US012393385B2

(12) **United States Patent**
Meruva et al.

(10) **Patent No.: US 12,393,385 B2**
(45) **Date of Patent: Aug. 19, 2025**

(54) **PROVIDING A COMFORT DASHBOARD**

(71) Applicant: **Honeywell International Inc.**, Charlotte, NC (US)

(72) Inventors: **Jayaprakash Meruva**, Bangalore (IN); **Andrew Lo**, Balmain (AU); **John Boothroyd**, NorthRyde (AU); **Hao Chen**, Beijing (CN)

(73) Assignee: **HONEYWELL INTERNATIONAL INC.**, Charlotte, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 140 days.

(21) Appl. No.: **18/480,917**

(22) Filed: **Oct. 4, 2023**

(65) **Prior Publication Data**

US 2024/0028284 A1 Jan. 25, 2024

Related U.S. Application Data

(63) Continuation of application No. 17/556,328, filed on Dec. 20, 2021, now Pat. No. 12,260,140, which is a (Continued)

(51) **Int. Cl.**

G06F 3/14	(2006.01)
F24F 11/52	(2018.01)
F24F 11/523	(2018.01)
G06F 3/04847	(2022.01)
F24F 11/46	(2018.01)

(Continued)

(52) **U.S. Cl.**

CPC ***G06F 3/14*** (2013.01); ***F24F 11/52*** (2018.01); ***F24F 11/523*** (2018.01); ***G06F 3/04847*** (2013.01); *F24F 11/46* (2018.01); *F24F 11/58* (2018.01); *F24F 2110/10* (2018.01);

(Continued)

(58) **Field of Classification Search**

None

See application file for complete search history.

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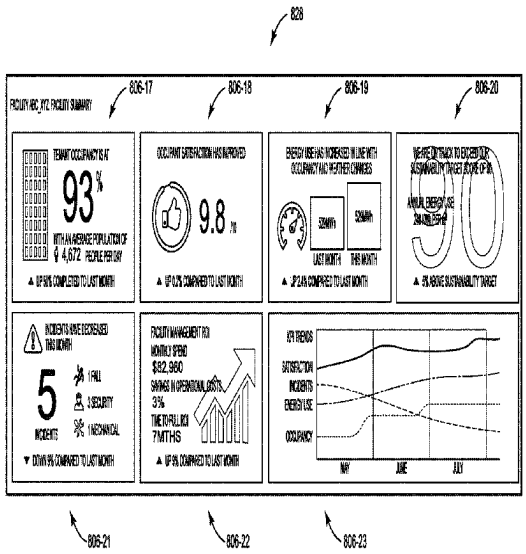
Primary Examiner — Toan H Vu

(74) *Attorney, Agent, or Firm* — Seager, Tufte & Wickhem, LLP

(57) **ABSTRACT**

Systems, methods, and devices for providing a comfort dashboard are described herein. One method includes receiving operational data associated with an HVAC system of a facility, receiving credentials associated with a user of a user device including a number of display elements configurable by the user, and determining a particular portion of the operational data to provide to the user via the display elements of the user device based, at least in part, on the credentials.

20 Claims, 9 Drawing Sheets



Related U.S. Application Data

continuation of application No. 15/941,952, filed on Mar. 30, 2018, now abandoned.

(60) Provisional application No. 62/480,047, filed on Mar. 31, 2017.

(51) **Int. Cl.**

F24F 11/58	(2018.01)
F24F 110/10	(2018.01)
F24F 110/20	(2018.01)
F24F 120/10	(2018.01)
F24F 130/20	(2018.01)

(52) **U.S. Cl.**

CPC *F24F 2110/20* (2018.01); *F24F 2120/10* (2018.01); *F24F 2130/20* (2018.01)

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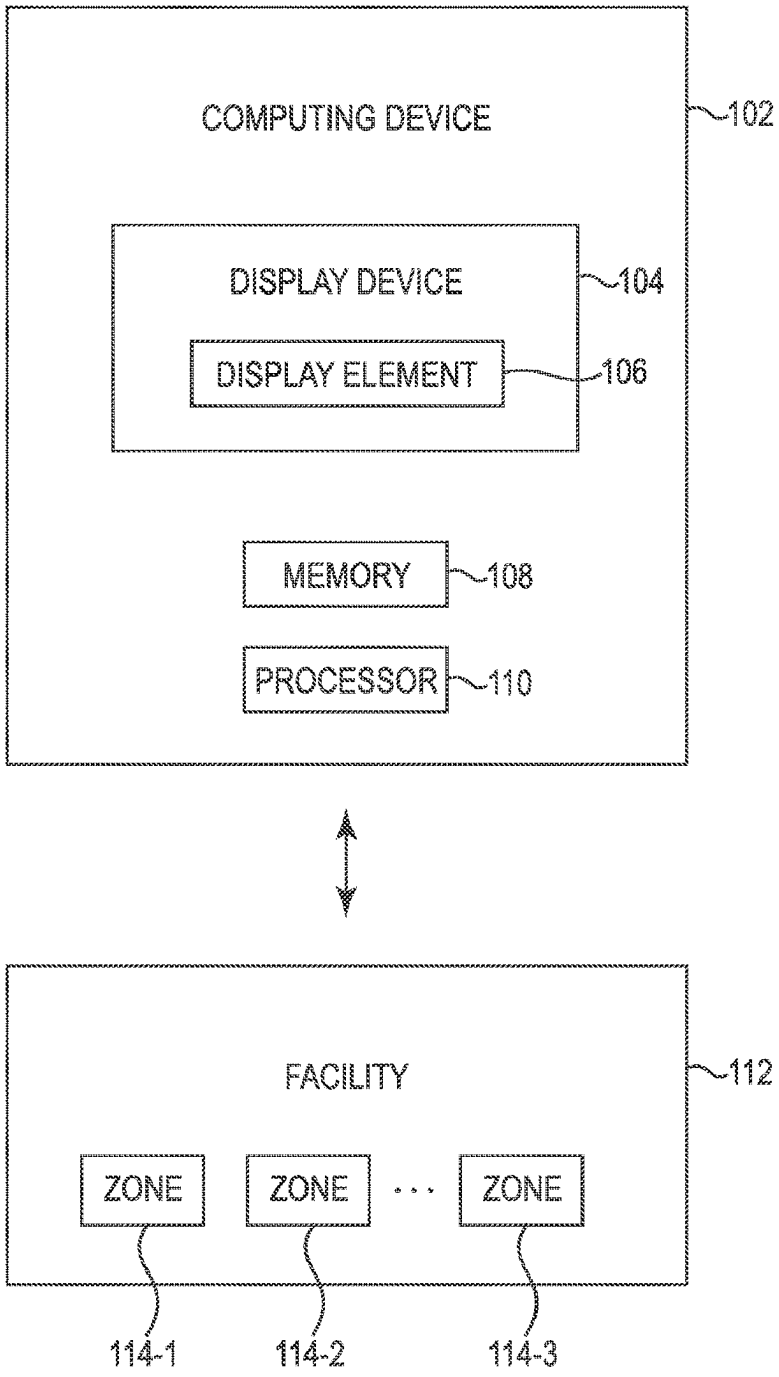
COMPUTING DEVICE
102
DISPLAY DEVICE
104
DISPLAY ELEMENT
106
MEMORY
108
PROCESSOR
110
FACILITY
112
ZONE
ZONE
ZONE
114-1
114-2
114-3

