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# Establishing a Need for a Protocol for the Interoperability of Heterogeneous IoT Home Devices

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ESTABLISHING A NEED FOR A PROTOCOL FOR THE INTEROPERABILITY OF  
HETEROGENEOUS IOT HOME DEVICES

by

JENNA BAYTO

(Under the Direction of Christopher Kadlec)

ABSTRACT

The Internet of Things (IoT) refers to the field of connecting devices consumers use every day to the internet. As the world relies on more and more internet-driven technological devices to control functions within the home, issues with compatibility of those devices are surfacing. This research was created to establish the need for standardization of IoT devices within the home.

INDEX WORDS: Internet of Things (IoT), Interconnection, Smart Object, Internet, Home Automation, Cloud computing, Smart environments, Standards, Security

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HETEROGENEOUS IOT HOME DEVICES

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A Thesis Submitted to the Graduate Faculty of Georgia Southern University  
in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE  
STATESBORO, GEORGIA

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Currently, one of the fastest growing segments within Information Technology (IT) is the Internet of Things (IoT). With new ways of applying IoT in constant development, defining it has become challenging. IBM describes IoT as a large network of connected things and people that collect and share data while Amazon focuses on the three core components of things, internet, and connectivity in their definition (IBM 2017, Amazon Web Services n.d.). For this study, the researcher defined IoT as connecting devices to the Internet and/or to each other.

IoT devices and systems are currently being implemented in many ways. Not only can thermostats be controlled while a user is away, but fans, heaters, and blinds can be configured to change with the temperature or the time of the day. Security devices, like doorbell cameras, can allow users to monitor their home when the residents are away while automated light bulbs can act as a theft deterrent by making the home appear occupied. There are also countless IoT devices geared toward convenience including pet feeders, lawn mowers, vacuums, and plant care systems.

Recently, the consumer market has experienced an increase in the production and sale of smart home and consumer IoT devices. Gartner predicted that 63% of all IoT devices purchased in 2017 would be for consumer use (Gartner 2017). The increase in consumer interest is largely due to the desire to control devices and functions within the home remotely. For example, someone who would like to reduce their energy bill would be interested in controlling their water heater and HVAC system consumption when the house is unoccupied.

#### 1.2 Statement of the Problem

IoT devices connect in different ways, leaving the consumer with many factors to consider when choosing devices to use in their home. With the many different connection methods available, such as Wi-Fi and Bluetooth, there are varying degrees of user difficulty for setup as well as operation of the devices.



In addition to the different ways to connect a device, users must also think of where the device will be controlled, such as through an application on a phone or tablet or through a hub in the home like the Amazon Echo or Apple TV.

An additional complication likely to be faced when choosing a smart home controller would be that everyone in the household may not agree on the same brand. For example, if one person prefers to use Apple products while someone else in the household prefers to use Google, IoT devices in the home may not be compatible with both. Even after the household decides which brand of devices to use, if the household were to move into a different home, the devices that are in the new residence (such as HVAC or appliances) may not be compatible with the IoT devices that the household already owns. Also, a household may find new products that they prefer from manufacturers other than their previously owned brands. This may cause a problem in the home with compatibility, causing more expense to reconfigure the home or buy additional products.

Another issue when choosing IoT devices could arise if the devices the household has chosen are no longer supported by their manufacturer or if the manufacturing company were to fold. This is a current problem arising with IoT devices called abandonware. Not only does the consumer lose technical support from the manufacturer, the device will no longer be able to receive potentially critical security and other necessary updates that would allow the device to properly function.

Given the challenges of choosing the appropriate smart home solution, this paper intends to establish the need for a setup and communication standard among IoT devices in the home.

## CHAPTER 2

### LITERATURE REVIEW

There are many considerations when choosing which IoT devices a consumer will use in his/her home. The decision may be based on how the devices will connect, how and where the data being collected will be processed and stored, or the compatibility the new device will have with other devices the user may already own. The researcher analyzed these criteria to determine the most effective solutions for different home users.

#### 2.1 Protocols

In the realm of IT, a protocol is a set of rules or procedures that define how computers and devices communicate with each other. The Open Systems Interconnection (OSI) model, a well known model in the IT field, categorizes different communication protocols into layers based on their function (Zimmermann 1980). While there are 7 layers in the model, this research primarily focused on protocols in the physical layer and the application layer. Physical layer protocols define the connection media for the devices, which include Ethernet and Bluetooth. Application layer protocols provide a communication interface that directly interact with the end-user, such as a thermostat communicating with an application on a user's phone.

##### 2.1.1 Ethernet

One of the most basic types of network connections is wired Ethernet. Ethernet is a connection that uses coaxial or fiber cabling, and its main advantages are security and speed. The primary security risk to anyone using wired Ethernet is from others that are physically connected to the network. Devices connected via a wireless network face a higher security risk. Ethernet boasts speeds over wireless connections because Ethernet does not encounter the possibility of interference within the wireless

spectrum. While wired connections provide greater security and higher speed, these devices lack the mobility of devices using a wireless connection. Devices either have to be located near previously installed infrastructure, or cables will need to be installed to where the device needs to be located within the given space.

### 2.1.2 Wi-Fi

Another type of network connection that many consumers are familiar with is Wi-Fi. Devices connected to a Wi-Fi network communicate via radio waves to an access point. The access point acts as a hub to allow communication between wireless devices and devices connected on a wired Ethernet network. Wi-Fi provides advantages of being the most commonly used wireless connection as well as mobility that Ethernet doesn't allow. However, it requires configuration for the network to be set up. The network also needs to be secured if the devices are going to be accessible on the internet, as many IoT devices are, rather than to just exist on a closed network.

### 2.1.3 Bluetooth

Bluetooth is another popular option for wireless IoT connectivity due to its easy configuration and ability to provide constant streams of data. This has made Bluetooth very popular for streaming audio and data. In order to be used widely in wireless sensors and controllers, Bluetooth devices need to have a lower power consumption to extend the battery life in small devices. This led to the creation of Bluetooth Low Energy (BLE). Unlike standard Bluetooth devices capable of streaming, BLE uses shorter data transmissions, and devices communicate with each other infrequently. Even though low energy capabilities have made it a popular candidate for IoT, Bluetooth was designed to pair with one device at a time, making it difficult to use as a smart home solution where there will be many different devices connecting at once. Bluetooth is also considered a Personal Area Network (PAN), which is optimal for wearable devices, but not for devices located further away within the home. (Kuor-Hsin Chang 2014).

### 2.1.4 Zigbee

Much like Bluetooth, Zigbee is becoming a more widely used method of connecting devices wirelessly. However, unlike Bluetooth, Zigbee has the ability to connect many devices at once and

communicate over much longer distances. Zigbee forms a network that is considered a mesh, meaning that data can travel from one device through the rest of the devices in any order needed to reach its destination. Zigbee works best in a scenario where devices that are connected are the same type of device. While this may be suitable, for example, in a large building that needs identical temperature sensors in every room that communicate together, most homes would only need a few temperature sensors that would be able to communicate with many different kinds of devices.

#### 2.1.5 Protocol Summary

Each of these protocols have strengths and weaknesses. Some can boast low energy consumption, mobility, and transmission speed advantages, whereas some have weaknesses in distance and security. While all of these protocols provide a way to connect to each smart device within the home, they do not form a comprehensive solution to controlling all IoT smart home devices.

### 2.2 Data Processing and Storage

Another important consideration when choosing IoT devices is where the data will be processed and stored. The options can be categorized into centralized, decentralized, or a combination of both. Some concerns when considering these options include: speed, network congestion, cost, and scalability. Three of the most prevalent approaches are cloud, edge, and fog computing.

#### 2.2.1 Cloud Computing

Cloud computing is an option for data processing and storage for IoT devices. There are several advantages to using cloud services in IoT. It is scalable, available on demand, and can elastically fit the needs of each user. Cloud computing is also available on a pay as is needed basis, making the upfront investment for the service minimal. Often the cloud where the storage and processing occurs is managed by another party, which transfers the risk to the cloud owner. There are, however, some disadvantages to using cloud computing to process data for IoT devices. Cloud computing can be an inadequate use of resources as data has to be sent back and forth to the cloud. Also, latency occurs due to the time taken to go back and forth between the cloud and devices, which makes it a poor choice for real-time analysis and decision making. (El-Seoud 2017)

### 2.2.2 Edge Computing

An alternative for those who have time-sensitive data processing needs may be edge computing. Unlike cloud computing, edge computing does its processing and storage locally near the IoT devices. This approach reduces network congestion, allowing for faster data analysis; therefore, faster decision making is available since the data is not being sent back and forth as in cloud computing. Edge computing also has its limitations. IoT applications have to compete for the resources available since edge computing devices are not as scalable and on demand as cloud devices are. In addition, the edge devices are not as capable of managing the competition for the resources.

While cloud computing is centralized, meaning all processing and storage occurs within a central location, edge computing is decentralized, meaning processing and storage occur where the IoT devices are utilized. In some instances, users may need a mixture of the two, which makes fog computing a better choice.

### 2.2.3 Fog Computing

Fog computing integrates both cloud computing and edge computing and gives users the best of both options. Fog allows for some initial data processing at the edge but also allows the use of cloud computing in situations that are more advantageous. Fog eliminates the congestion as IoT devices compete for edge resources, but it also does not cause as much traffic traveling back and forth to the cloud. While cloud computing is centralized and edge decentralized, fog is somewhere in the middle as processing and storage can occur both within a central location as well as where the devices are located. It facilitates what occurs in the cloud and what occurs at the edge near the devices to allow for the best allocation of resources.

## 2.3 Smart Home Solutions

There are currently several solutions on the market to control the IoT devices in the home. They are manufactured by many popular consumer technology companies such as Google's Home, Amazon's Echo, and Apple devices containing Homekit. Each company's approach to controlling and managing these devices is very different.

### 2.3.1 Smart Speakers

Many users are starting to control their smart home devices using voice-controlled smart speakers. The speakers are always listening, allowing the user to speak an activation phrase or “wake word” to interact with the device. Once the activation phrase has been recognized, the speaker streams voice audio to the device’s cloud platform to process the request given. While the industry’s leading manufacturers of smart speakers, Amazon and Google, claim their smart speakers are not supposed to capture audio until the device hears its activation phrase, users must trust that the device is not capturing more or could not be compromised to capture information unbeknownst to the user. Voice controlled smart home speakers also exclude hearing impaired users who would not be able to effectively communicate with the speaker.

### 2.3.2 Apple HomeKit

Apple has created a framework for communicating with and controlling IoT devices called HomeKit. HomeKit allows devices to be organized by room and scenes so that devices can be controlled based on the time of day or the user’s mood. Devices can also be controlled by using Siri. HomeKit primarily uses Apple TV for a hub, but an iPad that is always kept at home can also be used. While HomeKit does not require the use of a hub to control devices when the user is at home, it is necessary to have a hub in order to control devices when away from the home. An example of this would be having the door unlock and the thermostat change when a person arrives home. In order to implement this type of smart home solution, it requires users to be somewhat invested in Apple products, as opposed to someone who just owns one iOS device. (Fog Computing: Helping the Internet of Things Realize Its Potential 2016)

## CHAPTER 3

### METHOD

With IoT being a new, developing field, a lack of research exists where it is concerned. This is especially true for IoT devices for the home. Thus, the researcher chose a qualitative approach for analyzing data. A quantitative approach would have only provided data that was descriptive in nature rather than developmental, while using a qualitative approach allows for a more holistic view and the production of richer data.

#### 3.1 Critical Incident Technique

The qualitative research technique chosen was the Critical Incident Technique (CIT). CIT collects direct observations of human behavior that are significant to the problem observed and meeting specific defined criteria. The observations are called incidents and are collected and used to solve a practical problem. This technique was created during World War II to develop procedures and classification of air crews. The military wanted specific reasoning to understand why certain pilots were unable to learn to fly and were subsequently eliminated from flight training school. Military officials had been receiving generic reasoning such as “lack of flying ability” and wanted to obtain more precise selection and training procedures.

Typically, the CIT collects incidents that match a specific defined criterion, which allows researcher to look at a group of incidents as a whole to determine a trend. The “incidents” that were gathered in the study were the existence of each IoT device. Because IoT devices are such an emerging technology, the intentions of this study are to develop a foundation as opposed to an exhaustive list.

In this research, the technique serves to evaluate the search term “smart home devices” to identify devices that were relevant to the research. Once a search term had been identified, an initial spreadsheet was developed with the first 50 results found (Appendix A – IoT Search 1). Each result was then reviewed for relevance to the desired criteria. After viewing 25 search results, the researcher began to

notice a pattern of several irrelevant results in a row and determined that further search would no longer be beneficial.

The list of relevant search results was used to create a coding document to be used within the study (Appendix B – Coding Document). After determining the devices to be studied, the researcher evaluated the core functions, categories, inputs and outputs of each device. The core functions of the devices found included monitor, control, measure, and trigger. The categories were temperature, security, convenience, utility, environmental comfort/safety, wellness, entertainment, and user configuration. The devices were evaluated to determine whether the core functions for these devices would be input, output, or both. Lastly, each device was labeled by type to identify devices whose names may not be self descriptive. Table 1 shows examples of devices and how each was classified.

**Table 1—Device List Format**

<b>Device</b>	<b>Core Functions</b>	<b>Categories</b>	<b>Input</b>	<b>Output</b>	<b>Type</b>
Nest Learning Thermostat	Monitor, Control, Measure	Temperature Control	Monitor, User	Trigger	Thermostat
Amazon Echo	Monitor, Control, Trigger	User Config	Monitor, Trigger User	Measure, Trigger	Hub

One example of a device found was a thermostat. The core functions relevant to a thermostat were monitor—such as viewing the temperature within the house over time, control—for example, controlling fans and blinds, and measure—looking at temperature at any specific point in time. Because a thermostat monitors temperature, the thermostat was categorized under temperature control. The inputs assigned were monitor (sensors within the house could communicate the temperature collected from various part of the house with the thermostat) and user (the homeowner can input the desired temperature). Lastly, the output found to be associated with a thermostat was trigger because the thermostat can direct another device to change its current state to adjust to the desired temperature.

