Simulation Step 4 Model Verification

July 4, 2024

1 Prelude

```
[1]: import matplotlib.pyplot as plt
     import pulp
     import math
     import random
     import pandas as pd
     import numpy as np
     import simpy
```

2 Utilities

2.1 Points and Distances

```
[2]: def dist(p1, p2):
         (x1, y1) = p1
         (x2, y2) = p2
         return int(math.sqrt((x1-x2)**2+(y1-y2)**2))
```

2.2 PlotMap

```
[3]: def label(i):
         return (label(i//26-1)+chr(65+i%26)) if i>25 else chr(65+i)
```

```
[4]: def plotMap(G, T=[], P=[], w=None,
                 style='r-o', lw=1, ms=3,
                 styleT='go', msT=3,
                 styleP='b-o', lwP=2, msP=3,
                 stylePT='go', msPT=7,
                 styleW='ro', msW=9,
                 text=None, grid=False, labels=False, scale=False):

         V, E = G

         def round_down(x, level): return (x//level)*level
         def round_up(x, level): return (x//level+1)*level
```

```python
    xmin = round_down(min([ x for (x, _) in V ]), 100)
    xmax = round_up(max([ x for (x, _) in V ]), 100)
    ymin = round_down(min([ y for (_, y) in V ]), 100)
    ymax = round_up(max([ y for (_, y) in V ]), 100)
    dx = xmax-xmin
    dy = ymax-ymin
    yoffset = (ymax-ymin)//10

    fig = plt.gcf()
    fig.set_size_inches(4, 4)
    plt.xlim(xmin, xmax)
    plt.ylim(ymin-yoffset, ymax)

    if not grid:
        plt.axis('off')

    for e in E:
        p1, p2 = e
        plt.plot( [ p1[0], p2[0] ],
                  [ p1[1], p2[1] ],
                  style, lw=lw, ms=ms)
    if scale:
        # plot 1000m scale
        ybar = ymin-0.9*yoffset
        D = [ (xmin, ybar+50), (xmin, ybar), (xmin+1000, ybar), (xmin+1000,␣
↪ybar+50) ]
        plt.plot( [ d[0] for d in D ], [ d[1] for d in D ], 'k-', lw=0.5)
        plt.text(xmin+500, ymin-0.7*yoffset, '1000m' ,␣
↪horizontalalignment='center', size=8)

    if labels:
        for i in range(len(V)):
            x, y = V[i]
            plt.text(x+0.0150*dx, y-0.0350*dy, label(i), size=8)

    for t in T:
        plt.plot( [ t[0] ], [ t[1] ],
                  styleT, ms=msT)

    plt.plot( [ p[0] for p in P ],
              [ p[1] for p in P ],
              styleP, lw=lwP, ms=msP)

    for p in P:
        if p in T:
            plt.plot( [ p[0] ], [ p[1] ],
                      stylePT, ms=msPT)
```

```
    if w is not None:
        plt.plot( [ w[0] ], [ w[1] ],
                        styleW, ms=msW)
    if text is not None:
        plt.text(xmax, ymin-0.7*yoffset, text, horizontalalignment='right',␣
 ↪size=8)
    if grid:
        plt.grid()
    plt.show()
```

2.3 Add Targets

```
[5]: def addTargets(M, T):
    V, E = M
    E = E.copy()
    V = V.copy()
    for t in T:
        minD = math.inf
        minE = None
        for e in E:
            P, Q = e
            distT = dist(P, t)+dist(t, Q)-dist(P, Q)
            if distT < minD:
                minD = distT
                minE = e
        P, Q = minE
        E.remove( (P, Q) )
        E.append( (P, t) )
        E.append( (t, Q) )
        V.append(t)
    return V, E
```

2.4 Generate Central Warehouse Location

```
[6]: from statistics import median

def generateWarehouseLocation(M):
    V, _ = M
    xc = median([ x for (x, y) in V ])
    yc = median([ y for (x, y) in V ])
    cloc = (xc, yc)
    minloc = V[0]
    mindist = dist(minloc, cloc)
    for i in range(1, len(V)):
        d = dist(V[i], cloc)
        if d<mindist:
            minloc = V[i]
```

```
                mindist = dist(V[i], cloc)
        return minloc
```

2.5 Time Handling (NEW)

Convention: In this project we measure simulation time in seconds. The simulation will start at 0:00. Time related methods will be added as they are needed.

`timestamp(t)` generates a timestamp string in the form `[dd] hh:mm:ss.d`

```
[7]: def timestamp(t):
         t = round(t, 1)
         day = int(t)//(24*3600)
         t = t - day*24*3600
         hour = int(t)//3600
         t = t - hour*3600
         mins = int(t)//60
         t = t - mins*60
         secs = int(t)
         t = int(round((t-secs)*10,1))
         return f"[{day:2d}] {hour:02d}:{mins:02d}:{secs:02d}.{t:1d}"
```

```
[8]: timestamp(24*3600*3+17*3600+615.1)
```

```
[8]: '[ 3] 17:10:15.1'
```

```
[9]: timestamp(24*3600*12+3*3600+122.96)
```

```
[9]: '[12] 03:02:03.0'
```

```
[10]: def day(now):
          return int(now//(24*3600))
```

```
[11]: def nextHour(env, hour):
          beginningOfDay = int(env.now//(24*3600))*24*3600
          timeOfDay = env.now-beginningOfDay
          if hour*3600 > timeOfDay:
              return hour*3600 - timeOfDay
          else:
              return hour*3600 + 24*3600 - timeOfDay
```

3 Finding Shortest Path (as before)

```
[12]: def pathLength(P):
          return 0 if len(P)<=1 else \
                 dist(P[0], P[1])+pathLength(P[1:])
```

4

```
[13]: def shortestPath(M, A, B):

          def h(p):
              return pathLength(p)+dist(p[-1],B)

          # candidates C are pairs of the path so far and
          # the heuristic function of that path,
          # sorted by the heuristic function, as maintained by
          # insert function
          def insert(C, p):
              hp = h(p)
              c = (p, hp)
              for i in range(len(C)):
                  if C[i][1]>hp:
                      return C[:i]+[c]+C[i:]
              return C+[c]

          V, E = M
          assert(A in V and B in V)
          C = insert([], [A])

          while len(C)>0:
              # take the first candidate out of the list of candidates
              path, _ = C[0]
              C = C[1:]
              if path[-1]==B:
                  return path
              else:
                  for (x, y) in E:
                      if path[-1]==x and y not in path:
                          C = insert(C, path+[y])
                      elif path[-1]==y and x not in path:
                          C = insert(C, path+[x])
          return None
```

4 Finding Short Delivery Route (as before)

4.1 Greedy Algorithm

```
[14]: def FW(M):

          V, E = M

          n = len(V)
          d = [ [ math.inf for j in range(n) ] for i in range(n) ]
          p = [ [ None for j in range(n) ] for i in range(n) ]
```

```
    for (A, B) in E:
        a = V.index(A)
        b = V.index(B)
        d[a][b] = d[b][a] = dist(A, B)
        p[a][b] = [A, B]
        p[b][a] = [B, A]

    for i in range(n):
        d[i][i] = 0
        p[i][i] = [V[i]]

    for k in range(n):
        for i in range(n):
            for j in range(n):
                dk = d[i][k] + d[k][j]
                if d[i][j] > dk:
                    d[i][j] = dk
                    p[i][j] = p[i][k][:-1] + p[k][j]

    return d, p
```

[15]:
```
def createLoopG(M, T, timing=False):

    def makeLoop(L):
        loop = []
        for i in range(len(L)-1):
            A = L[i]
            B = L[i+1]
            a = V.index(A)
            b = V.index(B)
            sub = P[a][b]
            loop += sub if len(loop)==0 else sub[1:]
        return loop

    if timing:
        start_time = time.time()
        last_time = time.time()

    V, E = M
    D, P = FW(M)    # note these are the distances between all vertices in M␣
 ↪(and T)

    W = T[0]
    customers = T[1:]
    if len(T)==1:
        L = T
    elif len(T)<=3:
```

```
            L = T + [T[0]]
        else:
            L = T[:3]+[T[0]]
            T = T[3:]
            while len(T)>0:
                minExt = math.inf
                minInd = None
                selInd = None
                for k in range(len(T)):
                    C = T[k]
                    c = V.index(C)
                    for i in range(0, len(L)-1):
                        A = L[i]
                        B = L[i+1]
                        a = V.index(A)
                        b = V.index(B)
                        ext = D[a][c] + D[c][b] - D[a][b]
                        if ext<minExt:
                            minExt, minInd, selInd = ext, i+1, k
                L = L[:minInd]+[T[selInd]]+L[minInd:]
                T = T[:selInd]+T[selInd+1:]

    if timing:
        print(f"createLoopH:    {time.time()-start_time:6.2f}s")

    return makeLoop(L)
```

5 Finding Optimal Delivery Route

5.1 Iterative Integer Programming

```
[16]: def createTables(M, T):

    def reverse(P):
        return [ P[-i] for i in range(1,len(P)+1) ]

    def index(x, L):
        for i in range(len(L)):
            if x==L[i]:
                return i
        return None

    n = len(T)
    d = [ [ math.inf for t in T ] for t in T ]
    p = [ [ None for t in T ] for t in T ]
    for i in range(n):
        d[i][i] = 0
```

7

```
                p[i][i] = [ T[i] ]
        for i in range(n):
            for j in range(n):
                if p[i][j] is None:
                    s = shortestPath(M, T[i], T[j])
                    d[i][j] = d[j][i] = pathLength(s)
                    p[i][j] = s
                    p[j][i] = reverse(s)
                    for m in range(len(s)-1):
                        smi = index(s[m], T)
                        if smi is None:
                            continue
                        for l in range(m+1, len(s)):
                            sli = index(s[l], T)
                            if sli is None:
                                continue
                            sub = s[m:l+1]
                            if p[smi][sli] is None:
                                p[smi][sli] = sub
                                p[sli][smi] = reverse(sub)
                                d[smi][sli] = d[sli][smi] = pathLength(sub)
        return d,p
```

[17]:
```
def roundtrips(x, n):

    def isElem(x, l):
        for i in range(len(l)):
            if l[i]==x:
                return True
        return False

    def startpoint(trips):
        for i in range(n):
            for t in trips:
                if isElem(i, t):
                    break
            else:
                return i

    def totalLength(trips):
        s=0
        for i in range(0, len(trips)):
            s += len(trips[i])-1
        return s

    trips = []
    while totalLength(trips)<n:
```

```
        start = startpoint(trips)
        trip = [ start ]
        i = start
        while len(trip) < n-totalLength(trips):
            for j in range(0, n):
                if pulp.value(x[i][j])==1:
                    trip.append(j)
                    i=j
                    break
            if pulp.value(x[trip[-1]][start])==1:
                    trip.append(start)
                    break
        trips.append(trip)
    return sorted(trips, key=lambda t: len(t), reverse=True)
```

```
[18]: import time

def createLoop(M, T, timing=False):

    if timing:
        start_time = last_time = time.time()

    D, P = createTables(M, T)    # These are the distances between customers and␣
    ↪warehouse only

    if timing:
        print(f"createTables:    {time.time()-start_time:6.2f}s")
        last_time = time.time()

    n = len(T)
    # create variables
    x = pulp.LpVariable.dicts("x", ( range(n), range(n) ),
                              lowBound=0, upBound=1, cat=pulp.LpInteger)
    # create problem
    prob = pulp.LpProblem("Loop",pulp.LpMinimize)
    # add objective function
    prob += pulp.lpSum([ D[i][j]*x[i][j]
                              for i in range(n) for j in range(n) ])
    # add constraints
    constraints=0
    for j in range(n):
        prob += pulp.lpSum([ x[i][j] for i in range(n) if i!=j ]) ==1
    constraints += n
    for i in range(n):
        prob += pulp.lpSum([ x[i][j] for j in range(n) if i!=j ]) ==1
    constraints += n
    for i in range(n):
```

```python
        for j in range(n):
            if i!=j:
                prob += x[i][j]+x[j][i] <= 1
                constraints += 1

    def cycles(k, n):
        if k==1:
            return [ [i] for i in range(0,n) ]
        else:
            sc=cycles(k-1, n)
            all=[]
            for c in sc:
                for i in range(0,n):
                    if c.count(i)==0:
                        all.append(c+[i])
            return all

    for k in range(3, 4):
        cycs=cycles(k,n)
        for c in cycs:
            c.append(c[0])
            prob+=pulp.lpSum([ x[c[i]][c[i+1]] for i in range(0,k)]) <= k-1
            constraints += 1

    # initialise solver
    solvers = pulp.listSolvers(onlyAvailable=True)
    solver = pulp.getSolver(solvers[0], msg=0, timeLimit=2)
    res = prob.solve(solver)

    if timing:
        print(f"Solver:        {time.time()-last_time:6.2f}s {constraints:6,d}␣
↪Constraints")
        last_time = time.time()

    trips = roundtrips(x, n)
    while len(trips)>1:
        longest = max([ len(t) for t in trips ])
        for t in trips:
            if len(t)<longest:
                prob += pulp.lpSum([ x[t[i]][t[i+1]] + x[t[i+1]][t[i]]
                                    for i in range(0,len(t)-1) ]) <=␣
↪len(t)-2
                constraints += 1
            else:
                longest = math.inf

        res = prob.solve(solver)
```

```
        if timing:
            print(f"Solver:        {time.time()-last_time:6.2f}s {constraints:
↪6,d} Constraints")
            last_time = time.time()

        trips = roundtrips(x, n)
    trip = trips[0]
    # print(trip)
    loop = []
    for k in range(len(trip)-1):
        sub = P[trip[k]][trip[k+1]]
        loop += sub if len(loop)==0 else sub[1:]

    if timing:
        print(f"createLoop:    {time.time()-start_time:6.2f}s")

    return loop
```

6 Class Recorder

We willl use a class Recorder as a reference point for capturing data during the simulation. There
will be only one recorder. It will be created at the beginning of every simulation run. Every entity
will carry a reference to the Recorder.

```python
[19]: import time

class Recorder:

    def __init__(self, env, M, W, C, days,
                 log=False, plot=False, timing=False):
        self.env = env
        self.M = M
        self.W = W
        self.C = C
        self.days = days
        self.log = log
        self.plot = plot

    def trace(self, event):
        if self.log:
            print(timestamp(self.env.now), event)

    def finish(self):
        # simulation is finished for good
        # by removing the simulation environment we can
        # pickle recorder
```

```python
        self.env = None
```

7 Class Customer

```python
[20]: class Customer:

          def __init__(self, rec, id, location):
              self.rec = rec
              self.id = id
              self.location = location
              self.atHome = True
              self.answersDoor = False
              self.parcelsReceived = []
              rec.env.process(self.process())

          def __str__(self):
              return f"Customer {self.id:d} at {str(self.location):s}"

          def leaveHouse(self):
              assert(self.atHome and not self.answersDoor)
              # self.rec.trace(str(self)+" leaves house")
              self.atHome = False

          def returnHome(self):
              assert(not self.atHome)
              # self.rec.trace(str(self)+" returns home")
              self.atHome = True

          def answerDoor(self):
              if self.atHome:
                  yield self.rec.env.timeout(random.expovariate(1/
      ↪AVERAGE_TIME_ANSWER_DOOR))
                  self.rec.trace(str(self)+" answers door")
                  self.answersDoor = True
              else:
                  yield self.rec.env.timeout(WAIT_TIME_IF_CUSTOMER_DOESNT_ANSWER_DOOR)
                  self.rec(str(self)+" not at home")

          def acceptParcel(self, parcel):
              assert(self.answersDoor)
              self.parcelsReceived += [parcel]
              self.rec.trace(str(self)+" accepts "+str(parcel))

          def signOff(self):
              assert(self.answersDoor)
              self.rec.trace(str(self)+" signs off")
```

```python
        self.answersDoor = False

    def process(self):
        yield self.rec.env.timeout(nextHour(self.rec.env, 8))
        while day(self.rec.env.now)<self.rec.days:
            # in a refinement we may use random times
            self.leaveHouse()
            yield self.rec.env.timeout(nextHour(self.rec.env, 18))
            self.returnHome()
            yield self.rec.env.timeout(nextHour(self.rec.env, 8))
```

