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INTERNATIONAL STANDARD



Internet of things (IoT) – Interoperability for IoT systems – Part 4: Syntactic interoperability



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INTERNET OF THINGS (IoT) – INTEROPERABILITY FOR IoT SYSTEMS –

Part 4: Syntactic interoperability

FOREWORD

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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 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

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INTRODUCTION

In the world of the Internet of Things (IoT), heterogeneous systems and devices need to be connected and exchange data with others. How data exchange can be implemented becomes a key issue of interoperability among IoT industries. Information models (IMs), which can well represent specifications of data, are adopted and utilized to solve the interoperability problem. Meanwhile, as systems and devices in IoT can have different information models with different modelling methodologies and formats, interoperability based on different information models is recognized as an urgent problem. The IoT interoperability related systems and applications have an 11 trillion market potentially [1]¹.

The ISO/IEC 21823 series standards address issues that relate to interoperability both between different IoT systems and within a single IoT system. ISO/IEC 21823-1 [2] describes a general framework for interoperability for IoT systems. It includes a five facet model for interoperability that includes transport, syntactic, semantic, behavioural, and policy viewpoints.

Different parts of ISO/IEC 21823, based on one of the facets, provide specifications from their corresponding viewpoints. Each of the parts can refer to others but is independent. Currently, ISO/IEC 21823-2 [3] defines specifications from the transport viewpoint, ISO/IEC 21823-3 [4] defines requirements, provides guidance, etc. from the semantic viewpoint, and ISO/IEC 21823-4 specifies the syntactic interoperability.

Syntactic interoperability means that exchanged information can be understood by the participating IoT systems which contain IoT devices. In more detail, the syntactic interoperability is related to the information models' representing formats, structures, and grammar of their modelling languages such as a length of a data string, constraints on data types, and forbidden characters.

This document first provides the principle of how to achieve syntactic interoperability based on metamodel-driven approaches. In other words, the reason why the information exchange rules based on metamodels can support syntactic interoperability among different IoT systems will be elaborated. Secondly, requirements on information models such as metamodels and models of IoT systems including IoT devices are described. Features related to IoT devices such as the identifier, device type, setup environments, and functions need to be considered to accomplish syntactic interoperability among different information models utilized in IoT systems. Thirdly, a framework for processes on developing information exchange rules related to IoT devices from the syntactic viewpoint is provided. For example, the kinds of metamodels, and the types of entities and relationships that shall be selected are specified, and the procedure of how to build the information exchange rules from different information models is provided.

In Annex A, possible intrinsic and extrinsic properties of IoT devices are listed as additional information of Clause 6. In Annex B, a use case of how the syntactic interoperability in accordance with specifications in this document among industrial IoT systems and IoT devices is described.

With this document, system and device vendors, who need to improve and/or develop their products to comply with IoT requirements, can implement specifications of this document to their products for an automatic or semi-automatic realization of IoT syntactic interoperability.

¹ Numbers in square brackets refer to the Bibliography.