

SYSTEM AND METHOD FOR ADVANCED INTEROPERABILITY

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 61/372,287, filed on 10 August 2010, which is herein incorporated by reference in its entirety.

BACKGROUND

Field of the Invention

[0002] The present invention relates generally to telecommunications services. More particularly, the present invention relates to capabilities that enhance substantially the value and usefulness of various communication and data exchange paradigms including, inter alia, voice telephone calls, the transfer of various forms of data (such as inter alia signaling data, command-and-control data, application data, etc.), Short Message Service (SMS), Multimedia Message Service (MMS), Internet Protocol (IP) Multimedia Subsystem (IMS), Wireless Application Protocol (WAP), Electronic Mail (E-Mail), Instant Messaging (IM), etc.

Background of the Invention

[0003] As the 'wireless revolution' continues to march forward through various flavors of 2G, 3G, 4G, and beyond, the importance to a Mobile Subscriber (MS) – for example a user of a Wireless Device (WD) that is serviced by possibly inter alia a Wireless Carrier (WC) – of their WD grows substantially. Examples of WDs include, possibly inter alia, mobile telephones, handheld computers, Internet-enabled phones,

paggers, radios, TVs, audio devices, car audio (and other) systems, recorders, text-to-speech devices, bar-code scanners, net appliances, mini-browsers, personal data assistants (PDAs), etc.

[0004] One consequence of such a growing importance is the resulting ubiquitous nature of WDs – i.e., MSs carry them at almost all times and use them for an everincreasing range of activities. For example, MSs employ their WDs to, possibly inter alia:

[0005] 1) Exchange messages, content (such as inter alia pictures and other static images; songs and other quanta of audio data; movies, streaming video, and other quanta of video data; data from software applications such as games), etc. with other MSs (e.g., “Let’s meet for dinner at 6”) through Peer-to-Peer, or P2P, messaging.

[0006] 2) Secure information (such as, for example, weather updates, travel alerts, news updates, sports scores, etc.), participate in voting initiatives (such as, for example, with the television show American Idol®), exchange content (such as for example pictures and other static images; songs and other quanta of audio data; movies, streaming video, and other quanta of video data; games and other software applications; etc.), interact with social networking sites, etc. through various of the available Application-to-Peer, or A2P, based service offerings.

[0007] 3) Engage in Mobile Commerce (which, broadly speaking, encompasses the buying and selling of merchant-supplied products, goods, and services through a WD) and Mobile Banking (which, broadly speaking, encompasses performing various banking activities through a WD).

[0008] 4) Receive and initiate voice telephone calls.

[0009] As just one usage example, around the world during 2009 there were over five trillion SMS messages exchanged and in North America during just the first half of 2010 over one trillion SMS messages were exchanged.

[0010] Coincident with the rapid growth of WDs has been the desire of WCs, and other entities within a mobile ecosystem, to offer to MSs a continuing stream of new and interesting products and services that, possibly inter alia, attract new MSs and retain existing MSs, leverage or exploit the continually increasing features and capabilities of new WDs, incrementally increase the volume of messaging traffic (and the revenue that is associated with same) that flows through a mobile ecosystem, etc.

[0011] Implementation of the various product/service offerings that were referenced above may raise a host of interoperability (for example and inter alia connectivity, communication, processing, routing, performance, billing, etc.) issues which an existing telecommunication infrastructure, which may have originated during the days of voice-only landline communication and which may have evolved incrementally over time to handle aspects of wireless communication, may be incapable of handling and which, as a consequence of the resulting void, may impact or preclude the delivery of such products or services.

[0012] Aspects of the present invention fill the lacuna that was noted above by (1) providing enhanced interoperability (e.g., connectivity, communication, processing, routing, billing, etc.) capabilities through among other things an IP eXchange (IPX) facility that among other things may offer a simple, consolidated, etc. interface mechanism and which may leverage various pools of data (e.g., routing data, location and presence data, MS profile data, Quality of Service [QoS] constraints, security

constraints, etc.) to expeditiously process and route a wide range of information (including conventional SMS, MMS, etc. messaging; Voice Over IP [VoIP] and other audio/video data streams; Session Initiation Protocol [SIP]-addressed artifacts; signaling data; voice call data; application data; etc.) while (2) addressing, in new and innovative ways, various of the not insubstantial challenges that are associated with same.

SUMMARY OF THE INVENTION

[0013] One embodiment of the present invention offers a server-based method for directing a quanta of data where (1) a quanta of data (having at least an originating address, a destination address, and a content) is received at a gateway, (2) a series of processing steps are completed including (a) creating an Internal Message Object (IMO) from at least aspects of the quanta of data, (b) characterizing aspects of the quanta of data including at least by type, and (c) completing a routing operation, using at least a lookup facility and aspects of the destination address, to identify a delivery route, and (3) selecting aspects of the IMO for dispatch via the delivery route.

[0014] Another embodiment of the present invention offers a processor-based system for directing a quanta of data including (1) a gateway at which a quanta of data (having at least an originating address, a destination address, and a content) is received, (2) workflow modules for completing a series of processing steps including (a) creating an IMO from at least aspects of the quanta of data, (b) characterizing aspects of the quanta of data including at least by type, and (c) completing a routing

operation, using at least a lookup facility and aspects of the destination address, to identify a delivery route, (3) a gateway at which selected aspects of the IMO are dispatched via the delivery route, (4) a repository in which various of the processing step results are preserved, and (5) an administrator.

[0015] These and other features of the embodiments of the present invention, along with their attendant advantages, will be more fully appreciated upon a reading of the following detailed description in conjunction with the associated drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings, which are incorporated herein and form part of the specification, depict embodiments of the present invention and, together with the summary that was presented above and the description that may be found below, further serve to illustrate inter alia the principles, structure, and operation of such embodiments. It will be readily apparent to one of ordinary skill in the relevant art that numerous variations, modifications, alternative forms, etc. of the depicted embodiments are easily possible and indeed are within the scope of the present invention.

[0017] Figure 1 is a diagrammatic presentation of an exemplary Messaging Inter-Carrier Vendor (MICV).

[0018] Figure 2 illustrates various implementation aspects of an exemplary MICV.

[0019] Figure 3 illustrates various implementation aspects of an exemplary MICV Data Processing Engine (DPE).