8   Class Parcel

Parcels follow through a sequence of states: - processing - in transit (from manufacture to distribution centre) - arrived in distribution centre - ready for delivery - out for delivery - customer not present - returned to distribution centre - delivered

```python
[21]: class Parcel:

    def __init__(self, rec, i, day, cust):
        self.rec = rec
        self.i = i
        self.arrival = day
        self.cust = cust
        self.status = [  ] # status record and
        self.timing = [  ] # timing

    def __str__(self):
        return f"Parcel {self.i:d} for cust {self.cust.id:d}"

    def index(self):
        return self.i

    def destination(self):
        return self.cust.location

    def __reg(self, state):
        self.status += [ state ]
        self.timing += [ self.rec.env.now ]
        self.rec.trace(str(self)+" "+state)

    def arrivedAtDeliveryCentre(self):
        self.__reg('arr at delivery centre')

    def outForDelivery(self):
        self.__reg('out for delivery')
```

```python
    def returnFromDelivery(self):
        self.__reg('return from delivery')
```

9 Class Driver

```python
[22]: class Driver:

    def __init__(self, rec, DC):
        self.rec = rec
        self.DC = DC
        self.location = None
        self.parcels = None
        self.tour = None
        self.rec.env.process(self.process())

    # activity
    def __drive(self, target):
        assert(self.tour[0] == self.location)
        while self.location!=target:
            d = dist(self.location, self.tour[1])
            yield self.rec.env.timeout(d / AVERAGE_SPEED)
            self.location = self.tour[1]
            self.tour = self.tour[1:]
        assert(self.tour[0] == self.location == target)

    def arriveForWork(self):
        self.location = self.DC.W
        self.parcels = []
        self.returns = []
        self.tour = [ self.DC.W ]
        self.rec.trace("Driver arrives for work")

    def leaveForDelivery(self, tour, parcels, addresses):
        self.tour, self.parcels = tour, parcels
        self.rec.trace(f"Driver leaves for delivery "
                       f"of {len(parcels):d} parcels "
                       f"to {len(addresses):d} customers")
        self.rec.trace(f"Length of delivery tour: {pathLength(tour):,d}m")
        if self.rec.plot:
            plotMap(self.rec.M, T=addresses, P=tour, w=tour[0],
                    text=f"Day {day(self.rec.env.now):d}:, {pathLength(tour):
    ↪,d}m")

    def process(self):
        yield self.rec.env.timeout(nextHour(self.rec.env, 18))
```

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```python
        while day(self.rec.env.now)<self.rec.days:
            self.arriveForWork()
            tour, parcels, addresses = self.DC.sendForDelivery()
            if len(parcels)==0:
                self.rec.trace("Nothing to do today")
            else:
                yield self.rec.env.timeout(PREP_TIME_PER_PARCEL*len(parcels))
                self.leaveForDelivery(tour, parcels, addresses)
                while len(self.parcels)>0:
                    # drive to customer
                    custLocation = self.parcels[0].destination()
                    cust = self.parcels[0].cust
                    self.rec.trace("Driver drives to "+str(cust))
                    yield from self.__drive(custLocation)
                    self.rec.trace("Driver arrived at "+str(cust))
                    # call at customer
                    yield from cust.answerDoor()

                    if cust.answersDoor:
                        while len(self.parcels)>0 and \
                                custLocation == self.parcels[0].destination():
                            cust.acceptParcel(self.parcels[0])
                            yield self.rec.env.timeout(random.expovariate(1/10))
                            self.parcels = self.parcels[1:]
                        cust.signOff()
                        yield self.rec.env.timeout(random.expovariate(1/10))
                    else:
                        while len(self.parcels)>0 and  \
                                custLocation == self.parcels[0].dest:
                            self.returns += self.parcels[0]
                            self.parcels = self.parcels[1:]

                # return to delivery centre
                self.rec.trace("Driver returns to delivery centre")
                yield from self.__drive(self.DC.W)
                self.rec.trace("Driver arrived at delivery centre")

                for parcel in self.returns:
                    self.DC.returnFromDelivery(parcel)
                    yield self.rec.env.timeout(RETURN_TIME_PER_PARCEL)

                leftOver = len(self.DC.parcels)+len(self.DC.leftOver)
                self.rec.trace(f"{leftOver:d} parcels left for next day")

            yield self.rec.env.timeout(600)

        self.rec.trace("Driver goes home")
```

```
            yield self.rec.env.timeout(nextHour(self.rec.env, 18))
```

10   Class Delivery Centre

```python
[23]: class DeliveryCentre:

          def __init__(self, rec, M, W):
              self.rec = rec
              self.M = M
              self.W = W
              self.limit = 30000

              self.leftOver = []     # list of parcels
              self.parcels = []      # list of parcels scheduled for delivery
              self.dest = []         # list of unique customer destinations
              self.tour = [self.W]   # tour planned for delivery

          def __accept(self, parcel):
              custLoc = parcel.destination()
              if custLoc not in self.dest:
                  MT = addTargets(self.M, self.dest + [custLoc])
                  SH = createLoopG(MT, [self.W] + self.dest + [custLoc])
                  if pathLength(SH)<self.limit:
                      self.parcels.append(parcel)
                      self.dest += [custLoc]
                      self.tour = SH
                  else:
                      self.leftOver.append(parcel)
              else:
                  self.parcels.append(parcel)

          def acceptParcel(self, parcel):
              parcel.arrivedAtDeliveryCentre()
              self.__accept(parcel)

          def sendForDelivery(self):
              parcels = []
              tour = self.tour
              addresses = []

              # pick parcels in sequence to be delivered
              for i in range(1, len(tour)-1):
                  dest = tour[i]
                  for p in self.parcels:
                      if p.destination() == dest and p not in parcels:
```

```python
                    parcels += [p]
                    p.outForDelivery()
                    if dest not in addresses:
                        addresses += [dest]

        # arrange the left overs for next day
        L = self.leftOver
        self.tour = [self.W]
        self.parcels = []
        self.leftOver = []
        self.dest = []
        for p in L:
            self.__accept(p)

        return tour, parcels, addresses

    def returnFromDelivery(self, parcel):
        parcel.returnFromDelivery()
        self.__accept(parcel)

    def getInventory(self):
        return len(self.parcels)+len(self.leftOver)
```

11 Simulation

11.1 Parameters from Specification

The time required for driving is based on the distance between way points at an average speed of 15km/h.

```
[24]:  AVERAGE_SPEED = 15/3.6
```

The **cumulative preparation time** (route planning and sorting of the parcels in the delivery order and packing the cargo-bike) is assumed to be 50 sec per parcel to be delivered.

```
[25]:  PREP_TIME_PER_PARCEL = 50
```

Additional assumption: The time to **process returned parcels** in the delivery centre is 30 sec per parce.

```
[26]:  RETURN_TIME_PER_PARCEL = 30
```

The average time to answer the door.

```
[27]:  AVERAGE_TIME_ANSWER_DOOR = 40
```

```
[28]:  WAIT_TIME_IF_CUSTOMER_DOESNT_ANSWER_DOOR = 60
```

11.2 Generate Input Data

```python
[29]: def generateDeliveries(p, C, days, seed=0):
          ## p is the average number of parcels per day per customer
          ## C is the number of customers to be served
          ## days is the number of days for which data are to be generated.
          random.seed(seed)
          deliveries = [ [ ] for _ in range(days) ]
          for c in range(C):
              arr = 0
              while True:
                  arr += random.expovariate(p)
                  day = int(arr)
                  if day>=days:
                      break
                  deliveries[day].append(c)
          return deliveries
```

11.3 Simulation Routine

```python
[30]: def simulation(M, W, C, p=0.2, days=10, seed=0,
                     log=False, plot=False, timing=False):

          random.seed(seed)
          D = generateDeliveries(p, len(C), days, seed)

          env = simpy.Environment()
          rec = Recorder(env, M, W, C, days,
                         log=log, plot=plot, timing=timing)

          print(f"Simulating delivery of {sum([len(d) for d in D]):d} parcels "
                f"over {len(D):d} days to {len(C):d} customers")

          CUSTOMERS = []
          for i in range(len(C)):
              CUSTOMERS.append(Customer(rec, i, C[i]))

          DC = DeliveryCentre(rec, M, W)
          Z = Driver(rec, DC)
          PARCELS = []

          def parcelGeneratorProcess(env, rec, D, C):
              for day in range(len(D)):
                  yield env.timeout(nextHour(env, 17.00))
                  for c in D[day]:
                      cust = CUSTOMERS[c]
                      parcel = Parcel(rec, len(PARCELS), day, cust)
```

```
                    PARCELS.append(parcel)
                    DC.acceptParcel(parcel)

        env.process(parcelGeneratorProcess(env, rec, D, C))
        env.run()

        rec.finish()

        if DC.getInventory()>0:
            print(f"Delivery Centre Inventory: {DC.getInventory():d} parcels")

        return rec
```

11.4 Model Verification

```
[31]: import pickle
      with open('simpleData.pickled', 'rb') as f:
          M, C = pickle.load(f)
```
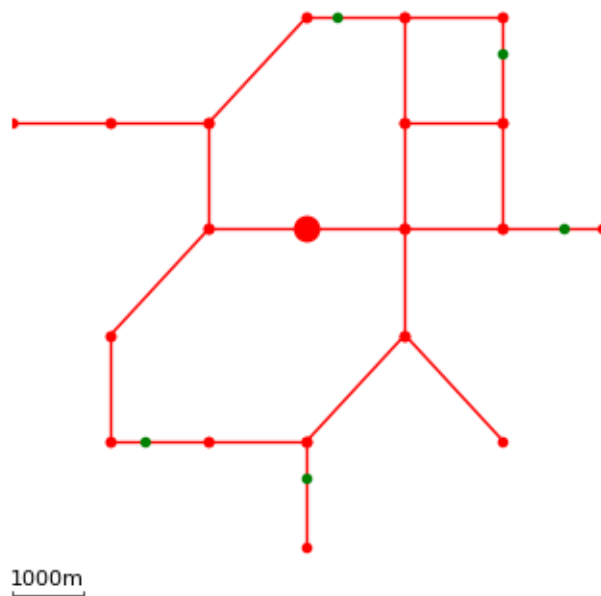
```
[32]: W = generateWarehouseLocation(M)
```

```
[33]: plotMap(M, T=C, w=W, scale=True)
```



```
[34]: rec1 = simulation(M, W, C, p=0.15, days=4, log=True)
```

```
Simulating delivery of 2 parcels over 4 days to 5 customers
[ 0] 18:00:00.0 Driver arrives for work
```

```
[ 0] 18:00:00.0 Nothing to do today
[ 0] 18:10:00.0 Driver goes home
[ 1] 18:00:00.0 Driver arrives for work
[ 1] 18:00:00.0 Nothing to do today
[ 1] 18:10:00.0 Driver goes home
[ 2] 18:00:00.0 Driver arrives for work
[ 2] 18:00:00.0 Nothing to do today
[ 2] 18:10:00.0 Driver goes home
[ 3] 17:00:00.0 Parcel 0 for cust 2 arr at delivery centre
[ 3] 17:00:00.0 Parcel 1 for cust 4 arr at delivery centre
[ 3] 18:00:00.0 Driver arrives for work
[ 3] 18:00:00.0 Parcel 0 for cust 2 out for delivery
[ 3] 18:00:00.0 Parcel 1 for cust 4 out for delivery
[ 3] 18:01:40.0 Driver leaves for delivery of 2 parcels to 2 customers
[ 3] 18:01:40.0 Length of delivery tour: 14,876m
[ 3] 18:01:40.0 Driver drives to Customer 2 at (4929, 7300)
[ 3] 18:22:21.0 Driver arrived at Customer 2 at (4929, 7300)
[ 3] 18:22:35.5 Customer 2 at (4929, 7300) answers door
[ 3] 18:22:35.5 Customer 2 at (4929, 7300) accepts Parcel 0 for cust 2
[ 3] 18:22:42.0 Customer 2 at (4929, 7300) signs off
[ 3] 18:22:50.7 Driver drives to Customer 4 at (8167, 4500)
[ 3] 18:46:59.8 Driver arrived at Customer 4 at (8167, 4500)
[ 3] 18:48:35.3 Customer 4 at (8167, 4500) answers door
[ 3] 18:48:35.3 Customer 4 at (8167, 4500) accepts Parcel 1 for cust 4
[ 3] 18:48:42.4 Customer 4 at (8167, 4500) signs off
[ 3] 18:48:45.7 Driver returns to delivery centre
[ 3] 19:03:25.8 Driver arrived at delivery centre
[ 3] 19:03:25.8 0 parcels left for next day
[ 3] 19:13:25.8 Driver goes home
```

```
[35]: rec2 = simulation(M, W, C, p=0.3, days=4, log=True, plot=True)
```

```
Simulating delivery of 5 parcels over 4 days to 5 customers
[ 0] 18:00:00.0 Driver arrives for work
[ 0] 18:00:00.0 Nothing to do today
[ 0] 18:10:00.0 Driver goes home
[ 1] 17:00:00.0 Parcel 0 for cust 2 arr at delivery centre
[ 1] 17:00:00.0 Parcel 1 for cust 3 arr at delivery centre
[ 1] 17:00:00.0 Parcel 2 for cust 4 arr at delivery centre
[ 1] 18:00:00.0 Driver arrives for work
[ 1] 18:00:00.0 Parcel 0 for cust 2 out for delivery
[ 1] 18:00:00.0 Parcel 1 for cust 3 out for delivery
[ 1] 18:00:00.0 Parcel 2 for cust 4 out for delivery
[ 1] 18:02:30.0 Driver leaves for delivery of 3 parcels to 3 customers
[ 1] 18:02:30.0 Length of delivery tour: 14,876m
```
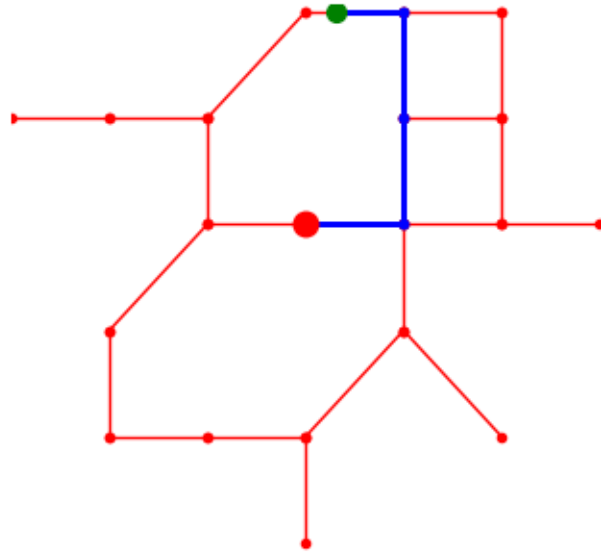
Day 1:, 14,876m
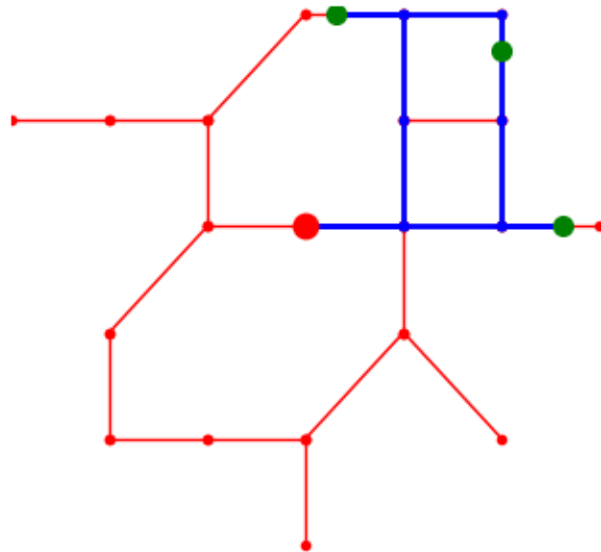
```
[ 1] 18:02:30.0 Driver drives to Customer 2 at (4929, 7300)
[ 1] 18:23:11.0 Driver arrived at Customer 2 at (4929, 7300)
[ 1] 18:24:46.5 Customer 2 at (4929, 7300) answers door
[ 1] 18:24:46.5 Customer 2 at (4929, 7300) accepts Parcel 0 for cust 2
[ 1] 18:24:53.6 Customer 2 at (4929, 7300) signs off
[ 1] 18:24:56.9 Driver drives to Customer 3 at (7300, 6825)
[ 1] 18:36:19.9 Driver arrived at Customer 3 at (7300, 6825)
[ 1] 18:37:16.3 Customer 3 at (7300, 6825) answers door
[ 1] 18:37:16.3 Customer 3 at (7300, 6825) accepts Parcel 1 for cust 3
[ 1] 18:37:25.9 Customer 3 at (7300, 6825) signs off
[ 1] 18:37:28.8 Driver drives to Customer 4 at (8167, 4500)
[ 1] 18:50:14.9 Driver arrived at Customer 4 at (8167, 4500)
[ 1] 18:51:51.1 Customer 4 at (8167, 4500) answers door
[ 1] 18:51:51.1 Customer 4 at (8167, 4500) accepts Parcel 2 for cust 4
[ 1] 18:52:31.7 Customer 4 at (8167, 4500) signs off
[ 1] 18:52:48.3 Driver returns to delivery centre
[ 1] 19:07:28.4 Driver arrived at delivery centre
[ 1] 19:07:28.4 0 parcels left for next day
[ 1] 19:17:28.4 Driver goes home
[ 2] 17:00:00.0 Parcel 3 for cust 2 arr at delivery centre
[ 2] 18:00:00.0 Driver arrives for work
[ 2] 18:00:00.0 Parcel 3 for cust 2 out for delivery
[ 2] 18:00:50.0 Driver leaves for delivery of 1 parcels to 1 customers
[ 2] 18:00:50.0 Length of delivery tour: 10,342m
```

Day 2:, 10,342m

