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Internet of Things (IoT) – Functional architecture for resource identifier interoperability

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FOREWORD

ISO/IEC 30181 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-SC41/458/FDIS	JTC1-SC41/471/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, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

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INTRODUCTION

Internet of Things (IoT) is defined as an infrastructure of interconnected entities, people, systems and information resources together with services which processes and reacts to information from the physical world and virtual world. IoT has attracted significant social attention globally and is expanding in various fields such as smart homes, healthcare, smart cities, logistics, smart cars, etc. In particular, IoT platforms are essential because they connect various devices (e.g. sensors, access points, and data networks) and provide services to the user. Heterogeneous IoT platforms refer to IoT platforms developed based on different standards such as various data models, policies, vendors, interfaces, and specifications. Therefore, interoperability, such as requesting services and sharing resources among heterogeneous IoT platforms, is important, and it is essential for a real IoT system.

IoT platform has many challenges to interoperability, such as support for diverse protocols, discovery service, well-defined semantic management, and processing of data formats in heterogeneous IoT platforms. However, current diverse IoT platforms and related standards make it difficult to achieve interoperability and collaboration between heterogeneous IoT platforms. Especially regarding resource interoperability issues, each IoT platform has been developed using a specific and unique resource identifier, including a different type of resource-request format, so it is difficult to identify resources among heterogeneous IoT platforms. Furthermore, the existing approaches mainly focus on integrating and managing each IoT platform's ontology and a method of duplicating resources for the target IoT platforms. It makes it a burden for the developer to construct specific ontologies for the diverse IoT platforms.

This document provides a functional architecture for resource identifier (ID) interoperability, which converts the format of a resource identifier among heterogeneous IoT platforms. This document concentrates on converting resource paths (e.g. uniform resource identifier (URI)) used in a specific IoT platform to the target IoT platform. In addition, this document provides an IoT resource name system (RNS) architecture based on the comparative analysis of heterogeneous IoT platforms and a smart city scenario, including resource registration, resource deletion, sharing mapping tables, and resource path conversion. To ensure the user can use heterogeneous IoT resources, IoT RNS analyses and converts identifier into desired resource-request formats, including reconfiguring resource requests between heterogeneous IoT platforms as appropriate for the user-requested resources.

This document has the ISO/IEC 30141 [1][1] IoT reference architecture as a reference to consider interoperability among heterogeneous components and systems. In addition, this document has IEC 61406-2 [2] as a reference to specify minimum requirements for a globally unique identification of resources which constitutes a link to its related digital information. Furthermore, the IoT RNS in this document can be modularized in middleware as edge computing in the IoT system. Therefore, this document has as a reference ISO/IEC TR 30164 [3], which describes the general concepts, terms, characteristics, use cases, and techniques (e.g. data management, coordination, processing, network functionality, heterogeneous computing, security, hardware and software optimization) of edge computing for IoT system applications.

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1 Numbers in square brackets refer to the Bibliography.

INTERNET OF THINGS (IoT) – FUNCTIONAL ARCHITECTURE FOR RESOURCE IDENTIFIER INTEROPERABILITY

1 Scope

This document specifies functional requirements and architecture about the following items for resource interoperability among heterogeneous IoT platforms through the conversion of resource identifiers (IDs) and paths (e.g. uniform resource identifier (URI)):

– requirements for interoperability of resource IDs in the heterogeneous IoT platforms;

– functional architecture for converting IDs and paths of resources on heterogeneous IoT platforms; and,

– functional architecture for mapping and managing resource IDs among heterogeneous IoT platforms.

2 Normative references

There are no normative references in this document.