

Handbook of TOOL 1

Excel to Gurobi for Network Models

STEP 1:

Input the data into the cells of the chosen sheet of the attached Excel file.

Callouts:

- Ensure there's an empty column between the columns of node and the column of 'FLOW IN = OUT'.
- For nodes that are transfer nodes (where net flow out equals net flow in), enter 'Y' in the 'FLOW IN = OUT' column. For all other nodes, enter 'N'. Transfer nodes should appear both in columns and rows.
- Don't change the content in cells highlighted in yellow.
- Ensure there's an empty row between the rows of node and the row of 'DEMAND'.
- Insert additional rows or columns if there are more nodes. The flow direction is from the row heading to the column heading.
- Here are the samples. Change the corresponding code in the Notebook. eg: main = wb['Sample-6']
- Here are the detailed explanation of the matrix.

Transshipment Problem

The matrix represents the cost per unit for shipping (listed in rows) to another node.

The 'SUPPLY' column indicates the supply capacity for each node, while the 'DEMAND' row delineates the requirements of the respective nodes.

For nodes that act as transfer points, where the 'net flow out' equals the 'net flow in', mark 'Y' in the 'FLOW IN=OUT' column.

START HERE	Chicago	Memphis	NY	Boston	FLOW IN = OUT (Y/N)	SUPPLY
Denver	6	8			N	200
LA	12	10			N	150
Chicago			4	5	Y	
Memphis			5	7	Y	
DEMAND			130	130		

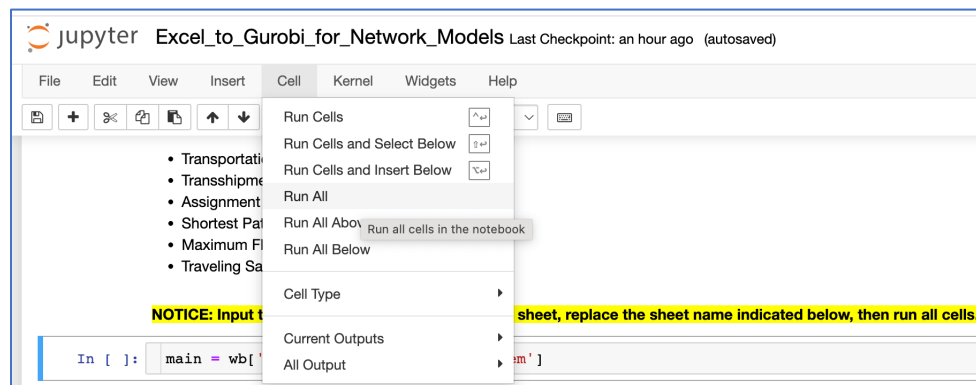
STEP 2:

Replace the sheet name in the Jupyter Notebook file.

```
main = wb['Transportation Problem']
```

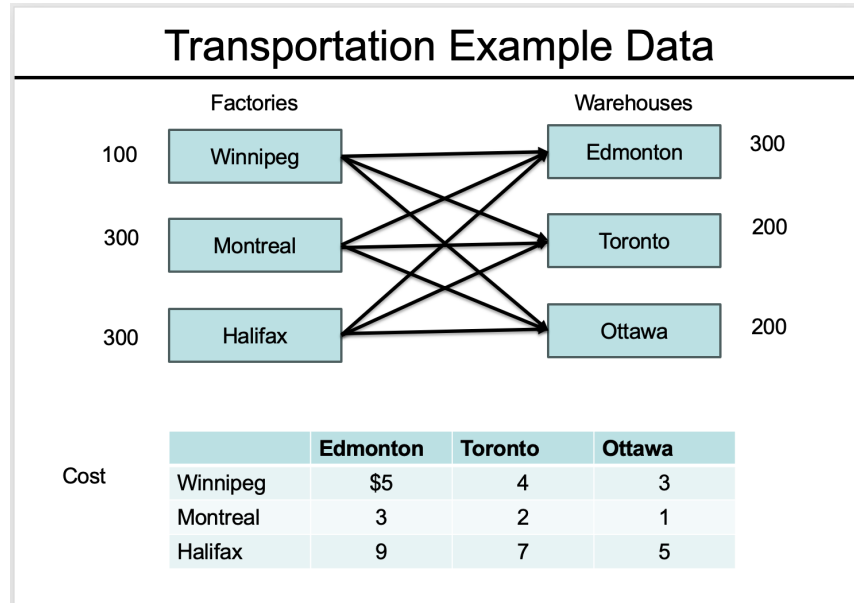
STEP 3:

