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Burrows et al.

(54) INTERNETWORKING MULTIPLE COMMUNICATION TECHNOLOGIES

(75) Inventors: **Gary Burrows**, Richardson, TX (US); **Pulin R. Patel**, McKinney, TX (US); **Rashad Mohammad Ali**, Plano, TX (US); **Achal R. Patel**, McKinney, TX (US)

Correspondence Address:
FISH & RICHARDSON P.C.
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

(73) Assignee: **Mavenir Systems, Inc.**, Richardson, TX (US)

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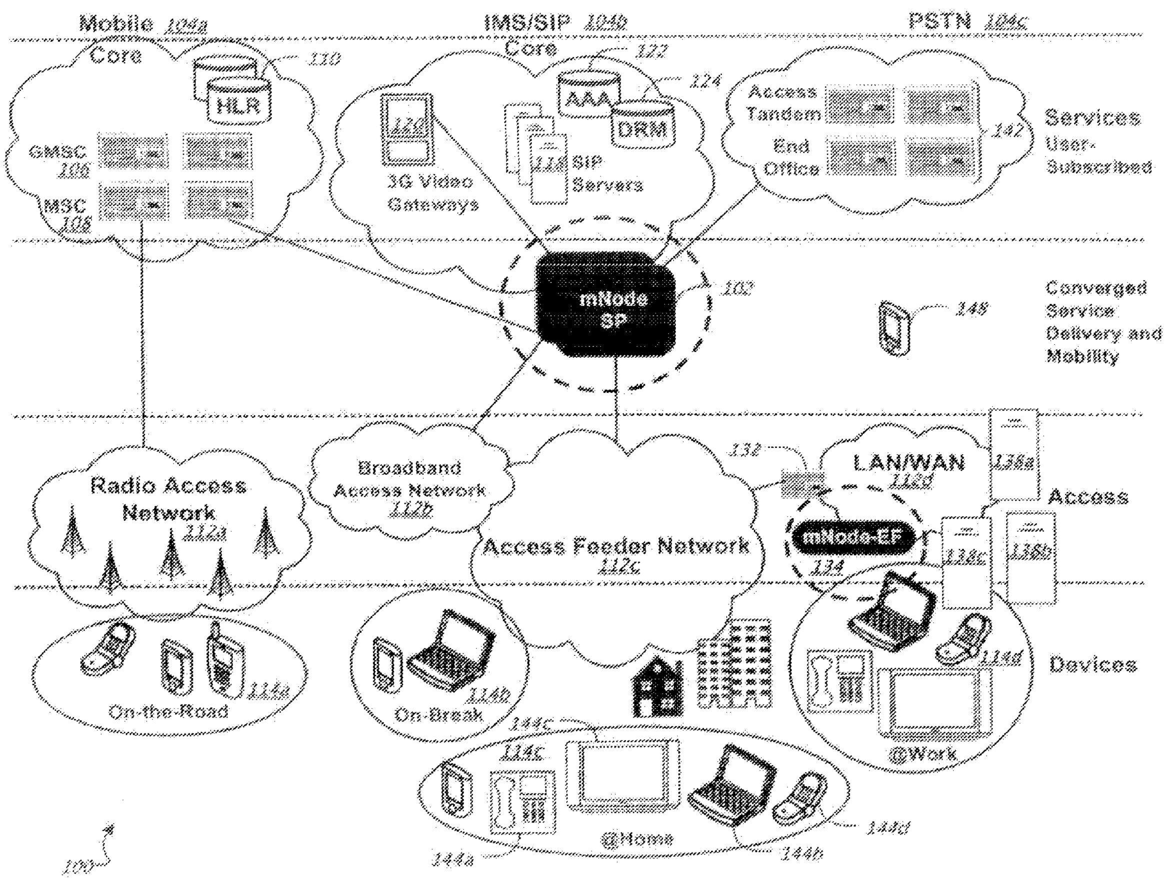
(57) **ABSTRACT**

The present disclosure includes a system and method for internetworking multiple communication technologies. In some embodiments, a method includes receiving services of a first communication technology in a first protocol. The first communication technology is internetworked with a second communication technology of an end user device.



