

INTERNATIONAL STANDARD

**Internet of things (IoT) – Base-station based underwater wireless acoustic
network (B-UWAN) –
Part 1: Overview and requirements**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2022 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 Secretariat
3, rue de Varembe
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 It also gives information on projects, replaced and withdrawn publications.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.



ISO/IEC 30171-1

Edition 1.0 2022-03

INTERNATIONAL STANDARD

**Internet of things (IoT) – Base-station based underwater wireless acoustic
network (B-UWAN) –
Part 1: Overview and requirements**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.020

ISBN 978-2-8322-1096-1

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

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Abbreviated terms	6
5 B-UWAN overview	7
5.1 General.....	7
5.2 Layered architecture of B-UWAN	8
5.3 Installation methods of B-UWAN	8
5.4 UWA-BSC communication system.....	10
5.5 UWA-BS communication system	11
5.6 UWA-SNode communication system	12
6 Requirements of B-UWAN	13
6.1 General requirements	13
6.1.1 General	13
6.1.2 Scalability.....	13
6.1.3 Device management	13
6.1.4 Low latency	13
6.1.5 Carrier frequency.....	14
6.1.6 Reliability.....	14
6.1.7 Availability	14
6.1.8 Safety	14
6.1.9 Security	14
6.1.10 Compatibility.....	14
6.1.11 Network monitoring and management	14
6.1.12 Support for other communication methods	14
6.2 Specific requirements of B-UWAN.....	14
6.2.1 General	14
6.2.2 Communication with terrestrial network.....	14
6.2.3 Centralized power management.....	14
6.2.4 Adaptive link management.....	15
6.2.5 Frequency and time resource management	15
6.2.6 Handover.....	15
6.2.7 Frequency reuse management.....	15
6.2.8 Multiple access.....	15
6.2.9 Inter-cell interference management.....	15
6.2.10 Sensor control and data management.....	15
Bibliography.....	16
Figure 1 – Overview of B-UWAN	7
Figure 2 – Layered architecture of B-UWAN.....	8
Figure 3 – B-UWAN installation with acoustic communication	9
Figure 4 – B-UWAN installation with wired and acoustic communication	9
Figure 5 – B-UWAN installation without UWA-BSC.....	10

Figure 6 – Overview of UWA-BSC communication system.....	11
Figure 7 – Overview of UWA-BS communication system	12
Figure 8 – Overview of UWA-SNode communication system	13

This document is a preview generated by EVS

INTERNET OF THINGS (IoT) – BASE-STATION BASED UNDERWATER WIRELESS ACOUSTIC NETWORK (B-UWAN) –

Part 1: 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.
- 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 and ISO National bodies.
- 3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and 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 and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO 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 document.
- 7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National 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, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
- 8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
- 9) Attention is drawn to the possibility that some of the elements of this ISO/IEC document may be the subject of patent rights. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 30171-1 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

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

Draft	Report on voting
JTC1-SC41/266/FDIS	JTC1-SC41/278/RVD

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 International Standard is English.

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

A list of all parts in the ISO/IEC 30171 series, published under the general title *Internet of Things (IoT) – Base-station based underwater wireless acoustic network (B-UWAN)*, can be found on the IEC website.

INTRODUCTION

Underwater network can play a major role in the underwater environment because approximately three quarters of the Earth is covered by water. Underwater network is important to deploy various underwater applications and services such as finding underwater pipeline leakage, detecting underwater climatic changes, monitoring water pollution levels, discovering underwater natural resources, monitoring and finding underwater intruders, performing strategic surveillance, and so on. Underwater network faces challenges due to constrained and time varying underwater environment, maintaining both stationary and mobile nodes, limited battery power, and managing a large number of sensors. Novel underwater communication methods are brought by emerging technologies to overcome these challenges. Base-station based underwater wireless acoustic networks (B-UWANs) can provide efficient communication and deployment in constrained underwater environment. B-UWAN follows centralized management to improve communication performance with a large number of sensors, stationary and mobile nodes, and to provide longer battery life.

This document describes the overview and requirements appropriate to the B-UWAN under the constrained underwater environment.

INTERNET OF THINGS (IoT) – BASE-STATION BASED UNDERWATER WIRELESS ACOUSTIC NETWORK (B-UWAN) –

Part 1: Overview and requirements

1 Scope

This document provides the general overview of base-station based underwater wireless acoustic networks (B-UWANs). It gives a detailed description of the main components of B-UWAN and also provides functions of B-UWAN components. It further specifies the requirements of B-UWAN.

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 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>

4 Abbreviated terms

B-UWAN	base-station based underwater wireless acoustic network
CDMA	code division multiple access
CSS	chirp spread spectrum
OFDM	orthogonal frequency division multiplexing
UWA-BS	underwater wireless acoustic base-station
UWA-BSC	underwater wireless acoustic base-station controller
UWA-SNode	underwater wireless acoustic sensor node