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Polson

(54) LAN / WWAN GATEWAY CARRIER CUSTOMIZATION

(75) Inventor: **Peter Polson**, Seattle, WA (US)

Correspondence Address:
SCHWABE, WILLIAMSON & WYATT, P.C.
PACWEST CENTER, SUITE 1900
1211 SW FIFTH AVENUE
PORTLAND, OR 97204 (US)

(73) Assignee: **Junxion, Inc.**

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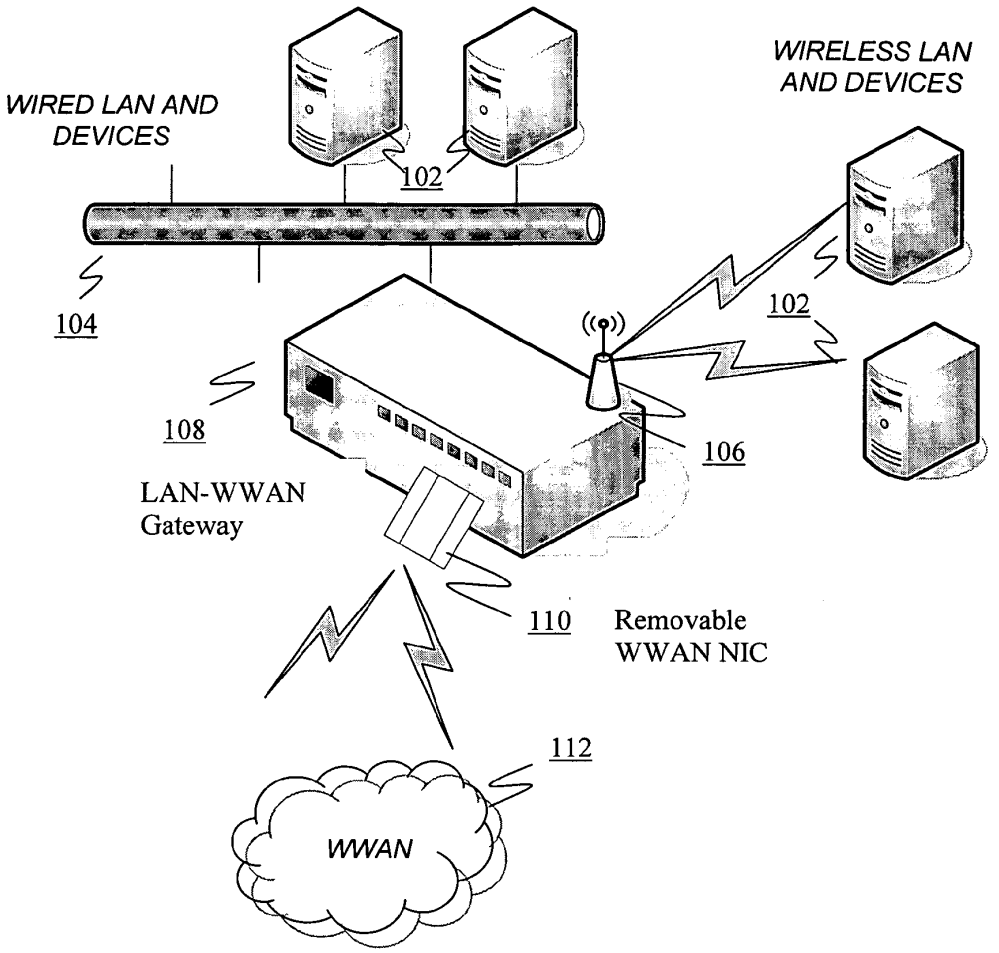
(57) **ABSTRACT**

A gateway adapted to establish a connection between itself and a WWAN, wherein the gateway has a WWAN interface adapted to receive data from and transmit data to the WWAN on behalf of devices of a LAN, is described herein. The gateway may further determine whether the WWAN interface is associated with a service agreement that provides for use of the gateway. If so, the gateway may operate the WWAN interface in accordance with the service agreement.



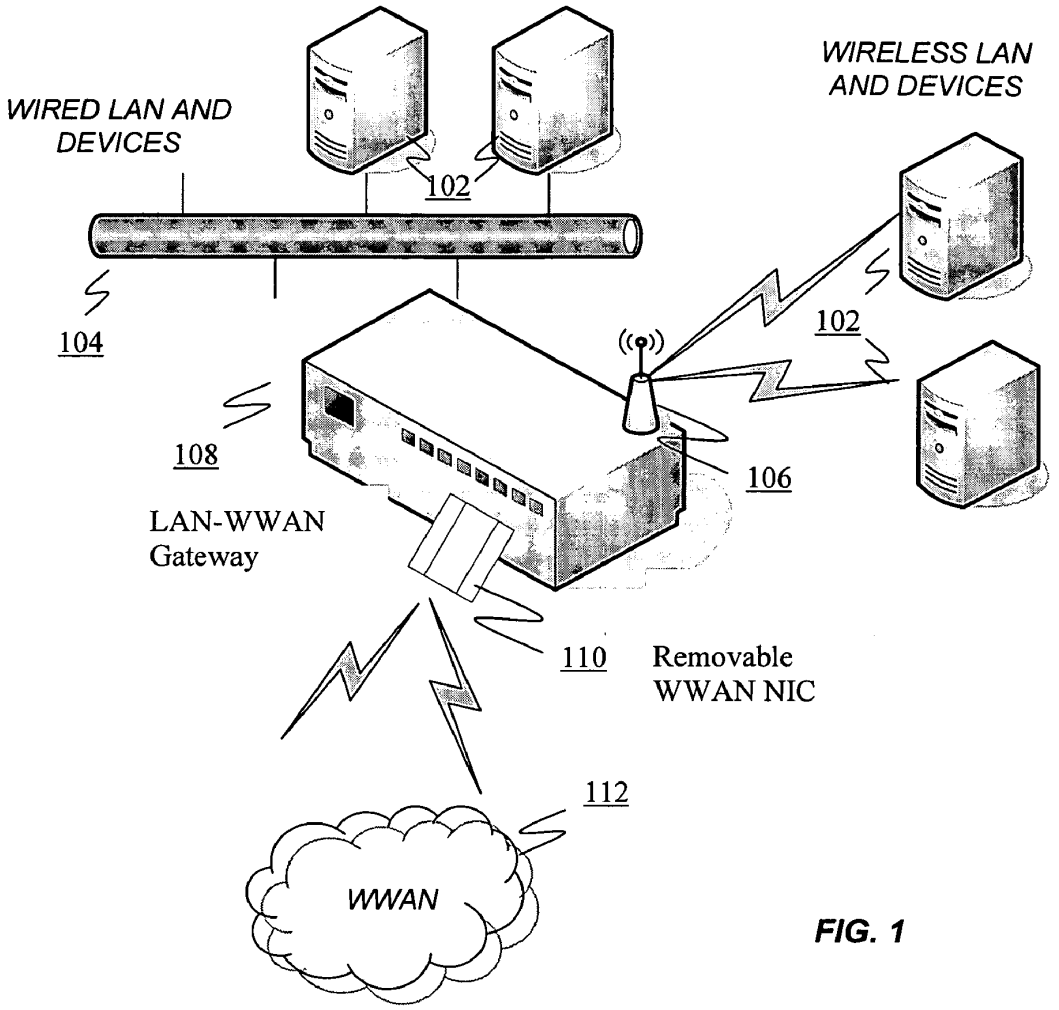

WIRED LAN AND DEVICES
WIRELESS LAN AND DEVICES
102
102
104
108
106
LAN-WWAN Gateway
110
Removable WWAN NIC
112
WWAN

FIG. 1

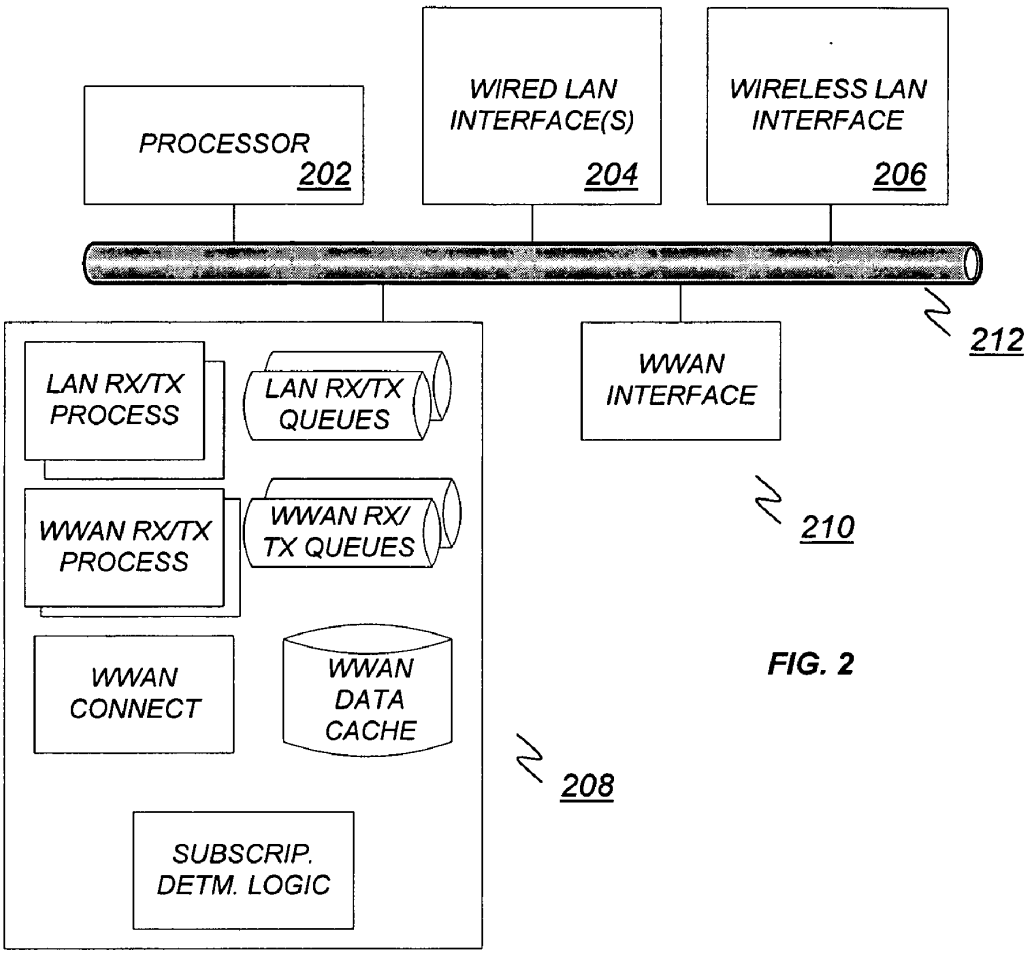

PROCESSOR
202
WIRED LAN INTERFACE(S)
204
WIRELESS LAN INTERFACE
206
212
LAN RX/TX PROCESS
LAN RX/TX QUEUES
WWAN INTERFACE
WWAN RX/TX PROCESS
WWAN RX/ TX QUEUES
210
WWAN CONNECT
WWAN DATA CACHE
208
SUBSCRIP. DETM. LOGIC

