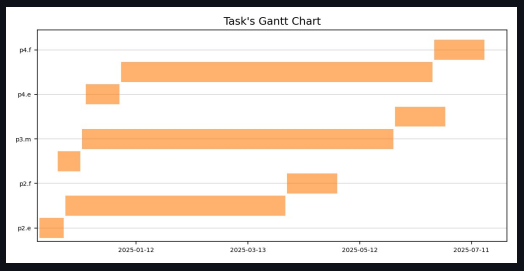
# Yumbo. Scheduling, Planning and Resource Allocation

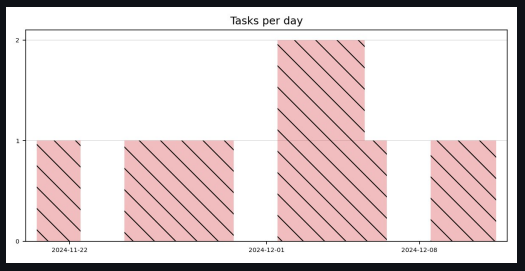

## Zbigniew Romanowski, Paweł Koczyk

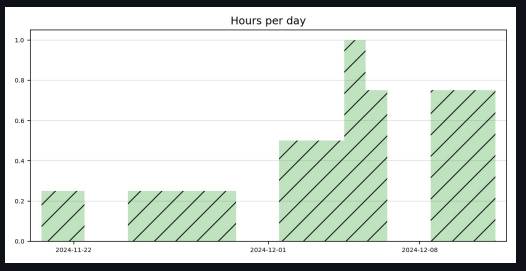

Source code, documentation and sample Excel input files can be found on Yumbo's GitHub repository.

