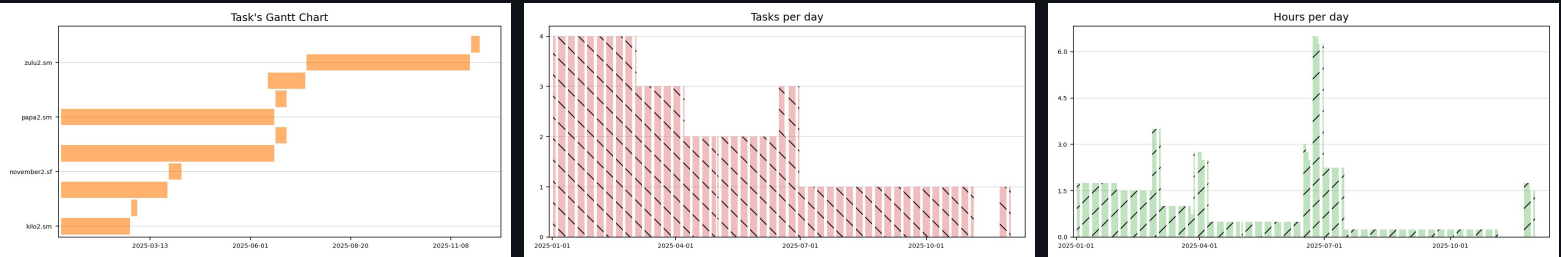# Yumbo. Scheduling, Planning and Resource Allocation

Zbigniew Romanowski, Paweł Koczyk

Source code, documentation and sample Excel input files can be found on Yumbo's GitHub repository.

28 January 2025, 14:03:42 PM

Experts overview

SA.Martha the 2nd unit

	Weekdays	kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-01-01	Wednesday											
2025-01-02	Thursday	0.50		0.50		0.25		0.50				
2025-01-03	Friday	0.50		0.50		0.25		0.50				
2025-01-04	Saturday											
2025-01-05	Sunday											
2025-01-06	Monday	0.50		0.50		0.25		0.50				
2025-01-07	Tuesday	0.50		0.50		0.25		0.50				
2025-01-08	Wednesday	0.50		0.50		0.25		0.50				
2025-01-09	Thursday	0.50		0.50		0.25		0.50				
2025-01-10	Friday	0.50		0.50		0.25		0.50				
2025-01-11	Saturday											
2025-01-12	Sunday											
2025-01-13	Monday	0.50		0.50		0.25		0.50				
2025-01-14	Tuesday	0.50		0.50		0.25		0.50				
2025-01-15	Wednesday	0.50		0.50		0.25		0.50				
2025-01-16	Thursday	0.50		0.50		0.25		0.50				
2025-01-17	Friday	0.50		0.50		0.25		0.50				
2025-01-18	Saturday											
2025-01-19	Sunday											
2025-01-20	Monday	0.50		0.50		0.25		0.50				
2025-01-21	Tuesday	0.50		0.50		0.25		0.50				
2025-01-22	Wednesday	0.50		0.50		0.25		0.50				
2025-01-23	Thursday	0.50		0.50		0.25		0.50				
2025-01-24	Friday	0.50		0.50		0.25		0.50				
2025-01-25	Saturday											
2025-01-26	Sunday											
2025-01-27	Monday	0.50		0.50		0.25		0.50				
2025-01-28	Tuesday	0.50		0.50		0.25		0.50				
2025-01-29	Wednesday	0.50		0.50		0.25		0.50				
2025-01-30	Thursday	0.50		0.50		0.25		0.50				
2025-01-31	Friday	0.25		0.50		0.25		0.50				
2025-02-01	Saturday											
2025-02-02	Sunday											
2025-02-03	Monday	0.25		0.50		0.25		0.50				
2025-02-04	Tuesday	0.25		0.50		0.25		0.50				
2025-02-05	Wednesday	0.25		0.50		0.25		0.50				
2025-02-06	Thursday	0.25		0.50		0.25		0.50				
2025-02-07	Friday	0.25		0.50		0.25		0.50				
2025-02-08	Saturday											
2025-02-09	Sunday											
2025-02-10	Monday	0.25		0.50		0.25		0.50				
2025-02-11	Tuesday	0.25		0.50		0.25		0.50				

