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Systems and software engineering — High-level Petri nets —

Part 2: Transfer format

Ingénierie des systèmes et du logiciel — Réseaux de Petri de haut niveau —

Partie 2: Format de transfert

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15909-2 was prepared by Joint Technical Committe ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

ISO/IEC 15909 consists of the following parts, under the general title *Systems and software engineering – High-level Petri nets*:

— *Part 1: Concepts, definitions and graphical notation*

— *Part 2: Transfer format*

“Extensions” will form the subject of a future Part 3.

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Introduction

ISO/IEC 15909 is concerned with defining a modelling language and its transfer format, known as *High-level Petri Nets*. ISO/IEC 15909-1 provides the mathematical definition of *High-level Petri Nets*, called the semantic model, the graphical form of the technique, known as *High-level Petri Net Graphs* (HLPNGs), and its mapping to the semantic model. It also introduces some common notational conventions for HLPNGs.

This part of ISO/IEC 15909 defines a transfer format for *High-level Petri Nets* in order to support the exchange of *High-level Petri Nets* among different tools. This format is called the *Petri Net Markup Language* (*PNML*). Since there are many different versions of *Petri nets* in addition to *High-level Petri Nets*, this part of ISO/IEC 15909 defines the *core concepts* of *Petri nets* along with an XML syntax, which can be used for exchanging any kind of *Petri net*. Based on this *PNML Core Model*, this part of ISO/IEC 15909 also defines the transfer syntax for the three versions of *Petri nets* that are defined in ISO/IEC 15909-1: *Place/Transition Nets*, *Symmetric Nets*[1], and *High-level Petri Nets*, where *Place/Transition Nets* and *Symmetric Nets* can be considered to be restricted versions of *High-level Petri Nets*. For *Place/Transition Nets*, this part of ISO/IEC 15909 introduces two different transfer formats: one is a format specifically tuned to *Place/Transition Nets*, the other is a format that represents *Place/Transition Nets* as a restricted version of *High-level Petri Nets* as defined in ISO/IEC 15909-1.

The basic level of conformance to this part of ISO/IEC 15909 is to the *PNML Core Model*. The other levels are according to the particular type of the *Petri net*; for *High-level Petri Nets* there are two levels of conformance: *textual conformance* ignores the exact syntax and structure of the *labels*; *structural conformance* requires that *labels* are given in the exact syntax as defined here. Since *Symmetric Nets* are designed for analysability, *textual conformance* does not make any sense for *Symmetric Nets*; therefore, there is only *structural conformance* for *Symmetric Nets*.

Note that this part of ISO/IEC 15909 introduces some concepts that are not defined in ISO/IEC 15909-1. These concepts are not related to the mathematical concepts of *Petri nets* and their semantics. They concern the graphical representation of nets and the structuring of large *Petri net* models. These concepts need to be defined, along with a transfer format for *Petri nets*, in order to ensure that the graphical appearance of a *Petri net* in different tools is similar.

This part of ISO/IEC 15909 is structured as follows: Clause 1 describes the scope, the areas of application and the intended audience of this part of ISO/IEC 15909. Clause 2 defines conformance. Clause 3 gives references that are essential for the correct interpretation of this International Standard. Clause 4 defines all terms relevant to this International Standard and includes a list of abbreviations. Clause 5 introduces the concepts of PNML using UML meta models. Clause 5.2 defines the *PNML Core Model*, which is the structure common to all versions of *Petri nets*. Clause 5.3 defines the particular concepts of the different *Petri net types*. Clause 6 provides the mapping of the syntactical concepts defined in this part of ISO/IEC 15909 to the concepts defined in ISO/IEC 15909-1. Clause 7 defines how the concepts of PNML as defined in Clause 5 are mapped to XML syntax.

Annex A defines the exact XML syntax for the *PNML Core Model* in terms of a RELAX NG grammar. Annex B defines the exact XML syntax for the different types of *Petri nets*. Annex C provides a small example for the syntax of a symmetric net. Annex D discusses a framework for implementing this International Standard and an API for accessing *Petri nets*, which is based on the UML models for the PNML meta models.

[1] Symmetric nets were first introduced as well-formed nets and are currently standardized as ISO/IEC 15909-1:2004/Amd. 1:2010.

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