MOSEK Licensing Guide

Release 8.0.0.74

MOSEK ApS

2017

CHAPTER

ONE

INTRODUCTION

The **MOSEK** Optimization Suite is a commercial product that requires a valid license. Therefore, this guide explains how the licensing system works and how to install a license.

1.1 Contact info

Phone	+45 7174 9373	
Website	www.mosek.com	
Email		
	sales@mosek.com	Sales, pricing, and licensing
	support@mosek.com	Technical support, questions and bug reports
	info@mosek.com	Everything else.
Mailing Address		
	MOSEK ApS	
	Fruebjergvej 3	
	Symbion Science Park, Box 16	
	2100 Copenhagen Ø	
	Denmark	

1.2 Social Media

You can get in touch with **MOSEK** using popular social medias as well:

Blogger	http://blog.mosek.com/
Google Group	https://groups.google.com/forum/#!forum/mosek
Twitter	https://twitter.com/mosektw
Google+	https://plus.google.com/+Mosek/posts
Linkedin	https://www.linkedin.com/company/mosek-aps

In particular **Twitter** is used for news, updates and release announcements.

1.3 License agreement

Before using the **MOSEK** software, please read the license agreement available in the distribution at `<MSKHOME>/mosek/8/mosek-eula.pdf` or on the **MOSEK** website https://mosek.com/sales/license-agreement.

MOSEK uses some third-party open-source libraries. Their license details follows.

zlib

MOSEK includes the *zlib* library obtained from the zlib website. The license agreement for *zlib* is shown in Listing 1.1.

Listing 1.1: *zlib* license.

```
zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.7, May 2nd, 2012

Copyright (C) 1995-2012 Jean-loup Gailly and Mark Adler

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   in a product, an acknowledgment in the product documentation would be
   appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be
   misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly        Mark Adler
jloup@gzip.org          madler@alumni.caltech.edu
```

fplib

MOSEK includes the floating point formatting library developed by David M. Gay obtained from the netlib website. The license agreement for *fplib* is shown in Listing 1.2.

Listing 1.2: *fplib* license.

```
/****************************************************************
 *
 * The author of this software is David M. Gay.
 *
 * Copyright (c) 1991, 2000, 2001 by Lucent Technologies.
 *
 * Permission to use, copy, modify, and distribute this software for any
 * purpose without fee is hereby granted, provided that this entire notice
 * is included in all copies of any software which is or includes a copy
 * or modification of this software and in all copies of the supporting
 * documentation for such software.
 *
 * THIS SOFTWARE IS BEING PROVIDED "AS IS", WITHOUT ANY EXPRESS OR IMPLIED
 * WARRANTY.  IN PARTICULAR, NEITHER THE AUTHOR NOR LUCENT MAKES ANY
 * REPRESENTATION OR WARRANTY OF ANY KIND CONCERNING THE MERCHANTABILITY
 * OF THIS SOFTWARE OR ITS FITNESS FOR ANY PARTICULAR PURPOSE.
 *
 ***************************************************************/
```

CHAPTER

TWO

LICENSE SYSTEM BASICS

The **MOSEK** Optimization Suite is licensed software which means a valid license is required. A license is provided by a license file that specifies:

- which features in **MOSEK** have been licensed (an example of a feature is the nonlinear extension `PTON`) and
- how many copies of a feature that can be used simultaneously,
- and an expiration date of each feature.

2.1 License Types

The license is managed by the |flexlm| license manager included in **MOSEK**. FLEXlm has the two type of licenses:

- **floating** and
- **server** also known as **node-locked**.

A **floating license** is tied to a particular computer that acts as a *token server*. **MOSEK** can be used on any computer connected to the token server through the local area network (LAN). In particular **MOSEK** can be used on the computer acting as token server. Information on how to setup a floating license can be found in Section *4*.

A **server license** is tied to a particular computer and allows unlimited use of the licensed features on that particular computer. Information on how to setup a server license can be found in Section *5*.

Both floating and server licenses are tied to a specific computer and therefore some computer-dependent informations must be provided:

- computer `hostname`: the name that identify the computer in the network,
- computer `hostid`: a unique computer identifier (typically its MAC address).

