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Hintersteiner et al.

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(54) **SYSTEM AND METHOD FOR NETWORK USER ISOLATION**

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(51) **Int. Cl.**

H04W 4/00	(2009.01)
H04W 48/02	(2009.01)
H04W 16/10	(2009.01)
H04W 52/24	(2009.01)
H04W 84/16	(2009.01)

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

CPC ***H04W 48/02*** (2013.01); ***H04W 16/10*** (2013.01); ***H04W 52/243*** (2013.01); *H04W 84/16* (2013.01)

(58) **Field of Classification Search**

CPC H04W 80/04; H04W 88/06; H04W 88/08; H04W 84/18; H04L 29/06

See application file for complete search history.

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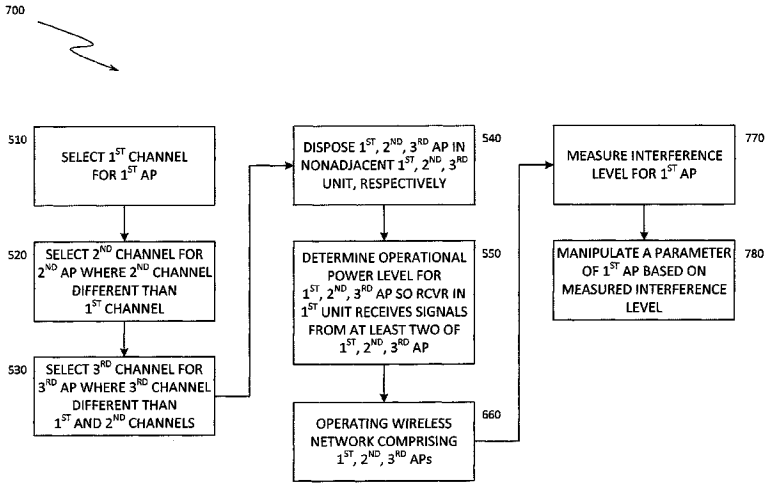
(57) **ABSTRACT**

A communications network for providing communications for Group 1 Users, Group 2 Users and a plurality of digitally-controlled appliances is disclosed. Said communications network includes a first switch operatively connected to a server, a router, a second switch, and a third switch. Said second switch is operatively connected to a first access point and a second access point. Said third switch is operatively connected to a third access point and a fourth access point. Said first access point is wirelessly connected to Device A, said second access point is wirelessly connected to Device B, said third access point is wirelessly connected to Device C. Said fourth access point is programmed to allow communications between User F wirelessly connected to said fourth access point and any said Group 1 Users, any said Group 2 Users, any of said plural appliances, said server, and said router.

30 Claims, 10 Drawing Sheets



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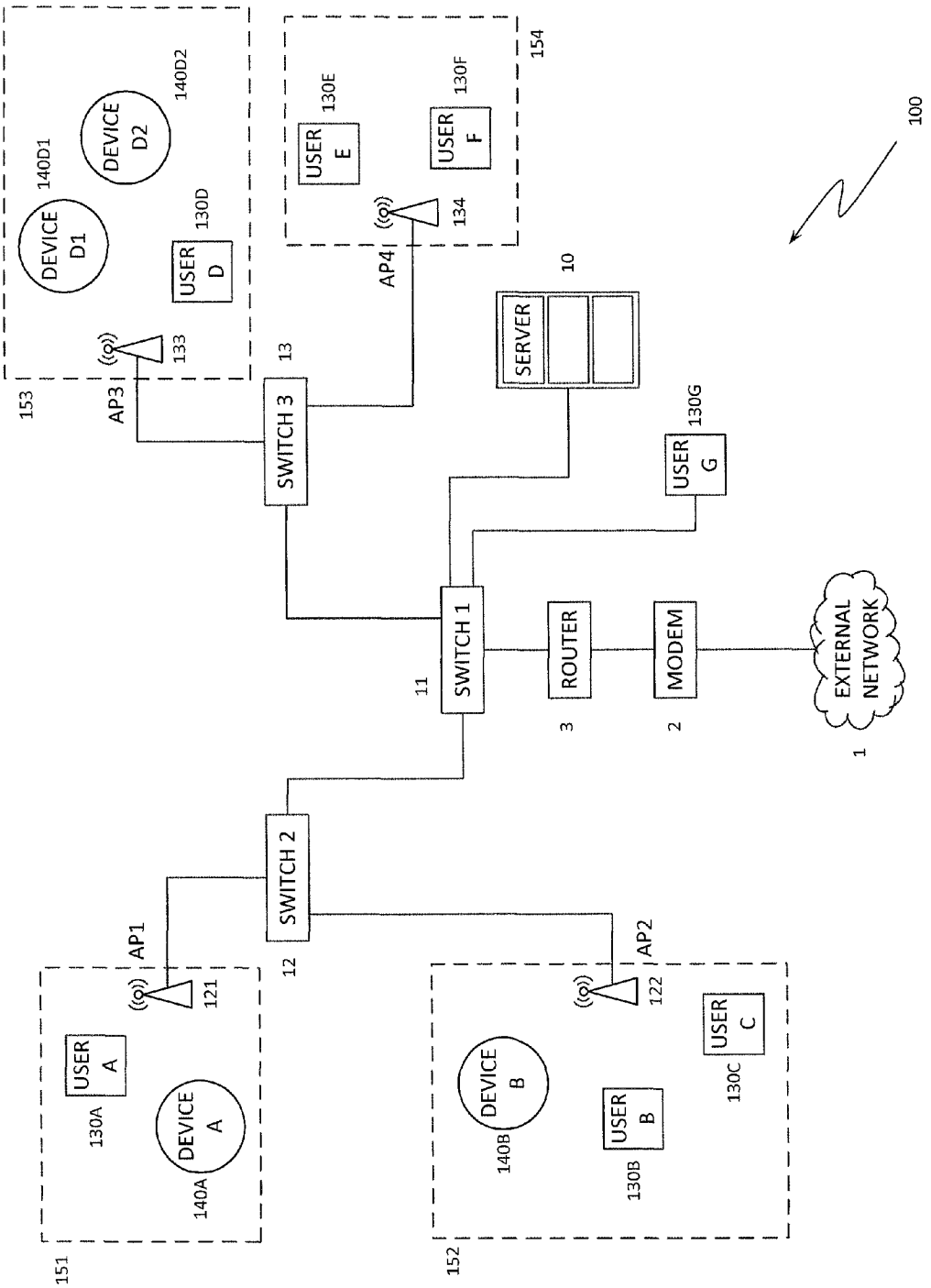

FIGURE 1
PRIOR ART

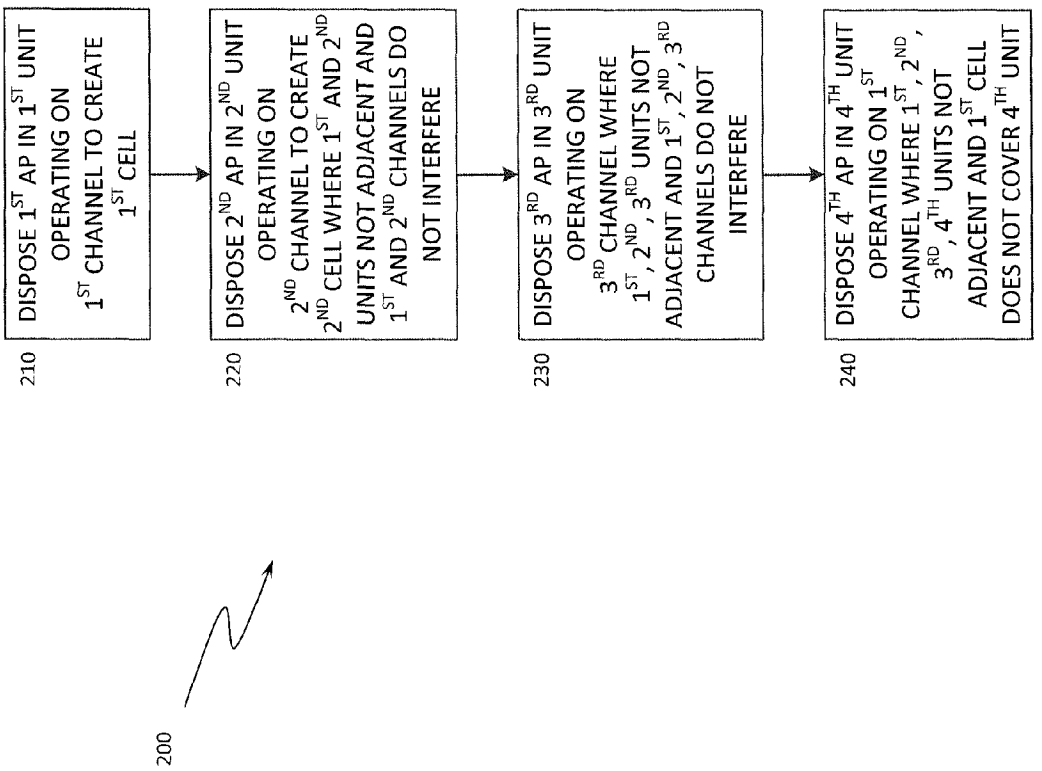
200
210
DISPOSE 1ST AP IN 1ST UNIT OPERATING ON 1ST CHANNEL TO CREATE 1ST CELL
220
DISPOSE 2ND AP IN 2ND UNIT OPERATING ON 2ND CHANNEL TO CREATE 2ND CELL WHERE 1ST AND 2ND UNITS NOT ADJACENT AND 1ST AND 2ND CHANNELS DO NOT INTERFERE
230
DISPOSE 3RD AP IN 3RD UNIT OPERATING ON 3RD CHANNEL WHERE 1ST, 2ND, 3RD UNITS NOT ADJACENT AND 1ST, 2ND, 3RD CHANNELS DO NOT INTERFERE
240
DISPOSE 4TH AP IN 4TH UNIT OPERATING ON 1ST CHANNEL WHERE 1ST, 2ND, 3RD, 4TH UNITS NOT ADJACENT AND 1ST CELL DOES NOT COVER 4TH UNIT

