

Hardware Model Checking Competition

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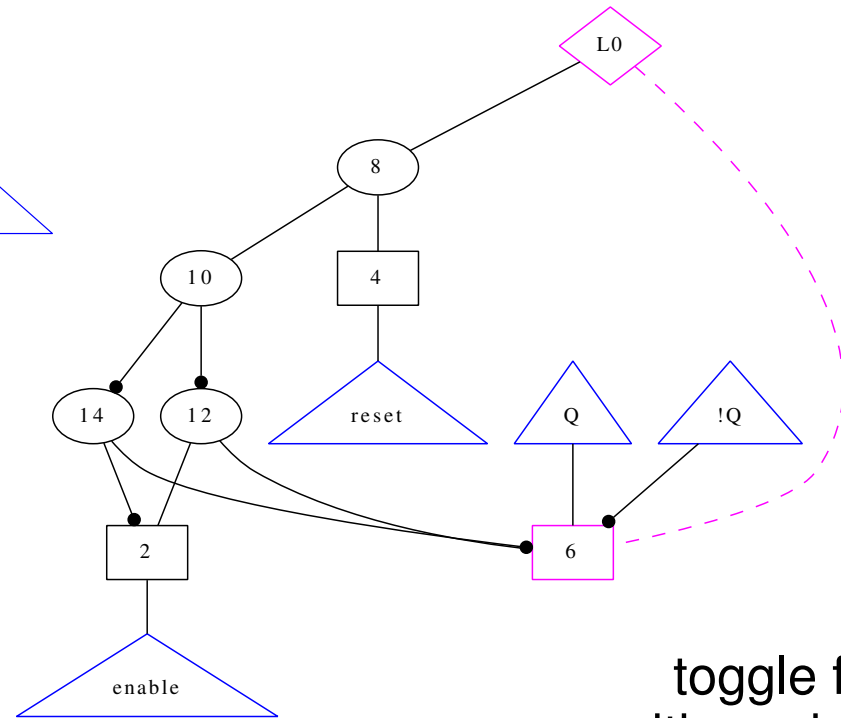
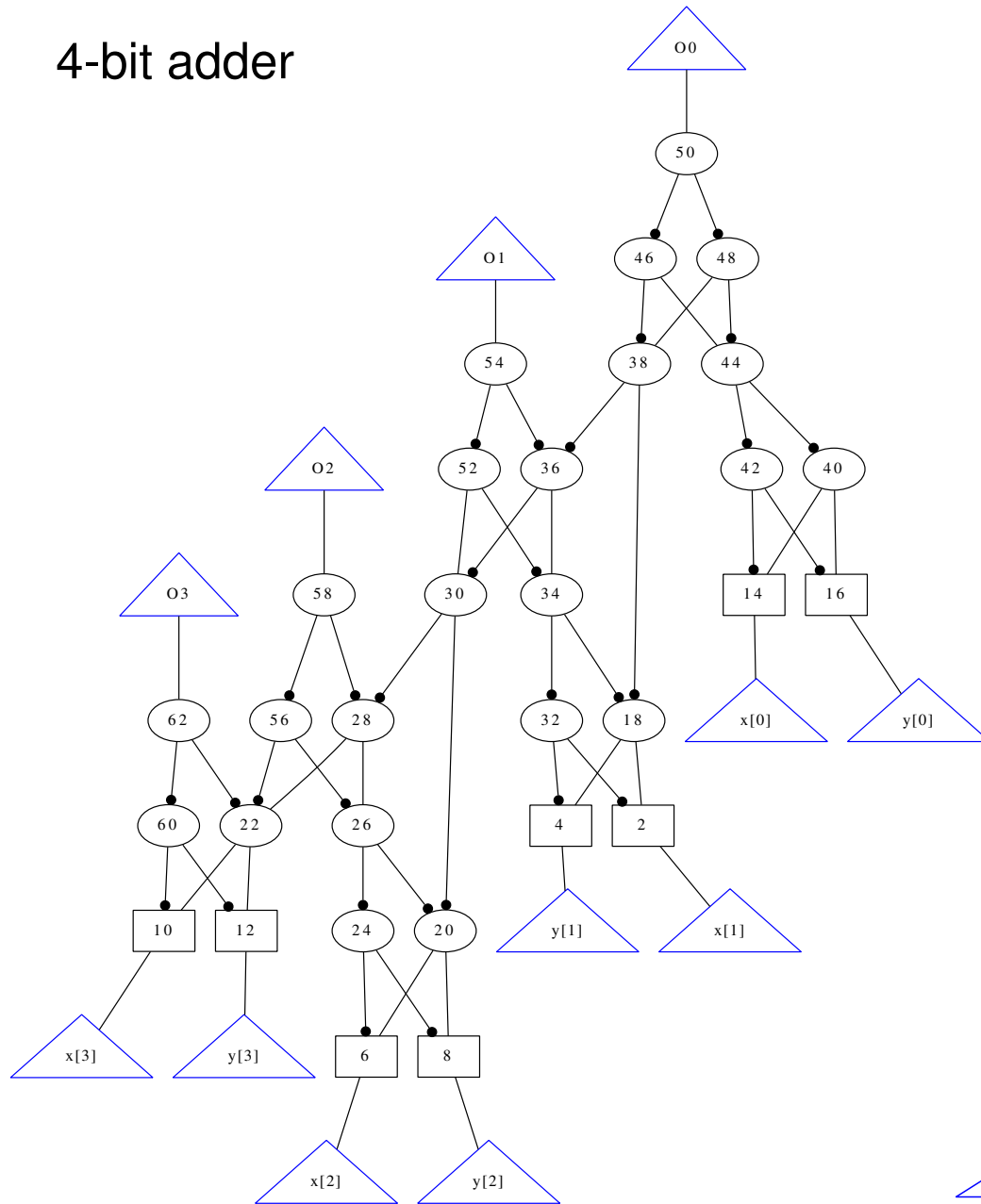




