US009270816B2

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

(10) **Patent No.: US 9,270,816 B2**
(45) **Date of Patent: Feb. 23, 2016**

(54) **REDIRECTING TELEPHONE CALL TO PACKET-SWITCHED DATA CALL VIA VOICEMAIL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 225 days.

(21) Appl. No.: **14/046,034**

(22) Filed: **Oct. 4, 2013**

(65) **Prior Publication Data**

US 2015/0098464 A1 Apr. 9, 2015

(51) **Int. Cl.**

H04L 12/66	(2006.01)
H04M 3/42	(2006.01)
H04L 12/707	(2013.01)
H04W 48/18	(2009.01)
H04W 48/06	(2009.01)
H04W 76/02	(2009.01)

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

CPC ***H04M 3/42289*** (2013.01); ***H04L 45/22*** (2013.01); *H04W 48/06* (2013.01); *H04W 48/18* (2013.01); *H04W 76/028* (2013.01)

(58) **Field of Classification Search**

CPC .. H04M 3/42289; H04L 45/22; H04W 48/06; H04W 48/18; H04W 76/028

See application file for complete search history.

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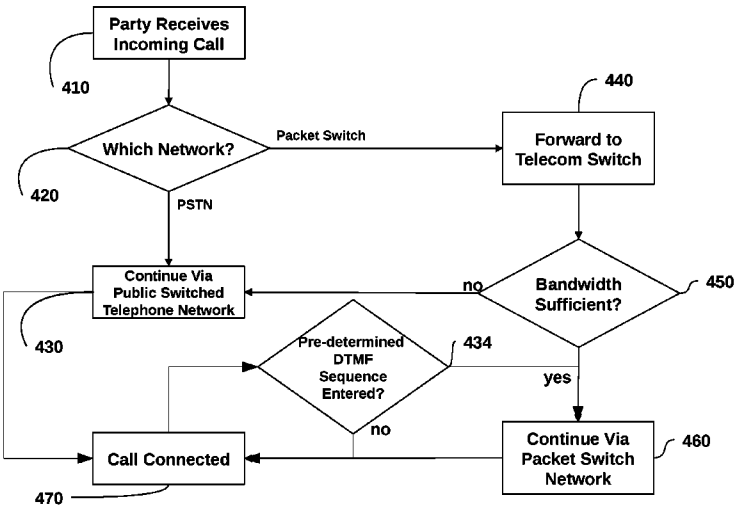
(57) **ABSTRACT**

In embodiments of the disclosed technology, devices and methods for redirecting a telephone call from a public-switched telephone to a packet-switched data network. The phone call is initially received via the public-switched telephone network having a dialed number associated with a hand-held wireless device of a called party. Upon initialization of the phone call, a route is determined from the telecommunications switch to the hand-held wireless device of the called party via a packet-switched network. The bandwidth of the packet-switched network is then detected to determine the ability of the network to handle the call. If the packet-switched network is determined to be capable of handling the call, the call is forwarded over the packet-switched data, thereby reducing or eliminating charges for wireless minutes.

23 Claims, 11 Drawing Sheets



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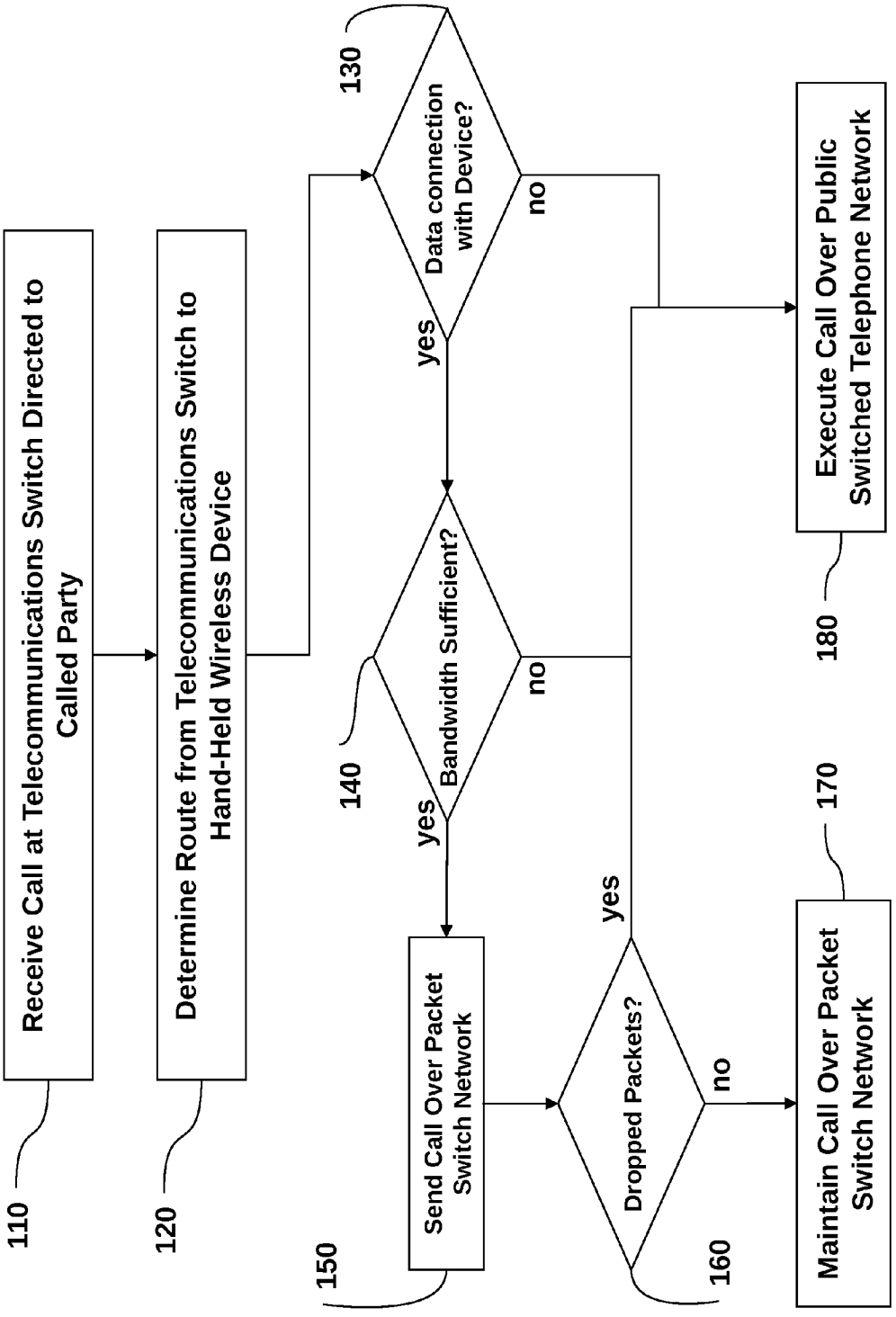
Receive Call at Telecommunications Switch Directed to Called Party
110
Determine Route from Telecommunications Switch to Hand-Held Wireless Device
120
Data connection with Device?
130
yes
no
Bandwidth Sufficient?
140
yes
no
Send Call Over Packet Switch Network
150
Dropped Packets?
160
yes
no
Execute Call Over Public Switched Telephone Network
180
Maintain Call Over Packet Switch Network
170

Figure 1

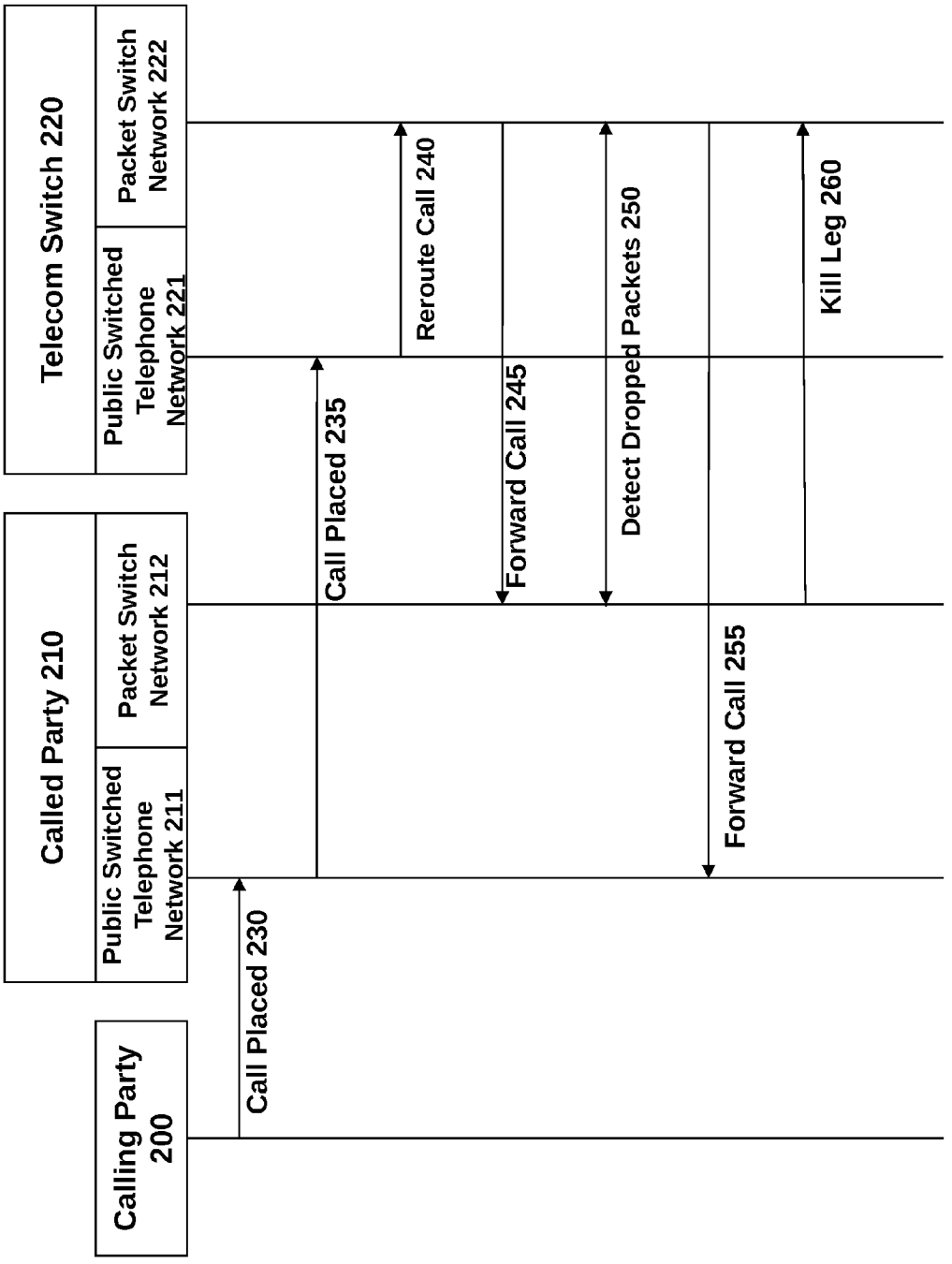
Calling Party 200
Called Party 210
Public Switched Telephone Network 211
Packet Switch Network 212
Telecom Switch 220
Public Switched Telephone Network 221
Packet Switch Network 222
Call Placed 230
Call Placed 235
Reroute Call 240
Forward Call 245
Detect Dropped Packets 250
Forward Call 255
Kill Leg 260

