UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

KAIFI LLC, Plaintiff, v. AMAZON.COM, INC.; AMAZON.COM SERVICES LLC; and AMAZON WEB SERVICES, INC. Defendants.	Case No. 2:24-cv-00542 JURY TRIAL DEMANDED

PLAINTIFF KAIFI LLC'S P.R. 3-1 AND 3-2 DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS AND ACCOMPANYING DOCUMENT PRODUCTION

Pursuant to Local Patent Rules 3-1 and 3-2 and the Court's Scheduling Order, Plaintiff KAIFI LLC ("KAIFI") hereby provides its disclosure of asserted claims and infringement contentions against Defendants Amazon.com, Inc., ("Amazon.com"), Amazon.com Services LLC ("Amazon Services"), and Amazon Web Services, Inc. ("Amazon AWS"), including by reference the entirety of the attached appendices and exhibits, and accompanying document production.

KAIFI makes these disclosures based on the information that is presently known and publicly available, without the benefit of discovery. KAIFI has not completed its preparation for trial and has not received discovery from Defendants or third parties, particularly of confidential, proprietary and/or non-public documents and information that describe the accused instrumentalities, or discovery on past, discontinued or other instrumentalities reasonably similar to the presently accused instrumentalities.

KAIFI's investigations are ongoing. KAIFI reserves the right to amend, supplement or otherwise revise its asserted claims and infringement contentions, including but not limited to identification of infringed patents and claims, and infringing instrumentalities.

I. Asserted claims

Pursuant to P.R. 3-1(a), KAIFI presently identifies each claim of each patent in suit that is infringed by Defendants as follows:

U.S. Patent No. 8,930,196 (the "'196 Patent"): claims 1-20;

U.S. Patent No. 8,040,232 (the "'232 Patent"): claims 1-12;

U.S. Patent No. 11,082,518 (the "'518 patent"): claims 1-20; and

U.S. Patent No. 7,689,001 (the "'001 Patent"): claims 1-3, 5, 7-8, 10-11.

II. Accused Instrumentalities

Pursuant to P.R. 3-1(b), KAIFI presently identifies the accused apparatus, product, device, process, method, act, or other instrumentality of which it is aware. This identification is

as specific as possible. Each product, device, and apparatus is identified by name or model number, if known. Each method or process is identified by name, if known.

The accused instrumentalities for the '196 Patent include at least methods and apparatuses for speech recognition, including but not limited to wake word detection. The accused instrumentalities for the '232 Patent include at least sensor node and network methods, apparatuses, and systems, including but not limited to Ubiquitous Sensor Network (USN) middleware. The accused instrumentalities for the '518 Patent include at least systems for multiple machines, including but not limited to a relation server and relation profile, such as for tasks and routines. The accused instrumentalities for the '001 Patent include at least methods and devices for location recognition, including but not limited to autonomous mobile robotics.

Appendix A provides an exemplary list of accused instrumentalities, as corresponding to each of the '196 Patent, '232 Patent, '518 Patent, and '001 Patent.

The accused instrumentalities may be provided in a variety of configurations, embodiments, or combinations of the claimed components and steps. The accused instrumentalities may incorporate various devices, servers, chips, circuit elements, modules, code, and the like. Different models, versions, or iterations may incorporate or embody the same or substantially similar components or configurations.

KAIFI reserves the right to identify additional accused instrumentalities as discovery commences and its investigation continues. KAIFI anticipates the full scope of configurations or combinations of the accused and reasonably similar instrumentalities will be further identified as discovery commences and investigation continues.

III. Claim Charts

Pursuant to P.R. 3-1(c), KAIFI provides claim charts, which are incorporated by reference as if fully set forth herein, identifying where each element of each asserted claim is

found within each accused instrumentality:

Appendix B – the '196 Patent;

Appendix C – the '232 Patent;

Appendix D – the '518 Patent; and

Appendix E – the '001 Patent.

The accused instrumentalities utilize the same or substantially similar technology as presented in the charts, such that the charts are representative of the manner of infringement by each accused instrumentality. On information and belief, the charting of elements of the asserted claims to the accused instrumentalities is substantially the same. The comparisons made in these contentions are representative of, and apply to, all accused and reasonably similar instrumentalities and their configurations and implementations.

The charts subdivide the asserted claims to better illustrate where each claim element or step may be found within the accused instrumentalities. The annotations to figures are provided solely for illustrative purposes. References and descriptions provided in conjunction with one claim within a chart are applicable to other claims within the chart with respect to the same or similar elements and limitations. These subdivisions or annotations should not be taken as an indication of the boundaries of claim elements or steps with respect to the doctrine of equivalents or any other issue. For example, particular claim structures or functionalities may be embodied by or distributed over one or more elements or functional blocks, including or in addition to those that have been annotated. KAIFI reserves the right to provide alternate claim mapping, and to amend, supplement or otherwise revise these charts as discovery and its investigation continues.

IV. Contentions

A. Direct Infringement

KAIFI contends that Defendants directly infringe the asserted claims by making, using, selling, and/or offering for sale in the United States, and/or importing into the United States, this State, and this District the accused instrumentalities, without authority. KAIFI also contends that Defendants' infringement is literal and/or under the doctrine of equivalents.

For example, on information and belief, and without the benefit of discovery, KAIFI presently contends: Amazon.com directly infringes the '196 Patent, the '232 Patent, the '518 Patent, and the '001 Patent; Amazon Services directly infringes the '196 Patent, the '232 Patent, the '518 Patent, and the '001 Patent; and Amazon AWS directly infringes at least the '196 Patent and the '232 Patent.

Additionally or alternatively, each Defendant directs or controls the performance by others (either another Defendant or third party) of one or more claim limitation(s), such that the performance or use of each claim limitation can be attributed to the Defendant. In particular, Defendants condition participation in an activity or receipt of a benefit upon performance of the step(s) and establish the manner or timing of that performance. For example, Amazon Services directs or controls Amazon AWS's performance of certain steps of the claimed methods. Furthermore, Amazon AWS directs or controls Amazon Service's performance of certain steps of the claimed methods.

Additionally or alternatively, Amazon.com, Amazon Services and/or Amazon AWS act as a joint enterprise whose members can be charged with each other's acts in the enterprise. For example, a joint enterprise exists between or among Defendants by virtue of agreement, express or implied, between or among Defendants with a common purpose to be carried out. There exists a community of pecuniary interest in that there is a common purpose among the members with an equal right among all members to a voice in the direction of the enterprise, giving equal

right to control.

Additionally or alternatively, each Defendant has, at least, used the claimed system or apparatus by putting the system or apparatus as a whole into service, *i.e.*, controlled the system and obtained benefit from it. For example, at least Amazon Services, including its employees, have put systems for multiple devices, machines, or components, including but not limited to local devices and back-end servers, as a whole into service, *i.e.*, controlled the system and obtained benefit from it.

Additionally or alternatively, Defendants have directly infringed by combining all elements of the infringing systems, devices, and other instrumentalities together, including via Defendants' software connecting the claimed devices. Further, Defendants directly infringe because they are the single supplier of the accused system where it comprises multiple devices and software.

B. Indirect Infringement

KAIFI contends that Defendants indirectly infringe by actively, knowingly, and/or intentionally inducing and/or contributing to the direct infringement of the asserted claims.

Defendants have induced and continued to induce infringement of the asserted claims by others (either other Defendants or third parties, including end-users and customers). By way of non-limiting examples, (i) Amazon Services induces Amazon AWS's performance of the claimed method or use of a claimed system or apparatus; (ii) Amazon AWS induces Amazon Service's performance of the claimed method or use of a claimed system or apparatus; (iii) Amazon Services or Amazon AWS induces direct infringement by an end-user or customer; and/or (iv) Amazon.com induces direct infringement by Amazon AWS and/or Amazon Services.

Additionally or alternatively, Defendants' customers and/or end-users have used the claimed systems by putting the claimed system as a whole into service, i.e., controlled the system and obtained benefit from it and were induced to do so by Defendants.

Defendants had knowledge or were on notice of the asserted patents by virtue of pre-suit communications between Amazon and PowerVoice, citations to one or more of the asserted patents during the prosecution of patent applications by Defendants and/or their affiliates, and the filing of the complaint in this case.

The acts of inducement may include making, selling, offering to sell, and/or importing the Accused Instrumentalities to or for others, and providing others with encouragement, instructions and training on how to use the accused instrumentalities in a manner that directly infringes the claims, all while Defendants have knowledge of the asserted patents and asserted claims, and knowledge that such use of the accused instrumentalities would infringe the asserted claims. Defendants affirmatively act with knowledge and specific intent to encourage and facilitate such infringing acts by others. Defendants' tutorials, user guides, and technical and marketing documentation for the accused instrumentalities provide specific instruction for using, and actively encourage others to use, the accused instrumentalities in an infringing manner.

Affirmative acts of inducement include, but are not limited to, any one or combination of encouraging and/or facilitating the infringement of others through advertisement, marketing, and dissemination of the accused instrumentalities and their components; creating and publishing promotional and marketing materials, supporting materials, product manuals, and/or technical support and information relating to the accused instrumentalities; describing to, training, and instructing users on the implementation of the accused instrumentalities and/or its components; and providing product manuals and other technical information that cause other Defendants, Defendants' customers and other third parties to use and/or operate the accused instrumentalities for their ordinary and customary use.

Defendants took active steps to encourage end users to use and operate the accused

instrumentalities despite knowing of the asserted patents, in a manner they knew directly infringements each element of the asserted claims. Defendants specifically intended and were aware that the ordinary and customary use of the accused instrumentalities and/or their components would infringe one or more of the asserted claims.

Defendants knew that the induced conduct would constitute infringement and intended said infringement at the time of committing the aforementioned acts, such that those acts and conduct have been and continue to be committed with the specific intent to induce infringement, or to deliberately avoid learning of the infringing circumstances at the time these acts were committed, so as to be willfully blind to the induced infringement.

Defendants have and continue to contributorily infringe the asserted claims by using, offering to sell, selling, or importing the Accused Instrumentalities. The accused instrumentalities in operation form a component of a machine, manufacture, combination, or composition, constituting a material part of the invention for each of the asserted patents. Defendants know that the Accused Instrumentalities are especially made or adapted for use in an infringement of the asserted claims, and that the Accused Instrumentalities are not a staple article or other system capable of substantial non-infringing use.

C. Doctrine of Equivalents

KAIFI contends that Defendants infringe under the doctrine of equivalents, to the extent that Defendants contend any claim elements or limitations are not found literally. Defendants have not specifically identified which claim elements or limitations they contend are not literally met. Should Defendants contend that any element, step or limitation is literally absent, KAIFI contends and reserves the right to prove that at least the equivalent of the allegedly missing element, step or limitation is nevertheless present and that accused instrumentalities at least infringe under the doctrine of equivalents. KAIFI anticipates that discovery will enable it to set

forth the additional scope of equivalents, and therefore reserves the right to amend, supplement or otherwise revise these contentions, and specifically as to the doctrine of equivalents.

V. Priority Dates

Pursuant to P.R. 3-1(e), Plaintiff identifies the priority date to which each asserted claim is entitled for asserted patents that claim priority to an earlier application.

- The asserted claims of '196 claim priority to PCT Appl. PCT/KR2009/002118 filed April 22, 2009.
- The asserted claims of '232 claim priority to PCT Appl. PCT/KR2006/005715 filed December 26, 2006.
- The asserted claims of '518 claim priority to US Appl. 14/931,213 filed November 3, 2015.
- The asserted claims of '001 claim priority to KR Appl. 10-2005-0114022 filed November 28, 2005.

KAIFI's investigation is continuing. KAIFI reserves the right to supplement its priority claim date (and to assert any applicable prior invention dates).

VI. Plaintiff's Practicing Instrumentalities

Pursuant to P.R. 3-1(f), at this time, KAIFI is not asserting that any apparatus, product, device, process, method, act, or other instrumentality of its own practices any of the claimed inventions. KAIFI's investigation is continuing. To the extent that additional responsive, discoverable information is found, including with respect to third parties, KAIFI reserves the right to and will supplement its response concerning P.R. 3-1(f) as appropriate.

VII. Document Production

Pursuant to P.R. 3-2(a), KAIFI is producing the following non-privileged documents sufficient to evidence each discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, the claimed invention prior to the date of application for the patent in suit:

Bates Nos. KAIFI0007448 - KAIFI0007495; KAIFI0007509 - KAIFI0007579; KAIFI0007673 - KAIFI0007691.

Pursuant to P.R. 3-2(b), KAIFI is producing herewith non-privileged documents evidencing the conception, reduction to practice, design, and development of each claimed invention, which were created on or before the date of application for the patent in suit or the priority date identified pursuant to P. R. 3-1(e):

Bates Nos. KAIFI0007448 - KAIFI0007691.

Pursuant to P.R. 3-2(c), KAIFI is producing herewith a copy of the file history for each of the Asserted Patents:

Bates Nos. KAIFI0000001 - KAIFI0001071.

KAIFI reserves the right to amend or supplement this production based on further investigation.

Date: November 14, 2024

/s/ Andrew Choung

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CERTIFICATE OF SERVICE

I certify that the foregoing document was served by electronic mail to counsel for Defendants.

Date: November 14, 2024

/s/ Andrew Choung

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

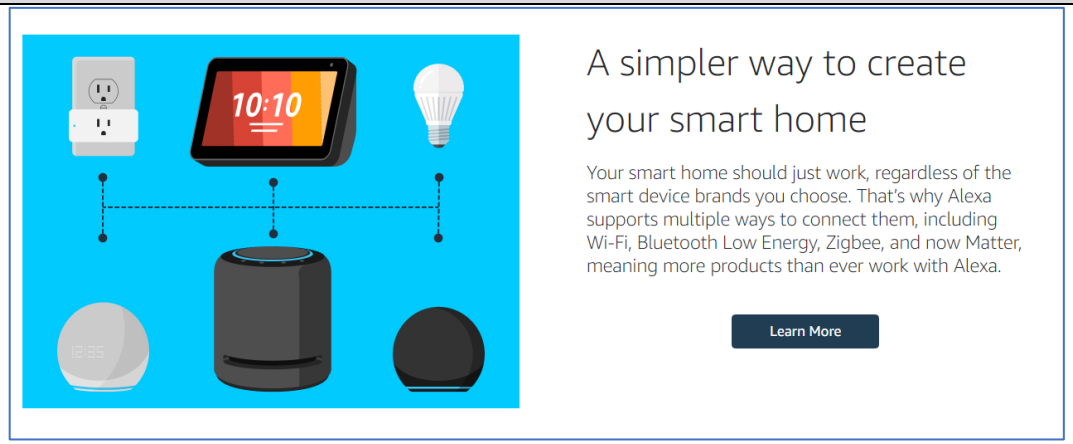
<u>Claim 1 of the ’232 Patent</u>

Claim 1	Accused Instrumentality(ies)
A system for providing an information service based on heterogeneous sensor networks, comprising:	Amazon provides a system for providing an information service based on heterogeneous sensor networks. For example, Amazon provides the Alexa Smart Home.[1] Connecting devices to Alexa Creating a connected home is easy. Simply plug in and power on your new smart home device. Then say, “Alexa, discover devices.” You can also add devices through the Amazon Alexa app: 1. Open the Alexa app and select **Devices**. 2. Tap the **+** icon and select **Add Device**. 3. Choose the device type and brand. 4. Follow the on-screen prompts. Expand your smart home Lighting Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what’s happening with the Amazon Alexa app, no matter where you are. Televisions Smart TVs let you use your voice to open streaming apps, change the channel, adjust the volume, and more when paired with an Alexa-enabled device. When you’re done watching, just say, “Alexa, turn off the TV.” Thermostats Heating and cooling costs can really add up. Smart thermostats can help you save energy by adjusting your home’s temperature when you’re away.

[1] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 13 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[2] For example, Amazon provides the Alexa app.[3] For example, Amazon provides Alexa Energy Dashboard.[4]

[2] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

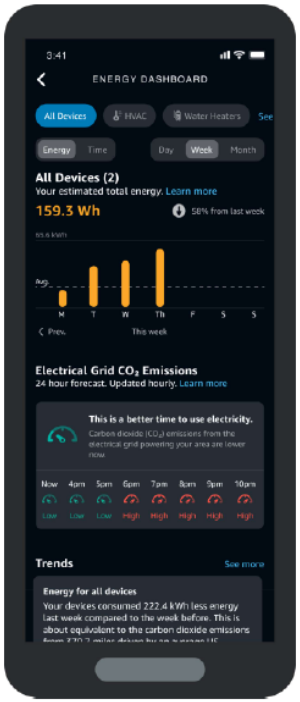
[3] *See* KAIFI0007048 *(The Alexa App*, https://www.amazon.com/Alexa-App/b?ie=UTF8&node=18354642011).

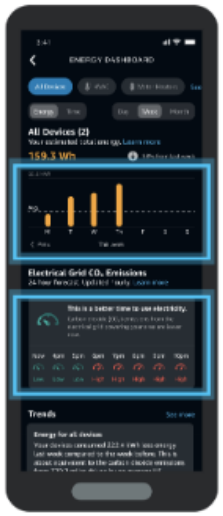
[4] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** Simple to set up and use

Claim 1	Accused Instrumentality(ies)
	 4- Start tracking and managing the energy usage of your Alexa-connected device. View a 24-hour forecast of when cleaner energy is available in your area. For example, the Alexa app can discover and add different networked devices.[5] For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable

[5] *See* KAIFI0007810 *(How to Set up Devices with Alexa | Amazon Echo*, https://youtu.be/XFfm_nEqVpk?si=r9Eo35tCu8MDd5cV); *see also* KAIFI0007808 *(How To Connect Smart Home Devices to Alexa*, https://www.youtube.com/watch?v=tT458bs2QPU).

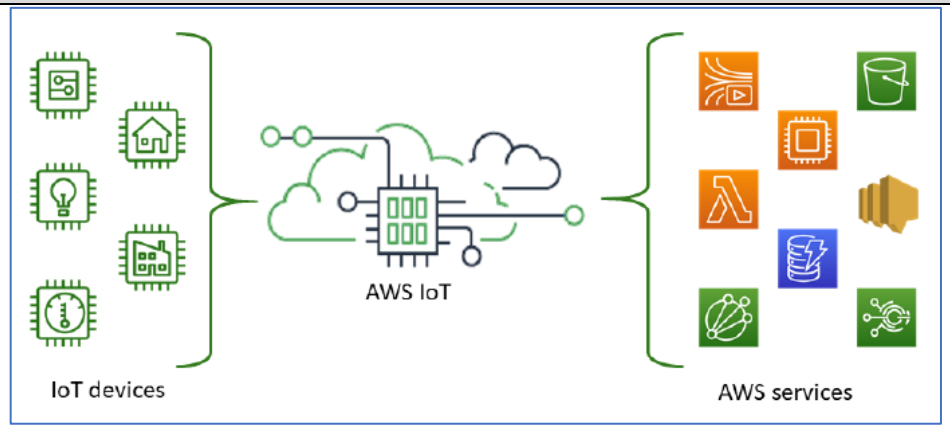
Claim 1	Accused Instrumentality(ies)
	light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[6] For example, Amazon provides AWS IoT.[7] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

[6] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[7] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Ex.1015 / Page 18 of 264
AMAZON.COM, INC.

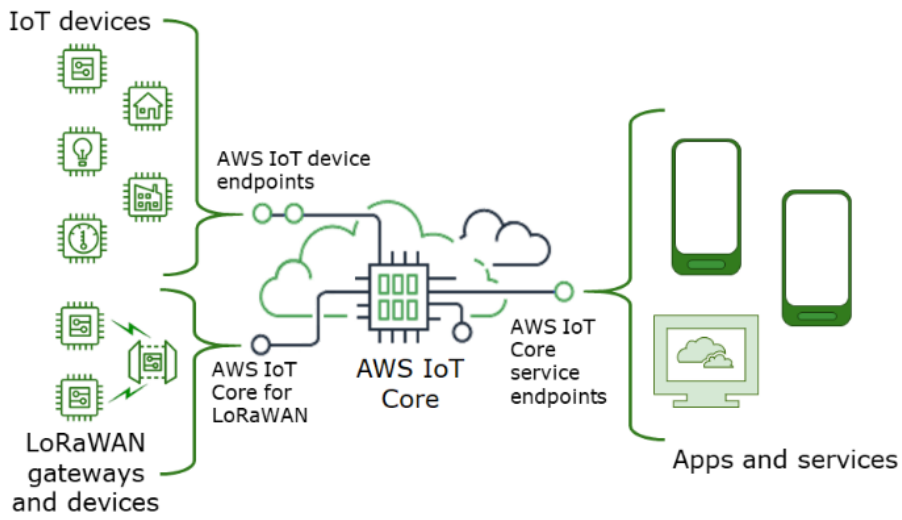
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT Core, which supports connections with IoT devices, wireless gateways, services, and apps.[8]

[8] *See* KAIFI0002118 *(Connect to AWS IoT Core*, https://docs.aws.amazon.com/iot/latest/developerguide/connect-to-iot.html).

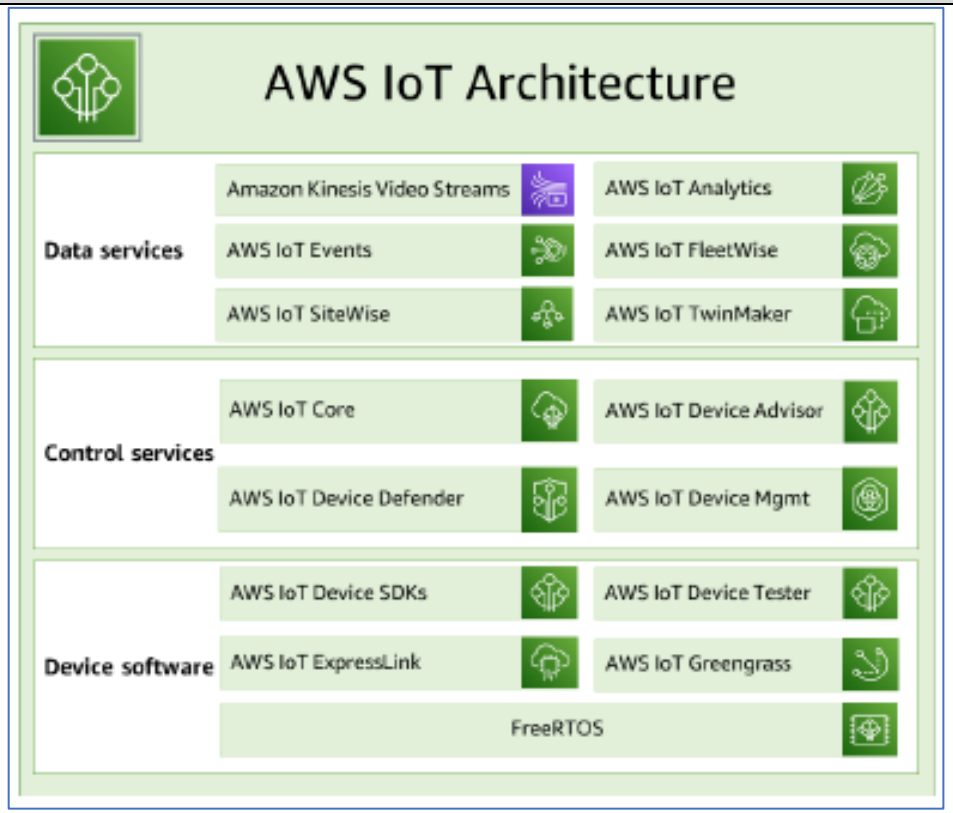
Ex.1015 / Page 19 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Connect to AWS IoT Core PDF AWS IoT Core supports connections with IoT devices, wireless gateways, services, and apps. Devices connect to AWS IoT Core so they can send data to and receive data from AWS IoT services and other devices. Apps and other services also connect to AWS IoT Core to control and manage the IoT devices and process the data from your IoT solution. This section describes how to choose the best way to connect and communicate with AWS IoT Core for each aspect of your IoT solution.  For example, Amazon provides AWS IoT Architecture. [9]

[9] *See id.*

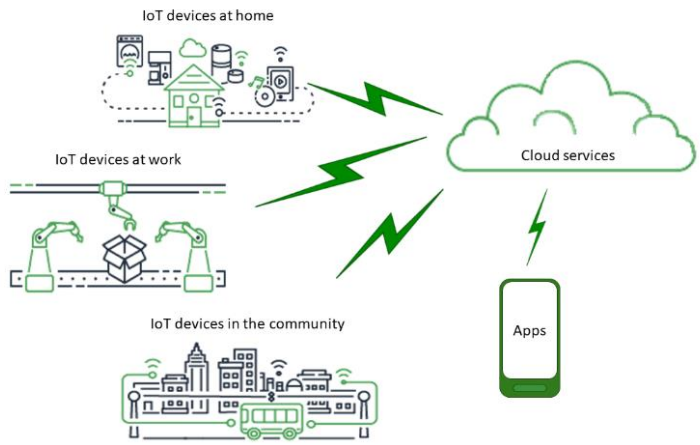
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, AWS IoT provides cloud services and device support.[10]

[10] *See* KAIFI0002118 *(How AWS IoT works*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-how-it-works.html).

Ex.1015 / Page 21 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	AWS IoT provides cloud services and device support that you can use to implement IoT solutions. AWS provides many cloud services to support IoT-based applications. So to help you understand where to start, this section provides a diagram and definition of essential concepts to introduce you to the IoT universe. **The IoT universe** In general, the Internet of Things (IoT) consists of the key components shown in this diagram.  For example, Amazon provides IoT solutions on AWS to connect devices and collect, store, and analyze device data.[11]

[11] *See* KAIFI0001934 *(Build IoT Solutions for Free on AWS*, https://aws.amazon.com/free/iot/?nc1=h_ls).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Product Benefits There are billions of devices in homes, factories, oil wells, hospitals, cars, and thousands of other places. With the proliferation of devices, you increasingly need solutions to connect them, and collect, store, and analyze device data. **Broad & Deep** AWS has broad and deep IoT services, from the edge to the cloud. AWS IoT is the only cloud vendor to bring together data management and rich analytics in easy to use services designed for noisy IoT data. **Multi-Layered Security** AWS IoT offers services for all layers of security, including preventive security mechanisms, like encryption and access control to device data, and a service to continuously monitor and audit configurations. **Superior AI Integration** AWS brings AI and IoT together to make devices more intelligent. You can create models in the cloud and deploy them to devices where they run 2x faster compared to other offerings. **Proven at Scale** AWS IoT is built on a secure and proven cloud infrastructure, and scales to billions of devices and trillions of messages. AWS IoT integrates with other AWS services, so you can build complete solutions. For example, Amazon provides connectivity, control, and analytics services.[12]

[12] *See id.*

Ex.1015 / Page 23 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)

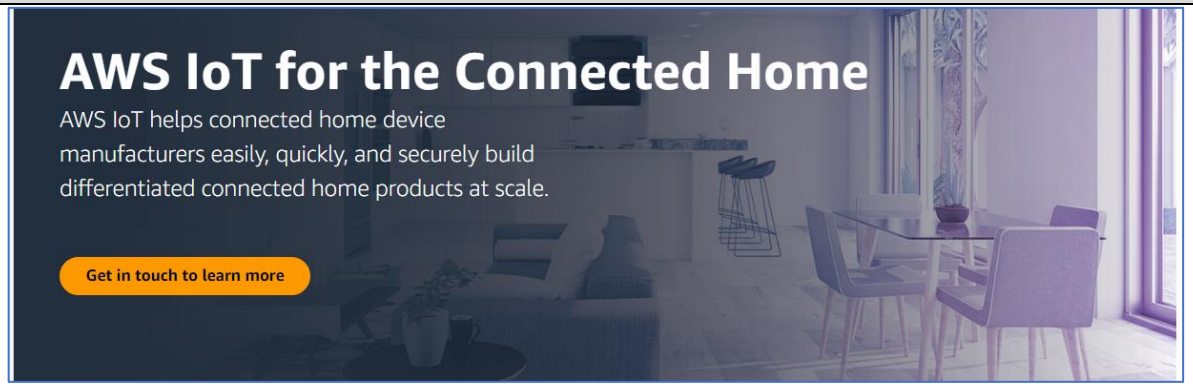
PRODUCT	DESCRIPTION
AWS IoT Core	Connectivity & Control Services Connect IoT devices to the AWS cloud without the need to provision or manage servers
AWS IoT Device Management	Connectivity & Control Services Onboard, organize, monitor, and remotely manage connected devices at scale.
AWS IoT Device Defender	Connectivity & Control Services A fully managed service that helps you secure your fleet of IoT devices.
AWS IoT Events	Analytics Services AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications.
AWS IoT SiteWise	Analytics Services A managed service that makes it easy to collect, store, organize, and monitor data from industrial equipment at scale to help you make better, data-driven decisions.
AWS IoT Greengrass	Device Software Local compute, messaging, data caching, and sync capabilities for connected devices.
FreeRTOS	Edge Computing Open source, real-time operating system for microcontrollers that makes small, low-power edge devices easy to program, deploy, secure, connect, and manage.

For example, Amazon provides AWS IoT for the Connected Home.[13]

[13] *See* KAIFI0001754 *(AWS IoT for the Connected Home*, https://aws.amazon.com/iot/solutions/connected-home/).

Ex.1015 / Page 24 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 As the use of connected home devices continues to grow, more and more data is being pushed to the cloud, where the latest IoT and machine learning technologies are enabling new innovations in connected home applications. AWS IoT makes it easy for you to build scalable IoT applications that collect, process, analyze, and act on data generated by connected home devices without having to manage any infrastructure. This helps you focus on building solutions and experiences that deliver value to both your businesses and your consumers and create a new class of connected home applications that interact with the physical world. For example, Amazon provides IoT use cases for Connected Home.[14]

[14] *See id.*

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 IoT for Connected Home Use Cases Home Automation & Voice Enablement Using AWS IoT, you can enable any device to connect to the Internet and perform a desired action quickly, reliably, and easily. These devices can work alone or together with other devices or hubs for an integrated smart home experience. Additionally, devices can also benefit from using voice services like Alexa for a seamless customer experience. See the infographic >> Home Security & Monitoring Devices like door locks, security cameras, and water leak detectors built with AWS IoT can use machine learning to automatically detect threats, take action, and send alerts to home owners. AWS IoT enables devices to run with low-latency and compute data locally, without internet connectivity. See the infographic >> Home Network Management Network operators are looking for new ways to help customers quickly discover, troubleshoot, and fix home network issues including Wi-Fi and cable TV connectivity. AWS IoT enabled set-top boxes can automatically log network diagnostics and send to the customer service center proactively or allow customers to monitor and troubleshoot their network health through a mobile app. See the infographic >> For example, Amazon's system utilizes network communication protocols.[15]

[15] *See* KAIFI0001149 *(Build Your Alexa Connected Device*, https://developer.amazon.com/en-US/alexa/devices/connected-devices/development-resources#local-connection).

Ex.1015 / Page 26 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)

	On the Cloud	On Device Module	Local Connection	Alexa Built-in
Connectivity Type	Connect your cloud to Alexa's cloud with Alexa skills	Add an on-device hardware module	Connect via local connectivity protocols	No additional integration required; use your existing AVS client
Technology	**Smart Home Skill API, Custom Skill API, Multi-Capability Skills**	**Alexa Connect Kit (ACK)**	**Zigbee, Bluetooth, Z-Wave and other local connectivity protocols**	**Alexa Voice Service (AVS) API**
Key Consideration	Requires your own device cloud	Managed service: No need to create a skill or manage cloud service	Zigbee or Z-Wave certified	Must have a microphone and meet AVS development requirements.
Supported Devices	Any smart device with Wi-Fi	Any device with a microcontroller: coffee makers, ovens, microwaves	Zigbee or Z-Wave certified lights, locks, plugs, sensors	Any device with Alexa Built-in
Voice User Interface	Pre-built (Amazon-defined) or custom built	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)
Certification Eligibility	Works with Alexa	Works with Alexa	Works with Alexa	Alexa Built-In
Development Information	Smart Home Skill API	Alexa Connect Kit	Local Connection	Smart Home for AVS

For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm Base Stations.[16]

[16] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).

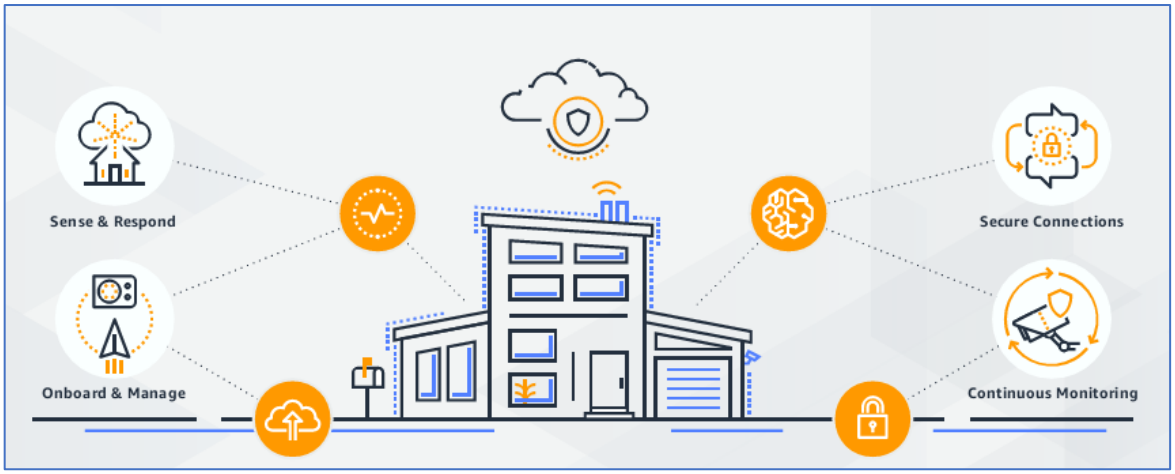
Ex.1015 / Page 27 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	Protocols and Ports Used by Ring Devices Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[17] **Welcome to Amazon Sidewalk** Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk.
a sensor node	The Accused Instrumentalities comprise a sensor node and a sensor network to sense environment

[17] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

Ex.1015 / Page 28 of 264
AMAZON.COM, INC.

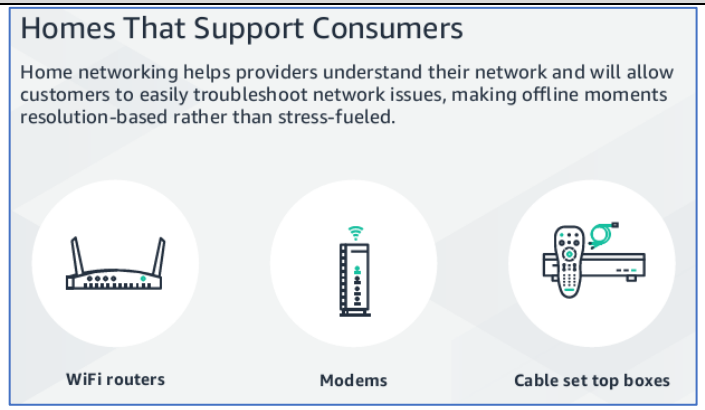
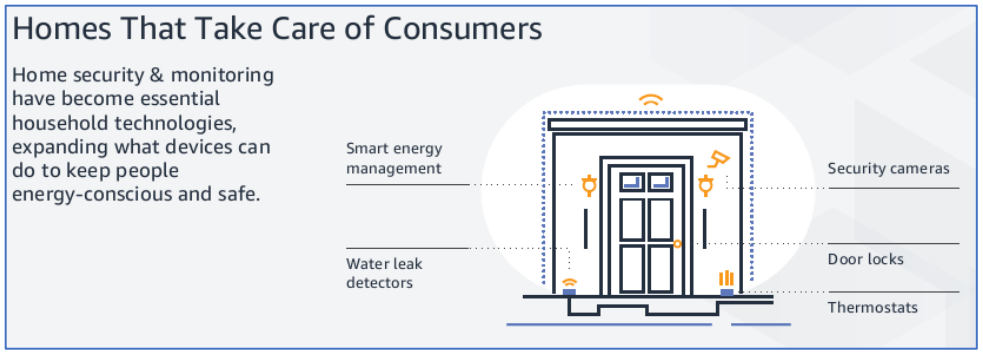
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
constructing a sensor network to sense environment information;	information. For example, Amazon provides Home Networking, Home Security & Monitoring, and Home Automation with AWS IoT. For example, Home Networking provides the following features.[18] 

[18] *See* KAIFI0001931 *(Connected Homes with AWS IoT: Home Networking*, https://pages.awscloud.com/rs/112-TZM-766/images/AWS_ConnectedHome_Network_DES_7.20.18_V3.pdf).

Ex.1015 / Page 29 of 264
AMAZON.COM, INC.

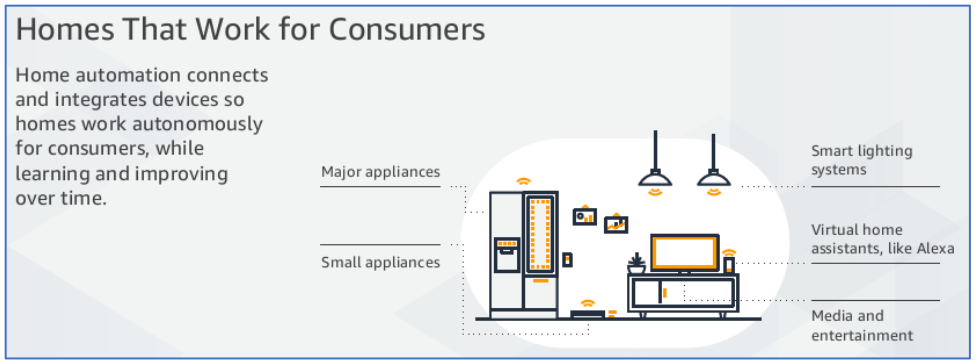
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, Home Security & Monitoring provides the following features.[19] 

[19] *See* KAIFI0001931 *(Connected Homes with AWS IoT: Home Networking*, https://pages.awscloud.com/rs/112-TZM-766/images/AWS_ConnectedHome_Network_DES_7.20.18_V3.pdf). .

Ex.1015 / Page 30 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, Home Automation provides the following features.[20]  For example, Amazon provides devices that sense environment information such as the Smart Air Quality Monitor.[21]

[20] *See* KAIFI0001931 *(Connected Homes with AWS IoT: Home Networking*, https://pages.awscloud.com/rs/112-TZM-766/images/AWS_ConnectedHome_Network_DES_7.20.18_V3.pdf).

[21] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa*, https://www.amazon.com/dp/B08W8KS8D3/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Know your air Amazon Smart Air Quality Monitor measures 5 important factors of air quality: particulate matter (PM 2.5), volatile organic compounds (VOCs), carbon monoxide (CO), humidity, and temperature. • Know your air – Amazon Smart Air Quality Monitor makes it easy to understand what's in your indoor air. • Track and measure – Keep tabs on 5 key factors: particulate matter (PM 2.5), volatile organic compounds (VOCs), carbon monoxide (CO), humidity, and temperature. • Stay informed – Get an indication of current air quality from the color-coded LED, and an easy-to-understand air quality score in the Alexa app anytime. • Get notifications – If Alexa detects poor air quality, you can get notifications on your phone or even announcements on Echo devices. • Enable Routines to turn your Alexa-enabled devices such as air purifiers, dehumidifiers, and fans on and off when the indoor air quality changes. For example, Amazon provides devices that sense environment information such as the Smart Thermostat.[22]

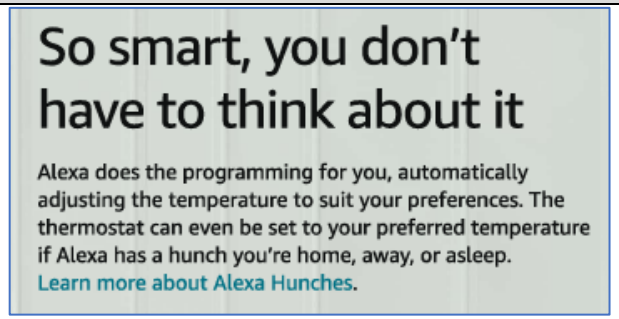
[22] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

Ex.1015 / Page 32 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 Alexa can help you Choose Cleaner Energy **Effortlessly optimize your indoor climate**: Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control**: Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone**: You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works**: To enable this feature, select your thermostat device in the Amazon Alexa app. Then, tap the Settings icon. Then, tap Choose Cleaner Energy.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, Amazon's Echo devices also sense environment information, including motion and temperature.[23]

[23] *See* KAIFI0001303 *(Amazon Echo Dot (5th Gen, 2022 release) | With bigger vibrant sound, helpful routines and Alexa | Charcoal*, https://www.amazon.com/All-New-release-Smart-speaker-Charcoal/dp/B09B8V1LZ3); *see also* KAIFI0007826 Chris Hall, *Which Amazon Echo devices feature a temperature sensor?*, https://www.pocket-lint.com/which-amazon-echo-devices-feature-a-temperature-sensor/.