- [0020] Figure 4 illustrates aspects of an exemplary incoming SMS message received via an IP-based protocol.
- [0021] Figure 5 illustrates aspects of an exemplary incoming SMS message received via Signaling System Number 7 (SS7).
- [0022] Figure 6 illustrates aspects of a hypothetical Internal Message Object (IMO) that is possible in connection with an SMS message received via an IP-based protocol.
- [0023] Figure 7 illustrates aspects of a hypothetical IMO that is possible in connection with an SMS message received via SS7.
- [0024] Figure 8 illustrates a hypothetical Feature Tag that is possible under aspects of the instant invention.
- [0025] Figure 9 is a diagrammatic presentation of the three logical IMS planes.
- [0026] Figure 10 illustrates exemplary logical connections of multiple carriers that is possible under aspects of the instant invention.
- [0027] Figure 11 is a diagrammatic presentation of the virtual implementation of the three logical IMS planes within aspects of the present invention.
- [0028] Figure 12 depicts various of the elements that might be found in an exemplary IPX environment.
- [0029] Figure 13 illustrates aspects of an exemplary IMO.
- [0030] Figure 14 illustrates aspects of an exemplary address resolution facility.
- [0031] Figure 15 illustrates elements of an exemplary data model that is supportive of various of the location aspects of the present invention.
- [0032] Figure 16 depicts the hypothetical contents of an exemplary data model.

- [0033] Figure 17 illustrates an exemplary Pricing Scheme (PS).
- [0034] Figure 18 illustrates an exemplary Contract Scheme (CS).
- [0035] Figure 19 depicts an exemplary Universal Rating Engine (URE).
- [0036] Figure 20 illustrates aspects of an exemplary IMO.
- [0037] Figure 21 illustrates one particular IMS-centric arrangement that is possible through aspects of the present invention.
- [0038] Figures 22a through 22f illustrate several of the exchanges or interactions that may be possible through aspects of the present invention.
- [0039] Figures 23 and 24 illustrate aspects of a Java-based OSGi dynamic component model.
- [0040] Figure 25 illustrates various of the exchanges or interactions that may take place during an exchange of signaling data under aspects of the present invention.
- [0041] Figure 26 illustrates various of the exchanges or interactions that may take place during the sending of an SMS message under aspects of the present invention.
- [0042] Figure 27 illustrates various of the exchanges or interactions that may take place during the receipt of a voice telephone call under aspects of the present invention.
- [0043] Figure 28 depicts an exemplary computer system through which embodiments of aspects of the present invention may be implemented.
- [0044] Figure 29 depicts some of the logical elements of a processing and routing layer that may be possible through aspects of the present invention.
- [0045] Figure 30 illustrates how aspects of a routing layer might be physically realized under one particular implementation approach.

[0046] Figure 31 depicts aspects of an exemplary IMO.

[0047] Figure 32 depicts various of the activities that may take place under a Processing, Routing, and Switching (PRS) layer that is possible through aspects of the present invention.

[0048] The present invention will now be described with reference to the accompanying drawings. In the drawings, generally, like reference numbers indicate identical or functionally similar elements. Additionally, generally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

DETAILED DESCRIPTION

[0049] The following detailed description of the present invention refers to the accompanying drawings that illustrate exemplary embodiments consistent with this invention. Other embodiments are possible, and modifications can be made to the embodiments within the spirit and scope of the invention. Therefore, the detailed description is not meant to limit the invention.

[0050] Note that in this description references to "one embodiment" or "an embodiment" mean that the feature being referred to is included in at least one embodiment of the present invention. Further, separate references to "one embodiment" in this description do not necessarily refer to the same embodiment; however, neither are such embodiments mutually exclusive, unless so stated and except as will be readily apparent to those skilled in the art.

[0051] In the discussion below aspects of IPX are described and illustrated as residing within a centrally-located, full-featured MICV facility. Reference is made to U.S. Patent No. 7,154,901 entitled “INTERMEDIARY NETWORK SYSTEM AND METHOD FOR FACILITATING MESSAGE EXCHANGE BETWEEN WIRELESS NETWORKS,” and its associated continuations, for a discussion of the concept of a MICV, a summary of various of the services/functions/etc. that may be performed by a MICV, and a discussion of the numerous advantages that may arise from same.

[0052] In the discussion below aspects of IPX are described and illustrated as being offered by a Service Provider (SP). A SP may, for example, be realized through any combination of, possibly inter alia, any one or more of (1) an element of a WC, an element of a landline carrier, an element of a MICV, or multiple such elements working together; (2) a Third-Party (3P) such as possibly inter alia a merchant, a Content Provider (CP, such as for example a news organization, an advertising agency, a brand, etc.), or a financial institution; (3) multiple 3P entities working together; (4) a 3P service bureau; etc.

[0053] As illustrated in Figure 1 and reference numeral 100, under one particular arrangement a MICV 120 is disposed between, possibly inter alia, multiple WCs (WC1 114, WC2 116 → WCx 118) and multiple SPs (SP1 122 → SPy 124) and thus ‘bridges’ all of the connected entities. A MICV 120 thus, as one simple example, may offer various routing, formatting, delivery, value-add, etc. capabilities that provide, possibly inter alia:

[0054] 1) A WC 114 → 118 (and, by extension, all of the MSs 102 → 104, 106 → 108, 110 → 112 that are serviced by the WC 114 → 118) with ubiquitous access to

a broad universe of SPs 122 → 124 (and other entities that may be connected to the MICV), and

[0055] 2) A SP 122 → 124 (and other entities that may be connected to the MICV) with ubiquitous access to a broad universe of WCs 114 → 118 (and, by extension, to all of the MSs 102 → 104, 106 → 108, 110 → 112 that are serviced by the WCs 114 → 118).

[0056] Generally speaking a MICV may have varying degrees of visibility (e.g., access, etc.) to the (MS ↔ MS, MS ↔ SP, etc.) messaging traffic:

[0057] 1) A WC may elect to route just their out-of-network messaging, signaling, data, etc. traffic to a MICV. Under this approach the MICV would have visibility (e.g., access, etc.) to just the portion of the WC's traffic that was directed to the MICV by the WC.

[0058] 2) A WC may elect to route all of their messaging, signaling, data, etc. traffic to a MICV. The MICV may, possibly among other things, subsequently return to the WC that portion of the traffic that belongs to (i.e., that is destined for a MS of) the WC. Under this approach the MICV would have visibility (e.g., access, etc.) to all of the WC's traffic.

[0059] For purposes of illustration, Figure 2 and reference numeral 200 depict a possible logical implementation of aspects of a MICV 202 under one particular arrangement. The figures depict among other things Gateways (208 and 214 that for example provide information/data receipt and dispatch capabilities across possibly inter alia different application-level communication protocols), Queues (210 and 212 that for example provide interim storage and buffering capabilities), a Data Highway

(DH 220, that for example provides interconnection capabilities), and DPEs 222 → 224.

[0060] Figure 3 and reference numeral 300 depict a possible logical implementation of aspects of a DPE 302. A DPE may contain several key components – Receivers (Rx1 304 → Rxa 314 in the diagram), Queues (Q1 306 → Qb 316 and Q1 310 → Qd 320 in the diagram), WorkFlows (WorkFlow1 308 → WorkFlowc 318 in the diagram), Transmitters (Tx1 312 → Txe 322 in the diagram), and an Administrator 326. It will be readily apparent to one of ordinary skill in the relevant art that numerous other components are possible within a DPE.

