**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](https://www.di.ens.fr/~bouillar/NCbounds/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.

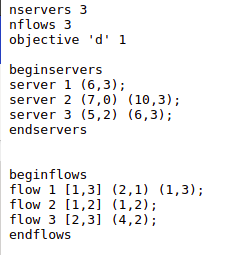
*ocamlopt -pp camlp4o nc-tandem-tight.ml*

* 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.

1. **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.



* 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.

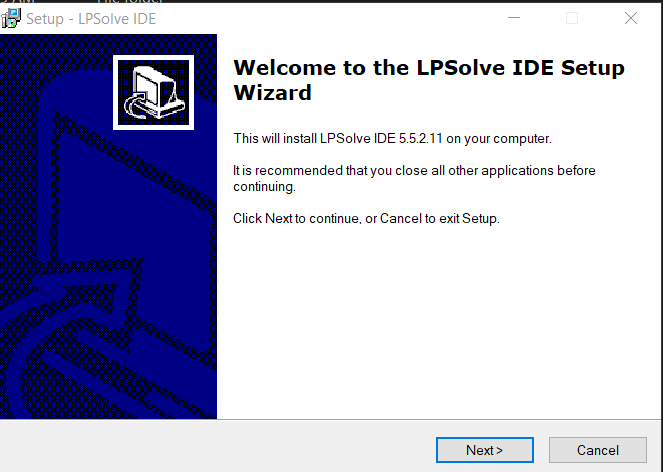
1. **Download LP Solve**

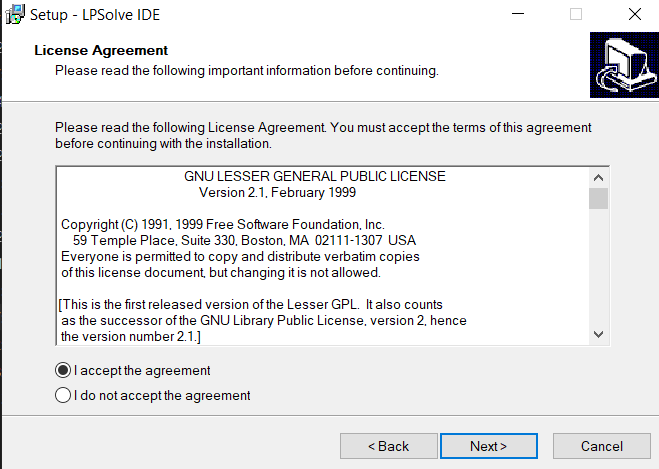
* Download LP Solve from the following link.

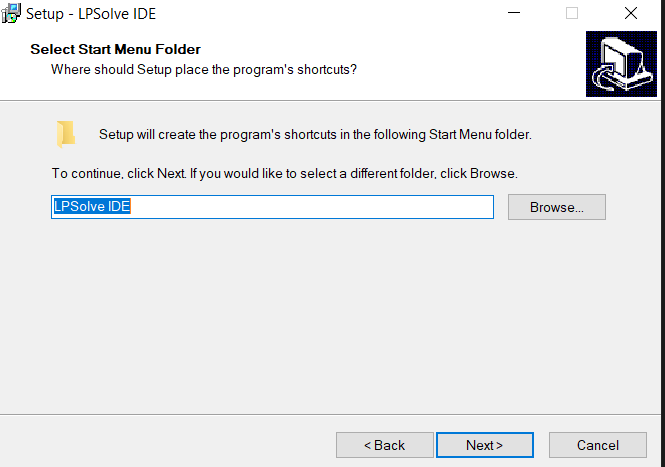
Link : [lp\_solve](https://sourceforge.net/projects/lpsolve/)

