

1. Detailed Results of Standard-Weight Instances

The detailed results of EC and ECS on the 14 most challenging standard-weight instances in S_A have been reported in Table 1 of the file "Analysis on standard instances".

Table 1 Detailed Results of ECS-NTP, ECS-NSL, and ECS-NRS on the 14 Most Challenging Standard-Weight Instances in S_A

Instances in S_A											
ECS-NTP											
ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
120-30-1	13038	0.00	133.86	120-30-1	12967	0.00	68.28	120-30-1	12955	0.00	40.15
120-30-2	11922	0.00	334.31	120-30-2	11896	0.00	10.42	120-30-2	11886	0.00	694.49
120-30-3	11191	0.00	57.77	120-30-3	11156	0.00	51.10	120-30-3	11152	0.00	5.61
120-30-4	11440	0.00	475.59	120-30-4	11382	0.00	52.43	120-30-4	11366	0.00	286.93
120-30-5	–	–	–	120-30-5	13314	0.00	33.14	120-30-5	13285	0.00	37.02
ECS-NSL											
ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
120-30-1	13038	0.00	101.27	120-30-1	12967	0.00	88.34	120-30-1	12955	0.00	71.22
120-30-2	11922	0.00	332.13	120-30-2	11896	0.00	38.51	120-30-2	11886	0.00	473.24
120-30-3	11191	0.00	44.98	120-30-3	11156	0.00	49.93	120-30-3	11152	0.00	3.29
120-30-4	11440	0.00	466.38	120-30-4	11382	0.00	78.83	120-30-4	11366	0.00	284.21
120-30-5	–	–	–	120-30-5	13314	0.00	31.32	120-30-5	13285	0.00	50.88
ECS-NRS											
ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
120-30-1	13038	0.00	159.42	120-30-1	12967	0.00	101.84	120-30-1	12955	0.00	85.64
120-30-2	11922	0.00	558.20	120-30-2	11896	0.00	98.40	120-30-2	11886	0.00	847.53
120-30-3	11191	0.00	114.75	120-30-3	11156	0.00	115.07	120-30-3	11152	0.00	3.42
120-30-4	11440	0.00	616.30	120-30-4	11382	0.00	147.95	120-30-4	11366	0.00	319.65
120-30-5	–	–	–	120-30-5	13314	0.00	61.45	120-30-5	13285	0.00	61.20