	Weekdays	kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-02-12	Wednesday	0.25		0.50		0.25		0.50				
2025-02-13	Thursday	0.25		0.50		0.25		0.50				
2025-02-14	Friday	0.25		0.50		0.25		0.50				
2025-02-15	Saturday											
2025-02-16	Sunday											
2025-02-17	Monday	0.25		0.50		0.25		0.50				
2025-02-18	Tuesday	0.25		0.50		0.25		0.50				
2025-02-19	Wednesday	0.25		0.50		0.25		0.50				
2025-02-20	Thursday	0.25		0.50		0.25		0.50				
2025-02-21	Friday	0.25		0.50		0.25		0.50				
2025-02-22	Saturday											
2025-02-23	Sunday											
2025-02-24	Monday	0.25		0.50		0.25		0.50				
2025-02-25	Tuesday	0.25		0.50		0.25		0.50				
2025-02-26	Wednesday		2.50	0.50		0.25		0.25				
2025-02-27	Thursday		2.50	0.50		0.25		0.25				
2025-02-28	Friday		2.50	0.50		0.25		0.25				
2025-03-01	Saturday											
2025-03-02	Sunday											
2025-03-03	Monday		2.50	0.50		0.25		0.25				
2025-03-04	Tuesday			0.50		0.25		0.25				
2025-03-05	Wednesday			0.50		0.25		0.25				
2025-03-06	Thursday			0.50		0.25		0.25				
2025-03-07	Friday			0.50		0.25		0.25				
2025-03-08	Saturday											
2025-03-09	Sunday											
2025-03-10	Monday			0.50		0.25		0.25				
2025-03-11	Tuesday			0.50		0.25		0.25				
2025-03-12	Wednesday			0.50		0.25		0.25				
2025-03-13	Thursday			0.50		0.25		0.25				
2025-03-14	Friday			0.50		0.25		0.25				
2025-03-15	Saturday											
2025-03-16	Sunday											
2025-03-17	Monday			0.50		0.25		0.25				
2025-03-18	Tuesday			0.50		0.25		0.25				
2025-03-19	Wednesday			0.50		0.25		0.25				
2025-03-20	Thursday			0.50		0.25		0.25				
2025-03-21	Friday			0.50		0.25		0.25				
2025-03-22	Saturday											
2025-03-23	Sunday											
2025-03-24	Monday			0.50		0.25		0.25				
2025-03-25	Tuesday			0.50		0.25		0.25				
2025-03-26	Wednesday			0.25		0.25		0.25				
2025-03-27	Thursday			0.25		0.25		0.25				
2025-03-28	Friday				2.25	0.25		0.25				
2025-03-29	Saturday											
2025-03-30	Sunday											
2025-03-31	Monday				2.25	0.25		0.25				
2025-04-01	Tuesday				2.25	0.25		0.25				
2025-04-02	Wednesday				2.25	0.25		0.25				
2025-04-03	Thursday				2.00	0.25		0.25				
2025-04-04	Friday				2.00	0.25		0.25				
2025-04-05	Saturday											
2025-04-06	Sunday											
2025-04-07	Monday				2.00	0.25		0.25				
2025-04-08	Tuesday					0.25		0.25				
2025-04-09	Wednesday					0.25		0.25				
2025-04-10	Thursday					0.25		0.25				
2025-04-11	Friday					0.25		0.25				
2025-04-12	Saturday											
2025-04-13	Sunday											
2025-04-14	Monday					0.25		0.25				
2025-04-15	Tuesday					0.25		0.25				
2025-04-16	Wednesday					0.25		0.25				
2025-04-17	Thursday					0.25		0.25				

