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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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B.S., Georgia Southern University, 2014

A Thesis Submitted to the Graduate Faculty of Georgia Southern University
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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

| Device | Core Functions | Categories | Input | Output | Type |
|--------------------------|---------------------------|---------------------|-----------------------|------------------|-------------|
| 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

| Core Function | Categories | Input | Output | Type |
|----------------------|-------------------|--------------|---------------|-------------|
| 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/

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...

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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 ...

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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.

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[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...

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

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/

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

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...

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<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...
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/
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/
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
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/
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/
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
[Jump to Building and home automation - The Internet of things \(IoT\) is the inter-networking of physical devices, vehicles buildings, and other ...](#)

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

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[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...

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...

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 ...

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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

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

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...

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...

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

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...

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

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 › *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 › *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...

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

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

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

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

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

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
 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
 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/
 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
 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/
 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
 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 › 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
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/
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-...

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

| Device | Core Function | Categories | Input | Output |
|-------------------|------------------------------------|--|---------------------------------|---------------------------|
| 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 | | | | |
| | Netowork | 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 | | | | |

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|----|---------------------------|---------------------------|-----------------------|------------------------|------------------|-------------------|
| | 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, Carbonmonioxide |
| 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 |

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|---|---------------------------|---------------------|---------------|-----------|------------------------|
| 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, Control | 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, Carbonmonioxide |
| #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 |

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|----|---------------------------------------|---|---|---|---|---|
| | | | | | | |
| 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 |

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|----|---|---|---|---|---|---|
| | 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 |

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|--|---|---|---|---|---|
| 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 |

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|----|---|---|---|---|---|---|
| | 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 |

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|----|-----------------------------------|---|---|---|---|---|
| | 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 |

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|----|--------------------------|---|---|---|---|---|
| | 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% |