LTL Model Checking with Neco

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http://code.google.com/p/neco-net-compiler/

What is Neco?

A Petri net compiler — transforms Petri nets into libraries

- works with high-level Petri nets — colored PN annotated by Python
  - based on SNAKES, a Python library for Petri nets

F. Pommereau. Quickly prototyping Petri nets tools with SNAKES. *Petri net newsletter*, October 2008

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- produces optimized code...
- ...for explicit model-checking
- expressivity compromise

With a set of command-line tools:

- `neco-compile` — PN compiler
- `neco-explore` — minimal exploration tool

Ł. Fronc and F. Pommereau. Building Petri nets tools around Neco compiler. *PNSE'13*

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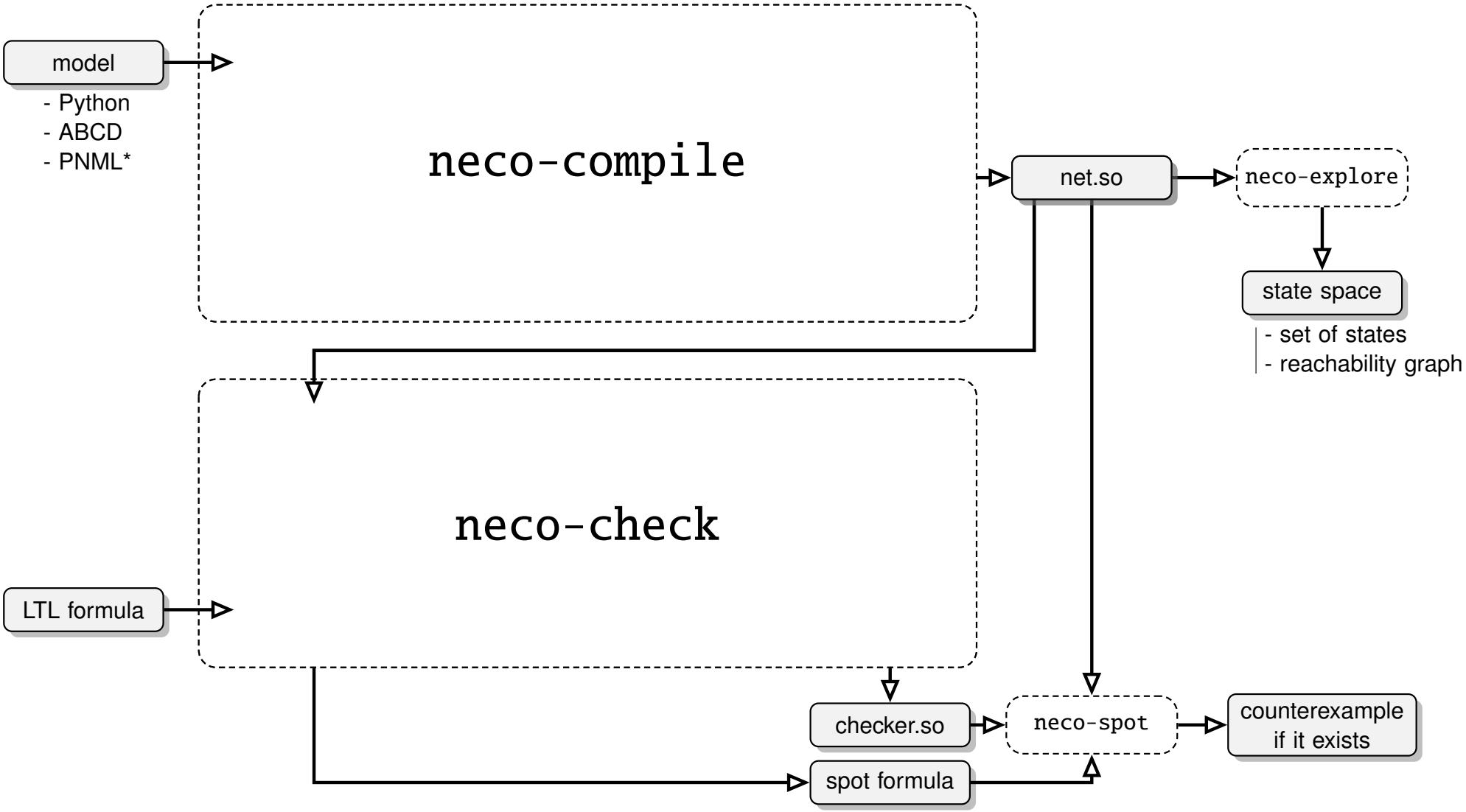
With a set of command-line tools:

- `neco-compile` — PN compiler
- `neco-explore` — minimal exploration tool
- `neco-check` new! — LTL-adapter compiler
- `neco-spot` new! — LTL model-checker

