An overview of MOSEK

Erling D. Andersen
MOSEK ApS
Fruebjergvej 3,
Symbion Science park, Box 16
2100 Copenhagen O
Denmark
Email: sales@mosek.com
WWW: http://www.mosek.com

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Introduction

Overview

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Background

The company

- MOSEK ApS is a Danish company.
- Vision: Create and sell software for solving linear and convex optimization problems.
- Located in Copenhagen at Symbion Science Park.
- Daily management: Erling D. Andersen.
- Currently 4 full-time, 4 part-time employees and 1 phd student.

Product overview

MOSEK optimization tools

- Main product: MOSEK optimization tools.
- Solves generic:
  - Linear, quadratic, and nonlinear problems. Only convex cases.
  - Conic optimization problems.

$$\begin{array}{lll} \min & c^T x & \\ \text{st.} & Ax & = b, \\ & x \in K & \end{array}$$

    where K is a convex cone (only linear, quadratic, semidefinite).
  - Integer optimization problems.
    - Same as above but some variables are integer constrained.
- The software is **NOT** application specific.

Customers

Types of customers

- Structural design.
  - Arch Bridge Analysis.
- Financial industry.
  - Portfolio optimization.
  - Trading and cash optimization.
- Power industry.
- Forestry.
- Bus crew scheduling.
- Analogue circuit design.
- Bio tech.
- Advertisement.
- + more.

- End customer size.
  - Small with 1 user.
  - Large with users e.g. large banks.
- OEM.
  - Integrate MOSEK into a another product.
- Value added resellers.

Geographical markets:

- North America.
- Europa (few Danish customers).
- Japan.
- Australia.
- South America.

Product details

Optimizers

- Primal and dual simplex for linear problems.
- Primal network simplex for network flow problems.
- Interior-point for linear, conic and nonlinear problems.
- Two branch and bound and cut optimizers.
  - Freely included. Tuned for conic problems.
  - Paid addon: Tuned for linear problems.

Interfaces

- Optimizer API
  - Matrix orientated.
  - C, Java, .NET and Python.
- Fusion
  - Object orientated.
  - Only linear and conic problems.
  - Java, MATLAB, .NET and Python.
- Other
  - AMPL
  - MATLAB toolbox.
  - R package.
- Third party links:
  - AIMMS, CVX, GAMS, MPL (soon), Woodstock.
  - Coin OSI, Raven Toolbox, Yalmip, ...

Getting started

Useful links

- Software download:
  - `http://mosek.com/download/`
- Trial license:
  - `http://mosek.com/resources/trial/`
- Documentation:
  - `http://docs.mosek.com`
- Support:
  - `http://mosek.com/support/`
- Social medias:
  - `http://mosek.com/resources/social-media/`

Licensing

Floating licenses

- PTS: Linear and quadratic optimization + integer variables.
- PTON: Nonlinear and conic extension + integer variables.

- PTOM: Mixed-integer optimizer extension.
- One usage at any computer in the network. Token server required.
- Pricing:
  - `http://mosek.com/sales/pricing/`

Server licenses

- PTS-NODE: Linear and quadratic optimization + integer variables.
- PTON-NODE: Nonlinear and conic extension + integer variables.
- PTOM-NODE: Mixed-integer optimizer + integer variables.
- No token server.
- Unlimited use on a single prespecified computer.
- Pricing:
  - `http://mosek.com/sales/pricing/`

Group license

- A rental license.
- Unlimited use of 1 or more features.
- One organizational unit e.g. one department.
- No license token server.
- Price negotiated every third year.

Academic license

- Free for both personal and classroom usage.
- Visit:
  - `http://mosek.com/resources/academic-license/`

Present and future of MOSEK

Present

- MOSEK version 7 released sping 2013.
  - Added support semidefinite optimization.
  - Added the linear and conic Fusion modeling API.
  - Added a new mixed integer optimizer.
- Strong emphasize on linear and conic problems.

The future

- Continued strong emphasize on linear and conic optimization + integer variables.
- Emphasize improvements:
  - Improve speed and stability.
  - Exploit hardware better. E.g. AVX and Intel
- New features:
  - Add mixed-integer semidefinite optimization.
  - Add nonsymmetric cones (if algorithms deemed good enough).

Summary

Final comments

- Presented MOSEK.
- Slides are available at:
  - `http://www.mosek.com/presentations/`