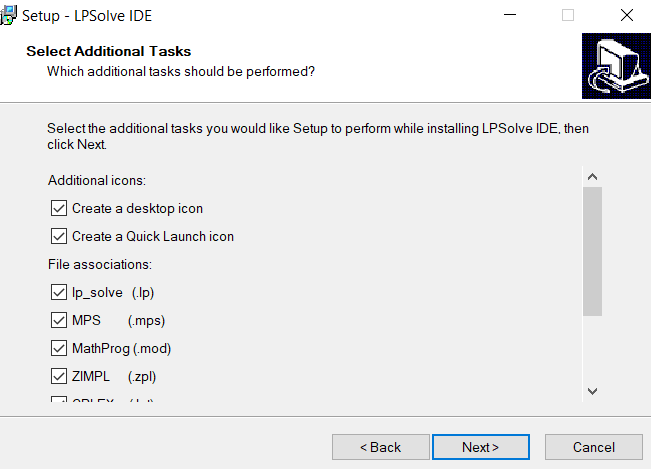
1. **Install LP Solve IDE**

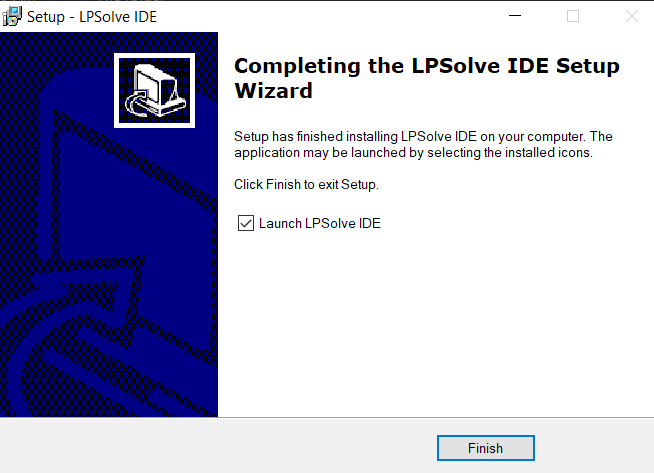
Open the executable file and install it as shown in the images below.