Fig. 1

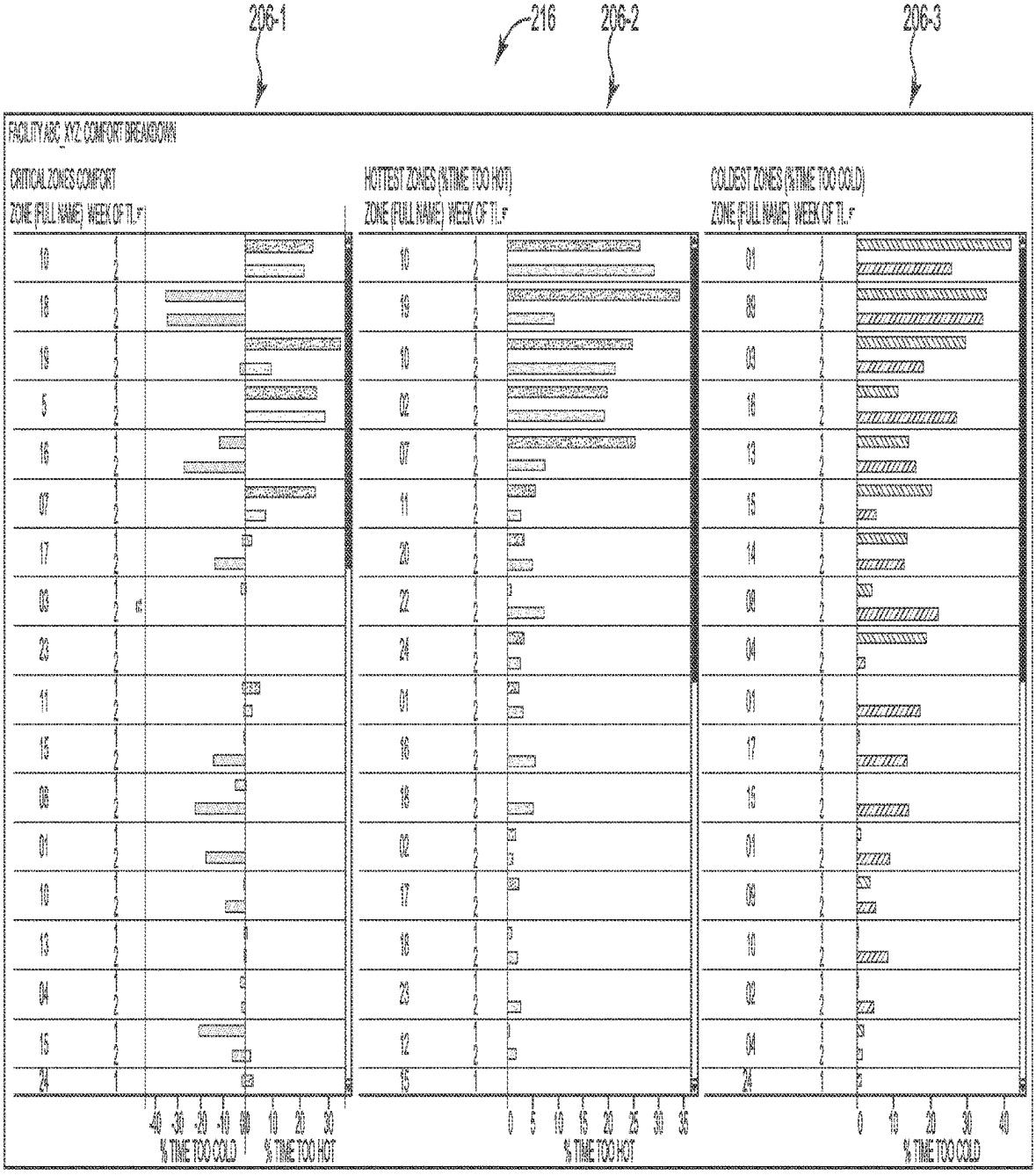
206-1
216
206-2
206-3
FACILITY ABC, XYZ COMFORT BREAKDOWN
CRITICAL ZONES COMFORT
ZONE (FULL NAME) WEEK OF TL
HOTTEST ZONES (% TIME TOO HOT)
ZONE (FULL NAME) WEEK OF TL
COLDEST ZONES (% TIME TOO COLD)
ZONE (FULL NAME) WEEK OF TL
% TIME TOO COLD
% TIME TOO HOT
% TIME TOO HOT
% TIME TOO COLD

Fig. 2

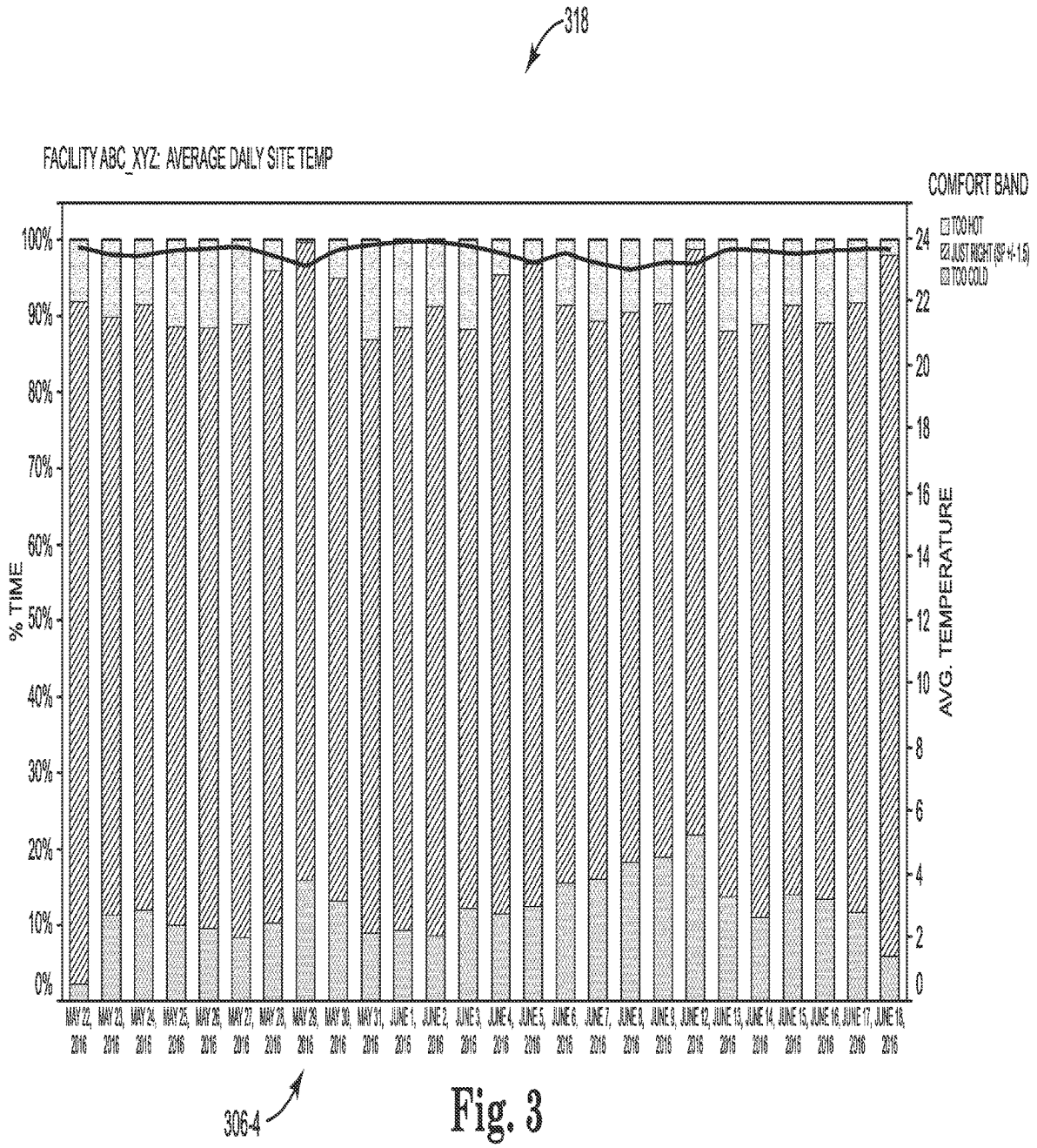
318
FACILITY ABC_XYZ: AVERAGE DAILY SITE TEMP
COMFORT BAND
TOO HOT
JUST RIGHT (68°+/-1.5)
TOO COLD
% TIME
AVG. TEMPERATURE
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
24
22
20
18
16
14
12
10
8
6
4
2
0
MAY 22, 2015
MAY 23, 2015
MAY 24, 2015
MAY 25, 2015
MAY 26, 2015
MAY 27, 2015
MAY 28, 2015
MAY 29, 2015
MAY 30, 2015
MAY 31, 2015
JUNE 1, 2015
JUNE 2, 2015
JUNE 3, 2015
JUNE 4, 2015
JUNE 5, 2015
JUNE 6, 2015
JUNE 7, 2015
JUNE 8, 2015
JUNE 9, 2015
JUNE 10, 2015
JUNE 11, 2015
JUNE 12, 2015
JUNE 13, 2015
JUNE 14, 2015
JUNE 15, 2015
JUNE 16, 2015
JUNE 17, 2015
JUNE 18, 2015
306-4