FIGURE 2

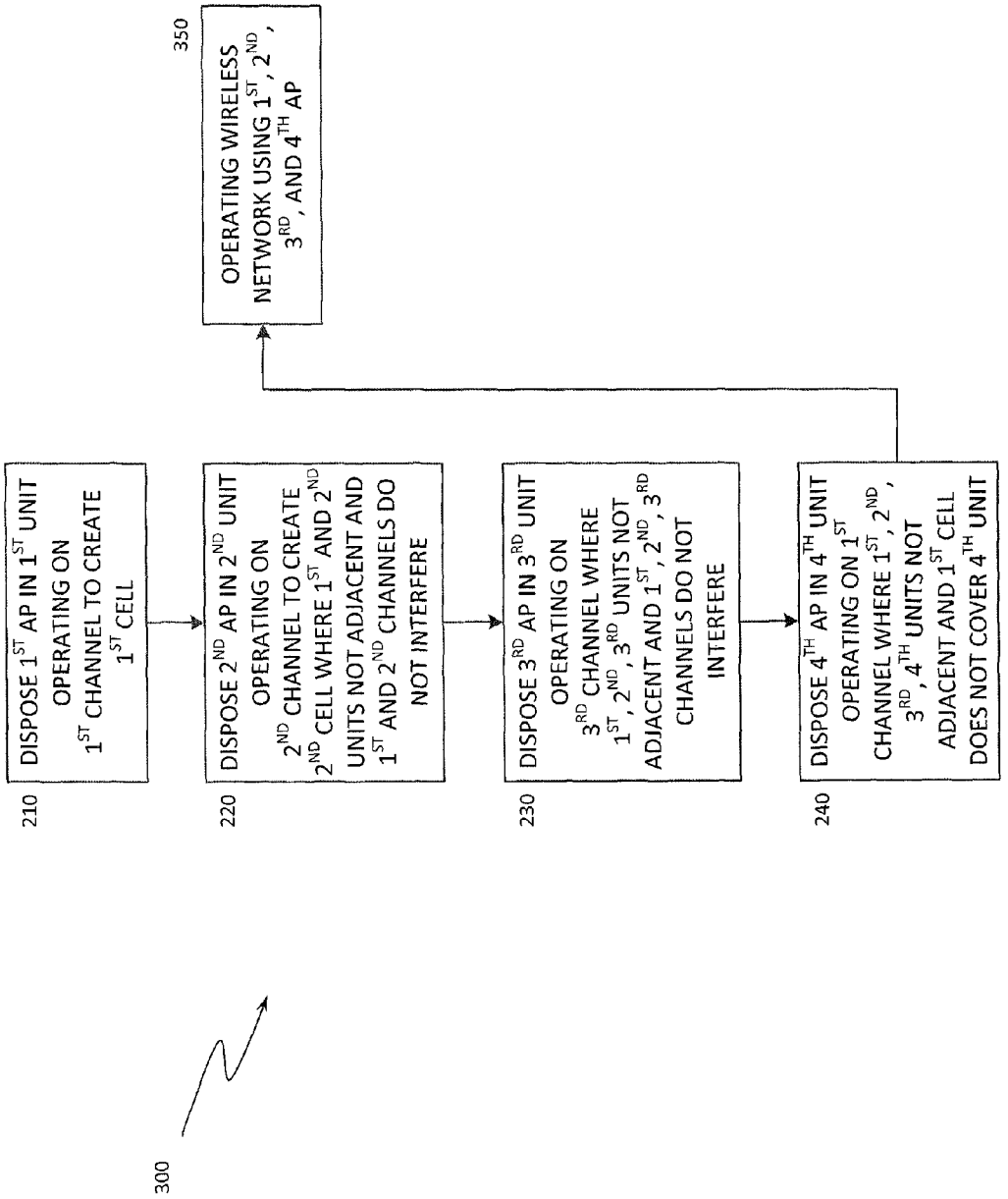
300
210
DISPOSE 1ST AP IN 1ST UNIT OPERATING ON 1ST CHANNEL TO CREATE 1ST CELL
220
DISPOSE 2ND AP IN 2ND UNIT OPERATING ON 2ND CHANNEL TO CREATE 2ND CELL WHERE 1ST AND 2ND UNITS NOT ADJACENT AND 1ST AND 2ND CHANNELS DO NOT INTERFERE
230
DISPOSE 3RD AP IN 3RD UNIT OPERATING ON 3RD CHANNEL WHERE 1ST, 2ND, 3RD UNITS NOT ADJACENT AND 1ST, 2ND, 3RD CHANNELS DO NOT INTERFERE
240
DISPOSE 4TH AP IN 4TH UNIT OPERATING ON 1ST CHANNEL WHERE 1ST, 2ND, 3RD, 4TH UNITS NOT ADJACENT AND 1ST CELL DOES NOT COVER 4TH UNIT
350
OPERATING WIRELESS NETWORK USING 1ST, 2ND, 3RD, AND 4TH AP

FIGURE 3

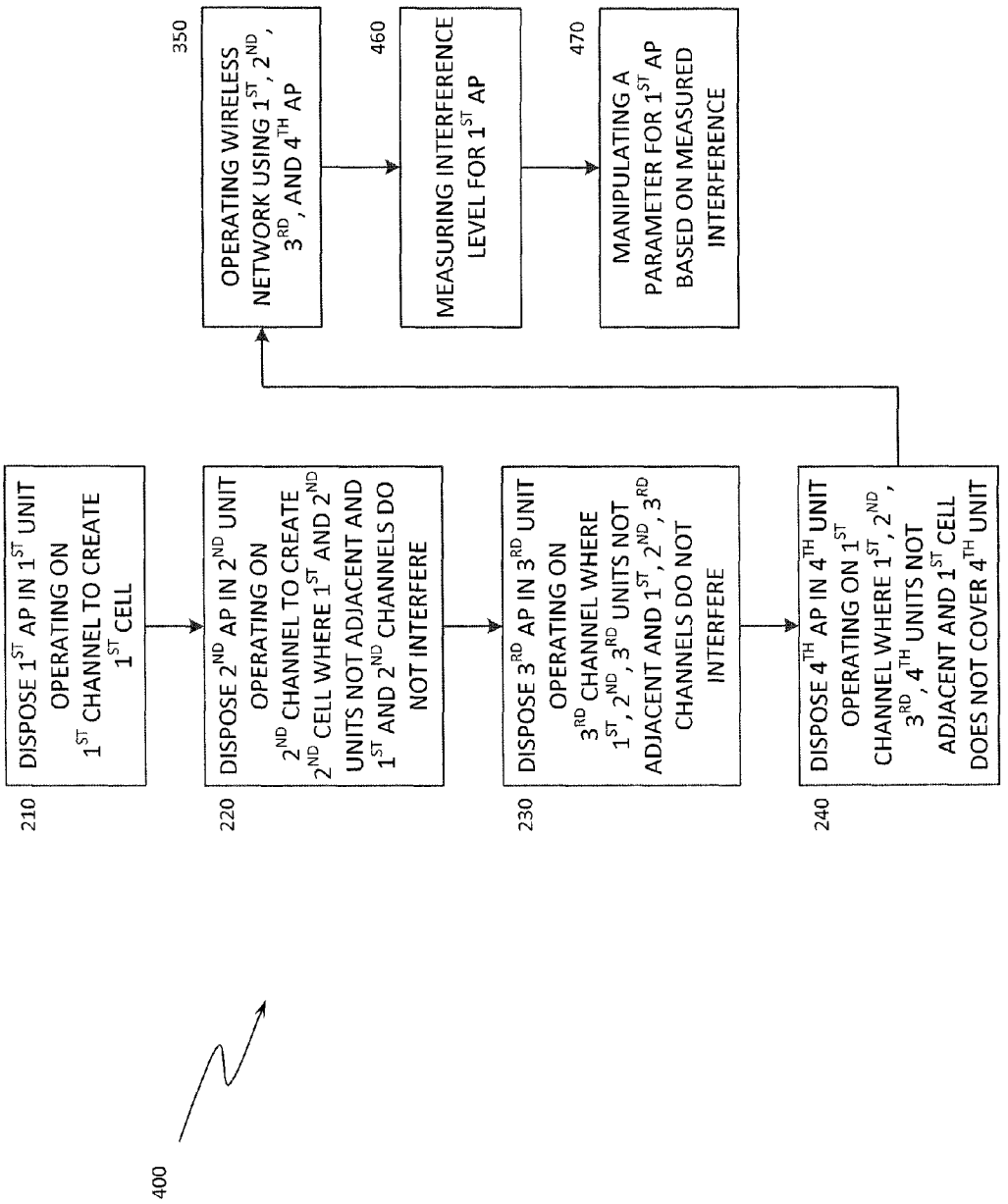
400
210
DISPOSE 1ST AP IN 1ST UNIT OPERATING ON 1ST CHANNEL TO CREATE 1ST CELL
220
DISPOSE 2ND AP IN 2ND UNIT OPERATING ON 2ND CHANNEL TO CREATE 2ND CELL WHERE 1ST AND 2ND UNITS NOT ADJACENT AND 1ST AND 2ND CHANNELS DO NOT INTERFERE
230
DISPOSE 3RD AP IN 3RD UNIT OPERATING ON 3RD CHANNEL WHERE 1ST, 2ND, 3RD UNITS NOT ADJACENT AND 1ST, 2ND, 3RD CHANNELS DO NOT INTERFERE
240
DISPOSE 4TH AP IN 4TH UNIT OPERATING ON 1ST CHANNEL WHERE 1ST, 2ND, 3RD, 4TH UNITS NOT ADJACENT AND 1ST CELL DOES NOT COVER 4TH UNIT
350
OPERATING WIRELESS NETWORK USING 1ST, 2ND, 3RD, AND 4TH AP
460
MEASURING INTERFERENCE LEVEL FOR 1ST AP
470
MANIPULATING A PARAMETER FOR 1ST AP BASED ON MEASURED INTERFERENCE

FIGURE 4

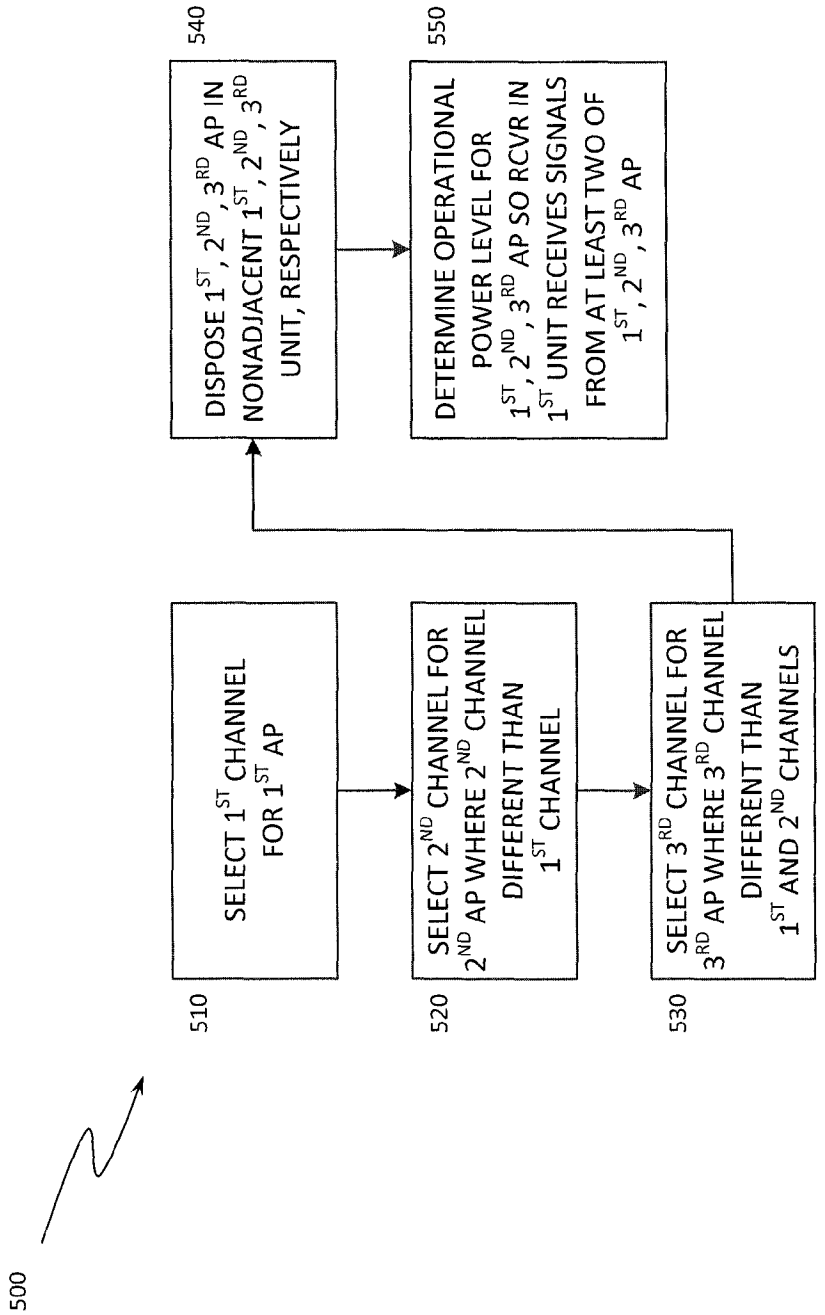
500
510
SELECT 1ST CHANNEL FOR 1ST AP
520
SELECT 2ND CHANNEL FOR 2ND AP WHERE 2ND CHANNEL DIFFERENT THAN 1ST CHANNEL
530
SELECT 3RD CHANNEL FOR 3RD AP WHERE 3RD CHANNEL DIFFERENT THAN 1ST AND 2ND CHANNELS
540
DISPOSE 1ST, 2ND, 3RD AP IN NONADJACENT 1ST, 2ND, 3RD UNIT, RESPECTIVELY
550
DETERMINE OPERATIONAL POWER LEVEL FOR 1ST, 2ND, 3RD AP SO RCVR IN 1ST UNIT RECEIVES SIGNALS FROM AT LEAST TWO OF 1ST, 2ND, 3RD AP