Ex.1015 / Page 34 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	• A Certified Refurbished Echo Dot (5th Gen, 2022 release) is refurbished, tested, and certified to look and work like new and comes with the same limited warranty as a new device. Certified Refurbished Amazon devices may be packaged in generic Amazon-branded boxes. • OUR BEST SOUNDING ECHO DOT YET – Enjoy an improved audio experience compared to any previous Echo Dot with Alexa for clearer vocals, deeper bass and vibrant sound in any room. • YOUR FAVORITE MUSIC AND CONTENT – Play music, audiobooks, and podcasts from Amazon Music, Apple Music, Spotify and others or via Bluetooth throughout your home. • ALEXA IS HAPPY TO HELP – Ask Alexa for weather updates and to set hands-free timers, get answers to your questions and even hear jokes. Need a few extra minutes in the morning? Just tap your Echo Dot to snooze your alarm. • KEEP YOUR HOME COMFORTABLE – Control compatible smart home devices with your voice and routines triggered by built-in motion or indoor temperature sensors. Create routines to automatically turn on lights when you walk into a room, or start a fan if the inside temperature goes above your comfort zone. • DESIGNED TO PROTECT YOUR PRIVACY – Amazon is not in the business of selling your personal information to others. Built with multiple layers of privacy controls, including a mic off button. • DO MORE WITH DEVICE PAIRING – Fill your home with music using compatible Echo devices in different rooms, create a home theatre system with Fire TV, or extend wifi coverage with a compatible eero network so you can say goodbye to drop-offs and buffering.

Claim 1	Accused Instrumentality(ies)
	Help keep your home comfortable Our fastest Echo Show 5 speeds up Alexa responses so that you can quickly manage your smart home, like turning off compatible lights around your house without having to get out of bed. You can also schedule routines or even start them with your motion. When you walk into a room, the lamp can turn on or music can start to play—just like that. For example, Amazon also provides the Alexa Connect Kit ("ACK") module, which is integrated into various devices.[24] Alexa Connect Kit Overview Alexa Connect Kit (ACK) is a managed service that makes it easy to integrate Alexa into your smart products. With ACK, you don't need to write an Alexa skill, manage a cloud service, or develop complex network and security firmware to connect your product to Alexa. Instead, you integrate the ACK module into your product and pay a one-time fixed cost. ACK provides the managed services, software, and tools you can use to develop and manage your Alexa-connected smart products on an ongoing basis. With an ACK-based smart product, your users benefit from Alexa device control and other features, such as Amazon's Wi-Fi simple setup. You can learn about Alexa Connect Kit features here, including:

[24] *See* KAIFI0001146 *(Alexa Connect Kit*, https://developer.amazon.com/en-US/alexa/devices/connected-devices/development-resources/alexa-connect-kit).

Ex.1015 / Page 36 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Example Products Built with Alexa Connect Kit **Smart Dimmer** *Eaton* The Eaton Wifi smart dimmer enables customers to control their lights using their voice or the Alexa app, and enable smart home automation with routines, groups, and more, no hub required. It also supports Frustration-Free Setup, making device setup as easy as plugging it in. Learn more **Smart Coffee Maker** *Hamilton Beach* Control this 12 cup connected coffee maker with the Alexa® app or your Amazon® smart speaker for voice-enabled brewing or automatic brewing. Just say "Turn on the Coffee Maker." Learn more **Air Purifier** *Toshiba* The Toshiba Smart WiFi Air Purifier can be controlled through the Alexa App or any Echo devices, making it easier to purify the air in your home from anywhere with just one-command. Plus it's Certified for Humans, making setup with Alexa simple. Learn more **Christmas Tree** *Mr. Christmas* Artificial Christmas tree with LED lights from Mr. Christmas that works with Alexa - select the lighting color, turn the tree lights on/off or schedule your tree to turn on at the same time every day. Just say "Set my Christmas Tree to Multi-Color", or "Turn on my Christmas Tree." Learn more For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Base Stations.[25] **Protocols and Ports Used by Ring Devices** Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[26]

[25] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).
[26] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

Ex.1015 / Page 38 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

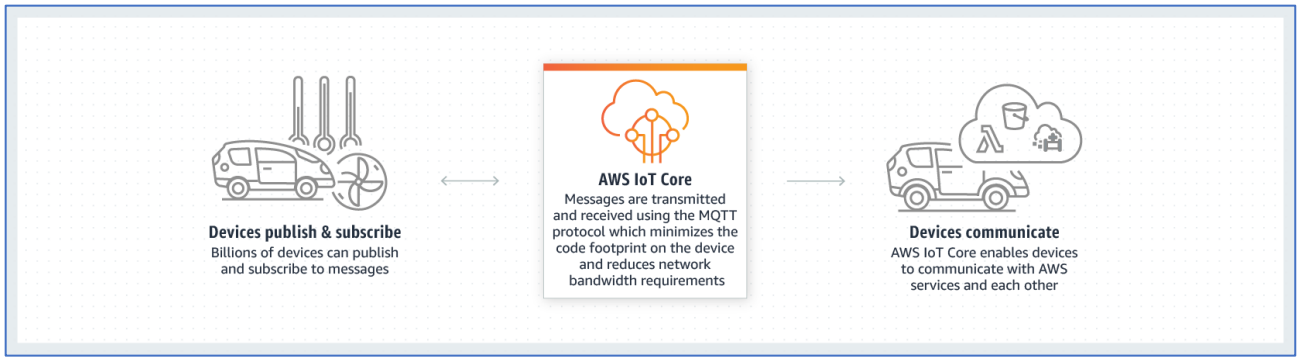
Claim 1	Accused Instrumentality(ies)
	Welcome to Amazon Sidewalk Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk. For example, Amazon's Alexa Smart Home devices include smart lights and smart cameras.[27]

[27] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 39 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	 Lighting Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what's happening with the Amazon Alexa app, no matter where you are. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a sensor network data transmitter for collecting sensed data sensed by the sensor in real-time and transmitting the collected	The Accused Instrumentalities comprise a sensor network data transmitter. The sensor network data transmitter collects data sensed by the sensor in real-time and transmits the collected sensed data in a message form.

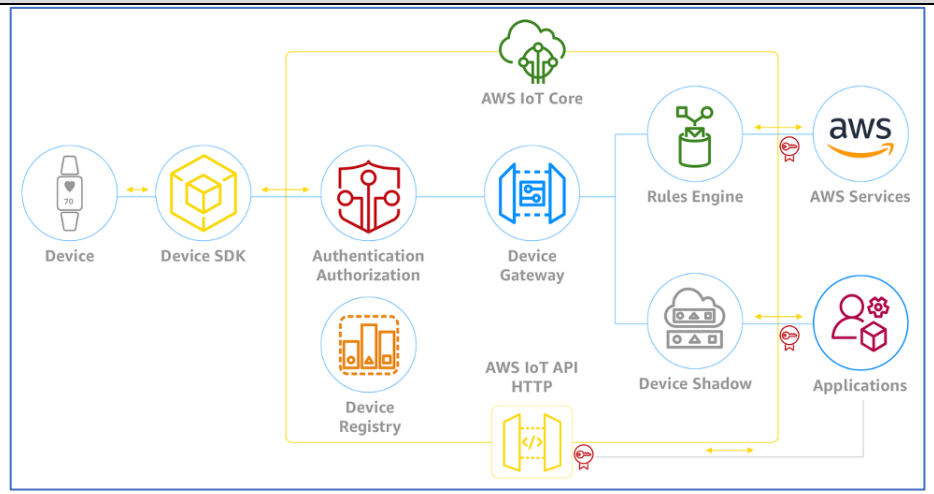
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
sensed data in a message form; and	For example, Amazon provides AWS.[28]  For example, Amazon provides AWS IoT Core.[29]

[28] *See* KAIFI0001590 *(AWS IoT Core*, https://aws.amazon.com/iot-core/).

[29] *See* KAIFI0001359 *(An Introduction to AWS IoT Core* (Apr. 5, 2021), https://aws.amazon.com/blogs/startups/an-introduction-to-aws-iot-core/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, devices communicate with various technologies and protocols.[30] **Communications** Devices communicate with cloud services by using various technologies and protocols. Examples include: • Wi-Fi/Broadband internet • Broadband cellular data • Narrow-band cellular data • Long-range Wide Area Network (LoRaWAN) • Proprietary RF communications For example, devices have connection interfaces.[31]

[30] *See* KAIFI0002118 *How AWS IoT works*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-how-it-works.html

[31] *See id.*

Ex.1015 / Page 42 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Interfaces An interface is a component that connects a device to the physical world. • User interfaces Components that allow devices and users to communicate with each other. ◦ Input interfaces Enable a user to communicate with a device Examples: keypad, button ◦ Output interfaces Enable a device to communicate with a user Examples: Alpha-numeric display, graphical display, indicator light, alarm bell • Sensors Input components that measure or sense something in the outside world in a way that a device understands. Examples include: ◦ Temperature sensor (converts temperature to an analog or digital signal) ◦ Humidity sensor (converts relative humidity to an analog or digital signal) ◦ Analog to digital convertor (converts an analog voltage to a numeric value) ◦ Ultrasonic distance measuring unit (converts a distance to a numeric value) ◦ Optical sensor (converts a light level to a numeric value) ◦ Camera (converts image data to digital data) For example, sensed data is collected and transmitted.[32]

[32] *See id.*

Ex.1015 / Page 43 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	AWS IoT Analytics AWS IoT Analytics lets you efficiently run and operationalize sophisticated analytics on massive volumes of unstructured IoT data. AWS IoT Analytics automates each difficult step that is required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time-series data store for analysis. You can analyze your data by running one-time or scheduled queries using the built-in SQL query engine or machine learning. **AWS IoT Events** AWS IoT Events detects and responds to events from IoT sensors and applications. Events are patterns of data that identify more complicated circumstances than expected, such as motion detectors using movement signals to activate lights and security cameras. AWS IoT Events continuously monitors data from multiple IoT sensors and applications, and integrates with other services, such as AWS IoT Core, IoT SiteWise, DynamoDB, and others to enable early detection and unique insights. **AWS IoT FleetWise** AWS IoT FleetWise is a managed service that you can use to collect and transfer vehicle data to the cloud in near-real time. With AWS IoT FleetWise, you can easily collect and organize data from vehicles that use different protocols and data formats. AWS IoT FleetWise helps to transform low-level messages into human-readable values and standardize the data format in the cloud for data analyses. You can also define data collection schemes to control what data to collect in vehicles and when to transfer it to the cloud. **AWS IoT SiteWise** AWS IoT SiteWise collects, stores, organizes, and monitors data passed from industrial equipment by MQTT messages or APIs at scale by providing software that runs on a gateway in your facilities. The gateway securely connects to your on-premises data servers and automates the process of collecting and organizing the data and sending it to the AWS Cloud.

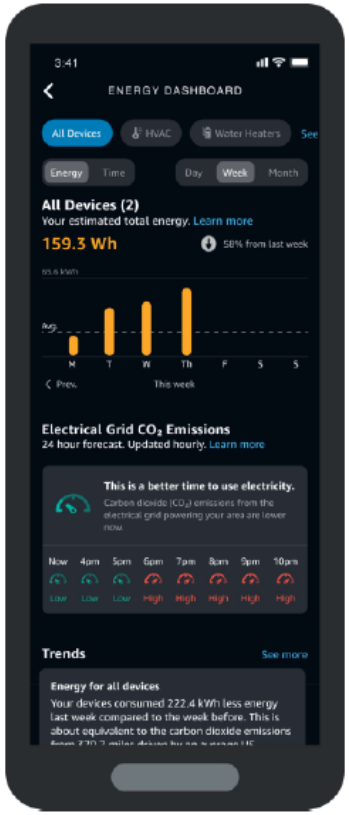
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, Amazon also provides the Alexa Energy Dashboard.[33] Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

[33] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci).

Ex.1015 / Page 45 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** Simple to set up and use

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, the Alexa app Energy Dashboard collects real-time data.[34] **Real-timely track the energy consumption of your devices.** In currently smart devices, not each of them is designed with energy tracking. Now with the energy dashboard, you are capable of tracking and checking the energy consumption of smart devices compatible with Alexa or Echo all in one place – Alexa app. Here, you can have a specific overview of whether your existing smart devices support the energy dashboard from the "compatible devices" page on Amazon website. To ensure you a clear understanding in advance, you can access here to check the specific supported brands and device types.

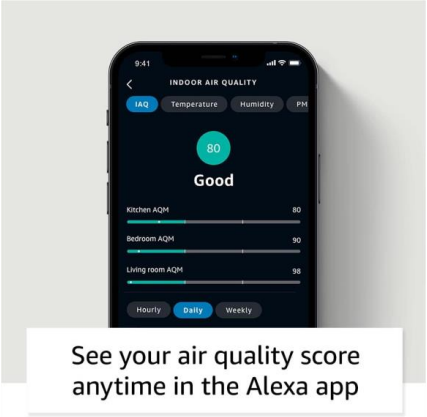
[34] *See* KAIFI0001158 *(Alexa Energy Dashboard: Track and Manage Energy Usage to Help Save Your Electricity Bills*, https://sonoff.tech/news-and-events/works-with/alexa-energy-dashboard-track-and-manage-energy-usage-to-help-save-your-electricity-bills/).

Ex.1015 / Page 47 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	Instantly report and sync the energy consumption in the Alexa app. Once your device's energy usage is monitored, their real-time energy consumption data will be reported and synced on the energy dashboard in the Alexa app. And with that, you can see a diagram that shows how many hours have your device run. The feature allows you to check the energy consumption that your devices consumed per day, week or month. This power data is reflected as a diagram form which you can make a comparison based on the daily, weekly or monthly consumption trend to set the corresponding routine to manage your electricity bills, to help save energy on your smart devices. In the energy dashboard, you have the option to have the power data tracked and reported in real-time or estimated by the parameters that you preset. For example, the Smart Air Quality Monitor measures air quality.[35]

[35] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, the Alexa Energy Dashboard provides an air quality score.[36]  For example, Alexa provides notifications.[37] **Get Notifications on Your Indoor Air Quality** Alexa can notify you through the app or a compatible Echo device when your indoor air quality becomes poor. To receive mobile app push notifications, go to Turn Air Quality Monitor Notifications On or Off. To set up notifications with a nearby compatible Echo device, go to Select a Preferred Alexa Compatible Device for Your Amazon Smart Air Quality Monitor.

[36] *See id.*

[37] *See* KAIFI0007118 *(Using Your Amazon Smart Air Quality Monitor*, https://www.amazon.com/gp/help/customer/display.html?nodeId=G373E3KMG3DN2MX9#:~:text=Amazon%20Smart%20Air%20Quality%20Monitor%20measures%20five%20factors%20for%20air,Monitor%20potential%20allergens%20and%20irritants).

Ex.1015 / Page 49 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

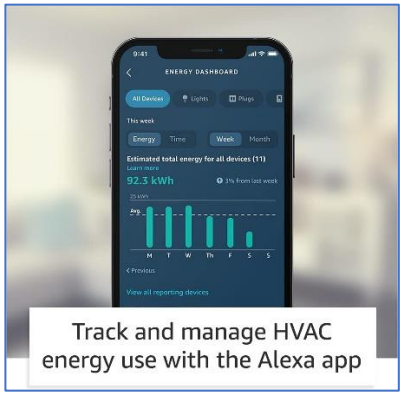
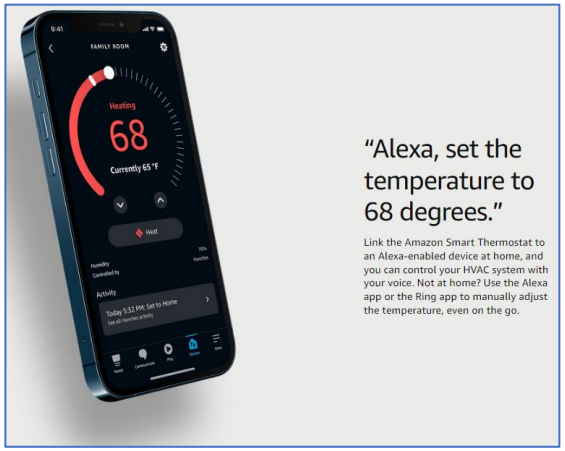
Claim 1	Accused Instrumentality(ies)
	For example, Alexa provides announcements.[38] **Select a Preferred Alexa Compatible Device for Your Amazon Smart Air Quality Monitor** Get announcements from your Alexa compatible device, such as your Echo, when your Air Quality score is Poor. 1. Open the Alexa app . 2. Select **Devices** . 3. Select your air quality monitor. 4. Select **Device Settings** . 5. Turn on **Announcements**, and then select your preferred Alexa-compatible device. **Note:** Ask Alexa for real-time information from your Amazon Smart Air Quality Monitor. Say "What's the indoor air quality?" For example, Amazon provides the Smart Thermostat.[39]

[38] *See* KAIFI0006990 *(Select a Preferred Alexa Compatible Device for Your Amazon Smart Air Quality Monitor*, https://www.amazon.com/gp/help/customer/display.html?ref_=hp_left_v4_sib&nodeId=GVL47NTRUF68G8NU).

[39] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

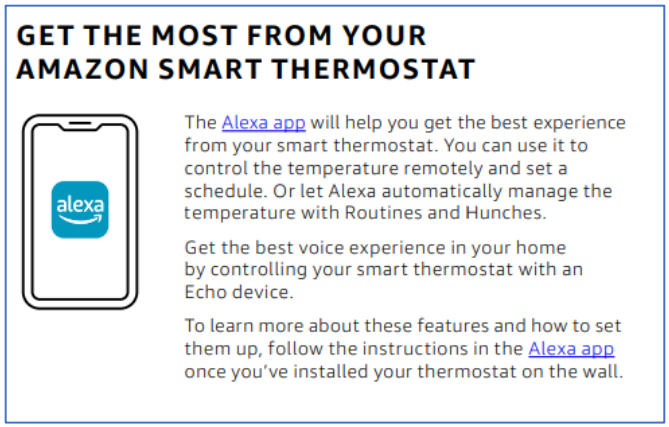
Ex.1015 / Page 50 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, the Alexa Energy Dashboard monitors temperature and energy usage.[40]  

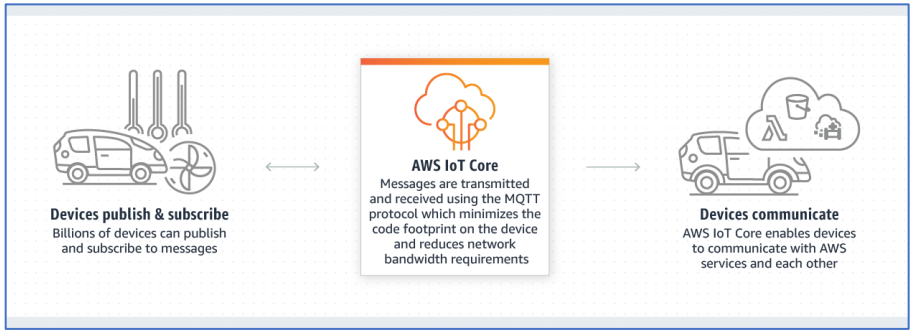
[40] *See id.*

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, Alexa manages temperature with Routines and Hunches.[41]  GET THE MOST FROM YOUR AMAZON SMART THERMOSTAT The Alexa app will help you get the best experience from your smart thermostat. You can use it to control the temperature remotely and set a schedule. Or let Alexa automatically manage the temperature with Routines and Hunches. Get the best voice experience in your home by controlling your smart thermostat with an Echo device. To learn more about these features and how to set them up, follow the instructions in the Alexa app once you've installed your thermostat on the wall. For example, Amazon's Echo (4thj Gen) includes Wifi connectivity, Amazon Sidewalk, eero Built-in, and Bluetooth connectivity.[42]

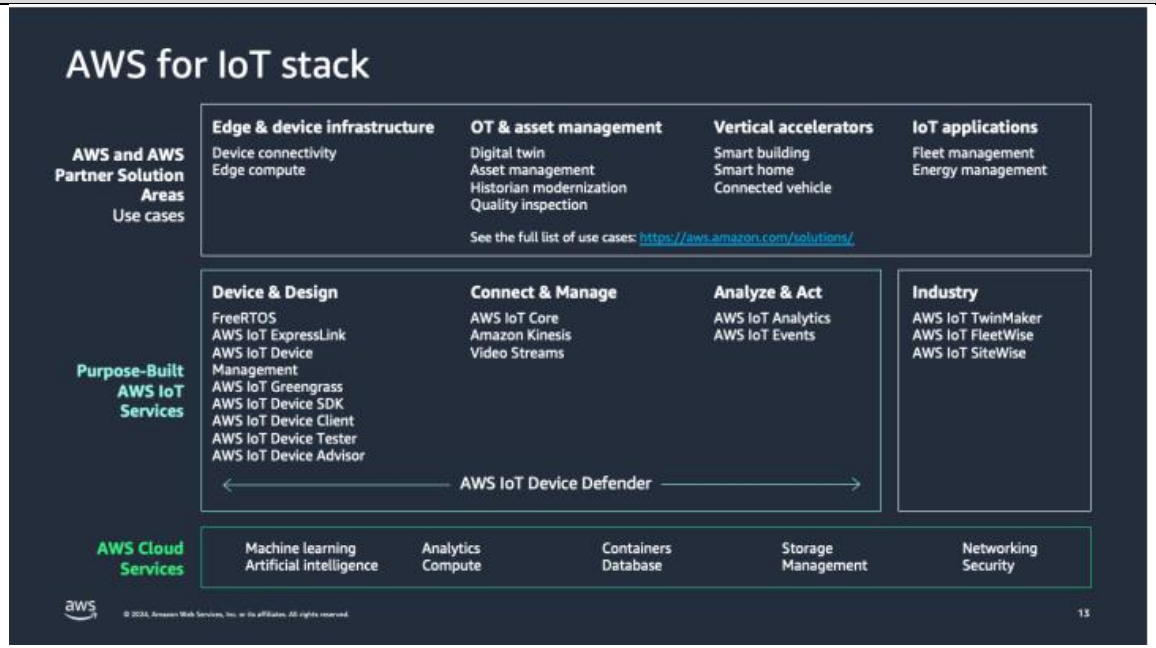
[41] *See* KAIFI0002091 *(Getting To Know Amazon Smart Thermostat*, https://m.media-amazon.com/images/G/01/kindle/journeys/MmE1OWJhOGQt/Smart_Thermostat_Online_Hello_Guide.pdf).
[42] *See* KAIFI0001105 *(Amazon Echo (newest model), Ideal for large bedrooms, living rooms and kitchens, Alexa speaker with premium sound, Charcoal*, https://www.amazon.com/Echo-4th-Gen/dp/B07XKF5RM3?th=1)..

Claim 1	Accused Instrumentality(ies)
	Wifi connectivity — Dual-band wifi supports 802.11a/b/g/n/ac (2.4 and 5 GHz) networks. Does not support connecting to ad-hoc (or peer-to-peer) wifi networks. **Amazon Sidewalk** — A shared network that helps compatible devices work better at home and beyond the front door. If wifi is lost, Sidewalk enables certain devices to stay connected. Also, Sidewalk helps devices like water sprinklers and pet locators work over longer distances. Sidewalk uses a small portion of your internet bandwidth to provide these benefits to you and your neighbors via Sidewalk Bridges (participating Echo and Ring devices), and is turned on for your device unless you have previously turned off the setting. You can turn off Sidewalk at any time. Learn more about Sidewalk. **Smart home hub** — Zigbee + Sidewalk + Matter + Thread Border Router **eero Built-in** — Your wifi network must use a compatible eero router and your Echo device must stay in range of a compatible eero device. You will need to link your eero and Amazon accounts and manage eero Built-in from the eero mobile application to use this feature. eero Built-in compatible Echo devices support up to 1,000 sq. ft. of additional coverage, speeds up to 100 Mbps, and 10 or fewer connected devices. Actual performance can vary and certain eero, Echo, or Alexa features may be incompatible with eero Built-in. Learn more about eero Built-in performance, availability and compatibility. Use of eero and eero-related products and services, including eero Built-in, requires creation of an eero account and agreement to eero's Terms of Service. Review eero's Privacy Notice. **Bluetooth connectivity** — Advanced Audio Distribution Profile (A2DP) support for audio streaming from your mobile device to Echo or from Echo to your Bluetooth speaker. Audio/Video Remote Control Profile (AVRCP) for voice control of connected mobile devices. Hands-free voice control is not supported for Mac OS X devices. Direct control of BLE Mesh. Bluetooth speakers requiring PIN codes are not supported. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly

Claim 1	Accused Instrumentality(ies)
	the same result.
a Ubiquitous Sensor Network (USN) middleware for extracting object and environment information by cleaning, classifying and integrating the message received from the sensor network data transmitter, generating conditional events, context aware information, and knowledge contents from the extracted object and environment information, and providing the information service to an application program, the application program providing a user with	The Accused Instrumentalities provide a Ubiquitous Sensor Network (USN) middleware for extracting object and environment information by cleaning, classifying and integrating the message received from the sensor network data transmitter, generating conditional events, context aware information, and knowledge contents from the extracted object and environment information, and providing the information service to an application program, the application program providing a user with information related to environment where the sensor network is installed. For Example, Amazon provides AWS IoT Core.[43]  For example, Amazon provides Internet of Things (IoT) services.[44]

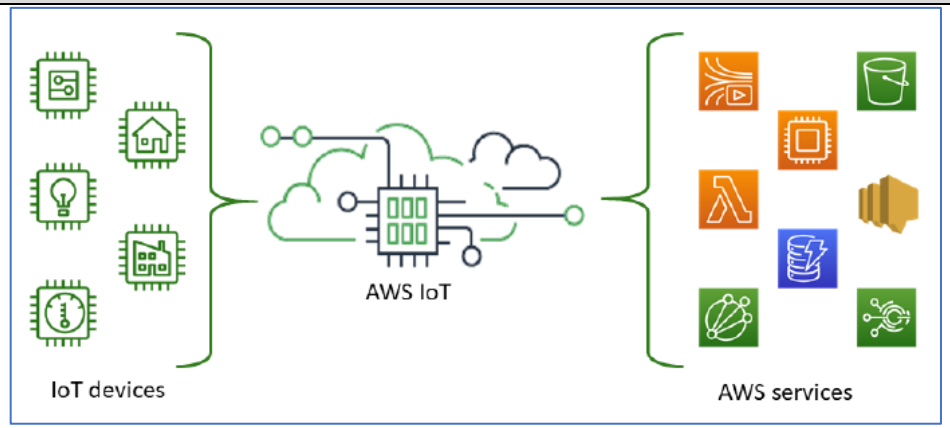
[43] *See* KAIFI0001590 *(AWS IoT Core*, https://aws.amazon.com/iot-core/*)*.

[44] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 1	Accused Instrumentality(ies)
information related to environment where the sensor network is installed.	 For example, Amazon provides AWS IoT.[45] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

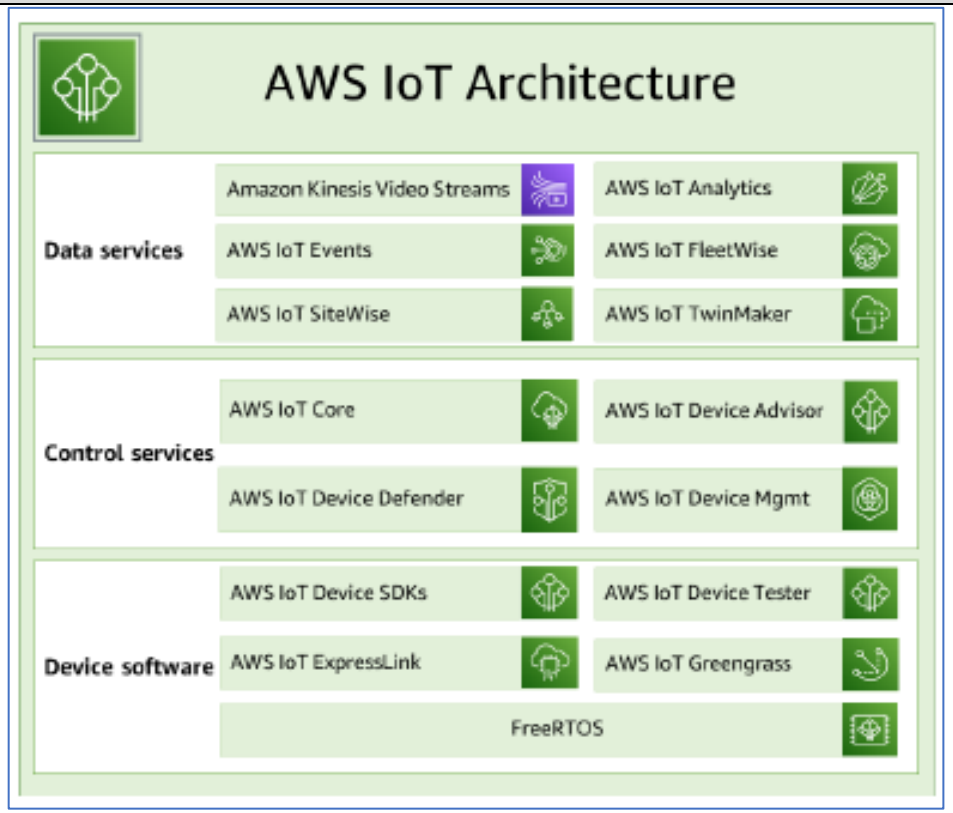
[45] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT Architecture. [46]

[46] *See id.*

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, devices may interact with AWS.[47]

[47] *See* KAIFI0001359 *(An Introduction to AWS IoT Core* (Apr. 5, 2021), https://aws.amazon.com/blogs/startups/an-introduction-to-aws-iot-core/).

Ex.1015 / Page 57 of 264
AMAZON.COM, INC.

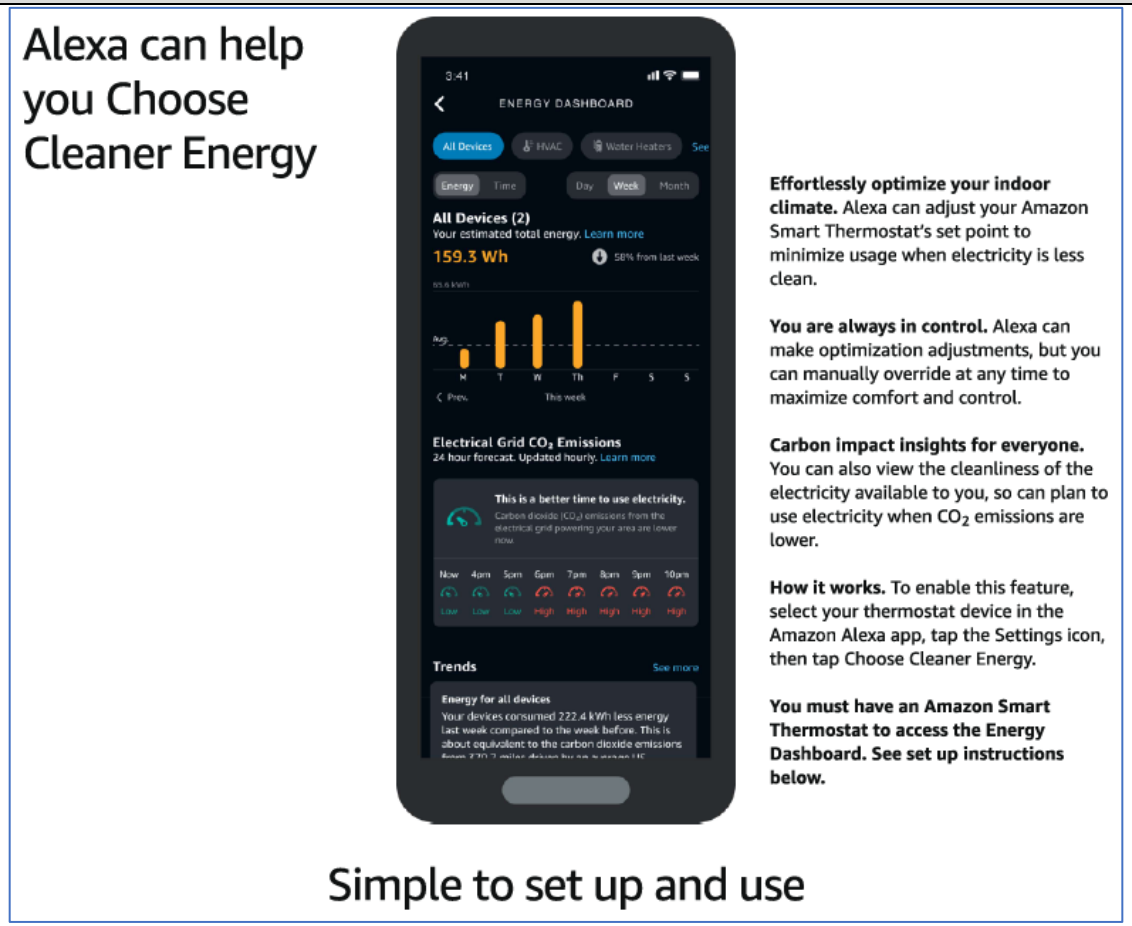
Claim 1	Accused Instrumentality(ies)
	Rules Engine The Rules Engine feature of AWS IoT Core gives devices the ability to interact with AWS services. Rules are analyzed and actions are performed based on the MQTT topic stream. Not only does the Rules Engine allow you to interact with other AWS services, but you can interact with third party services as well like Apache Kafka, Salesforce, or Snowflake. You can use rules to support tasks like streaming the data into an Amazon Kinesis Data Firehose, putting it in an Amazon SQS queue, triggering a script that processes the data with AWS Lambda, storing the metadata into Amazon DynamoDB, or storing the raw data for historical or backup purposes in Amazon S3. Before AWS IoT can perform these actions with the Rules Engine, you must authorize it and grant it permission to access your AWS resources on your behalf. You can set a rule based on the topic above that can stream into Amazon DynamoDB to store data, or AWS Lambda can capture the data from the stream to process it for any calculations you would like to do with the data. For example, the Alexa app is comprised of the Alexa Energy Dashboard.[48]

[48] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci). *see also* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

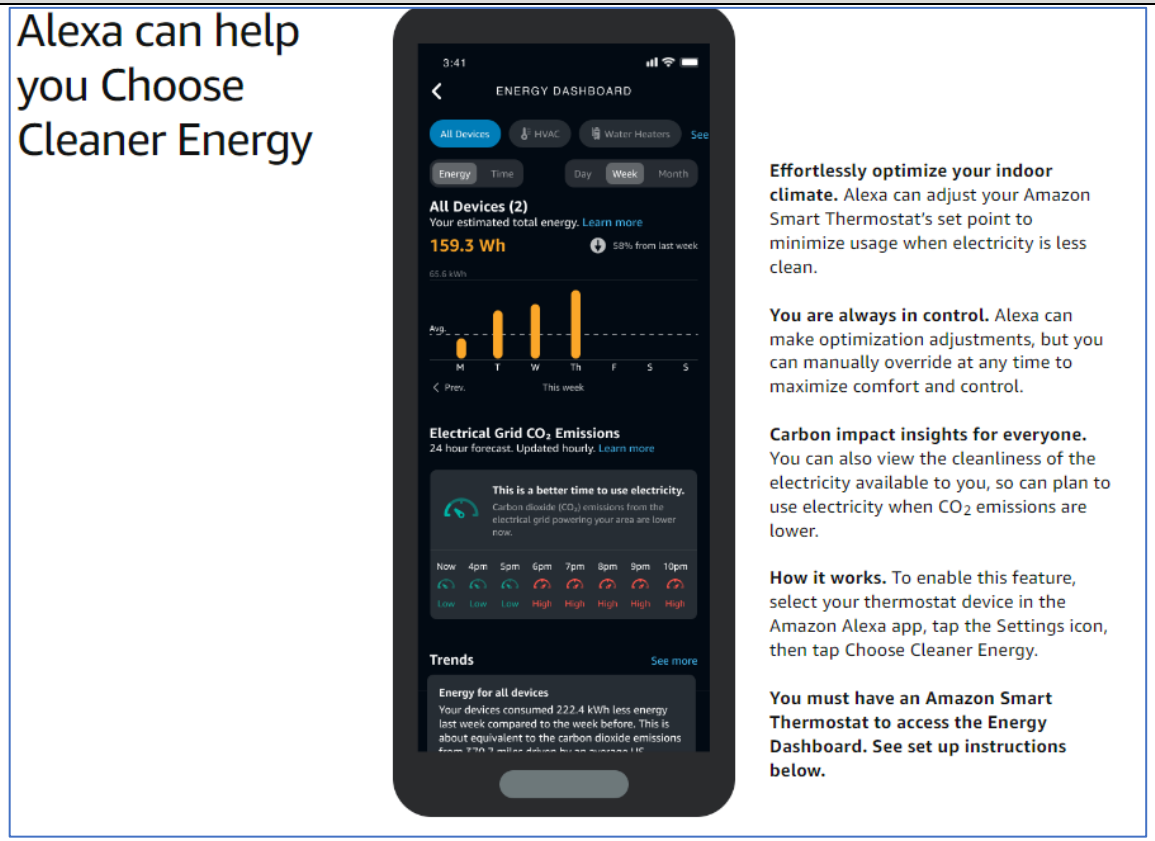
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

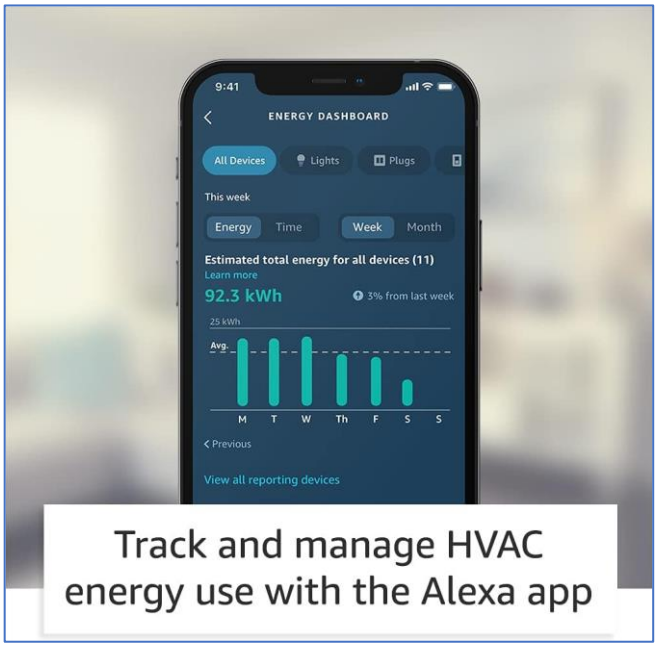
Claim 1	Accused Instrumentality(ies)
	 For example, the Alexa Energy Dashboard provides information services using data from different

Claim 1	Accused Instrumentality(ies)
	devices.[49] Understanding your home's energy usage is easier than ever, with the Alexa energy dashboard. It works with a selection of high-load devices like water heaters and thermostats to help you track the usage of devices that consume the most energy in your home. Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you. It's a smart and convenient way to help your home be kinder to the world around it. Every device, every home, and every day counts. Let's make a difference, together. Amazon is committed to building a sustainable business for our customers and the planet. Learn more about our sustainability efforts.