Fig. 3

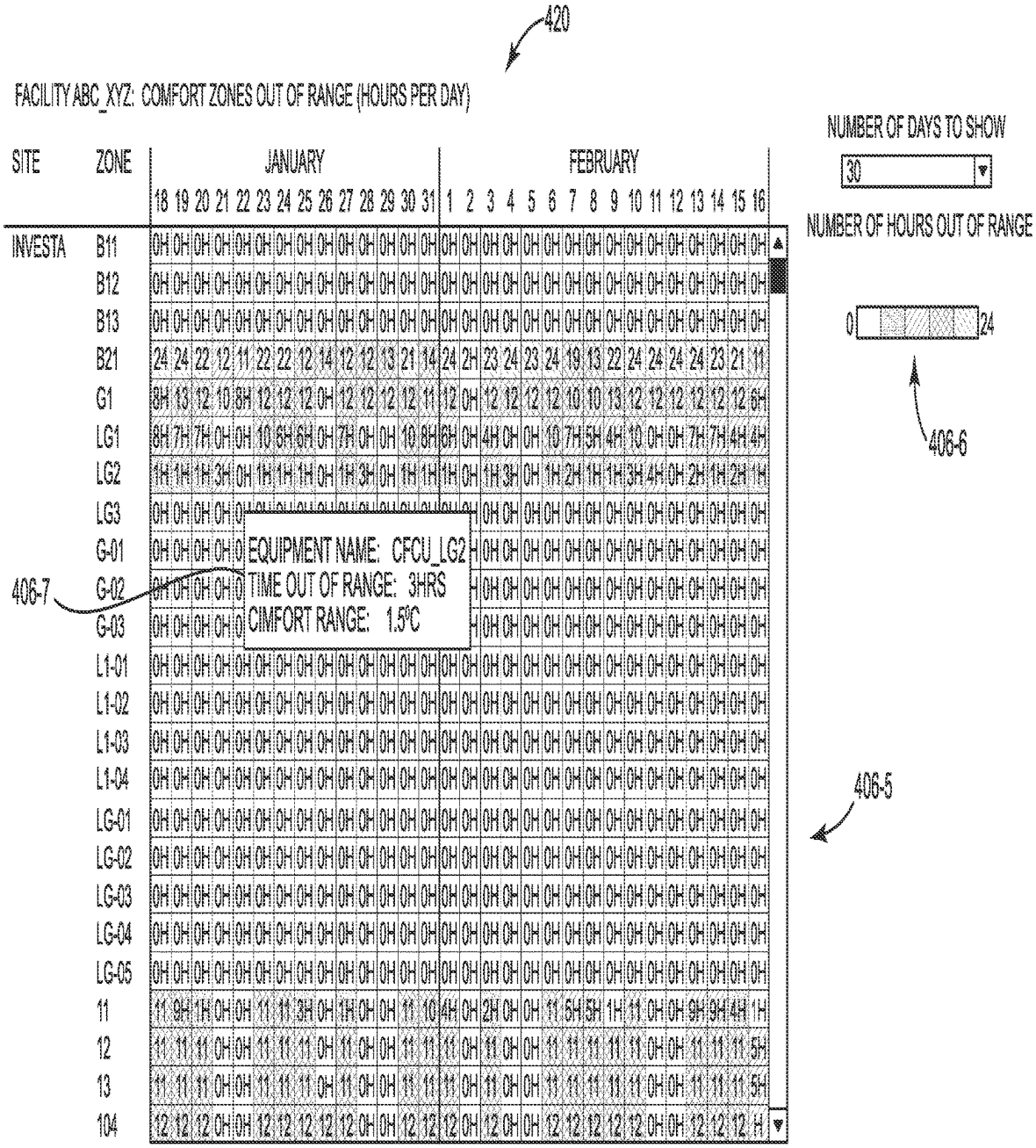
420
FACILITY ABC_XYZ: COMFORT ZONES OUT OF RANGE (HOURS PER DAY)
NUMBER OF DAYS TO SHOW
30
NUMBER OF HOURS OUT OF RANGE
0
24
406-6
406-7
406-5
EQUIPMENT NAME: CFCU_LG2
TIME OUT OF RANGE: 3HRS
CIMFORT RANGE: 1.5°C

Fig. 4

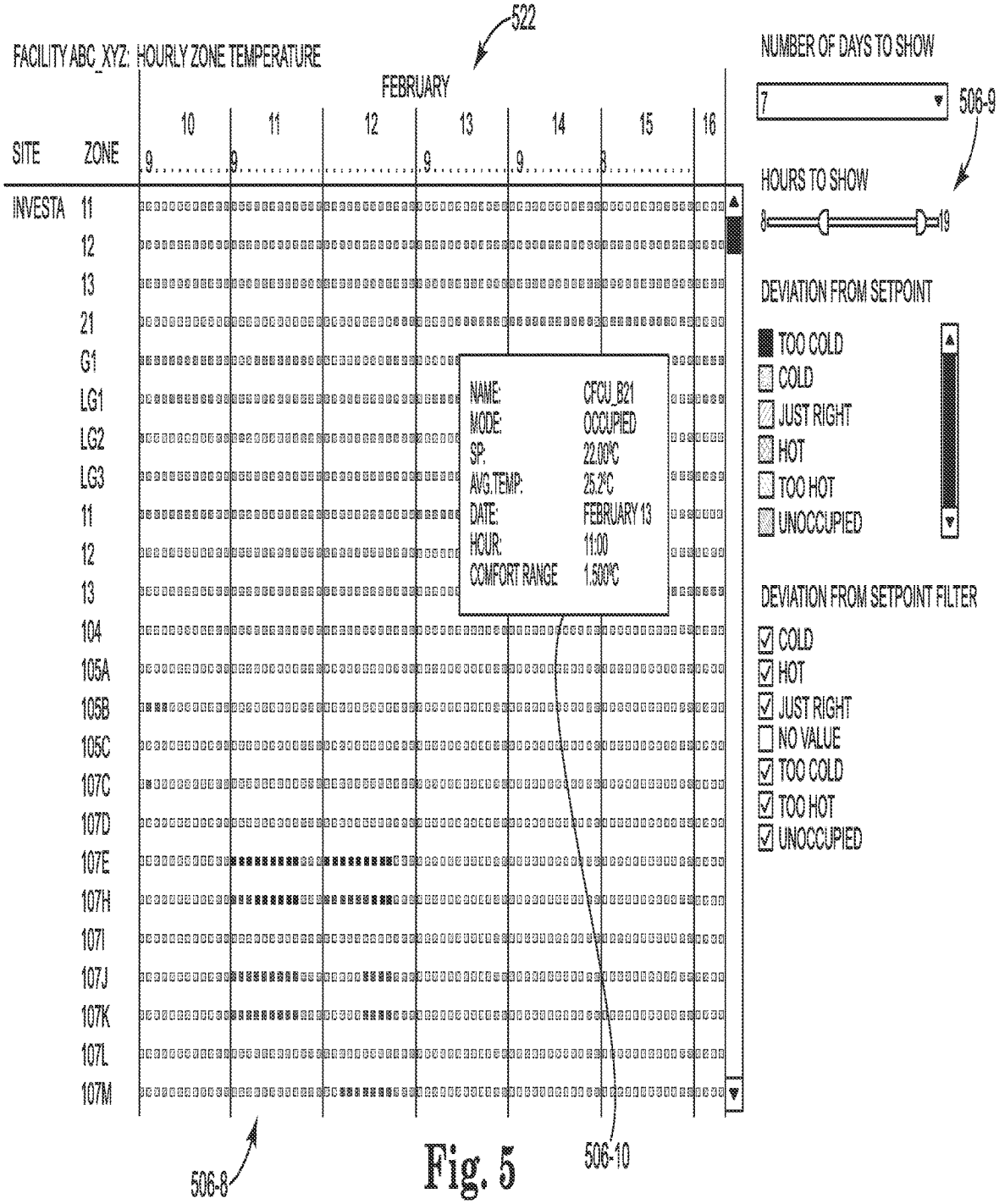
522
FACILITY ABC_XYZ: HOURLY ZONE TEMPERATURE
FEBRUARY
10
11
12
13
14
15
16
SITE
ZONE
INVESTA
11
12
13
21
G1
LG1
LG2
LG3
11
12
13
104
105A
105B
105C
107C
107D
107E
107H
107I
107J
107K
107L
107M
NAME: CFCU_B21
MODE: OCCUPIED
SP: 22.00°C
AVG.TEMP: 25.2°C
DATE: FEBRUARY 13
HOUR: 11:00
COMFORT RANGE 1.500°C
NUMBER OF DAYS TO SHOW
7
506-9
HOURS TO SHOW
8
19
DEVIATION FROM SETPOINT
TOO COLD
COLD
JUST RIGHT
HOT
TOO HOT
UNOCCUPIED
DEVIATION FROM SETPOINT FILTER
COLD
HOT
JUST RIGHT
NO VALUE
TOO COLD
TOO HOT
UNOCCUPIED
506-8
506-10

Fig. 5

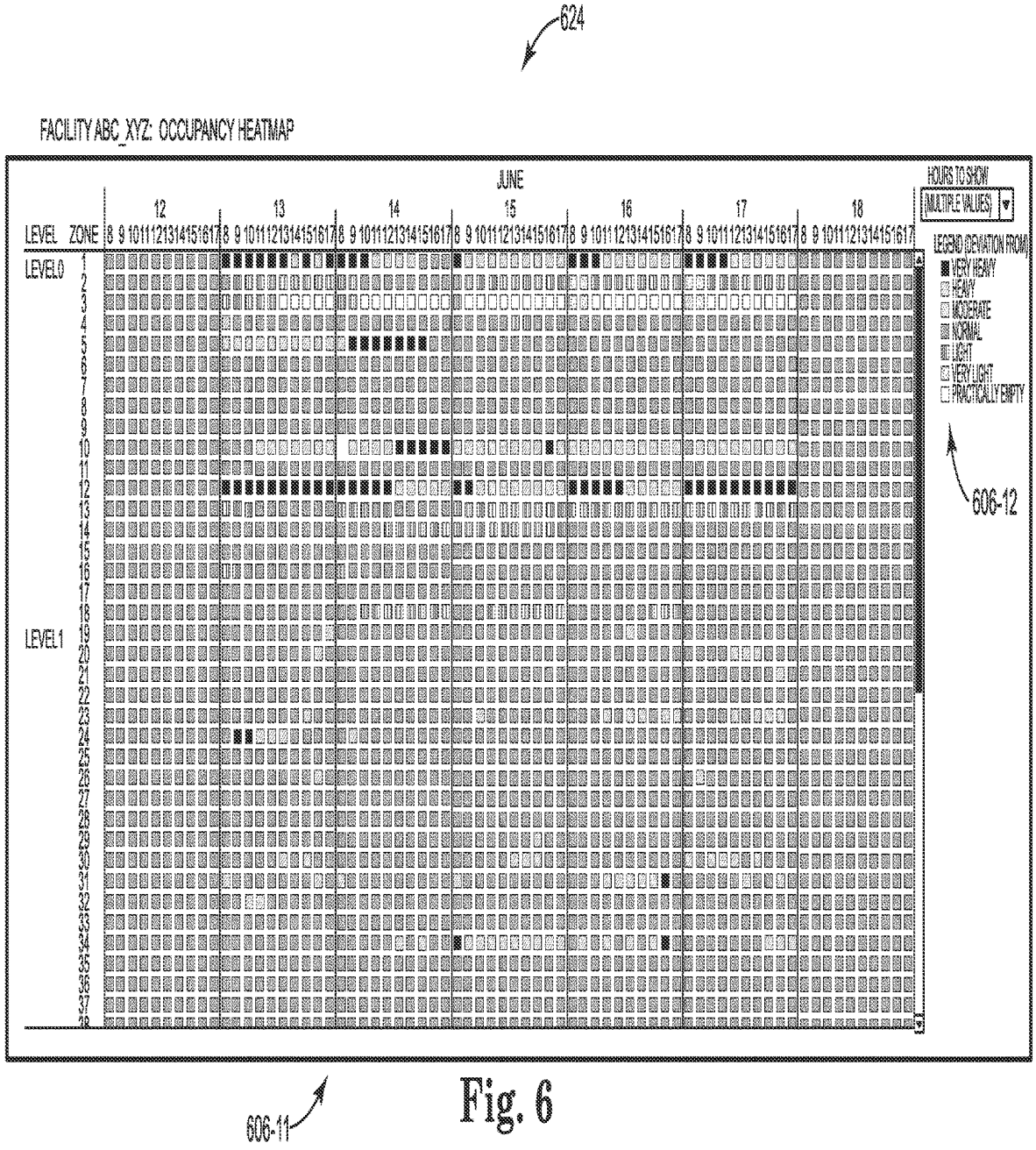
624
FACILITY ABC_XYZ: OCCUPANCY HEATMAP
JUNE
12
13
14
15
16
17
18
LEVEL
ZONE
LEVEL0
LEVEL1
HOURS TO SHOW
(MULTIPLE VALUES)
LEGEND (DEVIATION FROM)
VERY HEAVY
HEAVY
MODERATE
NORMAL
LIGHT
VERY LIGHT
PRACTICALLY EMPTY
606-12
606-11

