

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 |