[49] *See id.*

Ex.1015 / Page 61 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	 For example, the different networked devices may including: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing

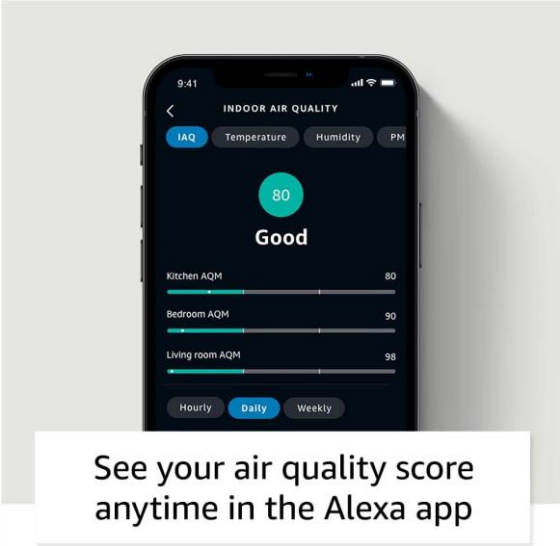
Claim 1	Accused Instrumentality(ies)
	machine, Water heater, and Wi-Fi router.[50] For example, the Alexa app Energy Dashboard can track energy usage.[51] 

[50] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[51] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

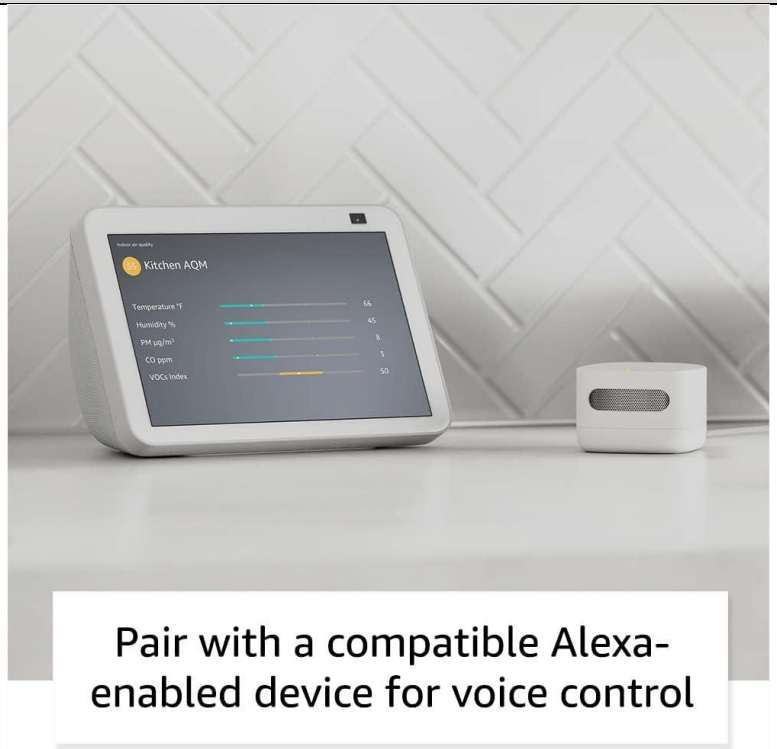
Ex.1015 / Page 63 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, the Alexa app Energy Dashboard can track air quality.[52] 

[52] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa*, https://www.amazon.com/dp/B08W8KS8D3/)..

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	 For example, Alexa utilizes sensed environment information.[53]

[53] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 65 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** "Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras.

Claim 1	Accused Instrumentality(ies)
	For example, Amazon provides AWS for various middleware and applications, including but not limited to Alexa, Smarthome, and IoT solutions. For example, Amazon provides a suite of middleware services.[54] **How does AWS support middleware technology?** Application Integration on AWS is a suite of services that are an affordable alternative to conventional middleware for cloud computing. Developers use the services to communicate between decoupled components within microservices, distributed systems, and serverless applications. For example: • AWS Step Functions is a visual workflow service that allows developers to build distributed applications, automate IT and business processes, and build data and machine learning pipelines by using AWS services. • Amazon Simple Notification Service (Amazon SNS) is an alternative to message-oriented middleware. It provides messaging services for applications. • Amazon EventBridge is a serverless event bus that developers use to integrate cloud applications with AWS services. Get started with middleware on AWS by creating an AWS account today. For example, Amazon provides Amazon Kinesis, AWS Lambda, Amazon SageMaker, and Amazon CloudWatch.[55]

[54] *See* KAIFI0007355 *(What is Middleware?* https://aws.amazon.com/what-is/middleware/).

[55] *See* KAIFI0004473 *(Learn more about AWS IoT*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-learn-more.html).

Ex.1015 / Page 67 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	• **Amazon Kinesis** Amazon Kinesis makes it easy to collect, process, and analyze real-time, streaming data so you can get timely insights and react quickly to new information. Amazon Kinesis can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications. • **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You can set up your code to automatically trigger from AWS IoT data and events or call it directly from a web or mobile app. • **Amazon SageMaker** Amazon SageMaker can create machine learning (ML) models by finding patterns in your IoT data. The service uses these models to process new data and generate predictions for your application. • **Amazon CloudWatch** Amazon CloudWatch provides a reliable, scalable, and flexible monitoring solution to help set up, manage, and scale your own monitoring systems and infrastructure.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, Amazon also provides the Smart Home API.[56] You can connect virtually any type of device to Alexa by using the Smart Home API. You describe your device endpoints and capabilities by using the standard discovery mechanism described in About Alexa Discovery. In your discovery response, you identify the smart home interfaces that each device supports. To help you get started, review the device templates to find the ones that match your device type. Each template recommends a set of smart home interfaces to implement for the device type. You can modify these recommendations by adding or removing interfaces to suit the needs of your specific device. Every template includes the required top-level `Alexa` interface and recommends that you implement the `Alexa.EndpointHealth` interface to report the health of your device to Alexa. Also, each template recommends a display category. The display category determines the icon and placement of your device in the Alexa app. For more details about Smart Home skills, see Understand the Smart Home Skills. For more details about required interfaces for Works with Alexa (WWA) certification, see Requirements for Specific Device Types. For example, Amazon provides the Amazon Common Software.[57] Alexa-enabled device developers can incorporate setup for their products into the Alexa mobile app. Instead of building and running a separate and branded app, the company can rely on the Alexa app as a platform for the initial setup. Amazon has updated the Alexa Voice Service (AVS) system to allow approved devices to be set up on the Alexa app using the same Frustration-Free Setup (FFS) tech.

[56] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[57] *See* KAIFI0007058 (Eric Hal Schwartz, *Third-Party Alexa Devices Can Now Use the Alexa App for Setup* (Jun. 17, 2021), https://voicebot.ai/2021/06/17/third-party-alexa-devices-can-now-use-the-alexa-app-for-setup/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	ECHO EXPANSION Manufacturers looking to streamline setup for customers use the same Amazon Common Software (ACS) first introduced early last year. Once the back-end is in place, customers will get an alert from the Alexa app or just when they turn on the device that the app will handle the setup, and a few taps will complete the process. It's essentially the same method as setting up an Echo smart speaker or smart display. The option removes the need for the manufacturer to invest the time and resources into creating their own setup process online or through their own app while simultaneously reducing the hassle for customers of running through a unique setup for every smart home device they purchase. "With connected devices becoming increasingly ubiquitous around the world, customers have come to expect a struggle-free, tinker-free, and stress-free experience when setting up their devices. The complexity of setting up devices is often cited as one of the top issues in customer reviews, leading to poor product engagement and satisfaction," Amazon explained in a blog post. "Device makers no longer need to create and maintain their own app for device setup, and can instead focus their resources on core device features." For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm Base Stations.[58]

[58] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).

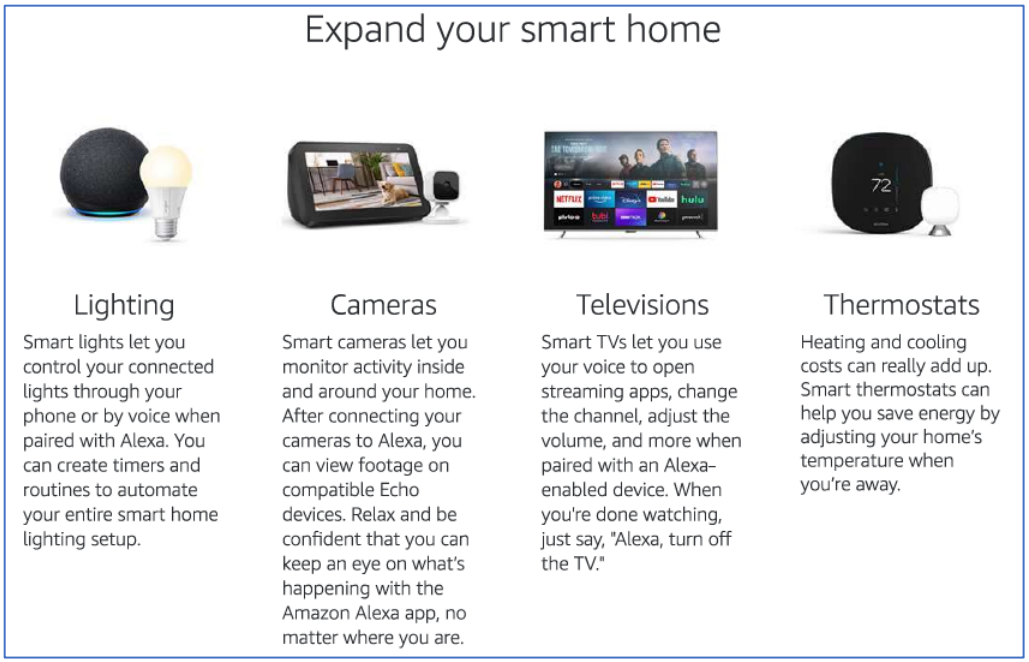
Ex.1015 / Page 70 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	Protocols and Ports Used by Ring Devices Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[59] **Welcome to Amazon Sidewalk** Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk.

[59] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

Ex.1015 / Page 71 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	For example, Alexa Smart Home devices include smart lights, smart cameras, and thermostats.[60]  For example, Amazon provides AWS IoT Events.[61]

[60] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

[61] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 1	Accused Instrumentality(ies)
	AWS IoT Events AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications. Events are patterns of data identifying more complicated circumstances than expected, such as changes in equipment when a belt is stuck or connected motion detectors using movement signals to activate lights and security cameras. To detect events before AWS IoT Events, you had to build costly, custom applications to collect data, apply decision logic to detect an event, and then start another application to react to the event. Using AWS IoT Events, it's simple to detect events across thousands of IoT sensors sending different telemetry data, such as temperature from a freezer, humidity from respiratory equipment, and belt speed on a motor, and hundreds of equipment management applications. You simply select the relevant data sources to ingest, define the logic for each event using simple 'if-then-else' statements, and select the alert or custom action to run when an event occurs. AWS IoT Events continuously monitors data from multiple IoT sensors and applications, and it integrates with other services, such as AWS IoT Core and AWS IoT Analytics, to enable early detection and unique insights into events. AWS IoT Events automatically initiates alerts and actions in response to events based on the logic you define. This helps resolve issues quickly, reduce maintenance costs, and increase operational efficiency. For example, Amazon provides AWS IoT Analytics, which is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in.[62]

[62] *See What is AWS IoT Analytics?*, https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome.

Ex.1015 / Page 73 of 264
AMAZON.COM, INC.

Claim 1	Accused Instrumentality(ies)
	Collect • Integrated with AWS IoT Core—AWS IoT Analytics is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in. • Use a batch API to add data from any source—AWS IoT Analytics can receive data from any source through HTTP. That means that any device or service that is connected to the internet can send data to AWS IoT Analytics. For more information, see BatchPutMessage in the *AWS IoT Analytics API Reference*. • Collect only the data you want to store and analyze—You can use the AWS IoT Analytics console to configure AWS IoT Analytics to receive messages from devices through MQTT topic filters in various formats and frequencies. AWS IoT Analytics validates that the data is within specific parameters you define and creates channels. Then, the service routes the channels to appropriate pipelines for message processing, transformation, and enrichment. For example, Amazon provides Alexa Hunches.[63]

[63] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 74 of 264
AMAZON.COM, INC.

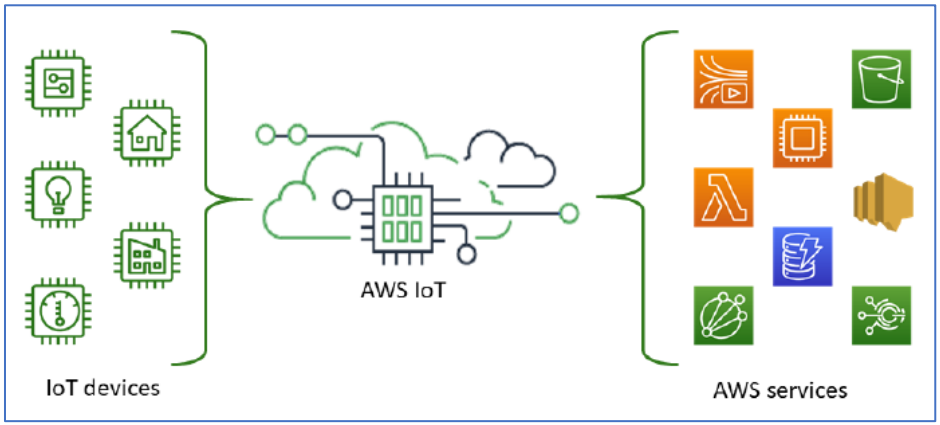
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 1	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Ex.1015 / Page 75 of 264
AMAZON.COM, INC.

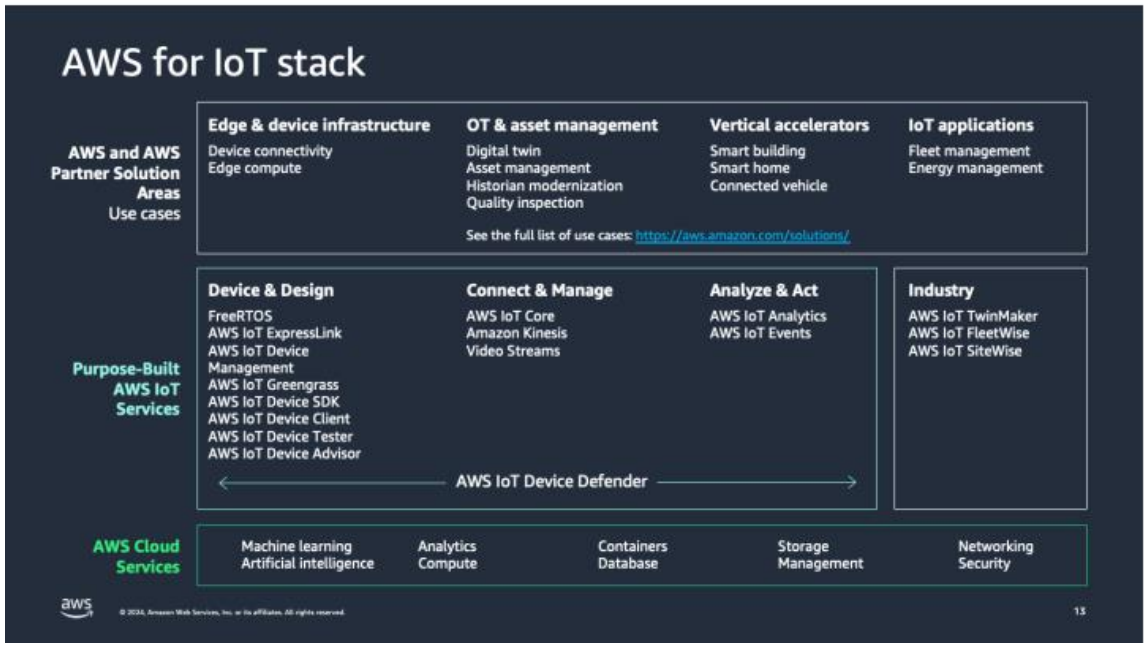
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 2 of the ’232 Patent

Claim 2	Accused Instrumentality(ies)
The system as recited in claim 1, wherein the ubiquitous sensor network middleware comprises: a sensor network abstraction unit for extracting the sensed data from the message received from the sensor network data transmitter;	Amazon’s ubiquitous sensor network middleware comprises a sensor network abstraction unit for extracting the sensed data from the message received from the sensor network data transmitter. For example, Amazon provides AWS IoT.[64] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides. 

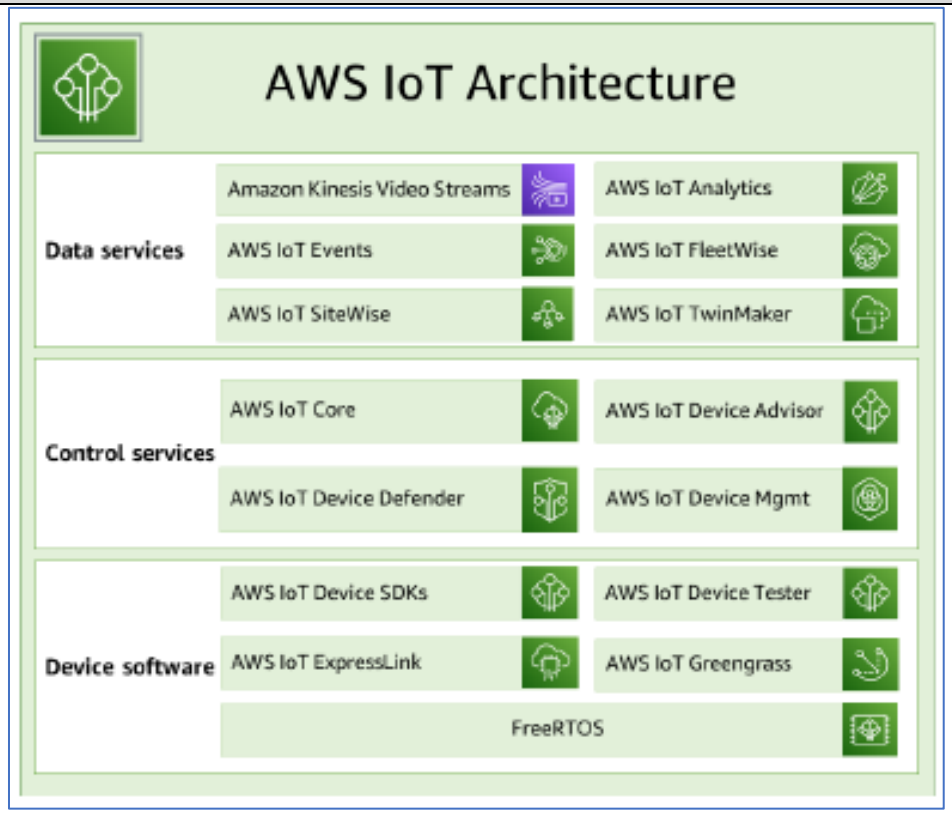
[64] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

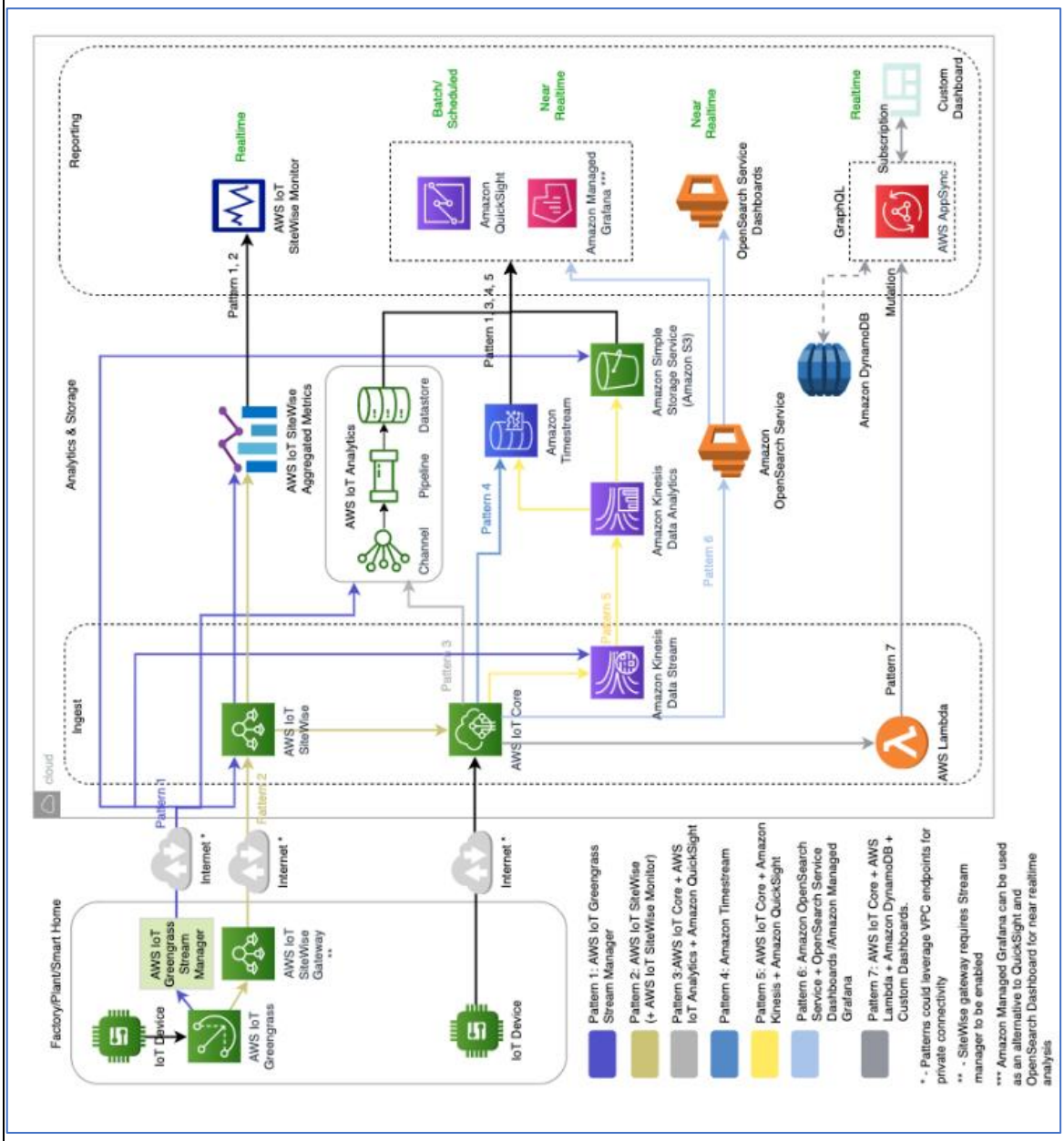
Claim 2	Accused Instrumentality(ies)
	For example, Amazon provides AWS Internet of Things (IoT) services.[65]  For example, Amazon provides AWS IoT Architecture. [66]

[65] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

[66] *See id*.

Claim 2	Accused Instrumentality(ies)
	 For example, Amazon provides IoT data ingestion and visualization. [67]

[67] *See* KAIFI0001081 (*7 patterns for IoT data ingestion and visualization- How to decide what works best for your use case*, https://aws.amazon.com/ko/blogs/iot/7-patterns-for-iot-data-ingestion-and-visualization-how-to-decide-what-works-best-for-your-use-case/).


Factory/Plant/Smart Home
IoT Device
AWS IoT Greengrass Stream Manager
AWS IoT Greengrass
AWS IoT SiteWise Gateway **
Internet *
Internet *
Internet *
IoT Device
cloud
Ingest
Pattern 1
Pattern 2
Pattern 3
AWS IoT SiteWise
AWS IoT Core
Amazon Kinesis Data Stream
Pattern 7
AWS Lambda
Analytics & Storage
AWS IoT SiteWise Aggregated Metrics
AWS IoT Analytics
Channel
Pipeline
Datastore
Pattern 4
Amazon Timestream
Pattern 5
Amazon Kinesis Data Analytics
Amazon Simple Storage Service (Amazon S3)
Pattern 6
Amazon OpenSearch Service
Amazon DynamoDB
Mutation
Reporting
Pattern 1, 2
Realtime
AWS IoT SiteWise Monitor
Pattern 1, 3, 4, 5
Batch/ Scheduled
Amazon QuickSight
Near Realtime
Amazon Managed Grafana ***
Near Realtime
OpenSearch Service Dashboards
GraphQL
Realtime
Subscription
AWS AppSync
Custom Dashboard
Pattern 1: AWS IoT Greengrass Stream Manager
Pattern 2: AWS IoT SiteWise (+ AWS IoT SiteWise Monitor)
Pattern 3: AWS IoT Core + AWS IoT Analytics + Amazon QuickSight
Pattern 4: Amazon Timestream
Pattern 5: AWS IoT Core + Amazon Kinesis + Amazon QuickSight
Pattern 6: Amazon OpenSearch Service + OpenSearch Service Dashboards /Amazon Managed Grafana
Pattern 7: AWS IoT Core + AWS Lambda + Amazon DynamoDB + Custom Dashboards.
* - Patterns could leverage VPC endpoints for private connectivity
** - SiteWise gateway requires Stream manager to be enabled
*** Amazon Managed Grafana can be used as an alternative to QuickSight and OpenSearch Dashboard for near realtime analysis

Claim 2	Accused Instrumentality(ies)
	For example, AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. The support for these protocols ensures that devices can communicate with AWS IoT core.[68] **1. Device Communication: MQTT, HTTP, and WebSocket Protocols** One of the critical aspects of any IoT service is the communication protocol. AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. **MQTT (Message Queuing Telemetry Transport)** is a lightweight messaging protocol designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. HTTP and WebSockets are standard web protocols that devices can use to send and receive data from AWS IoT Core. The support for these protocols ensures that your devices can communicate with AWS IoT Core, irrespective of their capabilities or the network conditions. This feature is crucial in creating versatile, resilient IoT systems that can function seamlessly under varying conditions. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

[68] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Ex.1015 / Page 80 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 2	Accused Instrumentality(ies)
a sensor network intelligence unit for extracting the object and environment information by analyzing the sensed data extracted by the sensor network abstraction unit, and generating the conditional events including notification and alarm about a certain condition, and the context aware information from the extracted object and environment information;	Amazon's ubiquitous sensor network middleware comprises a sensor network intelligence unit for extracting the object and environment information by analyzing the sensed data extracted by the sensor network abstraction unit, and generating the conditional events including notification and alarm about a certain condition, and the context aware information from the extracted object and environment information. For example, Amazon provides AWS IoT Events.[69]

[69] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

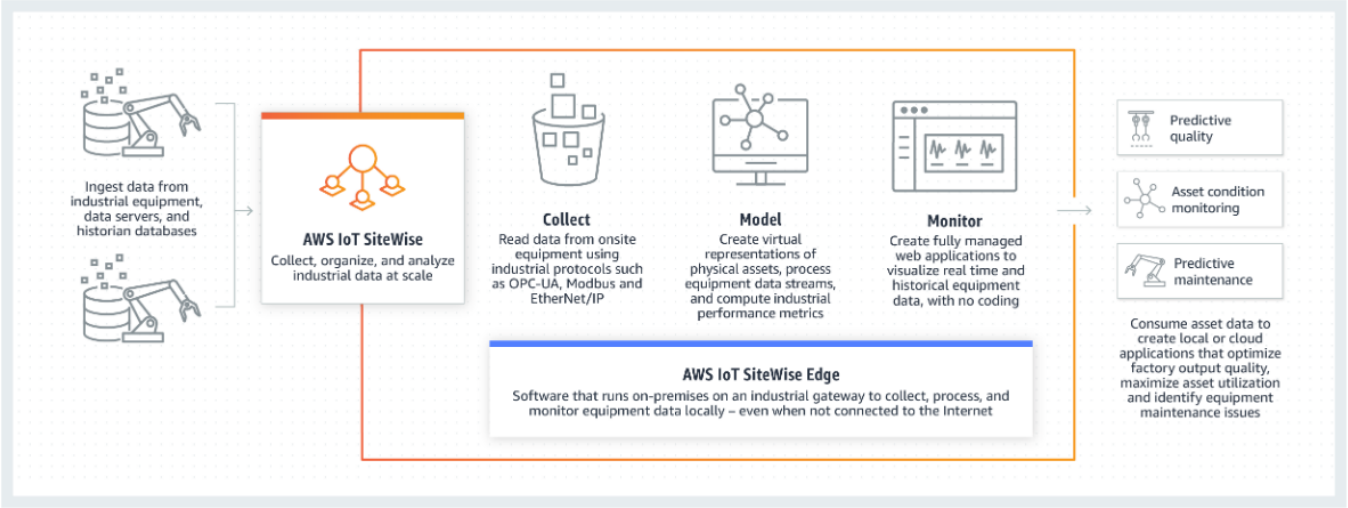
Ex.1015 / Page 81 of 264
AMAZON.COM, INC.

Claim 2	Accused Instrumentality(ies)
	AWS IoT Events AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications. Events are patterns of data identifying more complicated circumstances than expected, such as changes in equipment when a belt is stuck or connected motion detectors using movement signals to activate lights and security cameras. To detect events before AWS IoT Events, you had to build costly, custom applications to collect data, apply decision logic to detect an event, and then start another application to react to the event. Using AWS IoT Events, it's simple to detect events across thousands of IoT sensors sending different telemetry data, such as temperature from a freezer, humidity from respiratory equipment, and belt speed on a motor, and hundreds of equipment management applications. You simply select the relevant data sources to ingest, define the logic for each event using simple 'if-then-else' statements, and select the alert or custom action to run when an event occurs. AWS IoT Events continuously monitors data from multiple IoT sensors and applications, and it integrates with other services, such as AWS IoT Core and AWS IoT Analytics, to enable early detection and unique insights into events. AWS IoT Events automatically initiates alerts and actions in response to events based on the logic you define. This helps resolve issues quickly, reduce maintenance costs, and increase operational efficiency. For example, Amazon provides AWS IoT Analytics.[70]

[70] *See id.*

Claim 2	Accused Instrumentality(ies)
	AWS IoT Analytics AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device- specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure.

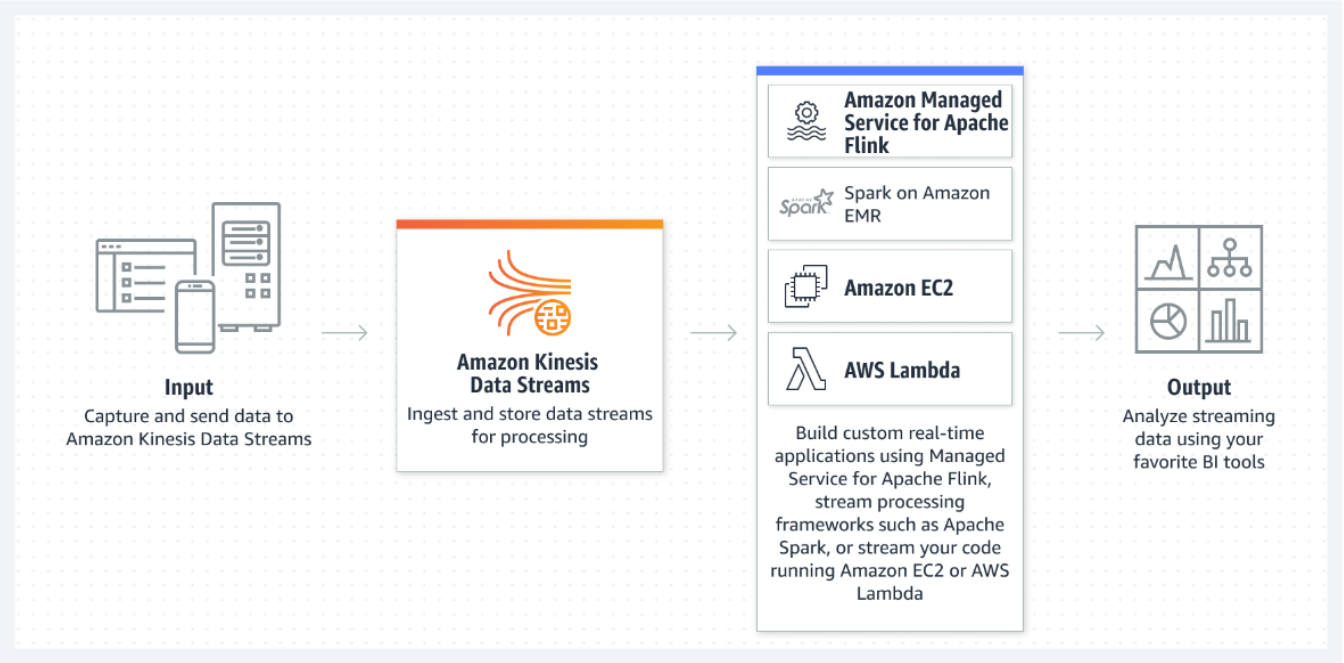
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 2	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT SiteWise.[71]  For example, Amazon provides Amazon Kinesis Data Stream.[72]

[71] *See* KAIFI0001758 (*AWS IoT SiteWise*, https://aws.amazon.com/iot-sitewise/?nc1=h_ls).

[72] *See* KAIFI0001245 (*Amazon Kinesis Data Stream*, https://aws.amazon.com/kinesis/data-streams/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 2	Accused Instrumentality(ies)
	How it works Amazon Kinesis Data Streams is a serverless streaming data service that makes it easy to capture, process, and store data streams at any scale.  For example, Amazon provides Amazon Kinesis Data Stream.[73]

[73] *See* KAIFI0001242 *(Amazon Kinesis Data Analytics for Java is now Amazon Kinesis Data Analytics for Apache Flink*, https://aws.amazon.com/about-aws/whats-new/2020/10/amazon-kinesis-data-analytics-for-java-is-now-amazon-kinesis-data-analytics-for-apache-flink/).

Claim 2	Accused Instrumentality(ies)
	Amazon Kinesis Data Analytics launched in 2016 as an easy way to analyze streaming data using SQL. When customers asked us to support additional languages, we built a new offering called Amazon Kinesis Data Analytics for Java that employed Apache Flink as a stream processing engine. Today, customers experience Amazon Kinesis Data Analytics for Java as an easy way to build and manage Apache Flink applications. Kinesis Data Analytics also now supports more languages provided by Apache Flink, including Scala, with more coming soon. We are now reflecting that experience in the updated name, Amazon Kinesis Data Analytics for Apache Flink. For example, Amazon provides AWS Lambda.[74] **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume—there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service—all with zero administration. Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically run from other AWS services, or you can call it directly from any web or mobile app. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

[74] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 2	Accused Instrumentality(ies)
and a service platform management unit for providing the events and the context aware information to the application program in a form suitable for the application program.	Amazon's ubiquitous sensor network middleware comprises a service platform management unit for providing the events and the context aware information to the application program in a form suitable for the application program. For example, Amazon provides AWS Lambda.[75] **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume—there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service—all with zero administration. Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically run from other AWS services, or you can call it directly from any web or mobile app. For example, Amazon provides Amazon QuickSight.[76]

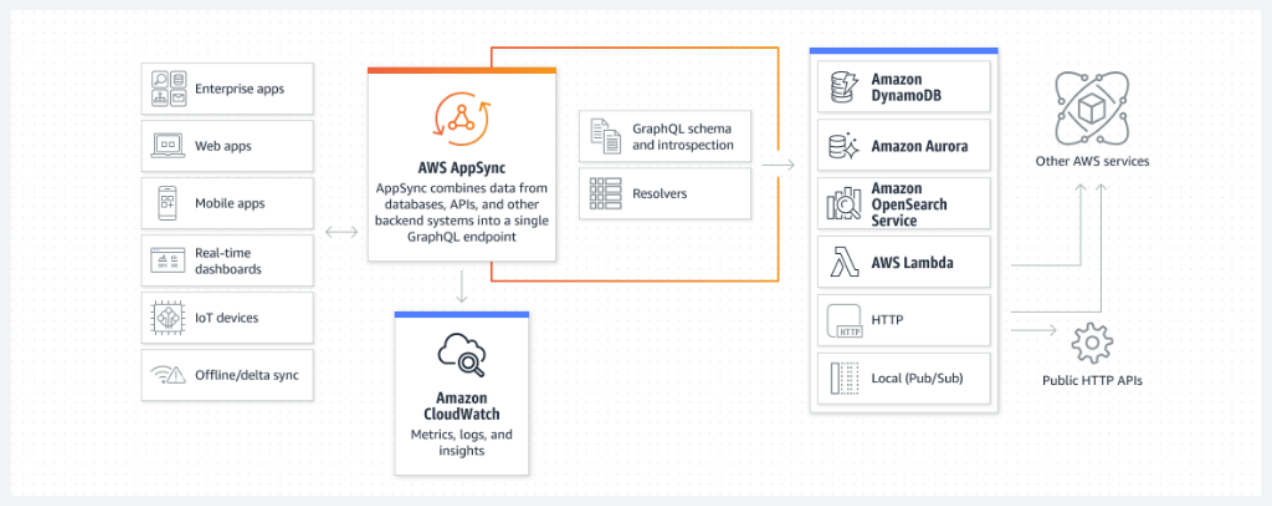
[75] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

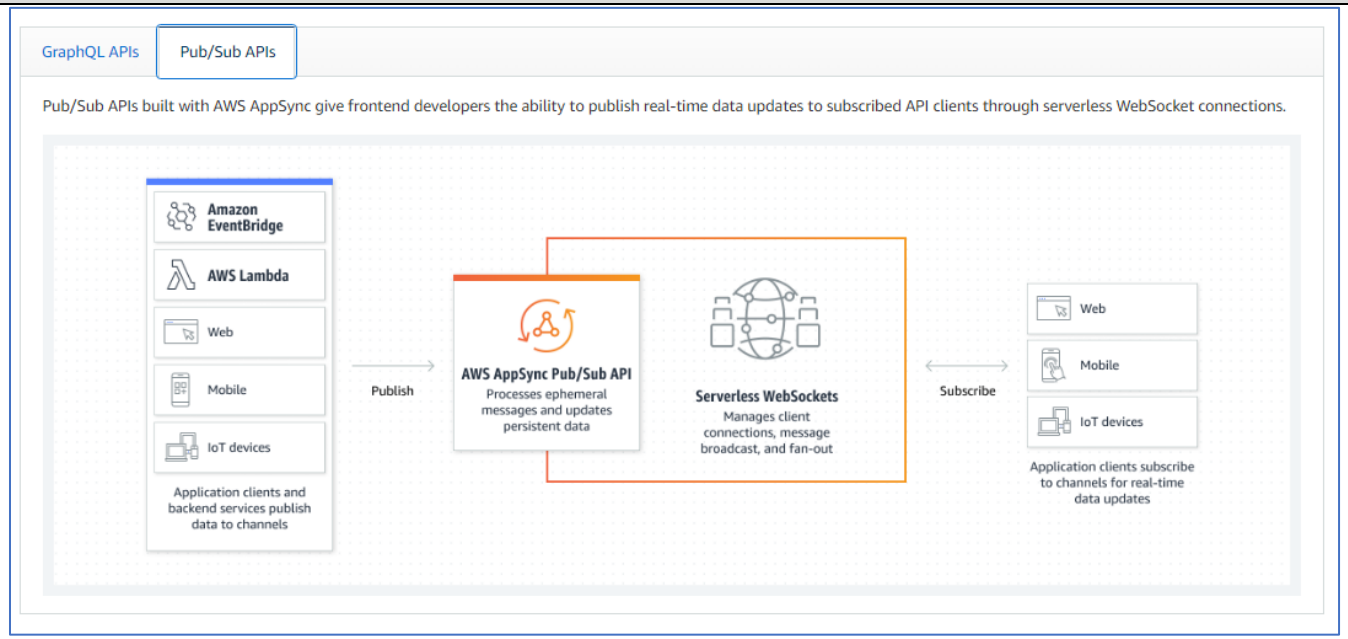
[76] *See* KAIFI0001253 (*Amazon QuickSight FAQs*, https://aws.amazon.com/quicksight/resources/faqs/).

