



Common Information Necessary to Intelligent Appliances

AHAM SA-1-2014



Leadership > Knowledge > Innovation

Documents

1111 19th Street NW, Suite 402 > Washington, DC 20036
t 202.872.5955 f 202.872.9354 www.aham.org

PREFACE

The Association of Home Appliance Manufacturers develops standards in accordance with AHAM's "Policy and Procedures Governing Technical Standards" which states:

"AHAM Standards shall be in the best interest, mutually, of consumers who use appliances, the industries which provide and service appliances, and other interested parties. They shall relate to actual use conditions, be technically and scientifically sound."

Use or observance of AHAM standards is voluntary.

As additional communication protocols and use cases are discussed in the Smart Grid community, it is important to ensure that stakeholders have an appropriate understanding of the capabilities and restrictions associated with end point assets within the Grid. This standard focuses on the appliance end point in a consumer's home and what functionalities, types of information, and actions can be completed by each appliance type.

The models included within this document are meant as a characterization of a general appliance to allow for structuring of protocol development in support of an intelligent appliance. Other factors of the protocol development such as payload capability, traffic scaling, security, implementation level, OSI Layer, etc. are not inferred or considered within this document and are at the discretion of the specifiers.

This information should be used in use case authoring and in end to end mapping - not as a definitive specification or commands architecture. For example, it is important that in end-to-end mapping exercises that consistency is confirmed so that a Utility or Aggregator does not issue a command in their selected protocol that result in a command at the appliance end point after end-to-end mapping that differs from what was intended – e.g. they request a delay of defrost and receive an immediate load shed.

The list of information included within this standard is not exhaustive and should be viewed as an approximate minimum of information that should be accommodated in a protocol. Appliance manufacturers may use some or all of the included content of this specification at their discretion. Additionally, it should be understood that manufacturers will have additional commands and data structures that are not included in this document. The document provides a good description of common data, commands, and structures that may be employed in a Smart Appliance to assist in protocol development. However, it is not definitive to the breadth of options, nor descriptive to a minimum requirement that an appliance must employ.

Copyright © 2014 by the Association of Home Appliance Manufacturers (AHAM)
All rights reserved.

The hard copy print version of this document shall be for individual use only.

The electronic file version of this document shall be for storage on one computer for purposes of viewing and/or printing one copy for individual use only.

This document shall not be reproduced in whole or in part by any means, and shall not be transmitted electronically or otherwise to a third person without the prior written permission of AHAM.

CONTENTS

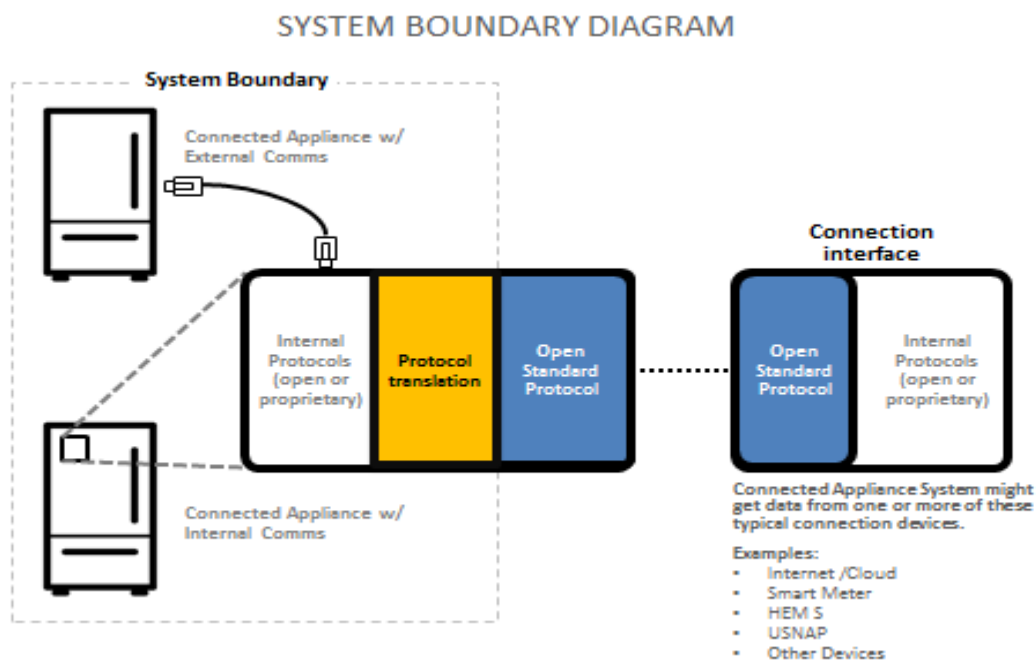
Section	Page
1. SCOPE	1
2. OVERALL SYSTEM DESCRIPTION	1
3. COMMON FUNCTIONALITY DATA CANDIDATES.....	3
3.1 General Data Candidates	3
3.1.1 Smart Grid / Energy Management Mode.....	3
3.1.2 Delay Appliance Load	3
3.1.3 Temporary Appliance Load Reduction	4
3.1.4 Appliance - Device ID	5
3.1.5 Product Type ID	6
3.1.6 Get Alerts.....	6
3.1.7 Alert Response/Notification	7
3.1.8 Start Time	8
3.1.9 Finish Time.....	9
3.1.10 Remaining Time.....	9
3.1.11 Execution of a Command.....	10
3.1.12 Signal State	11
3.1.13 Status / Notification	12
3.1.14 Company Name	12
3.1.15 Brand Name	13
3.1.16 Model Name.....	14
3.2 Refrigerator Data Candidates	15
3.2.1 Energy Use Representation	15
3.2.2 Ice-Maker status	15
3.2.3 Embedded Delay Defrost Setting	16
4. ALERTS.....	18
4.1 Refrigerator Alerts.....	18
4.1.1 Door Notification.....	18
4.1.2 Clean Coils Notification	18
4.2 General Alerts.....	19
4.2.1 Power Loss Notification	19
4.2.2 Excessive Energy Consumption Notification.....	20
4.2.3 Service Required Notification	21
Appendix A.....	22