FIG. 2

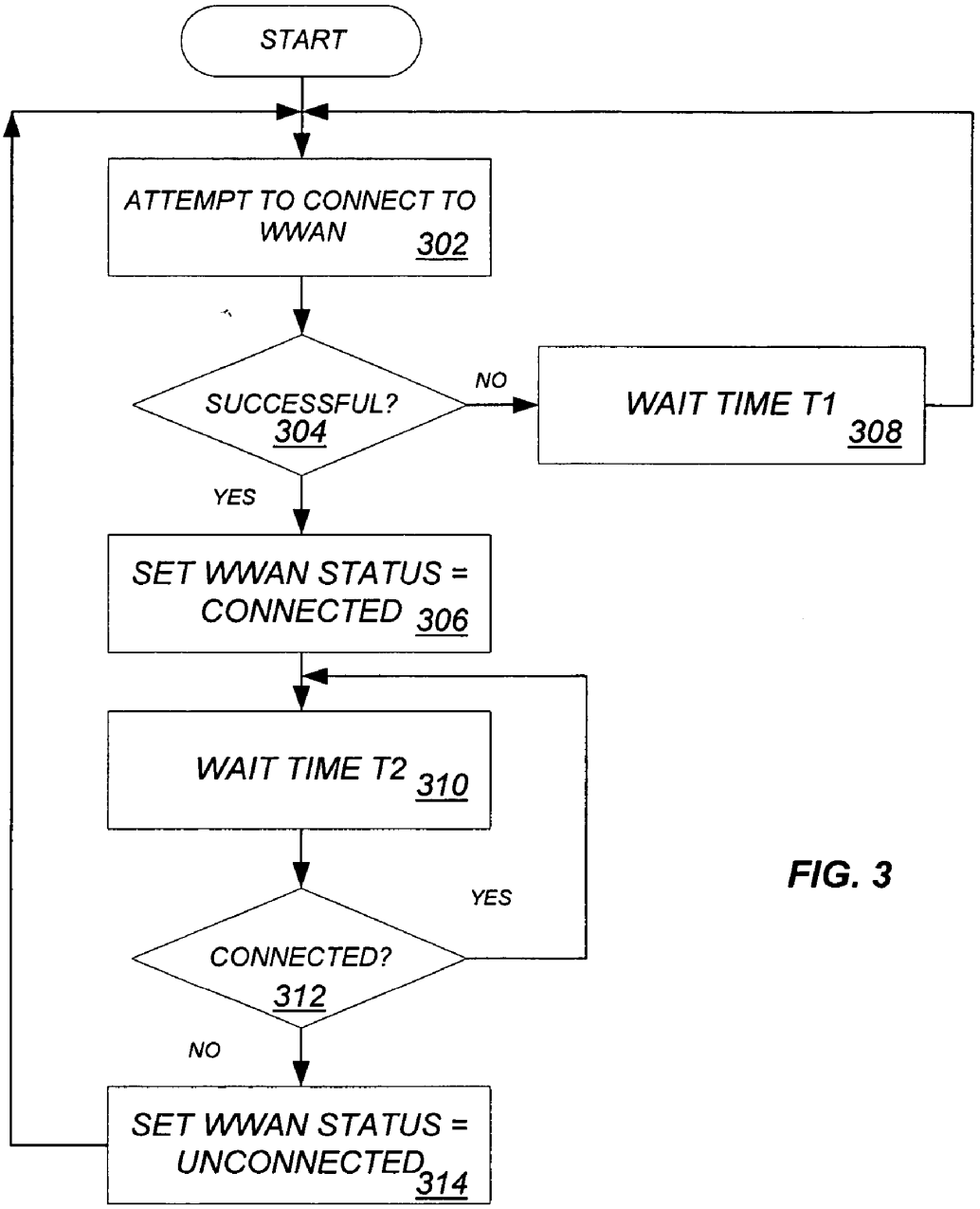

START
ATTEMPT TO CONNECT TO WWAN 302
SUCCESSFUL? 304
NO
WAIT TIME T1 308
YES
SET WWAN STATUS = CONNECTED 306
WAIT TIME T2 310
YES
CONNECTED? 312
NO
SET WWAN STATUS = UNCONNECTED 314

FIG. 3

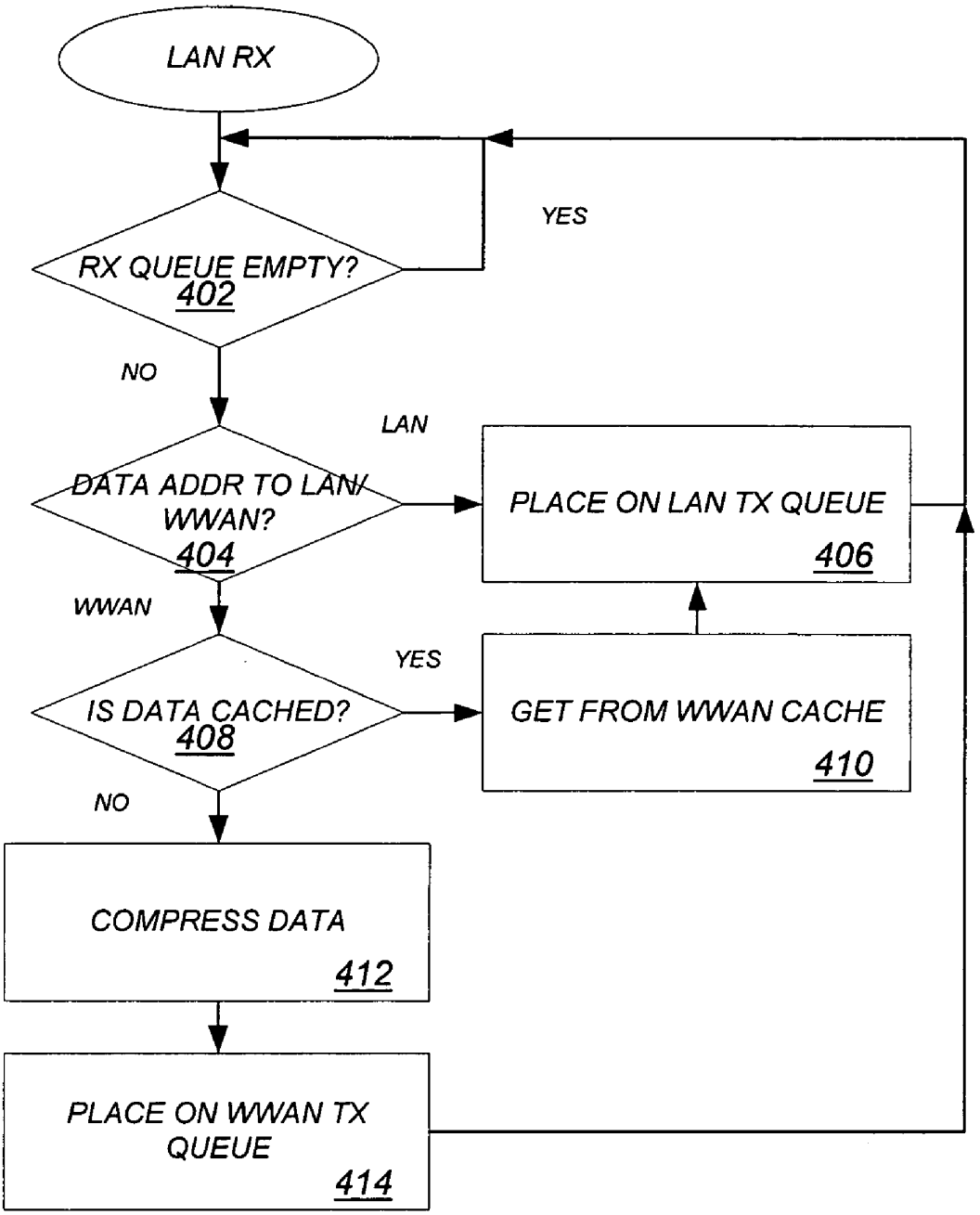

LAN RX
RX QUEUE EMPTY?
402
YES
NO
DATA ADDR TO LAN/ WWAN?
404
LAN
PLACE ON LAN TX QUEUE
406
WWAN
IS DATA CACHED?
408
YES
GET FROM WWAN CACHE
410
NO
COMPRESS DATA
412
PLACE ON WWAN TX QUEUE
414

FIG. 4

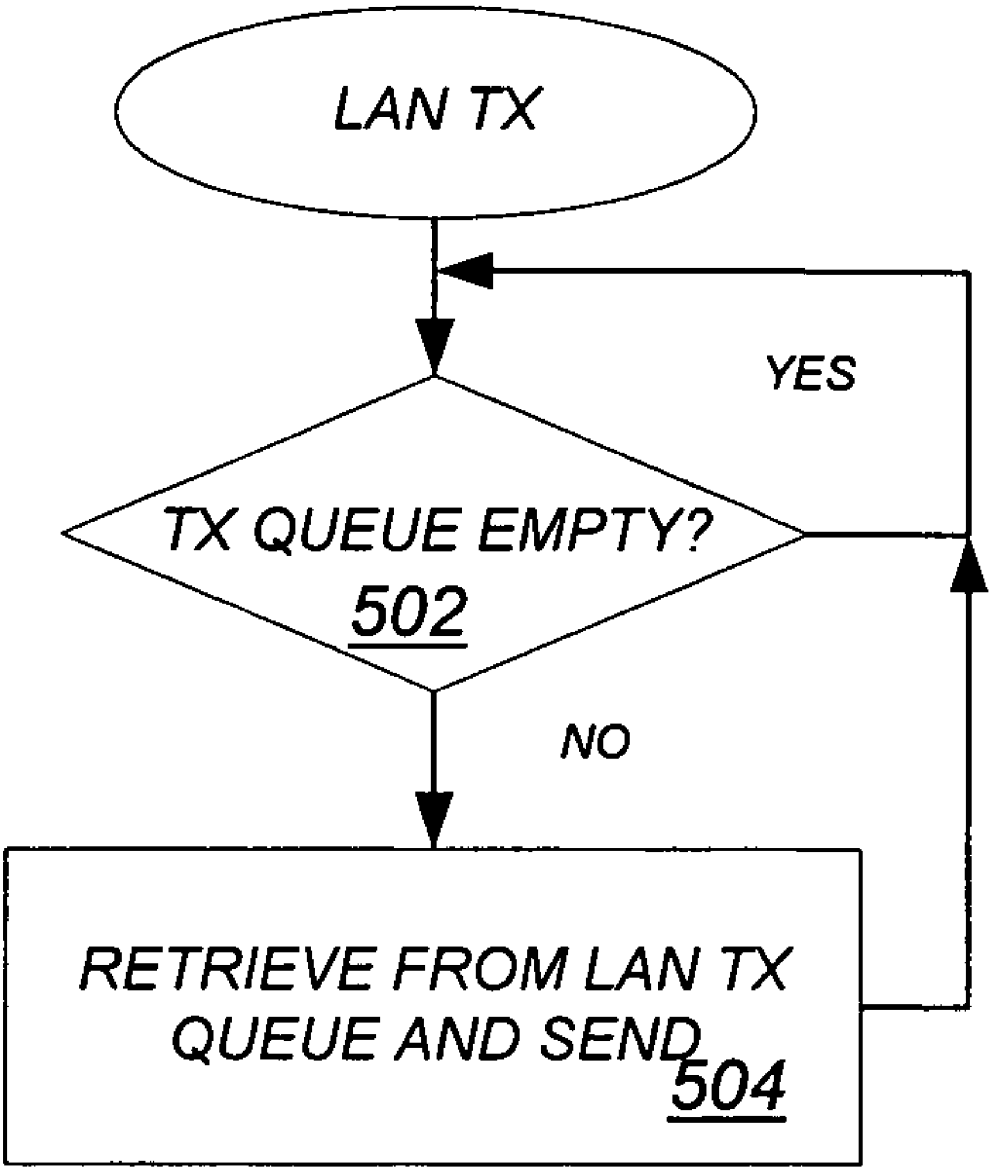

LAN TX
YES
TX QUEUE EMPTY?
502
NO
RETRIEVE FROM LAN TX QUEUE AND SEND
504

FIG. 5

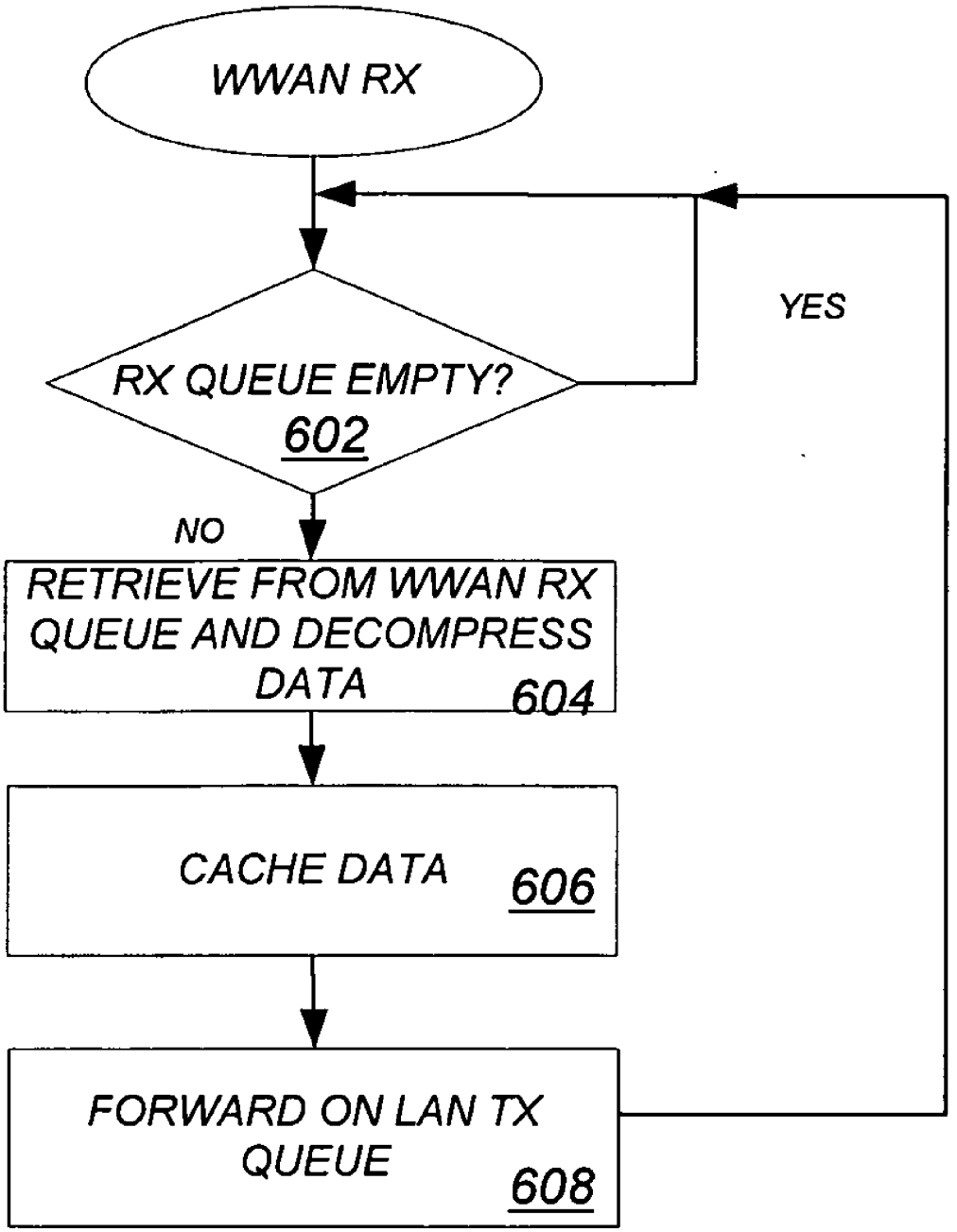

WWAN RX
RX QUEUE EMPTY?
602
YES
NO
RETRIEVE FROM WWAN RX QUEUE AND DECOMPRESS DATA
604
CACHE DATA
606
FORWARD ON LAN TX QUEUE
608