Neco's Workflow



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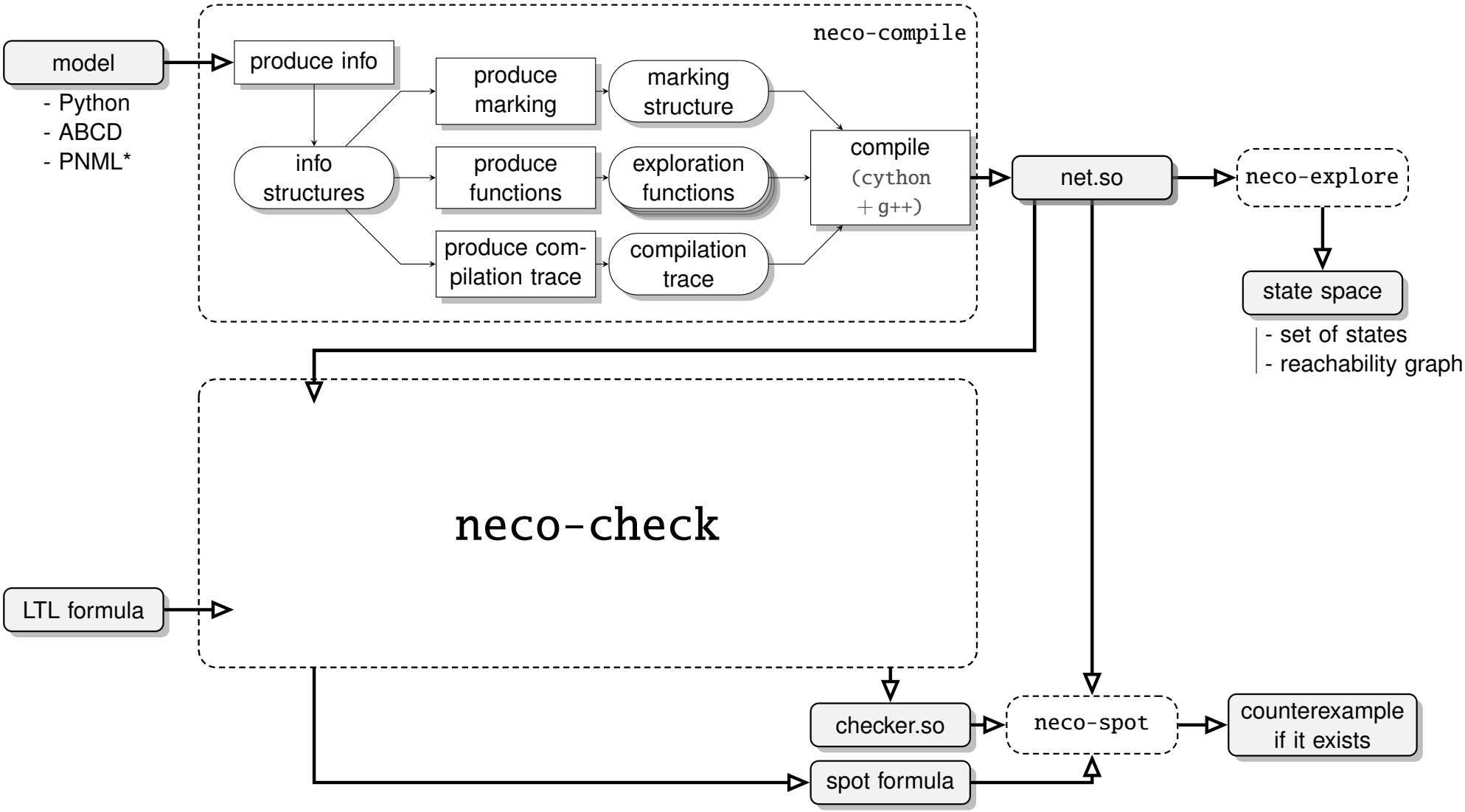