Detailed instruction can be found in Section *3*.

2.2 The License File

A license file is a plain text file that can be opened for inspection using any plain text editor (such as `vim` or `emacs` on Linux, or `notepad` on Windows. It is sometimes useful to inspect the file to check the expiration date, the activated features and computer information.

Listing 2.1: An example of license file for a floating license.

```
SERVER MYHOSTNAME MYHOSTID 27000
USE_SERVER
VENDOR MOSEKLM
FEATURE PTS MOSEKLM 8.00 permanent 2 ... more stuff ...
```

In Listing 2.1 an extract of a license file for a floating license is presented. The `SERVER` line shows

- the *hostname* is `MYHOSTNAME`,
- the *hostid* is `MYHOSTID`, and
- the port on which the token server will listen on is `27000`.

Moreover, the `FEATURE` line specifies one or more license tokens of a given feature type. The interpretation of the feature line is as follows

- it enables two `PTS` tokens,
- the license is perpetual because of the `permanent` keyword,
- 2 is the number of license tokens, and
- the 8.00 implies version 8 or older clients is supported.

Observe **MOSEK** only checks the major version number so any **MOSEK** version 8 is supported by the above license file.

Perhaps somehat confusing if there is no `SERVER` line in the license file, then it is a server license also known as a node-locked license. A server license does not and CANNOT be used with a token server.

2.3 Best practices

In general the token server binaries must be as new as the newest client contacting the token server. If that is not case issues can be expected.

CHAPTER

THREE

HOSTNAME AND HOSTID

The `hostname` and `hostid` are the two basic computer identifier employed by **MOSEK** to generate license files.

3.1 The Hostname

To obtain the host name open a shell and execute the command:

```
hostname
```

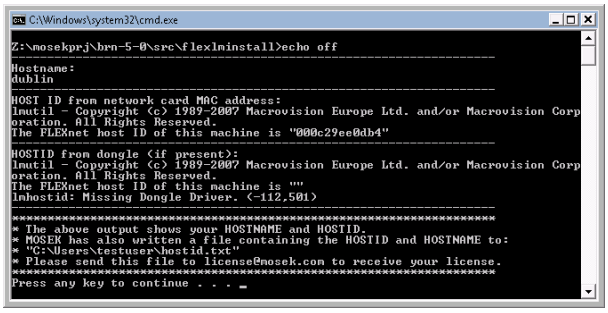
3.2 The Host ID

A purchased **MOSEK** license is tied to a particular computer using a unique id of the computer called a *host ID*. Usually the host ID is identical to the MAC address of a network card. Therefore, the computer needs to be equipped with a network card. However, an actual network connection is not needed as **MOSEK** requires only a number encoded in the network card.

3.2.1 Windows: How to get the Host ID

In the start menu below All programs select *Mosek Optimization tools* 8.0 and click on **Generate HOSTID**. **MOSEK** will display the hostname and the host ID and generate a file named `hostid.txt` in the users home directory e.g

```
%UserProfile%\hostid.txt
```



Please provide the `hostid.txt` file whenever the host ID is requested.

3.2.2 Linux: How to get the Host ID

To use the license manager the *Linux standard base 3.0* must be installed. This package is called *lsb-base* or *lsb* in most Linux distributions.

The `host ID` is obtained as follows:

```
<MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/lmutil lmhostid
```

An example output is

```
lmutil - Copyright (c) 1989-2006 Macrovision Europe Ltd.
and/or Macrovision Corporation. All Rights Reserved.
The FLEXnet host ID of this computer is "00001a1a5a6a";
```

In this case the `host ID` is `00001a1a5a6a`.

3.2.3 Mac OS: How to get the Host ID

The `host ID` is obtained as follows:

```
<MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/lmutil lmhostid
```

An example output is

```
lmutil - Copyright (c) 1989-2006 Macrovision Europe Ltd.
and/or Macrovision Corporation. All Rights Reserved.
The FLEXnet host ID of this computer is "00001a1a5a6a";
```

In this case the `host ID` is `00001a1a5a6a`.