FIG. 6

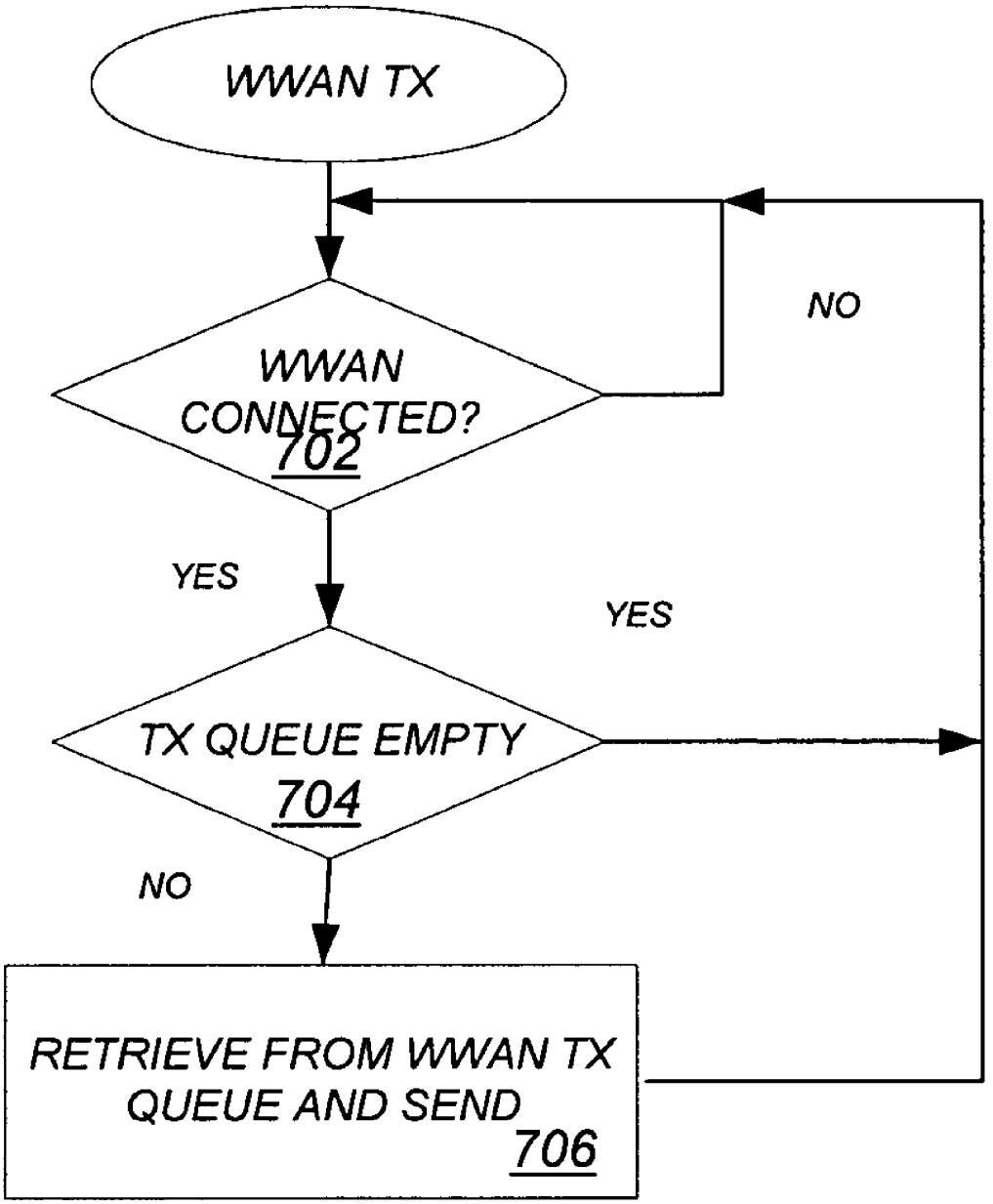

WWAN TX
WWAN CONNECTED?
702
NO
YES
YES
TX QUEUE EMPTY
704
NO
RETRIEVE FROM WWAN TX QUEUE AND SEND
706

FIG. 7

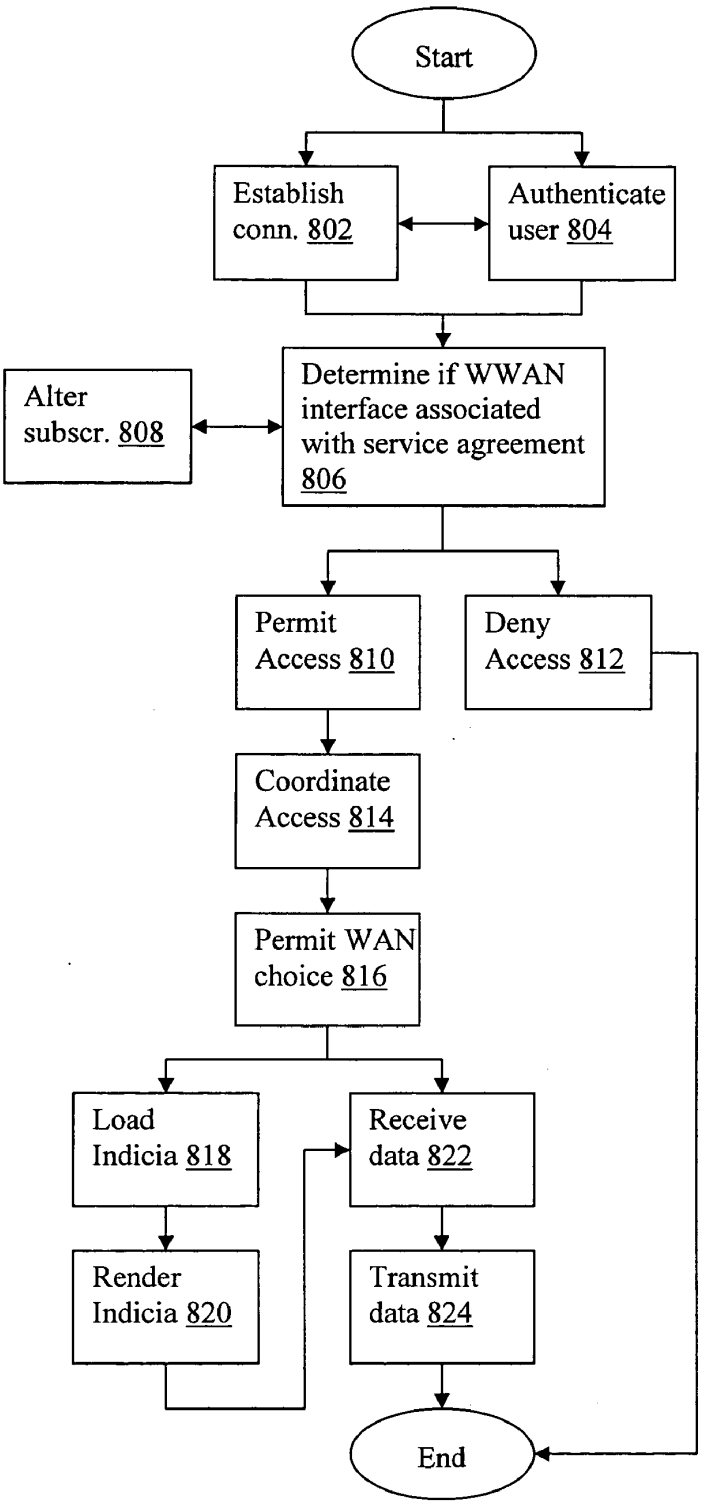

Start
Establish conn. 802
Authenticate user 804
Alter subscr. 808
Determine if WWAN interface associated with service agreement 806
Permit Access 810
Deny Access 812
Coordinate Access 814
Permit WAN choice 816
Load Indicia 818
Receive data 822
Render Indicia 820
Transmit data 824
End

FIG. 8

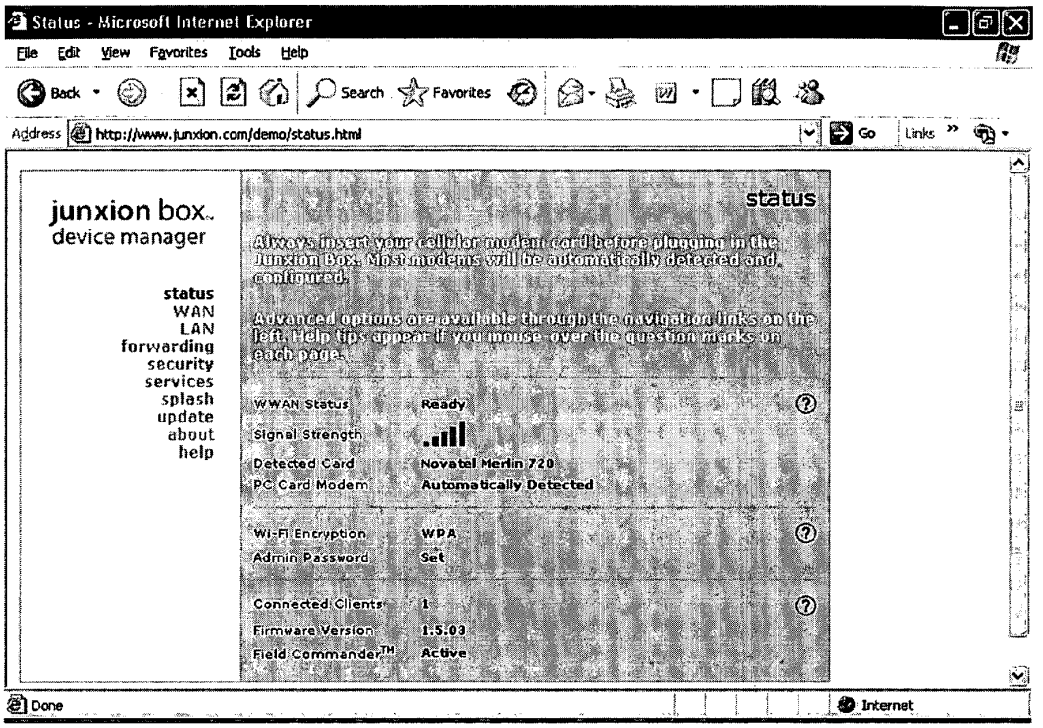

Status - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/status.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
status
Always insert your cellular modem card before plugging in the Junxion Box. Most modems will be automatically detected and configured.
Advanced options are available through the navigation links on the left. Help tips appear if you mouse over the question marks on each page.
WWAN Status Ready
Signal Strength
Detected Card Novatel Merlin 720
PC Card Modem Automatically Detected
Wi-Fi Encryption WPA
Admin Password Set
Connected Clients 1
Firmware Version 1.5.03
Field Commander™ Active
Done
Internet