FIGURE 5

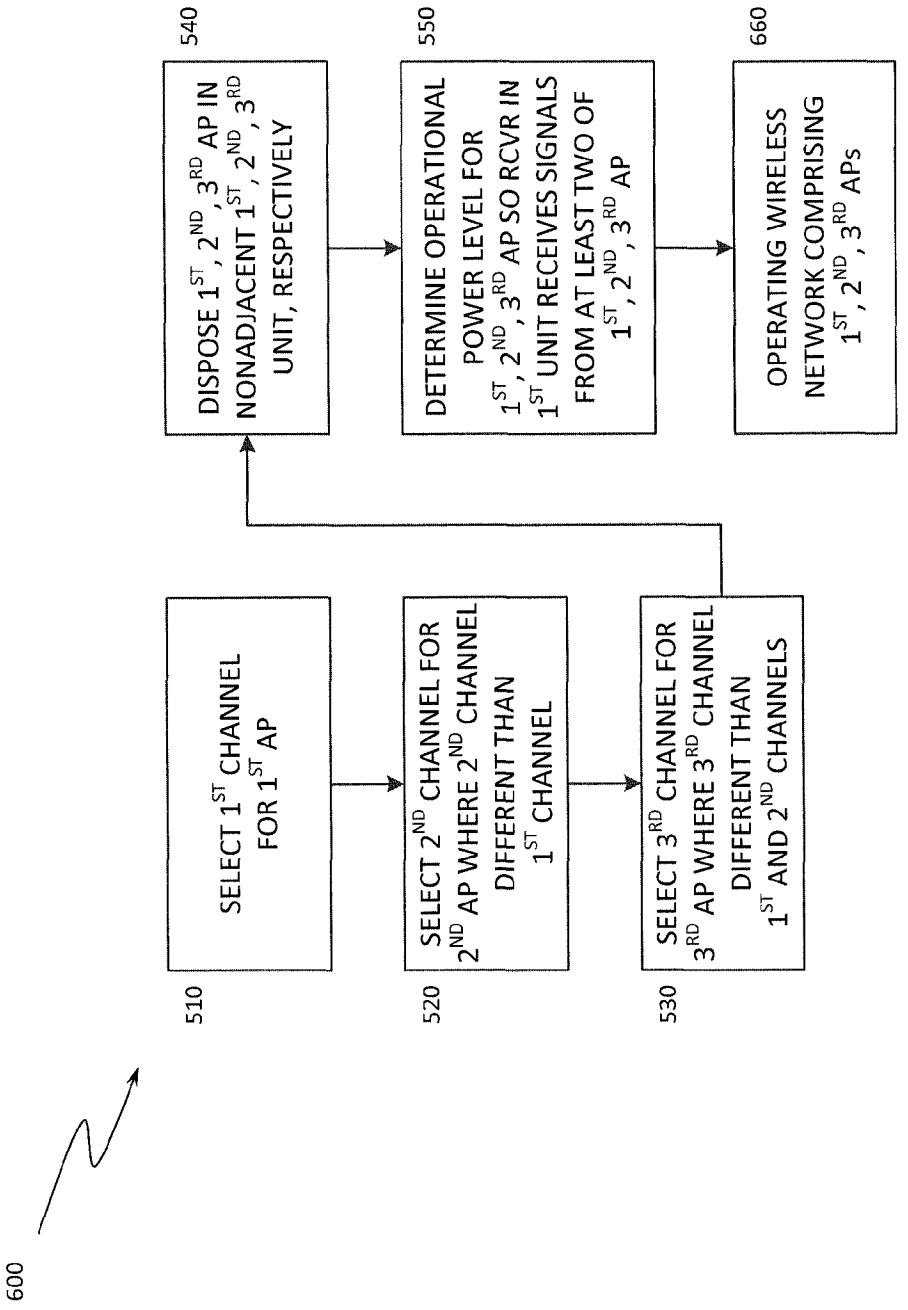
600
510
SELECT 1ST CHANNEL FOR 1ST AP
520
SELECT 2ND CHANNEL FOR 2ND AP WHERE 2ND CHANNEL DIFFERENT THAN 1ST CHANNEL
530
SELECT 3RD CHANNEL FOR 3RD AP WHERE 3RD CHANNEL DIFFERENT THAN 1ST AND 2ND CHANNELS
540
DISPOSE 1ST, 2ND, 3RD AP IN NONADJACENT 1ST, 2ND, 3RD UNIT, RESPECTIVELY
550
DETERMINE OPERATIONAL POWER LEVEL FOR 1ST, 2ND, 3RD AP SO RCVR IN 1ST UNIT RECEIVES SIGNALS FROM AT LEAST TWO OF 1ST, 2ND, 3RD AP
660
OPERATING WIRELESS NETWORK COMPRISING 1ST, 2ND, 3RD APs

FIGURE 6

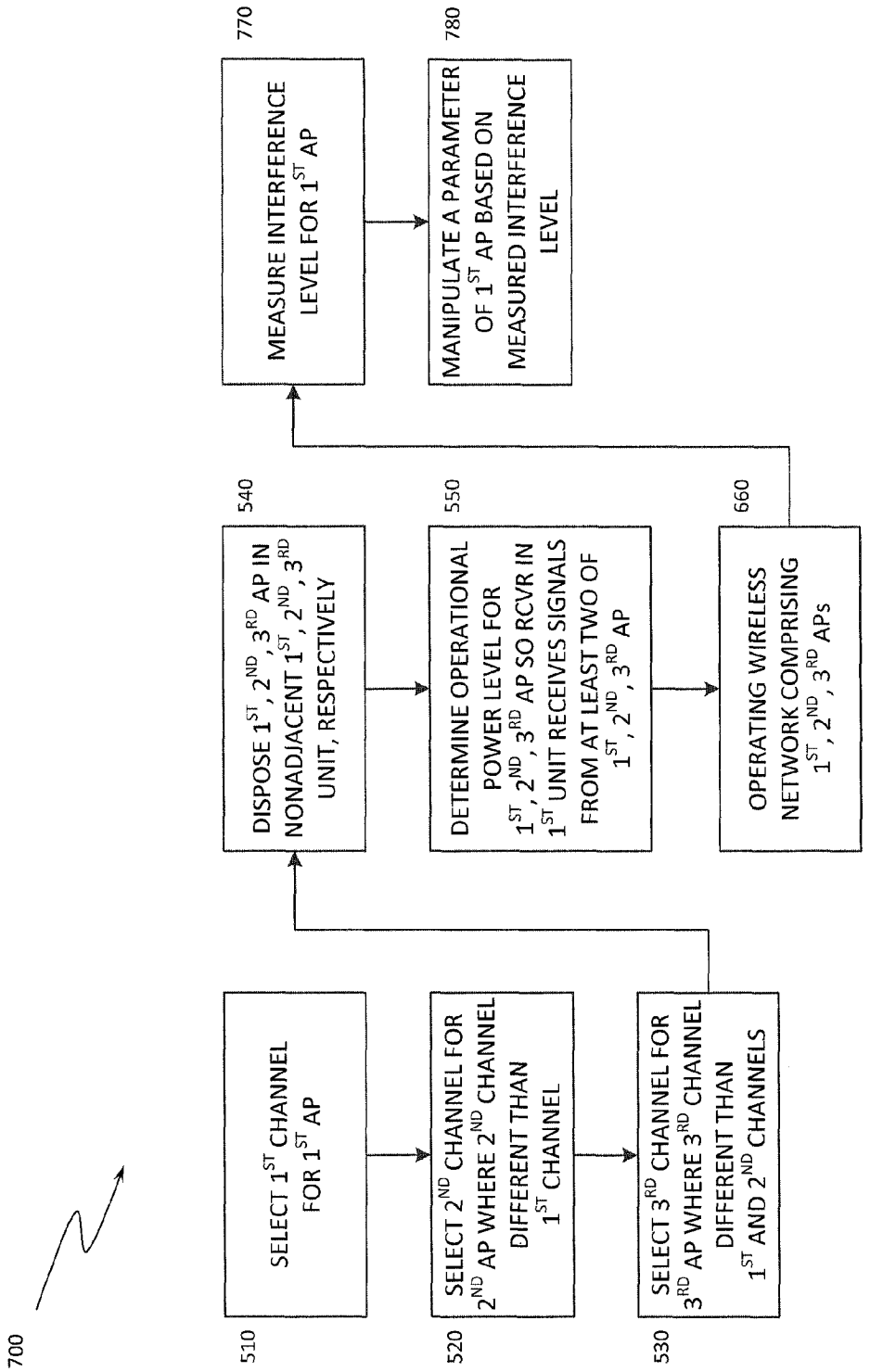
700
510
SELECT 1ST CHANNEL FOR 1ST AP
520
SELECT 2ND CHANNEL FOR 2ND AP WHERE 2ND CHANNEL DIFFERENT THAN 1ST CHANNEL
530
SELECT 3RD CHANNEL FOR 3RD AP WHERE 3RD CHANNEL DIFFERENT THAN 1ST AND 2ND CHANNELS
540
DISPOSE 1ST, 2ND, 3RD AP IN NONADJACENT 1ST, 2ND, 3RD UNIT, RESPECTIVELY
550
DETERMINE OPERATIONAL POWER LEVEL FOR 1ST, 2ND, 3RD AP SO RCVR IN 1ST UNIT RECEIVES SIGNALS FROM AT LEAST TWO OF 1ST, 2ND, 3RD AP
660
OPERATING WIRELESS NETWORK COMPRISING 1ST, 2ND, 3RD APs
770
MEASURE INTERFERENCE LEVEL FOR 1ST AP
780
MANIPULATE A PARAMETER OF 1ST AP BASED ON MEASURED INTERFERENCE LEVEL

