

Benchmark for Non Commercial Min Cost Flow Solvers

These pages contain some benchmark results for Min Cost Network Flow (MCNF) Solvers on several problem structures generated with three different problem generators:

- A) GRIDGEN
- B) NETGEN
- C) GOTO

These generators were chosen mainly because they are used in many other benchmark reports, but other generators could also be included which might give a different picture. See appendix for input parameters used in the listed problems.

The test includes four simplex based solvers and two cost scaling codes.

- 1) *Net simplex* a primal network simplex code by Jensen & Berthelsen
- 2) *MCF-1.2* a primal network simplex code by Andreas Löbel
- 3) *Simp4.4* a primal network simplex code by Florian & Lebeuf
- 4) *NETFLO* a primal network simplex code by Kennington & Helgason
- 5) *RELAX-IV* a relax code by Bertsekas & Tseng
- 6) *CS2-3.9* a cost scaling code by Cherkassky & Goldberg

The benchmark was run on a windows based AMD Athlon 1700+. All results are CPU seconds. All codes use default settings, except RELAX =>AUCTION initialization.

Results for the Gridgen generator (GRID WIDE, GRID LONG & GRID SQUARE):

Problem:	Nodes:	Arcs:	Net_simplex:	MCF 1.2	Simp4.4:	Netflo:	Relax:	CS2-3.9:
Wide11:	2049	47127	0,23	0,83	0,30	0,66	1,70	0,79
Wide11_5:	2897	66631	0,50	0,94	0,47	1,62	2,85	1,12
Wide12:	4097	94231	0,60	1,48	0,74	3,17	3,02	1,56
Wide12_5:	5793	133239	0,95	2,47	1,47	7,15	4,73	2,46
Wide13:	8193	188439	1,77	6,21	4,22	16,36	8,73	4,03
Wide13_5:	11585	266455	3,48	14,44	10,81	44,74	10,20	6,89
Wide14:	16385	376855	11,05	41,14	45,47	126,20	17,09	10,59
Wide14_5:	23169	532887	18,11	102,93	154,54	459,87	26,25	17,47
Wide15:	32769	753687	40,79	177,90	500,47	1550,62	62,34	28,82
Sum:			77,48	348,34	718,47	2210,39	136,91	73,73

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
Long11:	2049	47127	0,28	0,77	0,30	0,81	1,67	0,48
Long11_5:	2897	66631	0,39	0,99	0,47	1,59	2,88	0,92
Long12:	4097	94231	0,63	1,43	0,83	3,14	2,99	1,54
Long12_5:	5793	133239	0,85	2,47	1,46	1,21	4,71	2,44
Long13:	8193	188439	1,80	6,04	4,32	16,26	8,03	4,15
Long13_5:	11585	266455	3,61	14,28	10,68	43,68	10,25	6,87
Long14:	16385	376855	10,23	40,42	47,34	134,57	17,08	10,59
Long14_5:	23169	532887	21,29	102,38	152,75	467,23	26,28	17,52
Long15:	32769	753687	40,41	178,56	514,20	1701,40	62,63	28,72
Sum:			79,47	347,34	732,32	2369,88	136,51	73,22

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
Square11:	2071	47633	0,27	0,77	0,20	0,72	2,12	0,69
Square11_5:	2917	67091	0,40	0,94	0,41	1,63	2,37	0,88
Square12:	4097	94231	0,57	1,53	0,77	3,11	3,62	1,65
Square12_5:	5777	132871	0,90	2,37	1,31	6,63	5,31	2,44
Square13:	8191	188393	1,73	5,49	4,44	16,05	7,72	4,14
Square13_5:	11585	266455	3,23	15,87	10,60	42,37	9,38	6,57
Square14:	16385	376855	7,19	38,51	45,69	120,53	17,04	11,21
Square14_5:	23105	531415	18,49	79,15	146,08	420,36	46,60	DNR
Square15:	32762	753526	43,41	193,17	521,42	1452,10	71,91	11,91
Sum:			76,18	337,80	730,89	2063,50	166,08	DNR

DNR=Bug in CS2

Results for the NETGEN generator (HI & LO):

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
HI1:	2048	17933	0,16	0,72	0,17	0,65	0,36	0,19
HI2:	2896	25355	0,23	0,76	0,26	0,91	0,56	0,59
HI3:	4096	32877	0,43	1,05	0,60	2,29	1,20	0,95
HI4:	5793	50760	0,92	2,20	1,09	4,83	1,83	1,26
HI5:	8192	65750	1,50	6,58	2,64	11,36	2,36	1,83
HI6:	11585	93033	2,35	18,95	5,85	30,16	4,63	2,98
HI7:	16384	131431	5,58	17,30	25,44	91,97	5,65	5,19
HI8:	23170	202986	12,07	46,08	86,77	317,26	9,35	7,73
HI9:	32768	262921	32,74	101,51	376,56	1211,12	14,70	12,70
HI10:	46341	406225	69,79	282,26	1027,92	?	26,06	21,30
Sum:			125,76	477,41	1527,28	?	66,71	54,72