Figure 2

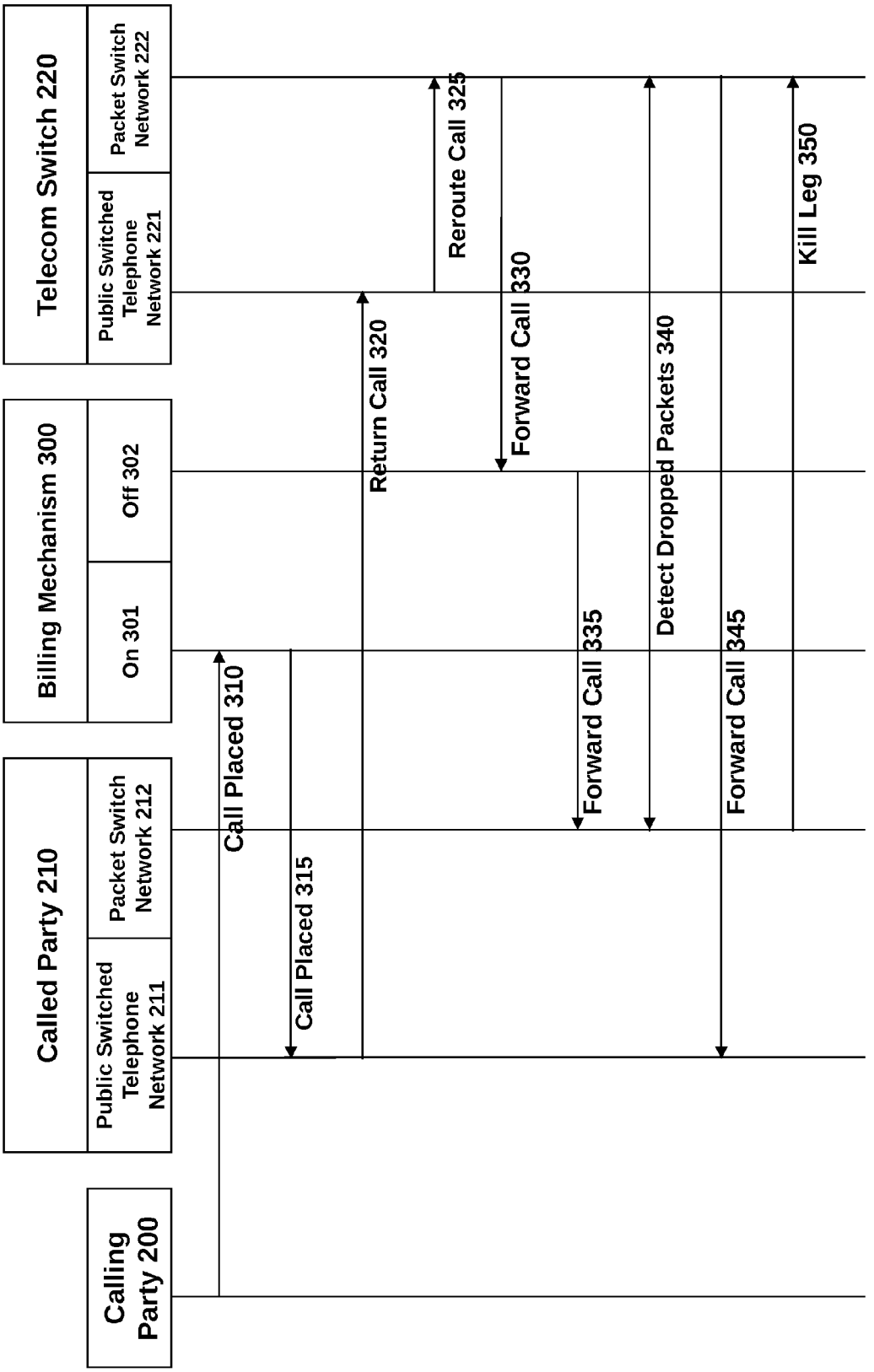
Calling Party 200
Called Party 210
Public Switched Telephone Network 211
Packet Switch Network 212
Billing Mechanism 300
On 301
Off 302
Telecom Switch 220
Public Switched Telephone Network 221
Packet Switch Network 222
Call Placed 310
Call Placed 315
Return Call 320
Reroute Call 325
Forward Call 330
Forward Call 335
Detect Dropped Packets 340
Forward Call 345
Kill Leg 350

Figure 3

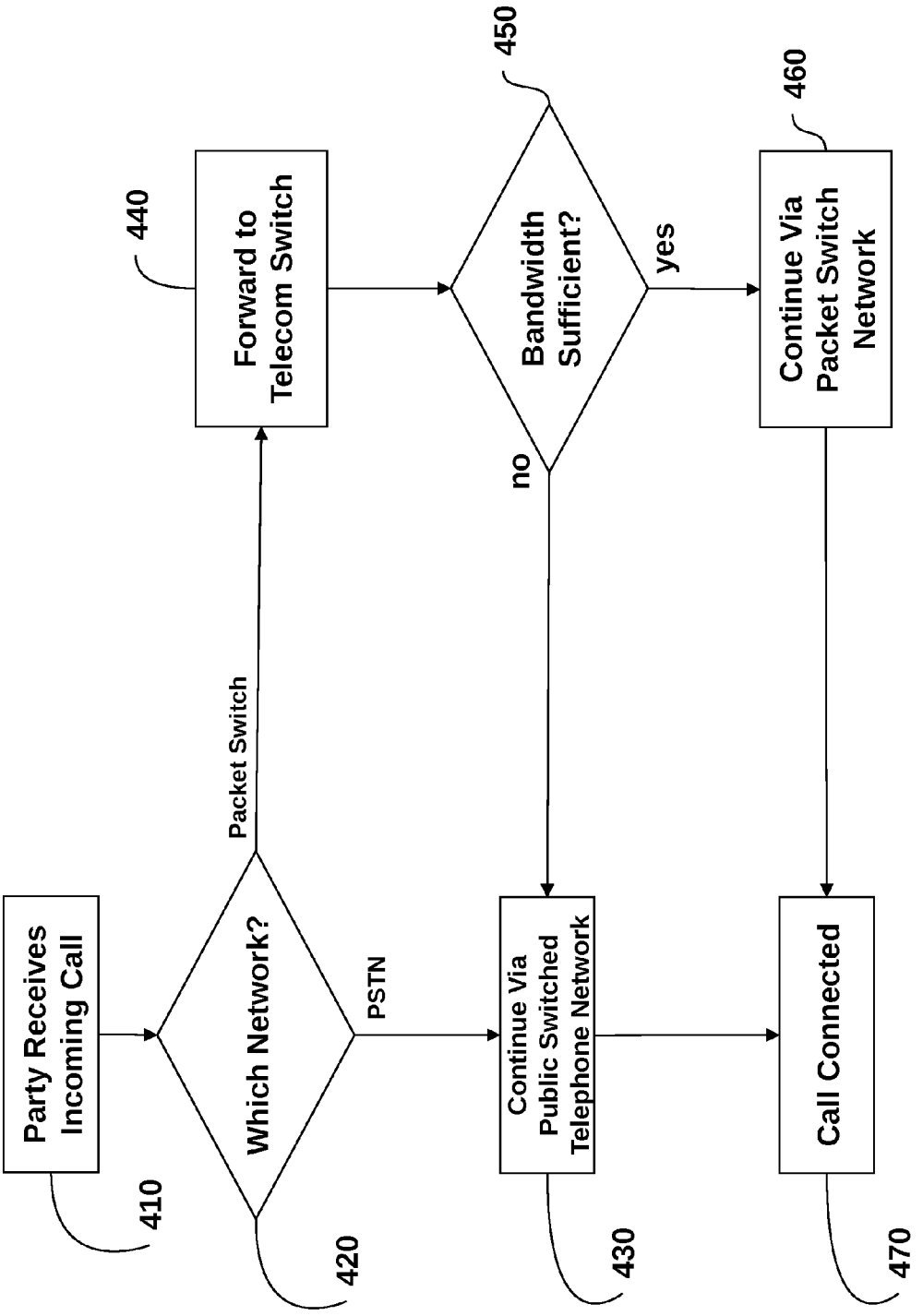
Party Receives Incoming Call
410
Which Network?
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Continue Via Public Switched Telephone Network
430
Bandwidth Sufficient?
450
no
yes
Continue Via Packet Switch Network
460
Call Connected
470