CHAPTER

FOUR

FLOATING LICENSE SETUP

A **floating license** is tied to a particular computer acting as a *token server*. A token server is a *service* on Windows and a *daemon* on UNIX that serves license tokens to **MOSEK** client programs using the LAN.

You may think of the token server as a computer with a bag of license tokens. Whenever a client computer starts using **MOSEK**, a license token is requested from the token server, and when **MOSEK** completes it sends back the license token to the token server. The following diagram Fig. 4.1 conveys the overall idea.

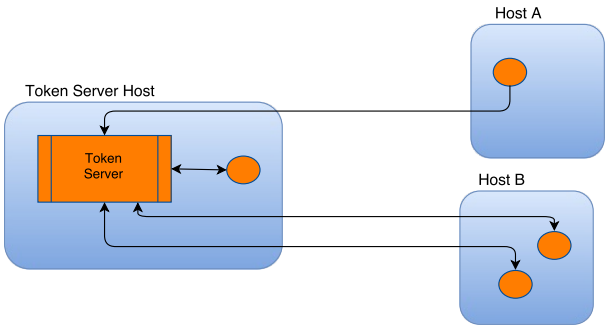


Fig. 4.1: General floating license scheme: any **MOSEK** instances that can connect to the token server can get a valid license.

This implies that you cannot use more license tokens than is available at any given point in time. Moreover, **MOSEK** can be used on any computer connected to the token server through the local area network. In particular **MOSEK** can also be used on the computer acting as token server.

A license file that contains at least one floating license always starts with

```
SERVER hostname hostid port
```

Observe that

- installing a license file without a `SERVER` line with a token server is *NOT* needed and is *NOT* possible.
- at most one token server can be running at a computer.

The token server consists of two daemons

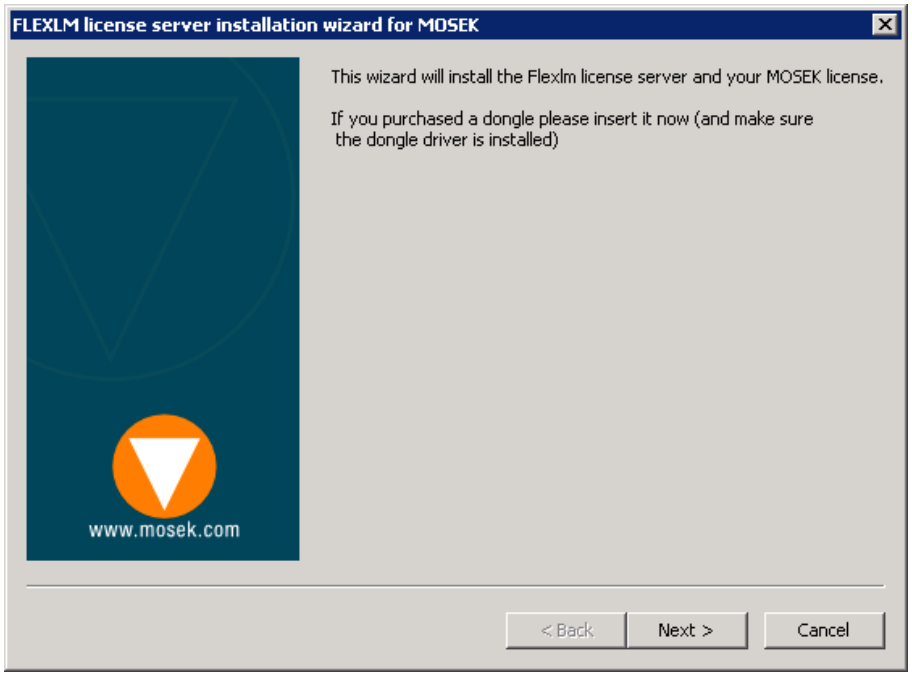
- `lmgrd`: The token server daemon running as a service,
- `MOSEKLM`: A daemon started by `lmgrd`.

