



## MOSEK Release notes

*Release 9.3.20*

MOSEK ApS

27 April 2022

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# 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
linuxaarch64	Ubuntu 20.04 compatible

### 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	3.6,3.7,3.8,3.9,3.10
osx64x86	Yes	1.8+	–	2.0	2.7	3.6,3.7,3.8,3.9,3.10
win32x86	Yes	1.8+	4.5+	2.0	2.7	3.6,3.7
win64x86	Yes	1.8+	4.5+	2.0	2.7	3.6,3.7,3.8,3.9,3.10
linuxaarch64	Yes	1.8+	–	2.0	–	3.7,3.8,3.9,3.10

### 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	3.6,3.7,3.8,3.9,3.10
osx64x86	C++11	1.8+	–	2.0	2.7	3.6,3.7,3.8,3.9,3.10
win32x86	–	1.8+	4.5+	2.0	2.7	3.6,3.7
win64x86	C++11	1.8+	4.5+	2.0	2.7	3.6,3.7,3.8,3.9,3.10
linuxaarch64	C++11	1.8+	–	2.0	–	3.7,3.8,3.9,3.10

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

Table 1.4: Other APIs and tools.

Platform	MAT-LAB	R	AMPL Shell	MOSEK to AMPL link	Opt-Server	Float. server	lic.
linux64x86	R2015a+	3.5+	Yes	Yes	Yes	Yes	
osx64x86	R2015a+	3.5+	Yes	Yes	–	Yes	
win32x86	–	–	–	Yes	–	Yes	
win64x86	R2015a+	3.5+	Yes	Yes	–	Yes	
linux-aarch64	–	–	–	–	–	–	

### Other distribution channels

- An Anaconda package (Python) via `conda`.
- A Wheels package (Python) via `pip`.
- 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 9 can be found in the section *Interface changes* towards the end of the respective API manual. This section lists general changes throughout **MOSEK**.

### 2.1 Release notes for 9.3

#### 2.1.1 New features

- Support for Linux on ARM64 platform (`linuxaarch64`); experimental.
- Updated FLEXlm to version 11.18. Upgrade of floating license servers required to use clients running **MOSEK** 9.3.
- Improved performance when solving many tasks in parallel.

### 2.2 Release notes for 9.2

#### 2.2.1 New features

- Parametrized models in *Fusion*.
- Support for Python 3.8 (and 3.9 from version 9.2.35).
- Expanded support for OptServer.

### 2.3 Release notes for 9.1

#### 2.3.1 New features

- Added support for calling OptServer from *Fusion* (`Model.solve(server, port)`).

#### 2.3.2 Deprecated features

The following are planned to be removed in version 10:

- Support for Python 2.7 on all platforms.
- Support for Java on Windows 32 bit.
- Support for all versions of Python on Windows 32 bit.

## 2.4 Release notes for 9.0

### 2.4.1 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 negible.
- Much improved performance on recent AMD CPUs.
- Mosek can now read and write Zstandard compressed files.
- Fixed many 32 bit overflow issues occuring for huge problems.

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

## Chapter 3

### Known issues



# Chapter 4

## Bug fixes

### 9.3.20

- The change to BLAS library used on the AMD introduced in v9.3.9 is rolled back.
- Fixed an assert occuring for certain large SDOs.

### 9.3.19

- Require Ubuntu 20.04 on Linux 64bit ARM for technical reasons.

### 9.3.18

- Enabled full support for Python 3.10 via `pip` and `conda`.

### 9.3.17

- Fixed an issue causing a crash for certain large SDOs in the Windows 32 bit version.

### 9.3.16

- Fixed a rare issue in core counting.

### 9.3.15

- Fixed an assert happening in rare cases for certain conic problems.

### 9.3.14

- Fixed an assert happening in rare cases for certain conic problems.
- Fixed a bug in the OPF file writer causing incorrect names been given to the cones in certain cases.

### 9.3.13

- Fixed `Model.getTask()` in C++ *Fusion*.

### 9.3.12

- Fixed a rare reallocation bug in *Fusion*.

### 9.3.11

- Initialized support for Python 3.10.
- Enabled `pip install` of the Python 3.10 module on major platforms (`win64x86`, `linux64x86`, `osx64x86`).

### 9.3.10

- Fixed a rare issue with parameterizing a cloned Fusion model.

### 9.3.9

- Fixed a CPU detection issue involving recent AMD CPUs.
- Improved performance when running on a AMD CPU on Linux.

### 9.3.8

- Made the JNI loading mechanism more flexible.

### 9.3.7

- Fixed a bug in the LU module. It can potentially affect all the optimizers.
- Fixed a bug that could trigger an assert in the presolve.

### 9.3.6

- Fix a rare bug that could cause an exception when defining LMIs in Fusion.

### 9.3.5

- Fix errors in `Constraint.remove()`.

### 9.3.4

- Roll back to .NET Standard 2.0.
- Fix an error in `Constraint.remove()`.

### 9.3.3

- Fix an issue leading to an assert when solving semidefinite problems on AMD CPU.

