Alpha

0 0 0 0 0 0 1 0 0 0 0 1

X (racks)

1 1 0 0 0 0 0 0 0 0 0 0 <-r1 (AC)

0 0 0 0 0 0 **1** 1 0 0 0 0 <-r2 (BD)

0 0 0 0 0 0 0 0 0 0 0 **1** <-r3 (CD)

Y (orders)

1 1 1 1 1 1 1 0 0 0 0 0 <-o1 (ABC)

1 1 1 1 1 1 1 1 1 0 0 0 <-o2 (ABCD)

0 0 0 0 0 0 0 1 1 1 1 1 <-o3 (BCD)

0 0 0 0 0 0 0 0 0 0 0 1 <-o4 (CD)

Z ("A")

0 1 0 0 0 0 0 0 0 0 0 0 <-o1 (ABC)

0 1 0 0 0 0 0 0 0 0 0 0 <-o2 (ABCD)

0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0

Z ("B")

0 0 0 0 0 0 1 0 0 0 0 0 <-o1 (ABC)

0 0 0 0 0 0 0 1 0 0 0 0 <-o2 (ABCD)

0 0 0 0 0 0 0 1 0 0 0 0 <-o3 (BCD)

0 0 0 0 0 0 0 0 0 0 0 0

Z ("C")

1 0 0 0 0 0 0 0 0 0 0 0 <-o1 (ABC)

1 0 0 0 0 0 0 0 0 0 0 0 <-o2 (ABCD)

0 0 0 0 0 0 0 0 0 0 0 1 <-o3 (BCD)

0 0 0 0 0 0 0 0 0 0 0 1 <-o4 (CD)

Z ("D")

0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 1 0 0 0 0 <-o2 (ABCD)

0 0 0 0 0 0 0 1 0 0 0 0 <-o3 (BCD)

0 0 0 0 0 0 0 0 0 0 0 1 <-o4 (CD)

// solution (optimal) with objective 2

// Quality Incumbent solution:

// MILP objective 2.0000000000e+00

// MILP solution norm |x| (Total, Max) 4.10000e+01 1.00000e+00

// MILP solution error (Ax=b) (Total, Max) 0.00000e+00 0.00000e+00

// MILP x bound error (Total, Max) 0.00000e+00 0.00000e+00

// MILP x integrality error (Total, Max) 0.00000e+00 0.00000e+00

// MILP slack bound error (Total, Max) 0.00000e+00 0.00000e+00

//

alpha = [0

0 0 0 0 0 1 0 0 0 0 1];

x = [[1 1 0 0 0 0 0 0 0 0 0 0]

[0 0 0 0 0 0 1 1 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 1]];

y = [[1 1 1 1 1 1 1 0 0 0 0 0]

[1 1 1 1 1 1 1 1 1 0 0 0]

[0 0 0 0 0 0 0 1 1 1 1 1]

[0 0 0 0 0 0 0 0 0 0 0 1]];

z = [[[0 1 0 0 0 0 0 0 0 0 0 0]

[0 1 0 0 0 0 0 0 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 0]]

[[0 0 0 0 0 0 1 0 0 0 0 0]

[0 0 0 0 0 0 0 1 0 0 0 0]

[0 0 0 0 0 0 0 1 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 0]]

[[1 0 0 0 0 0 0 0 0 0 0 0]

[1 0 0 0 0 0 0 0 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 1]

[0 0 0 0 0 0 0 0 0 0 0 1]]

[[0 0 0 0 0 0 0 0 0 0 0 0]

[0 0 0 0 0 0 0 1 0 0 0 0]

[0 0 0 0 0 0 0 1 0 0 0 0]

[0 0 0 0 0 0 0 0 0 0 0 1]]];

Tried aggregator 1 time.

MIP Presolve eliminated 48 rows and 0 columns.

Reduced MIP has 1093 rows, 239 columns, and 3483 nonzeros.

Reduced MIP has 180 binaries, 0 generals, 0 SOSs, and 0 indicators.

Presolve time = 0.01 sec. (1.23 ticks)

Found incumbent of value 4.000000 after 0.05 sec. (4.55 ticks)

Probing time = 0.00 sec. (0.30 ticks)

Tried aggregator 1 time.

Reduced MIP has 1093 rows, 239 columns, and 3483 nonzeros.

Reduced MIP has 191 binaries, 0 generals, 0 SOSs, and 0 indicators.