In the following subsections we discuss how to setup a token server on Linux, Mac OS and Windows

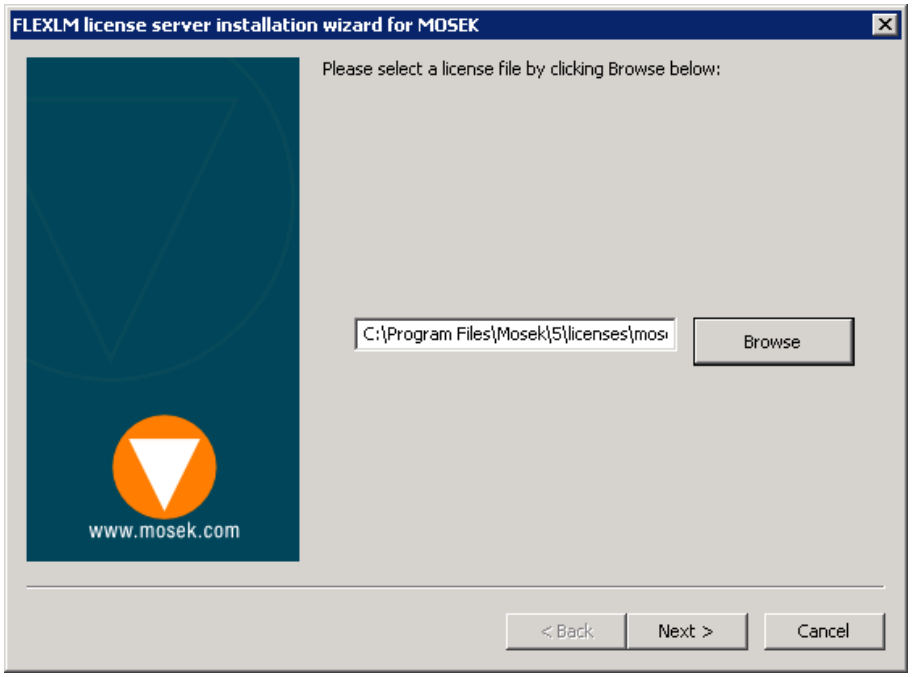
4.1 Windows: Token server setup

Below follows a step-by-step guide for how to install a token server on Windows.

- Step 1: Make sure you have *administrative privileges*.
- Step 2: Download the license file and store it on the local drive of the computer running the token server.
- Step 3: In the start menu select **Mosek Optimization tools** and click on **Install MOSEK token server** to start the license installation wizard.



- Step 4: Click **Next** and then click **Browse** and select the license file.



- Step 5: Click **Next** to install the token server.

- Step 6: Click **Finish**.
- Step 7: To verify that the license system is running open a command prompt and run the command `lmutil -c @127.0.0.1 -a`. The result for a successfully running license server is shown below:

```
lmutil  lmstat -c @127.0.0.1 -a

lmutil - Copyright (c) 1989-2015 Flexera Software LLC. All Rights Reserved.
Flexible License Manager status on Tue 3/7/2017 17:45

License server status: 27000@127.0.0.1
    License file(s) on 127.0.0.1: c:\users\auser\mosek\mosek.lic

 127.0.0.1: license server UP (MASTER) v11.13.1

Vendor daemon status (on 127.0.0.1):

MOSEKLM: UP v11.13.1
Feature usage info:
Users of PTS:  (Total of 4 licenses issued;  Total of 0 licenses in use)
```

- Step 8: You have now installed the token server. Next client users should follow the instructions in Section *6* to connect to the token server.

The above procedure describes how to install the token server using the **MOSEK** token server installation tool. Alternatively the FLEXlm installation tool `lmtools` may be used. For information about this tool and the many other options of FLEXlm please see License Administration Guide at http://docs.mosek.com.

4.2 Linux: Token server setup

This section discusses how to install the token server on Linux. On Linux LSB 3.0 or later must be installed in order for token server binaries to work. Therefore, please make sure the LSB package is installed. The LSB package is called `lsb-base` or `lsb` in most Linux distributions.