### 9.3.2

- Fix a rare bug in Rmosek that could cause segmentation fault when reading data files with semidefinite variables.
- API and GUI improvements in the OptServer (includes OptServer version 2.1.27).

### 9.3.1

- Fixed a rarely occurring bug in the simplex optimizer.
- Fixed several bugs in the presolve.

### 9.3.0(BETA)

- Updated FLEXlm to version 11.18. Upgrade of floating license servers required to use clients running **MOSEK** 9.3.
- Initiated support for Linux on ARM64.
- Improved performance when solving many tasks in parallel.

### 9.2.49

- Unified treatment of unused solutions in Fusion.

### 9.2.48

- Fixed the outer product operator in Fusion.

### 9.2.47

- Fixed a bug that could cause a segmentation fault in rare cases.

### 9.2.46

- Fixed a bug that could cause a hang in the interior-point optimizer.
- Fixed a bug in handling empty sparse parameters in Fusion.

### 9.2.45

- Fixed some bugs in handling of sparse parameters in Fusion.
- Fixed a bug that could trigger an assert on problems containing power cone constraints.
- Fixed a bug in JTask writer causing JSON syntax error in some cases.

### 9.2.44

- Optimized memory allocation in Fusion for huge expressions.

### 9.2.43

- Fixed a bug in Fusion that could cause array overruns affecting especially versions 9.2.39-9.2.42.

### 9.2.42

- Fixed an issue with indexing constraint entries in Fusion.
- Updated instructions for setting **MOSEK** up in Visual Studio.

#### 9.2.41

- Fixed an issue that could trigger an assert when doing basis identification.
- Fixed a bug that could trigger an assert in the public sparse Cholesky interface for certain singular inputs.
- Fixed a memory leak in the Python public sparse Cholesky interface.
- Fixed an issue with setting simplex basis in the MIP solver.
- Fixed handling of license path in environment constructor in Python.
- Fixed a rare issue in core counting on AMD CPUs.
- Fixed a minor issue in Fusion related to compressing expressions internally.
- Fixed a minor error in the solution reader log output.

#### 9.2.40

- Fix an issue that could trigger an assert because of unexpected basis singularity.

#### 9.2.39

- Added checks for invalid floating point values which could be silently missed.
- Fix potential issue with Python interface installation on Windows.

#### 9.2.38

- Improved data checks in Matlab and R interfaces.
- Fix in *Fusion* related to counting floating-point nonzeros in certain expressions.

#### 9.2.37

- Fixed a bug that could trigger an assert in the presolve.
- Fixes in the writing of the solution section in PTF files.

#### 9.2.36

- Fixed a bug that could trigger an assert on certain problems that employed the power cone constraints.

#### 9.2.35

- Initialize support for Python 3.9.

#### 9.2.33

- Fixed a bug occurring when changing the default starting point type for the conic optimizer.

#### 9.2.32

- Fixed a rare internal buffer overrun in *Fusion*.

### 9.2.31

- Fixed a rare bug in handling of termination criteria.

### 9.2.30

- Fixed an issue causing a crash in CBF file reader in rare cases.
- Fixed a minor error in the log output.

### 9.2.29

- Fixed an issue causing excessive memory usage when using the interior-point optimizer.

### 9.2.28

- Fixed a bug in the presolve triggering an assert in rare cases.

### 9.2.27

- Fixed a bug in certain sparse multiplications in *Fusion*.

### 9.2.26

- Fixed overflow detection in Python Fusion.
- Simplify problem size bounds in the `mosekcli` tool.
- Fixed an issue when cloning tasks with semidefinite variables.

### 9.2.25

- Fixed a bug in the presolve triggering an assert on some dual infeasible problems.

### 9.2.24

- Fixed a bug in the presolve occurring rarely on conic problems.

### 9.2.22

- Fixed a bug in *Fusion* related to multiplication of a constant matrix by a parameter.

### 9.2.21

- Fixed a bug in *Fusion* related to adding parametrized and non-parametrized expressions.

### 9.2.20

- Fixed a bug preventing automatic primal repair with the mixed-integer optimizer.
- Include missing Cilk library in the Conda package on Windows.
- Scaling update in the conic solver.
- Fixed some rare issues in the PTF writer.

### 9.2.19

- Removed some debug printing.
- Fix an issue with updating partially parametrized expressions in *Fusion*.

### 9.2.18

- Fixed accessing information items in *Fusion* for .NET.

### 9.2.17

- Fixed some rare issues occurring for sparse multiplications in *Fusion*.

### 9.2.16

- Fixed a bug that triggered an assert for certain conic problems.

### 9.2.15

- Fixed a bug that prevented certain conic optimization models to be dualized.

### 9.2.14

- Fixed a bug triggering an assert for certain dual infeasible problems.

### 9.2.13

- Fixed a rare issue in exponential cone problems leading to internal numeric values of high magnitude which could overflow and trigger an assert.

### 9.2.12

- Fixed a bug in the conic optimizer that could cause an assert or an invalid solution to be reported.