1. SCOPE

This specification focuses on the minimum requirements for a Smart Appliance that complies with the EPA Energy Star Connected Appliance Criteria. For each data item listed the minimum requirements are specified. Thus, it is not exhaustive and any implementation may exceed the capabilities of any and all data items included within this specification. Future revisions will expand further to provide a wider characterization of possible functionalities, data items, and the content within each.

The methods of interaction and requirements of commands for any data candidates within this document are not specified. An implementing protocol can choose whether any one or more data candidate is pushed, pulled, pinged, or otherwise transmitted to or from the appliance. Also, necessary communication items for the protocol such as ack, nack, crc, payload size, etc are within the domain of the implementing protocol to specify.

2. OVERALL SYSTEM DESCRIPTION



This diagram illustrates system boundary for this document. The Smart Appliance may institute various structures or methods of communication. Additionally, the Smart Appliance may communicate with any number of various external systems or devices and means. This document describes the common information necessary to intelligent appliances in internal and open communication protocols for the Smart Appliance to perform its functions.

The functionalities are defined under the following categories:

“Expected Data Change Rate” indicates a change rate that could occur and generally approximates a basic minimum. Various systems may however exhibit a change rate that is higher or lower.

“Minimum Data Rate to Accommodate” describes a minimum data rate that the implementing protocol shall plan to support.

“Minimum Data to Accommodate” describes a level of data the implementing protocol shall be able to handle (transport, payload) at a minimum. Additionally, this data represents a general minimum required for the functionalities of a smart appliance.

Copyright Association of Home Appliance Manufacturers
Provided by IHS
No reproduction or networking permitted without license from IHS
Full document details: AHAM SA-1 2014

3. COMMON FUNCTIONALITY DATA CANDIDATES

3.1 General Data Candidates

3.1.1 Smart Grid / Energy Management Mode

Purpose: To provide the Smart Grid related mode of the smart appliance, and if the appliance is enabled or disabled by the consumer.

Background: The consumer always has the right and ability to override or disable Smart Grid functions on their appliance. In more advanced applications, the consumer may want to be informed regarding operations or modes the appliance may be executing including Demand Response, Delayed Loads, or other Smart Grid/ Energy Management features.

Consumer Benefit: The customer can monitor the smart grid / energy management mode remotely or at the appliance. Also other systems such as an energy management system may work with this information. The consumer can then use this information to make sure the performance and features they desire are being used appropriately.

Common Data Values: An appliance shall be able to enable/disable Smart Grid/Energy modes. It may also be necessary to indicate the demand response state and/or level, if a delay load has been scheduled and potentially the time of such scheduling, and other such modes that become common over time for the Smart Grid. However, these additional elements are out of scope of this document at this time to describe.

Data Characterization:

Expected Data Change Rate:

In most cases the Smart Grid/Energy mode is not expected to occur more than one or two times per day. However, some situations such as Temporary Appliance Load Reduction states or more dynamic modes may occur in time segments of tens of minutes. As the state of the art evolves additional and more frequent modes may arise.

Minimum Data Rate to Accommodate: Hourly

Representative Size of Data Type:

At the most basic the Smart Grid Mode may be represented as enabled/disabled. Some protocols may choose to map the various known modes, such as Demand Response or Delay Load, to different values, or provide a dynamic data type to provide greater information.

Minimum Data to Accommodate: Enabled/Disabled

3.1.2 Delay Appliance Load

Purpose: This functionality asks the appliance to temporarily delay load for a period of up to 4 hours.

Background: Certain grid events and situations can be improved to the benefit of the consumer and the utility by having assets on the grid that can reduce their consumption on demand.

Consumer Benefit: The smart grid / energy management system can use this functionality to shift the load during peak periods or grid distress events. This can result in lower costs of energy to the consumer due to avoiding peak pricing periods. Also, such abilities can result in overall efficiency gains for the grid as a whole resulting in reduced costs. Some consumers may have programs available through the utilities or other companies that will financially incentivize these actions. Furthermore, environmental benefits of reduced consumption are important to many consumers.

