Mathematics for Decisions

AMPL and GMPL/GLPK Installation Guide

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AMPL
- Installation
- AMPL for Mac OS X
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- Installation
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- GLPK for Windows

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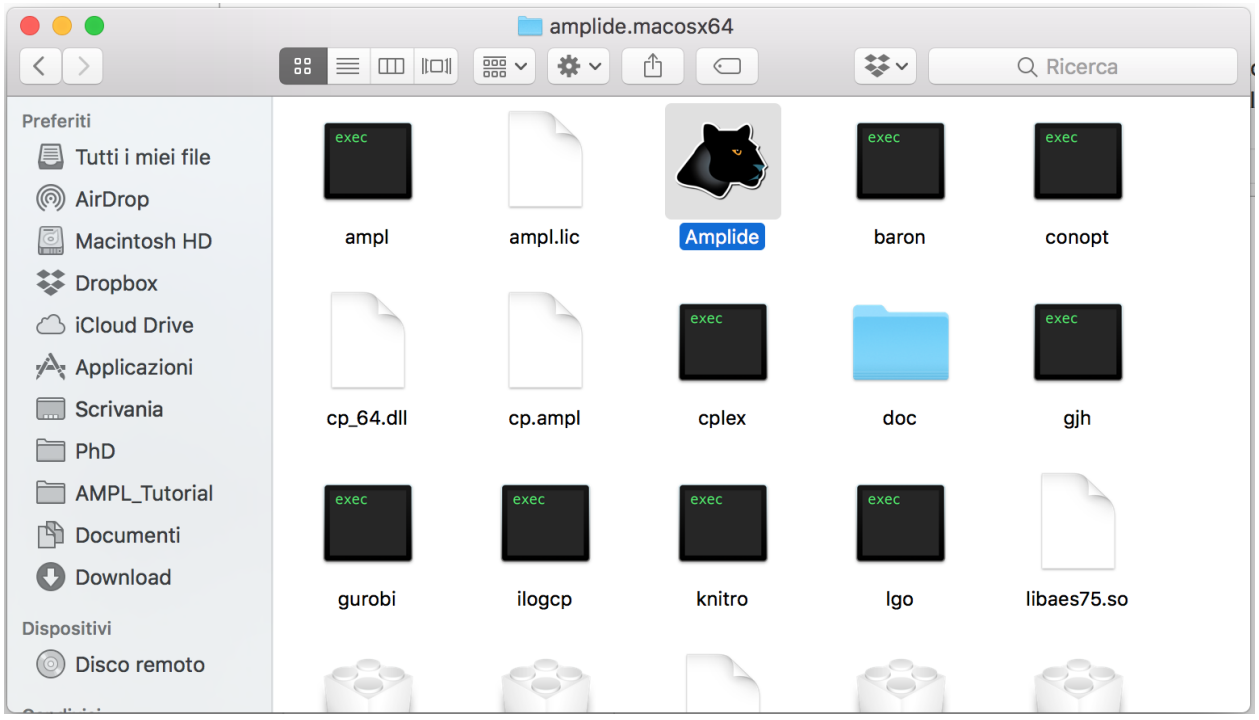
How to install AMPL

- Free size-limited AMPL Demo Version (500 variables and 500 constraints for linear problems, 300 for nonlinear ones)
- Versions for most common platforms (Windows, Linux, Mac OS X) available at the following link: http://ampl.com/try-ampl/download-a-free-demo/
- Two modelling environments:
  - AMPL IDE
  - Command-line AMPL
- The AMPL Demo Version already includes, among others, the following solvers:
  - CPLEX and Gurobi for linear and quadratic problems in both continuous and discrete variables;
  - CONOPT and MINOS for nonlinear problems in continuous variables.