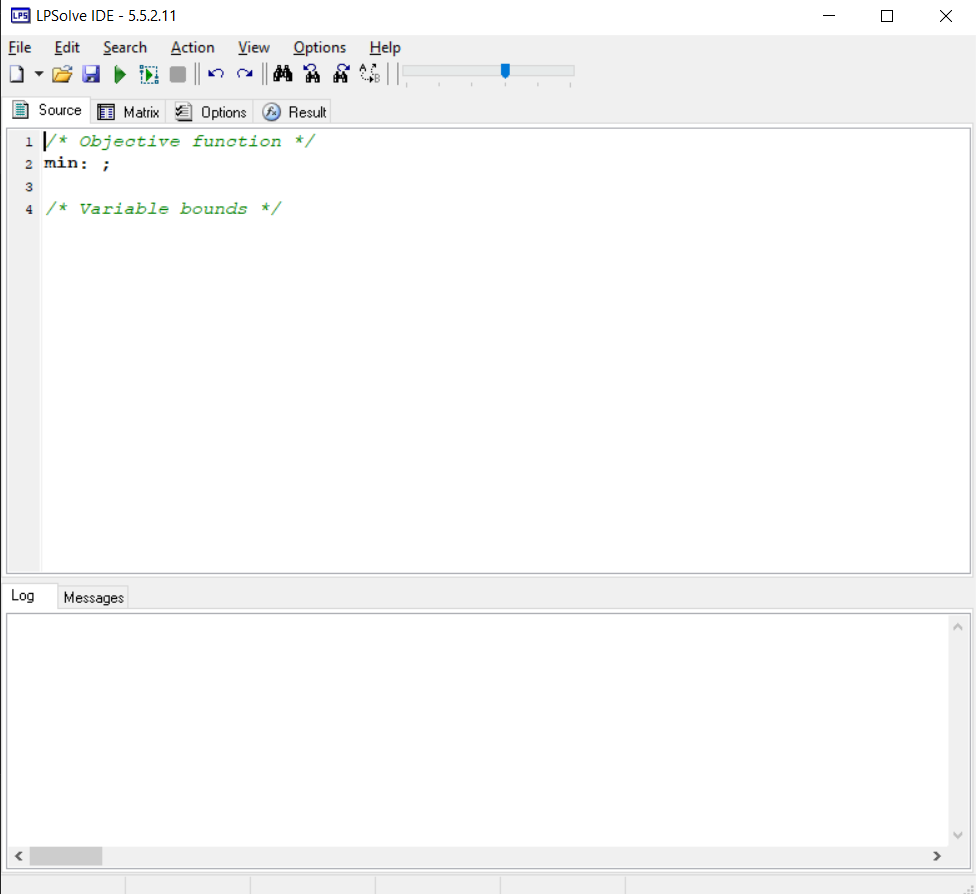






1. **Open LPSolve IDE**

* Open LPSolve IDE



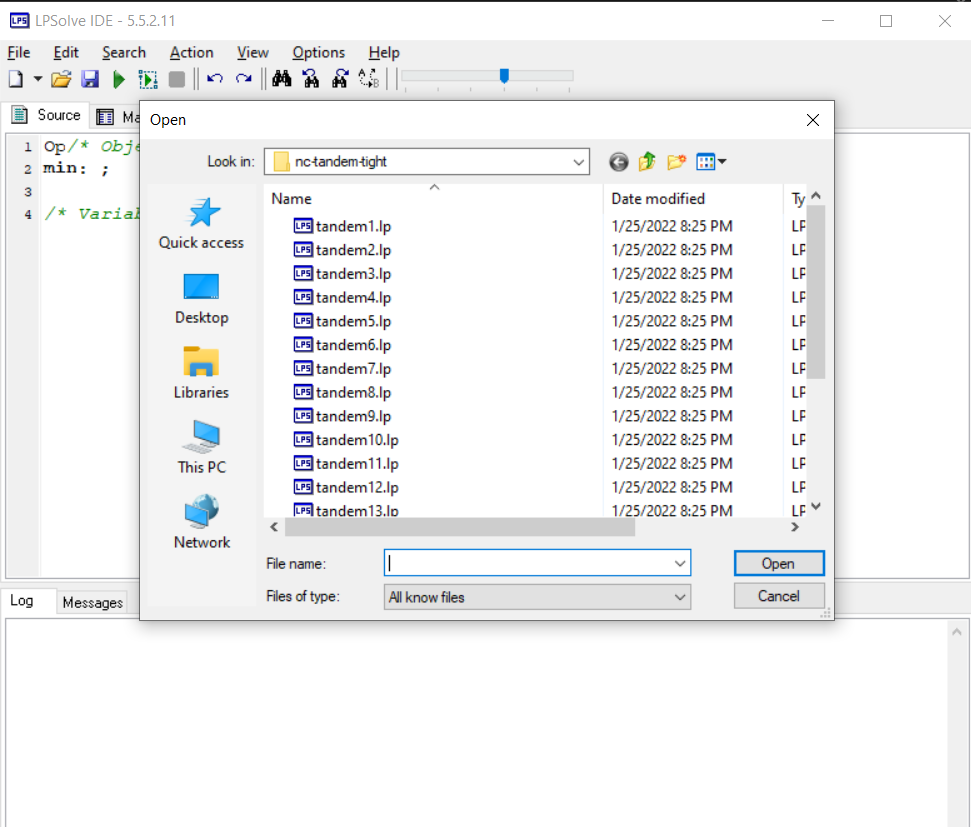
1. **Download lp files**

* Download the lp files generated from nc-tandom-tight from the given link.