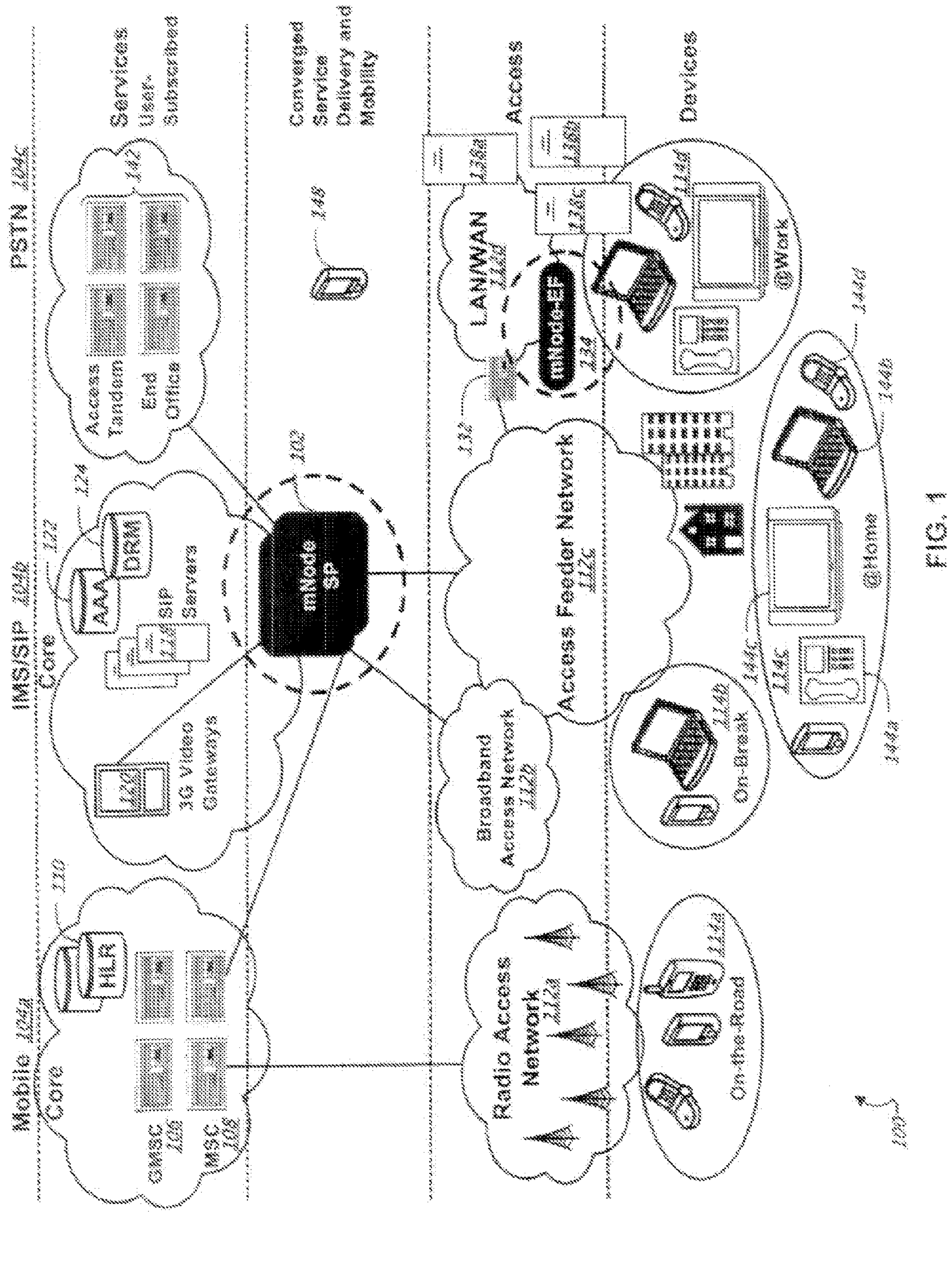

Mobile 104a
Core
HLR
110
GMSC 106
MSC 108
IMS/SIP 104b
Core
AAA
DRM
122
124
SIP Servers
118
3G Video Gateways
120
PSTN 104c
Access Tandem
End Office
142
Services User-Subscribed
Converged Service Delivery and Mobility
146
mNode SP
102
Radio Access Network
112a
Broadband Access Network
112b
Access Feeder Network
112c
132
LAN/WAN
112d
mNode-EF
134
138a
138b
138c
Access
Devices
On-the-Road
114a
On-Break
114b
@Home
114c
@Work
114d
144a
144b
144c
144d
100

FIG. 1

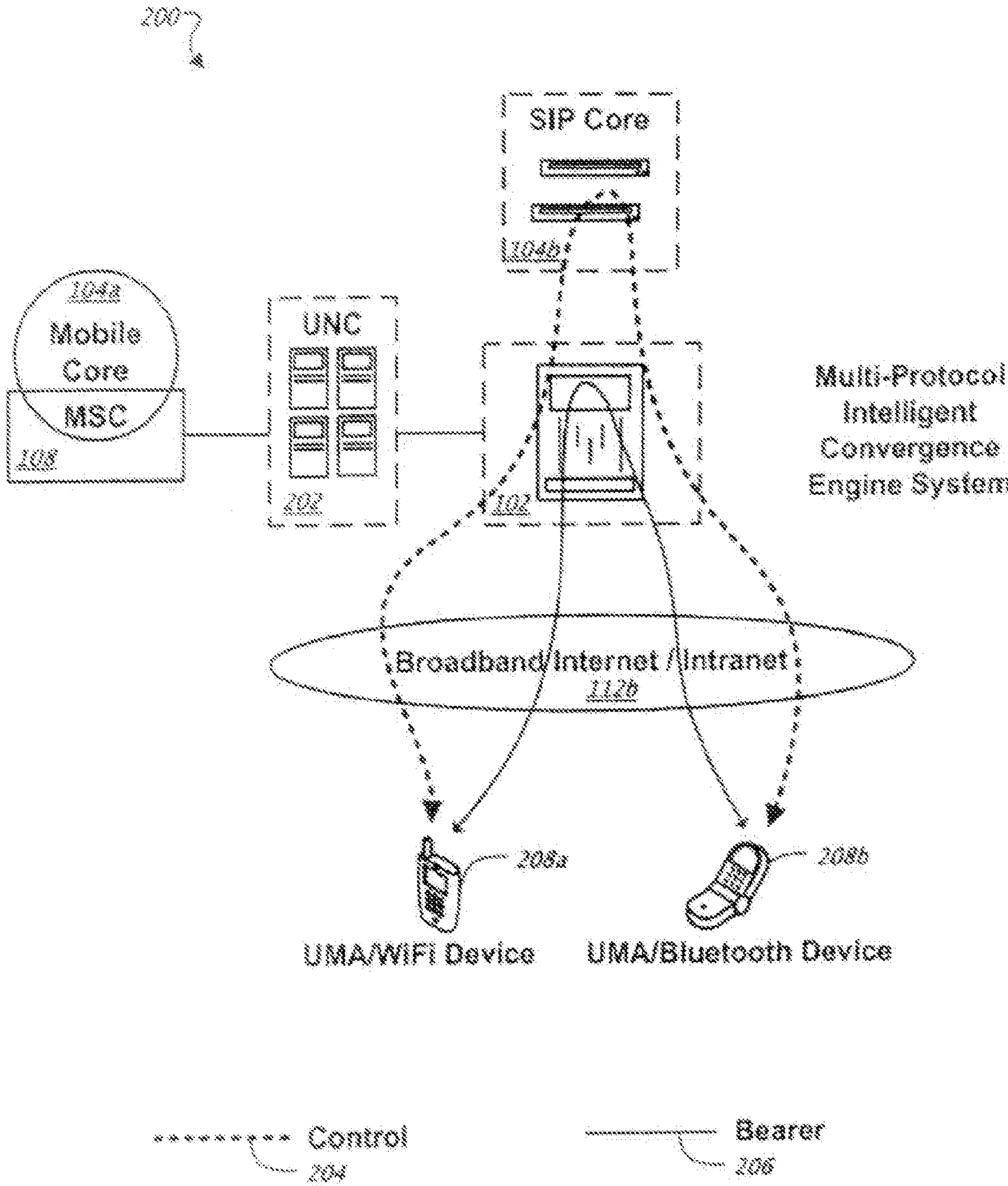

200
SIP Core
104b
104a
Mobile
Core
MSC
108
UNC
202
102
Multi-Protocol
Intelligent
Convergence
Engine System
Broadband/Internet /Intranet
112b
208a
208b
UMA/WiFi Device
UMA/Bluetooth Device
Control
204
Bearer
206