	Weekdays	kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-04-18	Friday					0.25		0.25				
2025-04-19	Saturday											
2025-04-20	Sunday											
2025-04-21	Monday					0.25		0.25				
2025-04-22	Tuesday					0.25		0.25				
2025-04-23	Wednesday					0.25		0.25				
2025-04-24	Thursday					0.25		0.25				
2025-04-25	Friday					0.25		0.25				
2025-04-26	Saturday											
2025-04-27	Sunday											
2025-04-28	Monday					0.25		0.25				
2025-04-29	Tuesday					0.25		0.25				
2025-04-30	Wednesday					0.25		0.25				
2025-05-01	Thursday											
2025-05-02	Friday					0.25		0.25				
2025-05-03	Saturday											
2025-05-04	Sunday											
2025-05-05	Monday					0.25		0.25				
2025-05-06	Tuesday					0.25		0.25				
2025-05-07	Wednesday					0.25		0.25				
2025-05-08	Thursday					0.25		0.25				
2025-05-09	Friday					0.25		0.25				
2025-05-10	Saturday											
2025-05-11	Sunday											
2025-05-12	Monday					0.25		0.25				
2025-05-13	Tuesday					0.25		0.25				
2025-05-14	Wednesday					0.25		0.25				
2025-05-15	Thursday					0.25		0.25				
2025-05-16	Friday					0.25		0.25				
2025-05-17	Saturday											
2025-05-18	Sunday											
2025-05-19	Monday					0.25		0.25				
2025-05-20	Tuesday					0.25		0.25				
2025-05-21	Wednesday					0.25		0.25				
2025-05-22	Thursday					0.25		0.25				
2025-05-23	Friday					0.25		0.25				
2025-05-24	Saturday											
2025-05-25	Sunday											
2025-05-26	Monday					0.25		0.25				
2025-05-27	Tuesday					0.25		0.25				
2025-05-28	Wednesday					0.25		0.25				
2025-05-29	Thursday					0.25		0.25				
2025-05-30	Friday					0.25		0.25				
2025-05-31	Saturday											
2025-06-01	Sunday											
2025-06-02	Monday					0.25		0.25				
2025-06-03	Tuesday					0.25		0.25				
2025-06-04	Wednesday					0.25		0.25				
2025-06-05	Thursday					0.25		0.25				
2025-06-06	Friday					0.25		0.25				
2025-06-07	Saturday											
2025-06-08	Sunday											
2025-06-09	Monday					0.25		0.25				
2025-06-10	Tuesday					0.25		0.25				
2025-06-11	Wednesday					0.25		0.25				
2025-06-12	Thursday					0.25		0.25				
2025-06-13	Friday					0.25		0.25				
2025-06-14	Saturday											
2025-06-15	Sunday											
2025-06-16	Monday					0.25		0.25		2.50		
2025-06-17	Tuesday					0.25		0.25		2.50		
2025-06-18	Wednesday					0.25		0.25		2.25		
2025-06-19	Thursday					0.25		0.25		2.25		
2025-06-20	Friday							0.25		2.25		
2025-06-21	Saturday											

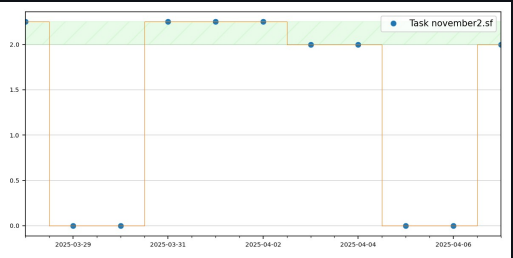| Weekdays		kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-06-22	Sunday											
2025-06-23	Monday						1.75		2.50	2.25		
2025-06-24	Tuesday						1.75		2.50	2.25		
2025-06-25	Wednesday						1.75		2.50	2.25		
2025-06-26	Thursday						1.75		2.50	2.25		
2025-06-27	Friday						1.50		2.50	2.25		
2025-06-28	Saturday											
2025-06-29	Sunday											
2025-06-30	Monday						1.50		2.50	2.25		
2025-07-01	Tuesday									2.25		
2025-07-02	Wednesday									2.25		
2025-07-03	Thursday									2.25		
2025-07-04	Friday									2.25		
2025-07-05	Saturday											
2025-07-06	Sunday											
2025-07-07	Monday									2.25		
2025-07-08	Tuesday									2.25		
2025-07-09	Wednesday									2.25		
2025-07-10	Thursday									2.25		
2025-07-11	Friday									2.25		
2025-07-12	Saturday											
2025-07-13	Sunday											
2025-07-14	Monday									2.25		
2025-07-15	Tuesday									2.25		
2025-07-16	Wednesday										0.25	
2025-07-17	Thursday										0.25	
2025-07-18	Friday										0.25	
2025-07-19	Saturday											
2025-07-20	Sunday											
2025-07-21	Monday										0.25	
2025-07-22	Tuesday										0.25	
2025-07-23	Wednesday										0.25	
2025-07-24	Thursday										0.25	
2025-07-25	Friday										0.25	
2025-07-26	Saturday											
2025-07-27	Sunday											
2025-07-28	Monday										0.25	
2025-07-29	Tuesday										0.25	
2025-07-30	Wednesday										0.25	
2025-07-31	Thursday										0.25	
2025-08-01	Friday										0.25	
2025-08-02	Saturday											
2025-08-03	Sunday											
2025-08-04	Monday										0.25	
2025-08-05	Tuesday										0.25	
2025-08-06	Wednesday										0.25	
2025-08-07	Thursday										0.25	
2025-08-08	Friday										0.25	
2025-08-09	Saturday											
2025-08-10	Sunday											
2025-08-11	Monday										0.25	
2025-08-12	Tuesday										0.25	
2025-08-13	Wednesday										0.25	
2025-08-14	Thursday										0.25	
2025-08-15	Friday										0.25	
2025-08-16	Saturday											
2025-08-17	Sunday											
2025-08-18	Monday										0.25	
2025-08-19	Tuesday										0.25	
2025-08-20	Wednesday										0.25	
2025-08-21	Thursday										0.25	
2025-08-22	Friday										0.25	
2025-08-23	Saturday											
2025-08-24	Sunday											
2025-08-25	Monday										0.25	

