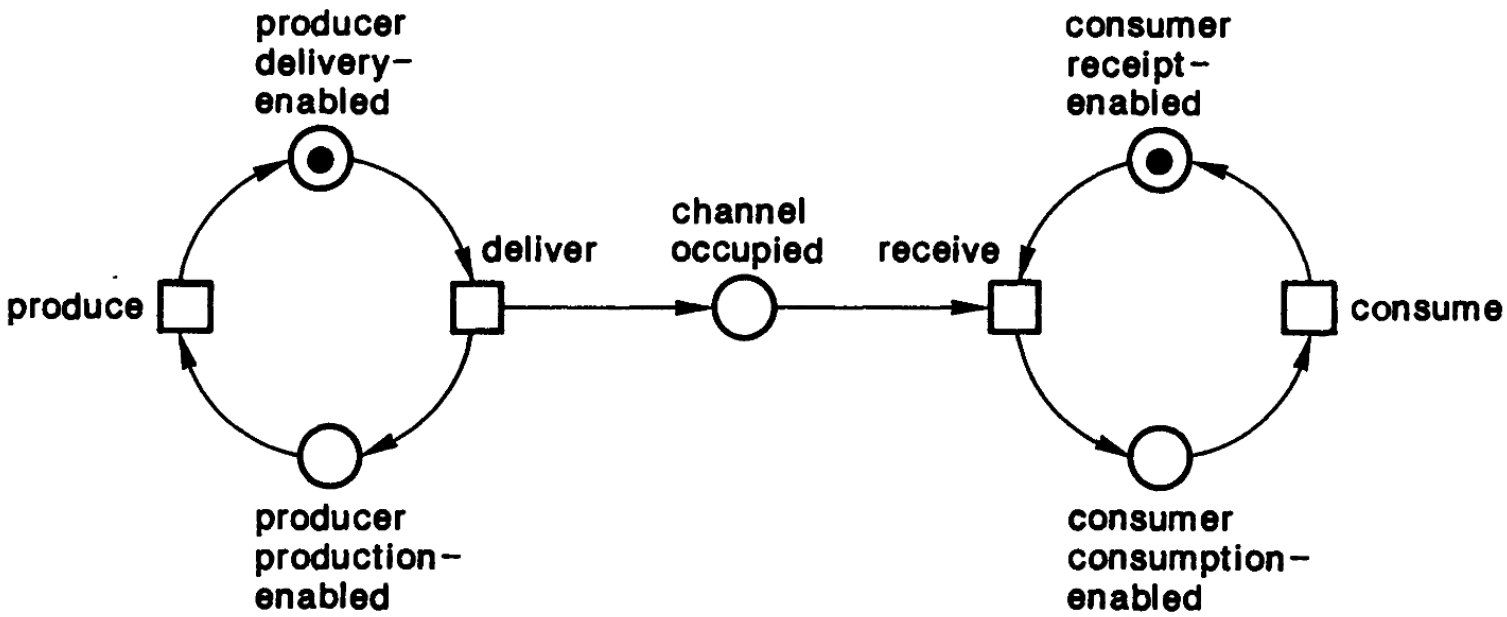
Petri nets

Conditions-Event

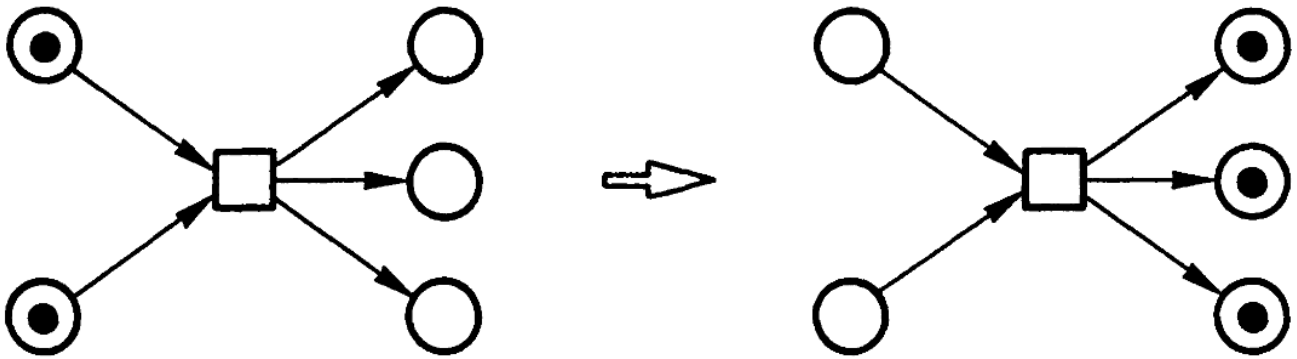
A producer-consumer system



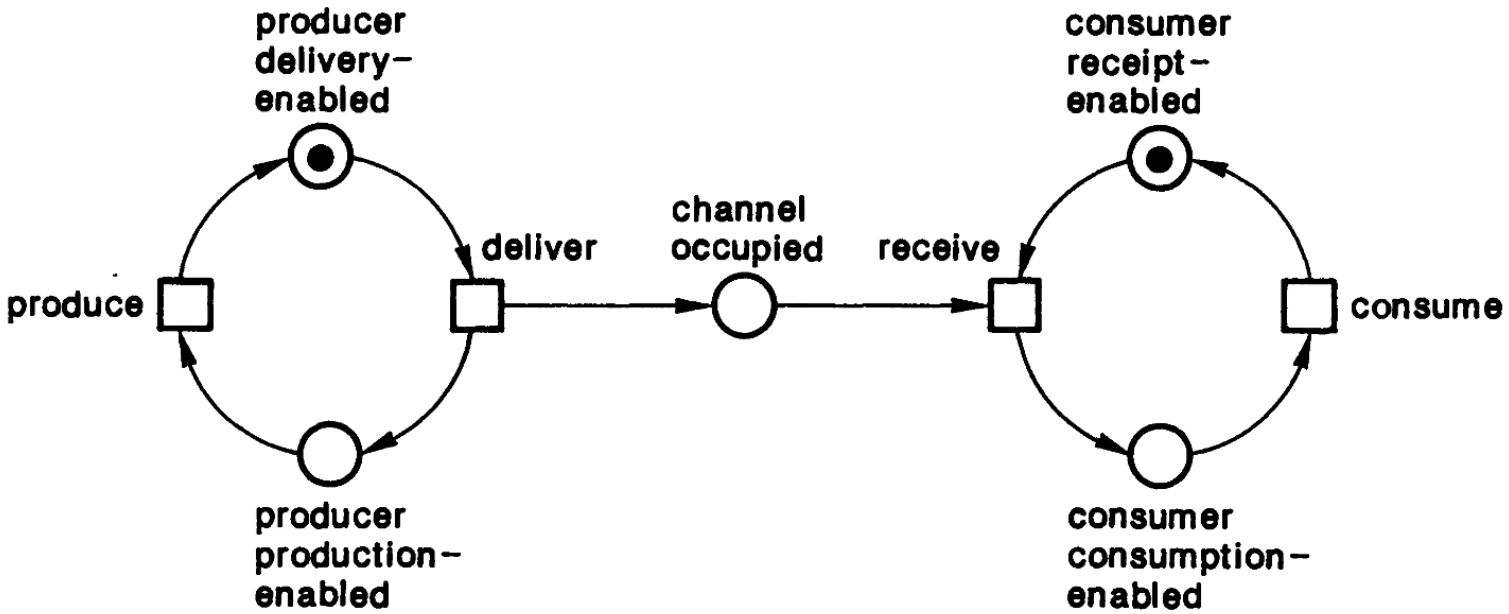
conditions (○), events (□) and arrows

Occurrence of an event

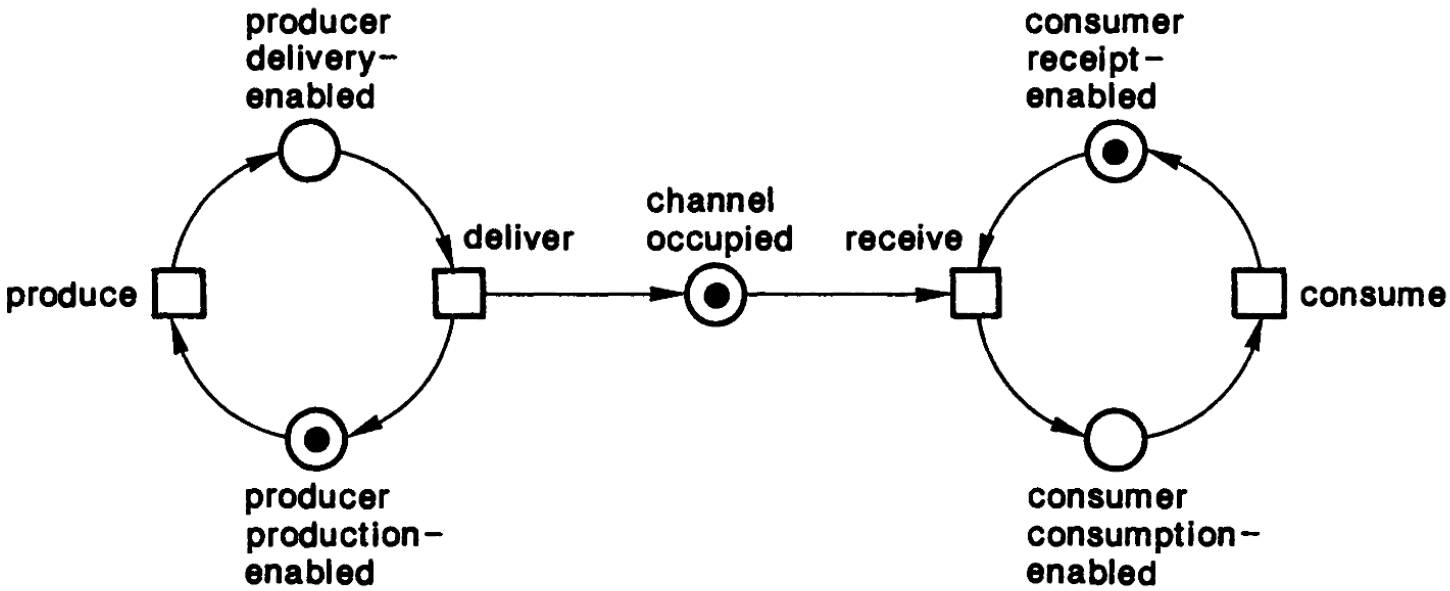