FIG. 9

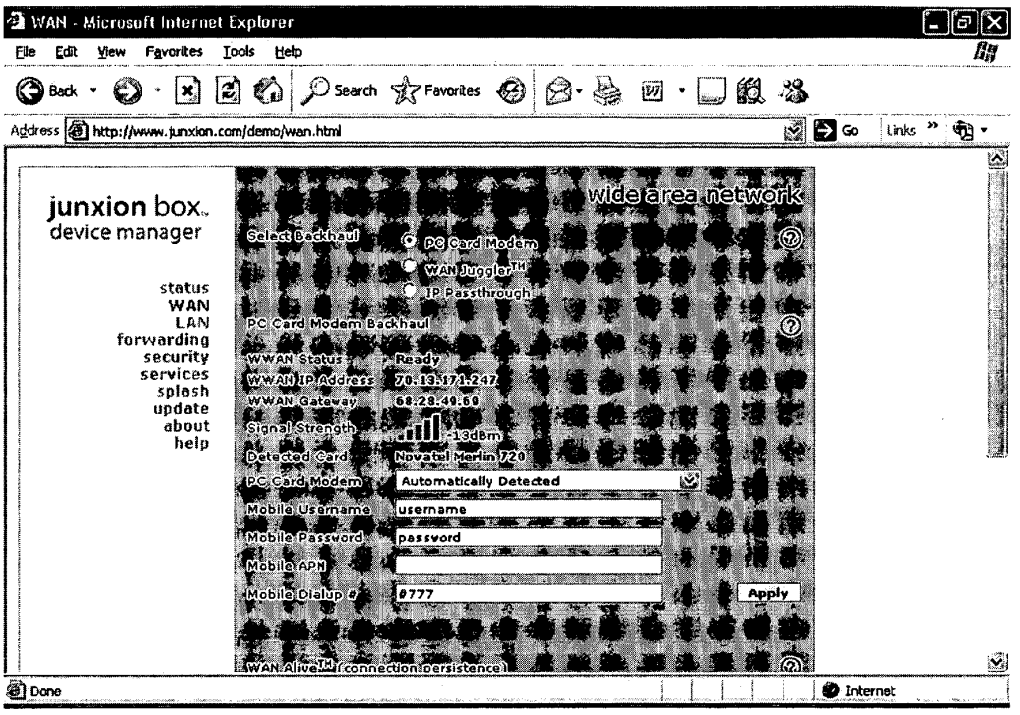

WAN - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/wan.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
wide area network
Select Backhaul
PC Card Modem
WAN Juggler™
IP Passthrough
PC Card Modem Backhaul
WWAN Status
Ready
WWAN IP Address
70.13.171.247
WWAN Gateway
68.28.49.60
Signal Strength
-13dBm
Detected Card
Novatel MerlinU720
PC Card Modem
Automatically Detected
Mobile Username
username
Mobile Password
password
Mobile APN
Mobile Dialup #
#777
Apply
WAN Alive™ (connection persistence)
Done
Internet

FIG. 10

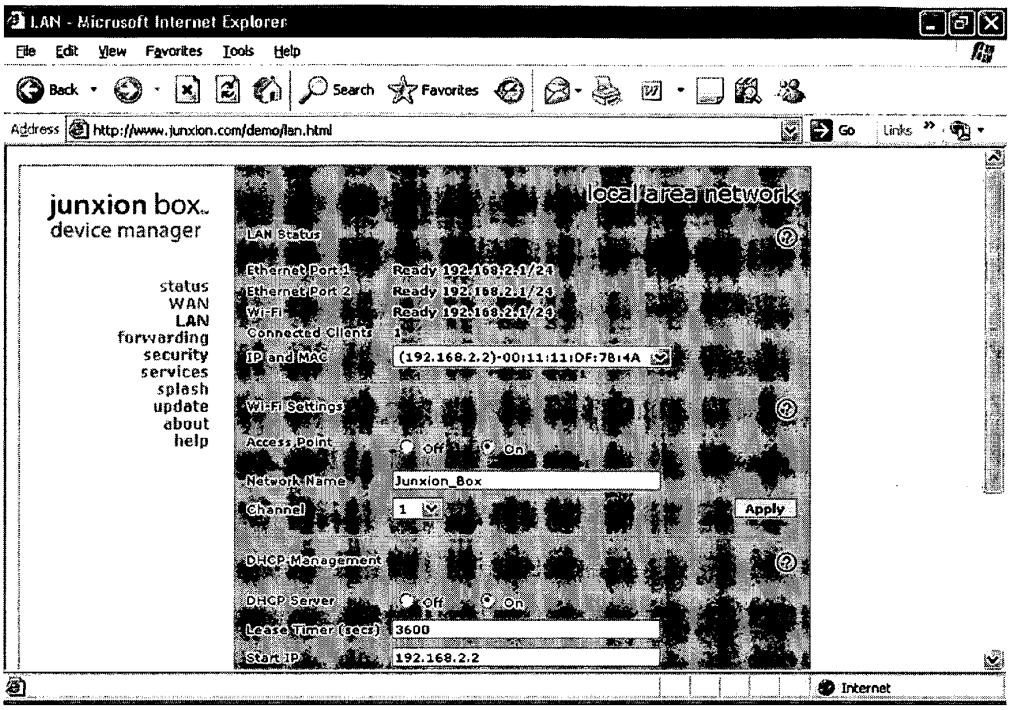

LAN - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/lan.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
local area network
LAN Status
Ethernet Port 1 Ready 192.168.2.1/24
Ethernet Port 2 Ready 192.168.2.1/24
Wi-Fi Ready 192.168.2.1/24
Connected Clients 1
IP and MAC (192.168.2.2)-00:11:11:DF:78:4A
Wi-Fi Settings
Access Point Off On
Network Name Junxion_Box
Channel 1
Apply
DHCP Management
DHCP Server Off On
Lease Timer (secs) 3600
Start IP 192.168.2.2
Internet

FIG. 11

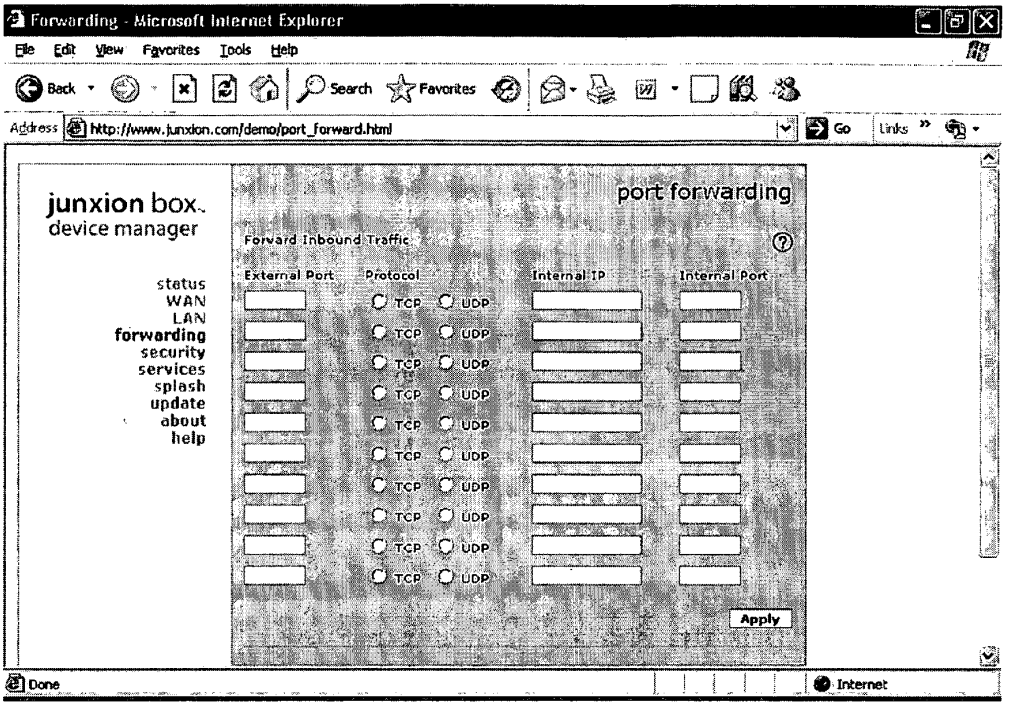

Forwarding - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/port_forward.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
port forwarding
Forward Inbound Traffic
External Port
Protocol
Internal IP
Internal Port
TCP UDP
Apply
Done
Internet

FIG. 12

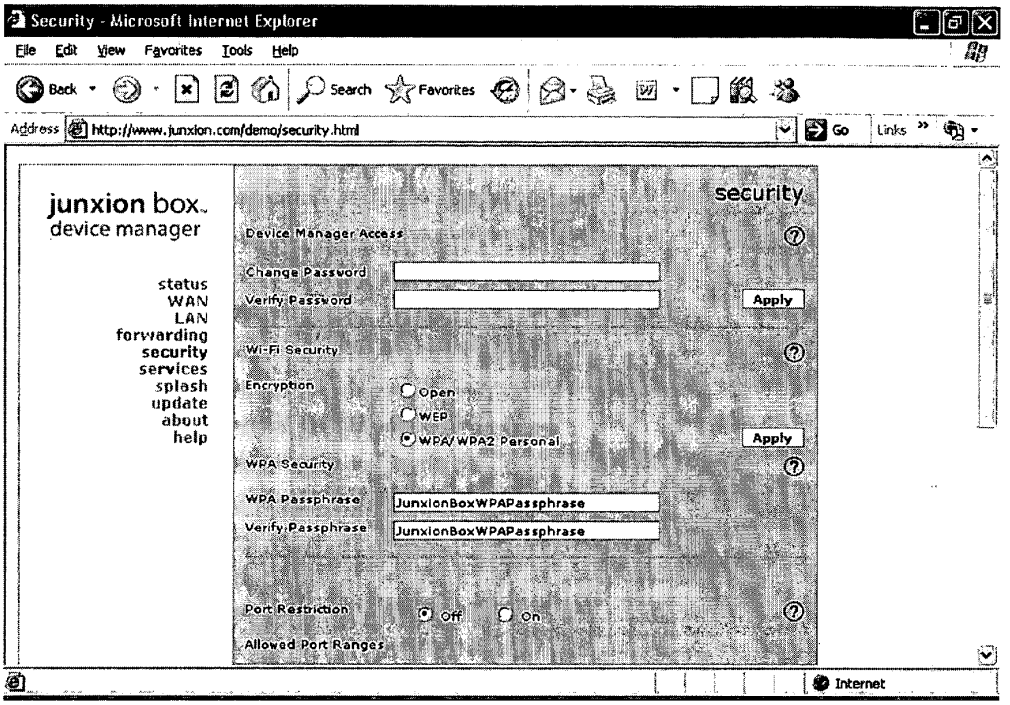

Security - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/security.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
security
Device Manager Access
Change Password
Verify Password
Apply
Wi-Fi Security
Encryption
Open
WEP
WPA/WPA2 Personal
Apply
WPA Security
WPA Passphrase
JunxionBoxWPAPassphrase
Verify Passphrase
JunxionBoxWPAPassphrase
Port Restriction
Off
On
Allowed Port Ranges
Internet

FIG. 13

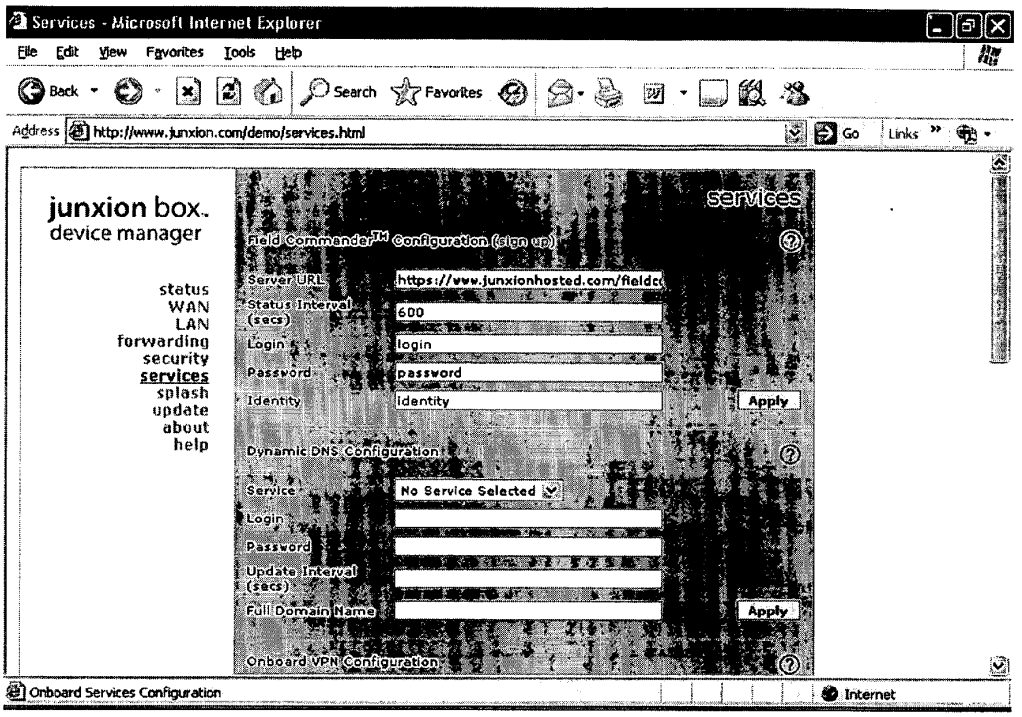

Services - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/services.html
Go Links
junxion box.
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
services
Field Commander™ Configuration (sign up)
Server URL
https://www.junxionhosted.com/fieldc
Status Interval (secs)
600
Login
login
Password
password
Identity
identity
Apply
Dynamic DNS Configuration
Service
No Service Selected
Login
Password
Update Interval (secs)
Full Domain Name
Apply
Onboard VPN Configuration
Onboard Services Configuration
Internet