As the study progressed, a second search was completed using the same search term to ensure the most relevant results (Appendix C – IoT Search 2). In the first search, 11 of the sites found in the search results had relevant items that were used to create the list of devices. Within those 11 sites, forty-three



devices were found. When the second search was conducted, 35 of the 50 sites were found to have relevant results. Of those 35 sites, eight of the sites had devices that were not shown in the list developed during the first search. Within those eight sites, 14 more devices were found and were added to create a revised device list, for a total of 57 devices researched (Appendix D – Revised Device List).

CHAPTER 4  
FINDINGS AND ANALYSIS

Once the second search had been conducted, the researcher requested an additional researcher to analyze the search to verify the first researcher's results. To determine the degree to which both researchers were in agreement on the devices found within the search as well as each device's attributes, a test of inter-rater reliability (IRR) was conducted. For each result found to be relevant, the researchers individually took 10% (the first five sites) from the list of results and defined for each device the core function, categories, input, output, and type to create a coding document. The researchers then compared their findings for the first ten percent. The researchers felt the results were comparative; therefore, each researcher individually coded the remaining 90% of the results (Appendix E – Rater 1, Appendix F – Rater 2).

After the results had been coded, the initial researcher took the documents and compared the results for exactness (Appendix G – IRR Final). The researcher divided the number of exactly matched devices found by the sum of the devices found for each of the attributes to compute a percent of agreement for each attribute. Table 2 below shows the inter-rater reliability results (IRR) for each attribute. The percentages found were a level of agreement acceptable to the researchers.

**Table 2—Inter-Rater Reliability**

<b>Core Function</b>	<b>Categories</b>	<b>Input</b>	<b>Output</b>	<b>Type</b>
82%	91%	82%	84%	91%

## CHAPTER 5

### FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

IoT continues to be a highly emerging field. Within the six months between the first and second searches the researcher conducted, 14 additional relevant devices were found, showing that the field continues growing at a rapid rate. The growth makes it very difficult to create a standard, but it also re-emphasizes the need for the standard while new devices are being created. The creation of a standard, which could potentially decrease the amount of abandonware is a huge consideration to continually encourage consumers to invest in IoT home products. Having a standard would also make buying decisions easier on the consumer, which also helps promote investment in these devices and would logically be of interest to manufacturers in the field.

Using the Critical Incident Technique, the researchers were able to identify 57 relevant types of devices, which did not create an exhaustive list, but provided a thorough foundation for future study. Examining the list of different devices currently used in the home and the attributes of those devices could provide guidance for future studies attempting to establish criteria for a standard. It also could assist to think of devices outside of their primary use such as new ways they could be integrated and utilized. For example, having smart light bulbs would not just be a convenience to turn on when the household needs them in use, they could also turn on at a certain time of the day to make it appear as if someone is home and deter potential criminal activity.

Because IoT is such an evolving field, there appears to be less interest in standardization as manufacturers work to get the latest and greatest products on the market. It is this researcher's conclusion that standardization is needed and is in the best interest of the consumer; however, it may take time and the right type exposure of device failures before the need is fully realized. This research has been created to hopefully lay ground work for creation of a future standard for all IoT devices.

## REFERENCES

- Amazon Web Services*. <https://aws.amazon.com/iot/what-is-the-internet-of-things/> (accessed August 15, 2017).
- El-Seoud, Samir A., Hosam F. El-Sofany, Mohamed Abdelfattah, and Reham Mohamed. "Big Data and Cloud Computing: Trends and Challenges." *International Journal of Interactive Mobile Technologies* 11, no. 2 (2017): 34-52.
- Flanagan, John C. "The Critical Incident Technique." *Psychological Bulletin* 51, 1954: 327-358.
- "Fog Computing: Helping the Internet of Things Realize Its Potential." *Computer* 8 (2016): 112-116.
- Gartner. February 7, 2017. <http://www.gartner.cozm/newsroom/id/3598917> (accessed 2017).
- IBM. September 19, 2017. <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/> (accessed April 11, 2018).
- Jin-Shyan Lee, Yu-Wei Su, Chung-Chou Shen. "A Comparative Study of Wireless Protocols: Bluetooth, UWB, ZigBee, and Wi-Fi." IECON 2007 – 33rd Annual Conference of The IEEE Industrial Electronics Society, 2007.
- Kuor-Hsin Chang, Chang Consulting. "Bluetooth: A Viable Solution for IoT? [Industry Perspectives]." *IEEE Wireless Communications*, 2014.
- Zhongmin Li, Mao Song, Lu Gao. "Design of Smart Home System Based on Zigbee." *Applied Mechanics and Materials* Vols. 635-637, 2014: 1086-1089.
- Zimmermann, H. 1980. "OSI Reference Model--The ISO Model of Architecture for Open Systems Interconnection." *IEEE Transactions On Communications* 28, no. 4: 425. *Complementary Index, EBSCOhost* (accessed April 30, 2018).

## APPENDIX A—IoT SEARCH 1

### [IoT Home Guide | 2017 Overview of the Best Connected Home Products](#)

[www.postscapes.com/internet-of-things-award/connected-home-products/](http://www.postscapes.com/internet-of-things-award/connected-home-products/)

Amazon Echo is a hands-free speaker you control with your voice. Echo connects to the Alexa Voice Service to play music, provide information,... The Wifi Smart Sprinkler Control system that saves 20-50% on watering bills using your laptop or smartphone to schedule watering times and...

Best Smart WiFi Outlets and ... · Wifi Lighting · Wireless Home Energy Monitors

### [The Internet of Things: 8 of the Best Smart Home Devices - Zipcar](#)

[www.zipcar.com/ziptopia/city-living/8-of-the-best-smart-home-devices](http://www.zipcar.com/ziptopia/city-living/8-of-the-best-smart-home-devices)

To celebrate the glorious ease of the *Internet of Things*, we've rounded up eight of the best smart *home devices*. These plugged-in gadgets come outfitted with ...

### [IOTLIST - Discover the Internet of Things](#)

[iotlist.co/](http://iotlist.co/)

Awair Glow: Smart plug that tracks air quality. TP-Link: Multicolor smart wi-fi. Wemo Mini: Wifi smart plug. Google Daydream: Virtual reality headset. Lyric: T5 wi-fi thermostat. Talkies: A new way to chat with kids. Google Wifi: Cover your *home* with wifi. Ring: Video doorbell pro.

Talkies: A new way to chat with ... · Google Wifi: Cover your home ... · 40

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### [The Best Smart Home Devices of 2017 - Digital Home - PCMag UK](#)

[uk.pcmag.com](http://uk.pcmag.com) › ... › Digital Home

3 days ago - The *Internet of Things* lets you automate your *home* and monitor it from afar. Ready to dive in? Start here.

### [Best Smart Home Devices of 2017 - CNET](#)

<https://www.cnet.com/topics/smart-home/best-smart-home-devices/>

Feb 27, 2017 - Ready to start building out your smart *home*? CNET editors' reviews of the best smart *home devices* include product photos, video, and user ...

### [11 home IoT devices actually worth getting | InfoWorld](#)

[www.infoworld.com/.../home.../these-home-iot-devices-are-actually-worth-getting.ht...](http://www.infoworld.com/.../home.../these-home-iot-devices-are-actually-worth-getting.ht...)

Dec 27, 2016 - There's a lot of junk pitched to you and me as part of the *internet of things* and *home* automation hype. Sadly, most of these products are silly ...

#### [How IoT & Smart Home Automation Will Change the Way We Live ...](#)

[www.businessinsider.com/internet-of-things-smart-home-automation-2016-8](http://www.businessinsider.com/internet-of-things-smart-home-automation-2016-8)

Dec 19, 2016 - With the internet coming soon to every *device* near you, smart *homes* will become more common. Connecting your *home* to your possessions ...

#### [Top 10 smart home gadgets and appliances | ZDNet](#)

[www.zdnet.com/pictures/top-10-smart-home-gadgets-and-appliances/](http://www.zdnet.com/pictures/top-10-smart-home-gadgets-and-appliances/)

Apr 17, 2015 - Philips Hue is a smart *home* lighting range which combines LED lighting with mobile technology. An accompanying mobile app connects to ...

#### [How to Protect All Your Internet-Connected Home Devices From ...](#)

[thehackernews.com/2016/12/protect-home-iot-network.html](http://thehackernews.com/2016/12/protect-home-iot-network.html)

Dec 12, 2016 - How many Internet-connected *devices* do you have in your *home*? ... But when it comes to manually protecting all *IoT* security issues, it is not ...

#### [The Dark Side of Internet of Things Home Devices – HOTforSecurity](#)

<https://hotforsecurity.bitdefender.com/.../the-dark-side-of-internet-of-things-home-de...>

Imagine you just bought a million-dollar mansion - the *home* you've always dreamed of. Everything is brand new, but one day you go to the attic and find...

#### [Bitdefender BOX - IoT Security Solution For All Connected Devices](#)

<https://www.bitdefender.com/box/>

Bitdefender BOX is a piece of hardware that protects every computer, phone, tablet, and smart *device* on your network. ... The first of its kind, Bitdefender BOX is a revolutionary internet security solution that incorporates hardware, cloud and software designed to protect your smart ...

#### [Best IoT devices for the connected home | TheINQUIRER](#)

<https://www.theinquirer.net/inquirer/feature/.../best-iot-devices-for-the-connected-ho...>

Aug 14, 2015 - THE *INTERNET OF THINGS (IoT)* is not something we can hide from, especially behind the sofa. The term itself is vague, sweeping and ...

### [Best of CES 2017 - Smart home devices: Alexa everywhere ...](#)

[www.pocket-lint.com/.../139916-best-of-ces-2017-smart-home-devices-alexa-everyw...](http://www.pocket-lint.com/.../139916-best-of-ces-2017-smart-home-devices-alexa-everyw...)  
Jan 5, 2017 - Along with a wealth of new televisions, laptops and other tech, CES is increasingly packed with connected *devices* for the *home*. We've walked ...

### [10 Smart Home Devices For Home Automation - Hongkiat](#)

[www.hongkiat.com/blog/smart-devices-home-automation/](http://www.hongkiat.com/blog/smart-devices-home-automation/)  
Dec 9, 2016 - Or turn the air conditioning on before you get *home* from work? Smart *Home devices* also can let you monitor the safety of your *home*, unlock ...

### [The best smart home, IoT products of CES 2017 | ZDNet](#)

[www.zdnet.com/pictures/the-best-smart-home-iot-products-of-ces-2017/](http://www.zdnet.com/pictures/the-best-smart-home-iot-products-of-ces-2017/)  
Jan 5, 2017 - The hallways are crammed with smart *home* and *Internet of Things* ... and acts as an additional layer of security for connected, *IoT devices*.

### [FTC Launches Contest For Technology Tool To Protect Home IoT ...](#)

[www.darkreading.com/vulnerabilities---threats/...home-iot-devices/.../1327831](http://www.darkreading.com/vulnerabilities---threats/...home-iot-devices/.../1327831)  
Jan 4, 2017 - *IoT Home Inspector Challenge* will award \$25000 for best proposal. ... to properly protect *home devices* that connect to the *Internet of Things*, ...

### [Another problem with the Internet of Things: smart home devices don't ...](#)

[globalnews.ca/news/3280756/amazon-s3-outage-smart-home-devices-wouldnt-work/](http://globalnews.ca/news/3280756/amazon-s3-outage-smart-home-devices-wouldnt-work/)  
Mar 1, 2017 - Smart *home* technology is pretty cool, until you're left sitting in the dark because a network outage is preventing you to turn on your wireless ...

### [The one thing you need to do to stop your home devices from getting ...](#)

[mashable.com/2016/10/21/protect-home-devices-iot-hacks/](http://mashable.com/2016/10/21/protect-home-devices-iot-hacks/)  
Oct 21, 2016 - The DDoS attack that targeted Dyn, an obscure but crucial internet infrastructure company, took advantage of *Internet of Things (IoT) devices*.

### [Internet of things - Wikipedia](#)

[https://en.wikipedia.org/wiki/Internet\\_of\\_things](https://en.wikipedia.org/wiki/Internet_of_things)  
[Jump to Building and home automation - The Internet of things \(IoT\) is the inter-networking of physical devices, vehicles buildings, and other ...](#)

### [Internet of Things: Why Connected Toasters and Other Smart Home ...](#)

<https://blog.rackspace.com> › Digital Marketing

Oct 7, 2016 - *Internet of Things: Why Connected Toasters and Other Smart Home ...* or *IoT*, is the network of electronic things, including computing *devices*, ...

### [How It Works | SmartThings](#)

[www.smarthings.com/how-it-works](http://www.smarthings.com/how-it-works)

\$99.00 - In stock

With the free SmartThings app, you can receive important notifications about what's happening at *home*, control your smart *devices* with a simple tap, and ...

### [How to quickly check that your home IoT devices are secure | PCWorld](#)

[www.pcworld.com/.../internet-of-things/how-to-quickly-check-that-your-home-iot-de...](http://www.pcworld.com/.../internet-of-things/how-to-quickly-check-that-your-home-iot-de...)

Jan 12, 2017 - Don't let your smart clock expose you to hackers. A web app from BullGuard can help.

### [Connected Home Devices – IoT Security Foundation](#)

<https://iotsecurityfoundation.org/tag/connected-home-devices/>

By David West, Engineering Director of Icon Labs. The original article can be seen here. In July of 2014, HP Labs did a study of 10 popular *IoT devices* and ...