Claim 2	Accused Instrumentality(ies)
	What is Amazon QuickSight? − Amazon QuickSight is a unified business intelligence service that makes it easier for all employees within an organization to build visualizations, perform ad hoc analysis, and quickly get business insights from their data, anytime, on any device. With QuickSight, all users can meet varying analytic needs from the same source of truth through modern interactive dashboards, paginated reports, natural language queries, and embedded analytics. With Amazon Q in QuickSight, business analysts and business users can use natural language to build, discover, and share meaningful insights in seconds, turning insights into impact faster. Upload CSV and Excel files; connect to SaaS applications like Salesforce; access on-premises databases like SQL Server, MySQL, and PostgreSQL; and seamlessly discover your AWS data sources such as Amazon Redshift, Amazon Relational Database Service (Amazon RDS), Amazon Aurora, Amazon Athena, and Amazon Simple Storage Service (Amazon S3). QuickSight enables organizations to scale their business analytics capabilities to hundreds of thousands of users, and delivers fast and responsive query performance by using a robust in-memory engine: SPICE. For example, Amazon provides AWS AppSync.[77]

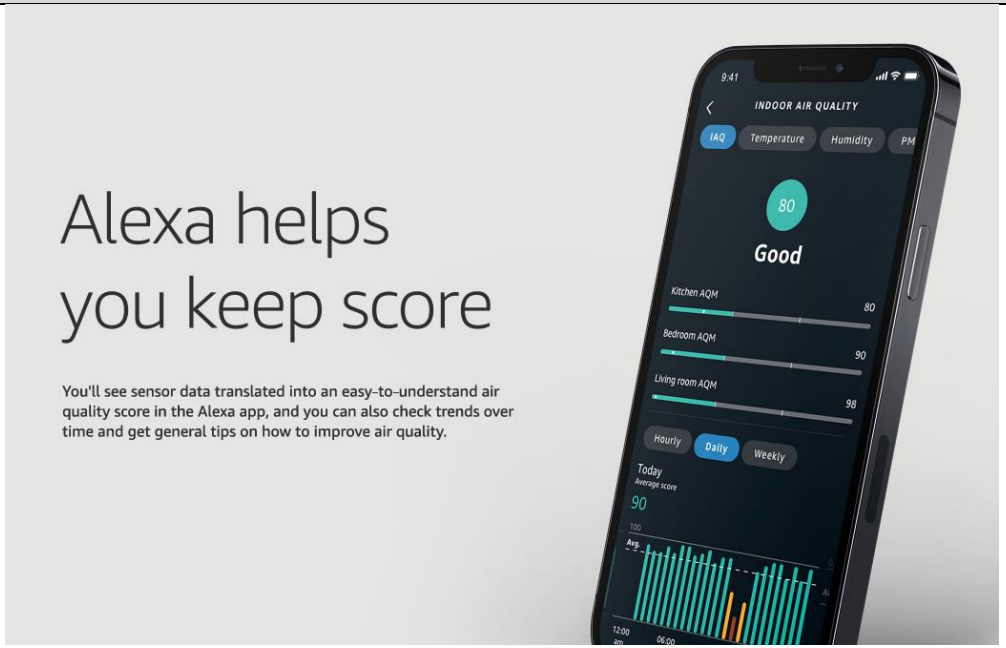
[77] *See* KAIFI0001369 *(AWS AppSync*, https://aws.amazon.com/appsync/?nc2=type_a).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 2	Accused Instrumentality(ies)
	How it works AWS AppSync creates serverless GraphQL and Pub/Sub APIs that simplify application development through a single endpoint to securely query, update, or publish data. GraphQL APIs | Pub/Sub APIs GraphQL APIs built with AWS AppSync give frontend developers the ability to query multiple databases, microservices, and APIs from a single GraphQL endpoint. 

Claim 2	Accused Instrumentality(ies)
	 For example, Amazon's Alexa app allows you to see sensor data translated into an easy-to-understand air quality score.[78]

[78] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

Claim 2	Accused Instrumentality(ies)
	 For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[79]

[79] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 91 of 264
AMAZON.COM, INC.

Claim 2	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

<u>Claim 3 of the '232 Patent</u>

Claim 3	Accused Instrumentality(ies)
The system as recited in claim 2, wherein the sensor network abstraction unit	The Accused Instrumentalities' sensor network abstraction unit comprises a sensor network interface for extracting the sensed data by referring to a message transfer protocol.

Claim 3	Accused Instrumentality(ies)
comprises: a sensor network interface for extracting the sensed data by referring to a message transfer protocol;	For example, Amazon provides AWS IoT Core.[80] **What Is AWS IoT Core?** AWS IoT Core is a managed cloud service that lets connected devices interact with cloud applications and other devices. It can support a large volume of messages, and can process and route those messages to AWS endpoints and to other devices reliably and securely. AWS IoT Core makes it possible to build applications that act on the data generated by connected devices. These applications can be hosted in the cloud, which enables web-based access to these services, thus enhancing the scalability, accessibility, and maintenance of IoT systems. AWS IoT Core is particularly useful in IoT use cases where devices need to communicate with each other and the cloud, but do not have the ability to directly interact with backend services. AWS IoT Core acts as the communication hub between these devices and the backend services, handling all the complexities of concurrent communication, message routing, security, authorization, and error handling. For example, AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. The support for these protocols ensures that devices can communicate with AWS IoT core.[81]

[80] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

[81] *See id.*

Claim 3	Accused Instrumentality(ies)
	1. Device Communication: MQTT, HTTP, and WebSocket Protocols One of the critical aspects of any IoT service is the communication protocol. AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. **MQTT (Message Queuing Telemetry Transport)** is a lightweight messaging protocol designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. HTTP and WebSockets are standard web protocols that devices can use to send and receive data from AWS IoT Core. The support for these protocols ensures that your devices can communicate with AWS IoT Core, irrespective of their capabilities or the network conditions. This feature is crucial in creating versatile, resilient IoT systems that can function seamlessly under varying conditions. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a sensor network interface protocol storage for managing a rule for the message transfer protocol; and	The Accused Instrumentalities' sensor network abstraction unit comprises a sensor network interface protocol storage for managing a rule for the message transfer protocol.

Claim 3	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Core, which manages protocols such as MQTT, HTTP, and WebSocket through the Message Broker.[82] **Message Broker** The Message Broker is a high throughput Pub/Sub messaging agent that securely transmits messages to and from all of your IoT devices and applications with low latency based on the MQTT Version 5.0 Message Standard. The flexible nature of the Message Broker's topic structure helps you send messages to, or receive messages from, a number of devices. It supports messaging patterns ranging from one-to-one command and control messaging, to one-to-one million (or more) broadcast notification systems and everything in between. Also, you can set up fine-grained access controls that help you manage the permissions of individual connections at the topic level. This verifies that your devices and applications will send and receive only the data that you want them to. The Message Broker is a fully managed service, so no matter how you choose to use it, it will scale automatically with your message volume without requiring you to run any infrastructure. For example, Amazon provides Rules Engine.[83]

[82] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/).

[83] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 3	Accused Instrumentality(ies)
	Rules Engine The Rules Engine helps you build IoT applications that gather, process, analyze, and act on data generated by connected devices at a global scale without having to manage any infrastructure. The Rules Engine evaluates inbound messages published on AWS IoT Core and transforms and delivers them to another device or a cloud service, based on business rules you define. A rule can apply to data from one or many devices, and it can take one or many actions in parallel. The Rules Engine can also route messages to AWS endpoints including AWS IoT Analytics, AWS IoT Events, AWS Lambda, Amazon Kinesis, Amazon S3, Amazon DynamoDB, Amazon CloudWatch, Amazon Simple Notification Service (SNS), Amazon Simple Queue Service (SQS), Amazon Elasticsearch Service, AWS Step Functions, and Amazon Location Service. External endpoints can be reached using AWS Lambda, Amazon Kinesis, Amazon SNS, and the Rules Engine's native HTTP action. You can author rules within the AWS Management Console or write rules using a SQL-like syntax. Rules can be authored to behave differently depending upon the content of the message. For example, if a temperature reading exceeds a certain threshold, it could initiate a rule to transmit data to AWS Lambda. Rules can also be written to take into account other data in the cloud, such as data from other devices. For example, you could initiate an action if the temperature is more than 15% higher than the average of the five other devices. The Rules Engine provides dozens of available functions that can be used to transform your data, and it's possible to create infinitely more by using AWS Lambda. For example, if you're dealing with a wide range of values, you could take the average of the incoming numbers. Rules can also initiate the runtime of your Java, Node.js or Python code on AWS Lambda, giving you maximum flexibility and power to process device data.

Claim 3	Accused Instrumentality(ies)
	4. Rules Engine: Processing and Routing of IoT Data The Rules Engine is a service within AWS IoT Core that enables data processing and routing from IoT devices. The engine evaluates inbound messages published into AWS IoT Core and transforms and delivers them to another device or a cloud service, based on business rules you define. With the Rules Engine, you can filter, transform, and act upon device data on the fly, based on business rules you define. You can route the data to AWS services like AWS Lambda, Amazon DynamoDB, Amazon S3, Amazon Kinesis, Amazon SNS, and many others. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a sensor network monitor for monitoring a state of the sensor network, based on the data received from	The Accused Instrumentalities provide a sensor network monitor for monitoring a state of the sensor network, based on the data received from the sensor network interface. For example, Amazon provides AWS IoT Device Shadow.[84]

[84] *See* KAIFI0002118 *(AWS IoT Core*, https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#iot-device-shadows); *see also* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/).; *see* KAIFI0007096 *(*EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 3	Accused Instrumentality(ies)
the sensor network interface.	**AWS IoT Device Shadow service** The AWS IoT Device Shadow service adds shadows to AWS IoT thing objects. Shadows can make a device's state available to apps and other services whether the device is connected to AWS IoT or not. AWS IoT thing objects can have multiple named shadows so that your IoT solution has more options for connecting your devices to other apps and services. **Device Shadow** With AWS IoT Core, you can create a persistent, virtual version, or Device Shadow, of each device. This includes the device's latest state so that applications or other devices can read messages and interact with the device. The Device Shadow persists the last reported state and desired future state of each device even when the device is offline. You can retrieve the last reported state of a device or set a desired future state through the API or use the rules engine. The Device Shadow makes it easier to build applications that interact with your devices by providing always available REST API operations. Also, applications can set the desired future state of a device without accounting for the devices' current state. AWS IoT Core will compare the difference between the desired and last reported state and command the device to make up the difference. The AWS IoT Device SDK makes it easier for your device to synchronize its state with its Device Shadow and to respond to desired future states set by using the Device Shadow. With Device Shadow you can store the state of your devices for up to a year, for free. If you update the Device Shadow at least once per year, then it will persist forever; otherwise, they will expire.

Claim 3	Accused Instrumentality(ies)
	3. Device Shadow: Storing and Retrieving Device State The Device Shadow feature in AWS IoT Core is a JSON document used to store and retrieve the current state of a device. This document enables applications to read from and write to the fields of the device shadow, providing a reliable way to track the device's state over time. This means even if your device is offline, you can set a desired future state, and the device will synchronize when it reconnects. For example, Amazon provides AWS IoT Core Registry.[85] **Registry** The registry establishes an identity for devices and tracks metadata, such as the devices' attributes and capabilities. The registry assigns an identity to each device that is consistently formatted regardless of the type of device or how it connects. It also supports metadata that describes the capabilities of a device (such as whether a sensor reports temperature and if the data are Fahrenheit or Celsius). The registry helps you store device metadata at no additional charge. Metadata in the registry does not expire if you access or update your registry entry at least once every 7 years. Learn more in the registry section of the AWS IoT Core user guide.

[85] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Ex.1015 / Page 99 of 264
AMAZON.COM, INC.

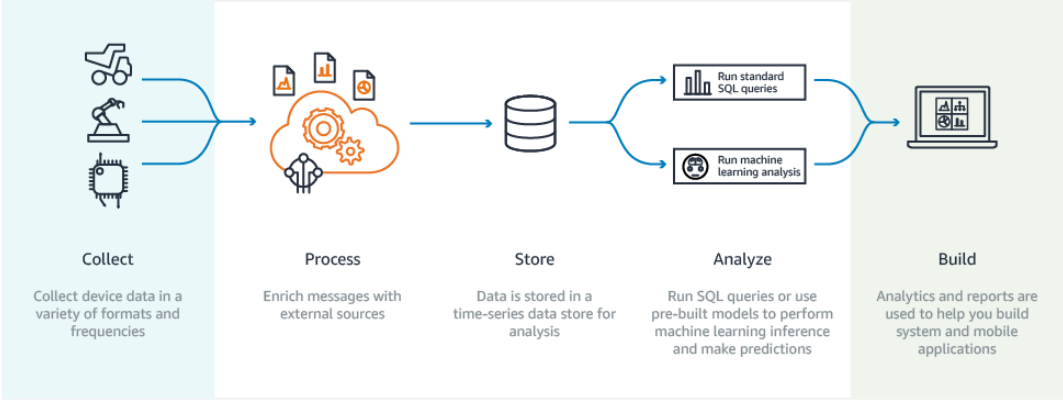
Claim 3	Accused Instrumentality(ies)
	5. Registry: Organize and Index Devices The Registry in AWS IoT Core allows you to categorize devices into a hierarchical structure based on function, security requirements, or any other category that fits your needs. The Registry also enables you to track metadata such as device attributes and capabilities. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Claim 4 of the ’232 Patent

Claim 4	Accused Instrumentality(ies)
The system as recited in claim 3, wherein the sensor network intelligence unit comprises: a sensed data analyzer for performing an analysis operation to clean, classify and integrate the sensed data	The Accused Instrumentalities’ sensor network intelligence unit comprises a sensed data analyzer for performing an analysis operation to clean, classify and integrate the sensed data processed by the sensor network abstraction unit.

Claim 4	Accused Instrumentality(ies)
processed by the sensor network abstraction unit;	For example, Amazon provides AWS IoT Analytics.[86] **AWS IoT Analytics** AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

[86] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf); *see also* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

Claim 4	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. **How to use AWS IoT Analytics** The following graphic shows an overview of how you can use AWS IoT Analytics.  For example, Amazon provides AWS IoT Analytics, which includes a SQL query engine to run ad-hoc

Claim 4	Accused Instrumentality(ies)
	queries and get results quickly. [87] **Analyze** • Run Ad-hoc SQL queries—AWS IoT Analytics provides a SQL query engine so you can run ad-hoc queries and get results quickly. The service enables you to use standard SQL queries to extract data from the data store to answer questions like the average distance traveled for a fleet of connected vehicles or how many doors in a smart building are locked after 7pm. These queries can be re-used even if connected devices, fleet size, and analytic requirements change. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
an event processor for generating the conditional events including notification and alarm according to a rule set by the application program	The Accused Instrumentalities provide an event processor for generating the conditional events including notification and alarm according to a rule set by the application program and managing the generated events. For example, Amazon provides AWS IoT Analytics, which is fully integrated with AWS IoT Core so it

[87] *See* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

Ex.1015 / Page 103 of 264
AMAZON.COM, INC.

Claim 4	Accused Instrumentality(ies)
and managing the generated events; and	can receive messages from connected devices as they stream in.[88] **Collect** • Integrated with AWS IoT Core—AWS IoT Analytics is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in. • Use a batch API to add data from any source—AWS IoT Analytics can receive data from any source through HTTP. That means that any device or service that is connected to the internet can send data to AWS IoT Analytics. For more information, see BatchPutMessage in the *AWS IoT Analytics API Reference*. • Collect only the data you want to store and analyze—You can use the AWS IoT Analytics console to configure AWS IoT Analytics to receive messages from devices through MQTT topic filters in various formats and frequencies. AWS IoT Analytics validates that the data is within specific parameters you define and creates channels. Then, the service routes the channels to appropriate pipelines for message processing, transformation, and enrichment. For example, Amazon provides Alexa Hunches.[89]

[88] *See* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

[89] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 4	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a context information manager for sensing and generating the context aware information, based on the sensed data	The Accused Instrumentalities provide a context information manager for sensing and generating the context aware information, based on the sensed data analyzed by the sensed data analyzer.

Claim 4	Accused Instrumentality(ies)
analyzed by the sensed data analyzer.	For example. Amazon provides AWS IoT Analytics.[90] **AWS IoT Analytics** AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

[90] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 4	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[91] "Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras.

[91] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 4	Accused Instrumentality(ies)
	This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Claim 5 of the '232 Patent

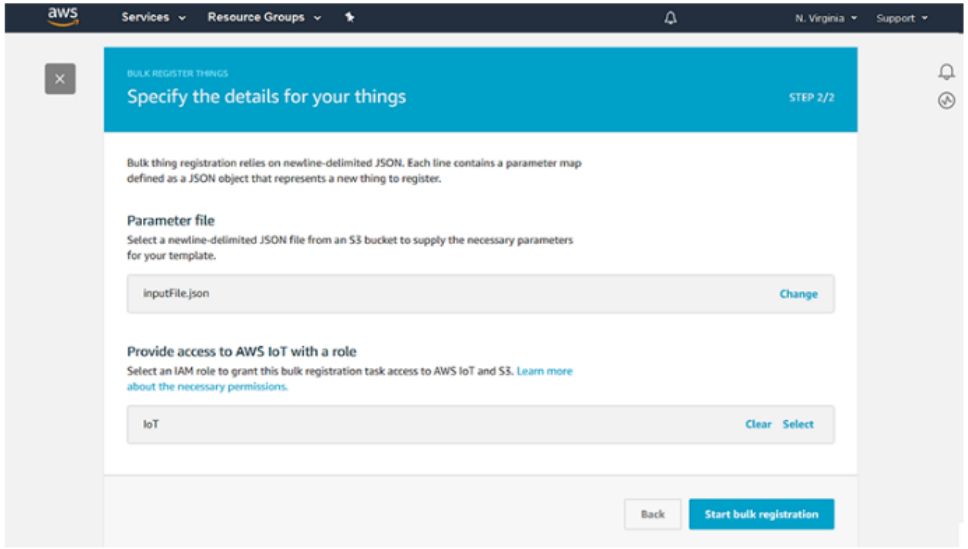
Claim 5	Accused Instrumentality(ies)
The system as recited in claim 4, wherein the service platform management unit comprises: a directory service manager for identifying and searching resources of the sensor network;	The Accused Instrumentalities' service platform management unit comprises: a directory service manager for identifying and searching resources of the sensor network. For example, Amazon provides AWS Lambda.[92] **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume—there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service—all with zero administration. Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically run from other AWS services, or you can call it directly from any web or mobile app.

[92] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 5	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Device Management.[93] **AWS IoT Device Management** As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments. For example, Amazon provides AWS IoT Device Management.[94]

[93] *See id.*

[94] *See* KAIFI0001738 *(AWS IoT Device Management features*, https://aws.amazon.com/iot-device-management/features/).

Claim 5	Accused Instrumentality(ies)
	Register connected devices in bulk Register new devices with AWS IoT Device Management. Using the IoT management console or API, you can upload templates that you populate with information like device manufacturer and serial number, X.509 identity certificates, or security policies. Then, you can configure the entire fleet of devices with this information in a few steps in the management console. Learn more about the bulk registration process.  This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation

Claim 5	Accused Instrumentality(ies)
	because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a service process manager for scheduling and managing an operation sequence of the sensed data analyzer, the event processor, the context information manager, and the directory service manager in order to obtain a desired information service according to the application program; and	The Accused Instrumentalities' service platform management unit comprises a service process manager for scheduling and managing an operation sequence of the sensed data analyzer, the event processor, the context information manager, and the directory service manager in order to obtain a desired information service according to the application program. For example, Amazon provides Amazon DynamoDB.[95] Amazon DynamoDB is a serverless, NoSQL database service that allows you to develop modern applications at any scale. As a serverless database, you only pay for what you use and DynamoDB scales to zero, has no cold starts, no version upgrades, no maintenance windows, no patching, and no downtime maintenance. DynamoDB offers a broad set of security controls and compliance standards. For globally distributed applications, DynamoDB global tables is a multi-Region, multi-active database with a 99.999% availability SLA and increased resilience. DynamoDB reliability is supported with managed backups, point-in-time recovery, and more. With DynamoDB streams, you can build serverless event-driven applications. This claim element is literally present, as described herein, but is also satisfied under the doctrine of

[95] *See* KAIFI0001220 *(Amazon DynamoDB*, https://aws.amazon.com/dynamodb/).

Claim 5	Accused Instrumentality(ies)
	equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
an application program interface for providing the application program with the results processed by the sensor network monitor, the sensed data analyzer, the event processor, the context information manager, and the directory service manager in an information service form suitable for the application program	The Accused Instrumentalities' service platform management unit comprises an application program interface for providing the application program with the results processed by the sensor network monitor, the sensed data analyzer, the event processor, the context information manager, and the directory service manager in an information service form suitable for the application program. For example, Amazon provides Amazon Gateway API. [96]

[96] *See* KAIFI0001210 *(Amazon API Gateway*, https://aws.amazon.com/api-gateway/).

Claim 5	Accused Instrumentality(ies)
	Amazon API Gateway is a fully managed service that makes it easy for developers to create, publish, maintain, monitor, and secure APIs at any scale. APIs act as the "front door" for applications to access data, business logic, or functionality from your backend services. Using API Gateway, you can create RESTful APIs and WebSocket APIs that enable real-time two-way communication applications. API Gateway supports containerized and serverless workloads, as well as web applications. For example, Amazon provides AWS IoT Device Management.[97]

[97] *See* KAIFI0001608 *(AWS IoT Device Management Documentation*, https://docs.aws.amazon.com/iot-device-management/) *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

Ex.1015 / Page 113 of 264
AMAZON.COM, INC.

Claim 5	Accused Instrumentality(ies)
	AWS IoT Device Management Documentation AWS IoT Device Management is a cloud-based device management service that makes it easy for customers to securely manage IoT devices throughout their lifecycle. Customers can use AWS IoT Device Management to onboard device information and configuration, organize their device inventory, monitor their fleet of devices, and remotely manage devices deployed across many locations. This remote management includes over-the-air (OTA) updates to device software. **Developer Guide** Describes device provisioning, thing groups, and jobs that are sent to and run on one or more devices connected to AWS IoT Core. HTML | PDF **API Reference** Describes all the API operations for AWS IoT Device Management in detail. Provides examples of request and response syntax. HTML | PDF **Fleet Hub for AWS IoT Device Management** **User Guide** You can use Fleet Hub for AWS IoT Device Management to build standalone web applications for monitoring the health of your device fleets. HTML | PDF

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 5	Accused Instrumentality(ies)

	AWS IoT Device Management - jobs data endpoints
	
	The AWS IoT Device Management - jobs data endpoints are specific to each AWS account and AWS Region. To find the AWS IoT Device Management - jobs data endpoint for your AWS account and AWS Region, use the **describe-endpoint** CLI command shown here, or the `DescribeEndpoint` REST API.
	
	`aws iot describe-endpoint --endpoint-type iot:Jobs`
	
	This command returns your Jobs data plane API endpoint in the following format:
	
	`account-specific-prefix.jobs.iot.aws-region.amazonaws.com.`
	
	For information about the actions supported by the AWS IoT Device Management - jobs data endpoints, see AWS IoT jobs data plane operations in the *AWS IoT API Reference*.
	
	The following table contains AWS Region-specific endpoints that AWS IoT Core supports for job data operations. In the **Endpoint** column, the `account-specific-prefix` from your account-specific endpoint replaces the `data` shown in the generic endpoint representation.

Claim 5	Accused Instrumentality(ies)
	AWS IoT Device Management - secure tunneling endpoints AWS IoT supports additional endpoints for secure tunneling. **Secure Tunneling Management APIs Endpoints** This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

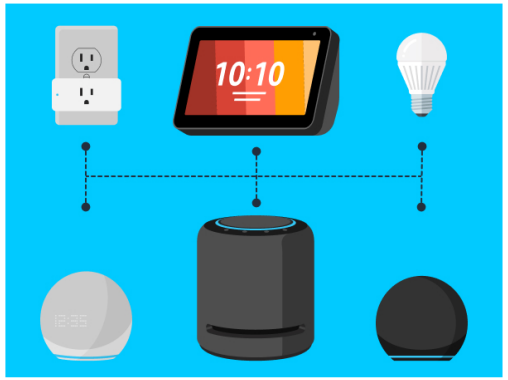
Region Name	Region	Endpoint	Protocol
US East (Ohio)	us-east-2	api.tunneling.iot.us-east-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-2.amazonaws.com	HTTPS
US East (N. Virginia)	us-east-1	api.tunneling.iot.us-east-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-1.amazonaws.com	HTTPS
US West (N. California)	us-west-1	api.tunneling.iot.us-west-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-1.amazonaws.com	HTTPS
US West (Oregon)	us-west-2	api.tunneling.iot.us-west-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-2.amazonaws.com	HTTPS
Asia Pacific (Hong Kong)	ap-east-1	api.tunneling.iot.ap-east-1.amazonaws.com	HTTPS
Asia Pacific (Mumbai)	ap-south-1	api.tunneling.iot.ap-south-1.amazonaws.com	HTTPS
Asia Pacific (Seoul)	ap-northeast-2	api.tunneling.iot.ap-northeast-2.amazonaws.com	HTTPS
Asia Pacific (Singapore)	ap-southeast-1	api.tunneling.iot.ap-southeast-1.amazonaws.com	HTTPS
Asia Pacific (Sydney)	ap-southeast-2	api.tunneling.iot.ap-southeast-2.amazonaws.com	HTTPS
Asia Pacific (Tokyo)	ap-northeast-1	api.tunneling.iot.ap-northeast-1.amazonaws.com	HTTPS

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 6 of the ’232 Patent

Claim 6	Accused Instrumentality(ies)
A Ubiquitous Sensor Network (USN) middleware apparatus for generating an information service based on heterogeneous sensor networks, comprising:	Amazon provides a Ubiquitous Sensor Network (USN) middleware apparatus for generating an information service based on heterogeneous sensor networks. For example, Amazon provides the Alexa Smart Home.[98] Connecting devices to Alexa Creating a connected home is easy. Simply plug in and power on your new smart home device. Then say, “Alexa, discover devices.” You can also add devices through the Amazon Alexa app: 1. Open the Alexa app and select **Devices**. 2. Tap the **+** icon and select **Add Device**. 3. Choose the device type and brand. 4. Follow the on-screen prompts. Expand your smart home Lighting Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what’s happening with the Amazon Alexa app, no matter where you are. Televisions Smart TVs let you use your voice to open streaming apps, change the channel, adjust the volume, and more when paired with an Alexa-enabled device. When you’re done watching, just say, “Alexa, turn off the TV.” Thermostats Heating and cooling costs can really add up. Smart thermostats can help you save energy by adjusting your home’s temperature when you’re away.

[98] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 6	Accused Instrumentality(ies)
	 A simpler way to create your smart home Your smart home should just work, regardless of the smart device brands you choose. That's why Alexa supports multiple ways to connect them, including Wi-Fi, Bluetooth Low Energy, Zigbee, and now Matter, meaning more products than ever work with Alexa. Learn More For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[99] For example, Amazon provides the Alexa app.[100] For example, Amazon provides Alexa Energy Dashboard.[101]

[99] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

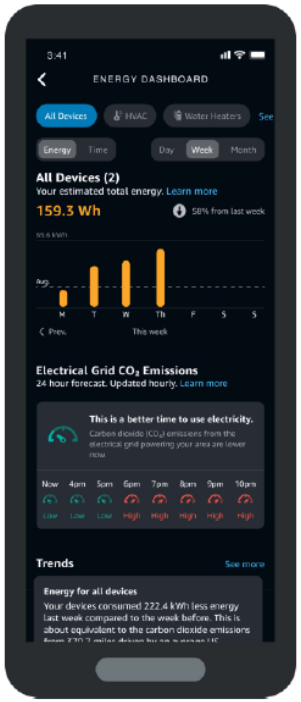
[100] *See* KAIFI0007048 *(The Alexa App*, https://www.amazon.com/Alexa-App/b?ie=UTF8&node=18354642011).

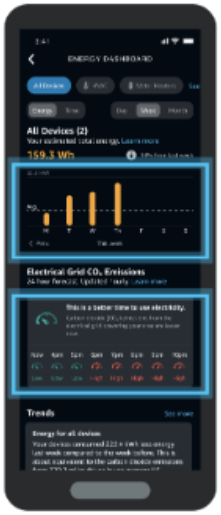
[101] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 6	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 6	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** Simple to set up and use

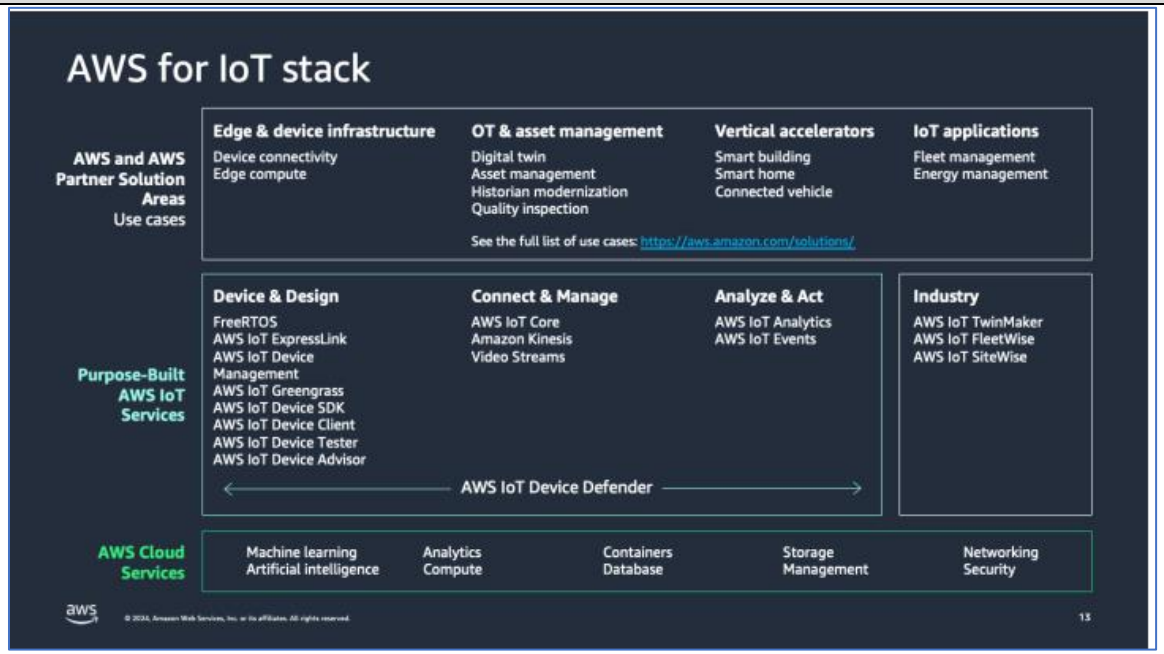
Claim 6	Accused Instrumentality(ies)
	 4- Start tracking and managing the energy usage of your Alexa-connected device. View a 24-hour forecast of when cleaner energy is available in your area. For example, the Alexa app can discover and add different networked devices.[102] For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb,

[102] *See* KAIFI0007810 *(How to Set up Devices with Alexa | Amazon Echo*, https://youtu.be/XFfm_nEqVpk?si=r9Eo35tCu8MDd5cV); *see also* KAIFI0007808 *(How To Connect Smart Home Devices to Alexa*, https://www.youtube.com/watch?v=tT458bs2QPU).

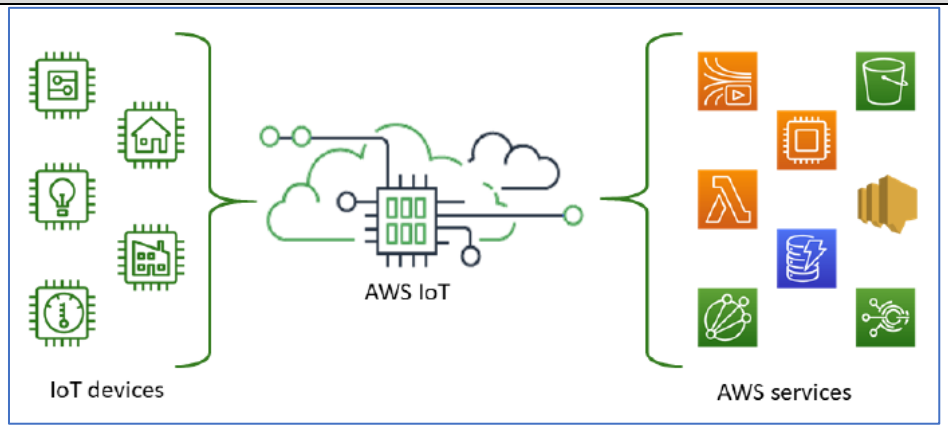
Claim 6	Accused Instrumentality(ies)
	Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[103] For example, Amazon provides Internet of Things (IoT) services.[104]

[103] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

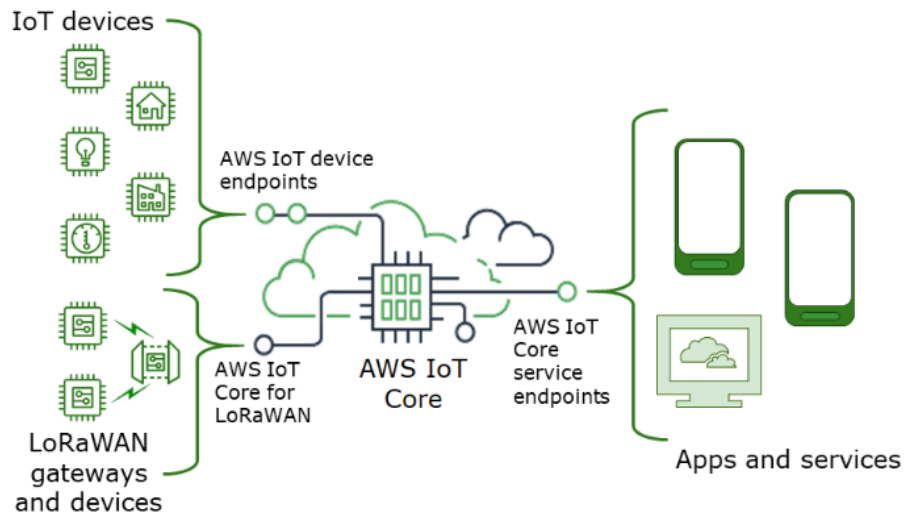
[104] *See* KAIFI0001768 *(*AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

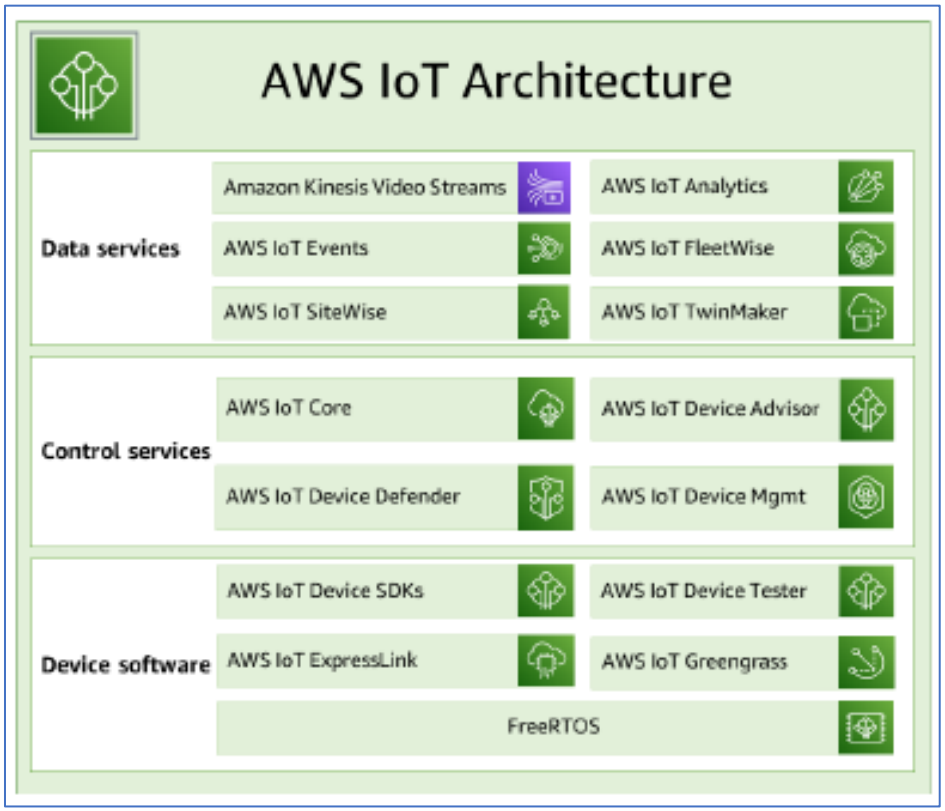
Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT.[105] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

[105] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT Core, which supports connections with IoT devices, wireless gateways, services, and apps.[106]

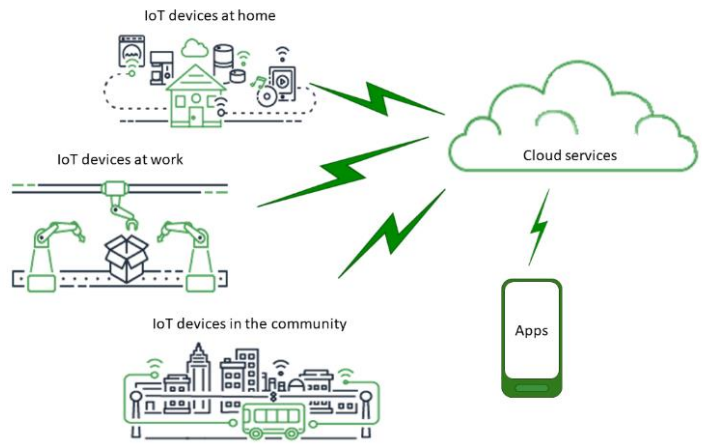
[106] *See id.*

Claim 6	Accused Instrumentality(ies)
	Connect to AWS IoT Core PDF AWS IoT Core supports connections with IoT devices, wireless gateways, services, and apps. Devices connect to AWS IoT Core so they can send data to and receive data from AWS IoT services and other devices. Apps and other services also connect to AWS IoT Core to control and manage the IoT devices and process the data from your IoT solution. This section describes how to choose the best way to connect and communicate with AWS IoT Core for each aspect of your IoT solution. 

Claim 6	Accused Instrumentality(ies)
	Amazon provides AWS IoT Architecture. [107]  For example, AWS IoT provides cloud services and device support.[108]

[107] *See id.*

[108] *See* KAIFI0002118 *(How AWS IoT works*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-how-it-works.html).