```
[ 2] 18:00:50.0 Driver drives to Customer 2 at (4929, 7300)
[ 2] 18:21:31.0 Driver arrived at Customer 2 at (4929, 7300)
[ 2] 18:23:04.0 Customer 2 at (4929, 7300) answers door
[ 2] 18:23:04.0 Customer 2 at (4929, 7300) accepts Parcel 3 for cust 2
[ 2] 18:23:07.7 Customer 2 at (4929, 7300) signs off
[ 2] 18:23:20.8 Driver returns to delivery centre
[ 2] 18:44:01.9 Driver arrived at delivery centre
[ 2] 18:44:01.9 0 parcels left for next day
[ 2] 18:54:01.9 Driver goes home
[ 3] 17:00:00.0 Parcel 4 for cust 4 arr at delivery centre
[ 3] 18:00:00.0 Driver arrives for work
[ 3] 18:00:00.0 Parcel 4 for cust 4 out for delivery
[ 3] 18:00:50.0 Driver leaves for delivery of 1 parcels to 1 customers
[ 3] 18:00:50.0 Length of delivery tour: 7,334m
```

Day 3:, 7,334m
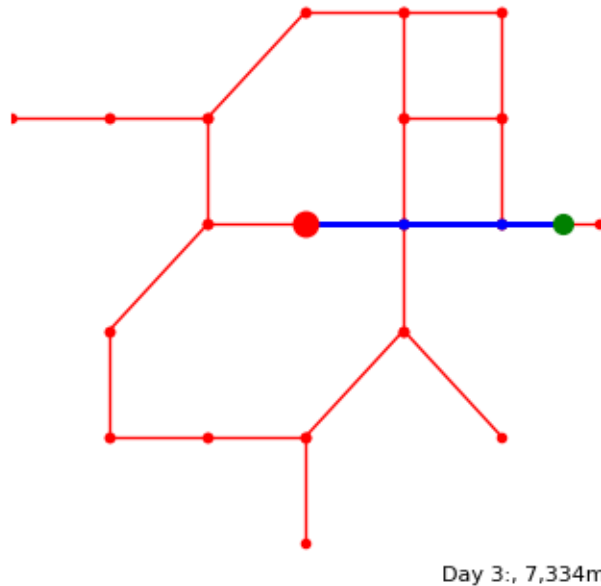
```
[ 3]  18:00:50.0 Driver drives to Customer 4 at (8167, 4500)
[ 3]  18:15:30.1 Driver arrived at Customer 4 at (8167, 4500)
[ 3]  18:17:01.7 Customer 4 at (8167, 4500) answers door
[ 3]  18:17:01.7 Customer 4 at (8167, 4500) accepts Parcel 4 for cust 4
[ 3]  18:17:13.2 Customer 4 at (8167, 4500) signs off
[ 3]  18:17:19.6 Driver returns to delivery centre
[ 3]  18:31:59.7 Driver arrived at delivery centre
[ 3]  18:31:59.7 0 parcels left for next day
[ 3]  18:41:59.7 Driver goes home
```

[36]: ```python
rec3 = simulation(M, W, C, p=0.6, days=4, log=True)
```

```
Simulating delivery of 12 parcels over 4 days to 5 customers
[ 0]  17:00:00.0 Parcel 0 for cust 1 arr at delivery centre
[ 0]  17:00:00.0 Parcel 1 for cust 2 arr at delivery centre
[ 0]  18:00:00.0 Driver arrives for work
[ 0]  18:00:00.0 Parcel 0 for cust 1 out for delivery
[ 0]  18:00:00.0 Parcel 1 for cust 2 out for delivery
[ 0]  18:01:40.0 Driver leaves for delivery of 2 parcels to 2 customers
[ 0]  18:01:40.0 Length of delivery tour: 18,052m
[ 0]  18:01:40.0 Driver drives to Customer 1 at (4500, 1224)
[ 0]  18:22:41.2 Driver arrived at Customer 1 at (4500, 1224)
[ 0]  18:25:23.7 Customer 1 at (4500, 1224) answers door
[ 0]  18:25:23.7 Customer 1 at (4500, 1224) accepts Parcel 0 for cust 1
[ 0]  18:25:40.3 Customer 1 at (4500, 1224) signs off
[ 0]  18:26:03.5 Driver drives to Customer 2 at (4929, 7300)
[ 0]  18:56:33.8 Driver arrived at Customer 2 at (4929, 7300)
```

```
[ 0] 18:56:48.6 Customer 2 at (4929, 7300) answers door
[ 0] 18:56:48.6 Customer 2 at (4929, 7300) accepts Parcel 1 for cust 2
[ 0] 18:57:01.7 Customer 2 at (4929, 7300) signs off
[ 0] 18:57:24.6 Driver returns to delivery centre
[ 0] 19:18:05.7 Driver arrived at delivery centre
[ 0] 19:18:05.7 0 parcels left for next day
[ 0] 19:28:05.7 Driver goes home
[ 1] 17:00:00.0 Parcel 2 for cust 1 arr at delivery centre
[ 1] 17:00:00.0 Parcel 3 for cust 2 arr at delivery centre
[ 1] 17:00:00.0 Parcel 4 for cust 3 arr at delivery centre
[ 1] 17:00:00.0 Parcel 5 for cust 3 arr at delivery centre
[ 1] 17:00:00.0 Parcel 6 for cust 4 arr at delivery centre
[ 1] 18:00:00.0 Driver arrives for work
[ 1] 18:00:00.0 Parcel 2 for cust 1 out for delivery
[ 1] 18:00:00.0 Parcel 6 for cust 4 out for delivery
[ 1] 18:00:00.0 Parcel 4 for cust 3 out for delivery
[ 1] 18:00:00.0 Parcel 5 for cust 3 out for delivery
[ 1] 18:00:00.0 Parcel 3 for cust 2 out for delivery
[ 1] 18:04:10.0 Driver leaves for delivery of 5 parcels to 4 customers
[ 1] 18:04:10.0 Length of delivery tour: 22,586m
[ 1] 18:04:10.0 Driver drives to Customer 1 at (4500, 1224)
[ 1] 18:25:11.2 Driver arrived at Customer 1 at (4500, 1224)
[ 1] 18:25:57.3 Customer 1 at (4500, 1224) answers door
[ 1] 18:25:57.3 Customer 1 at (4500, 1224) accepts Parcel 2 for cust 1
[ 1] 18:26:03.7 Customer 1 at (4500, 1224) signs off
[ 1] 18:26:04.7 Driver drives to Customer 4 at (8167, 4500)
[ 1] 18:50:34.0 Driver arrived at Customer 4 at (8167, 4500)
[ 1] 18:50:56.8 Customer 4 at (8167, 4500) answers door
[ 1] 18:50:56.8 Customer 4 at (8167, 4500) accepts Parcel 6 for cust 4
[ 1] 18:51:06.2 Customer 4 at (8167, 4500) signs off
[ 1] 18:51:30.6 Driver drives to Customer 3 at (7300, 6825)
[ 1] 19:04:16.7 Driver arrived at Customer 3 at (7300, 6825)
[ 1] 19:06:32.7 Customer 3 at (7300, 6825) answers door
[ 1] 19:06:32.7 Customer 3 at (7300, 6825) accepts Parcel 4 for cust 3
[ 1] 19:06:39.2 Customer 3 at (7300, 6825) accepts Parcel 5 for cust 3
[ 1] 19:06:59.2 Customer 3 at (7300, 6825) signs off
[ 1] 19:07:02.2 Driver drives to Customer 2 at (4929, 7300)
[ 1] 19:18:25.3 Driver arrived at Customer 2 at (4929, 7300)
[ 1] 19:19:30.7 Customer 2 at (4929, 7300) answers door
[ 1] 19:19:30.7 Customer 2 at (4929, 7300) accepts Parcel 3 for cust 2
[ 1] 19:19:38.6 Customer 2 at (4929, 7300) signs off
[ 1] 19:19:38.8 Driver returns to delivery centre
[ 1] 19:40:19.8 Driver arrived at delivery centre
[ 1] 19:40:19.8 0 parcels left for next day
[ 1] 19:50:19.8 Driver goes home
[ 2] 17:00:00.0 Parcel 7 for cust 1 arr at delivery centre
[ 2] 17:00:00.0 Parcel 8 for cust 4 arr at delivery centre
[ 2] 18:00:00.0 Driver arrives for work
```

```
[ 2] 18:00:00.0 Parcel 7 for cust 1 out for delivery
[ 2] 18:00:00.0 Parcel 8 for cust 4 out for delivery
[ 2] 18:01:40.0 Driver leaves for delivery of 2 parcels to 2 customers
[ 2] 18:01:40.0 Length of delivery tour: 15,044m
[ 2] 18:01:40.0 Driver drives to Customer 1 at (4500, 1224)
[ 2] 18:22:41.2 Driver arrived at Customer 1 at (4500, 1224)
[ 2] 18:23:32.1 Customer 1 at (4500, 1224) answers door
[ 2] 18:23:32.1 Customer 1 at (4500, 1224) accepts Parcel 7 for cust 1
[ 2] 18:23:37.2 Customer 1 at (4500, 1224) signs off
[ 2] 18:23:54.6 Driver drives to Customer 4 at (8167, 4500)
[ 2] 18:48:23.9 Driver arrived at Customer 4 at (8167, 4500)
[ 2] 18:49:08.0 Customer 4 at (8167, 4500) answers door
[ 2] 18:49:08.0 Customer 4 at (8167, 4500) accepts Parcel 8 for cust 4
[ 2] 18:49:08.0 Customer 4 at (8167, 4500) signs off
[ 2] 18:49:14.8 Driver returns to delivery centre
[ 2] 19:03:54.9 Driver arrived at delivery centre
[ 2] 19:03:54.9 0 parcels left for next day
[ 2] 19:13:54.9 Driver goes home
[ 3] 17:00:00.0 Parcel 9 for cust 0 arr at delivery centre
[ 3] 17:00:00.0 Parcel 10 for cust 1 arr at delivery centre
[ 3] 17:00:00.0 Parcel 11 for cust 2 arr at delivery centre
[ 3] 18:00:00.0 Driver arrives for work
[ 3] 18:00:00.0 Parcel 9 for cust 0 out for delivery
[ 3] 18:00:00.0 Parcel 10 for cust 1 out for delivery
[ 3] 18:00:00.0 Parcel 11 for cust 2 out for delivery
[ 3] 18:02:30.0 Driver leaves for delivery of 3 parcels to 3 customers
[ 3] 18:02:30.0 Length of delivery tour: 20,852m
[ 3] 18:02:30.0 Driver drives to Customer 0 at (2176, 1700)
[ 3] 18:23:31.2 Driver arrived at Customer 0 at (2176, 1700)
[ 3] 18:24:52.1 Customer 0 at (2176, 1700) answers door
[ 3] 18:24:52.1 Customer 0 at (2176, 1700) accepts Parcel 9 for cust 0
[ 3] 18:24:54.9 Customer 0 at (2176, 1700) signs off
[ 3] 18:24:58.8 Driver drives to Customer 1 at (4500, 1224)
[ 3] 18:36:10.8 Driver arrived at Customer 1 at (4500, 1224)
[ 3] 18:37:32.6 Customer 1 at (4500, 1224) answers door
[ 3] 18:37:32.6 Customer 1 at (4500, 1224) accepts Parcel 10 for cust 1
[ 3] 18:37:34.7 Customer 1 at (4500, 1224) signs off
[ 3] 18:37:43.1 Driver drives to Customer 2 at (4929, 7300)
[ 3] 19:08:13.3 Driver arrived at Customer 2 at (4929, 7300)
[ 3] 19:08:24.2 Customer 2 at (4929, 7300) answers door
[ 3] 19:08:24.2 Customer 2 at (4929, 7300) accepts Parcel 11 for cust 2
[ 3] 19:08:58.5 Customer 2 at (4929, 7300) signs off
[ 3] 19:09:14.7 Driver returns to delivery centre
[ 3] 19:29:55.8 Driver arrived at delivery centre
[ 3] 19:29:55.8 0 parcels left for next day
[ 3] 19:39:55.8 Driver goes home
```

```python
[37]: import pickle
      with open('testData.pickled', 'rb') as f:
          MX, CX = pickle.load(f)
```

```python
[38]: WX = generateWarehouseLocation(MX)
```

```python
[39]: rec4 = simulation(MX, WX, CX, p=0.15, days=7, log=True)
```

```
Simulating delivery of 14 parcels over 7 days to 20 customers
[ 0] 18:00:00.0 Driver arrives for work
[ 0] 18:00:00.0 Nothing to do today
[ 0] 18:10:00.0 Driver goes home
[ 1] 18:00:00.0 Driver arrives for work
[ 1] 18:00:00.0 Nothing to do today
[ 1] 18:10:00.0 Driver goes home
[ 2] 17:00:00.0 Parcel 0 for cust 4 arr at delivery centre
[ 2] 17:00:00.0 Parcel 1 for cust 12 arr at delivery centre
[ 2] 17:00:00.0 Parcel 2 for cust 19 arr at delivery centre
[ 2] 18:00:00.0 Driver arrives for work
[ 2] 18:00:00.0 Parcel 0 for cust 4 out for delivery
[ 2] 18:00:00.0 Parcel 2 for cust 19 out for delivery
[ 2] 18:00:00.0 Parcel 1 for cust 12 out for delivery
[ 2] 18:02:30.0 Driver leaves for delivery of 3 parcels to 3 customers
[ 2] 18:02:30.0 Length of delivery tour: 18,677m
[ 2] 18:02:30.0 Driver drives to Customer 4 at (2821, 1578)
[ 2] 18:19:48.7 Driver arrived at Customer 4 at (2821, 1578)
[ 2] 18:20:20.5 Customer 4 at (2821, 1578) answers door
[ 2] 18:20:20.5 Customer 4 at (2821, 1578) accepts Parcel 0 for cust 4
[ 2] 18:20:20.7 Customer 4 at (2821, 1578) signs off
[ 2] 18:20:33.4 Driver drives to Customer 19 at (7950, 4122)
[ 2] 18:51:32.2 Driver arrived at Customer 19 at (7950, 4122)
[ 2] 18:51:52.6 Customer 19 at (7950, 4122) answers door
[ 2] 18:51:52.6 Customer 19 at (7950, 4122) accepts Parcel 2 for cust 19
