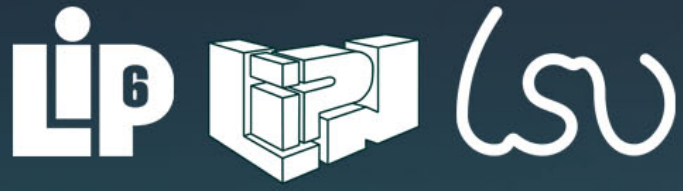

Teaching Formal Methods: Experience at UPMC and UP13 with *CosyVerif*

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CosyVerif

Motivation

Meeting students' expectations...

- practical coursework
- challenge for courses on formal approaches to software engineering
- previous experiences not satisfactory due to platform dependency or textual interface

...with appropriate tailored tool support

designed for both hands-on sessions and homework:

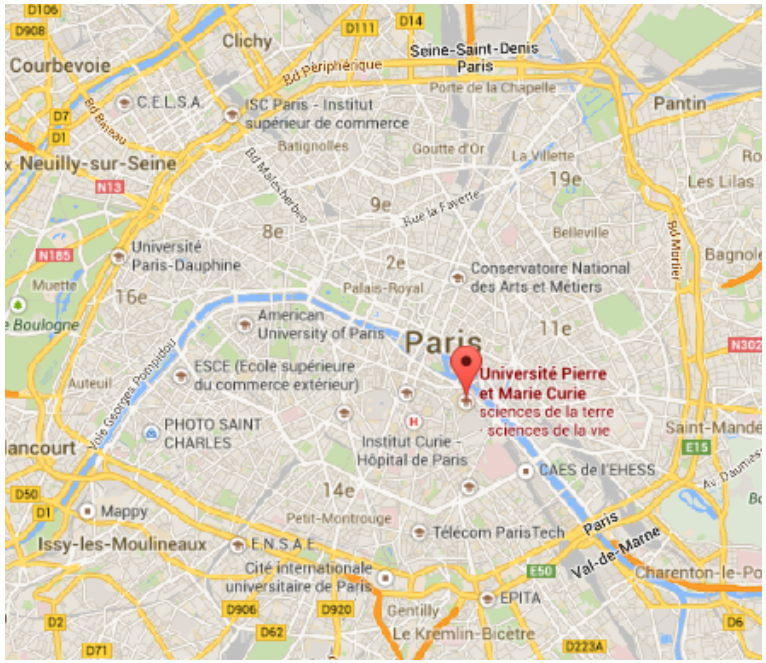
- multi-platform
- lightweight
- easy to deploy and use
- flexible to be easily extended

Outline

Master SAR at UPMC

University Pierre and Marie Curie

- 30,000 students
- subjects
  - science
  - medicine
- Computer science master studies
  - 800 students
  - 7 tracks



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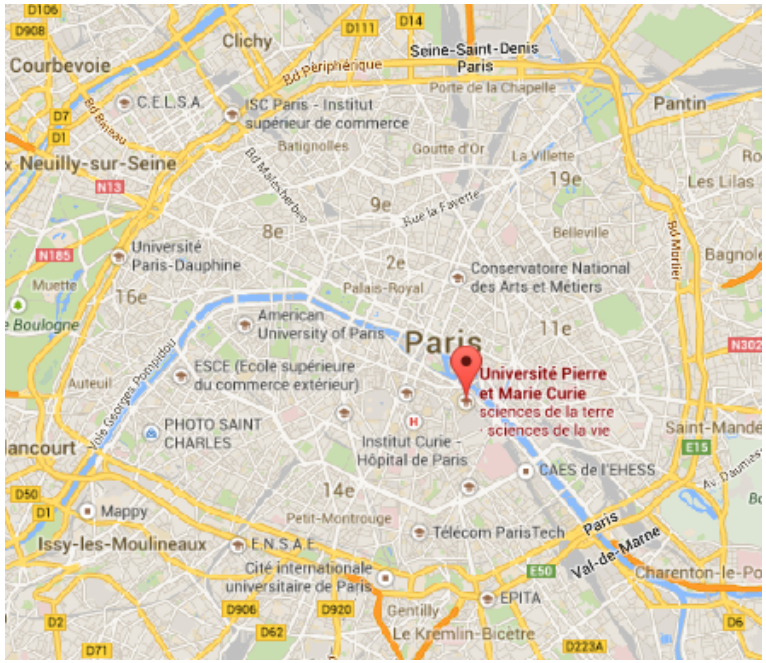