Claim 6	Accused Instrumentality(ies)
	AWS IoT provides cloud services and device support that you can use to implement IoT solutions. AWS provides many cloud services to support IoT-based applications. So to help you understand where to start, this section provides a diagram and definition of essential concepts to introduce you to the IoT universe. **The IoT universe** In general, the Internet of Things (IoT) consists of the key components shown in this diagram.  For example, Amazon provides IoT solutions on AWS providing the following benefits.[109]

[109] *See* KAIFI0001934 *(Build IoT Solutions for Free on AWS*, https://aws.amazon.com/free/iot/?nc1=h_ls).

Claim 6	Accused Instrumentality(ies)
	Product Benefits There are billions of devices in homes, factories, oil wells, hospitals, cars, and thousands of other places. With the proliferation of devices, you increasingly need solutions to connect them, and collect, store, and analyze device data. **Broad & Deep** AWS has broad and deep IoT services, from the edge to the cloud. AWS IoT is the only cloud vendor to bring together data management and rich analytics in easy to use services designed for noisy IoT data. **Multi-Layered Security** AWS IoT offers services for all layers of security, including preventive security mechanisms, like encryption and access control to device data, and a service to continuously monitor and audit configurations. **Superior AI Integration** AWS brings AI and IoT together to make devices more intelligent. You can create models in the cloud and deploy them to devices where they run 2x faster compared to other offerings. **Proven at Scale** AWS IoT is built on a secure and proven cloud infrastructure, and scales to billions of devices and trillions of messages. AWS IoT integrates with other AWS services, so you can build complete solutions. For example, Amazon provides connectivity, control, and analytics services.[110]

[110] *See id.*

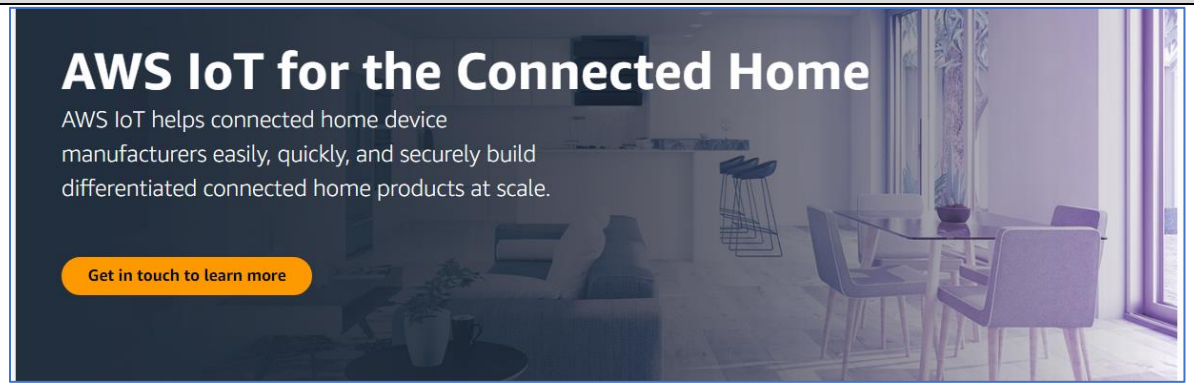
Ex.1015 / Page 128 of 264
AMAZON.COM, INC.

Claim 6	Accused Instrumentality(ies)

PRODUCT	DESCRIPTION
AWS IoT Core	Connectivity & Control Services Connect IoT devices to the AWS cloud without the need to provision or manage servers
AWS IoT Device Management	Connectivity & Control Services Onboard, organize, monitor, and remotely manage connected devices at scale.
AWS IoT Device Defender	Connectivity & Control Services A fully managed service that helps you secure your fleet of IoT devices.
AWS IoT Events	Analytics Services AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications.
AWS IoT SiteWise	Analytics Services A managed service that makes it easy to collect, store, organize, and monitor data from industrial equipment at scale to help you make better, data-driven decisions.
AWS IoT Greengrass	Device Software Local compute, messaging, data caching, and sync capabilities for connected devices.
FreeRTOS	Edge Computing Open source, real-time operating system for microcontrollers that makes small, low-power edge devices easy to program, deploy, secure, connect, and manage.

For example, Amazon provides AWS IoT for the Connected Home.[111]

[111] *See* KAIFI0001754 *(AWS IoT for the Connected Home*, https://aws.amazon.com/iot/solutions/connected-home/).

Claim 6	Accused Instrumentality(ies)
	 As the use of connected home devices continues to grow, more and more data is being pushed to the cloud, where the latest IoT and machine learning technologies are enabling new innovations in connected home applications. AWS IoT makes it easy for you to build scalable IoT applications that collect, process, analyze, and act on data generated by connected home devices without having to manage any infrastructure. This helps you focus on building solutions and experiences that deliver value to both your businesses and your consumers and create a new class of connected home applications that interact with the physical world. For example, Amazon provides IoT for Connected Home for Home Automation & Voice Enablement, Home Security & Monitoring, and Home Network Management.[112]

[112] *See id.*

Claim 6	Accused Instrumentality(ies)
	 IoT for Connected Home Use Cases Home Automation & Voice Enablement Using AWS IoT, you can enable any device to connect to the Internet and perform a desired action quickly, reliably, and easily. These devices can work alone or together with other devices or hubs for an integrated smart home experience. Additionally, devices can also benefit from using voice services like Alexa for a seamless customer experience. See the infographic >> Home Security & Monitoring Devices like door locks, security cameras, and water leak detectors built with AWS IoT can use machine learning to automatically detect threats, take action, and send alerts to home owners. AWS IoT enables devices to run with low-latency and compute data locally, without internet connectivity. See the infographic >> Home Network Management Network operators are looking for new ways to help customers quickly discover, troubleshoot, and fix home network issues including Wi-Fi and cable TV connectivity. AWS IoT enabled set-top boxes can automatically log network diagnostics and send to the customer service center proactively or allow customers to monitor and troubleshoot their network health through a mobile app. See the infographic >> For example, Amazon connects devices to Alexa with a range of software and hardware solutions.[113]

[113] *See* KAIFI0001149 *(Build Your Alexa Connected Device*, https://developer.amazon.com/en-US/alexa/devices/connected-devices/development-resources#local-connection).

Claim 6	Accused Instrumentality(ies)

	On the Cloud	On Device Module	Local Connection	Alexa Built-in
Connectivity Type	Connect your cloud to Alexa's cloud with Alexa skills	Add an on-device hardware module	Connect via local connectivity protocols	No additional integration required; use your existing AVS client
Technology	**Smart Home Skill API, Custom Skill API, Multi-Capability Skills**	**Alexa Connect Kit (ACK)**	**Zigbee, Bluetooth, Z-Wave and other local connectivity protocols**	**Alexa Voice Service (AVS) API**
Key Consideration	Requires your own device cloud	Managed service: No need to create a skill or manage cloud service	Zigbee or Z-Wave certified	Must have a microphone and meet AVS development requirements.
Supported Devices	Any smart device with Wi-Fi	Any device with a microcontroller: coffee makers, ovens, microwaves	Zigbee or Z-Wave certified lights, locks, plugs, sensors	Any device with Alexa Built-in
Voice User Interface	Pre-built (Amazon-defined) or custom built	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)
Certification Eligibility	Works with Alexa	Works with Alexa	Works with Alexa	Alexa Built-In
Development Information	Smart Home Skill API	Alexa Connect Kit	Local Connection	Smart Home for AVS

For example, Amazon provides Application Integration on AWS.[114]

[114] *See* KAIFI0007355 *(What is Middleware?* https://aws.amazon.com/what-is/middleware/).

Claim 6	Accused Instrumentality(ies)
	How does AWS support middleware technology? Application Integration on AWS is a suite of services that are an affordable alternative to conventional middleware for cloud computing. Developers use the services to communicate between decoupled components within microservices, distributed systems, and serverless applications. For example: • AWS Step Functions is a visual workflow service that allows developers to build distributed applications, automate IT and business processes, and build data and machine learning pipelines by using AWS services. • Amazon Simple Notification Service (Amazon SNS) is an alternative to message-oriented middleware. It provides messaging services for applications. • Amazon EventBridge is a serverless event bus that developers use to integrate cloud applications with AWS services. Get started with middleware on AWS by creating an AWS account today. For example, Amazon provides Amazon Kinesis, AWS Lambda, Amazon SageMaker, and Amazon CloudWatch.[115] • **Amazon Kinesis** Amazon Kinesis makes it easy to collect, process, and analyze real-time, streaming data so you can get timely insights and react quickly to new information. Amazon Kinesis can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications.

[115] *See* KAIFI0004473 *(Learn more about AWS IoT*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-learn-more.html).

Claim 6	Accused Instrumentality(ies)
	• **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You can set up your code to automatically trigger from AWS IoT data and events or call it directly from a web or mobile app. • **Amazon SageMaker** Amazon SageMaker can create machine learning (ML) models by finding patterns in your IoT data. The service uses these models to process new data and generate predictions for your application. • **Amazon CloudWatch** Amazon CloudWatch provides a reliable, scalable, and flexible monitoring solution to help set up, manage, and scale your own monitoring systems and infrastructure. For example, Amazon provides the Smart Home API.[116]

[116] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

Claim 6	Accused Instrumentality(ies)
	You can connect virtually any type of device to Alexa by using the Smart Home API. You describe your device endpoints and capabilities by using the standard discovery mechanism described in About Alexa Discovery. In your discovery response, you identify the smart home interfaces that each device supports. To help you get started, review the device templates to find the ones that match your device type. Each template recommends a set of smart home interfaces to implement for the device type. You can modify these recommendations by adding or removing interfaces to suit the needs of your specific device. Every template includes the required top-level `Alexa` interface and recommends that you implement the `Alexa.EndpointHealth` interface to report the health of your device to Alexa. Also, each template recommends a display category. The display category determines the icon and placement of your device in the Alexa app. For more details about Smart Home skills, see Understand the Smart Home Skills. For more details about required interfaces for Works with Alexa (WWA) certification, see Requirements for Specific Device Types. For example, Amazon provides Amazon Common Software.[117] Alexa-enabled device developers can incorporate setup for their products into the Alexa mobile app. Instead of building and running a separate and branded app, the company can rely on the Alexa app as a platform for the initial setup. Amazon has updated the Alexa Voice Service (AVS) system to allow approved devices to be set up on the Alexa app using the same Frustration-Free Setup (FFS) tech.

[117] *See* KAIFI0007058 (Eric Hal Schwartz, *Third-Party Alexa Devices Can Now Use the Alexa App for Setup* (Jun. 17, 2021), https://voicebot.ai/2021/06/17/third-party-alexa-devices-can-now-use-the-alexa-app-for-setup/)

Claim 6	Accused Instrumentality(ies)
	ECHO EXPANSION Manufacturers looking to streamline setup for customers use the same Amazon Common Software (ACS) first introduced early last year. Once the back-end is in place, customers will get an alert from the Alexa app or just when they turn on the device that the app will handle the setup, and a few taps will complete the process. It's essentially the same method as setting up an Echo smart speaker or smart display. The option removes the need for the manufacturer to invest the time and resources into creating their own setup process online or through their own app while simultaneously reducing the hassle for customers of running through a unique setup for every smart home device they purchase. "With connected devices becoming increasingly ubiquitous around the world, customers have come to expect a struggle-free, tinker-free, and stress-free experience when setting up their devices. The complexity of setting up devices is often cited as one of the top issues in customer reviews, leading to poor product engagement and satisfaction," Amazon explained in a blog post. "Device makers no longer need to create and maintain their own app for device setup, and can instead focus their resources on core device features." For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm Base Stations.[118]

[118] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).

Ex.1015 / Page 136 of 264
AMAZON.COM, INC.

Claim 6	Accused Instrumentality(ies)
	Protocols and Ports Used by Ring Devices Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[119] **Welcome to Amazon Sidewalk** Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk.

[119] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

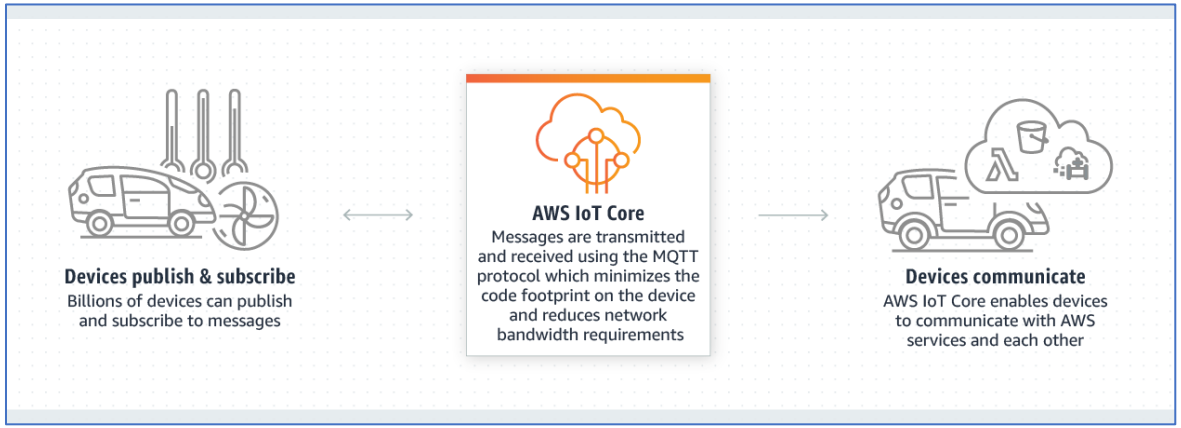
Ex.1015 / Page 137 of 264
AMAZON.COM, INC.

Claim 6	Accused Instrumentality(ies)
	For example, Amazon's Alexa Smart Home devices include smart lights and smart cameras.[120] Lighting Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what's happening with the Amazon Alexa app, no matter where you are. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

[120] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

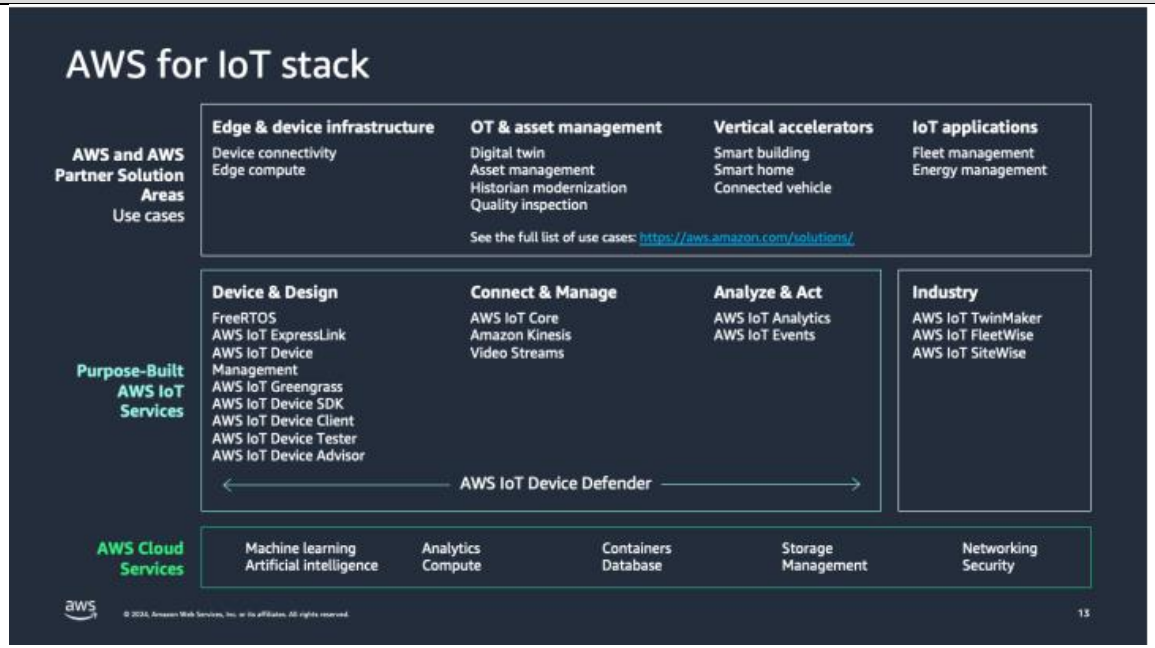
Claim 6	Accused Instrumentality(ies)
a sensor network abstraction unit for extracting sensed data from a message received from a sensor network;	The Accused Instrumentalities provide a sensor network abstraction unit for extracting sensed data from a message received from a sensor network. For example, Amazon provides AWS IoT Core.[121] **What Is AWS IoT Core?** AWS IoT Core is a managed cloud service that lets connected devices interact with cloud applications and other devices. It can support a large volume of messages, and can process and route those messages to AWS endpoints and to other devices reliably and securely. AWS IoT Core makes it possible to build applications that act on the data generated by connected devices. These applications can be hosted in the cloud, which enables web-based access to these services, thus enhancing the scalability, accessibility, and maintenance of IoT systems. AWS IoT Core is particularly useful in IoT use cases where devices need to communicate with each other and the cloud, but do not have the ability to directly interact with backend services. AWS IoT Core acts as the communication hub between these devices and the backend services, handling all the complexities of concurrent communication, message routing, security, authorization, and error handling.

[121] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

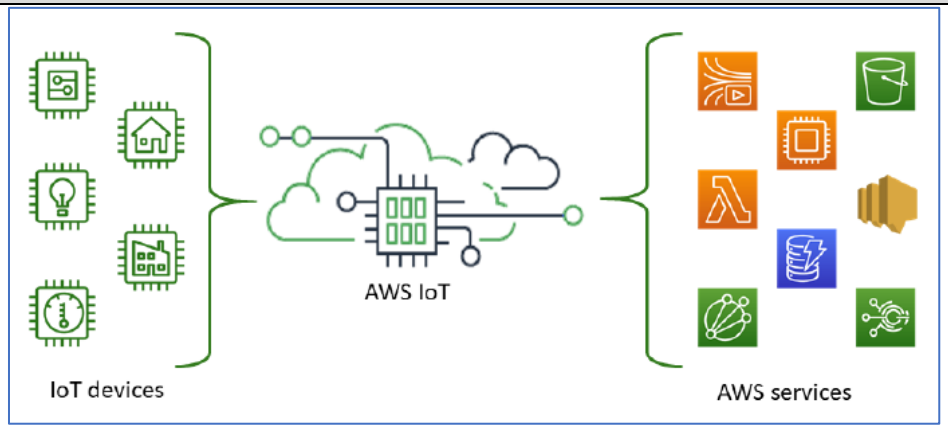
Claim 6	Accused Instrumentality(ies)
	For example, in Amazon's AWS IoT Core messages are transmitted and received using the MQTT protocol.[122]  For example, Amazon provides Internet of Things (IoT) services.[123]

[122] *See* KAIFI0001590 *(AWS IoT Core*, https://aws.amazon.com/iot-core/).

[123] *See* KAIFI0001768 *(*AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT.[124] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

[124] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Claim 6	Accused Instrumentality(ies)
	 This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a sensor network intelligence unit for extracting object and environment information by performing an analysis operation to clean, classify and integrate the	The Accused Instrumentalities provide a sensor network intelligence unit for extracting object and environment information by performing an analysis operation to clean, classify and integrate the sensed data extracted by the sensor network abstraction unit, and generating an event, including notification and alarm, and context aware information from the extracted object and environment information. For example, Amazon provides AWS IoT Events.[125]

[125] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf)..

Claim 6	Accused Instrumentality(ies)
sensed data extracted by the sensor network abstraction unit, and generating an event, including notification and alarm, and context aware information from the extracted object and environment information; and	**AWS IoT Events** AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications. Events are patterns of data identifying more complicated circumstances than expected, such as changes in equipment when a belt is stuck or connected motion detectors using movement signals to activate lights and security cameras. To detect events before AWS IoT Events, you had to build costly, custom applications to collect data, apply decision logic to detect an event, and then start another application to react to the event. Using AWS IoT Events, it's simple to detect events across thousands of IoT sensors sending different telemetry data, such as temperature from a freezer, humidity from respiratory equipment, and belt speed on a motor, and hundreds of equipment management applications. You simply select the relevant data sources to ingest, define the logic for each event using simple 'if-then-else' statements, and select the alert or custom action to run when an event occurs. AWS IoT Events continuously monitors data from multiple IoT sensors and applications, and it integrates with other services, such as AWS IoT Core and AWS IoT Analytics, to enable early detection and unique insights into events. AWS IoT Events automatically initiates alerts and actions in response to events based on the logic you define. This helps resolve issues quickly, reduce maintenance costs, and increase operational efficiency. For example, Amazon provides AWS IoT Analytics.[126]

[126] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

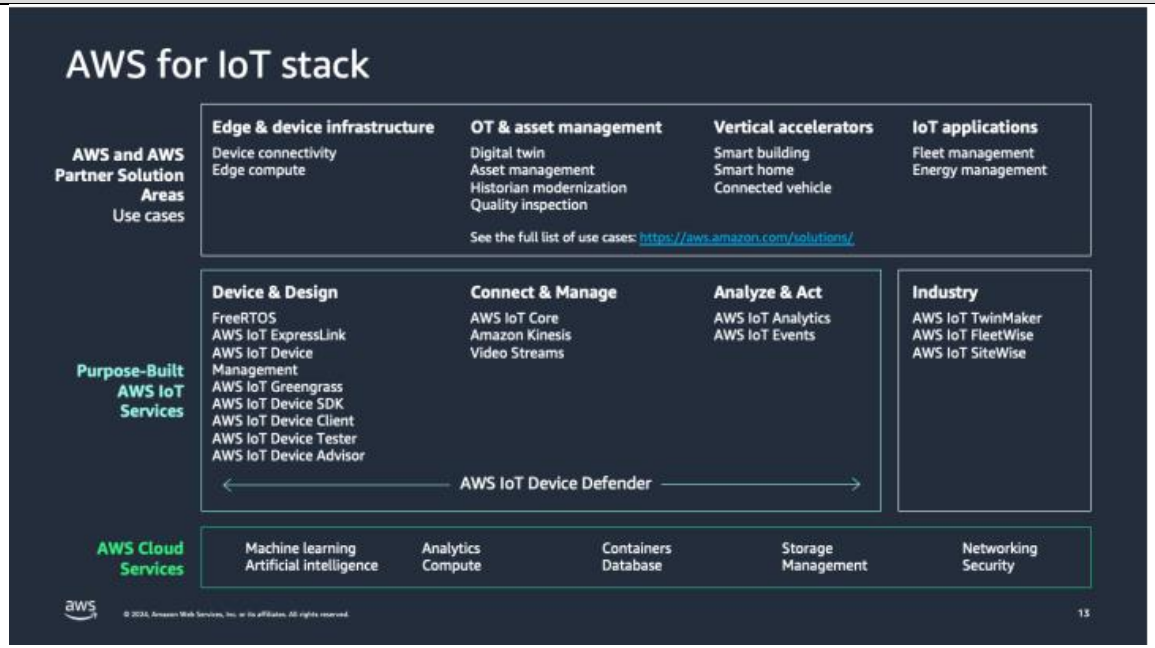
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 6	Accused Instrumentality(ies)
	AWS IoT Analytics AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

Claim 6	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. For example, Amazon provides AWS Lambda.[127] **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume—there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service—all with zero administration. Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically run from other AWS services, or you can call it directly from any web or mobile app. For example, Amazon provides Internet of Things (IoT) services.[128]

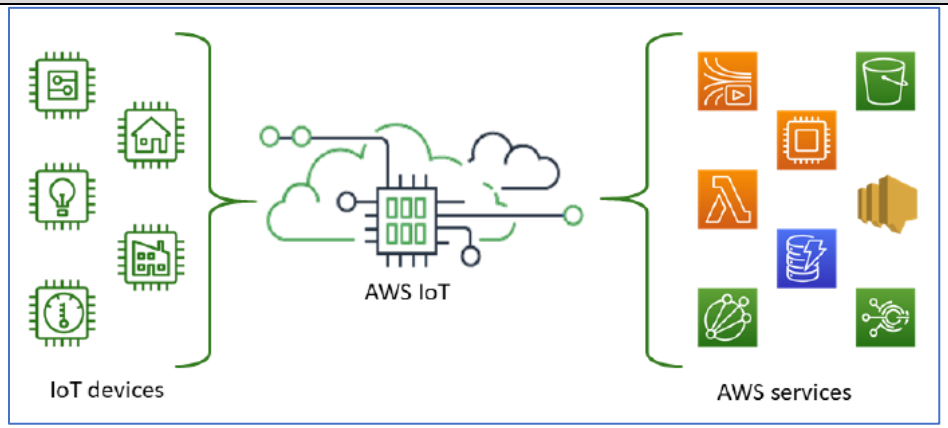
[127] *See id.*

[128] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

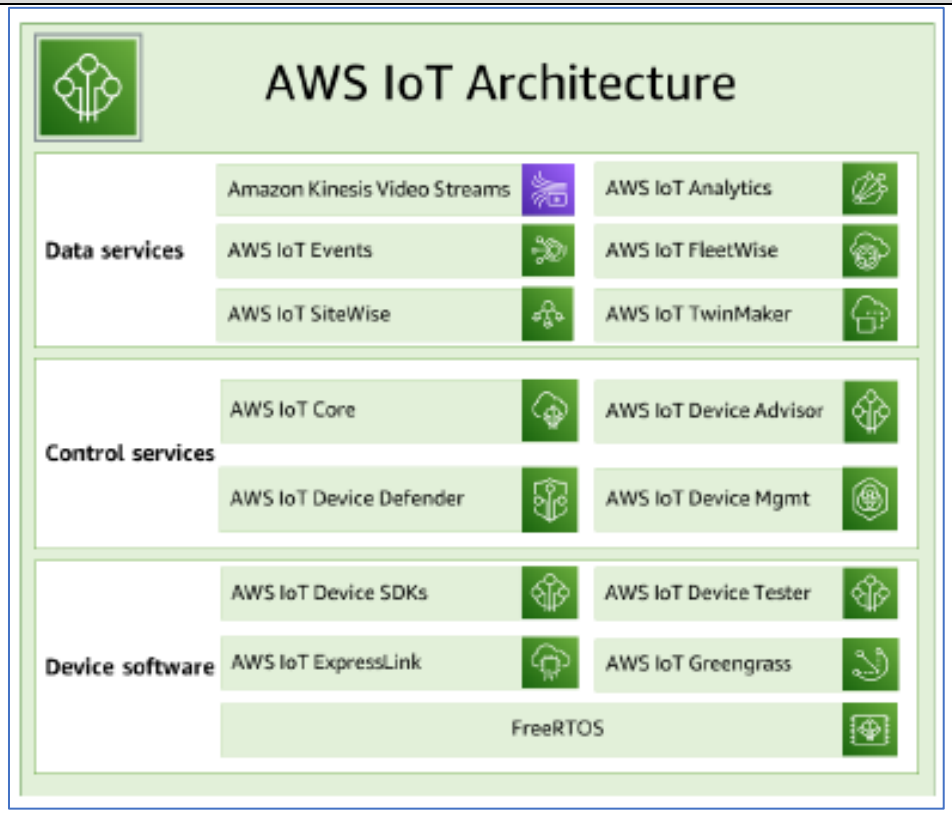
Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT.[129] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

[129] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT Architecture. [130]

[130] *See id.*

Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides Rules Engine.[131]

[131] *See* KAIFI0001359 *(An Introduction to AWS IoT Core* (Apr. 5, 2021), https://aws.amazon.com/blogs/startups/an-introduction-to-aws-iot-core/).

Claim 6	Accused Instrumentality(ies)
	Rules Engine The Rules Engine feature of AWS IoT Core gives devices the ability to interact with AWS services. Rules are analyzed and actions are performed based on the MQTT topic stream. Not only does the Rules Engine allow you to interact with other AWS services, but you can interact with third party services as well like Apache Kafka, Salesforce, or Snowflake. You can use rules to support tasks like streaming the data into an Amazon Kinesis Data Firehose, putting it in an Amazon SQS queue, triggering a script that processes the data with AWS Lambda, storing the metadata into Amazon DynamoDB, or storing the raw data for historical or backup purposes in Amazon S3. Before AWS IoT can perform these actions with the Rules Engine, you must authorize it and grant it permission to access your AWS resources on your behalf. You can set a rule based on the topic above that can stream into Amazon DynamoDB to store data, or AWS Lambda can capture the data from the stream to process it for any calculations you would like to do with the data. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a service platform management unit for providing the event and the context aware information to the application program in a	The Accused Instrumentalities comprise a service platform management unit for providing the event and the context aware information to the application program in a form suitable for the application program.

Claim 6	Accused Instrumentality(ies)
form suitable for the application program.	For example, Amazon provides AWS IoT Device Management.[132] **AWS IoT Device Management** As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments. For example, the Alexa app includes the Alexa Energy Dashboard. [133]

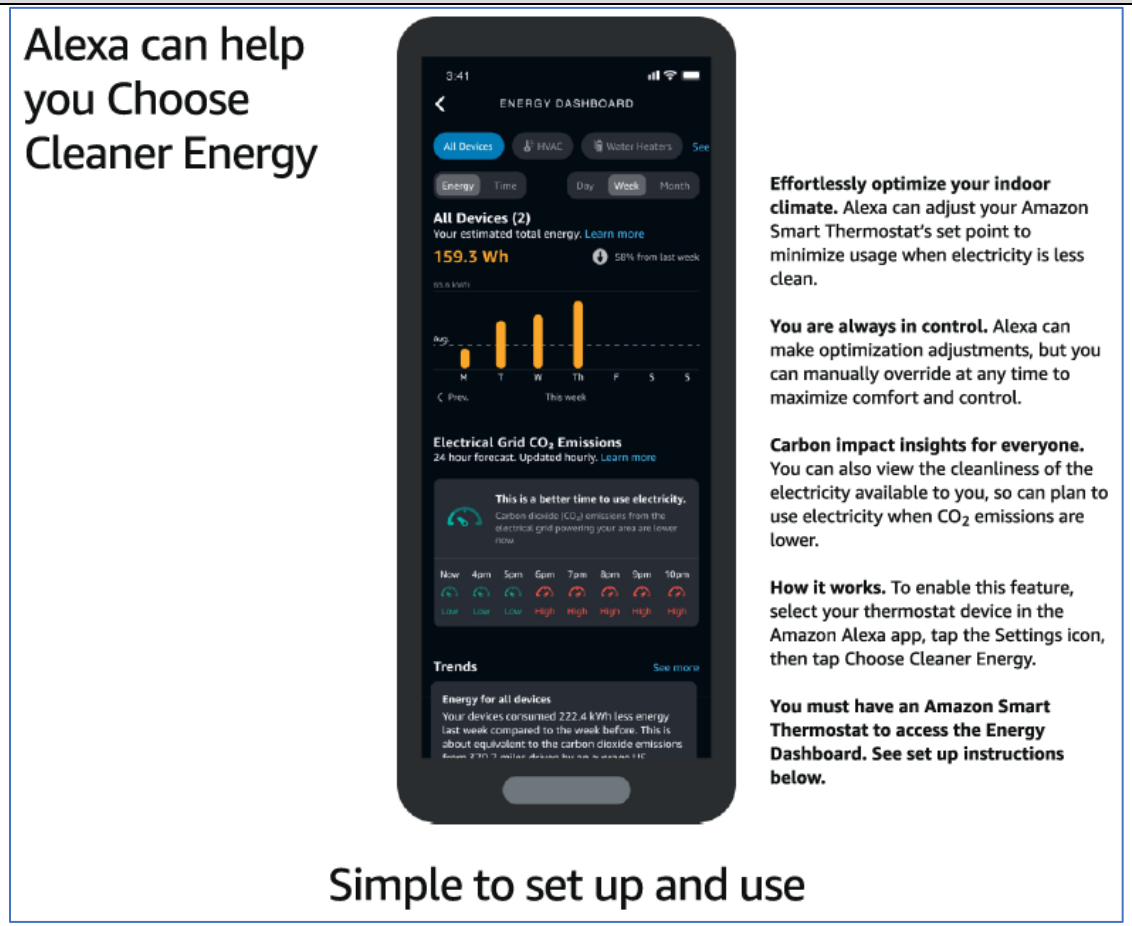
[132] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf); *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

[133] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci); *see also* KAIFI0001281 *(Amazon Smart Thermostat – Save*

Claim 6	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

money and energy - Works with Alexa and Ring - C-wire required, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

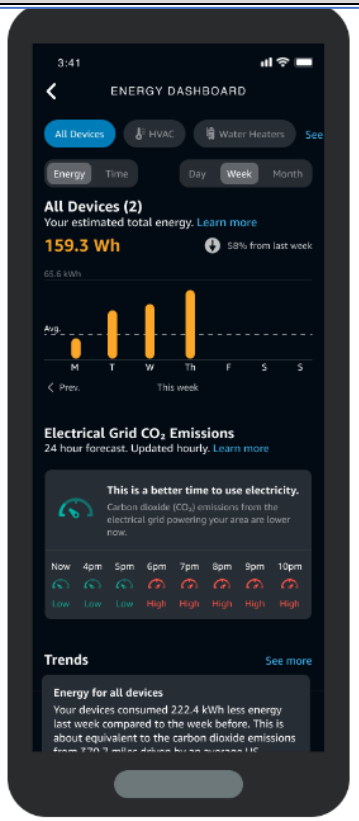
Ex.1015 / Page 151 of 264
AMAZON.COM, INC.

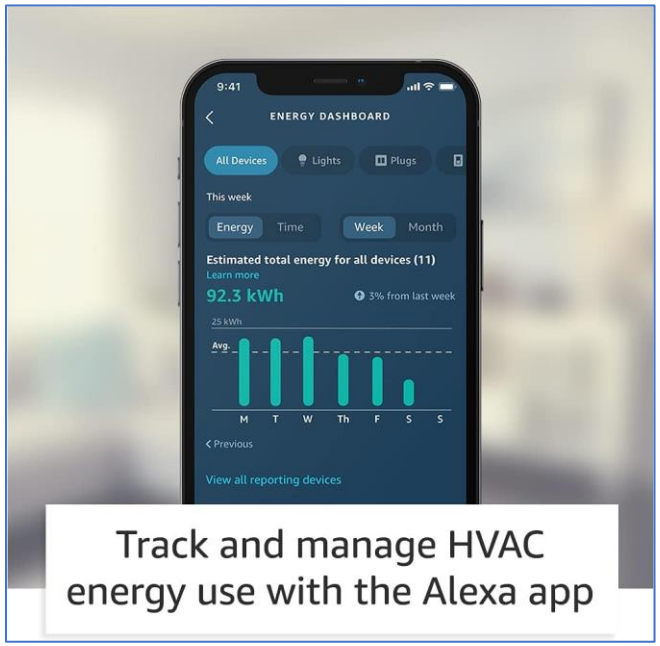
Claim 6	Accused Instrumentality(ies)
	 For example, Amazon provides the Alexa Energy Dashboard.[134]

[134] *See id.*

Claim 6	Accused Instrumentality(ies)
	Understanding your home's energy usage is easier than ever, with the Alexa energy dashboard. It works with a selection of high-load devices like water heaters and thermostats to help you track the usage of devices that consume the most energy in your home. Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you. It's a smart and convenient way to help your home be kinder to the world around it. Every device, every home, and every day counts. Let's make a difference, together. Amazon is committed to building a sustainable business for our customers and the planet. Learn more about our sustainability efforts.

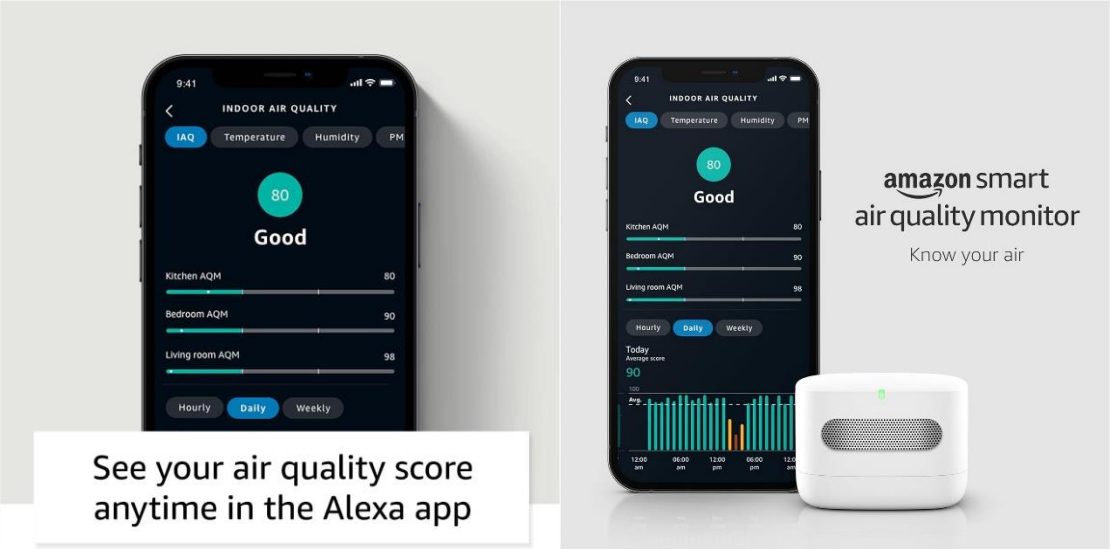
Ex.1015 / Page 153 of 264
AMAZON.COM, INC.

Claim 6	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** For example, the different networked devices may including: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine,

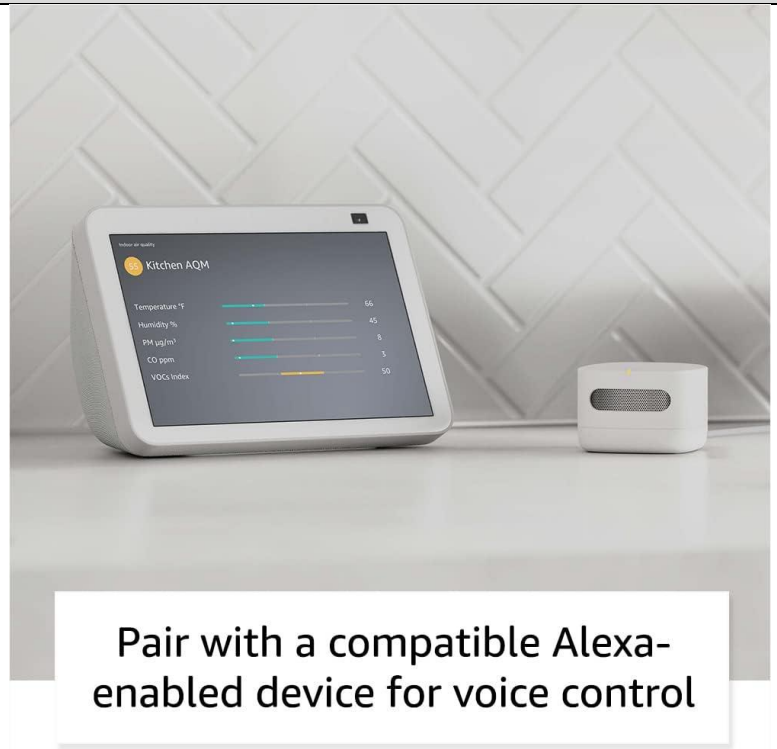
Claim 6	Accused Instrumentality(ies)
	Water heater, and Wi-Fi router.[135] For example, the Alexa app Energy Dashboard can track and manage HVAC energy use.[136] 

[135] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[136] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

Claim 6	Accused Instrumentality(ies)
	For example, the Alexa app Energy Dashboard can show air quality score.[137] 

[137] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

Claim 6	Accused Instrumentality(ies)
	 For example, Alexa can give helpful suggestions about connected smart devices.[138]

[138] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 6	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** For example, Alexa can show cameras.[139]

[139] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 158 of 264
AMAZON.COM, INC.