### [Suddenly hot smart home devices are ripe for hacking, experts warn](#)

[www.cnn.com/.../suddenly-hot-smart-home-devices-are-ripe-for-hacking-experts-wa...](http://www.cnn.com/.../suddenly-hot-smart-home-devices-are-ripe-for-hacking-experts-wa...)

Dec 25, 2016 - Smart *home devices* are soaring in popularity and sales but experts ... Experts expect the number of attacks on the *Internet of Things (IoT)* will ...

### [IBM Watson IoT - IoT in the home](#)

<https://www.ibm.com/internet-of-things/iot-zones/iot-home/>

*Home* is where the smart is. Don't ignore the 90% of smart *device* data that goes uncaptured today. Realize the potential of the smart *home* by understanding ...

### [Connected Home Devices Remain Favorite IoT Products For Parents |](#)



[www.geomarketing.com/connected-home-devices-remain-favorite-iot-products-for-p...](http://www.geomarketing.com/connected-home-devices-remain-favorite-iot-products-for-p...)

Jan 5, 2017 - Connected *Home Devices* Remain Favorite *IoT* Products For Parents. A possible interpretation of the stats: Staying in with the kids translates to ...

#### [The Internet of Things at home: 14 smart products that could change ...](#)

[www.computerworld.com/article/2474727/.../150407-the-internet-of-things](http://www.computerworld.com/article/2474727/.../150407-the-internet-of-things)

Jun 30, 2014 - The *Internet of Things* is changing simple *homes* into smart *homes*, ... make sure the *devices* you're considering are compatible with those you ...

#### [Identity and Access Management for Smart Home Devices | NCCoE](#)

<https://nccoe.nist.gov/projects/project-concepts/idam-smart-home-devices>

The *Internet of Things (IoT)* refers to the ability of everyday objects (things) to ... models for the lifecycle of *IoT* and/or smart *home devices*; threat vectors and ...

#### [IoT device management framework for smart home scenarios - IEEE ...](#)

[ieeexplore.ieee.org/document/7398711](http://ieeexplore.ieee.org/document/7398711)

by T Perumal - 2015 - Cited by 4 - Related articles

In recent time, rapid growth of *IoT devices* in smart *home* environment envisioned a wide range of novel services and applications. However, due to the inherent ...

#### [Four ways to unlock the full potential of the IoT connected home - IoT ...](#)

[internetofthingsagenda.techtarget.com/.../IoT.../Four-ways-to-unlock-the-full-potentia...](http://internetofthingsagenda.techtarget.com/.../IoT.../Four-ways-to-unlock-the-full-potentia...)

Jan 24, 2017 - There are four strategies for the *IoT* industry to consider as it seeks to ... Ninety-nine percent of appliances and *devices* in the *home* are not ...

#### [Internet of Things: Forget the big numbers, what are the best IoT ...](#)

[www.techradar.com/.../internet-of-things-forget-the-big-numbers-what-are-the-best-io...](http://www.techradar.com/.../internet-of-things-forget-the-big-numbers-what-are-the-best-io...)

Dec 19, 2015 - 34 billion connected *devices* by 2020, global investment of \$7.3 trillion by 2017. Blah blah blah. What about the gadgets themselves?

#### [Smart Homes with Intel® Internet of Things \(IoT\) Technologies](#)

[www.intel.com/content/www/us/en/internet-of-things/smart-home.html](http://www.intel.com/content/www/us/en/internet-of-things/smart-home.html)

Intel® *IoT* Technologies for the Smart *Home*. Build the smart *home* of the future with *Internet of Things (IoT)* technologies: Customer-premises *device* and ...

#### [This Small Device Detects Cyber Threats In Your Smart Home Devices](#)

[www.forbes.com/.../this-small-device-detects-cyber-threats-in-your-smart-home-devic...](http://www.forbes.com/.../this-small-device-detects-cyber-threats-in-your-smart-home-devic...)

Dec 21, 2016 - This pebble-like *device* will protect your smart *home* from cyber threats and secure ... This is largely because *IoT devices* offer easily accessible ...

#### [CUJO Smart Firewall - Stay Safe Online](#)

<https://www.getcujo.com/>

CUJO is a smart firewall that keeps your connected *home* safe. From smartphones to laptops, secure all *devices* against hacks and web threats. Now you can ...

#### [Glympse brings its location sharing to connected home devices](#)

<https://www.engadget.com/2017/01/.../glympse-familymap-location-sharing-iot-devic...>

Jan 12, 2017 - The *Internet of Things* is set to expand in a big way if all the voice-controlled and Alexa-equipped tech we saw at CES last week is any ...

#### [FTC Launches Contest For Technology Tool To Protect Home IoT ...](#)

[www.darkreading.com/vulnerabilities---threats/...home-iot-devices/.../1327831](http://www.darkreading.com/vulnerabilities---threats/...home-iot-devices/.../1327831)

Jan 4, 2017 - *IoT Home Inspector Challenge* will award \$25000 for best proposal. ... to properly protect *home devices* that connect to the *Internet of Things*, ...

#### [Home Automation | Smart Home Technology - The Home Depot](#)

[www.homedepot.com](http://www.homedepot.com) › *Electrical*

New *home automation devices* let you transform virtually any house into a push-button smart *home* easily controlled with a tablet, computer or smartphone.

#### [How Secure are Home IoT Devices?- Internet of Things Recruiting](#)

[internetofthingsrecruiting.com](http://internetofthingsrecruiting.com) › *IOT Security*

One of the fastest growing areas within the industry, is in the market of *home IoT devices*. These are *devices* designed to make life easier, such as connected ...

#### [Here's what you can do to prevent your smart-home devices from ...](#)

[www.recode.net/.../bot-iot-devices-malware-cyber-attack-internet-safety-router-passw...](http://www.recode.net/.../bot-iot-devices-malware-cyber-attack-internet-safety-router-passw...)

Oct 26, 2016 - Podcasts · Events; ✕. *Internet of Things* · Security. Here's what you can do to prevent your smart-*home devices* from being hijacked ...

## APPENDIX B—Coding Document

<b>Core Functions:</b>	
<b>Measure:</b>	Captures a discrete value (Ex: a temp at a point in time, a picture)
<b>Monitor:</b>	Captures a continuous stream of values (Ex: analog temp values over time, video)
<b>Control:</b>	Performs action when something happens based on user input
<b>Trigger:</b>	Performs action when something happens when some value is met

<b>Categories:</b>	
<b>Temp Control:</b>	Devices that collect temperature data or control temperature
<b>Security:</b>	Precautions that help users secure their home (and its occupants?)
<b>Convenience:</b>	Devices that saves the user time or simplify/decrease the work needed to complete desired tasks
<b>Utility Control:</b>	Informs user of utility consumption from individual devices or from the household as a whole
<b>Environmental Comfort/Safety :</b>	Alert or inform user of environmental factors
<b>Entertainment:</b>	Devices used by the user for enjoyment
<b>User Config:</b>	Devices with multiple or complex functions that must be controlled or configured by the user
<b>Wellness:</b>	Assists user with maintaining or improving the quality of their health

## APPENDIX C—IoT SEARCH 2

### [The Best Smart Home Devices of 2017 | PCMag.com](#)

<https://www.pcmag.com/article2/0,2817,2410889,00.asp>

Oct 2, 2017 - Alexa works with a number of *smart home devices* directly, as well as with If This Then That (IFTTT) to control plenty of others via "recipes" you ...

Wink Hub 2 · Robomow RS622 · Door locks · Hisense 10,000 BTU Portable ...

### [Best Smart Home Devices of 2017 - CNET](#)

<https://www.cnet.com/topics/smart-home/best-smart-home-devices/>

Aug 7, 2017 - Ready to start building out your smart home? CNET editors' reviews of the best *smart home devices* include product photos, video, and user ...

### [Welcome to My Smart Home: The 12 Best Devices to Make Your ...](#)

[fortune.com](#) › *The 21st Century Corporation* › *smart home*

Feb 17, 2017 - The Future Is Now: Welcome to My (*Smart*) House. ... There are more connected *home gadgets* to install than ever before, from locks to switches to speakers.

... Philips Hue *Smart Light Bulbs*.

### [Smart Home Automation - The Home Depot](#)

<https://www.homedepot.com/b/Smart-Home/N-5yc1vZc1jw>

Welcome to the Home for *Smart Home*. Get all the latest *smart devices* for home automation, including smart hubs, smart locks, smart thermostats, and more.

### [Smart Home Devices Buying Guide - Best Buy](#)

<https://www.bestbuy.com/site/buying-guides/smart-home.../pcmcat333300050013.c?...>

Best Buy shares the important information you need when buying *smart home devices* and automation products.

### [Smart Home & Home Automation Products - Best Buy](#)

<https://www.bestbuy.com> › *Home, Garage & Office* › *Smart Home*

Shop Best Buy for a great selection of *smart home devices*, from security solutions to home automation systems.

### [The 10 best smart home devices in the world right now | Stuff](#)

<https://www.stuff.tv/top-10/smart-home-devices>

The 10 best *smart home devices* in the world. Read on for the definitive Smart Home buying guide from Stuff, the gadget and tech experts.

[Smart Home Devices & Systems | Amazon.com](#)

<https://www.amazon.com/smart-home/b?node=6563140011>

Results 1 - 16 of 631 - Looking for *smart home devices*? Welcome to the Amazon smart home store, where you'll find great prices on a variety of smart products to ...

[Best Smart Home Technology of 2017 - Systems, Devices and Products](#)

<https://www.tomsguide.com/us/best-smart-home-gadgets,review-2008.html>

Looking to make your home just a little smarter? While still in its infancy, the number of *smart home* products—*devices* that let you control your lighting, ...

[25 Best Smart Home Products for 2017 - Smart Home Automation ...](#)

[www.bestproducts.com/tech/gadgets/g1962/smart-home-automation-products/](http://www.bestproducts.com/tech/gadgets/g1962/smart-home-automation-products/)

Oct 13, 2017 - *Smart home* products are usually defined by their ability to connect to a ... which allows their users to interact with them from their mobile *device*.

[The Internet of Things: 8 of the Best Smart Home Devices - Zipcar](#)

[www.zipcar.com/ziptopia/city-living/8-of-the-best-smart-home-devices](http://www.zipcar.com/ziptopia/city-living/8-of-the-best-smart-home-devices)

We've rounded up eight of the best *smart home devices*, these gadgets come with Wi-Fi capabilities and companion apps for a more streamlined life.

[The 10 best devices to turn your home into a smart home - Business ...](#)

[www.businessinsider.com/best-smart-home-devices-2015-12](http://www.businessinsider.com/best-smart-home-devices-2015-12)

Dec 2, 2015 - If you can appreciate forward-looking tech, and have a wallet with money to burn, here are a few *smart home devices* that might genuinely help ...

[smart home & home automation devices - Target](#)

<https://www.target.com › home › smart home & home automation devices>

Items 1 - 24 of 237 - Shop Target for *smart home* & automation *devices* you will love at great low prices. Free shipping on orders of \$35+ or free same-day pick-up ...

[The Best Apple HomeKit-compatible Smart Home Devices of 2017 ...](#)

[smarthome.reviewed.com/best.../best-apple-homekit-compatible-smart-home-devices](https://smarthome.reviewed.com/best.../best-apple-homekit-compatible-smart-home-devices)  
 Apple's HomeKit *smart home* ecosystem might not have the same cool factor as Amazon Alexa, but it's still a compelling solution, especially if you own lots of ...

#### [Sonos will let apps and smart home devices connect to its speakers ...](#)

<https://www.theverge.com/2017/10/4/16418946/sonos-platform-open-2018>  
 Oct 4, 2017 - That means apps, hardware, and even *smart home devices* will be able to more closely integrate with Sonos' hardware. Sonos has Olutron ...

#### [Smart Home | App and Cloud Controlled Devices | John Lewis](#)

<https://www.johnlewis.com> › *Electricals*  
 Buy *Smart Home* Kit at John Lewis. Take control using your Apple iOS 8 iPhone, iPad or Android *device*. Free Standard Delivery on orders over £50.

#### [7 Smart Home Devices Worth Splurging On | MyDomaine](#)

[www.mydomaine.com/smart-home-devices](http://www.mydomaine.com/smart-home-devices)  
 Oct 9, 2017 - Even if you're not one-hundred percent sure how Wi-Fi works, you can (and should) splurge on these *smart home devices*—here's why.

#### [Control smart home devices using Google Home - Google Home Help](#)

<https://support.google.com/googlehome/answer/7073578?hl=en>  
 You can control *smart home devices* including lights, switches, plugs, and thermostats using Google Home. Supported *smart home devices* Here's a list of ...

#### [Smart Home Products - Best Home Automation and Smart Home ...](#)

[https://www.gearbest.com/smart-home-c\\_11343/](https://www.gearbest.com/smart-home-c_11343/)  
 Shop for the best intelligent home for *smart home* security system at unbeatable great prices, including home security cameras, remote light switch, wireless ...

#### [These 4 smart-home devices work with your iPhone - Business Insider](#)

[www.businessinsider.com/smart-home-devices-that-work-with-iphone-2016-11](http://www.businessinsider.com/smart-home-devices-that-work-with-iphone-2016-11)  
 Amazon might be the first company to come to mind when you think about the *smart home*, but there are some products that you can control with just your ...

#### [The Best Ways to Control All Your Smarthome Devices from One Place](#)

<https://www.howtogeek.com/.../the-best-ways-to-control-all-your-smarthome-devices/>  
 Sep 17, 2017 - The more *smarthome* products you pile onto your house, the more complicated it gets to integrate all of them together and seamlessly control ...