FIG. 14

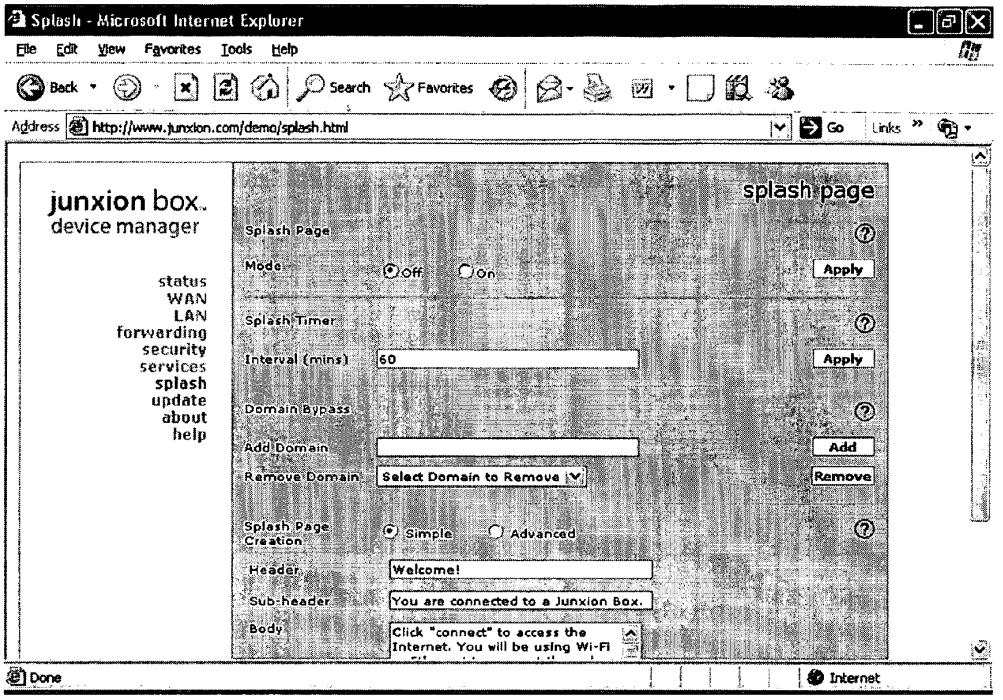

Splash - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/splash.html
Go Links
junxion box.
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
splash page
Splash Page
Mode
Off
On
Apply
Splash Timer
Interval (mins)
60
Apply
Domain Bypass
Add Domain
Add
Remove Domain
Select Domain to Remove
Remove
Splash Page Creation
Simple
Advanced
Header
Welcome!
Sub-header
You are connected to a Junxion Box.
Body
Click "connect" to access the Internet. You will be using Wi-Fi
Done
Internet

FIG. 15

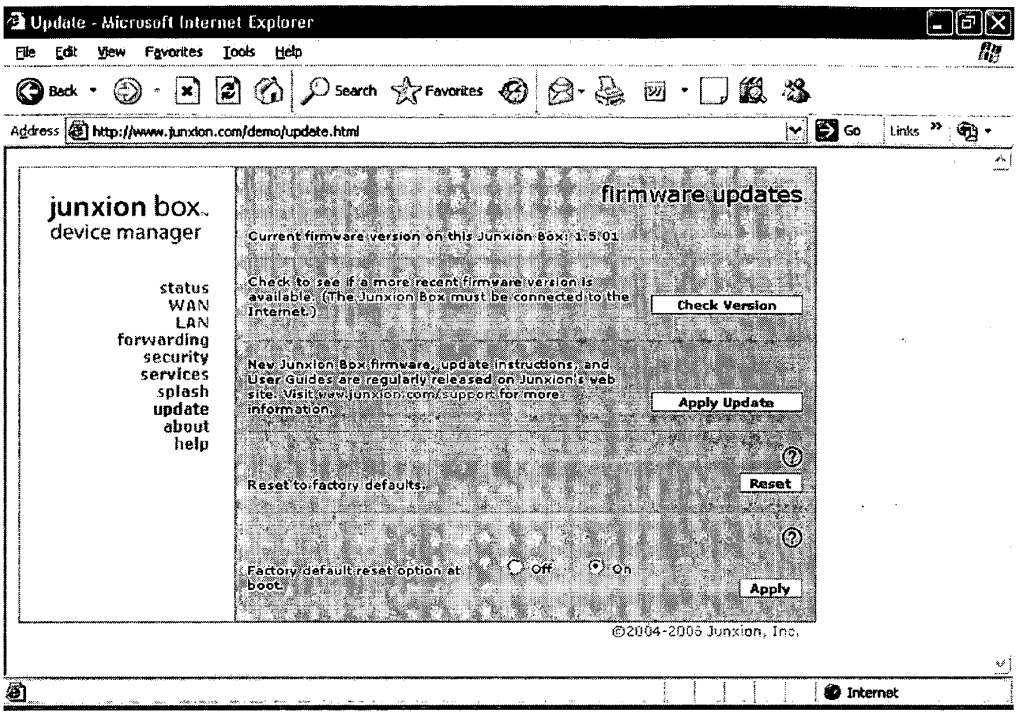

Update - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.junxion.com/demo/update.html
Go Links
junxion box
device manager
status
WAN
LAN
forwarding
security
services
splash
update
about
help
firmware updates
Current firmware version on this Junxion Box: 1.5.01
Check to see if a more recent firmware version is available. (The Junxion Box must be connected to the Internet.)
Check Version
New Junxion Box firmware, update instructions, and User Guides are regularly released on Junxion's web site. Visit www.junxion.com/support for more information.
Apply Update
Reset to factory defaults.
Reset
Factory default reset option at boot.
Off
On
Apply
©2004-2005 Junxion, Inc.
Internet

FIG. 16

LAN / WWAN GATEWAY CARRIER CUSTOMIZATION

PRIORITY CLAIM

[0001] This application claims priority to U.S. provisional patent application No. 60/735,301, filed on Nov. 10, 2005, and entitled "LAN/WWAN Gateway Carrier Customization;" and to U.S. non-provisional patent application No. 11/392,454, filed on Mar. 29, 2006, and entitled "LAN and WWAN Gateway."

FIELD OF THE INVENTION

[0002] Embodiments of the present invention relate to the field of data communication. More specifically, some embodiments of the present invention are related to bridging local area networks (LAN) and wireless wide area networks (WWAN).

BACKGROUND

[0003] Advances in microprocessor related technology have lead to widespread development and the adoption of computing devices. Computing powers that used to be available only in expensive mainframe computers requiring special operating environments are now available in many personal-computing (PC) devices. The form factors vary from desktop, laptop, palm-sized, and so forth. A number of these computing devices are packaged as "purpose" devices, such as set-top boxes, entertainment personal digital assistants (PDA), pagers, text messengers, game devices, smart appliances and wireless mobile phones.

[0004] Concurrently, advances in networking, telecommunications and related technologies, in particular, in the area of wireless networking/communications, have led to increased connectivity between computing devices over local, private, wide area, and/or public networks. Of particular notoriety is the Internet.

[0005] Today, local area networks may be wired or wireless. Similarly, wide area networks may be wired or wireless. Examples of the former include UWB, Ethernet, serial, WiFi, and Bluetooth. Examples of the latter include cellular, PCS, or WiMAX wireless networks offered by various wireless network service providers, such as Cingular, Sprint, T-Mobile, and Clearwire.

BRIEF DECRIPTION OF THE DRAWINGS

[0006] The present invention will be described by way of exemplary embodiments but not limitations, illustrated in the accompanying drawings in which like references denote similar elements, and in which:

[0007] FIG. **1** illustrates a system view of an example operating environment suitable for use to practice the present invention, in accordance with various embodiments;

[0008] FIG. **2** illustrates an architectural view of a device suitable for use as a LAN-WWAN Gateway, in accordance with various embodiments;

[0009] FIG. **3** illustrates the operational flow of selected aspects of a process at the Gateway for maintaining the WWAN connection;

[0010] FIG. **4** illustrates the operational flow of selected aspects of a LAN Receive process at the Gateway for handling receipt processing of LAN data;

[0011] FIG. **5** illustrates the operational flow of selected aspects of a LAN Transmit process at the Gateway for handling transmission processing of LAN data;

[0012] FIG. **6** illustrates the operational flow of selected aspects of a WWAN Receive process at the Gateway for handling receipt processing of WWAN data;

[0013] FIG. **7** illustrates the operational flow of selected aspects of a WWAN Transmit process at the Gateway for handling transmission processing of WWAN data;

[0014] FIG. **8** illustrates the operational flow of selected aspects of regulating network access, in accordance with various embodiments of the invention; and

[0015] FIGS. **9-16** illustrate various graphical user interfaces associated with the gateway, in accordance with various embodiments of the invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0016] Illustrative embodiments of the present invention include but are not limited to methods and apparatuses for establishing, by a gateway, a connection between itself and a WWAN, wherein the gateway has a WWAN interface adapted to receive data from and transmit data to the WWAN on behalf of one or more devices of a LAN. The gateway may further determine whether the WWAN interface is associated with a service agreement that provides for use of the gateway. If so, the gateway may operate the WWAN interface in accordance with the service agreement or in accordance with one or more features of the service agreement.

[0017] Various aspects of the illustrative embodiments will be described using terms commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. However, it will be apparent to those skilled in the art that alternate embodiments may be practiced with only some of the described aspects. For purposes of explanation, specific numbers, materials, and configurations are set forth in order to provide a thorough understanding of the illustrative embodiments. However, it will be apparent to one skilled in the art that alternate embodiments may be practiced without the specific details. In other instances, well-known features are omitted or simplified in order not to obscure the illustrative embodiments.

[0018] Further, various operations will be described as multiple discrete operations, in turn, in a manner that is most helpful in understanding the illustrative embodiments; however, the order of description should not be construed as to imply that these operations are necessarily order dependent. In particular, these operations need not be performed in the order of presentation.

[0019] The phrase "in one embodiment" is used repeatedly. The phrase generally does not refer to the same embodiment; however, it may. The terms "comprising-,""having," and "including" are synonymous, unless the context dictates otherwise. The phrase "A/B" means "A or B". The phrase "A and/or B" means "(A), (B), or (A and B)". The phrase "at least one of A, B and C" means "(A), (B), (C),

(A and B), (A and C), (B and C) or (A, B and C)". The phrase "(A) B" means "(B) or (A B)", that is, A is optional.

[0020] FIG. **1** illustrates a system view of an example operating environment suitable for use to practice the present invention, in accordance with various embodiments. As illustrated, gateway **108** has one or more local networking interfaces, such as wireless LAN interface **106**, adapted to receive data from, and transmit data to one or more devices **102** of one or more LANs, such as the wireless LAN shown as connected to gateway **108** through local networking interface **106**. Gateway **108** further comprises a socket adapted to removably receive a selected one of a first and a second WWAN interface, such as WWAN interface **110**, the interface adapted to receive data from, and transmit data to a recipient gateway device (not shown) through a first and/or a second WWAN, such as WWAN **112**. Further, gateway **108** includes subscriber determination logic capable of determining whether WWAN interface **110** is associated with a service agreement. Additionally, gateway **108** comprises a routing engine coupled to a local networking interface and the socket, and adapted to transmit data received from one or more devices **102** of a LAN **104** to a recipient gateway device through a first WWAN **112**, and selectively transmit data received from the recipient gateway device through the first WWAN **112** to the one or more devices **102** of the LAN **104**, if a first WWAN interface **110** is removably received by a socket of the gateway, and transmit data received from the one or more devices **102** of the LAN **104** to a recipient gateway device through a second WWAN (not shown), and selectively transmit data received from the recipient gateway device through the second WWAN to the one or more devices **102** of the LAN **104**, if the second WWAN interface is removably received by the socket.

[0021] In various embodiments, the one or more devices **102** of one or more LANs may be any sort of computing device known in the art, such as PCs, workstations, servers, PDAs, pagers, text messengers, game devices, smart appliances, wireless mobile phones, cameras, and GPS receivers. The devices may connect to the LAN using any sort of connection known in the art, such as a TCP/IP connection, or an ATM virtual connection. Devices **102** may further receive data from a LAN **104** and may transmit data to the LAN **104**. Data to be transmitted and/or received may include both content and requests for content, and may consist of any sequence of zero, one, or more bits.

[0022] As shown, gateway **108** may be connected to either a wired and/or a wireless LAN. A LAN connected to gateway **108** may use common standards for data transmission, such as Ethernet, Bluetooth, and 802.11, although the LAN may use any standard for data transmission known in the art. LAN **104** may further comprise a LAN router (not shown) capable of routing LAN traffic between devices **102** of the LAN **104**, and of routing traffic from any one or more devices **102** of the LAN **104** that is directed to a WWAN to gateway **108**. In alternate embodiments, gateway **108** may additionally act as the LAN router, receiving traffic from one device **102** of LAN **104** and directing traffic back to another device **102** of the same LAN **104**. The one or more devices **102** of LAN **104** may all be located in the same building or room, as in the case of a wired LAN, or in the same geographic area, as in the case of a wireless LAN. Because of the geographic proximity and limited number of hops for a given transmission, data may be transferred across a LAN at a high rate of speed.

[0023] In some embodiments, local networking interfaces may be of any sort known in the art, including Ethernet interfaces, Bluetooth interfaces, and 802.11 wireless interfaces, such as wireless local networking interface **106**. The local networking interface may thus consist of a PC card to be received by a PC card port of gateway **108**, a miniPCI wireless interface, an interface embedded into the PCB, or a radio antenna, the PC Card, miniPCI, embedded interface, and/or antenna facilitating 802.11 wireless transmission. The local networking interface may also consist of an Ethernet port of gateway **108** receiving an Ethernet cable, the cable further connected to, in some embodiments, a LAN router.