FIG. 2A

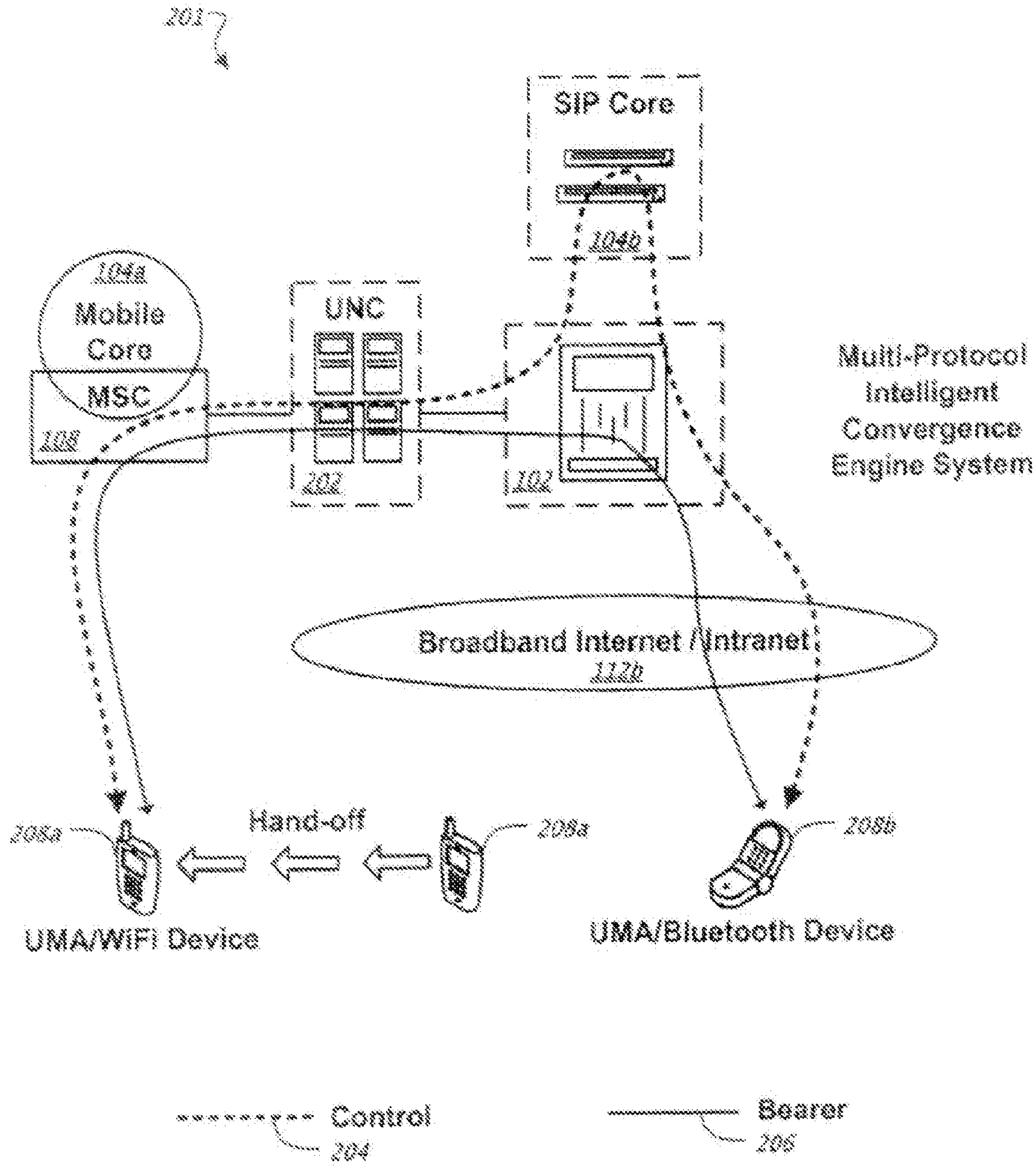

201
SIP Core
104b
104a
Mobile Core
MSC
108
UNC
202
202
Multi-Protocol Intelligent Convergence Engine System
Broadband Internet / Intranet
112b
Hand-off
208a
208a
208b
UMA/WiFi Device
UMA/Bluetooth Device
Control
204
Bearer
206

FIG. 2B

FIGURE 3A

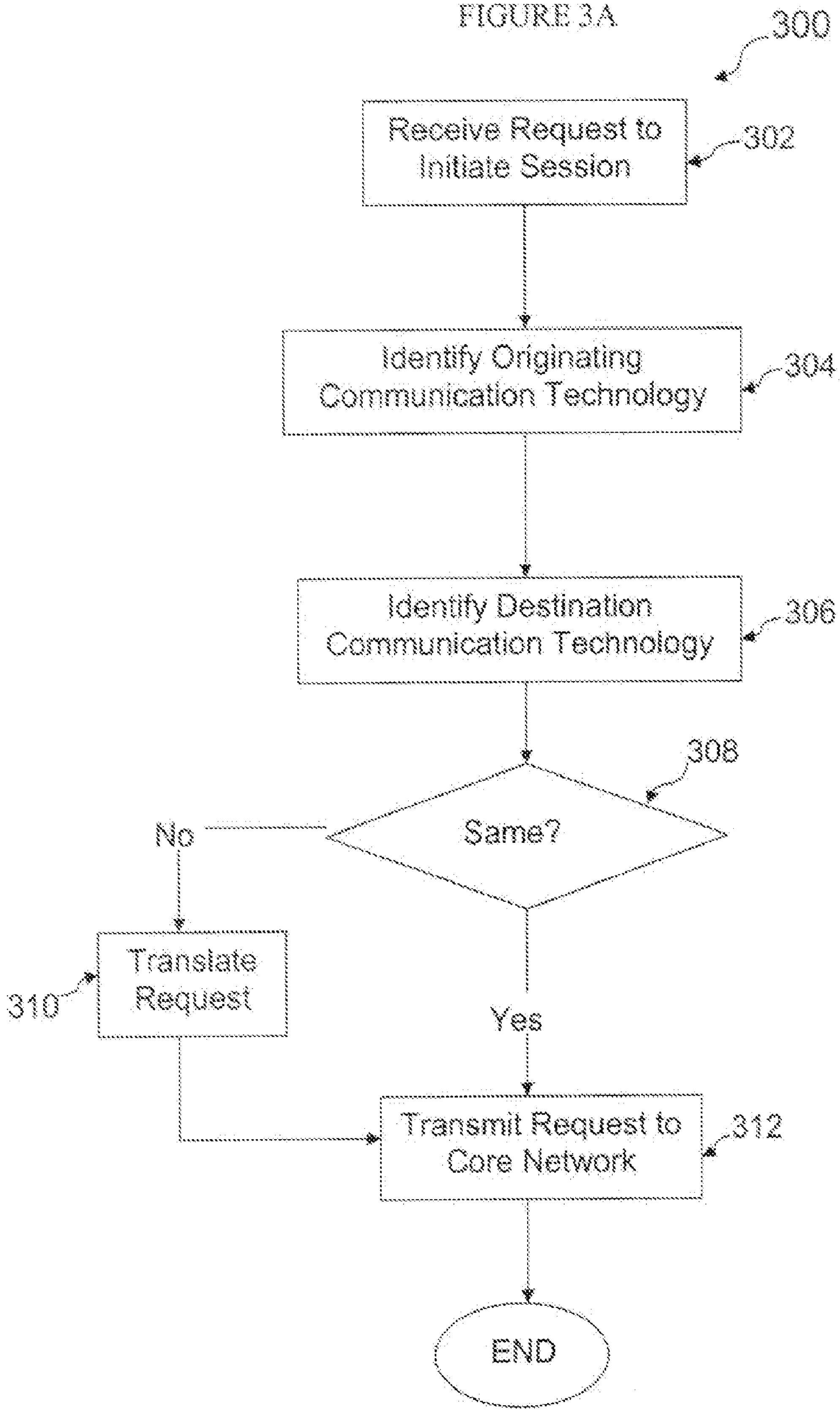
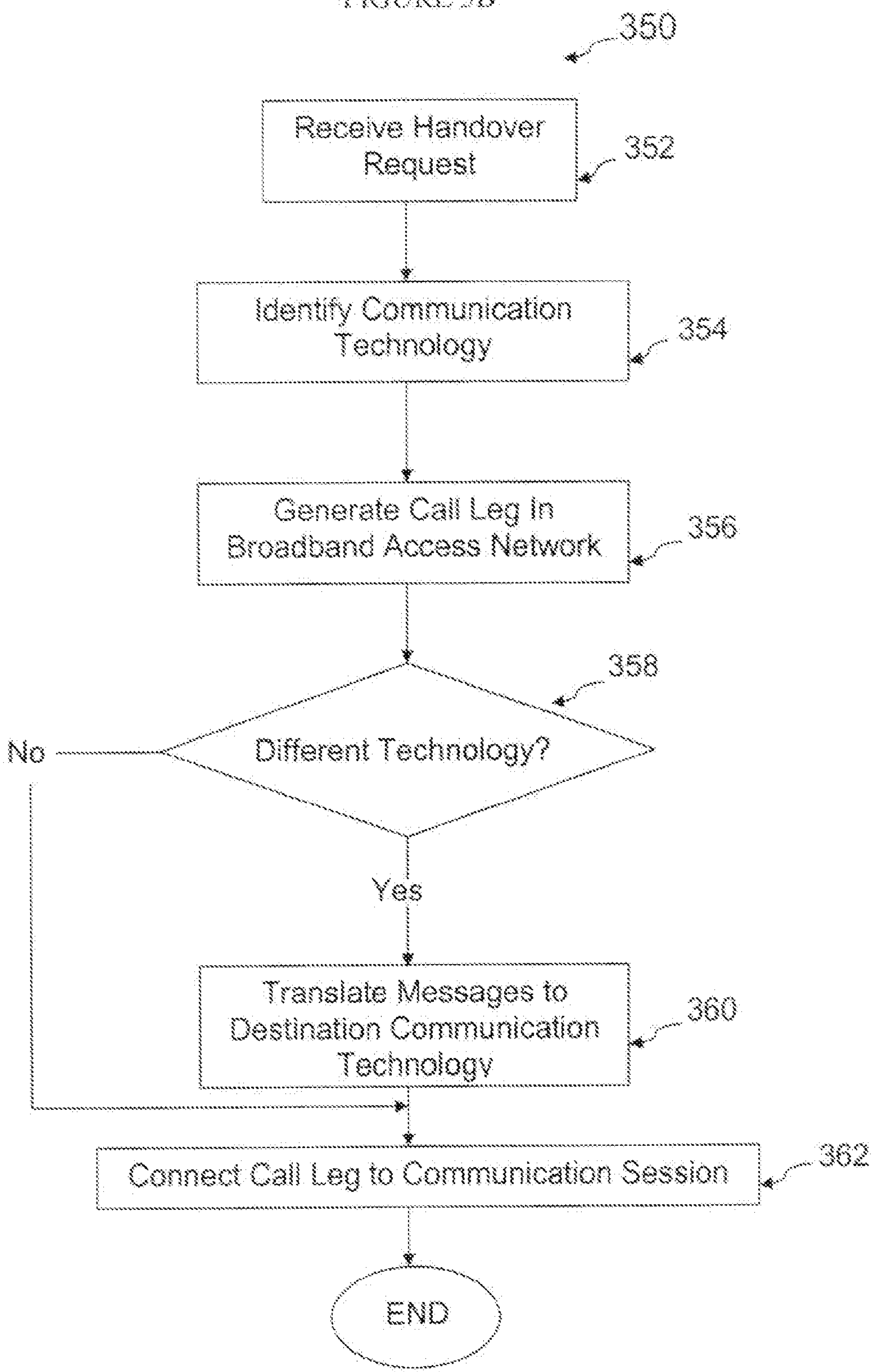