Fig. 6

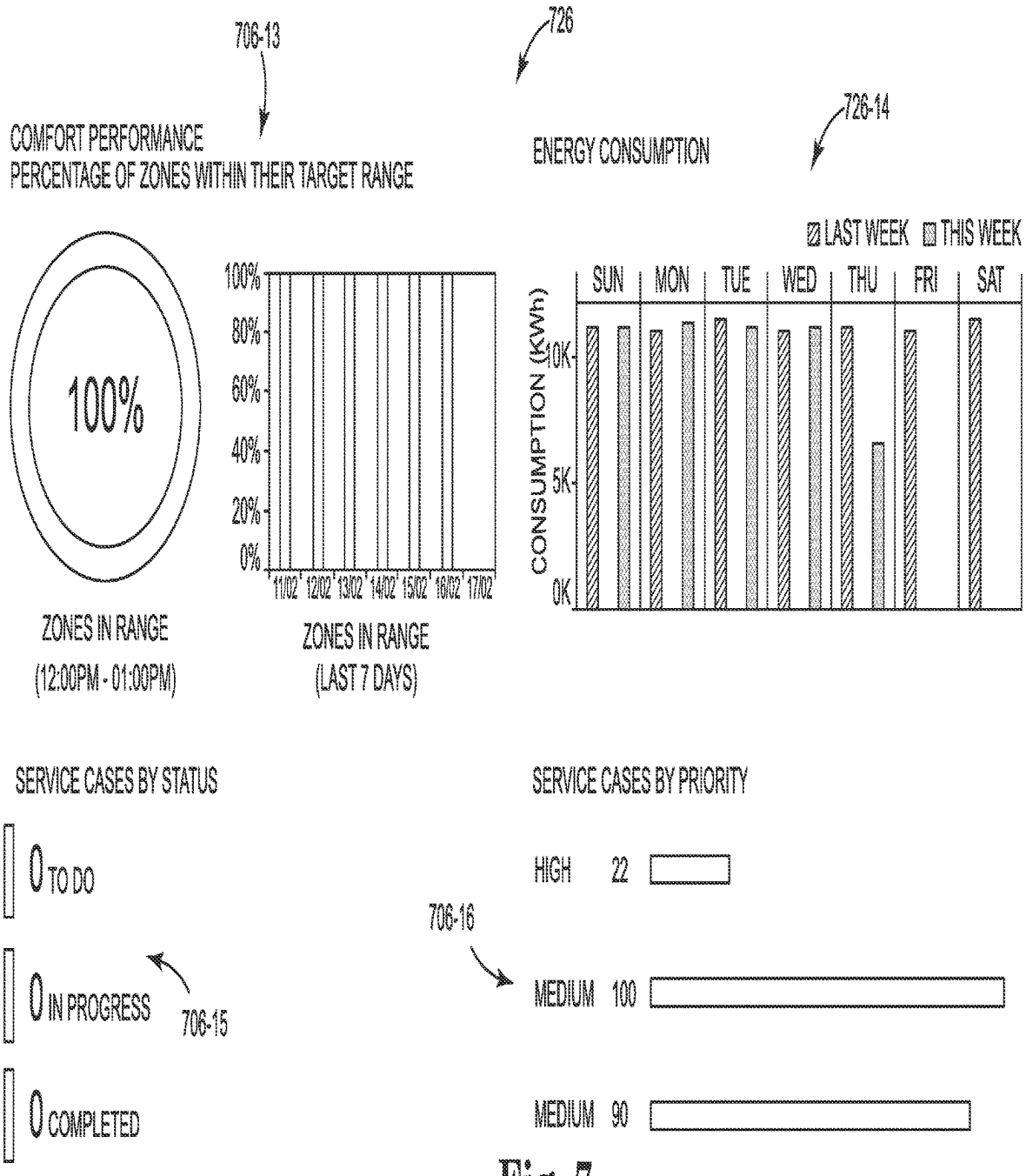
706-13
726
COMFORT PERFORMANCE
PERCENTAGE OF ZONES WITHIN THEIR TARGET RANGE
ENERGY CONSUMPTION
726-14
LAST WEEK
THIS WEEK
100%
ZONES IN RANGE
(12:00PM - 01:00PM)
100%
80%
60%
40%
20%
0%
11/02
12/02
13/02
14/02
15/02
16/02
17/02
ZONES IN RANGE
(LAST 7 DAYS)
CONSUMPTION (KWh)
10K
5K
0K
SUN
MON
TUE
WED
THU
FRI
SAT
SERVICE CASES BY STATUS
0 TO DO
0 IN PROGRESS
706-15
0 COMPLETED
SERVICE CASES BY PRIORITY
706-16
HIGH 22
MEDIUM 100
MEDIUM 90

Fig. 7

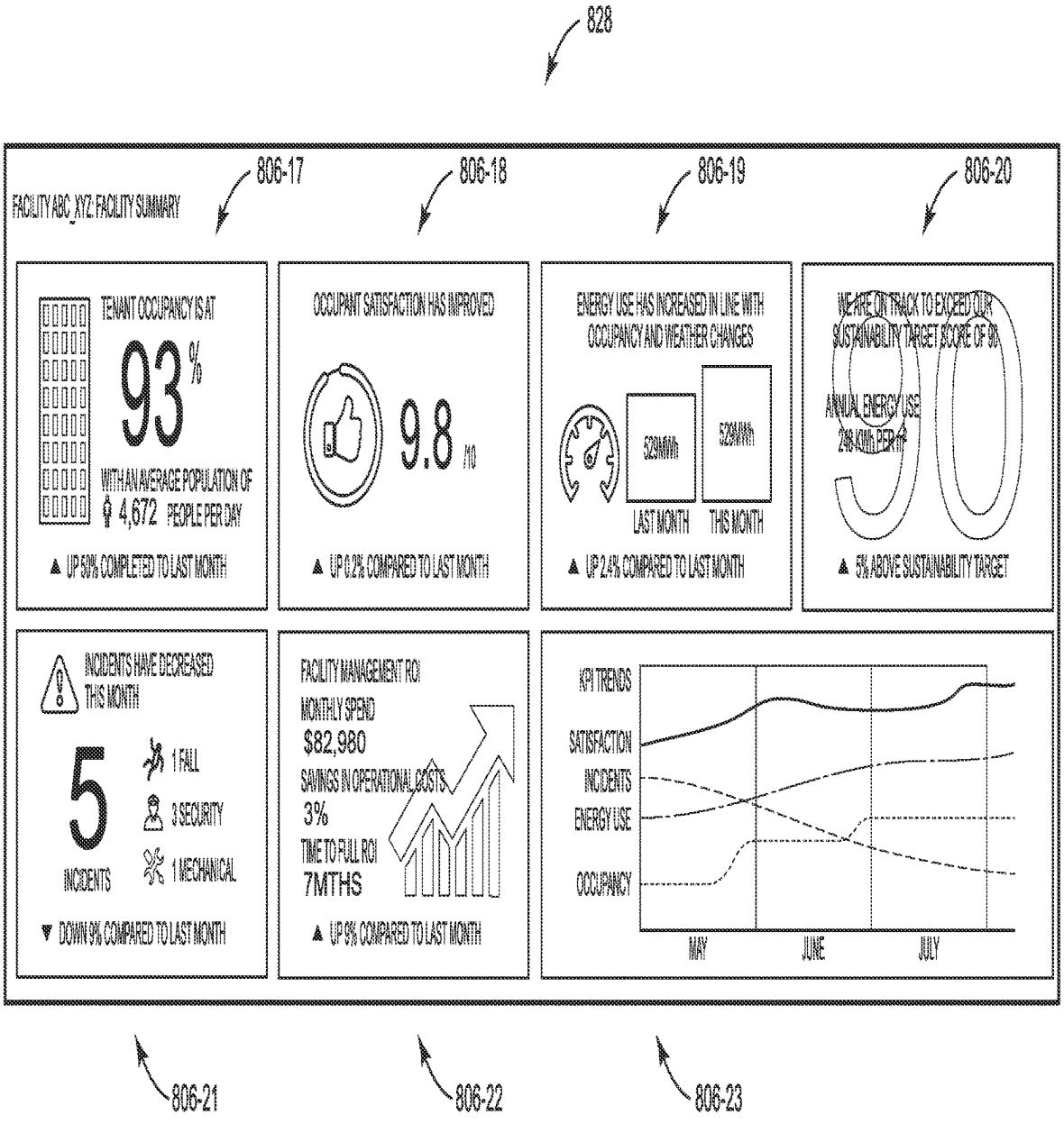
828
FACILITY ABC_XYZ FACILITY SUMMARY
806-17
806-18
806-19
806-20
TENANT OCCUPANCY IS AT
93%
WITH AN AVERAGE POPULATION OF
4,672 PEOPLE PER DAY
▲ UP 9% COMPLETED TO LAST MONTH
OCCUPANT SATISFACTION HAS IMPROVED
9.8 /10
▲ UP 0.2% COMPARED TO LAST MONTH
ENERGY USE HAS INCREASED IN LINE WITH OCCUPANCY AND WEATHER CHANGES
523MWh
523MWh
LAST MONTH
THIS MONTH
▲ UP 2.4% COMPARED TO LAST MONTH
WE ARE ON TRACK TO EXCEED OUR SUSTAINABILITY TARGET SCORE OF 90
ANNUAL ENERGY USE
246 KWh PER M²
90
▲ 5% ABOVE SUSTAINABILITY TARGET
INCIDENTS HAVE DECREASED THIS MONTH
5
INCIDENTS
1 FALL
3 SECURITY
1 MECHANICAL
▼ DOWN 9% COMPARED TO LAST MONTH
FACILITY MANAGEMENT ROI
MONTHLY SPEND
$82,980
SAVINGS IN OPERATIONAL COSTS
3%
TIME TO FULL ROI
7MTHS
▲ UP 9% COMPARED TO LAST MONTH
KPI TRENDS
SATISFACTION
INCIDENTS
ENERGY USE
OCCUPANCY
MAY
JUNE
JULY
806-21
806-22
806-23