	Weekdays	kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-08-26	Tuesday										0.25	
2025-08-27	Wednesday										0.25	
2025-08-28	Thursday										0.25	
2025-08-29	Friday										0.25	
2025-08-30	Saturday											
2025-08-31	Sunday											
2025-09-01	Monday										0.25	
2025-09-02	Tuesday										0.25	
2025-09-03	Wednesday										0.25	
2025-09-04	Thursday										0.25	
2025-09-05	Friday										0.25	
2025-09-06	Saturday											
2025-09-07	Sunday											
2025-09-08	Monday										0.25	
2025-09-09	Tuesday										0.25	
2025-09-10	Wednesday										0.25	
2025-09-11	Thursday										0.25	
2025-09-12	Friday										0.25	
2025-09-13	Saturday											
2025-09-14	Sunday											
2025-09-15	Monday										0.25	
2025-09-16	Tuesday										0.25	
2025-09-17	Wednesday										0.25	
2025-09-18	Thursday										0.25	
2025-09-19	Friday										0.25	
2025-09-20	Saturday											
2025-09-21	Sunday											
2025-09-22	Monday										0.25	
2025-09-23	Tuesday										0.25	
2025-09-24	Wednesday										0.25	
2025-09-25	Thursday										0.25	
2025-09-26	Friday										0.25	
2025-09-27	Saturday											
2025-09-28	Sunday											
2025-09-29	Monday										0.25	
2025-09-30	Tuesday										0.25	
2025-10-01	Wednesday										0.25	
2025-10-02	Thursday										0.25	
2025-10-03	Friday										0.25	
2025-10-04	Saturday											
2025-10-05	Sunday											
2025-10-06	Monday										0.25	
2025-10-07	Tuesday										0.25	
2025-10-08	Wednesday										0.25	
2025-10-09	Thursday										0.25	
2025-10-10	Friday										0.25	
2025-10-11	Saturday											
2025-10-12	Sunday											
2025-10-13	Monday										0.25	
2025-10-14	Tuesday										0.25	
2025-10-15	Wednesday										0.25	
2025-10-16	Thursday										0.25	
2025-10-17	Friday										0.25	
2025-10-18	Saturday											
2025-10-19	Sunday											
2025-10-20	Monday										0.25	
2025-10-21	Tuesday										0.25	
2025-10-22	Wednesday										0.25	
2025-10-23	Thursday										0.25	
2025-10-24	Friday										0.25	
2025-10-25	Saturday											
2025-10-26	Sunday											
2025-10-27	Monday										0.25	
2025-10-28	Tuesday										0.25	
2025-10-29	Wednesday										0.25	

Weekdays		kilo2.sm	kilo2.sf	november2.sm	november2.sf	oscar2.sm	oscar2.sf	papa2.sm	papa2.sf	zulu2.se	zulu2.sm	zulu2.sf
2025-10-30	Thursday										0.25	
2025-10-31	Friday										0.25	
2025-11-01	Saturday											
2025-11-02	Sunday											
2025-11-03	Monday										0.25	
2025-11-04	Tuesday										0.25	
2025-11-05	Wednesday											
2025-11-06	Thursday											
2025-11-07	Friday											
2025-11-08	Saturday											
2025-11-09	Sunday											
2025-11-10	Monday											
2025-11-11	Tuesday											
2025-11-12	Wednesday											
2025-11-13	Thursday											
2025-11-14	Friday											
2025-11-15	Saturday											
2025-11-16	Sunday											
2025-11-17	Monday											
2025-11-18	Tuesday											
2025-11-19	Wednesday											
2025-11-20	Thursday											
2025-11-21	Friday											
2025-11-22	Saturday											
2025-11-23	Sunday											
2025-11-24	Monday											1.75
2025-11-25	Tuesday											1.75
2025-11-26	Wednesday											1.75
2025-11-27	Thursday											1.75
2025-11-28	Friday											1.50
2025-11-29	Saturday											
2025-11-30	Sunday											
2025-12-01	Monday											1.50