The programs `lmgrd` and `MOSEKLM` required for installation can be found in:

`<MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/`

To start the token server run the following commands:

```
cd <MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/
./lmgrd -c PATH_TO_LICENSE -l lmgrd.log
```

Where `PATH_TO_LICENSE` is the path to your license file. The token server will save a log file in the location given by the `-l` command line parameter. If the token server was started successfully the `lmgrd.log` file will look similar to this

```
cat lmgrd.log
15:03:09 (lmgrd) -----------------------------------------------
15:03:09 (lmgrd)   Please Note:
15:03:09 (lmgrd)
15:03:09 (lmgrd)   This log is intended for debug purposes only.
15:03:09 (lmgrd)   In order to capture accurate license
15:03:09 (lmgrd)   usage data into an organized repository,
15:03:09 (lmgrd)   please enable report logging. Use Macrovision's
15:03:09 (lmgrd)   software license administration  solution,
15:03:09 (lmgrd)   FLEXnet Manager, to  readily gain visibility
15:03:09 (lmgrd)   into license usage data and to create
15:03:09 (lmgrd)   insightful reports on critical information like
15:03:09 (lmgrd)   license availability and usage. FLEXnet Manager
15:03:09 (lmgrd)   can be fully automated to run these reports on
15:03:09 (lmgrd)   schedule and can be used to track license
```

```
15:03:09 (lmgrd)   servers and usage across a heterogeneous
15:03:09 (lmgrd)   network of servers including Windows NT, Linux
15:03:09 (lmgrd)   and UNIX. Contact Macrovision at
15:03:09 (lmgrd)   www.macrovision.com for more details on how to
15:03:09 (lmgrd)   obtain an evaluation copy of FLEXnet Manager
15:03:09 (lmgrd)   for your enterprise.
15:03:09 (lmgrd)
15:03:09 (lmgrd) ------------------------------------------------
15:03:09 (lmgrd)
15:03:09 (lmgrd)
15:03:09 (lmgrd) FLEXnet Licensing (v11.4.0.0 build 31341) started on kolding (linux) (5/14/
 ↪2007)
15:03:09 (lmgrd) Copyright (c) 1988-2006 Macrovision Europe Ltd. and/or Macrovision␣
 ↪Corporation. All Rights Reserved.
15:03:09 (lmgrd) US Patents 5,390,297 and 5,671,412.
15:03:09 (lmgrd) World Wide Web:  http://www.macrovision.com
15:03:09 (lmgrd) License file(s): /home/sandvik/kolding.lic
15:03:09 (lmgrd) lmgrd tcp-port 27000
15:03:09 (lmgrd) Starting vendor daemons ...
15:03:09 (lmgrd) Started MOSEKLM (internet tcp_port 44950 pid 23251)
15:03:09 (MOSEKLM) FLEXnet Licensing version v11.4.0.0 build 31341
15:03:09 (MOSEKLM) Server started on kolding for:       PTS
15:03:09 (MOSEKLM) PTOC         PTON            PTOM
15:03:09 (lmgrd) MOSEKLM using TCP-port 44950
```

In this case `lmgrd` is running on port *27000* and `MOSEKLM` is running on port *44950*.

In order to verify that the license system works run the commands

```
cd <MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/
./msktestlic
```

The message

```
***********************************
A license was checked out correctly.
***********************************
```

will appear if the license system works correctly. If the license does not check out correctly, then contact **MOSEK** support at support@mosek.com. Please include the error messages in your email and the file lmgrd.log created during the installation.

You have now installed the token server. Next client users should follow the instructions in Section *6*.

Starting `lmgrd` on boot

For security reasons `lmgrd` should not run as root. To start `lmgrd` at boot time we recommend that you add the following command to your startup script:

```
su username -c "umask 022; lmgrd -c path_to_license_file -l lmgrd.log"
```

Where:

- `username` is a normal, non-root, non-privileged user.
- `lmgrd` is the complete path and file name to the `lmgrd` binary.
- `path_to_license_file` is the complete path and file name to the license file.
- `log` is the complete path and file name to the debug log file.

4.3 Mac OS token server

This section discusses how to install the token server on Mac OS.