? = Long time

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
LO1:	2048	17933	0,36	0,76	0,28	0,81	0,65	0,55
LO2:	2896	25355	0,65	1,15	0,64	2,08	1,53	1,02
LO3:	4096	32877	1,17	1,49	1,18	3,54	2,70	1,47
LO4:	5793	50760	1,78	3,40	1,80	8,52	3,36	2,30
LO5:	8192	65750	2,58	9,50	3,35	17,64	8,44	3,39
LO6:	11585	93033	6,16	25,16	7,51	38,52	11,38	5,86
LO7:	16384	131431	11,80	31,14	23,67	100,29	26,76	9,74
LO8:	23170	202986	22,21	50,64	67,47	331,12	75,46	16,94
LO9:	32768	262921	59,58	127,86	225,00	1064,21	95,81	27,09
LO10:	46341	406225	132,92	262,30	583,19	?	182,40	50,30
Sum:			239,21	513,40	914,08	?	408,49	118,67

? = Long time

Results for the GOTO generator (GOTO 8, GOTO 16 & GOTO I):

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
8_n9:	512	4096	0,18	0,60	0,27	0,40	0,34	0,11
8_n95:	724	5792	0,41	0,77	0,39	0,60	0,66	0,17
8_n10:	1024	8192	0,82	1,05	0,97	1,09	1,12	0,33
8_n105:	1448	11584	1,29	1,32	1,14	1,71	1,81	0,58
8_n11:	2048	16384	2,35	2,64	2,08	3,12	3,87	0,99
8_n115:	2896	23168	5,00	6,04	3,90	6,24	7,83	1,47
8_n12:	4096	32768	9,70	12,30	9,47	16,84	17,65	2,61
8_n125:	5793	46344	20,31	41,08	15,46	26,20	35,04	3,43
8_n13:	8192	65536	65,64	132,86	71,45	58,84	71,69	5,56
8_n135:	11585	92680	136,11	361,63	133,52	143,33	142,56	9,45
8_n14:	16834	131072	295,38	851,40	351,22	339,37	336,37	15,48
Sum:			537,17	1411,69	589,86	597,75	618,94	40,17

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
16_n9:	512	8192	0,44	0,66	0,72	0,74	0,86	0,22
16_n95:	724	11584	0,60	0,88	0,89	1,18	1,53	0,46
16_n10:	1024	16384	1,42	1,81	1,80	2,18	2,64	0,81
16_n105:	1448	23168	2,22	4,66	2,55	3,94	6,34	1,22
16_n11:	2048	32768	3,67	3,85	4,64	7,12	14,63	1,90
16_n115:	2896	46336	6,97	9,39	8,26	14,14	31,88	2,83
16_n12:	4096	65536	15,13	20,65	21,04	28,90	68,35	4,49
16_n125:	5793	92688	36,09	88,43	36,44	62,83	130,43	7,03
16_n13:	8192	131072	99,76	215,47	147,05	137,97	236,91	11,31
16_n135:	11585	185360	193,14	432,92	252,88	305,80	496,54	17,36
16_n14:	16384	262144	557,48	1354,85	926,98	758,14	995,18	28,21
Sum:			916,91	2133,57	1403,25	1322,93	1985,27	75,81

Problem:	Nodes:	Arcs:	Net_simplex:	MCF-1.2:	Simp4.4:	Netflo:	Relax:	CS2-3.9:
I_n9:	512	11585	0,56	0,82	0,82	1,22	1,219	0,33
I_n95:	724	19481	1,10	1,04	1,29	1,75	3,66	0,72
I_n10:	1024	32768	3,22	2,04	3,71	6,38	3,68	1,35
I_n105:	1448	55100	4,09	4,61	6,59	16,14	24,74	2,06
I_n11:	2048	92682	10,43	10,00	17,32	42,66	84,87	4,15
I_n115:	2896	155847	30,47	26,45	48,43	114,47	243,97	8,32
I_n12:	4096	262144	84,91	102,49	183,76	375,19	600,6408	15,21
I_n125:	5793	440915	218,37	261,44	302,08	923,54	2337,13	33,88
I_n13:	8192	741455	679,12	881,21	1555,36	?	3818,92	62,43
Sum:			1032,25	1290,10	2119,35	?	7118,83	128,44

For comments or question related to the benchmark, please contact:

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This email can also be used if you are interested in obtaining the free GUI and exe for *Net_simplex*.