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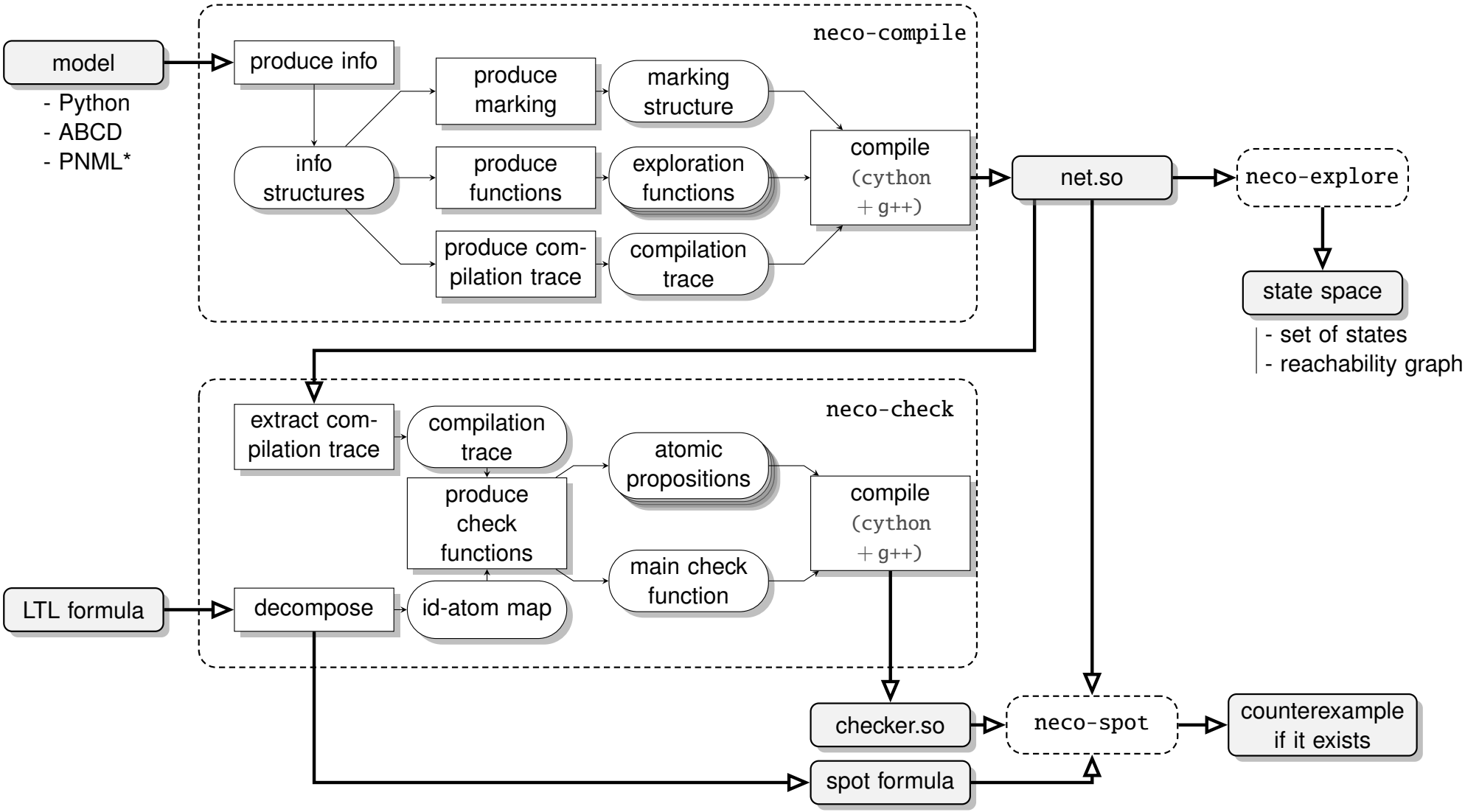
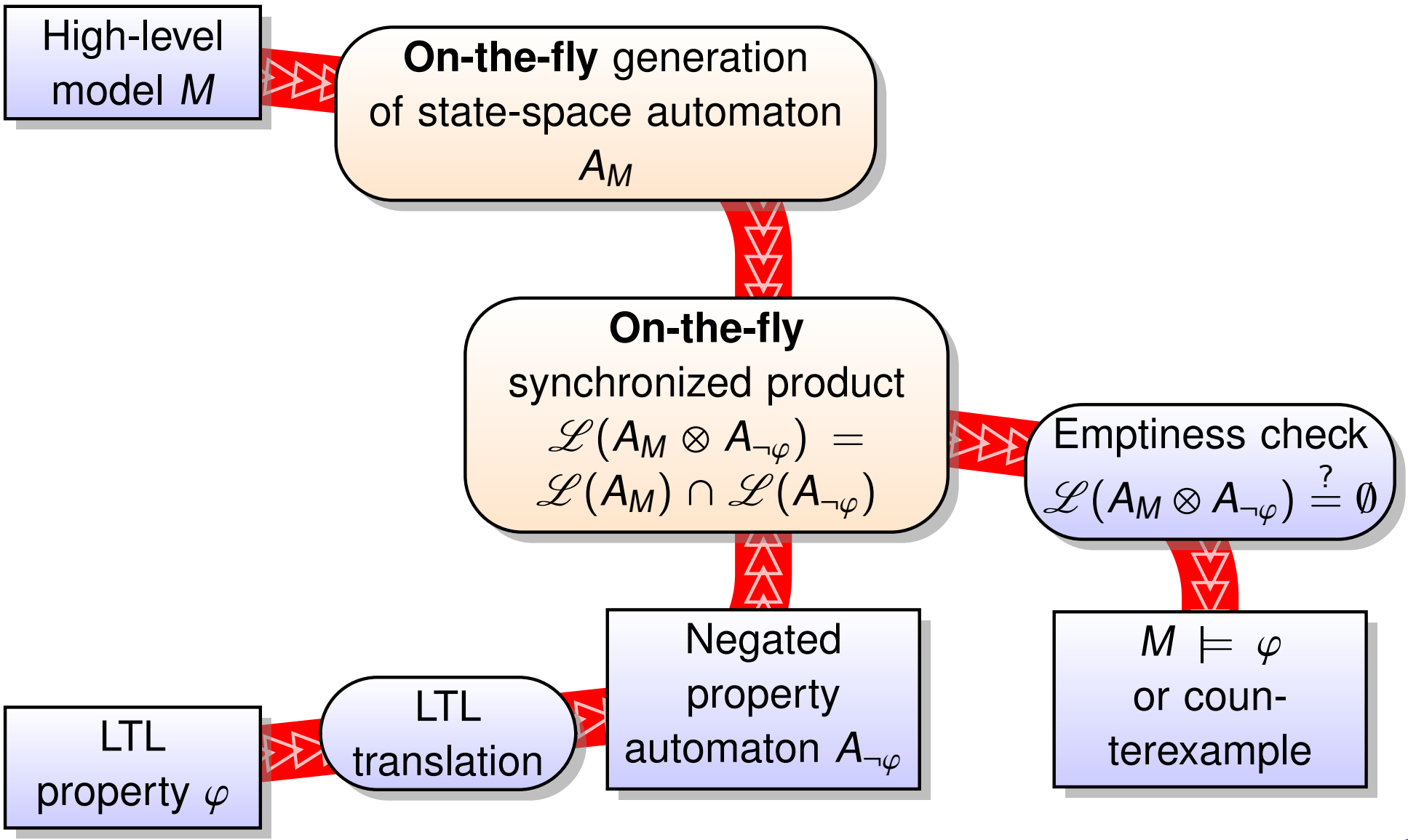


