



# Model Checking Contest results for 2015

Fabrice Kordon – LIP6, Univ. P. & M. Curie, France

Hubert Garavel – Inria/LIG, France

Lom Messan Hillah – LIP6 & Univ. Paris Ouest Nanterre, France

Francis Hulin-Hubard – LSV, CNRS/ENS de Cachan, France

Emmanuel Paviot-Adet – LIP6 & Univ. Paris Descartes, France

Loïg Jézequel, IRCCyN, Univ. Nantes, France

César Rodríguez – LIPN, Univ. Paris 13, France

INCO  
2015



## Promote model checking tools

- Compare and debug
- Enhance reproducibility of results
  - ▶ **BenchKit + dedicated environment**
  - ▶ **Submission available online**
- Encourage tools and tool support
  - ▶ **Observatory for the community**



## Creating a common benchmark

- Models from various origins (more to tell later)
  - ▶ **PNML is a good tool for this**



## Competing tools not only dedicated to Petri nets

- Tools coming from other communities



## Promote model checking tools

- Compare and debug
- Enhance reproducibility of results
  - ▶ BenchKit + dedicated environment
  - ▶ Submission available online
- Encourage tools and tool support
  - ▶ Observatory for the community

All of this...  
in the model checking contest



## Creating a common benchmark

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  - ▶ PNML is a good tool for this



## Competing tools not only dedicated to Petri nets

- Tools coming from other communities

# Model Checking Contest — who does what?

Hubert Garavel  
(Inria)



Lom Hillah  
(UPO)



Managing  
Execution +  
analysis

Fabrice Kordon  
(UPMC)



Managing  
Models

Francis Hulin-Hubard  
(CNRS)



Loïg Jezequel  
(U. Nantes)



César Rodríguez  
(UP13)

Managing  
Formulas

Emmanuel Paviot-Adet  
(UP5)



Alban Linard  
(Inria)

# Tools submitted this year

**Cunf**

Univ. paris 13

**GreatSPN-Meddy**

Univ. Torino

**ITS-Tools**

UPMC

**LoLA 2.0**

Univ. Rostock

**LTSMin**

Univ. Twente

**Marcie**

Univ. Cottbus

**pnmc**

IRT Sain-Exupéry

**PNXDD**

UPMC

**StrataGEM 0.5.0**

Univ. Geneva

**TAPAAL**

Univ. Aalorg

4 variants



# Tools submitted this year

Cunf

Univ. paris 13

GreatSPN-

Univ. Torino

ITS-Tools

UPMC

LoLA 2.0

Univ. Rostock

LTSMin

Univ. Twente

All VM will be published

Reproducibility can be achieved  
Soon on the web site

Thank you very  
much

IRI Saint-Exupéry

PNXDD

UPMC

StrataGEM 0.5.0

Univ. Geneva

TAPAAL

Univ. Aalorg

4 variants



# Machines for processing

	bluewhale03	Ebro	Quadhexa-2	Small (cluster)	Total
Cores	40 @ 2.8GHz	64 @ 2.7GHz	24 @ 2.66GHz	5x24 @ 2.4GHz	-
Memory (GB)	512	1024	128	5x64	-
Used Cores (1 per VM) for sequential tools	31 31 VM in //	63 63 VM in //	7 7 VM in //	5x3, 5x3 VM in //	-
Used Cores (4 per VM) for parallel tools	36, 9 VM in //	60, 15 VM in //	20, 5 VM in //	5x12, 5x3 VM in //	-
Number of runs	42 406	79 534	20 748	26 390	<b>169 078</b>
Total CPU required	400d, 12h, 48m, 36s	713d, 04h, 30m, 32s	175d, 17h, 25m, 55s	249d, 19h, 19m, 20s	<b>1539d, 6h, 4m, 23s</b>
Total CPU	<b>about 4 years, 2 months and 18 days</b>				
Time spent to complete benchmarks	<b>about 23 days and 12 hours</b>				
VM boot time of VMs + management (overhead)	<b>58 d, 16h, 59m (Included in total CPU)</b>				

# Machines for processing

	bluewhale03	Ebro	Quadhexa-2	Small (cluster)	Total
Memory (GB)	128	128	128	128	128
Used Cores (1 per VM for sequential tools)	36, 9 VM in //	60, 15 VM in //	20, 5 VM in //	5x12, 5x3 VM in //	169 078
Used Cores (4 per VM for parallel tools)	36, 9 VM in //	60, 15 VM in //	20, 5 VM in //	5x12, 5x3 VM in //	1539d, 6h, 4m, 23s
Number of runs	26 390	9d, 19h, 2m, 20s			
Total CPU required					
Total CPU management					
Time spent to complete benchmark					
VM boot time of VMs + management (overhead)					58 d, 16h, 59m (Included in total CPU)



## «known» models

- Those from past years
  - ▶ Test the tool as used by its developers



## «Stripped» models

- «known» (original archive) and set as «surprise» ones
  - ▶ Test the tool as used by «newbies»



## «Surprise» models

- New models proposed by the community this year
  - ▶ Test the tool as used by «newbies» +
  - ▶ new situations for the tool

## «known» models

- Those from past years
  - ▶ Test the tool as used by its developer

## «Stripped» models

- «known» (original archive) and set as «surprise» ones
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## «Surprise» models

- New models proposed by the committee
  - ▶ Test the tool as used by «newbies»
  - ▶ new situations for the tool

### Coefficients (after pool)

«known» =  $x_1$   
«stripped» =  $x_3$   
«surprise» =  $x_4$

### Execution consistency

On the same machine

«known» / «stripped»  
colored + associated P/T

# New models for 2015

 **A. Ahmad**

 IOTPpurchase

 **H. Evrard**

 Raft

 **M. Heiner**

 PhaseVariation

 **J. Jourdan-Lu & E. Léo**

 Parking

 **F. Kordon**

 BridgesAndVehicle, SafeBus,  
SmallOperatingSystem,  
SwimmingPool

 **T. Shmeleva**

 HypercubeGrid

 **K. Wolf**

 IBM319, IBM5964, IBM703

 **I. Zaitsev**

 SquareGrid

## New models for 2015

A. Ahmad

IOTPpurchase

H. Evrard

Raft

M. Heiner

PhaseVariation

J. Jourdan-Lu & E. Léo

Parkin...

Thanks!!!

