



MOSEK Release notes

*Release 9.0.97*

MOSEK ApS

04 July 2019

# Contents

<b>1</b>	<b>Supported platforms</b>	<b>1</b>
<b>2</b>	<b>Major changes</b>	<b>3</b>
<b>3</b>	<b>Known issues</b>	<b>5</b>
<b>4</b>	<b>Bug fixes</b>	<b>6</b>

# Chapter 1

## Supported platforms

Below are the minimal requirements for various **MOSEK** interfaces. In some cases using **MOSEK** with older versions of the software will be possible, but is neither actively supported nor tested.

### Operating systems

Table 1.1: Operating systems

Platform	Minimal OS version
linux64x86	RHEL 6 compatible
osx64x86	Mac OS 10.9
win32x86	Windows 8, Server 2012
win64x86	Windows 8, Server 2012

### Optimizer API

Table 1.2: Optimizer API.

Platform	C	Java	.NET	.NET Core	Python 2	Python 3
linux64x86	Yes	1.8+		2.0	2.7	3.6+
osx64x86	Yes	1.8+		2.0	2.7	3.6+
win32x86	Yes	1.8+	4.5+		2.7	3.6+
win64x86	Yes	1.8+	4.5+	2.0	2.7	3.6+

### Fusion API

Table 1.3: Fusion API.

Platform	C++	Java	.NET	.NET Core	Python 2	Python 3
linux64x86	C++11	1.8+		2.0	2.7	3.6+
osx64x86	C++11	1.8+		2.0	2.7	3.6+
win32x86		1.8+	4.5+		2.7	3.6+
win64x86	C++11	1.8+	4.5+	2.0	2.7	3.6+

### Optimization Toolbox for MATLAB, Rmosek and other MOSEK tools

Table 1.4: Other APIs and tools.

Platform	MATLAB	R	AMPL Shell	MOSEK to AMPL link	OptServer
linux64x86	R2015a+	3.5+	Yes	Yes	Yes
osx64x86	R2015a+	3.5+	Yes	Yes	
win32x86				Yes	
win64x86	R2015a+	3.5+	Yes	Yes	

### Other distribution channels

- An Anaconda package (Python).
- A Wheels package (Python).
- A NuGet package for .NET Core 2.0 or higher.
- A Julia package (unofficial).

### Other remarks

- If you are using a floating license, the license manager tools requires *Linux Standard Base 3* or newer is installed (package **lsb**).
- Numpy is required in Python Fusion.

# Chapter 2

## Major changes

Specific information regarding particular APIs, parameters and portability of code from version 8 can be found in the section *Interface changes* towards the end of the respective manual. This section lists general changes throughout **MOSEK**.

### 2.1 New features

#### Optimizer

- Introduced the primal exponential cone  $K_{\text{exp}}$  (the constraint  $x \geq y \exp(z/y)$ ).
- Introduced the primal power cone  $\mathcal{P}$  (the constraint  $x^\alpha y^{1-\alpha} \geq |z|$ ).

#### Presolve

- Improved presolve. Primary noticeable for particular conic problems.

#### Interior-point Optimizer

- Tighten the stopping criteria when solving conic optimization problems.
- Changed the scaling so better accuracy is obtained in some cases.

#### Mixed-integer Optimizer

- Handles exponential and power cones.
- Introduced an outer approximation method for solving conic mixed integer optimization problems. This can be enabled with the parameter `MSK_IPAR_MIO_CONIC_OUTER_APPROXIMATION`.

#### Linear algebra utilities

- Employs the BLIS library when run on an AMD CPU instead of the Intel MKL library.
- Updated the Intel MKL BLAS library employed.

#### License Manager

- The FLEXlm license system has been updated to version 11.14.1.0.

#### Interface

- Added support for constraints of the form  $Fx + g \in \mathcal{K}$  (affine conic constraints) in the Toolbox for MATLAB and in Rmosek.

## General

- The Intel C compiler version 19 is used. This will improve performance of the interior-point optimizer on computers with a CPU that supports AVX-512 instructions. However, for most sparse problems the improvement will be negligible.
- Much improved performance on recent AMD CPUs.
- Mosek can now read and write Zstandard compressed files.
- Fixed many 32 bit overflow issues occurring for huge problems.

## 2.2 Removed features

### General nonlinear optimizer

The optimizer for general nonlinear problems in C is removed. Most likely problems using this tool can be expressed in conic form.

### Separable convex optimization SCopt

The Separable Convex interface (SCopt) and extensions for exponential and dual geometric optimization are removed. All applications of these interfaces can now be expressed using cones. It is recommended to rewrite these problems in conic form.

Please see your interface documentation for a tutorial on converting SCopt-like problems to conic form. Please ask us if there are questions or you require help adapting your code.

Note that the SCopt interface was relying on the general nonlinear optimizer.