300
Receive Request to Initiate Session
302
Identify Originating Communication Technology
304
Identify Destination Communication Technology
306
308
Same?
No
Translate Request
310
Yes
Transmit Request to Core Network
312
END

FIGURE 3B


350
Receive Handover Request
352
Identify Communication Technology
354
Generate Call Leg In Broadband Access Network
356
Different Technology?
358
No
Yes
Translate Messages to Destination Communication Technology
360
Connect Call Leg to Communication Session
362
END

INTERNETWORKING MULTIPLE COMMUNICATION TECHNOLOGIES

TECHNICAL FIELD

[0001] This invention relates to network communications and, more particularly, to internetworking multiple communication technologies.

BACKGROUND

[0002] Communication networks include wired and wireless networks. Example wired networks include the Public Switched Telephone Network (PSTN) and the Internet. Example wireless networks include cellular networks as well as unlicensed wireless networks that connect to wire networks. Calls and other communications may be connected across wired and wireless networks.

[0003] Cellular networks are radio networks made up of a number of radio cells, or cells, that are each served by a base station or other fixed transceiver. The cells are used to cover different areas in order to provide radio coverage over a wide area. When a call phone moves from place to place, it is handed off from cell to cell to maintain a connection. The handoff mechanism differs depending on the type of cellular network. Example cellular networks include Universal Mobile Telecommunications System (UMTS), Wide-band Code Division Multiple Access (WCDMA), and CDMA2000. Cellular networks communicate in a radio frequency band licensed and controlled by the government.

[0004] Unlicensed wireless networks are typically used to wirelessly connect portable computers, PDAs and other computing devices to the internet or other wired network. These wireless networks include one or more access points that may communicate with computing devices using an 802.11 and other similar technologies.

SUMMARY

[0005] The present disclosure includes a system and method for internetworking multiple communication technologies. In some embodiments, a method includes receiving services of a first communication technology in a first protocol. The first communication technology is internetworked with a second communication technology of an end user device.

[0006] The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF DRAWINGS

[0007] FIG. **1** is a communication system in accordance with one embodiment of the present disclosure;

[0008] FIGS. **2**A and **2**B are diagrams illustrating signal paths in the communication system of FIG. **1** in accordance with some embodiments of the present disclosure; and

[0009] FIGS. **3**A and **3**B illustrate example flow charts for internetworking different communication technologies.

[0010] Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0011] FIG. **1** illustrates a communication system **100** for internetworking a plurality of different communication technologies. The communication technologies may include Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), IP Multimedia Subsystem (IMS), digital television service (IPTV), Public Switch Telephone Network (PSTN), Universal Mobile Telecommunications System (UMTS). Code Division Multiple Access (CDMA), CDMA2000, Wide-band CDMA (WCDMA), 1X-EVDO, High Speed Downlink Packet Access (HSDPA), Peer-to-Peer (P2P) technologies (e.g., Googletalk, Skype, XMPP, Jabber), Unlicensed Mobile Access (UMA) technology, Real Time Streaming Protocol (RTSP) technologies (e.g., RealPlayer, Quicktime, Media Player), and others. For example, system **100** may modify, translate, or convert a P2P message to one of a plurality of communication technologies such as a GSM message, a SIP message, or a UMA message. In doing so, system **100** may provide P2P services to a GSM device **114**, a SIP device **114**, or a UMA device **114**. Conventionally, network devices **114** are associated with a single core network **104** that provides services in accordance with the associated communication technologies. In internetworking a plurality of different communication technologies, devices **114** may receive services (e.g., authentication services, delivery of services, mobility of services) from a foreign core network **104** independent of the native core network **104**. For example, system **100** may identify a GSM message destined for an RTSP device **114** and, in response to at least identifying the transmitting technology and the receiving technology, convert the GSM message to an RTSP message capable of being processed by the RTSP device **114**. In addition, system **100** may enable communication session to be mobilized across devices **114** of disparate communication technologies. A communication session may be a call, data, video, audio, multimedia or other session in which information and requests are exchanged. In short, system **100** may provide mobility of services across terminals such as devices **114**, across access networks **112**, and/or across core networks **104**. Such services may include Voice Service with or without Mobility Functionality (e.g., GSM UMTS, Dual Mode GSM/WiFi or BT UMA, SIP Phones, Google Talk or Skype soft phones, POTS), Presence Aware Service, and/or Multi Media Service (e.g., streaming video, IPTV via set-top box P2P Video).

[0012] At a high level, system **100** includes network element **102**, core networks **104**, access networks, **112**, and client devices **114**. Network element **102** can include any hardware, software, and/or firmware operable to convert between a plurality of different communication technologies. For example, network element **102** may receive a message from a UTMS device destined for a Google Talk soft phone. After receiving the UTMS message, network element **102** may identify the originating technology and the destination technology and, in response to at least these identifications, convert the received UMTS message to a Goggle Talk message. Network element **102** may perform any number of functions when converting between different technologies. For example, conversion functions may include one or more of the following: translating between different parameters; encapsulating at least a portion of a message; converting between real time and non-real time services; or any other suitable functions for translating between different technologies.

