

# Termination Competition 2016

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# The Halting Problem

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The longer it keeps you waiting  
the more you appreciate a termination analysis

# History of the Termination Competition

- Started in 2003.
- From 2004 to 2009: executed online on all benchmarks
- From 2009 on: random selection of benchmarks
- From 2010 on: Live execution during a conference.
- 2014: First time running under StarExec

- Steering Committee
  - Jürgen Giesl, RWTH Aachen, Germany
  - Frederic Mesnard, Université de la Réunion, France
  - Albert Rubio, UPC BarcelonaTech, Spain
  - René Thiemann, Universität Innsbruck, Austria
  - Johannes Waldmann, HTWK Leipzig, Germany
- Organizing Committee
  - Johannes Waldmann, HTWK Leipzig, Germany (StarExec)
  - René Thiemann, Universität Innsbruck, Austria (CPF)
  - Akihisa Yamada, Universität Innsbruck, Austria (TPDB)

- Rewriting (and Transition systems)

TRS (Standard, Context-Sensitive, Higher-Order, Integer, Cycles,...)

String Rewrite Systems

Integer Transition Systems

- Programming Languages

C, Integer C, Java, Haskell, Prolog.

# Competition Meta-Categories and participants

- Termination of Rewriting (and Transition Systems)

- Different kinds of rewriting
- Rewriting strategies
- Certified categories

Participants: AProVE, NaTT, TTT2, muterm, MultumNonMultum, matchbox, VeryMax, cycsrs, Ctrl, CycNTA, Wanda

- Complexity of Rewriting (and Transition Systems)

- Runtime complexity and Derivational complexity (TRS)
- Certified categories
- Complexity of integer transition systems

Participants: AProVE, TcT, Loopus, CoFloCo

- Termination of Programs

Participants: AProVE, UltimateBuchiAutomizer, [VeryMax](#)

- Complexity of Programs

Participants: AProVE, [CoFloCo](#), [Loopus](#), TcT



# Running Competition

- Third time running under StarExec Platform.
  - It provides the needed storage and computing infrastructure (150 nodes).
  - But many technical problems have been appearing over the last two years
- Benchmarks taken from the Termination Problem Data Base (TPDB)
- Timeouts
  - complexity and termination of rewriting and transition systems: 30 s
  - complexity and termination of programs: 300 s
- Only categories with at least two participants are run in the life competition.

The rest of categories will be run afterwards.

- 15 tools
- > 16,000 problems from the TPDB (benchmarks library)
- 150 execution nodes (StarExec).
- ~ 3 hours of live execution (expected!)
- CeTA is the certifier in use (Christian Sternagel, René Thiemann and Harald Zankl)

# Competition life results

## Termination Competition 2015

General Information wc = 300 a = 1 b = 1 c = 0.1 ( 2015-08-05 18:48:18.60928 UTC ) 51787 pairs, 12024641.5 / 6232857.3 s finished in 399686h 5m 50s

### Termination of Term Rewriting (and Transition Systems) finished in 399686h 5m 50s, 33684 pairs, 6726808.6 / 3493948.5 s

Combined Ranking (Rules): 1. AProVE 2015 (20) 2. TTT2 (10) NaTT 1.3 (10) 4. matchbox2015-07-26.1 (365), NaTT 1.3 (202), muterm 5.17 (6) 6. AProVE certified (3) 7. T2 - 2015-07-09 - 13745bd6 (2) Wanda (2)  
9. AProVE certified TRS Standard (1) 10. cysars-29-07-2015.5 (0) AutoNon 1.21 (0) CtrI (0)