[0061] A dynamically updateable set of one or more Receivers (Rx1 304 → Rxa 314 in the diagram) ‘get’ messages from a MICV DH and deposit them on an intermediate or temporary Queue (Q1 306 → Qb 316 in the diagram) for subsequent processing.

[0062] A dynamically updateable set of one or more Queues (Q1 306 → Qb 316 and Q1 310 → Qd 320 in the diagram) operate as intermediate or temporary buffers for incoming and outgoing messages.

[0063] A dynamically updateable set of one or more WorkFlows (WorkFlow1 308 → WorkFlowc 318 in the diagram) remove incoming messages from an intermediate or temporary Queue (Q1 306 → Qb 316 in the diagram), perform all of the required operations on the messages, and deposit the processed messages on an intermediate or temporary Queue (Q1 310 → Qd 320 in the diagram). The WorkFlow component will be described more fully below.

[0064] A dynamically updateable set of one or more Transmitters (Tx1 312 → Txe 322 in the diagram) remove processed messages from an intermediate or temporary Queue (Q1 310 → Qd 320 in the diagram) and ‘put’ the messages on a MICV DH.

[0065] An Administrative Engine 324 provides a linkage to all of the different components of a DPE so that a DPE, along with all of the different components of a DPE, may be fully and completely administered or managed 326.

[0066] While portions of the discussion below will reference a MICV, it will be readily apparent to one of ordinary skill in the relevant art that numerous other arrangements are equally possible and indeed are fully within the scope of the present invention.

[0067] Under one possible implementation paradigm aspects of an IPX environment may be physically realized through the Java-based OSGi dynamic component model (see for example Figure 23). Under such an approach various of the aspects of the present invention may be realized through possibly inter alia one or more of the following components (see for example Figure 24):

[0068] 1) Process Bundle – e.g., an executable entity that supports some processing activity such as inter alia routing, billing, reporting, etc.

[0069] 2) Service Bundle – e.g., an aggregation of application-level services that may be realized (implemented) through other bundles.

[0070] 3) Object Bundle – e.g., a set of Java classes that may be accessed or leveraged by other bundles.

[0071] 4) System Bundle – e.g., a collection that offers core or key services.

[0072] Under different implementation paradigms the ‘boundary’ between various IPX components may be realized through possibly inter alia queues (e.g., in-memory, via disk drives, etc.), through shared memory regions, through files, through application-level communication protocols, etc. and information may be passed across such boundaries as possibly inter alia proprietary data structures, Java Message Service (JMS) messages or objects, etc.

[0073] In portions of the discussion below reference is made to a message (a quanta of data such as for example and inter alia an SMS message, a MMS message, a portion of a voice telephone call, signaling data, application data, a portion of a video stream, a portion of an audio stream, etc.) that is sent, for example, between a MS and a SP. As set forth below, a given message sent between a MS and a SP may actually comprise a series of steps in which the message is received, forwarded and routed between different entities, including possibly inter alia a MS, a WC, a MICV, and a SP. Thus, unless otherwise indicated, it will be understood that reference to a particular message generally includes that particular message as conveyed at any stage between an origination source, such as for example a MS, and an end receiver, such as for example a SP. As such, reference to a particular message generally includes a series of related communications between, for example, a MS and a WC; a WC and a MICV; a MICV and a SP; etc. The series of related communications may, in general, contain substantially the same information, or information may be added or subtracted in different communications that nevertheless may be generally referred to as a same message. To aid in clarity, a particular message, whether undergoing

changes or not, is referred to by different reference numbers at different stages between a source and an endpoint of the message.

[0074] Aspects of IPX may 'plug into' different layers/levels of legacy, current, and/or future technology and among other things may for example facilitate interoperation between such technologies.

[0075] For example, from a traditional messaging context an entity (such as for example a WC, a 3P such as a CP, etc.) may direct their Short Message Service Center (SMSC) complexes, their Multimedia Message Service Center (MMSC) complexes, etc. to connect to a single, simple, consolidated, etc. interface mechanism that is exposed by an IPX environment and subsequently seamlessly exchange message traffic.

[0076] For example, from a traditional wireless context an entity (such as for a WC, etc.) may direct aspects of their infrastructure to connect to a single, simple, consolidated, etc. interface mechanism that is exposed by an IPX environment and subsequently seamlessly exchange SS7-based and/or IP-based signaling data, General Packet Radio Service (GPRS) Roaming Exchange (GRX) data, location and presence data, etc.

[0077] For example, from an IMS context:

[0078] 1) Figure 9 and reference numeral 900 illustrate IMS' three logical planes:

[0079] a) Services Plane 902. For example, one or more Application Server (AS) instances 904, Billing facilities 906, Reporting facilities 908, etc.

- [0080] b) Control Plane 910. For example, a Home Subscriber Server (HSS) capability 912, a Call Session Control Function (CSCF) capability 914, one or more Media Gateway (MG) instances 916, etc.
- [0081] c) Network or Transport Plane 918. Support, interfaces, etc. for, possibly inter alia, VoIP 920, WiFi 922, Public Land Mobile Network (PLMN) 924, Public Switched Telephone Network (PSTN) 926, etc.
- [0082] 2) Figure 10 and reference numeral 1000 depict how the different functional elements of an entity (e.g., carriers such as Ca 1002 → Cz 1010, 3Ps such as CPs and others, etc.) within an IPX ecosystem may plug in to IPX's single access/connection point 1032 – e.g., elements of carrier Ca's 1002 Control Plane and Network or Transport Plane may plug in to IPX's single access/connection point 1018 → 1020, elements of carrier Cb's 1004 Services Plane may plug into IPX's single access/connection point 1022. Similar access points may be realized at 1024 → 1030.
- [0083] 3) Figure 11 and reference numeral 1100 illustrate how the single access/connection point 1104 serves much like a façade, behind which connected entities (e.g., carriers such as Ca → Cz 1102, 3Ps such as CPs and others, etc.) may access one or more of the virtual implementations of IPX's logical planes 1106 → 1110.
- [0084] Thus, for example, as a carrier's environment grows and changes, as a carrier's business needs and models change and evolve, as a carrier deploys new service offerings, etc. it can, possibly among other things, plug into (and thus take advantage of the features and functions that are offered by) different combinations of

the virtual implementations of IPX's logical planes all through the single access/communication point.

[0085] Additionally, placing the virtual planes behind a single façade allows for, possibly among other things, ongoing and dynamic changes, updates, etc. to the physical implementation of a plane without any impact on, or interruptions to, any of the connected entities.