### Fusion for MATLAB

Separate *Fusion* distribution for MATLAB (`mosekmatlab.jar`) is discontinued. Users are recommended to import the general Java library `mosek.jar` into MATLAB and adapt the code to 0-based numbering. This applies to all explicitly indexed references to entries in *Fusion* objects such as variables and expressions. See also <https://themosekblog.blogspot.com/2019/02/porting-fusion-for-matlab-code.html>

### Other

- Remove the optimial partition sensitivity analysis method.
- Remove all “near” solution statuses, such as “near optimal”.

## 2.3 Deprecated features

None.

## Chapter 3

### Known issues

# Chapter 4

## Bug fixes

### 9.0.97

- Fixed a bug occurring when affine conic constraints and matrix variables appear together (Optimization Toolbox for MATLAB).

### 9.0.96

- Fixed a bug occurring when reading a problem with power cones via `mosek_read` in Rmosek.
- Fixed bugs related to handling of an empty problem.
- Fixed an issue in the conic optimizer that would cause NaNs in the solution.
- Fixed primal/dual value retrieval for a `PSDConstraint` in Fusion.
- Fixed a bug triggering an assert in presolve.

### 9.0.95

- Fix in example `sdo1.py`
- Fix in Rmosek for quadratic problems.

### 9.0.94

- Fixed a recently introduced bug in the BI occurring for primal infeasible problems.

### 9.0.93

- Improved numerical stability of interior-point optimizer a bit.

### 9.0.92

- Fixed a bug that could make reduced cost for basic variables nonzero in the case when basis identification is employed.
- Fixed a bug in model cloning in Fusion.

### 9.0.91

- The parameter `MSK_IPAR_MIO_PROBING_LEVEL` now correctly impacts work limits for probing.
- If `MSK_IPAR_MIO_MAX_NUM_BRANCHES` is zero optimizer exits after presolve and before root relaxation is solved.



### 9.0.90

- Big speedup for Fusion models containing a large number of constraints added one by one (without vectorizing).
- Fixed a bug that could cause a segmentation fault in rare cases.
- Fix a bug that caused a crash in `getbara`-related functions.
- Fixed a bug occurring when using `Expr.mul` with a large sparse matrix (Fusion).

### 9.0.89

- Speedup in `Matrix` class in Python Fusion.
- Update in Fusion C++ linker settings on Linux required for some OS versions.
- Fix a memory leak in .NET API.
- Fixed a bug that would trigger an assert in very rare cases if a problem contained power cones.

### 9.0.88

- Fixed a 32bit integer overflow occurring when writing a task file.
- Fixed a bug in the LU factorization that could cause nondeterministic behaviour.
- Improve efficiency of sparse multiplication in Fusion.
- Fix a memory leak in .NET API.

### 9.0.87

- Fixed a bug in the LU factorization occurring when the LU becomes singular.

### 9.0.86

- Final release.

### 9.0.85(BETA)

- Fix constraint searching by name in Fusion.
- Minor tuning.
- Internal clean up in the code.

### 9.0.84(BETA)

- Tuning and minor fixes.
- Major change to linear interior-point optimizer.

### 9.0.81(BETA)

- Fixed uninitialized read when solving mixed integer quadratic problems with an initial solution defined.
- Fixed some issues related to reoptimization through Fusion.

### 9.0.80(BETA)

- Some minor performance improvements.

### 9.0.79(BETA)

- Fix a bug in the primal simplex optimizer.
- Fix a bug in Rmosek related to specification of cones.
- Fix an issue in mixed-integer presolve that could lead to an infinite loop.
- Adjustments in install script for MacOS.

### 9.0.78(BETA)

- Improve error handling in remote optimization routine.

### 9.0.77(BETA)

- Fix a recently introduced bug in the interior-point optimizer triggering an assert.

### 9.0.76(BETA)

- Restore RHEL 6 compatibility.

### 9.0.75(BETA)

- Improved the presolve.
- Fixed several rarely occurring bugs in the conic optimizer.
- Fixed a bug that could make linear interior-point optimizer crash.
- Fixed a bug in the presolve that could cause a crash on infeasible problems.

### 9.0.74(BETA)

- Fixed a case where the conic optimizer return an incorrect termination status.

### 9.0.73(BETA)

- Improved performance of the conic optimizer.
- Fixed a rarely occurring bug in the simplex optimizer.

### 9.0.72(BETA)

- Fixed an issue causing poor performance when using multiple threads when the A matrix is big.
- Fix a bug in constant expressions in Fusion.
- Change Rmosek installation process.

### 9.0.71(BETA)

- Fix in a ranged constraint in Fusion.

### 9.0.70(BETA)

- First beta release.

### 9.0.68(ALPHA)

- The mixed conic problems having power and/or exponential conic constraints are now solvable.