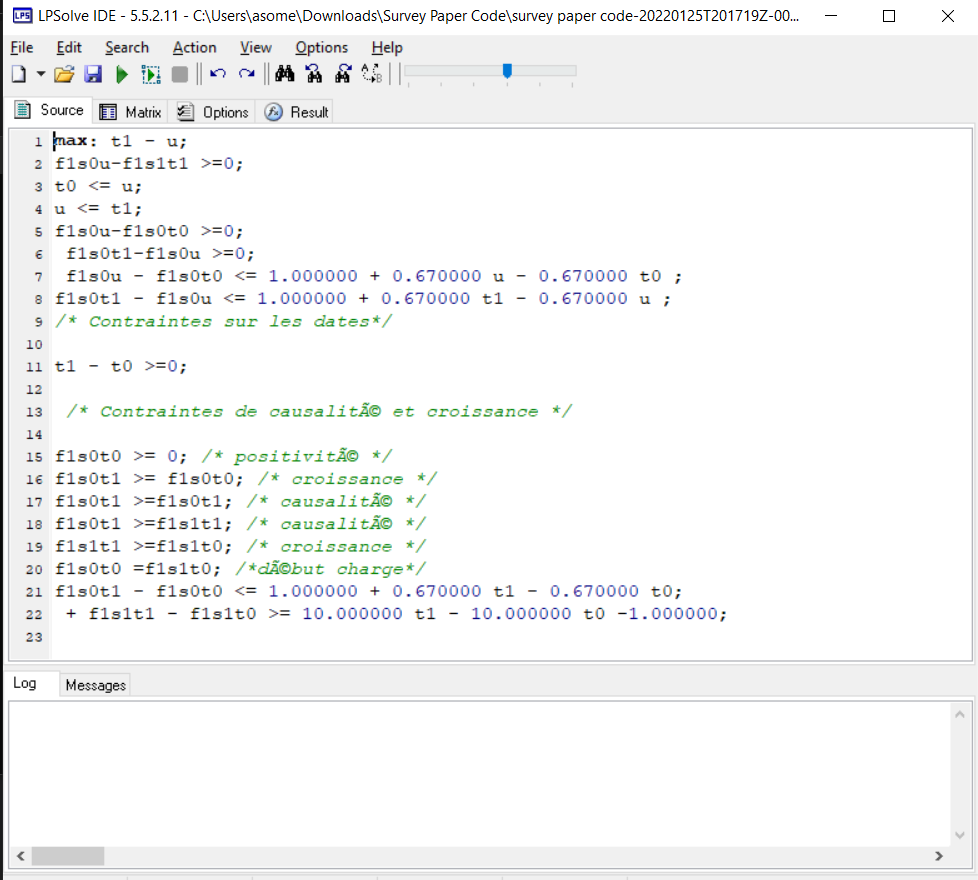
Link:

1. **Execute the lp files**

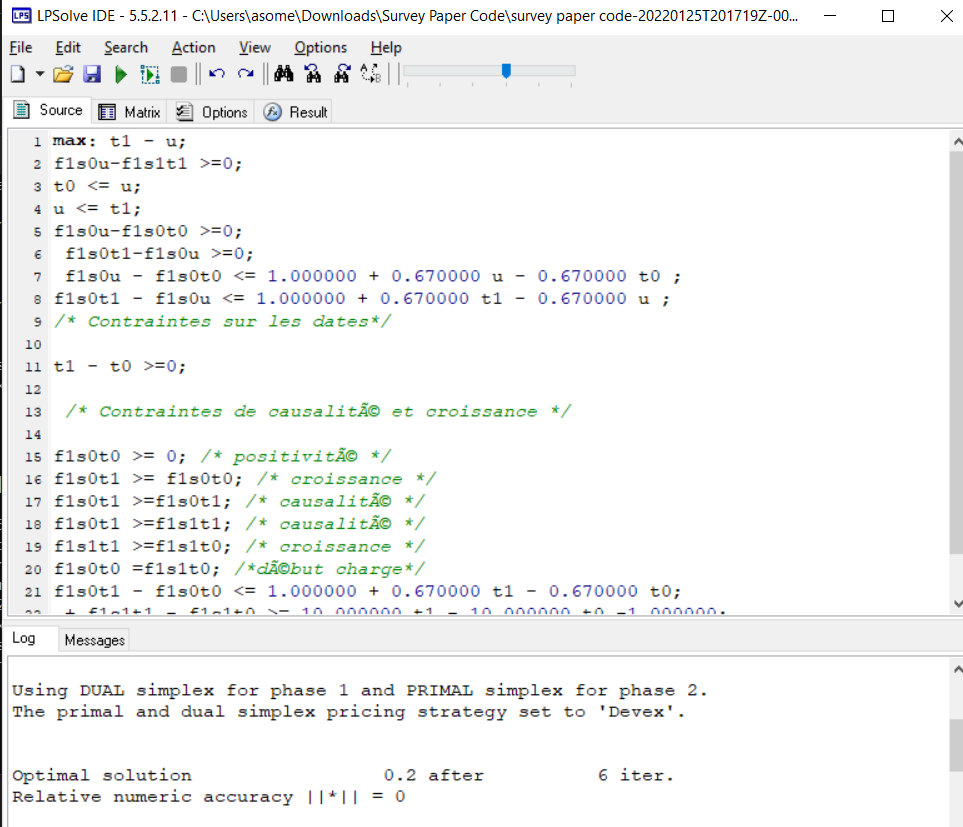
* Go to files and click on open.
* Select the directory where the lp files from nc-tandom-tight were downloaded.



* 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 lp files you want to visualize and Plot the delays to get a graph using any visualization technique.
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