Process modeling in Petri Nets

Basics

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Example Petri Nets



Petri Net with a token



A Complex Petri Net



Circles are called **Places**

Rectangles are called **Transitions**

Tokens can be inserted in a set of places as **initial condition**

Then as per the **rules** of the petri-net language, the tokens move through the Petri Net

This is "**execution**" of our process, that is, state changes.

At a given point of time, **multiple places may have token**s,

The set of places which have tokens in them at a given point of time is called **Marking**

If pre-conditions of transitions are fulfilled (all its input places have tokens), the transitions are called "**enabled**"

One of the triggered transitions can "fire/trigger"

Once a transition fires, the **tokens** in the pre-places are **moved out** into output places of that transition

Basic Petri-net Elements

- Places
 - Represent states
- Transitions
 - Represent actions
- Tokens
 - Part of current state
- Arrows
 - Flow elements





Elementary Petri-Nets at most one token per place

Transition Enabling Rule

- . A Transition is Enabled only if
 - each of its preplaces (preconditions) has a token
 - after it is fired, each of its post places must be able to hold one new token



The above transition in the picture is enabled

Transition Firing Rule and Example

- Enabled transition fires, and it moves the token(s) downstream Into all post places
 - One token is removed from every preplace
 - One token is deposited in every output place



Transition Enabling Rule- multiple transitions may get enabled due to a single marking

- A marking may enable one or more transitions
- . Any one of them can be fired



We label the places and transitions So that we can analyze the state changes



Current Marking = {P1, P2} Set of enabled transitions = {t1, t2}

Firing Sequence (Trace): sequence of transition firings



- Following firing sequences (traces) are possible Note that only one transition fires at a time
 - t1 --> t3
 - t2 --> t4 -->t5
 - t2 --> t5 -->t4

Firing Sequence (Trace) is sequence of transition firings We can have many traces in a given marked net, since a marking can enable more than one transitions



- Here, the following firing sequences (traces) are possible. Note that only one transition fires at a time
 - t1 --> t3 (trace 1)
 - t2 --> t4 -->t5 (trace 2)
 - t2 --> t5 -->t4 (trace 3)





P5

Enabled transitions are shown in red



P5

Enabled transitions are shown in red