

Sets

As per paper +

N set of time space nodes (s, t) represents supplier s at time t , plus the depot at time 0

$A = A^c + A^w + A^0$ full set of arcs

A^0 starting arcs – depot to some starting time at a supplier – cost is the vehicle cost

A^c service a request (trip) travel from a supplier at a specified time back to a (potentially different) supplier at another time – cost is the delay times the weight

A^w waiting arc – wait at a node – cost nothing

Data

$a \in A$ consists of (f_a, t_a, c_a, i_a) being the from node, to node, cost and the request (if any) covered by the arc.

Variables

x_a , integer $\forall a \in A$ (may be multiple starting arcs for the same supplier)

Objective

$$\min \sum_{a \in A} c_a x_a$$

Constraints

Conserve flow

$$\sum_{a \in A | f_a = n} x_a = \sum_{a \in A | t_a = n} x_a \quad \forall n \in N$$

Cover

$$\sum_{a \in A^c | i_a = i} x_a = 1 \quad \forall i \in I$$