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Information technology – Home Electronic System (HES) application model – Part 3-51: Framework of a narrow AI engine for a premises energy management system using energy management agents

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) APPLICATION MODEL –

Part 3-51: Framework of a narrow AI engine for a premises energy management system using energy management agents

FOREWORD

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ISO/IEC 15067-3-51 has been prepared by subcommittee 25: Interconnection of information technology equipment, 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-SC25/3225/FDIS	JTC1-SC25/3245/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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A list of all parts of the ISO/IEC 15067 series, published under the general title *Information technology – Home Electronic System (HES) application model*, can be found on the IEC and ISO websites.

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INTRODUCTION

This document adds artificial intelligence (AI) functions to support the energy management agent (EMA) specified in ISO/IEC 15067-3 for EMAs located on customer premises. A narrow AI engine framework and guidelines for implementation in an EMA are provided. Furthermore, the placement of AI support infrastructure in an EMA addresses the challenges of developing a scalable energy management solution for home energy management. The narrow AI engine is a system that is deployed inside a home to operate as the protected on-premises system for energy management. The narrow AI engine responds to energy management events by operating an AI algorithm customized for energy management.

The HES gateway, specified in the ISO/IEC 15045 series and ISO/IEC 18012 series, supports the AI functionality. The term "premises energy management agent (PEMA)" is introduced as a type of EMA that is hosted on the HES gateway. The PEMA primarily focuses on the needs, including generation and storage, of the premises, while the connection to the public utility can also be included when aligned with the needs of the premises.

The objective of the AI functions in an EMA is to help the consumer decide from which source and when to acquire power and to which loads and at which times this power should be allocated. Sources may include a public power utility, an aggregator, a prosumer (a producer and consumer with excess power who offers the surplus for sale through a transactive energy scheme), local generators (such as wind or solar), or batteries (stationary or mobile). Loads can include consumer electronics, appliances, and EV chargers. The EMA decision assistance is predicated on the consumer’s time and day preferences for appliance usage and electric vehicle (EV) charging, constrained by the consumer’s budget for energy and any preference for reducing greenhouse gas emissions to mitigate climate change. The EMA is introduced to provide energy management focused on the needs of a premises, while considering local power generation such as wind turbines and solar panels, and energy storage (collectively called PER – premises energy resources).

This document specifies a high-level framework of a narrow AI engine to facilitate an energy management system. The narrow AI engine provides several capabilities such as demand prediction, decision making for energy consumption, and control. This AI framework offers a robust and scalable energy management solution for home energy management.

The EMA provides automation to help the user make and execute complex decisions in real time. We are seeking practical AI that can be deployed locally. On-premises deployment implies that the narrow AI engine can be executed in consumer or commercial electronic devices that are affordable in a competitive marketplace. Also, customer data are not shared with a service provider in the cloud, thus protecting privacy. Energy consumption patterns can reveal considerable information about equipment owned and activities identifiable by location and time. For this reason, the AI implementation specified is called "protected on-premises." In many cases, AI performance, and hence the value of the EMA, may be significantly increased if at least part of the AI learning phase is performed in the cloud or at other computational entities outside the premises. The cloud, as well as the use of additional local computational resources outside the premises, allows for use of more computational power as well as access to additional aggregated data that can improve the results of AI algorithms. If there is use of any customer data outside the premises in a learning phase, it would be subject to customer permission and may be protected by the HES gateway functions.

This AI framework may be extended beyond energy management for other home applications.

Figure 1 shows the core interoperability and HES gateway documents. Figure 2 shows the narrow AI engine series of documents consisting of three parts:

– ISO/IEC 15067-3-51: Framework
– future planned parts on data model (ISO/IEC 15067-3-52) and service procedure and message flow (ISO/IEC 15067-3-53).