Presolve time = 0.00 sec. (1.59 ticks)

Probing time = 0.00 sec. (0.30 ticks)

Clique table members: 564.

MIP emphasis: balance optimality and feasibility.

MIP search method: dynamic search.

Parallel mode: deterministic, using up to 8 threads.

Root relaxation solution time = 0.02 sec. (4.67 ticks)

Nodes Cuts/

Node Left Objective IInf Best Integer Best Bound ItCnt Gap

\* 0+ 0 4.0000 0.0000 100.00%

0 0 0.0000 28 4.0000 0.0000 84 100.00%

0 0 0.0000 113 4.0000 Cuts: 198 174 100.00%

0 0 0.0000 30 4.0000 Cuts: 8 188 100.00%

0 0 0.0000 77 4.0000 Cuts: 373 334 100.00%

\* 0+ 0 2.0000 0.0000 100.00%

0 2 0.0000 33 2.0000 0.0000 334 100.00%

Elapsed time = 0.44 sec. (121.70 ticks, tree = 0.02 MB, solutions = 2)

1247 614 1.0000 6 2.0000 0.0000 31633 100.00%

2450 926 1.0000 12 2.0000 0.5000 76734 75.00%

3511 810 1.0000 8 2.0000 1.0000 121727 50.00%

4721 634 1.0000 13 2.0000 1.0000 171434 50.00%

5885 450 cutoff 2.0000 1.0000 229118 50.00%

7122 334 infeasible 2.0000 1.0000 274334 50.00%

8307 220 cutoff 2.0000 1.0000 320937 50.00%

9512 197 infeasible 2.0000 1.0000 375968 50.00%

10704 167 infeasible 2.0000 1.0000 420696 50.00%

15518 158 infeasible 2.0000 1.0000 633501 50.00%

Elapsed time = 4.45 sec. (3222.89 ticks, tree = 0.08 MB, solutions = 2)

GUB cover cuts applied: 19

Clique cuts applied: 2

Cover cuts applied: 88

Implied bound cuts applied: 87

Flow cuts applied: 1

Mixed integer rounding cuts applied: 46

Zero-half cuts applied: 1

Lift and project cuts applied: 1

Gomory fractional cuts applied: 1

Root node processing (before b&c):

Real time = 0.31 sec. (121.22 ticks)

Parallel b&c, 8 threads:

Real time = 5.17 sec. (4042.32 ticks)

Sync time (average) = 0.71 sec.

Wait time (average) = 0.00 sec.

------------

Total (root+branch&cut) = 5.48 sec. (4163.54 ticks)

Description Time Time % Peak Memory Peak Memory % Self Time Self Time % Local Memory Local Memory % Count Nodes

ROOT 5.7170 100% 34.922 M 100% 0.1610 3% 510.32 K 1% 1 50

READ\_DEFINITION OrderPicking 0.0000 0% 0 B 0% 0.0000 0% 256 B 0% 1 1

LOAD\_MODEL Configuration1-000000001403E3F8 0.0450 1% 192 K 1% 0.0150 0% 111.602 K 0% 1 19

LOAD\_DATA C:\Users\user\Desktop\OrderPicking\OrderPicking.dat 0.0230 0% 56 K 0% 0.0020 0% 38.578 K 0% 1 9