Table 2 Detailed Results of ECS on Standard-Weight Instances in S_A

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap%	CPU
60-10-1	1872	0.00	0.21	60-10-1	1866	0.00	0.11	60-10-1	1862	0.00	0.07
60-10-2	2018	0.00	0.10	60-10-2	2003	0.00	0.15	60-10-2	1999	0.00	0.10
60-10-3	2271	0.00	0.13	60-10-3	2265	0.00	0.13	60-10-3	2261	0.00	0.10
60-10-4	2025	0.00	0.03	60-10-4	2011	0.00	0.04	60-10-4	2009	0.00	0.07
60-10-5	1910	0.00	0.10	60-10-5	1906	0.00	0.07	60-10-5	1903	0.00	0.05
60-20-1	3753	0.00	0.12	60-20-1	3745	0.00	0.08	60-20-1	3740	0.00	0.08
60-20-2	3932	0.00	0.12	60-20-2	3922	0.00	0.49	60-20-2	3916	0.00	0.17
60-20-3	3202	0.00	0.28	60-20-3	3189	0.00	0.20	60-20-3	3178	0.00	0.12
60-20-4	3824	0.00	0.10	60-20-4	3811	0.00	0.09	60-20-4	3807	0.00	0.09
60-20-5	3652	0.00	0.22	60-20-5	3637	0.00	0.15	60-20-5	3629	0.00	0.06
60-30-1	6670	0.00	0.82	60-30-1	6659	0.00	0.45	60-30-1	6647	0.00	0.55
60-30-2	–	–	–	60-30-2	5741	0.00	1.47	60-30-2	5712	0.00	0.63
60-30-3	5324	0.00	0.42	60-30-3	5293	0.00	0.48	60-30-3	5283	0.00	0.21
60-30-4	–	–	–	60-30-4	5492	0.00	0.66	60-30-4	5479	0.00	1.29
60-30-5	–	–	–	60-30-5	5296	0.00	0.37	60-30-5	5278	0.00	0.32
90-10-1	2925	0.00	0.26	90-10-1	2919	0.00	0.14	90-10-1	2916	0.00	0.14
90-10-2	3017	0.00	0.13	90-10-2	2996	0.00	0.06	90-10-2	2990	0.00	0.07
90-10-3	2930	0.00	0.05	90-10-3	2917	0.00	0.05	90-10-3	2915	0.00	0.05
90-10-4	–	–	–	90-10-4	3162	0.00	0.04	90-10-4	3160	0.00	0.09
90-10-5	2621	0.00	0.12	90-10-5	2615	0.00	0.08	90-10-5	2614	0.00	0.08
90-20-1	6536	0.00	0.58	90-20-1	6496	0.00	0.22	90-20-1	6490	0.00	0.38
90-20-2	6816	0.00	0.81	90-20-2	6797	0.00	0.92	90-20-2	6778	0.00	2.83
90-20-3	6132	0.00	1.15	90-20-3	6111	0.00	0.59	90-20-3	6107	0.00	0.21
90-20-4	5292	0.00	0.42	90-20-4	5269	0.00	0.22	90-20-4	5259	0.00	0.35
90-20-5	–	–	–	90-20-5	5974	0.00	0.83	90-20-5	5959	0.00	0.23
90-30-1	9588	0.00	40.59	90-30-1	9544	0.00	17.73	90-30-1	9527	0.00	3.46
90-30-2	8591	0.00	2.67	90-30-2	8515	0.00	5.56	90-30-2	8497	0.00	2.43
90-30-3	8673	0.00	3.32	90-30-3	8648	0.00	1.79	90-30-3	8638	0.00	2.03
90-30-4	8981	0.00	2.04	90-30-4	8942	0.00	3.93	90-30-4	8935	0.00	0.74
90-30-5	7989	0.00	2.58	90-30-5	7964	0.00	1.94	90-30-5	7961	0.00	1.05
120-10-1	3881	0.00	5.95	120-10-1	3867	0.00	0.76	120-10-1	3866	0.00	0.62
120-10-2	3555	0.00	0.08	120-10-2	3554	0.00	0.17	120-10-2	3551	0.00	0.05
120-10-3	–	–	–	120-10-3	3413	0.00	0.34	120-10-3	3407	0.00	0.14
120-10-4	4313	0.00	1.70	120-10-4	4307	0.00	0.82	120-10-4	4305	0.00	0.82
120-10-5	3839	0.00	0.88	120-10-5	3827	0.00	0.58	120-10-5	3821	0.00	0.41
120-20-1	8062	0.00	2.35	120-20-1	8051	0.00	2.59	120-20-1	8049	0.00	3.91
120-20-2	9309	0.00	1.32	120-20-2	9273	0.00	0.61	120-20-2	9260	0.00	0.54
120-20-3	9723	0.00	20.30	120-20-3	9638	0.00	3.40	120-20-3	9611	0.00	12.18
120-20-4	7739	0.00	24.57	120-20-4	7719	0.00	9.13	120-20-4	7716	0.00	8.28
120-20-5	–	–	–	120-20-5	7470	0.00	2.74	120-20-5	7460	0.00	4.29

Table 3 Results of DK23-WTFRPA for the 14 Most Challenging Standard-Weight Instances in S_A

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
120-30-1	13058	4.59	252.80	120-30-1	12975	1.54	181.08	120-30-1	12959	0.77	180.64
120-30-2	11924	0.83	299.91	120-30-2	11899	1.68	339.16	120-30-2	11887	1.68	180.40
120-30-3	11195	0.00	104.74	120-30-3	11157	0.00	3.69	120-30-3	11154	0.00	2.11
120-30-4	11454	3.49	320.83	120-30-4	11390	0.00	134.22	120-30-4	11368	1.75	180.49
120-30-5	–	–	–	120-30-5	13316	0.75	181.95	120-30-5	13287	2.25	214.52