We really need various models

... , SpringSystem,

SwimmingPool

T. Shmeleva

HypercubeGrid

K. Wolf

5964, IBM703

**With scaling parameters**

121 models in fact

**Already from past years**

404 instances of models

## StateSpace

## Reachability

- ReachabilityBounds
- ReachabilityCardinality
- ReachabilityComputeBounds
- ReachabilityDeadlock
- ReachabilityFireability
- ReachabilityFireabilitySimple

## CTL

- CTLCardinality
- CTLFireability
- CTLFireabilitySimple

## LTL

- LTCARDinality
- LTLFireability
- LTLFireabilitySimple

# The protocol



## May 1st, delivery of disk images

- Qualification phase
- Completed by mid May
- 25 000 test runs



## May 20, starting to operate tools

- 169 078 runs distributed over 4 different machines over Europe
- VM with 4 cores / 16GB
  - ▶ **ITS-Tools, LTSMin, TAPAAL(MC), TAPAAL-OTF(PAR), StrataGEM0.5.0**
- WM with 1 core / 16 GB
  - ▶ **Cunf, LoLA 2.0, Marcie, pnmc, PNXDD, TAPAAL(SEQ), TAPAAL-OTF(SEQ)**
- Time confinement, 1h

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- Qualification phase
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- 169 078 runs distributed over 4 different machines over Europe
- VM with 4 cores / 16GB
  - ▶ ITS-Tools, LTSMiner
  - WM with 1 core
  - ▶ Cunf, LoLA 2.0, ...
- Time confinement

Pool sent to participating  
tool developers + MCCC

Various answers (opposite ;-)  
interesting points

EM0.5.0

AL-OTF(SEQ)



## Mid June, analysis of outcomes

- 24 GByte of logs and CSV files

- ▶ **Analysis must be automated**
- ▶ ~12KLOC Ada + ~200 LOC bash (but CPU problems solved)



## Evaluation of «good results»

- Pass 1, computing results for the majority in a «line»

- ▶ **All tools for an examination for a model instance**

- Pass 2, evaluating tool reliability

- ▶ **Only considering cases where the majority is 3 and more**

- Pass 3, reconstructing the results using tool rates

- ▶ **Help to decide when only 2 different answers**

- ▶ **A result must be of confidentiality 0.9 or more**

- ▶ **Some results are tagged «insecure»**

- Pass 4 computing points

- ▶ **«insecure» results not considered when counting points**

## Mid June, analysis of

- 24 GByte of logs and CSV files
  - ▶ Analysis must be automated
  - ▶ ~12KLOC Ada + ~200 LOC bash

## Evaluation of «good results»

- Pass 1, computing results for
  - ▶ All tools for an examination for each formula
- Pass 2, evaluating tool reliability
  - ▶ Only considering cases where a tool has found a solution
- Pass 3, reconstructing the results using tool rates
  - ▶ Help to decide when only 2 different results are found
  - ▶ A result must be of confidence level 99%
  - ▶ Some results are tagged «insecure»
- Pass 4 computing points
  - ▶ «insecure» results not considered when counting points

### Scoring

StateSpace, 10 / 2 / 2 / 2

Deadlock, 16

Other formulas, 1 per formula

### Bonus for a «line»

+2 for the fastest tool

+2 for the smallest memory footprint

### No penalty for mistakes

Difficult to identify «good solutions»

Problem raised very late

# Techniques reported by tools

Tools	parallelism	Techniques
Cunf	/	NET_UNFOLDING SAT_SMT
GreatSPN-Medddy	/	DECISION_DIAGRAMS SYMMETRIES
LoLA 2.0	/	EXPLICIT SEQUENTIAL_PROCESSING STATE_COMPRESSION STUBBORN_SETS SYMMETRIES TOPOLOGICAL
Marcie	/	DECISION_DIAGRAMS SEQUENTIAL_PROCESSING UNFOLDING_TO_PT
pnmc	/	DECISION_DIAGRAMS USE_NUPN
PNXDD	/	DECISION_DIAGRAMS SEQUENTIAL_PROCESSING TOPOLOGICAL
TAPAAL (SEQ)	/	EXPLICIT STRUCTURAL_REDUCTION
TAPAAL-OTF (SEQ)	/	EXPLICIT STRUCTURAL_REDUCTION
ITS-Tools	MC	CEGAR COLLATERAL_PROCESSING DECISION_DIAGRAMS SAT_SMT TOPOLOGICAL USE_NUPN
LTSMin	PAR	DECISION_DIAGRAMS PARALLEL_PROCESSING STATIC_VARIABLE_REORDERING USE_NUPN
StrataGEM0.5.0	MC	COLLATERAL_PROCESSING DECISION_DIAGRAMS TOPOLOGICAL
TAPAAL(MC)	MC	EXPLICIT STRUCTURAL_REDUCTION
TAPAAL-OTF(PAR)	PAR	EXPLICIT STRUCTURAL_REDUCTION

## Detailed results (extraction)

## tool	Input	Examination	nb cores	time flag	memory flag	re
Cunf	Angiogenesis-PT-05	StateSpace	1	OK	OK	DNC
GreatSPN-Medddy	Angiogenesis-PT-05	StateSpace	1	OK	OK	42734900 ???
ITS-Tools	Angiogenesis-PT-05	StateSpace	4	OK	OK	42734935 ???
LoLA2.0	Angiogenesis-PT-05	StateSpace	1	OK	OK	DNC
LTSMin	Angiogenesis-PT-05	StateSpace	4	OK	OK	42734935 ? 5 ?
Marcie	Angiogenesis-PT-05	StateSpace	1	OK	OK	42734935 4.868
pnmc	Angiogenesis-PT-05	StateSpace	1	OK	OK	42734935 ? 5 40
PNXDD	Angiogenesis-PT-05	StateSpace	1	DNF	OK	DNF
StrataGEM0.5.0	Angiogenesis-PT-05	StateSpace	4	OK	OK	42734935 ???
TAPAAL-OTF(PAR)	Angiogenesis-PT-05	StateSpace	4	OK	OK	13762040 ???
TAPAAL-OTF(SEQ)	Angiogenesis-PT-05	StateSpace	1	DNF	OK	DNF
TAPAAL(MC)	Angiogenesis-PT-05	StateSpace	4	DNF	OK	DNF
TAPAAL(SEQ)	Angiogenesis-PT-05	StateSpace	1	DNF	OK	DNF

## Detailed results (extraction)

15

results	techniques	max memory (MB)	CPU (ms)	Time (ms)	i/o wait (ms)	Status	
DNC	-	79.290	30.00	14.00	0.00	normal	r003
42734900 ???	DECISION_DI	112.440	724.00	796.00	40.80	normal	r004
42734935 ???	DECISION_DI	368.960	15019.00	7064.00	175.50	normal	r005
DNC	-	79.250	39.00	53.00	9.90	normal	r006
42734935 ?5 ?	DECISION_DI	9792.570	52136.00	14718.00	30.50	normal	r007
42734935 4.8687E+0008 5 40	SEQUENTIAL	3977.730	8841.00	9375.00	19.80	normal	r008
42734935 ?5 40	DECISION_DI	2457.240	7989.00	8349.00	20.20	normal	r011
DNF	-	10314.270	3565296.00	3600000.00	20.00	timeout	r012
42734935 ???	TOPOLOGICA	2069.140	49149.00	34611.00	143.00	normal	r013
13762040 ???	PARALLEL_PF	2710.710	5034530.00	1259637.00	20.10	normal	r009
DNF	-	6482.090	3598968.00	3600000.00	61.20	timeout	r010
DNF	-	5467.640	3612091.00	3600000.00	6888.60	timeout	r001
DNF	-	4680.540	3600000.00	3600000.00	393.70	timeout	r002