Spot as a library for explicit model-checking



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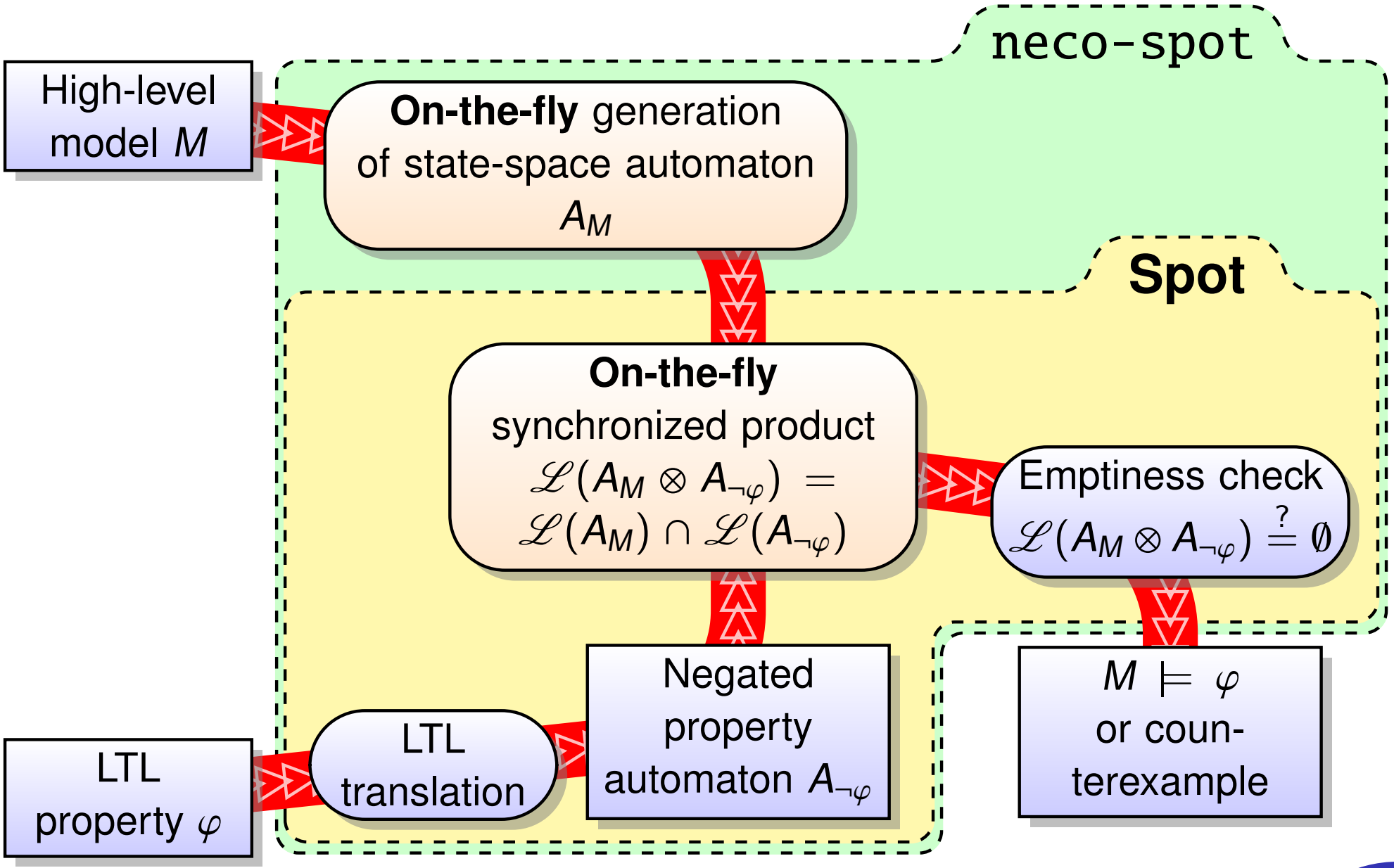
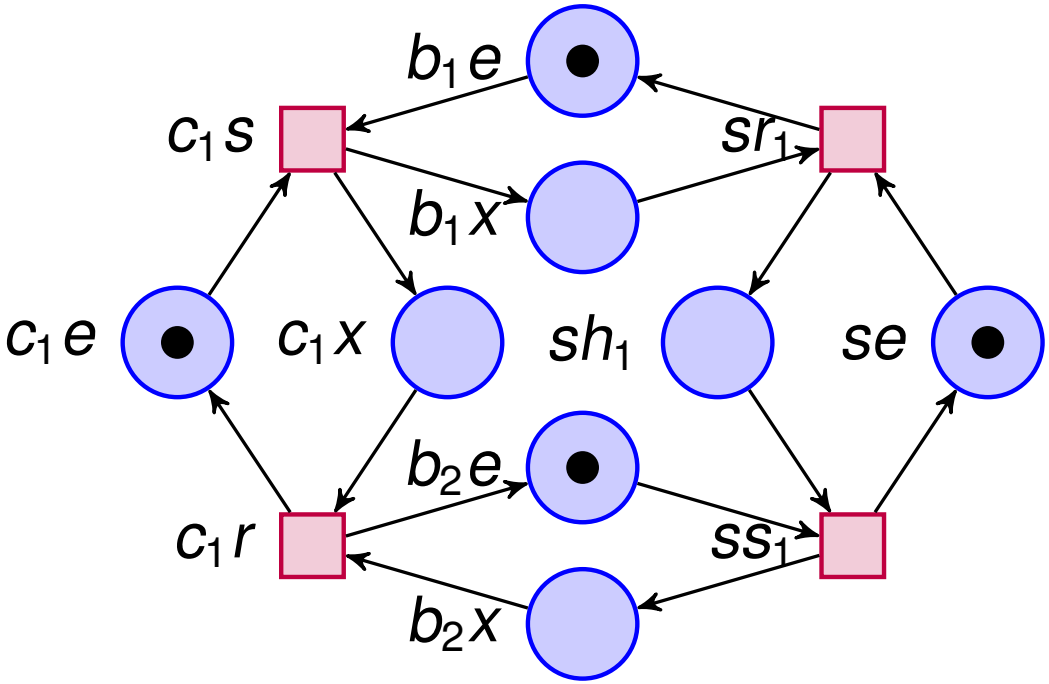