FIGURE 7

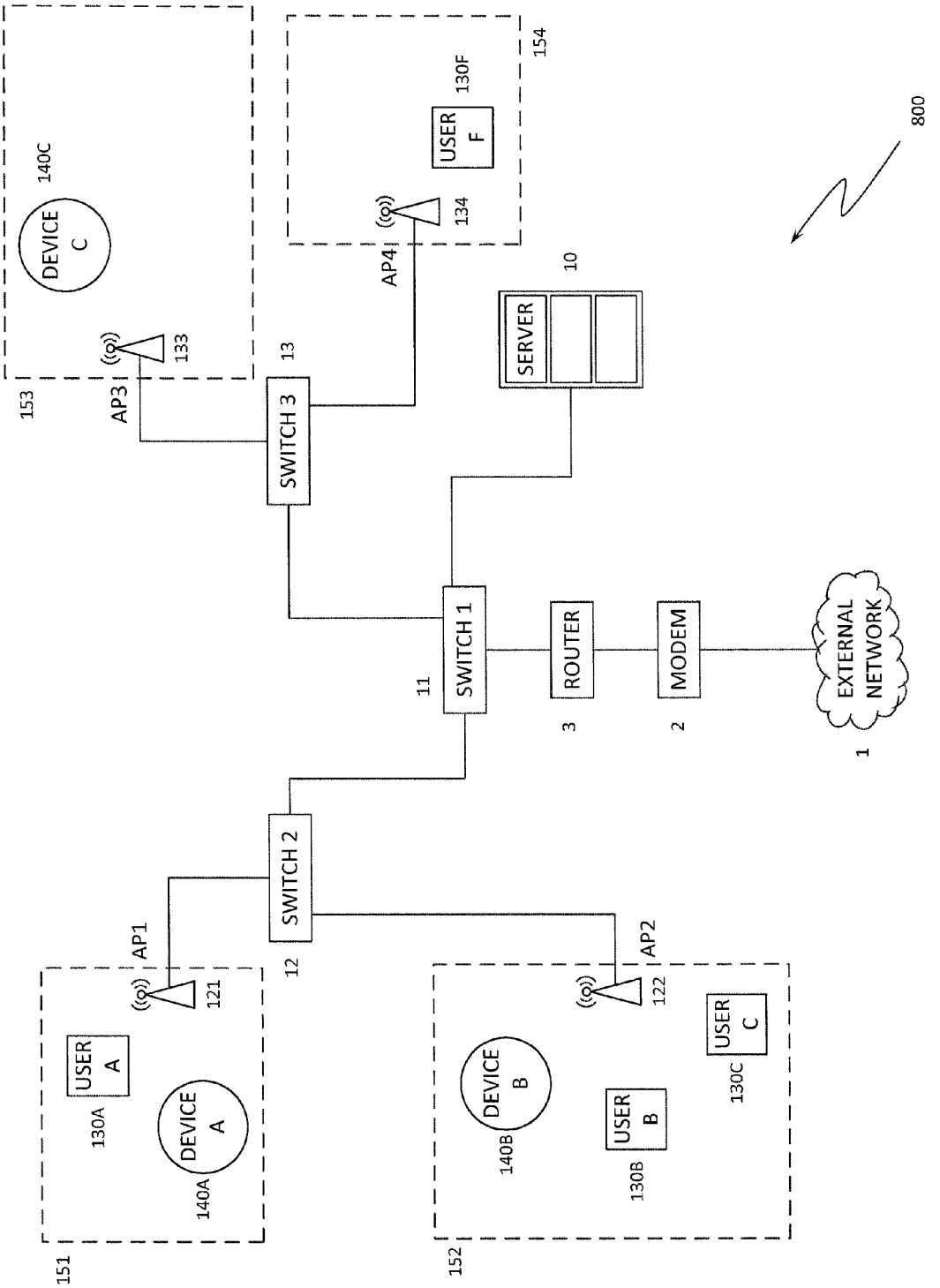
800
EXTERNAL NETWORK
1
MODEM
2
ROUTER
3
SWITCH 1
11
SWITCH 2
12
SWITCH 3
13
SERVER
10
AP1
121
AP2
122
AP3
133
AP4
134
USER A
130A
DEVICE A
140A
151
USER B
130B
DEVICE B
140B
USER C
130C
152
DEVICE C
140C
153
USER F
130F
154

FIGURE 8

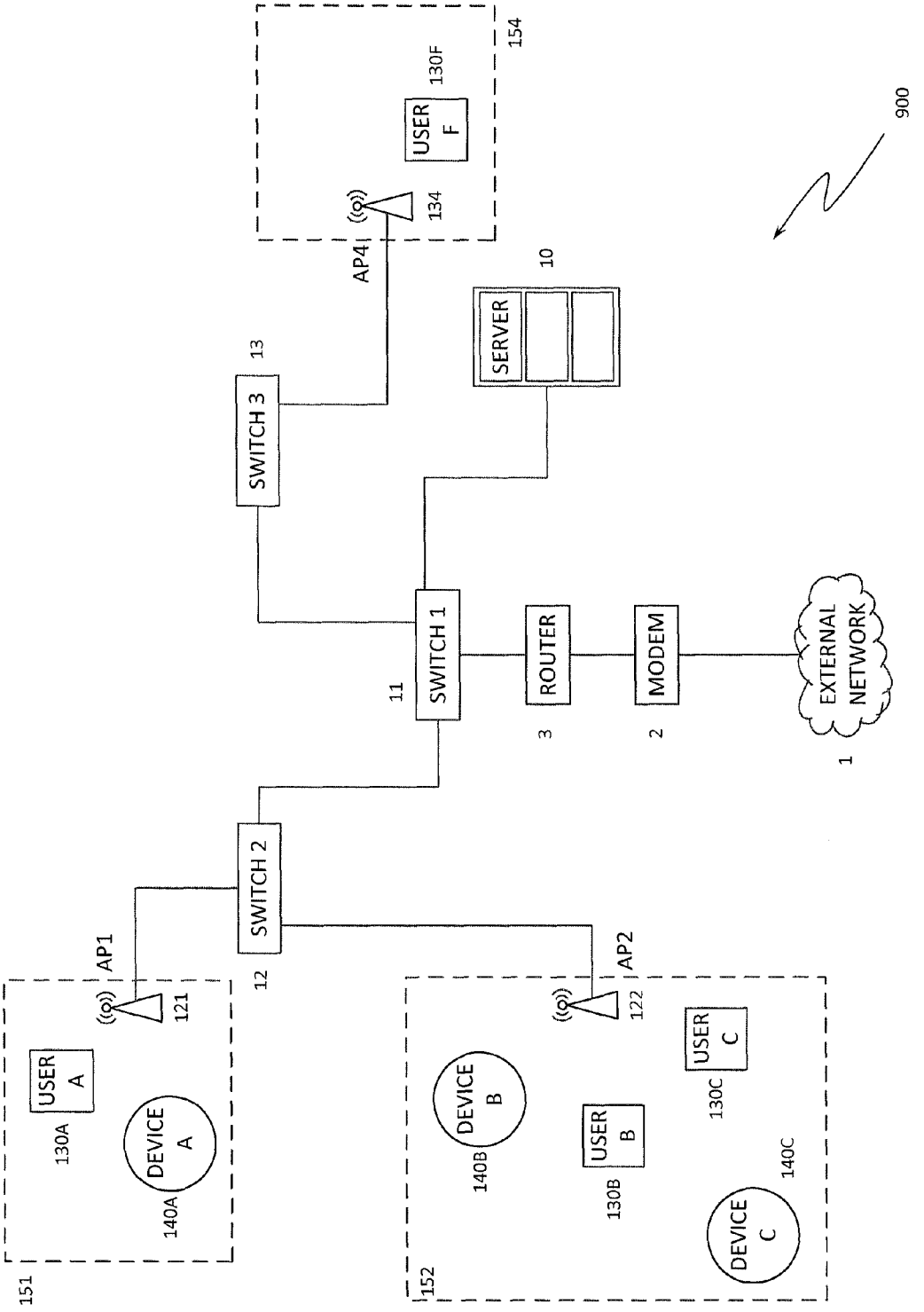
900
EXTERNAL NETWORK
1
MODEM
2
ROUTER
3
SWITCH 1
11
SWITCH 2
12
SWITCH 3
13
SERVER
10
AP1
121
AP2
122
AP4
134
USER A
130A
DEVICE A
140A
151
USER B
130B
DEVICE B
140B
USER C
130C
DEVICE C
140C
152
USER F
130F
154

FIGURE 9

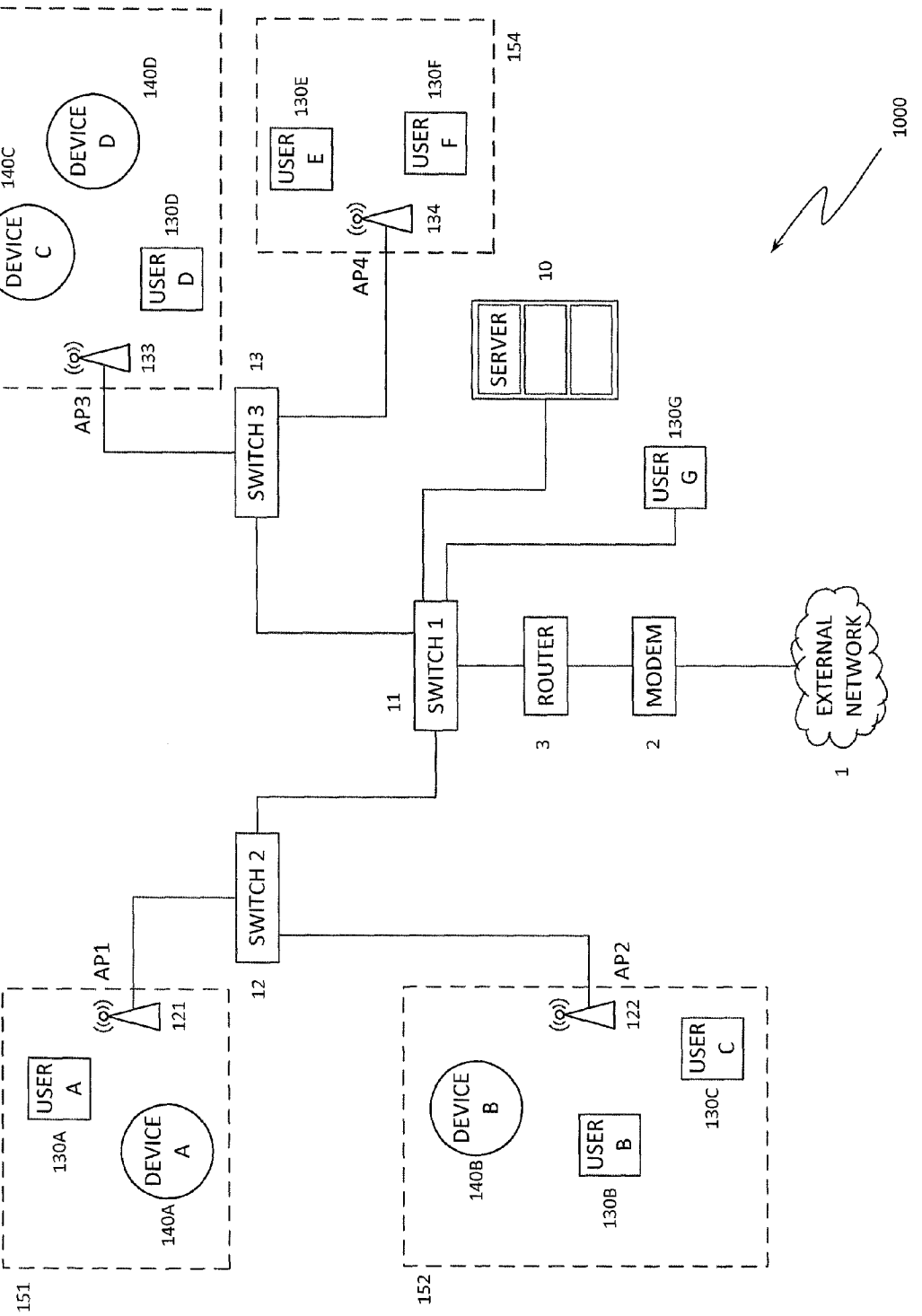
1000
EXTERNAL NETWORK
1
MODEM
2
ROUTER
3
SWITCH 1
11
SWITCH 2
12
SWITCH 3
13
SERVER
10
AP1
AP2
AP3
AP4
121
122
133
134
USER A
130A
DEVICE A
140A
USER B
130B
DEVICE B
140B
USER C
130C
USER D
130D
DEVICE C
140C
DEVICE D
140D
USER E
130E
USER F
130F
USER G
130G
151
152
153
154

FIGURE 10

SYSTEM AND METHOD FOR NETWORK USER ISOLATION

RELATED AND CO-PENDING APPLICATIONS

This application is a continuation-in-part of co-pending U.S. application Ser. No. 14/020,489 filed 6 Sep. 2013 entitled "System and Method for Wireless Access Point Layout and Network Operation", which claims priority to U.S. provisional application 61/698,234 filed 7 Sep. 2012 entitled "System and Method for Wireless Access Point Layout and Network Operation", the entirety of each is hereby incorporated herein by reference. This application also claims priority to U.S. provisional application 61/856,396 filed 19 Jul. 2013 entitled "System and Method for Wireless Access Point Layout and Network Operation", the entirety of which is hereby incorporated herein by reference.