## Detailed results (extraction)

15

run id	flags:bonus:scores:mask	estimated result
n-ebro-14321423030002	FFF:--:0:?	42734935 4.8687E+0008 5 40
n-ebro-14321423220002	TFF:--:ERR:X ---	42734935 4.8687E+0008 5 40
n-ebro-14321423400002	FFF:PM:10:T ---	42734935 4.8687E+0008 5 40
n-ebro-14321423580002	FFF:--:0:?	42734935 4.8687E+0008 5 40
n-ebro-14321423720002	FFF:--:12:T - T -	42734935 4.8687E+0008 5 40
n-ebro-14321423880002	FFF:--:16:T T T T	42734935 4.8687E+0008 5 40
n-ebro-14321424480002	FFF:--:14:T - T T	42734935 4.8687E+0008 5 40
n-ebro-14321430890002	FFF:--:0:?	42734935 4.8687E+0008 5 40
n-ebro-14321429810002	FFF:--:10:T - - -	42734935 4.8687E+0008 5 40
n-ebro-14321424040002	TFT:--:ERR:X ---	42734935 4.8687E+0008 5 40
n-ebro-14321424290002	FFF:--:0:?	42734935 4.8687E+0008 5 40
n-ebro-14321422530002	FFF:--:0:?	42734935 4.8687E+0008 5 40
n-ebro-14321422750002	FFF:--:0:?	4.35 0.92 2.71 1.92



## Consistency checks

- Colored versus equivalent P/T nets
- «known» models versus «stripped» models

15

run id	flags:bonus:scores:mask	estimated result	
n-ebro-14321423030002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423220002	TFF:--:ERR:X ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423400002	FFF:PM:10:T ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423580002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423720002	FFF:--:12:T - T -	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423880002	FFF:--:16:T T T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424480002	FFF:--:14:T - T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321430890002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321429810002	FFF:--:10:T - - -	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424040002	TFT:--:ERR:X ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424290002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422530002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422750002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92



## Elaboration of flags

- Result appears to be faulty
- Inconsistency between colored and its equivalent P/T
- Inconsistency between «known» and «stripped»

15

run id	flags:bonus:scores:mask	estimated result	
n-ebro-14321423030002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423220002	TFF:--:ERR:X ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423400002	FFF:PM:10:T ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423580002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423720002	FFF:--:12:T - T -	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423880002	FFF:--:16:T T T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424480002	FFF:--:14:T - TT	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321430890002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
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n-ebro-14321424290002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422530002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422750002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92



## Result confidence

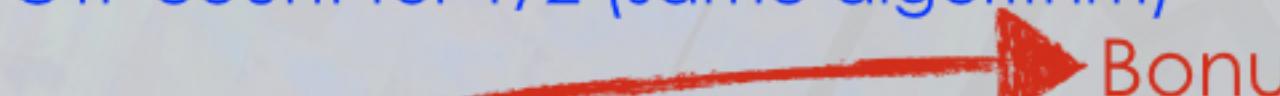
- Decimal value
- TAPAAL and TAPAAL-OTF count for 1/2 (same algorithm)

15

run id	flags:bonus:scores:mask	estimated result	
n-ebro-14321423030002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423220002	TFF:--:ERR:X ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423400002	FFF:PM:10:T ---	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423580002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423720002	FFF:--:12:T - T -	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423880002	FFF:--:16:T T T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424480002	FFF:--:14:T - T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321430890002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
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n-ebro-14321424290002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422530002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
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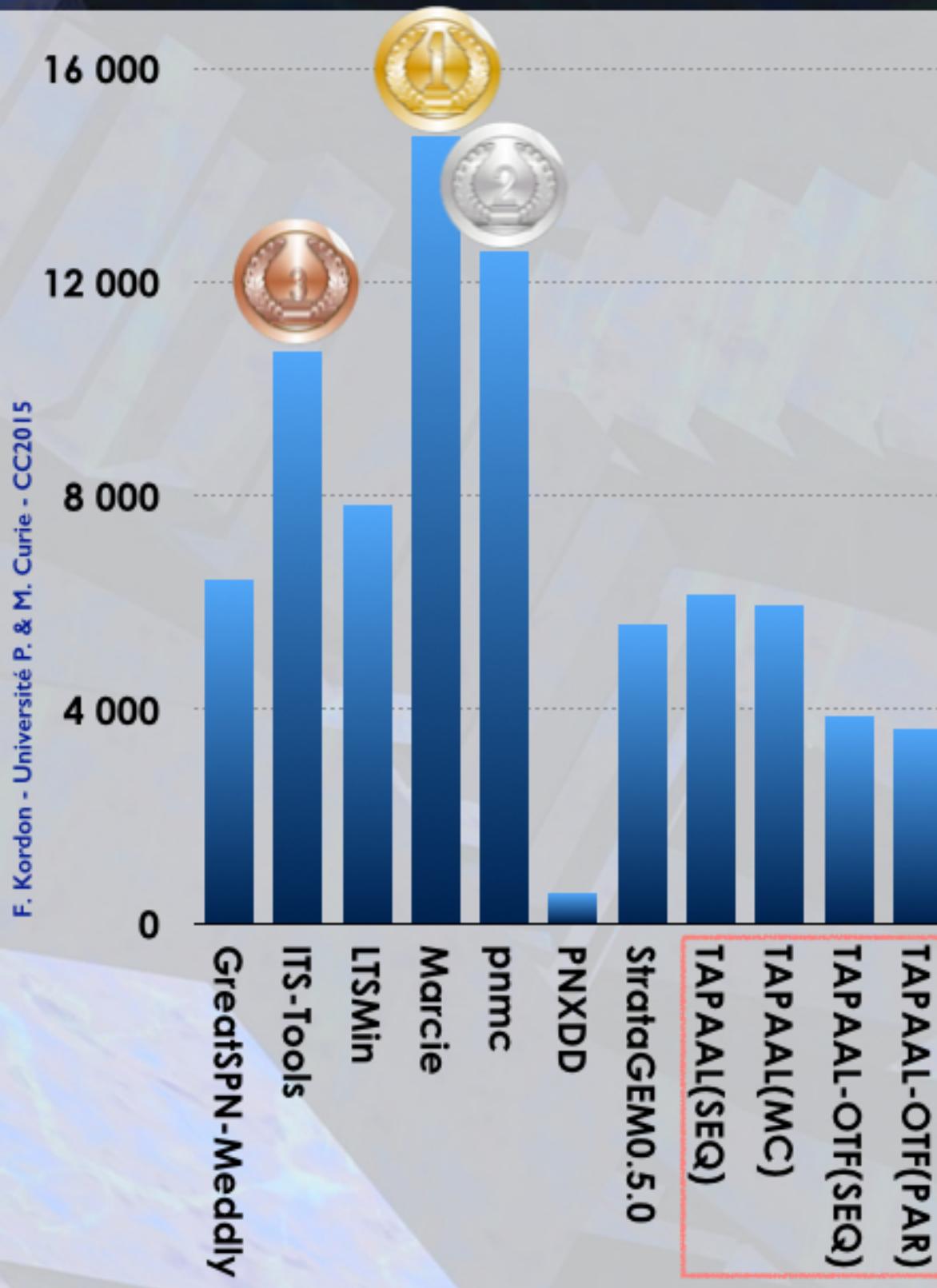


## Result confidence

- Decimal value
  - TAPAAL and TAPAAL-OTF count for 1/2 (same algorithm)
- 
- Bonus!