neco-spot

- A wrapper of `net.so` and `checker.so` that presents the reachability graph as a subclass of `spot::kripke`:
  - `get_init_state()` — initial state
  - `succ_iter(s)` — iterator over the successors of state s
  - `state_condition(s)` — value of atomic propositions for s

  This interface supports on-the-fly exploration.
- Translate the formula into a generalized Büchi automaton:
  - `spot::translator::run(f)` — includes many optimizations
- Synchronize reachability graph and formula automaton:
  - `spot::tgba_product(model, prop)` — on-the-fly
- Check the product for emptiness:
  - `spot::emptiness_check::check()`
- Optionally compute a counterexample:
  - `spot::emptiness_check_result::accepting_run()`

Demo



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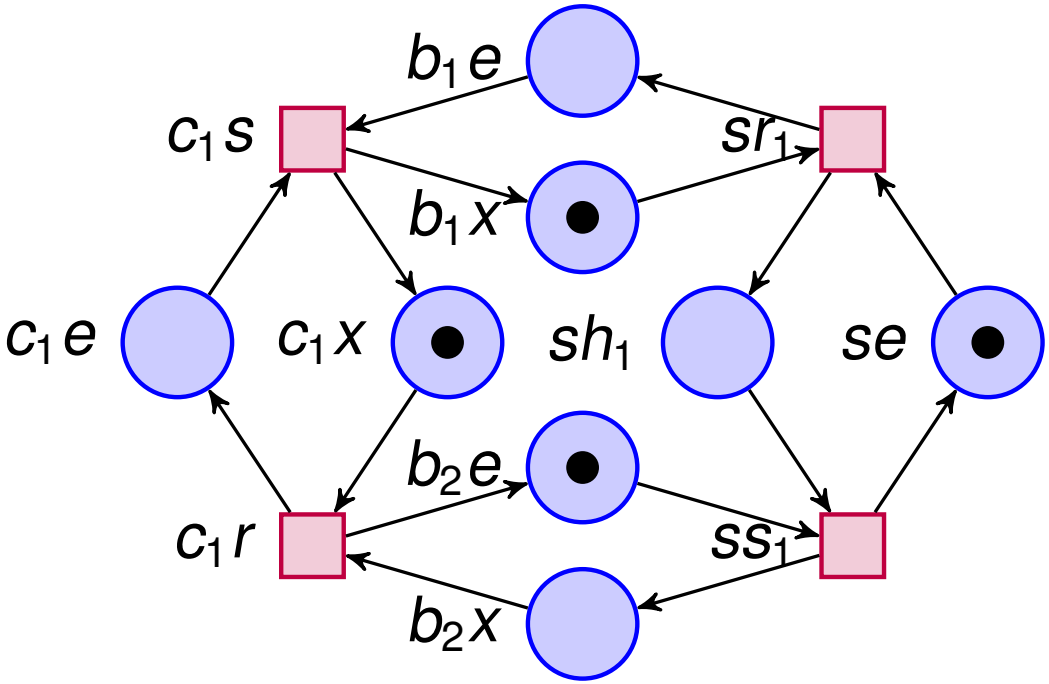

