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Chapter II

Petri Nets with Clocks for the Analytical Validation of Business Process

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ABSTRACT

This chapter introduces a theoretical frame for the Process Definition (PD) validation in Workflow or in those processes with temporal restrictions. The Interface 1 of Workflow makes the PD of the Work Flow Reference Model. This interface combined with Petri Nets with Clocks (PNwC) allows the formalization and verification of systems, based on the Petri Net theory and the extension. This extension allows the specification of temporal requirements via clocks specification, using temporal invariants for the places and temporal conditions in the transitions.

In this chapter we present a technique to validate the Process Definition (PD) by means of PNwC. The algorithm for the analysis of a PNwC allows correction of errors in the modeling of the time variable. The algorithm generates information about temporal unreachable states and process deadlocks with temporal blocks. Also, it corrects activities invariants and transitions conditions.

INTRODUCTION

Recently, Business Process Reengineering (BPR) has become one of the most popular topics at conferences on business management and information-systems design. BPR is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvement in critical, contemporary measures of performance, such as cost, quality, service and speed. BPR implies taking a comprehensive view of the entire existing operation, analyzing and trying to redesign it in a way that uses new technology to better serve the customers (Jacobson, Ericsson & Jacobson, 1995).

Workflow is an important and valuable technology in BPR. It is a discipline, practice and concept. Most workflow engines can handle very complex series of processes with a workflow system. Workflow is normally comprised of a number of logical steps, each of which is known as an activity. An activity can involve manual interaction with a user or a workflow participant, or the activity might be executed using machine resources. Delivering work to users does increase efficiency. Automating the actual work provides huge increases in efficiency and provides managers with the facilities to create a virtual organization and participate effectively in the e-commerce revolution (Allen, 2000).

Petri Net (PN) is a tool for studying and modeling systems. PN theory allows system modeling and obtaining a mathematical representation of the system (Peterson, 1981). An important part of these system requirements are the temporal ones. The growing complexity and critical nature of these systems have motivated the search for verification methods (Alur, Courcoubetis & Dill, 1990; Ghezzi, Mandrioli, Morascas & Pezze, 1991). The PN models use an efficient method of analysis of network behavior. More networks are analyzed by simulations than by the generation of the state space. This does not guarantee that the states with very low probability happen in long runs. The analysis of these states with low probability can be the object of a serious analysis, for example, the loss of a message in a communication network. The systematic analysis of the state space takes all the events into account, even those that are improbable.

The PNwC proposed in Montejano, Riesco, Vilallonga, Dasso and Favre (1998) and Riesco, Montejano, Vilallonga, Dasso and Uzal (1999) has a high expressive power in the concurrent and asynchronous process modeling and allows modeling real-time systems. PNwC includes additional temporal elements, clocks, which are