# INTERNATIONAL STANDARD

# ISO/IEC 15909-1

First edition
2004-12-01

**AMENDMENT 1**
2010-05-15

**Software and system engineering — High-level Petri nets —**

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

AMENDMENT 1: Symmetric Nets

*Ingénierie du logiciel et du système — Réseaux de Petri de haut niveau —*

*Partie 1: Concepts, définitions et notation graphique*

*AMENDEMENT 1: Réseaux symétriques*





Reference number
ISO/IEC 15909-1:2004/Amd.1:2010(E)

# Foreword

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Amendment 1 to ISO/IEC 15909-1:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This amendment to ISO/IEC 15909-1 concerns the addition of a class of high-level nets, known as Symmetric Nets, to Annex B and the corresponding changes required to the Conformance Clause. Additional references related to Symmetric Nets are to be included in the Bibliography. Revised Annex B is included in full, due to some minor notational corrections in clause B.1.



 

# Software and system engineering — High-level Petri nets —

## Part 1: Concepts, definitions and graphical notation

## AMENDMENT 1: Symmetric Nets

*Cover page and page 1*

In the document title, replace "Software and system engineering" with "Systems and software engineering".

*Page 19, Conformance*

Insert the following subclause after subclause 9.1 (PN Conformance):

### 9.2 Conformance to Symmetric Nets

This subclause expresses the requirements for a tool implementing high-level Petri nets to conform to the Symmetric Net class.

#### 9.2.1 Level 1

To claim Level 1 conformance to the Symmetric Net class of this International Standard, an implementation shall demonstrate that it has the semantics defined in clause 4, with the types (domains) and pre and post functions that can be derived from the Symmetric Net Graph defined in Annex B.2, by providing a mapping from the implementation's syntax to the semantic model in a similar way to that defined in clause 8.

#### 9.2.2 Level 2

To claim Level 2 conformance to the Symmetric Net class of this International Standard, an implementation must satisfy the requirements for Level 1 conformance to the Symmetric Net class and additionally shall include the syntax of the Symmetric Net Graph defined in Annex B.2 and the notational conventions of clause 7.

Change the numbering of HLPN Conformance to subclause 9.3.

*Page 25, Annex B*

Replace normative Annex B with the text starting on the next page, which adds new clause B.2 to define the Symmetric Net class of High-level Petri Net Graphs (HLPNGs).

 

# Annex B
(normative)
# Net Classes

The purpose of this Annex is to define various classes of nets as subclasses of the HLPNG. It currently comprises two clauses: B.1 for Place/Transition nets (without capacities), which is a common form of Petri nets where tokens are simply 'black dots'; and B.2 for Symmetric Nets, which describes a basic form of coloured Petri nets with simple types that are amenable to efficient analysis. Other subclasses may include Elementary Net systems and other high-level nets.

## B.1 Place/Transition Nets

A Place/Transition net graph (without capacity), **PTNG**, is a special HLPNG

$$\mathbf{PTNG} = (NG, Sig, V, H, Type, AN, M_0)$$

where

- $NG = (P, T, F)$ is a net graph
- $Sig = (S, O)$ with $S = \{Dot, Bool, Mdot\}$, $O = \{\bullet_{Dot}, true_{Bool}, 1_{Mdot}, 2_{Mdot}, \ldots\}$
- $V = \emptyset$
- $H = (\{dot, Boolean, \mu dot\}, \{\bullet, true, 1`\bullet, 2`\bullet, \ldots\})$ a many-sorted algebra for the signature $Sig$, with $dot = \{\bullet\}$, $\mu dot = \{\{(\bullet, n)\} | n \in N\}$ and $H_{Dot} = dot$, $H_{Bool} = Boolean$, $H_{Mdot} = \mu dot$, $(\bullet_{Dot})_H = \bullet$, $(true_{Bool})_H = true$, $(1_{Mdot})_H = 1`\bullet$, $(2_{Mdot})_H = 2`\bullet$ etc.
- $Type : P \rightarrow \{dot, Boolean, \mu dot\}$ is a function that assigns the type $dot$ to all places ($\forall p \in P$, $Type(p) = dot$).
- $AN = (A, TC)$ is a pair of net annotations:
  - $A : F \rightarrow \{1_{Mdot}, 2_{Mdot}, \ldots\}$ is a function that annotates each arc with a syntactic 'positive integer' constant, that when evaluated becomes the corresponding multiset over $dot$.
  - $TC : T \rightarrow \{true_{Bool}\}$ is a function that annotates every transition with the syntactic constant true (which by convention is omitted) that on evaluation is the Boolean value $true$.
- $M_0 : P \rightarrow \mu dot$.

Although this is a rather baroque definition of Place/Transition nets, it can be seen to be in one to one correspondence with a more usual definition given below.

$$\mathbf{PTNG} = (NG, W, M_0)$$

where

- $NG = (P, T; F)$ is a net graph.
- $W : F \rightarrow N^+$ is the weight function, assigning a positive integer to each arc.
- $M_0 : P \rightarrow N$ is the initial marking assigning a natural number of tokens to each place. These are represented by dots ($\bullet$).

This is because:

- the transition condition is true for each transition, and hence doesn't need to be considered,

 

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