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# TECHNICAL REPORT

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## Internet of things (IoT) – Socialized IoT system resembling human social interaction dynamics



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# INTERNET OF THINGS (IoT) – SOCIALIZED IoT SYSTEM RESEMBLING HUMAN SOCIAL INTERACTION DYNAMICS

## FOREWORD

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IEC TR 30174 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 this Technical Report is based on the following documents:

| Draft | Report on voting |
|---|---|
| JTC1-SC41/227/DTR | JTC1-SC41/240A/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 ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

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# INTRODUCTION

The Internet of Things (IoT) technology is the third wave of information industry, following the computer, communications network and the Internet. It provides the technology tools to build an effective interactive IoT system connecting human users and the physical world, which causes the changes in individual's daily life and also in the operations of human society. The innovative ideas can be implemented in IoT systems creating new markets for technology-based but user-friendly services. The technologies in the IoT systems will keep evolving with improving the existing technology and also the insertion of new technologies.

The communications network focuses on connection and transmission, and it realizes transmission service. The Internet focuses on information sharing, and provides services related to information sharing. The IoT systems focus on the objective physical world, realizing the basic sensing service and other services for the objects of interest (i.e. targets), events, etc., in the physical world.

In order to realize the sensing of the complex physical world, an IoT system needs to have an organized and coordinated sensing capability. For a specific target, this capability activates relevant sensor nodes, and division of labour and cooperation strategies are applied, which is similar to an enterprise that organizes people with required capabilities to form a project team and completes the project with proper division of labour and cooperation. In this perspective, therefore, it can be stated that the IoT system has socialized attributes as IoT nodes and terminals establish an orderly socialized system.

This document comprises five main clauses. Clause 5 introduces the background and motivations for the study of the socialized IoT system. Clause 6 discusses the essential differences of the IoT systems compared to the communications network and the Internet. This comparison is summarized with the key features of the socialized IoT system. Clause 7 further analyses the socialized network, socialized collaboration and socialized service, which are designated as the three pillars of the IoT socialized attributes. Clause 8 addresses the sensing security issue for IoT systems. Clause 9 discusses the application methods of the socialized IoT attributes using a use case analysis, such as the intrusion prevention system or infrastructure protection. This document provides readers with the knowledge of the socialized characteristics and features of the IoT system, and inspires readers to adopt them in the design of IoT systems and provision of IoT services.

# INTERNET OF THINGS (IoT) – SOCIALIZED IoT SYSTEM RESEMBLING HUMAN SOCIAL INTERACTION DYNAMICS

## 1 Scope

This document describes:

- key features of the socialized IoT systems, e.g. sensing the external physical world, resolving the uncertainties of targets, satisfying users' demand and providing quality service, etc.;
- socialized attributes, i.e. socialized network, socialized collaboration, and socialized services, which are derived from the key features; and
- guidelines on how to use or apply the socialized attributes in the design and development of IoT systems.

## 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**
**event**
something that happens in the physical world and is observable or detectable by sensors

[SOURCE: IEC 60050-113:2011, 113-01-04, modified – In the definition, "subspace time of space-time" is replaced with "the physical world and is observable or detectable by sensors.]

**3.2**
**object**
person or thing that is observable or detectable by sensors

Note 1 to entry: Thing can be any living one (animals, plants, etc.) or any material one (table, car, etc.).

**3.3**
**target**
object or event about which information is searched by interest to IoT system

[SOURCE: IEC 60050-713:1998, 713-04-14, modified – In the definition, "or event" is added and "radar" is replaced with "interest to IoT system."]

**3.4**
**socialized**
having organized and constructive behaviour of functions in a system or among systems built with the attributes of the division of labour and the collaboration of tasks

**3.5**
**socialized IoT system**
system providing functionalities of IoT built on *socialized* (3.4) capability

Note 1 to entry: A socialized IoT system can include, but not be limited to, IoT devices, IoT gateways, sensors and actuators.

[SOURCE: ISO/IEC 20924:2021, 3.2.9, modified – In the term, "socialized" is added. In the definition, "built on *socialized* (3.4) capability" is added.]

## 4 Symbols and abbreviated terms

ICT information and communication technologies

IoT Internet of Things

D/I data/information

SNR signal-to-noise ratio

## 5 Introduction to the socialized IoT systems

### 5.1 Three technological waves in ICT

Information acquisition, information transmission and information processing constitute the three pillars of information technology. The impact of IoT technology on information technology has caused significantly positive ripples on these pillars, which are denoted as "three waves" as described below and also shown in Figure 1.

1) The first wave: The rise of the computer brings us to the digital world, which has changed the way of processing data/information (D/I). The first wave is labelled as "digitalization".
2) The second wave: The rapid development of communications technology and the Internet has created a world of inter-networking, which changes the way of transmitting D/I. The second wave is marked as "networking".
3) The third wave: IoT technology is the third revolution in information technology, which has changed the way of acquiring D/I. The third wave is designated as "socialization".

IoT technology has been moving forward to realize comprehensive information systems by sensing the physical world and providing sensing services, which requires the IoT physical and virtual entities to form an organized infrastructure in order to cooperate and collaborate with each other to accomplish given purposes or tasks similar to the teamwork by organized human teams. Therefore, an information system with such abilities can be characterized as a "socialized" system resembling human social dynamics.