

Working of NC- TANDEM – TIGHT

Nc-tandem-tight is a program written in Ocaml which computes delay bounds under arbitrary multiplexing. It uses linear programming to find the worst-case delay bound. Note: It only works for tandem networks.

This documentation provides insight into installation of Nc-tandem-tight and its configuration:

Note: nc-tandem-tight only works on the Linux environment.

1. Downloading nc-tandem-tight

- Download nc-tandem-tight file from following link:

Link: nc-tandem-tight.ml

- We need to compile this file. For that we need **Ocaml**. We can install it by running the following command in the Linux terminal.

```
apt install ocaml
```

- Now go into the directory where **nc-tandem-tight.ml** was downloaded. Open the terminal and run the following command.

```
ocamlopt -pp camlp4o nc-tandem-tight.ml
```

- This will create **a.out** file in the directory. It is an executable file which converts the network topography from text format to lp format.

2. Using nc-tandem-tight and generating linear program file

Nc-tandem-tight generates linear programs to compute tight bounds in tandem networks under blind multiplexing and Network Calculus constraints.

- Suppose we want to find delay for our following tandem network in our tandem1.txt file.

```
nservers 3
nflows 3
objective 'd' 1

beginservers
server 1 (6,3);
server 2 (7,0) (10,3);
server 3 (5,2) (6,3);
endservers

beginflows
flow 1 [1,3] (2,1) (1,3);
flow 2 [1,2] (1,2);
flow 3 [2,3] (4,2);
endflows
```

- To convert this text file into lp file we need to execute the following command:

```
./a.out tandem1.txt tandem1.lp
```

Note: Here tandem1.txt is input file and tandem1.lp is output file

- Go inside the directory where nc-tandem-tight was downloaded and copy the text file to the same directory.
- Then execute the above command to generate the linear program file.
- After this nc-tandem-tight program will generate tandem1.lp file

Now we need a linear programming solver to solve this lp format file and generate the results for delay.