[0086] 4) Figure 21 and reference numeral 2100 depict one particular IMS-centric arrangement that is possible through aspects of the present invention -- Networks A 2102, B 2106, and C 2110 represent hypothetical IMS-enabled or IMS-capable carriers; Network D 2112 represents a hypothetical non-IMS-enabled carrier that offers, possibly inter alia, MMS services; and Network E 2108 represents a hypothetical fixed (e.g., landline) carrier that offers, possibly inter alia, Digital Subscriber Line (DSL) services. IPX 2104 may among other things tie together the different (disparate, natively incompatible, etc.) environments. The depicted arrangement is illustrative only and it will be readily apparent to one of ordinary skill in the relevant art that numerous other arrangements are easily possible and indeed are fully within the scope of the present invention.

[0087] Central to the operation of IPX is the unit of information within IPX that is received, manipulated or otherwise operated on, dispatched, etc. Unlike prior environments that might operate just on, and thus potentially be limited just to, an SMS message or a MMS message, the unit of information within IPX is a more general quanta of data. Accordingly IPX is natively capable of operating on inter alia an SMS message, a MMS message, an IMS message, an E-Mail message, a VoIP data

stream, a video data stream [e.g., a movie, a video conference call, etc.], a voice telephone call, signaling and other command-and-control data, an audio data stream [e.g., a song, etc.], IM data, games and other software applications, pictures and other static images, data from software applications such as games, etc.

[0088] Within IPX a flexible, extensible, and dynamically configurable IMO (see for example Figure 13 and Figure 20) may be employed as an internal representation of a received quanta of data. An IMO (1302 and 2004) may logically contain possibly inter alia one or more headers (1304 and 2006), a body (1312 and 2008), etc. within which for example aspects of a received quanta of data may be preserved (1306 → 1310 and 2010 → 2012). An IMO may physically be realized through any combination of possibly inter alia proprietary data structures, JMS messages or objects, flat files, database entries, in-memory constructs, etc.

[0089] For purposes of illustration, within an SMS context IPX may support the receipt and dispatch of information through possibly inter alia Short Message Peer-to-Peer (SMPP) via Transmission Control Protocol (TCP)/IP and Mobile Application Part (MAP) via SS7. Under such a context:

[0090] 1) Figure 4 and reference numeral 400 depict an exemplary incoming SMS message received via for example SMPP with for example the data elements associated with the SMS message 428 → 436 encapsulated within a SMPP Protocol Data Unit (PDU 422) encapsulated within a TCP Segment 412 encapsulated within an IP Packet 402.

[0091] 2) Figure 5 and reference numeral 500 depict an exemplary incoming SMS message received via for example MAP with for example the data elements

associated with the SMS message encapsulated within a Message Signal Unit (MSU 502)

[0092] 3) Figure 6 and reference numeral 600 depict a hypothetical IMO that is possible in support of an SMS message received via for example SMPP, and

[0093] 4) Figure 7 and reference numeral 700 depict a hypothetical IMO that is possible in support of an SMS message received via for example MAP.

[0094] It will be readily apparent to one of ordinary skill in the art that numerous alternative arrangements, in connection with for example different contexts (such as inter alia MMS, VoIP, a voice call, signaling data, application data, etc.) and different communication protocols, are easily possible.

[0095] IPX includes among other elements a vertically and horizontally scalable Protocol Engine (PE) layer (see for example reference point 1220 in Figure 12) through which information may be received and/or transmitted using any combination of one or more of the supported communication protocols including inter alia SS7, TCP/IP, User Datagram Protocol (UDP)/IP, Really Simple Syndication (RSS), SMPP, Simple Mail Transfer Protocol (SMTP), HyperText Transfer Protocol (HTTP), Extensible Messaging and Presence Protocol (XMPP), MM4, MM7, SIP, GRX, etc.

[0096] A PE layer may house a dynamically updateable set of one or more PEs (PE1 1224 → PEn 1230 in the Figure 12). A PE may, for example, leverage a body of flexible, extensible, and dynamically updateable configuration information as it completes its tasks, including possibly inter alia:

- [0097] A) Receiving incoming and sending outgoing traffic using any combination of the supported communication protocols, paradigms, etc.
- [0098] B) Performing various extraction, validation, editing, formatting, conversion, etc. operations on the elements of an incoming and/or outgoing data stream – e.g., source address, destination address, encoding indicators or flags, payload or body, etc. The specific elements that were just described are illustrative only and it will be readily apparent to one of ordinary skill in the relevant art that numerous other elements are easily possible and indeed are fully within the scope of the present invention.
- [0099] C) Encapsulating various elements of an incoming data stream within an IMO and/or un-encapsulating various elements of an outgoing data stream from an IMO.
- [00100] The catalog of PE processing steps that was described above is illustrative only and it will be readily apparent to one of ordinary skill in the relevant art that numerous other processing steps are easily possible and indeed are fully within the scope of the present invention.
- [00101] A PE layer may be quickly and easily scaled either vertically (to for example add additional capacity in response to increases in demand [e.g., message volume]), horizontally (to for example add support for a new application-level communication protocol), or both.
- [00102] IPX includes among other elements a flexible, extensible, and dynamically configurable WorkFlow-based PRS layer (see reference numeral 1232 in Figure 12 along with Figure 29 and reference numeral 2900). The WorkFlow elements of the PRS layer may be ‘glued’ together by a Message Routing Language (MRL, a full-

featured scripting language that is based in part on the disclosures found in U.S.

Patent No. 6,735,586 entitled “System and Method for Dynamic Content Retrieval”

and U.S. Patent No. 7,240,067 entitled “System and Methodology for Extraction and Aggregation of Data from Dynamic Content”) and may support among other things:

[00103] 1) Processing. For example, the automatic and dynamic determination of the type of content (e.g., an SMS message, a VoIP data stream, a voice telephone call, signaling data, etc.) in a received quanta of data and the preservation of same in for example an IMO; content transcoding operations; billing activities (including possibly pricing/rating events); data logging and collection in support of reporting; the generation of a Feature Tag; etc.

[00104] 2) Routing. For example, the authoritative resolution of destination and/or source addresses; the examination of available routes and the application of various criteria (possibly including for example MS WD location information, least cost routing rules, MS profile and preference information, route loadings, aspects of a Feature Tag, attributes of a received quanta of data [e.g., data type, size, etc.], QoS constraints, billing and revenue constraints, etc.) to available routes to arrive at a specific route selection; etc.

[00105] 3) Switching. For example, directing (switching) based on a selected route data to an appropriate outbound delivery channel (see for example reference number 1234 in Figure 12).

[00106] The catalog of activities that was described above is illustrative only and it will be readily apparent to one of ordinary skill in the relevant art that numerous other

activities are easily possible and indeed are fully within the scope of the present invention.

