ISO/IEC 30142

Edition 1.0 2020-06

INTERNATIONAL STANDARD

colour inside

Internet of things (IoT) – Underwater acoustic sensor network (UWASN) – Network management system overview and requirements



ISO/IEC 30142:2020-06(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 ISO/IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about ISO/IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
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 It also gives information on projects, replaced and withdrawn publications.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.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

ISO/IEC 30142

Edition 1.0 2020-06

INTERNATIONAL STANDARD

colour inside

Internet of things (IoT) – Underwater acoustic sensor network (UWASN) – Network management system overview and requirements

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.110

ISBN 978-2-8322-8484-1

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

CONTENTS

FOREWORD 5
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Abbreviated terms 8
5 U-NMS overview 8
5.1 General 8
5.2 Problem statements 9
5.3 Description of the U-NMS 10
5.4 Purpose and advantages of the U-NMS 10
6 Functions of the U-NMS 11
6.1 Overview 11
6.2 U-NMS fault management 11
6.3 U-NMS configuration management 12
6.4 U-NMS account management 14
6.5 U-NMS performance management 14
6.5.1 General 14
6.5.2 The challenges in performance management 14
6.5.3 Functions of performance management 15
6.6 U-NMS security management 16
6.7 U-NMS constrained management 17
6.7.1 General 17
6.7.2 Constrained network management 17
6.7.3 Constrained device management 18
7 U-NMS components 19
7.1 Management station 19
7.2 U-NMS agent 20
7.2.1 General 20
7.2.2 Types of agents 21
7.2.3 Elements of agent 22
7.2.4 Underwater Management Information Base (u-MIB) 22
7.3 Managed elements 23
7.4 Management protocol 24
8 Requirements of U-NMS 25
8.1 U-NMS general requirements 25
8.2 U-NMS functional requirements 25
8.3 U-NMS constrained requirements 27
9 Model for underwater network management 28
9.1 FCAPSC modelling for the U-NMS 28
9.2 U-NMS architectural model 28
9.3 U-NMS specific architecture 29
Annex A (informative) U-NMS use cases 31
A.1 General 31
A.2 Environmental management use case 31
A.2.1 Description 31

A.2.2 Actors 32
A.2.3 Potential requirements 32
A.2.4 Environmental monitoring and management use case diagram 32
A.3 Underwater pipeline management use case 35
A.3.1 General 35
A.3.2 Actors 35
A.3.3 Potential requirements 35
A.3.4 Pipeline leakage detection and management use case diagram 36
A.4 Underwater natural resource management use case 37
A.5 Underwater fish farm management use case 37
A.6 Harbour security management use case 38
Bibliography 39

Figure 1 – Stack of layers in a U-NMS 9
Figure 2 – Functions of the U-NMS 11
Figure 3 – Fault management in the U-NMS 12
Figure 4 – Configuration management in the U-NMS 13
Figure 5 – Account management in U-NMS 14
Figure 6 – Performance management in U-NMS 15
Figure 7 – Security management in U-NMS 16
Figure 8 – Constrained network management in U-NMS 18
Figure 9 – Constrained device management in U-NMS 19
Figure 10 – Management station 20
Figure 11 – U-NMS agent architecture 21
Figure 12 – Components of Agent 22
Figure 13 – u-MIB in different devices 23
Figure 14 – Managed elements 23
Figure 15 – Management protocol in U-NMS system 24
Figure 16 – FCAPSC modelling for the U-NMS 28
Figure 17 – U-NMS architectural model 29
Figure 18 – U-NMS specific architecture 30
Figure A.1 – Environmental management use case 31
Figure A.2 – Environmental management use case diagram 33
Figure A.3 – Use case for network management station 34
Figure A.4 – Use case for agents in environmental management 34
Figure A.5 – Underwater pipeline management use case 35
Figure A.6 – Underwater pipeline leakage management use case 36
Figure A.7 – Underwater natural resource management use case 37
Figure A.8 – Underwater fish farm management use case 37
Figure A.9 – Harbour security management use case 38

Table 1 – Types of agents in different devices of U-NMS 21
Table 2 – General requirements of U-NMS 25
Table 3 – Functional requirements of U-NMS 26
Table 4 – Constrained requirements of the U-NMS 27
Table A.1 – Potential U-NMS requirements of environmental monitoring application 32
Table A.2 – Potential U-NMS requirements of pipeline monitoring application 36

INTERNET OF THINGS (IoT) – UNDERWATER ACOUSTIC SENSOR NETWORK (UWASN) – NETWORK MANAGEMENT SYSTEM OVERVIEW AND REQUIREMENTS

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.
2) The formal decisions or agreements of IEC and ISO 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 and ISO member bodies.
3) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC National Committees and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO 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 and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO, IEC or ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.
5) ISO and IEC do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. ISO or IEC are 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 ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC National Committees or ISO member bodies 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 of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/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 ISO/IEC publication may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 30142 was prepared by subcommittee 41: Internet of Things and related technologies, of ISO/IEC joint technical committee 1: Information technology.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
JTC1-SC41/149/FDIS	JTC1-SC41/160/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

Water covers approximately 70 % of the surface of the Earth. Modern technologies introduce new methods to monitor the body of water, such as 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 find underwater intruders, perform strategic surveillance, and so on.

In order to build and apply the UWASN technology, most suitable methods for managing the network have been developed based on the ISO/IEC 30140 series. This document describes the network management outline and requirements appropriate to the UWASN under the constraints of underwater physical environment.

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.

This document provides the information such as requirements of an underwater network management system (U-NMS), functions supporting U-NMS and components required for U-NMS in UWASN.

Various technical standards derived from the R&D results of the technical areas under the UWASN and underwater communication fields not covered by the ISO/IEC 30140 series are continuously proposed and developed.

INTERNET OF THINGS (IoT) – UNDERWATER ACOUSTIC SENSOR NETWORK (UWASN) – NETWORK MANAGEMENT SYSTEM OVERVIEW AND REQUIREMENTS

1 Scope

This document provides the overview and requirements of a network management system in underwater acoustic sensor network (UWASN) environment. It specifies the following:

– functions which support underwater network management system;
– entities required for underwater network management system;
– data about the communication between elements in underwater network management system;
– guidelines to model the underwater network management system;
– general and functional requirements of underwater network management system.

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

3.1
agent
software program that manages the devices installed in underwater

3.2
u-MIB
collection of managed objects, which acts as the database for the management of each device in the underwater environment

3.3
manager
program installed in the management station, which is used for the management of devices in underwater networks