[0024] As is further shown, gateway **108** may have multiple local networking interfaces, such as an interface connected to wired LAN **104** and a wireless local networking interface **106** connected to a wireless LAN. In alternate embodiments, gateway **108** may comprise multiple wired LAN interfaces, multiple wireless LAN interfaces, or some combination of one or more of both. Additionally, the routing engine of gateway **108** described above may be further adapted to transmit data received from a device **102** of one LAN **104** to another device **102** of a second LAN.

[0025] Additionally, in various embodiments, gateway **108** may further comprise a configuration/management process (not shown) to provide a LAN IP address to all devices **102** of a LAN **104** that may not change if the WWAN **112** is temporarily disconnected. Thus, transmission of LAN-to-LAN traffic is facilitated even in the absence of a WWAN connection.

[0026] Further, as is used herein, the term "gateway" refers to any computing device capable of facilitating transmission of data from one or more LANs to one or more WWANs, and transmission of data from the one or more WWANs to the one or more LANs. The interfaces, sockets, subscriber determination logic, routing engine, other processes, and storage comprising the gateway **108** may, in some embodiments comprise a single enclosure. Additionally, gateway **108** may be provided with LED lights and display screens on the gateway **108** or on an attached peripheral device to indicate the status of the gateway **108** as well as the status of the LAN and/or WWAN connections.

[0027] In some embodiments, gateway **108** may be adapted to be powered through a wall outlet, a vehicle power adapter, or an internal or external battery. Inclusion of the latter power supplies enables the gateway **108** to be used in portable settings. For example, teams of users may carry the gateway **108** in a briefcase or bag. Gateway **108** may also be mounted in a building, vehicle, server rack, or other fixed location.

[0028] Also, gateway **108** may adjust the power available to the LAN or WWAN network interfaces **106/110** to improve performance. For example, more power to either the LAN or WWAN network interfaces **106/110** may improve the speed, persistence, and reliability of the interface. Less power to either interface may reduce the power requirements of the gateway **108** and, when used with a battery, extend the operating time before the battery power is drained.

[0029] In various embodiments, gateway **108** may include subscriber determination logic adapted to determine whether a WWAN interface **110** for accessing WWAN **112** is associated with a service agreement between a subscriber and the wireless service provider associated with WWAN **112**. Once a connection is established with WWAN **112** (see below for further details on establishing the connection), the subscriber determination logic of gateway **108** may determine whether the WWAN interface **110** being used is associated with a service agreement having one or more features specifying the terms for use of gateway **108**. If the service agreement associated with the WWAN interface **110** permits use of gateway **108**, then gateway **108** may operate the WWAN interface **110** in accordance with the service agreement, which may include providing connectivity to the applicable network according to the features of the service agreement and/or the policies of the wireless service provider. If the service agreement associated with the WWAN interface **110** does not permit use of the gateway **108**, then gateway **108** may restrict WWAN **112** access. In one embodiment, more than one WWAN interface **110** may be available for use by gateway **108** to establish a WWAN **112** connection, and the subscriber determination logic of gateway **108** may further be adapted to determine service agreements, if any, for each WWAN interface **110**. In one embodiment, gateway **108** may have and operate a plurality of WWAN interfaces **110**, may determine service agreements for each interface **110**, and, for each interface **110** associated with a service agreement, may operate the interface **110** in accordance with the service agreement.

[0030] Service agreement features and/or wireless service provider policies may restrict WWAN **112** access in any number of ways, including limitations on the number of simultaneous WiFi or Ethernet LAN **104** connections, the quality of service (e.g., of a suitable level to support Voice-over-IP), the throughput provided, the cumulative bits per hour, day or month, port-forwarding, on-board VPN, etc. In cases where the WWAN interface **110** is not associated with a service agreement that includes access through gateway **108**, gateway **108** may also block all WWAN **112** traffic.

[0031] In various embodiments, the subscriber determination logic of gateway **108** may facilitate a subscriber in altering their existing WWAN **112** access ability on attempting WWAN **112** access via gateway **108**. In some such embodiments, the subscriber may be able to change their service agreement to one that allows for WWAN **112** access via gateway **108**, or to purchase WWAN **112** access on another basis, e.g., a certain period of time, a certain quantity of bytes downloaded, etc. An example of a service agreement that does not permit use of gateway **108** may be a service agreement that envisions the subscriber only being able to use a single computer at a time to access the carrier's WWAN **112**. Another example of a service agreement that doesn't permit a gateway **108** is one that's designed specifically for a phone. In a subset of such an example, the service agreement may permit use of gateway **108**, but only in connection with a single computer at a time. Other examples may vary from the ones provided.

[0032] In some embodiments, the subscriber determination logic of gateway **108** may determine the existence of a service agreement and its features by the IP address assigned to the WWAN interface **110** by the wireless service provider. When gateway **108** connects to WWAN **112**, gateway **108** may interrogate a server, such as a server of the wireless service provider, to determine what policies are associated with the WWAN interface **110**'s IP address. IP addresses may be categorized in any number of ways in relation to network accessibility. For example, some IP addresses may permit complete WWAN **112** access, while other IP addresses may have policies associated with them that may partially or completely restrict WWAN **112** connectivity.

[0033] In one embodiment, where WWAN **112** is a GSM network, the subscriber determination logic of gateway **108** may base WWAN **112** connectivity on the Access Point Name (APN) assigned by the wireless service provider. For example, gateway **108** may provide unrestricted WWAN **112** access for one set of APNs, while providing restricted access for another set of APNs. For example, the "proxy" and "public" APNs on one wireless service provider's network may provide restricted WWAN **112** access (with potentially varying levels of restricted access), but the custom APNs may provide unrestricted access. In some embodiments, the unrestricted and restricted APNs may be configured on gateway **108**, or the subscriber determination logic of gateway **108** may access a server, such as a server of the wireless service provider, for updated information about the policies associated with specific APNs. Other GSM network embodiments may incorporate different network access management methods.

[0034] In some embodiments, the subscriber determination logic of gateway **108** may determine an SIM, MIN or ESSID of the WWAN **112** connection and then interrogate a server associated with the gateway **108**, or with the wireless service provider, to determine one or more features of the service agreement and/or policies of the wireless service provider based on the SIM, MIN or ESSID. WWAN **112** access restrictions may then be configured on gateway **108** based on the one or more features of the service agreement, or based on one or more policies of the wireless service provider.

[0035] In some embodiments, LAN **104** users may be authenticated onto gateway **108** through an authentication system, such as, for example, RADIUS/AAA or other methods. Access to WWAN **112** and specific policies/service agreement features for WWAN **112** access may then be determined by the subscriber determination logic based on the results of the authentication.

[0036] In some embodiments, if the wireless service provider provides both landline network access and WWAN **112** access, and gateway **108** is connected to both, the subscriber determination logic of gateway **108** may coordinate the wired and wireless access. For example, subscriber determination logic may prefer one access method over the other. In some such embodiments, such coordination of wired and wireless access may be a feature of the service agreement, such as, for example, simultaneous wired and wireless access to maximize throughput for a premium service agreement. Another example of a service agreement may provide for wired access as a preference, unless wired access is unavailable. In some embodiments, such access preference may be dynamic, such as, for example, in the case of a wireless preference, with wireless being used unless signal conditions are such that better service is available via wired access.

[0037] Additionally, in various embodiments, gateway **108** may provide customizable components/indicia and an

overall user experience based on the carrier/wireless service provider of the WWAN interface **110** being used. In one embodiment, gateway **108** may download and provide the customizable components/indicia based on features of the service agreement and/or based on wireless service provider policies. For example, for a given wireless service provider, the use of their WWAN interface **110** may invoke specific branding/indicia, customizable components, and provider-centric documentation. As an illustrative embodiment, a user interface of gateway **108** may be branded with a wireless service provider's information and logo. In some embodiments, the wireless service provider may also add or restrict certain customizable components/indicia to the gateway **108**. In some such embodiments, addition or restriction of customizable components/indicia may be done in connection with different service agreement features of the wireless service provider. Gateway **108** may associate customizable components/indicia with different service agreement features in a wide variety of ways, including the operations described above in regard to associating WWAN **112** access to different service agreements. Gateway **108** may be configured to be wireless service provider specific to some degree, including completely configured, on shipment of gateway **108**. In some embodiments, gateway **108** may be updated by an updating download operation, performed in a periodic manner or otherwise. Gateway **108** may customize to a certain wireless service provider on the first use of a WWAN interface **110** of the wireless service provider, downloading customization components upon initialization of a wireless service provider's WWAN interface **110**. In some embodiments, further customization may be implemented by a wireless service provider for a certain customer, for example for a large corporate customer of the wireless service provider.

[**0038**] In one embodiment, a WWAN interface **110** may not be specifically tied to a particular wireless service provider, but may be capable of accessing one or more wireless service providers. Such a WWAN interface **110** may be sold by a "virtual" wireless service provider that has arranged for use of the service of one or more WWAN **112** wireless service providers. In some embodiments, gateway **108** may be customized for the virtual wireless service provider. For example, the features of gateway **108** for the virtual wireless service provider may vary on the WWAN **112** being accessed, as in the example case of the virtual wireless service provider having different service agreements with different WWAN **112** wireless service providers. In some embodiments, a user may select which wireless service provider's WWAN **112** they would prefer. The user may select the wireless service provider's WWAN **112** in the context of available network characteristics, including, for example, throughput and the like. In some embodiments, pricing may be displayed in the context of selecting a wireless service provider's WWAN **112**.

[**0039**] In various embodiments, the routing engine of gateway **108** may facilitate two-way transmission of data to and from the one or more LANs and to and from one or more WWANs. As mentioned above, capabilities of the routing engine may be affected by the results of the subscriber determination logic. That is, receipt from and transmission to a WWAN may be based on a service agreement between a user and a wireless service provider. Also, transmission of data from one device **102** of a LAN **104** to another device **102** of a second LAN is described in greater detail above.

[**0040**] When receiving data from a device **102** of a LAN **104** destined for a WWAN **112**, the routing engine of gateway **108** may, in some embodiments, determine if the data received from the device **102** is a request for content from the WWAN **112**, and may further determine if such content is cached in storage of gateway **108**. If the content is cached, the routing engine may simply retrieve the requested content from the storage of gateway **108**, and transmit the content to the device **102** of LAN **104** requesting the content. In such embodiments, no current connection to WWAN **112** is required. In one embodiment, if the subscriber determination logic has determined that the WWAN interface is not associated with a service agreement, the routing module may not provide the cached content.

[**0041**] If on the other hand the content is not cached, or the data received from device **102** of LAN **104** is not a request for content, the routing engine may, in various embodiments, compress the received data prior to transmitting it. By compressing the data, the routing engine may facilitate transmission of the data at a higher speed than might otherwise be achieved, especially given the typically low speeds at which data is transmitted across a WWAN. Such compression may be achieved through recourse to any compression algorithm known in the art, such as Huffman, Lempel-Ziv, or Venturi, or any combination of such algorithms.

[**0042**] In some embodiments, the routing engine of gateway **108** may determine whether the gateway **108** is connected to any gateway of any WWAN **112** before attempting transmission of data to the WWAN **112**. In some embodiments, as mentioned above, the subscriber determination logic, rather than the routing engine of gateway **108**, may make this determination. The gateway **108** may determine whether a connection exists by pinging an address of a WWAN **112** and listening for a reply. If no reply is received, the gateway **108** may wait some pre-determined time and try again. After a certain number of attempts have been met without success, the gateway **108** may, in some embodiments, buffer the data to be transmitted in some sort of data structure and continue on an intermittent basis to attempt connection to the WWAN **112**. Once a connection has been achieved, the buffered data may then be transmitted to its appropriate destination.

[**0043**] In other embodiments, gateway **108** may also include a networking interface to receive a wired WAN connection. Such a connection may be achieved via an Ethernet plug and cable received into an Ethernet port of the gateway **108**. In such embodiments, the wired WAN connection may serve as a backup that the gateway **108** may switch to if the WWAN **112** connection is unavailable. Gateway **108** may then attempt connection with the wired WAN, in some embodiments by pinging the wired WAN. If the wired WAN is also unavailable, gateway **108** may buffer the data in the manner described above. In one embodiment, the wired WAN connection may be a wired connection to a wireless device, such as a device having a cellular or satellite modem.

[**0044**] Still in other embodiments, a configuration/management process of gateway **108** such as the one described above may communicate the status of the WWAN **112** to the one or more devices **102** of the one or more LANs **104** through a web page. Such status information may include

availability of (connection to) WWAN **112**, WWAN **112** signal strength, the WWAN **112** IP address, and statistics about the users and data being transmitted through the WWAN**112**. Example user interfaces capable of communicating status information are illustrated by FIGS. **9-15** and are described in greater detail below.

[**0045**] In various embodiments, a configuration/management process of gateway **108** may be adapted to shut down or otherwise restrict transmission to the LAN **104** or a second LAN when no WWAN **112** access is available.