[00107] The billing activities within the Processing portion of a PRS layer may make use of a PS. A PS is a self-contained framework for capturing all of the particulars associated with cost and may include, possibly among other things, elements such as:

[00108] 1) Descriptive Information. A range of descriptive or identifying information that may include, possibly inter alia, a unique identifier, a description (that may be displayed, that may be conveyed to an Operator for inclusion in a line-item on a MS monthly statement, etc.), effective dates/times, etc.

[00109] 2) Interval. The starting point (e.g., the first of each month) and the duration (e.g., one calendar month) of the interval or cycle during which cost is accumulated.

[00110] 3) Pre Amounts. Zero, one, or more fixed (e.g., \$5.00) or variable (e.g., \$0.05 times the number of items processed) amounts that contribute to an interval's overall or aggregate cost amount. A Pre Amount may be either a charge (a positive amount) or a discount (a negative amount) and may include, possibly inter alia, set-up fees, monthly service charges, etc.

[00111] 4) Base Amount. The particulars that are applied to each event to rate, or determine the cost of, an event. Numerous plans or models are available to select from, including inter alia Static – Flat Rate – Basic (e.g., a single, fixed price), Static – Flat Rate – Tiered (e.g., price is derived from, inter alia, volume through defined thresholds or plateaus), etc. It is important to note that the preceding catalog of plans is illustrative only; it will be readily apparent to one of ordinary skill in the relevant art that other plans may be easily added.

[00112] 5) Post Amounts. Zero, one, or more fixed (e.g., \$1.00) or variable (e.g., 2% of the aggregate interval cost) amounts that contribute to an interval's overall or aggregate cost. A Post Amount may be either a charge (a positive amount) or a discount (a negative amount).

[00113] For purposes of illustration, consider the hypothetical PS 1702 that is illustrated in Figure 17 (and reference number 1700) which includes three (3) Pre Amounts (1706 → 1710), one (1) Base Amount 1712, and two (2) Post Amounts (1714 → 1716).

[00114] It should be noted that the specific PS that was just presented is illustrative only. It will be readily apparent to one of ordinary skill in the relevant art that the inclusion of different elements and/or alternative arrangements of the elements are easily possible.

[00115] One or more PSs may be associated with a Contract. A Contract may contain, possibly inter alia, descriptive information (e.g., a unique identifier, a description, etc.), all applicable terms and conditions (e.g., including support for one or more levels of optional taxation by, possibly inter alia, geography, national entity, etc.), etc.

[00116] One or more Contracts may be associated with an Operator, Merchant, etc. through a CS. For purposes of illustration consider the hypothetical CS 1800 that is presented in Figure 18. The depicted CS 1800 employs a flexible and extensible ontology that easily supports multiple contracts (1806, 1814, 1816) per Operator/Merchant/etc 1802. A contract may include a Pricing Scheme1 -> Pricing Schemen (1808, 1810, 1812). Descriptive material may also be associated with a given Operator/Merchant 1802.

[00117] The billing activities within the PRS layer may also make use of a URE. As illustrated in Figure 19 and reference numeral 1900 a hypothetical URE 1904 may accept as input a raw (or unrated) event 1902; leverage a pool of flexible, extensible, and dynamically configurable definitional 1908 → 1910 and configuration 1912 information; and produce as output a processed (or rated) event 1906.

[00118] The different billing activities may yield among other things a billing transaction. A billing transaction may take any number of forms and may involve different external entities (e.g., a carrier billing system, a carrier billing system service bureau, a credit or debit card clearinghouse, a financial institution, etc.). A billing transaction may include, possibly inter alia:

[00119] 1) The appearance of a line item charge on the bill or statement that a MS receives from her WC.

[00120] 2) The charging of a credit card or the debiting of a debit card.

[00121] 3) The (electronic, etc.) transfer of funds.

[00122] 4) The generation of an invoice, statement, etc.

[00123] The Processing portion of a PRS layer may optionally generate, and possibly preserve in for example an IMO, one or more Feature Tags. A Feature Tag (see Figure 8 and reference numeral 802) is effectively a compact digest of key data elements, thus providing inter alia a representation of or an alias for or a 'fingerprint' of those data elements, and may be based on possibly inter alia (a) attributes of a received quanta of data (e.g., data type, size, etc.), (b) routing and switching attributes (e.g., a selected route, the current loading on that route, QoS and other Service Level Agreement [SLA] requirements, etc.), (c) MS and/or WD characteristics, preferences,

etc. (such as for example time-of-day, day-of-week, or other ‘follow me’ directives; defined contact or delivery windows and quiet [no contact] periods; physical location; etc.), (d) billing attributes, etc. Once generated, a Feature Tag may be quickly referenced by other elements of an IPX environment as those elements complete their processing activities. (See for example U.S. Patent No. 7,240,067 entitled “System and Methodology for Extraction and Aggregation of Data from Dynamic Content” and pending U.S. Patent Application Serial No. 12/140,478 entitled “System and Method for Enhanced Message Routing” for a discussion of aspects of a Feature Tag). Feature Tags will be discussed further below.

[00124] The Routing portion of a PRS layer may support, and may include as it makes a route determination, among other things information on the current physical location of a MS’ WD (as received for example from possibly inter alia the WC that services the WD). For purposes of illustration, a portion of an exemplary data model is illustrated in Figure 15 and hypothetical contents of such a data model are presented in Figure 16.

[00125] The Routing portion of a PRS layer may also leverage a comprehensive, flexible, scalable, etc. lookup facility (indicated, albeit at a very high level, as Routing Data 1264 in Figure 12) to support, possibly inter alia, its routing operations. Such a lookup facility may provide authoritative answers to inquiries like “At this moment in time what carrier services the Telephone Number (TN) 1-703-555-1212?”, “What entity services the SIP addresssip:john.doe@bigcompany.com?”, etc. Among other things such a lookup facility may address (1) the complexities that are associated with all of the different TN numbering plans, schemes, etc. that exist around the world; (2)

the complexities that arise with worldwide Mobile Number Portability (MNP) regimes; etc. A more detailed depiction of such a lookup facility is presented in Figure 14 and reference numeral 1400. Such a lookup facility may consist of, possibly inter alia:

[00126] A) An Electronic Numbering (ENUM) façade 1410 through which possibly inter alia various PRSEs (E1 1402 → En 1408 in Figure 14) may connect, submit routing inquiries, receive routing responses, etc.

[00127] B) A dynamically updateable set of one or more In-Memory Databases (In-Memory Database1 1412 → In-Memory Databases 1414 in the diagram) that optionally house or host selected data (including, possibly inter alia, data from a Composite Routing Database [CRD] 1416) to provide, as one example, optimal performance.