Figure 4

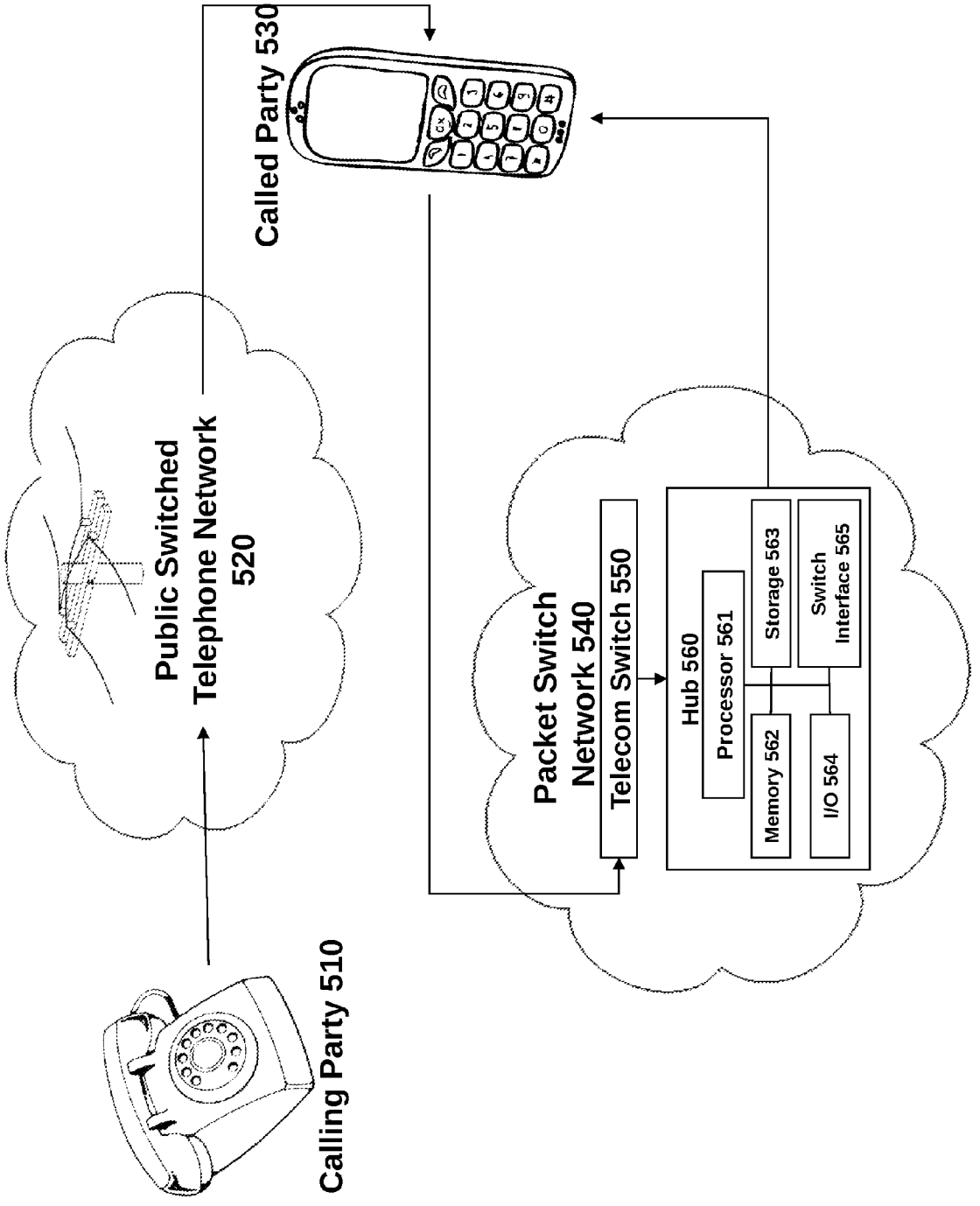
Called Party 530
Public Switched Telephone Network 520
Packet Switch Network 540
Telecom Switch 550
Hub 560
Processor 561
Storage 563
Switch Interface 565
Memory 562
I/O 564
Calling Party 510

Figure 5

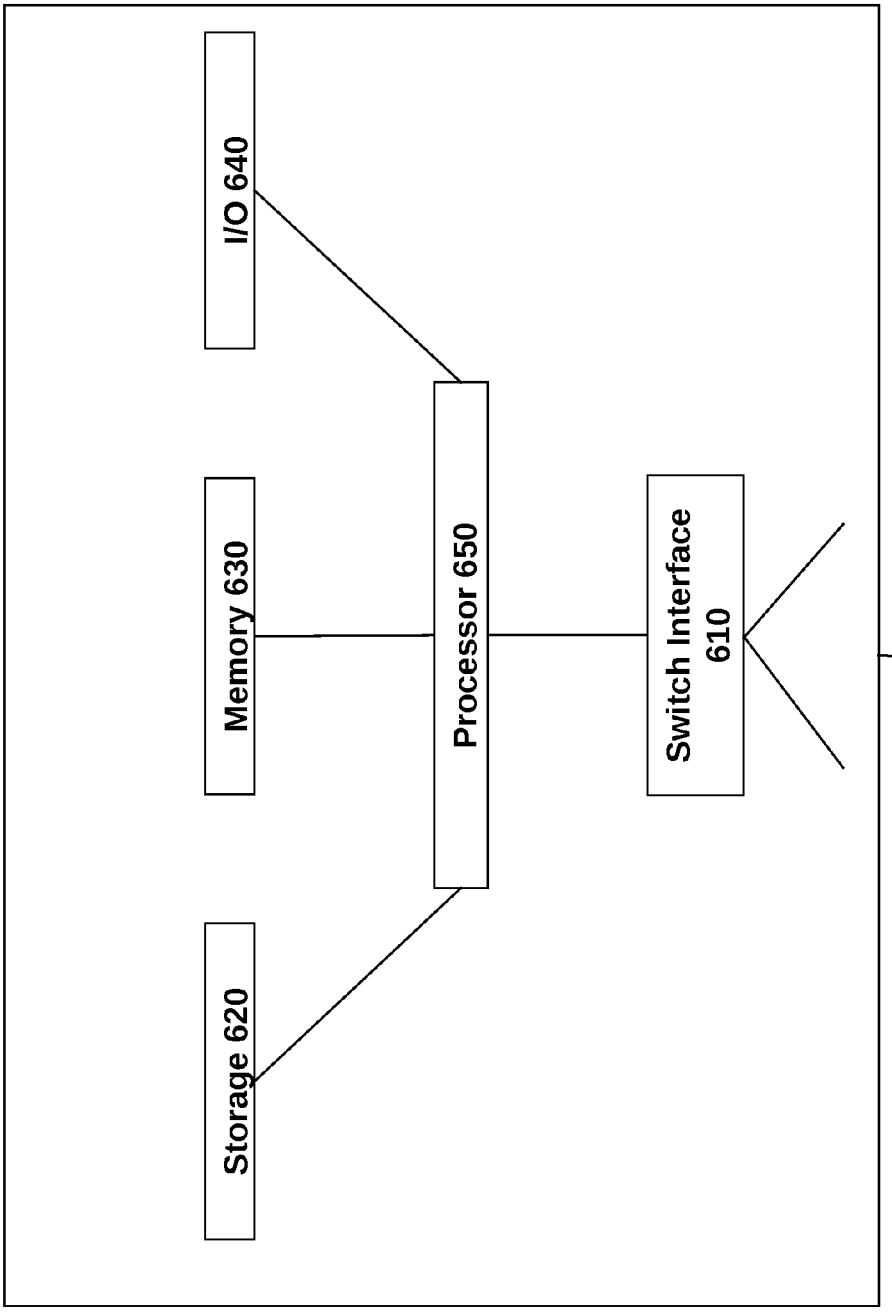
I/O 640
Memory 630
Processor 650
Switch Interface 610
Storage 620
600

Figure 6

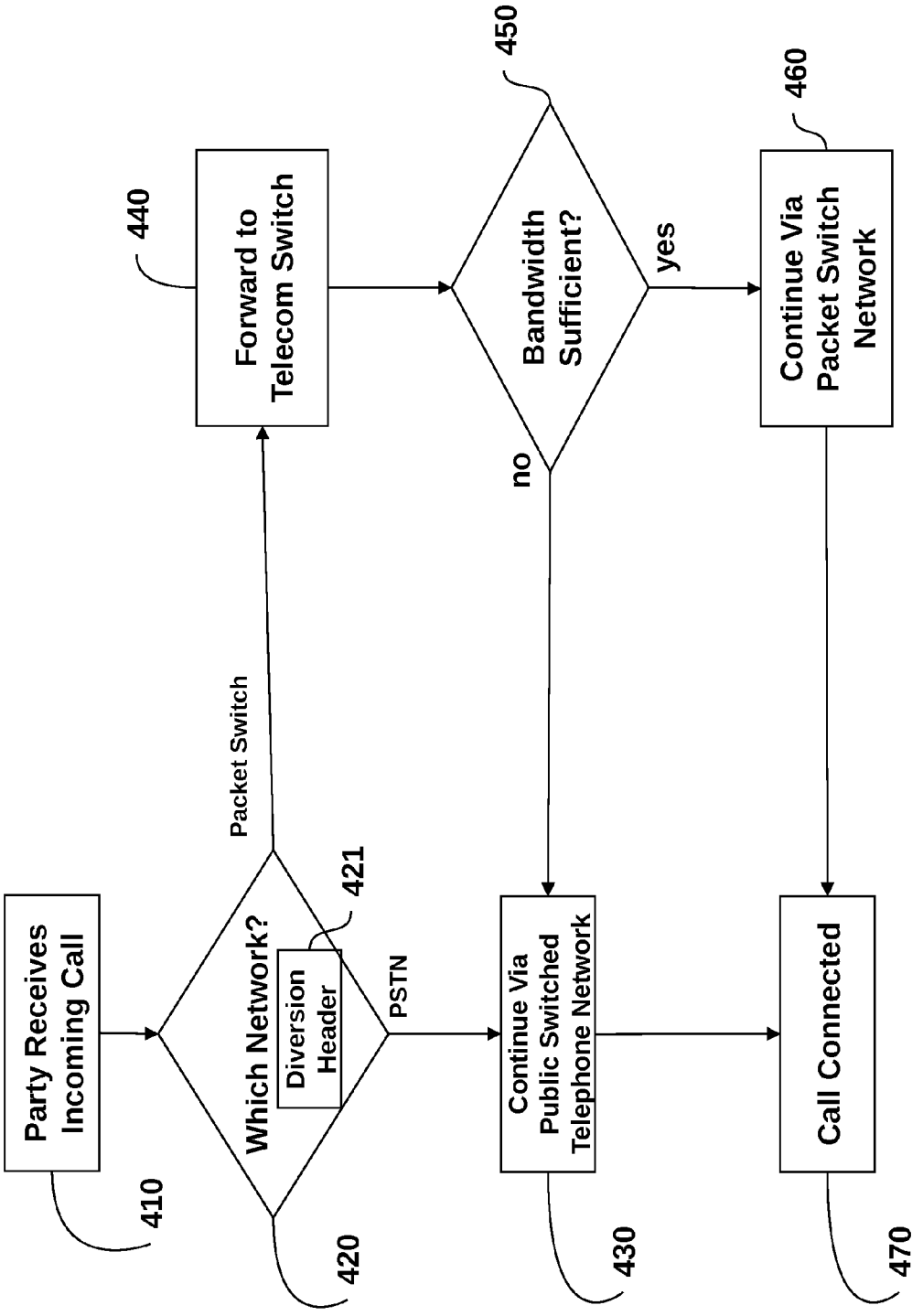
Party Receives Incoming Call
410
Which Network?
Diversion Header
421
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Bandwidth Sufficient?
450
yes
no
Continue Via Packet Switch Network
460
Continue Via Public Switched Telephone Network
430
Call Connected
470