Fig. 8

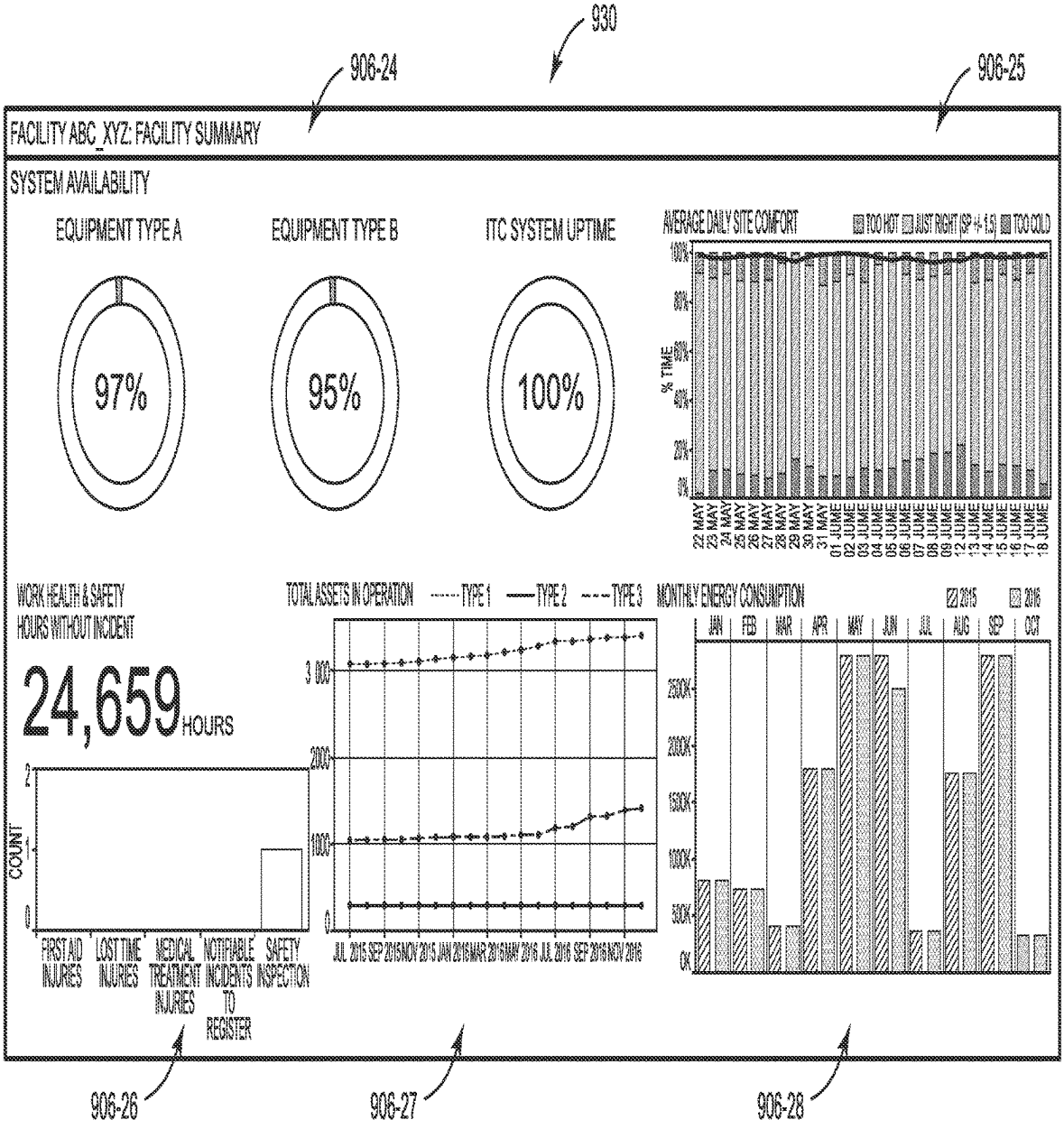
930
906-24
906-25
FACILITY ABC_XYZ: FACILITY SUMMARY
SYSTEM AVAILABILITY
EQUIPMENT TYPE A
97%
EQUIPMENT TYPE B
95%
ITC SYSTEM UPTIME
100%
AVERAGE DAILY SITE COMFORT
TOO HOT
JUST RIGHT (SP +/- 1.5)
TOO COLD
% TIME
WORK HEALTH & SAFETY
HOURS WITHOUT INCIDENT
24,659 HOURS
COUNT
FIRST AID INJURIES
LOST TIME INJURIES
MEDICAL TREATMENT INJURIES
NOTIFIABLE INCIDENTS TO REGISTER
SAFETY INSPECTION
TOTAL ASSETS IN OPERATION
TYPE 1
TYPE 2
TYPE 3
MONTHLY ENERGY CONSUMPTION
2015
2016
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
906-26
906-27
906-28

Fig. 9

PROVIDING A COMFORT DASHBOARD

PRIORITY INFORMATION

This is a continuation of co-pending U.S. patent application Ser. No. 17/556,328, filed Dec. 20, 2021, which is a continuation of co-pending U.S. patent application Ser. No. 15/941,952, filed Mar. 30, 2018, which claims the benefit of U.S. Provisional Application No. 62/480,047, filed Mar. 31, 2017, both of which are incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates to providing a comfort dashboard.

BACKGROUND

Facilities (e.g., buildings, departments, warehouses, plants, factories, refineries, airports, laboratories, etc.) can have various systems configured to provide human comfort (e.g., thermal comfort). Such systems can be and/or include, for example, heating, ventilation, and air conditioning (HVAC) systems and/or energy management systems, among other types of systems.

Previous approaches to providing comfort may lack key performance indicators (KPIs) that indicate (e.g., measure, evaluate, etc.) the efficacy of a comfort provision system. For instance, previous approaches may inform managers or decision-makers about energy usage and/or energy savings, but may lack information regarding the extent to which comfort is actually being provided in the facility. Furthermore, previous approaches may rely on reports that are manually created and/or out-of-date upon their creation. Such reports may additionally lack helpful interpretations and/or summarizations of a large amount of data.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a system for providing a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **2** illustrates a display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **3** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **4** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **5** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **6** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **7** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **8** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

FIG. **9** illustrates another display including a number of widgets of a comfort dashboard in accordance with one or more embodiments of the present disclosure.

DETAILED DESCRIPTION

Methods, systems, and computer-readable media for providing a comfort dashboard are described herein. For example, one or more embodiments include receiving operational data associated with an HVAC system of a facility, receiving credentials associated with a user of a user device including a number of display elements configurable by the user, and determining a particular portion of the operational data to provide to the user via the display elements of the user device based, at least in part, on the credentials.