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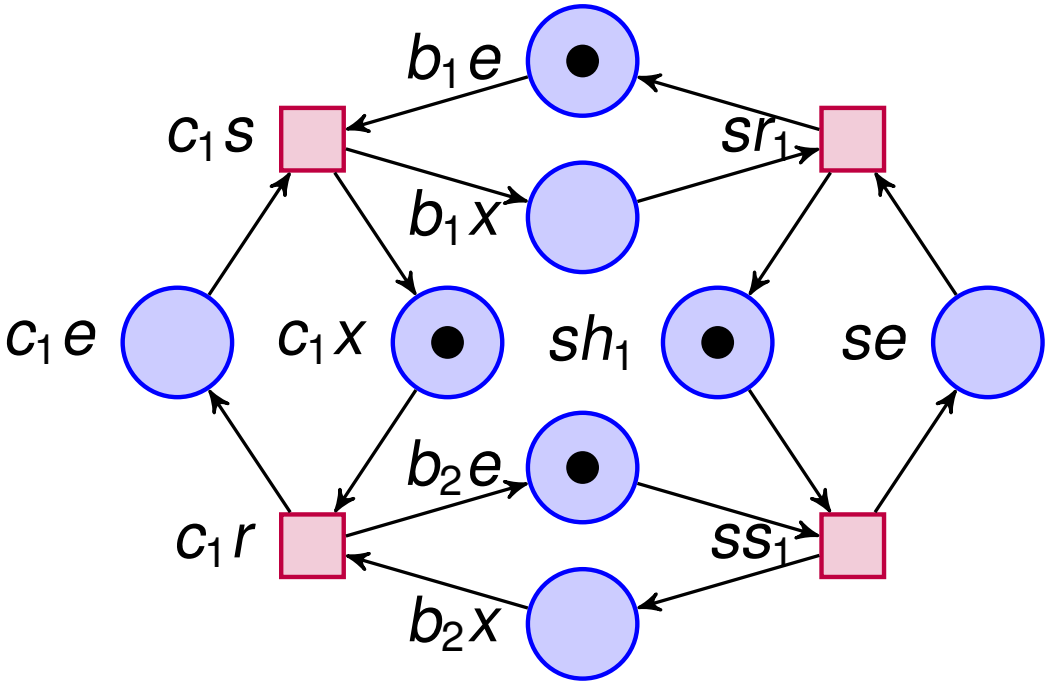

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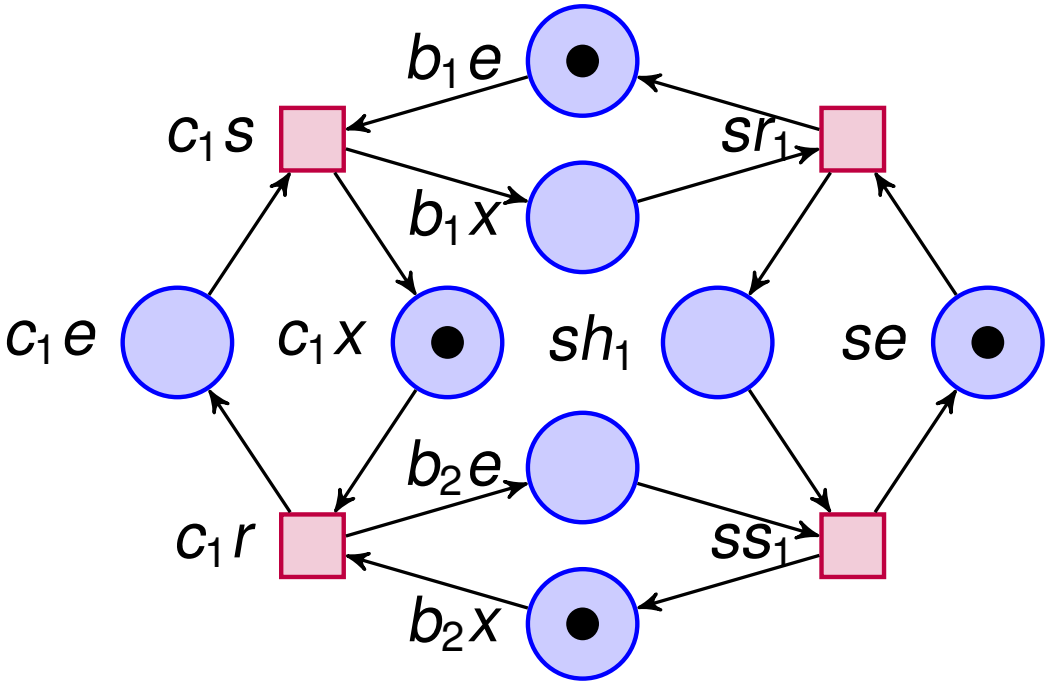

