IEC SRD 63233-1

Edition 1.0 2022-06

SYSTEMS REFERENCE DELIVERABLE

colour inside

Smart city standards inventory and mapping – Part 1: Methodology

IEC SRD 63233-1:2022-05(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC SRD 63233-1

Edition 1.0 2022-06

SYSTEMS REFERENCE DELIVERABLE

colour inside

Smart city standards inventory and mapping – Part 1: Methodology

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 03.100.70; 13.020.20

ISBN 978-2-8322-2351-2

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

SMART CITY STANDARDS INVENTORY AND MAPPING –

Part 1: Methodology

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC SRD 63233-1 has been prepared by IEC systems committee Smart Cities: Electrotechnical aspects of Smart Cities. It is a Systems Reference Deliverable.

The text of this Systems Reference Deliverable is based on the following documents:

Draft	Report on voting
SyCSmartCities/232/DTS	SyCSmartCities /254/RVDTS

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 Systems Reference Deliverable 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 ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC SRD 63233 series, published under the general title *Smart city standards inventory and mapping*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

International, and regional standards development organizations (SDOs), as well as consortia and national standardization institutions, have been vigorously promoting the development of smart city standards. But different organizations focus on standards at different levels of smart cities and the effective coordination in the standards development process needs to be strengthened. At present, there is no overall architectural understanding of standards of smart cities.

The smart city standards inventory and mapping project was initiated to provide a systematic approach to retrieve and map the standards of smart cities on smart city reference architectures, models or frameworks and provide fundamental support for the collaborative work of standard-setters and users. Standards maps are the practical base for helping SDOs and users to identify directly and instantly the standards that are needed for any aspects of smart cities (citizen services, city infrastructure, governance, etc.). Standards maps also help in identifying the standardization gap in the ecosystem.

SMART CITY STANDARDS INVENTORY AND MAPPING –

Part 1: Methodology

1 Scope

This part of IEC SRD 63233, which is a Systems Reference Deliverable, describes a systematic approach to carry out smart city standards analysis based on the IEC systems approach. It gives methods for developing smart city standards inventory and mapping.

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 terminological 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
domain
field of special knowledge

[SOURCE: ISO 10241-1:2011, 3.3.1]

3.2
stakeholder
individual or organization having a right, share, claim or interest in a system or in its possession of characteristics that meet their needs and expectations

[SOURCE: ISO/IEC 12207:2017, 3.1.59]

3.3
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

[SOURCE: ISO/IEC 19505-2:2012, 16.3.6]

3.4
standard
deliverable, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context

[SOURCE: IEC 60050-901:2013, 901-02-02, modified – In the definition, "document" has been replaced by "deliverable".]

3.5
standard implementer
component that enables the provision of services based on the standards

EXAMPLE A developer who needs to comply with SQL commands would be an implementer of that standard.

[SOURCE: ISO/IEC TR 20547-5:2018, 3.2.1]

3.6
standard user
person or component that interacts with a service via the standard or that accepts/consumes/decodes data represented by the standard

[SOURCE: ISO/IEC TR 20547-5:2018, 3.2.2]

4 Systematic approach to standards inventory building and mapping

Typically, establishing a standards map, for example for an IEC smart grid standards map, starts with an architectural model that can then identify points within the architecture model for where standards apply, and then perform an inventory on those points. The inventory should identify relevant SDOs, and then sub-areas within each SDO that apply to the content of the smart city architecture model, and then identify the standards to be applied to each point or area of that architecture model.

There will be a series of architecture models of different views to describe the reference architecture of smart city and SCRA (Smart Cities Reference Architecture discussed in the project development of IEC 63205), and there are also existing architecture models built by other SDOs. The systematic approach in this document is proposed for developing a mapping tool for smart cities. This tool will be designed to establish a common smart city standards pool and automatically or at least half-automatically identify relevant standards that apply to the content of a specific architecture model from this common standards repository. This will avoid repetitive labour to identify the standards applied to each architecture model from multiple different SDOs from scratch.

This document focuses on understanding and mapping the relevant standards for the various parts of the smart city ecosystem and whether they are contributing to or counteracting the objectives identified in market analysis.

Figure 1 shows the steps to perform inventory and mapping and depicts concepts about standards mapping as a context for understanding the practice of standards analysis.