BACKGROUND

Current systems and methods for deploying and/or operating a wireless communication network in a private residential neighborhood or a multi-unit building generally rely on placing a wireless router (e.g., access point) in each individual unit. As used herein, multi-unit buildings may be single floor or multi-floor buildings, and include buildings containing apartments, offices, condominiums, dormitories, etc., as well as referring to buildings such as hotels, motels, inns, shopping malls, and similar structures. One of the problems with the approach used by current methods is that wireless routers are typically designed to provide coverage of an area that is much larger than an individual unit. Consequently, there is significant bleed over of signals into neighboring units, both on the same floor and on neighboring floors. Such an arrangement compromises the privacy and security of the user of a unit's router and may also lead to interference between the wireless routers used in different units.

Furthermore, if a unit's user (i.e., the owner, renter, resident, office worker, guest, etc.) has a wireless device in his unit (e.g., a wirelessly-controlled thermostat, refrigerator, light, or other similar appliance or device) which he controls from his mobile apparatus (e.g., cell phone, laptop, wireless electronic tablet, etc.) his control of that wireless device may be partially or totally impaired once the user exits the coverage area (e.g., "cell") of his unit's particular access point ("AP").

Additionally, there is a need to prevent one user from seeing a neighboring user while still allowing each of the users to access authorized networks (e.g., a server and/or a router to the internet) as well as allowing each user to access only his/her authorized wireless devices (e.g., user A can access his wireless thermostat but cannot access user B's thermostat). Moreover, it would be advantageous for each user to access his/her authorized wireless devices from a location that is outside of the range of his unit's particular AP. On top of all this, the building owner may desire to operate a network separate from the user network such that the building owner can access the internet and/or a server and any user and/or any user's wireless device while the users are prevented from accessing anyone other than the building owner's designated representative (e.g., a system operator).

Accordingly, there is a need for a solution to the problems described above associated with current methods for deploying and/or operating a wireless network in a multi-unit building.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram for a topology of an exemplary prior art network.

FIG. **2** is a flow chart for creating a wireless network according to an embodiment of the present subject matter.

FIG. **3** is a flow chart for creating and operating a wireless network according to another embodiment of the present subject matter.

FIG. **4** is a flow chart for creating and operating a wireless network according to yet another embodiment of the present subject matter.

FIG. **5** is a flow chart for deploying a wireless network according to an embodiment of the present subject matter.

FIG. **6** is a flow chart for deploying and operating a wireless network according to another embodiment of the present subject matter.

FIG. **7** is a flow chart for deploying a wireless network according to yet another embodiment of the present subject matter.

FIG. **8** is a block diagram for a topology of a communication network according to an embodiment of the present subject matter.

FIG. **9** is a block diagram for another topology of a communication network according to an embodiment of the present subject matter.

FIG. **10** is a block diagram for a further topology of a communication network according to an embodiment of the present subject matter.

DETAILED DESCRIPTION

The following description of the present subject matter is provided as an enabling teaching of the present subject matter and its best, currently-known embodiment. Those skilled in the art will recognize that many changes can be made to the embodiments described herein while still obtaining the beneficial results of the present subject matter. It will also be apparent that for some embodiments, some of the desired benefits of the present subject matter can be obtained by selecting some of the features of the present subject matter without utilizing other features. Accordingly, those skilled in the art will recognize that many modifications and adaptations of the present subject matter are possible and may even be desirable in certain circumstances and are part of the present subject matter. Thus, the following description is provided as illustrative of the principles of the present subject matter and not in limitation thereof and may include modification thereto and permutations thereof. While the following exemplary discussion of embodiments of the present subject matter may be directed towards or reference specific devices and/or methodologies, it is to be understood that the discussion is not intended to limit the scope of the present subject matter in any way and that the principles presented are equally applicable to other devices and/or methodologies.

Those skilled in the art will further appreciate that many modifications to the exemplary embodiments described herein are possible without departing from the spirit and scope of the present subject matter. Thus, the description is not intended and should not be construed to be limited to the examples given but should be granted the full breadth of protection afforded by the appended claims and equivalents thereto.

With reference to the figures where like elements have been given like numerical designations to facilitate an understanding of the present subject matter, various embodi-

ments of a system and method for wireless access point layout and network operation are described.

The present disclosure describes novel systems and methods for deploying and operating a wireless network in a multi-unit building. With attention drawn to FIG. **1**, a block diagram for the topology of an exemplary prior art network **100** is depicted. The network **100** connects to external network **1** (such as a wide area network, an enterprise network, the internet, or other similar network) via modem **2** and router **3**, as is known in the art. The exemplary network **100** includes switches switch 1 (**11**), switch 2 (**12**), and switch 3 (**13**), connected as shown. Connected to switch 2 are AP1 (**121**) and AP2 (**122**). Connected to switch 3 are AP3 (**133**) and AP4 (**134**). Server **10** for network **100** is connected to switch 1 as shown. Those of skill in the art will readily understand that the topology depicted in FIG. **1** is exemplary only and in no way limits the scope of the disclosure.

AP1 services unit **151** in which user A has a mobile apparatus **130**A and wireless device A (**140**A), such as a wirelessly-controlled appliance. AP1 also services one or more units adjacent to unit **151** (not shown for clarity). AP2 services unit **152** in which user B has a mobile apparatus **130**B and wireless device B (**140**B). Additionally, unit **152** includes user C who has a mobile apparatus **130**C. AP2 also services one or more units adjacent to unit **152** (not shown for clarity). Similarly, AP3 services unit **153** in which user D has a mobile apparatus **130**D and wireless device D1 (**140**D**1**) and wireless device D2 (**140**D**2**). AP3 also services one or more units adjacent to unit **153** (not shown for clarity). Likewise, AP4 services unit **154** in which user E has a mobile apparatus **130**E. Additionally, unit **154** includes user F who has a mobile apparatus **130**F. AP4 also services one or more units adjacent to unit **154** (not shown for clarity).

User G, in the depicted topology of exemplary network **100**, is hard-wired into switch 1 (**11**) although user G may also be connected via a wireless link. User G represents typical network administration users such as one or more of a network administrator, supervisor, building maintenance, etc.

In conventional private residential neighborhoods or multi-dwelling units, each unit typically has a dedicated AP which may interfere with and/or bleed over to a neighboring unit thereby inviting privacy and security problems. To combat this, the conventional approach is to employ an encryption key for each AP. While this may be an effective answer to the security problem, it does nothing to overcome the privacy problem since users in neighboring units will still be able to see all other connected users on that network.

Unlike most private residential or multi-dwelling unit networks, it is desirable in the multi-dwelling unit space to prevent neighboring users from seeing each other while still allowing each user appropriate access to certain services and/or devices (the internet, a shared server, a particular wireless device or devices which only a specific user can control, etc.) Furthermore, it is desirable to have user isolation be user-dependent rather than being location-dependent. In other words, a given user should be able to have the ability to control his/her specific wireless thermostat through any connection in the multi-dwelling unit network and not only when connected to the AP that services his/her specific dwelling unit.

Now turning to FIG. **2**, a flow chart **200** is shown for creating and/or deploying a wireless network according to an embodiment of the present subject matter that will address both the security and privacy issues of the prior art.

At block **210**, a first access point operating on a first channel of a predetermined set of channels is disposed in a first unit to create a first wireless cell. The first wireless cell provides wireless coverage to the first unit and to a unit adjacent to the first unit. At block **220**, a second access point operating on a second channel of the predetermined set of channels is disposed in a second unit, which is not adjacent (either horizontally or vertically) to the first unit, to create a second wireless cell. The second wireless cell provides wireless coverage to the second unit and to a unit adjacent to the second unit. The second channel is chosen so as to not interfere with the first channel.

At block **230**, a third access point operating on a third channel of the predetermined set of channels is disposed in a third unit, which is not adjacent (either horizontally or vertically) to either of the first or the second unit, to create a third wireless cell. The third wireless cell provides wireless coverage to the third unit and to a unit adjacent to the third unit. The third channel is chosen so as to not interfere with the first or the second channel. At block **240**, a fourth access point operating on the first channel of the predetermined set of channels is disposed in a fourth unit, which is not adjacent (either horizontally or vertically) to either of the first, second, or third unit, to create a fourth wireless cell. The fourth wireless cell provides wireless coverage to the fourth unit and to a unit adjacent to the fourth unit. Furthermore, the first wireless cell does not provide wireless coverage to either of the fourth unit or to the unit adjacent to the fourth unit which is served by the third access point.

In this manner, fewer APs need to be deployed to cover all of the units in the multi-unit building. The above process may be repeated as necessary to ensure each unit, as desired, in the multi-unit building is serviced by adequate wireless coverage.

Further enhancements to the above deployment embodiment are also contemplated. In an embodiment, the first AP may operate at a first selected power level while the second AP operates at a second power level that is determined based on an interference measurement in the second unit due to the wireless signal from the first wireless cell. In a further embodiment, the third AP operates at a third power level that is determined based on an interference measurement in the third unit due to the wireless signals from the first and second wireless cells.

In yet another embodiment, which may be a further enhancement to any of the above-described deployment strategies, the first, second, and third APs may each have the capability to transmit a wireless signal according to a configurable antenna beam pattern. In this embodiment, the first AP may operate using a first selected antenna beam pattern while the second AP operates using a second antenna beam pattern that is determined based on an interference measurement in said second unit due to the wireless signal from the first wireless cell. In still another embodiment, the third AP operates using a third antenna beam pattern that is determined based on an interference measurement in the third unit due to the wireless signals from the first and second wireless cells.

In other embodiments, the first and second units are on a same level of a multi-unit building and/or at least one of the first, second, third, and fourth units are on a first floor of a multi-unit building and the other(s) of the first, second, third, and fourth units are on a second floor of the multi-unit building.

In still other embodiments, the first and second wireless cells provide wireless coverage to the second unit and/or the first, second, and third wireless cells provide coverage to the first unit.

FIG. **3** illustrates a flow chart **300** for creating and operating a wireless network according to another embodiment of the present subject matter. In FIG. **3**, blocks **210**, **220**, **230**, and **240** are as described above with respect to FIG. **2** for creating and/or deploying a wireless network including the first, second, third, and fourth APs. At block **350**, the wireless network that was created and/or deployed is operated using the first, second, third, and fourth APs.

Considering FIG. **4**, a flow chart **400** is shown for creating and operating a wireless network according to yet another embodiment of the present subject matter. In FIG. **4**, blocks **210**, **220**, **230**, **240**, and **350** are as described above with respect to FIG. **3** for creating and operating a wireless network including the first, second, third, and fourth APs. At block **460**, an interference level for the first AP is measured. At block **470**, at least one parameter of the first AP is manipulated based on the measured interference level for the first AP. The parameters that may be manipulated include antenna beam pattern, communication channel selection, and output power level. Therefore, the wireless network will be able to operate without undue interference amongst the various APs while maintaining the privacy desired by the network users.

