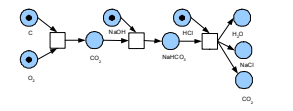



Petri Net - Modelling the Work Flow

Adam Petri

Devised in 1932 by Adam Petri to describe Chemical Reactions

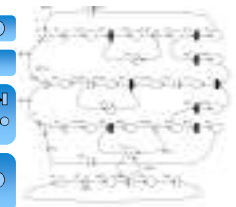
LATER In 1962 described in his thesis 'Communication with Automata' how the Petri Net can be used to model Concurrent Processing

Adam Petri





The Petri Net Notation

- A place represents state
- A transition is a process
- An arc connects a place to transition or a transition to a place. The arrow identifies direction.
- A token a small black dot identifies the current state(s) within a place.



The Petri Net Definition

Sometimes called a Place/Transition Diagrams

$$M_{p,q} = \sum_{i=1}^n M_{p,i} \cdot \Delta_i - \sum_{j=1}^m M_{j,q} \cdot \Delta_j = \sum_{i=1}^n M_{p,i} \cdot \Delta_i - \sum_{j=1}^m M_{j,q} \cdot \Delta_j$$

$$M_p = M^T \cdot \Delta \in \mathbb{N}^n, M_q = M^T$$

The above firing a transition on a marked Petri net consumes W_{ij} tokens from each of the input places i , and produces W_{ji} tokens in each of the output places j . (see Petri Net Theory and the Modeling of Systems, Adam P. Petri, 1981)

The Workflow

A workflow as described in ISO 12052:2006 is a depiction of a sequence of operations, declared as work of a person, work of a simple or complex mechanism, work of a group of persons, work of an organisation of staff, or machines

Workflow can be described in the following terms

- Activity – A logical step
- Process – An automation or manipulation
- Instances – Represents a single separate thread of execution

A workflow can usually be described using formal or informal flow diagramming techniques showing the relationship between inputs/outputs and transformations/transitions

The Firing Sequence

(1)

(2)

(3)

Split

(1)

(2)

Join

Recognised Extensions

- Inhibitor Arc denoted by a circle indicates states that this state will 'inhibit' firing.
- Stochastic Petri Net - a transition.
- Coloured - the token itself contains state - colour.

Conflict and Resolution

Petri Nets are often used to model choice and conflict. It is an excellent tool to represent non-deterministic behaviour.

Conflict

Resolution

Extensions

- Coloured Guards - limit arcs to only allow tokens of a particular colour.
- Token Cardinality - arc requires 'x' number of tokens.
- Back tracking representation - allow alternate arcs due to transition failure.

Other Processing Modelling Languages