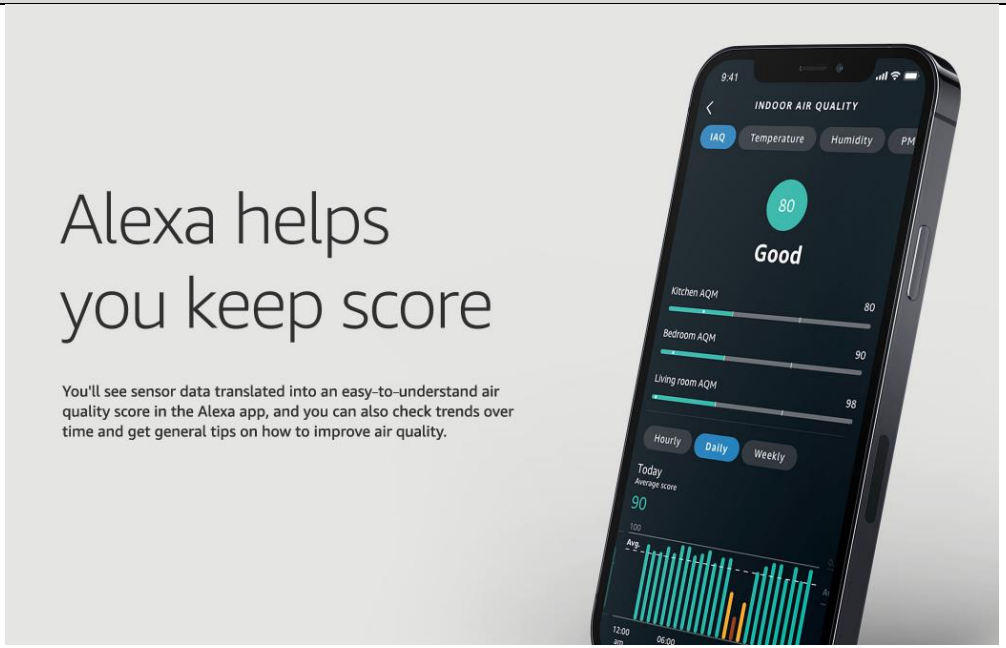
Claim 6	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. For example, Amazon provides AWS for various middleware and applications, including but not limited to Alexa, Smarthome, and IoT solutions. For example, Amazon provides AWS IoT Greengrass.[140]

[140] *See id.*

Ex.1015 / Page 159 of 264
AMAZON.COM, INC.

Claim 6	Accused Instrumentality(ies)
	AWS IoT Greengrass seamlessly extends AWS to devices so they can act locally on the data they generate, while still using the cloud for management, analytics, and durable storage. With AWS IoT Greengrass, connected devices can run AWS Lambda functions, run predictions based on machine learning models, keep device data in sync, and communicate with other devices securely – even when not connected to the internet. With AWS IoT Greengrass, you can use familiar languages and programming models to create and test your device software in the cloud, and then deploy it to your devices. AWS IoT Greengrass can be programmed to filter device data and only transmit necessary information back to the cloud. You can also connect to third-party applications, on-premises software, and AWS services out-of-the-box with AWS IoT Greengrass Connectors. Connectors also jumpstart device onboarding with pre-built protocol adapter integrations and allow you to streamline authentication via integration with AWS Secrets Manager. For example, Amazon's Alexa app allows you to see sensor data translated into an easy-to-understand air quality score.[141]

[141] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa*, https://www.amazon.com/dp/B08W8KS8D3/).

Claim 6	Accused Instrumentality(ies)
	 For example, Amazon's Echo (4th Gen) includes Wifi connectivity, Amazon Sidewalk, eero Built-in, and Bluetooth connectivity.[142]

[142] *See* KAIFI0001105 *(Amazon Echo (newest model), Ideal for large bedrooms, living rooms and kitchens, Alexa speaker with premium sound, Charcoal*, https://www.amazon.com/Echo-4th-Gen/dp/B07XKF5RM3?th=1).

Claim 6	Accused Instrumentality(ies)
	Wifi connectivity — Dual-band wifi supports 802.11a/b/g/n/ac (2.4 and 5 GHz) networks. Does not support connecting to ad-hoc (or peer-to-peer) wifi networks. **Amazon Sidewalk** — A shared network that helps compatible devices work better at home and beyond the front door. If wifi is lost, Sidewalk enables certain devices to stay connected. Also, Sidewalk helps devices like water sprinklers and pet locators work over longer distances. Sidewalk uses a small portion of your internet bandwidth to provide these benefits to you and your neighbors via Sidewalk Bridges (participating Echo and Ring devices), and is turned on for your device unless you have previously turned off the setting. You can turn off Sidewalk at any time. Learn more about Sidewalk. **Smart home hub** — Zigbee + Sidewalk + Matter + Thread Border Router **eero Built-in** — Your wifi network must use a compatible eero router and your Echo device must stay in range of a compatible eero device. You will need to link your eero and Amazon accounts and manage eero Built-in from the eero mobile application to use this feature. eero Built-in compatible Echo devices support up to 1,000 sq. ft. of additional coverage, speeds up to 100 Mbps, and 10 or fewer connected devices. Actual performance can vary and certain eero, Echo, or Alexa features may be incompatible with eero Built-in. Learn more about eero Built-in performance, availability and compatibility. Use of eero and eero-related products and services, including eero Built-in, requires creation of an eero account and agreement to eero's Terms of Service. Review eero's Privacy Notice. **Bluetooth connectivity** — Advanced Audio Distribution Profile (A2DP) support for audio streaming from your mobile device to Echo or from Echo to your Bluetooth speaker. Audio/Video Remote Control Profile (AVRCP) for voice control of connected mobile devices. Hands-free voice control is not supported for Mac OS X devices. Direct control of BLE Mesh. Bluetooth speakers requiring PIN codes are not supported. For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[143]

[143] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 6	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

<u>Claim 7 of the '232 Patent</u>

Claim 7	Accused Instrumentality(ies)
The ubiquitous sensor network middleware	The Accused Instrumentalities' sensor network abstraction unit comprises a sensor network interface for

Ex.1015 / Page 163 of 264
AMAZON.COM, INC.

Claim 7	Accused Instrumentality(ies)
apparatus as recited in claim 6, wherein the sensor network abstraction unit comprises: a sensor network interface for extracting the sensed data by referring to a message transfer protocol;	extracting the sensed data by referring to a message transfer protocol. For example, Amazon provides AWS IoT Core.[144] **What Is AWS IoT Core?** AWS IoT Core is a managed cloud service that lets connected devices interact with cloud applications and other devices. It can support a large volume of messages, and can process and route those messages to AWS endpoints and to other devices reliably and securely. AWS IoT Core makes it possible to build applications that act on the data generated by connected devices. These applications can be hosted in the cloud, which enables web-based access to these services, thus enhancing the scalability, accessibility, and maintenance of IoT systems. AWS IoT Core is particularly useful in IoT use cases where devices need to communicate with each other and the cloud, but do not have the ability to directly interact with backend services. AWS IoT Core acts as the communication hub between these devices and the backend services, handling all the complexities of concurrent communication, message routing, security, authorization, and error handling.

[144] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 7	Accused Instrumentality(ies)
	For example, AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. The support for these protocols ensures that devices can communicate with AWS IoT core.[145] **1. Device Communication: MQTT, HTTP, and WebSocket Protocols** One of the critical aspects of any IoT service is the communication protocol. AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. **MQTT (Message Queuing Telemetry Transport)** is a lightweight messaging protocol designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. HTTP and WebSockets are standard web protocols that devices can use to send and receive data from AWS IoT Core. The support for these protocols ensures that your devices can communicate with AWS IoT Core, irrespective of their capabilities or the network conditions. This feature is crucial in creating versatile, resilient IoT systems that can function seamlessly under varying conditions. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

[145] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 7	Accused Instrumentality(ies)
a sensor network interface protocol storage for managing a rule for the message transfer protocol;	The Accused Instrumentalities' sensor network abstraction unit comprises a sensor network interface protocol storage for managing a rule for the message transfer protocol. For example, Amazon provides AWS IoT Core, which manages protocols such as MQTT, HTTP, and WebSocket through the Message Broker.[146] **Message Broker** The Message Broker is a high throughput Pub/Sub messaging agent that securely transmits messages to and from all of your IoT devices and applications with low latency based on the MQTT Version 5.0 Message Standard. The flexible nature of the Message Broker's topic structure helps you send messages to, or receive messages from, a number of devices. It supports messaging patterns ranging from one-to-one command and control messaging, to one-to-one million (or more) broadcast notification systems and everything in between. Also, you can set up fine-grained access controls that help you manage the permissions of individual connections at the topic level. This verifies that your devices and applications will send and receive only the data that you want them to. The Message Broker is a fully managed service, so no matter how you choose to use it, it will scale automatically with your message volume without requiring you to run any infrastructure. For example, Amazon provides Rules Engine.[147]

[146] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/)..

[147] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 *(*EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 7	Accused Instrumentality(ies)
	Rules Engine The Rules Engine helps you build IoT applications that gather, process, analyze, and act on data generated by connected devices at a global scale without having to manage any infrastructure. The Rules Engine evaluates inbound messages published on AWS IoT Core and transforms and delivers them to another device or a cloud service, based on business rules you define. A rule can apply to data from one or many devices, and it can take one or many actions in parallel. The Rules Engine can also route messages to AWS endpoints including AWS IoT Analytics, AWS IoT Events, AWS Lambda, Amazon Kinesis, Amazon S3, Amazon DynamoDB, Amazon CloudWatch, Amazon Simple Notification Service (SNS), Amazon Simple Queue Service (SQS), Amazon Elasticsearch Service, AWS Step Functions, and Amazon Location Service. External endpoints can be reached using AWS Lambda, Amazon Kinesis, Amazon SNS, and the Rules Engine's native HTTP action. You can author rules within the AWS Management Console or write rules using a SQL-like syntax. Rules can be authored to behave differently depending upon the content of the message. For example, if a temperature reading exceeds a certain threshold, it could initiate a rule to transmit data to AWS Lambda. Rules can also be written to take into account other data in the cloud, such as data from other devices. For example, you could initiate an action if the temperature is more than 15% higher than the average of the five other devices. The Rules Engine provides dozens of available functions that can be used to transform your data, and it's possible to create infinitely more by using AWS Lambda. For example, if you're dealing with a wide range of values, you could take the average of the incoming numbers. Rules can also initiate the runtime of your Java, Node.js or Python code on AWS Lambda, giving you maximum flexibility and power to process device data.

Claim 7	Accused Instrumentality(ies)
	4. Rules Engine: Processing and Routing of IoT Data The Rules Engine is a service within AWS IoT Core that enables data processing and routing from IoT devices. The engine evaluates inbound messages published into AWS IoT Core and transforms and delivers them to another device or a cloud service, based on business rules you define. With the Rules Engine, you can filter, transform, and act upon device data on the fly, based on business rules you define. You can route the data to AWS services like AWS Lambda, Amazon DynamoDB, Amazon S3, Amazon Kinesis, Amazon SNS, and many others. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
and a sensor network monitor for monitoring a state of the sensor network, based on the data	The Accused Instrumentalities' sensor network abstraction unit comprises a sensor network monitor for monitoring a state of the sensor network, based on the data received from the sensor network interface. For example, Amazon provides AWS IoT Core Device Shadow.[148]

[148] *See* KAIFI0002118 *(AWS IoT Core,* https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#iot-device-shadows); *see also* KAIFI0001580 *(AWS IoT Core Features,* https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 *(*EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial,* https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 7	Accused Instrumentality(ies)
received from the sensor network interface.	**AWS IoT Device Shadow service** The AWS IoT Device Shadow service adds shadows to AWS IoT thing objects. Shadows can make a device's state available to apps and other services whether the device is connected to AWS IoT or not. AWS IoT thing objects can have multiple named shadows so that your IoT solution has more options for connecting your devices to other apps and services. **Device Shadow** With AWS IoT Core, you can create a persistent, virtual version, or Device Shadow, of each device. This includes the device's latest state so that applications or other devices can read messages and interact with the device. The Device Shadow persists the last reported state and desired future state of each device even when the device is offline. You can retrieve the last reported state of a device or set a desired future state through the API or use the rules engine. The Device Shadow makes it easier to build applications that interact with your devices by providing always available REST API operations. Also, applications can set the desired future state of a device without accounting for the devices' current state. AWS IoT Core will compare the difference between the desired and last reported state and command the device to make up the difference. The AWS IoT Device SDK makes it easier for your device to synchronize its state with its Device Shadow and to respond to desired future states set by using the Device Shadow. With Device Shadow you can store the state of your devices for up to a year, for free. If you update the Device Shadow at least once per year, then it will persist forever; otherwise, they will expire.

Claim 7	Accused Instrumentality(ies)
	3. Device Shadow: Storing and Retrieving Device State The Device Shadow feature in AWS IoT Core is a JSON document used to store and retrieve the current state of a device. This document enables applications to read from and write to the fields of the device shadow, providing a reliable way to track the device's state over time. This means even if your device is offline, you can set a desired future state, and the device will synchronize when it reconnects. For example, Amazon provides AWS IoT Core Registry.[149] **Registry** The registry establishes an identity for devices and tracks metadata, such as the devices' attributes and capabilities. The registry assigns an identity to each device that is consistently formatted regardless of the type of device or how it connects. It also supports metadata that describes the capabilities of a device (such as whether a sensor reports temperature and if the data are Fahrenheit or Celsius). The registry helps you store device metadata at no additional charge. Metadata in the registry does not expire if you access or update your registry entry at least once every 7 years. Learn more in the registry section of the AWS IoT Core user guide.

[149] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 *(*EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

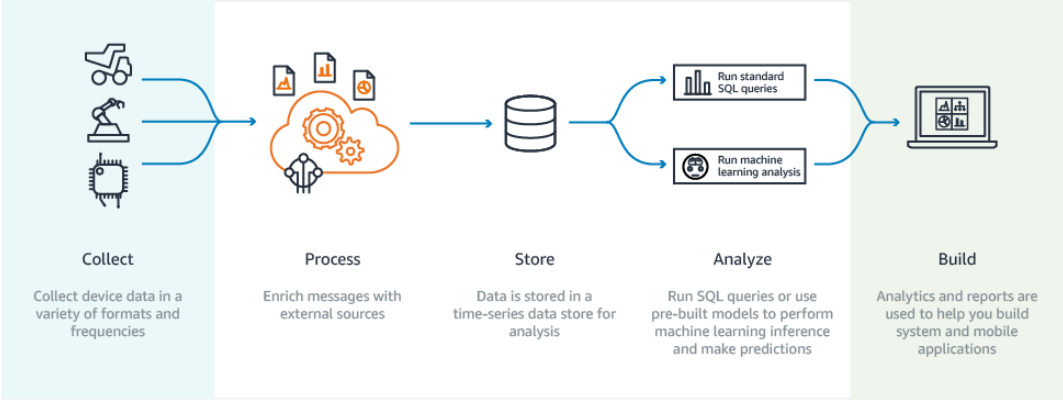
Claim 7	Accused Instrumentality(ies)
	5. Registry: Organize and Index Devices The Registry in AWS IoT Core allows you to categorize devices into a hierarchical structure based on function, security requirements, or any other category that fits your needs. The Registry also enables you to track metadata such as device attributes and capabilities. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

<u>Claim 8 of the ’232 Patent</u>

Claim 8	Accused Instrumentality(ies)
The ubiquitous sensor network middleware apparatus as recited in claim 7, wherein the sensor network intelligence unit comprises: a sensed data analyzer for performing an analysis operation to	The Accused Instrumentalities’ sensor network intelligence unit comprises: a sensed data analyzer for performing an analysis operation to clean, classify and integrate the sensed data processed by the sensor network abstraction unit.

Claim 8	Accused Instrumentality(ies)
clean, classify and integrate the sensed data processed by the sensor network abstraction unit;	For example, Amazon provides AWS IoT Analytics.[150] **AWS IoT Analytics** AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

[150] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf); *see also* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome)

Claim 8	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. **How to use AWS IoT Analytics** The following graphic shows an overview of how you can use AWS IoT Analytics.  For example, Amazon provides AWS IoT Analytics, which includes a SQL query engine to run ad-hoc

Claim 8	Accused Instrumentality(ies)
	queries and quickly retrieve results. [151] **Analyze** • Run Ad-hoc SQL queries—AWS IoT Analytics provides a SQL query engine so you can run ad-hoc queries and get results quickly. The service enables you to use standard SQL queries to extract data from the data store to answer questions like the average distance traveled for a fleet of connected vehicles or how many doors in a smart building are locked after 7pm. These queries can be re-used even if connected devices, fleet size, and analytic requirements change. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
an event processor for generating the event including the knowledge contents according to a rule set by the application	The Accused Instrumentalities' sensor network intelligence unit comprises an event processor for generating the conditional events including notification and alarm according to a rule set by the application program and managing the generated events. For example, Amazon provides AWS IoT Analytics, which is fully integrated with AWS IoT Core so it

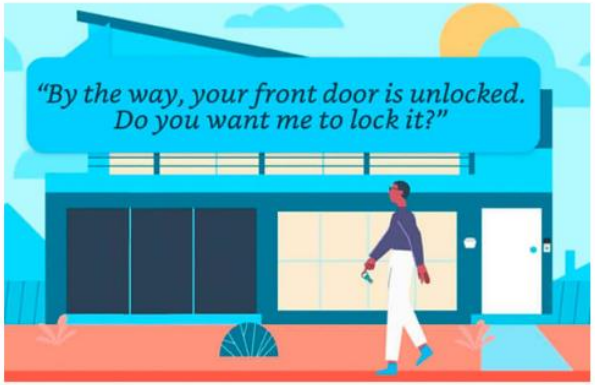
[151] *See* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

Claim 8	Accused Instrumentality(ies)
program and managing the generated event; and	can receive messages from connected devices as they stream in.[152] **Collect** • Integrated with AWS IoT Core—AWS IoT Analytics is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in. • Use a batch API to add data from any source—AWS IoT Analytics can receive data from any source through HTTP. That means that any device or service that is connected to the internet can send data to AWS IoT Analytics. For more information, see BatchPutMessage in the *AWS IoT Analytics API Reference*. • Collect only the data you want to store and analyze—You can use the AWS IoT Analytics console to configure AWS IoT Analytics to receive messages from devices through MQTT topic filters in various formats and frequencies. AWS IoT Analytics validates that the data is within specific parameters you define and creates channels. Then, the service routes the channels to appropriate pipelines for message processing, transformation, and enrichment. For example, Amazon provides Alexa Hunches.[153]

[152] *See* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

[153] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 175 of 264
AMAZON.COM, INC.

Claim 8	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"***  This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a context information manager for sensing and generating the environment condition information, based on the sensed data analyzed by the sensed data analyzer.	The Accused Instrumentalities' sensor network intelligence unit comprises a context information manager for sensing and generating the context aware information, based on the sensed data analyzed by the sensed data analyzer. For example. Amazon provides AWS IoT Analytics. Additionally, it can generate context-aware

Claim 8	Accused Instrumentality(ies)
	information through machine learning and analytical tools.[154] **AWS IoT Analytics** AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

[154] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 8	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[155] "Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras.

[155] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 8	Accused Instrumentality(ies)
	This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Claim 9 of the '232 Patent

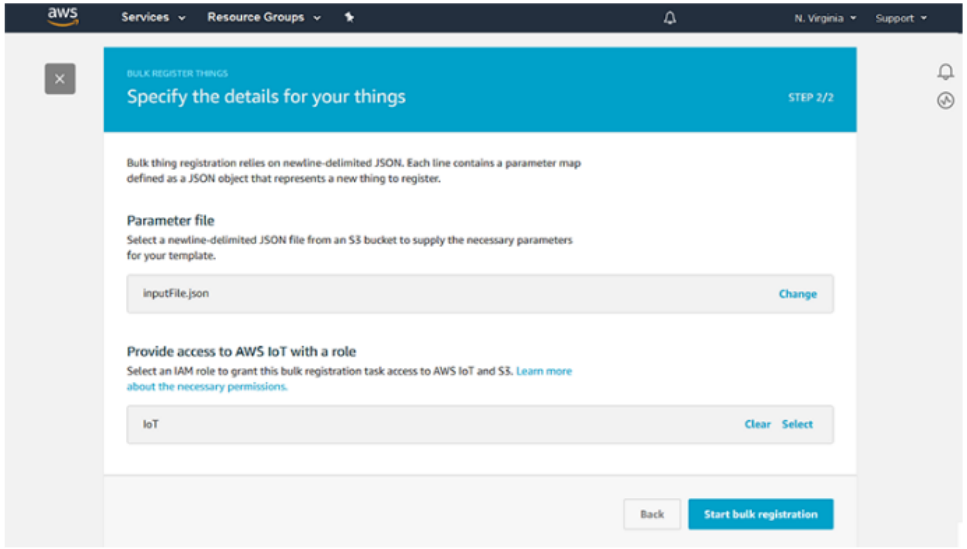
Claim 9	Accused Instrumentality(ies)
The ubiquitous sensor network middleware apparatus as recited in claim 8, wherein the service platform management unit comprises: a directory service manager for identifying and searching resources of the sensor network;	The Accused Instrumentalities' service platform management unit comprises a directory service manager for identifying and searching resources of the sensor network. For example, Amazon provides AWS Lambda.[156] **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume—there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service—all with zero administration. Just upload your code, and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically run from other AWS services, or you can call it directly from any web or mobile app.

[156] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 9	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Device Management.[157] **AWS IoT Device Management** As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments. For example, Amazon provides AWS IoT Device Management.[158]

[157] *See id.*

[158] *See* KAIFI0001738 *(AWS IoT Device Management features*, https://aws.amazon.com/iot-device-management/features/).

Claim 9	Accused Instrumentality(ies)
	Register connected devices in bulk Register new devices with AWS IoT Device Management. Using the IoT management console or API, you can upload templates that you populate with information like device manufacturer and serial number, X.509 identity certificates, or security policies. Then, you can configure the entire fleet of devices with this information in a few steps in the management console. Learn more about the bulk registration process.  This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation

Claim 9	Accused Instrumentality(ies)
	because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
a service process manager for scheduling and managing an operation order of the sensed data analyzer, the event processor, the context information manager, and	The Accused Instrumentalities' service platform management unit comprises a service process manager for scheduling and managing an operation order of the sensed data analyzer, the event processor, and the context information manager. For example, Amazon provides Amazon DynamoDB.[159] Amazon DynamoDB is a serverless, NoSQL database service that allows you to develop modern applications at any scale. As a serverless database, you only pay for what you use and DynamoDB scales to zero, has no cold starts, no version upgrades, no maintenance windows, no patching, and no downtime maintenance. DynamoDB offers a broad set of security controls and compliance standards. For globally distributed applications, DynamoDB global tables is a multi-Region, multi-active database with a 99.999% availability SLA and increased resilience. DynamoDB reliability is supported with managed backups, point-in-time recovery, and more. With DynamoDB streams, you can build serverless event-driven applications.

[159] *See* KAIFI0001220 *(Amazon DynamoDB*, https://aws.amazon.com/dynamodb/).

Claim 9	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Device Management Device Jobs.[160] Device Jobs: Device Jobs runs and monitors software updates and other remote operations such as device reboots. It lets you manage updates to a single device or to your entire fleet. You can control the pace of deployment (e.g. deploy to 10 devices per second), and receive real-time information about the status of your jobs as they're deployed to your devices. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
an application program interface for providing the application program with the results processed by the sensor network monitor, the sensed data analyzer, the event processor, the context information manager, and the directory service manager in an information	The Accused Instrumentalities' service platform management unit comprises an application program interface for providing the application program with the results processed by the sensor network monitor, the sensed data analyzer, the event processor, the context information manager, and the directory service manager in an information service form suitable for the application program. For example, Amazon provides Amazon Gateway API. [161]

[160] *See* KAIFI0001731 *(AWS IoT Device Management FAQs*, https://aws.amazon.com/iot-device-management/faqs/).

[161] *See* KAIFI0001210 *(Amazon API Gateway*, https://aws.amazon.com/api-gateway/).

Claim 9	Accused Instrumentality(ies)
service form suitable for the application program	Amazon API Gateway is a fully managed service that makes it easy for developers to create, publish, maintain, monitor, and secure APIs at any scale. APIs act as the "front door" for applications to access data, business logic, or functionality from your backend services. Using API Gateway, you can create RESTful APIs and WebSocket APIs that enable real-time two-way communication applications. API Gateway supports containerized and serverless workloads, as well as web applications. For example, Amazon provides AWS IoT Device Management and APIs.[162]

[162] *See* KAIFI0001608 *(AWS IoT Device Management Documentation*, https://docs.aws.amazon.com/iot-device-management/); *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

Claim 9	Accused Instrumentality(ies)
	AWS IoT Device Management Documentation AWS IoT Device Management is a cloud-based device management service that makes it easy for customers to securely manage IoT devices throughout their lifecycle. Customers can use AWS IoT Device Management to onboard device information and configuration, organize their device inventory, monitor their fleet of devices, and remotely manage devices deployed across many locations. This remote management includes over-the-air (OTA) updates to device software. **Developer Guide** Describes device provisioning, thing groups, and jobs that are sent to and run on one or more devices connected to AWS IoT Core. HTML | PDF **API Reference** Describes all the API operations for AWS IoT Device Management in detail. Provides examples of request and response syntax. HTML | PDF **Fleet Hub for AWS IoT Device Management** **User Guide** You can use Fleet Hub for AWS IoT Device Management to build standalone web applications for monitoring the health of your device fleets. HTML | PDF

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

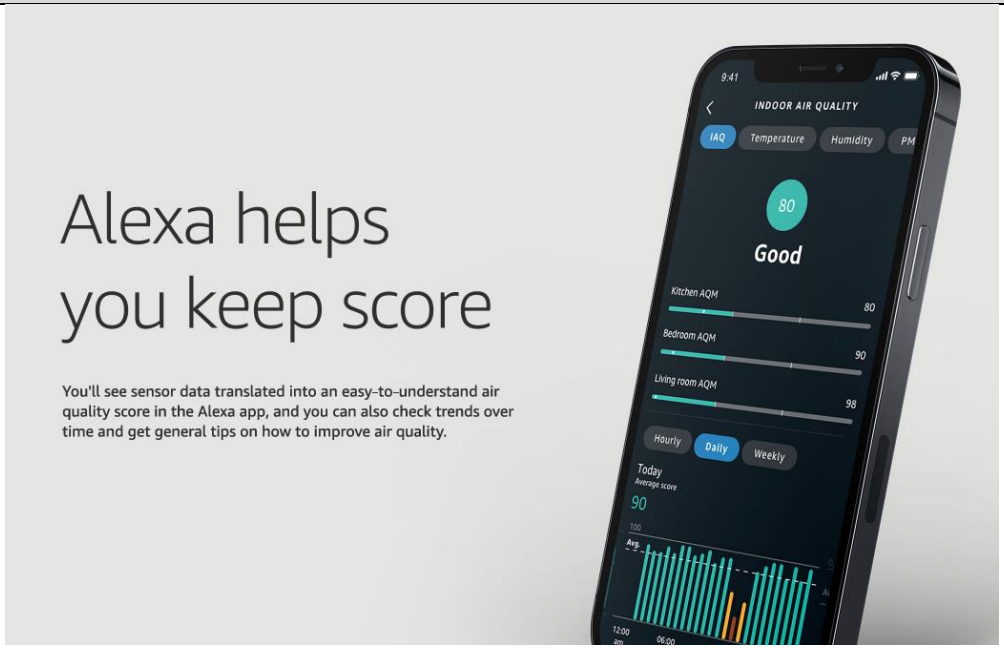
Claim 9	Accused Instrumentality(ies)

	AWS IoT Device Management - jobs data endpoints
	
	The AWS IoT Device Management - jobs data endpoints are specific to each AWS account and AWS Region. To find the AWS IoT Device Management - jobs data endpoint for your AWS account and AWS Region, use the **describe-endpoint** CLI command shown here, or the `DescribeEndpoint` REST API.
	
	`aws iot describe-endpoint --endpoint-type iot:Jobs`
	
	This command returns your Jobs data plane API endpoint in the following format:
	
	`account-specific-prefix.jobs.iot.aws-region.amazonaws.com.`
	
	For information about the actions supported by the AWS IoT Device Management - jobs data endpoints, see AWS IoT jobs data plane operations in the *AWS IoT API Reference*.
	
	The following table contains AWS Region-specific endpoints that AWS IoT Core supports for job data operations. In the **Endpoint** column, the `account-specific-prefix` from your account-specific endpoint replaces the `data` shown in the generic endpoint representation.

Claim 9	Accused Instrumentality(ies)
	AWS IoT Device Management - secure tunneling endpoints AWS IoT supports additional endpoints for secure tunneling. **Secure Tunneling Management APIs Endpoints** For example, Amazon's Alexa app allows you to see sensor data translated into an easy-to-understand air quality score.[163]

Region Name	Region	Endpoint	Protocol
US East (Ohio)	us-east-2	api.tunneling.iot.us-east-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-2.amazonaws.com	HTTPS
US East (N. Virginia)	us-east-1	api.tunneling.iot.us-east-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-1.amazonaws.com	HTTPS
US West (N. California)	us-west-1	api.tunneling.iot.us-west-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-1.amazonaws.com	HTTPS
US West (Oregon)	us-west-2	api.tunneling.iot.us-west-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-2.amazonaws.com	HTTPS
Asia Pacific (Hong Kong)	ap-east-1	api.tunneling.iot.ap-east-1.amazonaws.com	HTTPS
Asia Pacific (Mumbai)	ap-south-1	api.tunneling.iot.ap-south-1.amazonaws.com	HTTPS
Asia Pacific (Seoul)	ap-northeast-2	api.tunneling.iot.ap-northeast-2.amazonaws.com	HTTPS
Asia Pacific (Singapore)	ap-southeast-1	api.tunneling.iot.ap-southeast-1.amazonaws.com	HTTPS
Asia Pacific (Sydney)	ap-southeast-2	api.tunneling.iot.ap-southeast-2.amazonaws.com	HTTPS
Asia Pacific (Tokyo)	ap-northeast-1	api.tunneling.iot.ap-northeast-1.amazonaws.com	HTTPS

[163] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

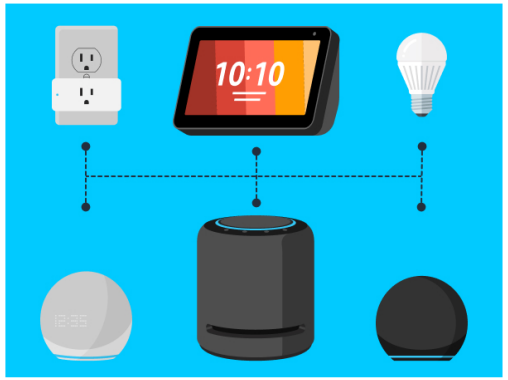
Claim 9	Accused Instrumentality(ies)
	 This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

<u>Claim 10 of the ’232 Patent</u>

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 10	Accused Instrumentality(ies)
A method for generating an information service based on heterogeneous sensor networks in a ubiquitous sensor network middleware apparatus, comprising:	Amazon practices a method for generating an information service based on heterogeneous sensor networks in a ubiquitous sensor network middleware apparatus. For example, Amazon provides the Alexa Smart Home.[164] Connecting devices to Alexa Creating a connected home is easy. Simply plug in and power on your new smart home device. Then say, "Alexa, discover devices." You can also add devices through the Amazon Alexa app: 1. Open the Alexa app and select **Devices**. 2. Tap the **+** icon and select **Add Device**. 3. Choose the device type and brand. 4. Follow the on-screen prompts. Expand your smart home Lighting: Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras: Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what's happening with the Amazon Alexa app, no matter where you are. Televisions: Smart TVs let you use your voice to open streaming apps, change the channel, adjust the volume, and more when paired with an Alexa-enabled device. When you're done watching, just say, "Alexa, turn off the TV." Thermostats: Heating and cooling costs can really add up. Smart thermostats can help you save energy by adjusting your home's temperature when you're away.

[164] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 10	Accused Instrumentality(ies)
	 A simpler way to create your smart home Your smart home should just work, regardless of the smart device brands you choose. That's why Alexa supports multiple ways to connect them, including Wi-Fi, Bluetooth Low Energy, Zigbee, and now Matter, meaning more products than ever work with Alexa. Learn More For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[165] For example, Amazon provides the Alexa app.[166] For example, Amazon provides Alexa Energy Dashboard.[167]

[165] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[166] *See* KAIFI0007048 *(The Alexa App*, https://www.amazon.com/Alexa-App/b?ie=UTF8&node=18354642011).

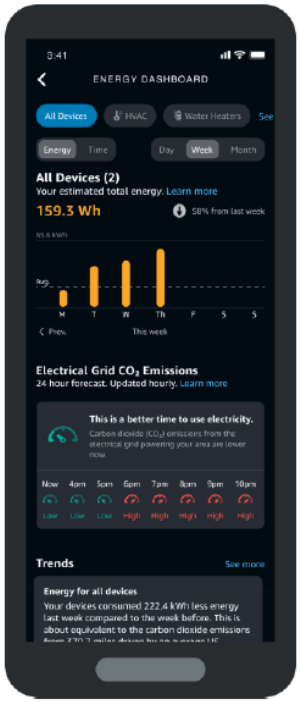
[167] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci).

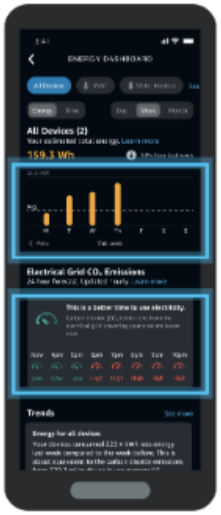
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 10	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

Ex.1015 / Page 191 of 264
AMAZON.COM, INC.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 10	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** Simple to set up and use

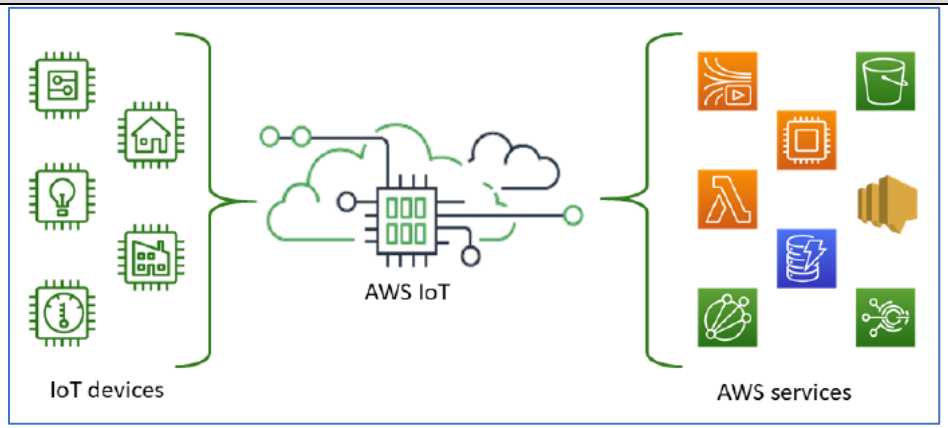
Claim 10	Accused Instrumentality(ies)
	 4- Start tracking and managing the energy usage of your Alexa-connected device. View a 24-hour forecast of when cleaner energy is available in your area. For example, the Alexa app can discover and add different networked devices.[168] For example, networked devices may include: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb,

[168] *See* KAIFI0007810 *(How to Set up Devices with Alexa | Amazon Echo*, https://youtu.be/XFfm_nEqVpk?si=r9Eo35tCu8MDd5cV); *see also* KAIFI0007808 *(How To Connect Smart Home Devices to Alexa*, https://www.youtube.com/watch?v=tT458bs2QPU).

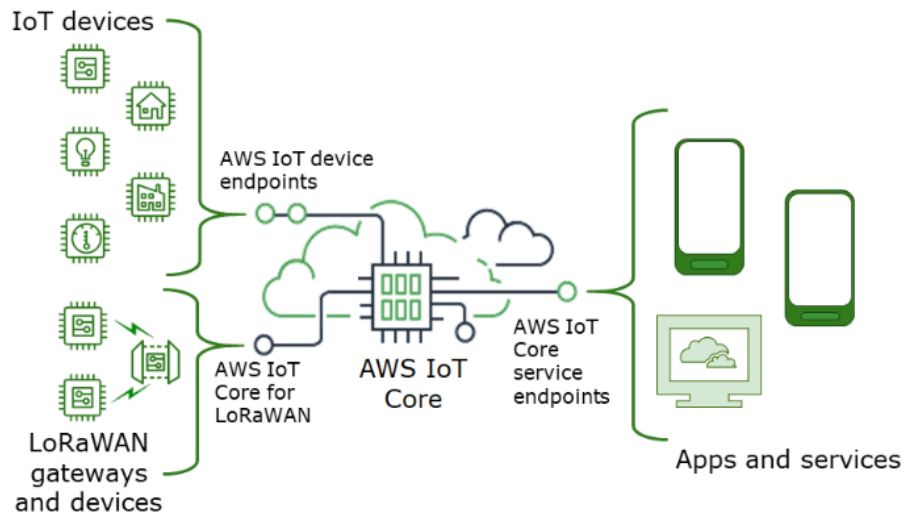
Claim 10	Accused Instrumentality(ies)
	Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[169] For example, Amazon provides AWS IoT.[170] **What is AWS IoT?** AWS IoT provides the cloud services that connect your IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help you integrate your IoT devices into AWS IoT-based solutions. If your devices can connect to AWS IoT, AWS IoT can connect them to the cloud services that AWS provides.

[169] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

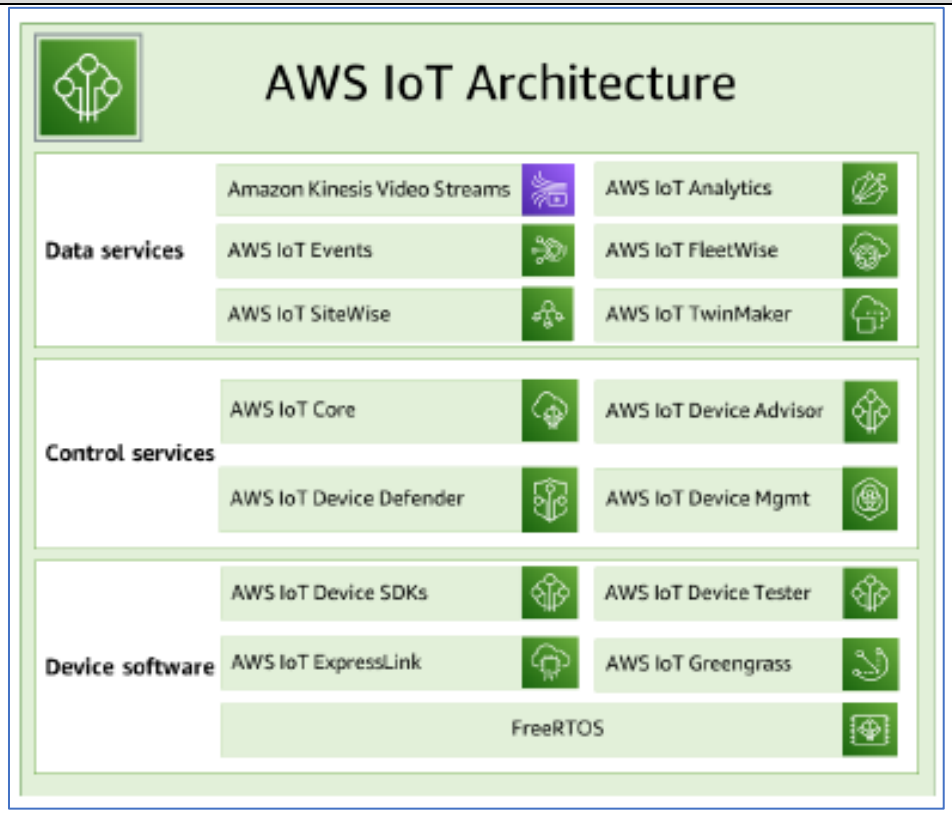
[170] *See* KAIFI0002118 *(AWS IoT Core* (2024), https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#aws-iot-how-it-works).