[00128] C) A Real-Time Query Facility (RTQF) 1422 through which inquiries may be dispatched real-time to authoritative bodies (such as, for example, TN assignment administrators) around the world. A RTQF 1422 may support multiple communication channels, paradigms, protocols, etc. (such as, possibly inter alia, SS7 1424, TCP/IP 1426, UDP/IP, SMPP 1428, etc.).

[00129] D) A CRD 1416 containing comprehensive routing information for, possibly inter alia, TNs within all of the different TN numbering plans, schemes, etc. that exist around the world. A CRD 1416 may receive updates (e.g., dynamically, on a scheduled basis, etc.) from any number of sources or feeds including, possibly inter alia, domestic 1418 (such as, for example, from a Local Exchange Routing Guide [LERG], from one or more Number Portability Administration Centers [NPACs],

etc.) and international 1420 (such as, for example, from Hong Kong, from the United Kingdom, etc.).

[00130] A lookup facility as described above may support a wide range of address types including among others a TN (such as 703-555-1234), a Short Code (SC, such as 46625), a SIP Uniform Resource Identifier (URI, such as sip:mark@mydomain.com), a Tel URI (such as tel:+19257652333), a Uniform Resource Locator (URL), etc.

[00131] The Routing portion of a PRS layer may during various of its activities combine, compare, etc. one or more Feature Tags with inter alia a range of supporting data. For example, for each supported WC a number of delivery routes may be defined based on various criteria such as for example service (SMS, MMS, IMS, IM, etc.), WC preferences, infrastructure needs, etc. One or more Feature Tags may be combined, merged, etc. with such supporting data to possibly inter alia generate a routing plan and then select from a routing plan a specific delivery route.

[00132] The Routing portion of a PRS layer may be physically realized through any number of technologies, arrangements, etc. As just one example, Figure 30 and reference numeral 3000 illustrate how aspects of the Routing portion of a PRS layer might be realized using a Java-based OSGi dynamic component model (see for example paragraphs 66 → 71 above).

[00133] The Routing portion of a PRS layer may leverage various Virtual Routing and Forwarding (VRF) capabilities where possibly inter alia collections of delivery channels, processing capabilities, bandwidth, routing data, etc. may be flexibly and dynamically allocated (and optionally monitored and adjusted as needed) and

assigned by for example content type (e.g., an SMS message containing simple text; pictures and other static images; songs and other quanta of audio data; movies, streaming video, and other quanta of video data; games and other software applications; etc.) to among other things meet different (operational, financial, etc.) requirements, QoS constraints, SLA requirements, security constraints, etc.

[00134] For purposes of illustration, the flowchart that is presented in Figure 32 depicts various of the activities that may take place under a hypothetical PRS layer that is possible through aspects of the present invention.

[00135] The Databases 1262, 1264, 1272 → 1276, 1282 → 1286 that are depicted in Figure 12 are a logical representation of the possibly multiple physical repositories that may be implemented to support, inter alia, configuration, routing, profile, monitoring, logging, reporting, etc. information. The physical repositories may be implemented through any combination of conventional Relational Database Management Systems (RDBMSs), through Object Database Management Systems (ODBMSs), through in-memory Database Management Systems (DBMSs), or through any other equivalent facilities.

[00136] The Administrator 1290 that is depicted in Figure 12 provides management or administrative control over all of the different components of an environment through, as one example, a World Wide Web (WWW)-based interface. It will be readily apparent to one of ordinary skill in the relevant art that numerous other interfaces (e.g., a data feed, an Application Programming Interface [API], etc.) are easily possible.

- [00137] As noted above, a Feature Tag is effectively a compact digest of key data elements, thus providing inter alia a representation of or an alias for or a 'fingerprint' of those data elements.
- [00138] Feature Tags may follow an organized naming scheme and the naming scheme may incorporate an encoding model (e.g., the name 'SIP-PSI' might indicate a SIP message that has a Person endpoint, is of type SIP SIMPLE, and has an Indeterminate or unknown domain), may be organized in any number of ways (including for example alphabetically, nested, hierarchically, etc.), and may be searched or matched against in numerous ways (including for example sequentially, through wildcards, etc.).
- [00139] For purposes of illustration, consider a simple Feature Tag model that is designed to support the processing, routing, etc. of SMS messages. Under such a model a hypothetical Feature Tag might be SP0TDTPMAAb and consist of:
- [00140] 1) A message type indicator. For example, 'S' for SMS.
- [00141] 2) A content type indicator. For example, 'P' for plain text, 'B' for binary data, etc.
- [00142] 3) A version number. For example, 0, 1, 2, etc. to allow for possibly inter alia future expansion, backwards compatibility, etc.
- [00143] 4) An originating address identifier. For example, 'T' for telephone number, 'S' for SC, etc.
- [00144] 5) An originating entity identifier. For example, 'U' for unknown, 'D' for a WC that is reachable directly, 'P' for a WC that is reachable indirectly through for example a peering partner, etc.

- [00145] 6) A destination address identifier. For example, 'T' for telephone number, 'S' for SC, etc.
- [00146] 7) A destination entity identifier. For example, 'U' for unknown, 'D' for a WC that is reachable directly, 'P' for a WC that is reachable indirectly through for example a peering partner, etc.
- [00147] 8) A content size indicator. For example, 'S' for small, 'M' for medium, 'L' for large, etc.
- [00148] 9) A spam assessment indicator. For example, 'A' for no spam found, 'Z' for spam found, etc.
- [00149] 10) An advertising assessment indicator. For example, 'A' for no advertising found, 'Z' for advertising found, etc.
- [00150] 11) A size indicator. For example, '9' for a total size of 9, 'b' for a total size of 11, 'h' for a total size of 17, etc.
- [00151] It will be readily apparent to one of ordinary skill in the relevant art that numerous other arrangements are possible within the illustrative model that was presented above. As one example, the originating entity portion and the destination entity portion of the above Feature Tag model might be extended to include:
- [00152] 5a) A three-character originating entity, route, etc. identifier. For example, '03a,' 'F2P,' '3eZ,' etc.
- [00153] 7a) A three-character destination entity, route, etc. identifier. For example, '29g,' 'G2Q,' 'J8k,' etc.
- [00154] where a hypothetical Feature Tag might be SP3TD3eZTPJ8kMAAh.

[00155] As another example, to support the processing, routing, etc. of MMS messages the message type indicator could be extended to include 'M' for MMS; the content type indicator could be extended to include different media types (such as 'I' for image, 'V' for video, 'A' for audio, etc.); the originating address identifier and the destination address identifier could be extended to include different address types (such as 'E' for E-Mail, etc.); etc.

