

$$\min \text{travel_cost} * \sum_{i \in ALL} \sum_{j \in ALL} \sum_{a \in A} x_{i,j,a} * \text{distance}_{i,j} + \text{wait_cost} * \sum_{i \in C} \sum_{a \in A} w_{i,a} + \sum_{i \in RBLE} \sum_{a \in A} s_{i,a}$$

- 1) $\sum_{i \in ALL} \sum_{a \in A} x_{i,j,a} = 1, \quad j \in C$
- 2) $\sum_{i \in ALL} \sum_{a \in A} x_{i,j,a} \leq 1, \quad j \in FO$
- 3) $\sum_{j \in REAL} x_{start,j,a} = 1, \quad a \in A$
- 4) $x_{start,j,a} = 0, \quad j \in FO, a \in A$
- 5) $\sum_{i \in RBLE} x_{i,s,a} = 1, \quad a \in A$
- 6) $\sum_{i \in ALL} x_{i,h,a} - \sum_{j \in ALL} x_{h,j,a} = 0, \quad h \in ALL, a \in A$
- 7) $x_{i,i,a} = 0, \quad i \in ALL, a \in A$
- 8) $c_{j,a} = \text{service}_j * \sum_{i \in ALL} x_{i,j,a}, \quad i \in C, a \in A$
- 9) $\sum_{i \in ALL} \sum_{j \in o+FO} c_{j,a} * x_{i,j,a} = \text{service}_o, \quad a \in A$
- 10) $c_{j,a} \geq x_{i,j,a}, \quad i \in ALL, j \in RBLE, a \in A$
- 11) $\sum_{i \in ALL} \sum_{i \in o+FO} x_{i,j,a} \geq 1, \quad a \in A$
- 12) $x_{i,j,a} = 0, \quad i \in o+FO, j \in o+FO, a \in A$
- 13) $x_{i,o,a} = 0, \quad i \in C, a \in A$
- 14) $x_{j,j+clients,a} \leq \sum_{i \in ALL} x_{i,j,a}, \quad j \in C, a \in A$
- 15) $\{x_{i,j,a} = 0 \text{ if } i \neq j - \text{clients}\}, \quad i \in REAL, j \in FO, a \in A$
- 16) $\text{window_start}_i * \sum_{h \in ALL} x_{h,i,a} \leq s_{i,a}, \quad i \in C, a \in A$
- 17) $\text{window_end}_i * \sum_{h \in ALL} x_{h,i,a} \geq s_{i,a}, \quad i \in C, a \in A$
- 18) $l_{i,j,a} * (s_{i,a} + c_{i,a} + \text{distance}_{i,j} + w_{j,a}) \geq l_{i,j,a} * \text{lunch_start},$
 $i \in RBLE, j \in RBLE, a \in A$
- 19) $l_{i,j,a} * (s_{i,a} + c_{i,a} + \text{distance}_{i,j} + w_{j,a}) \leq l_{i,j,a} * \text{lunch_end},$
 $i \in RBLE, j \in RBLE, a \in A$
- 20) $l_{i,j,a} \leq x_{i,j,a} * \text{lunch_end}, \quad i \in RBLE, j \in RBLE, a \in A$
- 21) $t_a = \max(s_{i,a}, i \in RBLE), \quad a \in A$
- 22) $\text{work_end} * \sum_{i \in RBLE} \sum_{j \in RBLE} l_{i,j,a} \geq t_a - \text{lunch_start}, \quad a \in A$
- 23) $\text{work_end} * \sum_{i \in RBLE} \sum_{j \in RBLE} (1 - l_{i,j,a}) \geq \text{lunch_start} - t_a, \quad a \in A$
- 24) $s_{j,a} = \sum_{i \in RBLE, i \neq j} x_{i,j,a} * (s_{i,a} + c_{i,a} +$
 $\text{distance}_{i,j} + l_{i,j,a} * \text{lunch_len}) + w_{j,a}, \quad j \in RBLE, a \in A$
- 25) $\sum_{i \in RBLE} \sum_{j \in RBLE} x_{i,j,a} * \text{distance}_{i,j} +$
 $\sum_{i \in ALL} \sum_{j \in RBLE} x_{i,j,a} * \text{service}_j +$
 $\sum_{i \in RBLE} w_{i,a} +$
 $\sum_{i \in RBLE} \sum_{j \in RBLE} l_{i,j,a} * \text{lunch_len} +$
 $\text{work_start} \leq \text{work_end}, \quad a \in A$

$$x_{i,j,a} \in \{0, 1\}, i \in ALL, j \in ALL, a \in A$$

$$y_{i,a} \in N, i \in ALL, a \in A$$

$$c_{i,a} \in N, i \in ALL, a \in A$$

$$w_{i,a} \in N, i \in ALL, a \in A$$

$$l_{i,j,a} \in \{0, 1\}, i \in ALL, j \in ALL, a \in A$$

$$t_a \in N, a \in A$$

$$\text{start} = \text{clients} + 1$$

$$o = 0$$

$$C = \{1, \dots, \text{clients}\}$$

$$ALL = \{0, \dots, 2\text{clients} + 1\}$$

$$REAL = \{0, \dots, \text{clients}\}$$

$$RBLE = ALL - \{s\}$$

$$FO = \{P + 2, \dots, 2\text{clients} + 1\}$$