Now considering FIG. **5**, a flow chart **500** is presented for deploying a wireless network according to an embodiment of the present subject matter. At block **510**, a first communication channel is selected for a first AP where the first communication channel is selected from a predetermined set of communication channels. At block **520**, a second communication channel is selected for a second AP where the second communication channel is selected from the same predetermined set of communication channels. Additionally, the second communication channel selected is different from the first communication channel selected. At block **530**, a third communication channel is selected for a third AP where the third communication channel is selected from the same predetermined set of communication channels. Additionally, the third communication channel selected is different from the first and second communication channels selected.

At block **540**, the first, second, and third APs are deployed in a first, second, and third unit, respectively, in a multi-unit building where each of the first, second, and third units is not adjacent to either of the other two units. At block **550**, for each of the first, second, and third APs, a respective operational power level is determined such that a receiver disposed in the first unit can receive communication signals from at least two of the first, second, and third APs. Thus, a user in the first unit can receive wireless communication signals from multiple, non-interfering APs. In a further embodiment, an antenna beam pattern for at least one of the first, second, and third APs may be manipulated as necessary to ensure adequate wireless coverage while maintaining user privacy.

In other embodiments, the wireless network of FIG. **5** is deployed in a multi-story, multi-unit building. In a further embodiment, each of the first, second, and third units is not adjacent to either of the other two units, either horizontally or vertically. In still a further embodiment, the step of disposing the first, second, and third APs in FIG. **5** occurs after the selection of the first, second, and third communication channels. In yet a further embodiment, the first access point is disposed in a hallway adjacent to the first unit.

FIG. **6** shows a flow chart **600** for deploying and operating a wireless network according to another embodiment of the present subject matter. In FIG. **6**, Blocks **510**, **520**, **530**, **540**, and **550** are as described above with respect to FIG. **5**. At block **660**, the wireless network that was deployed is operated using the first, second, and third APs.

FIG. **7** depicts a flow chart **700** for deploying a wireless network according to yet another embodiment of the present subject matter. In FIG. **7**, Blocks **510**, **520**, **530**, **540**, **550**, and **660** are as described above with respect to FIG. **6**. At block **770**, an interference level for the first AP is measured. At block **780**, based on the measured interference level for the first AP, at least one parameter of the first AP is manipulated where the parameter is one or more of antenna beam pattern, communication channel selection, and output power level.

In a further embodiment regarding FIG. **7**, the steps of selecting the first, second, and third communication channels are accomplished prior to operating the wireless communication network.

Most modern networks require that the same physical network be used by different parties that require different access rights. An example of this is a hotel wired and wireless network that is used by both hotel guests and hotel staff. The hotel guests need to be isolated from each other as well as from hotel staff network equipment, whereas hotel staff need to be able to inter-communicate with each other as well as in-house server and client equipment for the enterprise, such as thermostats, as well as having the ability, for at least someone on the staff, to communicate with the hotel guests. In an embodiment, this may be accomplished by using a combination of virtual local area networks ("VLANs"), access control list rules, and station isolation.

For example, for a network for hotel guests, the guest network is placed on its own VLAN associated with a particular service set identifier ("SSID"). This SSID would generally be open to allow any guest and, in an embodiment, one or more hotel staff, to access the guest network. In a certain embodiment, the guest network would have an encryption key, such as a WEP/WPA-TKIP/WPA2-AES key, as is known in the art, that is provided by the hotel/network owner. The station isolation rules for the access points in the guest network are turned on for this SSID, and the range of IPv4 and/or IPv6 addresses assigned to users on the guest network preclude certain inter-communication, such as, but not limited to, communication between guest users and/or between a first guest user and a device that is associated with a second guest.

Continuing with the above example, a network for the hotel staff is placed on its own VLAN associated with a different SSID than the SSID associated with the guest network. The staff network SSID would generally have an encryption key, such as a WEP/WPA-TKIP/WPA2-AES key, or WPA2-EAP, as is known in the art, with authentication provided by, for example, a standalone RADIUS server, to thereby prevent guests and other unauthorized users from associating with the staff network. The station isolation rules for the access points on the guest network are disabled and the range of IPv4 and/or IPv6 addresses assigned to users on the staff network allow certain inter-communication such as, but not limited to, communication between staff members and/or between a staff member and one or more devices associated with a particular guest's room (e.g., a unit's thermostat) and/or between a staff member (such as a system operator) and one or more guests.

Considering FIG. **8**, a block diagram is presented for a topology of a communication network **800** according to an

embodiment of the present subject matter. The communication network **800** connects to external network **1** (such as a wide area network, an enterprise network, the internet, or other similar network) via modem **2** and router **3**, as is known in the art. The exemplary communication network **800** includes switches switch 1 (**11**), switch 2 (**12**), and switch 3 (**13**), connected as shown. Connected to switch 2 are AP1 (**121**) and AP2 (**122**). Connected to switch 3 are AP3 (**133**) and AP4 (**134**). Server **10** for communication network **800** is connected to switch 1 as shown. Those of skill in the art will readily understand that the topology depicted in FIG. **8** is exemplary only and in no way limits the scope of the disclosure.

AP1 services unit **151** in which user A has a mobile apparatus **130**A and wireless device A (**140**A), such as a wirelessly-controlled appliance. AP1 may also service one or more units adjacent to unit **151** (not shown for clarity) and/or a hallway adjacent unit **151**. AP2 services unit **152** in which user B has a mobile apparatus **130**B and wireless device B (**140**B). Additionally, unit **152** includes user C who has a mobile apparatus **130**C. AP2 may also service one or more units adjacent to unit **152** (not shown for clarity) and/or a hallway adjacent unit **152**. Similarly, AP3 services unit **153** which contains wireless device C (**140**C). AP3 may also service one or more units adjacent to unit **153** (not shown for clarity) and/or a hallway adjacent unit **153**. Likewise, AP4 services unit **154** in which user F has a mobile apparatus **130**F. AP4 also services one or more units adjacent to unit **154** (not shown for clarity) and/or a hallway adjacent unit **154**.

The communication network **800** provides communication for users in a first group ("Group 1 Users") which, in an embodiment, are hotel guests or residents in a multi-dwelling unit building, and communication for users in a second group ("Group 2 Users") which, in an embodiment, are hotel staff or staff for the owner of a multi-dwelling unit building. In FIG. **8**, Group 1 Users include User A (**130**A), User B (**130**B), and User C (**130**C). Those of skill in the art will understand that the present disclosure is not limited to just three Group 1 Users. Group 2 Users in FIG. **8** include User F (**130**F) and may include additional users not shown. Additionally, communication network **800** provides communication for various digitally-controlled wireless appliances such as, but not limited to, Device A (**140**A), Device B (**140**B), and Device C (**140**C).

The communication network **800** includes a first switch **11** connected to a server **10**, a router **3**, a second switch **12**, and a third switch **13**. The connections between these network components may be wired or wireless. Additionally, the second switch **12** is connected to a first access point **121** and a second access point **122**, either by wire or wirelessly. The third switch **13** is connected to a third access point **133** and a fourth access point **134**, either by wire or wirelessly.

The first access point **121** is wirelessly connected to a first wireless appliance Device A (**140**A) and the first access point **121** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The first access point **121** is programmed to allow communications at least between each of the following: User A (**130**A) and Device A regardless of whether User A is wirelessly connected to the first access point **121**; any Group 1 User wirelessly connected to the first access point **121** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the first access point **121**, (b) any Group 2 User wirelessly connected to the first access point **121**, and (c) Device A. Additionally, the first access point **121** is programmed to prevent communications between any two Group 1 Users (e.g., User A and User B) that are both wirelessly connected to the first access point **121**.

The second access point **122** is wirelessly connected to a second wireless appliance Device B (**140**B) and the second access point **122** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The second access point **122** is programmed to allow communications at least between each of the following: User B (**130**B) and Device B regardless of whether User B is wirelessly connected to the second access point **122**; User C (**130**C) wirelessly connected to the second access point **122** and Device C (**140**C); any Group 1 User wirelessly connected to the second access point **122** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the second access point **122**, (b) any Group 2 User wirelessly connected to the second access point **122**, and (c) Device B. Additionally, the second access point **122** is programmed to prevent communications between any two Group 1 Users (e.g., User B and User C) that are both wirelessly connected to the second access point **122**.

The third access point **133** is wirelessly connected to Device C (**140**C) and the third access point **133** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The third access point **133** is programmed to allow communications at least between each of the following: User C (**130**C) and Device C regardless of whether User C is wirelessly connected to the third access point **133**; any Group 1 User wirelessly connected to the third access point **133** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the third access point **133**, (b) any Group 2 User wirelessly connected to the third access point **133**, and (c) Device C. Additionally, the third access point **133** is programmed to prevent communications between any two Group 1 Users (e.g., User A and User C) that are both wirelessly connected to the third access point **133**.

The fourth access point **134** is programmed to allow communications at least between User F (**130**F) when User F is wirelessly connected to the fourth access point **134** and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **800**, (d) the server **10**, or (e) the router **3**.

In a further embodiment of the communications network **800**, the second switch **12** is further programmed to allow communications at least between each of the following: User A and Device A; User B and Device B; User C and Device C; and User F and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **800**, (d) the server **10**, or (e) the router **3**.

In a still further embodiment of the communications network **800**, the second switch **12** is still further programmed to prevent communications between any two Group 1 Users. In yet a further embodiment, the third switch **13** is yet further programmed to allow communications at least between each of the following: User A and Device A; User B and Device B; User C and Device C; and User F and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **800**, (d) the server **10**, or (e) the router **3**. In yet still a further embodiment, the third switch **13** is yet still further programmed to prevent communications between any two Group 1 Users.

In an embodiment of the communications network **800**, the router **3** is connected to an external network, as described above, via a modem **2**. The communications network **800** may be located in a multi-dwelling unit building and in an embodiment the first access point **121** creates a first wireless cell providing wireless communication coverage to a first and a second unit of the multi-unit building and/or to a hallway adjacent the first unit.

Thus, in an embodiment of the present subject matter, isolation between particular users, such as two users in a multi-dwelling unit building, is user-dependent and not location-dependent. Similarly, communication/interface rights between two users are user-dependent and not location-dependent on the network access points.

As a non-limiting example, considering communications network **800** and a given set of communication/interface rights/isolations, at time t_1 User A (**130**A) and Device A (**140**A) are located in unit **151**. User A is connected to the communications network **800** via AP1 (**121**) and, according to the given communication/interface rights, User A can interface with Device A which is also connected to the communications network **800** via AP1. Also at time t_1, User B (**130**B) and Device B (**140**B) are located in unit **152**. User B is connected to the communications network **800** via AP2 (**122**) and, according to the given communication/interface rights, User B can interface with Device B which is also connected to the communications network **800** via AP2. However, according to the given communication/interface isolation rules, User A cannot communicate with User B nor can User A interface with Device B or User B interface with Device A.

At time t_2, User A and User B are each located in unit **152** and each are connected to the communication network **800** via AP2. User A can still interface with Device A even though User A is now connected to the communications network **800** via a different AP (AP2) than Device A (AP1). However, User A still cannot communicate with User B and User A still cannot interface with Device B. User B can still interface with Device B but User B still cannot interface with Device A.

At time t_3, User A and User B are each located in unit **153** (or, for example, in a hallway near unit **153** such that User A and User B are within range of AP3 (**133**)) and are connected to the communication network **800** via AP3. User A can still interface with Device A even though User A is connected to the network via a different AP (AP3) than Device A (AP1) and is serviced by a different switch (switch 3 (**13**)) than Device A (switch 2 (**12**)). User A still cannot communicate with User B and User A cannot interface with Device B (or with Device C which is connected via AP3). Nor can User A communicate with User B even though both are connected to the communication network **800** via AP3. User B can still interface with Device B and still cannot interface with Device A (or with Device C which is connected via AP3).

