ISO/IEC 15909-1:2019 (E)

Systems and software engineering — High-level Petri nets — Part 1: Concepts, definitions and graphical notation

Contents

Foreword

Introduction

1 Scope

2 Normative references

3 Terms and definitions

4 Conformance

4.1 General
4.2 Mandatory conformance: common concepts for Petri nets
4.3 Place/Transition nets
4.4 Symmetric nets
4.5 High-level Petri nets
4.5.1 Level 1
4.5.2 Level 2
4.6 Petri nets with priorities
4.7 Petri nets with time — Level 1

5 Common concepts for Petri nets

5.1 General
5.2 Definition
5.2.1 Concept 1 (net)
5.2.2 Concept 2 (marking of a net)
5.2.3 Concept 3 (marked net)
5.2.4 Concept 4 (precondition of a transition)
5.2.5 Concept 5 (postcondition of a transition)
5.2.6 Notation 1 (precondition and postcondition of a transition)
5.3 Behavioral semantics
5.3.1 General
5.3.2 Concept 6 (net enabling rule)
5.3.3 Concept 7 (net firing rule)

6 Place/Transition nets

6.1 General
6.2 Definition — Concept 8 (place/transition net)
6.3 Behavioral semantics
6.3.1 General
6.3.2 Concept 9 (marking of a P/T net)
6.3.3 Concept 10 (P/T net enabling rule)
6.3.4 Concept 11 (enabling function of enabled transitions)
6.3.5 Concept 12 (P/T net firing rule)

7 Symmetric nets

7.1 Definition
7.1.1 Concept 13 (color class)
7.1.2 Concept 14 (color domain)
7.1.3 Concept 15 (symmetric net)
7.1.4 Concept 16 (basic color functions)
7.1.5 Concept 17 (class color functions)
7.2 Behavioral semantics

7.2.1 Concept 18 (marking of a symmetric net)
7.2.2 Concept 19 (symmetric net enabling rule)
7.2.3 Concept 20 (symmetric net firing rule)

8 High-level Petri nets

8.1 General
8.2 Definition — Concept 21 (high-level Petri net)
8.3 Behavioral semantics
8.3.1 Concept 22 (marking of a high-level Petri net)
8.3.2 Concept 23 (high-level Petri net enabling rule)
8.3.3 Concept 24 (high-level Petri net firing rule)

9 Petri nets with priorities

9.1 General
9.2 Definition
9.2.1 Concept 25 (dynamic prioritized Petri net)
9.2.2 Concept 26 (statically prioritized Petri net)
9.3 Behavioral semantics
9.3.1 Concept 27 (marking of a prioritized Petri net)
9.3.2 Concept 28 (prioritized Petri net enabling rule)

10 Time Petri nets

10.1 General
10.2 Definition
10.2.1 Concept 29 (generic time Petri net)
10.2.2 Concept 30 (time Petri net)
10.3 Behavioral semantics
10.3.1 General
10.3.2 Concept 31 (time Petri net enabling rule)
10.3.3 Concept 32 (time Petri net firing rule)

Annex A (normative) Mathematical conventions

A.1 General
A.2 Sets — Notation 2 (basic sets)
A.3 Boolean functions
A.4 Relation functions
A.5 Multisets
A.5.1 Definitions
A.5.1.1 Concept 33 (multiset)
A.5.1.2 Concept 34 (support of a multiset)
A.5.1.3 Notation 3 (set of multisets)
A.5.1.4 Concept 35 (membership)
A.5.1.5 Notation 4 (occurrences of an element)
A.5.1.6 Concept 36 (empty multiset)
A.5.1.7 Concept 37 (sum representation)
A.5.1.8 Concept 38 (cardinality and finite multiset)
A.5.1.9 Concept 39 (sub-multiset)
A.5.1.10 Concept 40 (multiset equality)
A.5.2 Multiset operations
A.5.2.1 General
A.5.2.2 Concept 41 (addition of multisets)
A.5.2.3 Concept 42 (subtraction of multisets)
A.5.2.4 Concept 43 (scalar multiplication of a multiset)
A.5.3 Bags
A.5.3.1 General
A.5.3.2 Concept 44 (bag, support and sum representation)
A.5.3.3 Notation 5 (bag notation, bag equivalence with the supporting set)
A.5.3.4 Concept 45 (cardinality)
A.5.3.5 Concept 46 (sub-bag)
A.5.3.6 Concept 47 (addition of bags)
A.5.3.7 Concept 48 (subtraction of bags)
A.5.3.8 Concept 49 (embedding of cartesian products)

Annex B (informative) Guidelines for graphical notations

B.1 General
B.2 Common concepts for Petri nets
B.2.1 General
B.2.2 Overview of all annotations
B.2.3 Places
B.2.4 Arcs
B.2.5 Transitions
B.3 Place/Transition Petri nets
B.3.1 General
B.3.2 Places
B.3.3 Arcs
B.3.4 Transitions
B.3.5 Example
B.4 Symmetric nets
B.4.1 General
B.4.2 Declarations
B.4.3 Places
B.4.4 Arcs
B.4.5 Transitions
B.4.6 Example
B.5 High-level Petri nets
B.5.1 General
B.5.2 Declarations
B.5.3 Places
B.5.4 Arcs
B.5.5 Transitions
B.5.6 Example
B.6 Petri nets with priorities
B.6.1 General
B.6.2 Example
B.7 Petri nets with time
B.7.1 General
B.7.2 Example

Page count: 29