ISO/IEC 21823-4:2022-03 (E)

Internet of things (IoT) - Interoperability for IoT systems - Part 4: Syntactic interoperability

Contents

Page

FOREWORD 4
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 6
4 Abbreviated terms 7
5 Principle for IoT syntactic interoperability 7
5.1 General 7
5.2 Principle for IoT syntactic interoperability 7
5.3 Relevant technologies for syntactic interoperability 8
5.3.1 Metamodel and syntactic interoperability 8
5.3.2 Metamodel-driven approaches supporting interoperability issues 9
5.4 The overall structure of the proposed approach 9
5.5 The methodology of metamodel-driven information exchange 10
5.6 Information exchange rules 11
5.6.1 Categories of information exchange rules 11
5.6.2 Information exchange rules expression 12
5.6.3 Information exchange rules expression example 12
6 Requirements on information related to IoT devices 12
6.1 General 12
6.2 General requirements on the translation rules 13
6.2.1 General 13
6.2.2 Required intrinsic properties of physical IoT devices (IPIoT) 13
6.2.3 Required extrinsic properties of physical IoT devices (EPIoT) 14
6.3 General requirements on the operation rules 15
6.3.1 Overview of mismatches between IoT systems 15
6.3.2 Required properties and syntactic resolutions for potential IoT mismatches 17
6.3.3 Details of required properties and syntactic resolutions for potential IoT mismatches 18
7 A framework for IoT syntactic interoperability 30
7.1 General 30
7.2 A conceptual model for dataset of operation rules (DOR) 31
7.3 Detailed procedures for a syntactic interoperability framework 31
7.3.1 Procedure A to prepare the required properties and resolutions 31
7.3.2 Procedure B to create information exchange rules (DIER) 32
7.3.3 Procedure C to execute the information exchange rules and check the result 32
Annex A (informative) Properties for physical IoT devices and data 33
A.1 Intrinsic properties of physical IoT devices 33
A.2 Extrinsic properties of physical IoT devices 35
Annex B (informative) A use case 37

B.1 General 37
B.2 The use case overview: Connected car and vehicle in smart city 37
B.3 A scenario of this use case 38
B.3.1 The architecture of this use case 38
B.3.2 Scenario: Data exchange between a connected car and a traffic management system (TMS) 38
B.4 Examples used in this use case 39
B.4.1 General 39
B.4.2 Illustrated example files and their relationships 40
Annex C (informative) Other metamodel definitions 41
Bibliography 42

Figure 1 – The overall structure of the proposed approach 9
Figure 2 – Model hierarchies and metamodel-driven information exchange rules 10
Figure 3 – Categories of information exchange rules 11
Figure 4 – Excerpted information exchange rules for Annex B 12
Figure 5 – Classifications of requirements on information related to IoT devices 13
Figure 6 – A procedure for mismatch detection and resolution 16
Figure 7 – An example of mismatch detection and resolution 17
Figure 8 – A framework for processes on developing information exchange rules related to IoT devices from the syntactic viewpoint 30
Figure 9 – An excerpted conceptual model of DOR (dataset of operation rules) 31
Figure 10 – Steps of Procedure A 32
Figure B.1 – Overall view of use case 1 37
Figure B.2 – Architecture of connected car and vehicle in smart city use case 38
Figure B.3 – Information exchange between a car and a TMS 38
Figure B.4 – Relationships of example files for this use case 40

Table 1 – Required intrinsic properties of physical IoT devices 14
Table 2 – Required extrinsic properties of physical IoT devices 15
Table 3 – Required properties and resolutions for potential IoT mismatches 18
Table 4 – Mismatch1: Synchronization mismatch 19
Table 5 – Mismatch2: Sampling frequency mismatch 20
Table 6 – Mismatch3: Location mismatch 21
Table 7 – Mismatch4: Data recording pattern mismatch 22
Table 8 – Mismatch5: Precision mismatch 23
Table 9 – Mismatch6: Significant figure mismatch 24
Table 10 – Mismatch7:Range mismatch 25
Table 11 – Mismatch8: Calibration mismatch 26
Table 12 – Mismatch9: Response time mismatch 27
Table 13 – Mismatch10: Acquisition status mismatch 28
Table 14 – Mismatch11: Unit mismatch 29
Table A.1 – Intrinsic properties of physical IoT devices 33
Table A.2 – Extrinsic properties of physical IoT devices 36
Table C.1 – Definitions of metamodel in various resources 41