

## LPL: Product Description

LPL is a full-fledged **mathematical modeling system** with a point-and-click user interface and a powerful **modeling language**. The language is a structured mathematical and logical modeling and programming language with an extended index mechanism, which allows one to build, maintain, modify, and document large linear, non-linear, and other mathematical (optimization) models. A language compiler translates the model automatically into a solver acceptable form; reads data directly from database, calls a solver and can write the results directly back to the database or generate complex solution report files. LPL can communicate with many commercial and free solvers.

### The full system contains:

- **A declarative mathematical language:** LPL can be used to formulate concisely complete mathematical linear, non-linear and logical models of large size. The data can be stored in the model itself or outside in databases or text files. The interface to various commercial solvers is integrated and easy configurable. Real-live models with 1'000'000 constraints and more have been processed and solved using LPL.
- **An algorithmic programming language:** LPL is a complete programming language which allows one to write algorithms to pre- or post-process the data or to loop through many optimizations (while adding constraints dynamically, for example). It has all necessary control structures of another programming language. The language further permits to break down a complex model into logical modules (itself models or model-parts). The modules can be themselves entire optimization models which can be processed individually or communicate their results.
- **An optimization tool:** LPL is designed to communicate with various commercial and free mathematical linear, mixed-integer, and non-linear mathematical packages to solve large optimization problems (gurobi, CPLEX, Xpress, MOPS, GLPK, Ip\_solve, XA, Mosek, Conopt, Loqo, and many others). LPL comes with an own LP-solver for solving small models, as well as with a heuristic Tabu-search solver to solve certain simple scheduling problems.
- **A data modeling tool:** LPL can be used to generate a database from scratch. From an LPL modeling specification one can generate automatically a SQL-script, which generates a complete database optionally loaded with data. LPL can read/write from/to various

database systems (mySQL, InterBase, SyBase, Oracle, DB2, Microsoft Access, and even Excel).

- **A data manipulation tool:** Like a data manipulation language (DML) in database, LPL can manipulate (join, select, project, etc.) large multi-dimensional data (data cubes) in a sparse way. The data are read from or written to databases or text files in various ways. Tools exist for generate various pivot tables from a multi-dimensional data cube in order to change the view on the fly in the modeling environment.
- **A modeling environment:** LPL comes with a powerful model browser. It allows the user to view and traverse the model in different ways and to find and modify all elements on a single mouse click. A model editor, a table browser with pivot-table functionality, a graphical modeling- and instance viewer, a drawing tool to generates various output and result graphs, this all is integrates in an easy to understand user interface.
- **A documentation tool:** From a LPL model specification enriched with inline model documentation text, one can generate automatically a LaTeX-file or a PDF-file to produce a printable or publishable model documentation report (this requires a free LaTeX-documentation system to be installed).
- **A reporting tool:** The LPL model system communicates with the commercial reporting system, called FastReport (<http://fast-report.com>), an advanced and well known reporting system. Reporting templates are generated automatically from easy-to-design output instructions within LPL. These templates can be modified by an integrated template point-and-click designer. The reports can be generated automatically as PDF-, RTF-, HTML-, TXT, or JPG-file.
- **A library in other applications:** The complete functionality of LPL comes as a dynamic link library and all its functions can be integrated (and hidden from the end user) in another “end-user” application, written, for example, in a Visual Basic, C++, Java, Delphi and others.
- **An Internet solving tool:** LPL is a client- and a server-application. Installing an LPL-client on a machine and a LPL-server on another, the two can communicate through the Internet: The client can send the model to the server machine where the model can be manipulated, calculated or solved by a LPL-server in the same way as on the local machine. It is completely transparent to the user (true ASP: application service providing). On the server machine, one only needs to install Tomcat engine (a free Java-based distributed software) and an LPL-server. On the client-side the user only needs to set a single parameter!