#### [Smart Home Deals, Sales & Special Offers – November 2017 ...](#)

<https://www.techbargains.com/category/394/lifestyle-home/smart-home-devices>  
 Looking for Smart Home deals? ... Eligible Prime members w/ compatible smart lock can watch their in-home package ..... 6 Tips for *Smart Home Devices*. Home ...

#### [Samsung Connect Home: Control Your Smart Home Devices ...](#)

<https://www.samsung.com> › Home › Mobile › Services  
 Discover and install new *smart devices* in your *home*. Samsung Connect scans your network, recognizes your compatible *devices* and then pairs them with your ...

#### [Smart Homes | Zigbee Alliance](#)

[www.zigbee.org/what-is-zigbee/494-2/](http://www.zigbee.org/what-is-zigbee/494-2/)  
 Zigbee is the language for a wide variety of *smart home devices* so companies can deliver an integrated ecosystem of home monitoring, energy management, ...

#### [Eco-Friendly Smart Home Devices - Sunset](#)

[www.sunset.com/home/natural-home/smart-home-devices](http://www.sunset.com/home/natural-home/smart-home-devices)  
 These *smart home devices* will help you save water, conserve energy, and lower your bills in the process.

#### [50 Best Smart Home Systems and Devices 2017 - Watchdog Reviews](#)

<https://watchdogreviews.com> › Home & Kitchen  
 The best *smart home devices* and systems are all user-friendly, easy to set up, expandable, compatible with various hardware, and are affordably priced.

#### [11 best smart home devices | The Independent](#)

[www.independent.co.uk](http://www.independent.co.uk) › Extras › IndyBest › Tech  
 Jun 13, 2017 - *best-smart-home-devices.jpg*. Sometimes it can be too much work to get off the sofa, slob over to the wall switch and turn the lights down, can't ...

#### [Best Smart Home Devices for the HomePod - Macworld UK](#)

<https://www.macworld.co.uk> › ... › *Best smart home devices for the HomePod*  
 Oct 4, 2017 - The best lights, locks, thermostats, cameras and other *smart home devices* you can control with an iPhone, iPad, Apple TV or HomePod.

#### [Xiaomi Mi Smart Home - category of Xiaomi smart devices and ...](#)

<https://xiaomi-mi.com/mi-smart-home/>  
 All of *Xiaomi Smart Home devices* ► Choose category: lighting, sockets & sensors, WiFi routers, air & water purifiers, beauty & personal care, appliances or ...

#### [Best Smart Home Devices And How IoT Is Changing The Way We Live](#)

<https://www.forbes.com/.../best-smart-home-devices-and-how-iot-is-changing-the-wa...>  
 Jun 6, 2017 - Successful CIOs, CTOs & executives from Forbes Technology Council offer firsthand insights on tech & business. ... With the rapid growth of the internet of things (IoT), this level of *home* automation has become a reality. ... About 68% of those interviewed were confident that *smart homes* ...

#### [9 Awesome Deals on Smart Home Devices on Amazon | Digital Trends](#)

<https://www.digitaltrends.com> › *Deals*  
 Enjoy discounts of up to \$270 on these brand-name *smart home devices* from manufacturers like Amazon and TP-Link.

#### [Home Automation Systems & Smart Home Devices | Vivint](#)

<https://www.vivint.com/packages/home-automation>  
 What are the benefits of *home* automation? ... Vivint SkyControl Panel is the hub that moderates communications between you and all your *home* automation products. An intuitive touch-screen dashboard puts all your *home* controls in one place, while the two-way talk feature links you ...

#### [2017 IoT Products | Overview of the Most Popular Smart Home Devices](#)

<https://www.postscapes.com/internet-of-things-award/winners/>  
 We've collected the best and most popular options the IoT has to offer, from *smart home devices* to enterprise platforms to the software and tools you need to ...

#### [Smart Home - Devices for Home Automation - Macy's](#)

<https://www.macys.com/shop/for-the-home/smart-home?id=140842>



Buy *Smart Home Devices* at Macy's! Automate your home with voice command & connected home devices: Amazon Alexa & Echo, wifi light switches, speakers ...

#### [Control your smart home devices with Cortana - Cortana Help](#)

<https://support.microsoft.com/en-us/help/4046777/control-smart-home-cortana>  
Oct 20, 2017 - How to connect Cortana to a *home device* or automation service.

#### [OhmConnect Store – ohmconnect](#)

<https://shop.ohmconnect.com/>  
The best energy-saving *smart devices*, hand-picked by our team ... Energate FZ100 Foundation *Smart Programmable Thermostat & Home Gateway* · Buy.

#### [Home automation - Wikipedia](#)

[https://en.wikipedia.org/wiki/Home\\_automation](https://en.wikipedia.org/wiki/Home_automation)  
Home automation or domotics is building automation for a home, called a *smart home* or smart ... Home *devices*, when remotely monitored and controlled via the Internet, are an important constituent of the Internet of Things. Modern systems ...

#### [The best smart home systems - Wareable](#)

<https://www.wareable.com/smart-home/the-best-smart-home-systems>  
Oct 17, 2017 - Now into its third generation, the *smart home device* now also adds the ability to control your hot water tank and uses OpenTherm technology to ...

#### [What is smart home? - Definition from WhatIs.com - IoT Agenda](#)

<internetofthingsagenda.techtarget.com/definition/smart-home-or-building>  
A *smart home* is a residence that uses internet-connected *devices* to enable the remote monitoring and management of appliances and systems, such as ...

#### [The 10 Best Smart Home Products to Buy in 2017 - Lifewire](#)

<https://www.lifewire.com> › Do More › New & Next › Cutting Edge  
Best bets: Help automate your home with these *smart home* products from Amazon ... The screen can connect to other *devices*, too, including cameras in the ...

#### [Sonoff Smart Home- remote control home appliances | ITEAD](#)

<https://www.itead.cc/smart-home.html>

e-WeLink is a free *smart home* center that can let you control and manage over hundred smart *devices* of 80 brands in a single APP. Start a care-free life with ...

#### [Cortana can command your smart home devices on Windows 10](#)

<https://www.engadget.com/2017/10/06/cortana-connected-home-windows-10/>  
Oct 6, 2017 - The company may be trying to catch up, and has added a new "Connected Home" section to the Cortana Notebook menu in some Windows 10 PCs. If you're using a Windows 10 computer, just type "Cortana Notebook" into the Start menu. ... After you enable this, Cortana can connect to *smart home* ...

#### [Smart Home - Walmart.com](#)

<https://www.walmart.com/cp/home-automation/1229875>  
Shop for *Smart Home Devices* at Walmart.com and browse Security Cameras, Smart Home Access, Home Alarms & Sensors and Smart Appliances.

#### [Home Automation & Smart Home Devices | Kohl's](#)

<https://www.kohls.com/.../smart-home-automation-electronics.jsp?...Smart...Home%2...>  
Enjoy free shipping and easy returns every day at Kohl's. Find great deals on *Smart Home Devices* at Kohl's today!

#### [Brilliant Lights Up \\$21 Million for Smart Home Device - WSJ](#)

<https://www.wsj.com/.../brilliant-lights-up-21-million-for-smart-home-device-15077214...>  
Oct 11, 2017 - Mr. Emigh set to work on the problem and founded Brilliant Inc., a *smart home device* that takes the place of a conventional light switch.

#### [Building a Smart Home With Apple's HomeKit: Wirecutter Reviews | A ...](#)

<https://thewirecutter.com/reviews/building-a-smart-home-with-apples-homekit/>  
Sep 20, 2017 - HomeKit is Apple's proprietary software and hardware smart-home platform, letting you control many of the most popular *smart-home devices*, ...

#### [Smart Home Automation System | Home Automation Ideas, Smart ...](#)

[www.nexiahome.com/](http://www.nexiahome.com/)  
Nexia is a smart home automation system that integrates all of your *smart home devices* in to an all-in-one app, making everyday tasks a little easier.

### [Smarthome - Home Automation Systems, Products, Kits, Hubs & Ideas](#)

<https://www.smarthome.com/>

*Smarthome* - Home Automation, Remote Control, Lighting Control, Whole Home Audio/Video IR Distribution, Surveillance, Security.

### [Best Smart Home Gadgets - November 2017 - Gadget Flow](#)

<https://thegadgetflow.com/portfolio/category/smart-home-gadgets/>

A curated collection of *smart home* gadgets and products that you need right now. From vacuums that follow you to automatic window cleaners.

### [How smart home products empower users with disabilities - Chicago ...](#)

[www.chicagotribune.com/.../home/sc-cons-1012-smart-home-people-with-disabilities-...](http://www.chicagotribune.com/.../home/sc-cons-1012-smart-home-people-with-disabilities-...)

Oct 10, 2017 - The consumer market's economies of scale can make *smart home* products cheaper and with better technology than assistive *devices*, he said.

**APPENDIX D—Revised Device List**

<b>Device</b>	<b>Core Function</b>	<b>Categories</b>	<b>Input</b>	<b>Output</b>
Thermostat	Monitor, Control	Temp Control	Monitor, User	Trigger
Temp Sensor	Measure, Monitor	Temp Control	No Input	Monitor, Measure
Fan	Control	Temp Control	Monitor, Measure, User, Trigger	Status
Heater	Control	Temp Control	Monitor, Measure, User, Trigger	Status
Blinds	Control	Temp Control	Monitor, Measure, User, Trigger	Status
Security System	Monitor, Control	Security	User, Status, Trigger	Trigger, Status, Monitor
Camera	Monitor, Measure	Security	No Input	Monitor, Measure
Lock	Control	Security	User, Trigger	Status
Door Bell	Monitor	Security	Monitor	Trigger, Monitor
Light Bulb	Control	Convenience, Security, Utility Control	Trigger	Status
Garage Door	Control	Convenience, Security	Trigger	Status
Appliances	Control, Monitor, Trigger, Trigger	Convenience, Security	Monitor, Measure, User, Trigger	Monitor, Measure, Trigger
Toilet	Measure, Monitor, Trigger, Control	Convenience	No Input	Monitor, Measure, Trigger
Shower	Monitor, Trigger	Convenience	Monitor, User	Status
Sprinkler	Control, Trigger	Convenience, Utility Control	Measure, Monitor, Trigger, User	Status, Measure
Pet Feeder	Trigger	Convenience	Trigger, User	Measure, Monitor, Trigger
Plant Care System	Monitor, Control	Convenience	Monitor, Trigger, User	Status, Measure
Lawn Mower	Control, Trigger	Convenience	Trigger, User	Monitor, Measure, Status
Vacuum	Trigger	Convenience	Trigger, User	Monitor, Measure, Status
Baby Monitor	Monitor	Convenience	User	Monitor, Measure

Cradle	Control, Trigger, Monitor	Convenience	User	Monitor, Measure
Bed	Monitor	Convenience	User	Measure
Scale	Measure	Convenience	User	Measure
Heated Sidewalk/Drive way	Control	Convenience	Trigger, User	Monitor, Measure, Status
Carbon Monoxide Detector	Trigger	Environmental Comfort/Safety	No Input	Trigger, Status
Smoke/CO2 Detector	Trigger	Environmental Comfort/Safety	No Input	Trigger, Status
Air Quality Monitor	Measure	Environmental Comfort/Safety	No Input	Measure, Trigger
Radon Gas Detector	Trigger	Environmental Comfort/Safety	No Input	Trigger, Status
Water Meter	Monitor	Utility Control	No Input	Measure, Monitor
Gas Usage	Monitor	Utility Control	No Input	Measure, Monitor
DVR	Trigger, Monitor, Control	Entertainment	Monitor, Trigger, User	Measure, Monitor, Trigger
Gaming Console	Trigger, Monitor, Control	Entertainment	Monitor, Trigger, User	Measure, Monitor, Trigger
Streaming Devices	Trigger, Monitor, Control	Entertainment	Monitor, Trigger, User	Measure, Monitor, Trigger
Speaker	Trigger	Entertainment	Monitor, User	Monitor
TV	Trigger, Monitor, Control	Entertainment	Monitor, Trigger, User	Measure, Monitor, Trigger
Computer	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Monitor, Trigger
Printer	Trigger, Monitor	User Config	Measure, User	Status
Smart Plug	Trigger, Monitor, Control	User Config	Trigger, User	Status
Smart Phone	Trigger, Monitor, Control, Measure	User Config	Monitor, Trigger, User	Measure, Monitor, Trigger
Wearables	Trigger, Monitor, Control Measure	User Config	Monitor, Trigger, User	Measure, Monitor, Trigger
(Apple TV)	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Monitor, Trigger
Voice Control Hub	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger

Home Automation	Trigger, Monitor, Measure, Control	Convenience	Monitor, Measure, User, Trigger	Monitor, Measure, User, Trigger
Pool Cleaner	Trigger, Measure, Monitor	Convenience	Monitor, Trigger	Measure
Water Sensor (Flood)	Trigger, Monitor	Convenience, Safety	Trigger, Monitor	Trigger
Energy Consumption Monitor	Monitor, Measure	Convenience, Utility Control	Monitor, Measure, User	Trigger, Monitor, Measure, User
Water Heater	Monitor, Measure, Trigger	Convenience, Utility Control	User, Trigger	Measure, Monitor, User
Fragrance Diffuser	Control, Trigger	Convenience	User	Trigger
Mirror	Control	Convenience	User	No Output
Change Counter	Trigger, Monitor, Measure	Convenience	No Input	Trigger, Monitor, Measure
Egg Tray	Measure, Trigger	Convenience	No Input	Measure, Trigger
Water Quality/Purifier	Monitor, Trigger, Measure	Environmental Comfort/Safety, Wellness	No Input	Monitor, Measure, Trigger
Blood Pressure Monitor	Measure	Wellness	No Input	Measure
Toothbrush	Monitor, Measure	Wellness, Convenience	No Input	Monitor, Measure, User
Fit/Workout Equipment	Monitor, Measure, Trigger, Control	Wellness, Convenience	User, Trigger	Measure, Monitor, User
Universal Remote	Control, Trigger	Convenience	User	Trigger