[ 2] 18:52:10.0 Customer 19 at (7950, 4122) signs off
[ 2] 18:52:21.0 Driver drives to Customer 12 at (6061, 4500)
[ 2] 19:01:25.1 Driver arrived at Customer 12 at (6061, 4500)
[ 2] 19:01:25.1 Customer 12 at (6061, 4500) answers door
[ 2] 19:01:25.1 Customer 12 at (6061, 4500) accepts Parcel 1 for cust 12
[ 2] 19:01:31.9 Customer 12 at (6061, 4500) signs off
[ 2] 19:01:52.2 Driver returns to delivery centre
[ 2] 19:19:13.0 Driver arrived at delivery centre
[ 2] 19:19:13.0 0 parcels left for next day
[ 2] 19:29:13.0 Driver goes home
[ 3] 17:00:00.0 Parcel 3 for cust 2 arr at delivery centre
[ 3] 17:00:00.0 Parcel 4 for cust 3 arr at delivery centre
[ 3] 18:00:00.0 Driver arrives for work
[ 3] 18:00:00.0 Parcel 3 for cust 2 out for delivery
[ 3] 18:00:00.0 Parcel 4 for cust 3 out for delivery
```

```
[ 3] 18:01:40.0 Driver leaves for delivery of 2 parcels to 2 customers
[ 3] 18:01:40.0 Length of delivery tour: 4,668m
[ 3] 18:01:40.0 Driver drives to Customer 2 at (1618, 4500)
[ 3] 18:08:35.7 Driver arrived at Customer 2 at (1618, 4500)
[ 3] 18:08:46.9 Customer 2 at (1618, 4500) answers door
[ 3] 18:08:46.9 Customer 2 at (1618, 4500) accepts Parcel 3 for cust 2
[ 3] 18:08:50.8 Customer 2 at (1618, 4500) signs off
[ 3] 18:09:11.2 Driver drives to Customer 3 at (2200, 3898)
[ 3] 18:13:55.4 Driver arrived at Customer 3 at (2200, 3898)
[ 3] 18:14:03.9 Customer 3 at (2200, 3898) answers door
[ 3] 18:14:03.9 Customer 3 at (2200, 3898) accepts Parcel 4 for cust 3
[ 3] 18:14:12.3 Customer 3 at (2200, 3898) signs off
[ 3] 18:14:15.0 Driver returns to delivery centre
[ 3] 18:21:15.5 Driver arrived at delivery centre
[ 3] 18:21:15.5 0 parcels left for next day
[ 3] 18:31:15.5 Driver goes home
[ 4] 17:00:00.0 Parcel 5 for cust 6 arr at delivery centre
[ 4] 17:00:00.0 Parcel 6 for cust 15 arr at delivery centre
[ 4] 17:00:00.0 Parcel 7 for cust 15 arr at delivery centre
[ 4] 17:00:00.0 Parcel 8 for cust 18 arr at delivery centre
[ 4] 18:00:00.0 Driver arrives for work
[ 4] 18:00:00.0 Parcel 5 for cust 6 out for delivery
[ 4] 18:00:00.0 Parcel 6 for cust 15 out for delivery
[ 4] 18:00:00.0 Parcel 7 for cust 15 out for delivery
[ 4] 18:00:00.0 Parcel 8 for cust 18 out for delivery
[ 4] 18:03:20.0 Driver leaves for delivery of 4 parcels to 3 customers
[ 4] 18:03:20.0 Length of delivery tour: 18,678m
[ 4] 18:03:20.0 Driver drives to Customer 6 at (4142, 1050)
[ 4] 18:26:48.3 Driver arrived at Customer 6 at (4142, 1050)
[ 4] 18:29:05.4 Customer 6 at (4142, 1050) answers door
[ 4] 18:29:05.4 Customer 6 at (4142, 1050) accepts Parcel 5 for cust 6
[ 4] 18:29:21.7 Customer 6 at (4142, 1050) signs off
[ 4] 18:29:27.6 Driver drives to Customer 15 at (7302, 3350)
[ 4] 18:48:36.3 Driver arrived at Customer 15 at (7302, 3350)
[ 4] 18:48:39.6 Customer 15 at (7302, 3350) answers door
[ 4] 18:48:39.6 Customer 15 at (7302, 3350) accepts Parcel 6 for cust 15
[ 4] 18:48:43.5 Customer 15 at (7302, 3350) accepts Parcel 7 for cust 15
[ 4] 18:48:50.6 Customer 15 at (7302, 3350) signs off
[ 4] 18:49:17.6 Driver drives to Customer 18 at (7816, 4500)
[ 4] 18:57:01.3 Driver arrived at Customer 18 at (7816, 4500)
[ 4] 18:57:05.9 Customer 18 at (7816, 4500) answers door
[ 4] 18:57:05.9 Customer 18 at (7816, 4500) accepts Parcel 8 for cust 18
[ 4] 18:57:13.9 Customer 18 at (7816, 4500) signs off
[ 4] 18:57:26.1 Driver returns to delivery centre
[ 4] 19:21:48.2 Driver arrived at delivery centre
[ 4] 19:21:48.2 0 parcels left for next day
[ 4] 19:31:48.2 Driver goes home
[ 5] 17:00:00.0 Parcel 9 for cust 2 arr at delivery centre
```

```
[ 5]  18:00:00.0  Driver arrives for work
[ 5]  18:00:00.0  Parcel 9 for cust 2 out for delivery
[ 5]  18:00:50.0  Driver leaves for delivery of 1 parcels to 1 customers
[ 5]  18:00:50.0  Length of delivery tour: 3,464m
[ 5]  18:00:50.0  Driver drives to Customer 2 at (1618, 4500)
[ 5]  18:07:45.7  Driver arrived at Customer 2 at (1618, 4500)
[ 5]  18:08:17.4  Customer 2 at (1618, 4500) answers door
[ 5]  18:08:17.4  Customer 2 at (1618, 4500) accepts Parcel 9 for cust 2
[ 5]  18:08:34.2  Customer 2 at (1618, 4500) signs off
[ 5]  18:08:42.0  Driver returns to delivery centre
[ 5]  18:15:37.7  Driver arrived at delivery centre
[ 5]  18:15:37.7  0 parcels left for next day
[ 5]  18:25:37.7  Driver goes home
[ 6]  17:00:00.0  Parcel 10 for cust 4 arr at delivery centre
[ 6]  17:00:00.0  Parcel 11 for cust 6 arr at delivery centre
[ 6]  17:00:00.0  Parcel 12 for cust 7 arr at delivery centre
[ 6]  17:00:00.0  Parcel 13 for cust 16 arr at delivery centre
[ 6]  18:00:00.0  Driver arrives for work
[ 6]  18:00:00.0  Parcel 10 for cust 4 out for delivery
[ 6]  18:00:00.0  Parcel 11 for cust 6 out for delivery
[ 6]  18:00:00.0  Parcel 13 for cust 16 out for delivery
[ 6]  18:00:00.0  Parcel 12 for cust 7 out for delivery
[ 6]  18:03:20.0  Driver leaves for delivery of 4 parcels to 4 customers
[ 6]  18:03:20.0  Length of delivery tour: 17,731m
[ 6]  18:03:20.0  Driver drives to Customer 4 at (2821, 1578)
[ 6]  18:20:38.7  Driver arrived at Customer 4 at (2821, 1578)
[ 6]  18:22:51.5  Customer 4 at (2821, 1578) answers door
[ 6]  18:22:51.5  Customer 4 at (2821, 1578) accepts Parcel 10 for cust 4
[ 6]  18:23:00.8  Customer 4 at (2821, 1578) signs off
[ 6]  18:23:09.6  Driver drives to Customer 6 at (4142, 1050)
[ 6]  18:29:19.0  Driver arrived at Customer 6 at (4142, 1050)
[ 6]  18:29:42.5  Customer 6 at (4142, 1050) answers door
[ 6]  18:29:42.5  Customer 6 at (4142, 1050) accepts Parcel 11 for cust 6
[ 6]  18:29:51.6  Customer 6 at (4142, 1050) signs off
[ 6]  18:29:56.5  Driver drives to Customer 16 at (7477, 5650)
[ 6]  18:58:59.1  Driver arrived at Customer 16 at (7477, 5650)
[ 6]  18:59:33.4  Customer 16 at (7477, 5650) answers door
[ 6]  18:59:33.4  Customer 16 at (7477, 5650) accepts Parcel 13 for cust 16
[ 6]  18:59:36.8  Customer 16 at (7477, 5650) signs off
[ 6]  18:59:38.9  Driver drives to Customer 7 at (5182, 5650)
[ 6]  19:08:49.7  Driver arrived at Customer 7 at (5182, 5650)
[ 6]  19:08:58.0  Customer 7 at (5182, 5650) answers door
[ 6]  19:08:58.0  Customer 7 at (5182, 5650) accepts Parcel 12 for cust 7
[ 6]  19:09:07.5  Customer 7 at (5182, 5650) signs off
[ 6]  19:09:18.2  Driver returns to delivery centre
[ 6]  19:18:32.1  Driver arrived at delivery centre
[ 6]  19:18:32.1  0 parcels left for next day
[ 6]  19:28:32.1  Driver goes home
```

```
[40]: rec5 = simulation(MX, WX, CX, p=1.2, days=7, log=True)
```

```
Simulating delivery of 151 parcels over 7 days to 20 customers
[ 0] 17:00:00.0 Parcel 0 for cust 5 arr at delivery centre
[ 0] 17:00:00.0 Parcel 1 for cust 6 arr at delivery centre
[ 0] 17:00:00.0 Parcel 2 for cust 6 arr at delivery centre
[ 0] 17:00:00.0 Parcel 3 for cust 7 arr at delivery centre
[ 0] 17:00:00.0 Parcel 4 for cust 7 arr at delivery centre
[ 0] 17:00:00.0 Parcel 5 for cust 8 arr at delivery centre
[ 0] 17:00:00.0 Parcel 6 for cust 13 arr at delivery centre
[ 0] 17:00:00.0 Parcel 7 for cust 13 arr at delivery centre
[ 0] 17:00:00.0 Parcel 8 for cust 15 arr at delivery centre
[ 0] 17:00:00.0 Parcel 9 for cust 16 arr at delivery centre
[ 0] 17:00:00.0 Parcel 10 for cust 16 arr at delivery centre
[ 0] 17:00:00.0 Parcel 11 for cust 16 arr at delivery centre
[ 0] 17:00:00.0 Parcel 12 for cust 17 arr at delivery centre
[ 0] 17:00:00.0 Parcel 13 for cust 17 arr at delivery centre
[ 0] 17:00:00.0 Parcel 14 for cust 18 arr at delivery centre
[ 0] 17:00:00.0 Parcel 15 for cust 19 arr at delivery centre
[ 0] 18:00:00.0 Driver arrives for work
[ 0] 18:00:00.0 Parcel 0 for cust 5 out for delivery
[ 0] 18:00:00.0 Parcel 3 for cust 7 out for delivery
[ 0] 18:00:00.0 Parcel 4 for cust 7 out for delivery
[ 0] 18:00:00.0 Parcel 9 for cust 16 out for delivery
[ 0] 18:00:00.0 Parcel 10 for cust 16 out for delivery
[ 0] 18:00:00.0 Parcel 11 for cust 16 out for delivery
[ 0] 18:00:00.0 Parcel 6 for cust 13 out for delivery
[ 0] 18:00:00.0 Parcel 7 for cust 13 out for delivery
[ 0] 18:00:00.0 Parcel 12 for cust 17 out for delivery
[ 0] 18:00:00.0 Parcel 13 for cust 17 out for delivery
[ 0] 18:00:00.0 Parcel 14 for cust 18 out for delivery
[ 0] 18:00:00.0 Parcel 15 for cust 19 out for delivery
[ 0] 18:00:00.0 Parcel 8 for cust 15 out for delivery
[ 0] 18:00:00.0 Parcel 5 for cust 8 out for delivery
[ 0] 18:00:00.0 Parcel 1 for cust 6 out for delivery
[ 0] 18:00:00.0 Parcel 2 for cust 6 out for delivery
[ 0] 18:13:20.0 Driver leaves for delivery of 16 parcels to 10 customers
[ 0] 18:13:20.0 Length of delivery tour: 26,192m
[ 0] 18:13:20.0 Driver drives to Customer 5 at (3350, 7580)
[ 0] 18:32:09.4 Driver arrived at Customer 5 at (3350, 7580)
[ 0] 18:32:25.8 Customer 5 at (3350, 7580) answers door
[ 0] 18:32:25.8 Customer 5 at (3350, 7580) accepts Parcel 0 for cust 5
[ 0] 18:32:26.3 Customer 5 at (3350, 7580) signs off
[ 0] 18:32:29.6 Driver drives to Customer 7 at (5182, 5650)
[ 0] 18:47:32.5 Driver arrived at Customer 7 at (5182, 5650)
[ 0] 18:47:43.4 Customer 7 at (5182, 5650) answers door
[ 0] 18:47:43.4 Customer 7 at (5182, 5650) accepts Parcel 3 for cust 7
[ 0] 18:48:14.0 Customer 7 at (5182, 5650) accepts Parcel 4 for cust 7
```