AMPL Demo Version for Mac OS X

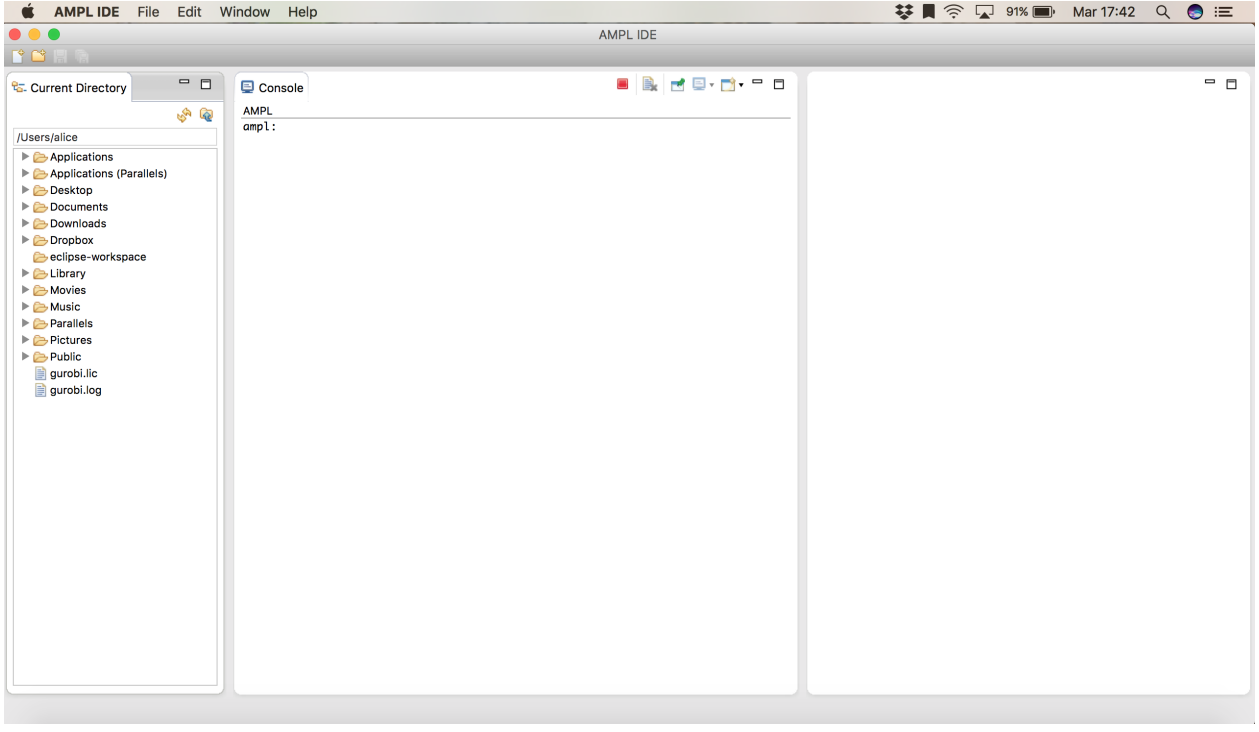
1. Please check you already have Java installed on your pc;
2. Download the distribution archive file named **amplide.macosx64.tgz** at this link: http://ampl.com/try-ampl/download-a-free-demo/#macosx
3. Extract its contents; by default the package will be extracted into a folder named **amplide.macosx64** that will be in your *Download* folder.
4. This will be your AMPL folder; you can rename it or move it to another location, for example into the Desktop.

5. To run AMPL, double click the **Amplide** file icon in the AMPL folder:



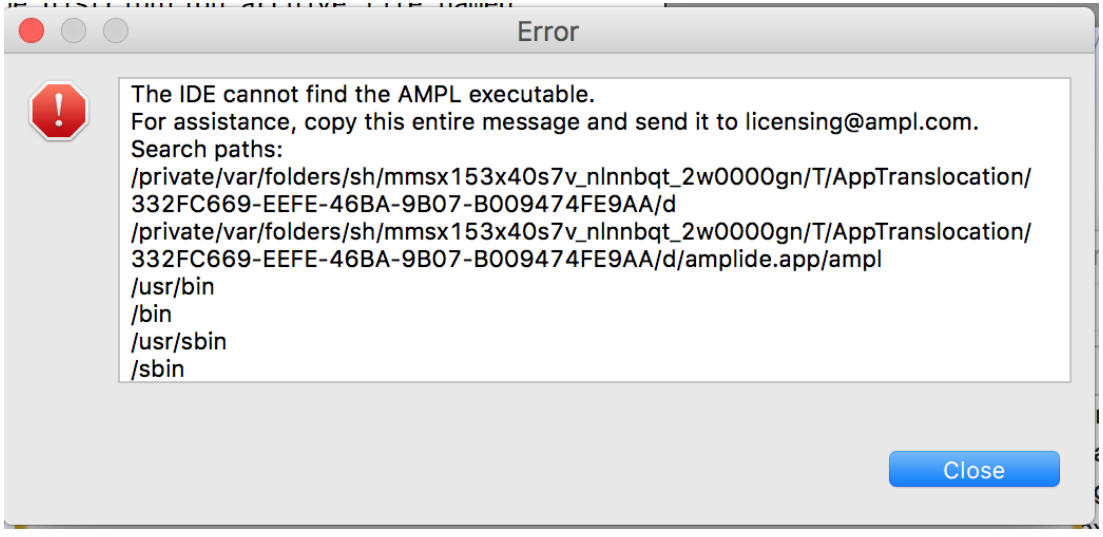
6. Loading files and workspace:

7. Finally the IDE appears:



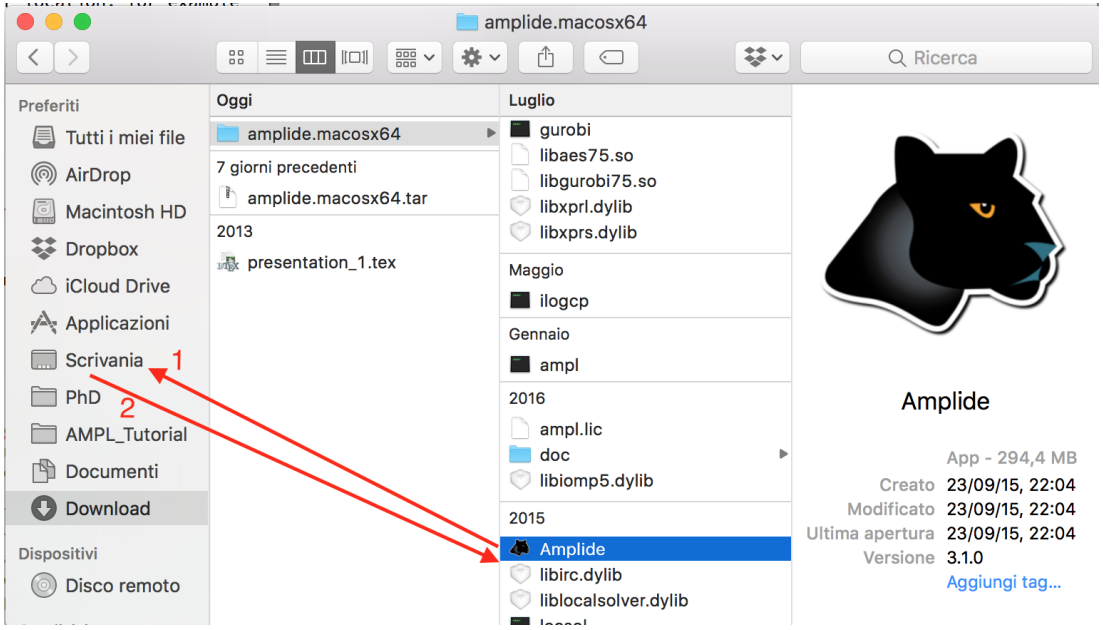
Important note for users of Mac OS X 10.12 Sierra

- It may happen that the first time you launch the AMPL IDE, during loading of files, you get the following error message:



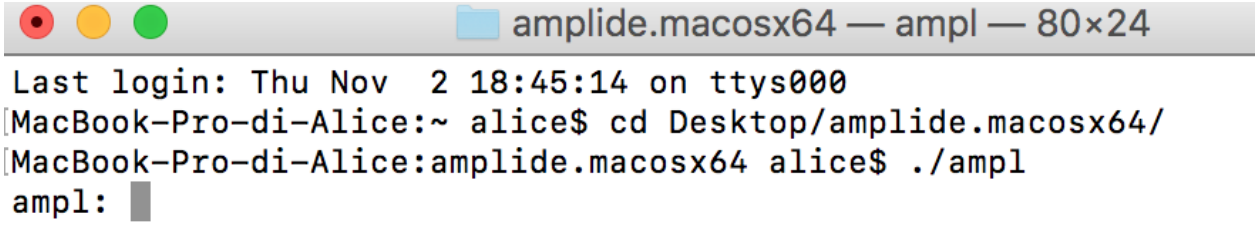
- It is a security issue due to the new security features introduced with Sierra, but it seems fixed in other versions of Mac OS X.

- To quickly solve it, you just need to drag the Amplide file icon and drop it to the Desktop; then drag and drop it again into the AMPL folder:



Command-line AMPL for Mac OS X

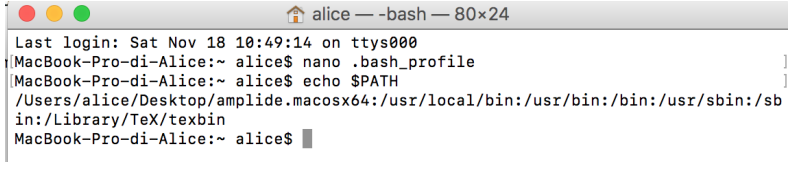
1. Open a new terminal window and go to the AMPL folder
2. Type **./ampl** and press enter: the AMPL prompt will appear



3. Now you can start using AMPL commands.

4. If you want to use AMPL from every directory, you need to edit the environment variable named $PATH. To do so, open a new terminal in your home directory.
5. Write **nano .bash_profile** to create a bash profile where to put your standard environment variables and the AMPL one.