- If an event occurs, its previously fulfilled preconditions are unfulfilled and its (previously unfulfilled) postconditions are fulfilled



A producer-consumer system



Occurrence of an event



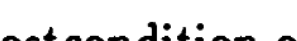
Rules - part I

A *net consisting of conditions and events* is based on

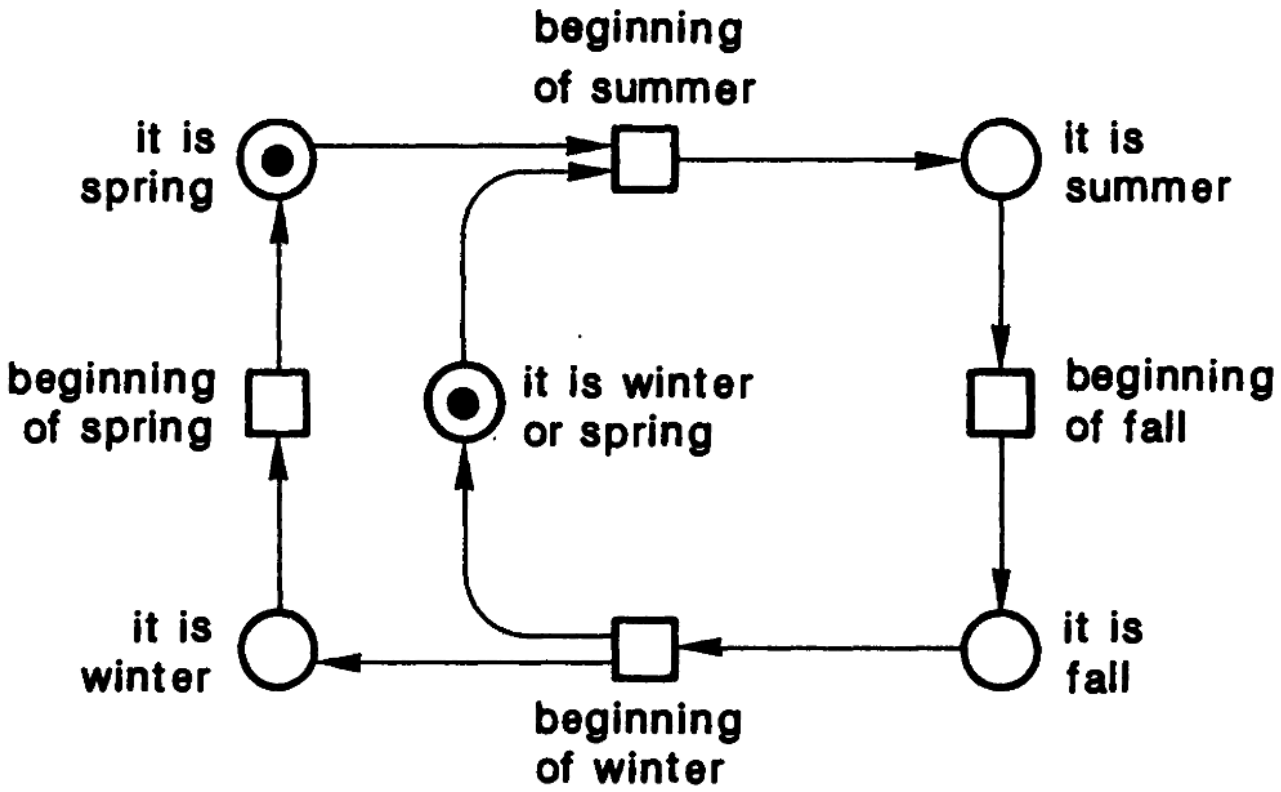
- *conditions*, represented as circles (○);
- *events*, represented as boxes (□);
- *arrows from conditions to events* (○⟶□);
- *arrows from events to conditions* (□⟶○);
- *tokens* in some conditions (◉) which indicate the *initial* case, i.e. the conditions fulfilled at the outset.