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[ 0] 18:48:18.4 Customer 7 at (5182, 5650) signs off
[ 0] 18:48:21.8 Driver drives to Customer 16 at (7477, 5650)
[ 0] 18:57:32.6 Driver arrived at Customer 16 at (7477, 5650)
[ 0] 18:57:50.4 Customer 16 at (7477, 5650) answers door
[ 0] 18:57:50.4 Customer 16 at (7477, 5650) accepts Parcel 9 for cust 16
[ 0] 18:58:19.7 Customer 16 at (7477, 5650) accepts Parcel 10 for cust 16
[ 0] 18:58:29.8 Customer 16 at (7477, 5650) accepts Parcel 11 for cust 16
[ 0] 18:58:39.5 Customer 16 at (7477, 5650) signs off
[ 0] 18:58:52.1 Driver drives to Customer 13 at (6800, 4901)
[ 0] 19:04:34.3 Driver arrived at Customer 13 at (6800, 4901)
[ 0] 19:04:53.9 Customer 13 at (6800, 4901) answers door
[ 0] 19:04:53.9 Customer 13 at (6800, 4901) accepts Parcel 6 for cust 13
[ 0] 19:04:59.3 Customer 13 at (6800, 4901) accepts Parcel 7 for cust 13
[ 0] 19:05:09.8 Customer 13 at (6800, 4901) signs off
[ 0] 19:05:09.8 Driver drives to Customer 17 at (7575, 4500)
[ 0] 19:09:52.1 Driver arrived at Customer 17 at (7575, 4500)
[ 0] 19:10:00.6 Customer 17 at (7575, 4500) answers door
[ 0] 19:10:00.6 Customer 17 at (7575, 4500) accepts Parcel 12 for cust 17
[ 0] 19:10:04.7 Customer 17 at (7575, 4500) accepts Parcel 13 for cust 17
[ 0] 19:10:07.4 Customer 17 at (7575, 4500) signs off
[ 0] 19:10:17.6 Driver drives to Customer 18 at (7816, 4500)
[ 0] 19:11:15.4 Driver arrived at Customer 18 at (7816, 4500)
[ 0] 19:11:34.4 Customer 18 at (7816, 4500) answers door
[ 0] 19:11:34.4 Customer 18 at (7816, 4500) accepts Parcel 14 for cust 18
[ 0] 19:11:55.3 Customer 18 at (7816, 4500) signs off
[ 0] 19:12:03.7 Driver drives to Customer 19 at (7950, 4122)
[ 0] 19:14:06.6 Driver arrived at Customer 19 at (7950, 4122)
[ 0] 19:14:28.0 Customer 19 at (7950, 4122) answers door
[ 0] 19:14:28.0 Customer 19 at (7950, 4122) accepts Parcel 15 for cust 19
[ 0] 19:14:33.1 Customer 19 at (7950, 4122) signs off
[ 0] 19:14:45.2 Driver drives to Customer 15 at (7302, 3350)
[ 0] 19:20:26.0 Driver arrived at Customer 15 at (7302, 3350)
[ 0] 19:20:47.7 Customer 15 at (7302, 3350) answers door
[ 0] 19:20:47.7 Customer 15 at (7302, 3350) accepts Parcel 8 for cust 15
[ 0] 19:20:58.5 Customer 15 at (7302, 3350) signs off
[ 0] 19:20:59.0 Driver drives to Customer 8 at (5650, 2783)
[ 0] 19:29:51.6 Driver arrived at Customer 8 at (5650, 2783)
[ 0] 19:30:15.1 Customer 8 at (5650, 2783) answers door
[ 0] 19:30:15.1 Customer 8 at (5650, 2783) accepts Parcel 5 for cust 8
[ 0] 19:30:18.1 Customer 8 at (5650, 2783) signs off
[ 0] 19:30:19.9 Driver drives to Customer 6 at (4142, 1050)
[ 0] 19:40:35.9 Driver arrived at Customer 6 at (4142, 1050)
[ 0] 19:41:05.9 Customer 6 at (4142, 1050) answers door
[ 0] 19:41:05.9 Customer 6 at (4142, 1050) accepts Parcel 1 for cust 6
[ 0] 19:41:12.6 Customer 6 at (4142, 1050) accepts Parcel 2 for cust 6
[ 0] 19:41:20.9 Customer 6 at (4142, 1050) signs off
[ 0] 19:41:34.9 Driver returns to delivery centre
[ 0] 20:05:03.3 Driver arrived at delivery centre
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[ 0] 20:05:03.3 0 parcels left for next day
[ 0] 20:15:03.3 Driver goes home
[ 1] 17:00:00.0 Parcel 16 for cust 0 arr at delivery centre
[ 1] 17:00:00.0 Parcel 17 for cust 1 arr at delivery centre
[ 1] 17:00:00.0 Parcel 18 for cust 3 arr at delivery centre
[ 1] 17:00:00.0 Parcel 19 for cust 5 arr at delivery centre
[ 1] 17:00:00.0 Parcel 20 for cust 5 arr at delivery centre
[ 1] 17:00:00.0 Parcel 21 for cust 6 arr at delivery centre
[ 1] 17:00:00.0 Parcel 22 for cust 7 arr at delivery centre
[ 1] 17:00:00.0 Parcel 23 for cust 8 arr at delivery centre
[ 1] 17:00:00.0 Parcel 24 for cust 8 arr at delivery centre
[ 1] 17:00:00.0 Parcel 25 for cust 9 arr at delivery centre
[ 1] 17:00:00.0 Parcel 26 for cust 11 arr at delivery centre
[ 1] 17:00:00.0 Parcel 27 for cust 13 arr at delivery centre
[ 1] 17:00:00.0 Parcel 28 for cust 14 arr at delivery centre
[ 1] 17:00:00.0 Parcel 29 for cust 14 arr at delivery centre
[ 1] 17:00:00.0 Parcel 30 for cust 14 arr at delivery centre
[ 1] 17:00:00.0 Parcel 31 for cust 15 arr at delivery centre
[ 1] 17:00:00.0 Parcel 32 for cust 15 arr at delivery centre
[ 1] 17:00:00.0 Parcel 33 for cust 16 arr at delivery centre
[ 1] 17:00:00.0 Parcel 34 for cust 18 arr at delivery centre
[ 1] 17:00:00.0 Parcel 35 for cust 19 arr at delivery centre
[ 1] 17:00:00.0 Parcel 36 for cust 19 arr at delivery centre
[ 1] 17:00:00.0 Parcel 37 for cust 19 arr at delivery centre
[ 1] 18:00:00.0 Driver arrives for work
[ 1] 18:00:00.0 Parcel 21 for cust 6 out for delivery
[ 1] 18:00:00.0 Parcel 23 for cust 8 out for delivery
[ 1] 18:00:00.0 Parcel 24 for cust 8 out for delivery
[ 1] 18:00:00.0 Parcel 25 for cust 9 out for delivery
[ 1] 18:00:00.0 Parcel 27 for cust 13 out for delivery
[ 1] 18:00:00.0 Parcel 22 for cust 7 out for delivery
[ 1] 18:00:00.0 Parcel 18 for cust 3 out for delivery
[ 1] 18:00:00.0 Parcel 16 for cust 0 out for delivery
[ 1] 18:00:00.0 Parcel 17 for cust 1 out for delivery
[ 1] 18:00:00.0 Parcel 19 for cust 5 out for delivery
[ 1] 18:00:00.0 Parcel 20 for cust 5 out for delivery
[ 1] 18:09:10.0 Driver leaves for delivery of 11 parcels to 9 customers
[ 1] 18:09:10.0 Length of delivery tour: 29,294m
[ 1] 18:09:10.0 Driver drives to Customer 6 at (4142, 1050)
[ 1] 18:32:38.3 Driver arrived at Customer 6 at (4142, 1050)
[ 1] 18:34:04.4 Customer 6 at (4142, 1050) answers door
[ 1] 18:34:04.4 Customer 6 at (4142, 1050) accepts Parcel 21 for cust 6
[ 1] 18:34:11.3 Customer 6 at (4142, 1050) signs off
[ 1] 18:34:15.0 Driver drives to Customer 8 at (5650, 2783)
[ 1] 18:44:31.1 Driver arrived at Customer 8 at (5650, 2783)
[ 1] 18:44:56.2 Customer 8 at (5650, 2783) answers door
[ 1] 18:44:56.2 Customer 8 at (5650, 2783) accepts Parcel 23 for cust 8
[ 1] 18:45:12.8 Customer 8 at (5650, 2783) accepts Parcel 24 for cust 8
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[ 1] 18:45:33.6 Customer 8 at (5650, 2783) signs off
[ 1] 18:45:50.3 Driver drives to Customer 9 at (5650, 3175)
[ 1] 18:47:24.4 Driver arrived at Customer 9 at (5650, 3175)
[ 1] 18:47:32.7 Customer 9 at (5650, 3175) answers door
[ 1] 18:47:32.7 Customer 9 at (5650, 3175) accepts Parcel 25 for cust 9
[ 1] 18:48:47.3 Customer 9 at (5650, 3175) signs off
[ 1] 18:48:57.3 Driver drives to Customer 13 at (6800, 4901)
[ 1] 19:00:27.5 Driver arrived at Customer 13 at (6800, 4901)
[ 1] 19:00:31.0 Customer 13 at (6800, 4901) answers door
[ 1] 19:00:31.0 Customer 13 at (6800, 4901) accepts Parcel 27 for cust 13
[ 1] 19:00:44.0 Customer 13 at (6800, 4901) signs off
[ 1] 19:01:27.3 Driver drives to Customer 7 at (5182, 5650)
[ 1] 19:10:55.3 Driver arrived at Customer 7 at (5182, 5650)
[ 1] 19:11:15.9 Customer 7 at (5182, 5650) answers door
[ 1] 19:11:15.9 Customer 7 at (5182, 5650) accepts Parcel 22 for cust 7
[ 1] 19:11:27.2 Customer 7 at (5182, 5650) signs off
[ 1] 19:11:31.0 Driver drives to Customer 3 at (2200, 3898)
[ 1] 19:27:45.4 Driver arrived at Customer 3 at (2200, 3898)
[ 1] 19:27:55.0 Customer 3 at (2200, 3898) answers door
[ 1] 19:27:55.0 Customer 3 at (2200, 3898) accepts Parcel 18 for cust 3
[ 1] 19:28:07.7 Customer 3 at (2200, 3898) signs off
[ 1] 19:28:07.7 Driver drives to Customer 0 at (1050, 4722)
[ 1] 19:36:01.5 Driver arrived at Customer 0 at (1050, 4722)
[ 1] 19:37:10.7 Customer 0 at (1050, 4722) answers door
[ 1] 19:37:10.7 Customer 0 at (1050, 4722) accepts Parcel 16 for cust 0
[ 1] 19:37:18.2 Customer 0 at (1050, 4722) signs off
[ 1] 19:37:19.2 Driver drives to Customer 1 at (1050, 5180)
[ 1] 19:39:09.1 Driver arrived at Customer 1 at (1050, 5180)
[ 1] 19:39:14.2 Customer 1 at (1050, 5180) answers door
[ 1] 19:39:14.2 Customer 1 at (1050, 5180) accepts Parcel 17 for cust 1
[ 1] 19:39:24.7 Customer 1 at (1050, 5180) signs off
[ 1] 19:39:45.4 Driver drives to Customer 5 at (3350, 7580)
[ 1] 19:55:51.6 Driver arrived at Customer 5 at (3350, 7580)
[ 1] 19:56:04.7 Customer 5 at (3350, 7580) answers door
[ 1] 19:56:04.7 Customer 5 at (3350, 7580) accepts Parcel 19 for cust 5
[ 1] 19:56:43.1 Customer 5 at (3350, 7580) accepts Parcel 20 for cust 5
[ 1] 19:56:44.2 Customer 5 at (3350, 7580) signs off
[ 1] 19:57:03.4 Driver returns to delivery centre
[ 1] 20:15:52.9 Driver arrived at delivery centre
[ 1] 20:15:52.9 11 parcels left for next day
[ 1] 20:25:52.9 Driver goes home
[ 2] 17:00:00.0 Parcel 38 for cust 0 arr at delivery centre
[ 2] 17:00:00.0 Parcel 39 for cust 1 arr at delivery centre
[ 2] 17:00:00.0 Parcel 40 for cust 1 arr at delivery centre
[ 2] 17:00:00.0 Parcel 41 for cust 3 arr at delivery centre
[ 2] 17:00:00.0 Parcel 42 for cust 4 arr at delivery centre
[ 2] 17:00:00.0 Parcel 43 for cust 5 arr at delivery centre
[ 2] 17:00:00.0 Parcel 44 for cust 7 arr at delivery centre
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[ 2] 17:00:00.0 Parcel 45 for cust 8 arr at delivery centre
[ 2] 17:00:00.0 Parcel 46 for cust 10 arr at delivery centre
[ 2] 17:00:00.0 Parcel 47 for cust 10 arr at delivery centre
[ 2] 17:00:00.0 Parcel 48 for cust 11 arr at delivery centre
[ 2] 17:00:00.0 Parcel 49 for cust 13 arr at delivery centre
[ 2] 17:00:00.0 Parcel 50 for cust 14 arr at delivery centre
[ 2] 17:00:00.0 Parcel 51 for cust 14 arr at delivery centre
[ 2] 17:00:00.0 Parcel 52 for cust 15 arr at delivery centre
[ 2] 17:00:00.0 Parcel 53 for cust 19 arr at delivery centre
[ 2] 18:00:00.0 Driver arrives for work
[ 2] 18:00:00.0 Parcel 41 for cust 3 out for delivery
[ 2] 18:00:00.0 Parcel 38 for cust 0 out for delivery
[ 2] 18:00:00.0 Parcel 39 for cust 1 out for delivery
[ 2] 18:00:00.0 Parcel 40 for cust 1 out for delivery
[ 2] 18:00:00.0 Parcel 43 for cust 5 out for delivery
[ 2] 18:00:00.0 Parcel 26 for cust 11 out for delivery
[ 2] 18:00:00.0 Parcel 48 for cust 11 out for delivery
[ 2] 18:00:00.0 Parcel 33 for cust 16 out for delivery
[ 2] 18:00:00.0 Parcel 49 for cust 13 out for delivery
[ 2] 18:00:00.0 Parcel 31 for cust 15 out for delivery
[ 2] 18:00:00.0 Parcel 32 for cust 15 out for delivery
[ 2] 18:00:00.0 Parcel 52 for cust 15 out for delivery
[ 2] 18:00:00.0 Parcel 35 for cust 19 out for delivery
[ 2] 18:00:00.0 Parcel 36 for cust 19 out for delivery
[ 2] 18:00:00.0 Parcel 37 for cust 19 out for delivery
[ 2] 18:00:00.0 Parcel 53 for cust 19 out for delivery
[ 2] 18:00:00.0 Parcel 34 for cust 18 out for delivery
[ 2] 18:00:00.0 Parcel 28 for cust 14 out for delivery
[ 2] 18:00:00.0 Parcel 29 for cust 14 out for delivery
[ 2] 18:00:00.0 Parcel 30 for cust 14 out for delivery
[ 2] 18:00:00.0 Parcel 50 for cust 14 out for delivery
[ 2] 18:00:00.0 Parcel 51 for cust 14 out for delivery
[ 2] 18:18:20.0 Driver leaves for delivery of 22 parcels to 11 customers
[ 2] 18:18:20.0 Length of delivery tour: 26,510m
[ 2] 18:18:20.0 Driver drives to Customer 3 at (2200, 3898)
[ 2] 18:25:20.5 Driver arrived at Customer 3 at (2200, 3898)
[ 2] 18:25:40.7 Customer 3 at (2200, 3898) answers door
[ 2] 18:25:40.7 Customer 3 at (2200, 3898) accepts Parcel 41 for cust 3
[ 2] 18:25:41.5 Customer 3 at (2200, 3898) signs off
[ 2] 18:25:44.8 Driver drives to Customer 0 at (1050, 4722)
[ 2] 18:33:38.5 Driver arrived at Customer 0 at (1050, 4722)
[ 2] 18:34:02.6 Customer 0 at (1050, 4722) answers door
[ 2] 18:34:02.6 Customer 0 at (1050, 4722) accepts Parcel 38 for cust 0
[ 2] 18:34:18.4 Customer 0 at (1050, 4722) signs off
[ 2] 18:34:38.1 Driver drives to Customer 1 at (1050, 5180)