[**0046**] Additionally, in some embodiments, gateway **108** may be adapted to prioritize specific data over the WWAN **112** to manage conflicts between devices **102** of LANs **104** that are sharing limited WWAN **112** capacity.

[**0047**] Once a connection to WWAN **112** has been determined to exist, however, the routing engine of gateway **108** may transmit the received data to its destination via the connected WWAN **112**.

[**0048**] In still other embodiments, the routing engine of gateway **108** is adapted to transmit data received from a WWAN **112** to one or more devices **102** of one or more LANs **104**. Upon receiving the data from WWAN **112**, the routing engine may first, in various embodiments, decompress the data, if the data is compressed. As mentioned above, compression of data may result in higher transmission speeds across a WWAN **112**, and may also be used to lower the connectivity cost to a user or reduce the load for a carrier. The routing engine may employ any compression algorithm known in the art to achieve decompression of the data, such algorithms including Huffman, Lempel-Ziv, Venturi, or any combination of such algorithms.

[**0049**] Upon decompressing the data, the routing engine may, in some embodiments, next determine if the data is content received from a device of a WWAN **112**. If the data is determined to comprise some sort of content, such as a web page, a PDF, or any other sort of content known in the art, the routing engine may then determine if the content is cached in storage of gateway **108**. If the received content is not cached, the routing engine, in various embodiments, may cache the content received from the WWAN **112** in a data structure of some type known in the art, and store the cached content in storage of gateway **108**.

[**0050**] In some embodiments, the routing engine of gateway **108** may then transmit the received data to its destination device **102** via the LAN **104** to which destination device **102** is connected.

[**0051**] As is further shown, gateway **108** comprises a socket adapted to receive a WWAN interface **110**. The WWAN interface **110** may be of any sort known in the art, such as cellular, PCS, and WiMax WWAN interfaces. The interface may come in the form of a PC Card or Modem, the PC Card or Modem capable of plugging into the socket of gateway **108**.

[**0052**] In various embodiments, each WWAN interface may be adapted for a specific wireless service provider, as described above, and may be associated with a service agreement with that service provider. Thus, gateway **108** facilitates the switching of WWAN interfaces in areas where another provider having a different WWAN interface is stronger, or where the provider associated with the current WWAN interface **110** does not provide service. Accordingly, the use of multiple WWAN interfaces **110** with the socket of gateway **108** facilitates the mobility of the gateway **108**, as described above.

[**0053**] In still other embodiments not illustrated, gateway **108** may support multiple WWAN interfaces removably received by multiple sockets of gateway **108**. By employing multiple sockets and multiple WWAN interfaces **110**, gateway **108** may facilitate connection to multiple WWAN service providers. If WWAN **112** is not available because of the location of the user, issues with the service provider of the WWAN **112**, or because of the features of a service agreement, WWAN access may be provided via the other WWAN connection. However, one or more of the WWAN interfaces **110** may be built in. Additionally, the gateway **108** may be adapted to support multiple WWAN interfaces **110** connecting simultaneously to the same WWAN **112**. The combination of networking interfaces may increase the performance, speed, and reliability of the WWAN **112** connection.

[**0054**] As is shown, WWAN **112** may comprise any sort of WWAN known in the art, such as a cellular, a PCS, or a WiMax WWAN. WWAN **112** may consist of a network of routers and gateways, of which gateway **108** is a part, working together to transmit data to various devices connected directly or indirectly to a router or gateway of WWAN **112**, such as the devices **102** connected to gateway **108** via LAN **104**. The routers and gateways of WWAN **112** may utilize any sort of connection type known in the art, such as TCP/IP connections or ATM virtual connections. Additionally, WWAN **112** may provide access to the Internet through another gateway or set of gateways.

[**0055**] In further embodiments, the gateway **108** may provide radio antenna enhancements for the WWAN **112** through either a passive or an active antennas apparatus in gateway **108**. This antenna apparatus may be directional or omni-directional. The radio antenna enhancements may improve the reliability, throughput, and performance of the WWAN **112**. The enhancements may also provide improved performance for other nearby, unrelated devices using a WWAN, such phones or modems using cellular, PCS, WiMAX, or other WWAN networks.

[**0056**] FIG. **2** illustrates an architectural view of a device suitable for use as a LAN-WWAN Gateway, in accordance with various embodiments. As shown, gateway **108** may include one or more processors, such as processor **202** and persistent storage **208**. Additionally, gateway **108** includes a plurality of networking interfaces, such as wired LAN interface **204**, wireless LAN interface **206**, and WWAN interface **210**, and wired WAN interface (not shown). The LAN interfaces **204** and **206** may include 802.11, Bluetooth, and Ethernet local networking interfaces, as is described in greater detail above. Also, the WWAN interface **210** may be a cellular, a PCS, or a WiMax WWAN interface in the form of a removable PC Card, embedded modem, or other modem to connect to a WWAN **112**, the WWAN interface also described in greater detail above.

[**0057**] In various embodiments, a card slot (not shown) may be used to allow users of gateway **108** to install or upgrade either the LAN or WWAN interfaces with updated LAN or WWAN interfaces. When new network interfaces and services are available, users can update the gateway **108**

to support these interfaces and services by inserting a new interface into the LAN or WWAN card slot.

[0058] Further, the elements are coupled to each other via system bus **212**, which represents one or more buses. In the case of multiple buses, the buses are bridged by one or more bus bridges (not shown). Each of these elements performs its conventional functions known in the art. In particular, persistent storage **208** is employed to store programming modules adapted to receive and transmit data to and from a LAN (shown as "LAN RX/TX Process"), to receive and transmit data to and from a WWAN (shown as "WWAN RX/TX Process"), to monitor the WWAN connection, and to determine whether a WWAN interface is associated with a service agreement (shown as "Subscriber Determination Logic"). Additionally, persistent storage **208** is also employed to store a WWAN data cache of cached WWAN content, and as well as data queues/buffers for data received from LAN **104**, data to be transmitted to LAN **104**, data received from WWAN **112**, and data to be transmitted to WWAN **112**. The instructions implementing the programming modules, the WWAN data cache, and the queues/buffers may be loaded into persistent storage **208** in the factory, or in the field, through a distribution medium (not shown) or through LAN and/or WWAN interfaces **204**, **206**, and/or **210**.

[0059] FIG. **3** illustrates the operational flow of selected aspects of a process at the gateway **108** for maintaining the WWAN **112** connection.

[0060] In some embodiments, the gateway **108** may determine whether the gateway **108** is connected to any gateway of any WWAN **112** before attempting transmission of data to the WWAN **112**. As is shown, the gateway **108** may attempt to connect to a WWAN **112**, block **302**, by pinging an address of a WWAN **112** and listening for a reply. If no reply is received, block **304**, gateway **108** may wait some predetermined time, here shown as time T**1**, block **308**, and try again, block **302**. After a certain number of attempts have been met without success, the gateway **108** may, in some embodiments, buffer the data to be transmitted in some sort of data structure and continue on an intermittent basis to attempt connection to the WWAN **112** (not shown). Once a connection has been achieved, the buffer data may then be transmitted to its appropriate destination. In other embodiments, the routing engine may additionally or instead automatically detect a loss of connection through drivers of gateway **108**. The drivers may detect if there is a drop in the connection, at which point the routing engine determines that the WWAN **112** connection has failed. The routing engine may then attempt to reconnect or fail-over.

[0061] If on the other hand an attempt to connect to WWAN **112** was successful, block **304**, gateway **108** may, in some embodiments, set a gateway **108** WWAN connection status variable to "connected," block **306**, or where the variable is Boolean, to "true." At some pre-determined time interval, here shown as time T**2**, block **310**, the gateway **108** may again attempt to connect to WWAN **112** to ensure that the connection still exists, block **312**. This may again be accomplished by pinging an address of WWAN **112**. If the connection is determined to exist, block **312**, the gateway **108** may again wait a predetermined time T**2**, block **310**, and attempt to connect to WWAN **112** again. On the other hand, if gateway **108** determines that a WWAN **112** connection no longer exists, block **312**, the gateway **108** may, in some embodiments, set a gateway **108** WWAN connection status variable to "unconnected," block **314**, or where the variable is Boolean, to "false." The WWAN connect process illustrated by FIG. **3** may then again loop back and attempt to reestablish a connection to WWAN **112**, block **302**.

[0062] In various embodiments, not illustrated herein, facilities may be provided to enable a user of gateway **108** to configure the address of the ping and the interval between pings, such as time intervals T**1** and T**2**.

[0063] FIG. **4** illustrates the operational flow of selected aspects of a LAN Receive process at the gateway **108** for handling receipt processing of LAN data. As is illustrated, the routing engine implementing the LAN Receive process may first determine if a LAN Receive Queue of gateway **108** is empty, block **402**. The queue may be implemented as any sort of data structure known in the art capable of organizing and storing data. Data received from a LAN may, in some embodiments, first be placed in this receive queue. If empty, the routing engine may check the queue periodically, on some basis, until it is not found to be empty. In other embodiments, received LAN data is processed as it is received, and is not placed in a receive queue. In yet other embodiments, the receive queue may contain buffered LAN data that has been placed in the queue to await transmission while a connection to a WWAN **112** is unavailable.

[0064] Upon determining that the receive queue is not empty, the routing engine implementing the LAN Receive process may next determine whether the received LAN data is destined for another device **102** of the same LAN **104** or of a second LAN, or whether the received data is destined for a device accessible over a WWAN **112**, block **404**. If destined for a device **102** of a LAN **104** or a second LAN, the data may be placed in a LAN Transmit Queue of gateway **108**, block **406**. The queue may be implemented as any sort of data structure known in the art capable of organizing and storing data. In other embodiments, the data may be transmitted immediately to the destination device **102** without being placed in such a queue.

[0065] As is shown, if on the other hand, the data is destined for a device accessible over a WWAN **112**, the LAN Receive process of the routing engine may then determine whether the data is cached, block **408**. Such a determination may be appropriate where the data received from a device **102** of a LAN **104** is a request for content from a device of a WWAN **112**, and the content may be cached in the persistent storage **208** of gateway **108**. If the content is cached, the routing engine may simply retrieve the requested content from the storage of gateway **108**, block **410**, and transmit the content to the device **102** of LAN **104** requesting the content. In alternate embodiments, rather than immediately transmitting the cached content, the LAN Receive process of the routing engine may place the cached content on a LAN Transmit Queue of gateway **108**, block **406**, such as the one described above. In such embodiments, no current connection to the WWAN **112** is required.

[0066] If on the other hand the content is not cached, or the data received from device **102** of LAN **104** is not a request for content, the LAN Receive process implemented by the routing engine may, in various embodiments, compress the received data prior to transmitting it, block **412**. By compressing the data, the routing engine may facilitate transmission of the data at a higher speed than might otherwise

be achieved, especially given the typically low speeds at which data is transmitted across a WWAN, and may also lower the connectivity cost to a user or reduce the load for a carrier. Such compression may be achieved through recourse to any compression algorithm known in the art, such as Huffman, Lempel-Ziv, or Venturi, or any combination of such algorithms.

[**0067**] After compressing the data, the LAN Receive Process may, in some embodiments, place the data in a WWAN Transmission Queue of gateway **108**, block **414**, to await transmission across WWAN **112**. In alternate embodiments, the routing engine may, immediately following compressing, determine if a WWAN **112** connection exists, as is further illustrated and described above, and if such a connection exists, transmit the data across the WWAN **112** to its destination.

[**0068**] FIG. **5** illustrates the operational flow of selected aspects of a LAN Transmit process at the gateway **108** for handling transmission processing of LAN data. As is illustrated, the routing engine implementing the LAN Transmit process may first determine if a LAN Transmit Queue of gateway **108** is empty, block **502**. The queue may be implemented as any sort of data structure known in the art capable of organizing and storing data. Data to be transmitted to a device **102** of a LAN **104** may, in some embodiments, first be placed in this transmit queue. If empty, the routing engine may check the queue periodically, on some basis, until it is not found to be empty. In other embodiments, data to be transmitted to a device **102** of the LAN **104** is transmitted immediately after processing, and is not placed in a transmit queue.

[**0069**] As is shown, the LAN Transmit process implemented by the routing engine may next retrieve the data from the LAN Transmit queue and send the data to its destination device **102** via the LAN **104** connected to the gateway **108** via a local networking interface **106**, block **504**.

[**0070**] FIG. **6** illustrates the operational flow of selected aspects of a WWAN Receive process at the gateway **108** for handling receipt processing of WWAN data. As is illustrated, the routing engine implementing the WWAN Receive process may first determine if a WWAN Receive Queue of gateway **108** is empty, block **602**. The queue may be implemented as any sort of data structure known in the art capable of organizing and storing data. Data received from a WWAN may, in some embodiments, first be placed in this receive queue. If empty, the routing engine may check the queue periodically, on some basis, until it is not found to be empty. In other embodiments, received WWAN data is processed as it is received, and is not placed in a receive queue.