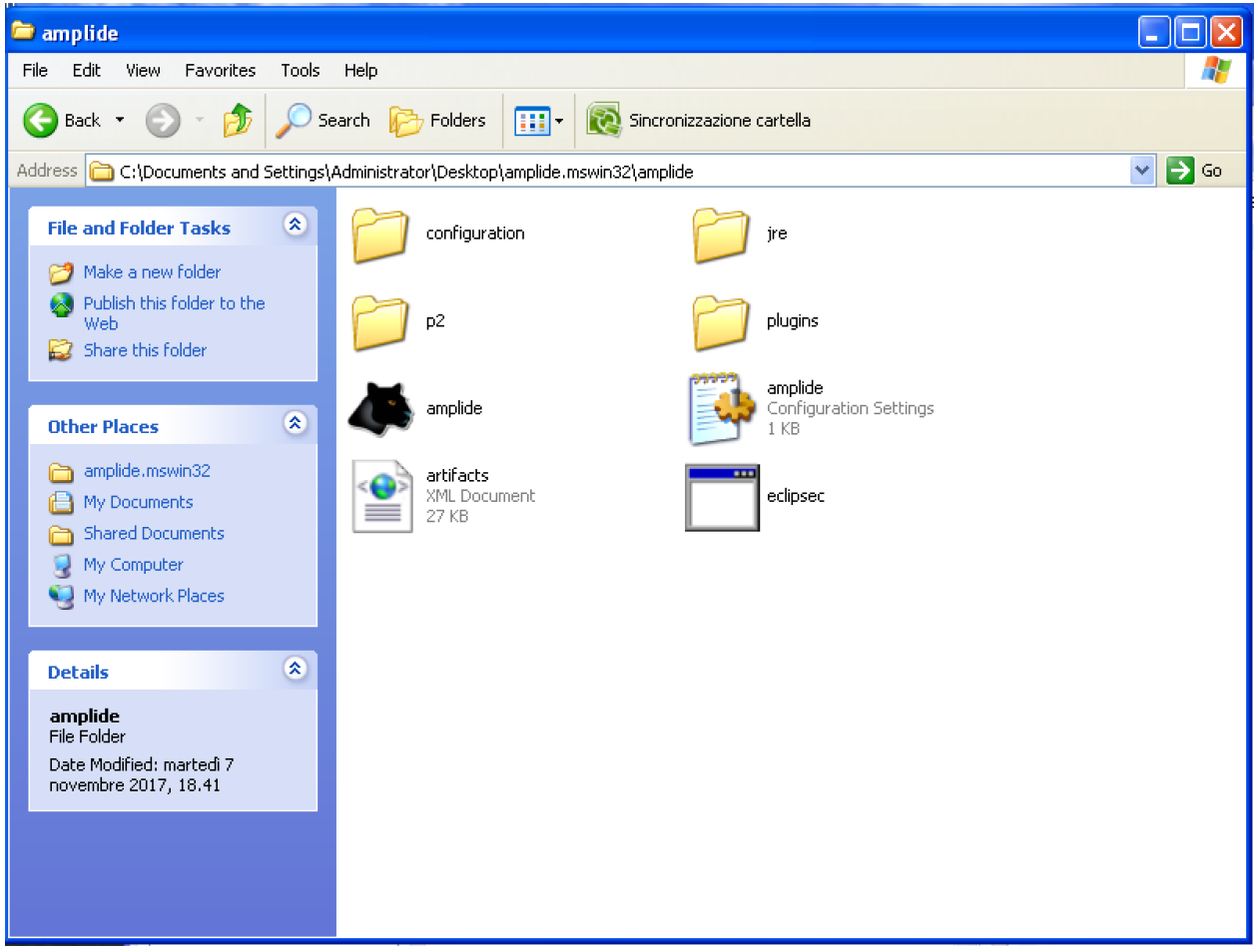
6. Save the file pressing CTRL-X and force the script to be executed: **source ∼/.bash_profile**;
7. **echo $PATH** to check the edit:



AMPL Demo Version for Windows

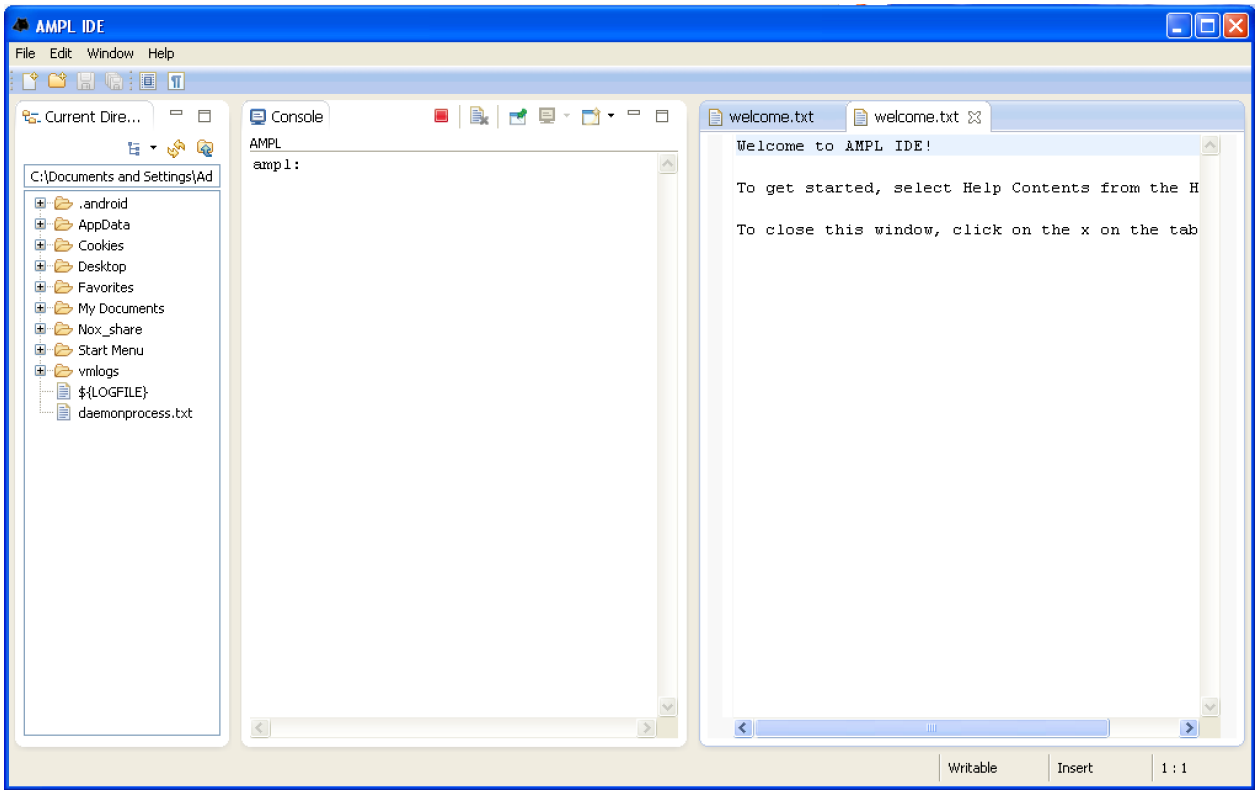
1. Download the distribution archive file named **amplide.mswin32.zip** or **amplide.mswin64.zip**, depending on the version of your operative system, at this link: http://ampl.com/try-ampl/download-a-free-demo/#windows
2. Extract contents of the main folder and also of the subfolders; by default the package will be extracted into a folder named **amplide.mswinXX** that will be in your *Download* folder.
3. This will be your AMPL folder; you can rename it or move it to another location, for example into your Desktop.