[ 2] 18:36:28.0 Driver arrived at Customer 1 at (1050, 5180)
[ 2] 18:36:33.8 Customer 1 at (1050, 5180) answers door
[ 2] 18:36:33.8 Customer 1 at (1050, 5180) accepts Parcel 39 for cust 1
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[ 2] 18:36:41.1 Customer 1 at (1050, 5180) accepts Parcel 40 for cust 1
[ 2] 18:36:51.6 Customer 1 at (1050, 5180) signs off
[ 2] 18:36:55.9 Driver drives to Customer 5 at (3350, 7580)
[ 2] 18:53:02.2 Driver arrived at Customer 5 at (3350, 7580)
[ 2] 18:54:24.3 Customer 5 at (3350, 7580) answers door
[ 2] 18:54:24.3 Customer 5 at (3350, 7580) accepts Parcel 43 for cust 5
[ 2] 18:54:27.6 Customer 5 at (3350, 7580) signs off
[ 2] 18:54:27.8 Driver drives to Customer 11 at (5650, 7250)
[ 2] 19:07:56.6 Driver arrived at Customer 11 at (5650, 7250)
[ 2] 19:07:58.2 Customer 11 at (5650, 7250) answers door
[ 2] 19:07:58.2 Customer 11 at (5650, 7250) accepts Parcel 26 for cust 11
[ 2] 19:08:09.7 Customer 11 at (5650, 7250) accepts Parcel 48 for cust 11
[ 2] 19:08:17.8 Customer 11 at (5650, 7250) signs off
[ 2] 19:08:47.1 Driver drives to Customer 16 at (7477, 5650)
[ 2] 19:22:29.6 Driver arrived at Customer 16 at (7477, 5650)
[ 2] 19:24:21.1 Customer 16 at (7477, 5650) answers door
[ 2] 19:24:21.1 Customer 16 at (7477, 5650) accepts Parcel 33 for cust 16
[ 2] 19:24:45.2 Customer 16 at (7477, 5650) signs off
[ 2] 19:24:45.6 Driver drives to Customer 13 at (6800, 4901)
[ 2] 19:30:27.8 Driver arrived at Customer 13 at (6800, 4901)
[ 2] 19:31:23.2 Customer 13 at (6800, 4901) answers door
[ 2] 19:31:23.2 Customer 13 at (6800, 4901) accepts Parcel 49 for cust 13
[ 2] 19:31:35.2 Customer 13 at (6800, 4901) signs off
[ 2] 19:31:45.9 Driver drives to Customer 15 at (7302, 3350)
[ 2] 19:39:58.6 Driver arrived at Customer 15 at (7302, 3350)
[ 2] 19:40:48.5 Customer 15 at (7302, 3350) answers door
[ 2] 19:40:48.5 Customer 15 at (7302, 3350) accepts Parcel 31 for cust 15
[ 2] 19:41:11.8 Customer 15 at (7302, 3350) accepts Parcel 32 for cust 15
[ 2] 19:41:22.0 Customer 15 at (7302, 3350) accepts Parcel 52 for cust 15
[ 2] 19:41:26.6 Customer 15 at (7302, 3350) signs off
[ 2] 19:41:34.4 Driver drives to Customer 19 at (7950, 4122)
[ 2] 19:47:15.2 Driver arrived at Customer 19 at (7950, 4122)
[ 2] 19:47:24.5 Customer 19 at (7950, 4122) answers door
[ 2] 19:47:24.5 Customer 19 at (7950, 4122) accepts Parcel 35 for cust 19
[ 2] 19:47:33.3 Customer 19 at (7950, 4122) accepts Parcel 36 for cust 19
[ 2] 19:47:33.4 Customer 19 at (7950, 4122) accepts Parcel 37 for cust 19
[ 2] 19:47:35.1 Customer 19 at (7950, 4122) accepts Parcel 53 for cust 19
[ 2] 19:47:39.1 Customer 19 at (7950, 4122) signs off
[ 2] 19:47:54.7 Driver drives to Customer 18 at (7816, 4500)
[ 2] 19:49:57.6 Driver arrived at Customer 18 at (7816, 4500)
[ 2] 19:50:48.3 Customer 18 at (7816, 4500) answers door
[ 2] 19:50:48.3 Customer 18 at (7816, 4500) accepts Parcel 34 for cust 18
[ 2] 19:50:52.4 Customer 18 at (7816, 4500) signs off
[ 2] 19:51:02.1 Driver drives to Customer 14 at (7188, 4500)
[ 2] 19:53:32.8 Driver arrived at Customer 14 at (7188, 4500)
[ 2] 19:53:34.5 Customer 14 at (7188, 4500) answers door
[ 2] 19:53:34.5 Customer 14 at (7188, 4500) accepts Parcel 28 for cust 14
[ 2] 19:53:36.3 Customer 14 at (7188, 4500) accepts Parcel 29 for cust 14
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[ 2] 19:54:16.4 Customer 14 at (7188, 4500) accepts Parcel 30 for cust 14
[ 2] 19:54:19.8 Customer 14 at (7188, 4500) accepts Parcel 50 for cust 14
[ 2] 19:54:24.9 Customer 14 at (7188, 4500) accepts Parcel 51 for cust 14
[ 2] 19:54:32.8 Customer 14 at (7188, 4500) signs off
[ 2] 19:54:36.3 Driver returns to delivery centre
[ 2] 20:16:27.6 Driver arrived at delivery centre
[ 2] 20:16:27.6 5 parcels left for next day
[ 2] 20:26:27.6 Driver goes home
[ 3] 17:00:00.0 Parcel 54 for cust 0 arr at delivery centre
[ 3] 17:00:00.0 Parcel 55 for cust 0 arr at delivery centre
[ 3] 17:00:00.0 Parcel 56 for cust 2 arr at delivery centre
[ 3] 17:00:00.0 Parcel 57 for cust 3 arr at delivery centre
[ 3] 17:00:00.0 Parcel 58 for cust 4 arr at delivery centre
[ 3] 17:00:00.0 Parcel 59 for cust 5 arr at delivery centre
[ 3] 17:00:00.0 Parcel 60 for cust 5 arr at delivery centre
[ 3] 17:00:00.0 Parcel 61 for cust 6 arr at delivery centre
[ 3] 17:00:00.0 Parcel 62 for cust 7 arr at delivery centre
[ 3] 17:00:00.0 Parcel 63 for cust 8 arr at delivery centre
[ 3] 17:00:00.0 Parcel 64 for cust 8 arr at delivery centre
[ 3] 17:00:00.0 Parcel 65 for cust 9 arr at delivery centre
[ 3] 17:00:00.0 Parcel 66 for cust 10 arr at delivery centre
[ 3] 17:00:00.0 Parcel 67 for cust 13 arr at delivery centre
[ 3] 17:00:00.0 Parcel 68 for cust 14 arr at delivery centre
[ 3] 17:00:00.0 Parcel 69 for cust 17 arr at delivery centre
[ 3] 17:00:00.0 Parcel 70 for cust 18 arr at delivery centre
[ 3] 17:00:00.0 Parcel 71 for cust 18 arr at delivery centre
[ 3] 17:00:00.0 Parcel 72 for cust 19 arr at delivery centre
[ 3] 17:00:00.0 Parcel 73 for cust 19 arr at delivery centre
[ 3] 17:00:00.0 Parcel 74 for cust 19 arr at delivery centre
[ 3] 18:00:00.0 Driver arrives for work
[ 3] 18:00:00.0 Parcel 56 for cust 2 out for delivery
[ 3] 18:00:00.0 Parcel 54 for cust 0 out for delivery
[ 3] 18:00:00.0 Parcel 55 for cust 0 out for delivery
[ 3] 18:00:00.0 Parcel 57 for cust 3 out for delivery
[ 3] 18:00:00.0 Parcel 42 for cust 4 out for delivery
[ 3] 18:00:00.0 Parcel 58 for cust 4 out for delivery
[ 3] 18:00:00.0 Parcel 61 for cust 6 out for delivery
[ 3] 18:00:00.0 Parcel 45 for cust 8 out for delivery
[ 3] 18:00:00.0 Parcel 63 for cust 8 out for delivery
[ 3] 18:00:00.0 Parcel 64 for cust 8 out for delivery
[ 3] 18:00:00.0 Parcel 65 for cust 9 out for delivery
[ 3] 18:00:00.0 Parcel 72 for cust 19 out for delivery
[ 3] 18:00:00.0 Parcel 73 for cust 19 out for delivery
[ 3] 18:00:00.0 Parcel 74 for cust 19 out for delivery
[ 3] 18:00:00.0 Parcel 70 for cust 18 out for delivery
[ 3] 18:00:00.0 Parcel 71 for cust 18 out for delivery
[ 3] 18:00:00.0 Parcel 69 for cust 17 out for delivery
[ 3] 18:00:00.0 Parcel 68 for cust 14 out for delivery
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[ 3] 18:00:00.0 Parcel 67 for cust 13 out for delivery
[ 3] 18:00:00.0 Parcel 46 for cust 10 out for delivery
[ 3] 18:00:00.0 Parcel 47 for cust 10 out for delivery
[ 3] 18:00:00.0 Parcel 66 for cust 10 out for delivery
[ 3] 18:00:00.0 Parcel 44 for cust 7 out for delivery
[ 3] 18:00:00.0 Parcel 62 for cust 7 out for delivery
[ 3] 18:00:00.0 Parcel 59 for cust 5 out for delivery
[ 3] 18:00:00.0 Parcel 60 for cust 5 out for delivery
[ 3] 18:21:40.0 Driver leaves for delivery of 26 parcels to 15 customers
[ 3] 18:21:40.0 Length of delivery tour: 28,687m
[ 3] 18:21:40.0 Driver drives to Customer 2 at (1618, 4500)
[ 3] 18:28:35.7 Driver arrived at Customer 2 at (1618, 4500)
[ 3] 18:29:01.7 Customer 2 at (1618, 4500) answers door
[ 3] 18:29:01.7 Customer 2 at (1618, 4500) accepts Parcel 56 for cust 2
[ 3] 18:29:04.4 Customer 2 at (1618, 4500) signs off
[ 3] 18:29:04.9 Driver drives to Customer 0 at (1050, 4722)
[ 3] 18:32:14.5 Driver arrived at Customer 0 at (1050, 4722)
[ 3] 18:32:22.4 Customer 0 at (1050, 4722) answers door
[ 3] 18:32:22.4 Customer 0 at (1050, 4722) accepts Parcel 54 for cust 0
[ 3] 18:32:29.8 Customer 0 at (1050, 4722) accepts Parcel 55 for cust 0
[ 3] 18:32:30.6 Customer 0 at (1050, 4722) signs off
[ 3] 18:32:35.7 Driver drives to Customer 3 at (2200, 3898)
[ 3] 18:40:29.5 Driver arrived at Customer 3 at (2200, 3898)
[ 3] 18:40:45.4 Customer 3 at (2200, 3898) answers door
[ 3] 18:40:45.4 Customer 3 at (2200, 3898) accepts Parcel 57 for cust 3
[ 3] 18:40:50.8 Customer 3 at (2200, 3898) signs off
[ 3] 18:40:51.8 Driver drives to Customer 4 at (2821, 1578)
[ 3] 18:51:10.1 Driver arrived at Customer 4 at (2821, 1578)
[ 3] 18:52:45.8 Customer 4 at (2821, 1578) answers door
[ 3] 18:52:45.8 Customer 4 at (2821, 1578) accepts Parcel 42 for cust 4
[ 3] 18:52:52.2 Customer 4 at (2821, 1578) accepts Parcel 58 for cust 4
[ 3] 18:53:10.6 Customer 4 at (2821, 1578) signs off
[ 3] 18:53:48.0 Driver drives to Customer 6 at (4142, 1050)
[ 3] 18:59:57.4 Driver arrived at Customer 6 at (4142, 1050)
[ 3] 19:00:14.2 Customer 6 at (4142, 1050) answers door
[ 3] 19:00:14.2 Customer 6 at (4142, 1050) accepts Parcel 61 for cust 6
[ 3] 19:00:20.7 Customer 6 at (4142, 1050) signs off
[ 3] 19:00:32.7 Driver drives to Customer 8 at (5650, 2783)
[ 3] 19:10:48.8 Driver arrived at Customer 8 at (5650, 2783)
[ 3] 19:11:11.1 Customer 8 at (5650, 2783) answers door
[ 3] 19:11:11.1 Customer 8 at (5650, 2783) accepts Parcel 45 for cust 8
[ 3] 19:11:14.7 Customer 8 at (5650, 2783) accepts Parcel 63 for cust 8
[ 3] 19:11:27.9 Customer 8 at (5650, 2783) accepts Parcel 64 for cust 8
[ 3] 19:11:50.4 Customer 8 at (5650, 2783) signs off
[ 3] 19:12:15.6 Driver drives to Customer 9 at (5650, 3175)
[ 3] 19:13:49.7 Driver arrived at Customer 9 at (5650, 3175)
[ 3] 19:14:29.1 Customer 9 at (5650, 3175) answers door
[ 3] 19:14:29.1 Customer 9 at (5650, 3175) accepts Parcel 65 for cust 9
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[ 3] 19:14:33.8 Customer 9 at (5650, 3175) signs off
[ 3] 19:15:10.6 Driver drives to Customer 19 at (7950, 4122)
[ 3] 19:28:09.8 Driver arrived at Customer 19 at (7950, 4122)
[ 3] 19:28:50.6 Customer 19 at (7950, 4122) answers door
[ 3] 19:28:50.6 Customer 19 at (7950, 4122) accepts Parcel 72 for cust 19
[ 3] 19:28:51.3 Customer 19 at (7950, 4122) accepts Parcel 73 for cust 19
[ 3] 19:28:52.1 Customer 19 at (7950, 4122) accepts Parcel 74 for cust 19
[ 3] 19:29:06.0 Customer 19 at (7950, 4122) signs off
[ 3] 19:29:06.6 Driver drives to Customer 18 at (7816, 4500)
[ 3] 19:31:09.5 Driver arrived at Customer 18 at (7816, 4500)
[ 3] 19:31:09.8 Customer 18 at (7816, 4500) answers door
[ 3] 19:31:09.8 Customer 18 at (7816, 4500) accepts Parcel 70 for cust 18
[ 3] 19:31:14.8 Customer 18 at (7816, 4500) accepts Parcel 71 for cust 18
[ 3] 19:31:22.2 Customer 18 at (7816, 4500) signs off
[ 3] 19:31:28.1 Driver drives to Customer 17 at (7575, 4500)
[ 3] 19:32:25.9 Driver arrived at Customer 17 at (7575, 4500)
[ 3] 19:32:52.8 Customer 17 at (7575, 4500) answers door
[ 3] 19:32:52.8 Customer 17 at (7575, 4500) accepts Parcel 69 for cust 17
[ 3] 19:33:01.6 Customer 17 at (7575, 4500) signs off
[ 3] 19:33:12.9 Driver drives to Customer 14 at (7188, 4500)
[ 3] 19:34:45.8 Driver arrived at Customer 14 at (7188, 4500)
[ 3] 19:35:07.8 Customer 14 at (7188, 4500) answers door
[ 3] 19:35:07.8 Customer 14 at (7188, 4500) accepts Parcel 68 for cust 14
[ 3] 19:35:12.4 Customer 14 at (7188, 4500) signs off
[ 3] 19:35:57.0 Driver drives to Customer 13 at (6800, 4901)
[ 3] 19:39:06.4 Driver arrived at Customer 13 at (6800, 4901)
[ 3] 19:39:18.5 Customer 13 at (6800, 4901) answers door
[ 3] 19:39:18.5 Customer 13 at (6800, 4901) accepts Parcel 67 for cust 13
[ 3] 19:39:33.5 Customer 13 at (6800, 4901) signs off
[ 3] 19:39:39.1 Driver drives to Customer 10 at (5650, 6203)
[ 3] 19:49:27.6 Driver arrived at Customer 10 at (5650, 6203)
[ 3] 19:49:45.4 Customer 10 at (5650, 6203) answers door
[ 3] 19:49:45.4 Customer 10 at (5650, 6203) accepts Parcel 46 for cust 10
[ 3] 19:49:46.0 Customer 10 at (5650, 6203) accepts Parcel 47 for cust 10
[ 3] 19:50:06.0 Customer 10 at (5650, 6203) accepts Parcel 66 for cust 10
[ 3] 19:50:18.1 Customer 10 at (5650, 6203) signs off
[ 3] 19:50:41.4 Driver drives to Customer 7 at (5182, 5650)
