Goblint

A Portfolio for Mixed Flow-Sensitive Abstract Interpretation

Simmo Saan[1(✉)] Ali Rasim Kocal[2] Michael Petter[2] Karoliine Holter[1]
Julian Erhard[2,3] Michael Schwarz[4] Vesal Vojdani[1] Helmut Seidl[2]

[1]University of Tartu, Tartu, Estonia
simmo.saan@ut.ee

[2]Technische Universität München, Garching, Germany

[3]Ludwig-Maximilians-Universität München, Munich, Germany

[4]National University of Singapore, Singapore

TACAS 2026

Static analyzer for C programs:

- Based on abstract interpretation — sound!
- Specializes in multi-threaded programs
- Implemented in OCAML
- MIT licence
- Developed at:

Advances since SV-COMP 2024

Domains

1. More precise bitwise operators (for intervals, etc.)
2. Bitfield domain
3. *Sparse* affine equalities

Analyses

1. Path-sensitivity w.r.t. branches (a la trace partitioning)
2. Path-sensitivity w.r.t. abstract values (a la explicit-state model checking)
3. Context gas

Solvers

1. Widening delay (for flow-sensitive and -insensitive unknowns)
2. Narrowing for flow-insensitive unknowns
3. Weak dependencies (for concurrent programs) [TACAS 2026]

Witnesses

1. YAML *ghost* witnesses (in *C.Concurrency*)
2. Fewer trivial and redundant invariants (including for octagons)
3. Fixed invariant expressions and locations

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Sequential portfolio

Handcrafted configurations:

- Level 0 Constant propagation, exclusion sets, context gas (30)
- Level 1 Intervals, symbolic equalities, autotuning (congruences, enumerator sets, octagons) *(Closest to SV-COMP 2025)*
- Level 2 Congruences, enumerator sets, bitfields, octagons, affine equalities, structs, widening delay (instead of context gas)
- Level 3 Path-sensitivity w.r.t. branches
- Level 4 Path-sensitivity w.r.t. abstract values, autotuning (octagons)
- Level 5 Polyhedra, widening delay ($\times 2$), narrowing for flow-insensitive unknowns

Configuration order

1. Evaluate separately
2. Simulate permutations
3. Choose best for *C.Overall*

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Portfolio results

- 12% more correct results compared to level 1
- 99% of tasks solvable by the virtual best of these configurations

Table: Cumulative and proportional distribution of results across portfolio levels

Level	*C.Overall* score			Solved tasks			Timeouts/out of memories		
0	19,258		84.9%	8,765		84.6%	511		3.0%
1	21,380	(+2,122)	9.4%	9,965	(+1,200)	11.6%	1,072	(+561)	3.3%
2	21,609	(+229)	1.0%	10,077	(+112)	1.1%	3,108	(+2,036)	12.0%
3	22,158	(+549)	2.4%	10,233	(+156)	1.5%	13,349	(+10,241)	60.3%
4	22,670	(+512)	2.3%	10,362	(+129)	1.2%	15,631	(+2,282)	13.4%
5	22,673	(+3)	0.0%	10,364	(+2)	0.0%	16,971	(+1,340)	7.9%

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Results

Verification:

- 1st in *C.no-data-race.Concurrency*
- 2nd in *C.TrueOverall*
- 4th in *C.Termination*
- 5th in *C.Overall*

Verification (demo):

- 1st in *C.Huawei-Concurrency-Challenges*

Validation (correctness witnesses v2):

- 1st in *C.SoftwareSystems*
- 2nd in *C.ValidationCrafted*
- 3rd in *C.Overall*

Further reading

Saan, S., Petter, M., Kocal, A. R., Holter, K., Erhard, J., Schwarz, M., Vojdani, V., Seidl, H.
GOBLINT: A Portfolio for Mixed Flow-Sensitive Abstract Interpretation
In: TACAS 2026. Springer (2026).

Kocal, A. R., Schwarz, M., Saan, S., Seidl, H.
Same Engine, Multiple Gears: Parallelizing Fixpoint Iteration at Different Granularities
In: TACAS 2026. Springer (2026).
Presentation: Wednesday 18:10

https://goblint.in.tum.de

https://github.com/goblint/analyzer