category	post-proc	rankings	statistics
TRS Standard	plain.3	AProVE 2015 (1310), NaTT 1.3 (1023), TTT2 (989), muterm 5.17 (834), Wanda (636), matchbox2015-07-26.1 (524), AutoNon 1.21 (228),	10486 pairs, 1966958.3 / 824051.3 s
SRS Standard	plain.3	AProVE 2015 (832), TTT2 (598), matchbox2015-07-26.1 (365), NaTT 1.3 (202), muterm 5.17 (135), AutoNon 1.21 (58),	7890 pairs, 2570235.3 / 1324912.6 s
Cycles	plain.3	matchbox2015-07-26.1 (646), cysars-29-07-2015.5 (422),	2630 pairs, 950125.9 / 453572.0 s
TRS Relative	plain.3	NaTT 1.3 (70), AProVE 2015 (55), TTT2 (41), matchbox2015-07-26.1 (40),	392 pairs, 77146.9 / 34711.5 s
SRS Relative	plain.3	AProVE 2015 (88), matchbox2015-07-26.1 (32), TTT2 (24), NaTT 1.3 (17),	820 pairs, 274225.6 / 145649.5 s
TRS Standard certified	ceta-2.20-2	AProVE certified TRS Standard (1223), TTT2 (962),	2996 pairs, 251319.4 / 124453.7 s
SRS Standard certified	ceta-2.20-2	AProVE certified (816), TTT2 (570),	2630 pairs, 486311.2 / 223843.9 s
TRS Relative certified	ceta-2.20-2	AProVE certified (51), TTT2 (41),	196 pairs, 29112.5 / 17898.6 s
SRS Relative certified	ceta-2.20-2	AProVE certified (88), TTT2 (20),	410 pairs, 76372.8 / 46591.8 s
TRS Equational	plain.3	AProVE 2015 (67), muterm 5.17 (63),	152 pairs, 3067.0 / 3466.0 s
TRS Conditional	plain.3	muterm 5.17 (101), AProVE 2015 (85),	234 pairs, 5576.4 / 5099.8 s
TRS Context Sensitive	plain.3	muterm 5.17 (98), AProVE 2015 (97),	216 pairs, 7100.2 / 5007.1 s
TRS Innermost	plain.3	AProVE 2015 (273), muterm 5.17 (203),	732 pairs, 102735.3 / 77628.8 s
Integer Transition Systems	plain.3	T2 - 2015-07-09 - 13745bd6 (1061), AProVE 2015 (1034), CtrI (423),	3666 pairs, 212567.8 / 200512.7 s
Integer TRS	plain.3	AProVE 2015 (102), CtrI (85),	234 pairs, 13954.0 / 6549.1 s

### Complexity Analysis of Term Rewriting finished in 399683h 19m 8s, 14796 pairs, 5140915.1 / 2607632.9 s

Combined Ranking (Rules): 1. TCT3\_2015 (6) 2. AProVE 2015 (4) 3. AProVE certified (1) matchbox2015-07-26.1 (1) 5. TCT2\_20150725 (0)

category	post-proc	rankings	statistics
Derivational Complexity - Full Rewriting	plain.3	TCT3_2015 (653), matchbox2015-07-26.1 (369), TCT2_20150725 (0),	5427 pairs, 2534205.9 / 1205378.3 s
Runtime Complexity - Full Rewriting	plain.3	AProVE 2015 (1218), TCT3_2015 (414), TCT2_20150725 (0),	2877 pairs, 791627.1 / 439245.3 s
Runtime Complexity - Innermost Rewriting	plain.3	AProVE 2015 (2102), TCT3_2015 (769), TCT2_20150725 (0),	3246 pairs, 916945.1 / 491516.2 s
Runtime Complexity - Innermost Rewriting certified	ceta-2.20-2	TCT3_2015 (689), AProVE certified (495), TCT2_20150725 (0),	3246 pairs, 898136.9 / 471493.2 s

### Termination of Programming Languages finished in 399683h 22m 25s, 3307 pairs, 156917.9 / 131275.9 s

Combined Ranking (Rules): 1. UltimateBuchiAutomizer (3) 2. HipTNT+ v3 (2) AProVE 2015 (2)

category	post-proc	rankings	statistics
C	plain.3	UltimateBuchiAutomizer (277), AProVE 2015 (252), HipTNT+ v3 (249),	1416 pairs, 84389.0 / 85616.8 s
C Integer Programs	plain.3	HipTNT+ v3 (305), UltimateBuchiAutomizer (295), AProVE 2015 (289),	1005 pairs, 40026.8 / 22753.0 s
Java Bytecode	plain.3	AProVE 2015 (410), UltimateBuchiAutomizer (141),	886 pairs, 32502.0 / 22906.2 s

Termination Competition 2015 data is produced on StarExec at U Iowa, and aggregated on star-exec-presenter at F-IMN, HTWK Leipzig.





Thanks to all participants