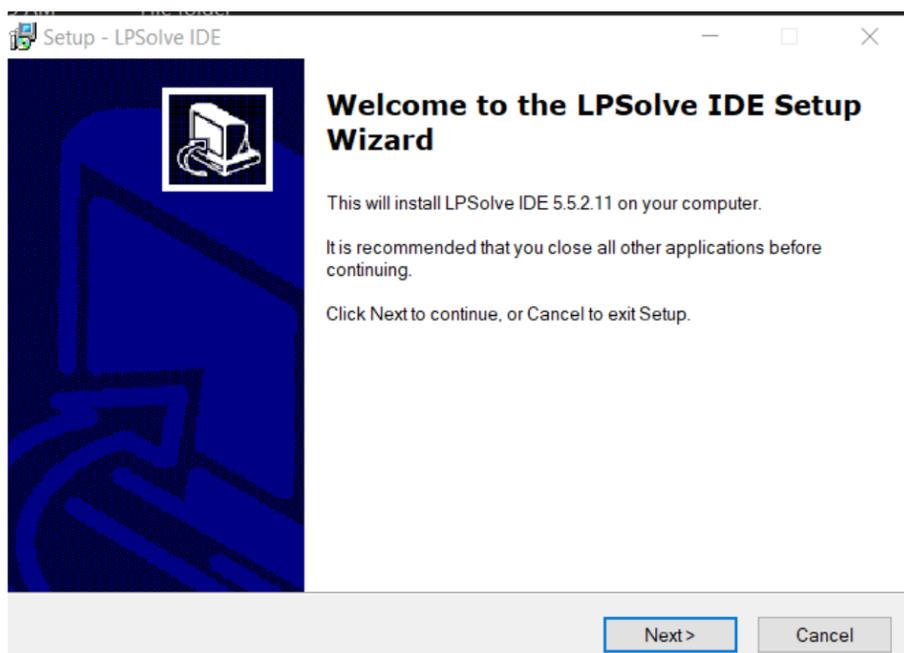
3. Download LP Solve

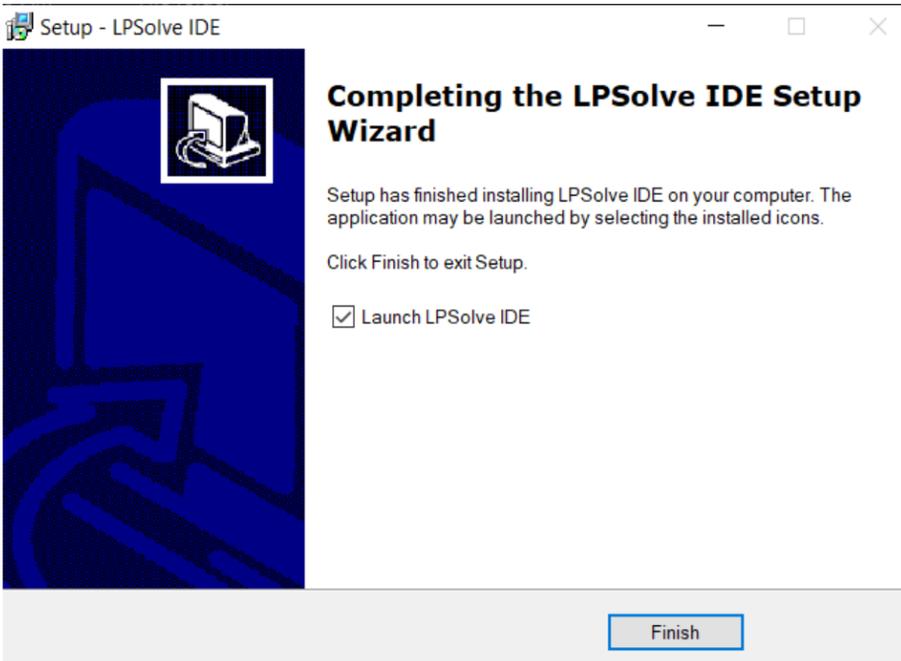
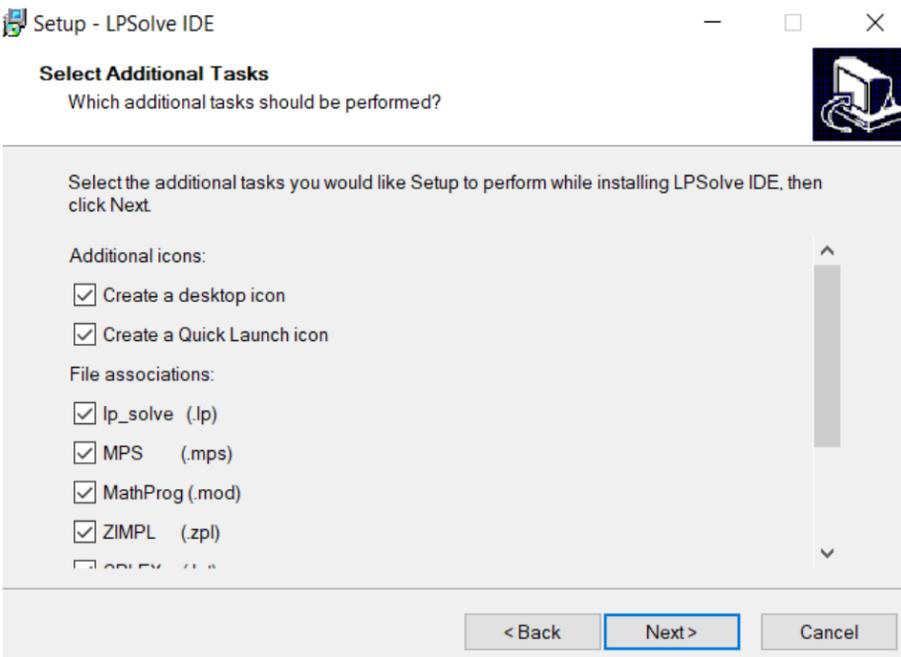
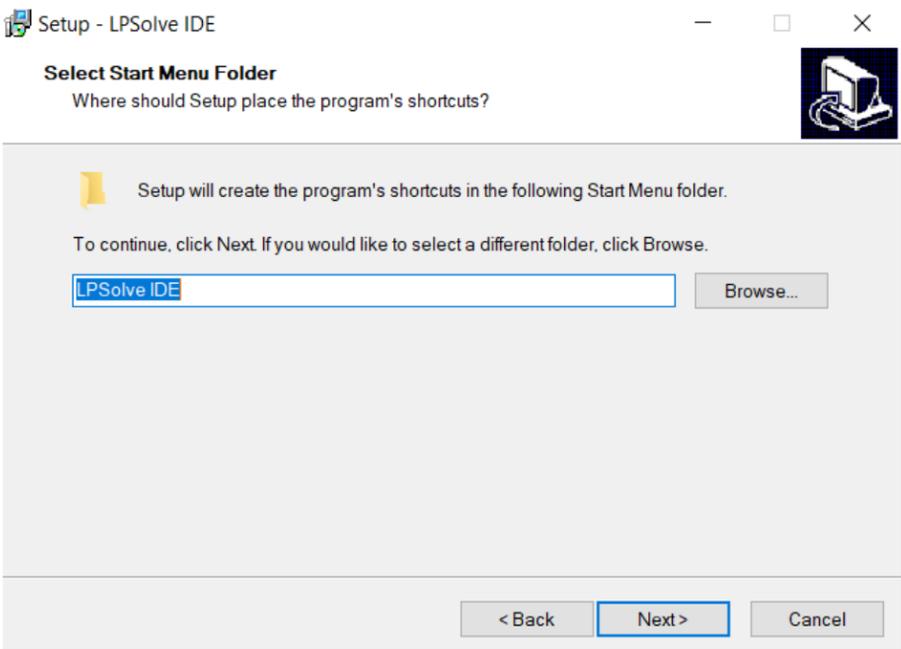
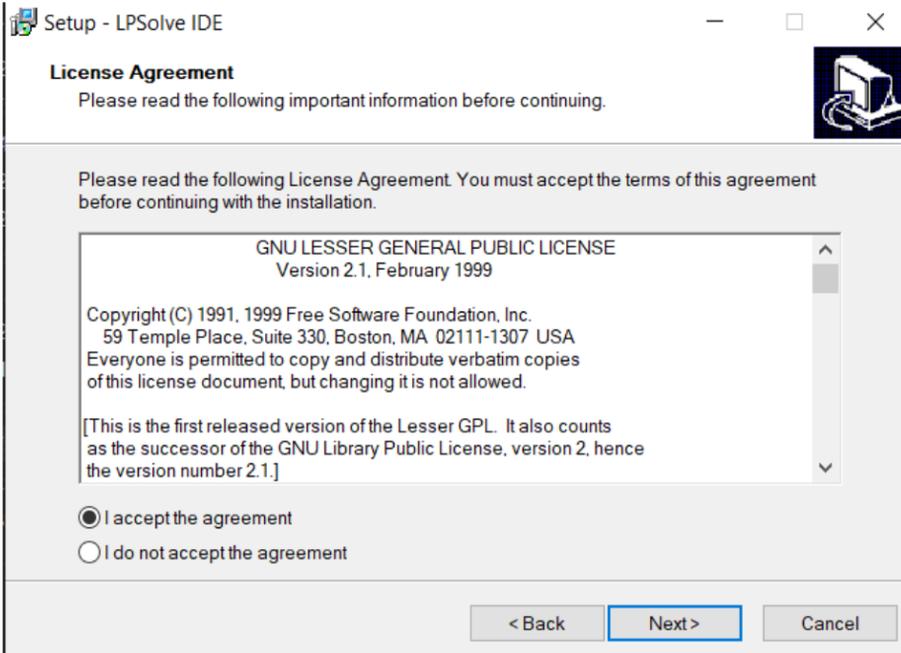
- Download LP Solve from the following link.

