TECHNICAL REFERENCE

Sensor network for homes

– Part 1 : Wireless protocols between home sensor gateway and devices

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NOTE

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Foreword

This Technical Reference was prepared by the Sensor Network Working Group (SNWG) under the direction of the IT Standards Committee (ITSC). The ITSC endorsed the Technical Reference on 17 June 2014. Acknowledgement is made to the Working Group members and industry partners who contributed to the development of the Technical Reference.

Sensor networks in the home setting are expected to proliferate with the rapid growth of connected devices. The scalability of these sensor networks however, are affected by the lack of standards based system architecture, as well as the security concerns in deploying such networks.

The purpose of the Technical Reference on sensor network for homes is to improve the interoperability of sensor networks at home by:

− defining the common interfaces which need to be considered among the various components in the sensor network at home architecture;

− defining a set of best practices to address the security risks associated with the implementation of sensor networks.

This Technical Reference comprises the following three parts under the general title, "Sensor network for homes":

Part 1: Wireless protocols between home sensor gateway and devices

      − provides guidance on the protocols for wireless connectivity between the devices or sensors and the home sensor gateway

Part 2: Protocols, APIs, data models and formats for home sensor gateway and sensor network integration platform

      − facilitates the interfaces between different system components

Part 3: End-to-end security

      − addresses the security risks associated with the implementation of an end-to-end sensor network at home solution

Acknowledgement is made for the use of ISO/IEC 29182-2:2013 'Information technology – Sensor networks : Sensor Network Reference Architecture (SNRA) – Vocabulary and terminology' and ITU-T Recommendation Y.2069 (07/2012) 'Terms and Definitions for the Internet of Things', on which 3.1 of Part 1 of this Technical Reference is based.

This Technical Reference is not to be regarded as a Singapore Standard. This Technical Reference is made available for provisional application over a period of two years, but does not have the status of a Singapore Standard. The aim is to use the experience gained to modify the Technical Reference so that it can be adopted as a Singapore Standard. Users of the Technical Reference are invited to comment on its technical content, ease of use and any ambiguities or anomalies. These comments can be submitted using the feedback form provided at the end of the Technical Reference and will be taken into account in the review of the publication. At the end of the two years, the Technical Reference will be reviewed by the Working Group to discuss the comments received and to determine its suitability as a Singapore Standard. Submission for approval by the Standards Council as a Singapore Standard will be carried out only upon agreement after review.

At the time of publication, this Technical Reference can be used by system integrators, technology developers and service providers.

Attention is drawn to the possibility that some of the elements of this Technical Reference may be the subject of patent rights. SPRING Singapore shall not be held responsible for identifying any or all of such patent rights.

Technical Reference for Sensor network for homes – Part 1 : Wireless protocols between home sensor gateway and devices

0   Introduction

0.1   Internet of Things

The Internet of Things (IoT) refers to a system of physical and virtual objects that are connected with one another, allowing interaction anytime, anywhere. It is an emerging field that has the potential to transform many aspects of our day-to-day life as well as impact many of our sectors and technologies.

According to ITU, IoT is expected to integrate leading technologies such as technologies related to advanced machine-to-machine communications, autonomic networking, data mining and decision-making, security protection, cloud computing and technologies for advanced sensing and actuation [ITU-T Recommendation Y.2060 (06/2012) Overview of Internet of Things]. Information and communication technologies (ICT) are key to making the IoT vision happen and many of these technologies are still evolving.

Figure 1 shows the general reference architecture of IoT.
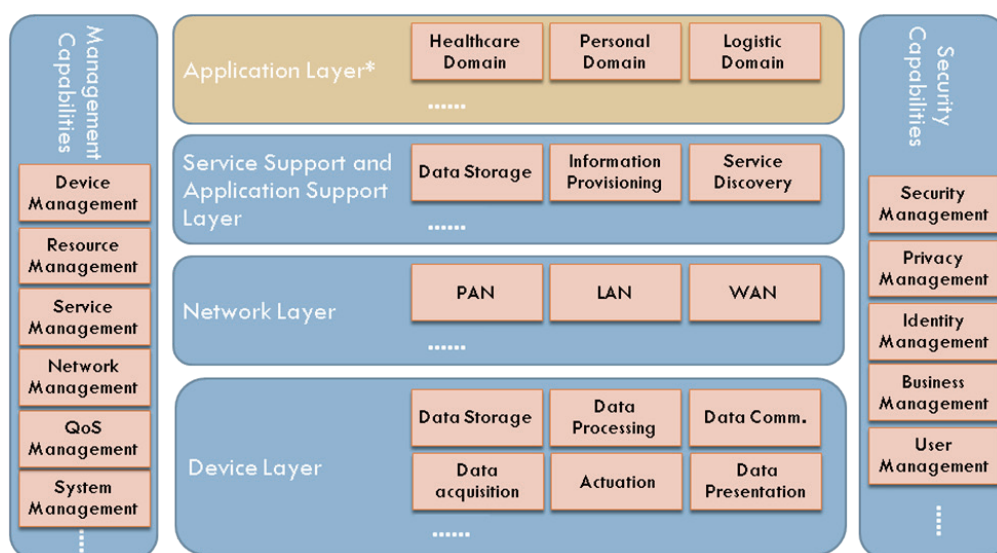
(NOTE – The functional blocks are for illustration purposes only).