15

run id	flags:bonus:scores:mask	estimated result	
n-ebro-14321423030002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
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n-ebro-14321423580002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423720002	FFF:--:12:T - T -	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321423880002	FFF:--:16:T T T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321424480002	FFF:--:14:T - T T	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321430890002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
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n-ebro-14321424290002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422530002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92
n-ebro-14321422750002	FFF:--:0:?	42734935 4.8687E+0008 5 40	4.35 0.92 2.71 1.92



**The most attended one**



Participation is the highest (11)

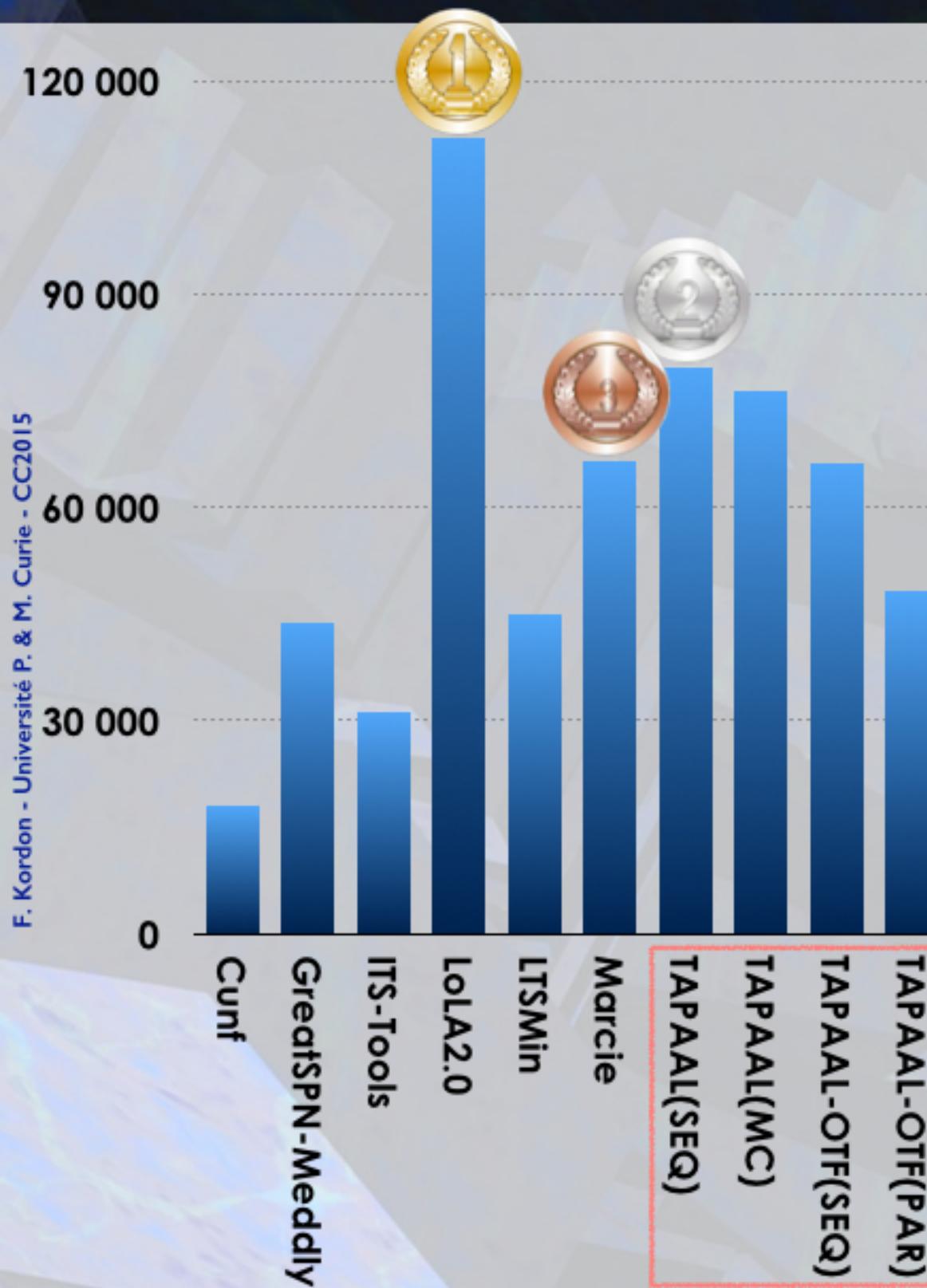


**PNXDD**



Java configuration problem

- ▶ No «Stripped» nor «Surprise»
- ▶ Could not be detected during qualification



## Also quite successful

- Many tools participating (10)

## ITS-Tools

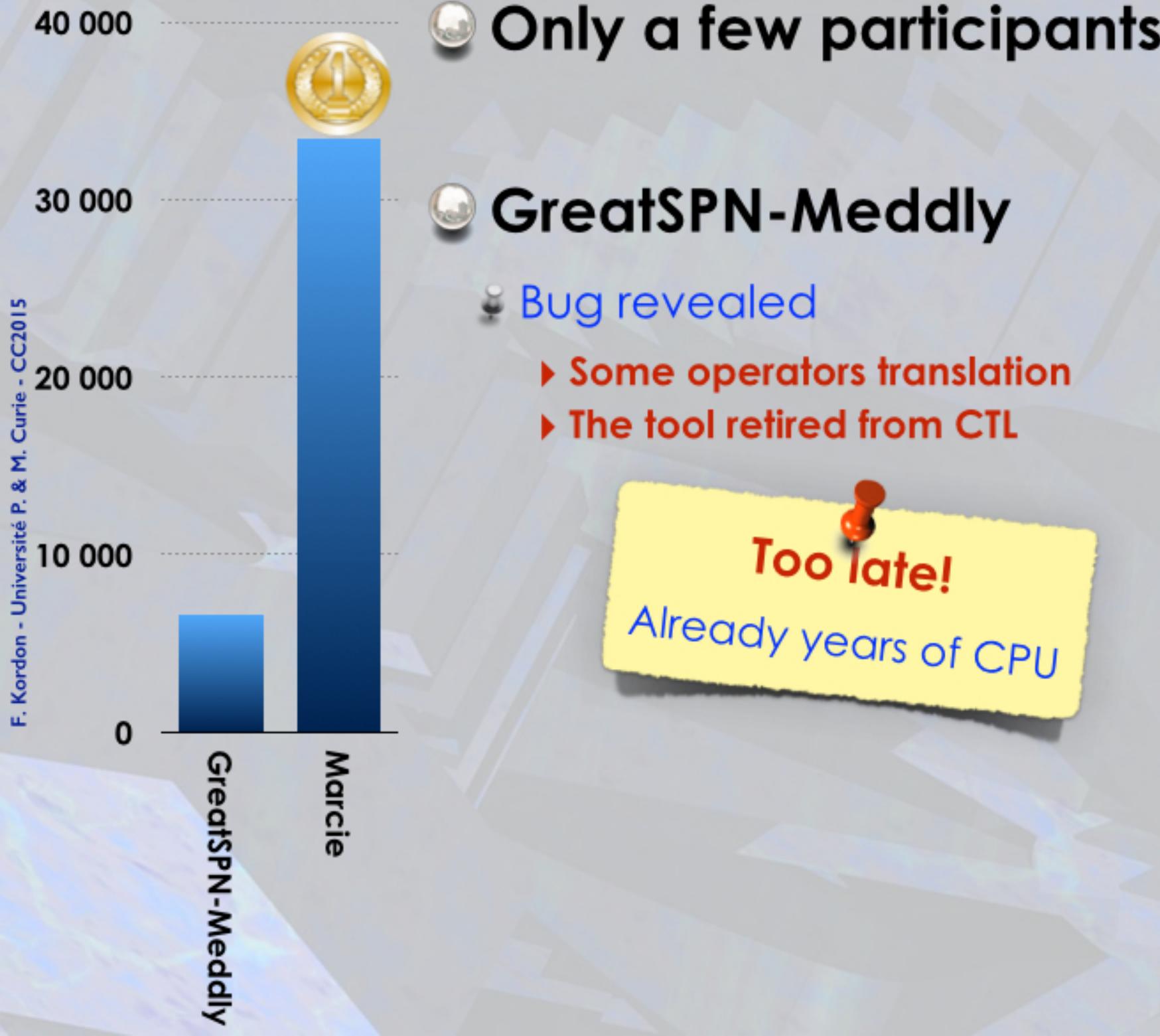
- Bugs revealed
  - Student work in formula converter
  - Bug in management of NUPN hierarchy

Too late!