[0013] Network element **102** may, in one embodiment, emulate or otherwise represent itself as a client to core networks **104** and/or a server to access networks **112**. For example, network element **102** may emulate a base station controller and/or an mobile switching center to mobile core **104***a*. In another example, network element **102** may represent itself as an call session control function (CSCF) to IMS core **104***b*. In yet another example, network element **102** may represent itself as an MSC to PSTN **104***c*. Thus, core networks **104** may query, transmit, or otherwise communicate with network element **102** like any other device associated with the core network **104**. Similarly, client devices **114** may also query, receive, or otherwise communicate with network element **102** like any server in an associated core network **104**. In representing both the client side and the server side, the conversion between different technologies performed by network element **102** may be transparent to both the core networks **104** an the clients **114**. To facilitate these representations, network element **102** may include one or more of the following interfaces: P2P XMPP, 1v, SIP/RTP, UMA, RTSP/RTP, Internet Group Management Protocol (IGMP), or Integrated Services Digital Network User Part (ISUP).

[0014] In addition, network element **102** can include any software, hardware, and/or firmware operable to locally switch messages between devices **114**. Network element **102** may be operable to receive a message from device **114** and identify a destination of the message. Network element **102** may identify a destination by realizing the address of the termination device or, for example, being provisioned to switch traffic received from a particular device, port, or session to another device, port or session. In the event that the destination of the message is a different device, network element **102** may convert the message to a different technology, if appropriate, and route the message to the receiving device. For example, network element **102** may receive a SIP message from a first device **114** and determine that the SIP message is destined for a UMA device **114**. In response to at least determining that the destination is local, network element **102** may convert the SIP message to a UMA message and transmit the converted message to the appropriate UMA device **114**. Similarly, in the event that network element **102** receives a UMA message from a first device **114** and determines that the receiving device is a SIP device **114**, network element **102** may convert the UMA message to a SIP message and transmit the converted message to the appropriate SIP device **114**.

[0015] Network element **102** may be operable to facilitate a handover between two devices, wherein a service being delivered to a first device **114** is handed-over or transitioned to a second device **114** independent of the technology standard of each device. For example, a voice call originated within a SIP device **114** may be handed-over to a GSM device **114** providing call continuity between the different technologies. In this example, both the SIP device **114** and the GSM device **114** may share a single number. In addition, network element **102** may be capable of delivering a notification of an incoming call (e.g., ring tone) to multiple devices **114** where each device **114** is based on different communication technology. For example, in the case that a Skype client **114** and a UMA handset **114** share a single number, an incoming call to that number may trigger a call received alert in both devices **114** even though that are based on different communication technologies. The hand-off feature is not limited to voice services. Any voice, video, data, or multimedia session may be capable of session hand-off. For example, a user engaged in a multimedia session on a GSM handset **114** may be able to transfer that session to an IPTV set-top box **114**. In some embodiments, network element **102** may provide continuity of the multimedia session during the transfer between the different communication technologies.

[0016] In summary, the network element **102** may offer converged services delivery and mobility across disparate core network **104**. In some embodiments, network element **102** may be configured to perform one or more of the following: manage the control layer of a communication session, coordinate the establishment of communication sessions, or initiate the origination of a communication session. The network elements **102** may operate independently of access-side elements. For example, the elements of network element **102** used to communicate with the core networks **104** may be separate and/or independent from the elements of network element **102** used to communicate with the access networks **112**. The independent operation of the two ends of communications may decouple terminal technology from access technology and/or access technology from core technology. By decoupling the access and core sides, independent communication sessions may be established to multiple terminating points such as devices **114** that utilized different technologies. The decoupling may also enable localized routing/switching in which only an intra-node connection is made without utilizing bearer traffic resources from the network-side. The network device **114** accessing core networks **104** through different access networks **112** (e.g., RAN **112***a*, broadband access network **112***b*) may appear to be compatible devices despite differing protocol technology. Network element **102** may enable inter-connectivity communications translations between diverse core services. Network element **102** may be accessed by any number of different access providers **112**, core networks **104**, and/or end user devices **114**.

[0017] As illustrated, core networks **104** include mobile core network **104***a*, IMS/SIP core network **104***b*, and PSTN core network **104***c*. Core networks **104** may include other core networks (e.g., GPRS, IPTV) without departing from the scope of this disclosure to provide services to devices **114**. Services provided by core networks **104** may include one or more of the following: Mobile Voice services, Short Message Service (SMS), Multimedia Messaging Services (MMS), Plain Old Telephone Service (POTS), Broadband Internet Access, VoIP service, or others. The system **100** may include some, all, or different core networks without departing from the scope of this disclosure. For example, core networks **104** may include an IPTV core network. The mobile core network **104***a* can offer services such as Gateway Mobile Switching Center (GMSC) **106** and Mobile Switching Center (MSC) **108**. The MSC **108** may provide GSM services, location update, and circuit switching to mobile access users. The GMSC **106** may interface the MSC **108** with the PSTN **104***c*. The GMSC **106** may also determine the closest MSC **108** to a user for putting a call through to the user. A Home Location Register (HLR) **110** can contain a database of GSM subscribers. The HLR **110** may contain information regarding which services each user has subscribed to. In addition, the HLR **110** may be used to track the billing of each user within the mobile core network **104***a*.

[0018] Another core network **204** within the system **100** is the IP Multimedia System (IMS)/Session Initiation Protocol (SIP) core network **104***b* is a network that enables mobile communication technology to access IP based services. The IMS standard was introduced by the 3rd generation partnership project (3GPP) which is the European 3rd generation mobile communication standard. In general, the IMS standard discloses a method of receiving an IP based service through a wireless communication terminal such as mobile devices **114**. A set of SIP servers **118** may allow subscribers of the IMS/SIP core network **104***b* to place voice and/or video calls via voice over internet protocol (VoIP) networking. A 3G video gateway **120** may provide third generation cellular technology, incorporating voice and non-voice data elements within the communication protocol. Content traveling through the 3G video gateway **120** can include video, music download, instant messaging, etc. An Authentication Authorization, and Accounting (AAA) database **122** tracks resources consumed by the subscribers of the IMS/SIP core network **104***b*. A Digital Rights Management (DRM) database **124** monitors the distribution of copyrighted content such as music, movies, etc. The DRM database **124** also enforces usage restrictions of the copyrighted content. Although not illustrated, IMS network **104***b* may include call session control function (CSCF), home subscriber server (HSS), application server (AS), and other elements. CSCF acts as a proxy and routes SIP messages to IMS network components such as AS. HSS typically functions as a data repository for subscriber profile information, such as type of services allowed for a subscriber. AS provides various services for users of IMS network **104***b*, such as, for example, video conferencing, in which case AS handles the audio and video synchronization and distribution to mobile devices **114**.

[0019] The Public Switched Telephone Network (PSTN) core network **104***c* is used for communicating via telephone land lines. The PSTN core network **104***c* is a circuit-switched telephone network which may be used for land line voice calls, digital subscriber line (DSL) internet access, and/or dial-up modem internet access. A set of access tandem and end office switches **142** segment the network into sections which are considered to be within a local calling distance. For example, communications relayed through the PSTN core network **104***c* can be sent from a local user via an end office switch, through a series of access tandem switches, and through the remote end office switch to a remote user. In transmitting signals, PSTN **104***b* may use one or more of the following: telephones, key telephone systems, private branch exchange trunks, and certain data arrangements. Since PSTN **104***b* may be a collection of different telephone networks, portions of PSTN **104***b* may use different transmission media and/or compression techniques. Completion of a circuit in PSTN **104***b* between a call originator and a call receiver may require network signaling in the form of either dial pulses or multi-frequency tones.