Table 4 Results of ECS-WTFRPA for the 14 Most Challenging Standard-Weight Instances in S_A

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
120-30-1	13058	0.00	37.20	120-30-1	12975	0.00	6.57	120-30-1	12959	0.00	4.91
120-30-2	11924	0.00	25.69	120-30-2	11898	0.00	6.08	120-30-2	11887	0.00	4.07
120-30-3	11195	0.00	3.73	120-30-3	11157	0.00	0.53	120-30-3	11154	0.00	2.32
120-30-4	11454	0.00	60.82	120-30-4	11390	0.00	2.32	120-30-4	11368	0.00	3.36
120-30-5	–	–	–	120-30-5	13316	0.00	8.27	120-30-5	13287	0.00	4.33

2.1 Results of Medium-Size Standard-Weight Instances in S_B with Various Time Granularities

Table 5 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 300

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
90-30-1	9588	0.00	32.99	90-30-1	9544	0.00	22.71	90-30-1	9527	0.00	3.17
90-30-2	8591	0.00	2.40	90-30-2	8515	0.00	1.41	90-30-2	8497	0.00	2.36
90-30-3	8673	0.00	15.90	90-30-3	8648	0.00	1.85	90-30-3	8638	0.00	1.98
90-30-4	8981	0.00	1.83	90-30-4	8942	0.00	3.81	90-30-4	8935	0.00	0.43
90-30-5	7989	0.00	1.98	90-30-5	7964	0.00	1.66	90-30-5	7961	0.00	0.68

Table 6 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 60

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
90-30-1	9551.40	0.00	57.56	90-30-1	9520.80	0.00	14.08	90-30-1	9510.00	0.00	6.05
90-30-2	8540.60	0.00	6.54	90-30-2	8490.20	0.00	1.99	90-30-2	8481.40	0.00	4.18
90-30-3	8641.80	0.00	15.66	90-30-3	8622.80	0.00	1.86	90-30-3	8619.40	0.00	2.66
90-30-4	8955.60	0.00	4.88	90-30-4	8919.40	0.00	4.85	90-30-4	8919.40	0.00	0.70
90-30-5	7967.40	0.00	8.64	90-30-5	7946.00	0.00	2.94	90-30-5	7950.00	0.00	0.81

Table 7 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 30

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU
90-30-1	9541.40	0.00	73.53	90-30-1	9517.60	0.00	21.90	90-30-1	9506.30	0.00	10.60
90-30-2	8535.20	0.00	8.18	90-30-2	8485.90	0.00	2.70	90-30-2	8476.60	0.00	4.37
90-30-3	8636.50	0.00	28.95	90-30-3	8618.90	0.00	3.20	90-30-3	8614.80	0.00	4.87
90-30-4	8949.80	0.00	39.71	90-30-4	8915.50	0.00	4.26	90-30-4	8916.40	0.00	0.64
90-30-5	7962.50	0.00	15.32	90-30-5	7943.10	0.00	2.79	90-30-5	7946.00	0.00	0.78

Table 8 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 15

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU
90-30-1	9537.85	0.00	137.63	90-30-1	9515.00	0.00	24.89	90-30-1	9503.40	0.00	10.36
90-30-2	8525.65	0.00	10.22	90-30-2	8482.35	0.00	2.70	90-30-2	8474.70	0.00	4.11
90-30-3	8632.30	0.00	21.14	90-30-3	8616.15	0.00	3.02	90-30-3	8612.40	0.00	2.51
90-30-4	8945.45	0.00	6.84	90-30-4	8912.80	0.00	24.40	90-30-4	8914.30	0.00	0.92
90-30-5	7959.45	0.00	2.88	90-30-5	7941.20	0.00	3.38	90-30-5	7944.55	0.00	0.84