Already years of CPU

## TAPAAL

- First for ReachabilityDeadlock
- Bug revealed too
  - In one variant





## No participant at all

- In the past, Neco did participate
  - ▶ **Neco is not maintained anymore**
- Why is LTL not covered by tools?



## Tool reliability

Bugs outlined  
(but too late)

Tools	Reliability	success	selected	Examinations
Cunf	96,96 %	4728	4 876	3 (Reach)
GreatSPN-Medddy	62,30 %	11 966	19 206	10 (State, Reach, CTL)
ITS-Tools	64,05 %	10 890	17 003	4 (State, Reach)
LoLA 2.0	97,80 %	25 796	26 378	6 (Reach)
LTSMin	79,13 %	13 995	17 687	5 (State, Reach)
Marcie	92,52 %	18 443	19 934	10 (State, Reach, CTL)
pnmc	99,59 %	741	744	1 (State)
PNXDD	88,89 %	56	63	1 (State)
STrataGEM0.5.0	100,00 %	243	243	1 (State)
TAPAAL (SEQ)	99,88 %	22 880	22 907	7 (State, reach)
TAPAAL(MC)	99,75 %	23 247	23 306	7 (State, reach)
TAPAAL-OTF (SEQ)	96,19 %	19 001	19 733	7 (State, reach)
TAPAAL-OTF(PAR)	88,43 %	15 253	17 248	7 (State, reach)

## Tool reliability

Remind the  
Java problem

Tools	Reliability	success	selected	Examinations
Cunf	96,96 %	4728	4 876	3 (Reach)
GreatSPN-Medddy	62,30 %	11 966	19 206	10 (State, Reach, CTL)
ITS-Tools	64,05 %	10 890	17 003	4 (State, Reach)
LoLA 2.0	97,80 %	25 796	26 378	6 (Reach)
LTSMin	79,13 %	13 995	17 687	5 (State, Reach)
Marcie	92,52 %	18 443	19 934	10 (State, Reach, CTL)
pnmc	99,59 %	741	744	1 (State)
PNXDD	88,89 %	56	63	1 (State)
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# Tool reliability

But a low number of answers...

Tools	Reliability	success	selected	Examinations
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TAPAAL-OTF(PAR)	88,43 %	15 253	17 248	7 (State, reach)

Origin of problems?

Formula translations  
PNML import

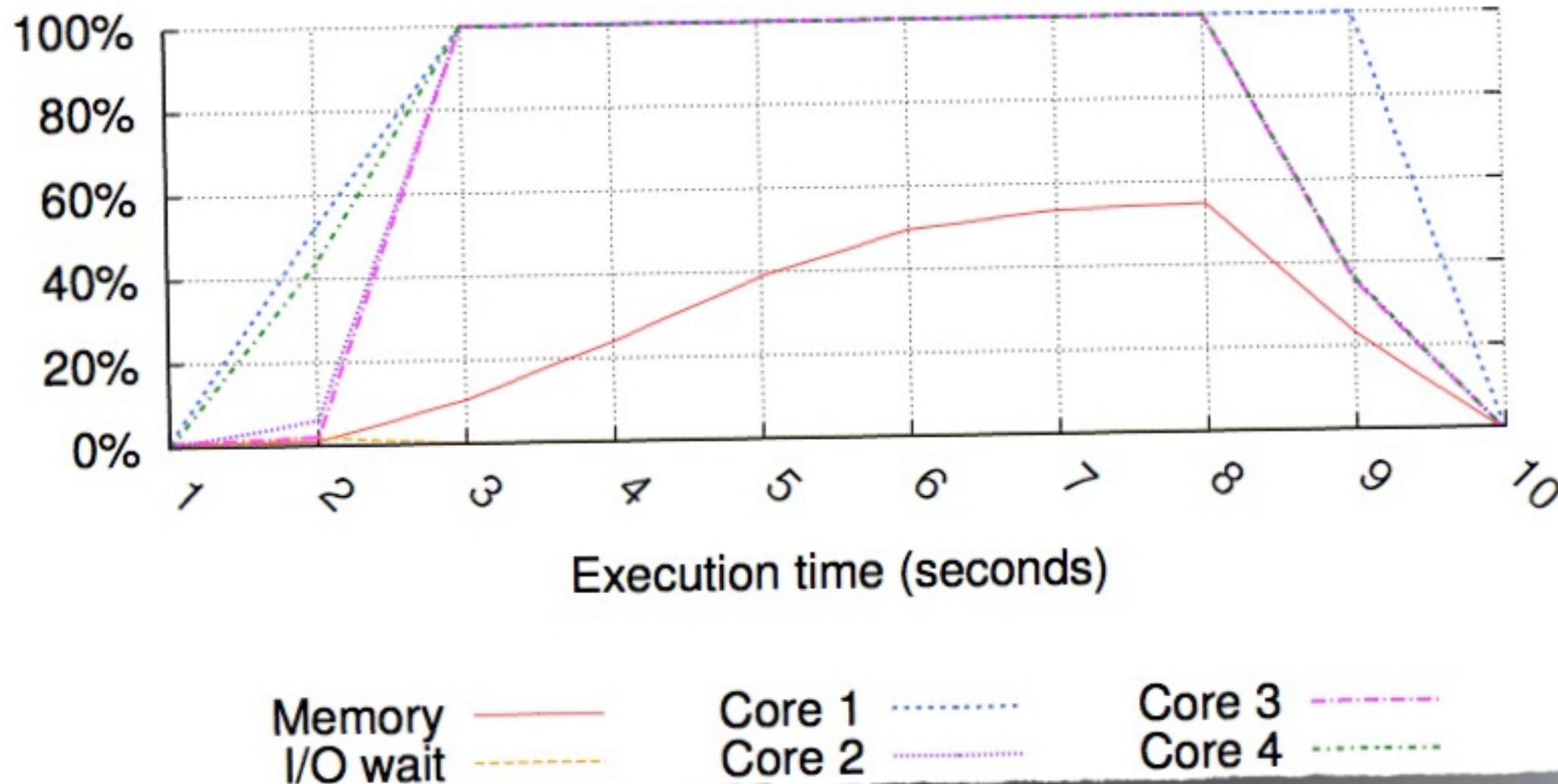
How to increase tool reliability?

