READINGS IN MALAYSIAN URBAN AND REGIONAL PLANNING

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CHAPTER 1

AN INTRODUCTION TO PETRI-NET

Syahriah Bachok, Mansor Ibrahim and Ummi Aqilah Khalid

INTRODUCTION

What is Petri-net?

Petri-nets have been proven to be a powerful modeling tool for various kinds of discrete event systems (Murata, 1989 & Peterson, 1981). The formalism of Petri-net provides a clear means for representing simulation and control logic. It systematically represent all the terminal activities, the shared resources, the synchronized or parallelize process, etc. (Murata, 1989 & Peterson, 1981). They can also be used to foresee, detect and prevent particular problems, i.e. the likely system congestion, blocking phenomena, and deadlocks. To this aim, most scientific literature uses Petri-Net even if other directed graphs (digraphs) seem more efficient to simplify models and detect particular system states when model is complex Maione & Naso (2003).

Sloane & Gelhot (2004) mentioned that, to understand the definition of Petri net, it is important to have a very abstract level view of the workings of a system. An example, a view stipulates existence of "state-like" objects (S) and "event-like" objects (T) and dependencies between these objects (F). The basic idea being that "any" phenomena or system can be described in terms of "cause and effect". The state-like objects become the cause for the event-like objects to "occur" and the effect of which is "another" state-like object (Sloane & Gelhot, 2004).

Further, Sloane & Gelhot (2004) explained that a Petri net consists of the following:

- A finite set of *states* or *places* (denoted S)
- A finite set (disjoint from S) of *transitions* or *events* (denoted T)
- A finite subset of $(S \times T) \cup (T \times S)$ called the *flow relation* or the *dependency relation* (denoted F)
- A mapping from S to natural numbers (including infinity) called marking (denoted M), i.e., $M : S \rightarrow \mathbf{N}$

As agreed by Hamid (2010), Sloane & Gelhot (2004), Petri nets are graphical and mathematical modeling techniques developed as effective modeling tools for concurrent system operations. They have been extended and applied to a wide variety of systems (Hamid, 2010).