Claim 10	Accused Instrumentality(ies)
	 For example, Amazon provides AWS IoT Core, which supports connections with IoT devices, wireless gateways, services, and apps.[171]

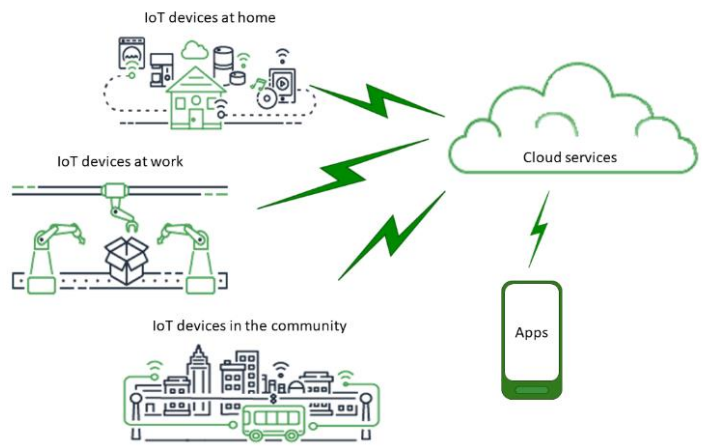
[171] *See* KAIFI0002118 *(Connect to AWS IoT Core*, https://docs.aws.amazon.com/iot/latest/developerguide/connect-to-iot.html).

Claim 10	Accused Instrumentality(ies)
	Connect to AWS IoT Core PDF AWS IoT Core supports connections with IoT devices, wireless gateways, services, and apps. Devices connect to AWS IoT Core so they can send data to and receive data from AWS IoT services and other devices. Apps and other services also connect to AWS IoT Core to control and manage the IoT devices and process the data from your IoT solution. This section describes how to choose the best way to connect and communicate with AWS IoT Core for each aspect of your IoT solution.  For example, Amazon provides AWS IoT Architecture. [172]

[172] *See id.*

Claim 10	Accused Instrumentality(ies)
	 For example, AWS IoT provides cloud services and device support.[173]

[173] *See* KAIFI0002118 *(How AWS IoT works*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-how-it-works.html).

Claim 10	Accused Instrumentality(ies)
	AWS IoT provides cloud services and device support that you can use to implement IoT solutions. AWS provides many cloud services to support IoT-based applications. So to help you understand where to start, this section provides a diagram and definition of essential concepts to introduce you to the IoT universe. **The IoT universe** In general, the Internet of Things (IoT) consists of the key components shown in this diagram.  For example, Amazon provides IoT solutions on AWS to connect devices and collect, store, and analyze

Claim 10	Accused Instrumentality(ies)
	device data.[174] **Product Benefits** There are billions of devices in homes, factories, oil wells, hospitals, cars, and thousands of other places. With the proliferation of devices, you increasingly need solutions to connect them, and collect, store, and analyze device data. **Broad & Deep** AWS has broad and deep IoT services, from the edge to the cloud. AWS IoT is the only cloud vendor to bring together data management and rich analytics in easy to use services designed for noisy IoT data. **Multi-Layered Security** AWS IoT offers services for all layers of security, including preventive security mechanisms, like encryption and access control to device data, and a service to continuously monitor and audit configurations. **Superior AI Integration** AWS brings AI and IoT together to make devices more intelligent. You can create models in the cloud and deploy them to devices where they run 2x faster compared to other offerings. **Proven at Scale** AWS IoT is built on a secure and proven cloud infrastructure, and scales to billions of devices and trillions of messages. AWS IoT integrates with other AWS services, so you can build complete solutions. For example, Amazon provides connectivity, control, and analytics services.[175]

[174] *See* KAIFI0001934 *(Build IoT Solutions for Free on AWS*, https://aws.amazon.com/free/iot/?nc1=h_ls).

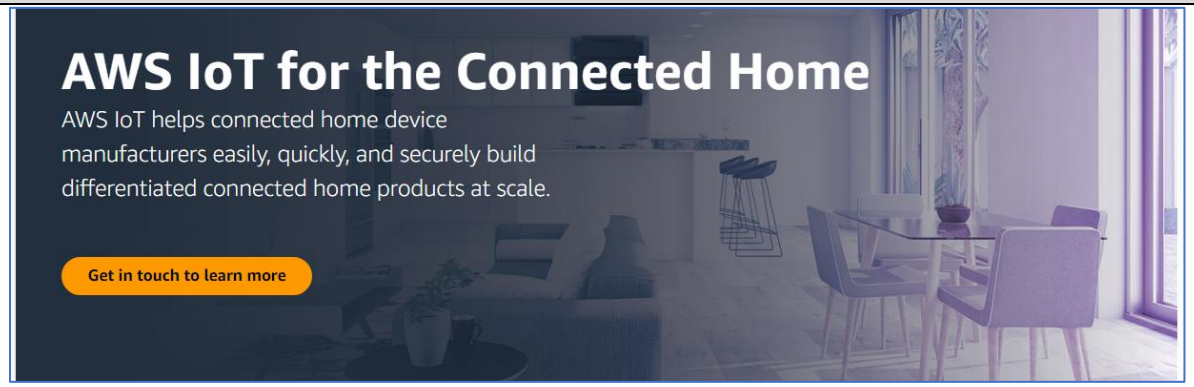
[175] *See id.*

Claim 10	Accused Instrumentality(ies)

PRODUCT	DESCRIPTION
AWS IoT Core	Connectivity & Control Services Connect IoT devices to the AWS cloud without the need to provision or manage servers
AWS IoT Device Management	Connectivity & Control Services Onboard, organize, monitor, and remotely manage connected devices at scale.
AWS IoT Device Defender	Connectivity & Control Services A fully managed service that helps you secure your fleet of IoT devices.
AWS IoT Events	Analytics Services AWS IoT Events is a fully managed IoT service that makes it easy to detect and respond to events from IoT sensors and applications.
AWS IoT SiteWise	Analytics Services A managed service that makes it easy to collect, store, organize, and monitor data from industrial equipment at scale to help you make better, data-driven decisions.
AWS IoT Greengrass	Device Software Local compute, messaging, data caching, and sync capabilities for connected devices.
FreeRTOS	Edge Computing Open source, real-time operating system for microcontrollers that makes small, low-power edge devices easy to program, deploy, secure, connect, and manage.

For example, Amazon provides AWS IoT for the Connected Home.[176]

[176] *See* KAIFI0001754 *(AWS IoT for the Connected Home*, https://aws.amazon.com/iot/solutions/connected-home/).

Claim 10	Accused Instrumentality(ies)
	 As the use of connected home devices continues to grow, more and more data is being pushed to the cloud, where the latest IoT and machine learning technologies are enabling new innovations in connected home applications. AWS IoT makes it easy for you to build scalable IoT applications that collect, process, analyze, and act on data generated by connected home devices without having to manage any infrastructure. This helps you focus on building solutions and experiences that deliver value to both your businesses and your consumers and create a new class of connected home applications that interact with the physical world. For example, Amazon provides IoT for Connected Home for Home Automation & Voice Enablement, Home Security & Monitoring, and Home Network Management.[177]

[177] *See id.*

Claim 10	Accused Instrumentality(ies)
	 IoT for Connected Home Use Cases Home Automation & Voice Enablement Using AWS IoT, you can enable any device to connect to the Internet and perform a desired action quickly, reliably, and easily. These devices can work alone or together with other devices or hubs for an integrated smart home experience. Additionally, devices can also benefit from using voice services like Alexa for a seamless customer experience. See the infographic >> Home Security & Monitoring Devices like door locks, security cameras, and water leak detectors built with AWS IoT can use machine learning to automatically detect threats, take action, and send alerts to home owners. AWS IoT enables devices to run with low-latency and compute data locally, without internet connectivity. See the infographic >> Home Network Management Network operators are looking for new ways to help customers quickly discover, troubleshoot, and fix home network issues including Wi-Fi and cable TV connectivity. AWS IoT enabled set-top boxes can automatically log network diagnostics and send to the customer service center proactively or allow customers to monitor and troubleshoot their network health through a mobile app. See the infographic >> For example, Amazon connects devices to Alexa with a range of software and hardware solutions.[178]

[178] *See* KAIFI0001149 *(Build Your Alexa Connected Device*, https://developer.amazon.com/en-US/alexa/devices/connected-devices/development-resources#local-connection).

Claim 10	Accused Instrumentality(ies)

	On the Cloud	On Device Module	Local Connection	Alexa Built-in
Connectivity Type	Connect your cloud to Alexa's cloud with Alexa skills	Add an on-device hardware module	Connect via local connectivity protocols	No additional integration required; use your existing AVS client
Technology	**Smart Home Skill API, Custom Skill API, Multi-Capability Skills**	**Alexa Connect Kit (ACK)**	**Zigbee, Bluetooth, Z-Wave and other local connectivity protocols**	**Alexa Voice Service (AVS) API**
Key Consideration	Requires your own device cloud	Managed service: No need to create a skill or manage cloud service	Zigbee or Z-Wave certified	Must have a microphone and meet AVS development requirements.
Supported Devices	Any smart device with Wi-Fi	Any device with a microcontroller: coffee makers, ovens, microwaves	Zigbee or Z-Wave certified lights, locks, plugs, sensors	Any device with Alexa Built-in
Voice User Interface	Pre-built (Amazon-defined) or custom built	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)	Pre-built (Amazon-defined)
Certification Eligibility	Works with Alexa	Works with Alexa	Works with Alexa	Alexa Built-In
Development Information	Smart Home Skill API	Alexa Connect Kit	Local Connection	Smart Home for AVS

For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm Base Stations.[179]

[179] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).

Ex.1015 / Page 203 of 264
AMAZON.COM, INC.

Claim 10	Accused Instrumentality(ies)
	Protocols and Ports Used by Ring Devices Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[180] **Welcome to Amazon Sidewalk** Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk.

[180] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

Claim 10	Accused Instrumentality(ies)
extracting sensed data and monitoring a state management of a sensor network, based on the extracted sensed data;	Amazon extracts sensed data and monitoring a state management of a sensor network, based on the extracted sensed data. For example, Amazon provides AWS IoT Core.[181] **What Is AWS IoT Core?** AWS IoT Core is a managed cloud service that lets connected devices interact with cloud applications and other devices. It can support a large volume of messages, and can process and route those messages to AWS endpoints and to other devices reliably and securely. AWS IoT Core makes it possible to build applications that act on the data generated by connected devices. These applications can be hosted in the cloud, which enables web-based access to these services, thus enhancing the scalability, accessibility, and maintenance of IoT systems. AWS IoT Core is particularly useful in IoT use cases where devices need to communicate with each other and the cloud, but do not have the ability to directly interact with backend services. AWS IoT Core acts as the communication hub between these devices and the backend services, handling all the complexities of concurrent communication, message routing, security, authorization, and error handling.

[181] *See* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 10	Accused Instrumentality(ies)
	For example, AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. The support for these protocols ensures that devices can communicate with AWS IoT core.[182] **1. Device Communication: MQTT, HTTP, and WebSocket Protocols** One of the critical aspects of any IoT service is the communication protocol. AWS IoT Core supports three main protocols: MQTT, HTTP, and WebSocket. **MQTT (Message Queuing Telemetry Transport)** is a lightweight messaging protocol designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. HTTP and WebSockets are standard web protocols that devices can use to send and receive data from AWS IoT Core. The support for these protocols ensures that your devices can communicate with AWS IoT Core, irrespective of their capabilities or the network conditions. This feature is crucial in creating versatile, resilient IoT systems that can function seamlessly under varying conditions. For example, Amazon provides AWS IoT Core Device Shadow service.[183]

[182] *See id.*

[183] *See* KAIFI0002118 *(AWS IoT Core*, https://docs.aws.amazon.com/pdfs/iot/latest/developerguide/iot-dg.pdf#iot-device-shadows); *see also* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/).; *see also* KAIFI0007096 (EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 10	Accused Instrumentality(ies)
	AWS IoT Device Shadow service The AWS IoT Device Shadow service adds shadows to AWS IoT thing objects. Shadows can make a device's state available to apps and other services whether the device is connected to AWS IoT or not. AWS IoT thing objects can have multiple named shadows so that your IoT solution has more options for connecting your devices to other apps and services. **Device Shadow** With AWS IoT Core, you can create a persistent, virtual version, or Device Shadow, of each device. This includes the device's latest state so that applications or other devices can read messages and interact with the device. The Device Shadow persists the last reported state and desired future state of each device even when the device is offline. You can retrieve the last reported state of a device or set a desired future state through the API or use the rules engine. The Device Shadow makes it easier to build applications that interact with your devices by providing always available REST API operations. Also, applications can set the desired future state of a device without accounting for the devices' current state. AWS IoT Core will compare the difference between the desired and last reported state and command the device to make up the difference. The AWS IoT Device SDK makes it easier for your device to synchronize its state with its Device Shadow and to respond to desired future states set by using the Device Shadow. With Device Shadow you can store the state of your devices for up to a year, for free. If you update the Device Shadow at least once per year, then it will persist forever; otherwise, they will expire.

Claim 10	Accused Instrumentality(ies)
	3. Device Shadow: Storing and Retrieving Device State The Device Shadow feature in AWS IoT Core is a JSON document used to store and retrieve the current state of a device. This document enables applications to read from and write to the fields of the device shadow, providing a reliable way to track the device's state over time. This means even if your device is offline, you can set a desired future state, and the device will synchronize when it reconnects. For example, Amazon provides AWS IoT Core Registry.[184] **Registry** The registry establishes an identity for devices and tracks metadata, such as the devices' attributes and capabilities. The registry assigns an identity to each device that is consistently formatted regardless of the type of device or how it connects. It also supports metadata that describes the capabilities of a device (such as whether a sensor reports temperature and if the data are Fahrenheit or Celsius). The registry helps you store device metadata at no additional charge. Metadata in the registry does not expire if you access or update your registry entry at least once every 7 years. Learn more in the registry section of the AWS IoT Core user guide.

[184] *See* KAIFI0001580 *(AWS IoT Core Features*, https://aws.amazon.com/iot-core/features/); *see also* KAIFI0007096 *(*EMQX Cloud Team, *Understanding AWS IoT Core: Features, Use Cases & Quick Tutorial*, https://www.emqx.com/en/blog/understanding-aws-iot-core).

Claim 10	Accused Instrumentality(ies)
	5. Registry: Organize and Index Devices The Registry in AWS IoT Core allows you to categorize devices into a hierarchical structure based on function, security requirements, or any other category that fits your needs. The Registry also enables you to track metadata such as device attributes and capabilities. For example, Amazon provides connected Ring devices, such as Ring doorbells, cameras, and Alarm Base Stations.[185] **Protocols and Ports Used by Ring Devices** Ring devices deliver advanced features such as notifications, video streams, and two-way audio to your mobile devices. In order for these features to work properly, Ring doorbells, cameras, and Alarm Base Stations need a healthy connection in order to contact services on the internet. For example, Amazon provides Amazon Sidewalk, a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better.[186]

[185] *See* KAIFI0007820 (*Protocols and Ports Used by Ring Devices*, https://ring.com/support/articles/xws8s/Protocols-and-Ports-Used-by-Ring-Devices?srsltid=AfmBOop6VO4M1-rkJqOA2jtg3m0FV5ibQNaDbMRVZht4n-dwm-jdbR3c).
[186] *See* KAIFI0007831 *(Connected Convenience Beyond Your Front Door*, https://ring.com/amazon-sidewalk?srsltid=AfmBOorsRCMtrtIeRgnmBcryL4ViGGQJucRq5UXsgFdHiAy-piRRnQmz).

Claim 10	Accused Instrumentality(ies)
	Welcome to Amazon Sidewalk Amazon Sidewalk is a shared network that helps devices like Amazon Echo devices, Ring Security Cams, outdoor lights, and motion sensors work better at home and beyond the front door. When enabled, Sidewalk can unlock unique benefits for your device, support other Sidewalk devices in your community, and even open the door to new innovations like locating items connected to Sidewalk. For example, Amazon's Alexa Smart Home devices include smart lights and smart cameras.[187]

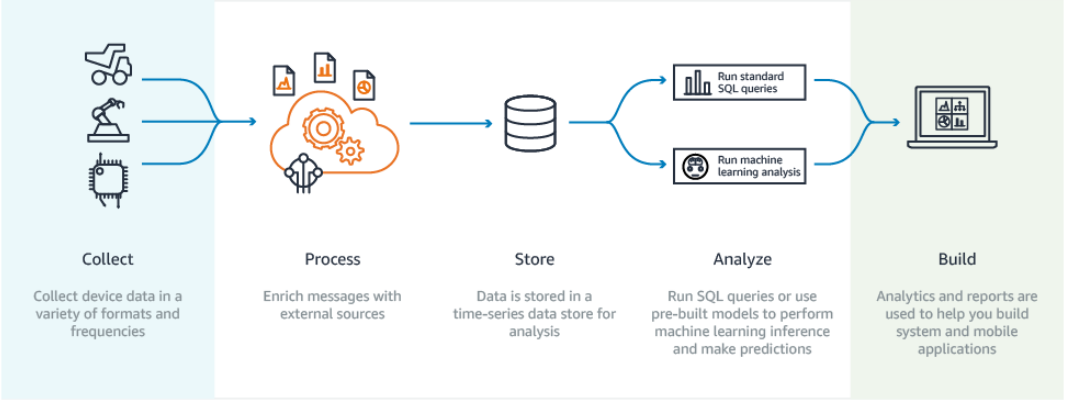
[187] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 210 of 264
AMAZON.COM, INC.

Claim 10	Accused Instrumentality(ies)
	 Lighting Smart lights let you control your connected lights through your phone or by voice when paired with Alexa. You can create timers and routines to automate your entire smart home lighting setup. Cameras Smart cameras let you monitor activity inside and around your home. After connecting your cameras to Alexa, you can view footage on compatible Echo devices. Relax and be confident that you can keep an eye on what's happening with the Amazon Alexa app, no matter where you are. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
performing an analysis operation to clean, classify and integrate the extracted sensed data; extracting object and environment information	Amazon performs an analysis operation to clean, classify and integrate the extracted sensed data; extract object and environment information from the analyzed sensed data, and generate context aware information based on the extracted object and environment information.

Claim 10	Accused Instrumentality(ies)
from the analyzed sensed data, and generating context aware information based on the extracted object and environment information;	For example, Amazon provides AWS IoT Analytics.[188] **AWS IoT Analytics** AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

[188] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf); *see also* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

Claim 10	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. **How to use AWS IoT Analytics** The following graphic shows an overview of how you can use AWS IoT Analytics.  For example, Amazon provides AWS IoT Analytics, which provides a SQL query engine to run ad-hoc

Claim 10	Accused Instrumentality(ies)
	queries and quickly retrieve results. [189] **Analyze** • Run Ad-hoc SQL queries—AWS IoT Analytics provides a SQL query engine so you can run ad-hoc queries and get results quickly. The service enables you to use standard SQL queries to extract data from the data store to answer questions like the average distance traveled for a fleet of connected vehicles or how many doors in a smart building are locked after 7pm. These queries can be re-used even if connected devices, fleet size, and analytic requirements change. For example, Amazon provides AWS IoT Analytics, which is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in.[190]

[189] *See* KAIFI0007146 (*AWS IoT Analytics* https://docs.aws.amazon.com/pdfs/iotanalytics/latest/userguide/iotanalytics-ug.pdf#welcome).

[190] *See id.*

Claim 10	Accused Instrumentality(ies)
	Collect • Integrated with AWS IoT Core—AWS IoT Analytics is fully integrated with AWS IoT Core so it can receive messages from connected devices as they stream in. • Use a batch API to add data from any source—AWS IoT Analytics can receive data from any source through HTTP. That means that any device or service that is connected to the internet can send data to AWS IoT Analytics. For more information, see BatchPutMessage in the *AWS IoT Analytics API Reference*. • Collect only the data you want to store and analyze—You can use the AWS IoT Analytics console to configure AWS IoT Analytics to receive messages from devices through MQTT topic filters in various formats and frequencies. AWS IoT Analytics validates that the data is within specific parameters you define and creates channels. Then, the service routes the channels to appropriate pipelines for message processing, transformation, and enrichment. For example. Amazon provides AWS IoT Analytics.[191]

[191] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Ex.1015 / Page 215 of 264
AMAZON.COM, INC.

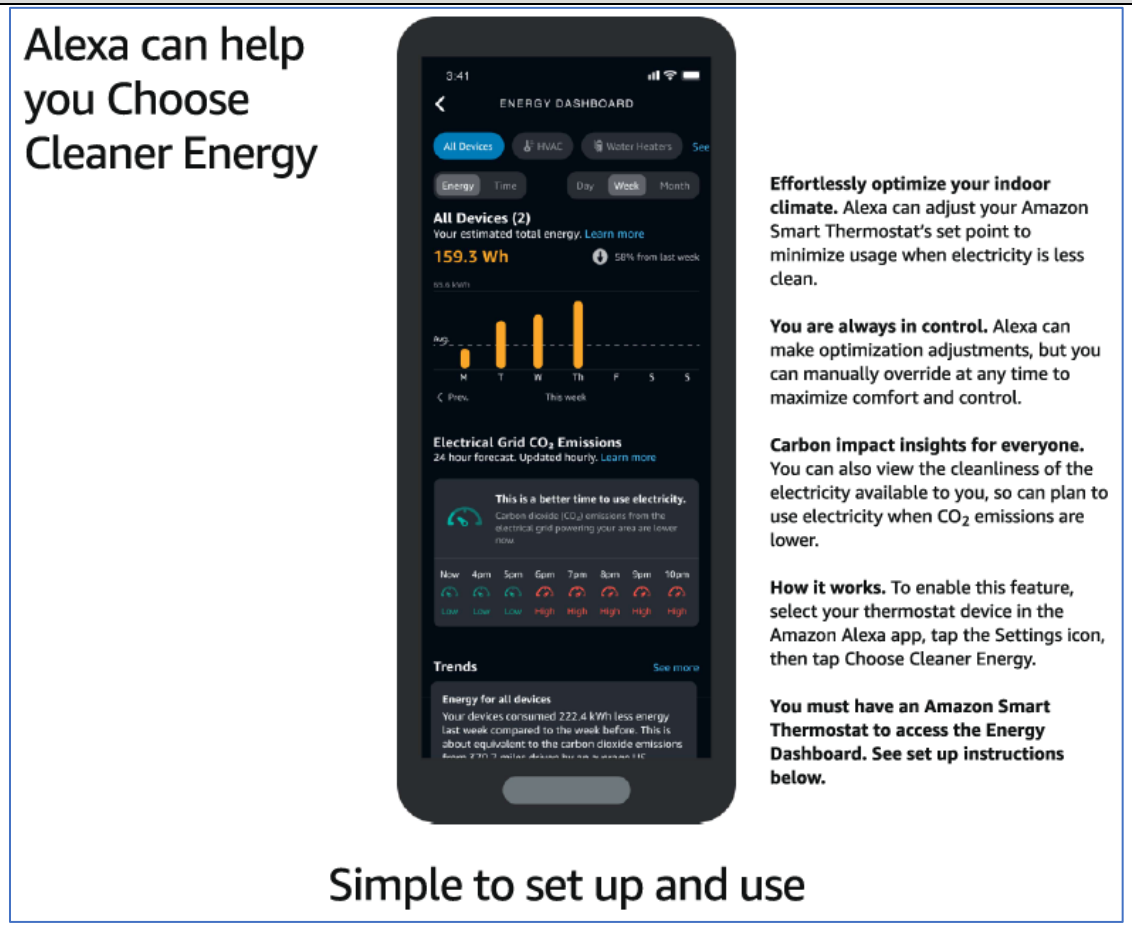
Claim 10	Accused Instrumentality(ies)
	AWS IoT Analytics AWS IoT Analytics is a fully-managed service that makes it easy to run and operationalize sophisticated analytics on massive volumes of IoT data without having to worry about the cost and complexity typically required to build an IoT analytics platform. It is the easiest way to run analytics on IoT data and get insights to make better and more accurate decisions for IoT applications and machine learning use cases. IoT data is highly unstructured which makes it difficult to analyze with traditional analytics and business intelligence tools that are designed to process structured data. IoT data comes from devices that often record fairly noisy processes (such as temperature, motion, or sound). The data from these devices can frequently have significant gaps, corrupted messages, and false readings that must be cleaned up before analysis can occur. Also, IoT data is often only meaningful in the context of additional, third party data inputs. For example, to help farmers determine when to water their crops, vineyard irrigation systems often enrich moisture sensor data with rainfall data from the vineyard, allowing for more efficient water usage while maximizing harvest yield. AWS IoT Analytics automates each of the difficult steps that are required to analyze data from IoT devices. AWS IoT Analytics filters, transforms, and enriches IoT data before storing it in a time series data store for analysis. You can setup the service to collect only the data you need from your devices, apply mathematical transforms to process the data, and enrich the data with device-

Claim 10	Accused Instrumentality(ies)
	specific metadata such as device type and location before storing the processed data. Then, you can analyze your data by running ad hoc or scheduled queries using the built-in SQL query engine, or perform more complex analytics and machine learning inference. AWS IoT Analytics makes it easy to get started with machine learning by including pre-built models for common IoT use cases. You can also use your own custom analysis, packaged in a container, to run AWS IoT Analytics. AWS IoT Analytics automates the running of your custom analyses created in Jupyter Notebook or your own tools (such as Matlab, Octave, and so on) to be run on your schedule. AWS IoT Analytics is a fully managed service that operationalizes analyses and scales automatically to support up to petabytes of IoT data. With AWS IoT Analytics, you can analyze data from millions of devices and build fast, responsive IoT applications without managing hardware or infrastructure. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
generating an event including notification event, alarm, and knowledge contents according to a rule set by an application program;	Amazon generates an event including notification event, alarm, and knowledge contents according to a rule set by an application program. For example, the Amazon provides the Alexa Energy Dashboard on the Alexa app. [192]

[192] *See* KAIFI0006980 *(Say Hello to the Alexa Energy Dashboard*, https://www.amazon.com/b?node=21442874011&ref_=ods_sh_sr_dp_ci).

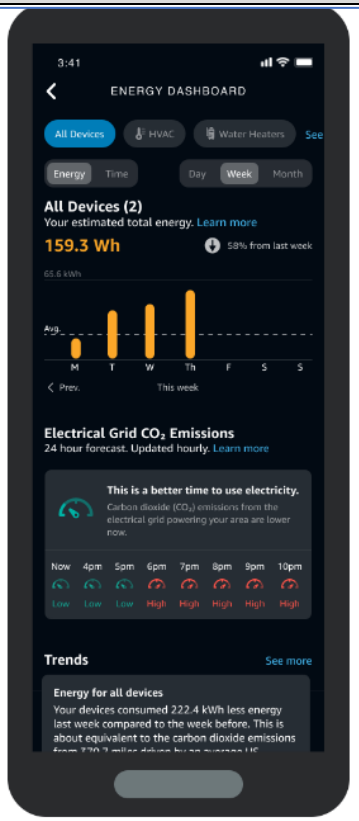
Appendix C
Claim Chart for U.S. Patent No. 8,040,232

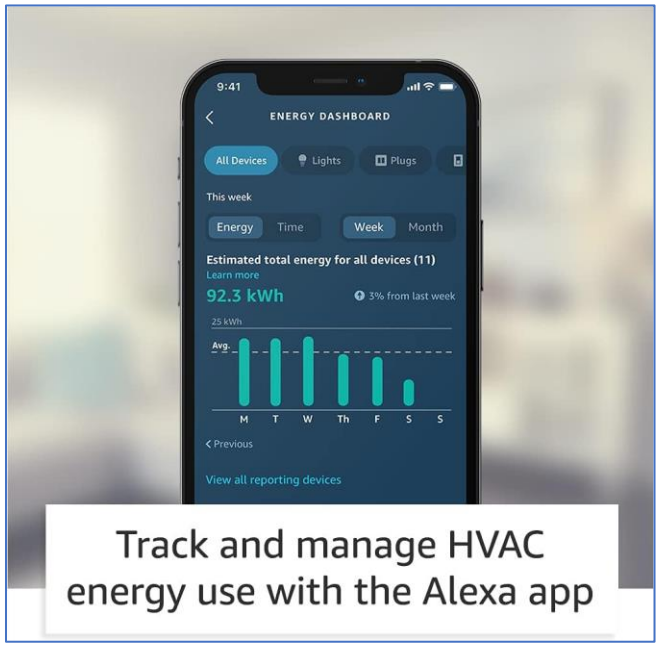
Claim 10	Accused Instrumentality(ies)
	Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you.

Claim 10	Accused Instrumentality(ies)
	 For example, the Alexa Energy Dashboard provides information services using data from different

Claim 10	Accused Instrumentality(ies)
	devices.[193] Understanding your home's energy usage is easier than ever, with the Alexa energy dashboard. It works with a selection of high-load devices like water heaters and thermostats to help you track the usage of devices that consume the most energy in your home. Once you connect your compatible devices to Alexa, you can get a better understanding of the energy they use, right in the Alexa app. The energy consumption of select smart home devices like thermostats and water heaters can be tracked and managed in the Alexa energy dashboard. You can also manage the energy use of your compatible connected devices using Routines and Hunches. Routines are short cuts for Alexa, saving you time by grouping together a bunch of actions so you don't have to ask for each one individually. For example, you can set the "Alexa, good night" Routine to turn off all of your porch lights at once. Hunches is a feature that can help you save energy without even thinking about it. Now, if Alexa has a hunch that you forgot to turn off a light and no one is home or everyone went to bed, Alexa can automatically turn it off for you. It's a smart and convenient way to help your home be kinder to the world around it. Every device, every home, and every day counts. Let's make a difference, together. Amazon is committed to building a sustainable business for our customers and the planet. Learn more about our sustainability efforts.

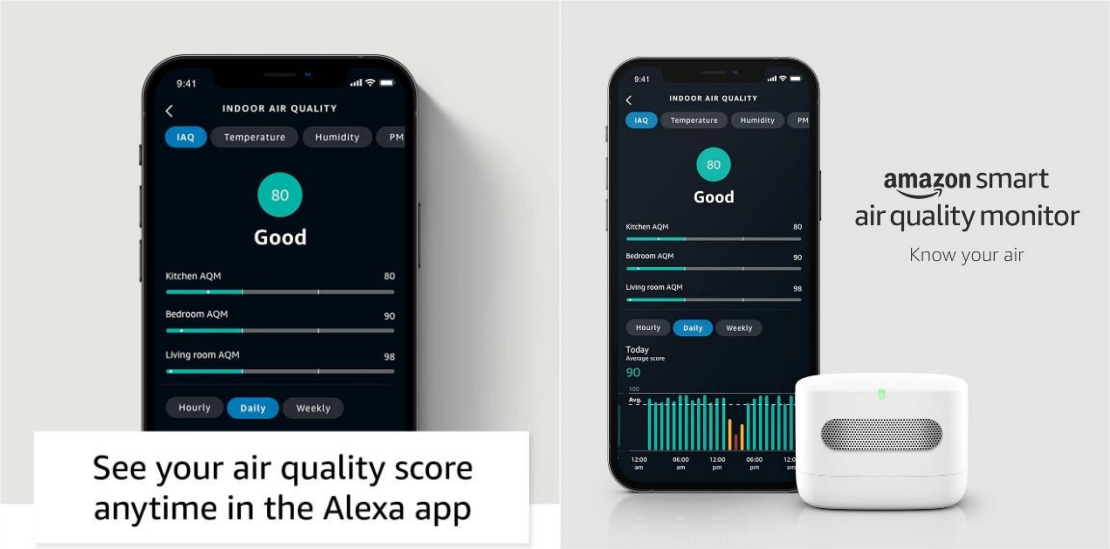
[193] *See id.*

Claim 10	Accused Instrumentality(ies)
	Alexa can help you Choose Cleaner Energy  **Effortlessly optimize your indoor climate.** Alexa can adjust your Amazon Smart Thermostat's set point to minimize usage when electricity is less clean. **You are always in control.** Alexa can make optimization adjustments, but you can manually override at any time to maximize comfort and control. **Carbon impact insights for everyone.** You can also view the cleanliness of the electricity available to you, so can plan to use electricity when CO_2 emissions are lower. **How it works.** To enable this feature, select your thermostat device in the Amazon Alexa app, tap the Settings icon, then tap Choose Cleaner Energy. **You must have an Amazon Smart Thermostat to access the Energy Dashboard. See set up instructions below.** For example, the different networked devices may including: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine,

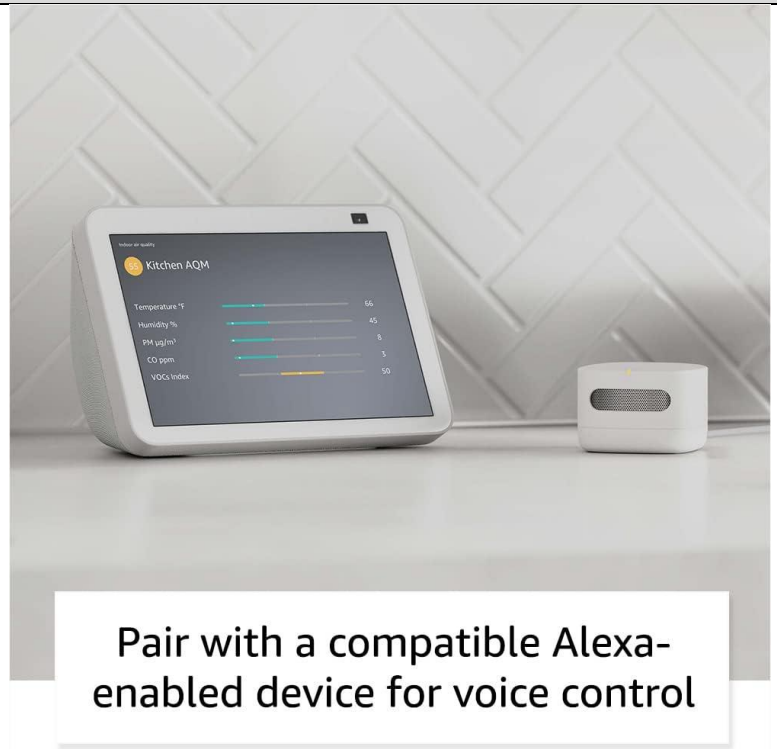
Claim 10	Accused Instrumentality(ies)
	Water heater, and Wi-Fi router.[194] For example, the Alexa app Energy Dashboard can track and manage HVAC energy use.[195] 

[194] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

[195] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

Claim 10	Accused Instrumentality(ies)
	For example, the Alexa app Energy Dashboard can show air quality score.[196] 

[196] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

Claim 10	Accused Instrumentality(ies)
	 For example, Alexa can give helpful suggestions about connected smart devices.[197]

[197] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 10	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** For example, Alexa can show cameras.[198]

[198] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 225 of 264
AMAZON.COM, INC.

Claim 10	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. For example, Amazon provides Amazon Kinesis, AWS Lambda, Amazon SageMaker, and Amazon CloudWatch.[199] • **Amazon Kinesis** Amazon Kinesis makes it easy to collect, process, and analyze real-time, streaming data so you can get timely insights and react quickly to new information. Amazon Kinesis can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications.

[199] *See* KAIFI0004473 *(Learn more about AWS IoT*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-learn-more.html).

Claim 10	Accused Instrumentality(ies)
	• **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You can set up your code to automatically trigger from AWS IoT data and events or call it directly from a web or mobile app. • **Amazon SageMaker** Amazon SageMaker can create machine learning (ML) models by finding patterns in your IoT data. The service uses these models to process new data and generate predictions for your application. • **Amazon CloudWatch** Amazon CloudWatch provides a reliable, scalable, and flexible monitoring solution to help set up, manage, and scale your own monitoring systems and infrastructure. For example, Amazon also provides the Smart Home API.[200]

[200] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

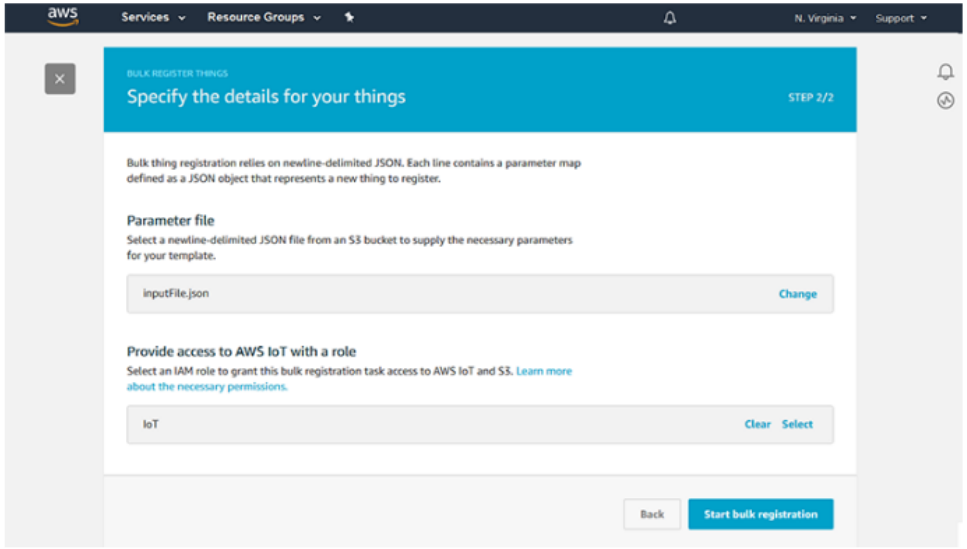
Ex.1015 / Page 227 of 264
AMAZON.COM, INC.

Claim 10	Accused Instrumentality(ies)
	You can connect virtually any type of device to Alexa by using the Smart Home API. You describe your device endpoints and capabilities by using the standard discovery mechanism described in About Alexa Discovery. In your discovery response, you identify the smart home interfaces that each device supports. To help you get started, review the device templates to find the ones that match your device type. Each template recommends a set of smart home interfaces to implement for the device type. You can modify these recommendations by adding or removing interfaces to suit the needs of your specific device. Every template includes the required top-level `Alexa` interface and recommends that you implement the `Alexa.EndpointHealth` interface to report the health of your device to Alexa. Also, each template recommends a display category. The display category determines the icon and placement of your device in the Alexa app. For more details about Smart Home skills, see Understand the Smart Home Skills. For more details about required interfaces for Works with Alexa (WWA) certification, see Requirements for Specific Device Types. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.
scheduling an operation sequence for providing an information service to the application program; and	Amazon schedules an operation sequence for providing an information service to the application program. For example, Amazon provides AWS IoT Device Management.[201]

[201] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 10	Accused Instrumentality(ies)
	AWS IoT Device Management As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments. For example, Amazon provides AWS IoT Device Management.[202]

[202] *See* KAIFI0001738 *(AWS IoT Device Management features*, https://aws.amazon.com/iot-device-management/features).

Claim 10	Accused Instrumentality(ies)
	Register connected devices in bulk Register new devices with AWS IoT Device Management. Using the IoT management console or API, you can upload templates that you populate with information like device manufacturer and serial number, X.509 identity certificates, or security policies. Then, you can configure the entire fleet of devices with this information in a few steps in the management console. Learn more about the bulk registration process.  For example, Amazon provides AWS IoT Device Management Device Jobs.[203]

[203] *See* KAIFI0001731 *(AWS IoT Device Management FAQs*, https://aws.amazon.com/iot-device-management/faqs/).