A big benchmark is helpful  
Comparison with other tools too

## Full HTML report

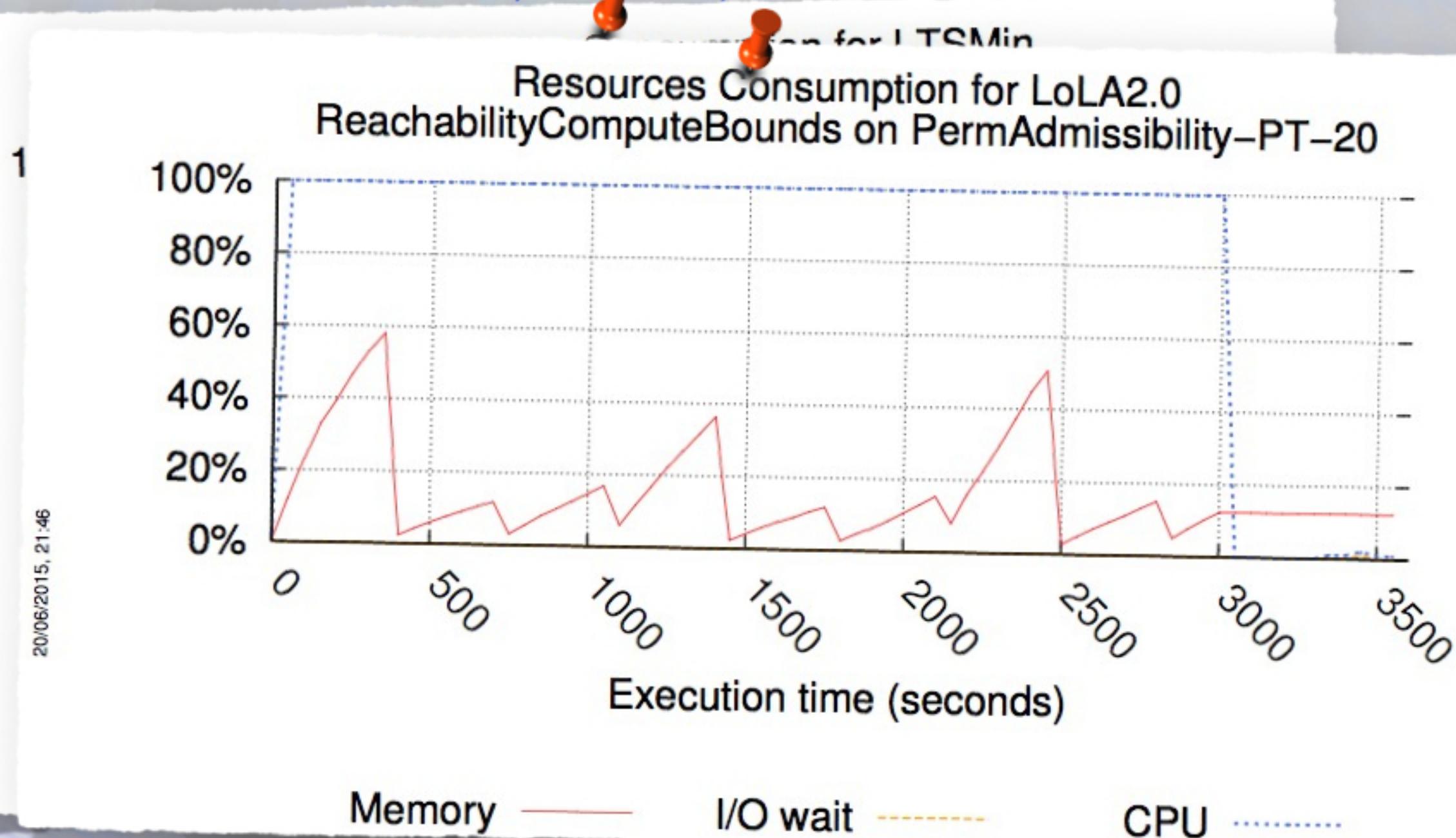
Generated automatically but not yet finished

Resources Consumption for LTSMin  
ReachabilityCardinality on Dekker-PT-015



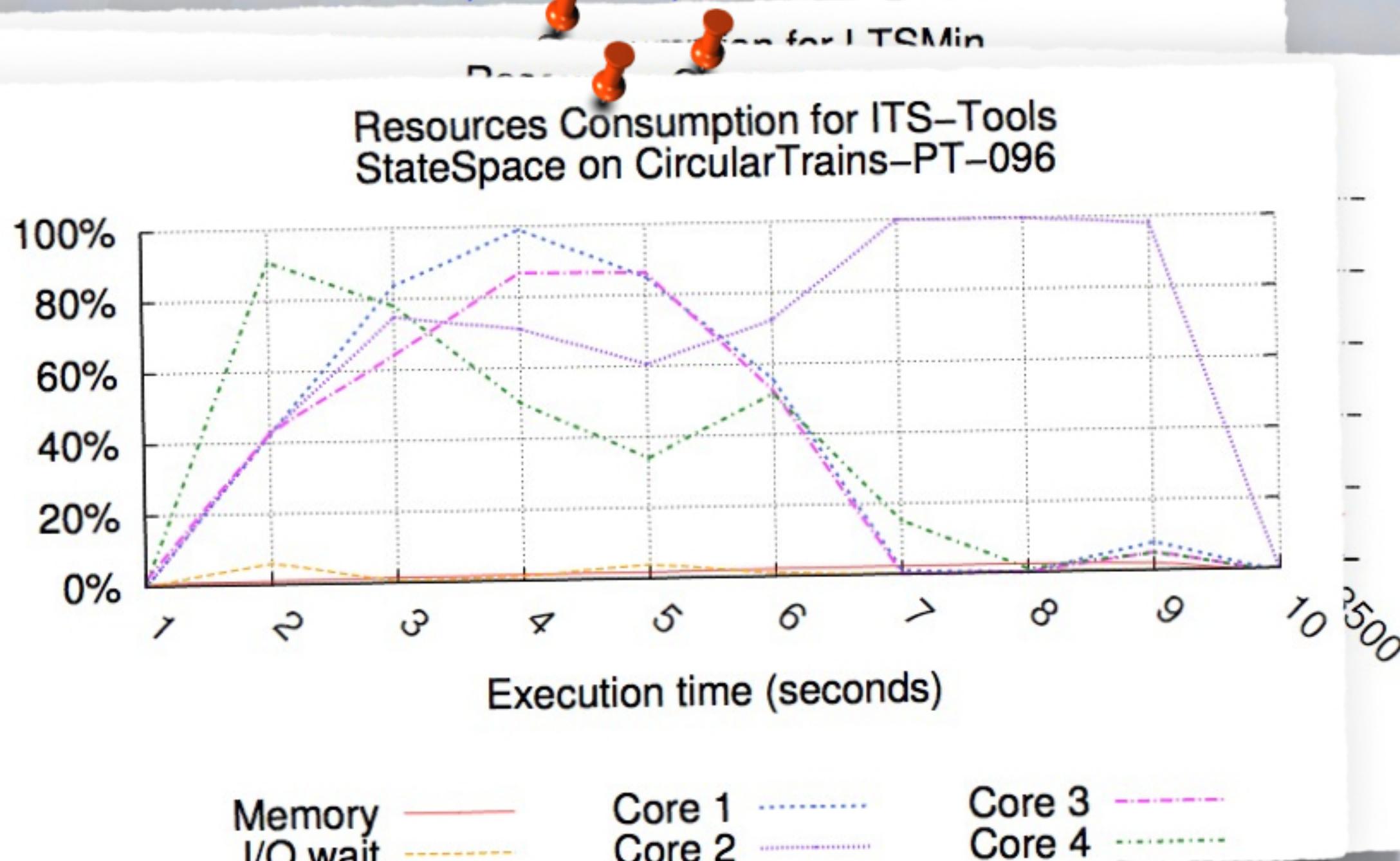
## Full HTML report

Generated automatically but not yet finished



## Full HTML report

Generated automatically but not yet finished



## It gather new tools

- Even from other communities
  - ▶ Bringing new experience

## Numerous improvements

- Models consistency checks
  - ▶ Possibly some information stored as «tool specific» attributes next year
  - ▶ Simple to parse
- New formula generators (164 433 produced)
  - ▶ Much smarter (SAT then model-check up to a given number of states)
  - ▶ Itself a complex problem