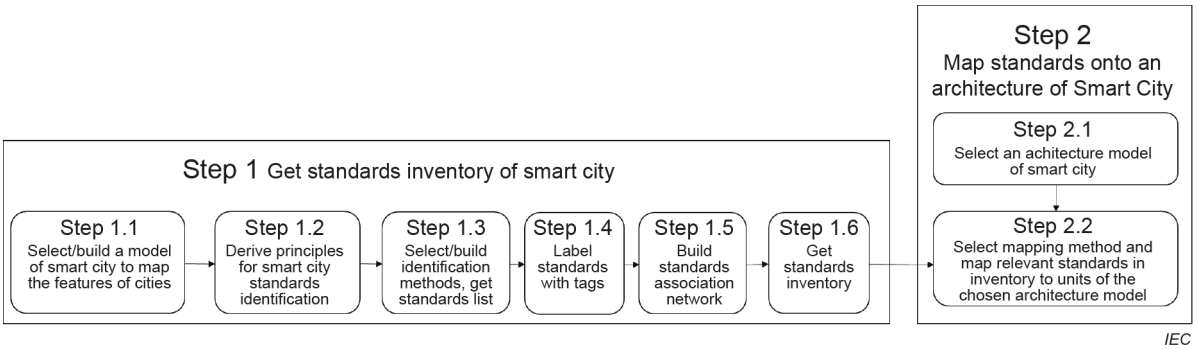

Figure 1 – Steps to perform inventory and mapping

– Step 1: Inventory of smart city standards
  - Step 1.1: select or build a model of smart city to map the features as a system by which principles for standards identification (Step 1.2) can be derived. This model can be chosen from the present models of smart cities.
  - Step 1.2: derive principles from the model in step 1.1 for identification of standards relevant to smart cities and set up criteria for smart city standards.
  - Step 1.3: select a method to identify the existing smart city standards following the principles in step 1.2 and get the list of existing smart city standards.
  - Step 1.4: label the existing standards with tags. The tags are derived from the standard's title, scope and content and used for standards mapping.
  - Step 1.5: build a standards association network described as in 6.4.1, based on the correlation between every existing two standards. It is used as a unified relationship structure of smart city standards to carry out standards mapping.
  - Step 1.6: get the standards inventory with tags for smart city standards and the standards association network.
– Step 2: Map standards onto an architecture of smart city
  - Step 2.1: for a map developer with a perspective of smart city, select an architecture model of smart city to map relevant standards onto. The architecture model can be one of IEC SCRA or others from SDOs such as developed in ISO/IEC 30145, ISO 37101 and ISO 37106.
  - Step 2.2: select a mapping method to get a standards map in which standards developers and users can find each particular standard in its corresponding section.

5 Smart city standards inventory building

5.1 Smart city standards identification

5.1.1 Guiding principles

The critical first step of city standards mapping is to identify relevant standards, noting these can number hundreds or even thousands worldwide. Identification should follow a smart city "standard" structure model described in Figure 2.

When developing the basic structure for the inventory model, common goals need to be abstracted to address the governance lifecycle of city level operational management. This then ensures consideration for the system development lifecycle across a smart city.

The model then identifies city services needed to lead and manage a smart city. Then common service delivery best practice methods can be identified and harmonized, recognizing the possibility that each operates in its own silo.

The model then lists inter- and intra-collaboration methods that can create horizontal linkages between service delivery silos. Stakeholders will take benefit from the created links. The corresponding linkages should be traced in service management (Figure 2).

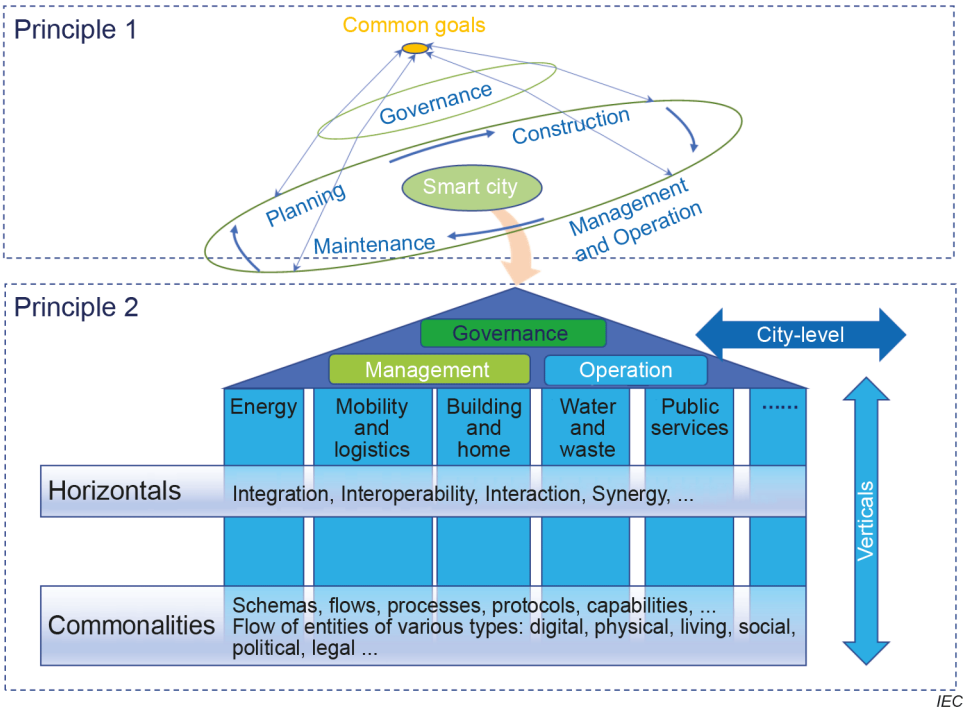

Figure 2 – A basic structure for smart city standards inventory

– Principle 1: Lifecycle of smart city evolution

  Principle 1 derives from consideration of time-dimension of a city.

  Cities are typically governed and evolve by following a lifecycle process of city design, development and operation which involves the engagement of multiple stakeholders to identify requirements and needs and deliver to expected outcomes. This level of prescriptive governance can vary but should ideally align to best practice standards and be one that is repeatable as cities evolve.

  Governance covers all the stages from planning to maintenance. A typical set of governance is a hierarchy of directives, policies, corporate standards and guidelines.

– Principle 2: City structure

  Principle 2 derives from consideration of space-dimension of a city.

  A smart city is a complicated system. It is a "system of systems", containing a variety of vertical domains that co-exist alongside and in certain cases between one another.

  Physical city structures and characteristics are expensive, disruptive and time consuming to change. Any physical constraints need to be factored into evolutionary thinking.

  City-level standards provide a city-wide perspective, whilst vertical-level standards consider specific domains such as a service the city consumes such as utilities.

  Vertical domains have points of interconnection to cooperate horizontally across cities. These interconnects are facilitated by designing communications protocols that are open between trusted service platforms to share data, processes and controls in secure ways that are either mutually beneficial or benefit the city as a whole.

  Commonalities within domains are common characteristics that are either required for compliance or are deemed to be expected best practice or a cultural norm such as approach to use and promotion of digital data and services, occupational health and safety standards, building development standards, financial audit and risk acceptance and regulatory compliance.