498.05	9550	498.07	1.000	9550	1.000	0	0
rocII-5-11	109.27%	3334	108.52%	1.000	3399	1.019	0	126
	108.98%	2853	109.87%	1.000	2764	0.969	0	118
	109.29%	2598	109.11%	1.000	2522	0.971	0	94
rococoB10-011000	13.92%	144924	13.71%	1.000	151103	1.043	0	5331
	15.37%	143892	15.09%	1.000	143253	0.996	0	7762
	13.34%	137107	12.80%	1.000	153839	1.122	0	6808
rococoC10-001000	1600.78	148511	765.76	0.478	53303	0.359	0	10771
	764.66	44285	851.99	<i>1.114</i>	63090	<i>1.425</i>	0	15639
	940.72	59267	1626.91	<i>1.729</i>	162527	<i>2.742</i>	0	36515
roi2alpha3n4	1763.64	15468	1424.80	0.808	12529	0.810	0	6122
	1888.36	15975	1940.46	1.028	17446	<i>1.092</i>	0	8516
	1456.75	13317	1486.54	1.020	13303	0.999	0	6848
roi5alpha10n8	35.44%	5821	35.37%	1.000	5989	1.029	0	4924

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
roll3000	32.93%	6871	40.36%	1.000	6346	0.924	0	4299
	32.14%	6691	32.14%	1.000	6789	1.015	0	5671
	36.10	2315	36.86	1.021	1986	0.858	0	714
s100	43.24	2623	38.91	0.900	2149	0.819	0	429
	35.13	1254	60.26	<i>1.715</i>	3736	<i>2.979</i>	0	1178
	5.53%	20	5.53%	1.000	20	1.000	0	0
s250r10	29.84%	17	29.84%	1.000	17	1.000	0	0
	1.06%	22	1.06%	1.000	22	1.000	0	127
	0.25%	23159	0.28%	1.000	22897	0.989	0	4109
satellites2-40	0.16%	53768	6366.45	0.884	45426	0.845	0	22032
	0.19%	34836	0.23%	1.000	31811	0.913	0	12717
	∞	19	∞	1.000	19	1.000	0	0
satellites2-60-fs	∞	6	∞	1.000	4	0.667	0	0
	70.59%	33	70.59%	1.000	33	1.000	0	0
	∞	33	∞	1.000	33	1.000	0	0
savsched1	∞	122	∞	1.000	137	1.123	0	10
	∞	28	∞	1.000	28	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	1
sct2	∞	1	∞	1.000	1	1.000	0	1
	0.03%	848166	0.03%	1.000	600226	0.708	0	26147
	0.06%	693585	0.05%	1.000	659682	0.951	0	20668
seymour1	0.03%	1040105	0.03%	1.000	994927	0.957	0	20050
	90.36	1627	90.45	1.001	1627	1.000	0	0
	67.69	1466	67.90	1.003	1466	1.000	0	0
seymour	71.78	1822	72.05	1.004	1822	1.000	0	0
	0.73%	235347	0.66%	1.000	242500	1.030	0	5789
	0.63%	213496	0.68%	1.000	222209	1.041	0	6059
	0.68%	240665	0.74%	1.000	225373	0.936	0	6259