INIT n 0.0010 0% 36 K 0% 0.0010 0% 128 B 0% 1 1

INIT m 0.0000 0% 0 B 0% 0.0000 0% 128 B 0% 1 1

INIT C 0.0000 0% 0 B 0% 0.0000 0% 128 B 0% 1 1

INIT SKUs 0.0040 0% 0 B 0% 0.0040 0% 568 B 0% 1 1

INIT SKUInOrder 0.0160 0% 0 B 0% 0.0070 0% 2.789 K 0% 1 2

INIT Orders 0.0090 0% 0 B 0% 0.0090 0% 648 B 0% 1 1

INIT SKUOnRack 0.0000 0% 0 B 0% 0.0000 0% 2.461 K 0% 1 2

INIT Racks 0.0000 0% 0 B 0% 0.0000 0% 640 B 0% 1 1

PRE\_PROCESSING 0.0060 0% 0 B 0% 0.0010 0% 3.648 K 0% 1 3

EXECUTE anonymous#1 0.0050 0% 0 B 0% 0.0040 0% 3.344 K 0% 1 2

INIT RackHostSKU 0.0010 0% 0 B 0% 0.0010 0% 1.719 K 0% 1 1

INIT T 0.0000 0% 0 B 0% 0.0000 0% 544 B 0% 1 1

INIT alpha 0.0000 0% 0 B 0% 0.0000 0% 2.859 K 0% 1 2

INIT Slots 0.0000 0% 0 B 0% 0.0000 0% 600 B 0% 1 1

INIT x 0.0000 0% 0 B 0% 0.0000 0% 6.258 K 0% 1 1

INIT y 0.0000 0% 0 B 0% 0.0000 0% 7.219 K 0% 1 1

INIT z 0.0010 0% 132 K 0% 0.0010 0% 24.953 K 0% 1 1

EXTRACT Configuration1-000000001403E3F8 0.0310 1% 700 K 2% 0.0200 0% 293.352 K 1% 1 2

OBJECTIVE 0.0110 0% 4 K 0% 0.0110 0% -2.336 K -0% 1 1

CPLEX MIP Optimization 5.4770 96% 34.922 M 100% 0.1150 2% -3.953 M -11% 1 26

CPLEX Pre Solve 0.0120 0% 404 K 1% 0.0120 0% 404 K 1% 1 1

CPLEX Solve LP Relaxation 0.0130 0% 356 K 1% 0.0130 0% 356 K 1% 1 2

CPLEX Pre Solve 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Probing 0.0010 0% 100 K 0% 0.0010 0% 100 K 0% 1 1

CPLEX Pre Solve 0.0060 0% 152 K 0% 0.0060 0% 152 K 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Generating Cuts for Root Node 0.1320 2% 20.316 M 58% 0.0480 1% 20.316 M 58% 1 9

CPLEX Solve LP Relaxation 0.0740 1% 11.512 M 33% 0.0520 1% 419.878 K 1% 33 3

CPLEX Pre Solve 0.0020 0% 0 B 0% 0.0020 0% 0 B 0% 3 1

CPLEX Solve LP Relaxation 0.0200 0% 3.887 M 11% 0.0200 0% 853.714 K 2% 7 1

CPLEX Heuristics 0.0050 0% 76 K 0% 0.0030 0% 20 K 0% 4 3

CPLEX Solve LP Relaxation 0.0020 0% 76 K 0% 0.0010 0% 6.333 K 0% 12 2

CPLEX Solve LP Relaxation 0.0010 0% 76 K 0% 0.0010 0% 19 K 0% 4 1

CPLEX Probing 0.0010 0% 132 K 0% 0.0010 0% 54 K 0% 4 1

CPLEX Pre Solve 0.0040 0% 792 K 2% 0.0040 0% 108.5 K 0% 8 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Heuristics 0.0250 0% 0 B 0% 0.0030 0% 0 B 0% 1 3

CPLEX Solve LP Relaxation 0.0220 0% 0 B 0% 0.0040 0% 0 B 0% 23 2

CPLEX Solve LP Relaxation 0.0180 0% 0 B 0% 0.0180 0% 0 B 0% 17 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0010 0% 0 B 0% 0.0000 0% 0 B 0% 1 2

CPLEX Solve LP Relaxation 0.0010 0% 0 B 0% 0.0010 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Branch and Bound 5.1720 90% 0 B 0% 5.1720 90% -10.461 M -30% 1 1

POST\_PROCESSING 0.0030 0% 0 B 0% 0.0030 0% 6.375 K 0% 1 1

Description Time Time % Peak Memory Peak Memory % Self Time Self Time % Local Memory Local Memory % Count Nodes

ROOT 5.7170 100% 34.922 M 100% 0.1610 3% 510.32 K 1% 1 50

READ\_DEFINITION OrderPicking 0.0000 0% 0 B 0% 0.0000 0% 256 B 0% 1 1

LOAD\_MODEL Configuration1-000000001403E3F8 0.0450 1% 192 K 1% 0.0150 0% 111.602 K 0% 1 19

LOAD\_DATA C:\Users\user\Desktop\OrderPicking\OrderPicking.dat 0.0230 0% 56 K 0% 0.0020 0% 38.578 K 0% 1 9

