Discrete-event models
part 5: Reachability Graphs

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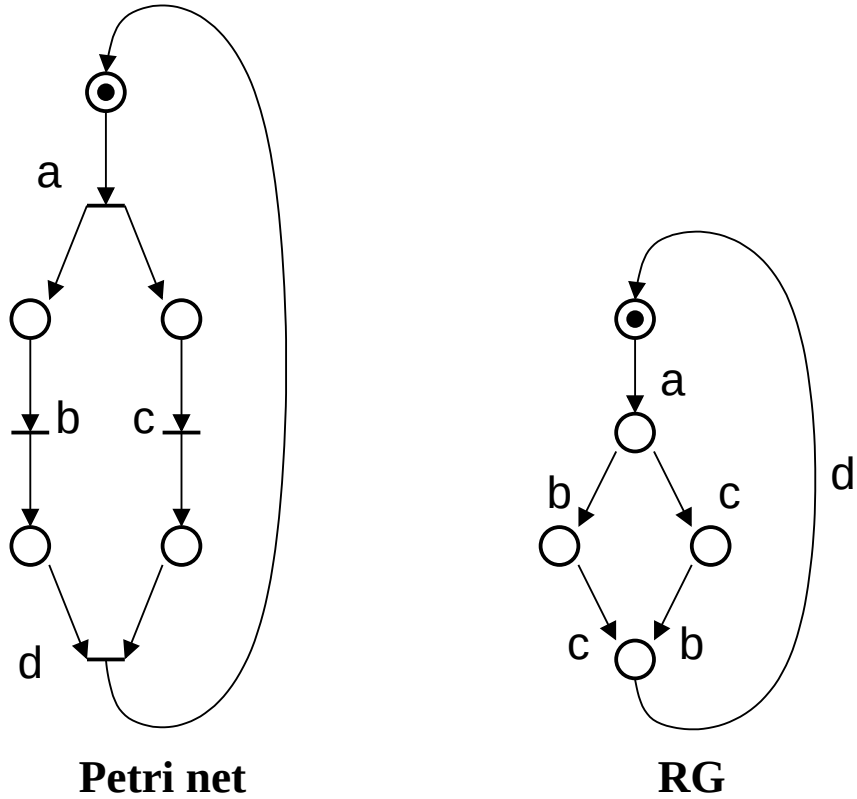
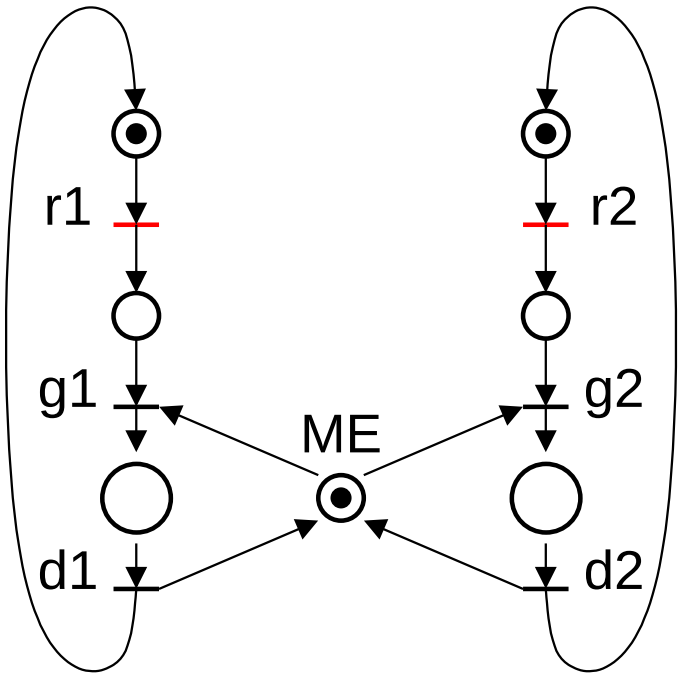
Reachability Graphs (PN traversal)

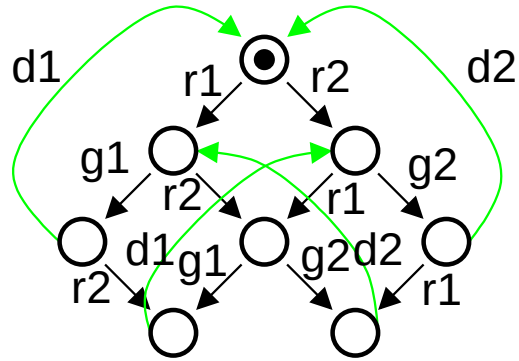


- **Concurrency** – "diamonds" in RGs – **interleaving semantics** (one t_i fires at a time)
- The diamonds are semi-modular, distributive lattices *read Foundations of Maths→Set Theory→Lattice Theory*

Reachability Graphs and hazards



Arbiter Petri Net



Reachability Graph

"Green" states are the instances of previously encountered states

- The diamond net is “split”
  - Non-semimodular, distributive lattice
- Non-determinism/persistence, unfairness properties

Properties – discussion

- Reachability of some particular marking/state
- Safety (at most one token in a place)
- Deadlock freedom
- Liveness (any marking can be reached from the given reachable marking)
- Persistence (choice, arbitration)
  - (non-)determinism, (un-)fairness
- Early evaluation and others, which are not covered here …

Summary

- Reactivity in models (open/closed models)
- FSM models (read the book by Rob Williams)
- Concurrency modelling
  - Petri nets
  - Reachability graphs
  - verification
- We need more examples and exercise. . .