## LPL: One Single Product – Different Packages

The *complete* software comes in only one version (with exception of the Server Package) that *can be downloaded free of charge* from [www.virtual-optima.com](http://www.virtual-optima.com). This downloaded package is called the **Unregistered Package**. It is free and everybody can use it without restriction. However the license text written in the file [license-free.txt](#) should be considered.

The user can obtain a **Registered Package** just by registering himself on the web site of Virtual-Optima free of charge. Registering means also that the user obtains a **Free Package** for a limited time (typically for 1 month). At any time the user can upgrade for a moderate price to the other packages that contain additional and increasing functionality: the **Academic Package**, the **Professional Package**, and the **Enterprise Package**. The Academic, Professional and the Enterprise Package are subjected to the license text written in file [license.txt](#).

All packages are basically limited in time, which means that the user can use the software for a limited amount of time, after that time (the due time) the package falls back to be **Registered** with the limited functionality as describe below. At any time, the time limit can be extended by buying the software for an additional amount of time. The different packages and the various time-limitation only differ in the license key, the software always is the same. The license key typically is stored in a small file (*lpl.lic*). Buying an upgrade or extend the due time then only means to buy, download and install a new license key – by replacing the previous one. All this can be done in a few easy clicks within the software. (How to install and buy a key is explained in the installation guide [install.pdf](#), the user manual [user.pdf](#) and in the reference manual: [manual.pdf](#).)

By default, the software comes as an **Unregistered Package** (or **Free Package** after registering), that disallows the use of some advanced functions in the modelling software. Besides of these advanced functions the Free Package is fully functional and can be used to solve and run models.

The advanced features that are *not* available in the Free Package are as follows :

- **Output-files:** Generating various advanced output-files, such as INT-file, EQU-file (equation listing), TEX-file (automatic model documentation), BUG-file (debugging output files), SPS-file (snapshots), SQL-file (generated database script files), report files.
- **Search Functionality:** Extended search functionality in *lp/w.exe*.
- **List / Files View:** Listing all entities in alphabetical order and all files in drop-down lists in order to be selected and browsed.
- **DB-Connectivity:** Reading from and writing to databases, generating database scripts in order to create databases on the fly.
- **Internet Solver:** There exists “out there” in the Internet a solver to which each LPL client program can communicate. Setting only a parameter within the software, the model can be processed (solved or manipulated) by that solver.
- **Link to commercial solvers:** The ability to communicate with commercial solvers such as CPLEX, Xpress, MOPS, XA, MOSEK, and others.
- **Console lplc:** *lplc.exe* is a program that allows running a model from the console and it can, therefore, be integrated into complex batch processes for multiple model processing.
- **Encrypt Model:** The model source code can be encrypted in order to hide the logic from other users or developers.
- **Instance View:** Showing the model structure as a graphical view in order to browse it more conveniently. There is a generic view and a full instance view.
- **Reporting:** Capability to use the FastReport® Reporting system and the ability to generate report templates on the fly and reports in the form of PDF-, HTML-, RTF- or text-files.
- **Dll Library:** The whole LPL software functionality can be accessed through a full-fetched dynamic linked library that can be integrated into any other application.
- **Lpl-Server:** Capability to use the LPL-Server program, installation of server as well as additional workshop to maintain the server are provided as well when buying this package.

Besides of these advanced functions, each package contains all functions. Table 1 gives an overview of the functionality of each package.

The **Unregistered Package**, the **Registered Package** and the **Free Package** are free of charge. They contain the whole functionality besides the mentioned advanced features listed above. The Free Package is great for a first test, for learning modelling and for developing and running all kind of models. The **Academic Package** allows one to create and solve model using commercial solvers, and to link to databases and do real modelling in a teaching environment. The **Professional Package** is for the professional model builder and contains all kind of model debugging tools. The **Enterprise Package** is for modelling tool and application developers. They can use the complete package as an additional module in their own modelling environ-

ment. Finally, the **Server Package** can be used to provide modelling services over the Internet *on you own site*.