[00156] It will be readily apparent to one of ordinary skill in the relevant art that the inherently flexible, extensible, etc. nature of a Feature Tag makes it easily possible to support any number of constructs. Two of many possible examples include:

[00157] 1) A content type indicator of 'D' might be employed for signaling data and other content type indicators might be employed for other forms of data (such as inter alia application data).

[00158] 2) A message type indicator of 'V' might be employed for an aspect of a voice telephone call.

[00159] Figure 31 depicts aspects of several illustrative Feature Tags (e.g., SIP-PSI → AGT-S → RCP-FR → TXT-NN1-001) under another Feature Tag model that is possible through aspects of the present invention.

[00160] It will be readily apparent to one of ordinary skill in the relevant art that numerous other Feature Tag models, beyond the illustrative models that were presented above, are easily possible.

[00161] As noted previously, a collection of Feature Tags may optionally be organized in any number of ways including inter alia hierarchically, in a nested fashion, alphabetically, by size, etc.

[00162] Aspects of the processing, searching, matching, etc. of Feature Tags may optionally employ wild card characters. For purposes of illustration, under the illustrative Feature Tag model that was presented above with the hypothetical Feature Tag SP0TDTPMAAb any number of searches, comparisons, etc. may be quickly completed using wild cards:

[00163] 1) SP*. Just plain text SMS messages.

[00164] 2) S?0*. Just version 0 Feature Tags.

[00165] 3) S???D?D*. Just SMS messages that were received from a WC that is reachable directly and that were delivered to a WC that is reachable directly.

[00166] 4) Etc.

[00167] It will be readily apparent to one of ordinary skill in the relevant art that numerous other Feature Tag processing, searching, matching, etc. mechanisms are easily possible including inter alia regular expressions, formal grammars, etc.

[00168] Beyond the Processing portion of a PRS layer, the other portions of a PRS layer (i.e., the Routing portion and the Switching portion) may as they complete various of their operations update one or more existing Feature Tags and/or generate, and optionally preserve, one or more new Feature Tags. For example, as the Routing portion of a PRS layer completes an address resolution operation it may update one or more existing Feature Tags and/or generate one or more new Feature Tags.

[00169] An IPX environment may maintain one or more repositories (e.g., 1272 → 1276 and 1282 → 1286 in Figure 12) into which selected details of all administrative, analytical, processing, routing, etc. activities; Transaction Detail Records (TDRs); the

results of Extraction-Transformation-Load (ETL) operations; etc. may be recorded.

Among other things, such repositories may be used to support:

[00170] 1) Scheduled (e.g., daily, weekly, etc.) and/or on-demand reporting with report results delivered through SMS, MMS, etc. messages; through E-Mail; through a WWW-based facility; etc.

[00171] 2) Scheduled and/or on-demand data mining initiatives (possibly leveraging or otherwise incorporating one or more external data sources) with the results of same presented through Geographic Information Systems (GISs), visualization, etc. facilities and delivered through SMS, MMS, etc. messages; through E-Mail; through a WWW-based facility; etc.

[00172] With the above discussion having provided important background and context, Figures 25 through 27 illustrate several of the exchanges or interactions that may be possible within an IPX-based environment when:

[00173] 1) Mary, a hypothetical MS, travels outside of her home WC's network and switches on her WD (see Figure 25) ...

[00174] 2) ... sends an SMS message (see Figure 26) ...

[00175] 3) ... and then receives an incoming voice telephone call (see Figure 27).

[00176] To help further illustrate aspects of the present invention, Figures 22a → 22e depict aspects of an IPX environment (including inter alia a simple, consolidated, etc. interface mechanism) supporting a range of services, communication paradigms, etc. (including inter alia SMS messaging, the exchange of signaling data, MMS messaging, etc.) with Figure 22f presenting a single consolidated view.

[00177] Various aspects of the present invention can be implemented by software, firmware, hardware, or any combination thereof. Figure 28 illustrates an example computer system 2800 in which the present invention, or portions thereof, (such as described above under paragraphs 48-171) can be implemented as computer-readable code. Various embodiments of the invention are described in terms of this example computer system 2800. After reading this description, it will become apparent to a person skilled in the relevant art how to implement the invention using other computer systems and/or computer architectures.

[00178] Computer system 2800 includes one or more processors, such as processor 2804. Processor 2804 can be a special purpose processor or a general purpose processor. Processor 2804 is connected to a communication infrastructure 2802 (for example, a bus or a network).

[00179] Computer system 2800 also includes a main memory 2806, preferably Random Access Memory (RAM), containing possibly inter alia computer software and/or data 2808.

[00180] Computer system 2800 may also include a secondary memory 2810. Secondary memory 2810 may include, for example, a hard disk drive 2812, a removable storage drive 2814, a memory stick, etc. A removable storage drive 2814 may comprise a floppy disk drive, a magnetic tape drive, an optical disk drive, a flash memory, or the like. A removable storage drive 2814 reads from and/or writes to a removable storage unit 2816 in a well known manner. A removable storage unit 2816 may comprise a floppy disk, magnetic tape, optical disk, etc. which is read by and written to by removable storage drive 2814. As will be appreciated by persons skilled

in the relevant art(s) removable storage unit 2816 includes a computer usable storage medium 2818 having stored therein possibly inter alia computer software and/or data 2820.

[00181] In alternative implementations, secondary memory 2810 may include other similar means for allowing computer programs or other instructions to be loaded into computer system 2800. Such means may include, for example, a removable storage unit 2824 and an interface 2822. Examples of such means may include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an Erasable Programmable Read-Only Memory [EPROM], or Programmable Read-Only Memory [PROM]) and associated socket, and other removable storage units 2824 and interfaces 2822 which allow software and data to be transferred from the removable storage unit 2824 to computer system 2800.

[00182] Computer system 2800 may also include an input interface 2826 and a range of input devices 2828 such as, possibly inter alia, a keyboard, a mouse, etc.

[00183] Computer system 2800 may also include an output interface 2830 and a range of output devices 2832 such as, possibly inter alia, a display, one or more speakers, etc.

[00184] Computer system 2800 may also include a communications interface 2834. Communications interface 2834 allows software and/or data 2838 to be transferred between computer system 2800 and external devices. Communications interface 2834 may include a modem, a network interface (such as an Ethernet card), a communications port, a Personal Computer Memory Card International Association (PCMCIA) slot and card, or the like. Software and/or data 2838 transferred via

communications interface 2834 are in the form of signals 2836 which may be electronic, electromagnetic, optical, or other signals capable of being received by communications interface 2834. These signals 2836 are provided to communications interface 2834 via a communications path 2840. Communications path 2840 carries signals and may be implemented using wire or cable, fiber optics, a phone line, a cellular phone link, a Radio Frequency (RF) link or other communications channels.