[ 3] 19:54:46.4 Driver arrived at Customer 7 at (5182, 5650)
[ 3] 19:55:10.5 Customer 7 at (5182, 5650) answers door
[ 3] 19:55:10.5 Customer 7 at (5182, 5650) accepts Parcel 44 for cust 7
[ 3] 19:55:21.8 Customer 7 at (5182, 5650) accepts Parcel 62 for cust 7
[ 3] 19:55:23.0 Customer 7 at (5182, 5650) signs off
[ 3] 19:55:28.1 Driver drives to Customer 5 at (3350, 7580)
[ 3] 20:10:31.0 Driver arrived at Customer 5 at (3350, 7580)
[ 3] 20:10:40.3 Customer 5 at (3350, 7580) answers door
[ 3] 20:10:40.3 Customer 5 at (3350, 7580) accepts Parcel 59 for cust 5
[ 3] 20:10:40.7 Customer 5 at (3350, 7580) accepts Parcel 60 for cust 5
[ 3] 20:11:10.3 Customer 5 at (3350, 7580) signs off
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[ 3] 20:11:12.7 Driver returns to delivery centre
[ 3] 20:30:02.1 Driver arrived at delivery centre
[ 3] 20:30:02.1 0 parcels left for next day
[ 3] 20:40:02.1 Driver goes home
[ 4] 17:00:00.0 Parcel 75 for cust 0 arr at delivery centre
[ 4] 17:00:00.0 Parcel 76 for cust 0 arr at delivery centre
[ 4] 17:00:00.0 Parcel 77 for cust 1 arr at delivery centre
[ 4] 17:00:00.0 Parcel 78 for cust 1 arr at delivery centre
[ 4] 17:00:00.0 Parcel 79 for cust 2 arr at delivery centre
[ 4] 17:00:00.0 Parcel 80 for cust 3 arr at delivery centre
[ 4] 17:00:00.0 Parcel 81 for cust 3 arr at delivery centre
[ 4] 17:00:00.0 Parcel 82 for cust 5 arr at delivery centre
[ 4] 17:00:00.0 Parcel 83 for cust 7 arr at delivery centre
[ 4] 17:00:00.0 Parcel 84 for cust 8 arr at delivery centre
[ 4] 17:00:00.0 Parcel 85 for cust 8 arr at delivery centre
[ 4] 17:00:00.0 Parcel 86 for cust 8 arr at delivery centre
[ 4] 17:00:00.0 Parcel 87 for cust 10 arr at delivery centre
[ 4] 17:00:00.0 Parcel 88 for cust 10 arr at delivery centre
[ 4] 17:00:00.0 Parcel 89 for cust 12 arr at delivery centre
[ 4] 17:00:00.0 Parcel 90 for cust 13 arr at delivery centre
[ 4] 17:00:00.0 Parcel 91 for cust 16 arr at delivery centre
[ 4] 17:00:00.0 Parcel 92 for cust 16 arr at delivery centre
[ 4] 17:00:00.0 Parcel 93 for cust 16 arr at delivery centre
[ 4] 17:00:00.0 Parcel 94 for cust 16 arr at delivery centre
[ 4] 17:00:00.0 Parcel 95 for cust 16 arr at delivery centre
[ 4] 17:00:00.0 Parcel 96 for cust 17 arr at delivery centre
[ 4] 17:00:00.0 Parcel 97 for cust 17 arr at delivery centre
[ 4] 17:00:00.0 Parcel 98 for cust 18 arr at delivery centre
[ 4] 17:00:00.0 Parcel 99 for cust 19 arr at delivery centre
[ 4] 18:00:00.0 Driver arrives for work
[ 4] 18:00:00.0 Parcel 83 for cust 7 out for delivery
[ 4] 18:00:00.0 Parcel 91 for cust 16 out for delivery
[ 4] 18:00:00.0 Parcel 92 for cust 16 out for delivery
[ 4] 18:00:00.0 Parcel 93 for cust 16 out for delivery
[ 4] 18:00:00.0 Parcel 94 for cust 16 out for delivery
[ 4] 18:00:00.0 Parcel 95 for cust 16 out for delivery
[ 4] 18:00:00.0 Parcel 90 for cust 13 out for delivery
[ 4] 18:00:00.0 Parcel 89 for cust 12 out for delivery
[ 4] 18:00:00.0 Parcel 84 for cust 8 out for delivery
[ 4] 18:00:00.0 Parcel 85 for cust 8 out for delivery
[ 4] 18:00:00.0 Parcel 86 for cust 8 out for delivery
[ 4] 18:00:00.0 Parcel 87 for cust 10 out for delivery
[ 4] 18:00:00.0 Parcel 88 for cust 10 out for delivery
[ 4] 18:00:00.0 Parcel 80 for cust 3 out for delivery
[ 4] 18:00:00.0 Parcel 81 for cust 3 out for delivery
[ 4] 18:00:00.0 Parcel 79 for cust 2 out for delivery
[ 4] 18:00:00.0 Parcel 75 for cust 0 out for delivery
[ 4] 18:00:00.0 Parcel 76 for cust 0 out for delivery
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[ 4] 18:00:00.0 Parcel 77 for cust 1 out for delivery
[ 4] 18:00:00.0 Parcel 78 for cust 1 out for delivery
[ 4] 18:00:00.0 Parcel 82 for cust 5 out for delivery
[ 4] 18:17:30.0 Driver leaves for delivery of 21 parcels to 11 customers
[ 4] 18:17:30.0 Length of delivery tour: 28,962m
[ 4] 18:17:30.0 Driver drives to Customer 7 at (5182, 5650)
[ 4] 18:26:43.9 Driver arrived at Customer 7 at (5182, 5650)
[ 4] 18:26:50.2 Customer 7 at (5182, 5650) answers door
[ 4] 18:26:50.2 Customer 7 at (5182, 5650) accepts Parcel 83 for cust 7
[ 4] 18:26:52.5 Customer 7 at (5182, 5650) signs off
[ 4] 18:26:57.2 Driver drives to Customer 16 at (7477, 5650)
[ 4] 18:36:08.0 Driver arrived at Customer 16 at (7477, 5650)
[ 4] 18:36:39.6 Customer 16 at (7477, 5650) answers door
[ 4] 18:36:39.6 Customer 16 at (7477, 5650) accepts Parcel 91 for cust 16
[ 4] 18:36:41.3 Customer 16 at (7477, 5650) accepts Parcel 92 for cust 16
[ 4] 18:37:26.1 Customer 16 at (7477, 5650) accepts Parcel 93 for cust 16
[ 4] 18:38:06.8 Customer 16 at (7477, 5650) accepts Parcel 94 for cust 16
[ 4] 18:38:08.4 Customer 16 at (7477, 5650) accepts Parcel 95 for cust 16
[ 4] 18:38:13.6 Customer 16 at (7477, 5650) signs off
[ 4] 18:38:25.0 Driver drives to Customer 13 at (6800, 4901)
[ 4] 18:44:07.3 Driver arrived at Customer 13 at (6800, 4901)
[ 4] 18:45:31.3 Customer 13 at (6800, 4901) answers door
[ 4] 18:45:31.3 Customer 13 at (6800, 4901) accepts Parcel 90 for cust 13
[ 4] 18:45:38.1 Customer 13 at (6800, 4901) signs off
[ 4] 18:46:03.0 Driver drives to Customer 12 at (6061, 4500)
[ 4] 18:50:36.6 Driver arrived at Customer 12 at (6061, 4500)
[ 4] 18:50:52.2 Customer 12 at (6061, 4500) answers door
[ 4] 18:50:52.2 Customer 12 at (6061, 4500) accepts Parcel 89 for cust 12
[ 4] 18:50:59.1 Customer 12 at (6061, 4500) signs off
[ 4] 18:51:06.0 Driver drives to Customer 8 at (5650, 2783)
[ 4] 18:59:36.7 Driver arrived at Customer 8 at (5650, 2783)
[ 4] 19:00:21.1 Customer 8 at (5650, 2783) answers door
[ 4] 19:00:21.1 Customer 8 at (5650, 2783) accepts Parcel 84 for cust 8
[ 4] 19:00:23.4 Customer 8 at (5650, 2783) accepts Parcel 85 for cust 8
[ 4] 19:00:32.8 Customer 8 at (5650, 2783) accepts Parcel 86 for cust 8
[ 4] 19:00:35.2 Customer 8 at (5650, 2783) signs off
[ 4] 19:00:39.4 Driver drives to Customer 10 at (5650, 6203)
[ 4] 19:14:20.2 Driver arrived at Customer 10 at (5650, 6203)
[ 4] 19:16:31.6 Customer 10 at (5650, 6203) answers door
[ 4] 19:16:31.6 Customer 10 at (5650, 6203) accepts Parcel 87 for cust 10
[ 4] 19:16:54.5 Customer 10 at (5650, 6203) accepts Parcel 88 for cust 10
[ 4] 19:17:11.6 Customer 10 at (5650, 6203) signs off
[ 4] 19:17:11.9 Driver drives to Customer 3 at (2200, 3898)
[ 4] 19:37:31.4 Driver arrived at Customer 3 at (2200, 3898)
[ 4] 19:37:37.8 Customer 3 at (2200, 3898) answers door
[ 4] 19:37:37.8 Customer 3 at (2200, 3898) accepts Parcel 80 for cust 3
[ 4] 19:37:40.8 Customer 3 at (2200, 3898) accepts Parcel 81 for cust 3
[ 4] 19:37:56.1 Customer 3 at (2200, 3898) signs off
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[ 4] 19:38:14.6 Driver drives to Customer 2 at (1618, 4500)
[ 4] 19:42:58.7 Driver arrived at Customer 2 at (1618, 4500)
[ 4] 19:43:33.7 Customer 2 at (1618, 4500) answers door
[ 4] 19:43:33.7 Customer 2 at (1618, 4500) accepts Parcel 79 for cust 2
[ 4] 19:43:46.4 Customer 2 at (1618, 4500) signs off
[ 4] 19:44:02.8 Driver drives to Customer 0 at (1050, 4722)
[ 4] 19:47:12.4 Driver arrived at Customer 0 at (1050, 4722)
[ 4] 19:47:15.2 Customer 0 at (1050, 4722) answers door
[ 4] 19:47:15.2 Customer 0 at (1050, 4722) accepts Parcel 75 for cust 0
[ 4] 19:47:16.1 Customer 0 at (1050, 4722) accepts Parcel 76 for cust 0
[ 4] 19:47:36.4 Customer 0 at (1050, 4722) signs off
[ 4] 19:47:36.8 Driver drives to Customer 1 at (1050, 5180)
[ 4] 19:49:26.7 Driver arrived at Customer 1 at (1050, 5180)
[ 4] 19:49:36.9 Customer 1 at (1050, 5180) answers door
[ 4] 19:49:36.9 Customer 1 at (1050, 5180) accepts Parcel 77 for cust 1
[ 4] 19:49:37.3 Customer 1 at (1050, 5180) accepts Parcel 78 for cust 1
[ 4] 19:49:37.5 Customer 1 at (1050, 5180) signs off
[ 4] 19:49:56.0 Driver drives to Customer 5 at (3350, 7580)
[ 4] 20:06:02.3 Driver arrived at Customer 5 at (3350, 7580)
[ 4] 20:06:18.3 Customer 5 at (3350, 7580) answers door
[ 4] 20:06:18.3 Customer 5 at (3350, 7580) accepts Parcel 82 for cust 5
[ 4] 20:06:20.1 Customer 5 at (3350, 7580) signs off
[ 4] 20:06:21.7 Driver returns to delivery centre
[ 4] 20:25:11.1 Driver arrived at delivery centre
[ 4] 20:25:11.1 4 parcels left for next day
[ 4] 20:35:11.1 Driver goes home
[ 5] 17:00:00.0 Parcel 100 for cust 0 arr at delivery centre
[ 5] 17:00:00.0 Parcel 101 for cust 1 arr at delivery centre
[ 5] 17:00:00.0 Parcel 102 for cust 3 arr at delivery centre
[ 5] 17:00:00.0 Parcel 103 for cust 3 arr at delivery centre
[ 5] 17:00:00.0 Parcel 104 for cust 4 arr at delivery centre
[ 5] 17:00:00.0 Parcel 105 for cust 4 arr at delivery centre
[ 5] 17:00:00.0 Parcel 106 for cust 6 arr at delivery centre
[ 5] 17:00:00.0 Parcel 107 for cust 6 arr at delivery centre
[ 5] 17:00:00.0 Parcel 108 for cust 6 arr at delivery centre
[ 5] 17:00:00.0 Parcel 109 for cust 8 arr at delivery centre
[ 5] 17:00:00.0 Parcel 110 for cust 9 arr at delivery centre
[ 5] 17:00:00.0 Parcel 111 for cust 10 arr at delivery centre
[ 5] 17:00:00.0 Parcel 112 for cust 11 arr at delivery centre
[ 5] 17:00:00.0 Parcel 113 for cust 11 arr at delivery centre
[ 5] 17:00:00.0 Parcel 114 for cust 13 arr at delivery centre
[ 5] 17:00:00.0 Parcel 115 for cust 13 arr at delivery centre
[ 5] 17:00:00.0 Parcel 116 for cust 13 arr at delivery centre
[ 5] 17:00:00.0 Parcel 117 for cust 14 arr at delivery centre
[ 5] 17:00:00.0 Parcel 118 for cust 15 arr at delivery centre
[ 5] 17:00:00.0 Parcel 119 for cust 15 arr at delivery centre
[ 5] 17:00:00.0 Parcel 120 for cust 15 arr at delivery centre
[ 5] 17:00:00.0 Parcel 121 for cust 16 arr at delivery centre
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[ 5] 17:00:00.0 Parcel 122 for cust 17 arr at delivery centre
[ 5] 17:00:00.0 Parcel 123 for cust 19 arr at delivery centre
[ 5] 18:00:00.0 Driver arrives for work
[ 5] 18:00:00.0 Parcel 100 for cust 0 out for delivery
[ 5] 18:00:00.0 Parcel 101 for cust 1 out for delivery
[ 5] 18:00:00.0 Parcel 102 for cust 3 out for delivery
[ 5] 18:00:00.0 Parcel 103 for cust 3 out for delivery
[ 5] 18:00:00.0 Parcel 111 for cust 10 out for delivery
[ 5] 18:00:00.0 Parcel 114 for cust 13 out for delivery
[ 5] 18:00:00.0 Parcel 115 for cust 13 out for delivery
[ 5] 18:00:00.0 Parcel 116 for cust 13 out for delivery
[ 5] 18:00:00.0 Parcel 117 for cust 14 out for delivery
[ 5] 18:00:00.0 Parcel 96 for cust 17 out for delivery
[ 5] 18:00:00.0 Parcel 97 for cust 17 out for delivery
[ 5] 18:00:00.0 Parcel 122 for cust 17 out for delivery
[ 5] 18:00:00.0 Parcel 98 for cust 18 out for delivery
[ 5] 18:00:00.0 Parcel 99 for cust 19 out for delivery
[ 5] 18:00:00.0 Parcel 123 for cust 19 out for delivery
[ 5] 18:00:00.0 Parcel 118 for cust 15 out for delivery
[ 5] 18:00:00.0 Parcel 119 for cust 15 out for delivery
[ 5] 18:00:00.0 Parcel 120 for cust 15 out for delivery
[ 5] 18:00:00.0 Parcel 110 for cust 9 out for delivery
[ 5] 18:00:00.0 Parcel 109 for cust 8 out for delivery
[ 5] 18:00:00.0 Parcel 106 for cust 6 out for delivery
[ 5] 18:00:00.0 Parcel 107 for cust 6 out for delivery
[ 5] 18:00:00.0 Parcel 108 for cust 6 out for delivery
[ 5] 18:00:00.0 Parcel 104 for cust 4 out for delivery
[ 5] 18:00:00.0 Parcel 105 for cust 4 out for delivery
[ 5] 18:20:50.0 Driver leaves for delivery of 25 parcels to 14 customers
[ 5] 18:20:50.0 Length of delivery tour: 28,755m
[ 5] 18:20:50.0 Driver drives to Customer 0 at (1050, 4722)
[ 5] 18:30:55.3 Driver arrived at Customer 0 at (1050, 4722)
[ 5] 18:31:38.0 Customer 0 at (1050, 4722) answers door
[ 5] 18:31:38.0 Customer 0 at (1050, 4722) accepts Parcel 100 for cust 0
