



TECHNICAL REPORT

**Internet of Things (IoT) - IoT-based management of tangible cultural heritage
assets -
Part 2: Use cases**

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Internet of Things (IoT) - IoT-based management of tangible cultural heritage assets - Part 2: Use cases

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ISO/IEC TR 30189-2 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is a Technical Report.

The text of Technical Report is based on the following documents:

Draft	Report on voting
JTC1-SC41/619/DTR	JTC1-SC41/643/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives

A list of all parts in the ISO/IEC 30189 series, published under the general title *Internet of Things (IoT) - IoT-based management of tangible cultural heritage assets*, can be found on the IEC and ISO websites.

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INTRODUCTION

Cultural heritage assets refer to museums, historical landmarks, artworks, and other culturally significant artefacts. Managing these assets contributes to their preservation and ensures long-term accessibility for future generations. **Cultural heritage** management includes activities that prevent damage, deterioration and theft by applying appropriate preservation and protection measures; see [ISO 21127:2014 \[1\]](#), [EN 15898:2019 \[2\]](#), [EN 15757:2010 \[3\]](#) and [EN 16893:2018 \[4\]](#) for more information.

IoT technology supports the management of tangible **cultural heritage** assets. In particular, **IoT**-based sensing, monitoring, and location tracking can improve the effectiveness of asset management; see [ISO/IEC TR 22417:2017 \[5\]](#) and [ISO/IEC 30141:2018 \[6\]](#) for more information.

In status monitoring, **IoT** technology enables tracking of the condition of **cultural heritage** assets, such as temperature and humidity levels in museums. Monitoring environmental conditions helps prevent damage and deterioration, as certain factors can negatively affect valuable assets. Real-time monitoring enables timely corrective actions and supports preservation under appropriate conditions.

In intrusion detection, **IoT** technology is utilized to identify the presence of unauthorized animals or persons. This capability is crucial for protecting **cultural heritage** assets, especially those in remote locations that are susceptible to damage from intrusions. When a camera or sensor detects an intruder, the system issues an alert, enabling a swift response to secure the asset.

In location tracking, **IoT** technology enables real-time monitoring of asset location and movement through the application of suitable sensors. This helps prevent theft and ensures proper protection of valuable assets. For example, when an artefact is removed from its display, the **IoT** sensor can trigger an alert, making possible prompt action to secure the asset.

This document describes the use of **IoT** technology for the management of **cultural heritage** assets. It provides information and guidelines for developing platforms and services that support **IoT**-based **cultural heritage** management.

The [ISO/IEC TR 30189 series \[7\]](#) consists of two parts.

- Part 1 describes a framework for the use of **IoT** technology for management of tangible **cultural heritage** assets, which includes the associated functional entities and information flows.
- Part 2 describes a set of use cases for **IoT**-based management of tangible **cultural heritage** assets, based on the framework.

1 Scope

This document describes the use cases for IoT-based management of tangible cultural heritage assets, which builds upon the framework provided in ISO/IEC TR 30189-1:2025 [8].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

cultural heritage

legacy of physical objects and intangible attributes of a group or a society that are inherited from past generations, maintained and protected in the present and preserved for future generations

[SOURCE: ISO 18461:2016 [9], 2.1.3]

3.2

Internet of Things

infrastructure of interconnected entities, people, systems and information resources together with services which processes and reacts to information from the physical world and virtual world

[SOURCE: ISO/IEC 20924:2024 [10], 3.2.8]

4 Abbreviated terms

BIM	building information modelling
GNSS	Global Navigation Satellite System
HBIM	historic building information modelling
IoT	Internet of Things
PII	personally identifiable information
SMS	Short Message Service

5 Use case scenarios

5.1 General

Based on the framework outlined in ISO/IEC TR 30189-1:2025 [8], this document presents specific use cases for IoT-based management of tangible cultural heritage assets. It focuses on standalone cultural heritage assets (e.g. individual items not part of a larger managed collection). Standalone cultural heritage assets refer to individual tangible assets that are not managed as part of a centralized institutional collection. These assets often require unique preservation strategies due to limited institutional support or resources compared to those within larger collections.

This document explores three primary use cases for IoT-based cultural heritage management:

- status monitoring 5.2;
- intrusion detection 5.3;
- location tracking 5.4.