## APPENDIX E—Rater 1

No.	Device	Core Function	Categories	Input	Output	Type
1	Amazon Echo	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
	Echo Dot	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
	Wink Hub 2	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
	Logitech Harmony Elite	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
	Netgear Arlo Pro 2	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
	LG Smart Security Wireless Camera	Monitor, Trigger	Security	Monitor, Trigger, User	Monitor, Measure	Camera/Security System
	Tend Secure Lynx Indoor	Monitor, Measure, Trigger	Security	No Input	Monitor, Measure, Trigger	Camera/Security System
	Nest Cam Outdoor	Monitor, Measure, Trigger	Security	No Input	Monitor, Measure, Trigger	Camera/Security System
	August Smart Lock	Control, Trigger	Security/ Convenience	User, Trigger	Status	Lock
	ADT Pulse	Monitor, Control, Trigger	Security	User, Status, Trigger	Trigger, Status, Monitor	Security System
	Adobe Home Security Starter Kit	Monitor, Control	Security	User, Status, Trigger	Trigger, Status, Monitor	Security System
	Ecobee4	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
	Nest Learning Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat

	Hisense 10,000 BTU	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
	Philips Hue Bulbs	Control	Convenience, Security	User, Trigger	Status	Light Bulb
	Anova Culinary Precision Cooker	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
	Char-Broil Digital Electric Smoker	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
	June Intelligent Oven	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
	Perfect Bake Pro	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
	Traeger Timberline 1300	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
	Eufy RoboVac 11	Control	Convenience	User	Status	Vacuum
	iRobot Roomba 690	Control	Convenience	User	Measure, Status	Vacuum
	iRobot Braava Jet 240	Control	Convenience	User	Status	Vacuum
	QardioBase 2	Measure	Wellness	User	Measure	Scale
	Polaris 9650iQ	Control	Convenience	User	Status	Vacuum
	Rachio Smart Sprinkler Controller Generation 2	Control, Trigger	Convenience	Trigger, User	Status	Sprinkler
	Robomow RS622	Control	Convenience	User	Status	Vacuum
2	Cloud Cam	Monitor	Security	No Input	Monitor	Camera/Security
	Amazon Echo	Ditto				
	Lifx Color 1000	Control	Convenience, Security	User	Status	Light Bulb
	Philips Hue White LED Starter Kit	Control	Convenience, Security	User	Status	Light Bulb
	BeOn Starter Pack	Control, Trigger	Convenience, Security	User, Trigger	Status	Light Bulb
	Ecobee4	Ditto				



	August Smart Lock HomeKit-enabled	Ditto				
	SkyBell HD Wi-Fi Video Doorbell	Control, Monitor	Security, Convenience	User	Monitor	Door Bell
	Kuna Toucan	Monitor, Measure	Security	No Input	Monitor, Measure	Camera
	Belkin WeMo Mini Wi-Fi Smart Plug	Control	Convenience	User	Status	Smart Plug
	Lutron Caseta In-Wall Wireless Smart Lighting Kit	Control	Convenience	User	Status	Smart Switch
	Nest Protect	Trigger, Monitor	Environmental Comfort/Safety	No Input	Trigger, Status	Smoke, Carbon monoxide
	D-Link Wi-Fi Water Sensor	Trigger	Convenience, Safety	No Input	Trigger	Water Sensor
	Neato Botvac Connected Robot Vacuum	Control	Convenience	User	Status	Vacuum
	Lutron Serena Remote Controlled Shades	Control	Temp Control, Convenience	User	Status	Blinds
3	Curb Energy:Monitoring Device	Monitor, Measure	Utility Control	User	Status, Monitor	Energy Consumption Monitor
	Ecobee 3	Ditto				
	Sonos Wireless Speaker System	Control	Entertainment	User	No Output	Speaker
	Philips Hue Smart Light Bulbs	Ditto				
	Amazon Echo	Ditto				
	SmartThings System	Trigger, Monitor, Control	User Config	Trigger, Monitor	Measure, Trigger	Hub
	Belkin WeMo Switch	Trigger, Monitor, Control	User Config	Trigger, User	Status	Smart Plug
	Lutron Dimmer Light Switches	Ditto				
	Jawbone UP3 Fitness Band	Monitor, Measure,	Wellness, Convenience	User, Trigger	Measure, Monitor, Trigger	Wearables

		Trigger, Control				
	Kwikset Z-Wave Locks	Control	Convenience, Security	User, Trigger	Status	Lock
	Chamberlain Garage Door Opener	Control	Convenience, Security	User, Trigger	Status	Lock
	Jasco Z-Wave Outdoor modules	Control	Convenience	User	Status	Smart Plug
4	-----	Catalog				
5	Philips Hue	Ditto				
	General Sec Cameras	Ditto				
	General Baby Monitors	Monitor	Convenience	User	Monitor	Baby Monitors
	General Security Systems	Ditto				
	General Smart Thermostats	Ditto				
	General Smart Locks	Ditto				
	General Home Alarms	Ditto				
	General Home Sensors	Ditto				
	General Appliance	Ditto				
	General Outlet	Ditto				
	General Sprinkler	Ditto				
	General Audio (speaker)	Ditto				
	Network	Not SMART				
	General Switch	Ditto				
6	Catalog					
7	Tado Smart Thermostat	Control, Measure	Temp Control	User	Measure	Thermostat
	Netatmo Welcome	Monitor, Control	Security	User	Monitor	Security Camera

	Nest 3.0	Ditto				
	Philips Hue	Ditto				
	Echo Dot	Ditto				
	Netgear Arlo Pro	Ditto				
	Google Wifi	Ditto				
	Google Home Mini	Trigger, Control	User Config	User	Trigger	Hub
	Ikea Tradfri Smart Lighting	Control	Convenience, Security	User	Status	Light
	Nanoleaf Aurora + Rhythm	Control	Convenience, Security	User	Status	Light
8	Catalog					
9	Amazon Echo	Ditto				
	Netgear Arlo	Ditto				
	Philips Hue White Starter Kit	Ditto				
	Tp-Link HS105	Control	Convenience	User	Status	Plug
	Ecobee4	Ditto				
	Roost Smart Battery	Control, Trigger	Environmental Comfort/Safety	User	Trigger	Battery
	Samsung SmartThings	Ditto				
	Google Home	Ditto				
	Chamberlain MyQ	Ditto				
	Kwikset Smartcode	Ditto				
	Anova Precision Cooker	Ditto				
10	Amazon Echo Show	Ditto				
	Samsung POWERbot R7040 Robot Vacuum	Control	Convenience	User	Status	Robot Vacuum
	WeMo Mini Smart Plug	Ditto				
	Google Home	Ditto				
	Airmega 400s Air Purifier	Monitor, Control	Wellness, Env. Comfort/Safety	User	Monitor	Air Purifier

	Netgear Arlo Pro Security System	Ditto				
	Amazon Echo	Ditto				
	Linksys Velop					
	Sonos One Smart Speaker	Ditto				
	Nest Cam IQ	Monitor, Trigger, Control	Security	Trigger, User	Monitor	Security Camera
	Nest Protect Smoke Detector	Ditto				
	Logitech Harmony Elite	Ditto				
	Philips Hue White Lighting Kit	Ditto				
	Logitech Pop Home Switch	Control	Convenience	User	Status	Switch
	TP-Link Smart Plug	Ditto				
	Kenmore Smart Air Conditioner	Control	Temp Control	User	Status	Air Conditioner
	Ring Video Doorbell	Monitor, Trigger	Convenience, Security	User	Monitor, Trigger	Doorbell
	Schlage Sense Smart Deadbolt	Trigger, Control	Convenience, Security	User, Trigger	Status	Lock
	Samsung Family Hub 2.0	Control	Convenience	User	User	Refrigerator
	Ecobee4	Ditto				
	Dyson Pure Hot Cool Link Air Purifier	Control, Monitor	Temp Control, Wellness, Env. Comfort/Safety	User	Monitor	Air Purifier
	Nest Thermostat	Ditto				
	Aera Smart Home Fragrance Diffuser	Control	Convenience	User	Status	Fragrance Diffuser
	Logi Circle 2 Security Camera	Control, Monitor	Security	User	Monitor	Camera
	Eufy Lumos Smart Bulb	Control	Convenience, Security	User	Status	Light bulb
11	Nest Thermostat	Ditto				
	Haiku Ceiling Fan	Trigger, Monitor, Control	Convenience, Temp Control	Trigger, User	Status	Ceiling Fan

	Smarter Coffee	Trigger, Control	Convenience	User	Trigger	Coffee Maker
	Twist	Control	Entertainment, Convenience	User	No Output	Light bulb, Speaker
	August Smart Lock	Ditto				
	June Intelligent Oven	Ditto				
	Awair	Monitor	Env. Comfort/Safety	No Input	Monitor	Air Quality Monitor
	Dojo	Monitor, Control	Security	Control	Monitor	Device Security
12	Nest Thermostat	Ditto				
	Ecobee3	Ditto				
	Philips Hue	Ditto				
	Cree Connected LED Bulb	Control	Convenience	User	Status	Light Bulb
	Nest Protect	Ditto				
	Amazon Echo	Ditto				
	Sonos Play:1	Ditto				
	Nest Cam	Ditto				
	Belkin WeMo Switch	Ditto				
	Roomba 980	Ditto				
	August Smart Lock	Ditto				
	Logitech Harmony Home Control	Ditto				
13	Catalog					
14	Apple TV (4th gen)	Control	User Config	User	User	Hub
	Philips Hue Starter Kit	Ditto				
	iDevices Switch	Control, Monitor	Convenience	User	Status, Monitor	Plug
	Emerson Sensi Touch WiFi Thermostat	Control, Measure	Temp Control	User	Measure	Thermostat
	Lutron Caseta Wireless Smart Lighting Starter Kit	Ditto				

	Leviton Decora Smart Switch	Control	Convenience	User	Status	Light Switch
	Schlage Sense Smart Deadbolt	Ditto				
	D-Link Omna 190 Cam HD	Monitor	Security	User	Monitor	Security Camera
	Fibaro Flood Sensor	Monitor, Trigger	Env. Comfort/Safety	Monitor	Trigger	Flood Sensor
15	Logitech Harmony	Ditto				
	Samsung SmartThings	Ditto				
16	Catalog					
17	Samsung's The Frame	Control	Entertainment	User	No Output	Smart TV
	Amazon Echo	Ditto				
	Nest Thermostat	Ditto				
	Philips Hue White Starter Kit	Ditto				
	Hisense Portable Air Conditioner	Ditto				
	Roomba 960	Ditto				
	Anova Culinary Precision Cooker	Ditto				
18	Support Page					
19	Catalog					
20	Amazon Echo	Ditto				
	Honeywell Lyric T5 Wi-Fi Thermostat	Measure, Monitor, Control	Temp Control	User	Measure	Thermostat
	August Smart Lock	Ditto				
	Elgato Eve Energy	Control, Monitor	Convenience, Utility Control	User	User, Monitor	Plug
	Philips Hue	Ditto				
21	Support Page					

22	Catalog					
23	Catalog					
24	Support Page					
25	Rain Bird ST8i-Wifi Sprinkler Timer	Control, Monitor	Convenience	User	Status	Sprinkler Timer
	WeMo Smart Plug	Ditto				
	PUR Bluetooth Ultimate Faucet Filtration System	Monitor	Wellness, Utility Control	No Input	Monitor	Water Filtration System
	Stick-up Cam	Monitor	Security	No Input	Monitor	Security Camera
	Edyn Garden Sensor	Monitor, Trigger	Convenience	No Input	Monitor, Trigger	Garden Sensor
	Caia	Monitor	Convenience	No Input	No Output	Smart?
	Zera Food Recycler	Control	Convenience	User	Status	Food Composter
26	Nest Thermostat 3rd Gen	Ditto				
	Ring Wi-Fi Enabled Video Doorbell	Ditto				
	Roomba 980 Vacuum	Ditto				
	Haiku Home L Series WiFi Enabled Ceiling Fan	Ditto				
	Oco Wireless Surveillance HD Video Monitoring Security Camera	Trigger, Monitor,	Security	Trigger	Trigger, Monitor	Security Camera
	simplehuman Sensor Mirror Pro	Control, Measure	Convenience	User, Measure	Status	Mirror
	Piper nv Smart Home Security System with Night Vision	Monitor, Measure, Trigger, Control	Security, Temp Control,	User, Trigger, Measure	Trigger, Status, Monitor	Security System

	Dropcam Pro Wi-Fi Wireless Video Monitoring Security Camera	Monitor, Control	Security	User	Monitor	Security Camera
	littleBits Electronics Smart Home Kit	Not Smart				
	August Smart Lock	Ditto				
	BeON Home Protection System	Ditto				
	Rachio Smart Sprinkler Controller 2nd Gen	Ditto				
	Schlage Connect Camelot Touchscreen Deadbolt with Built-In Alarm	Ditto				
	Sonos Play:1	Ditto				
	Lutron Caseta Wireless Smart Lighting In-Wall Dimmer Kit	Ditto				
	Nest Cam Security Camera	Ditto				
	Honeywell Wi-Fi Touch Screen Programmable Thermostat	Ditto				
	Amazon Echo	Ditto				
	iBaby Wi-Fi Wireless Digital Baby Video Camera	Monitor, Control	Convenience	User	Monitor	Baby Monitor
	Kuna Smart Home Security Outdoor Light & Camera	Ditto				
	Philips Hue White and Color Ambience Starter Kit	Ditto				