[ 5] 18:32:12.6 Customer 0 at (1050, 4722) signs off
[ 5] 18:32:19.6 Driver drives to Customer 1 at (1050, 5180)
[ 5] 18:34:09.5 Driver arrived at Customer 1 at (1050, 5180)
[ 5] 18:35:42.1 Customer 1 at (1050, 5180) answers door
[ 5] 18:35:42.1 Customer 1 at (1050, 5180) accepts Parcel 101 for cust 1
[ 5] 18:35:49.1 Customer 1 at (1050, 5180) signs off
[ 5] 18:35:57.6 Driver drives to Customer 3 at (2200, 3898)
[ 5] 18:45:41.3 Driver arrived at Customer 3 at (2200, 3898)
[ 5] 18:46:26.7 Customer 3 at (2200, 3898) answers door
[ 5] 18:46:26.7 Customer 3 at (2200, 3898) accepts Parcel 102 for cust 3
[ 5] 18:46:43.0 Customer 3 at (2200, 3898) accepts Parcel 103 for cust 3
[ 5] 18:46:57.2 Customer 3 at (2200, 3898) signs off
[ 5] 18:47:43.8 Driver drives to Customer 10 at (5650, 6203)
[ 5] 19:08:03.2 Driver arrived at Customer 10 at (5650, 6203)
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[ 5]  19:08:58.2 Customer 10 at (5650, 6203) answers door
[ 5]  19:08:58.2 Customer 10 at (5650, 6203) accepts Parcel 111 for cust 10
[ 5]  19:09:21.8 Customer 10 at (5650, 6203) signs off
[ 5]  19:09:24.1 Driver drives to Customer 13 at (6800, 4901)
[ 5]  19:19:12.6 Driver arrived at Customer 13 at (6800, 4901)
[ 5]  19:19:43.3 Customer 13 at (6800, 4901) answers door
[ 5]  19:19:43.3 Customer 13 at (6800, 4901) accepts Parcel 114 for cust 13
[ 5]  19:19:52.4 Customer 13 at (6800, 4901) accepts Parcel 115 for cust 13
[ 5]  19:20:09.9 Customer 13 at (6800, 4901) accepts Parcel 116 for cust 13
[ 5]  19:20:16.5 Customer 13 at (6800, 4901) signs off
[ 5]  19:20:32.1 Driver drives to Customer 14 at (7188, 4500)
[ 5]  19:23:41.5 Driver arrived at Customer 14 at (7188, 4500)
[ 5]  19:24:01.2 Customer 14 at (7188, 4500) answers door
[ 5]  19:24:01.2 Customer 14 at (7188, 4500) accepts Parcel 117 for cust 14
[ 5]  19:24:10.0 Customer 14 at (7188, 4500) signs off
[ 5]  19:24:29.0 Driver drives to Customer 17 at (7575, 4500)
[ 5]  19:26:01.9 Driver arrived at Customer 17 at (7575, 4500)
[ 5]  19:27:05.9 Customer 17 at (7575, 4500) answers door
[ 5]  19:27:05.9 Customer 17 at (7575, 4500) accepts Parcel 96 for cust 17
[ 5]  19:27:16.6 Customer 17 at (7575, 4500) accepts Parcel 97 for cust 17
[ 5]  19:27:16.6 Customer 17 at (7575, 4500) accepts Parcel 122 for cust 17
[ 5]  19:27:18.6 Customer 17 at (7575, 4500) signs off
[ 5]  19:27:25.7 Driver drives to Customer 18 at (7816, 4500)
[ 5]  19:28:23.5 Driver arrived at Customer 18 at (7816, 4500)
[ 5]  19:28:35.3 Customer 18 at (7816, 4500) answers door
[ 5]  19:28:35.3 Customer 18 at (7816, 4500) accepts Parcel 98 for cust 18
[ 5]  19:28:36.0 Customer 18 at (7816, 4500) signs off
[ 5]  19:28:55.6 Driver drives to Customer 19 at (7950, 4122)
[ 5]  19:30:58.5 Driver arrived at Customer 19 at (7950, 4122)
[ 5]  19:32:53.0 Customer 19 at (7950, 4122) answers door
[ 5]  19:32:53.0 Customer 19 at (7950, 4122) accepts Parcel 99 for cust 19
[ 5]  19:32:56.7 Customer 19 at (7950, 4122) accepts Parcel 123 for cust 19
[ 5]  19:33:01.9 Customer 19 at (7950, 4122) signs off
[ 5]  19:33:18.5 Driver drives to Customer 15 at (7302, 3350)
[ 5]  19:43:05.1 Driver arrived at Customer 15 at (7302, 3350)
[ 5]  19:43:07.6 Customer 15 at (7302, 3350) answers door
[ 5]  19:43:07.6 Customer 15 at (7302, 3350) accepts Parcel 118 for cust 15
[ 5]  19:43:17.9 Customer 15 at (7302, 3350) accepts Parcel 119 for cust 15
[ 5]  19:43:19.2 Customer 15 at (7302, 3350) accepts Parcel 120 for cust 15
[ 5]  19:43:22.6 Customer 15 at (7302, 3350) signs off
[ 5]  19:43:40.3 Driver drives to Customer 9 at (5650, 3175)
[ 5]  19:50:58.8 Driver arrived at Customer 9 at (5650, 3175)
[ 5]  19:51:01.1 Customer 9 at (5650, 3175) answers door
[ 5]  19:51:01.1 Customer 9 at (5650, 3175) accepts Parcel 110 for cust 9
[ 5]  19:51:01.5 Customer 9 at (5650, 3175) signs off
[ 5]  19:51:06.9 Driver drives to Customer 8 at (5650, 2783)
[ 5]  19:52:41.0 Driver arrived at Customer 8 at (5650, 2783)
[ 5]  19:53:08.0 Customer 8 at (5650, 2783) answers door
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[ 5] 19:53:08.0 Customer 8 at (5650, 2783) accepts Parcel 109 for cust 8
[ 5] 19:53:27.9 Customer 8 at (5650, 2783) signs off
[ 5] 19:53:40.6 Driver drives to Customer 6 at (4142, 1050)
[ 5] 20:07:04.8 Driver arrived at Customer 6 at (4142, 1050)
[ 5] 20:07:49.6 Customer 6 at (4142, 1050) answers door
[ 5] 20:07:49.6 Customer 6 at (4142, 1050) accepts Parcel 106 for cust 6
[ 5] 20:07:51.2 Customer 6 at (4142, 1050) accepts Parcel 107 for cust 6
[ 5] 20:08:34.4 Customer 6 at (4142, 1050) accepts Parcel 108 for cust 6
[ 5] 20:08:39.7 Customer 6 at (4142, 1050) signs off
[ 5] 20:08:49.2 Driver drives to Customer 4 at (2821, 1578)
[ 5] 20:14:58.6 Driver arrived at Customer 4 at (2821, 1578)
[ 5] 20:15:18.1 Customer 4 at (2821, 1578) answers door
[ 5] 20:15:18.1 Customer 4 at (2821, 1578) accepts Parcel 104 for cust 4
[ 5] 20:15:18.6 Customer 4 at (2821, 1578) accepts Parcel 105 for cust 4
[ 5] 20:15:25.0 Customer 4 at (2821, 1578) signs off
[ 5] 20:15:26.6 Driver returns to delivery centre
[ 5] 20:32:45.3 Driver arrived at delivery centre
[ 5] 20:32:45.3 3 parcels left for next day
[ 5] 20:42:45.3 Driver goes home
[ 6] 17:00:00.0 Parcel 124 for cust 0 arr at delivery centre
[ 6] 17:00:00.0 Parcel 125 for cust 0 arr at delivery centre
[ 6] 17:00:00.0 Parcel 126 for cust 2 arr at delivery centre
[ 6] 17:00:00.0 Parcel 127 for cust 4 arr at delivery centre
[ 6] 17:00:00.0 Parcel 128 for cust 5 arr at delivery centre
[ 6] 17:00:00.0 Parcel 129 for cust 5 arr at delivery centre
[ 6] 17:00:00.0 Parcel 130 for cust 5 arr at delivery centre
[ 6] 17:00:00.0 Parcel 131 for cust 6 arr at delivery centre
[ 6] 17:00:00.0 Parcel 132 for cust 6 arr at delivery centre
[ 6] 17:00:00.0 Parcel 133 for cust 8 arr at delivery centre
[ 6] 17:00:00.0 Parcel 134 for cust 8 arr at delivery centre
[ 6] 17:00:00.0 Parcel 135 for cust 8 arr at delivery centre
[ 6] 17:00:00.0 Parcel 136 for cust 11 arr at delivery centre
[ 6] 17:00:00.0 Parcel 137 for cust 12 arr at delivery centre
[ 6] 17:00:00.0 Parcel 138 for cust 13 arr at delivery centre
[ 6] 17:00:00.0 Parcel 139 for cust 14 arr at delivery centre
[ 6] 17:00:00.0 Parcel 140 for cust 14 arr at delivery centre
[ 6] 17:00:00.0 Parcel 141 for cust 14 arr at delivery centre
[ 6] 17:00:00.0 Parcel 142 for cust 16 arr at delivery centre
[ 6] 17:00:00.0 Parcel 143 for cust 16 arr at delivery centre
[ 6] 17:00:00.0 Parcel 144 for cust 16 arr at delivery centre
[ 6] 17:00:00.0 Parcel 145 for cust 17 arr at delivery centre
[ 6] 17:00:00.0 Parcel 146 for cust 18 arr at delivery centre
[ 6] 17:00:00.0 Parcel 147 for cust 18 arr at delivery centre
[ 6] 17:00:00.0 Parcel 148 for cust 19 arr at delivery centre
[ 6] 17:00:00.0 Parcel 149 for cust 19 arr at delivery centre
[ 6] 17:00:00.0 Parcel 150 for cust 19 arr at delivery centre
[ 6] 18:00:00.0 Driver arrives for work
[ 6] 18:00:00.0 Parcel 127 for cust 4 out for delivery
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[ 6] 18:00:00.0 Parcel 131 for cust 6 out for delivery
[ 6] 18:00:00.0 Parcel 132 for cust 6 out for delivery
[ 6] 18:00:00.0 Parcel 126 for cust 2 out for delivery
[ 6] 18:00:00.0 Parcel 124 for cust 0 out for delivery
[ 6] 18:00:00.0 Parcel 125 for cust 0 out for delivery
[ 6] 18:00:00.0 Parcel 128 for cust 5 out for delivery
[ 6] 18:00:00.0 Parcel 129 for cust 5 out for delivery
[ 6] 18:00:00.0 Parcel 130 for cust 5 out for delivery
[ 6] 18:00:00.0 Parcel 112 for cust 11 out for delivery
[ 6] 18:00:00.0 Parcel 113 for cust 11 out for delivery
[ 6] 18:00:00.0 Parcel 136 for cust 11 out for delivery
[ 6] 18:00:00.0 Parcel 138 for cust 13 out for delivery
[ 6] 18:00:00.0 Parcel 121 for cust 16 out for delivery
[ 6] 18:00:00.0 Parcel 142 for cust 16 out for delivery
[ 6] 18:00:00.0 Parcel 143 for cust 16 out for delivery
[ 6] 18:00:00.0 Parcel 144 for cust 16 out for delivery
[ 6] 18:14:10.0 Driver leaves for delivery of 17 parcels to 8 customers
[ 6] 18:14:10.0 Length of delivery tour: 29,338m
[ 6] 18:14:10.0 Driver drives to Customer 4 at (2821, 1578)
[ 6] 18:31:28.7 Driver arrived at Customer 4 at (2821, 1578)
[ 6] 18:31:30.0 Customer 4 at (2821, 1578) answers door
[ 6] 18:31:30.0 Customer 4 at (2821, 1578) accepts Parcel 127 for cust 4
[ 6] 18:31:39.6 Customer 4 at (2821, 1578) signs off
[ 6] 18:31:49.6 Driver drives to Customer 6 at (4142, 1050)
[ 6] 18:37:58.9 Driver arrived at Customer 6 at (4142, 1050)
[ 6] 18:38:03.4 Customer 6 at (4142, 1050) answers door
[ 6] 18:38:03.4 Customer 6 at (4142, 1050) accepts Parcel 131 for cust 6
[ 6] 18:38:11.4 Customer 6 at (4142, 1050) accepts Parcel 132 for cust 6
[ 6] 18:38:15.6 Customer 6 at (4142, 1050) signs off
[ 6] 18:38:20.5 Driver drives to Customer 2 at (1618, 4500)
[ 6] 18:59:32.2 Driver arrived at Customer 2 at (1618, 4500)
[ 6] 19:00:32.1 Customer 2 at (1618, 4500) answers door
[ 6] 19:00:32.1 Customer 2 at (1618, 4500) accepts Parcel 126 for cust 2
[ 6] 19:00:38.9 Customer 2 at (1618, 4500) signs off
[ 6] 19:01:00.2 Driver drives to Customer 0 at (1050, 4722)
[ 6] 19:04:09.8 Driver arrived at Customer 0 at (1050, 4722)
[ 6] 19:04:47.5 Customer 0 at (1050, 4722) answers door
[ 6] 19:04:47.5 Customer 0 at (1050, 4722) accepts Parcel 124 for cust 0
[ 6] 19:04:53.8 Customer 0 at (1050, 4722) accepts Parcel 125 for cust 0
[ 6] 19:05:03.8 Customer 0 at (1050, 4722) signs off
[ 6] 19:05:07.9 Driver drives to Customer 5 at (3350, 7580)
[ 6] 19:23:04.0 Driver arrived at Customer 5 at (3350, 7580)
[ 6] 19:23:09.4 Customer 5 at (3350, 7580) answers door
[ 6] 19:23:09.4 Customer 5 at (3350, 7580) accepts Parcel 128 for cust 5
[ 6] 19:23:20.8 Customer 5 at (3350, 7580) accepts Parcel 129 for cust 5
[ 6] 19:23:30.6 Customer 5 at (3350, 7580) accepts Parcel 130 for cust 5
[ 6] 19:23:46.1 Customer 5 at (3350, 7580) signs off
[ 6] 19:23:47.5 Driver drives to Customer 11 at (5650, 7250)
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[ 6] 19:37:16.3 Driver arrived at Customer 11 at (5650, 7250)
[ 6] 19:38:53.4 Customer 11 at (5650, 7250) answers door
[ 6] 19:38:53.4 Customer 11 at (5650, 7250) accepts Parcel 112 for cust 11
[ 6] 19:39:09.4 Customer 11 at (5650, 7250) accepts Parcel 113 for cust 11
[ 6] 19:39:34.3 Customer 11 at (5650, 7250) accepts Parcel 136 for cust 11
[ 6] 19:39:54.9 Customer 11 at (5650, 7250) signs off
[ 6] 19:40:06.3 Driver drives to Customer 13 at (6800, 4901)
[ 6] 19:54:06.1 Driver arrived at Customer 13 at (6800, 4901)
[ 6] 19:55:12.6 Customer 13 at (6800, 4901) answers door
[ 6] 19:55:12.6 Customer 13 at (6800, 4901) accepts Parcel 138 for cust 13
[ 6] 19:55:19.9 Customer 13 at (6800, 4901) signs off
[ 6] 19:55:35.3 Driver drives to Customer 16 at (7477, 5650)
[ 6] 20:01:17.5 Driver arrived at Customer 16 at (7477, 5650)
[ 6] 20:01:25.9 Customer 16 at (7477, 5650) answers door
[ 6] 20:01:25.9 Customer 16 at (7477, 5650) accepts Parcel 121 for cust 16
[ 6] 20:01:41.2 Customer 16 at (7477, 5650) accepts Parcel 142 for cust 16
[ 6] 20:01:47.0 Customer 16 at (7477, 5650) accepts Parcel 143 for cust 16
[ 6] 20:02:01.2 Customer 16 at (7477, 5650) accepts Parcel 144 for cust 16
[ 6] 20:02:07.2 Customer 16 at (7477, 5650) signs off
[ 6] 20:02:22.8 Driver returns to delivery centre
[ 6] 20:20:47.6 Driver arrived at delivery centre
[ 6] 20:20:47.6 13 parcels left for next day
[ 6] 20:30:47.6 Driver goes home
Delivery Centre Inventory: 13 parcels
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