Link : lp_solve

4. Install LP Solve IDE

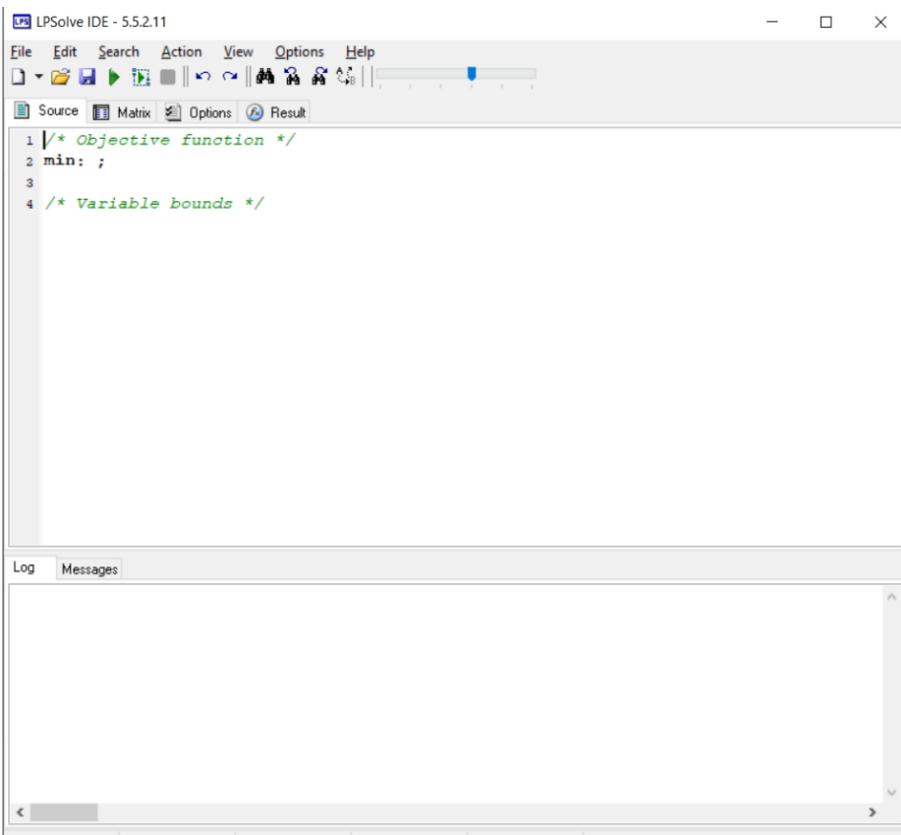
Open the executable file and install it as shown in the images below.