Figure 1 – Internet of Things reference architecture

0.2   Sensor networks at home

Sensor networks are one of the key technologies for realising the IoT vision. ISO/IEC 29182-1 describes a sensor network as a system of distributed sensor nodes communicating with each other and with other sensor networks or infrastructure to acquire, process, transfer, and provide information about the physical world and optionally react to such information. Typically, sensor networks gather information about their physical surrounding and deliver this information to the sensor network user(s) and any of the communication links using wired or wireless technologies.

There is a wide range of sensor network applications in a variety of domains, e.g. energy management, healthcare, home, logistics, etc.

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As sensor networks in the home setting are expected to proliferate with the rapid growth of connected devices, the scalability of these sensor networks may be affected by the heterogeneous sensor networks we have today, and the security concerns of deploying such networks.

The purpose of the Technical Reference is to define the interfaces between the objects in the IoT reference architecture that enables the sensor network services and applications to facilitate the interoperability of sensor networks for homes.

Figure 2 shows the different layers of the sensor network integrated platform functional architecture and the areas covered by the following parts of the Technical Reference:

Part 1 : Wireless protocols between home sensor gateway and devices

Part 2 : Protocols, APIs, data models and formats for home sensor gateway and sensor network integration platform
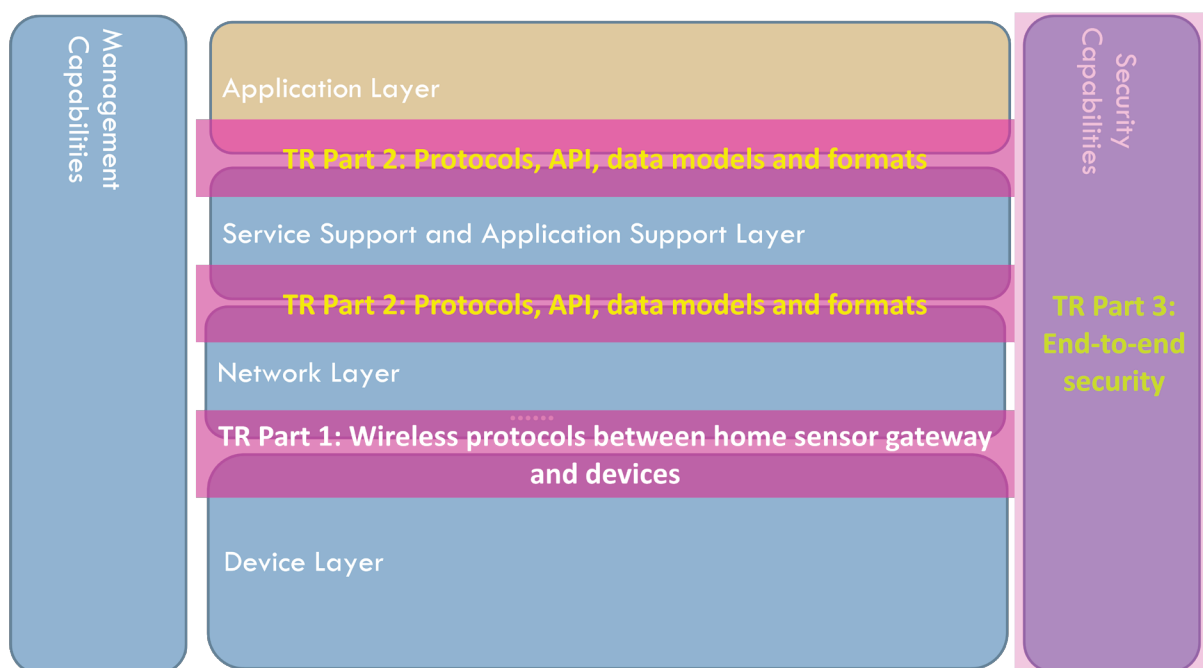
Part 3 : End-to-end security

Figure 2 – High level sensor network for homes standardisation areas

To contextualise the Technical Reference, it will identify the applicable standards for two vertical applications--healthcare and energy, for the home setting. The same set of standards is extensible to other vertical applications.

1   Scope

This part of the Technical Reference provides guidance on the wireless protocols for the sensor networks in the home setting. It specifies the protocols between the connected devices or sensors and the sensor gateway.

Adopting a common set of communication protocols for the sensor network will facilitate the interoperability of the devices and sensors from different manufacturers.

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