As a further non-limiting example, if the above given set of communication/interface rights/isolations were to allow User A to communicate with User B, then for each of the time scenarios above User A would be able to communicate with User B regardless of their respective physical locations, i.e., the AP they are using for access to the communication network **800**.

As an additional non-limiting example, if the above given set of communication/interface rights/isolations were to allow User A to communicate with the server **10**, then for each of the time scenarios above User A would be able to communicate with server **10** regardless of the physical location (i.e., accessing AP) of User A on the communication network **800**. Furthermore, if the above given set of communication/interface rights/isolations were to allow User A to communicate with User F, then for each of the time scenarios above User A would be able to communicate with User F regardless of their respective physical locations (i.e., accessing AP) on the communication network **800**. Moreover, in a further embodiment, if a function of User F is to access each of the Devices on the communication network **800** (e.g., User F is a staff employee tasked with updating/calibrating/adjusting the Devices), then regardless of the physical location (i.e., accessing AP) of User F on the communication network **800**, User F would be able to access each of the Devices on the network.

With attention now drawn to FIG. **9**, a block diagram is presented for a topology of a communication network **900** according to an embodiment of the present subject matter. The communication network **900** connects to external network **1** (such as a wide area network, an enterprise network, the internet, or other similar network) via modem **2** and router **3**, as is known in the art. The exemplary communication network **900** includes switches switch 1 (**11**), switch 2 (**12**), and switch 3 (**13**), connected as shown. Connected to switch 2 are AP1 (**121**) and AP2 (**122**). Connected to switch 3 is AP4 (**134**). Server **10** for communication network **900** is connected to switch 1 as shown. Those of skill in the art will readily understand that the topology depicted in FIG. **9** is exemplary only and in no way limits the scope of the disclosure.

AP1 services unit **151** in which user A has a mobile apparatus **130**A and wireless device A (**140**A), such as a wirelessly-controlled appliance. AP1 may also service one or more units adjacent to unit **151** (not shown for clarity) and/or a hallway adjacent unit **151**. AP2 services unit **152** in which user B has a mobile apparatus **130**B and wireless device B (**140**B). Additionally, unit **152** includes user C who has a mobile apparatus **130**C and wireless device C (**140**C). AP2 may also service one or more units adjacent to unit **152** (not shown for clarity) and/or a hallway adjacent unit **152**. Similarly, AP4 services unit **154** in which user F has a mobile apparatus **130**F. AP4 also services one or more units adjacent to unit **154** (not shown for clarity) and/or a hallway adjacent unit **154**.

The communication network **900** provides communication for users in a first group ("Group 1 Users") which, in an embodiment, are hotel guests or residents in a multi-dwelling unit building, and communication for users in a second group ("Group 2 Users") which, in an embodiment, are hotel staff or staff for the owner of a multi-dwelling unit building. In FIG. **9**, Group 1 Users include User A (**130**A), User B (**130**B), and User C (**130**C). Those of skill in the art will understand that the present disclosure is not limited to just three Group 1 Users. Group 2 Users in FIG. **9** include User F (**130**F) and may include additional users not shown. Additionally, communication network **900** provides communication for various digitally-controlled wireless appliances such as, but not limited to, Device A (**140**A), Device B (**140**B), and Device C (**140**C).

The communication network **900** includes a first switch **11** connected to a server **10**, a router **3**, a second switch **12**, and a third switch **13**. The connections between these network components may be wired or wireless. Additionally, the second switch **12** is connected to a first access point **121** and a second access point **122**, either by wire or wirelessly. The third switch **13** is connected to a third access point **134**, either by wire or wirelessly.

The first access point **121** is wirelessly connected to a first wireless appliance Device A (**140**A) and the first access point **121** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The first access point **121** is programmed to allow communications at least between each of the following: User A (**130**A) and Device A regardless of whether User A is wirelessly connected to the first access point **121**; any Group 1 User wirelessly connected to the first access point **121** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the first access point **121**, (b) any Group 2 User wirelessly connected to the first access point **121**, and (c) Device A. Additionally, the first access point **121** is programmed to prevent communications between any two Group 1 Users (e.g., User A and User B) that are both wirelessly connected to the first access point **121**.

The second access point **122** is wirelessly connected to a second wireless appliance Device B (**140**B) and a third wireless appliance Device C (**140**C), and the second access point **122** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The second access point **122** is programmed to allow communications at least between each of the following: User B (**130**B) and Device B regardless of whether User B is wirelessly connected to the second access point **122**; User C (**130**C) and Device C regardless of whether User C is wirelessly connected to the second access point **122**; any Group 1 User wirelessly connected to the second access point **122** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the second access point **122**, (b) any Group 2 User wirelessly connected to the second access point **122**, (c) Device B, and (d) Device C. Additionally, the second access point **122** is programmed to prevent communications between (a) any two Group 1 Users (e.g., User B and User C) that are both wirelessly connected to the second access point **122**, (b) User B and Device C, and (c) User C and Device B.

The third access point **134** is programmed to allow communications at least between User F (**130**F) when User F is wirelessly connected to the third access point **134** and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **900**, (d) the server **10**, or (e) the router **3**.

In a further embodiment of the communications network **900**, the second switch **12** is further programmed to allow communications at least between each of the following: User A and Device A; User B and Device B; User C and Device C; and User F and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **900**, (d) the server **10**, or (e) the router **3**.

In a still further embodiment of the communications network **900**, the second switch **12** is still further programmed to prevent communications between any two Group 1 Users. In yet a further embodiment, the third switch **13** is yet further programmed to allow communications at least between the following: User A and Device A; User B and Device B; User C and Device C; and User F and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **900**, (d) the server **10**, or (e) the router **3**. In yet still a further embodiment, the third switch **13** is yet still further programmed to prevent communications between any two Group 1 Users.

In an embodiment of the communications network **900**, the router **3** is connected to an external network, as described above, via a modem **2**. The communications network **900** may be located in a multi-dwelling unit building and in an embodiment the first access point **121** creates a first wireless cell providing wireless communication coverage to a first and a second unit of the multi-dwelling unit building and/or to a hallway adjacent the first unit.

Now with attention drawn to FIG. **10**, a block diagram is presented for a topology of a communication network **1000** according to an embodiment of the present subject matter. The communication network **1000** connects to external network **1** (such as a wide area network, an enterprise network, the internet, or other similar network) via modem **2** and router **3**, as is known in the art. The exemplary communication network **1000** includes switches switch 1 (**11**), switch 2 (**12**), and switch 3 (**13**), connected as shown. Connected to switch 1 is User G (**130**G). Connected to switch 2 are AP1 (**121**) and AP2 (**122**). Connected to switch 3 are AP3 (**133**) and AP4 (**134**). Server **10** for communication network **1000** is connected to switch 1 as shown. Those of skill in the art will readily understand that the topology depicted in FIG. **10** is exemplary only and in no way limits the scope of the disclosure.

AP1 services unit **151** in which user A has a mobile apparatus **130**A and wireless device A (**140**A), such as a wirelessly-controlled appliance. AP1 may also service one or more units adjacent to unit **151** (not shown for clarity) and/or a hallway adjacent unit **151**. AP2 services unit **152** in which user B has a mobile apparatus **130**B and wireless device B (**140**B). Additionally, unit **152** includes user C who has a mobile apparatus **130**C. AP2 may also service one or more units adjacent to unit **152** (not shown for clarity) and/or a hallway adjacent unit **152**. Similarly, AP3 services unit **153** in which user D has a mobile apparatus **130**D and which contains wireless device C (**140**C) and wireless device D (**140**D). AP3 may also service one or more units adjacent to unit **153** (not shown for clarity) and/or a hallway adjacent unit **153**. Likewise, AP4 services unit **154** in which user E has a mobile apparatus **130**E and in which user F has a mobile apparatus **130**F. AP4 also services one or more units adjacent to unit **154** (not shown for clarity) and/or a hallway adjacent unit **154**.

The communication network **1000** provides communication for users in a first group ("Group 1 Users") which, in an embodiment, are hotel guests or residents in a multi-dwelling unit building, and communication for users in a second group ("Group 2 Users") which, in an embodiment, are hotel staff or staff for the owner of a multi-dwelling unit building. In FIG. **10**, Group 1 Users include User A (**130**A), User B (**130**B), User C (**130**C), and User D (**130**D). Those of skill in the art will understand that the present disclosure is not limited to just four Group 1 Users. Group 2 Users in FIG. **10** include User E (**130**E), User F (**130**F), and User G (**130**G) and may include additional users not shown. Additionally, communication network **1000** provides communication for various digitally-controlled wireless appliances such as, but not limited to, Device A (**140**A), Device B (**140**B), Device C (**140**C), and Device D (**140**D).

The communication network **1000** includes a first switch **11** connected to User G (**130**G), a server **10**, a router **3**, a second switch **12**, and a third switch **13**. The connections between these network components may be wired or wireless. The connection between switch 1 and User G is typically, but need not be, a wired connection. Additionally, the second switch **12** is connected to a first access point **121** and a second access point **122**, either by wire or wirelessly.

The third switch **13** is connected to a third access point **133** and a fourth access point **134**, either by wire or wirelessly.

The first access point **121** is wirelessly connected to a first wireless appliance Device A (**140**A) and the first access point **121** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The first access point **121** is programmed to allow communications at least between each of the following: User A (**130**A) and Device A regardless of whether User A is wirelessly connected to the first access point **121**; any Group 1 User wirelessly connected to the first access point **121** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the first access point **121**, (b) any Group 2 User wirelessly connected to the first access point **121**, and (c) Device A. In an embodiment, any or all of the Group 2 Users that have wireless connection capability may be treated similarly as User F. In an embodiment, the first access point **121** is programmed to allow communications at least between User G (**130**G) and (a) any Group 1 User wirelessly connected to the first access point **121**, (b) any Group 2 User wirelessly connected to the first access point **121**, and (c) Device A. Additionally, the first access point **121** is programmed to prevent communications between any two Group 1 Users (e.g., User A and User B) that are both wirelessly connected to the first access point **121**.

The second access point **122** is wirelessly connected to a second wireless appliance Device B (**140**B) and the second access point **122** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The second access point **122** is programmed to allow communications at least between each of the following: User B (**130**B) and Device B regardless of whether User B is wirelessly connected to the second access point **122**; User C (**130**C) wirelessly connected to the second access point **122** and Device C (**140**C); any Group 1 User wirelessly connected to the second access point **122** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the second access point **122**, (b) any Group 2 User wirelessly connected to the second access point **122**, and (c) Device B. In an embodiment, any or all of the Group 2 Users that have wireless connection capability may be treated similarly as User F. In an embodiment, the second access point **122** is programmed to allow communications at least between User G (**130**G) and (a) any Group 1 User wirelessly connected to the second access point **122**, (b) any Group 2 User wirelessly connected to the second access point **122**, and (c) Device B. Additionally, the second access point **122** is programmed to prevent communications between any two Group 1 Users (e.g., User B and User C) that are both wirelessly connected to the second access point **122**.