## Long term objective, see the evolution of tools

- Participate in their reliability
- Identify «good techniques»
- Promote a «simpler way» to express formula across tools

## It gather new tools

- Even from other communities
  - Bringing new experience

## Numerous i

- Models considered
    - Possibly some new ones
    - Simple to parse
  - New formulae
    - Much smaller
    - Itself a complex problem
- Towards more universal model checkers?**
- Engine connected to a «front-end»
    - Support of several notations
    - Like LTSMin, ITS-Tools, etc?
- next year  
number of states)

## Long term objective, see the evolution of tools

- Participate in their reliability
- Identify «good techniques»
- Promote a «simpler way» to express formula across tools



## Enabling the use of more data for tool developers

- Original experience, PetriWeb

- Discontinued

- Bring models to the community

- Model Checking Contest

- Other sources



## Provide a reference for benchmarking

- Such as BEEM (2007, but apparently discontinued)

The screenshot shows a web browser window titled "Welcome to Petri Nets Repository". The address bar indicates the site is at [pnrepository.lip6.fr:9000](http://pnrepository.lip6.fr:9000). The top navigation bar includes links for "search", "Wikipedia", "gest publics", "HP Iku", "Equipe/Labo", "TA Iku", "Projets", "Conferences/reviews", "Enseignements", "SAR", "Divers", "Images", "Wiktionnaire", and "Lecteur". Below the header, the main title "PETRI NETS REPOSITORY" is displayed in large white letters, followed by the subtitle "A community-driven reference repository of collections of Petri nets." A message states "The following collections are available:" with three buttons: "Model Checking Contest" (white), "Petri Web" (orange), and "Very Large Petri Nets" (blue). The main content area features a dark background with a starry effect. A section titled "The best place to find Petri nets" contains the text "You will find here a large collection of Petri nets provided by the community, for your benchmarks or case studies." Another section titled "Features" lists "Repository Browsing", "RESTful API", and "Reasons to use Petri Nets Repository (PNR)". Under "Repository Browsing", there is a brief description of the MCC, VLPN, and PetriWeb collections. Under "RESTful API", there is a description of the JSON-based API. Under "Reasons to use Petri Nets Repository (PNR)", four categories are listed: "Benchmarking" (represented by a gear icon), "Fast" (represented by a lightning bolt icon), "Public Models" (represented by a heart icon), and "Community-Driven" (represented by a people icon). Each category has a detailed description below it.

# PETRI NETS REPOSITORY

A community-driven reference repository of collections of Petri nets.

The following collections are available:

Model Checking Contest    Petri Web    Very Large Petri Nets

## The best place to find Petri nets

You will find here a large collection of Petri nets provided by the community, for your benchmarks or case studies.

## Features

### Repository Browsing

Browse the Model Checking Contest (MCC, UPMC), the Very Large Petri Net (VLPN, INRIA), or the PetriWeb (TU/e) collections and download the proposed Petri net models as much as you please.

The MCC collection showcases several large parameterised instances of the MCC yearly competition. The VLPN collection proposes several hundreds of complex Petri nets. The PetriWeb collection contains simpler or smaller models that you might want to use to get started with a new tool of yours.

### RESTful API

This repository exposes an API that is easy to understand, intuitive to use, and fast to interact with. Data is exchanged in JSON, and you really can play with it right away using your browser!

After having learnt a bit about the data structure of the responses you will get, you can start integrating the repository in your own tool. It cannot be simpler. You can learn more about the RESTful API on the [API reference page](#).

### Reasons to use Petri Nets Repository (PNR)

<b>Benchmarking</b>	<b>Fast</b>	<b>Public Models</b>	<b>Community-Driven</b>
It is the first and foremost reason why we created this repository. Such a repository complements the efforts of the <a href="#">Model Checking Contest</a> .	This repository will help you quickly find the type of model you are looking for! There are hundreds of models available, including those coming from the <a href="#">Very Large Petri Nets repository</a> .	Models in this repository are publicly available thanks to the generosity of people from universities, research institutes, and from the industry, around the world.	PNR is a large collection of collections of Petri nets, maintained by the organisers of the Model Checking Contest. If you wish to contribute your models, we will be happy to help you <a href="#">publish them here!</a>

Browse the PetriWeb Repository

Lecteur

search Wikipedia search Wikipedia gest publics HP floc Equipe/Labo TA floc Projets Conferences/revues Enseignements SAR Divers Images Wiktionnaire

PW PETRI WEB COLLECTION

Home MCC PetriWeb VLPN About API

PetriWeb Collection Content PetriWeb Collection Cover Flow Metrics

## The PetriWeb Collection

Help on this Page

The models in the PetriWeb collection come from the former PetriWeb repository. They have been donated by the research group at TU/e which used to maintain it before it was put out of service. We have adapted the presentation of these models using the layout of the MCC.

You can browse this repository through its [cover flow](#). Some metrics on the content of the repository are shown on the [Metrics](#) tab.

**▲ Downloading Models**

**Q Filter the models using the following properties**

<input type="checkbox"/> Ordinary	<input type="checkbox"/> Simple Free Choice	<input type="checkbox"/> State Machine	<input type="checkbox"/> Marked Graph	<input type="checkbox"/> Connected	<input type="checkbox"/> Strongly Connected	<input type="checkbox"/> (Include Unknowns)
<input type="checkbox"/> Source Place	<input type="checkbox"/> Sink Place	<input type="checkbox"/> Source Transition	<input type="checkbox"/> Sink Transition	<input type="checkbox"/> Loop Free	<input type="checkbox"/> Sub-Conservative	<input type="checkbox"/> Conservative
<input type="checkbox"/> Nested Units	<input type="checkbox"/> Safe	<input type="checkbox"/> Deadlock	<input type="checkbox"/> Reversible	<input type="checkbox"/> Quasi live	<input type="checkbox"/> Live	

Alternatively, you can also search in the contents of the table. Its presentation is updated as you type. For instance, type peter, or phi.

