ISO/IEC 30141:2024-08 (E)

Internet of Things (IoT) - Reference architecture

Contents

Page

FOREWORD 5
INTRODUCTION 7
0.1 General 7
0.2 About Internet of Things (IoT) 7
0.3 IoT sources of information 7
0.4 General principles of a reference architecture 8
1 Scope 9
2 Normative references 9
3 Terms and definitions 9
4 Abbreviated terms 9
5 IoT RA context 10
5.1 Overview 10
5.2 Stakeholders and concerns 11
6 IoT RA viewpoints and views 12
6.1 Overview 12
6.2 Foundational IoT viewpoint and views 13
6.2.1 Foundational IoT viewpoint 13
6.2.2 Foundational IoT view 13
6.3 Business viewpoint and view 19
6.3.1 Business viewpoint 19
6.3.2 Business view 19
6.4 Usage viewpoint and view 21
6.4.1 Usage viewpoint 21
6.4.2 Usage view 21
6.5 Functional viewpoint and view 22
6.5.1 Functional viewpoint 22
6.5.2 Functional view 23
6.6 Trustworthiness viewpoint and view 25
6.6.1 Trustworthiness viewpoint 25
6.6.2 Trustworthiness view 26
6.7 Construction viewpoint and views 29
6.7.1 Construction viewpoint 29
6.7.2 Construction view 31
6.7.3 IoT component pattern 32
Annex A (normative) Additional IoT construction patterns 38
A.1 General 38
A.2 Reference Architecture Model Industrie 4.0 (RAMI 4.0) pattern 38
A.3 Dynamic IoT system pattern 40
A.4 IoT enterprise system pattern 43
A.5 IoT enterprise networking pattern 45
A.6 IoT enterprise usage pattern 47
Annex B (informative) Guidance on the use of ISO/IEC/IEEE 42010:2022 53

B.1 Overview 53
B.2 Systems and architectures 53
B.3 Elements in ISO/IEC/IEEE 42010:2022 used in ISO/IEC 30141 IoT reference architecture description 53
B.3.1 Overview 53
B.3.2 Stakeholders, perspective, and concerns 54
B.4 Viewpoints, model kinds, legends, correspondences, and correspondence methods 55
B.5 Views and models 55
B.6 Correspondences 55
Annex C (informative) Characteristics for IoT systems in particular contexts 56
C.1 Common characteristics 56
C.1.1 Legacy support 56
C.1.2 Network connectivity 56
C.1.3 Unique identification 56
C.1.4 Well-defined components 57
C.1.5 Auto-configuration 57
C.1.6 Content-awareness 57
C.1.7 Context-awareness 57
C.1.8 Discoverability 57
C.1.9 Manageability 58
C.1.10 Network management and operation 58
C.1.11 Real-time capability 58
C.1.12 Self-description 59
C.1.13 Service subscription 59
C.2 Characteristics related to trustworthiness 59
C.2.1 Data characteristics – volume, velocity, veracity, variability, and variety 59
C.2.2 Protection of personally identifiable information (PII) 60
C.2.3 Flexibility 60
Bibliography 61

Figure 1 – Using the IoT RA standard 8
Figure 2 – Relationship between IoT component, IoT system and IoT environment 14
Figure 3 – Example of IoT environment 16
Figure 4 – External facing functions 21
Figure 5 – Internal model of abstract function classes 23
Figure 6 – Legend used in the trustworthiness view 26
Figure 7 – IoT architecture construction view 31
Figure 8 – Capabilities of an IoT component 32
Figure A.1 – RAMI 4.0 39
Figure A.2 – DSC components 41
Figure A.3 – Message flow in DSC 42
Figure A.4 – Home smart air cleaning service 42
Figure A.5 – Example system deployment model 43
Figure A.6 – Networking model 45
Figure A.7 – Roles present when the system is in use 48
Figure A.8 – IoT service provider subroles and activities 48

Figure A.9 – IoT service developer subroles and activities 49
Figure A.10 – IoT subroles and activities 50
Figure A.11 – Activities of device and application development 50
Figure A.12 – Using device data for security-related analytics and operations. 51
Figure B.1 – Conceptual model of an architecture description 54

Table 1 – List of viewpoints, stakeholders, and concerns 11
Table 2 – Foundational IoT viewpoint 13
Table 3 – Business viewpoint 19
Table 4 – Usage viewpoint 21
Table 5 – Functional viewpoint 23
Table 6 – Trustworthiness viewpoint 26
Table 7 – Construction viewpoint 30
Table 8 – Construction pattern legend 30
Table 9 – IoT component pattern 32
Table 10 – Additional information on IoT component capabilities 33
Table 11 – Key capability transformations 35
Table 12 – IoT system pattern 36
Table A.1 – RAMI 4.0 pattern 38
Table A.2 – Dynamic IoT system pattern 40
Table A.3 – IoT enterprise system pattern 43
Table A.4 – IoT enterprise networking system 45
Table A.5 – IoT enterprise usage pattern 47
Table A.6 – Overview of activities and roles 51
Table A.7 – Overview of enterprise activities and roles 52