4. To run AMPL, double click the **Amplide** file icon in the following path: **amplide.mswinXX****amplide**



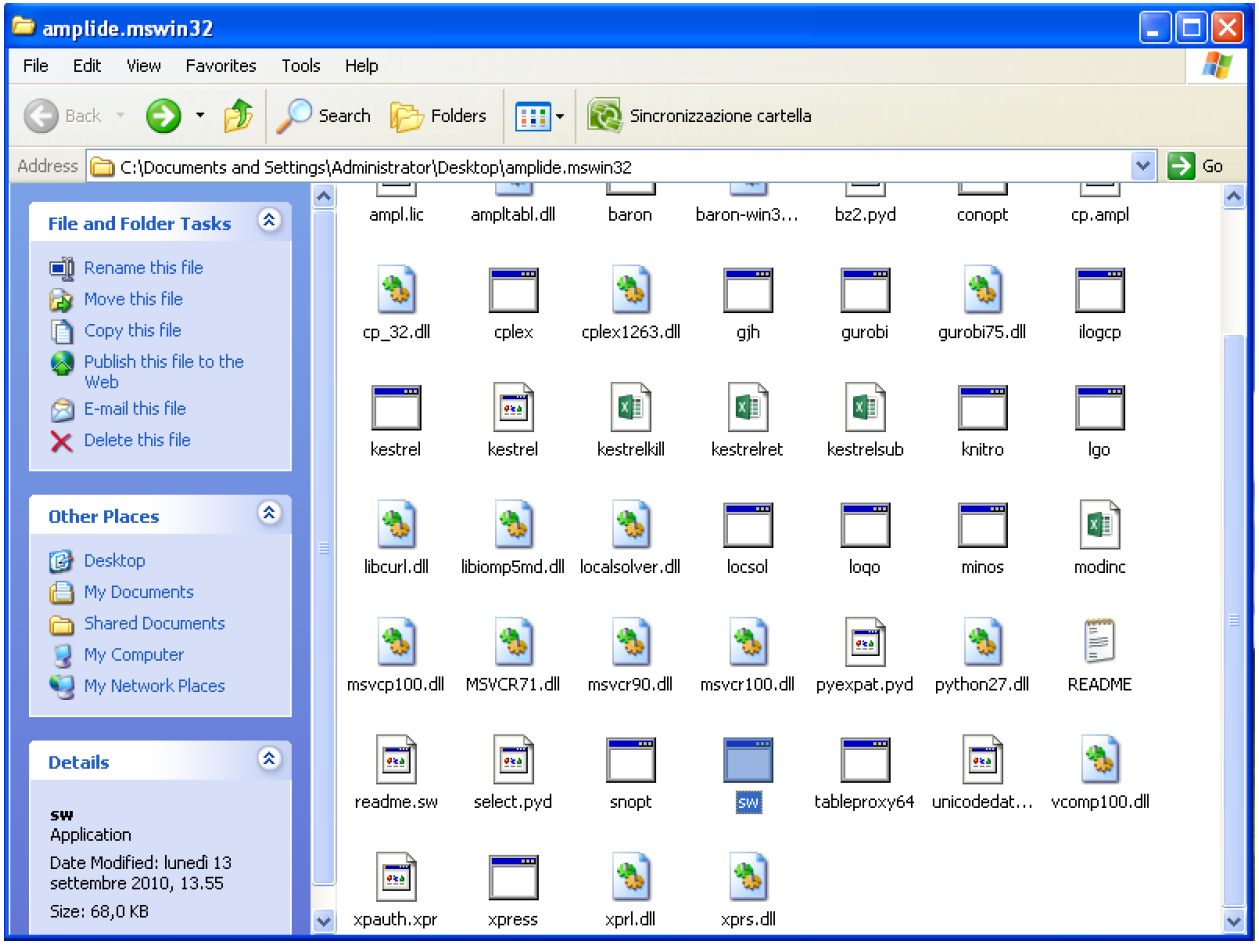
5. Loading files and workspace:

6. Finally the IDE appears:

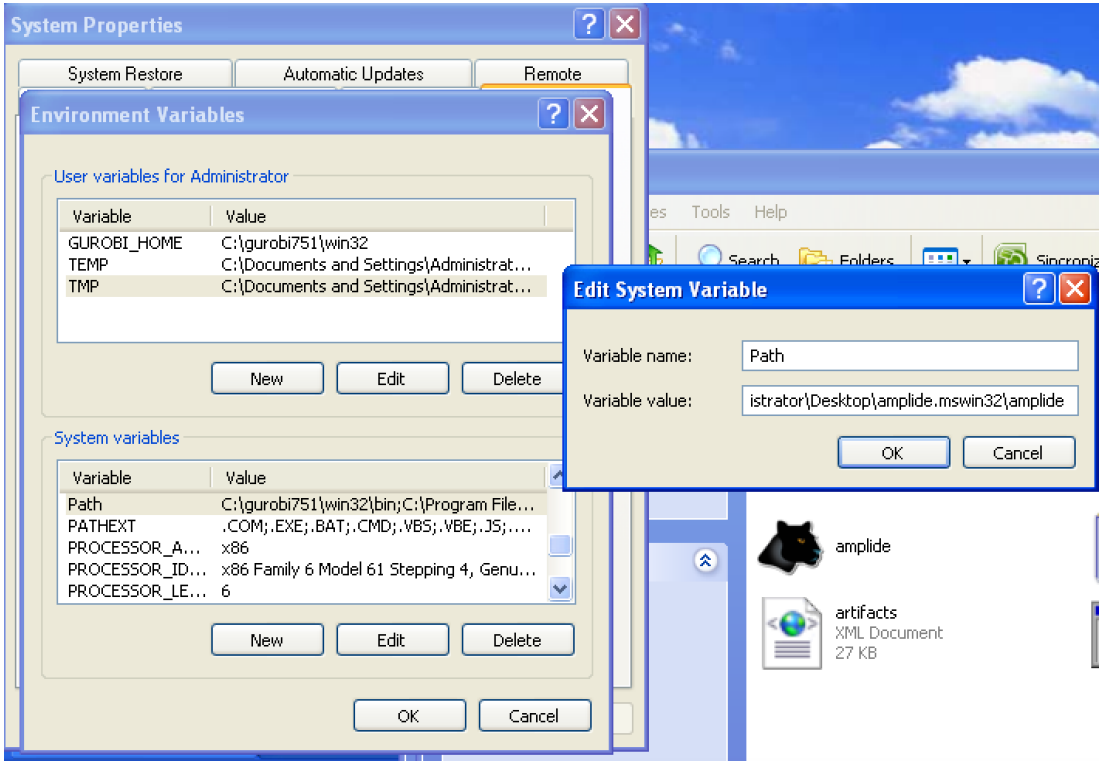


Command-line AMPL for Windows

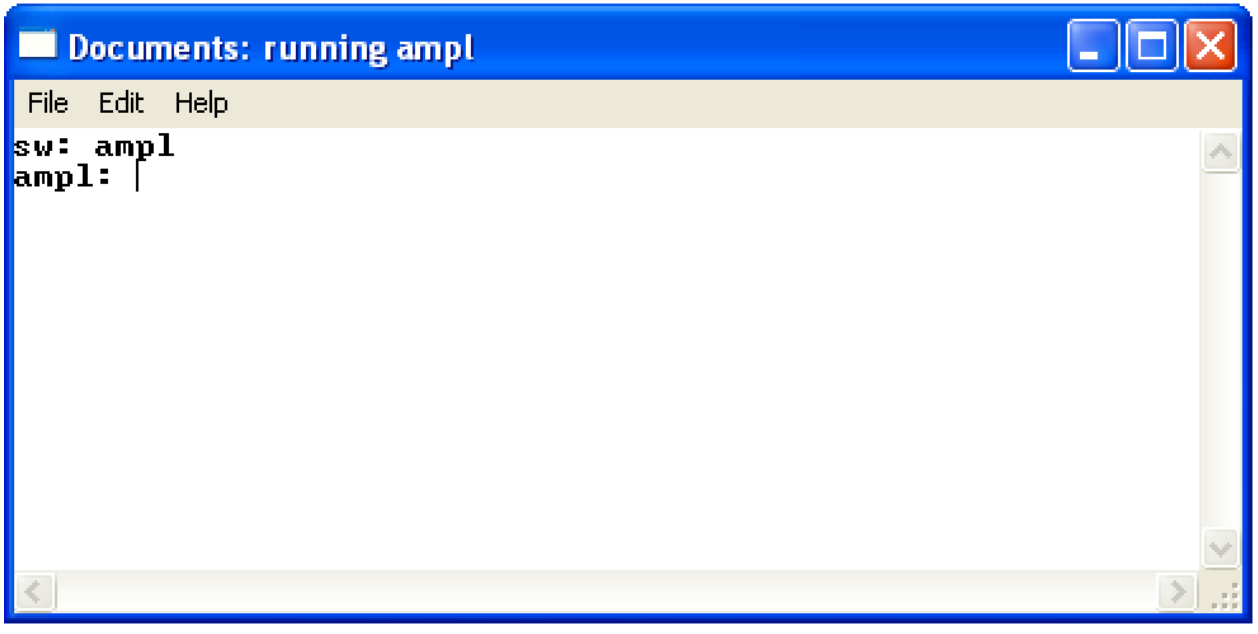
1. In your AMPL folder, look for **sw.exe** and double-click on it to make a prompt window appear:



2. To be able to run ampl from every directory (and not just from its one), go to Start → Computer → View system information → Advanced tab → "Environment Variables".
3. Look for "Path", click "Edit", do not erase anything but just add at the end the path to the directory where you have put ampl.exe and sw.exe.