Master SAR (*Systèmes et Applications Répartis* — Distributed Systems and Applications)

- learn to design and implement complex systems with distributed, OS-based, real-time and critical features
- courses on modelling and analysis of behaviours for parallel programs

Master PLS at UP13

University Paris 13

- 23,000 students on 4 campuses
- subjects
  - humanities and social sciences
  - science, technology and health
  - culture and communication
  - law, economics and management
  - arts, literature and languages
- Institut Galilée (maths, physics, chemistry, informatics)
  - 7 research laboratories
  - 2 tracks in the master in informatics

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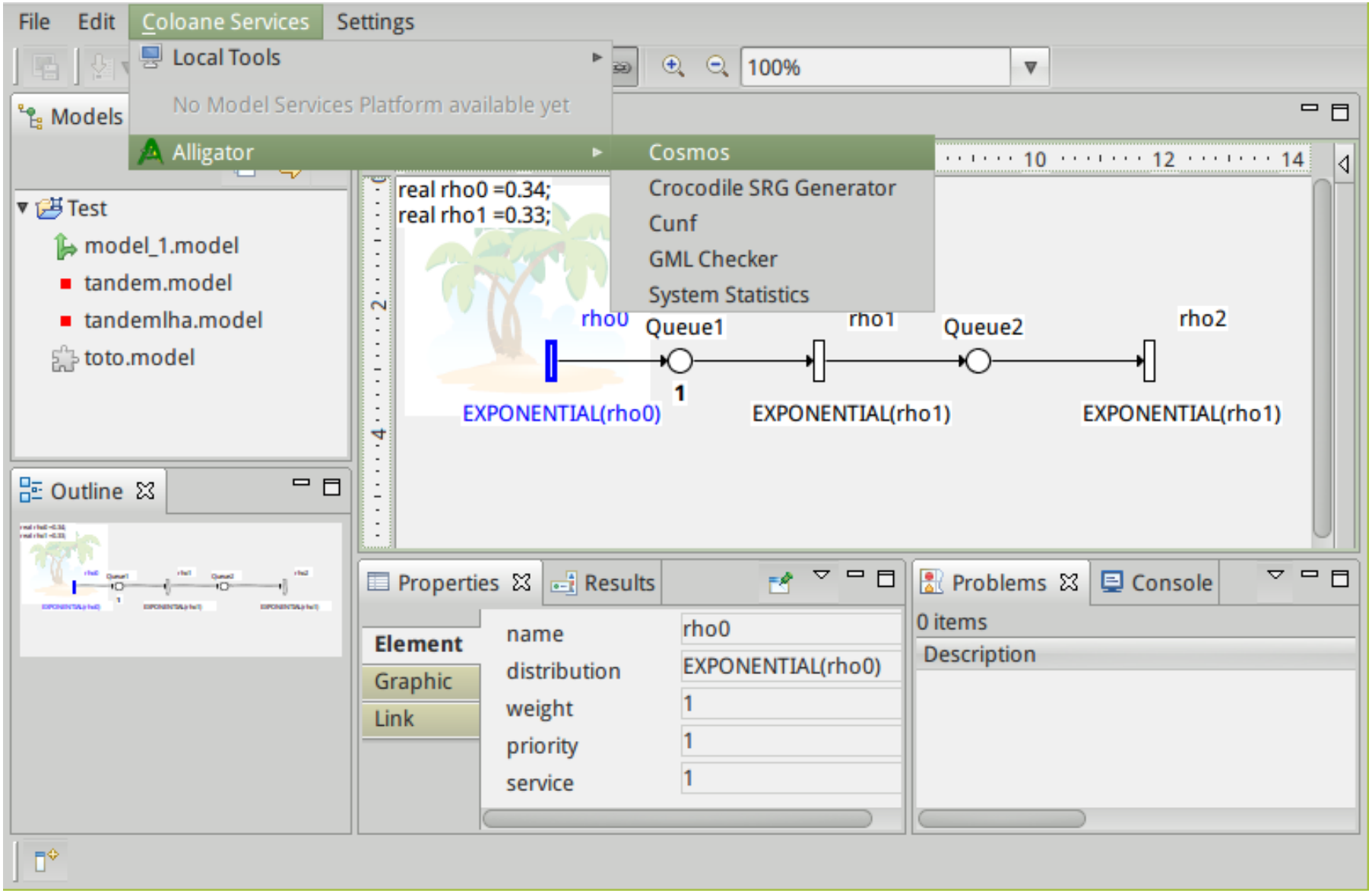
Master PLS (*Programmation et Logiciels Sûrs* — Programming Tools and Safety)