Figure 7

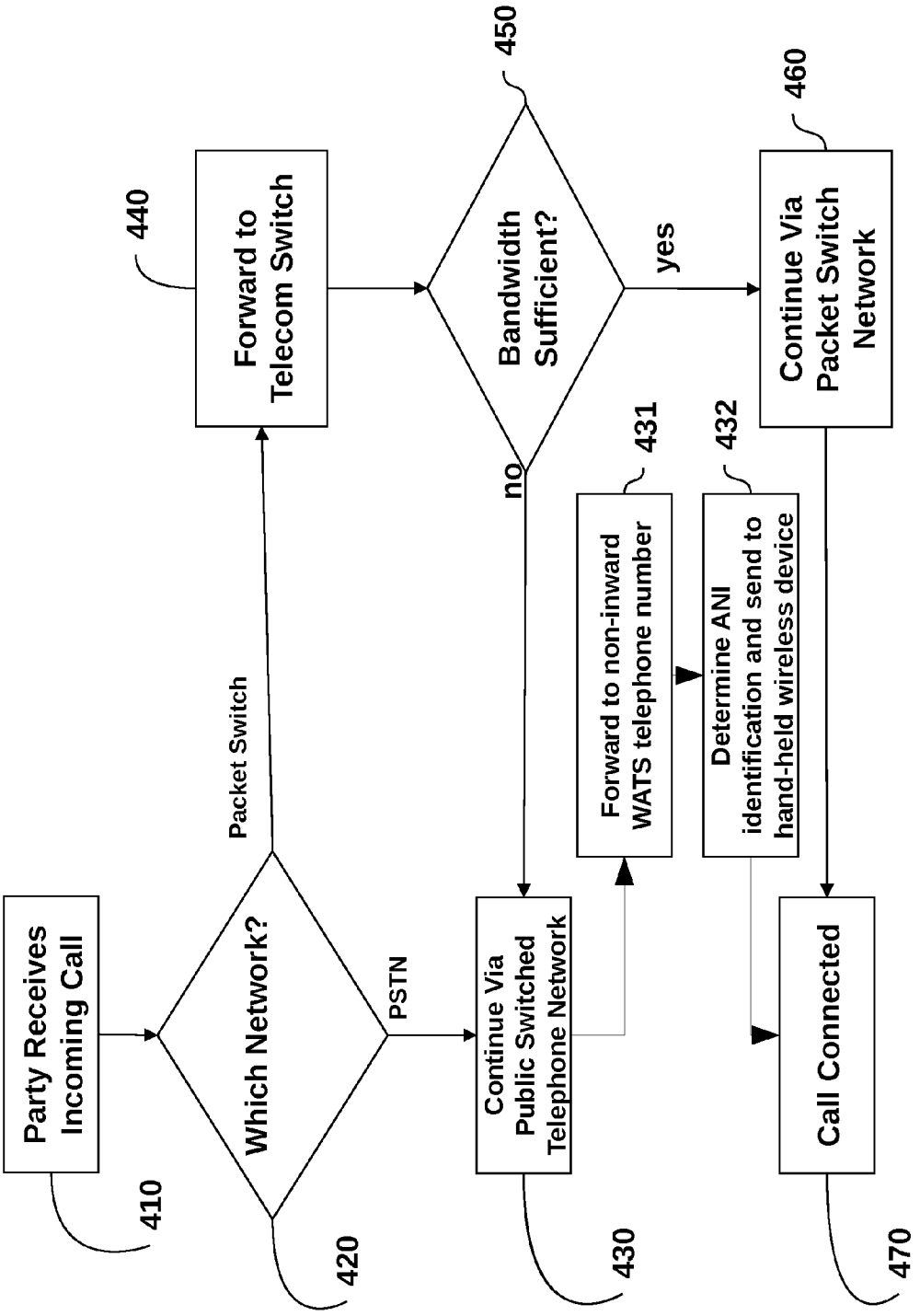
Party Receives Incoming Call
410
Which Network?
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Bandwidth Sufficient?
450
yes
no
Continue Via Packet Switch Network
460
Continue Via Public Switched Telephone Network
430
Forward to non-inward WATS telephone number
431
Determine ANI identification and send to hand-held wireless device
432
Call Connected
470

Figure 8

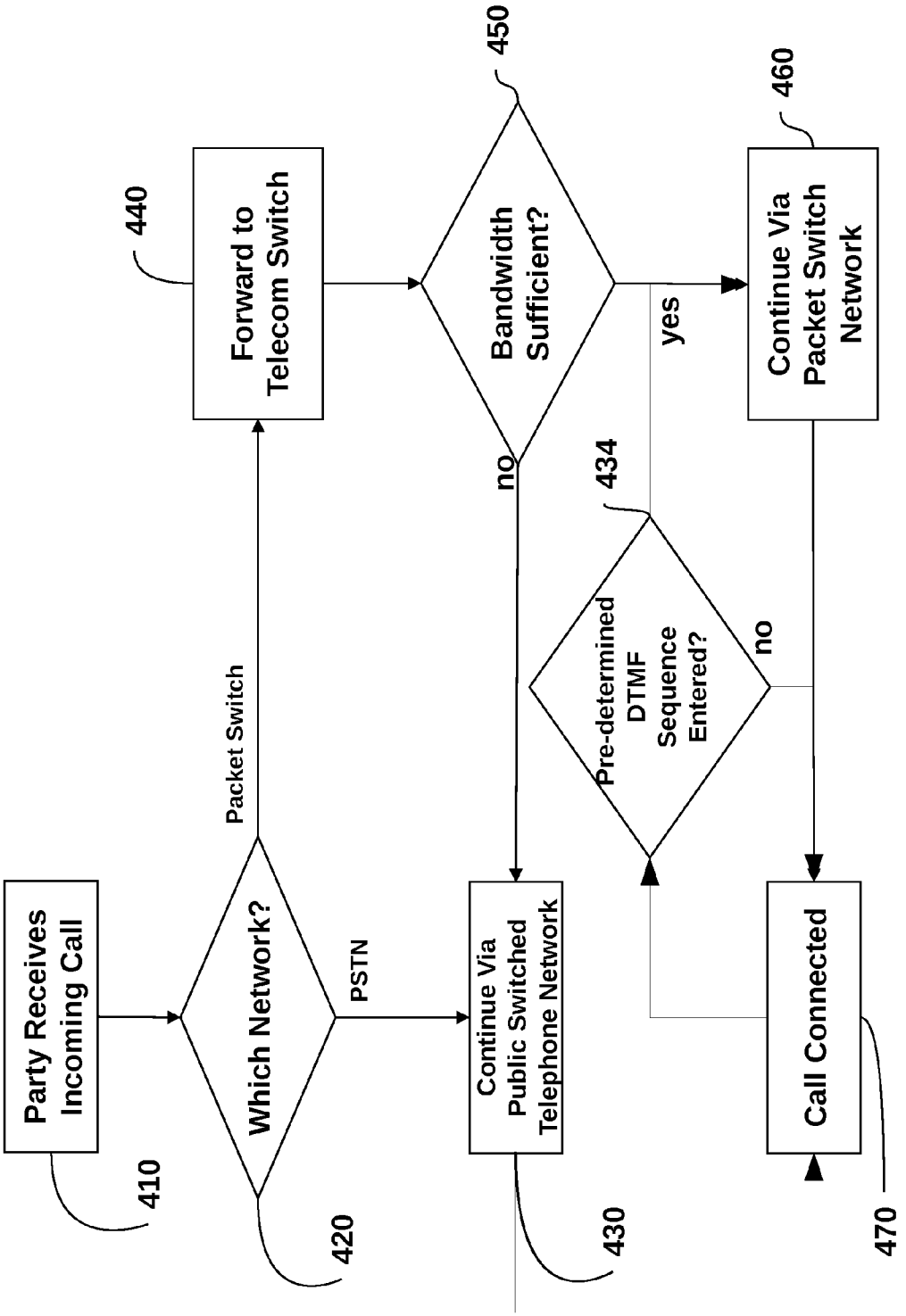
Party Receives Incoming Call
410
Which Network?
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Bandwidth Sufficient?
450
no
yes
Continue Via Public Switched Telephone Network
430
Pre-determined DTMF Sequence Entered?
434
no
Continue Via Packet Switch Network
460
Call Connected
470