Rules - part II

In a net consisting of conditions and events

- a condition b is a *precondition* of an event e if there is an arrow  ;
- a condition b is a postcondition of an event e if there is an arrow  ;
- in any given situation every condition is either *fulfilled* or *unfulfilled*;
- every fulfilled condition is indicated by a *token*;
- a *case* consists of the conditions fulfilled in a given situation.

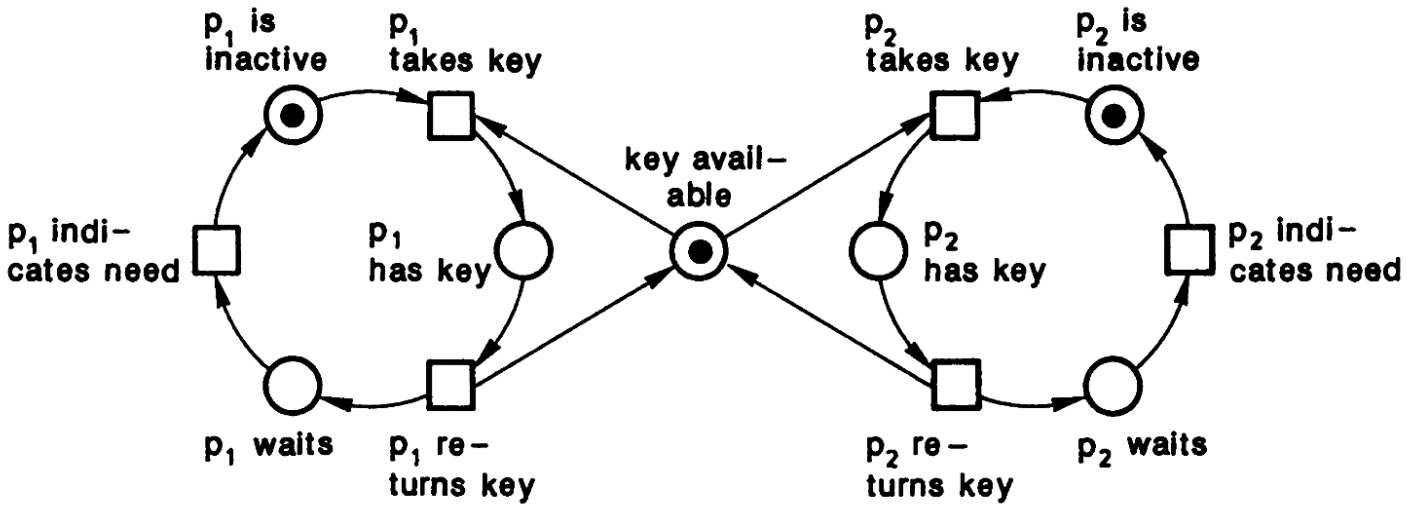
Rules - part III



- Represent the following conditions:
  - It is autumn or winter,
  - It is not summer.