[0020] Access networks **112** includes a radio access network (RAN) **112***a*, a broadband access network **112***b*, an access feeder network **112***c*, and a LAN/WAN **112***d*. The system **100** may include some, all, or different access networks without departing from the scope of this disclosure. For example, access networks **112** may include a cable television network. RAN **112***a* provides a radio interface between mobile device **114***a* and cellular core network **104***a* that may provide real-time voice, data, and multimedia services (e.g., a call) to mobile devices **114***a*. In general, RAN **112***a* communicates air frames via radio frequency (RF) links. In particular, RAN **112***a* converts between air frames to physical link based messages for transmission through cellular core network **104***a*. RAN **112***a* may implement, for example, one of the following wireless interface standards during transmissions: IS-54 (TDMA), Advanced Mobile Phone Service (AMPS), GSM standards, CDMA, Time Division Multiple Access (TDMA), General Packet Radio Service (GPRS), ENHANCED DATA rates for Global EVOLUTION (EDGE), or proprietary radio interfaces.

[0021] RAN **112***a* may include Base Stations (BS) connected to Base Station Controllers (BSC). BS receives and transmits air frames within a geographic region of RAN **112***a* called a cell and communicates with mobile devices **114***a* in the cell. Each BSC is associated with one or more BS and controls the associated BS. For example, BSC may provide functions such as handover, cell configuration data, control of RF power levels or any other suitable functions for managing radio resource and routing signals to and from BS. MSC **108** handles access to BSC and network element **102**, which may appear as a BSC to MSC **108**. MSC **108** may be connected to BSC through a standard interface such as the A-interface.

[0022] Access feeder network **112***c* may provide devices **114** access to core networks **104** via network element **102**. In addition, access feeder network **112***c* may include a Wide Area Network/Metro Area Network (WAN/MAN), cable television network, wireless microwave broadband access (WiMAX), fiber optic cable access network (FTTC/H Ethernet), wireless personal access networks (WiFi/Bluetooth), digital mobile telephony access networks (GSM over IP, UMTS over IP), and/or any other suitable internet/intranet access provider. Alternatively or in combination, access feeder network **112***c* may include broadband access network **112***b*. In general, network **106***b* communicates IP packets to transfer voice, video, data, and other suitable information between network addresses. In the case of multimedia sessions, network **106***b* may use Voice over IP (VoIP) protocols to set up, route, and tear down calls. In some embodiments, broadband access network **112***b* may include SIP proxy servers for routing SIP messages. Each SIP proxy server can be any software, hardware, and/or firmware operable to route SIP messages to other SIP proxies, gateways, SIP phones, network element **102**, and others. In some embodiments broadband access network **112***b* may comprises a third generation IP multimedia subsystem for cellular technology (3G/IMS packet network).

[0023] A privately-run corporate LAN/WAN **112***d*, such as a Server Message Block (SMB)/Enterprise network, can additionally connect to the access feeder network **112***c* via a gateway server **132**. In some embodiments, a communication node **134** running on the gateway server **132** can provide translation between the public access feeder network **112***c* and the corporate LAN/WAN **112***d*. For example, the communication node **134** may translate between disparate protocols (e.g., WiFi/Bluetooth, GSM over IP, or WiMAX). In another example, the communication node **134** translates between proprietary protocols/methods and open protocols/methods. A set of network servers **138***a-c* may provide wireless and/or wired access to the LAN/WAN **112***d*. Any number of devices **114** may be connected to any number of servers **138** within the LAN/WAN **112***d*.

[0024] As illustrated, the devices **114** are segregated into groupings based on common location of usage. The devices **114** are grouped into a set of on-the-road devices **114***a*, a set of on-break devices **114***b*, a set of at-home devices **114***c*, and a set of at-work devices **114***d*. The system **100** may include some, all, or different end user devices without departing from the scope of this disclosure. In addition, the devices **114** may switch between different access networks **112** without departing from the scope of this disclosure. The set of on-the-road devices **114***a* illustrates a variety of portable devices which may be used to access core networks **104** through RAN **112***a*. The on-the-road devices **114***a* can include, but aren't limited to, a cellular phone, a GPS handset and a satellite phone. The set of on-break devices **114***b* illustrates a variety of limited mobility devices which can be used to access core networks **104** through access feeder network **112**. The on-break devices **114***b* may be physically connected to the access feeder network **112***c* or broadband access network **112***b* such as through an Ethernet cable, a WiFi/Bluetooth link, or any other suitable wireless and/or wireline link. The on-break devices **114***b* can include, but aren't limited to, a personal digital assistant (PDA) or laptop computer.

[0025] The set of at-home devices **114***c* illustrate a variety of devices which can be used to access the core networks **104** via the access feeder network **112***c*, the broadband access network **112***b*, and/or the radio access network **112***a*. The at-home devices **114***c* may have limited or no mobility, potentially requiring dedicated lines for their use. For example, a telephone **144***a* may connected via land line to the PSTN core network **104***c*. Alternatively, the telephone **144***a* may be connected via home computer such as the laptop **144***b* to the IMS/SIP core network **104***b* to enable IP telephony. The laptap **144***b*, similarly, may be connected to the PSTN core network **104***c* via a dial-up modem or broadband DSL service. In another embodiment, the laptop **114***b* may be connected via a cable modem or Ethernet to the IMS/SIP core network **104***b*. A television **144***c* may be connected to IPTV service within the IMS/SIP core network **104***b* via a set-top box. The at-home devices **114***c* may also include a cellular phone **144***d* communicating with the mobile core network **104***a*. Any number of devices, including but not limited to GPS, cellular, IP, and other technology, may be included within the at-home devices **114***c*.

[0026] Similarly, a set of at-work devices **114***d* allows users access to the core networks **104** through the corporate LAN/WAN **112***d* environment. The at-work devices **114***d* may include, but are not limited to, intranet/internet access via personal computers such as a laptop computer, SIP telephones, cellular phones, and IP teleconferencing service through a television set.

[0027] In some embodiments, a personal communication device **148** may have built-in converged service offerings and/or communication methods. The personal communication device **148** can be any device capable of communicating information from a core network, including but not limited to a cellular phone, data phone, pager, personal computer, smart phone, PDA, etc. In one example, the multi-protocol convergence engine technology could be embedded within a PDA **148**. In this circumstance, the PDA **148** would have built-in capability of accessing services from a number of core networks **104**. In some embodiments, the device **148** could be capable of simultaneously communicating via the PSTN core network **140***a* and the IMS/SIP core network **104***b*, for example to provide concurrent voice services along with music downloads.

[0028] In one aspect of operation, a user may be at work initiating a Skype session on a laptop device **114***d* connected to the corporate LAN **112***d* to contact a colleague who is on an international business trip and is only accessible via a satellite phone **114***a*. The network element **102** recognizes the destination address of the Skype session as requiring translation between core networks **104** and facilitates the translation of the Skype client technology based on the IMS/SIP core network **104***b* to the satellite access network technology based in the mobile core network **104***a* to enable the call. In the opposite direction, the network element **102** facilitates the translation from the mobile core network **104***a* back to the IMS/SIP core network **104***b* to relay the colleague's response back to the home office.