Various embodiments of the present disclosure provide for a unified interest layer (referred to herein as a "dashboard") allowing at-a-glance views of various aspects (e.g., performance indicators, statistics, analytics, and/or metrics) associated with an operational (e.g., working) system. Systems, as used herein, refers to systems configured to provide human comfort. Such systems include, for example, HVAC systems. In a general sense, dashboards of the present disclosure can display data associated with the various aspects of such systems (herein referred to as "information" in and/or as summaries, trends, comparisons, and/or exceptions, among other ways of displaying information.

Whereas previous approaches may inform users as to energy savings of HVAC equipment, embodiments herein can additionally or alternatively provide meaningful insights into the actual comfort being provided in a facility. In an example, HVAC equipment may be simultaneously heating and cooling a particular space (e.g., room) of a facility due to a failed sensor. While previous approaches may indicate an elevated energy usage due to the simultaneous heating and cooling, they may fail to provide any indication that comfort is not being provided because a desired temperature (e.g., setpoint) is not being maintained. Embodiments of the present disclosure can provide such information in real-time, for instance.

Though not limited to such scenarios, embodiments of the present disclosure may be beneficial in instances where an entity (e.g., comfort provider) is hired to provide comfort to a customer. For instance, a facility may contract out the installation and/or maintenance of its HVAC system(s) to an outside entity. Providers enabled with embodiments herein can demonstrate performance results immediately, thereby providing quality assurance and transparency to their customers.

Dashboards in accordance with embodiments herein can provide indications of whether a facility (or a subset of a facility) is below a lower temperature threshold (e.g., too cold), within a temperature range (e.g., comfortable), and/or above an upper temperature threshold (e.g., too hot). Further, embodiments herein can track such information across hours, days, months, and/or years to provide different, meaningful, and easy-to-digest trends, patterns, and areas of interest. Users may readily understand which parts of a facility may need attention, maintenance, and/or reduction(s) thereof. As a result, cost savings may be realized while the provision of comfort across the facility is improved.

Embodiments of the present disclosure can receive (e.g., gather) data from a number of systems and/or devices and display information in various displays, determined based on an identity and/or role of a user, for instance. In some embodiments, information can be displayed based on one or more preferences of a user. In some embodiments, information can be displayed based on one or more user inputs.

Embodiments of the present disclosure can display a dashboard on various user devices including, by way of

example and not limitation, desktop computers, laptop computers, tablets, smart phones, and/or personal digital assistants (PDAs), for instance. Further, embodiments of the present disclosure can display dashboards on various computing and/or device platforms (e.g., operating systems).

Accordingly, embodiments of the present disclosure can provide various users (e.g., operators, managers, maintenance personnel, etc.) easily viewable and easily understandable information associated with the various systems described herein. Such users can use the provided information to make more informed and/or higher-level decisions than by using previous approaches. For example, managers can use such information to make decisions regarding contracts, purchases, and maintenance, among other decisions.

Dashboards in accordance with one or more embodiments of the present disclosure can include a number of display elements, sometimes referred to herein as "widgets." Widgets in accordance with embodiments of the present disclosure can include software accessories for providing (e.g., displaying) various information associated with various aspects of systems such as those previously discussed. Widgets in accordance with embodiments herein can provide different key performance indicators of the provision of comfort in a facility.

Widgets can interact with remote sources of information, such as servers (e.g., computing device **102** discussed below in connection with FIG. **1**), to provide information. Widgets can be used to access various pages (e.g., html webpages). Widgets can be interactive, so that a user performs common input operations (e.g., clicking a mouse, typing on a keyboard, touching a screen) to utilize the functionality of a widget.

Dashboards (e.g., widgets of a dashboard) in accordance with one or more embodiments of the present disclosure can be user-configurable. A user can interact with and/or configure widgets as desired, for instance. In some embodiments, a user can move widgets around the display, and/or can resize widgets if applicable. In various embodiments, some widgets may be resizable, and some may be of fixed size. Some widgets can automatically resize themselves based on the amount or nature of the information being displayed.

In some embodiments, widgets may overlap one another. In some embodiments, widgets do not overlap one another; if a user attempts to move one widget to the position occupied by another widget, one of the widgets may automatically move out of the way to make room.

In various embodiments, position(s), configuration(s), and/or size(s) of widgets can be saved when the dashboard is dismissed, so that the same state can be restored the next time the dashboard is invoked. Various embodiments allow a user to manipulate, adjust, and/or otherwise personalize particular information included in dashboards and/or widgets in accordance with the present disclosure.

Personalization of displayed information may be determined and/or limited by a user's role (e.g., identity). For example, a high-level user (e.g., a manager) may desire higher-level summarized information (e.g., summarized monthly). Higher-level information can include, for example, monthly spending associated with an HVAC system. A lower-level user (e.g., a maintenance worker) may desire lower-level information (e.g., current and/or real-time information). Lower-level information can include, for example, current temperatures of facility zones and/or HVAC devices that may be malfunctioning.

Display of information to a particular user can therefore be determined based on a role of the user. The role can be determined based upon user input of credentials and/or authentication information (e.g., log in).

Dashboards can be overlaid on an existing desktop user interface of a user device, for instance. The user interface can be darkened, brightened, blurred, distorted, or otherwise altered so as to emphasize that it is temporarily inactivated. The existing desktop can be visible behind the dashboard. In some embodiments, the existing desktop is not visible while the dashboard is active. In some embodiments, the desktop can be shrunk to a small portion of the screen while the dashboard is active, and can be reactivated by various user inputs.

A number of embodiments of the present disclosure can include the capability to alert a user when a widget needs attention or has new information to display to the user, even if the dashboard is not currently active. For example, if a particular portion of comfort data (e.g., proportion of time a zone is "too hot" per week) exceeds a particular threshold (e.g., **80** percent) a user may be alerted. A distinctive sound can be played, a dialog box can be presented, and/or a text alert can be displayed. Such alerts can be of a generalized type, may indicate the specific widget that issued the alert, and/or can display additional information specifying the nature of the alert. The user can then activate the dashboard to see the widget that issued the alert, for instance. Alternatively, the dashboard can automatically be activated in such a situation, or a dialog box can be presented to allow the user to indicate whether or not the dashboard should be activated.

In the following detailed description of the present disclosure, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration how one or more embodiments of the disclosure may be practiced. These embodiments are described in sufficient detail to enable those of ordinary skill in the art to practice the embodiments of this disclosure, and it is to be understood that other embodiments may be utilized and that process, electrical, and/or structural changes may be made without departing from the scope of the present disclosure.

The figures herein follow a numbering convention in which the first digit or digits correspond to the drawing figure number and the remaining digits identify an element or component in the drawing. Similar elements or components between different figures may be identified by the use of similar digits. For example, **206** may reference element "**06**" in FIG. **1**, and a similar element may be referenced as **306** in FIG. **3**. Multiple analogous elements within one figure may be referenced with a reference numeral followed by a hyphen and another numeral or a letter. For example, **206-1** may reference element **06-1** in FIGS. **2** and **206-2** may reference element **06-2**, which can be analogous to element **06-1**. Such analogous elements may be generally referenced without the hyphen and extra numeral or letter. For example, elements **206-1** and **206-2** may be generally referenced as **206**.

As will be appreciated, elements shown in the various embodiments herein can be added, exchanged, and/or eliminated so as to provide a number of additional embodiments of the present disclosure. As used herein, "a" or "a number of" something can refer to one or more such things. For example, "a number of widgets" can refer to one or more widgets. In addition, as will be appreciated, the proportion and the relative scale of the elements provided in the figures are intended to illustrate the embodiments of the present invention, and should not be taken in a limiting sense.

For purposes of illustration, various embodiments are herein described in the context of a particular operational

system (e.g., an HVAC system). As will be appreciated, and as is previously discussed, embodiments of the present disclosure do not limit systems and/or dashboards to a particular type, and such examples are not to be taken in a limiting sense.

FIG. **1** illustrates a system for providing a comfort dashboard in accordance with one or more embodiments of the present disclosure. As shown in FIG. **1**, the system includes a computing device **102** in communication with a facility **112**. The computing device **102** and the facility **112** (e.g., devices and/or systems of the facility **112**) can be connected via a wired and/or wireless connection, such as a network, for instance, to allow data to be transferred in any direction between the computing device **102**, and the facility **112**. The network can be the Internet and/or a private network belonging to an entity, for example. The entity can be defined as an individual, group of individuals, and/or a business.

The facility **112** can be or include one or more buildings, departments, warehouses, plants, factories, refineries, airports, laboratories, mines, etc. The facility **112** can include a plurality of zones, illustrated in FIG. **1** as a zone **114-1**, a zone **114-2**, and a zone **114**-N. Facilities herein are not limited to a particular number of zones **114**. Zones **114** may refer to subsets of the facility **112**. Zones **114** may be of same, similar, or different sizes. For instance, in some embodiments, zones **114** may be rooms, wings, floors, departments, buildings, etc.

As shown in FIG. **1**, computing device **102** includes a processor **110** and a memory **108**. Memory **108** can be coupled to processor **110**. Memory **108** can be volatile or nonvolatile memory. Memory **108** can also be removable (e.g., portable) memory, or non-removable (e.g., internal) memory. For example, memory **108** can be random access memory (RAM) (e.g., dynamic random access memory (DRAM) and/or phase change random access memory (PCRAM)), read-only memory (ROM) (e.g., electrically erasable programmable read-only memory (EEPROM) and/or compact-disk read-only memory (CD-ROM)), flash memory, a laser disk, a digital versatile disk (DVD) or other optical disk storage, and/or a magnetic medium such as magnetic cassettes, tapes, or disks, among other types of memory.