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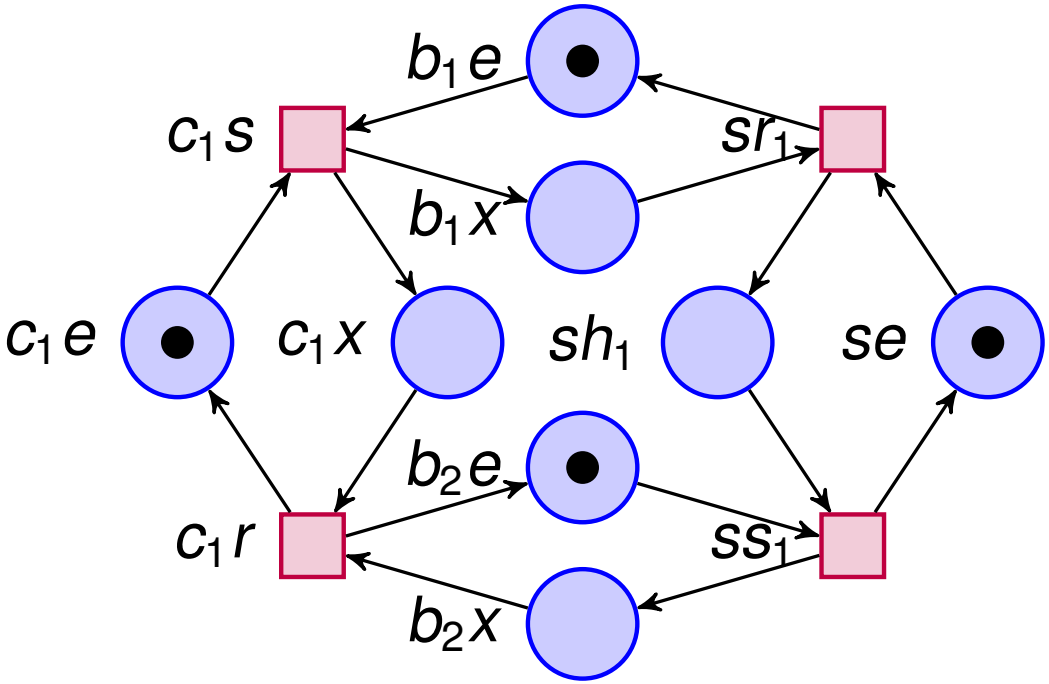

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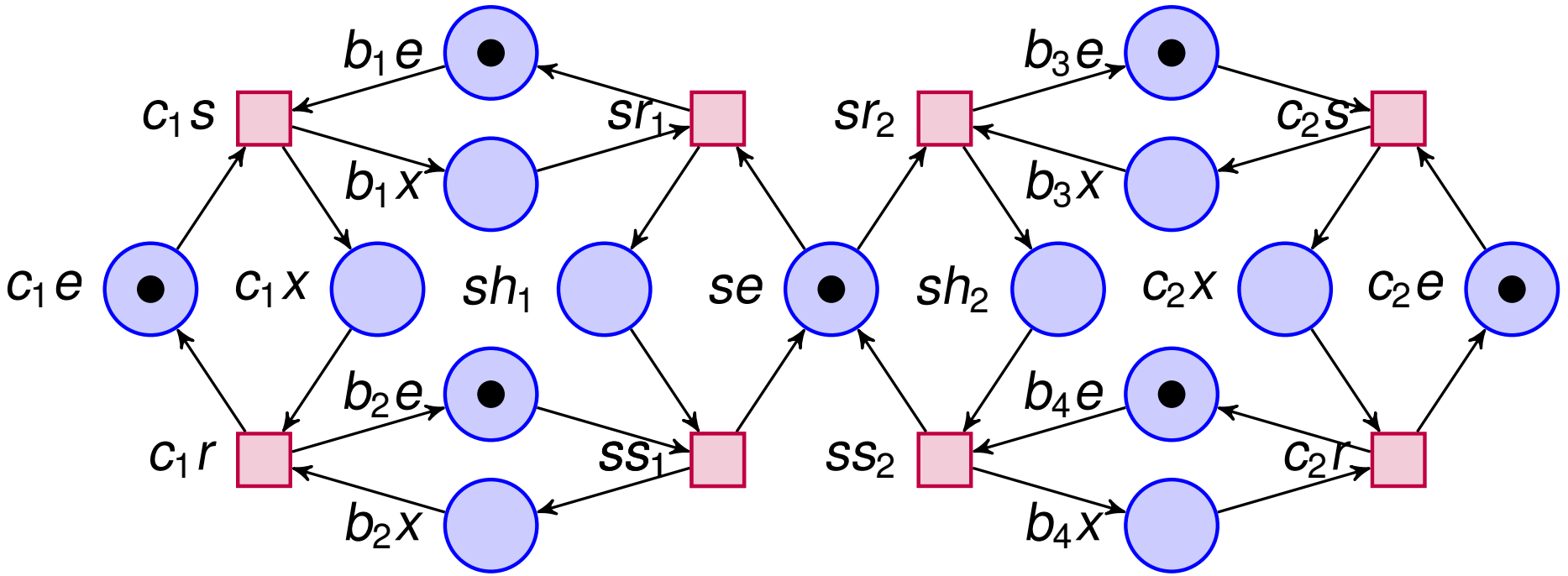
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sr_2
$c_2 s$
$b_3 x$
sh_2
$c_2 x$
$c_2 e$
$b_4 e$
ss_2
$c_2 r$
$b_4 x$