Common Data Values: A request for delay appliance load can be assumed to have a fixed length, or include time information. If time information is included it could vary from a total length that starts immediately to a start and end time being included.

Data Characterization:

Expected Data Change Rate:

Delay Appliance Loads are expected to occur once a day and typically be greater than an hour. Requirements of applications may require the data to be provided to the appliance in a more timely fashion however to enable a specific response time desired.

Minimum Data Rate to Accommodate: Hourly

Representative Size of Data Type: An event could be transmitted as simply as enable/disable for the event if a pre-determined period is assumed (4 hours to meet the maximum EPA specification). However, if time information is included the data type may vary widely depending on the time types and methods included.

Minimum Data to Accommodate: Enable/Disable

3.1.3 Temporary Appliance Load Reduction

Purpose: An appliance may be able to react to an immediate need to reduce consumption at a high level for a short period of time via this feature.

Background: Similar to a spinning reserve or other near instant reduction the load reduction feature allows utilities or a management system within a home to request a significant reduction in consumption of the appliance for a short period of time, up to 10 minutes per the EPA Energy Star Connected Appliance specification.

Consumer Benefit: Some utilities and organizations intend to incentivize the consumer if they have devices that can meet a temporary load reduction need. Additionally, some energy management systems and programs can utilize a feature such as this for controlling peak loads within the home to a consumer's preferences. Such uses can provide financial and environmental benefits desirable to the consumer.

Common Data Values: A request for load reduction can be assumed to have a fixed length (default of 10 minutes), or include time information. If time information is included it could vary from a total length that starts immediately to a start and end time being included.

Data Characterization:

Expected Data Change Rate: Given that the maximum time period is limited to ten minutes, the majority of the data will be associated with minute type periods. However, if certain systems are trying to attain faster response rates higher frequencies may be required at the implementing protocols discretion.

Minimum Data Rate to Accommodate: Minute

Representative Size of Data Type: An event could be transmitted as simply as enable/disable for the event if a pre-determined period is assumed (10 minutes to meet the maximum EPA specification). However, if time information is included the data type may vary widely depending on the time types and methods included.

Minimum Data to Accommodate: Enable/Disable

3.1.4 Appliance - Device ID

Purpose: In order to help systems identify the type of appliance being communicated with, identity information is provided to help select the appropriate information and commands set.

Background: Smart appliances will theoretically encompass all devices manufactured for the consumer market that consumers demand the features for. As this will reflect many device types including, but not limited to, refrigerators, freezers, washers, dryers, dishwashers, air conditioners, and others an identification is necessary. Some features may exist for some appliances and not others, e.g. icemakers. Selecting the appropriate commands based on those features will be necessary in many cases.

Consumer Benefit: Allowing for identification of the appliance allows for richer feature sets while keeping overhead and definitions more limited. This will give consumers better value in the devices they purchase and more advanced features that they desire.

Common Data Values: The identification method employed will be determined by the implementing protocol. This can include a predefined range of numbers to dynamic text and data fields that will describe the appliance and potential subsets within an appliance type (e.g. freezer w/icemaker, freezer w/o icemaker).

Data Characterization:

Expected Data Change Rate: It is expected that the appliance will only need to be identified during initialization or query sequences. This could vary widely but would be expected to less than once per day.

Minimum Data Rate to Accommodate: Daily

Representative Size of Data Type: As this will be in the domain of the implementing protocol data type will vary widely. A minimum ability to discretely identify multiple appliance types should be implemented.

Minimum Data to Accommodate: Multiple Discrete Identification Values

3.1.5 Product Type ID

Purpose: This function helps identify the type of appliance to enable easier identification and command selection.

Background: A wide variety of appliances are expected to participate in the Smart Grid. This can range from coffee makers to dishwashers to refrigerators to washer and dryers.

Consumer Benefit: The smart grid / energy management system can use this functionality to better identify the functions and priority a consumer has for a given appliance. Knowing more about the device in use by being certain of its type and capabilities will allow for greater functionality and greater convenience for the consumer.

Common Data Values: Product ID's will provide more clarity as to the appliance type. This may be identification of a dishwasher versus a clothes washer, or could be defining a drawer type dishwasher versus a standard single door configuration. These ID's may be product ID's that can be defined in the implementing protocol via various types of assignments, text definitions, lookups, or generic concepts. XML, ASCII, integers and other methods can achieve the functionality as structured within the protocol.

Data Characterization:

Expected Data Change Rate:

Appliances will not change type during use as it is an element of their build rather than a dynamic aspect. This will remain fixed for the life of the product. This data may need to be exchanged periodically as new systems are installed, or during identification after power cycles, etc.

Minimum Data Rate to Accommodate: Monthly

Representative Size of Data Type: The description of the appliance will be determined in size by the method implemented. Integer representations will be fixed in size, but some methods may employ text definitions that could be variable in size. As such, XML or ASCII implementations, for example, will require slightly larger data types than using an integer lookup table.

Minimum Data to Accommodate: Multiple Discrete Identification Values

3.1.6 Get Alerts

Purpose: This function allows a connected device to query as to whether any alerts are present or available. This could be due to missed alerts previously, or a periodic double check, or as other needs are identified by the developer and implementers.