- learn to design and implement safe systems
- course on infinite, timed and hybrid systems

Principles of the *CosyVerif* platform

- distributed and open
- supports different families of formalisms
  - automata
  - Petri nets
- 12 concrete formalisms
- 2-layered XML-based description language:
  - FML, Formalism Markup Language (modelling language description)
  - GrML, Graph Markup Language (actual model description)
- reuse of existing formalisms
- open to new tool contributions
- tools invoked through web services transparent to the user
- graphical user interface
- repository of models

CosyVerif interface



Tailored bundles

Architecture, from research...

- lightweight client GUI, Coloane
- more sophisticated analysis tools on powerful servers

...to teaching

- no need for a very powerful server, using virtualisation
- tailored bundles including
  - the Coloane GUI
  - a disk image with the server installation, embedding a selected subset of analysis tools
  - scripts to handle execution through VitualBox
- provided for Linux, MacOS and Windows
- 2 bundles available up to now
  - *CosyVerif4PN* for Petri nets, used at UPMC
  - *CosyVerif4Imitator* for parametric timed automata, used at UP13

Initial experiments

at workshop and summer school tutorial sessions

- use of a beta version
- bundles not available yet, so complete installation
- specific attendance, with background, motivation and practice

Experience report for UPMC

- 350 machines in computer rooms accessed by $1,500$ students
- security issue using virtualisation: in case of students using a disk image with root
- thus declare students as part of a sudo group for that specific usage
- tune the virtualisation environment so as not to allow outgoing root connections

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Feedback

- course attended by 25 students
- students had to provide a small individual project as homework
- only issue (first practical session only, since patch was then provided): misuse of the permissions leading to a crash, due to Eclipse embedded libraries for Coloane
- students downloaded the bundle and provided their project on time

Experience report for UP13

- VirtualBox already installed on machines in computer rooms
- disk quotas for students: install in `/tmp`
- installation from the USB stick encountered permissions problems
- installation on students laptops only possible when usurping MAC address to get an internet connection

Experience report for UP13

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Feedback

- course attended by 20 students
- anonymous aftercourse evaluation
- 87% satisfied or very satisfied by their experience

Conclusion and perspectives

A flexible platform for teaching

- experimented at UPMC and UP13
- client/server architecture
- tailored for each course via a bundle mechanism
- easy to distribute and install
- embedded virtual machines for platform independence

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Perspectives

- full day tutorial at the Petri Nets conference in June (will be podcasted)
- embed new tools
- new bundles for other courses in other universities worldwide
- sharing examples via a model repository