Figure 1 describes the scenarios and goals for the three use cases: status monitoring, intrusion detection, and location tracking. Status monitoring involves monitoring the status of devices, cultural heritage assets, and their surrounding environments, aiming to protect the assets from disasters and detect any natural deterioration early. Intrusion detection focuses on identifying unauthorized objects, such as people or animals, and gathering relevant data to safeguard the cultural assets. Location tracking is concerned with providing real-time location information to facilitate the recovery of movable cultural heritage items.

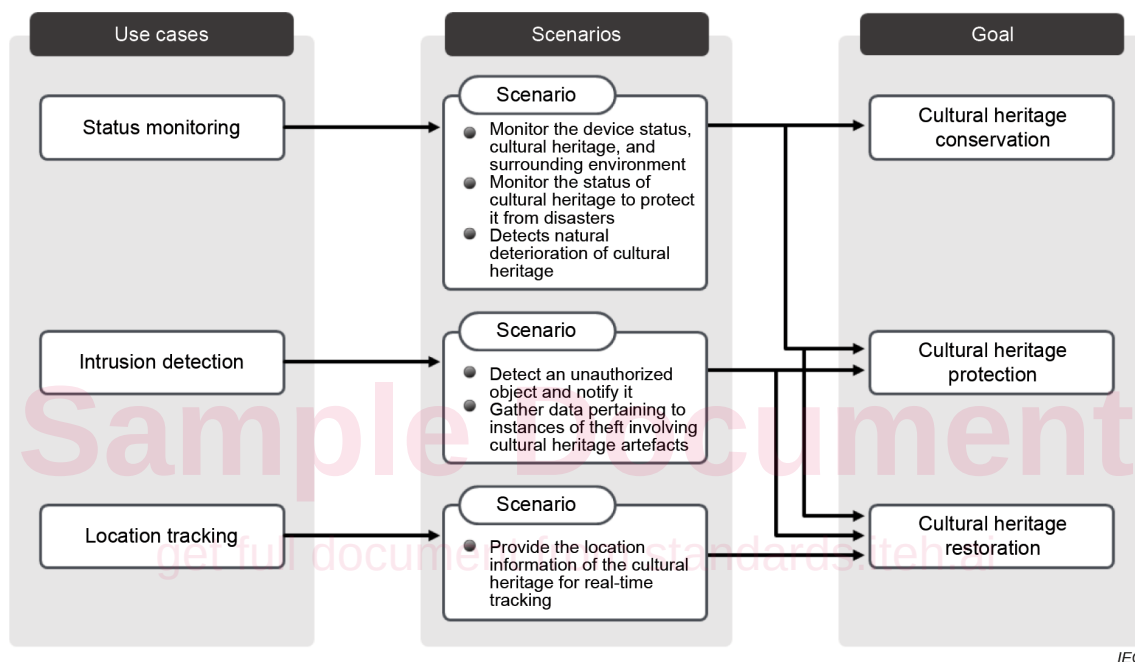


Figure 1 – Use case scenarios and goals

These scenarios directly contribute to achieving the goals outlined in the rightmost column of the figure. The use cases of status monitoring and intrusion detection are essential for the preservation and protection of cultural heritage assets. Location tracking, on the other hand, is particularly valuable for the restoration of movable cultural heritage items. Figure 1 clearly illustrates the logical progression from use cases to the realization of specific goals, emphasizing the pivotal role of IoT-based solutions in cultural heritage management. See Annex A for use case description, Annex B for some examples of test bed experimentation, and Annex C for historic building information modelling.

5.2 Status monitoring

Figure 2 illustrates the use case scenario for status monitoring of cultural heritage assets. IoT technology can be employed to monitor the condition of these assets, such as temperature and humidity levels in a museum, using a variety of sensors. Sensor data collected from devices are transmitted to the platform for processing and subsequently made available to applications for visualization and decision support. This is important because certain environmental conditions can lead to damage and deterioration. By real-time monitoring, corrective actions can be implemented to prevent damage and preserve assets in optimal conditions. An IoT platform, see ISO/IEC TR 30189-1:2025 [8], can be utilized to store relevant data and process events to ensure the conservation of cultural heritage. The monitored status information is then delivered to the associated application.