The programs `lmgrd` and `MOSEKLM` required for installation can be found in:

`<MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/`

To start the token server run the following commands:

```
cd <MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/
./lmgrd -c PATH_TO_LICENSE -l lmgrd.log
```

Where `PATH_TO_LICENSE` is the path to your license file. The token server will save a log file in the location given by the `-l` command line parameter. If the token server was started successfully the `lmgrd.log` file will look similar to this

```
cat lmgrd.log
15:03:09 (lmgrd) -----------------------------------------------
15:03:09 (lmgrd)   Please Note:
15:03:09 (lmgrd)
15:03:09 (lmgrd)   This log is intended for debug purposes only.
15:03:09 (lmgrd)   In order to capture accurate license
15:03:09 (lmgrd)   usage data into an organized repository,
15:03:09 (lmgrd)   please enable report logging. Use Macrovision's
15:03:09 (lmgrd)   software license administration  solution,
15:03:09 (lmgrd)   FLEXnet Manager, to  readily gain visibility
15:03:09 (lmgrd)   into license usage data and to create
15:03:09 (lmgrd)   insightful reports on critical information like
15:03:09 (lmgrd)   license availability and usage. FLEXnet Manager
15:03:09 (lmgrd)   can be fully automated to run these reports on
15:03:09 (lmgrd)   schedule and can be used to track license
15:03:09 (lmgrd)   servers and usage across a heterogeneous
15:03:09 (lmgrd)   network of servers including Windows NT, Linux
15:03:09 (lmgrd)   and UNIX. Contact Macrovision at
15:03:09 (lmgrd)   www.macrovision.com for more details on how to
15:03:09 (lmgrd)   obtain an evaluation copy of FLEXnet Manager
15:03:09 (lmgrd)   for your enterprise.
15:03:09 (lmgrd)
15:03:09 (lmgrd) -----------------------------------------------
15:03:09 (lmgrd)
15:03:09 (lmgrd)
15:03:09 (lmgrd) FLEXnet Licensing (v11.4.0.0 build 31341) started on kolding (linux) (5/14/
 ↪2007)
15:03:09 (lmgrd) Copyright (c) 1988-2006 Macrovision Europe Ltd. and/or Macrovision␣
 ↪Corporation. All Rights Reserved.
15:03:09 (lmgrd) US Patents 5,390,297 and 5,671,412.
15:03:09 (lmgrd) World Wide Web:  http://www.macrovision.com
15:03:09 (lmgrd) License file(s): /home/sandvik/kolding.lic
15:03:09 (lmgrd) lmgrd tcp-port 27000
15:03:09 (lmgrd) Starting vendor daemons ...
15:03:09 (lmgrd) Started MOSEKLM (internet tcp_port 44950 pid 23251)
15:03:09 (MOSEKLM) FLEXnet Licensing version v11.4.0.0 build 31341
15:03:09 (MOSEKLM) Server started on kolding for:       PTS
15:03:09 (MOSEKLM) PTOC         PTON            PTOM
15:03:09 (lmgrd) MOSEKLM using TCP-port 44950
```

In this case `lmgrd` is running on port *27000* and `MOSEKLM` is running on port *44950*.

In order to verify that the license system works run the commands

```
cd <MSKHOME>/mosek/8/tools/platform/<PLATFORM>/bin/
./msktestlic
```

The message

```
**********************************
A license was checked out correctly.
**********************************
```

will appear if the license system works correctly. If the license does not check out correctly, then contact **MOSEK** support at support@mosek.com. Please include the error messages in your email and the file lmgrd.log created during the installation.

You have now installed the token server. Next client users should follow the instructions in Section *6*.

Starting `lmgrd` on boot

For security reasons `lmgrd` should not run as root. To start `lmgrd` at boot time we recommend that you add the following command to your startup script:

```
su username -c "umask 022; lmgrd -c path_to_license_file -l lmgrd.log"
```

Where:

- `username` is a normal, non-root, non-privileged user.
- `lmgrd` is the complete path and file name to the `lmgrd` binary.
- `path_to_license_file` is the complete path and file name to the license file.
- `log` is the complete path and file name to the debug log file.

4.4 Firewall issues

The token server consists of two daemons

- `lmgrd`: The token server daemons.
- `MOSEKLM`: A demon started by `lmgrd`.

