

## Software for Queueing Modelling

### Snoopy Petri Nets

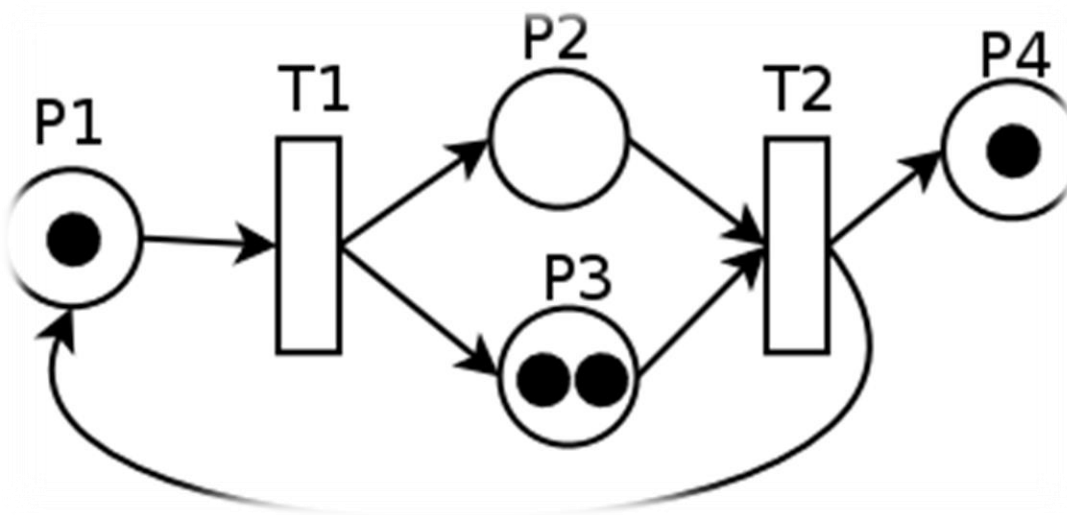
#### [Petri Nets in Software Engineering](#)

Because software and computer-integrated systems are more and more often abstractly modeled before their actual implementation, the role of Petri nets grows as they successfully combine intuition and precision during the planning and configuration of IT products. Petri nets are graphical and mathematical modeling tool applicable to many systems for describing and studying information processing systems. It is a class of discrete event dynamic system.

Graphically, a Petri net consists of places, transitions, and arcs. Arcs run from a place to a transition or vice versa. The places from which an arc runs to a transition are called the input places of the transition; the places to which arcs run from a transition are called the output places of the transition. A place may contain a discrete number of marks called tokens.

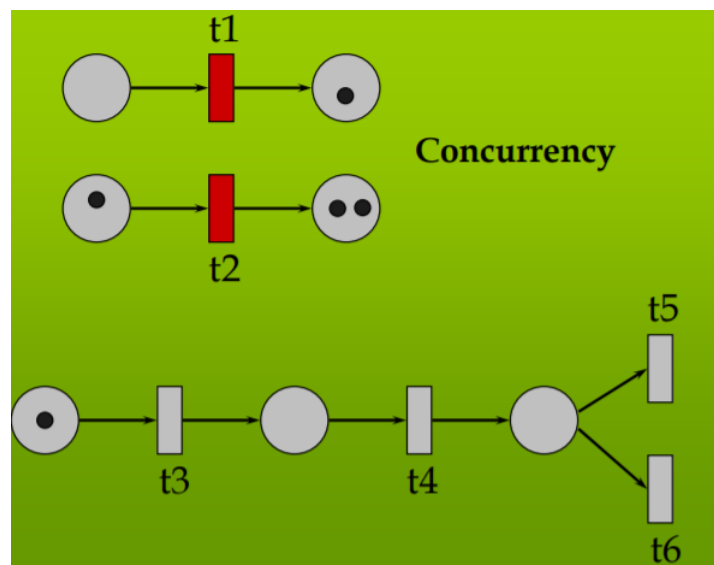
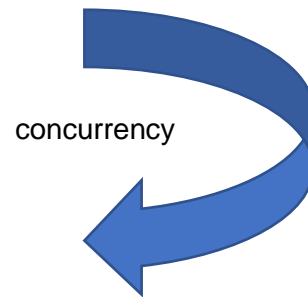
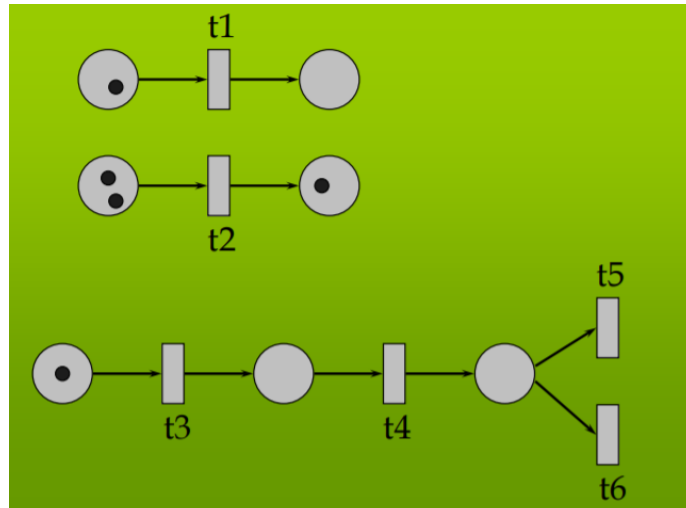
An example of a Petri net graph is shown in the flowing picture:

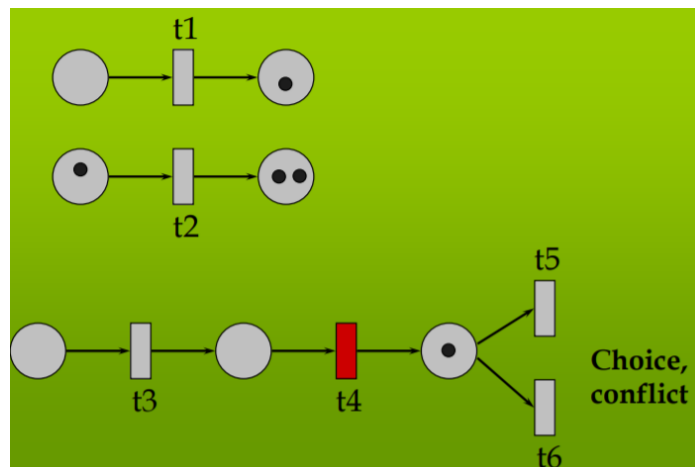
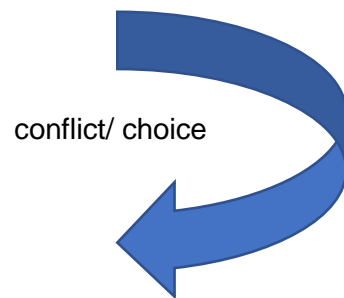
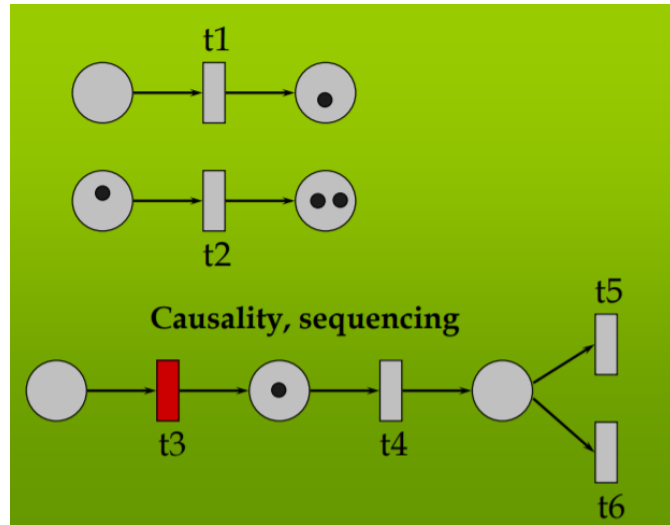
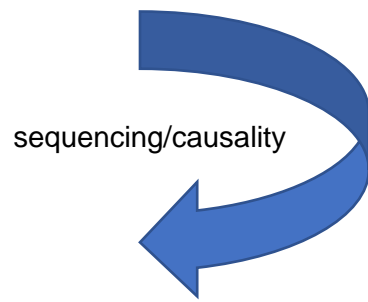
- Places: circles
- Transitions: bars or boxes
- Arcs: arrows labeled with weights
- Tokens: black dots



Petri nets describe explicitly and graphically:

- sequencing/causality
- conflict/non-deterministic choice
- concurrency





### The advantages of Petri nets for the modelling of systems are well-known:

- They provide a graphically and mathematically founded modelling formalism. This contrasts with many similar techniques, where only one of these properties is well developed and the other is added in a less systematic way. These two sides of the coin are of high importance as the system development process needs graphical as well as algorithmic tools.
- To date there exists a huge variety of algorithms for the design and analysis of Petri nets and powerful computer tools have been developed to aid this process. To give just one example, we would like to mention reachability analysis as a subfield of model checking.
- Abstraction and hierarchical design are crucial for the effective design of large scale and complex systems. Petri nets provide mechanisms for abstraction and refinement that are well integrated into the basic model.
- There is a huge number of commercial or university tools for the design, simulation, and analysis of Petri-net-based systems. Many of them achieve industrial standards.
- Petri nets have been used in many different application areas. As a result, there is a high degree of expertise in the modelling field.
- Different variants of Petri net models have been developed that are all related by the basic net formalism which they build upon. This allows them to meet the needs in different application domains on the one hand, but on the other hand gives facilities for communication and the transfer of methods and tools from one field to another. Currently, besides the basic model, there are extensions such as timed, stochastic, high-level, and object-oriented Petri nets, meeting the specific needs for (almost) every applications area that comes to mind.