Chapter 2

The Basic Concepts

Now we take a little closer look at Petri nets, that is, at their structure of places, transitions and arcs, the fundamental data structure of multisets, the structure of markings and steps and lastly the reachable markings and the final markings. We explain this with the help of the (slightly modified) cookie vending machine.

2.1 A Variant of the Cookie Vending Machine

Figure 2.1 shows a modified version of the cookie vending machine previously shown in Fig. 1.10 (the denotations A...H of the places and a...e of the transitions make the notation easier). In addition to the five rectangular cookie packets,

two round packets are now in the storage H. The customer receives two cookie packets for one euro. The machine decides non-deterministically whether those packets are rectangular or round. Bought packets are dropped into the compartment C. The customer can remove one packet at a time (via the cold transi-

two kinds of tokens:
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2.2 Components of a Net

The example of the cookie vending machine shows all the kinds of components that can occur in a Petri net.¹ We will look at them again individually and explain their roles in the model of the system.

Places

A Petri net is a structure with two kinds of elements. One kind of element is places. Graphically, a place is represented by a circle or ellipse. A place \( p \) always models a passive component: \( p \) can store, accumulate or show things. A place has discrete states.

Transitions

The second kind of elements of a Petri net are transitions. Graphically, a transition is represented by a square or rectangle. A transition \( t \) always models an active component: \( t \) can produce things, consume, transport or change them.

Arcs

Places and transitions are connected to each other by directed arcs. Graphically, an arc is represented by an arrow. An arc never models a system component, but an abstract, sometimes only notional relation between components such as logical connections, access rights, spatial proximities or immediate linkings.

In the example of the cookie vending machine, it is striking that an arc never connects two places or two transitions. An arc rather runs from a place to a transition or vice versa from a transition to a place. This is neither coincidental nor arbitrary, but

¹ The literature gives a multitude of extensions and generalizations, which are not covered here.