Model- \ Package ing Functions	Unregistered, Registered or Free	Academic Package	Professional Package	Enterprise Package	Server Package
Output-files	--	yes	yes	yes	yes
Search Functionality	--	yes	yes	yes	yes
List / Files View	--	yes	yes	yes	yes
DB-Connectivity	--	yes	yes	yes	yes
Internet Solver	--	yes	yes	yes	yes
Link to Commercial Solvers		yes	yes	yes	yes
Console Iplc	--	--	yes	yes	yes
Encrypt Model	--	--	yes	yes	yes
Instance View	--	--	yes	yes	yes
Reporting	--	--	yes	yes	yes
DII Library	--	--	--	yes	yes
LPL-Server	--	--	--	--	yes
Everything else ... Unlimited model-size	yes	yes	yes	yes	yes

**Table 1: The various Packages**

The LPL software is constantly updated and its functionality is extended on a regular base. Updating the software is free of charge: it only consists in downloading the newest version from the Virtual-Optima Site. Hence, the user can fully benefit from the developments of LPL free of charge at any time.

Upgrading (passing from one package to another) is also very easy: It only consists of buying another Package, the already bought Package will be automatically discounted.

All packages – as mentioned above already – are available as time-limited versions. “Time-limited” means that during a certain time (typically for 3-6 months) the software runs and then expires.

The software is protected by Swiss law and the user must read and understand the license before using the software (see file: [license-free.txt](#) (for the Free Package) and [license.txt](#) (for the other packages)).

## Price Sheet for the LPL Software (32bit)

The price of the LPL modeling software are easy calculated by a formula: The Free Package has price zero and has always a time limit of 1 months. After that time it falls back to be a Registered Package. One can “buy” then a new license for another Free Package – completely free of charge, or another advanced Package for a moderate price.

The following Table 2 gives an overview of the prices in EURO (€) of the different Packages and on the various time limitation. It means, for example, that an Academic Package for 6 months only costs 66 €. After six months, the software will cease to run and the user must buy another key for an additional time period. Of course, at any time, the user can download the complete software or an update free of charge or buy an upgrade and extend the time limit.

\ Time Package	1 month	2 months	3 months	6 months	1 year	2 years	3 years	5 years
<b>Free</b>	0	--	--	--	--	--	--	--
<b>Academic</b>	13	25	36	66	110	160	182	196
<b>Professional</b>	32	62	91	165	275	399	455	491
<b>Enterprise</b>	52	100	145	264	441	638	727	785
<b>Server /64bit</b>	--	--	--	ask	ask	ask	ask	ask

(All prices are in EURO (€) (1 EURO  $\approx$  1.5 US-DOLLAR))

**Table 2: The Price Sheet**

*This prices are calculated using the simple formula as follows :*

The costs for the **Free Package** is:                    0                    Euros

The costs for the **Academic Package** is:         $200 \cdot (1 - e^{-n/15})$         Euros

The costs for the **Professional Package** is:     $500 \cdot (1 - e^{-n/15})$     Euros

The costs for the **Enterprise Package** is:      $800 \cdot (1 - e^{-n/15})$      Euros

where  $n$  is the number of months. The amount is rounded to full Euros.

Hence, a Professional Package costs 2 times the academic package and the Enterprise Package costs 6 times the Academic Package.

One can also buy **LPL-Server/Solver Internet time**: We offer a service to run and solve your model on our high speed Internet-Server. For the moment this is free. You can buy 1000 secondes – maximally – of Server time at the present time, supposing you have at least an Academic Package.

Note that, a commercial solver such as gurobi, CPLEX, Xpress, XA, MOPS, Mosek, conopt, etc. is *not* included in the price and must be bought separately. The free GLPK GNU-solver as well as the lp\_solve works with LPL and can be used under the GNU license and downloaded free of charge from the GLPK (lp\_solve) home page or from the Virtual-Optima download page.

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### Please note also that

we offer model building and consulting and implement complete projects ready to be used. We organize client specific workshops on mathematical modeling or LPL tutorials. Contact us and ask for the prices !

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