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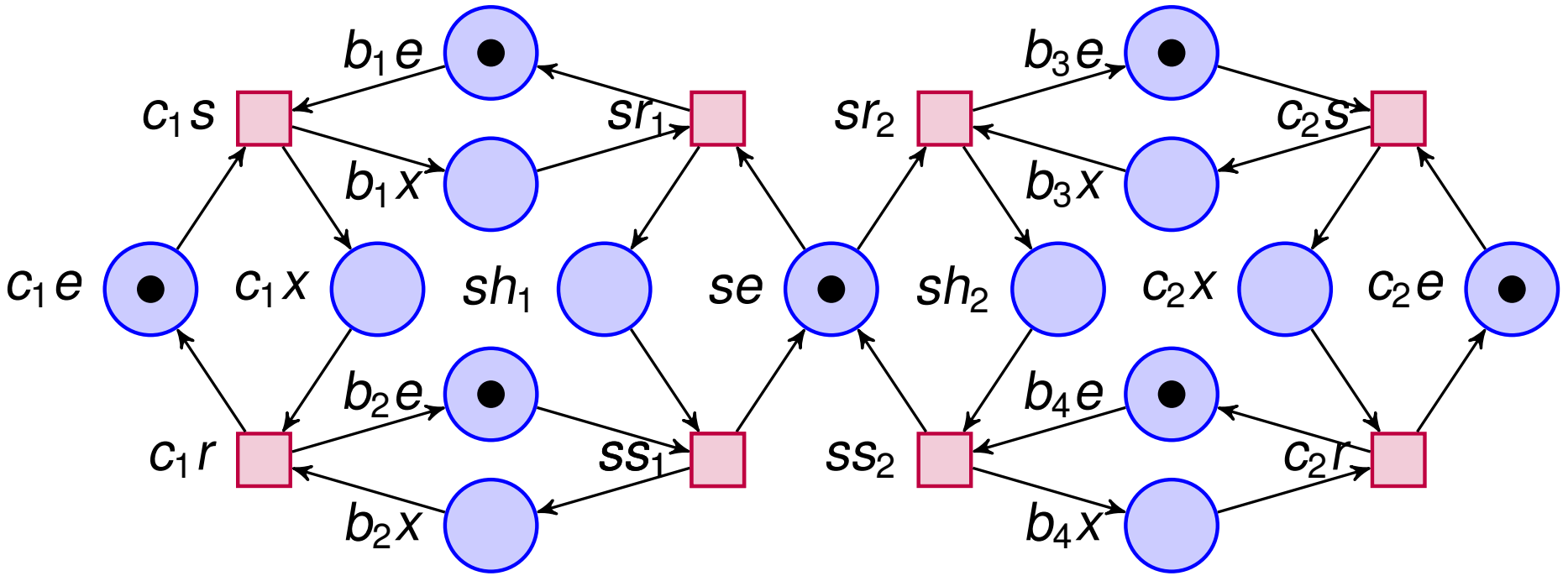

Running a model-checking task

```
$ neco-compile --module cs.py -lcython
$ neco-check --formula 'G ((marking(c1e)=[dot] and
    X marking(c1x)=[dot]) -> X F(marking(c1e)=[dot]))'
$ neco-spot neco_formula
```

Availability

Neco and Spot are free software.
Documentation and installation instructions can be found at

- `http://code.google.com/p/neco-net-compiler/` and
- `http://spot.lip6.fr/`