Figure 9

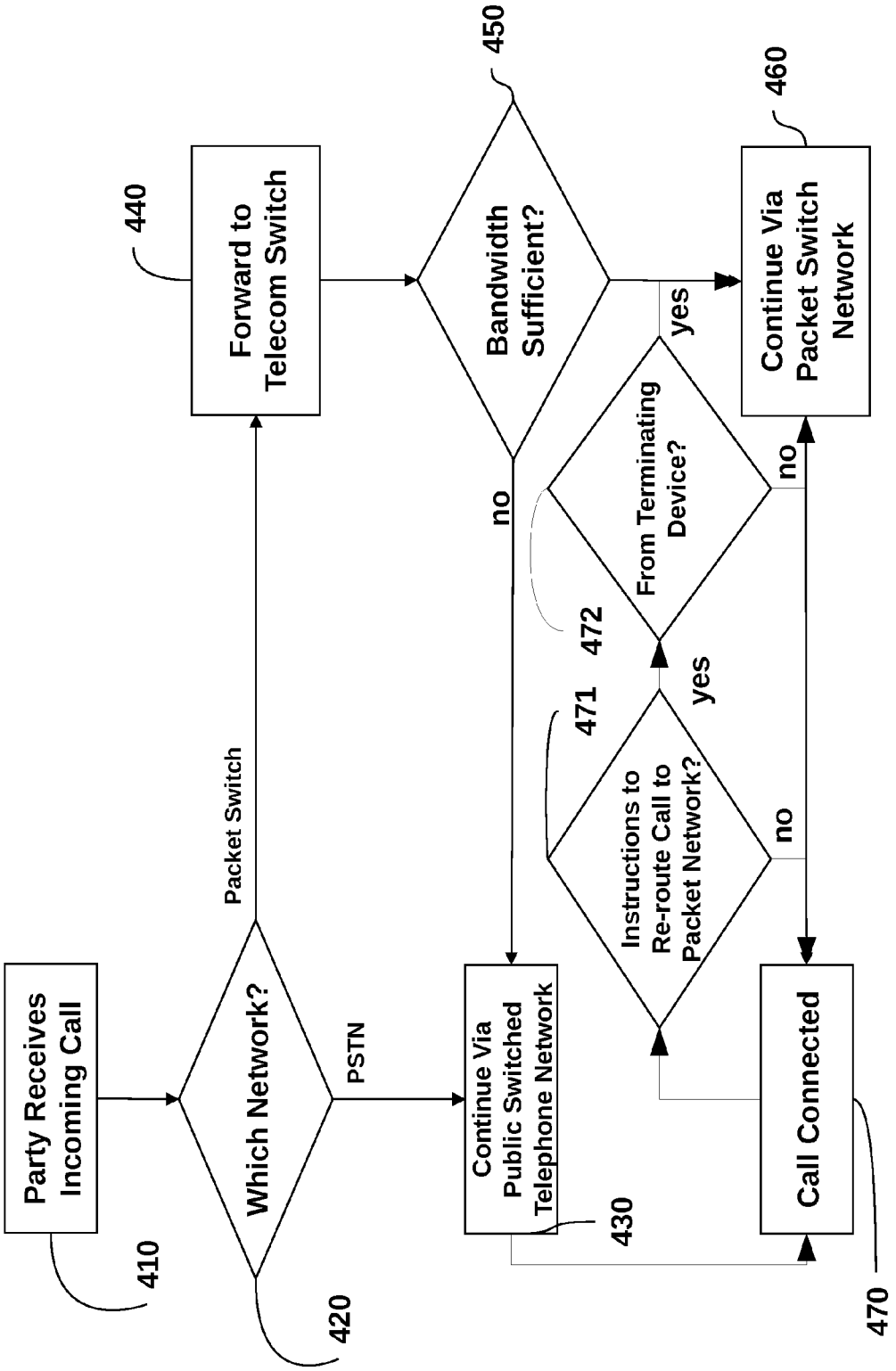
Party Receives Incoming Call
410
Which Network?
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Bandwidth Sufficient?
450
no
yes
Continue Via Public Switched Telephone Network
430
Continue Via Packet Switch Network
460
From Terminating Device?
472
no
yes
Instructions to Re-route Call to Packet Network?
471
no
yes
Call Connected
470

Figure 10

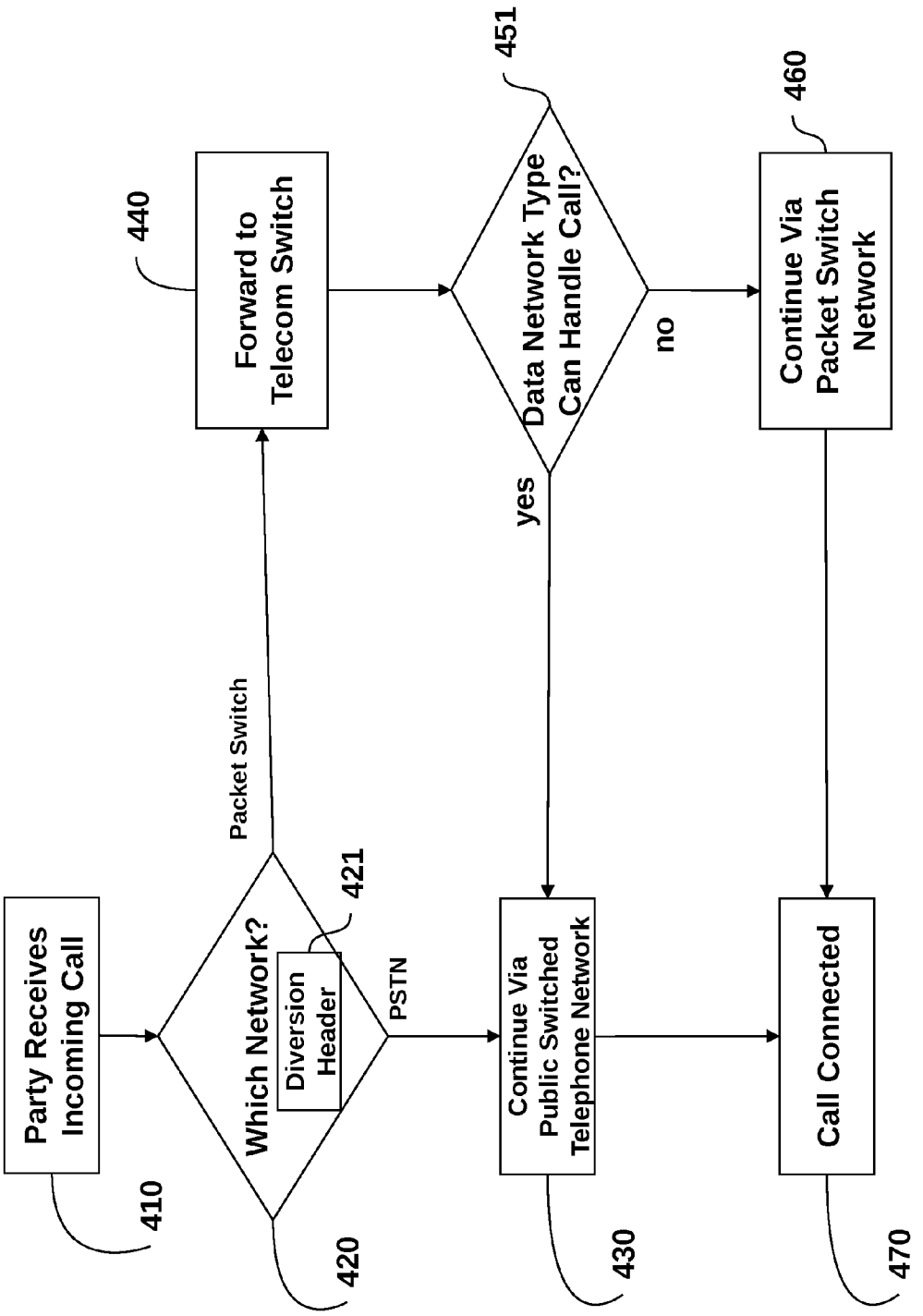
Party Receives Incoming Call
410
Which Network?
Diversion Header
421
420
Packet Switch
PSTN
Forward to Telecom Switch
440
Data Network Type Can Handle Call?
451
yes
no
Continue Via Public Switched Telephone Network
430
Continue Via Packet Switch Network
460
Call Connected
470

Figure 11

REDIRECTING TELEPHONE CALL TO PACKET-SWITCHED DATA CALL VIA VOICEMAIL

FIELD OF THE DISCLOSED TECHNOLOGY

The disclosed technology relates generally to telephone switches and, more specifically, to customized call routing.

BACKGROUND OF THE DISCLOSED TECHNOLOGY

Mobile phone technology has improved drastically to give Internet access to a greater number of users. Many users are afforded unlimited data usage by way of their mobile providers. However, those same users may be restricted as to the number of minutes they are allocated in a given month. In many instances, unlimited data carries a flat monthly rate, while voice calling is tolled on a minute-by-minute basis.

Further, users traveling internationally may incur significant roaming charges for voice calling. However, these users may have access via Wi-Fi to the Internet. Presently, online services exist through which a user may communicate using voice calling. However, none of these services allow a user to use his or her original number. Moreover, none of these services allow a regular incoming call to be transferred from the public-switched telephone network over to a packet-switch data network, and vice versa.

SUMMARY OF THE DISCLOSED TECHNOLOGY

In one embodiment of the disclosed technology, a telecommunications switch is disclosed. Such a telecommunications switch or switch is defined as a device which, at least, receives and routes telephone calls. The telecommunications switch, in embodiments, has a connection, such as direct or wireless-based electrical connection to a packet-switched network and a connection to the public switched telephone network. The public switch telephone network (herein "PSTN") is a publicly accessible circuit-switched telephone network which allows telephones in the world to communicate with other telephones. A phone call is received via the PSTN at a hand-held wireless device of a called party. A processor or other non-transitory medium (herein, used interchangeably) is instructed to determine a route from the telecommunications switch to the hand-held wireless device of the called party via the packet-switched network. When the route is found, the bandwidth of said packet-switched network is determined. A processor is instructed to select to send the call to the hand-held wireless device associated with the called party via one of the networks. The call is sent via the packet-switched network when the determined bandwidth is sufficient to handle the phone call. The call is sent via the public-switched telephone network when the determined bandwidth is insufficient to handle the phone call.