Table 9 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 5

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU
90-30-1	9535.28	0.00	157.64	90-30-1	9513.35	0.00	95.76	90-30-1	9501.43	0.00	14.98
90-30-2	8522.70	0.00	20.83	90-30-2	8479.85	0.00	2.43	90-30-2	8472.88	0.00	5.08
90-30-3	8629.95	0.00	28.31	90-30-3	8614.33	0.00	3.54	90-30-3	8611.08	0.00	3.22
90-30-4	8943.08	0.00	15.61	90-30-4	8911.15	0.00	5.60	90-30-4	8913.00	0.00	4.32
90-30-5	7957.45	0.00	23.08	90-30-5	7939.72	0.00	3.37	90-30-5	7943.25	0.00	0.88

Table 10 Results of Medium-Size Standard-Weight Instances in S_B with Granularity 1

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU	Name	Cost	Gap% ₀₀₀	CPU
90-30-1	9534.25	0.00	138.66	90-30-1	9512.66	0.00	121.06	90-30-1	9500.75	0.00	17.14
90-30-2	8520.95	0.00	18.59	90-30-2	8478.83	0.00	3.13	90-30-2	8472.31	0.00	5.98
90-30-3	8629.05	0.00	40.57	90-30-3	8613.61	0.00	4.04	90-30-3	8610.36	0.00	3.21
90-30-4	8942.18	0.00	14.10	90-30-4	8910.37	0.00	5.02	90-30-4	8912.49	0.00	3.22
90-30-5	7956.74	0.00	19.17	90-30-5	7939.18	0.00	3.69	90-30-5	7942.67	0.00	1.04

2.2 Results of Standard-Weight Instances with 1-Second Time Granularity in S_B

Table 11 Detailed Results of Standard-Weight Instances in S_B with 1-Second Time Granularity