[00185] As used in this document, the terms “computer program medium,” “computer usable medium,” and “computer readable medium” generally refer to media such as removable storage unit 2816, removable storage unit 2824, and a hard disk installed in hard disk drive 2812. Signals carried over communications path 2840 can also embody the logic described herein. Computer program medium and computer usable medium can also refer to memories, such as main memory 2806 and secondary memory 2810, which can be memory semiconductors (e.g. Dynamic Random Access Memory [DRAM] elements, etc.). These computer program products are means for providing software to computer system 2800.

[00186] Computer programs (also called computer control logic) are stored in main memory 2806 and/or secondary memory 2810. Computer programs may also be received via communications interface 2834. Such computer programs, when executed, enable computer system 2800 to implement the present invention as discussed herein. In particular, the computer programs, when executed, enable processor 704 to implement the processes of aspects of the present invention, such as the steps discussed above under paragraphs 48-174. Accordingly, such computer programs represent controllers of the computer system 2800. Where the invention is

implemented using software, the software may be stored in a computer program product and loaded into computer system 2800 using removable storage drive 2814, interface 2822, hard drive 2812 or communications interface 2834.

[00187] The invention is also directed to computer program products comprising software stored on any computer useable medium. Such software, when executed in one or more data processing devices, causes data processing device(s) to operate as described herein. Embodiments of the invention employ any computer useable or readable medium, known now or in the future. Examples of computer useable mediums include, but are not limited to, primary storage devices (e.g., any type of random access memory), secondary storage devices (e.g., hard drives, floppy disks, Compact Disc Read-Only Memory [CD-ROM] disks, Zip disks, tapes, magnetic storage devices, optical storage devices, Microelectromechanical Systems [MEMS], nanotechnological storage device, etc.), and communication mediums (e.g., wired and wireless communications networks, local area networks, wide area networks, intranets, etc.).

[00188] It is important to note that the hypothetical examples that were presented above, which were described in the narrative and which were illustrated in the accompanying figures, are exemplary only. They are not intended to be exhaustive or to limit the invention to the specific forms disclosed. It will be readily apparent to one of ordinary skill in the relevant art that numerous alternatives to the presented examples are easily possible and, indeed, are fully within the scope of the present invention.

[00189] The following list defines acronyms as used in this disclosure.

Acronym	Meaning
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A2P	Application-to-Peer
API	Application Programming Interface
AS	Application Server
CD-ROM	Compact Disc Read-Only Memory
CP	Content Provider
CRD	Composite Routing Database
CS	Contract Scheme
CSCF	Call Session Control Function
DBMS	Database Management System
DH	Data Highway
DPE	Data Processing Engine
DRAM	Dynamic Random Access Memory
DSL	Digital Subscriber Line
E-Mail	Electronic Mail
ENUM	Electronic Numbering
EPROM	Erasable Programmable Read-Only Memory
ETL	Extraction-Transformation-Load
GIS	Geographic Information System
GPRS	General Packet Radio Service
GRX	GPRS Roaming Exchange
HSS	Home Subscriber Server
HTTP	HyperText Transfer Protocol
IM	Instant Messaging
IMO	Internal Message Object
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPX	IP eXchange
JMS	Java Message Service
LERG	Local Exchange Routing Guide
MAP	Mobile Application Part
MEMS	Microelectromechanical Systems
MG	Media Gateway
MICV	Messaging Inter-Carrier Vendor
MMS	Multimedia Message Service
MMSC	Multimedia Message Service Center
MNP	Mobile Number Portability
MRL	Message Routing Language
MS	Mobile Subscriber
MSU	Message Signal Unit
NPAC	Number Portability Administration Center
ODBMS	Object Database Management System
P2P	Peer-to-Peer
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
PDU	Protocol Data Unit
PE	Protocol Engine
PLMN	Public Land Mobile Network
PROM	Programmable Read-Only Memory
PRS	Processing, Routing, and Switching
PS	Pricing Scheme
PSTN	Public Switched Telephone Network
QoS	Quality of Service

RAM	Random Access Memory
RDBMS	Relational Database Management System
RF	Radio Frequency
RSS	Really Simple Syndication
RTQF	Real-Time Query Facility
SC	Short Code
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SMPP	Short Message Peer to Peer
SMS	Short Message Service
SMSC	Short Message Service Center
SMTP	Simple Mail Transfer Protocol
SP	Service Provider
SS7	Signaling System Number 7
3P	Third Party
TCP	Transmission Control Protocol
TDR	Transaction Detail Record
TN	Telephone Number
UDP	User Datagram Protocol
URE	Universal Rating Engine
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
VoIP	Voice Over IP
VRF	Virtual Routing and Forwarding
WAP	Wireless Application Protocol
WC	Wireless Carrier
WD	Wireless Device
WWW	World Wide Web
XMPP	Extensible Messaging and Presence Protocol

What is claimed is:

1. Within an IP eXchange facility, a server-based method for directing a quanta of data, the server-based method comprising:

receiving the quanta of data at a gateway, the quanta of data comprising an originating address, a destination address, and a content;

performing a plurality of processing steps including at least:

- (a) creating an Internal Message Object (IMO) from at least aspects of the quanta of data,
 - (b) characterizing aspects of the quanta of data including at least by a type, and
 - (c) completing a routing operation, using at least a lookup facility and aspects of the destination address, yielding a delivery route; and
- selecting aspects of the IMO for dispatch via the delivery route.

2. The server-based method of claim 1 wherein the quanta of data is one of (a) a Short Message Service message, (b) a Multimedia Message Service message, (c) an IP Multimedia Subsystem message, (d) an Extensible Markup Language document, (e) audio data, (f) video data, (g) signaling data, or (h) application data.

3. The server-based method of claim 1 wherein the plurality of processing steps further comprises one or more transcoding operations.

4. Within an IP eXchange facility a processor-based system configured to direct a quanta of data, the processor-based system comprising:

a gateway configured to receive the quanta of data, the quanta of data comprising an originating address, a destination address, and a content;

workflow modules configured to perform a plurality of processing steps including at least:

- (a) create an Internal Message Object (IMO) from at least aspects of the quanta of data,
- (b) characterize aspects of the quanta of data including at least by a type, and
- (c) complete a routing operation, using at least a lookup facility and aspects of the destination address, yielding a delivery route;

a gateway configured to select aspects of the IMO for dispatch via the delivery route;
a repository configured to preserve aspects of the results of the plurality of processing steps; and

an administrator.

5. The processor-based system of claim 4 wherein the quanta of data is one of (a) a Short Message Service message, (b) a Multimedia Message Service message, (c) an IP Multimedia Subsystem message, (d) an Extensible Markup Language document, (e) audio data, (f) video data, (g) signaling data, or (h) application data.

6. The processor-based system of claim 4 wherein the plurality of processing steps further comprises one or more transcoding operations.