Claim 10	Accused Instrumentality(ies)
	Device Jobs: Device Jobs runs and monitors software updates and other remote operations such as device reboots. It lets you manage updates to a single device or to your entire fleet. You can control the pace of deployment (e.g. deploy to 10 devices per second), and receive real-time information about the status of your jobs as they're deployed to your devices. For example, Amazon provides AWS IoT Device Management and APIs.[204]

[204] *See* KAIFI0001608 *(AWS IoT Device Management Documentation*, https://docs.aws.amazon.com/iot-device-management/); *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

Claim 10	Accused Instrumentality(ies)
	AWS IoT Device Management Documentation AWS IoT Device Management is a cloud-based device management service that makes it easy for customers to securely manage IoT devices throughout their lifecycle. Customers can use AWS IoT Device Management to onboard device information and configuration, organize their device inventory, monitor their fleet of devices, and remotely manage devices deployed across many locations. This remote management includes over-the-air (OTA) updates to device software. **Developer Guide** Describes device provisioning, thing groups, and jobs that are sent to and run on one or more devices connected to AWS IoT Core. HTML | PDF **API Reference** Describes all the API operations for AWS IoT Device Management in detail. Provides examples of request and response syntax. HTML | PDF **Fleet Hub for AWS IoT Device Management** **User Guide** You can use Fleet Hub for AWS IoT Device Management to build standalone web applications for monitoring the health of your device fleets. HTML | PDF

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 10	Accused Instrumentality(ies)

	AWS IoT Device Management - jobs data endpoints
	
	The AWS IoT Device Management - jobs data endpoints are specific to each AWS account and AWS Region. To find the AWS IoT Device Management - jobs data endpoint for your AWS account and AWS Region, use the **describe-endpoint** CLI command shown here, or the `DescribeEndpoint` REST API.
	
	`aws iot describe-endpoint --endpoint-type iot:Jobs`
	
	This command returns your Jobs data plane API endpoint in the following format:
	
	`account-specific-prefix.jobs.iot.aws-region.amazonaws.com.`
	
	For information about the actions supported by the AWS IoT Device Management - jobs data endpoints, see AWS IoT jobs data plane operations in the *AWS IoT API Reference*.
	
	The following table contains AWS Region-specific endpoints that AWS IoT Core supports for job data operations. In the **Endpoint** column, the `account-specific-prefix` from your account-specific endpoint replaces the `data` shown in the generic endpoint representation.

Claim 10	Accused Instrumentality(ies)
	AWS IoT Device Management - secure tunneling endpoints AWS IoT supports additional endpoints for secure tunneling. **Secure Tunneling Management APIs Endpoints** For example, Amazon's Echo (4thj Gen) includes Wifi connectivity, Amazon Sidewalk, eero Built-in, and Bluetooth connectivity.[205]

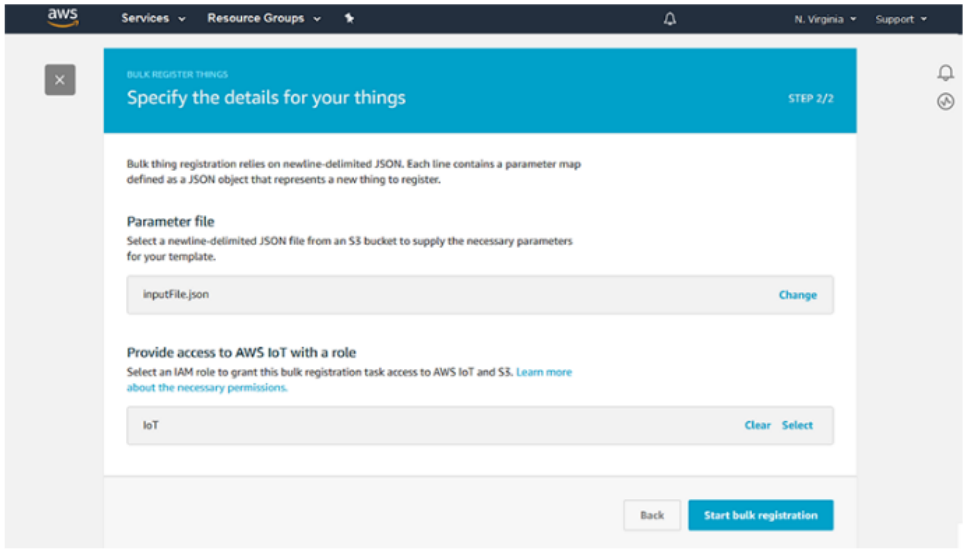
Region Name	Region	Endpoint	Protocol
US East (Ohio)	us-east-2	api.tunneling.iot.us-east-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-2.amazonaws.com	HTTPS
US East (N. Virginia)	us-east-1	api.tunneling.iot.us-east-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-1.amazonaws.com	HTTPS
US West (N. California)	us-west-1	api.tunneling.iot.us-west-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-1.amazonaws.com	HTTPS
US West (Oregon)	us-west-2	api.tunneling.iot.us-west-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-2.amazonaws.com	HTTPS
Asia Pacific (Hong Kong)	ap-east-1	api.tunneling.iot.ap-east-1.amazonaws.com	HTTPS
Asia Pacific (Mumbai)	ap-south-1	api.tunneling.iot.ap-south-1.amazonaws.com	HTTPS
Asia Pacific (Seoul)	ap-northeast-2	api.tunneling.iot.ap-northeast-2.amazonaws.com	HTTPS
Asia Pacific (Singapore)	ap-southeast-1	api.tunneling.iot.ap-southeast-1.amazonaws.com	HTTPS
Asia Pacific (Sydney)	ap-southeast-2	api.tunneling.iot.ap-southeast-2.amazonaws.com	HTTPS
Asia Pacific (Tokyo)	ap-northeast-1	api.tunneling.iot.ap-northeast-1.amazonaws.com	HTTPS

[205] *See* KAIFI0001105 *(Amazon Echo (newest model), Ideal for large bedrooms, living rooms and kitchens, Alexa speaker with premium sound, Charcoal*, https://www.amazon.com/Echo-4th-Gen/dp/B07XKF5RM3?th=1).

Claim 10	Accused Instrumentality(ies)
	Wifi connectivity — Dual-band wifi supports 802.11a/b/g/n/ac (2.4 and 5 GHz) networks. Does not support connecting to ad-hoc (or peer-to-peer) wifi networks. **Amazon Sidewalk** — A shared network that helps compatible devices work better at home and beyond the front door. If wifi is lost, Sidewalk enables certain devices to stay connected. Also, Sidewalk helps devices like water sprinklers and pet locators work over longer distances. Sidewalk uses a small portion of your internet bandwidth to provide these benefits to you and your neighbors via Sidewalk Bridges (participating Echo and Ring devices), and is turned on for your device unless you have previously turned off the setting. You can turn off Sidewalk at any time. Learn more about Sidewalk. **Smart home hub** — Zigbee + Sidewalk + Matter + Thread Border Router **eero Built-in** — Your wifi network must use a compatible eero router and your Echo device must stay in range of a compatible eero device. You will need to link your eero and Amazon accounts and manage eero Built-in from the eero mobile application to use this feature. eero Built-in compatible Echo devices support up to 1,000 sq. ft. of additional coverage, speeds up to 100 Mbps, and 10 or fewer connected devices. Actual performance can vary and certain eero, Echo, or Alexa features may be incompatible with eero Built-in. Learn more about eero Built-in performance, availability and compatibility. Use of eero and eero-related products and services, including eero Built-in, requires creation of an eero account and agreement to eero's Terms of Service. Review eero's Privacy Notice. **Bluetooth connectivity** — Advanced Audio Distribution Profile (A2DP) support for audio streaming from your mobile device to Echo or from Echo to your Bluetooth speaker. Audio/Video Remote Control Profile (AVRCP) for voice control of connected mobile devices. Hands-free voice control is not supported for Mac OS X devices. Direct control of BLE Mesh. Bluetooth speakers requiring PIN codes are not supported. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Claim 10	Accused Instrumentality(ies)
providing the application program with the information service obtained according to the scheduled operation sequence, the information service including events and context aware information.	Amazon provides the application program with the information service obtained according to the scheduled operation sequence, the information service including events and context aware information. For example, Amazon provides AWS IoT Device Management.[206] **AWS IoT Device Management** As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments.

[206] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 10	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Device Management.[207] **Register connected devices in bulk** Register new devices with AWS IoT Device Management. Using the IoT management console or API, you can upload templates that you populate with information like device manufacturer and serial number, X.509 identity certificates, or security policies. Then, you can configure the entire fleet of devices with this information in a few steps in the management console. Learn more about the bulk registration process. 

[207] *See* KAIFI0001738 *(AWS IoT Device Management features*, https://aws.amazon.com/iot-device-management/features).

Claim 10	Accused Instrumentality(ies)
	For example, Amazon provides AWS IoT Device Management Device Jobs.[208] Device Jobs: Device Jobs runs and monitors software updates and other remote operations such as device reboots. It lets you manage updates to a single device or to your entire fleet. You can control the pace of deployment (e.g. deploy to 10 devices per second), and receive real-time information about the status of your jobs as they're deployed to your devices. For example, Amazon provides AWS IoT Device Management and APIs.[209]

[208] *See* KAIFI0001731 *(AWS IoT Device Management FAQs*, https://aws.amazon.com/iot-device-management/faqs/).

[209] *See* KAIFI0001608 *(AWS IoT Device Management Documentation*, https://docs.aws.amazon.com/iot-device-management/); *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

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Claim 10	Accused Instrumentality(ies)

	AWS IoT Device Management - jobs data endpoints
	
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Claim 10	Accused Instrumentality(ies)
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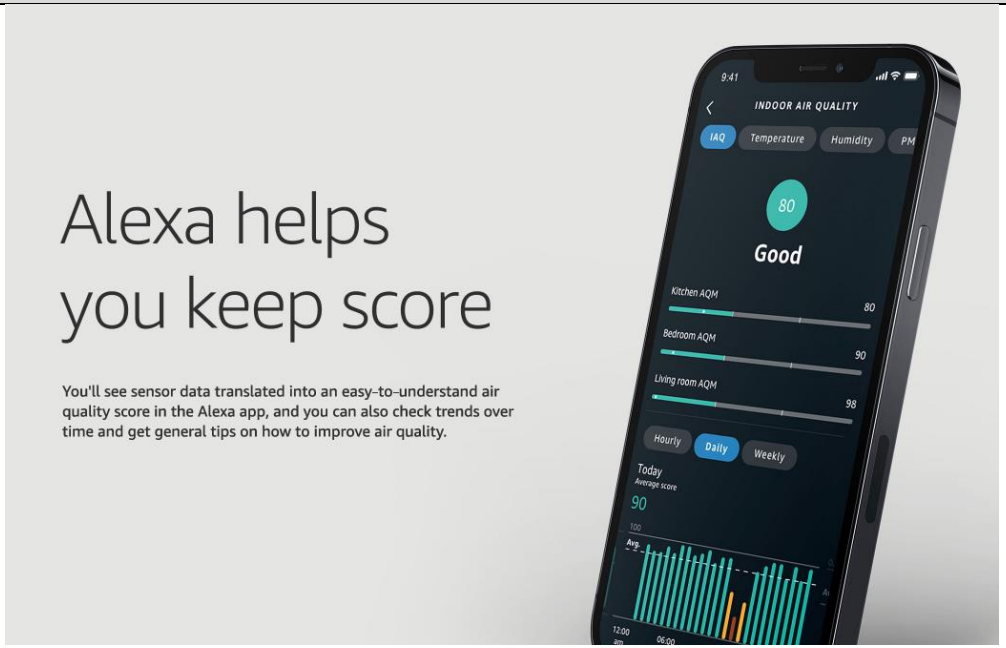
		api.tunneling.iot-fips.us-east-2.amazonaws.com	HTTPS
US East (N. Virginia)	us-east-1	api.tunneling.iot.us-east-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-1.amazonaws.com	HTTPS
US West (N. California)	us-west-1	api.tunneling.iot.us-west-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-1.amazonaws.com	HTTPS
US West (Oregon)	us-west-2	api.tunneling.iot.us-west-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-2.amazonaws.com	HTTPS
Asia Pacific (Hong Kong)	ap-east-1	api.tunneling.iot.ap-east-1.amazonaws.com	HTTPS
Asia Pacific (Mumbai)	ap-south-1	api.tunneling.iot.ap-south-1.amazonaws.com	HTTPS
Asia Pacific (Seoul)	ap-northeast-2	api.tunneling.iot.ap-northeast-2.amazonaws.com	HTTPS
Asia Pacific (Singapore)	ap-southeast-1	api.tunneling.iot.ap-southeast-1.amazonaws.com	HTTPS
Asia Pacific (Sydney)	ap-southeast-2	api.tunneling.iot.ap-southeast-2.amazonaws.com	HTTPS
Asia Pacific (Tokyo)	ap-northeast-1	api.tunneling.iot.ap-northeast-1.amazonaws.com	HTTPS

[210] *See* KAIFI0001105 *(Amazon Echo (newest model), Ideal for large bedrooms, living rooms and kitchens, Alexa speaker with premium sound, Charcoal*, https://www.amazon.com/Echo-4th-Gen/dp/B07XKF5RM3?th=1).

Claim 10	Accused Instrumentality(ies)
	Wifi connectivity — Dual-band wifi supports 802.11a/b/g/n/ac (2.4 and 5 GHz) networks. Does not support connecting to ad-hoc (or peer-to-peer) wifi networks. **Amazon Sidewalk** — A shared network that helps compatible devices work better at home and beyond the front door. If wifi is lost, Sidewalk enables certain devices to stay connected. Also, Sidewalk helps devices like water sprinklers and pet locators work over longer distances. Sidewalk uses a small portion of your internet bandwidth to provide these benefits to you and your neighbors via Sidewalk Bridges (participating Echo and Ring devices), and is turned on for your device unless you have previously turned off the setting. You can turn off Sidewalk at any time. Learn more about Sidewalk. **Smart home hub** — Zigbee + Sidewalk + Matter + Thread Border Router **eero Built-in** — Your wifi network must use a compatible eero router and your Echo device must stay in range of a compatible eero device. You will need to link your eero and Amazon accounts and manage eero Built-in from the eero mobile application to use this feature. eero Built-in compatible Echo devices support up to 1,000 sq. ft. of additional coverage, speeds up to 100 Mbps, and 10 or fewer connected devices. Actual performance can vary and certain eero, Echo, or Alexa features may be incompatible with eero Built-in. Learn more about eero Built-in performance, availability and compatibility. Use of eero and eero-related products and services, including eero Built-in, requires creation of an eero account and agreement to eero's Terms of Service. Review eero's Privacy Notice. **Bluetooth connectivity** — Advanced Audio Distribution Profile (A2DP) support for audio streaming from your mobile device to Echo or from Echo to your Bluetooth speaker. Audio/Video Remote Control Profile (AVRCP) for voice control of connected mobile devices. Hands-free voice control is not supported for Mac OS X devices. Direct control of BLE Mesh. Bluetooth speakers requiring PIN codes are not supported. For example, Amazon's Alexa app allows you to see sensor data translated into an easy-to-understand air quality score.[211]

[211] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa,* https://www.amazon.com/dp/B08W8KS8D3/).

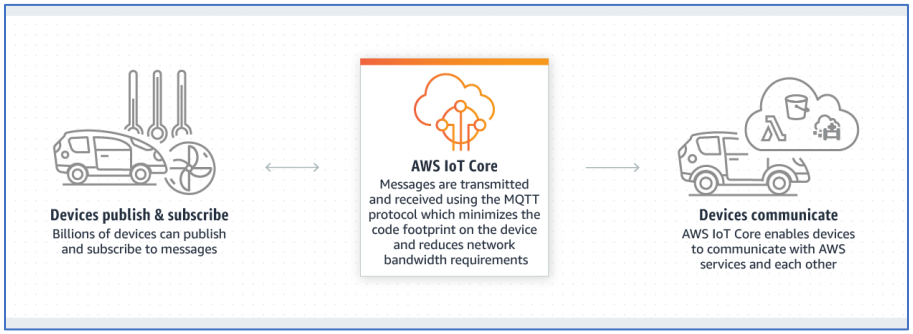
Claim 10	Accused Instrumentality(ies)
	 For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[212]

[212] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 10	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 11 of the ’232 Patent

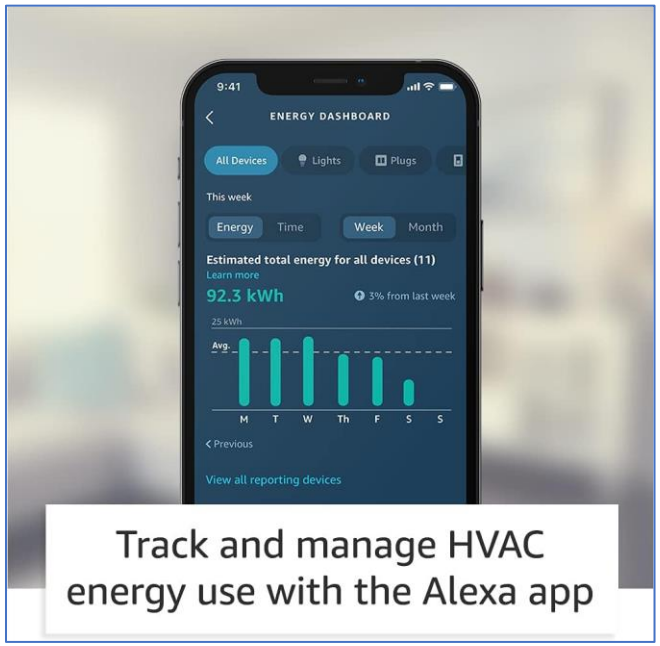
Claim 11	Accused Instrumentality(ies)
The method as recited in claim 10, wherein the performing an analysis operation to clean, classify and integrate the extracted sensed data analyzes sensed data from a specific single sensor network, or analyzes sensed data from a plurality of sensor networks, or analyzes sensed data from the sensor network in association with predefined legacy data.	Amazon’s performing an analysis operation to clean, classify and integrate the extracted sensed data analyzes sensed data from a specific single sensor network, or analyzes sensed data from a plurality of sensor networks, or analyzes sensed data from the sensor network in association with predefined legacy data. For example, Amazon provides AWS IoT Core.[213]  For example, devices may interact with AWS.[214]

[213] *See* KAIFI0001590 *(AWS IoT Core*, https://aws.amazon.com/iot-core/).

[214] *See* KAIFI0001359 *(An Introduction to AWS IoT Core* (Apr. 5, 2021), https://aws.amazon.com/blogs/startups/an-introduction-to-aws-iot-core/).

Claim 11	Accused Instrumentality(ies)
	Rules Engine The Rules Engine feature of AWS IoT Core gives devices the ability to interact with AWS services. Rules are analyzed and actions are performed based on the MQTT topic stream. Not only does the Rules Engine allow you to interact with other AWS services, but you can interact with third party services as well like Apache Kafka, Salesforce, or Snowflake. You can use rules to support tasks like streaming the data into an Amazon Kinesis Data Firehose, putting it in an Amazon SQS queue, triggering a script that processes the data with AWS Lambda, storing the metadata into Amazon DynamoDB, or storing the raw data for historical or backup purposes in Amazon S3. Before AWS IoT can perform these actions with the Rules Engine, you must authorize it and grant it permission to access your AWS resources on your behalf. You can set a rule based on the topic above that can stream into Amazon DynamoDB to store data, or AWS Lambda can capture the data from the stream to process it for any calculations you would like to do with the data. For example, the different networked devices may including: Air conditioner (AC) unit, Air purifier, Air quality monitor, Blinds or shades, Camera, Clothes dryer, Color-changing light bulb, Contact sensor, Dimmable light bulb, Dimmer switch, Dishwasher, Fan, Game console, Garage door opener, Guitar amplifier, Lock, Microwave, Motion sensor, Plug or power strip, Printer, Remotes and buttons, Security panel, Soundbar or speaker, Switch, Television, Vacuum cleaner, Wall thermostat, Washing machine, Water heater, and Wi-Fi router.[215]

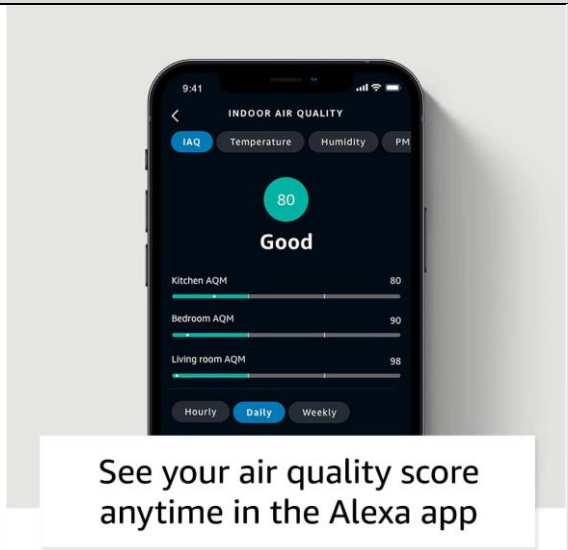
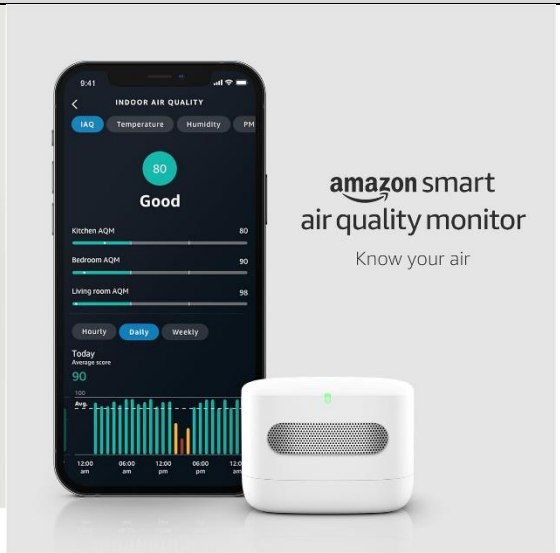
[215] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

Claim 11	Accused Instrumentality(ies)
	For example, the Alexa app Energy Dashboard can track and manage HVAC energy use.[216]  For example, the Alexa app Energy Dashboard can track air quality.[217]

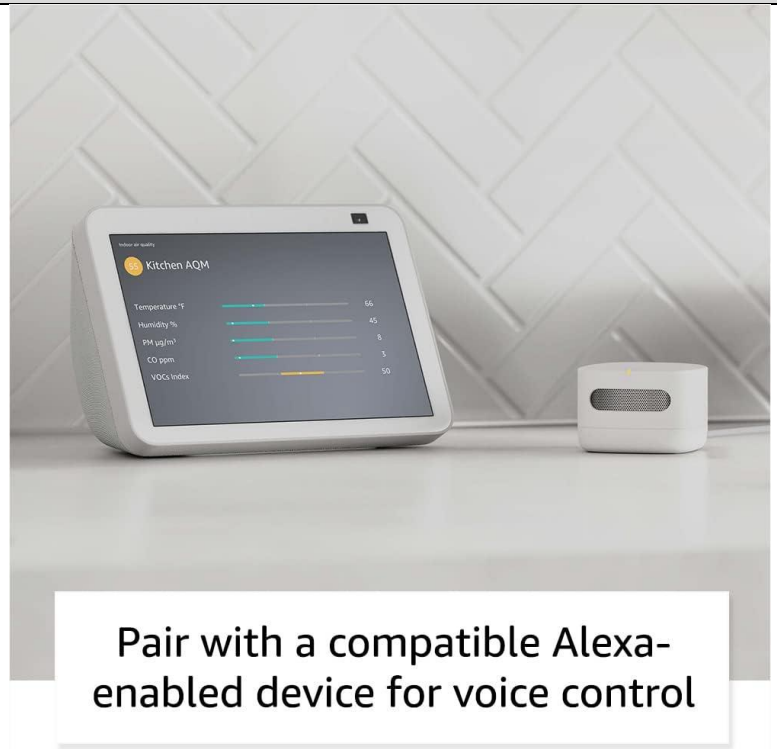
[216] *See* KAIFI0001281 *(Amazon Smart Thermostat – Save money and energy - Works with Alexa and Ring - C-wire required*, https://www.amazon.com/Amazon-Smart-Thermostat/dp/B08J4C8871).

[217] *See* KAIFI0001269 *(Amazon Smart Air Quality Monitor – Know your air, Works with Alexa*, https://www.amazon.com/dp/B08W8KS8D3/).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 11	Accused Instrumentality(ies)
	 

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 11	Accused Instrumentality(ies)
	 For example, Alexa can give helpful suggestions about connected smart devices.[218]

[218] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Claim 11	Accused Instrumentality(ies)
	Fewer things to think about with Hunches With Hunches, Alexa can give you helpful suggestions about your connected smart devices. For example, if you forget to lock a door, Alexa can let you know. You can also choose to have Alexa proactively act on her hunches without having to ask. If Alexa has a hunch that you're away from home or everyone has gone to bed, she can proactively turn off lights and adjust the thermostat to your preferred sleeping temperature. To learn more, just ask, ***"Alexa, what are Hunches?"*** For example, Alexa can show cameras.[219]

[219] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Ex.1015 / Page 250 of 264
AMAZON.COM, INC.

Claim 11	Accused Instrumentality(ies)
	"Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras. For example, Amazon provides AWS for various middleware and applications, including but not limited to Alexa, Smarthome, and IoT solutions. For example, Amazon provides a suite of middleware services.[220]

[220] *See* KAIFI0007355 *(What is Middleware?* https://aws.amazon.com/what-is/middleware/).

Claim 11	Accused Instrumentality(ies)
	How does AWS support middleware technology? Application Integration on AWS is a suite of services that are an affordable alternative to conventional middleware for cloud computing. Developers use the services to communicate between decoupled components within microservices, distributed systems, and serverless applications. For example: • AWS Step Functions is a visual workflow service that allows developers to build distributed applications, automate IT and business processes, and build data and machine learning pipelines by using AWS services. • Amazon Simple Notification Service (Amazon SNS) is an alternative to message-oriented middleware. It provides messaging services for applications. • Amazon EventBridge is a serverless event bus that developers use to integrate cloud applications with AWS services. Get started with middleware on AWS by creating an AWS account today. For example, Amazon provides Amazon Kinesis, AWS Lambda, Amazon SageMaker, and Amazon CloudWatch.[221] • **Amazon Kinesis** Amazon Kinesis makes it easy to collect, process, and analyze real-time, streaming data so you can get timely insights and react quickly to new information. Amazon Kinesis can ingest real-time data such as video, audio, application logs, website clickstreams, and IoT telemetry data for machine learning, analytics, and other applications.

[221] *See* KAIFI0004473 *(Learn more about AWS IoT*, https://docs.aws.amazon.com/iot/latest/developerguide/aws-iot-learn-more.html).

Claim 11	Accused Instrumentality(ies)
	• **AWS Lambda** AWS Lambda lets you run code without provisioning or managing servers. You can set up your code to automatically trigger from AWS IoT data and events or call it directly from a web or mobile app. • **Amazon SageMaker** Amazon SageMaker can create machine learning (ML) models by finding patterns in your IoT data. The service uses these models to process new data and generate predictions for your application. • **Amazon CloudWatch** Amazon CloudWatch provides a reliable, scalable, and flexible monitoring solution to help set up, manage, and scale your own monitoring systems and infrastructure. Amazon also provides the Smart Home API.[222]

[222] *See* KAIFI0002032 *(Get Started with Device Templates*, https://developer.amazon.com/en-US/docs/alexa/smarthome/get-started-with-device-templates.html).

Claim 11	Accused Instrumentality(ies)
	You can connect virtually any type of device to Alexa by using the Smart Home API. You describe your device endpoints and capabilities by using the standard discovery mechanism described in About Alexa Discovery. In your discovery response, you identify the smart home interfaces that each device supports. To help you get started, review the device templates to find the ones that match your device type. Each template recommends a set of smart home interfaces to implement for the device type. You can modify these recommendations by adding or removing interfaces to suit the needs of your specific device. Every template includes the required top-level `Alexa` interface and recommends that you implement the `Alexa.EndpointHealth` interface to report the health of your device to Alexa. Also, each template recommends a display category. The display category determines the icon and placement of your device in the Alexa app. For more details about Smart Home skills, see Understand the Smart Home Skills. For more details about required interfaces for Works with Alexa (WWA) certification, see Requirements for Specific Device Types. For example, Amazon provides Amazon Common Software.[223] Alexa-enabled device developers can incorporate setup for their products into the Alexa mobile app. Instead of building and running a separate and branded app, the company can rely on the Alexa app as a platform for the initial setup. Amazon has updated the Alexa Voice Service (AVS) system to allow approved devices to be set up on the Alexa app using the same Frustration-Free Setup (FFS) tech.

[223] *See* KAIFI0007058 (Eric Hal Schwartz, *Third-Party Alexa Devices Can Now Use the Alexa App for Setup* (Jun. 17, 2021), https://voicebot.ai/2021/06/17/third-party-alexa-devices-can-now-use-the-alexa-app-for-setup/)

Ex.1015 / Page 254 of 264
AMAZON.COM, INC.

Claim 11	Accused Instrumentality(ies)
	ECHO EXPANSION Manufacturers looking to streamline setup for customers use the same Amazon Common Software (ACS) first introduced early last year. Once the back-end is in place, customers will get an alert from the Alexa app or just when they turn on the device that the app will handle the setup, and a few taps will complete the process. It's essentially the same method as setting up an Echo smart speaker or smart display. The option removes the need for the manufacturer to invest the time and resources into creating their own setup process online or through their own app while simultaneously reducing the hassle for customers of running through a unique setup for every smart home device they purchase. "With connected devices becoming increasingly ubiquitous around the world, customers have come to expect a struggle-free, tinker-free, and stress-free experience when setting up their devices. The complexity of setting up devices is often cited as one of the top issues in customer reviews, leading to poor product engagement and satisfaction," Amazon explained in a blog post. "Device makers no longer need to create and maintain their own app for device setup, and can instead focus their resources on core device features." This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 12 of the ’232 Patent

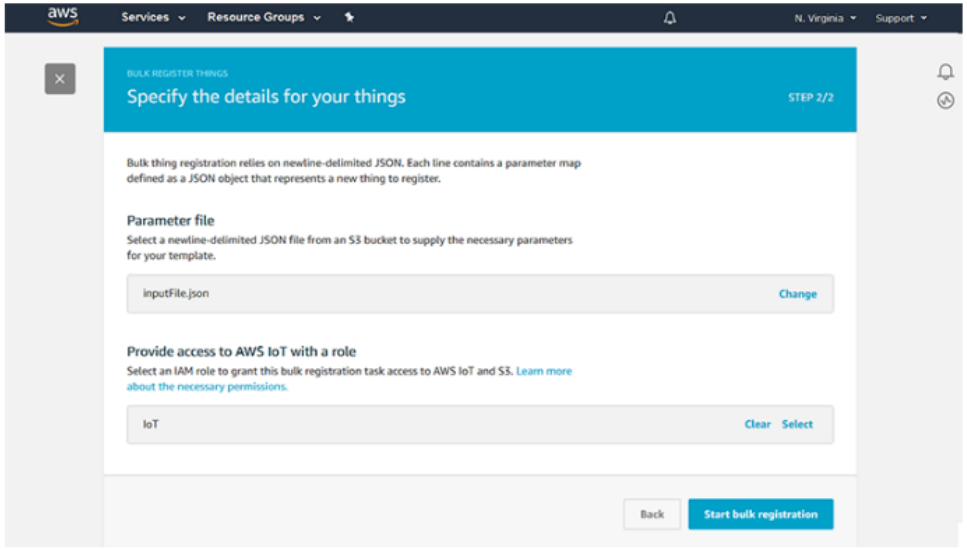
Claim 12	Accused Instrumentality(ies)
The method as recited in claim 10, wherein the providing the application program with the information service obtained according to the scheduled operation sequence, the information service including events and context aware information provides the information service to the application program only one time, or periodically provides the information service during a request period of the application program, or provides the information service at a specific time point when a requirement from the application program is satisfied.	Amazon’s providing the application program with the information service obtained according to the scheduled operation sequence, the information service including events and context aware information provides the information service to the application program only one time, or periodically provides the information service during a request period of the application program, or provides the information service at a specific time point when a requirement from the application program is satisfied. For example, Amazon provides AWS IoT Device Management.[224] **AWS IoT Device Management** As many IoT deployments consist of hundreds of thousands to millions of devices, it is essential to track, monitor, and manage connected device fleets. You need to ensure your IoT devices work properly and securely after they have been deployed. You also need to secure access to your devices, monitor health, detect and remotely troubleshoot problems, and manage software and firmware updates. AWS IoT Device Management makes it easy to securely onboard, organize, monitor, and remotely manage IoT devices at scale. With AWS IoT Device Management, you can register your connected

[224] *See* KAIFI0001768 (AWS Whitepaper, *Overview of Amazon Web Services*, https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf).

Claim 12	Accused Instrumentality(ies)
	devices individually or in bulk, and easily manage permissions so that devices remain secure. You can also organize your devices, monitor and troubleshoot device functionality, query the state of any IoT device in your fleet, and send firmware updates over-the-air (OTA). AWS IoT Device Management is agnostic to device type and OS, so you can manage devices from constrained microcontrollers to connected cars all with the same service. AWS IoT Device Management allows you to scale your fleets and reduce the cost and effort of managing large and diverse IoT device deployments. For example, Amazon provides AWS IoT Device Management.[225]

[225] *See* KAIFI0001738 *(AWS IoT Device Management features*, https://aws.amazon.com/iot-device-management/features).

Ex.1015 / Page 257 of 264
AMAZON.COM, INC.

Claim 12	Accused Instrumentality(ies)
	Register connected devices in bulk Register new devices with AWS IoT Device Management. Using the IoT management console or API, you can upload templates that you populate with information like device manufacturer and serial number, X.509 identity certificates, or security policies. Then, you can configure the entire fleet of devices with this information in a few steps in the management console. Learn more about the bulk registration process.  For example, Amazon provides the AWS IoT Device Management Device Jobs.[226]

[226] *See* KAIFI0001731 *(AWS IoT Device Management FAQs*, https://aws.amazon.com/iot-device-management/faqs/).

Claim 12	Accused Instrumentality(ies)
	Device Jobs: Device Jobs runs and monitors software updates and other remote operations such as device reboots. It lets you manage updates to a single device or to your entire fleet. You can control the pace of deployment (e.g. deploy to 10 devices per second), and receive real-time information about the status of your jobs as they're deployed to your devices. For example, Amazon provides AWS IoT Device Management and APIs.[227]

[227] *See* KAIFI0001608 *(AWS IoT Device Management Documentation*, https://docs.aws.amazon.com/iot-device-management/); *see also* KAIFI0001610 (*AWS IoT Device Management endpoints and quotas*, https://docs.aws.amazon.com/general/latest/gr/iot_device_management.html).

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Claim 12	Accused Instrumentality(ies)
	AWS IoT Device Management Documentation AWS IoT Device Management is a cloud-based device management service that makes it easy for customers to securely manage IoT devices throughout their lifecycle. Customers can use AWS IoT Device Management to onboard device information and configuration, organize their device inventory, monitor their fleet of devices, and remotely manage devices deployed across many locations. This remote management includes over-the-air (OTA) updates to device software. **Developer Guide** Describes device provisioning, thing groups, and jobs that are sent to and run on one or more devices connected to AWS IoT Core. HTML | PDF **API Reference** Describes all the API operations for AWS IoT Device Management in detail. Provides examples of request and response syntax. HTML | PDF **Fleet Hub for AWS IoT Device Management** **User Guide** You can use Fleet Hub for AWS IoT Device Management to build standalone web applications for monitoring the health of your device fleets. HTML | PDF

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 12	Accused Instrumentality(ies)

	AWS IoT Device Management - jobs data endpoints
	
	The AWS IoT Device Management - jobs data endpoints are specific to each AWS account and AWS Region. To find the AWS IoT Device Management - jobs data endpoint for your AWS account and AWS Region, use the **describe-endpoint** CLI command shown here, or the `DescribeEndpoint` REST API.
	
	`aws iot describe-endpoint --endpoint-type iot:Jobs`
	
	This command returns your Jobs data plane API endpoint in the following format:
	
	`account-specific-prefix.jobs.iot.aws-region.amazonaws.com.`
	
	For information about the actions supported by the AWS IoT Device Management - jobs data endpoints, see AWS IoT jobs data plane operations in the *AWS IoT API Reference*.
	
	The following table contains AWS Region-specific endpoints that AWS IoT Core supports for job data operations. In the **Endpoint** column, the `account-specific-prefix` from your account-specific endpoint replaces the `data` shown in the generic endpoint representation.

Claim 12	Accused Instrumentality(ies)
	AWS IoT Device Management - secure tunneling endpoints AWS IoT supports additional endpoints for secure tunneling. **Secure Tunneling Management APIs Endpoints** For example, Amazon provides Amazon API Gateway.[228]

Region Name	Region	Endpoint	Protocol
US East (Ohio)	us-east-2	api.tunneling.iot.us-east-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-2.amazonaws.com	HTTPS
US East (N. Virginia)	us-east-1	api.tunneling.iot.us-east-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-east-1.amazonaws.com	HTTPS
US West (N. California)	us-west-1	api.tunneling.iot.us-west-1.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-1.amazonaws.com	HTTPS
US West (Oregon)	us-west-2	api.tunneling.iot.us-west-2.amazonaws.com	HTTPS
		api.tunneling.iot-fips.us-west-2.amazonaws.com	HTTPS
Asia Pacific (Hong Kong)	ap-east-1	api.tunneling.iot.ap-east-1.amazonaws.com	HTTPS
Asia Pacific (Mumbai)	ap-south-1	api.tunneling.iot.ap-south-1.amazonaws.com	HTTPS
Asia Pacific (Seoul)	ap-northeast-2	api.tunneling.iot.ap-northeast-2.amazonaws.com	HTTPS
Asia Pacific (Singapore)	ap-southeast-1	api.tunneling.iot.ap-southeast-1.amazonaws.com	HTTPS
Asia Pacific (Sydney)	ap-southeast-2	api.tunneling.iot.ap-southeast-2.amazonaws.com	HTTPS
Asia Pacific (Tokyo)	ap-northeast-1	api.tunneling.iot.ap-northeast-1.amazonaws.com	HTTPS

[228] *See* KAIFI0001210 *(Amazon API Gateway*, https://aws.amazon.com/api-gateway/).

Claim 12	Accused Instrumentality(ies)
	Amazon API Gateway • Deploy an edge-optimized API Endpoint • Creates API Resources with `POST` Method to publish messages to IoT Topics • Creates API Resources with `POST` Method to publish messages to ThingShadow & NamedShadows • Enable CloudWatch logging for API Gateway • Configure IAM role for API Gateway with access to all topics and things • Set the default authorizationType for all API methods to IAM • Enable X-Ray Tracing • Creates a UsagePlan and associates to `prod` stage For example, Amazon shows up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15.[229] "Alexa, show my cameras." Check in on loved ones and home security, all at once. View up to 4 live camera feeds on Echo Show 8 (2nd gen), Echo Show 10, and Echo Show 15 with compatible cameras.

[229] *See* KAIFI0001185 (*Alexa Smart Home*, https://www.amazon.com/alexa-smart-home/b?ie=UTF8&node=21442899011&ref=pe_alxhub_aucc_en_us_HOL22_HUB_SMA).

Appendix C
Claim Chart for U.S. Patent No. 8,040,232

Claim 12	Accused Instrumentality(ies)
	This claim element is literally present, as described herein, but is also satisfied under the doctrine of equivalents because the structure and functionality provided by Amazon is being used to satisfy this claim limitation and therefore there is no vitiation of this element, and the Accused Instrumentalities incorporate structure and functionality that is not substantially different from the requirements of this limitation because they achieve substantially or exactly the same function, in substantially or exactly the same way as set forth in the claim element (as described herein), and achieves substantially or exactly the same result.