AIGER format AVM'06 Ascona	1st HWMCC	2nd HWMCC CAV'08 Princeton	3rd HWMCC	4th HWMCC	5th HWMCC	6th HWMCC	7th HWMCC	8th HWMCC
Founding Lunch CAV'06 FLOC'06 Seattle	CAV'07 Berlin	HWMCC Lunch FMCAD'08 Portland	CAV'10 FLOC'10 Edinburgh	FMCAD'11 Austin	FMCAD'12 Cambridge UK	FMCAD'13 Portland USA	CAV'14 FLOC'14 Vienna Austria	FMCAD'15 Austin USA
2006	2007	2008	2010	2011	2012	2013	2014	2015

- founding lunch at CAV'06, first competition at CAV'07
- HWMCC lunch at FMCAD'08 $\Rightarrow$ need multiple properties !!!
- affiliated with either CAV (2007,'8,'10,'14) or FMCAD (2011,'12,'13,'15)
- HWMCC'11: old SINGLE, new LIVEness and new MULTI property track
- HWMCC'12 as HWMCC'11, new DEEP bounds track sponsored by Oski
- in essence no change in HWMCC'12 - HWMCC'15
- HWMCC'15: DEEP, SINGLE, and LIVE, ~~MULTI~~, **1h time limit**, before 15min