The dialed number may be determined based on a diversion header associated with the phone call. A diversion header carries information about the redirection of a call. The phone call may be initially received by the hand-held wireless device associated with the called party and forwarded to the telecommunications switch, such as through existing protocols known, including call forwarding and/or forwarding to voicemail, with the voicemail number being associated with the communications switch. In further embodiments, the processor carries out instructions to forward the phone call to a non-inward WATS (wide area telephone service) telephone number before the step of sending. Then, ANI (automated number identification) information associated with said phone call is determined and provided to the hand-held wireless device.

In further embodiments, the phone call is sent via the packet-switched network and the phone call is rerouted to the PSTN upon a pre-determined threshold number of packets being dropped. After the telecommunications switch reroutes the call to the PSTN, the telecommunications switch performs another re-routing back to the packet-switched network upon detection of a pre-determined DTMF key sequence being entered. The phone ringing may be suppressed and/or the software on the phone may instruct a processor to automatically answer the PSTN call and disconnect the VOIP connection. Similarly, this may happen in reverse when transferring a call from PSTN to VOIP. The In another embodiment, during a call on the PSTN, the telecommunications switch may reroute the call via the packet-switched network. The processor of the telecommunications switch determines that the instruction to transfer the phone call to the packet-switched network originated from the hand-held wireless device where the call is currently terminating.

In a still further embodiment, the step of determining bandwidth is based on a data network type reported via the packet-switched network from the hand-held wireless device. Further, the step of sending the call to the public-switched telephone network is carried out in all cases when the data network type is known to be unable to support the call on the packet switch network.

In still a further embodiment, a bill mechanism may be instructed to levy a fee on an account associated with the called party. The billing mechanism may be any way of tolling a wireless subscriber for usage. The fee is determined based on units of time during which the phone call is carried on the PSTN. "Units of time," for purposes of this specification, are defined as any measurable interval of time during which a call is carried on a particular route or over a particular network. For example, the fee may be levied in 6-second intervals, whereby a one minute-duration of a call carried over the PSTN would be measured and billed as 10 units of time. The fee per unit time is higher when the phone call is carried on the PSTN. The called party may be charged for part of the duration of the phone call—the part of the duration corresponding to an amount of time said call was active over the PSTN.

In another embodiment of the disclosed technology, a method is provided for switching telecommunications networks. The method proceeds, not necessarily in any particular order, by: a) receiving a phone call via the public-switched telephone network, the phone call having a dialed number associated with a hand-held wireless device of a called party; b) determining if, in addition to a network path via the public-switched telephone network, the hand-held wireless device of said called party has an active and authenticated data connection via a packet-switched network with a telecommunications switch; c) determining that sufficient bandwidth exists over the packet-switched network for the phone call; d) sending the phone call to the hand-held wireless device associated with the called party via the authenticated data connection; and/or e) where an insufficient bandwidth condition arises over the packet-switched network, connecting the phone call via the public-switched telephone network.

In further embodiments of the disclosed method, the call is first sent to the handheld wireless device via the PSTN; then after receiving a command from the wireless device to reconnect the call, the call is sent via the packet-switch network. Still further, the call may be received at the telecommunica-

tions switch after having been initially received via the public-switched telephone network. In another embodiment, the phone call is received at the telecommunications switch after being initially received from the wireless device and automatically forwarded to the telecommunications switch. The call may also be sent to the hand-held wireless device via the packet-switched network.

In still a further embodiment of the disclosed method, an additional step may be provided of receiving an indication from the hand-held wireless device to reconnect the call via the public-switch telephone network. The call may be transferable to the packet-switch network by a prompt on the hand-held wireless device. The call may be initially forwarded to the telecommunications switch over the PSTN or the packet switched data network.

In further embodiments of the disclosed method, a fee may be charged for even only a portion of minutes of the phone call. The portion may consist of, for example, minutes during which the phone call continues over the public-switched telephone network. Additional steps may be provided of: a) determining network conditions of the packet switched network before the step of attempting to send the phone call via the packet switched network; b) at a first connecting of the call to the called party, connecting the call via the public switched telephone network based on insufficient network conditions for the call; and/or c) transferring the phone call, to the packet switched network upon detection of a pre-determined dual-tone multi-frequency ("DTMF") key sequence being entered. Alternatively, the call may be sent via the packet switch network, and during the call, the call may be transferred to the public switched telephone network upon a pre-determined threshold number of packets being dropped. Still further, the phone call may be forwarded to a non-inward WATS telephone number before the step of sending, and ANI information may be sent to the hand-held wireless device in the form of caller identification information.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a diagram of steps taken when a call is received by a called party of embodiments of the disclosed technology.

FIG. **2** shows a diagram of a method of routing a call over multiple switches in embodiments of the disclosed technology.

FIG. **3** shows a diagram of a method of routing a call similar to that of FIG. **2**, while incorporating a fee in embodiments of the disclosed technology.

FIG. **4** shows a diagram of steps taken from the perspective of a called party of embodiments of the disclosed technology.

FIG. **5** shows a high level drawing of an exemplary system arrangement according to an embodiment of the disclosed technology.

FIG. **6** shows a high-level block diagram of a device that may be used to carry out the disclosed technology.

FIG. **7** shows a diversion header with the steps taken from the perspective of a called party of embodiments of the disclosed technology.

FIG. **8** shows steps of forwarding to an non-inward WATS telephone number with the steps taken from the perspective of a called party of embodiments of the disclosed technology.

FIG. **9** shows a DTMF sequence to move a call from a PSTN to packet-switched network from the perspective of a called party of embodiments of the disclosed technology.

FIG. **10** shows checking if instructions to re-route a call over a packet switched network are received from the terminating handheld wireless device from the perspective of a called party of embodiments of the disclosed technology.

FIG. **11** shows an embodiment of FIG. **4** where the data network type, instead of bandwidth determination is used to determine which network to send the call from the perspective of a called party of embodiments of the disclosed technology.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE DISCLOSED TECHNOLOGY

The disclosed technology described herein provides devices and methods for redirecting a telephone call from a public-switched telephone to a packet-switched data network. The phone call initially being received via the public-switched telephone network having a dialed number associated with a hand-held wireless device of a called party. Upon initialization of the phone call, a route is determined from the telecommunications switch to the hand-held wireless device of the called party via a packet-switched network. The bandwidth of the packet switched network is then detected to determine the ability of the network to handle the call. If the packet-switched network is determined to be capable of handing the call, the call is forwarded over the packet-switched data, thereby reducing or eliminating charges for wireless minutes. If the bandwidth of the data-switched network is insufficient to handle the current call, the call is moved to the public-switched network for continuation.

Embodiments of the disclosed technology are described below, with reference to the figures provided.

FIG. **1** shows a diagram of steps taken when a call is received by a called party of embodiments of the disclosed technology—the method being in step **110** when a telephone call is received at a telecommunications switch, and the call being directed to a called party. The call is received from a calling party. A "calling party" defined as a person or device that initiates a phone call over a telephone network, such as, for example, a ordinary telephone service network, voice over internet protocol network, combination thereof, or other. A switch is defined as a device which, at least, receives and routes telephone calls. A switch may also create and disconnect electrical connections between two devices on a phone network, may record a phone call, may receive/send and interpret DTMF tones or voice prompts, and so forth. Further, when used in this disclosure, a "switch" may include one or more separate devices which are electrically connected, or with exchange data with each other over a network to carry out steps disclosed in the claims of this patent application. The telecommunications switch may be operated by a third party and may be separate and distinct from the wireless providers of the calling party and/or the called party.

Such a switch, as defined above, receives an incoming call in step **310**. This call is designated for a target-called party, such as based on a phone number of the called party (a SIP ID or other equivalents should be understood as being within the concept of "called party," where a SIP ID is a session interface protocol.) Next, in step **120**, a route is determined by which the call will be delivered to the hand-held wireless device (herein "wireless device" or "mobile device") of the called party. This step may be carried out before or after the phone call has been initially delivered to the wireless device.

In step **130**, it is determined whether the wireless device is connected to a packet-switch data network. Packet-switch data network, for purposes of this specification, is defined as any network through which data packets may be sent wirelessly and received via the internet. Such networks may be, for example, 3G, 3.5G, 4G, HSPA, HSPA+, Edge, LTE, etc.

Furthermore, a mobile device connected via wireless local area network (e.g., Wi-Fi) to the internet may also be considered to be connected to a wireless network. Such networks are distinguishable from a core-switched network and/or the public-switched telephone network, both of which are limited to transmitting voice calls and text. If a data connection is detected, the method proceeds to step **140**. If no data connection is detected, in step **180**, the call is executed over the public-switched telephone network. The public switch telephone network (herein "PSTN") is the publicly accessible circuit-switched telephone network which allows any telephone in the world to communicate with any other telephone.

In embodiments, the call may be received via the public-switched telephone network, in which case step **180** would involve the call continuing on the public-switched telephone network. Detection of packet switch data network connectivity may be carried out, at least in part, by a software application on the mobile device. If data connectivity is detected, in step **140** is determined whether sufficient bandwidth is available for handling a voice call over the packet-switch data network. Thus, for example, if the wireless device is connected to an Enhanced Data Rates for GSM Evolution ("EDGE") network, the bandwidth may be approximately 400 kilobytes per second. Such speeds may be insufficient for handling a voice call via packet data. As such, the call may be directed to be executed over the public-switch telephone network in step **180**. If the wireless device is connected to a 4G network or a local area network via Wi-Fi, for example, the bandwidth may be sufficient. In carrying out this step, a threshold minimum bandwidth may be calibrated that, if met, the method proceeds to step **150**.