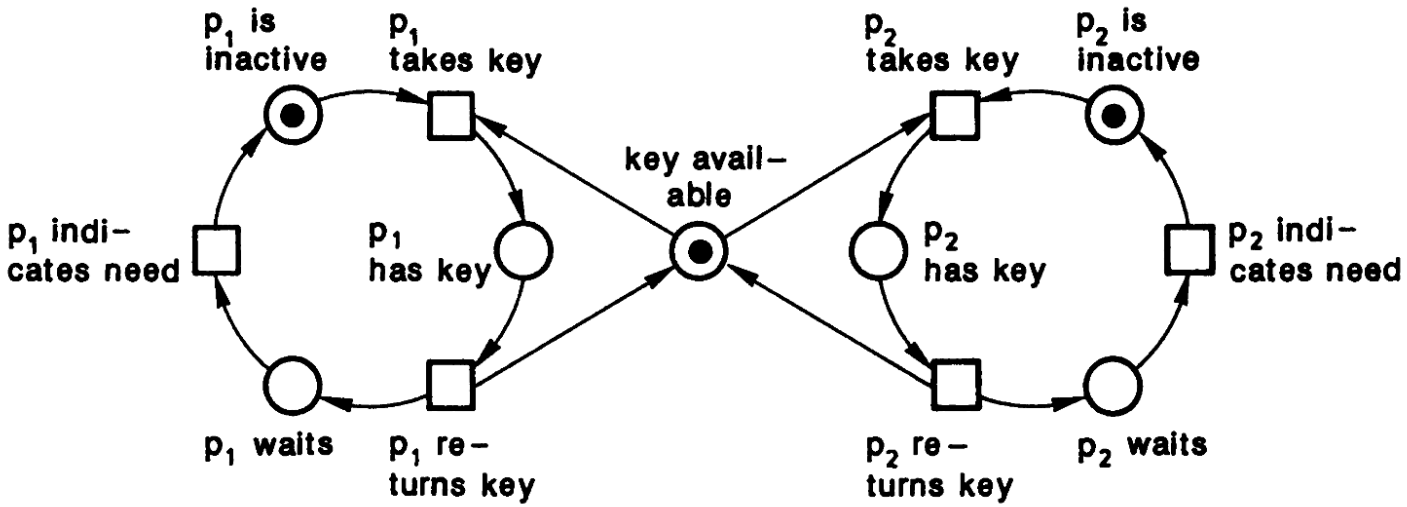
Non-determined behavior

- An important characteristic of condition-event nets is their **non-determined behavior** in the case of a conflict.