Further, although memory **108** is illustrated as being located in computing device **102**, embodiments of the present disclosure are not so limited. For example, memory **108** can also be located internal to another computing resource (e.g., enabling computer readable instructions to be downloaded over the Internet or another wired or wireless connection). Memory **108** can also store executable instructions, such as, for example, computer readable instructions (e.g., software), for providing a comfort dashboard according one or more embodiments of the present disclosure.

Computing device **102** can be various devices capable of displaying a comfort dashboard in accordance with embodiments of the present disclosure (e.g., a desktop computer, laptop computer, tablet, smart phone, and/or personal digital assistant (PDAs), for instance, among others). In some embodiments, the dashboard can be available to a user from a remote location (e.g., via display device **104**, discussed below). Configuration information for the user's dashboard can be stored at a remote server (e.g., the computing device **102**, in some embodiments, discussed below), pursuant to a user command or automatically. The user can then enter credentials and/or authentication information (e.g., log in) and be presented with a display **104**, for instance.

In some embodiments, computing device **102** includes the display **104**. In some embodiments, the display **104** can be a portion of a device separate from the computing device **102** and may be alternatively referred to as a display device **104**. Display **104** can be a graphic user interface (GUI) that can provide (e.g., display and/or present) and/or receive information (e.g., data and/or images) to and/or from a user. For example, display **104** can include a screen that can provide information to a user and/or receive information entered into display **104** by the user. However, embodiments of the present disclosure are not limited to a particular type of display.

Display **104** can be analogous to display **216**, **318**, **420**, **522**, **624**, **726**, **828**, and/or **930** discussed below in connection with FIGS. **2-9**, respectively, for instance. As shown in FIG. **1**, display **104** includes a display element **106**. Display element **106** can be analogous to one or more of the display elements **206**, **306**, **406**, **506**, **706**, **806**, and/or **906** discussed below in connection with FIGS. **2-9**, respectively, for instance. Though a single display **104** and display element **106** are shown in FIG. **1**, embodiments of the present disclosure are not so limited and reference to a single display element is not to be taken in a limiting sense.

In some embodiments, display element **106** can be preinstalled on computing device **102** or display device **104** (e.g., in memory **108**). In other embodiments, display element **106** is not preinstalled, but can be installed in response to various user input(s). In various embodiments, a user can download display element **106** onto display **104** from a repository associated with and/or maintained by computing device **102**, for instance. Such a download (e.g., installation) can be and/or be a portion of a fully functional application containing related functionality (e.g., additional display elements).

Computing device **102** (e.g., processor **110** of computing device **102**) can be configured to perform various tasks in accordance with embodiments herein. For instance, processor **110** can execute the executable instructions stored in memory **108** to receive operational data associated with an HVAC system of the facility **112**. Such data can be received from sensors, actuators, controllers, programmable communicating thermostats (PCTs), and/or other devices. In some embodiments, for instance, operational data can be received from edge devices such as temperature sensors. In some embodiments, operational data can be received from a building management system (BMS) associated with the facility **112**.

In some embodiments, computing device **102** can provide (e.g., transmit) a portion of the operational data responsive to a request (e.g., a request, as discussed below, made by display device **104**). Computing device **102** can include an Application Programming Interface (API), for instance, associated with display element **106**. The API can gather a particular portion of operational data received from the facility **112** configured to be displayed as information by display element **106**. A particular portion of operational data can refer to operational data from a particular time period (e.g., a particular time instance, hour, day, month, year, etc.), and/or operational data associated with a particular aspect of the facility **112** (e.g., occupancy data) or an HVAC system of the facility **112**, such as configuration settings, setpoints, temperature data, humidity data, sunlight data, etc.

Additionally, computing device **102** can include a number of APIs, each associated with a respective display element **106** of display **104**. Where appropriate, authentication and/or user verification may be required before computing device **102** provides requested data. The information can be transmitted across a secure channel and/or encrypted prior to transmission, according to various techniques.

Providing operational data can be in response to a determination that display device **104** is connected (e.g., wired and/or wirelessly connected) to computing device **102**. As such, operational data can be updated upon subsequent reconnection if the connection is lost. Operational data can be updated responsive to user inputs and/or according to a schedule, for instance. Operational data can be provided along with an indicator associated with a time it was provided (e.g., a time stamp), for instance. Such an indicator can be produced and/or displayed by display **104** (e.g., by display element **106**) in association with received data.

Processor **110** can execute the executable instructions stored in memory **108** to receive credentials associated with a user of a user device including a number of display elements configurable by the user. For instance, the user can enter credentials and/or authentication information (e.g., log in) from a display device **104** and/or computing device **102**. Processor **110** can execute the executable instructions stored in memory **108** to determine a particular portion of the operational data to provide to the user via the display elements of the user device based, at least in part, on the credentials. Different portions of operational data displayed via display elements are illustrated in FIGS. **2-9** and discussed below. In some embodiments, the operational data displayed is summarized via the display element **106**. Displaying a summary of a portion of the data can include agglomerating the **106** (e.g., converting the data to information displayed by display element **106**).

Computing device **102** can store dashboard configuration information. Dashboard configuration information can be used by computing device **102** and/or display **104** to specify the configuration options for displaying display element **106**. Dashboard configuration information can include display detail configuration levels and the like based on roles.

FIG. **2** illustrates a display **216** including a number of widgets **206** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. As shown, widgets herein can display information in various manners. Information can be displayed via charts, graphs, text, images, icons, trends, symbols, etc. Widgets can allow a user to visualize increased and/or decreased levels of information detail via various inputs (e.g., touching particular portions of widgets).

Widgets can interact with various functionalities of computing device **102**. Such functionalities can include image capturing functionalities (e.g., a camera) and/or location functionalities (e.g., using Global Positioning System (GPS) technology), for instance.

In an example, a user may be navigating a particular portion of a facility. The user can activate a GPS functionality of the computing device **102** such that, via one or more of widgets **206**, the user can visualize comfort statuses in zone(s) of the facility within a particular distance from the user's geographical location (e.g., a particular area having a radius of 20 meters). Such information can allow the user to make various decisions such as, for example, a decision to perform maintenance within the area.

Widgets can form a request for data, and transmit the request according to HTTP or some other network protocol. A computing device, (e.g., computing device **102**) can respond to the request with information; and the widgets can use the information in forming the output that will be displayed. For example, such operations can take place in response to JavaScript code within widgets.

As illustrated in FIG. **2**, display **216** includes critical zones comfort widget **206-1**, a hottest zones widget **206-2**, and a coldest zones widget **206-3**. As will be appreciated, embodiments of the present disclosure do not limit the number, names and/or appearance of widgets to those illustrated by the Figures herein.

In some embodiments, a user can indicate, via input, a subset of particular zones which may be deemed "critical zones." Such zones may include zones where human occupancy is high and/or likely. Such zones may include zones wherein comfortable conditions are particularly desired. The critical zones comfort widget **206-1** can display each of these critical zones along with a percentage of time they were above an upper temperature threshold (e.g., too hot) and below a lower temperature threshold (e.g., too cold). A time period for such display can be automatically determined and/or selected by the user. Two weeks is shown in FIG. **2**, for example (week 24 and week 25). Similarly, the upper and/or lower thresholds can be determined statistically (e.g., based on numerical differences and/or standard deviations from setpoint) or by user input.

The hottest zones widget **206-2** can display the zones of the facility having the greatest proportion of time wherein the temperature was above the upper threshold. These zones may call for special attention and/or maintenance, for instance. Similarly, the coldest zones widget **206-3** can display the zones having the greatest proportion of time wherein the temperature was below the lower threshold.

FIG. **3** illustrates a display **318** including a number of widgets **306-4** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The overview widget **306-4** can display a percentage of time comfort in the facility was within a desired range (e.g., below upper threshold and above lower threshold), too hot, and too cold for a period of time (a month, in the example of FIG. **3**). Additionally, the overview widget **306-4** can illustrate a trend line indicating outside air temperature. Such a trend line can allow a user to readily visualize and understand what effect external conditions may have on the provision of comfort in the facility.

FIG. **4** illustrates a display **420** including a number of widgets **406-5**, **406-6**, and **406-7** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The out of range widget **406-5** can display zone temperatures that are outside a desired (e.g., acceptable range) for a period of time. The intensity of the coloration can, for instance, indicate how much time (how many hours) the average temperature has been outside of the desired setpoint range. It is noted that embodiments herein are not limited to color variations to indicate such distinctions. A display settings widget **406-6** can be provided to allow user modification of the time period and/or the display coloration, for instance.

Selecting or hovering over a particular cell of the widget **406-5** corresponding to a zone and day can generate a details widget **406-7**. The details widget **406-7** can display a name of a device or component (e.g., thermostat and/or controller) assigned to a particular zone, the time the zone has been out of the desired range, and the value of the range (e.g., from setpoint value).

FIG. **5** illustrates a display **522** including a number of widgets **506-8**, **506-9**, and **506-10** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The hourly zone temperature widget **506-8** can display the deviation from setpoint for each zone for each hour in a day. As shown in FIG. **5**, the further away from the setpoint, the darker the displayed color. In some embodiments, red coloration can indicate too hot, and blue coloration can indicate too cold, though embodiments herein are not so limited. In some embodiments, zones that are within

a desired range from setpoint may not be highlighted so that the user readily appreciates those zones that exhibit the most deviation.

