

# INTERNATIONAL STANDARD

**Information technology – Underwater acoustic sensor network (UWASN) –  
Part 1: Overview and requirements**



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# INFORMATION TECHNOLOGY – UNDERWATER ACOUSTIC SENSOR NETWORK (UWASN) –

## Part 1: Overview and requirements

### FOREWORD

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International Standard ISO/IEC 30140-1 was prepared by subcommittee 41: Internet of Things and related technologies, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 30140 series, under the general title *Information technology – Underwater acoustic sensor network (UWASN)*, can be found on the IEC and ISO websites.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

## INTRODUCTION

Water covers approximately 71 % of the surface of the Earth. Modern technologies introduce new methods to monitor the body of water, for example pollution monitoring and detection. Underwater data gathering techniques require exploring the water environment, which can be most effectively performed by underwater acoustic sensor networks (UWASNs). Applications developed for the UWASNs can record underwater climate, detect and control water pollution, monitor marine biology, discover natural resources, detect pipeline leakages, monitor and locate underwater intruders, perform strategic surveillance, and so on.

The ISO/IEC 30140 series provides general requirements, reference architecture (RA) including the entity models and high-level interface guidelines supporting interoperability among UWASNs in order to provide the essential UWASN construction information to help and guide architects, developers and implementers of UWASNs.

Additionally, the ISO/IEC 30140 series provides high-level functional models related to underwater sensor nodes and relationships among the nodes to construct architectural perspective of UWASNs. However, the ISO/IEC 30140 series is an application agnostic standard. Thus, ISO/IEC 30140 series specifies neither any type of communication waveforms for use in UWASNs nor any underwater acoustic communication frequencies. Specifying communication waveforms and/or frequencies are the responsibility of architects, developers and implementers.<sup>1</sup>

Acoustical data communication in sensor networks necessitates the introduction of acoustical signals that overlap biologically important frequency bands into the subject environment. These signals may conflict with regional, national, or international noise exposure regulations. Implementers of acoustical communication networks should consult the relevant regulatory agencies prior to designing and deployment of these systems to ensure compliance with regulations and avoid conflicts with the agencies.

The purpose of the ISO/IEC 30140 series is to provide general requirements, guidance and facilitation in order for the users of the ISO/IEC 30140 series to design and develop the target UWASNs for their applications and services.

The ISO/IEC 30140 series comprises four parts as shown below.

Part 1 provides a general overview and requirements of the UWASN reference architecture.

Part 2 provides reference architecture models for UWASN.

Part 3 provides descriptions for the entities and interfaces of the UWASN reference architecture.

Part 4 provides information on interoperability requirements among the entities within a UWASN and among various UWASNs.

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<sup>1</sup> Architects, developers and implementers need to be aware of the submarine emergency frequency band, near and below 12 kHz, and it is recommended to provide a provision for such submarine emergency band in their UWASN design and applications.

# INFORMATION TECHNOLOGY – UNDERWATER ACOUSTIC SENSOR NETWORK (UWASN) –

## Part 1: Overview and requirements

### 1 Scope

This part of ISO/IEC 30140 provides a general overview of underwater acoustic sensor networks (UWASN). It describes their main characteristics in terms of the effects of propagation variability and analyses the main differences with respect to terrestrial networks. It further identifies the specificities of UWASN and derives some specific and general requirements for these networks.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 29182-2, *Information technology – Sensor networks: Sensor Network Reference Architecture (SNRA) – Part 2: Vocabulary and terminology*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 29182-2 and the following apply.

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

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

#### 3.1

##### **ad-hoc node**

device in a wireless ad-hoc network

Note 1 to entry: A wireless ad-hoc network is defined in ISO/IEC 27033-6:2016<sup>[1],2</sup> 3.12, as a “decentralized wireless network which does not rely on a pre-existing infrastructure”.

#### 3.2

##### **cross-layer**

technology that permits communication between different layers by allowing one layer to access data of another layer to exchange information and enable interaction

#### 3.3

##### **management cross-layer**

technology that provides a system-level management service to all or selected OSI layers in a wireless network system

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<sup>2</sup> Numbers in square brackets refer to the Bibliography.