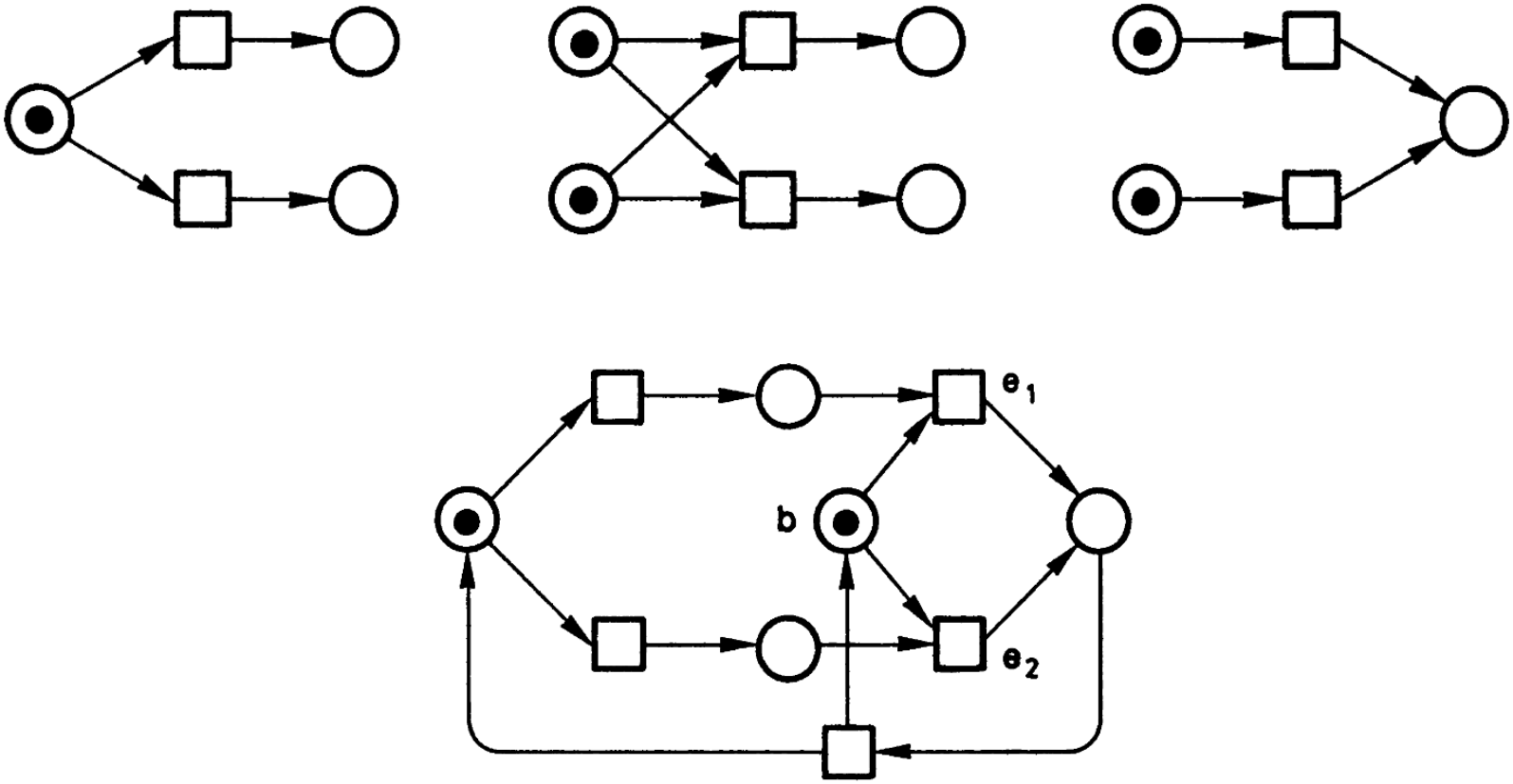


Non-determined behavior

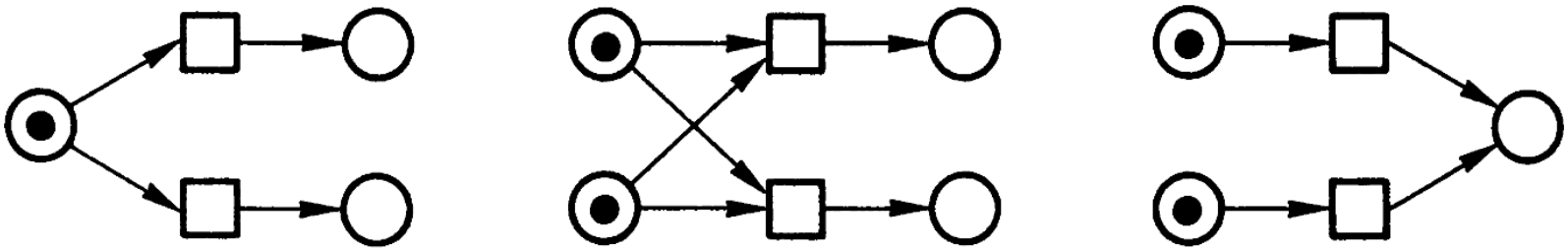
- Two events of a condition-event net are in conflict with one another if both are activated and the other is no longer activated as a result of the occurrence of one event.