ws-0.5				ws-0.6				ws-0.7			
Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU	Name	Cost	Gap‰	CPU
60-10-1	1859.23	0.00	0.24	60-10-1	1857.32	0.00	0.08	60-10-1	1855.66	0.00	0.06
60-10-2	1999.74	0.00	0.10	60-10-2	1991.84	0.00	0.02	60-10-2	1991.72	0.00	0.05
60-10-3	2260.34	0.00	0.06	60-10-3	2256.21	0.00	0.03	60-10-3	2255.07	0.00	0.02
60-10-4	2019.79	0.00	0.06	60-10-4	2004.37	0.00	0.03	60-10-4	2002.80	0.00	0.07
60-10-5	1900.38	0.00	0.03	60-10-5	1900.46	0.00	0.05	60-10-5	1897.32	0.00	0.05
60-20-1	3740.41	0.00	0.25	60-20-1	3734.14	0.00	0.31	60-20-1	3731.04	0.00	0.05
60-20-2	3921.11	0.00	2.21	60-20-2	3908.59	0.00	0.15	60-20-2	3901.47	0.00	0.61
60-20-3	3186.12	0.00	1.86	60-20-3	3175.15	0.00	0.20	60-20-3	3169.06	0.00	0.15
60-20-4	3806.88	0.00	0.17	60-20-4	3798.74	0.00	0.20	60-20-4	3796.96	0.00	0.07
60-20-5	3632.94	0.00	0.27	60-20-5	3621.38	0.00	0.12	60-20-5	3620.97	0.00	0.03
60-30-1	6645.22	0.00	2.04	60-30-1	6638.13	0.00	0.17	60-30-1	6628.88	0.00	0.85
60-30-2	5736.35	0.00	19.80	60-30-2	5704.14	0.00	17.42	60-30-2	5691.82	0.00	0.44
60-30-3	5298.99	0.00	12.44	60-30-3	5272.94	0.00	0.50	60-30-3	5266.68	0.00	0.50
60-30-4	5491.95	0.00	7.83	60-30-4	5467.38	0.00	1.94	60-30-4	5461.61	0.00	0.66
60-30-5	5296.34	0.00	5.12	60-30-5	5270.45	0.00	3.92	60-30-5	5258.89	0.00	1.22
90-10-1	2907.87	0.00	0.55	90-10-1	2906.42	0.00	0.25	90-10-1	2909.39	0.00	0.24
90-10-2	2995.87	0.00	0.45	90-10-2	2985.21	0.00	0.25	90-10-2	2981.07	0.00	0.10
90-10-3	2922.65	0.00	0.13	90-10-3	2911.74	0.00	0.07	90-10-3	2908.22	0.00	0.04
90-10-4	3156.39	0.00	0.14	90-10-4	3151.57	0.00	0.21	90-10-4	3150.84	0.00	0.17
90-10-5	2608.79	0.00	0.04	90-10-5	2606.61	0.00	2.93	90-10-5	2604.07	0.00	0.09
90-20-1	6507.74	0.00	0.99	90-20-1	6477.76	0.00	0.69	90-20-1	6474.81	0.00	1.16
90-20-2	6783.09	0.00	2.76	90-20-2	6771.15	0.00	2.17	90-20-2	6760.03	0.00	0.20
90-20-3	6108.01	0.00	1.20	90-20-3	6090.41	0.00	0.27	90-20-3	6091.03	0.00	0.20
90-20-4	5257.72	0.00	1.88	90-20-4	5246.83	0.00	4.88	90-20-4	5241.73	0.00	9.75
90-20-5	5980.39	0.00	1.60	90-20-5	5946.36	0.00	0.55	90-20-5	5945.04	0.00	0.50
90-30-1	9534.25	0.00	138.66	90-30-1	9512.66	0.00	121.06	90-30-1	9500.75	0.00	17.14
90-30-2	8520.95	0.00	18.59	90-30-2	8478.83	0.00	3.13	90-30-2	8472.31	0.00	5.98
90-30-3	8629.05	0.00	40.57	90-30-3	8613.61	0.00	4.04	90-30-3	8610.36	0.00	3.21
90-30-4	8942.18	0.00	14.10	90-30-4	8910.37	0.00	5.02	90-30-4	8912.49	0.00	3.22
90-30-5	7956.74	0.00	19.17	90-30-5	7939.18	0.00	3.69	90-30-5	7942.67	0.00	1.04
120-10-1	3861.84	0.00	2.65	120-10-1	3857.57	0.00	1.91	120-10-1	3854.95	0.00	3.40
120-10-2	3547.55	0.00	0.32	120-10-2	3542.99	0.00	0.05	120-10-2	3540.09	0.00	0.03
120-10-3	3419.65	0.00	0.73	120-10-3	3400.17	0.00	0.37	120-10-3	3397.93	0.00	0.09
120-10-4	4298.57	0.00	4.01	120-10-4	4293.41	0.00	2.29	120-10-4	4291.76	0.00	2.11
120-10-5	3825.76	0.00	7	120-10-5	3816.87	0.00	0.28	120-10-5	3808.00	0.00	0.11
120-20-1	8038.72	0.00	247.54	120-20-1	8028.39	0.00	4.17	120-20-1	8025.76	0.00	6.13
120-20-2	9270.73	0.00	31.95	120-20-2	9240.79	0.00	1.61	120-20-2	9233.91	0.00	0.37
120-20-3	9623.13	0.00	327.34	120-20-3	9589.35	0.00	35.48	120-20-3	9576.99	0.00	47.30
120-20-4	7707.35	0.00	123.01	120-20-4	7700.79	0.00	70.62	120-20-4	7697.83	0.00	41.81
120-20-5	7486.23	0.00	16.82	120-20-5	7447.75	0.00	17.87	120-20-5	7440.68	0.00	8.55
120-30-1	12970.10	2.75	3600.00(T)	120-30-1	12927.19	0.00	1247.68	120-30-1	12928.70	0.00	12.13
120-30-2	11870.88	0.00	119.87	120-30-2	11857.96	0.00	152.94	120-30-2	11853.76	0.00	9.28
120-30-3	11149.55	0.00	1854.13	120-30-3	11130.46	0.00	534.87	120-30-3	11126.50	0.00	7.64
120-30-4	11379.24	0.00	1428.60	120-30-4	11341.99	0.00	1121.19	120-30-4	11337.79	2.82	1088.28(M)
120-30-5	—	—	—	120-30-5	13266.76	0.00	221.49	120-30-5	13245.06	0.00	269.72