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
sing326	0.17%	6850	0.15%	1.000	11755	1.716	0	523
	0.15%	7092	0.17%	1.000	8196	1.156	0	432
	0.12%	13196	0.32%	1.000	7997	0.606	0	853
sing44	0.41%	5591	0.45%	1.000	5531	0.989	0	249
	0.23%	7062	0.19%	1.000	7349	1.041	0	345
	0.17%	3892	0.27%	1.000	2267	0.582	0	292
snp-02-004-104	0.00%	14573	0.00%	1.000	14561	0.999	0	0
	0.00%	18040	0.00%	1.000	18040	1.000	2	0
	0.00%	19695	0.00%	1.000	19680	0.999	8	0
sorrell3	35.13%	41274	43.81%	1.000	41208	0.998	0	3480
	45.00%	39264	35.59%	1.000	39514	1.006	0	2619
	18.16%	14782	19.11%	1.000	8801	0.595	0	4288
sp150x300d	4.05	3472	3.96	0.978	3472	1.000	0	478
	3.18	2569	3.12	0.981	2569	1.000	0	374
	1.30	848	1.29	0.992	848	1.000	0	148
sp97ar	1.25%	24002	0.98%	1.000	15747	0.656	0	1436
	1.04%	25138	1.02%	1.000	22961	0.913	0	1912
	1.37%	22524	1.53%	1.000	24828	1.102	0	3564
sp98ar	0.70%	48051	1.43%	1.000	71746	1.493	0	4469
	0.50%	55454	0.48%	1.000	67060	1.209	0	5933
	0.73%	48778	0.98%	1.000	71271	1.461	0	14342
splice1k1	309.21%	411	309.20%	1.000	513	1.248	0	130
	376.20%	503	376.10%	1.000	594	1.181	0	181
	358.74%	1033	358.74%	1.000	834	0.807	0	73
square41	109.98%	30	109.98%	1.000	30	1.000	0	10
	92.32%	5	89.32%	1.000	37	7.400	0	4
	79.78%	11	92.32%	1.000	28	2.545	0	1
square47	231.21%	4	231.21%	1.000	4	1.000	0	0
	117.00%	13	117.00%	1.000	13	1.000	0	1

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
	231.21%	3	231.21%	1.000	1	0.333	0	1
supportcase10	803.51%	1	803.51%	1.000	1	1.000	0	0
	989.07%	1	989.07%	1.000	1	1.000	0	0
	1054.36%	1	1054.36%	1.000	1	1.000	0	0
supportcase12	1.31%	1454	1.31%	1.000	1463	1.006	0	0
	1.35%	2280	1.35%	1.000	2297	1.007	0	0
	1.30%	1522	1.30%	1.000	1505	0.989	0	0
supportcase18	3.84%	394624	3.84%	1.000	419350	1.063	0	12210
	5.96%	226660	5.96%	1.000	237591	1.048	0	11386
	3.84%	245639	3.84%	1.000	198815	0.809	0	18486
supportcase19	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
	∞	1	∞	1.000	1	1.000	0	0
supportcase22	∞	51	∞	1.000	51	1.000	0	1
	∞	18	∞	1.000	18	1.000	0	0
	∞	66	∞	1.000	66	1.000	0	0
supportcase26	8.94%	8140773	8.94%	1.000	8135621	0.999	4	0
	5261.03	6761735	5238.22	0.996	6761735	1.000	0	0
	4507.34	5497025	4487.28	0.996	5497025	1.000	0	0
supportcase33	1488.12	10781	1598.38	<i>1.074</i>	12756	<i>1.183</i>	0	5003
	3927.65	20793	1600.98	0.408	7176	0.345	0	4139
	2636.30	22200	682.16	0.259	3786	0.171	0	2673
supportcase40	787.96	6335	786.50	0.998	6335	1.000	0	0
	950.06	7991	946.94	0.997	7991	1.000	0	0
	803.31	6970	797.74	0.993	6970	1.000	0	0
supportcase42	0.36%	389477	0.38%	1.000	305571	0.785	16	0
	0.12%	487868	0.10%	1.000	380155	0.779	15	0
	0.35%	466458	0.35%	1.000	467610	1.002	4	0
supportcase6	10.15%	14606	9.13%	1.000	18980	1.299	0	5977