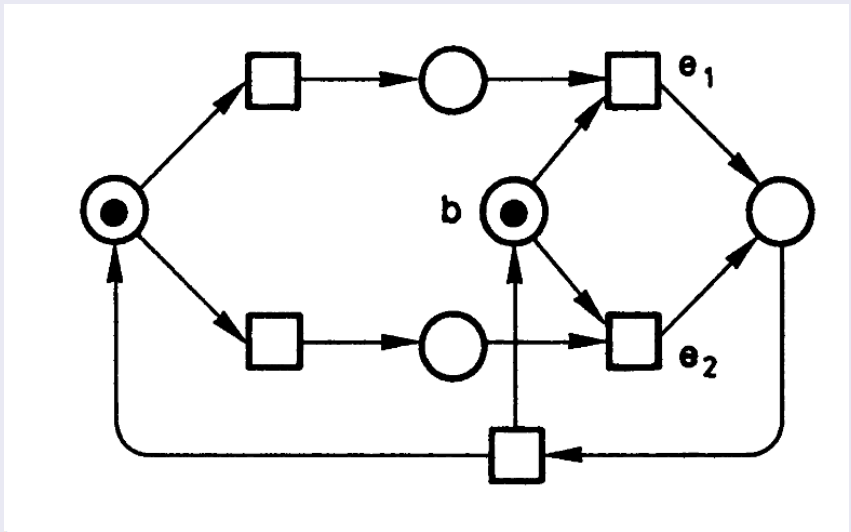
Examples of confict



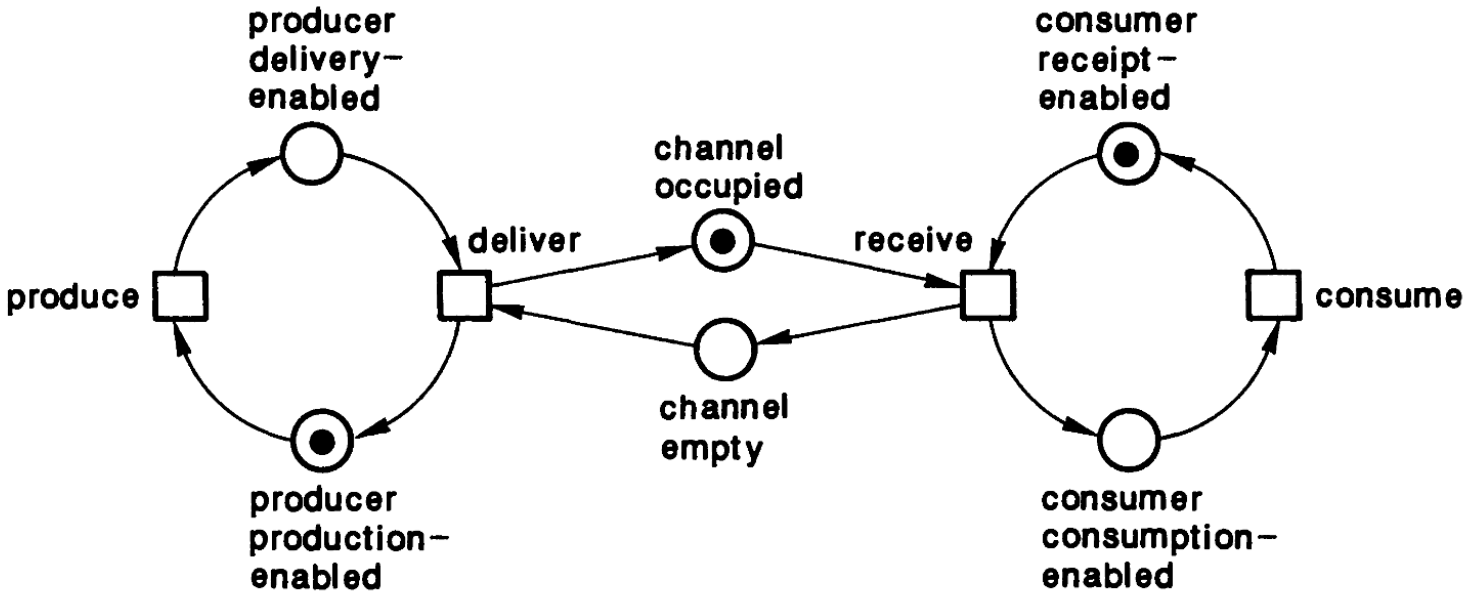
Examples of confict



e_1 and e_2 both have the condition b in their pre-set. However, there is never a conflict between them



Contact and Complementation



In a condition-event net a condition b' is a *complement* to a condition b if the following is valid for every event e:

- b is a pre-condition of e when b' is a post-condition of e;
- b is a post-condition of e when b' is a pre-condition of e;
- b' is unfulfilled in the initial case if and only if b is fulfilled in the initial case.

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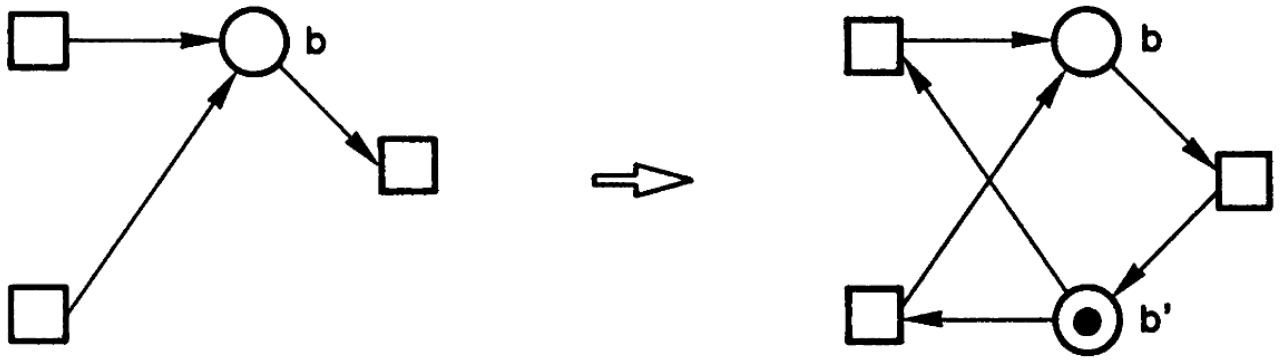