☐ Show schedule as Streamlit table

Task kilo2.sm

Task kilo2.sf

Task november2.sm

Task november2.sf

Task oscar2.sm

Task oscar2.sf

Task papa2.sm

Task papa2.sf

Task zulu2.se

Task zulu2.sm

Task zulu2.sf
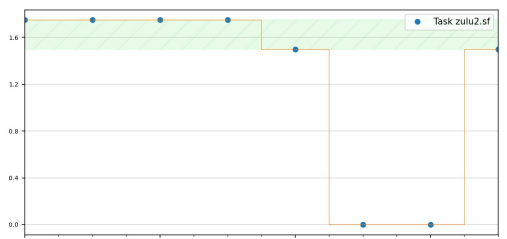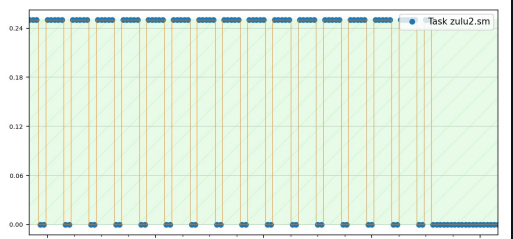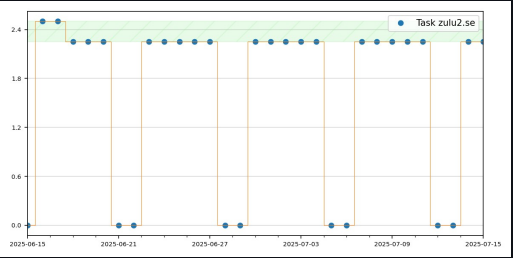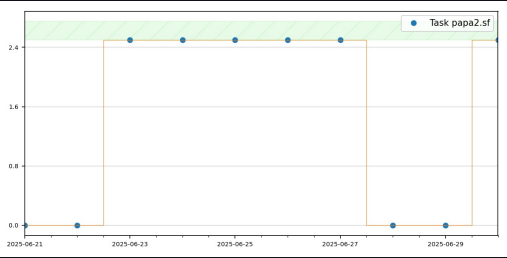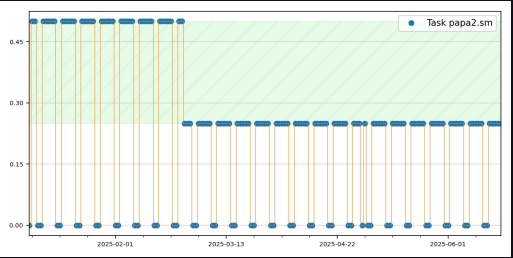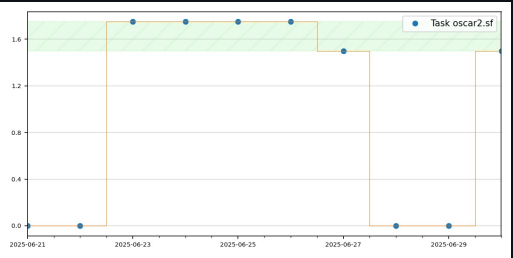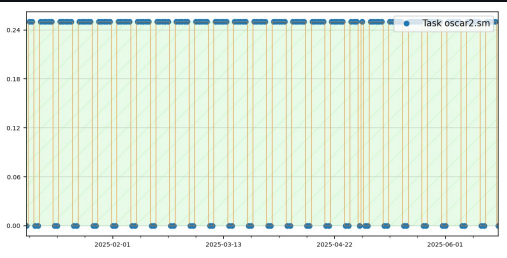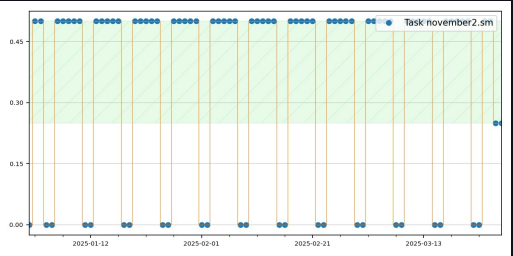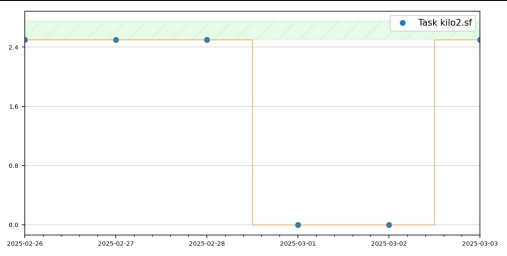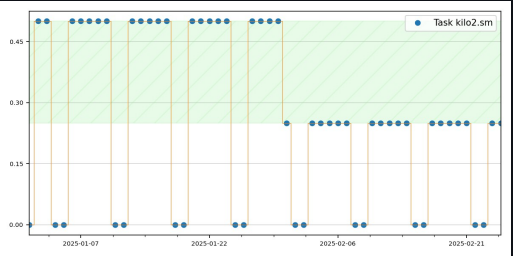
Solver output at 28 January 2025, 14:03:42 PM

```
HiGHS 1.8.1:   tech:outlev = 1
Running HiGHS 1.8.1 (git hash: 4a7f24a): Copyright (c) 2024 HiGHS under MIT licence terms
Coefficient ranges:
  Matrix [1e+00, 3e+01]
  Cost   [1e+00, 1e+00]
  Bound  [1e+00, 1e+02]
  RHS    [4e+01, 2e+02]
Presolving model
437 rows, 690 cols, 1332 nonzeros  0s
9 rows, 476 cols, 476 nonzeros  0s
9 rows, 386 cols, 386 nonzeros  0s
9 rows, 359 cols, 359 nonzeros  0s

Solving MIP model with:
   9 rows
   359 cols (97 binary, 262 integer, 0 implied int., 0 continuous)
   359 nonzeros
MIP-Timing:      0.0052 - starting analytic centre calculation

Src: B => Branching; C => Central rounding; F => Feasibility pump; H => Heuristic; L => Sub-MIP;
     P => Empty MIP; R => Randomized rounding; S => Solve LP; T => Evaluate node; U => Unbounded;
     z => Trivial zero; l => Trivial lower; u => Trivial upper; p => Trivial point

        Nodes      |    B&B Tree     |        Objective Bounds        |  Dynamic Constraints |      Work