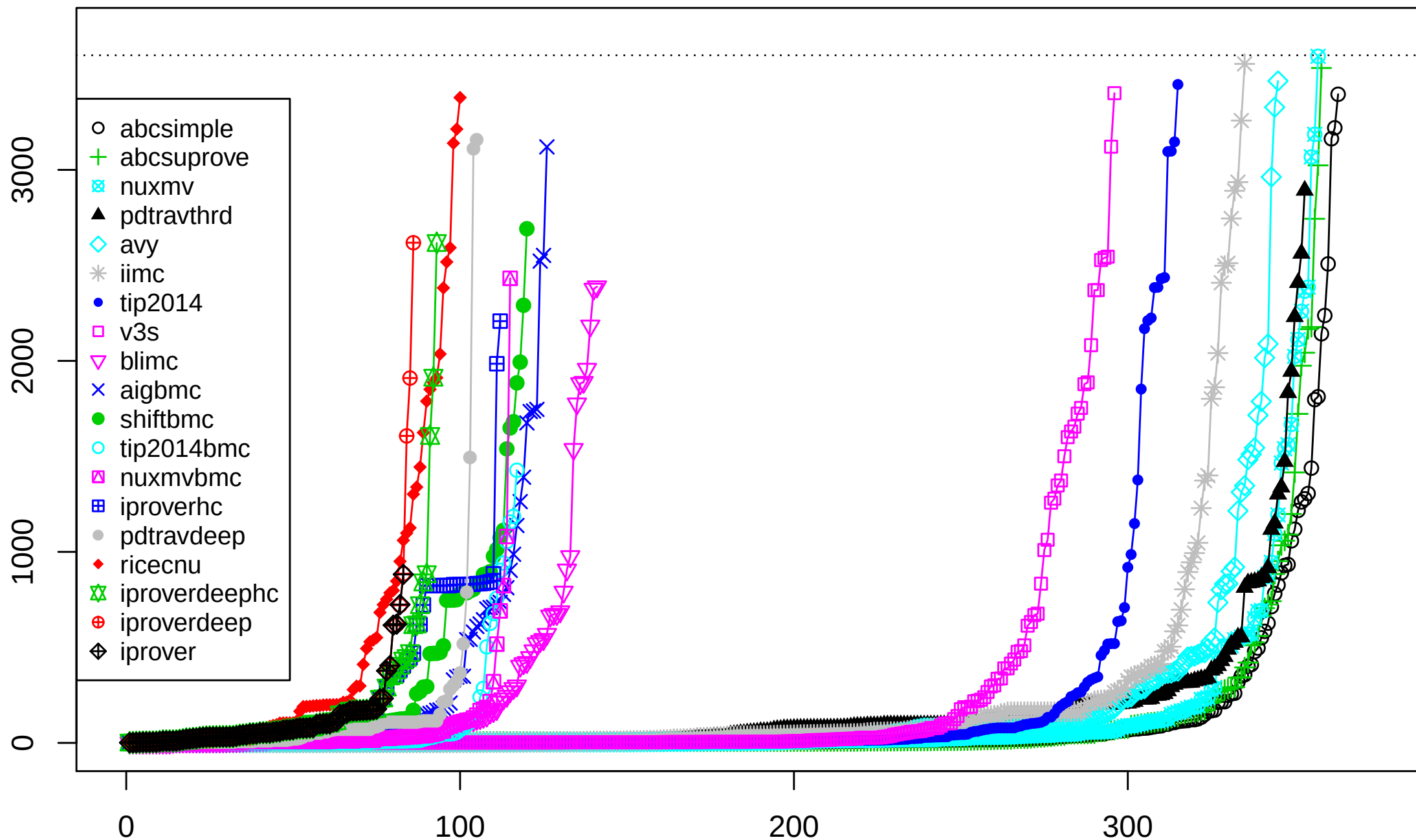
4-bit adder



toggle flip-flop
with enable & reset

- **abcsimple, abcsimplive, abcsuprove** from Berkeley Brayton, Sterin, Mishchenko, ...
- **aigbmc, blimc** from JKU Linz Biere
- **avy** from Technion+SEI+Princeton Vizel, Gurfinkel, Malik
- **iimc** from Boulder Somenzi, Bradley, Hassan
- **iprover(hc), iproverdeep(hc)** from Manchester Tsarkov, Korovin
- **nuxmv, nuxmvbmc** from Trento Griggio, Roveri, ...
- **pdtravdeep, pdtravthrd** from Torino Cabodi, Quer, ...
- **ricecnu** from Rice Li, Vardi
- **shiftbmc** from Dresden Manthey
- **tip2014, tip2014bmc** from Chalmers Sörensson, Claessen
- **v3s** from Taipei Yang, Wu, Huang

HWMCC'15 Cactus SINGLE Track SAT+UNSAT



HWMCC'15 Table SINGLE SAT+UNSAT

rank		cnt	ok	sat	uns	fld	to	mo	s11	s6	unk	real	time	max	best	uniq
1	abcsimple	548	363	122	241	185	154	31	0	0	0	45438	161407	6785	28	1
	abcsuprove	548	358	120	238	190	156	34	0	0	0	41596	115597	6905	23	1
2	nuxmv	548	357	127	230	191	165	26	0	0	0	47600	186902	6900	30	0
	pdtravthrd	548	353	115	238	195	62	124	3	0	6	52819	158951	6824	18	3
3	avy	548	345	115	230	203	171	30	0	0	2	49724	166878	5924	19	1
	iimc	548	335	105	230	213	163	50	0	0	0	57840	202386	6969	76	7
	tip2014	548	315	98	217	233	233	0	0	0	0	46817	46596	1062	144	0
	v3s	548	296	62	234	252	141	7	102	2	0	54273	152125	6037	28	4
	blimc	548	141	128	13	407	287	20	0	0	100	31687	31584	2241	61	1
	aigbmc	548	126	126	0	422	310	43	0	0	69	34210	34104	3644	47	1
	shiftbmc	548	120	120	0	428	247	12	0	0	169	37819	37697	1810	28	0
	tip2014bmc	548	117	117	0	431	225	50	0	0	156	11054	10911	5496	64	1
	nuxmvbmc	548	115	115	0	433	256	28	0	0	149	8885	8796	2504	45	0
	iproverhc	548	112	64	48	436	156	0	0	0	280	32269	17292	6730	3	0
	pdtravdeep	548	105	46	59	443	345	86	4	0	8	14725	14568	4202	11	0
	ricecnu	548	100	30	70	440	342	88	0	10	0	49153	49054	2204	0	0
	iproverdeephc	548	93	46	47	455	177	0	0	0	278	18116	17482	6728	2	0
	iproverdeep	548	86	46	40	462	149	0	0	0	313	14899	14818	6322	1	0
	iprover	548	83	43	40	465	59	0	0	0	406	8768	8698	6176	3	0

hors concours (not ranked):

aigbmc blimc: organizer model checkers

pdtravthrd: issue catching 'FATAL' for 'intel045' (not counted)

ricecnu: reports 8 instances SAT which are UNSAT (not counted)

iprover*hc: last minute (script) fixes after deadline

each team / submitter only ranked once (one medal maximum)

■ success

- increase capacity and features of model checking
- generate synergy through academic and industrial interaction
- collect **benchmarks**
- objective comparisons
- generate **research**

■ challenges

- new sequential BTOR word-level format
- making use of **word-level** information
- model checking (even) higher-level models
- **parallel** symbolic reasoning
- more benchmarks (particularly word-level)

acknowledgements

organizers

Heljanko, Seidl,
Wieringa, Sörensson,
Claessen, Jussila,
McMillan, Somenzi

benchmarks

Intel, Berkeley, IBM,
Mentor, Oski
...

model checkers

Tip, ABC, PDTrav, IIMC,
V3, NuXMV
...