The third access point **133** is wirelessly connected to Device C (**140**C) and Device D (**140**D) and the third access point **133** can be wirelessly connected to any Group 1 User within range and at least one Group 2 User within range. The third access point **133** is programmed to allow communications at least between each of the following: User C (**130**C) and Device C regardless of whether User C is wirelessly connected to the third access point **133**; User D (**130**D) and Device D regardless of whether User D is wirelessly connected to the third access point **133**; any Group 1 User wirelessly connected to the third access point **133** and the server **10** or the router **3**; and User F (a Group 2 User) and (a) any Group 1 User wirelessly connected to the third access point **133**, (b) any Group 2 User wirelessly connected to the third access point **133**, (c) Device C, and (d) Device D. In an embodiment, any or all of the Group 2 Users that have wireless connection capability may be treated similarly as User F. In an embodiment, the third access point **133** is programmed to allow communications at least between User G (**130**G) and (a) any Group 1 User wirelessly connected to the third access point **133**, (b) any Group 2 User wirelessly connected to the third access point **133**, (c) Device C, and (d) Device D. Additionally, the third access point **133** is programmed to prevent communications between any two Group 1 Users (e.g., User A and User C) that are both wirelessly connected to the third access point **133**.

The fourth access point **134** is programmed to allow communications at least between User F (**130**F) when User F is wirelessly connected to the fourth access point **134** and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **1000**, (d) the server **10**, or (e) the router **3**. In an embodiment, User E may be treated similarly to User F. Additionally, the fourth access point **134** is programmed to allow communications at least between User G (**130**G) and (a) any Group 1 User wirelessly connected to the fourth access point **134**, and (b) any Group 2 User wirelessly connected to the fourth access point **134**.

In a further embodiment of the communications network **1000**, the second switch **12** is further programmed to allow communications at least between each of the following: User A and Device A; User B and Device B; User C and Device C; and User G and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **1000**, (d) the server **10**, or (e) the router **3**. In an embodiment, either or both of User E and User F may be treated similarly to User G.

In a still further embodiment of the communications network **1000**, the second switch **12** is still further programmed to prevent communications between any two Group 1 Users. In yet a further embodiment, the third switch **13** is yet further programmed to allow communications at least between each of the following: User A and Device A; User B and Device B; User C and Device C; and User G and (a) any Group 1 User, (b) any Group 2 User, (c) any of the wireless appliances attached to an access point on the communications network **1000**, (d) the server **10**, or (e) the router **3**. In an embodiment, either or both of User E and User F may be treated similarly to User G. In yet still a further embodiment, the third switch **13** is yet still further programmed to prevent communications between any two Group 1 Users.

In an embodiment of the communications network **1000**, the router **3** is connected to an external network, as described above, via a modem **2**. The communications network **1000** may be located in a multi-dwelling unit building and in an embodiment the first access point **121** creates a first wireless cell providing wireless communication coverage to a first and a second unit of the multi-unit building and/or to a hallway adjacent the first unit.

While this specification contains many specifics, these should not be construed as limitations on the scope of the claimed subject matter, but rather as descriptions of features that may be specific to particular embodiments. Certain features that are described in this specification in the context of separate embodiments can also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable subcombination. Moreover, although features may be described above as acting in

certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a subcombination or variation of a subcombination.

Similarly, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. In certain circumstances, multitasking and parallel processing may be advantageous. Moreover, the separation of various system components in the embodiments described above should not be understood as requiring such separation in all embodiments, and it should be understood that the described program components and systems can generally be integrated together in a single software product or packaged into multiple software products.

While some embodiments of the present subject matter have been described, it is to be understood that the embodiments described are illustrative only and that the scope of the invention is to be defined solely by the appended claims when accorded a full range of equivalence, many variations and modifications naturally occurring to those of skill in the art from a perusal hereof.

We claim:

1. A communication network for providing communication for a plurality of users in a first group ("Group 1 Users"), a plurality of users in a second group ("Group 2 Users"), and a plurality of digitally-controlled appliances, the communication network comprising:

a first switch operatively connected to a server, a router, a second switch, and a third switch;

said second switch operatively connected to a first access point and a second access point;

said third switch operatively connected to a third access point and a fourth access point;

said first access point wirelessly connected to a first of said plural appliances ("Device A"), wherein said first access point is programmed to allow communications between:

a first of said Group 1 Users ("User A") and Device A regardless of whether User A is wirelessly connected to said first access point;

any said Group 1 User wirelessly connected to said first access point and said server or said router; and

a first of said Group 2 Users ("User F") and any said Group 1 User wirelessly connected to said first access point, any said Group 2 User wirelessly connected to said first access point, and Device A;

and wherein said first access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said first access point;

said second access point wirelessly connected to a second of said plural appliances ("Device B"), wherein said second access point is programmed to allow communications between:

a second of said Group 1 Users ("User B") and Device B regardless of whether User B is wirelessly connected to said second access point;

a third of said Group 1 Users ("User C") wirelessly connected to said second access point and a third of said plural appliances ("Device C");

any said Group 1 User wirelessly connected to said second access point and said server or said router; and

User F and any said Group 1 User wirelessly connected to said second access point, any said Group 2 User wirelessly connected to said second access point, and Device B;

and wherein said second access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said second access point;

said third access point wirelessly connected to Device C, wherein said third access point is programmed to allow communications between:

User C and Device C regardless of whether User C is wirelessly connected to said third access point;

any said Group 1 User wirelessly connected to said third access point and said server or said router; and

User F and any said Group 1 User wirelessly connected to said third access point, any said Group 2 User wirelessly connected to said third access point, and Device C;

and wherein said third access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said third access point;

and

said fourth access point programmed to allow communications between User F wirelessly connected to said fourth access point and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

2. The communication network of claim **1** wherein said second switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User F and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

3. The communication network of claim **2** wherein said second switch is programmed to prevent communications between any two said Group 1 Users.

4. The communication network of claim **3** wherein said third switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User F and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

5. The communication network of claim **4** wherein said third switch is programmed to prevent communications between any two said Group 1 Users.

6. The communication network of claim **1** wherein said router is connected to an external network via a modem.

7. The communication network of claim **1** wherein said network is located in a multi-unit building.

8. The communication network of claim **7** wherein said first access point creates a first wireless cell providing wireless communication coverage to a first and a second unit of said multi-unit building.

9. The communication network of claim **8** wherein said first wireless cell provides wireless communication coverage to a hallway adjacent said first unit.

10. The communication network of claim **1** wherein said first access point is located geographically remotely from said second access point.

11. A communication network for providing communication for a plurality of users in a first group ("Group 1 Users"), a plurality of users in a second group ("Group 2

Users"), and a plurality of digitally-controlled appliances, the communication network comprising:

a first switch operatively connected to a server, a router, a second switch, and a third switch;

said second switch operatively connected to a first access point and a second access point;

said third switch operatively connected to a third access point;

said first access point wirelessly connected to a first of said plural appliances ("Device A"), wherein said first access point is programmed to allow communications between:

a first of said Group 1 Users ("User A") and Device A regardless of whether

User A is wirelessly connected to said first access point;

any said Group 1 User wirelessly connected to said first access point and said server or said router; and

a first of said Group 2 Users ("User F") and any said Group 1 User wirelessly connected to said first access point, any said Group 2 User wirelessly connected to said first access point, and Device A;

and wherein said first access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said first access point;

said second access point wirelessly connected to a second of said plural appliances ("Device B") and a third of said plural appliances ("Device C"), wherein said second access point is programmed to allow communications between:

a second of said Group 1 Users ("User B") and Device B regardless of whether User B is wirelessly connected to said second access point;

a third of said Group 1 Users ("User C") and Device C regardless of whether User C is wirelessly connected to said second access point;

any said Group 1 User wirelessly connected to said second access point and said server or said router; and

User F and any said Group 1 User wirelessly connected to said second access point, any said Group 2 User wirelessly connected to said second access point, Device B, and Device C;

and wherein said second access point is programmed to prevent communications between:

any two said Group 1 Users wirelessly connected to said second access point;

User B and Device C; and

User C and Device B;

and

said third access point programmed to allow communications between User F wirelessly connected to said third access point and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

12. The communication network of claim **11** wherein said second switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User F and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

13. The communication network of claim **12** wherein said second switch is programmed to prevent communications between any two said Group 1 Users.

14. The communication network of claim **13** wherein said third switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User F and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

15. The communication network of claim **14** wherein said third switch is programmed to prevent communications between any two said Group 1 Users.

16. The communication network of claim **11** wherein said router is connected to an external network via a modem.

17. The communication network of claim **11** wherein said network is located in a multi-unit building.

18. The communication network of claim **17** wherein said first access point creates a first wireless cell providing wireless communication coverage to a first and a second unit of said multi-unit building.

19. The communication network of claim **18** wherein said first wireless cell provides wireless communication coverage to a hallway adjacent said first unit.

20. The communication network of claim **11** wherein said first access point is located geographically remotely from said second access point.

21. A communication network for providing communication for a plurality of users in a first group ("Group 1 Users"), a plurality of users in a second group ("Group 2 Users"), and a plurality of digitally-controlled appliances, the communication network comprising:

a first switch operatively connected to a server, a router, a second switch, a third switch, and a first of said Group 2 Users ("User G");

said second switch operatively connected to a first access point and a second access point;

said third switch operatively connected to a third access point and a fourth access point;

said first access point wirelessly connected to a first of said plural appliances

("Device A"), wherein said first access point is programmed to allow communications between:

a first of said Group 1 Users ("User A") and Device A regardless of whether User A is wirelessly connected to said first access point;

any said Group 1 User wirelessly connected to said first access point and said server or said router; and

User G and any said Group 1 User wirelessly connected to said first access point, any said Group 2 User wirelessly connected to said first access point, and Device A;

and wherein said first access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said first access point;

said second access point wirelessly connected to a second of said plural appliances ("Device B"), wherein said second access point is programmed to allow communications between:

a second of said Group 1 Users ("User B") and Device B regardless of whether User B is wirelessly connected to said second access point;

a third of said Group 1 Users ("User C") wirelessly connected to said second access point and a third of said plural appliances ("Device C");

any said Group 1 User wirelessly connected to said second access point and said server or said router; and

User G and any said Group 1 User wirelessly connected to said first access point, any said Group 2 User wirelessly connected to said first access point, Device B, and Device C;

and wherein said second access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said second access point;

said third access point wirelessly connected to Device C and a fourth of said plural appliances ("Device D"), wherein said third access point is programmed to allow communications between:

User C and Device C regardless of whether User C is wirelessly connected to said third access point;

a fourth of said Group 1 Users ("User D") and Device D regardless of whether User D is wirelessly connected to said third access point;

any said Group 1 User wirelessly connected to said third access point and said server or said router; and

User G and any said Group 1 User wirelessly connected to said third access point, any said Group 2 User wirelessly connected to said third access point, Device C, and Device D;

and wherein said third access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said third access point; and

said fourth access point programmed to allow communications between:

User E wirelessly connected to said fourth access point and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router;

User F wirelessly connected to said fourth access point and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router; and

User G and any said Group 1 User wirelessly connected to said fourth access point, and any said Group 2 User wirelessly connected to said fourth access point;

and wherein said fourth access point is programmed to prevent communications between any two said Group 1 Users wirelessly connected to said fourth access point.

22. The communication network of claim **21** wherein said second switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User G and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

23. The communication network of claim **22** wherein said second switch is programmed to prevent communications between any two said Group 1 Users.

24. The communication network of claim **23** wherein said third switch is programmed to allow communications between:

User A and Device A;

User B and Device B;

User C and Device C; and

User G and any said Group 1 User, any said Group 2 User, any of said plural appliances, said server, or said router.

25. The communication network of claim **24** wherein said third switch is programmed to prevent communications between any two said Group 1 Users.

26. The communication network of claim **21** wherein said router is connected to an external network via a modem.

27. The communication network of claim **21** wherein said network is located in a multi-unit building.

28. The communication network of claim **27** wherein said first access point creates a first wireless cell providing wireless communication coverage to a first and a second unit of said multi-unit building.

29. The communication network of claim **28** wherein said first wireless cell provides wireless communication coverage to a hallway adjacent said first unit.

30. The communication network of claim **21** wherein said first access point is located geographically remotely from said second access point.

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