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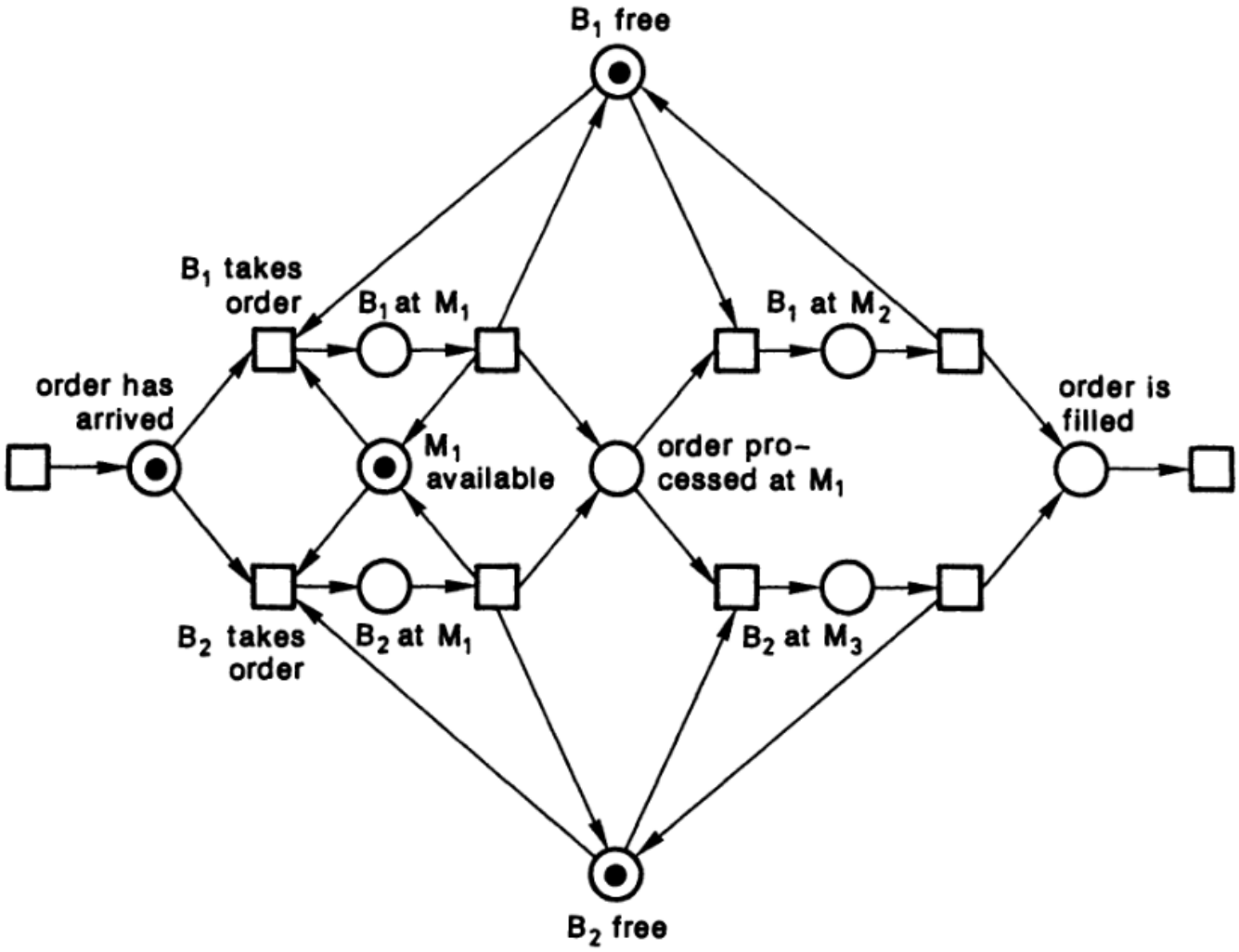
Example of Productive system - Part I

- Example of a small (production) system that consists of three machines Mi,M2,M3 and two operators B1 and B2.
- Every order will be processed first by M1, then by M2 or M3.
- The operator B1 will work on M1 and M2, whereas B2 will work on M1 and M3.

Example of Productive system - Part II



Example of self-service filling station - Part I

- a self-service filling station in which there are two pumps, with a space next to each pump so that only one car can be fueled when parked in this space and when the pump is available (green light).
- There is an attendant who is paid by the customer before the respective pump is cleared for use by the next customer.

Example of self-service filling station - Part II