### 9.2.11

- Fixed a in the CBF writer causing a memory leak.
- Fixed several bugs causing an invalid solution report for some problems containing power cones.
- Fixed a bug in the solution analyzer occurring when no constraints are present in the problem.
- Fixed a bug in `updateObjective` in *Fusion*.

### 9.2.10

- Fixed a bug in the MPS writer occurring for models having general integer variables.
- Added missing GUI elements in the OptServer (includes OptServer version 2.1.24).

### 9.2.9

- Fixed a bug in Fusion related to multiplication of parametrized expressions.
- Fixed a possible memory leak when disposing a Fusion model.

### 9.2.8

- Fixed a bug causing an assert in rare cases on conic problems.
- Improvements and security fixes in the OptServer (includes OptServer version 2.1.23).

### 9.2.7

- Enable setting initial integer solution in MATLAB in the presence of affine conic constraints.
- Fixed an issue in the mixed integer optimizer causing initial solutions to not be correctly recognized by the optimizer.
- Fixed a bug in the presolve that triggered an assert in rare cases.

### 9.2.6

- Fixed an issue in the mixed integer optimizer affecting a small set of problem instances.

### 9.2.5

- Fixed a bug in the conic optimizer causing an invalid result is reported in rare cases.
- Fixed a bug in the conic optimizer causing a stall on certain problems containing exponential cones.

### 9.2.4

- Fixes in PTF and MPS readers/writers.
- Fixed issues with using `Domain.isLinPSD()` in *Fusion*.

### 9.2.3

- Fix in the conic optimizer affecting problems with 3-dimensional matrix variables.
- Fixed a bug occurring when writing CBF formatted files for problems having matrix variables.
- Fixed a bug in the presolve occurring rarely on conic problems.
- Further expansion of OptServer API calls.
- Improved error messages.

### 9.2.2(BETA)

- Expanded OptServer calls API.

### 9.2.1(BETA)

- Fixed an issue in the sparse Cholesky factorization module.

### 9.2.0(BETA)

- First release with parametrized Fusion.
- Initialize support for Python 3.8.
- Fixed an issue where the number of cores is not detected correctly on recent AMD CPUs.
- Updated the BLAS library used on the AMD platform.
- Fixed a rare issue involving stopping criteria.

### 9.1.13

- Fixed a bug in the conic optimizer.

### 9.1.12

- Fixed a bug in the conic problem setup affecting few problems.

### 9.1.11

- Internal.

### 9.1.10

- Fixed an issue in mixed integer presolve that could cause the solver to enter an infinite loop.
- Fixed a bug in two-dimensional ranged domain (Fusion).
- Improvements and fixes in the semidefinite optimisation tutorial and examples.
- Fixed a bug in the presolve triggering an assert.

### 9.1.9

- Fixed a numerical issue in the conic interior-point optimizer causing slow convergence in rare cases.

### 9.1.8

- Fixed an issue with scaling matrices for power cones.

### 9.1.7

- Improved presolve for some conic problems.

### 9.1.6

- Fixed a bug in the conic optimizer causing an assert in rare cases.
- Fixed a bug occurring in rare cases when the problem contained power cones.
- Fixed a number of bugs causing a crash in special cases removecones is used.

### 9.1.5

- Updated FLEXLM license system to version 11.16.4.0 fixing important security vulnerability.
- Added missing MS Visual Studio redistributables needed by license installation.
- Fixed possible segfault in the mixed integer optimizer.

### 9.1.4

- Made the presolve slightly less conservative about declaring a problem primal or dual infeasible.
- Improve error diagnostic in the Optimization Toolbox for MATLAB.



### 9.1.3

- Restore backwards compatibility of `linprog` in the MOSEK Optimization Toolbox for MATLAB.

### 9.1.2

- Fix a bug in `MSK_toconic` occurring for certain quadratic constraints.

### 9.1.1

- Fixed a bug in the interior-point optimizer that could cause a stall in rare cases on quadratic and conic problems.

### 9.1.0

- Corrections in the OptServer documentation.
- First release with OptServer available from Fusion.

### 9.0.105

- Reduced the memory consumption.
- Fixed several bugs occurring for certain problems containing power cones.
- Fixed the response code handling example in Rmosek and Optimization Toolbox for MATLAB.

### 9.0.104

- Fixed issue in mixed integer presolve affecting badly scaled problems.

### 9.0.103

- Fixed possible memory leaks in the mixed integer optimizer.
- Fixed several potential 32 bit integer overflows in the simplex optimizer. These overflows would only occur for very large problems.

### 9.0.102

- Corrections in OptServer installation and documentation.
- Removed debug output.

### 9.0.101

- Fixed a bug in the presolve that would trigger an assert in the postsolve.
- Added Windows 32bit to the .NET Core package.
- Fixes related to license expiry warning.

### 9.0.100

- Fixed an issue causing an assert on some quadratic problems.
- Removed debug output.

### 9.0.99

- Fixed a bug in handling certain forms of sparse input in Fusion.
- Fixed an issue occurring when number of working threads is greater than 128.

### 9.0.98

- A fix related to handling of names in empty constraints (Fusion).
- Update obsolete code samples in documentation.

### 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.