Search:  Show / hide columns

Showing 1 to 42 of 42 entries

Model Name	Model Type	Fixed Size	Ordinary	Simple Free Choice	State Machine	M
desel_esparza_10_2	PT	P=4; T=4; A=10	✓	✗	✗	
desel_esparza_10_3a	PT	P=9; T=9; A=27	✓	✗	✗	
desel_esparza_10_3b	PT	P=11; T=9; A=31	✓	✗	✗	
desel_esparza_5_1	PT	P=8; T=7; A=20	✓	✗	✗	
desel_esparza_5_2	PT	P=8; T=10; A=20	✓	✓	✓	



## Benchmark

It is the first and foremost I created this repository. Sui complements the efforts

Checking Conti

Browse the VLPN Petri Nets Repository

search Wikipedia search Wikipedia gest publics HP fko Equipe/Labo TA fko Projets Conférences/revues Enseignements SAR Divers Images Wiktionnaire > +

**VLPN**  
VERY LARGE PETRI NETS

Home MCC PetriWeb VLPN About API

PetriWeb C

## The VLPN Collection

The I

All models in this collection come from the CONVECS group at LIG. They were collected over several years within the context of the CADP tool. This collection of complex Petri nets was prepared by Hubert Garavel

VLPN group 1: nets containing redundant units							
vlpn_001	52 units	330 places	512 transitions	3–49–162	$\geq 6.75209e+10$ states	LOT	NUPN PNML PDF
vlpn_002	55 units	152 places	3213 transitions	8–28–91	$1.52668e+14$ states	LOT	NUPN PNML PDF
vlpn_003	69 units	176 places	134 transitions	16–35–91	$1.13293e+13$ states	LOT	NUPN PNML PDF
vlpn_004	72 units	218 places	215 transitions	5–62–143	$\geq 9.14574e+09$ states	LOT	NUPN PNML PDF
vlpn_005	81 units	199 places	219 transitions	19–51–120	$2.46905e+12$ states	LOT	NUPN PNML PDF

VLPN group 2: nets containing disconnected places or transitions							
vlpn_006	25 units	572 places	588 transitions	6–13–74	$2.36483e+12$ states	LOT	NUPN PNML PDF
vlpn_007	35 units	223 places	1088 transitions	18–18–75	$3.29769e+13$ states	LOT	NUPN PNML PDF
vlpn_008	37 units	644 places	660 transitions	7–19–104	$3.85119e+14$ states	LOT	NUPN PNML PDF
vlpn_009	200 units	199 places	699 transitions	--199	$1.1418e+46$ states	MCC	NUPN PNML PDF
vlpn_010	486 units	486 places	776 transitions	2–485–486	$9.79474e+21$ states	MCC	NUPN PNML PDF

VLPN group 3: unsafe nets							
vlpn_011	76 units	75 places	56105 transitions	--75	unknown state space	MCC	NUPN PNML PDF
vlpn_012	103 units	102 places	136662 transitions	--102	unknown state space	MCC	NUPN PNML PDF
vlpn_013	1409 units	1408 places	2400 transitions	--1408	unknown state space	MCC	NUPN PNML PDF
vlpn_014	2458 units	2457 places	5400 transitions	--2457	unknown state space	MCC	NUPN PNML PDF
vlpn_015	9154 units	9153 places	25110 transitions	--9153	unknown state space	MCC	NUPN PNML PDF

VLPN group 4: nets having one single unit							
vlpn_016	1 unit	2816 places	11520 transitions	1–1–12	2816 states	LOT	NUPN PNML PDF
vlpn_017	1 unit	5121 places	8961 transitions	1–1–13	5121 states	LOT	NUPN PNML PDF
vlpn_018	1 unit	6144 places	25600 transitions	1–1–13	6144 states	LOT	NUPN PNML PDF
vlpn_019	1 unit	11521 places	20225 transitions	1–1–14	11521 states	LOT	NUPN PNML PDF
vlpn_020	1 unit	25601 places	45057 transitions	1–1–15	25601 states	LOT	NUPN PNML PDF

VLPN group 5: nets having one more unit than the number of places (i.e., with no genuine NUPN structure)							
vlpn_021	118 units	117 places	176 transitions	--117	$\geq 4.53408e+07$ states	MCC	NUPN PNML PDF
vlpn_022	121 units	120 places	111160 transitions	--120	unknown state space	MCC	NUPN PNML PDF
vlpn_023	140 units	139 places	87 transitions	--139	$\geq 4.07308e+07$ states	MCC	NUPN PNML PDF

**Repository Bro**

Browse the Model Checker (INRIA), or the PetriWeb (INRIA) as you please.

The MCC collection shows competition. The VLPN collection contains a new tool of

**Benchmarking**

It is the first and foremost created this repository. It complements the efforts

Checking Conti

Browse the MCC Petri Nets Repository

PetriWeb VLPN MCC Model Checking Contest Home MCC PetriWeb VLPN About API

## The VLPN

All models in this collection prepared by Hubert Garavel

The models to maintain in the MCC Collection

You can browse the MCC Collection Cover Flow

[Help on this Page](#)

**Repository Browser**

Browse the Model Checking Contest (INRIA), or the PetriWeb (TUM) as much as you please.

The MCC collection shows competition. The VLPN collection contains the PetriWeb collection content started with a new tool of:

**Filter**

Ordinary Simple Free Choice State Machine Marked Graph Connected Strongly Connected (Include Unknowns)

Source Place Sink Place Source Transition Sink Transition Loop Free Sub-Conservative Conservative

Nested Units Safe Deadlock Reversible Quasi live Live 2015 Surprise Models

Alternatively, you can also search in the contents of the table. Its presentation is updated as you type. For instance, type energy, or phi, or the name of one of the model contributors (See column Submitter, or the Contributors' page).

Showing 1 to 43 of 43 entries

Model Name	Model Type	Fixed Size	Parameterised	Ordinary
A hot drink vending machine	COLORED + PT	P=6; T=7; A=28	Yes	x
A variant of Dekker's algorithm for mutual exclusion	PT	Unknown	Yes	✓
AI Planning	PT	P=126; T=128; A=652	None	✓
Angiogenesis	PT	P=38; T=64; A=185	Yes	✓
ARMACacheCoherency	PT	P=87; T=23676; A=246936	None	✓

The screenshot shows a web-based Petri Net repository interface. On the left, there's a sidebar with navigation links like 'Repository Bro...', 'Browse the Model Checker...', and 'The MCC collection shows...'. The main area displays a table of models with columns for name, description, and various metrics. A search bar at the top right allows filtering by model type (Ordinary, Source Place, Sink Place, etc.) and other parameters. Several yellow sticky notes are overlaid on the page:

- Selection functions** (red text) - Based on net characteristics
- RESTful API to automate queries** (red text)
- A way to advertise your models** (red text)
- Soon on the web** (red text)  
<http://pnrepository.lip6.fr>



## Full HTML report soon online

- Will be mostly generated automatically from the gathered data
- Image disks from virtual machines will be published too
  - ▶ With all models
  - ▶ With all formulas
- ▶ Reproducibility of experimentations is important



## PNRepository also online soon

- Please feed us with your models
  - ▶ Used for the next editions of the MCC
- If you have nice machines (but inactive)
  - ▶ Please allow us to use them





## Full HTML report soon online

- Will be mostly
- Image disks from
- ▶ With all models
- ▶ With all formulas
- ▶ Reproducibility

Once again, thank you!

Université de Genève

Rostock University

Université Paris Ouest

Université P. & M. Curie

hundreds of days of CPU!



## PNRepository

- Please feed us with your models
  - ▶ Used for the next editions of the MCC
- If you have nice machines (but inactive)
  - ▶ Please allow us to use them





And now...  
let's have time for discussion

INCE  
2015