In step **150**, with certain prerequisites having been met, the call is sent over the packet-switch network. As far as the calling party is concerned, the call may carried out in similar manner to any PSTN voice call, and the calling party may not even be made aware that the call is being executed via a packet-switch data network. The called party may or may not be put on notice that the call is being executed over a packet-switch network. Such knowledge however, may be invaluable to the called party upon taking the call because the called party may choose to remain on the phone call for a longer duration if he or she knows they aren't being charged for minutes.

While the call is being carried out, packet loss may be monitored. Packet loss occurs when one or more packets of data traveling across a computer network fail to reach their destination or are "dropped." For a wireless device, packet loss may occur, for example, when a user is moving out of the range of a packet-switch data network Thus, in step **160**, if a threshold number of packets is dropped during the course of the call, the call may be transferred back to the PSTN. The dropped packets may be measured as a function of time or in total. Such a measure prevents a possible drop call or poor call quality. If few or no dropped packets are detected, the call is maintained on the packet switch network in step **170**.

Furthermore, when a call is rerouted to the public-switched network, it may be re-routed back to the packet-switched network upon detection of a pre-determined dual-toned multi-frequency key being entered. Dual-toned multi-frequency (herein "DTMF) signaling is the telecommunication signaling system carried out over analog telephone lines on the public-switch telephone network. When a desired number is to be called, such signals are sent in an array and interpreted for determination of the number dialed to be called.

FIG. **2** shows a diagram of a method of routing a call over multiple switches in embodiments of the disclosed technology. A calling party **200**, defined as a person or device that initiates a phone call over a telephone network (a plain old telephone service (POTS) network, voice over internet protocol network (VOIP), combination thereof, or other) places a call **230** directed to a called party **210**. This call is executed via a public switch **211**, which may be operated by the telecom provider of the calling party and/or may comprise a plurality of switches between the calling party **200** and called party **210**. The call is then placed **235**, via a further leg or further legs (communications channels between two switches or a switch and a party to the phone call) over the public switched telephone network **211**, **221** to a telecommunications switch **220**. The telecommunications switch **220** ("telecom switch") may be operated by a telecom provider or a third-party having no association with either telecom provider of the calling party **200** and/or the called party **210**.

At the telecom switch **220**, the call may be moved **240** from the PSTN **221** to a packet-switch network **222**. The called party **210** is the desired target of the calling party **200** (or may be a new target designated by the called party **210**, such as by way of call forwarding or the like). Thus, the call is then forwarded in step **245** via the packet switched network **222**, from the called party **210**. Before forwarding the call and during the call, the number of dropped packets is detected **250** over the packet switched network **222**, **212** between the telecom switch **220** and the called party **210**. Upon detection of dropped packets, either before forwarding the call or during the call, the call may be forwarded **255** back to the called party **210** on the public switched telephone network **211**. In this instance, the leg of the call on the packet switch network, if existing, is killed **260**.

FIG. **3** shows a diagram of a method of routing a call similar to that of FIG. **2**, while incorporating a fee in embodiments of the disclosed technology. In this embodiment, upon placing a call **310** to a called party **210**, a billing mechanism **300** is initiated **301** to apply billing charges. Such charges may be facilitated by a wireless provider, and may be measured, for example, in minutes. The call is placed **315** to the called party **210** over the PSTM **211** with charges accruing. The wireless device of the called party **210**, if employing the disclosed technology, returns the call **320** to the telecommunications switch **220** via PSTN **211**, **221** communication.

At the telecom switch **220**, the call is moved **325** to the packet switch network **222**. As the call is forwarded **330**, the billing mechanism **300** is turned off **302** due to the call being transmitted via packet data. The call is then forwarded **335** to the called party **210** via the packet-switch network **212**. Again, the monitoring of dropped packets **340** begins before the forwarding and during the handling of the call over the packet switch network **212**. Upon detection of packet loss, a leg may be initiated forwarding the call **345** to the called party **210** via the PSTN **211**. If the call is forwarded in step **345** via the PSTN **211**, then the packet-switched leg **212**, **222** is killed in step **350**.

The billing mechanism **300** is instructed to levy (charge) a fee to an account associated with the called party **200**. The billing mechanism **300** may be any way of tolling a wireless subscriber for usage. The fee is determined based on units of time during which the phone call is carried on the PSTN. "Units of time," for purposes of this specification, are defined as any measurable interval of time during which a call is carried on a particular route or over a particular network. For example, the fee may be levied in 6-second intervals whereby a one minute duration of a call carried over the PSTN would be measured and billed as 10 units of time. The fee per unit time may be higher when the phone call is carried over the PSTN. Alternatively, the fee may only be charged when the call is carried over the PSTN. As such, when the call is

switched to the PSTN **211**, the billing mechanism **300** is toggled to be on **301**, thus recording units of time for purposes of billing. The called party may be charged for part of the duration of the phone call, the part of the duration corresponding to an amount of time said call was active over the PSTN.

FIG. **4** shows a diagram of steps taken from the perspective of a called party of embodiments of the disclosed technology. In this embodiment, the called party may have an interface configured via an associated wireless device by which the called party may be able to designate how an incoming call is routed. For example, the called party may configure the wireless device to automatically take certain steps when an incoming call is received. Alternatively, the wireless device may be configured to prompt the called party, each time a call is received, to decide how the call should be routed.

The method begins with step, **410** whereby a called party receives an incoming call. In step **420**, the network employed to carry the call is determined. Again, this may be carried out automatically based on user pre-configuration, or on a manual basis by prompting the called party. If the PSTN is chosen, then the call continues on the PSTN pursuant to step **430**. In step **470**, the call is connected. If the packet-switch network is elected to carry out the call, the call is forwarded to the telecom switch **440**. Then, in step **450** the bandwidth of the packet data connection is assessed to determine if the call can be handled via packet data. If the bandwidth is insufficient, the call may be routed back to the public switched telephone network in step **430**. As such, the call would be connected in step **470** via the PSTN. If the bandwidth is determined to be sufficient to handle the call, then, in step **460**, the call is sent via the packet-switch data network. Then, the call is connected in step **470** via the packet-switch data network.

FIG. **5** shows a high level drawing of an exemplary system arrangement according to an embodiment of the disclosed technology. A calling party **510** initiates a phone call over a telephone network, such as, for example, a plain old telephone service network, voice over internet protocol network, combination thereof, or other. The call accesses the public-switched telephone network **520** to be forwarded to a wireless device of a called party **530**. When the call is received, the wireless device of the called party **530** accesses a telecom switch **550** via a packet-switch network **540** for purposes of transferring the call thereto. Access to the packet switch network **540** may be carried out using a pre-existing data connection provided by a telecommunications provider associated with the wireless device.

Access to the telecom switch **550** may be carried out via the packet switch network **540** using an interface on the wireless device. The interface may be, for example, a software application installed onto the wireless device. The software application may be configured by a user. The wireless device may communicate data to and from the telecom switch **550**. The data may include account information, billing information, automatic number identification ("ANI"), and other information relevant to the call, the calling party, and the called party. The telecom switch **500** is a central repository for all accounts associated with called parties. The telecom switch **550** executes the transfer and forwarding of calls using a hub **560**. In an embodiment thereof, a hub **560** comprises a processor **561**, memory **562**, input/output **563**, storage **564**, and a network interface **565**. These features correspond to those described in further detail below with regard to FIG. **6** and the description thereof, below.

From the telecom switch **550**, the call is transferred back to the called party **530** to be preferably handled over the packet-switch network **540** subject to the bandwidth and connectivity considerations previously discussed. All of the steps and processes illustrated may be carried out simultaneously or over a short period of time.

FIG. **6** shows a high-level block diagram of a device that may be used to carry out the disclosed technology. Device **600** comprises a processor **650** that controls the overall operation of the computer by executing the device's program instructions which define such operation. The device's program instructions may be stored in a storage device **620** (e.g., magnetic disk, database) and loaded into memory **630** when execution of the console's program instructions is desired. Thus, the device's operation will be defined by the device's program instructions stored in memory **630** and/or storage **620**, and the console will be controlled by processor **650** executing the console's program instructions. A device **600** also includes one or a plurality of input network interfaces for communicating with other devices via a network (e.g., the internet). The device **600** further includes an electrical input interface. A device **600** also includes one or more output network interfaces **610** for communicating with other devices. Device **600** also includes input/output **640** representing devices which allow for user interaction with a computer (e.g., display, keyboard, mouse, speakers, buttons, etc.). One skilled in the art will recognize that an implementation of an actual device will contain other components as well, and that FIG. **6** is a high level representation of some of the components of such a device for illustrative purposes. It should also be understood by one skilled in the art that the method and devices depicted in FIGS. **1** through **5** may be implemented on a device such as is shown in FIG. **6**.

Further, it should be understood that all subject matter disclosed herein is directed and should be read only on statutory, non-abstract subject matter. All terminology should be read to include only the portions of the definitions which may be claimed. By way of example, "computer readable storage medium" is understood to be defined as only non-transitory storage mediums.

While the disclosed technology has been taught with specific reference to the above embodiments, a person having ordinary skill in the art will recognize that changes can be made in form and detail without departing from the spirit and the scope of the disclosed technology. The described embodiments are to be considered in all respects only as illustrative and not restrictive. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope. Combinations of any of the methods, systems, and devices described hereinabove are also contemplated and within the scope of the disclosed technology.

FIG. **7** shows a diversion header with the steps taken from the perspective of a called party of embodiments of the disclosed technology. Here, the elements of FIG. **4** remain identical to that of FIG. **7** except that a diversion header **421** is shown in the "Which Network?" block **420**. A dialed number may be determined based on the diversion header **421** associated with the phone call.

FIG. **8** shows steps of forwarding to an non-inward WATS telephone number with the steps taken from the perspective of a called party of embodiments of the disclosed technology. Here, the elements of FIG. **4** remain identical to that of FIG. **7** except that in step **431** the call over a PSTN is forwarded to a non-inward WATS telephone number. Then, in step **432**, ANI indemnification is determined and this data is sent to a hand-held wireless device.

FIG. **9** shows a DTMF sequence to move a call from a PSTN to packet-switched network from the perspective of a called party of embodiments of the disclosed technology. Here, the elements of FIG. **4** remain identical to that of FIG.

