

LINGO 12.0

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**1. Introduction**

LINGO is a tool for utilizing the power of linear, integer and nonlinear optimization to formulate large problems concisely, solve them, and analyze the solution. Optimization helps you find the answer that yields the best result; attains the highest profit, output, or happiness; or the one that achieves the lowest cost, waste, or discomfort. Often these problems involve making the most efficient use of your resources including money, time, machinery, staff, inventory, and more. Optimization problems are often classified as linear or nonlinear, depending on whether the relationships in the problem are linear with respect to the variables.

## 2. Installation

The current release of LINGO has the following directory structure

lingo12/	' Installation directory
lingo12/bin/<PLATFORM>	' Executables, dynamic libraries
lingo12/doc	' User manual and documentation
lingo12/license/<PLATFORM>	' License files, by platform
lingo12/samples	' Sample models directory
lingo12/programming_samples	' Examples on calling LINGO from ' C, FORTRAN & Java

**2.1 Windows Platforms:** No specific installation procedure is required on Windows platforms, other than to run the supplied setup program and follow the prompts.

**2.2. Unix/Linux Platforms:** Follow the steps below to complete the installation:

**Step 1.** For 32-bit Linux platforms, locate the:

LINGO-LINUX-IA32-12.0.tar.gz

file on your CD. Alternatively, if you are running a 64-bit version of Linux, then you can choose to install a 64-bit version of LINGO using:

LINGO-LINUX-64x86-12.0.tar.gz

**Step 2.** Copy this file into an installation directory of your choice (e.g. \$HOME):

```
%> cp LINGO-LINUX-IA32-12.0.tar.gz $HOME
```

**Step 3.** Change the working directory to \$HOME and uncompress the file using the 'gzip -d' command as below. This operation creates LINGO-LINUX-IA32-12.0.tar (in the case of 64-bit versions, LINGO-LINUX-64x86-12.0.tar will be created).

```
%> gzip LAPI-LINUX-IA32-12.0.tar.gz
```

**Step 4.** Uncompress the tar file using the 'tar -xvf' command as below. This will create the LINGO directory lingo12/.

```
%> tar -xvf LINGO-LINUX-IA32-12.0.tar
```

**Step 5.** Go to the lingo12/bin/<PLATFORM> binaries directory and make sure all the files are in executable mode. If they are not, you should change their mode by typing

```
%> chmod 755 *
```

For 32-bit installations, the <PLATFORM> folder will be linux32/ and for 64-bit installations the folder will be linux64/.

**Step 6.** Update the LD\_LIBRARY\_PATH environment variable so that it also points to the LINGO binaries folder. It is assumed that the installation directory is \$HOME/lingo12.

```
%> LD_LIBRARY_PATH=$HOME/lingo12/bin/<PLATFORM>:$LD_LIBRARY_PATH
%> export LD_LIBRARY_PATH
```

**Step 7.** Set the LINGO\_12\_HOME environment variable to point to the main LINGO folder. For example, if your installation directory is \$HOME/lingo12, then the environment variable should be set as:

```
%> LINGO_12_HOME=$HOME/lingo12
%> export LINGO_12_HOME
```

You may also execute the shell script lingo12/bin/<PLATFORM>/lingovars.sh to perform the required updates on these environment variables. To execute this script manually, enter the following at command line

```
%> source $HOME/lingo12/bin/<PLATFORM>/lingovars.sh
```

Alternatively, to execute the script automatically at logon, append this line to the end of your startup script (.bashrc or .bash\_profile for the bash shell).

**Step 8.** If you were provided a LINGO license file (look for a file called lndlng12.lic), then you should copy this file into the appropriate folder, e.g.: \$HOME/lingo12/license/<PLATFORM>.

If you do not have a valid LINGO license file and you wish to create a demo license, then go to the lingo12 folder and run the create\_demo\_license script as follows:

```
cd $HOME/lingo12
sh create_demo_license.sh
```

A demo version of LINGO will run just as standard versions do, however, the maximum model capacity is restricted.