4. Open a command prompt and try to type **sw.exe** or **ampl.exe** and press enter: the AMPL prompt will appear



5. Now you can start using AMPL commands.

Introduction to GLPK

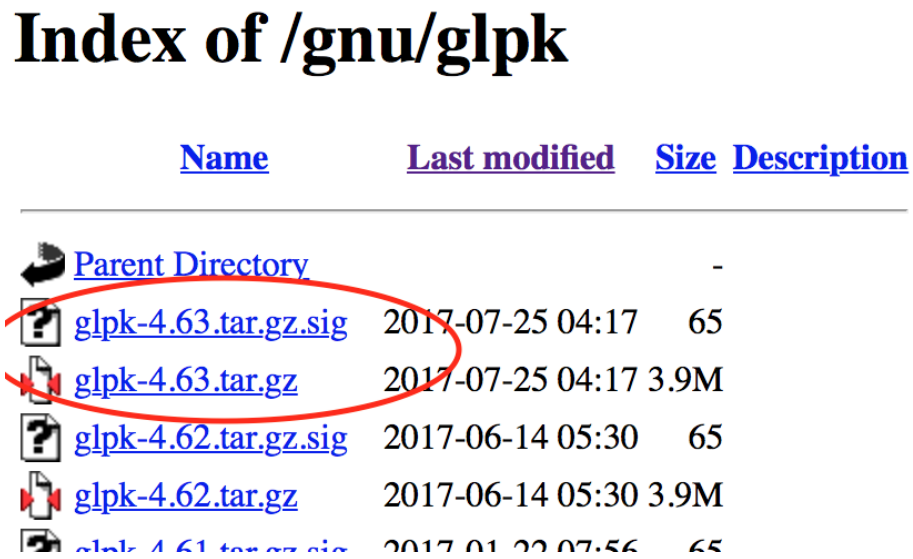
- GLPK (i.e., GNU Linear Programming Kit) is a software package developed in ANSI C by Andrew Makhorin (Department for Applied Informatics, Moscow Aviation Institute) to solve large-scale LP and MIP problems.
- GLPK is a library included in the GNU Project.
- The package contains several components:
  - For LP problems: revised simplex method and primal-dual interior point method;
  - For IP problems: Branch-and-bound method and cut routines;
  - Others: translator for GNU MathProg modelling language; API; stand-alone LP/MIP solver **glpsol**

glpsol and GMPL

- Since GLPK is a library, it needs a client software that calls GLPK APIs $\rightarrow$ The default client is the glpsol solver (GNU Linear Program Solver).
- glpsol takes a **GMPL** model and the related data as inputs and it outputs a solution.
- **GMPL** (i.e., GNU Math Programming Language) is a modelling language intended to describe linear mathematical programming models:
  - Like in AMPL, the model is described through **model objects** such as sets, parameters, variables, constraints and objectives;
  - The model description is composed of two parts:
    - the model section
    - the data section
  - GMPL syntax is basically the same as AMPL

GLPK for Mac OS X and Linux

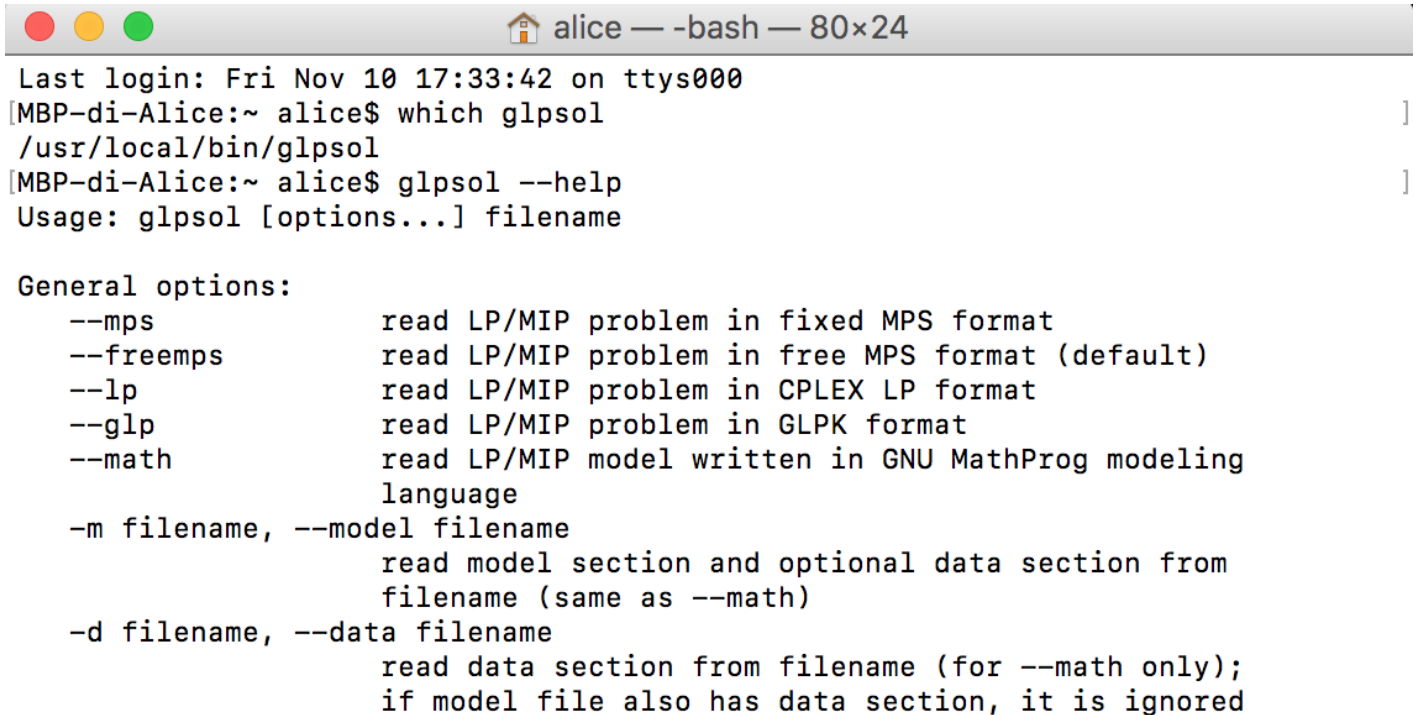
1. Main page: https://www.gnu.org/software/glpk/
2. Download the lastest version of GLPK (4.65) from this link: http://ftp.gnu.org/gnu/glpk/
3. Extract the package