7 except as follows. Once a call is connected in step **470**, it is determined in step **434** whether a pre-determined DTMF sequence has been entered. If not, the call remains connected as it was over the PSTN. If so, then the call is moved to a packet switched network.

FIG. **10** shows checking if instructions to re-route a call over a packet switched network are received from the terminating handheld wireless device from the perspective of a called party of embodiments of the disclosed technology. Here, the elements of FIG. **4** remain identical to that of FIG. **7** except as follows. Once the call is connected in step **470**, then the telecommunications switch receives instructions to reroute the call via the packet-switched network as represented by box **471**. When such instructions aren't received, the call remains connected. When they are received, it must be checked, in step **472**, if the instructions originate from the hand-held wireless device where the call is currently terminating. If so, then the call continues over the packet switched network in step **460**. If not, then the call remains as currently connected.

FIG. **11** shows an embodiment of FIG. **4** where the data network type, instead of bandwidth determination is used to determine which network to send the call from the perspective of a called party of embodiments of the disclosed technology. Here, the elements of FIG. **4** remain identical to that of FIG. **7** except as follows. Box **450** is replaced with box **451** where it is determined whether the data network type is known to be unable to support the call to the packet-switched network. In such a case where it cannot handle the call, the call is always continued on the PSTN in step **430**. Where it can handle the call, the call continues on the packet switched network **460**.

I claim:

1. A telecommunications switch with,

a physical data connection to a packet-switched network;

an electrical connection to a public-switched telephone network via which a phone call is received, said phone call having a dialed number associated with a hand-held wireless device of a called party;

a processor coupled to memory executing instructions received from said memory to determine a route from said telecommunications switch to said hand-held wireless device of said called party via said packet-switched network and where said route is found, to determine bandwidth of said packet-switched network;

said processor or a different processor coupled to said memory or different memory executing instructions to send said call to said hand-held wireless device associated with said called party via one of:

said packet-switched network when said determined bandwidth is sufficient to handle said phone call; or

said public-switched telephone network when said determined bandwidth is insufficient to handle said phone call,

wherein said processor carries out instructions to forward said phone call to a non-inward WATS (wide area telephone service) telephone number before said step of sending, and determines ANI (automated number identification) information associated with said phone call and provides said ANI information to said hand-held wireless device.

2. A telecommunications switch with,

a physical data connection to a packet-switched network;

an electrical connection to a public-switched telephone network via which a phone call is received, said phone call having a dialed number associated with a hand-held wireless device of a called party;

a processor coupled to memory executing instructions received from said memory to determine a route from said telecommunications switch to said hand-held wireless device of said called party via said packet-switched network and where said route is found, to determine bandwidth of said packet-switched network;

said processor or a different processor coupled to said memory or different memory executing instructions to send said call to said hand-held wireless device associated with said called party via one of:

said packet-switched network when said determined bandwidth is sufficient to handle said phone call; or

said public-switched telephone network when said determined bandwidth is insufficient to handle said phone call;

wherein said phone call is sent via said packet-switched network; and

said telecommunications switch reroutes said call to said public-switched telephone network upon a pre-determined threshold number of dropped packets; and

after said telecommunications switch reroutes said to call to said public-switched telephone network, during said phone call said telecommunications switch performs another re-routing back to said packet-switched network upon detection of a pre-determined DTMF (dual-tone multi-frequency) key sequence being entered.

3. A telecommunications switch with,

a physical data connection to a packet-switched network;

an electrical connection to a public-switched telephone network via which a phone call is received, said phone call having a dialed number associated with a hand-held wireless device of a called party;

a processor coupled to memory executing instructions received from said memory to determine a route from said telecommunications switch to said hand-held wireless device of said called party via said packet-switched network and where said route is found, to determine bandwidth of said packet-switched network;

said processor or a different processor coupled to said memory or different memory executing instructions to send said call to said hand-held wireless device associated with said called party via one of:

said packet-switched network when said determined bandwidth is sufficient to handle said phone call; or

said public-switched telephone network when said determined bandwidth is insufficient to handle said phone call, wherein said telecommunications switch sends said call to said public-switched telephone network and

during said call via said packet-switched network, said telecommunications switch receives instructions to reroute said call via said packet-switched network; and

said processor of said telecommunications switch determines that said instruction to transfer said phone call to said packet-switched network originated from said hand-held wireless device where said call is currently terminating.

4. The telecommunications switch of claim **3**, wherein said dialed number is determined based on a diversion header associated with said phone call.

5. The telecommunications switch of claim **3**, wherein said phone call was initially received at said hand-held wireless device associated with said called party and forwarded to said telecommunications switch.

6. The telecommunications switch of claim **3**, further comprising a billing mechanism coupled to memory executing instructions received from said memory levying a fee to an

account associated with said called party, said fee determined based on units of time said phone call is carried on said packet-switched network and units of time said phone call is carried on said public-switched telephone network, wherein said fee per unit time is higher when said phone call is carried on said public-switched telephone network.

7. The telecommunications switch of claim **6**, wherein said called party is charged for part of the duration of said phone call, said part of said duration of said phone call corresponding to an amount of time said call was active over said public-switched telephone network.

8. A telecommunications switch with,

a physical data connection to a packet-switched network;

an electrical connection to a public-switched telephone network via which a phone call is received, said phone call having a dialed number associated with a hand-held wireless device of a called party;

a processor coupled to memory executing instructions received from said memory to determine a route from said telecommunications switch to said hand-held wireless device of said called party via said packet-switched network and where said route is found, to determine bandwidth of said packet-switched network;

said processor or a different processor coupled to said memory or different memory executing instructions to send said call to said hand-held wireless device associated with said called party via one of:

said packet-switched network when said determined bandwidth is sufficient to handle said phone call; or

said public-switched telephone network when said determined bandwidth is insufficient to handle said phone call,

wherein said determining bandwidth is based on a data network type reported via said packet-switched network from said hand-held wireless device; and

wherein said sending to said public-switched telephone network is carried out in all cases when said data network type is known to be unable to support said call on said packet-switched network.

9. A method of switching telecommunications networks, comprising:

receiving a phone call to a hand-held wireless device via the public-switched telephone network, said phone call having a dialed number associated with said hand-held wireless device of a called party;

determining by way of a telecommunications switch if, in addition to a network path via said public-switched telephone network, said hand-held wireless device of said called party has an active and authenticated data connection via a packet-switched network with said telecommunications switch or another telecommunications switch;

determining that sufficient bandwidth exists over said packet-switched network for said phone call;

sending said phone call to said hand-held wireless device associated with said called party via said authenticated data connection; and

where an insufficient bandwidth condition arises over said packet-switched network, connecting said phone call via said public-switched telephone network;

wherein said call is first sent to said handheld wireless device via said PSTN (public switched telephone network); and

after receiving a command from said wireless device said call is sent via said packet-switched network.

10. The method of claim **9**, wherein said call is received at said telecommunications switch after having been initially received via said public-switched telephone network and forwarded from said called party.

11. The method of claim **10**, wherein said call is carried out via said telecommunications switch.

12. The method of claim **9** wherein said phone call is received at said telecommunications switch after having been initially received from said wireless device and automatically forwarded to said telecommunications switch.

13. The method of claim **11** wherein said call is automatically forwarded to said telecommunications switch.

14. The method of claim **12** wherein said call is sent to said hand-held wireless device via said packet-switched network.

15. The method of claim **9**, wherein said call is transferable to said packet-switched network by a prompt on said hand-held wireless device.

16. The method of claim **11** wherein said phone call was forwarded over the public-switched telephone network.

17. The method of claim **11** wherein said phone call was forwarded via said packet-switched data network.

18. The method of claim **9**, charging a fee for only a portion of minutes of said phone call, wherein said portion consists of minutes during which said call continues on said public-switched telephone network.

19. The method of claim **9**, further comprising:

determining network conditions of said packet-switched network before said step of attempting to send said phone call via said packet-switched network; and

at a first connecting of said call to said called party, connecting said call via said public-switched telephone network based on insufficient network conditions for said call.

20. The method of claim **9**, further comprising transferring said phone call, to said packet-switched network upon detection of a pre-determined DTMF (dual tone multi-frequency) key sequence being entered.

21. The method of claim **9**, wherein said phone call is sent via said packet-switched network; and

during said call, said call is transferred to said public-switched telephone network upon a pre-determined threshold number of packets being dropped.

22. A method of switching telecommunications networks, comprising:

receiving a phone call to a hand-held wireless device via the public-switched telephone network, said phone call having a dialed number associated with said hand-held wireless device of a called party;

determining by way of a telecommunications switch if, in addition to a network path via said public-switched telephone network, said hand-held wireless device of said called party has an active and authenticated data connection via a packet-switched network with said telecommunications switch or another telecommunications switch;

determining that sufficient bandwidth exists over said packet-switched network for said phone call;

sending said phone call to said hand-held wireless device associated with said called party via said authenticated data connection; and

where an insufficient bandwidth condition arises over said packet-switched network, connecting said phone call via said public-switched telephone network;

further comprising receiving an indication from said hand-held wireless device to reconnect said call via the public-switched telephone network.

23. A method of switching telecommunications networks, comprising:

receiving a phone call to a hand-held wireless device via the public-switched telephone network, said phone call having a dialed number associated with said hand-held wireless device of a called party;

determining by way of a telecommunications switch if, in addition to a network path via said public-switched telephone network, said hand-held wireless device of said called party has an active and authenticated data connection via a packet-switched network with said telecommunications switch or another telecommunications switch;

determining that sufficient bandwidth exists over said packet-switched network for said phone call;

sending said phone call to said hand-held wireless device associated with said called party via said authenticated data connection; and

where an insufficient bandwidth condition arises over said packet-switched network, connecting said phone call via said public-switched telephone network;

wherein said phone call is forwarded to a non-inward WATS (wide area telephone service) telephone number before said step of sending, and ANI (automated number identification) information is sent to said hand-held wireless device in the form of caller identification (caller ID) information.

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