[0029] In another aspect of operation, a user may be at home watching a baseball game on the television **144***c* which is connected to IPTV service provided by the cable television network **112***c* within the IMS/SIP core network **104***b* via a set-top box. If the user needs to pick up a child from soccer practice in the middle of the baseball game, the user may choose to migrate the IPTV session from the television **144***c* to an on-the-road device **114***a* such as a cellular phone with multimedia capability. The network element **102** may enables transition of the IPTV session currently transmitting to the television **144***c* to the user's cellular phone **114***a*, for example by converting the session stream from the IPTV communication technology to the GSM communication technology and routing the session to the user's cellular phone **114***a*, so that the user may continue to follow the baseball game while in transit.

[0030] FIG. **2**A is a diagram **200** illustrating an example signal path between two UMA devices **208** in accordance with one embodiment of the present disclosure. For ease of reference, only some of the elements of communication system **100** of FIG. **1** are shown. UMA allows roaming and handover between local area networks and wide area networks through a dual-mode mobile device. The local network provider may be based on a private wireless technology such as Bluetooth or WiFi which provide access to the SIP core network **104***b*, while the wide network provider may be GSM or UMTS, for example, which correlate their services with the mobile core network **104***a*. Dual-mode UMA devices **208** may switch between local network and wide network operating modes depending upon current use. In the illustrated embodiment, two signal streams are shown between UMA/WiFi device **208***a* and UMA/Bluetooth device **208***b*; a control signal **204** and a bearer signal **206**. UMA/WiFi device **208***a* and UMA/Bluetooth device **208***b* are connected to the communications system **100** through the broadband internet/intranet access network **112***b*.

[0031] A UMA Network Controller (UNC) **202** connects the mobile core network **104***a* to the network element **102**. The UNC **202** may authenticate and authorize access to GSM voice and GPRS data services within the mobile core network **104***a* for UMA devices which otherwise may communicate locally with SIP core network **104***b*. UNC **202** can include any software, hardware, and/or firmware operable to manage UMA devices. For example, UNC **202** may perform registration for UMA control services, set up or tear down bearer paths, terminate secure remote access tunnels from enterprise devices, and other suitable services. In addition, UNC **202** appears as a base station subsystem to mobile core network **104***a* and thus, may provide location information for the UMA devices **208**. For example, UNC **202** may store the identity, location, and/or capabilities of the UMA devices **208** during registration. UNC **202** may require such information to provide support services and/or potentially handover functionality for UMA devices **208** when interconnecting with the mobile core network **104***a*.

[0032] Due to the difference in communication protocol between WiFi and Bluetooth, the UMA devices **208** may use the mobile core network **104***a* and GSM to engage in a voice session. Rather than depending upon the services of UNC **202** to allow UMA/WiFi device **208***a* to communicate with UMA/Bluetooth device **208***b*, the network element **102** may provide more localized access by translating and locally switching to WiFi and Bluetooth communication protocols between devices **208**. The network element **102** may enable a service to be delivered to an end user independent of the user's terminal device type and independent of the access/core network from which the user is being serviced. The network element **102** can accomplish this by coordinating the establishment of network sessions or voice calls. For example, the network element **102** may initiate the origination of a bi-directional voice/video call or chat session or a uni-directional streaming media or IPTV communication. The network element **102** may also manage the control layer of network protocol communications.

[0033] In one aspect of operation, UMA/WiFi device **208***a* wirelessly transmits a request through the broadband internet/intranet access network **112***b* to network element **102** to initiate a call with UMA/Bluetooth device **208***b*. In some embodiments, network element **102** receives a WiFi control message **204** and switches it to SIP core **104***b*. The network device **102** intercepts the control response **204**, generates a Bluetooth control response **204** based, at least in part, on the WiFi control response, and routes it to the UMA/Bluetooth device **208***b* through the broadband internet/intranet access network **112***b*. Control traffic **204** may enable the SIP core network **104***b* to authenticate and authorize subscribers for services, implement call-routing policies, and provide features to subscribers.

[0034] However, SIP is a peer-to-peer communication method, which means that the voice session itself does not require interaction with the SIP core network **104***b*. In this case, the bearer signal **206** is capable of being routed between the devices **208** through the network element **102** via the broadband internet/intranet access network **112***b* independent of the SIP core network **104***b*. The network element **102** may translate between protocol parameters and/or digits to enable communication between the two devices **208**.

[0035] In one aspect of operation, network element **102** may intercept a WiFi voice transmission destined for UMA/Bluetooth device **208***b*, convert, translate, or otherwise modify the WiFi message to a form readable by UMA/Bluetooth device **208***b*, and then route the modified WiFi message to UMA/Bluetooth device **208***b*. Similarly, an incoming voice message from the UMA/WiFi device **208***a* may be captured and converted, translated, or otherwise modified to enable recognition by UMA/Bluetooth device **208***b*. The network element **102** may track the destination address of each device **208** in order to provide local switching of the messages independent of UNC **202**.

[0036] FIG. 2B is a diagram **201** illustrating an example signal path between two UMA devices **208** in accordance with another embodiment of the present disclosure. The network element **102**, having the capability of independently controlling both the incoming and the outgoing segments of the communication signals **204** and **206**, may also be able to handover a service being delivered to one device **208** to another device **208** based on a different communication technology. Similarly, network element **102** may be able to handover services for a device **208**, such that a device functioning under a first service (e.g., access network or core network mode, etc) can seamlessly transition into functioning under a second service.

[0037] In one aspect of operation, UMA/WiFi device **208***a* wirelessly transmits a request to initiate a call with UMA/Bluetooth device **208***b*. If, once the communications signals **204** and **206** have been established as in diagram **200** of FIG. 2A, the subscriber of the UMA/WiFi device **208***a* leaves the reach of the local broadband internet/intranet **112***b* access area, for instance by driving away in a taxi, the network element **102** may activate a session hand-off so that the nearest MSC **108** of the mobile core network **104***a* may track and provide services to the UMA/WiFi device **208***a* to continue the voice session. In accomplishing a device hand-off, the UMA/Bluetooth device **208***b* outgoing control signal **204** and bearer signal **206**, after the control signal **204** has been bounced through the SIP core network **104***b*, are now routed from the network element **102** through the UNC **202** to the MSC **108** and potentially the mobile core network **104***a* before reaching the UMA/WiFi device **208***a*. Similarly, communications signals **204** and **206**, originating from the UMA/WiFi device **208***a*, may be routed to the MSC **108** and mobile core network **104***a*, over the UNC **202**, before reaching the network element **102** and onwards towards the destination of the UMA/Bluetooth device **208***b*. This allows the UMA/WiFi device **208***a* communication to achieve authorization, authentication, and subscriber services from the mobile core network **104***a* while allowing the UMA/Bluetooth device **208***b* to continue to utilize the local broadband internet/intranet access network **112***b* and SIP core network **104***b* services. The network element **102**, in this circumstance, provides conversion between GSM communications protocol being used by the UMA/Wifi device **208***a* and Bluetooth communications protocol being used by the UMA/Bluetooth device **208***b*.