[**0071**] In various embodiments, the WWAN Receive process implemented by the routing engine may next retrieve data from the WWAN receive queue and decompress the received data, block **604**, if the data is compressed. As mentioned above, compression of data may result in higher transmission speeds across a WWAN **112**, and may also be used to lower the connectivity cost to a user or reduce the load for a carrier. The routing engine may employ any compression algorithm known in the art to achieve decompression of the data, such algorithms including Huffman, Lempel-Ziv, Venturi, or any combination of such algorithms.

[**0072**] Upon decompressing the data, the WWAN Receive process of the routing engine may, in some embodiments, next determine if the data is content received from a device of a WWAN **112**. If the data is determined to comprise some sort of content, such as a web page, a PDF, or any other sort of content known in the art, the routing engine may then determine if the content is cached in persistent storage **208** of gateway **108**. If the received content is not cached, the routing engine, in various embodiments, may cache the content received from the WWAN **112**, block **606**, in a data structure of some type known in the art, and store the cached content in the persistent storage **208** of gateway **108**. Other caching may be proactive, storing new data at non-peak hours when the WWAN **112** is underutilized.

[**0073**] After caching the data, the WWAN Receive Process may, in some embodiments, place the data in a LAN Transmit Queue of gateway **108**, block **608**, to await transmission to its destination device **102** of LAN **104**. In alternate embodiments, the routing engine may, immediately following caching, transmit the data across the LAN **104** to its destination device **102**.

[**0074**] FIG. **7** illustrates the operational flow of selected aspects of a WWAN Transmit process at the gateway **108** for handling transmission processing of WWAN data. As is illustrated, the routing engine implementing the WWAN Transmit process may first determine if a WWAN **112** connection exists, block **702**. The operations for determining whether such a connection exists are illustrated by FIG. **3** and described in greater detail above.

[**0075**] As is shown, the routing engine implementing the WWAN Transmit process may then determine if a WWAN Transmit Queue of gateway **108** is empty, block **704**. The queue may be implemented as any sort of data structure known in the art capable of organizing and storing data. Data to be transmitted to a device connected to a WWAN **112** may, in some embodiments, first be placed in this transmit queue. If empty, the routing engine may check the queue periodically, on some basis, until it is not found to be empty. In other embodiments, data to be transmitted to a device of the WWAN **112** is transmitted immediately after processing, and is not placed in a transmit queue.

[**0076**] As is shown, the WWAN Transmit process implemented by the routing engine may next retrieve the data from the WWAN Transmit queue and send the data to its destination device via the WWAN **112** connected to the gateway **108** via a WWAN interface **110**.

[**0077**] FIG. **8** illustrates the operational flow of selected aspects of regulating network access, in accordance with various embodiments of the invention. As illustrated, prior to determining whether one of its WWAN interfaces is associated with a service agreement, a gateway may establish a connection with a WWAN, block **802**. In some embodiments, the WWAN having the resultant connection to the gateway may be associated with a wireless service provider, and the wireless service provider may be party to the service agreement. In other embodiments, prior to establishing a WWAN connection, the gateway may authenticate a user accessing the gateway through a LAN connected to the gateway, block **804**. After establishing the connection, block **802**, or authenticating the user, block **804**, the gateway may then perform the other of the operations. In alternate embodiments, the gateway may only establish the connection, block **802**, but not authenticate the user, block **804**.

[0078] In various embodiments, the gateway may then determine whether its WWAN interface is associated with a service agreement with a wireless service provider, block **806**, the service agreement having one or more features outlining gateway usage benefits and restrictions. The gateway may determine the existence of the service agreement and one or more features of any such agreement in a number of ways. The gateway may inquire of a server, such as a server associated with the gateway or with a wireless service provider, as to the existence and features of a service agreement associated with one of a number of inputs, such as an IP address associated with a WWAN interface, an APN, a SIM, a MIN, a SSID, or a LAN user authentication. Exemplary features include a limitation on a number of simultaneous WiFi or Ethernet LAN connections of the gateway, a restriction associated with data ports, a quality of service, a throughput limitation, and a data transfer rate limitation. In addition to providing the features of a service agreement, the server may also return one or more policies of the wireless service provider. In one embodiment, the gateway may also facilitate a subscriber in altering the features of his/her service agreement, block **808**.

[0079] If the gateway determines the existence of a service agreement, the gateway may provide WWAN access in accordance with either or both the one or more service agreement features and the one or more wireless service provider policies, block **810**. On the other hand, if the gateway determines that the WWAN interface is not associated with a service agreement, the gateway may deny access to all WWAN traffic, block **812**. In one embodiment, if the gateway determines that service plans are associated with multiple WWAN interfaces, the gateway may coordinate access to the WWAN through the multiple interfaces, block **814**. Further, if the WWAN interface provides access to a plurality of WWANs, the gateway may facilitate a user in choosing one of multiple WWANs, block **816**.

[0080] As is shown, in some embodiments, the gateway may download customizable components and branding indicia of a wireless service provider from the service provider, block **818**. The gateway may then render the indicia and components on a user interface to a user, block **820**. In various embodiments, the gateway may also receive data from LAN and WWAN devices, block **822**, and transmit data to LAN and WWAN devices, block **824**, these operations illustrated in FIGS. **3-7** and described in greater detail above.

[0081] FIGS. **9-16** illustrate various graphical user interfaces associated with the gateway, in accordance with various embodiments of the invention. In various embodiments, portions of selected graphical user interfaces shown in FIGS. **9-16** may be associated with various discussed functionalities of the gateway. In various other embodiments, various discussed functionality of the gateway may not be associated with any of the graphical user interfaces shown

[0082] Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations may be substituted for the specific embodiments shown and described, without departing from the scope of the present invention. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.

What is claimed:

1. A method comprising:

establishing a connection between a gateway and a wireless wide area network, wherein the gateway has a wireless wide area networking interface adapted to receive data from and transmit data to the wireless wide area network on behalf of a plurality of devices of a local area network;

determining whether the wireless wide area networking interface is associated with a service agreement of a wireless service provider providing for use of the gateway; and

operating the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the plurality of devices of the local area network if the wireless wide area networking interface is determined to be associated with a service agreement, the operating being in accordance with the associated service agreement.

2. The method of claim 1, wherein operating in accordance with the associated service agreement comprises operating in accordance with (1) one or more features of the service agreement and/or (2) a wireless service provider policy.

3. The method of claim 1, further comprising preventing or restrictively operating the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the plurality of devices of the local area network if the wireless wide area networking interface is determined to be not associated with a service agreement of a wireless service provider.

4. The method of claim 1, further comprising, prior to said determining, authenticating one or more of the plurality of devices of the local area network.

5. The method of claim 1, wherein the service agreement comprises one or more restrictions on wireless wide area network access, including at least one of a limitation on a number of simultaneous WiFi or Ethernet LAN connections of the gateway, a restriction associated with data ports, a quality of service, a throughput limitation, a data transfer rate limitation, a port-forwarding limitation, or an on-board VPN limitation.

6. The method of claim 4, wherein the one or more restrictions on wireless wide area network access comprises one or more restricted time periods of a day.

7. The method of claim 1, further comprising facilitating a user of one of the devices of the local area network in altering at least one of one or more features of the service agreement to allow the gateway to operate the wireless network interface to provide more or less wireless wide area network access.

8. The method of claim 1, wherein the determining comprises inquiring of a server whether an IP address or an APN assigned by the wireless service provider to the wireless wide area networking interface belongs to a wireless wide area networking interface associated with the service agreement.

9. The method of claim 1, wherein the determining comprises determining a SIM, a MIN, or an SSID associated with the wireless wide area network connection and inquir-

ing of a server associated with the gateway and/or the wireless service provider to determine whether the wireless wide area networking interface is associated with the service agreement.

10. The method of claim 1, wherein the wireless service provider provides both landline network access and WWAN access, and the gateway is connected to both, and the method further comprises coordinating, by the gateway, wired and wireless access in accordance with one or more features of the service agreement.

11. The method of claim 1, further comprising rendering, by the gateway, to a display, wireless-service-provider customizable indicia including wireless service provider information and a wireless service provider logo.

12. The method of claim 1, further comprising downloading, upon initialization of the wireless service provider's wireless wide area networking interface, one or more customized components and/or indicia from the wireless service provider.

13. The method of claim 1, wherein the wireless wide area networking interface is not associated with a specific wireless service provider, but is capable of accessing one or more wireless wide area networks of one or more wireless service providers, and the method further comprises facilitating a user, by the gateway, in selecting one of the one or more capable-of-access wireless wide area networks for access.

14. The method of claim 1, wherein the gateway has a plurality of wireless wide area networking interfaces, and the method further comprises determining whether each of the interfaces is associated with a service agreement and, for each interface determined to be associated with a service agreement operating each interface in accordance with the determined service agreement.

15. A gateway comprising:

a local area networking interface adapted to receive data from, and transmit data to first one or more devices of a local area network;

a wireless wide area networking interface adapted to conditionally receive data from, and conditionally transmit data to second one or more devices of a wireless wide area network; and

logic coupled to the wireless wide area networking interface and adapted to

establish a connection between the gateway and the wireless wide area network,

determine whether the wireless wide area networking interface is associated with a service agreement of a wireless service provider providing for use of the gateway, and

operate the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the one or more devices of the local area network if the wireless wide area networking interface is determined to be associated with a service agreement, the operating being in accordance with the associated service agreement.

16. The gateway of claim 15, wherein the logic is adapted to operate in accordance with the associated service agreement, and said operate comprises operating in accordance with (1) one or more features of the service agreement and/or (2) a wireless service provider policy.

17. The gateway of claim 15, wherein the logic is further adapted to prevent or restrictively operate the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the one or more devices of the local area network if the wireless wide area networking interface is determined to be not associated with a service agreement of a wireless service provider.

18. The gateway of claim 15, wherein the service agreement comprises one or more restrictions on wireless wide area network access, including at least one of a limitation on a number of simultaneous WiFi or Ethernet LAN connections of the gateway, a restriction associated with data ports, a quality of service, a throughput limitation, a data transfer rate limitation, a port-forwarding limitation, or an on-board VPN limitation.

19. The gateway of claim 15, wherein the logic is further adapted to facilitate a a user of one of the devices of the local area network in altering at least one of one or more features of the service agreement to allow the gateway to operate the wireless wide area networking interface to provide more or less wireless wide area network access.

20. The gateway of claim 15, wherein said determine comprises inquire of a server whether an IP address or an APN assigned by the wireless service provider to the wireless wide area networking interface belongs to a wireless wide area networking interface associated with the service agreement.

21. The gateway of claim 15, wherein said determine comprises determine a SIM, a MIN, or an SSID associated with the wireless wide area network connection and inquire of a server associated with the gateway and/or the wireless service provider to determine whether the wireless wide area networking interface is associated with the service agreement.

22. The gateway of claim 15, wherein the logic is further adapted to render, to a display, wireless-service-provider customizable indicia including wireless service provider information and a wireless service provider logo.

23. The gateway of claim 15, wherein the logic is further adapted to download, upon initialization of the wireless service provider's wireless wide area networking interface, one or more customized components and/or indicia from the wireless service provider.

24. An article of manufacture comprising:

a storage medium; and

a plurality of programming instructions stored on the storage medium and configured to program a gateway to

establish a connection between the gateway and a wireless wide area network, wherein the gateway has a wireless wide area networking interface adapted to receive data from and transmit data to the wireless wide area network on behalf of a plurality of devices of a local area network,

determine whether the wireless wide area networking interface is associated with a service agreement of a wireless service provider providing for use of the gateway, and

operate the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the plurality of

devices of the local area network if the wireless wide area networking interface is determined to be associated with a service agreement, the operating being in accordance with the associated service agreement.

25. The article of claim 24, wherein the plurality of programming instructions is further configured to program the gateway to operate in accordance with the associated service agreement, and operating in accordance with the service agreement comprises operating in accordance with (1) one or more features of the service agreement and/or (2) a wireless service provider policy.

26. The article of claim 24, wherein the plurality of programming instructions is further configured to program the gateway to prevent or restrictively operate the wireless wide area networking interface to receive data from and transmit data to the wireless wide area network on behalf of the plurality of devices of the local area network if the wireless wide area networking interface is determined to be not associated with a service agreement of a wireless service provider.

27. The article of claim 24, wherein the service agreement comprises one or more restrictions on wireless wide area network access, including at least one of a limitation on a number of simultaneous WiFi or Ethernet LAN connections of the gateway, a restriction associated with data ports, a quality of service, a throughput limitation, a data transfer rate limitation, a port-forwarding limitation, or an on-board VPN limitation.

28. The article of claim 24, wherein the plurality of programming instructions is further configured to program the gateway to facilitate a user of one of the devices of the local area network in altering at least one of the one or more features of the service agreement to allow the gateway to operate the wireless wide area networking interface to provide more or less wireless wide area network access.

29. The article of claim 24, wherein said determine comprises inquire of a server whether an IP address or an APN assigned by the wireless service provider to the wireless wide area networking interface belongs to a wireless wide area networking interface associated with the service agreement.

30. The article of claim 24, wherein said determine comprises determine a SIM, a MIN, or an SSID associated with the wireless wide area network connection and inquire of a server associated with the gateway and/or the wireless service provider to determine whether the wireless wide area networking interface is associated with the service agreement.

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