Both needs an open port in the firewall if a **MOSEK** client on another computer should be able to check out a license license token. To specify which port number each daemon should use you must change the license file. The first two lines in a standard **MOSEK** license file look like

```
SERVER my_server 123456789ABC
VENDOR MOSEKLM
```

To instruct `lmgrd` to use port *27000* and `MOSEKLM` to use port *3084* change the first two lines of the license file to:

```
SERVER my_server 123456789ABC 27000
VENDOR MOSEKLM port=3084
```

Restart the token server and configure your firewall to allow access to the chosen port numbers which in this case is 27000 and 3084.

Finally, it is a good idea to check if the port is open by using the telnet command as follows

```
telnet my_server 27000
```

on the client computer(s). You will get an error message similar to

```
Connecting To birkende...Could not open connection to the host,
on port 27000: Connect failed
```

if the port is *not* open. See also the License Administration Guide at https://docs.mosek.com for more information.

4.5 License Checkout Overhead

From FLEXlm version `11.13.1.2` users may experience an overhead of few tenths of a second when checking out the license token the first time. This is mainly due to additional checking the FLEXlm performs to detect virtual machines. Unfortunately it is an issues that is out of scope for **MOSEK**. FLEXlm is working on a solution for the issue. In addition if the **MOSEK** environment is reused and license caching is turned on, then the issue will only be noticed for the first optimization. Please contact support@mosek.com to obtain more information if needed.

CHAPTER

FIVE

SERVER LICENSE SETUP

In case of a server license (aka. node-locked) nothing should be installed. All that should be done is to follow the instructions in Section *6*.

CHAPTER

SIX

CLIENT SETUP

MOSEK client applications require a valid license in order to be used. Here the preferred and most commonly used license installation method is described.

In practice the license consist of file named

```
mosek.lic
```

On Windows save the license file to

```
%USERPROFILE%\mosek\mosek.lic
```

If the folder mosek in the home directory does not exist, then it must be created.

On Mac OS and Linux like operating systems save the license file to

```
$HOME/mosek/mosek.lic
```

Alternatively, the OS variable

```
MOSEKLM_LICENSE_FILE
```

can be defined to point the license file. I.e. on Windows define

```
MOSEKLM_LICENSE_FILE=c:\users\mylogin\mosek.lic
```

If the license is checked out from a token server, then

```
MOSEKLM_LICENSE_FILE=portnumber@hostname
```

is also a valid setting. This means that the client contacts the host named `hostname` on the port `portnumber`. If `portnumber` is admitted the client searches the ports for a token server. Please observe that a firewall may block access to the token server.

CHAPTER

SEVEN

LICENSE IN A CLOUD COMPUTING ENVIRONMENT

The token server may be deployed in a cloud environment. The main challenge in deploying a token server in the cloud is to guarantee that the *hostid* stay unchanged when the instance running the token server is stopped.

In the following section we discuss one possible deployment strategy on Amazon EC2.

7.1 Example: Token server in Amazon EC2

The license will be bound to a MAC address. In the most basic Amazon EC2 instance setup the MAC address may change when the instance is stopped and later started again. Below we describe how to avoid this.

In Amazon EC2 a MAC address is a persistent resource associated with an Elastic network interface (ENI). To keep the MAC address constant we advice creating an ENI that can then be associated with the Amazon EC2 instance acting as a token server. The ENI can later be moved to another instance within the same subnet if the token server needs to be moved.

Creating a token server Amazon EC2 instance

1. Create an ENI in the subnet you wish to launch the token server instance into. Please consult the Amazon EC2 documentation for how to create an ENI
2. Create an new instance in the same subnet as the ENI. When configuring the network interface select the newly created ENI as a network interface
3. Launch the instance
4. ***(optional)*** **If the machine needs a public IP address then create an Elastic IP (EIP) and associate i**
   to have automatically assigned public IP addresses when using an ENI in Amazon EC2
5. Install **MOSEK** on the instance
6. Retrieve the *hostid* (MAC address) associated with the ENI from the machine as described in *3*
7. Contact support@mosek.com with the relevant MAC address to obtain a valid license file
8. Make sure the security groupe associated with the instance running the token server allow for incomming trafic to the token server. Allow for inbound TCP trafic on the ports you select the token server to listen to as shown in *4.4*
9. Install the token server as described in *4*