Using a display settings widget **506-9**, a user can filter the hours to be displayed in the hourly zone temperature widget **506-8**. In addition, the user can modify to the number of days to be displayed, how the deviation is displayed (e.g., coloration, cross-hatching, etc.), and which types of deviation are to be displayed.

Selecting or hovering over a particular cell of the hourly zone temperature widget **506-8** corresponding to a zone and an hour can generate a details widget **506-10**. The details widget **506-10** can display details such as a name of a device or component (e.g., thermostat and/or controller) assigned to a particular zone, the date, the hour, whether the zone is occupied or unoccupied, the setpoint, the average temperature during that hour, and the value of the range (e.g., from setpoint value), among others.

FIG. **6** illustrates a display **624** including a number of widgets **606-11**, **606-12** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The occupancy heatmap widget **606-11** can display level of occupancy for each zone for each hour in a day. As shown in FIG. **6**, the higher the occupancy level (e.g., the more people in a zone), the darker the displayed color. In some embodiments, zones may be split into levels so that the user can see where in the facility the provision of comfort may be most needed. A display settings widget **606-12** can allow a user to modify which days or hours are to be displayed by the occupancy heatmap widget **606-11**.

FIG. **7** illustrates a display **726** including a number of widgets **706-13**, **706-14**, **706-706-16**, of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The comfort performance widget **706-13** can display a percentage of zones that have exhibited a desired temperature range within a particular time period. The energy consumption widget **706-14** can display a comparison of energy comfort across a plurality of zones between two different time periods. The service cases by status widget **706-15** can display a number of pending service cases or maintenance cases sorted by their respective statuses. The services cases by priority widget **706-16** can display a number of service cases or maintenance cases sorted by their respective priorities.

FIG. **8** illustrates a display **828** including a number of widgets **806-17**, **806-18**, **806-19**, **806-20**, **806-21**, **806-22**, **806-23**, of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The tenant occupancy widget **806-17** can display a percentage of the facility that is currently occupied in conjunction with other information such as average tenant occupancy and/or a comparison to previous time periods.

The occupant satisfaction widget **806-18** can display feedback from occupants of the facility regarding the comfort provided. The normalized energy usage widget **806-19** can display a relationship to an expected energy consumption based on variables such as occupancy and/or weather. The target energy usage widget **806-20** can display a relationship to a target energy consumption goal for a period of time. The incidents widget **806-21** can display an amount and/or trend of facility incidents such as, for example, falls, security breaches, and/or mechanical incidents.

The return on investment (ROI) widget **806-22** can display an amount spent on the provision of comfort over a period of time in conjunction with savings in operational costs and/or a time until full return on investment, in some embodiments. The overall trends widget **806-23** can display trends respectively associated with a variety of factors over a period of time, such as occupant satisfaction, incidents, energy use, and or occupancy, for instance. The display **828** may be of particular use to higher-level management given the increased degree of summarized information and variety beyond thermal comfort.

FIG. **9** illustrates a display **930** including a number of widgets **906-24**, **906-25**, **906-26**, **906-27**, **906-28** of a comfort dashboard in accordance with one or more embodiments of the present disclosure. The system availability widget **906-24** can display the proportion of each of a number of facility systems that is available and/or functioning properly. The average daily site comfort widget **906-25** can display an average daily site comfort in a manner analogous to the widget **306-4** previously discussed in connection with FIG. **3**. The work health and safety widget **906-26** can display a length of time since a most recent incident and an identification of that incident. The total assets in operation widget **906-27** can display a respective quantity of a plurality of different facility system devices, components, or equipment. The monthly energy consumption widget **906-28** can display energy consumption over a period of time in conjunction with an analogous and previous period of time (e.g., the same 10 months of two different years).

Although specific embodiments have been illustrated and described herein, those of ordinary skill in the art will appreciate that any arrangement calculated to achieve the same techniques can be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments of the disclosure.

It is to be understood that the above description has been made in an illustrative fashion, and not a restrictive one. Combination of the above embodiments, and other embodiments not specifically described herein will be apparent to those of skill in the art upon reviewing the above description.

The scope of the various embodiments of the disclosure includes any other applications in which the above structures and methods are used. Therefore, the scope of various embodiments of the disclosure should be determined with reference to the appended claims, along with the full range of equivalents to which such claims are entitled.

What is claimed:

1. A system for displaying information related to the operation of a facility, the system comprising:

a port for receiving operational data associated with the operation of the facility;

a user interface including a display;

one or more processors operatively coupled to the port and the user interface, the one or more processors configured to:

display a dashboard on the display, wherein the dashboard includes content including one or more widgets that each include a software accessory for displaying particular information derived at least in part from the operational data associated with the facility;

receive a user input via the user interface; and

modify the content displayed by the dashboard based at least in part on the received user input.

2. The system of claim **1**, wherein the one or more processors are configured to modify one or more of widgets included with the dashboard based at least in part on the received user input.

3. The system of claim **2**, wherein the one or more processors are configured to modify the particular informa-

tion that is displayed by one or more of the widgets included with the dashboard based at least in part on the received user input.

4. The system of claim **2**, wherein the software accessory of each of one or more of the widgets included with the dashboard provide a corresponding functionality for the widget, and wherein the one or more processors are configured to use at least in part of the received user input to exercise the functionality of one or more of the widgets.

5. The system of claim **2**, wherein the functionality for at least one widget includes configuring the widget to display the particular information.

6. The system of claim **1**, wherein the particular information that is displayed for at least one of the one or more widgets is derived at least in part from an aggregation of at least some of the operational data associated with the facility over time.

7. The system of claim **1**, wherein the particular information that is displayed for at least one of the one or more widgets is derived at least in part from an aggregation of at least some of the operational data associated with the facility over a period of time, wherein the period of time is based at least in part on the received user input.

8. The system of claim **1**, wherein the one or more processors are configured compare at least some of the operational data associated with the facility with a threshold, and wherein at least one of the one or more widgets included with the dashboard is configured to visually represent the comparison.

9. The system of claim **8**, wherein at least one of the widgets included with the dashboard that is configured to visually represent the comparison includes visually representing the comparison using a coloration.

10. The system of claim **1**, wherein one or more of the widgets included with the dashboard comprise a widget that identifies two or more types of equipment supporting the operation of the facility and an amount of each of the two or more types of equipment supporting the operation of the facility.

11. The system of claim **1**, wherein the one or more processors are configured to identify one or more pending service cases and/or maintenance cases associated with the operation of the facility each having a priority level, and wherein one or more of the widgets included with the dashboard comprise a widget that identifies service cases and/or maintenance cases that have a highest priority level.

12. The system of claim **1**, wherein the port is configured to receive weather data, and wherein one or more of the widgets included with the dashboard comprise a widget that displays an expected energy consumption of at least some equipment supporting the operation of the facility that is based at least in part on the weather data.

13. The system of claim **1**, wherein the port is configured to receive weather data, and wherein one or more of the widgets included with the dashboard comprise a widget that displays an energy consumption of at least some equipment supporting the operation of the facility that is normalized based at least in part on the weather data.

14. The system of claim **1**, wherein one or more of widgets included with the dashboard comprise a widget that detects a pointing device of the user interface hovering over at least part of the widget, and in response, displays a pop-up window that includes additional information beyond the particular information displayed by the widget.

15. The system of claim **1**, wherein one or more of widgets included with the dashboard comprise a widget that displays cumulative energy savings against a defined energy baseline.

16. The system of claim **1**, wherein one or more of widgets included with the dashboard comprise a widget that displays a total monthly spend for at least one operational cost to support the operation of the facility.

17. A method for providing a dashboard, comprising:

receiving operational data associated with an operation of a facility;

displaying one or more widgets on a display that each are configured to display corresponding particular information derived at least in part from the operational data associated with the operation of the facility, wherein the particular information that is displayed for at least one of the one or more widgets is derived at least in part from an aggregation of at least some of the operational data associated with the operation of the facility over a period of time, wherein the period of time is based at least in part on a user input; and

exercising a functionality of one or more of the widgets based at least in part on user input, wherein the functionality of at least one of the widgets defines at least in part the particular information that is displayed by the corresponding widget.

18. The method of claim **17**, comprising:

comparing at least some of the operational data associated with the facility with a threshold; and

visually representing the comparison via one or more of the widgets using a coloration.

19. The method of claim **17**, comprising:

receiving weather data; and

displaying by one or more of the widgets an energy consumption of at least some equipment supporting the operation of the facility that is normalized based at least in part on the weather data.

20. A non-transitory computer readable medium storing instructions thereon that when executed by one or more processors causes the one or more processors to:

receiving operational data associated with an operation of a facility;

displaying one or more widgets on a display that each are configured to display corresponding particular information derived at least in part from operational data associated with the operation of the facility, wherein the particular information that is displayed for at least one of the one or more widgets is derived at least in part from an aggregation of at least some of the operational data associated with the operation of the facility over a period of time, wherein the period of time is based at least in part on a user input; and

exercising a functionality of one or more of the widgets based at least in part on user input, wherein the functionality of at least one of the widgets defines at least in part the particular information that is displayed by the corresponding widget.

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