5. Open LPSolve IDE

- Open LPSolve IDE



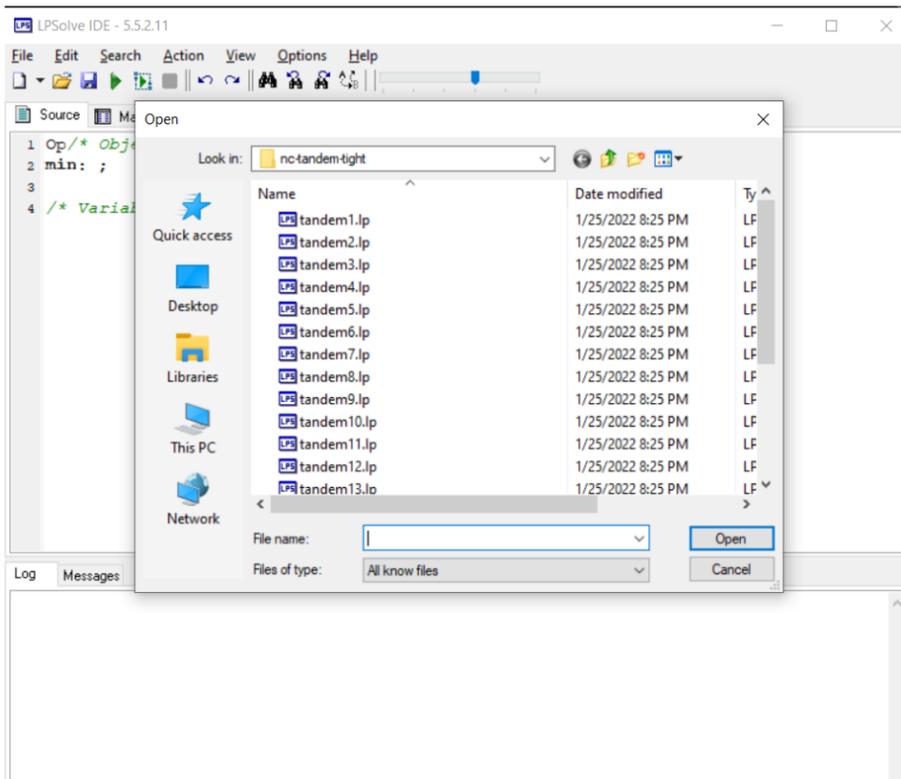
6. Download Ip files

- Download the Ip files generated from nc-tandem-tight from the given link.

