What's new in HiGHS?

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HiGHS Workshop

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HiGHS

What's new in HiGHS?

Overview

2024–25 An expanding team

2025–26
- Solver enhancement
- New office

Highlights

- Enhancement of HiPO for LP; extension to QP
- Development of HiPDLP
- Multi-threading the MIP solver
- HiPO in highspy
- Energy benchmarking with OET

NESO National Energy System Operator

OET Open Energy Transition

HiPO: Enhancement and extension to QP

Developments

- Interior point solver for LP
  - Multithreaded with parallel BLAS
  - Released in October 2025 (v1.12.0)
- Performance enhancements
- Build implications (Apache 2.0 license)
- Extension to convex QP in April 2026 (v1.14.0)

Looking forward

- Further performance enhancements
- Serial Metis+Cholesky decomposition for “easy” large LPs

Filippo’s talk is at 14:30

Development of HiPDLP

GPU-accelerated LP solver for NESO

- First order primal dual LP (PDLP) solver
  - Developed as a Network Innovation Allowance funded project
  - Released in April 2026 (v1.14.0)
  - NVIDIA GPUs
- (Also) available via self-built Google OR-Tools

Looking forward

- Presolve "light"
- Performance enhancement
- Microsoft internship

Microsoft Research

Yanyu's talk is at 10:15

MIP solver development

Multi-threading the MIP solver

- Long awaited development!
  - Parallel primal heuristics
  - Parallel dives in branch-and-bound tree
- Fifteen months of work by Mark Turner
- Logically correct prototype
- Will be released in June 2026 (v1.15.0)

Looking forward

- Profiling
- Tuning
- Lazy constraints
- More primal heuristics and cuts

Mark's talk is at 15:00; Ben's talk is at 16:00

Building and testing

Build enhancements

- Initial build for `HiPO` (v1.12.0)
- Local binaries with(out) `HiPO`
- Resolving the MIT/Apache issue (v1.15.0)
- `HiPO` in `highspy` (v1.15.0)

Testing environment

- Local tuning/enhancement/regression testing for LP and MIP
- Graphical interface

Looking forward

- C# build
- A return to algorithmic programming!

Ivet gave a keynote talk at JuliaCon Local Paris (October 2025)

Energy funding and benchmarking

Funding from Breakthrough Energy

- Began in 2025; enhanced in 2026
- Enabled Julian to go part-time
- Enabled `HiGHS` to recruit Mark
- Also supported `JuMP`

Benchmarking with OET

- Solver benchmarks for energy models
- Sustained communication with modellers via Oscar
- Exposure to instances that are
  - Badly scaled
  - Large but "easy"
- Highlights the need for tuned LP solver selection

Daniele's talk is at 14:00

Collaboration with MathWorks

- Used HiGHS LP and MIP solvers since 2024
- Franz Wesselmann:
  - LP/MIP presolve
  - MIP solver collaboration
- Haman Bagherianlemraski:
  - Enhanced IIS for LP

Giovanni Ghisalberti

- Started PhD in January 2026
- Studying active set for QP
  - Hot start; Hessian oracle
  - Local solution of indefinite problems
  - Presolve; IPM crossover
- Better sub-solver tools for Uno

Other MIP issues

Features in development

- Indicator constraints (v1.16)
- Special ordered sets

Handled by reformulation

HiGHS in CVXPY

- Default MIP solver in v1.8 (January 2026)
- `highspy` downloads up fivefold!

Presolve "light"

When benchmarking cuPDLPx against HiGHS

			Reduction		
Solver	Presolve	Time	Columns	Rows	Nonzeros
HiGHS	Default	20.8	61%	47%	66%
cuPDLPx	PSLP	1.4	61%	47%	65%
HiGHS	Light	0.4	54%	45%	53%

- Presolve reductions for PDLP less valuable than for simplex or IPM
- Cost of presolve can be meaningful relative to solve for PDLP
- PSLP typically sufficiently good for PDLP, but rather cheaper than Gurobi presolve
  Cederberg and Boyd (2026)
- Presolve light avoids overhead of dynamic data structure for constraint matrix

Summary

- Goodbye crowded office!
- Real progress on solvers!