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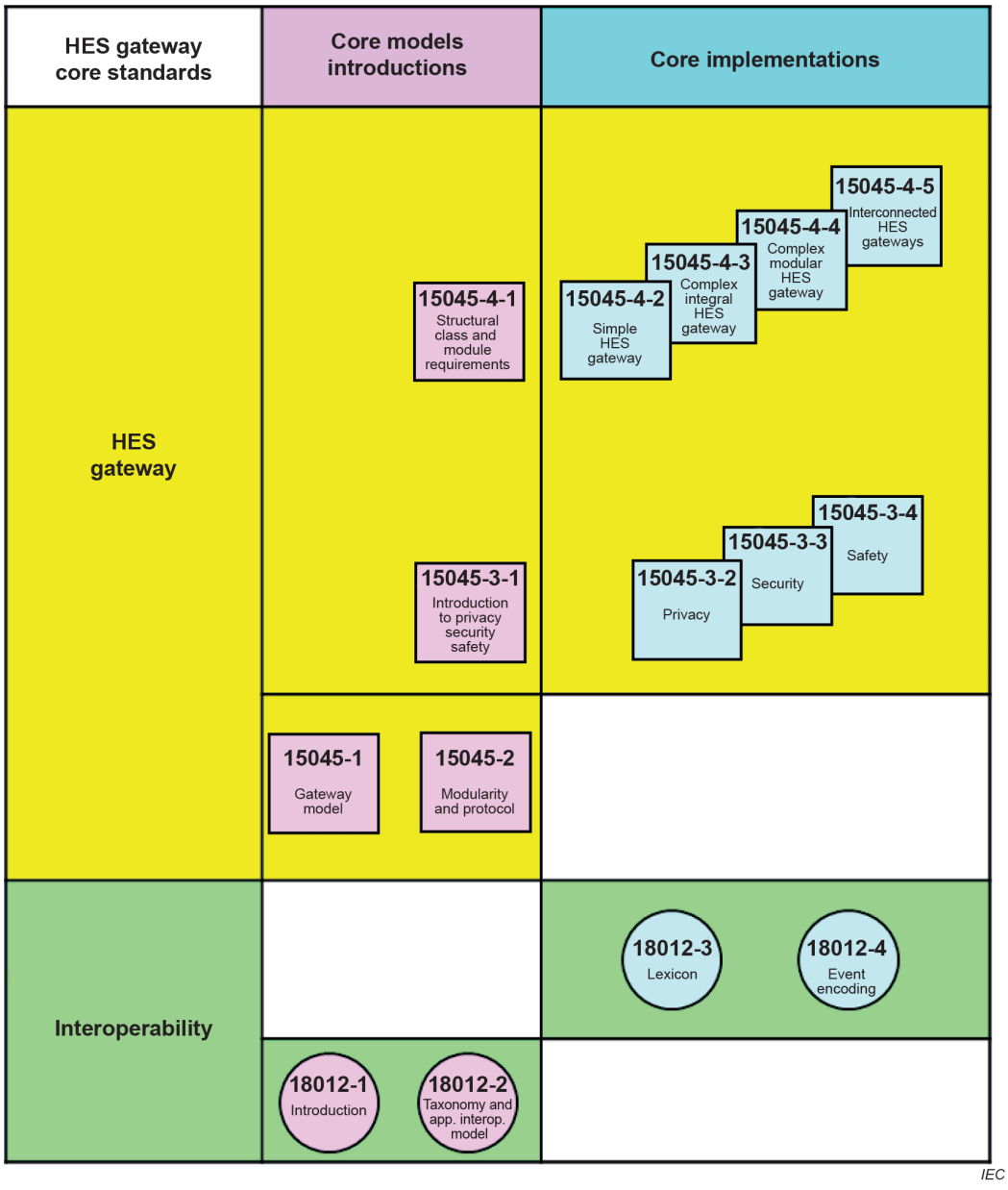

Figure 1 – Core interoperability and HES gateway

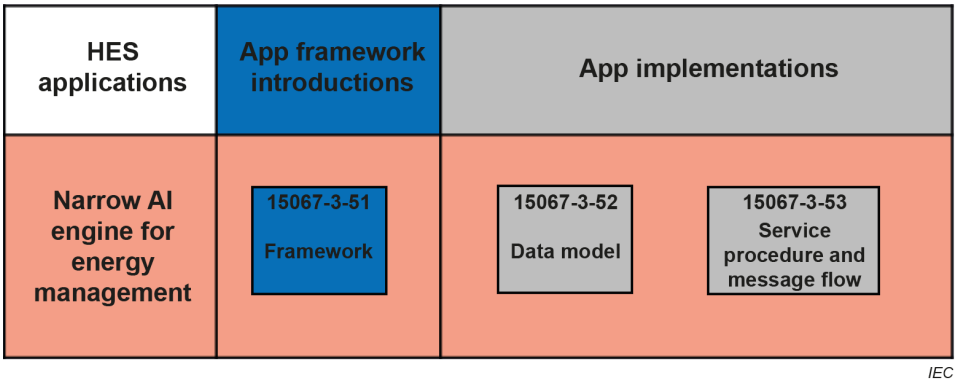

Figure 2 – HES AI applications

NOTE Additional documents needed for implementation are under development.

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INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) APPLICATION MODEL –

Part 3-51: Framework of a narrow AI engine for a premises energy management system using energy management agents

1 Scope

This document specifies a framework for adding artificial intelligence (AI) functions to support the energy management agent (EMA) specified in ISO/IEC 15067-3 for EMAs located on customer premises. It also defines "premises EMA" (PEMA), a type of EMA that resides in the HES gateway (specified in the ISO/IEC 15045 series and ISO/IEC 18012 series).

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 15045-1, *Information technology – Home Electronic System (HES) gateway – Part 1: A residential gateway model for HES*

ISO/IEC 15045-2, *Information technology – Home Electronic System (HES) gateway – Part 2: Modularity and protocol*

ISO/IEC 15067-3, *Information technology – Home Electronic System (HES) application model – Part 3: Model of a demand-response energy management system for HES*

ISO/IEC 18012-1, *Information technology – Home Electronic System – Guidelines for product interoperability – Part 1: Introduction*

ISO/IEC 18012-2, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 2: Taxonomy and application interoperability model*