[0038] In another aspect of operation, UMA/WiFi device **208***a* wirelessly transmits a request to initiate a call with UMA/Bluetooth device **208***b*. If, once the communications signals **204** and **206** have been established as in diagram **200** of FIG. 2A, the subscriber of the UMA/WiFi device **208***a* receives a second call from a device not pictured within diagram **201**, and the subscriber opts to conference the new call into the ongoing voice session with UMA/Bluetooth device **208***b* using Explicit Call Transfer (ECT), the network element **102** may activate a session hand-off so that the services available through the MSC **108** of the mobile core network **104***a*, e.g. ECT, are available to the UMA/WiFi device **208***a* to complete the conference call.

[0039] FIGS. 3A to 3B are flow diagrams illustrating example methods for managing communication sessions using different communication technologies. The illustrated methods are described with respect to system **100** of FIG. 1, but these methods could be used by any other suitable system. Moreover, system **100** may use any other suitable techniques for performing these tasks. Thus, many of the steps in this flowchart may take place simultaneously and/or in different orders as shown. System **100** may also use methods with additional steps, fewer steps, and/or different steps, so long as the methods remain appropriate.

[0040] Referring to FIG. 3A, method **300** begins at decisional step **302** where network element **102** receives a request from a device **114** to initiate a communication session with a core network **104**. For example, network element **102** may receive the initiation request from a UMA device **114** to receive streaming video from IMS network **104***b*. At step **302**, network element **102** identifies the originating communication technology. In the example, network element **102** identifies that device **114** is a UMA device requesting services through broadband access network **112***b*. Network element **102** identifies the terminating communication technology at step **306**. Returning to the example, network element **102** identifies that UMA device **114** is requesting services from an RSTP server in IMS network **104***b*. If network element determines that the originating and terminating communication technologies are the same at decisional step **308**, then execution proceeds to step **312**. If network element determines that the originating and terminating communication technologies are different at decisional step **308**, then network element **102** translates the initiation request from the originating communication technology to the second communication technology at step **310**. Again returning to the example, network element **102** translates the UMA request to an RSTP request. Next, at step **312**, network element **102** transmits the initiation request to the appropriate core network **104**.

[0041] Referring to FIG. 3B, method **350** begins at step **352** where network element **102** receives a request to handover an existing communication session to a different client device **114**. For example, network element **102** may receive a request to transfer a call session from a UMA device **114** to a SIP device **114**. At step **354**, network element **102** identifies the communication technology of the new device **114**. In the example, network element determines that the new device **114** is a SIP-based device requesting to establish service through broadband access network **112***b*. Network element **102** generates a call leg with the SIP device **114** through broadband access network **112***b* at step **356**. If the communication session provided by the core network **104** is based on a different communication technology that the new device **114**, then, at step **360**, network element **102** translates messages between the two different communication technologies. At step **362**, network element connect the call leg to the communication session to receive services from the core network **104**. Network element **102** may establish ½ call legs associated with different communication technologies and connect these portions to form a single logical stream enabling sing directional or bi-directional transfer of information.

[0042] Although this disclosure has been described in terms of certain embodiments and generally associated methods, alterations and permutations of these embodiments and methods will be apparent to those skilled in the art. Accordingly, the above description of example embodiments does not define or constrain this disclosure. Other changes, substitutions, and alterations are also possible without departing from the spirit and scope of this disclosure.

What is claimed is:

1. A method, comprising:

receiving a message from a first network device, the received message compatible with a first communication technology;

identifying a destination communication technology from a plurality of communication technologies based, at least in part, on the received message;

automatically converting the received message to a message compatible with the destination communication technology, the first communication technology different from the destination communication technology; and

transmitting the converted message to a second network device comprising the first of the plurality of communication technologies.

2. The method of claim **1**, the received message encoded in a first protocol, the converted message encoded in a second protocol.

3. The method of claim **2**, the first protocol different from the second protocol.

4. The method of claim **1**, the plurality of communication technologies comprises a second plurality of communication technologies, the method further comprising identifying the first communication technology from a first plurality of communication technologies.

5. The method of claim **4**, the first plurality of communication technologies different from the second plurality of communication technologies.

6. The method of claim **1**, wherein transmitting the converted message to the second network device comprises transmitting the converted message to the second network device independent of the first network device.

7. The method of claim **1**, the received message associated with a connection-oriented session, the converted message associated with a connectionless-oriented session.

8. The method of claim **1**, wherein the plurality of communication technologies comprises at least one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

9. A method, comprising:

identifying a device operable to receive services from a first core network through a first access network, the first core network and the first access network comprising a first communication technology; and

providing services from a second core network to the device through the first access network, the second core network comprising a second communication technology different from the first communication technology.

10. The method of claim **9**, wherein providing services from a second core network to the device through the first access network comprises translating services based on a second communication technology to services based on the first communication technology, the first communication technology different from the second communication technology.

11. A method comprising:

receiving a request to handover a communication session from a first device based on a first communication technology to a second device based on a second communication technology, the first communication technology different than the second communication technology; and

providing the communication session to the second device in a form compatible with the second communication technology.

12. The method of claim **11**, wherein providing the communication session to the second device comprises translating the communication session to a form compatible with the second communication technology.

13. A method for providing services for a communication session, comprising:

receiving services of a first communication technology in a first protocol; and

internetworking the first communication technology with a second communication technology of an end user device.

14. The method of claim **13**, further comprising internetworking the first protocol with a second protocol used by the end user device.

15. A communication network, comprising:

a technology aware node coupled to a plurality of core networks of different communication technologies; and

the technology aware node configured to provide services from each of the core network to end user devices of a plurality of communication technologies.

16. A method of providing services in a communication session, comprising:

providing services from a network of a first communication technology over a communication session to an end user device; and

providing services from a second network of a second communication technology over the communication session to the end user device.

17. The method of claim **16**, the end user device comprising a mobile device.

18. The method of claim **16**, the end user device using communication technology different from the first communication technology and the second communication technology.

19. The method of claim **16**, the first communication technology is one of one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

20. The method of claim **16**, the second communication technology is one of one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

21. A method for providing services in a communication network, comprising:

providing services over a communication session from a network of a first communication technology to a first end user device; and

handing over the call session to a second end user device, the second end user device using a communication technology different from that of the first end user device.

22. The method of claim **21**, the communication technology of the first and second end user devices different from the communication technology of the network.

23. The method of claim **21**, the communication technology of the first end user device is one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

24. The method of claim **21**, the communication technology of the second end user device is one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

25. The method of claim **21**, the first end user device comprising a mobile device.

26. The method of claim **21**, both the first and second end user devices comprising first and second mobile devices.

27. A system for a communication network, comprising:

one or more interfaces configured to communicate with a plurality of core networks of different communication technologies and a plurality of access networks of different communication types; and

a convergence engine coupled to one or more interfaces and configured to receive from one of the core networks information in a first communication technology for a call session and to convert the information to a second communication technology of the access networks over which an end user device of the call session is coupled to the convergence engine.

28. The system of claim **27**, the convergence engine further configured to convert between different communication protocols.

29. The system of claim **27**, the system integrated into a single network node.

30. The system of claim **27**, the first communication technology is one of one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

31. The system of claim **27**, the second communication technology is one of one of peer to peer, GSM, UMTS, SIP, UMA, RTSP, IGMP, or ISUP.

32. The system of claim **27**, the system integrated into a single network node, the convergence engine including a client side configured to translated between different protocols and a server side configured to translated between different protocols and having a half call model switch.

33. A method, comprising:

receiving a request to handover a communication session from a first device coupled to an access network to a second device couple to the access network, the first device and the second device comprise a same communication technology; and

providing the communication session to the second device independent of a core network associated with the communication technology.

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