*29 January 2025, 19:00:22 PM*

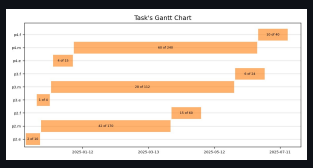
## Experts overview

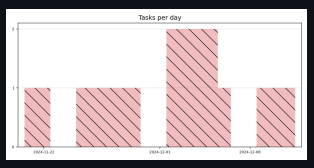


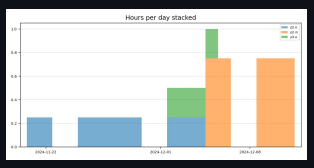



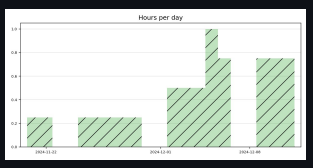



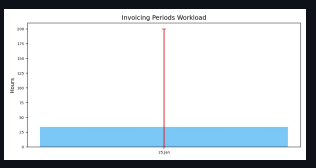

## Radosław Project Manager role




## Solver output at 29 January 2025, 19:00:23 PM

```
max_context = 2
tva cells:    0 at level 0
              26 at levels above 0
tva_hcl = 7, tva_len = 128
rewrites: m = 0, o = 26
0 variables, 0 constraints, 0 objectives
max_context = 3
tva cells:    0 at level 0
              42 at levels above 0
tva_hcl = 8, tva_len = 256
rewrites: m = 20, o = 41
4329 variables, 7192 constraints, 1 objectives
14916 nonzeros

Presolve eliminates 6792 constraints and 3848 variables.
"option presolve 10;" used, but "option presolve 2;" would suffice.
Adjusted problem:
481 variables:
       194 binary variables
       278 integer variables
       9 linear variables
400 constraints, all linear; 1336 nonzeros
       6 equality constraints
       394 inequality constraints
1 linear objective; 9 nonzeros.

presolve results:
       variables omitted:   3848
       constraints omitted: 6792
       ranges relaxed:            620
       bounds improved:     4235
       constraint_drop_tol range: [0, 4)
       nba cycles:          1
       bound row scans:     707
       row-scan updates:    5
SCIP 9.0.1:   tech:outlev-native = 5
LP Solver <Soplex 7.0.1>: barrier convergence tolerance cannot be set -- tolerance of SCIP and LP solver may differ
LP Solver <Soplex 7.0.1>: fastmip setting not available -- SCIP parameter has no effect
LP Solver <Soplex 7.0.1>: number of threads settings not available -- SCIP parameter has no effect
transformed problem has 481 variables (194 bin, 278 int, 0 impl, 9 cont) and 400 constraints
    400 constraints of type <linear>

original problem has 1336 active (0.694387%) nonzeros and 1336 (0.694387%) check nonzeros

presolving:
(round 1, fast)       10 del vars, 6 del conss, 0 add conss, 3 chg bounds, 0 chg sides, 194 chg coeffs, 0 upgd conss, 0 impls, 0 clqs
(round 2, exhaustive) 10 del vars, 6 del conss, 0 add conss, 3 chg bounds, 0 chg sides, 194 chg coeffs, 194 upgd conss, 0 impls, 0 clqs
(round 3, exhaustive) 10 del vars, 6 del conss, 0 add conss, 3 chg bounds, 0 chg sides, 194 chg coeffs, 388 upgd conss, 194 impls, 0 clqs
   (0.0s) probing: 100/194 (51.5%) - 0 fixings, 0 aggregations, 216 implications, 0 bound changes
   (0.0s) probing cycle finished: starting next cycle
   (0.0s) symmetry computation started: requiring (bin +, int +, cont +), (fixed: bin -, int -, cont -)
   (0.0s) no symmetry present (symcode time: 0.00)
cons components found 6 undirected components at node 1, depth 0 (0)
clique table cleanup detected 0 bound changes

presolved problem has 595 active (1.04603%) nonzeros and 595 (1.04603%) check nonzeros

presolving (4 rounds: 4 fast, 3 medium, 3 exhaustive):
 243 deleted vars, 161 deleted constraints, 0 added constraints, 3 tightened bounds, 0 added holes, 0 changed sides, 194 changed coefficients
 598 implications, 0 cliques
presolved problem has 238 variables (119 bin, 119 int, 0 impl, 0 cont) and 239 constraints
    238 constraints of type <varbound>
      1 constraints of type <linear>
Presolving Time: 0.01

  time | node   | left  |LP iter|LP it/n|mem/heur|mdpt |vars |cons |rows |cuts |sepa|confs|strbr|  dualbound    | primalbound   |  gap    | compl.
p 0.0s|     1  |     0 |      0 |     0 |      - | vbounds|   0 | 238 | 239 | 239 |   0 |  0 |   0 |   0 | 7.125715e+03 | 9.062956e+03 |  27.19%| unknown
p 0.0s|     1  |     0 |      0 |     0 |      - | vbounds|   0 | 238 | 239 | 239 |   0 |  0 |   0 |   0 | 7.125715e+03 | 8.958080e+03 |  25.71%| unknown
```

```
  0.0s|     1 |     0 |     1 |     - |  4799k |   0 | 238 | 239 | 239 |   0 |  0 |   0 |   0 | 8.958080e+03 | 8.958080e+03 |   0.00%| unknown

SCIP Status        : problem is solved [optimal solution found]
Solving Time (sec) : 0.02
Solving Nodes      : 1
Primal Bound       : +8.95808022146408e+03 (2 solutions)
Dual Bound         : +8.95808022146408e+03
Gap                : 0.00 %
WARNING: No dual information available when presolving was performed.
max_context = 3
tva cells:    0 at level 0
              25 at levels above 0
tva_hcl = 7, tva_len = 128
rewrites: m = 20, o = 41
max_context = 3
tva cells:    0 at level 0
              25 at levels above 0
tva_hcl = 7, tva_len = 128
rewrites: m = 20, o = 41
SCIP 9.0.1: optimal solution; objective 8958.080221
1 simplex iterations
1 branching nodes
max_context = 3
tva cells:    0 at level 0
              25 at levels above 0
tva_hcl = 7, tva_len = 128
rewrites: m = 20, o = 41
max_context = 3
tva cells:    0 at level 0
              25 at levels above 0
tva_hcl = 7, tva_len = 128
rewrites: m = 20, o = 41
```

## Statistics on chart creation

| Chart title | Chart short name | Number of calls | Total time [s] | Average time [s] | Total nbytes | Average nbytes |
|---|---|---|---|---|---|---|
| Hours per day stacked | simg | 1 | 0.157 | 0.157 | 4592 | 4592 |
| Hours per day (Summary) | himgsum | 1 | 0.151 | 0.151 | 5734 | 5734 |
| Task's Gantt Chart | gimg | 1 | 0.149 | 0.149 | 6808 | 6808 |
| Tasks per day (Summary) | timgsum | 1 | 0.139 | 0.139 | 4642 | 4642 |
| Tasks per day | timg | 1 | 0.137 | 0.137 | 4642 | 4642 |
| Hours per day | himg | 1 | 0.129 | 0.129 | 5734 | 5734 |
| Task's Gantt Chart (Summary) | gimgsum | 1 | 0.111 | 0.111 | 3370 | 3370 |
| Invoicing Periods Workload | wimg | 1 | 0.100 | 0.100 | 4448 | 4448 |
| Plot task with its constrains | bimg | 0 | 0.000 | 0.000 | 0 | 0 |

## Statistics on AMPL solution

Total elapsed time: 0.674 [s]