Src  Proc. InQueue |  Leaves   Expl. | BestBound       BestSol    Gap |   Cuts   InLp Confl. | LpIters     Time

        0       0       0   0.00%   2107.053976    inf            inf       0      0      0        0     0.0s
 T      0       0       0   0.00%   2107.053976    2766.565615   23.84%     0      0      0        9     0.0s
        1       0       1 100.00%   2766.565615    2766.565615    0.00%     0      0      0        9     0.0s

Solving report
  Status         Optimal
  Primal bound   2766.56561545
  Dual bound     2766.56561545
  Gap            0% (tolerance: 0.01%)
  P-D integral   4.66053139346e-06
  Solution status  feasible
                 2766.56561545 (objective)
                 0 (bound viol.)
                 0 (int. viol.)
                 0 (row viol.)
  Timing         0.01 (total)
                 0.00 (presolve)
                 0.00 (solve)
                 0.00 (postsolve)
  Max sub-MIP depth 0
  Nodes          1
  Repair LPs     0 (0 feasible; 0 iterations)
  LP iterations  9 (total)
                 0 (strong br.)
                 0 (separation)
                 0 (heuristics)
HiGHS 1.8.1: optimal solution; objective 2766.565615
9 simplex iterations
1 branching nodes
```

Elapsed time for chart creation

Chart title	Chart short name	Number of calls	Elapsed time [s]	Average time per chart [s]
Hours per day stacked	simg	1	1.944	1.944
Plot task with its constrains	bimg	11	1.096	0.100
Tasks per day	timg	1	0.297	0.297
Hours per day	himg	1	0.288	0.288
Task's Gantt Chart	gimg	1	0.127	0.127
Invoicing Periods Workload	wimg	1	0.112	0.112