Run all cells.



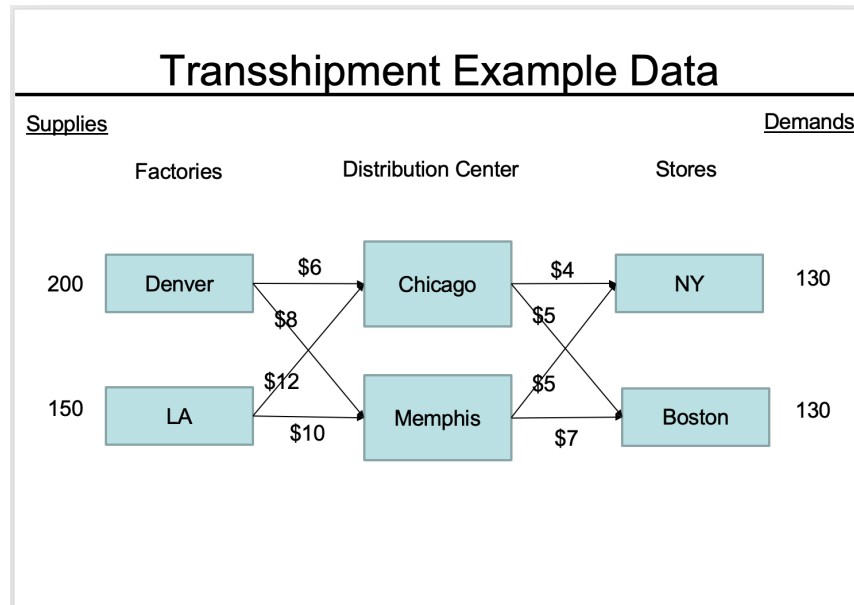
Appendix

Example 1: Transportation Problem



	A	B	C	D	E	F	G
1	Objective	min					
2	Variable Type						
3	non-neg?	Y					
4	Problem Type	MCNF					
5							
6							
7	START HERE	Edmonton	Toronto	Ottawa		FLOW IN = OUT (Y/N)	SUPPLY
8	Winnipeg	5	4	3		N	100
9	Montreal	3	2	1		N	300
10	Halifax	9	7	5		N	300
11							
12	DEMAND	300	200	200			

Example 2: Transshipment Problem



	A	B	C	D	E	F	G	H
1	Objective	min						
2	Variable Type							
3	non-neg?	Y						
4	Problem Type	MCNF						
5								
6								
7	START HERE	Chicago	Memphis	NY	Boston		FLOW IN = OUT (Y/N)	SUPPLY
8	Denver	6	8				N	200
9	LA	12	10				N	150
10	Chicago			4	5		Y	
11	Memphis			5	7		Y	
12								
13	DEMAND			130	130			

Example 3: Assignment Problem

Assignment Example Data

- The time it would take each employee to complete each task is given by this table. How to minimize total hours worked?