	Zmodo Smart Wireless Security Camera	Monitor, Control	Security	User	Monitor	Security Camera
	iSmartAlarm Home Security System	Trigger, Control	Security	User	Trigger, Status	Security System
	Canary All-in-One Home Security Device	Monitor, Trigger, Control, Measure	Security, Temp Control, Wellness	User, Trigger	Status, Monitor, Measure	Security System
	Arlo Smart Home	Ditto				
	Samsung SmartCam HD Pro 1080p Full-HD Wi-Fi Camera	Ditto				
	Petcube Interactive Wi-Fi Pet Camera	Monitor, Control	Convenience	User	Monitor	Pet Camera
	Crock-Pot Smart Wi-Fi Enabled WeMo 6-Quart Slow Cooker	Control	Convenience	User	Status	Appliance
	SkyBell Wi-Fi Video Doorbell Version 2.0 Classic	Ditto				
	Funlux NEW Outdoor 720P HD Smart Wireless Surveillance Camera System	Monitor, Trigger	Security	No Input	Monitor, Trigger, Status	Security Camera
	Chamberlain MyQ-Garage	Ditto				
	Circle with Disney	Control	Convenience	User		
	CUJO Smart Internet Security Firewall					
	Samsung SmartThings Hub	Ditto				
	Kohler Moxie Showerhead and Wireless Speaker	Control	Entertainment	User	Status	Bluetooth Speaker
	Mr. Coffee Smart WiFi-Enabled	Control	Convenience	User	Status	Coffee Maker

	WeMo 10-cup Optimal Brew Coffeemaker					
	Ooma Telo Free Home Phone Service	Control	Convenience	User	No Output	Phone
	Nest Protect Smoke Plus Carbon Monoxide	Ditto				
	Wink Connected Home Hub	Ditto				
	LIFX Color 1000 Wi-Fi Smart LED Light Bulb	Ditto				
	Lutron Caseta Wireless Smart Lighting In-Wall Dimmer Kit	Ditto				
	WeMo Switch Smart Plug	Ditto				
	TP-Link Smart Plug w/ Energy Monitoring	Ditto				
	iDevices Kitchen Thermometer	Monitor	Convenience	No Input	Monitor, Status	Kitchen thermometer
	GE12722 Z-Wave Wireless Lighting Control On/Off Switch	Control	Convenience	User	Status	Light switch
	Quirky Porkfolio Smart Piggy Bank	Measure	Convenience	No Input	Measure	Coin Counter
	Philips Hue Wireless Dimming Kit	Ditto				
	Ankuoo NEO Smart Plug	Control	Convenience	User	Status	Smart Plug
	GE Link Wireless Smart Connected LED Light Bulb	Ditto				
	Quirky Egg Minder Wink App Enabled Smart Egg Tray	Trigger, Measure	Convenience	No Input	Trigger, Measure	Appliance

27	Amazon Echo	Ditto				
	Nest Learning Thermostat	Ditto				
	Elgato Eve Degree	Measure	Temp Control	No Input	Measure	Weather Sensor
	Nest Cam IQ	Ditto				
	Philips Hue Ambiance Starter Kit	Ditto				
	Google Home	Ditto				
	Elgato Eve Energy	Ditto				
	Furbo	Monitor, Trigger, Control	Convenience	User, Trigger	Monitor	Pet Camera
	Nest Protect	Ditto				
	Amazon Echo Dot	Ditto				
	Dyson 360 Eye	Control	Convenience	User	Status	Robot vacuum
28	August Smart Lock	Ditto				
	Netatmo Smart Thermostat	Control, Monitor	Temp Control, Utility Control	User	Monitor	Thermostat
	Philips Hue Starter Kit	Ditto				
29	Catalog					
30	Amazon Echo	Ditto				
	Nest Thermostat	Ditto				
	Wink	Ditto				
	Philips Hue	Ditto				
	Rachio Smart Sprinkler Controller	Ditto				
	Google Home	Ditto				
31	Arlo Pro Security System	Ditto				
	LIFX Wi-Fi Smart LED Light Bulb	Ditto				
	iRobot Roomba Robot Vacuum	Ditto				

	Sonos Play:1 Compact Wireless Speaker	Ditto				
	Amazon Tap	Control	User Config	User	User	Smart Speaker
	Vine Smart Wi-Fi Thermostat	Control, Trigger, Monitor	Temp Control	User	Trigger, Monitor	Thermostat
	Ring Wi-Fi Enabled Video Doorbell	Ditto				
	TP-Link Smart Plug	Ditto				
	Echo Show	Ditto				
32	Catalog					
33	Can't Use					
34	Catalog					
35	Support Page					
36	Catalog					
37	Nest Learning Thermostat	Ditto				
	Amazon Echo	Ditto				
	Revolv	Ditto				
	Roomba	Ditto				
38	Amazon Echo	Ditto				
	Google Home	Ditto				
	Nest Learning Thermostat	Ditto				
	British Gas Hive	Measure, Trigger, Control, Monitor	Temp Control, User Config	User, Trigger	Measure, Monitor, Status	Thermostat, Hub
	Tado Smart AC Control	Ditto				
	Philips Hue	Ditto				
	LIFX	Ditto				

	IKEA Tradfri	Ditto				
	August Smart Lock Pro	Ditto				
	Yale Keyless Connected	Trigger, Control	Security, Convenience	User, Trigger	Status	Lock
	Canary	Ditto				
	Netatmo Welcome	Ditto				
	Nest Protect	Ditto				
	First Alert ONELINK Wi-Fi	Trigger, Control	Env. Comfort/Safety	User, Trigger	Trigger, Status	Smoke/CO Detector
39	Nest Learning Thermostat	Ditto				
	Nest Smoke Detector	Ditto				
	Philips Hue	Ditto				
	Amazon Echo	Ditto				
	Google Home	Ditto				
	Insteon Hub Pro	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
	Samsung SmartThings/	Ditto				
	Wink Hub	Ditto				
40	Amazon Echo	Ditto				
	WeMo	Ditto				
	Philips Hue	Ditto				
	Samsung SmartThings	Ditto				
	Nest Cam	Ditto				
	Nest Learning Thermostat	Ditto				
	Nest Protect	Ditto				
	Amazon Echo Show	Ditto				
	Amazon Echo Dot	Ditto				
	Ecobee3	Ditto				
	Tado	Ditto				

41	Catalog					
42	Can't Use					
43	Catalog					
44	Catalog					
45	Brilliant	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
46	Apple Watch	Monitor, Measure, Trigger, Control	Wellness, Convenience	User, Trigger	Measure, Monitor, Trigger	Wearables
	Apple TV	Ditto				
	Elgato Eve Motion	Trigger	Convenience	No Input	Trigger	Motion Sensor
	Lutron Caseta Dimmer	Ditto				
47	Can't Use					
48	Catalog					
49	Can't Use					
50	Amazon Echo	Ditto				
	Echo Dot	Ditto				
	Echo Show	Ditto				
	August Smart Lock	Ditto				
	Schlage	Ditto				
	Hunter Fan	Control	Convenience, Temp Control	User	Status	Ceiling Fan
	iDevices	Ditto				
	WeMo	Ditto				
	Philips Hue	Ditto				

## APPENDIX F—Rater 2

Device	Core Function	Categories	Input	Output	Type
Amazon Echo	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Echo Dot	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Wink Hub 2	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Logitech Harmony Elite	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Netgear Arlo Pro 2	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
LG Smart Security Wireless Camera	Monitor, Trigger	Security	Monitor, Trigger, User	Monitor, Measure	Camera/Security System
Tend Secure Lynx Indoor	Monitor, Measure, Trigger	Security	No Input	Monitor, Measure, Trigger	Camera/Security System
Nest Cam Outdoor	Monitor, Measure, Trigger	Security	No Input	Monitor, Measure, Trigger	Camera/Security System
August Smart Lock	Control, Trigger	Security/ Convenience	User, Trigger	Status	Lock
ADT Pulse	Monitor, Control, Trigger	Security	User, Status, Trigger	Trigger, Status, Monitor	Security System
Adobe Home Security Starter Kit	Monitor, Control	Security	User, Status, Trigger	Trigger, Status, Monitor	Security System
Ecobee4	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Nest Learning Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat

Hisense 10,000 BTU	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Philips Hue Bulbs	Control	Convenience, Security	User, Trigger	Status	Light Bulb
Anova Culinary Precision Cooker	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Char-Broil Digital Electric Smoker	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
June Intelligent Oven	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Perfect Bake Pro	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Traeger Timberline 1300	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Eufy RoboVac 11	Control	Convenience	User	Status	Vacuum
iRobot Roomba 690	Control	Convenience	User	Measure, Status	Vacuum
iRobot Braava Jet 240	Control	Convenience	User	Status	Vacuum
QardioBase 2	Measure	Wellness	User	Measure	Scale
Polaris 9650iQ	Control	Convenience	User	Status	Vacuum
Rachio Smart Sprinkler Controller Generation 2	Control, Trigger	Convenience	Trigger, User	Status	Sprinkler
Robomow RS622	Control	Convenience	User	Status	Vacuum
Cloud Cam	Monitor	Security	No Input	Monitor	Camera/Security
Amazon Echo	Ditto				
Lifx Color 1000	Control	Convenience, Security	User	Status	Light Bulb
Philips Hue White LED Starter Kit	Control	Convenience, Security	User	Status	Light Bulb
BeOn Starter Pack	Control, Trigger	Convenience, Security	User, Trigger	Status	Light Bulb
Ecobee4	Ditto				



August Smart Lock HomeKit-enabled	Ditto				
SkyBell HD Wi-Fi Video Doorbell	Control, Monitor	Security, Convenience	User	Monitor	Door Bell
Kuna Toucan	Monitor, Measure	Security	No Input	Monitor, Measure	Camera
Belkin WeMo Mini Wi-Fi Smart Plug	Control	Convenience	User	Status	Smart Plug
Lutron Caseta In-Wall Wireless Smart Lighting Kit	Control	Convenience	User	Status	Smart Switch
Nest Protect	Trigger, Monitor	Environmental Comfort/Safety	No Input	Trigger, Status	Smoke, Carbonmonoxide
D-Link Wi-Fi Water Sensor	Trigger	Convenience, Safety	No Input	Trigger	Water Sensor
Neato Botvac Connected Robot Vacuum	Control	Convenience	User	Status	Vacuum
Lutron Serena Remote Controlled Shades	Control	Temp Control, Convenience	User	Status	Blinds
Curb Energy:Monitoring Device	Monitor, Measure	Utility Control	User	Status, Monitor	Energy Consumption Monitor
Ecobee 3	Ditto				
Sonos Wireless Speaker System	Control	Entertainment	User	No Output	Speaker
Philips Hue Smart Light Bulbs	Ditto				
Amazon Echo	Ditto				
SmartThings System	Trigger, Monitor, Control	User Config	Trigger, Monitor	Measure, Trigger	Hub
Belkin WeMo Switch	Trigger, Monitor, Control	User Config	Trigger, User	Status	Smart Plug
Lutron Dimmer Light Switches	Ditto				
Jawbone UP3 Fitness Band	Monitor, Measure, Trigger, Control	Wellness, Convenience	User, Trigger	Measure, Monitor, Trigger	Wearables

Kwikset Z-Wave Locks	Control	Convenience, Security	User, Trigger	Status	Lock
Chamberlain Garage Door Opener	Control	Convenience, Security	User, Trigger	Status	Lock
Jasco Z-Wave Outdoor modules	Control	Convenience	User	Status	Smart Plug
-----	Catalog	Home Depot			
	#5				
Philips Hue	Ditto				
General Sec Cameras	Ditto				
General Baby Monitors	Monitor	Convenience	User	Monitor	Baby Monitors
General Security Systems	Ditto				
General Smart Thermostats	Ditto				
General Smart Locks	Ditto				
General Home Alarms	Ditto				
General Home Sensors	Ditto				
General Appliance	Ditto				
General Outlet	Ditto				
General Sprinkler	Ditto				
General Audio (speaker)	Ditto				
Network	Not SMART				
General Switch	Ditto				
#6	Catalog				
#7					
Tado	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Netatmo Welcome	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Nest 3.0	Ditto				
Philips Hue	Ditto				
Amazon Dot	Ditto				

Netgear Arlo Pro	Ditto				
Google WiFi	Ditto				
Google Home	Ditto				
Ikea Tradfri Smart Lighting	Control	Convenience	User, Trigger	Status	Switch
Nanoleaf Aurora + Rhythm	Control	Entertainment	User, Monitor	No Output	Light
#8	Catalog				
#9					
Amazon Echo	Ditto				
Netgear Arlo Pro	Ditto				
Philips Hue	Ditto				
Ecobee4	Ditto				
Tp-Link	Control	Convenience	User	Status	Smart Plug
Roost Smart Battery	Trigger, Monitor	Environmental Comfort/Safety	No Input	Trigger, Status	Smoke, Carbonmonoxide
Samsung Smartthings	Ditto				
Google Home	Ditto				
Chamberlain MyQ	Control, Trigger	Security/Convenience	User, Trigger	Status	Lock
Kwikset Smartcode	Ditto				
Anova Precision Cooker	Ditto				
#10					
Amazon Echo Show	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Samsung POWERbot R7040	Control	Convenience	User	Status	Vacuum
WeMo Mini Smart Plug	Ditto				
Google Home	Ditto				
Airmega 400S Air Purifier	Control, Monitor	Convenience	Monitor, User	No Output	Appliance
Netgear Arlo Pro	Ditto				
Amazon Echo Plus	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub

Linksys Velop	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Sonos One Smart Speaker	Ditto				
Nest Cam IQ	Ditto				
Nest Smoke Detector	Ditto				
Logitech Harmony Elite	Ditto				
Philips Hue	Ditto				
Logitech Pop Home Switch	Control	Convenience	User	Status	Smart Switch
iKettle Smart 1.8L Electric Kettle	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Kenmore Smart AC	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	AC/Thermostat
Ring Video Doorbell	Control, Monitor	Security, Convenience	User	Monitor	Door Bell
Schlage Sense Smart Deadbolt	Control, Trigger	Security/ Convenience	User, Trigger	Status	Lock
Samsung Family Hub 2.0 Smart Refrigerator	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Ecobee4	Ditto				
Dyson Pure Hot Cool Link Air Purifier	Control, Monitor	Convenience	Monitor, User	No Output	Appliance
Nest Thermostat	Ditto				
Aera Smart Home Fragrance Diffuser	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Logi Circle 2 Security Camera	Monitor	Security	No Input	Monitor	Camera/Security
Eufy Lumos Smart Bulb	Control	Convenience, Security	User	Status	Light Bulb
#11					
Nest Thermostat	Ditto				
Haiku Ceiling Fan	Trigger, Monitor	Convenience	User, Trigger	No Output	Appliance

Smarter Coffee	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
Twist	Control	Convenience, Entertainment	User, Trigger	Status	Light Bulb/Speaker
August Smart Locks	Ditto				
June Intelligent Oven	Ditto				
Awair	Trigger, Monitor	Environmental Comfort/Safety	No Input	Trigger, Status	Air Monitor
DoJo	Monitor, Control, Trigger	Security	User, Status, Trigger	Trigger, Status, Monitor	Security System
#12					
Ecobee3	Ditto				
Philips Hue	Ditto				
Nest Protect	Ditto				
Amazon Echo	Ditto				
Sonos Play:1	Ditto				
Nest Cam	Ditto				
Belkin WeMo Switch	Ditto				
Roomba 980	Ditto				
August Smart Locks	Ditto				
Logitech Harmony Home Control	Ditto				
#13	Catalog				
#14					
Apple TV	Trigger, Monitor, Control	User Config/ Entertainment	Monitor, Trigger, User	Measure, Trigger	Hub
Philips Hue	Ditto				
iDevices Switch	Control	Convenience	User	Status	Smart Switch
Emerson Sensi Touch Wi-Fi Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Lutron Caseta Wireless Smart Lighting	Ditto				
Leviton Decora Smart Switch	Control	Convenience	User	Status	Smart Switch

Schlage Sense Smart Deadbolt	Ditto				
D-Link Omna 180 Cam HD	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Fibaro Flood Sensor	Trigger	Convenience, Safety	No Input	Trigger	Water Sensor
#15					
Sonos	Ditto				
#16	Catalog				
#17					
Samsung Frame	Control	Entertainment	User, Monitor	No Output	Speaker
Amazon Echo	Ditto				
Nest Thermostat	Ditto				
Philips Hue	Ditto				
Hisense Portable Air Conditioner	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	AC/Thermostat
iRobot Roomba	Ditto				
Anova Culinary Bluetooth Sous Vide Precision Cooker	Ditto				
#18	Support Page				
#19	Catalog				
#20					
Honeywell Lyric T5 Wi-Fi Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
August Smart Locks	Ditto				
Elgato Eve Energy	Control	Convenience	User	Status	Smart Switch
Philips Hue	Ditto				
#21	Support Page				
#22	Catalog				
#23	Catalog				
#24	Support Page				
#25					
Rain Bird ST8i-WiFi	Control, Trigger	Convenience	Trigger, User	Status	Sprinkler

WeMo	Ditto				
PUR Bluetooth Ultimate Faucet Filtration System	Monitor, Contrl	Convenience	Monitor	Monitor	Appliance
Stick-up Cam	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Nebia	Monitor, Contrl	Convenience	Monitor	Monitor	Appliance
Edyn Garden Sensor	Monitor, Control, Trigger	Convenience	Monitor, User	Monitor, Trigger	Appliance
Caia	Monitor	Convenience	No Input	No Output	Not SMART
Zera Food Recycler	Monitor	Convenience	No Input	Monitor	Appliance
#26					
Ring Wi-Fi	Ditto				
iRobot Roomba	Ditto				
Haiku Ceiling Fan	Ditto				
Oco Wireless Surveillance	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Simplehuman Sensor Mirror Pro	Monitor	Convenience	No Input	No Output	Light Bulb
Piper NV	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Dropcam Pro	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Nest Learning	Ditto				
LittleBits Electronics Smart Home Kit	Not Smart				
August Smart Locks	Ditto				
BeOn Home Protection	Control	Convenience, Security	User, Trigger	Status	Light Bulb/Security
Rachio Smart Sprinkler Control	Ditto				
Ring Wi-Fi	Ditto				
Schlage Sense Smart Deadbolt	Ditto				
Sonos Play:1	Ditto				
Lutron Caseta Wireless Smart Lighting	Ditto				

Nest Cam	Ditto				
Honeywell Lyric T5 Wi-Fi Thermostat	Ditto				
Amazon Echo	Ditto				
iBaby Wi-Fi Wireless Digital Baby Video Camera	Monitor	Convenience	User	Monitor	Baby Monitors
Kuna Smart Home Security	Ditto				
Philips Hue	Ditto				
Zmodo	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
iSmartAlarm	Monitor, Trigger	Security	Monitor, Trigger, User	Monitor, Measure	Security System
Canary	Monitor, Trigger	Security	Monitor, Trigger, User	Monitor, Measure	Security System
Arlo	Ditto				
Samsung SmartCam	Ditto				
PetCube	Monitor	Convenience	User	Monitor	Baby Monitors
Crock-Pot	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance
SkyBell	Ditto				
FunLux	Monitor, Trigger	Security	Trigger	Monitor	Camera/Security System
Chamberlain	Ditto				
Circle With Disney	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
CuJo	Monitor, Trigger	Security	Monitor, User	Trigger	Router/Firewall
Samsung SmartThings Hub	Ditto				
Kohler	Monitor, Contrl	Convenience	Monitor	Monitor	Appliance/Speaker
Mr. Coffee Smart WeMo	Control, Monitor	Convenience	Monitor, Measure, User	Monitor, Measure	Appliance



Oama Telo Free Home Phone Service	Conrol	Convenience	User	no Output	Appliance
Nest Protect	Ditto				
Wink Connected Home Hub	Ditto				
Lifx	Ditto				
WeMo Switch	Ditto				
Tp-Link plug	Ditto				
iDevices Kitchen Thermometer	Control	Convenience	User	Monitor, Trigger	Smart Switch
GE12722	Control	Convenience	User	Status	Smart Switch
Quirky Porkfolio Smart Piggy Bank	Monitor	Convenience	Measure	Monitor	Appliance
Philips Hue	Ditto				
Ankuoo	Control	Convenience	User	Status	Smart Plug
GE Link	Ditto				
Quirky Egg Minder Wink	Monitor	Convenience	Measure	Monitor	Appliance
#27					
Amazon Echo	Ditto				
Nest Learning	Ditto				
Elgato Eve Degree	Monitor	Convenience	Monitor	Monitor	Appliance
Nest Cam	Ditto				
Philips Hue	Ditto				
Google Home	Ditto				
Elgato Eve Energy	Ditto				
Furbo	Monitor	Convenience	User	Monitor	Baby Monitors
Nest Protect	Ditto				
Amazon Echo Dot	Ditto				
Dyson 360 Eye	Control	Convenience	User	Status	Vacuum
#28					
August Smart Locks	Ditto				
Netatmo Smart Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Phillips Hue Starter Pack	Ditto				
#29					
#30					

Amazon Echo	Ditto				
Nest Thermostat	Ditto				
Wink	Ditto				
Philips Hue	Ditto				
Rachio Smart Sprinkler Control	Ditto				
Smart Fridge????					
Protect????					
Google Home	Ditto				
#31					
Arlo Pro	Ditto				
Lifx	Ditto				
iRobot Roomba	Ditto				
Sonos Play:1	Ditto				
Amazon Tap	Control	Entertainment	User	No Output	Speaker
Vine Smart Wi-Fi Thermostat	Monitor, Control, Measure	Temp Control	Monitor, User	Trigger	Thermostat
Ring Wi-Fi	Ditto				
Tp-Link plug	Ditto				
Echo Show	Control	Entertainment	User	No Output	Entertainment
#32??					
#33	Can't Use				
#34	Catalog				
#35	Support Page				
#36	Catalog				
#37					
Amazon Echo	Ditto				
Roomba 980	Ditto				
Revolv Hub	Ditto				
Nest	Ditto				
#38					
Amzon Echo	Ditto				
Google Home	Ditto				
Nest Learning	Ditto				
Tado Smart AC Control	Ditto				

Philips Hue	Ditto				
Lifx	Ditto				
August Smart Lock Pro	Ditto				
Yale Keyless Connected	Control, Trigger	Security/Convenience	User, Trigger	Status	Lock
Canary	Ditto				
Netatmo Welcome	Ditto				
Nest Protect	Ditto				
First Alert ONELINK Wi-Fi	Trigger, Monitor	Environmental Comfort/Safety	No Input	Trigger, Status	Smoke, Carbonmonoxide
#39					
Nest Learning	Ditto				
Nest Smoke Detector	Ditto				
Philips Hue	Ditto				
Amazon Echo	Ditto				
Google Home	Ditto				
Insteon Hub Pro	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
Samsung SmartThings Hub	Ditto				
Wink Connected Home Hub	Ditto				
#40					
Amazon Echo	Ditto				
Nest Cam	Ditto				
Echo Show	Ditto				
Nest Learning	Ditto				
Ecobee3	Ditto				
Philips Hue	Ditto				
Nest Protect	Ditto				
Tado Smart AC Control	Ditto				
#41	Catalog				
#42	Can't Use				
#43	Catalog				
#44	Catalog				
#45					

Brilliant smart switch	Trigger, Monitor, Control	User Config	Monitor, Trigger, User	Measure, Trigger	Hub
#46					
Apple TV	Ditto				
#47	Can't Use				
#48	Catalog				
#49	Can't Use				
#50					
Amazon Echo Show	Ditto				
Echo Dot	Ditto				
Ring Wi-Fi	Ditto				
August Smart Lock	Ditto				
Schlage Sense Smart Deadbolt	Ditto				
Hunter Signal Fan	Trigger, Monitor	Convenience	User, Trigger	No Output	Appliance
iDevice	Ditto				
Belkin WeMo Switch	Ditto				
Philips Hue	Ditto				

## APPENDIX G—IRR Final

No.	Device	Core Function	Categories	Input	Output	Type
1	Amazon Echo	1	1	1	1	1
	Echo Dot	1	1	1	1	1
	Wink Hub 2	1	1	1	1	1
	Logitech Harmony Elite	1	1	1	1	1
	Netgear Arlo Pro 2	1	1	1	1	1
	LG Smart Security Wireless Camera	1	1	1	1	1
	Tend Secure Lynx Indoor	1	1	1	1	1
	Nest Cam Outdoor	1	1	1	1	1
	August Smart Lock	1	1	1	1	1
	ADT Pulse	1	1	1	1	1
	Adobe Home Security Starter Kit	1	1	1	1	1
	Ecobee4	1	1	1	1	1
	Nest Learning Thermostat	1	1	1	1	1
	Hisense 10,000 BTU	1	1	1	1	1
	Philips Hue Bulbs	1	1	1	1	1
	Anova Culinary Precision Cooker	1	1	1	1	1
	Char-Broil Digital Electric Smoker	1	1	1	1	1
	June Intelligent Oven	1	1	1	1	1
	Perfect Bake Pro	1	1	1	1	1
	Traeger Timberline 1300	1	1	1	1	1
	Eufy RoboVac 11	1	1	1	1	1
	iRobot Roomba 690	1	1	1	1	1
	iRobot Braava Jet 240	1	1	1	1	1
	QardioBase 2	1	1	1	1	1
	Polaris 9650iQ	1	1	1	1	1
	Rachio Smart Sprinkler Controller Generation 2	1	1	1	1	1
	Robomow RS622	1	1	1	1	1
2	Cloud Cam	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	Lifx Color 1000	1	1	1	1	1

	Philips Hue White LED Starter Kit	1	1	1	1	1
	BeOn Starter Pack	1	1	1	1	1
	Ecobee4	1	1	1	1	1
	August Smart Lock HomeKit-enabled	1	1	1	1	1
	SkyBell HD Wi-Fi Video Doorbell	1	1	1	1	1
	Kuna Toucan	1	1	1	1	1
	Belkin WeMo Mini Wi-Fi Smart Plug	1	1	1	1	1
	Lutron Caseta In-Wall Wireless Smart Lighting Kit	1	1	1	1	1
	Nest Protect	1	1	1	1	1
	D-Link Wi-Fi Water Sensor	1	1	1	1	1
	Neato Botvac Connected Robot Vacuum	1	1	1	1	1
	Lutron Serena Remote Controlled Shades	1	1	1	1	1
3	Curb Energy:Monitoring Device	1	1	1	1	1
	Ecobee 3	1	1	1	1	1
	Sonos Wireless Speaker System	1	1	1	1	1
	Philips Hue Smart Light Bulbs	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	SmartThings System	1	1	1	1	1
	Belkin WeMo Switch	1	1	1	1	1
	Lutron Dimmer Light Switches	1	1	1	1	1
	Jawbone UP3 Fitness Band	1	1	1	1	1
	Kwikset Z-Wave Locks	1	1	1	1	1
	Chamberlain Garage Door Opener	1	1	1	1	1
	Jasco Z-Wave Outdoor modules	1	1	1	1	1
4	-----					
5	Philips Hue	1	1	1	1	1
	General Sec Cameras	1	1	1	1	1