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
supportcase7	10.04%	16253	8.41%	1.000	17726	1.091	0	5426
	9.14%	18145	9.72%	1.000	17709	0.976	0	3696
	182.77	59	179.98	0.985	59	1.000	0	0
swath1	195.10	45	193.62	0.992	45	1.000	0	0
	211.44	32	210.25	0.994	32	1.000	0	0
	18.88	225	21.09	<i>1.117</i>	281	<i>1.249</i>	0	458
swath3	15.98	175	17.34	<i>1.085</i>	245	<i>1.400</i>	0	384
	16.12	190	19.82	<i>1.230</i>	292	<i>1.537</i>	0	375
	285.63	40400	226.20	0.792	28316	0.701	0	2847
tbfp-network	215.30	23312	182.91	0.850	21837	0.937	0	2411
	335.65	53934	427.45	<i>1.273</i>	74192	<i>1.376</i>	0	5631
	2493.68	323	2356.81	0.945	574	<i>1.777</i>	0	235
thor50dday	1687.55	71	1683.80	0.998	71	1.000	0	18
	1092.72	99	1088.57	0.996	99	1.000	0	42
	23.30%	95	23.30%	1.000	95	1.000	0	7
timtab1	21.49%	13	21.49%	1.000	12	0.923	0	1
	14.80%	36	14.80%	1.000	34	0.944	0	0
	69.88	56513	73.73	<i>1.055</i>	64175	<i>1.136</i>	0	3137
tr12-30	70.24	54392	67.90	0.967	51540	0.948	0	2251
	81.32	64759	70.92	0.872	55054	0.850	0	3270
	608.69	423661	606.97	0.997	423661	1.000	0	0
traininstance2	647.41	475420	650.32	1.004	475420	1.000	0	0
	399.86	211580	397.52	0.994	213946	1.011	3	29
	$\geq 10000\%$	57909	∞	1.000	67099	1.159	0	2934
traininstance6	∞	57559	∞	1.000	52063	0.905	0	4459
	∞	56089	6286.13%	1.000	73138	1.304	1	2682
	656.91%	429240	634.16%	1.000	456248	1.063	0	41885
	596.81%	466043	626.92%	1.000	347529	0.746	0	24445
	685.56%	369433	520.12%	1.000	454368	1.230	0	39689

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Table 6: Detailed computational results on MIPLIB 2017 benchmark with and without filtering dual proofs. Relative changes by at least 5% are highlighted in bold and blue (**improvement**) or italic and red (*deterioration*).

Instance	filtering disabled		combined					
	time	nodes	time	time _Q	nodes	nodes _Q	filter-num	filter-len
trento1	0.08%	51522	0.07%	1.000	57766	1.121	0	17518
	0.07%	67101	0.10%	1.000	51033	0.761	0	14570
	2.86%	33340	1.67%	1.000	35013	1.050	0	4333
triptim1	1112.15	8	1099.43	0.989	8	1.000	0	0
	749.66	7	747.73	0.997	7	1.000	0	0
	1059.75	8	1065.09	1.005	8	1.000	0	0
uccase12	0.00%	77081	0.00%	1.000	77800	1.009	0	0
	0.00%	91920	0.00%	1.000	91468	0.995	0	0
	0.00%	97971	0.00%	1.000	98605	1.006	0	0
uccase9	1.98%	608	1.98%	1.000	498	0.819	0	52
	1.16%	883	1.48%	1.000	1166	1.320	0	35
	2.84%	512	2.82%	1.000	550	1.074	0	66
uct-subprob	1107.60	39010	1102.62	0.996	44339	<i>1.137</i>	0	3576
	2167.46	85998	1631.60	0.753	59559	0.693	0	5112
	2386.63	83769	2506.36	<i>1.050</i>	95674	<i>1.142</i>	0	6420
unitcal_7	272.88	89	272.59	0.999	89	1.000	5	0
	297.97	180	298.12	1.001	180	1.000	0	0
	384.79	436	387.18	1.006	436	1.000	1	0
var-smallemercy-m6j6	0.89%	629156	0.93%	1.000	568323	0.903	0	38516
	0.90%	648593	0.87%	1.000	656232	1.012	0	55395
	6320.27	700461	6729.45	<i>1.065</i>	683202	0.975	0	39067
wachplan	2476.62	219408	2340.84	0.945	219938	1.002	0	32589
	3179.70	286834	3419.67	<i>1.075</i>	302179	<i>1.053</i>	0	54422
	2439.36	191025	2343.95	0.961	198054	1.037	0	31992