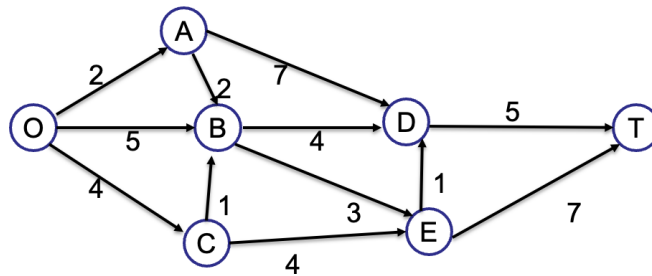
	Task 1	Task 2	Task 3	Task 4
Employee 1	7	3	4	8
Employee 2	5	4	6	5
Employee 3	6	7	15	6
Employee 4	8	6	7	4

	A	B	C	D	E	F	G	H	
1	Objective	min							
2	Variable Type								
3	non-neg?	Y							
4	Problem Type	MCNF							
5									
6									
7	START HERE	Task_1	Task_2	Task_3	Task_4		FLOW IN = OUT (Y/N)	SUPPLY	
8	Employee_1	7	3	4	8		N	1	
9	Employee_2	5	4	6	5		N	1	
10	Employee_3	6	7	15	6		N	1	
11	Employee_4	8	6	7	4		N	1	
12									
13	DEMAND	1	1	1	1				

Example 4: Shortest Path Problem

Shortest Path Problem Example Data

- Find the shortest path from station O to station T

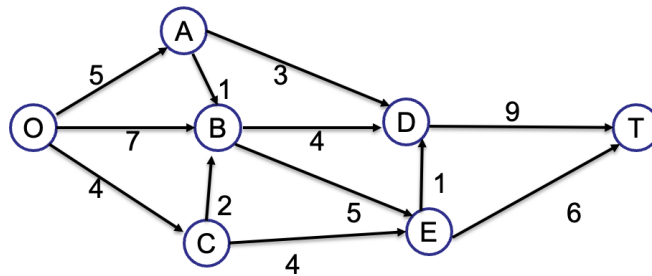


	A	B	C	D	E	F	G	H	I	J
1	Objective	min								
2	Variable Type									
3	non-neg?	Y								
4	Problem Type	MCNF								
5										
6										
7	START HERE	A	B	C	D	E	T		FLOW IN = OUT (Y/N)	SUPPLY
8	O	2	5	4					N	1
9	A		2		7				Y	
10	B				4	3			Y	
11	C		1			4			Y	
12	D						5		Y	
13	E				1		7		Y	
14										
15	DEMAND						1			

Example 5: Maximum Flow Problem

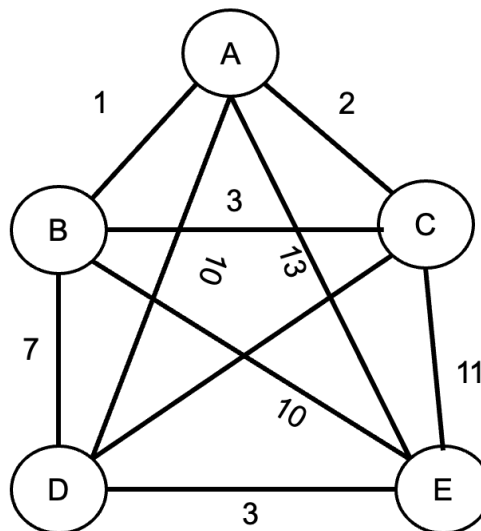
Maximum Flow Problem Example Data

- Determine the maximum flow from O to T, the limit between the nodes shown in the diagram:

[illegible]

Example 6: Traveling Salesperson Problem

Traveling Salesperson Problem



	A	B	C	D	E	F	G	H	I
1	Objective	min							
2	Variable Type	int							
3	non-neg?	Y							
4	Problem Type	TSP							
5									
6									
7	START HERE	A	B	C	D	E		FLOW IN = OUT (Y/N)	SUPPLY
8	A		1	2	10	13		Y	1
9	B	1		3	7	10		Y	1
10	C	2	3		9	11		Y	1
11	D	10	7	10		3		Y	1
12	E	8	9	11	4			Y	1
13									
14	DEMAND	1	1	1	1	1			