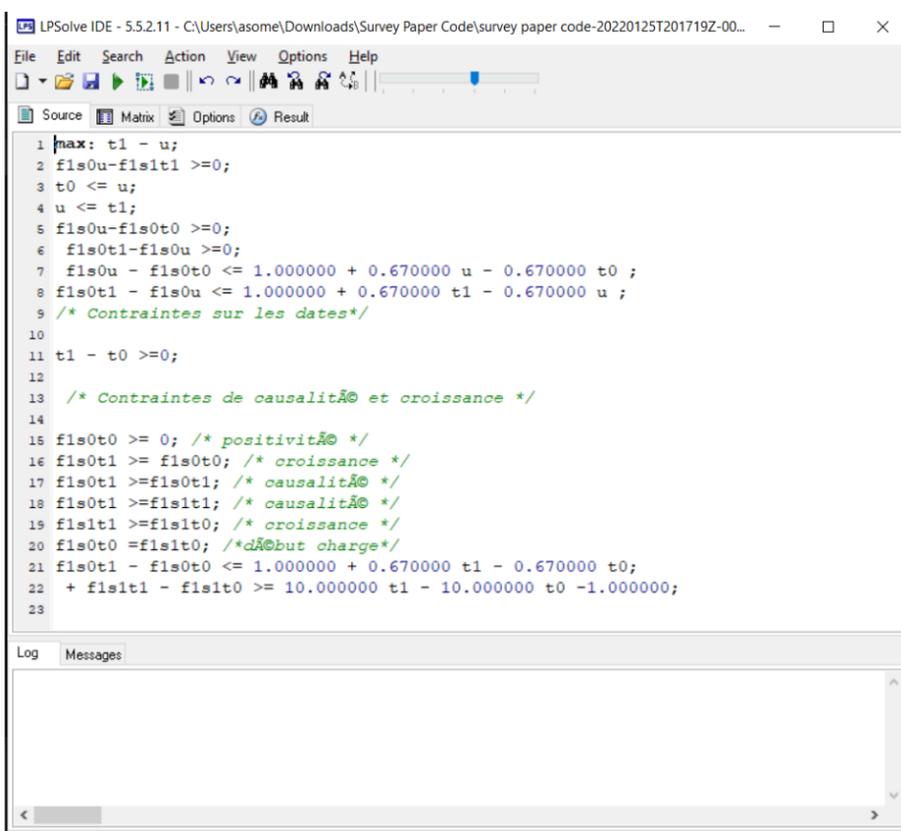
Link:

7. Execute the Ip files

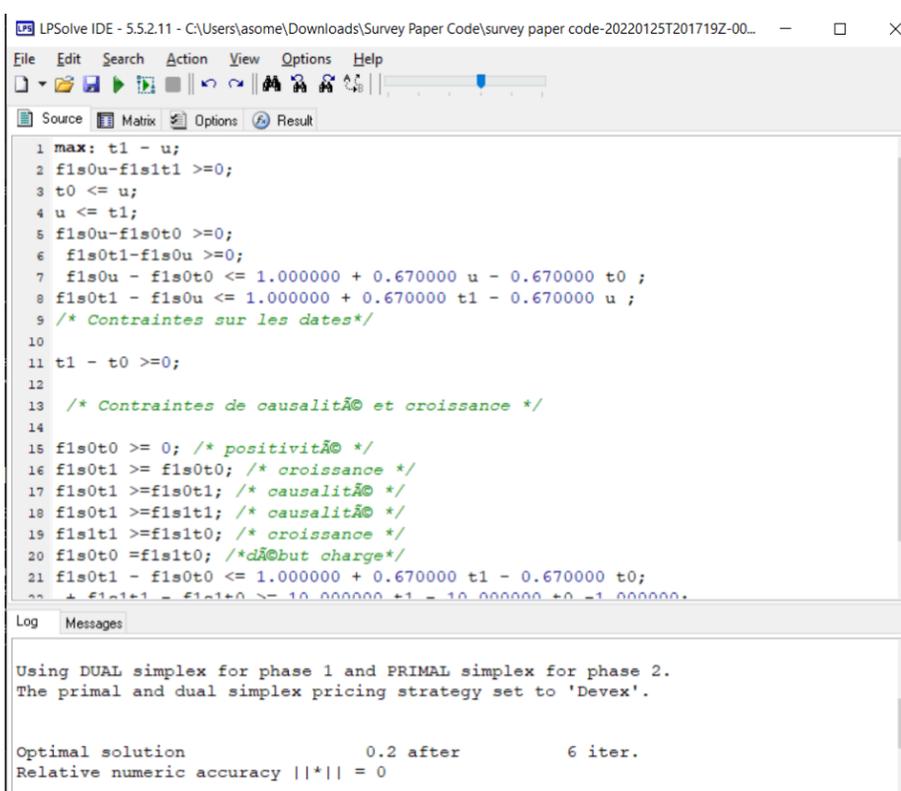
- Go to files and click on open.
- Select the directory where the Ip files from nc-tandem-tight were downloaded.



- Select the files you want to execute



- Click on play button to execute the file and display the results.



As we can see that, for the particular tandem network, delay is 0.2 second.

- Take note of all delays from the Ip files you want to visualize and Plot the delays to get a graph using any visualization technique.