Index of /gnu/glpk

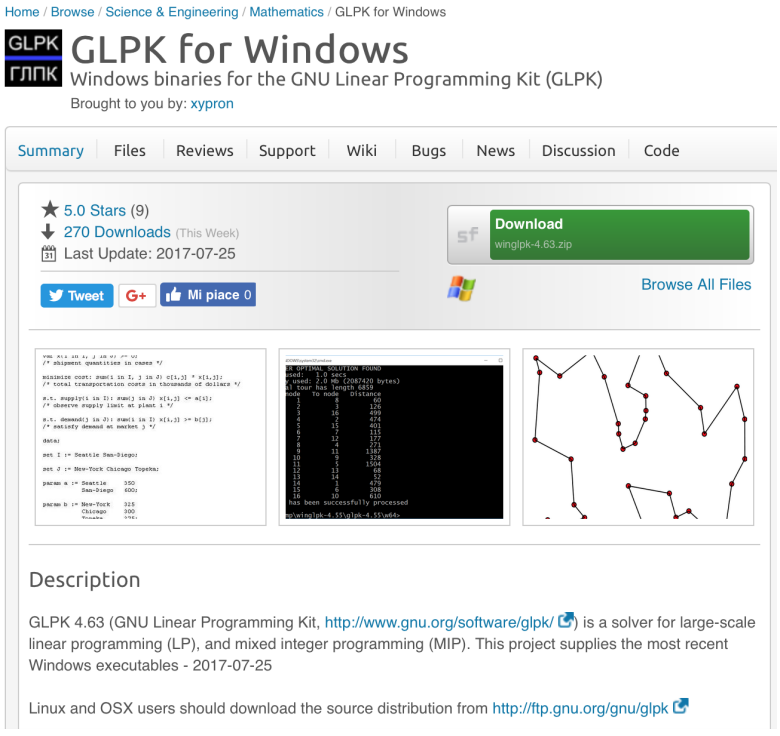
Name	Last modified	Size	Description
Parent Directory		-	
glpk-4.63.tar.gz.sig	2017-07-25 04:17	65	
glpk-4.63.tar.gz	2017-07-25 04:17	3.9M	
glpk-4.62.tar.gz.sig	2017-06-14 05:30	65	
glpk-4.62.tar.gz	2017-06-14 05:30	3.9M	

4. Open a new terminal window, go to the folder where you have extracted files and then type **./configure –prefix=/usr/local** to launch the installation on your system
5. Type **make**
6. When it is finished, type **sudo make install**
7. To verify that GLPK is installed, type **which glpsol** and you should get something like this: **/usr/local/bin/glpsol**
8. Try also GLPK help: **glpsol –help**



GLPK for Windows

1. Main page: http://winglpk.sourceforge.net
2. Download the latest version of GLPK (4.65) from this link: https://sourceforge.net/projects/winglpk/
3. Extract the package



4. The executables and dynamic link libraries for 32 bit (or 64 bit) Windows can be found in directory w32 (or w64).
5. Now, to be able to run glpsol, go to the folder where you have just extracted the package and then double-click on the folder *winXX* (according to your operative system version); you have two options:
   - You can copy all .dll files into %SystemRoot\%nsystem32 (for example, C:\windows\system32);
   - Otherwise, you can add the path to this *winXX* folder into the environment variable *PATH* (as you did before for AMPL).
6. If you open a command prompt windows, you should get information about the version of the package by typing **glpsol**; this means that the link to the dynamic libraries is working.
7. For more information:
   https://en.wikibooks.org/wiki/GLPK/Windows_executables

References

AMPL

http://ampl.com

AMPL: A Modelling Language for Mathematical Programming
R. Fourer, D.M. Gay, B. Kernighan

http://ampl.com/resources/the-ampl-book/

GLPK

https://en.wikibooks.org/wiki/GLPK

GLPK/GMPL

https://en.wikibooks.org/wiki/GLPK/GMPL_(MathProg)