

ISO/IEC TR 30172:2023-10 (E)

Internet of things (IoT) - Digital twin - Use cases

Contents	Page
FOREWORD.....	5
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Abbreviated terms	9
5 Applications.....	9
5.1 Application domains.....	9
5.2 Life cycle stage coverage.....	10
6 Use cases	10
6.1 Overview.....	10
6.2 Properties.....	10
6.3 Basic statistics.....	11
6.3.1 Use cases by application domain.....	11
6.3.2 Use cases by status of life cycle	13
7 Use case summaries	14
Annex A (informative) Use case template.....	16
A.1 General.....	16
A.2 Description of use case.....	16
A.2.1 Name of use case.....	16
A.2.2 Digital twin application area or context of use	16
A.2.3 Version management.....	17
A.2.4 Basic information to use case	17
A.2.5 Scope of use case (bullet points).....	18
A.2.6 Objectives of use case (bullet points)	18
A.2.7 Narrative of use case.....	18
A.2.8 Entities which need to be modelled as digital entities in use case	19
A.2.9 Actors: people, organizations or systems.....	19
A.2.10 Life cycle of digital twin system in use case	20
A.2.11 Key performance indicators (KPIs) of use case.....	21
A.2.12 Digital infrastructures.....	21
A.2.13 Referenced standards and standardization committees (optional).....	22
A.2.14 Referenced papers or patent (optional).....	22
A.2.15 Relation with other known use cases, for example common requirements (optional).....	22
A.2.16 General remarks (optional)	22
A.2.17 Challenges and issues (optional)	22
A.2.18 Data security, privacy and trustworthiness (optional)	23
A.2.19 User requirements and interactions with other actors (optional).....	23
A.3 Drawings or diagrams depicting the use case	23
A.3.1 Drawing of use case	23
A.3.2 Data flow diagram of use case (optional)	23
A.3.3 Sequence diagram(s) of use case (optional)	23
A.3.4 Deployment diagram(s) of use case (optional)	24
A.3.5 Others (optional).....	24
Annex B (informative) Collected use cases	25

B.1	Smart building – Smart building operation based on digital twins	25
B.1.1	Description of use case	25
B.1.2	Drawings or diagrams depicting the use case	37
B.2	Industrial smart park – Digital twin based industrial smart park design and construction	39
B.2.1	Description of use case	39
B.2.2	Drawings or diagrams depicting the use case	46
B.3	Smart city – Digital twin based smart city management system	49
B.3.1	Description of use case	49
B.3.2	Drawings or diagrams depicting the use case	59
B.4	Smart energy – Construction and application of digital twins for a large oil and gas processing facility	61
B.4.1	Description of use case	61
B.4.2	Drawings or diagrams depicting the use case	73
B.5	Smart building – Monitoring of water	74
B.5.1	Description of use case	74
B.5.2	Drawings or diagrams depicting the use case	82
B.6	Smart Power Grid – Smart grid operation based on a digital twin	82
B.6.1	Description of use case	82
B.6.2	Drawings or diagrams depicting the use case	90
B.7	Smart construction life cycle – Construction-phase digital twin model	91
B.7.1	Description of use case	91
B.7.2	Drawings or diagrams depicting the use case	104
B.8	Smart building – Residential explicit demand response – Consumer behavioural digital twin for energy demand prediction	106
B.8.1	Description of use case	106
B.8.2	Drawings or diagrams depicting the use case	119
B.9	Smart city - Greater Hobart Digital Twin	120
B.9.1	Description of use case	120
B.9.2	Drawings or diagrams depicting the use case	129
B.10	Smart city - NSW Spatial Digital Twin	130
B.10.1	Description of use case	130
B.10.2	Drawings or diagrams depicting the use case	138
B.11	Transport - Sydney Trains Engineering and Maintenance Digital Twin	138
B.11.1	Description of use case	138
B.11.2	Drawings or diagrams depicting the use case	145
B.12	Transport - TfNSW Infrastructure Delivery Digital Twin	148
B.12.1	Description of use case	148
B.12.2	Drawings or diagrams depicting the use case	155
B.13	Smart energy – From grid planning to grid operation and maintenance, based on grid digital twin(s)	157
B.13.1	Description of use case	157
B.13.2	Drawings or diagrams depicting the use case	164
B.14	Smart energy – Electrical field level subsystem digital twin, as the basis for its specification, commissioning, operation and maintenance	165
B.14.1	Description of use case	165
B.14.2	Drawings or diagrams depicting the use case	174
	Bibliography.....	177

Figure 1 – Distribution of use cases collected in Annex B by application domains	12
Figure 2 – Statistics on adopted key technologies from use cases in JTC 1/AG 11 report.....	13
Figure B.1 – Geometric analysis of safety prevention.....	94
Figure B.2 – Identification of close proximity events between heavy machinery.....	95
Figure B.3 – Safety training scenario	95
Figure B.4 – Segmented construction components after voxel space point matching.....	96
Figure B.5 – Sample defect predictions	96
Figure B.6 – On-site defect visualization, defect confirmation, and addition of remedial work.....	97
Figure B.7 – Use case diagram: before construction starts.....	104
Figure B.8 – Use case diagram: during construction	105
Table 1 – List of use cases in JTC 1/AG 11 report	12
Table 2 – List of use cases by status of life cycle.....	14
Table 3 – List of use cases	14
Table A.1 – Description of some qualitative indicators	21