**Step 9.** You should now be able to run LINGO by entering 'lingo12' to a command prompt. 64-bit users should enter 'lingo64\_12'. If the environment variables are not set up correctly, you will receive the following error message every time you start LINGO.

```
[Error Code: 171]
License key was not found or is invalid.
```

In this case, please refer to the steps above to be sure the required environment variables are set up correctly and that you have run the script to create a demo license.

**NOTE:** Unlike the Windows version of LINGO, which has a GUI front end, Unix/Linux versions are command-line applications. All commands are typed into LINGO's command-line prompt that begins with a colon character (:). Available commands are discussed in detail in Chapter 6, Command-Line Commands, of the LINGO Users Manual.

### 3. License File

In a default installation, the license file, `lndlng12.lic`, is located in the `lingo12/license` directory. By default, the download version of LINGO available from the LINDO Systems Web site includes a license for a demo version of LINGO. The demo version allows full access to LINGO's feature set, however with a limited model capacity.

***IMPORTANT: If you purchased a license and received it via email, you should update the license file in the lingo12/license folder with the license file you obtained from your sales representative. You should install the license file under the name lndlng12.lic. If you received a distribution CD, your license file may have been pre-installed in the lingo12/license directory, and no additional steps will be required. Your license key is unique to your installation and contains information regarding your version's serial number, size, and supported options. Given that your license key is unique to your installation, you should not share it with any user not licensed to use your copy of the LINGO.***

### 4. Sample Models

The `lingo12/samples` directory created during the installation contains several model examples using LINGO's algebraic modeling language. In the sample session below, a small transportation model, `tran.lng`, is read into LINGO using the `TAKE` command (note: user commands are listed in ***bold italics***):

- - -

```
%> lingo12 (or 'lingo64_12' for 64-bit versions)
LINGO/LNX32 12.0.2.15 (25 May 10)
```

```
LINDO API 6.1.1.467 (Jun 9 2010 18:18:03)
```

```
Copyright (C) 2005-2009 LINDO Systems Inc. Licensed material,
all rights reserved. Copying except as authorized in license
agreement is prohibited.
```

```
License location: /home/lindo/lingo12/license/linux32/lndlng12.lic
Config location: /home/lindo/lingo12/LINGO.CNF
```

```
Licensed for commercial use.
Branch-and-bound solver enabled.
Nonlinear solver enabled.
Barrier solver enabled.
Global solver enabled.
Integer solver enabled.
Stochastic solver enabled.
```

```
: take ../../samples/tran.lng
```

: *go*

Compiling model ...  
Structural analysis, pass 1 ...  
Scalarizing model ...  
Generating nonzero matrix ...  
Solving ...

Iters	Status	Objective	Suminf
0	UNKNOWN	0.00	0.00
6	OPTIMAL	161.	0.00

Global optimal solution found.  
Objective value: 161.0000  
Infeasibilities: 0.000000  
Total solver iterations: 6

: *quit*

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## 5. Programming Samples

In addition to using LINGO interactively to solve your models, you may also call LINGO from within your own programming applications. The `lingo12/programming_samples` directory contains examples written in C, FORTRAN and Java. Make files are also included to illustrate how to build your applications and link them with the LINGO shared object libraries. If you wish to call the LINGO libraries from applications that you build, you will need to establish some symbolic links in the LINGO bin folder. You may do this by going to the `lingo12/bin/<PLATFORM>` folder for your installation and run the `symlinks.sh` script.

## 6. Technical Support

If you require technical support, contact LINDO Systems with the following information

- 1) The serial and version numbers of LINGO you are running. The version number is printed on the console screen right after LINGO is started.
- 2) The steps to reproduce the problem that you have encountered along with the copies of required input/parameter files.
- 3) The operating system and version.

## **7. Contact Information**

You can contact us via email using the following addresses:

General Information and Questions:  
webinfo@lindo.com

Sales and ordering:  
sales@lindo.com

Technical Support:  
tech@lindo.com

Or, by phone by using the following numbers:

Main Numbers:  
(800)441-BEST(2378) or (312)988-7422

Technical Support:  
(312)988-9421

Fax:  
(312)988-9065

Or, by mail via the following address:

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