	General Baby Monitors	1	1	1	1	1
	General Security Systems	1	1	1	1	1
	General Smart Thermostats	1	1	1	1	1
	General Smart Locks	1	1	1	1	1
	General Home Alarms	1	1	1	1	1
	General Home Sensors	1	1	1	1	1
	General Appliance	1	1	1	1	1
	General Outlet	1	1	1	1	1
	General Sprinkler	1	1	1	1	1
	General Audio (speaker)	1	1	1	1	1
	Network	1	1	1	1	1
	General Switch	1	1	1	1	1
6	Catalog					
7	Tado Smart Thermostat	0	1	0	0	1
	Netatmo Welcome	0	1	0	1	1
	Nest 3.0	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	Echo Dot	1	1	1	1	1
	Netgear Arlo Pro	1	1	1	1	1
	Google Wifi	1	1	1	1	1
	Google Home Mini	0	0	0	0	0
	Ikea Tradfri Smart Lighting	1	0	0	1	1
	Nanoleaf Aurora + Rhythm	1	0	0	0	1
8	Catalog					
9	Amazon Echo	1	1	1	1	1
	Netgear Arlo	1	1	1	1	1
	Philips Hue White Starter Kit	1	1	1	1	1
	Tp-Link HS105	1	1	1	1	1
	Ecobee4	1	1	1	1	1
	Roost Smart Battery	0	1	0	0	1
	Samsung SmartThings	1	1	1	1	1
	Google Home	1	1	1	1	1
	Chamberlain MyQ	0	0	0	0	0
	Kwikset Smartcode	1	1	1	1	1
	Anova Precision Cooker	1	1	1	1	1

10	Amazon Echo Show	0	0	0	0	0
	Samsung POWERbot R7040 Robot Vacuum	1	1	1	1	1
	WeMo Mini Smart Plug	1	1	1	1	1
	Google Home	1	1	1	1	1
	Airmega 400s Air Purifier	1	0	0	0	0
	Netgear Arlo Pro Security System	1	1	1	1	1
	Amazon Echo	0	0	0	0	0
	Linksys Velop	1	1	1	1	1
	Sonos One Smart Speaker	1	1	1	1	1
	Nest Cam IQ	0	0	0	0	0
	Nest Protect Smoke Detector	1	1	1	1	1
	Logitech Harmony Elite	1	1	1	1	1
	Philips Hue White Lighting Kit	1	1	1	1	1
	Logitech Pop Home Switch	1	1	1	1	1
	Kenmore Smart Air Conditioner	0	1	0	0	1
	Ring Video Doorbell	0	1	1	0	1
	Schlage Sense Smart Deadbolt	1	1	1	1	1
	Samsung Family Hub 2.0	0	1	0	0	1
	Ecobee4	1	1	1	1	1
	Dyson Pure Hot Cool Link Air Purifier	1	0	0	0	1
	Nest Thermostat	1	1	1	1	1
	Aera Smart Home Fragrance Diffuser	0	1	0	0	0
	Logi Circle 2 Security Camera	0	1	0	1	1
	Eufy Lumos Smart Bulb	1	1	1	1	1
11	Nest Thermostat	1	1	1	1	1
	Haiku Ceiling Fan	0	0	1	0	0
	Smarter Coffee	0	1	0	0	0
	Twist	1	1	0	0	1
	August Smart Lock	1	1	1	1	1
	June Intelligent Oven	1	1	1	1	1
	Awair	0	1	1	0	1
	Dojo	0	1	0	0	1



12	Nest Thermostat	1	1	1	1	1
	Ecobee3	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	Cree Connected LED Bulb	1	1	1	1	1
	Nest Protect	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	Sonos Play:1	1	1	1	1	1
	Nest Cam	1	1	1	1	1
	Belkin WeMo Switch	1	1	1	1	1
	Roomba 980	1	1	1	1	1
	August Smart Lock	1	1	1	1	1
	Logitech Harmony Home Control	1	1	1	1	1
13	Catalog					
14	Apple TV (4th gen)	0	0	0	0	1
	Philips Hue Starter Kit	1	1	1	1	1
	iDevices Switch	0	1	1	0	1
	Emerson Sensi Touch WiFi Thermostat	0	1	0	0	1
	Lutron Caseta Wireless Smart Lighting Starter Kit	1	1	1	1	1
	Leviton Decora Smart Switch	1	1	1	1	1
	Schlage Sense Smart Deadbolt	1	1	1	1	1
	D-Link Omna 190 Cam HD	0	1	0	1	1
	Fibaro Flood Sensor	0	0	0	1	1
15	Logitech Harmony	1	1	1	1	1
	Samsung SmartThings	1	1	1	1	1
	Sonos	1	1	1	1	1
16	Catalog					
17	Samsung's The Frame	1	1	0	1	0
	Amazon Echo	1	1	1	1	1
	Nest Thermostat	1	1	1	1	1
	Philips Hue White Starter Kit	1	1	1	1	1

	Hisense Portable Air Conditioner	0	0	0	0	0
	Roomba 960	1	1	1	1	1
	Anova Culinary Precision Cooker	1	1	1	1	1
18	Support Page					
19	Catalog					
20	Amazon Echo	1	1	1	1	1
	Honeywell Lyric T5 Wi-Fi Thermostat	1	1	0	0	1
	August Smart Lock	1	1	1	1	1
	Elgato Eve Energy	0	0	1	0	1
	Philips Hue	1	1	1	1	1
21	Support Page					
22	Catalog					
23	Catalog					
24	Support Page					
25	Rain Bird ST8i-Wifi Sprinkler Timer	0	1	0	1	1
	WeMo Smart Plug	1	1	1	1	1
	PUR Bluetooth Ultimate Faucet Filtration System	0	0	0	1	0
	Stick-up Cam	0	1	0	1	1
	Edyn Garden Sensor	0	1	0	1	0
	Caia	1	1	1	1	1
	Zera Food Recycler	0	1	0	0	0
26	Nest Thermostat 3rd Gen	1	1	1	1	1
	Ring Wi-Fi Enabled Video Doorbell	1	1	1	1	1
	Roomba 980 Vacuum	1	1	1	1	1

	Haiku Home L Series WiFi Enabled Ceiling Fan	1	1	1	1	1
	Oco Wireless Surveillance HD Video Monitoring Security Camera	1	1	1	0	1
	simplehuman Sensor Mirror Pro	0	1	0	0	0
	Piper nv Smart Home Security System with Night Vision	0	0	0	0	1
	Dropcam Pro Wi-Fi Wireless Video Monitoring Security Camera	0	1	0	1	1
	August Smart Lock	1	1	1	1	1
	BeON Home Protection System	0	0	0	0	0
	Rachio Smart Sprinkler Controller 2nd Gen	1	1	1	1	1
	Schlage Connect Camelot Touchscreen Deadbolt with Built-In Alarm	1	1	1	1	1
	Sonos Play:1	1	1	1	1	1
	Lutron Caseta Wireless Smart Lighting In-Wall Dimmer Kit	1	1	1	1	1
	Nest Cam Security Camera	1	1	1	1	1
	Honeywell Wi-Fi Touch Screen Programmable Thermostat	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	iBaby Wi-Fi Wireless Digital Baby Video Camera	0	1	1	1	1
	Kuna Smart Home Security Outdoor Light & Camera	1	1	1	1	1
	Philips Hue White and Color Ambience Starter Kit	1	1	1	1	1
	Zmodo Smart Wireless Security Camera	0	1	0	1	1
	iSmartAlarm Home Security System	0	1	0	0	1
	Canary All-in-One Home Security Device	0	0	0	0	1
	Arlo Smart Home	1	1	1	1	1
	Samsung SmartCam HD Pro 1080p Full-HD Wi-Fi Camera	1	1	1	1	1

Petcube Interactive Wi-Fi Pet Camera	0	1	1	1	1
Crock-Pot Smart Wi-Fi Enabled WeMo 6-Quart Slow Cooker	0	1	0	0	1
SkyBell Wi-Fi Video Doorbell Version 2.0 Classic	1	1	1	1	1
Funlux NEW Outdoor 720P HD Smart Wireless Surveillance Camera System	1	1	0	0	1
Chamberlain MyQ-Garage	1	1	1	1	1
Circle with Disney	0	0	0	0	0
CUJO Smart Internet Security Firewall	0	0	0	0	0
Samsung SmartThings Hub	1	1	1	1	1
Kohler Moxie Showerhead and Wireless Speaker	0	0	0	0	1
Mr. Coffee Smart WiFi-Enabled WeMo 10-cup Optimal Brew Coffeemaker	0	1	0	0	0
Ooma Telo Free Home Phone Service	1	1	1	1	0
Nest Protect Smoke Plus Carbon Monoxide	1	1	1	1	1
Wink Connected Home Hub	1	1	1	1	1
LIFX Color 1000 Wi-Fi Smart LED Light Bulb	1	1	1	1	1
Lutron Caseta Wireless Smart Lighting In-Wall Dimmer Kit	1	1	1	1	1
WeMo Switch Smart Plug	1	1	1	1	1
TP-Link Smart Plug w/ Energy Monitoring	1	1	1	1	1
iDevices Kitchen Thermometer	0	1	0	0	0
GE12722 Z-Wave Wireless Lighting Control On/Off Switch	1	1	1	1	1
Quirky Porkfolio Smart Piggy Bank	0	1	0	0	0
Philips Hue Wireless Dimming Kit	1	1	1	1	1
Ankuoo NEO Smart Plug	1	1	1	1	1

	GE Link Wireless Smart Connected LED Light Bulb	1	1	1	1	1
	Quirky Egg Minder Wink App Enabled Smart Egg Tray	0	1	0	0	1
27	Amazon Echo	1	1	1	1	1
	Nest Learning Thermostat	1	1	1	1	1
	Elgato Eve Degree	0	0	0	0	0
	Nest Cam IQ	1	1	1	1	1
	Philips Hue Ambiance Starter Kit	1	1	1	1	1
	Google Home	1	1	1	1	1
	Elgato Eve Energy	1	1	1	1	1
	Furbo	0	1	0	1	1
	Nest Protect	1	1	1	1	1
	Amazon Echo Dot	1	1	1	1	1
	Dyson 360 Eye	1	1	1	1	1
28	August Smart Lock	1	1	1	1	1
	Netatmo Smart Thermostat	0	0	0	0	1
	Philips Hue Starter Kit	1	1	1	1	1
29	Catalog					
30	Amazon Echo	1	1	1	1	1
	Nest Thermostat	1	1	1	1	1
	Wink	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	Rachio Smart Sprinkler Controller	1	1	1	1	1
	Google Home	1	1	1	1	1
31	Arlo Pro Security System	1	1	1	1	1
	LIFX Wi-Fi Smart LED Light Bulb	1	1	1	1	1
	iRobot Roomba Robot Vacuum	1	1	1	1	1
	Sonos Play:1 Compact Wireless Speaker	1	1	1	1	1
	Amazon Tap	1	0	1	0	1
	Vine Smart Wi-Fi Thermostat	0	1	0	0	1

	Ring Wi-Fi Enabled Video Doorbell	1	1	1	1	1
	TP-Link Smart Plug	1	1	1	1	1
	Echo Show	0	0	0	0	0
32	Catalog					
33	Can't Use					
34	Catalog					
35	Support Page					
36	Catalog					
37	Nest Learning Thermostat	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	Revolv	1	1	1	1	1
	Roomba	1	1	1	1	1
38	Amazon Echo	1	1	1	1	1
	Google Home	1	1	1	1	1
	Nest Learning Thermostat	1	1	1	1	1
	British Gas Hive	1	0	1	1	1
	Tado Smart AC Control	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	LIFX	1	1	1	1	1
	IKEA Tradfri	1	1	1	1	1
	August Smart Lock Pro	1	1	1	1	1
	Yale Keyless Connected	1	1	1	1	1
	Canary	1	1	1	1	1
	Netatmo Welcome	1	1	1	1	1
	Nest Protect	1	1	1	1	1
	First Alert ONELINK Wi-Fi	0	1	0	1	1
39	Nest Learning Thermostat	1	1	1	1	1
	Nest Smoke Detector	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	Amazon Echo	1	1	1	1	1
	Google Home	1	1	1	1	1

	Insteon Hub Pro	1	1	1	1	1
	Samsung SmartThings	1	1	1	1	1
	Wink Hub	1	1	1	1	1
40	Amazon Echo	1	1	1	1	1
	WeMo	1	1	1	1	1
	Philips Hue	1	1	1	1	1
	Samsung SmartThings	1	1	1	1	1
	Nest Cam	1	1	1	1	1
	Nest Learning Thermostat	1	1	1	1	1
	Nest Protect	1	1	1	1	1
	Amazon Echo Show	1	1	1	1	1
	Amazon Echo Dot	1	1	1	1	1
	Ecobee3	1	1	1	1	1
	Tado	1	1	1	1	1
41	Catalog					
42	Can't Use					
43	Catalog					
44	Catalog					
45	Brilliant	1	1	1	1	1
46	Apple Watch	1	1	1	1	1
	Apple TV	1	1	1	1	1
	Elgato Eve Motion	1	1	1	1	1
	Lutron Caseta Dimmer	1	1	1	1	1
47	Can't Use					
48	Catalog					
49	Can't Use					
50	Amazon Echo	1	1	1	1	1
	Echo Dot	1	1	1	1	1

	Echo Show	1	1	1	1	1
	August Smart Lock	1	1	1	1	1
	Schlage	1	1	1	1	1
	Hunter Fan	0	0	0	0	0
	iDevices	1	1	1	1	1
	WeMo	1	1	1	1	1
	Philips Hue	1	1	1	1	1
Matches		240	266	239	246	268
Count		293	293	293	293	293
IRR		82%	91%	82%	84%	91%