INIT n 0.0010 0% 36 K 0% 0.0010 0% 128 B 0% 1 1

INIT m 0.0000 0% 0 B 0% 0.0000 0% 128 B 0% 1 1

INIT C 0.0000 0% 0 B 0% 0.0000 0% 128 B 0% 1 1

INIT SKUs 0.0040 0% 0 B 0% 0.0040 0% 568 B 0% 1 1

INIT SKUInOrder 0.0160 0% 0 B 0% 0.0070 0% 2.789 K 0% 1 2

INIT Orders 0.0090 0% 0 B 0% 0.0090 0% 648 B 0% 1 1

INIT SKUOnRack 0.0000 0% 0 B 0% 0.0000 0% 2.461 K 0% 1 2

INIT Racks 0.0000 0% 0 B 0% 0.0000 0% 640 B 0% 1 1

PRE\_PROCESSING 0.0060 0% 0 B 0% 0.0010 0% 3.648 K 0% 1 3

EXECUTE anonymous#1 0.0050 0% 0 B 0% 0.0040 0% 3.344 K 0% 1 2

INIT RackHostSKU 0.0010 0% 0 B 0% 0.0010 0% 1.719 K 0% 1 1

INIT T 0.0000 0% 0 B 0% 0.0000 0% 544 B 0% 1 1

INIT alpha 0.0000 0% 0 B 0% 0.0000 0% 2.859 K 0% 1 2

INIT Slots 0.0000 0% 0 B 0% 0.0000 0% 600 B 0% 1 1

INIT x 0.0000 0% 0 B 0% 0.0000 0% 6.258 K 0% 1 1

INIT y 0.0000 0% 0 B 0% 0.0000 0% 7.219 K 0% 1 1

INIT z 0.0010 0% 132 K 0% 0.0010 0% 24.953 K 0% 1 1

EXTRACT Configuration1-000000001403E3F8 0.0310 1% 700 K 2% 0.0200 0% 293.352 K 1% 1 2

OBJECTIVE 0.0110 0% 4 K 0% 0.0110 0% -2.336 K -0% 1 1

CPLEX MIP Optimization 5.4770 96% 34.922 M 100% 0.1150 2% -3.953 M -11% 1 26

CPLEX Pre Solve 0.0120 0% 404 K 1% 0.0120 0% 404 K 1% 1 1

CPLEX Solve LP Relaxation 0.0130 0% 356 K 1% 0.0130 0% 356 K 1% 1 2

CPLEX Pre Solve 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Probing 0.0010 0% 100 K 0% 0.0010 0% 100 K 0% 1 1

CPLEX Pre Solve 0.0060 0% 152 K 0% 0.0060 0% 152 K 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Generating Cuts for Root Node 0.1320 2% 20.316 M 58% 0.0480 1% 20.316 M 58% 1 9

CPLEX Solve LP Relaxation 0.0740 1% 11.512 M 33% 0.0520 1% 419.878 K 1% 33 3

CPLEX Pre Solve 0.0020 0% 0 B 0% 0.0020 0% 0 B 0% 3 1

CPLEX Solve LP Relaxation 0.0200 0% 3.887 M 11% 0.0200 0% 853.714 K 2% 7 1

CPLEX Heuristics 0.0050 0% 76 K 0% 0.0030 0% 20 K 0% 4 3

CPLEX Solve LP Relaxation 0.0020 0% 76 K 0% 0.0010 0% 6.333 K 0% 12 2

CPLEX Solve LP Relaxation 0.0010 0% 76 K 0% 0.0010 0% 19 K 0% 4 1

CPLEX Probing 0.0010 0% 132 K 0% 0.0010 0% 54 K 0% 4 1

CPLEX Pre Solve 0.0040 0% 792 K 2% 0.0040 0% 108.5 K 0% 8 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Heuristics 0.0250 0% 0 B 0% 0.0030 0% 0 B 0% 1 3

CPLEX Solve LP Relaxation 0.0220 0% 0 B 0% 0.0040 0% 0 B 0% 23 2

CPLEX Solve LP Relaxation 0.0180 0% 0 B 0% 0.0180 0% 0 B 0% 17 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0010 0% 0 B 0% 0.0000 0% 0 B 0% 1 2

CPLEX Solve LP Relaxation 0.0010 0% 0 B 0% 0.0010 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Solve LP Relaxation 0.0000 0% 0 B 0% 0.0000 0% 0 B 0% 1 1

CPLEX Branch and Bound 5.1720 90% 0 B 0% 5.1720 90% -10.461 M -30% 1 1

POST\_PROCESSING 0.0030 0% 0 B 0% 0.0030 0% 6.375 K 0% 1 1