

FICO® Xpress Kalis Library APIs

13.4.2

USER GUIDE

FICO® Xpress Optimization

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How to Contact the Xpress Team

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- Phone: +1 (408) 535-1500 or +44 207 940 8718
- Web: www.fico.com/optimization and use the available contact forms

Product Support

Customer Self Service Portal (online support): www.fico.com/en/product-support

Email: Support@fico.com (Please include 'Xpress' in the subject line)

For the latest news and Xpress software and documentation updates, please visit the Xpress website at <http://www.fico.com/xpress> or subscribe to our mailing list.

How to Contact Artelys

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For the latest news about Kalis, training course programs, and examples, please visit the Artelys website at <http://www.artelys.com>.

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CHAPTER 1

Kalis Library Guide

1.1 Introduction

This document introduces the Xpress Kalis APIs. In addition to Kalis for Mosel, Xpress Kalis includes application programming interfaces for C++, Java, and Python to formulate Constraint Programming (CP) models and solve them using the Kalis constraint programming engine for applications developed in those languages.

1.2 Installation and Licensing

During the installation of Xpress, you will be asked whether you would like to install Xpress Kalis. If you choose to install and accept the license terms, the Xpress Kalis libraries will be installed into the `<XPRESSDIR>/lib` folder and the corresponding binaries in the `<XPRESSDIR>/bin` folder. `<XPRESSDIR>` is the folder in which you have installed Xpress. The distribution includes the [Kalis Mosel User Guide](#) and [Kalis Mosel Reference Manual](#) which can be found in PDF format in `<XPRESSDIR>/docs/solver/kalis`.

You need a valid license file to use the Kalis engine. To obtain a license, please contact your sales representative or see the 'How to Contact the Xpress Team' section. See the [FICO Xpress Licensing](#) section on how to setup Xpress licenses.

1.3 Prerequisites

Please refer to the list of [supported platforms](#) to determine the supported platforms for installing and using the Xpress Kalis APIs. To use the Xpress Kalis APIs, it is assumed that you have installed Xpress and have setup the licenses appropriately as described in the previous sections. It is also assumed that you have installed the programming language (C++, Java or Python) that you wish to use to develop Xpress Kalis applications.

1.3.1 *Setting Environment Variables on Windows*

In order to run Xpress Kalis binary or executable files from anywhere on your Windows machine, as well as load dynamic libraries (or DLLs) used by Xpress Kalis at runtime, it is necessary to make sure that the `PATH` system environment variable is set properly on your Windows machine. In particular, you must update the system `PATH` environment variable so that it indicates the locations of the `<XPRESSDIR>/lib` and `<XPRESSDIR>/bin` folders.

Note that you may need to restart your Windows machine after modifying the environment variables, for the changes to take effect. Simply logging out and relogging in is not enough. Moreover, if the `PATH` environment variable points to more than one folder that contains an executable or DLL of the same name, the one that will be chosen is the one whose folder appears first in the `PATH` variable definition.

1.3.2 Setting Environment Variables on Linux, MacOS

In order to run Xpress Kalis binary or executable files from anywhere on your Linux or MacOS computer, as well as load dynamic, shared libraries (*i.e.* `.so` or `.dylib` files) used by Xpress Kalis at runtime, it is necessary to make sure that several environment variables are set properly on your machine.

You must also update the `LD_LIBRARY_PATH` (`DYLD_LIBRARY_PATH` on MacOS) environment variable so that it indicates the location of the `<XPRESSDIR>/lib` directory.

Setting the `PATH` and `LD_LIBRARY_PATH` (`DYLD_LIBRARY_PATH` on MacOS) environment variables can be done as follows. In the instructions below, replace `<file_absolute_library_path>` with the full path to the directory containing the Xpress Kalis shared object library (*e.g.*, the `<XPRESSDIR>/lib` directory) and `<file_absolute_path>` with the path to the directory containing the binary files (*e.g.*, the `<XPRESSDIR>/bin` directory).

1.3.2.1 Linux

If you run a bash shell, then type:

```
> export PATH=<file_absolute_path>:$PATH
> export LD_LIBRARY_PATH=<file_absolute_library_path>:$LD_LIBRARY_PATH
```

If you run a csh or tcsh shell, then type:

```
> setenv PATH <file_absolute_path>:$PATH
> setenv LD_LIBRARY_PATH <file_absolute_library_path>:$LD_LIBRARY_PATH
```

1.3.2.2 MacOS

Determine the shell being used:

```
> echo $SHELL
```

If you run a bash shell, then type:

```
> export PATH=<file_absolute_path>:$PATH
> export DYLD_LIBRARY_PATH=<file_absolute_library_path>:$DYLD_LIBRARY_PATH
```

If you run a csh or tcsh shell, then type:

```
> setenv PATH <file_absolute_path>:$PATH
> setenv DYLD_LIBRARY_PATH <file_absolute_library_path>:$DYLD_LIBRARY_PATH
```

Note that the value of the environment variable is only valid in the shell in which it was defined.

Moreover, if a particular environment variable points to more than one directory that contains a binary or dynamic library of the same name, the one that will be chosen is the one whose directory appears first in the environment variable definition.

1.4 Documentation

Please refer to the following links for documentation on how to use the Xpress Kalis Libraries.

NOTE that upon clicking the links below, you will be leaving <https://www.fico.com> and directed to Artelys' website <https://www.artelys.com>.

1.4.1 Kalis Libraries User Guide

[Solving a constraint problem](#)

[Continuous variables and numerical CSP](#)

[Optimizing with Kalis](#)

[Controlling the solution search](#)

[Improvement Techniques](#)

[Debugging and Tracing](#)

[Advanced Search Strategies](#)

[Define your own constraints](#)

[Constraints examples](#)

[Scheduling](#)

[Glossary](#)

1.4.2 Kalis Libraries Reference Manuals

[C++ reference](#)

[Java reference](#)

[Python reference](#)

APPENDIX A

Contacting FICO

FICO provides clients with support and services for all our products.

FICO Customer Support

FICO Customer Support offers technical support and services ranging from self-help tools to direct assistance with a FICO technical support engineer. Support is available to all clients who have an active maintenance contract.

The FICO Customer Self-Service Portal (support.fico.com) is a secure web portal that allows users to open, review, and update their support cases; manage their organization's portal users; find solutions to common problems in the FICO Knowledge Base; and view the availability of their cloud applications 24 hours a day, 7 days a week.

You can find support contact information and a link to the FICO Customer Self-Service Portal (online support) on the Product Support home page (www.fico.com/en/product-support).

Please include 'Xpress' in the subject line of your support queries.

Documentation

FICO continually looks for new ways to improve and enhance the value of the products and services we provide.

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FICO Learning

FICO Learning is the principal provider of product training for our clients and partners. FICO Learning offers instructor-led classroom courses, web-based training, seminars, and training tools for both new user enablement and ongoing performance support.

For additional information, visit the FICO Learning home page at www.fico.com/en/product-training or email producteducation@fico.com.

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